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GENERAL

0

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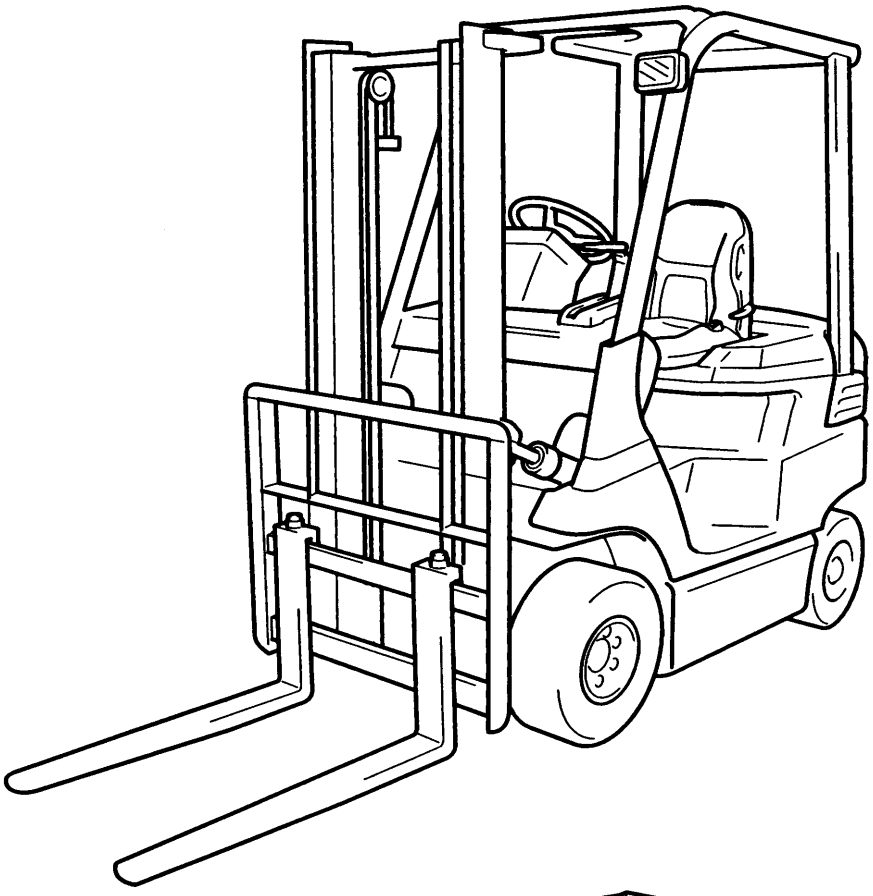
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EXTERIOR VIEWS





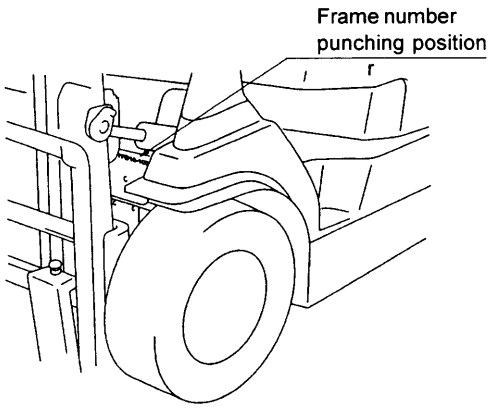
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VEHICLE MODEL

Classification		Vehicle model	Controller type	Voltage (V)
Series	Model			
1 ton series	1.0 ton model	7FB10	AC Micon controller	48
		7FBH10	↑	↑
	1.35 ton model	7FB14	↑	↑
		7FBH14	↑	↑
	1.5 ton model	7FB15	↑	↑
		7FBH15	↑	↑
		40-7FB15	↑	↑
	1.8 ton model	7FB18	↑	↑
		7FBH18	↑	↑
2 ton series	2.0 ton model	7FB20	↑	↑
		7FBH20	↑	↑
		40-7FB20	↑	↑
	2.5 ton model	7FB25	↑	↑
		7FBH25	↑	↑
		40-7FB25	↑	↑
3 ton series	3.0 ton model	7FB30	↑	80
	3.5 ton model	7FBJ35	↑	↑

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FRAME NUMBER

	Drive motor model	Vehicle model	Punching format	Punching position
1 ton series	AP11	7FB10	7FB18–10001	
		7FBH10		
		7FB14		
		7FBH14		
		7FB15		
		7FBH15		
		7FB18		
		7FBH18		
2 ton series	AP15	40-7FB15	7FB25–10001	
		7FB20		
		7FBH20		
		7FB25		
		7FBH25		
	AP15	40-7FB20	407FB25–10001	
		40-7FB25		
3 ton series	AP16	7FB30	7FBJ35–10001	
		7FBJ35		

Note: © in place of [–] on vehicles for EEC.

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HOW TO USE THIS MANUAL

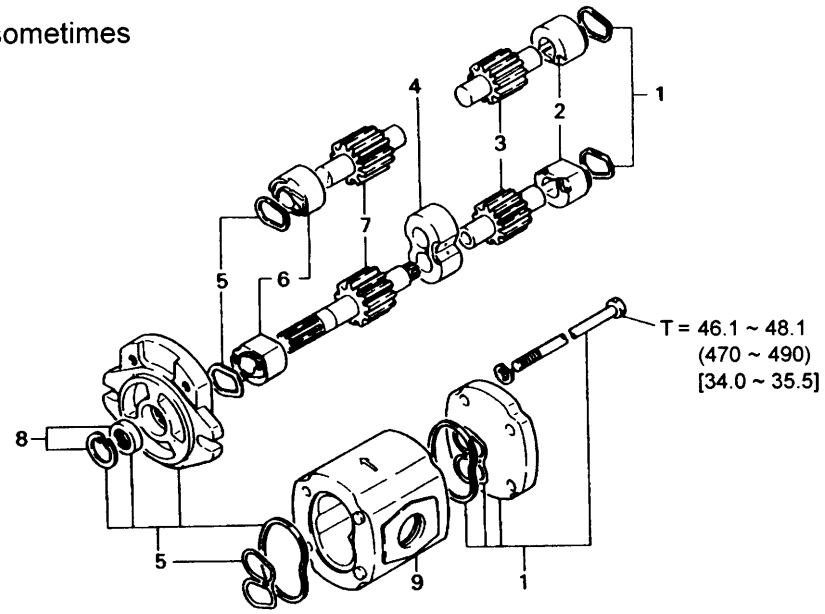
EXPLANATION METHOD

1. Operation procedure
   (1) The operation procedure is described in either pattern A or pattern B below.
   Pattern A: Explanation of each operation step with illustration.
   Pattern B: Explanation of operation procedure by indicating step numbers in one illustration, followed by explanation of cautions and notes summarized as point operations.

Example of description in pattern B

DISASSEMBLY·INSPECTION·REASSEMBLY Tightening torque unit T = N·m(kgf-cm)[ft-lbf]

- Step Nos. are partially sometimes omitted in illustrations.



Disassembly Procedure

1 Remove the cover. **[Point 1]**

2 Remove the bushing **[Point 2]** ← Operation explained later

3 Remove the gear.

Point Operations

Explanation of key point for operation with an illustration

[Point 1]
Disassembly: Put a match mark when removing the pump cover.

[Point 2]
Inspection: Measure the bush inside diameter.

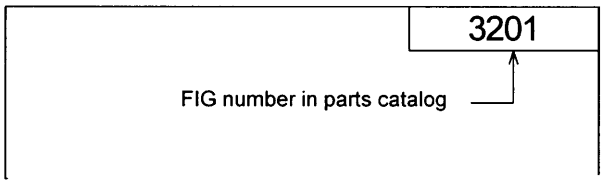
Limit: 19.12 mm (0.7528 in)

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2. How to read components figures

(1) The components figure uses the illustration in the parts catalog for the vehicle model. Please refer to the catalog for checking the part name.
The number at the right shoulder of each components figure indicates the Fig. number in the parts catalog.

(Example)



3. Matters omitted in this manual

(1) This manual omits description of the following jobs, but perform them in actual operation:
① Cleaning and washing of removed parts as required
② Visual inspection (partially described)

TERMINOLOGY

Caution:
Important matters of which negligence may cause accidents. Be sure to observe them.

Note:
Important items of which negligence may cause accidents, or matters in operation procedure requiring special attention.

Standard: Values showing allowable range in inspection and adjustment.
Limit: Maximum or minimum allowable value in inspection or adjustment.

ABBREVIATIONS

Abbreviation (code)	Meaning	Abbreviation (code)	Meaning
ASSY	Assembly	SAS	System of active stability
LH	Left hand	SST	Special service tool
LLC	Long life coolant	STD	Standard
M/T	Manual transmission	T=	Tightening torque
OPT	Option	T/C	Torque converter & transmission
O/S	Oversize	OOT	Number of teeth (OO)
PS	Power steering	U/S	Undersize
RH	Right hand	W/	With
SAE	Society of Automotive Engineers (USA)	L/	Less

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SI UNITS

Meaning of SI

SI represents the International System of Units, which has been established for unifying various systems of units used in the past, for smoother international technical communication.

New Units Adopted in SI

Characteristic	New unit	Conventional unit	Conversion rate*1 (1 [conventional unit] = X [SI unit])
Force*2	N (newton)	kgf	1 kgf = 9.80665 N
Torque*2 (moment)	N·m	kgf·cm	100 X kgf·cm = 9.80665 N·m
Pressure*2	P (pascal)	kgf/cm^2	1 kgf/cm^2 = 98.0665 kPa = 0.0980665 MPa
↑	↑	mmHg	1 mmHg = 0.133322 kPa
Revolving speed	r/min	rpm	1 rpm = 1 r/min
Spring constant*2	N/mm	kgf/mm	1 kgf/mm = 9.80665 N/mm
Volume	L	cc	1 cc = 1 mL
Power	W	PS	1 PS = 0.735499 kW
Heat quantity	W·h	cal	1 kcal = 1.16279 W·h
Specific fuel consumption	g/W·h	g/PS·h	1 g/PS·h = 1.3596 g/kW·h

<Reference>
*1: X represents the value in SI unit as converted from 1 [in conventional unit], which can be used as the rate for conversion between conventional and SI units.
*2: In the past, kilogram [kg] representing the mass was often used in place of weight kilogram [kgf] that should be used as the unit of force.

Conversion between Conventional and SI Units

Value in SI unit = Conversion rate × value in conventional unit	Conversion rate: Figure corresponding to X in the conversion rate column in the table above
Value in conventional unit = Value in SI unit ÷ Conversion rate	

Caution:
At the time of conversion, change the unit of the value in conventional or SI unit to the one in the conversion rate column in the table above before calculation. When converting 100 W to the value in conventional unit PS, change it to 0.1 kW first and divide by 0.735499 as the conversion rate.

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OPERATIONAL TIPS

1. Safe operation
   (1) After jacking up, always support with wooden blocks or rigid stands.
   (2) When hoisting the vehicle or its heavy component, use wire rope(s) with a sufficient reserve in load capacity.
   (3) Always disconnect the battery plug before the inspection or servicing of electrical parts.

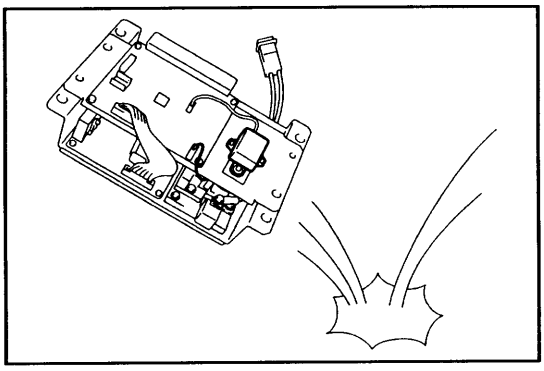
2. Tactful operation
   (1) Prepare the mechanic tools, necessary measuring instruments (circuit tester, megger, oil pressure gauge, etc.) and SSTs before starting operation.
   (2) Before disconnecting wiring, always check the cable color and wiring state.
   (3) When overhauling functional parts, complicated portions or related mechanisms, arrange the parts neatly to prevent confusion.
   (4) When disassembling and inspecting such a precision part as the control valve, use clean tools and operate in a clean location.
   (5) Follow the described procedures for disassembly, inspection and reassembly.
   (6) Replace, gaskets, packing and O-rings with new ones each time they are disassembled.
   (7) Use genuine Toyota parts for replacement.
   (8) Use specified bolts and nuts. Observe the specified tightening torque at the time of reassembly. (Tighten to the center of the specified tightening torque range.)
   If no tightening torque is specified, tighten the bolt or nut according to the standard tightening torque table.

3. Protection of functional parts
   (1) Thoroughly check each connector for any failure in or imperfect connection before reconnecting the battery plug after the end of vehicle inspection or maintenance.
   Failure in or imperfect connection of connectors related to controllers, especially, may damage elements inside the controllers.

4. Confirming defect status
   Do not start immediate disassembly or replacement, but first confirm if such disassembly or replacement is actually needed.

5. Handling of waste fluid, etc.
   When draining waste fluid from the vehicle, always receive it with an appropriate container.
   Since careless or arbitrary discharge or disposal of oil, fuel, coolant, oil filter, battery or any other harmful substance may cause adverse affect to people or environmental destruction, sort each waste and always ask an authorized contractor for appropriate disposal.

6. Handling of electronic parts



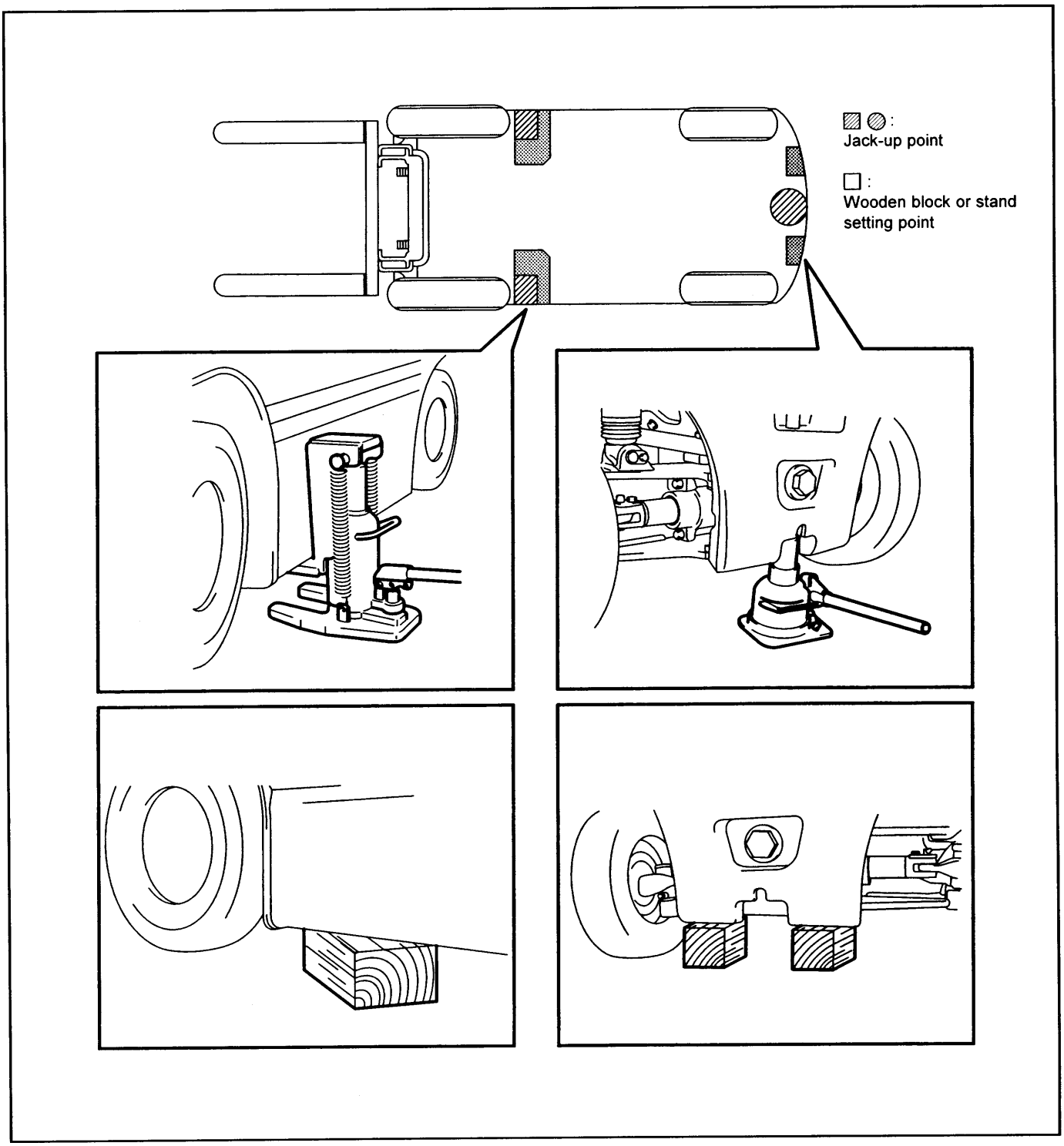
   (1) Never apply impacts to electronic parts such as a microcomputer or relay.
   (2) Never let electronic parts be exposed to a high temperature or humidity.
   (3) Do not touch connector pins since they may be deformed or be damaged due to static electricity.

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JACK-UP POINT

Strictly observe the following instructions when jacking up the vehicle.

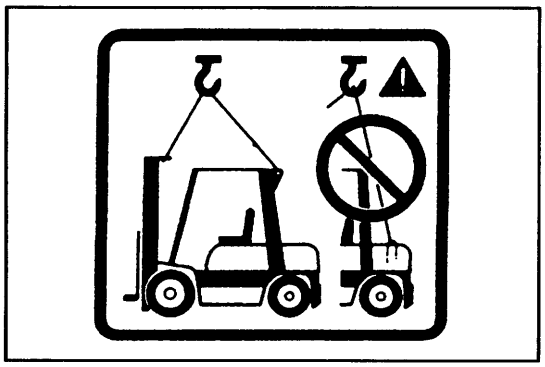
- When a load is on the fork, unload it and park the vehicle on a flat floor. Be sure to avoid an inclined or rugged place.
- Use a jack with ample capacity and jack up the vehicle at the specified jack-up point. Jacking up at any other point will be dangerous.
- Never operate while the vehicle is held with a jack. Always support the frame with a wooden block after jacking up.
- In any case, never let a part of the body (including hands and feet) be under the jacked-up vehicle.



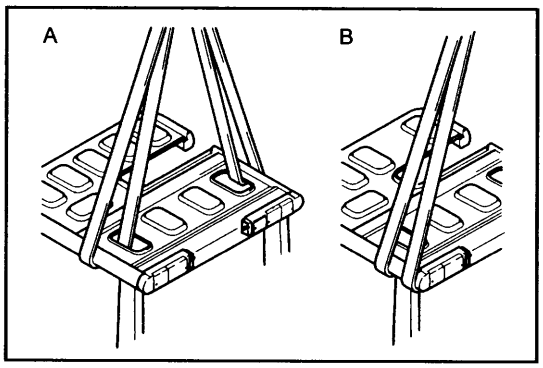
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HOISTING THE VEHICLE

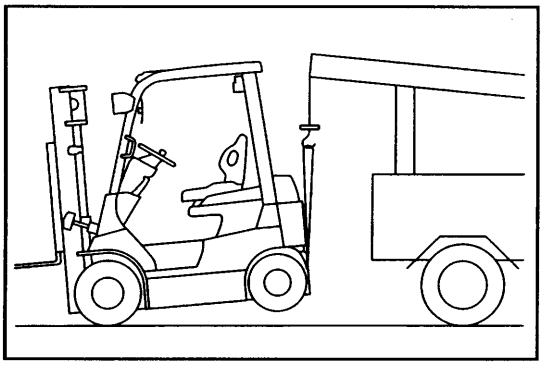
Always hoist each part of the vehicle at the specified position. Never hoist at any other position because it is very dangerous.

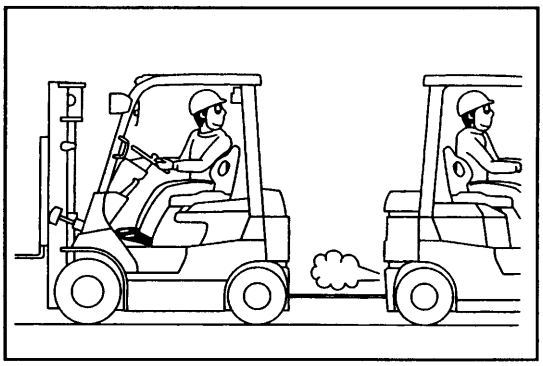


When hoisting the vehicle, sling with a fiber or wire rope at the mast hook hole and the rear end of the head guard.



Slinging the head guard can be done in two illustrated ways.
Case A:
Remove the head guard sheet.
case B:
If the fiber or wire rope comes into contact with a rear combination lamp, remove the lamp ASSY.





CAUTION FOR TOWING

1. When towing the forklift, always lift the rear wheels away from the ground.
2. The traveling speed in towing must not exceed the maximum traveling speed of the forklift.
3. Always set the key switch to OFF and the direction switch to the neutral position before starting towing. In case of towing by connection with a wire rope with the operator on the forklift, however, set the key switch to ON (PS operation) and always set the direction switch to the neutral position.
4. Before towing, either remove the fork or take an action to prevent fork contact with the ground due to bounding.

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ATTENTIVE POINTS ON SAS

1. Read Section 18 SAS "Precautions for Repair" on Page 18-9 in this repair manual in advance.

2. Whenever the repair or replacement is performed to the place where relative to SAS function, re-setting procedure by which the SAS regain proper function must be performed. (See Page 18-19)

3. The warning on the SAS caution label must be confirmed when the modification or change is such as to change the original specification.
   If improper, change the label. (See Page 18-10-1)

4. Care should always be exercised for safety operation whenever you operate the truck.
   Make distinction between the SAS featured trucks and those of none, because the control features are different.

5. The SAS oil control valves comprise many precision valves. Since dirty or contaminated hydraulic oil will adversely affect the functions of these valves, always wash the parts clean at the time of installation after disassembly or for replacement of hydraulic parts (valves, piping, etc.). Periodic replacement of the hydraulic oil is very important.

6. Since this vehicle uses high-precision electronic devices, modification of electrical parts may cause faults. Always use genuine Toyota parts when replacing or installing electrical parts (auxiliary equipment, optional parts, etc.).

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CIRCUIT TESTER

Circuit testers are available in both the analog and digital types. They should be used selectively according to the purpose of measurement.

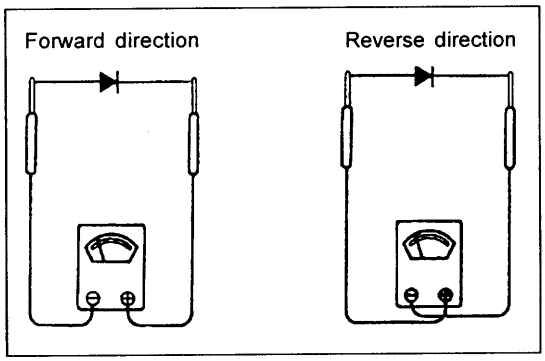
Analog type: This type is convenient for observing movement during operation, but the measured value should only be used for reference or rough judgement.

Digital type: Fairly accurate reading is possible, but it is difficult to observe the variation or movement.

1. Difference in measurement results with the digital type and analog type

   * The result may be different between measurements with the analog type and digital type. Always use a circuit tester according to its operation manual. Cautions when the polarities are different between the analog type and digital type are described below.

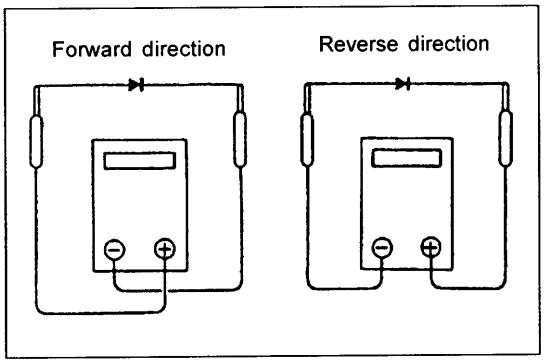
   (1) Analog circuit tester



Measurement result example
Tester range: kΩ range

	Analog type
Forward	Continuity exists
	11 kΩ
Reverse	No continuity
	∞

   (2) Digital circuit tester

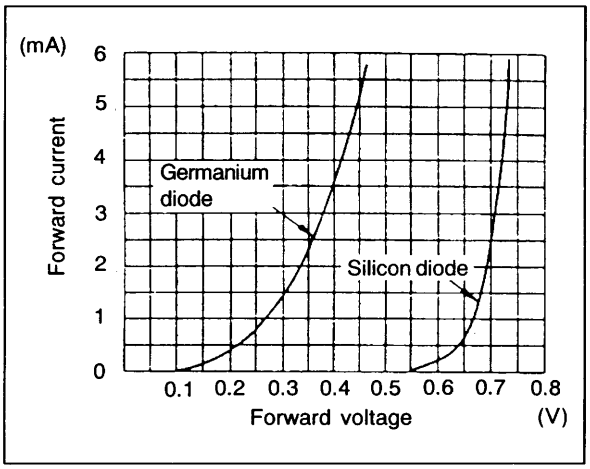


Measurement result example
Tester range: MΩ range

	Digital type
Forward	No continuity
	1
Reverse	Continuity exists
	2 MΩ

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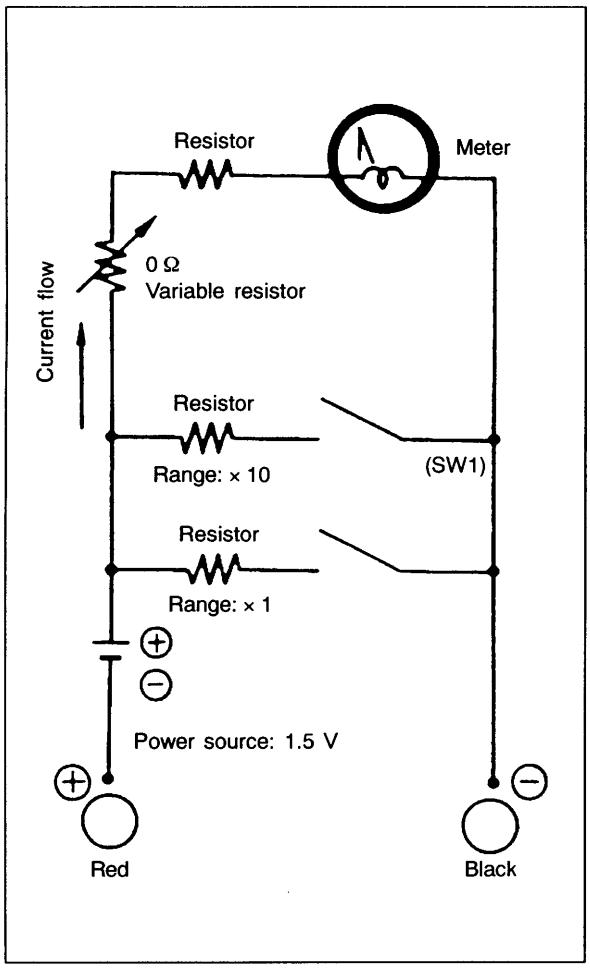
2. Difference in result of measurement with circuit tester
The circuit tester power supply voltage depends on the tester type. 1.5 V, 3.0 V or 6.0 V is used.
The resistance of a semiconductor such as a diode varies with the circuit tester power supply voltage.
The diode characteristics are shown in the figure below.



The resistance values of the same semiconductor measured with two types of circuit testers having different power supply voltages are different.

This manual describes the results of measurement with a circuit tester whose power supply voltage is 3.0 V.

3. Difference in measurement result by measurement range (analog type)
In the analog type circuit tester, changing the measurement range switches over the internal circuit to vary the circuit resistance. Even when the same diode is measured, the measurement result varies with the measurement range.



Always use the range described in the repair manual for measurement.

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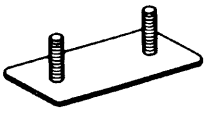
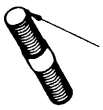
STANDARD BOLT & NUT TIGHTENING TORQUE

Standard bolt and tightening torques are not indicated.
Judge the standard tightening torque as shown below.

1. Find out the type of the bolt from the list below and then find the bolt tightening torque from the table.
2. The nut tightening torque can be judged from the mating bolt type.

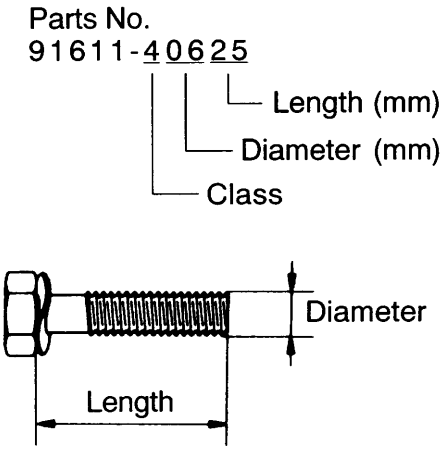
BOLT STRENGTH TYPE IDENTIFICATION METHOD

1. Identification by bolt shape

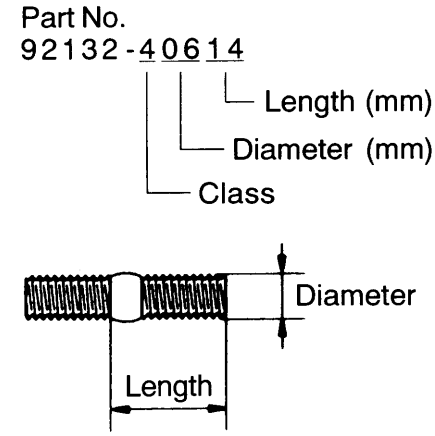
	Shape and class	Class
Hexagon head bolt	 Bolt head No.	4 = 4T 5 = 5T 6 = 6T 7 = 7T 8 = 8T
	 No mark	4T
Hexagon flange bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T
Welded bolt		4T
Stud bolt	 No mark	4T
	 Grooved	6T

2. Identification by part No.

Hexagon head bolt



Stud bolt

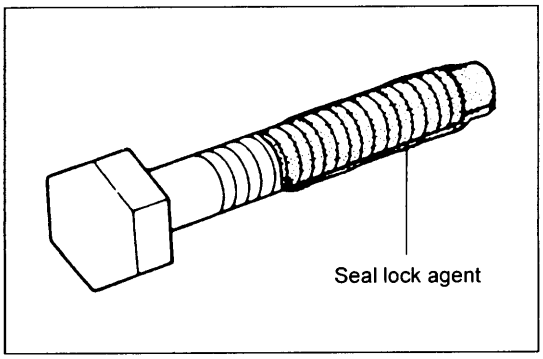


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TIGHTENING TORQUE TABLE

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt 			Hexagon flange bolt 		
			N·m	kgf-cm	ft-lbf	N·m	kgf-cm	ft-lbf
4T	6	1.0	5.4	55	48 in-lbf	5.9	60	52 in-lbf
	8	1.25	13	130	9	14	145	10
	10	1.25	25	260	19	28	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	75	760	55	83	850	61
	16	1.5	113	1150	83	—	—	—
5T	6	1.0	6.4	65	56 in-lbf	7.5	75	65 in-lbf
	8	1.25	16	160	12	18	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1050	76
	16	1.5	137	1400	101	157	1600	116
6T	6	1.0	7.8	80	69 in-lbf	8.8	90	78 in-lbf
	8	1.25	19	195	14	21	215	16
	10	1.25	38	400	29	43	440	32
	12	1.25	72	730	53	79	810	59
	14	1.5	110	1100	80	123	1250	90
	16	1.5	170	1750	127	191	1950	141
7T	6	1.0	11	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	103	1050	76
	14	1.5	147	1500	108	167	1700	123
	16	1.5	226	2300	166	—	—	—
8T	6	1.0	12	125	9	14	145	9
	8	1.25	29	300	22	32	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	108	1100	80	123	1250	90
	14	1.5	172	1750	127	196	2000	145
	16	1.5	265	2700	195	299	3050	221

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PRECOAT BOLTS

(Bolts with seal lock agent coating on threads)

1. Do not use the precoat bolt as it is in either of the following cases:
   (a) After it is removed.
   (b) When the precoat bolt is moved (loosened or tightened) by tightness check, etc.

   Note:
   For torque check, use the lower limit of the allowable tightening torque range. If the bolt moves, re-tighten it according to the steps below.

2. Method for reuse of precoat bolts
   (1) Wash the bolt and threaded hole. (The threaded hole must be washed even for replacement of the bolt.)
   (2) Perfectly dry the washed parts by air blowing.
   (3) Coat the specified seal lock agent to the threaded portion of the bolt.

HIGH PRESSURE HOSE FITTING TIGHTENING TORQUE

1. When connecting a high pressure hose, wipe the hose fitting and mating nipple contact surfaces with clean cloth to remove foreign matters and dirt. Also check no dent or other damage on the contact surfaces before installation.

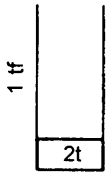
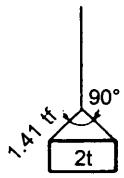
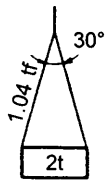
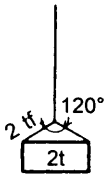
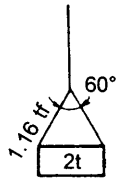
2. When connecting a high pressure hose, hold the hose to align the fitting with the nipple and tighten the fitting.

3. The maximum tightening torque must not exceed twice the standard tightening torque.

Nominal diameter of screw	Standard tightening torque N·m (kgf-cm)[ft-lbf]		Hose inside diameter mm (in)
	Standard	Tightening range	
7/16 — 20UNF	25 (250) [18.1]	24 ~ 26 (240 ~ 270) [17.4 ~ 19.5]	6 (0.24)
9/16 — 18UNF	49 (500) [36.2]	47 ~ 52 (480 ~ 530) [34.7 ~ 38.3]	9 (0.35)
3/4 — 16UNF	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47)
7/8 — 14UNF	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47), 15 (0.59)
1·1/16 — 12UNF	118 (1200) [86.8]	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.4]	19 (0.75)
1·5/16 — 12UNF	137 (1400) [101.3]	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.4]	25 (0.98)
PF1/4	25 (250) [18.1]	24 ~ 26 (240 ~ 270) [17.4 ~ 19.5]	6 (0.24)
PF3/8	49 (500) [36.2]	47 ~ 52 (480 ~ 530) [34.7 ~ 38.3]	9 (0.35)
PF1/2	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47)
PF3/4	118 (1200) [86.8]	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.4]	19 (0.75)
PF1	137 (1400) [101.3]	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.4]	25 (0.98)

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WIRE ROPE SUSPENSION ANGLE LIST

Lifting angle	Tension	Compression	Suspension method	Lifting angle	Tension	Compression	Suspension method
0°	1.00 time	0 time		90°	1.41 time	1.00 time	
30°	1.04 time	0.27 time		120°	2.00 time	1.73 time	
60°	1.16 time	0.58 time					

SAFE LOAD FOR EACH WIRE ROPE SUSPENSION ANGLE

Unit: N (tf) [lbf]

Rope diameter	Cutting load	Single-rope suspension	Two-rope suspension				Four-rope suspension			
		0°	0°	30°	60°	90°	0°	30°	60°	90°
6 mm (0.24 in)	21380 (2.18) [4807]	3040 (0.31) [683.6]	6080 (0.62) [1367]	5880 (0.6) [1323]	5200 (0.53) [1169]	4310 (0.44) [970]	12160 (1.24) [2734]	11770 (1.2) [2646]	10400 (1.06) [2337]	8630 (0.88) [1940]
8 mm (0.32 in)	31480 (3.21) [7078]	4410 (0.45) [992.3]	8830 (0.9) [1985]	8530 (0.87) [1918]	7650 (0.78) [1720]	6280 (0.64) [1411]	17650 (1.8) [3969]	17060 (1.74) [3937]	15300 (1.56) [3440]	12550 (1.28) [2322]
10 mm (0.4 in)	49230 (5.02) [11.69]	6960 (0.71) [1565.6]	14020 (1.43) [3153]	13440 (1.37) [3021]	11770 (1.2) [2646]	9810 (1.0) [2205]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	19610 (2.0) [4410]
12.5 mm (0.5 in)	76880 (7.84) [17387]	10980 (1.12) [2469.5]	21570 (2.2) [4851]	21280 (2.1) [4631]	18630 (1.9) [4190]	14710 (1.5) [3308]	43150 (4.4) [9702]	41190 (4.2) [9261]	37270 (3.8) [8379]	29420 (3.0) [6615]
14 mm (0.56 in)	96400 (9.83) [21675]	13730 (1.4) [3087]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	18630 (1.9) [4190]	54920 (5.6) [12348]	52960 (5.4) [11907]	47070 (4.8) [10584]	37270 (3.8) [8379]

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COMPONENTS WEIGHT

Member weight list

Unit: kg

Member	Vehicle model	Weight
Battery ASSY	See page 1-2	
Drive motor ASSY	See page 6-2	
Pump motor ASSY	See page 6-8	
Front axle & drive unit W/drive motor	1 ton series (excluding 40-7FB15)	Approx. **250**
	2 ton series (excluding 40-7FB20·25), and 40-7FB15	Approx. 280
	3.0 ton·J3.5 ton, and 40-7FB20·25	Approx. 400
Rear axle ASSY	1 ton series	Approx. 75
	2 ton series	Approx. 75
	3.0 ton·J3.5 ton	Approx. 85
Counterweight	1.0 ton (*1)	Approx. 400 (*1 Approx. 415)
	1.35 ton	Approx. 470
	1.5 ton (*1) (*2)	Approx. 545 (*1 Approx. 545) (*2 Approx. 700)
	1.8 ton	Approx. 720
	2.0 ton	Approx. 825
	2.5 ton (*1) (*2)	Approx. 1205 (*1 Approx. 1165) (*2 Approx. 915)
	3.0 ton	Approx. 1380
	J3.5 ton	Approx. 1800
Oil control valve	Approx. 20	
Oil pump	Approx. 4	
Seat stand ASSY	Approx. 45	
V mast ASSY W/lift bracket (W/lift cylinder, L/fork, lifting height: 3,000 mm)	1 ton series (excluding 40-7FB15)	Approx. 410
	2 ton series (excluding 40-7FB20·25) and 40-7FB15	Approx. 465
	3 ton	Approx. 570
	J3.5 ton	Approx. 680

*1 : 7FBH series *2 : 40-7FB series

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RECOMMENDED LUBRICANT QUANTITY & TYPES

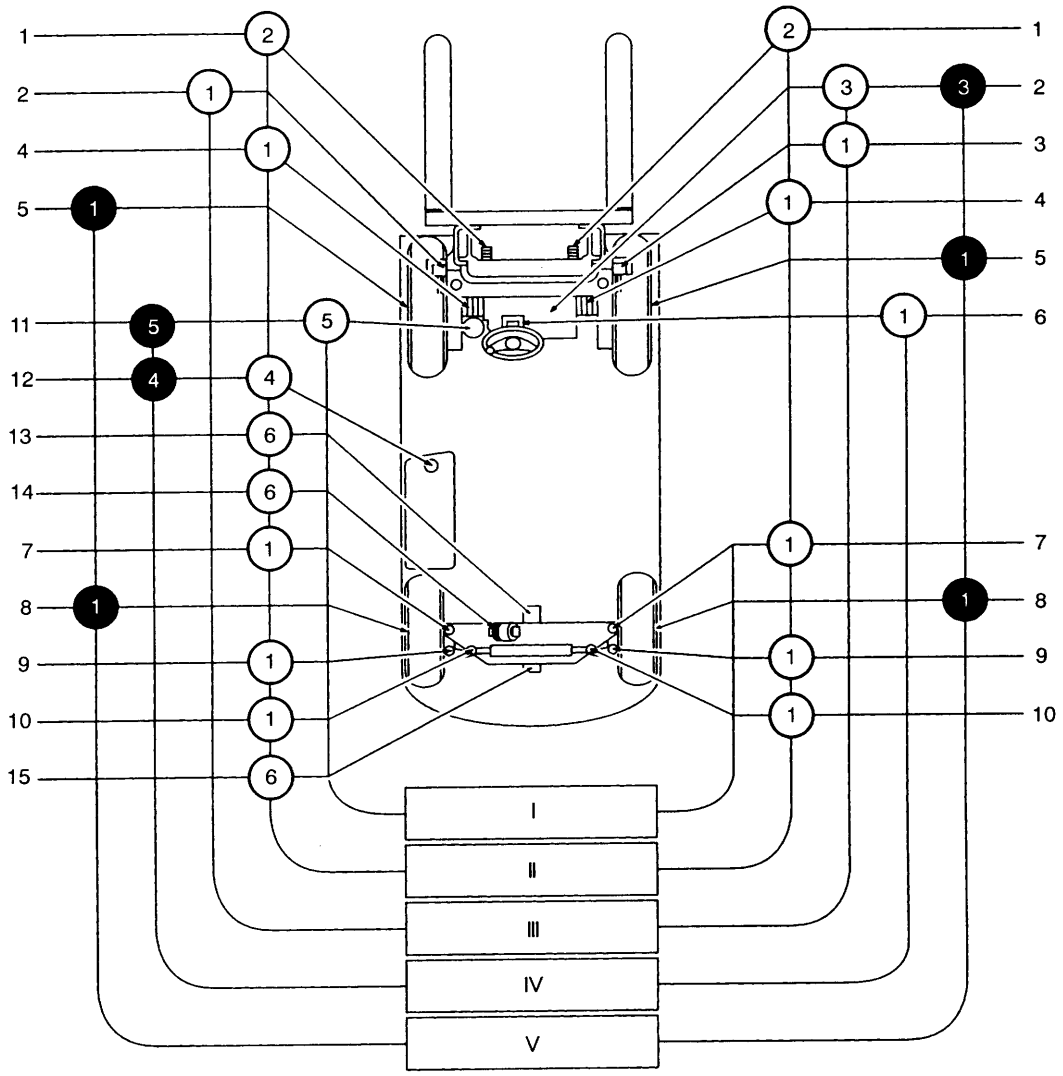
Amounts and Types of Specified Lubricants

Applicable portion	Type		
Drive unit	Hypoid Gear Oil (SAE75W-80W)	1 ton series (excluding 40-7FB15)	4.0 ℓ
		2 ton series (excluding 40-7FB20·25), and 40-7FB15	4.2 ℓ
		3.0 ton·J3.5 ton, and 40-7FB20·25	6.5 ℓ
		Values shown above are for reference. See page 7-8 for details.	
Hydraulic oil*: Total amount, with tank capacity in ( )	STD models: Hydraulic Oil (ISO VG32) Refrigerator model: Mobil Aero HFE	1 ton series	18 ℓ (13 ℓ)
		2 ton series (excluding 40-7FB20·25)	18 ℓ (13 ℓ)
		40-7FB20·25	20.5 ℓ (15.3 ℓ)
		3.0 ton	20.5 ℓ (15.3 ℓ)
		J3.5 ton	26.5 ℓ (21.6 ℓ)
Brake line	STD models: SAE J-1703 DOT-3 Refrigerator model 45S: Brake fluid Arctic S	Appropriate amount	
Chassis parts	MP Grease	Appropriate amount	
Battery	Distilled water	Appropriate amount	

*Standard mast

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LUBRICATION CHART



O	Inspection and supply
●	Replacement
①	MP Grease
②	Engine Oil
③	Hypoid gear Oil (SAE75W-80W)
④	Hydraulic Oil (ISO VG32)
⑤	Brake Fluid Refrigerator type S45: Brake Fluid Arctic S
⑥	Molybdenum disulfide gress

I.	Inspect every 8 hours (daily)
II.	Inspect every 40 hours (weekly)
III.	Inspect every 170 hours (monthly)
IV.	Inspect every 1000 hours (6 monthly)
V.	Inspect every 2000 hours (annual)

1	Chain
2	Drive unit
3	Tilt cylinder front pin
4	Mast support bush
5	Front wheel bearing
6	Tilt steering lock mechanism
7	Steering knuckle king pin
8	Rear wheel bearing
9	Tie rod end pin
10	Rear axle cylinder end pin
11	Brake master cylinder
12	Oil tank
13	Rear axle beam front pin
14	Swing lock cylinder lower pin
15	Rear axle beam rear pin

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PERIODIC MAINTENANCE

INSPECTION METHOD

I : Inspection·Repair or replacement if required.
M : Measurement·Repair or adjustment if required.
T : Retightening C: Cleaning L: Lubrication
* : For new vehicle *1: Flaw detector

Item \ Inspection Period		Every month Every 170 hours	Every 3 months Every 500 hours	Every 6 months Every 1000 hours	Every 12 months Every 2000 hours
ELECTRICAL SYSTEM					
Motor	Rotation sound	I	←	←	←
	Looseness in the connecting parts	T	←	←	←
	Insulation resistance		M	←	←
	Brush wear and sliding condition (For PS motor only)			I	←
	Commutator contamination, damage (For PS motor only)			I	←
	Brush, spring wear (For PS motor only)				M
Battery	Charging level	I	←	←	←
	Electrolyte level	I	←	←	←
	Electrolyte specific gravity	M	←	←	←
	Terminal looseness	I	←	←	←
	Abnormality in the upper portion of the battery case	I	←	←	←
	Insulation resistance		M	←	←
	Voltage measurement of each battery cell after charging				M
Charger	Timer function	I	←	←	←
	Terminal looseness	I	←	←	←
	HVR function voltage measurement		M	←	←
	Operating condition of the magnetic switch, contact contamination, roughness				I

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Item \ Inspection Period		Every month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Magnet contactor	Contact looseness, damage, abrasion	I	←	←	←
	Operating condition of the auxiliary contact, contamination, abrasion	I	←	←	←
	Mounting condition of the arc shooter				I
	Operating condition and timings				I
	Looseness of the coil mounting parts				I
	Mounting condition of the main circuit lead wire, looseness				I
Microswitch	Operating condition and timing	I	←	←	←
	Damage and looseness of installing parts	I	←	←	←
Direction switch	Operation condition, damage	I	←	←	←
Controller	Operation condition	I	←	←	←
	Interior contamination, damage	C	←	←	←
	Motor input voltage				M
Fuse	Looseness	I	←	←	←
Wiring (including charging cord)	Harness deterioration, champ damage and looseness	I	←	←	←
	Looseness in connecting parts, taping condition	I	←	←	←
	Connecting condition and damage of the battery connector	I	←	←	←
POWER TRANSFER SYSTEM					
Drive unit	Oil leakage	I	←	←	←
	Oil level	I	←	←	←
	Bolt or nut looseness				T
DRIVE SYSTEM					
Wheels	Tire inflation pressure	M	←	←	←
	Tire cuts, damage and uneven wearing	I	←	←	←
	Loose rim and hub nuts	T	←	←	←
	Tire groove depth	M	←	←	←
	Metal chips, pebbles and other foreign matter trapped in tire grooves	I	←	←	←
	Rim, side bearing and disc wheel damage	I	←	←	←
	Abnormal sound and looseness of front wheel bearing	I	←	←	←

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Item	Inspection Period	Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Wheel	Abnormal sound and looseness of rear wheel bearing	I	←	←	←
Front axle	Cracks, damage and deformation of housing				I
Rear axle	Cracks, damage and deformation of beam				I
	Looseness of axle beam in vehicle longitudinal direction	M*			M
STEERING SYSTEM					
Steering wheel	Play and looseness	I	←	←	←
	Function	I	←	←	←
Steering valve	Oil leak	I	←	←	←
	Looseness of mounting	T	←	←	←
Power steering	Oil leak	I	←	←	←
	Mounting and linkage looseness	I	←	←	←
	Damage of power steering hose				I
Knuckle	King pin looseness	I	←	←	←
	Cranks and deformation				I
BRAKING SYSTEM					
Brake pedal	Play and reserve	M	←	←	←
	Braking effect	I	←	←	←
Parking brake	Operating force	I	←	←	←
	Braking effect	I	←	←	←
	Rod and cable looseness and damage	I	←	←	←
Brake pipe	Leak, damage and mounting condition	I	←	←	←
Reservoir tank	Leak and fluid level	I	←	←	←
Master cylinder and wheel cylinder	Function, wear, damage, leak and mounting looseness				I

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Item \ Inspection Period		Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Brake drum and brake shoe	Clearance between drum and lining	M	←	←	←
	Wear of shoe sliding portion and lining				I
	Drum wear and damage				I
	Shoe operating condition				I
	Anchor pin rusting				I
	Return spring fatigue				M
	Automatic adjuster function				I
Backing plate	Deformation, cracks and damage				I
	Loose mounting				T
MATERIAL HANDLING SYSTEM					
Forks	Abnormality of fork and stopper pin	I	←	←	←
	Misalignment between left and right fork fingers	I	←	←	←
	Cracks at fork root and welded part				I*1
Mast and lift bracket	Deformation and damage of each part and crack at welded part	I	←	←	←
	Mast and lift bracket looseness	I	←	←	←
	Wear and damage of mast support bushing				I
	Wear, damage and rotating condition of rollers	I	←	←	←
	Wear and damage of roller pins				I
	Wear and damage of mast trip	I	←	←	←
Chain and chain wheel	Tension, deformation and damage of chain	I	←	←	←
	Chain lubrication	I	←	←	←
	Abnormality of chain anchor bolt	I	←	←	←
	Wear, damage and rotating condition of chain wheel	I	←	←	←
Various attachments	Abnormality and mounting condition of each part	I	←	←	←
HYDRAULIC SYSTEM					
Cylinder	Loosening and damage of cylinder mounting	T	←	←	←
	Deformation and damage of rod, rod screw and rod end	I	←	←	←
	Cylinder operation	I	←	←	←
	Natural drop and natural forward tilt (hydraulic drift)	M	←	←	←

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Item	Inspection Period	Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Cylinder	Oil leak and damage	I	←	←	←
	Wear and damage of pin and cylinder bearing	I	←	←	←
	Lifting speed	M	←	←	←
	Uneven movement	I	←	←	←
Oil pump	Oil leak and abnormal sound	I	←	←	←
Hydraulic oil tank	Oil level and contamination	I	←	←	←
	Tank and oil strainer			C	←
	Oil leak	I	←	←	←
Control lever	Loose linkage	I	←	←	←
	Operation	I	←	←	←
Oil control valve	Oil leak	I	←	←	←
	Relief pressure measurement				M
	Relief valve and tilt lock valve functions	I	←	←	←
Hydraulic piping	Oil leak	I	←	←	←
	Deformation and damage	I	←	←	←
	Loose joint	T	←	←	←
SAFETY DEVICES, ETC.					
Head guard	Cracks at welded portion	I	←	←	←
	Deformation and damage	I	←	←	←
Back-rest	Loosening of mounting	T	←	←	←
	Deformation, crack and damage	I	←	←	←
Lighting system	Function and mounting condition	I	←	←	←
Horn	Function and mounting condition	I	←	←	←
Direction indicator	Function and mounting condition	I	←	←	←
Instruments	Functions	I	←	←	←
Backup buzzer	Function and mounting condition	I	←	←	←
Rear-view mirror	Dirt, damage	I	←	←	←
	Rear reflection status	I	←	←	←
Seat	Loosening and damage of mounting	I	←	←	←
	Seatbelt damage and function	I	←	←	←

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Item	Inspection Period	Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Body	Damage and cracks of frame, cross members, etc.				I
	Bolt looseness				T
SAS	Functions	I	←	←	←
	Loosening and damage at sensor mounting portion	I	←	←	←
	Damage, deformation, oil leakage and loosening of the mounting of functional parts	I	←	←	←
	Loosening and damage of wire harnesses	I	←	←	←
	Lock cylinder accumulator performance				I
	Rusting and corrosion of load sensor				I
Others	Grease up	L	←	←	←

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PERIODIC REPLACEMENT OF PARTS AND LUBRICANTS

● : Replacement

Replacement timing / Item	Every week	Every 0.5 month	Every months	Every 3 months	Every 6 months	Every 12 months
	Every 50 hours	Every 100 hours	Every 170 hours	Every 500 hours	Every 1,000 hours	Every 2,000 hours
Drive unit oil						●
Hydraulic oil					●	←
Hydraulic oil filter			● New vehicle initial replace-ment		●	←
Wheel bearing grease						●
Brake fluid					●	←
Brake master cylinder rubber parts						●
Wheel cylinder cup seals						●
Brake fluid reservoir hose						● Every 2 years
Power steering hose						● Every 2 years
Power steering rubber parts						● Every 2 years
Hydraulic hose						● Every 2 years
Chain						● Every 3 years
Swing lock cylinder						● Every 10,000 hours

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Totaldokument

Toyota 7FB 10-35

Var 250:e timme

Pos	Kontroll av:
0:0	**Grupp 0 Hel maskin**
0:1	Dörrar/luckor
0:2	Motviktsinfästning
0:3	Förarskydd/hytt
0:4	Batterilåsning
0:5	Skyltar/dekaler
0:6	Förarmiljö
0:7	Stol/mattor
0:8	Pedalgummin
0:9	Torkare/spolare
0:10	Provkörning test av samtliga funktioner
0:11	Smörjning enligt schema
0:12	SAS system, funktion
1:0	**Grupp 1 Motorer**
1:1	Missljud
1:2	Fastsättning/infästning
2:0	**Grupp 2 Kraftöverföring**
2:1	Oljenivå
2:2	Fastsättning
3:0	**Grupp 3 Bromsar/hjul**
3:1	Däck/hjul
3:2	Lufttryck däck
3:3	Hjulbultar/hjullager
3:4	Färdbroms, funktion/läckage
3:5	Parkeringsbroms
3:6	Bromsvätskenivå
3:7	Pedallänkage/pedalspel
4:0	**Grupp 4 Styrning**
4:1	Styrlänkar, kontroll
4:2	Slangar/rör, läckage
4:3	Styraxel/upphängning
5:0	**Grupp 5 Elsystem**
5:1	Belysning/körriktningsvisare
5:2	Instrument/kontrollampor
5:3	Signalhorn
5:4	P-broms-/Backalarm
5:5	Timmätare, avläsning
5:6	Färdväljare
5:7	Kablar/anslutningar
5:8	Transistorpanel
5:9	Accelerationspedal/fartreglage
5:10	Microbrytare
5:11	Kontaktorer/kontakter
5:12	Säkringar
5:13	Batterivätskenivå
5:14	Batteri, smuts/läckage
5:15	Batterianslutningar
5:16	Batteripoler reng./infettning
5:17	Batterihandskar, kontroll
6:0	**Grupp 6 Hydraulik**
6:1	Slangar/rör, läckage
6:2	Ventilreglage/länkage
6:3	Andningsfilter/ventilatorer
6:4	Oljenivå
7:0	**Grupp 7 Arbetsfunktion**
7:1	Lyftstativ
7:2	Gafflar
7:3	Lyftkedjor
7:4	Laststöd
7:5	Lyft-/tiltcylindrar

Var 500:e timme tillkommer:

1:0	**Grupp 1 Motorer**
1:3	Drivmotor, renblåsning
1:4	Pumpmotor, renblåsning
1:5	Styrp. motor, renblåsning
1:6	Motorer, isolationsprov
5:0	**Grupp 5 Elsystem**
5:18	Batteri, isolationsprov

Var 1000:e timme tillkommer:

1:0	**Grupp 1 Motorer**
1:7	Styrp.motorkol, kontroll
3:0	**Grupp 3 Bromsar/hjul**
3:9	Bromsvätska byte
3:10	Hjullager infettning
4:0	**Grupp 4 Styrning**
4:4	Slangar, kontroll
6:0	**Grupp 6 Hydraulik**
6:5	Hydraulolja, byte
6:6	Returfilter, byte
6:7	Sugfilter, rengöring/byte
6:8	Andningsfilter, reng./byte

Var 2000:e timme tillkommer:

0:0	**Grupp 0 Hel maskin**
0:13	Ram, kontroll av sprickor
0:14	Bultar/Muttrar, fastsättning
2:0	**Grupp 2 Kraftöverföring**
2:3	Drivaxel, oljebyte
2:4	Drivaxel, fastsättn./sprickor
3:0	**Grupp 3 Bromsar/hjul**
3:11	Hjulbroms, slitagekontroll
5:0	**Grupp 5 Elsystem**
5:19	Batteribelastningsprov
5:20	Motorström, mätning
6:0	**Grupp 6 Hydraulik**
6:9	Hydraultryck, kontroll
7:0	**Grupp 7 Arbetsfunktion**
7:6	Gafflar, gaffeltest

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BATTERY

Page

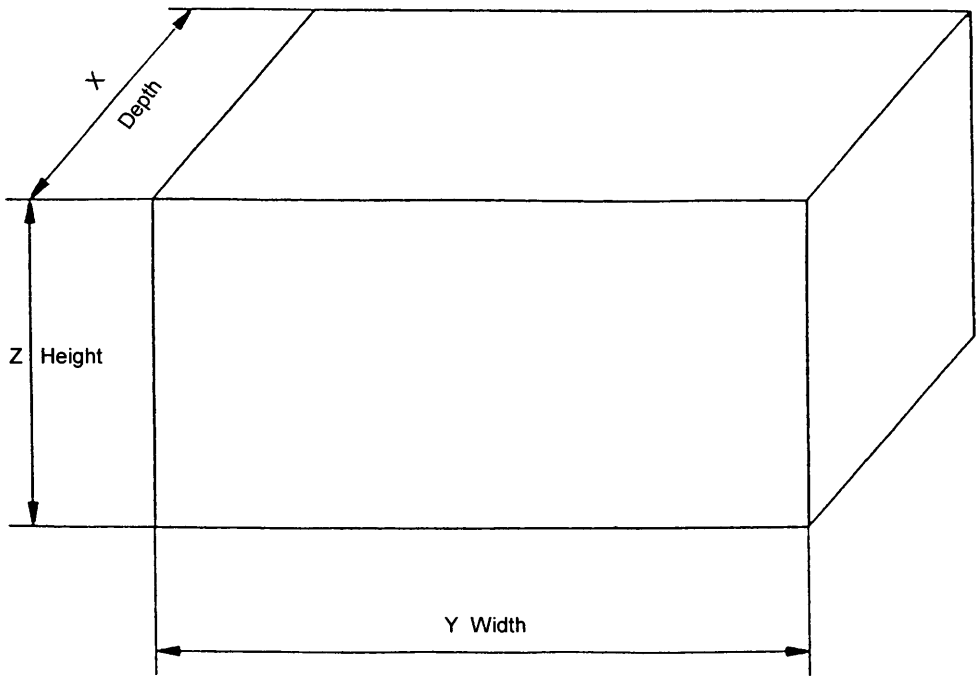
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BATTERY COMPARTMENT AND REQUIRED WEIGHT

When the battery is to be purchased locally, always adjust the weight to satisfy the minimum required weight as shown in the table below.

	Compartment dimensions mm (in)			Minimum required battery weight (with case) Kg (lb)	Remarks
	Depth X	Width Y	Height Z		
7FB10, 14	747 (29.4)	821 (32.3)	460 (18.1)	550 (1213)	
7FB15, 18				655 (1444)	
7FBH10 ~ 18			540 (21.3)	805 (1775)	
40-7FB15	822 (32.4)	911 (35.7)		855 (1885)	
7FB20			460 (18.1)	760 (1676)	
7FB25				825 (1819)	
7FBH20, 25			540 (21.3)	1045 (2304)	
40-7FB20, 25		954 (37.6)	570 (22.4)	1225 (2700)	
7FB30, J35				920 (2029)	

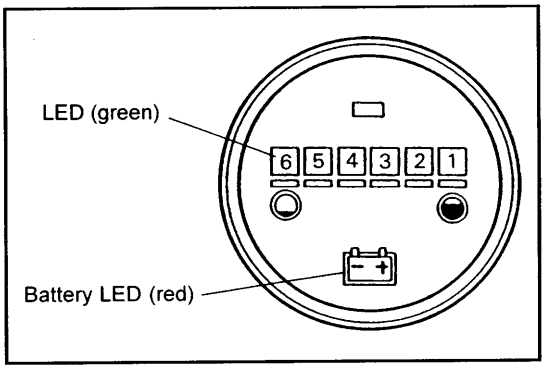


B098-040400-01

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SERVICE STANDARDS

Specific gravity upon perfect charging		1.280 [20°C (68°F)]
Specific gravity upon end of discharge		1.150 [20°C (68°F)]
Discharge end voltage	48 V specification	42.5 V
	80 V specification	68 V
Electrolyte		Refined dilute sulfuric acid
Added fluid		Distilled (deionized) water
Insulation resistance		1 MΩ or more



DISPLAY

Battery Capacity Indicator

The display lights up 6 LEDs (green) to indicate the battery capacity. When battery DISCHARGE reaches 100%, the overdischarge warning function is activated. This function, however, is limited to the vehicle with the display function.

Overdischarge Warning Function

1. When this function is activated, it becomes impossible to operate for traveling and material handling at a time. Simultaneous operation, if attempted, priority is given to traveling and material handling fails. (This prevent the battery from being damaged by large current flow.)

2. Soft starting in load lifting is delayed further to make the operator feel decrease of the remaining battery capacity.

Display

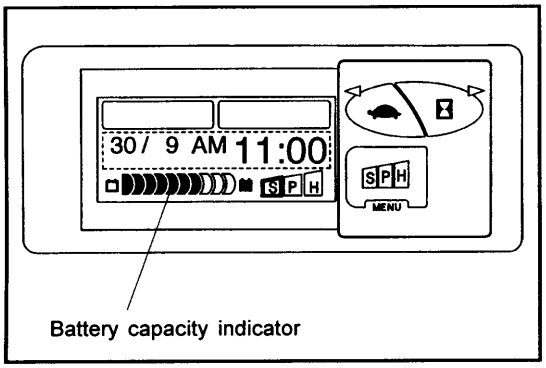
Battery discharged state (%)	LEDs (green) 6 E	5	4	3	2	1 F	Battery LED (red)
0 to 20 (exclusive)	o	o	o	o	o	o	x
20 to 35 (exclusive)	o	o	o	o	o	x	x
35 to 50 (exclusive)	o	o	o	o	x	x	x
50 to 65 (exclusive)	o	o	o	x	x	x	x
65 to 80 (exclusive)	o	o	x	x	x	x	x
80 to 90 (exclusive)	o	o	x	x	x	x	o
90 to 100 (exclusive)	o	x	x	x	x	x	o
100 or more	x	x	x	x	x	x	o

(Note) o: On, x: Off

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SERVICE STANDARDS (OPT)

Specific gravity upon perfect charging		1.280 [20°C (68°F)]
Specific gravity upon end of discharge		1.150 [20°C (68°F)]
Discharge end voltage	48 V specification	42.5 V
	80 V specification	68 V
Electrolyte		Refined dilute sulfuric acid
Added fluid		Distilled (deionized) water
Insulation resistance		1 MΩ or more



DISPLAY (OPT)

Battery Capacity Indicator

The battery capacity indicator indicates the charge in the battery in 10 levels by means of the LCD.

Remaining Battery Charge Warning

When the remaining battery capacity drops below the set level, the capacity display blinks and the alarm sounds for 5 seconds after the key switch is set to ON.

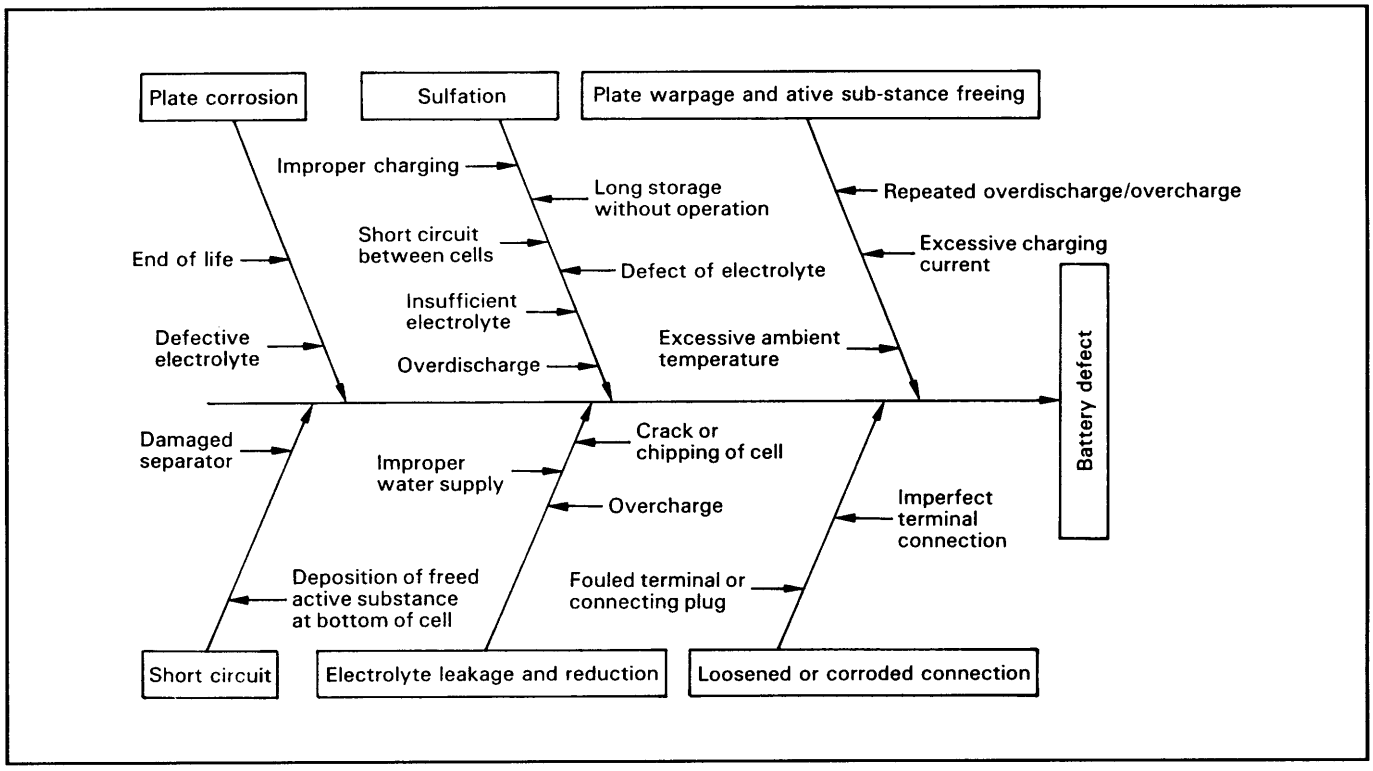
Overdischarge Warning Function

When the battery capacity decreases further below the set level after the remaining battery charge warning, drive or material handling operation, if tried, causes all capacity indicator segments to blink and the alarm sounds.

Battery discharged state (%)	LED display									
	10 F	9	8	7	6	5	4	3	2	1 E
0 to 10 (exclusive)	O	O	O	O	O	O	O	O	O	O
10 to 20 (exclusive)	–	O	O	O	O	O	O	O	O	O
20 to 30 (exclusive)	–	–	O	O	O	O	O	O	O	O
30 to 40 (exclusive)	–	–	–	O	O	O	O	O	O	O
40 to 50 (exclusive)	–	–	–	–	O	O	O	O	O	O
50 to 60 (exclusive)	–	–	–	–	–	O	O	O	O	O
60 to 70 (exclusive)	–	–	–	–	–	–	O	O	O	O
70 to 80 (exclusive)	–	–	–	–	–	–	–	O	O	O
80 to 90 (exclusive)	–	–	–	–	–	–	–	–	O	O
90 to 100 (exclusive)	–	–	–	–	–	–	–	–	–	O
100 or more	–	–	–	–	–	–	–	–	–	–

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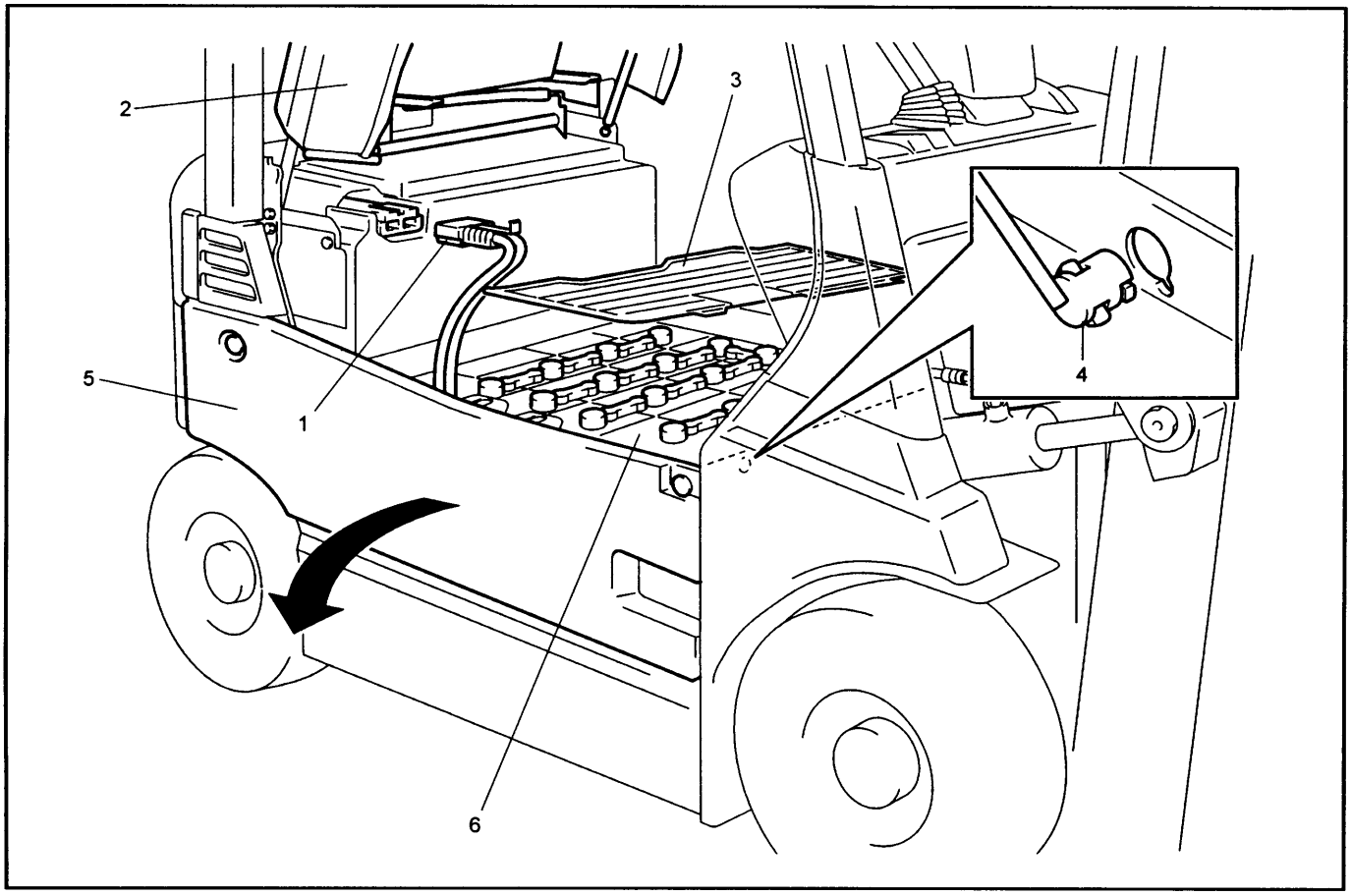
TROUBLESHOOTING



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BATTERY ASSY

REMOVAL·INSTALLATION

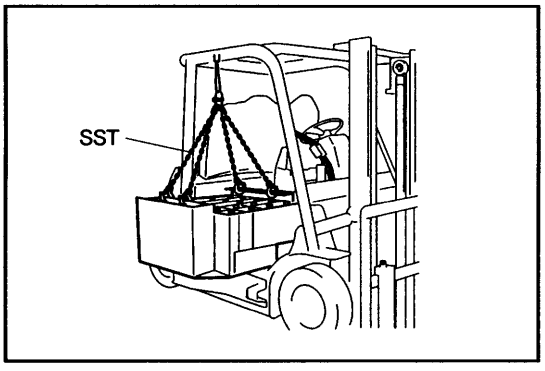


Removal Procedure

1 Disconnect the battery plug.
2 Open the seat stand.
3 Remove the floor mat and toe board.
4 Open the side hood RH.
5 Remove the battery stopper.
6 Remove the battery ASSY. **[Point 1]**

Installation Procedure

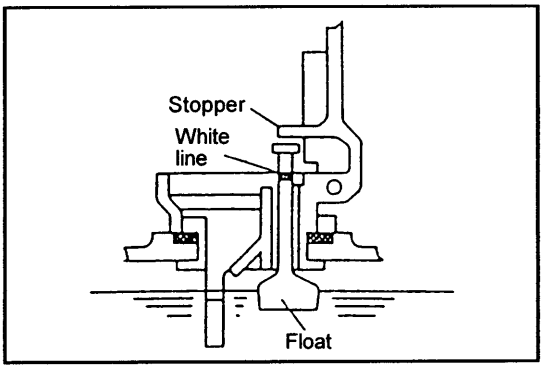
The installation procedure is the reverse of the removal procedure.

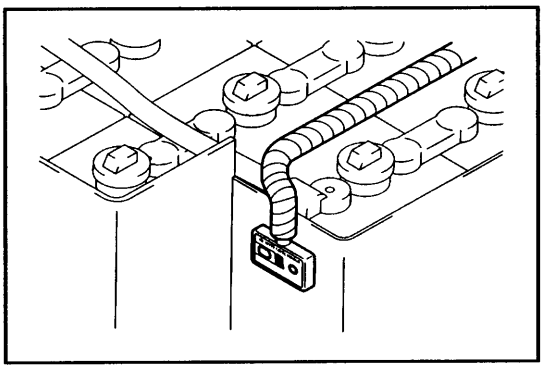


Point Operation

[Point 1]
Removal Installation:
SST 25009-13201-71

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INSPECTION

1. Electrolyte level inspection
   Open the cap, and, if the white line on the red float has fallen, add water until the white line appears.
   Since water addition is excessive if the float tip end comes into contact with the stopper, stop water addition as soon as the white line appears.

   Since a level gage is provided at a front of the battery case, the electrolyte level can generally be checked at a glance but check the level by opening the cap at the time of periodic inspection.
   The green lamp of the level gage comes on to indicate actuation of the level gage sensor, and the red lamp flashes to indicate the necessity of water addition.

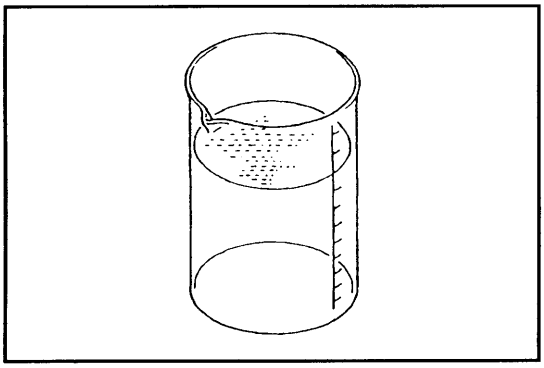
	Red lamp	Green lamp
Normal electrolyte level	Off	On
Insufficient electrolyte level	Flashing	On

Note:
Never change the mounting position of the plug with the sensor.

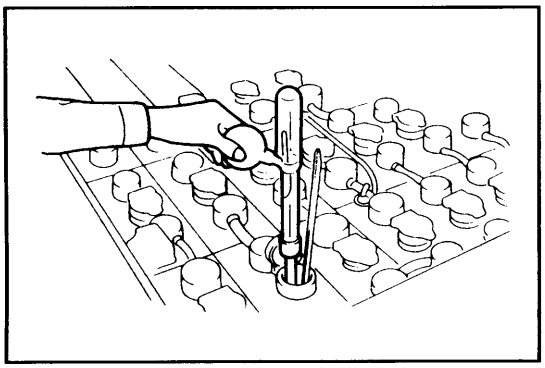
Reference
The consumption of the electrolyte can be calculated by the following equation:
Consumption (cc) = 5 hour capacity x 0.0336 x number of cells x number of charges

	Number of cells	Battery capacity (AH/5HR)
7FB10-14	24	330
7FB15-18	↑	400
7FBH10 ~ 18	↑	545
7FB20	↑	450
7FB25	↑	565
7FBH20-25	↑	730
7FB30-J35	**40**	370
40-7FB15	24	600
40-7FB20-25	↑	845

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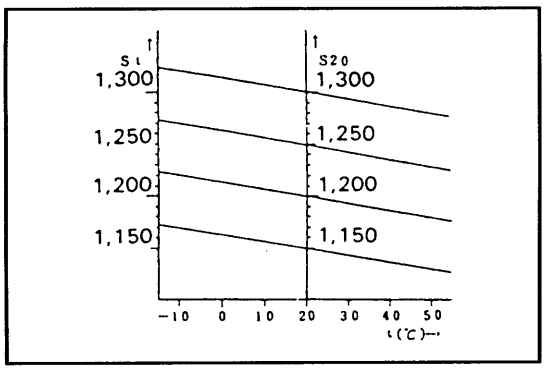


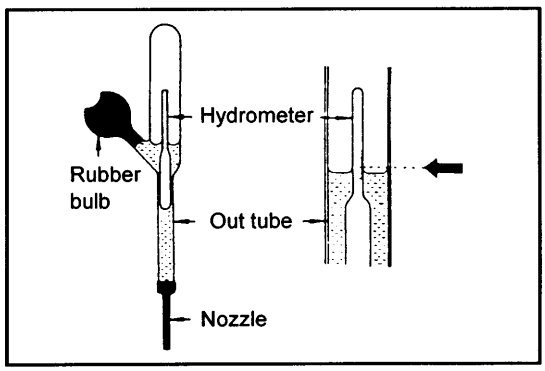
2. Electrolyte inspection
The battery electrolyte is colorless and transparent in normal state. Inspect any turbidity at the time of specific gravity inspection. If not checked clearly, put the electrolyte in a breaker for inspection.



3. Battery electrolyte specific gravity inspection
Use a hydrometer and measure the specific gravity of the electrolyte.
Specific gravity upon perfect charging:
1.280 at 20°C (68°F)
Specific gravity upon end of discharge:
1.150 at 20°C (68°F)
The specific gravity of the electrolyte is expressed with that at 20°C (68°F) as the standard.

Equation for converting specific gravity
$S_{20} = St + 0.0007 (t-20)$
S_{20}: Specific gravity at 20°C
St : Specific gravity at t°C
t : Electrolyte temperature (°C) at the time of measurement





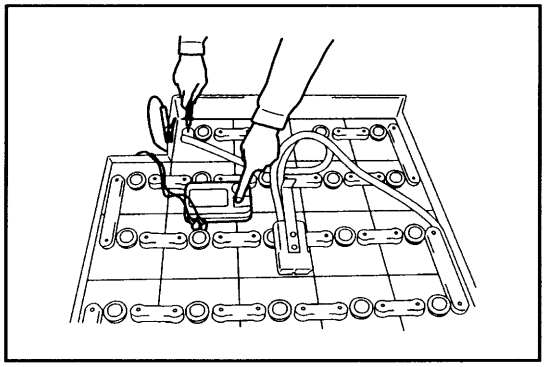
* How to use the hydrometer

① Insert the nozzle of the hydrometer into the electrolyte port and let the electrolyte be sucked into its outer tube.

② Make the hydrometer in the outer tube float correctly without contact with the outer tube, its top or bottom. Wait until the air bubbles in the sucked electrolyte disappear. Read the scale at the top of the raised portion of the surface as shown at left.

③ After the measurement, wash the inside and outside of the hydrometer with clear water, and wipe the hydrometer thoroughly with clean cloth for storage.

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4. Insulation resistance inspection
   Measure the resistance between the battery and battery case with an insulation resistance meter (megger).
   Insulation resistance value:
   1 MΩ or more

Note:

- **When the insulation resistance is less than 1 MΩ, remove the battery from the vehicle and wash it with water.**
- **After washing with water, make the battery dry thoroughly. Measure the insulation resistance again and install the battery on the vehicle after confirming that it is 1 MΩ or more.**

* Battery control table
Prepare a control table for the battery to record and maintain the inspection results.

Inspection date and time	Inspected cell No.	Specific gravity	Electrolyte temperature	Added water quantity	Remarks	Inspector

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CHARGER

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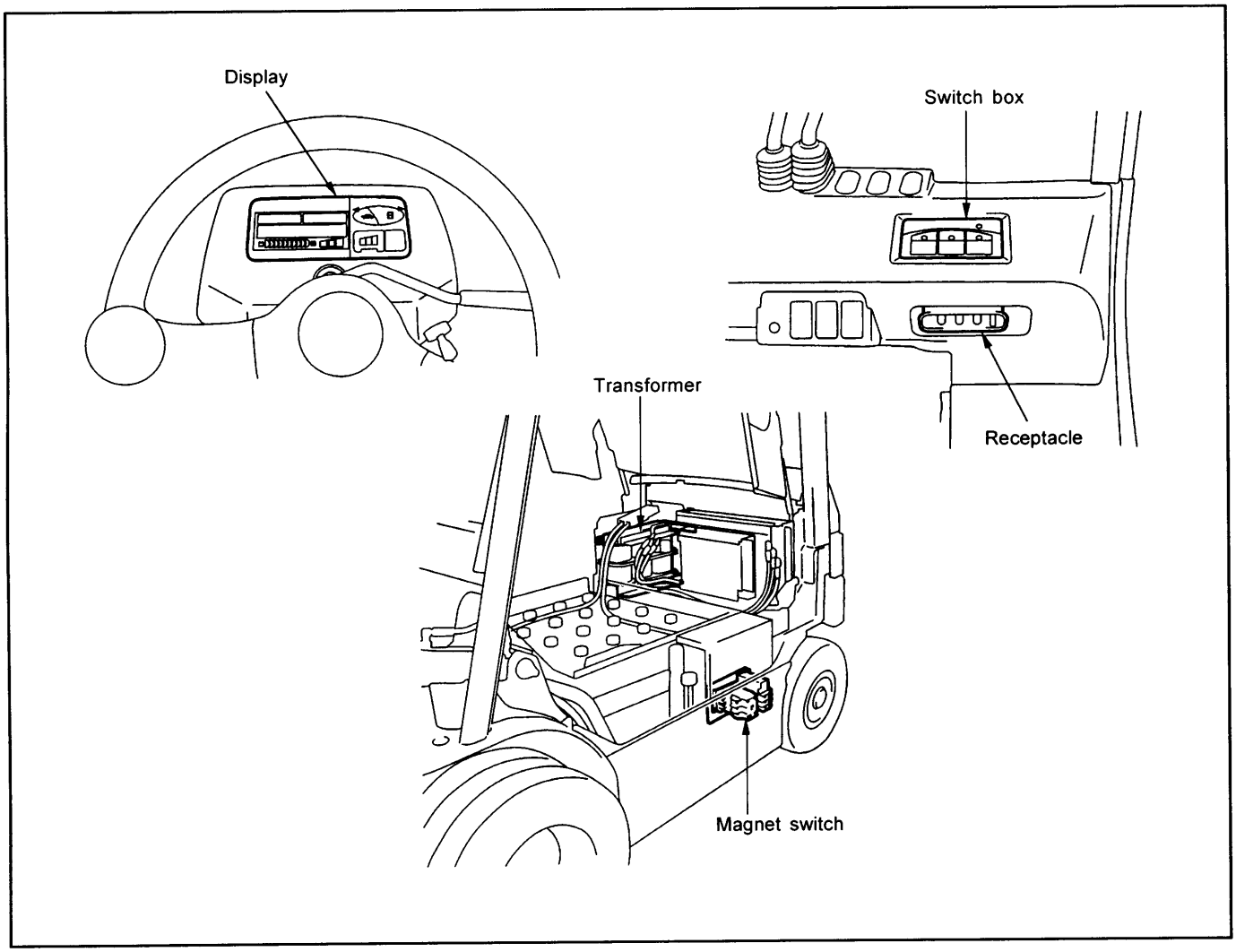
TROUBLESHOOTING 2-42

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GENERAL

A fully automatic, microcomputer-controlled, on-vehicle charger (STD) and a fully automatic, microcomputer-controlled, off-vehicle charger (OPT) are provided.
The on-vehicle charger is not provided on models with refrigerator specifications.

ON-VEHICLE CHARGER



APPLICABLE CHARGER LIST

Transformer model	Power supply voltage	Transformer capacity (50/60 Hz)	Battery voltage	Applicable capacity (AH/5H)	Power capacity (50/60 Hz)	Charger type																
						7FB10	7FBH10	7FB14	7FBH14	7FB15	7FBH15	40I7FB15	7FB18	7FBH18	7FB20	7FBH20	40I7FB20	7FB25	7FBH25	40I7FB25	7FB30	7FBJ35
SG3-69-60JBY	200 V	5.0/4.7	48 V	330	15/15 A	O		O														
SG3-69-80JBY	↑	6.3/5.9	↑	400 ~ 450	20/20 A	O		O		O			O		O							
SG3-69-100JBY	↑	7.6/7.2	↑	485 ~ 565	30/30 A	O	O	O	O	O	O		O	O	O			O				
SG3-69-130JBY	↑	11.0/9.9	↑	600 ~ 730	40/30 A							O			O	O		O	O			
SG3-69-165JBY	↑	11.0/10.0	↑	845	40/30 A												O			O		
SG3-115-85JBY	↑	10.0/9.5	80 V	370 ~ 470	30/30 A																O	O

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SPECIFICATIONS

Item		Charger type	
		SG3-69-60JBY-1	SG3-69-80JBY-1
Magnet switch (MSch)	Type	CLK-20JT-F (Togami Electric)	FW-1S (Fuji Electric)
	Rating	20 A	26 A
	Thermal setting	18 A	26 A
Transformer (TF)	Capacity	5.0/4.7 KVA (50/60 Hz)	6.3/5.9 KVA (50/60 Hz)
	Insulation	Type H	←
Diode (Dch)	Type	SKR70/02, SKN71/02	←
Fuse (Fch)	Type	BM 80 A	BM 80 A
	Capacity	96 V, 80 A	96 V, 80 A

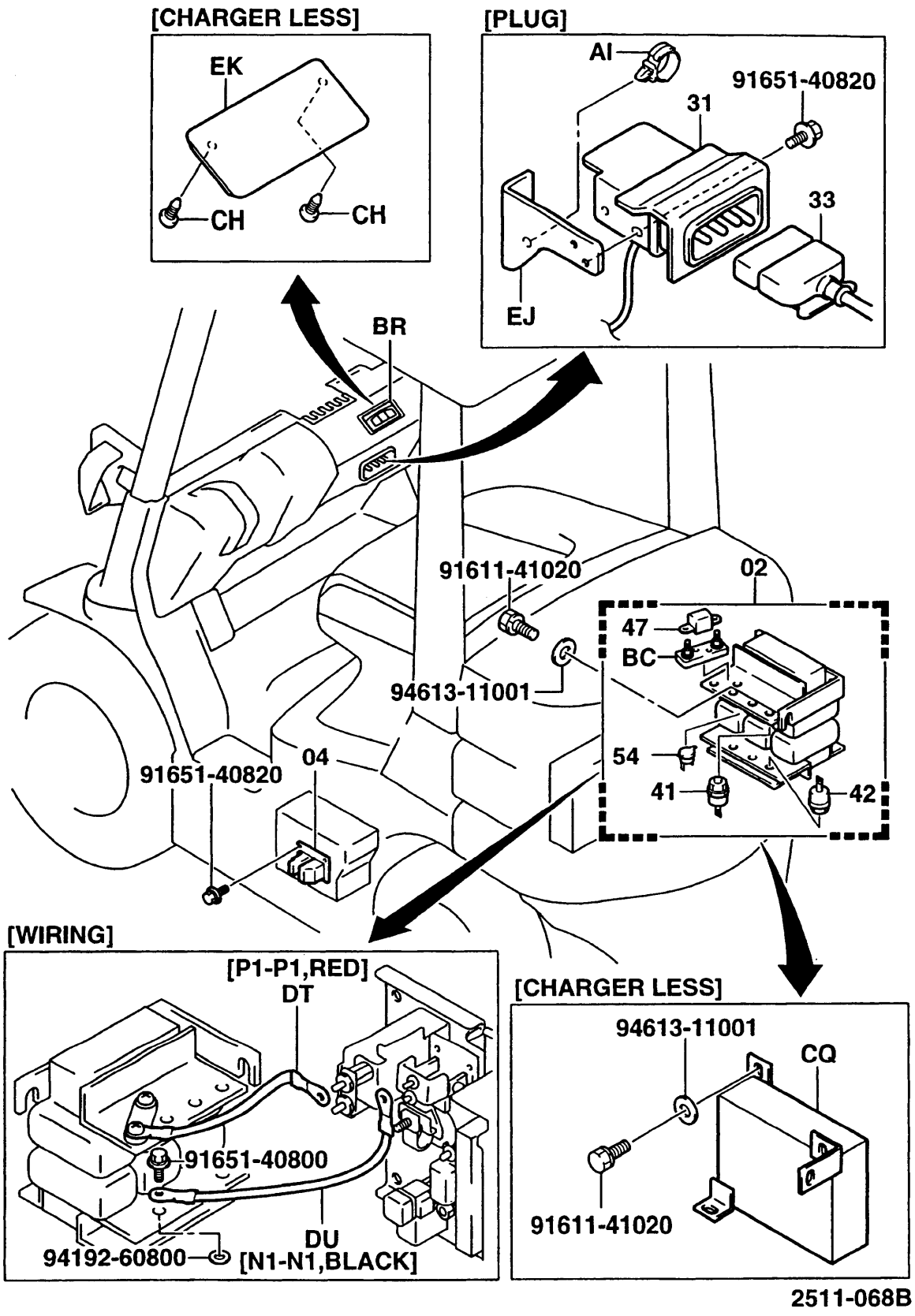
Item		Charger type	
		SG3-69-100JBY-1	SG3-69-130JBY-1
Magnet switch (MSch)	Type	FW-1S (Fuji Electric)	CLK-50JT-F (Togami Electric)
	Rating	26 A	50 A
	Thermal setting	26 A	42 A
Transformer (TF)	Capacity	7.6/7.2 KVA (50/60 Hz)	11.0/9.9 KVA (50/60 Hz)
	Insulation	Type H	←
Diode (Dch)	Type	SKR130/02, SKN130/02	←
Fuse (Fch)	Type	BM 100 A	BM 150 A
	Capacity	96 V, 100 A	96 V, 150 A

Item		Charger type	
		SG3-69-165JBY-1	SG3-115-85JBY-1
Magnet switch (MSch)	Type	CLK-50JT-F (Togami Electric)	←
	Rating	50 A	←
	Thermal setting	42 A	←
Transformer (TF)	Capacity	11.0/10.0 KVA (50/60 Hz)	10.0/9.6 KVA (50/60 Hz)
	Insulation	Type H	←
Diode (Dch)	Type	SKR240/02, SKN240/02	SKR71/04, SKN71/04
Fuse (Fch)	Type	BM 150 A	BM 100 A
	Capacity	96 V, 150 A	150 V, 100 A

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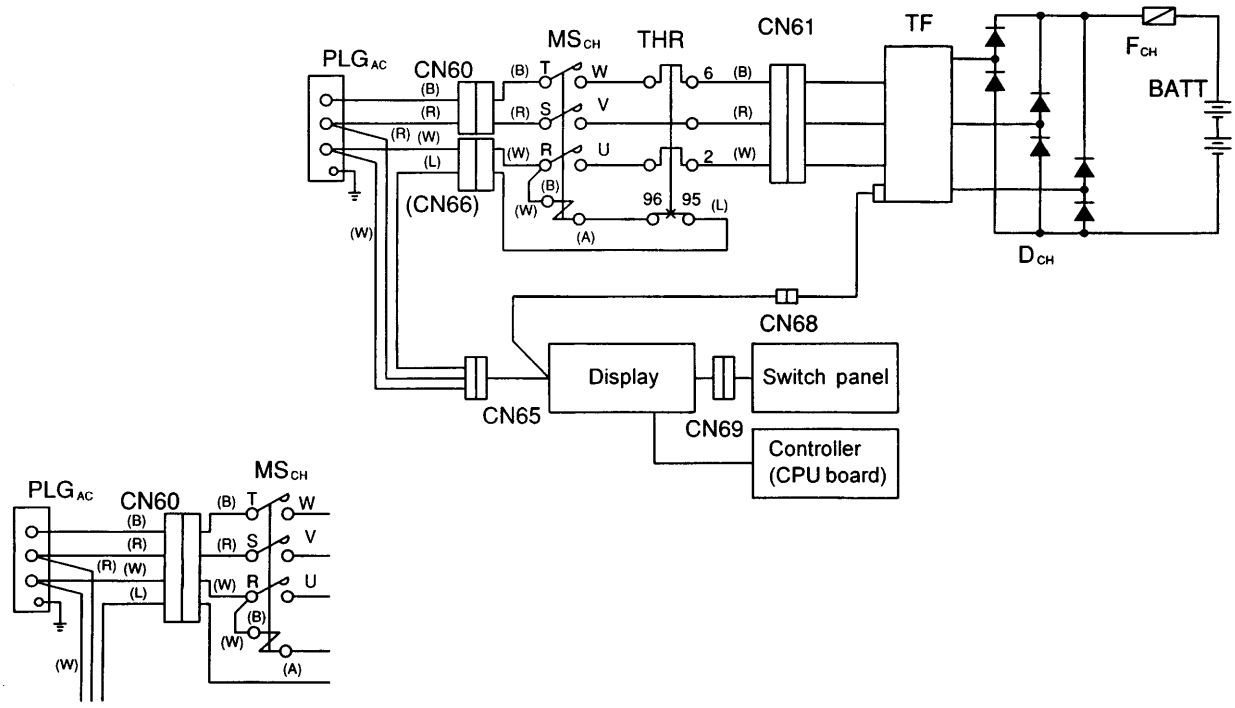
COMPONENTS

2511



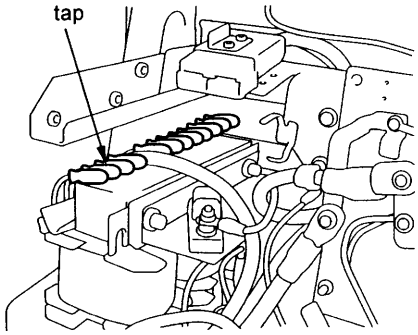
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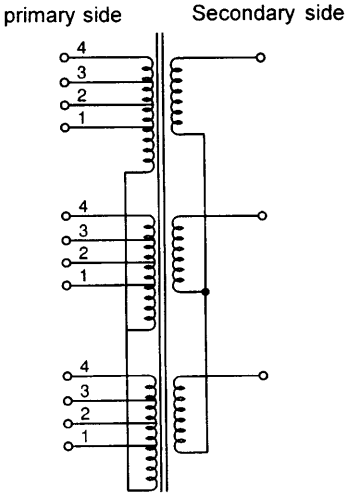
WIRING DIAGRAM



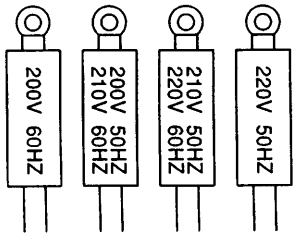
(For 48V 600A or more, 80V 370 ~ 470AH)

TAP LAYOUT





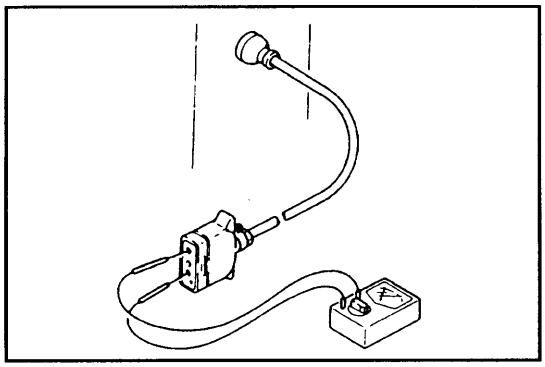
Tap position / Power supply	①	②	③	④
50HZ	—	200V	210V	220V
60HZ	200V	210V	220V	—

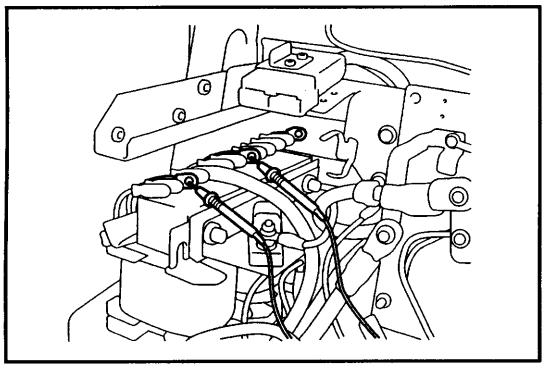


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BEFORE CHARGING

If the ampere capacity at the charger installed location is insufficient because of the use of other electrical appliances, ask an electrical work contractor to provide an exclusive circuit for the charger.
See the On-vehicle Charger List on page 2-2 for the AC power supply capacity.





If error code "F6-2" is displayed during charging after tap changer setting, change to the tap one rank above.

Tap Changer

1. Measure the power supply voltage to be used for charging.

   Tester range: AC (250 or 1000 V)

Note:
Measure the power supply voltage at night (or during the noon recess when electrical appliances are not operated).

2. Set the tap changer.
   (1) Open the seat stand.
   (2) Disconnect the battery plug.
   (3) Remove the transformer cover.
   (4) Remove the tap cover for each phase corresponding to the power supply voltage mesured in step 1.
   (5) Set the taps.
   (6) Connect the charger to the power supply outlet and press the NORMAL switch.
   (7) Check the voltage between the set taps.

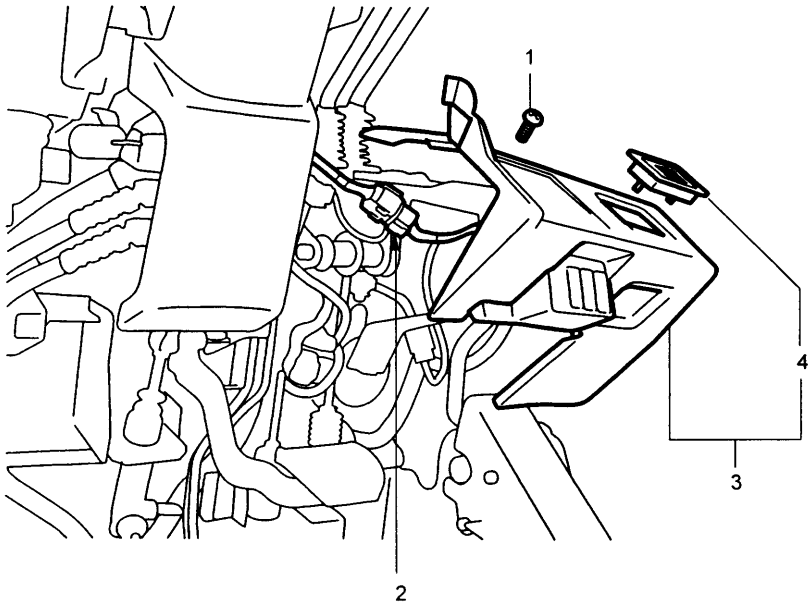
Measured voltage	Tap
199 V or less	200 V
200 ~ 209 V	210 V
210 ~ 219 V	220 V

Note:
- **Taps are set to 220 V at the time of shipment.**
- **Set the tap changer surely for phases U, V and W.**
- **Surely check the battery charging state (specific gravity and electrolyte level) for about a week after tap changer setting to see if the tap setting is appropriate.**

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SWITCH BOX

DISASSEMBLY·INSPECTION·REASSEMBLY



Removal Procedure

1 Remove the instrument panel RH set screws.

2 Disconnect the CN69 connector.

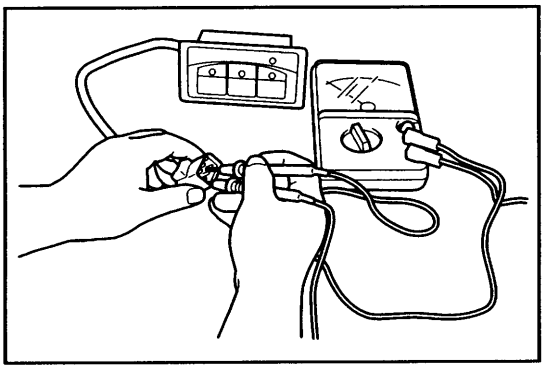
3 Remove the switch box W/instrument panel.

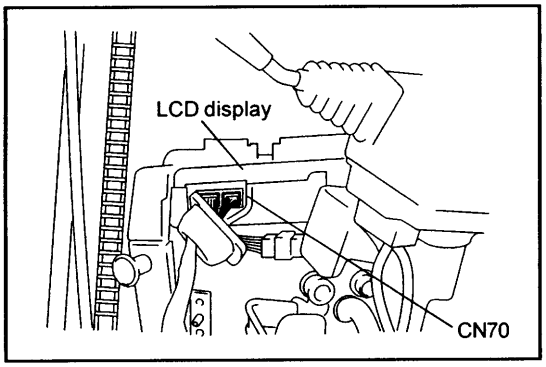
4 Remove the switch box ASSY. **[Point 1]**

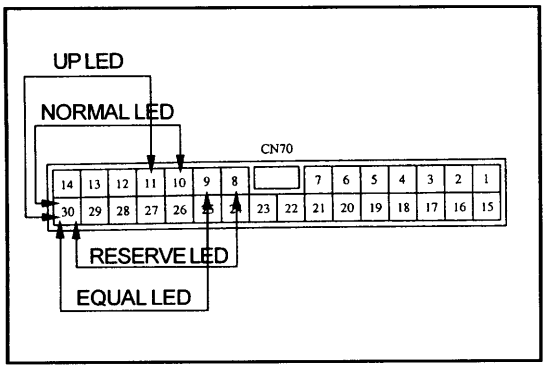
Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Point Operation

[Point 1]
Inspection:
Check the switch ON/OFF state. (CN69 connector)

	Measurement terminals	ON	OFF	Tester range
NORMAL switch	Between 2 and 8	0 Ω	∞	Ω x 1
EQUL switch	Between 3 nd 8	0 Ω	∞	
RESERVE switch	Between 1 and 8	0 Ω	∞	

Inspection:
Check the voltage applied to the LED at the display connector (CN70). (CN69 must have been connected.)

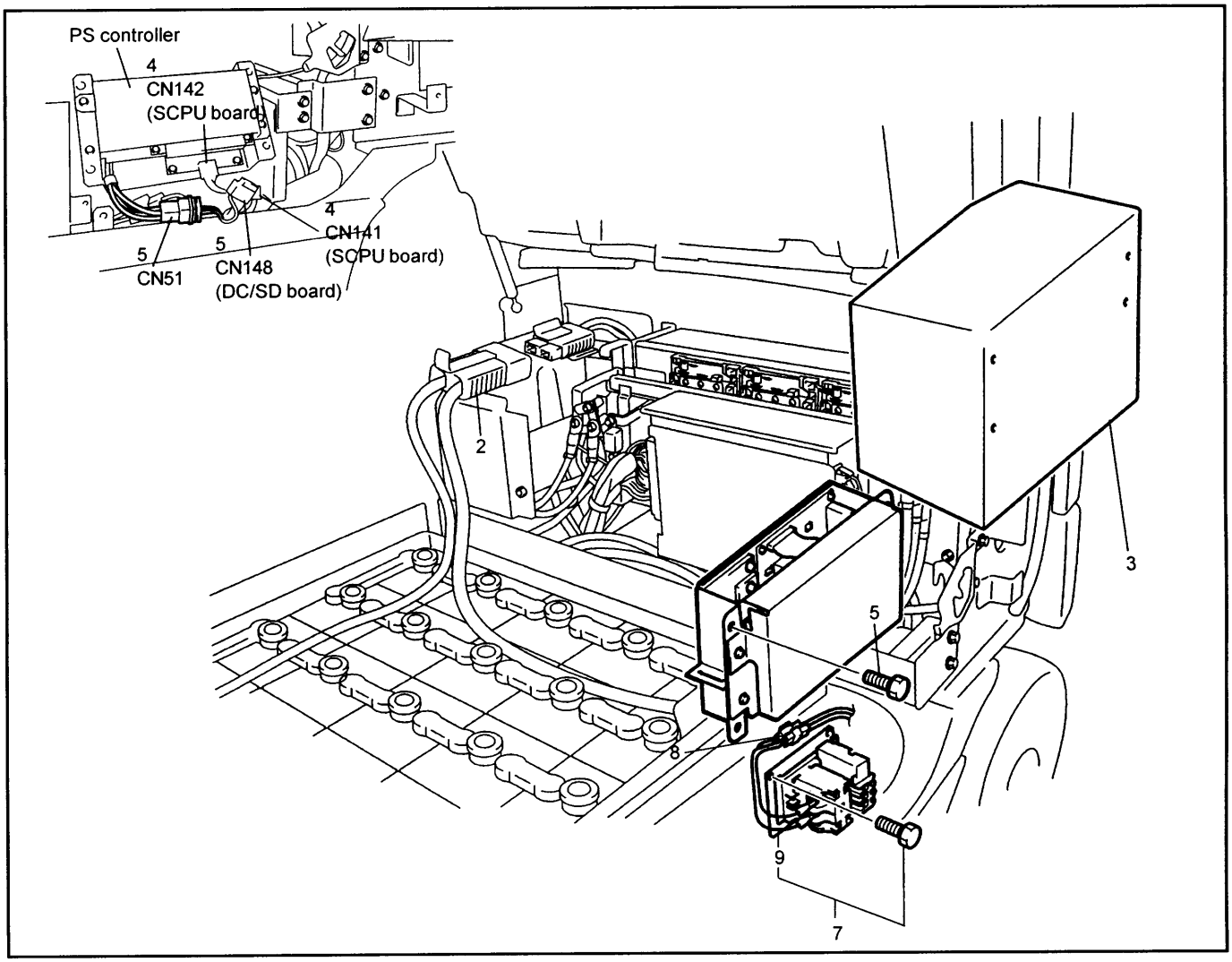
	CN70	During charging (LED on)	Charging stopped (LED off)	Tester range
EQUAL LED	Between 9 and 30 (Y-B and BR)	5 V	0 V	DC 10 V
NORMAL LED	Between 10 and 30 (Y-G and BR)	5 V	0 V	
RESERVE LED	Between 8 and 30 (Y-R and BR)	5 V	0 V	

	CN70	Upon end of test mode (LED on)	Other state (LED off)	Tester range
UP LED	Between 11 and 30 (Y-W and BR)	5 V	0 V	DC 10 V

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MAGNET SWITCH ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY



Removal Procedure

1 Open the seat stand.

2 Disconnect the battery plug.

3 Remove the PS controller cover.

4 Disconnect the SCPU board connector.

5 Remove the PS controller set bolt and take the PS controller out.

6 Disconnect the DC/SD board connector and CN51, and remove the PS controller.

7 Remove the set bolt of the charger magnet switch ASSY W/bracket, and remove the magnet switch ASSY W/bracket.

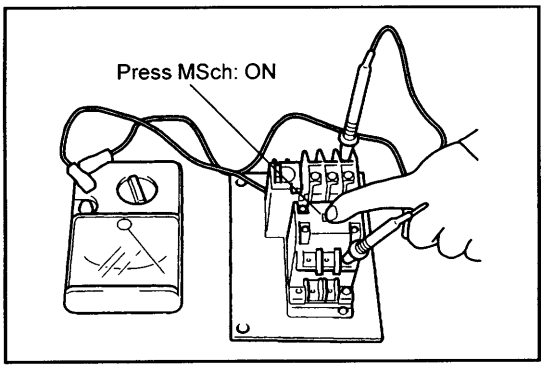
8 Disconnect the CN60 and CN66 connectors and the harness (transformer side wiring).

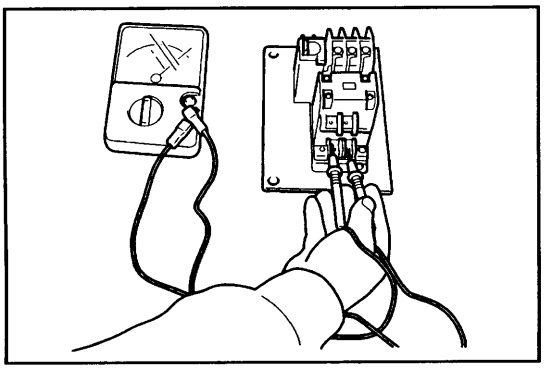
9 Remove the magnet ASSY W/bracket.

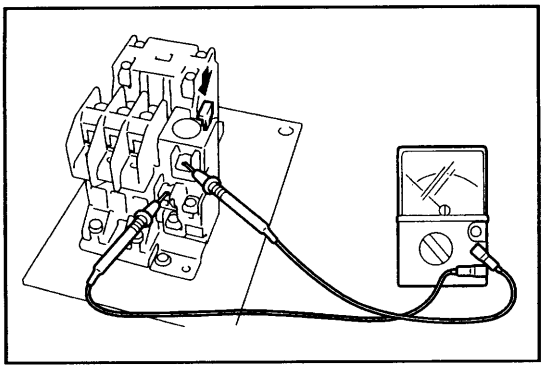
Installation Procedure

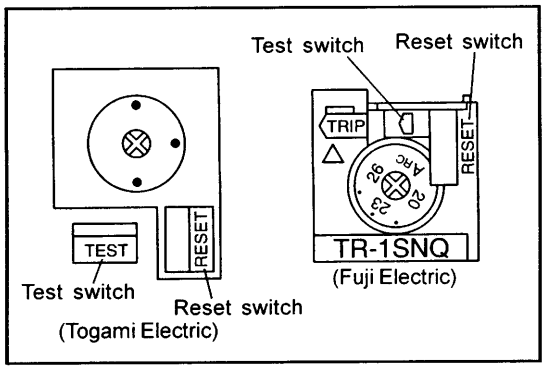
The installation procedure is the reverse of the removal procedure.

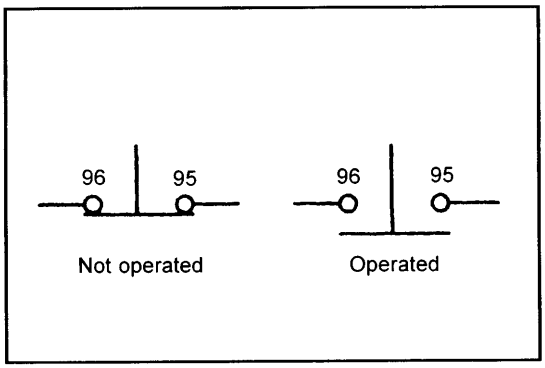
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Point Operation

[Point 1]

Inspection:

Magnet switch contact continuity inspection

Tester range		Ω x 1
Measurement terminals		T-W, S-V, R-U
Standard	MSch ON	0 Ω
	MSch OFF	∞ Ω

Inspection:

Magnet switch contact continuity inspection

Tester range		Ω x 1
Measurement terminals		A1-A2
Standard	CLK20JT (Togami)	700 Ω
	FW-1S (Fuji)	400 Ω
	CLK50JT (Togami)	350 Ω

Inspection:

Thermal relay contact continuity inspection

Tester range		Ω x 1
Measurement terminals		95-96
Standard	Not operated	0 Ω
	Operated	∞ Ω

Inspection:

Inspect if the thermal relay is deactivated upon pressing the reset switch when the thermal relay is activated. Do not adjust the thermal relay operating current.

If charging stops due to thermal relay activation while the charger is in use, always check the thermal relay activating cause and perform resetting after taking the corrective action.

Pres the reset switch lightly to reset the thermal relay.

* Test the thermal relay as follows:

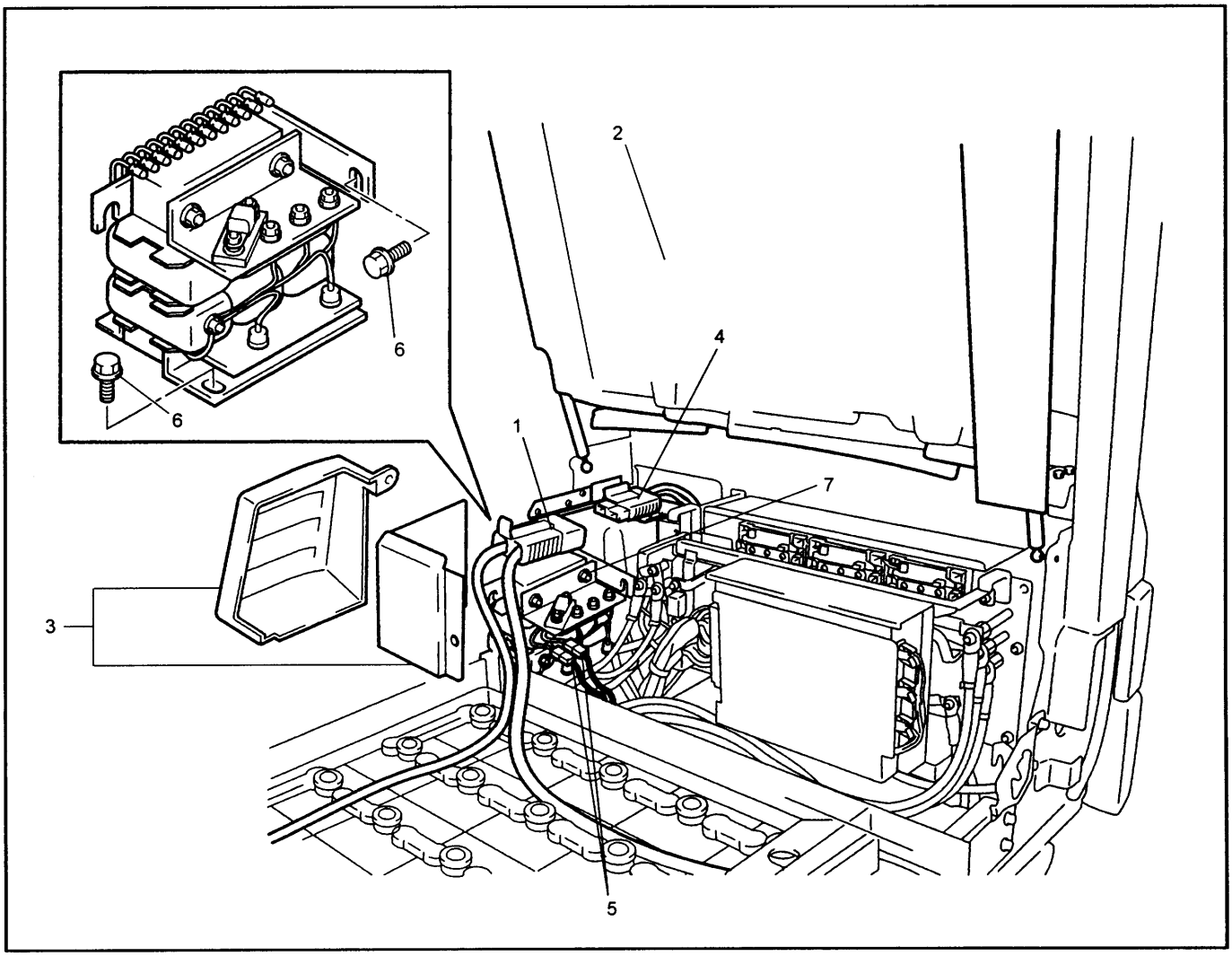
Togami: Press the reset switch.

Fuji: Use a thin screwdriver and move the reset switch to the left.

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TRANSFORMER ASSY

REMOVAL·INSPECTION·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the seat stand.

3 Remove the louver and transformer cover.

4 Remove the battery plug bracket.

5 Disconnect the CN61. CN68 connector.

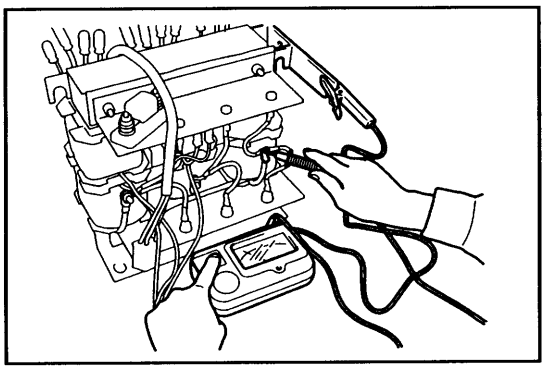
6 Remove the transformer ASSY set bolts.

7 Remove the transformer ASSY by hoisting it. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

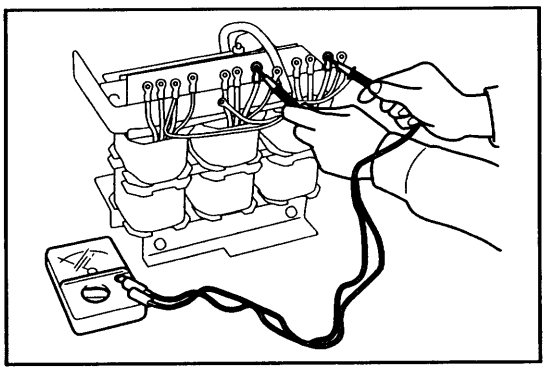
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Point Operations

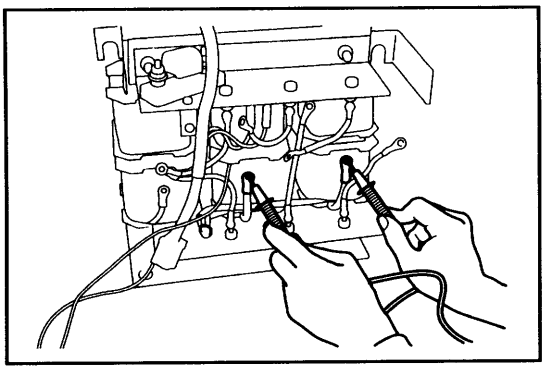
[Point 1]
Inspection:
Measure the insulation resistance.

Measuring instrument	DC 500 V megger
Measurement terminals	Each coil terminal – Frame
Standard	1 MΩ or more



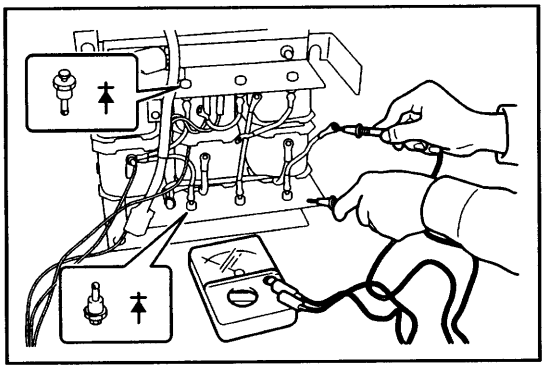
[Point 2]
Inspection:
Measure the primary coil continuity.

Tester range	Ω x 1
Measurement terminals	U_1-V_1, V_1-W_1, W_1-U_1
Standard	0 Ω



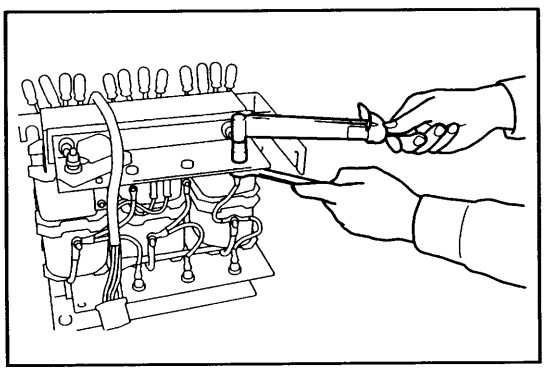
Inspection:
Measure the secondary coil continuity.

Tester range	Ω x 1
Measurement terminals	U_2-V_2, V_2-W_2, W_2-U_2
Standard	0 Ω



Inspection:
Measure the diode continuity.
Inspect the diode as installed on the radiating fin plate and remove it only when an abnormality is found.

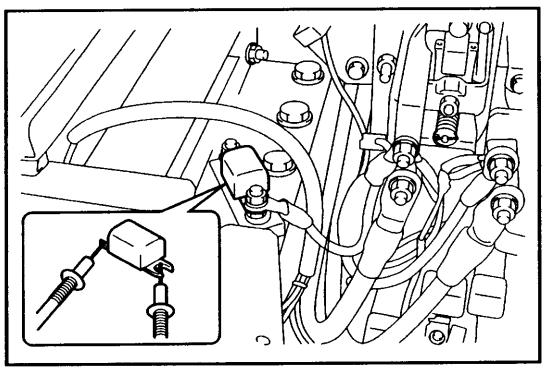
Tester range		Ω x 1K
Measurement terminals	Forward	Anode ⊖ – Cathode ⊕
	Reverse	Anode ⊕ – Cathode ⊖
Standard	Forward	Continuity shall exist.
	Reverse	∞ Ω



Installation:
Since two diode different in polarity are used, carefully avoid incorrect installation.

Installation:
Install each diode by tightening to the specified torque.
SKR71/02, SKN71/02: 4N·m (40 kgf-cm) [2.9 ft-lbf]
SKR130/02, SKN130/02: 10N·m (100 kgf-cm) [7.2 ft-lbf]
SKR240/02, SKN240/02: 30N·m (300 kgf-cm) [21.7 ft-lbf]
SKR71/04, SKN71/04: 4N·m (40 kgf-cm) [2.9 ft-lbf]

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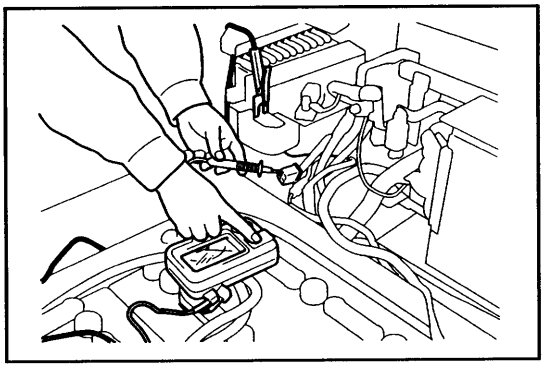
Inspection:
Inspect the fuse.

Standard: 0 Ω

Inspection after Installation

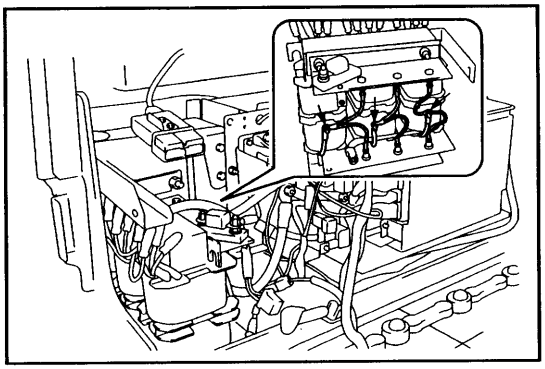
1. Inspect each wiring connection.

Note:
Check each wiring connection by referring to the charger wiring diagram.

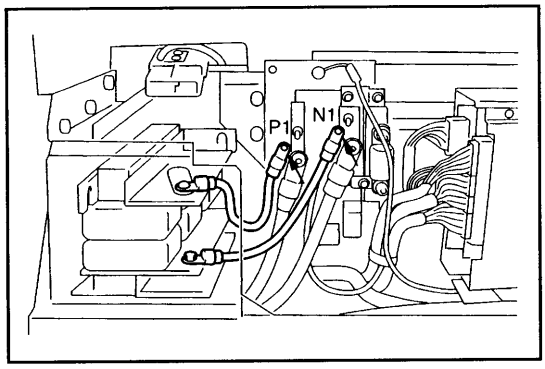


2. Measure the insulation resistance.

Measuring instrument	DC 500 V megger
Measurement terminals	Each coil terminal – Frame
Standard	1 MΩ or more



3. Measure the no-load secondary voltages.
Connect the charger plug to an AC power supply outlet (with the transformer P1 and N1 cables disconnected). Start charging (by pressing the NORMAL ON/OFF switch) and measure the following voltages.
("F7" error is displayed when charging is started with either the P1 or the N1 cable of the transformer disconnected, but this is not an abnormality.)



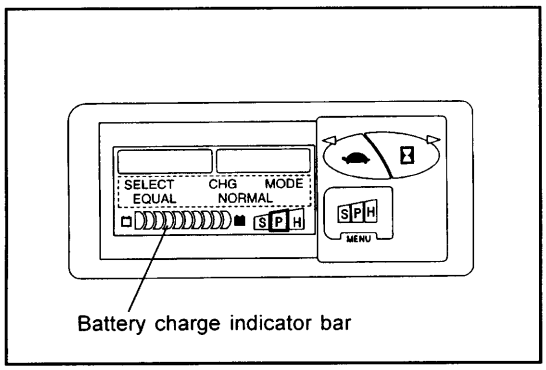
AC voltage

Tester range	AC 250 V-AC 500 V
Measurement terminals	U_2-V_2, V_2-W_2, W_2-U_2
Standard (50/60 Hz)	48 V system: 55/55 V 80 V system: 94/94 V

DC voltage

Tester range	DC 250 V
Measurement terminals	Transformer P1 and N1 terminals P1 terminal: ⊕ probe, N1 terminal: ⊖ probe
Standard (50/60 Hz)	48 V system: 74/74 V 80 V system: 127/127 V

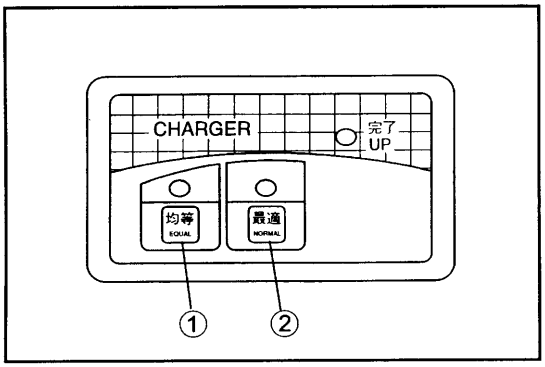
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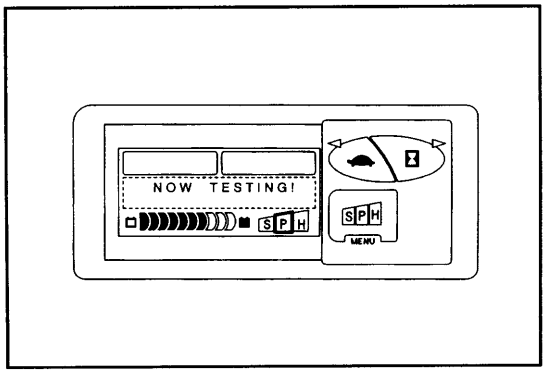
TIMER TEST

Operation Procedure

1. Connect the power plug to the receptacle on the vehicle.
2. The initial timer test screen appears on the display.

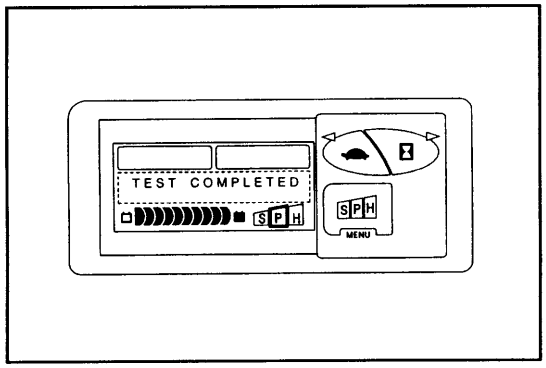


3. Press switches ① and ② at the same time to start the timer test. The display shows "NOW TESTING!".

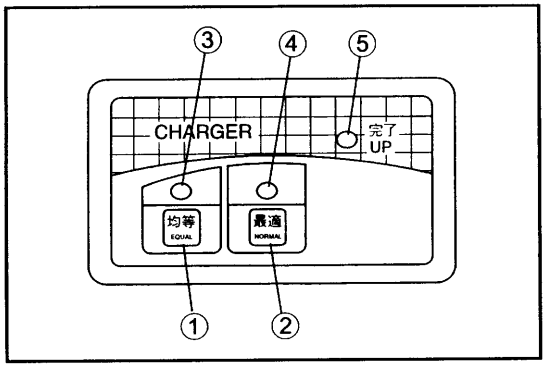


Note:

- **The number of charge indicating bars increases at a rate of one per second as the test proceeds. When ten bars are indicated upon lapse of 10 seconds, the test is completed and "TEST COMPLETED" appears on the screen.**
  LEDs on the switch box come on in the order of ③, ④ and ⑤.



- **The magnet switch is closed when "NOW TESTING!" is displayed, and is opened upon display of "TEST COMPLETED" about ten seconds later.**



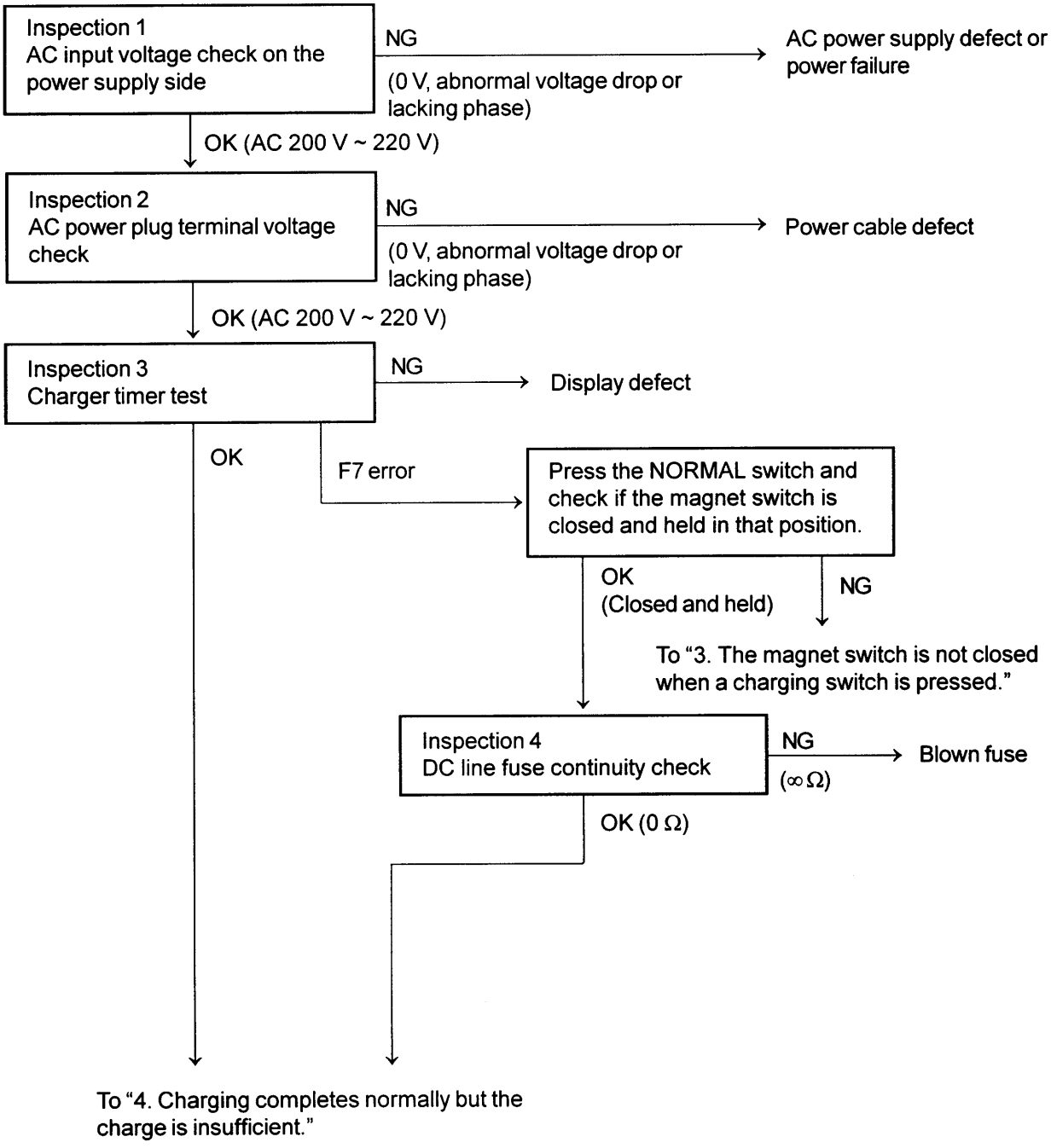
4. The display returns to the initial timer test screen when either switch ① and ② is pressed.

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TROUBLESHOOTING

When a Error Code is Displayed

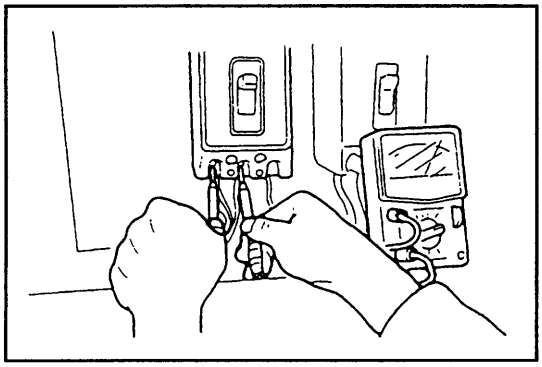
Error Code F6-1: Safety Timer Operated



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Inspection 1:
AC input voltage check

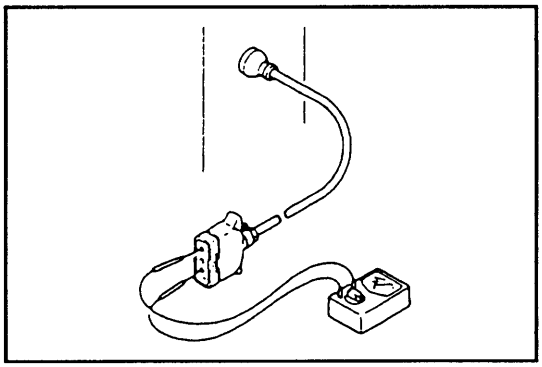
Measurement trminals	AC power outlet terminals
Tester range	AC 250 V
Standard	200 V ~ 220 V



OK (200 V ~ 220 V) → To Inspection 2
NG (0 V, abnormal voltage drop or lacking phase) → AC power supply defect

Inspection 2:
AC power plug terminal voltage check

Measurement terminals	Power plug terminals
Tester range	AC 250 V
Standard	200 V ~ 220 V



OK (200 V ~ 220 V) → To Inspection 3
NG (0 V, abnormal voltage drop or lacking phase) → Power cable defect

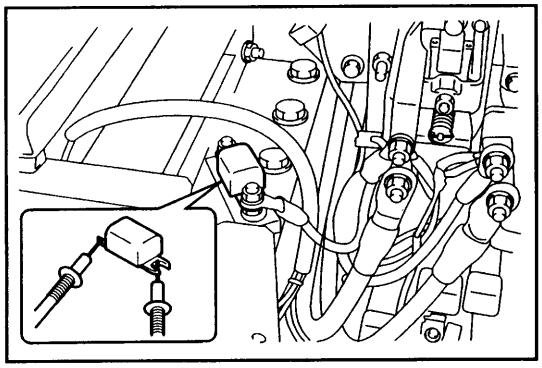
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Inspection 3:
Charger timer test
See the "Timer Test" section on page 2-14.

OK → To "No Diagnosis Error Code Display 4"
NG → Display defect

Inspection 4:
DC line fuse continuity check
AC power plug off, charging switch off and fuse removal

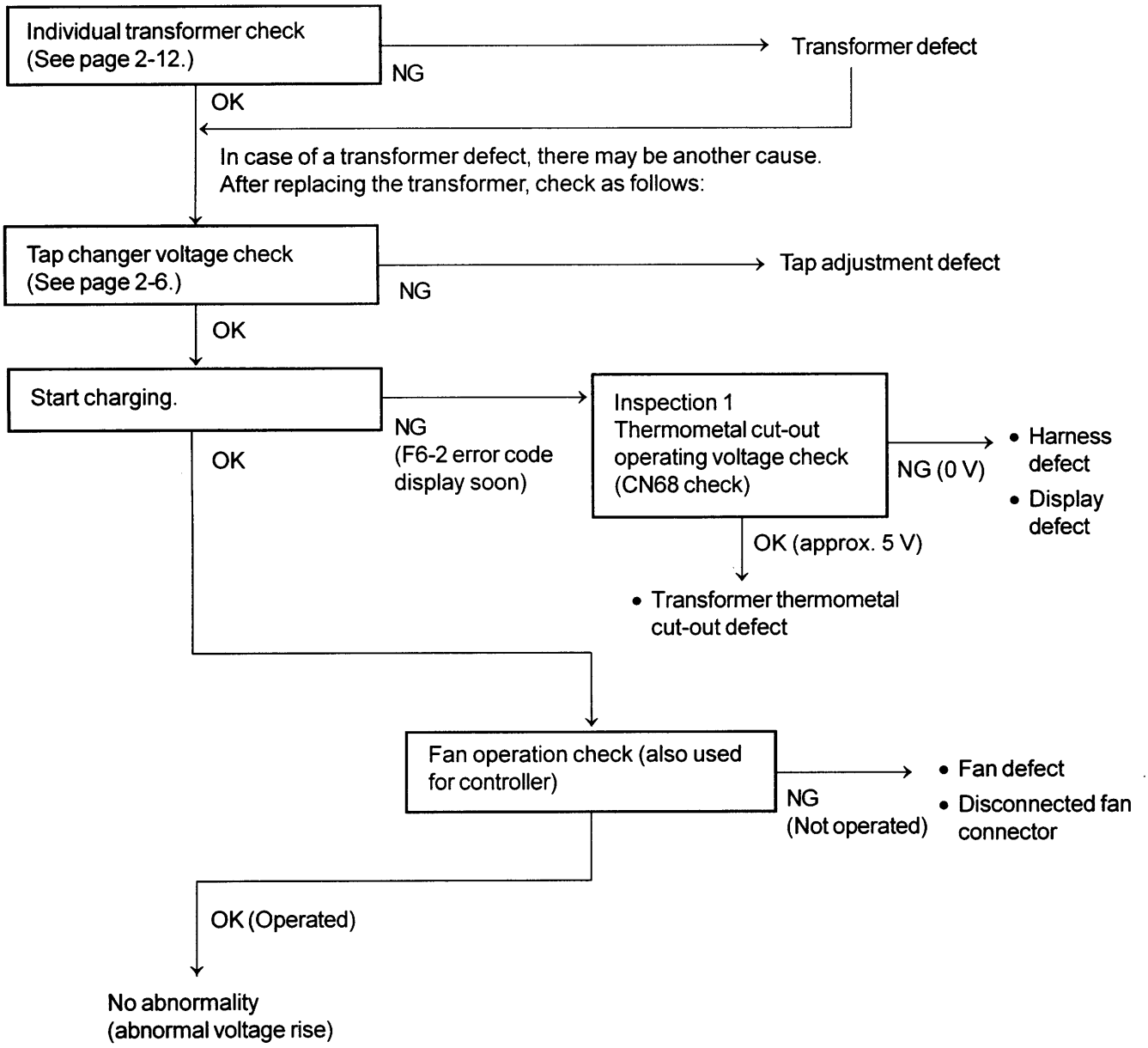
Measurement terminals	Both terminals of DC fuse
Tester range	Ω x 1
Standard	0 Ω



OK (0 Ω) → To "No Diagnosis Error Code Display 4"
NG (∞ Ω) → Blown fuse

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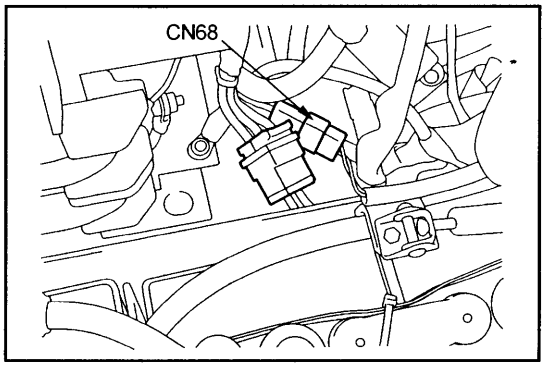
Error Code F6-2: Overheat Detection

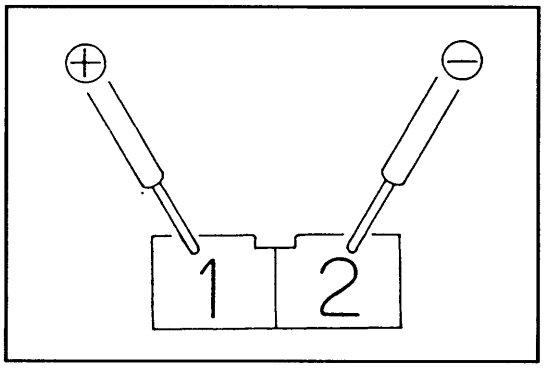


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Inspection 1:
Thermometal cut-out operating voltage check

Measurement terminals	CN68-1 (139) ⊕ – CN68-2 (17) ⊖ (main harness side)
Tester range	DC 10 V
Standard	Approx. 5 V

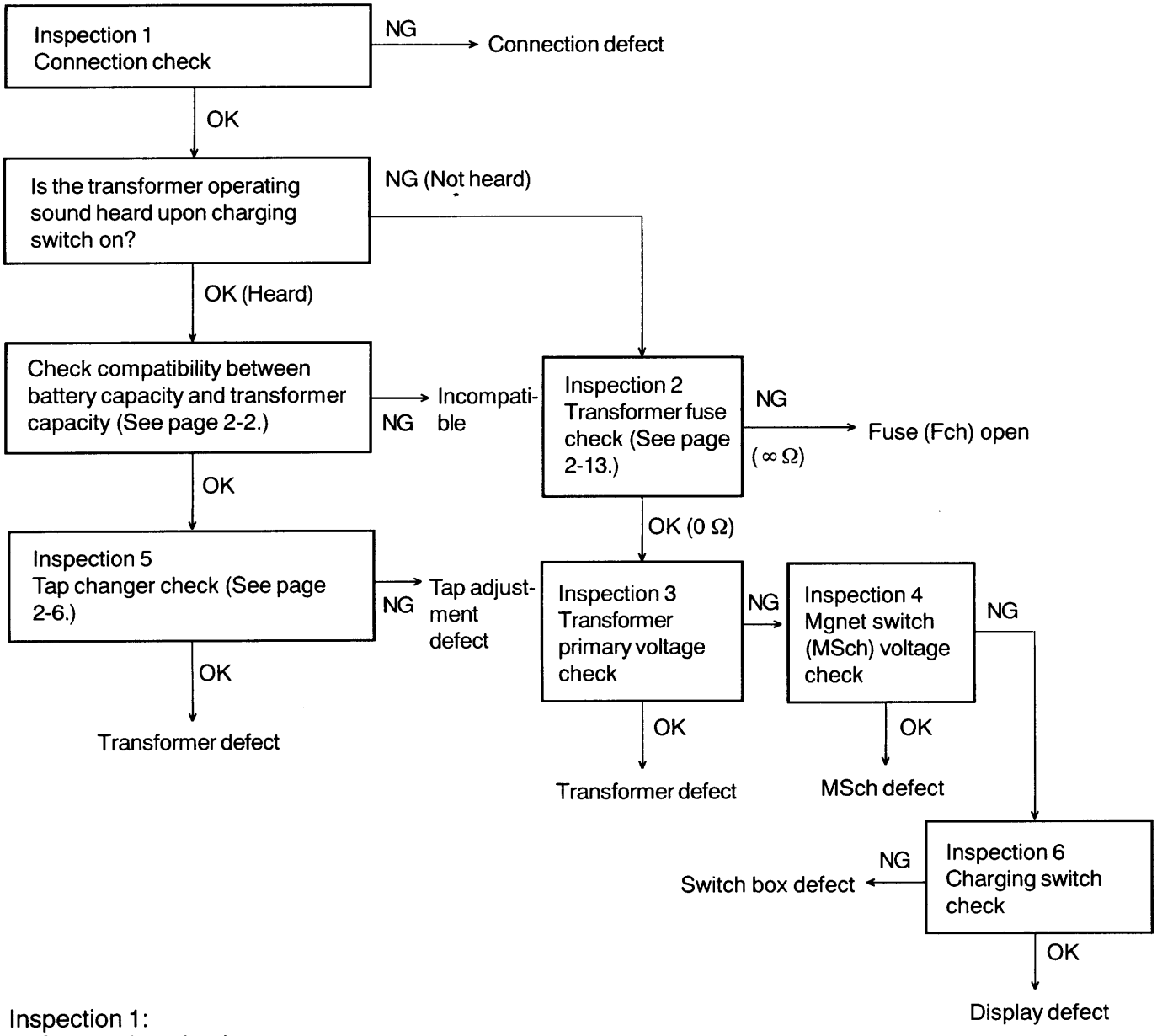




OK (approx. 5 V) → Transformer thermometal cut-out defect
NG (0 V) → Harness defect, display defect

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Error Code F7: Charging Starting Failure



Inspection 1:
Connection check

(1) The P1 and N1 terminals of the transformer and controller shall be connected correctly without any loosening.
(2) The CN60, CN66 (applicable to 48 V, 330 to 565 AH battery) and CN61 connection shall be connected correctly and securely.
(3) The AC and DC plugs shall be free from contact defect.
(No roughened terminal or heating during power conduction)
(4) The power cable shall not be damaged.

OK → Transformer operating sound check
NG → Connection defect

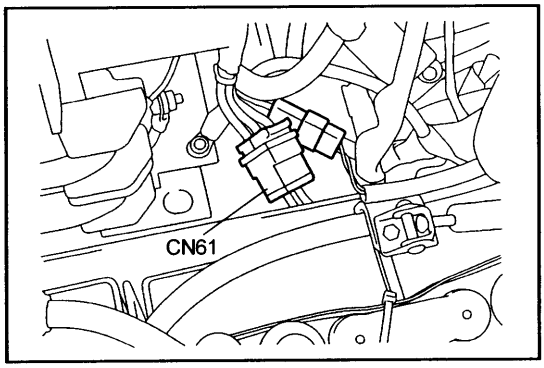
Inspection 2:
Transformer fuse (Fch) check (See page 2-13.)

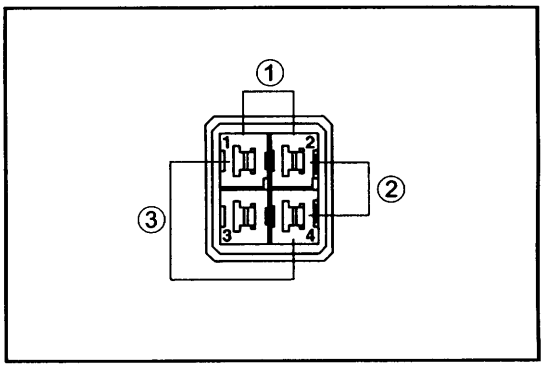
OK (0 Ω) → To Inspection 3
NG (∞ Ω) → Fuse (Fch) open

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Inspection 3:
Transformer primary voltage check
CN61 connector disconnection, AC plug ON and charging switch ON

Measurement terminals	① CN61-1 (U) – CN61-2 (V) (REC side) ② CN61-2 (V) – CN61-4 (W) (REC side) ③ CN61-4 (W) – CN61-1 (V) (REC side)
Tester range	AC 250 V
Standard	200 V ~ 220 V

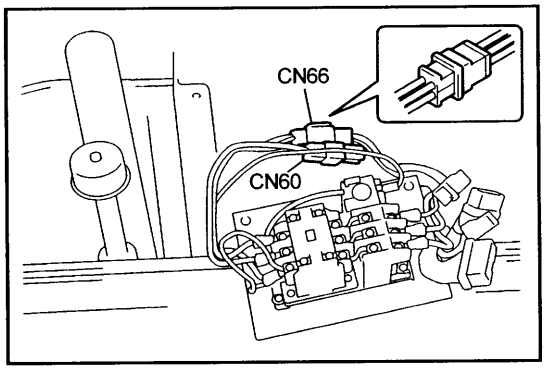


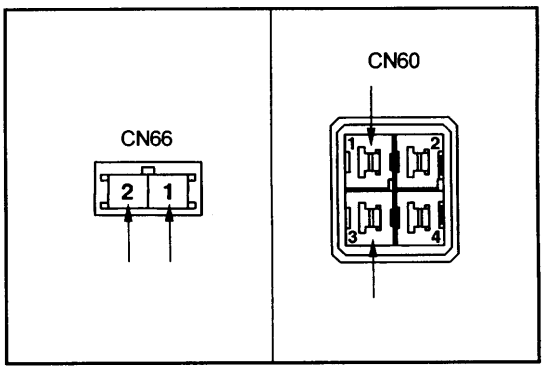


OK (200 V ~ 220 V) → Transformer defect
NG (other than standard) → To Inspection 4

Inspection 4:
Magnet switch voltage check
CN66 connector disconnection (CN60 connector for 48 V, 330 to 565 AH battery, AC plug ON, charging switch ON/OFF operation

Measurement terminals	CN66-1 (R) – CN66-2 (95) (REC side) CN60-1 (R) – CN66-3(95) (REC side)
Tester range	AC 250 V
Standard	Charging switch ON: 200 V ~ 220 V, charging switch OFF: 0 V





OK (200 V ~ 220 V) → MSch defect
NG (other than standard) → To Inspection 6

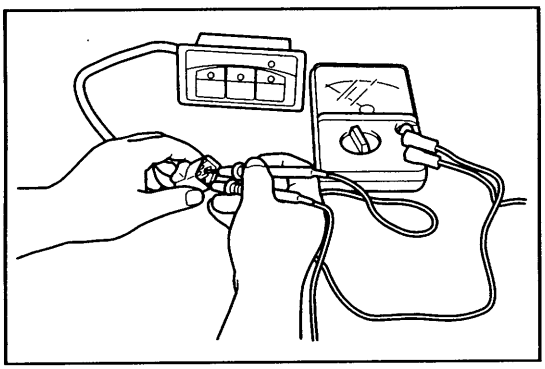
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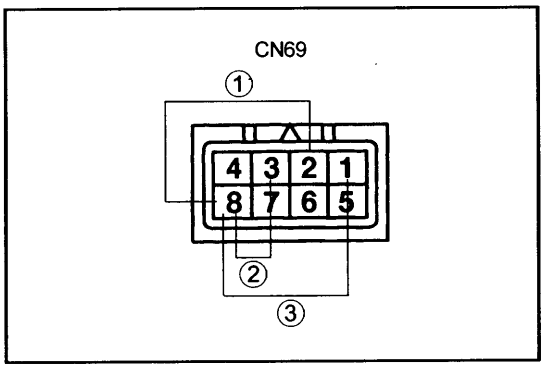
Inspection 5:
Tap changer check (See page 2-6.)

OK → Transformer defect
NG → Tap adjustment defect

Inspection 6:
Charging switch check
CN69 connector disconnection

	CN69	Pressed state	Released state	Tester range
NORMAL switch	① Between 2 and 8	0 Ω	∞	Ω x 1
EQUAL switch	② Between 3 and 8	0 Ω	∞	
RESERVE switch	③ Between 1 and 8	0 Ω	∞	

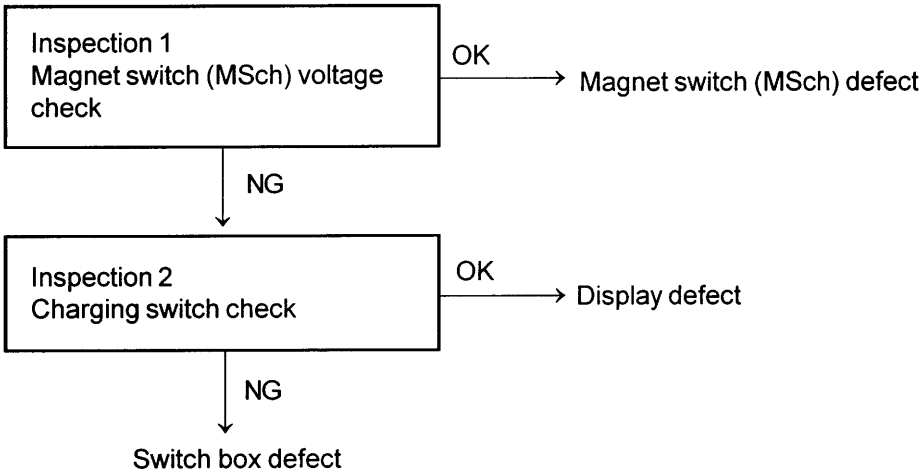




OK → Display defect
NG → Switch box defect

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Error Code F8: Charging Ending Failure



Inspection 1:
Magnet switch (MSch) voltage check
(See page 2-21.)

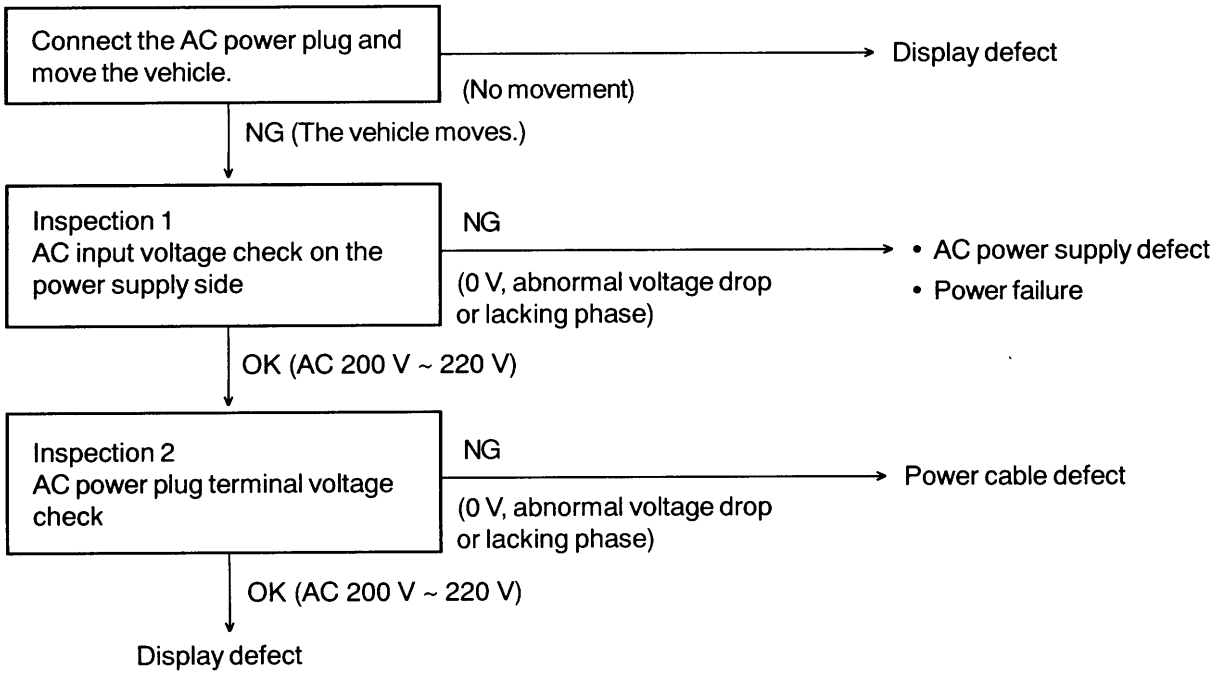
Inspection 2:
Charging switch check
(See page 2-22.)

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No Error Code Display

1. The vehicle does not move at all. (Charging screen appears though the AC power plug is not connected.)
   → Display defect

2. Charging screen does not appear though the AC power plug is connected.



Inspection 1:
AC input voltage check on power supply side
See Inspection 2 for error code “F6-1” (page 2-16).

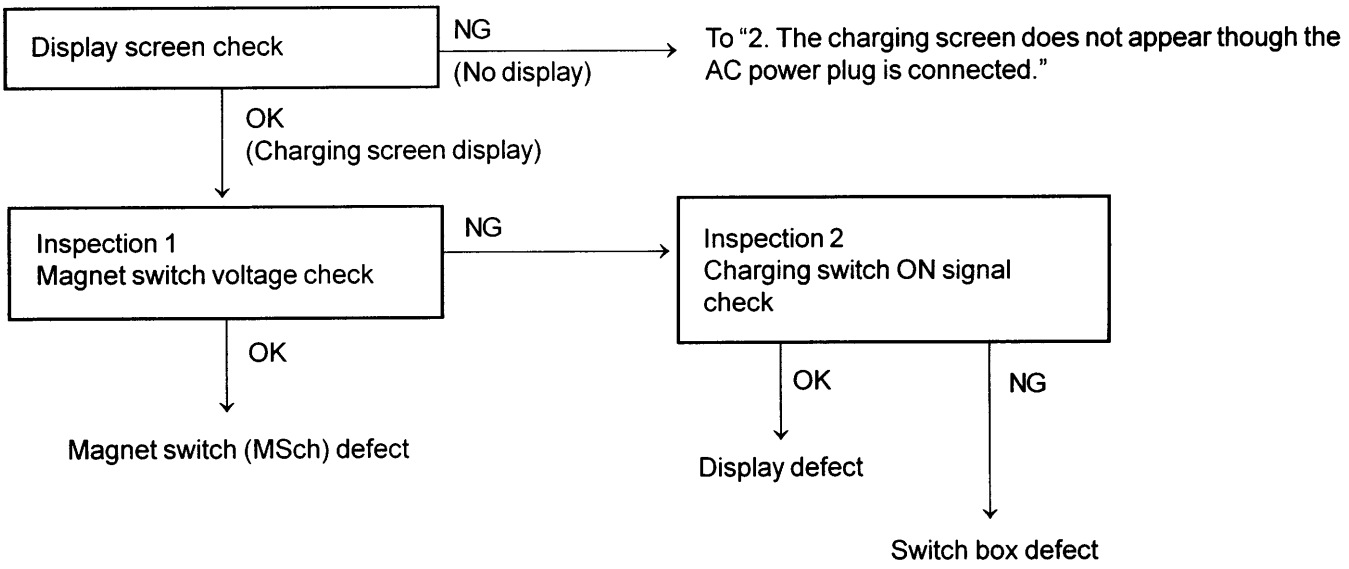
OK (AC 200 V ~ 220 V) → To Inspection 2
NG (0 V, abnormal voltage drop or lacking phase) → AC power supply defect or power failure

Inspection 2:
AC power plug terminal voltage check
See Inspection 2 for error code “F6-1” (page 2-16).

OK (AC 200 V ~ 220 V) → Display defect
NG (0 V, abnormal voltage drop or lacking phase) → Power cable defect

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3. The magnet switch is not closed when a charging switch is pressed.

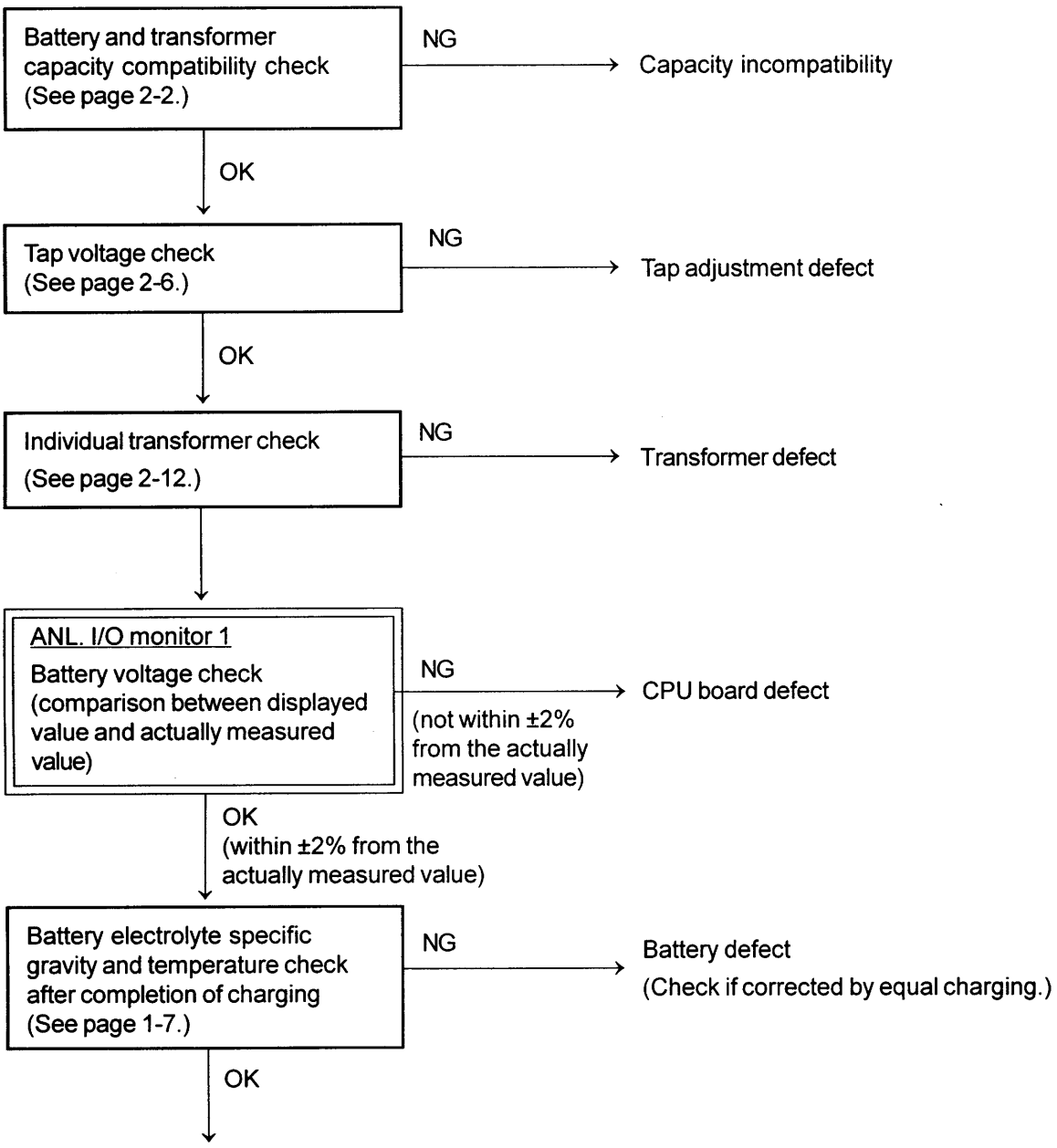


Inspection 1:
Magnet switch voltage check.
(See page 2-21.)

Inspection 2:
Charging switch ON signal check.
(See page 2-22.)

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4. Charging completes normally but the charge is insufficient.

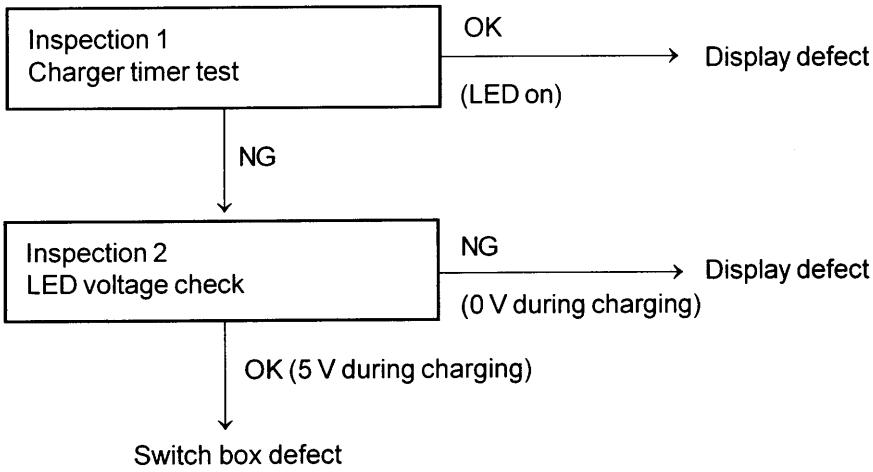


- Decreased capacity due to lowering of electrolyte temperature
- Decreased capacity due to battery service life

5. Charging progress indication does not advance at the time of timer test.
   → Display defect

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6. LEDs on the switch box does not come on.



Inspection 1:
Charger timer test
(See page 2-14.)

Inspection 2:
LED voltage check (See page 2-8)
The CN69 connector must be connected.

	CN70	During charging (LED on)	Charging stopped (LED off)	Tester range
NORMAL LED	Between 9 and 30 (Y-B and BR)	5 V	0 V	DC 10 V
EQUAL LED	Between 10 and 30 (Y-G and BR)	5 V	0 V	
RESERVE LED	Between 8 and 30 (Y-R and BR)	5 V	0 V	

	CN70	Test mode end state (LED on)	Other state (LED off)	Tester range
UP LED	Between 11 and 30 (Y-W and BR)	5 V	0 V	DC 10 V

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CONTROLLER

Page

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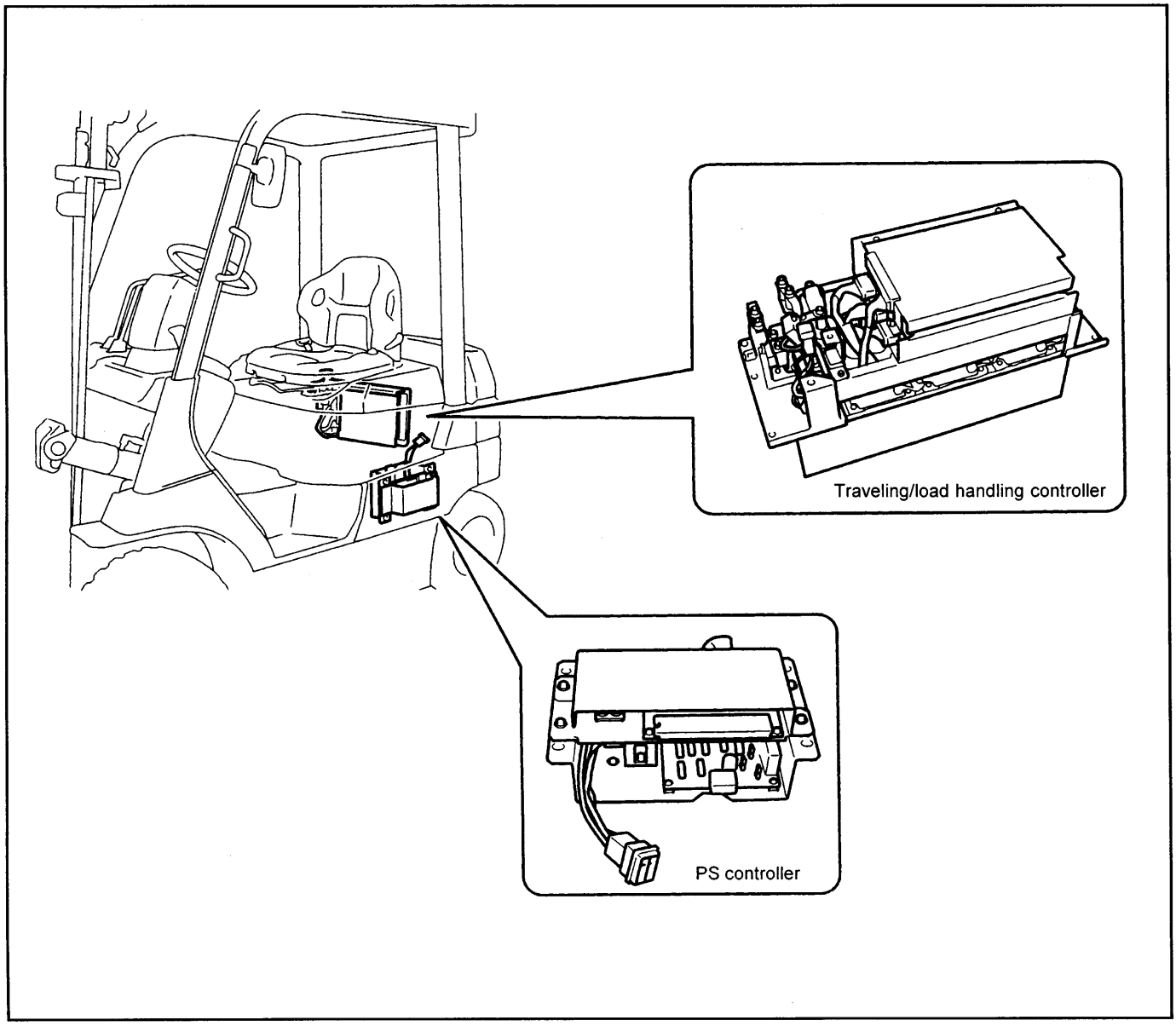
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AC CONTROLLER

The 7FB series vehicle is installed with the travelling and load handling controller that controls the traveling and load handling systems and the PS controller that controls the PS system.
SAS function controllers are built in respective controllers as shown below.

- Mast control: Built in the traveling/load handling controller.
- Rear wheel swing control: Built in the PS controller.
- Steering knob offset correcting control: Built in the PS controller.

Each of them is a multifunctional controller utilizing a microcomputer. The traveling and load handling controller provides high performance in a wide range by means of inverter control of the AC motor drive system.
The controller has self diagnosis function that automatically detects any abnormality of the accelerator, PS circuit, SAS function or any other sensor and displays the corresponding error code together with the warning buzzer tone.
At the same time, an action such as stopping traveling, stopping load handling or restriction of traveling speed is automatically taken to ensure safety.
Identification of faulty portion and functional check of the traveling and load handling circuits, each operating system and sensors are also possible by setting the display to the analyzer (fault analysis) mode.
See page 4-2 in the “Multidisplay Function” section for the diagnosis, and page 4-7 in the “Multidisplay Function” section for the analyzer.

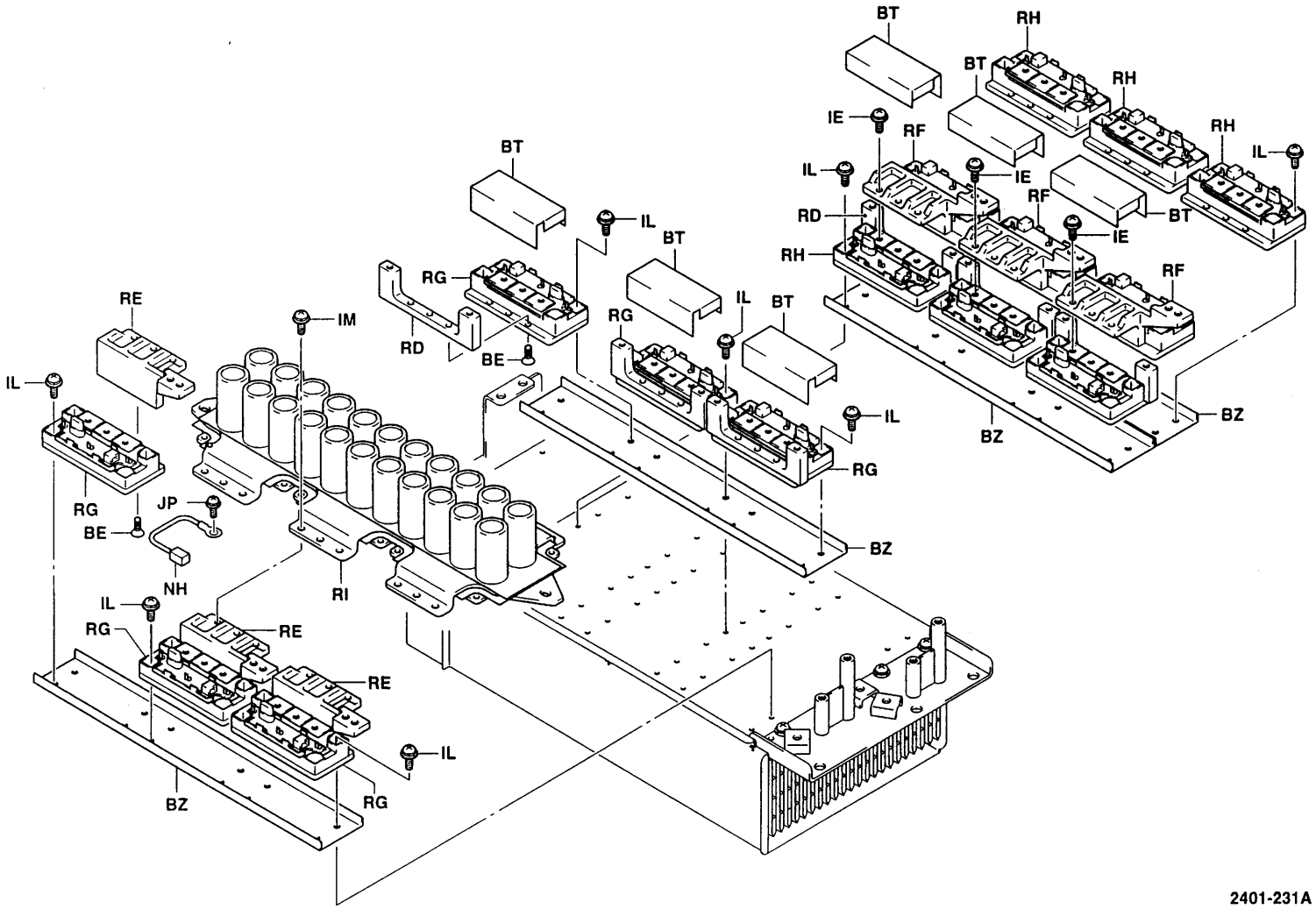


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SPECIFICATIONS

		1 ton series	2 ton series	3 ton and J3.5 ton
Fuse	F1 (For traveling and load handling circuits)	500A 40-7FB15: 600A	600A	500A
	F3 (For PS circuit)	60A	←	←
	F4 (For lamps)	10	←	←
	F5 (For control circuit)	10	←	←
	F6 (For PS and solenoid)	10	←	←
	F7 (For DC/MD)	—	—	10A
Transistor	TMD (For traveling)	100V/640A	100V/800A	150V/600A
	TMP (For load handling)	100V/560A 40-7FB15: 100V/640A	100V/720A	150V/540A
	TMPS (For PS)	1MI 100H-025	←	←
Current sensor	CS_{BATT} (For power supply)	S3CM7-800/4QG	←	←
	CSD_A CSD_B (For traveling)	S3CM7-800/4QG	←	←
	CSP_A, CSP_B (For load handling)	S3CM7-800/4QG	←	←
Capacitor	CO (For traveling and load handling)	100V, 2700μF × 20 pcs.	100V, 2700μF × 22 pcs.	160 V, 1800μF × 22 pcs.
Contactor	MB (For power supply)	Type ME251	←	←

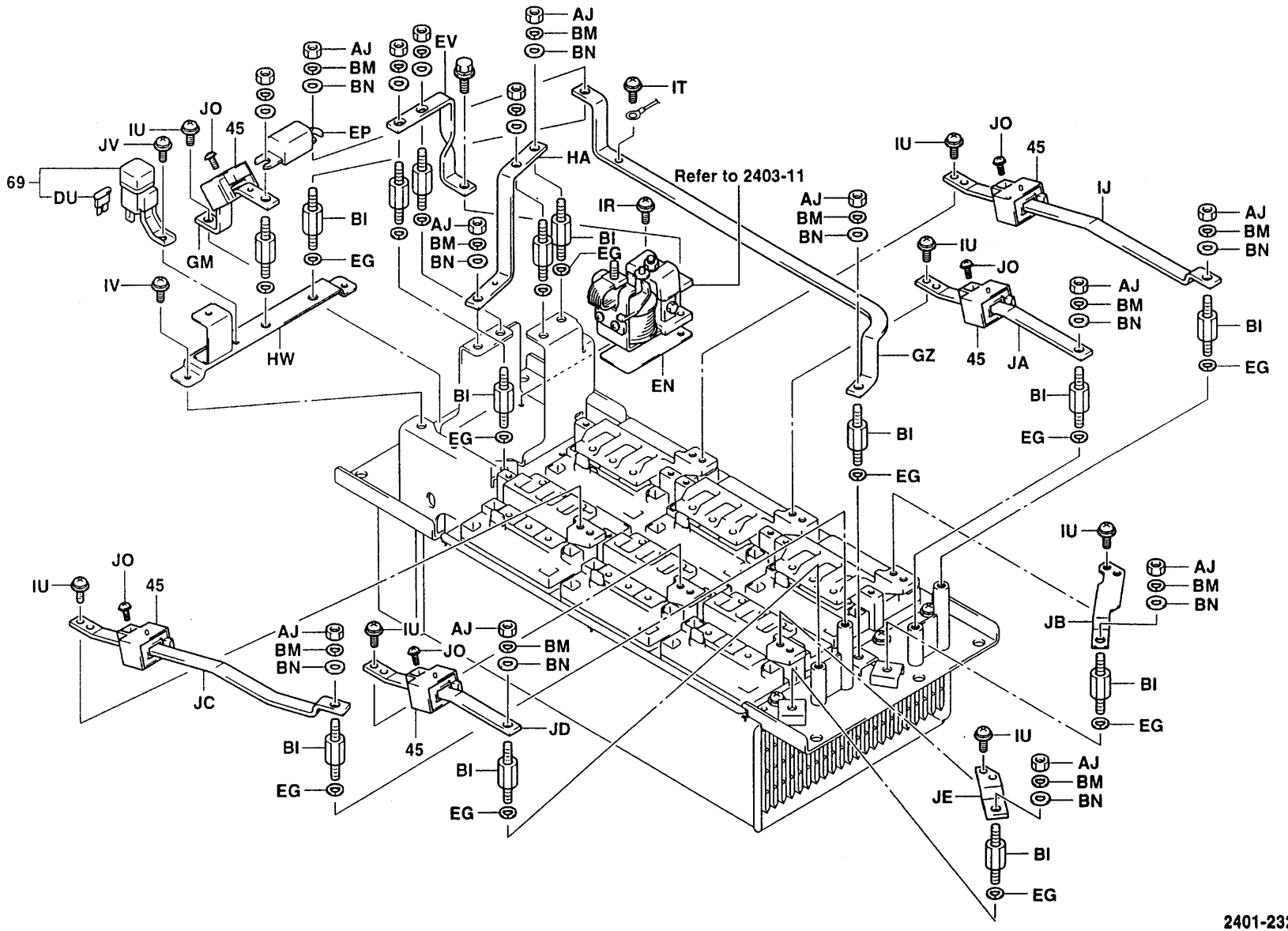
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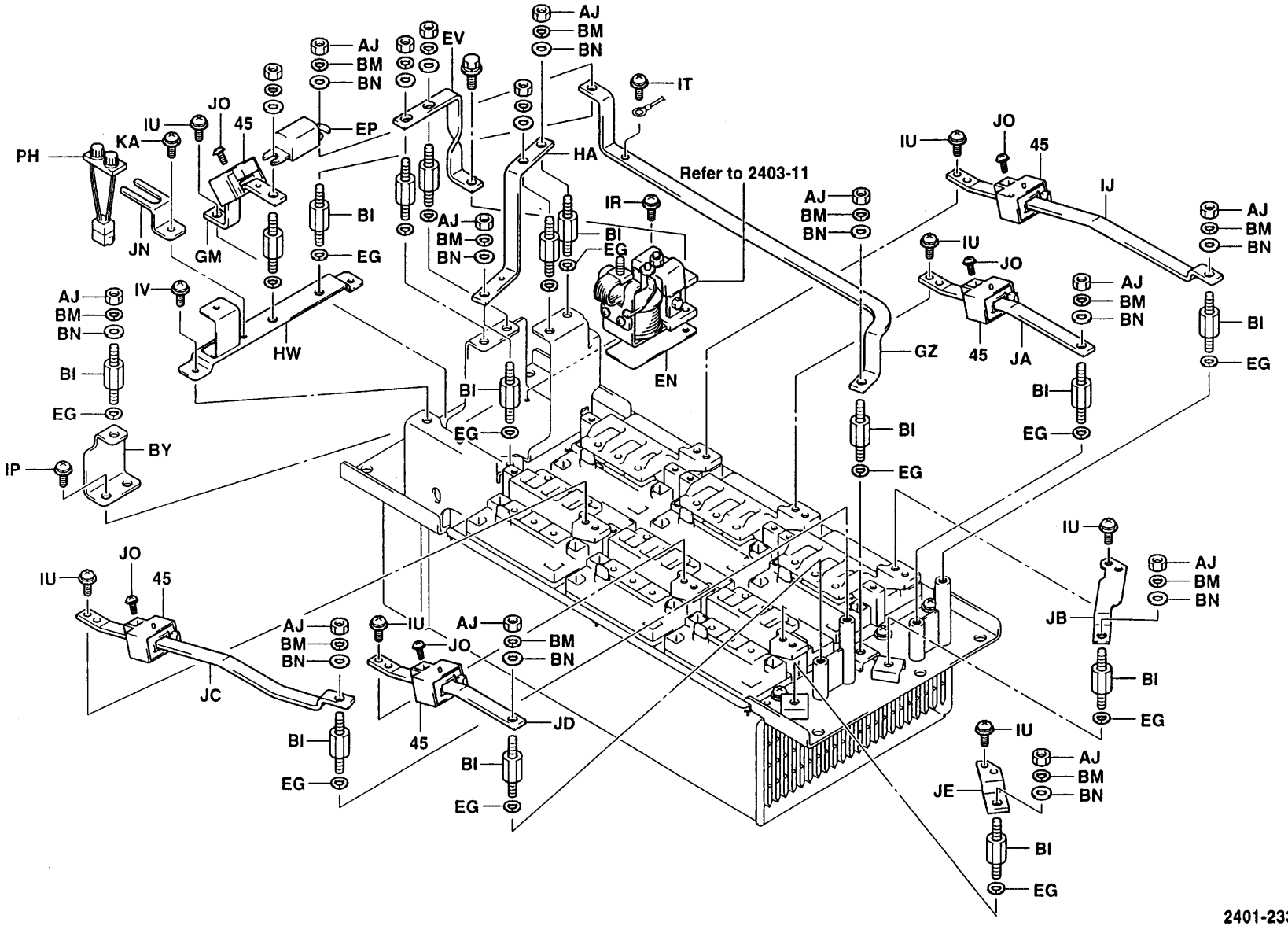
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(For 1·2 ton series)

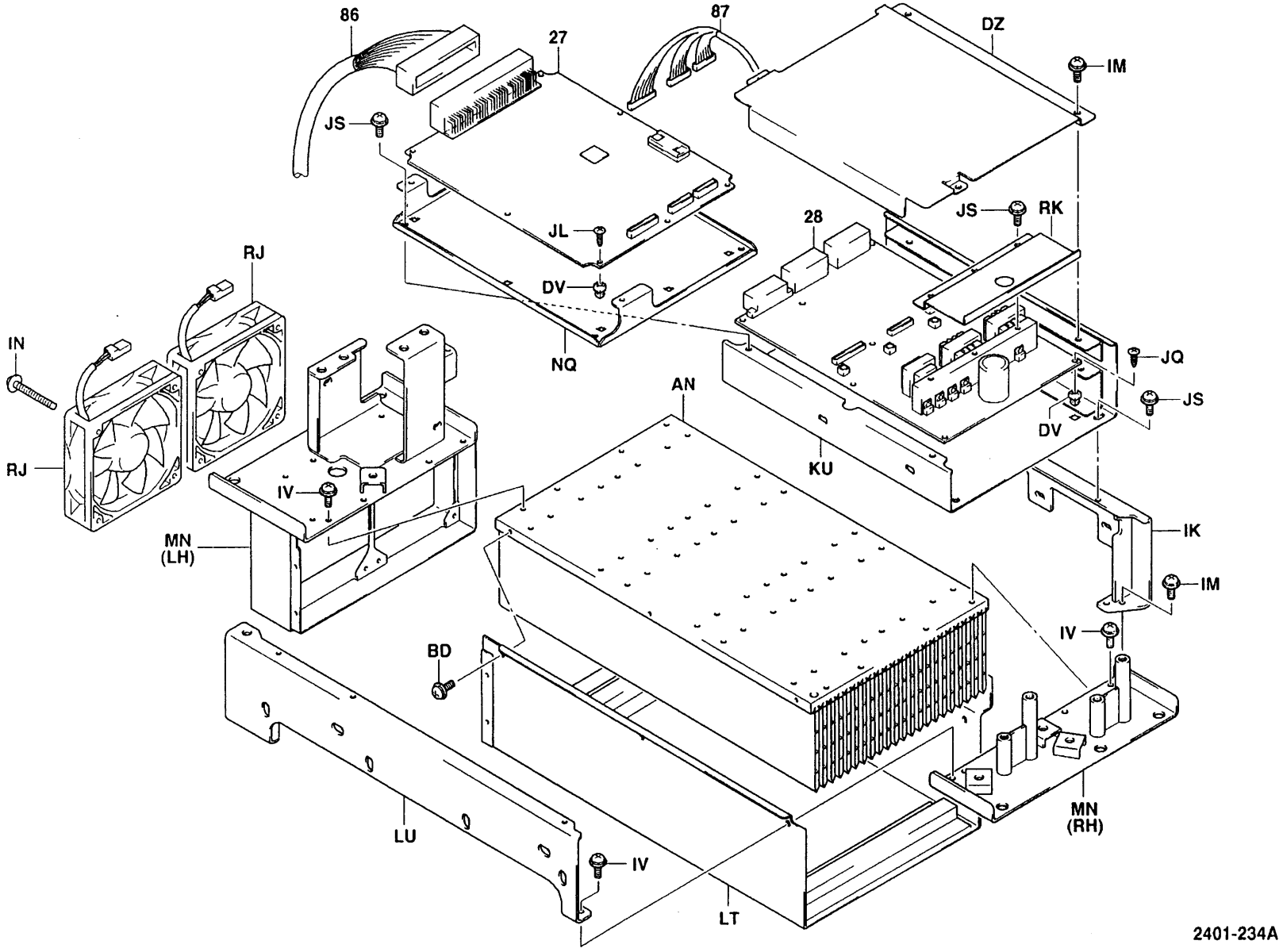


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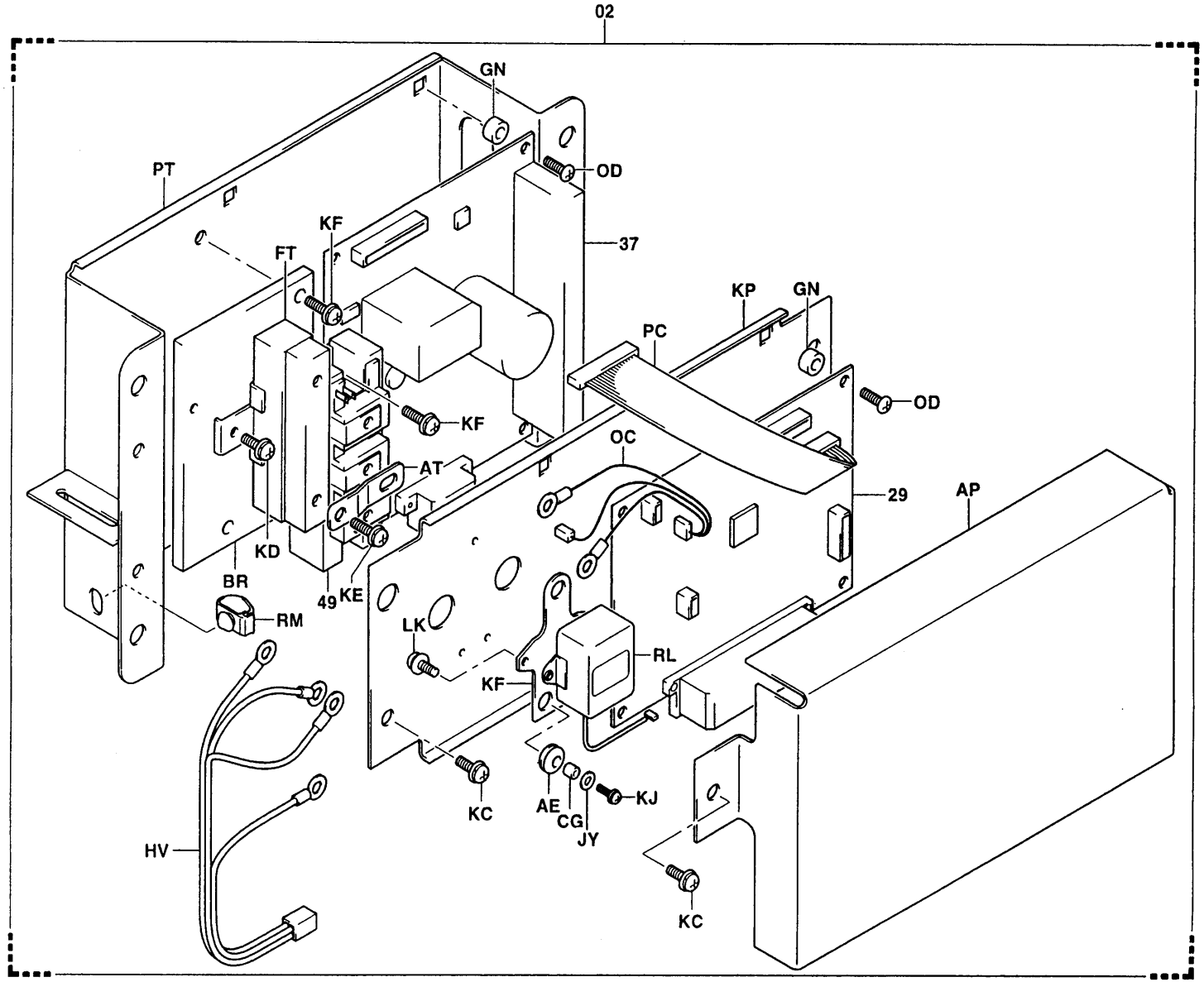
(For 3 ton, J3.5 ton)



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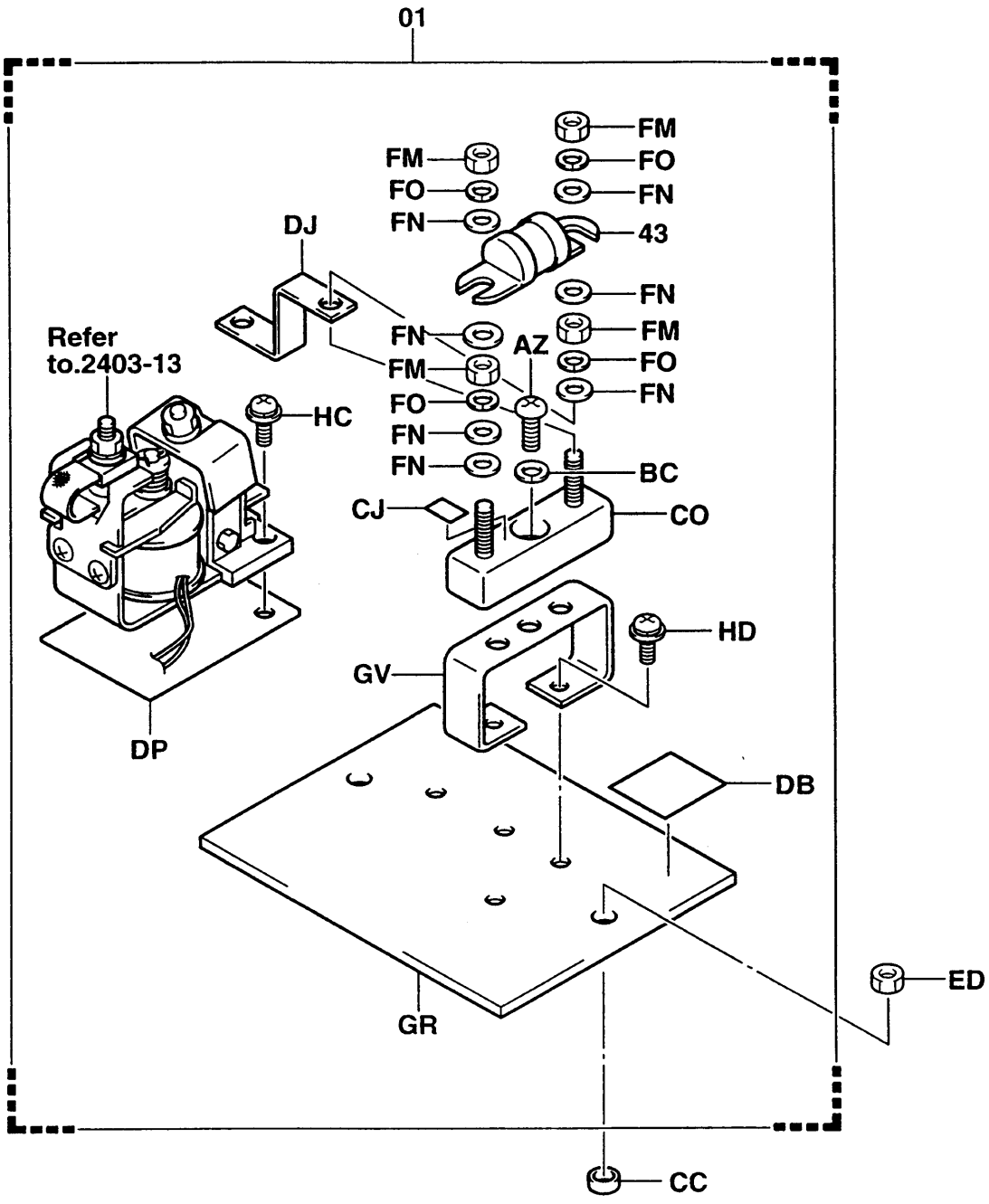


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2402



2402-093A

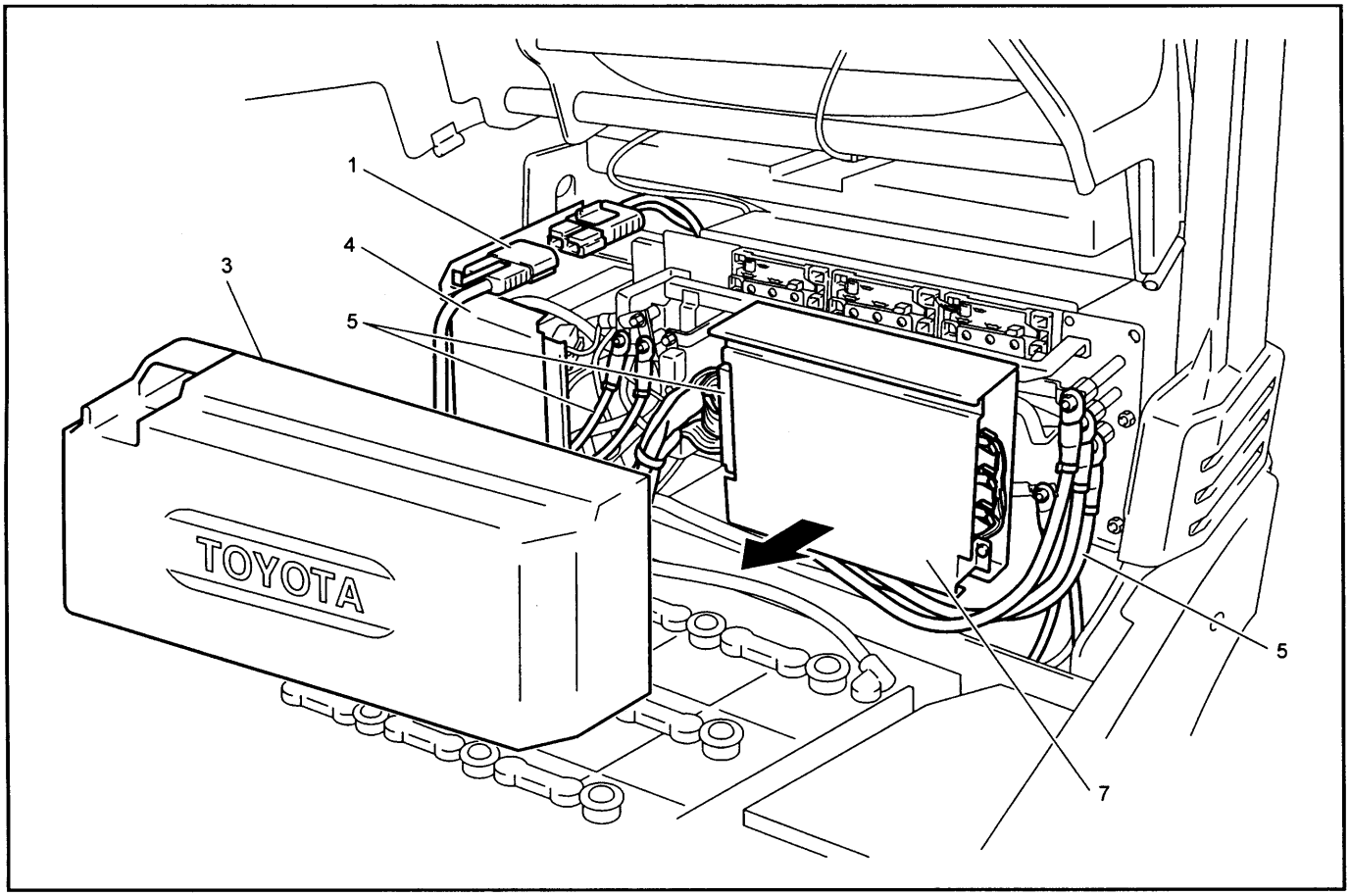
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CONTROLER

CONTROL PANEL ASSY (FOR TRAVELING AND MATERIAL HANDLING)

Removal·Installation

Caution:
Measure the voltage between P4 and N1 before starting the job. If any voltage exists, insert a resistor at approx. 100 Ω between P4 and N1 to discharge the capacitor.



Removal Procedure

1 Disconnect the battery plug.

2 Open the seat stand.

3 Remove the controller cover.

4 Remove the transformer cover.

5 Disconnect the external wiring to the controller at the connector and terminals.

6 Place relatively thick corrugated cardboard on top of the battery.

7 Remove the controller set nut and remove the controller ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

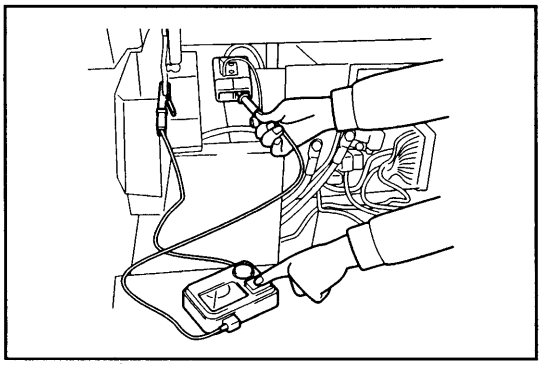
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Inspection

Some components can be inspected after they are removed from the vehicle while others cannot unless they are installed on the vehicle.
The CPU and DC-MD boards are to be inspected as installed on the vehicle because they must be applied with the battery voltage. The inspection method for the control panel ASSY explained here is mainly for the state after removal from the vehicle.

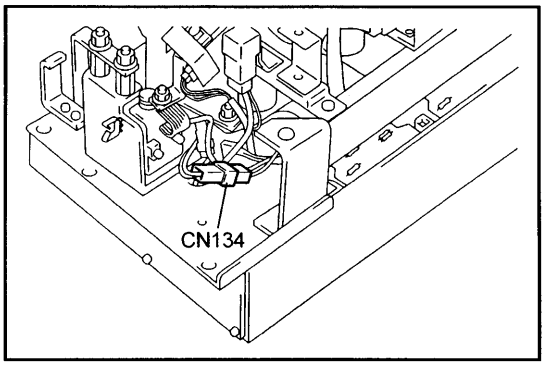
1. Insulation resistance measurement (This is a must before starting the control panel inspection.)
   (1) Disconnect the battery plug and measure the insulation resistance between the battery plug and body.

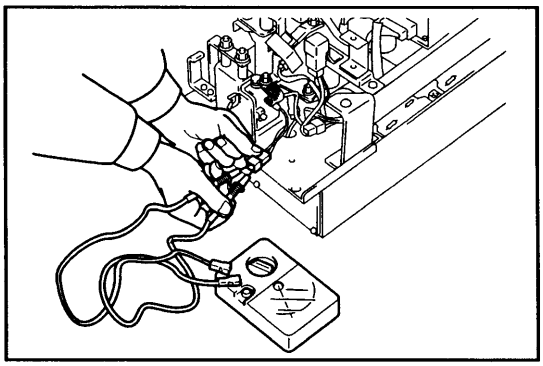
Measurement terminals	Controller side of battery plug – Body
Standard	The higher the better, but it varies greatly with the vehicle operating condition, place and weather. (Approx. 1 MΩ or more)



2. MB (power supply contactor)
   (1) Inspection method
   Disconnect the CN134 connector and measure the resistance of the MB coil.

Portion to be inspected	Measurement terminals	Standard	Tester range
MB coil	Both terminals of CN134	Approx. 20 Ω (at 20°C)	Ω x 1





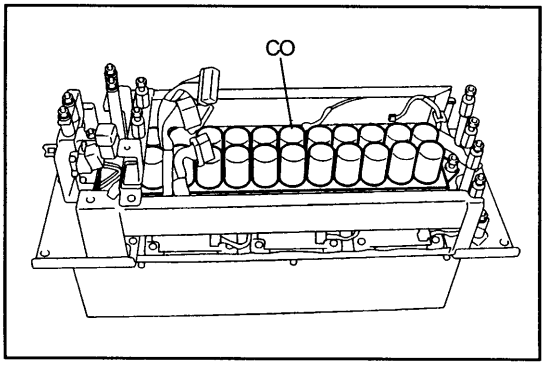
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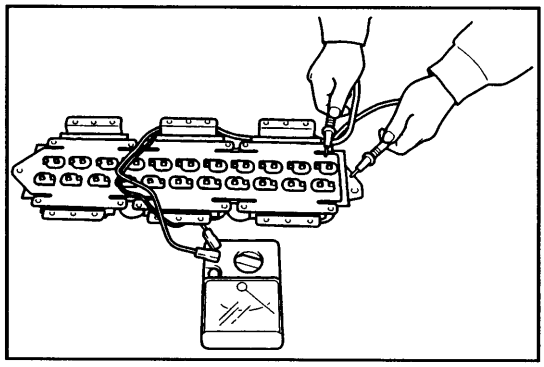
3. CO (overall capacitor)
   (1) Inspection method
   Make sure that CO is fully discharged before inspecting it.

Portion to be inspected	Measurement terminals	Tester range
CO	Both terminals on the rear side of CO	Ω x 1 k

Standard

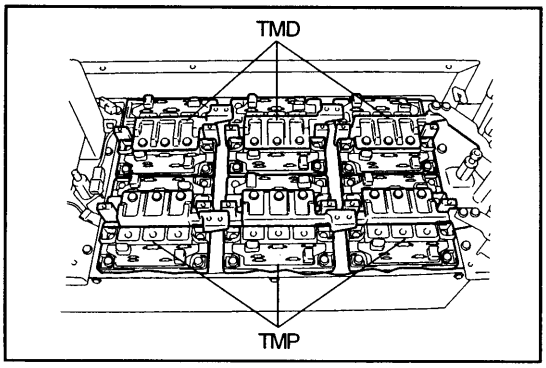
Bring tester probes into contact with both contacts of CO. The pointer deflects once to the 0 Ω side, then gradually returns to indicate ∞ finally. ∞ Ω is indicated because the capacitor is charged by the tester current.

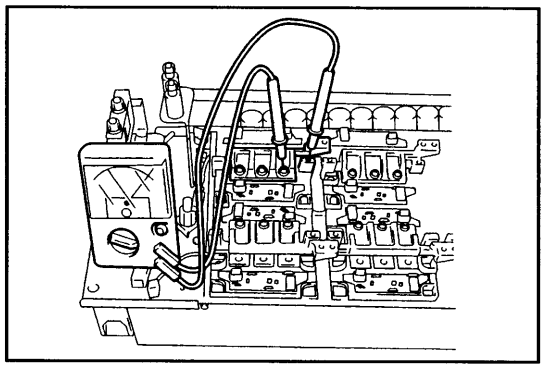




4. TMD (traveling transistor) and TMP (load handling transistor)
   (1) Inspection method
   Remove CO (overall capacitor) and insulation cover.

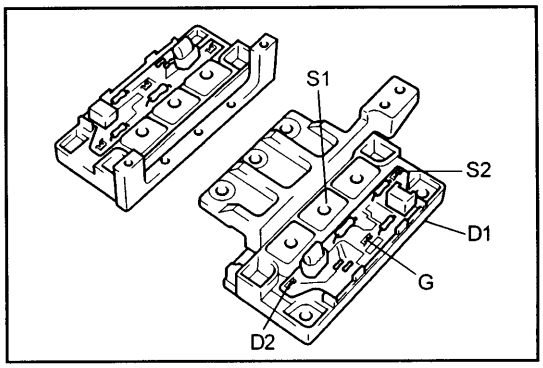
Portion to be inspected	Measurement terminals	Standard	Tester range
TMD TMP	D1 (D2) ⊕ – S1 (S2) ⊖	Approx. 2 kΩ	Ω x 1 k
	D1 (D2) ⊕ – G ⊖	Approx. 12 kΩ	
	S1 (S2) ⊕ – D1 (D2) ⊖	∞	
	S1 (S2) ⊕ – G ⊖	Approx. 10 kΩ	
	G ⊕ – D1 (D2) ⊖	∞	
	G ⊕ – S1 (S2) ⊖	Approx. 1 kΩ	





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(2) TMD·TMP inspection terminals

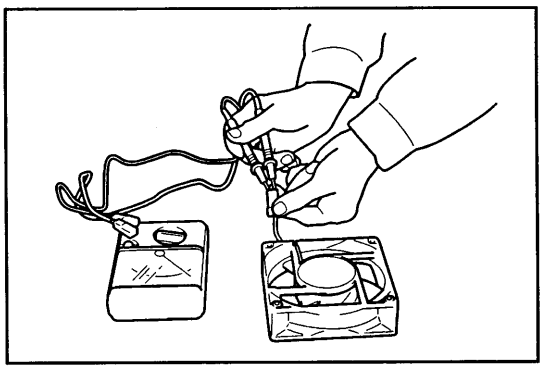


5. Traveling and load handling motor fans

(1) Inspection method

Disconnect the fan connector.

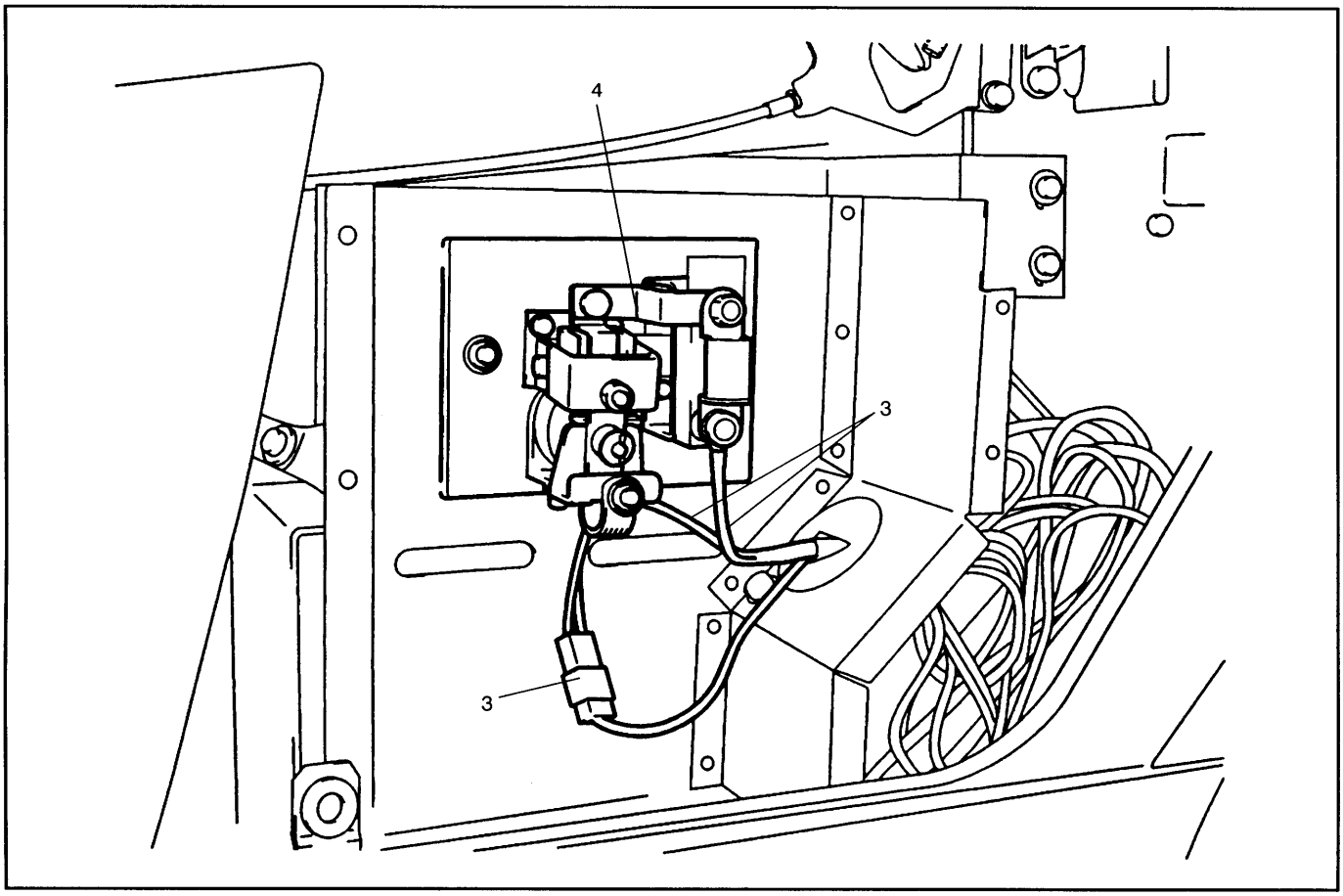
Portion to be inspected	Measurement terminals	Standard	Tester range
Traveling motor fan Load handling motor fan	CN132-1 (7) – CN132-2 (8) CN133-1 (9) – CN133-2 (10)	∞ Ω	Ω x 1



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PS CONTROL PANEL ASSY (FOR STD)

Removal·Installation



Removal Procedure

1. Disconnect the battery plug.
2. Open the seat stand.
3. Disconnect the electrical wiring.
4. Remove the control panel ASSY.

Installation Procedure

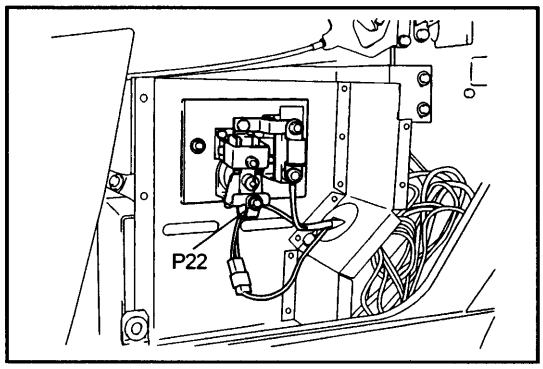
The installation procedure is the reverse of the removal procedure.

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Inspection

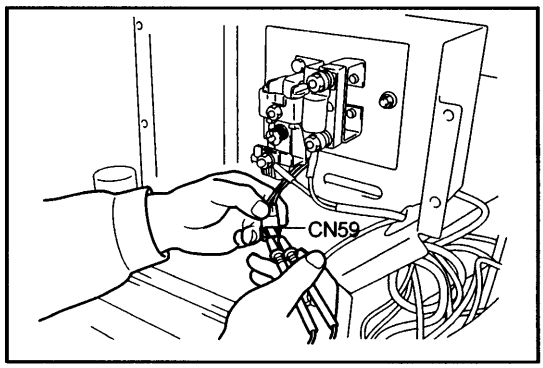
1. P22-N1 voltage measurement
   Battery plug ON•SWky ON

Measurement terminals	P22 — N1
Circuit tester range	DC200 V
Standard	1·2 ton series: 48 V 3 ton, J3.5 ton: 80 V



2. Mps contactor coil conduction measurement
   Battery plug OFF•SWky OFF

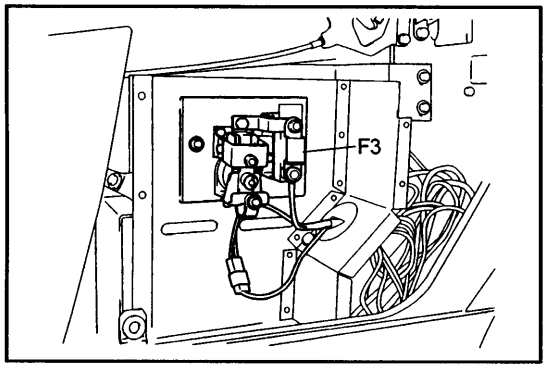
Measurement terminals	Both terminals of connector (CN59) of Mps Contactor
Circuit tester range	Ω x 1
Standard	Approx. 20 Ω (at 20°C)

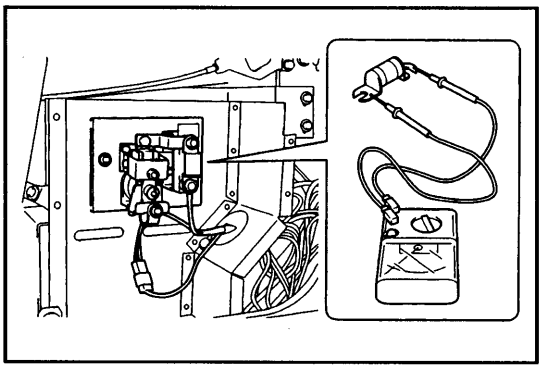


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3. F3 (PS circuit fuse) inspection
Battery plug OFF, F3 removal

Measurement terminals	Both terminals of F3
Tester range	Ω x 1
Standard	0 Ω

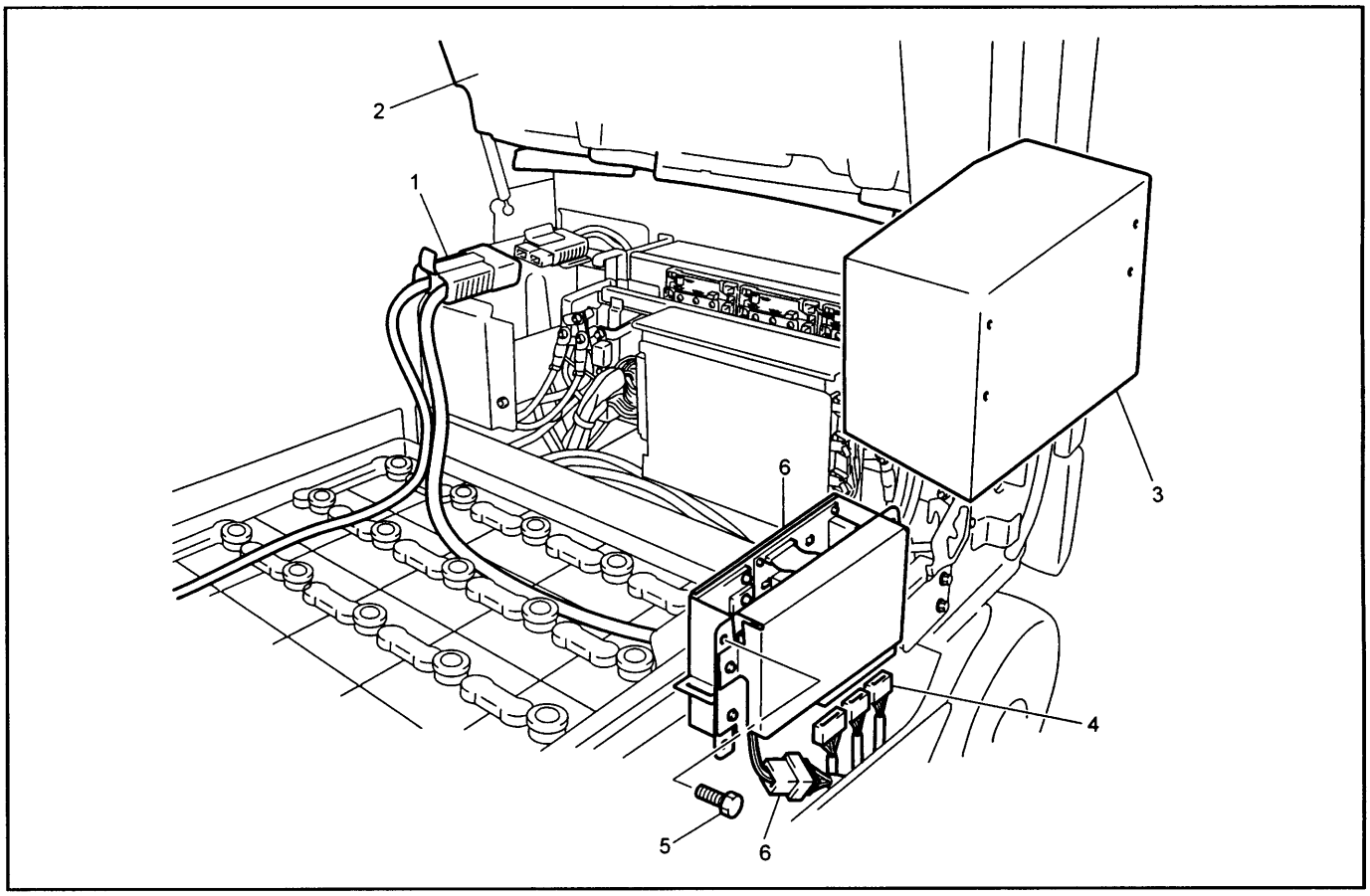




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PS CONTROL PANEL ASSY (FOR WITH SAS)

Removal·Installation



Removal Procedure

1 Disconnect the battery plug.

2 Open the seat stand.

3 Remove the PS controller cover.

4 Disconnect the SCPU board connector.

5 Remove the PS controller set bolts.

6 Disconnect the DC/SD board and CN51 connectors, and remove the PS controller ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

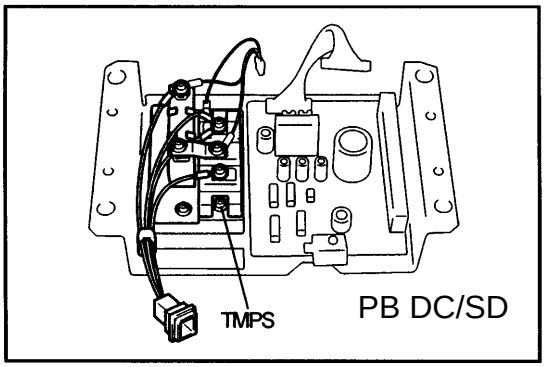
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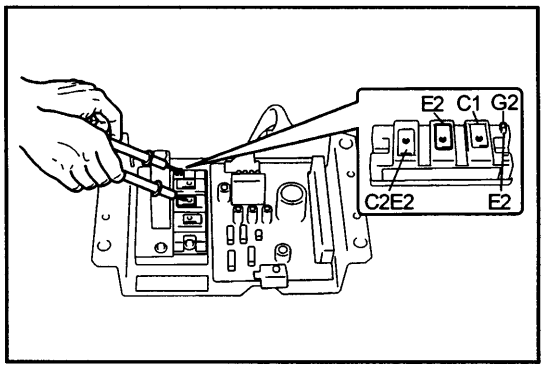
Inspection

Similarly as the traveling and load handling controllers, some components can be inspected after removal from the vehicle while others cannot unless they are installed on the vehicle.
The SCPU and DC/SD boards are to be inspected as installed on the vehicle because they must be applied with the battery voltage. The inspection method for the SK/PS control panel ASSY explained here is mainly for the state after removal from the vehicle.

1. TMPS (transistor for PS)
   (1) Inspection method
   Disconnect the TMPS wiring.

Portion to be inspected	Measurement terminals		Standard	Tester range
TMPS	C2E1-E2	C2E1 ⊖ probe – E2 ⊕ probe	∞ Ω	Ω x 1 k
		C2E1 ⊕ probe – E2 ⊖ probe	Continuity shall exist.	
	G2-E2	G2 ⊖ probe – E2 ⊕ probe	∞ Ω	
		G2 ⊕ probe – E2 ⊖ probe	∞ Ω	
	C2E1-C1	C2E1 ⊖ – C1 ⊕	Continuity shall exist.	
		C2E1 ⊕ – C1 ⊖	∞ Ω	



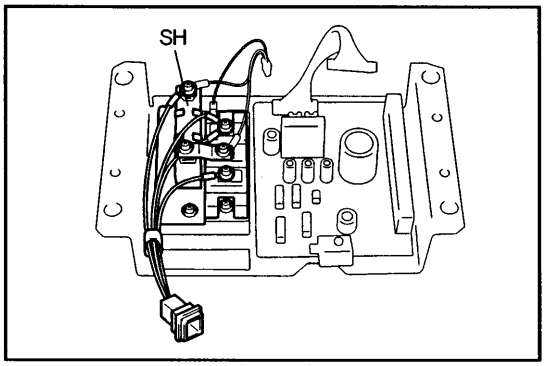


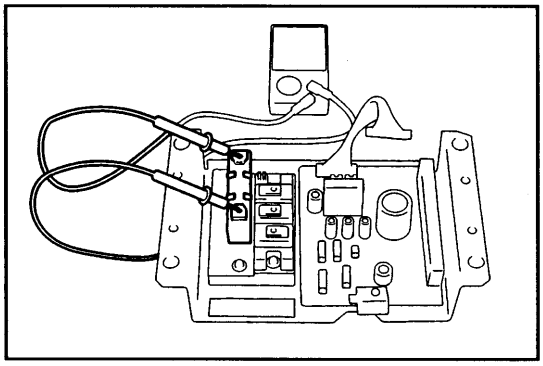
Caution:
- **When shifting to check C2E1-E2 from G2-E2 short connect G2-E2 to avoid the possibility of continuity on both directions.**
- **Never touch to G2 terminal with a naked hand. Because static electricity may damage the transistor.**

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2. SH (shunt)
   (1) Inspection method
   Disconnect the SH wiring.

Portion to be inspected	Measurement to be inspected	Standard	Tester range
SH	Both terminals of SH	Continuity shall exist.	Ω x 1





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BOARD INSPECTION

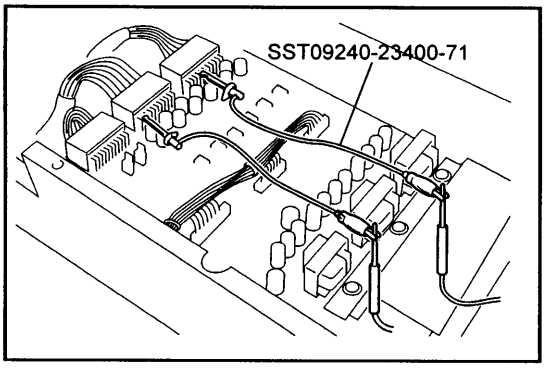
When the cause of a trouble is judged to exist in the CPU board or the DC/MD board, connect SST 09240-23400-71 or 09230-13700-71 to the corresponding connector and measure the applied voltage and resistance at each connector.
Always disconnect the battery plug before measuring the resistance.

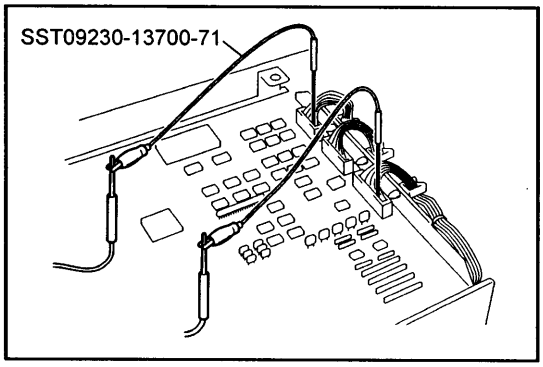
Caution:
Always disconnect the battery plug before removing or installing the CPU board or the DC/MD board.

Note:
When replacing the CPU or DC/MD board since it is judged as the cause of a trouble as the result of troubleshooting, always measure the applied voltage and resistance of each related portion.

(1) SST setting method
① Set the key switch to OFF and disconnect the battery plug.
② Connect the SST to the corresponding connector pin.

Caution:
Carefully connect the SST to the correct connector pin by confirming the pin NO. since incorrect connection may damage normal portions.





Connectors to which SST 09240-24300-71 is applicable

CPU board:	CN101 ~ CN104
DC/MD board:	CN111 ~ CN113
SCPU board:	CN140 ~ CN142
DC/SD board:	CN148

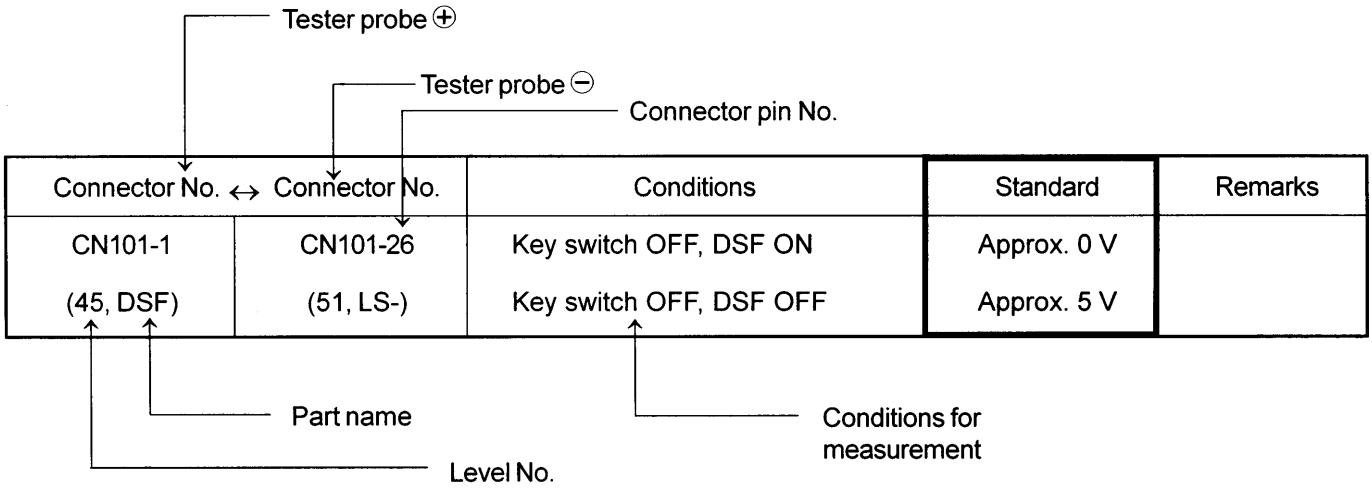
Connectors to which SST 09230-13700-71 is applicable

CPU board:	CN105 ~ CN107
DC/MD board:	CN108 ~ CN110
SCPU board:	CN146, CN144 and CN145
DC/SD board:	CN147

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(2) Measurement method and standard list

① How to read the list



Traveling and load handling systems

CPU board

CN101 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN101-1 (45, DSF)	CN101-26 (51, LS-)	Key switch OFF, DSF ON Key switch OFF, DSF OFF	Approx. 0 V Approx. 5 V	
CN101-2 (46, DSR)	CN101-26 (51, LS-)	Key switch OFF, DSR ON Key switch OFF, DSR OFF	Approx. 0 V Approx. 5 V	
CN101-3 (65, LSB)	CN101-26 (51, LS-)	Key switch OFF, LSB ON Key switch OFF, LSB OFF	Approx. 5 V Approx. 0 V	
CN101-4 (66, LSPB)	CN101-26 (51, LS-)	Key switch OFF, LSPB ON Key switch OFF, LSPB OFF	Approx. 5 V Approx. 0 V	
CN101-5 (67, LSD)	CN101-26 (51, LS-)	Key switch OFF, LSD ON (with shorting connector) Key switch OFF, LSD OFF	Approx. 0 V Approx. 5 V	
CN101-6		Unused	–	
CN101-7		Unused	–	
CN101-8		Unused	–	
CN101-9 (307, SMTSA)		Immeasurable	–	
CN101-10 (308, SMTSK)		Immeasurable	–	
CN101-11 (63, LSAT1)		Unused	–	
CN101-12 (309, SSTMA)		Immeasurable	–	
CN101-13 (310, SSTMK)		Immeasurable	–	
CN101-14 (93, M15V)	CN101-26 (51, LS-)		Approx. 15 V	

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN101-15 (146, BIBC)		Immeasurable	–	
CN101-16 (61, LSTF)	CN101-26 (51, LS-)	Key switch OFF, LSTF ON Key switch OFF, LSTF OFF	Approx. 0 V Approx. 5 V	
CN101-17 (62, LSTR)	CN101-26 (51, LS-)	Key switch OFF, LSTR ON Key switch OFF, LSTR OFF	Approx. 0 V Approx. 5 V	
CN101-18 (70, SWTK)	CN101-26 (51, LS-)	Key switch OFF, SWTK ON Key switch OFF, SWTK OFF	Approx. 0 V Approx. 5 V	
CN101-19 (90, MH1)	CN101-26 (51, LS-)	Lift cylinder at the bottom position	Approx. 0 V	
CN101-20 (91, MH2-1)	CN101-26 (51, LS-)	Lift cylinder at the bottom position	Approx. 5 V	
CN101-21 (92, MH2-2)	CN101-26 (51, LS-)	Lift cylinder at the bottom position	Approx. 5 V	
CN101-22 (69, LSAT2)		Unused	–	
CN101-23		Unused	–	
CN101-24 (LSOPT2)		Unused	–	
CN101-25 (145, BIBD)		Immeasurable	–	
CN101-26 (51, LS-)	CN101-26 (51, LS-)		Approx. 0 V	
CN101-27 (OPTO)		Unused	–	
CN101-28		Unused	–	
CN101-29		Unused	–	
CN101-30		Unused	–	
CN101-31		Unused	–	
CN101-32 (60, LSL)	CN101-26 (51, LS-)	Key switch OFF, LSL ON Key switch OFF, LSL OFF	Approx. 5 V Approx. 0 V	
CN101-33		Unused	–	
CN101-34		Unused	–	

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CN102 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN102-1 (64, SWAC)	CN101-22 (69, LSAT2)	Key switch OFF, SWAC ON Key switch OFF, SWAC OFF	Approx. 0 V 4 V ~ 5 V	
CN102-2 (52, POTA)	CN101-22 (69, LSAT2)	Key switch OFF, accelertor pedal full depression	0.5 V ~ 3 V	
CN102-3 (AOPT)		Unused	–	
CN102-4 (56, POTT)	CN101-22 (69, LSAT2)	Variation upon changeover from forward to backward tilting	0.5 V ~ 4 V	
CN102-5 (59, SPL)	CN101-22 (69, LSAT2)		0.5 V ~ 4 V	
CN102-6 (81, SSD1)		Traveling in stopped state	Approx. 15 V or 0 V	
CN102-7 (82, SSD2)		Traveling in stopped state	Approx. 15 V or 0 V	
CN102-8 (84, SSP+)	CN101-26 (51, LS-)		Approx. 0 V	
CN102-9 (85, SSP-)	CN102-8 (84, SSP+)	Resistance measurement with battery OFF	Approx. 600 Ω	
CN102-10 (86, TD+)	CN101-26 (51, LS-)		Approx. 4.6 V	
CN102-11 (87, TD-)	CN101-26 (51, LS-)		1 V ~ 4 V	
CN102-12 (88, TP+)	CN101-26 (51, LS-)		Approx. 5 V	
C102-13 (89, TP-)	CN101-26 (51, LS-)		1 V ~ 4 V	
CN102-14 (53, POTA+)	CN101-26 (51, LS-)		Approx. 4.6 V	
CN102-15 (54, AOPT+)		Unused	–	
CN102-16 (57, POTT+)	CN101-26 (51, LS-)		Approx. 4.6 V	
CN102-17 (58, SPL+)	CN101-26 (51, LS-)		Approx. 5 V	
CN102-18 (80, SSD+)	CN101-26 (51, LS-)		Approx. 14 V	
CN102-19 (83, SSD-)	CN101-26 (51, LS-)		Approx. 0 V	
CN102-20		Unused	–	
CN102-21		Unused	–	
CN102-22 (51, POT-)	CN101-26 (51, LS-)		Approx. 0 V	

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CN103 connector basic conditions (battery plug ON , key switch ON)

Connector No.↔ Connector No.		Conditions	Standard	Remarks
CN103-1 (3, SOLL+)	CN103-2 (4, SOLL-)	Measurement with ⊖ probe in contact with CN103-2	Approx. 11 V	
CN103-2 (4, SOLL-)	CN103-1 (3, SOLL+)	Resistance measurement with battery OFF	Approx. 10 Ω	
CN103-3 (41, B48V)	CN104-10 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 48 V Approx. 80 V	
CN103-4 (43, VBKY)	CN104-10 (N2, N2)	Key switch OFF Key switch ON 1·2 ton series 3 ton, J3.5 ton	Approx. 0 V Approx. 48 V Approx. 80 V	
CN103-5 (5, SOLT+)	CN103-6 (6, SOLT-)	Measurement during forward tilting with ⊖ probe in contact with CN103-6	Approx. 11 V	
CN103-6 (6, SOLT-)	CN103-5 (5, SOLT+)	Resistance measurement with battery OFF	Approx. 10 Ω	
CN103-7 (41, VBBT)	CN104-10 (N2, N2)		Approx. 48 V	
CN103-8 (44, VBMB)	CN104-10 (N2, N2)	1·2 ton series 3 ton, J3.5 ton Key switch OFF	Approx. 48 V Approx. 80 V Approx. 0 V	
CN103-9		Unused	–	
CN103-10 (16, D15V)	CN104-10 (N2, N2)		14 V ~ 15 V	
CN103-11		Unused	–	
CN103-12 (14, GNDD)	CN104-10 (N2, N2)		Approx. 0 V	
CN103-13 (144, SMTDK)		Immeasurable	–	
CN103-14 (143, SDTMK)		Immeasurable	–	
CN103-15 (142, SDTMA)		Immeasurable	–	
CN103-16 (141, SMTDA)		Immeasurable	–	

CN104 connector basic conditions (battery plug ON, key switch ON)

Connector No.↔ Connector No.		Conditions	Standard	Remarks
CN104-1 (N2, N2C)	CN104-10 (N2, N2)		Approx. 0 V	
CN104-2 (54, CSBATT)	CN104-10 (N2, N2)		Approx. 7 V	
CN104-3		Unused	–	
CN104-4 (18, B80V)	CN104-10 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 0 V Approx. 80 V	
CN104-5 (75, CSD+)	CN104-10 (N2, N2)		14 V ~ 15 V	
CN104-6 (75, CSP+)	CN104-10 (N2, N2)		14 V ~ 15 V	

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN104-7 (71, CSDA)	CN104-10 (N2, N2)		Approx. 7 V	
CN104-8 (72, CSDB)	CN104-10 (N2, N2)		Approx. 7 V	
CN104-9 (13, C20V)	CN104-10 (N2, N2)		Approx. 21 V	
CN104-10 (N2, N2)	CN104-10 (N2, N2)		Approx. 0 V	
CN104-11 (2, MB-)	CN104-13 (1, MB+)	Resistance measurement with battery OFF	Approx. 20 Ω	
CN104-12 (P2, VBP2)	CN104-10 (N2, N2)		Approx. 50 V	
CN104-13 (1, MB+)	CN104-11 (2, MB-)	Measurement with ⊖ probe in contact with CN104-11	Approx. 11 V	
CN104-14 (44, VBMB)	CN104-10 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 48 V Approx. 80 V	
CN104-15 (41, B48V)	CN104-10 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 48 V Approx. 80 V	
CN104-16 (16, D15V)	CN104-10 (N2, N2)		14 V ~ 15 V	
CN104-17 (15, C15V)	CN104-10 (N2, N2)		14 V ~ 15 V	
CN104-18 (73, CSPA)	CN104-10 (N2, N2)		Approx. 7 V	
CN104-19 (74, CSPB)	CN104-10 (N2, N2)		Approx. 7 V	
CN104-20 (78, THCD)	CN104-10 (N2, N2)		1 V ~ 4 V	
CN104-21 (77, THC+)	CN104-10 (N2, N2)		Approx. 5 V	
CN104-22 (44, VBMB)	CN104-10 (N2, N2)		Approx. 50 V	
CN104-23 (14, GNDD)	CN104-10 (N2, N2)		Approx. 0 V	
CN104-24 (14, GNDC)	CN104-10 (N2, N2)		Approx. 0 V	
CN104-25 (79, THCP)	CN104-10 (N2, N2)		1 V ~ 4 V	
CN104-26		Unused	–	
CN104-27 (76, CSD-)	CN104-10 (N2, N2)		Approx. 0 V	
CN104-28 (76, CSP-)	CN104-10 (N2, N2)		Approx. 0 V	

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CN105 connector basic conditions (battery plug ON, key switch ON, direction lever at N, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN105-1 (38, FAN+)	CN104-10 (N2, N2)		Approx. 5 V	
CN105-2 (38, FAN+)	CN104-10 (N2, N2)		Approx. 5 V	
CN105-3 (36, FANCD)	CN104-10 (N2, N2)		Approx. 5 V (Approx. 4.5 V)	Fan stopped (fan ON)
CN105-4 (37, FANCP)	CN104-10 (N2, N2)		Approx. 5 V (Approx. 4.5 V)	Fan stopped (fan ON)
CN105-5		Unused	Approx. 6 V	
CN105-6 (39, DDC)	CN104-10 (N2, N2)		Approx. 4 V	
CN105-7 (40, PDC)	CN104-10 (N2, N2)		Approx. 4 V	
CN105-8 (94, CKFAND+)	CN104-10 (N2, N2)		Approx. 0 V (Approx. 0.5 V)	Fan stopped (fan ON)
CN105-9 (97, CKFAND-)		Immeasurable	–	
CN105-10 (98, CKFANP+)	CN105-11 (99, CKFANP-)		Approx. 0 V (Approx. 0.5 V)	Fan stopped (fan ON)
CN105-11 (99, CKFANP-)		Immeasurable	–	
CN105-12		Unused	–	
CN105-13		Unused	–	
CN105-14 (100, CHGFAN)	CN104-10 (N2, N2)		Approx. 5 V	

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CN106 connector basic conditions (battery plug ON, key switch ON, direction lever at N, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN106-1 (33, TMPU+)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-2 (27, TMPAU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-3 (28, TMPBU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-4 (29, TMPCU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-5 (30, TMPAD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-6 (31, TMPBD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-7 (32, TMPCD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-8 (33, TMPD+)	CN104-10 (N2, N2)		Approx. 5 V	
CN106-9 (35, CKPV)	CN104-10 (N2, N2)		Approx. 10 V	
CN106-10		Unused	–	
CN106-11		Unused	–	

CN107 connector basic conditions (battery plug ON, key switch ON, direction lever at N, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN107-1 (26, TMDU+)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-2 (20, TMDAU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-3 (21, TMDBU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-4 (22, TMDCU-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-5 (23, TMDAD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-6 (24, TMDBD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-7 (25, TMDCD-)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-8 (26, TMDD+)	CN104-10 (N2, N2)		Approx. 5 V	
CN107-9 (34, CKDV)	CN104-10 (N2, N2)		Approx. 10 V	
CN107-10		Unused	–	

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DC/MD board

CN111 connector basic conditions (battery plug ON, key switch ON, direction lever at neutral, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN111-1 (150, TMDAU1+)	CN111-14 (P3, TMDAU-SD)		13 V ~ 15 V	
CN111-2 (152, TMDAD1+)	CN111-15 (N2, TMDAD-SD)		13 V ~ 15 V	
CN111-3 (154, TMDBU1+)	CN111-16 (P5, TMDBU-SD)		13 V ~ 15 V	
CN111-4 (153, TMDAU-G)	CN111-14 (P3, TMDAU-SD)		13 V ~ 15 V	
CN111-5 (153, TMDAD-G)	CN111-15 (N2, TMDAD-SD)		13 V ~ 15 V	
CN111-6 (155, TMDBU-G)	CN111-16 (P5, TMDBU-SD)		13 V ~ 15 V	
CN111-7 (157, TMDBD-G)	CN111-24 (N2, TMDBD-SD)		13 V ~ 15 V	
CN111-8 (159, TMDCU-G)	CN111-25 (P7, TMDCU-SD)		13 V ~ 15 V	
CN111-9 (161, TMDCD-G)	CN111-26 (N2, TMDCD-SD)		13 V ~ 15 V	
CN111-10		Unused	–	
CN111-11 (156, TMDBD1+)	CN111-24 (N2, TMDBD-SD)		13 V ~ 15 V	
CN111-12 (158, TMDCU1+)	CN111-25 (P7, TMDCU-SD)		13 V ~ 15 V	
CN111-13 (160, TMDCD1+)	CN111-26 (N2, TMDCD-SD)		13 V ~ 15 V	
CN111-14 (P3, TMDAU-SD)		Immeasurable	–	
CN111-15 (N2, TMDAD-SD)		Immeasurable	–	
CN111-16 (P5, TMDBU-SD)		Immeasurable	–	
CN111-17 (150, TMDAU2+)	CN111-14 (P3, TMDAU-SD)		13 V ~ 15 V	
CN111-18 (152, TMDAD2+)	CN111-15 (N2, MDAD-SD)		13 V ~ 15 V	
CN111-19 (154, TMDBU2+)	CN111-16 (P5, TMDBU-SD)		13 V ~ 15 V	
CN111-20 (156, TMDBD2+)	CN111-24 (N2, TMDBD-SD)		13 V ~ 15 V	
CN111-21 (158, TMDCU2+)	CN111-25 (P7, TMDCU-SD)		13 V ~ 15 V	
CN111-22 (160, TMDCD2+)	CN111-26 (N2, TMDCD-SD)		13 V ~ 15 V	
CN111-23		Unused	–	

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN111-24 (N2, TMDBD-SD)		Immeasurable	–	
CN111-25 (P7, TMDCU-SD)		Immeasurable	–	
CN111-26 (N2, TMDCD-SD)		Immeasurable	–	

CN112 connector basic conditions
(battery plug ON, key switch ON, direction lever at neutral, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN112-1 (162, TMPAU1+)	CN112-14 (P12, TMPAU-SD)		13 V ~ 15 V	
CN112-2 (164, TMPAD1+)	CN112-15 (N2, TMPAD-SD)		13 V ~ 15 V	
CN112-3 (166, TMPBU1+)	CN112-16 (P14, TMPBU-SD)		13 V ~ 15 V	
CN112-4 (163, TMPAU-G)	CN112-14 (P12, TMPAU-SD)		13 V ~ 15 V	
CN112-5 (165, TMPAD-G)	CN112-15 (N2, TMPAD-SD)		13 V ~ 15 V	
CN112-6 (167, TMPBU-G)	CN112-16 (P14, TMPBU-SD)		13 V ~ 15 V	
CN112-7 (169, TMPBD-G)	CN112-24 (N2, TMPBD-SD)		13 V ~ 15 V	
CN112-8 (171, TMPCU-G)	CN112-25 (P16, TMPCU-SD)		13 V ~ 15 V	
CN112-9 (173, TMPCD-G)	CN112-26 (N2, TMPCD-SD)		13 V ~ 15 V	
CN112-10		Unused	–	
CN112-11 (168, TMPBD1+)	CN112-24 (N2, TMPBD-SD)		13 V ~ 15 V	
CN112-12 (170, TMPCU1+)	CN112-25 (P16, TMPCU-SD)		13 V ~ 15 V	
CN112-13 (172, TMPCD1+)	CN112-26 (N2, TMPCD-SD)		13 V ~ 15 V	
CN112-14 (P12, TMPAU-SD)		Immeasurable	–	
CN112-15 (N2, TMPAD-SD)		Immeasurable	–	
CN112-16 (P14, TMPBU-SD)		Immeasurable	–	
CN112-17 (162, TMPAU2+)	CN112-14 (P12, TMPAU-SD)		13 V ~ 15 V	
CN112-18 (164, TMPAD2+)	CN112-15 (N2, TMPAD-SD)		13 V ~ 15 V	
CN112-19 (166, TMPBU2+)	CN112-16 (P14, TMPBU-SD)		13 V ~ 15 V	
CN112-20 (168, TMPBD2+)	CN112-24 (N2, TMPBD-SD)		13 V ~ 15 V	

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN112-21 (170, TMPCU2+)	CN112-25 (P16, TMPCU-SD)		13 V ~ 15 V	
CN112-22 (172, TMPCD2+)	CN112-26 (N2, TMPCD-SD)		13 V ~ 15 V	
CN112-23		Unused	–	
CN112-24 (N2,TMPBD-SD)		Immeasurable	–	
CN112-25 (P16, TMPCU-SD)		Immeasurable	–	
CN112-26 (N2, TMPCD-SD)		Immeasurable	–	

CN113 connector basic conditions
(battery plug ON, key switch ON, direction lever at neutral, and motor cable disconnection)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN113-1 (41, B48V)	CN113-18 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 48 V Approx. 80 V	
CN113-2 (44, VBMB)	CN113-18 (N2, N2)	1·2 ton series 3 ton, J3.5 ton	Approx. 48 V Approx. 80 V	
CN113-3		Unused	–	
CN113-4 (7, FAND+)	CN113-18 (N2, N2)		Approx. 0 V (Approx. 24 V)	Fan stopped (fan ON)
CN113-5 (8, FAND-)		Immeasurable	–	
C113-6 (9, FANP+)	CN113-18 (N2, N2)		Approx. 0 V (Approx. 24 V)	Fan stopped (fan ON)
CN113-7 (10, FANP-)		Immeasurable	–	
CN113-8		Unused	–	
CN113-9		Unused	–	
CN113-10		Unused	–	
CN113-11		Unused	–	
CN113-12 (14, GNDD)	CN113-18 (N2, N2)		Approx. 0 V	
CN113-13 (14, GNDC)	CN113-18 (N2, N2)		Approx. 0 V	
CN113-14 (15, D15V)	CN113-18 (N2, N2)		14 V ~ 15 V	
CN113-15 (15, C15V)	CN113-18 (N2, N2)		14 V ~ 15 V	
CN113-16 (13, C20V)	CN113-18 (N2, N2)		Approx. 21 V	
CN113-17 (N2, N2)		Immeasurable	–	
CN113-18 (N2, N2)		Immeasurable	–	

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MMP board

CN114 to CN125 connectors basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CNOOO-1 (TM***2+)	CNOOO-3 (TM***-SD)		14 V ~ 15 V	
CNOOO-2 (TM***1+)	CNOOO-3 (TM***-SD)		14 V ~ 15 V	
CNOOO-3 (TM***-SD)	–		–	
CNOOO-4 (TM***-G)	CNOOO-3 (TM***-SD)		13 V ~ 15 V	

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PS system

SCPU board

CN140 connector: For software writing and not connected

CN141 connector basic conditions (battery plug ON, key switch ON)

Connector No.↔ Connector No.		Conditions	Standard	Remarks
CN141-1 (SSTXA)		Immeasuable	–	
CN141-2 (SXTSA)		Immeasurable	–	
CN141-3 (309, SSTMA)		Immeasurable	–	
CN141-4 (307, SMTSA)		Immeasurable	–	
CN141-5 (324, SS+)	CN141-15 (325, SS-)	Traveling stopped Battery plug OFF and traveling stopped	0 V 0 V, 620 Ω	
CN141-5 (324, SS+)	CN141-15 (325, SS-)	Battery plug OFF and traveling stopped	620 Ω	
CN141-6 (312, STS1)		Immeasurable	–	
CN141-7 (313, STS2)		Immeasurable	–	
CN141-8 (314, STSC)		Immeasurable	–	
CN141-9 (SSTXK)		Immeasurable	–	
CN141-10 (SXTSK)		Immeasurable	–	
CN141-11 (310, SSTMK)		Immeasurable	–	
CN141-12 (308, SMTSK)		Immeasurable	–	
CN141-13 (138, SL/L-)	CN141-16 (315, STS-)		Approx. 5 V	
CN141-14 (137, SL/L+)	CN141-16 (315, STS-)		Approx. 5 V	
CN141-15 (325, SS-)	CN146-6 (312, STS1)	Traveling stopped	Approx. 2.5 V	
CN141-16 (315, STS-)	CN146-6 (312, STS1)		0 V	
CN141-17 (311, STS+)	CN141-16 (315, STS-)		Approx. 15 V	
CN141-18		Unused	–	

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CN142 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN142-1 (POTOPT)		Unused	–	
CN142-2 (319, POTS)	CN142-8 (314, STSC)	Vehicle frame in horizontal state	Approx. 3.2 V	
CN142-3 (317, POTH)	CN142-8 (314, STSC)	Steering wheel in neutral position	Approx. 2.0 V	
CN142-4		Unused	–	
CN142-5		Unused	–	
CN142-6		Unused	–	
CN142-7 (POTOPT-)		Unused	–	
CN142-8 (320, SPOT-)	CN146-6 (312, STS1)		0 V	
CN142-9 (POTOPT+)		Unused	–	
CN142-10 (318, POTS+)	CN142-8 (314, STSC)		Approx. 5 V	
CN142-11 (316, P0TH+)	CN142-8 (314, STSC)		Approx. 5 V	
CN142-12		Unused	–	

CN144 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN144-1 (321, SYR+)	CN144-2 (323, SYR-)		Approx. 5 V	
CN144-2 (323, SYR-)	CN146-6 (353, GNDSC)		0 V	
CN144-3 (322, SYR)	CN144-2 (323, SYR-)		Approx. 2.5 V	

CN145 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN145-1 (340, TMPSG)		Immeasurable	–	
CN145-2 (P24, SH+)		Immeasurable	–	
CN145-3 (N1, SH-)	CN148-7 (N1, N1)		0 V	

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CN146 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN146-1 (PS15V)		Immeasurable	–	
CN146-2 (44, VBMB)	CM146-6 (353, GNDSC)	Key switch OFF	Approx. 48 V (Approx. 80 V)	1·2 ton series (3 ton, J3.5 ton)
CN146-3 (350, PS20V)	CN146-4 (351, GNDPS)		Approx. 21 V	
CN146-4 (351, GNDPS)		Immeasurable	–	
CN146-5 (352, SC15V)	CN146-6 (353, GNDSC)		Approx. 15 V	
CN146-6 (353, GNDSC)	CN148-7 (N1, N1)		0 V	
CN146-7 (331, DRSOL+)		Immeasurable	–	
CN146-8 (332, DRSOL-)		Immeasurable	–	
CN146-9 (333, CKSOLS)		Immeasurable	–	
CN146-10 (334, CKSOLST)		Immeasurable	–	
CN146-11 (335, SGSOLS)	CN146-6 (353, GNDSC)		0 V	
CN146-12 (336, SGSOLST)	CN146-6 (353, GNDSC)		Approx. 15 V	
CN146-13 (337, RESOL)	CN146-6 (353, GNDSC)		Approx. 15 V	
CN146-14		Unused	–	

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DC/SD board

CN147 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN147-1		Unused		Measurement unnecessary
CN147-2 (44, VBMB)	CN147-6 (353, GNDSC)	Key switch ON	Approx. 48 V (Approx. 80 V)	1·2 ton series (3 ton, J3.5 ton)
CN147-3 (350, PS20V)	CN147-4 (351, GNDPS)		Approx. 21 V	
CN147-4 (351, GNDPS)		Immeasurable		
CN147-5 (352, SC15V)	CN147-6 (353, GNDSC)		Approx. 15 V	
CN147-6 (353, GNDSC)	CN148-7 (351, GNDPS)		0 V	
CN147-7 (331, DRSOL+)		Immeasurable	–	
CN147-8 (332, DRSOL-)		Immeasurable	–	
CN147-9 (333, CKSOLS)	CN147-6 (353, GNDSC)		–	
CN147-10 (334, CKSOLST)	CN147-6 (353, GNDSC)		–	
CN147-11 (335, SGSOLS)	CN147-6 (353, GNDSC)		–	
CN147-12 (336, SGSOLST)	CN147-6 (353, GNDSC)		Approx. 15 V	
CN147-13 (337, RESOL)	CN147-6 (353, GNDSC)		Approx. 15 V	
CN147-14 (CKT-G)		Unused	–	

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CN148 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN148-1 (327, SOLS+)	CN148-6 (328, SOLS-)	Key switch ON Key switch OFF	Approx. 12 V 0 V Approx. 6 Ω	
CN148-2 (329, SOLST+)	CN148-5 (330, SOLST-)	Key switch OFF	0 V Approx. 10 Ω	
CN148-3 (44, VBMB)	CN148-7 (N1, N1)	Key switch ON Key switch OFF	Approx. 48 V (Approx. 80 V) 0 V	1.2 ton series (3 ton, J3.5 ton)
CN148-4 (CK20V)		Immeasurable	–	
CN148-5 (330, SOLST-)	CN148-7 (N1, N1)		Approx. 12 V	
CN148-6 (328, SOLS-)	CN148-7 (N1, N1)		0 V	
CN148-7 (N1, N1)		Immeasurable	–	
CN148-8		Immeasurable	–	

CN149 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN149-1 (340, TMPSG)		Immeasurable	–	

CN51 connector basic conditions (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN51-1 (P21, VBP21)	CN51-4 (N1, TMPS)		Approx. 48 V (Approx. 80 V)	1.2 ton series (3 ton, J3.5 ton)
CN51-2 (P21, VBP21)	CN51-4 (N1, TMPS)		Approx. 48 V (Approx. 80 V)	1.2 ton series (3 ton, J3.5 ton)
CN51-3 (P23, P23)	CN51-4 (N1, TMPS)	PS motor stopped	Approx. 48 V (Approx. 80 V)	1.2 ton series (3 ton, J3.5 ton)
CN51-4 (N1, N1)	CN148-7 (N1, N1)		0 V	1.2 ton series (3 ton, J3.5 ton)

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BEFORE REPLACING EACH BOARD

When the necessity of replacing the CPU, DC/MD or another board is judged as a result of troubleshooting, avoid replacing the board immediately, but check the following points:

- Abnormality in related circuit harnesses
- Play of any related circuit connector
- Chipping, bend or defective contact of any related circuit connector pin

If one of the above is the true cause of a problem, board replacement may damage a normal board. Always replace the board after careful inspection.

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DISASSEMBLY

Overhaul of the control panel is rarely required. In most cases, the required job is replacement of faulty parts after checking the problem cause through inspection.
Perform a correct job by referring to components and assembly drawings.

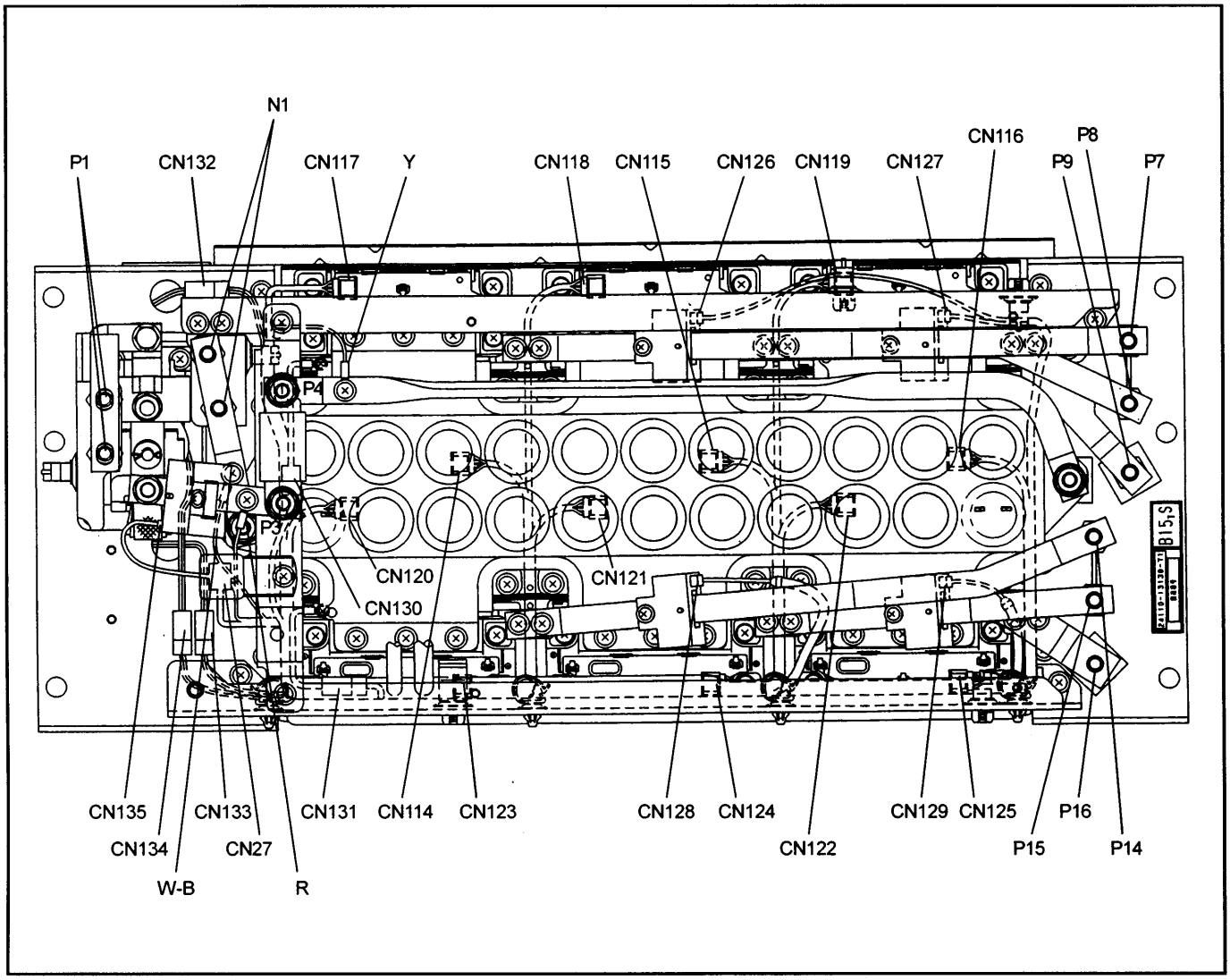
Notes on Parts Replacement

- Tighten the set nuts and screws of bars and harnesses to the specified torque. Loose or insufficiently tightened nuts and screws can produce other problems.
- Always take notes of installation positions or attach tags when disconnecting bars and harnesses so that they can be reconnected or re-installed in correct positions.
- Always apply new silicone grease when reassembling parts originally applied with silicone grease. Otherwise, overheating may occur.
- After reassembly, check that non-contact portions of bars and wiring are not in contact with any other parts. Also check continuity of specified points with a circuit tester before mounting on a vehicle. (As for the check points, see page 3-36.)
- Replace TMD·TMP always for each arm.
  Do not use the color seal affixed on each transistor and MMP board for identification. Always check the part number for identification (because each seal is for identification in production).

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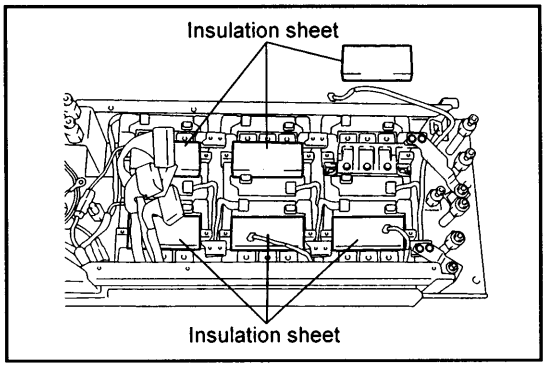
REASSEMBLY

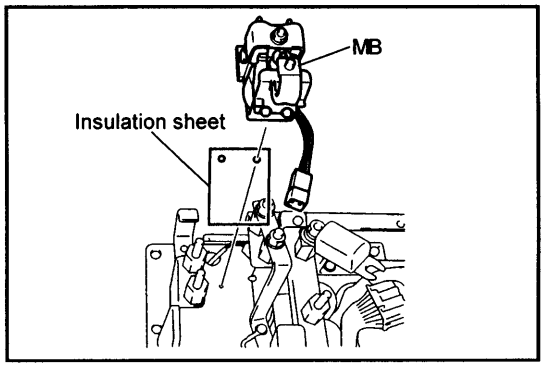
Control Panel Reassembly Drawing



Caution:
Pay sufficient attention so that insulating sheets are installed without fail.

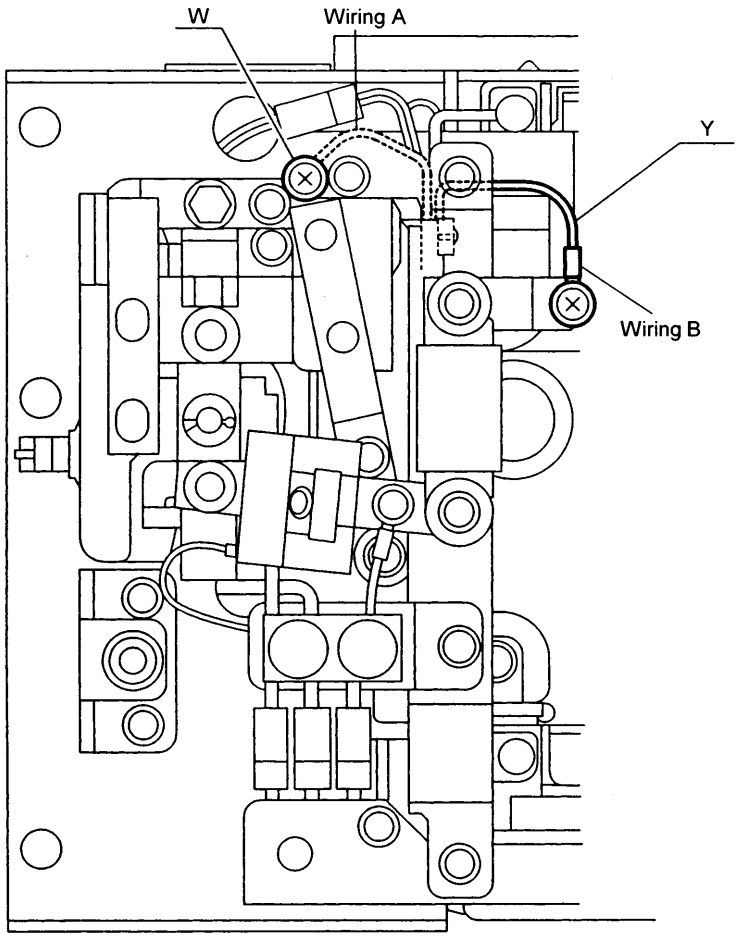
- **If the insulating sheet for the TMD or TMP is omitted, the TMD or TMP will be damaged.**
- **If the insulating sheet is not installed under the MB contactor, a critical failure may occur.**
- **Check the insulation resistance between the bracket and each pin after the end of controller reassembly.**
  Standard: 3 MΩ or more





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Cautions for 3 or J3.5 Ton Controller Reassembly

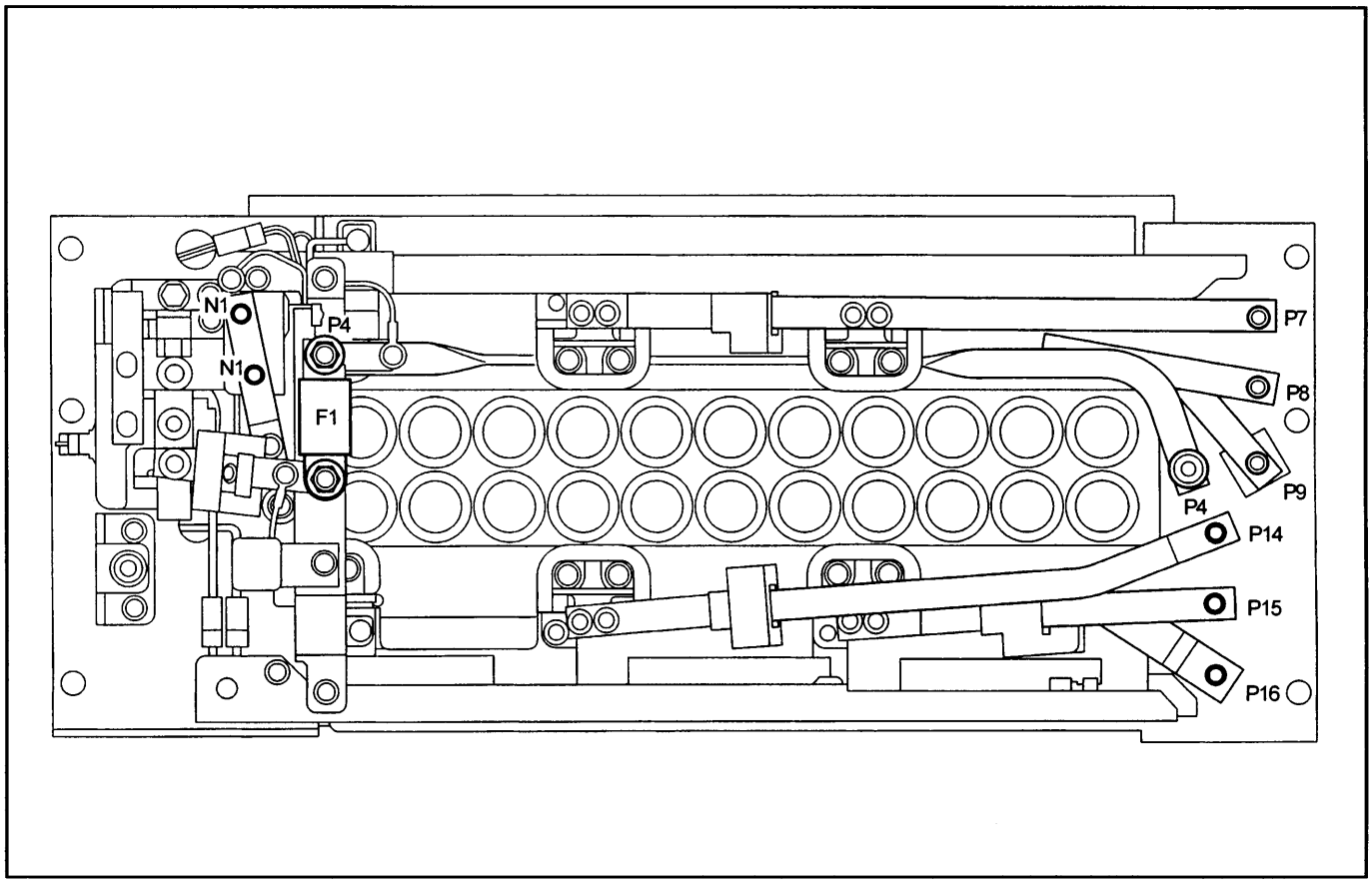


Wiring A: Round terminal of white cable — Control voltage to the CPU board
Wiring B: Round terminal of yellow cable — Voltage for F1 fuse detection
If A and B are connected incorrectly, the vehicle does not respond to key switch ON at all (no indication on display either). Pay sufficient attention to correct wiring.

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Continuity Checks after Reassembly of Control Panel ASSY Installation

(1) Check Method
The drive motor and pump motor cables must be disconnected beforehand.
Tester range: Ω × 10



① Motor cable terminal inspection

Motor cable terminal		N1		P4	
		⊖	⊕	⊖	⊕
P7·P8·P9	⊖		Capacitor characteristic		Approx. 50 Ω
	⊕	Approx. 50 Ω		Capacitor characteristic	
P14·P15·P16	⊖		Capacitor characteristic		Approx. 50 Ω
	⊕	Approx. 50 Ω		Capacitor characteristic	

② P4 – N1 inspection

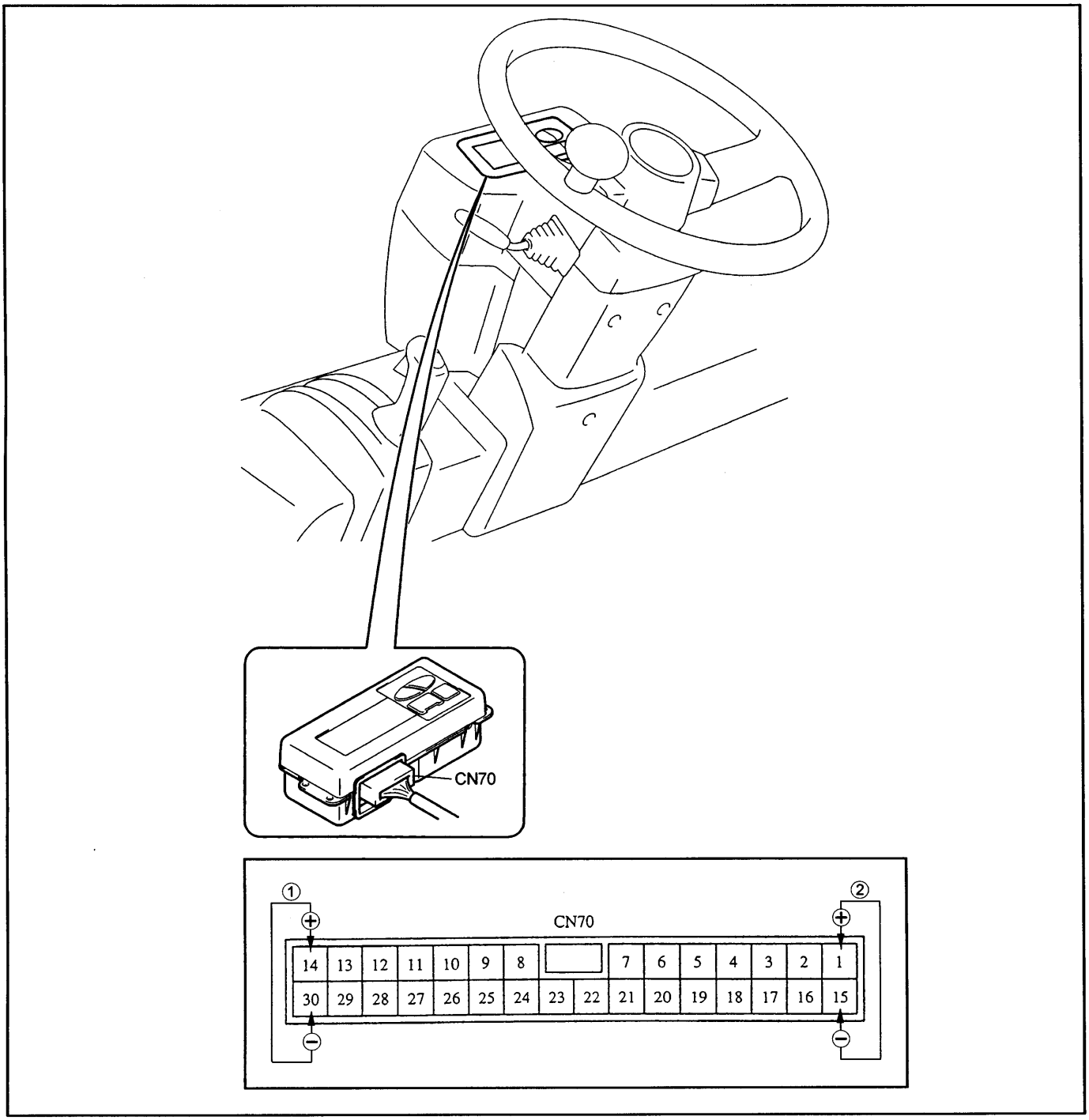
P4 ⊖ – N1 ⊕	Capacitor characteristic
P4 ⊕ – N1 ⊖	Approx. 50 Ω

Capacitor characteristic: The pointer deflects to 0 Ω once and slowly returns toward ∞ Ω then. Finally, the pointer indicates ∞ Ω.

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DISPLAY INSPECTION

When it is judged that the cause of a trouble exists in the display, apply the battery voltage and measure the voltage applied to the connector.



CN70 connector　　Basic condition (Battery plug ON)

Connector NO. ←→ Connector No.		Condition	Standard	Remarks
① CN70-14 (16, D15 V)	CN70-30 (14, GNDD)		Approx. 10~18 V	
② CN70-1 (43, 48 V)	CN70-15 (N1)		Approx. 48 V	

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Motor Input Voltage Check

When traveling or load handling operation seems abnormal or after controller overhaul, it is possible to accurately judge if the controller is functioning correctly or not by measuring the motor input voltage.

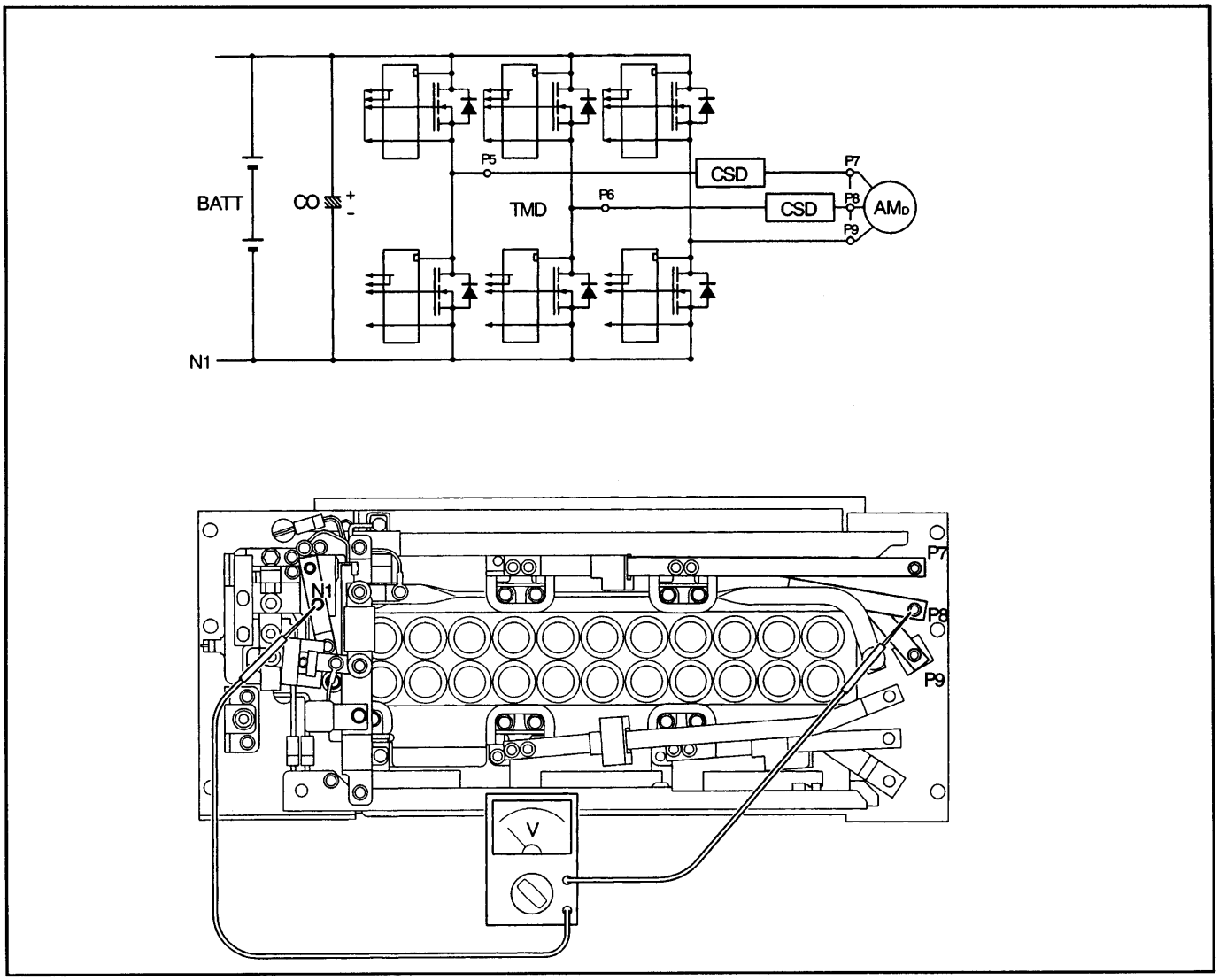
1. Drive Motor Input Voltage Measurement

Procedure

(1) Jack up the front wheels.
(2) Disconnect the battery plug.
(3) Open the seat stand.
(4) Remove the controller cover.
(5) Connect the ⊖ probe of an analog voltmeter to the N1 terminal. (Tester range: DC Voltage)
(6) Connect the ⊕ probe of the voltmeter to P7 (or P8 or P9).
(7) Connect the battery plug.

Standard: 1·2 ton series: 2 V or less
3 ton·J3.5 ton: 4 V or less

(8) Turn the key switch to ON. Release the parking brake.
(9) Shift the direction switch to the forward (or backward) position.
(10) Depress the accelerator pedal fully and record the voltmeter reading at the time. Do not depress the brake pedal.
(11) Repeat steps (6) through (10) also for P8 and P9.
(12) Compare voltages measured between N1 and each of P7, P8 and P9. Then check the difference between the measured voltages satisfies the standard shown below.



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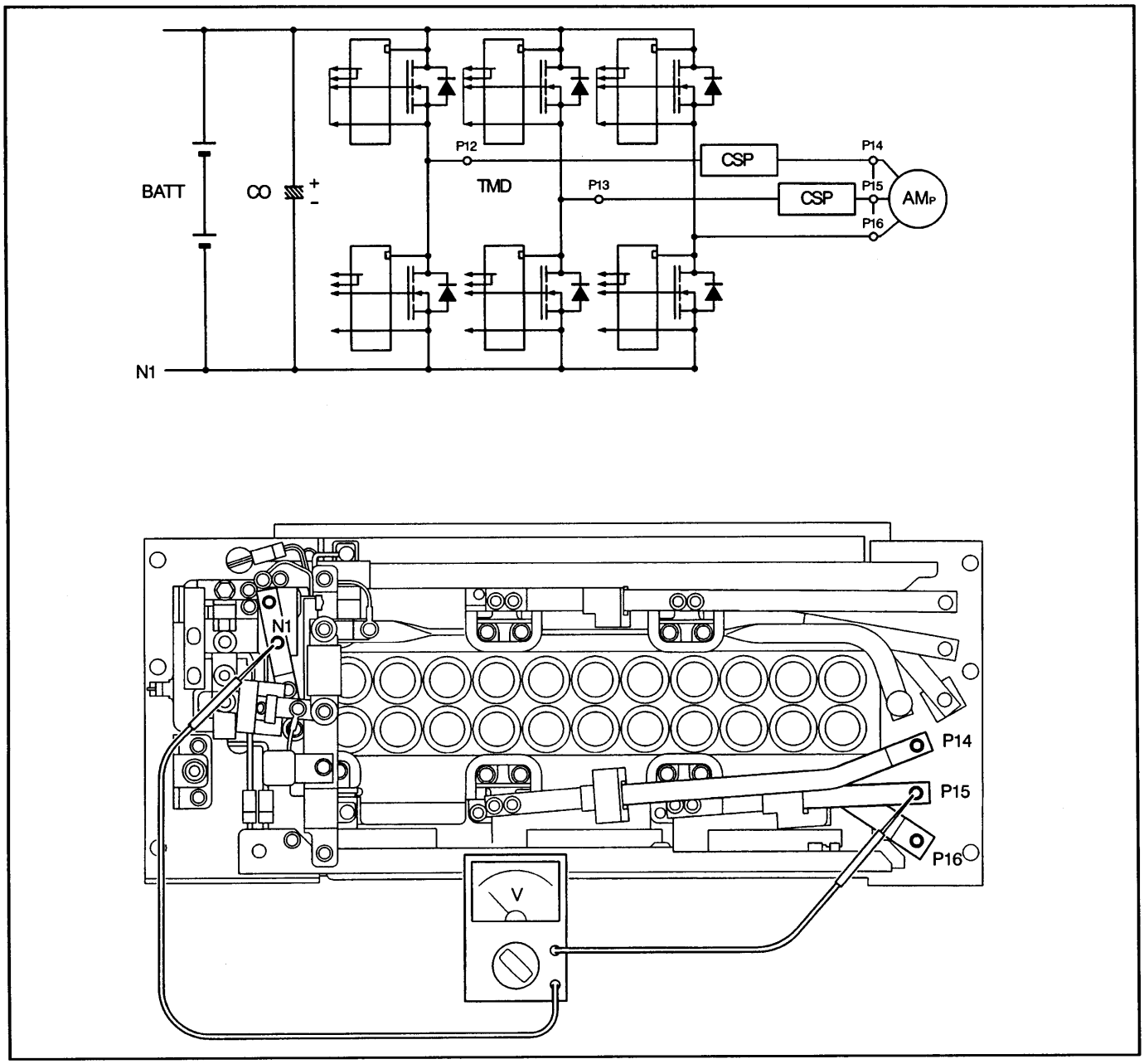
2. Pump Motor Input Voltage Measurement

Procedure

(1) Disconnect the battery plug.
(2) Open the seat stand.
(3) Remove the controller cover.
(4) Connect the ⊖ probe of an analog voltmeter to the N1 terminal. (Tester range: DC Voltage)
(5) Connect the ⊕ probe of the voltmeter to P14 (or P15 or P16).
(6) Connect the battery plug.

Standard: 1·2 ton series: 2 V or less
3 ton·J3.5 ton: 4 V or less

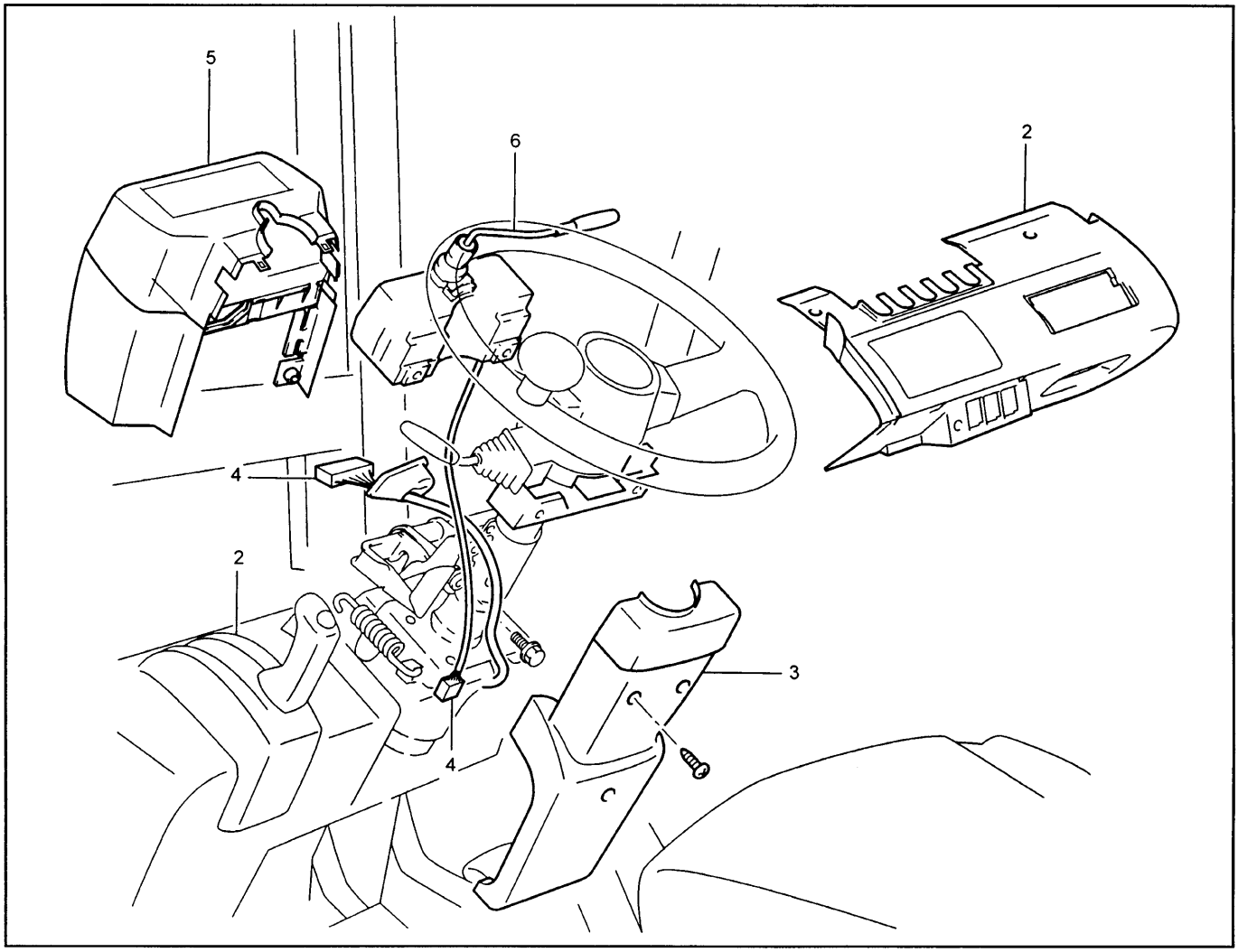
(7) Turn the key switch to ON. Relese the parking brake.
(8) Operate the tilt lever to the backward position and record the voltmeter reading in the relief state.
(9) Repeat steps (5) through (8) also for P15 and P16.
(10) Compare voltages measured between N1 and each of P14, P15 and P9. Then check the difference between the measured voltages satisfies the standard shown below.



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DIRECTION SWITCH

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the instrument panel.

3 Remove the steering cover.

4 Disconnect wiring of the display and direction switch.

5 Remove the meter cover with display.

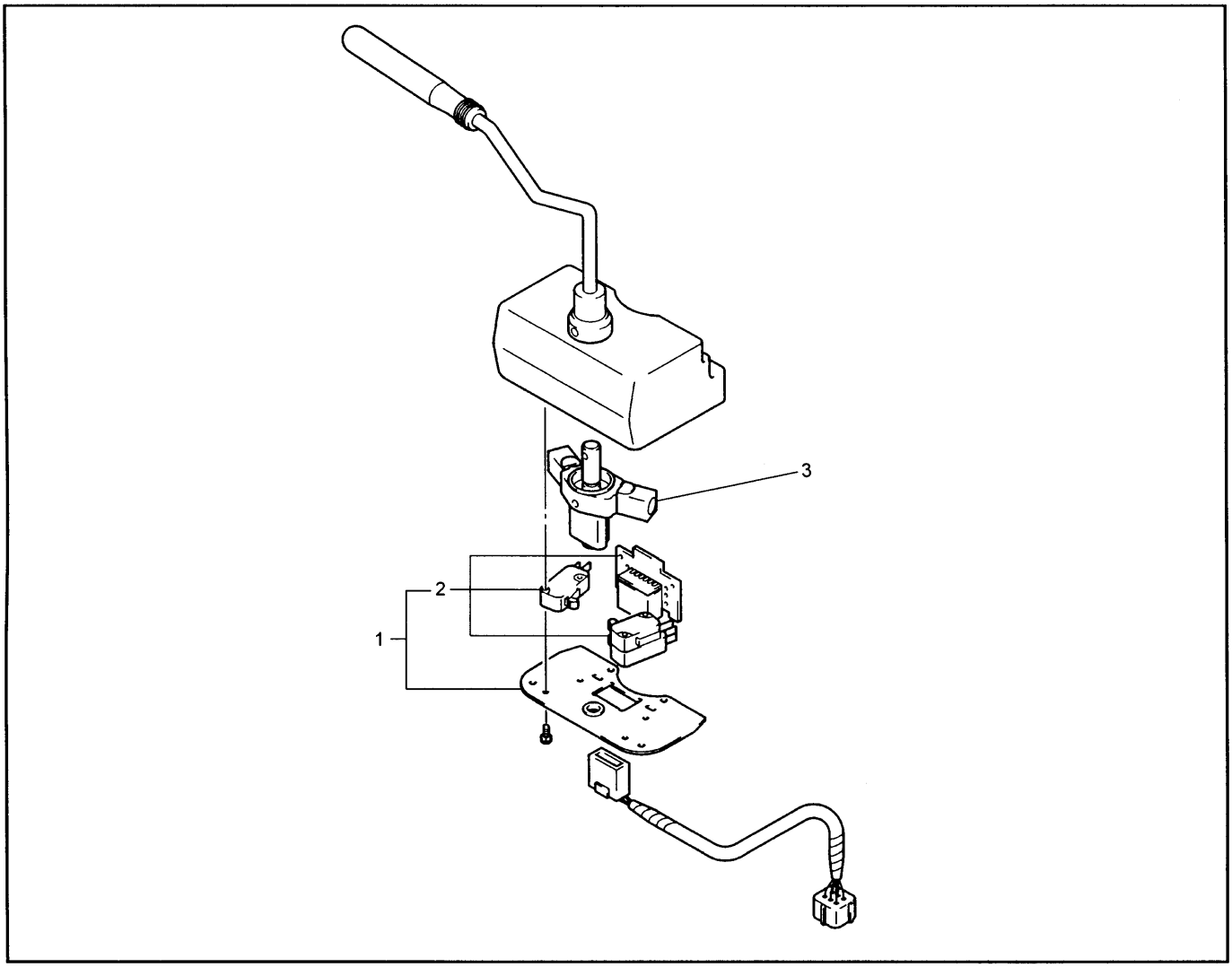
6 Remove the direction switch

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the plate.

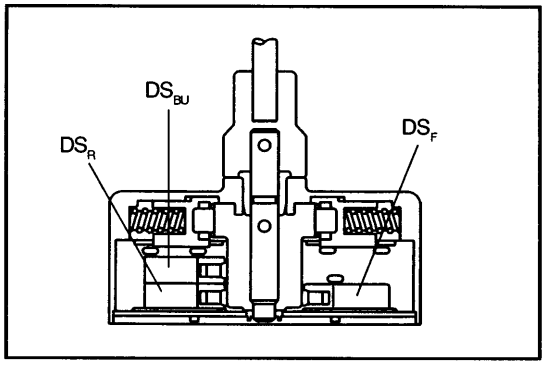
2 Remove the base with micro-switch. **[Point 1]**

3 Remove the cam.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

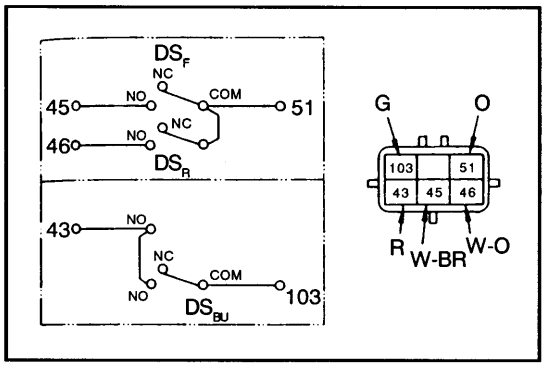
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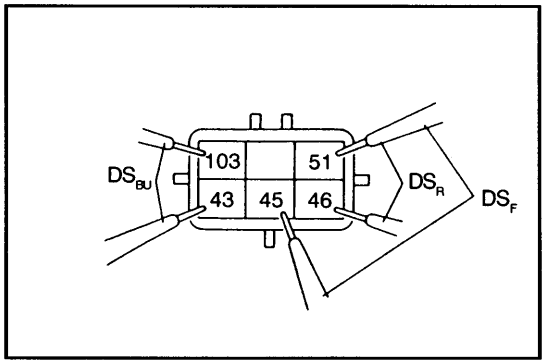
Point Operations

[Point 1]
Reassembly:

1. Install the micro-switch in the correct position.



2. Carry out wiring according to the cable colors shown in the illustration when replacing the micro-switch.

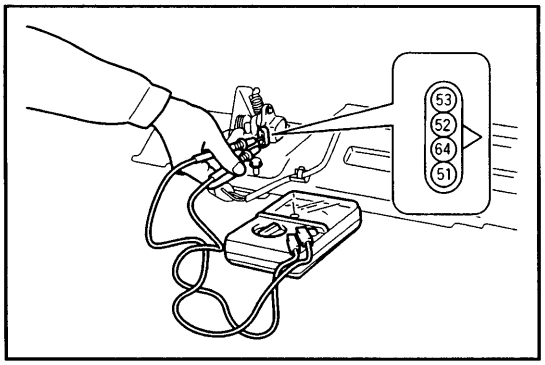


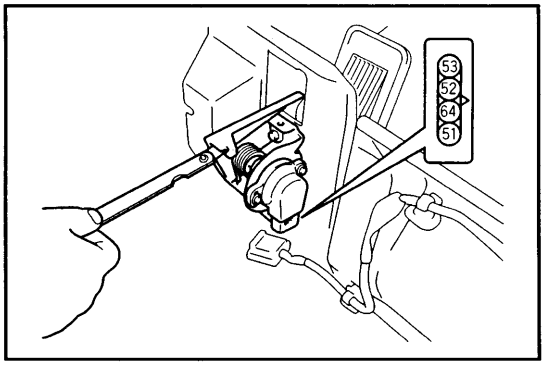
Inspection

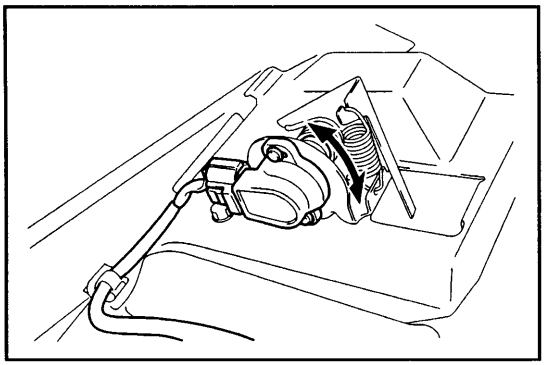
After installing the direction switch, check continuity of each switch before mounting on the vehicle.
Standard

	Lever position		
Check point	Neutral	Forward	Backward
DS$_F$	∞ Ω	0 Ω	∞ Ω
DS$_R$	∞ Ω	∞ Ω	0 Ω
DS$_{BU}$	∞ Ω	∞ Ω	0 Ω

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ACCELERATOR POTENTIOMETER ADJUSTMENT

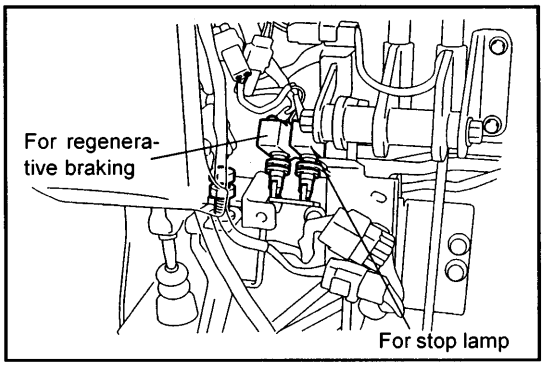
1. Check that the switch is set to ON and OFF as the accelerator pedal is operated.

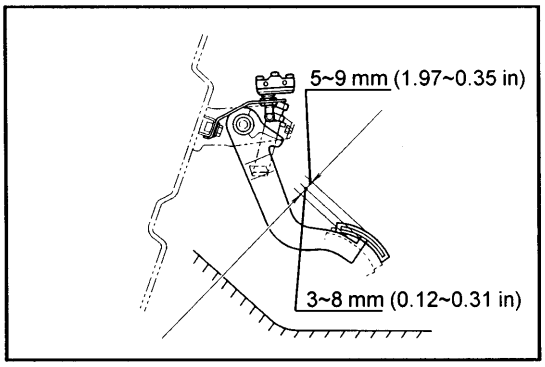
Measurement terminals		51 – 64
Standard	Pedal not operated	∞ Ω
	Pedal operated	0 Ω

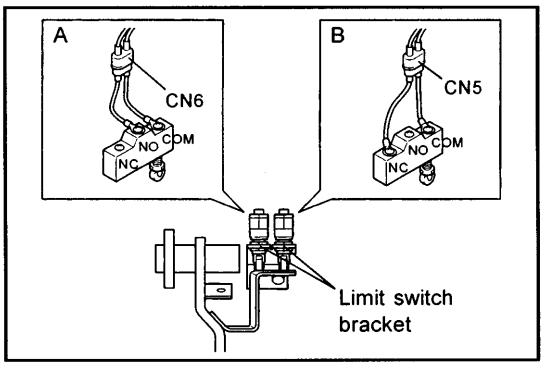
2. Adjustment of Accelerator Potentiometer Installation
   (1) Insert a 1.5-mm thickness gauge between the acceleration link stopper and the accelerator bracket.
   (2) Tentatively set the potentiometer so that the accelerator switch (SW_{AC}) is turned ON.
   (3) Check the ON/OFF switching point of the accelerator switch (SW_{AC}).
   When 1.0-mm (0.0394 in) thickness gage is inserted: OFF (∞ Ω)
   When 2.0-mm (0.0787 in) thickness gage is inserted: ON (0 Ω)

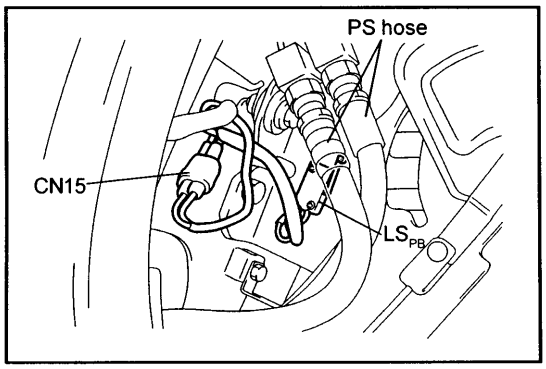
   (4) After the end of switch ON/OFF adjustment, apply 08833 - 00080 on the threaded portion of the set screw.

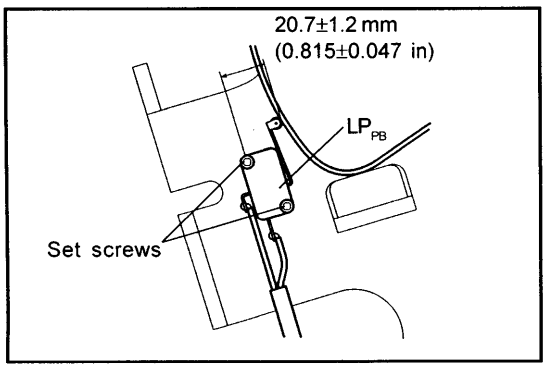
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BRAKE SWITCH ADJUSTMENT

FOOT BRAKE

1. Adjust the brake pedal play.
   Standard: 5 to 9 mm
2. Adjust protrusion of the limit switch roller.
3. Check continuity of the limit switch for the stop lamp when the brake pedal is operated and when not operated.

   Standard: Not operated: OFF (∞ Ω)
   Operated: ON (0 Ω)

4. See that the limit switch for regeneration is activated (OFF) when the brake pedal is depressed further (3 to 8 mm) from the position without any play.

   Standard: Not operated: ON (0 Ω)
   Operated: OFF (∞ Ω)

5. If the standard is not satisfied, make adjustment by bending the limit switch bracket.

   A: For regenerative brake
   B: For stop lamp

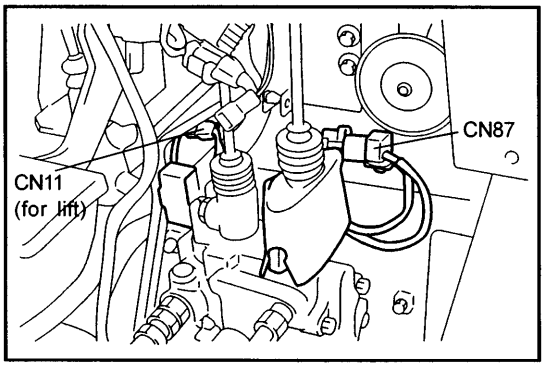
PARKING BRAKE

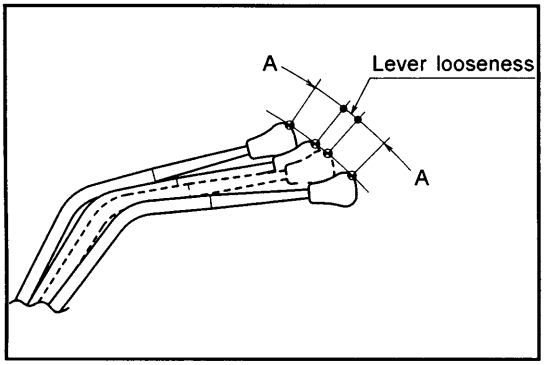
1. Check ON and OFF of the parking brake limit switch.

   Standard: Lever returned: ON (0 Ω)
   Lever pulled: OFF (∞ Ω)

2. If the measured values are out of the standard, adjust the limit switch position.

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MATERIAL HANDLING LEVER SWITCH ADJUSTMENT

1. Operate the lift lever and check continuity of the limit switch.

   Standard:
   Lift: Between CN11-1 and CN11-2
   Not operated: OFF (∞ Ω)
   Operated: ON (0 Ω)

2. Operate the lift lever and check that the limit switch is turned on at dimension A beyond the no-play position.

   A = 10 to 20 mm (0.40 ~ 0.79 in)

3. If the limit switch ON timing is deviated from dimension A, adjust the limit switch position.
   As for the tilt lever, the micro-switch is built in the control valve ASSY. So, no adjustment is required.

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MULTI-DISPLAY FUNCTIONS

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GENERAL

1. An LED display and hour meter are installed on the standard specification vehicle.

2. A plug-in analyzer (SST) is provided for the standard vehicle with the LED display.
   The plug-in analyzer has the following functions:
   - Indicating the status of vehicle's electrical system operation
   - Indicating the information on errors detected by controllers
   - Tuning of vehicle function setting

3. Use of the plug-in analyzer functions allows control system inspection and supports troubleshooting for quick, easy servicing and vehicle setting according to customer needs.

4. An LCD display is provided as a set on a vehicle with optional SAS features.

5. Differences of functions between the standard vehicle with the LED display and the vehicle with the optional LCD display are listed below. Since the plug-in analyzer is not mounted on the vehicle, it has nothing to do with the function table below.

O : Available – : Not available

Function \ Vehicle type		LED display and hour meter (standard)	LCD display (option)
Status display functions	Battery charge indicator	O	O
	Speedometer	–	O
	Two-traveling-speed control set indicator	–	O
	Swing lock indicator	–	O
	Parking brake ON indicator	–	O
	Power select indicator	–	O
Level setting function	Power select	– *1	O
	Traveling power control level setting	–	O
	Load handling power control level setting	–	O
	Two-traveling-speed control level setting	–	O
Integrating functions	Key ON hour meter	O *2	O
	Traveling/load handling motor ON hour meter	–	O
	Traveling motor ON hour meter	–	O
	Material handling motor ON hour meter	–	O
	Lap hour meter	–	O
	Odometer	–	O
	Trip meter	–	O
	Calendar and clock	–	O
Alarm functions	Battery overdischarge alarm	O	O
	Low battery charge alarm	O	O
	Battery electrolyte level alarm	–	O
	Overheat alarm	–	O
	Parking brake non-release alarm	–	O
	Parking brake application failure alarm	–	O *3
	Return-to-neutral alarm	–	O
	Over-speed alarm	–	O
	Diagnostic display	O	O

*1: A selector switch is provided on the instrument panel on the standard vehicle (with LED display).
*2: This represents the hour meter provided separately from the LED display on the standard vehicle.
*3: This function is provided only on the vehicle with the deadman switch (option).

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ABBREVIATIONS INDICATED ON PLUG-IN ANALYZER·MULTI-DISPLAY

Abbreviation	Meaning	Abbreviation	Meaning
AOPT	Analog input voltage	SPL	Load sensor
C/R	Controller	SS1	Steering angle sensor
CSBATT	Battery current	SSC	Steering angle sensor
DM	Drive motor	SSD1	Traveling motor rpm sensor (1)
DSF	Forward direction switch	SSD2	Traveling motor rpm sensor (2)
DSR	Reverse direction switch	SSOL	Swing solenoid
FAND	Traveling system fan	SSP	Pump motor rpm pulse sensor
FANP	Material handling system fan	STS	Steering angle sensor
H/M	Hour meter	STS1	Steering angle sensor No. 1
K-DIFF	Deviation of steering angle knob position	STS2	Steering angle sensor No. 2
K-POS	Steering angle knob position	STSC	Steering angle sensor for straight traveling
KSOL	Knob position conecting solenoid		
LOAD	Material handling hydraulic pressure	SWAC	Accelerator switch
LSAT1	Attachment switch No.1	SWG	Swing angle sensor
LSAT2	Attachment switch No.2	SWTK	Tilt knob switch
LSB	Brake switch	TD	Drive motor temperature
LSD	Deadman seat switch	TEMP	Temperature on CPU board
LSL	Lift switch	THCD	Main traveling circuit temperature
LSOPT1	Option limit switch No. 1	THCP	Main load handling circuit temperature
LSOPT2	Option limit switch No. 2	TILTF	Forward tilt
LSTF	Forward tilt switch	TILTL	Tilt neutral position
LSTR	Backward tilt switch	TIRE	Tire angle sensor voltage
MH	Lifting height switch	TP	Material handling pump motor temperature
P/C	Power control		
PM	Pump motor	VBBT	Battery voltage
POTA	Accelerator potentiometer	VBMB	Main battery input voltage
POTT	Tilt angle potentiometer	VBKY	Voltage after key switch
SPDM	Main vehicle speed	YAW	Yaw rate sensor voltage
SPDS	PS vehicle speed		

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LED DISPLAY

GENERAL

The LED display has two main functions: battery charge indication and diagnostic display. It acts as the battery charge indicator while the vehicle is operating normally. When an error occurs in the vehicle electrical system, it is automatically switched to diagnostic display to warn the operator of an error and make the controller automatically control traveling and material handling to ensure safety.

Battery Charge Indication and Alarm Functions

1. The LED display appearance and the function of each LED are as illustrated.

2. The battery charge is indicated by ON/OFF of each LED as listed below.

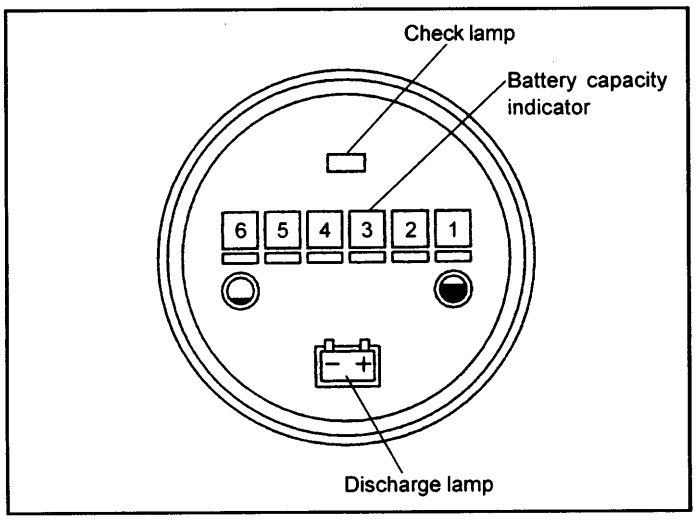
3. Upon key switch ON, all LEDs come on for 2 seconds to enable defective LED check. If normal, the display indicates the remaining battery charge. If any abnormality is found, the display indicates the diagnostic result (which will be explained later).

4. The number of lighting LEDs decreases as the battery charge drops. When the discharge level decreases to the set level (initial setting: approx. 80% of full capacity), the discharge lamp on the display is lit to warn the operator of the low level status.

5. When the battery charge drops further from the discharge alarm level to another the set level (initial setting: approx. 90% of full capacity), material handling during traveling is disabled.

   * The setting can be varies in the tuning mode of the SST plug-in analyzer. (See the Material Handling Restriction Level Setting on page 4-27).

   Setting ranges:
   Discharge lamp ON: 80% to 100%
   Material Handling Restriction: 90% to 100%



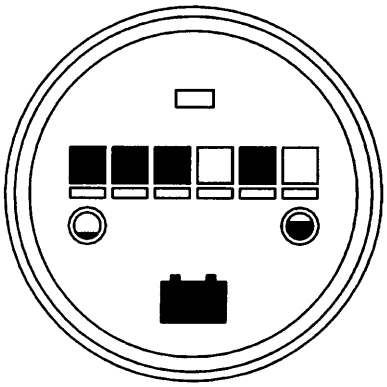
Battery discharge level	LED indication (O: ON, ×: OFF)						Discharge lamp	Material handling restriction
	6	5	4	3	2	1		
0~19%	O	O	O	O	O	O	×	×
20~34%	O	O	O	O	O	×	×	×
35~49%	O	O	O	O	×	×	×	×
50~64%	O	O	O	×	×	×	×	×
65~79%	O	O	×	×	×	×	×	×
80~89%	O	O	×	×	×	×	O*	×
90~99%	O	×	×	×	×	×	O	ON*
100%	×	×	×	×	×	×	O	ON

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DIAGNOSIS FUNCTION

1. As with conventional vehicles, diagnostic functions are provided.

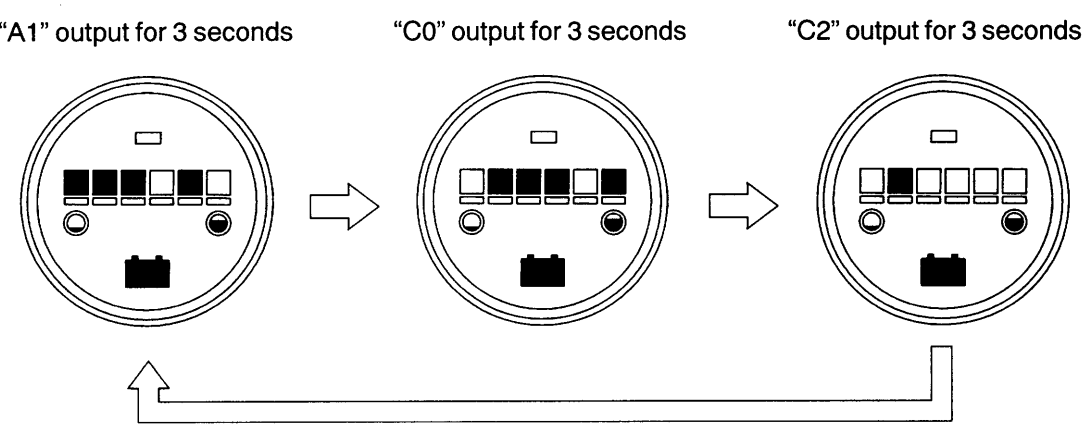
2. When a traveling, material handling or PS circuit defect or a sensor defect is found, the check lamp is lit to warn the operator of the abnormality. The lighting pattern of battery charge LEDs shows the defect position (See the Diagnosis Code List).



Example of display of diagnosis

3. The diagnostic display indicates all faulty positions detected by the controller repeatedly at intervals 3 seconds.

Example: The controller detected three errors simultaneously, A1, C0 and C2



The error code output cycle repeats itself.

4. The controller stores up to 10 errors detected up to the time. Connect the SST plug-in analyzer to call and check the diagnosis error codes stored in the controller. For details, see the Plug-in Analyzer section of this manual.

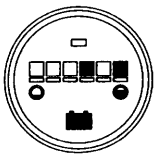
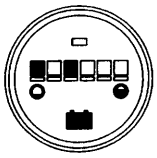
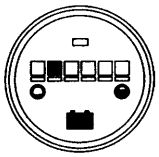
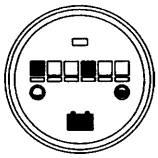
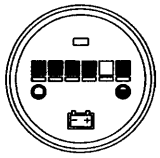
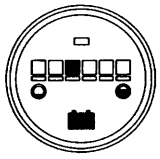
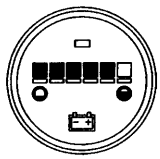
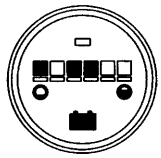
5. When repair is completed according to the indicated diagnosis code, clear all of the stored diagnosis codes using the SST plug-in analyzer.
This enables the operator to distinguish between old and new diagnosis codes.

6. When an error code is indicated on the display, make a prompt repair by referring to the troubleshooting procedure for each indicated diagnosis code described later (Section 5) in this manual.

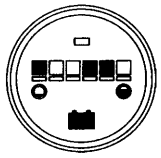
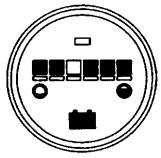
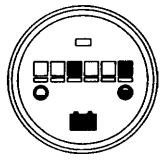
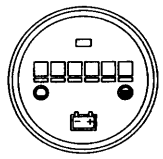
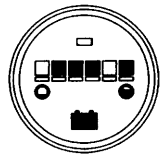
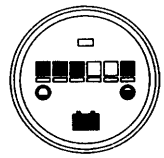
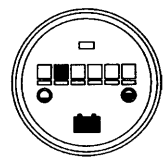
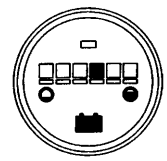
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DIAGNOSIS CODE LIST

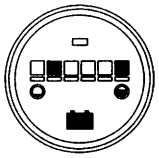
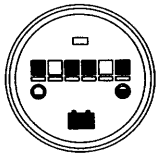
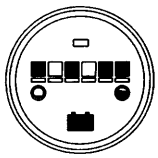
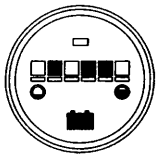
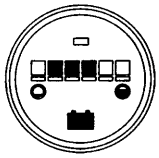
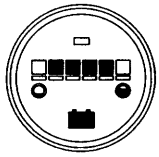
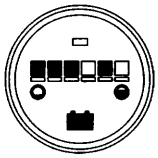
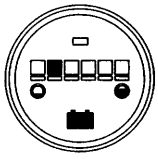
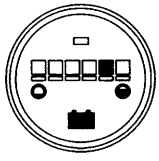
□:ON ■:OFF * Diag memory: Indicated by the SST plug-in analyzer.

LED display indication	Diag memory*	Faulty position	Error mode	Phenomenon on vehicle
	65–2	PS circuit	PS contactor defect	PS not operable
	67–1		Mode switch defect	Fixed to S mode and not variable
	A0–1	Main traveling circuit	Overheat	Drive output restriction
	A0–2	Main load handling circuit	Overheat	Material handling output restriction
	A0–4	Traveling system fan	Fan defect signal	Drive output restriction
	A0–5	Material handling system fan	Fan defect signal	Material handling output restriction
	A1	Controller	High controller voltage	Both traveling and material handling disabled
	A2	CPU board	Overheat	Drive output restriction
	A3–1	Battery power supply	Incorrect battery connection (CHG)	MB not closed.
	A3–2	Battery power supply	Incorrect battery connection (wrong voltage)	MB not closed.
	A4	Accelerator switch	Switch defect	Traveling disabled.

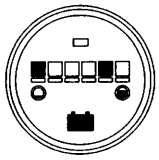
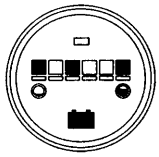
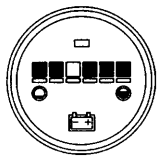
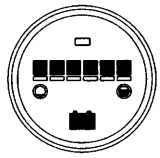
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LED display indication	Diag memory*	Faulty position	Error mode	Phenomenon on vehicle
	A6–1	Material handling limit switch	LSL1 defect	Material handling disabled.
	A6–3	Material handling limit switch	LSTF, LSTR defect	
	A6–5	Material handling limit switch	LSAT1 defect	
	A6–6	Material handling limit switch	LSAT2 defect	
	A8	Traveling and material handling fuse	Blown fuse (F1)	Indication only
	AA	CPU board	Temperature sensor defect	Indication only
	AF–1 AF–2 AF–3	CPU board	CPU board defect	Both traveling and material handling disabled
	AF–4			Both traveling and material handling disabled
	C0–1	Main traveling circuit	Main circuit defect	Traveling disabled
	C0–3 C0–4	Drive circuit	Driving power supply defect Driving circuit defect	
	C1	Drive current sensor	Sensor defect	Traveling disabled
	C2–1	Drive motor	Motor overheat	Limited drive output
	C2–2	Drive motor temperature sensor	Temperature sensor defect	Limited drive output

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LED display indication	Diag memory*	Faulty position	Error mode	Phenomenon on vehicle
	C3	Main drive circuit temperature sensor	Temperature sensor defect	Limited drive output
	C4–1	Accelerator potentiometer	Accelerator potentiometer defect	Traveling disabled
	C4–2			No traveling is allowed. Traveling disabled
	C4–3			Traveling disabled
	C4–4			Maximum speed not attained
	C7	Direction switch	Switch defect	Traveling disabled
	C8–1	Drive rpm sensor	Rpm sensor (1) defect	Traveling disabled, but enabled by turning the key switch OFF and then ON
	C8–2	Drive rpm sensor	Rpm sensor (2) defect	
	CB–1	MB	MB defect	Indication only
	CB–2		Fused MB	Indication only
	E0–1	Main material handling circuit	Main load handling circuit defect	Material handling disabled
	E0–3	Material handling power supply	Material handling power supply defect	
	E0–4	Material handling circuit	Material handling circuit defect	
	E1	Material handling current sensor	Current sensor defect	Material handling disabled
	E2–1	Material handling motor	Motor overheat	Material handling output restriction
	E2–2	Material handling motor temperature sensor	Temperature sensor defect	Material handling output restriction

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LED display indication	Diag memory*	Faulty position	Error mode	Phenomenon on vehicle
	E3	Main material handling circuit temperature sensor	Temperature sensor defect	Material handling output restriction
	E8	Material handling pump rpm sensor	Rpm sensor defect	Material handling disabled
	EF–1	EEP–ROM	EEP–ROM	Operation at default setting
	EF–2			
	EF–3	CPU	CPU defect	Indication only
 (Flahing)	–	Parking brake OFF alarm	When the operator leaves the vehicle without applying the parking brake	Traveling, material handling and ESP stop. (Beep only)
		Return to neutral	When accelerator switch is on. When accelerator switch returns on while direction switch is ON.	No travel *1
		Warning for parking brake lever return	When parking brake switch is OFF while travel.	(Beep only) *1

*1 No alarm buzzer sounds on a vehicle with the LED display.

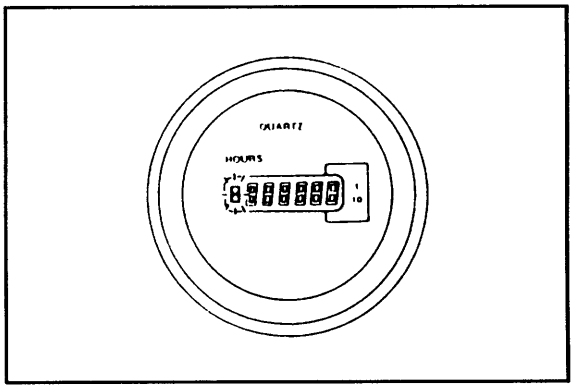
Hour Meter

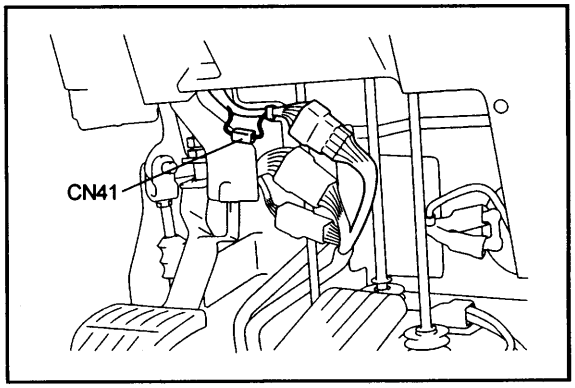
1. An hour meter is standard equipment on all vehicles. While a round hour meter is equipped on standard vehicles (with LED display), the function is included in the LCD display on vehicles with the optional LCD.

2. The hour meter starts upon key switch ON. The minimum unit of indication is 0.1 hour.

3. Since the hour meter is not activated at the time of shipment from the factory, connect CN41 hour meter starting connector before starting operation at each customer.

Note:
Connection of the hour meter has nothing to do with the controller functions (lift interrupt for example).





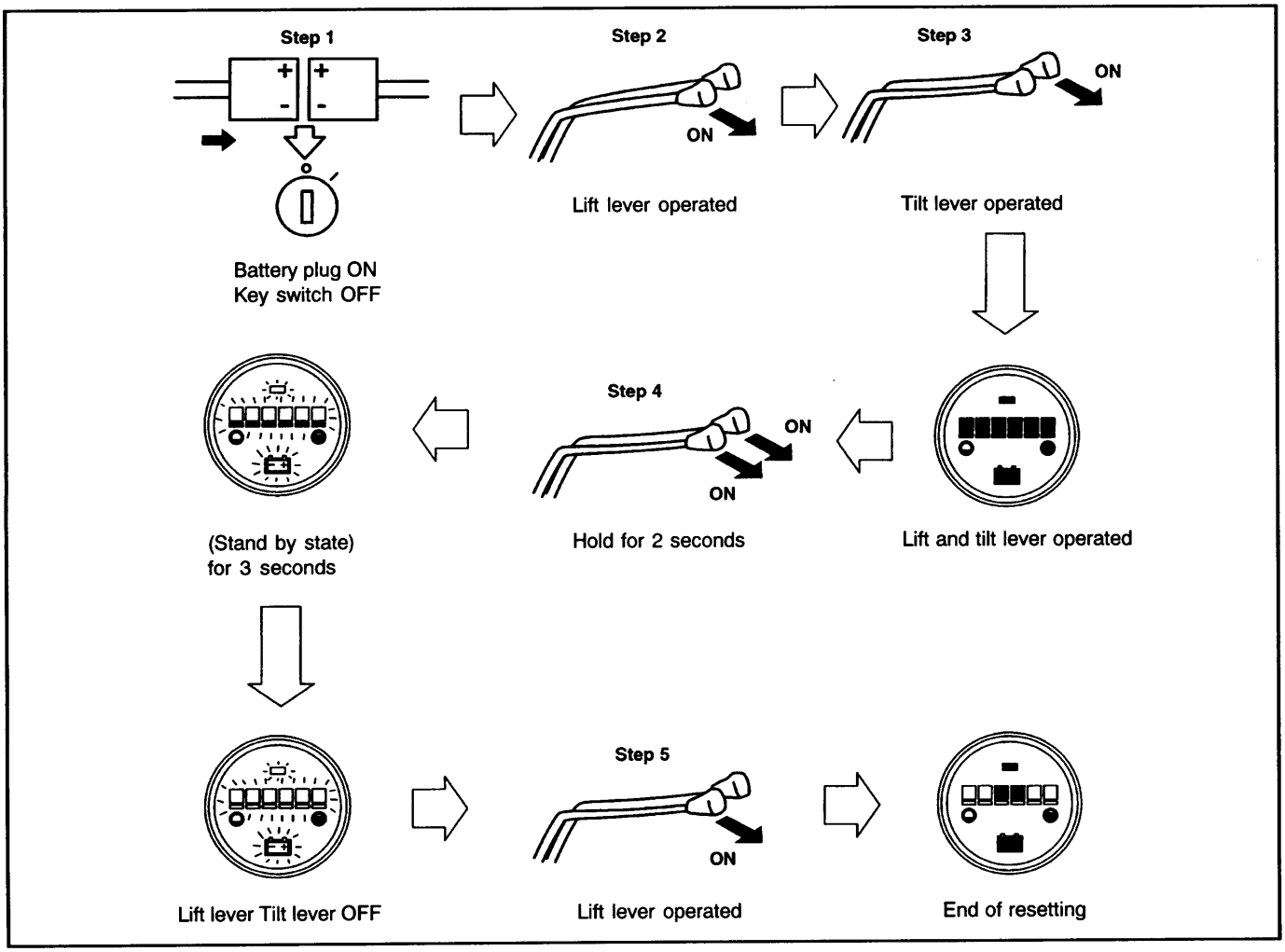
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Lift Interrupt Function and Cancellation Procedure

The lift interrupt function is enabled at the time of shipment from the factory to disable Material handling during traveling. Cancel the lift interrupt function as follows for vehicle demonstration or according to the request from a user:

1. Place the vehicle stationary, set the mast in the vertical position, set the folk at the bottom position, chock wheels and apply the parking brake.
2. Turn the key switch OFF.
3. Operate the lift lever momentarily to the UP side.
4. Operate the tilt lever momentarily to the backward tilt side.
5. Operate the lift and tilt levers to the UP and backward tilt sides, respectively, for 2 seconds or more and hold them there.
6. Leave the vehicle without any operation for 3 seconds or more.
7. Operate both the lift and tilt levers momentarily to the OFF positions.
8. Operate the lift lever momentarily to the UP side.

   Note:
   Accurately perform each operation.
9. Cancellation of the lift interrupt function is completed.



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PLUG-IN ANALYZER (SST)

GENERAL

1. For a standard vehicle with an LED display, use the SST plug-in analyzer to indicate the status of each electrical system operation such as traveling, Material handling, EPS or acceleration, to read the information on errors detected by the controller, and to perform tuning to set vehicle functions.

2. The plug-in analyzer enables quick, easy servicing and vehicle tuning to match customer needs.

3. The plug-in analyzer supports the operator in checking the control system and troubleshooting through communication with the traveling/material handling controller.

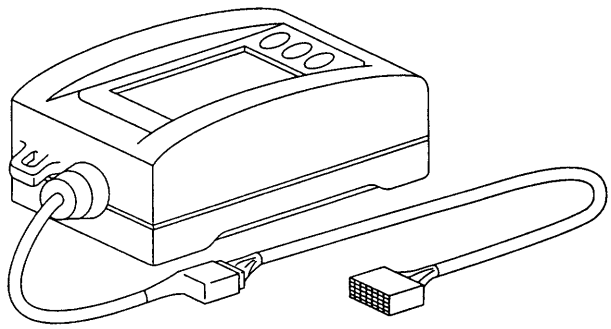
4. The plug-in analyzer functions for the electrical system are the same as those on the vehicle with the LCD display (option).

   Note:
   The plug-in analyzer, however, cannot check SAS functions.

Plug-in Analyzer Function List

Function	Description	When used		
		Vehicle delivery	Board replace-ment	Others
ANALYZER	Indicating electrical system status and reading information on errors detected by controllers	—	—	Upon vehicle defect detection
TUNNING	Fine adjustment of traveling and load handling functions	—	O *1	As requested by the customer
OPTION SET	Setting for a Japanese battery or a locally purchased battery.	—	O *1	—

*1: Board: Control board for the traveling/material handling controller



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SCREEN DISPLAY LIST

ANALYZER	DIAG MEMORY	Checking past diagnostic results in memory
	I/O MONITOR1	Checking temperatures and voltages of functional components
	I/O MONITOR2	Checking ON/OFF of traveling switches
	I/O MONITOR3	Checking ON/OFF of material handling and mast control switches
	I/O MONITOR4	Checking ON/OFF of other (attachment) switches
	ACTIVE TEST	Test switches by forcible ON/OFF operations.
TUNING	NO.1	Setting regenerative braking torque (switch back)
	NO.2	Setting regenerative braking torque (accelerator off)
	NO.3	Lift interrupt level setting *1
	NO.4	Correction battery charge indication
	NO.5	Maximum speed limiter
	NO.6	Setting pump motor rpm upon attachment switch ON
	NO.7	Setting pump motor rpm upon tilt switch ON
	NO.8	Spare
	NO.9	Spare
	NO.10	Spare
	NO.11	Spare
	NO.12	Spare
OPTION SET	NO.1	Selecting calculation for battery charge indication (selection of battery setting)
	NO.2	Spare
	NO.3	Spare
	NO.4	Spare
	NO.5	Spare
	NO.6	Spare
	NO.7	Spare
TESTER SET	ONTRAST SET	Adjusting LCD contrast
	LANGUAGE SET	Unused *2

*1: This means that material handling operation is restricted (disabled during traveling) upon battery overdischange.

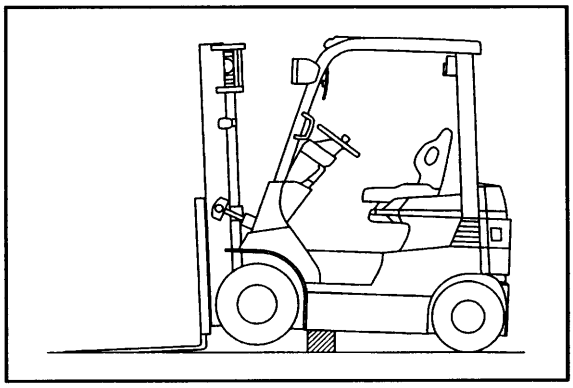
*2: Whichever you select on the LANGUAGE SET screen, the indication will be in English.

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PLUG-IN ANALYZER CONNECTION METHOD

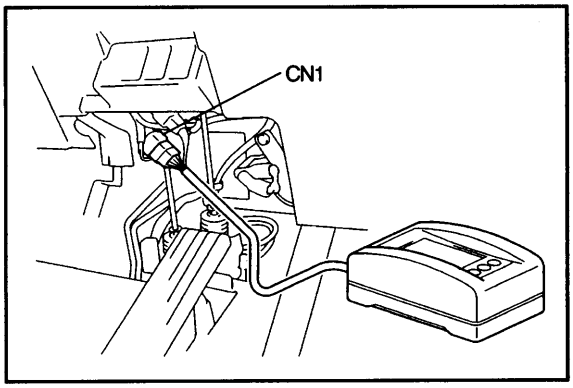
Preparation

Caution:
Always jack up the drive wheels (front tires) until they leave the ground and stabilize the vehicle by supporting it with wooden blocks under both side frames at the front. Lower the fork fully.



1. Turn the key switch to OFF and disconnect the battery plug.

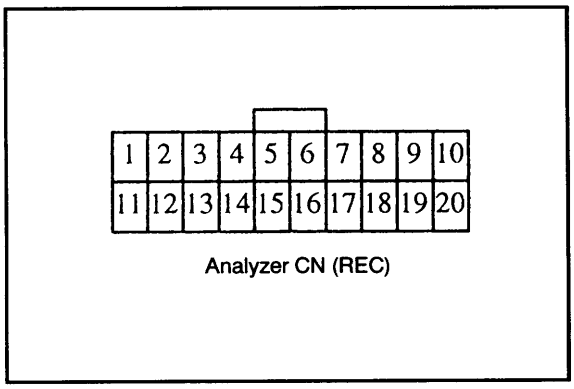
2. Remove the lower panel and disconnect the harness connector (CN1) between the LED display and controller.



3. Connect the extension harness to the disconnected connector on the controller side.

4. Check voltages between extension harness connector terminals as follows:
   1) Connect the battery plug.
   2) Use a circuit tester and measure voltages between extension connector terminals as listed below.

Terminal No. (+) — (–)	Standard voltage
(1) — (13)	Approx. 15 V
(7) — (13)	Approx. 5 V
(8) — (13)	Approx. 0 V
(17) — (13)	Approx. 0 V
(18) — (13)	Approx. 0 V



Analyzer CN (REC)

Note:
(1) Turn the key switch to OFF.
(2) If any measured voltage does not satisfy the standard, do not connect the plug-in analyzer.

5. Disconnect the battery plug and then connect the plug-in analyzer to the extension harness.

6. Connect the battery plug and turn the key switch to ON.

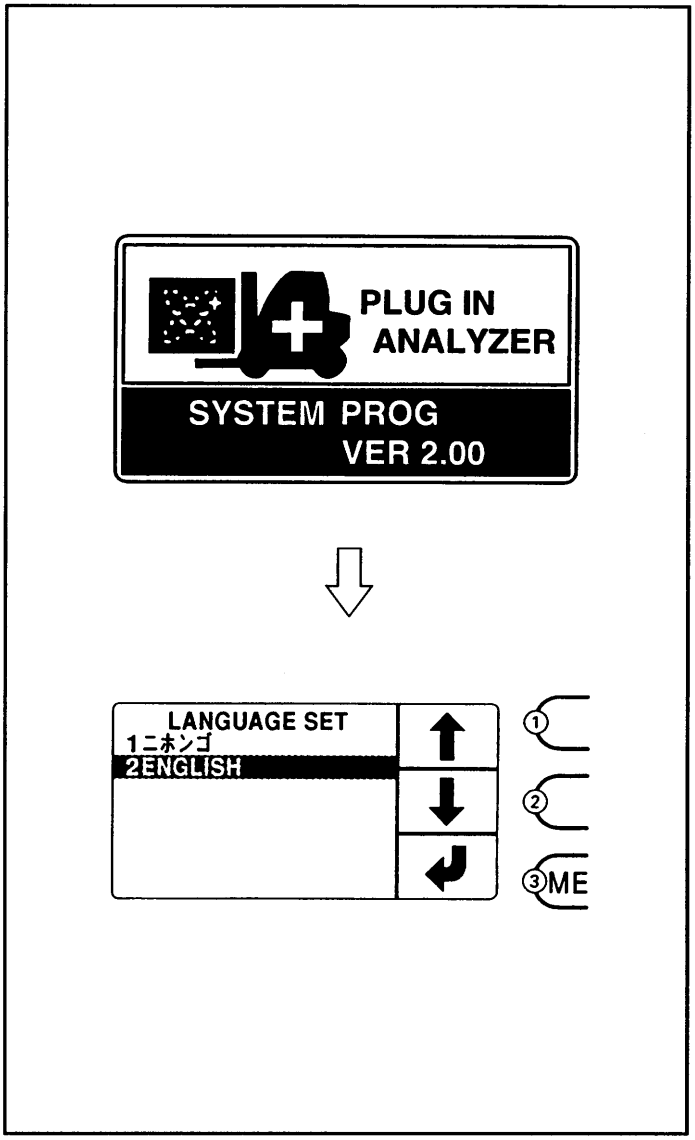
Note:
(1) If nothing is indicated on the plug-in analyzer after turning the key switch to ON, check each of the plug-in analyzer, harness, connector and controller.
(2) Error code EE-1 is stored and indicated if the result of voltage measurement in step 4 above does not satisfy the standard.

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7. The plug-in analyzer displays the controller version for approx. 15 seconds, followed by the step below.

   When the display indication is normal:
   The screen automatically changes to the LANGUAGE SET screen.

   When an error code is indicated:
   Press the MODE switch for transition to the LANGUAGE SET screen.

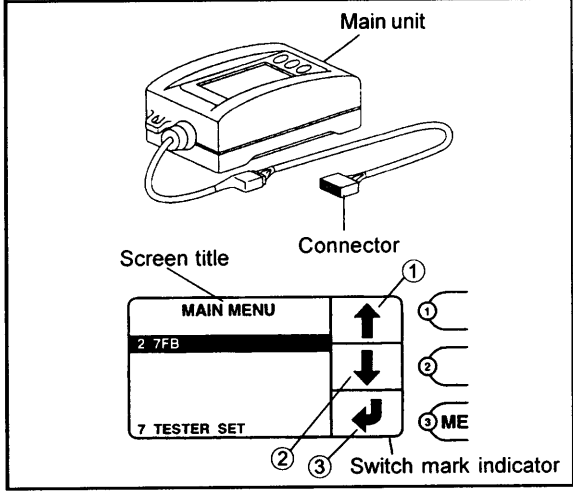


Caution:

- **If you connect the LED display after use of the plug-in analyzer, with the battery plug kept connected, the controller stores EE-1 or EE-2 as error codes. Always disconnect and connect the wiring after turning the key switch to OFF and disconnecting the battery plug.**
- **Do not apply strong impact by dropping or crashing the plug-in analyzer.**
- **Do not expose the plug-in analyzer to strong sunlight for a long period of time.**
- **Always operate each switch with a finger. If you use a sharp edged substance, the switch may be damaged.**
- **For defects of the plug-in analyzer, see the troubleshooting section appearing later in this manual.**

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OPERATION PANEL OF PLUG-IN ANALYZER AND SWITCH FUNCTIONS

Operation panel of plug-in analyzer	Switch	Indication	Description
	①	↑	Moves the cursor to the upper item.
		↔	Moves the cursor to the right or left.
		CLR	Clears the diag memory.
		TUNE	Changes the tuning level.
	②	↓	Moves the cursor to the lower item or to the next page.
	③	↵	Enters the selected item.

In some cases, the indication for switch operation may be different from the above and blank. Switch operation in such a case will result in the following:

- Switch ①: Pressing this switch while nothing is indicated is ignored. (Unused)
- Switch ②: Pressing this switch while nothing is indicated is ignored. (Unused)
- Switch ③: Press this switch to return to the respective screen.

EXPLANATION ON OPERATION

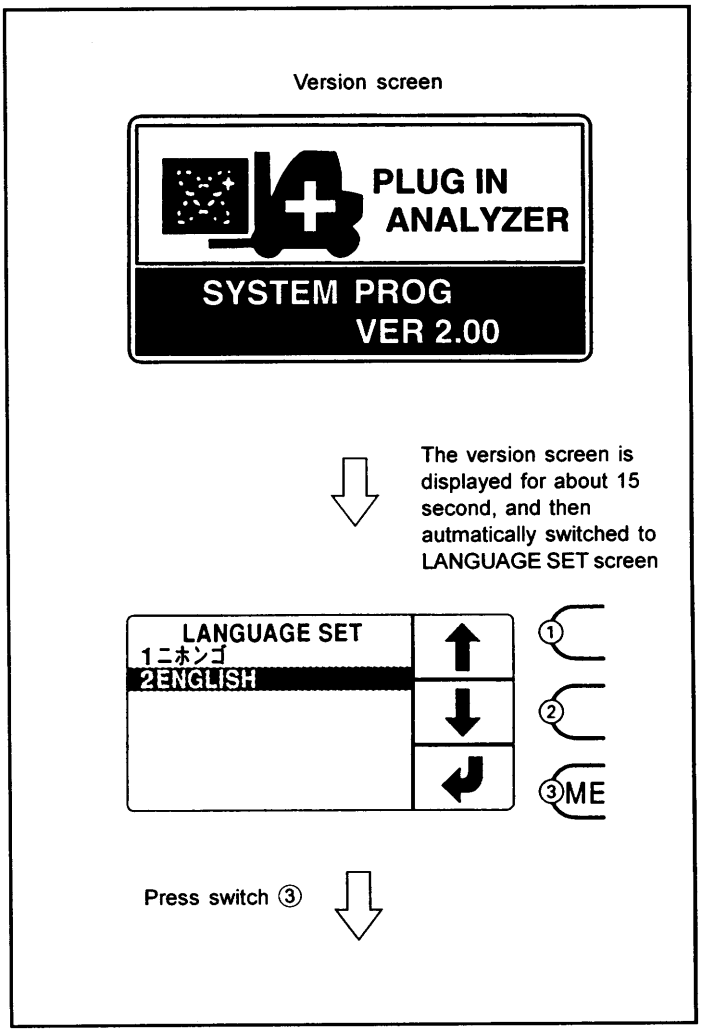
Menu (Function) Selection

Handle the plug-in analyzer as explained below after connecting it as described earlier.

1. Connect the plug-in analyzer and turn the key switch to ON. (See page 4-13.)

2. The initial screen appears for 15 seconds. Then the screen automatically displays the LANGUAGE SET screen.
   Press switch ③ while the initial screen is displayed also changes the screen display.
   This display occurs only when the plug-in analyzer is operated for the first time after purchase and will not occur any more.

3. Default value of the LANGUAGE SET screen is 2. ENGLISH. Although the cursor may be moved, the indication will be in English for each position, which is not a trouble.
   This menu appears only when nothing is set on the LANGUAGE SET screen.



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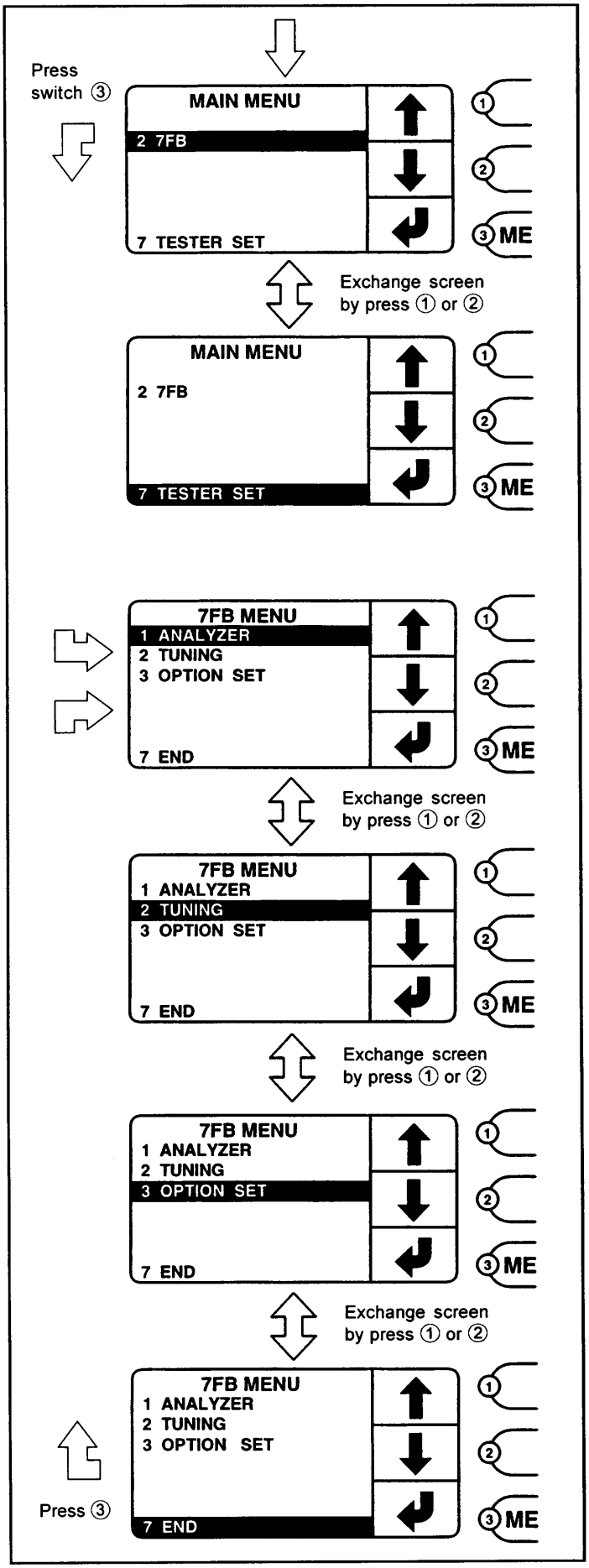
4. Press switch ③ to call the MAIN MENU screen.

5. On the MAIN MENU screen, items 2 and 7 are indicated and "2. 7FB" is selected.
   (1) 2. 7FB function
   When this item is selected and entered, 7FB MENU screen appears.
   (2) 7. TESTER SET
   While the contrast set and language set functions are indicated as tester set functions, only the contrast set function is used.

6. Press switch ③ here to select the 7FB function, and the 7FB MENU screen appears.

   "7FB MENU"
   (1) 1. ANALYZER
   This function indicates the operation status of the electrical system and reads the information on errors detected by the controller.
   (2) TUNING
   This function is for fine adjustment related to traveling and material handling.
   (3) OPTION SET
   This function controls the controller according to the option setting. For a vehicle with the LED display, use this function to set the battery type (Japanese or locally purchased).

7. Select the desired function menu by operating switches ① and ② and press switch ③ (enter) for transition to the function menu or the setting screen.



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ANALYZER

GENERAL

1. The analyzer function of the plug-in analyzer allows the operation status of the electrical system including main traveling and material handling circuits, operating systems such as the accelerator, and functions of sensors to be checked, which are useful for troubleshooting.

2. The analyzer functions enable quick, easy servicing.

3. The plug-in analyzer supports control system inspection and troubleshooting through communication with the traveling/material handling controller.

4. Analyzer functions are as follows:
   (1) Diagnosis memory function (DIAG MEMORY)
   The controller stores up to 10 error codes (diagnosis codes) related to the electrical system detected in the past. The diagnosis function reads the stored error codes and indicates them on the display.
   (2) In/out monitor function (I/O MONITOR)
   This function indicates analog input values to individual sensors in the traveling and material handling systems on the display. Monitoring the display enables the quality of each circuit/sensor to be judged.
   ① I/O MONITOR 1
   Indicates the temperature and analog input voltage at the respective terminal of each electrical component detected by the controller.
   ② I/O MONITOR 2
   Indicates the ON/OFF status of traveling-related switches and the analog input voltages of sensors.
   ③ I/O MONITOR 3
   Indicates the ON/OFF status of material handling switches and analog input voltages of sensors.
   ④ I/O MONITOR 4
   Indicates the ON/OFF status of other switches.
   (3) Active test (ACTIVE TEST)
   In the active test mode, the controller forcibly outputs an operation signal (ON or OFF signal) to the selected item for functional inspection.
   (4) One most recent error code at the time is indicated in the right upper portion of each I/O MONITOR or ACTIVE TEST screen.

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ANALYZER SCREEN LIST

Analyzer screen	Indication		Description
	1st indication	2nd indication	
1. DIAG MEMORY • Diagnosis	DIAG–1 ~ DIAG–10		Refer to the Diagnosis List.
2-1. I/O MONITOR1 • Voltage • Temperature	THCD	+25	Main traveling circuit temperature (°C)
	THCP	+25	Main material handling circuit temperature (°C)
	TD	+25	Drive motor temperature (°C)
	TP	+25	Material handling motor temperature (°C)
	TEMP	+25	Temperature on CPU board (°C)
	VBBT	50.0	Battery voltage (V)
	VBKY	50.0	Voltage after key switch (V)
	VBP4	50	Voltage at P4 terminal (V)
	VBMB(M)	50	Main battery input voltage (V)
2-2. I/O MONITOR2 • Traveling system	POTA	0.70	Accelerator potentiometer voltage (V)
	SWAC	OFF	Accelerator switch (OFF/ON)
	DSF	OFF	Forward switch (OFF/ON)
	DSR	OFF	Reverse switch (OFF/ON)
	LSB	ON	Brake switch (OFF/ON)
	LSD	OFF	Deadman switch (OFF/ON)
	SSD1	00	Drive motor rpm sensor 1 (pulse count)
	SSD2	00	Drive motor rpm sensor 2 (pulse count)
	SPDM	0.0	Main vehicle speed (km/h)
2-3. I/O MONITOR3 • Material handling system	LSL	OFF	Lift switch (OFF/ON)
	LSTF	OFF	Forward tilt switch (OFF/ON)
	LSTR	OFF	Backward tilt switch (OFF/ON)
	LSAT1	OFF	Attachment switch 1 (OFF/ON)
	LSAT2	OFF	Attachment switch 2 (OFF/ON)
	SSP	00	Pump motor rpm sensor: Number of pulses
2-4. I/O MONITOR4 • Others	CSBATT	2.50	Battery current sensor voltage
	AOPT	0.00	Spare
	LSOPT	OFF	Spare
3. ACTIVE TEST • Operation test	LSOPT	OFF	Spare
	FAND	OFF/ON (0)	Traveling circuit fan (Value in ( ) is the controller input value.)
	FANP	OFF/ON (0)	Material handling circuit fan (Value in ( ) is the controller input value.)
7. END	Return to 7FB MENU screen.		

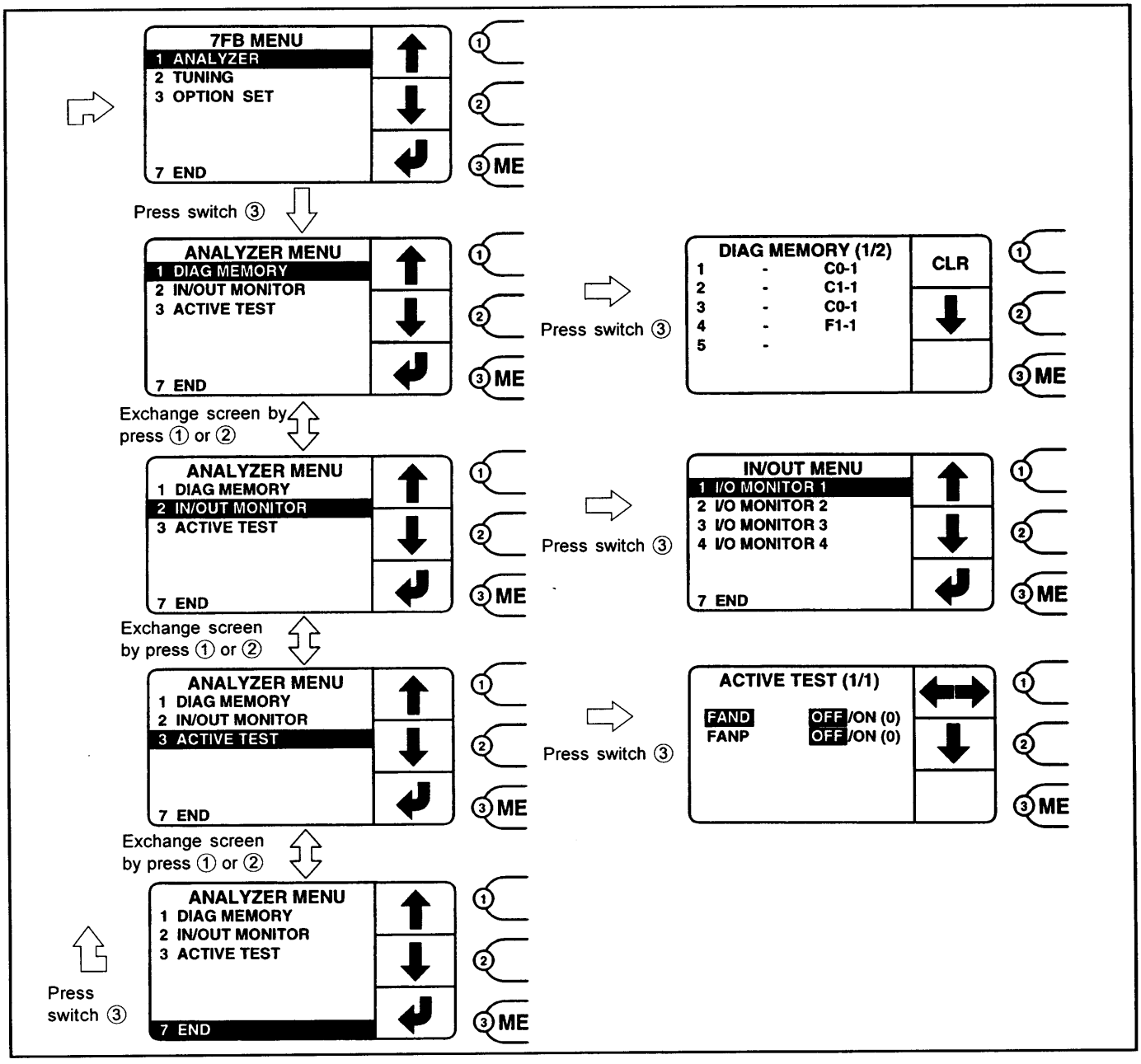
Note:
The 2nd indication is an example when the key switch is ON, lever is at the neutral position and the vehicle is stopping, which is not the standard. Pay special attention to the values of I/O MONITOR1 of the 2nd indication, which largely vary according to the vehicle status at measurements.

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BASIC OPERATION ON ANALYZER SCREEN

1. Connect the plug-in analyzer according to the Plug-in Analyzer Connection Method on page 4-12.
2. Display the 7FB MENU screen.
3. Check that 1. ANALYZER is selected (highlighted) on the menu and press switch ③ (enter) to display the ANALYZER MENU screen. (See page 4-15.)
4. Select the desired test screen by operating switches ① and ② and press switch ③ (enter) to display the selected screen.
   - Switch ①: Moves the cursor to the upper row to select the upper test item.
   - Switch ②: Moves the cursor to the lower row to select the lower test item.
   - Switch ③: Enters (Displays the test screen for the selected item.)

Note:
Select 7. END on the ANALYZER MENU screen and press switch ③ to display the 7FB MENU screen again.



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DIAG MEMORY

GENERAL

1. The controller stores up to 10 most recent errors. On the DIAG MEMORY screen, the stored diagnosis codes are read and displayed on two pages.

2. The most recent diagnosis code is indicated as 1. The second one as 2, the third as 3 and so on down to 10.

3. Peform troubleshooting for the faulty portion by referring to "Section 5. Troubleshooting".

Operation Procedure

1. Display the ANALYZER MENU screen.

2. Check that 1. DIAG MEMORY is highlighted and press switch ③ (enter) to enable the diag memory function, which indicates diagnosis codes detected in the past sequentially starting from the most recent one.

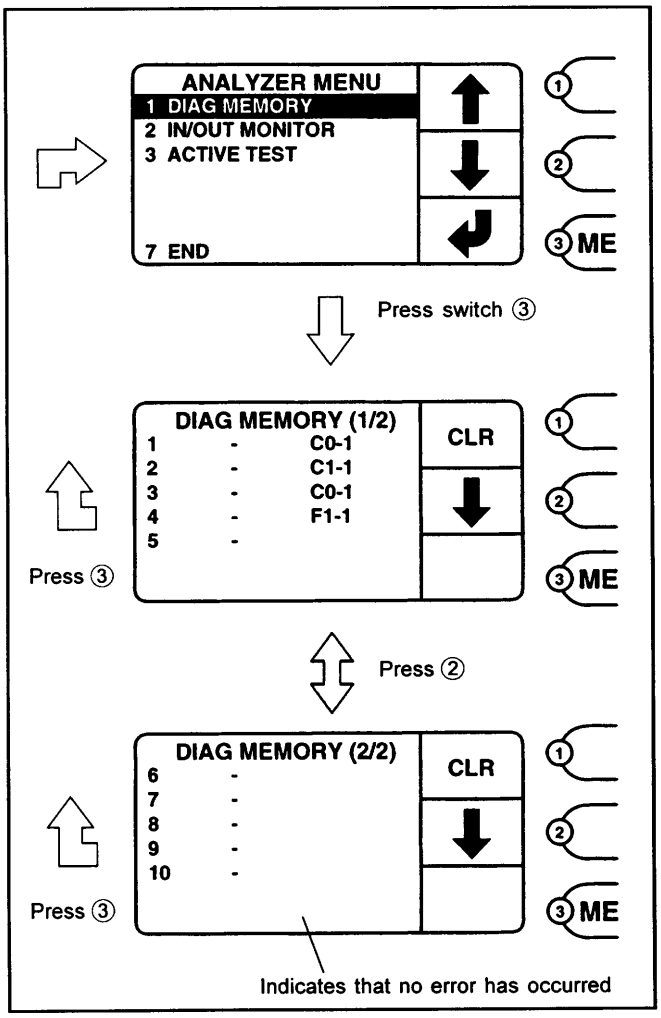
   Note:
   For diagnosis codes, see Diagnosis Code List on page 4-6 and take the action for correcting the problem by referring to the "Troubleshooting" section.

3. Functions of switches on 1. DIAG MEMORY screen are as follows:
   - Switch ① (CLR)
     Press this switch to clear all error codes stored in the memory. Keep switch ① pressed for 2 seconds. When the switch is accepted, beep sound is heard twice. A beep sound is generated after the end of clearing error codes in the memory.

     Caution:
     While the plug-in analyzer is connected, the error code can be cleared only once. (Disconnect the battery plug once to clear another code.)
     Once cleared, the CLR indication disappears and switch ① operation becomes invalid.

   - Switch ②
     Use this switch for switching over between pages 1/2 and 2/2.
   - Switch ③
     Press this switch to return to the ANALYZER MENU screen.

     Note:
     Each field where only "–" is indicated shows that no error has been detected thereafter.
     It is impossible to directly jump to another test screen from the DIAG MEMORY screen. Always return to the ANALYZER MENU screen first and then go to the desired test screen.



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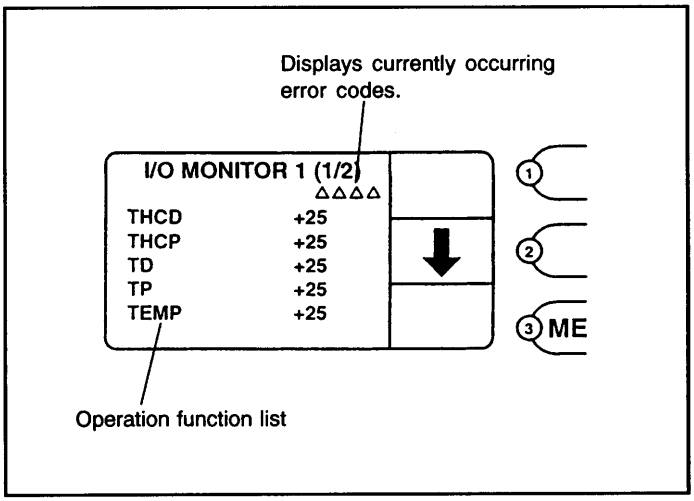
IN/OUT MONITOR MENU

GENERAL

1. The IN/OUT MONITOR function displays the ON/OFF status of each switch and analog input value from each sensor in the traveling, material handling and EPS systems on the analyzer screen.

2. Monitor the displayed switch status and analog input value for judgment on the quality of each switch and sensor.

3. For detailed items that can be monitored, see the "ANALYZER screen List" on page 4-18.



Operation Procedure

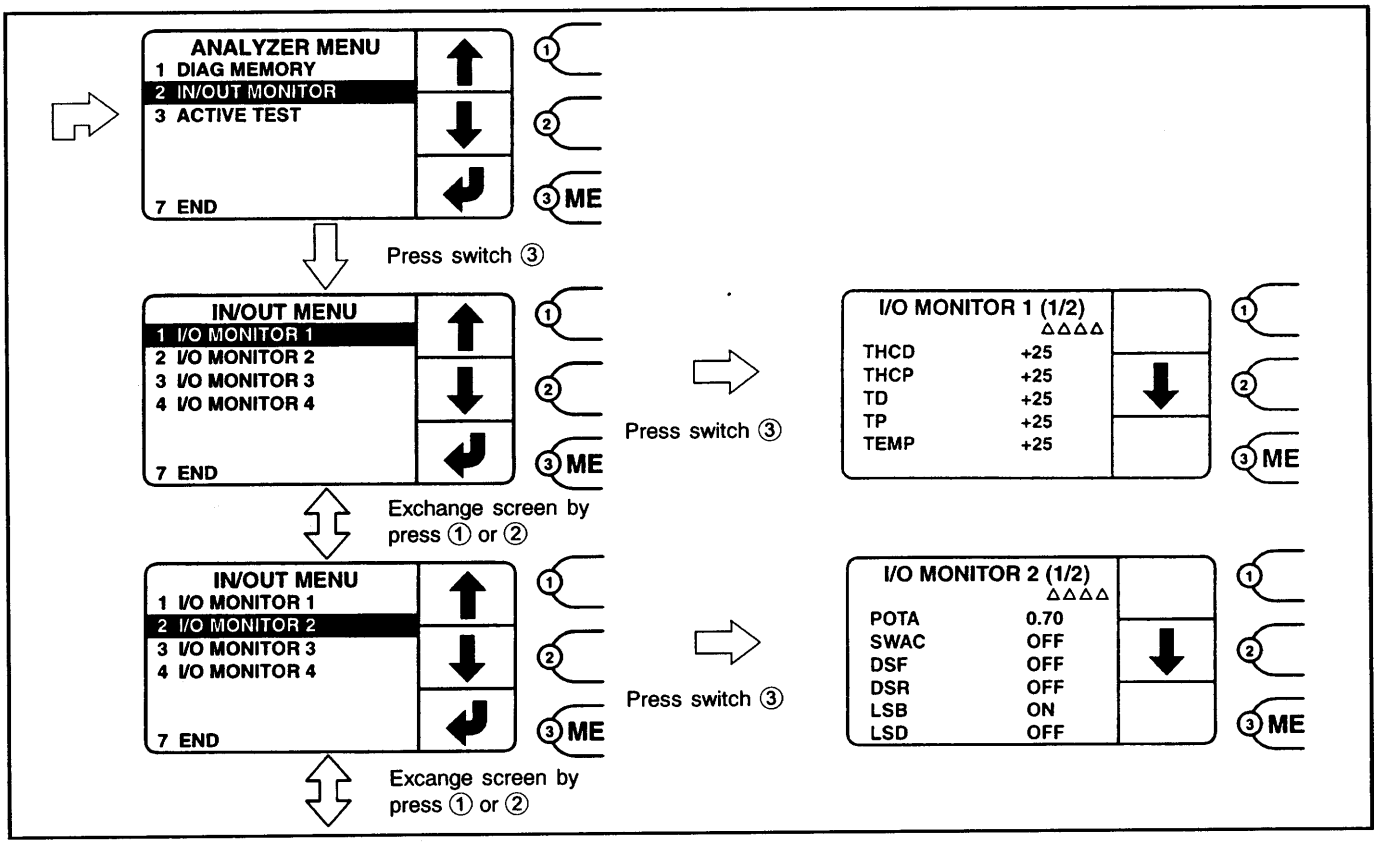
1. Display the ANALYZER MENU screen.

2. Press switch ② once.

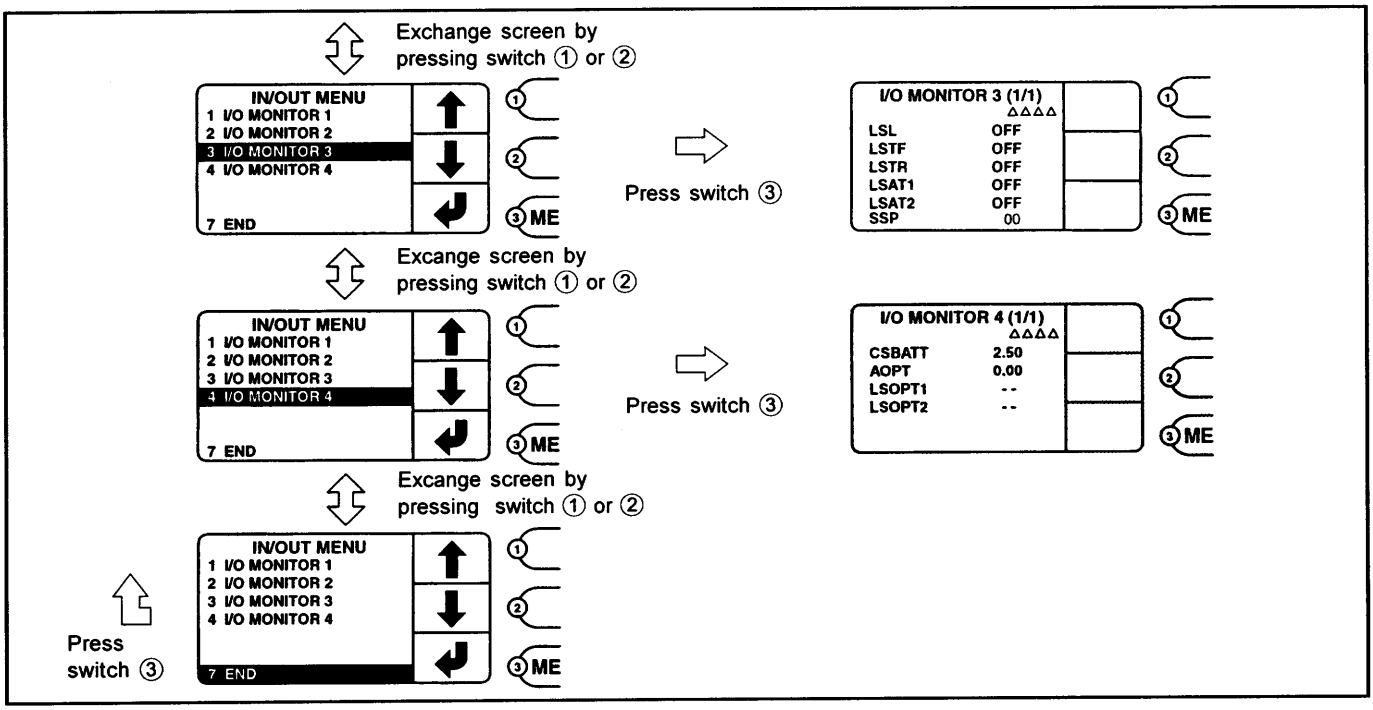
3. Check that 2. IN/OUT MONITOR is highlighted and press switch ③ (enter) to display the IN/OUT MENU screen.

4. Select a desired item from I/O MONITOR 1 through 4 using switches ① and ② and press switch ③ to display the respective function screen.

Note:
It is impossible to directly jump to another test screen from the IN/OUT MONITOR function screen. Return to the ANALYZER MENU screen once and go to the desired test screen then.



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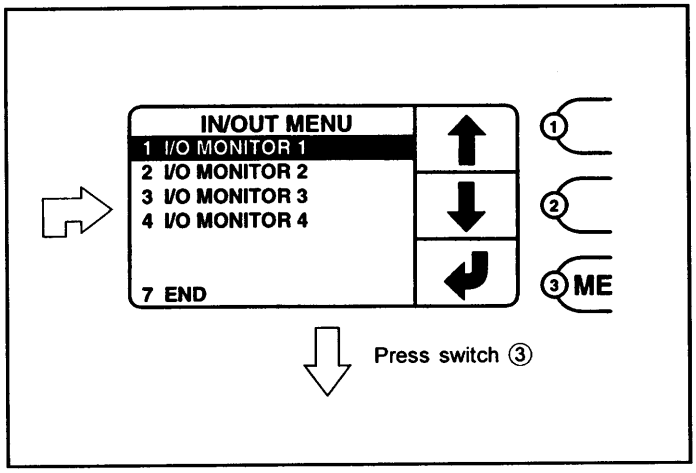
I/O MONITOR 1

This function indicates the temperature of each electrical component and the voltage at the respective terminal.

Operation Procedure

1. Indicate the IN/OUT MENU screen.
2. Check that the I/O MONITOR1 is highlighted and press switch ③ to indicate the I/O MONITOR1 screen.
3. Functions of switches on this screen are as follows:
   - Switch ① : Unused (no indication)
   - Switch ② : Selects page 1/2 or 2/2 of I/O MONITOR1 screen.
   - Switch ③ : Changes the screen from I/O MONITOR1 to the IN/OUT MENU screen.

   Note:
   It is impossible to directly jump from I/O MONITOR1 MENU screen to another test screen. Return to the IN/OUT MENU screen or ANALYZER MENU screen once and go to the desired test screen then.



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I/O MONITOR 1 (1/2) screen

① THCD: Main traveling circuit temperature (°C)
- Temperature of the element on main traveling circuit

② THCP: Main material handling circuit temperature (°C)
- Temperature of the element on main material handling circuit

③ TD: Drive motor temperature (°C)
- Temperature of the drive motor

④ TP: Pump motor temperature (°C)
- Temperature of the material handling motor

⑤ TEMP: Temperature on the CPU board (°C)
- Temperature on the CPU board

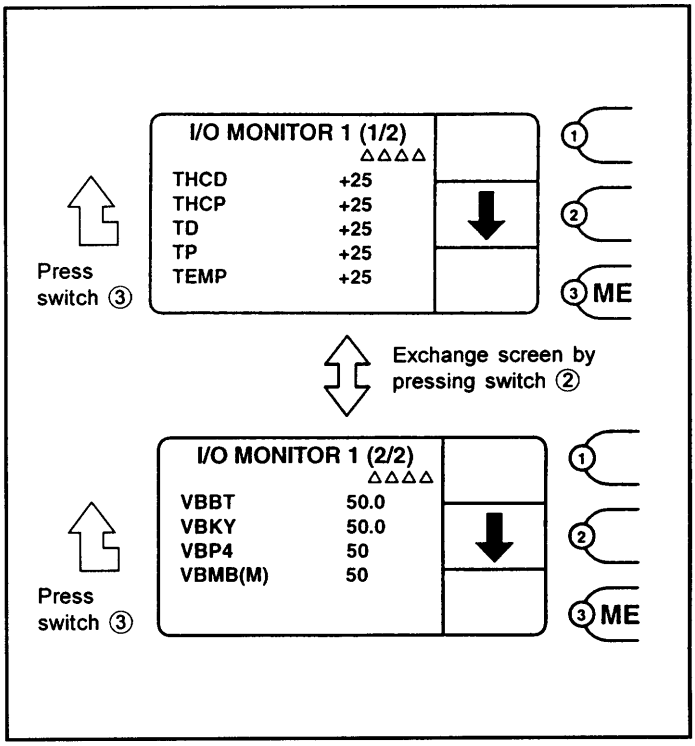
I/O MONITOR 1 (2/2) screen

① VBBT: Battery voltage (V)
- Voltage before the key switch

② VBKY: Battery voltage (V)
- Voltage after the key switch

③ VBP4: Voltage at P4 terminal (V)
- Voltage measured at terminal P4

④ VBMB(M): Main battery input voltage (V)
- Voltage after the MB contactor



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I/O MONITOR 2

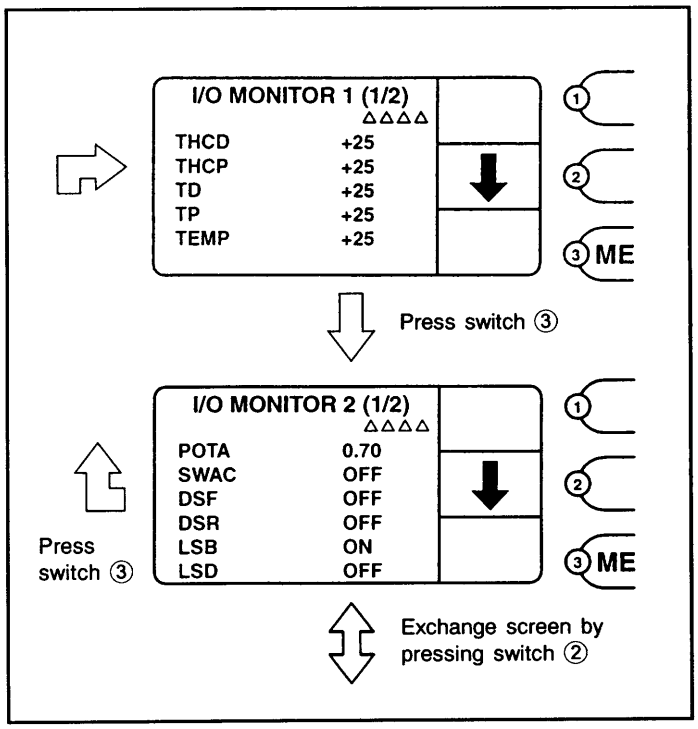
This function indicates the ON/OFF status of each traveling-related switch and analog input voltage of each sensor.

Operation Procedure

1. Display the IN/OUT MENU screen.
2. Check that the I/O MONITOR2 is highlighted and press switch ③ to display I/O MONITOR2 screen.
3. Functions of switches on this screen are as follows:
   - Switch ① : Unused (no indication)
   - Switch ② : Selects page 1/2 or 2/2 of I/O MONITOR2 screen.
   - Switch ③ : Changes the screen from I/O MONITOR2 to the IN/OUT MENU screen.

   Note:
   It is impossible to directly jump from each I/O MONITOR2 screen to another test screen. Return to the IN/OUT MENU screen or ANALYZER MENU screen once and go to the desired test screen then.

I/O MONITOR 2 (1/2) screen



① POTA: Accelerator potentiometer voltage (V)
   1) When accelerator pedal is not operated (SWAC: OFF)
      Standard value: 0.3 - 2.4 V
   2) Standard voltage when accelerator pedal is depressed to stroke end: 1.7 - 4.7 V
   3) If 2) - 1) = 1.4 V or more, function is normal.

② SWAC: Accelerator switch (ON/OFF)
   - Switch ON/OFF quality judgment by operating the accelerator pedal
     The quality is OK if OFF when the accelerator pedal is released, and ON when the pedal is depressed.

③ DSF: Forward switch (ON/OFF)
   - Switch ON/OFF quality judgment by operating the direction lever to the forward position
     The quality is OK if OFF when the direction lever is at the neutral position, and ON when it is at the forward position.

④ DSR: Reverse switch (ON/OFF)
   - Switch ON/OFF quality judgment by operating the direction lever to the reverse position
     The quality is OK if OFF when the direction lever is at the neutral position, and ON when it is at the backward position.

⑤ LSB: Brake switch (ON/OFF)
   - Switch ON/OFF quality judgment by operating the brake pedal
     The quality is OK if ON when brake pedal is released, and OFF when the pedal is depressed.

⑥ LSD: Deadman switch (ON/OFF)
   - Switch ON/OFF quality judgment by sitting on and leaving the operator's seat
     The quality is OK if ON when the operator sits on the operator's seat, and OFF when the operator leaves the seat.

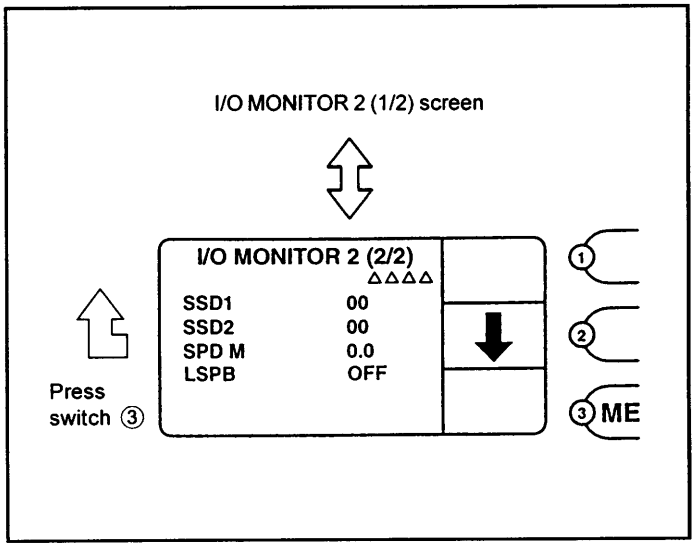
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I/O MONITOR 2 (2/2) screen

Use this function for checking the vehicle speed sensor defect detecting circuit.

① SSD1: Traveling rpm sensor 1 (pulse count)
② SSD2: Traveling rpm sensor 2 (pulse count)
③ SPD M: Main vehicle speed (km/h)
- Check each rpm sensor and the main vehicle speed under actual traveling state with the wheels jacked up.

When vehicle is stopping:
SSD1: 00
SSD2: 00
SPD: 0.0
During acceleration after starting the vehicle
The quality is OK if both the pulse counts from SSD1 and SSD2 increases and the SPD value increase with the vehicle speed.



I/O MONITOR 3

This function displays the ON/OFF status of each material handling switch and the analog input voltage from each sensor.

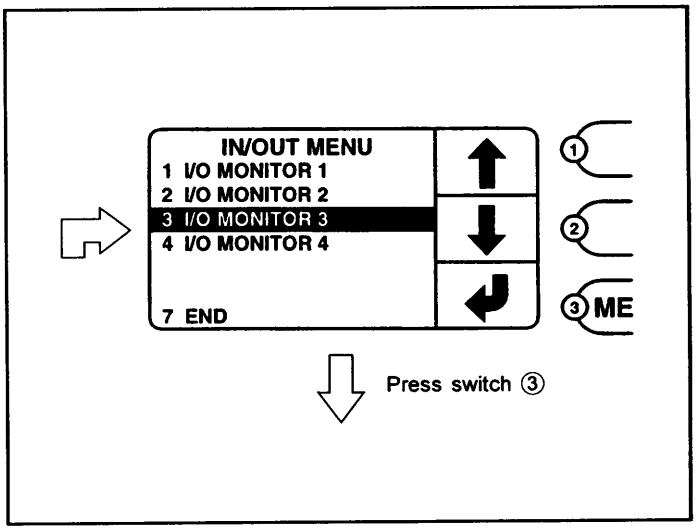
Operation Procedure

1. Display the IN/OUT MENU screen.

2. Check that I/O MONITOR3 is highlighted and press switch ③ to display I/O MONITOR3 screen.

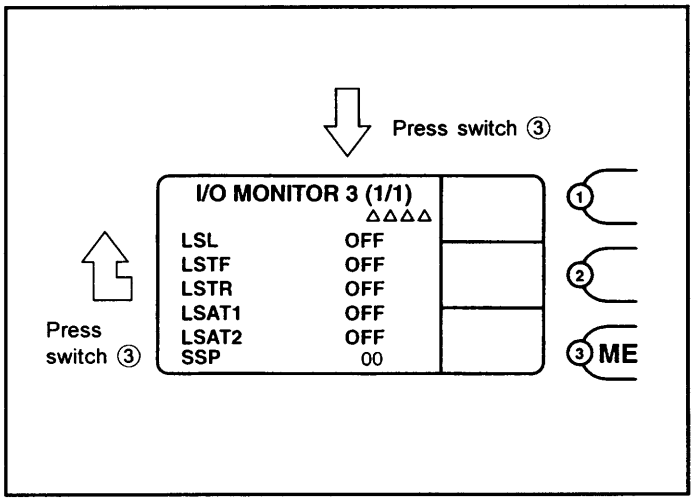
3. Functions of switches on this screen are as follows:
   - Switch ① : Unused (no indication)
   - Switch ② : Unused (no indication)
   - Switch ③ : Changes the screen from I/O MONITOR3 to the IN/OUT MENU screen.

Note:
It is impossible to directly jump from each I/O MONITOR3 screen to another test screen. Return to the IN/OUT MENU screen or ANALYZER MENU screen once and go to the desired test screen then.



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I/O MONITOR 3 screen



① LSL: Lift switch (ON/OFF)
- Switch ON/OFF quality judgment by operating the lift lever
  The ON/OFF quality is OK if OFF when the material handling lever is at the neutral position, and ON when it is operated to the UP side.

② LSTF: Tilt forward switch (ON/OFF)
- Switch ON/OFF quality judgment by operating the tilt lever to the forward side
  It is judged OK if OFF when the tilt lever is at the neutral position, and ON when it is operated to the forward side.

③ LSTR: Tilt backward switch (ON/OFF)
- Switch ON/OFF quality judgment by operating the tilt lever to the backward side
  The quality is OK if OFF when the tilt lever is at the neutral position, and ON when it is operated to the backward side.

④ LSAT1: Attachment switch No. 1 (ON/OFF)
- Switch ON/OFF quality judgment by operating attachment lever No. 1

Note:
ON/OFF is not indicated for a vehicle without attachment.

The quality is judged OK if OFF when the attachment lever No. 1 is at the neutral position, and ON when it is operated.

⑤ LSAT2: Attachment switch No.2 (ON/OFF)
- Switch ON/OFF quality judgment by operating the attachment lever No. 2

Note:
ON/OFF is not indicated for a vehicle without attachment.

The quality is OK if OFF when the attachment lever No. 2 is at the neutral position, and ON when it is operated.

⑥ SSP: Pump motor rpm sensor (number of pulses)
- Perform material handling and check if the number of pulses is detected.

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I/O MONITOR 4

This function displays the analog input voltage from any other switch or sensor.

Operation Procedure

1. Display the IN/OUT MENU screen.
2. Check that I/O MONITOR4 is highlighted and press switch ③ to display the I/O MONITOR4 screen.
3. Functions of switches on this screen are as follows:
   - Switch ① : Unused (no indication)
   - Switch ② : Unused (no indication)
   - Switch ③ : Changes the screen from I/O MONITOR4 to the IN/OUT MENU screen.

   Note:
   It is impossible to directly jump from I/O MONITOR4 screen to another test screen. Return to the IN/OUT MENU screen or ANALYZER MENU screen once and go to the desired test screen then.

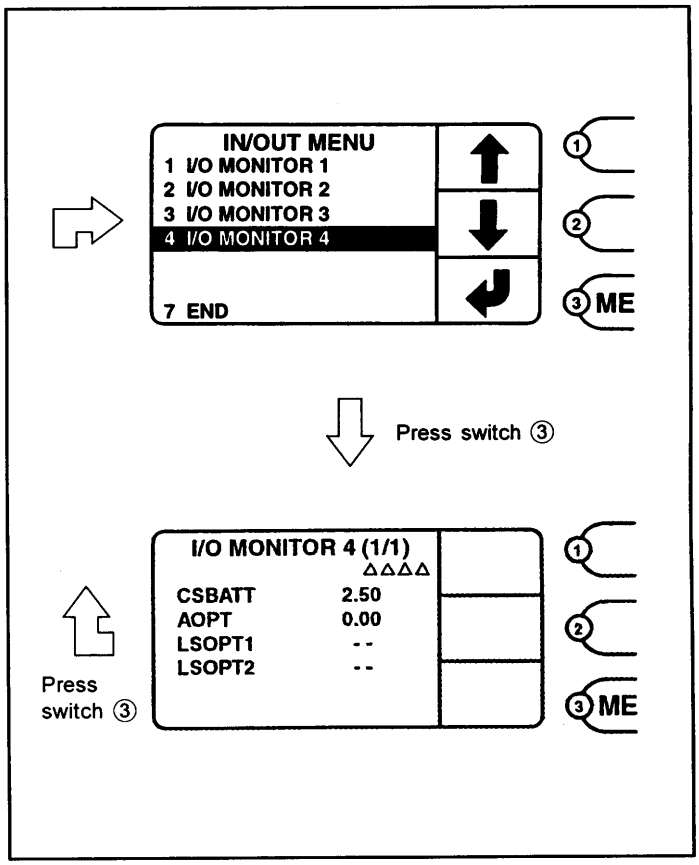
I/O MONITOR 4 (1/1) screen

① CSBATT: Battery current sensor voltage (V)
- Voltage of the sensor that detects the battery curent.

② AOPT: Spare

③ LSOPT1: Spare

④ LSOPT2: Spare



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ACTIVE TEST

This function outputs electrical switch ON/OFF signals and compares controller input signals with those signals.

Operation Procedure

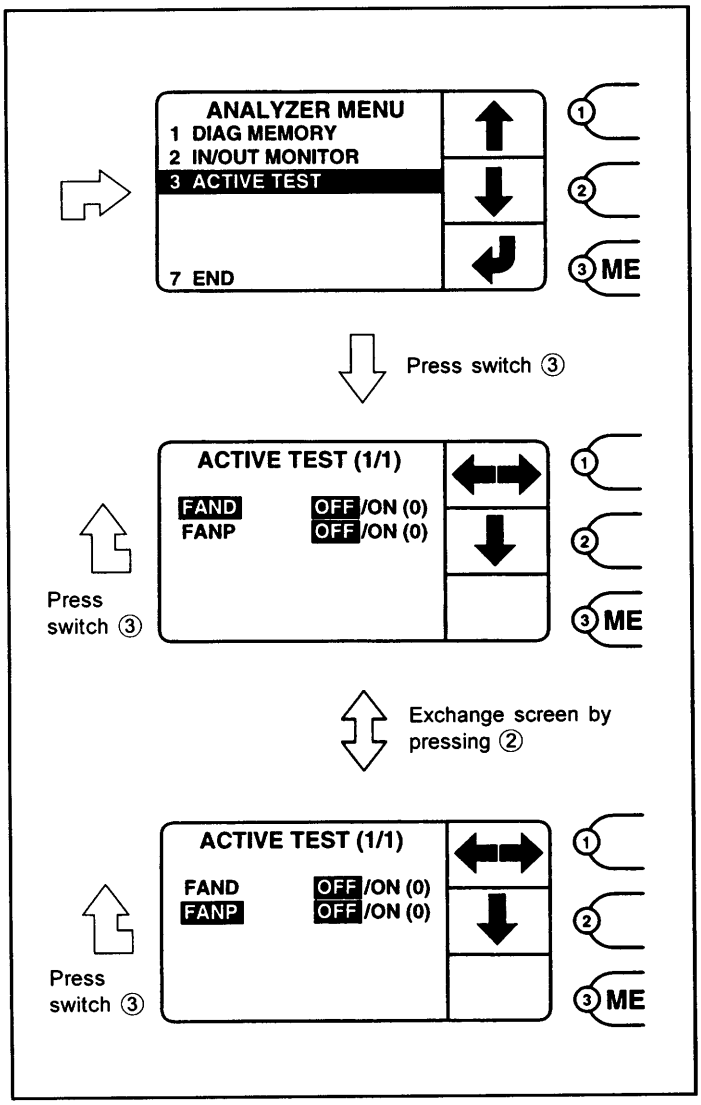
1. Display the ANALYZER MENU screen.
2. Press switch ② twice.
3. See that 3. ACTIVE TEST is highlighted and press switch ③. Switch operation test function is activated and the ACTIVE TEST screen is displayed.
4. Functions of switches on this screen are as follows:
   - Switch ① : Forced ON or OFF
     ON and OFF are alternated each time the switch is pressed.
   - Switch ② : Selects an item.
   - Switch ③ : Causes exit from the active test mode to return to the ANALYZER MENU screen.

   Note:
   It is impossible to directly jump from the ACTIVE TEST screen to another test screen. Return to the ANALYZER MENU screen once and go to the desired test screen then.

ACTIVE TEST SCREEN

① FAND: Traveling circuit fan
Traveling circuit fan: ON (1)
Traveling circuit fan: OFF (0)
- Operation of the traveling circuit fan is checked by forced output of the ON/OFF signal.
  Operation is OK if the fan rotates when the ON (1) signal is output and stops when the OFF (0) signal is output.

② FANP: Material handling circuit fan
Material handling circuit fan: ON (1)
Material handling circuit fan: OFF (0)
- The fan operation is checked by forced output of the ON/OFF signal.
  Operation is OK if the fan rotates when the ON (1) signal is output, and stops when the OFF (0) signal is output.



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TUNING

GENERAL

When the user requests to limit the maximum speed or weaken the regenerative braking force, use the plug-in analyzer and change the setting level.
Twelve tuning items including spares are provided.

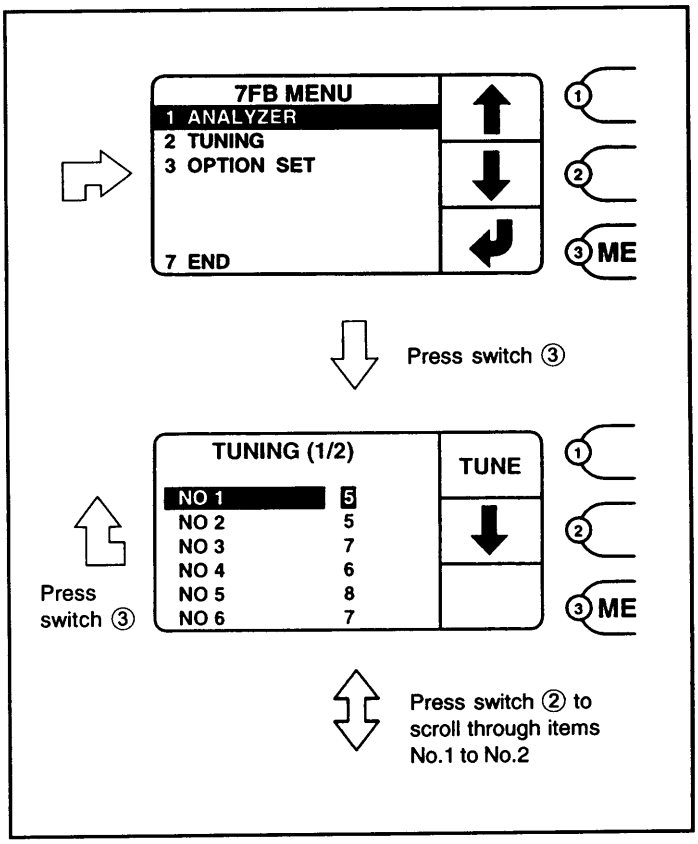
Tuning Mode List

TUNING	NO.1	Setting regenerative braking torque (switch back)
	NO.2	Setting regenerative braking torque (accelerator off)
	NO.3	Lift interrupt level setting
	NO.4	Battery charge indicator correction
	NO.5	Maximum speed limiter
	NO.6	Pump motor rpm setting upon attachment switch ON
	NO.7	Pump motor rpm setting upon tilt switch ON
	NO.8	Spare
	NO.9	Spare
	NO.10	Spare
	NO.11	Spare
	NO.12	Spare

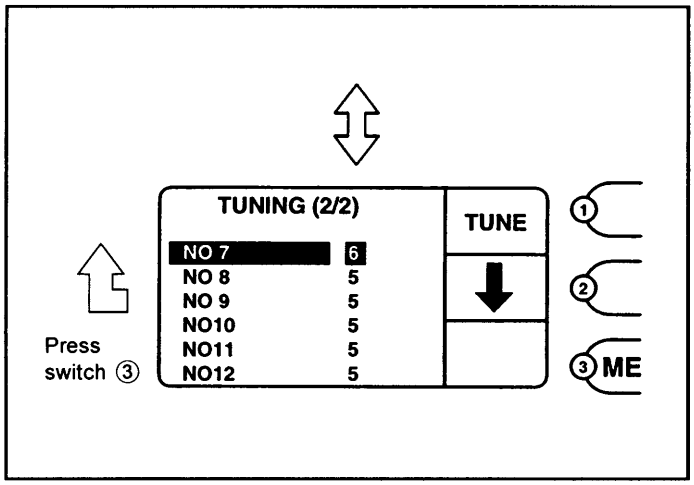
Operation Procedure on TUNING screen

1. Connect the plug-in analyzer and select the 7FB MENU screen. (See page 4-13.)
2. Press switch ② once on the 7FB MENU screen. Check that 2. TUNING is highlighted.
3. Press switch ③ (enter) to display the TUNING screen.
4. Select a tuning item using switches ① and ②, and then press switch ③ to enter the setting screen.
5. Functions of operation switches on the tuning function setting screen are as follows:
   - Switch ① : Changes the tuning level.
   - Switch ② : Selects a tuning item.
   - Switch ③ : Enters the selected level and returns to the 7FB MENU screen.

Note:
Select a tuning level from levels 1 to 8. For the contents of tuning items and default values, see the next page.



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Tuning Item List

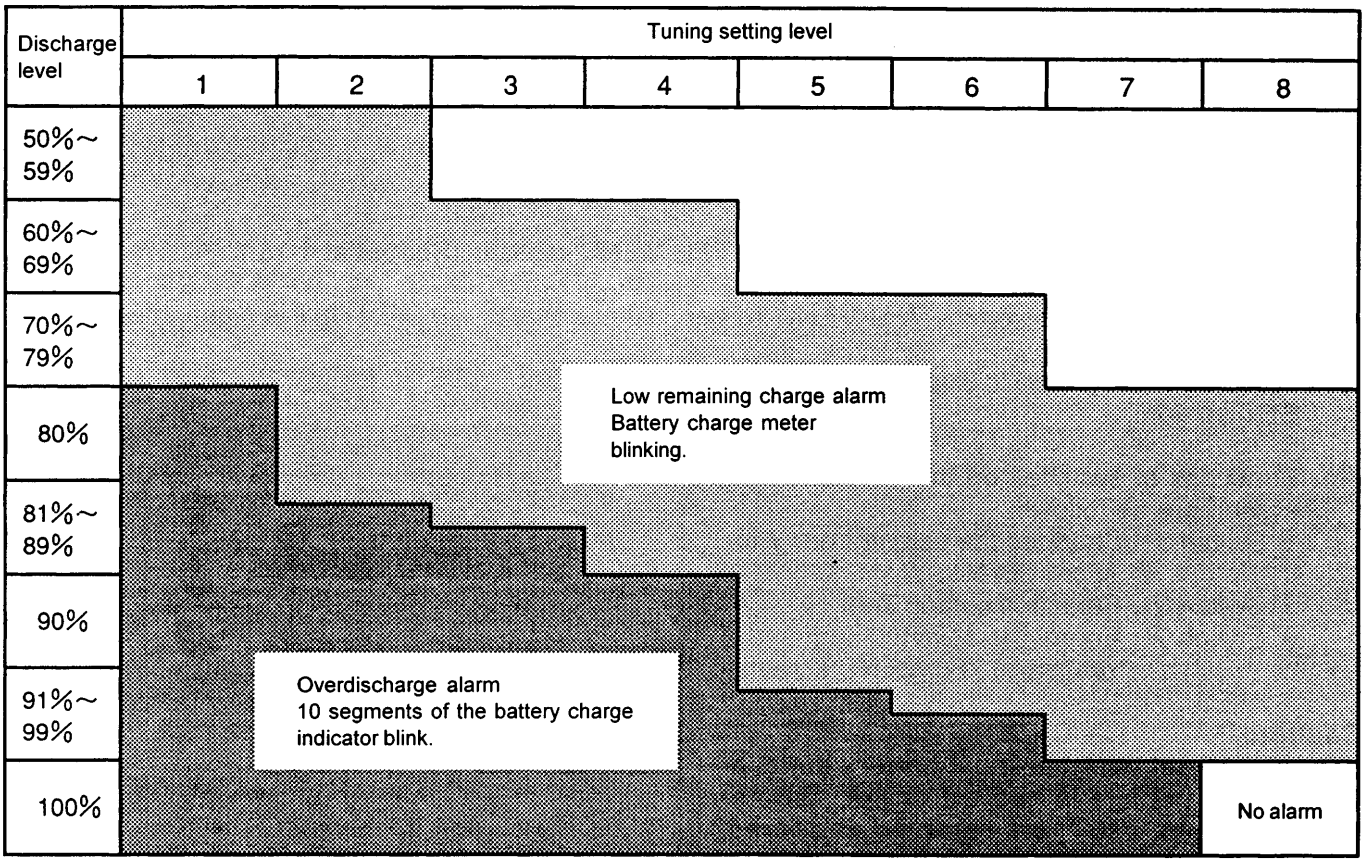
Tuning No.	Item	Level (●: Default setting position) 1 2 3 4 5 6 7 8
1	Setting regenerative braking torque (switch back) Adjustment of regenerative braking torque during switch back operation	Weak ◄——●——► Strong
2	Setting regenerative braking torque (accelerator off) Changing the regenerative braking torgue when acceleration is OFF	None Weak ◄——●——► Strong
3	Lift interrupt level setting Adjustment of overcharge alarm activation timing (prohibiting simultaneous traveling and material handling)	Small ◄——► Large Invalid
4	Battery charge indication correction Correction of decrease in battery charge indication	Slow decrease ◄——●——► Quick decrease
5	Maximum speed limiter Adjustment of maximum vehicle speed	Low speed ◄——► High speed None ●
6	Attachment power control No.1 Adjustment of pump motor rpm upon attachment switch No.1 ON	Low speed ◄——●——► High speed
7	Tilt power control Adjustment of pump motor rpm upon tilt switch ON (The mast control speed of SAS function cannot be adjusted.)	Low speed ◄——●——► High speed
8	Spare	
9	Spare	
10	Spare	
11	Spare	
12	Spare	

<Reference>
Lift interrupt setting level: For the battery alarm tuning level setting method and levels, see the figure on the next page.

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Remaining Battery Charge Alarm and Battery Overdischarge Alarm Setting

⑦ : Initial setting position



How to read the figure:

- Level 7 is the initial setting level upon factory shipment.

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OPTION SET

GENERAL

Use the Option Set function to adjust the controller and display control to match option setting of the vehicle. Seven option setting items including spares are provided. For a vehicle with the LED display, it is possible to set only whether or not the battery has been mounted on the vehicle. In this case, six remaining items are reserved as spares.

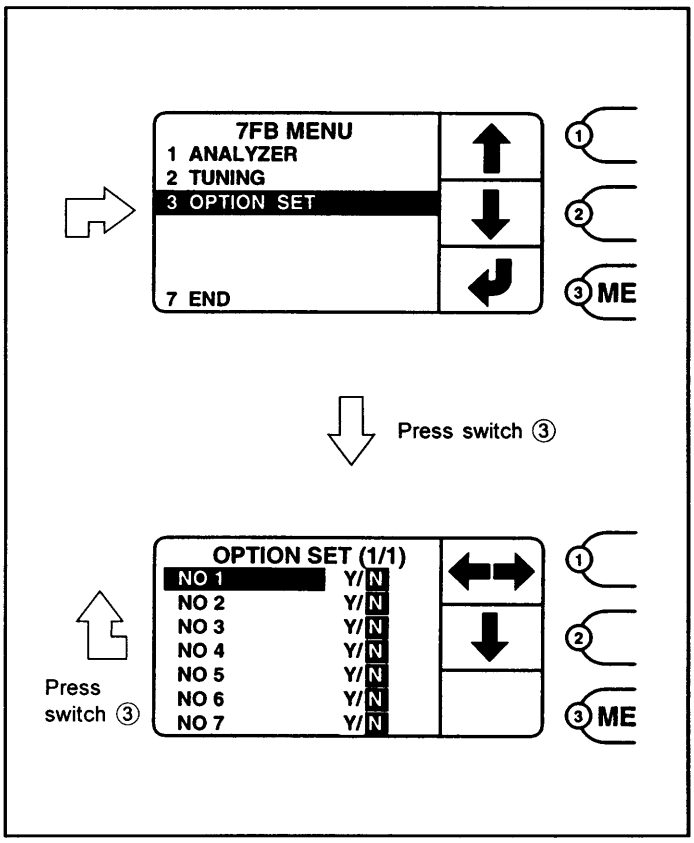
Operation Procedure on OPTION SET screen

1. Connect the plug-in analyzer and select the 7FB MENU screen. (See page 4-13.)

2. Press switch ② once on the 7FB MENU screen. Check that 3. OPTION SET is highlighted.

3. Press switch ③ (enter) to display the OPTION SET screen.

4. Functions of switches on the OPTION SET screen are as follows:
   - Switch ① : Changes the setting from Y to N or from N to Y.
   - Switch ② : Selects a setting item.
   - Switch ③ : Enters the selected item and returns to 7FB MENU screen.



Caution:
Item 1 is to set whether local battery installation on the vehicle is needed or not. Six remaining items, 2 to 7, are reserved as spares, which do not need any setting.

- **Battery-less vehicle: Select Y. (When a locally purchased battery is to be mounted)**
- **Vehicle mounted with a battery: Select N. (When the battery is mounted in Japan before shipment)**

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TESTER SET

GENERAL

Although the CONTRAST SET and LANGUAGE SET functions are displayed on the TESTER SET MENU screen, only the CONTRAST SET function is used.

1. CONTRAST SET
   This adjusts the contrast of the LCD display.

2. LANGUAGE SET
   This is not used. Though this function may be selected by moving the cursor on the menu, the display is always made in English. It is, however, recommended to select 2. ENGLISH.

Operation Procedure on TESTER SET MENU screen

Since only the contrast set function is used on this menu, only that function is explained here.

1. Connect the plug-in analyzer to display the MAIN MENU screen. (See page 4-13.)

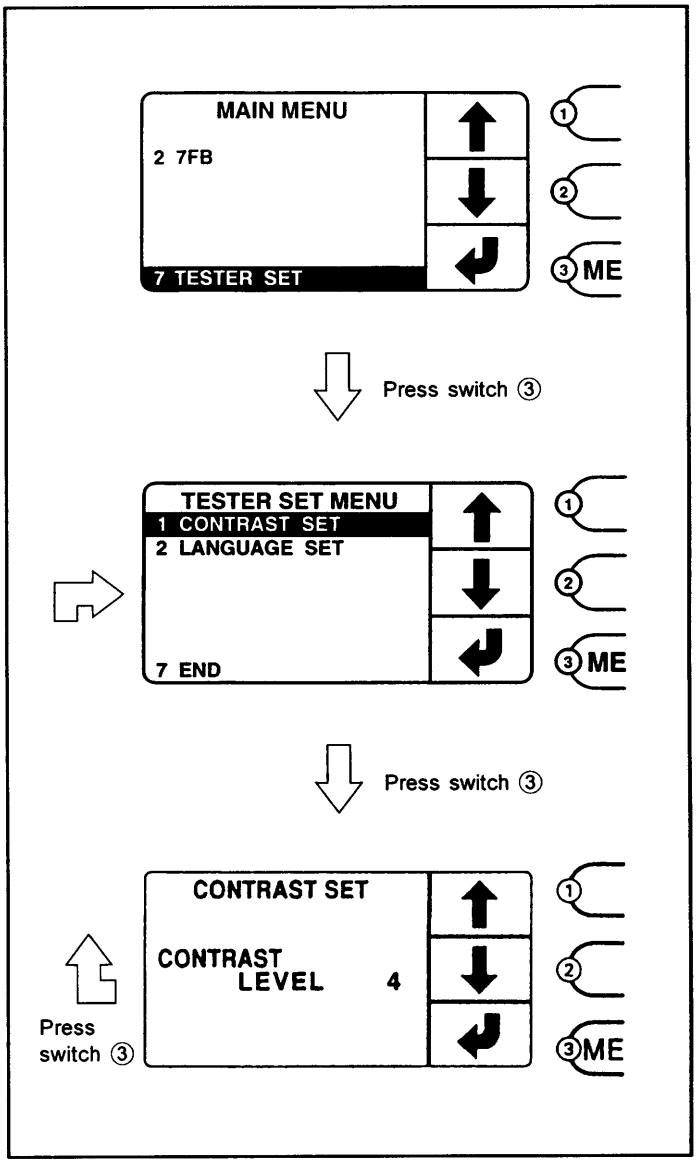
2. Press switch ② once on the MAIN MENU screen. Check that 7. TESTER SET is highlighted.

3. Press switch ③ (enter) to display the TESTER SET MENU screen.
   If you select 7. END on this screen, the screen changes to the MAIN MENU screen.

4. Select the desired tester set item using switches ① and ②, and then press switch ③ (enter) to determine the setting screen. (The function used here is only the LCD display contrast.)

5. Check that 1. CONTRAST SET is highlighted and press switch ③ to display the CONTRAST SET MENU screen.

6. Functions of switches on the CONTRAST SET screen are as follows:
   - Switch ① : Increases the level (darker).
   - Switch ② : Decreases the level (lighter).
   - Switch ③ : Enters the selected level and returns to the TESTER SET MENU screen.



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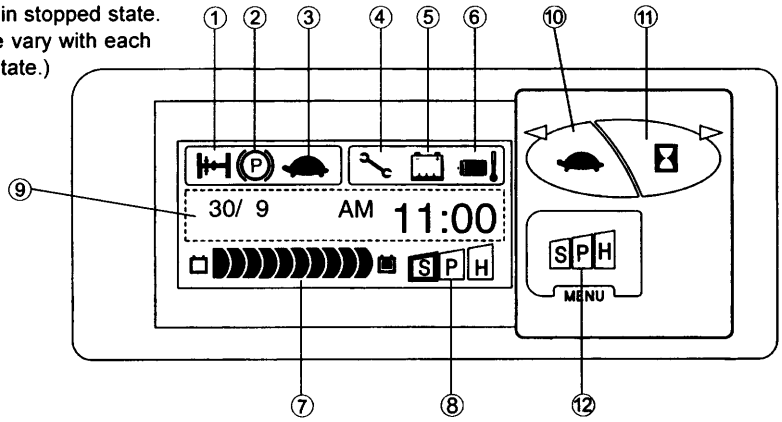
MULTI-SCREEN, MULTI-DISPLAY (OPTION)

GENERAL

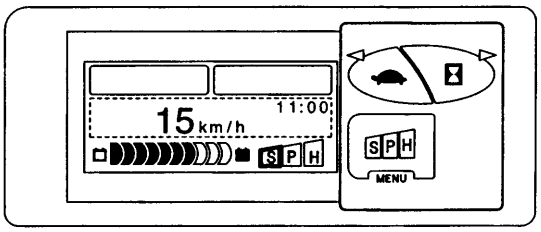
1. The multi-screen, multi-display is capable of indicating various types of vehicle information by switching the screen according to the displayed contents.

2. Easier recognition and operation on multi-display
   (1) Adoption of white back light and color filter
   (2) Display of battery charge indication and various indicators in fixed positions
   (3) Large switches and addition of function marks

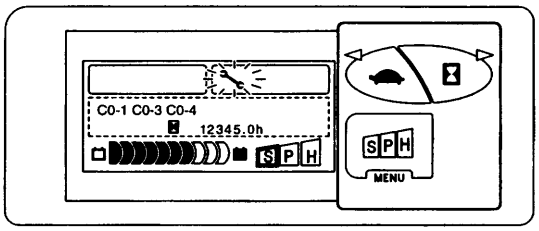
When the vehicle is in stopped state. (① to ⑧ in the table vary with each function activation state.)



During traveling <speed indication>



Upon error occurrence <Error indication>



No.	Item	No.	Item
①	Swing lock indicator	⑧	Power select indicator
②	Parking brake ON indicator	⑨	Multiplex screen display area
③	2-speed travel speed set indicator	⑩	2-speed travel speed control set switch
④	Diagnosis digital indicator	⑪	Hour meter selector switch
⑤	Battery electrolyte level alarm indicator	⑫	Power select switch
⑥	Overheat alarm indicator		
⑦	Battery charge indication		

① Swing lock indicator
This indicator comes on when the rear wheel swing lock is activated. It automatically goes out when the swing lock is released.

② Parking brake ON indicator
This indicator comes on upon activation of the parking brake. If the operator fails to release the parking brake during forward or reverse traveling, alarm sounds (beeps) to warn the operator. For a vehicle with the optional deadman switch, the indicator comes on when no operator is sitting on the operator's seat.

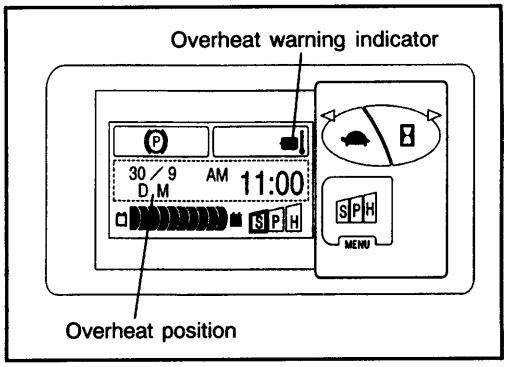
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③ 2-speed travel speed set indicator
This indicator repeats on or off each time the 2-speed travel speed control switch is pressed. When this indicator is on, the 2-speed travel speed control is activated to limit the maximum vehicle speed to the set level. For the level setting method, see the "2-speed Travel Speed Control Level Set Screen" on page 4-40.

④ Diagnosis digital indicator
This indicator blinks when an abnormality occurs in the vehicle to activate the diagnosis function. An abnormality code appears on the display with alarm sounding to warn the operator of the abnormality. Up to 3 abnormality codes are displayed at a time. When more than 3 abnormalitys occur at a time, up to 6 abnormality codes are displayed with switching at intervals of 2 seconds.
When the SAS function matching is not complete, this indicator comes on to warn the serviceman. If it is on, carry out matching by referring to the Matching section.

⑤ Battery electrolyte level alarm indicator
This indicator comes on, when the battery electrolyte decreases to the specified level by evaporation or other reasons, to warn the operator of the low electrolyte level.

⑥ Overheat alarm indicator
When the controller, drive motor or material handling motor temperature rises beyond the specified level, the overheat alarm indicator blinks with alarm sounding to warn the operator. While the overheat alarm indicator is blinking, the vehicle operation is restricted and the overheated component is indicated on the display.
Indication contents:
C/R : Controller
DM : Drive motor
PM : Pump motor



Vehicle Operation Restriction at Overheating
DM: Drive motor

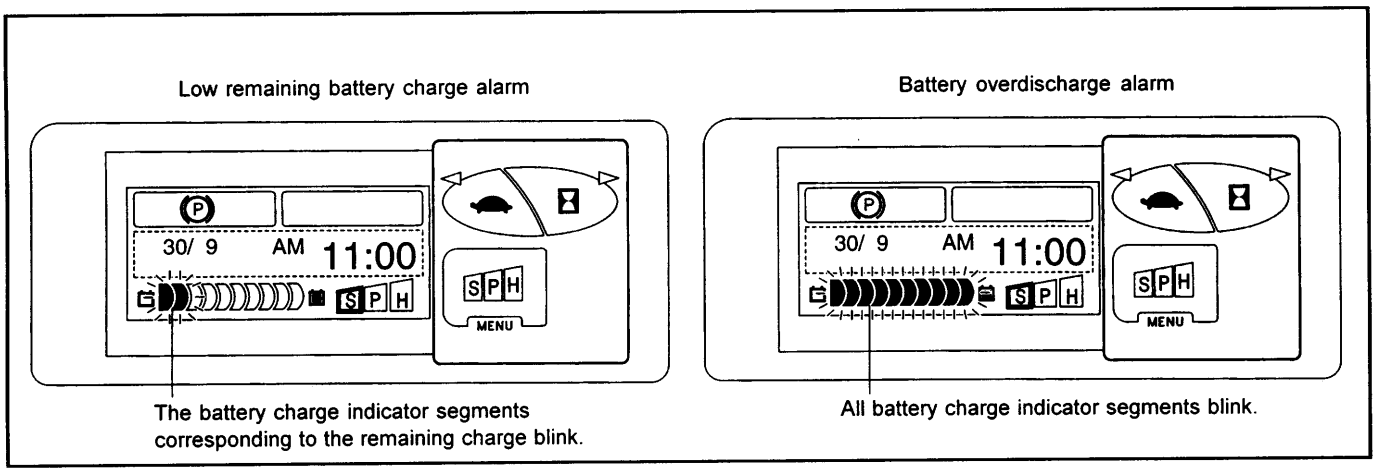
Selected mode	Content of control	
	Primary control	Secondary control
H mode	1. Character indication, blinking indicator 2. Intermittent buzzer sounding for 5 seconds 3. Switching to S mode	1. Character indication, blinking indicator 2. Continuous beeping buzzer sounding 3. Switching to half speed
P mode	1. Character indication, blinking indicator 2. Continuous beeping buzzer sounding 3. Switching to half speed	
S mode	1. Character indication, blinking indicator 2. Continuous beeping buzzer sounding 3. Switching to half speed	

Indication	Content of control	
CR: Contorller	Main drive circuit and CPU temperature	1. Character indication, blinking indicator 2. Intermittent buzzer sounding for 5 seconds 3. Switching to half throttle
	Main material handling circuit	1. Character indication, blinking indicator 2. Intermittent buzzer sounding for 5 seconds 3. Performance upon 100% discharge
PM: Pump motor	All SPH mode	1. Character indication, blinking indicator 2. Continuous beeping buzzer sounding 3. Performance upon 100% discharge

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⑦ Battery charge indicator
This indicator indicates the remaining battery charge in 10 stages.
A: Low remaining battery charge alarm
The battery charge indicator blinks when the remaining battery charge drops to the set level* or below. When the key switch is turned from OFF to ON in this state, the alarm sounds for 5 seconds to warn the operator of the low battery charge.
B: Battery overdischarge alarm (lift interrupt function)
When the remaining battery charge drops further from tha remaining charge warning level to the set level*, all segments of the battery charge indicator start blinking to warn the operator. Then, material handling during traveling is disabled.

Note:
Use the tuning mode of the mask feature to set the desired level. (See page 4-66.)



⑧ Power select indicator (traveling and material handling)
The currently selected mode is indicated by enclosing S, P or H with a square. Press the power select switch on the normal function menu to change the mode setting.
When all of S, P and H are enclosed in squares, the control is performed in the mode set on the Power Control Function Set Menu screen. (See page 4-41.)

⑨ Multi-screen display area
The date and time are normally indicated in this area. This area is also used for various purposes such as function setting and abnormality code display by the diagnosis function.

⑩ 2-speed travel speed control set switch
Press this switch on the normal function screen to set or clear 2-speed travel speed control.

⑪ Hour meter selector switch
This switch changes the screen of multi-hour-meter function.

⑫ Power select switch
This switch selects the operating mode from S, P and H. Press this switch on the normal function screen to shift the position of the square indicating the currently selected mode sequentially to the right. Press the switch continuously for 2 seconds to set the level of each function.

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SCREEN DISPLAY (LIST)

Normal Function Screen

Input of password
Press switch ③ for 2 sec.

· For user setting

2-speed travel speed ON/OFF	ON or OFF setting of 2-speed travel speed control
Switching over hour meter display	Checking traveling or material handling system ON time
Power select	Power mode selection

· For user setting

Traveling speed level	Setting of 2-speed travel speed control level
Speed alarm	Traveling speed setting for overspeed alarm
Power control select	Fine adjustment of power control level
Clock set	Adjustment of indicated time

Mask Function Screen

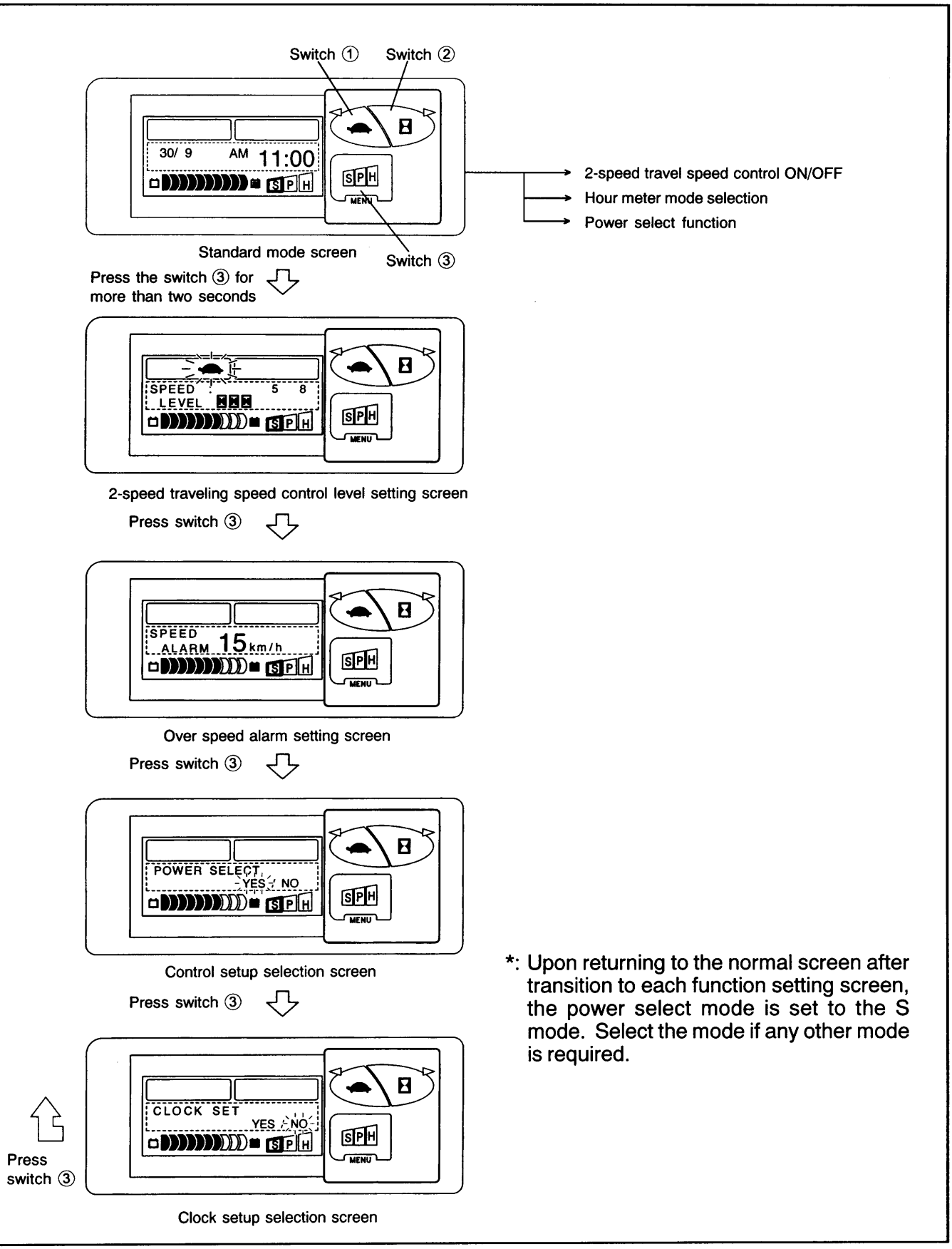
· For setting by dealer or serviceman

ANALYZER	DIAG MEMORY	Checking past diagnosis codes stored in memory
	I/O MONITOR1	Checking the temperature and voltage of each functional part
	I/O MONITOR2	Checking traveling-related sensors
	I/O MONITOR3	Checking material handling and mast control sensors
	I/O MONITOR4	Knob position correction control and checking other sensors
	ACTIVE TEST	Forced ON/OFF test of each switch
TUNING	NO.1	Setting regenerative braking torque (switch back)
	NO.2	Setting regenerative braking torque (accelerator off)
	NO.3	Lift interrupt level setting
	NO.4	Battery charge indication correction
	NO.5	Maximum speed limiter
	NO.6	Setting pump motor rpm upon attachment switch ON
	NO.7	Setting pump motor rpm upon tilt switch ON
	NO.8	Spare
	NO.9	Spare
	NO.10	Spare
	NO.11	Spare
	NO.12	Spare
OPTION SET	DEMO MODE	Enabling simultaneous traveling and material handling before starting the hour meter
	H/M START	Starting integration by hour meter
	P/C LOCK	Disabling setting the traveling/lift power control, 2-speed travel speed control and speed alarm level
	DESTI	Changing display indications to match each destination
	B LEVEL	Setting the battery electrolyte level alarm function
	MPH	Selecting the traveling speed display
	C/CNT RES	Clearing the battery charge counter to 0
	BATTERY	Setting the calculation constant for battery charge indication
	SHOU-TOKU	Speed limit setting for a small-sized special vehicle
	AUTO P-OFF	Setting the auto power OFF function
	PARKING ERR	Setting of Parking Brake Warning Function
	TILT CONT	Setting the mast forward tilt angle limit
	SWG W-LOCK	Unused
	TILT F-LIM	Setting the mast forward/backward tilt speed control function
MATCHING	TILTL	Horizontal matching for tilt angle sensor
	TILTF	Forward tilt position matching for tilt angle sensor
	LOAD	Pressure sensor no-load matching
	TIRE	Straight direction matching for tire angle sensor
	SWG	Unused
WHEEL DIA	WHEEL DIA	Tire constant setting

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NORMAL FUNCTION SCREEN

OPERATION PROCEDURE

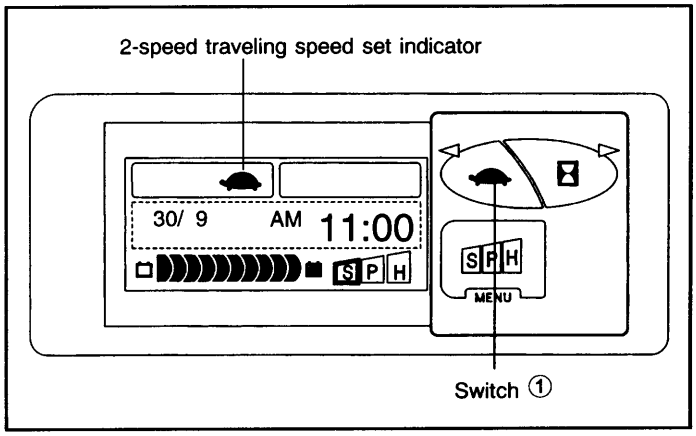


*: Upon returning to the normal screen after transition to each function setting screen, the power select mode is set to the S mode. Select the mode if any other mode is required.

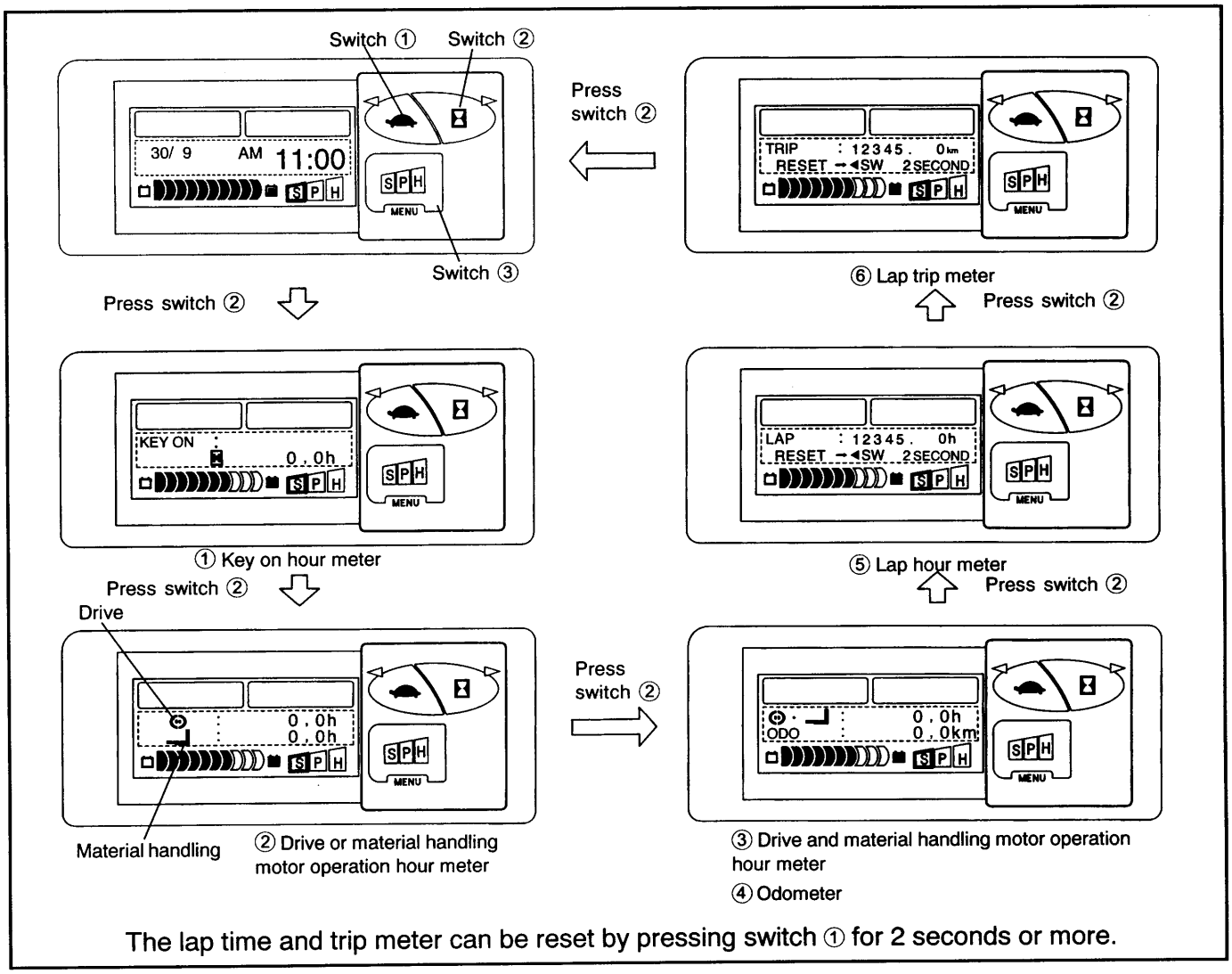
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NORMALLY INDICATED SCREEN

1. Selecting 2-speed travel speed control ON/ OFF
   Press switch ① to enable or disable the 2-speed travel speed control indicator. When the indicator is displayed, the 2-speed travel speed control is enabled.



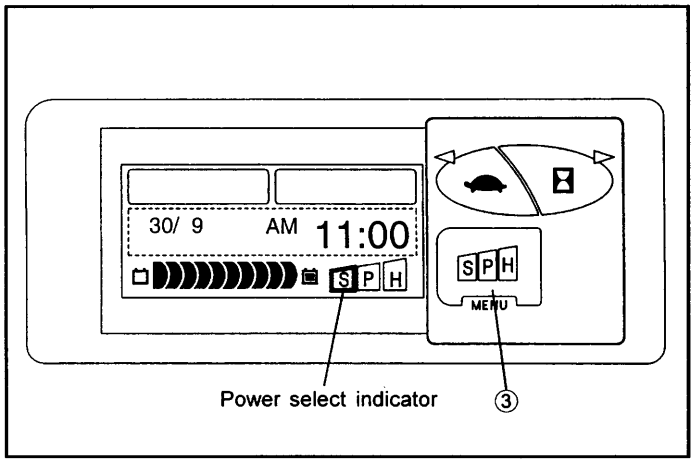
2. Selection of hour meter type to be displayed
   Press switch ② to select the hour meter type to be displayed.
   ① Key ON hour meter: Indicate the total key ON hours.
   ② Traveling/material handling hour meter: Drive/pump motor ON hours
   ③ Traveling and material handling hour meter: Total of drive and pump motor ON hours
   ④ Odometer: Total traveling distance
   ⑤ Hour meter lap: Lap time at key ON
   ⑥ Trip meter: Trip traveling distance



The lap time and trip meter can be reset by pressing switch ① for 2 seconds or more.

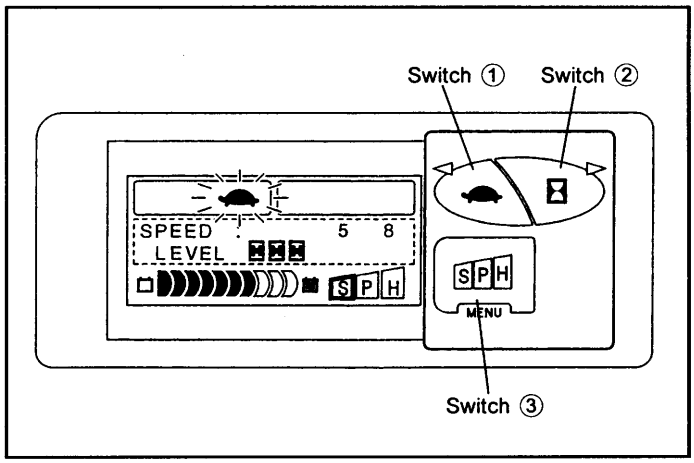
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3. Selecting the power select mode (S , P or H) Press switch ③ on the normal function screen to select the desired power mode by shifting to the corresponding indicator position.
   S : Standard performance of conventional vehicles
   P : Maintaining the maximum performance of conventional vehicle
   H : Improving loaded performance by 20% to 30%



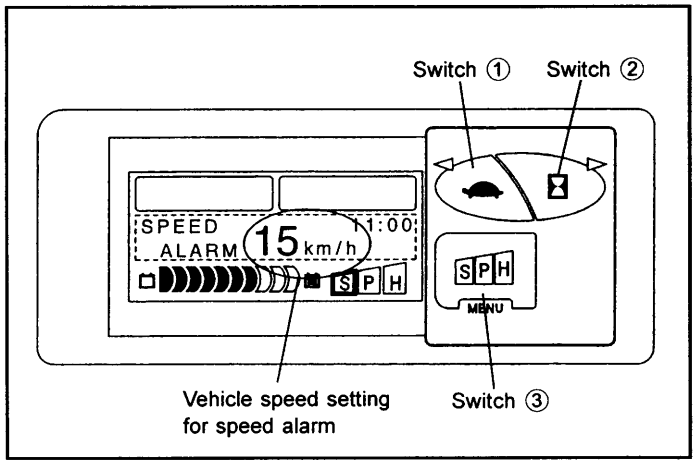
- Pattern 1: When nothing is set on the power control level set screen
  Each time switch ③ is pressed, the selected mode position shifts to the right in the order shown below:
  S → P → H → S and so on
- Pattern 2: When setting is made on the POWER CONTROL LEVEL SET screen
  Each time switch ③ is pressed, the selected mode shifts to the right as shown below:
  S → P → H → S P H → S → P ·and so on
  When all modes are enclosed in squares, the control is made by the mode selected on the POWER CONTROL LEVEL SET screen.

4. Switching to 2-speed travel speed control level, overspeed alarm level, power control (traveling, material handling) level or clock set function
   - Press switch ③ on the normal function screen for 2 seconds or more to display the 2-SPEED TRAVEL SPEED CONTROL LEVEL SET screen.



2-SPEED TRAVEL SPEED CONTROL LEVEL SET SCREEN

Use this screen to set the 2-speed travel speed control level.
1) Press switch ① to decrease the 2-speed travel speed control level.
2) Press switch ② to increase the 2-speed travel speed control level.
3) Press switch ③ to go to the next screen, (OVER-SPEED ALARM SET screen).



OVER-SPEED ALARM SET SCREEN

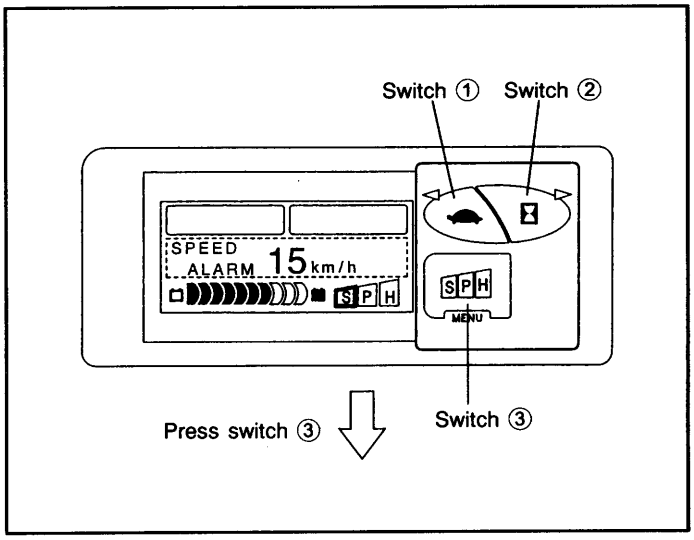
This screen sets the traveling speed level for overspeed alarming. To call the OVER-SPEED ALARM SET screen from the 2-SPEED TRAVEL SPEED CONTROL LEVEL SET screen, press switch ③ once.
1) Press switch ① to decrease the set traveling speed.
2) Press switch ② to increase the set traveling speed.
3) Press switch ③ to go to the next screen, POWER CONTROL FUNCTION SET screen.

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POWER CONTROL FUNCTION SET SCREEN

This screen sets the drive and lift power control levels independently.
Press switch ③ on the OVER-SPEED ALARM SET screen to go to the POWER CONTROL FUNCTION SET screen.

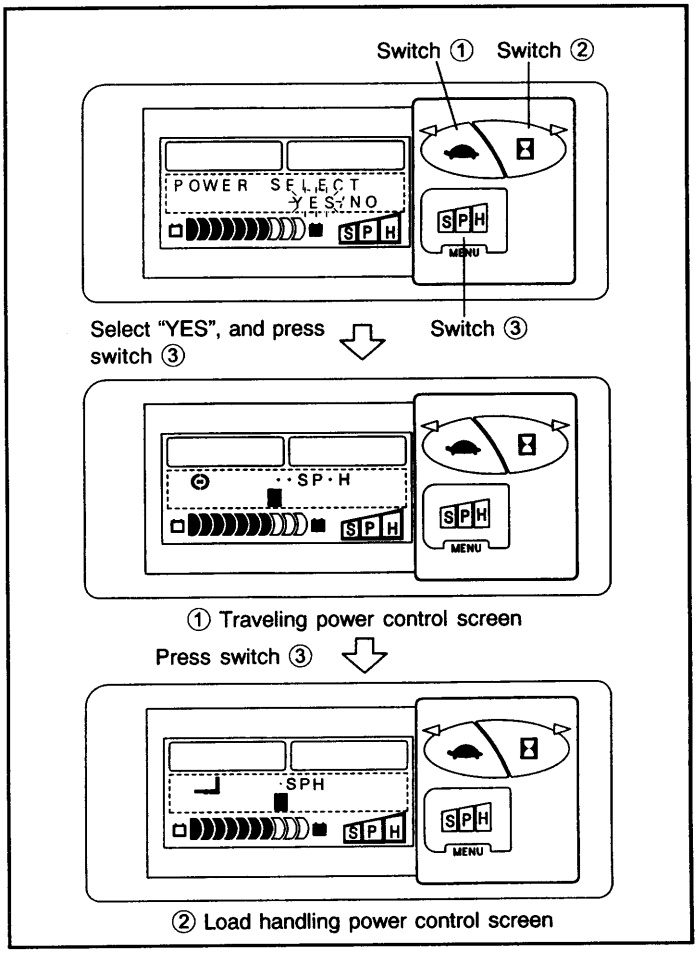
1) Press switch ① on the POWER CONTROL FUNCTION SET screen, select "Y" and press switch ③ to go to the DRIVE POWER CONTROL screen.



(1) DRIVE POWER CONTROL screen
- Press switch ① to decrease the set level.
- Press switch ② to increase the set level.
- Press switch ③ to go to the next menu, LIFT POWER CONTROL screen.

(2) LIFT POWER CONTROL screen
- Press switch ① to decrease the set level.
- Press switch ② to increase the set level.
- Press switch ③ to go to the next menu, CLOCK SET screen.

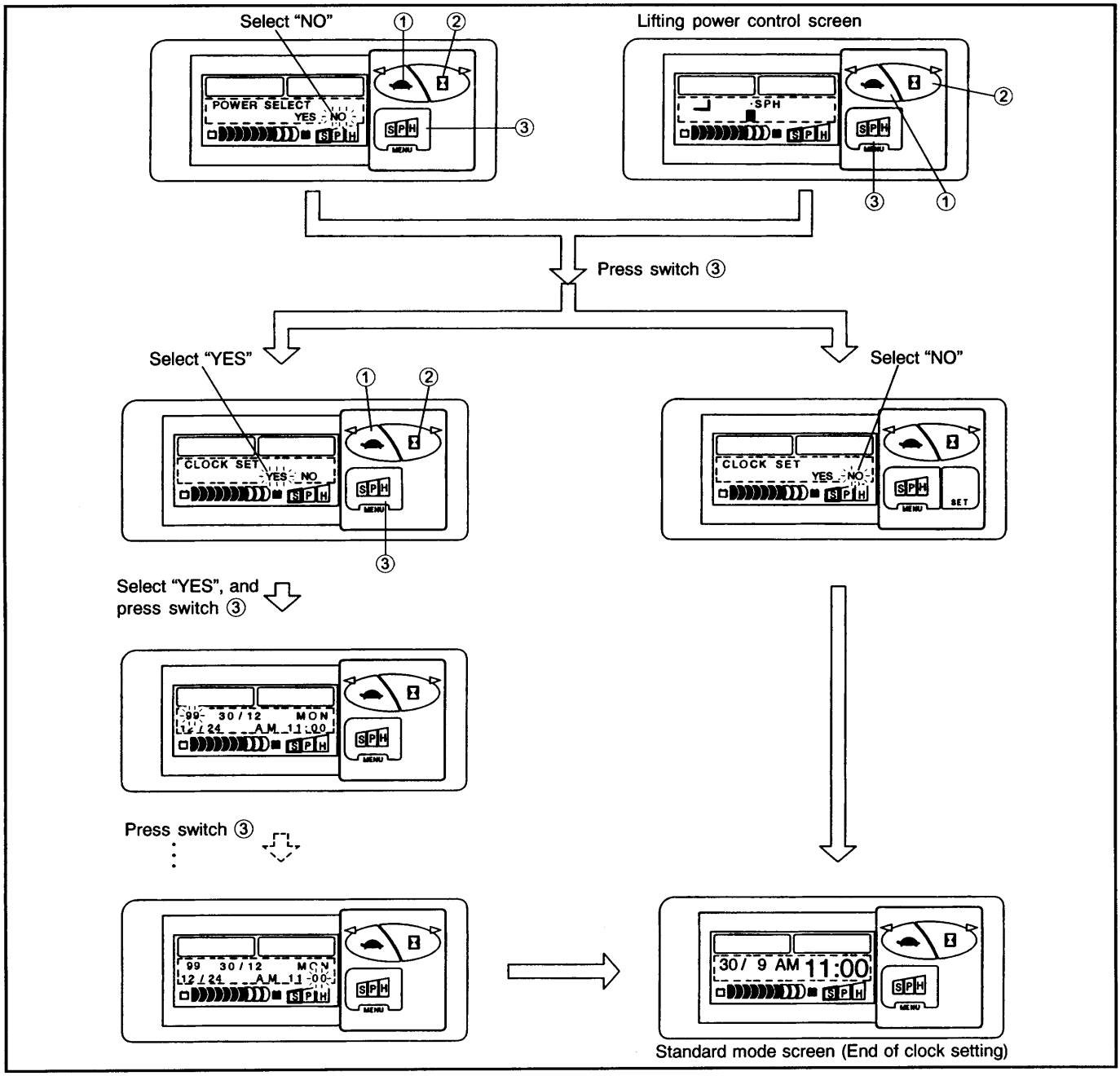
2) Press switch ② on the POWER CONTROL FUNCTION SET screen, select "N" and press switch ③ to go to the Clock Set Screen.



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CLOCK SET SCREEN

The year, month, day, day of week, time and 12/24-hour system can be set independently.
Press switch ② on the POWER CONTROL FUNCTION SET screen, select "NO" and press switch ③ to open the CLOCK SET screen.



1. Press switch ① on the CLOCK SET screen, select "YES" and press switch ③ to open the CLOCK SET screen.
   (1) CLOCK SET screen
   - Press switch ① to decrease the set value (blinking).
   - Press switch ② to increase the set value (blinking).
   - Press switch ③ to set the currently selected item (blinking) and go to the next item.
   - Press switch ③ when Minute is selected on the CLOCK SET screen to return to the normal function screen.

2. Press switch ② on the CLOCK SET screen, select "NO" and press switch ② to return to the normal function screen.

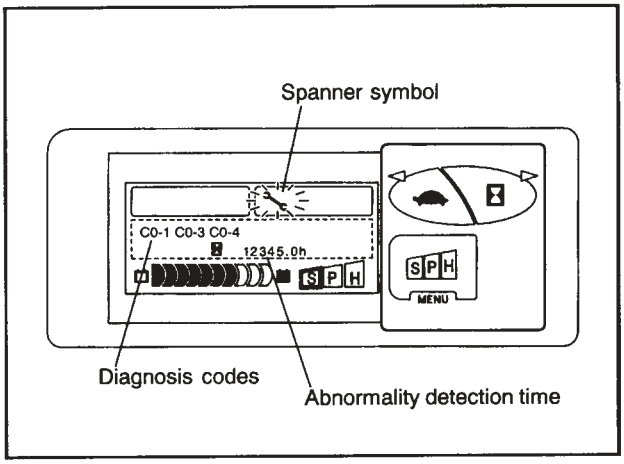
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DIAGNOSIS

1. When diagnosis is activated, a spanner symbol appears on the display with alarm sounding to warn the operator of an abnormal state of the vehicle.

2. Also, one or up to 3 diagnosis codes appear to indicate the trouble positions.

3. The battery charge can be checked even while diagnosis codes are displayed.



Felkodslista

Display/ Felkod	Sida i kap 5	Felaktig komponent	Orsak / Typ av fel	Inverkan på trucken
51-1	Sid. 114	Traveling speed sensor	Sensor open	· Swing lock during turning disabled · PS normal (partial function restricted)
51-2	Sid. 114	Traveling speed sensor	Sensor shorted to the ground	· Swing lock during turning disabled
52-1	Sid. 116	Yaw rate sensor	Open	· Swing lock during turning disabled
52-2	Sid. 116	Yaw rate sensor	VCC shorted	· Swing lock during turning disabled
52-3	Sid. 117	Yaw rate sensor	Neutral voltage abnormality	· Swing lock during turning disabled
54-1	Sid. 118	Swing solenoid	Abnormality	Swing lock state holding
54-2	Sid. 120	Swing solenoid	Abnormality	Swing lock state holding
61-1	Sid. 121	Pressure sensor	Open	NL control No forward tilt restriction No automatic leveling control
61-2	Sid. 122	Pressure sensor	VCC shorted	
62-1	Sid. 124	Tilt angle sensor	Open	No forward tilt restriction No automatic leveling control
62-2	Sid. 125	Tilt angle sensor	Open circuit of ground wiring	
63-1	Sid. 128	Tilt switch	Simultaneous ON of forward and backward tilt switches	No forward tilt restriction No automatic leveling control (Forward tilting disabled)
63-2	Sid. 128	Tilt switch	Shorting of forward tilt switch for 2 minutes or more	
63-3	Sid. 128	Tilt switch	Shorting of backward tilt switch for 2 minutes or more	
64-1	Sid. 130	Lift solenoid	Solenoid open	Interruption of lift solenoid output
64-2	Sid. 131	Lift solenoid	Shorted	
65-1	Sid. 133	Tilt solenoid	Solenoid open	Interruption of tilt solenoid output
65-2	Sid. 134	Tilt solenoid	Shorted	
66-1	Sid. 138	Tilt angle sensor	Tilt matching abnormality	No forward tilt restriction No automatic leveling control

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Display/ Felkod	Sida i kap 5	Felaktig komponent	Orsak / Typ av fel	Inverkan på trucken
67-1	Sid. 139	Lifting height switch W/SAS	Switch abnormality	Low lifting height control No forward tilt restriction No automatic leveling control
		Mode switch W/O SAS		
71-1	Sid. 144	Tire angle sensor	Open	Knob offset occurrence
71-2	Sid. 145	Tire angle sensor	VCC shorted	Knob offset occurrence
72-1	Sid. 147	Steering angle sensor	SS1 abnormality	· Knob offset occurrence · Heavy steering wheel
72-2	Sid. 147	Steering angle sensor	SWS2 abnormality	· Knob offset occurrence · Heavy steering wheel
72-3	Sid. 150	Steering angle sensor	SSC abnormality	Knob offset occurrence
72-4	Sid. 150	Steering angle sensor	Sensor open	· Knob offset occurrence · PS operation disabled
73-1	Sid. 154	Knob deviation solenoid	Solenoid open	Knob offset occurrence
73-2	Sid. 156	Knob deviation solenoid	Solenoid shorted	Knob offset occurrence
74-1	Sid. 157	Tire angle sensor	Matching abnormality	Knob offset occurrence
A0-1 	Sid. 11	Main drive circuit temperature	Overheat	Restricted drive output
A0-2 C/R	Sid. 11	Main lift circuit temperature	Overheat	Restricted material handling output
A0-4	Sid. 15	Traveling system fan	Shorted	Limited drive output
A0-5	Sid. 15	Material handling system fan	Shorted	Restricted lift output
A1	Sid. 16	Controller	High voltage	Traveling and material handling are halted after abnormality indication.
A2  C/R	Sid. 18	CPU temperature	Overheat	Restricted drive output
A3-1	Sid. 19	Incorrect battery connection	Charger-related incorrect connection	Stopped traveling and material handling MB does not turn ON.
A3-2	Sid. 21	Incorrect battery connection	Incorrect battery voltage	Stopped traveling and material handling MB remains OFF.
A4	Sid. 22	Accelerator switch	Switch abnormality	Traveling disabled after abnormality indication
A6-1	Sid. 24	Lift switch	Limit switch LSL1 abnormality	Traveling disabled after abnormality indication
A6-3	Sid. 24	Lift switch	Limit switch LSTF, LSTR abnormality	Traveling disabled after abnormality indication
A6-5	Sid. 24	Lift switch	Limit switch LSAT1 abnormality	Traveling disabled after abnormality indication
A6-6	Sid. 24	Lift switch	Limit switch LSAT2 abnormality	Traveling disabled after abnormality indication
A8	Sid. 26	Traveling/material handling system	Open fuse F1	Indication only
AA	Sid. 28	CPU temperature sensor	Temperature sensor abnormality	Indication only

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Display/ Felkod	Sida i kap 5	Felaktig komponent	Orsak / Typ av fel	Inverkan på trucken
AF-1	Sid. 28	Main CPU	CPU board abnormality ①	Traveling and Material handling outputs are stopped after abnormality detection. Reset
AF-2	Sid. 28	Main CPU	CPU board abnormality ②	
AF-3	Sid. 28	Main CPU	CPU board abnormality ③	
AF-4	Sid. 28	Main CPU	CPU board abnormality ④	Traveling and material handling outputs are stopped after abnormality detection.
AF-5	Sid. 28		CPU board abnormality	Swing control · PS control disabled
AF-6	Sid. 28		ROM abnormality	Swing control · PS control disabled
AF-7	Sid. 28		RAM abnormality	Swing control · PS control disabled
AF-8	Sid. 28		AD converter abnormality	Swing control · PS control disabled
C0-1	Sid. 29	Main drive circuit	Main drive circuit abnormality	Traveling disabled after abnormality indication
C0-3	Sid. 33	Traveling drive	Power supply abnormality	Traveling drive power supply is stopped.
C0-4	Sid. 35	Traveling drive	Circuit abnormality	
C1	Sid. 37	Drive current sensor	Sensor abnormality	Traveling disabled after abnormality indication
C2-1 	Sid. 40	Drive motor	Motor temperature overheating	Limited drive output
C2-2	Sid. 41	Drive motor	Temperature sensor abnormality	
C3	Sid. 43	Main drive circuit	Temperature sensor abnormality	Limited drive output
C4-1	Sid. 45	Drive accelerator	Accelerator potentiometer abnormality ①	Traveling and material handling disabled
C4-2	Sid. 48	Drive accelerator	Accelerator potentiometer abnormality ②	Traveling and material handling disabled
C4-3	Sid. 48	Drive accelerator	Accelerator potentiometer abnormality ③	Traveling and material handling disabled
C4-4	Sid. 48	Drive accelerator	Accelerator potentiometer abnormality ④	Traveling and material handling disabled
C7	Sid. 50	Direction switch	Switch abnormality	Traveling disabled after abnormality detection
C8-1	Sid. 52	Drive motor	Rotary sensor abnormality ①	Traveling disabled after abnormality detection
C8-2	Sid. 52	Drive motor	Rotary sensor abnormality ②	Traveling resumed by key OFF and then ON
CB-1	Sid. 54	MB (main contactor)	Contactor open	Traveling and material handling disabledv
CB-2	Sid. 60	MB (main contactor)	Contactor fused	Indication only
CF-1	Sid. 61	CPU"ROM"	Write abnormality ①	Traveling and material handling are prohibited after abnormality detection.
CF-2	Sid. 61	CPU"ROM"	Write abnormality ②	
CF-3	Sid. 61	CPU"ROM"	Write abnormality ③	
CF-4	Sid. 61	CPU"ROM"	Write abnormality ④	
CF-5	Sid. 61	CPU"ROM"	Write abnormality ⑤	

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Display/ Felkod	Sida i kap 5	Felaktig komponent	Orsak / Typ av fel	Inverkan på trucken
E0-1	Sid. 66	Main lift circuit	Main circuit abnormality	Material handling disabled after abnormality indication Stop of lift drive power supply
E0-3	Sid. 70	Lift drive	Power supply abnormality	
E0-4	Sid. 73	Lift drive	Circuit abnormality	
E1	Sid. 75	Lift current sensor	Sensor abnormality	Material handling disabled after abnormality indication
E2-1 	Sid. 78	Lift motor	Motor overheating	Limited lift output
E2-2	Sid. 79	Lift motor	Motor temperature sensor abnormality	
E3	Sid. 81	Main lift circuit	Temperature sensor abnormality	Limited lift output
E8	Sid. 83	Lift motor	Rotary sensor abnormality	Stop of material handling operations
EE-1	Sid. 87	Communications system between display and main controller	Communication abnormality ①	Indication only
EE-2	Sid. 90	Communications system between display and main controller	Communication abnormality ②	Indication only
EE-3	Sid. 90	Communications system between display and main controller	Communication abnormality ③	Indication only (Operate under the default.)
EF-1	Sid. 90	Main controller EEP-ROM	EEP-ROM abnormality ①	Operate under the default.
EF-2	Sid. 90	Main controller EEP-ROM	EEP-ROM abnormality ②	Operate under the default.
EF-3	Sid. 90	Main controller CPU	CPU board abnormality	Indication only
EF-5	Sid. 90	PS controller EEP-ROM	EEP-ROM abnormality ①	Swing control·PS control disabled
EF-6	Sid. 90	PS controller EEP-ROM	EEP-ROM abnormality ②	Indication only
F0-1	Sid. 107	PS main circuit	Main circuit abnormality	
F1-1	Sid. 109	Communications system between main controller and display	Communication abnormality ①	Indication only
F1-2	Sid. 110	Communications system between main controller and display	Communication abnormality ②	Indication only
FE-1	Sid. 62	Communications system between PS controller and main controller	Communication abnormality ①	Indication only
FE-2	Sid. 64	Communications system between PS controller and main controller	Communication abnormality ②	Indication only
FE-4	Sid. 64	Main communications system	Communication abnormality ①	· Material handling lock disabled · PS normal control (with partial function restriction)
FE-5	Sid. 64	Main communications system	Communication abnormality ②	· PS normal control (with partial function restriction)
FE-6	----------	AFS communications system	Communication abnormality ①	Material handling lock disabled
FE-7	----------	AFS communications system	Communication abnormality ②	Material handling lock disabled

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MASK FUNCTIONS

GENERAL

In addition to the functions described in the instruction manual for use by general users, the multi-screen, multi-display provides the following mask functions for use by the service staff for vehicle maintenance and specification setting.
The service functions are protected by the password so that the important internal data will not be damaged by wrong use of service functions by users by mistake.

Mask Function List

Function		Description	When used		
			Vehicle delivery	Board replacement	Others
Analyzer		Displays the electrical system status and reads the error information detected by controllers	—	—	Upon vehicle abnormality
Tuning		Makes fine adjustment of traveling and material handling functions.	—	O *2	As requested by customer
Option Setting	Specification setting	Sets each vehicle option and other specifications. *1	—	O *2·*3	—
	Each control function enable/ disable	Enables or disables each control function	—	O *2·*3	—
	Hour meter start	Starts counting by the hour meter.	O	O *4	—
	Demo mode	Enables or disables the demo mode. (Material handling prohibition during traveling set at the time of delivery)	—	—	New vehicle or before demonstration
Matching		Updates voltage values of sensor signals under the standard vehicle condition.	—	O *2	—
Tire constant set		Makes the speedometer reading appropriate.	—	O	—

*1: This is to match the controller and display control according to the installed option and control functions equipped on the vehicle. Note that this function does not enable or disable the option or control function itself.
*2: Board: Traveling/material handling controller or PS controller control board
*3: Board: Control board for the multi-display

Traveling, Material handling and EHPS Operations on Each Mode Screen

O: Operable ×: Not operable

Mode screen	Traveling	Material handling	EPS	Mode screen	Traveling	Material handling	EPS
MASK MENU screen	O	O	O	TUNING screen	O	O	O
ANALYZER MENU screen	O	O	O	OPTION SET screen	×	×	O
ANALYZER MODE, MONITOR1 to MONITOR4 screen	O	O	O	MATCHING screen	O	O*	O
ANALYZER MODE, ACTIVE TEST screen	O	O	O	TIRE CONSTANT SET screen	O	O	O

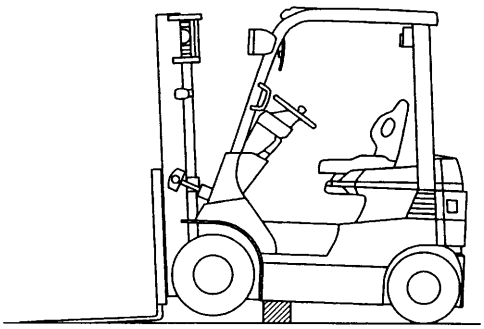
* Only tilt control function disabled

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HOW TO USE THE MASK MENU SCREEN

Preparation

Caution:
Always jack up the frame until the drive wheels (front tires) leave the ground and support the vehicle with wooden block under both side frames in the front. Fully lower the fork.



1. See that the battery plug is connected securely and turn the key switch to ON.

2. Operate the mask function according to the password input procedure explained on page 4-49.

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PASSWORD

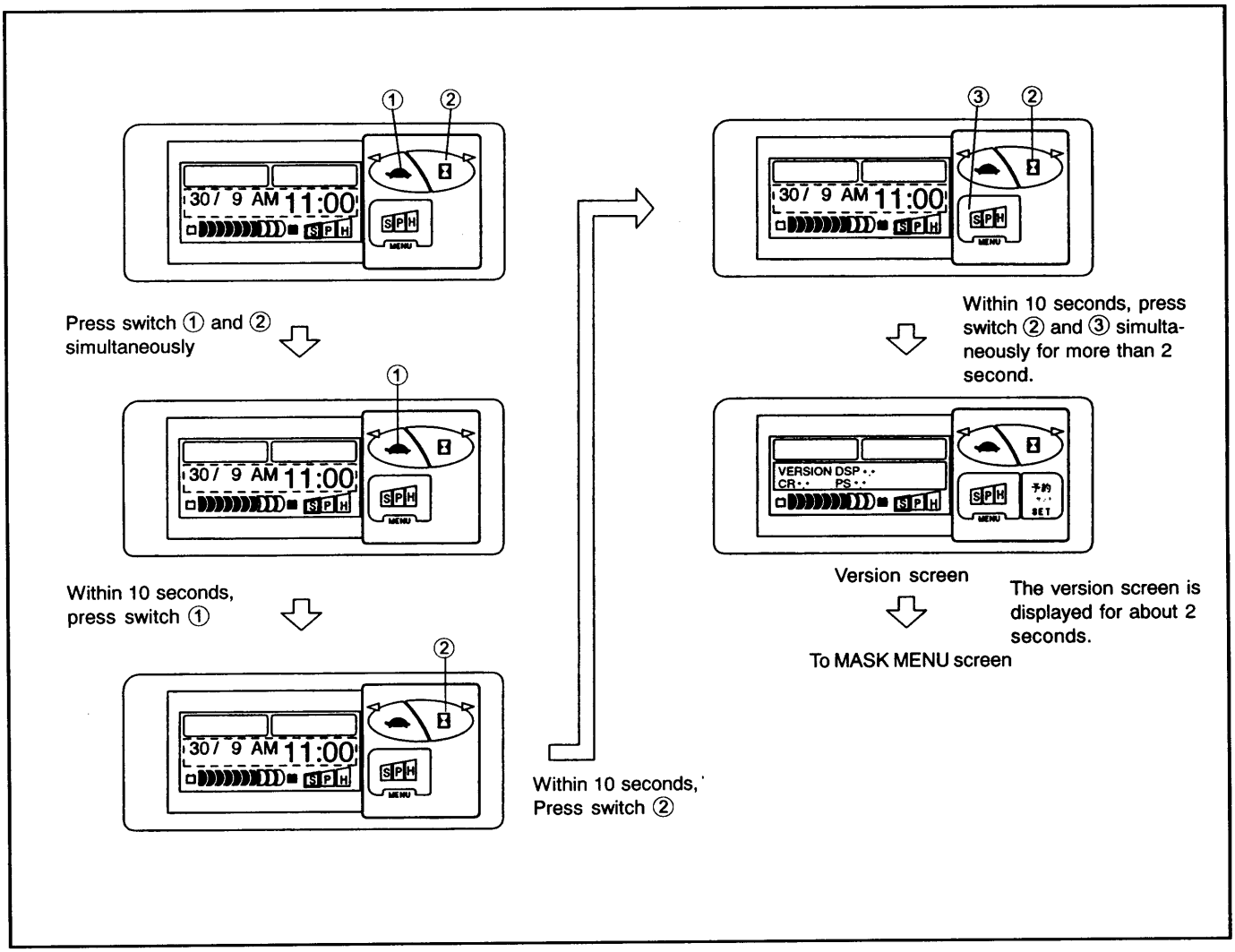
Notes on password input:

1. Always operate switches displayed on the display with a finger tip. If a sharp edged tool is used, the switch may be damaged.

2. If a wrong input is found midway, turn the key switch to OFF and restart from the beginning. If the MASK MENU cannot be displayed after several attempts, the system may be faulty.

Password Input Procedure

Step	Operation	Vehicle operation
1	Press switches ① and ② at a time.	A short high-pitched electronic sound is given off.
2	Press switch ①.	A short high-pitched electronic sound is given off.
3	Press switch ②.	A short high-pitched electronic sound is given off.
4	Simultaneously press switches ② and ③ for 2 seconds or more. (End of password input)	A longer high-pitched electronic sound is given off.
5	The version screen appears automatically.	
6	After displaying the version screen for 2 seconds, the MASK MENU screen appears automatically.	



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OPERATION ON MASK MENU SCREEN

Operation Procedure

1. Input the password on the normal function menu (as explained on the preceding page) to display the MASK MENU screen.

2. Select a desired function using switches ① and ②. Then, press switch ③ (set) to display the function screen or setting screen of the selected function.

   (1) ANALYZER SCREEN
   This screen indicates the electrical system status and reads the error information detected by the controller.

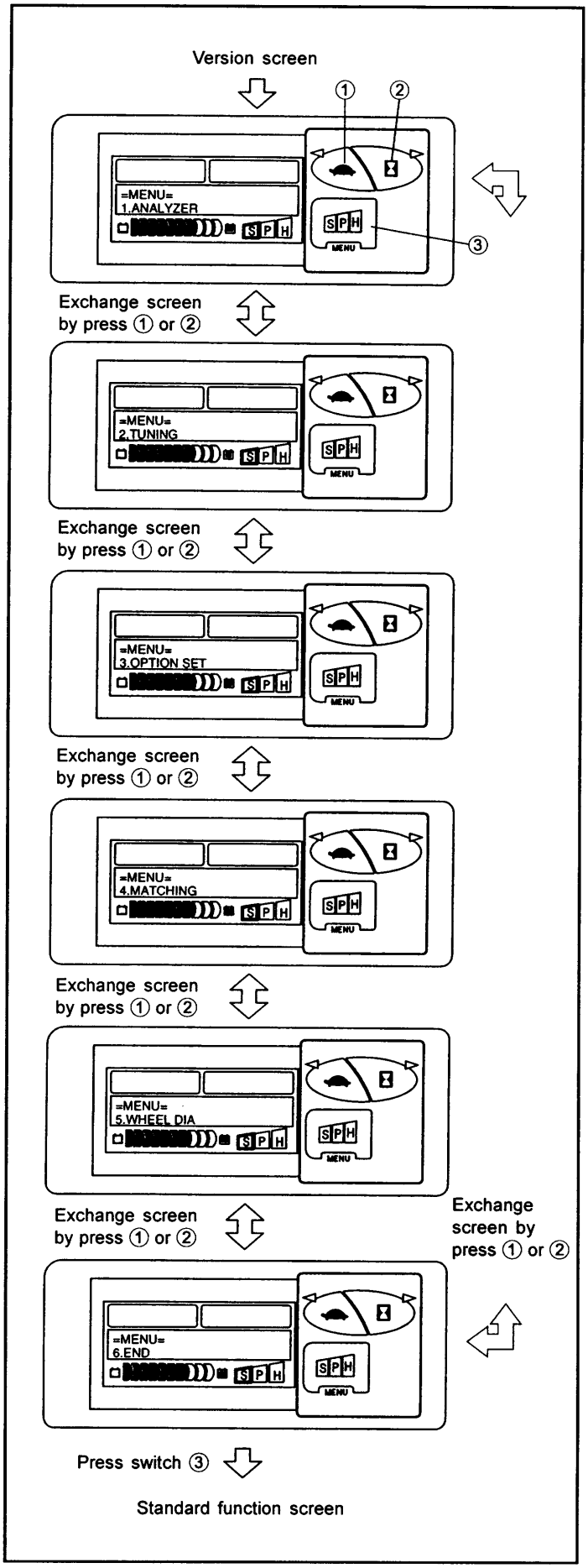
   (2) TUNING SCREEN
   Use this screen for fine adjustment of control of the traveling and material handling.

   (3) OPTION SET SCREEN
   Use this screen to match the controller or display control according to the set option or control.

   (4) MATCHING SCREEN
   This screen updates the signal voltage values stored in the controller (signal voltage values from the SAS function sensors under the standard vehicle condition).

   (5) WHEEL DIA SCREEN
   This screen rewrites the tire information in the controller for correcting the speed indication and trip meter.

   (6) END SCREEN
   It is possible to go to the normal function screen from this screen. Press switch ③ on this screen to go to the normal function screen.
   Press switch ② to return to the (1) ANALYZER MENU. As an alternative method, turn the key switch to OFF when any menu is displayed to return to the normal function screen.



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ANALYZER

GENERAL

1. Switching the multi-display to the analyzer mode permits checks of traveling, material handling, EHPS and SAS main circuits, operation systems such as the accelerator and sensor functions as well as detection of problem components.

2. Full utilization of the analyzer functions helps quick, easy servicing.

3. The analyzer supports inspection of the control system and troubleshooting through full communication with the traveling/material handling controller.

4. The analyzer has the following functions:
   (1) Diagnosis memory function (DIAG MEMORY)
   The controller stores up to 10 error codes (diagnosis codes) detected in the electrical system in the past. The diagnosis function reads these error codes and indicates them on the display.
   Each error code is displayed with its detection time as the key ON hour meter reading.

   (2) In/out monitor function (I/O MONITOR)
   This function displays the analog input values from individual sensors in the traveling, material handling, EHPS and SAS systems. Monitoring the displayed values enables the quality of each circuit/sensor to be judged.

   ① I/O MONITOR1
   Displays the temperature and analog input voltage at the respective terminal of each electrical component detected by the controller.

   ② I/O MONITOR2
   Displays each switch ON/OFF state and analog input voltages from sensors for traveling and swing control.

   ③ I/O MONITOR3
   Displays the material handling and mast switch ON/OFF states and analog input voltages from material handling and mast sensors.

   ④ I/O MONITOR4
   Displays the ON/OFF states of knob position correction control and other switches and the analog input voltages from respective sensors.

   (3) Active test (ACTIVE TEST)
   In the active test mode, the controller forcibly outputs an activate signal (ON or OFF signal) to the selected item in order to permit operation check of that function.

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ANALYZER MENU SCREEN LIST

Note:
Values displayed on the second row are examples and not the standard.

Analyzer menu screen	Indication		Description
	1st row	2nd row	
1. DIAG MEMORY ·Diagnosis code display	DIAG-1 DAIG-10	Error codes are displayed together with detection time information.	Refer to the Diagnosis Code List.
2. I/O MONITOR1 ·Voltage ·Temperature	I/O1-1	THCD: +25	Main traveling circuit temperature: °C
	I/O1-2	THCP: +25	Main material handling circuit temperature: °C
	I/O1-3	TD : +25	Drive motor temperature: °C
	I/O1-4	TP : +25	Pump motor temperature: °C
	I/O1-5	TEMP: +25	Temperature on CPU board: °C
	I/O1-6	VBBT: 50.0	Battery voltage: V
	I/O1-7	VBKY: 50.0	Voltage after key switch: V
	I/O1-8	VBP4: 50	Voltage at P4 terminal: V
	I/O1-9	VBMB(M): 50	Voltage after MB contactor (main input): V
	I/O1-10	VBMB(S): 50	Voltage after MB contactor (PS input): V
3. I/O MONITOR2 ·Traveling system ·Swing control	I/O2-1	POTA : 0.70 SWAC: 0	Accelerator potentiometer voltage: V Accelerator switch: 0 (OFF), 1 (ON)
	I/O2-2	DSF: 0 SDR: 0	Forward switch: 0 (OFF), 1 (ON) Reverse switch: 0 (OFF), 1 (ON)
	I/O2-3	LSB: 1 LSD: 0	Brake switch: 0 (OFF), 1 (ON) Deadman switch: 0 (OFF), 1 (ON)
	I/O2-4	SSD: 1→00 2→00	Drive motor rpm sensor 1: Number of pulses Drive motor rpm sensor 2: Number of pulses
	I/O2-5	SPD: M10.0 S10.5	Main traveling speed: km/h SKPS traveling speed: km/h
	I/O2-6	YAW: 2.50	Yaw rate sensor voltage: V
	I/O2-7	SWG: 0.0	Not used
4. I/O MONITOR3 ·Material handling system ·Mast control	I/O3-1	LSL : 1 SWTK: 0	Lift switch: 0 (OFF), 1 (ON) Tilt knob switch: 0 (OFF), 1 (ON)
	I/O3-2	LSTF: 1 LSTR: 0	Forward tilt switch: 0 (OFF), 1 (ON) Backward tilt switch: 0 (OFF), 1 (ON)
	I/O3-3	LSAT1: 0 LSAT2: 1	Attachment switch 1: 0 (OFF), 1 (ON) Attachment switch 2: 0 (OFF), 1 (ON)
	I/O3-4	SSP : 00	Lift rotary sensor: Number of pulses
	I/O3-5	MH : 001	Lifting height switch: 0 (OFF), 1 (ON)
	I/O3-6	POTT: 2.50	Tilt angle sensor voltage: V
	I/O3-7	SPL : 2.50	Lift sensor voltage: V
5. I/O MONITOR4 ·Knob position correction control ·Others	I/O4-1	STS: 001	Steering angle sensor: 0 (OFF), 1 (ON)
	I/O4-2	K-POS: 159 (150)	Steering angle knob position: Actual value (target value)
	I/O4-3	K-DIFF: 100 SOL: 0	Steering angle knob position deviation: Knob position correction solenoid: 0 (OFF), 1 (ON)
	I/O4-4	TIRE: 2.50	Tire angle sensor voltage: V
	I/O4-5	CSBATT: 2.50	Voltage from battery current sensor: V
	I/O4-6	AOPT: 0.00	Spare
	I/O4-7	SOPT: 1→0 2→0	Spare Spare
6. ACTIVE TEST ·Operation test	ACT-1	FAND: ON/OFF (0)	Drive fan
	ACT-2	FANP: ON/OFF (0)	Lift fan
	ACT-3	SSOL: ON/OFF (0)	Rear stabilizer swing control solenoid
	ACT-4	KSOL: ON/OFF (0)	Knob position correction solenoid
7. END	Return to Mask Menu by pressing switch ③.		

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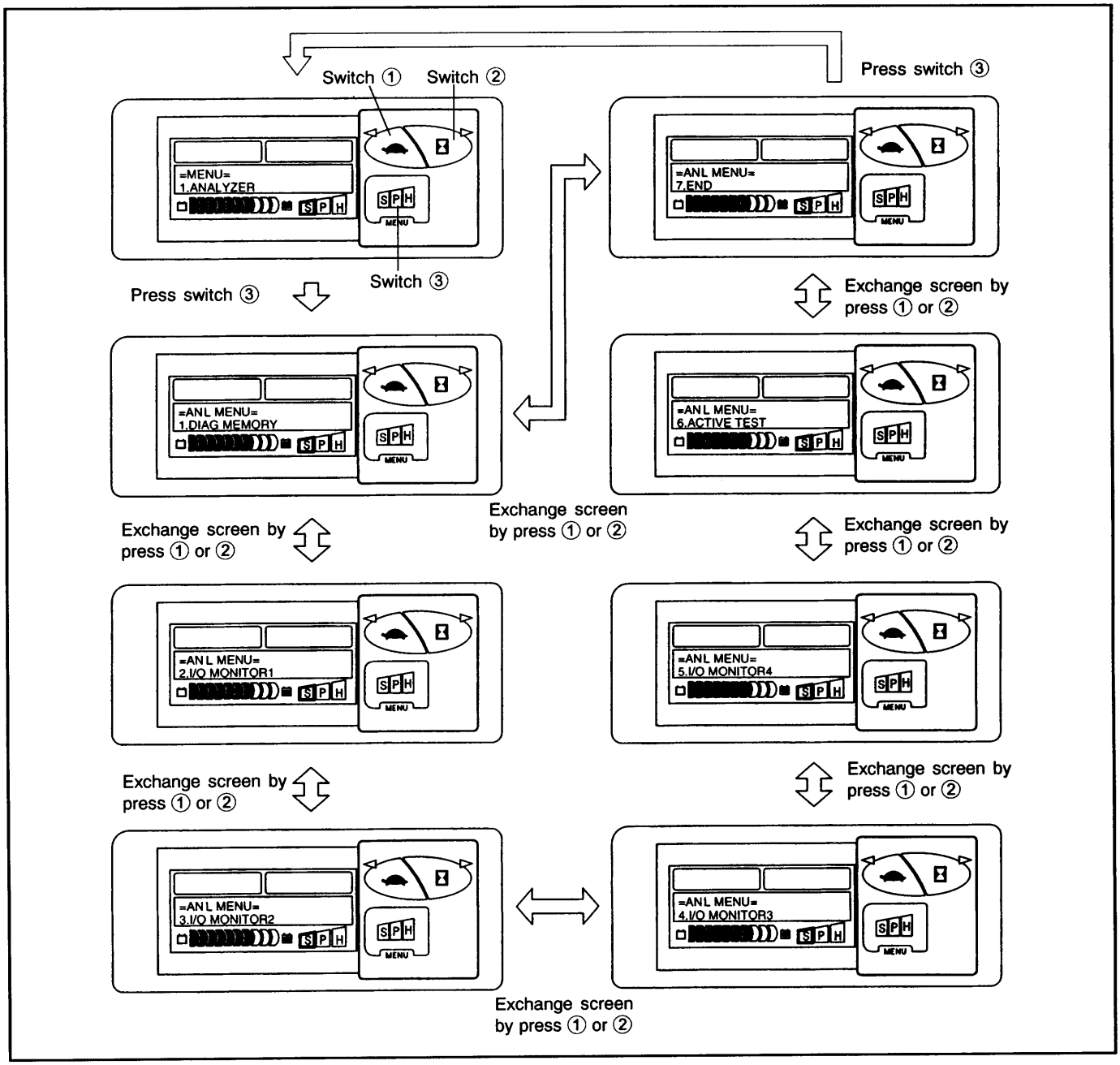
Operation Procedure

1. Input the password on the normal function menu (as instructed before) to display the MASK MENU screen.

2. Check that 1. ANALYZER is selected (highlighted) on the screen and press switch ③ (enter) to call the ANALYZER MENU screen.

3. Select the menu for the desired test using switches ① and ② and then press switch ③ (enter) to display the set screen.
   - Switch ①: The cursor moves to the preceding item.
   - Switch ②: The cursor moves to the next item.
   - Switch ③: Enters (Changes to the test screen for the selected item.)

   Note:
   If you select 7. END on the MASK MENU screen and press switch ③, the ANALYZER MENU screen appears again.



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DIAG MEMORY

The controller stores up to 10 most recent errors. The DIAG MEMORY screen displays these diagnosis codes together with their detection time information (in key ON hour meter reading).
The most recent diagnosis code is displayed as DIAG-1, followed by DIAG-2, DIAG-3 and so on to DIAG-10.

Operation Procedure

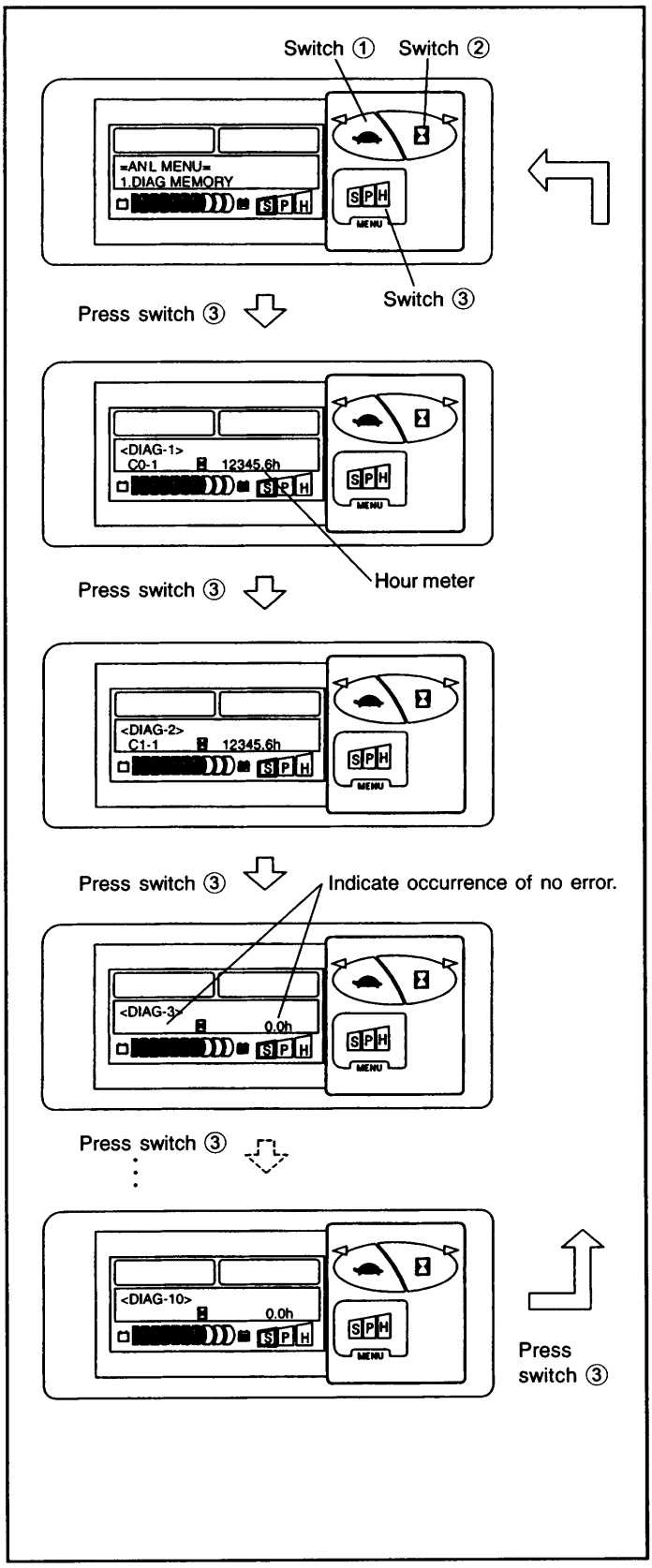
1. Call the ANALYZER MENU screen.

2. Check that 1. DIAG MEMORY is displayed and then press switch ③ (enter) to activate the diag memory function which displays diagnosis codes detected in the past sequentially starting from the most recent one.

3. Functions of switches on the 1. DIAG MEMORY screen are as follows:
   - Switch ①: Not used
   - Switch ②: Not used
   - Switch ③: Displays diagnosis code detected in the past.

Note:
Press switch ③ on the DIAG-10 screen to return to the ANALYZER MENU screen.
When no error codes are displayed on the screen and the hour-meter time is 0.0h, it indicates that no errors occurred in the past after that row.
It is impossible to directly jump from the DIAG MEMORY screen to other test screen. Return to the ANALYZER MENU screen once and then go to the desired test screen.

Note:
As for diagnosis codes, problem components, error modes and phenomena on the vehicle, see pages 4-43 through 4-46.



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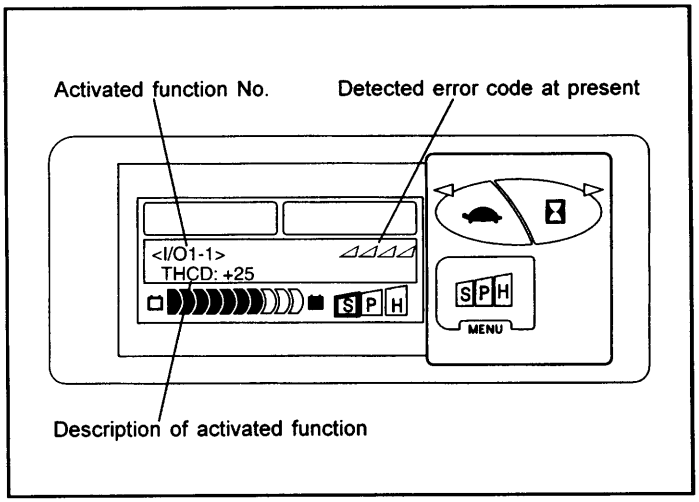
Vehicle Abnormalities Not Stored in Diag Memory

There are abnormalities that are not stored in the diagnosis memory even if the controller detects them.

Alarm item	Alarm content	Symbol displayed
1. Parking lever ON alarm Alarm occurs upon attempt at traveling with the direction switch at either forward or reverse position while the parking lever is kept applied.	• Alarm indication: Blinking parking brake indicator • Alarm sound (longer high-pitched electronic sound) A short high-pitched electronic sound	
2. Parking lever OFF alarm Alarm occurs when the operator leaves the operator's seat without applying the parking brake (also without turning the key switch to OFF). This alarm is provided on vehicles with the deadman switch (option).	• Alarm indication: Blinking parking brake indicator • Alarm sound (longer high-pitched electronic sound)	No display
3. Overdischarge alarm (lift interrupt) Overdischarged state of the battery is warned at the level set at the tuning (explained later) to prohibit simultaneous traveling and material handling.	• Alarm indication: Blinking battery charge indicator • Alarm sound (longer high-pitched electronic sound)	
4. Return to neutral alarm Alarm occurs when the key switch is turned to ON while the direction switch is set at the forward or reverse position.	• Alarm sound (longer high-pitched electronic sound)	No display
5. Mismatching alarm (1) Tilt angle sensor when the fork is horizontal (2) Tilt angle sensor at forward tilt limit angle (3) Pressure sensor in no-load state (4) Tire angle sensor in straight traveling (5) Swing angle sensor when the rear axle in horizontal state	• Alarm indication (spanner symbol)	

I/O MONITOR Function

This function displays the analog input voltage from each of traveling, material handling and SAS sensors. The circuit or sensor quality can be judged by monitoring the displayed value.
During activation of I/O MONITOR function
When any abnormality is detected, it is indicated as an error code on the display.



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I/O MONITOR1

This function displays the temperature of each electrical component and the voltage at the respective terminal.

Operation Procedure

1. Display the ANALYZER MENU screen.

2. Press switch ② once.

3. Check that the 2. I/O MONITOR1 is displayed and press switch ③ to activate the I/O MONITOR1 function. Press switch ③ each time to sequentially display I/O1-1 through I/O1-10.

4. Functions of switches on this screen are as follows:
   - Switch ①: Unused
   - Switch ②: Unused
   - Switch ③: Sequentially changes the screen from I/O1-1 to I/O1-10.

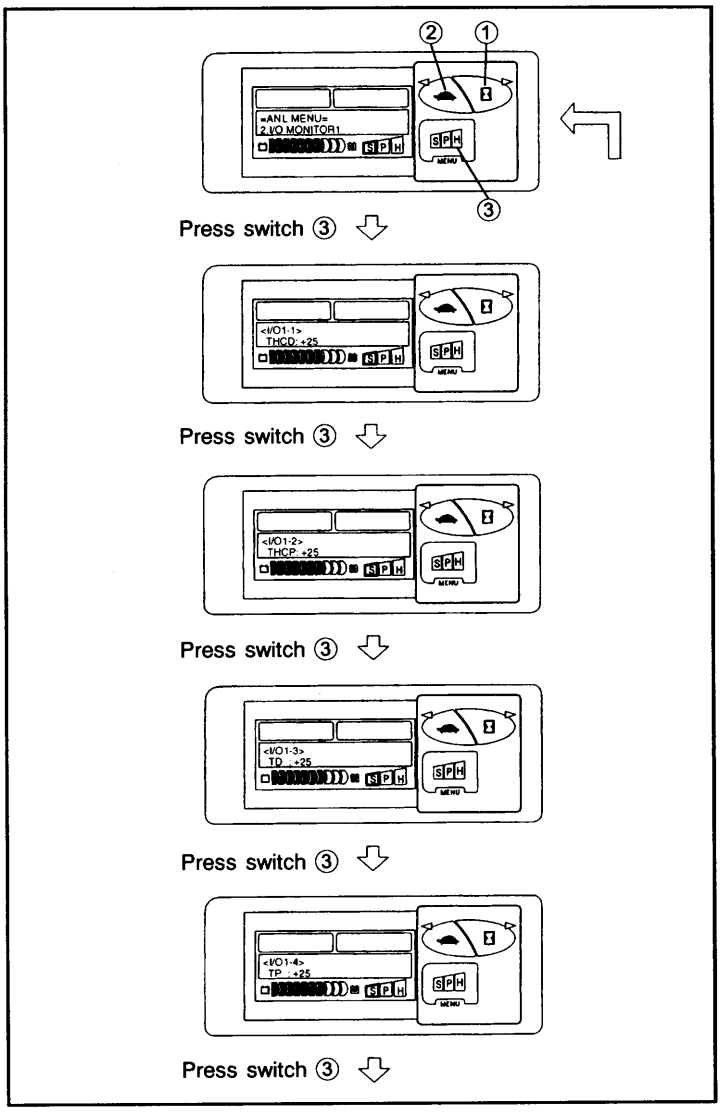
Note:
Press switch ③ on the I/O1-10 screen to return to the ANALYZER MENU screen.
It is impossible to directly jump from I/O MONITOR1 function screen to another test screen. Return to the ANALYZER MENU screen once and then go to the desired test menu.

① I/O1-1 screen
THCD: Main drive circuit temperature (°C)
Temperature of the main traveling circuit

② I/O1-2 screen
THCP: Main material handling circuit temperature (°C)
Temperature of the main material handling circuit

③ I/O1-3 screen
TD: Drive motor temperature (°C)
Temperature at the drive motor.

④ I/O1-4 screen
TP: Pump motor temperature (°C)
Temperature at the pump motor.



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⑤ I/O1-5 screen
TEMP: Temperature on the CPU board (°C)
Temperature on the CPU board of the traveling/material handling controller

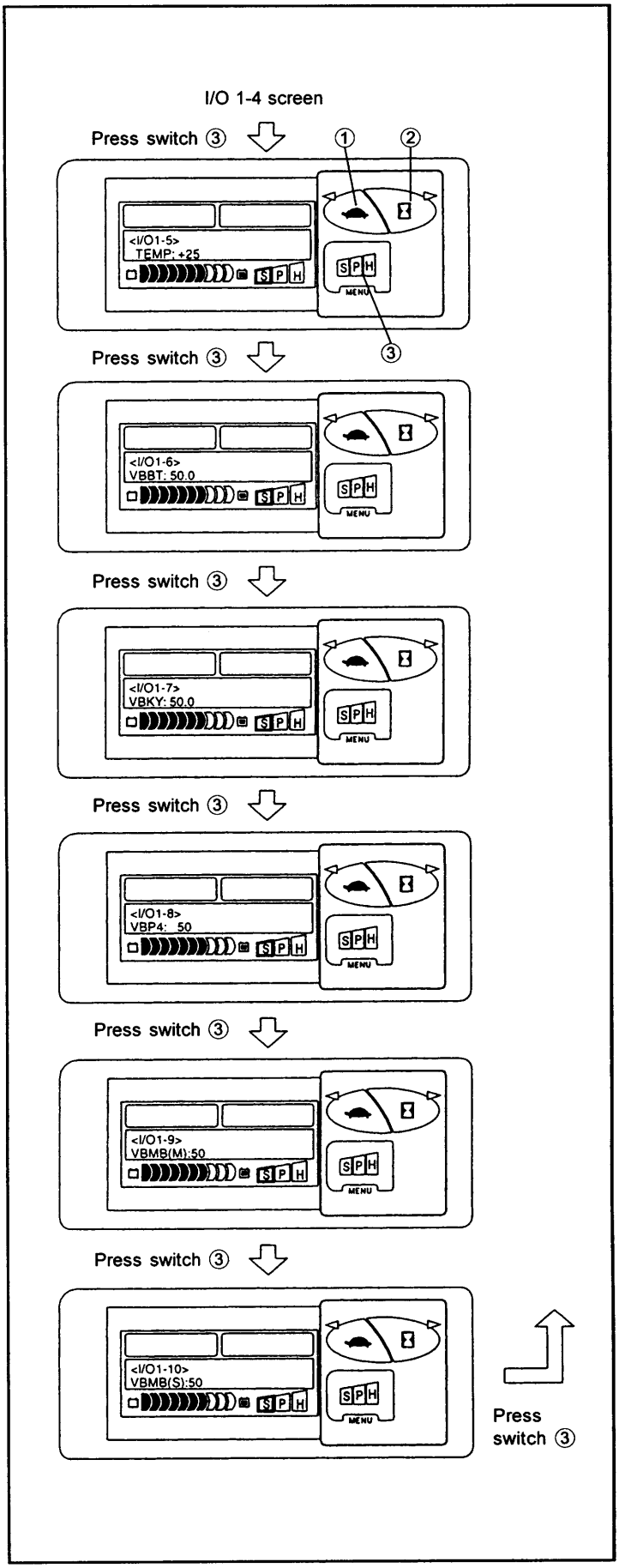
⑥ I/O1-6 screen
VBBT: Battery voltage (V)
Voltage before key switch

⑦ I/O1-7 screen
VBKY: Battery voltage (V)
Voltage after key switch

⑧ I/O1-8 screen
VBP4: Voltage at P4 terminal (V)
Voltage measured at terminal P4

⑨ I/O1-9 screen
VBMB(M): Voltage (V) after (main input) MB contactor
Input voltage to the main controller after the MB contactor

⑩ I/O1-10 screen
VBMB(S): Voltage (V) (PS input) after MB contactor
Input voltage to the PS controller after the MB contactor



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I/O MONITOR2

This function displays the ON/OFF status of traveling and swing switches and analog input voltages of sensors.

Operation Procedure

1. Display the ANALYZER MENU screen.
2. Press switch ② twice.
3. Check that the 3. I/O MONITOR2 is displayed and press switch ③ to enter the I/O MONITOR2 function and to sequentially display I/O2-1 to I/O2-7 menus.
4. Functions of switches on this screen are as follows:
   - Switch ①: Unused
   - Switch ②: Unused
   - Switch ③: Press switch ③ each time to sequentially change the screen from I/O2-1 to I/O2-7.

Note:
Press switch ③ on the I/O2-7 menu to return to the ANALYZER MENU screen.
It is impossible to directly jump from I/O MONITOR2 function screen to another test menu. Return to the ANALYZER MENU screen once and then go to the desired test screen.

① I/O2-1 menu
- POTA: Accelerator potentiometer voltage (V)

a Standard voltage when the accelerator pedal is not depressed (SWAC at OFF): 0.3 to 2.4 V

b Standard voltage when the accelerator pedal is depressed to its stroke end: 1.7 to 4.7 V

c Normal if b - a = 1.4 V or more

- SWAC: Accelerator switch check
  When accelerator pedal is not operated: 0→OFF
  When accelerator pedal is depressed: 1→ON

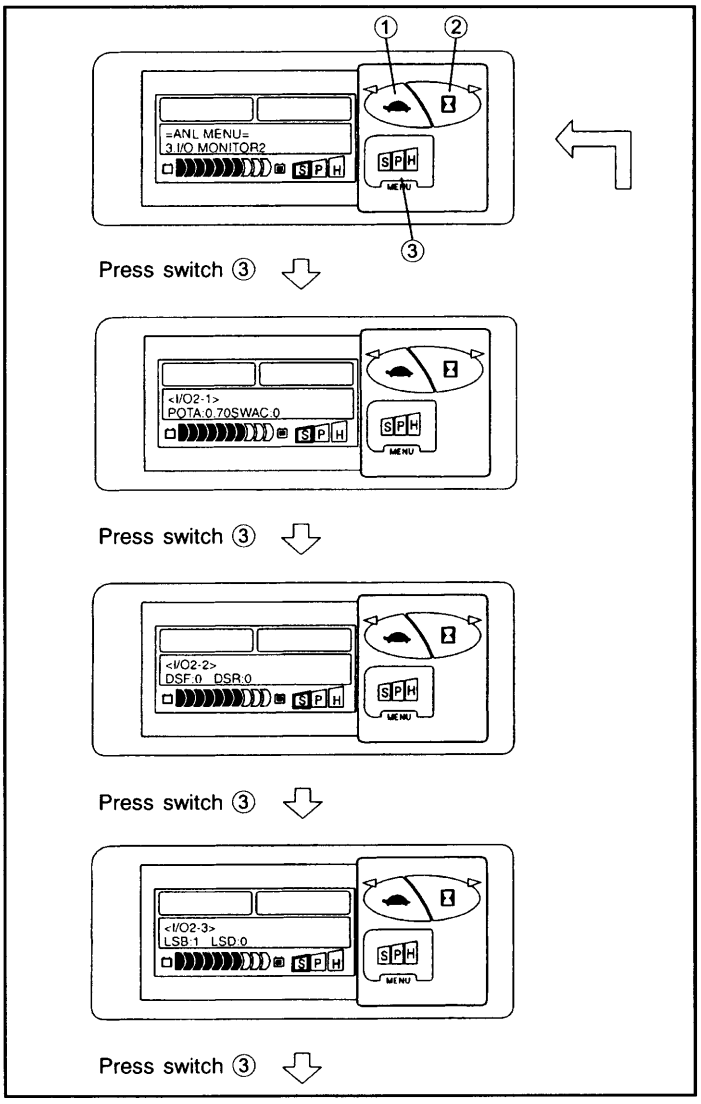
Switch ON/OFF quality judgment by operating the accelerator pedal

② I/O2-2 menu
- Direction switch check
  DSF: Forward switch, DSR: reverse switch

Operation \ Indication	DSF	DSR
Forward traveling	1	0
Neutral	0	0
Reverse traveling	0	1

1 → ON 0 → OFF

Switch ON/OFF quality judgment by operating the direction lever



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③ I/O2-3 screen
- LSB: Brake switch check
  When brake pedal is not operated: 1→ON
  When brake pedal is depressed: 0→OFF
  Switch ON/OFF quality judgment by operating the brake pedal
- LSD: Deadman switch check
  When the operator is on the seat: 1→ON
  When the operator leaves the seat: 0→OFF
  Switch ON/OFF quality judgment by sitting on and leaving the operator's seat

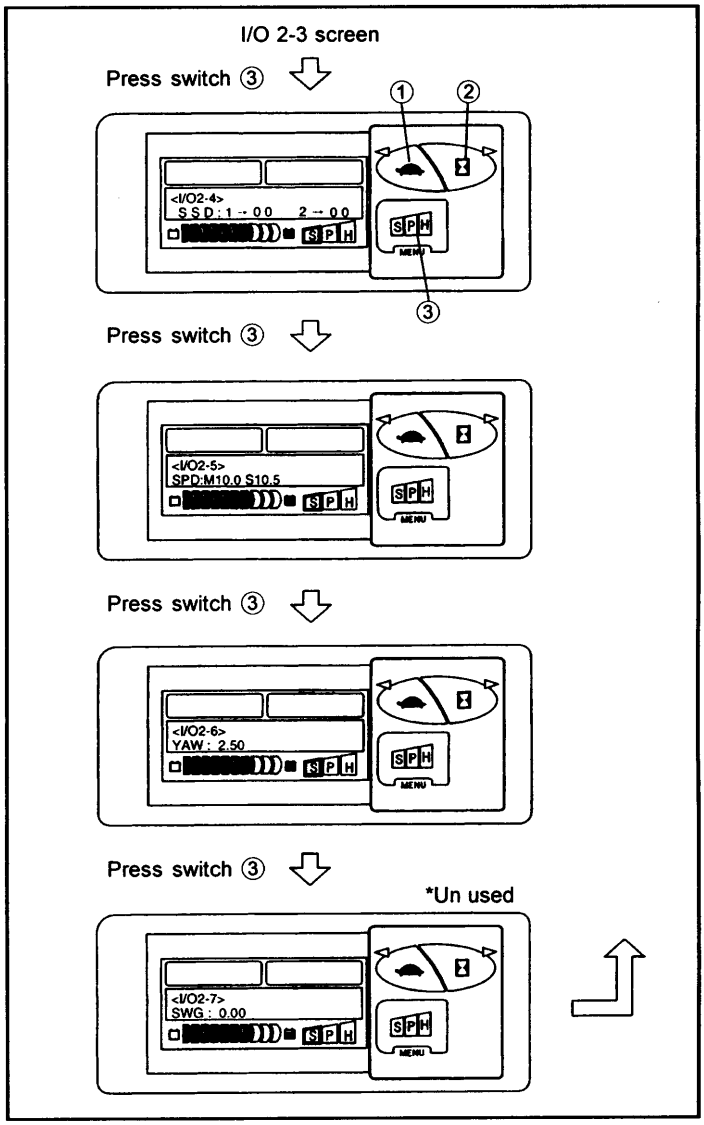
④ I/O2-4 screen
SSD1: Drive motor rpm sensor 1 (number of pulses)
SSD2: Drive motor rpm sensor 2 (number of pulses)
Check the rpm sensors while actually traveling the vehicle. The number of pulse increases with the traveling speed.

⑤ I/O2-5 screen
SPDM: Main traveling speed (km/h)
SPDS: PS traveling speed (km/h)
Check the vehicle speed by actually depressing the accelerator pedal to increase the speed. Check that the measured value changes in proportion to the traveling speed. Also, check that the value detected by the main controller equals the input value to the PS controller.

⑥ I/O2-6 screen
YAW: Yaw rate sensor voltage (V)
Check the input voltage to the yaw rate sensor controller.

Standard when the vehicle is stopping: 2.50 V

⑦ I/O2-7
SWG: Unused



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I/O MONITOR3

This function displays the ON/OFF status of material handling and mast control switches and analog input voltages from sensors.

Operation Procedure

1. Display the ANALYZER MENU screen.

2. Press switch ② three times.

3. Check that the 4. I/O MONITOR3 is displayed and press switch ③ to activate the Input/Output MONITOR3 function and to display I/O3-1 to I/O3-7 on the display.

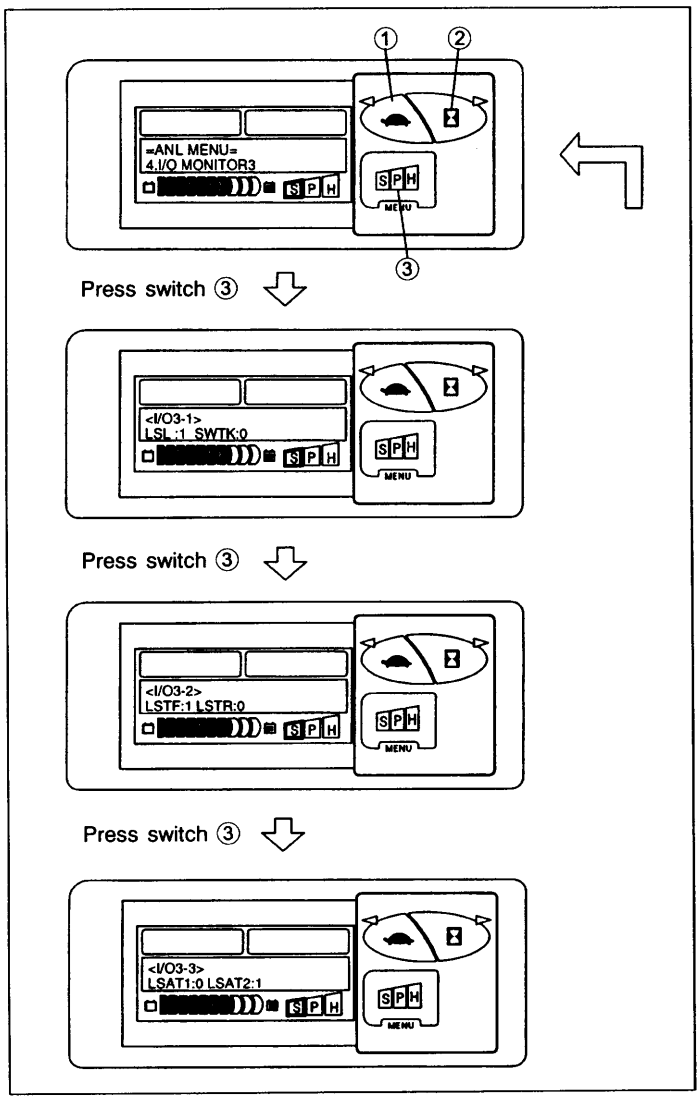
4. Functions of switches on this screen are as follows:
   - Switch ① : Unused
   - Switch ② : Unused
   - Switch ③ : Sequentially changes the screen from I/O3-1 to I/O3-7.

   Note:
   Press switch ③ on the I/O3-7 screen to return to the ANALYZER MENU screen. It is impossible to directly jump from I/O MONITOR3 function screen to another test screen. Return to the ANALYZER MENU screen once and then go to the desired test screen.

① I/O3-1 screen
LSL: Lift switch: 0→OFF
1→ON
SWTK: Tilt knob switch: 0→OFF
1→ON
Switch ON/OFF quality judgment by operating the lift lever or tilt knob

② I/O3-2 screen
LSTF: Forward tilt switch: 0→OFF
1→ON
LSTR: Backward tilt switch: 0→OFF
1→ON
Switch ON/OFF quality judgment by operating the tilt lever to forward or backward

③ I/O3-3 screen
LSAT1: Attachment switch No. 1:
0→OFF
1→ON
LSAT2: Attachment switch No. 2:
0→OFF
1→ON
Switch ON/OFF quality judgment by operating the attachment lever No. 1 or No. 2
For a vehicle without attachment, the input value (ON/OFF) is not displayed.



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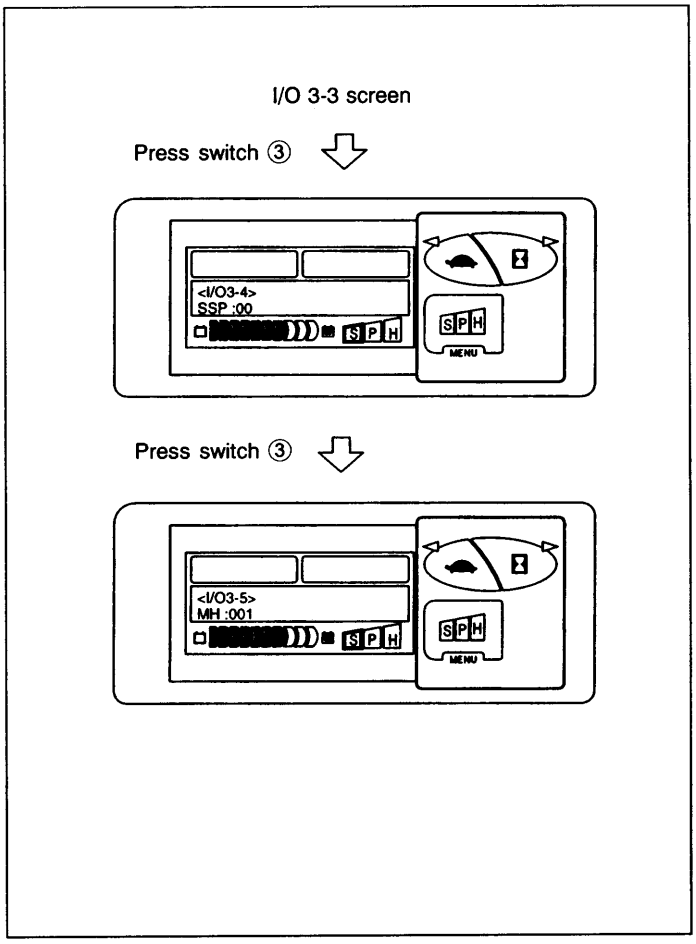
④ I/O3-4 screen
SSP: Pump rpm sensor (number of pulses)
Check that the number of pulses is detected by material handling operation.

⑤ I/O3-5 screen
MH: Lifting height: 1→ON
0→OFF

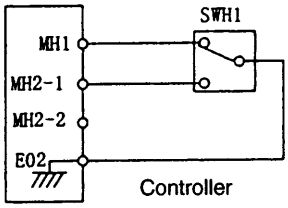
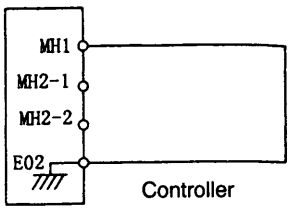
Note:
Example indication
(When the number of lifting height switch is 1 and the lifting height is low)

1 0 0
- MH2-2
- MH2-1
- MH1

Standard: See the table below.



Lifting Height Switch (MH) ON/OFF Combination Table

	When number of lifting height switch is 1		When there is no lifting height switch		Reference lifting height
					
Low lifting height	MH 1	ON	MH 1	ON	2,000 mm or less
	MH 2-1	OFF	MH 2-1	OFF	
	MH 2-2	OFF	MH 2-2	OFF	
Medium lifting height	MH 1	OFF			Over 2,000 and below 4,000 mm
	MH 2-1	ON			
	MH 2-2	OFF			

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⑥ I/O3-6 screen
POTT: Tilt angle sensor voltage (V)
Check the input voltage to the tilt angle sensor controller.

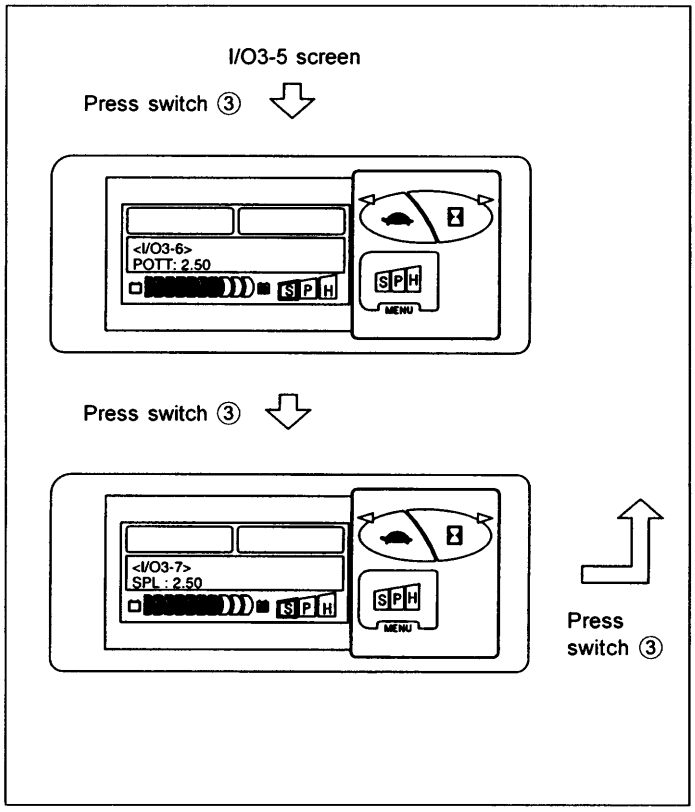
Standard with mast set to vertical position: 2.5 V

Note:
Neutral to forward tilt: Input voltage decreases.
Neutral to backward tilt: Input voltage increases.

⑦ I/O3-7 screen
SPL: Lift sensor voltage (V)
Check the input voltage to the lift sensor controller.

Standard at no-load condition: 2.5 V

Note:
The input voltage increases as the load increases.



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I/O MONITOR4

This function displays ON/OFF status of the knob position correction and other switches and analog input voltages from sensors.

Operation Procedure

1. Display the Analyzer Menu screen.

2. Press switch ② four times.

3. Check that the 4. I/O MONITOR4 is displayed and press switch ③ to activate the I/O MONITOR4 function and to display I/O4-1 to I/O4-7 sequentially.

4. Functions of switches on this screen are as follows:
   - Switch ① : Unused
   - Switch ② : Unused
   - Switch ③ : Press switch ③ to change the screen sequentially from I/O4-1 to I/O4-7.

   Note:
   Press switch ③ on the I/O4-7 screen to return to the ANALYZER MENU screen. It is impossible to directly jump from I/O MONITOR4 function screen to another test screen. Return to the ANALYZER MENU screen once and then go to the desired test screen.

① I/O4-1 screen
STS: Steering angle sensor: 1→ON
0→OFF

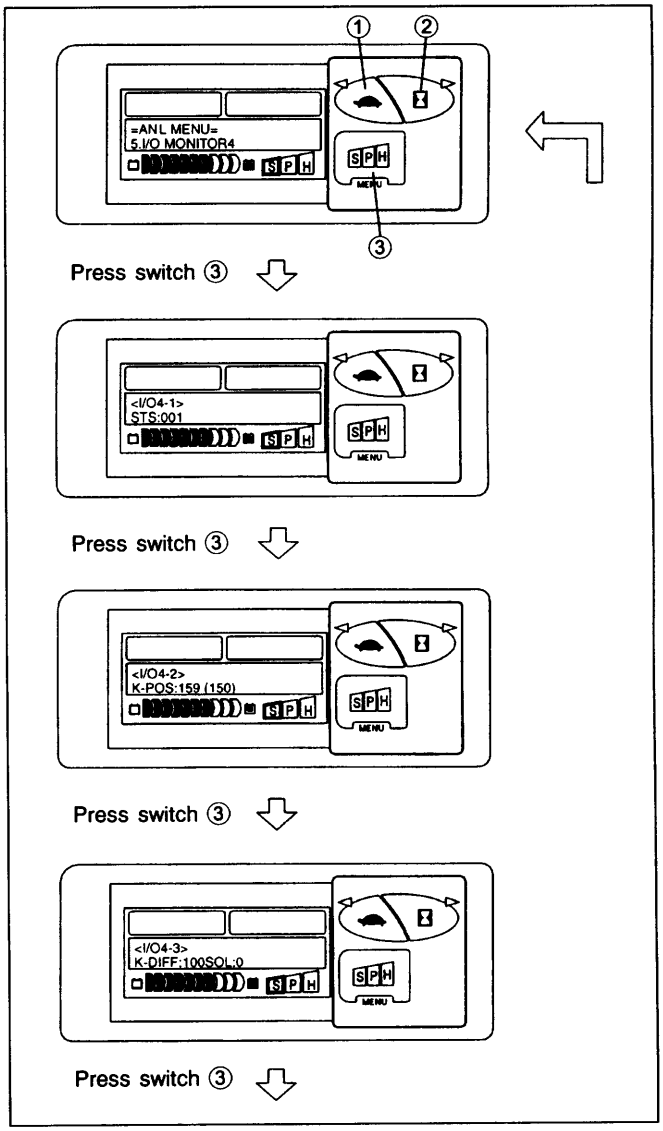
0 0 1
- STSC
- STS2
- STS1

When the steering wheel is rotated to the right or left, STS1 and STS2 repeat ON and OFF. The STS is set to upon one wheel rotation from the straight traveling position as the reference.

② I/O4-2 screen
K-POS: Steering angle knob position: Actual value (target)
Operate the steering wheel and check variation of the value.
Standard: 80 when the steering wheel is at the neutral position

Left←Neutral→Right
0 ← 80 → 160

③ I/O4-3 screen
K-DIFF: Steering angle knob position deviation
Actual value (target)
SOL: Knob position correcting solenoid:
0→OFF
1→ON
Operate the steering wheel and check that the knob position correcting solenoid turns ON when the steering angle knob position is deviated.
Caution:
The knob position is mainly corrected when returning the steering wheel to the neutral (straight traveling) position.



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④ I/O4-4 screen
TIRE: Tire angle sensor voltage (V)
Operate the steering wheel and check the voltage changes.

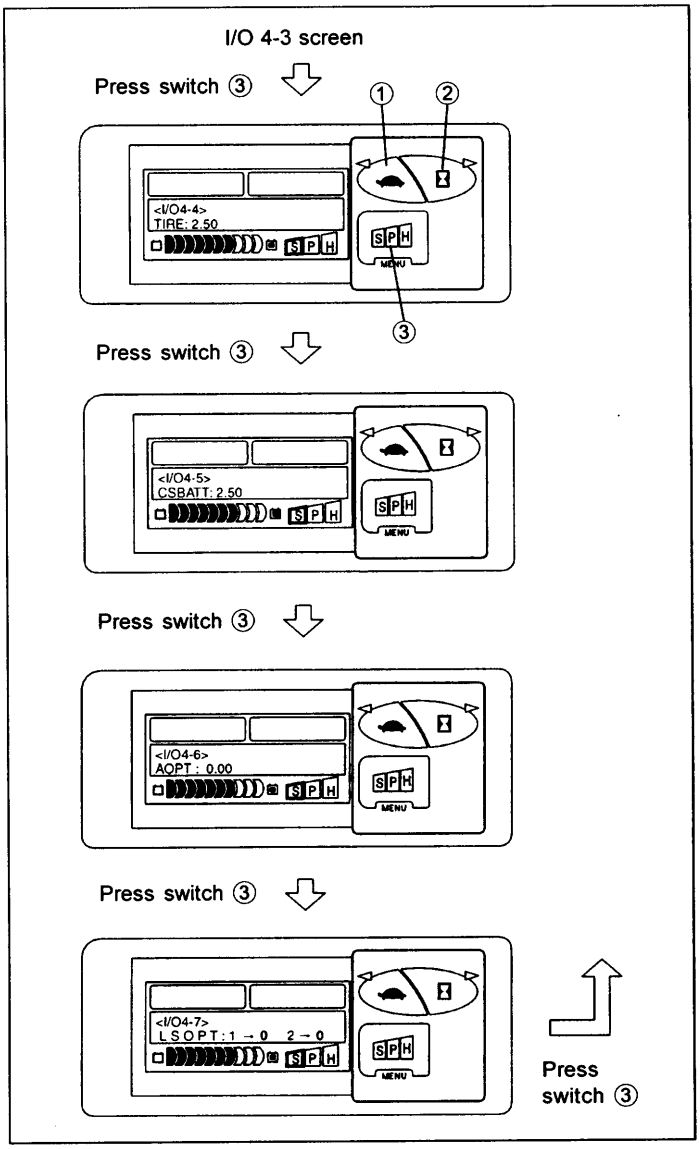
Standard when tire is traveling straight: 2.50 V

Turn to the left↔Straight traveling↔Turn to the right
Voltage decreases←Standard→Voltage increases

⑤ I/O4-5 screen
CSBATT: Battery current sensor voltage (V)
Indicates the voltage of an input from current sensor to the main controller.

⑥ I/O4-6 screen
AOPT: Spare

⑦ I/O4-7 screen
LSOPT1: Spare
LSOPT2: Spare



ACTIVE TEST

This function outputs ON/OFF signals to switches in the electrical system and compare controller input signals with those signals.

Operation Procedure

1. Display the ANALYZER MENU screen.
2. Press switch ② four times.
3. Check that the 5. ACTIVE TEST is displayed and press switch ③ to activate the ACTIVE TEST function to display ACT-1 to ACT-4 screens sequentially.
4. Functions of switches on this screen are as follows:
   - Switch ① : Forced ON
   - Switch ② : Forced OFF
   - Switch ③ : Sequentially changes the screen from ACT-1 to ACT-4.

Note:
Press switch ③ on the ACT-4 screen to return to the ANALYZER MENU screen.
It is impossible to directly jump from the ACTIVE TEST FUNCTION screen to another test screen. Return to the ANALYZER MENU screen once and then go to the desired test screen.

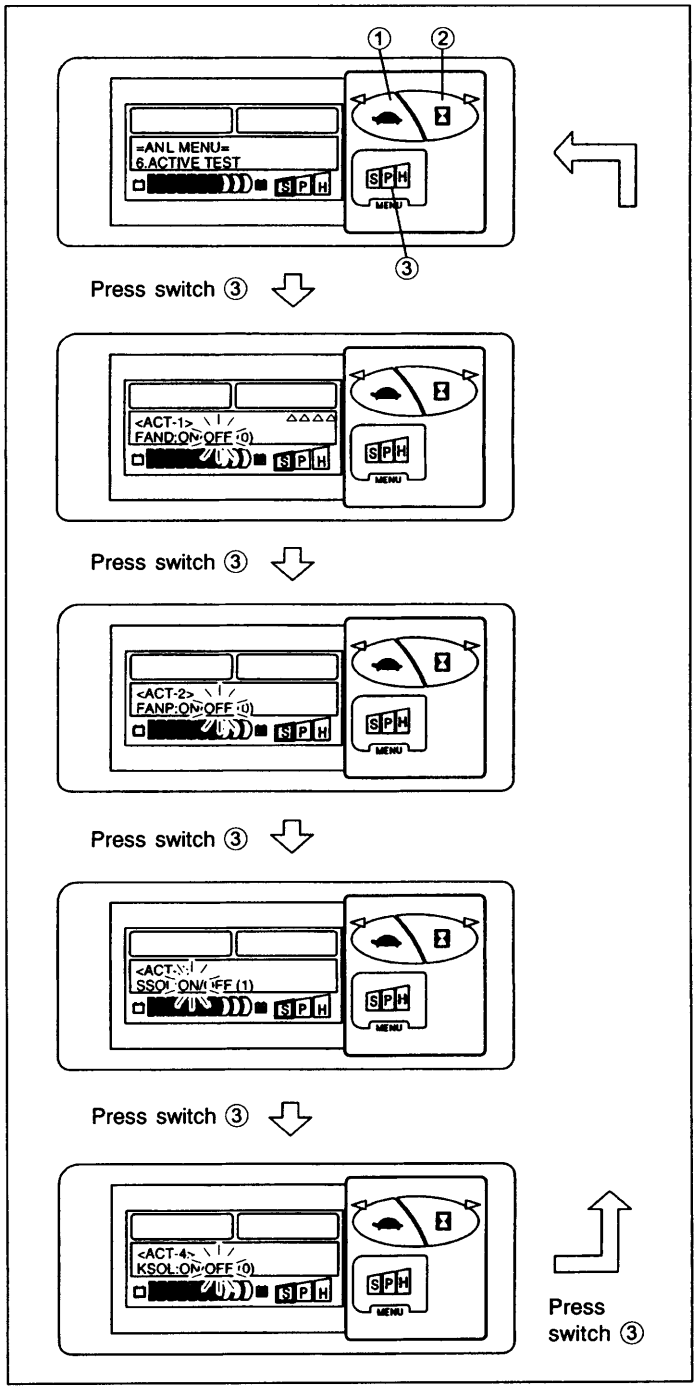
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① ACT-1 screen
FAND: Drive circuit fan
(1): Drive circuit fan ON
(0): Drive circuit fan OFF
The traveling system fan operation is checked visually and observing the display while forcibly outputting the ON/OFF signal.
Press switch ① and select ON: Fan rotates and the signal is set to (1).
Press switch ② and select OFF: Rotation stops and the signal is set to (0).

② ACT-2 screen
FANP: Material handling circuit fan
(1): Material handling circuit fan ON
(0): Material handling circuit fan OFF
The material handling system fan operation is checked visually and observing the display while forcibly outputting the ON/OFF signal.

③ ACT-3 screen
SSOL: Rear stabilizer swing control solenoid.
(1): Signal check line ON (error occurrence)
(0): Signal check line OFF (normal)
You can send signals to forcibly turn the rear stabilizer's swing control solenoid ON and OFF. Check the signal check line by watching indications on the display.

④ ACT-4 screen
KSOL: Knob position correcting solenoid
(1): Signal check line ON (error occurrence)
(0): Signal check line OFF (normal)
You can send signals to forcibly turn the active steering synchronizer solenoid ON and OFF. Check the signal check line by watching indications on the display.



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TUNING

GENERAL

When the user requests to limit the maximum speed or weaken the regenerative braking force, use the Tuning Menu to indicate the set levels and adjust them in the same manner as those for Power Control Level setting. Twelve tuning items are prepared including spares.

Tuning Item List

Tuning No.	Item	Level (●: Default setting position) 1	2	3	4	5	6	7	8
1	Setting regenerative braking torque (switch back) Adjustment of regenerative braking torque at switch back	Weak				●			Strong
2	Setting regenerative braking torque (accelerator off) Changing the regenerative braking torque when acceleration is OFF	None	Weak			●			Strong
3	Lift interrupt level setting Adjustment of activation timings for remaining battery charge alarm and overdischarge alarm function (See page 4-67.)	Small						●	Large Invalid
4	Battery charge indicator correction Correction of decrease in battery charge indication	Slow decrease					●		Quick decrease
5	Vehicle speed limiter Adjustment of maximum vehicle speed	Low speed					High speed		None ●
6	Attachment power control No.1 Adjustment of pump motor revolution at attachment switch No.1 ON	Low speed						●	High speed
7	Tilt power control Adjustment of pump motor rpm upon tilt switch ON (The mast control speed of SAS function cannot be adjusted.)	Low speed					●		High speed
8	Spare								
9	Spare								
10	Spare								
11	Spare								
12	Spare								

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TUNING Screen Operation Procedure

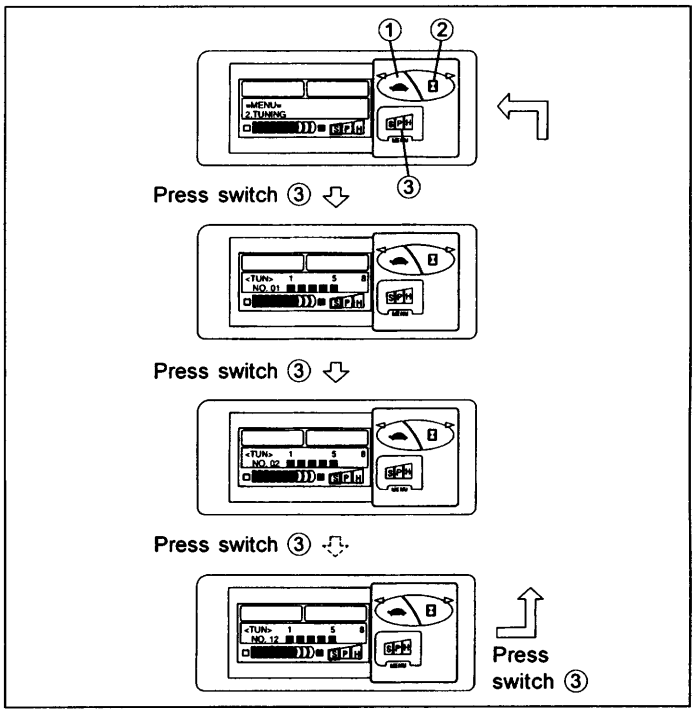
1. Input the password on the normal function screen (see page 4-48) to display the MASK MENU screen.

2. Press switch ② to display 2. TUNING. Press switch ③ (enter) to display the TUNING screen.

3. Select the desired tuning item using switches ③ and ②.

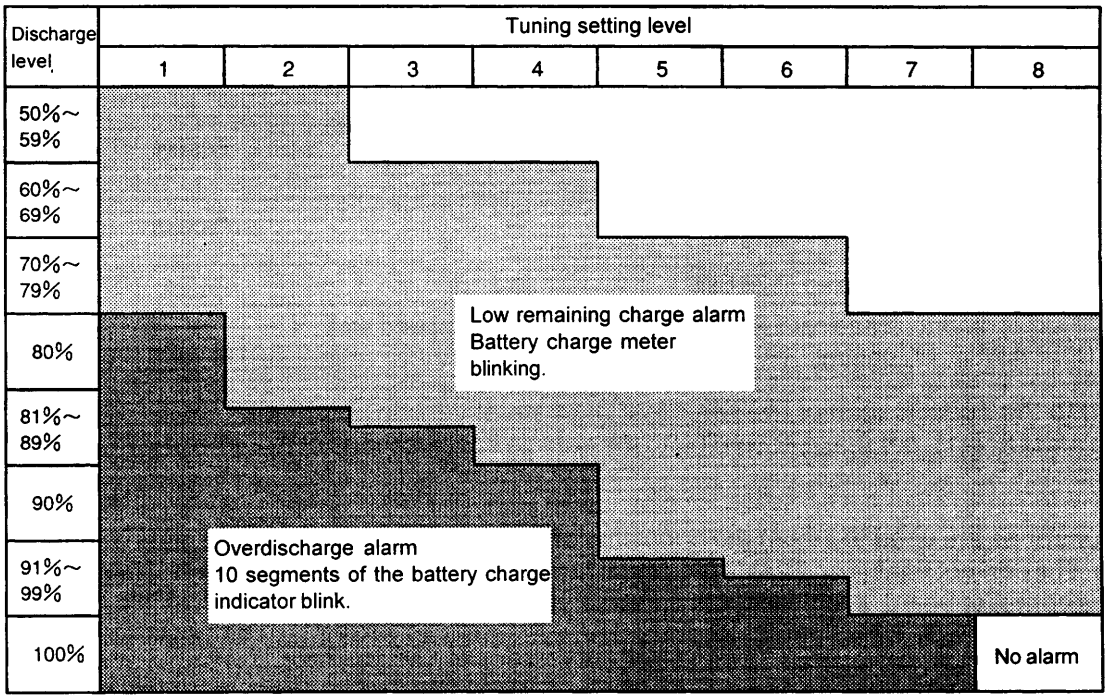
4. Functions of switches on the TUNING screen are as follows:
   - Switch ① : Decreases the tuning level.
   - Switch ② : Increases the tuning level.
   - Switch ③ : Enters (and switches to the next screen)

Note:
Press switch ③ on the Tuning No.12 (spare) screen to return to the ANALYZER MENU screen.



Low Remaining Battery Charge Alarm and Overdischarge Alarm Setting Levels (Tuning No. 3)

Level 7 is the initial setting.



How to read the figure:
Example: When set to level 5
The battery charge indicator (10 segments) on the normal function screen is activated when the battery discharge is up to 69%. The low remaining battery charge alarm is activated when the battery discharge level is between 70% and 90% to blink the battery charge indicator. All 10 segments blink in case of overdischarge alarm, which is activated when the degree of battery discharge exceeds 90%.

Caution:
When level 8 is set, the overdischarge alarm (including lift interrupt) does not function. Carefully avoid overdischarge of battery also in view of the battery life.

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OPTION SET

Option Set Menu List

No.	Indication	Description	Selection	
			Y	N
OPT-1	DEMO MODE	Enables simultaneous traveling and material handling before starting the hour meter.	Enable	Disable
OPT-2	H/M START	Start counting by hour meter.	Counting	No counting
OPT-3	P/C LOCK	Disables setting of levels for traveling/load handling power control, 2-speed travel speed control and overspeed alarm (option).	Enable	Disable
OPT-4	DESTI *	Sets the data according to the destination. Changes the display indication.	Domestic (J)	Overseas (I)
OPT-5	B LEVEL	Enables/disables the battery electrolyte level alarm function.	Enable	Disable
OPT-6	MPH *	Displays the vehicle speed in mph.	Setting to mph	Setting to km/h
OPT-7	C/CNT RES	Resets the charge counter to 0. (Normal charge count)	Reset	Not reset
OPT-8	BATTERY	Adjusts the charge indicator calculation constant.	Battery-less vehicle (L) **(STD)**	Vehicle mounted with battery (W)
OPT-9	SHOU-TOKU *	Limit the vehicle speed for small special vehicle to 15 km/h.	Limited (Y)	**(STD)** Unlimited (N)
OPT-10	AUTO P-OFF	Enables/disables the auto power off function. **(15 min)**	Enable (Y)	Disable (N)
OPT-11	PARKING ERR	Enables/disables the parking brake and deadman switch (option) operation indicator.	Enable	Disable
OPT-12	TILT CONT	Enables/disables the mast forward tilt automatic stopping function	Enable **(STD)**	Disable
OPT-13	SWG W-LOCK*	Unused (Set to N.)	Enable **(STD)**	Disable
OPT-14	TILT F-LIM	Enables/disables the mast forward tilt speed limit control.	Enable **(STD)**	Disable

*: Matched to the specification of the vehicle at the time of vehicle shipment.
For OPT-5 and OPT-11, set again according to the vehicle specifications at the time of CPU board replacment.

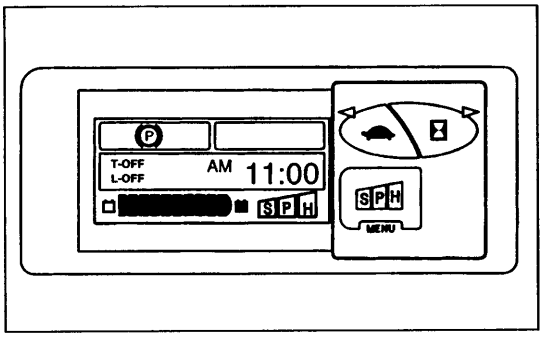
Notes:

- **These functions are used to adjust the controller and display setup to the availability of optional or control features. They do not enable or disable the actual functioning of the optional or control features.**
- **When the contoller board is replaced, it is necessaly to set again according to the vehicle apecification.**

Caution:

- **The Option Set function is used to adjust the controller with the display control according to the options equipped on the vehicle and does not enable or disable the function itself.**
- **When the TILT CONT•SWG W-LOCK is disabled by option setting, the disabled status is displayed for 5 seconds upon key switch ON.**

Indication contents:
T-OFF: TILT CONT (mast forward tilt speed control is disabled)
L-OFF: SWG W-LOCK (material handling swing lock is disabled)



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Operation Procedure Screen

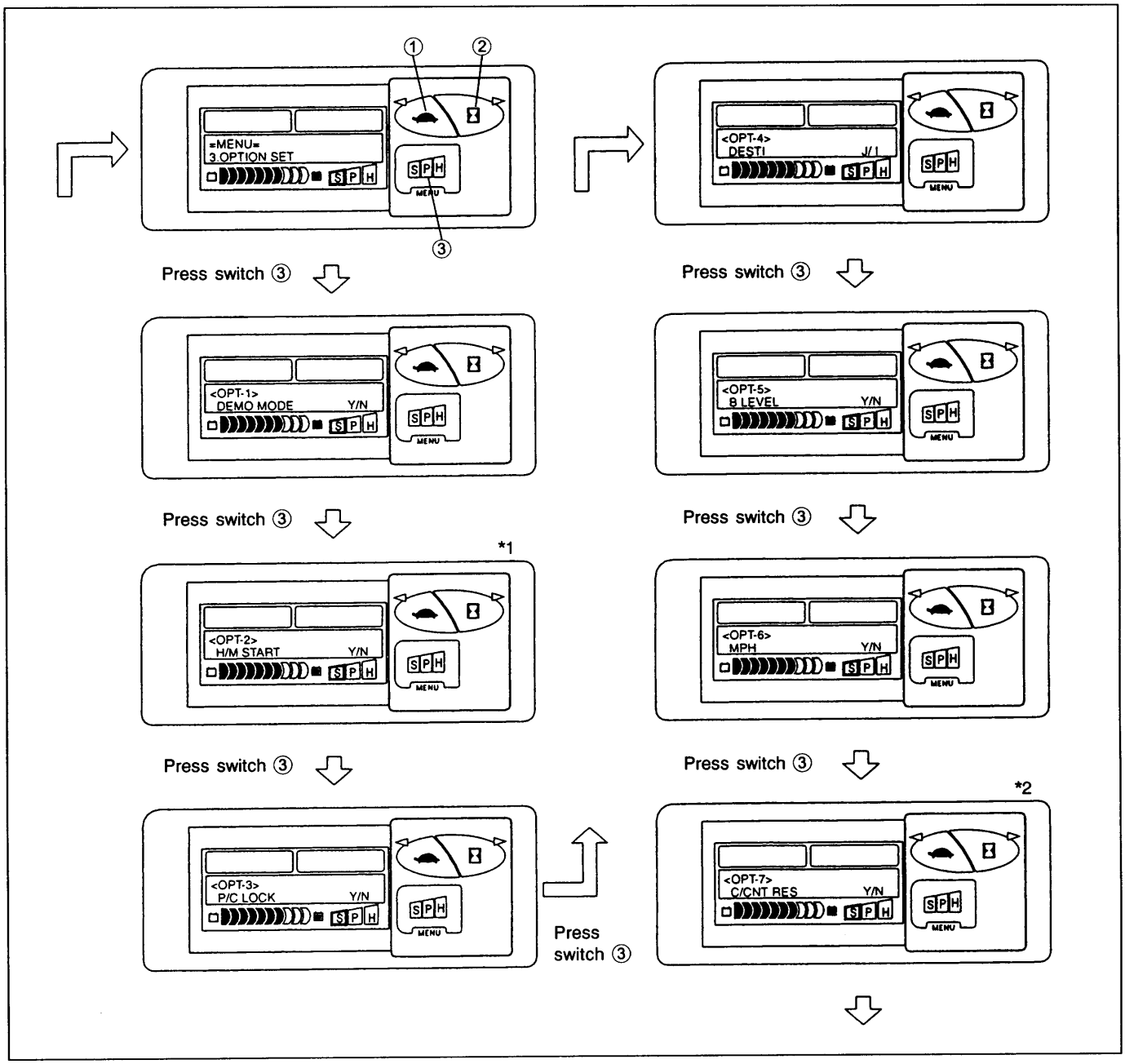
1. Input the password on the normal function screen (see page 4-48) to display the MASK MENU screen.

2. Press switch ② twice to display 3. OPTION SET. Press switch ③ (enter) to display the OPTION SET MENU screen.

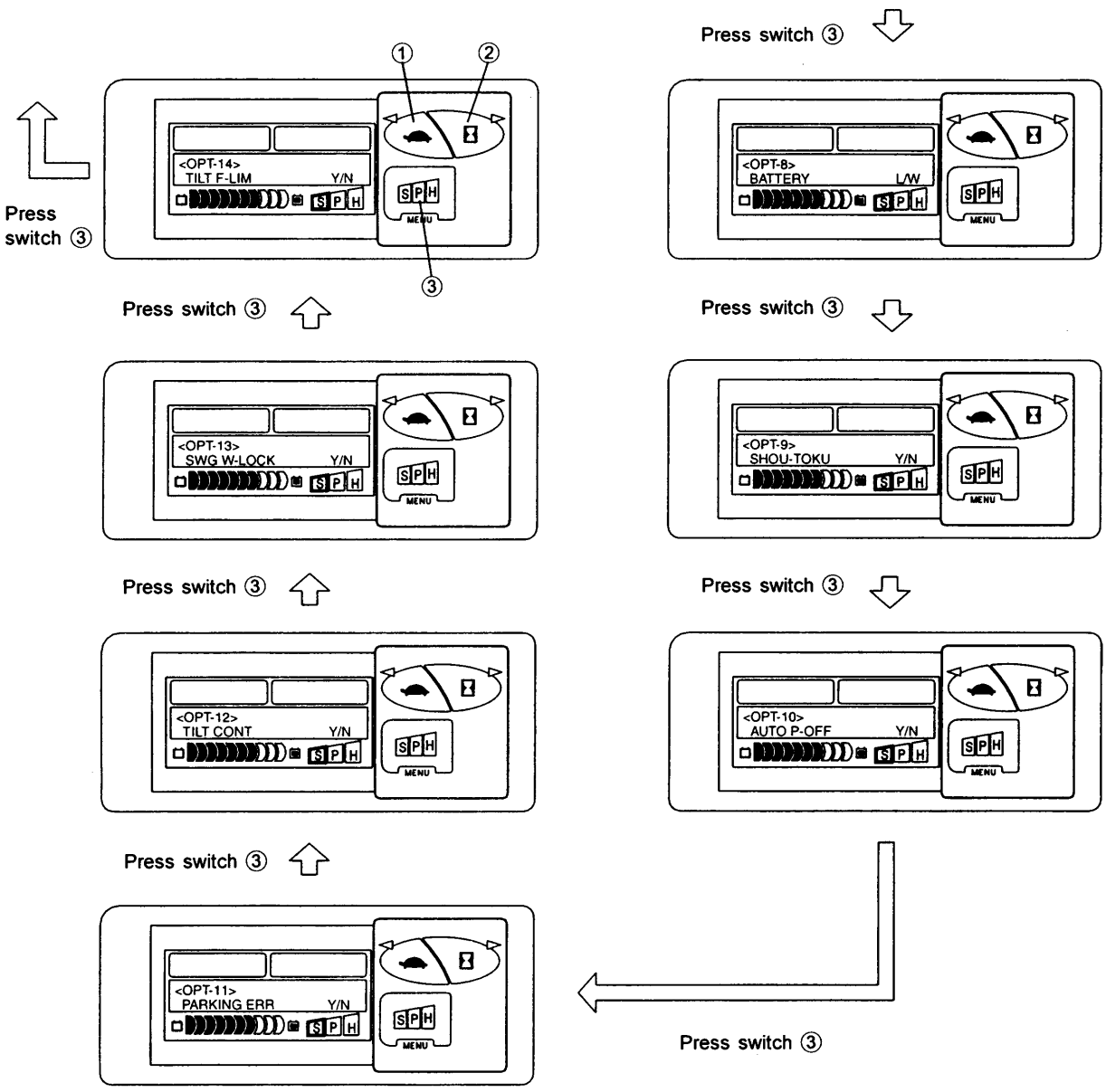
3. Select a desired option menu item using switches ① and ②.

4. Functions of switches on the OPTION SET MENU screens are as follows:
   - Switch ① : Changes the setting from N to Y.
   - Switch ② : Changes the setting from Y to N.
   - Switch ③ : Enters (changes to the next item setting screen)

   Note:
   Press switch ③ on the OPT-14 OPTION SET MENU screen to return to the ANALYZER MENU screen.



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*1: Hour meter starting method
1. Press switch ① for 2 seconds or more.
2. Press switch ② while pressing switch ① (held in the state of 1 above).

*2: OPT-7 (C/CNT RES)
Charge counter resetting method
Press switch ① for 2 seconds or more.

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MATCHING

GENERAL

For the tilt angle, load, tire angle and swing angle sensors among sensors used for SAS functions, the signal voltage values under the mast vertical, no load, tire straight and rear axle horizontal conditions are stored, respectively, in the controller for the control based on these values. When servicing or replacing these sensors, matching (updating the sensor signal voltage to match the standard vehicle condition) is necessary. Also, matching is needed for the tilt angle sensor when the vehicle posture has changed excessively, and for the load sensor when the load under no load condition (no load on fork) is changed because of addition or removal of any attachment.

Matching Menu List

No.	Indication	Description	Necessary condition
1	TILTL	Stores the tilt angle sensor output value with fork in the horizontal position to the controller.	① · ③ · ④ · ⑧ ⑨ · ⑩ · ⑪
2	TILTF	Stores the tilt angle sensor output value at the mast vertical standard position to the controller.	① · ③ · ④ · ⑧ ⑨ · ⑩ · ⑪
3	LOAD	Stores the pressure sensor output value under no-load condition to the controller.	① · ② · ⑤ · ⑧ ⑨
4	TIRE	Stores the tire angle sensor output value while the vehicle is traveling straight to the controller.	② · ⑥

Contents of necessary conditions:

① Traveling and material handling controller replacement
② PS controller replacement
③ Tilt angle sensor replacement
④ Length change or replacement of tilt angle sensor rod
⑤ Load sensor replacement
⑥ Removal-reinstallation or replacement of tire angle sensor or sensor cover
⑦ Removal-reinstallation or replacement of swing angle sensor
⑧ Change of attachment
⑨ Mast replacement
⑩ Tilt cylinder replacement
⑪ Tilt angle sensor replacement

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Before Starting Matching

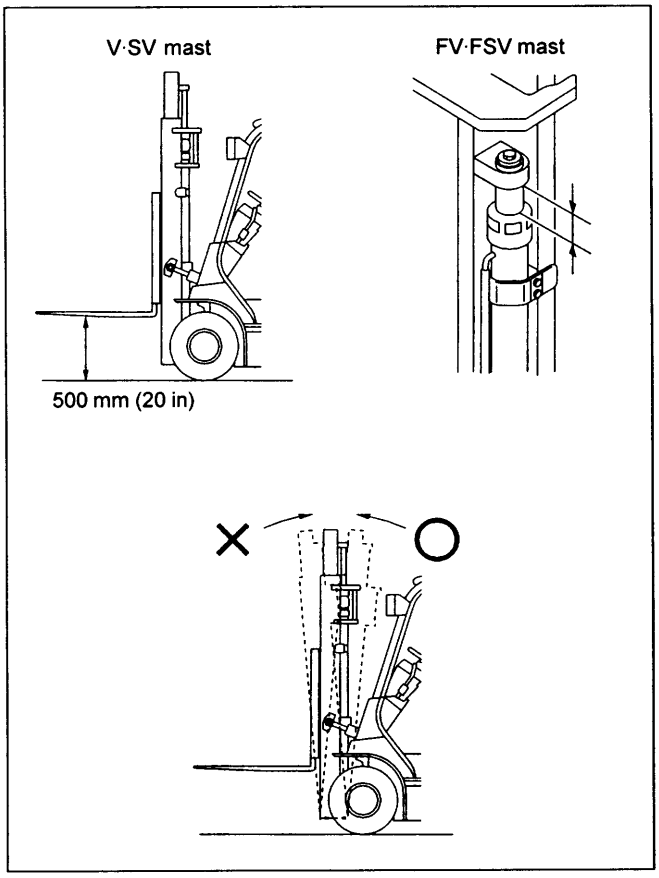
Set the vehicle to the standard vehicle condition before starting matching. The standard vehicle condition means when the vehicle satisfies the conditions described below.

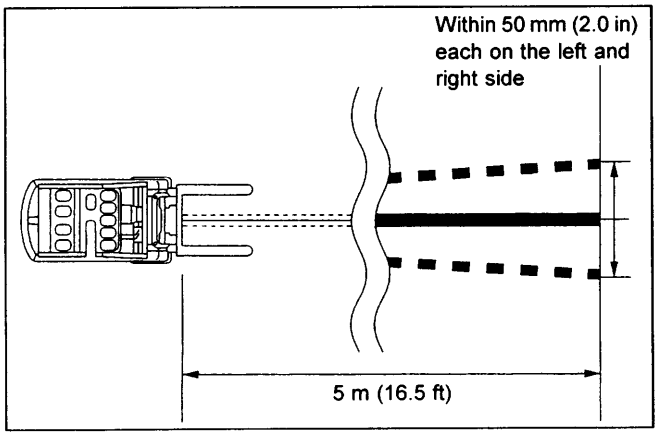
1. Tire inflating pressure check
   Adjust the tire inflating pressure to the specified level.
   If it is insufficient or if there is a difference between the front and rear wheels or between LH and RH wheels, Matching will become inaccurate.

2. Floor levelness check
   If matching is conducted on an inclined or rough floor surface, errors in matching will result. So, perform matching on a flat, horizontal floor (inclination: Within 0.5°).
   Generally the inclination of floors in ordinary plants, warehouses and buildings is within 0.5°, which does not influence matching adversely. Be careful since some parts of floors may be inclined over 0.5° for some reason or other.

3. No-load vertical condition check
   The voltage of the load sensor signal in no-load state is stored in the controller. Therefore, the following conditions must be satisfied:
   - For the V/SV mast, set the fork height to about 500 mm (20 in.) and use a goniometer to see that the mast is vertical.
   - For the FV/FSV mast, set the rear cylinder rod projection to about 100 mm (4 in.) and use a goniometer to see that the mast is vertical.
   - For the vehicle with an attachment, install the attachment.
   - Set the mast vertical by operating tilting it in the forward tilting direction from the backward tilted position.
   - On a vehicle with attachment (U61C671-1·2 or an attachment whose weight exceeds that shown in the table below), set the mast vertical with the attachment at a height of 500 mm (19.7 in) and perform relief at the topmost position. (See the table below showing the Allowable Weight for Installation on Mast.

4. Tire straight traveling condition check
   The signal voltage of tire angle sensor is stored in the controller when the tires are traveling straight. So, fix the steering wheel and see that the leftward or rightward deviation during traveling 5 meters (16.5 ft.) is within 50 mm (2.0 in.).





Allowable Weight for Installation on Mast (kg)

Mast lifting height	Vehicle model										
	7FB10	7FB14	7FB15	7FB18	40-7FB15	7FB20	7FB25	40-7FB20	40-7FB25	7FB30	7FBJ35
Up to 3000	500	650	650	650	600	950	950	950	950	1100	1350
Over 3000 up to 4000	350	550	550	550	450	800	800	750	750	950	1150
Over 4000 up to 5000	350	500	500	500	400	750	750	700	700	900	1100
Over 5000 up to 6000	300	450	450	450	350	700	700	700	700	850	1050

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Operation Procedure

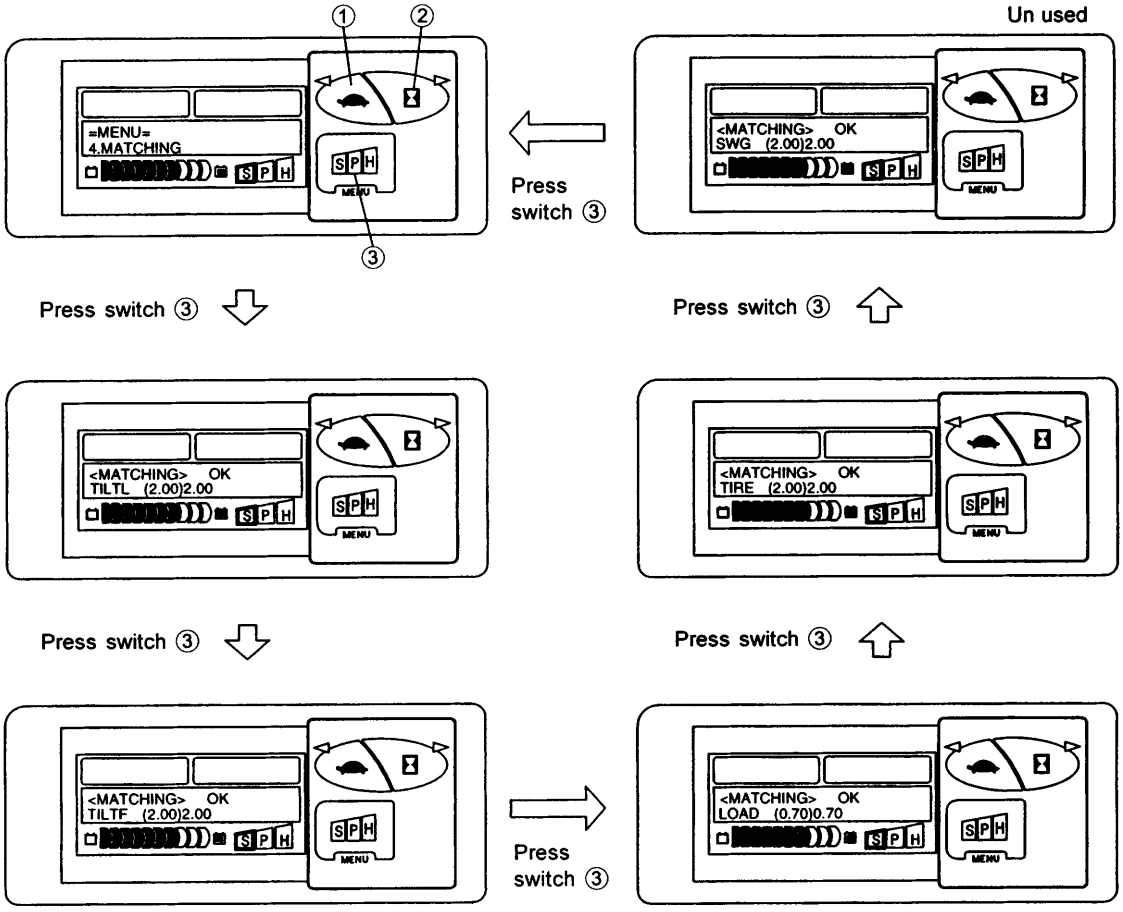
1. Input the password on the normal function menu (see page 4-48) to display the MASK MENU screen.

2. Press switch ② twice to display 3. MATCHING. Press switch ③ (enter) to display the MATCHING SET Screen.

3. Select the desired matching item using switches ① and ②. SWG matching is not used.

4. Functions of switches on the ACTIVE TEST screen are as follows:
   - Switch ① : Unused.
   - Switch ② : Performs matching of the selected item.
   - Switch ③ : Causes transition to the next item.

Note:
Press switch ③ on the SWG MATCHING SET Screen to return to the ANALYZER MENU screen.



If values in 1 and 2 below are different while the vehicle is in the standard state, the item needs matching. Matching is also needed when the control panel or each sensor is replaced.

1. The value in parentheses is the stored value at present.
2. The value outside the parentheses is the one in the present vehicle state.
3. OK is displayed only when matching is performed (switch ② is pressed).

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WHEEL DIA

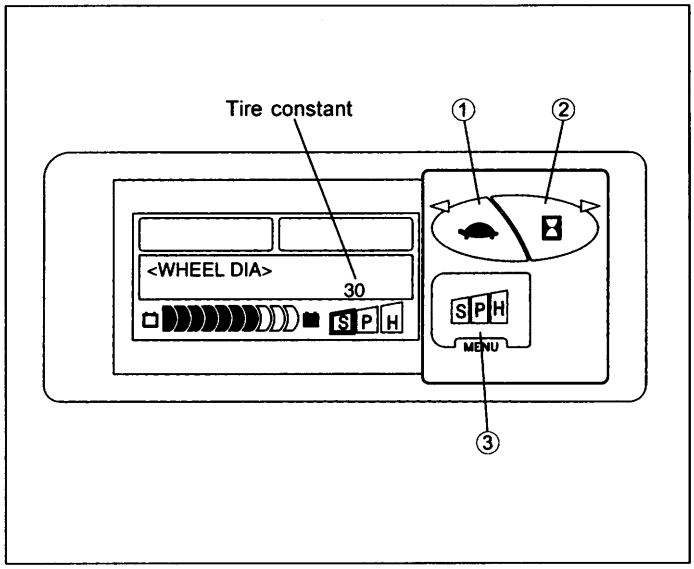
It is necessary to input the tire constant to the controller according to the tire radius, for optimizing the speedometer reading. Although the tire constant is set on a new vehicle at shipment from the factory, adjust it whenever the tire size is changed or the tires are worn excessively to a degree affecting the speedometer indication.

Operation Procedure

1. Input the password on the normal function screen (see page 4-48) to display the MASK MENU screen.

2. Press switch ② four times to display 4. WHEEL DIA. Press switch ③ (set) to display the CONSTANT SETUP screen.

3. Select the desired tire constant value using switches ① and ②. Press switch ③ to enter the value and return to the MASK MENU screen.
   Functions of switches on this screen are as follows:
   - Switch ① : Decreases the tire constant.
   - Switch ② : Increases the tire constant.
   - Switch ③ : Enters the selected value and returns to the ANALYZER MENU screen.



Tire Constant List

Tire type \ Vehicle model				7FB10·14	7FB15·18	7FB20·25 40-7FB15	40-7FB20·25	7FB30 7FBJ35
Pneumatic	Single	Standard single	Constant	34	34	39	71	82
			Size	6.00-9-10	15 (6.00-9-10) 18 (21×8-9-10)	21×8-9-14	7.00-12-12	28×9-15-14
		Oversize single	Constant	55	54	51	—	—
			Size	6.50-10-12	6.50-10-12	23×9-10-16		
	Double	Standard double	Constant	42	41	—	79	81
			Size	4.50-12-8	4.50-12-8		5.50-15-8	6.00-15-12
		Special double	Constant	38	37	37	81	85
			Size	6.00-9-10	6.00-9-10	6.00-9-10	7.00-12-12	28×8-15-12
Cushion	Single	Standard single	Constant	39	15 : 39 18 : 36	35	72	84
			Size	6.00-9	15 (6.00-9) 18 (21×8-9)	21×8-9	7.00-12	28×9-15
		Oversize single	Constant	50	48	57	—	—
			Size	6.50-10	6.50-10	23×9-10		
	Double	Standard double	Constant	44	44	—	—	85
			Size	4.50-12	4.50-12			6.00-15
		Special double	Constant	42	42	42	75	94
			Size	6.00-9	6.00-9	6.00-9	7.00-12	7.00-15

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Toyota 7FB 10-35

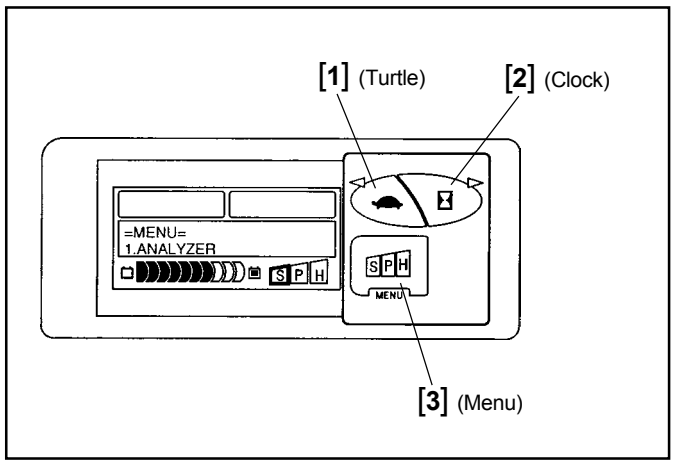
Programmering och felsökning

De maskerade funktionerna i displayen blir tillgängliga efter att man har knappat in ett lösenord.
För en närmare beskrivning av respektive parameter, följ sidhänvisningen till servicemanualen.

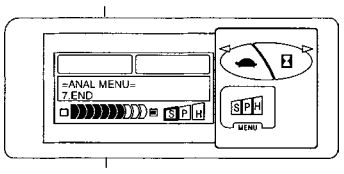
Lösenord för maskerade funktioner

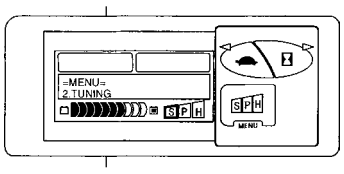
1. Tryck samtidigt på “[**1**]” och “[**2**]”.
2. Tryck på “[**1**]” inom 10 sekunder.
3. Tryck på “[**2**]” inom 10 sekunder.
4. Tryck samtidigt på “[**3**]” och “[**2**]” och håll dessa nedtryckta i minst 2 sekunder.

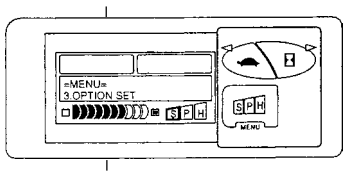
Ett kort “pip” hörs efter varje knapptryckning, och ett längre “pip” hörs när lösenordet är accepterat.

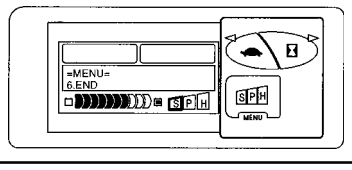


Funktion	Knappval	Meny	Knappval	Ämne	Beskrivning	Knappval
1. ANALYZER (Sid. 4 - 58)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	1. Diag Memory (Sid. 4 - 43)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	DIAG-1	Felkod 1 (senaste)	(Menu): Gå till nästa parameter. ↓
				DIAG-2	Felkod 2	
				DIAG-3	Felkod 3	
				DIAG-4	Felkod 4	
				DIAG-5	Felkod 5	
				DIAG-6	Felkod 6	
				DIAG-7	Felkod 7	
				DIAG-8	Felkod 8	
				DIAG-9	Felkod 9	
				DIAG-10	Felkod 10 (äldsta lagrade)	(Menu): Tillbaka till Meny 1.
		2. I/O Monitor 1 (Sid. 4 - 56) (spänning och temperaturer)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	I/O 1-1	THCD (temperatur på åkpanelen)	(Menu): Gå till nästa parameter. ↓
				I/O 1-2	THCP (temperatur på hydraulpanelen)	
				I/O 1-3	TD (temperatur på drivmotor)	
				I/O 1-4	TP (temperatur på pumpmotor)	
				I/O 1-5	TEMP (temperatur på CPU kortet)	
				I/O 1-6	VBBT (spänning före nyckel)	
				I/O 1-7	VBKY (spänning efter nyckel)	
				I/O 1-8	VBP4 (spänning efter MB kontaktor)	
				I/O 1-9	VBMB(M) (CPU inspänning efter säkring F6)	
				I/O 1-10	VBMB(S) (DC/SD inspänning efter säkring F6)	(Menu): Tillbaka till Meny 2.
		3. I/O Monitor 2 (Sid. 4 - 58) (åkfunktioner)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	Se i servicemanualen	Se i servicemanualen	Lika som I/O Monitor 1 ovan.
		4. I/O Monitor 3 (Sid. 4 - 60) (hydraulikfunktioner)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	Se i servicemanualen	Se i servicemanualen	Lika som I/O Monitor 1 ovan.
		5. I/O Monitor 4 (Sid. 4 - 63) (funktioner för styrning)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	Se i servicemanualen	Se i servicemanualen	Lika som I/O Monitor 1 ovan.
		6. Active Test (Sid. 4 - 64) (test av komponenter)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	ACT-1	FAND (fläkt för åkpanel)	(Menu): Gå till nästa parameter. ↓ (Turtle)(Clock): ON/OFF
				ACT-2	FANP (fläkt för hydraulpanel)	
				ACT-3	SSOL (stabiliseringscylinder)	
				ACT-4	KSOL (shuntventil för styrning)	(Menu): Tillbaka till Meny 6.
		7. END	(Menu): Tillbaka till huvudmenyn.			
2. TUNING (Sid. 4 - 66)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	NO. 1	Reverserings- och pedalbroms			(Menu): Gå till nästa parameter. ↓ (Turtle)(Clock): Justering av värde ← →
		NO. 2	Rullbroms			
		NO. 3	Låg batteriladdningsnivå, lyftblockering			
		NO. 4	Kompensering för batteriindikator			
		NO. 5	Max åkhastighet			
		NO. 6	Hydraulmotorvarv för extrafunktioner			
		NO. 7	Hydraulmotorvarv för tilt			
		NO. 8	Reserv			
		NO. 9	Reserv			
		NO. 10	Reserv			
		NO. 11	Reserv			
		NO. 12	Reserv			(Menu): Tillbaka till huvudmenyn. (Turtle)(Clock): Justering av värde ← →
3. OPTION SET (Sid. 4 - 68)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	OPT-1	DEMO MODE			(Menu): Gå till nästa parameter. ↓ (Turtle)(Clock): Ändra värde ← →
		OPT-2	H/M START (Sid. 4 - 70)			
		OPT-3	P/C LOCK			
		OPT-4	DESTI			
		OPT-5	B LEVEL			
		OPT-6	MPH			
		OPT-7	C/CNT RES			
		OPT-8	BATTERY			
		OPT-9	SHOU-TOKU			
		OPT-10	AUTO P-OFF			
		OPT-11	PARKING ERR			
		OPT-12	TILT CONT			
		OPT-13	SWG W-LOCK			
		OPT-14	TILT F-LIM			
		OPT-19	OPT-15 till OPT-19 används ej!			(Menu): Tillbaka till huvudmenyn.
4. MATCHING (SAS kalibrering) (Sid. 4 - 71)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	TILTL	Kalibrering av tiltvinkelsensor. Horisontella gafflar.			(Menu): Gå till nästa parameter. ↓ (Clock): Kalibrering, lagrar nytt värde ← →
		TILTF	Kalibrering av tiltvinkelsensor. Vertikal mast.			
		LOAD	Kalibrering av lastsensor. Grundlast.			
		TIRE	Kalibrering av styrhjulspotentiometer. Styrhjulen i positionen rakt.			
		SWG	(används ej)			(Menu): Tillbaka till huvudmenyn. (Clock): Kalibrering, lagrar nytt värde ← →
5. WHEEL DIA (Sid. 4 - 74)	(Menu): Enter. → (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓	WHEEL DIA	Kompensation för drivhjulsdiameter			(Turtle)(Clock): Ändra värde . ← → (Menu): Tillbaka till huvudmenyn .
6. END	(Menu): Avsluta. Tillbaka till normal visning i displayen. (Turtle): Stega uppåt. ↑ (Clock): Stega nedåt. ↓					









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ELECTRICAL SYSTEM TROUBLESHOOTING

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GENERAL

Troubles can be classified into those indicated by respective error codes on the display and those for which no error code is displayed.

Measuring instruments such as a tester and a megger are used for troubleshooting, but some troubles can be checked by the analyzer mounted on the vehicle.

Description in this manual are for mechanics who have mastered handling of measuring instruments, accurate reading of wiring and connection diagrams and measurement according to connector diagrams. Please use the attached Wiring, Connection and Connector Diagrams.

Composition of Troubleshooting

1. Drive and Material Handling System Troubleshooting
   (1) When an error code is displayed:
   See "When an error code is displayed" (See page 5-11).
   (2) When no error code is displayed:
   See "When no error code is displayed" (See page 5-91).
2. Failure in Concurrent Traveling and Material Handling (See page 5-105).
3. Steering System Troubleshooting (See page 5-107).
4. Multidisplay - MCS Communication System Troubleshooting
   (1) When an error code is displayed:
   See "When an error code is displayed" (See page 5-109).
   (2) When no error code is displayed:
   See "When no error code is displayed" (See page 5-111).
5. SAS Troubleshooting
   (1) See "When an error code is displayed" (See page 5-113).
   (2) See "When no error code is displayed" (See page 5-162).

How to Proceed with Troubleshooting

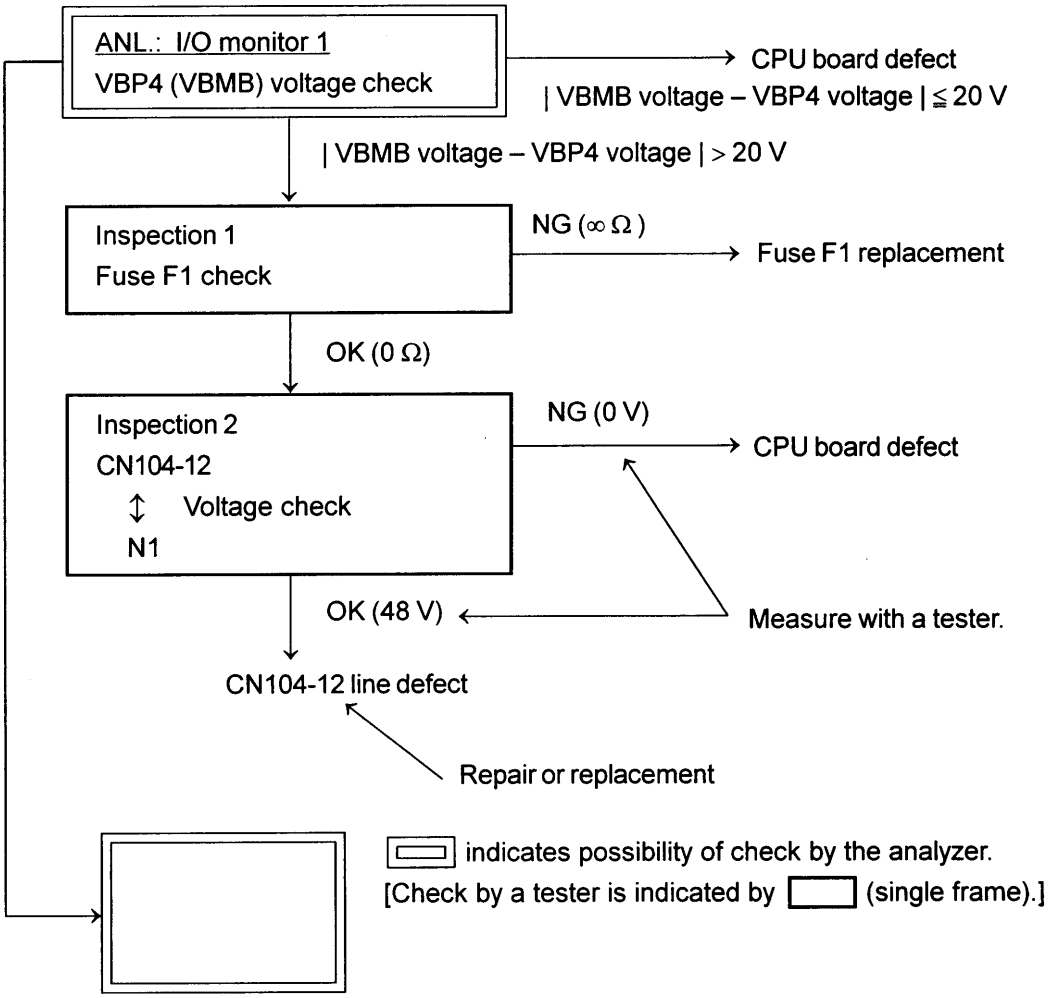
Numerical values shown in the troubleshooting section may differ from those described in the connector list in Section 3.

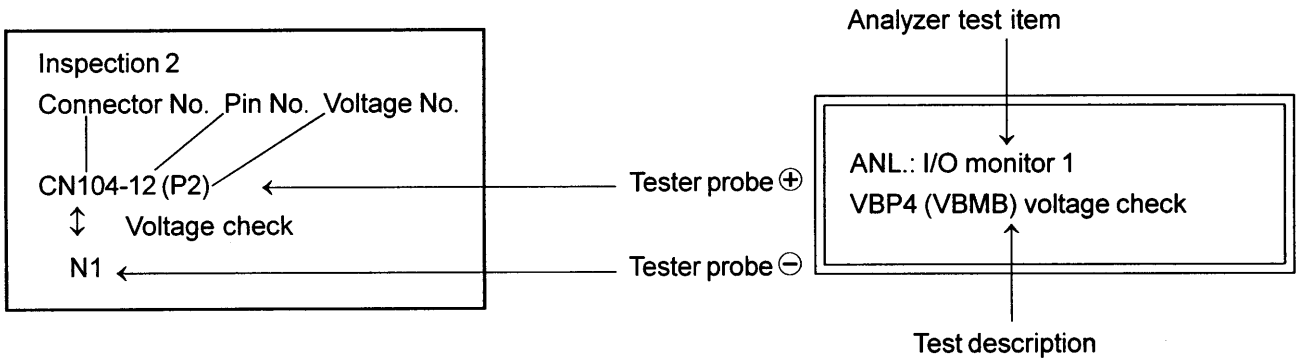
Values described in the troubleshooting section are as follows:

- Criteria concerning error codes
- Conditions causing troubles (Minimum values for vehicle driving)
- Values depending on flowchart conditions

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HOW TO READ TROUBLESHOOTING CHARTS





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SST SETTING METHODS

Use SSTs for accurate, quick troubleshooting of the electrical system of the 7FB series.
Nine types of SSTs are provided for selective use according to the portion to be checked.
Correct check is impossible if the connection method is wrong.

	SST 09230-13130-71 Controller check harness		
1	SST1	09231-13130-71	Fan check harness (for CN105) (also for DC/MD board power supply check)
2	SST2	09232-13130-71	Shorting harness (for CN20, 52, 55, 58, 86, 90 and 94)
3	SST3	09233-13130-71	MOS drive signal check harness 1 (for CN111 and 112)
4	SST4	09234-13130-71	MOS drive signal check harness 2 (for CN106 and 107)
5	SST5	09235-13130-71	Swing and knob offset solenoid check harness (for CN146)
6	SST6	09236-13130-71	Traveling motor rpm sensor check harness (for CN57)
7	SST7	09237-13130-71	Steering sensor check harness (for CN19)
8	SST8	09238-13130-71	Acceleration potentio meter check harness (for CN25)
9	SST9	09239-13130-71	Signal sub-harness (for CN106 and 107), Used in connection with SST1 or SST4.

Perform quick troubleshooting by referring to the SST setting method on the next page.

Caution:
- **Always disconnect the battery plug before setting or disconnecting an SST. Otherwise, board damage may be caused.**
- **Error code CB-2 appears when the key switch is turned to OFF once and to ON again during inspection, with SST1 and SST9 connected to the CPU board or SST3 connected to the DC/MD board. This error code is detected due to SST connection and is not related to actual abnormal ity. Neglect CB-2 indication and continue inspection.**
- **Capacitor CO may not be discharged fully when any SST is connected. Before connecting and disconnecting the board connector, measure the voltage between P4 and N1. If not discharged, fully discharge CO before starting operation.**

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1. SST1·SST9 setting method

*SST 1 is used for two different types of check.

(1) Disconnect CN105, 106 and 107 connectors from the CPU board.

(2) Set the SST1 main connector to CN105.

(3) Set the SST9 connector (for CN106 and 107) to CN106 and 107 on the CPU board.

(4) Connect the 3-pin connector of SST1 to the 3-pin connector of SST9.

<For fan signal line check>

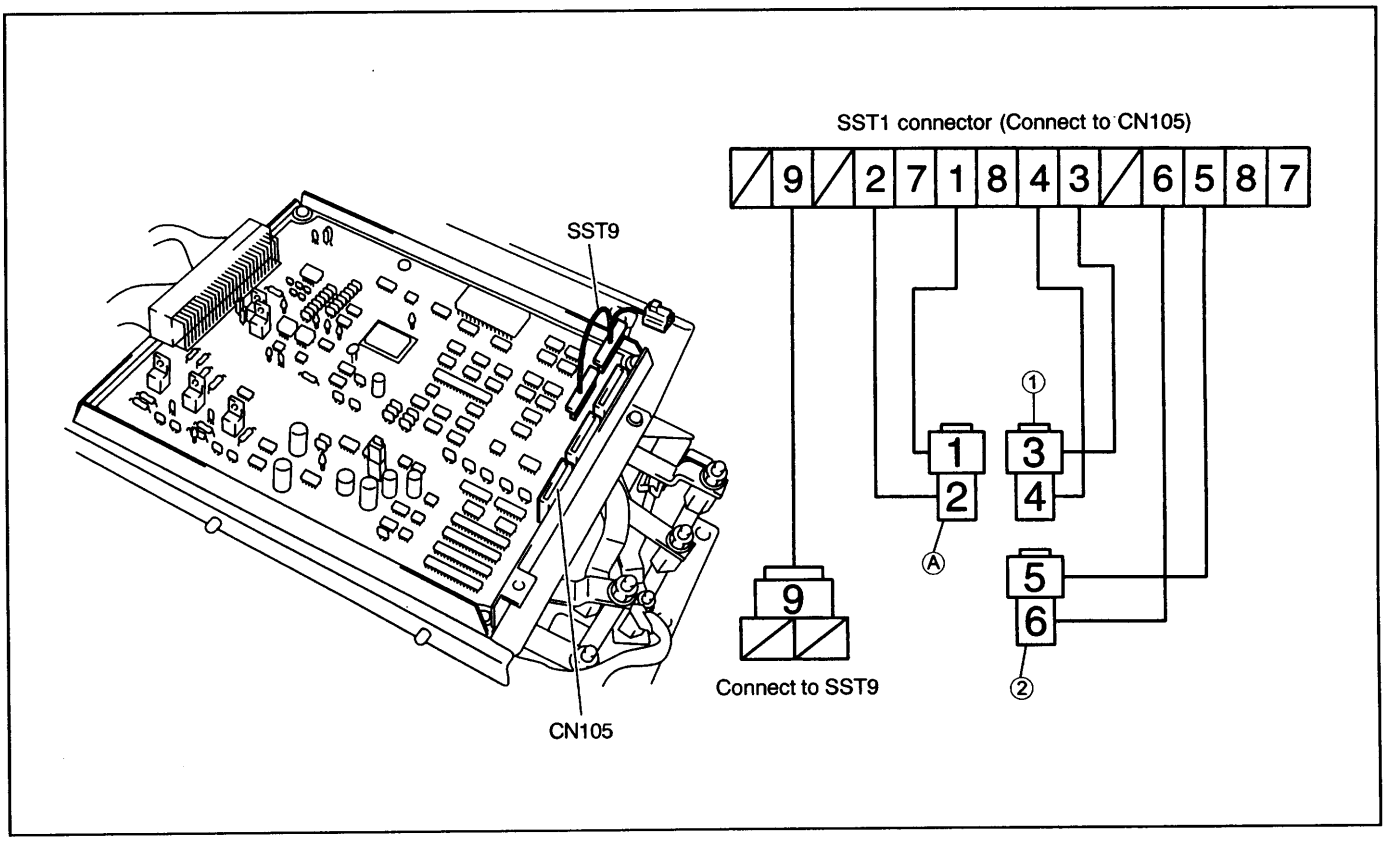
(5) Connect connector Ⓐ and connector ② and check the fan ON/OFF signal by the analyzer "ACTIVE TEST".

(6) The traveling or material handling system fan is selected by the switch on the display.

<For DC/MD board check>

(5) Connect connectors Ⓐ and ① and check the power ON/OFF by the analyzer "ACTIVE TEST".

(6) The traveling or material handling signal is selected by the switch on the display.



2. SST2·SST8 setting method

SST2·SST8 is a shorting connector for shorting between corresponding connector pins. Check the pin No. carefully since connection with an incorrect pin will cause damage to the board.

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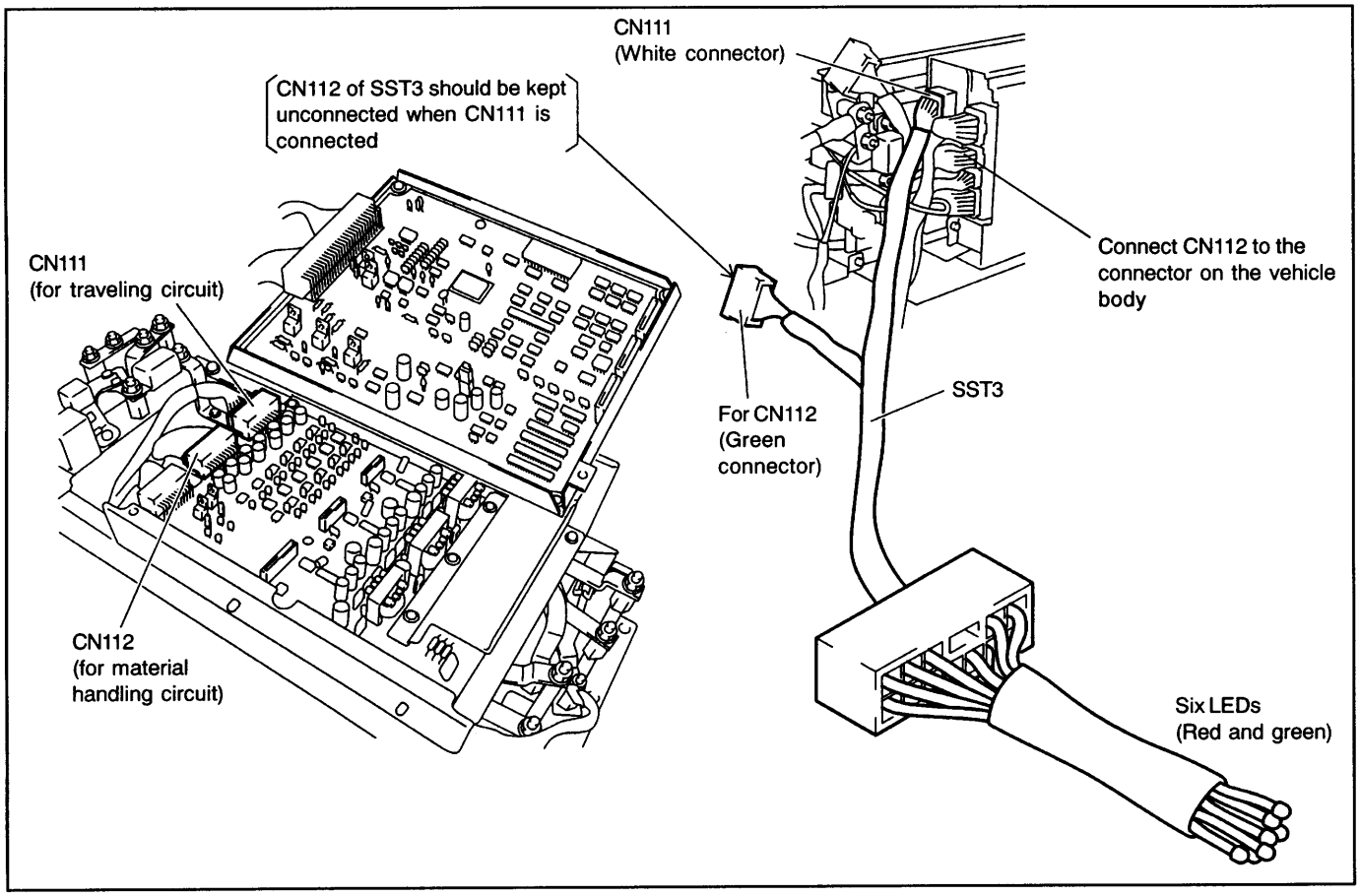
3. SST3 setting method

(1) Jack up the front portion of the vehicle to let the drive wheels float.

(2) Disconnect the drive motor cable (from P7, P8 and P9) and the pump motor cable (from P14, P15 and P16).

(3) Disconnect CN111 (for traveling circuit) and CN112 (for material handling circuit), and set SST3.

*SST3 must be connected to either CN111 or CN112, and must not be connected to both of them at a time.



When set to CN111 connector:

(4) Shift the direction lever to forward or reverse.
All LEDs are lit.

(5) Depress the accelerator pedal.
When the accelerator pedal is depressed, six LEDs repeat blinking. A pair of red and green LEDs correspond to the transistor operation for one phase, and the six LEDs in total correspond to the transistor operation for three phases. The speed of blinking varies with the degree of accelerator pedal depression.
When either LED is off, either the signal from the CPU board or the signal from the DC/MD board is defective. The blinking sequence for three phases is reverse between forward traveling and backward traveling.

When set to CN112 connector

(4) Operate the lift lever to the UP position, and check the LED ON/OFF state.

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4. SST4·SST9 setting method

The traveling/material handling motor drive instruction signal is checked by reversal between the traveling and material handling systems. The material handling lever operation for checking the traveling circuit is not an error.
SST4 and SST9 are used for judging the quality of the instruction signal from the CPU board to the DC/MD board and the drive signal from the DC/MD board to the MOS when any abnormality is found in the check using SST3.
Pay special attention to the operation because SST4 and SST9 are set while SST3 is set. (Especially pay attention to battery plug ON/OFF and motor cable disconnection.)

To check the traveling circuit (Parenthesized portions apply to checking the material handling circuit.)

(1) Disconnect the CN106 and 107 connectors on the CPU board and the CN110 (CN109) connector on the DC/MD board.

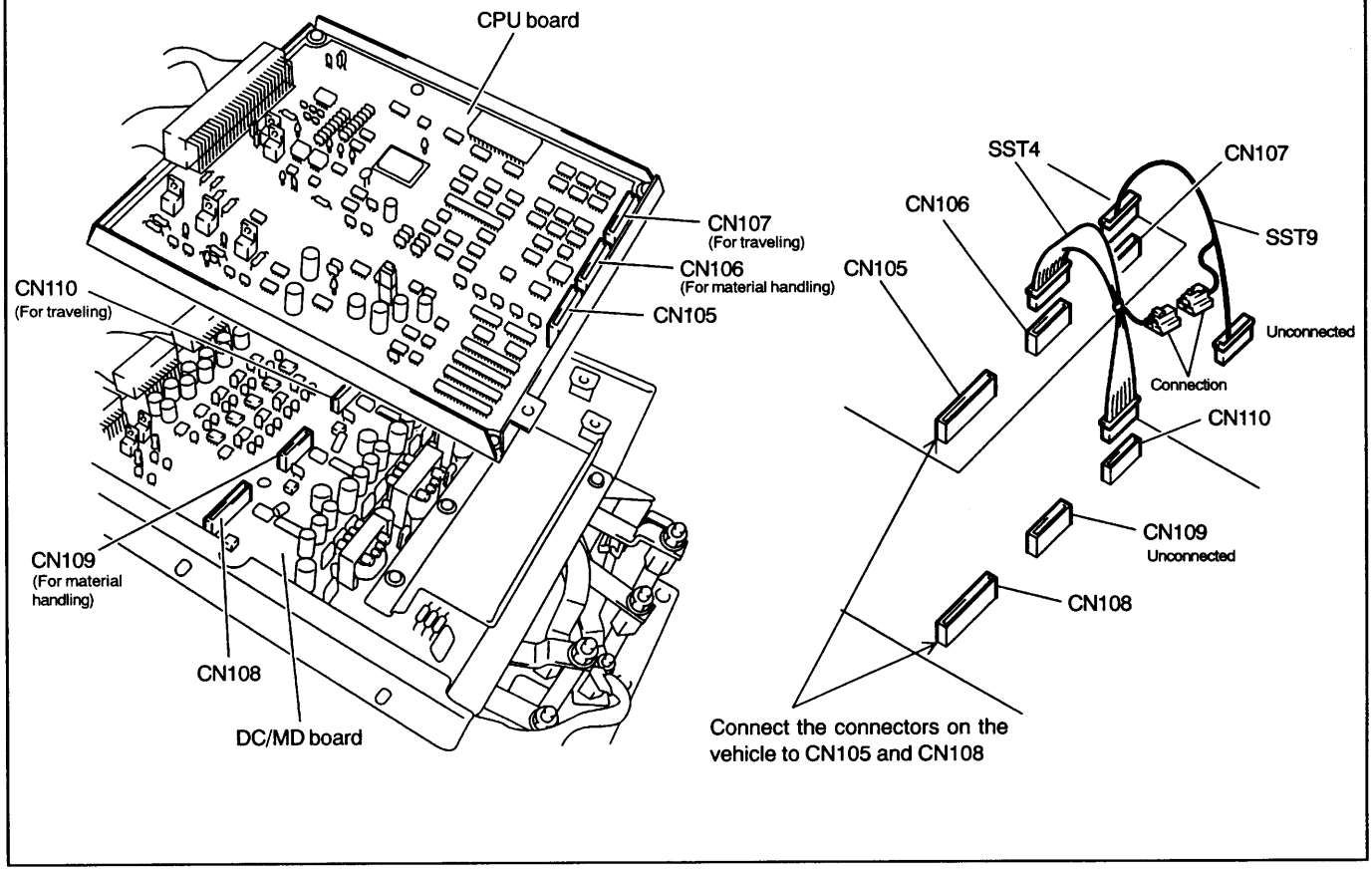
(2) Connect the 11-pin (10-pin) connector of SST4 to the CN106 (CN107) connector on the CPU board, and connect the 10-pin (11-pin) connector of SST4 to the CN110 (CN109) connector on the DC/MD board.

(3) Connect the 10-pin (11-pin) connector of SST9 to the CN107 (CN106) connector on the CPU board. The 11-pin (10-pin) connector of SST9 is left unconnected.

(4) Connect the 3-pin connector of SST4 to the 3-pin connector of SST9.

(5) In case of traveling circuit check: Operate the material handling lever with the battery plug ON and key switch ON, and check the LED blinking state.
In case of material handling circuit checking: Operate the direction lever with the battery plug ON and key switch ON and depress the accelerator pedal to check the LED blinking state.

<For traveling circuit check>



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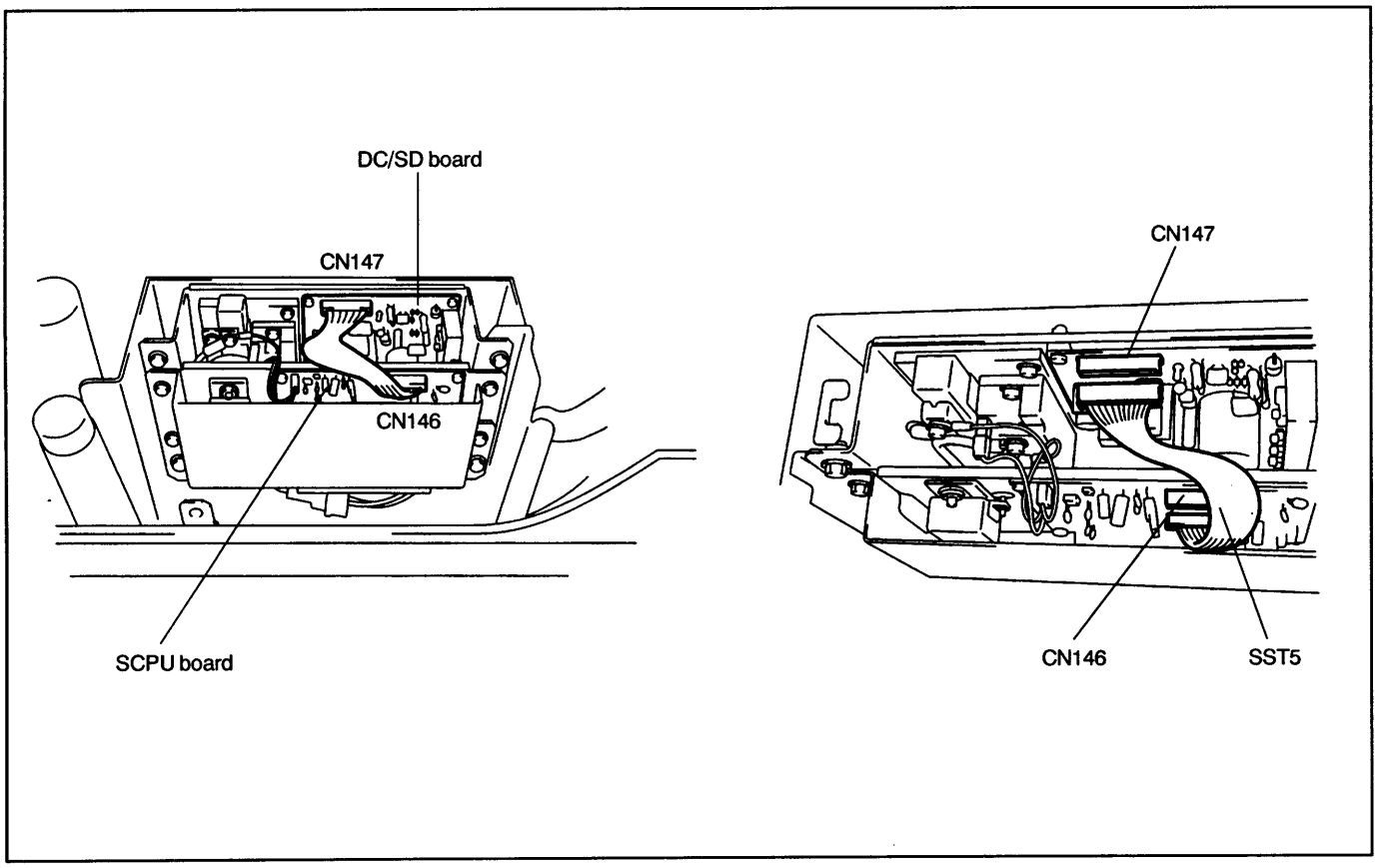
5. SST5 setting method

SST5 is used for judging the quality of the spring solenoid valve and steering angle correction solenoid valve drive signals.
It is used to check whether the drive signal from the SCPU board in the PS controller or the drive signal from the DC/SD board is defective.

(1) Disconnect the wiring between CN146 and CN147, and set SST5.

Always connect the connector connected with more number of cables to the SCPU board (CN146). Since the number of pins and the shape are the same at both ends of SST5, carefully avoid wrong connection.

(2) Check the ON state of each solenoid in the ANL.ACTIVE mode.

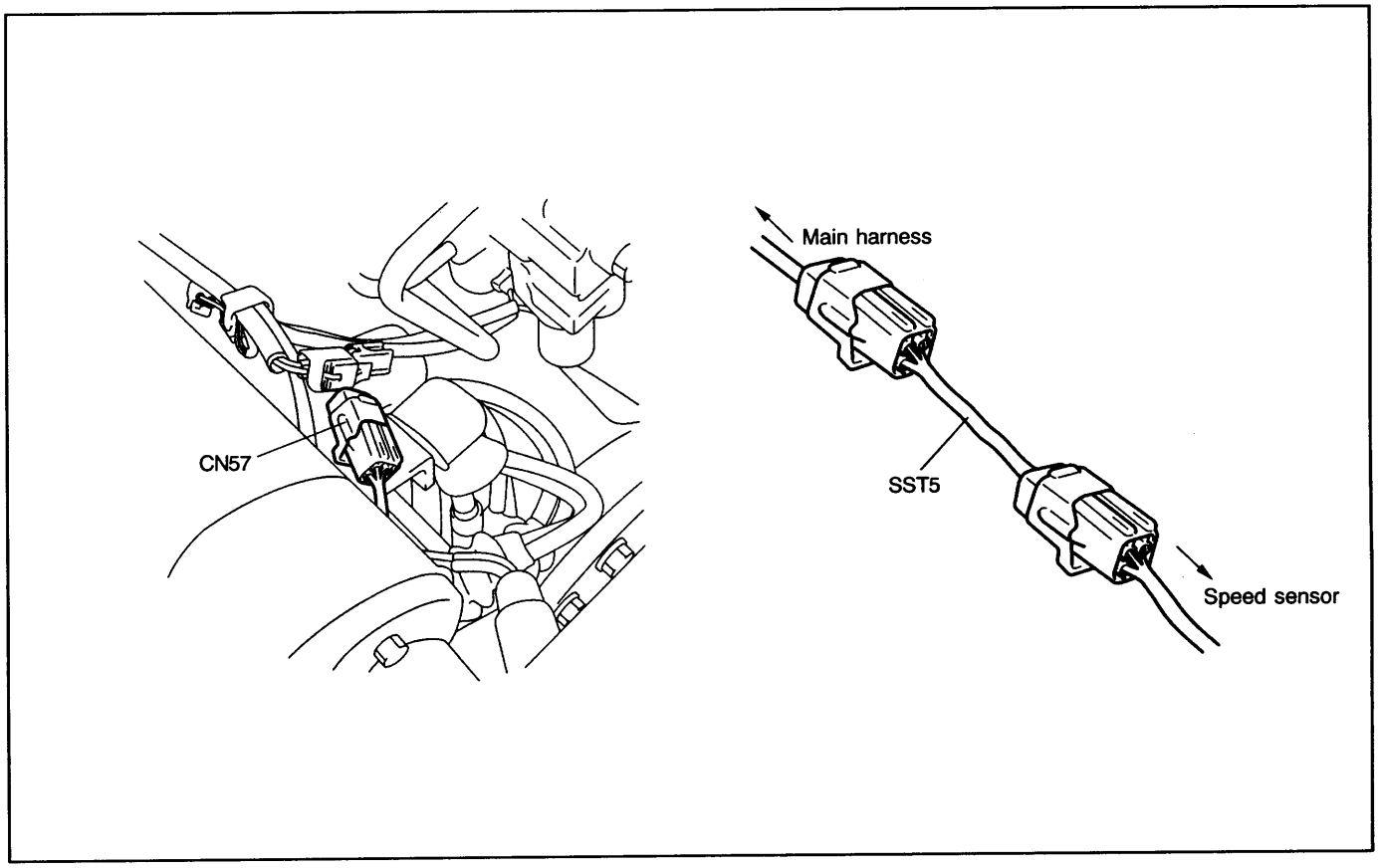


- Carefully avoid wrong connection of CN146 and 147.
- Though error codes 54-2 and 73-2 are displayed upon key switch ON, it does not indicate an abnormality.

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6. SST6 setting method

SST6 is for checking the drive motor speed sensor signal.
Two drive motor speed sensors are used: SSD1 and SSD2.
Individual speed sensor quality judgment is impossible. Set SST6 and judge by analyzer "ACTIVE TEST".
SST6 is for checking by reversing the SSD1 and SSD2 output signals.



(1) Disconnect the CN57 connector and set SST6.

(2) Check the speed sensor by using ANL.I/O monitor 2.

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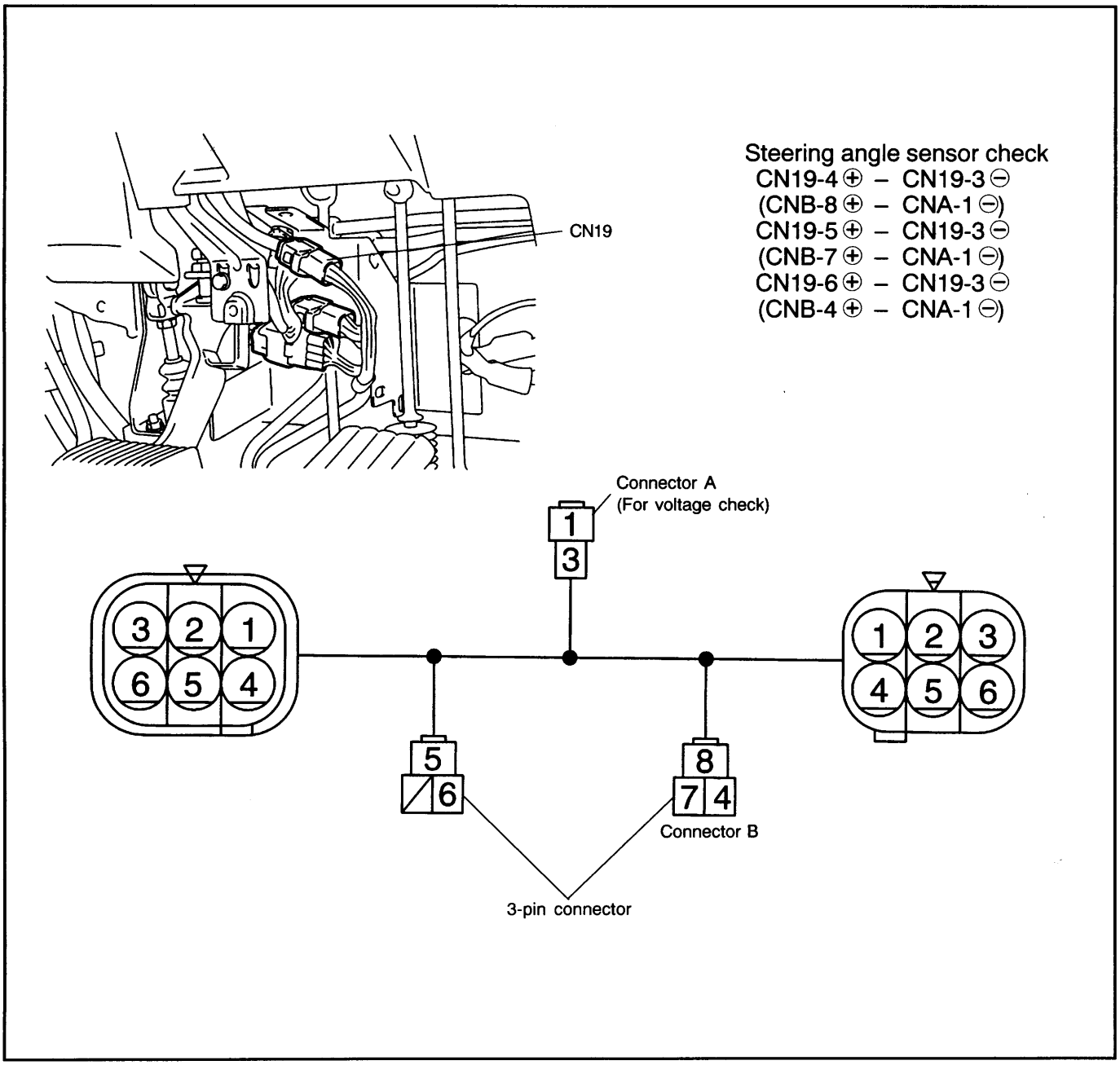
7. SST7 setting method

SST7 is used for judging the steering sensor signal quality.
When SST7 is connected, the output signals from STS1 and STS2 are reversed, and the STSC signal is set to ON.

(1) Disconnect the CN19 connector and set SST7 (The 3-pin connector must be connected before reconnection).

(2) Check the steering angle sensor by using ANL.I/O monitor 4.

(3) Voltage check (connector B side) the steering angle sensor with a circuit tester.



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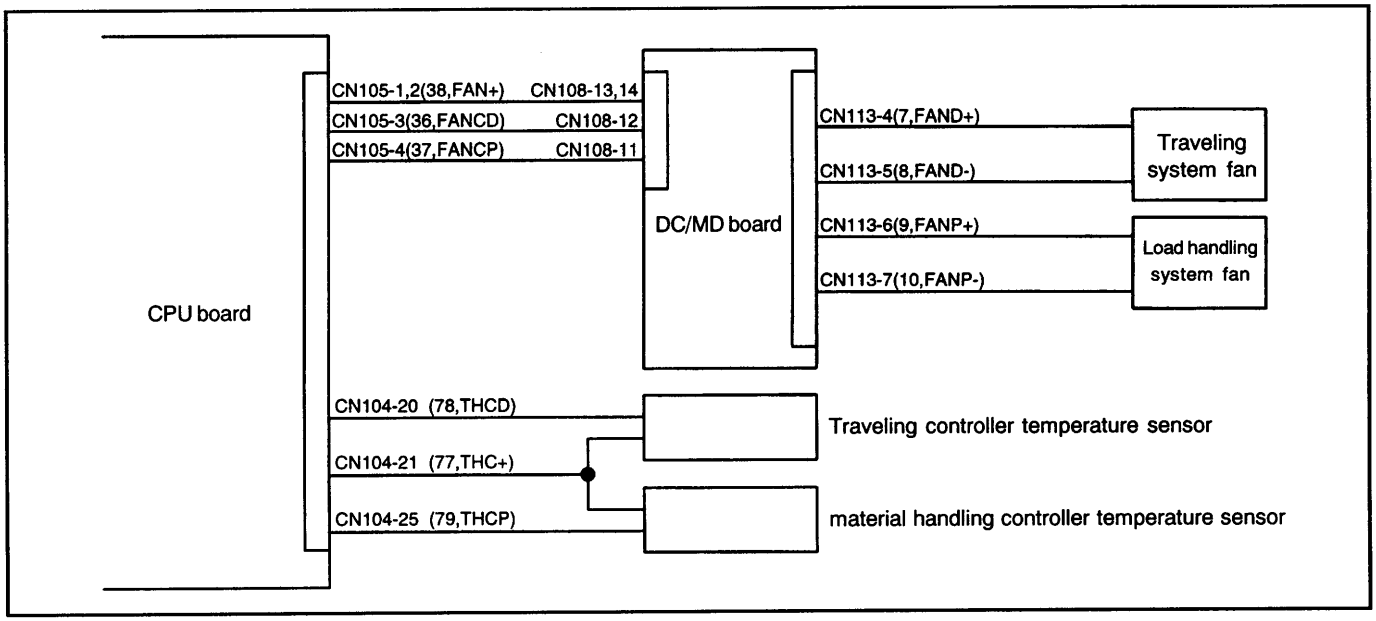
TRAVELING AND MATERIAL HANDLING SYSTEMS TROUBLESHOOTING

WHEN AN ERROR CODE IS DISPLAYED

Safety Monitor (blinking)

A0-1, A0-2: Abnormal Controller Temperature Rise (Overheat)

Related portion

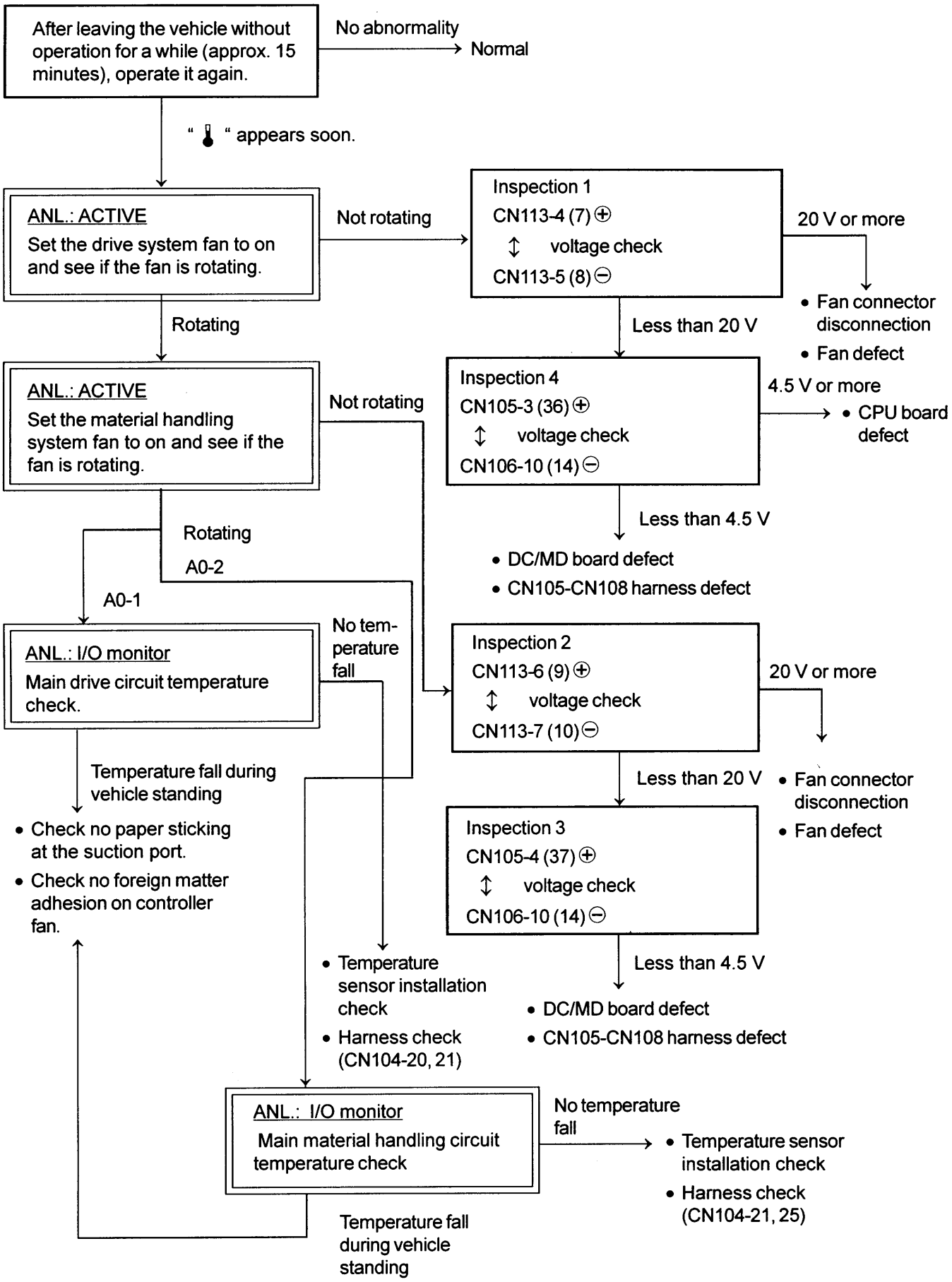


Estimated causes

① Overheat (from continuous overloaded operation)
② Fan abnormality
③ Clogged fin

*** If A0-4 or A0-5 is displayed, carry out troubleshooting with priority given to A0-4 or A0-5.**

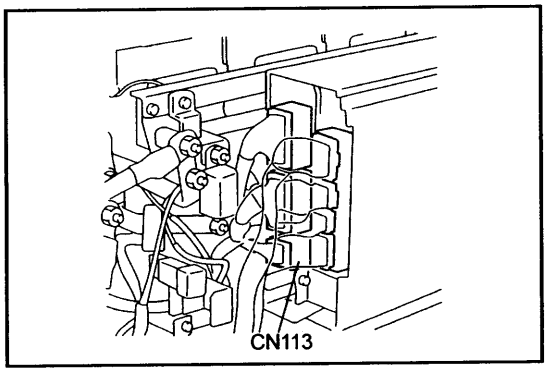
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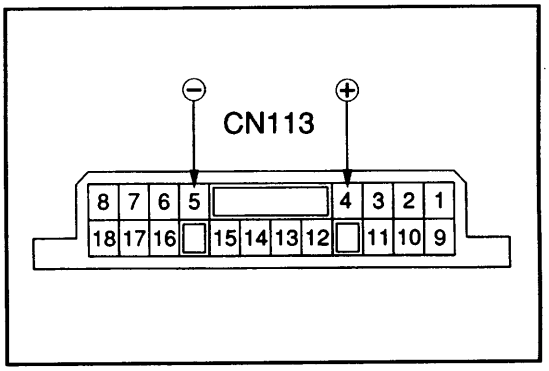


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Inspection 1:
CN113-4 – CN113-5 voltage check
Battery plug ON, key switch ON

Measurement terminals	CN113-4 (7) ⊕ – CN113-5 (8) ⊖
Tester range	50 V
Standard	20 V or more

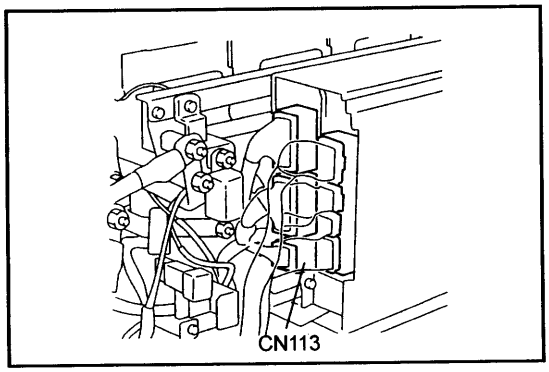


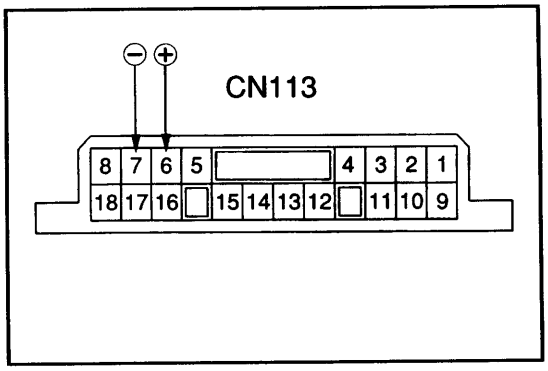


Less than 20 V → To Inspection 4
20 V or more → Fan connector disconnection, fan defect

Inspection 2:
CN113-6 – C113-7 voltage check
Battery plug ON, key switch ON

Measurement terminals	CN113-6 (9) ⊕ – CN113-7 (10) ⊖
Tester range	50 V
Standard	24 V



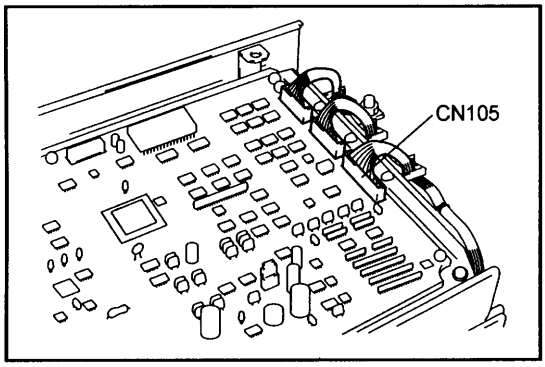


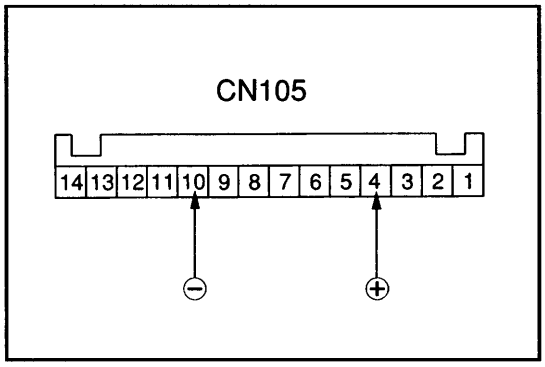
Less than 20 V → To Inspection 3
20 V or more → Fan connector disconnection, fan defect

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Inspection 3:
CN105-4 (37) – C106-10 (14) voltage check
Battery plug ON, key switch ON

Measurement terminals	CN105-4 (37) ⊕ – CN106-10 (14) ⊖
Tester range	10 V
Standard	4.5 V

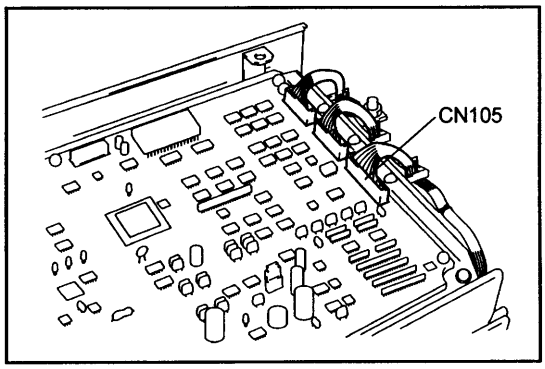


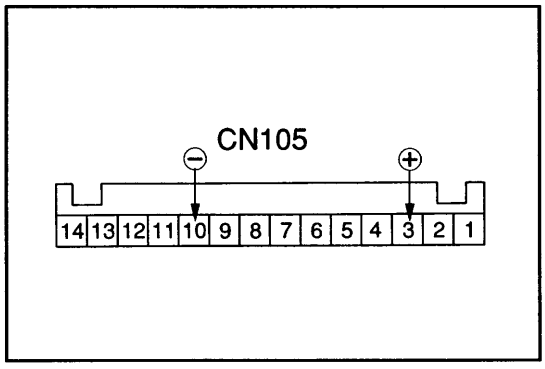


Less than 4.5 V → DC/MD board defect, CN105-CN108 harness defect
4.5 V or more → CPU board defect

Inspection 4:
CN105-3 (36) – CN106-10 (14) voltage check
Battery plug ON, key switch ON

Measurement terminals	CN105-3 (36) ⊕ – CN106-10 (14) ⊖
Tester range	10 V
Standard	4.5 V



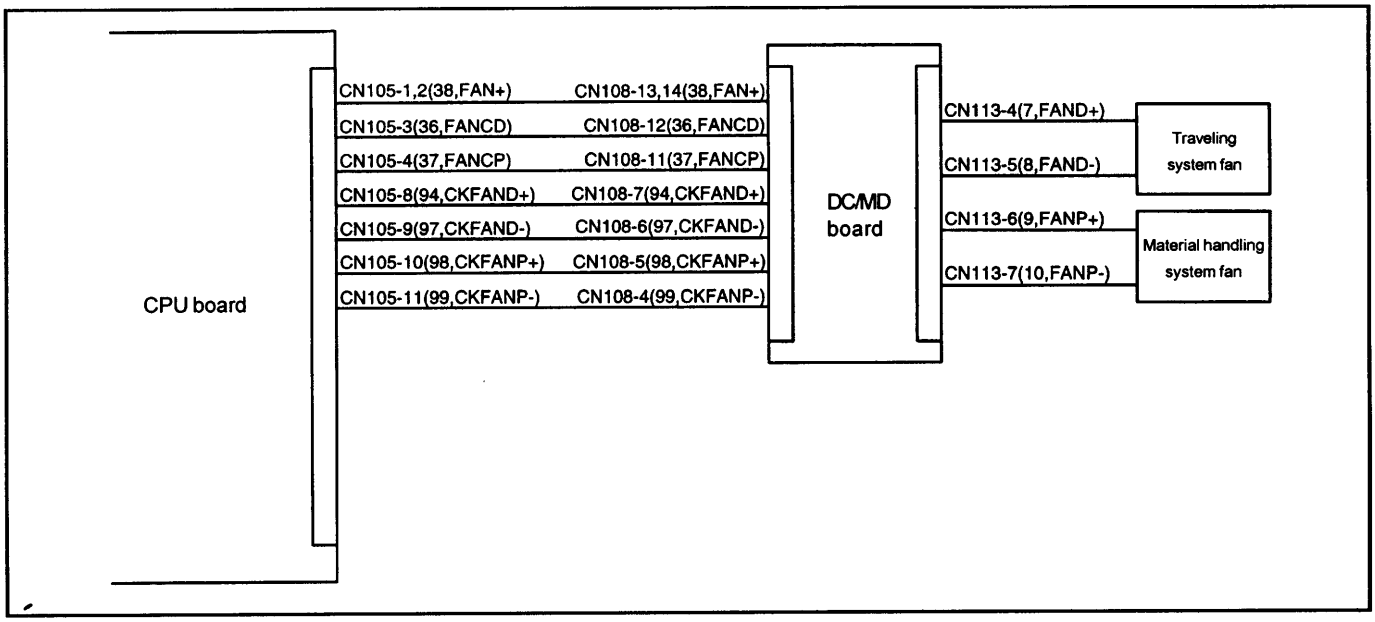


Less than 4.5 V → DC/MD board defect, CN105-CN108 harness defect
4.5 V or more → CPU board defect

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Error Code: A0-4 (for Drive Circuit) • A0-5 (for Material Handling Circuit): Fan Abnormality

Related portion

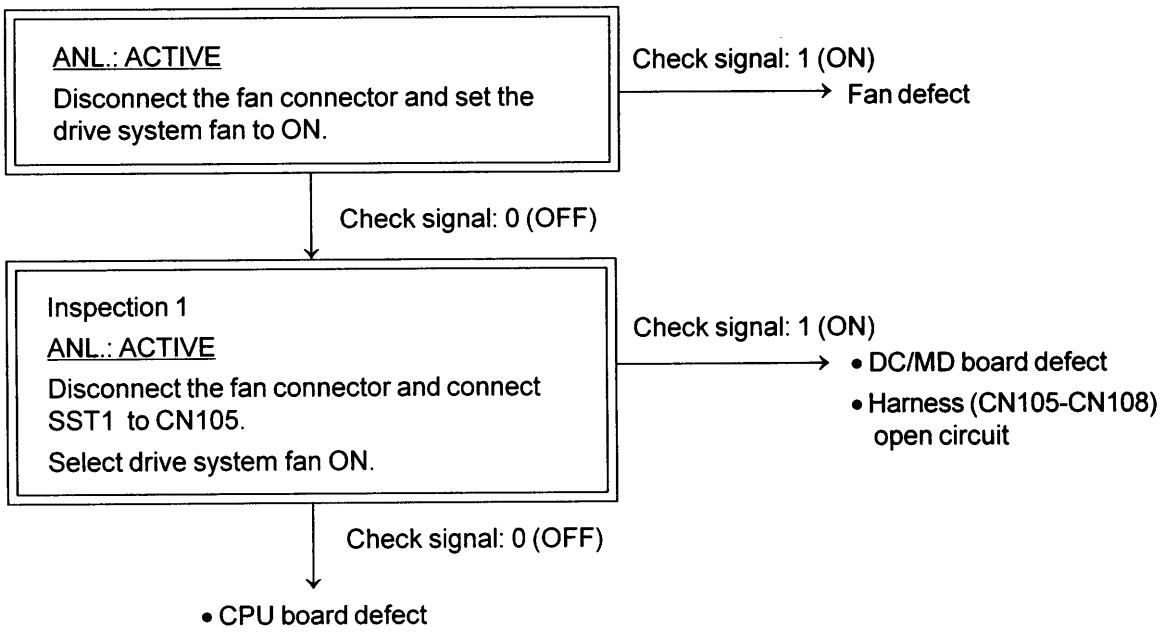


Estimated causes

① Fan abnormality
② Harness open circuit
③ DC/MD board defect

*** If error code C0 is also displayed, prefer C0.**

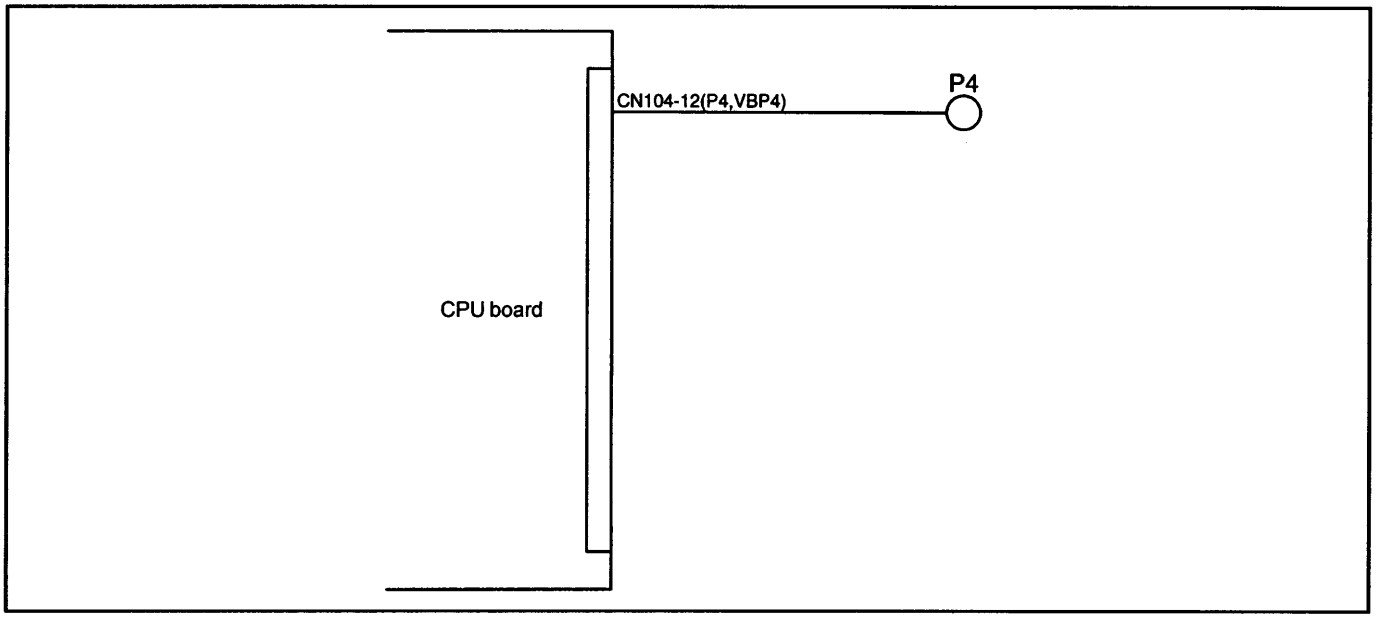
The troubleshooting procedure below is for A0-4 (for drive circuit). The procedure for A0-5 (for material handling circuit) is similar.



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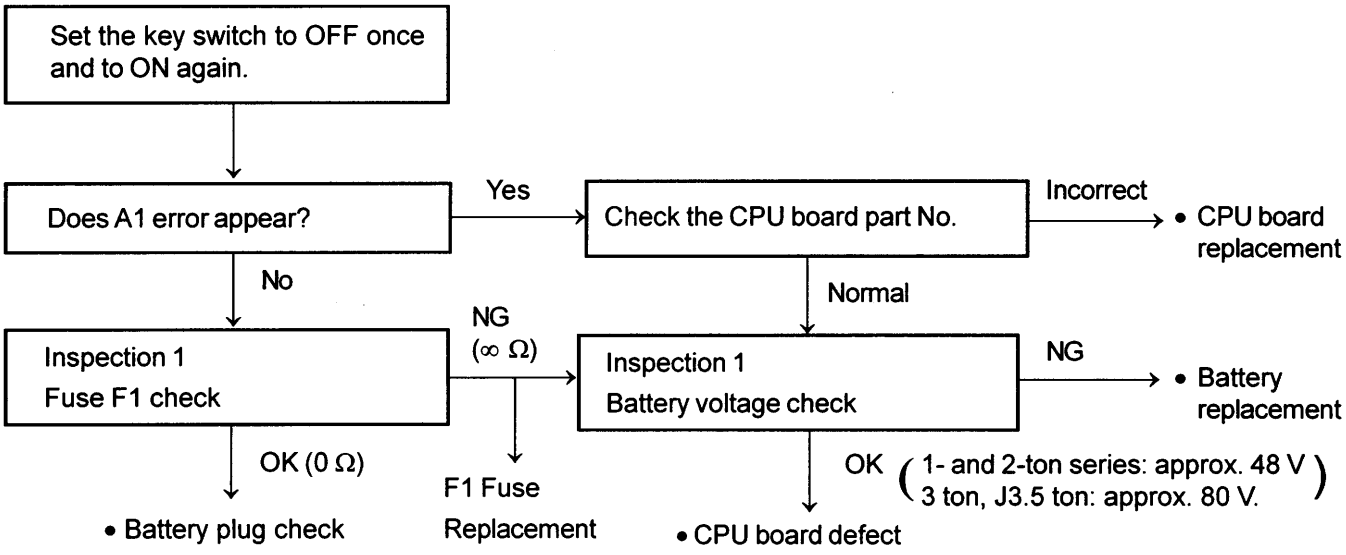
Error Code A1: High Controller Voltage

Related portion



Estimated causes

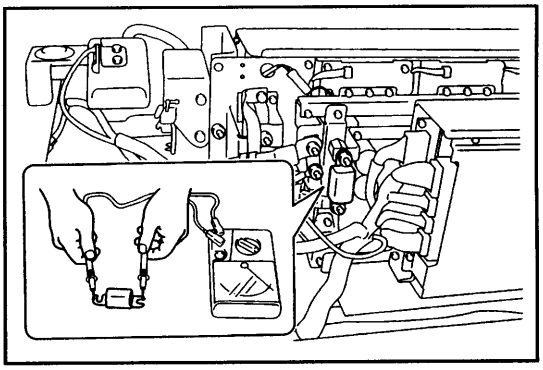
① Fuse F1 blown during regeneration (changes to A8 display after key switch ON and OFF)
② Battery plug disconnection during regeneration
③ Wrong CPU board part No.
④ Battery overvoltage



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Inspection 1:
Fuse F1 check
Battery plug OFF

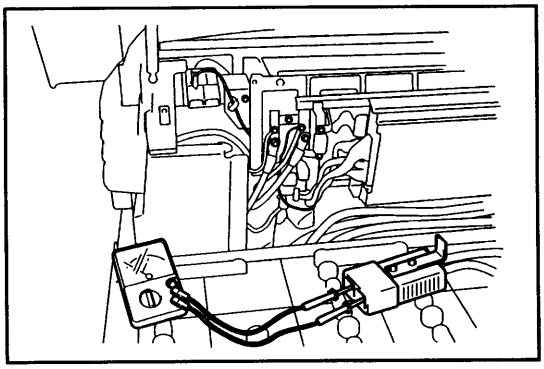
Measurement terminals	Both terminals of fuse F1
Tester range	Ω x 1
Standard	0 Ω



OK (0 Ω) → Battery plug check
NG (∞ Ω) → F1 fuse Replacement

Inspection 2:
Battery voltage check
Battery plug OFF

Measurement terminals	Both terminals of battery plug
Tester range	200 V
Standard	1- and 2-ton series: approx. 48 V 3 ton, J3.5 ton: approx. 80 V

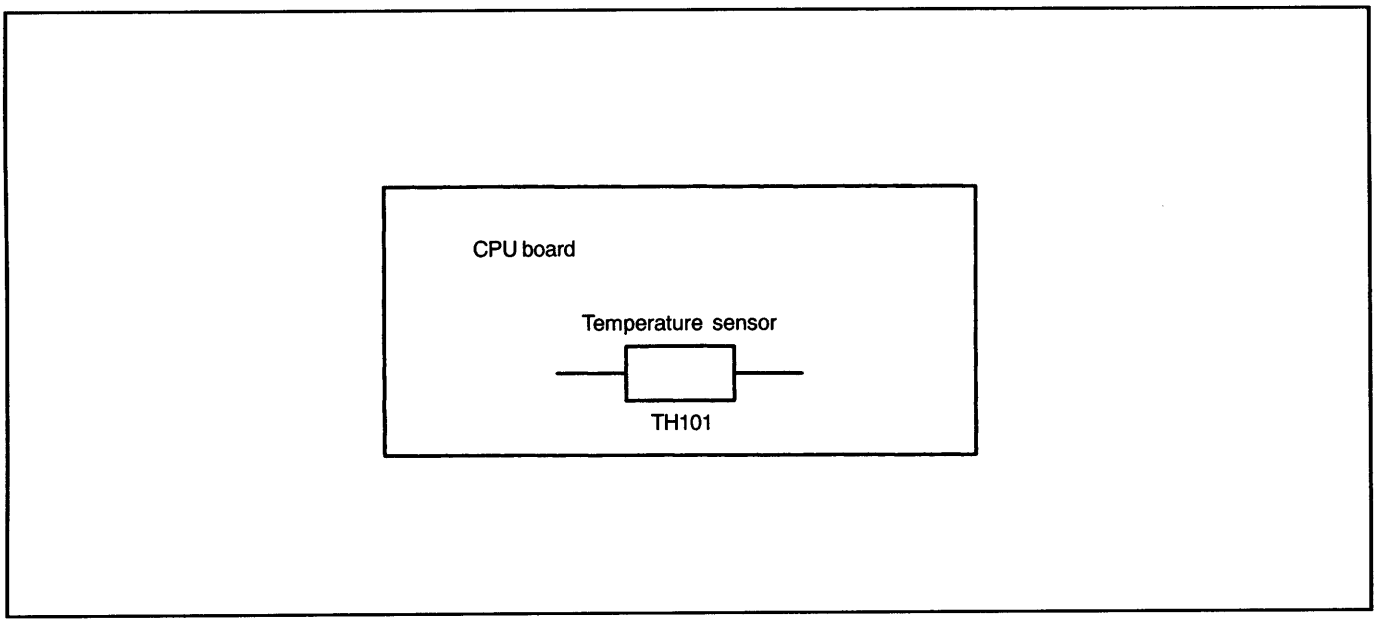


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Safety monitor (blinking)

A2: Abnormal temperature rise of CPU board

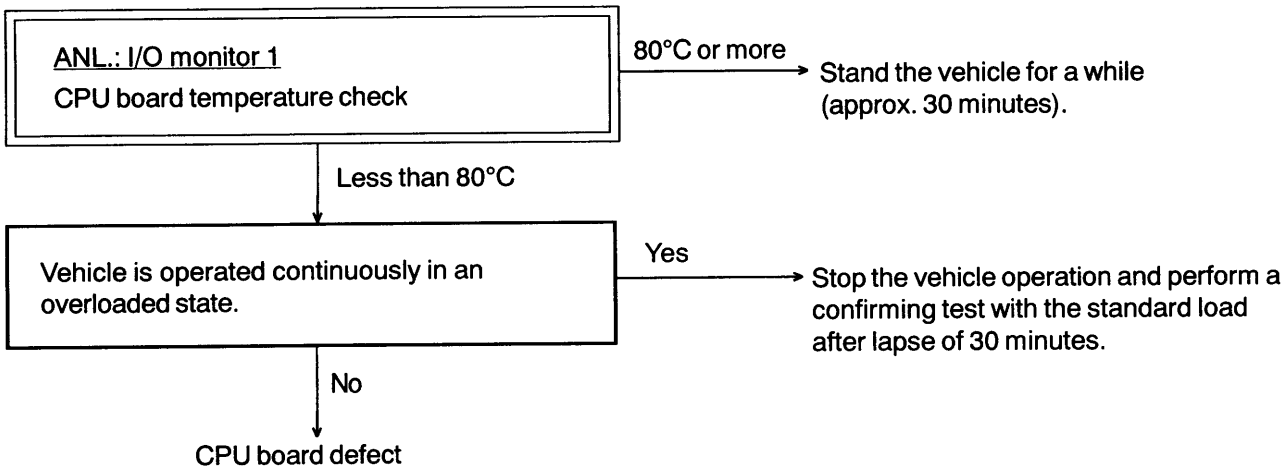
Related portion



Estimated causes

① The temperature around the CPU board is 80°C or above.
② Overheat (from continuous overloaded operation)
③ Temperature sensor defect (CPU board defect)

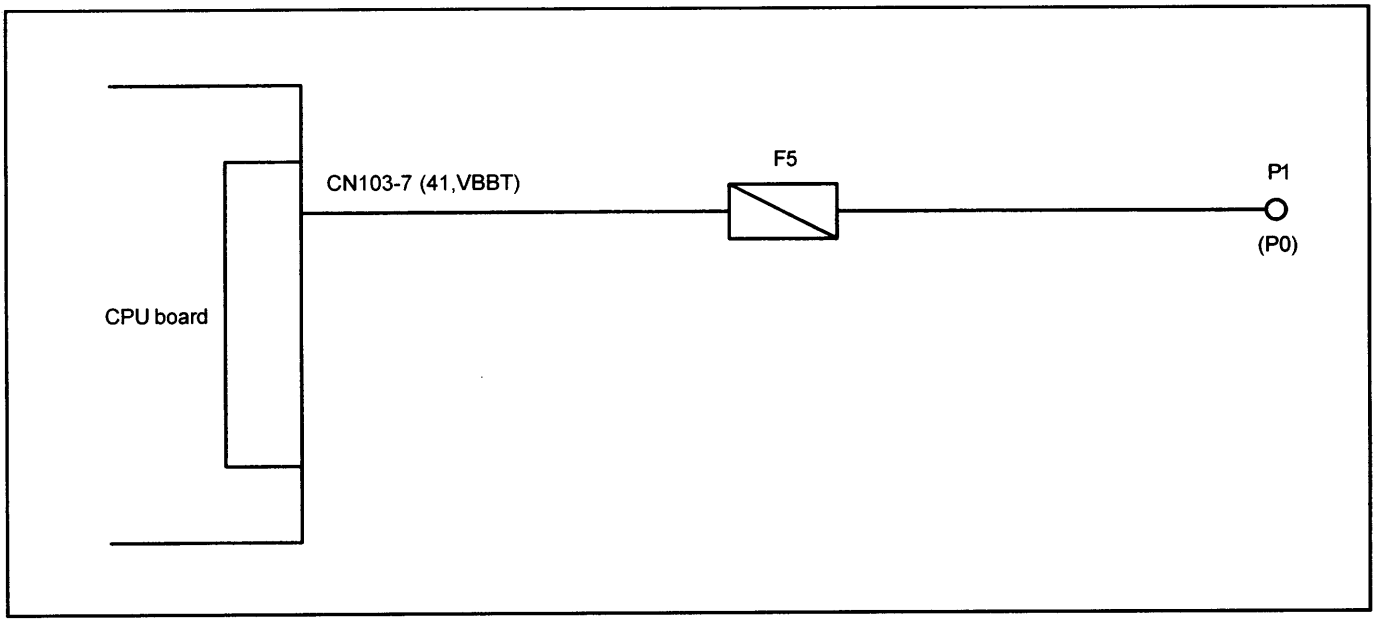
- **When the diagnosis memory displays A0, perform troubleshooting for error code A0-1 or -2.**



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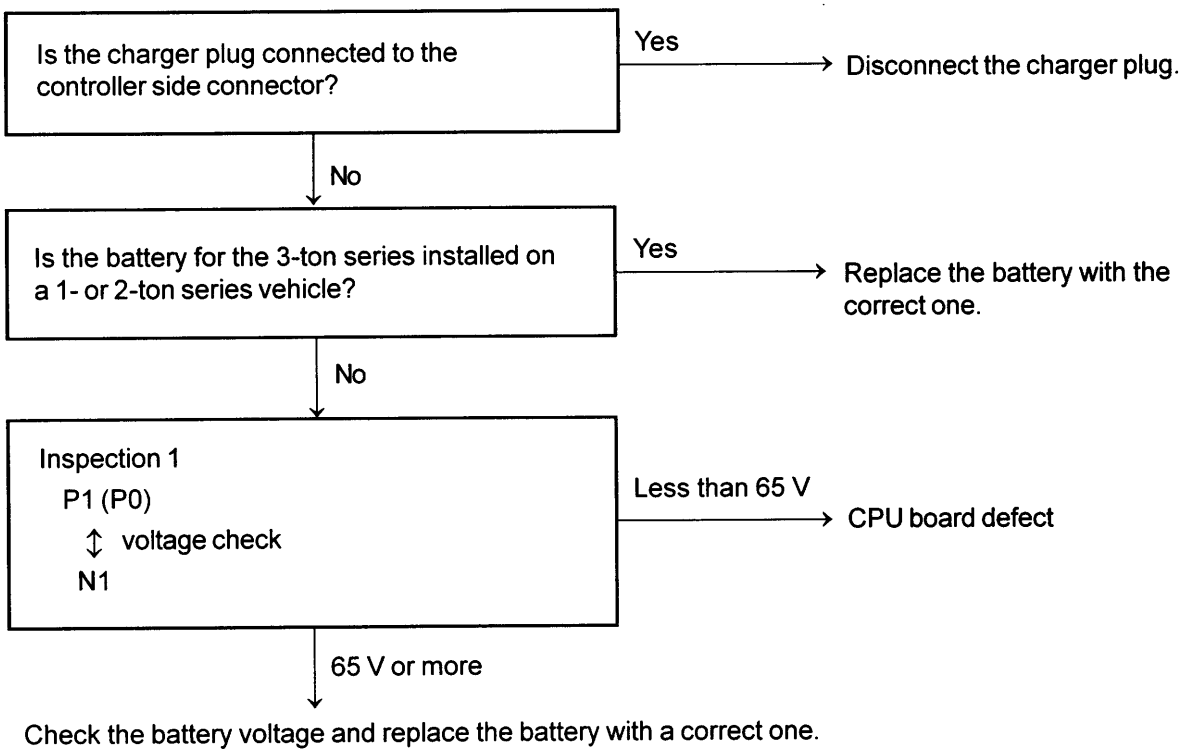
Error Code A3-1: Incorrect Charging Plug Connection

Related portion



Estimated causes

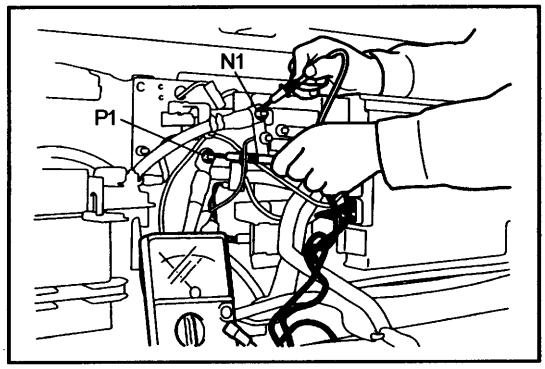
① Reverse connection of charger (Separate charger plug connection to the controller side)
② Incorrect battery voltage



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Inspection 1:
P1 (P0)-N1 voltage check
Battery plug ON, key switch ON

Measurement terminals	P1 (P0) ⊕ – N1 ⊖
Tester range	200 V
Standard	Battery voltage

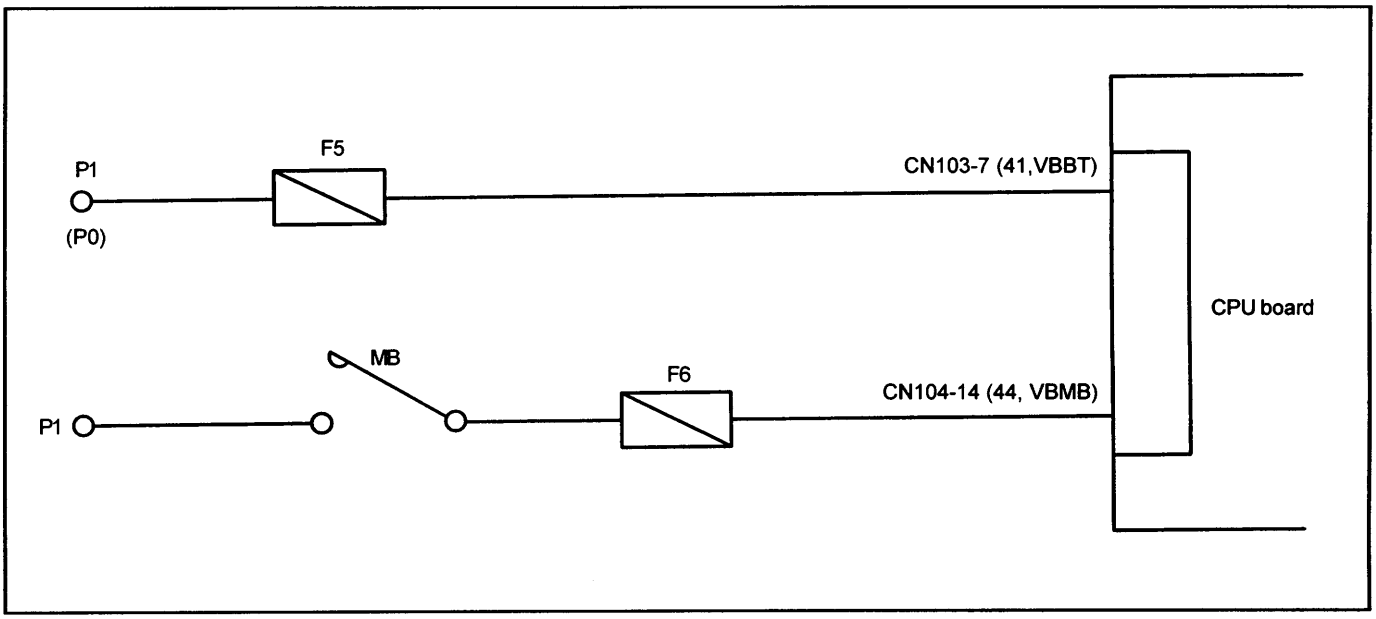


65 V or more → Check the battery voltage, and replace the battery with a correct one if incorrect.
Less than 65 V → CPU board defect

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A3-2: Incorrect Battery Connection

Related portion



Estimated causes

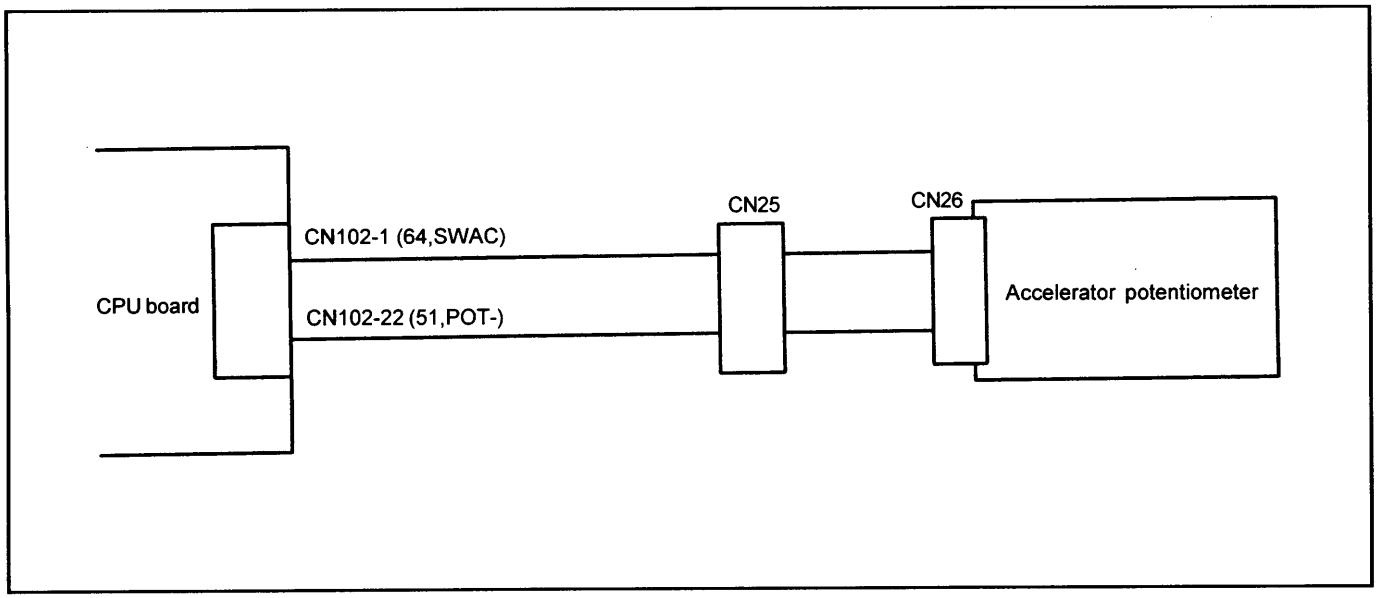
① Incorrect CPU board

- The CPU board for the 1- and 2-ton series is installed on a 3-ton vehicle.
- The CPU board for the 3-ton, J3.5-ton is installed on a 1- or 2-ton vehicle.

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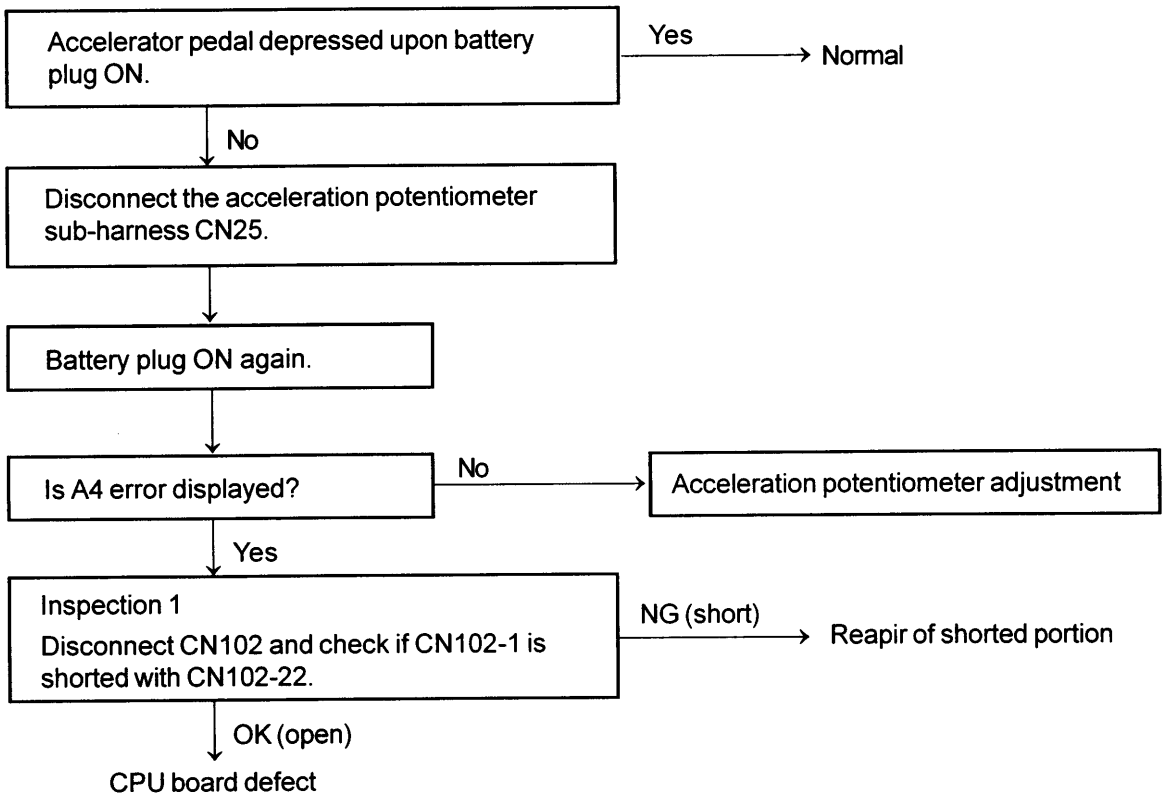
Error Code A4: Acceleration Switch Abnormality

Related portion



Estimated causes

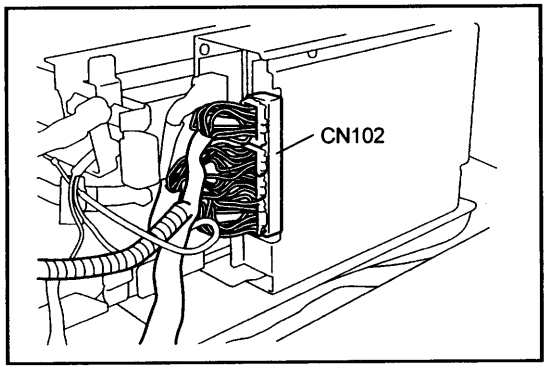
① Accelerator pedal depressed upon battery plug ON
② Acceleration potentiometer adjustment defect
③ Harness short circuit

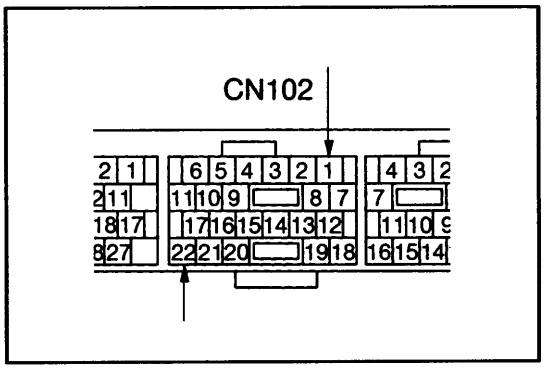


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Inspection 1:
CN102 short circuit check
Battery plug OFF, CN102 connector disconnection

Measurement terminals	CN102-1 (64) – CN102-22 (69)
Tester range	Ω x 1
Standard	Open (∞ Ω)



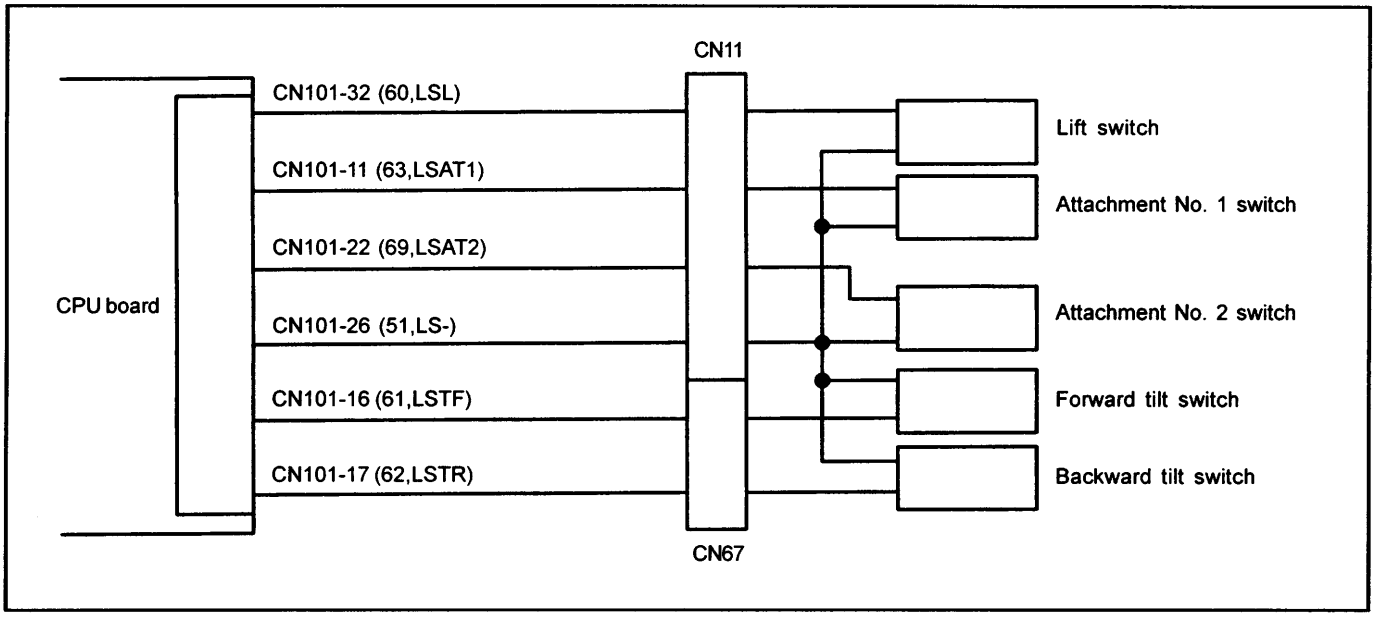


OK (open) → CPU board defect
NG (short) → Shorted portion repair

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A6-1, A6-3, A6-5, A6-6: Material Handling limit Switch Abnormality

Related portion



Estimated causes

① Lift or tilt (attachment) switch ON upon battery plug ON
② Lift or tilt (attachment) switch adjustment error
③ Harness short circuit

Lift or tilt (attachment) lever laid down upon battery plug ON
→ Yes → Normal

*** A6-1, -5 or -6 is displayed: CN1**
A6-3 is displayed: CN67

↓ No

Disconnect material handling switch sub-harness CN11 and CN67, and set the battery plug to ON again.

↓

Is A6 error displayed?
→ No → Limit switch adjustment

↓ Yes

Inspection 1
Check if the following terminals are shorted:
CN101-32 (60), CN101-11 (63), CN101-22 (69), check CN101-16 (61), CN101-17 (62) – CN101-26 (51) for short circuit.
→ NG (short) → Reapir of shorted portion

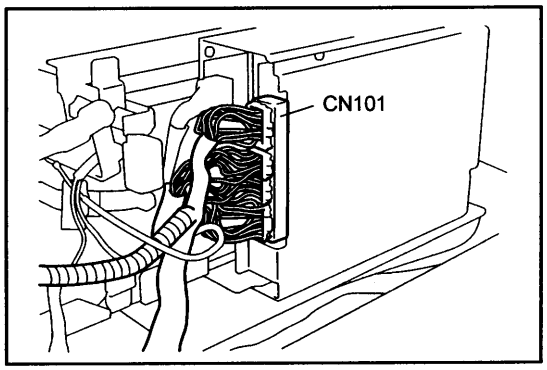
↓ OK (open)

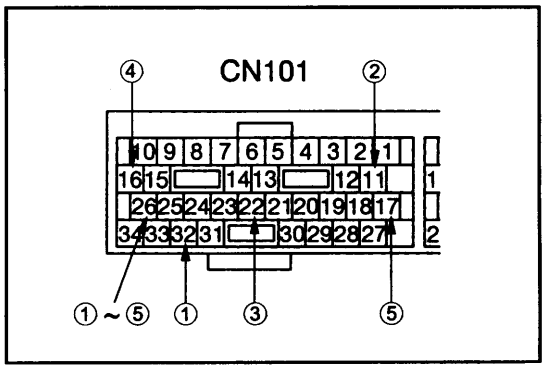
CPU board defect

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Inspection 1:
CN101 short circuit check
Battery plug OFF

Measurement terminals	① CN101-32 (60) – CN101-26 (51) ② CN101-11 (63) – CN101-26 (51) ③ CN101-22 (69) – CN101-26 (51) ④ CN101-16 (61) – CN101-26 (51) ⑤ CN101-17 (62) – CN101-26 (51)
Tester range	Ω x 1
Stanard	Open (∞ Ω)



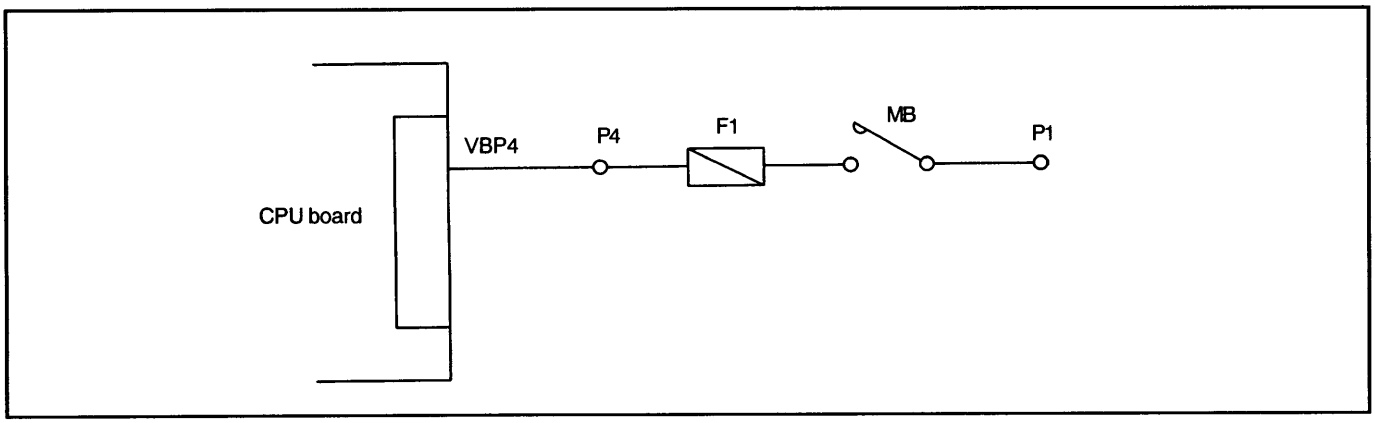


OK (open) → CPU board defect
NG (shorted) → Shorted portion repair

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Error Code A8: Blown Fuse F1

Related portion



Estimated causes

① Blown fuse F1
② Harness open circuit

*** If CB-1 is also displayed, prefer CB-1.**

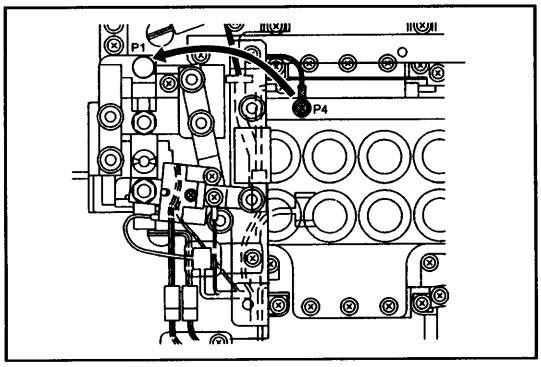
ANL.: I/O monitor 1
VBP4 (VBMB) voltage check

| VBMB voltage - VBP4 voltage | ≦ 20 V → Is any error being displayed?
- Yes → CPU board defect
- • Fuse F1 installation defect

| VBMB voltage - VBP4 voltage | > 20 V

Inspection 1. Fuse F1 check
NG (∞ Ω) → Fuse F1 replacement
OK (0 Ω)

Disconnect the P4 harness and connect it to the P1 terminal.



ANL.: I/O monitor 1
VBP4 (VBMB) voltage check

| VBMB voltage - VBP4 voltage | ≦ 20 V
- • Check copper bar terminals at P1 to P4 lines.

|VBMB voltage – VBP4 voltage | > 20 V

Inspection 2
CN104-12 (P2)
↕ voltage check
N1

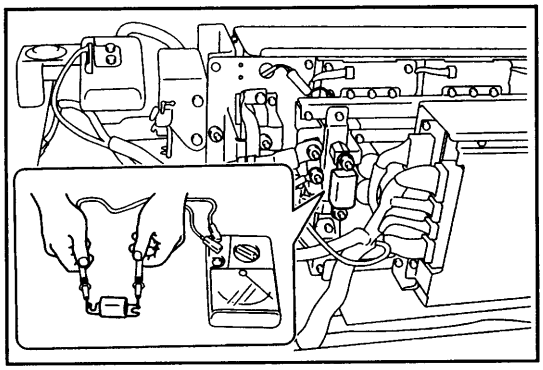
| VBMB voltage – check voltage | ≦ 20 V
- • CPU board defect

| VBMB voltage - check voltage | > 20 V
CN104-12 line harness defect

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Inspection 1:
Fuse F1 check
Battery plug OFF

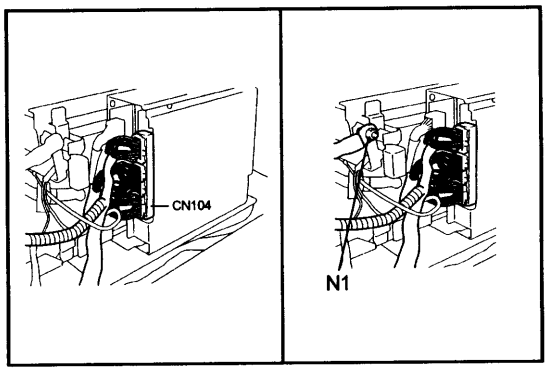
Measurement terminals	Both ends of fuse F1
Tester range	Ω x 1
Standard	0 Ω

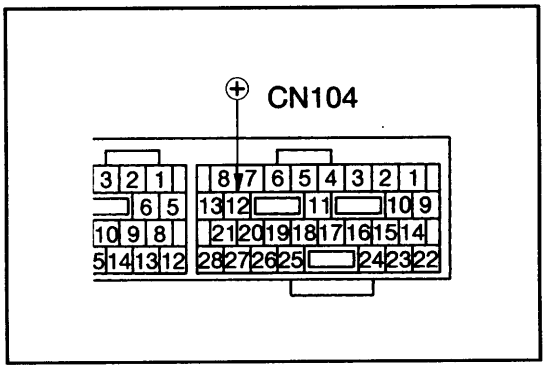


OK (0 Ω) → To inspection 2
NG (∞ Ω) → Fuse F1 replacement

Inspection 2:
CN104-12 – N1 voltge check
Battery plug ON, key switch ON

Measurement terminals	CN104-12 (P2) ⊕ – N1 ⊖
Tester range	200 V
Standard	| VBMB – check voltage | > 20 V



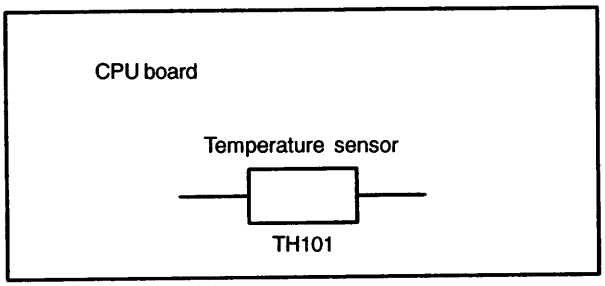


OK (| VBMB - check voltage | > 20 V) → CN104-12 line harness defect
NG (| VBMB - check voltage | ≦ 20 V) → CPU board defect

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Error Code AA: CPU Board Temperature Sensor Abnormality

Related portion



Estimated causes

① CPU board defect
② CPU board replacement as the action upon code AA display

Error Code AF: CPU Abnormality

Related portion

CPU board

Estimated causes

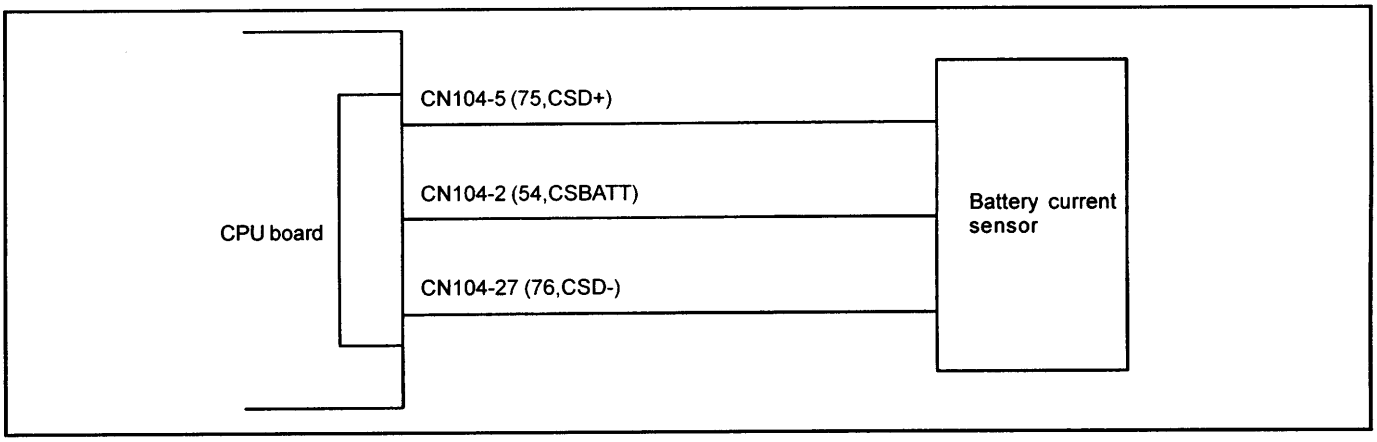
① CPU board defect

*** If code AF is displayed, replace the CPU board since it is defective.**

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Error Code C0-1: Main Drive Circuit Abnormality

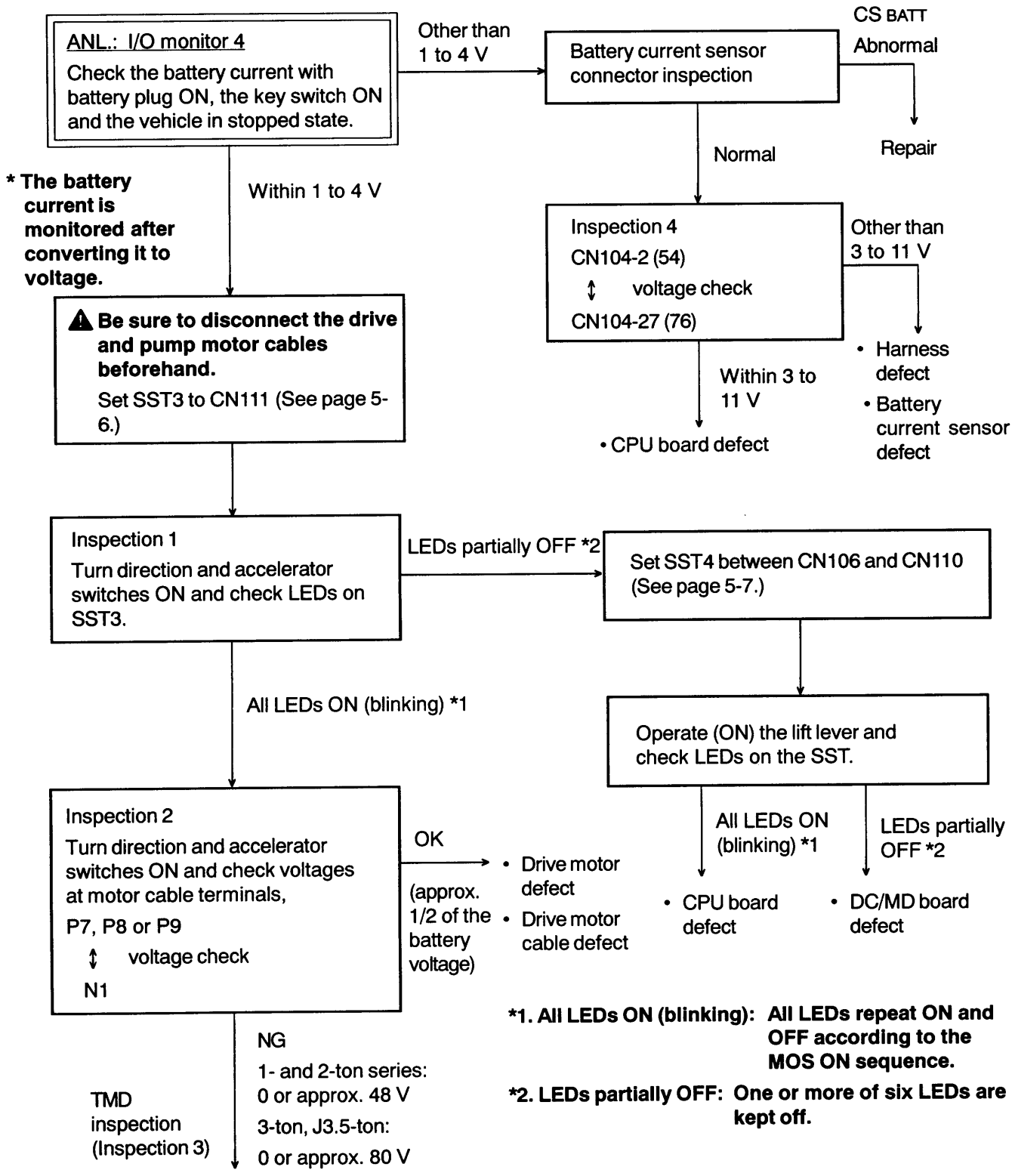
Related portion



Estimated causes

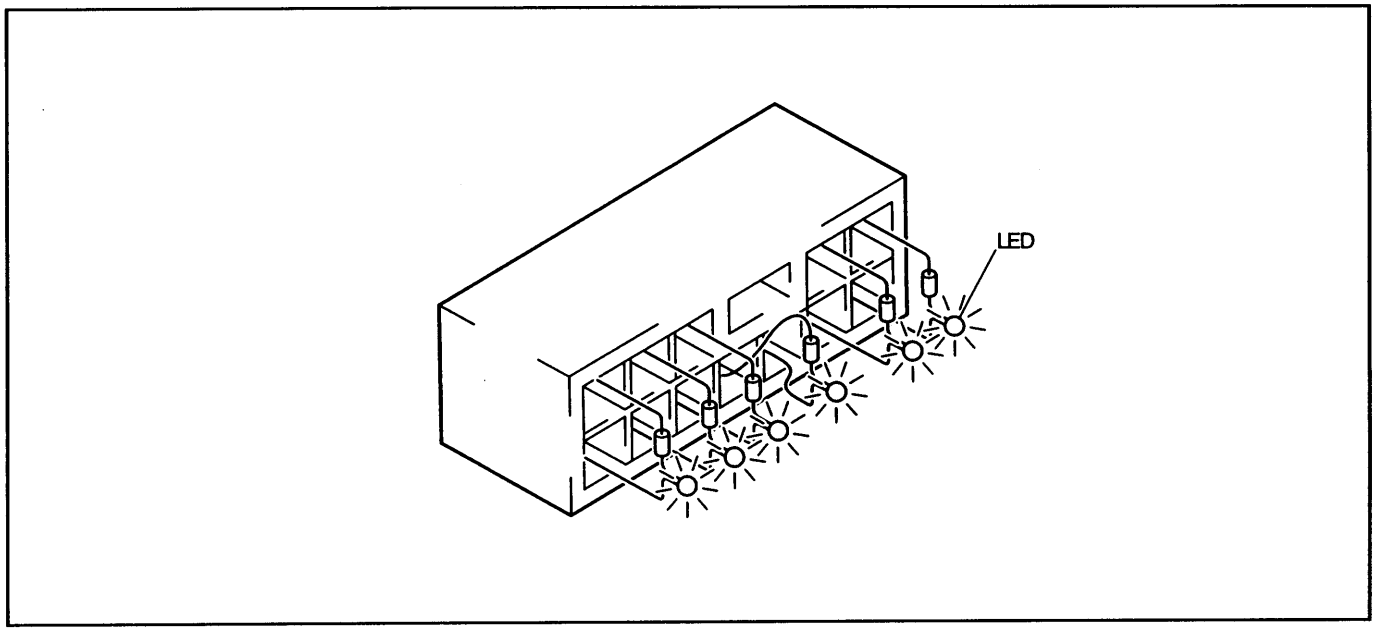
① TMD (MOS) defect
② Battery current sensor defect
③ DC/MD board defect
④ Short-circuiting of motor cable

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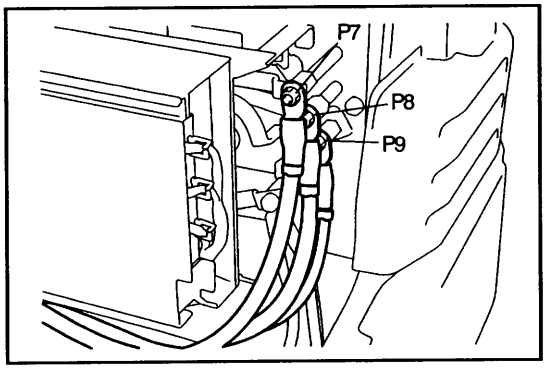
Inspection 1: SST LEDs ON Check
Abnormal positions of signal circuits to the TMD can be judged by observing ON or OFF of the SST LEDs.

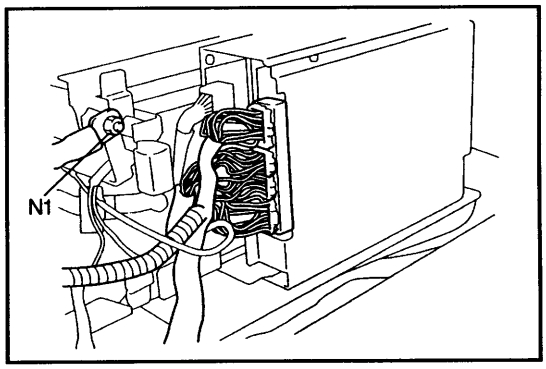


All LEDs ON (blinking) → Go to Inspection 2.
LEDs partially OFF → Set the SST4 between CN106 and CN110.

Inspection 2: Motor Cable Voltage Check
Battery plug ON, key switch ON

Measurement terminals	P7-N1, P8-N1, P9-N1
Tester range	200 V
Standard	Approx. 1/2 of the battery voltage



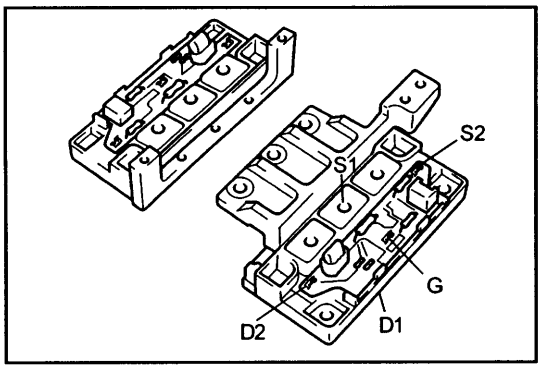


NG (1- to 2-ton series: 0 or approx. 48 V, 3-ton, J3.5-ton: 0 or approx. 80 V) → TMD inspectio 3
OK (approx. 1/2 of the battery voltage) → Drive motor cable defect or drive motor defect

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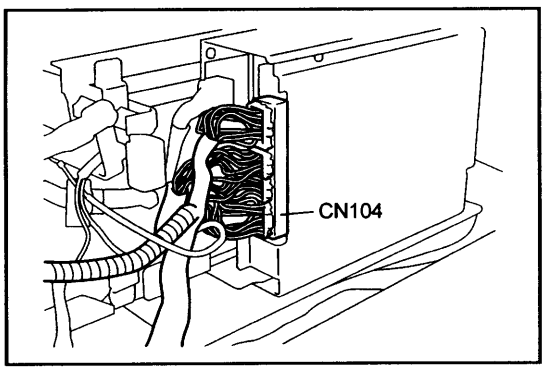
Inspection 3: Individual TMD inspection
Remove each TMD and inspect the respective TMD.

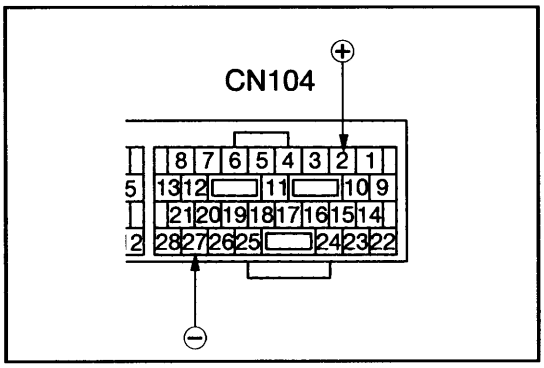
Measurement terminals	D1 (D2) ⊕ – S1 (S2) ⊖ D1 (D2) ⊕ – G ⊖ S1 (S2) ⊕ – D1 (D2) ⊖ S1 (S2) ⊕ – G ⊖ G ⊕ – D1 (D2) ⊖ G ⊕ – S1 (S2) ⊖
Tester range	Ω x 1k
Standard	D1 (D2) – S1 (S2) : Approx. 2 kΩ D1 (D2) – G : Approx. 12 kΩ S1 (S2) – D1 (D2) : ∞ S1 (S2) – G : Approx. 10 kΩ G – D1 (D2) : ∞ G – S1 (S2) : Approx. 1 kΩ



Inspection 4. Current sensor signal voltage check
Battery plug ON, key switch ON

Measurement terminals	CN104-2 (54) ⊕ – CN104-27 (76) ⊖
Tester range	50 V
Standard	Between 3 and 11 V



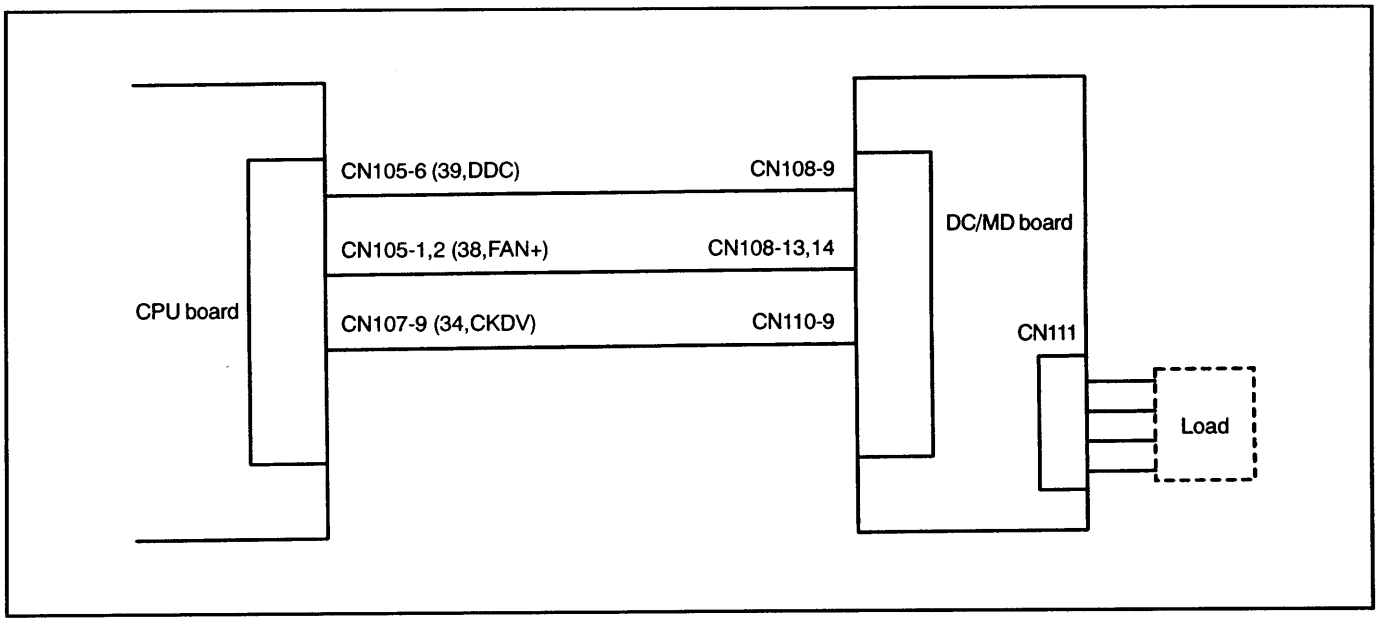


(Between 3 and 11 V) → CPU board defect
(Not between 3 and 11 V) → Harness defect, battery current sensor defect

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Error Code C0-3: Travel Drive Power Supply Abnormality

Related portion



Estimated causes

① Short-circuiting of load
② DC/MD board defect
③ Open circuit of harness

Turn the battery plug OFF and disconnect CN111. Turn the battery plug ON.

Does C0-3 disappear?

Change to C0-4 → Connect CN111 and check that the error code changes again to C0-3.

Battery plug OFF → Disconnect harness CN117 through CN119. Turn battery plug and key switch ON.

Change to C0-4 → Inspect the TMD A assy to which harnesses CN117 through CN119 are connected.

Remains as C0-3 as it is → Inspect the TM assy to which harnesses CN114 through CN116 are connected.

No

ANL.: ACTIVE
Set SST1 to CN105. Check the drive fan check signal. (See page 5-5.)

Check signal: 0 → • CPU board defect

Check signal: 1

Inspection 1
CN107-9 (34)
↕ continuity check
CN110-9 (34)

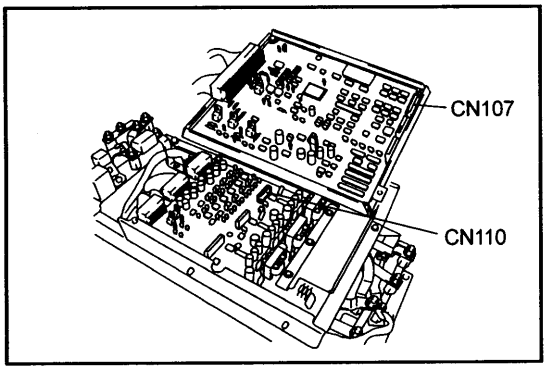
0 Ω
- DC/MD board defect
- Harness defect (between CN105 and CN108)

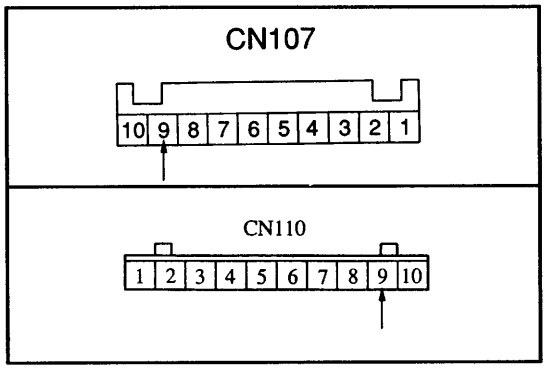
∞ Ω
- Battery plug check (CN107-CN110)

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Inspection 1:
Active Check Between CN107-9 and CN110-9
Battery plug OFF

Measurement terminals	CN107-9 (34) – CN110-9 (34) (REC)
Tester range	Ω x 1
Standard	0 Ω



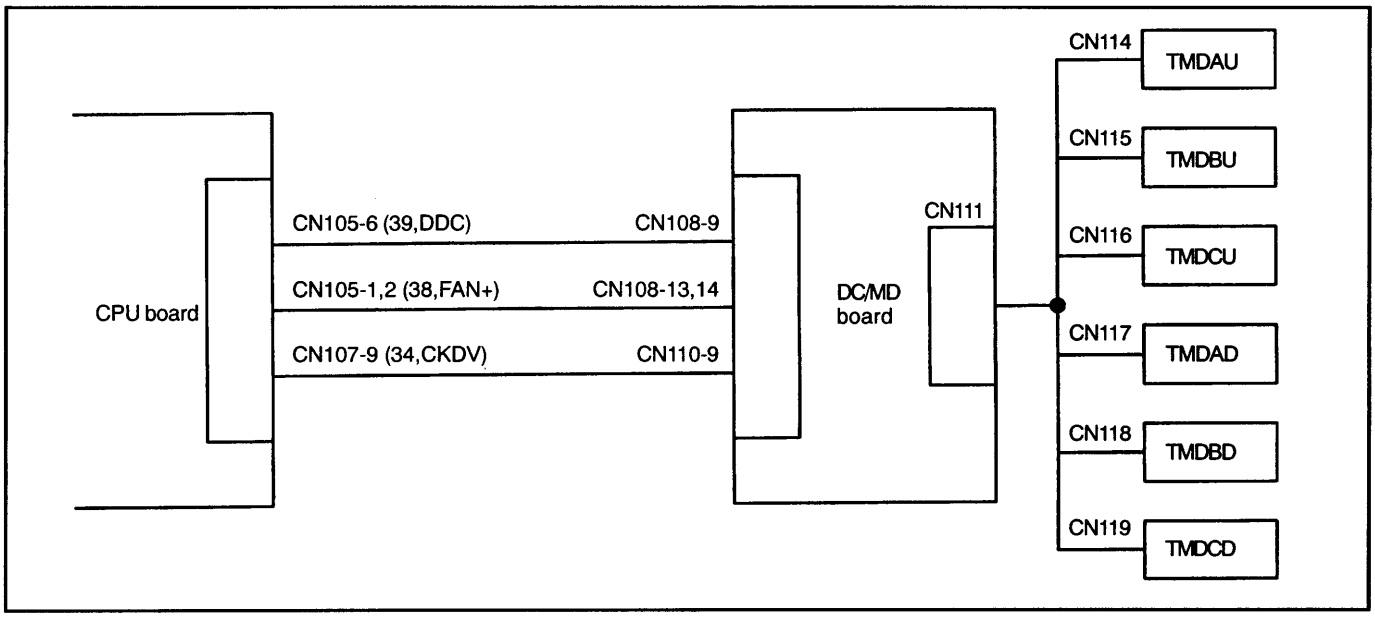


OK (0 Ω) → DC/MD board defect or harness defect (between CN105 and CN108)
NG (∞ Ω) → Harness defect (between CN107 and CN110)

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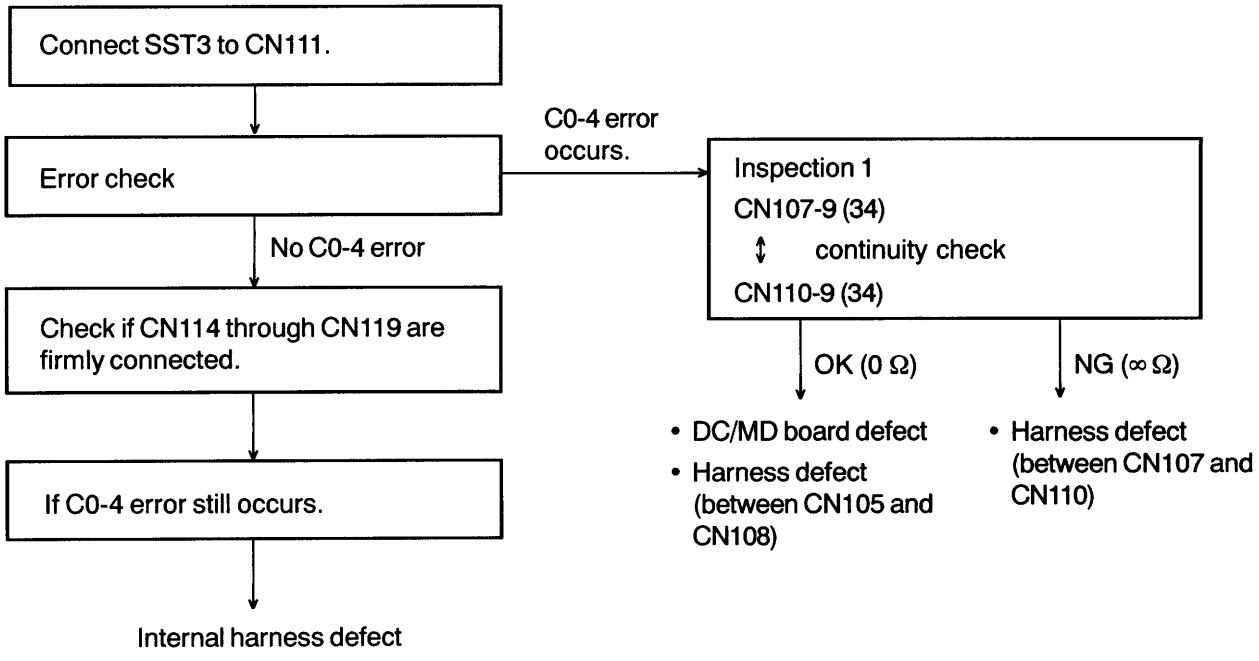
Error Code C0-4: Travel Drive Circuit Abnormality

Related portion



Estimated causes

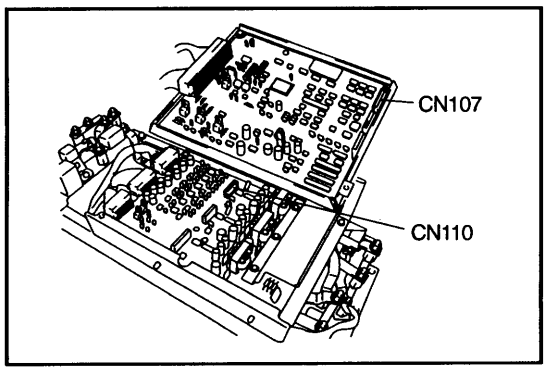
① DC/MD board defect
② Open circuit of internal harness
③ Disconnected MMP connector

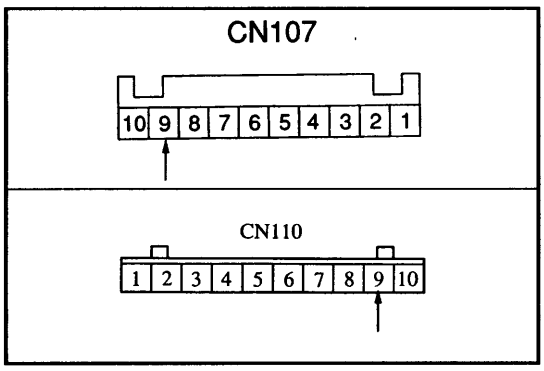


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Inspection 1:
Continuity Check Between CN107 and CN110
Battery plug OFF

Measurement terminals	CN107-9 (34) – CN110-9 (34) (REC)
Tester range	Ω x 1
Standard	0 Ω



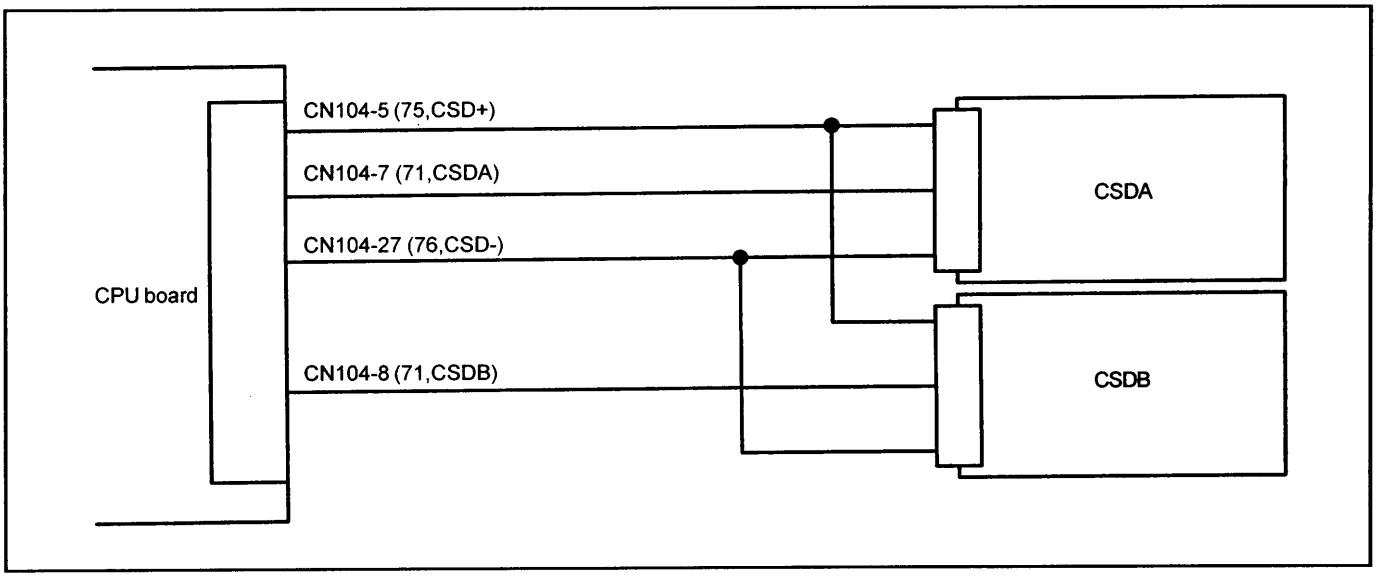


OK (0 Ω) → DC/MD board defect or harness defect (between CN105 and CN108)
NG (∞ Ω) → Harness defect (between CN107 and CN110)

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Error Code C1: Drive Current Sensor Abnormality

Related portion



Estimated causes

① Current sensor defect	③ CPU board defect
② Open circuit of harness	④ Poor electrical contact of contactor

Visually check the CSDA and CSDB connectors.

NG → Repair or replacement

*** Connector connection status:**
- Pin locking condition
- Check for disconnection when the harness is pulled slightly.

OK

Inspection 1
Turn the key switch ON.
CN104-7 (71)
↕ voltage check
N1

NG (other than 7 V ± 0 .5 V)

Inspection 3
Exchange the CSDA and CSDB.
CN104-7 (71)
↕ voltage check
N1

NG (other than 7 V ± 0.5 V) → • Harness defect

OK (7 V ± 0.5 V) → • CSDA defect

OK (7 V ± 0.5 V)

Inspection 2
Turn the key switch ON.
CN104-8 (72)
↕ voltage check
N1

NG (other than 7 V ± 0.5 V)

Inspection 4
Exchange the CSDA and CSDB.
CN104-8 (72)
↕ voltage check
N1

NG (other than 7 V ± 0.5 V) → • Harness defect

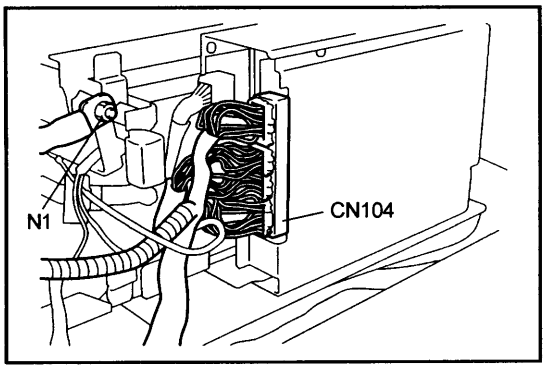
OK (7 V ± 0.5 V) → • CPU board defect

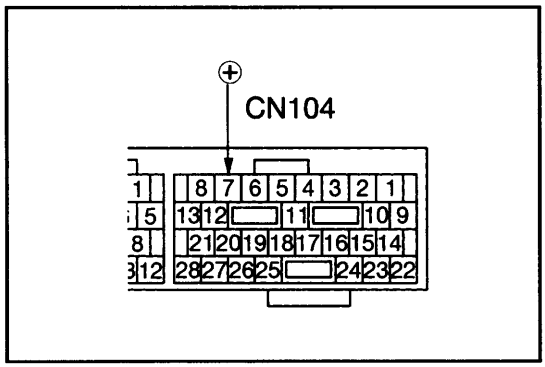
OK (7 V ± 0.5 V) → • CSDB defect

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Inspection 1:
CN104-N1 Voltage Check 1
Battery plug ON, key switch ON

Measurement terminals	CN104-7 (71) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V

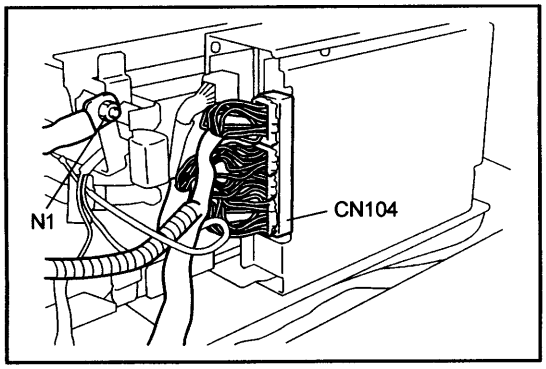


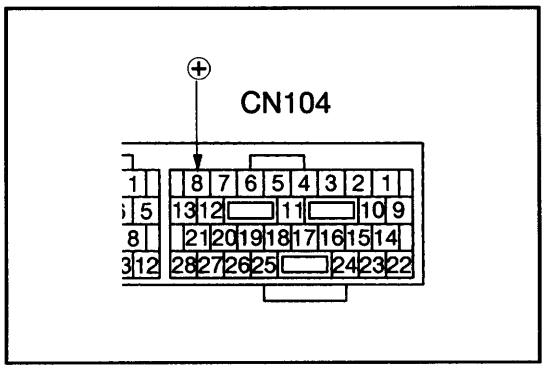


OK (7 V ± 0.5 V) → Go to Inspection 2.
NG (other than 7 V ± 0.5 V) → Go to Inspection 3.

Inspection 2:
CN104 – N1 Voltage Check 2
Battery plug ON, key switch ON

Measurement terminals	CN104-8 (72) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V



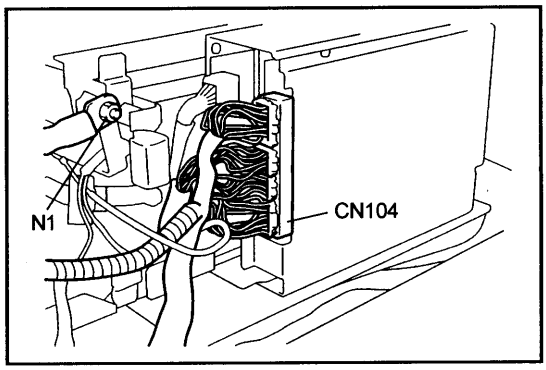


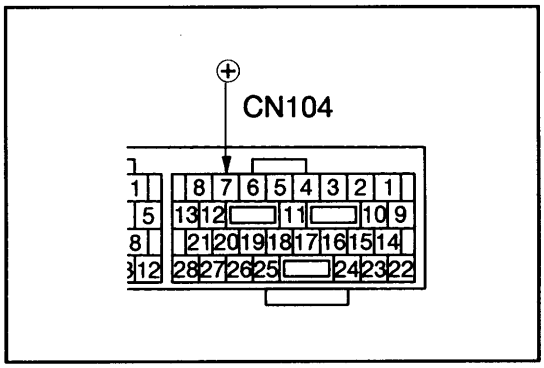
OK (7 V ± 0.5 V) → CPU board defect
NG (other than 7 V ± 0.5 V) → Go to Inspection 4.

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Inspection 3:
CN104-N1 Voltage Check 3
Battery plug ON, key switch ON, exchange CSDA and CSDB

Measurement terminals	CN104-7 (71) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V

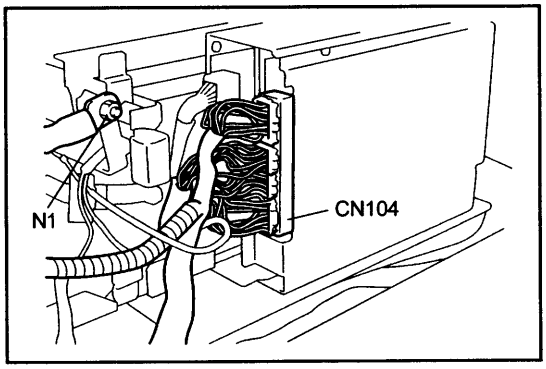


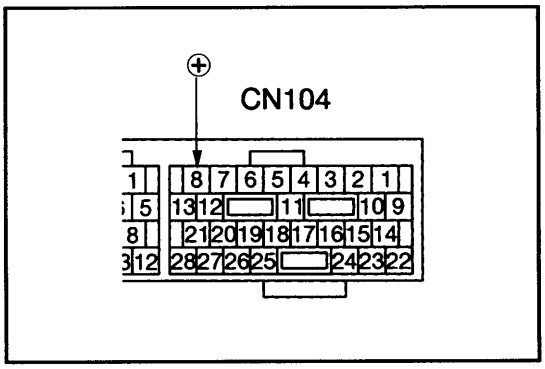


OK (7 V ± 0.5 V) → CSDA defect
NG (other than 7 V ± 0.5 V) → Harness defect

Inspection 4:
CN104 – N1 Voltage Check 4
Battery plug ON, key switch ON, exchange CSDA and CSDB

Measurement terminals	CN104-8 (72) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V





OK (7 V ± 0.5 V) → CSDB defect
NG (other than 7 V ± 0.5 V) → Harness defect

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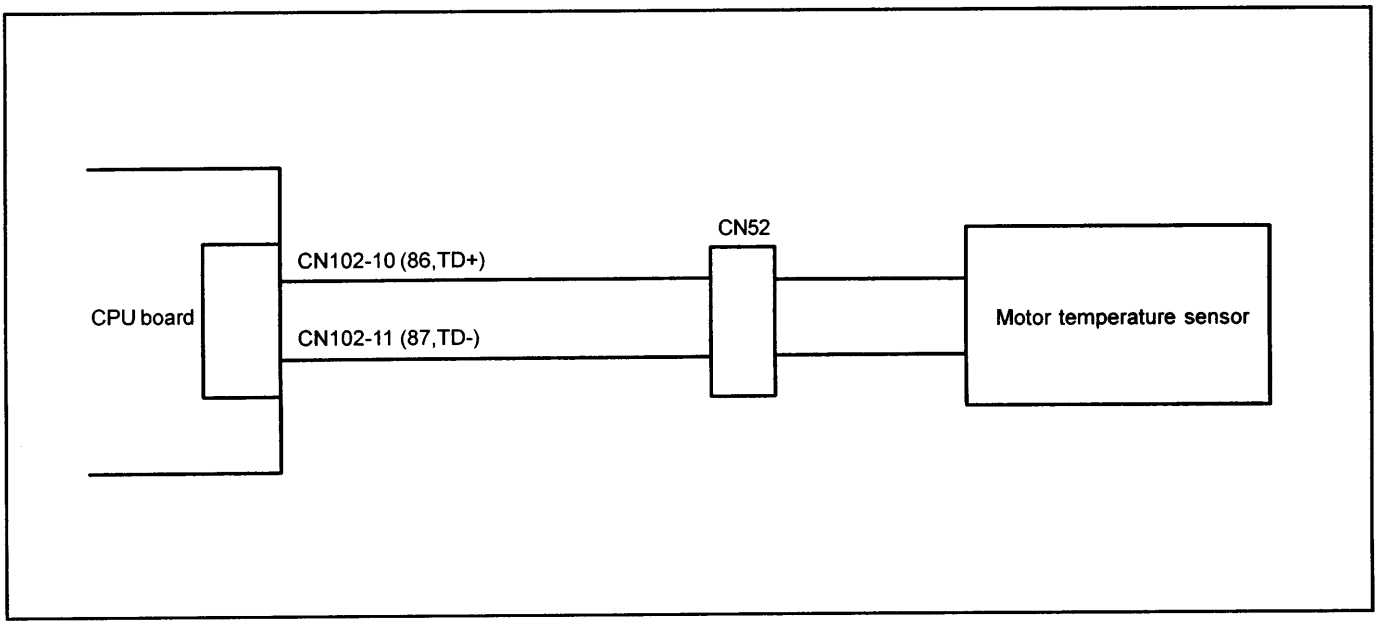
Safety monitor (Blinking): Drive motor overheat (C2-1)

Leave the vehicle as it is for a while (about 30 minutes).

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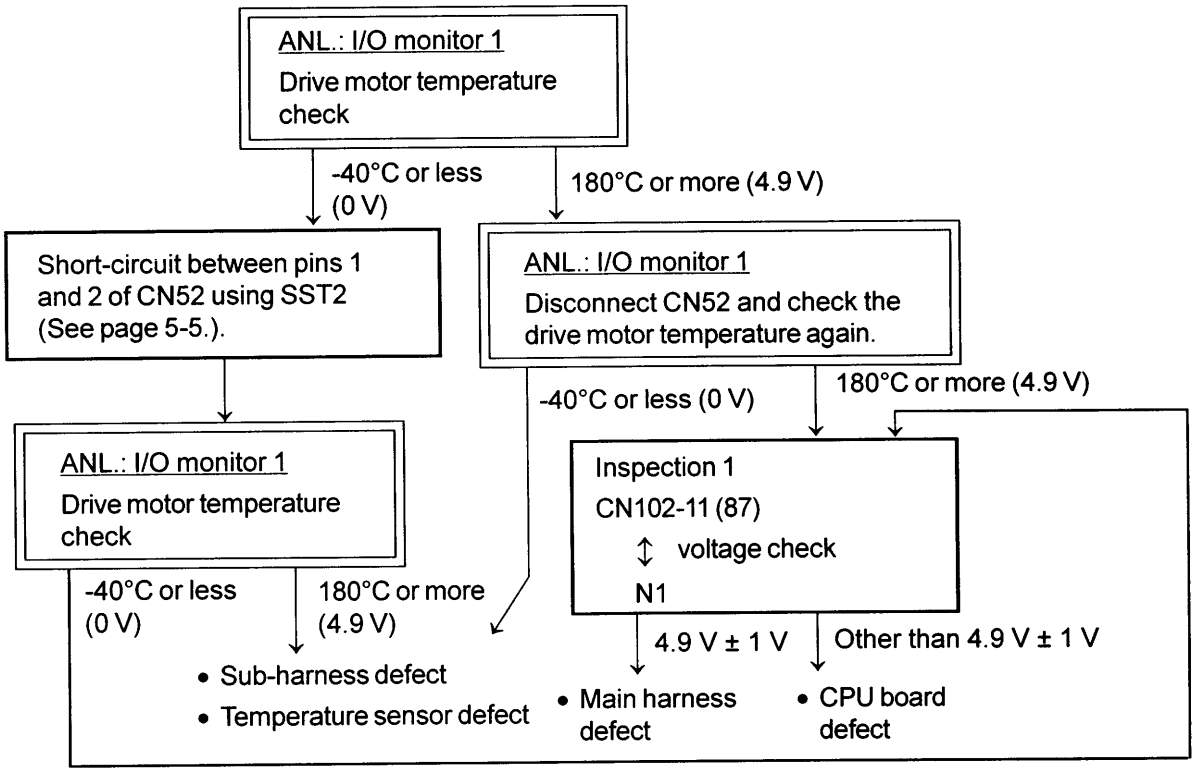
Error Code C2-2: Drive Motor Temperature Sensor Abnormality

Related portion



Estimated causes

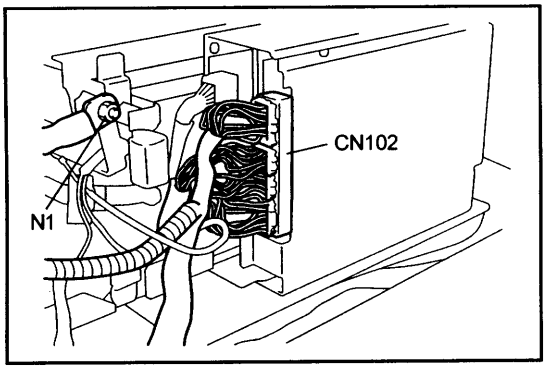
① Temperature sensor defect
② Harness defect

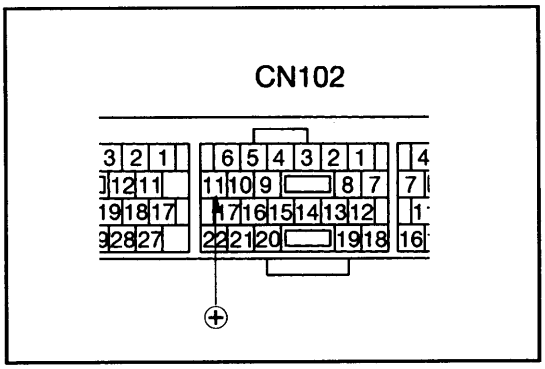


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Inspection 1:
CN102 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	CN102-11 (87) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	4.9 V ± 1 V



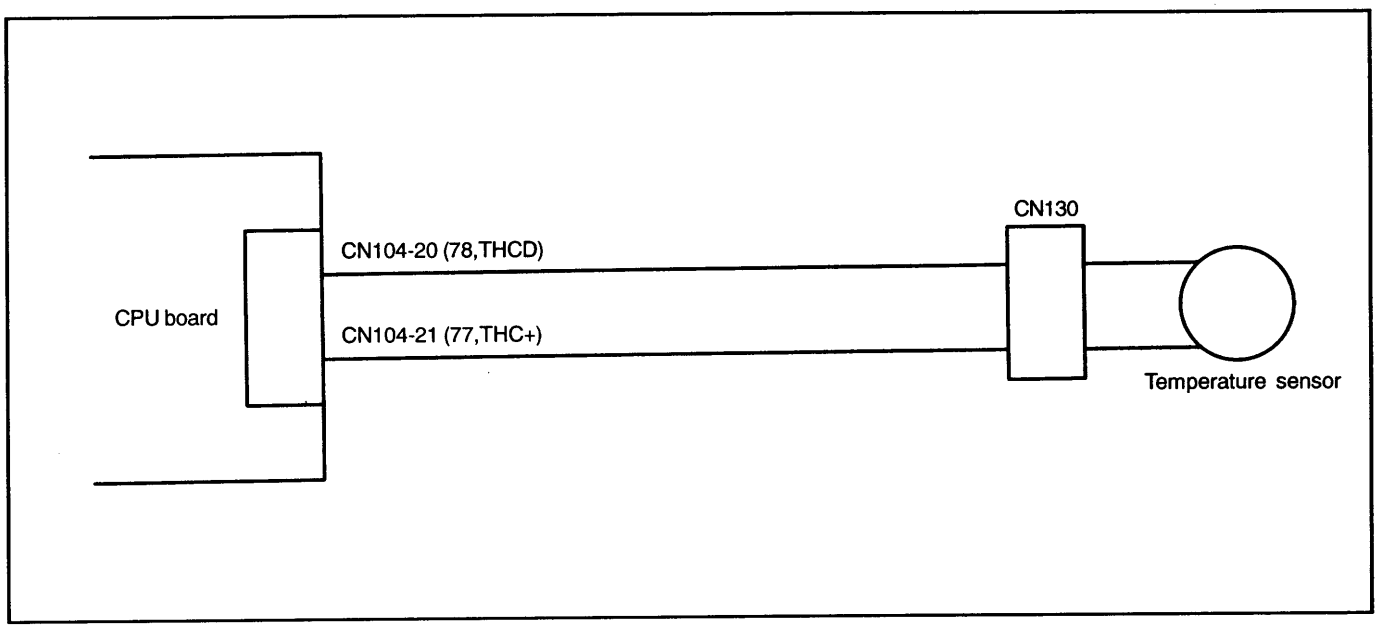


OK (4.9 V ± 1 V) → Main harness defect
NG (other than 4.9 V ± 1 V) → CPU board defect

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Error Code C3: Drive Main Circuit Temperature Sensor Abnormality

Related portion



Estimated causes

① Disconnected connector or open circuit of harness
② Temperature sensor defect

ANL.: I/O monitor 1
Disconnect CN130 and check the drive main circuit temperature sensor.

Less than -40°C (less than 0.1 V)

197°C or more (4.8 V or more)
• Check short-circuiting between CN104-20 and -21.

ANL.: I/O monitor 1
Disconnect CN130 and check the drive main circuit temperature sensor.

197°C or more (4.8 V or more)
• Temperature sensor defect

Less than -40°C (less than 0.1 V)

Inspection 1
Check temperature of CN130 on the temperature sensor side.

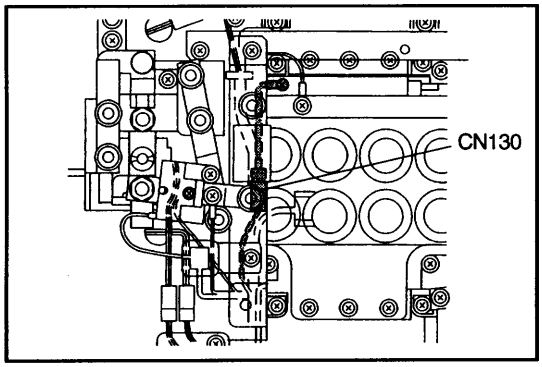
OK (approx. 11 ~ 12 kΩ (at 25°C))
• Open circuit of CN104-20 or CN104-21

NG (200 kΩ or more)
• Temperature sensor defect

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Inspection 1:
Temperature Sensor Resistance Check
Battery plug OFF

Measurement terminals	Both terminals of CN130 connector (temperature sensor side)
Tester range	kΩ x 1
Standard	Approx. 11 ~ 12 kΩ (at 25°C)

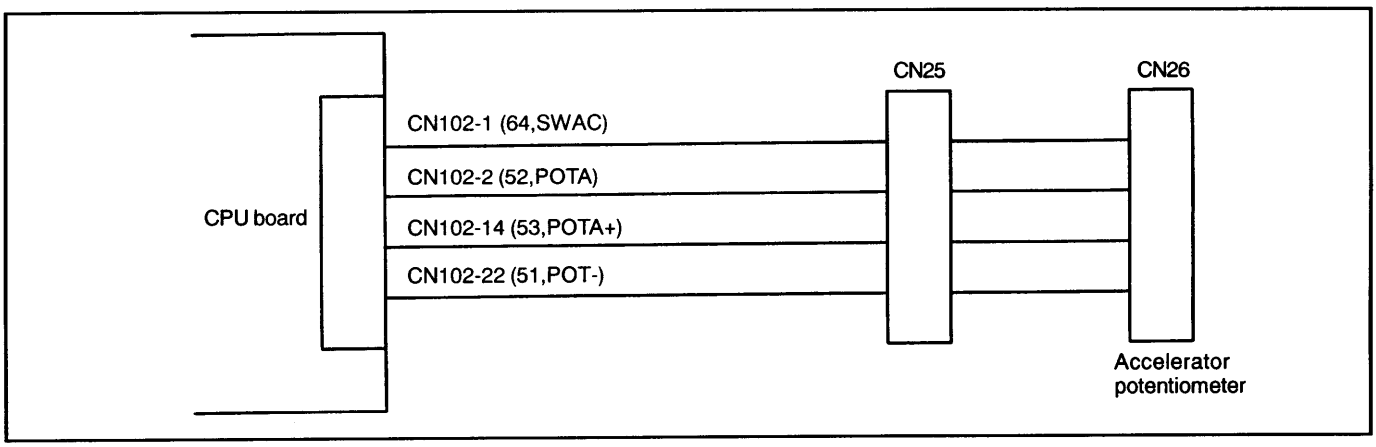


OK (approx. 11 ~ 12 kΩ) → Open circuit of CN104-20 or CN104-21 harness
NG (200 kΩ or more) → Temperature sensor defect

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Error Code C4: Acceleration Potentiometer Abnormality

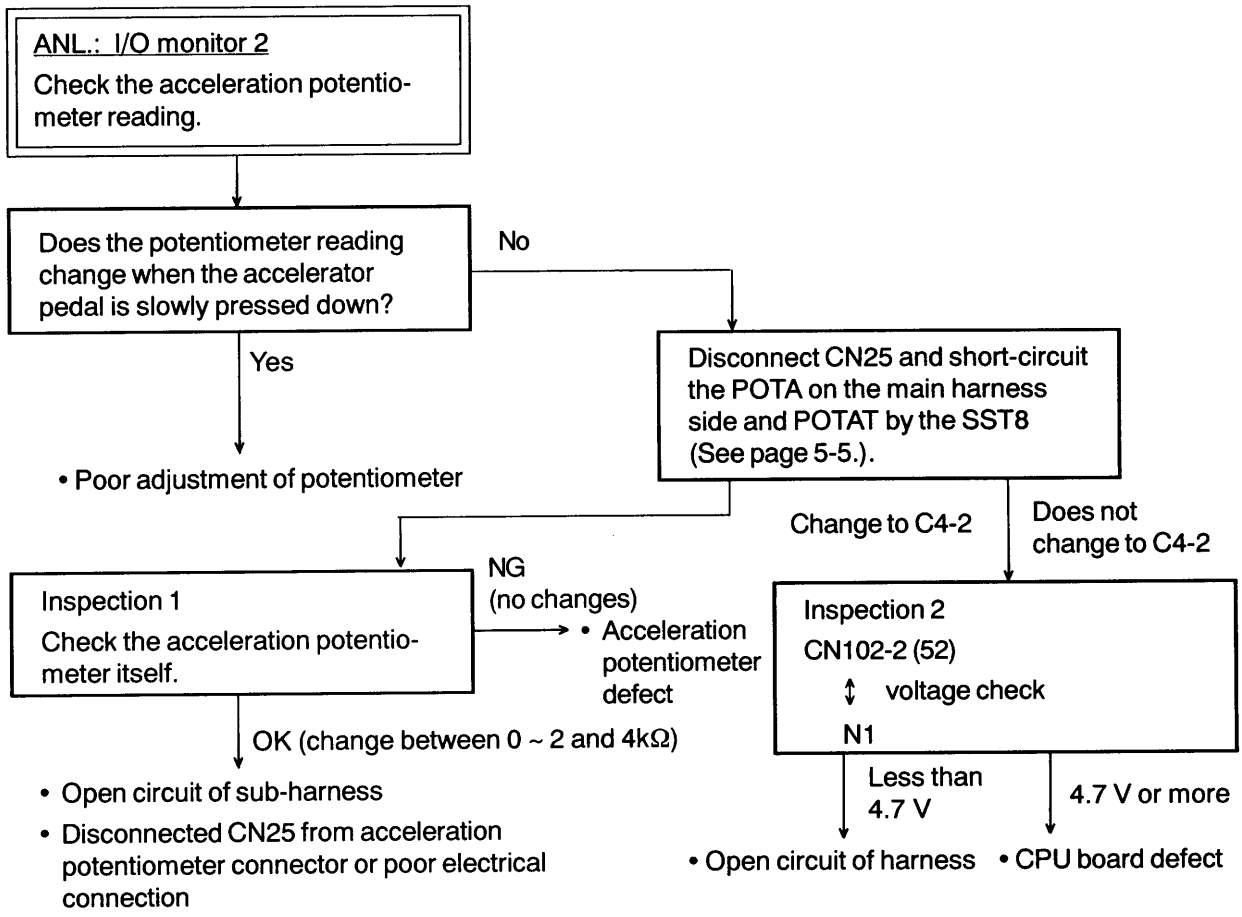
Related portion



Estimated causes

① Poor adjustment or mounting of acceleration potentiometer
② Acceleration potentiometer defect
③ Open circuit of harness

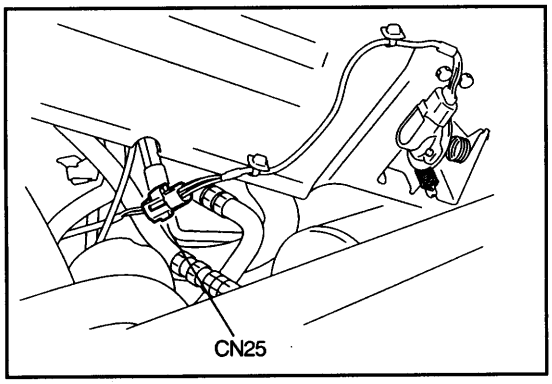
<For diag memory C4-1>

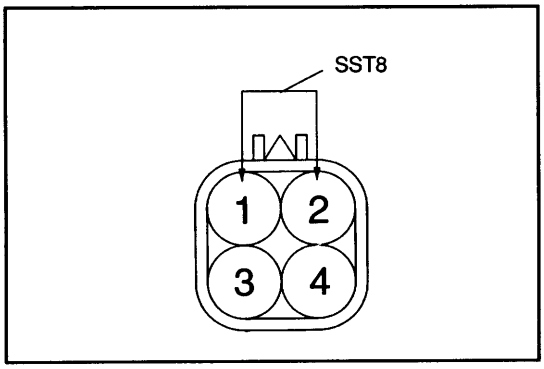


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Inspection 1:
Acceleration Potentiometer Individual Check

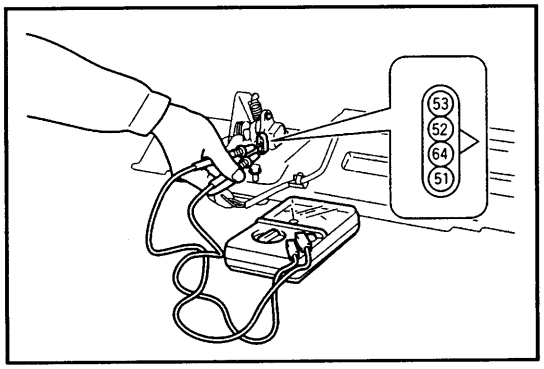
SST Setting Procedure
Battery plug OFF
Disconnect connector CN25 and set the SST8 to the connector on the main harness side.





Battery plug OFF, acceleration potentiometer connector disconnection

Measurement terminals	CN26-3 (52) – CN26-4 (53)
Tester range	Ω x 1
Standard	Change between 0 ~ 2 and 4kΩ

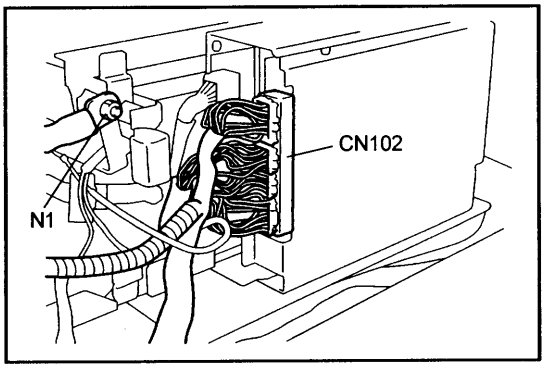


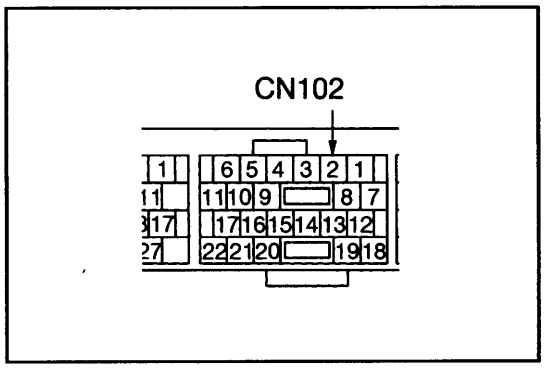
OK (change between 0 ~ 2 and 4kΩ) → Open circuit of sub-harness or disconnected CN25 or CN26
NG (no change) → Acceleration potentiometer defect

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Inspection 2:
CN102 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	CN102-2 (52) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Less than 4.7 V

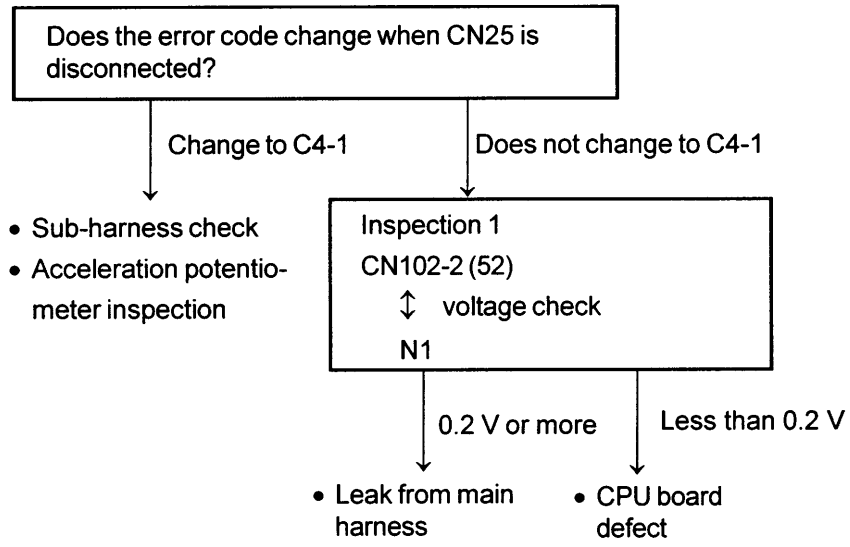




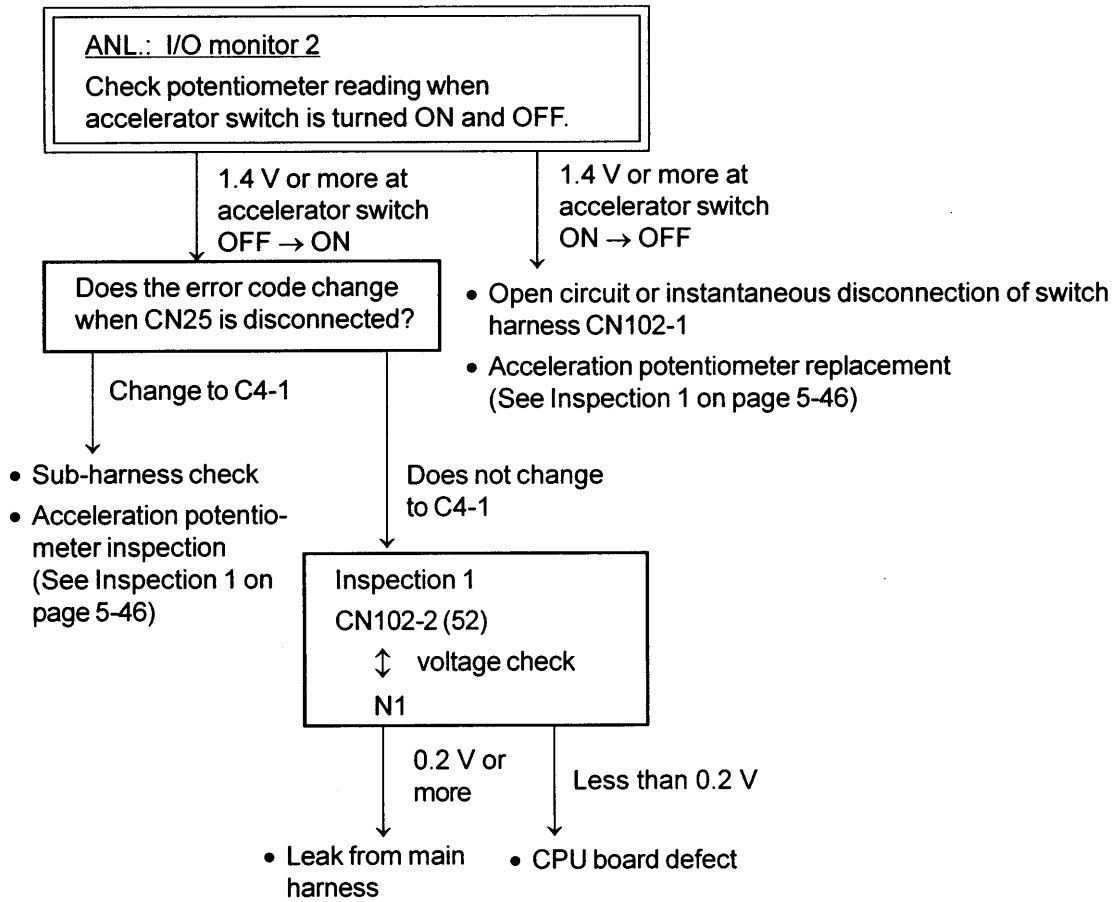
Less than 4.7 V → Open circuit of main harness
4.7 V or more → CPU board defect

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<For diag memory C4-2 or C4-3>



<For diag memory C4-4>

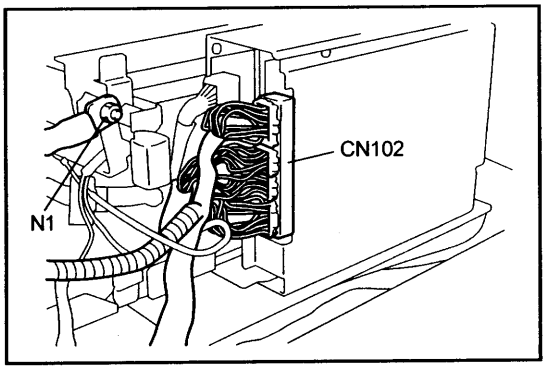


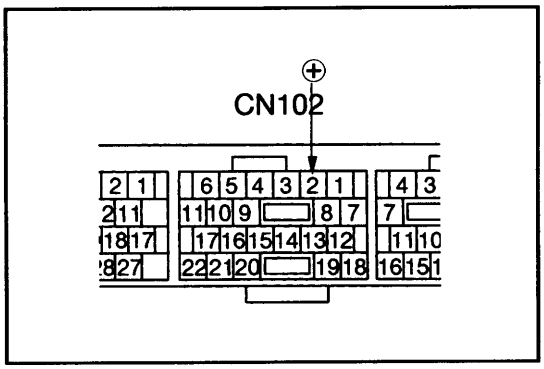
Inspection 1:
Check voltage between CN102-2 and N1. See Inspection 1 of Diag memory C4-2.

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Inspection 1:
CN102-2 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	CN102-2 (52) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	0.2 V or more



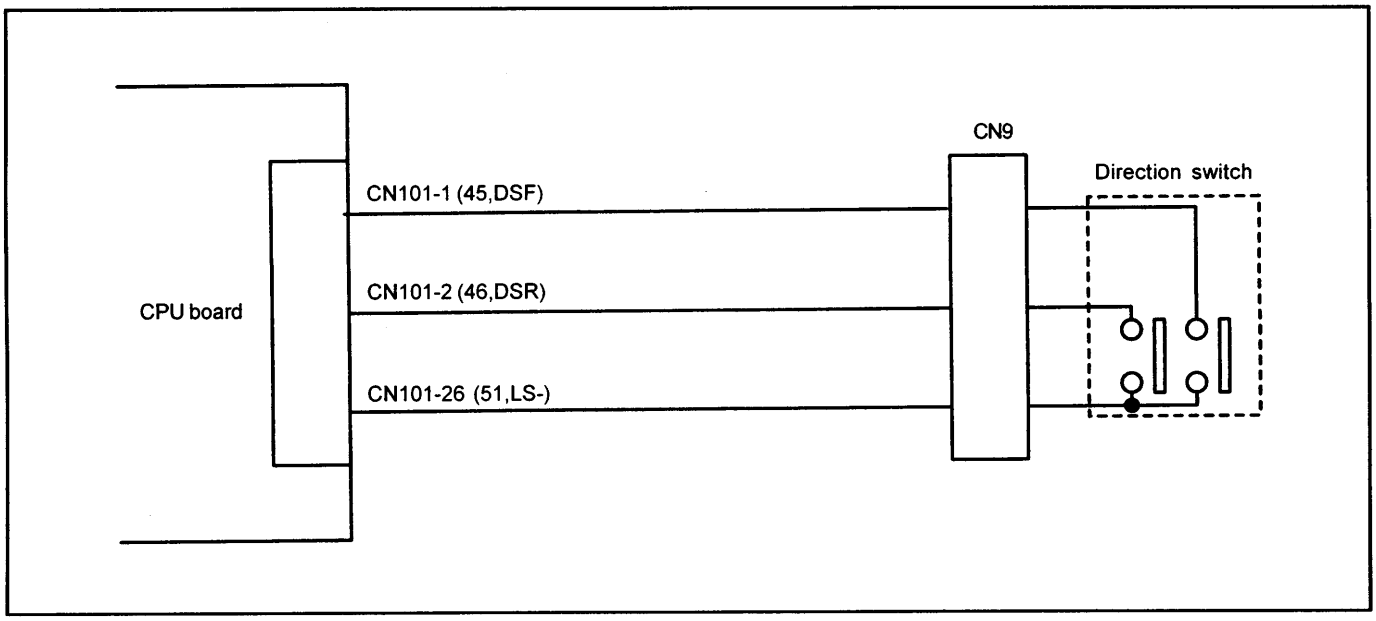


0.2 V or more → Leak from main harness
Less than 0.2 V → CPU board defect

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Error Code C7: Direction Switch Abnormality

Related portion



Estimated causes

① Short-circuiting of direction switch
② Short-circuiting of harness

ANL.: I/O monitor 2
Disconnect CN9 and conduct the ON/OFF check with direction switch at the neutral state.

Turns OFF → • Direction switch inspection

DSF or DSR turns ON

Inspection 1
CN101-1 (45) (at DS_F ON)
CN101-2 (46) (at DS_R ON)
↕ voltage check
N1

NG (0 V) → • Short-circuiting of main harness

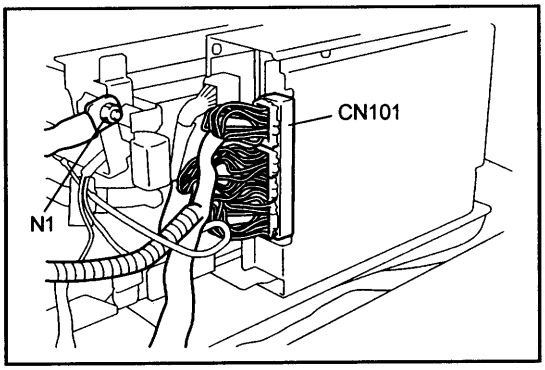
OK (approx. 5 V)

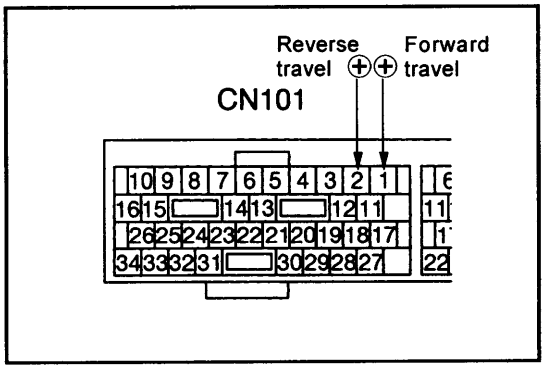
• CPU board defect

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Inspection 1:
CN101 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	Forward: CN101-1 (45) ⊕ – N1 ⊖ Backward: CN101-2 (46) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Approx. 5 V





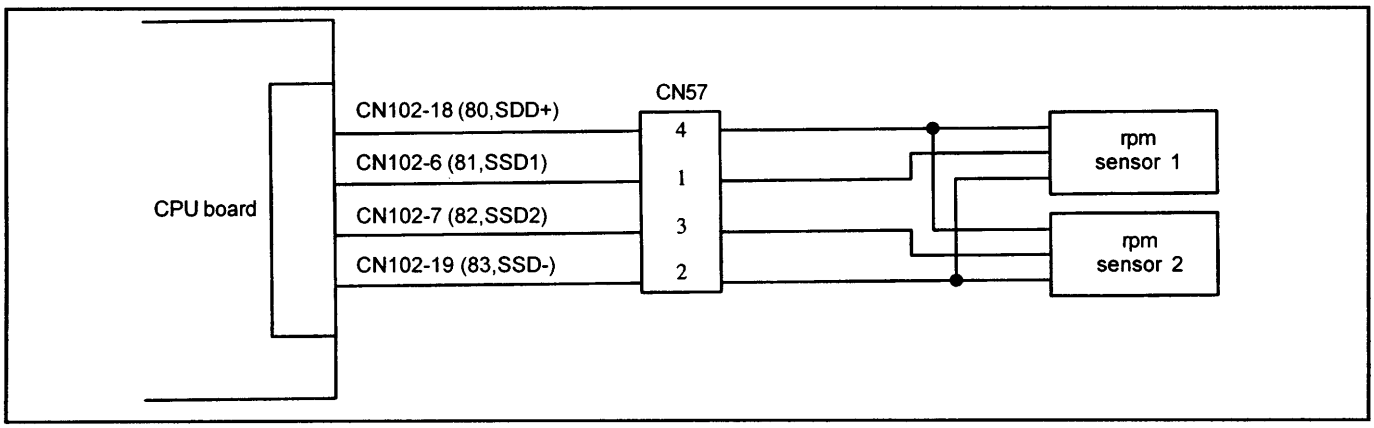
OK (approx. 5 V) → CPU board defect
NG (0 V) → Short-circuiting of main harness

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Error Code C8: Drive Rotary Sensor Abnormality

Diagnosis memory C8-1·C8-2

Related portion



Estimated causes

① Rotary sensor defect
② Open circuit of harness
③ CPU board defect

*** Make sure to jack up the vehicle front and support the frame by woods to float the front wheels, before beginning the troubleshooting.**

ANL.: I/O monitor 2
Check rotary sensor readings during driving.

Check which sensor reads 0

Set the SST6.
(See page 5-9.)

Same sensor reads 0

Short-circuit the connector pin of which SSD1 or SSD2 reading of 0 remains at the same sensor with the SSD pin - using SST2 (harness for short-circuiting).
(See page 5-5.)

Sensor reading 0 changed

- Open circuit of sub-harness
- Rotary sensor defect

Inspection 1
CN102-6 (81) (SSD1)
CN102-7 (82) (SSD2)
↕ voltage check
N1

0 V

- CPU board defect

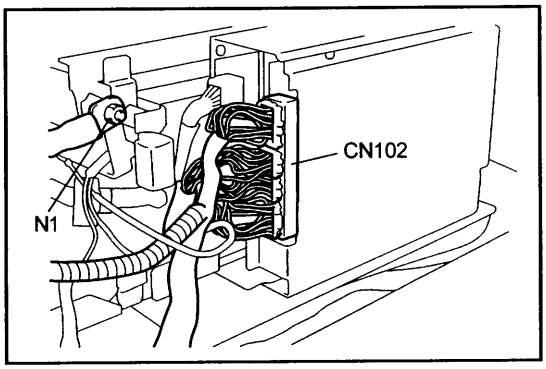
Approx. 15 V

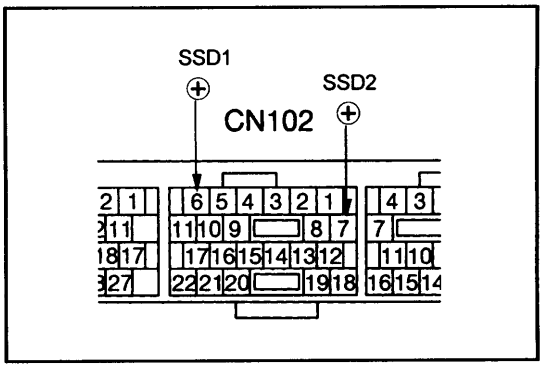
- Main harness open circuit

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Inspection 1:
CN102 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	SSD1: CN102-6 (81) ⊕ – N1 ⊖ SSD2: CN102-7 (82) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	0 V



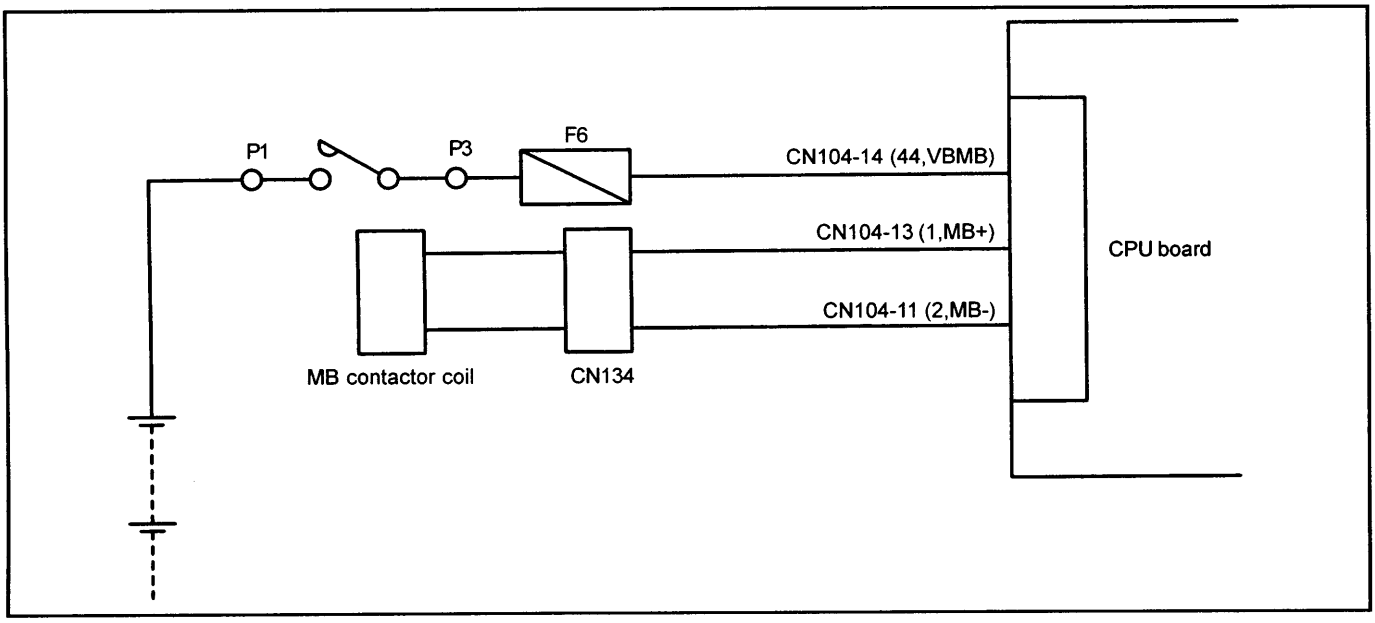


NG (approx. 15 V) → Open circuit of main harness
OK (0 V) → CPU board defect

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Error Code CB-1: MB Abnormality (Open)

Related portion



Estimated causes

① Blown off F6 fuse
② MB ON defect
③ Open circuit of harness

Is the MB ON sound heard at key switch ON?

No → Go to Ⓐ on the next page.

Yes

Inspection 1
F6 fuse check

NG (∞ Ω) → F6 Replacement

OK (0 Ω)

Inspection 2
P3
↕ voltage check
N1

NG (0 V)

Inspection 4
P1
↕ voltage check
N1

NG (0 V)
- Battery cable defect
- Poor electric connection of copper bar

OK
(1- to 2-ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V)
- Poor electric connection of MB contactor

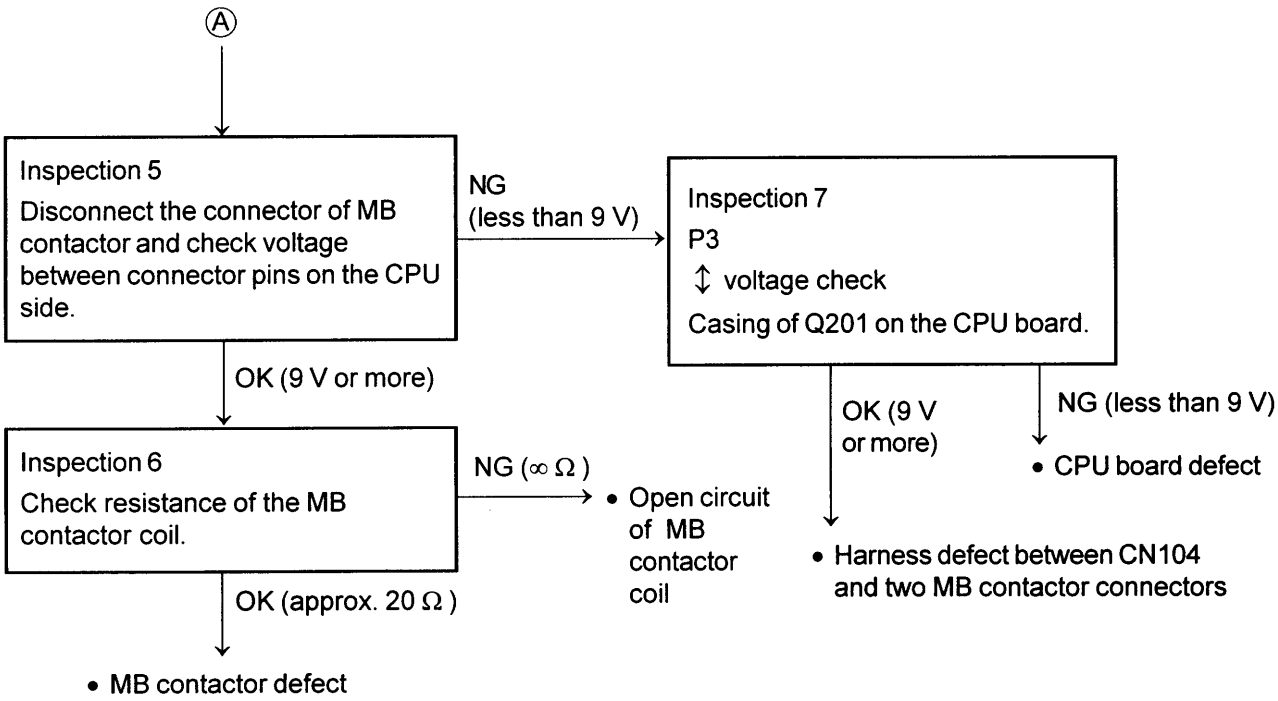
OK

Inspection 3
CN104-14 (44)
↕ voltage check
CN104-10 (N2)

NG (0 V)
- Harness check

OK
(1- to 2-ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V)
- CPU board defect

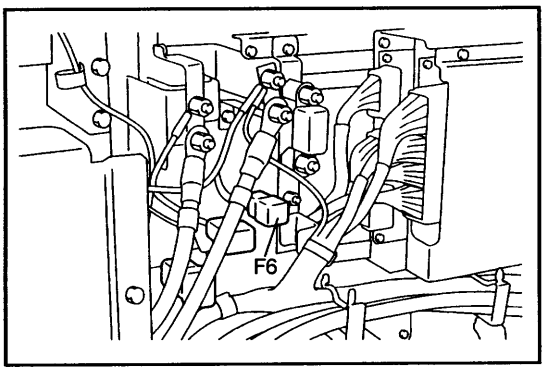
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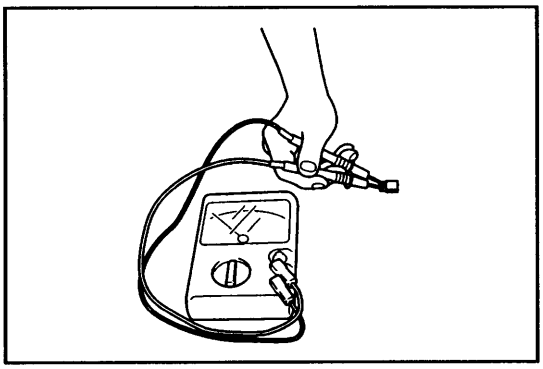


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Inspection 1:
F6 Fuse Check
Battery plug OFF, removed F6 fuse

Measurement terminals	Both ends of F6 fuse
Tester range	Ω x 1
Standard	0 Ω

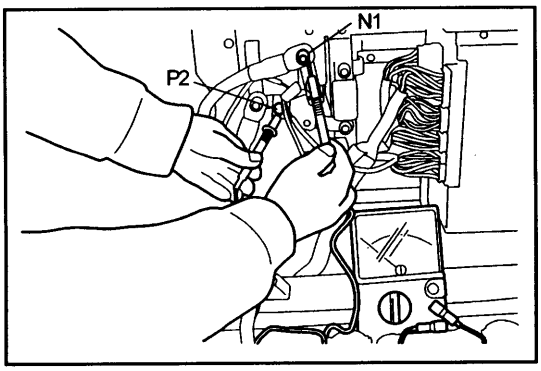




OK (0 Ω) → Go to Inspection 2.
NG (∞ Ω) → F6 fuse replacement

Inspection 2:
P2 – N1 Voltage Measurement
Battery plug ON, key switch ON

Measurement terminals	P2 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1- to 2-ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V (battery voltage)

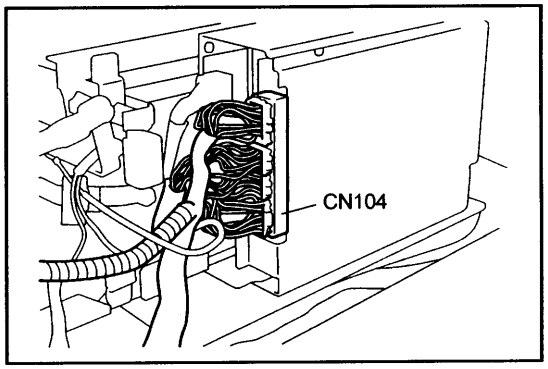


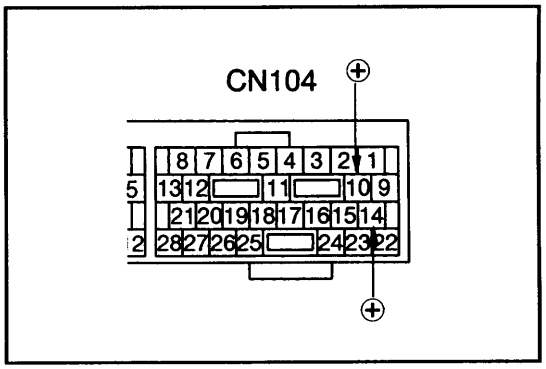
OK (battery voltage) → Go to Inspection 3.
NG (0 V)→ Go to Inspection 4.

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Inspection 3:
CN104 – CN104 (N2) Voltage Check
Battery plug ON, key switch ON

Measurement terminals	CN104-14 (44) ⊕ – CN104-10 (N2) ⊖
Tester range	DC 200 V
Standard	1- to 2-ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V (battery voltage)

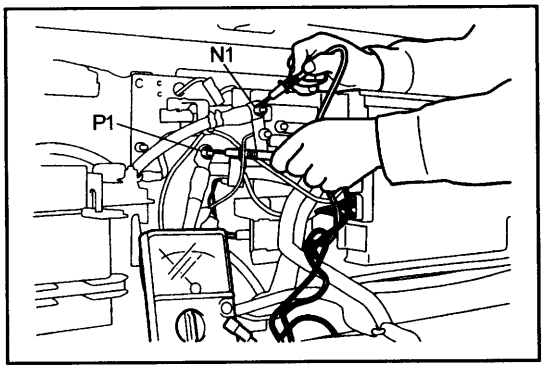




OK (battery voltage) → CPU board defect
NG (0 V) → Harness defect

Inspection 4:
P1 – N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	P1 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1- to 2-ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V (battery voltage)

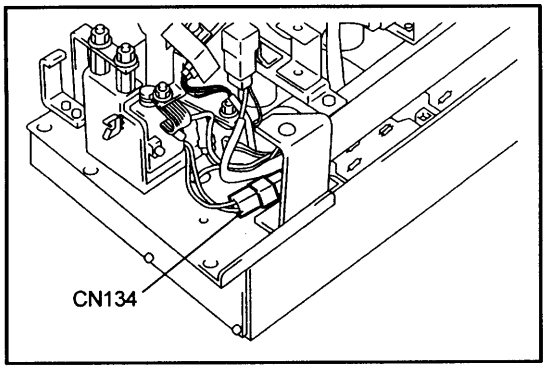


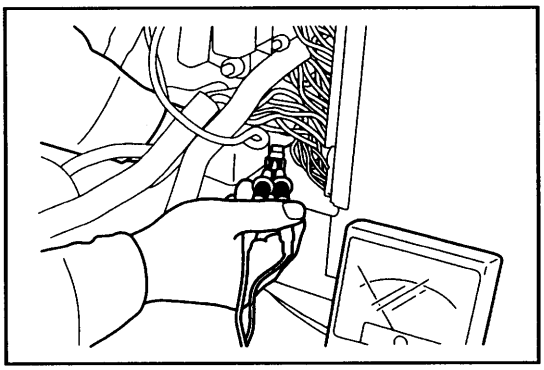
OK (battery voltage) → Poor electrical contact of MB contactor
NG (0 V)→ Battery cable defect or poor electrical connection of copper bar

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Inspection 5:
MB Contactor Signal Voltage Check
Disconnected MB contactor connector (CN134), battery plug ON, key switch ON

Measurement terminals	CN134-1 (W-R) ⊕ – CN134-2 (A-R) ⊖
Tester range	DC 10 V
Standard	9 V or more

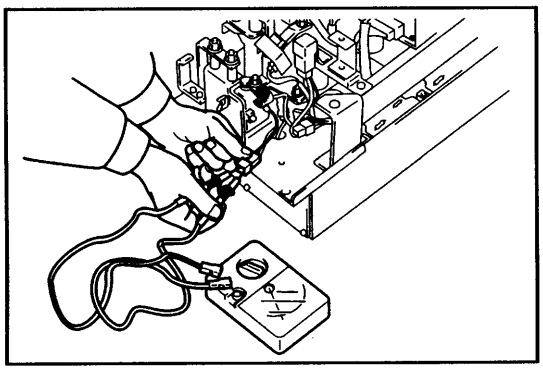




OK (9 V or more) → Go to Inspection 6.
NG (less than 9 V) → Go to Inspection 7.

Inspection 6:
MB Contactor Coil Resistance Check
Battery plug OFF

Measurement terminals	Both terminals of CN134 (on contactor side)
Tester range	Ω x 1
Standard	Approx. 20 Ω

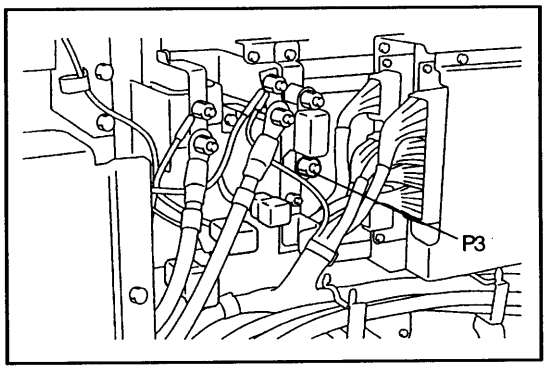


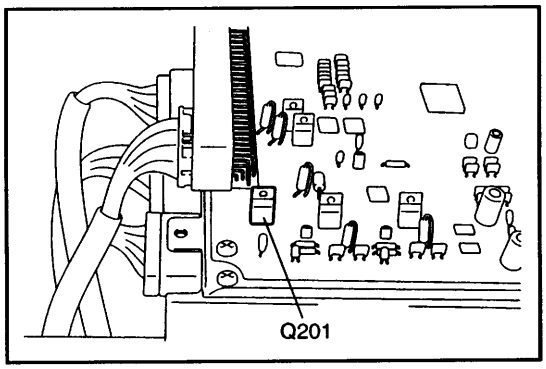
OK (approx. 20 Ω) → MB contactor defect
NG (∞ Ω) →Open circuit of MB contactor coil

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Inspection 7. Voltage measurement between P3 and Q201 on CPU board

Measurement terminals	P3 ⊕ – Q201 on CPU board ⊖
Tester range	DC 50 V
Standard	9 V or more



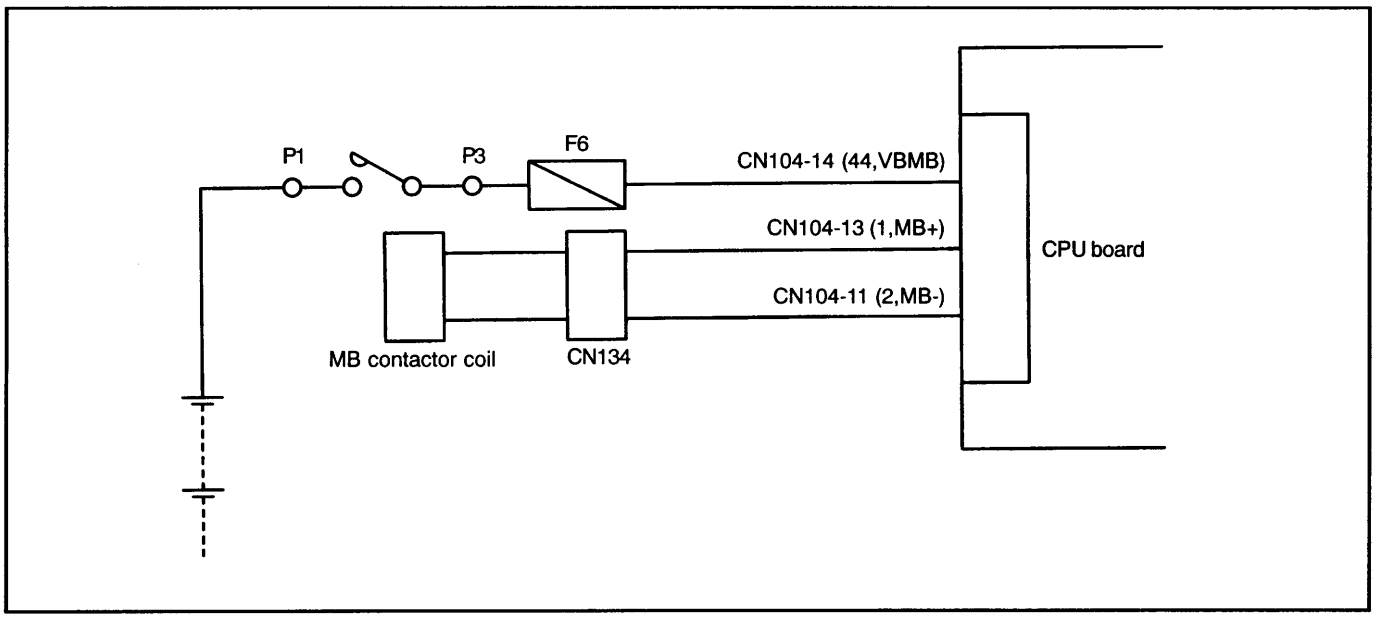


OK (9 V or more) → Harness defect between CN104 and MB connector
NG (less than 9 V) → CPU board defect

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Error Code CB-2: MB Fusing

Related portion



Estimated causes

① Fusing of MB
② No revolution of material handling motor (material handling main circuit abnormality)

Are ON/OFF sounds heard at turning key switch ON and OFF?

No → Inspection 2
Check the MB contactor signal voltage at key switch OFF.

- NG (8 to 10 V) → • CPU board defect
- OK (0 V) → • MB contactor defect

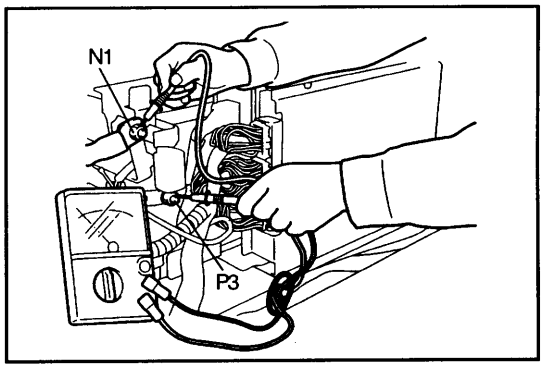
Yes → Inspection 1
P3
↕ voltage check
N1
when the key switch is turned OFF.

- No voltage change upon key switch OFF → • Main material handling circuit abnormality
  • Occurrence an error causing material handling prohibition
- Becomes 15 V or less 5 sec after key switch OFF → • CPU board defect

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Inspection 1:
P3 – N1 Voltage Check
Battery plug ON, voltage check at key switch OFF

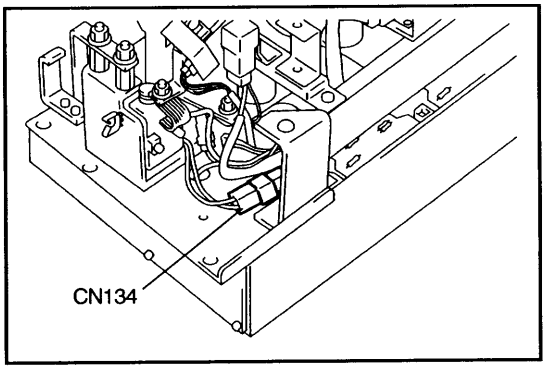
Measurement terminals	P3 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	Becomes 15 V or less 5 sec after key switch OFF

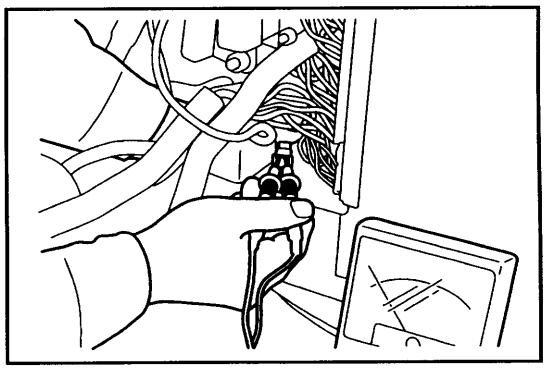


Becomes 15 V or less 5 sec after key switch OFF → CPU board defect
Voltage does not change after key switch OFF→ Material handling circuit defect or occurrence of an error prohibiting material handling

Inspection 2:
MB Contactor Signal Voltage Check
Battery plug ON, key switch ON

Measurement terminals	CN134-1 (1) ⊕ – CN134-2 (2) ⊖
Tester range	DC 10 V
Standard	0 V





OK (0 V) → MB contactor defect
NG (8 V to 10 V) → CPU board defect

Error Code CF1-CF5: CPU Abnormal

Related portion

CPU Board

Estimated causes

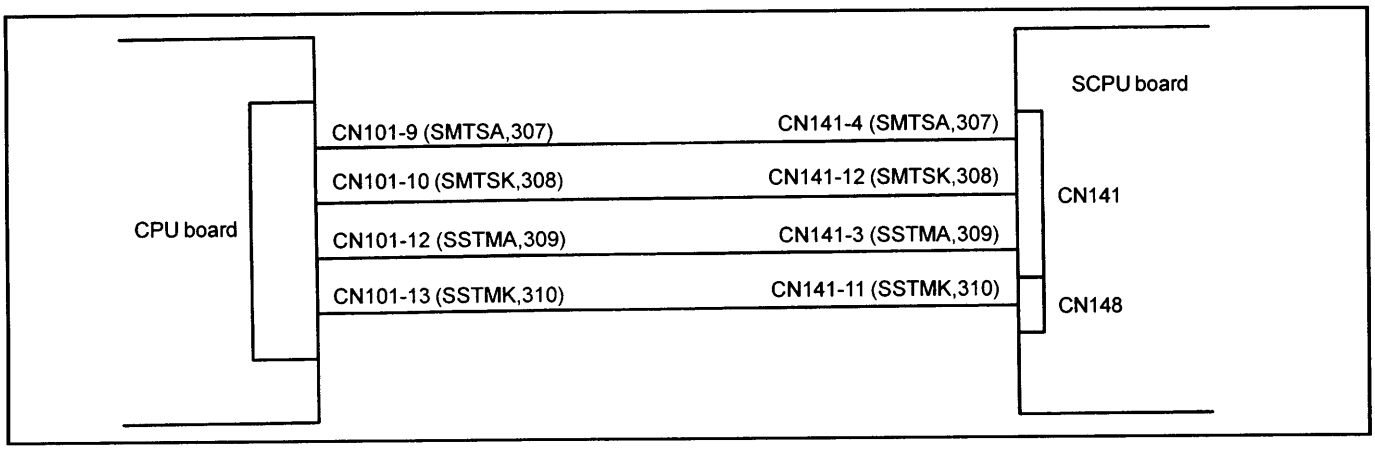
① CPU Board faulty

*** In case CF1-CF5 indicated, replace CPU board due to fault.**

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Error Code FE: Communication from PS Controller Abnormality

Related portion

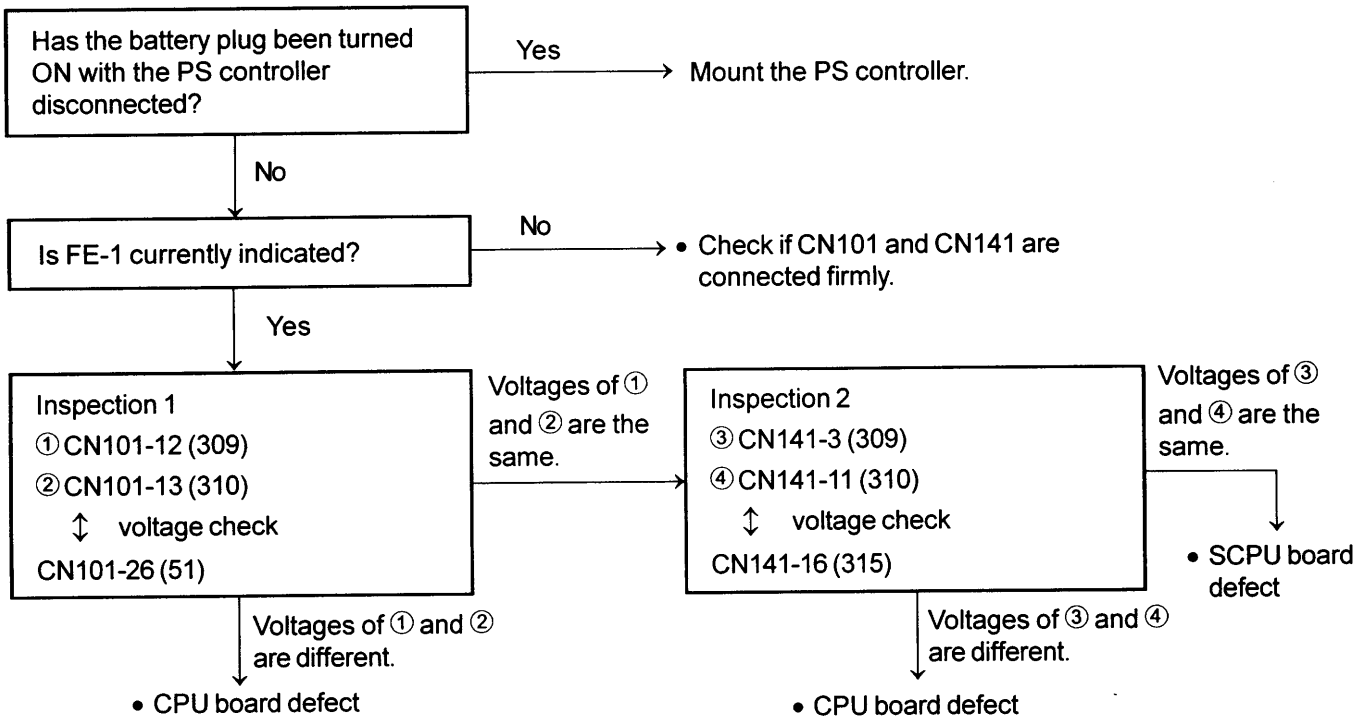


Estimated causes

① SCPU board defect
② Disconnected PS controller
③ Open circuit of harness

*** If the CB-1 error is occurring simultaneously, give priority to clearing the CB-1 error.**

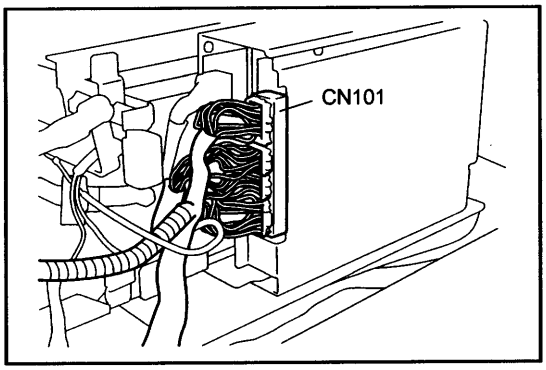
<For FE-1>

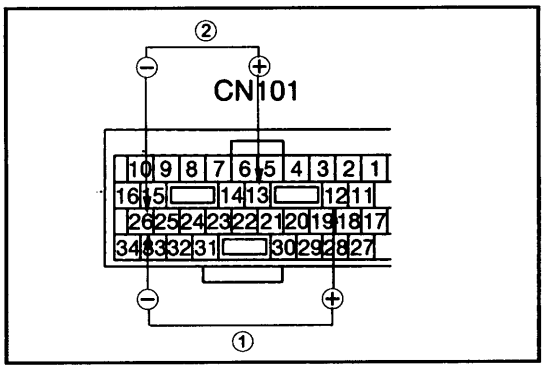


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Inspection 1:
<For FE-1>: CPU Board – SCPU Board Signal Voltage Check 1
Battery plug ON, key switch ON

Measurement terminals	① CN101-12 (309) ⊕ – CN101-26 (51) ⊖ ② CN101-13 (310) ⊕ – CN101-26 (51) ⊖
Tester range	DC 200 V
Standard	Measured voltages of ① and ② are the same.

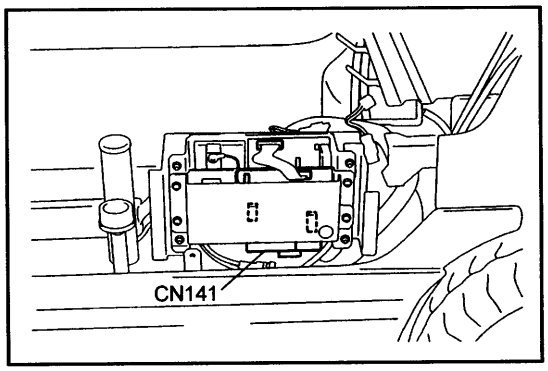


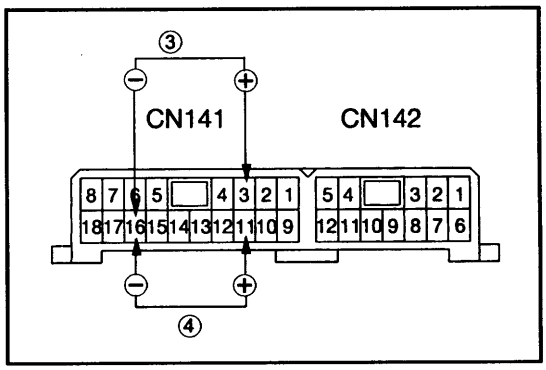


(Voltages of ① and ② are the same) → Go to Inspection 2.
(Voltages of ① and ② are different) → CPU board defect

Inspection 2:
<For FE-1>: CPU Board – SCPU Board Signal Voltage Check 2
Battery plug ON, key switch ON

Measurement terminals	③ CN141-3 (309) ⊕ – CN141-16 (315) ⊖ ④ CN141-11 (310) ⊕ – CN141-16 (315) ⊖
Tester range	DC 200 V
Standard	Measured voltages of ③ and ④ are the same.





(Voltages of ③ and ④ are the same) → SCPU board defect
(Voltages of ③ and ④ are different) → Harness defect

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<For FE-2>

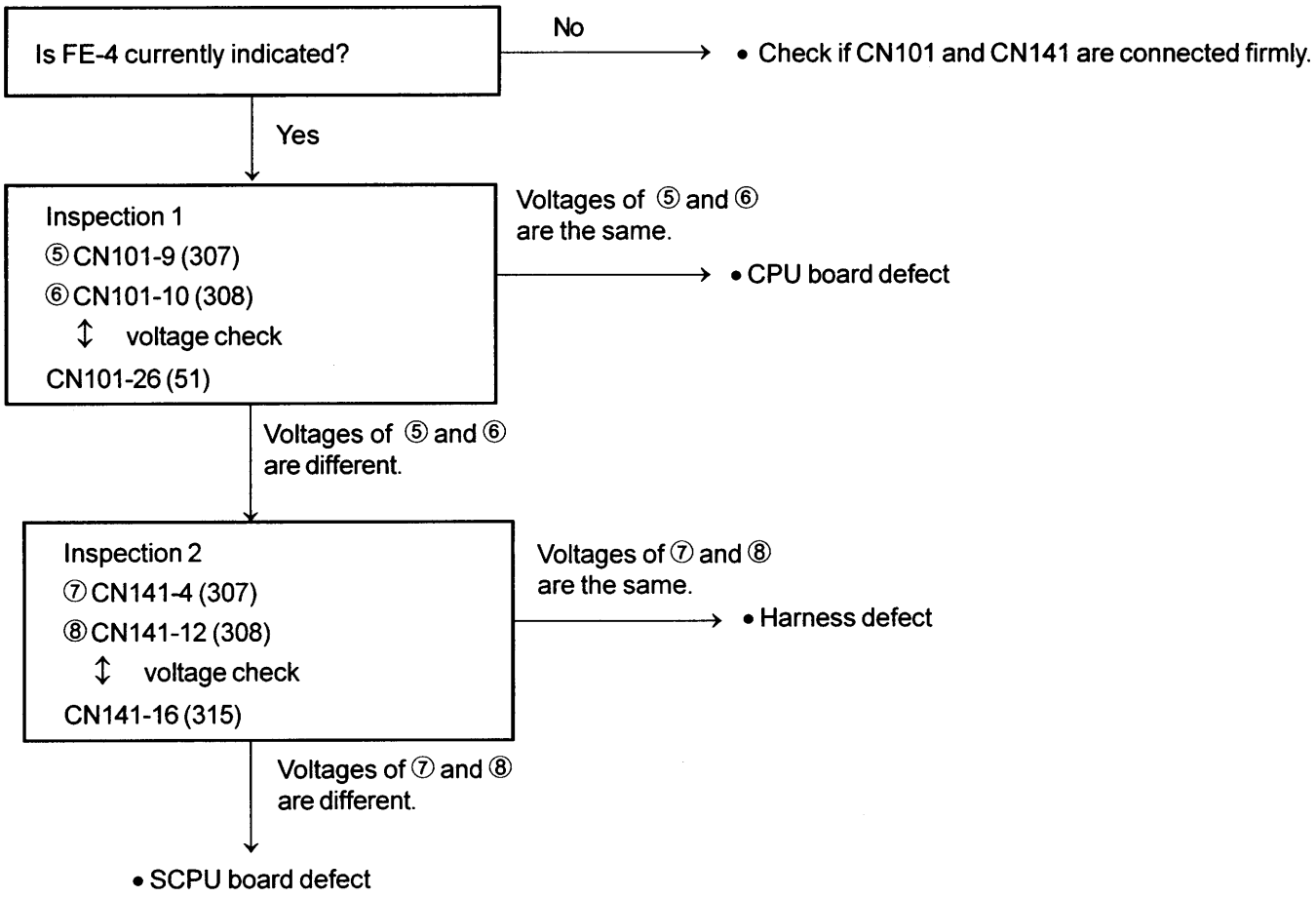
When FE-2 is indicated to the diag memory:

- Check the connection status of connectors CN101 and CN141.
- Check the harness between connectors CN101 and CN141.

↓ If results of both checks are OK:

• SCPU board defect

<For FE-4>



<For FE-5>

When FE-5 is indicated to the diag memory:

- Check the connection status of connectors CN101 and CN141.
- Check the harness between connectors CN101 and CN141.

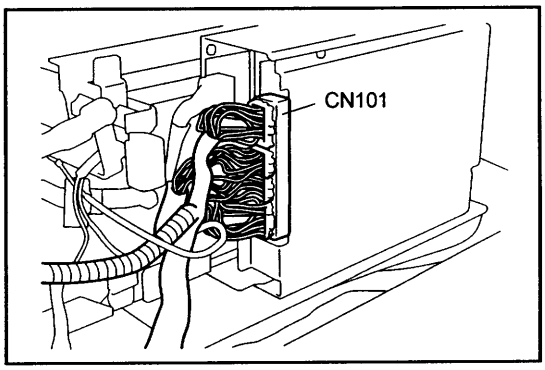
↓ If results of both checks are OK:

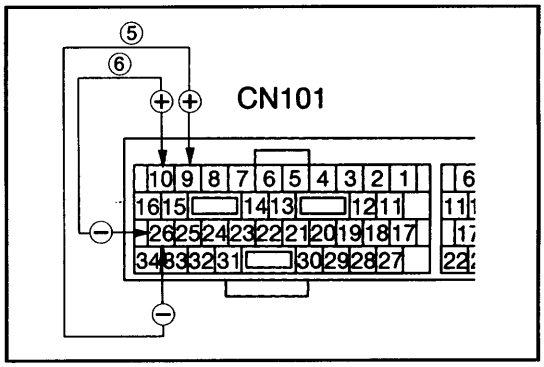
• CPU board defect

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Inspection 1:
<For FE-1>: CPU Board – SCPU Board Signal Voltage Check 3
Battery plug ON, key switch ON

Measurement terminals	⑤ CN101-9 (307) ⊕ – CN101-26 (51) ⊖ ⑥ CN101-10 (308) ⊕ – CN101-26 (51) ⊖
Tester range	DC 200 V
Standard	Measured voltages of ⑤ and ⑥ are the same.

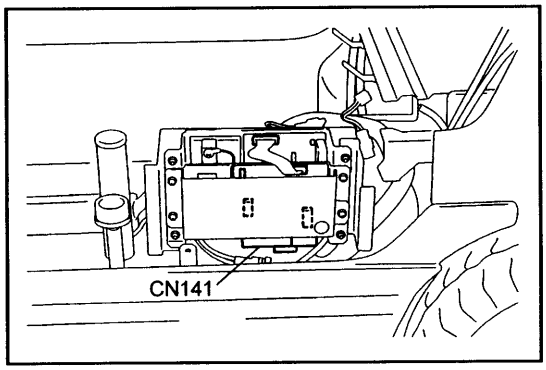


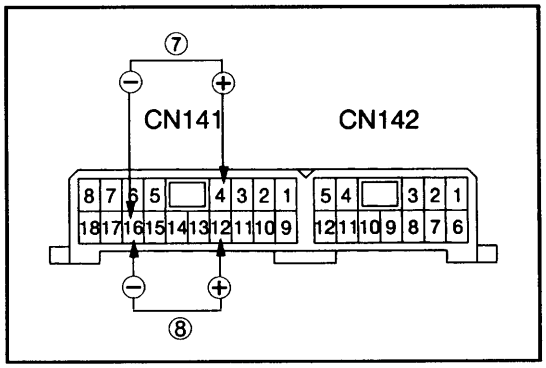


(Voltages of ⑤ and ⑥ are the same) → CPU board defect
(Voltages of ⑤ and ⑥ are different) → Go to Inspection 2.

Inspection 2:
<For FE-4>: CPU Board – SCPU Board Signal Voltage Check 4
Battery plug ON, key switch ON

Measurement terminals	⑦ CN141-4 (307) ⊕ – CN141-16 (315) ⊖ ⑧ CN141-12 (308) ⊕ – CN141-16 (315) ⊖
Tester range	DC 200 V
Standard	Measured voltages of ⑦ and ⑧ are the same.



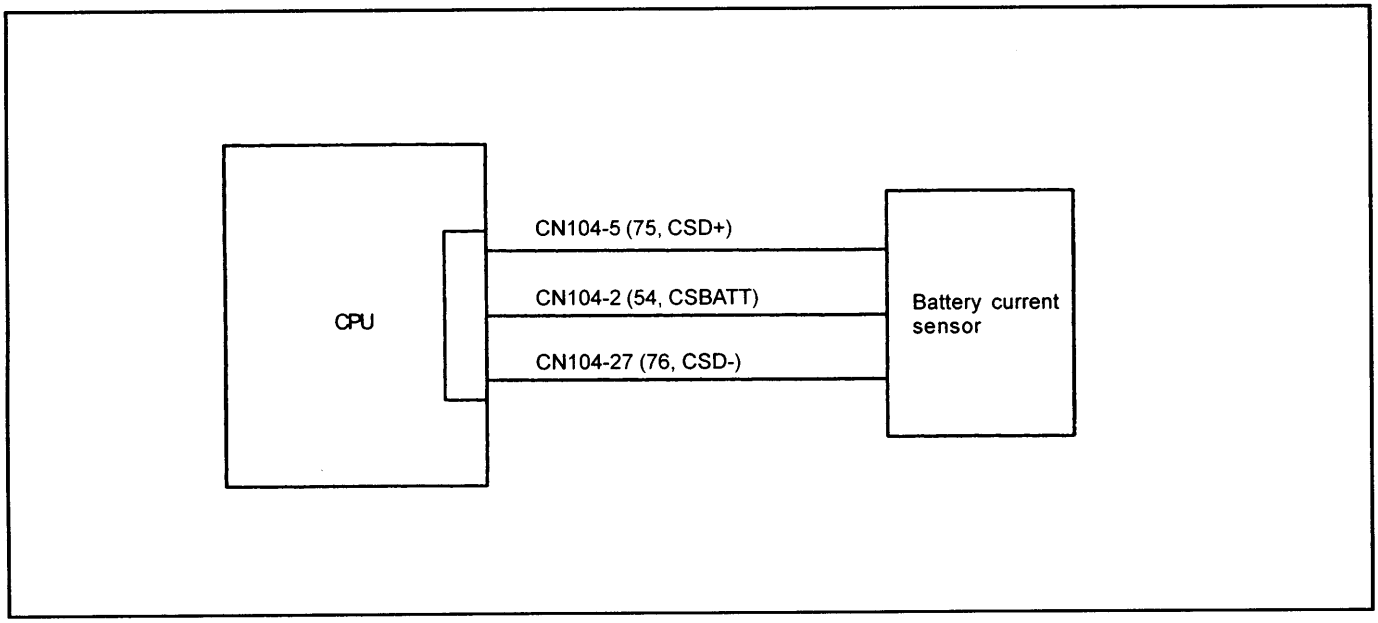


(Voltages of ⑦ and ⑧ are the same) → Harness defect
(Voltages of ⑦ and ⑧ are different) → SCPU board defect

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Error Code E0-1: Material Handling Main Circuit Abnormality

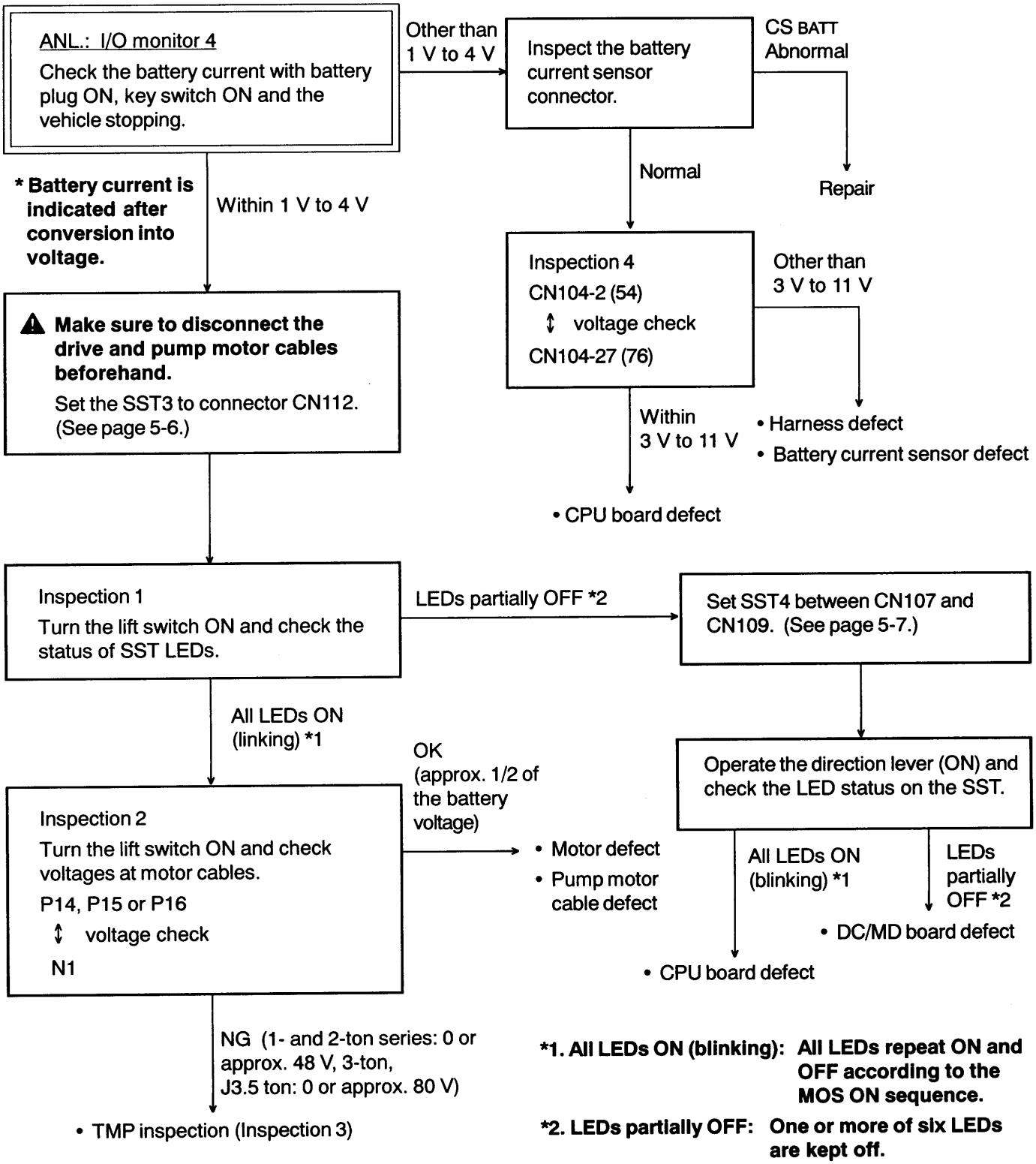
Related portion



Estimated causes

① TMP (MOS) defect
② Battery current sensor defect
③ DC/MD board defect

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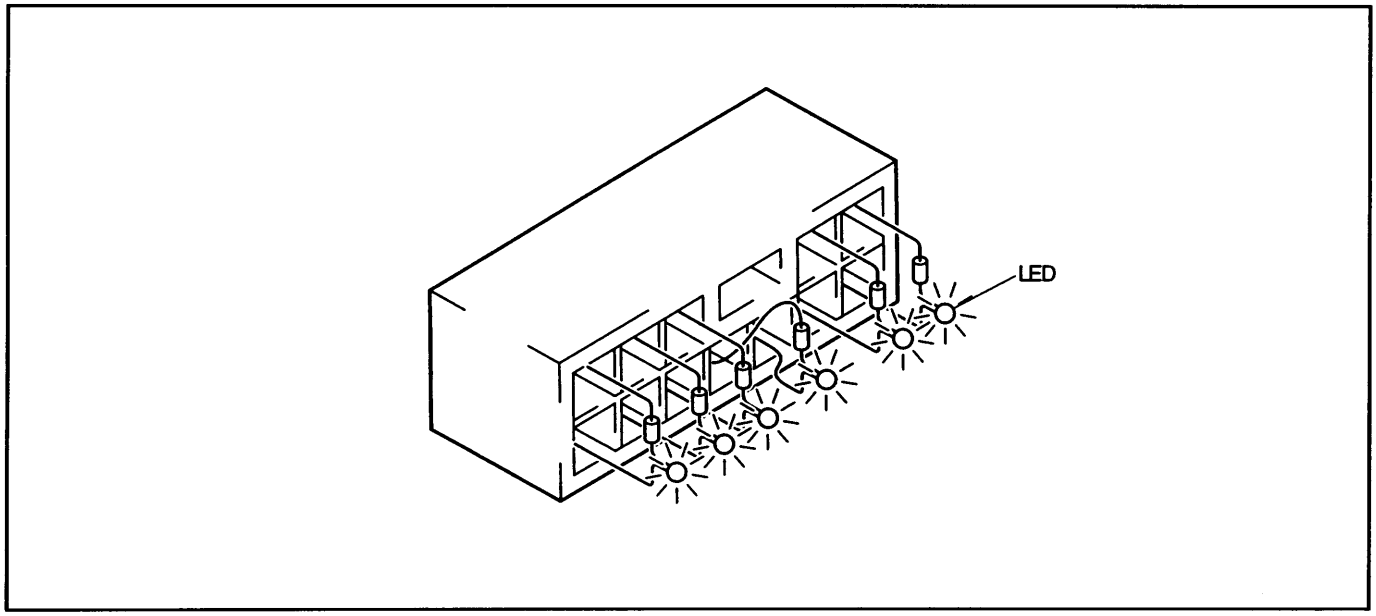


***1. All LEDs ON (blinking): All LEDs repeat ON and OFF according to the MOS ON sequence.**

***2. LEDs partially OFF: One or more of six LEDs are kept off.**

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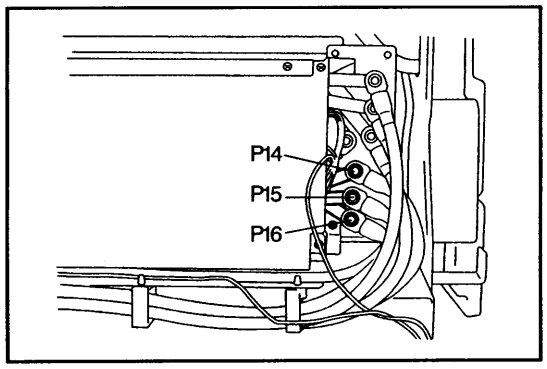
Inspection 1:
SST3 LED Status Check
An abnormal position of the signal circuit to the TMP can be determined by observing ON or OFF of LEDs on SST3.

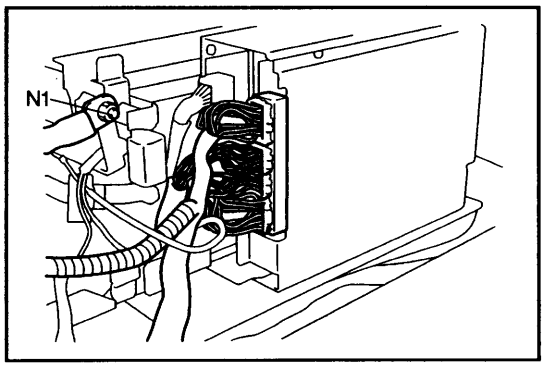


All LEDs ON (blinking) → Go to Inspection 2.
LEDs partially OFF → Set the SST between CN107 and CN109.

Inspection 2:
Motor Cable Voltage Check
Battery plug ON, key switch ON

Measurement terminals	P14, P15, P16 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	Approx. 1/2 of the battery voltage



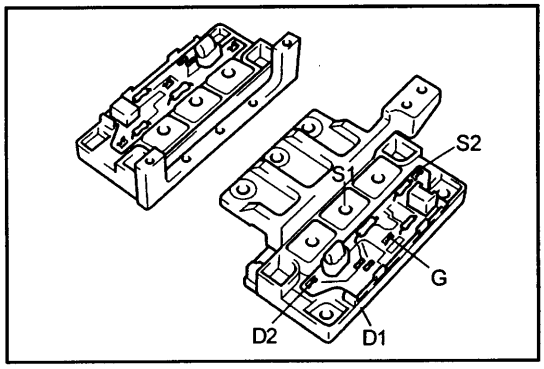


NG (1- to 2-ton series: 0 or approx. 48 V, 3-ton, J3.5 ton: 0 or approx. 80 V) → TMP inspection (Inspection 3)
OK (approx. 1/2 of the battery voltage) → Pump motor cable or pump motor defect

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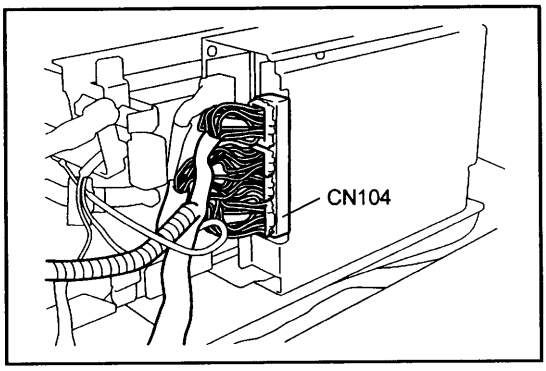
Inspection 3:
TMP Itself Inspection
Disconnect each TMP and inspect.

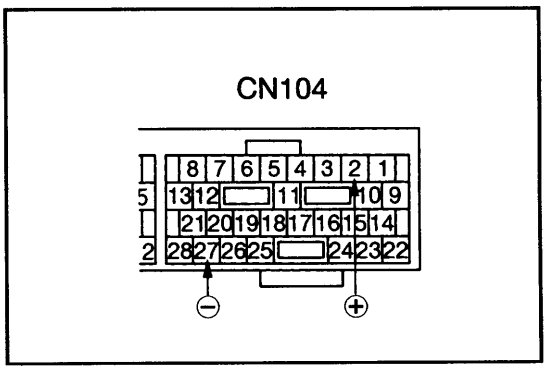
Measurement terminals	D1 (D2) ⊕ – S1 (S2) ⊖ D1 (D2) ⊕ – G ⊖ S1 (S2) ⊕ – D1 (D2) ⊖ S1 (S2) ⊕ – G ⊖ G ⊕ – D1 (D2) ⊖ G ⊕ – S1 (S2) ⊖
Tester range	Ω x 1 k
Standard	D1 (D2) – S1 (S2): Approx. 2 kΩ D1 (D2) – G : Approx. 12 kΩ S1 (S2) – D1 (D2) : ∞ S1 (S2) – G : Approx. 10 kΩ G – D1 (D2) : ∞ G – S1 (S2) : Approx. 1 kΩ



Inspection 4. Current sensor signal voltage check
Battery plug ON, key switch ON

Measurement terminals	CN104-2 (54) ⊕ – CN104-27 (76) ⊖
Tester range	50 V
Standard	Between 3 and 11 V



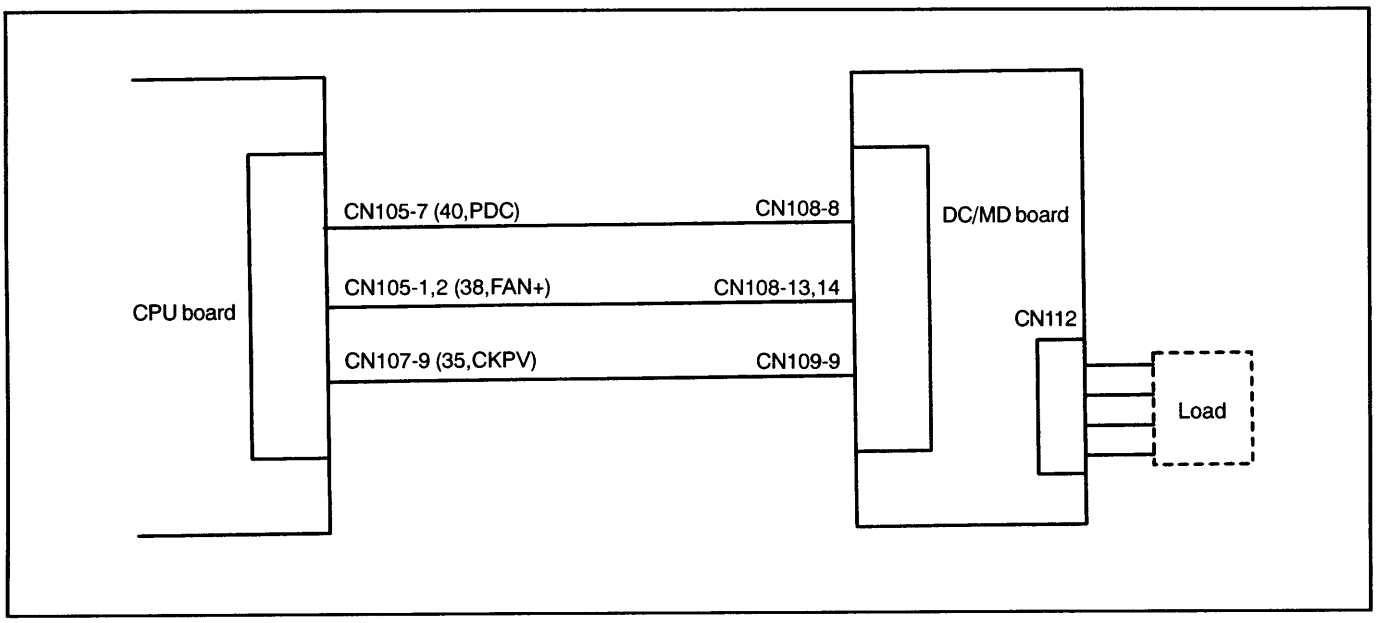


(Between 3 and 11 V) → CPU board defect
(Not between 3 and 11 V) → Harness defect, battery current sensor defect

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Error Code E0-3: Material Handling Drive Power Supply Abnormality

Related portion

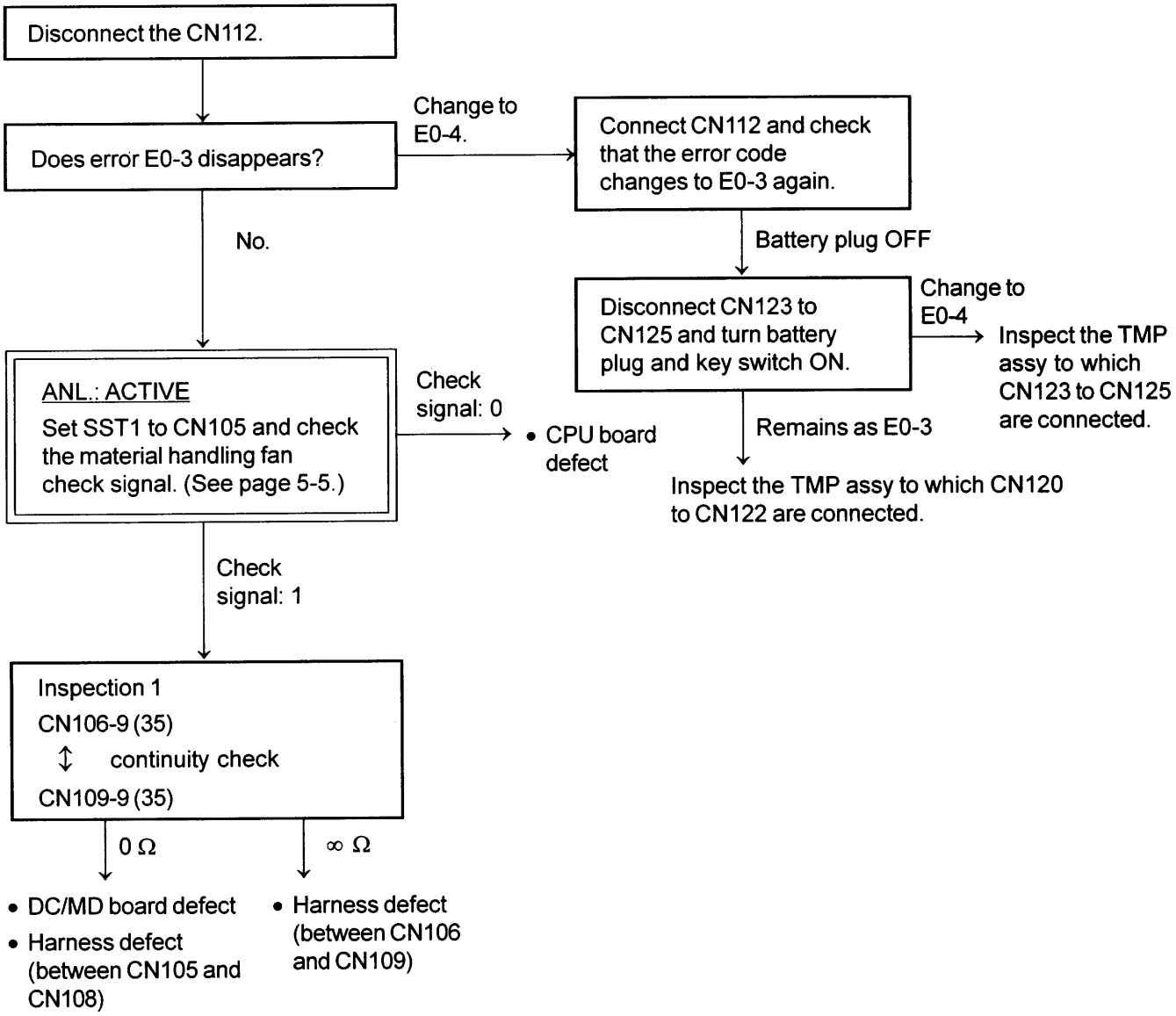


Estimated causes

① Short-circuiting of load (load = transistorerna för pumpmotorn)
② DC/MD defect
③ Open circuit of harness

(transistorerna för pumpmotorn)

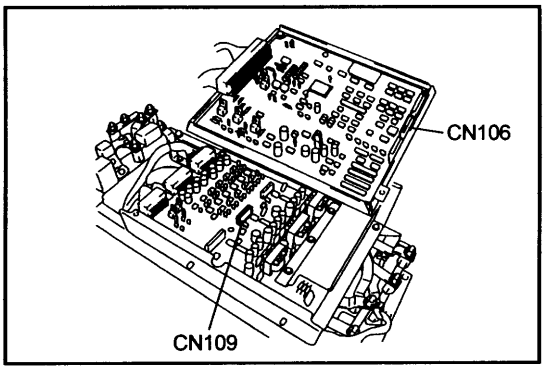
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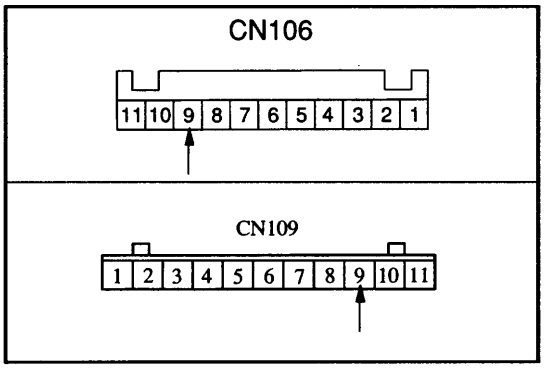


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Inspection 1:
CN106-9 – CN109-9 Active Check
Battery plug OFF

Measurement terminals	CN106-9 (35) – CN109-9 (35) (REC)
Tester range	Ω x 1
Standard	0 Ω



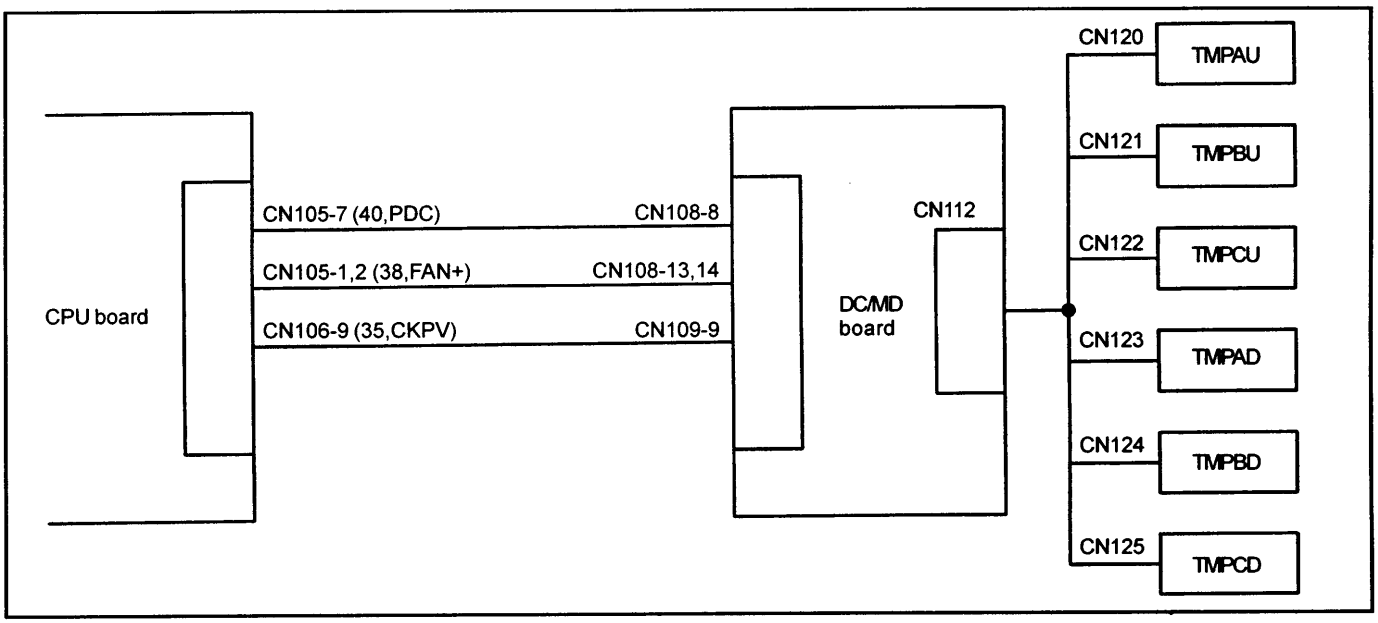


OK (0 Ω) → DC/MD board or harness defect (between CN105 and CN108)
NG (∞ Ω) → Harness defect (between CN106 and CN109)

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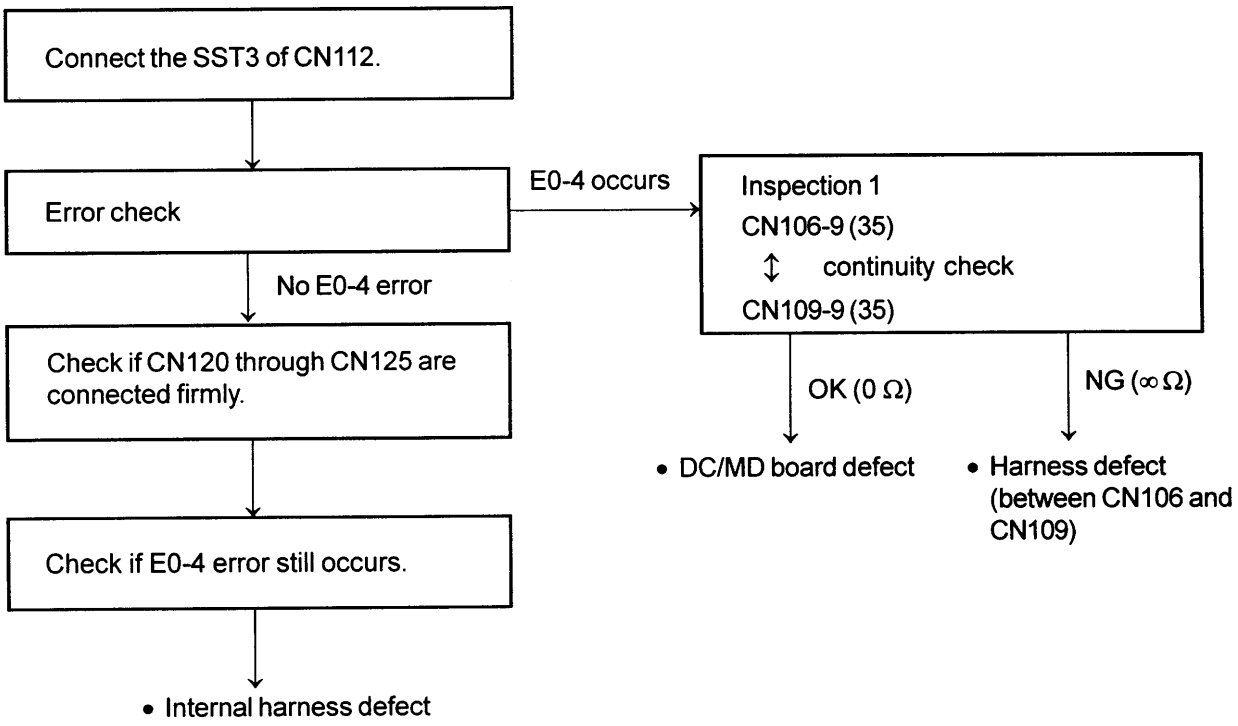
Error Code E0-4: Material Handling Drive Circuit Abnormality

Related portion



Estimated causes

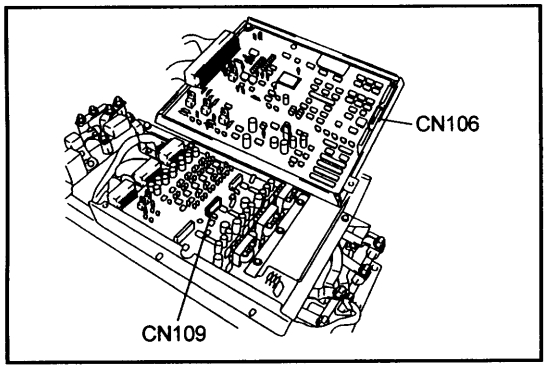
① DC/MD board defect
② Open circuit of internal harness
③ Disconnected MMP connector

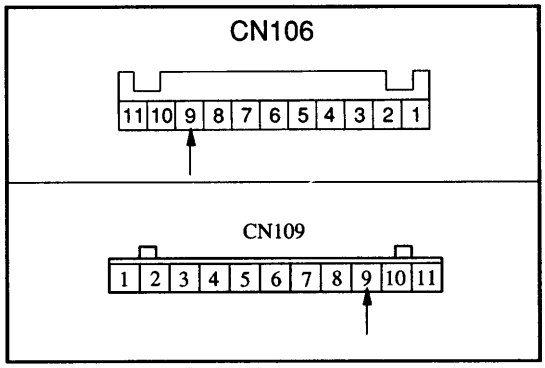


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Inspection 1:
CN106 – CN109 Active Check
Battery plug OFF

Measurement terminals	CN106-9 (35) – CN109-9 (35) (REC)
Tester range	Ω x 1
Standard	0 Ω



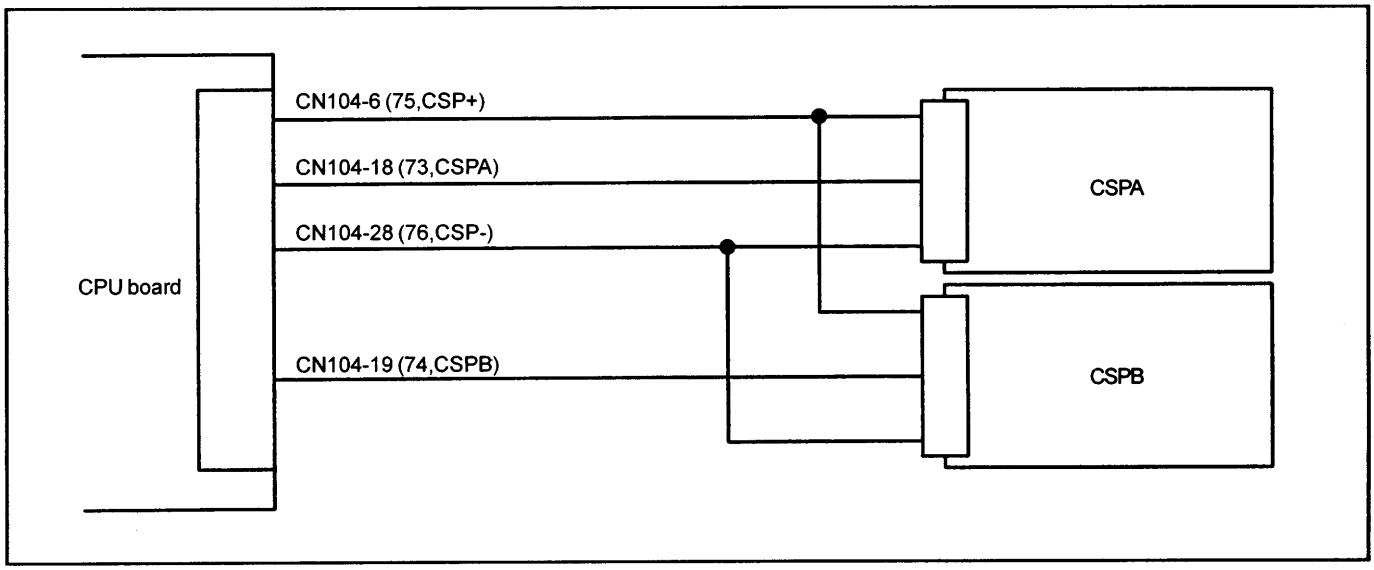


OK (0 Ω) → DC/MD board defect
NG (∞ Ω) → Harness defect (between CN106 and CN109)

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Error Code E1: Material Handling Sensor Abnormality

Related portion



Estimated causes

① Current sensor defect
② Open circuit of harness
③ CPU board defect
④ Poor electrical connection of connector

Visually check the CSPA and CSPB connectors.
NG → • Repair or replacement
OK
* Check the connector connection status:
• Pin locking status
• Check if the connector is disconnected when the harness is pulled lightly.

Inspection 1
Turn key switch ON
CN104-18 (73)
↕ voltage check
N1

NG (other than 7 V ± 0.5 V) → Inspection 3
Exchange the CSPA and CSPB
CN104-18 (73)
↕ voltage check
N1

NG (other than 7 V ± 0.5 V) → • Harness defect
OK (7 V ± 0.5 V) → • CSPA defect

NG (other than 7 V ± 0.5 V) → Inspection 2
Turn key switch ON
CN104-19 (74)
↕ voltage check
N1

OK (7 V ± 0.5 V) → • CPU board defect

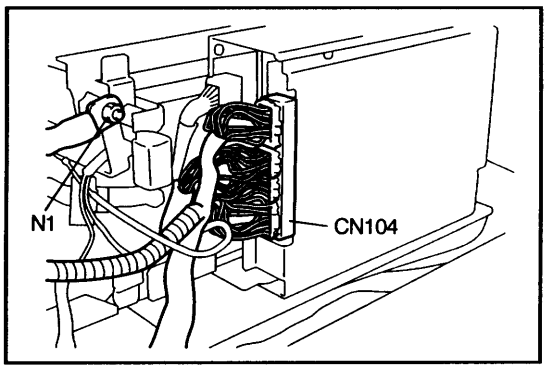
Inspection 4
Exchange the CSPA and CSPB
CN104-19 (74)
↕ voltage check
N1

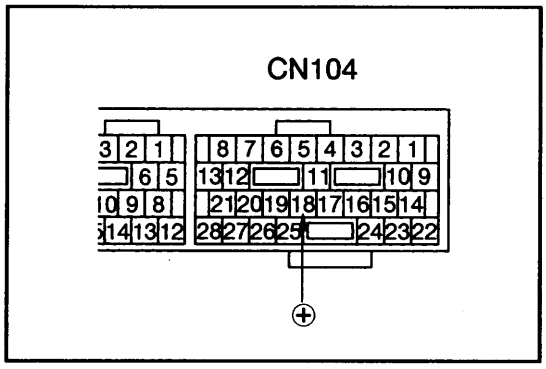
NG (other than 7 V ± 0.5 V) → • Harness defect
OK (7 V ± 0.5 V) → • CSPB defect

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Inspection 1:
CN104 – N1 Voltage Check 1
Battery plug ON, key switch ON

Measurement terminals	CN104-18 (73) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V

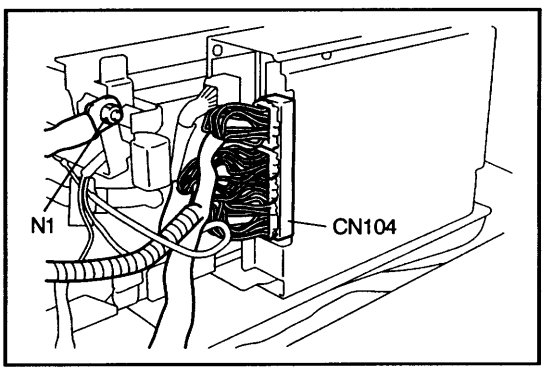


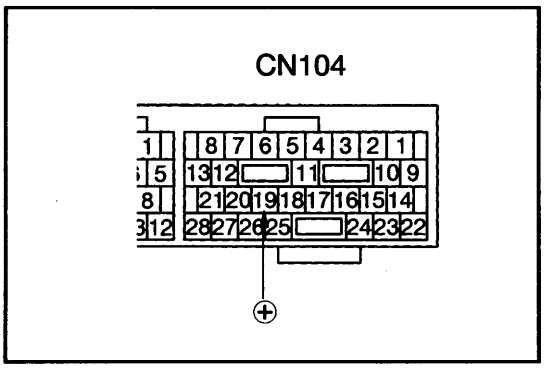


OK (7 V ± 0.5 V) → Go to Inspection 2.
NG (other than 7 V ± 0.5 V) → Go to Inspection 3.

Inspection 2:
CN104 – N1 Voltage Check 2
Battery plug ON, key switch ON

Measurement terminals	CN104-19 (74) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V



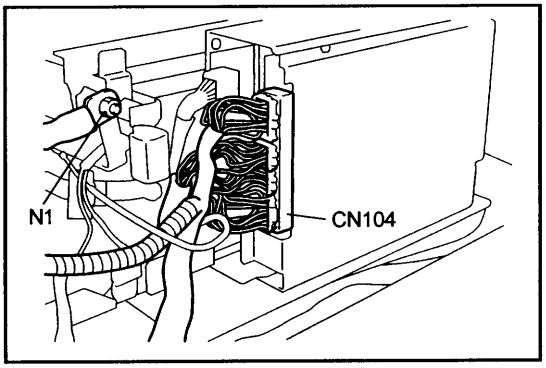


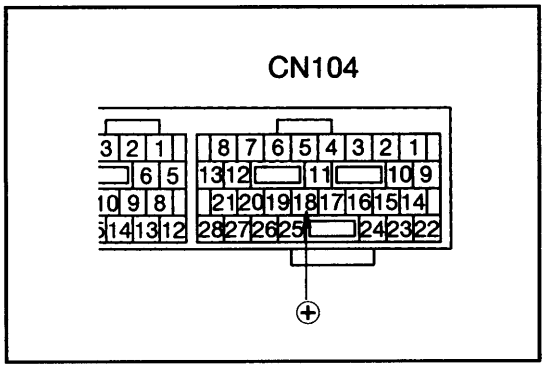
OK (7 V ± 0.5 V) → CPU board defect
NG (other than 7 V ± 0.5 V) → Go to Inspection 4.

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Inspection 3:
CN104 – N1 Voltage Check 3
Battery plug ON, key switch ON, exchange CSPA and CSPB

Measurement terminals	CN104-18 (73) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V

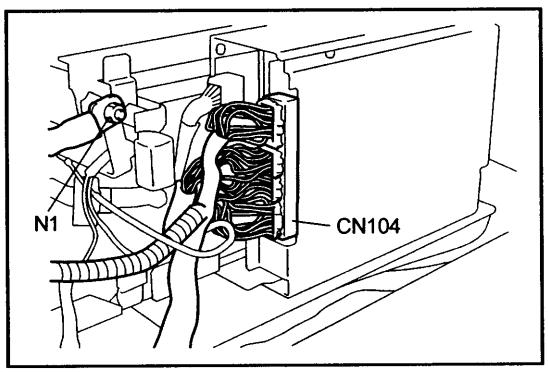


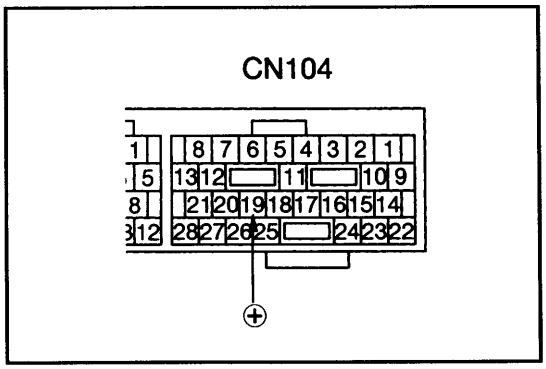


OK (7 V ± 0.5 V) → CSPA defect
NG (other than 7 V ± 0.5 V) → Harness defect

Inspection 4:
CN104 – N1 Voltage Check 4
Battery plug ON, key switch ON, exchange CSPA and CSPB

Measurement terminals	CN104-19 (74) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	7 V ± 0.5 V





OK (7 V ± 0.5 V) → CSPB defect
NG (other than 7 V ± 0.5 V) → Harness defect

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Safety monitor → Material handling motor overheat (E2-1)

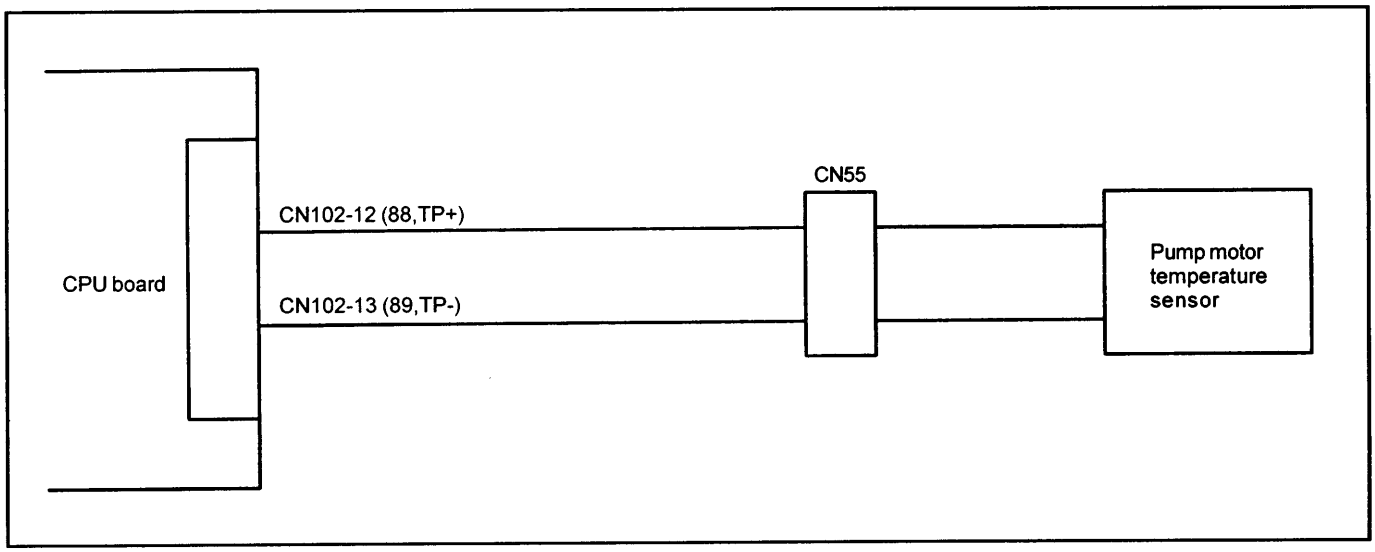
(Blinking)

Leave the vehicle as it is for a while (about 30 minutes).

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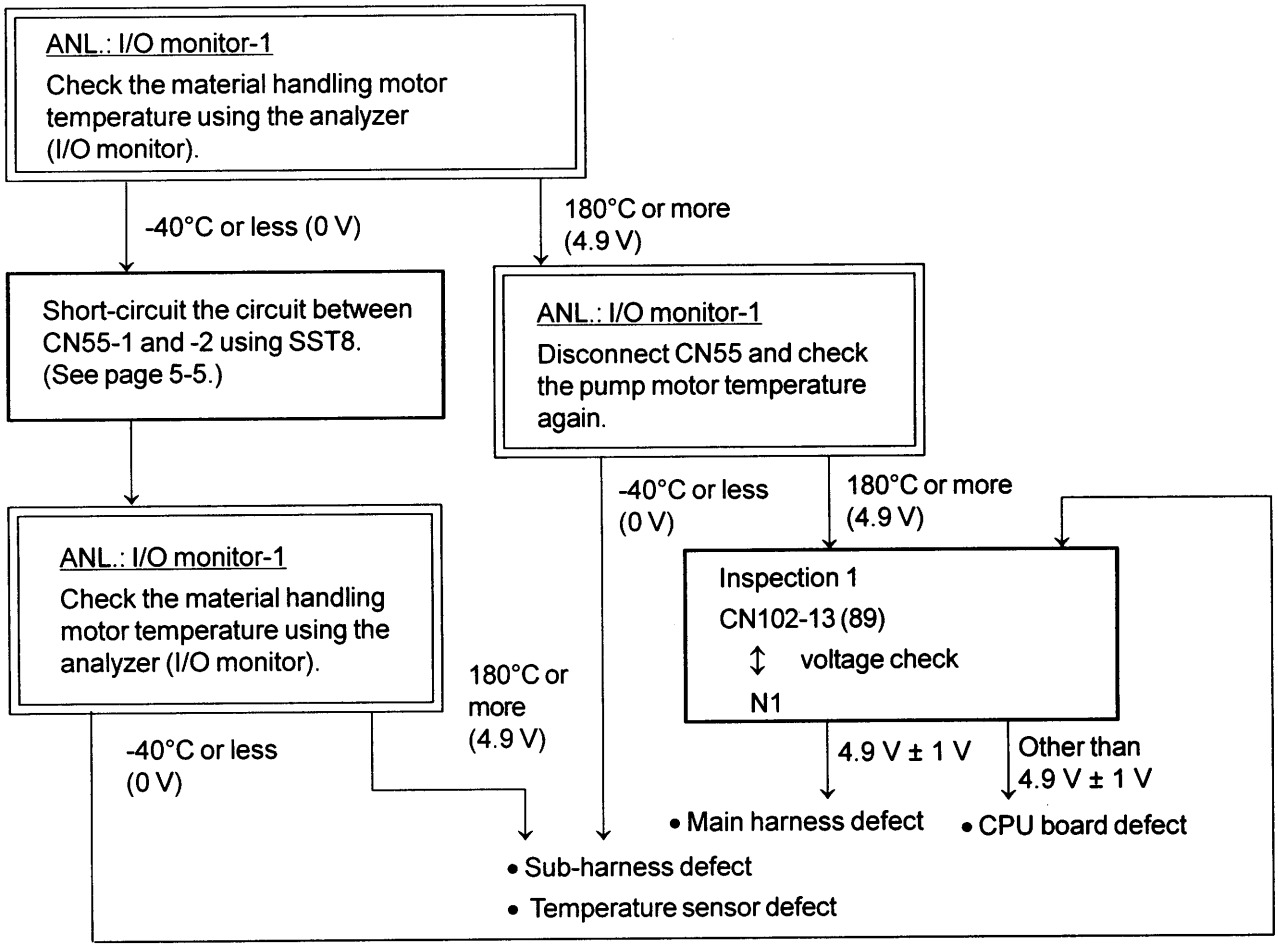
Error Code E2-2: Material Handling Motor Temperature Sensor Abnormality

Related portion



Estimated causes

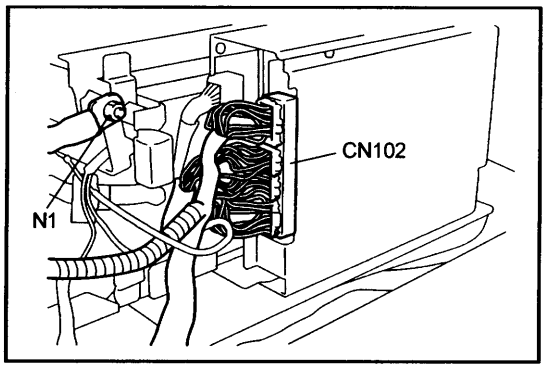
① Temperature sensor defect
② Open circuit of harness

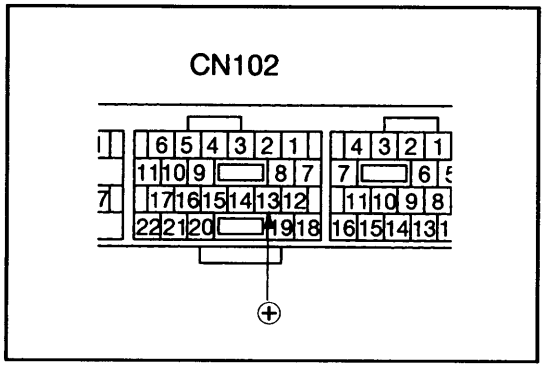


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Inspection 1:
CN102 – N1 Voltage check
Battery plug ON, key switch ON

Measurement terminals	CN102-13 (89) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	4.9 V ± 1 V



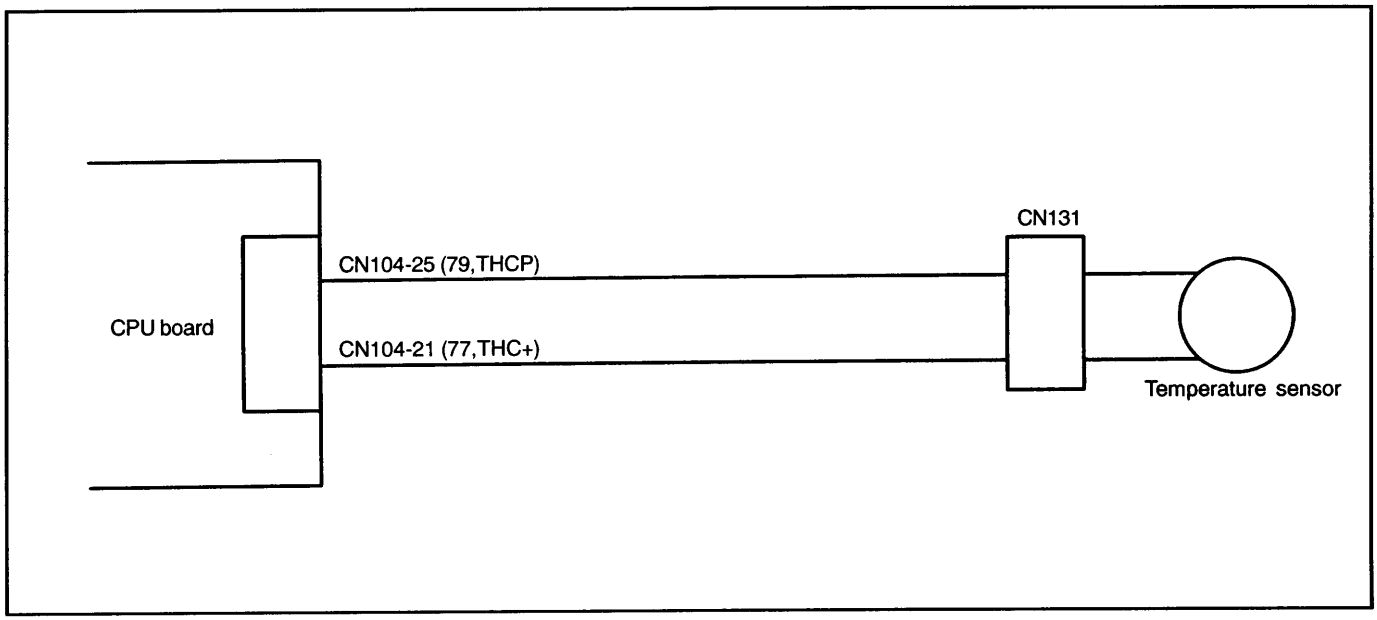


OK (4.9 V ± 1 V) → Main harness defect
NG (other than 4.9 V ± 1 V) → CPU board defect

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Error Code E3: Material Handling Main Circuit Temperature Sensor Abnormality

Related portion



Estimated causes

① Disconnected connector or open circuit of harness
② Temperature sensor defect

ANL.: I/O monitor 1
Disconnect CN131 and check the material handling main circuit temperature sensor reading.

-40°C or less (0.1 V)

197°C or more (4.8 V)
• Check short-circuiting between CN104-25 and -21.

ANL.: I/O monitor 1
Connect CN131 and check the material handling main circuit temperature sensor reading.

197°C or more (4.8 V)
• Temperature sensor defect

-40°C or more (0.1 V)

Inspection 1
Check resistance of CN131 on the temperature sensor side.

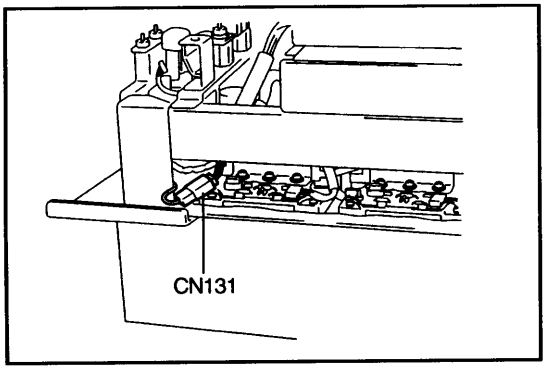
OK (approx. 11 ~ 12 kΩ (at 25°C))
• Open circuit of CN104-25 or CN104-21

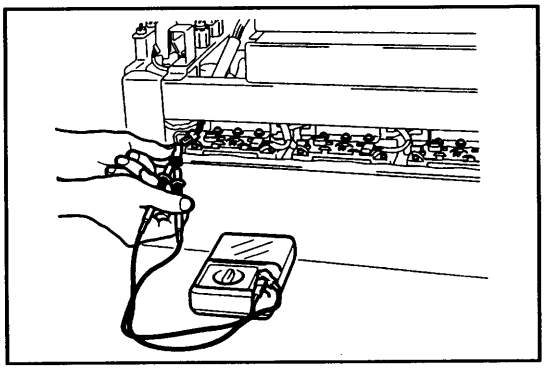
NG (200 kΩ or more)
• Temperature sensor defect

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Inspection 1:
Temperature Sensor Resistance Check
Battery plug OFF

Measurement terminals	Both terminals of CN131 connector (temperature sensor side)
Tester range	kΩ x 1
Standard	Approx. 11 ~ 12 kΩ (at 25°C)



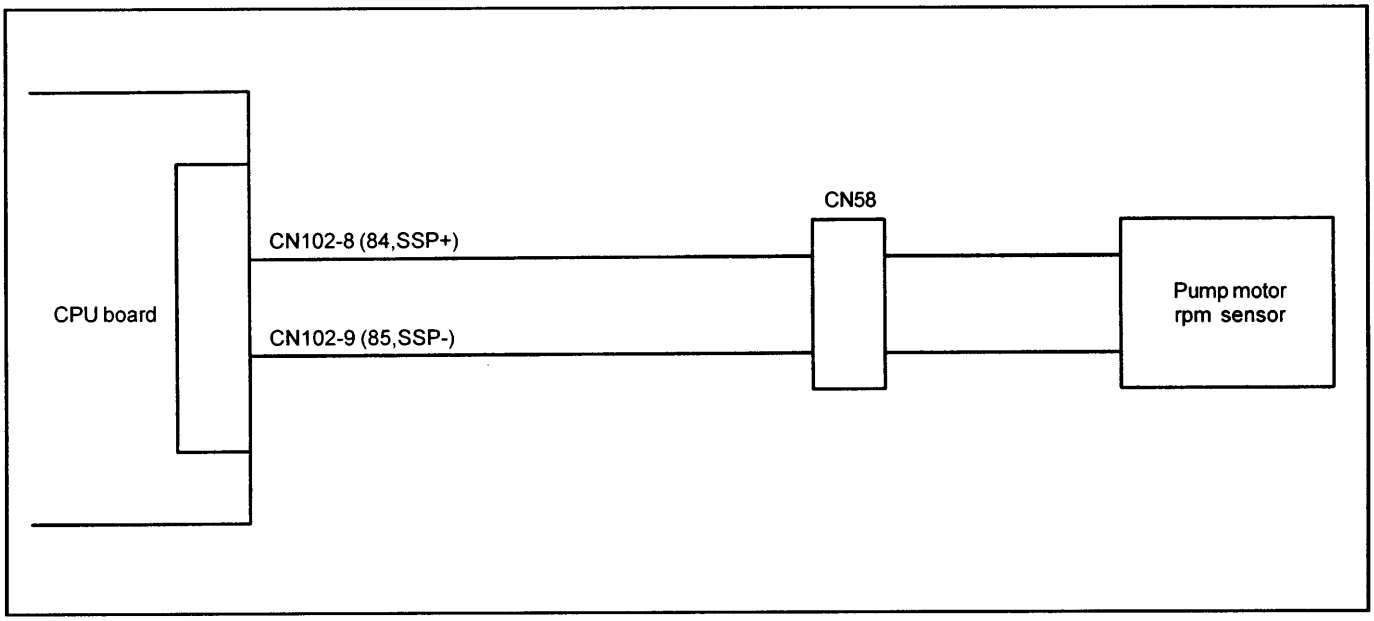


OK (Approx. 11 ~ 12 kΩ) → Open circuit of CN104-25 or CN104-21 harness
NG (200 kΩ or more) → Temperature sensor defect

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Error Code E8: Material Handling Rotary Sensor Abnormality

Related portion

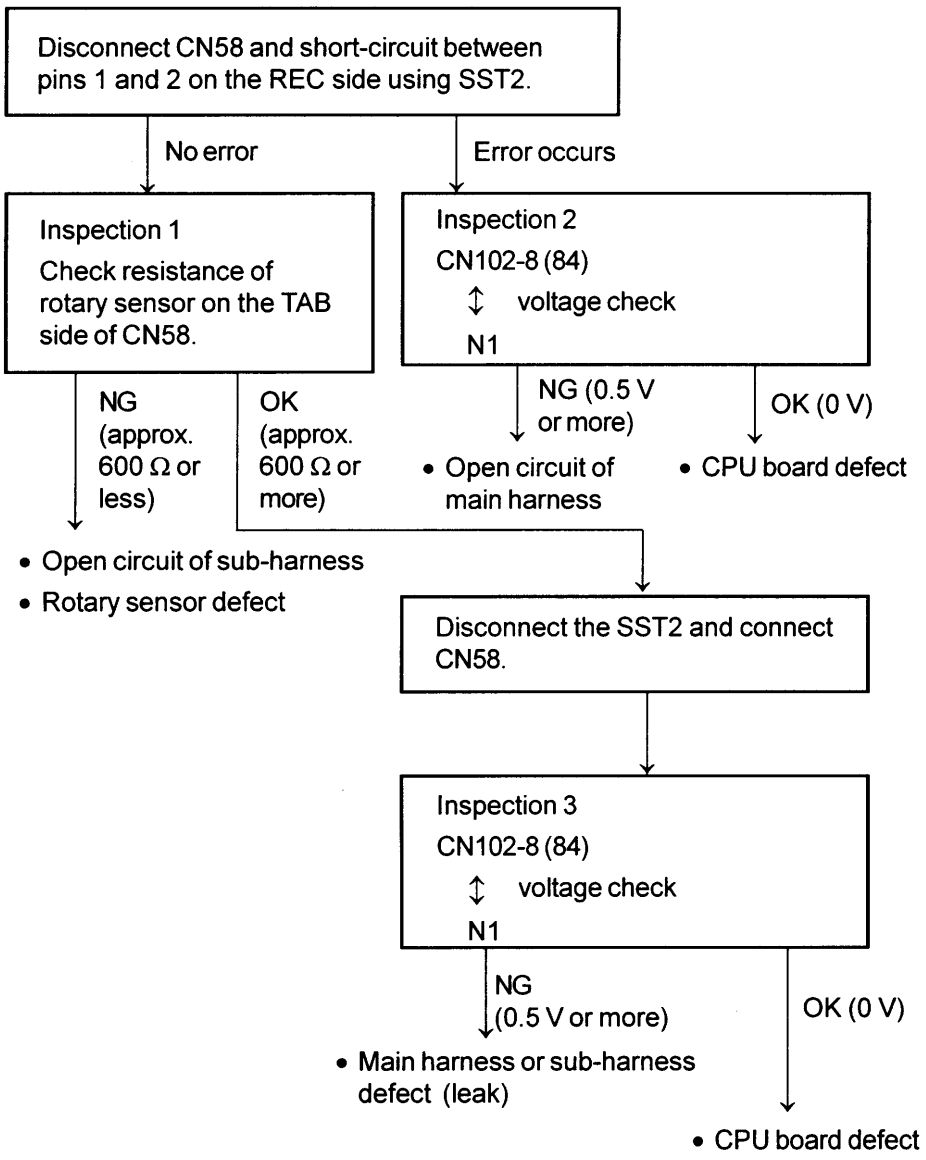


Estimated causes

① Material handling rotary sensor defect
② Open circuit of harness
③ CPU board defect

*** Do not come near the mast during the troubleshooting.**

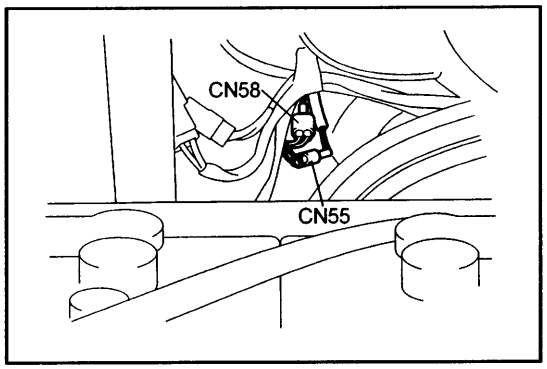
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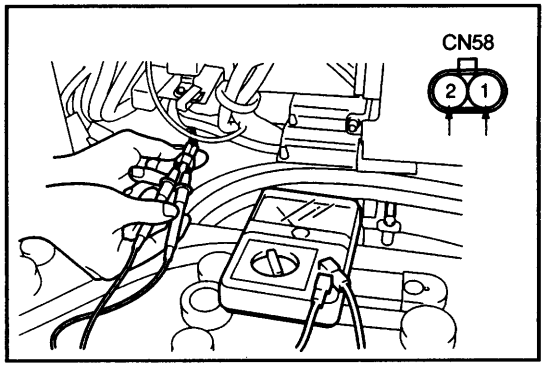


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Inspection 1:
Rotary Sensor Resistance Check
Battery plug OFF, CN58 disconnection

Measurement terminals	CN58-1 (85) – CN58-2 (84)
Tester range	Ω x 1
Standard	Approx. 600 Ω or less

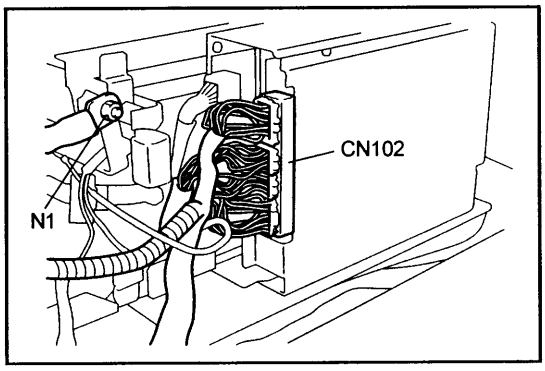


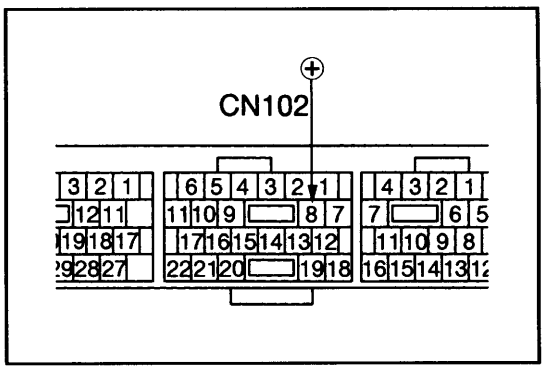


OK (approx. 600 Ω or less) → Remove SST2, connect CN58 and then go to Inspection 3.
NG (approx. 600 Ω or more) → Open circuit of sub-harness or rotary sensor defect.

Inspection 2:
CN102 – N1 Voltage Measurement
Battery plug ON, CN58 disconnection

Measurement terminals	CN102-8 (84) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Approx. 0 V



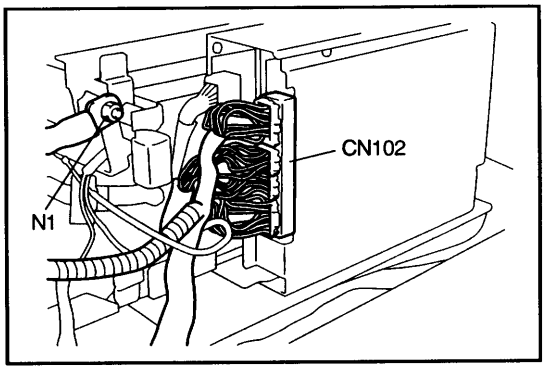


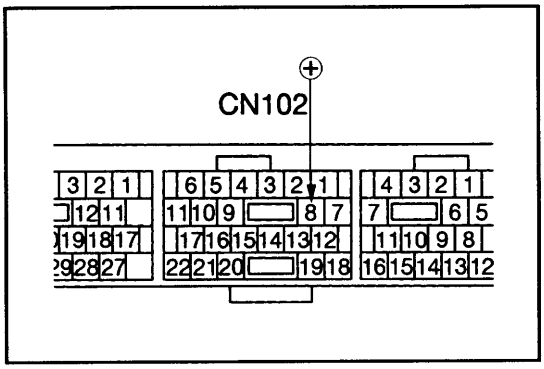
OK (0 V) → CPU board defect
NG (0.5 V or more) → Open circuit of main harness

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Inspection 3:
CN102 – N1 Voltage Measurement
Battery plug ON, key switch ON, CN58 must be connected

Measurement terminals	CN102-8 (84) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Approx. 0 V



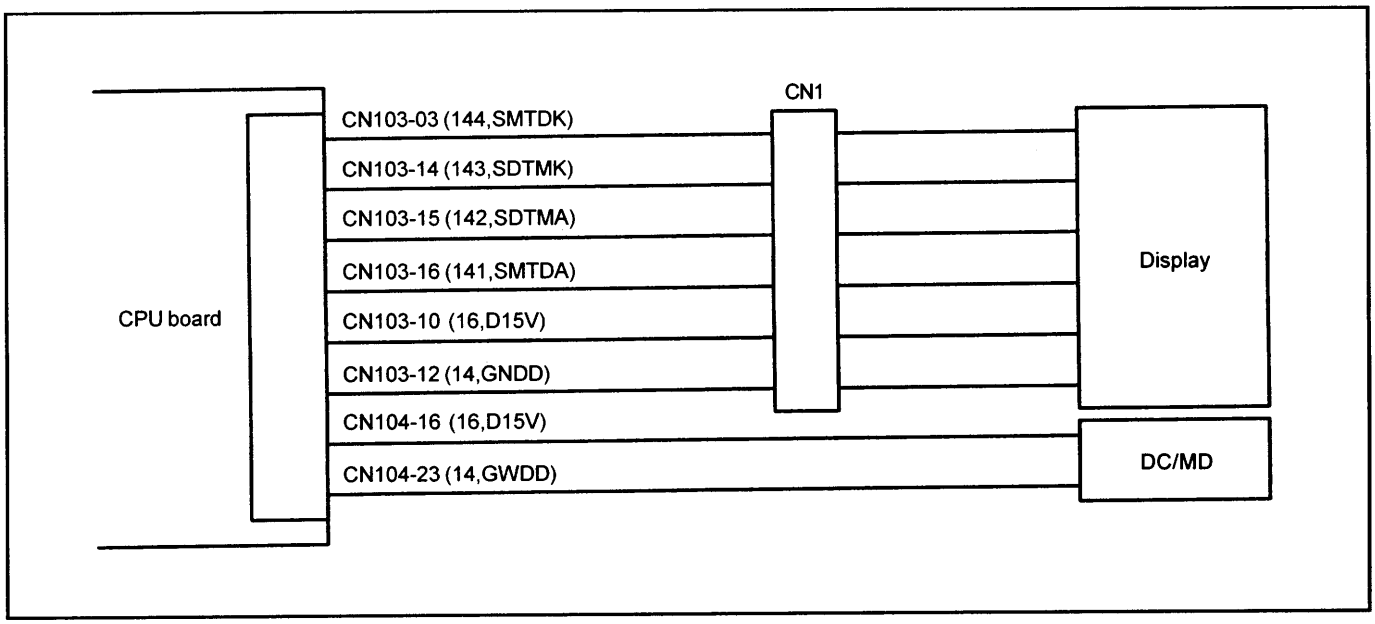


OK (approx. 0 V) → CPU board defect
NG (0.5 V or more) → Main harness or sub-harness defect (leak)

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Error Code EE: Communications from LCD Display Abnormality

Related portion

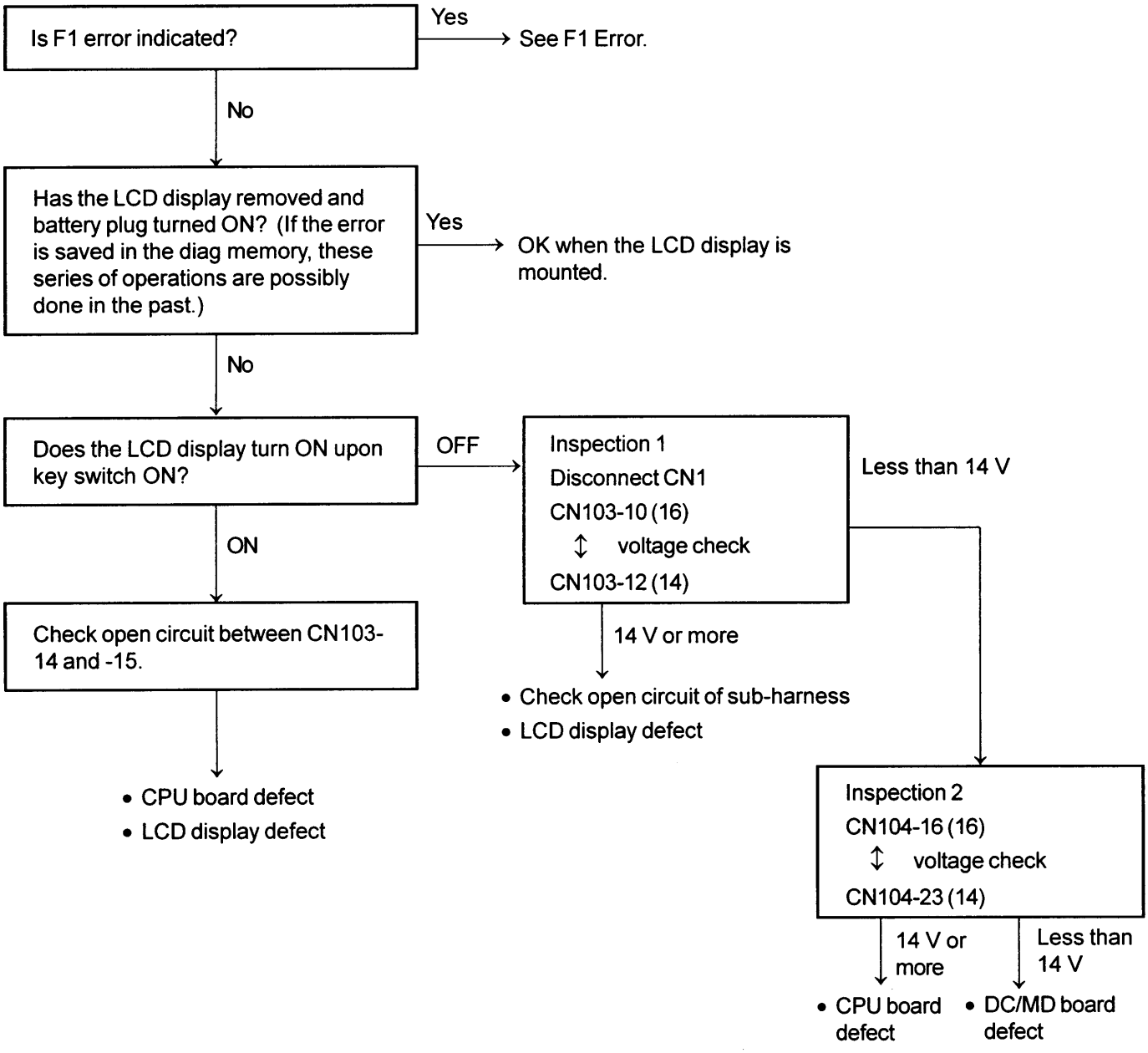


Estimated causes

① Display defect
② No indication on display
③ Open circuit of harness
④ Display power supply defect

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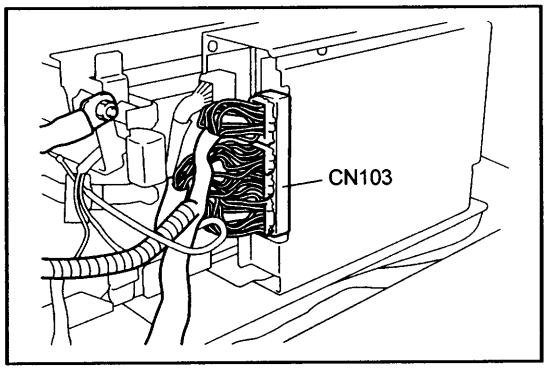
<For EE-1>

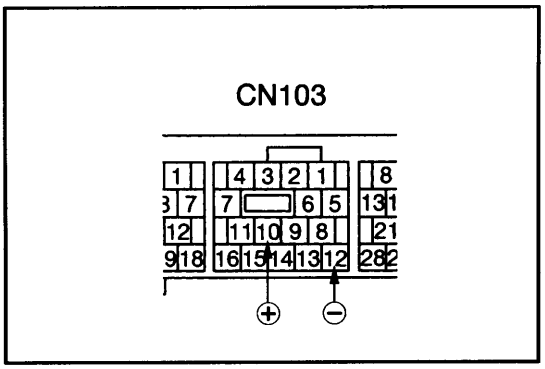


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Inspection 1. Display signal voltage check 1
Battery plug ON, key switch ON

Measurement terminals	CN103-10 (16) ⊕ – CN103-12 (14) ⊖
Tester range	DC50 V
Standard	14 V or more

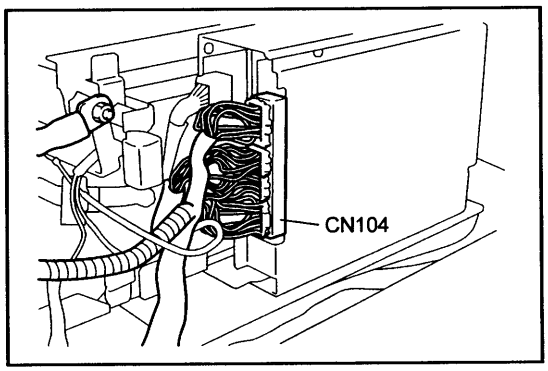


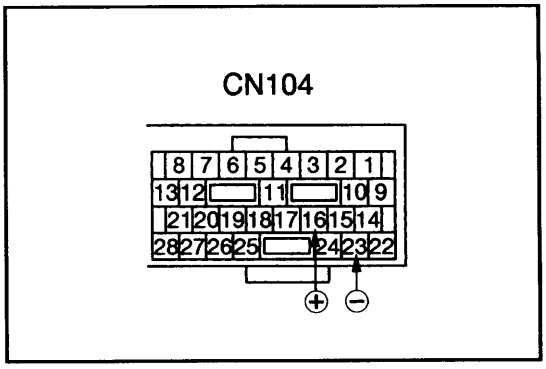


14 V or more → Sub-harness open-circuit check, LCD display defect
Less than 14 V → To inspection 2

Inspection 2. Display signal voltage check 2
Battery plug ON, key switch ON

Measurement terminals	CN104-16 (16) ⊕ – CN104-23 (14) ⊖
Tester range	DC50 V
Standard	14 V or more





14 V or more → CPU board defect
Less than 14 V → DC/MD board defect

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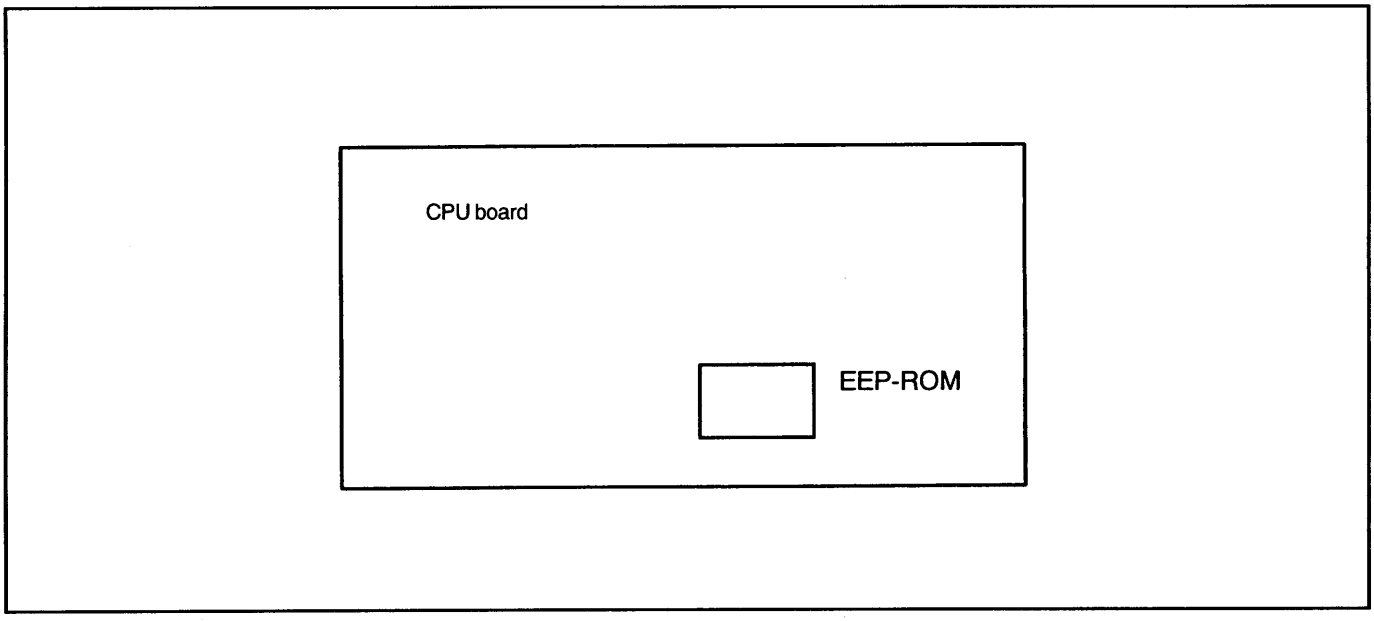
Error Code EE-2·EE-3:

Check the following circuuits of connector CN103 and harnesses:

- Check connectors of CN103-14 through -16 and harnesses. If connectors and harnesses are normal, replace the LCD display.

Error Code EF: EEP-ROM

Related portion



*** When an error code EF is indicated, replace the CPU board.**

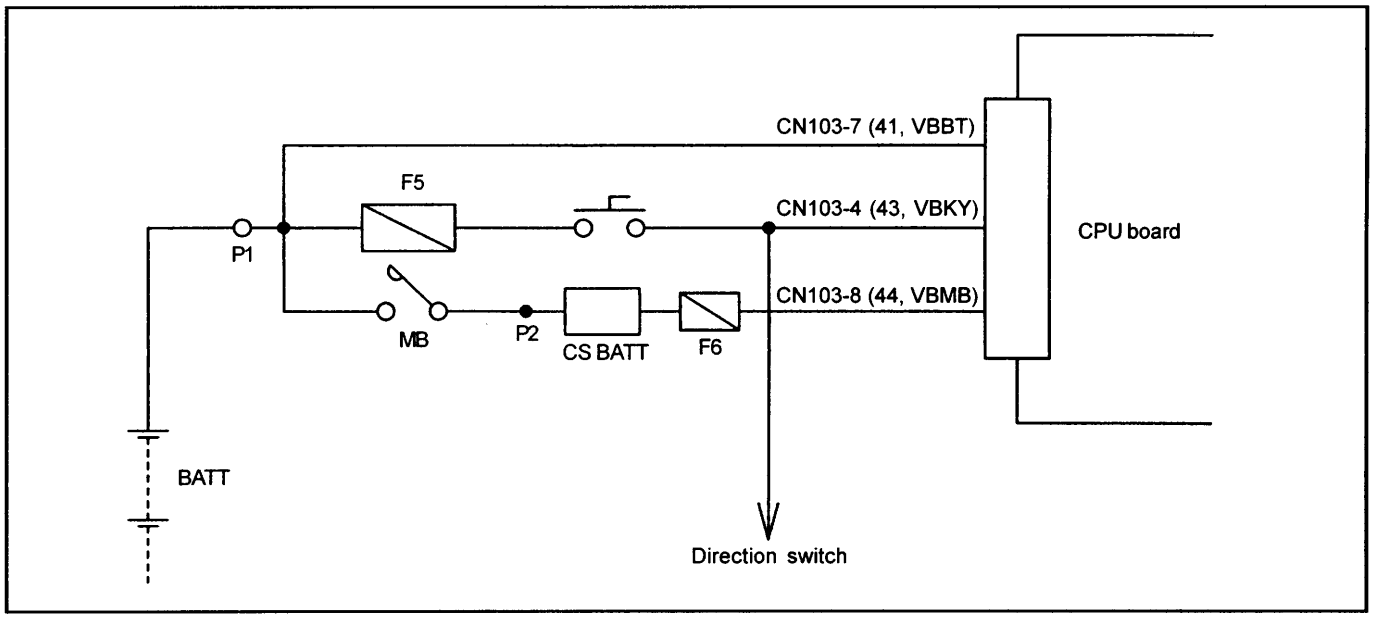
[EF-1, EF-2, EF-3: CPU board defect of drive or material handling circuit]
[EF-5, EF-6: SCPU board defect in PS controller]

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WHEN NO ERROR CODE IS DISPLAYED

1. Vehicle does not move at all (disabled travel, mateerial handling and PS operations)

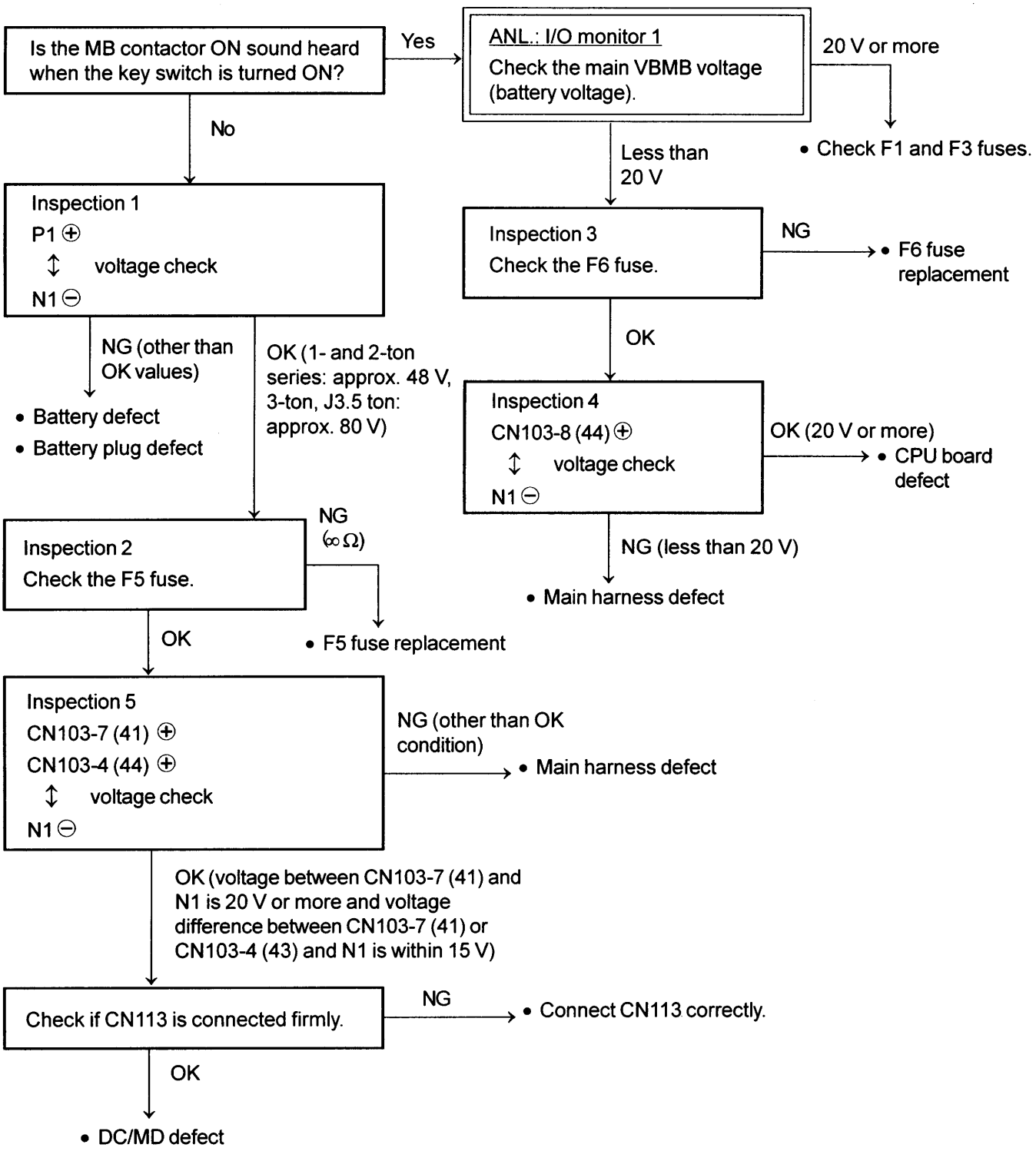
Related portion



Estimated causes

① Blown F5 fuse	④ Main harness defect
② Blown F6 fuse	⑤ DC/MD board defect
③ Blown F1 fuse	

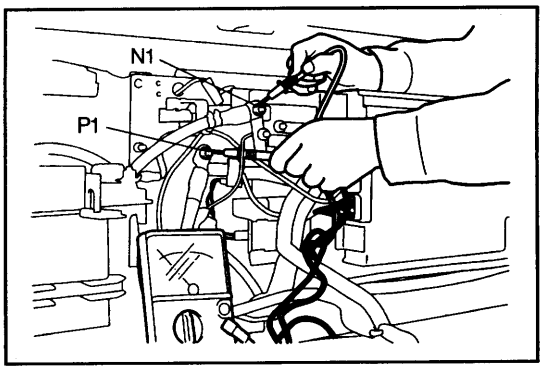
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Inspection 1:
P1 – N1 Voltage Check
Battery plug ON

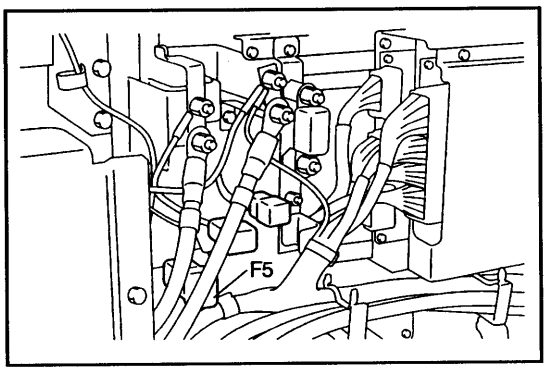
Measurement terminals	P1 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1 and 2 ton series: approx. 48 V, 3-ton, J3.5 ton: approx. 80 V

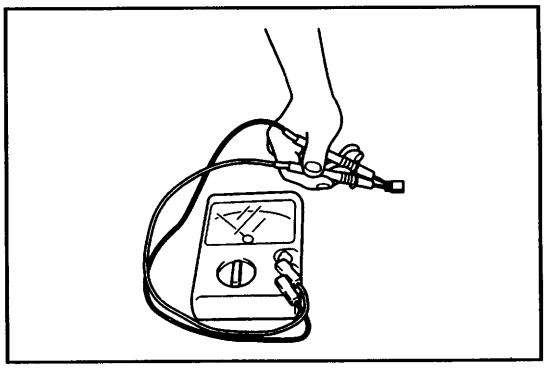


OK (1- and 2-ton series: approx. 48 V, 3-ton series: approx. 80 V) → Go to Inspection 2.
NG (other than OK values) → Battery defect, battery plug defect

Inspection 2:
F5 Fuse Check
Battery plug OFF, removed F5 fuse

Measurement terminals	Both terminals of fuse F5
Tester range	Ω x 1
Standard	0 Ω



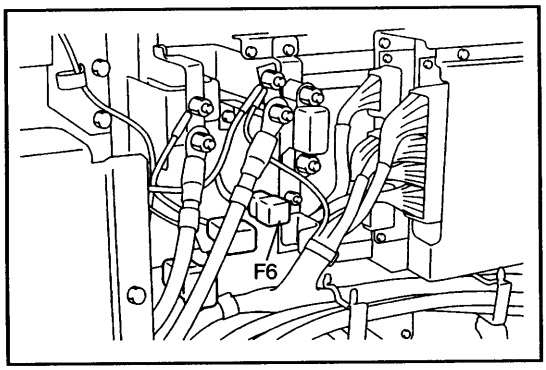


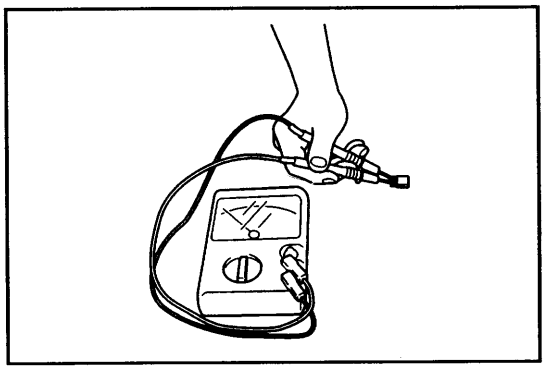
OK (0 Ω) → Go to Inspection 5.
NG (∞ Ω) → F5 fuse replacement

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Inspection 3:
F6 Fuse Check
Battery plug OFF, removed F6 fuse

Measurement terminals	Both terminals of fuse F6
Tester range	Ω x 1
Standard	0 Ω

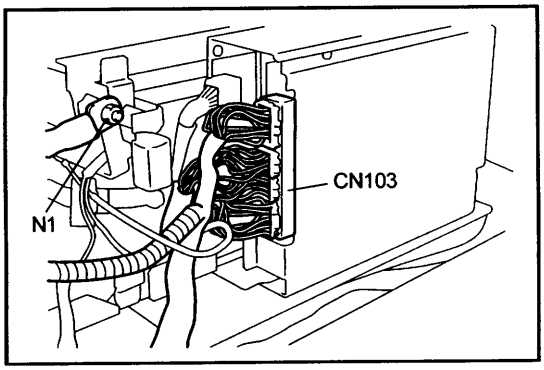


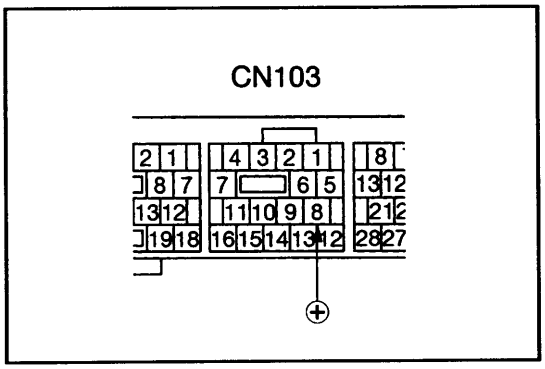


OK (0 Ω) → Go to Inspection 4.
NG (∞ Ω) → F6 fuse replacement

Inspection 4:
Voltage Check After F6 Fuse Check
Battery plug ON

Measurement terminals	C103-8 (44) ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	20 V or more



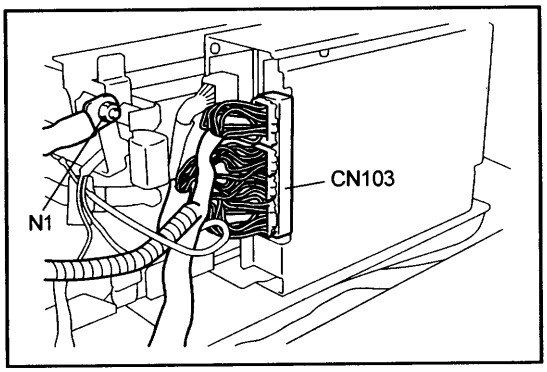


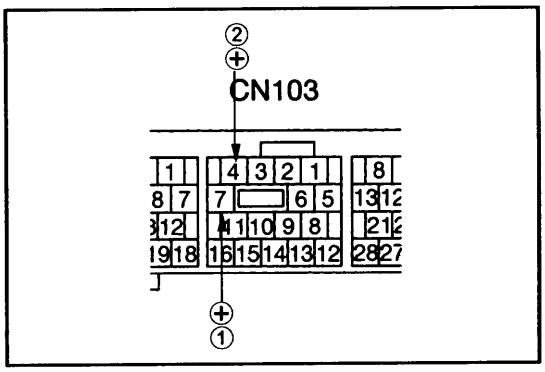
OK (20 V or more) → CPU board defect
NG (less than 20 V) → Main harness defect

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Inspection 5:
Input Voltage to CPU Board Check
Battery plug ON, key switch ON

Measurement terminals	① CN103-7 (41) ⊕ – N1 ⊖ ② CN103-4 (44) ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	Voltage between level No. 41 and N1 is 20 V or more and voltage difference between level No. 41 or No. 44 and N1 is within 15 V.



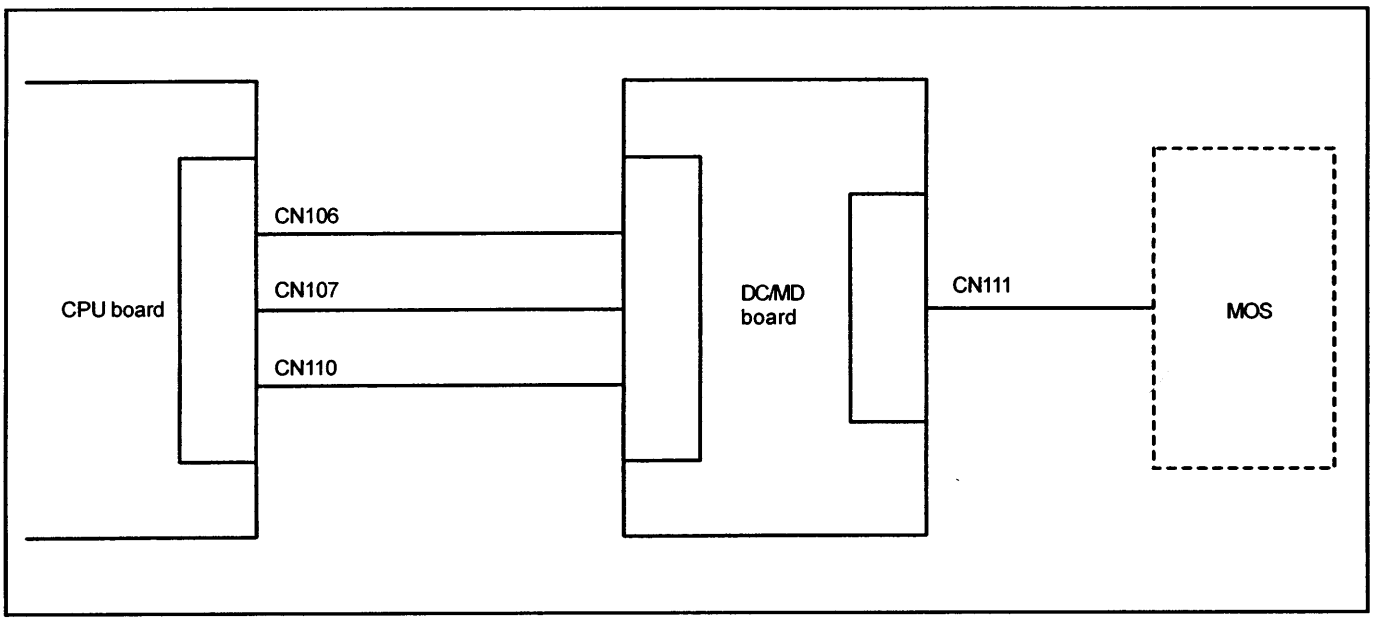


OK (within standard) → Check if CN113 connector is connected firmly.
NG (outside of the standard) → Main harness defect

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2. Failure in Traveling Only or Wobbling

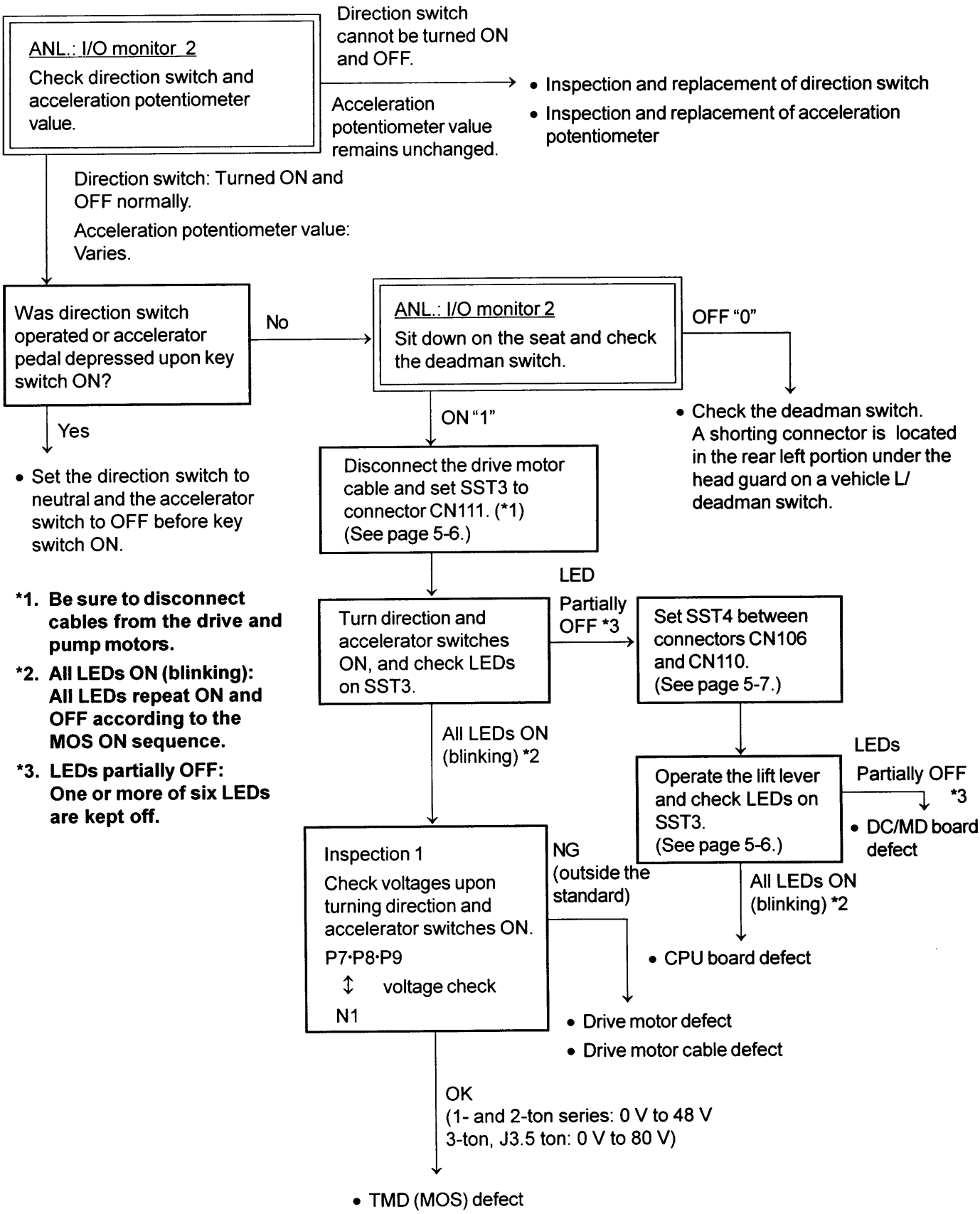
Related portion



Estimated causes

① Direction switch defect
② Acceleration potentiometer defect
③ TMD (MOS) defect
④ Drive motor defect
⑤ Drive motor cable defect
⑥ CPU board defect
⑦ DC/MD board defect

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***1. Be sure to disconnect cables from the drive and pump motors.**

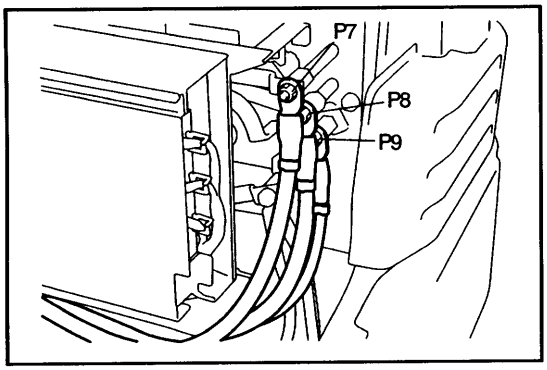
***2. All LEDs ON (blinking): All LEDs repeat ON and OFF according to the MOS ON sequence.**

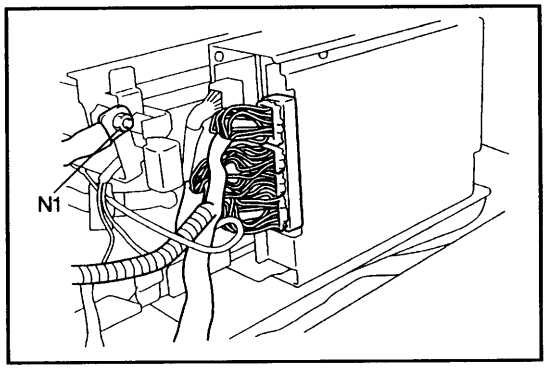
***3. LEDs partially OFF: One or more of six LEDs are kept off.**

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Inspection 1:
Motor voltage check
Battery plug ON, key switch ON

Measurement terminals	P7 · P8 · P9 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1- and 2- ton series: 0 V to 48 V, 3-ton, J3.5 ton: 0 V to 80 V



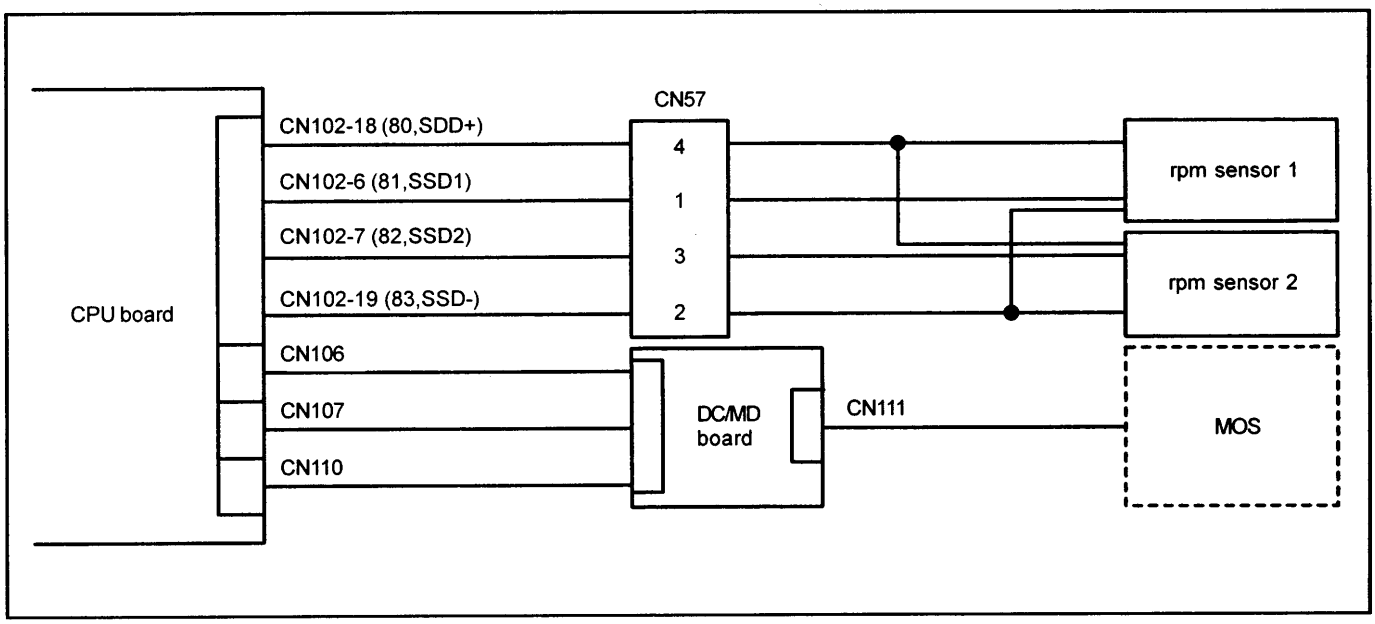


OK (within the standard) → TMD (MOS) defect
NG (outside the standard) → Drive motor or drive motor cable defect

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3. Vehicle Can Travel Only Slowly.

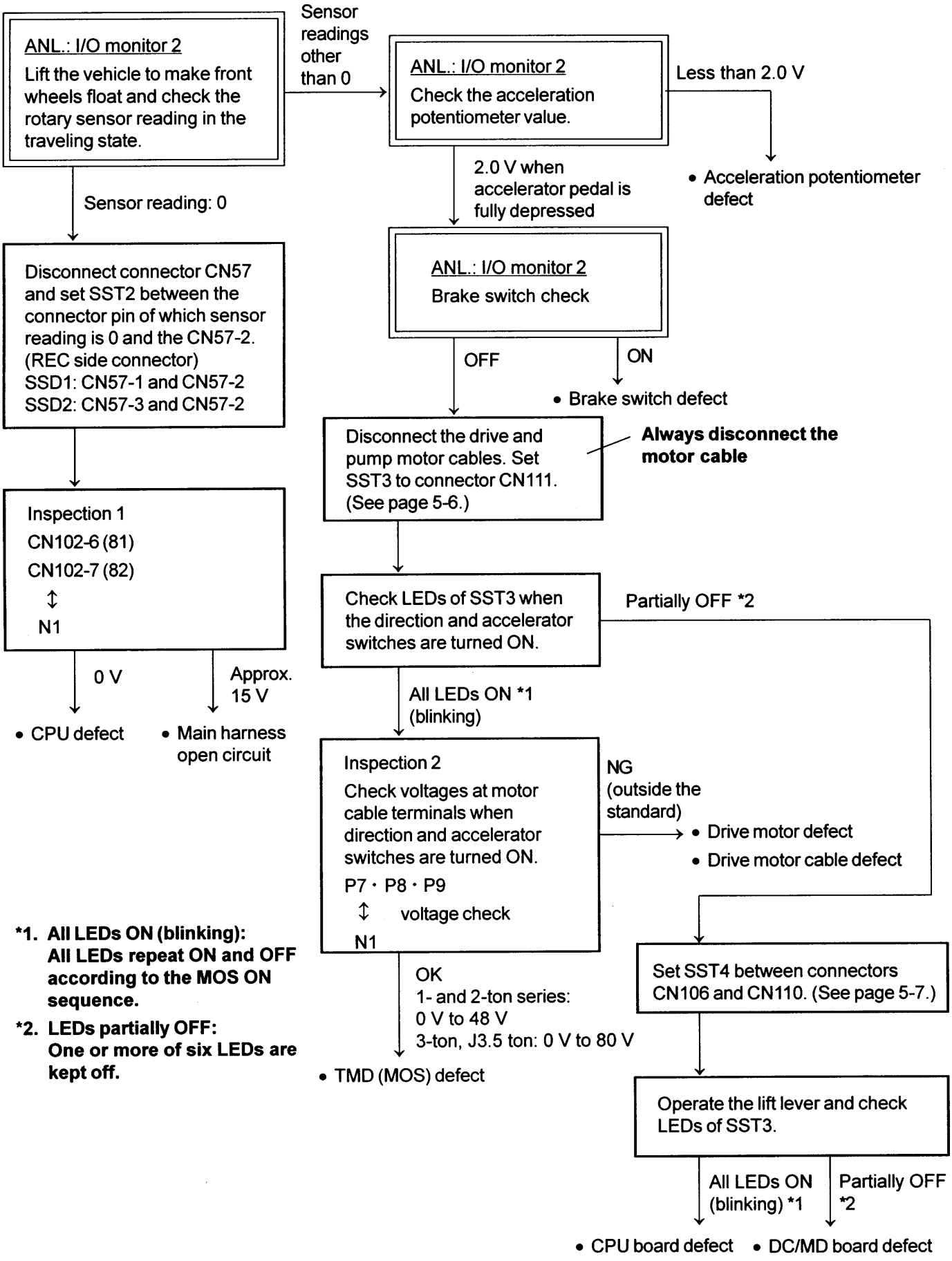
Related portion



Estimated causes

① CPU board defect	⑤ TMD (MOS) defect
② Main harness defect	⑥ Drive motor defect
③ Acceleration potentiometer defect	⑦ Drive motor cable defect
④ Brake switch defect	⑧ DC/MD board defect

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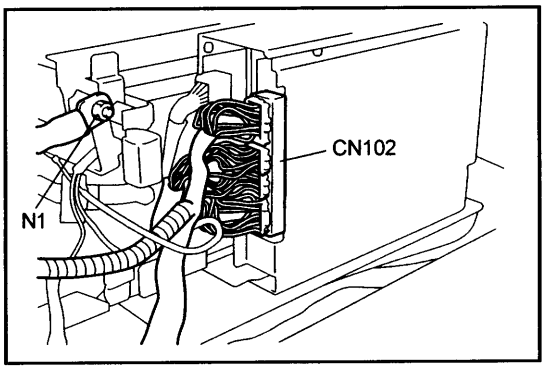
***1. All LEDs ON (blinking): All LEDs repeat ON and OFF according to the MOS ON sequence.**

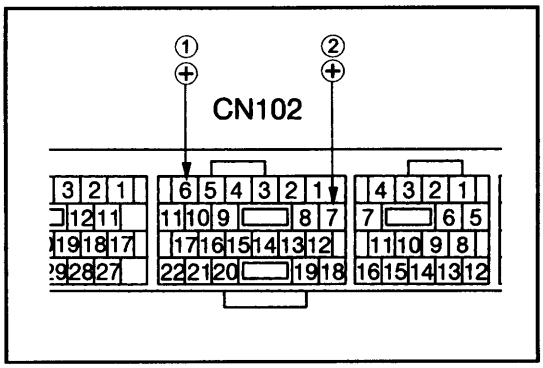
***2. LEDs partially OFF: One or more of six LEDs are kept off.**

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Inspection 1:
Rotary sensor signal voltage check
Battery plug ON, key switch ON

Measurement terminals	① CN102-6 (81) ⊕ – N1 ⊖ ② CN102-7 (82) ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	Approx. 15 V

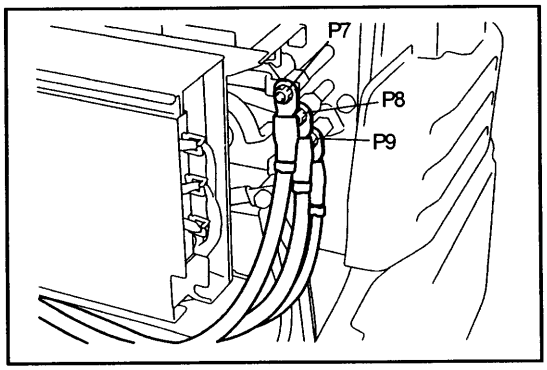


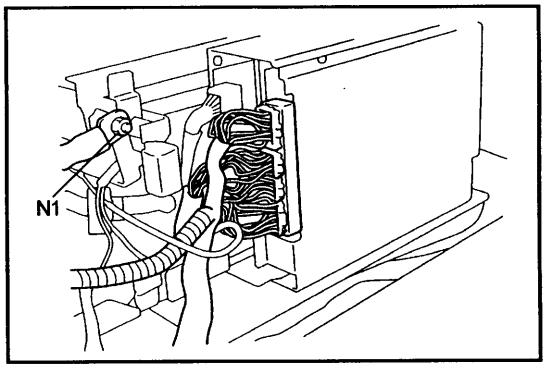


OK (approx. 15 V) → Main harness open circuit
NG (0 V) → CPU board defect

Inspection 2:
Motor voltage check
Battery plug ON, key switch ON

Measurement terminals	P7•P8•P9 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1- and 2-ton series: 0 V to 48 V, 3-ton, J3.5 ton: 0 V to 80 V



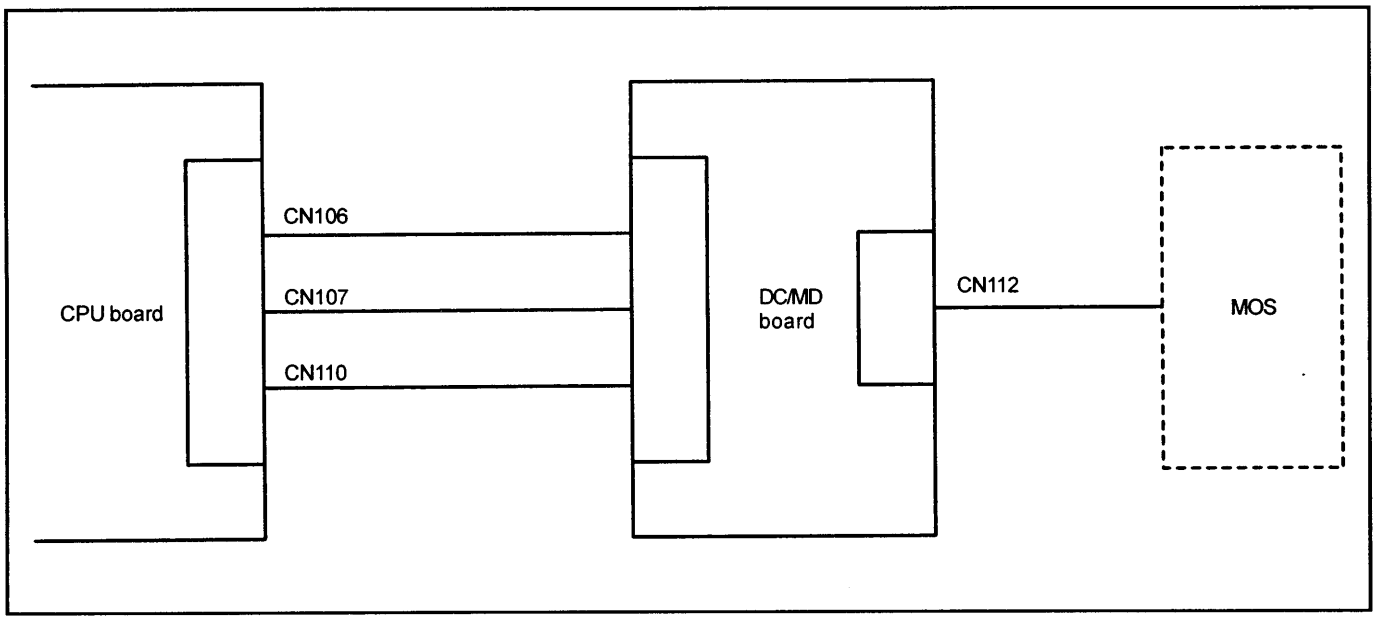


OK (1- and 2-ton series: 0 V to 48 V, 3-ton series: 0 V to 80 V) → TMD (MOS) defect
NG (outside the standard) → Drive motor or drive motor cable defect

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4. Failure in Material Handling Only or Wobbling

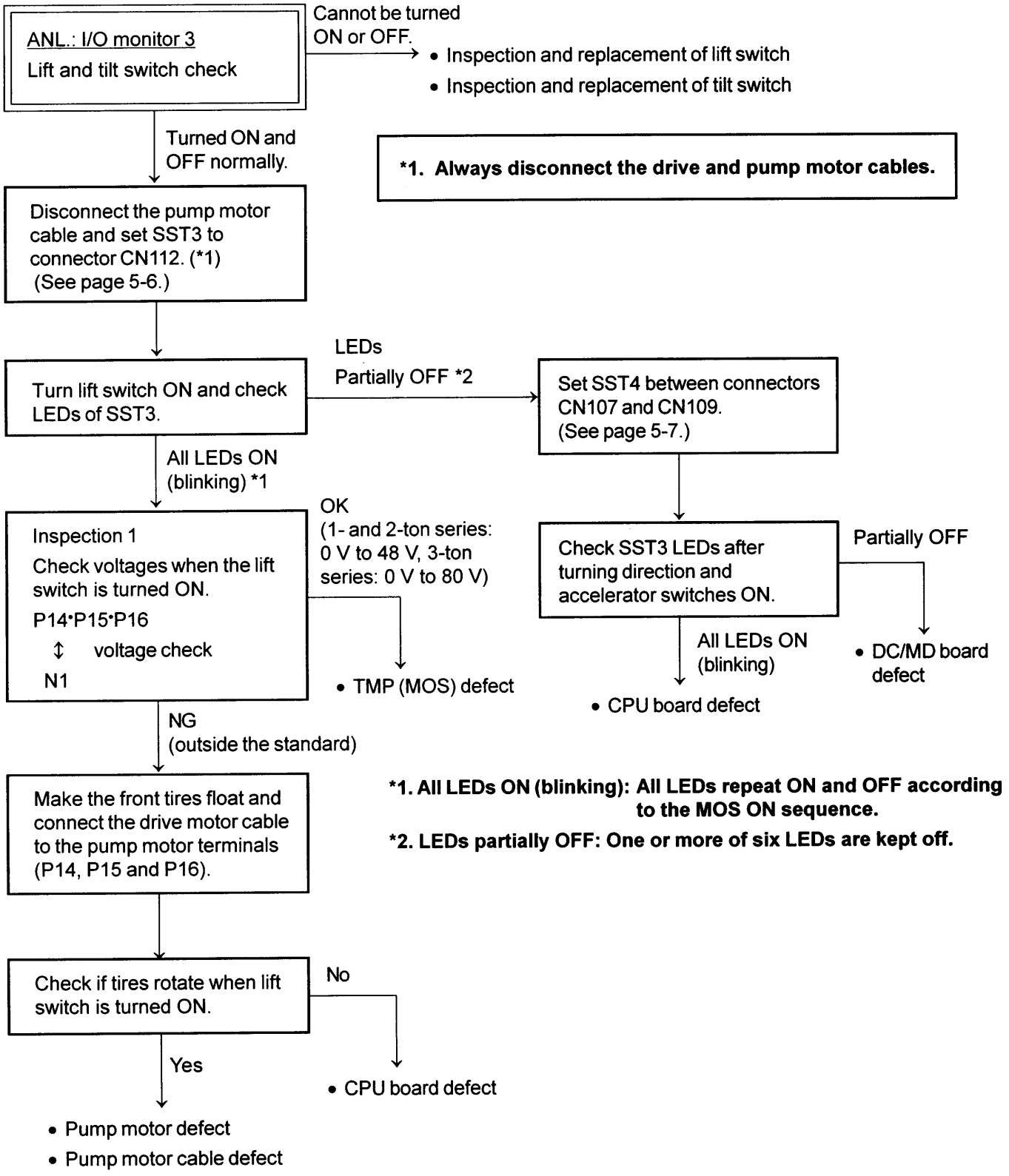
Related portion



Estimated causes

① Lift/tilt switch defect
② TMD (MOS) defect
③ CPU board defect
④ Pump motor defect
⑤ Pump motor cable defect
⑥ DC/MD board defect

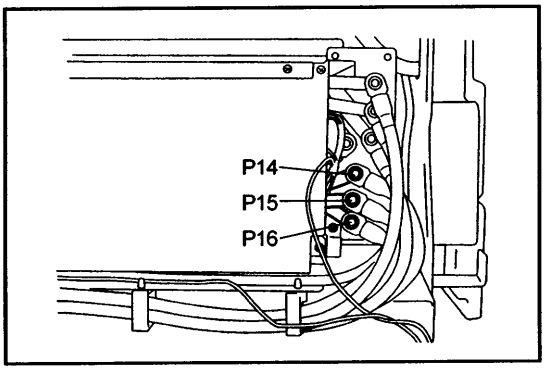
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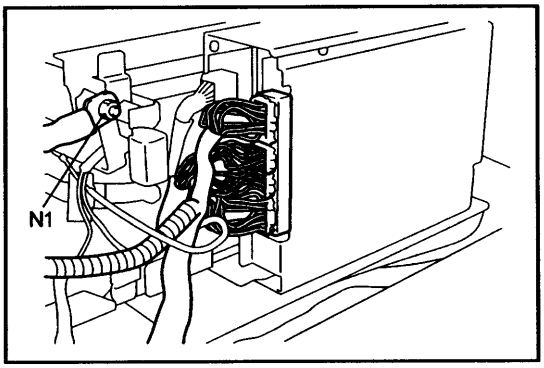


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Inspection 1:
Pump motor voltage check
Battery plug ON, key switch ON

Measurement terminals	P14•P15•P16 ⊕ – N1 ⊖
Tester range	DC 200 V
Standard	1- and 2-ton series: 0 V to 48 V, 3-ton, J3.5 ton: 0 V to 80 V



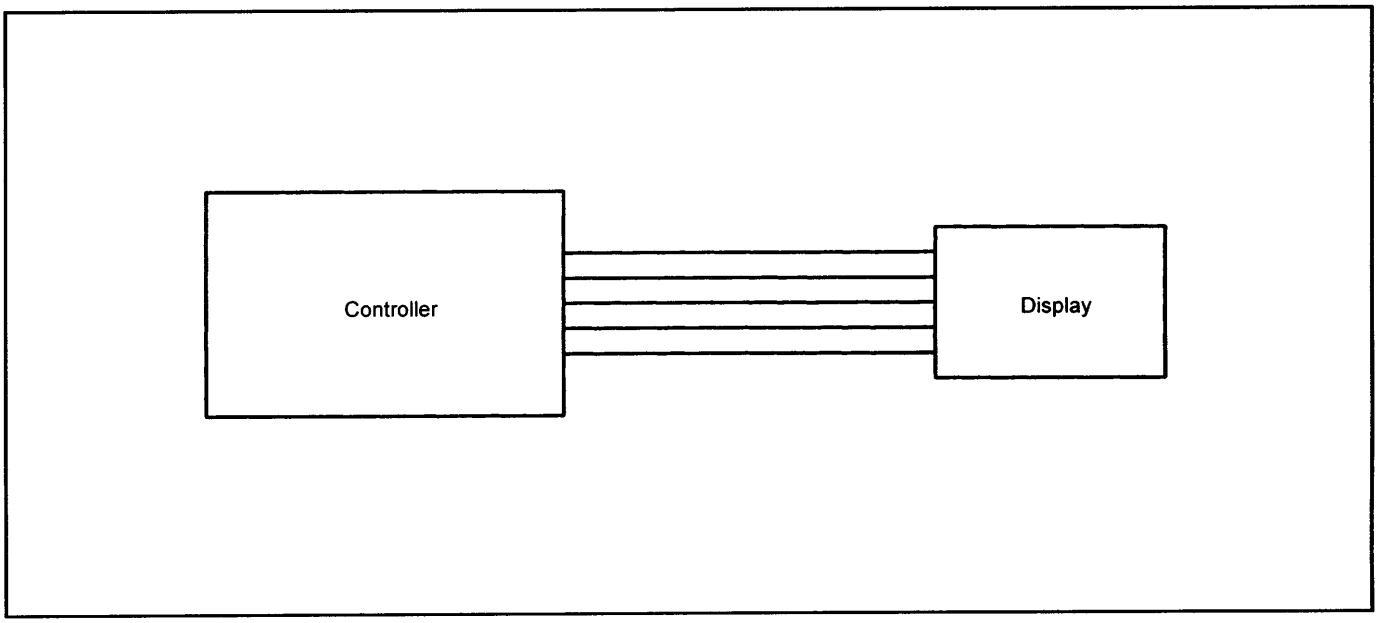


OK (within the standard) → TMD (MOS) defect
NG (outside the standard) → Connect the drive motor cable and check if tires rotate.

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FAILURE IN CONCURRENT TRAVELING AND MATERIAL HANDLING

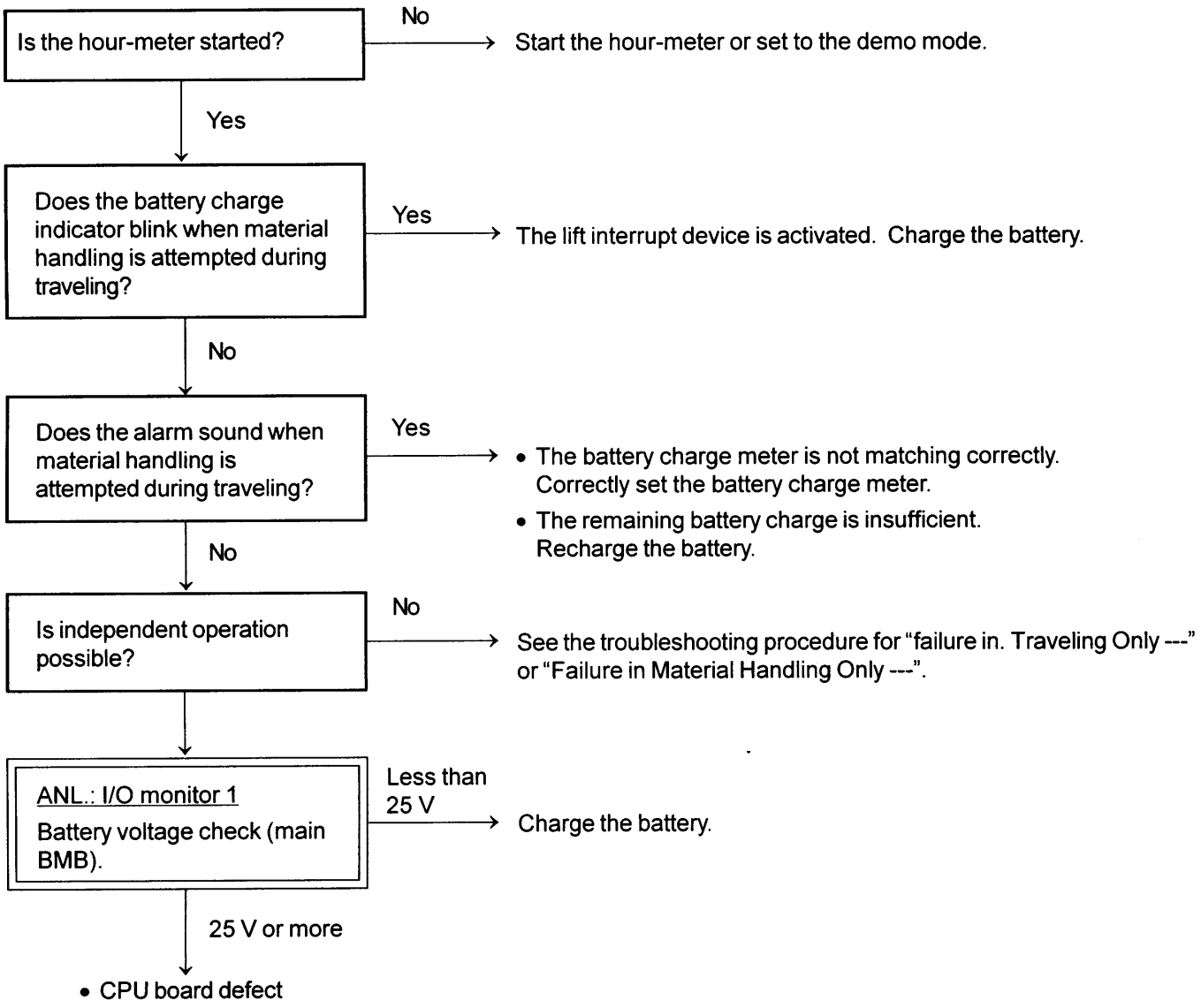
Related portion



Estimated causes

① Hour-meter not started
② Lift interrupt activated
③ Overcharged battery

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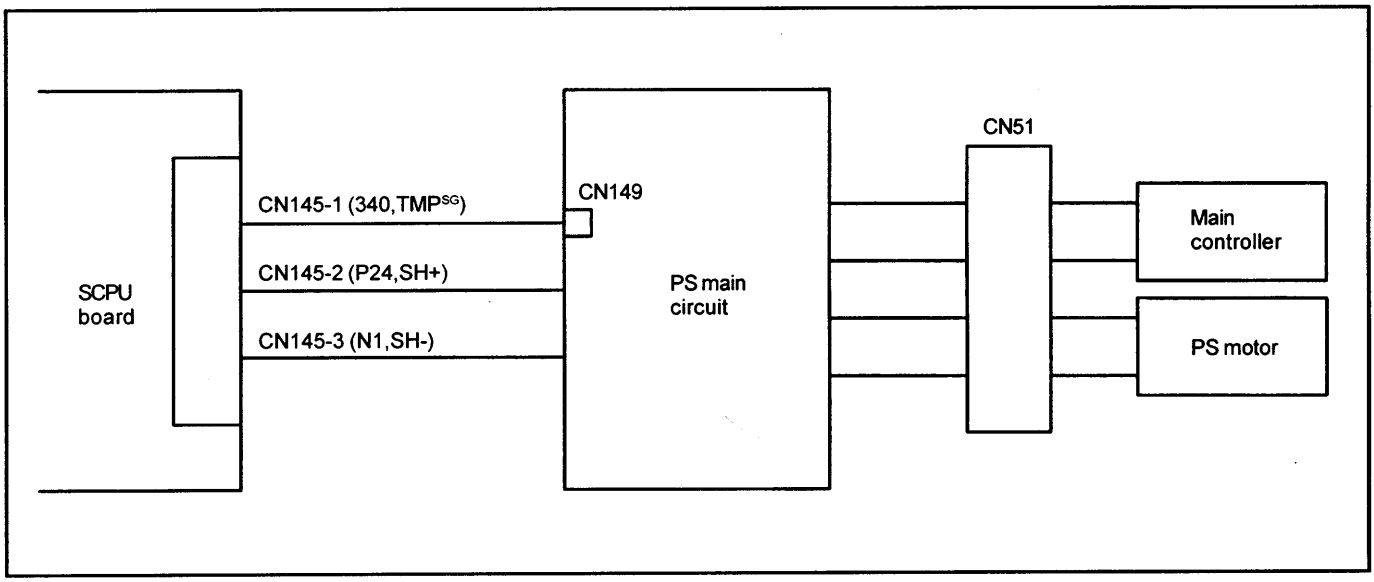


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STEERING SYSTEM TROUBLESHOOTING

Error code F0: PS Main Circuit Abnormality

Related portion



Estimated causes

① TMPS defect
② SCPU board defect
③ Poor electrical contact of CN149

Disconnect connector CN51.

F0 cleared.

- Poor electrical connection of connector CN149
- TMPS inspection

F0 remains.

Inspection 1
Check resistance between shunt and CN145-2.

NG (approx. ∞ Ω)

- Harness defect

OK (approx. 0 Ω)

- CPU board defect

For TMPS defect

Inspection 2
Disconnect connector CN149 after turning key switch to ON.
CN149-1 (340)
↕ voltage check
SH (shunt) ⊖ level side

NG (outside 0.5 V to 4 V)

- SCPU board defect

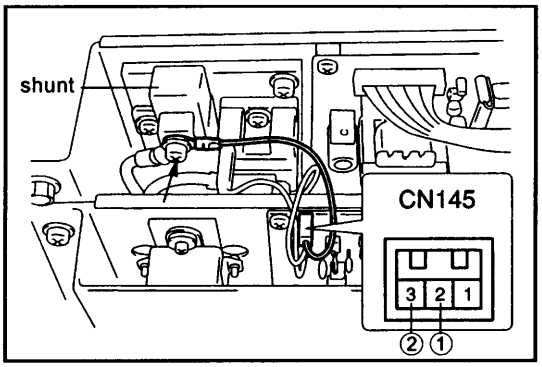
OK (0.5 V to 4 V)

- Normal SCPU board

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Inspection 1:
Resistance check between shunt and CN145
Battery plug OFF

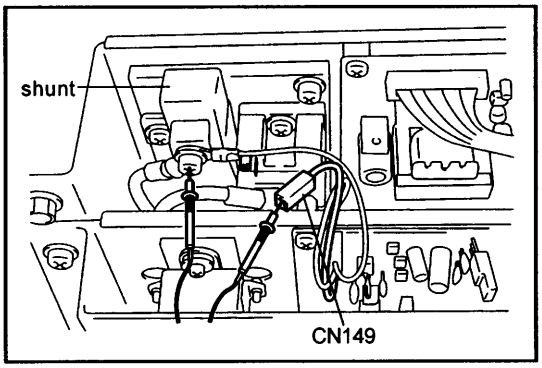
Measurement terminals	① CN145-2 (P24) – SH (shunt) ② CN145-3 (N1) – SH (shunt)
Tester range	Ω x 1
Standard	Approx. 0 Ω



OK (approx. 0 Ω) → SCPU board normal
NG (approx. ∞ Ω) → Harness defect

Inspection 2:
Shunt voltage check
Battery plug ON, key switch ON

Measurement terminals	CN149-1 (340) (REC side) ⊕ – SH (shunt) ⊖
Tester range	DC 10 V
Standard	0.5 V to 4 V



OK (0.5 V to 4 V) → SCPU board normal
NG (outside the standard) → SCPU board defect

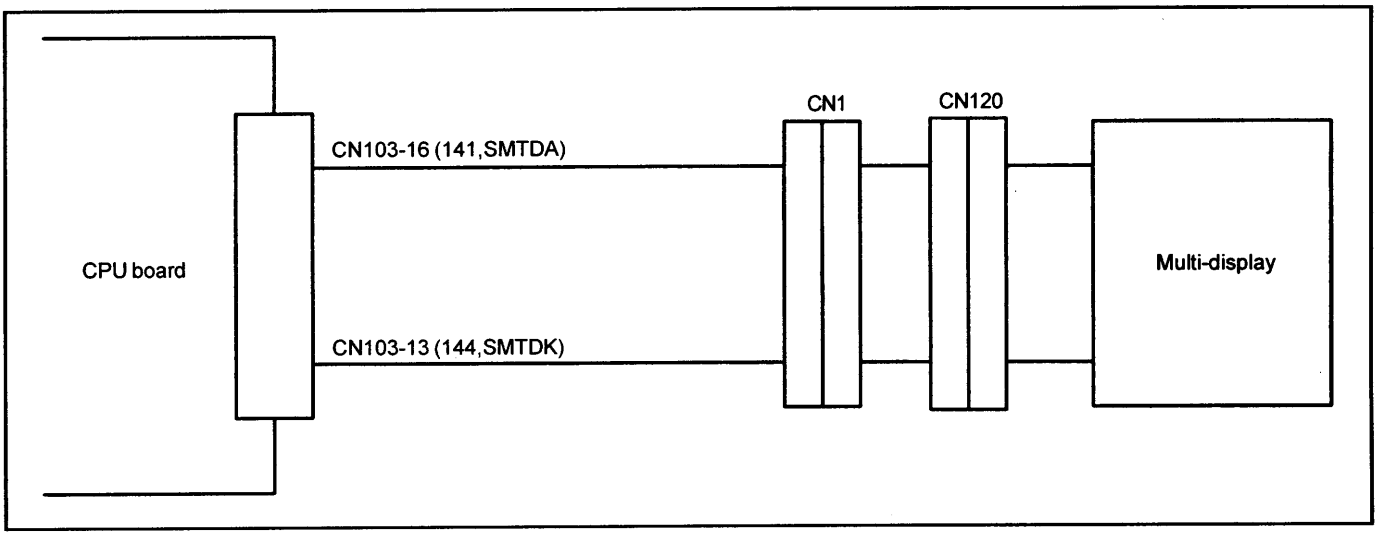
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MULTI-DISPLAY – MCS COMMUNICATION SYSTEM TROUBLESHOOTING

WHEN AN ERROR CODE IS DISPLAYED

Error code F1: Multi-display – MCS communication system

Related portion

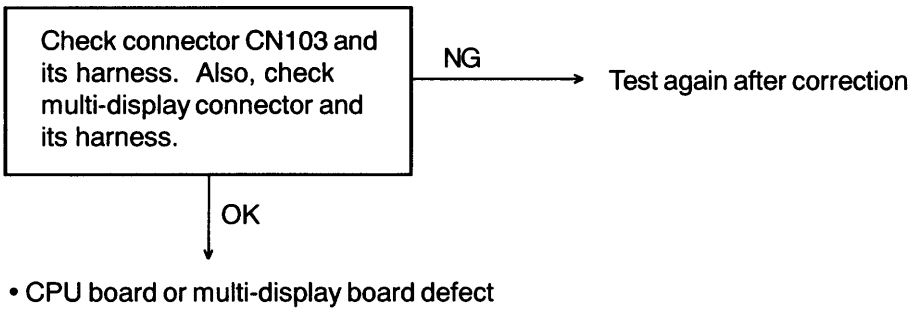


Estimated causes

① Open circuit between CN103 and multi-display	③ Multi-display defect
② Poor electrical contact of CN103, CN1 or CN120	④ CPU board defect

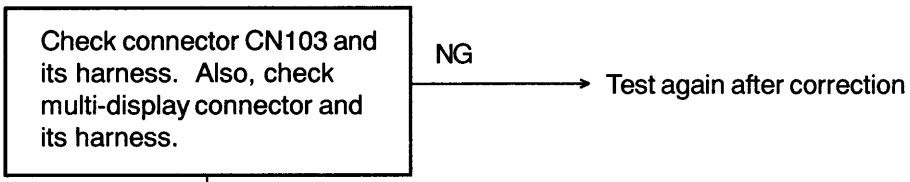
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Error code F1-1: No communication between multi-display and MCS



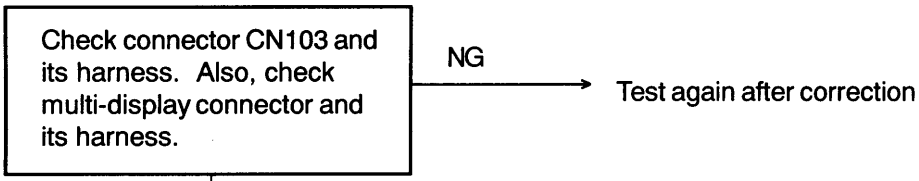
- CPU board or multi-display board defect

Error code F1-2: Defective communication data between multi-display and MCS



- CPU board defect
- Multi-display board defect

Error code F1-3: Improper communication data between multi-display and MCS



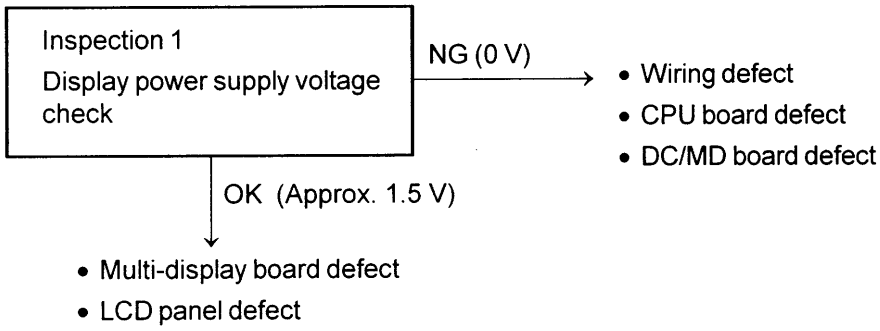
- CPU board defect
- Multi-display board defect

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WHEN NO ERROR CODE IS DISPLAYED

When an F1-1 occurs, error code F1-1 remains on the multi-display regardless of ON or OFF of the key switch, since no communication data is sent from CPU to the multi-display.
(The power for the multi-display is directly supplied from the CPU.)

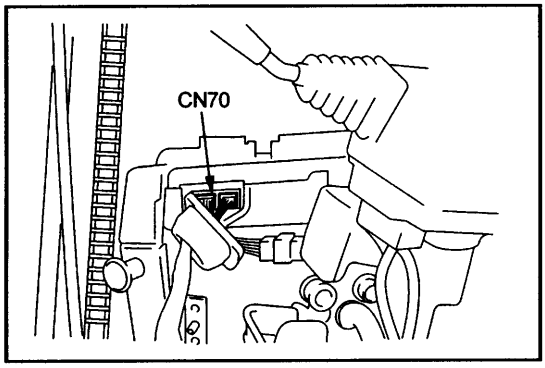
1. No indication on multi-display (including error indication)

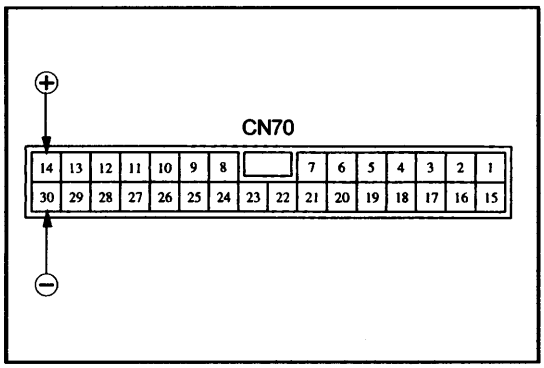


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Inspection 1:
Display power supply voltage check
Battery plug ON

Measurement terminals	CN70-14 (16) ⊕ – CN70-30 (14) ⊖
Tester range	DC 50 V
Standard	Approx. 15 V





OK (approx. 15 V) → Multi-display board or LCD panel defect
NG (0 V) → Wiring, CPU board or DC-BD board defect

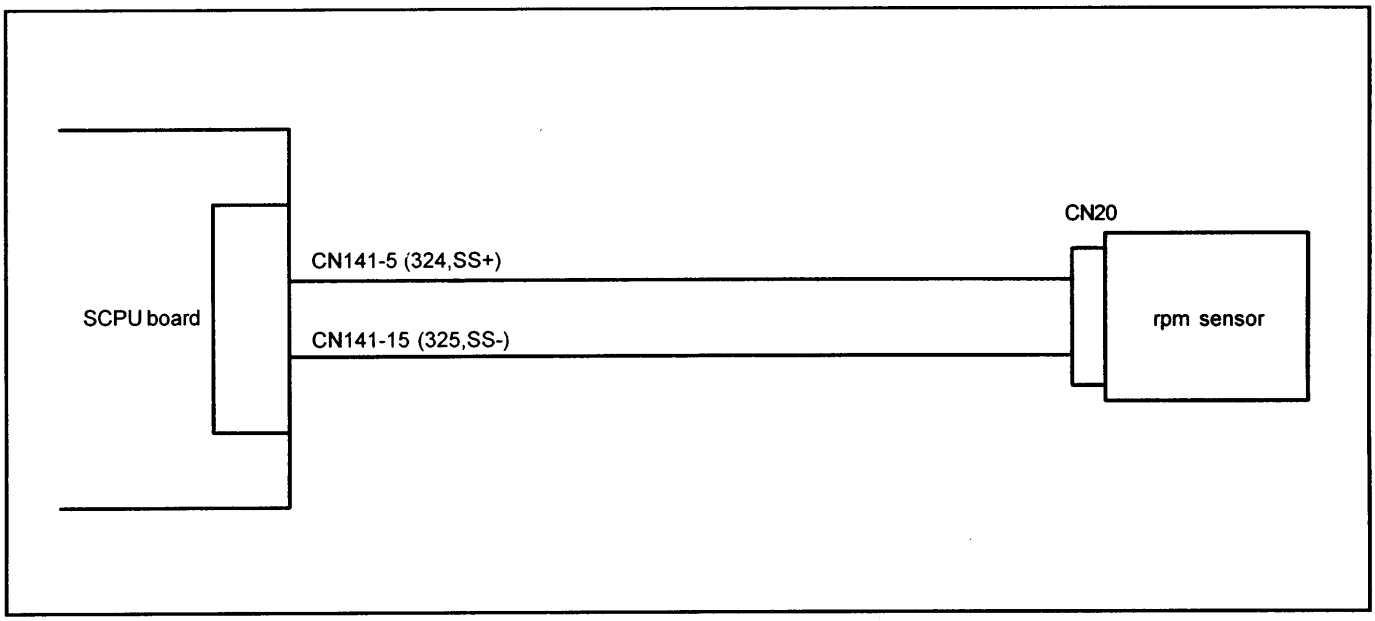
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SAS TROUBLESHOOTING

WHEN AN ERROR CODE IS DISPLAYED

Error code 51: Vehicle Speed Sensor Abnormality

Related portion

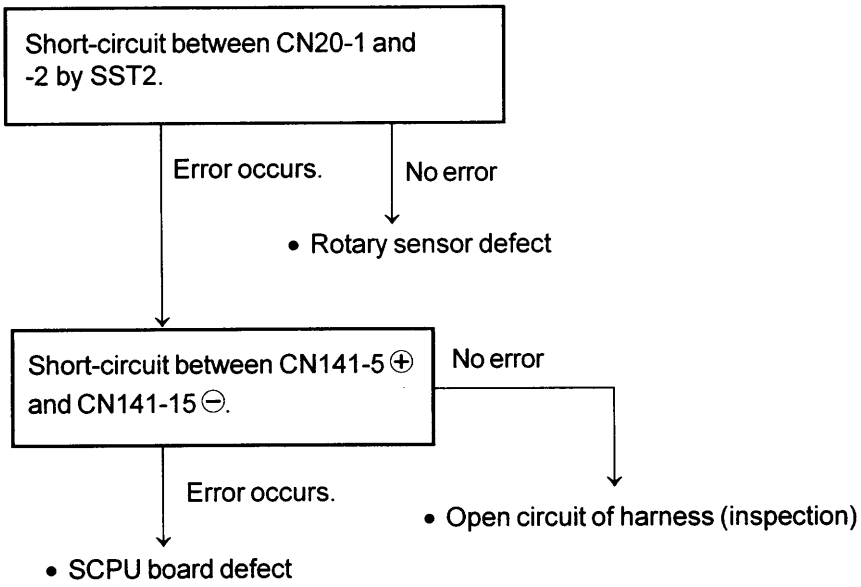


Estimated causes

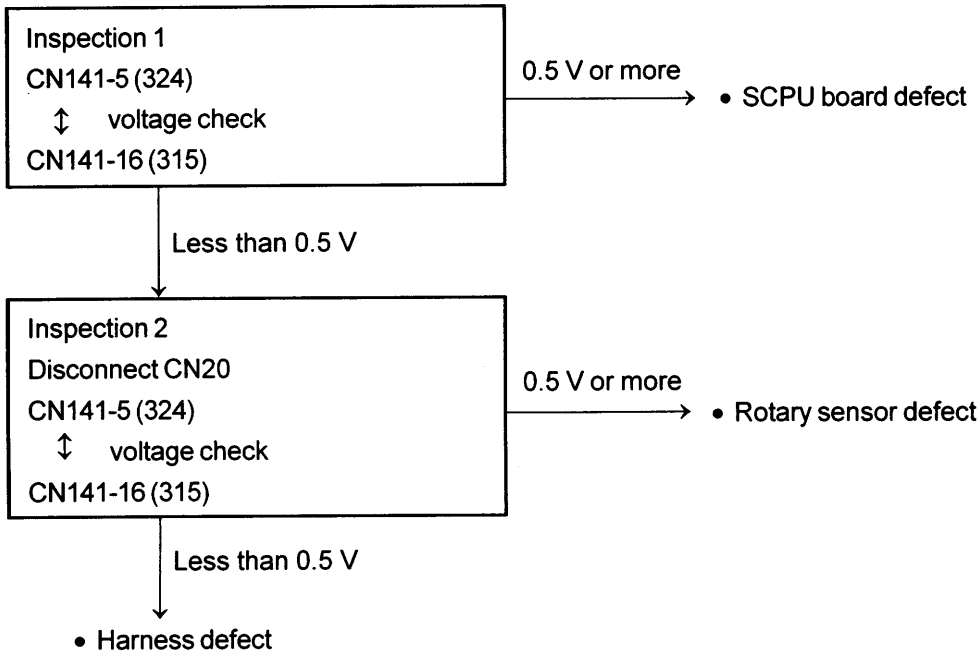
① Rotary sensor defect
② Open circuit of harness
③ SCPU board defect

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For 51-1



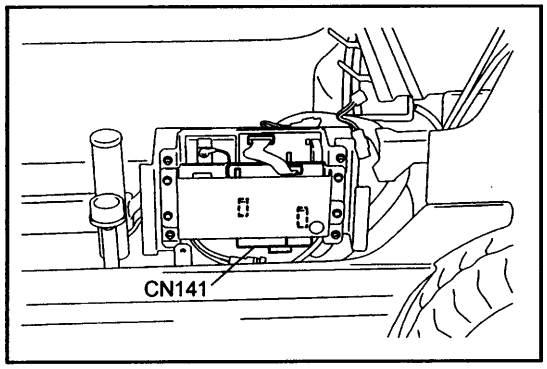
For 51-2

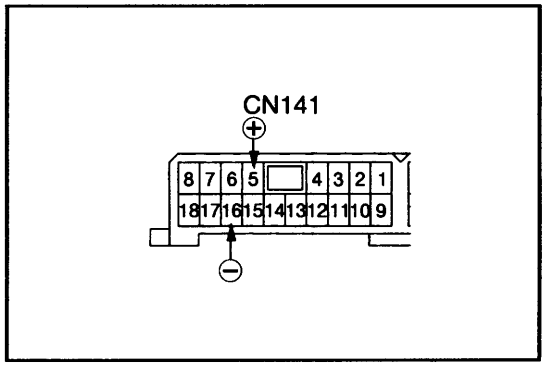


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Inspection 1 <for 51-2>:
Rotary sensor signal voltage check 1
Battery plug ON, key switch ON

Measurement terminals	CN141-5 (324) ⊕ – CN141-16 (315) ⊖
Tester range	DC 10 V
Standard	0.5 V or more

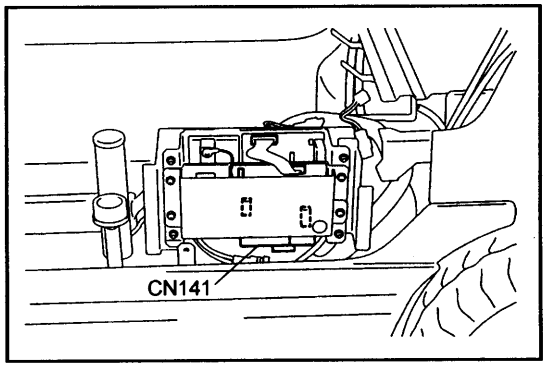


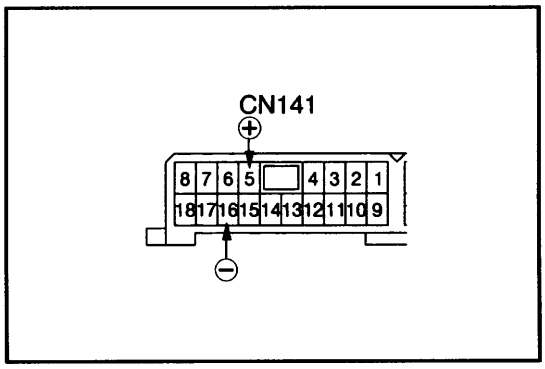


OK (0.5 V or more) → SCPU board defect
NG (less than 0.5 V) → Go to Inspection 2.

Inspection 2 <for 51-2>:
Rotary sensor signal voltage check 2
Battery plug ON, key switch ON, CN20 disconnection

Measurement terminals	CN141-5 (324) ⊕ – CN141-16 (315) ⊖
Tester range	DC 10 V
Standard	0.5 V or more



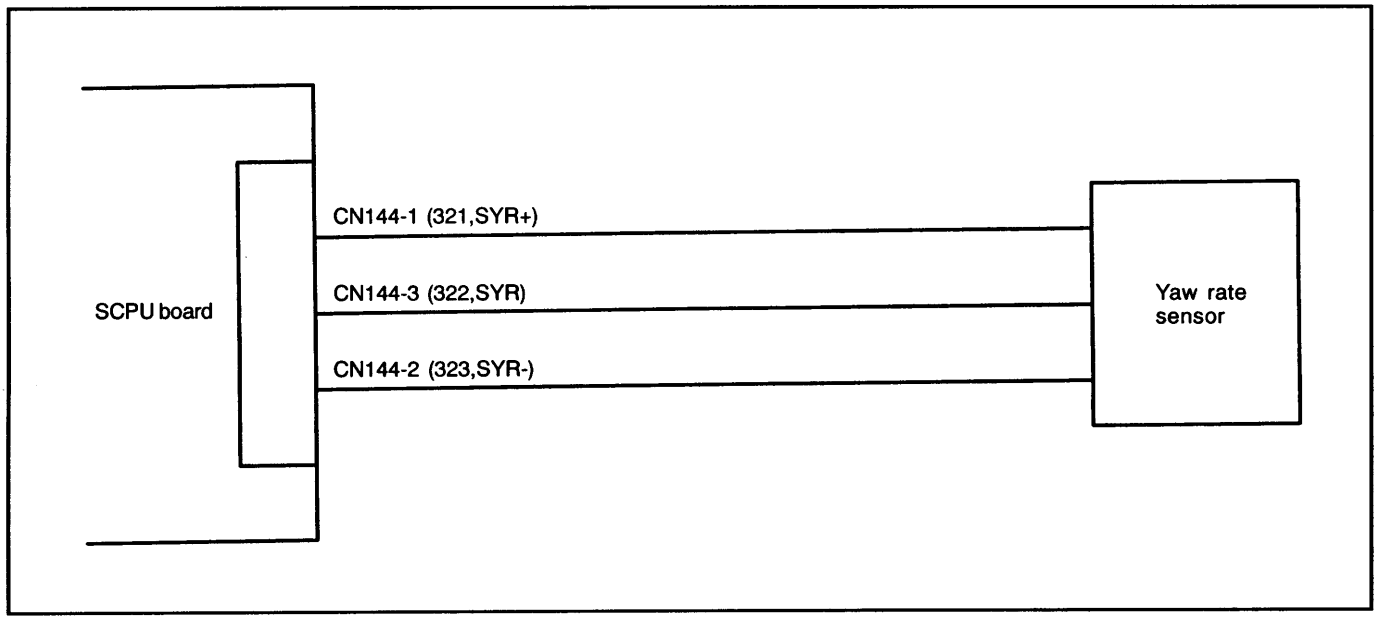


OK (0.5 V or more) → Rotary sensor defect
NG (less than 0.5 V) → Harness defect

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Error Code 52: Yaw Rate Sensor Abnormality

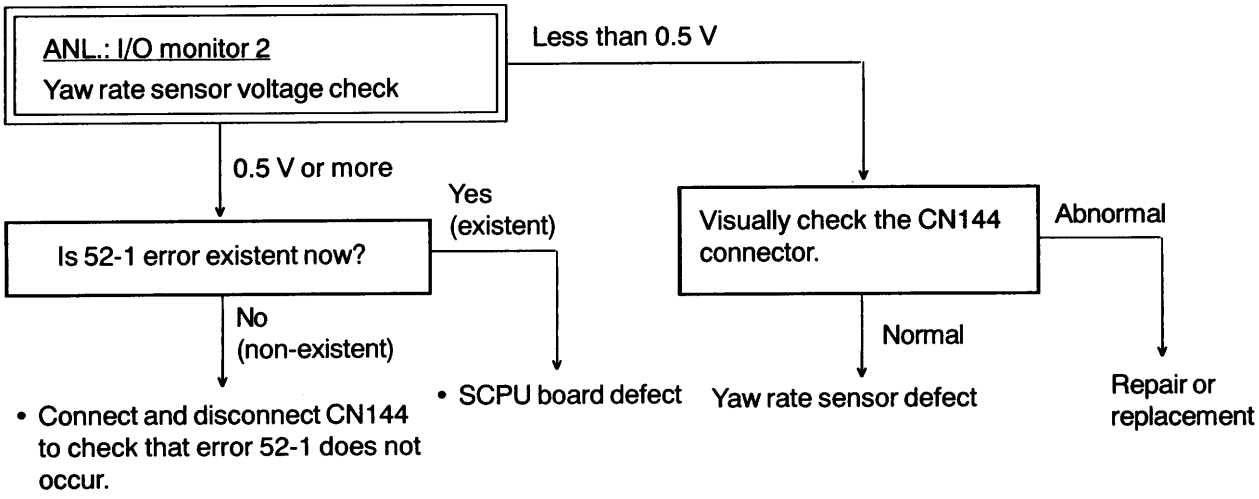
Related portion



Estimated causes

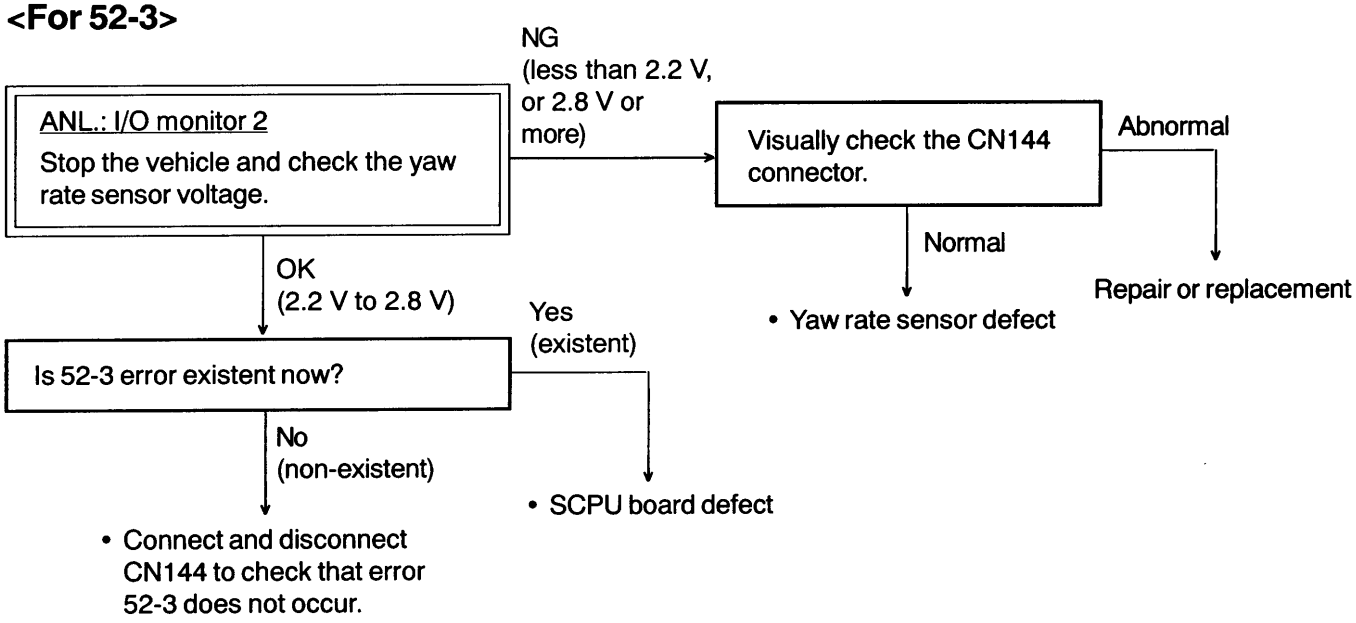
① Yaw rate sensor defect
② Short or open circuit of connector

<For 52-1 or 52-2>



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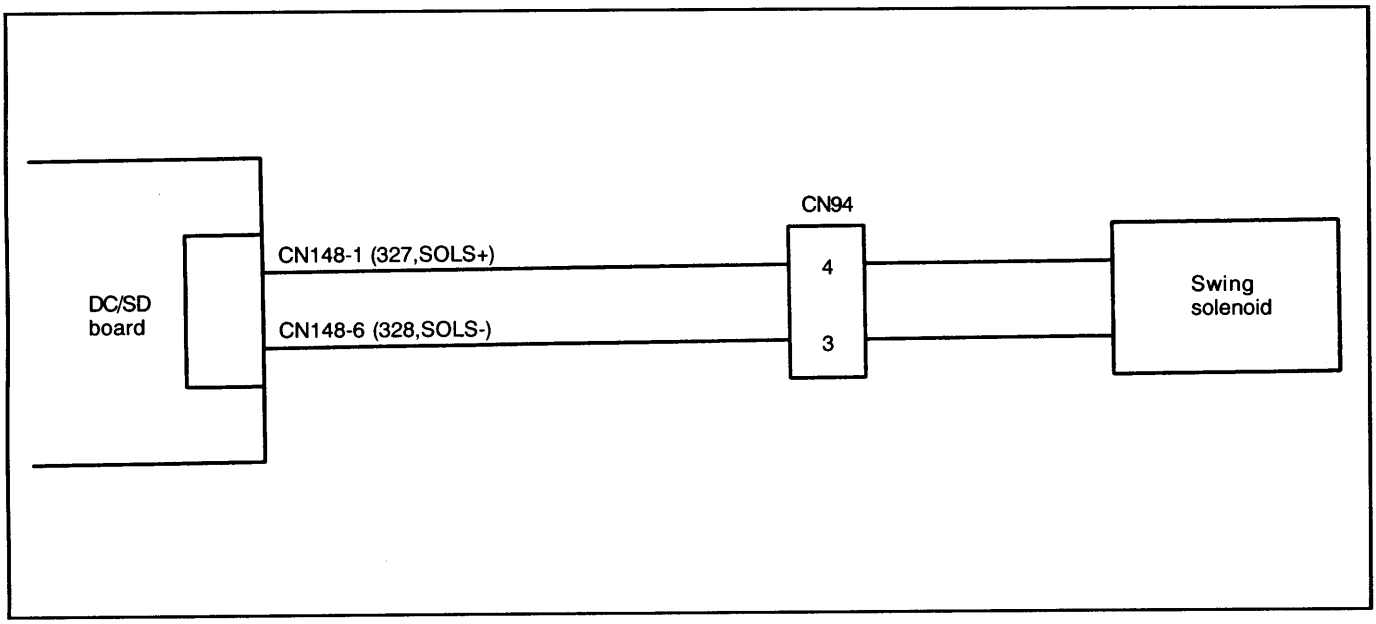
<For 52-3>



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Error Code 54: Swing Solenoid Abnormality

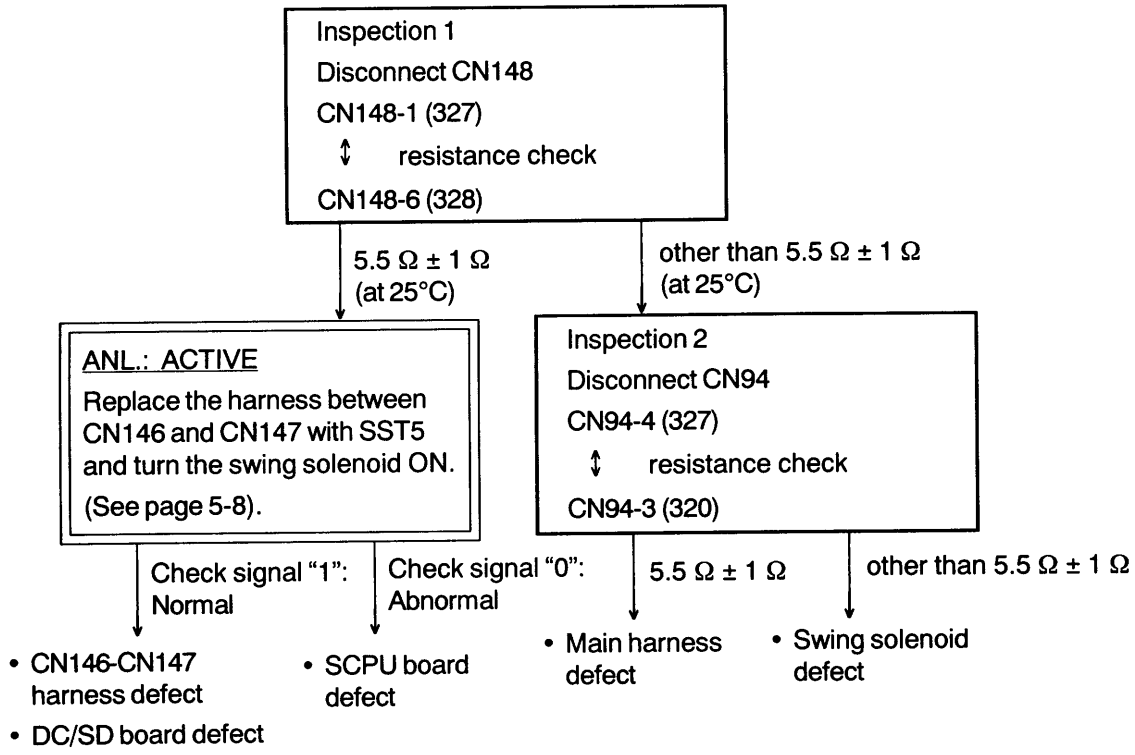
Related portion



Estimated causes

① Swing solenoid defect	③ DC/SD board defect
② Short or open circuit of harness	④ SCPU board defect

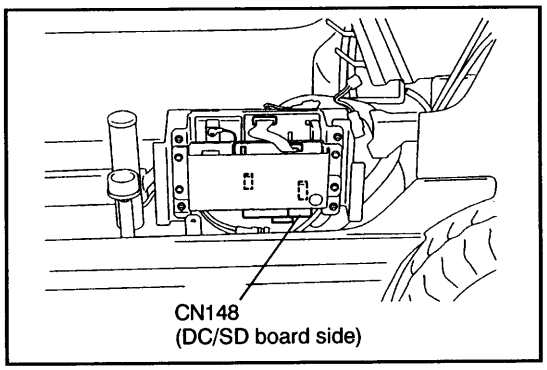
<For 54-1>

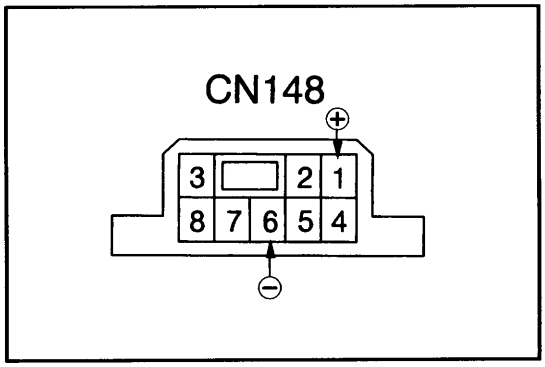


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Inspection 1 <for 54-1>:
Swing solenoid resistance check 1
Battery plug OFF, CN148 disconnection

Measurement terminals	CN148-1 (327) ⊕ – CN148-6 (328) ⊖
Tester range	Ω x 1
Standard	5.5 ± 1 Ω (at 25°C)

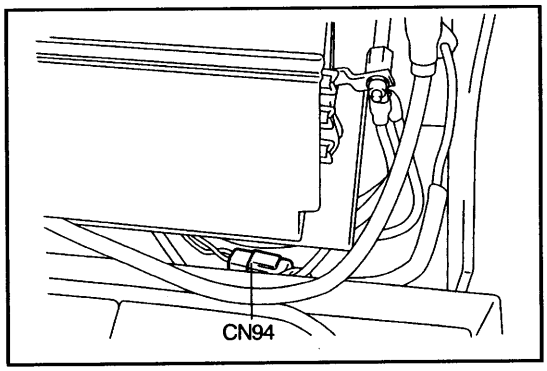


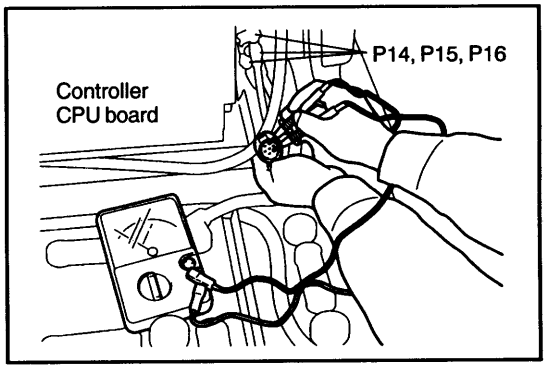


OK (5.5 ± 1Ω) → Go to ANL.: ACTIVE.
NG (other than 5.5 ± 1 Ω) → Go to Inspection 2.

Inspection 2 <for 54-1>:
Swing solenoid resistance check 2
Battery plug OFF, CN94 disconnection

Measurement terminals	CN94-4 (327) ⊕ – CN94-3 (320) ⊖
Tester range	Ω x 1
Standard	5.5 ± 1 Ω (at 25°C)

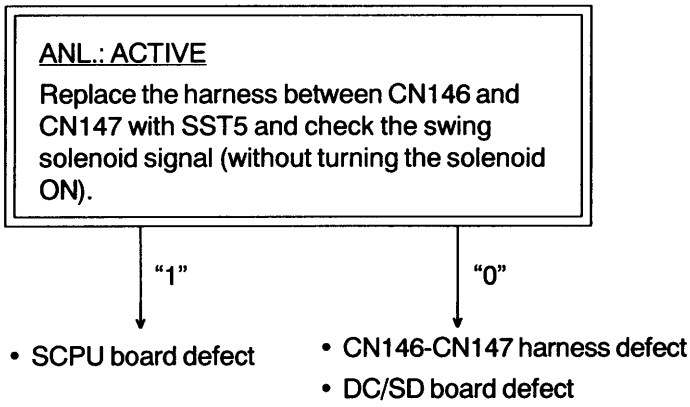




OK (5.5 ± 1 Ω) → Main harness defect
NG (other than 5.5 ± 1 Ω) → Swing solenoid defect

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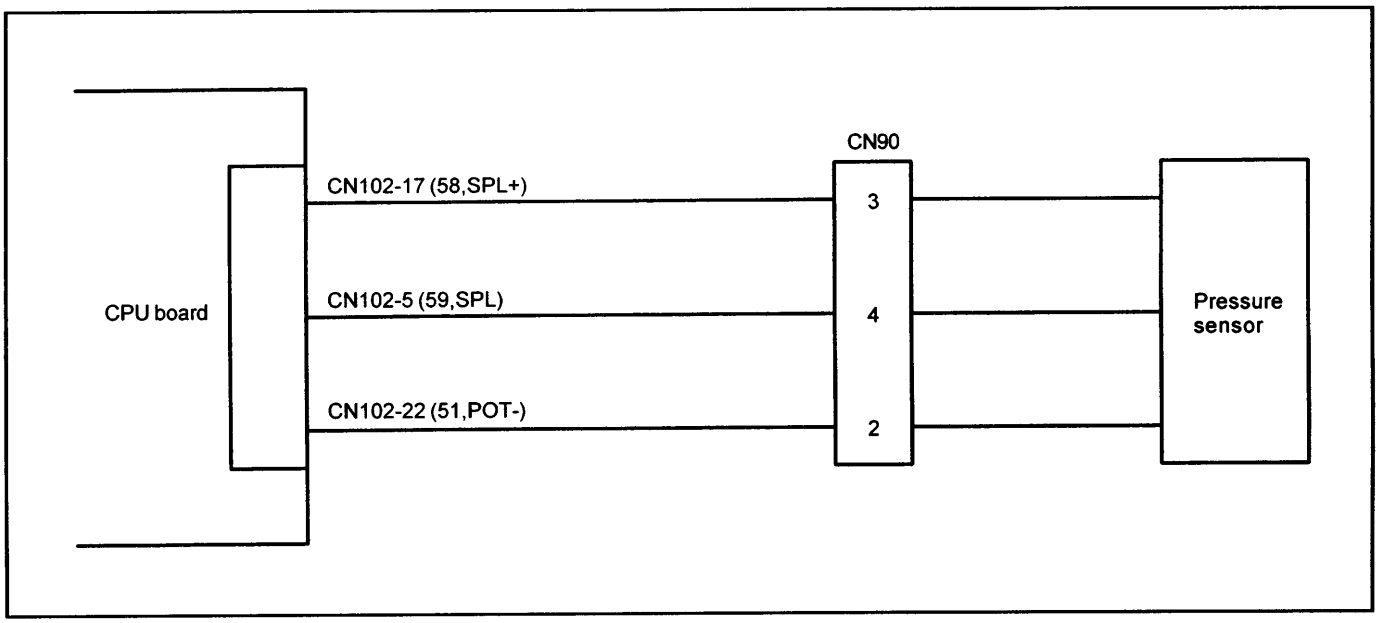
<For 54-2>



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Error Code 61: Pressure Sensor Abnormality

Related portion



Estimated causes

① Pressure sensor defect
② Harness defect (short or open circuit)
③ CPU board defect

<For 61-1>

Disconnect CN90, and use SST2 to short between terminals 3 and 4 on the REC side.

→ Error 61-2 occurs.
- Sub-harness check
- Pressure sensor check

↓ Error 61-2 does not occur.

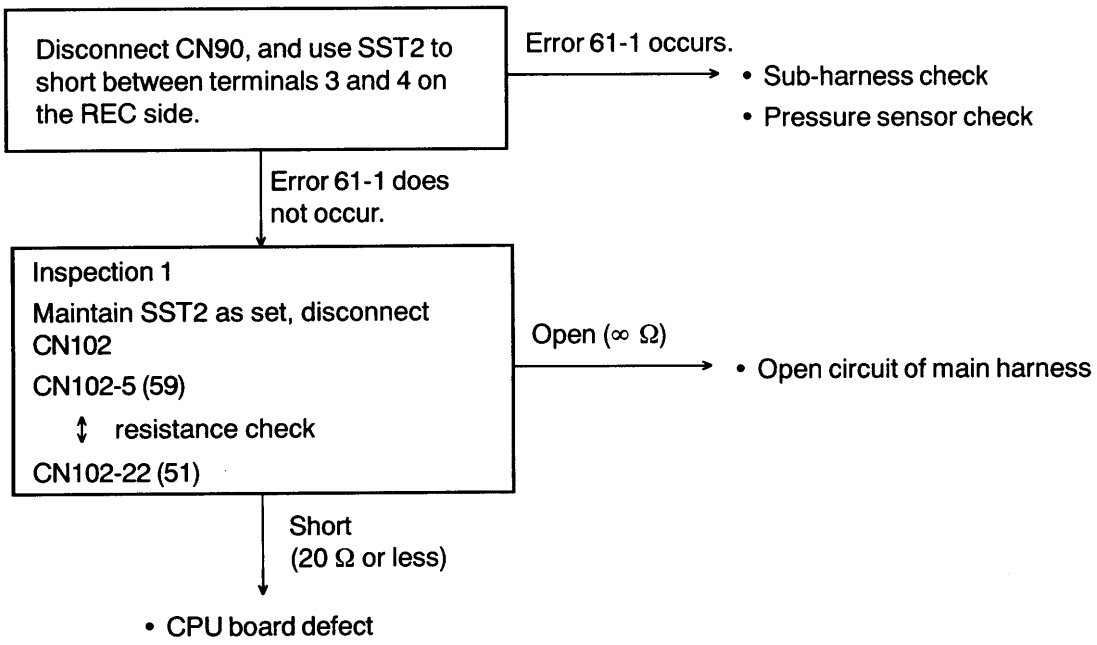
Inspection 1
Maintain SST2 as set, disconnect CN102
CN102-17 (58)
↕ resistance check
CN102-5 (59)

→ Open (∞ Ω)
- Main harness defect

↓ Short (20 Ω or less)
- CPU board defect

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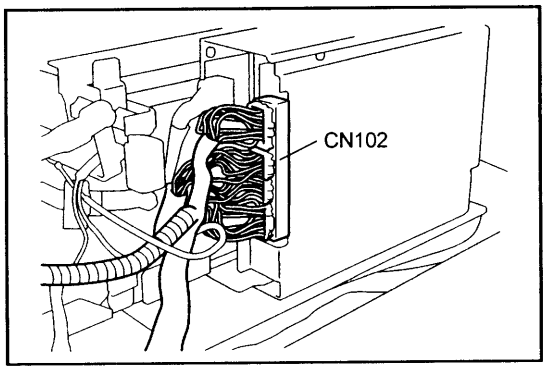
<For 61-2>

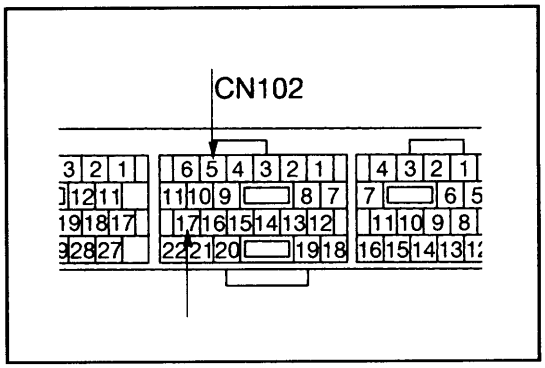


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Inspection 1 <for 61-1>:
Pressure sensor resistance check 1
Battery plug OFF, CN90 disconnection

Measurement terminals	CN102-17 (58) – CN102-5 (59)
Tester range	Ω x 10
Standard	Less than 20 Ω

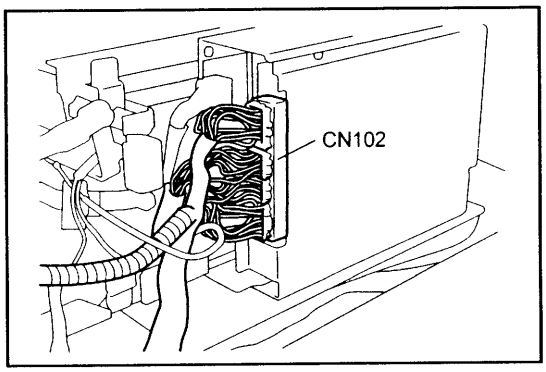


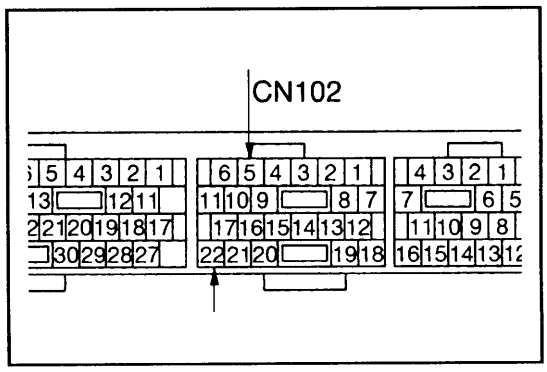


OK (short: less than 20 Ω) → CPU board defect
NG (open: ∞ Ω) → Open circuit of main harness

Inspection 1 <for 61-2>:
Pressure sensor resistance check 2
Battery plug OFF, CN102 disconnection

Measurement terminals	CN102-5 (59) – CN102-22 (51)
Tester range	Ω x 10
Standard	Less than 20 Ω



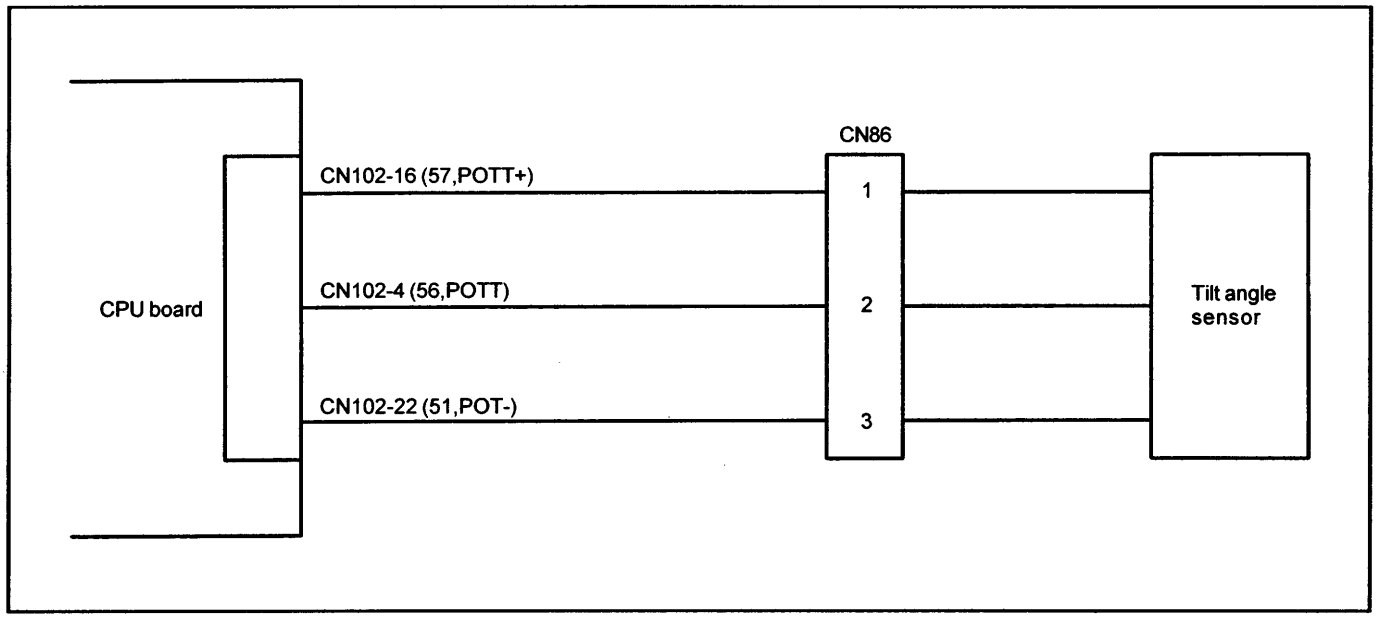


OK (short: less than 20 Ω) → CPU board defect
NG (open: ∞ Ω) → Open circuit of main harness

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Error Code 62: Tilt Angle Sensor Abnormality

Related portion



Estimated causes

① Tilt angle sensor abnormality
② Harness (short or open circuit)

<For 62-1>

Disconnect CN86, and use SST2 to short terminals 1 and 2 on the REC side.

→ Error 62-2 occurs.
- Sub-harness check
- Inspection of tilt angle sensor

↓ Error 62-2 does not occur.

Inspection 1
Maintain SST2 as set, disconnect
CN102-16 (57)
↕ resistance check
CN102-4 (56)

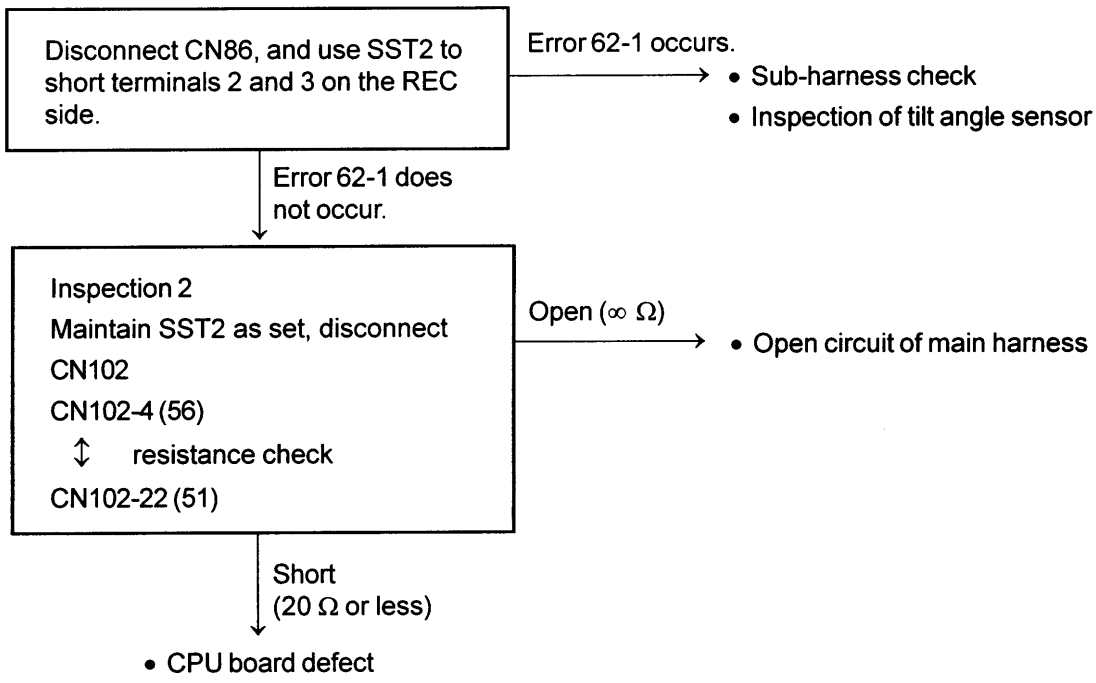
→ Open (∞ Ω)
- Open circuit of main harness

↓ Short (20 Ω or less)

- CPU board defect

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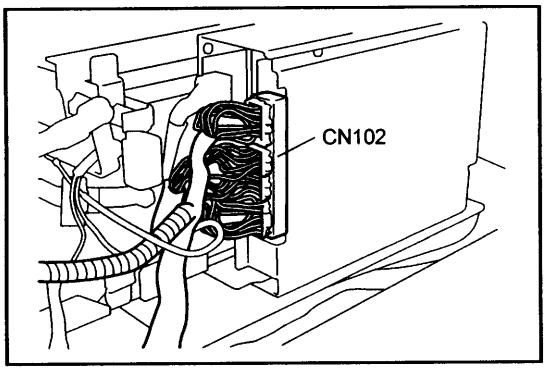
<For 62-2>

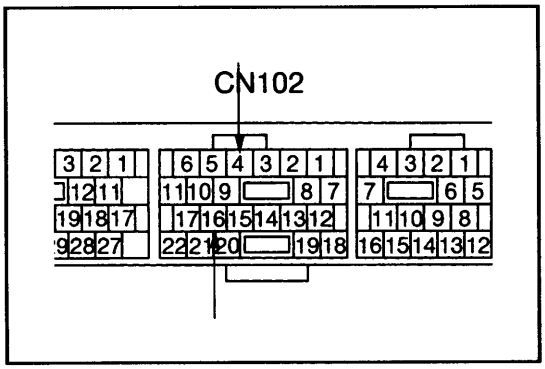


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Inspection 1 <for 62-1>:
Tilt angle sensor resistance check 1
Battery plug OFF, connector CN86 disconnection

Measurement terminals	CN102-16 (57) – CN102-4 (56)
Tester range	Ω x 10
Standard	20 Ω or less

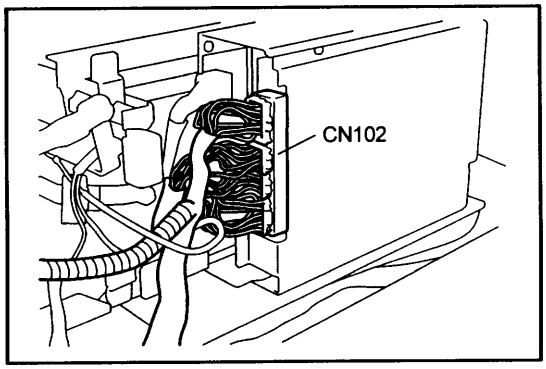


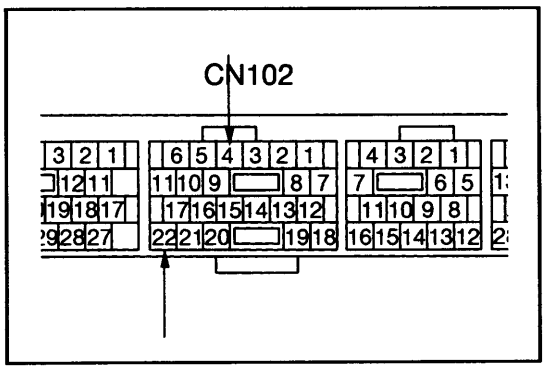


OK (short: 20 Ω or less) → CPU board defect
NG (open: ∞ Ω) → Open circuit of main harness

Inspection 1 <for 62-2>:
Tilt angle sensor resistance check 2
Battery plug OFF, connector CN102 disconnection

Measurement terminals	CN102-4 (56) – CN102-22 (51)
Tester range	Ω x 10
Standard	20 Ω or less



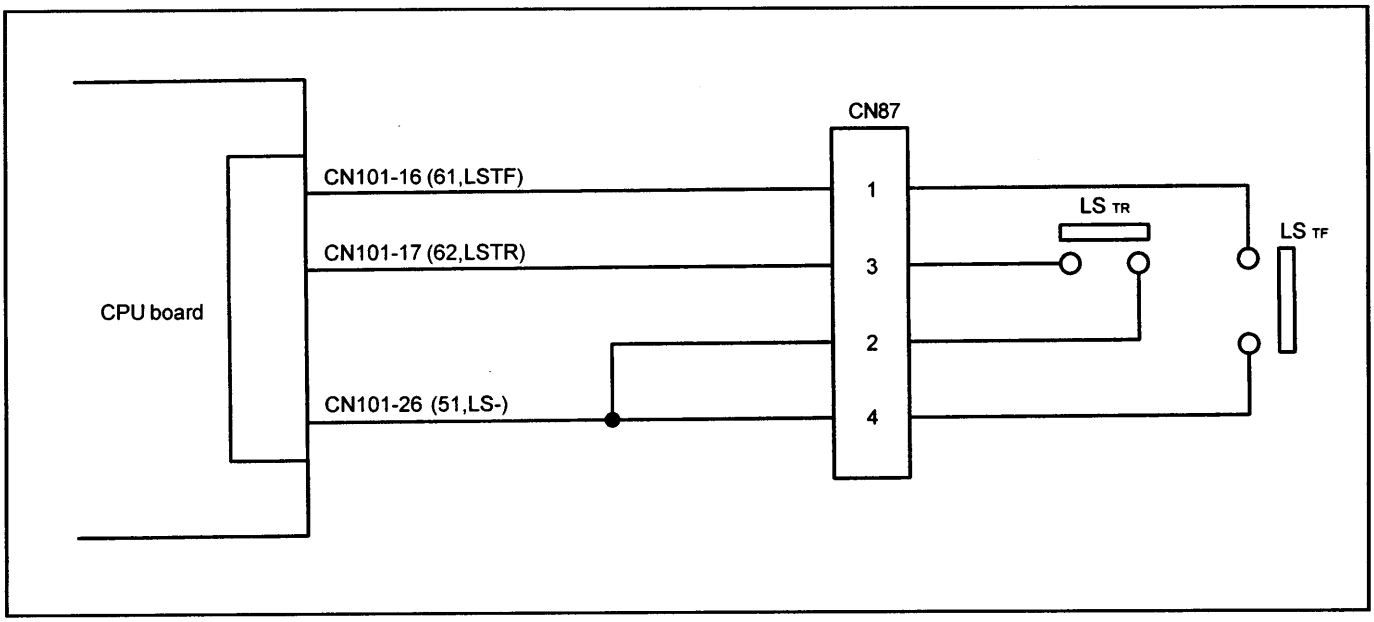


OK (short: 20 Ω or less) → CPU board defect
NG (open: ∞ Ω) → Open circuit of main harness

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Error Code 63: Tilt Switch Abnormality

Related portion

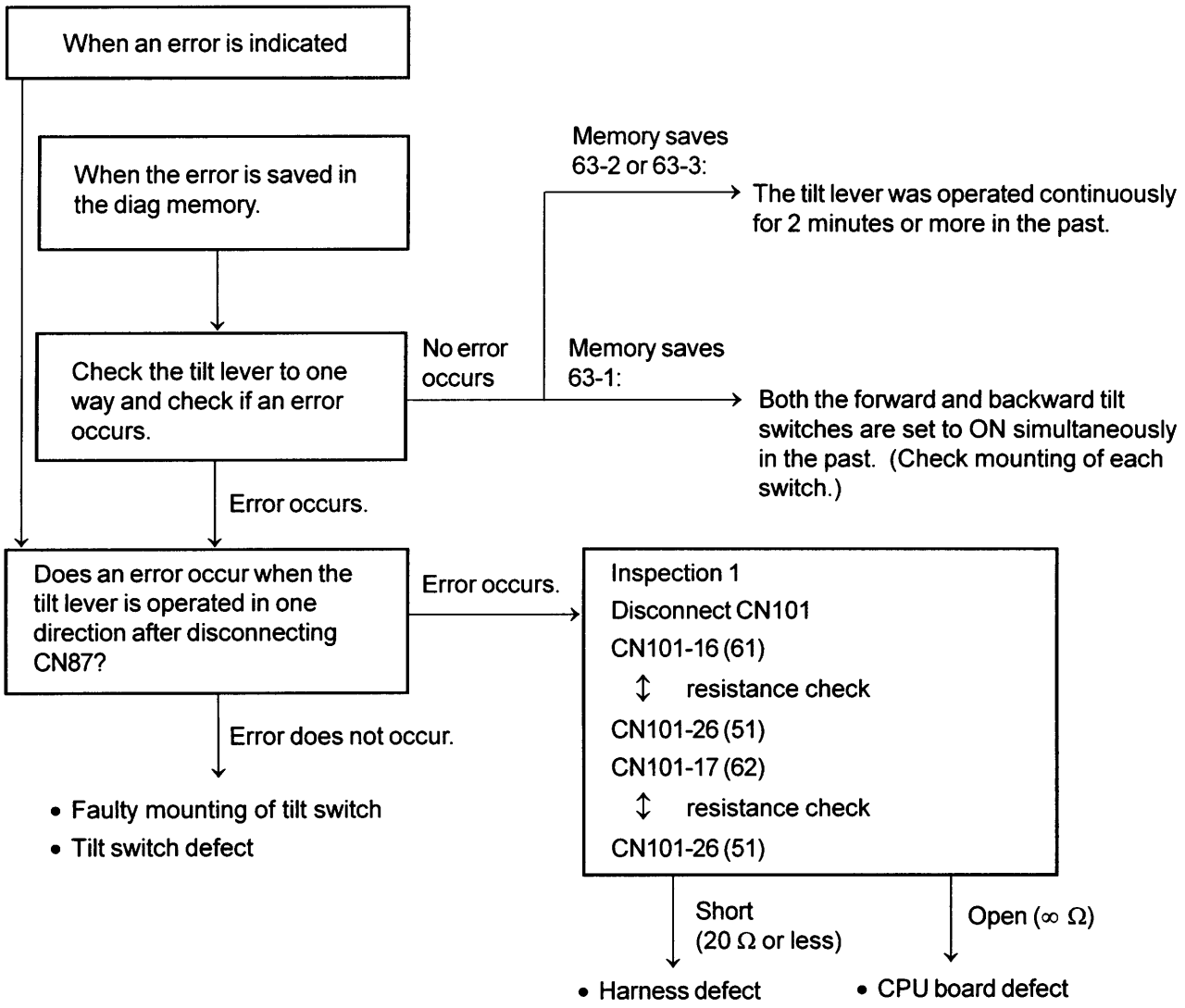


Estimated causes

① Short-circuit of tilt switch
② Short-circuit of harness
③ CPU board defect

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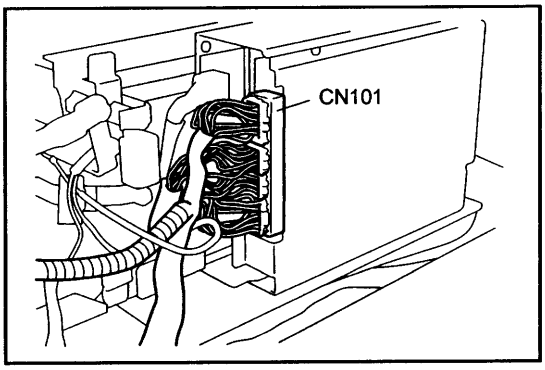
<For 63-1, 63-2 or 63-3>

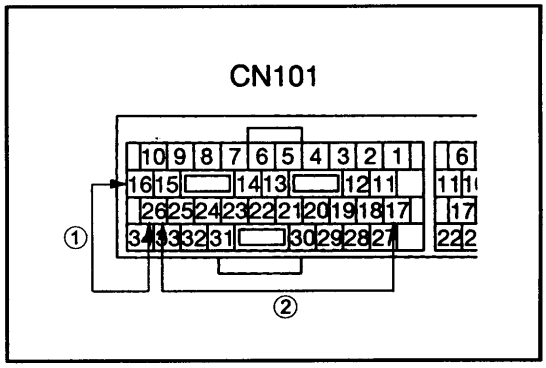


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Inspection 1
Forward/Backward Tilt Switch Check:
Battery plug OFF

Measurement terminals	① Forward: CN101-16 (61) – CN101-26 (51) ② Backward: CN101-17 (62) – CN101-26 (51)
Tester range	Ω x 1
Standard	∞ Ω



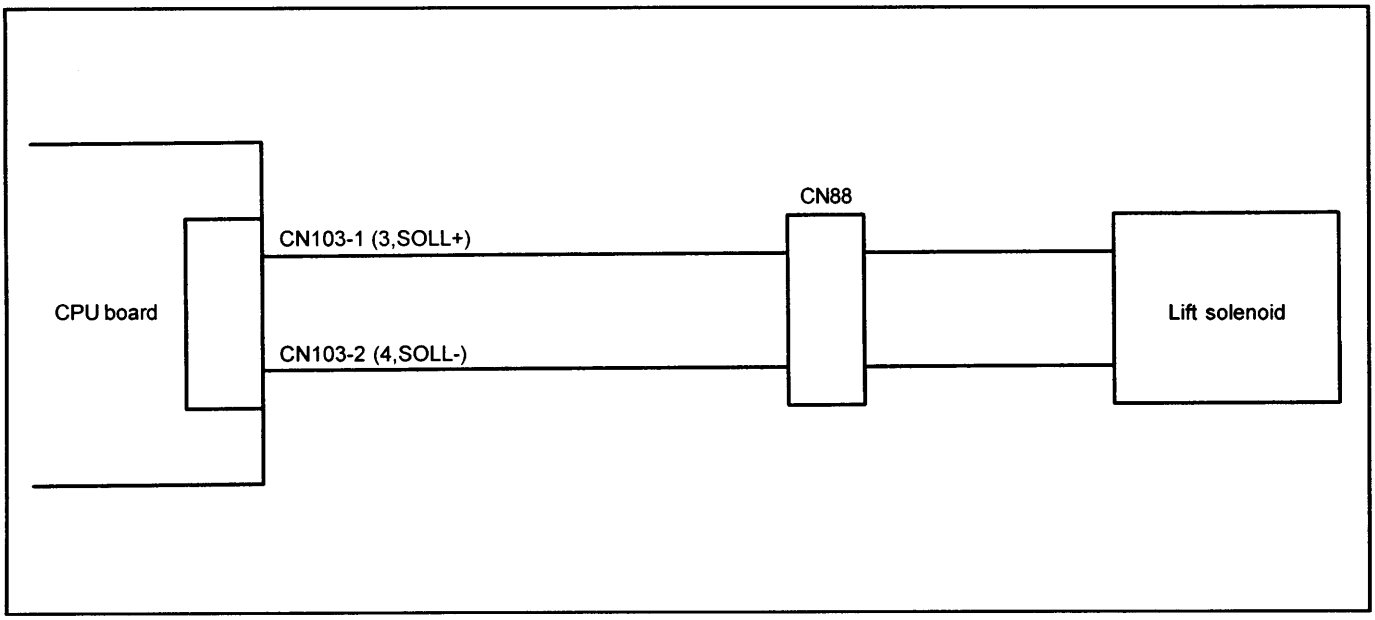


OK (open: ∞ Ω) → CPU board normal
NG (short: 20 Ω or less) → Short-circuit of harness

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Error Code 64: Lift Solenoid Abnormality

Related portion



Estimated causes

① Lift solenoid defect
② Open or short circuit of harness
③ CPU board defect

<For 64-1>

Exchange the tilt and lift solenoids and then turn the key switch to ON.

* **As the solenoid energizes upon key switch ON, do not operate the material handling lever.**

No error 64-1 → • Lift solenoid defect

Error 64-1 occurs. →

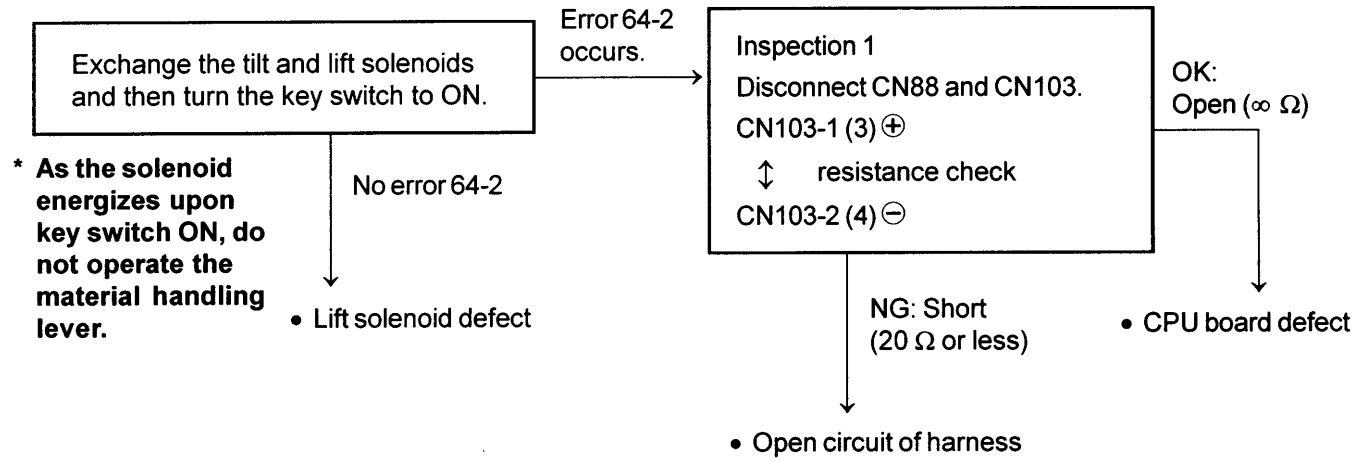
Inspection 1
CN103-1 (3) ⊕
↕ voltage check
CN103-2 (4) ⊖

NG (less than 10 V) → • CPU board defect

OK (10 V or more) → • Open circuit of harness

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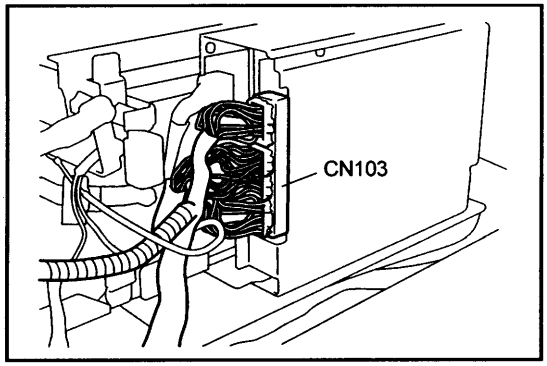
<For 64-2>

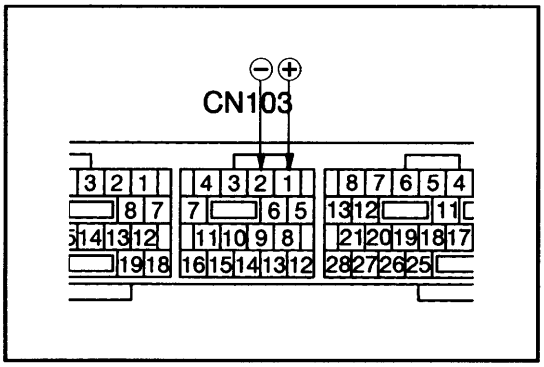


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Inspection 1 <for 64-1>:
Lift solenoid signal voltage check
Battery plug ON, key switch ON
*** Use the analog tester for measurement.**

Measurement terminals	CN103-1 (3) ⊕ – CN103-2 (4) ⊖
Tester range	DC 50 V
Standard	10 V or more

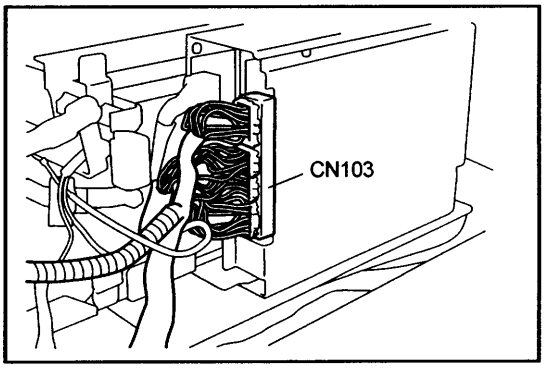


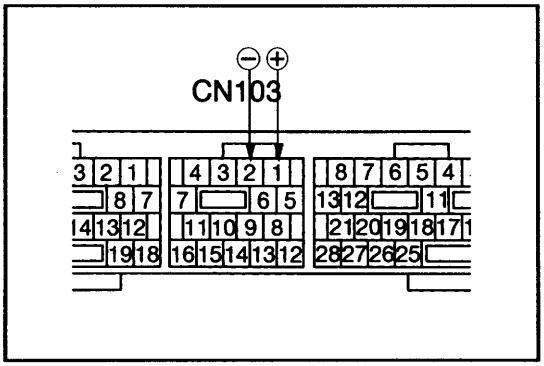


NG (less than 10 V) → CPU board defect
OK (10 V or more) → Open circuit of harness

Inspection 1 <for 64-2>:
Lift solenoid resistance check
Battery plug OFF, connector CN88 and CN103 disconnection

Measurement terminals	CN103-1 (3) ⊕ – CN103-2 (4) ⊖
Tester range	Ω x 10
Standard	∞ Ω



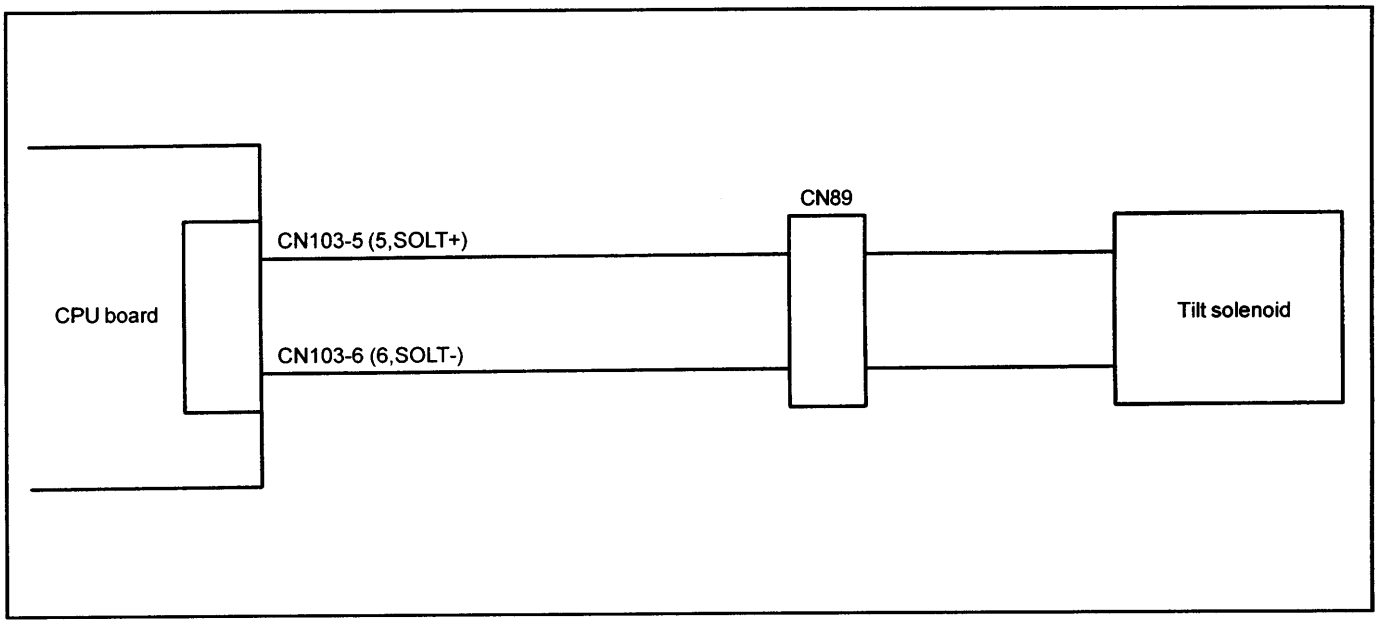


OK (∞ Ω) → CPU board defect
NG (20 Ω or less) → Short-circuit of harness

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Error Code 65: Tilt Solenoid Abnormality (SAS Vehicle)

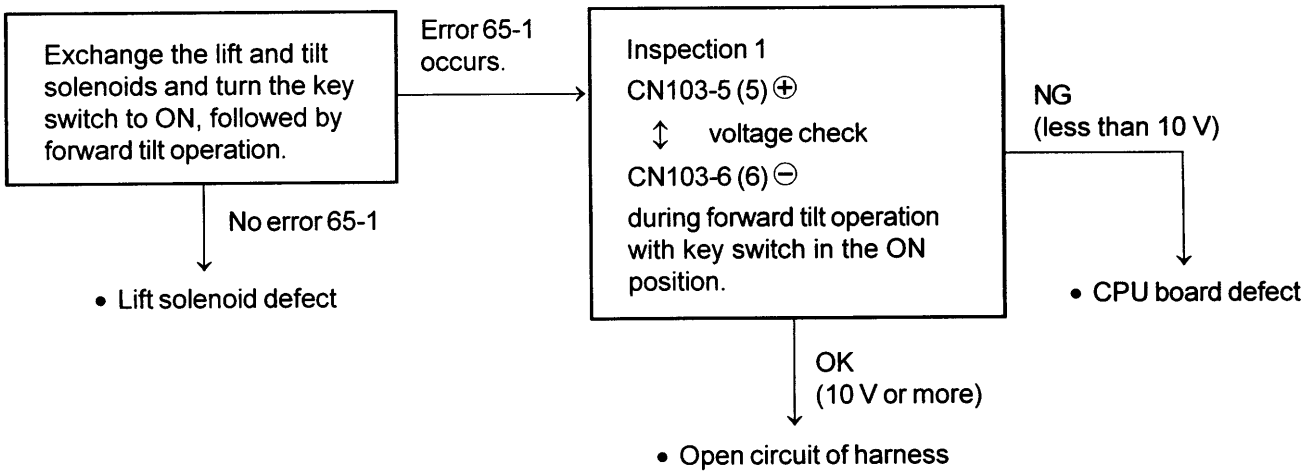
Related portion



Estimated causes

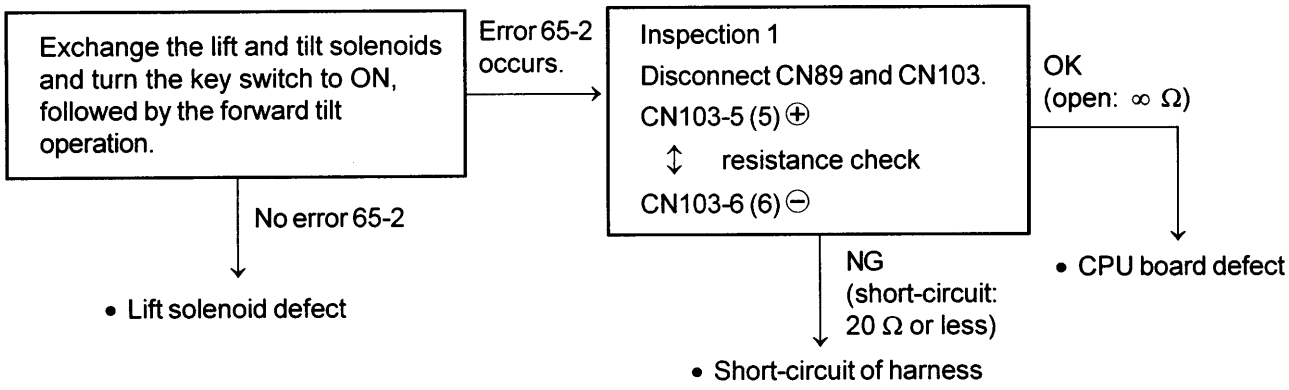
① Tilt solenoid defect
② Open or short circuit of harness
③ CPU board defect

<For 65-1>



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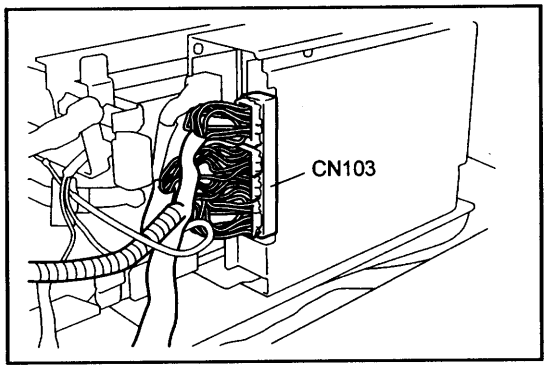
<For 65-2>

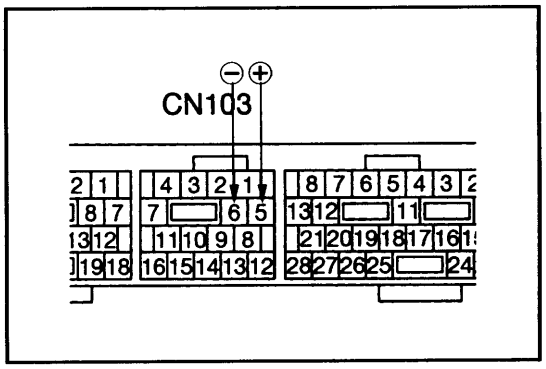


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Inspection 1 <for 65-1>:
Tilt solenoid signal voltage check
Battery plug ON, check during forward tilt operation with key switch in the ON position
*** Use the analog tester for measurement.**

Measurement terminals	CN103-5 (5) ⊕ – CN103-6 (6) ⊖
Tester range	DC 50 V
Standard	10 V or more

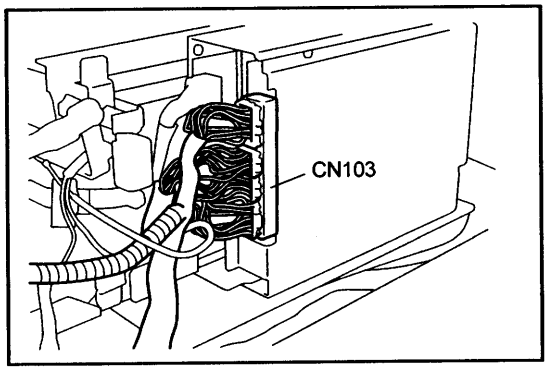


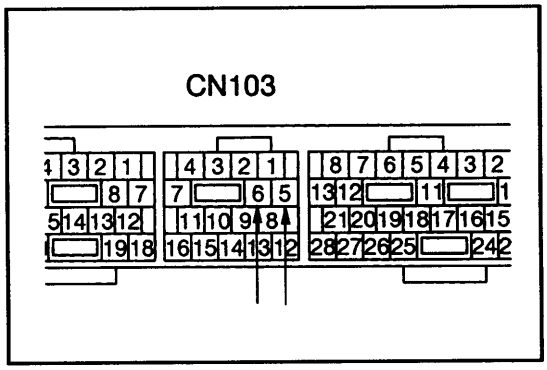


OK (10 V or more) → CPU board defect
NG (less than 10 V) → Open circuit of harness

Inspection 1 <for 65-2>:
Lift solenoid resistance check
Battery plug OFF, connectors CN88 and CN103 disconnection

Measurement terminals	CN103-5 (5) ⊕ – CN103-6 (6) ⊖
Tester range	Ω x 1
Standard	∞ Ω



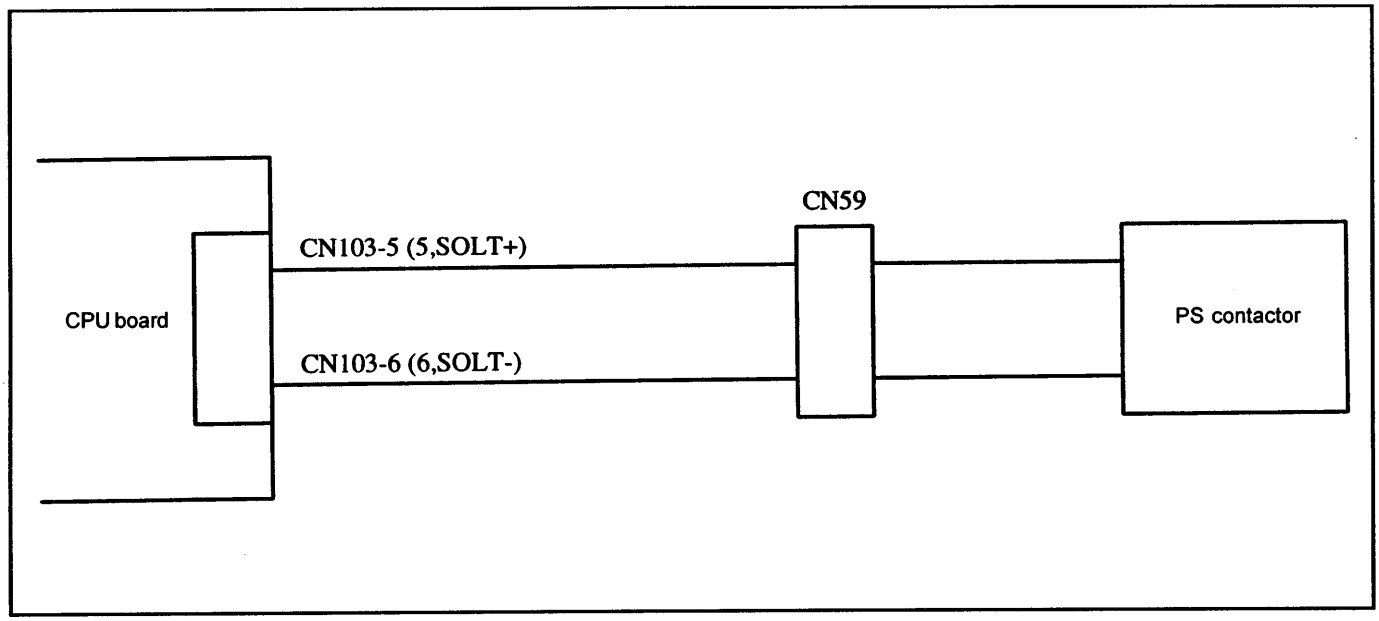


NG (20 Ω or less) → Short-circuit harness
OK (∞ Ω) → CPU board defect

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Error Code 65: PS Contactor Abnormality (Vehicle without SAS)

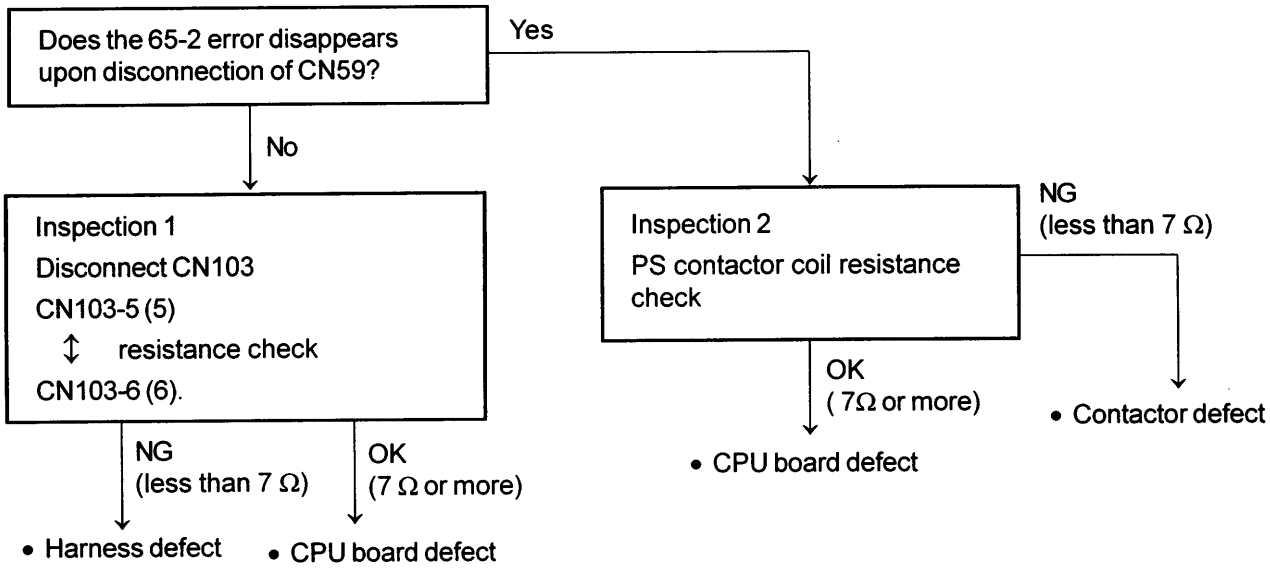
Related portion



Estimated causes

① PS contactor defect
② Short-circuit of harness
③ CPU board defect

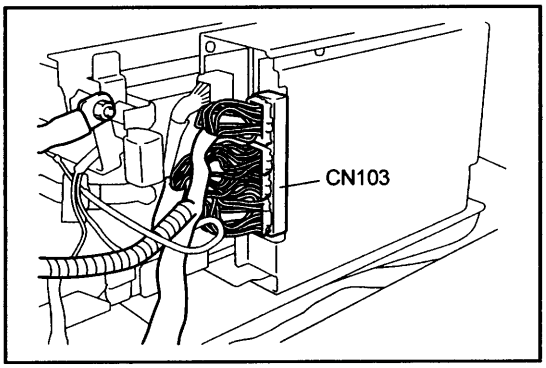
<For 65-2>

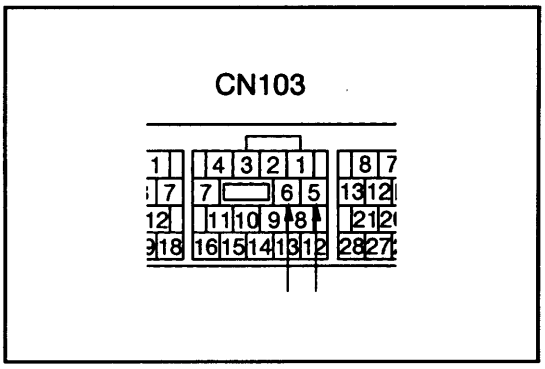


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Inspection 1:
PS contactor coil resistance check 1
Battery plug OFF, connector CN103 disconnection

Measurement terminals	CN103-5 (5) – CN103-6 (6)
Tester range	Ω x 1
Standard	7 Ω or more

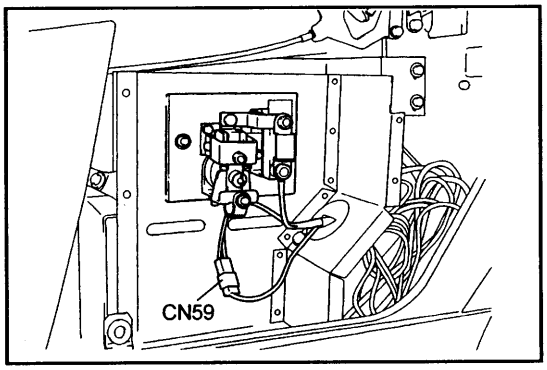


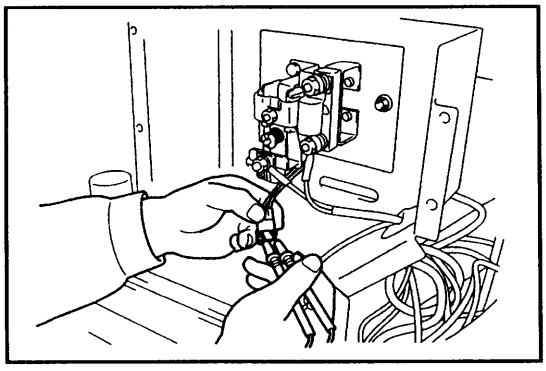


OK (7 Ω or more) → CPU board defect
NG (less than 7 Ω) → Harness defect

Inspection 2:
PS contactor coil resistance check 2
Battery plug OFF, connector CN59 disconnection

Measurement terminals	CN59-1 (85) – CN59-2 (84)
Tester range	Ω x 1
Standard	7 Ω or more





OK (7 Ω or more) → CPU board defect
NG (less than 7 Ω) → Contactor defect

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Error Code 66: Tilt Switching Value Abnormality

Related portion

SCPU board

Estimated causes

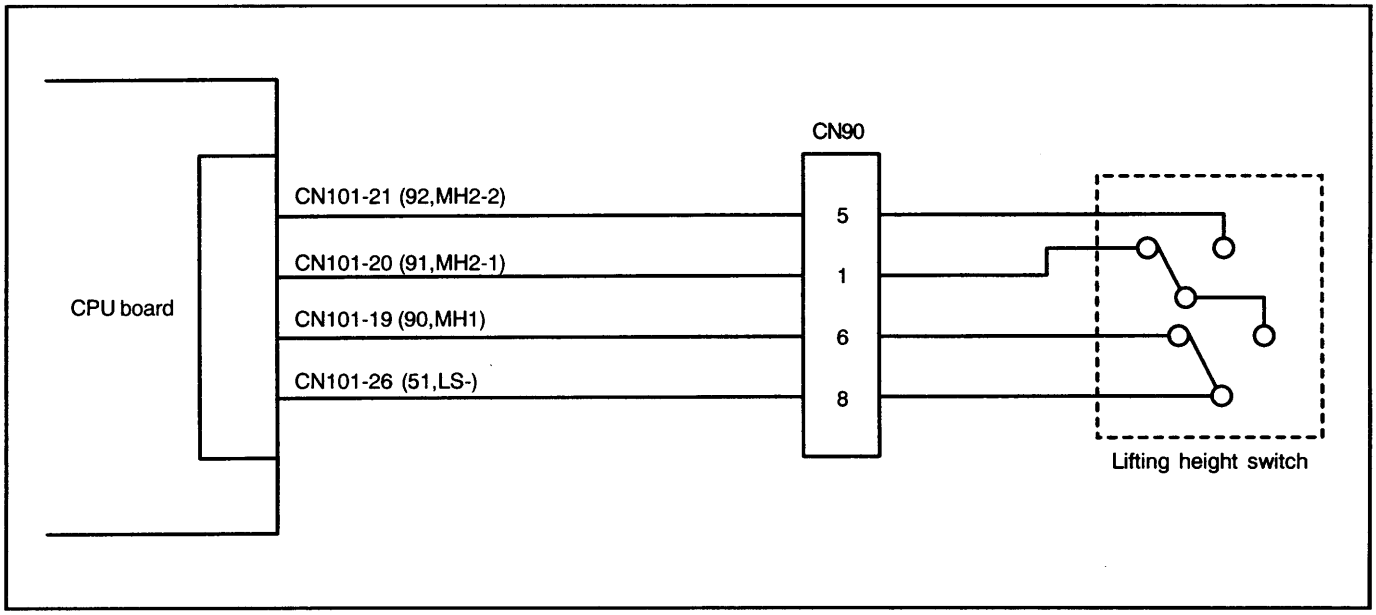
① CPU board defect

* **Since the CPU board is defective whenever error code 66-1 is indicated, replace the CPU board.**

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Error Code 67: Lifting Height Switch Abnormality (SAS Vehicle)

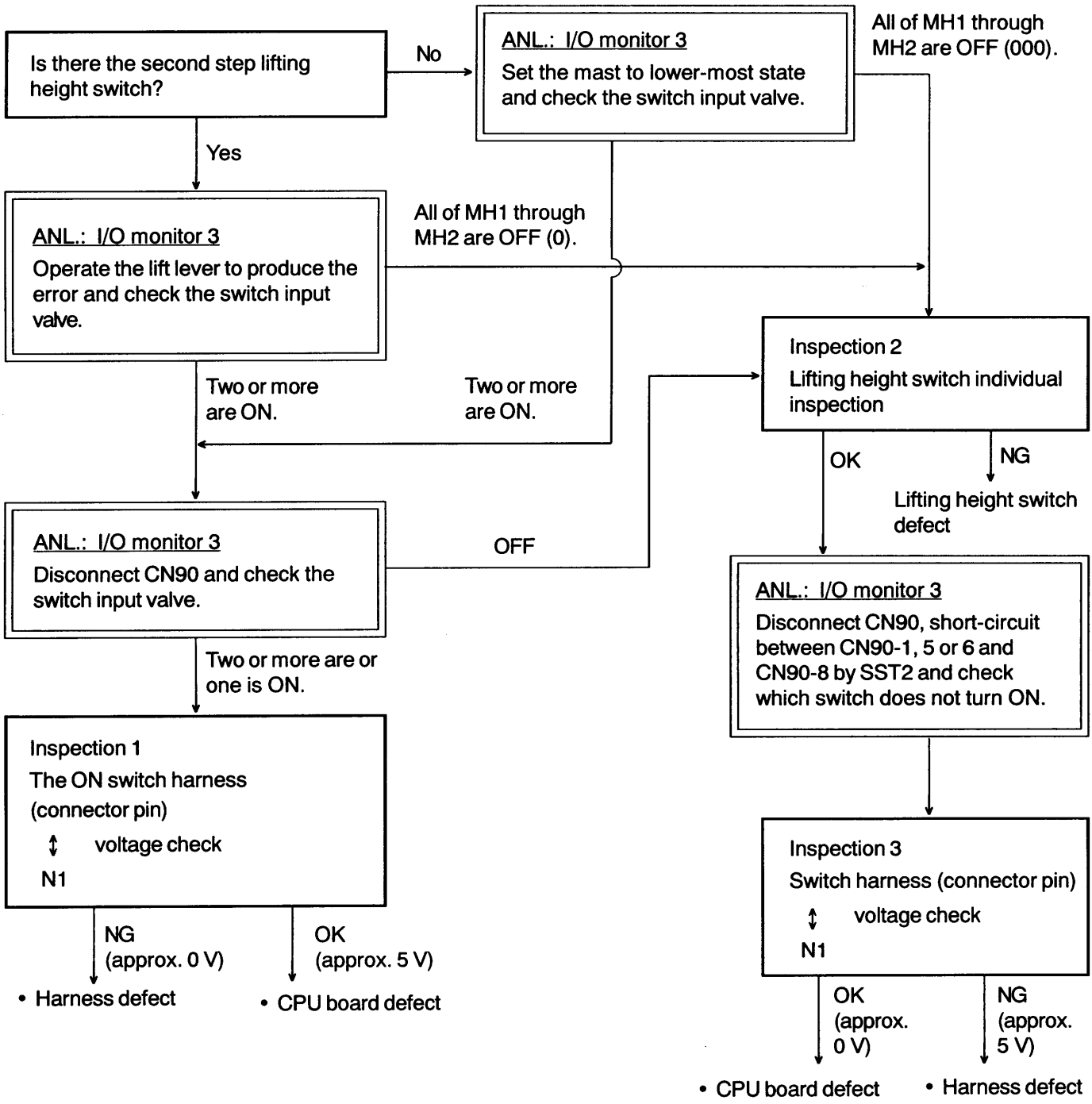
Related portion



Estimated causes

① Open or short circuit of harness
② Lifting height sensor switch defect

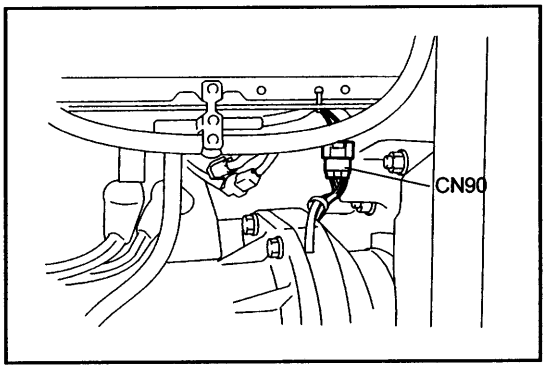
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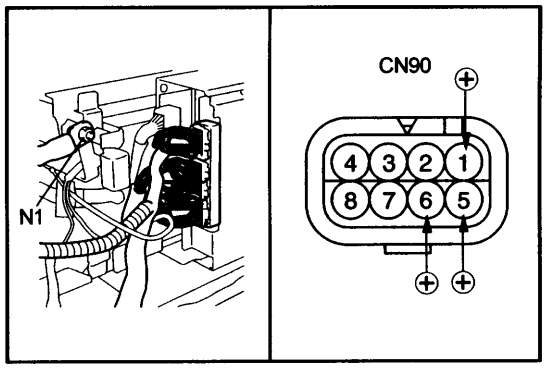


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Inspection 1:
Lifting height switch ON voltage check
Battery plug ON, key switch ON

Measurement terminals	CN90-1 (11), 5 (92), 6 (90) (ON position) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Approx. 5 V

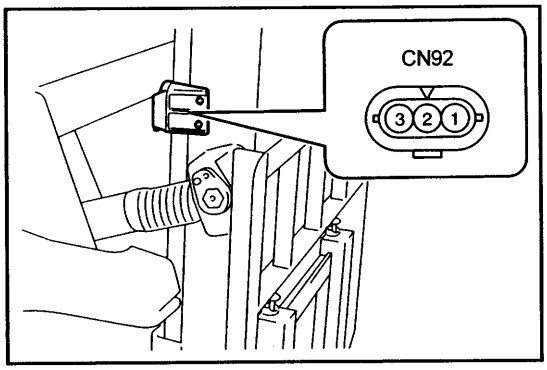


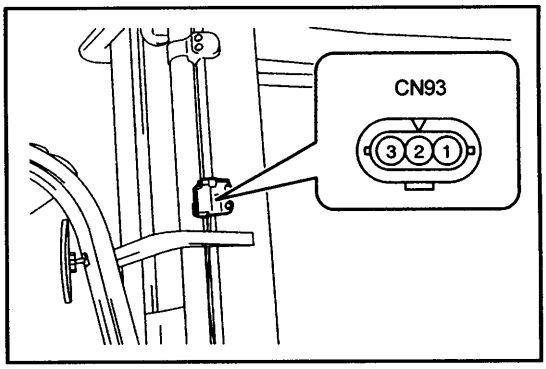


NG (approx. 0 V) → Harness defect
OK (approx. 5 V) → CPU board defect

Inspection 2:
Lifting height switch individual inspection
Battery plug OFF, connectors CN92 and CN93 disconnection

Measurement terminals	Low lifting height	High lifting height
CN92-1 (51) – CN92-2 (90)	Continuous	Not continuous
CN92-1 (51) – CN92-3 (91)	Not continuous	Continuous
CN93-1 (105) – CN93-2 (91)	Continuous	Not continuous
CN93-1 (105) – CN93-3 (92)	Not continuous	Continuous

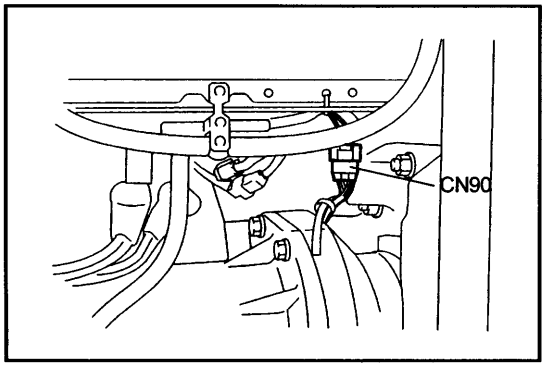


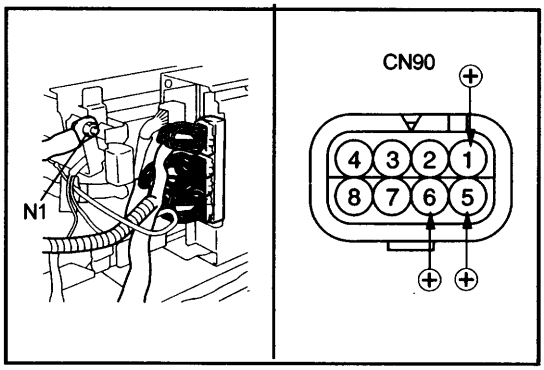


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Inspection 3:
Lifting height switch ON voltage check
Battery plug ON, key switch ON

Measurement terminals	CN90-1 (9), 5 (92), 6 (90) (OFF position) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Approx. 0 V



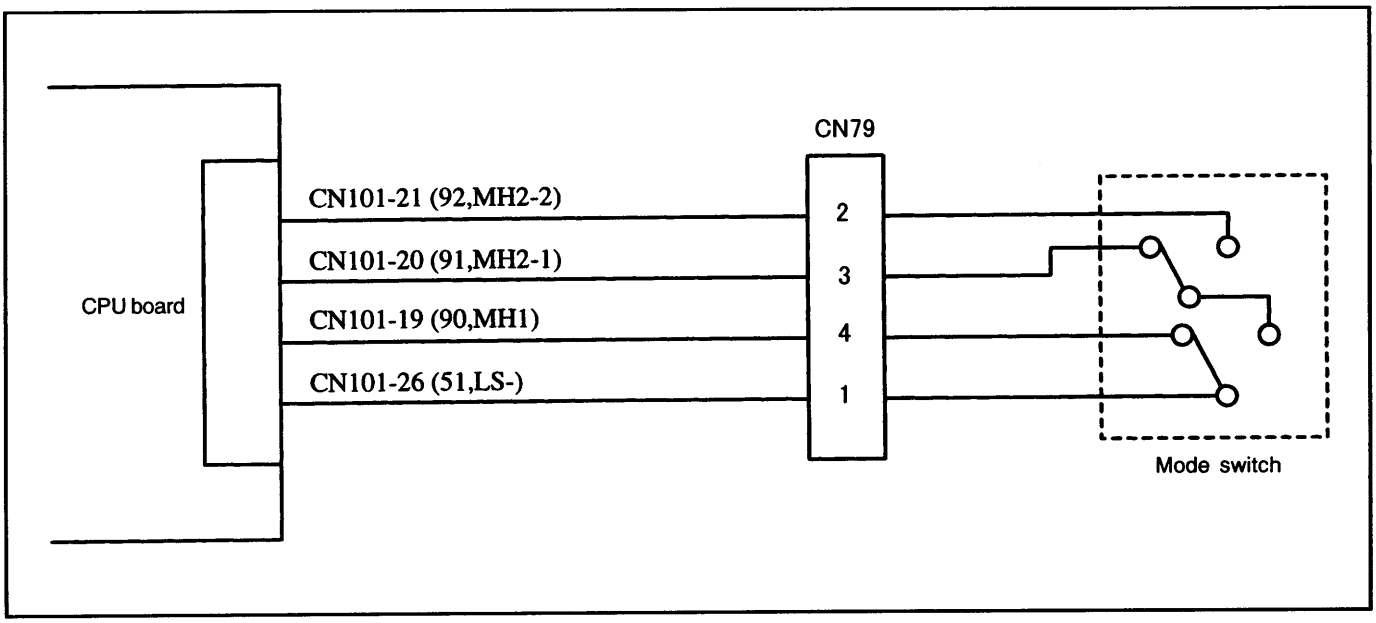


OK (approx. 0 V) → CPU board defect
NG (approx. 5 V) → Harness defect

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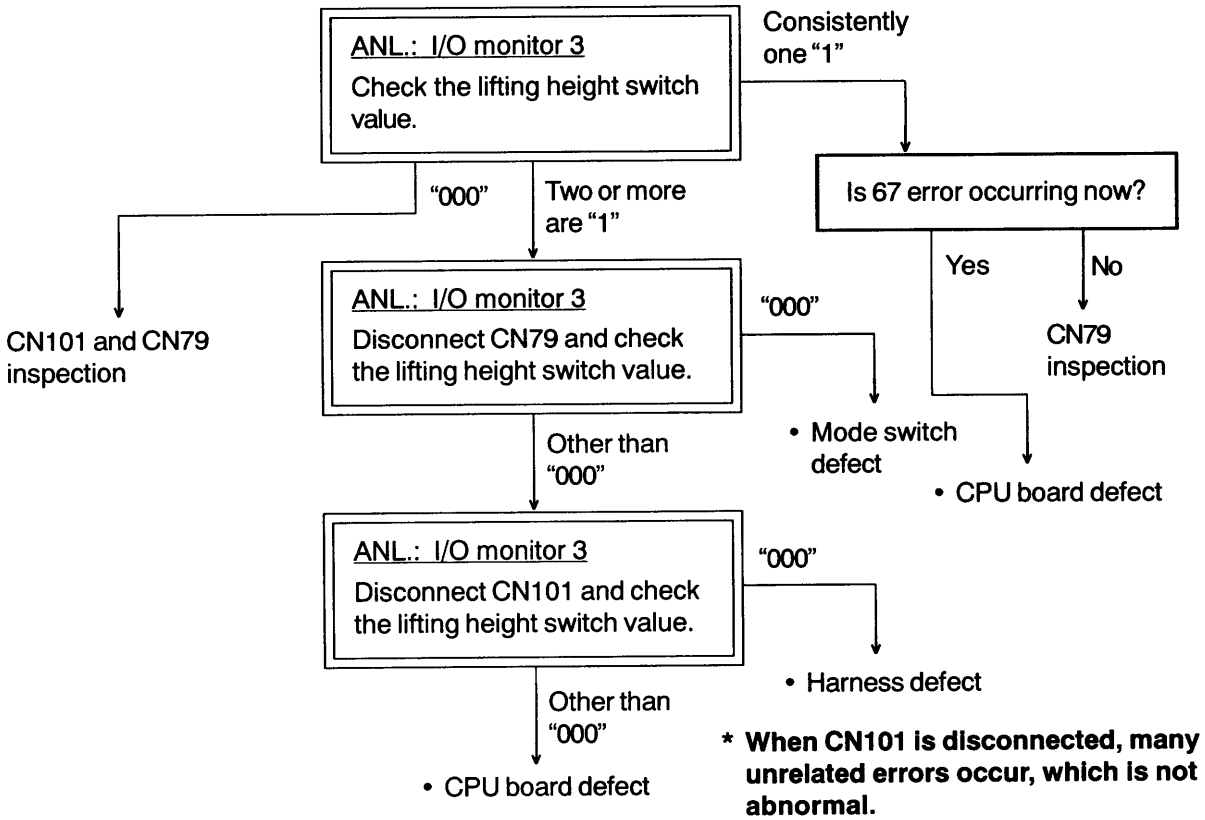
Error Code 67: Mode Switch Abnormality (Vehicle without SAS)

Related portion



Estimated causes

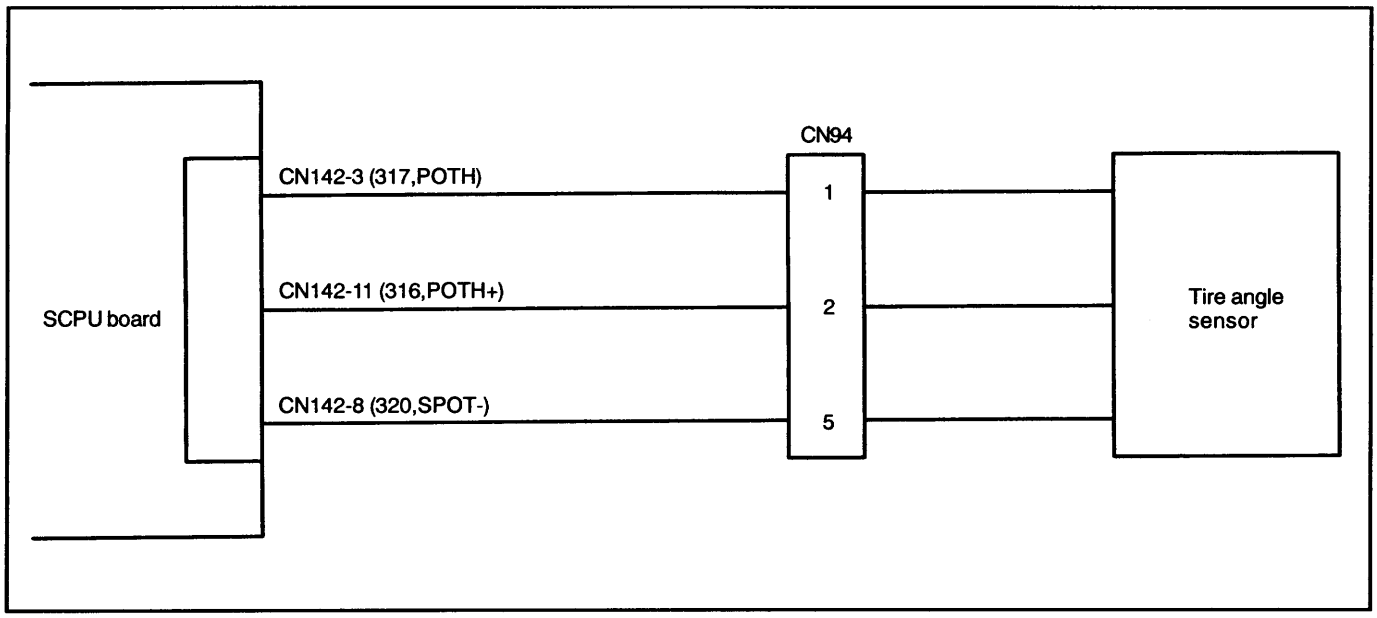
① Open or short circuit of harness
② Mode switch defect



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Error Code 71: Tire Angle Sensor Abnormality

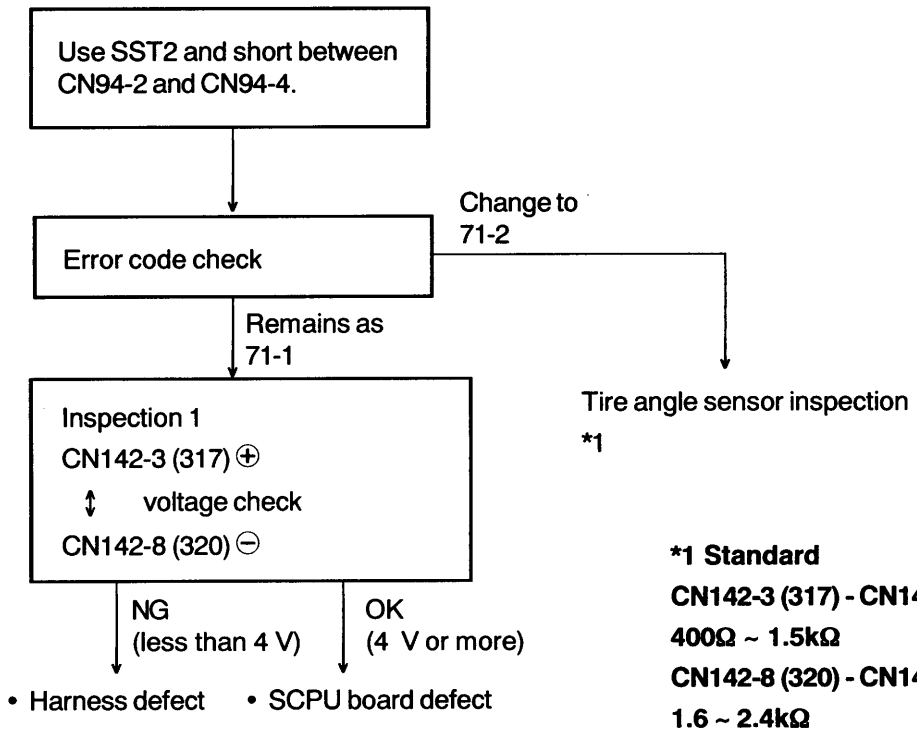
Related portion



Estimated causes

① Tire angle sensor defect
② Open or short circuit of harness

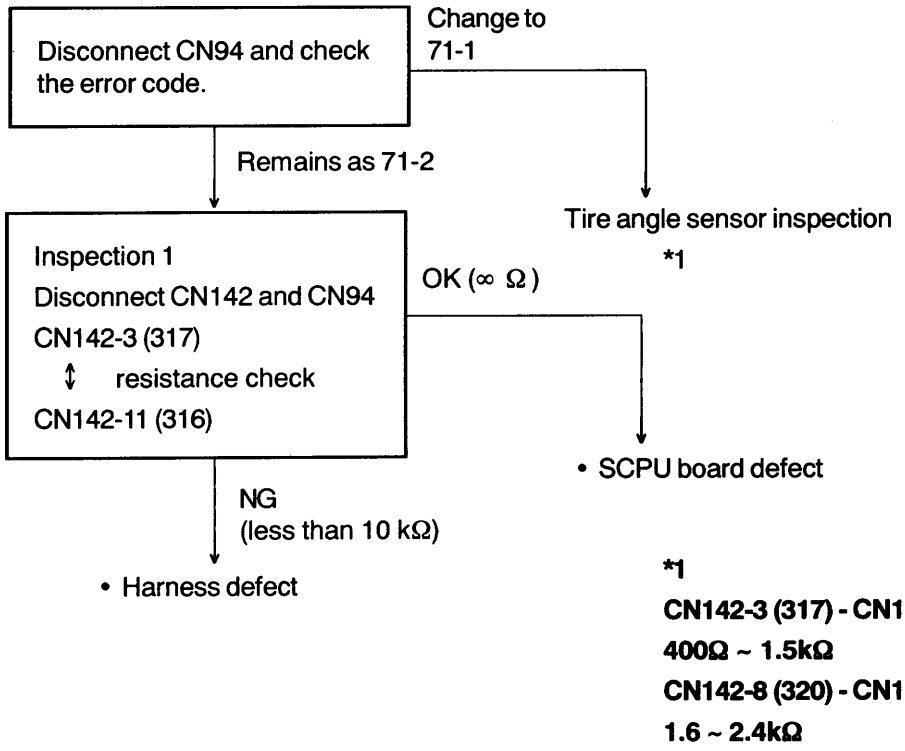
<For 71-1>



***1 Standard**
CN142-3 (317) - CN142-11 (316): 400Ω ~ 1.5kΩ
CN142-8 (320) - CN142-11 (316): 1.6 ~ 2.4kΩ

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<For 71-2>



***1**

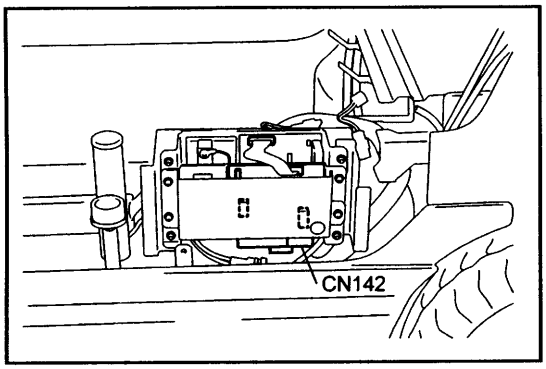
CN142-3 (317) - CN142-11 (316): 400Ω ~ 1.5kΩ

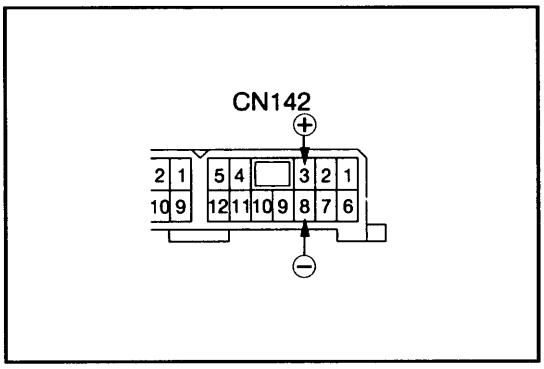
CN142-8 (320) - CN142-11 (316): 1.6 ~ 2.4kΩ

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Inspection 1 <for 71-1>:
Tire angle sensor signal voltage check
Battery plug ON, key switch ON

Measurement terminals	CN142-3 (317) ⊕ – CN142-8 (320) ⊖
Tester range	DC 10 V
Standard	Approx. 4 V

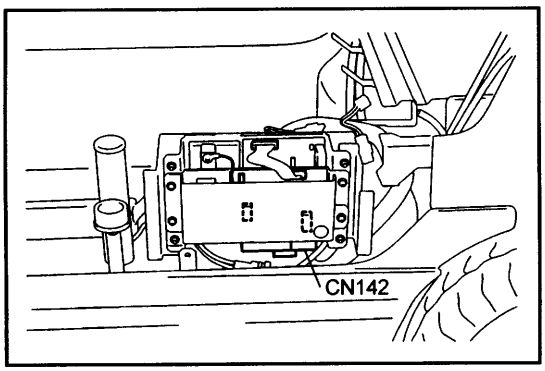


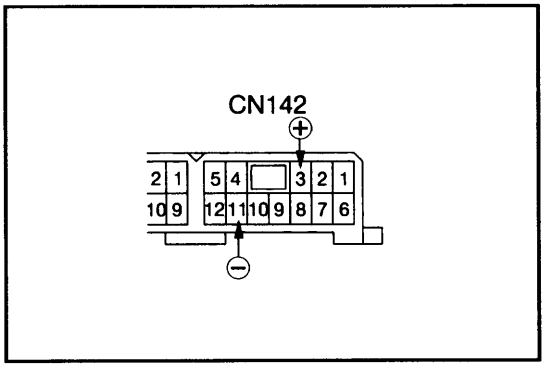


OK (4 V or more) → SCPU board defect
NG (less than 4 V) → Harness defect

Inspection 1 <for 71-2>:
Tire Angle Sensor Abnormality
Battery plug OFF

Measurement terminals	CN142-3 (317) ⊕ – CN142-11 (316) ⊖ (harness side)
Tester range	Ω x 1 k
Standard	∞ Ω



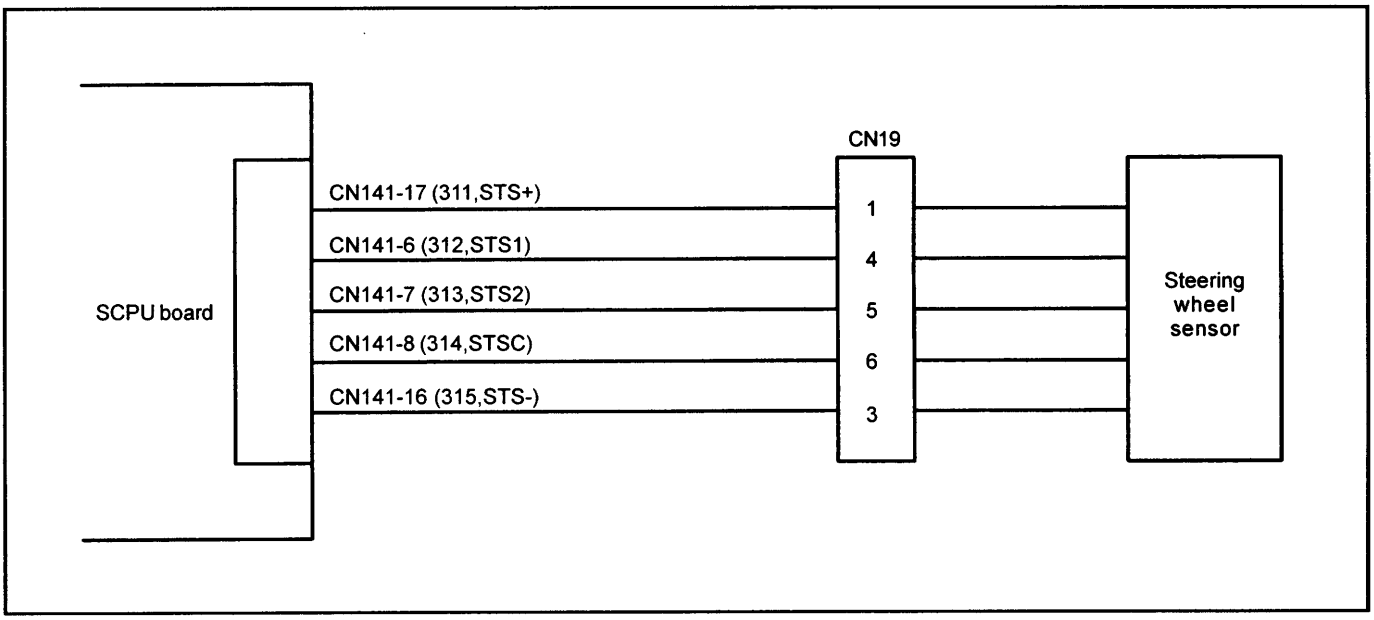


OK (∞ Ω) → SCPU board defect
NG (10 kΩ or more) → Harness defect

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Error Code 72: Steering Angle Sensor Abnormality

Related portion

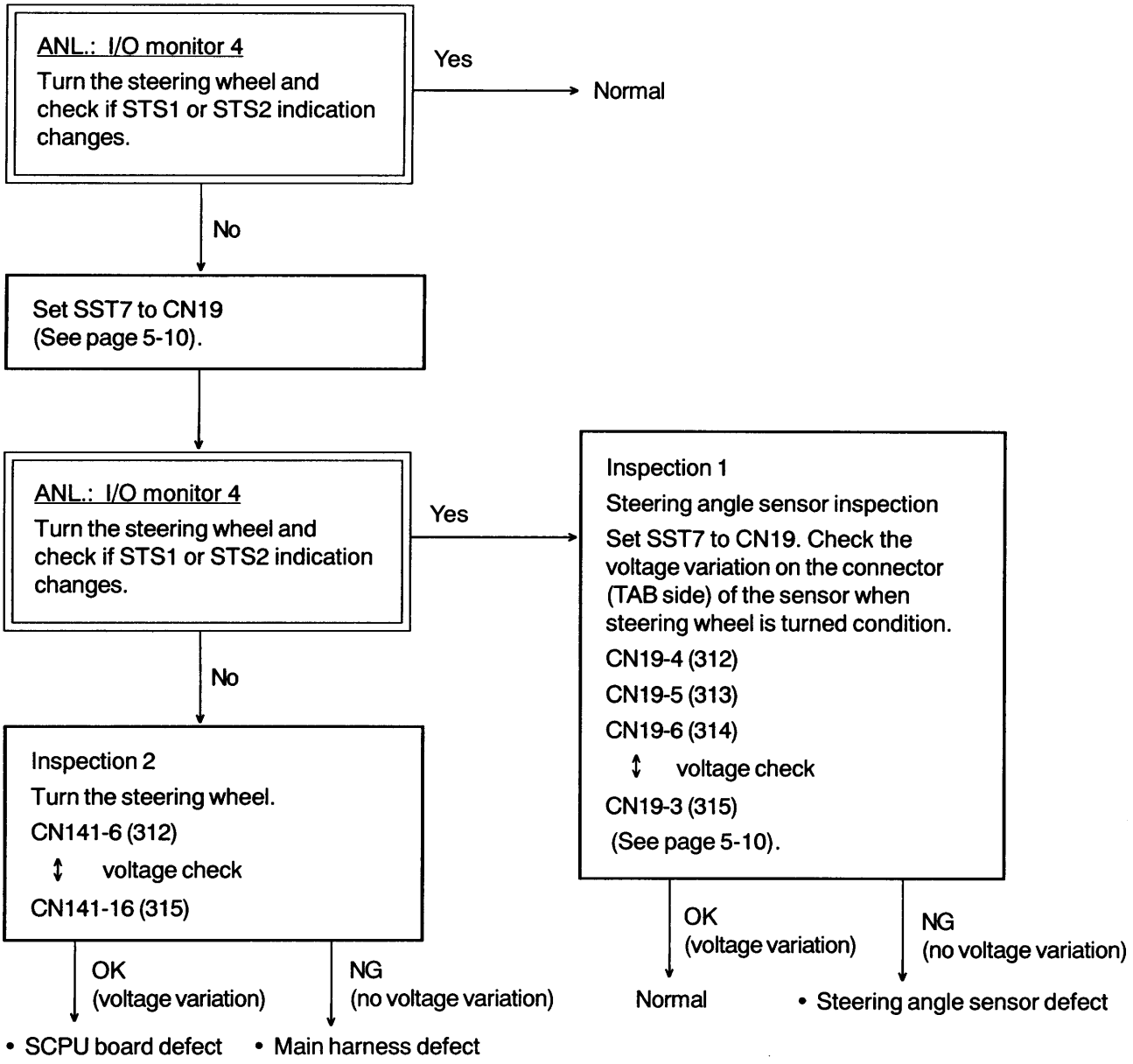


Estimated causes

① Steering angle sensor defect
② Open circuit of harness

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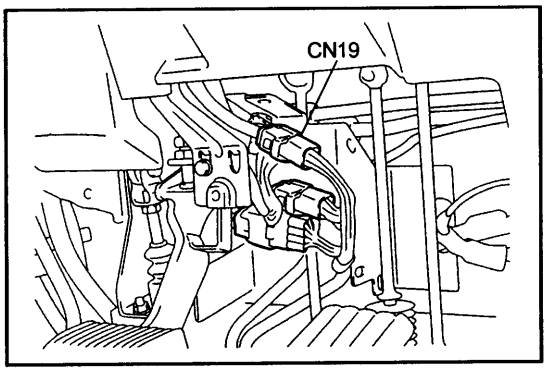
<For 72-1 (STS1), 72-2 (STS2)>

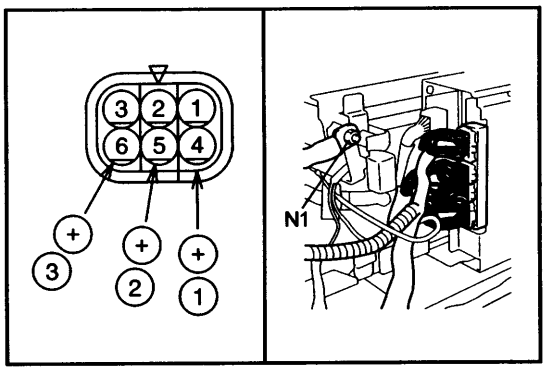


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Inspection 1:
Steering angle sensor check
Battery plug ON, key switch ON, SST7 set to CN19

Measurement terminals	① CN19-4 (312) ⊕ – N1 ⊖ ② CN19-5 (313) ⊕ – N1 ⊖ ③ CN19-6 (314) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Voltage varies between 1 V and 4 V.

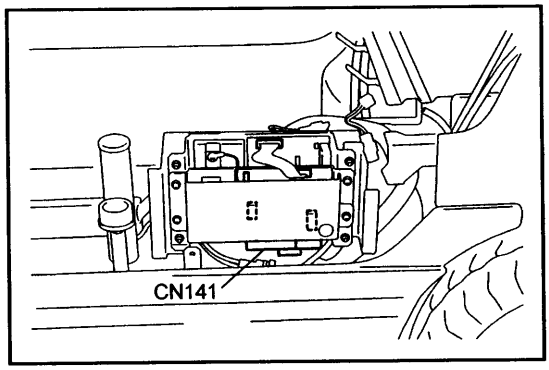


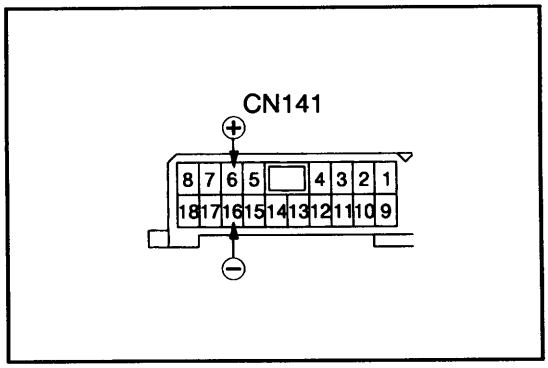


OK (variation between 1 V and 4 V) → Normal
NG (no voltage variation) → Steering angle sensor defect

Inspection 2:
Signal voltage variation check
Battery plug ON, key switch ON

Measurement terminals	CN141-6 (312) ⊕ – CN141-16 (315) ⊖
Tester range	DC 10 V
Standard	Voltage varies between 1 V and 4 V.

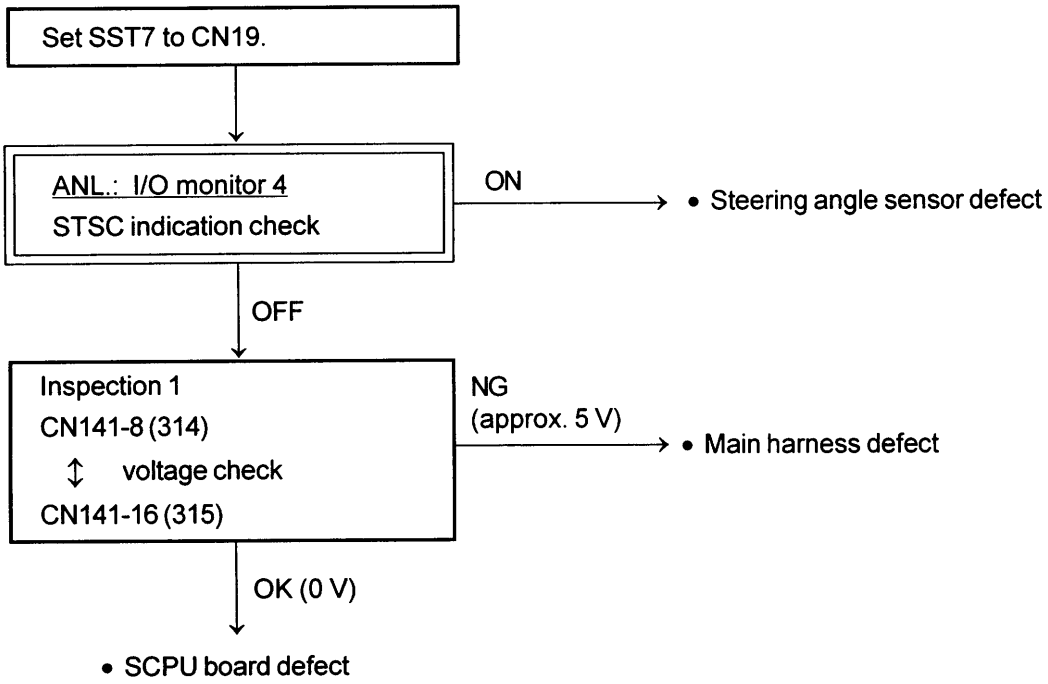




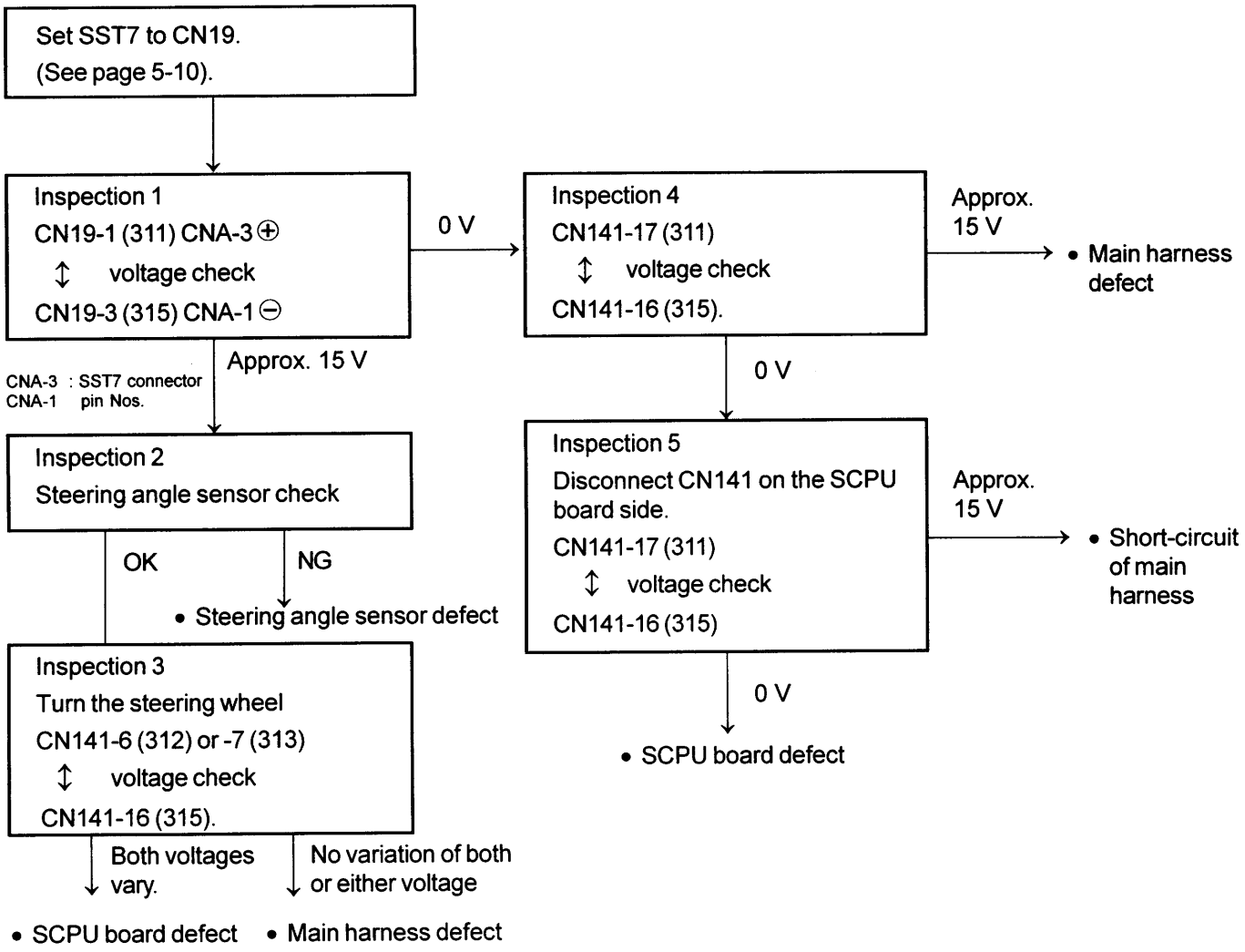
OK (variation between 1 V and 4 V) → SCPU board defect
NG (no voltage variation) → Main harness defect

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<For 72-3>



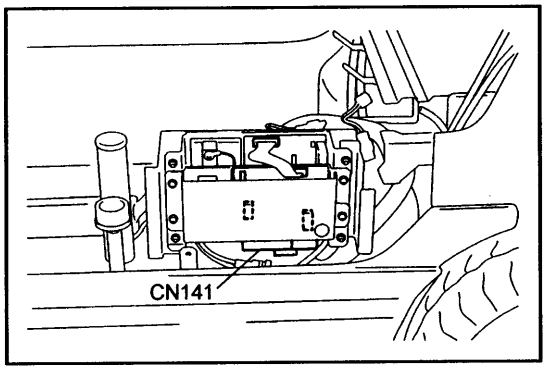
<For 72-4>

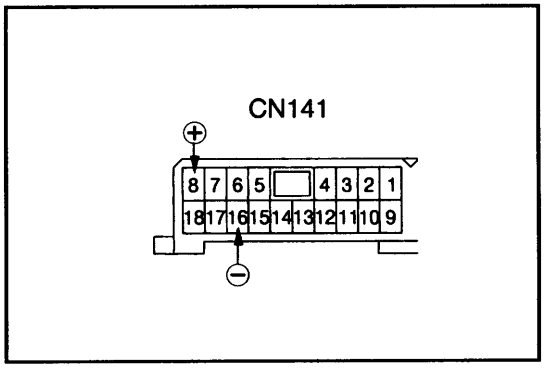


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Inspection 1 <for 72-3>:
Steering angle sensor signal voltage check 1
Battery plug ON, key switch ON

Measurement terminals	CN141-8 (314) ⊕ – CN141-16 (315) ⊖
Tester range	DC 10 V
Standard	Approx. 0 V

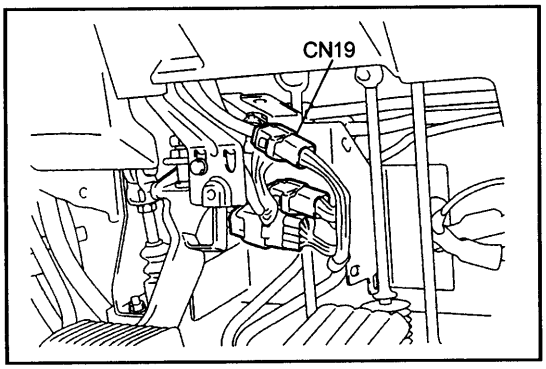


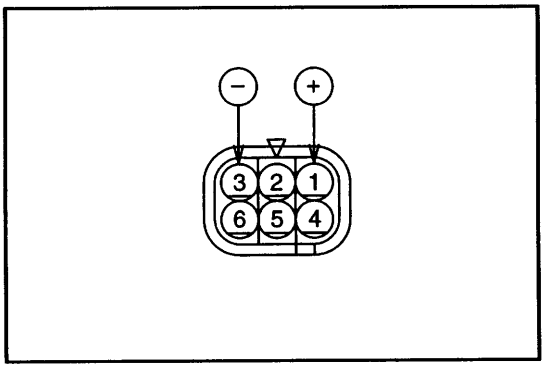


NG (approx. 5 V) → Main harness defect
OK (0 V) → SCPU board defect

Inspection 1 <for 72-4>:
Steering angle sensor signal voltage check 1
Battery plug ON, key switch ON

Measurement terminals	CN19-1 (311) ⊕ – CN19-3 (315) ⊖
Tester range	DC 200 V
Standard	Approx. 15 V



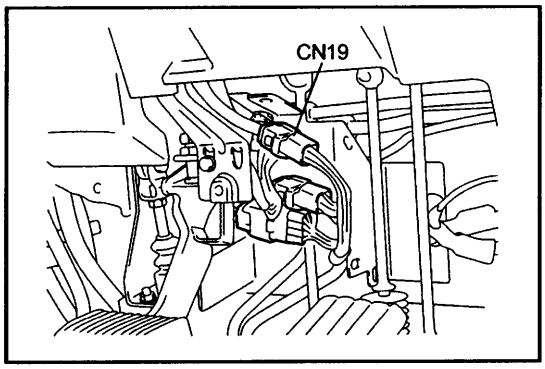


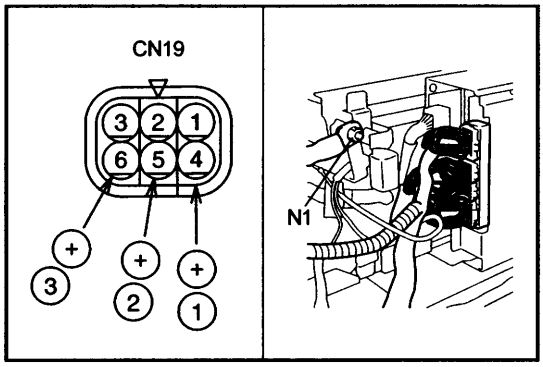
OK (approx. 15 V) → Go to Inspection 2.
NG (0 V) → Go to Inspection 4.

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Inspection 2 <for 72-4>:
Steering angle sensor check
Battery plug ON, key switch ON, SST7 set to CN19

Measurement terminals	① CN19-4 (312) ⊕ – N1 ⊖ ② CN19-5 (313) ⊕ – N1 ⊖ ③ CN19-6 (314) ⊕ – N1 ⊖
Tester range	DC 10 V
Standard	Voltage varies between 1 V and 4 V.

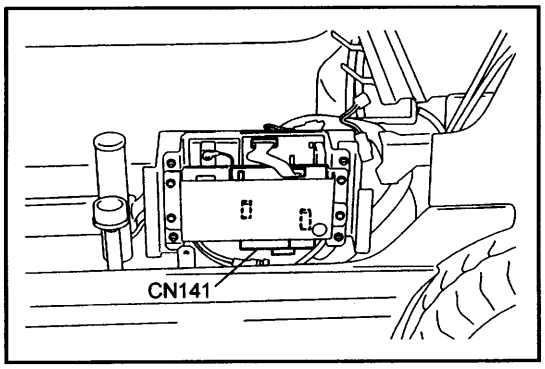


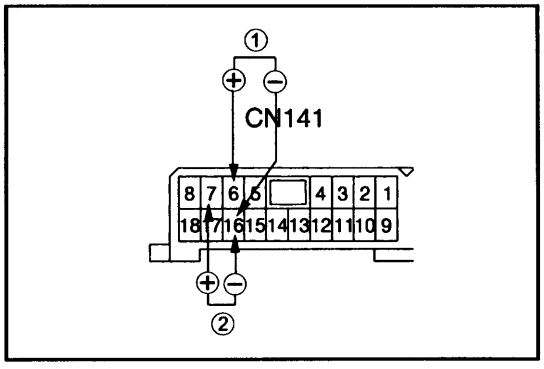


OK (variation between 1 V and 4 V) → Normal
NG (no voltage variation) → Steering angle sensor defect

Inspection 3 <for 72-4>:
Steering angle sensor signal voltage check 2
Battery plug ON, key switch ON, check during steering wheel operation

Measurement terminals	① CN141-6 (312) ⊕ – CN141-16 (315) ⊖ ② CN141-7 (313) ⊕ – CN141-16 (315) ⊖
Tester range	DC 200 V
Standard	Voltage varies between 1 V and 4 V.



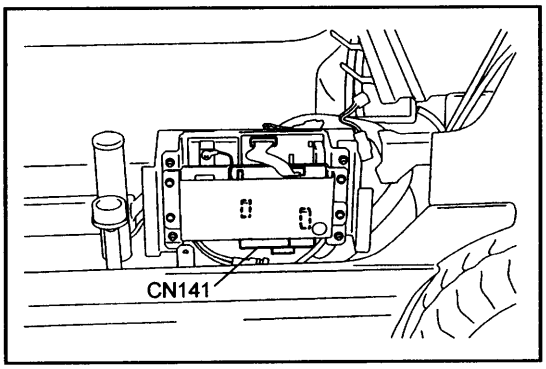


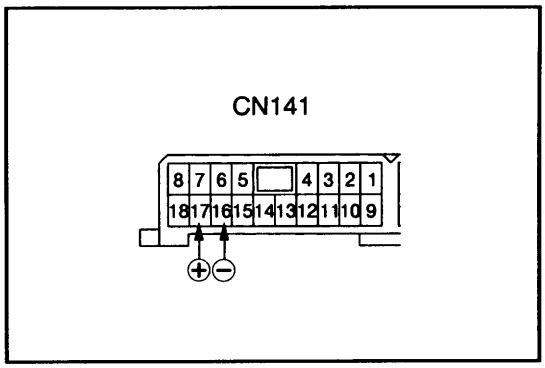
(Both voltages vary between 1 V and 4 V) → SCPU board defect
(Both or one voltage do not vary) → Main harness defect

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Inspection 4 <for 72-4>:
Steering angle sensor signal voltage check 3
Battery plug ON, key switch ON

Measurement terminals	CN141-17 (311) ⊕ – CN141-16 (315) ⊖
Tester range	DC 200 V
Standard	Approx. 15 V

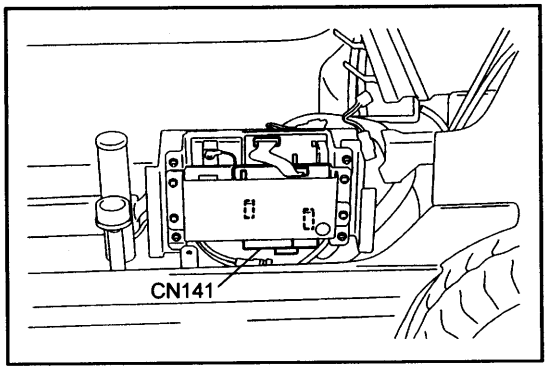


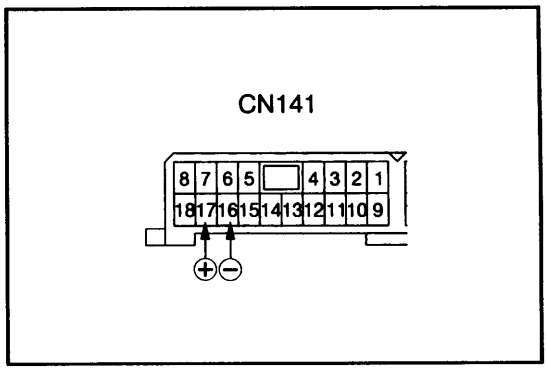


OK (approx. 15 V) → Main harness defect
NG (0 V) → Go to Inspection 5.

Inspection 5 <for 72-4>:
Battery plug ON, key switch ON, CN141 disconnection

Measurement terminals	CN141-17 (311) ⊕ – CN141-16 (315) ⊖
Tester range	DC 200 V
Standard	Approx. 15 V



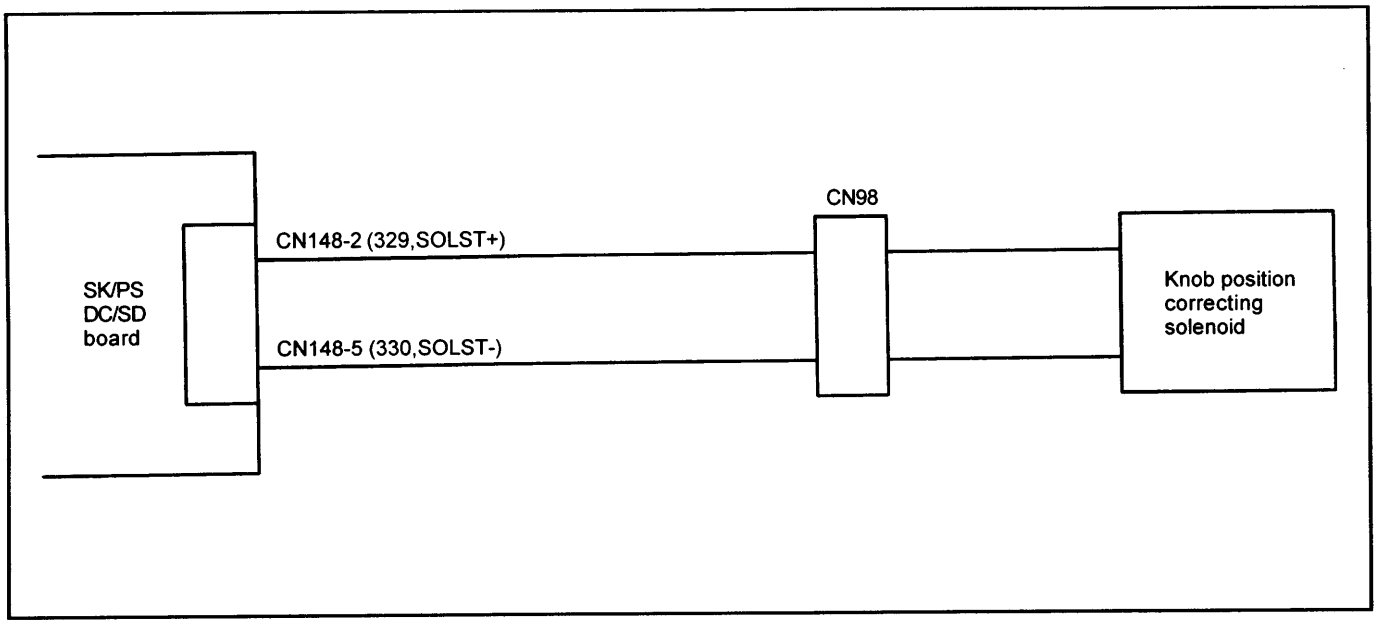


OK (approx. 15 V) → Short-circuit of main harness
NG (0 V) → SCPU board defect

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Error Code 73: Knob Position Compensation Solenoid Abnormality

Related portion



Estimated causes

① Knob position compensation solenoid defect	③ DC/SD board defect
② Open or short circuit of harness	④ SCPU board defect

<For 73-1>

Inspection 1
Disconnect CN148
CN148-2 (44)
↕ resistance check
CN148-6 (353).

OK
(10 ± 1 Ω at 25°C)

NG
(other than 10 ± 1 Ω at 25°C)

ANL.: Active
Disconnect CN146 and CN147 and set SST5. Turn the knob position compensation solenoid ON.
(See page 5-8)

Check signal "1"
(normal)

Check signal "0"
(abnormal)

- CN146-CN147 harness defect
- DC/SD board defect

- SCPU board defect

Inspection 2
Disconnect CN98
CN98-1 (329)
↕ resistance check
CN98-2 (330).

OK
(10 ± 1 Ω)
(at 25°C)

- Main harness defect

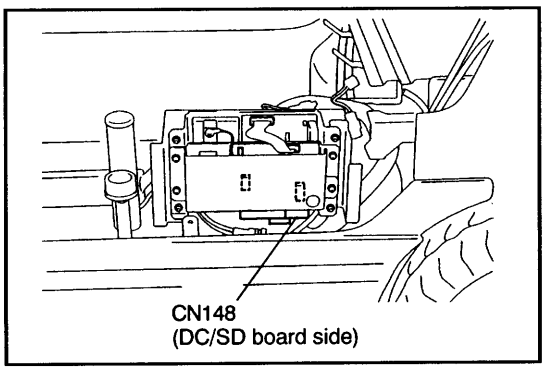
NG
(other than 10 ± 1 Ω at 25°C)

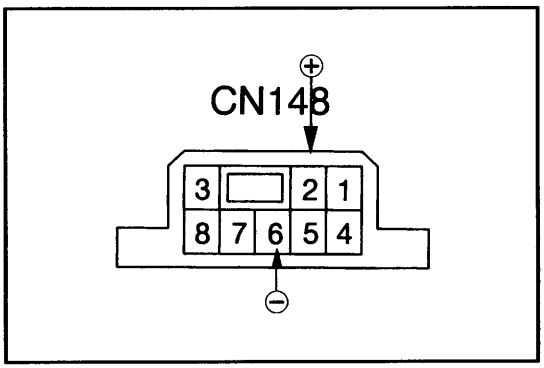
- Knob position correcting solenoid defect

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Inspection 1 <for 73-1>:
Knob position correcting solenoid harness check
Battery plug OFF, connector CN148 disconnection

Measurement terminals	CN148-2 (44) ⊕ – CN148-6 (353) ⊖
Tester range	Ω x 1
Standard	10 ± 1 Ω (at 25°C)

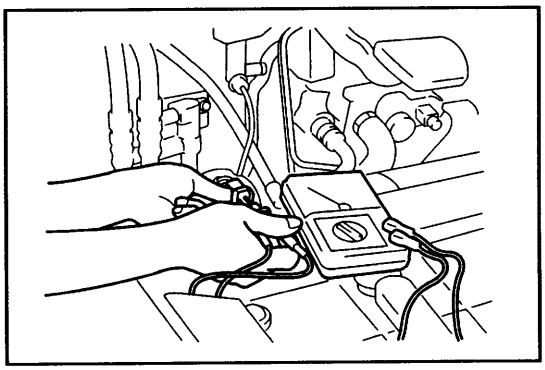


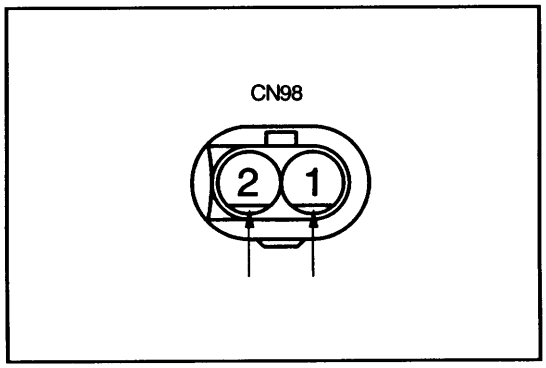


OK (10 ± 1 Ω) → Go to ANL.: ACTIVE
NG (other than 10 ± 1 Ω) → Go to Inspection 2.

Inspection 2:
Knob position correcting solenoid resistance check
Battery plug OFF, connector CN98 disconnection

Measurement terminals	CN98-1 (329) – CN98-2 (330)
Tester range	Ω x 1
Standard	10 ± 1 Ω

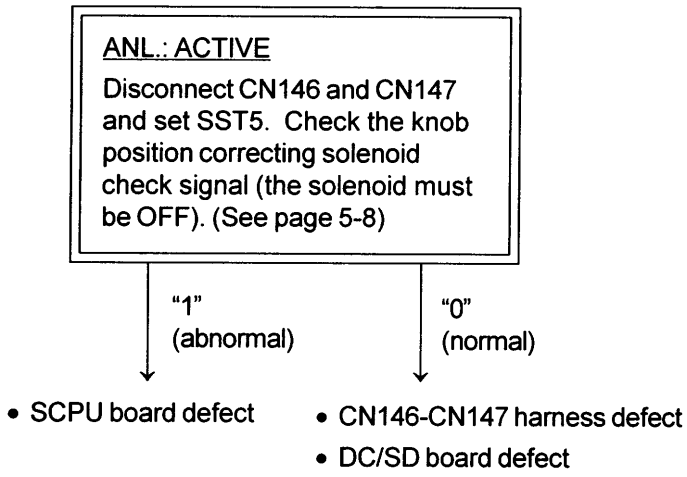




OK (10 ± 1 Ω) → Main harness defect
NG (other than 10 ± 1 Ω) → Knob position correcting solenoid defect

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<For 73-2>



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Error Code 74: Tire Angle Matching Value Abnormality

Related portion

SCPU board

Estimated causes

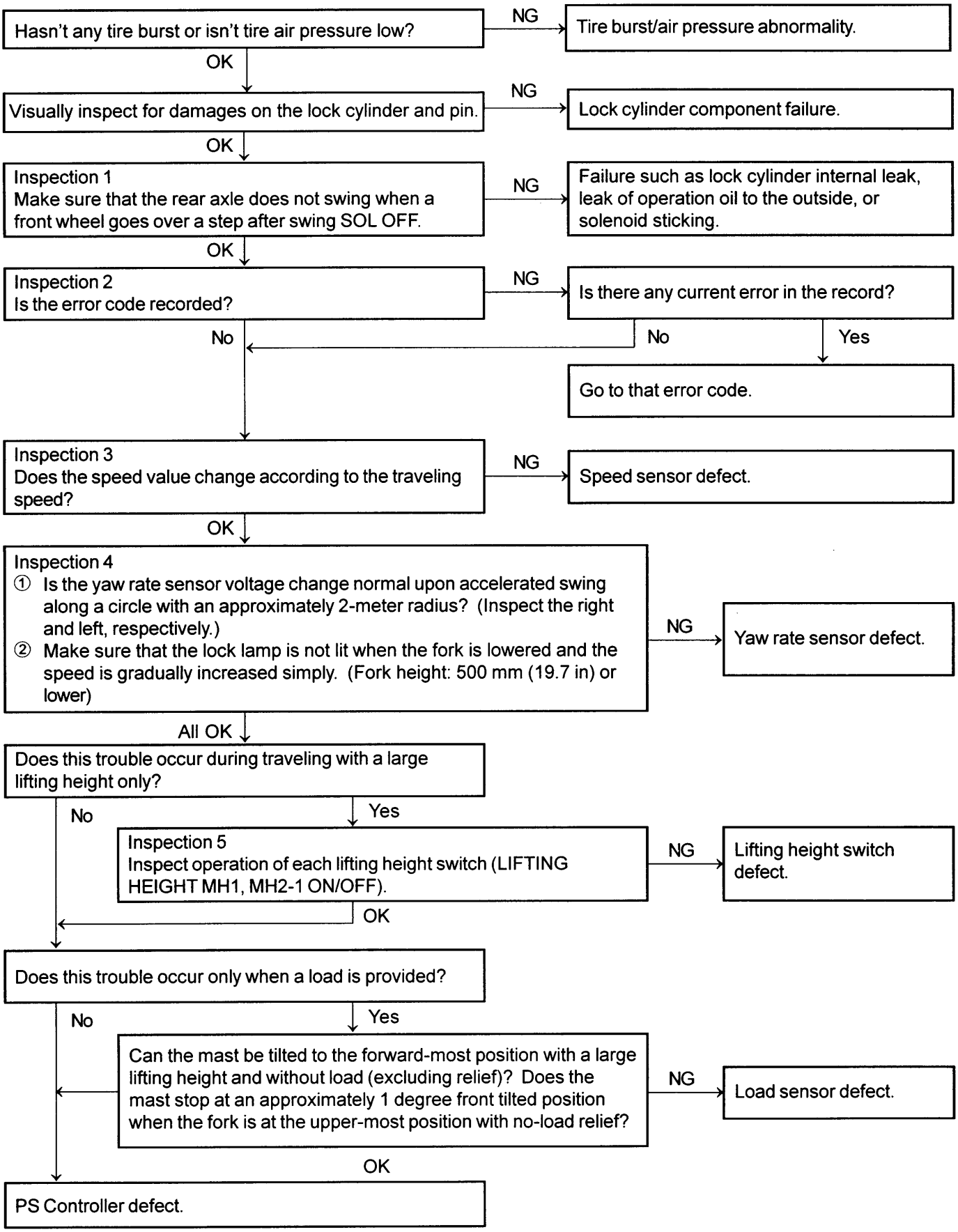
① SCPU board defect

Since the SCPU board is defective whenever 74-1 is indicated to the diagnosis memory, replace the SCPU board.

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WHEN NO ERROR CODE IS DISPLAYED

○ Stability not provided during traveling (-Locking hardly or not provided during traveling)

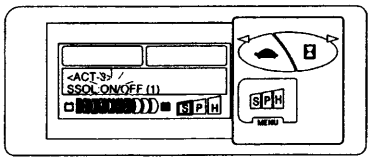


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Inspection 1:
See that the rear axle does not swing when one front wheel rides on a high place after swing solenoid OFF.

Analyzer: ACTIVE TEST

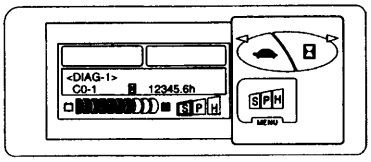
Standard:
When one front wheel rides on a high place after the swing solenoid is set to ON and OFF on a flat road, one front or rear wheel shall float above the ground.
Caution:
Perform this inspection with no load at a low fork height.



Inspection 2:
Is any error code recorded?

Analyzer: DIAG MEMORY

Standard:
No error shall be displayed near the current time on the hour meter.

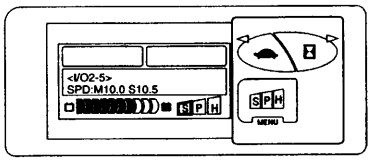


Inspection 3:
Does the speed value change according to the traveling speed?

Analyzer: I/O MONITOR 2/VEHICLE SPEED

Standard:
During traveling the speed value shall change according to the varying vehicle speed.

Note:
The speed value is in a range of 95 to 130% of the actual vehicle speed.



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Inspection 4:

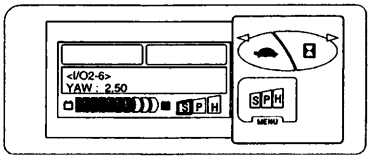
① Let the vehicle travel with acceleration on a circle whose radius is approx. 2 m (79 in), and check if the yaw sensor voltage variation is appropriate (check for each of right and left turns).

Analyzer: I/O MONITOR 2/YAW RATE SENSOR VOLTAGE

Standard:

At a low fork height with no load, travel with gradual acceleration (at a speed of 5 to 6 km/h (27.3 ~ 32.8 fpm)) on a circle whose radius is approx. 2 m (79 in) (with respect to the center of the vehicle). The yaw sensor voltage shall vary smoothly.

In right turn	2.5 V (stationary state) → approx. 3.0 V
In left turn	2.5 V (stationary state) → approx. 2.0 V



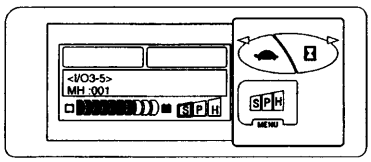
Inspection 5:

Check functioning of each fork height switch (ON/OFF of fork height MH1 and MH2-1).

Analyzer: I/O MONITOR 3/LIFTING HEIGHT SWITCH

Standard:

① Lift and lower the fork at around 2,200 mm (86.6 in) to actuate the fork height switch.
Only fork height MH1 is ON at a low fork height (below the fork height switch).
Only MH2-1 is ON at a high fork height (above the fork height switch).



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● **Swing lock always occurs during traveling or loarding work.**
Or swing lock frequently occurs.

Lock is always maintained (bracing kept) and the rear axle does not swing when the vehicle goes over a step although the swing lock indicator is not lit (upon engine start).
→ Yes → Failure such as lock cylinder solenoid valve sticking or clogging.

↓ No

Inspection 1
① Is the yaw rate sensor voltage change normal upon accelerated swing along a circle with an approximately 2-meter radius? (Inspect the right and left, respectively.)
② Make sure that the swing lock indicator is not lit when the fork is lowered and the speed is gradually increased simply. (Fork height: 500 mm (19.7 in) or lower).
→ NG → Yaw rate sensor abnormality.

↓ All OK

Inspection 2
Inspect the operation of each the lifting height switch. (LIFTING HEIGHT MH1, MH2-1 ON/OFF)
→ NG → Lifting height switch abnormality.

↓ OK

Can the mast be tilted to the forward-most position with a large lifting height and without load (excluding relief)? Does the mast stop at an approximately 1 degree front tilted position when the fork is at the upper-most position with no-load relief?
→ NG → Load sensor abnormality.

↓ OK

PS Controller defect.

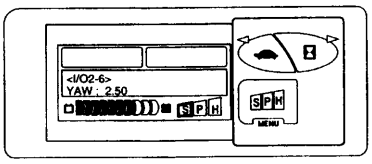
Inspection 1:

① Is the yaw rate sensor voltage change normal upon accelerated swing along a circle with an approximately 2-meter radius? (Inspect the right and left, respectively.)

Analyzer: I/O MONITOR 2/YAW RATE SENSOR VOLTAGE

Standard:
With a small lifting height and without load, perform accelerated swing along an approximately 2-meter radius circle (based on the vehicle center) gradually (up to 5 to 6 km/h (3.1 ~ 3.7 mile/h)). The yaw rate sensor voltage shall change.

Swing to the right	2.5 V (stop) to Approx. 3.0 V
Swing to the left	2.5 V (stop) to Approx. 2.0 V



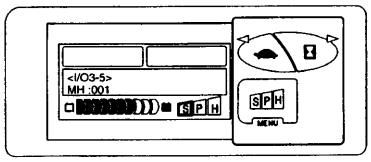
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Inspection 2:
Inspect the operation of each the lifting height switch.
(LIFTING HEIGHT MH1, MH2-1 ON/OFF)

Analyzer: I/O MONITOR 3/LIFTING HEIGHT SWITCH

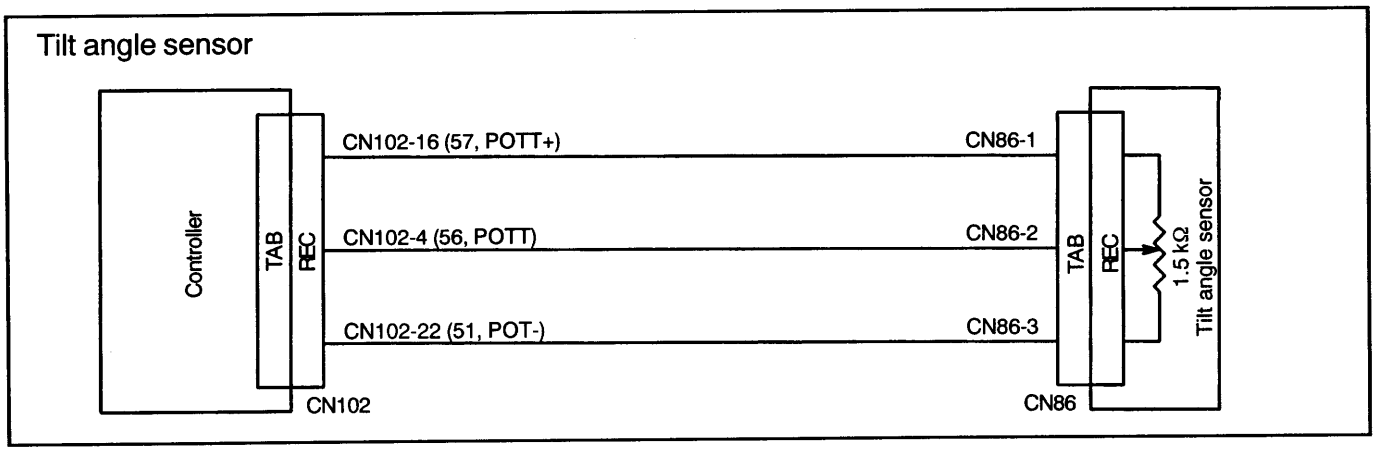
Standard:

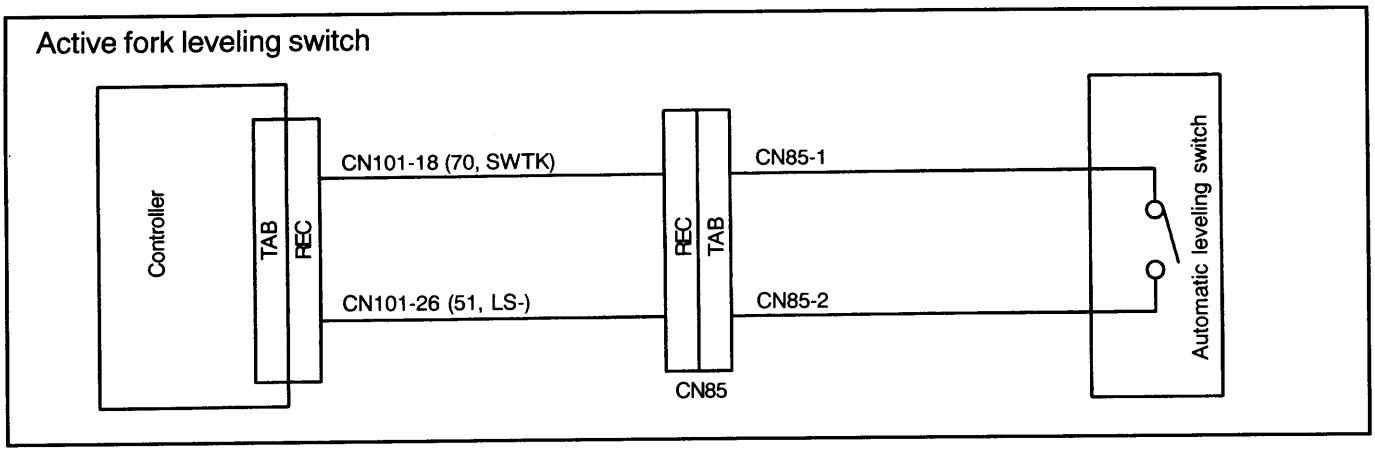
① Lift and lower the fork at a height of approximately 2200 mm (87 in) to activate the lifting height switch.
Note:
- LIFTING HEIGHT MH1 only is turned ON for a small lifting height (below the switch).
- LIFTING HEIGHT MH2-1 only is turned ON for a large lifting height (above the switch).



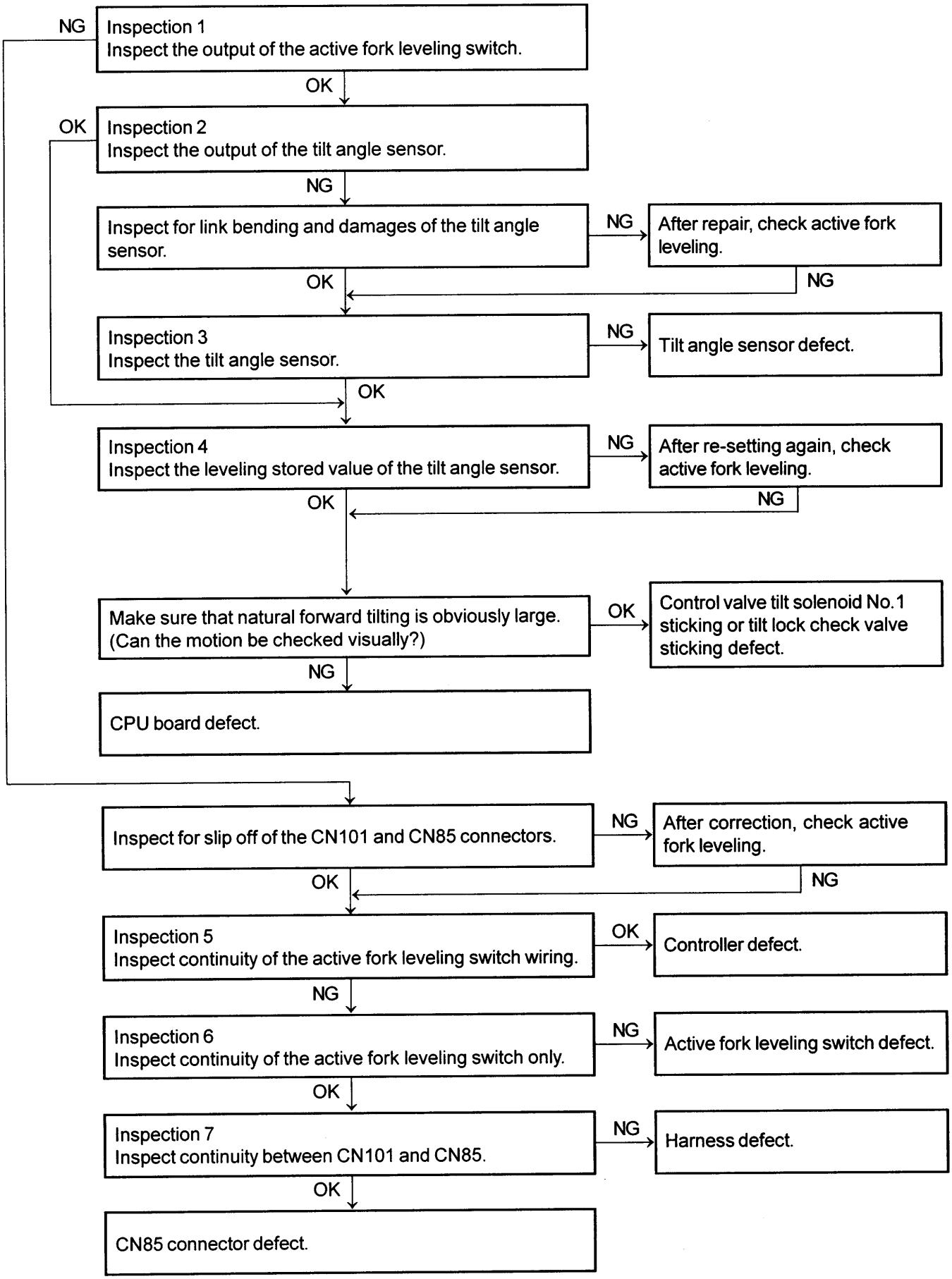
- **Stopping with automatic leveling fails. (Does not stop at a horizontal position but tilts at the forward-most position.)**

Related Portion





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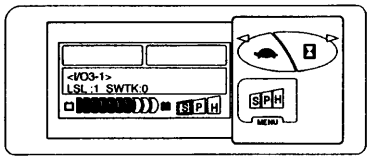
Inspection 1:
Inspect the output of the active fork leveling switch.

Turn the key switch ON

Analyzer: I/O MONITOR 3/TILT KNOB SWITCH

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
SWTK	OFF	ON

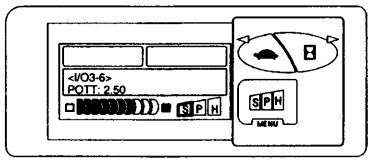


Inspection 2:
Inspect the output of the tilt angle sensor.

Turn the key switch ON

Analyzer: I/O MONITOR 3/TILT ANGLE SENSOR VOLTAGE

Standard:
When the tilt operation is performed and the mast is moved from the forward-most tilt position to the backward-most tilt position, the potential shall rise between 0.1 V and 4.9 V along with backward tilting.



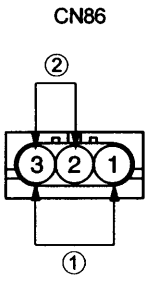
Inspection 3:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

① CN86-1 ~ CN86-3	1.5 kΩ ± 0.3 kΩ

	Sensor lever free	Sensor lever with full stroke
② CN86-2 ~ CN86-3	0 kΩ	1.5 kΩ ± 0.3 kΩ



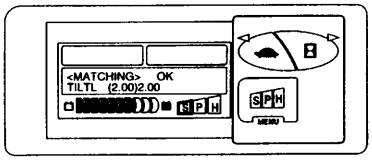
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Inspection 4:
Inspect the leveling stored value of the tilt angle sensor.

Turn the key switch ON

Matching: Tilt horizontal angle

Standard:
The TILT value shall be smaller than the LEVEL value when the tilt is at the forward-most position.



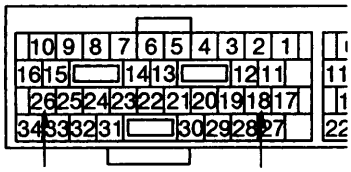
Inspection 5:
Inspect continuity of the active fork leveling switch wiring.

Turn the ignition switch OFF and disconnect CN101.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN101-18 – CN101-26	No continuity	Continuity shall exist.

CN101



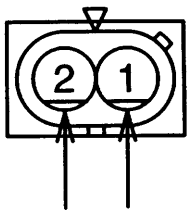
Inspection 6:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN85.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN85-1 – CN85-2	No continuity	Continuity shall exist.

CN85

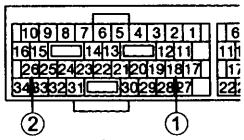


Inspection 7:
Inspect continuity between CN101 and CN85.

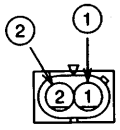
Turn the ignition switch OFF and disconnect CN101 and CN85.

Standard:
① CN101-18 – CN85-1: Continuity shall exist.
② CN101-26 – CN85-2: Continuity shall exist.

CN101



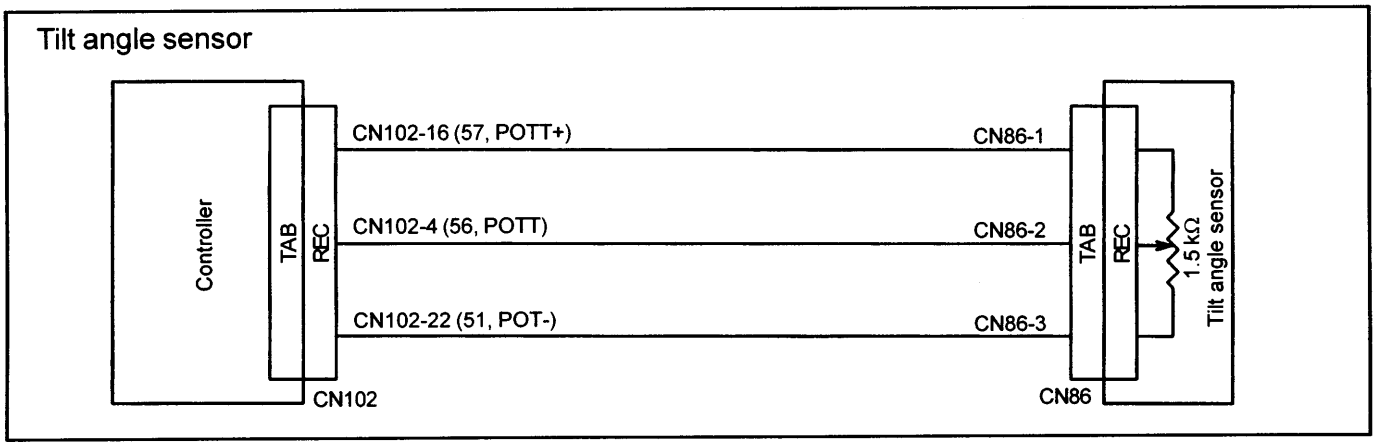
CN85

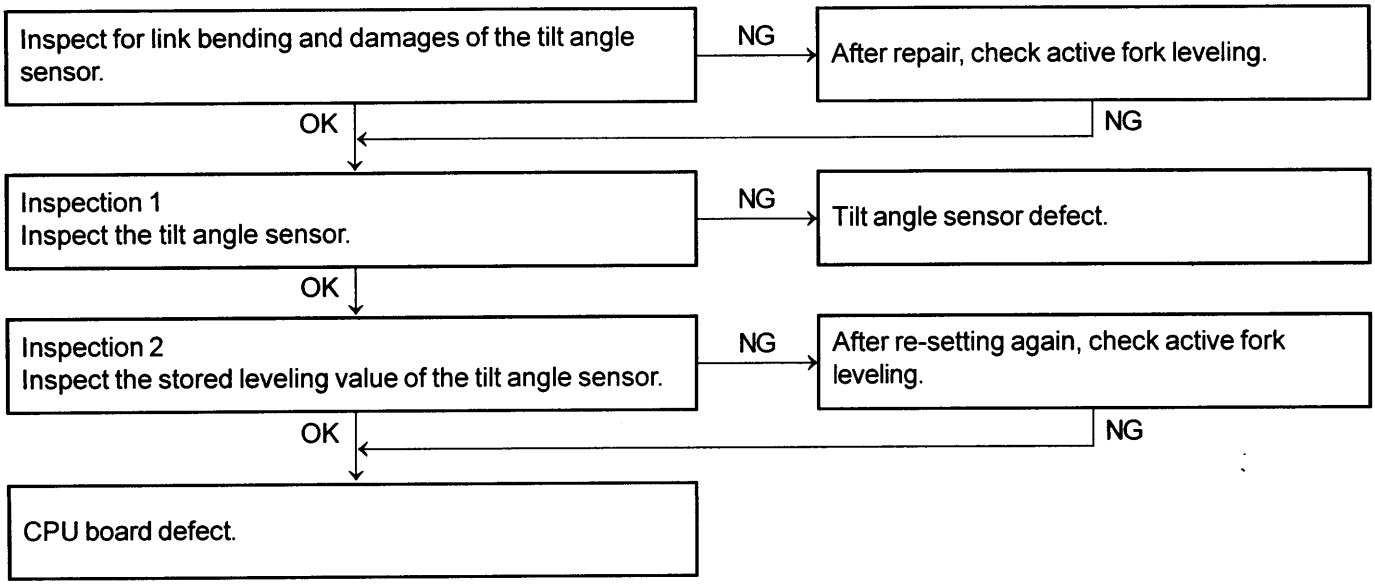


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● **Active fork leveling is not provided. (Stops at a non-horizontal position.)**

Related Portion:





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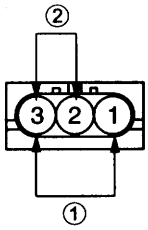
Inspection 1:
Inspect the tilt angle sensor.

Turn the key switch OFF and remove the tilt angle sensor.

Standard:

① CN86-1 – CN86-3	1.5 kΩ ± 0.3 kΩ

	Sensor lever free	Sensor lever with full stroke
② CN86-2 – CN86-3	0 kΩ	1.5 kΩ ± 0.3 kΩ



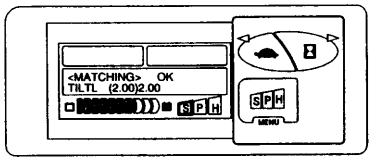
Inspection 2:
Inspect the stored leveling value of the tilt angle sensor.

Turn the key switch ON

Matching: Tilt horizontal angle

Standard:
The TILT value shall be the LEVEL value ± 0.05 V when the mast is upright.

Note:
Set the mast slowly forward from the backward-tilted position.

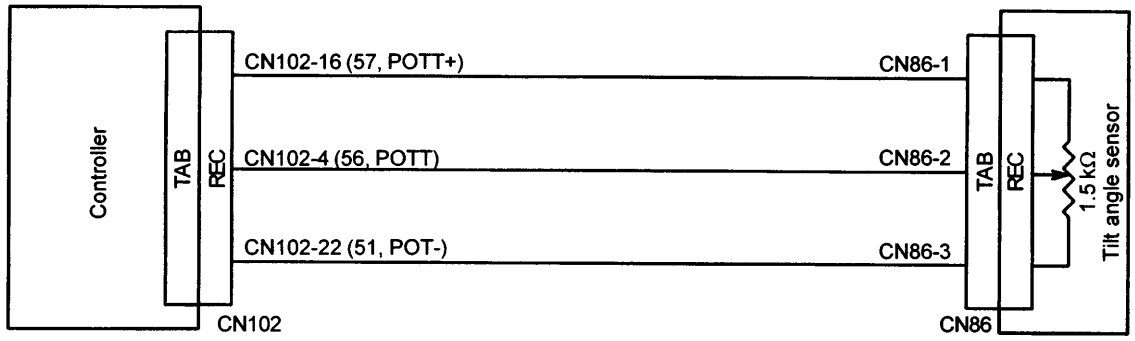


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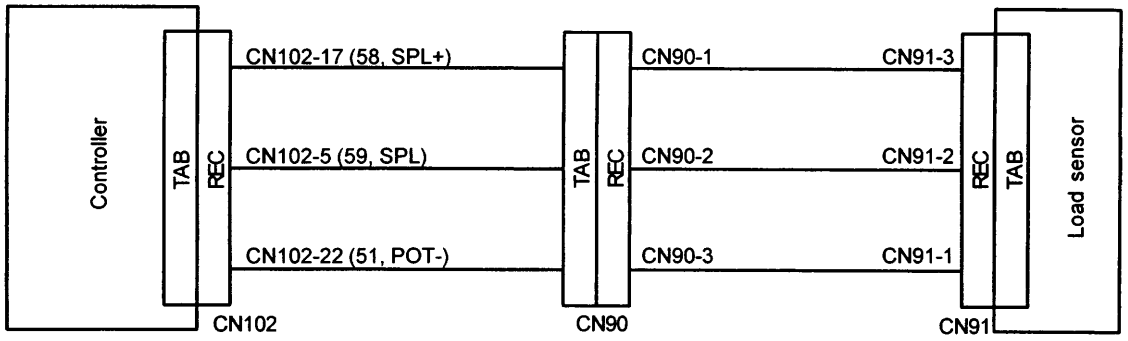
● **Active fork leveling is not provided. (Stops at a position when the knob switch is pressed.)**

Related Portion

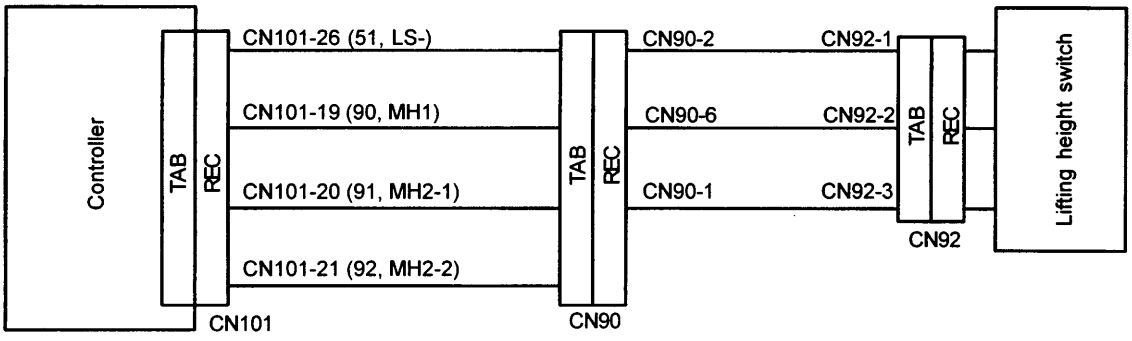
Tilt angle sensor



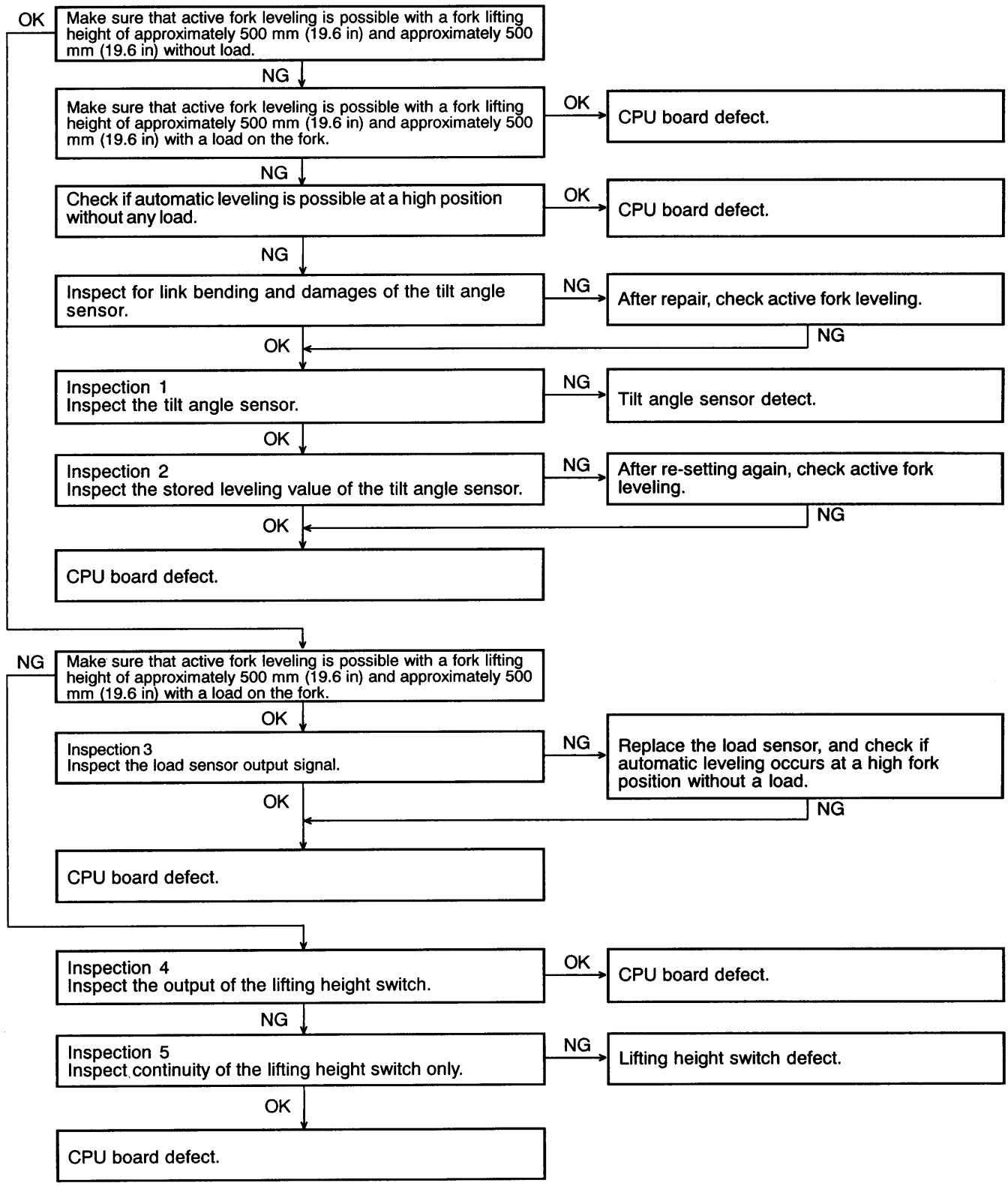
Load sensor



Lifting height switch



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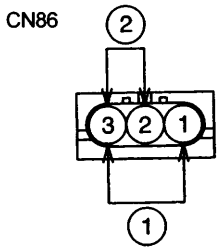
Inspection 1:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

① CN86-1 – CN86-3	1.5 kΩ ± 0.3 kΩ

	Sensor lever free	Sensor lever with full stroke
② CN86-2 – CN86-3	0 kΩ	1.5 kΩ ± 0.3 kΩ



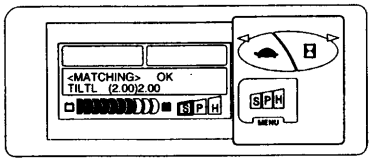
Inspection 2:
Inspect the stored leveling value of the tilt angle sensor.

Turn the key switch ON

Matching: Tilt horizontal angle

Standard:
The TILT value with the mast tilted fully backward is greater than the LEVEL value.

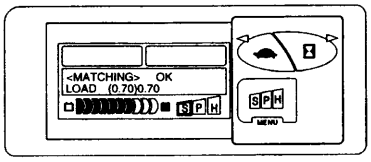
Inspection 3:
Inspect the load sensor output signal.



Turn the key switch ON

Matching: Load value

Standard:
The LOAD value is the value in ( ) ± 0.2 V or lower.
(Fork lifting height of approximately 500 mm (19.6 in) without load.)

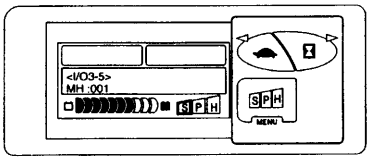


Inspection 4:
Inspect the lifting height switch output signal.

Turn the key switch ON

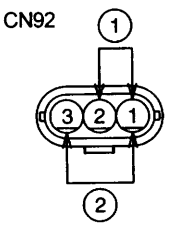
Analyzer: I/O MONITOR 3/LIFTING HEIGHT SWITCH

Standard:
When the fork height is 500 mm (19.6 in). the LIFTING HEIGHT output shall be as follows:
MH1: ON
MH2-1: OFF
MH2-2: OFF



Inspection 5:
Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN31.

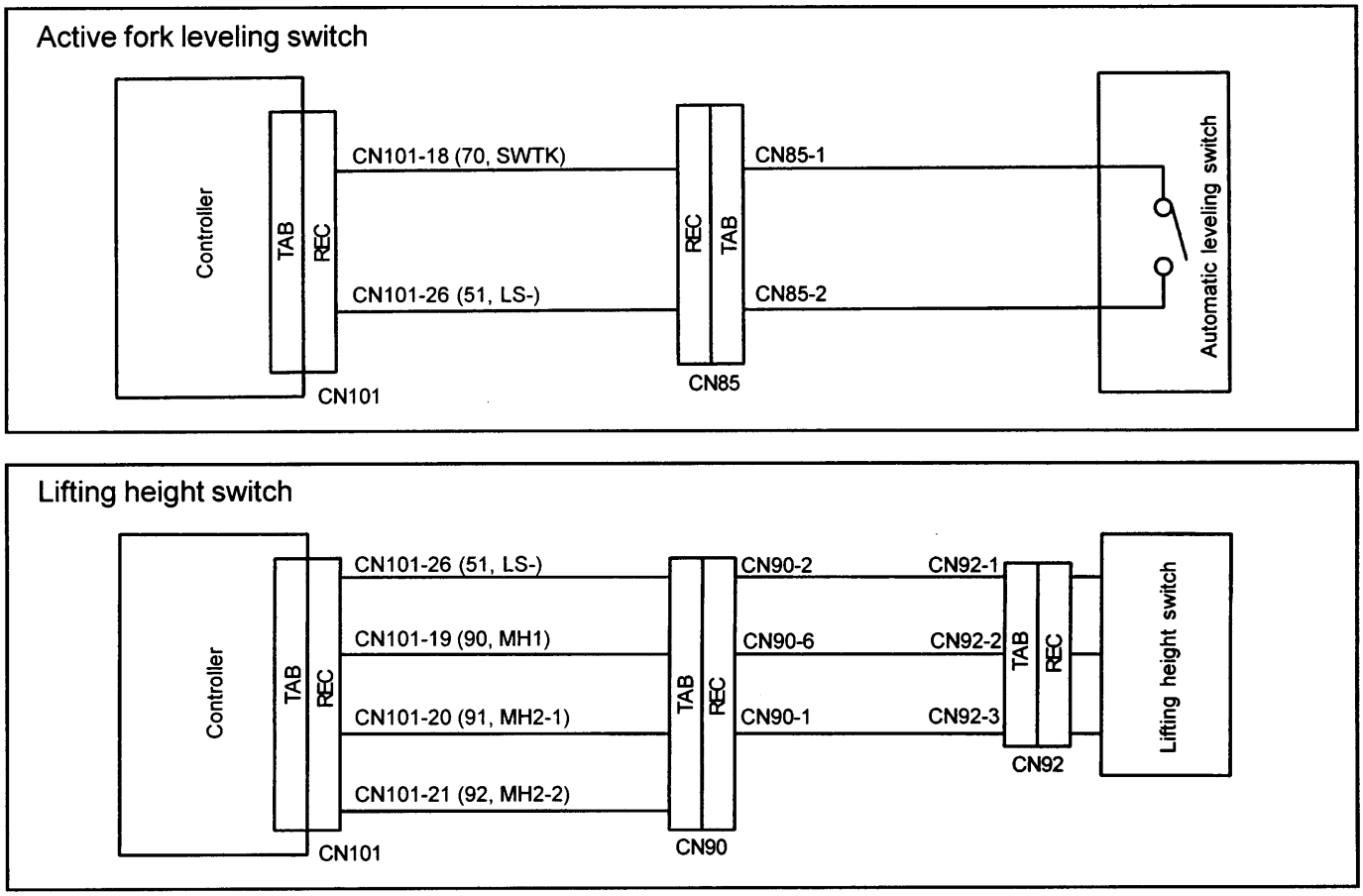


Standard:

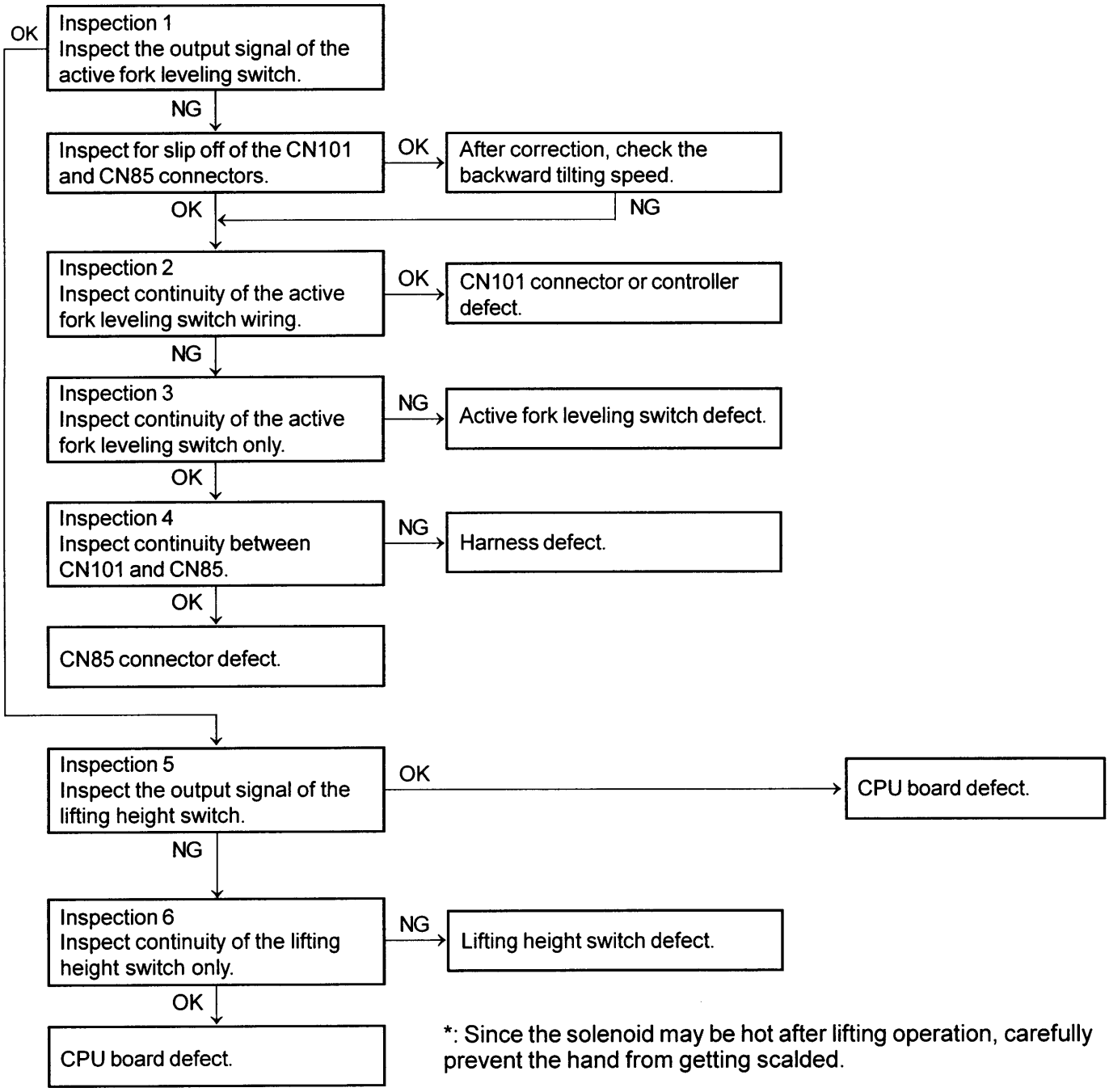
	Fork height: Approximately 500 mm (19.6 in)
① CN92-1 ~ CN92-2	Continuity shall exist.
② CN92-1 ~ CN92-3	No continuity

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● **The active mast rear tilt speed is not regulated, or the backward tilting speed is always slow.**
Related Portion



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*: Since the solenoid may be hot after lifting operation, carefully prevent the hand from getting scalded.

Inspection 1:

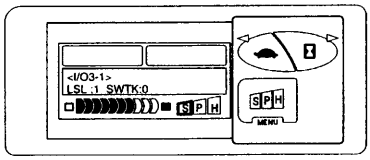
Inspect the output signal of the active fork leveling switch.

Turn the key switch ON

Analyzer: I/O MONITOR 3/TILT KNOB SWITCH

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
SWTK	OFF	ON



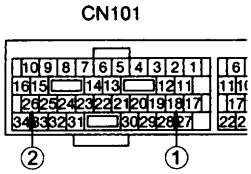
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Inspection 2:
Inspect continuity of the active fork leveling switch wiring.

Turn the key switch OFF and disconnect CN101.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN101-18 – CN101-26	No continuity	Continuity shall exist.

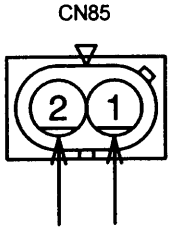


Inspection 3:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN85.

Standard:

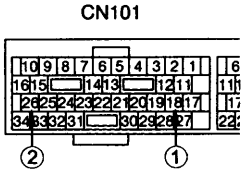
	Active fork leveling switch free	Active fork leveling switch depressed
CN85-1 – CN85-2	No continuity	Continuity shall exist.

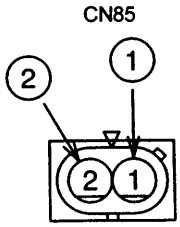


Inspection 4:
Inspect continuity between CN101 and CN85.

Turn the key switch OFF and disconnect CN101 and CN85.

Standard:
① CN101-18 – CN85-1: Continuity shall exist.
② CN101-26 – CN85-2: Continuity shall exist.



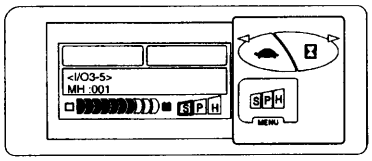


Inspection 5:
Inspect the output signal of the lifting height switch.

Turn the ignition switch ON (start the engine).

Analyzer: I/O MONITOR 3/LIFTING HEIGHT SWITCH

Standard:
When the fork height is 500 mm (19.6 in). the LIFTING HEIGHT output shall be as follows:
MH1: ON
MH2-1: OFF
MH2-2: OFF

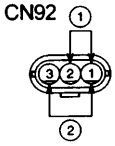


Inspection 6:
Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN92.

Standard:

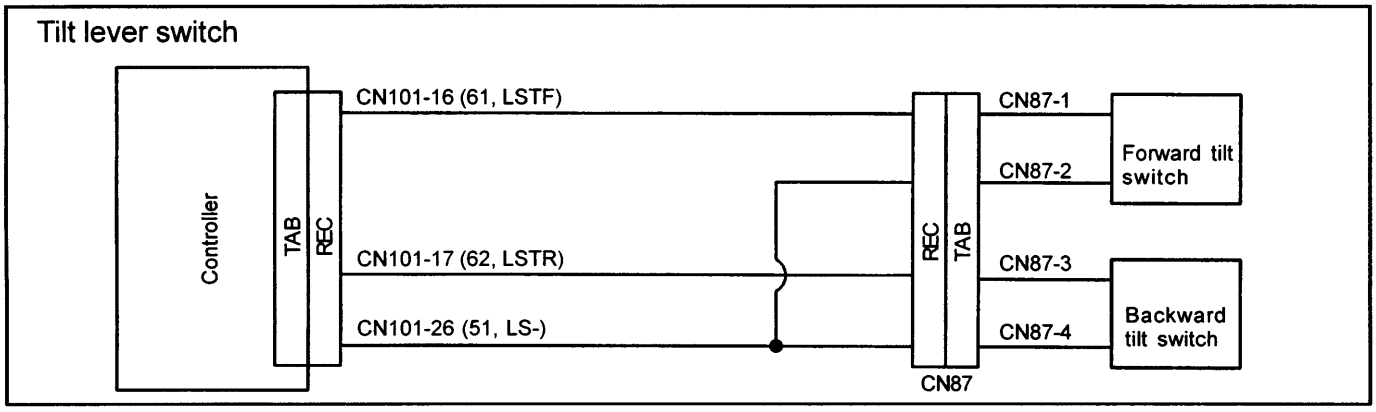
	Small lifting height	Large lifting height
① CN92-1 – N92-2	Continuity shall exist.	No continuity.
② CN92-1 – CN92-3	No continuity.	Continuity shall exist.

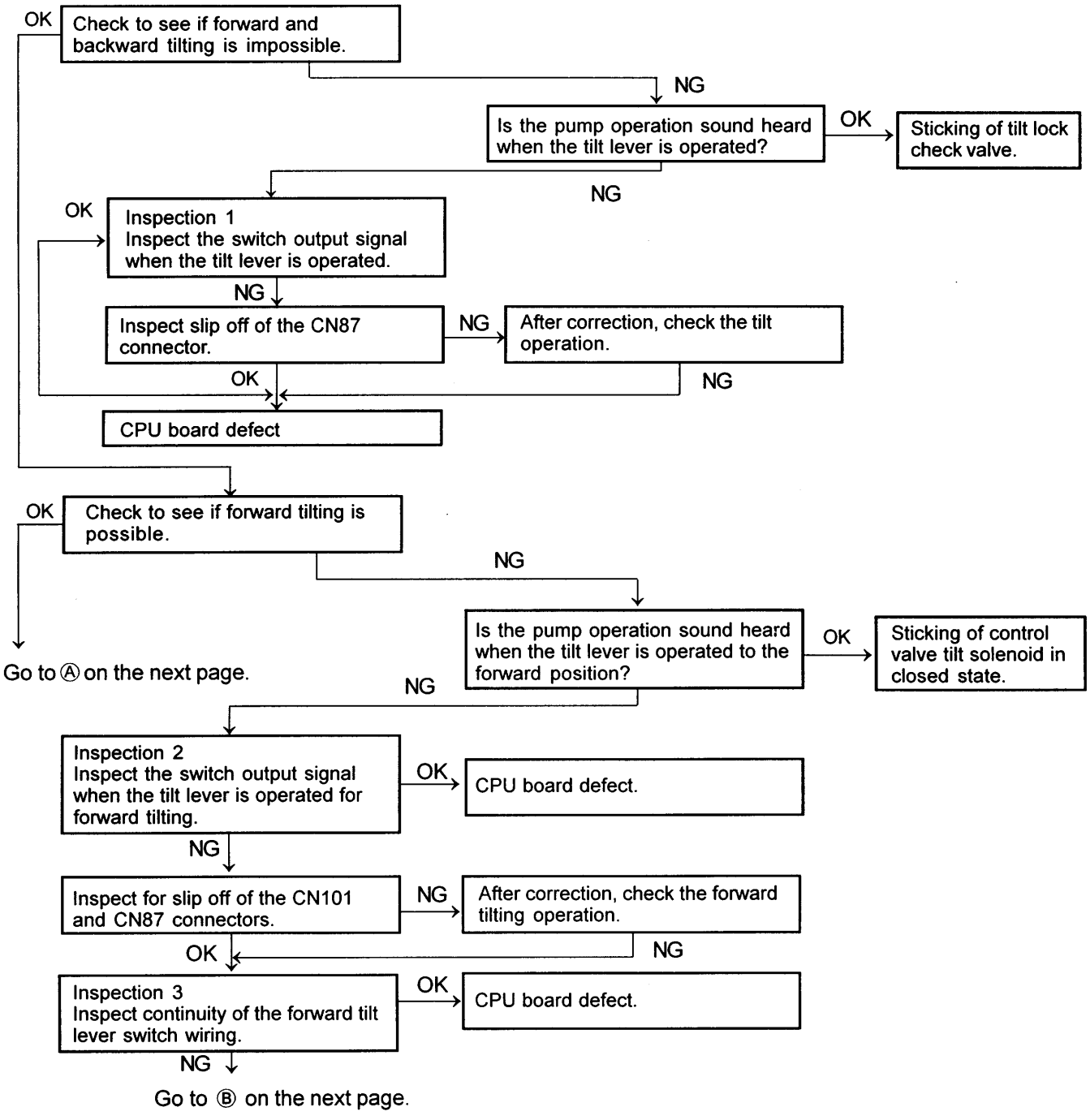


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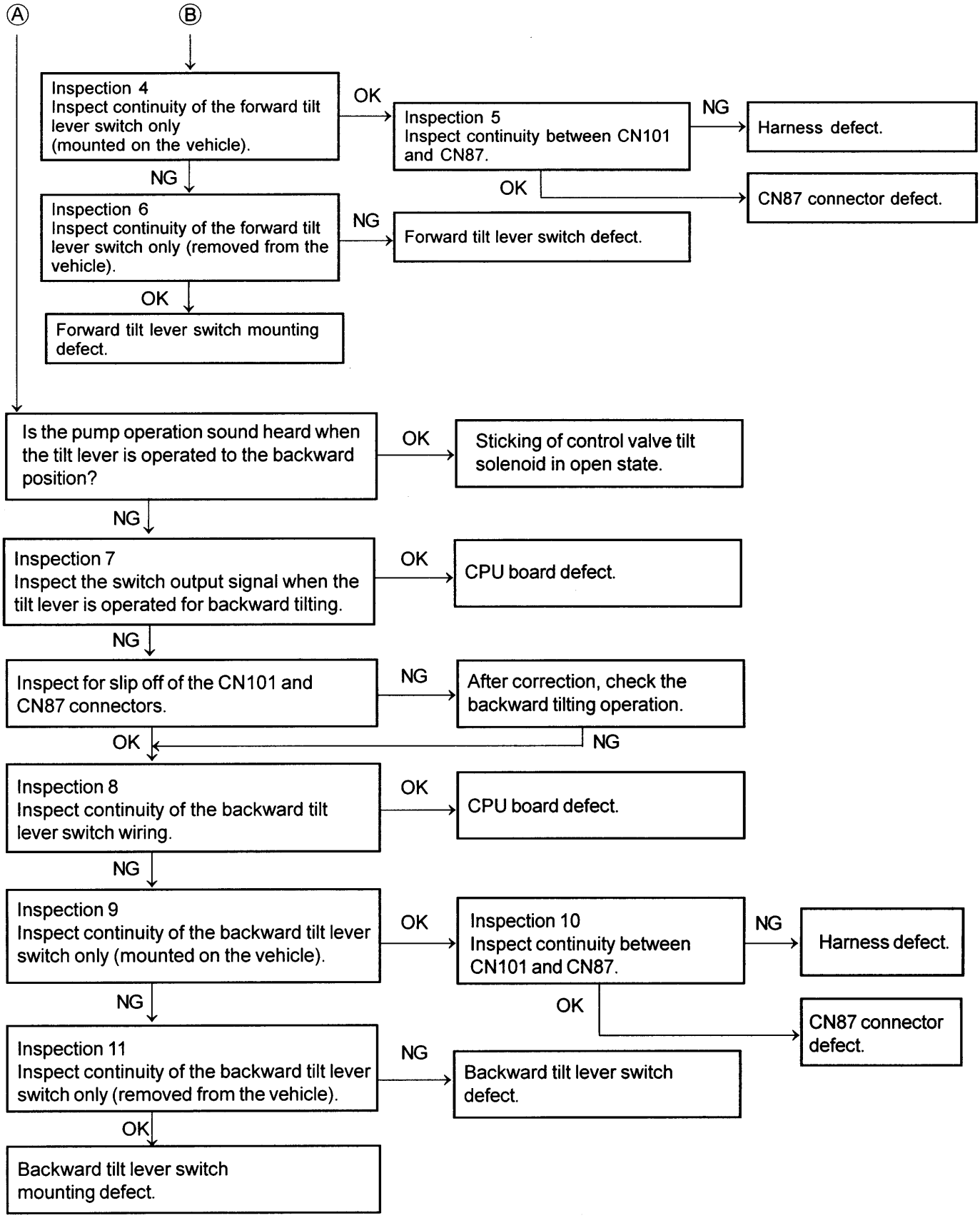
● **The mast does not perform forward/backward tilt.**

Related Portion





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Inspection 1:
Inspect the switch output signal when the tilt lever is operated for backward tilting.
Turn the ignition switch ON (stop the engine).
Analyzer: I/O MONITOR 3/FORWARD TILT SWITCH, BACKWARD TILT SWITCH

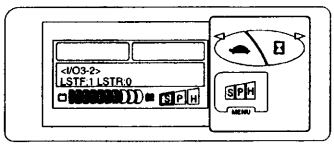
Standard:

	Tilt lever neutral	Tilt lever at forward	Tilt lever at backward
LSTF	OFF	ON	OFF
LSTR	OFF	OFF	ON

Inspection 2:
Inspect the switch output signal when the tilt lever is operated for forward tilting.
Turn the ignition switch ON (stop the engine).
Analyzer: I/O MONITOR 3/FORWARD TILT SWITCH, BACKWARD TILT SWITCH

Standard:

	Tilt lever neutral	Tilt lever at forward
LSTF	OFF	ON
LSTR	OFF	OFF

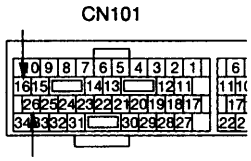


Inspection 3:
Inspect continuity of the forward tilt lever switch wiring.

Turn the key switch OFF and disconnect CN101.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN101-16 – CN101-26	No continuity	Continuity shall exist.

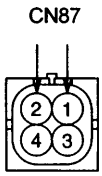


Inspection 4:
Inspect continuity of the forward tilt lever switch only (mounted on the machine).

Turn the key switch OFF and disconnect CN87.

Standard:

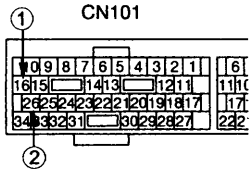
	Tilt lever neutral	Tilt lever at forward
CN87-1 – CN87-2	No continuity	Continuity shall exist.

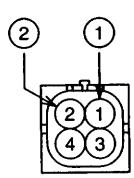


Inspection 5:
Inspect continuity between CN101 and CN87.

Turn the key switch OFF and disconnect CN101 and CN87.

Standard:
① CN101-16 – CN87-1: Continuity shall exist.
② CN101-26 – CN87-2: Continuity shall exist.



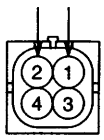


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Inspection 6:
Inspect continuity of the forward tilt lever switch only (removed from the machine).

Turn the ignition switch OFF and disconnect CN87.
Remove the forward tilt lever switch (upper-side switch on the control valve).

CN87



Standard:

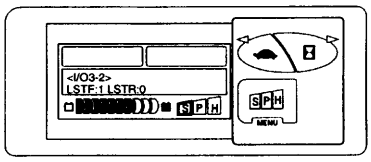
	Switch free	Switch depressed
CN87-1 – CN87-2	Continuity shall exist.	No continuity

Inspection 7:
Inspect the switch output signal when the tilt lever is operated for backward tilting.

Turn the ignition switch ON (stop the engine).
Analyzer: I/O MONITOR 3/FORWARD TILT SWITCH, BACKWARD TILT SWITCH

Standard:

	Tilt lever neutral	Tilt lever at backward
LSTF	OFF	OFF
LSTR	OFF	ON



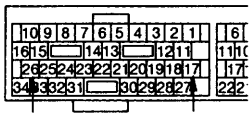
Inspection 8:
Inspect continuity of the backward tilt lever switch wiring.

Turn the key switch OFF and disconnect CN101.

Standard:

	Tilt lever neutral	Tilt lever at backward
CN101-17 – CN101-26	No continuity	Continuity shall exist.

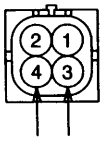
CN101



Inspection 9:
Inspect continuity of the backward tilt lever switch only (mounted on the vehicle).

Turn the key switch OFF and disconnect CN87.

CN87



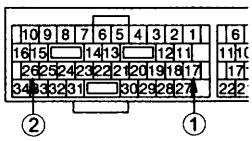
Standard:

	Tilt lever neutral	Tilt lever at backward
CN87-3 – CN87-4	No continuity	Continuity shall exist.

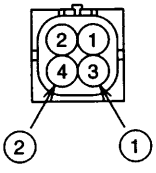
Inspection 10:
Inspect continuity between CN101 and CN87.

Turn the key switch OFF and disconnect CN101 and CN87.

CN101



CN87



Standard:
① CN101-17 – CN87-3: Continuity shall exist.
② CN101-26 – CN87-4: Continuity shall exist.

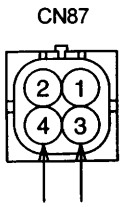
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Inspection 11:
Inspect continuity of the backward tilt lever switch only (removed from the vehicle).

Turn the key switch OFF and disconnect CN87.
Remove the backward tilt lever switch (lower-side switch on the control valve).

Standard:

	Switch free	Switch depressed
CN87-3 – CN87-4	Continuity shall exist.	No continuity



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- **The knob position runs out to a certain point (at least by 10 degrees from the straight-forward position).**

Inspection 1
Steering wheel looseness check
Adjust the steering wheel to the neutral position (knob at eight o'clock position) from the left and right sides, and check that the center value difference of the knob position (K_POS) between the left and right sides is within 4.

NG → Damage of steering angle sensor fitting portion
Wear of steering angle sensor fitting portion and collar

OK ↓

Inspection 2
Steering wheel displacement check
Adjust the steering wheel to the neutral position (knob at eight o'clock position) from the left and right sides, and check that the median of the knob position (K_POS) is within 80 ± 1.

NG → Steering wheel installation defect
(Correct defective installation --- serration misalignment.)

NG ↓

Inspection 3
Steering wheel installation check
Adjust the steering wheel to the neutral position (knob st eight o'clock position), remove the horn cap and check if the neutral position mark on top of the steering shaft is in the nine o'clock position.

OK → Steering angle sensor defect
Collar installation defect (180° opposite)

Inspection 4
Tire straight traveling angle matching check
Adjust the rear wheel tire correctly to the straight traveling position and check the difference between the tire angle sensor voltage and the matching voltage value.
⇒The difference must be within 0.04 V.

NG → Tire straight traveling matching defect
(Perform matching again.)

OK ↓

Inspection 5
Knob solenoid ON operation check
Turn the knob solenoid (KSOL) ON in the analyzer function test mode and check that the steering wheel slips at the tire end. (Turning speed: one turn in 2 to 3 seconds).

NG → Knob solenoid valve defect
(Plunger sticking, clogged orifice, etc.)

OK ↓

Inspection 6
Knob control operation check
Make sure that the knob solenoid (SOL) is turned ON/OFF (1/0) when the steering wheel is turned to the left and right (stationary steering) by analyzer I/O monitor 4-3.

OK →

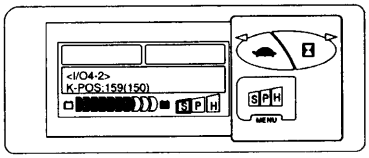
NG ↓

SK/PS controller defect

Inspection 1:
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.
Analyzer: I/O MONITOR 4/STEERING ANGLE KNOB POSITION

Standard:
The difference between the knob position values obtained when the steering wheel is turned from the right or left end to just the neutral position shall be 4 or less.

Example: Turning from the right end — 78
Turning from the left end — 83
83 — 78 = 5 (NG)

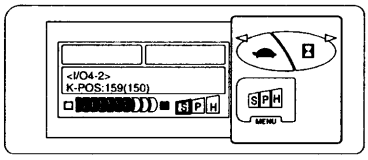


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Inspection 2:
Make sure that the central value of the knob position value is within 80 ± 1 when the steering wheel is turned from the right or left end to the neutral (straight-forward) position.

Analyzer: I/O MONITOR 4/STEERING ANGLE KNOB POSITION

Standard:
The knob position value shall be within 80 ± 1 when the steering wheel is turned from the right or left end to the neutral (straight-forward) position.



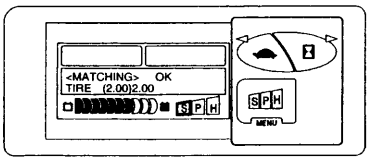
Note:
Start from at least 1/3 turn before the TOYOTA mark center position.

Inspection 3:
Remove the horn cap when the steering wheel is in the neutral position, and check if the positioning mark on top of the steering shaft is in the nine o'clock direction. If deviated, turn the steering wheel to adjust to the nine o'clock position. If the knob position then is not in the eight o'clock direction, remove the steering wheel and install it so that the knob is located in the eight o'clock position.

Inspection 4:
Inspect the difference between the tire voltage value and re-setting voltage value when the rear wheel tires are just in straight-forward position.
⇒ The difference shall be at least 0.04 V.

Matching: Tire angle

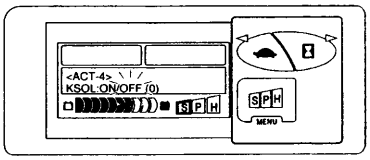
Standard:
The difference between the tire voltage value and re-setting voltage value shall be at least 0.04 V when the rear wheel tires are just in straight-forward position.



Inspection 5:
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end. (Turning speed: 1 turn per 2 to 3 seconds)

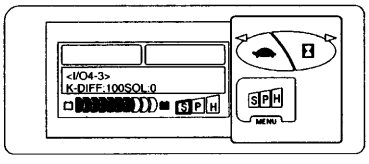
Analyzer: ACTIVE TEST/KNOB POSITION CORRECTING SOLENOID

Standard:
The steering wheel shall turn idle when the knob SOL is turned ON and the steering wheel turns idle at the tire end. (Turning speed: 1 turn per 2 to 3 seconds)



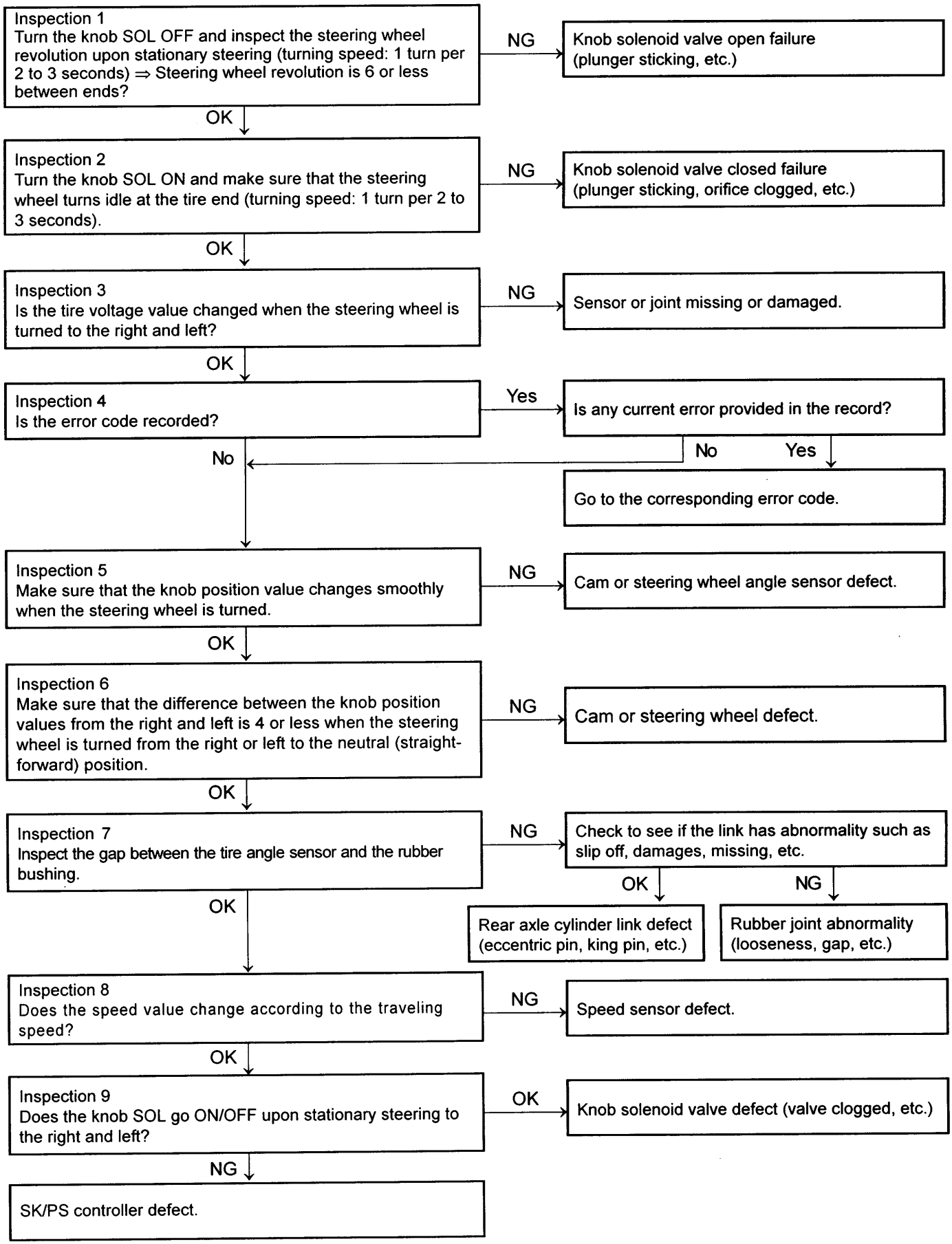
Inspection 6:
Make sure that the SOL value on analyzer: I/O monitor 4-3 is switched between 1 and 0.
Upon SOL ON: 1
Upon SOL OFF: 0

Standard:
The knob SOL shall sometimes go ON/OFF when the steering wheel is turned from an end to another alternately. Perform this operation three times.



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● The knob position runs out. (The knob position in straight-forward status is not constant.)

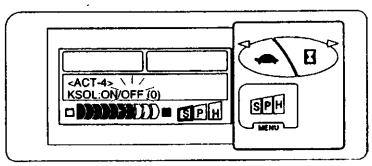


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Inspection 1:
Turn the knob SOL OFF and inspect the steering wheel revolution upon stationary steering (turning speed: 1 turn per 2 to 3 seconds)
⇒ Steering wheel revolution is 6 or less between ends?

Analyzer: ACTIVE TEST/KNOB POSITION CORRECTING SOLENOID

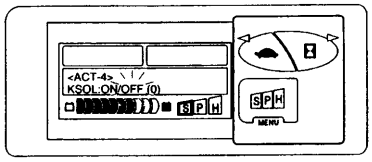
Standard:
Six or fewer rotations upon stationary steering after the knob SOL is turned OFF (turning speed: 1 turn per 2 to 3 seconds)



Inspection 2:
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end (turning speed: 1 turn per 2 to 3 seconds).

Analyzer: ACTIVE TEST/KNOB POSITION CORRECTING SOLENOID

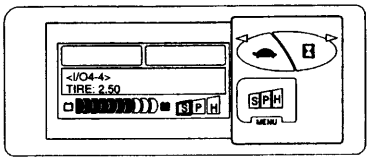
Standard:
When the knob SOL is turned ON, the steering wheel is turned to the tire end, and the steering wheel is further turned, the steering wheel shall turn idle (turning speed: 1 turn per 2 to 3 seconds).



Inspection 3:
Is the tire voltage value changed when the steering wheel is turned to the right and left?

Analyzer: I/O MONITOR 4/TIRE ANGLE SENSOR VOLTAGE

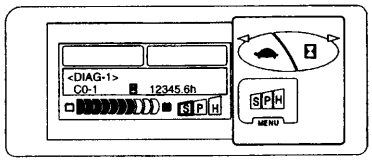
Standard:
When the steering wheel is turned to the right and left, the tire voltage value should change smoothly and continuously in the whole rage.



Inspection 4:
Is the error code recorded?

Analyzer: DIAG MEMORY

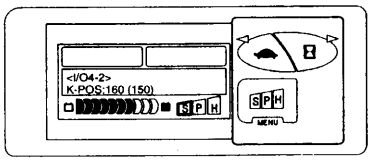
Standard:
Errors shall not exist near the current time.



Inspection 5:
Make sure that the knob position value changes smoothly when the steering wheel is turned.

Analyzer: I/O MONITOR 4/STEERING ANGLE KNOB POSITION

Standard:
When the steering wheel is turned to the right and left, the knob position value shall change smoothly.
0 to 159 ⇒ 0 to 159 ⇒ repeated



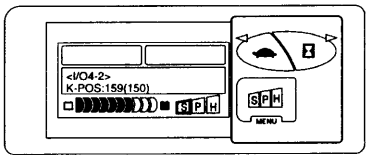
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Inspection 6:
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.

Analyzer: I/O MONITOR 4/STEERING ANGLE KNOB POSITION

Standard:
The difference between the knob position values from the right and left shall be 4 or less when the steering wheel is turned from the right or left to the neutral position.

Example: Turning from the right end — 78
Turning from the left end — 83
83 - 78 = 5 (NG)

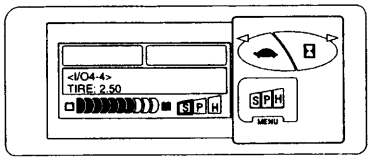


Note:
Start from at least 1/3 turn before the TOYOTA mark center position.

Inspection 7:
Jack up the vehicle until rear wheels leave the ground, and fully turn the steering wheel to either side. Then return the knob by approx. 70 mm (2.8 in) (approx. 25 degrees) from that position, and inspect variation in the tire voltage value. Inspect this for one direction at a time.

Analyzer: I/O MONITOR 4/TIRE ANGLE SENSOR VOLTAGE

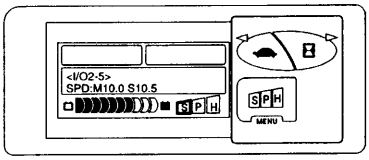
Standard:
When the knob is alternately turned (tire is slightly moved) in 70 mm (approximately 25 degrees), the tire voltage change shall be at least 0.02 V.



Inspection 8:
Does the speed value change according to the traveling speed?

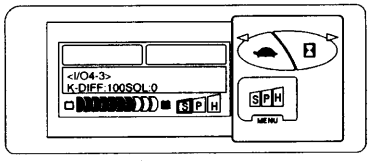
Analyzer: I/O MONITOR 2/VEHICLE SPEED

Standard:
The speed value shall change according to the traveling speed.



Inspection 9:
Make sure that the SOL value on analyzer: I/O monitor 4-3 is switched between 1 and 0.
Upon SOL ON: 1
Upon SOL OFF: 0

Standard:
The knob SOL shall sometimes go ON/OFF when the steering wheel is turned from an end to another alternately. Perform this operation three times.

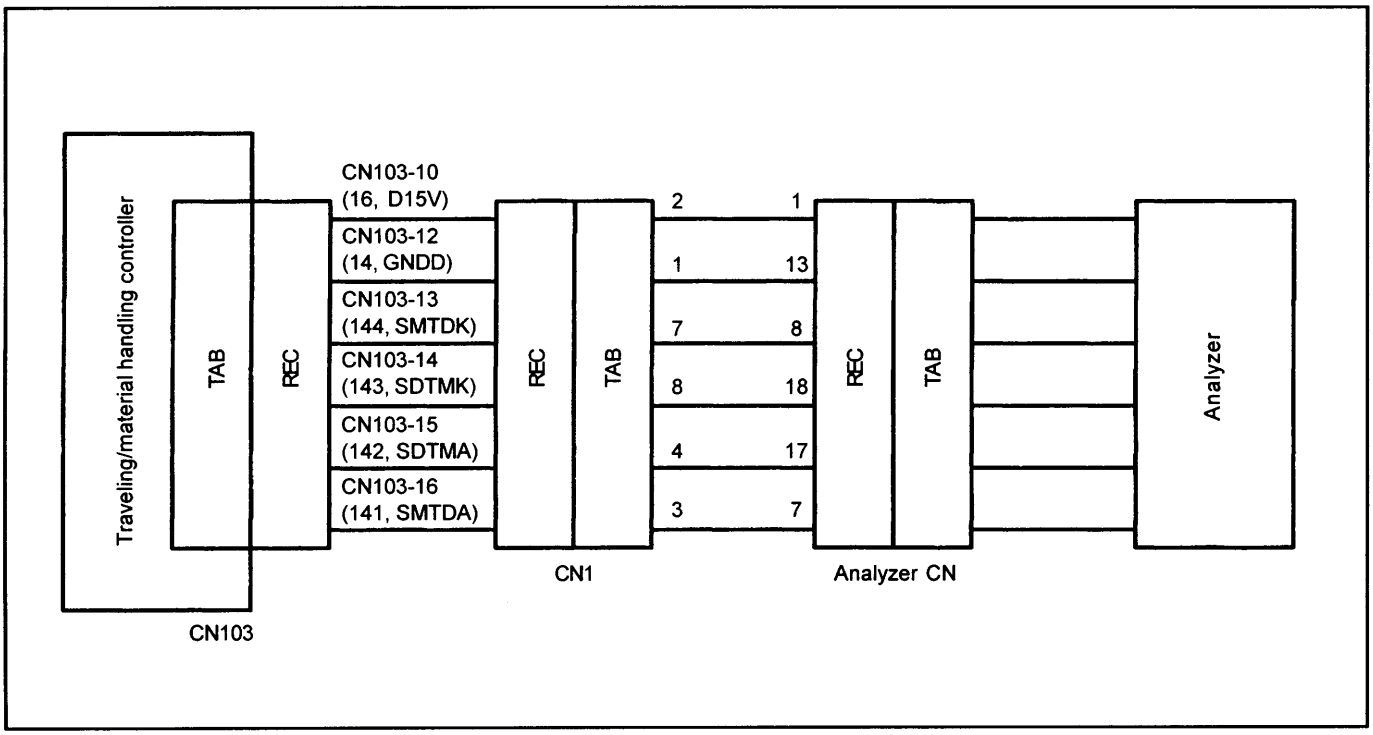


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PLUG-IN ANALYZER

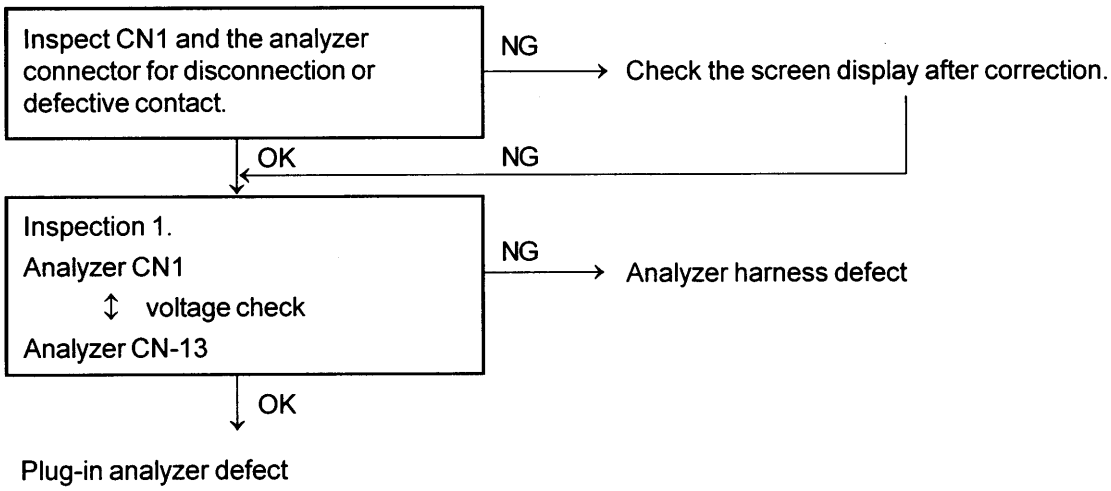
• No Display on Screen

Related portion



Estimated causes

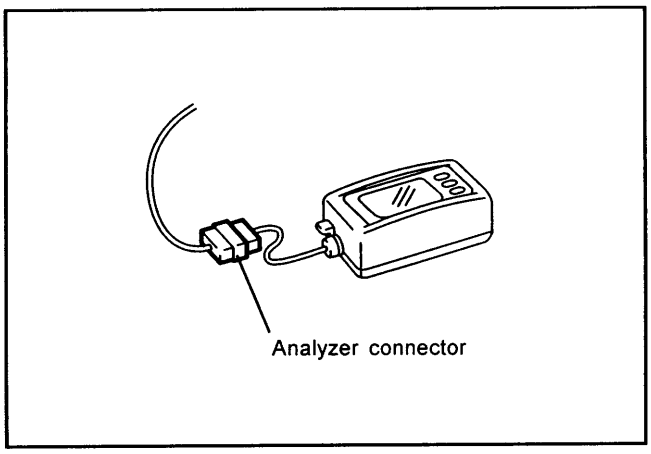
① Defective connector contact
② Analyzer harness defect
③ Defect of plug-in analyzer itself (mainly CPU board defect and not ROM defect)

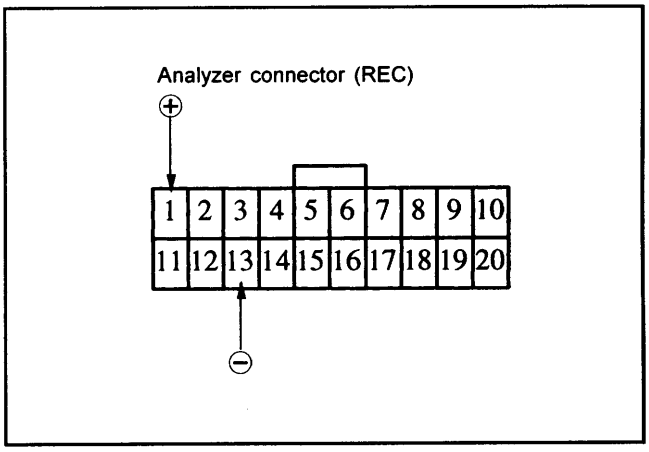


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Inspection 1:
Analyzer supply voltage check
Battery plug ON, key switch ON

Measurement terminals	Analyzer CN1 ⊕ – 13 ⊖
Tester range	DC 50
Standard	Approx. 15 V



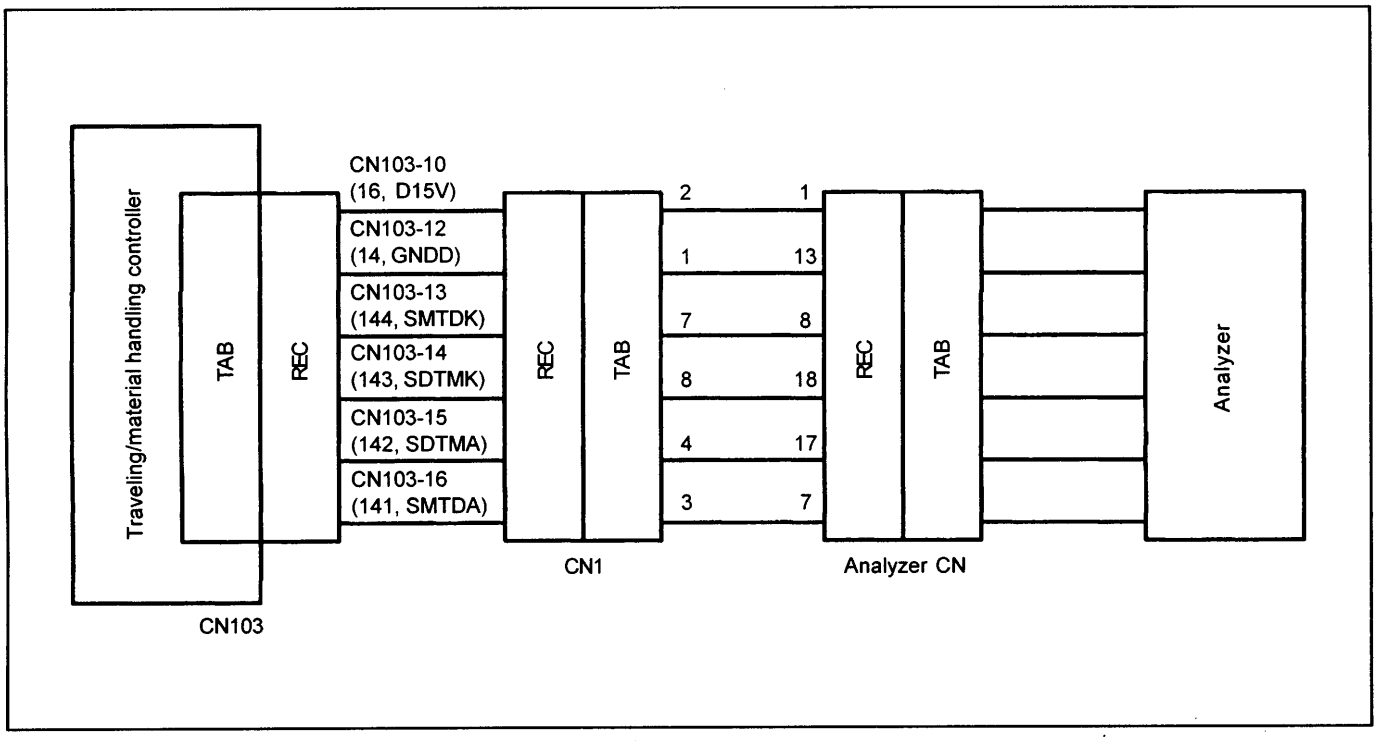


OK (Approx. 15 V) → Plug-in analyzer defect
NG (0 V) → Analyzer harness defect

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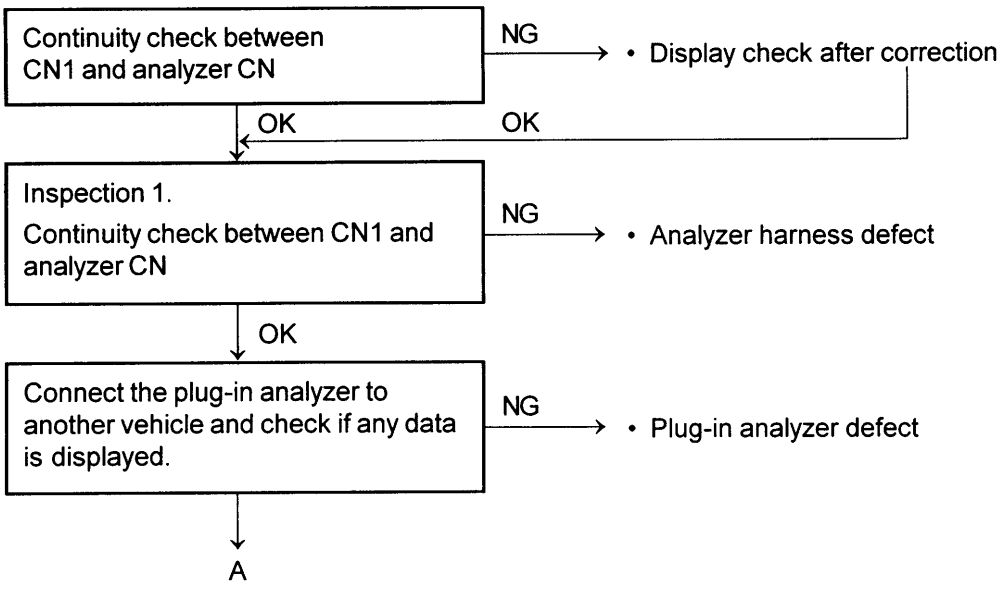
- **"1. SAS" is displayed instead of "2. 7FB" on the MAIN MENU screen.**
- **No data (error memory, I/O monitor 1-4) display.**

Related portion

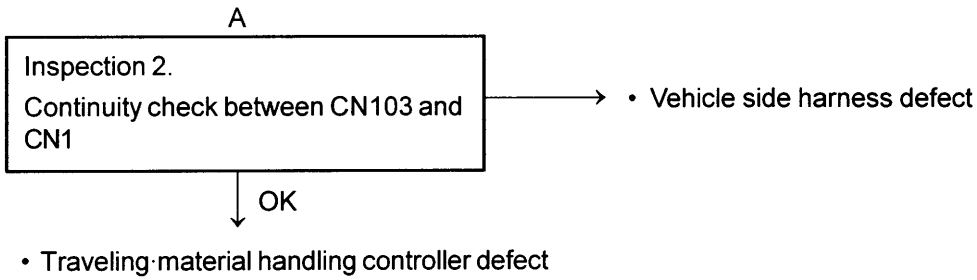


Estimated causes

① Connector contact defect
② Analyzer harness defect
③ Plug-in analyzer defect (mainly CPU defect and not ROM defect)
④ Traveling/material handling controller defect



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Inspection 1:
Continuity check between CN1 and analyzer CN
Key switch off, battery plug off, and analyzer harness disconnection

Measurement terminals	CN1-7 – Analyzer CN-8 CN1-8 – Analyzer CN-18 CN1-4 – Analyzer CN-17 CN1-3 – Analyzer CN-7
Tester range	Ω × 1
Standard	0 Ω

OK (0 Ω) → Check by connecting the plug-in analyzer to another vehicle.
NG (∞ Ω) → Analyzer harness defect

Inspection 2:
Continuity check between CN103 and CN1
Key switch off, battery plug off, CN103 and CN1 disconnection

Measurement terminals	CN103-13 (144) – CN1-7 (144) CN103-14 (143) – CN1-4 (143) CN103-15 (142) – CN1-8 (142) CN103-16 (141) – CN1-3 (141)
Tester range	Ω × 1
Standard	0 Ω

OK (0 Ω) → Traveling·material handling controller defect
NG (∞ Ω) → Vehicle side harness defect

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MOTOR

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- REMOVAL·INSTALLATION 6-4
- DISASSEMBLY·INSPECTION·REASSEMBLY 6-6

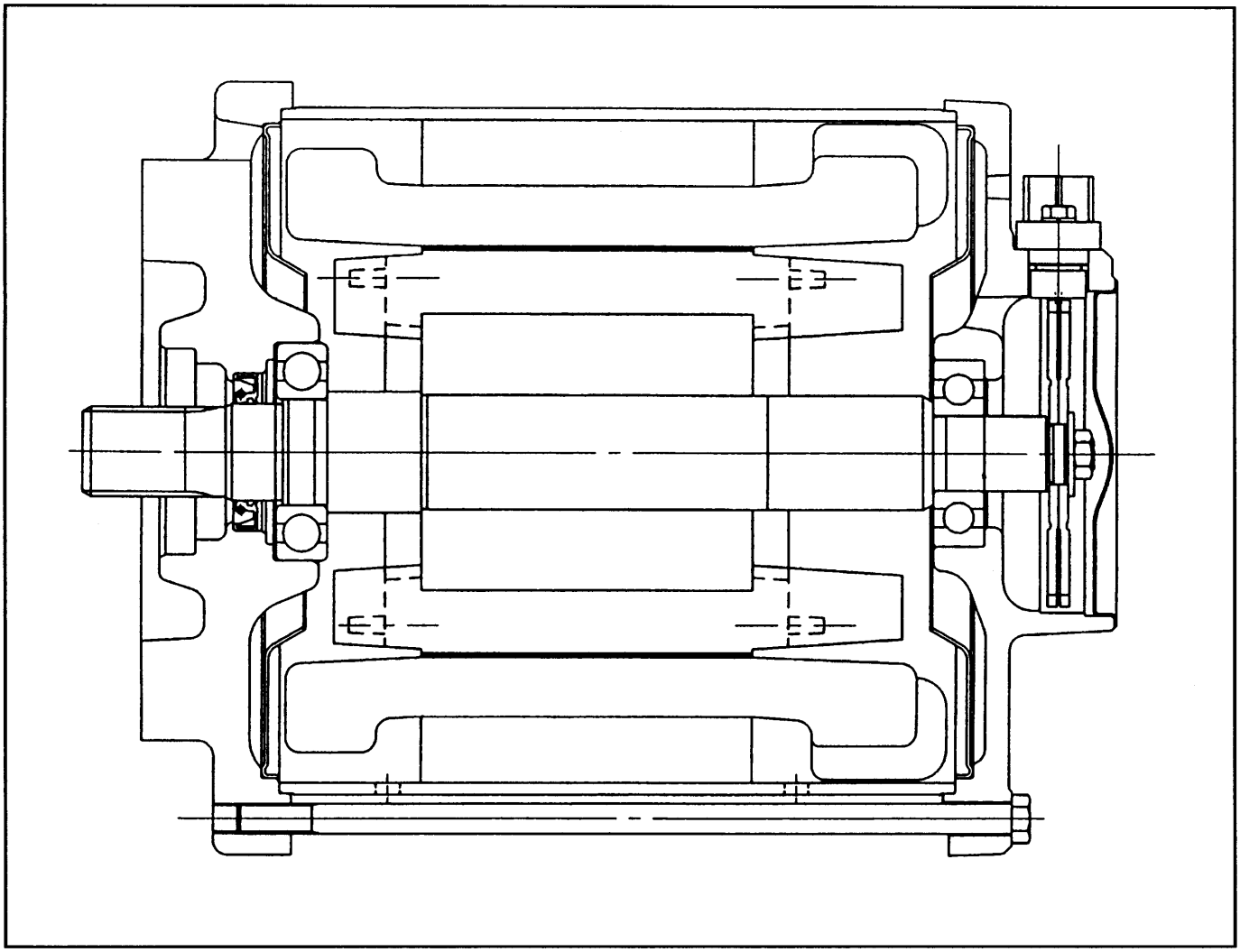
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- DISASSEMBLY·INSPECTION·REASSEMBLY 6-17

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DRIVE MOTOR

GENERAL



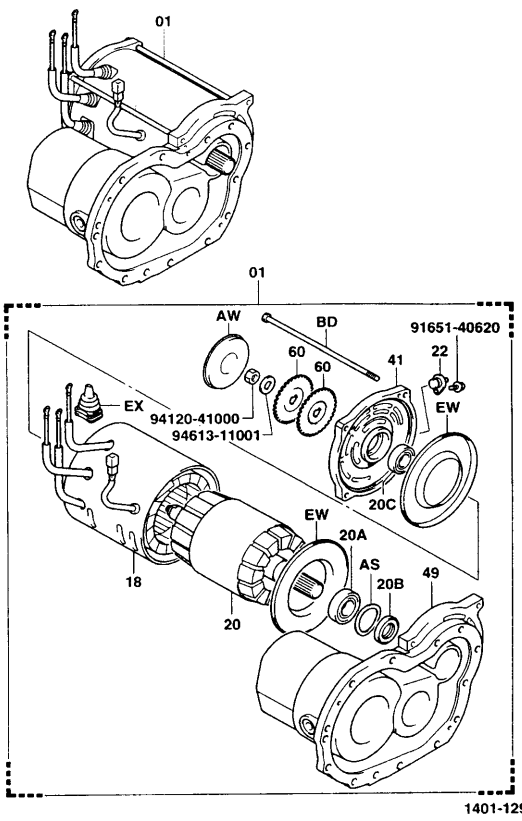
SPECIFICATIONS

Item		1 ton series (excluding 40-7FB15)	2 ton series (excluding 40-7FB20·25) 40-7FB15	3 and J3.5 ton 40-7FB20·25 **(48v)**
Type		3-phase AC, open type	←	←
Normal voltage	V	48	←	80
Rated output (60-minutes rating)	kW	7.6	10.7	11.9
Dimensions (outside diameter x length)	mm (in)	ϕ 230 x 325 (9.06 x 12.80)	ϕ 230 x 365 (9.06 x 14.37)	ϕ 230 x 368 (9.06 x 14.49)
Weight (including drive unit case)	kg (lb)	73 (161)	88 (194)	102 (225)
Insulation class		Class F	←	←

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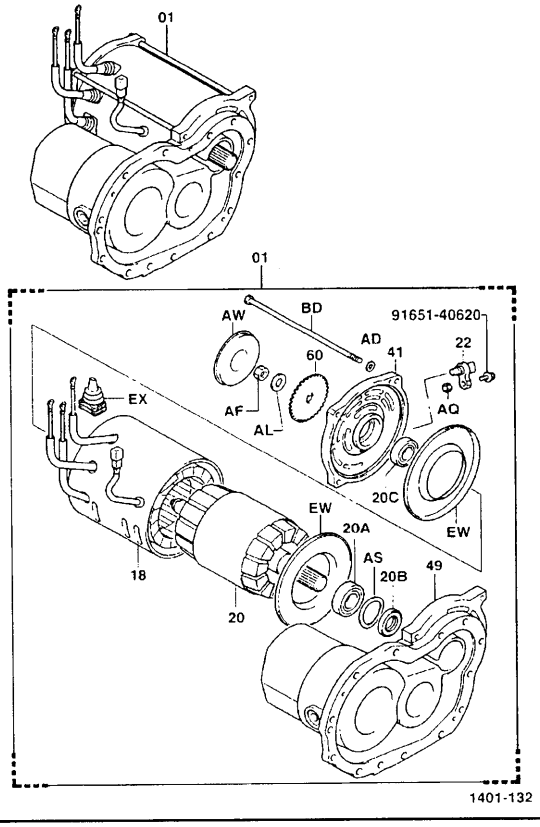
COMPONENTS
(1999. 9 ~ 2000. 11)

1401



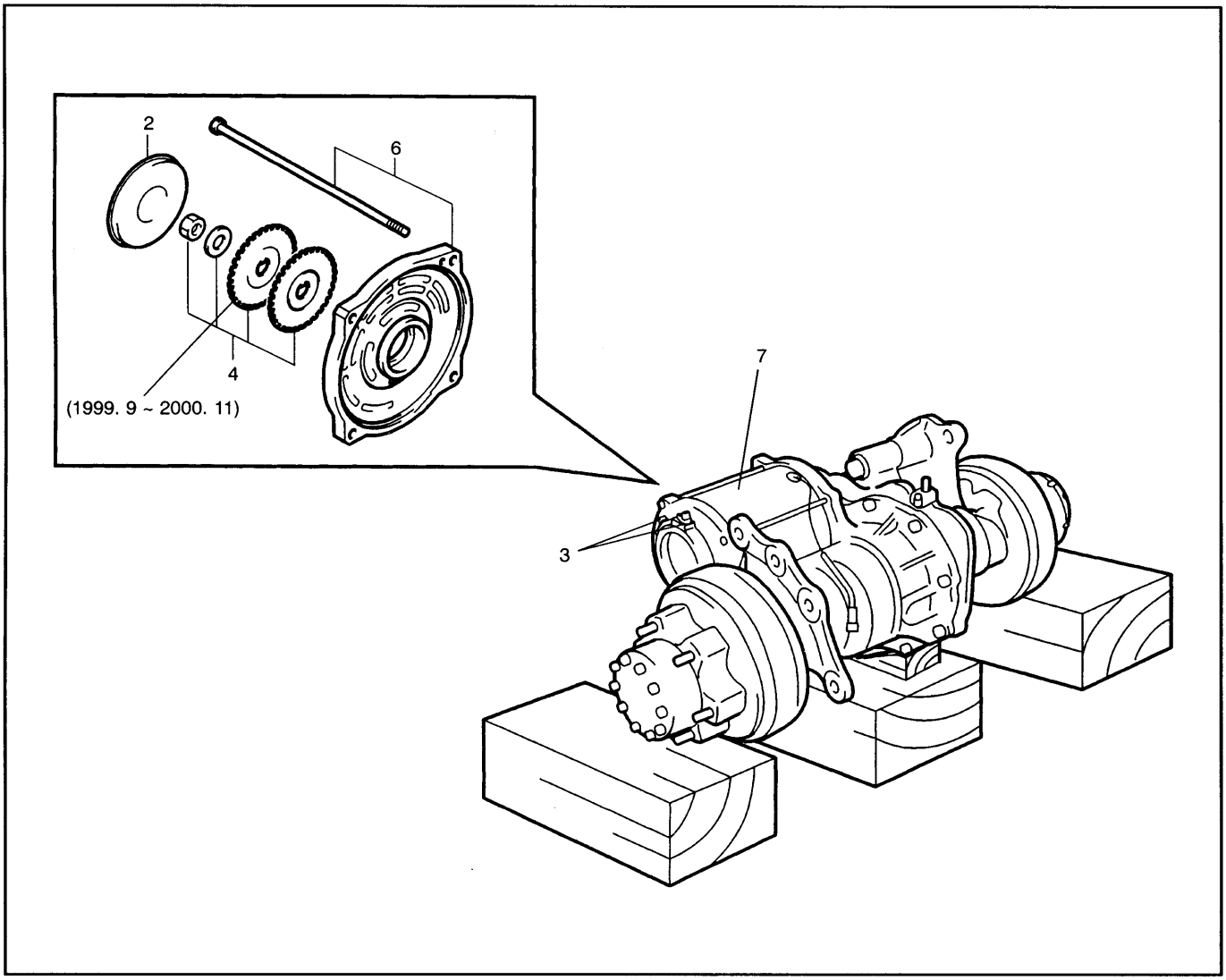
(2000. 12 ~)

1401



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REMOVAL·INSTALLATION



Removal Procedure

1 Remove the front axle ASSY W/drive motor ASSY. (See the drive unit on page 7-7.)

2 Remove the rotation sensor cover. **[Point 1]**

3 Remove the rotation sensor. **[Point 2]**

4 Remove the pickup gear. **[Point 3]**

5 Put match marks between the end bracket and the stator yoke and between the drive unit case and yoke. **[Point 4]**

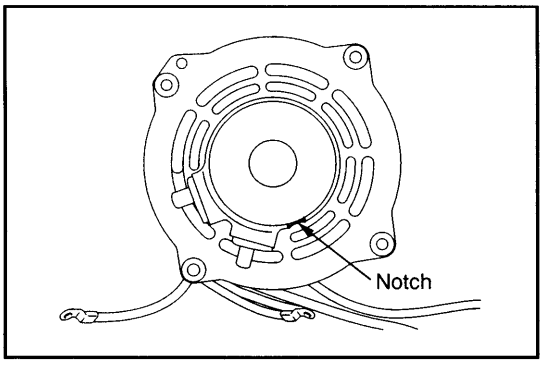
6 Loosen the through bolt and remove the end bracket.

7 Remove the stator ASSY and rotor ASSY. **[Point 5]**

Installation Procedure

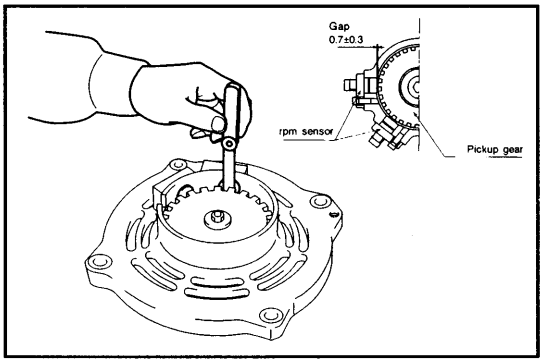
The installation procedure is the reverse of the removal procedure.

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Point Operations

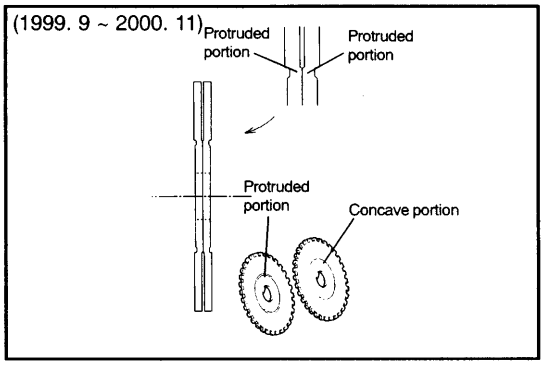
[Point 1]
Removal:
Remove the sensor cover using the cutout in the end face of end bracket.



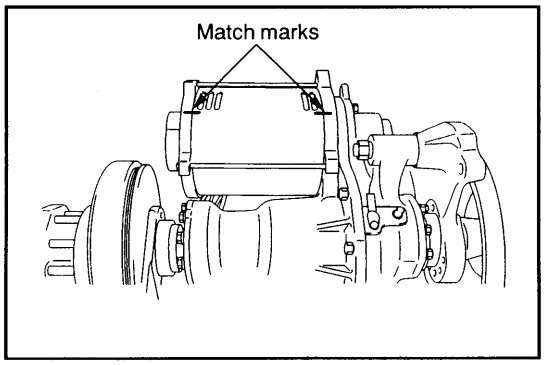
[Point 2]
Inspection:
Measure the clearance between the rotary sensor and pickup gear.

Standard: 0.4 to 1.0 mm (0.016 to 0.039 in)
(1999. 9 ~ 2000. 11)
1.2 to 1.8 mm (0.047 to 0.071 in) (2000. 12 ~)

If the measured value is out of the standard, replace the rotation sensor and pickup gear.

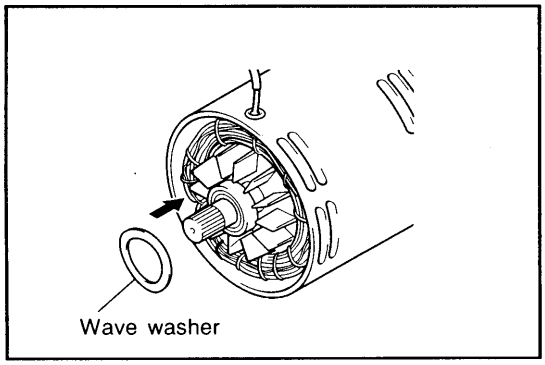


[Point 3]
Installation:
(1) Install pickup gears with their protruded portions facing each other. Make sure that the inner and outer gears are offset when installed on the drive motor. They must not be overlapped in the same position. (1999. 9 ~ 2000. 11)
(2) Apply 08833-00080 before tightening the set nut.



[Point 4]
Disassembly:
Put match marks on the end bracket, drive unit case and stator yoke.

Reassembly:
Align match marks when reassembling these parts.

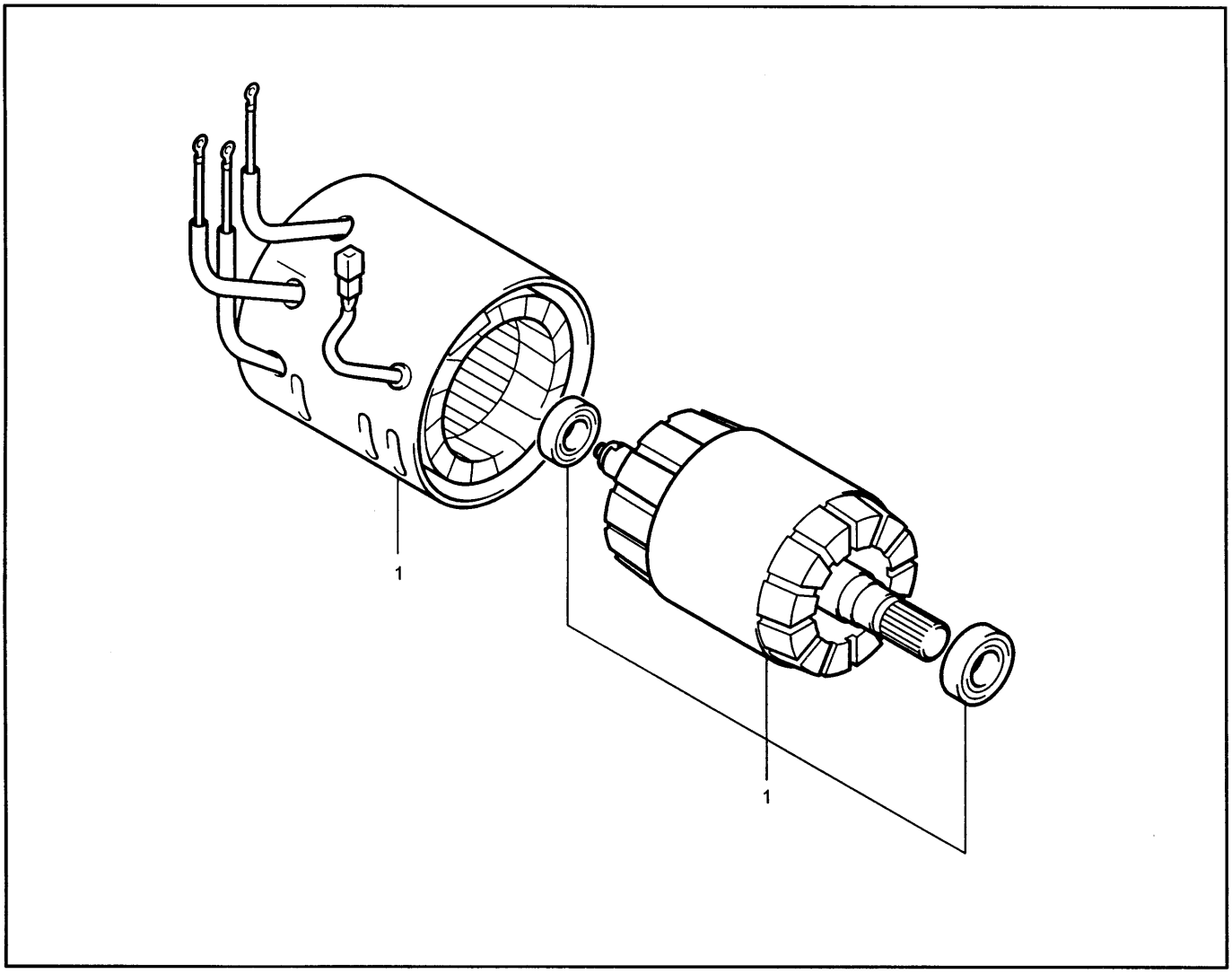


[Point 5]
Removal·Installation:
Carefully operate so as not to drop the rotor ASSY.

Installation:
(1) Never fail to install the wave washer on the bearing face of the rotor ASSY. It is recommended to apply a small amount of MP grease in order to prevent the washer from falling.
(2) Apply the chassis special grease at the splined portion of the rotor shaft.
(3) Carefully operate so as not to damage the oil seal lip surface.

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DISASSEMBLY·INSPECTION·REASSEMBLY



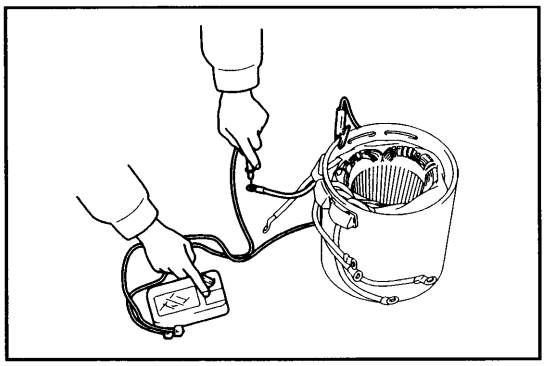
Disassembly Procedure

1 Remove the rotor ASSY from the stator ASSY. **[Point 1]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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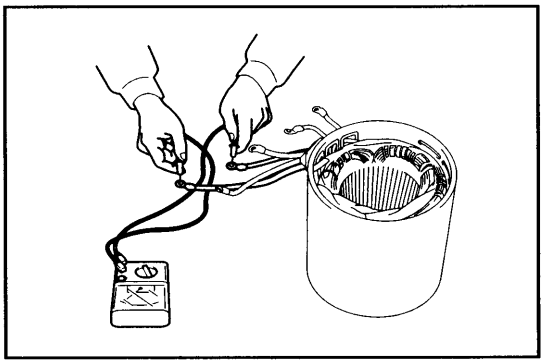


Point Operations

[Point 1]
Inspection:

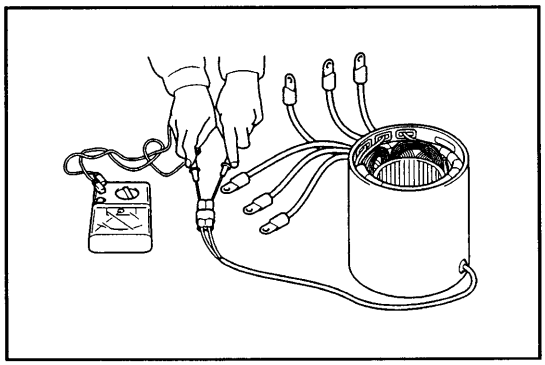
(1) Measure the insulation resistance of the stator ASSY.

Measurement terminals: Between the motor cable and body
Standard: 1 MΩ or more



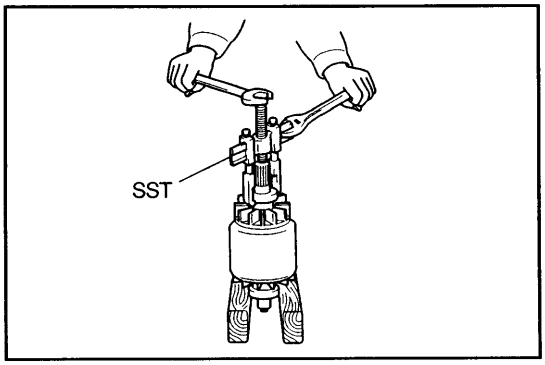
(2) Check continuity between motor cables.

Measurement terminals: P7-P8, P8-P9 and P9-P7
Standard: 0 Ω



(3) Measure resistance of the temperature sensor.

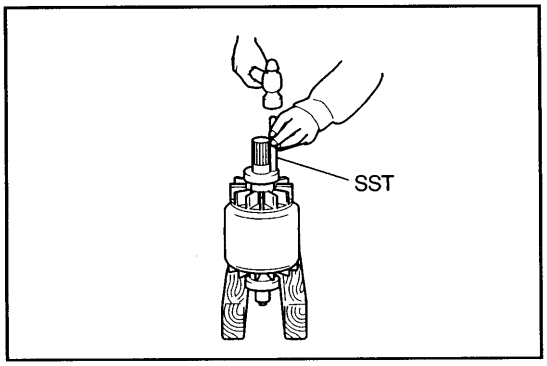
Measurement terminals: Both pins of temperature sensor connector
Standard: Approx. 11 to 15 kΩ (at 20°C)



(4) Check the bearing of the rotor ASSY.
If abnormal noise or damage is found, replace the bearing.

① Rotary sensor side

Removal: SST 09950-76014-71
(SST 09950-40011)
Installation: SST 09700-30200-71



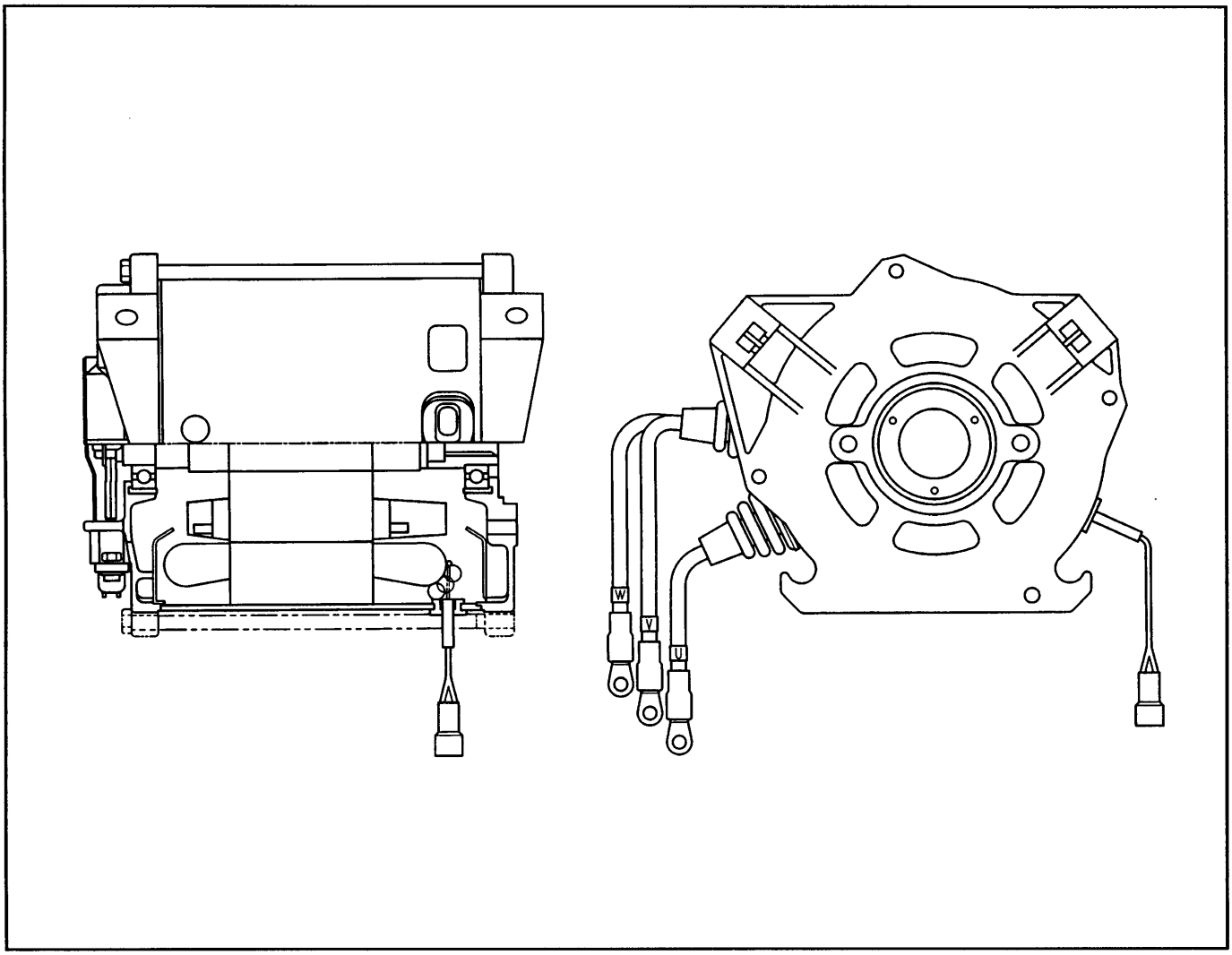
② Drive unit side:

Removal: SST 09950-76014-71
(SST 09950-40011)
Installation: SST 09700-30200-71

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PUMP MOTOR

GENERAL



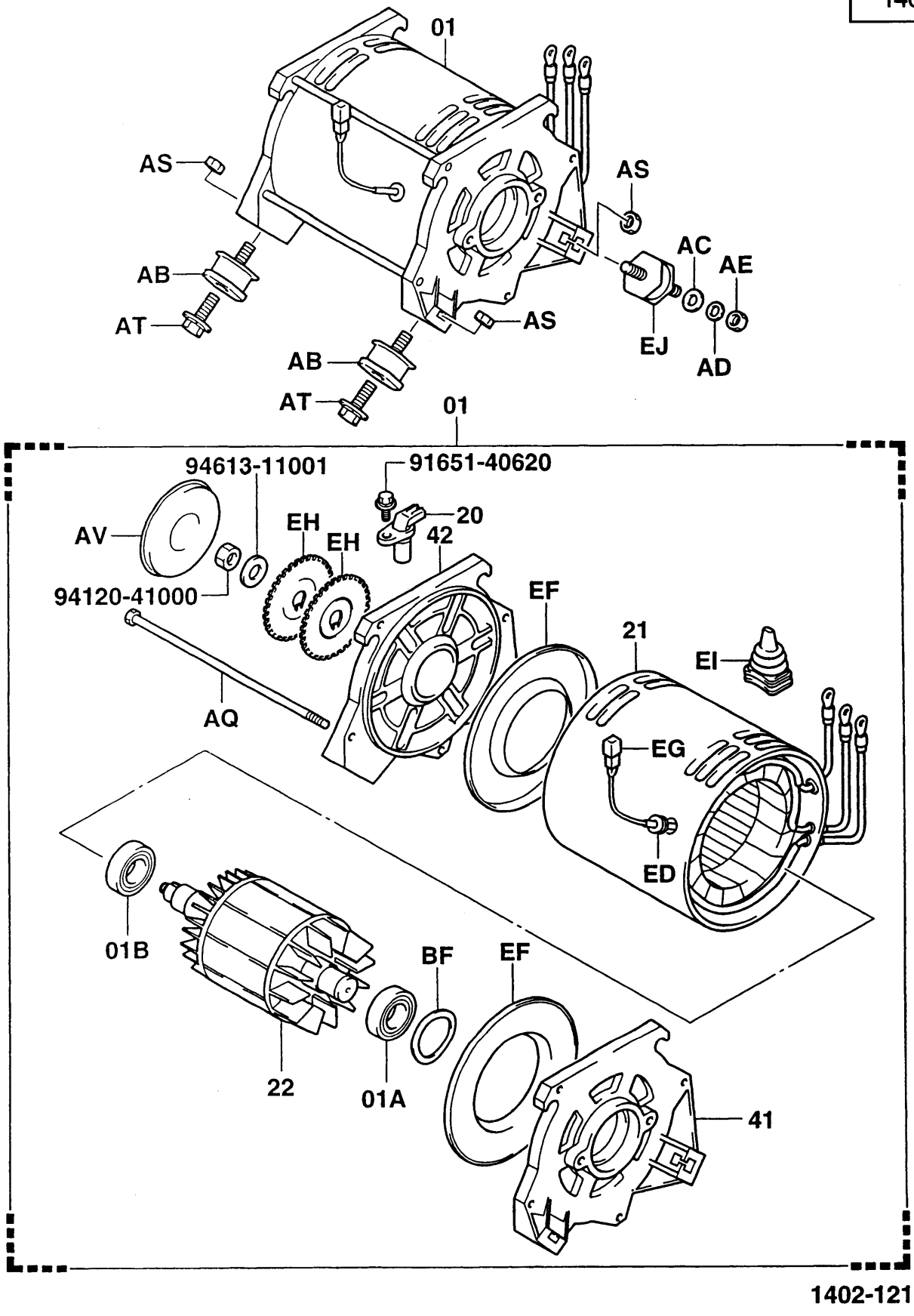
SPECIFICATIONS

Item		1 ton series (excluding 40-7FB15)	2 ton series (excluding 40-7FB20·25) 40-7FB15	3 and J3.5 ton 40-7FB20·25 (48v)
Type		3-phase AC, open type	←	←
Normal voltage	V	48	←	80
Rated output (5-minutes rating)	kW	9.5	12.2	14.4
Dimensions (outside diameter x length)	mm (in)	ϕ 230 x 292 (9.06 x 11.50)	ϕ 230 x 317 (9.06 x 12.48)	ϕ 230 x 332 (9.06 x 13.07)
Weight (including drive unit case)	kg (lb)	58 (127.9)	68 (150.0)	74 (163.2)
Insulation class		Class F	←	←

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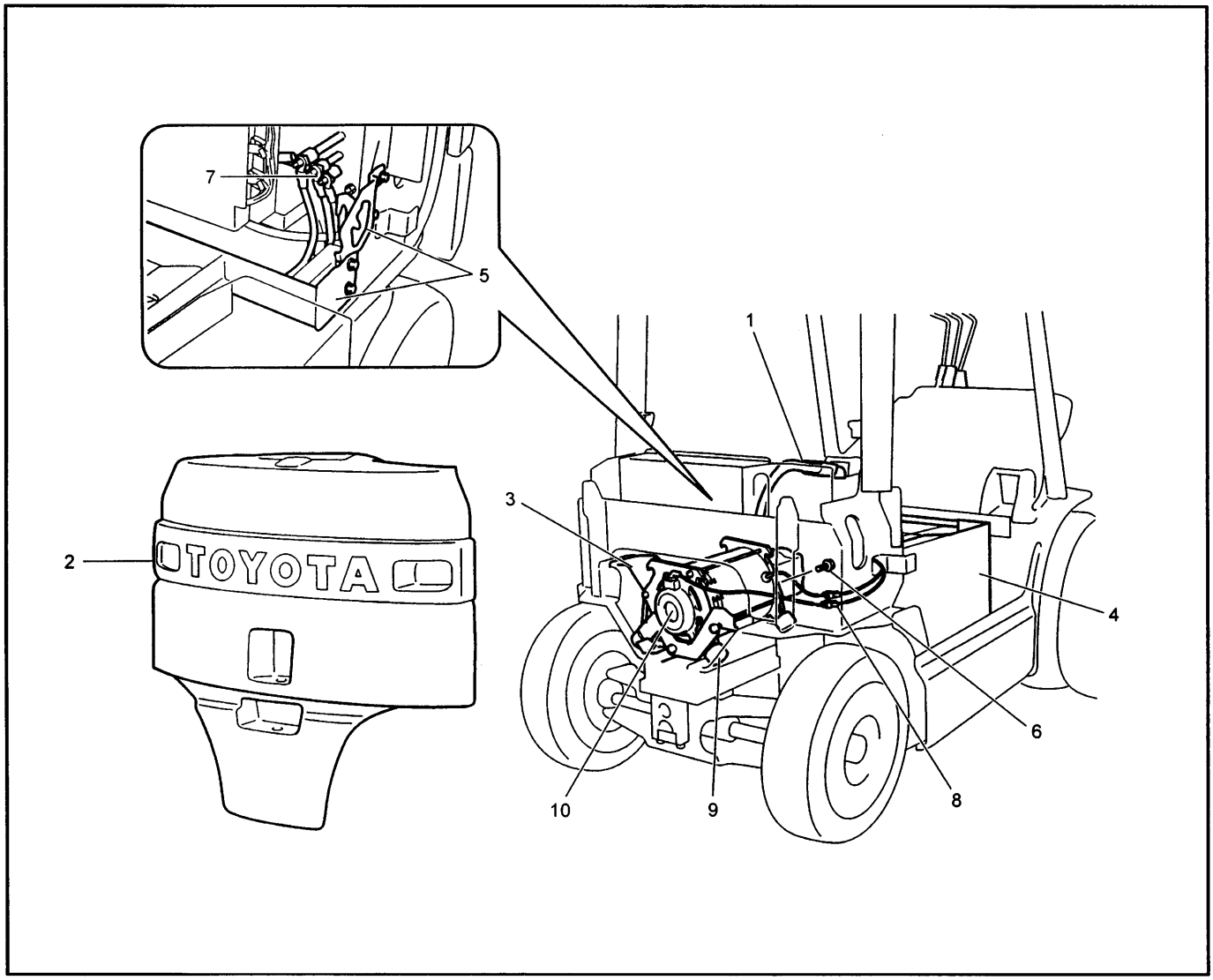
COMPONENTS

1402



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REMOVAL·INSTALLATION



Removal Procedure

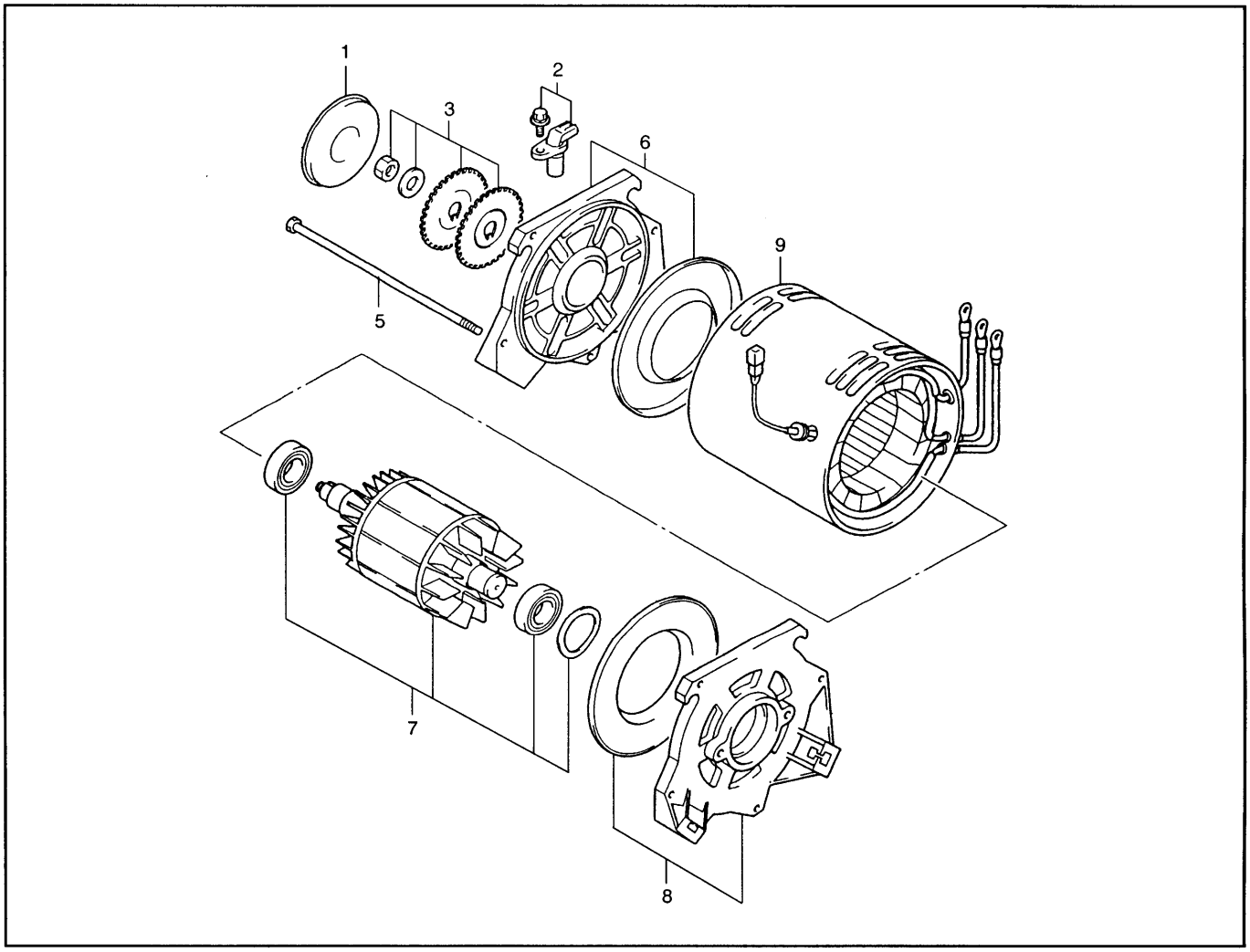
1 Disconnect the battery plug.
2 Remove the counterweight.
3 Remove the lock cylinder cover.
4 Remove the battery ASSY.
5 Remove the seat stand hook and battery guard.
6 Remove the oil pump set bolt.
7 Disconnect the motor cable at the controller.
8 Disconnect the rotary sensor and temperature sensor connectors.
9 Remove the pump motor set bolts.
10 Remove the pump motor ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the sensor cover. **[Point 1]**

2 Remove the rotation sensor. **[Point 2]**

3 Remove the pickup gear. **[Point 3]**

4 Put match marks on the end bracket, frame bracket and stator yoke. **[Point 4]**

5 Remove the through bolt.

6 Remove the end bracket.

7 Remove the rotor ASSY. **[Point 5]**

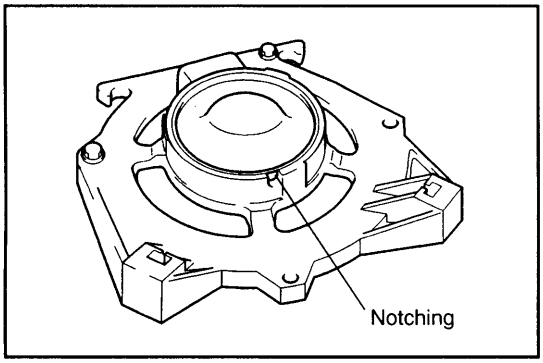
8 Remove the frame bracket.

9 Remove the stator ASSY. **[Point 6]**

Reassembly Procedure

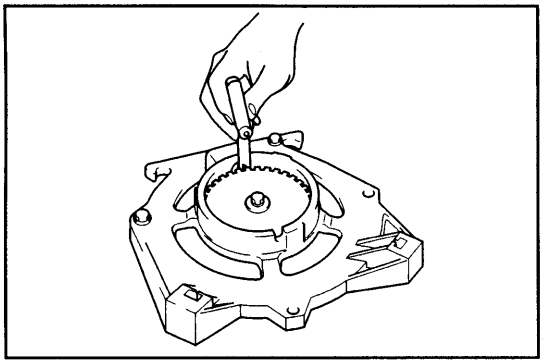
The reassembly procedure is the reverse of the disassembly procedure.

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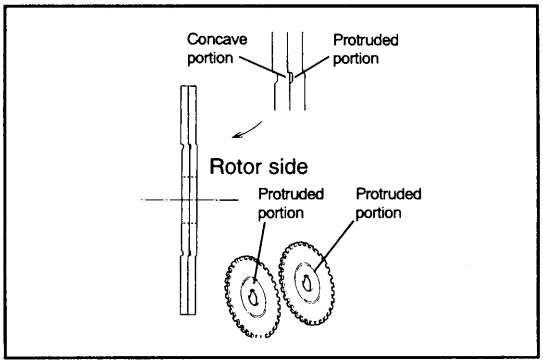
Point Operations

[Point 1]
Removal:
Remove the sensor cover using the cutout in the end face of end bracket.

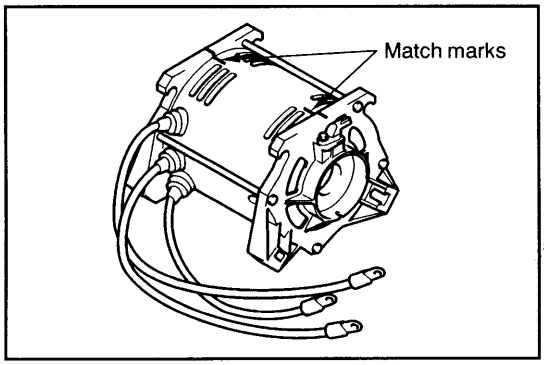


[Point 2]
Inspection:
Measure the clearance between the rotation sensor and pickup gear.

Standard: 0.2 to 1.2 mm (0.0079 to 0.047 in)

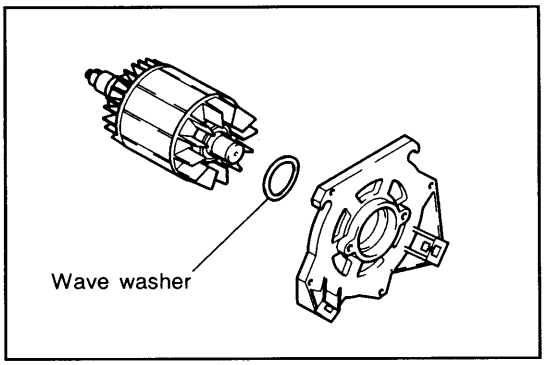


[Point 3]
Installation:
- Install the inner and outer pickup gears with their concave portions facing outward (with the protruded portions facing the rotor). Make sure that the inner and outer gears are in the same position when installed on the pump motor.
- Apply 08833-76002-71 (08833-00080) before tightening the pickup gear set nut.



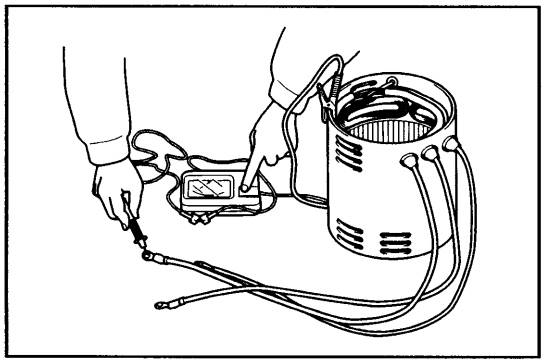
[Point 4]
Disassembly:
Put match marks on the end bracket, frame bracket and stator yoke.

Installation:
Align match marks when reassembling these parts.



[Point 5]
Installation:
Never fail to install the wave washer on the bearing face of the rotor ASSY. It is recommended to apply a small amount of MP grease in order to prevent the washer from falling.

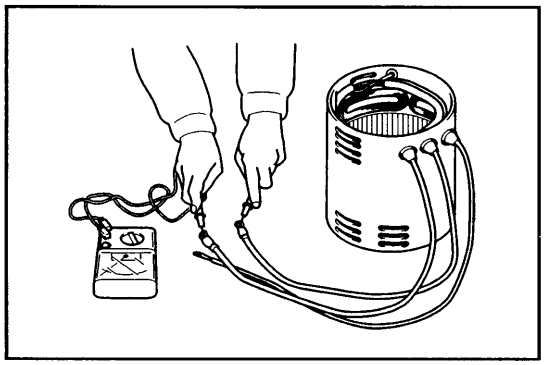
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[Point 6]
Inspection:

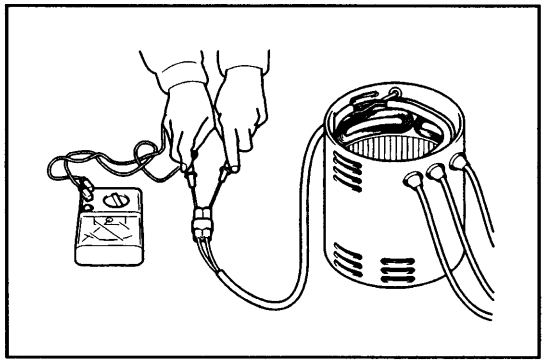
(1) Measure the insulation resistance of the stator ASSY.

Measurement terminals: Between the motor cable and body
Standard: 1 MΩ or more



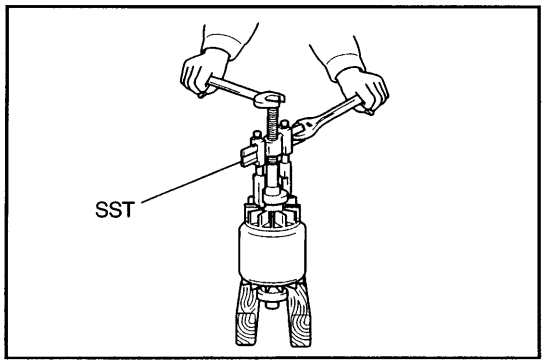
(2) Check continuity between motor cables.

Measurement terminals: P14-P15, P15-P16 and P16-P14
Standard: 0 Ω



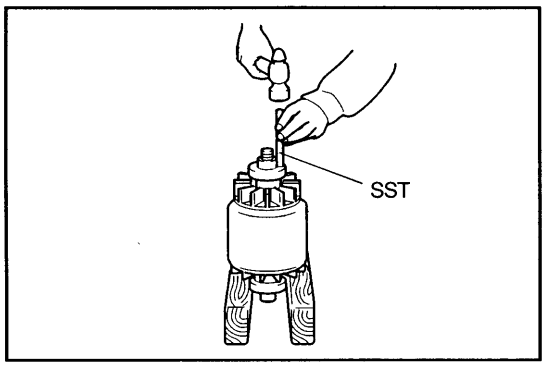
(3) Measure the resistance of the temperature sensor.

Measurement terminals: Both pins of temperature sensor connector
Standard: Approx. 620 Ω (at 20°C)



(4) Check the bearing of rotor ASSY.
If abnormal noise or damage is found, replace the bearing.

Removal:
SST 09950-76014-71
(SST 09950-40011)

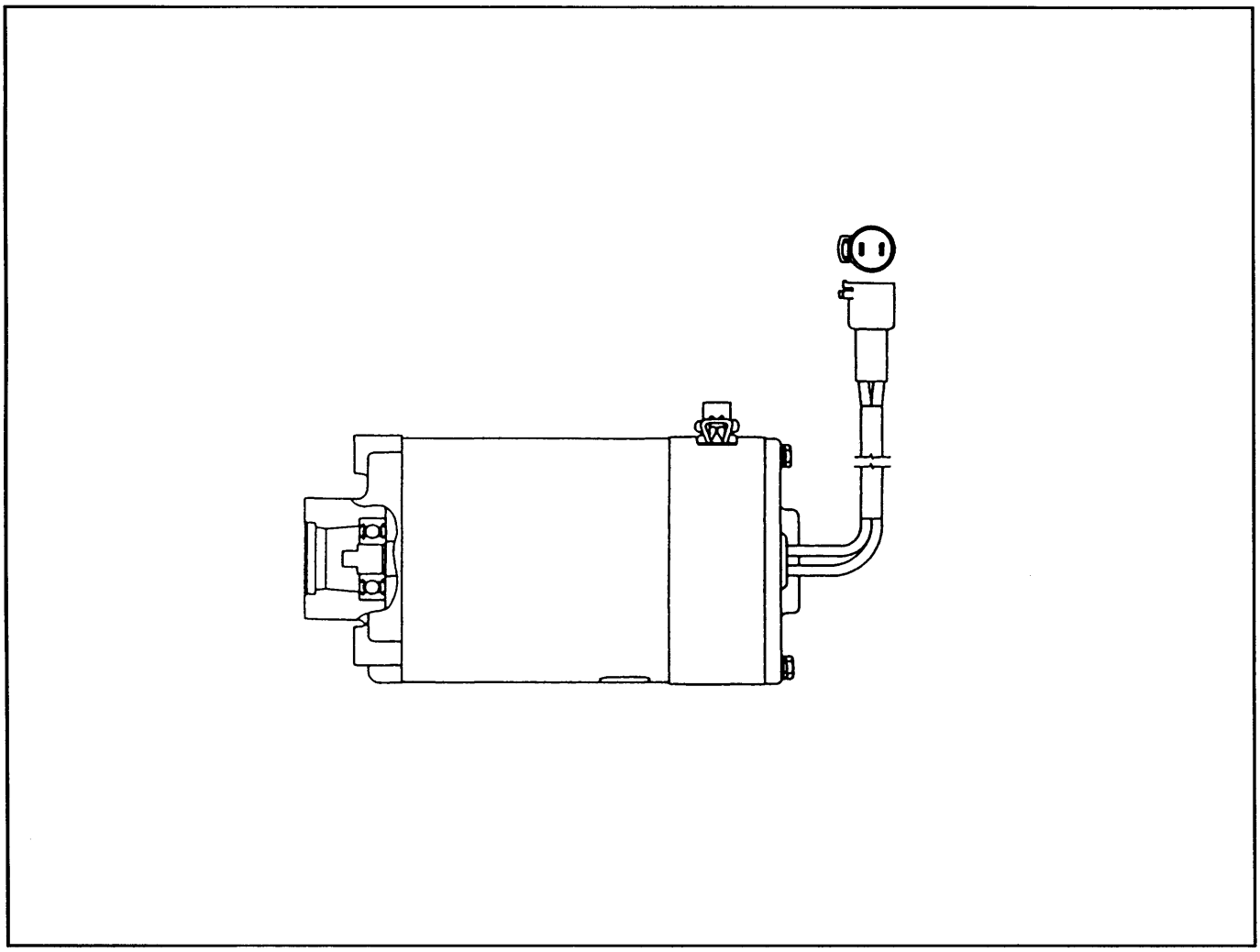


Installation:
SST 09700-30200-71

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POWER STEERING MOTOR

GENERAL

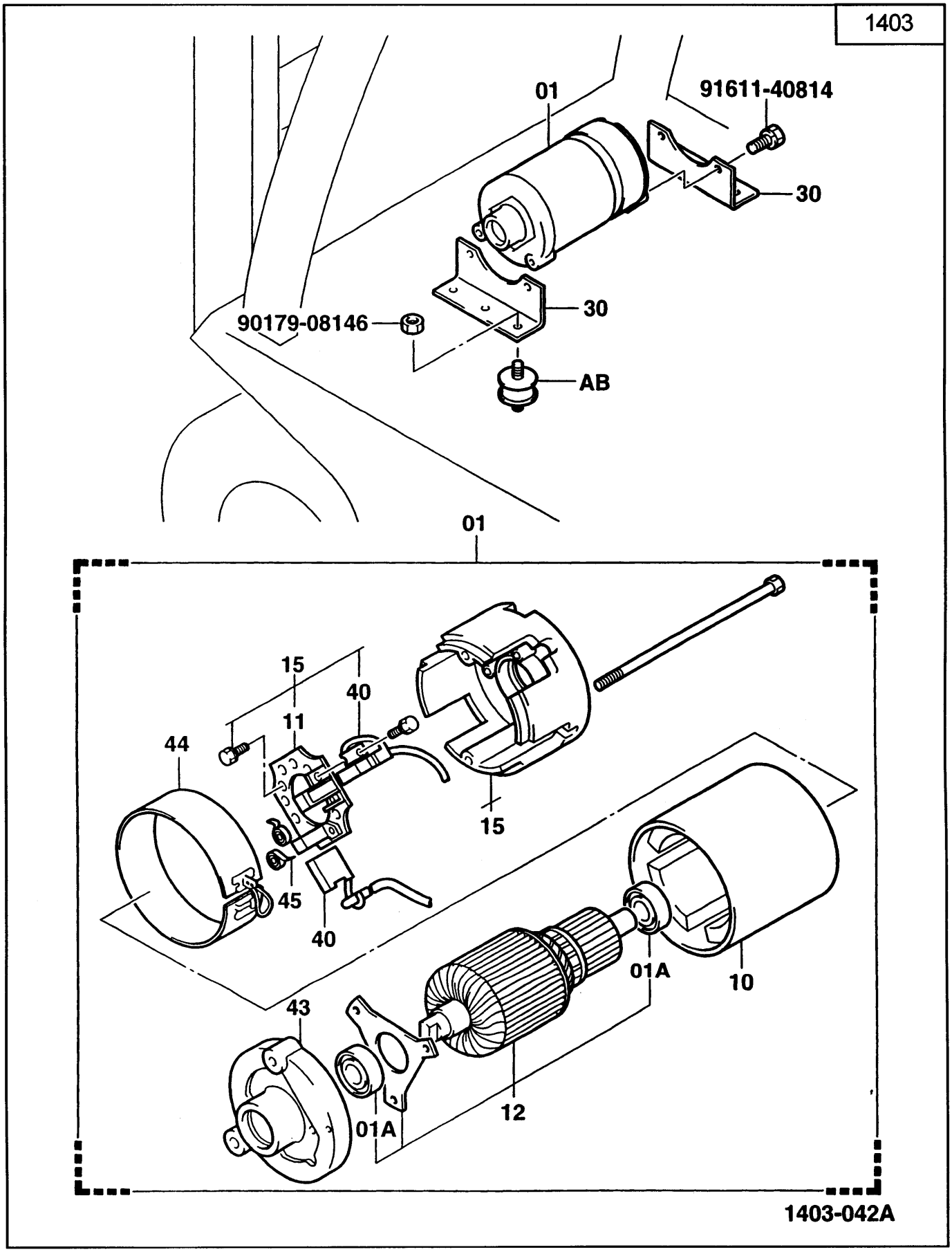


SPECIFICATIONS

Item	1 ton series (excluding 40-7FB15)	2 ton series (excluding 40-7FB20·25) 40-7FB15	3 and J3.5 ton 40-7FB20·25 (48v)
Type	DC permanent magnet type	←	←
Normal voltage V	48	←	80
Rated output kW	0.9	1.0	1.2
Dimensions mm (outside diameter x length) (in)	ϕ 125 x 250 (4.92 x 9.84)	ϕ 125 x 270 (4.92 x 10.63)	ϕ 125 x 250 (4.92 x 9.84)
Weight kg (lb)	9 (19.8)	11 (24.2)	9 (19.8)
Insulation class	Class F	←	←
Brush size (T x D x L) mm (in)	8 x 30 x 25 (0.315 x 1.18 x 0.98)	←	←
Number of brushes	2	←	←

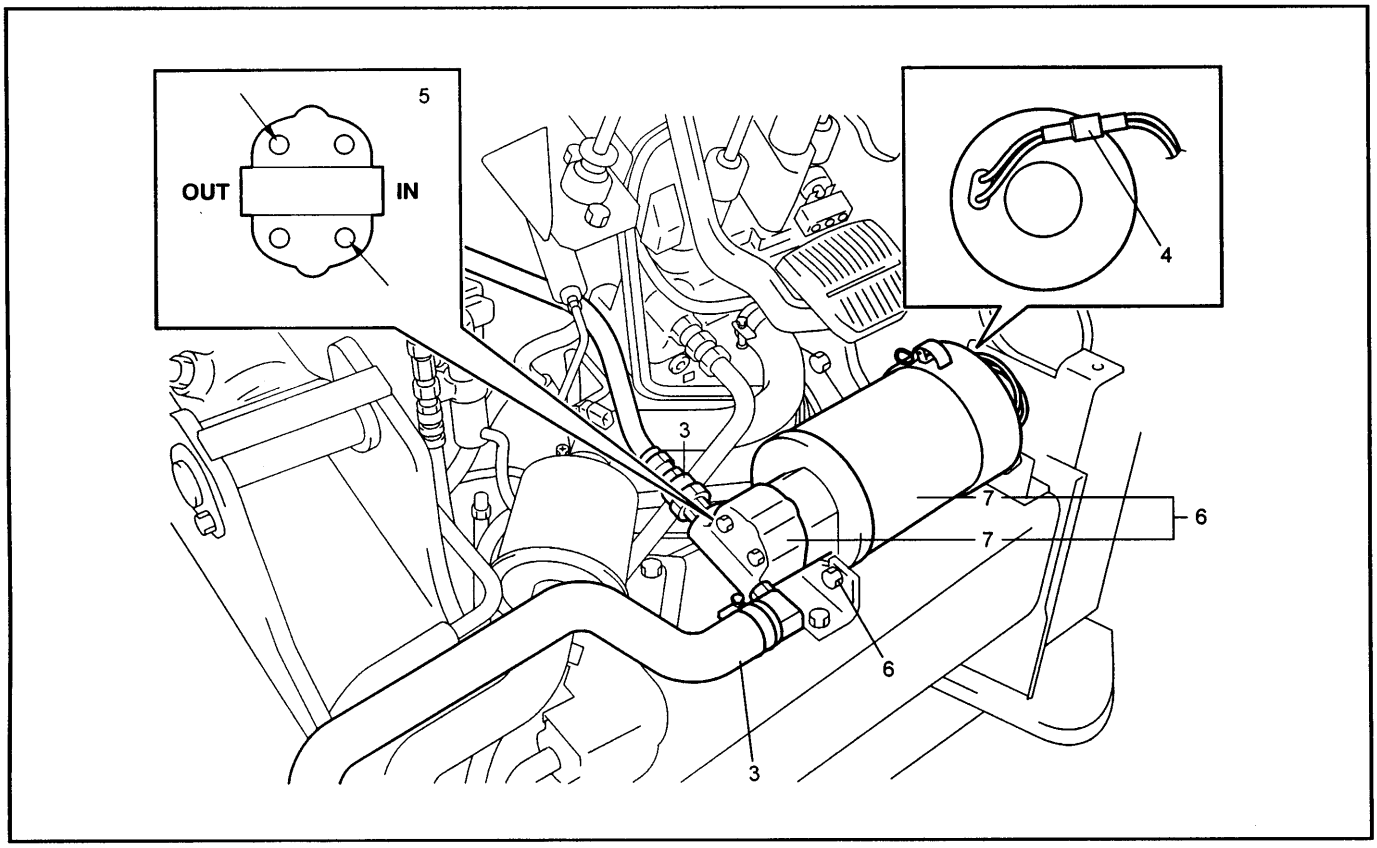
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COMPONENTS



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REMOVAL·INSTALLATION

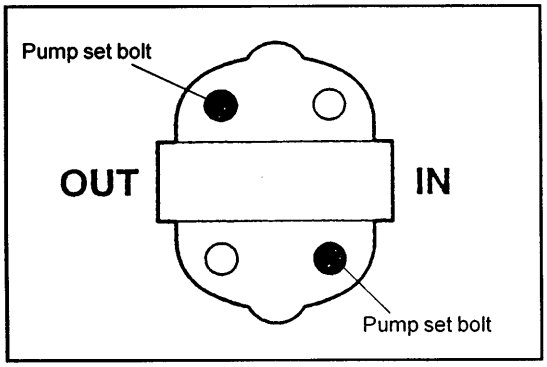


Removal Procedure

1 Disconnect the battery plug.
2 Open the seat stand.
3 Disconnect the PS pump piping.
4 Disconnect the PS pump wiring.
5 Loosen the PS pump set bolts. **[Point 1]**
6 Remove PS motor set bolts and then the PS motor ASSY with PS pump.
7 Separate the PS motor ASSY and the PS pump.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



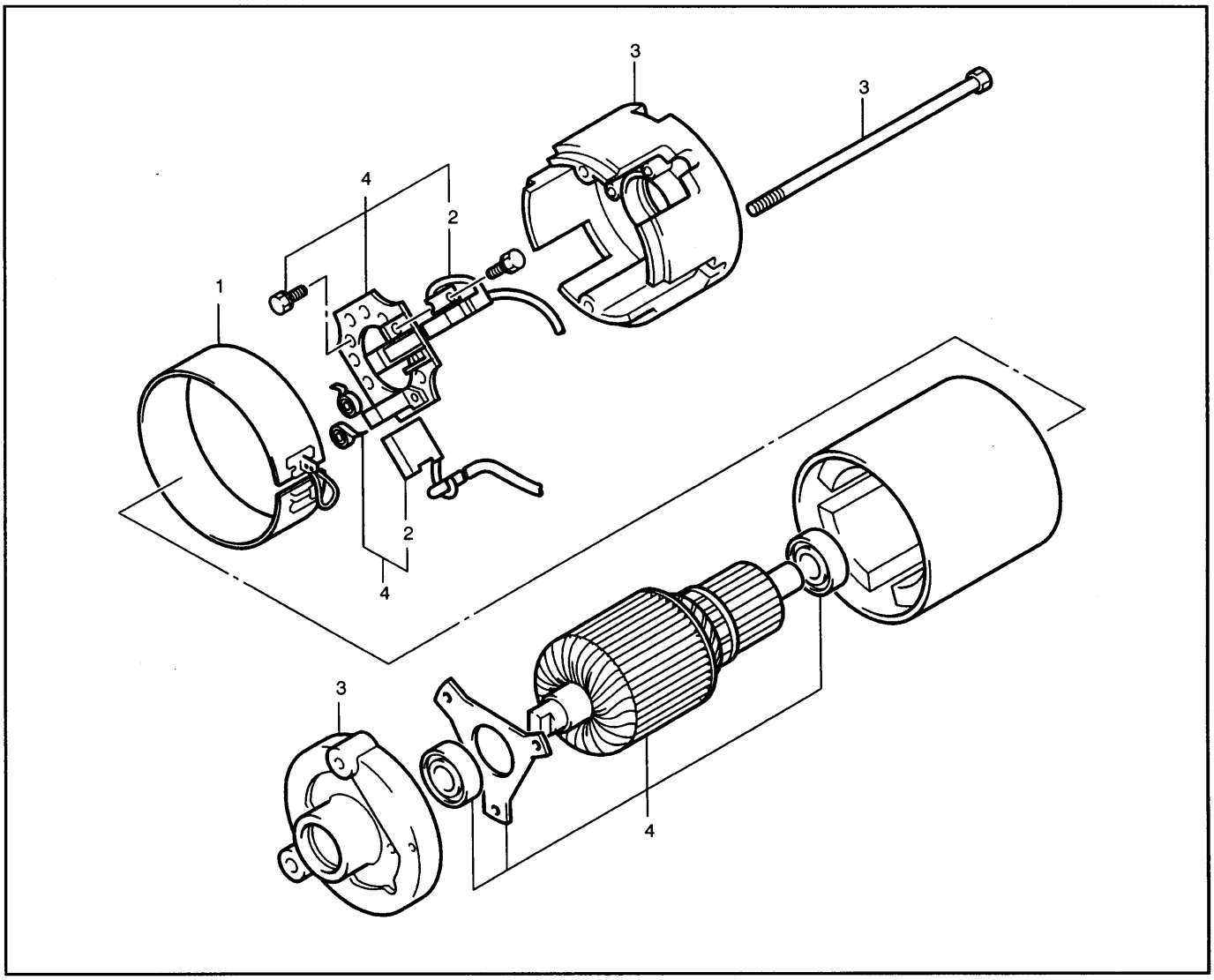
Point Operations

[Point 1]
Removal:
PS pump set bolts are located as illustrated.

Installation:
Be sure to fully tighten the two set bolts after installing the PS motor ASSY.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the brush cover. **[Point 1]**

2 Float the brush to set it free.

3 Remove bracket No. 2 and the commutator frame. **[Point 2]**

4 Remove the armature ASSY. **[Point 3]**

5 Remove the brush holder. **[Point 4]**

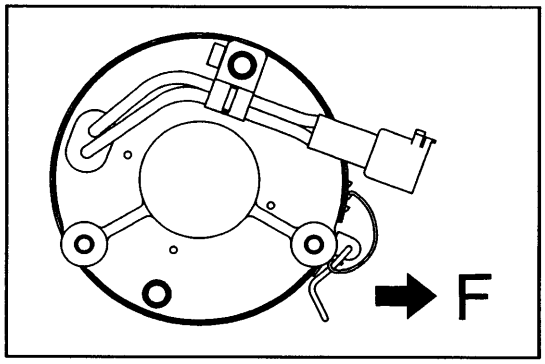
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Check the insulation between the motor connector terminal and the motor body after reassembly.

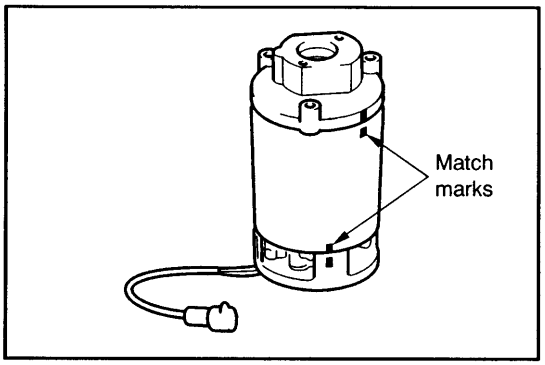
Standard: 1 MΩ or more (with a DC 500 V megger)

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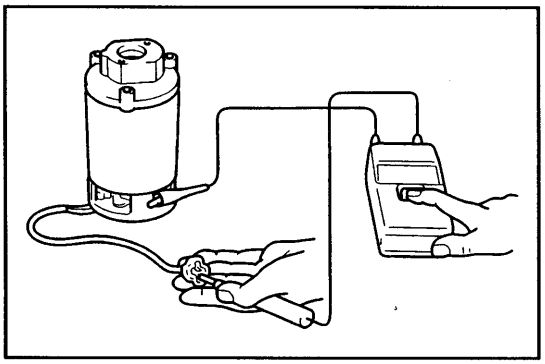
Point Operations

[Point 1]
Reassembly:
Reassemble so that the brush hook is in the position illustrated at left.



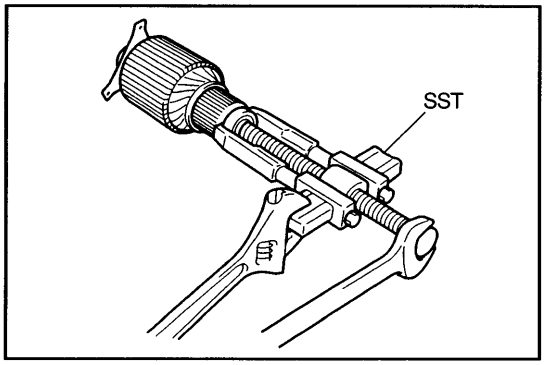
[Point 2]
Disassembly:
Punch a match mark on bracket No. 2 and the yoke. (Punch a match mark also on the commutator frame and yoke.)

Reassembly:
Install by aligning the match marks.

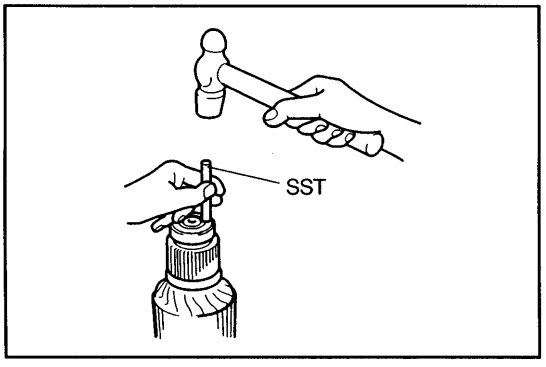


Inspection:
Mesure the insulation resistance between the connector terminal and motor body.

Standard: 1 MΩ or more

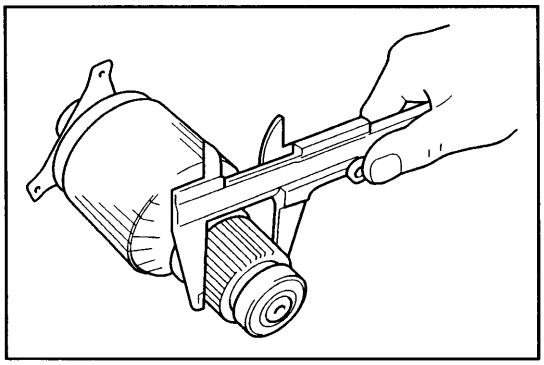


[Point 3]
Disassembly:
SST 09950-76014-71
(SST 09950-40011)



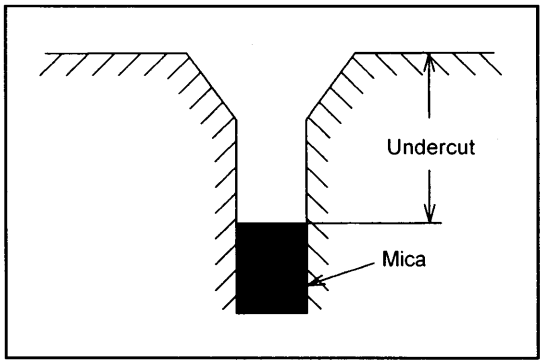
Reassembly:
SST 09700-30200-71

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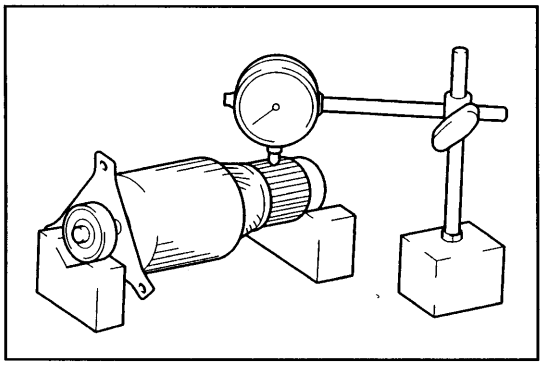
Inspection:
If the commutator surface is roughened, polish with a sand-paper (about #600). If the surface is excessively rough, repair with a lathe.

Standard: 50 mm (1.97 in)
Limit: 45 mm (1.77 in)



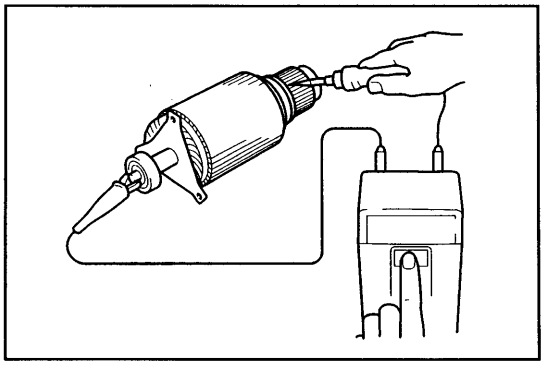
Inspection:
When the commutator is repaired, undercut the mica.

Amount of undercutting
Standard: 0.8 mm (0.031 in)
Limit: 0.3 mm (0.012 in)



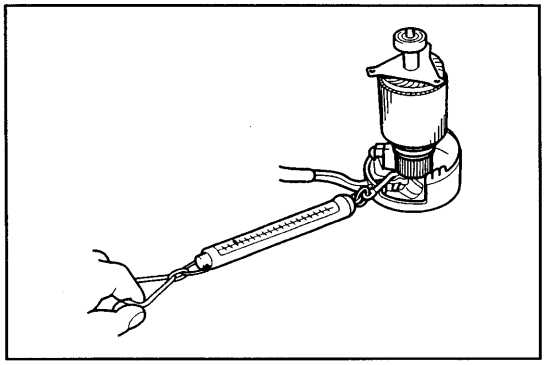
Inspection:
Measure the commutator runout.

Standard: 0.05 mm (0.00197 in) or less



Inspection:
Measure the insulation resistance of the armature coil.

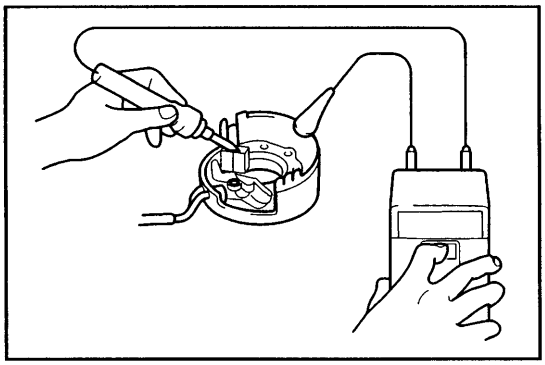
Standard: 1 MΩ or more



[Point 4]
Inspection:
Reassemble the armature coil and brush. Hook a spring balance to the brush spring. Measure the reading on the instant when the spring comes off from the brush.

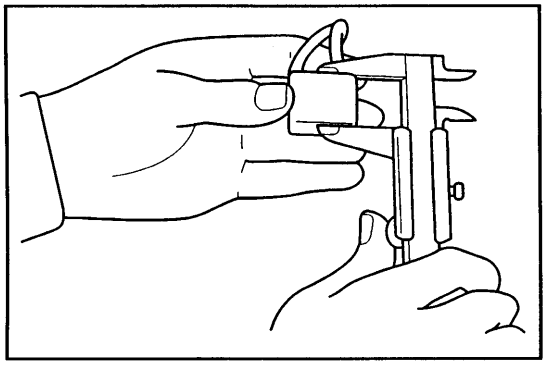
Spring force:
Standard: 5.59 N (0.57 kgf) [1.26 lbf]
Limit: 2.74 N (0.28 kgf) [0.62 lbf]

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Inspection:
Measure the insulation resistance between the brush holder and bracket.

Standard: 1 MΩ or more



Inspection:
Check the brush for wear and contact state.

Brush length:
Standard: 25 mm (0.98 in)
Limit: 14 mm (0.55 in)

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DRIVE UNIT

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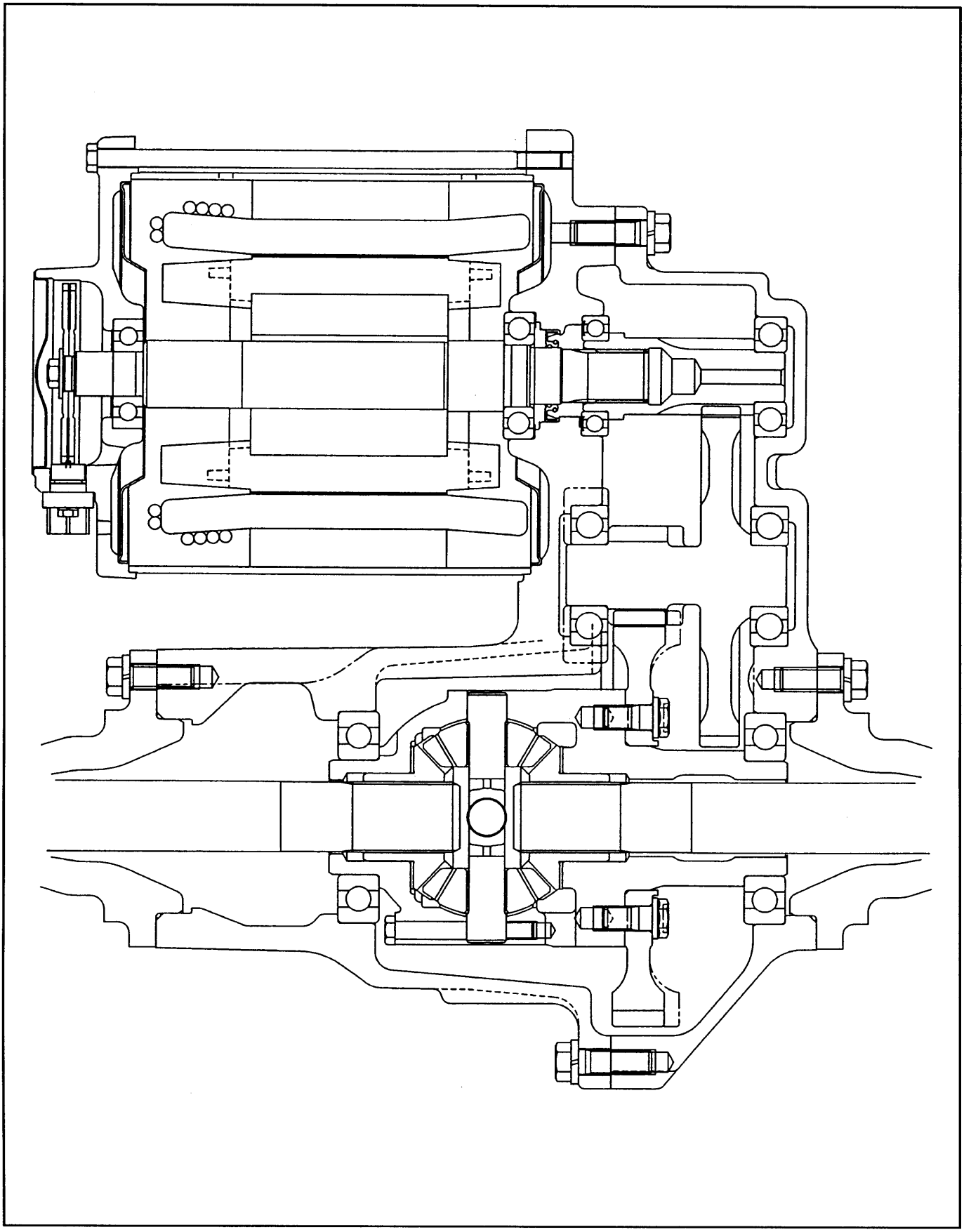
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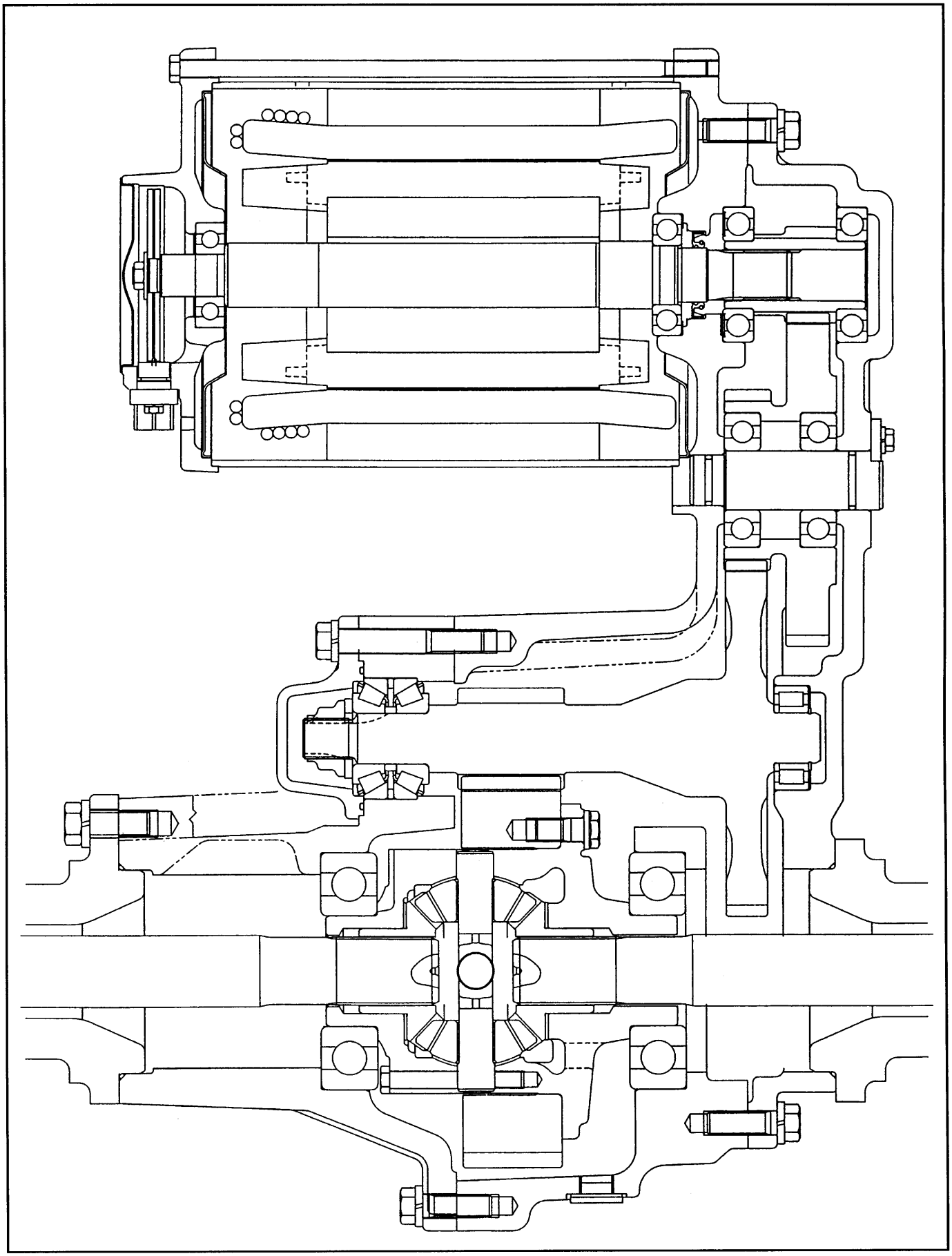
GENERAL

1 and 2 ton series (excluding 40-7FB20·25)



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3·J3.5 ton and 40-7FB20·25



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SPECIFICATIONS

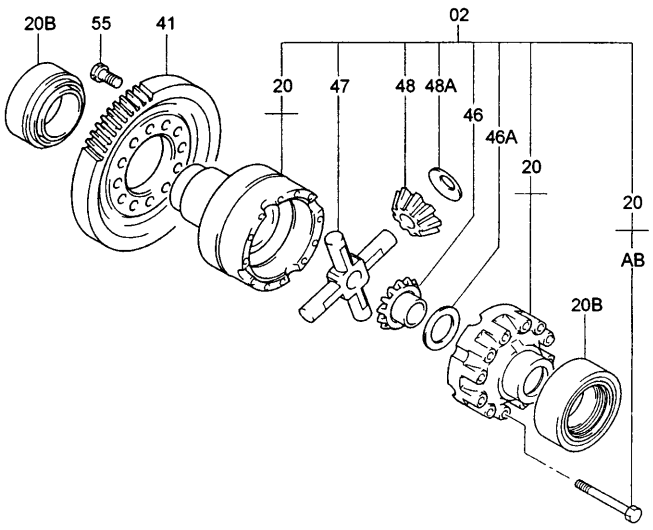
Item \ Model	7FB10-18 7FBH10-18	7FB20, 25 7FBH20, 25 40-7FB15	7FB30 7FBJ35 40-7FB20, 25
Total reduction gear ratio	25.247	←	35.307
Number of teeth of drive unit gear No. 1	14	←	16
Number of teeth of drive unit gear No. 2	Large: 72 Small: 11	←	Large: 61 Small: 31
Number of teeth of drive unit gear No. 3			Large: 65 Small: 12
Number of teeth of drive unit gear No. 4	54	←	53
Differential oil amount (reference) (ℓ)	4.0	4.2	6.5

COMPONENTS

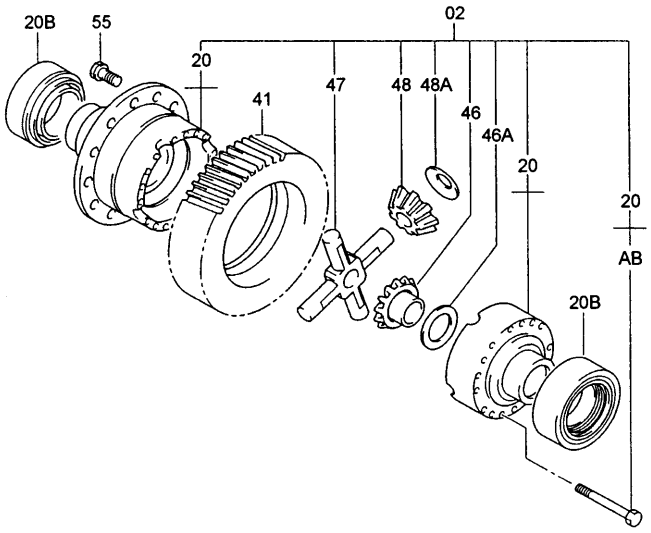
1 and 2 ton series (excluding 40-7FB20·25)

3·J3.5 ton and 40-7FB20·25

4101



4101-158

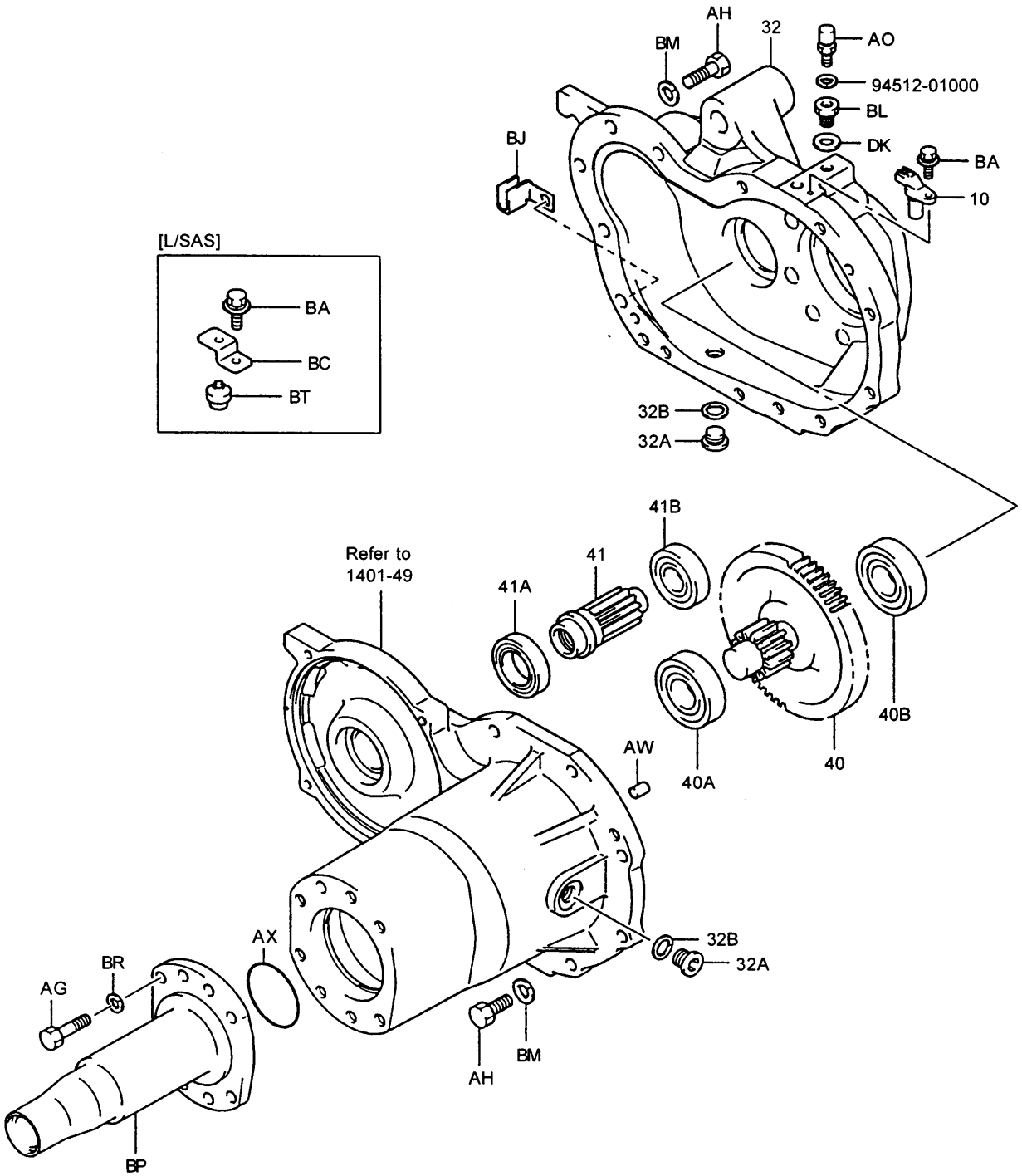


4101-159

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1 and 2 ton series (excluding 40-7FB20·25)

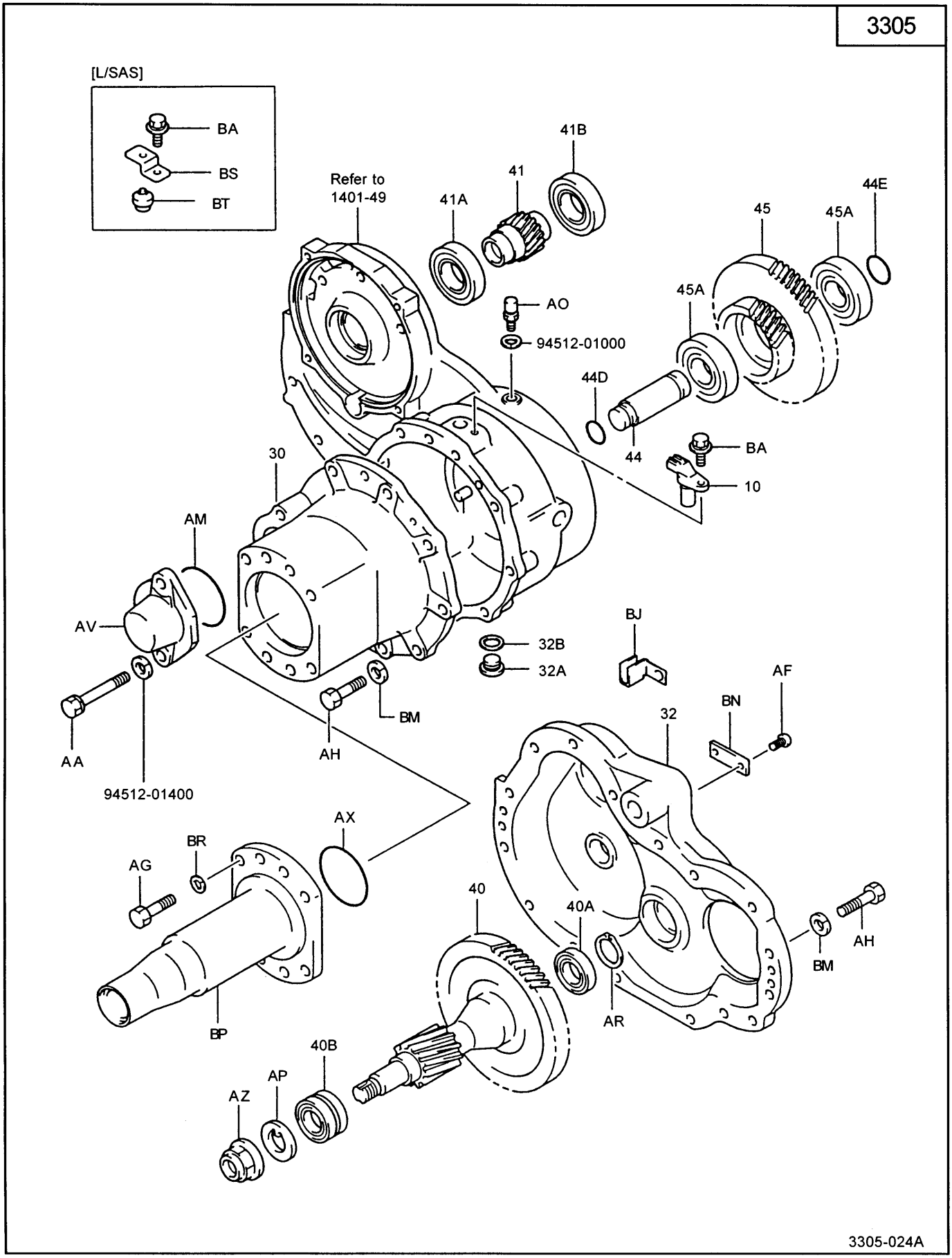
3305



3305-023A

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3-J3.5 ton and 40-7FB20-25

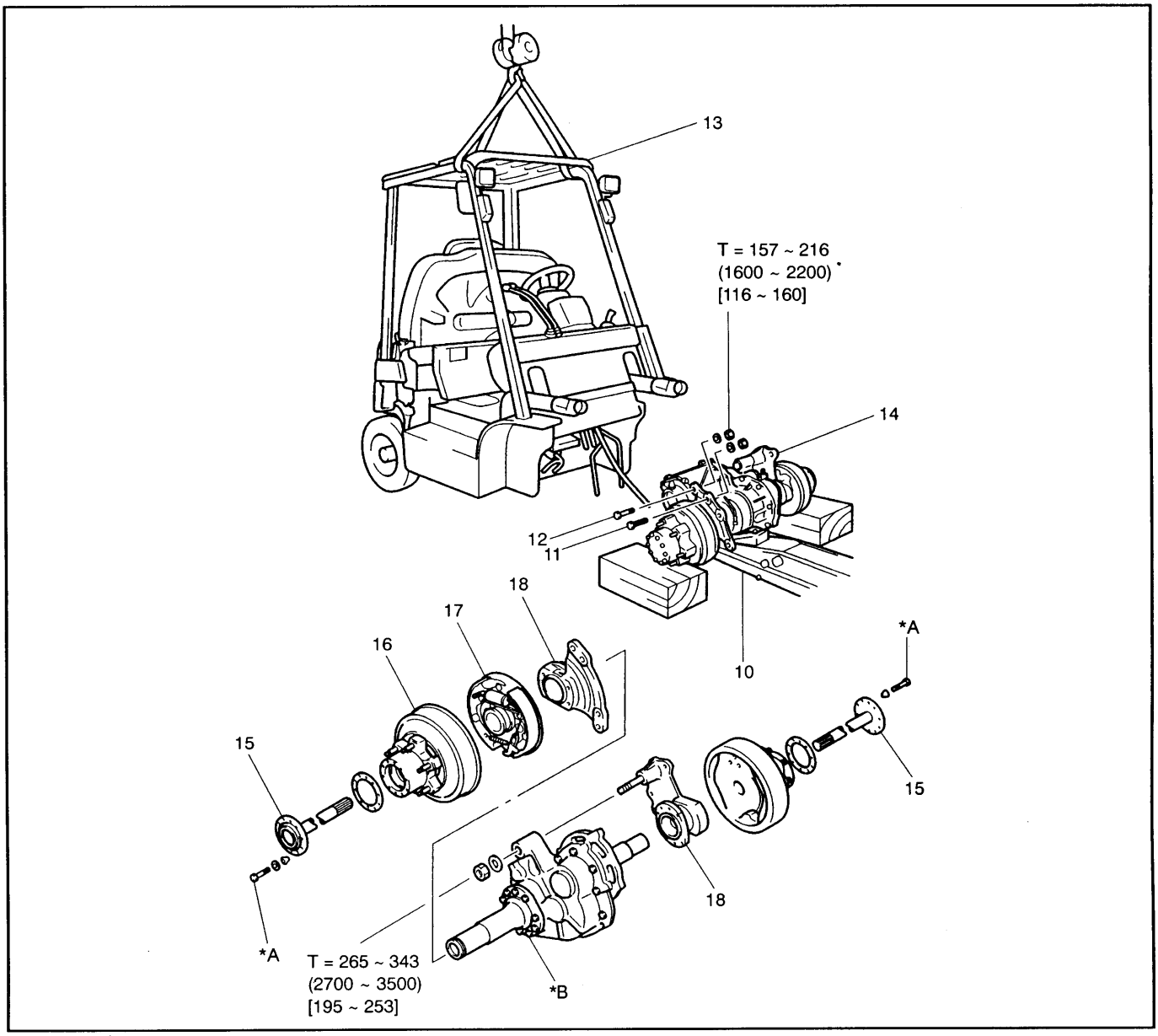


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DRIVE UNIT ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



*A Axle shaft set bolt	1 and 2 ton series (excluding the type for simultaneous fastening of tire)	T = 69 ~ 88 (700 ~ 900) [51 ~ 65]
	3·J3.5 ton (excluding the type for simultaneous fastening of tire)	T = 98 ~ 127 (1,000 ~ 1,300) [72 ~ 94]
*B Front axle housing set bolt	1 and 2 ton series (excluding 40-7FB20·25)	T = 108 ~ 137 (1,100 ~ 1,400) [80 ~ 101]
	3·J3.5 ton and 40-7FB20·25	T = 127 ~ 167 (1,300 ~ 1,700) [94 ~ 123]

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Removal Procedure

1 Disconnect the battery plug.

2 Remove the mast ASSY.

3 Drain drive unit oil. **[Point 1]**

4 Jack up the vehicle, and remove the front wheels. **[Point 2]**

5 Drain brake fluid, and disconnect the brake piping. **[Point 3]**

6 Disconnect the speed sensor connector on top of the differential.

7 Remove the toe board, lower panel and instrument panel LH.

8 Disconnect the parking brake wire.

9 Disconnect the drive motor wiring and speed sensor connector.

10 Use a garage jack and support the front axle ASSY W/drive motor.

11 Remove the front axle bracket through bolts.

12 Remove the front axle bracket reamer bolts. **[Point 4]**

13 Hoist the front side of the vehicle and move the vehicle backward. **[Point 5]**

14 Remove the drive motor ASSY. **[Point 6]**

15 Remove the front axle shaft.

16 Remove the front axle hub W/drum.

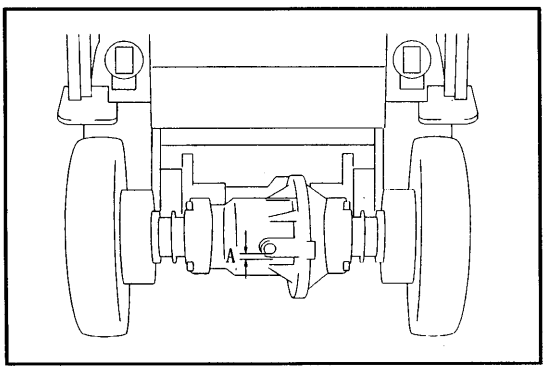
17 Remove the brake ASSY.

18 Remove the front axle bracket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

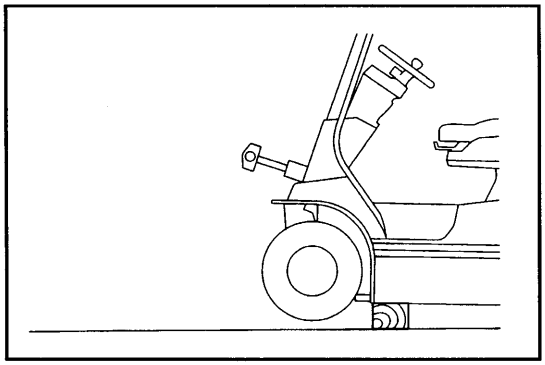
Note:
After the end of installation, perform air bleeding from the brake system (see page 11-21) and parking brake adjustment (see page 11-25).



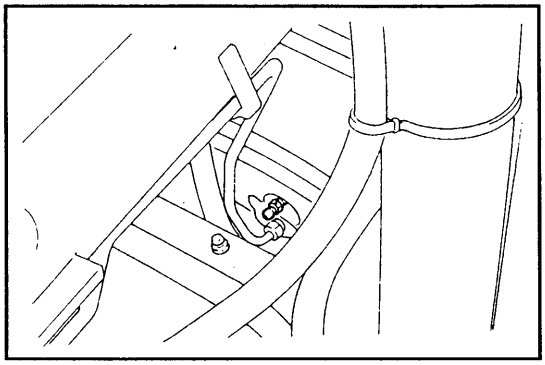
Point Operations

[Point 1]
Installation:
After installation, fill hypoid gear oil to the specified level.
A = 10 mm (0.4 in) or less

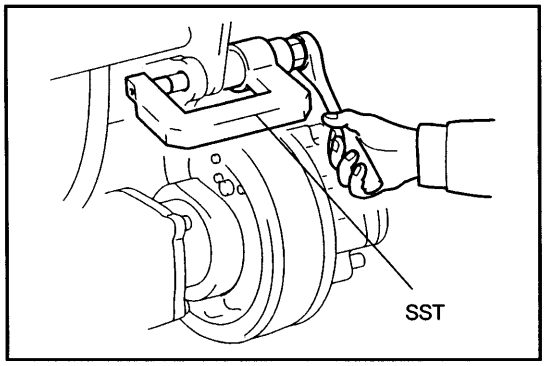
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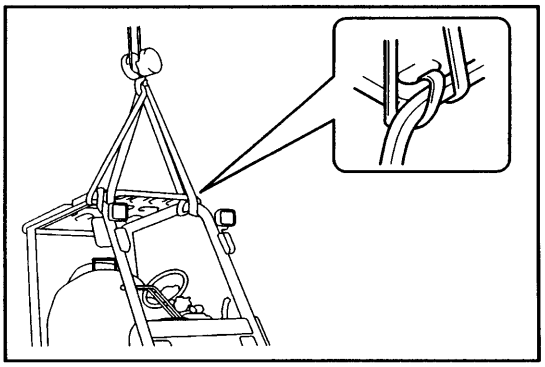
[Point 2]
Removal·Installation:
Jack up the vehicle and support both sides of the front frame with wooden blocks.



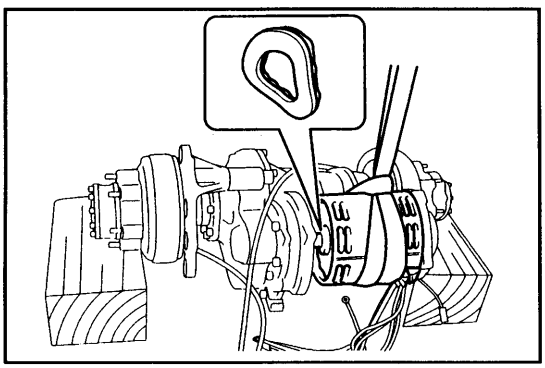
[Point 3]
Installation:
Bleed air from the brake system.



[Point 4]
Removal:
SST 09310-23320-71



[Point 5]
Removal·Installation:
Wind a fiber rope on the front side of the head guard.



[Point 6]
Removal·Installation:
Wind a fiber rope on the drive motor, and take it out (install it) carefully.

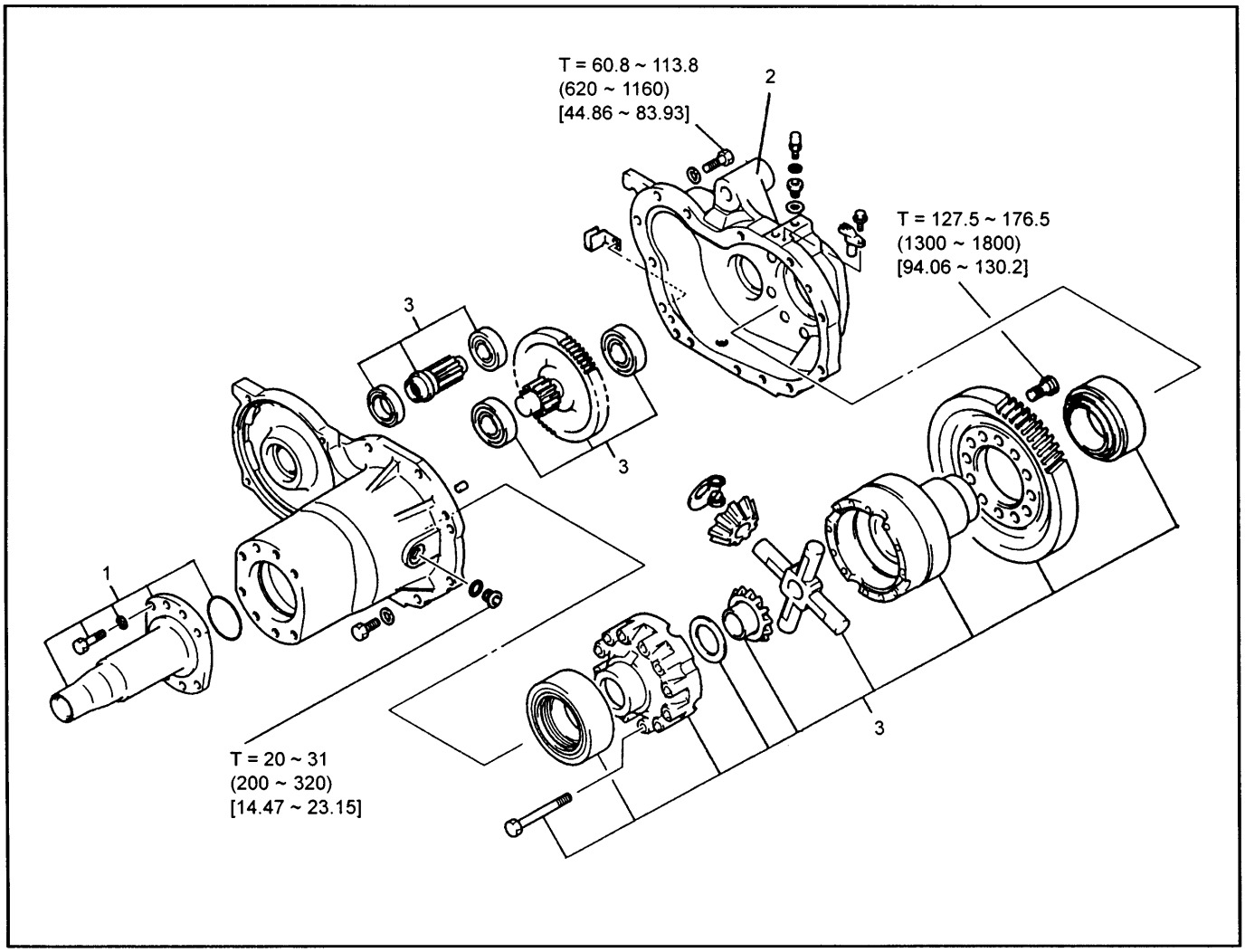
Installation:
Do not forget to insert a wave washer. It is recommended to apply a small amount of MP grease to prevent it from coming off.

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DISASSEMBLY·INSPECTION·REASSEMBLY

1 and 2 ton series (excluding 40-7FB20·25)

T = N·m (kgf-cm) [ft-lbf]



Disasssembly Procedure

1 Remove the front axle housing.

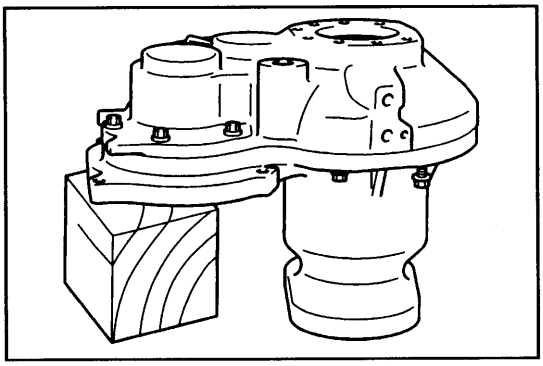
2 Erect it with the drive unit case LH on the upper side, and remove the case LH. **[Point 1]**

3 Remove drive unit gears Nos. 1 and 2 and differential ASSY W/drive unit gear No. 3. **[Point 2]**

Reassembly Procedure

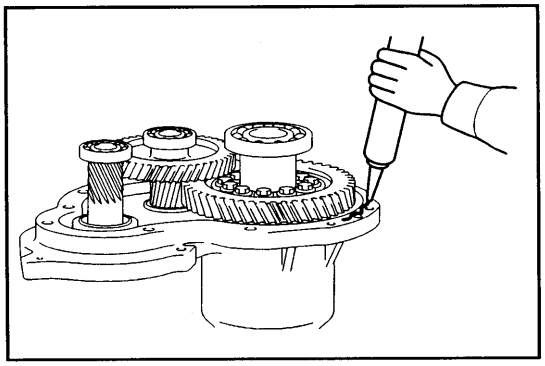
The reassembly procedure is the reverse of the disassembly procedure.

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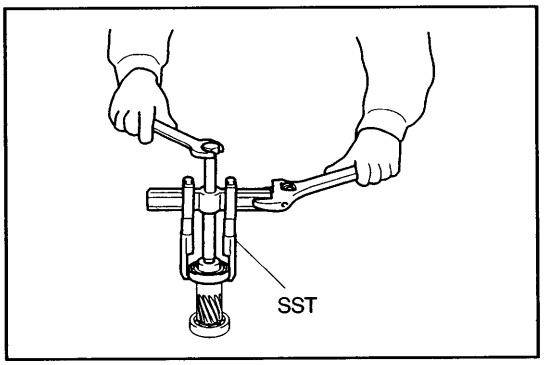


Point Operations

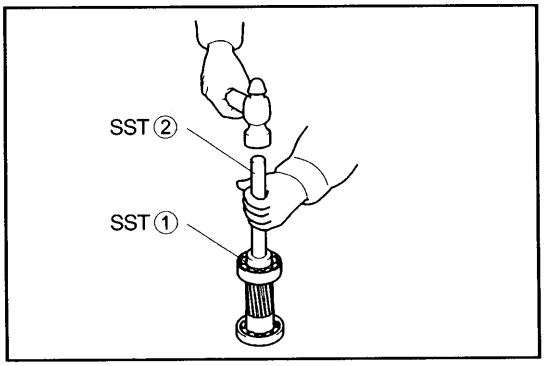
[Point 1]
Disassembly:
Use a service bolt and remove the front axle housing RH.
Service bolt: M14 × 1.5



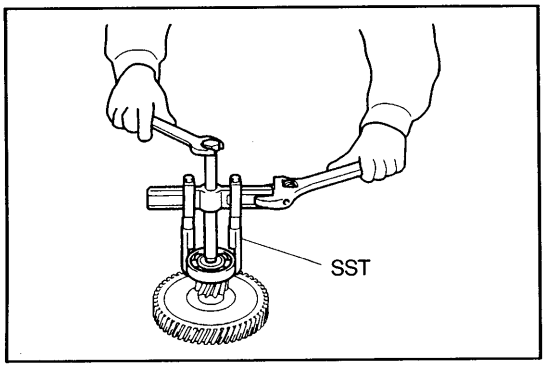
Reassembly:
Apply liquid gasket (08826-00090) to the surface to be in contact with the gear case.



[Point 2]
Disassembly:
Remove the bearing for drive unit gear No. 1.
SST 09950-40011

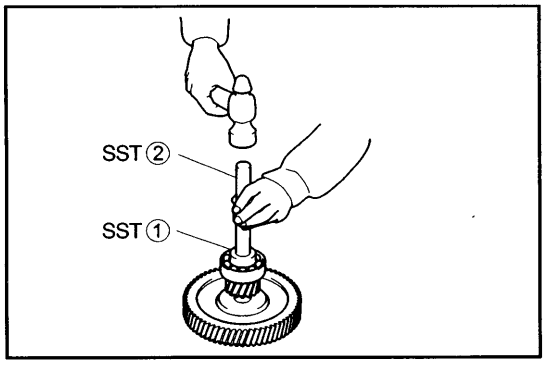


[Point 2]
Reassembly:
Install the bearing for drive unit gear No. 1.
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)

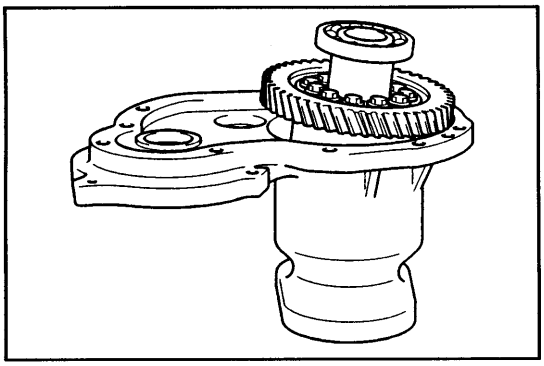


[Point 2]
Disassembly:
Remove the bearing for drive unit gear No. 2.
SST 09950-76014-71
(SST 09950-40011)

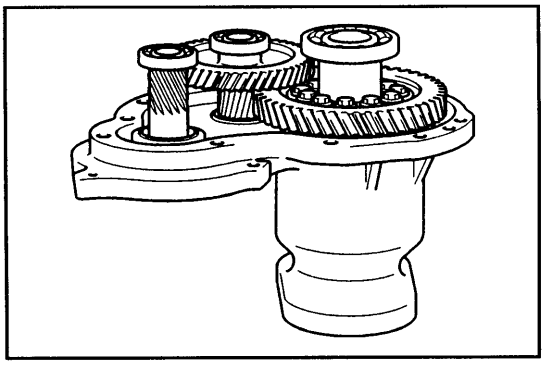
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[Point 2]
Reassembly:
Install the bearing for drive unit gear No. 2.
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 2]
Reassembly:
Insert the differential ASSY w/drive unit gear No.3 obliquely into the case RH.



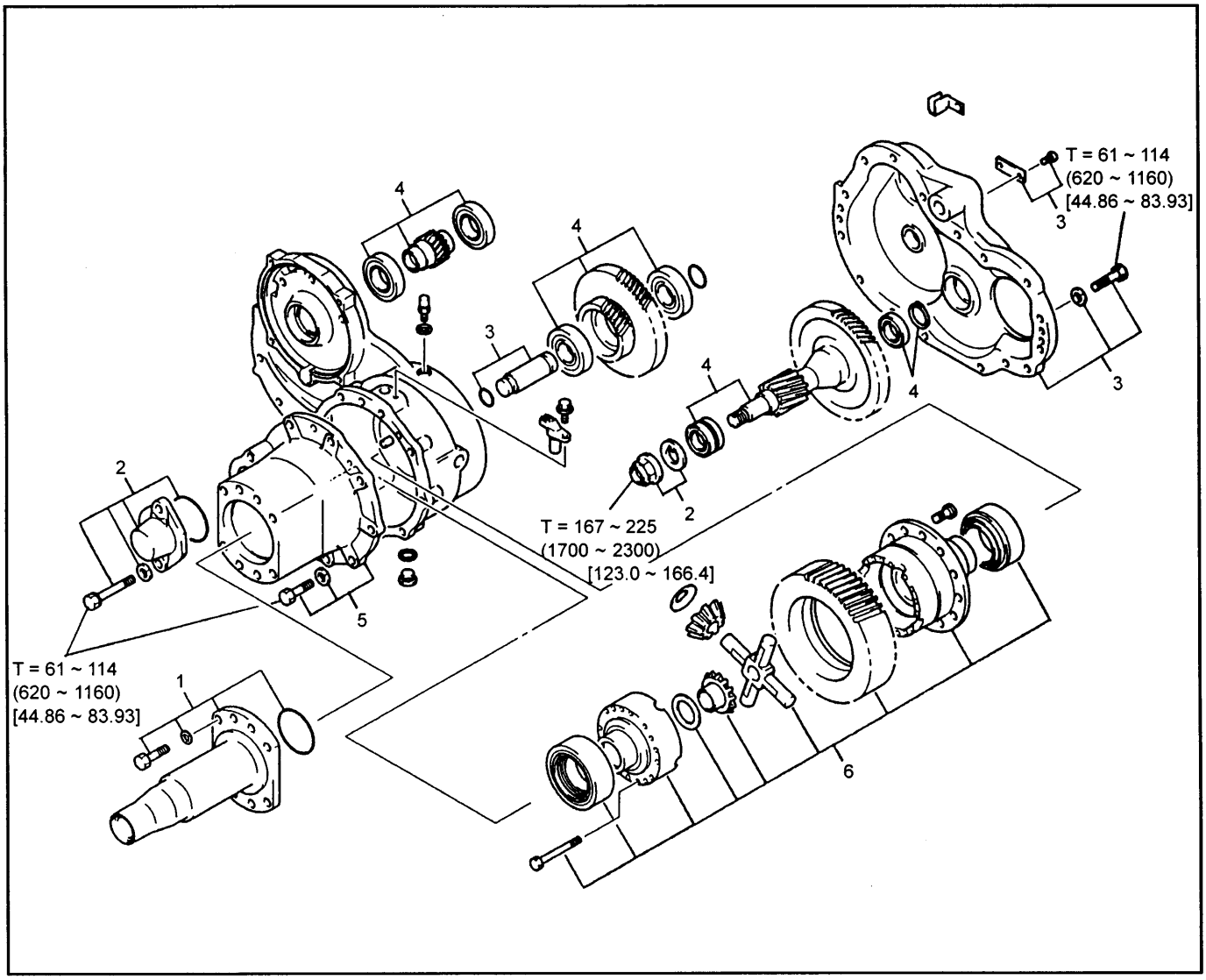
[Point 2]
Reassembly:
Set drive unit gears Nos.1 and 2, and bring them into mesh with the ring gear.

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DISASSEMBLY·INSPECTION·REASSEMBLY

3·J3.5 ton and 40-7FB20·25

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the front axle housing.

2 Remove the drive unit cap and drive gear lock nut. **[Point 1]**

3 Erect the housing with the drive unit cover LH on the upper side, and remove the idle gear key plate, idle gear pin and drive unit cover LH. **[Point 2]**

4 Remove the drive unit gears Nos. 1, 2 and 3. **[Point 3]**

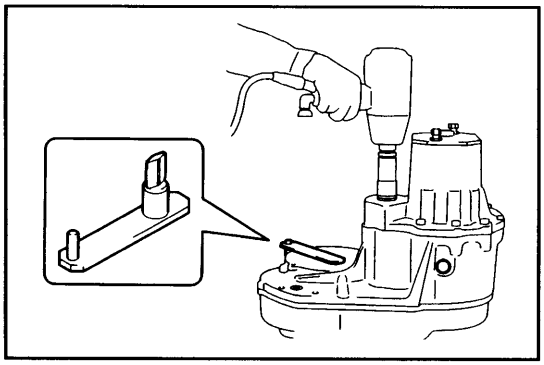
5 Face the drive unit cover RH upward, and remove the cover RH. **[Point 2]**

6 Remove differential ASSY W/drive unit gear No. 4.

Reassembly Procedure

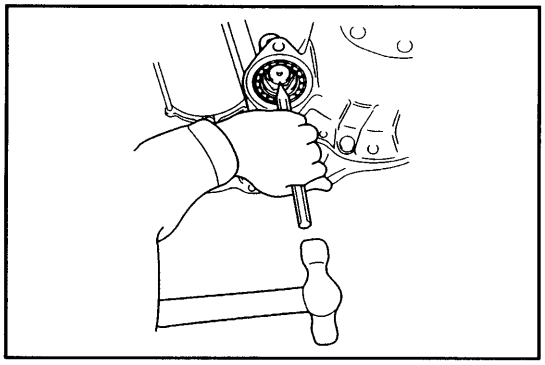
The reassembly procedure is the reverse of the disassembly procedure.

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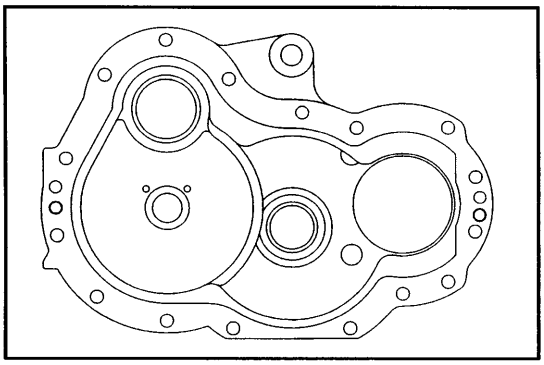


Point Operations

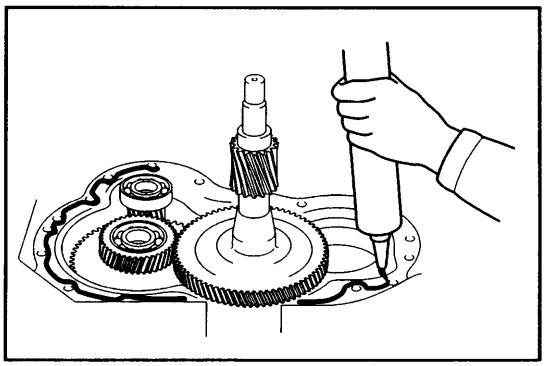
[Point 1]
Disassembly·Reassembly:
Set the SST on the spline of the input shaft, and remove the lock nut.
Take care not to give harm on the oil seal when setting SST.
SST 09330-33130-71
Tightening torque T = 167 to 225 N·m
(1,700 to 2,300 kgf-cm) [123 to 166 ft-lbf]



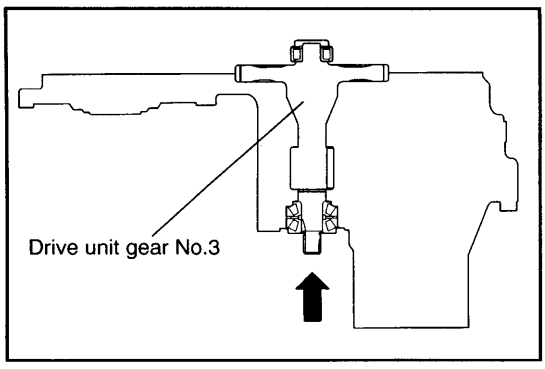
Reassembly:
Use a punch and caulk the lock nut securely (at 2 places).



[Point 2]
Disassembly:
Use a service bolt and remove the drive unit cover LH.
Service bolt: M14 × 1.5



Reassembly:
Apply liquid gasket 08826-76002-71 (08826-00090) on the surface to be in contact with the gear case.



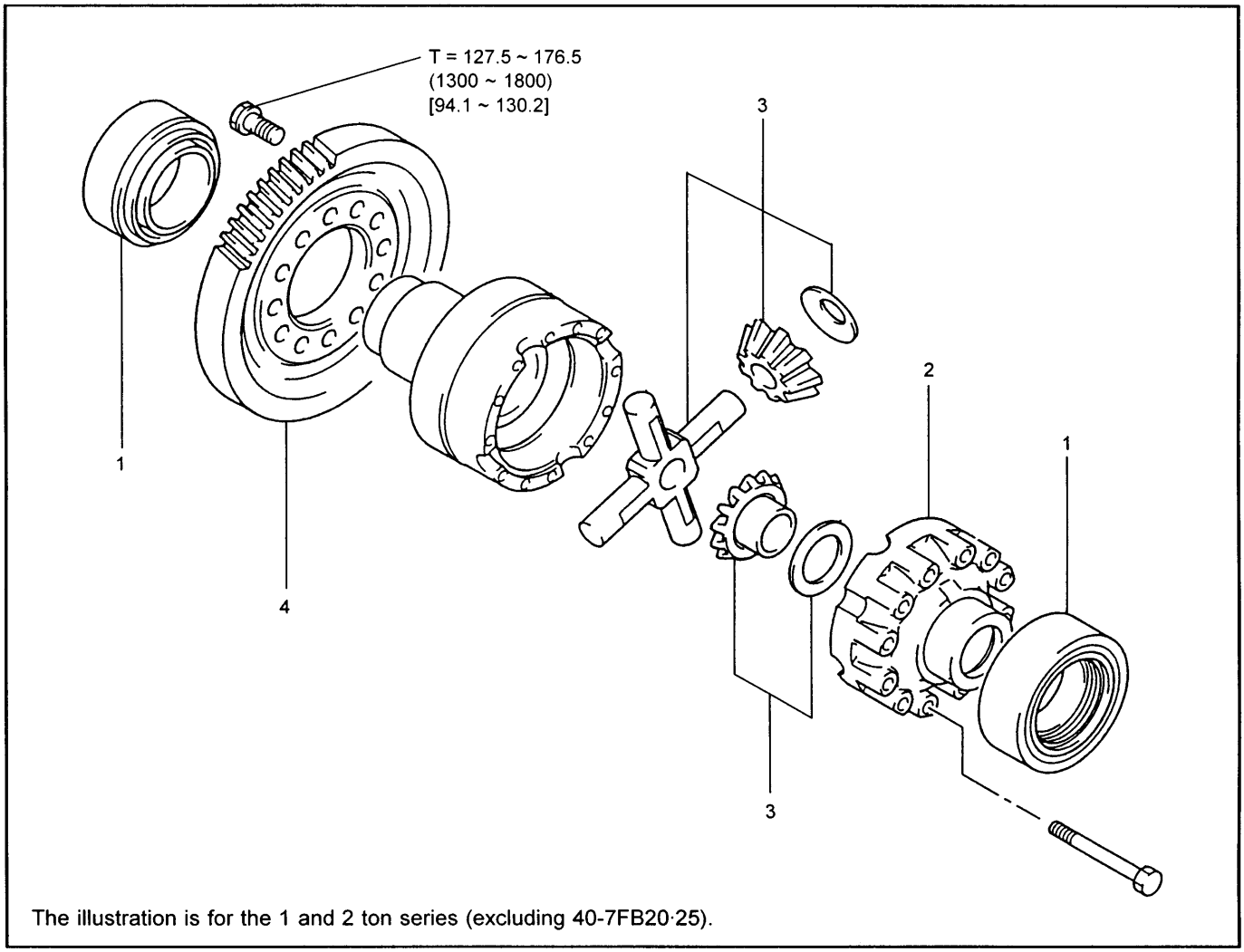
[Point 3]
Disassembly:
As a bearing exists on the nut side end of drive unit gear No. 3, remove the gear by pulling it up while tapping the nut side end with a hammer.

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DIFFERENTIAL CASE ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



The illustration is for the 1 and 2 ton series (excluding 40-7FB20·25).

Disasssembly Procedure

1 Remove the differential case bearings. **[Point 1]**

2 Remove the differential upper case. **[Point 2]**

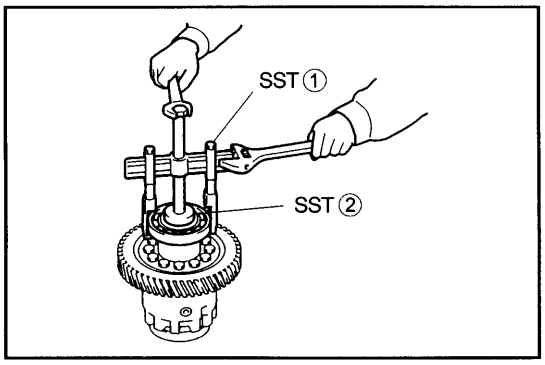
3 Remove the side gear and pinion gear. **[Point 3]**

4 Remove the ring gear. **[Point 4]**

Reassembly Procedure

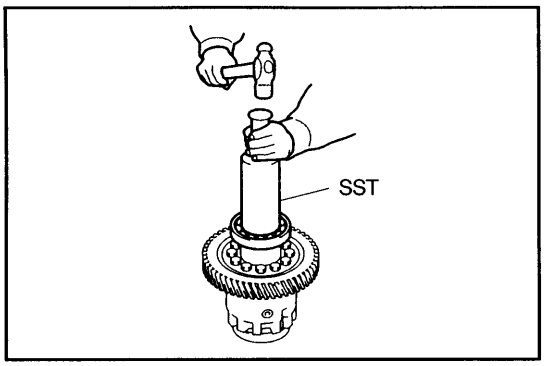
The reassembly procedure is the reverse of the disassembly procedure.

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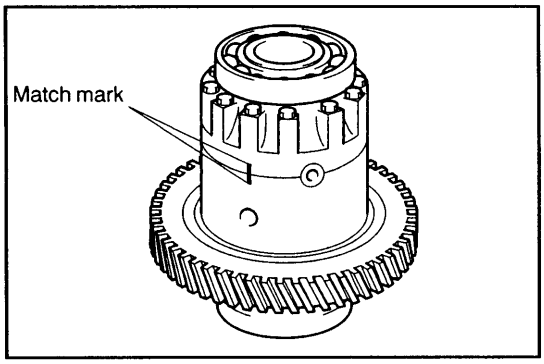


Point Operations

[Point 1]
Disassembly:
SST 09950-76014-71 --- ①
(SST 09950-40010)
SST 09950-76018-71 --- ②
(SST 09950-60010)

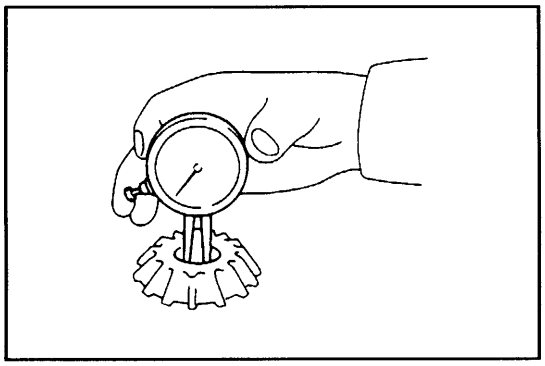


Reassembly:
Install the side bearing.
1. Use the SST and install the side bearing up to the end face of the case.
   SST 09370-10410-71
2. Use an appropriate tool and hammer to drive the bearing fully in.



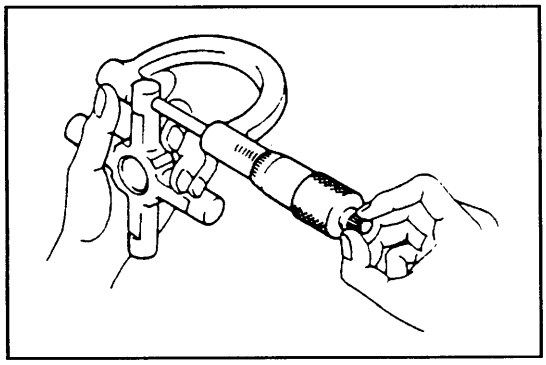
[Point 2]
Disassembly·Reassembly:
Check the match mark.

Reassembly:
Apply locking agent (Locktite No. 271 or equivalent) on the threaded portion of the set bolt.



[Point 3]
Inspection:
Measure the differential pinion inside diameter.

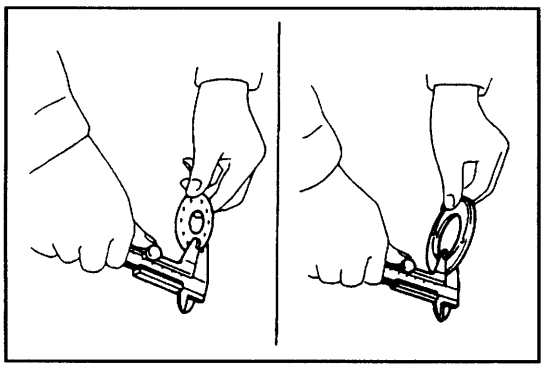
Standard: 22.12 mm (0.8709 in)
Limit: 22.22 mm (0.8748 in)



Inspection:
Measure the spider outside diameter.

Standard: 22.00 mm (0.8661 in)
Limit: 21.75 mm (0.8563 in)

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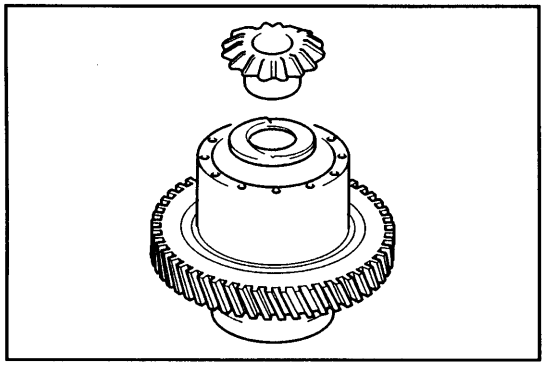


Inspection:
Measure the side gear thrust washer thickness.

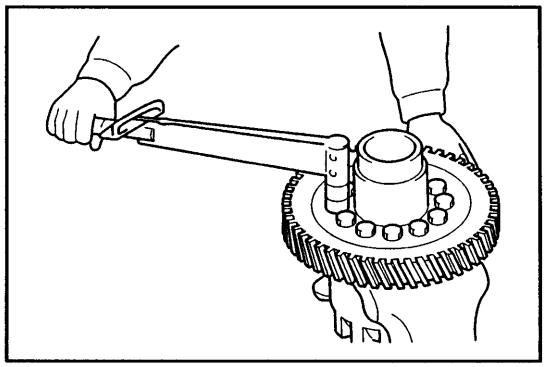
Standard: 1.6 mm (0.063 in)
Limit: 1.3 mm (0.051 in)

Inspection:
Measure the pinion gear thrust washer thickness.

Standard: 1.6 mm (0.063 in)
Limit: 1.0 mm (0.039 in)



Reassembly:
Install the side gear thrust washer with its oil groove facing the tooth flank. Uniformly apply chassis grease (molybdenum disulfide grease) on both faces of the pinion gear thrust washer before installation.



[Point 4]
Reassembly:
Apply locking agent (Locktite No. 271 or equivalent) on the threaded portion of the set bolts. Tighten them gradually first in the diagonal order, and finally tighten them in the circular order to the specified torque.

T = 127.5 ~ 176.5 N·m
(1300 ~ 1800 kgf-cm)
[94.1 ~ 130.2 ft-lbf]

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FRONT AXLE

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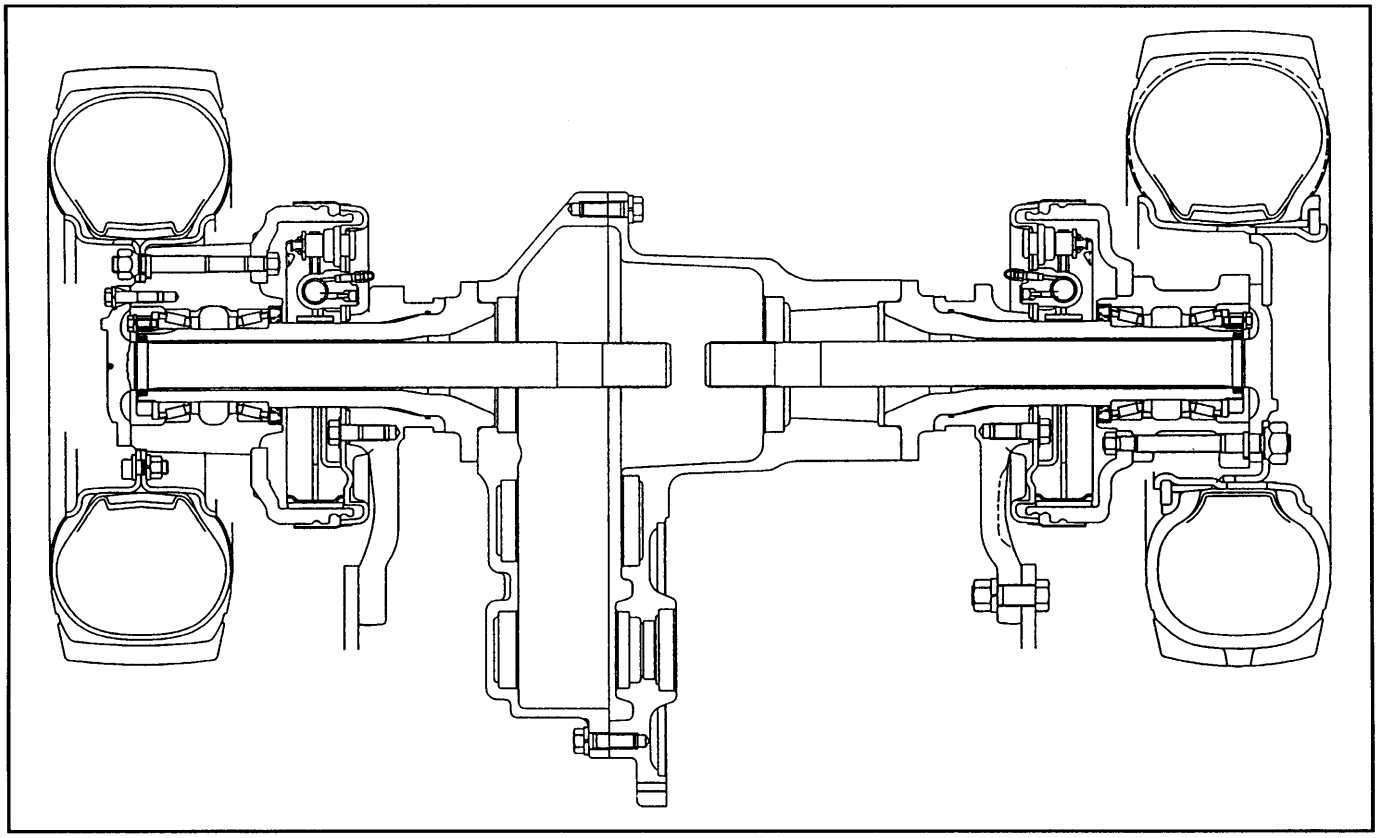
FRONT AXLE BRACKET·AXLE HOUSING 8-11

REMOVAL·INSTALLATION 8-11

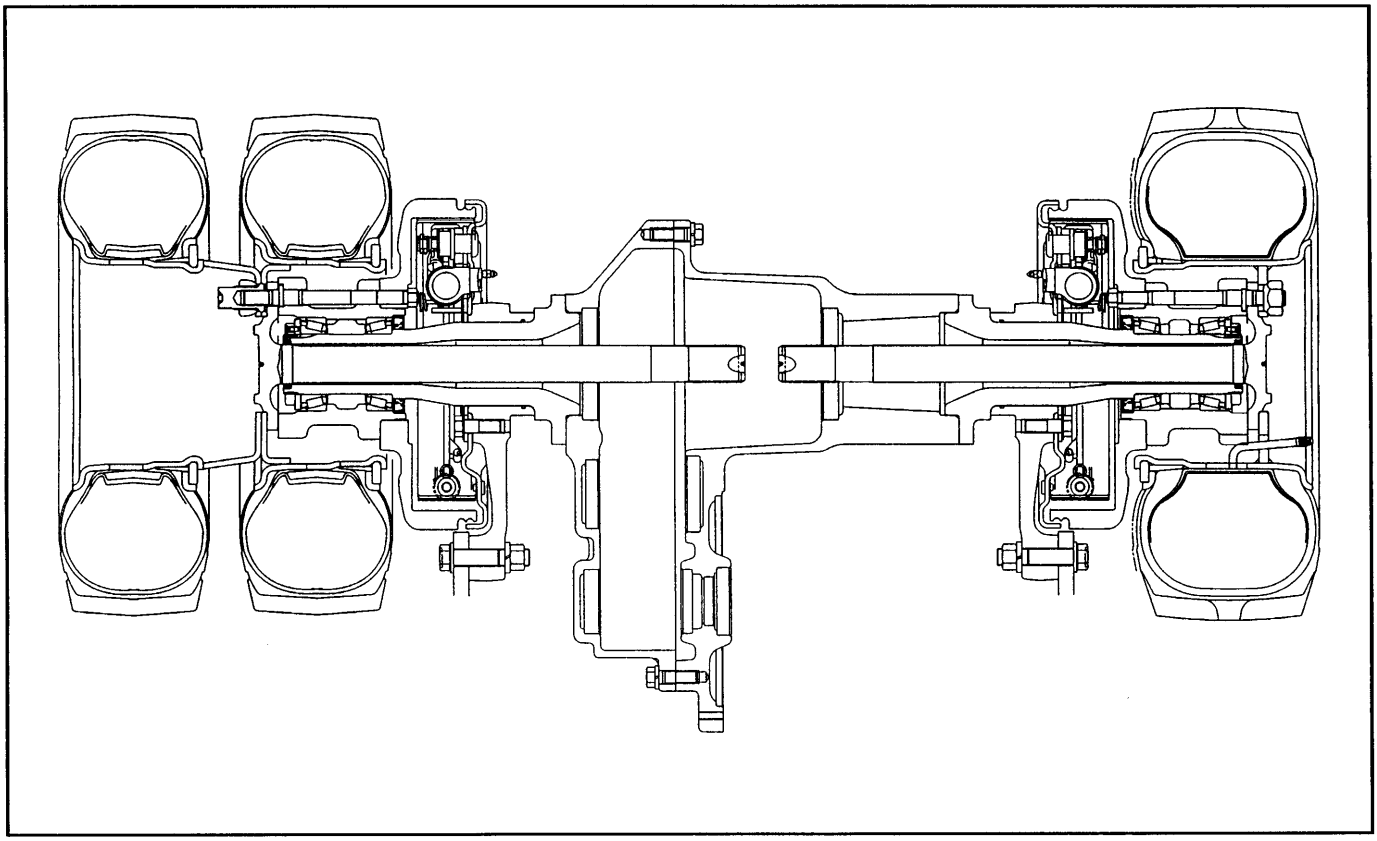
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GENERAL

1 ton series (excluding 40-7FB15) (single tire)

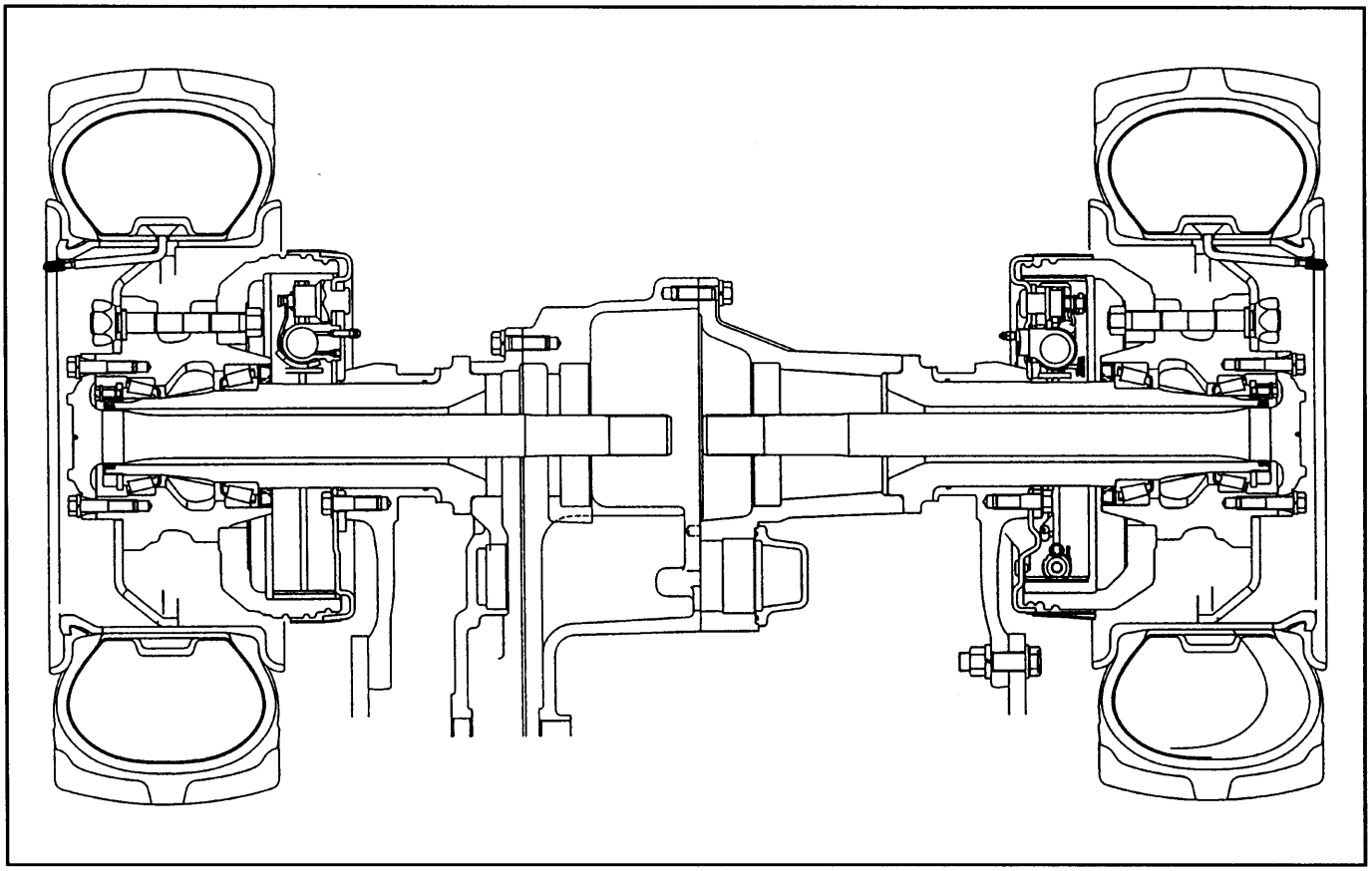


2 ton series (excluding 40-7FB20·25) and 40-7FB15



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3 and J3.5 ton (single tire)



SPECIFICATIONS

Item \ Vehicle model		1 ton series	2 ton series	3·J3.5 ton
Front axle type		Full-floating	←	←
Suspension type		Fixed to frame	←	←
Axle shaft diameter	mm (in)	40 (1.57)	←	42 (1.65)
Axle shaft diameter (spline portion)	mm (in)	39.5 (1.55)	←	←

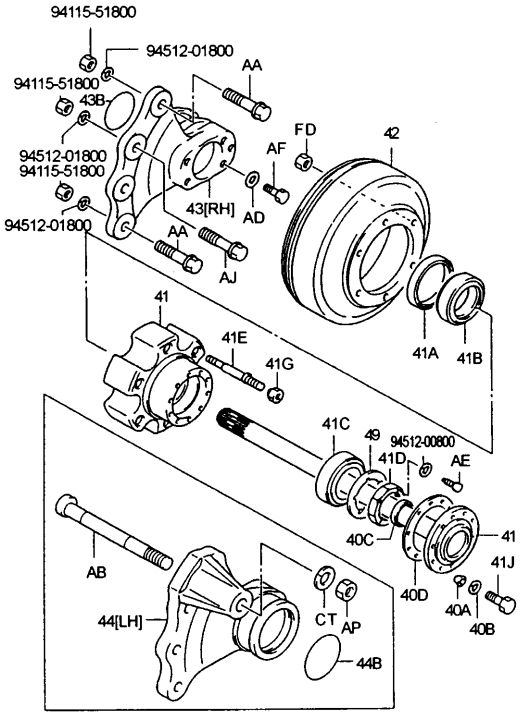
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COMPONENTS

1 ton series (excluding 40-7FB15)

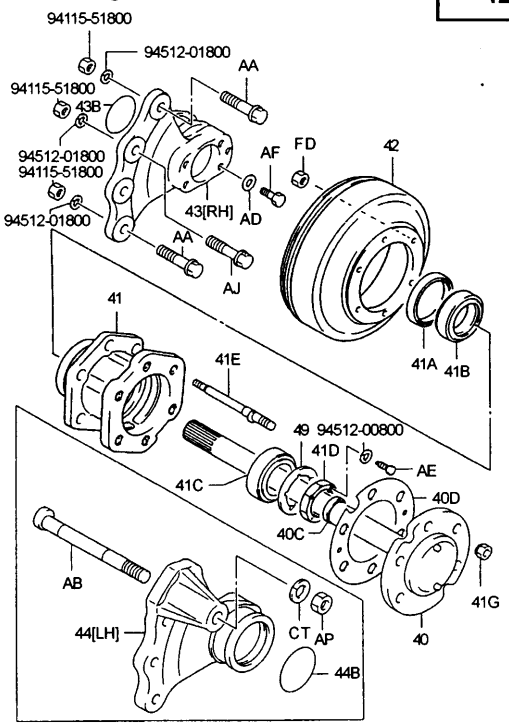
4201

Divided rim



4201-188

Side ring rim

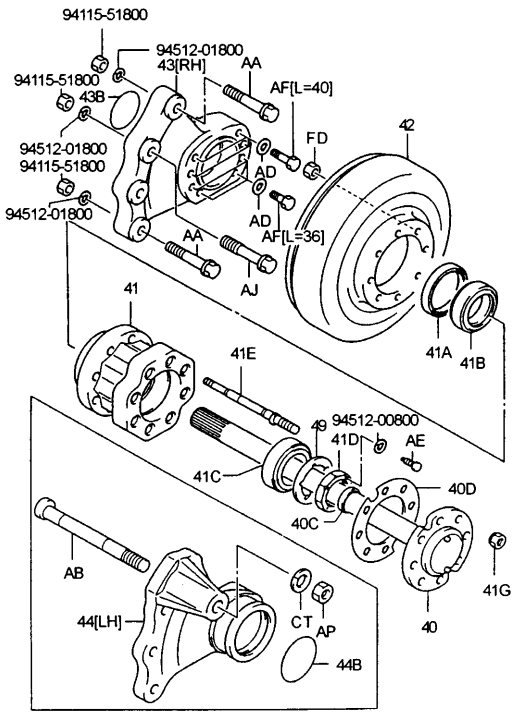


4201-190

2 ton series (excluding 40-7FB20·25) and 40-7FB15

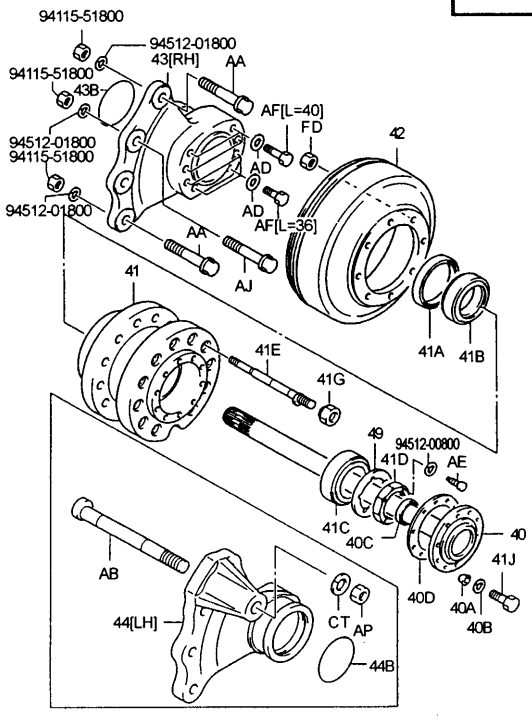
4201

Single tire



4201-191

23×9-10 size tire



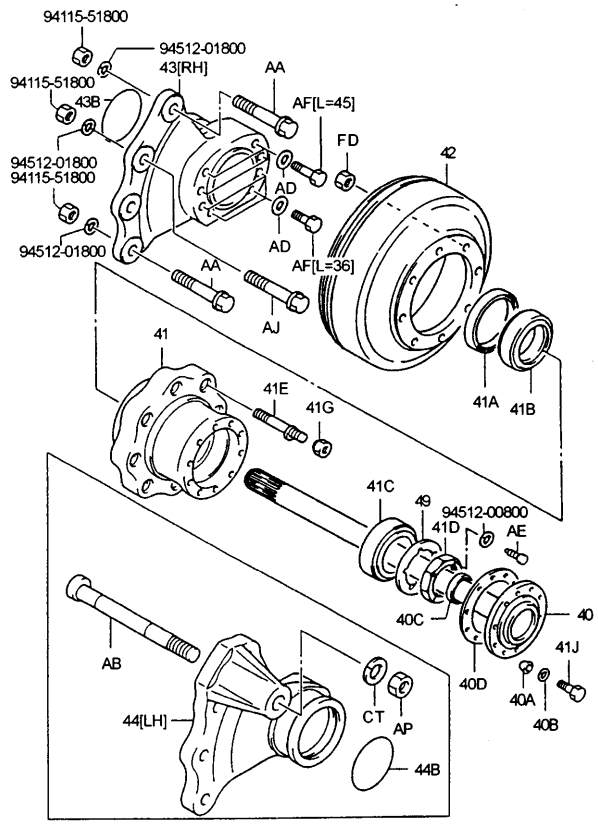
4201-192

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40-7FB20·25

Divided rim

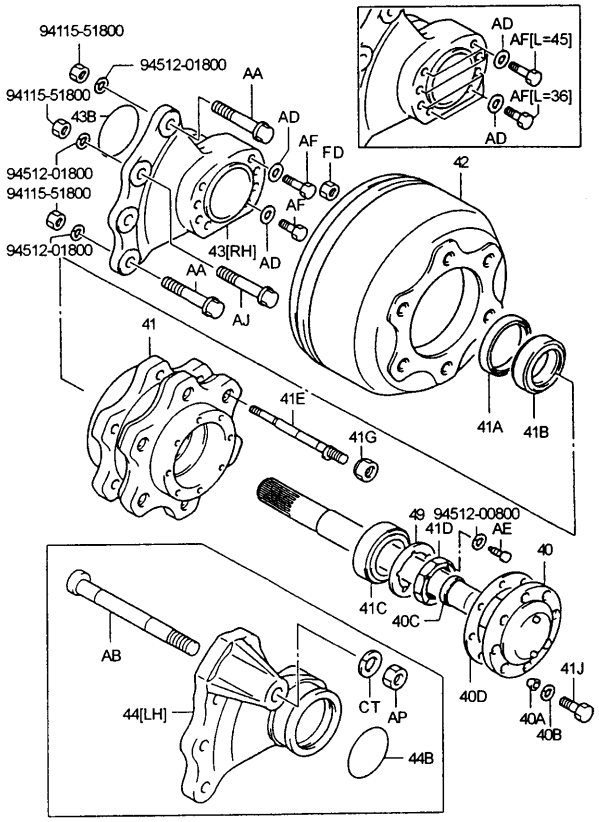
4201



4201-194

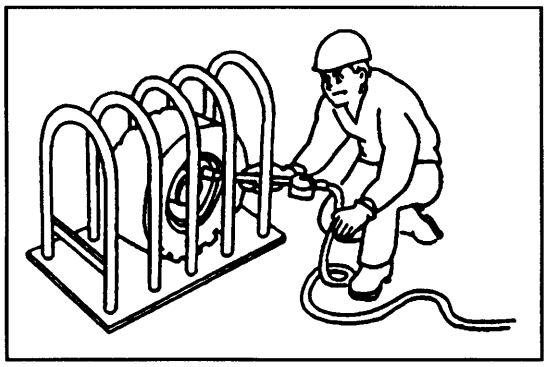
3 and J3.5 ton (Single tire)

4201



4201-196

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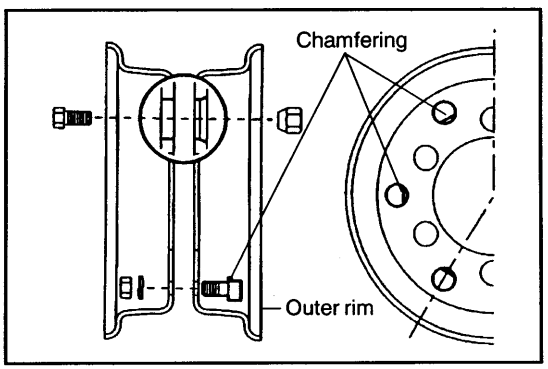
TIRES·WHEELS

1. Adjusting the Inflating Pressure

Caution:
- **Do not inflate tires beyond the specified pressure because it may cause dangerous tire bursting.**
- **When inflating a tire removed from the vehicle, place it in a safety fence.**

Specified Inflating Pressure

Vehicle model	Specification	Tire size	Rim type	Inflating pressure kPa (kgf/cm²) [psi]
1.0 and 1.35 ton models	STD single	6.00-9-10PR	Divided rim and side ring	700 (7)[100]
	O/S single	6.50-10-12PR	Side ring	900 (9)[128]
	STD double	4.50-12-8PR		700 (7)[100]
	Special double	6.00-9-10PR	Side ring	700 (7)[100]
1.5 ton models (excluding 40-7FB15)	STD single	6.00-9-10PR	Divided rim and side ring	700 (7)[100]
	Wide single	21x8-9-10PR	Side ring	625 (6.25)[89]
	O/S single	6.50-10-12PR	Side ring	900 (9)[128]
	STD double	4.50-12-8PR		700 (7)[100]
	Special double	6.00-9-10PR	Side ring	700 (7)[100]
1.75 ton models	STD single	21x8-9-10PR	Side ring	625 (6.25)[89]
	O/S single	6.50-10-12PR	Side ring	900 (9)[128]
	STD double	4.50-12-8PR		700 (7)[100]
	Special double	6.00-9-10PR	Side ring	700 (7)[100]
2.0 and 2.5 ton models (excluding 40-7FB20·25) and 40-7FB15 model	STD single	21x8-9-14PR	Side ring	900 (9)[128]
	O/S single	23x9-10-16PR	Side ring	900 (9)[128]
	STD double	6.00-9-10PR	Side ring	700 (7)[100]
40-7FB20·25 models	STD single	7.00-12-12PR	Divided rim and side ring	700 (7)[100]
	STD double	5.50-15-8PR		700 (7)[100]
	Special double	7.00-12-12PR	Side ring	700 (7)[100]
3.0 and J3.5 ton models	STD single	28x9-15-14PR	Side ring	800 (8)[114]
	STD double	6.00-15-10PR		700 (7)[100]
	Special double	28x8-15-12PR	Side ring	700 (7)[100]



2. Wheel Disassemly·Reassembly

Caution:
Always discharge air fully before disassembling the wheel. Otherwise, it is very dangerous since the rim may come off suddenly due to the internal pressure.

Note:
Install each divided rim set bolt with its head on the outer rim side and the chamfered portion facing the center of the wheel.

N·m (kgf-cm) [ft-lbf]

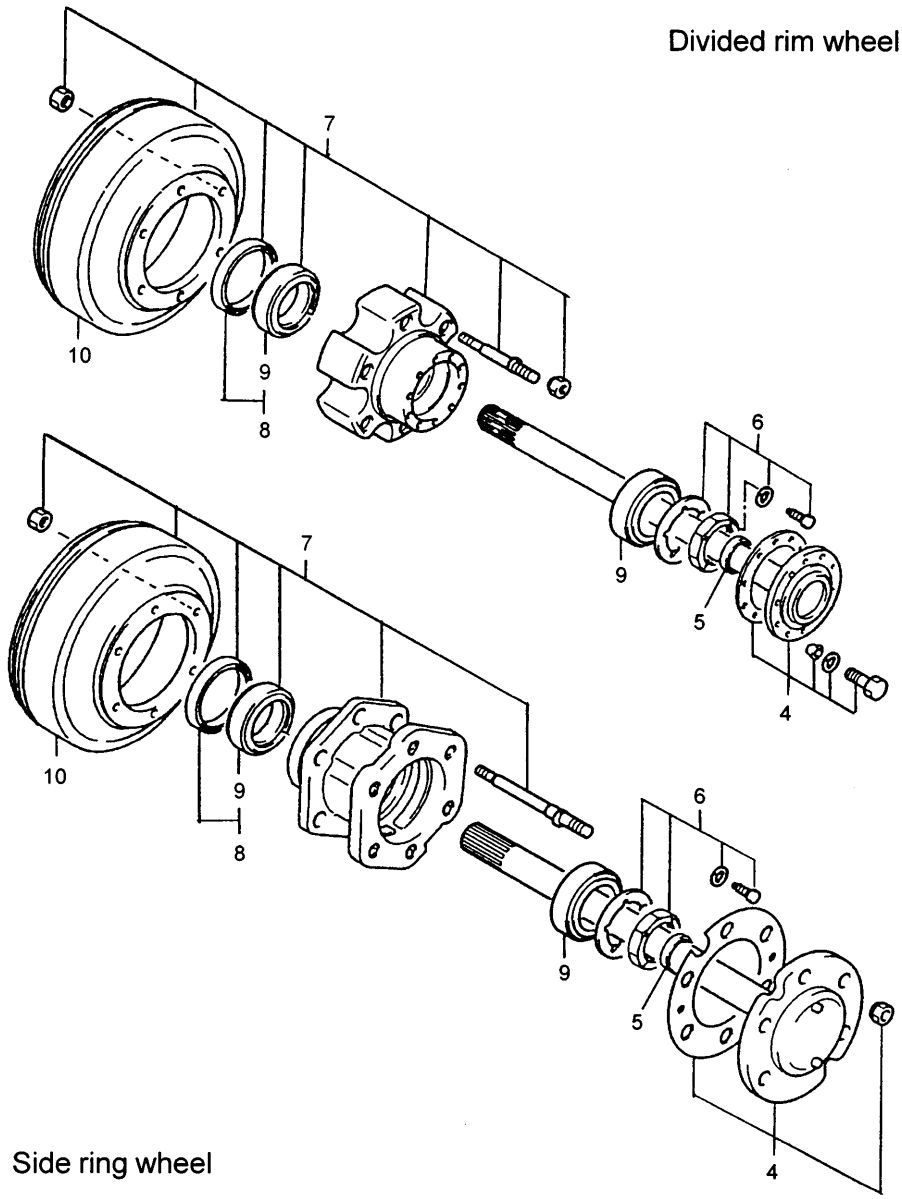
1 ton series	T = 49 ~ 69 (500 ~ 700) [36 ~ 51]
2 ton series	T = 118 ~ 176 (1200 ~ 1800) [87 ~ 130]

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FRONT AXLE SHAFT·AXLE HUB

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Hub nut (Tire fastening)	1 and 2 ton series, side ring	T = 176 ~ 392 (1800 ~ 4000)[130 ~ 289]
	1 and 2 ton series, divided rim, O/S single	T = 108 ~ 196 (1100 ~ 2000)[80 ~ 145]
	3 and J3.5 ton	T = 294 ~ 588 (3000 ~ 6000)[217 ~ 434]
Axle shaft set bolt	1 and 2 ton series	T = 69 ~ 88 (700 ~ 900)[51 ~ 65]
	3 and J3.5 ton	T = 98 ~ 127 (1000 ~ 1300)[72 ~ 94]
Brake drum set nut	1 ton series 2 ton series (excluding 40-7FB20·25)	T = 88 ~ 118 (900 ~ 1200)[65 ~ 87]
	40-7FB20·25	T = 147 ~ 186 (1500 ~ 1900)[109 ~ 137]
	3 and J3.5 ton	T = 167 ~ 206 (1700 ~ 2100)[123 ~ 152]

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Removal Procedure

1 Disconnect the battery plug.

2 Jack up the vehicle and remove front wheels. **[Point 1]**

3 Drain drive unit oil. **[Point 2]**

4 Remove the front axle shaft.

5 Remove the axle shaft oil seal. **[Point 3]**

6 Remove the bearing lock nut and plate. **[Point 4]**

7 Remove the front axle hub W/brake drum. **[Point 5]**

8 Remove the oil seal and inner bearing. **[Point 6]**

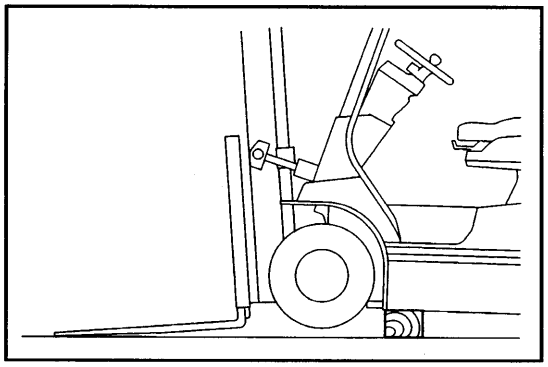
9 Remove the bearing outer race. **[Point 7]**

10 Remove the brake drum.

Installation Procedure

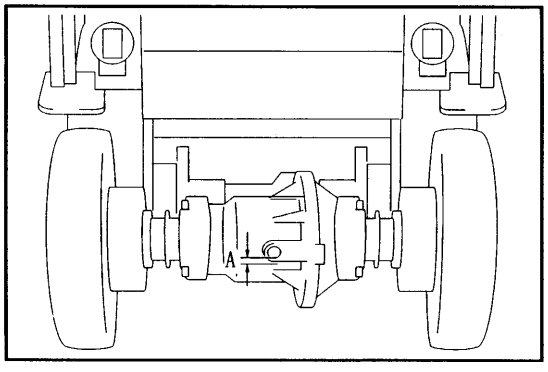
The installation procedure is the reverse of the removal procedure.

Note:
Apply thread tightener (08833-00070) on the brake drum set nut before tightening.



Point Operations

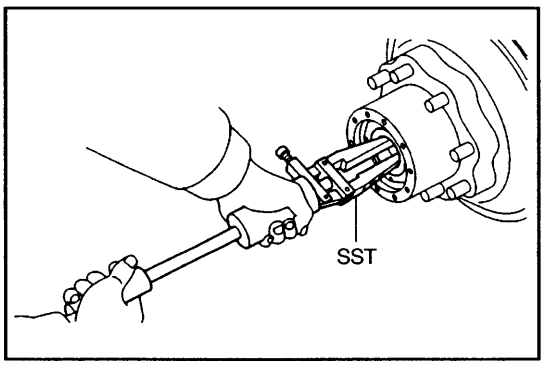
[Point 1]
Removal·Installation:
Jack up the vehicle and support both sides of the front frame with wooden blocks.



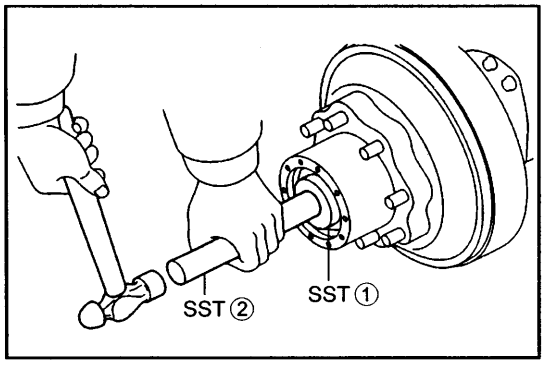
[Point 2]
Installation:
Fill Hypoid gear oil to the specified level after installation.

A = 10 mm (0.4 in) or less

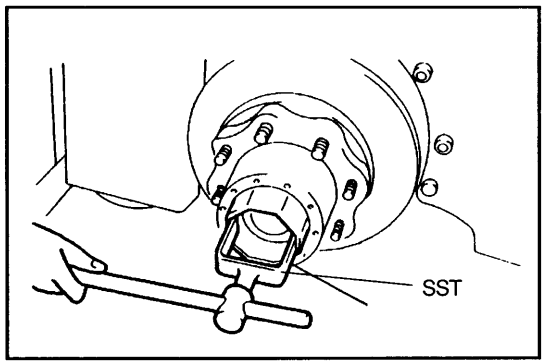
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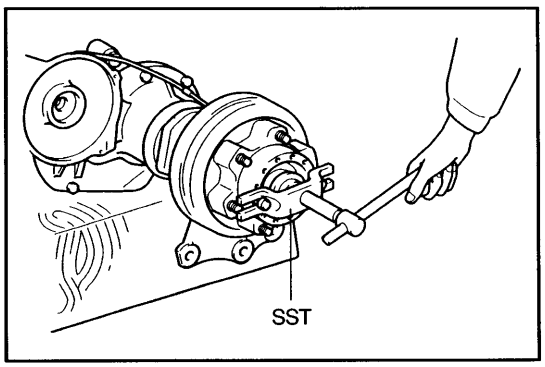
[Point 3]
Removal:
SST 09320-23000-71



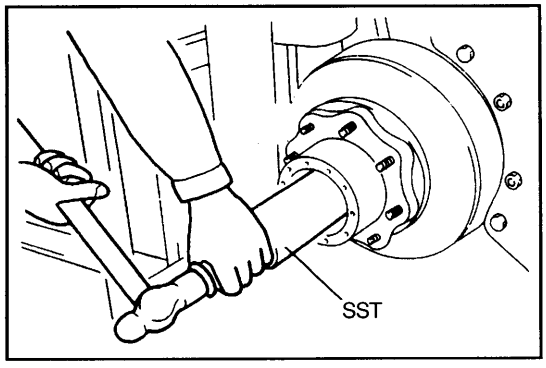
Installation:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 4]
Removal·Installation:
1·2 ton series
SST 09509-76002-71
(SST 09509-55020)
3·J3.5 ton
SST 09509-76003-71
(SST 09509-55030)



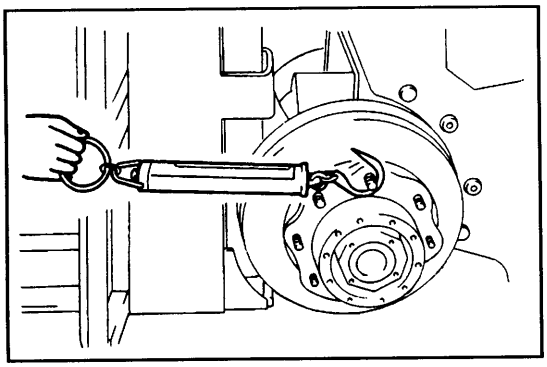
[Point 5]
Removal:
SST 09310-10160-71

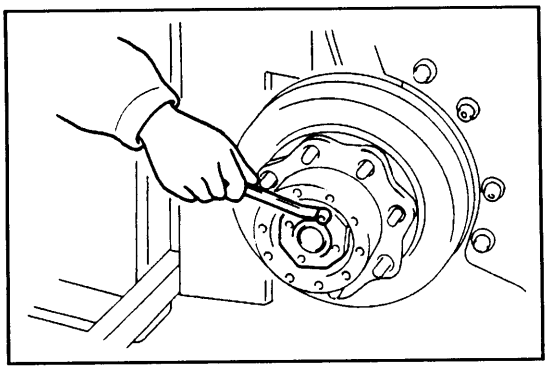


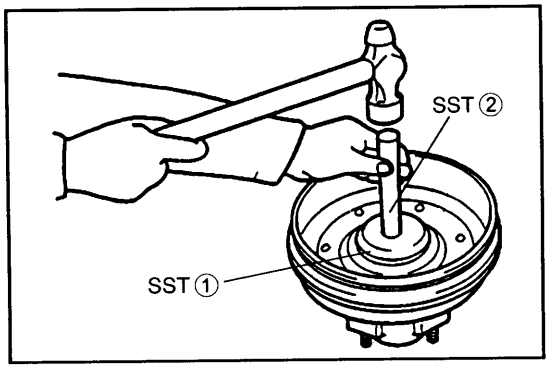
[Point 5]
Installation:
Fill MP grease in the hub before installing the front axle hub w/brake drum.

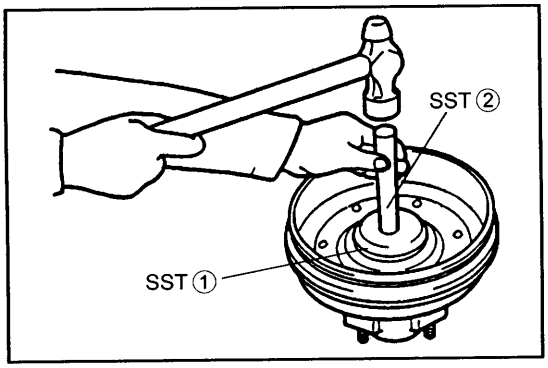
Installation:
1·2 ton series
SST 09370-10410-71
3·J3.5 ton
SST 09421-33020-71

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[Point 5]
Installation:
Adjust the front axle hub starting force.

1. Fully tighten the bearing lock nut. Then loosen it by about 1/12 to 1/6 turn, and tap lightly with a soft hammer.
2. Set a spring scale on a hub bolt, and measure the front axle hub starting force.

Standard:

Applicable vehicle	Wheel type	Starting force at the hub bolt position
1 ton series, and 2 ton series (excluding 40-7FB20·25)	Divided rim	19.6 ~ 35.3 N (2.0 ~ 3.6 kgf) [4.4 ~ 7.9 lbf]
	Side ring	24.5 ~ 44.1 N (2.5 ~ 4.5 kgf) [5.5 ~ 9.9 lbf]
40-7FB20·25, 3·J3.5 ton	All wheels	24.5 ~ 78.4 N (2.5 ~ 8.0 kgf) [5.5 ~ 17.6 lbf]

3. If the standard is not satisfied, adjust the degree of bearing lock nut tightening for adjustment.
4. Install the nut lock bolt.
   Coat thread tightener 08833-76001-71 (08833-00070) on the nut lock bolt before tightening.

[Point 6]
Removal:
Use a screwdriver or the like to remove the oil seal.

Installation:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

[Point 7]
Removal:
Use a brass bar to remove the bearing outer race.

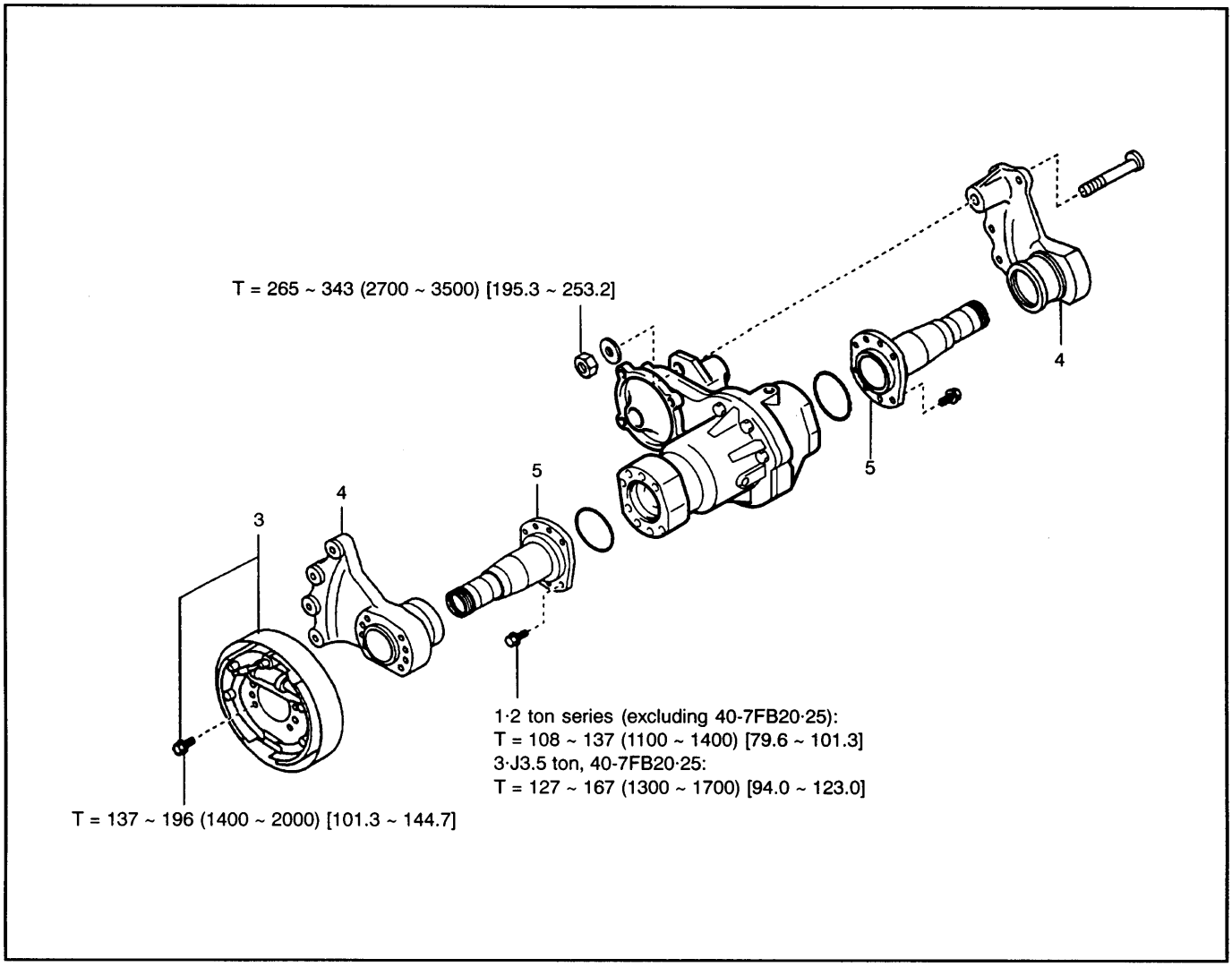
Installation:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

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FRONT AXLE BRACKET·AXLE HOUSING

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the front axle & drive unit ASSY. (See page 7-7)

2 Remove the front axle shaft and axle hub. (See page 7-7)

3 Remove the brake ASSY. **[Point 1]**

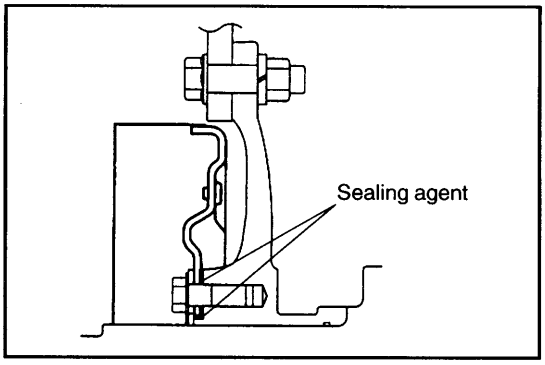
4 Remove the front axle bracket.

5 Remove the axle housing.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

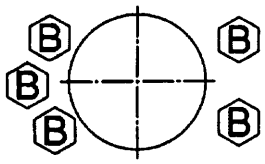
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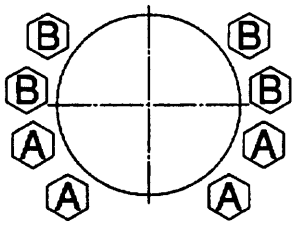
Point Operations

[Point 1]
Installation:
Apply sealing agent 08826-76001-71 (08826-00080) on the mating surfaces of the brake backing plate and front axle bracket before installation.

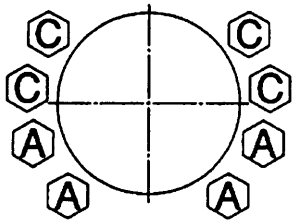
1 ton series (excluding 40-7FB15):



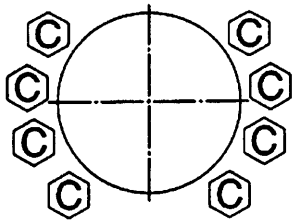
2 ton series (excluding 40-7FB20·25) and 40-7FB15:



3 ton and 40-7FB20·25:



J3.5 ton:



Installation:
Be careful as the brake backing plate set bolts are different in length.
Apply locking agent (08833-00070) on the set bolts before tightening.
Bolt length
A: ℓ = 36 mm (1.42 in)
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)

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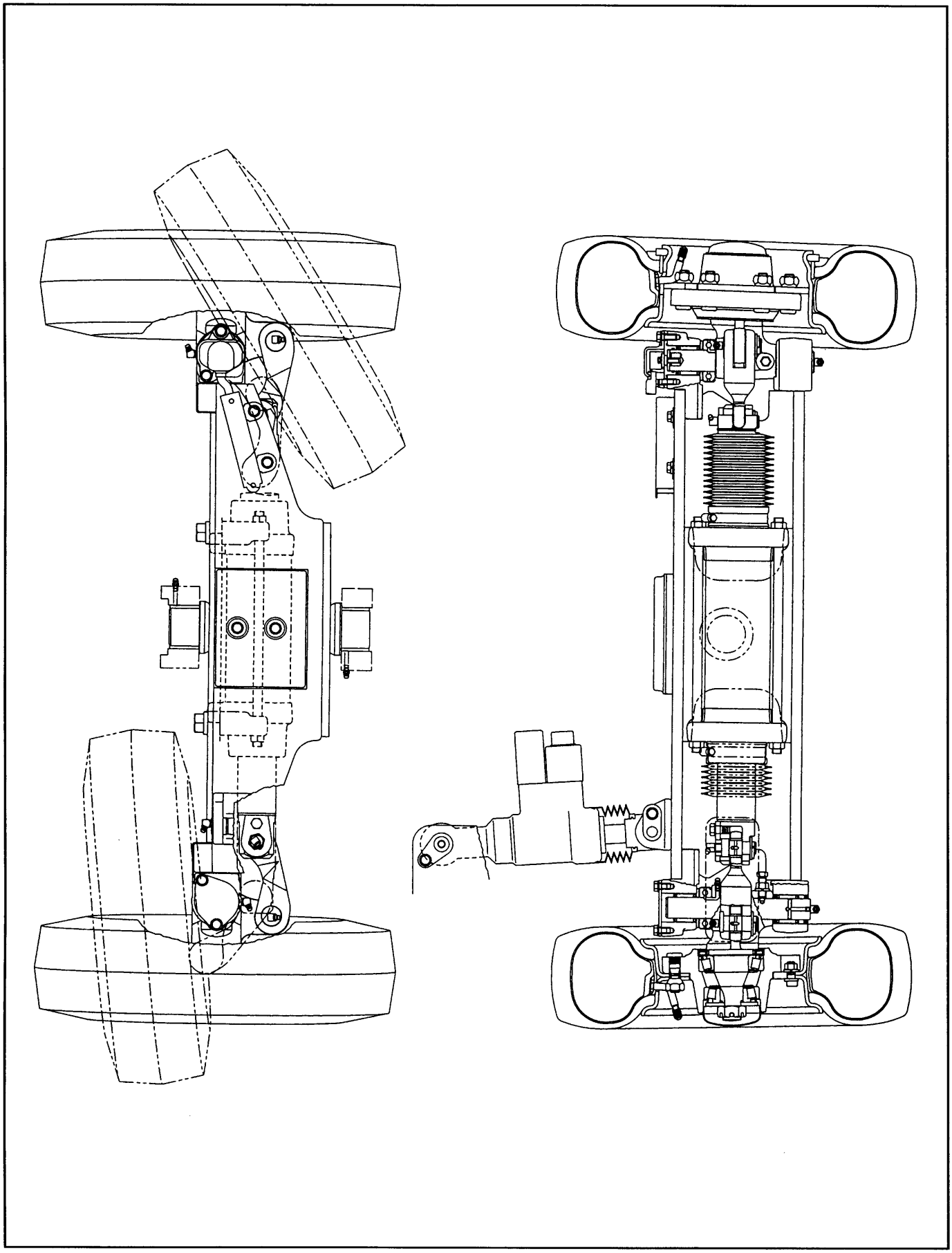
REAR AXLE

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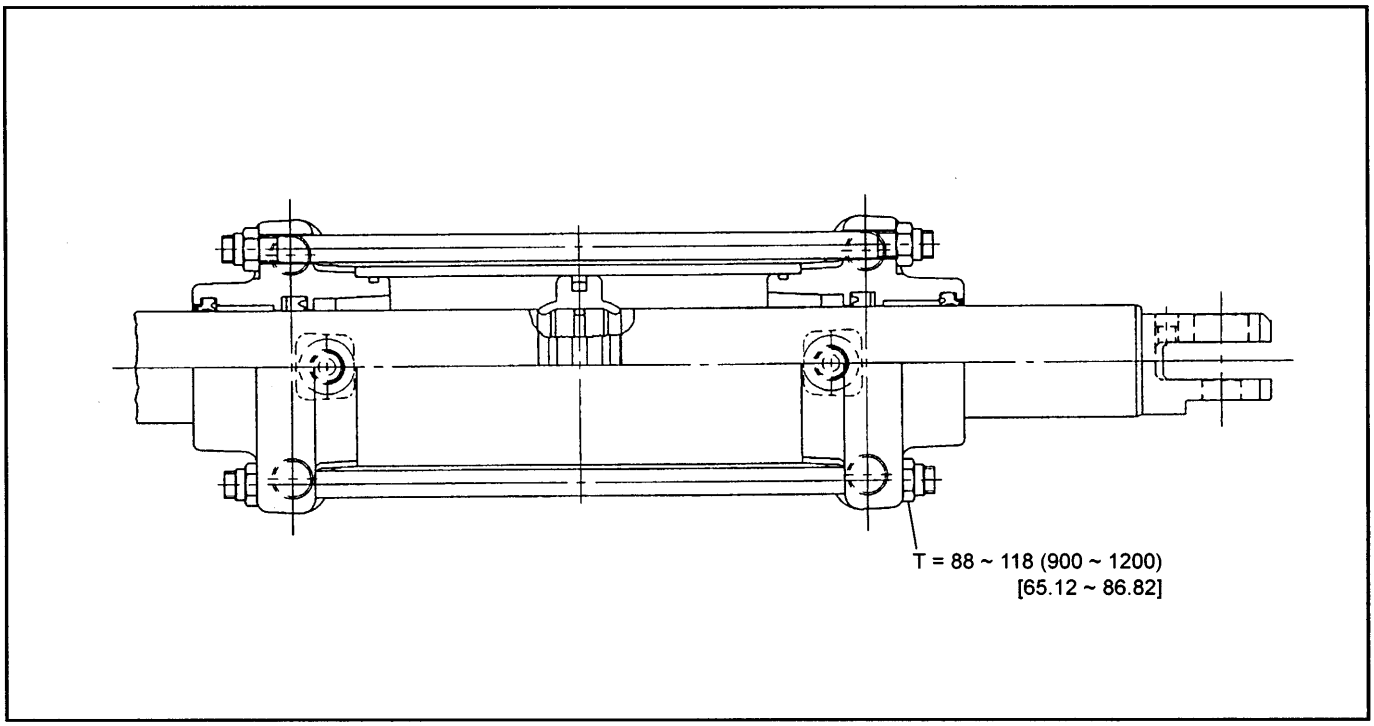
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GENERAL



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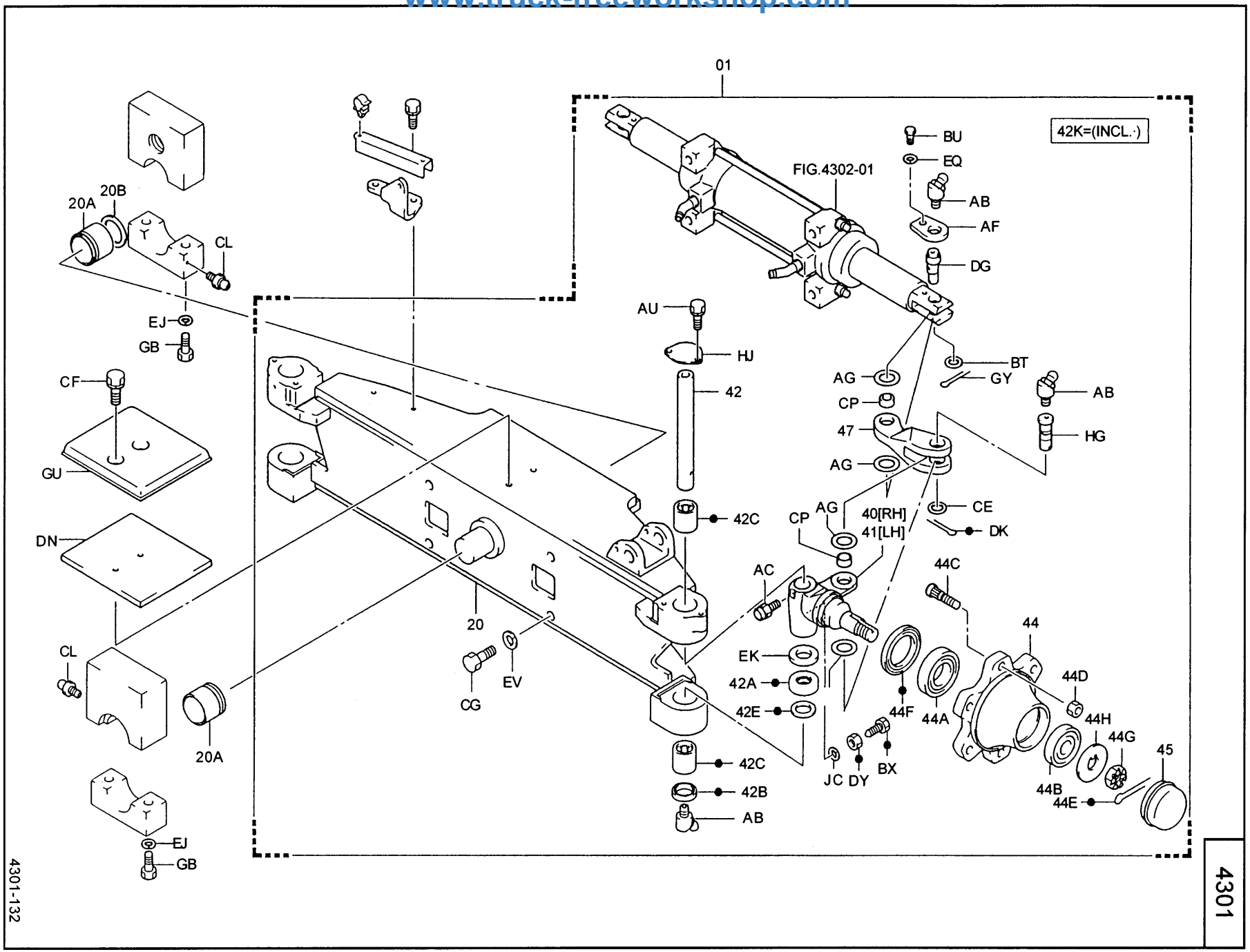
Rear Axle Cylinder T = N·m (kgf-cm) [ft-lbf]



SPECIFICATIONS

Rear axle type			Elliot type	
Rear axle suspension type			Center-supported right-left rocking type	
Wheel alignment	Toe-in	mm	0	
	Camber	degree	1.5°	
	Caster	degree	0°	
	King pin angle	degree	0°	
Minimum turning radius (outermost)		mm (in)	1.0 ton model	1750 (68.9)
			1.35 ton model	1760 (69.3)
			7FB15·7FBH15	1770 (69.7)
			40-7FB15	1980 (78.0)
			1.75 ton model	1780 (70.1)
			7FB20·7FBH20	1980 (78.0)
			40-7FB20	2145 (84.4)
			7FB25·7FBH25	2000 (78.7)
			40-7FB25	2170 (85.4)
			3.0 ton model	2210 (87.0)
			J3.5 ton model	2270 (89.4)

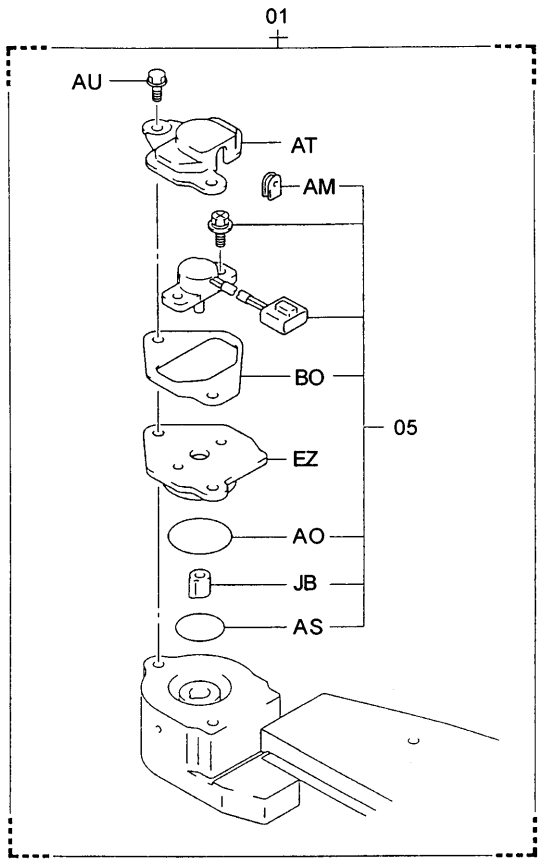
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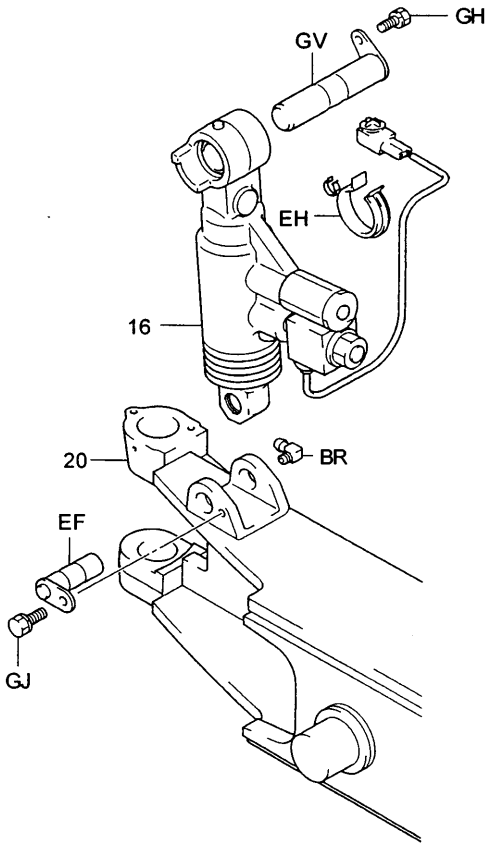
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4301

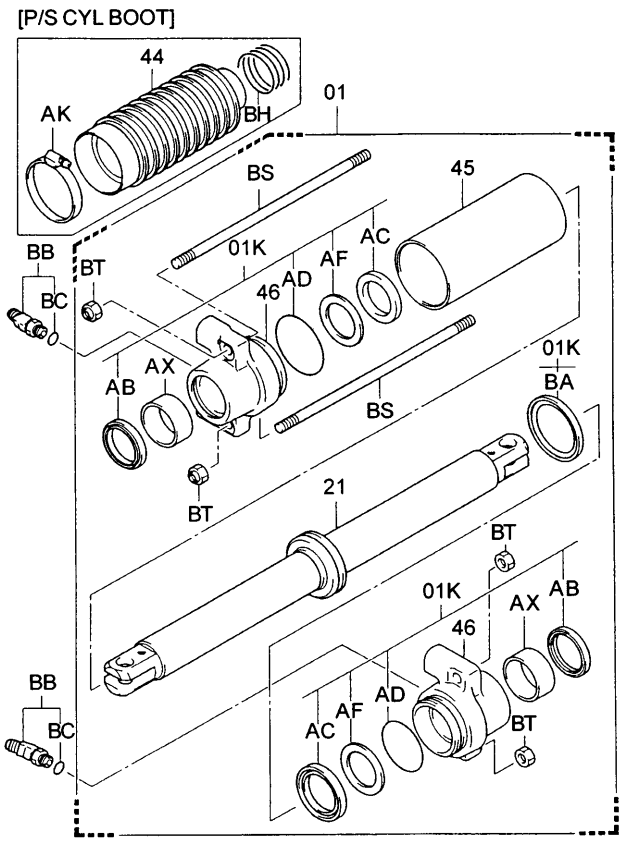


4301-120B



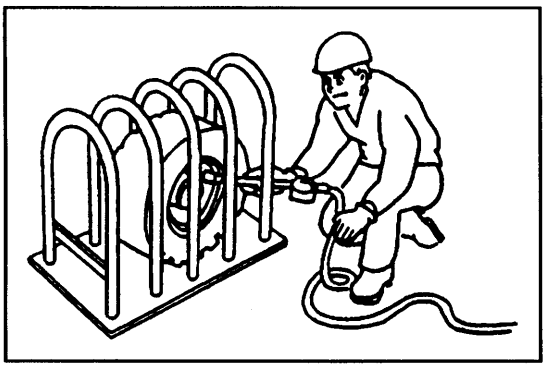
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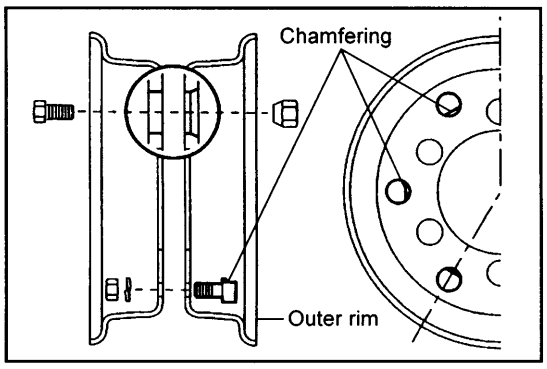
TIRES·WHEELS

1. Adjusting the Inflating Pressure

Caution:
- **Do not inflate tires beyond the specified pressure because it may cause dangerous tire bursting.**
- **When inflating a tire removed from the vehicle, place it in a safety fence.**

Specified Inflating Pressure

Vehicle model	Tire size	Rim type	Inflating pressure kPa (kgf/cm²) [psi]
1.0, 1.35 and 1.5 ton models (excluding 40-7FB15)	5.00-8-8PR	Divided rim, side ring	800 (8)
1.8 ton model	5.00-8-10PR	Side ring	1000 (10)
2.0 ton model (excluding 40-7FB20) and 40-7FB15	18 x 7-8-14PR	Divided rim, side ring	700 (7)
2.5 ton model (excluding 40-7FB25)	18 x 7-8-14PR	Side ring	900 (9)
40-7FB20·25	6.00-9-10PR	Divided rim, side ring	700 (7)
3.0 ton model	6.50-10-10PR	Divided rim, side ring	775 (7.75)
J3.5 ton model	6.50-10-14PR	Side ring	1000 (10)



2. Wheel Disassemly·Reassembly

Caution:
Always discharge air fully before disassembling the wheel. Otherwise, it is very dangerous since the rim may come off suddenly due to the internal pressure.

Note:
Install each divided rim set bolt with its head on the outer rim side and the chamfered portion facing the center of the wheel.

T = N·m (kgf-cm) [ft-lbf]

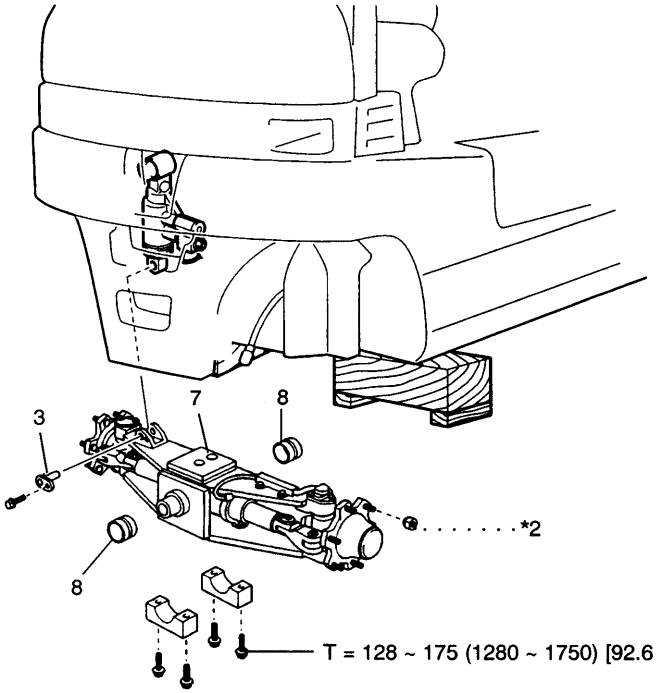
1 ton series (excluding 40-7FB15)	T = 29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
2 ton series (excluding 40-7FB20·25) and 40-7FB15	T = 78.5 ~ 117.7 (800 ~ 1200) [57.9 ~ 86.8]
3 and J3.5 ton and 40-7FB20·25	T = 49.0 ~ 68.6 (500 ~ 700) [36.2 ~ 50.7]

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REAR AXLE ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



*2 Hub nut

Vehicle model / Rim type	1 ton series excluding 40-7FB15	40-7FB15 and 2 ton series (excluding 40-7FB20·25)	40-7FB20·25	3·J3.5 ton
Devided rim	88.3 ~ 157.0 (900 ~ 1600) [65.12 ~ 115.8]	117.6 ~ 196.0 (1200 ~ 2000) [86.82 ~ 144.7]	←	
Side ring rim	88.3 ~ 157.0 (900 ~ 1600) [65.12 ~ 115.8]	↑	176.4 ~ 392.0 (1800 ~ 4000) [130.2 ~ 289.4]	117.6 ~ 196.0 (1200 ~ 2000) [86.82 ~ 144.7]

Removal Procedure

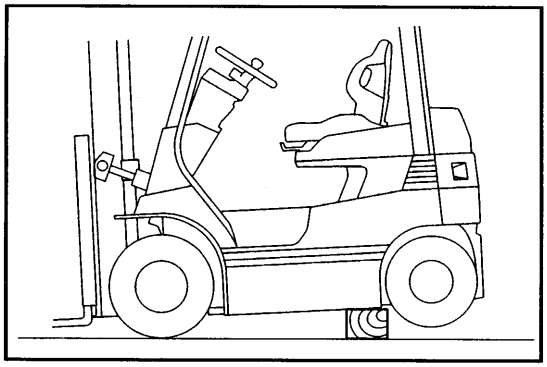
1 Disconnect the battery plug.
2 Jack up the vehicle and remove rear wheels. **[Point 1]**
3 Remove the swing lock cylinder lower pin. (Vehicle W/SAS) (See section 18.)
4 Disconnect the rear axle cylinder hose.
5 Disconnect the tire angle sensor connector. (Vehicle W/SAS)
6 Support the rear axle ASSY with a garage jack.
7 Remove the rear axle ASSY. **[Point 2]**
8 Remove the center pin bushing. **[Point 3]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

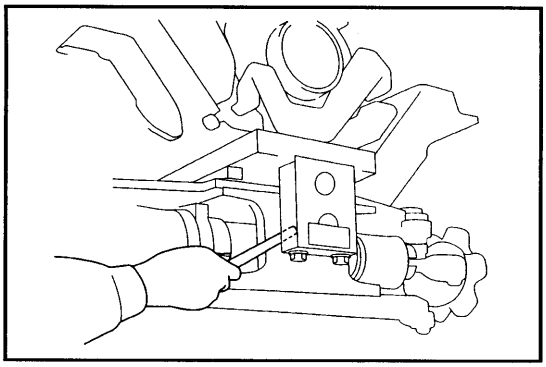
Note:
After installation, add grease through each grease fitting. Add genuine molybdenum disulfide grease at the rear axle beam center pins (two places) and swing lock cylinder lower pin. Use MP grease to other grease fittings.

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Point Operations

[Point 1]
Removal·Installation:
Jack up the vehicle and support both sides of the frame rear side with wooden blocks.



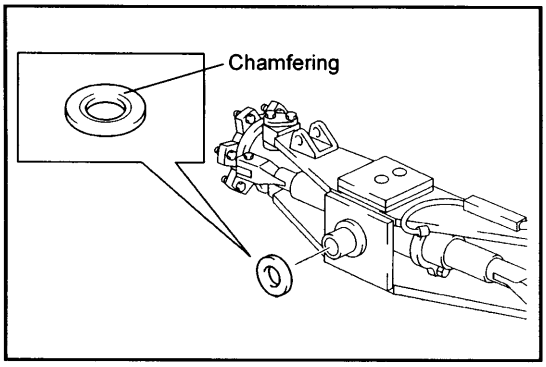
[Point 2]
Inspection:
Measure the rear axle front to rear clearance.

1. Before removing the rear axle ASSY, measure the front to rear clearance on the rear side.

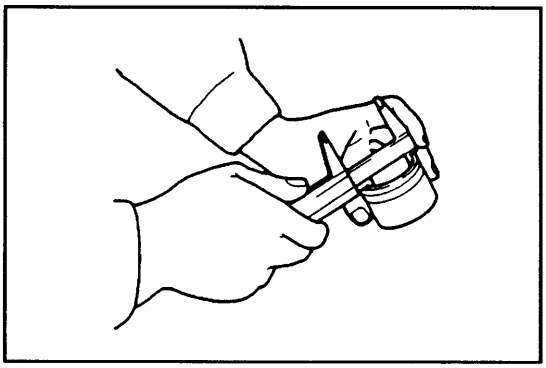
   Standard clearance: 0.3 mm (0.012 in) or less

2. If the measured value does not satisfy the standard, remove the rear axle ASSY and make adjustment by selecting the spacer.

   Spacer thickness:
   0.3·0.5·1.2·2.3·3.0·3.5·4.0·4.5 and 5.0 mm (0.012·0.020·0.047·0.091·0.118·0.138·0.157·0.177 and 0.197 in)

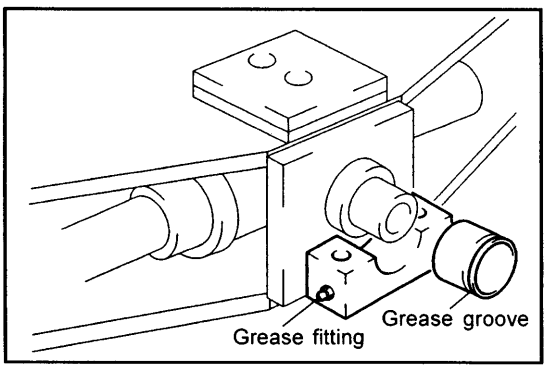


3. Install the spacer at the rear side center pin.
   The first spacer shall be installed with its chamfered at the inside diameter in contact with the center pin boss.



[Point 3]
Inspection:
Inspect the inside diameter of the rear axle center pin bushing.

Limit: 52.0 mm (2.047 in)



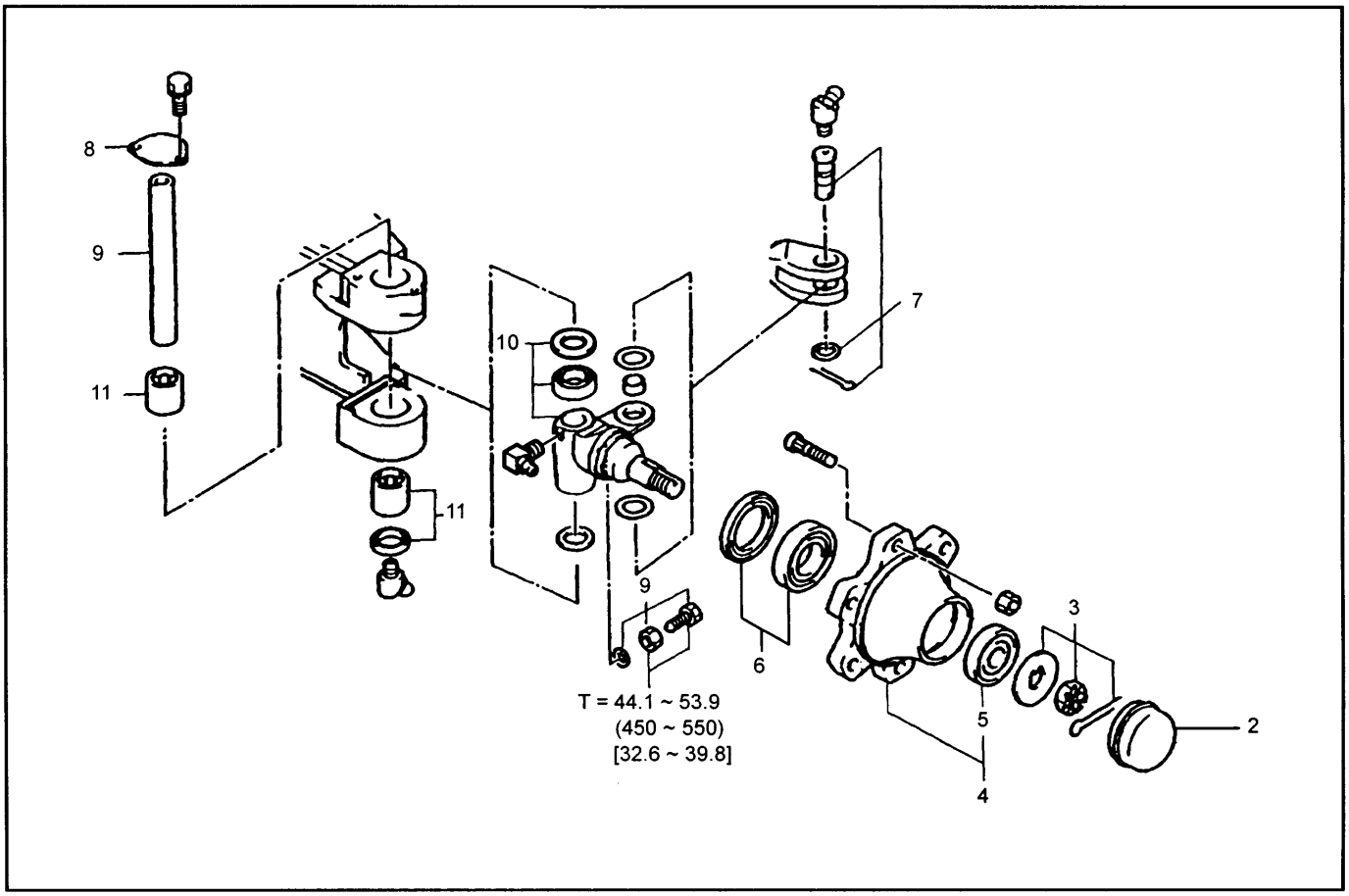
Installation:
Apply molybdenum disulfide grease on the bushing and install the bushing by aligning the grease groove in the bushing with the grease fitting position.

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REAR AXLE HUB·STEERING KNUCKLE

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Jack up the vehicle and remove rear wheels.

2 Remove the hub caps. **[Point 1]**

3 Remove the castle nut and claw washer. **[Point 2]**

4 Remove the outer bearing and axle hub. **[Point 3]**

5 Remove the bearing outer race from the axle hub. **[Point 4]**

6 Remove the inner bearing and oil seal. **[Point 5]**

7 Disconnect the tie rod (on the knuckle side).

8 Remove the king pin cover (on the LH side) or the tire angle sensor (on the RH side) (Vehicle W/ SAS).

9 Remove the king pin lock bolt and king pin. **[Point 6]**

10 Remove the thrust bearing, spacer and steering knuckle.

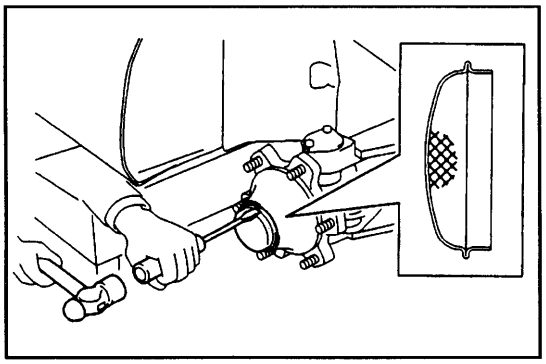
11 Remove the king pin oil seal and needle bearing. **[Point 7]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

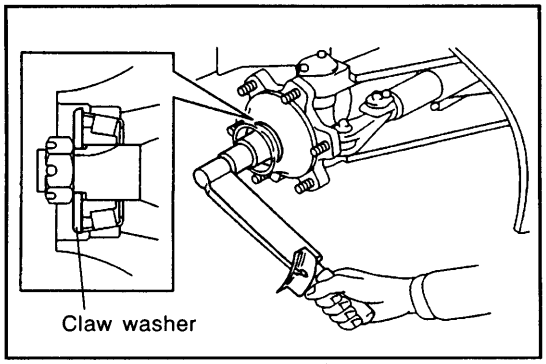
Note:
After installation, add MP grease through grease fittings.

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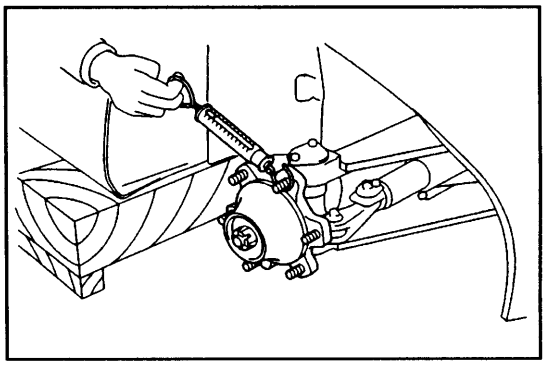
Point Operations

[Point 1]
Installation:
Fill MP grease in the hub cap, and install by tapping the flange portion.



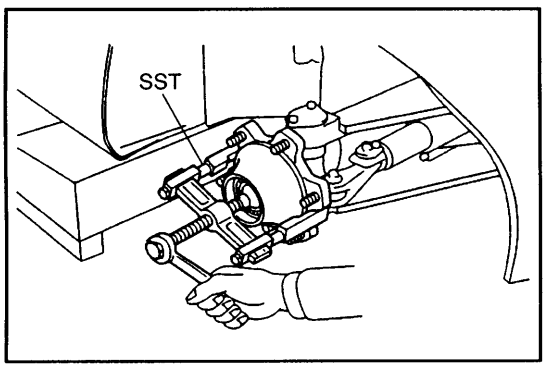
[Point 2]
Installation:
Adjust the rear axle hub starting force.
1. Install the claw washer in the correct direction.
2. Install the castle nut and temporarily tighten it to a torque of 15 to 32 N·m (150 to 330 kgf-cm) [10.9 to 23.9 ft-lbf].
3. Rotate the hub by 3 to 5 turns to run in the bearing.
4. Set a spring scale on a hub bolt, and measure the starting force.

Standards:

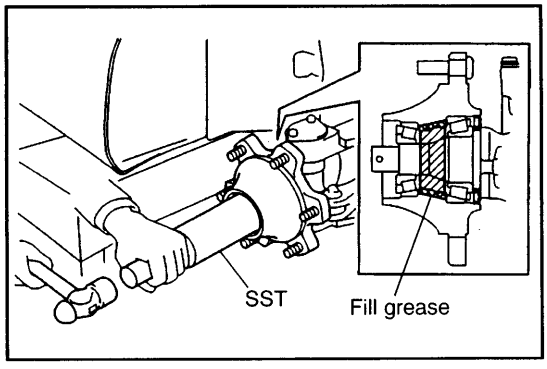


1 ton series (excluding 40-7FB15)	15 ~ 39 N (1.5 ~ 4.0 kgf) [3.3 ~ 8.5 lbf]
2 ton series (excluding 40-7FB20·25) and 40-7FB15	20 ~ 58 N (2.0 ~ 5.9 kgf) [4.4 ~ 13.0 lbf]
3·J3.5 ton and 40-7FB20·25	15 ~ 44 N (1.5 ~ 4.5 kgf) [3.3 ~ 9.9 lbf]

5. If the standard is not satisfied, adjust the degree of castle nut tightening for adjustment.
6. Install a new cotter pin.

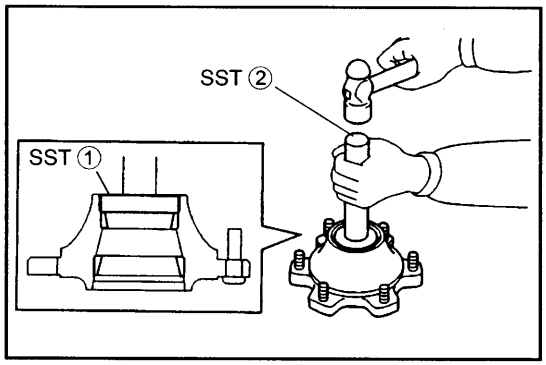


[Point 3]
Removal:
SST 09950-76014-71
(SST 09950-40011)



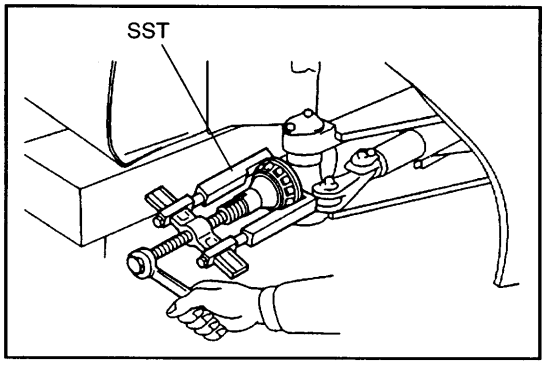
Installation:
Install the axle hub and outer bearing.
1. Fill MP grease in the axle hub and knuckle spindle.
2. Install the axle hub.
3. Use the SST and install the outer bearing roller.
SST 09370-20270-71

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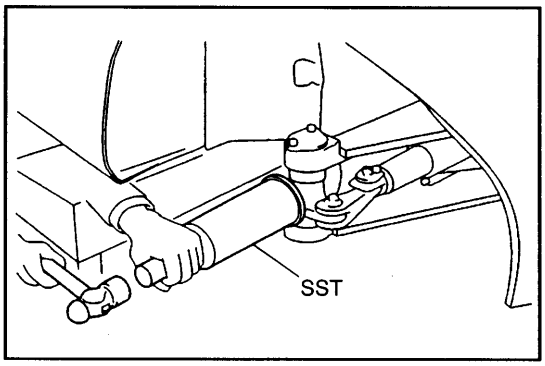


[Point 4]
Removal:
Use a brass bar and remove the bearing outer race.

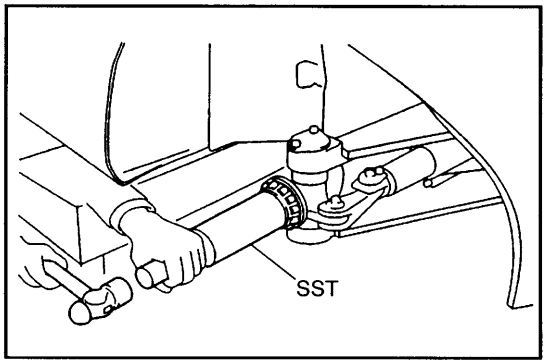
Installation:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)



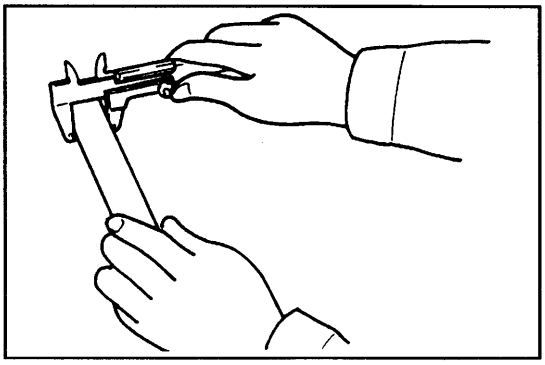
[Point 5]
Removal:
SST 09950-76014-71
(SST 09950-40011)



Installation:
Install the oil seal and inner bearing.
1. Use the SST and install the oil seal.
SST 09370-10410-71



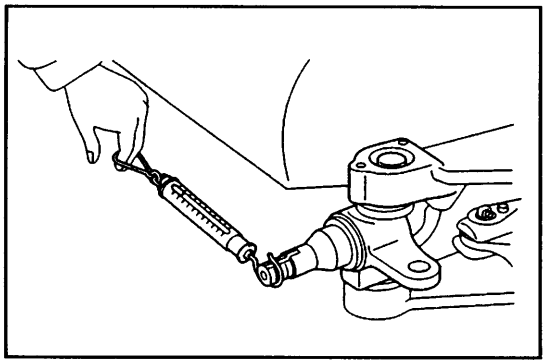
2. Use the SST and install the inner bearing.
SST 09370-20270-71

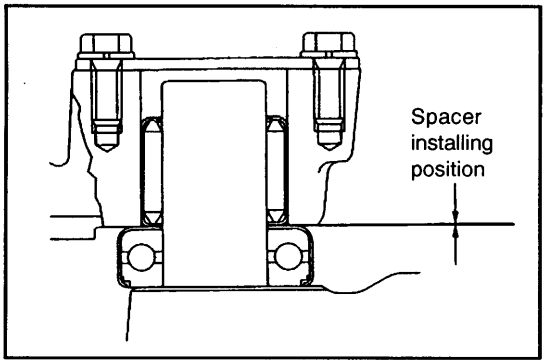


[Point 6]
Inspection:
Measure the king pin outside diameter.

Limit: 27.8 mm (1.094 in)

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Installation:

Measure the steering knuckle starting force.

1. Temporarily install the king pin and king pin lock bolt. Select the spacer so as to minimize vertical looseness of the knuckle, and install it on top of the thrust bearing.

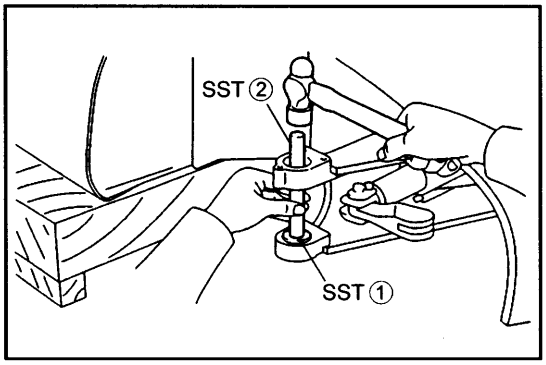
   Spacer thickness: 3.0, 3.5, 4.0 and 4.5 mm (0.118, 0.138, 0.157 and 0.177 in)

2. Set a spring scale at the tip end of the knuckle spindle, and measure the starting force.

   Standard: 19.3 N (2.0 kgf) [4.4 lbf] or less

3. If the standard is exceeded, check the king pin for bend, the needle bearing for damage and axle beam for deformation.

4. Tighten the lock nut for the king pin lock bolt.

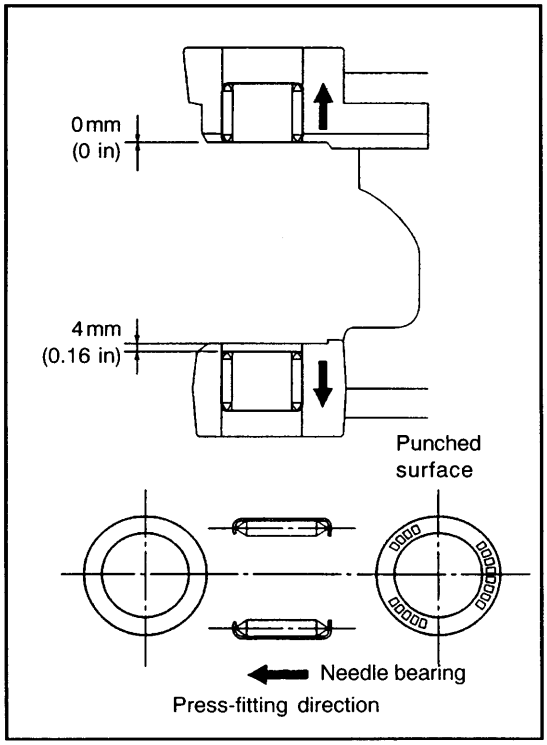


[Point 7]

Removal:

Remove the king pin oil seal and needle bearing.

1. Use a straight-edge screwdriver to remove the dust seal and oil seal.
2. Use the SST and remove the needle bearing.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)



Installation:

Install the needle bearing and king pin oil seal.

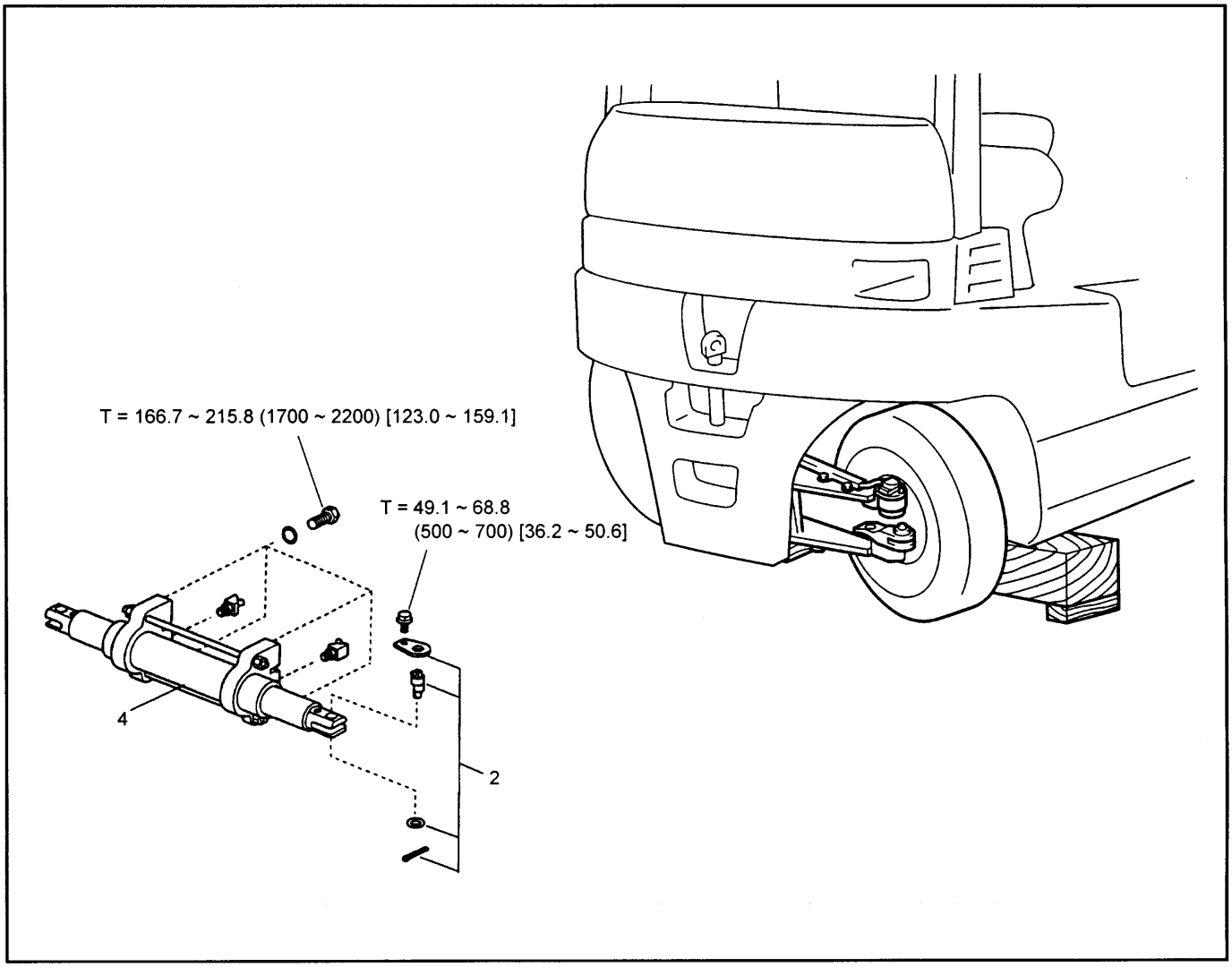
1. Use the SST and install the needle bearing.
   Check the needle bearing press-fitting surface, pressing direction and installation depth.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)
2. Install the dust seal.
3. Use the SST and install the oil seal.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)

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REAR AXLE CYLINDER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Jack up the vehicle.

2 Disconnect the tie rod (on the piston rod side). **[Point 1]**

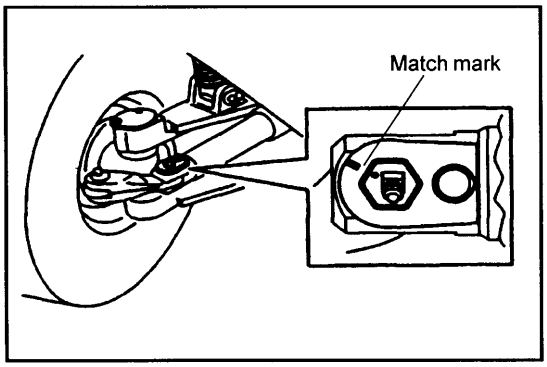
3 Disconnect the rear axle cylinder hose and remove the fitting. **[Point 2]**

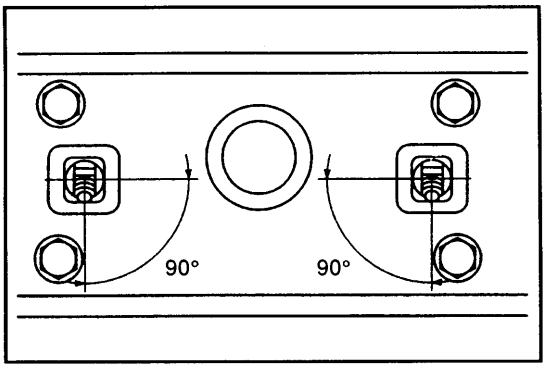
4 Remove the rear axle cylinder.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Point Operations

[Point 1]
Removal:
Mark the punch mark position on each of cylinder end pins LH and RH.

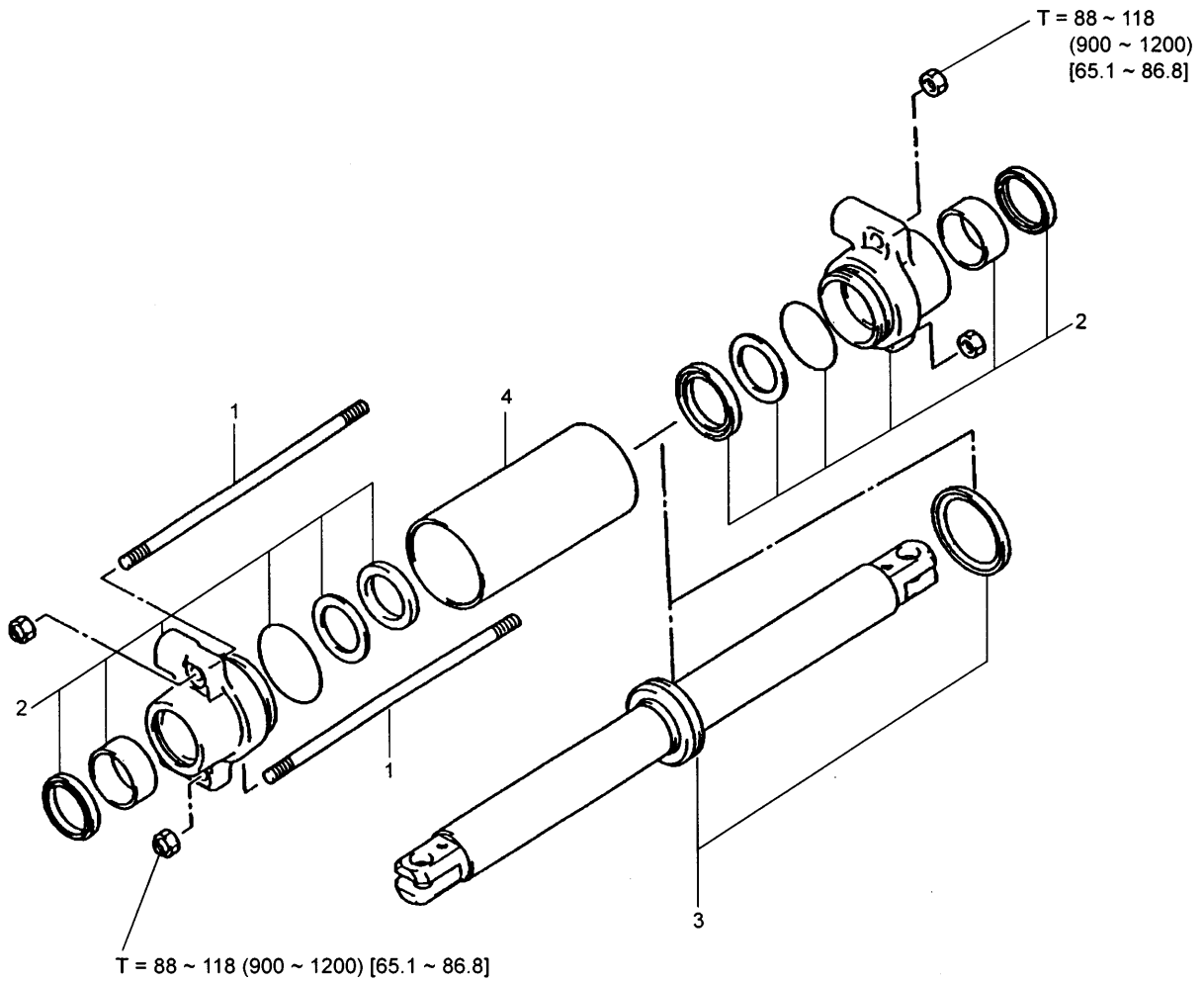
Installation:
Install each cylinder end pin by aligning the punch mark with the mark.

[Point 2]
Installation:
Install the fitting in the illustrated direction.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the through bolt.

2 Remove the piston rod guide.

3 Remove the piston rod. **[Point 1]**

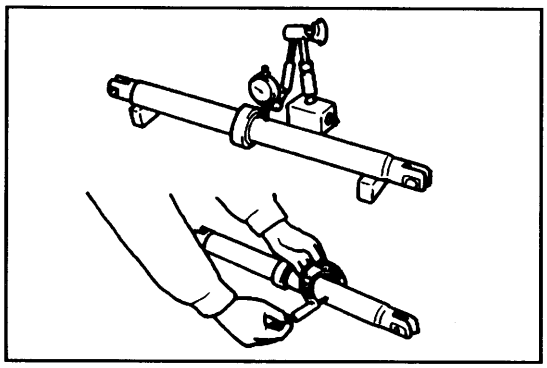
4 Inspect the cylinder. **[Point 2]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Coat hydraulic oil before reassembly.

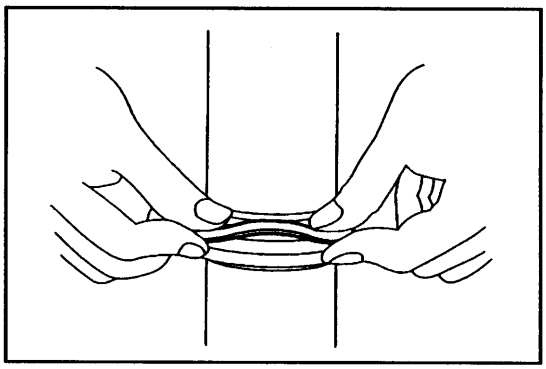
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Point Operations

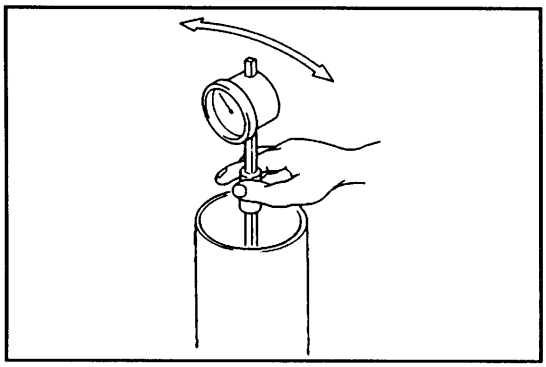
[Point 1]
Inspection:
Measure the piston rod outside diameter.
Limit: 49.92 mm (1.9654 in)

Inspection:
Measure the bend of the piston rod.
Limit: 0.5 mm (0.020 in)



Reassembly:
Warm the seal ring to a little below 80°C (176°F) in hot oil or water before installation.
Do not stretch it excessively.

Caution:
Operate carefully to avoid scalding.



[Point 2]
Inspection:
Measure the rear axle cylinder bore.

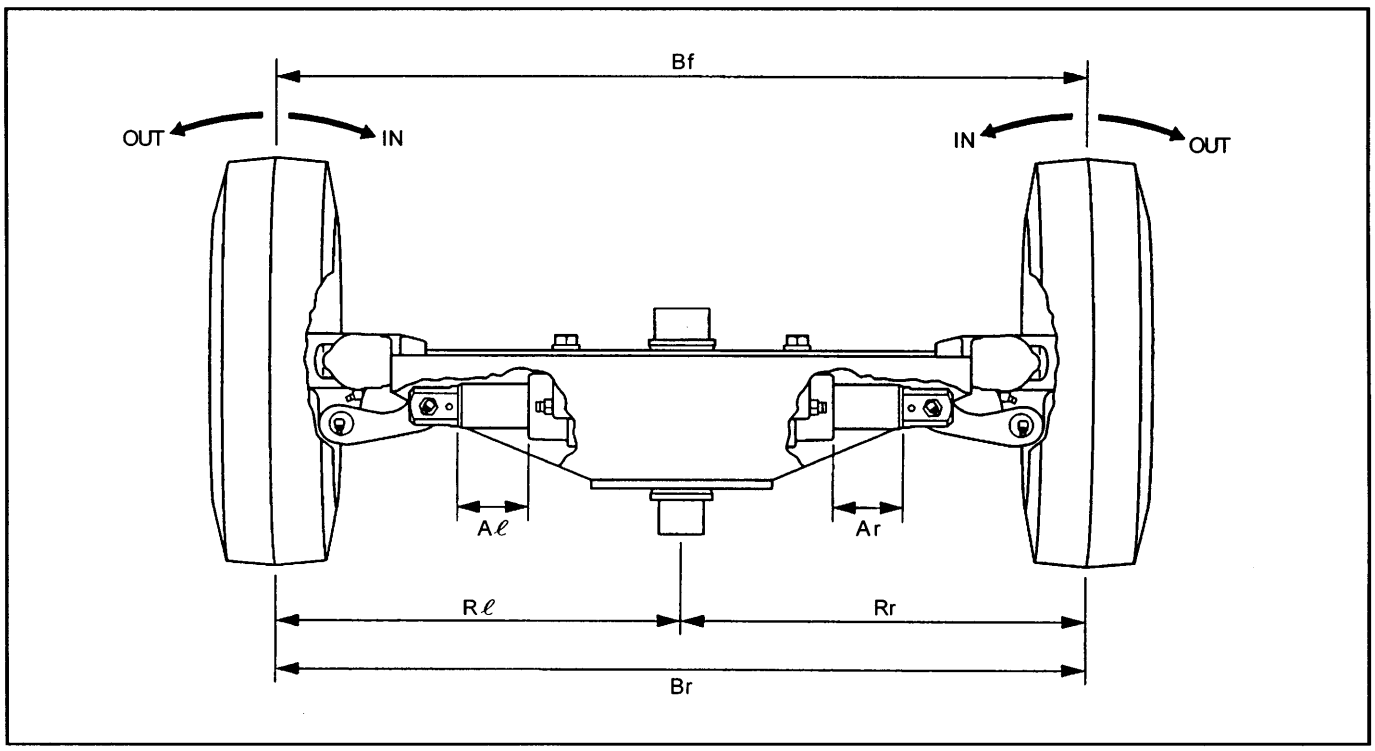
Limit:
1 and 2 ton series (excluding 40-7FB20·25): 76.35 mm (3.0059 in)
3·J3.5 ton and 40-7FB20·25: 80.35 mm (3.1634 in)

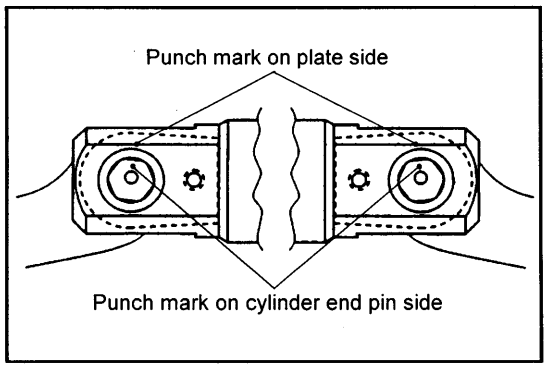
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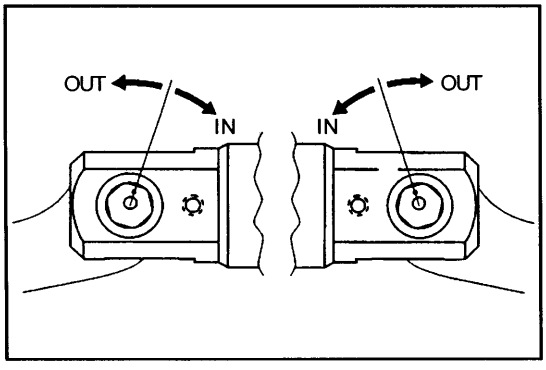
REAR WHEEL ALIGNMENT

Toe-in Inspection

1. Check to see that dimensions Ar and Aℓ of the rear axle cylinder are equal.
2. Measure the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)







Toe-in Adjustment

1. Check to see that Ar and Aℓ of the rear axle cylinder are equal.
2. Align the punch mark on the cylinder end pin (eccentric pin) with the punch mark on the plate on the front side for both the LH and RH sides.
3. Measure and adjust the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)
   If the standard is not satisfied, make adjustment by the cylinder end pin in the range where the difference between Rℓ and Rr is within 0 ± 3 mm (0.12 in).
   (1) When measued value > 4 mm (0.16 in):
   Measure Rℓ and Rr, and adjust the cylinder end pin on the smaller side toward IN.
   (2) When measured value < 4 mm (0.16 in):
   Measure Rℓ and Rr, and adjust the cylinder end pin on the greater side toward OUT.
   Note:
   - **If Rℓ equals to Rr, adjust the same amount on the LH and RH sides.**
   - **If the standard is not attained by adjustment on one side, make adjustment also on the other side.**
4. Install the plate. The plate can be installed with either face up.
5. After adjustment, fully steer the tires and check to see that they do not come into contact with the vehicle body.

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STEERING

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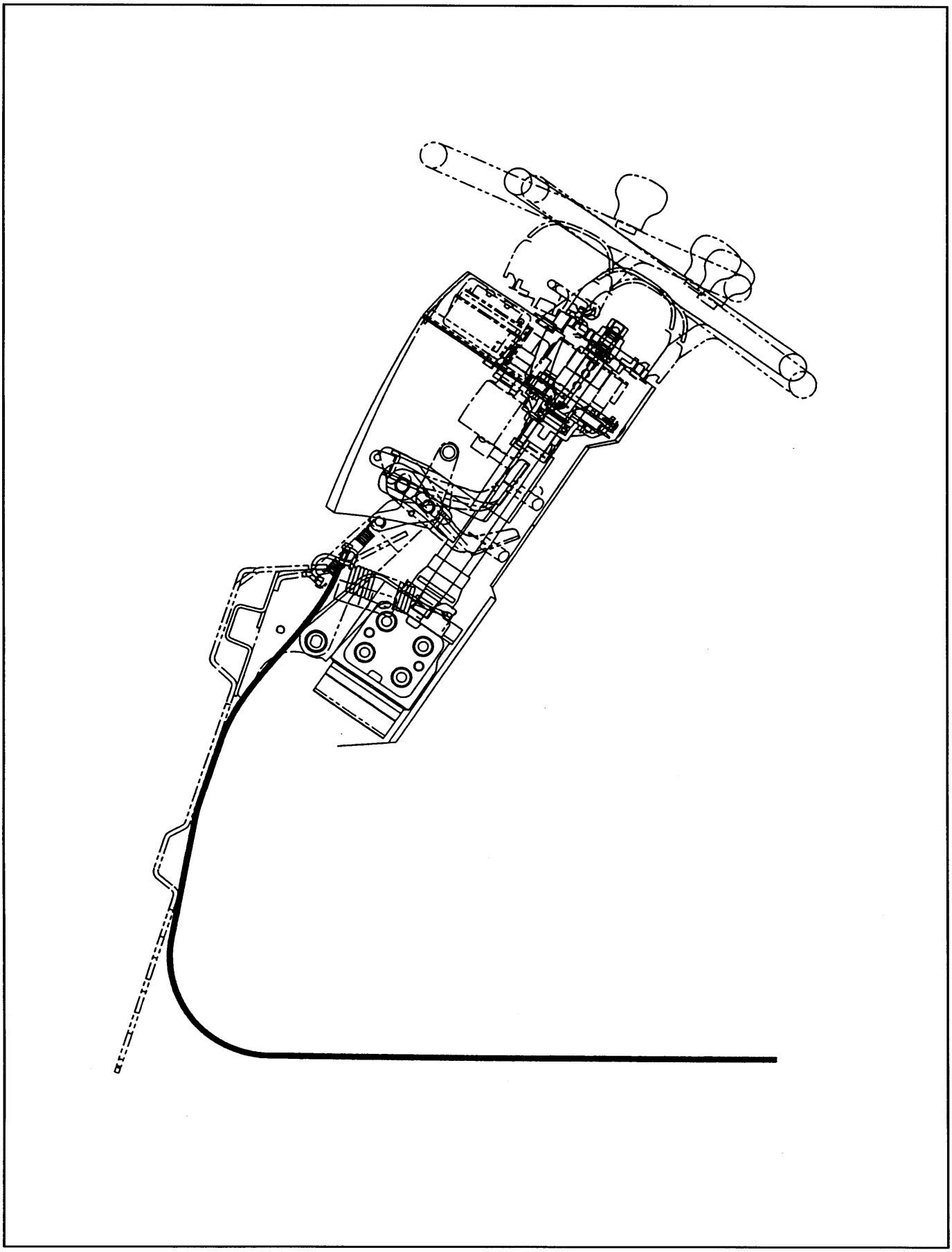
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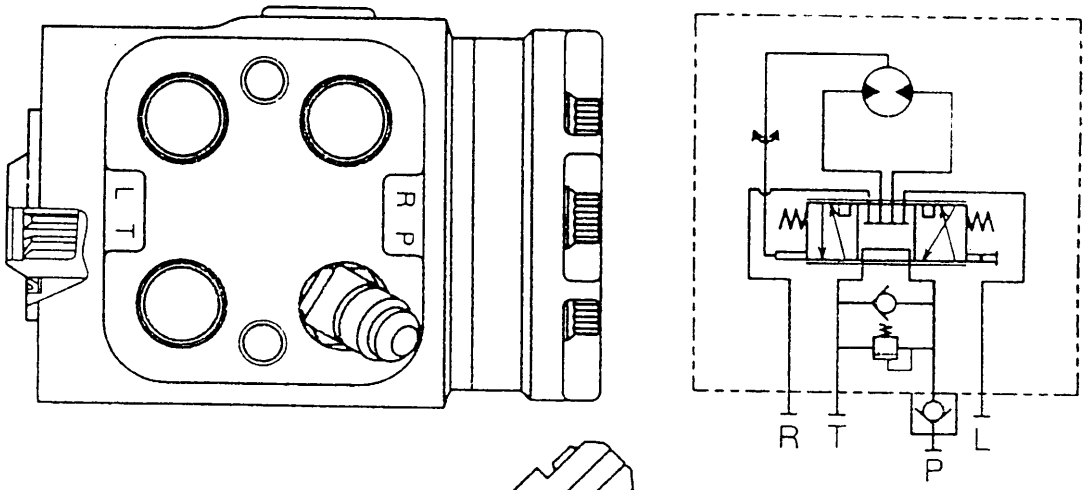
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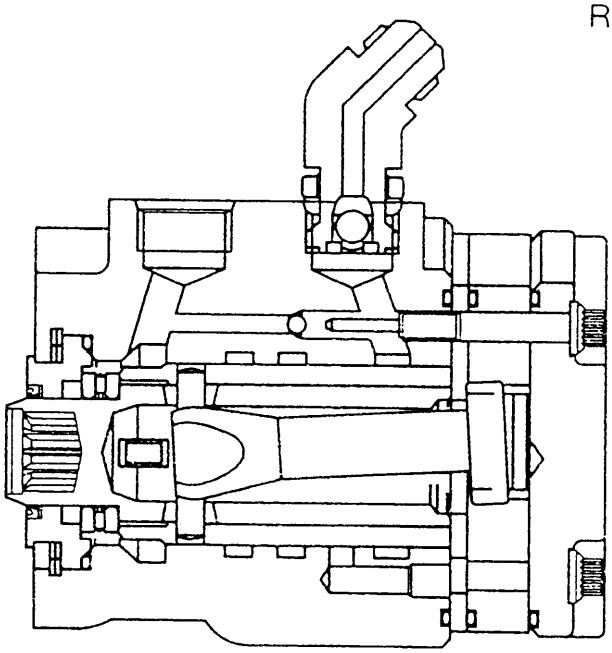
GENERAL

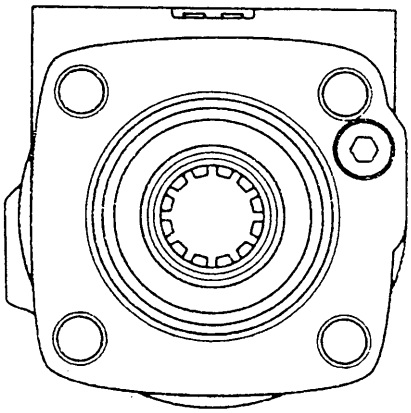


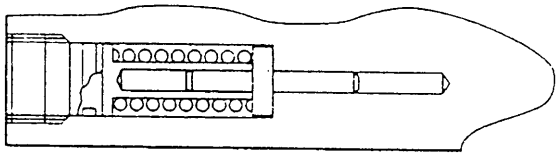
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Hydrostatic Steering Valve (1999. 9 ~ 2000. 8)





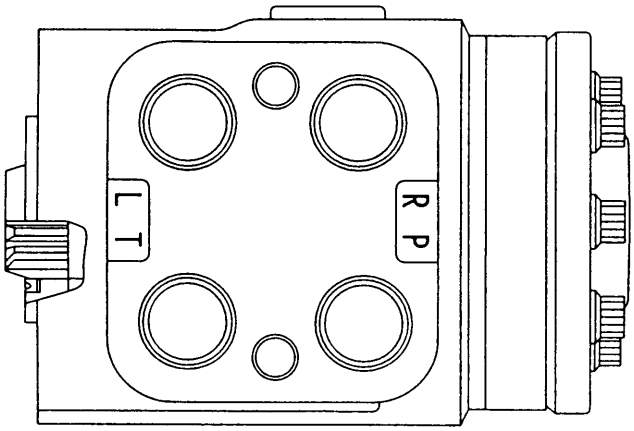


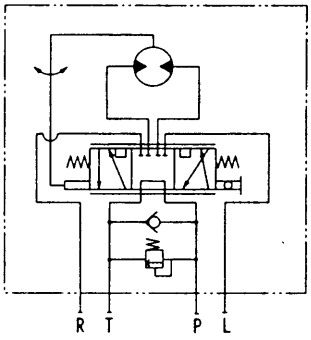


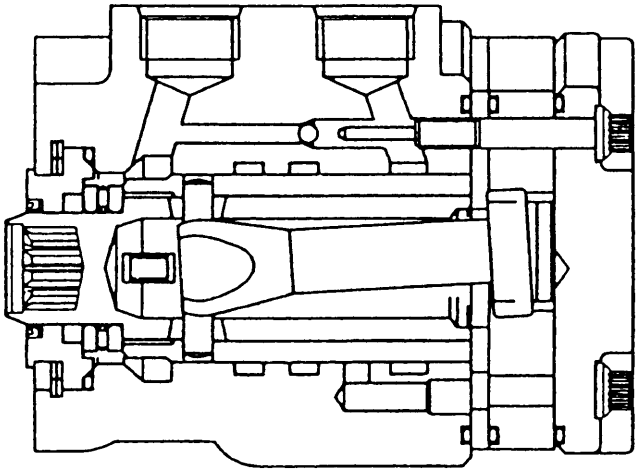
Relief valve

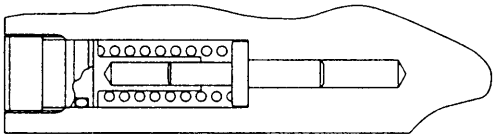
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Hydrostatic Steering Valve (2000. 9~)









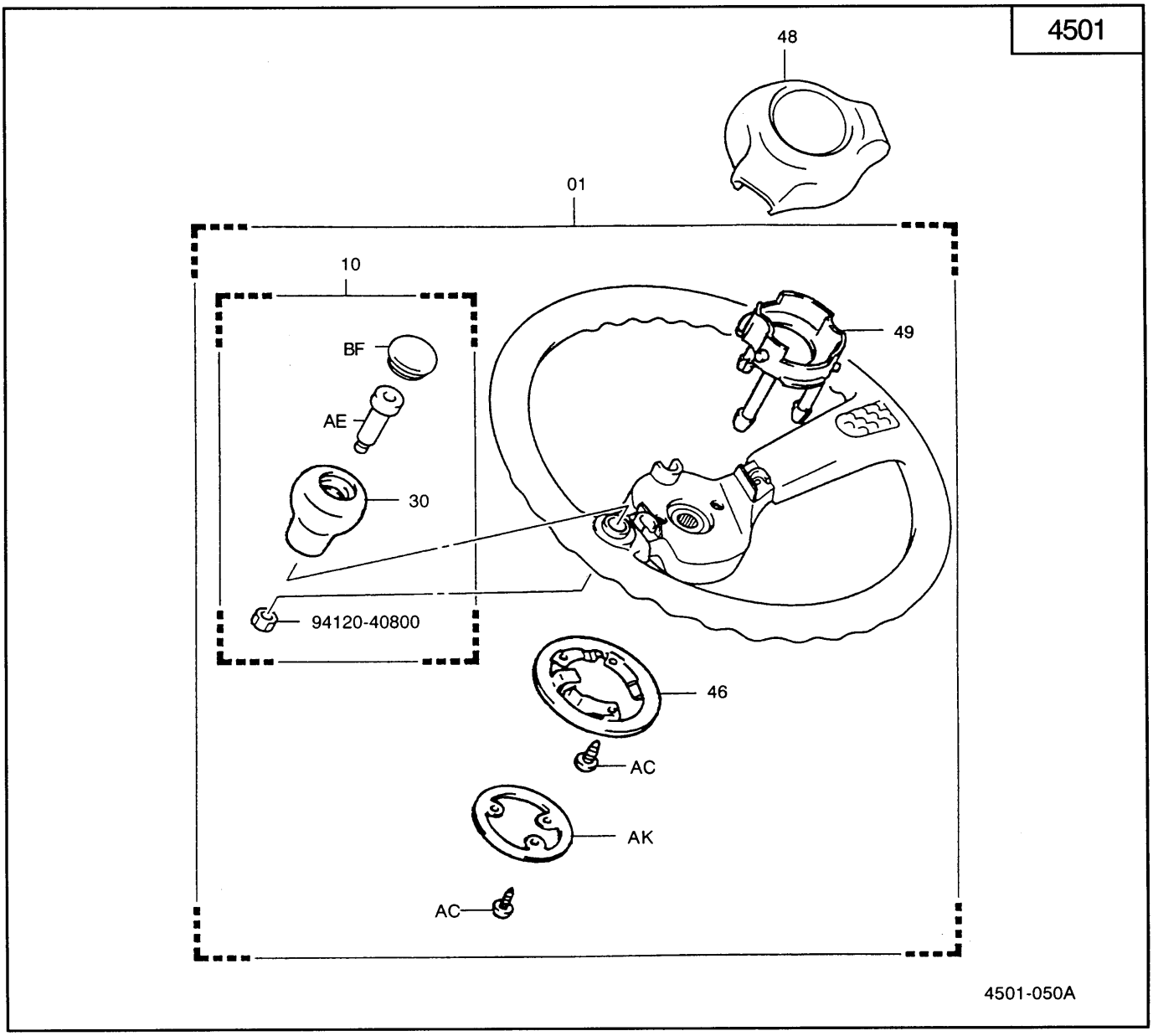
Relief valve

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SPECIFICATIONS

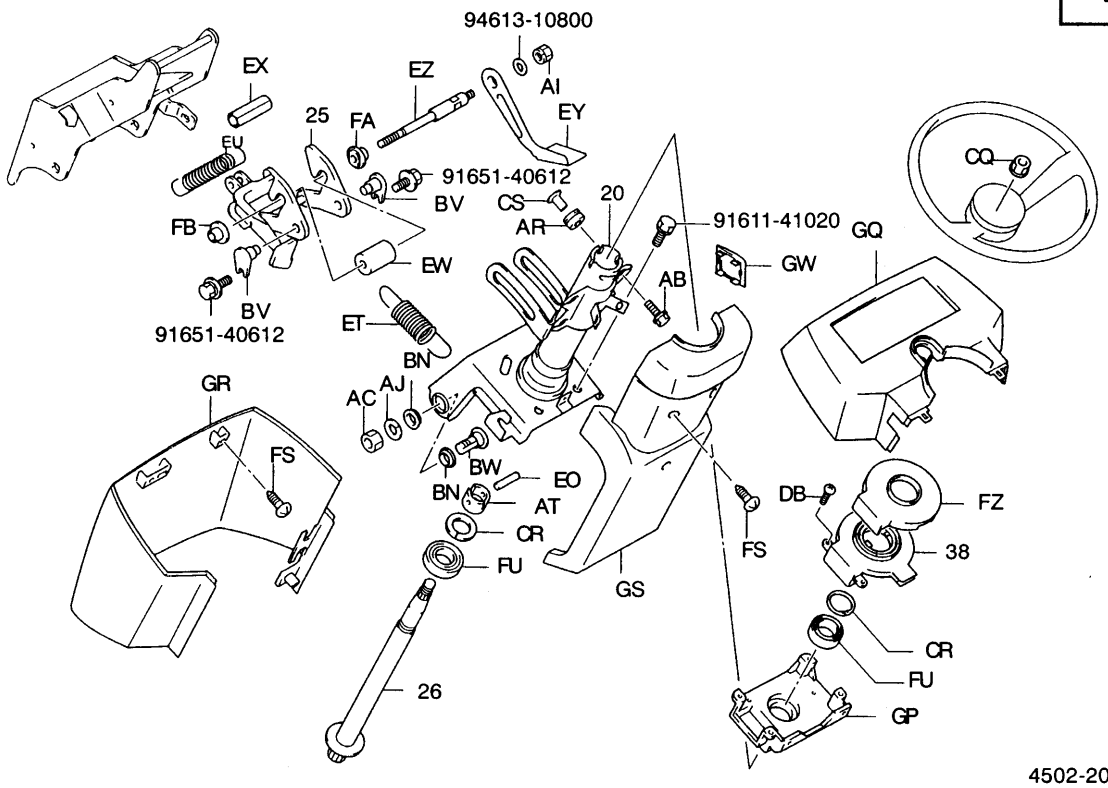
Item \ Vehicle model			1 and 2 ton series (excluding 40-7FB20·25)	40-7FB20·25	3 and J3.5 ton
Steering wheel diameter		mm (in)	360 (14.17)		
Steering wheel play (at idling)		mm (in)	20 ~ 50 (0.79 ~ 1.97)		
Power steering type (Char-Lynn)			Hydrostatic steering		
Hydrostatic steering valve	Delivery	cm^3 (in^3)/rev	88 (5.37)	96 (5.86)	←
	Rated flow rate	ℓ (US gal)/min	12 (3.2)	13 (3.4)	←
	Relief set pressure	kPa (kgf/cm^2) [psi]	8340 (85) [1210]	←	9810 (100) [1420]

COMPONENTS



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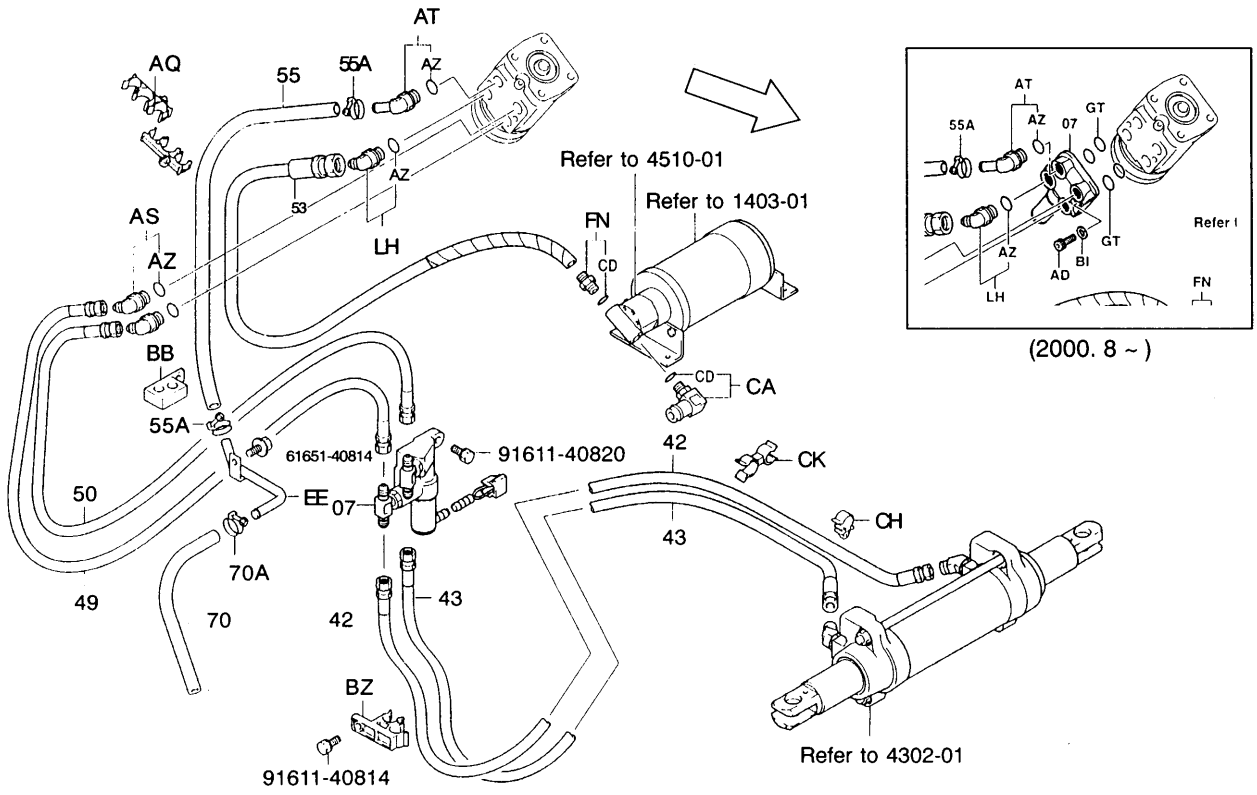
4502



4502-202A

(1999. 9 ~ 2000. 8)

4507



(2000. 8 ~)

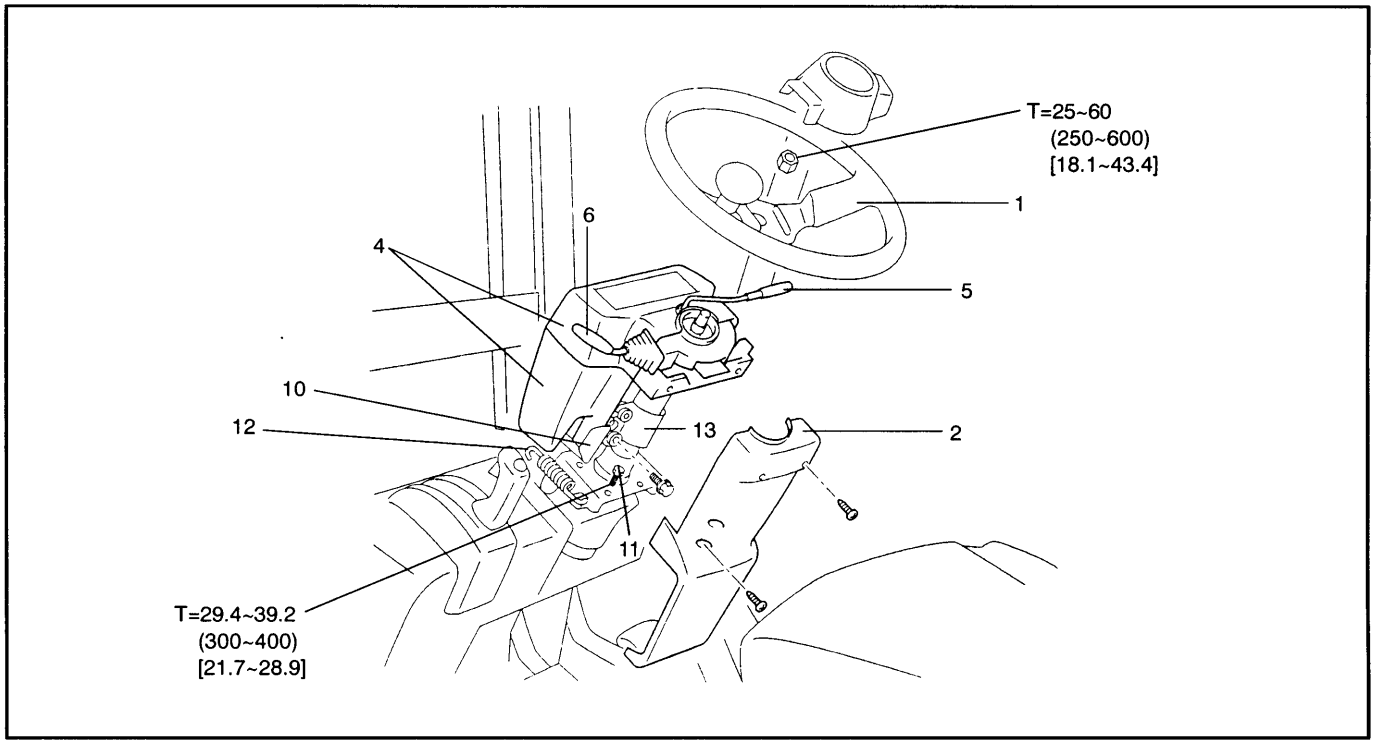
4507-183

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STEERING WHEEL·MAST JACKET

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

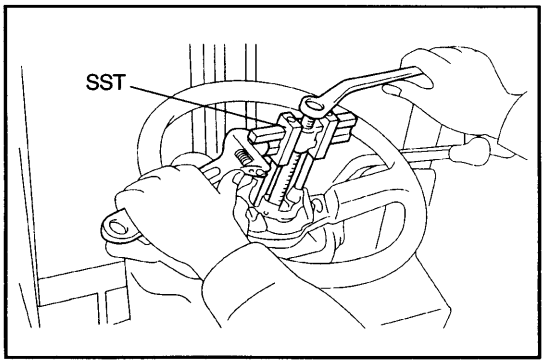
1 Remove the steering wheel. **[Point 1]**
2 Remove the column cover (rear).
3 Disconnect the connectors of the display, turn signal switch, direction switch and steering angle sensor.
4 Disconnect the lamp switch and key switch connectors, and remove the column covers (upper and lower).
5 Remove the direction switch.
6 Remove the turn signal switch.
7 Remove the steering angle sensor.
8 Remove the spring pin and collar. **[Point 2]**
9 Remove the tilt lock mechanism. **[Point 3]**
10 Disconnect the seat stand opening device.
11 Remove the steering valve set bolt and keep the valve free.
12 Remove the return spring.
13 Remove the mast jacket ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

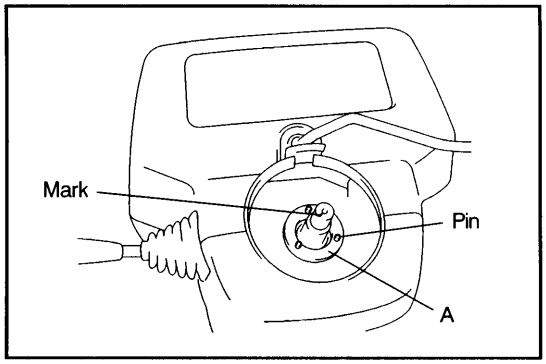
Note:
- **Apply MP grease on each sliding portion of the tilt lock mechanism and seat stand opening device.**
- **Fill MP grease at the coupling between the tilt steering shaft and steering valve.**

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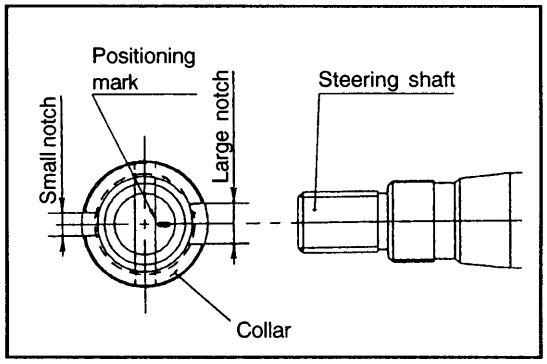


Point Operations

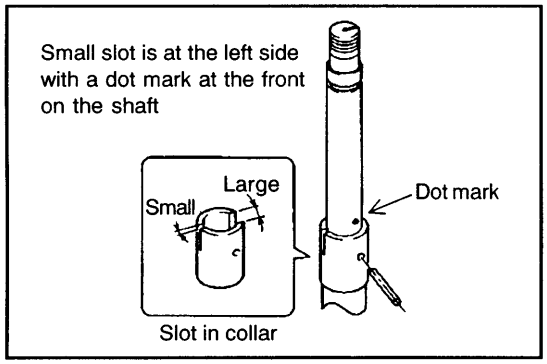
[Point 1]
Removal:
SST 09950-76003-71
(SST 09950-50012)



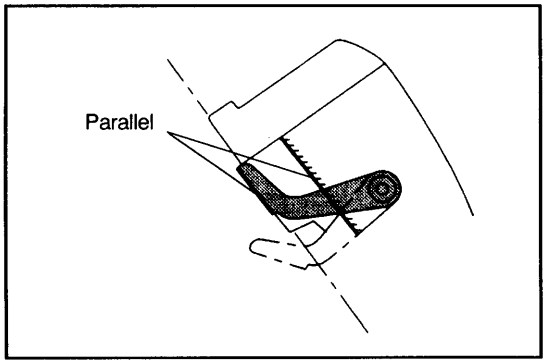
Installation:
Steering wheel installation procedure
1. Apply rubber grease on sliding face A of the turn signal switch.
2. Install the steering wheel by aligning the positioning mark (linear mark) on the tip end of the steering shaft with the steering knob position.
3. After installation, rotate the steering wheel. When the steering wheel is rotated, pins (3 pcs.) on the turn signal switch are automatically set in the holes on the steering wheel side.



[Point 2]
Installation:
Install the collar with the larger notch aligned with the steering shaft positioning mark.



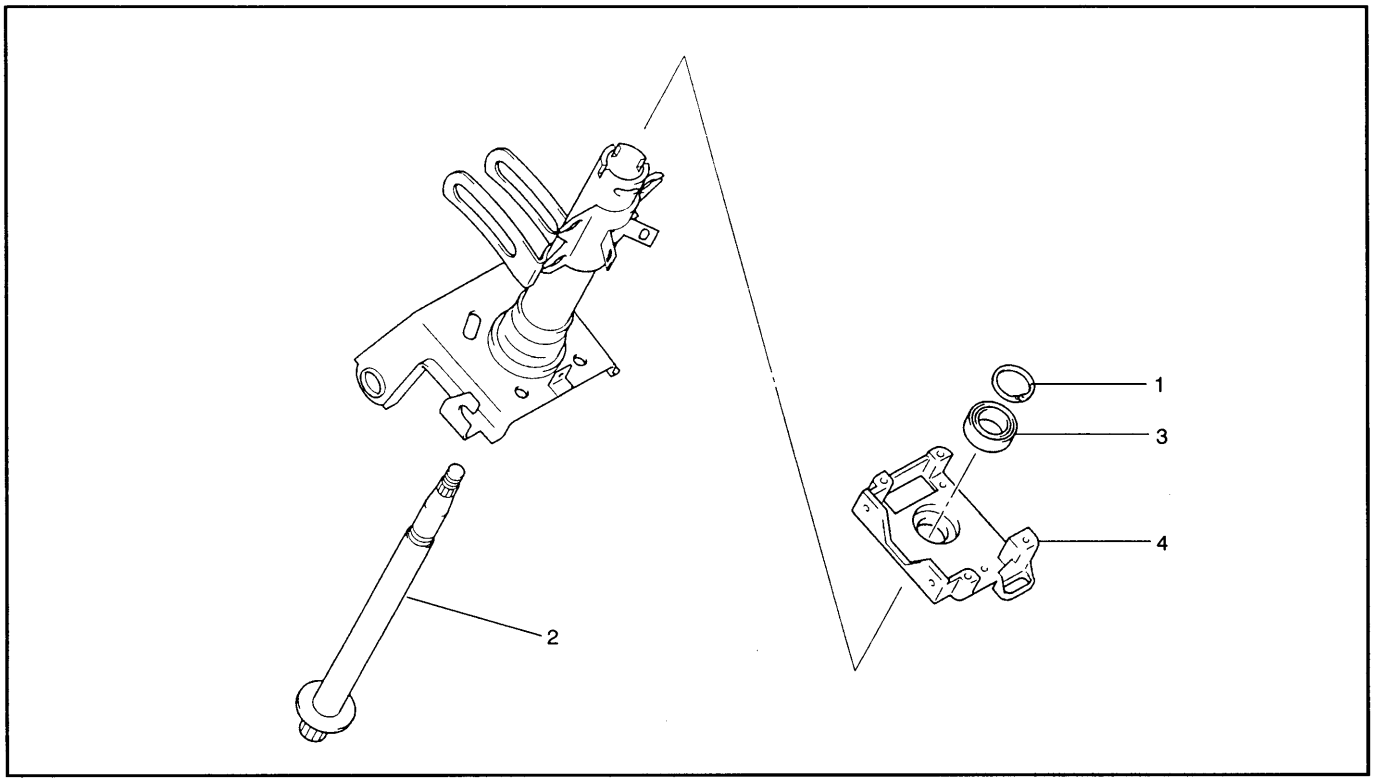
Collar for steering wheel angle sensor mounting direction mark.
Identification mark is newly made on the steering shaft to indicate the spring pin position so that the pin can be inserted through the sensor collar hole to the shaft in proper orientation, as shown in the illustration.



[Point 3]
Installation:
Install so that the tilt lever line and meter box line are in parallel as illustrated, and check to see if tilt lock operation is normal.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the snap ring.

2 Remove the steering shaft.

3 Remove the bearing.

4 Remove the turn signal switch bracket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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HYDROSTATIC STEERING VALVE ASSY

TROUBLESHOOTING

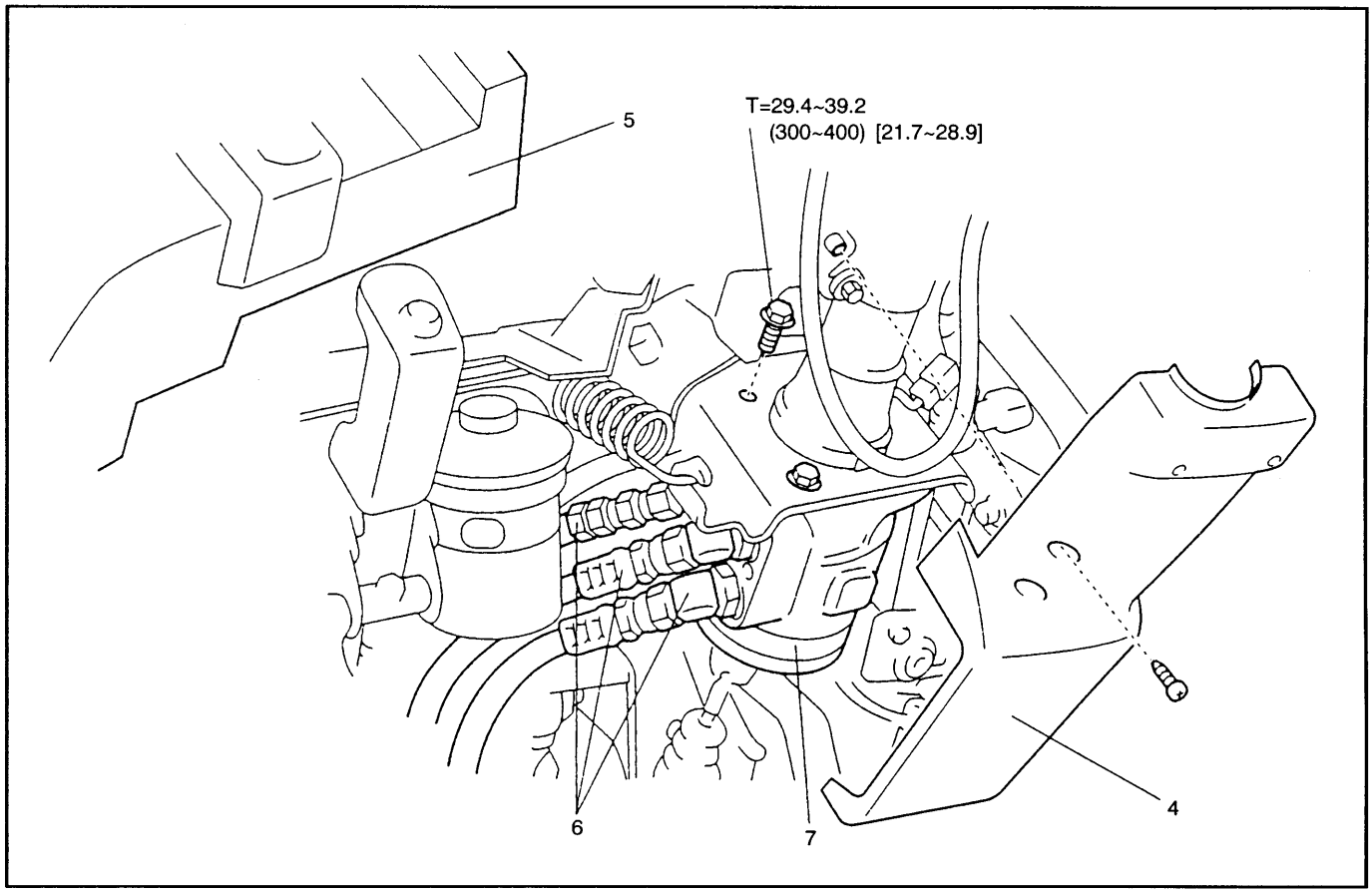
Only hydraulic troubles are covered here. (See Section 5 for electric troubles.)

Phenomenon	Estimated cause	Corrective action
The steering wheel cannot be rotated.	• The steering valve drive shaft is installed incorrectly or damaged. • The piping is damaged.	Inspect and correct or replace. Replace.
The steering wheel is heavy.	• The tire inflating pressure is low. • The oil pressure does not rise. • The high and low pressure pipes are connected reversely. • The power steering cylinder rod is bent or the piston is sticking.	Adjust the inflating pressure. Inspect and adjust the relief pressure. Inspect and correct. Inspect and correct or replace.
The oil pressure does not rise.	• The high and low pressure pipes are connected reversely. • The relief valve is faulty or not closed. • The PS pump function is degraded or the oil volume is insufficient. • The power steering cylinder piston packing is damaged.	Inspect and correct. Inspect and correct. Inspect and correct or replace. Replace.
The steering wheel does not return properly.	• The tire inflating pressure is low. • The steering valve spool does not move smoothly. • The steering knuckle sliding motion is improper.	Adjust the inflating pressure. Correct or replace the steering valve ASSY. Add the lubricant or correct.
The steering wheel does not return to the neutral position when released.	• The steering valve spool does not move smoothly. • The steering valve drive shaft is damaged. • The centering spring is damaged. • The piping is blocked (crushed or clogged).	Correct or replace the steering valve ASSY. Replace the steering valve ASSY. Replace. Inspect and correct or replace.
The play is excessive and the vehicle wobbles.	• Oil moves in the steering valve. • The steering valve spool is not moving correctly. • Air is sucked from the piping. • The steering shaft is defective.	Replace the steering valve ASSY. Correct or replace the steering valve ASSY. Inspect and correct or replace. Inspect and correct or replace.
The steering wheel shim mies.	• The steering valve drive shaft is installed incorrectly.	Inspect and correct.
The tires are steered opposite to the steering wheel operated direction.	• The cylinder piping is connected reversely.	Inspect and correct.
Abnormal noise is generated.	• The relief valve is defective. • Air is sucked from the piping. • The piping is blocked (crushed or clogged).	Correct, inspect the pressure, and adjust. Inspect and correct or replace. Inspect and correct or replace.

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REMOVAL·INSTALLATION (1999. 9 ~ 2000. 8)

T = N·m (kgf-cm) [ft-lbf]

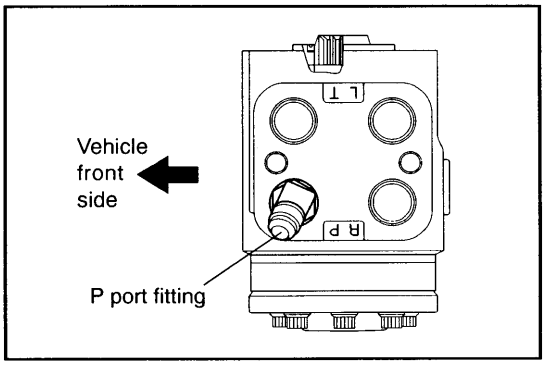


Removal Procedure

1 Disconnect the battery plug.
2 Remove the toe board.
3 Remove the lower panel.
4 Remove the column covers (upper, lower and rear).
5 Remove the instrument panel.
6 Disconnect the piping.
7 Remove the steering valve ASSY.
8 Remove the fitting. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.



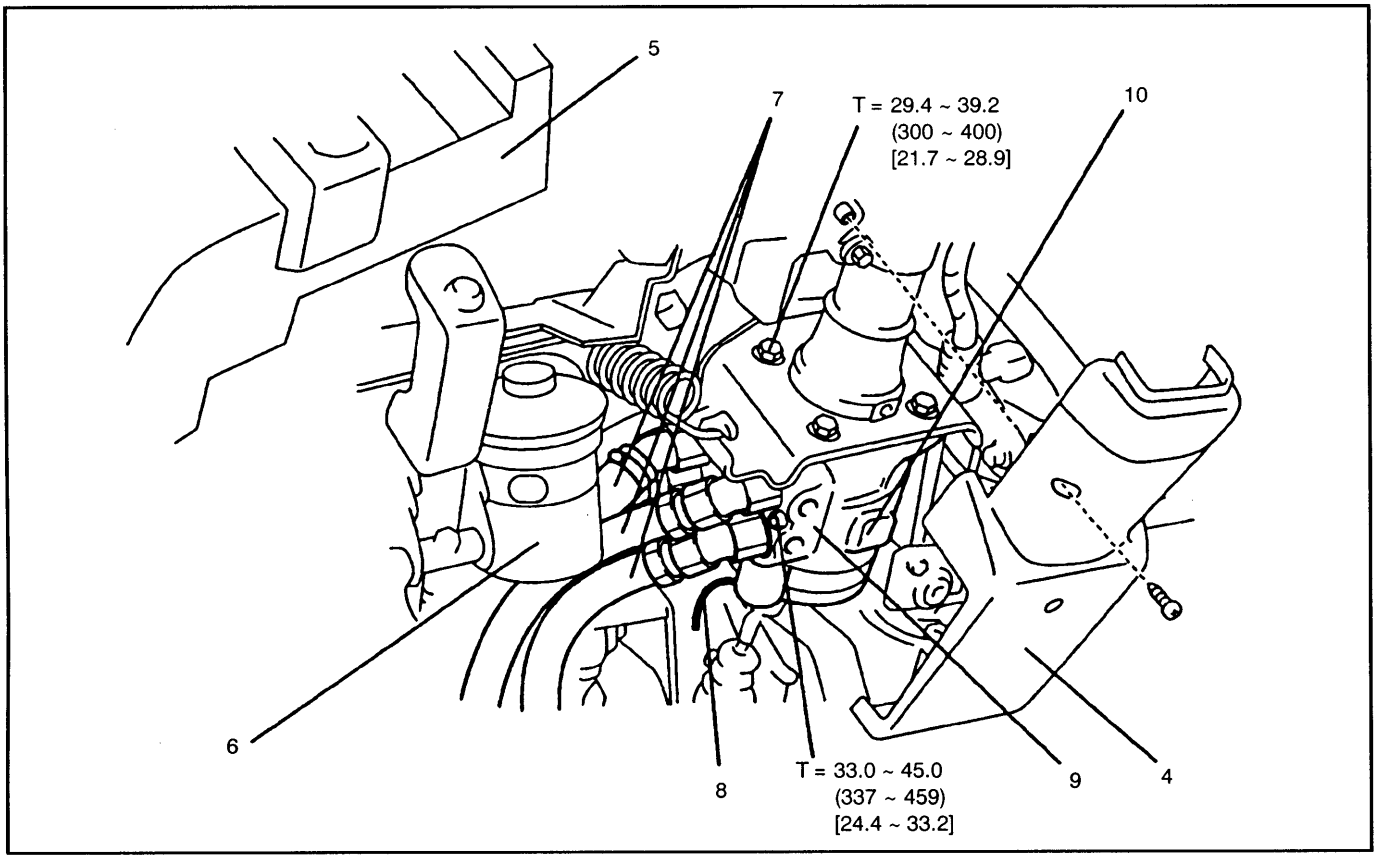
Point Operation

[Point 1]
Installation:
Since the P port fitting is with the check valve, do not install in an incorrect position.

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REMOVAL·INSTALLATION (2000. 9 ~)

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Disconnect the battery plug.

2 Remove the toe board.

3 Remove the lower panel.

4 Remove the column cover.

5 Remove the instrument panel.

6 Remove the brake fluid reservoir tank mounting bolts to set the reservoir tank free.

7 Disconnect the piping.

8 Remove the knob position correcting solenoid wiring.

9 Remove the knob position correcting solenoid valve ASSY W/fitting.

10 Remove the steering valve ASSY.

Installation Procedure

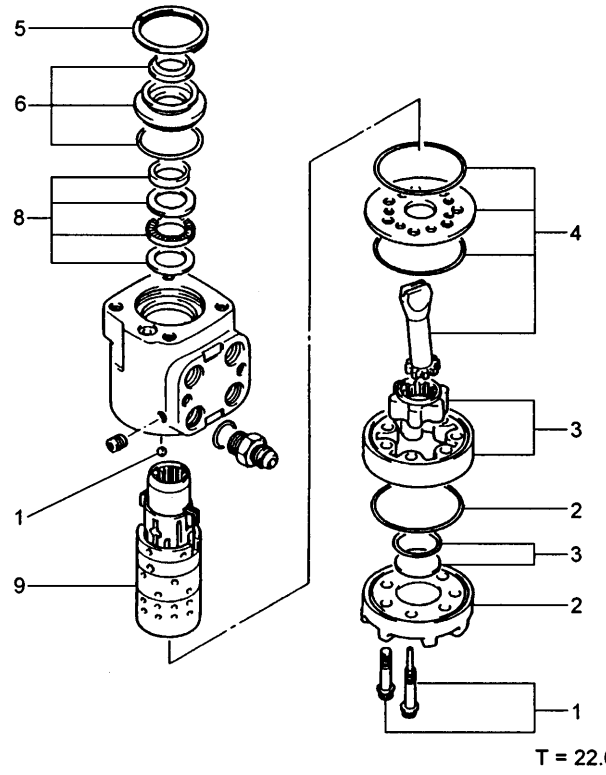
Follow the reverse sequence of the removal.

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
Clean dirt off from ports and joints before disassembly and operate in a clean place.

T = N·m (kgf-cm) [ft-lbf]



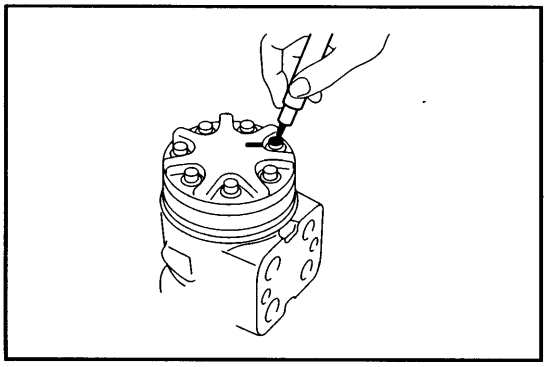
Disassembly Procedure

1 Remove the screw, ball and retainer screw. **[Point 1]**
2 Remove the end cap and O-ring.
3 Remove the spacer, star, O-ring and rotor.
4 Remove the drive, spacer plate and O-ring. **[Point 2]**
5 Remove the retaining ring. **[Point 3]**
6 Remove the seal gland bushing and oil seal.
7 Remove the dust seal from the seal gland bushing.
8 Remove the bearing race and thrust needle.
9 Remove the spool and sleeve ASSY.
10 Remove the pin from the spool and sleeve ASSY. **[Point 4]**
11 Remove the centering spring. **[Point 5]**
12 Remove the sleeve from the spool.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Point Operations

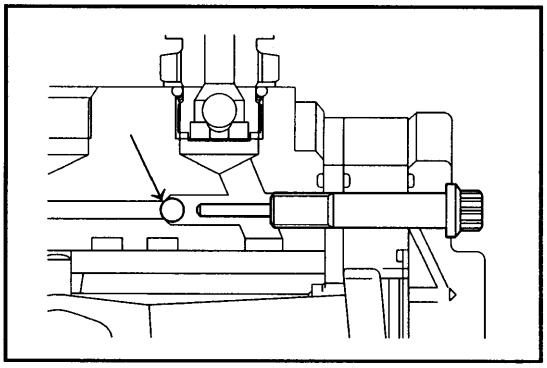
[Point 1]

Disassembly:

Fix the valve ASSY in a vise with the rotor facing upward. Operate carefully since strong holding may cause distortion.

Disassembly:

Put a match mark to prevent an error in each retainer screw tightening position.

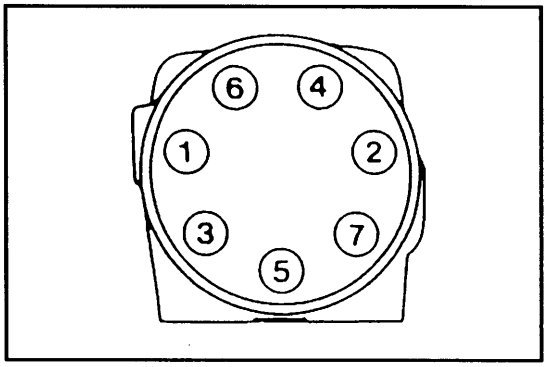


Disassembly:

When removing each retainer screw, carefully operate so as not to lose the steel ball.

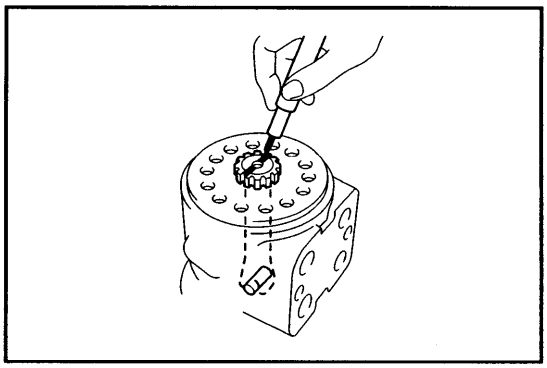
Reassembly:

Put a steel ball in the illustrated position before installing each retainer screw.



Reassembly:

Tighten the screws and retainer screws in the illustrated order.

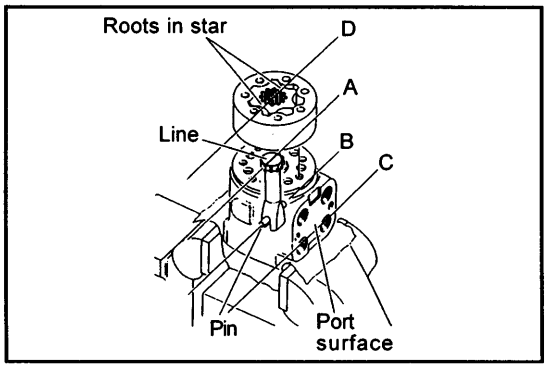


[Point 2]

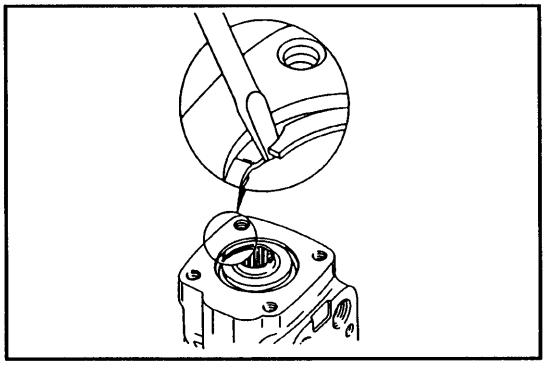
Reassembly:

Reassemble the drive and star as follows:

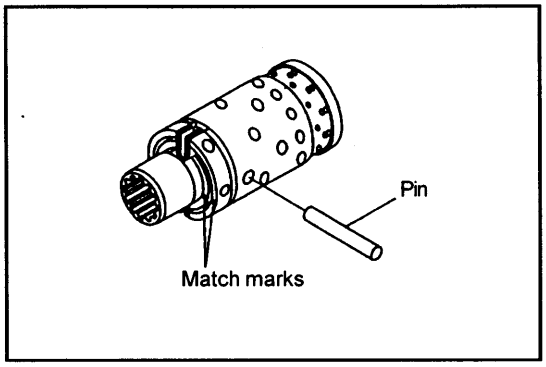
1. Rotate the spool and sleeve ASSY to bring the pin parallel with the housing port surface.
2. Install the O-ring in the housing and place the spacer plate by aligning the bolt holes.
3. Insert the drive and fit the pin.
4. Use a pen and put a line on the drive end in parallel with the pin.
5. Install the rotor and O-ring.
6. Install the star by matching the roots of the gear teeth in the star with the line put in step 4.
7. Rotate the rotor without disengaging the drive and star until the bolt holes are aligned.
8. See that lines A, B, C and D are are parallel as illustrated.



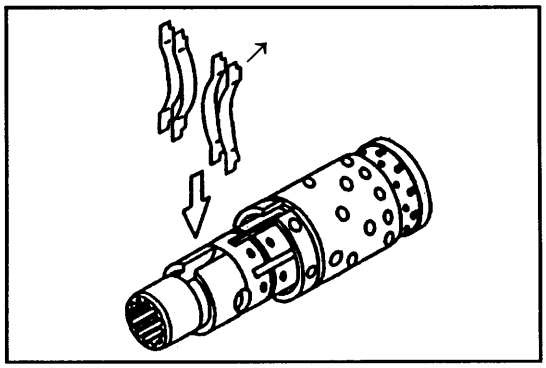
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[Point 3]
Disassembly:
Use a straight-edge screwdriver and remove the retaining ring.

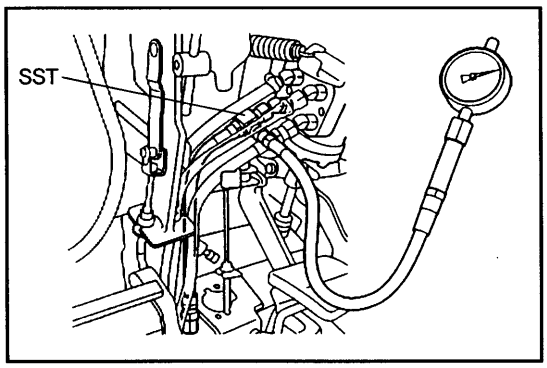


[Point 4]
Disassembly:
Put match marks on the spool and sleeve.



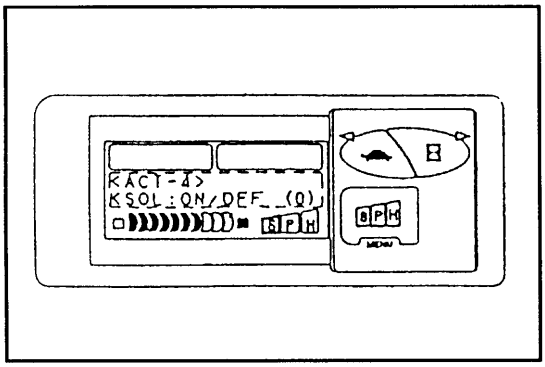
[Point 5]
Reassembly:
Install the centering springs with their notched portions in the illustrated directions.

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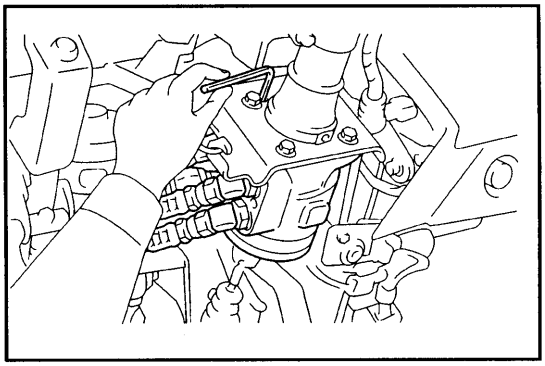


RELIEF PRESSURE INSPECTION·ADJUSTMENT

1. Install a pressure gauge on the P port of the steering valve.
   (1) Disconnect the hose from the P port and connect the adapter.
   SST 09450-23320-71
   (2) Install the pressure gauge.
   Plug size: PT1/8



2. Set the knob position control solenoid to **off** in the analyzer mode. (See page 4-64.)
3. When the steering wheel is rotated beyond the end, relief state is obtained. Read the pressure on the pressure gauge at the time.



Standard:

kPa (kg/cm²) [psi]

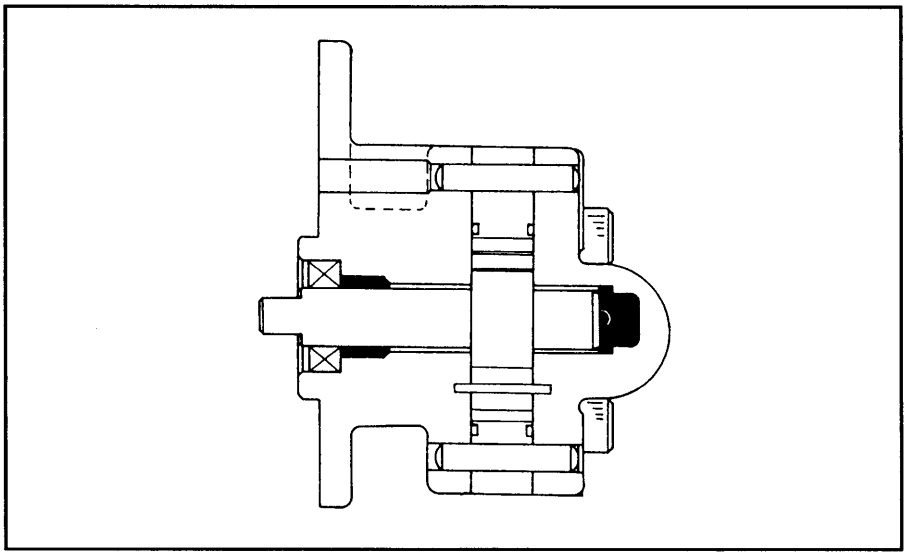
1 and 2 ton series	$8340\ ^{+490}_{0}\ (85^{+5}_{0})\ [1210^{+70}_{0}]$
3 and J3.5 ton	$9810\ ^{+490}_{0}\ (100^{+5}_{0})\ [1420^{+70}_{0}]$

4. If the standard is not satisfied, make adjustment by turning the steering valve adjusting screw.

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POWER·STEERING PUMP ASSY

GENERAL

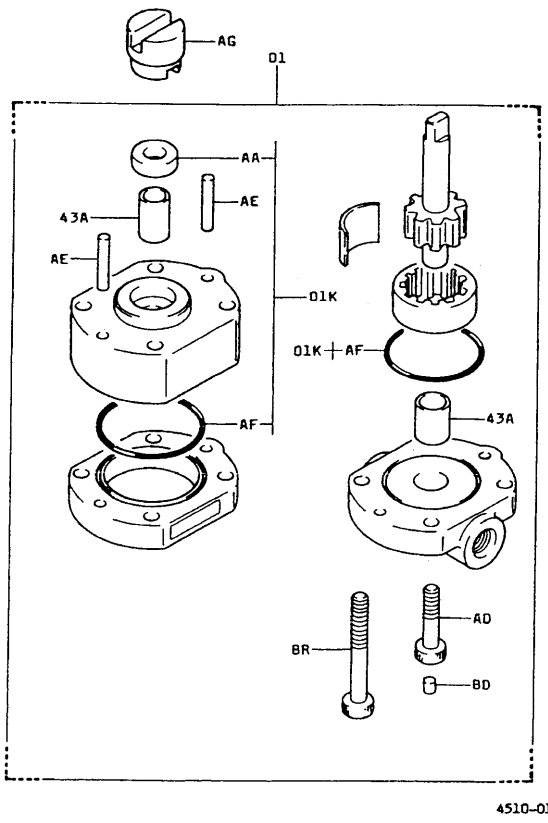


SPECIFICATIONS

Pump model	Standard	TCP-031-B
	Refrigerator spec.	TCP-041-B
Discharge (at 1,800 rpm)	ℓ (US gal)/min.	Approx. 4.8 (1.27)
Theoretical delivery	$cm^3(in^3)$/rev.	3.5 (0.214)

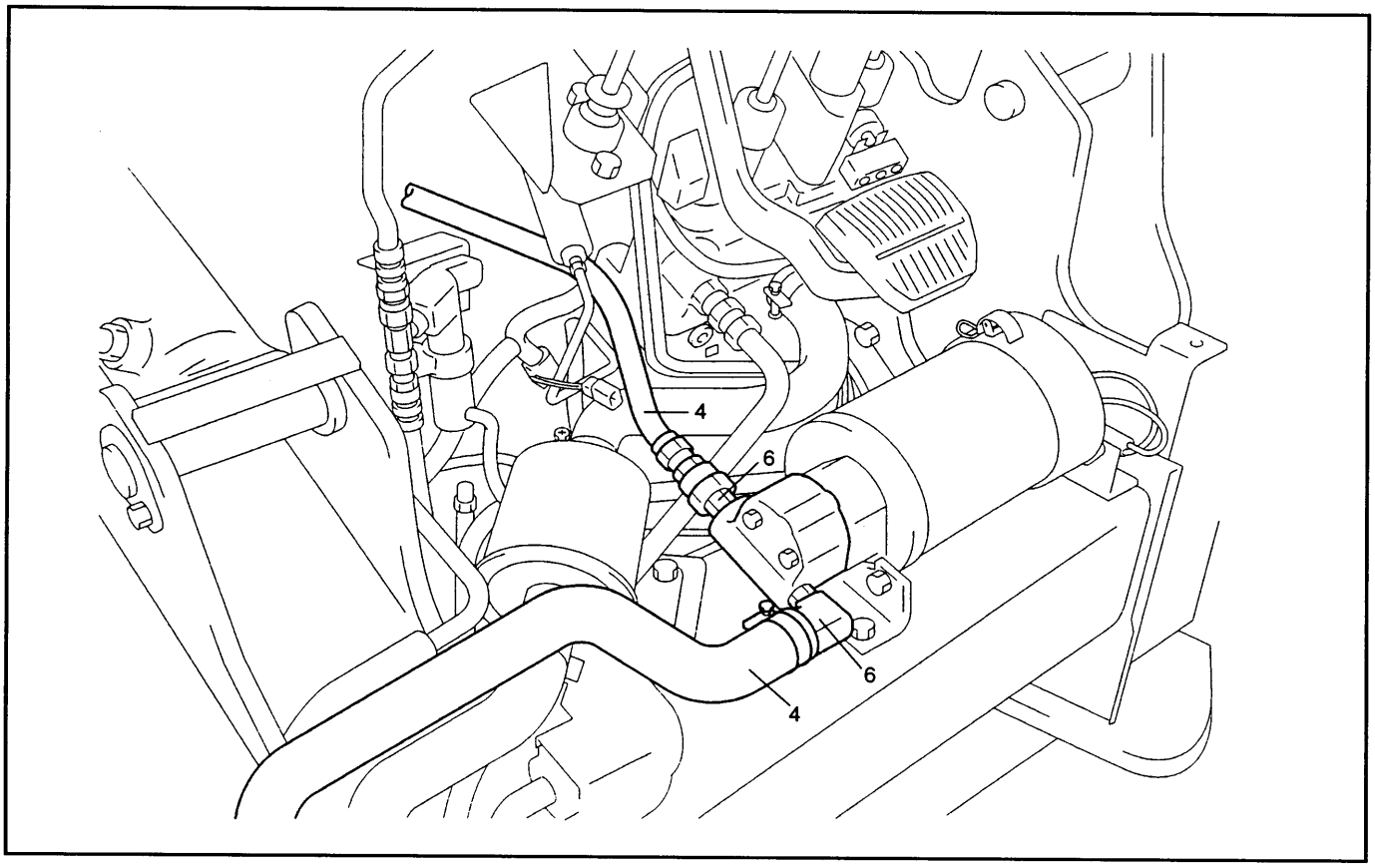
COMPONENTS

4510



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REMOVAL·INSTALLATION



Removal Procedure

1 Open the seat stand and disconnect the battery plug.

2 Remove the toe board.

3 Remove the lower panel.

4 Disconnect hoses from both ends of the PS pump ASSY.

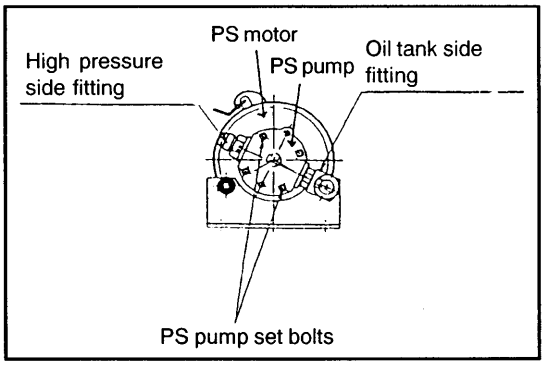
5 Remove the PS pump ASSY W/fitting. **[Point 1]**

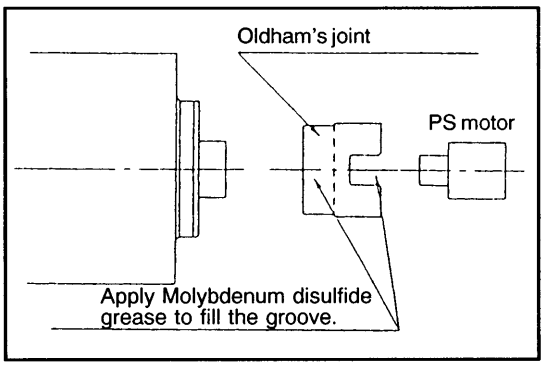
6 Remove the fitting.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Point Operations

[Point 1]
Removal·Installation:
Loosen (or tighten) two set bolts in the illustrated positions to remove (or install) the PS pump.

Tightening torque T = 25 ± 5 N·m (255 ± 51 kgf-cm) [18.4 ± 3.7 ft-lbf]

[Point 1]
Installation:
When assembling the PS motor and pump, fill molybdenum disulfide grease in the groove on the oldham's joint.

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BRAKE

Page

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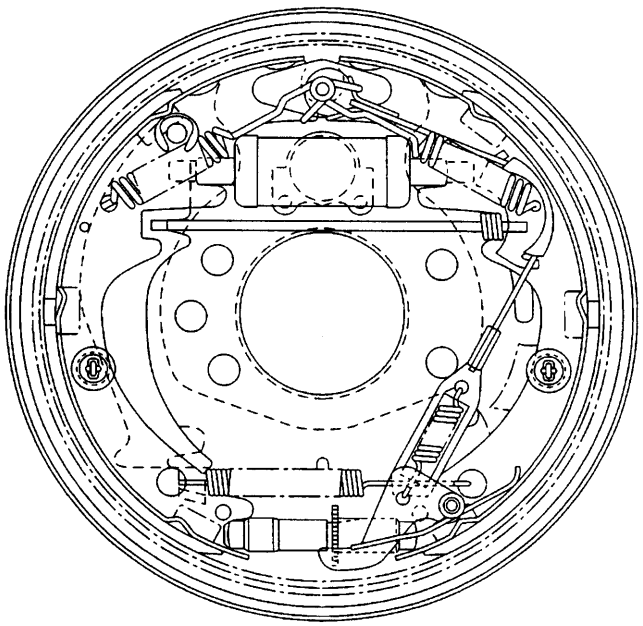
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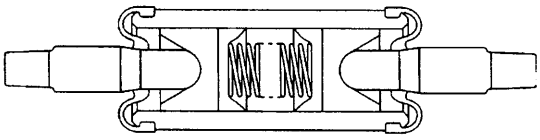
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GENERAL

FRONT BRAKE

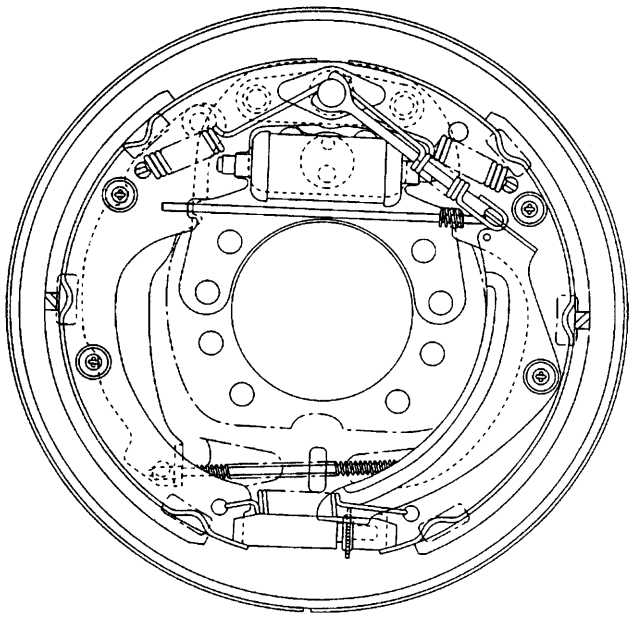
1 ton series (excluding 40-7FB15 model)

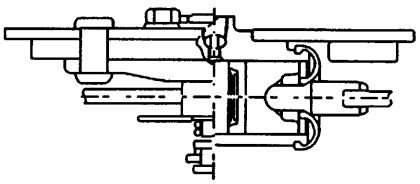




Wheel cylinder

40-7FB15 model, 2 ton series and 3 ton model

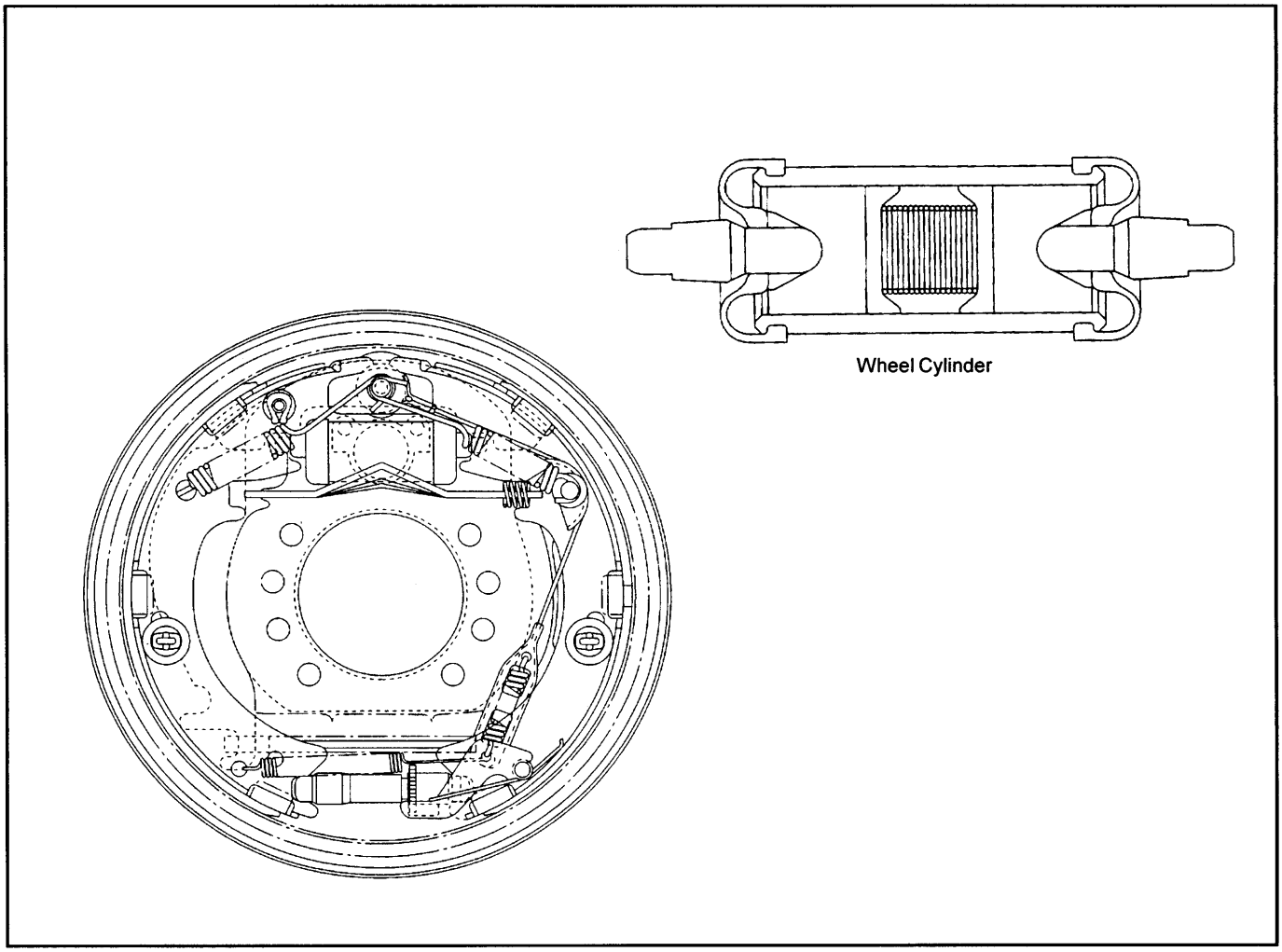




Wheel cylinder

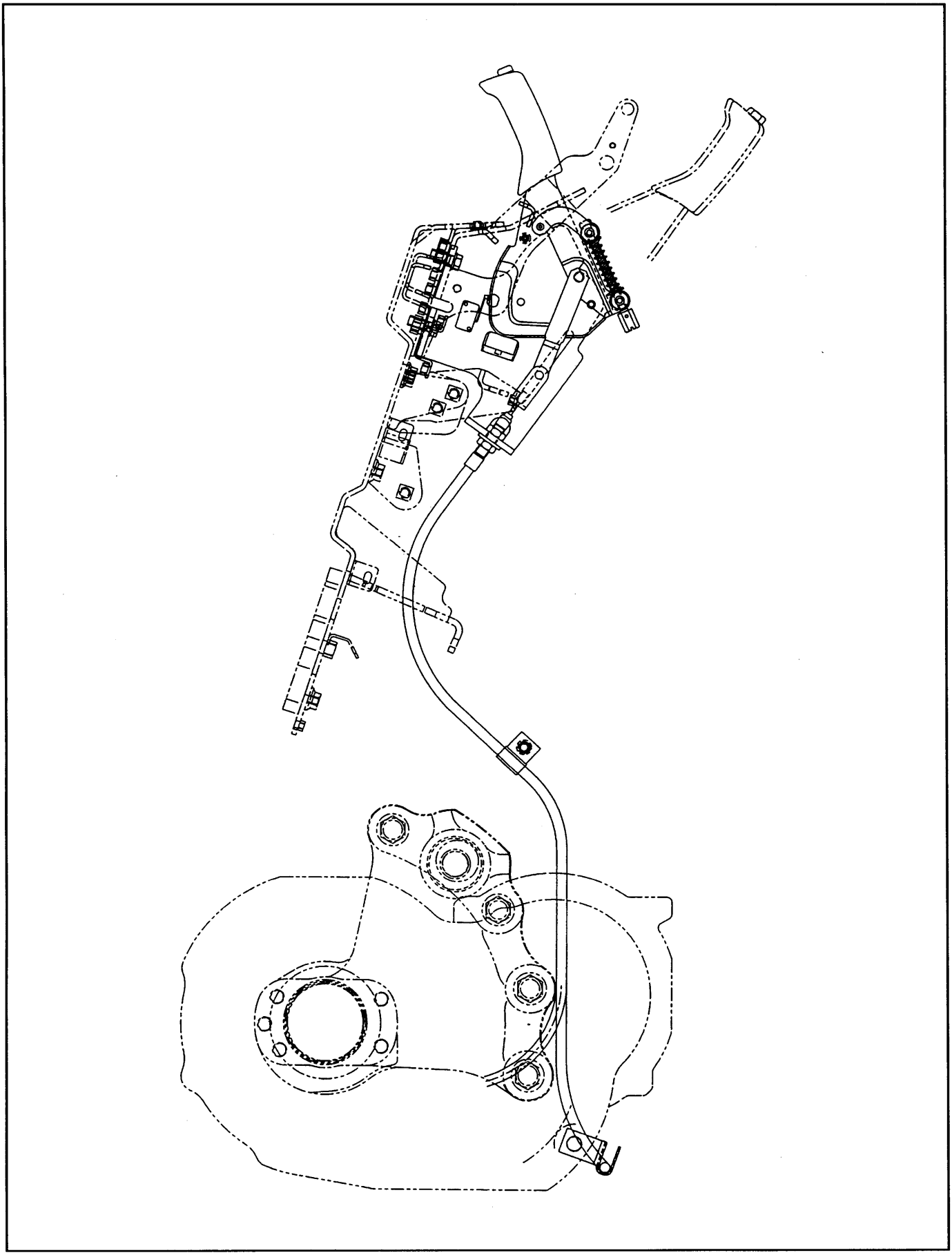
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J3.5 ton



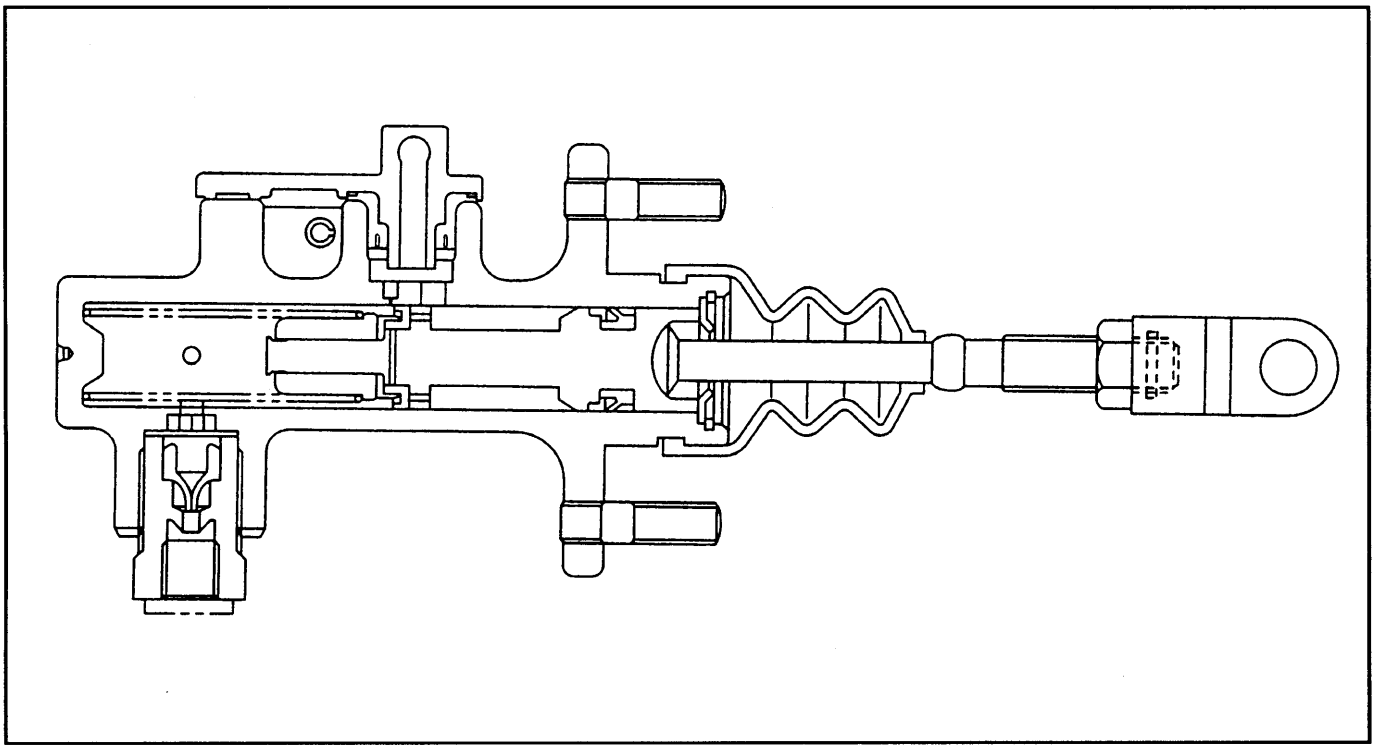
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Parking Brake



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Master Cylinder



SPECIFICATIONS

Item \ Vehicle model		1 ton series (excluding 40-7FB15)	40-7FB15 model, and 2 ton series (excluding 40-7FB20·25 models)	40-7FB20·25 models and 3 ton	J3.5 ton
Foot brake type		Hydraulic internal expanding duo servo brake	←	←	←
Parking brake		Internal expanding mechanical brake	←	←	←
Brake drum inside diameter mm (in)		254 (10.0)	310 (12.2)	←	317.5 (12.5)
Brake lining	Material	Resin mold (asbestos-free)	←	←	←
	Dimensions Length x width x thickness mm (in)	279 x 48.5 x 5 (11.0 x 1.91 x 0.20)	323 x 60 x 7 (12.7 x 2.36 x 0.28)	343 x 60 x 7 (13.5 x 2.36 x 0.28)	352 x 60 x 5.6 (13.9 x 2.36 x 0.22)
Wheel cylinder bore mm (in)		22.2 (0.87)	28.5 (1.12)	←	←
Brake master cylinder	Bore mm (in)	19.05 (0.75)	←	←	←
	Stroke mm (in)	30 (1.18)	←	←	←
Applicable oil		SAE J-1703-DOT-3	←	←	←

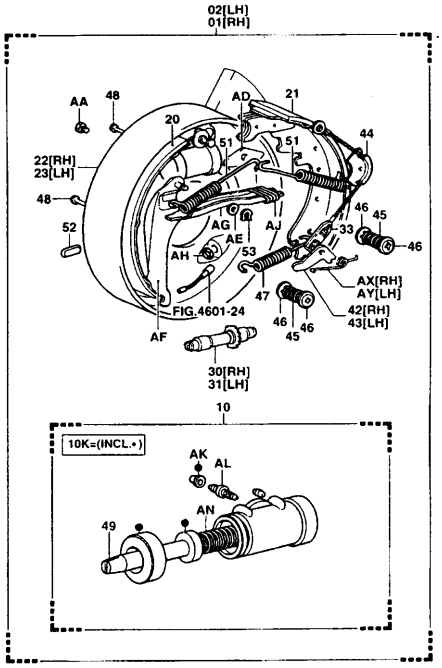
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COMPONENTS

Front Brake

1 ton Series (excluding 40-7FB15)

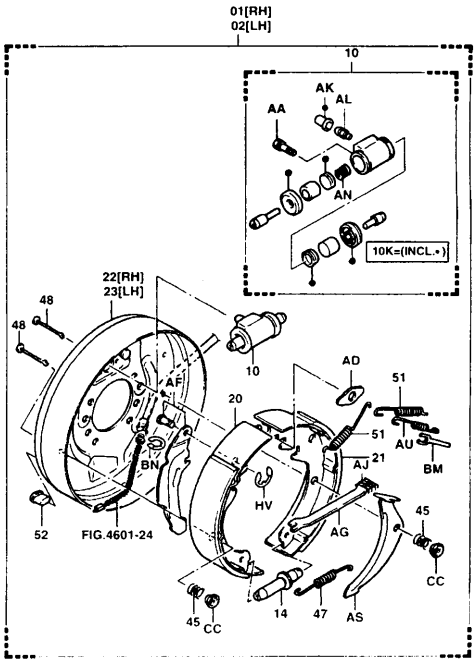
4715



4715-096

40-7FB15 model, 2 ton Series and 3 ton model

4715

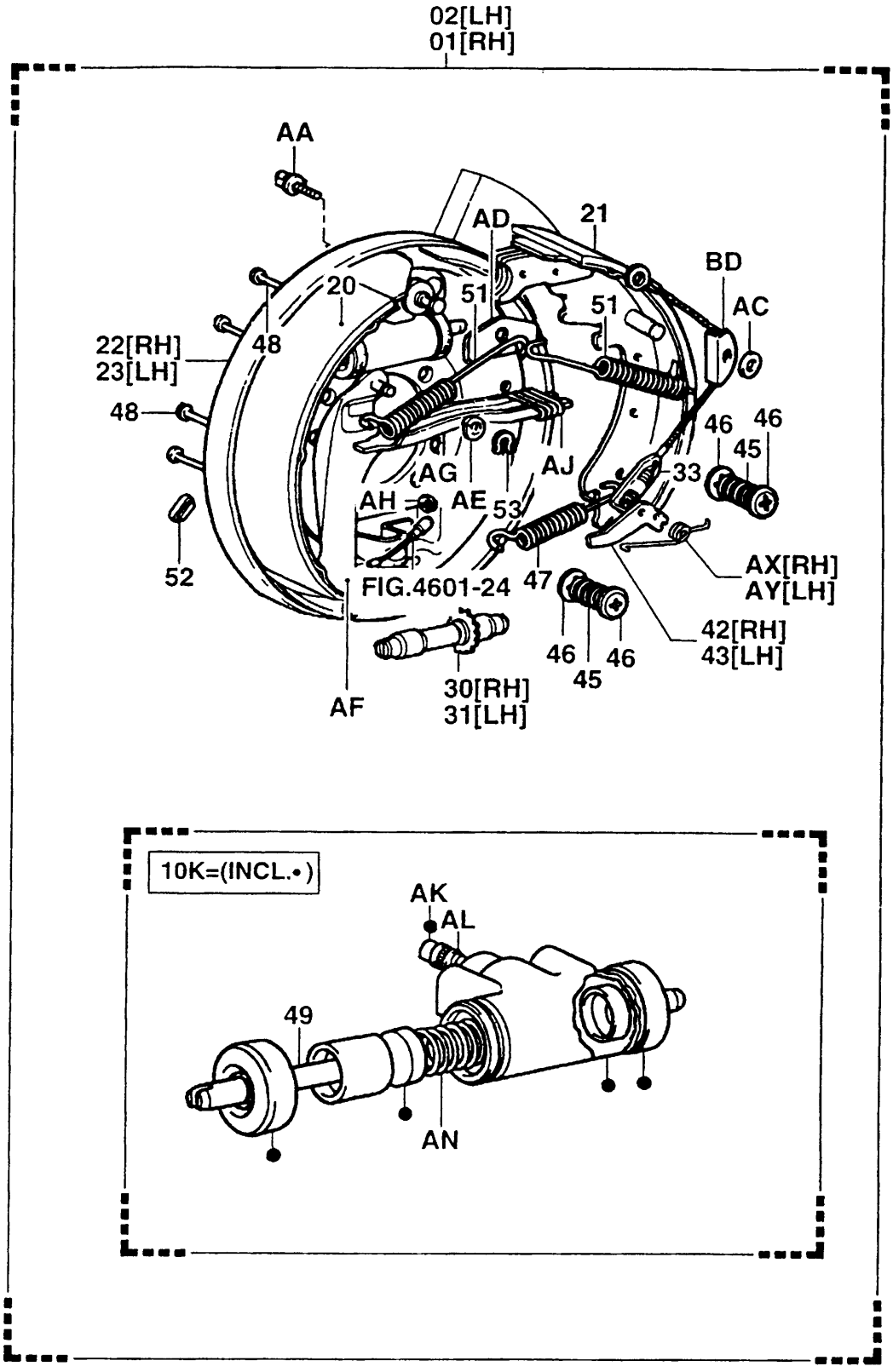


4715-095

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J3.5 ton

4715

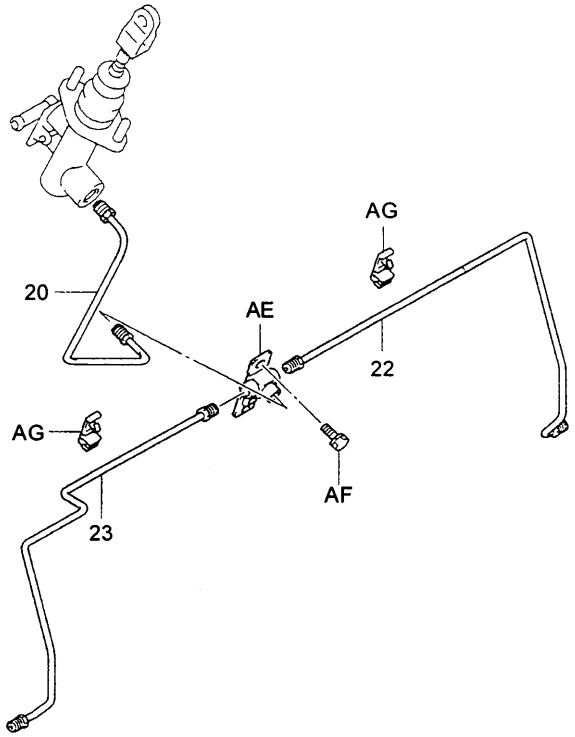


4715-097

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Brake Pipe

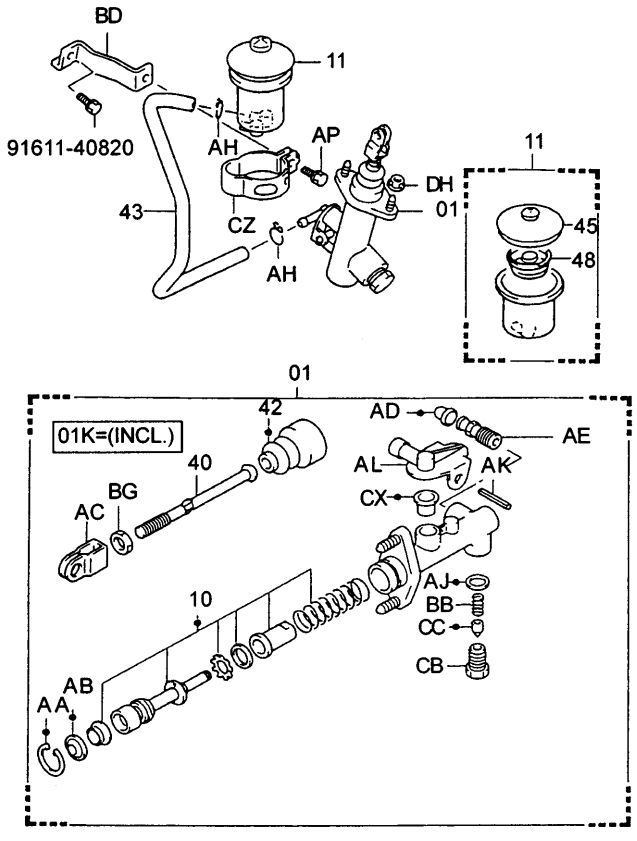
4714



4714-191

Brake Master Cylinder

4702

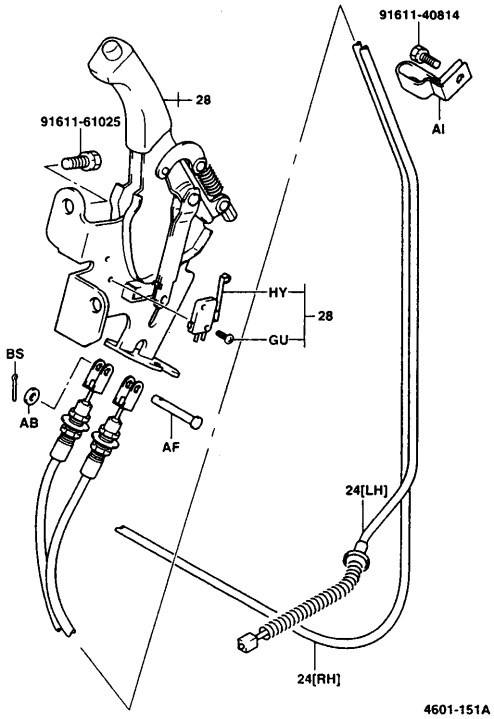


4702-083

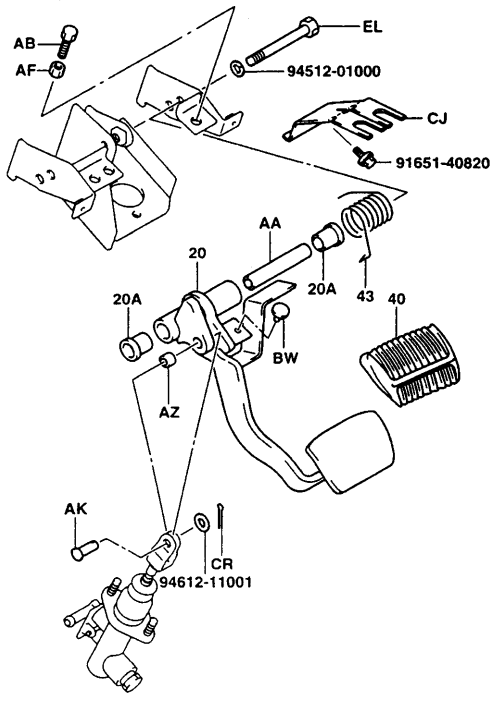
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Parking Brake

4601



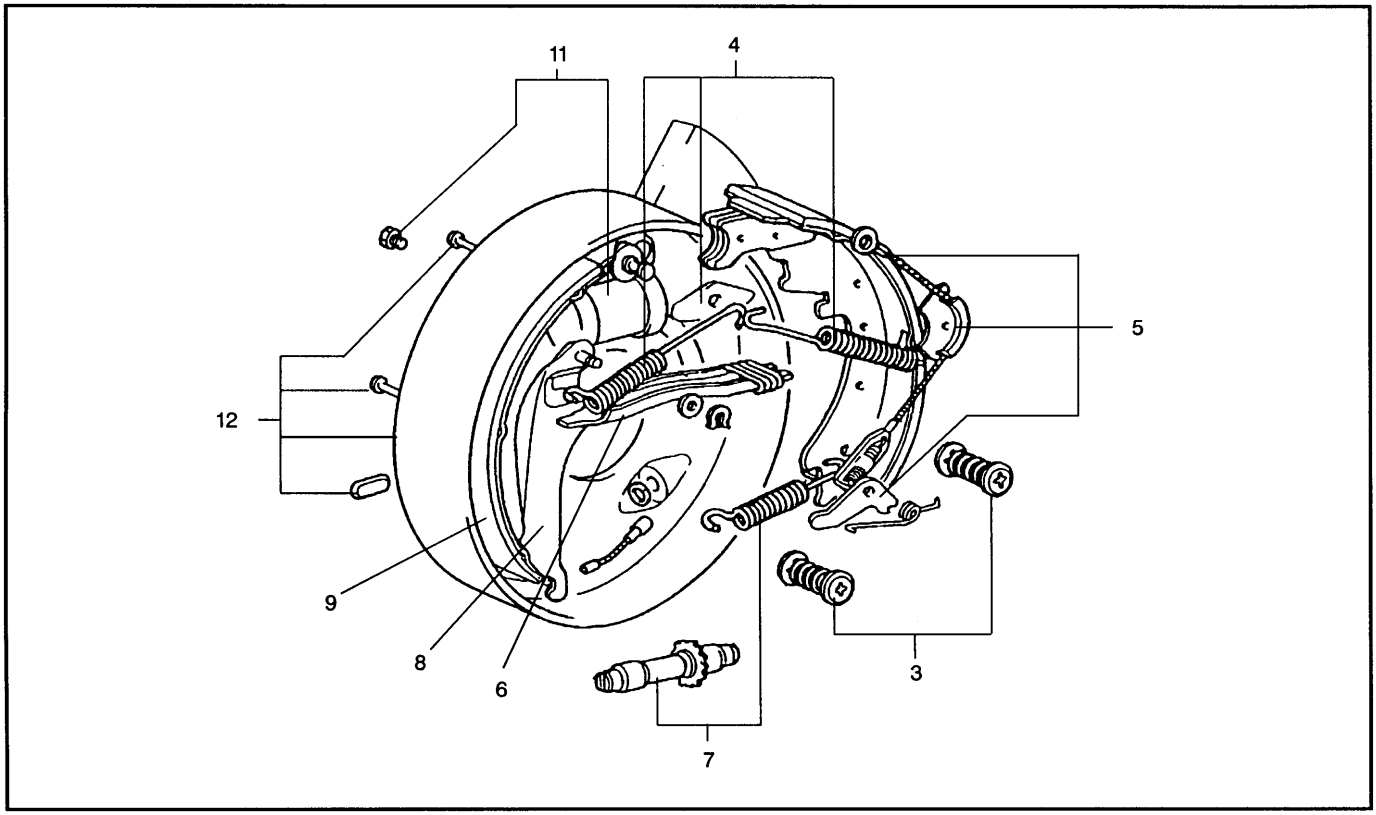
Brake Pedal



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FRONT BRAKE

DISASSEMBLY·INSPECTION·REASSEMBLY (1 TON SERIES (EXCLUDING 40-7FB15 MODEL), J3.5 TON)



Disassembly Procedure

1 Drain brake fluid.

2 Remove the front axle hub W/brake drum. (See page 8-7.)

3 Remove the shoe hold down spring and cup. **[Point 1]**

4 Remove the anchor to shoe spring and shoe guide plate. **[Point 2]**

5 Remove the cable and cable guide.

6 Remove the lever strut. **[Point3]**

7 Remove the adjuster spring and adjusting screw. **[Point 4]**

8 Disconnect the parking brake cable. **[Point 5]**

9 Remove the brake shoe. **[Point 6]**

10 Disconnect the brake pipe.

11 Remove the wheel cylinder ASSY. **[Point 7]**

12 Remove the backing plate. **[Point 8]**

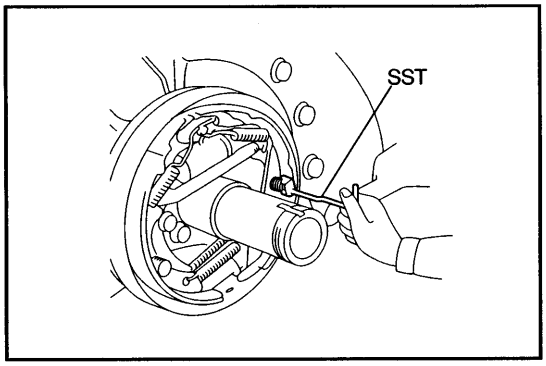
13 Separate the brake drum from the front axle hub. **[Point 9]**

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Reassembly Procedure

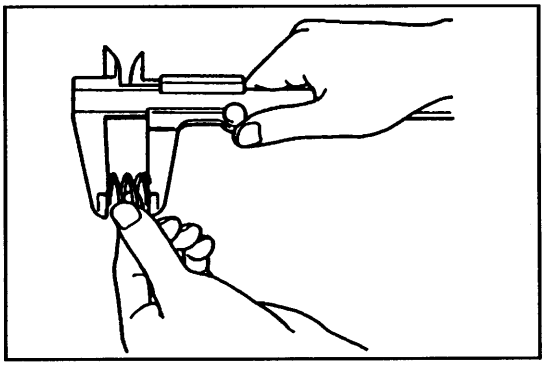
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **See that the brake lining and brake drum interior surface are free from grease or oil before installation.**
- **Before reassembly, decrease the brake drum outside diameter for installation to approx. 1 mm (0.04 in) less than the drum inside diameter by tightening the adjusting screw.**
- **After reassembly, perform brake air bleeding (see page 11-21) and braking force inspection (see page 11-21).**



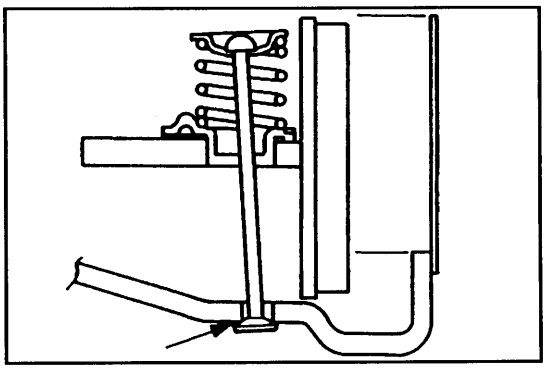
Point Operations

[Point 1]
Disassembly·Reassembly:
SST 09510-31960-71



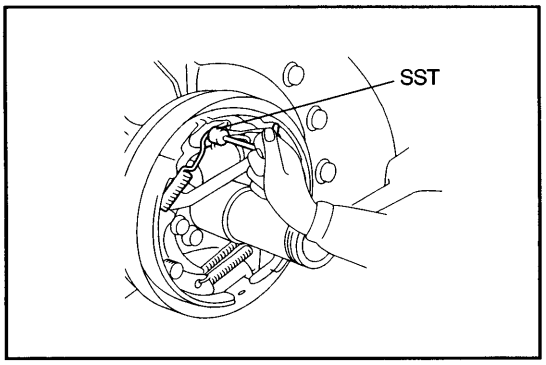
Inspection:
Measure the free length of the hold down spring.

Standard:
1 ton series (excluding 40-7FB15 model): 25.5 mm (1.004 in)
J3.5 ton: 44.0 mm (1.732 in)

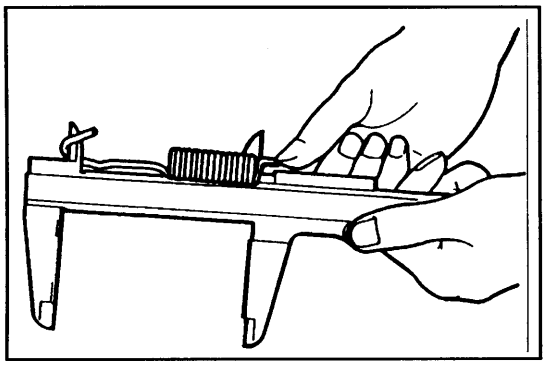


Reassembly:
Apply liquid packing (08826-00080) on the shoe hold down pin and the contact surface on the back side of the backing plate to eliminate any clearance.

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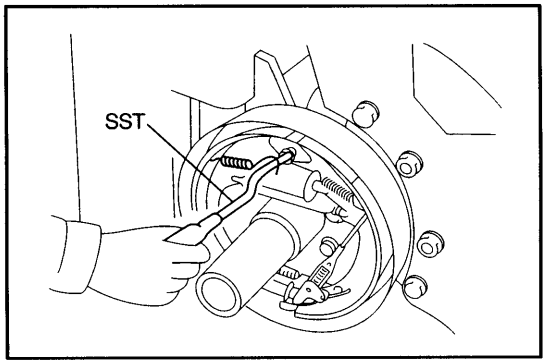


[Point 2]
Disassembly:
SST 09717-76001-71
(SST 09717-20010)

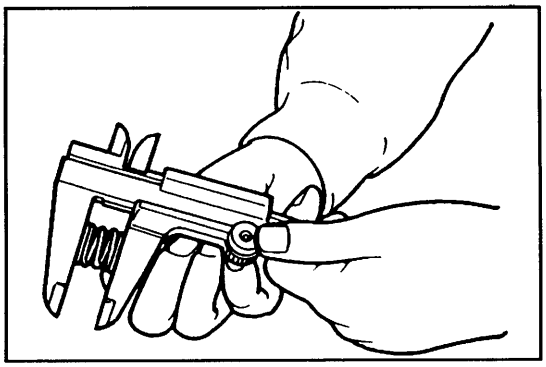


Inspection:
Measure the free length of the anchor to shoe spring.

Standard:
1 ton series (excluding 40-7FB15 model):
102.2 mm (4.024 in)
J3.5 ton: On the side of lining W/pin
138.2 mm (5.441 in)
On the side of lining W/O pin
121.2 mm (4.772 in)
Limit: No clearance between coil turns

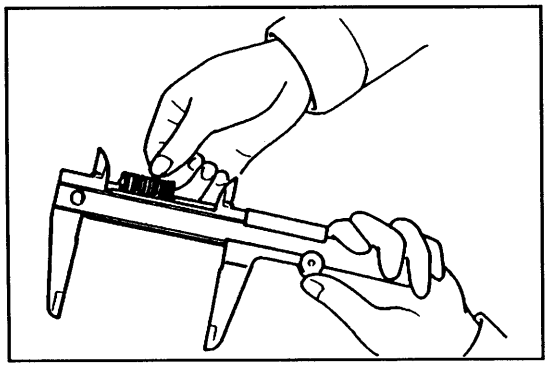


Reassembly:
SST 09718-76001-71
(SST 09718-20010)



[Point 3]
Inspection:
Measure the free length of the strut to shoe spring.

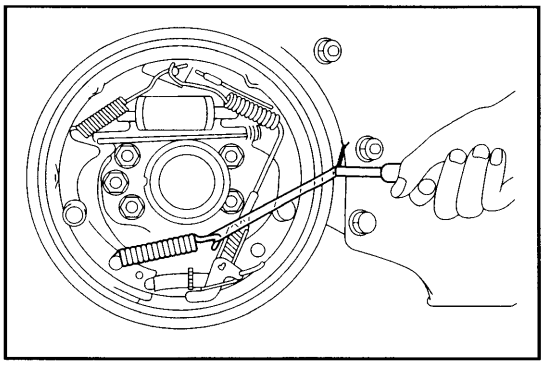
Standard:
1 ton series (excluding 40-7FB15 model):
19.7 mm (0.776 in)
J3.5 ton: 31.4 mm (1.236 in)



[Point 4]
Inspection:
Measure the free length of the adjuster spring.

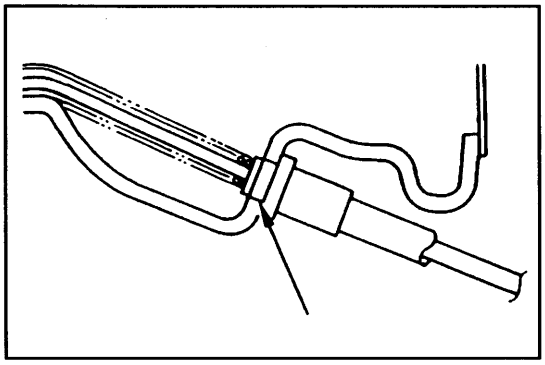
Standard:
1 ton series (excluding 40-7FB15 model):
99.4 mm (3.913 in)
J3.5 ton: 125.4 mm (4.937 in)
Limit: No clearance between coil turns

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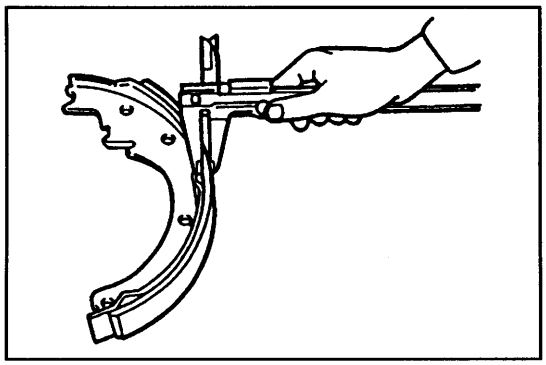


Reassembly:
Apply grease on the adjusting screw threaded portion and fill grease in the cap.

Reassembly:
Tie a wire to the free end of the adjuster spring and set by pulling with a screwdriver.

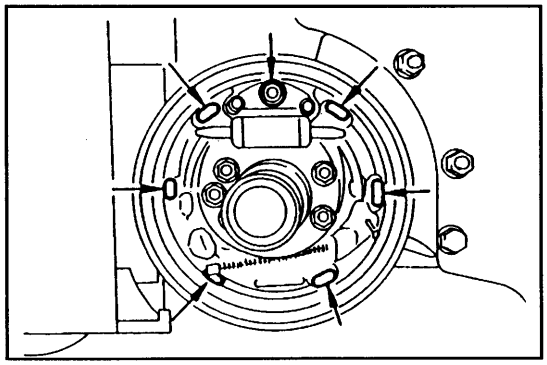


[Point 5]
Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the parking brake cable outlet in the backing plate to eliminate any clearance.

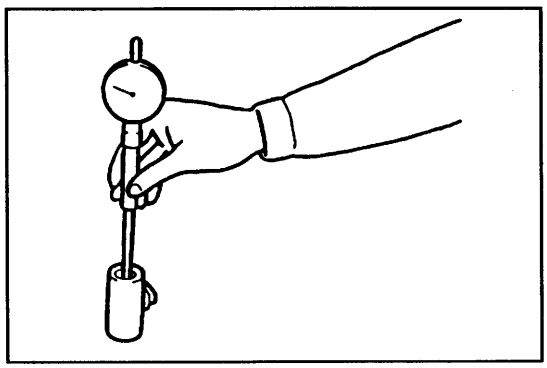


[Point 6]
Inspection:
Measure the brake lining thickness.

Standard:
1 ton series (excluding 40-7FB15 model):
4.9 mm (0.193 in)
J3.5 ton: 5.6 mm (0.220 in)
Limit:
1 ton series (excluding 40-7FB15 model):
1.0 mm (0.039 in)
J3.5 ton: 1.0 mm (0.039 in)



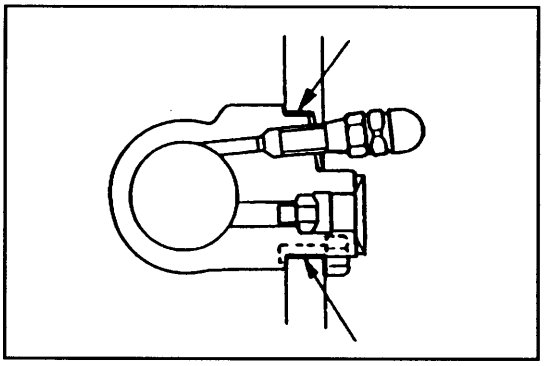
Reassembly:
Before brake shoe installation, apply grease on illustrated portions of the backing plate (6 places in contact with the shoe rim and the anchor pin).



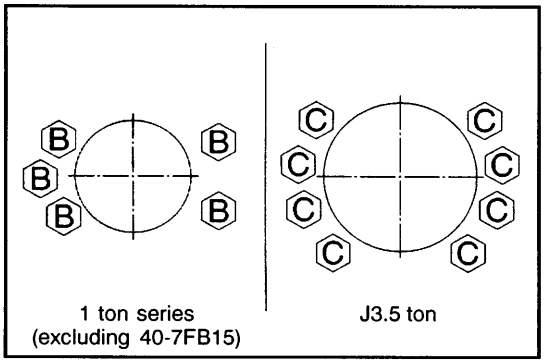
[Point 7]
Inspection:
Measure the clearance between the wheel cylinder and piston.

Limit:
1 ton series (excluding 40-7FB15 model):
0.125 mm (0.00492 in)
J3.5 ton: 0.15 mm (0.0059 in)

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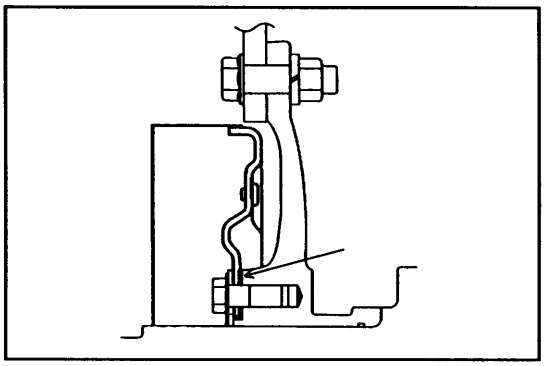


Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) to backing plate fitting portion of the wheel cylinder and on whole periphery of the set bolts to eliminate any clearance.

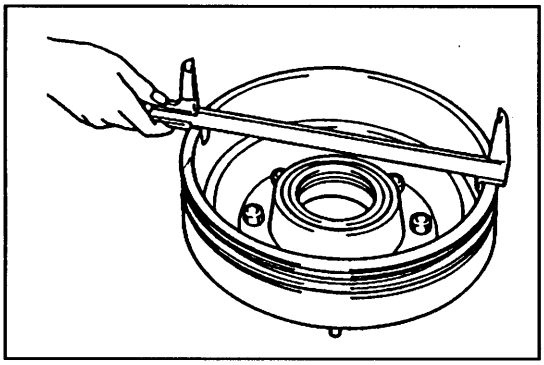


[Point 8]
Reassembly:
Carefully install the backing plate set bolts because they are different in length.
Apply thread tightener 08833-76001-71 (08833-00070) on the set bolts before reassembly.

Bolt length
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)



Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the backing plate surface in contact with the front axle bracket to eliminate any clearance.



[Point 9]
Inspection:
Measure the brake drum inside diameter.

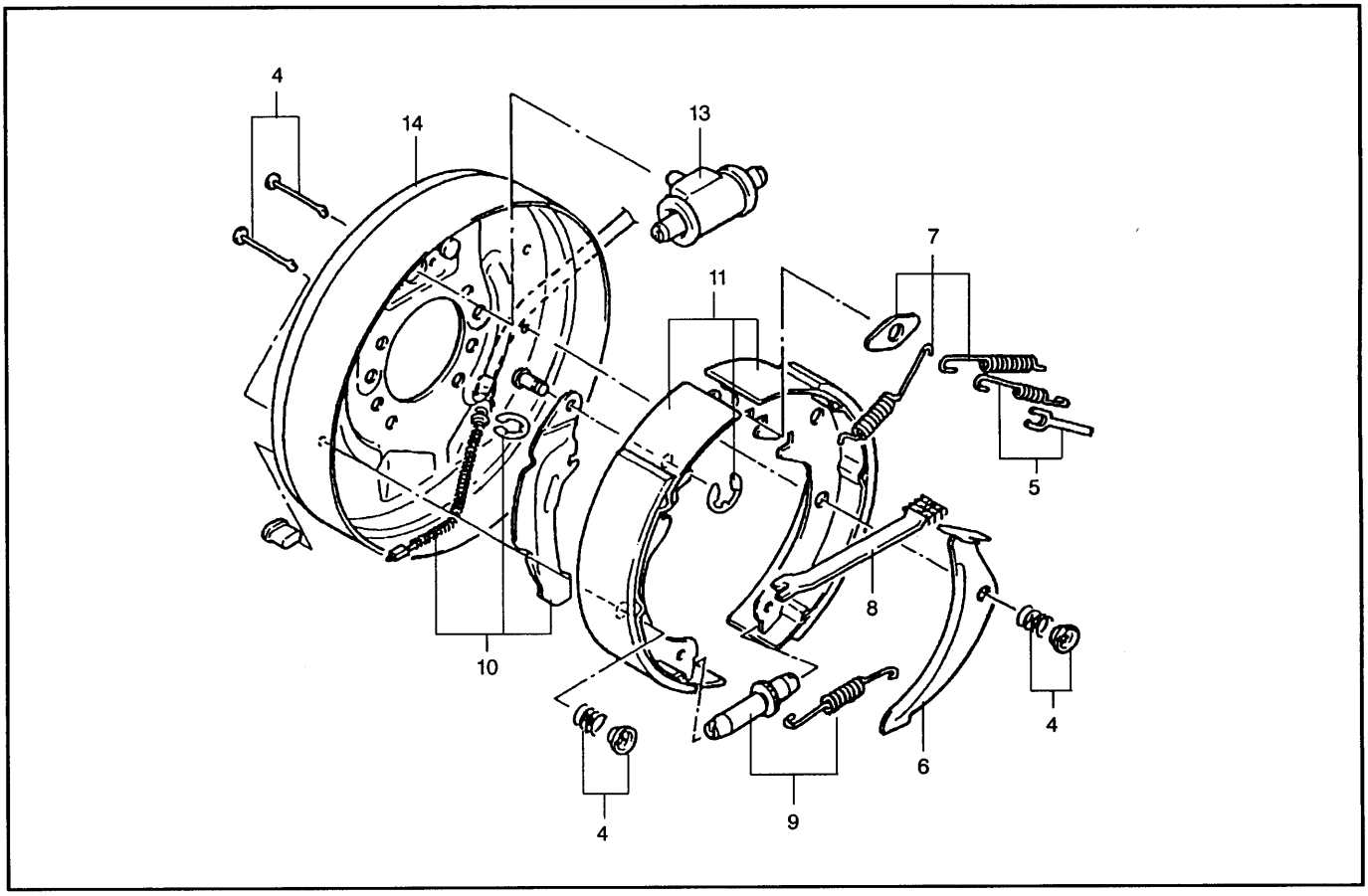
Standard:
1 ton series (excluding 40-7FB15 model):
254 mm (10.0 in)
J3.5 ton: 317.5 mm (12.50 in)

Limit:
1 ton series (excluding 40-7FB15 model):
256 mm (10.1 in)
J3.5 ton: 319.5 mm (12.579 in)

Reassembly:
Apply thread tightener 08833-76001-71 (08833-00070) on the brake drum set nut before reassembly.

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DISASSEMBLY·INSPECTION·REASSEMBLY (40-7FB15 MODEL, 2 TON SERIES AND 3 TON)



Disassembly Procedure

1 Drain brake fluid.

2 Remove front wheels.

3 Remove the front axle hub W/brake drum. (See page 8-7.)

4 Remove the hold down spring. **[Point 1]**

5 Remove the pawl lever stopper. **[Point 2]**

6 Remove the pawl lever.

7 Remove the anchor to shoe spring. **[Point 3]**

8 Remove the strut lever. **[Point 4]**

9 Remove the adjuster spring and adjusting screw. **[Point 5]**

10 Disconnect the parking brake cable. **[Point 6]**

11 Remove the brake shoe. **[Point 7]**

12 Disconnect the brake piping.

13 Remove the wheel cylinder ASSY. **[Point 8]**

14 Remove the backing plate. **[Point 9]**

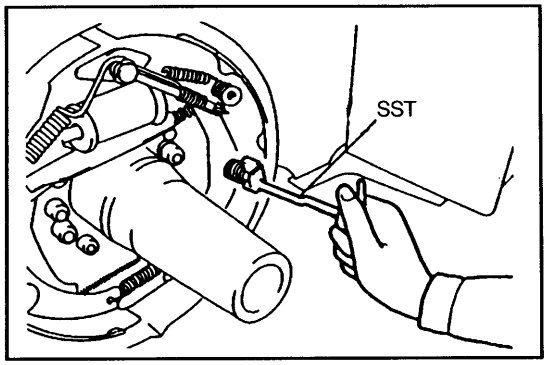
15 Separate the brake drum from the front axle hub. **[Point 10]**

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Reassembly Procedure

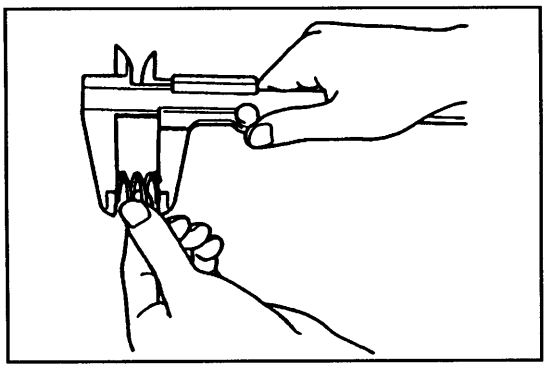
The reassembly procedure is the reverse of the disassembly procedure.
(With regard to steps 4 and 5, however, install the pawl lever stopper after installing the hold down spring.)

Note:
- **See that the brake lining and brake drum interior surface are free from grease or oil before reassembly.**
- **Before reassembly, decrease the brake shoe outside diameter for installation to approx. 1 mm (0.04 in) less than the brake drum inside diameter by tightening the adjusting screw.**
- **After reassembly, perform brake air bleeding (page 11-21) and braking force inspection and adjustment (page 11-21).**



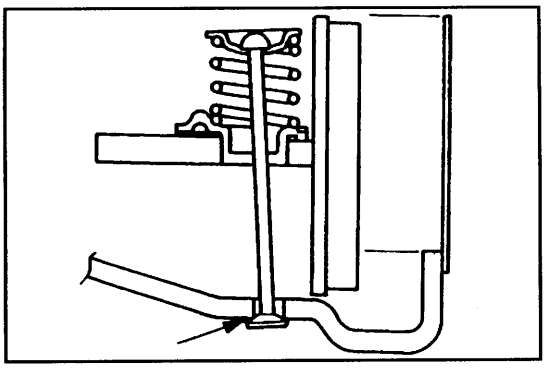
Point Operations

[Point 1]
Disassembly-Reassembly:
SST 09510-31960-71



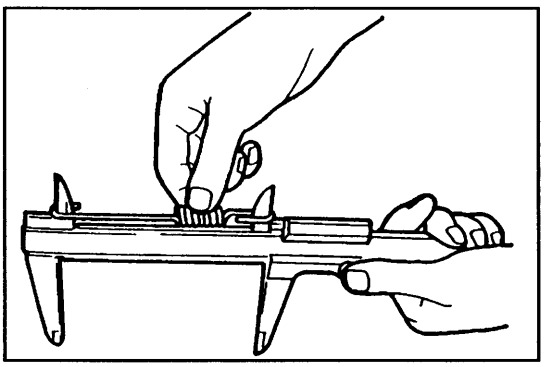
Inspection:
Measure the free length of hold down spring.

Standard: 32.3 mm (1.272 in)
Limit: 29.1 mm (1.146 in)



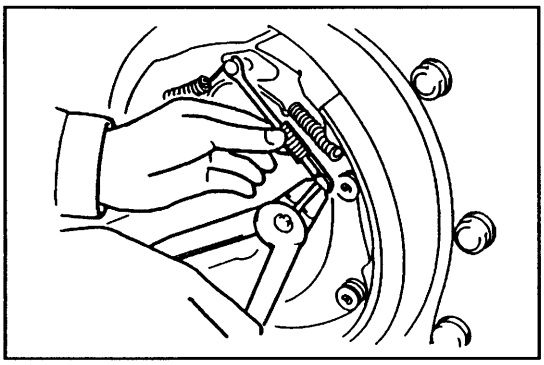
Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the back side of the backing plate in contact with the shoe hold down spring to eliminate any clearance.

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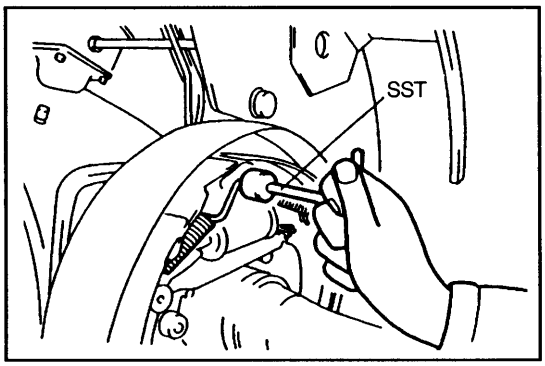


[Point 2]
Inspection:
Measure the free length of the actuator spring.

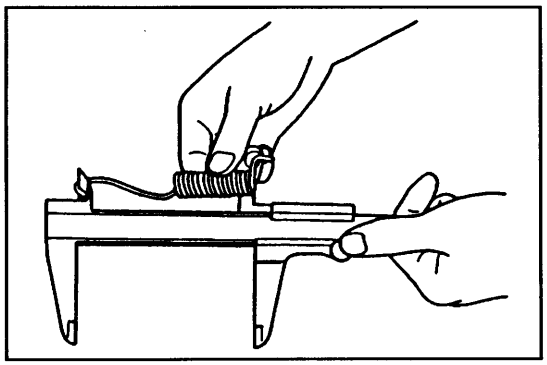
Standard: 124.5 mm (4.902 in)
Limit: No clearance between coil turns



Reassembly:
Use snap ring pliers and install the pawl lever stopper and actuator spring.

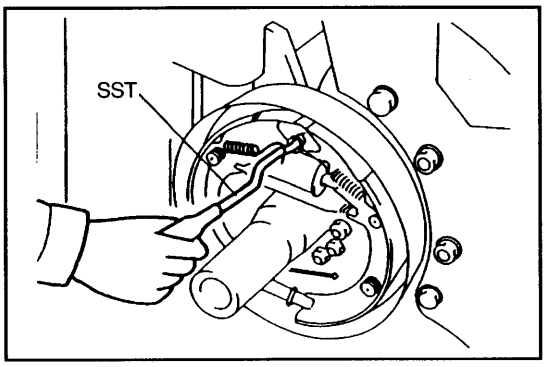


[Point 3]
Disassembly:
SST 09717-76001-71
(SST 09717-20010)



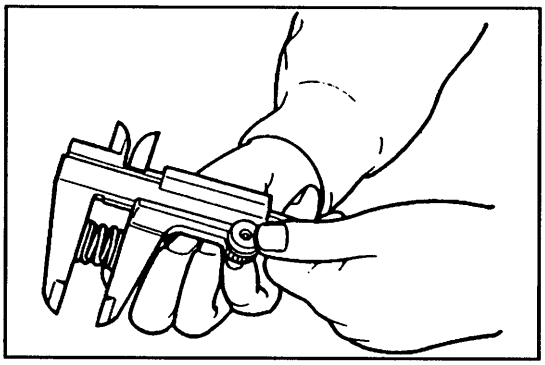
Inspection:
Measure the free length of the anchor to shoe spring.

Standard: 106 mm (4.17 in)
Limit: No clearance between coil turns



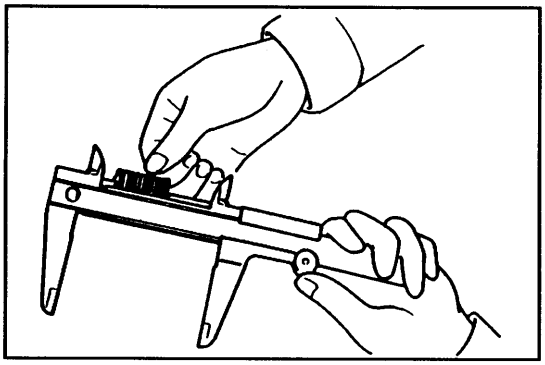
Reassembly:
SST 09718-76001-71
(SST 09718-20010)

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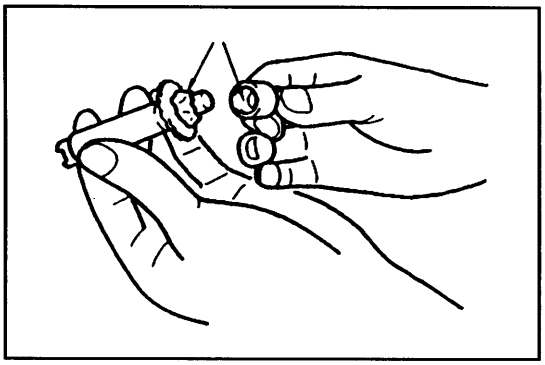
[Point 4]
Inspection:
Measure the free length of the strut to shoe spring.

Standard: 23 mm (0.91 in)
Limit: 20 mm (0.79 in)

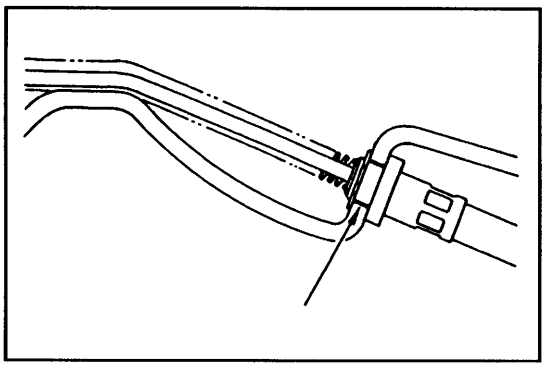


[Point 5]
Inspection:
Measure the free length of the adjuster spring.

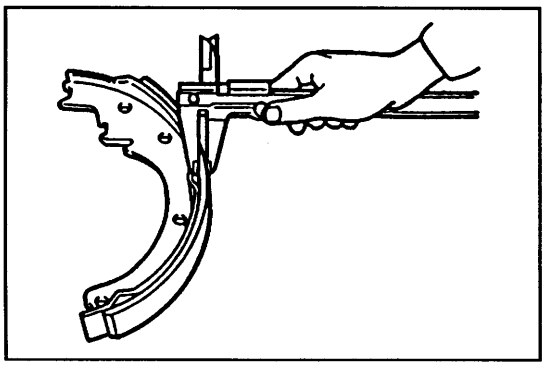
Standard: 86 mm (3.39 in)
Limit: No clearance between coil turns



Reassembly:
Apply grease on the adjusting screw threaded portion and fill grease in the cap.



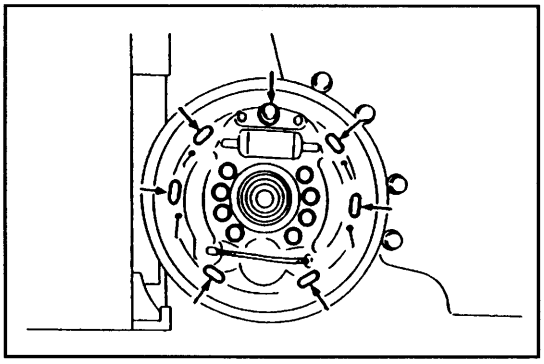
[Point 6]
Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the parking brake outlet on the backing plate to eliminate any clearance.



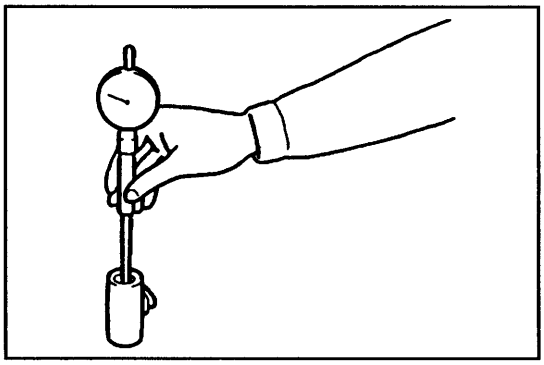
[Point 7]
Inspection:
Measure the brake lining thickness.

Standard: 7.0 mm (0.276 in)
Limit: 2.0 mm (0.079 in)

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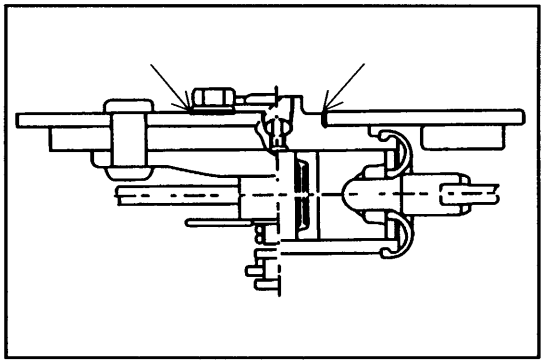


Reassembly:
Apply grease on the illustrated portions of the backing plate (6 places in contact with the shoe rim and the anchor pin) before brake shoe installation.

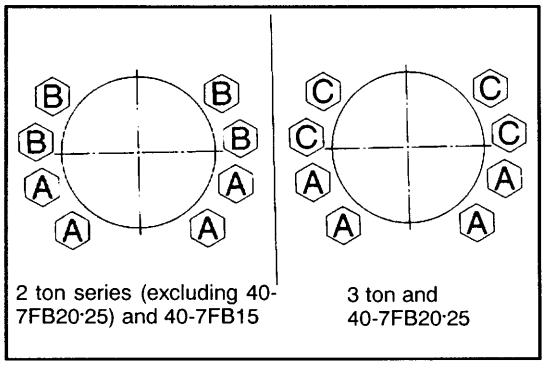


[Point 8]
Inspection:
Measure the clearance between the wheel cylinder and piston.

Limit: 0.145 mm (0.00571 in)



Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the wheel cylinder backing plate fitting portion and whole periphery of set bolts to eliminate any clearance.

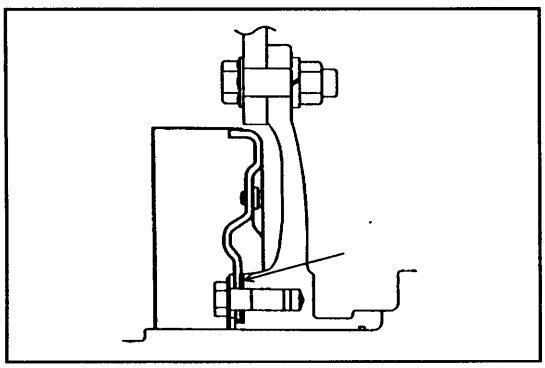


2 ton series (excluding 40-7FB20·25) and 40-7FB15

3 ton and 40-7FB20·25

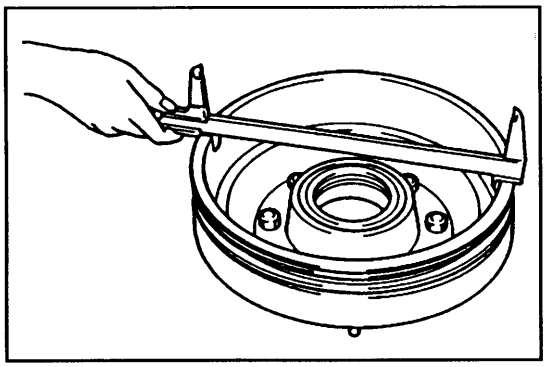
[Point 9]
Reassembly:
Carefully install the backing plate set bolts in correct positions since they are different in length.
Apply thread tightener 08833-76001-71 (08833-00070) on the set bolts before reassembly.

Bolt length
A: ℓ = 36 mm (1.42 in)
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)



Reassembly:
Apply liquid packing 08826-76001-71 (08826-00080) on the backing plate surface in contact with the front axle bracket to eliminate any clearance.

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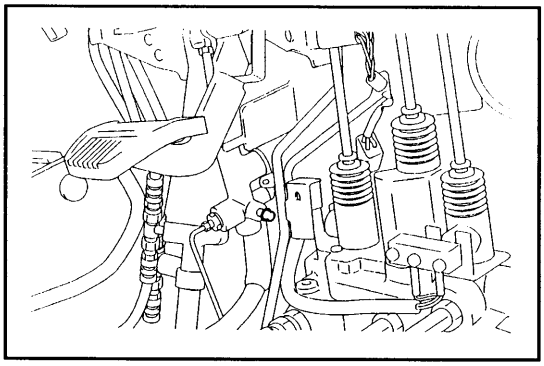


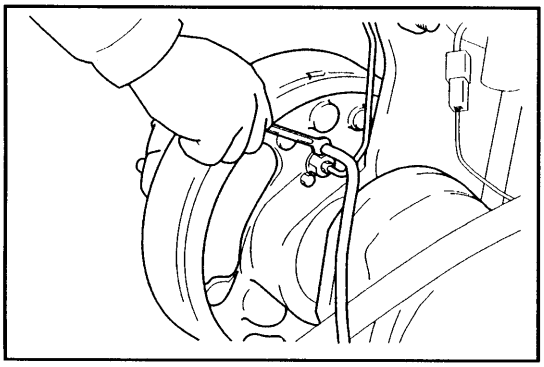
[Point 10]
Inspection:
Measure the brake drum inside diameter.

Standard: 310 mm (12.20 in)
Limit: 312 mm (12.28 in)

Reassembly:
Apply thread tightener 08833-76001-71 (08833-00070) on the brake drum set nut before reassembly.

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BRAKE AIR BLEEDING

Note:
Add brake fluid to the reservoir tank during air bleeding to prevent it from becoming insufficient.

1. Bleed air from the brake master cylinder.
   (1) Depress the brake pedal several times to compress the air in the piping, and hold that state.
   (2) Loosen the breather plug to discharge air in the piping with the brake fluid, and tighten the plug immediately before the fluid stops to run out.
   (3) Repeat steps (1) and (2) above until no air bubbles are seen in the discharged brake fluid.
2. Bleed air from wheel cylinders RH and LH.
   (1) Operate as described in step 1 above for each of the RH and LH side at a time.
3. Add brake fluid to the specified level.
   (1) Add brake fluid through the filter provided at the reservoir tank.
   (2) Add brake fluid up to the staged portion in the reservoir tank.

BRAKING FORCE INSPECTION·ADJUSTMENT

1. Inspect the braking force by means of a brake tester or traveling test.
   Braking distance (without load)

Initial speed of braking km/h (mph)	Max. speed
Braking distance m (ft)	5.0 (16.4) or less

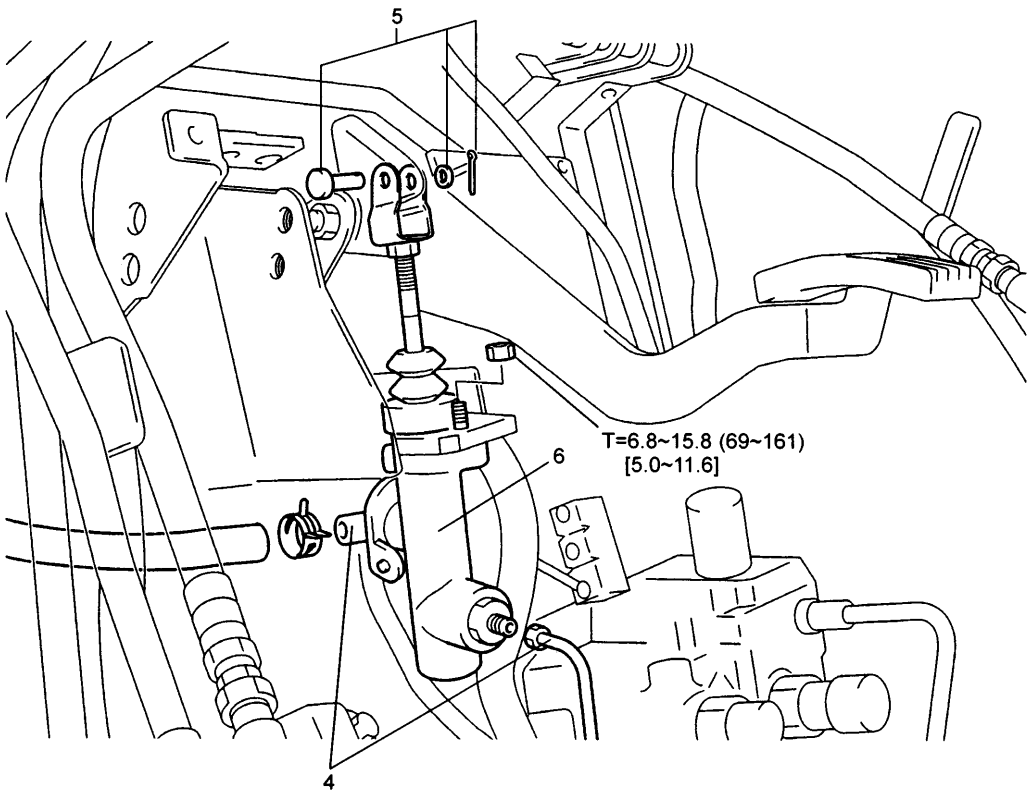
2. Adjust the braking force.
   (1) Repeat traveling in the forward and reverse directions to adjust the brake shoe clearance.
   The adjusting screw adjusts the clearance automatically when the brake pedal is depressed in reverse traveling.
   (2) If the braking force is insufficient, adjuster malfunction, lining contact defect, foreign matter adhesion on the lining or brake fluid leakage is assumed. Remove and inspect the brake drum.
   (3) When the brake shoe is replaced with a new one, repeat traveling in the forward and reverse directions for running in.

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BRAKE MASTER CYLINDER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.

2 Remove the lower panel.

3 Disconnect the brake side hose from the reservoir tank and drain brake fluid.

4 Disconnect the piping.

5 Remove the push rod clevis pin.

6 Remove the brake master cylinder.

Installation Procedure

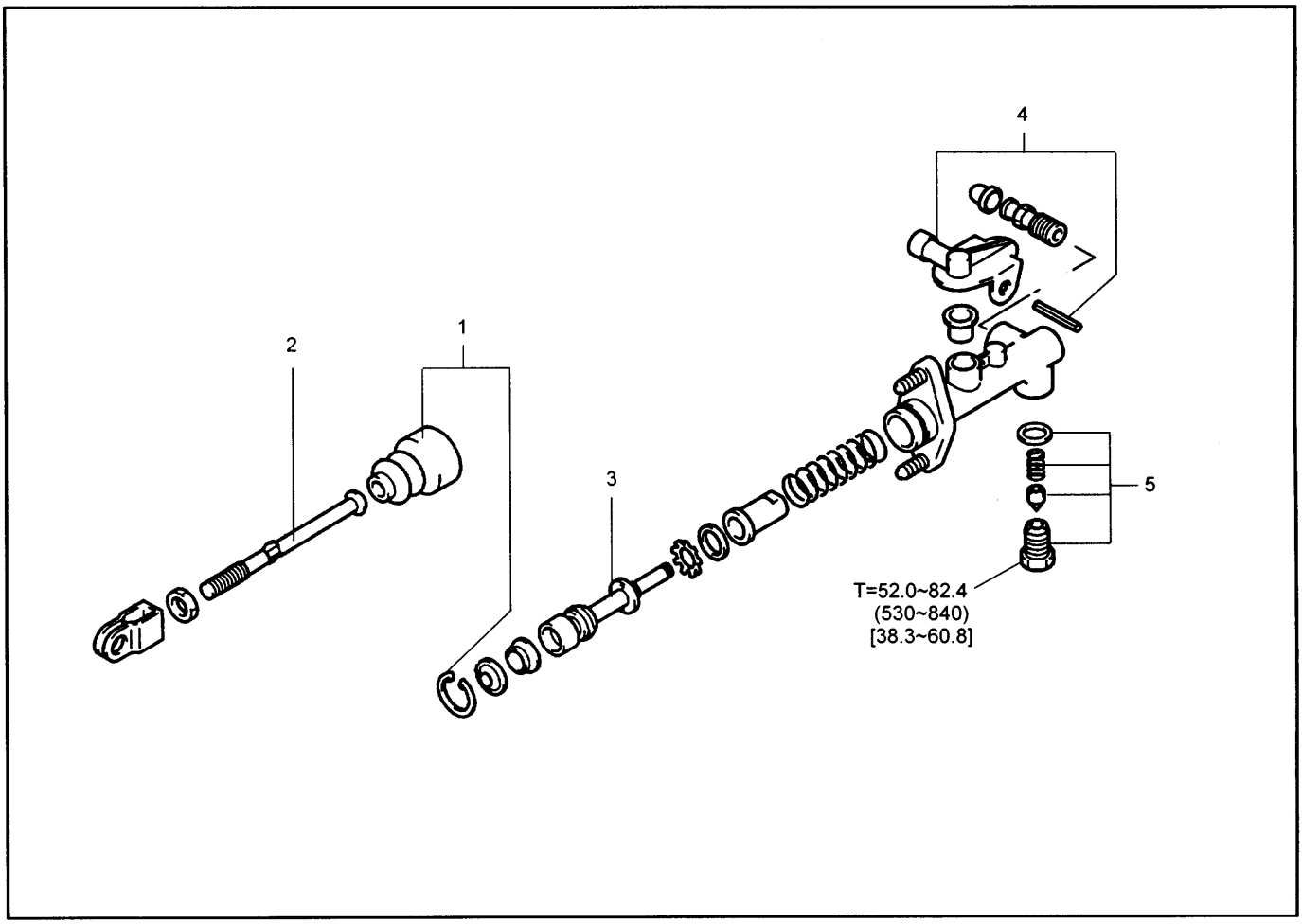
The installation procedure is the reverse of the removal procedure.

Note:
After installation, perform brake pedal adjustment (page 11-26) and air bleeding (page 11-21).

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Turn the boot up and remove the snap ring.

2 Remove the push rod. **[Point 1]**

3 Remove the piston. **[Point 2]**

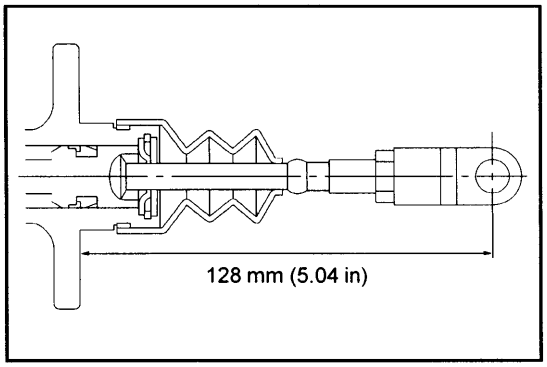
4 Remove the pin and the fluid inlet elbow.

5 Remove the outlet plug and valve.

Reassembly Procedure

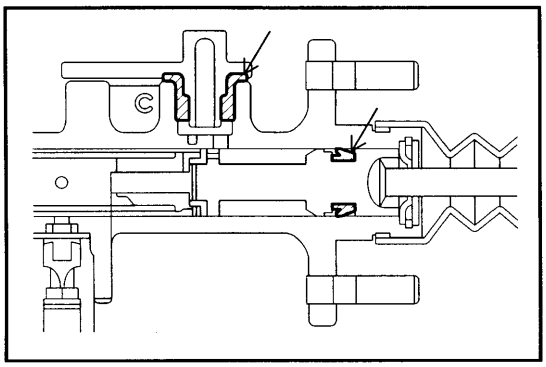
The reassembly procedure is the reverse of the disassembly procedure.

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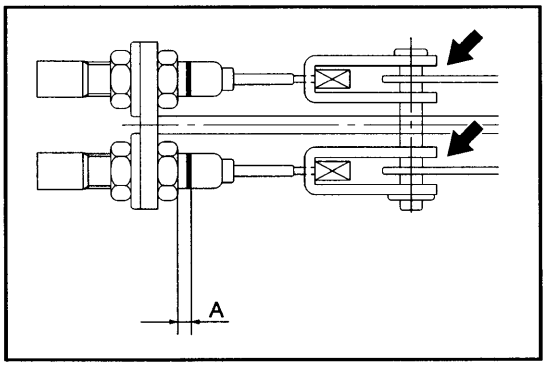
Point Operations

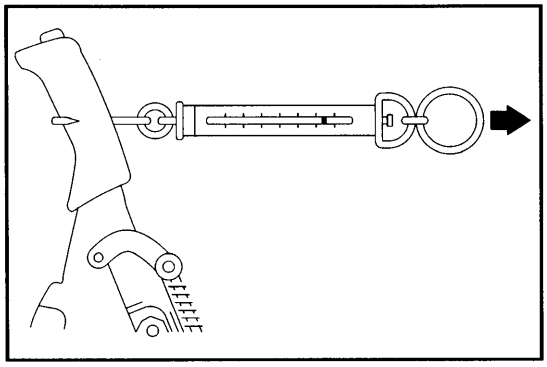
[Point 1]
Installation:
Temporarily set the push rod length to the illustrated dimension, and make readjustment after installation.

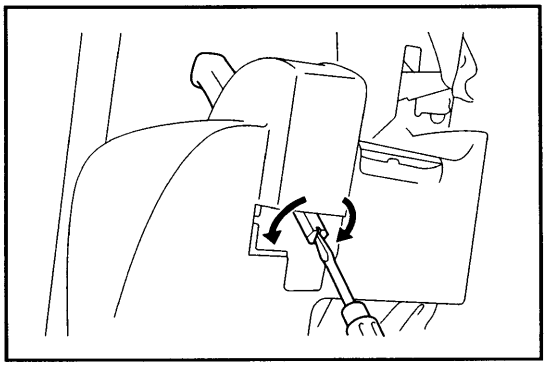


[Point 2]
Installation:
Apply rubber grease on the piston cup and whole periphery of the cup before reassembly.

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PARKING BRAKE INSPECTION·ADJUSTMENT

1. Check the parking brake cable set position.

   Standard: A = 0 ~ 2 mm (0 ~ 0.08 in)

2. Apply chassis grease on the portions indicated by arrows.

3. Inspect and adjust the parking brake lever operating force.
   (1) Set a spring scale at the center of the lever knob, and measure the operating force by pulling it backward.

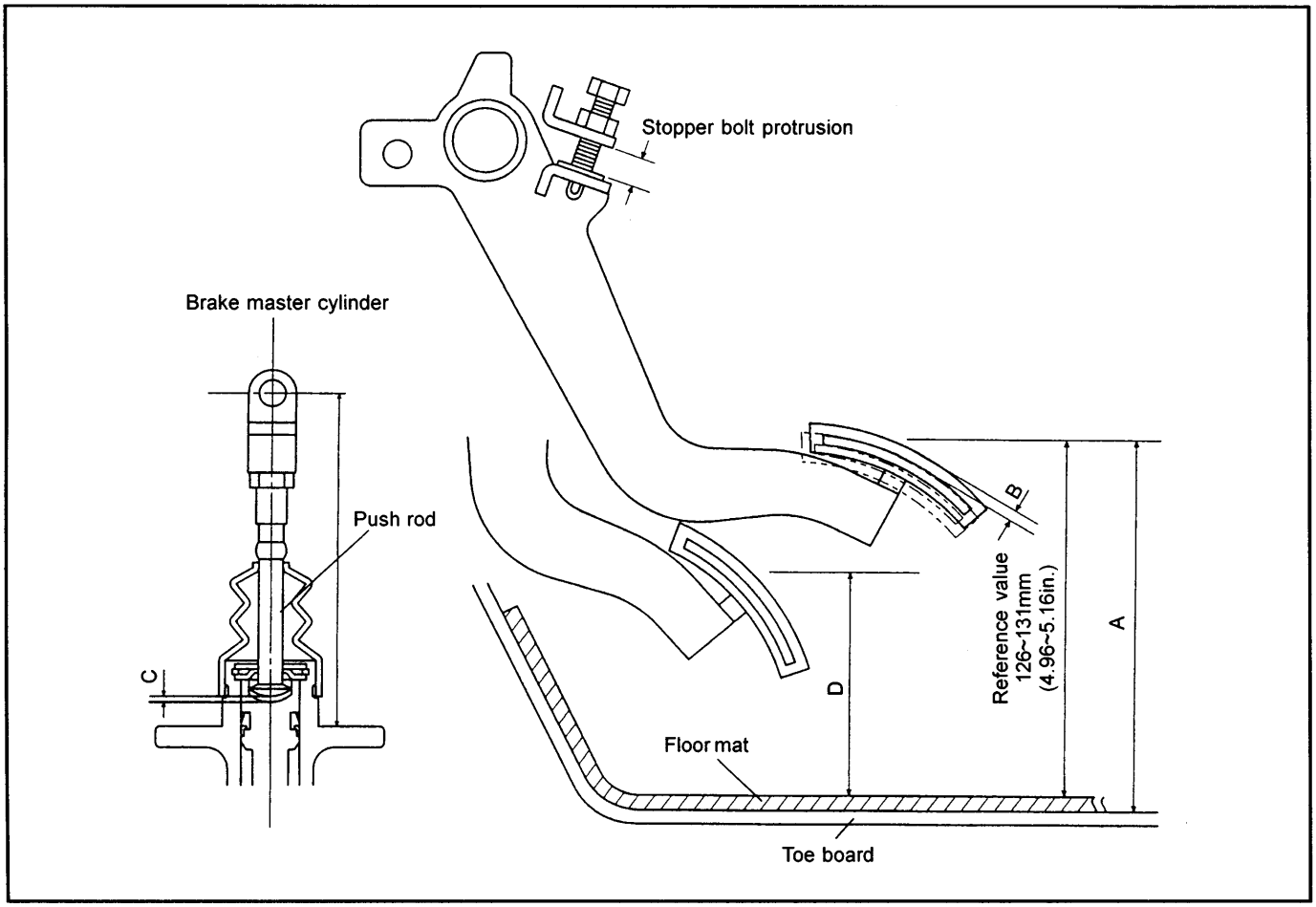
   Standard:
   1·2 ton series, 3 ton
   255 ~ 275 N (26 ~ 28 kgf) [48.5 ~ 52.9 lbf]
   J3.5 ton
   284 ~ 304 N (29 ~ 31 kgf) [59.5 ~ 63.9 lbf]

   (2) If the operating force is out of the standard range, release the parking brake and make adjustment at the adjusting portion.

   Clockwise turn: Increases the operating force.
   Counterclockwise turn: Decreases the operating force.

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BRAKE PEDAL INSPECTION·ADJUSTMENT



1. Inspect brake pedal height A. (From toe board to top of pedal)

   Standard: A = 131 ~ 136 mm (5.16 ~ 5.35 in) (with pedal pad)

   If the standard is not satisfied, make adjustment by changing the stopper bolt protrusion.

2. Inspect brake pedal play B.

   Standard: B = 5 ~ 9 mm (0.2 ~ 0.35 in)

   If the standard is not satisfied, make adjustment by changing the master cylinder push rod length.

3. Check master cylinder push rod play C with the brake pedal in the above state.

   Standard: C = 1 ~ 2 mm (0.04 ~ 0.08 in)

4. After the adjustment, fully depress the brake pedal D and inspect the pedal height in that state.

   Standard: D = 71 mm (2.80 in) or more

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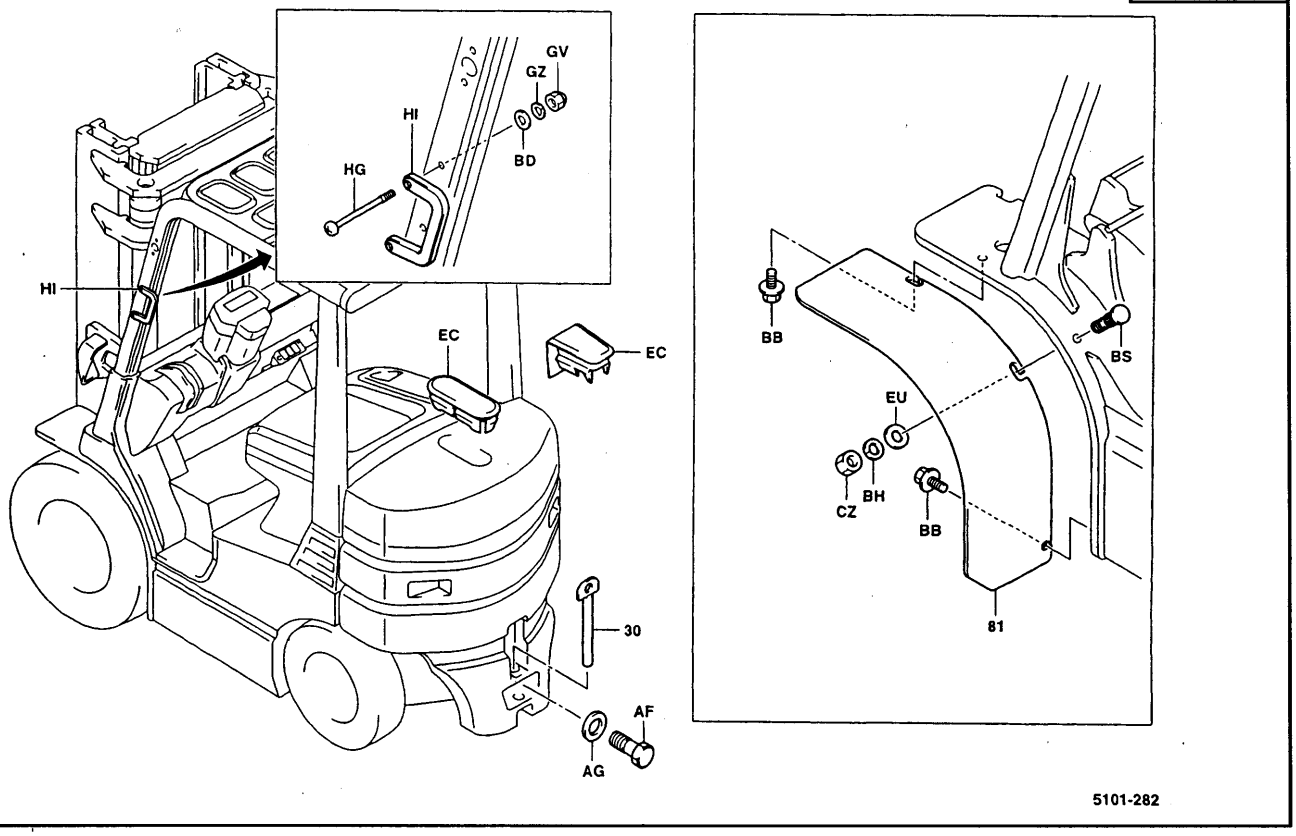
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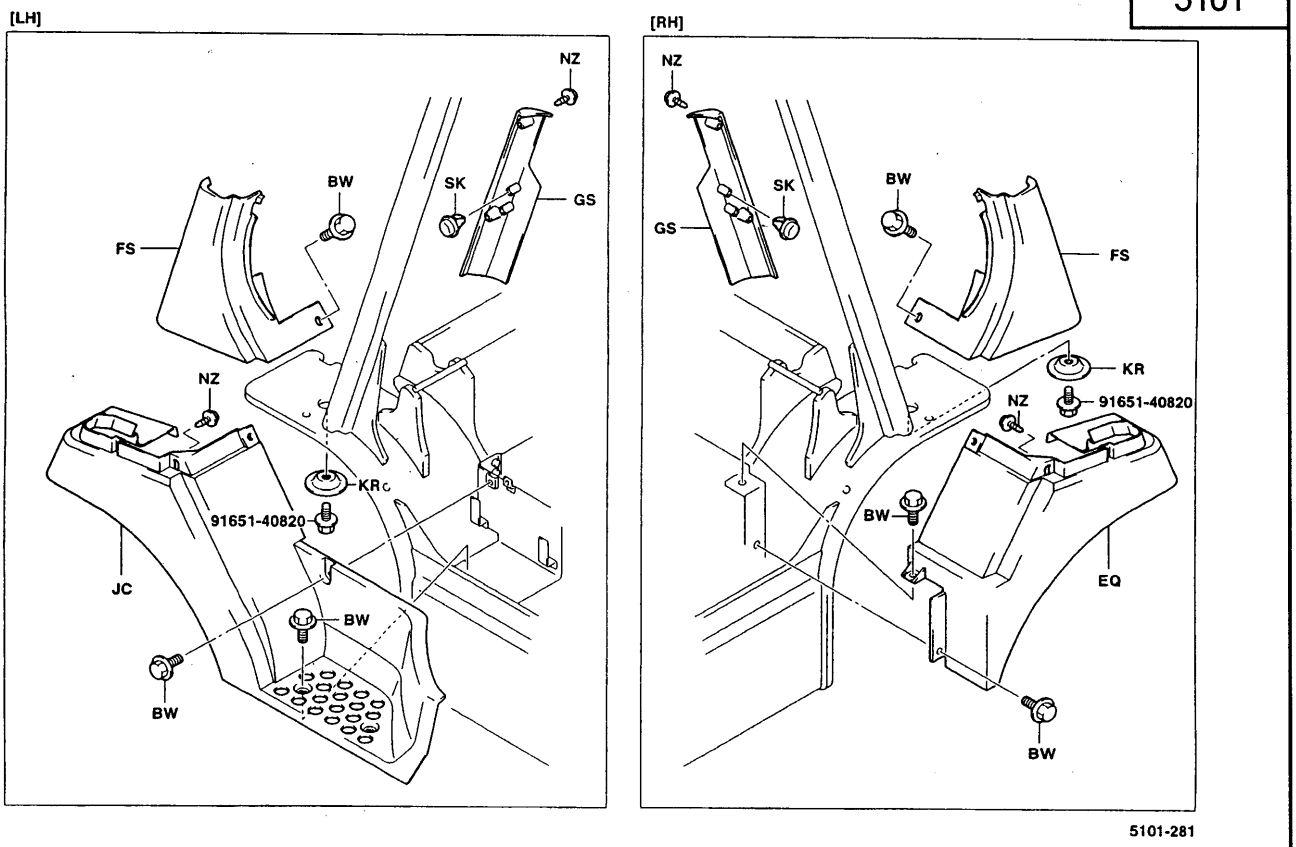
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5101

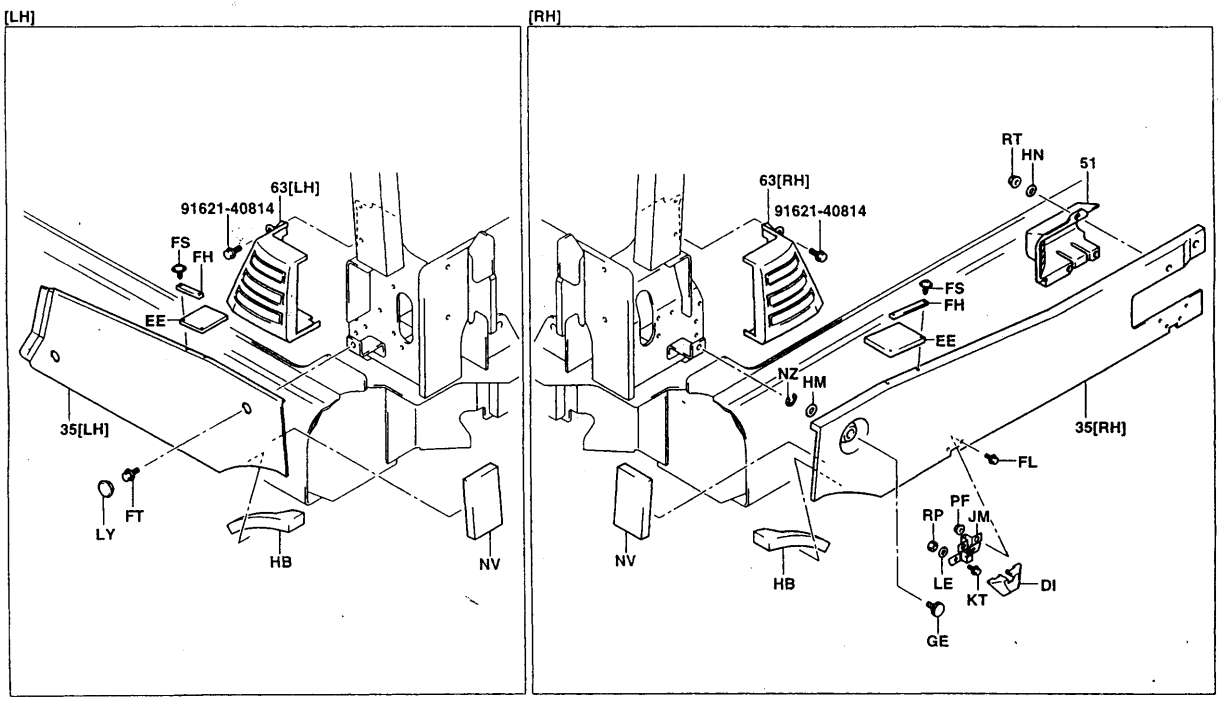


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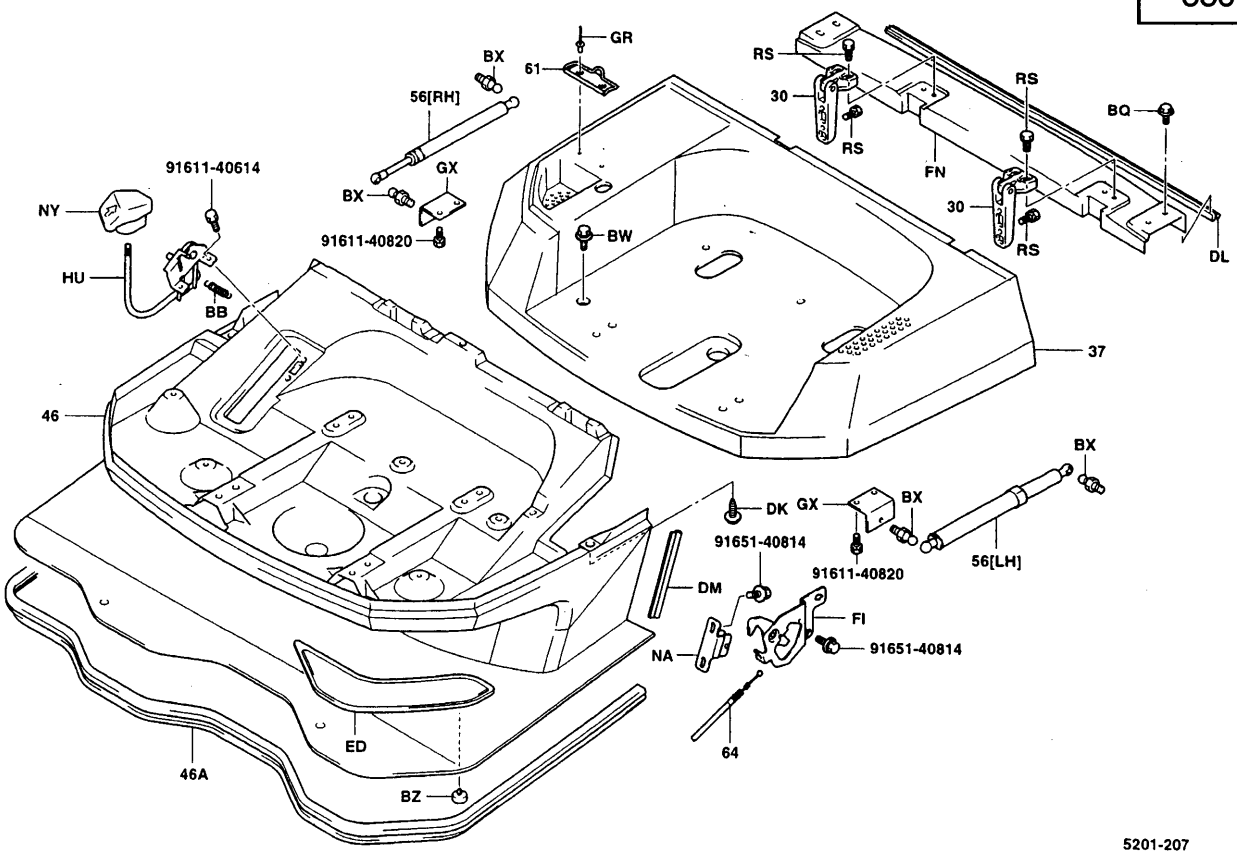
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5201



5201-208A

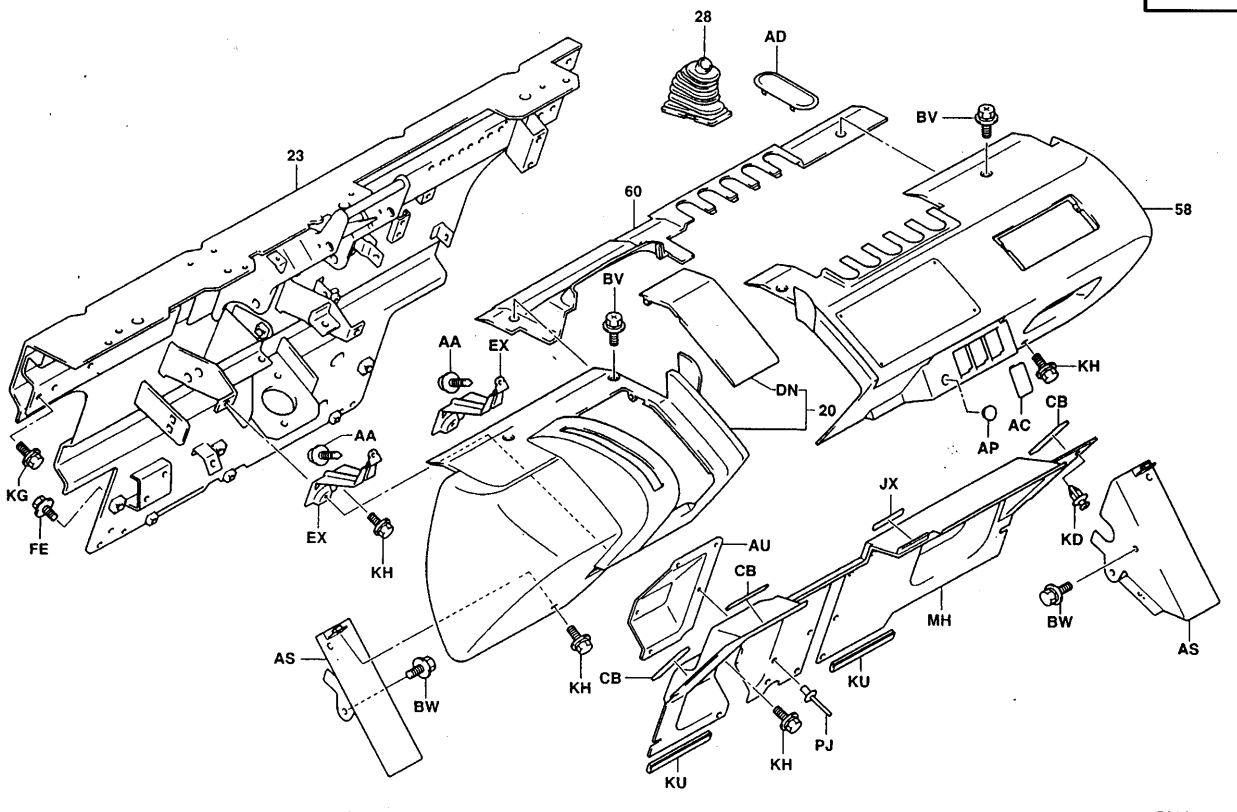
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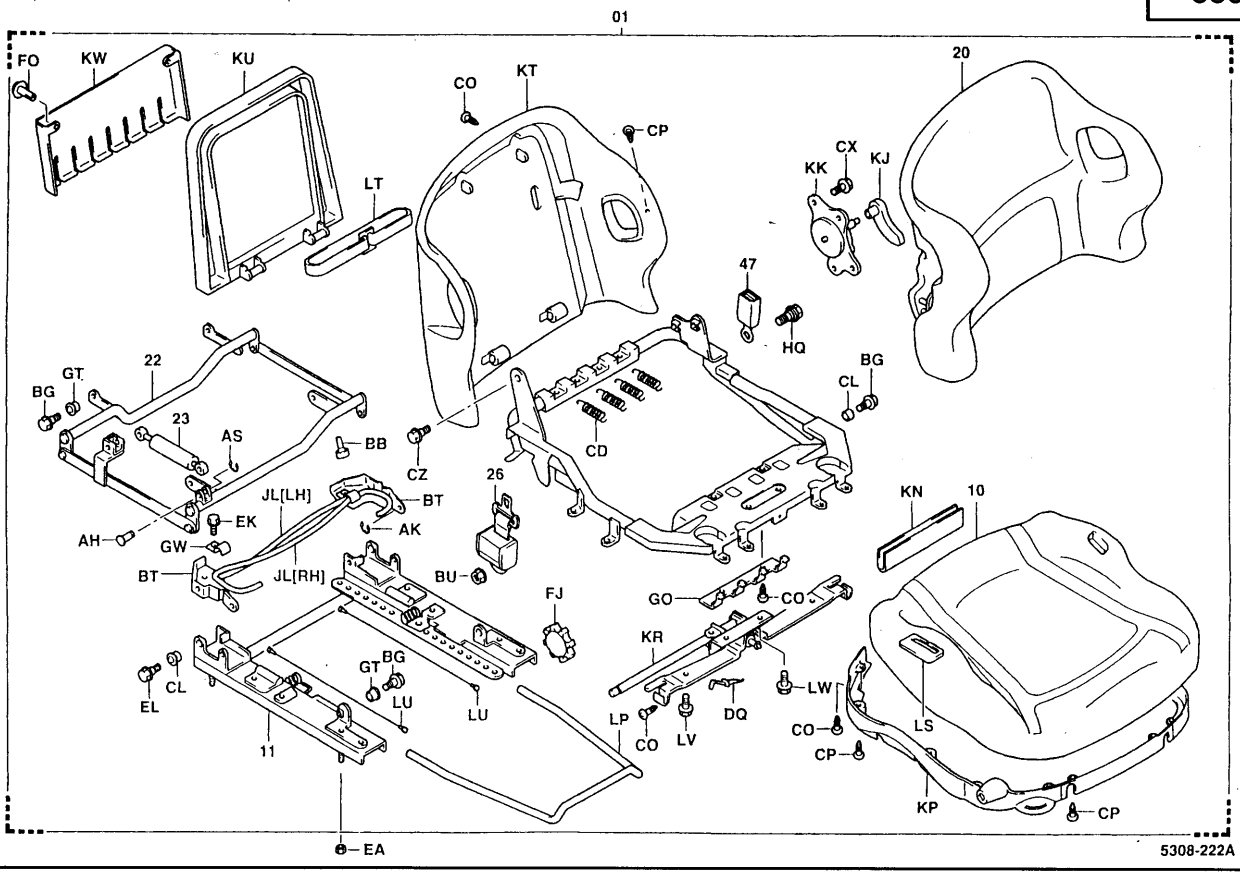
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5301



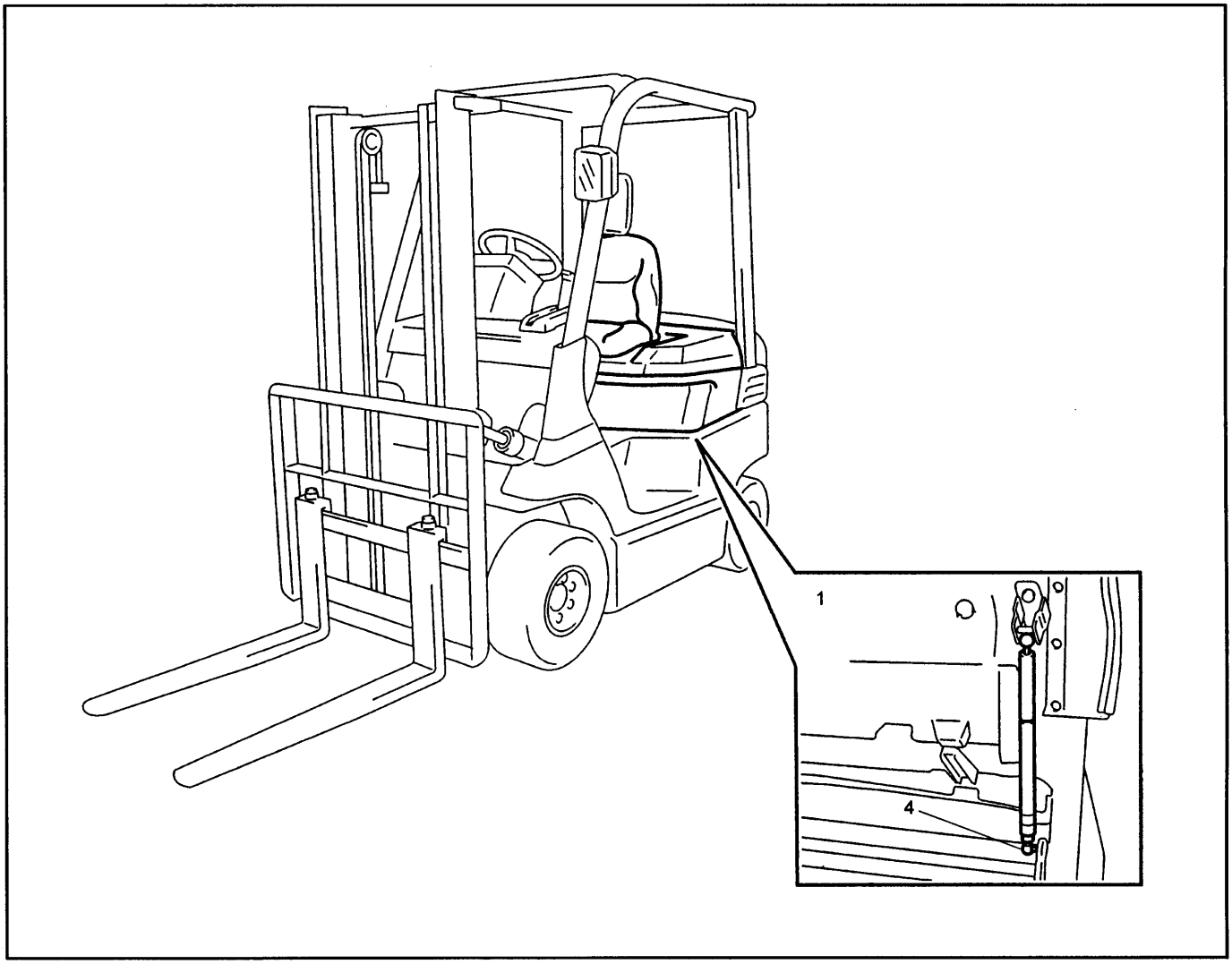
5308



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SEAT STAND ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Open the seat stand.

2 Disconnect the battery plug.

3 Use a string and tie the seat stand W/seat ASSY to the headguard rear pillar.

4 Disconnect the seat stand damper (on the frame side).

5 Close the seat stand.

6 Remove the seat stand set bolts.

7 Remove the seat stand.

Installation Procedure

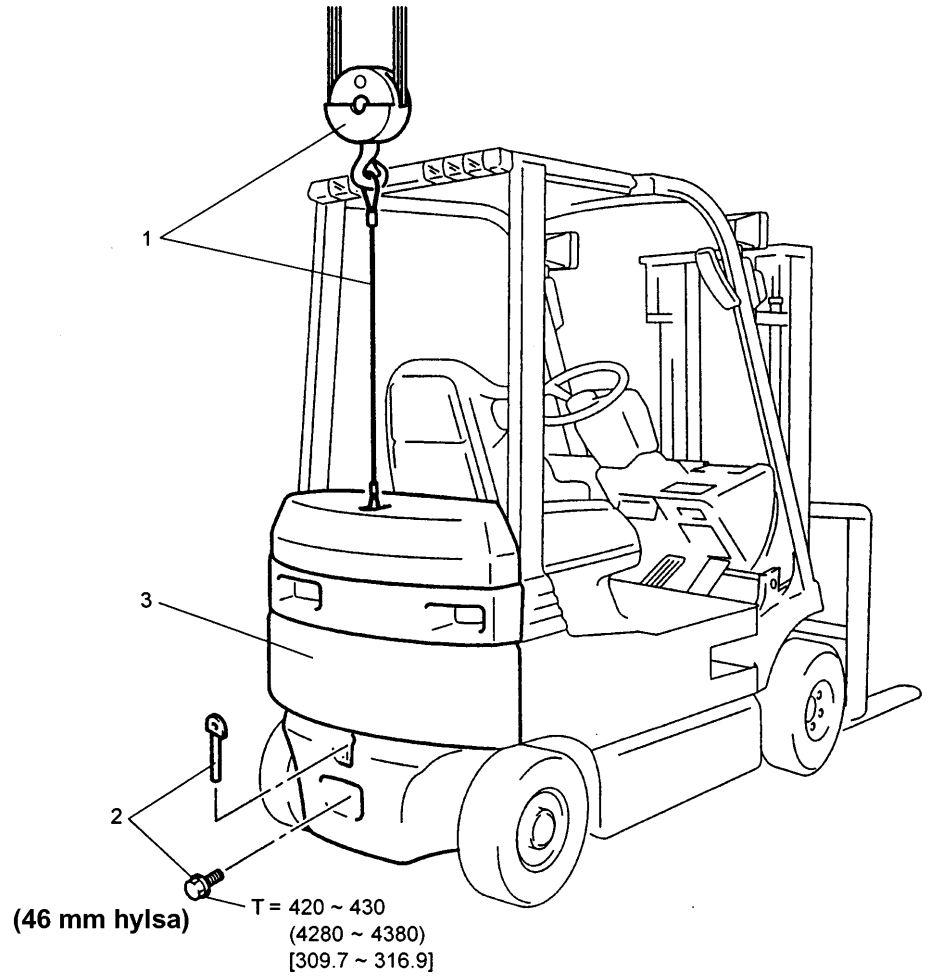
The installation procedure is the reverse of the removal procedure.

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COUNTERWEIGHT

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the weight cap and temporarily hoist the counterweight by slinging with a wire rope.

2 Remove the drawbar, and remove the counterweight set bolt.

3 Remove the counterweight.

Installation Procedure

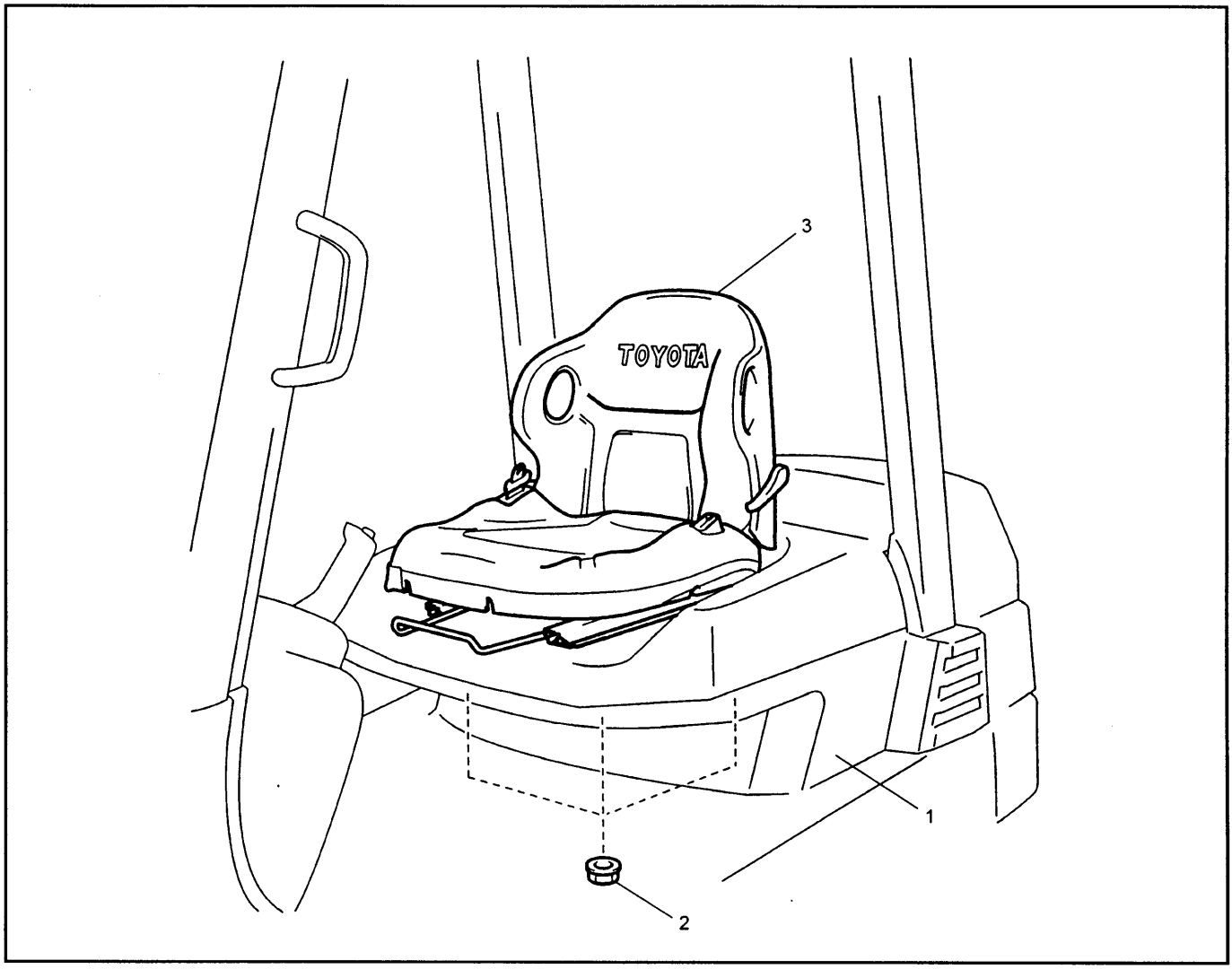
The installation procedure is the reverse of the removal procedure.

Note:
See page 0-17 for the mass of the counterweight.

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DRIVER'S SEAT

REMOVAL·INSTALLATION



Removal Procedure

1 Open the seat stand.

2 Remove the driver's seat set nuts.

3 Remove the driver's seat.

Installation Procedure

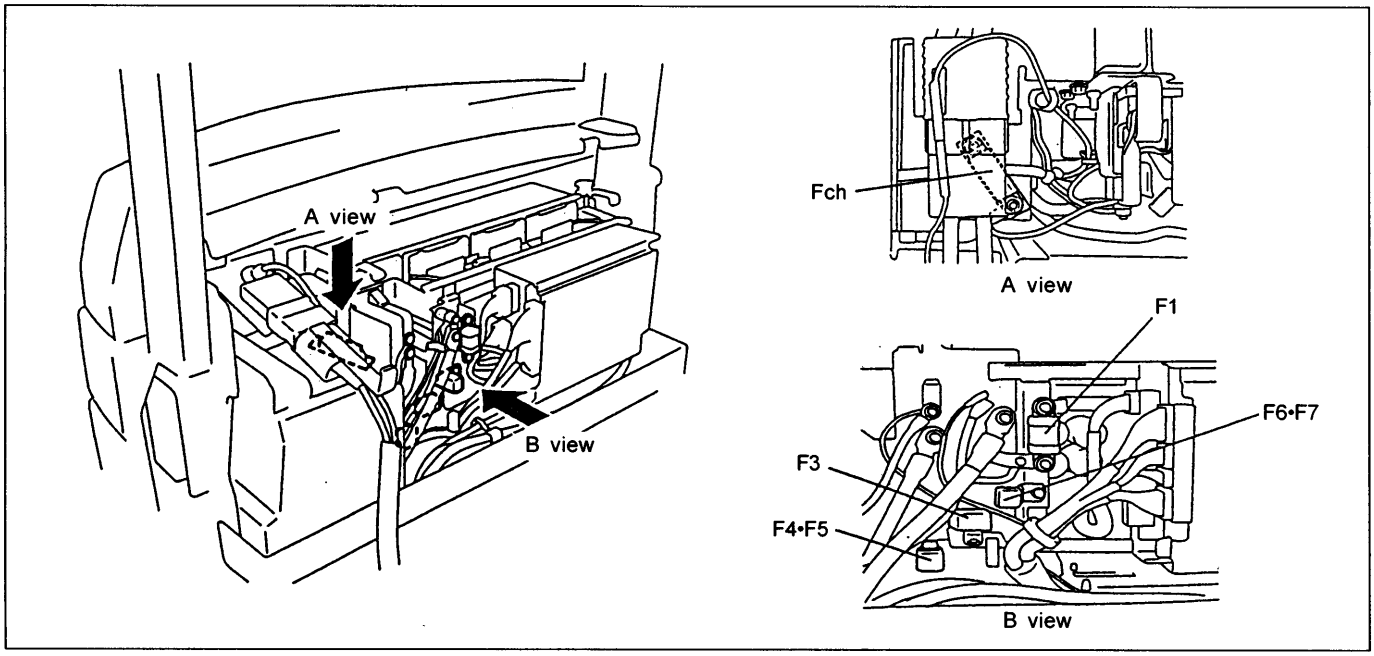
The installation procedure is the reverse of the removal procedure.

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FUSE

Fuse mounting position

All fuses are installed in the seat stand. Fuses F1 through F6 are prepared on the main controller and Fch is on the transformer situated beside the controller. So far independent fuses F1 for traveling and F2 for load handling have now been integrated into one as the traveling /load handling fuse F1.



Names (applicable portions) and capacities

		1 ton series (excluding 40-7FB15), 3 and J3.5 ton	2 ton series and 40-7FB15			1 and 2 ton series	3 and J3.5 ton
F1	For traveling and load handling	500A	600A	F5	For flasher and buzzer	10A	
F3	For PS	Vehicle without SAS: 75A Vehicle with SAS: 60A		F6	For controller power supply	10A	
F4	For lamps	10A		F7	For controller power supply	—	10A

		Type	AH/5HR	Capacity	Type	AH/5HR	Capacity
Fch	For charger	SG3-69-60JBY	330	80A	SG3-69-130JBY	600 ~ 730	150A
		SG3-69-80JBY	400 ~ 450	80A	SG3-69-165JBY	845	150A
		SG3-69-100JBY	485 ~ 565	100A	SG3-115-85JBY	370 ~ 470	100A

Caution for fuse replacement
Always disconnect the battery plug and discharge CO (overall capacitor) by connection between P4 and N1 with a resistance of about 100 Ω before replacing any fuse.

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MATERIAL HANDLING SYSTEM

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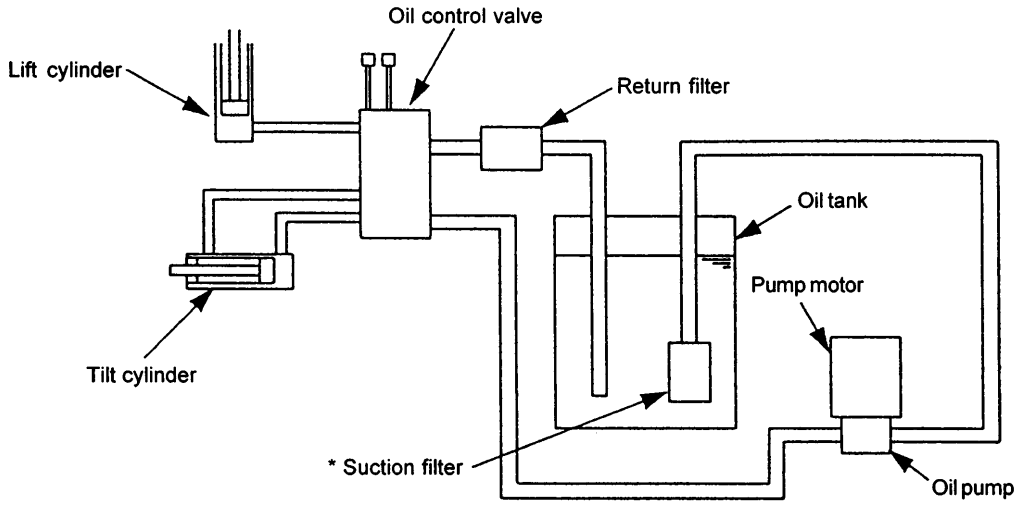
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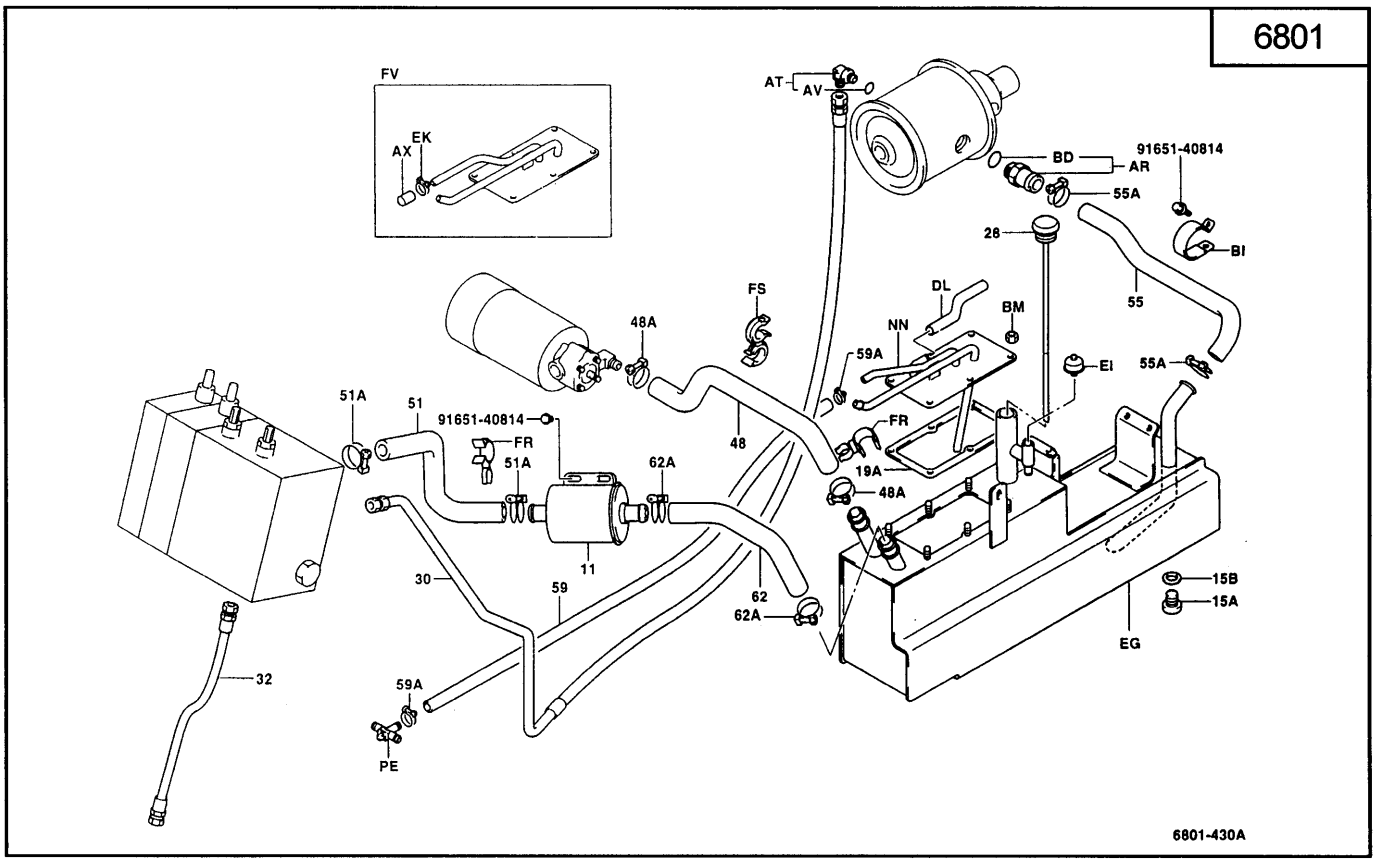
HYDRAULIC SYSTEM DIAGRAM

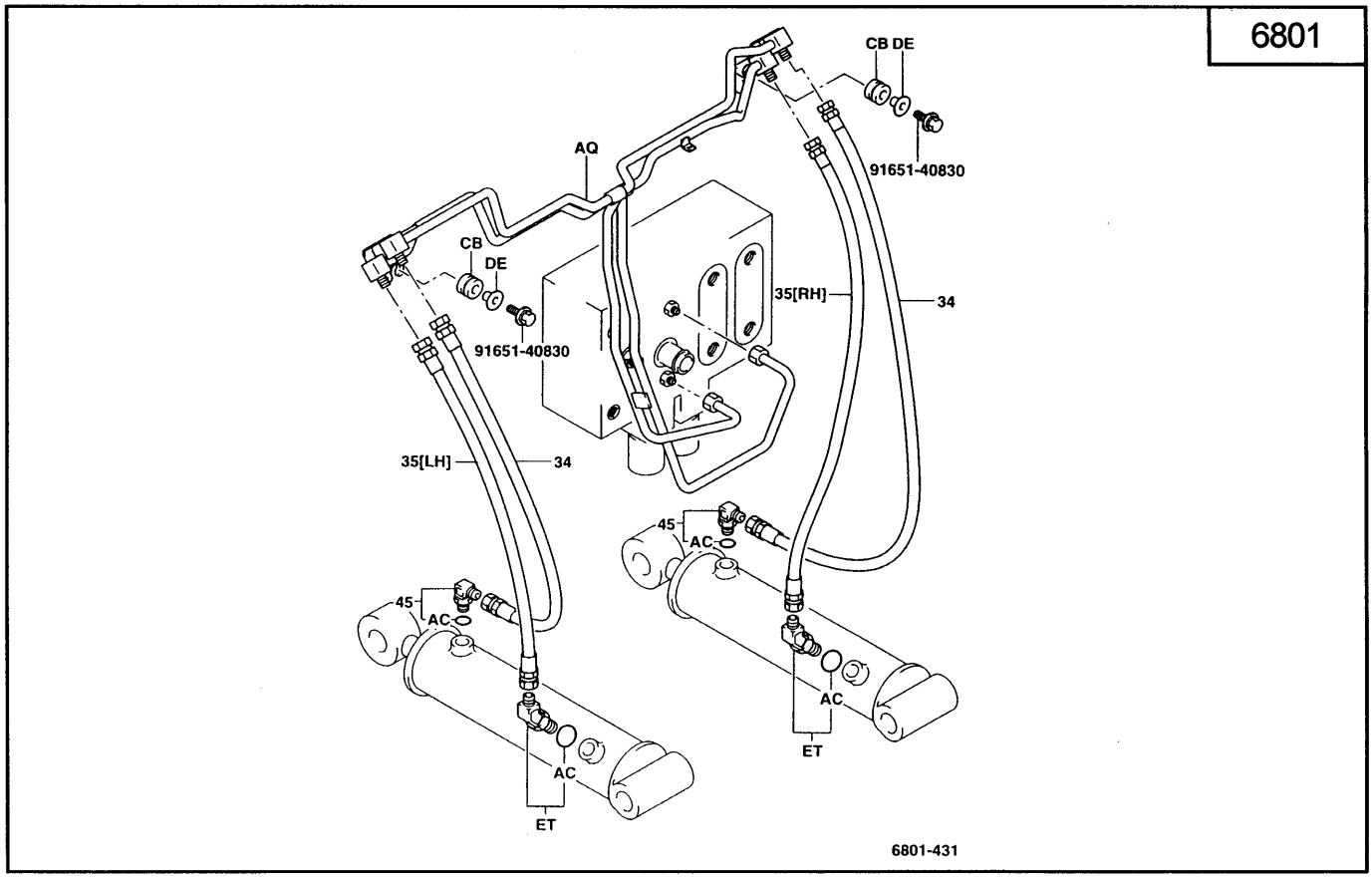


* The suction filter is provided on 3.0·J3.5 ton and 40-7FB20·25 models.

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COMPONENTS



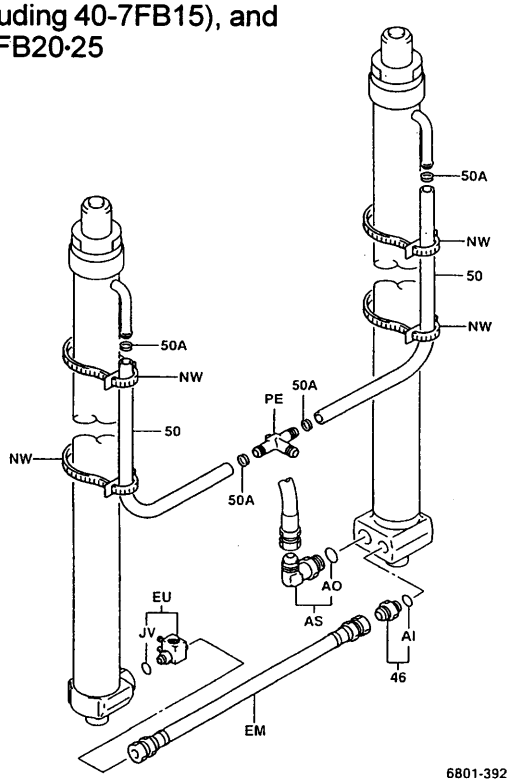


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V·SV Mast

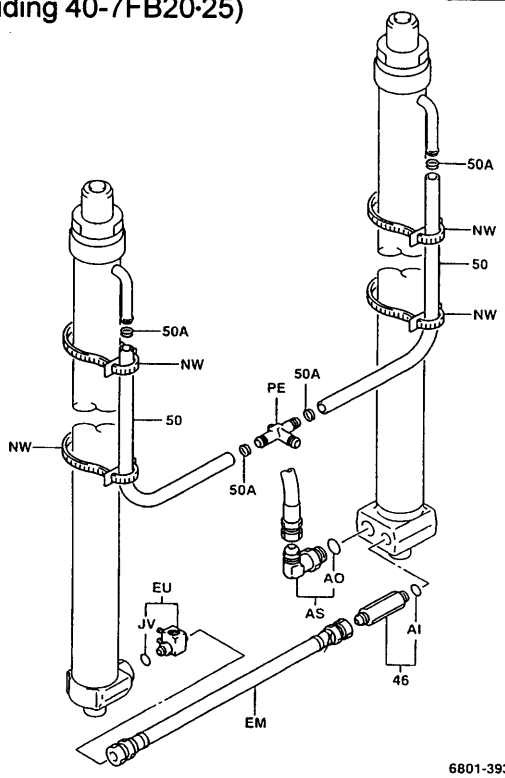
6801

1.0 to 1.8 ton and J3.5 ton (excluding 40-7FB15), and 40-7FB20·25



6801-392

40-7FB15 and 2.0, 2.5 and 3.0 ton (excluding 40-7FB20·25)

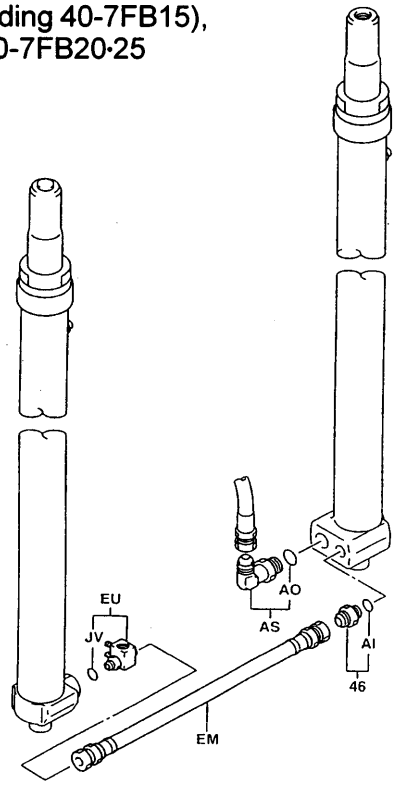


6801-393

FV Mast

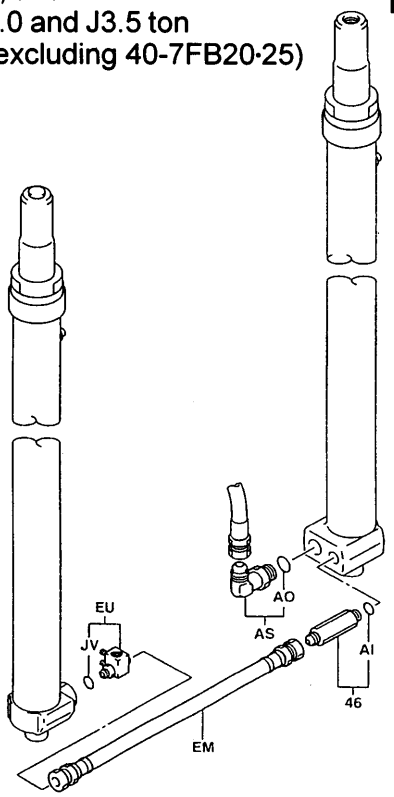
6801

1.0 to 1.8 ton vehicles (excluding 40-7FB15), and 40-7FB20·25



6801-395

40-7FB15, and 2.0, 2.5, 3.0 and J3.5 ton vehicles (excluding 40-7FB20·25)



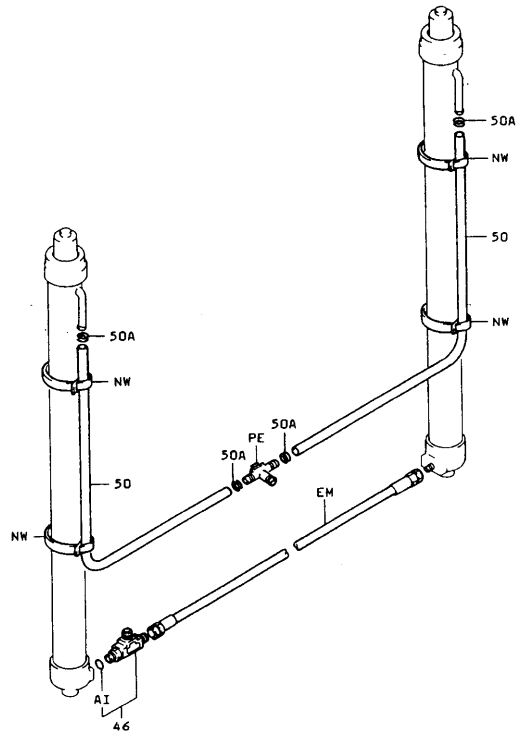
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FSV Mast

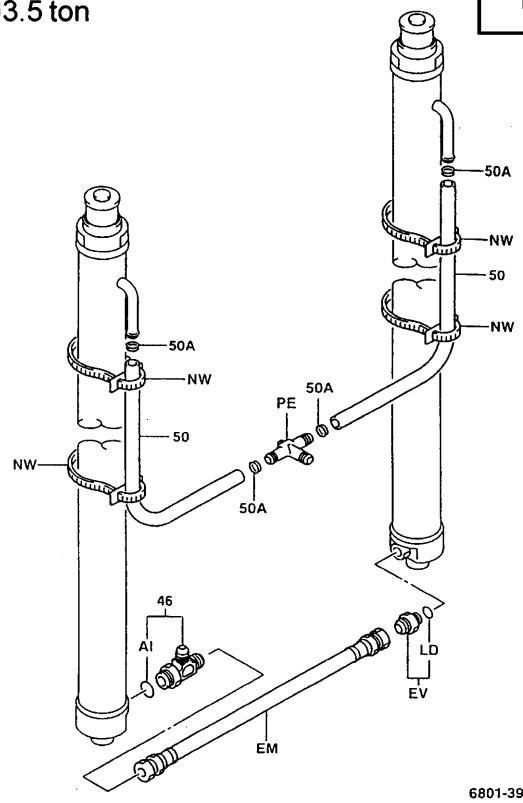
1·2 ton series, 3 ton

6801



6801-288

J3.5 ton

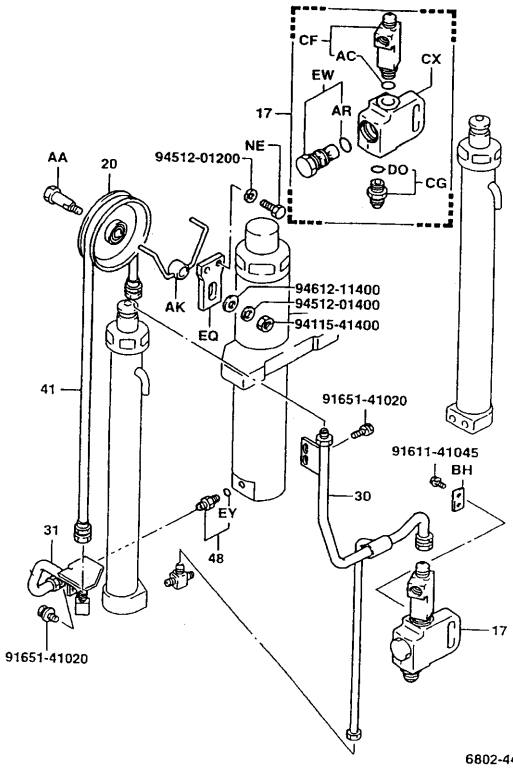


6801-394

FSV Mast

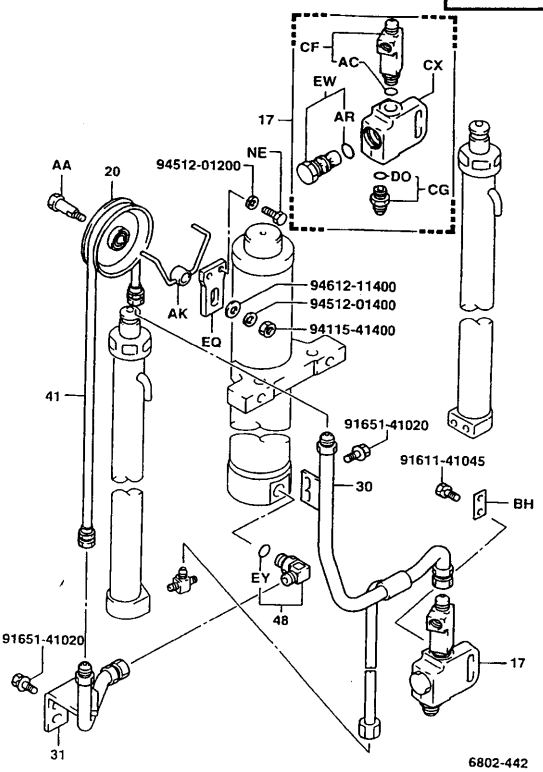
1.0 to 2.5 ton

6802



6802-441

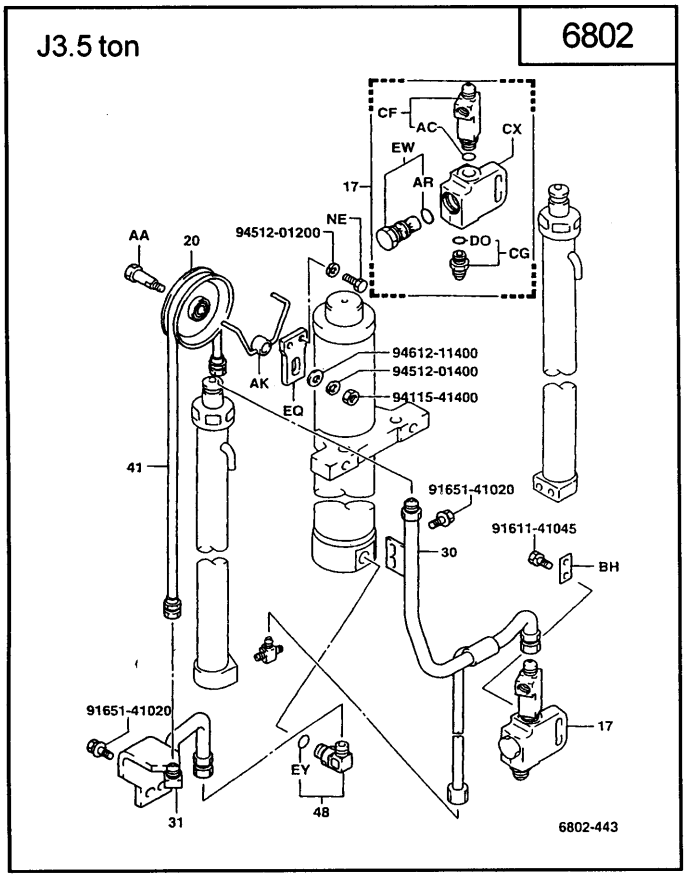
3.0 ton



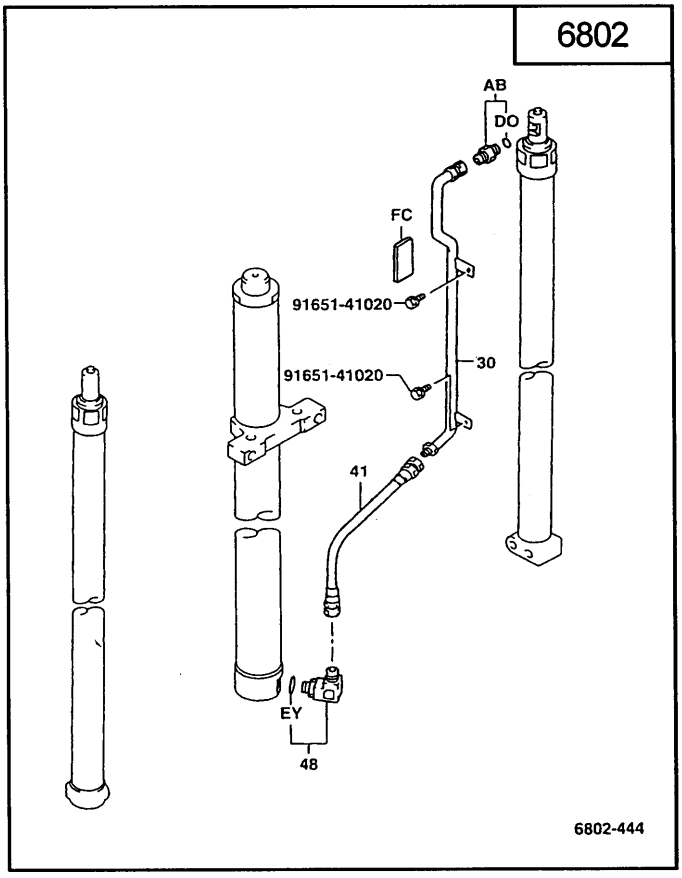
6802-442

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FSV Mast



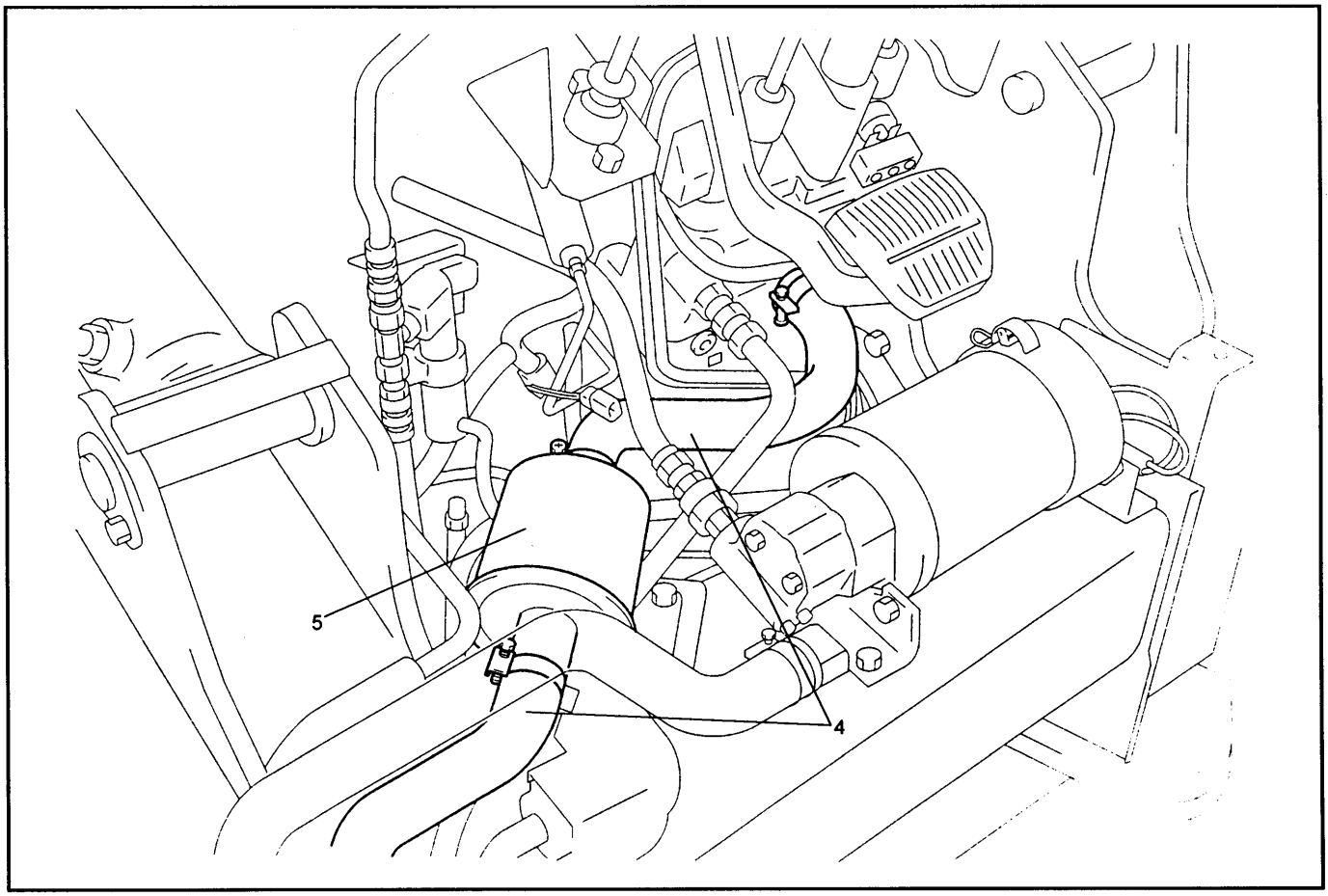
FV Mast



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RETURN FILTER

REMOVAL·INSTALLATION



Removal Procedure

1 Open the seat stand.

2 Remove the rear toe board.

3 Remove the front toe board.

4 Disconnect hoses from the front and rear of the return filter.

5 Remove the return filter

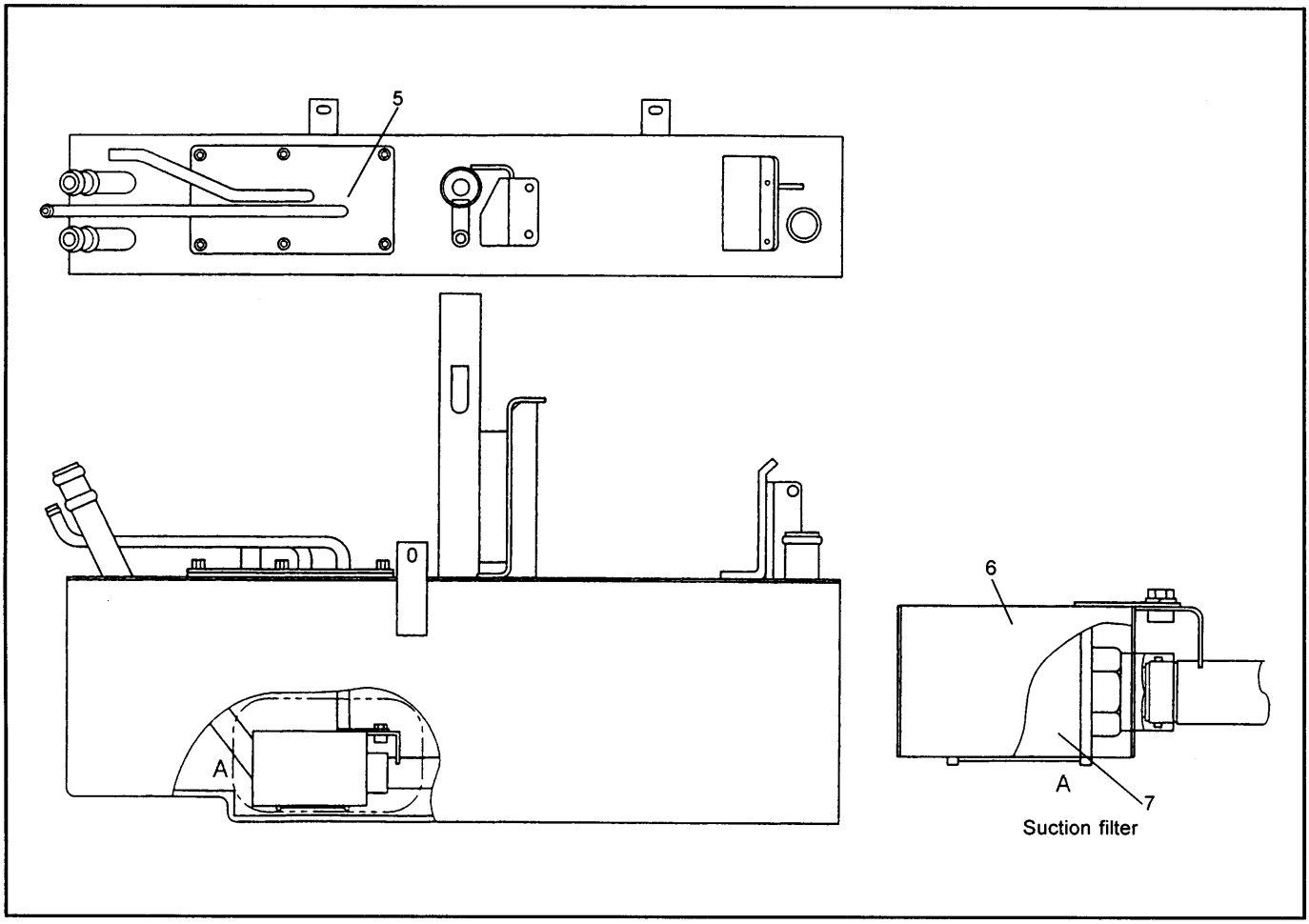
Installation Procedure

The installation procedure is the reverse of the removal procedure.

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SUCTION FILTER (FOR 3 TON•J3.5 TON AND 40-7FB20•25)

REMOVAL•INSTALLATION



Removal Procedure

1 Drain oil.

2 Remove the bolt on top of the instrument panel LH.

3 Remove the side step and cover (LH).

4 Disconnect the piping from the oil tank cover.

5 Remove the oil tank cover.

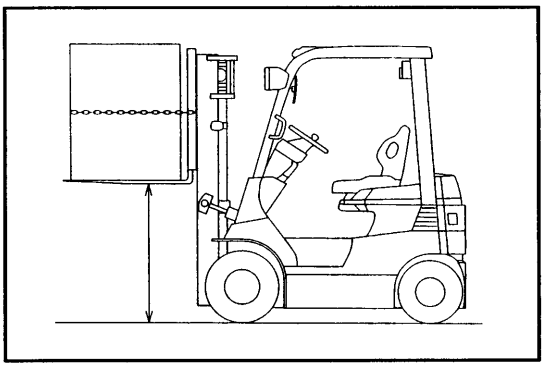
6 Remove the suction filter cover.

7 Remove the suction filter.

Installation Procedure

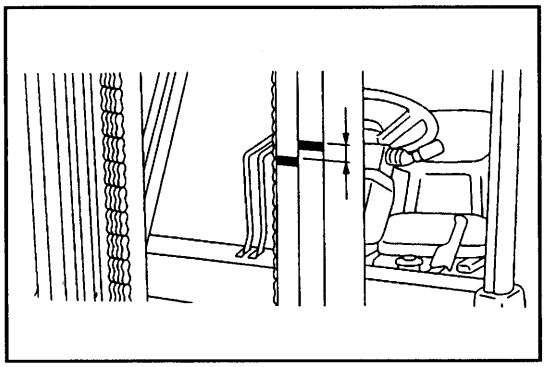
The installation procedure is the reverse of the removal procedure.

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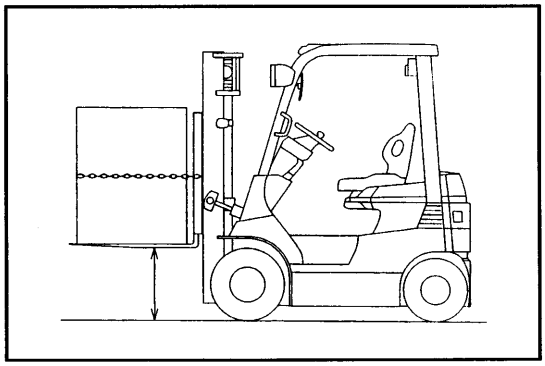


NATURAL DROP TEST

1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 to 1.5 m (40 to 59 in), and turn the key switch to OFF.

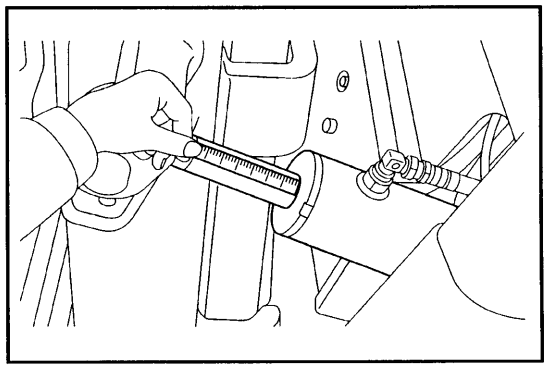


2. Draw datum lines on the inner and outer masts, and measure the drop in 15 minutes.
   Limit: 45 mm (1.77 in)



NATURAL FORWARD TILT TEST

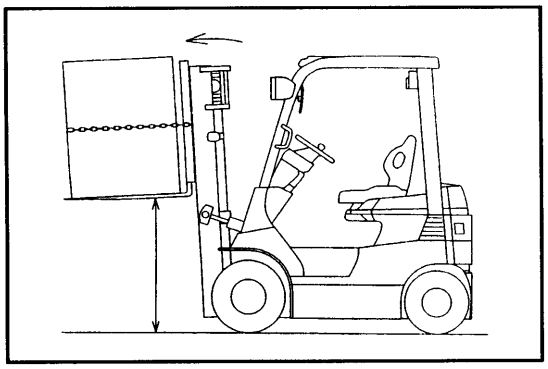
1. Set the mast in the vertical position with standard load on the fork. Lift the fork by about 50 cm (19.7 in) and turn the key switch to OFF.

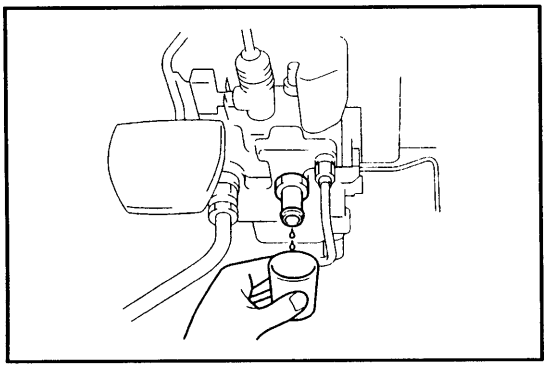


2. Measure the tilt cylinder rod extension in 15 minutes.

Vehicle model	Natural forward tilt amount mm (in)
1 ton series	15 (0.59) or less
2 ton series	20 (0.79) or less
3·J3.5 ton	25 (0.98) or less

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OIL LEAK TEST

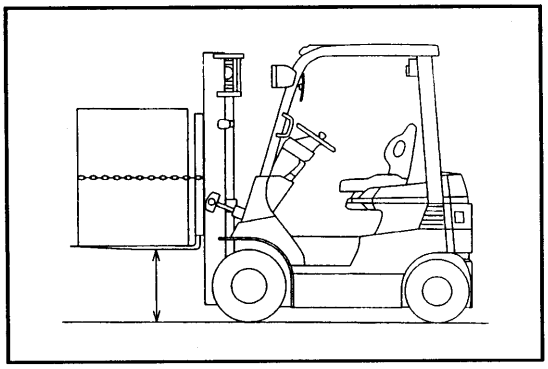
LIFT CYLINDER

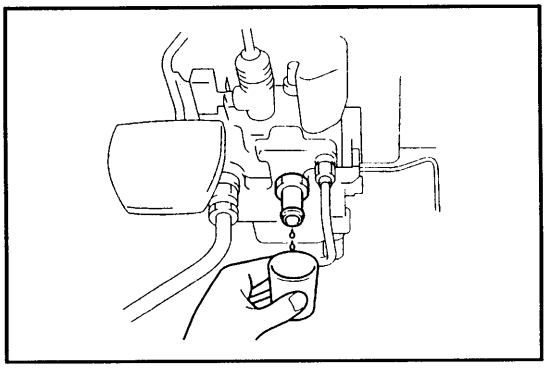
1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 to 1.5 m (40 to 59 in).

2. Slowly tilt the mast fully forward, and turn the key switch to OFF. After 5 minutes, disconnect the oil control valve to oil tank hose. Place a measuring cylinder under the elbow and measure the amount of oil leaking in one minute.

   Standard (at lift port): 8 cm^3 (0.49 in^3) or less

   Note:
   If the natural drop is great even though the oil leak amount is within the standard, the lift lock valve or lift cylinder packing is defective.





TILT CYLINDER

1. Set the mast in the vertical position with standard load on the fork. Lift the fork by about 50 cm (19.7 in) and turn the key switch to OFF.

2. After waiting for 5 minutes, disconnect the oil control valve to oil tank hose. Place a measuring cylinder under the elbow and measure the amount of oil leaking in one minute.

   Standard (total for lift and tilt): 16 cm^3 (0.98 in^3)or less

3. The leak amount at the tilt port is the total leak amount less the leak amount from the lift port.

   Note:
   If the natural forward tilt is great even though the oil leak amount is within the standard, either the tilt lock valve or the tilt cylinder packing is defective.

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MAST

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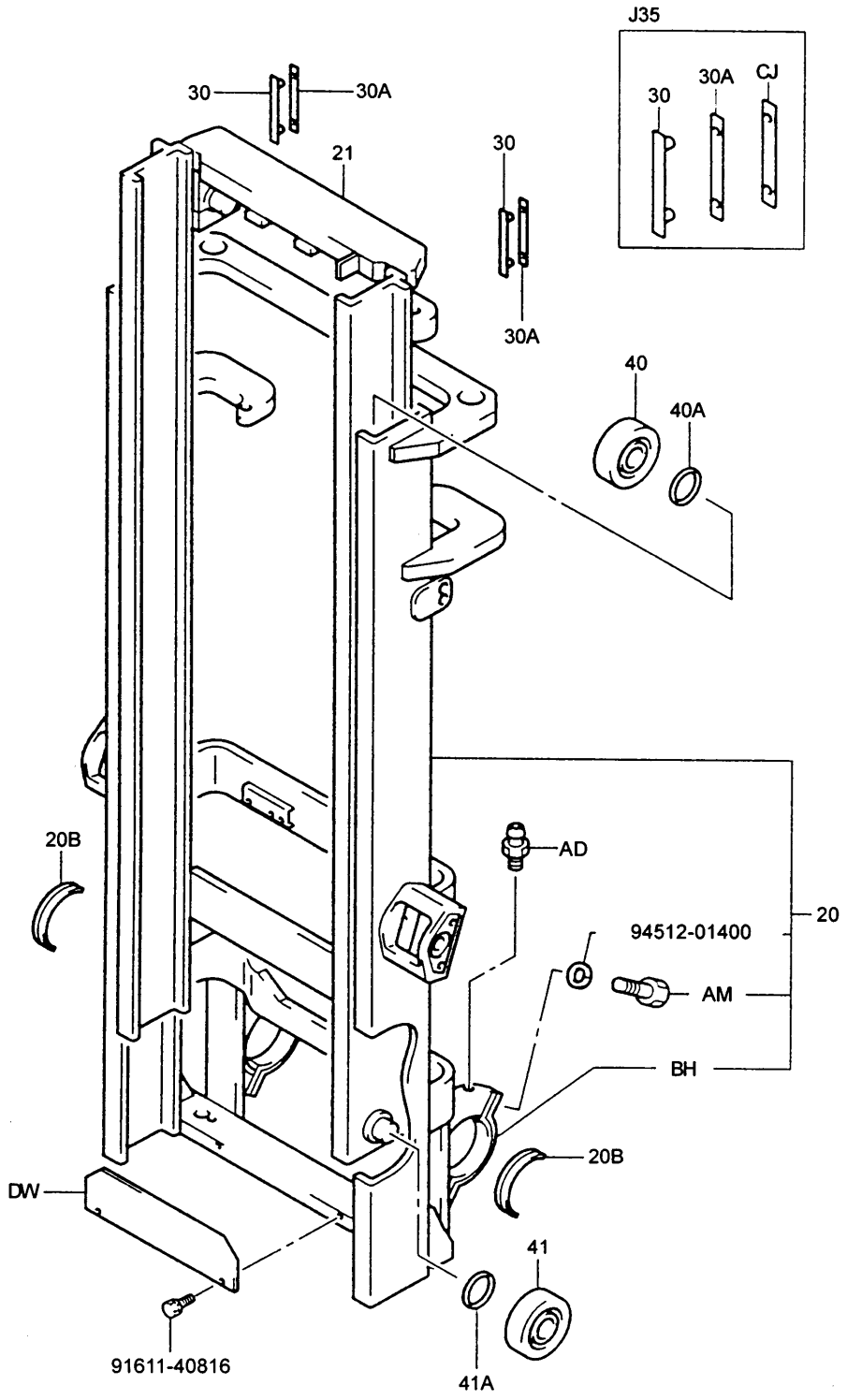
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V MAST ASSY

COMPONENTS

6101

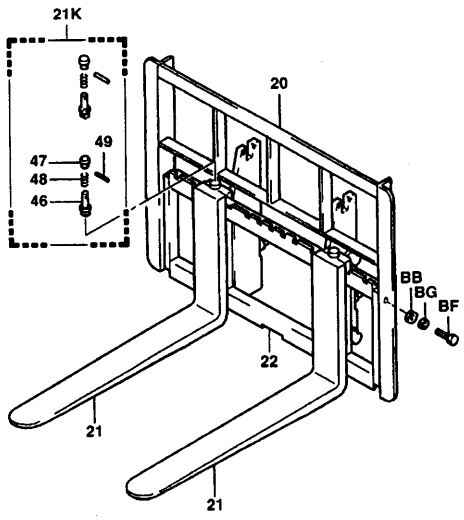


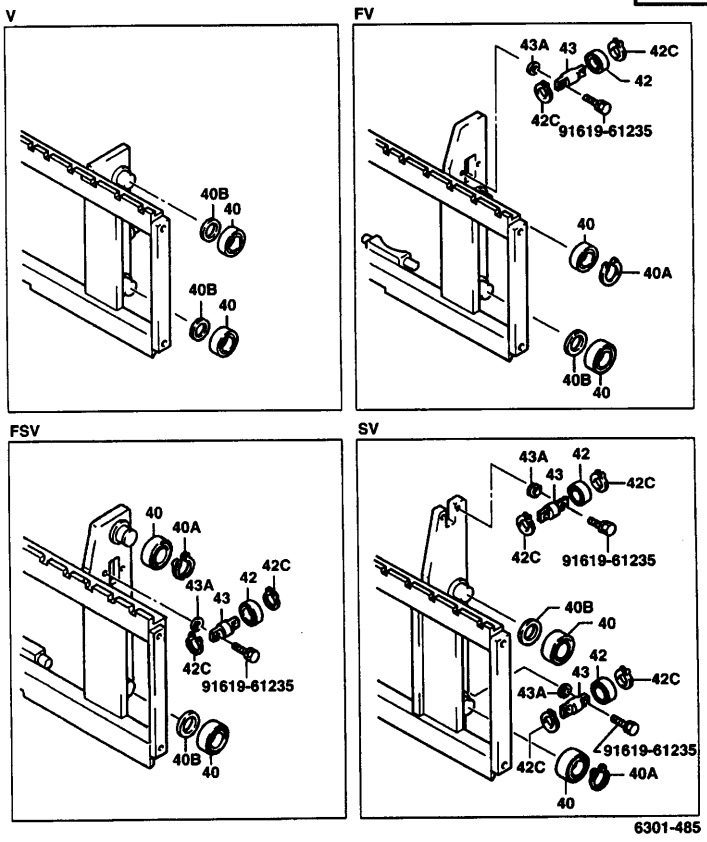
6101-469B

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6301

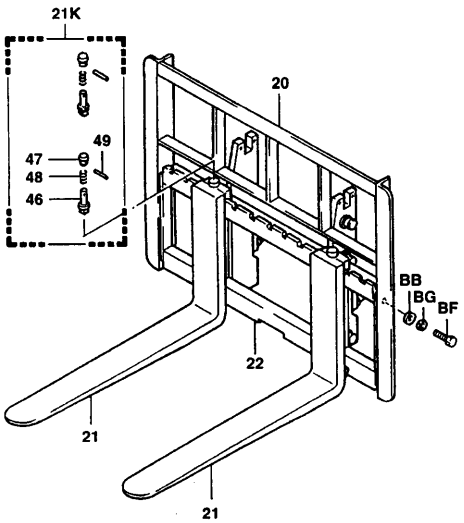
1 ton

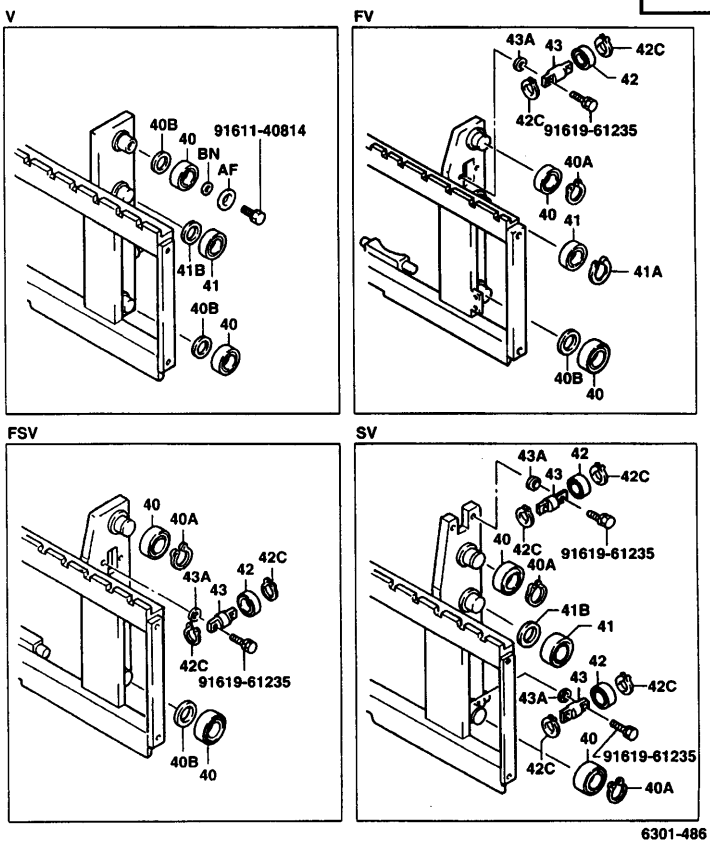




6301

1.35 ~ 1.8 ton
(exclusive 40-7FB15)

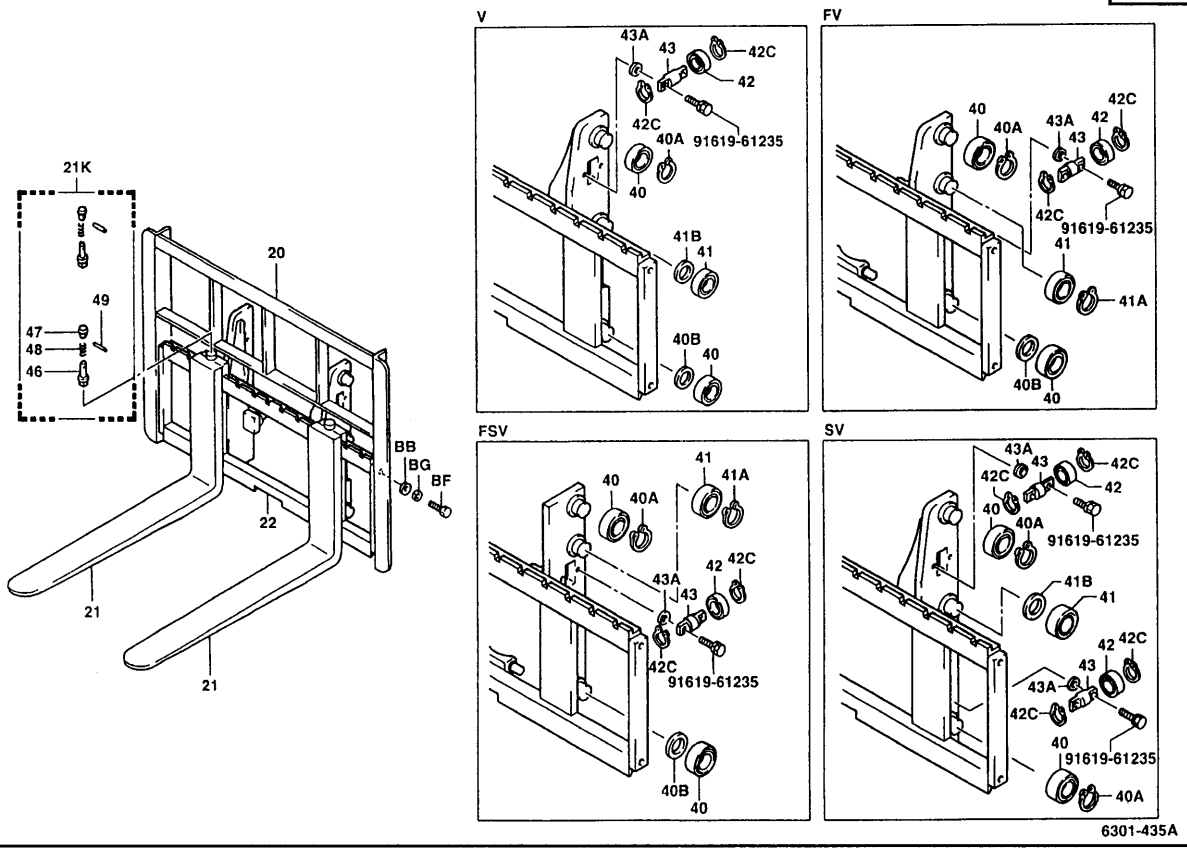




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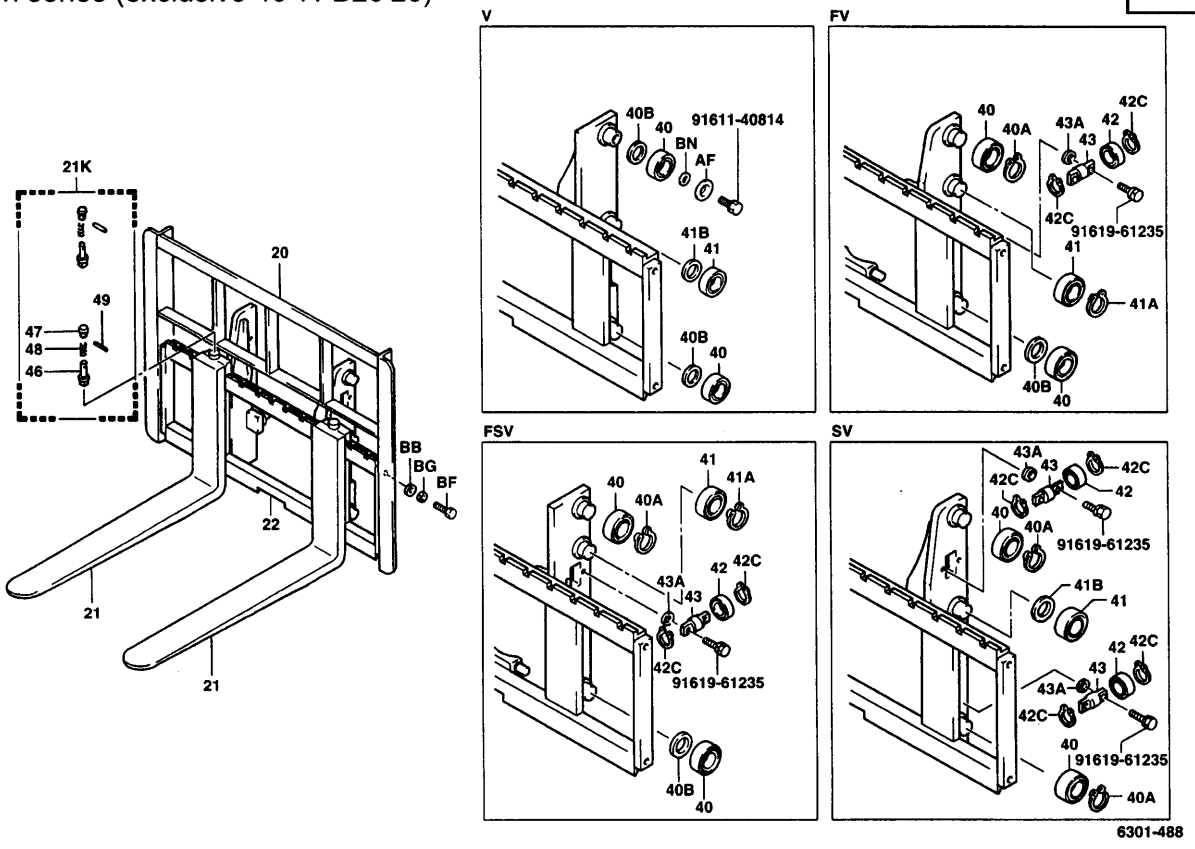
40-7FB15

6301



2 ton series (exclusive 40-7FB20·25)

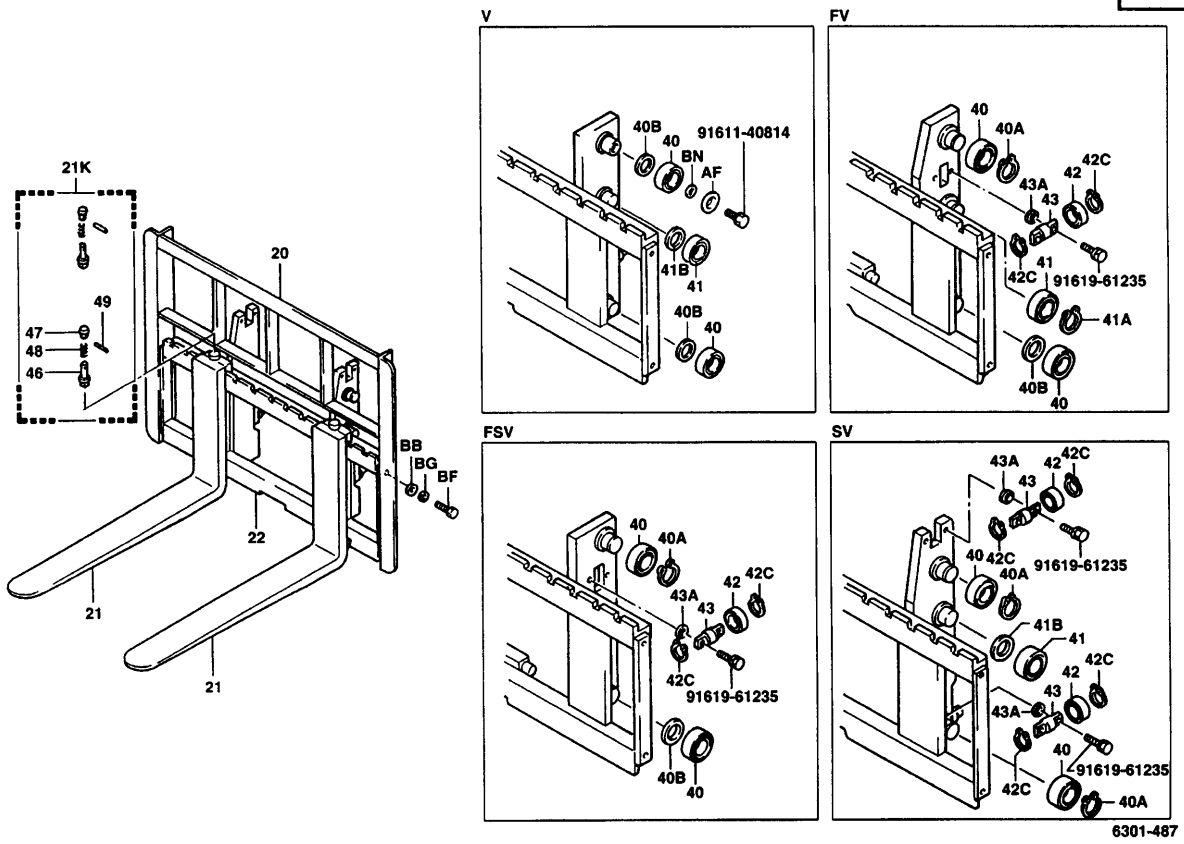
6301



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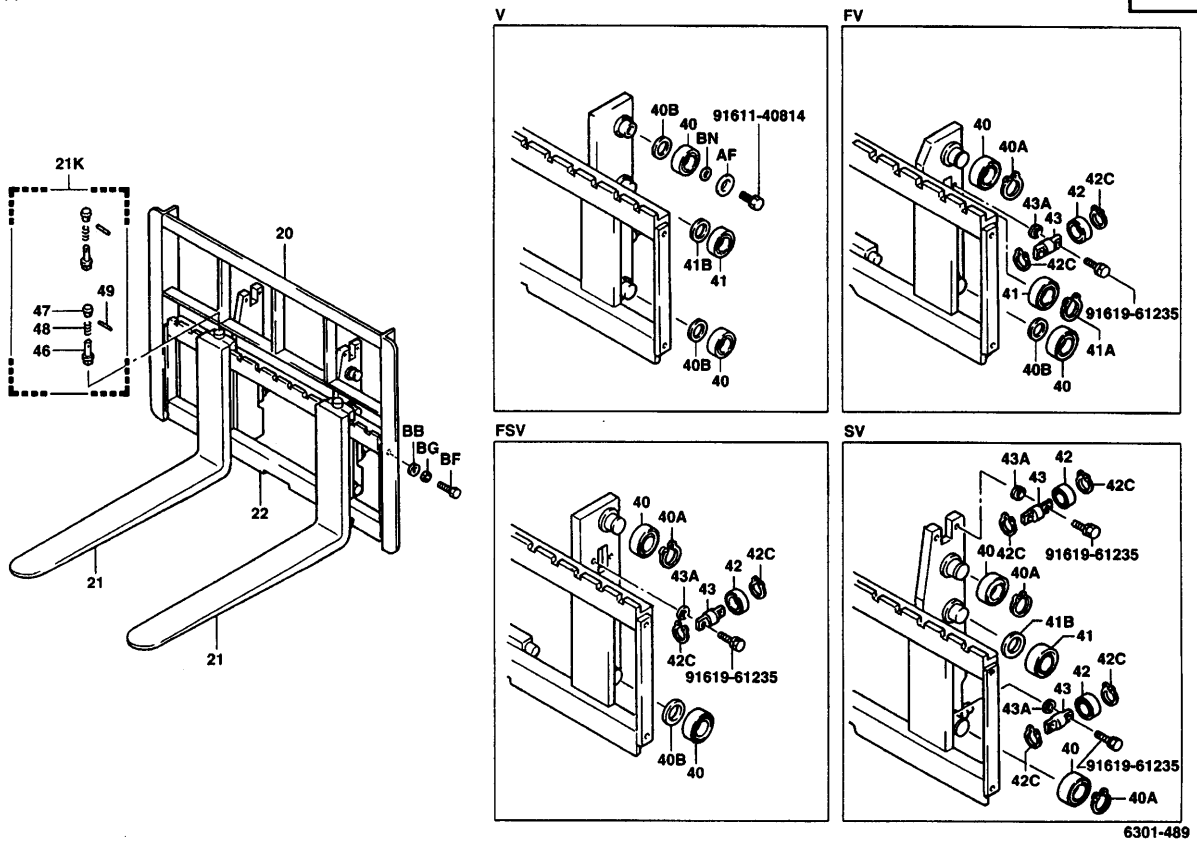
40-7FB20·25

6301



3 ton

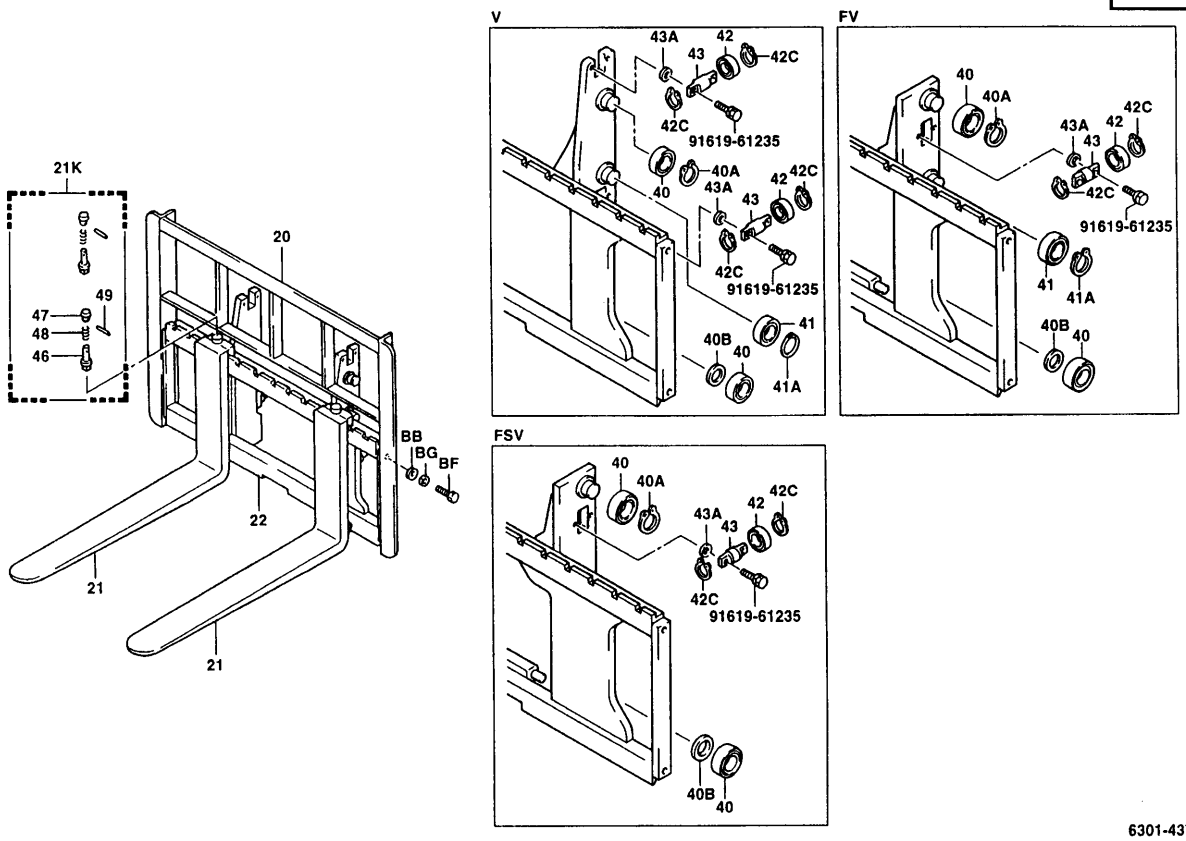
6301



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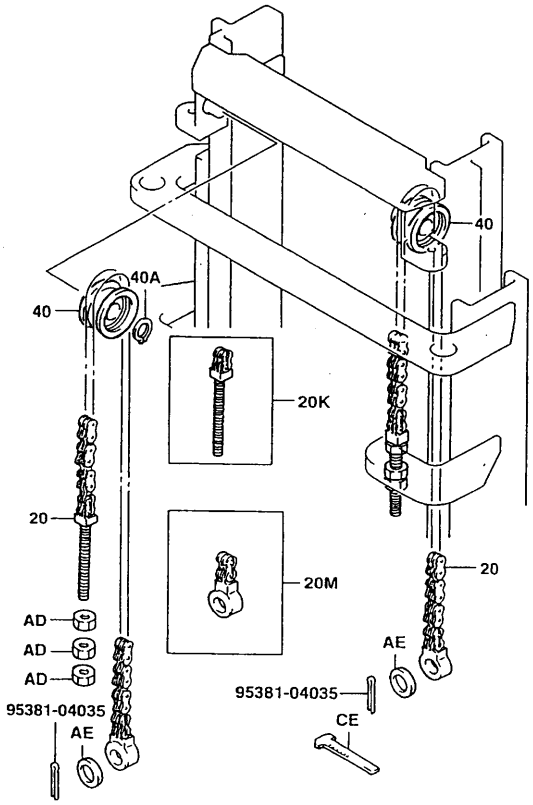
J3.5 ton

6301



6301-437B

6302

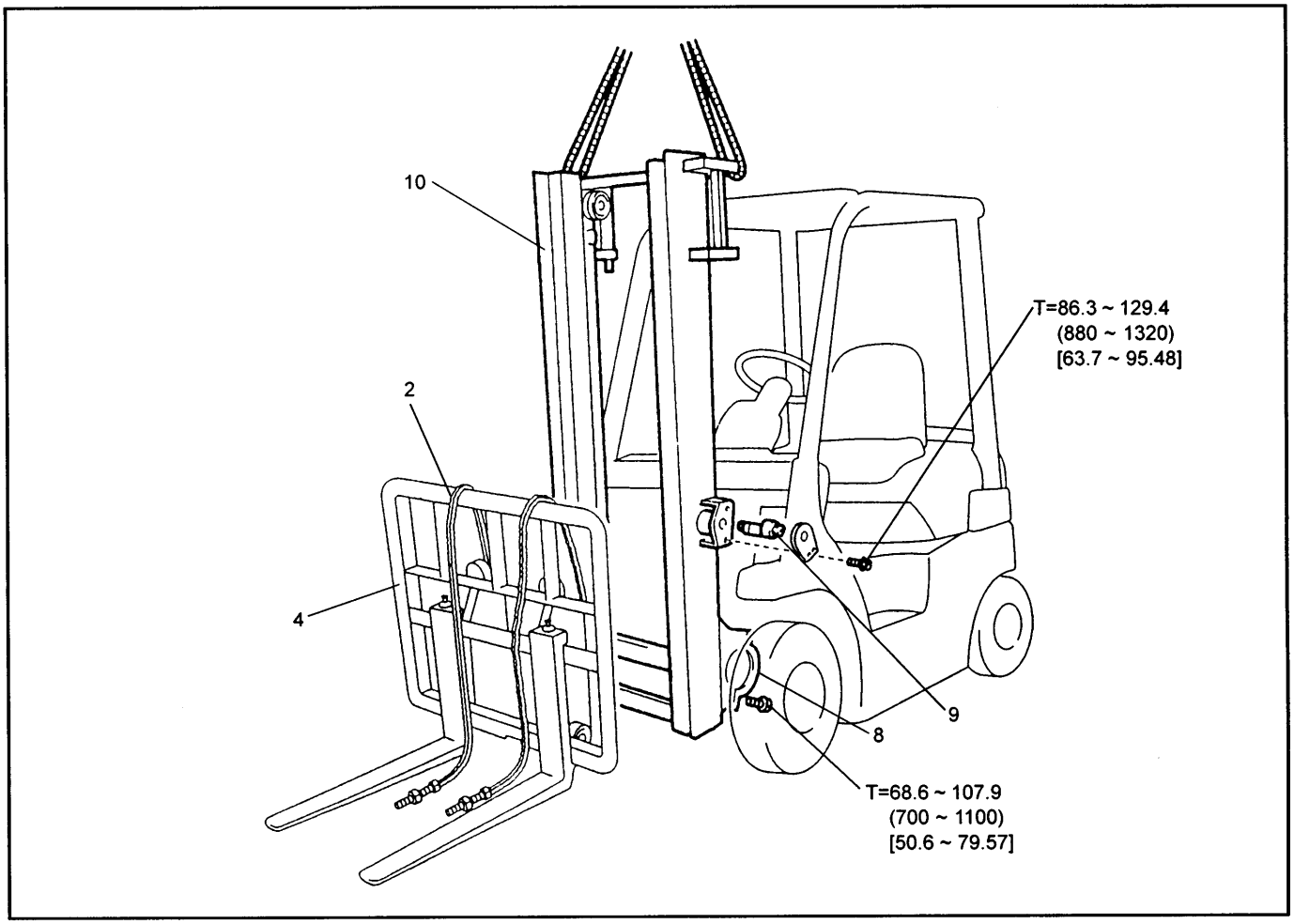


6302-343

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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Set the mast vertical and fully lower the fork.

2 Disconnect the chain. **[Point 1]**

3 Remove the chain wheel. **[Point 2]**

4 Remove the lift bracket. (For lift bracket removal, raise the inner mast until it comes off from the lift bracket, and slowly run the vehicle backward to depart from the lift bracket.)

5 Disconnect the fork height switch and load sensor wiring. (SAS spec.)

6 Disconnect the overflow hose and high pressure hose. (Before hose disconnection, fully lower the inner mast, operate the lift lever several times to release the residual pressure in the lift cylinder.)

7 Slightly hoist the mast.

8 Remove the mast support cap.

9 Remove the tilt cylinder front pin. **[Point 3]**

10 Remove the mast ASSY.

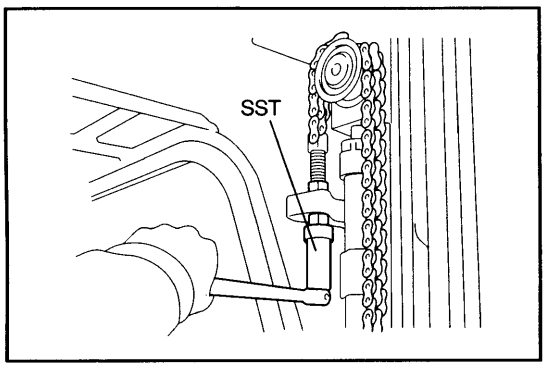
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Installation Procedure

The installation procedure is the reverse of the removal procedure.

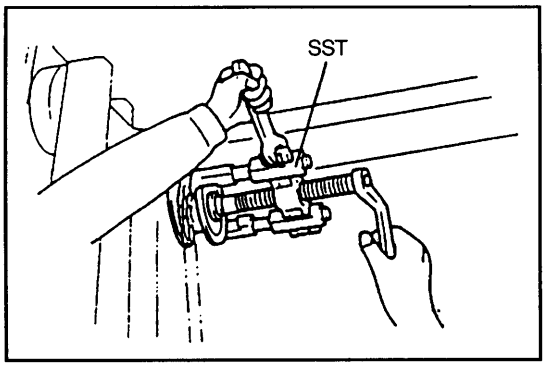
Note:

- **Apply molybdenum disulfide grease on the mast support bushing and mast support cap interior surfaces. Apply MP grease on the tilt cylinder front pin.**
- **Adjust lift cylinder uneven movement when the mast ASSY, outer mast, inner mast or either lift cylinder is replaced. (See page 14-36.)**
- **Adjust the chain tension after installation. (See page 14-25.)**
- **When the mast is replaced, perform SAS re-setting after installation. (SAS spec.) (See section 18.)**



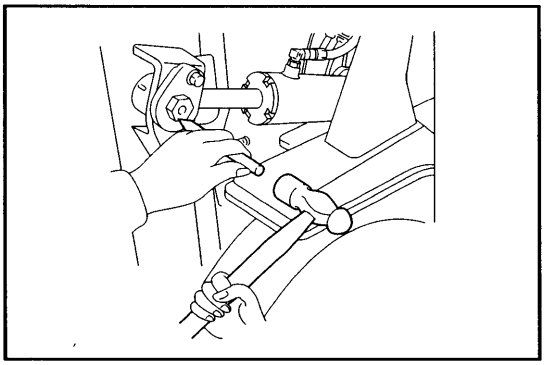
Point Operations

[Point 1]
Removal-Installation:
SST 09630-23600-71

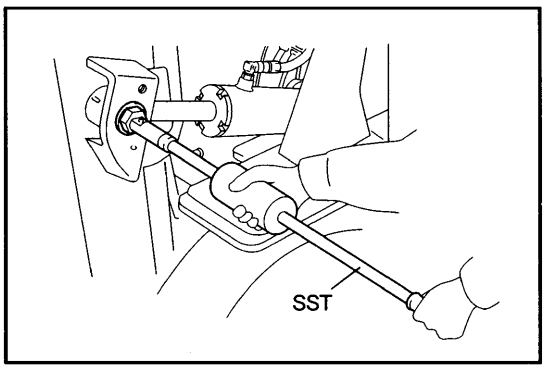


[Point 2]
Removal:
If the fitting is hard, use the SST for removal.
SST 09950-76014-71
(SST 09950-40011)

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[Point 3]
Removal:
Put match marks to clarify relative positions of the front pin, stopper plate and lock bolt. Match marks, however, are unnecessary when the mast or mast ASSY is replaced since mast tilt angle adjustment is to be done after the replacement.

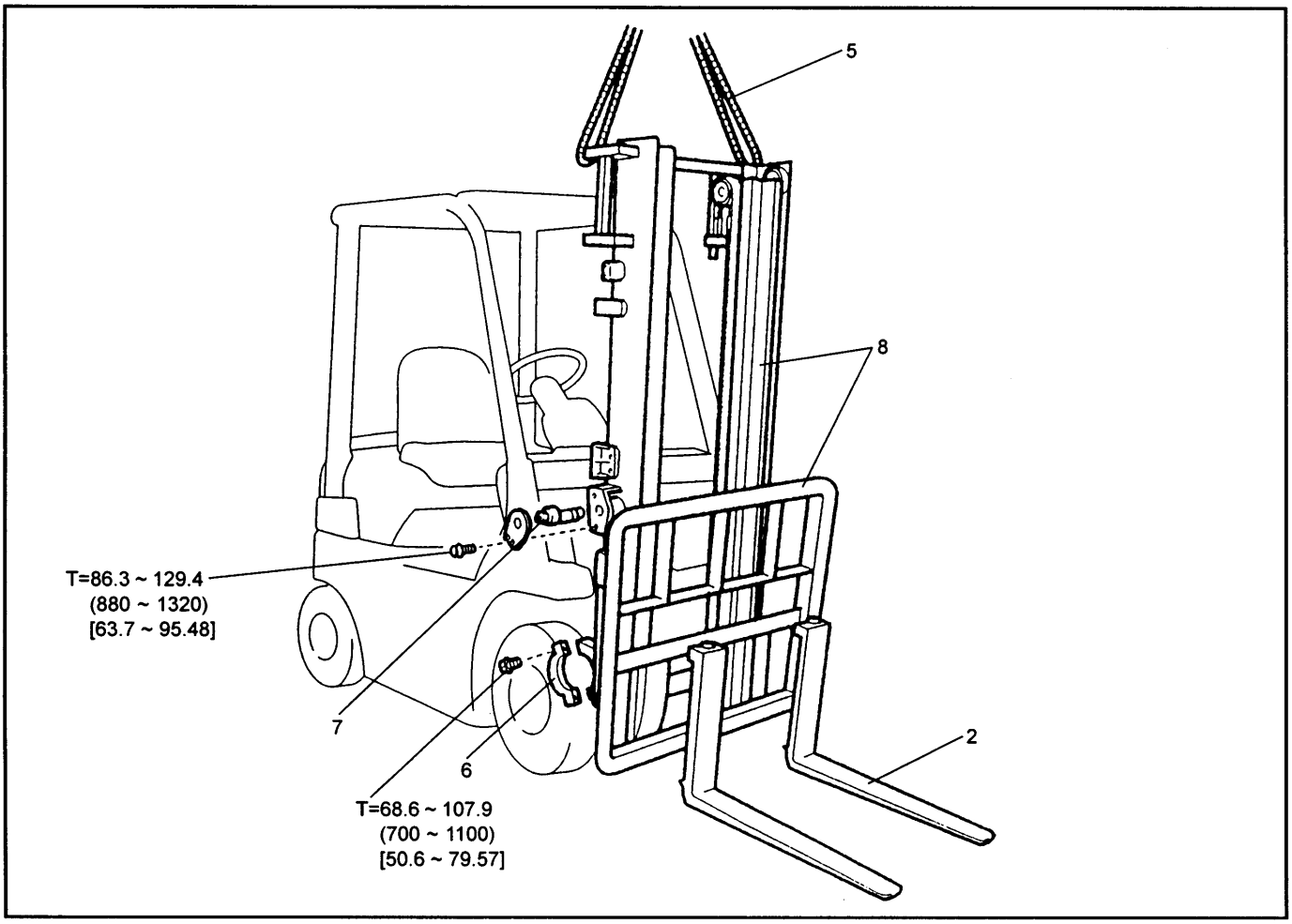


Removal:
SST 09810-20172-71

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REMOVAL·INSTALLATION (W/LIFT BRACKET)

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Set the mast vertical.

2 Remove the fork. (See page 14-25.)

3 Disconnect the wiring of the fork height switch and load sensor. (SAS spec.)

4 Disconnect the overflow hose and high pressure hose. (Before hose disconnection, fully lower the inner mast and operate the lift lever several times to release the residual pressure from the lift cylinder.)

5 Slightly hoist the mast.

6 Remove the mast support cap.

7 Remove the tilt cylinder front pin. **[Point 1]**

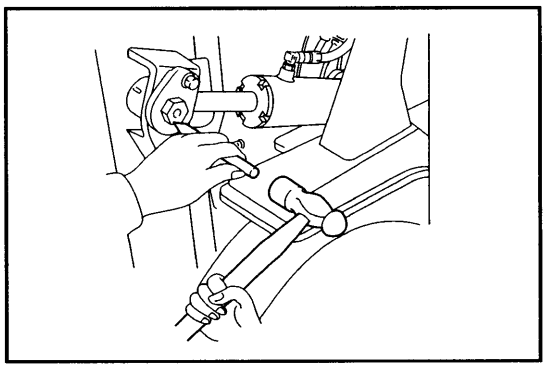
8 Remove the mast ASSY W/lift bracket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Note:
- **Apply molybdenum disulfide grease on the mast support bushing and mast support cap interior surfaces. Apply MP grease on the tilt cylinder front pin.**
- **Correct lift cylinder uneven lifting, if any, when the mast ASSY, outer mast, inner mast or either lift cylinder is replaced. (See page 14-36.)**
- **When the mast is replaced, perform SAS re-setting after installation. (SAS spec.) (See section 18.)**



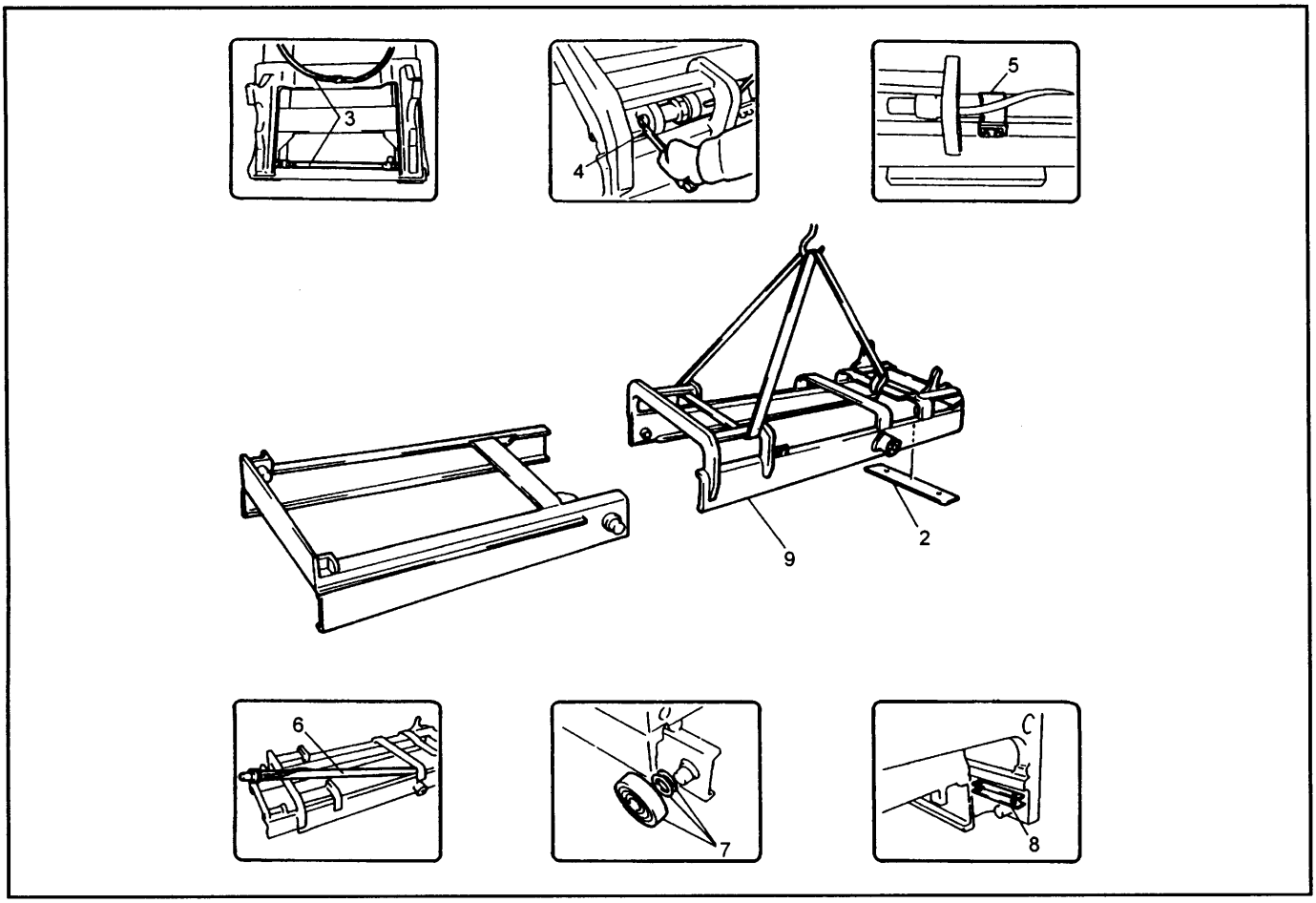
Point Operation

[Point 1]
Removal:

Put match marks to clarify relative positions of the front pin, stopper plate and lock bolt. Match marks, however, are unnecessary when the mast or mast ASSY is replaced since mast tilt angle adjustment is to be done after the replacement.

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MAST DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the fork height switch. (SAS spec.)

2 Remove the hose cover.

3 Disconnect the overflow hose and high pressure hose.

4 Remove each cylinder rod end set bolt, and take each rod end off. **[Point 1]**

5 Remove each cylinder support. **[Point 2]**

6 Remove each cylinder bottom set bolt, and remove each lift cylinder.

7 Slide the inner mast in the lowering direction, and remove the lift rollers.

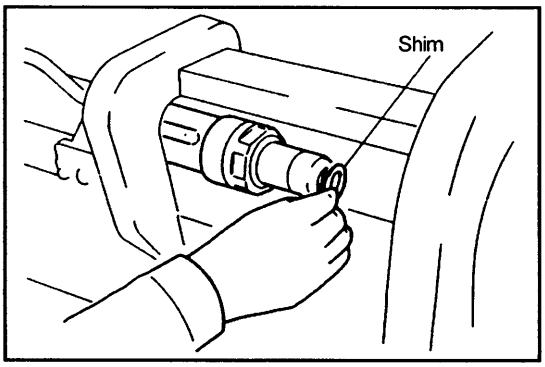
8 Remove the mast strip. **[Point 3]**

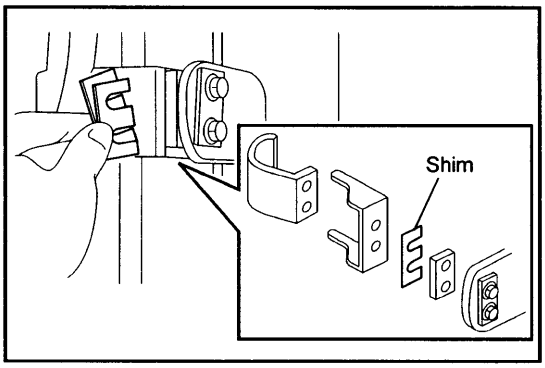
9 Remove the outer mast.

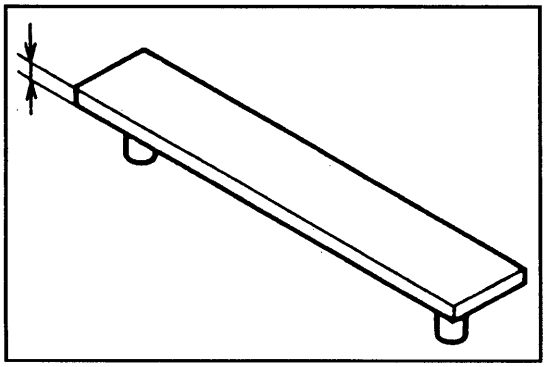
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Point Operations

[Point 1]
Disassembly:
Shim adjustment is made at the lift cylinder rod end for preventing uneven lifting by lift cylinders LH and RH.
Take a note on the cylinder where the adjustment is made and the number of shims in use.

[Point 2]
Disassmbly:
Take a note on the number of cylinder support shims in use.

Reassembly:
Make cylinder support shim adjustment if the mast or either cylinder is replaced.
With the cylinder rod end inserted to the inner mast, insert shim(s) between the cylinder support and outer mast to eliminate the clearance. The shim thickness should be slightly greater than the clearance.

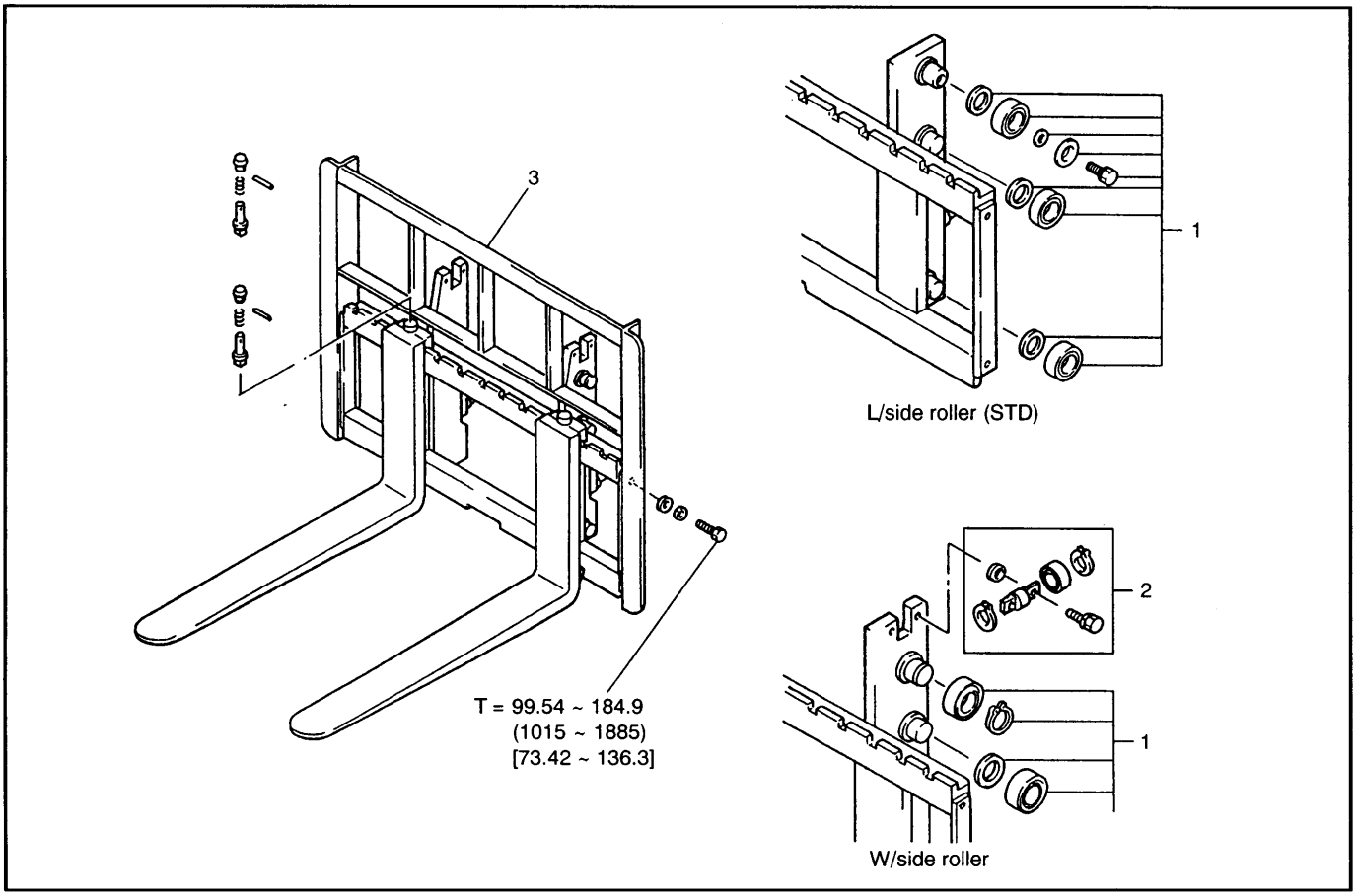
[Point 3]
Inspection:
Measure the mast strip thickness.

Limit: 1.5 mm (0.059 in)

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LIFT BRACKET DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

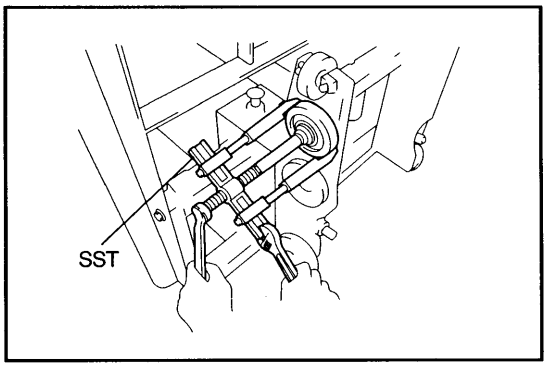
1 Remove lift rollers. **[Point 1]**

2 Remove side rollers. (Vehicle W/side rollers) **[Point 2]**

3 Remove the back rest.

Reassembly Procedure

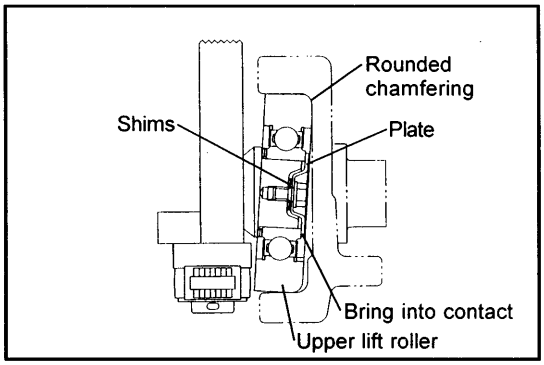
The reassembly procedure is the reverse of the disassembly procedure.

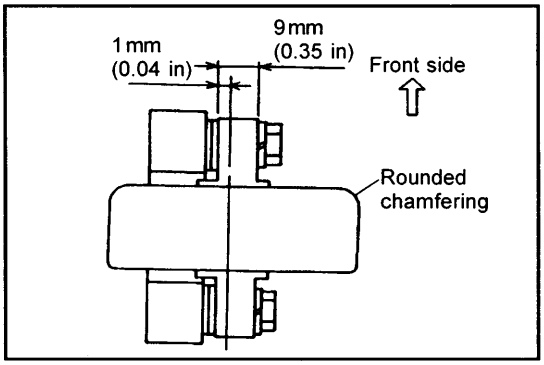


Point Operations

[Point 1]
Disassembly:
SST 09950-76014-71
(SST 09950-40011)

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Vehicle without side rollers:

Disassembly:

Remove upper roller after removing the roller stop plate.

Reassembly:

Install each roller with the side chamfered with greater radius facing outward.

Reassembly:

Bring the stop plate into contact with the roller inner ring. Minimize the clearance between the plate and pin by shim insertion.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

[Point 2]

Reassembly:

Install the side roller in the correct direction.

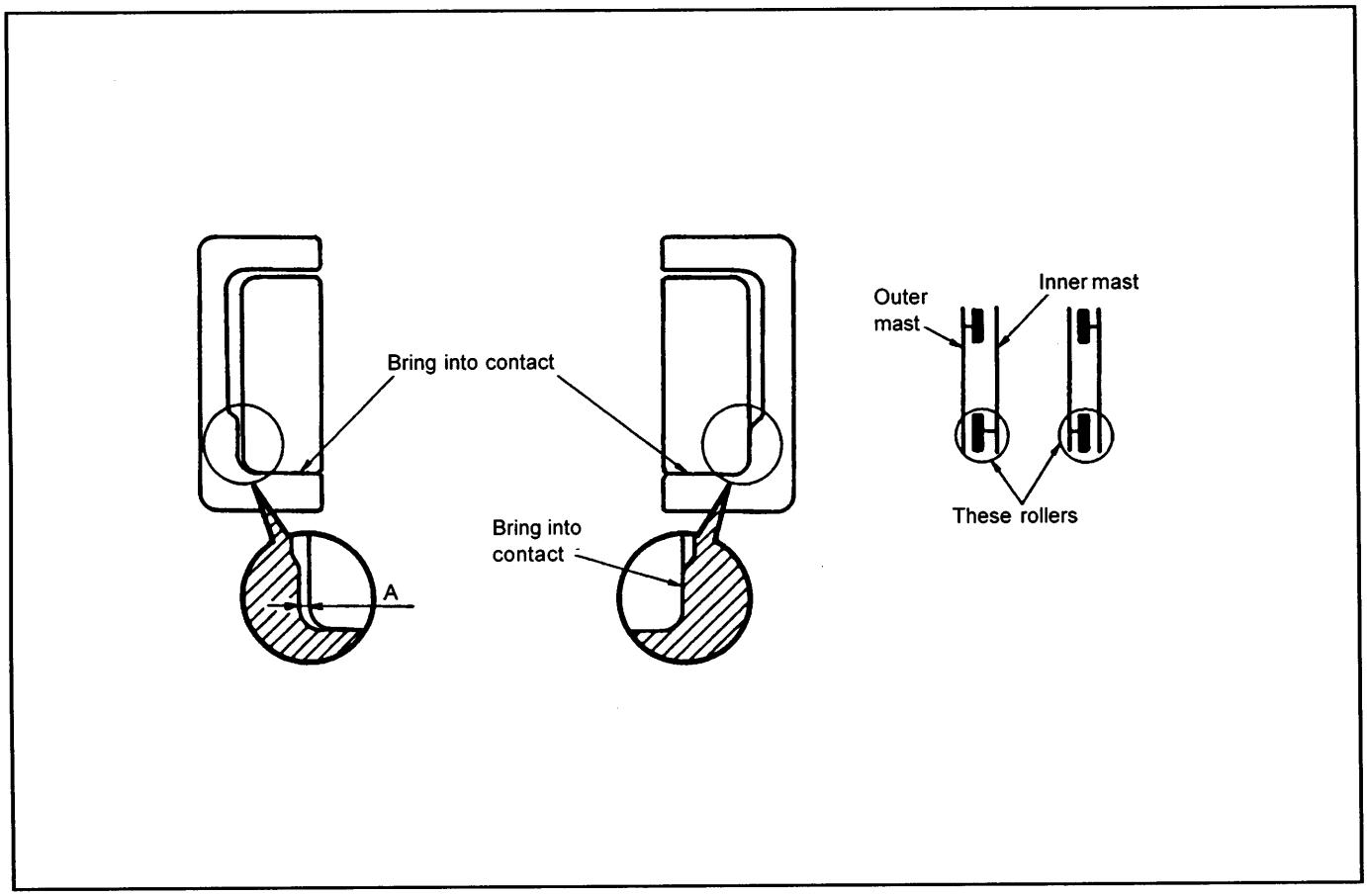
The side chamfered with a greater radius of the roller shall be on the front side of the vehicle.

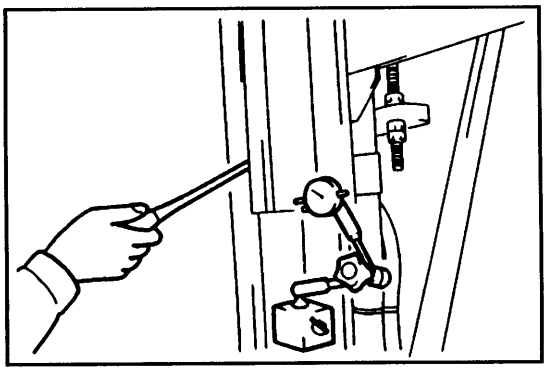
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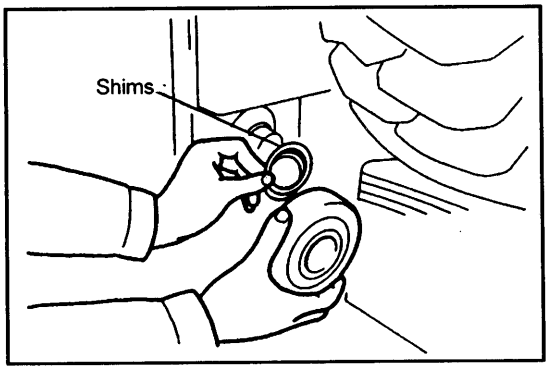
MAST ADJUSTMENT (V MAST)

Lift Roller Adjustment at Mast

1. Inner mast to roller clearance adjustment







(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: A = 0 ~ 0.8 mm (0 ~ 0.031 in)

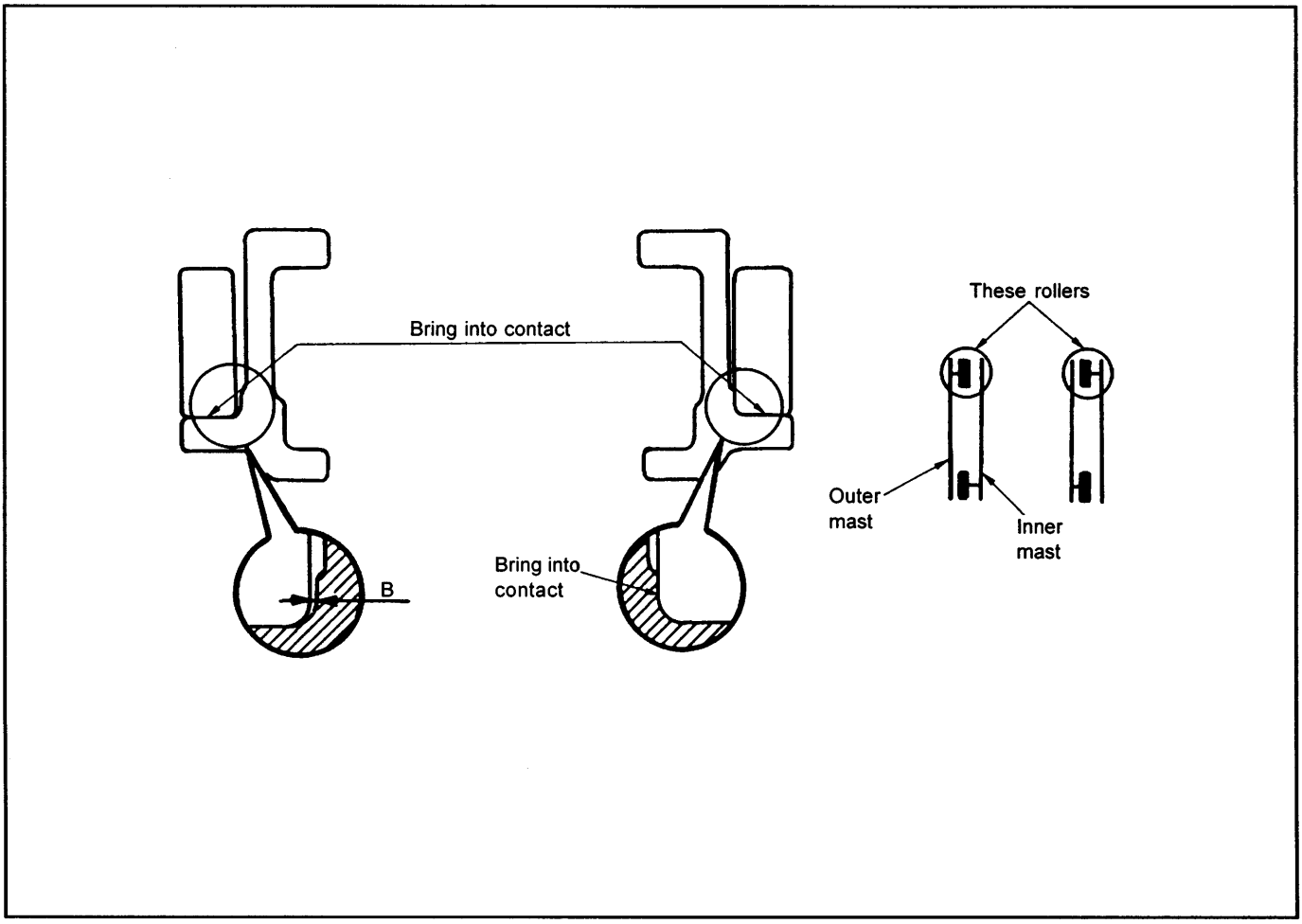
If the standard is not satisfied, make adjustment by changing the inner mast roller shim thickness. (See page 14-23 for the mast roller removal and installation.)

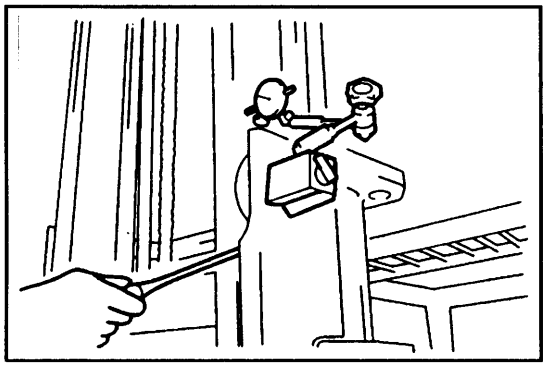
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

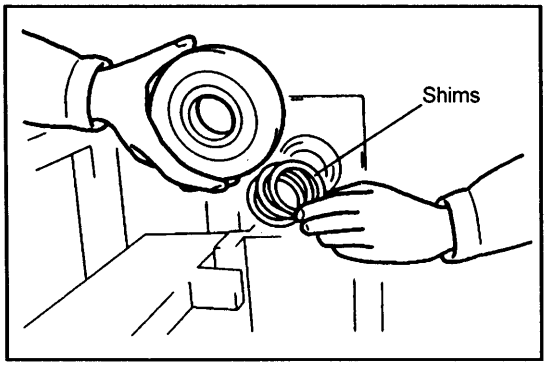
(3) Distribute shims equally to the rollers on the left and right side.
(4) After the adjustment, see that the inner mast moves smoothly in the outer mast.

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2. Outer mast roller clearance adjustment







(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: B = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the outer mast roller shim thickness.
(See page 14-23 for the mast roller removal and installation.)

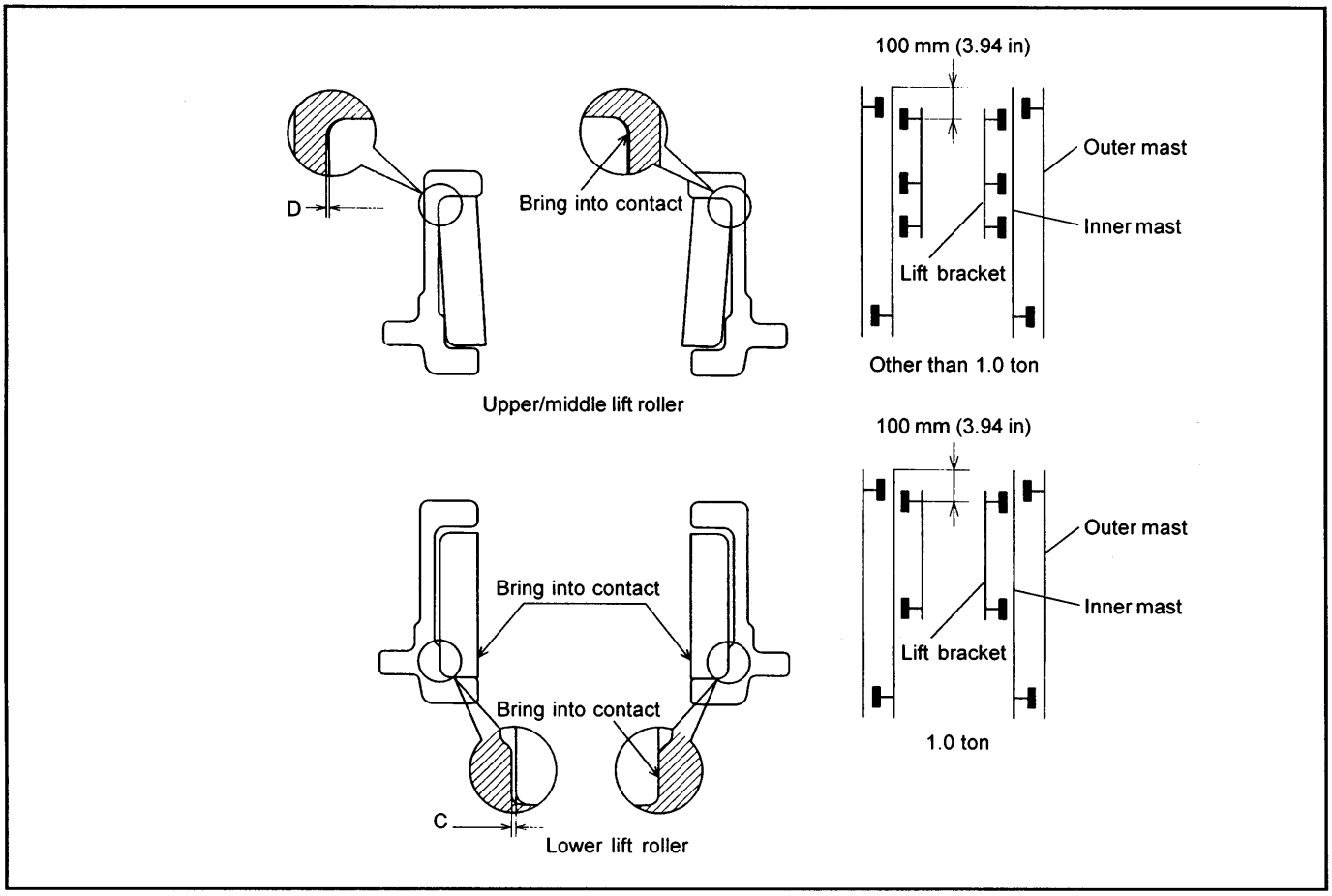
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

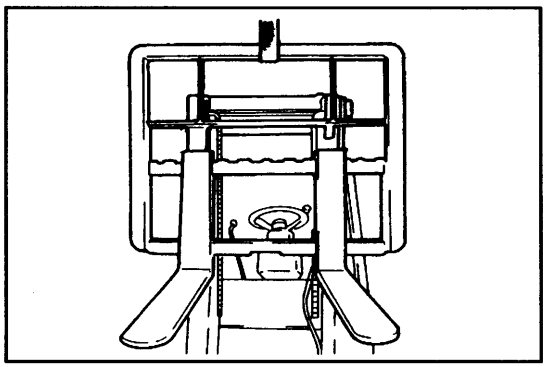
(3) Distribute shims equally to the rollers on the left and right side.
(4) After the adjustment, see that the inner mast moves smoothly in the outer mast.

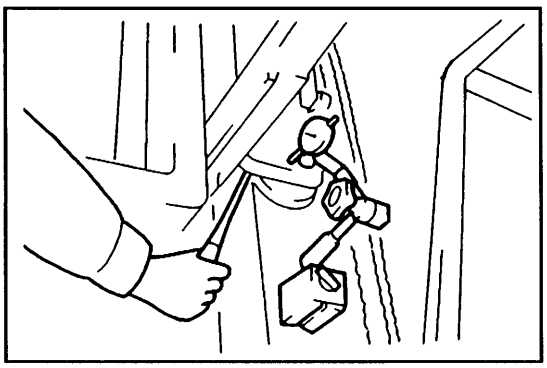
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Roller Adjustment at Lift Bracket (Vehicle Without Side Roller)

1. Lift roller clearance adjustment







(1) Bring the center of the lift roller in the upper part of the lift bracket to 100 mm (3.94 in) from the top of the inner mast.

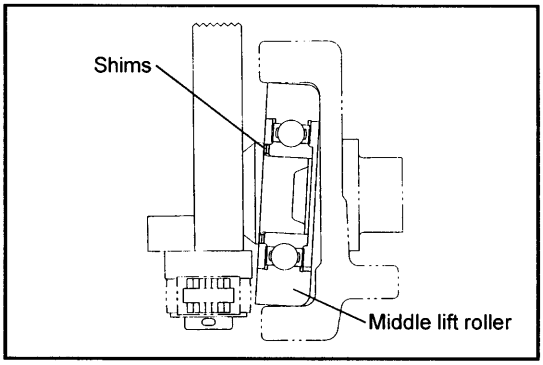
(2) Adjust the middle and lower rollers.
Shift the lift bracket to one side to bring the roller into contact with the inner mast and inspect the lift roller clearance at the position on the opposite side where the roller side is closest to the mast.

Standard
Lower lift roller: C = 0 ~ 0.8 mm (0 ~ 0.031 in)
Middle lift roller: D = 0 ~ 0.8 mm (0 ~ 0.031 in)

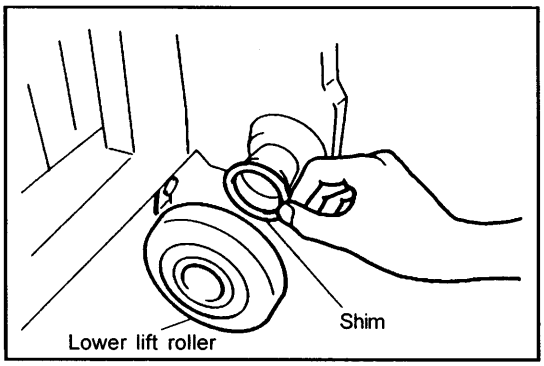
If the standard is not satisfied, make adjustment by changing the lift roller shim thickness.

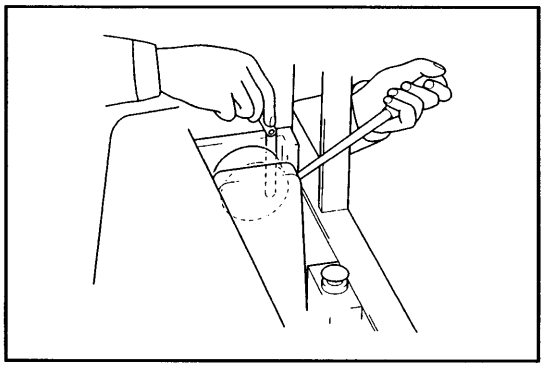
Shim thickness: 0.5 and 1.0 mm (0.020 and 0,039 in)

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Distribute shims equally to the left and right rollers.



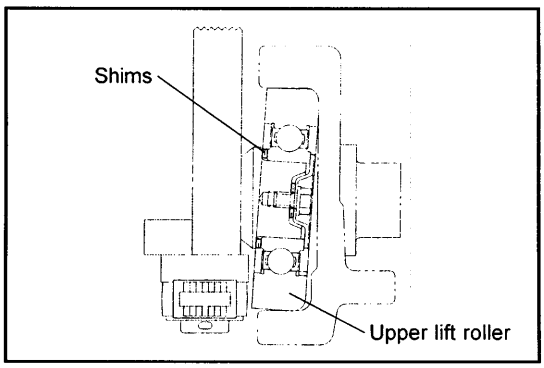


(3) Adjust the upper lift rollers after adjusting the middle and lower lift rollers.
Shift the lift bracket to one side to bring the roller into contact with the inner mast, and inspect the lift roller clearance on the opposite side where the roller side face is closest to the mast.

Standard
Upper lift roller: D = 0 ~ 0.6 mm (0 ~ 0.024 in)

If the standard is not satisfied, make adjustment by changing the lift roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)



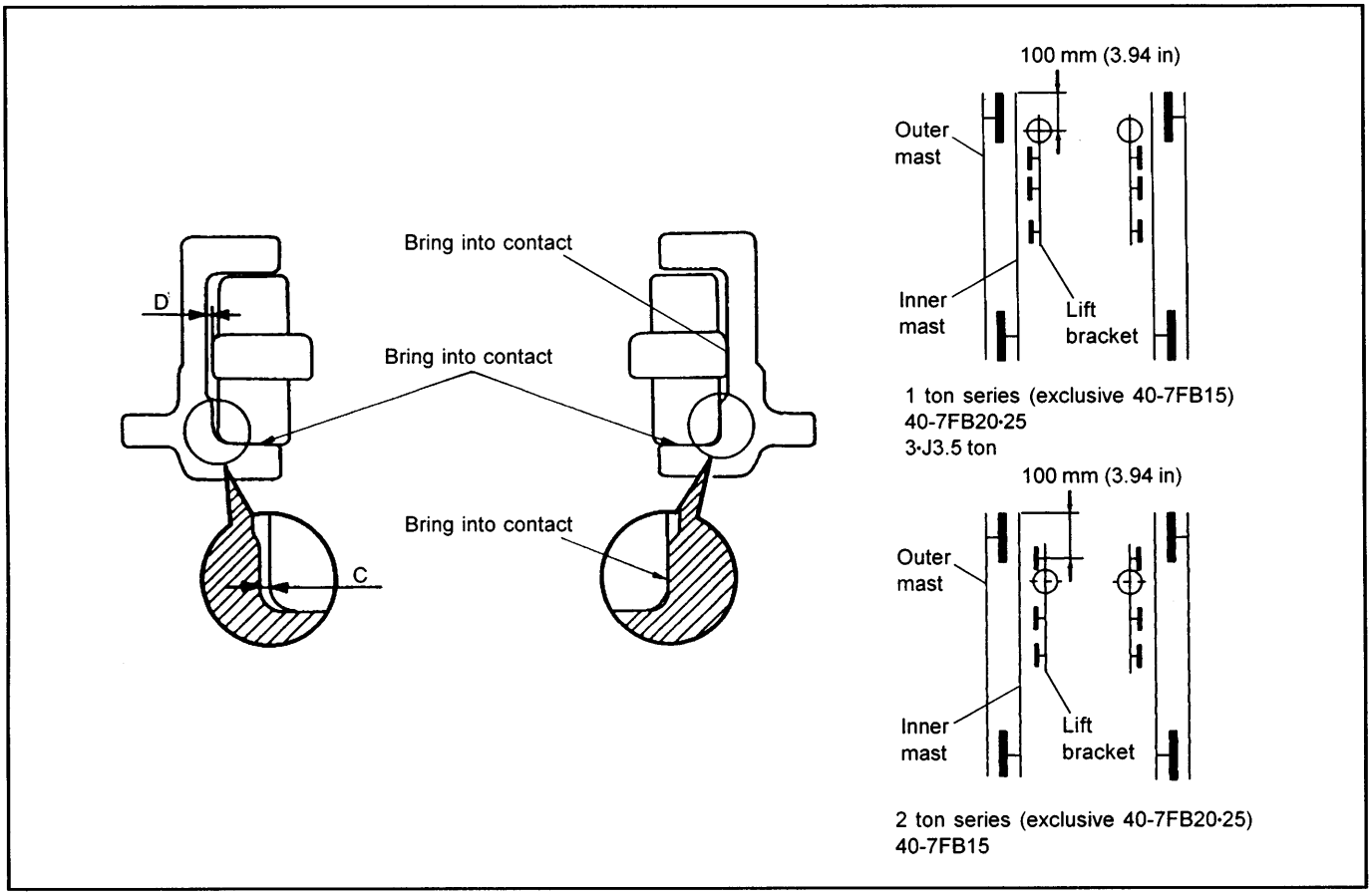
Distribute shims equally to the rollers on the right and left sides.
(See "Lift Bracket Disassembly·Inspection·Reassembly" for the roller installation.)

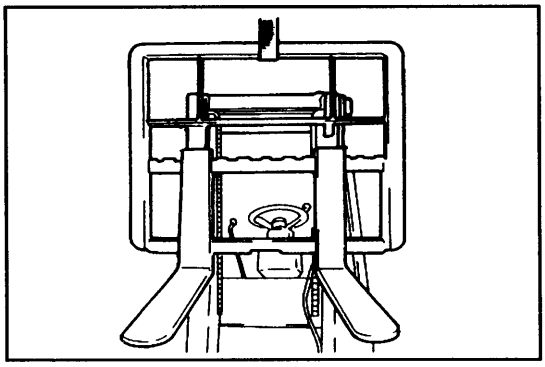
(4) After the adjustment, see that the lift bracket moves smoothly along the overall length of the mast.

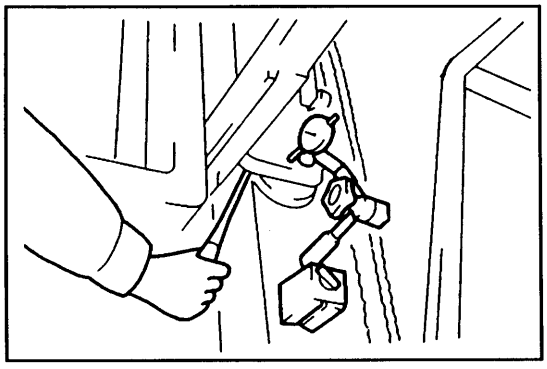
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Roller Adjustment at Lift Bracket (Vehicle W/Side Rollers)

1. Middle/lower lift roller and side roller clearance adjustment







(1) 1 ton series (exclusive 40-7FB15), 40-7FB20·25, 3·J3.5 ton:
Bring the center of the side roller in the upper part of the lift bracket to approx. 100 mm (3.94 in) from the top of the inner mast.
2 ton series (exclusive 40-7FB20·25), 40-7FB15:
Bring the center of the lift roller in the upper part of the lift bracket to approx. 100 mm (3.94 in) from the top of the inner mast.

(2) Remove side rollers.

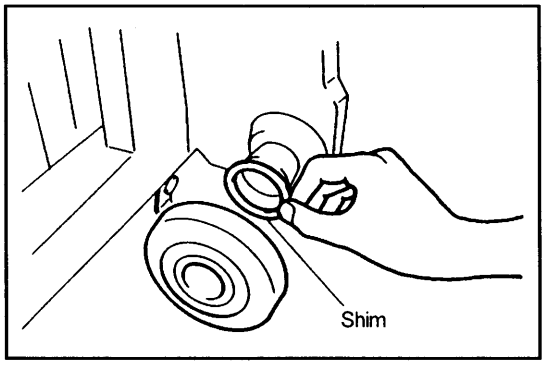
(3) Shift the lift bracket to one side to bring the roller into contact with the inner mast, and inspect on the opposite side the clearance between the roller side face and the mast where they are the closest. (No adjustment is necessary for the upper lift rollers since they are fastened by snap rings.)

Standard:
C = 0 ~ 0.8 mm (0 ~ 0.031 in)

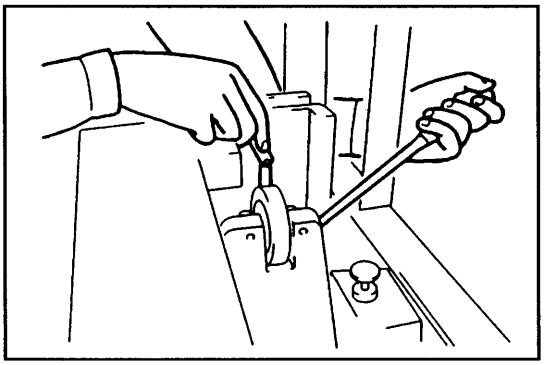
If the standard is not satisfied, make adjustment by changing the lift roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

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(4) Distribute shims equally to the left and right side.
(5) Install side rollers.

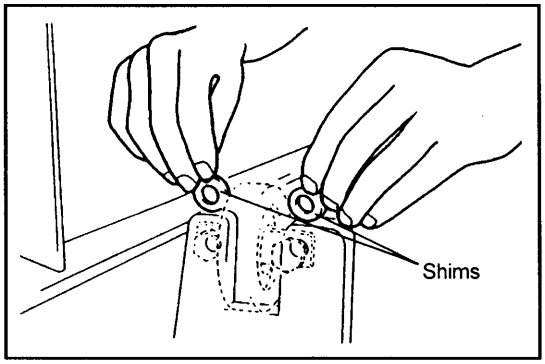


(6) After adjusting the middle and lower lift rollers, bring the side roller on one side into contact with the outer mast and measure on the opposite side the clearance between the side roller and inner mast surface.

Standard:
D = 0 ~ 0.6 mm (0 ~ 0.024 in)

If the standard is not satisfied, make adjustment by changing the side roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

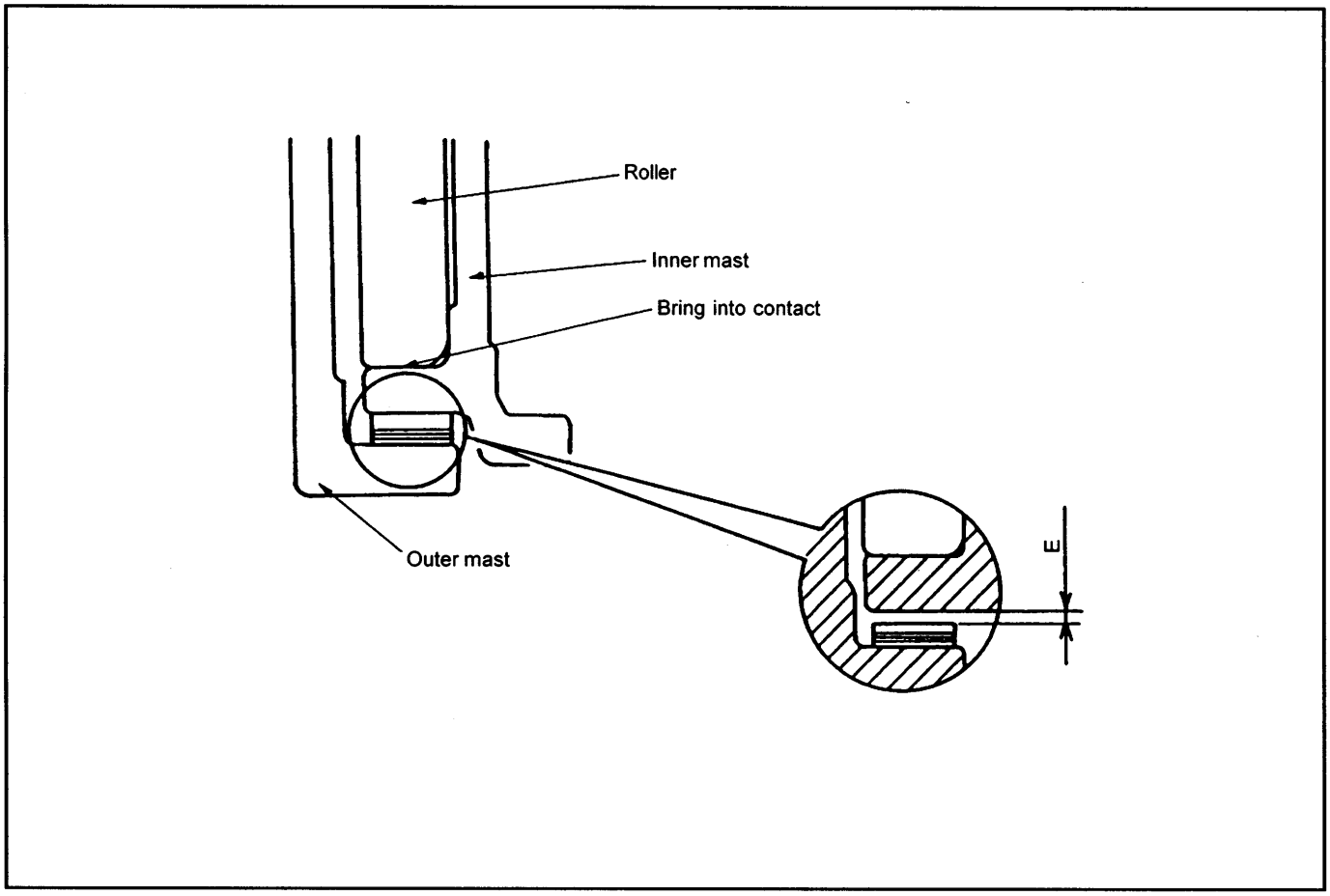


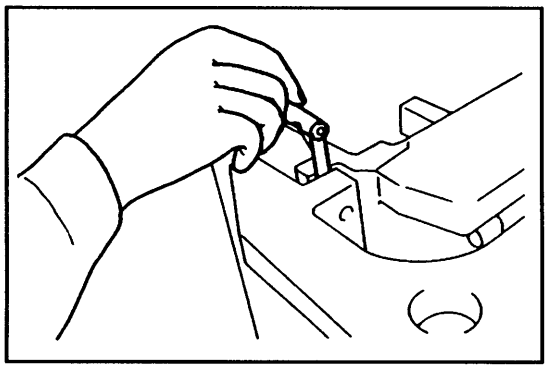
(7) Distribute shims equally to the left and right side. (See Lift Bracket Disassembly-Inspection-Reassembly section for the side roller installation method. Shim replacement is possible on the vehicle.)
(8) After the adjustment, see that the lift bracket moves smoothly over the entire length of the mast.

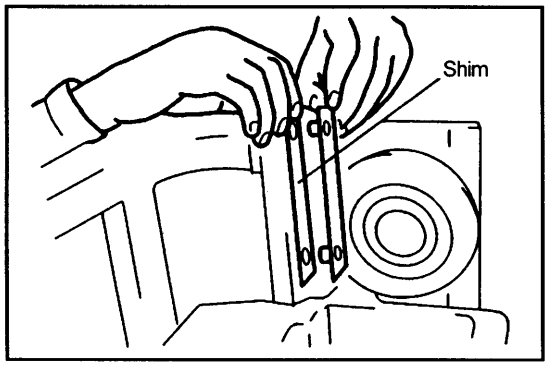
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Mast Strip Adjustment

1. Mast strip clearance adjustment







(1) Lower the inner mast fully.
(2) With the inner mast in contact with the outer mast roller, measure the clearance between the mast strip and inner mast.

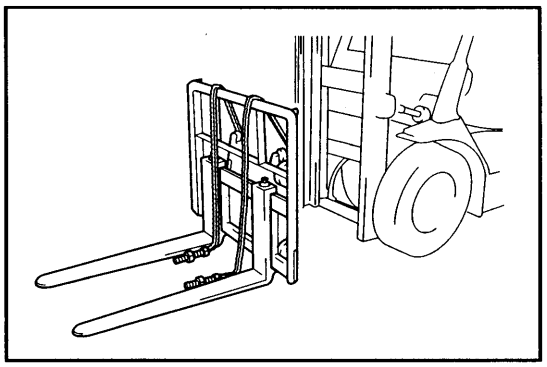
Standard: E = 0 ~ 0.8 mm (0 ~ 0.031 in)

If the standard is not satisfied, make adjustment by changing the mast strip shim thickness. (See page 14-23 for the mast roller removal/installation method.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

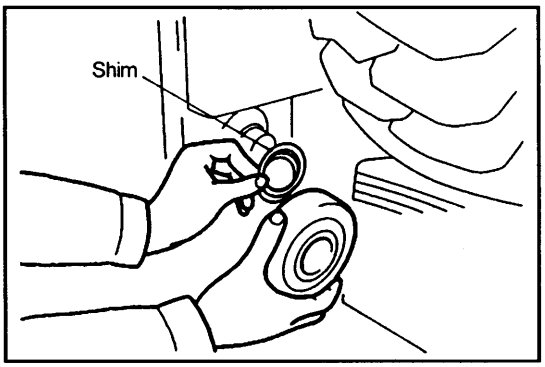
(3) After the adjustment, check the mast for smooth movement.

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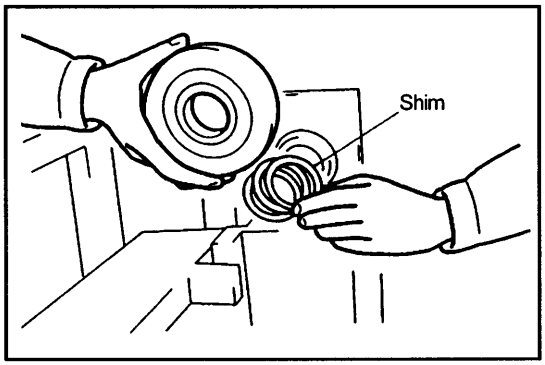


MAST ROLLER REMOVAL·INSTALLATION

1. Remove the lift bracket. (See steps 1 to 4 of the mast ASSY removal procedure on page 14-7.)
2. Jack up the vehicle, and support tires with wooden blocks. Also lock the front and rear tires from rotation.
3. Remove the lift cylinders. (See page 15-10.)

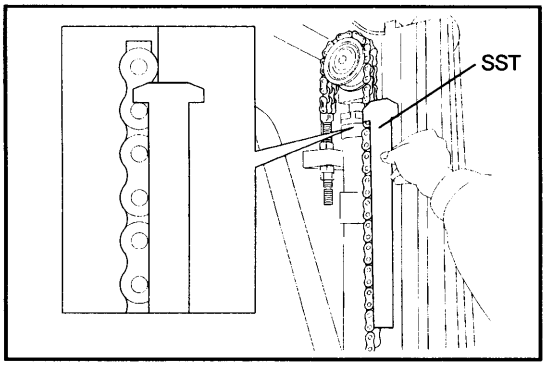


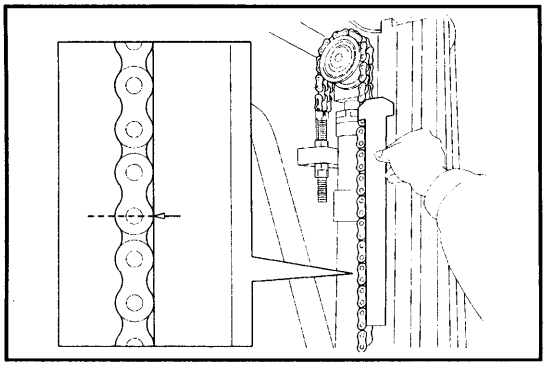
4. Remove mast rollers.
   (1) Remove wooden blocks under the inner mast, and lower the hoisted inner mast slowly until mast rollers appear.
   (2) Support the bottom of the inner mast with wooden blocks.
   (3) Remove the inner mast rollers and shims.



   (4) Remove the outer mast rollers and shims.
5. The installation procedure is the reverse of the removal procedure.

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CHAIN

INSPECTION

1. Inspect the chain elongation according to the following procedure:
   SST 09631-22000-71
   (1) Since the SST measurement line varies with the chain type, set the corresponding line on the chain as illustrated.
   (2) Check the number of the chain to be inspected, and check the pin center position.
   If the pin center is at the arrow mark on the chain gauge, it is the limit.

Chain Link Pitch Standard

Vehicle model	Pitch mm (in)	Type	Chain No.
1 ton series (exclusive 40-7FB15)	15.88 (0.6252)	BL534	50
2 ton series, 40-7FB15	19.05 (0.7500)	BL634	60
3 ton	25.4 (1.0)	BL823	80
J3.5 ton	25.4 (1.0)	BL834	80

Note:
- **Perform measurement without removing the chain from the vehicle.**
- **Inspect elongation over the entire chain length since it may be localized.**

REASSEMBLY

1. Installing direction

Applicable mast and portion	V: Lift bracket SV: Lift bracket	FV: Lift bracket FSV: Lift bracket	FSV inner mast
Rough sketch	Center of vehicle ⇦ Cotter pin Install the chain with the cotter pin facing the center of the vehicle.	Center of vehicle ⇦ Cotter pin Install the chain with the cotter pin facing the center of the vehicle.	Front of vehicle ⇦ Cotter pin Install the chain with the cotter pin on the front side of the vehicle.

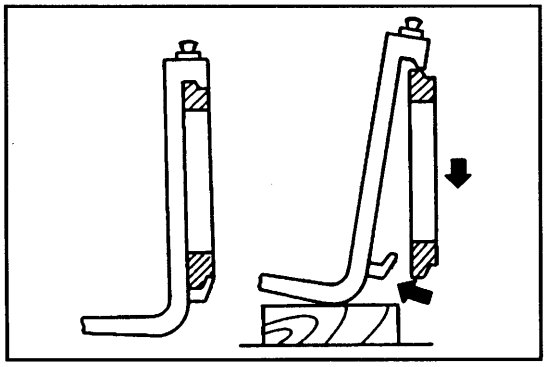
2. Chain adjusting nut tightening order
   (1) Tighten nuts ① and ②. T = 49.0 ~ 78.0 N·m (500 ~ 800 kgf-cm) [36.1 ~ 57.5 ft-lbf]
   (2) Tighten nut ③.

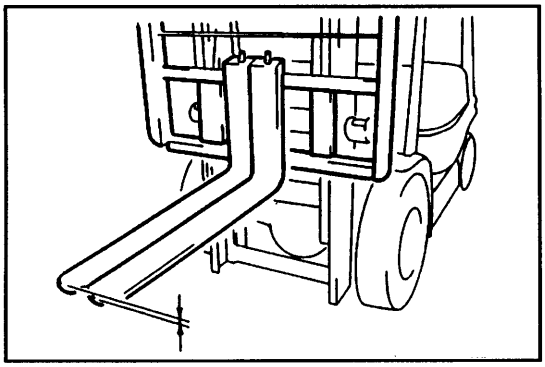
Applicable mast and portion	V: Outer mast SV: Outer mast (maximum fork height: 3000 mm (118 in) or above)	FV: Front cylinder portion (3·J3.5 ton) FSV: Front cylinder portion (3·J3.5 ton) * SV: Outer mast (maximum fork height: 2700 mm (106 in) or less)	FV: Front cylinder portion (1·2 ton series) FSV: Front cylinder portion (1·2 ton series) FSV: Outer mast
Rough sketch	③ ② ①	Clamp ② ① Clamp for SV mast only	Clamp ② ①

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ADJUSTMENT

1. Park the vehicle on a flat ground and set the mast vertical.
2. Lower the fork to the ground, and make adjustment to eliminate any chain sag by turning the adjusting nut.
3. Check to see that the chain tension is equal on the left and right side.
4. Check to see no chain twist.
5. See that the fork height is the standard.
6. With the fork raised fully, check to see that the lift bracket freeing prevention stopper at the innermast is not in contact with the lift bracket.





FORK

REMOVAL

1. Set the fork at approx. 20 cm (7.9 in) above the ground.
2. Place a wooden block under the knotched portion of the fork rail.
3. Unlock the fork by lifting the fork stopper pin, and shift the fork blades, one at a time, to the center.
4. Slowly lower the fork for removal.

INSTALLATION

The installation procedure is the reverse of the removal procedure.

INSPECTION

1. Inspect misalignment of the fork tip ends.

   Limit: 10 mm (0.39 in)

   If the limit is exceeded, inspect individual fork bend, looseness of fork installation and lift bracket finger bar distortion.

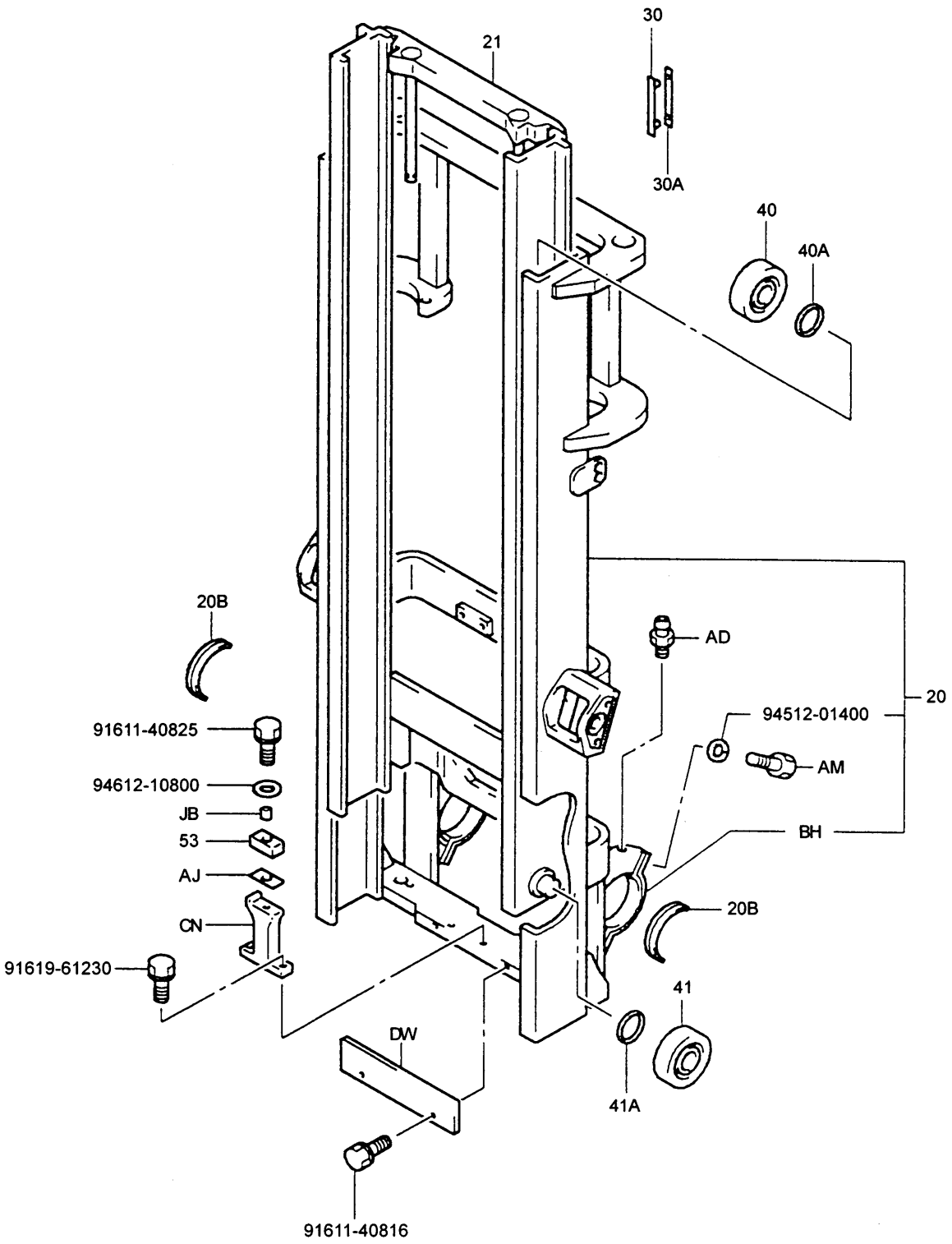
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SV·FV·FSV MAST ASSY

COMPONENTS

SV

6101

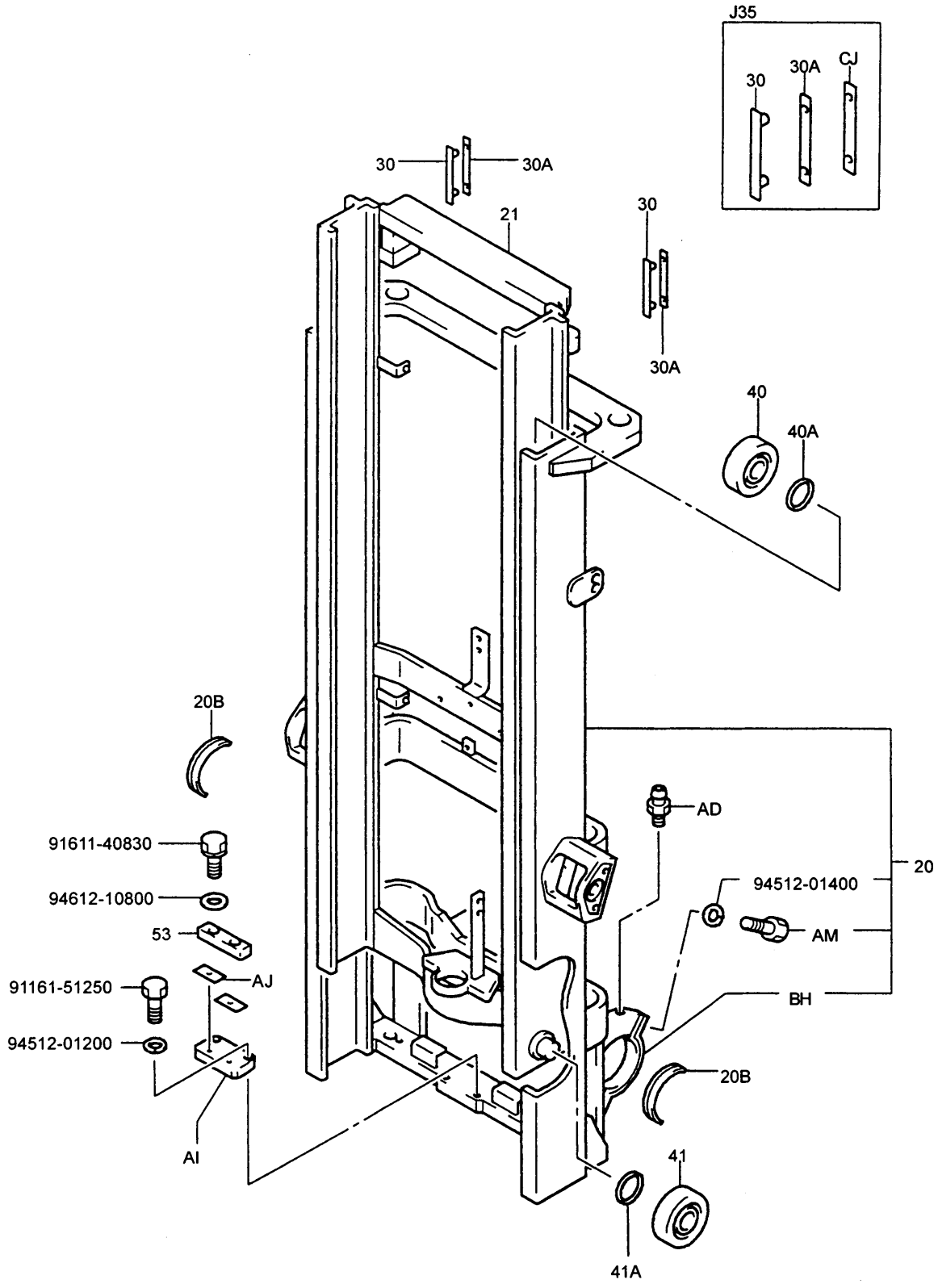


6101-473

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FV

6101

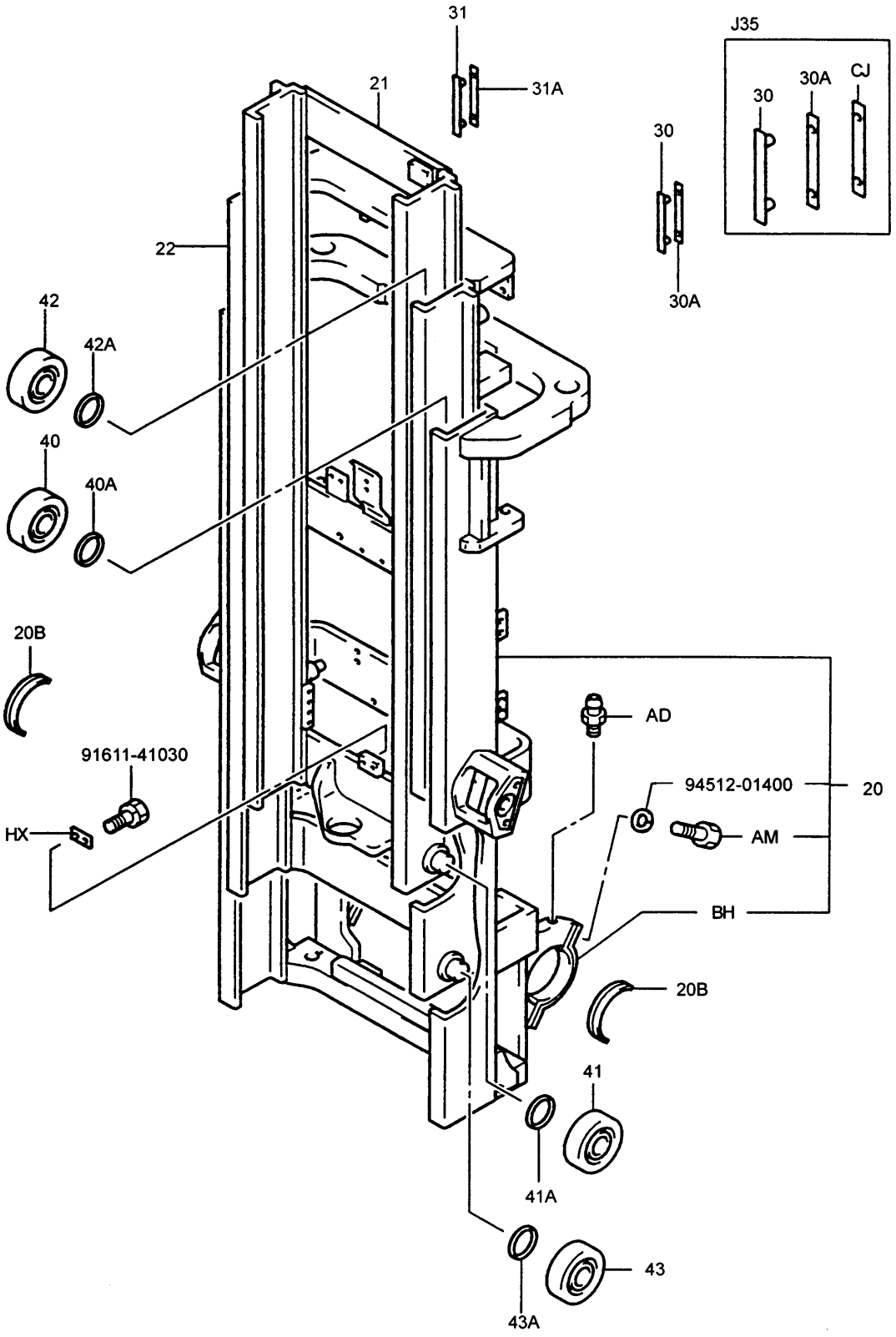


6101-495

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FSV

6101

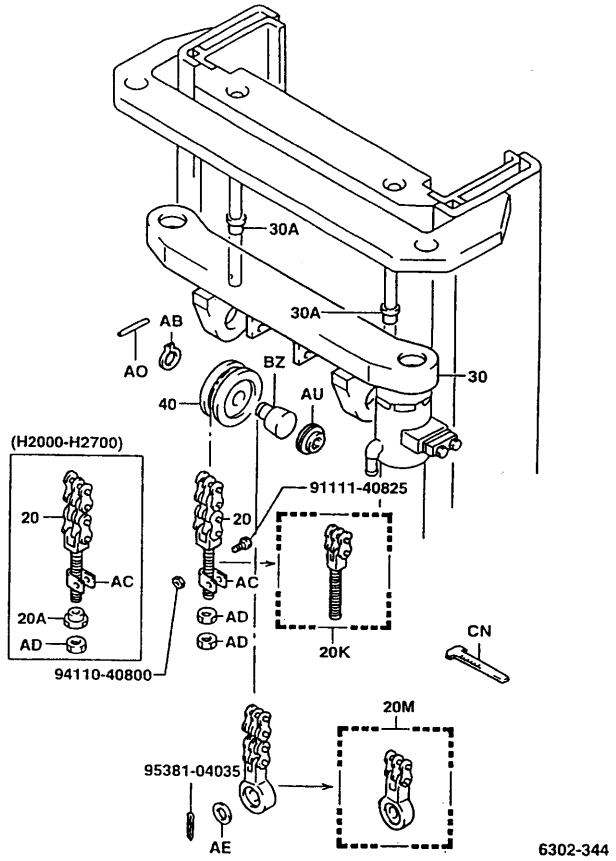


6101-476A

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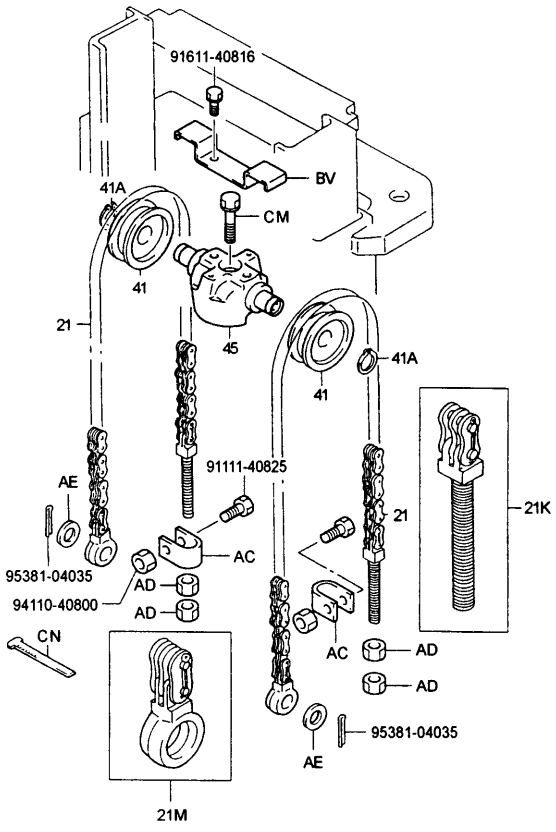
SV

6302



FV (1 and 2 ton series)

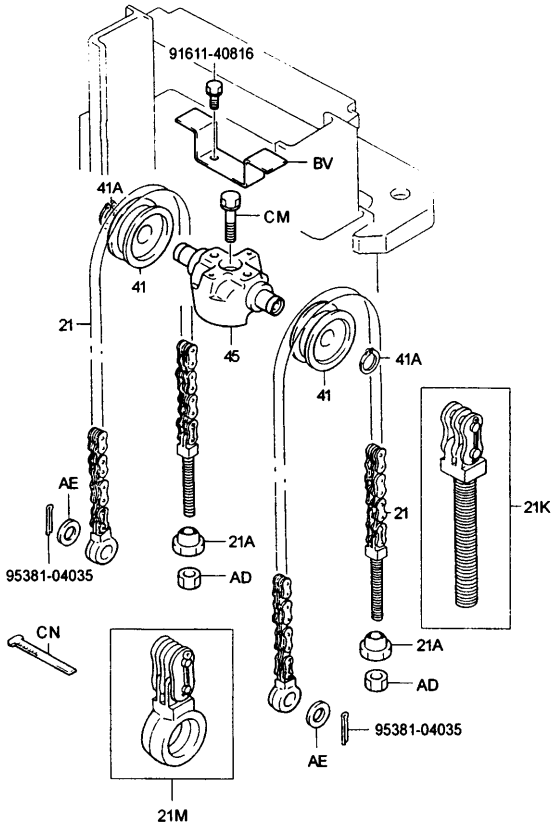
6302



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FV (3·J3.5 ton)

6302



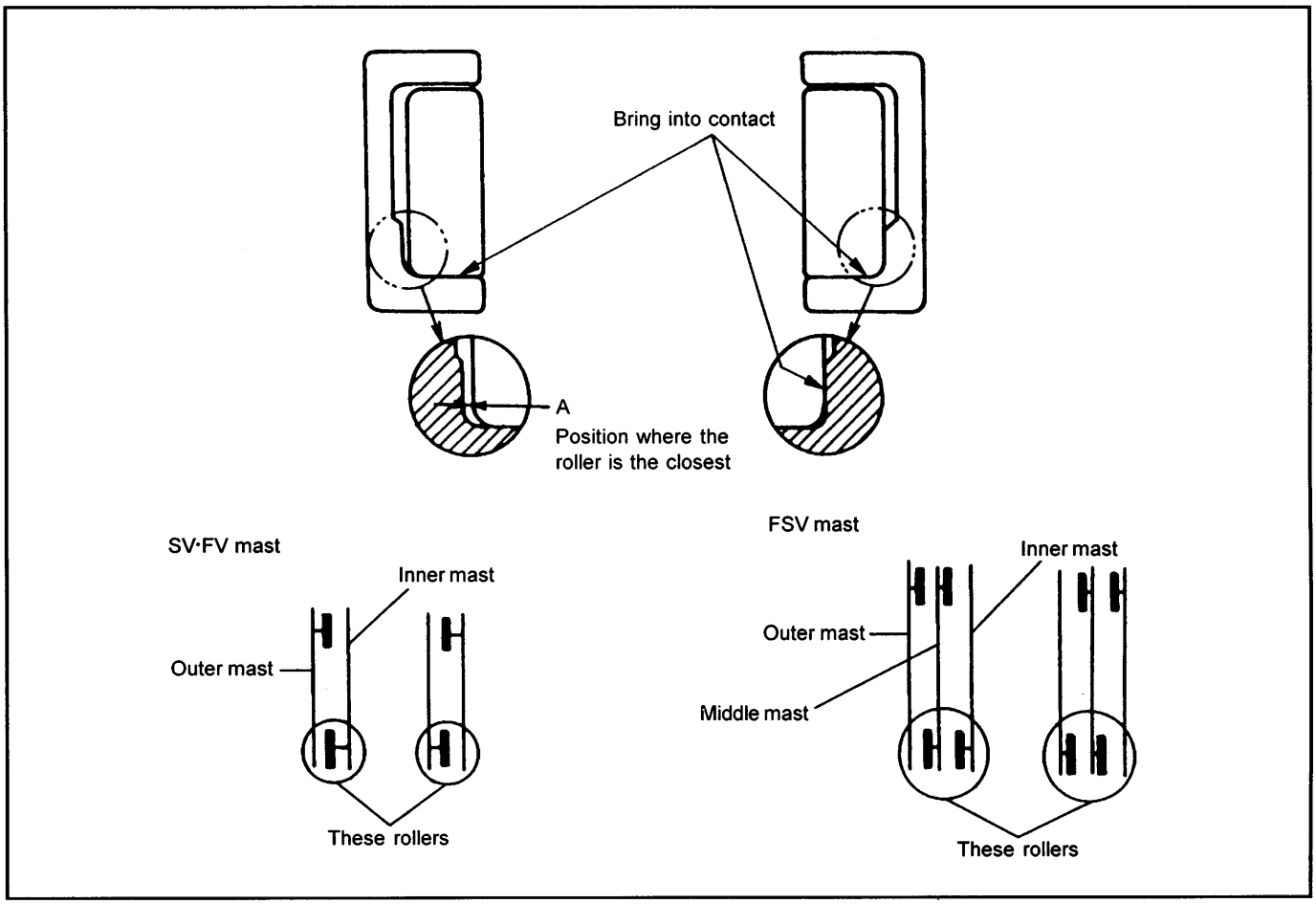
6302-372

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MAST ADJUSTMENT (SV·FV·FSV)

Lift Roller Adjustment at Mast

1. Inner mast roller (SV·FV·FSV) and middle mast lower roller (FSV) clearance adjustment



(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: A = 0 ~ 0.8 mm (0 ~ 0.031 in)

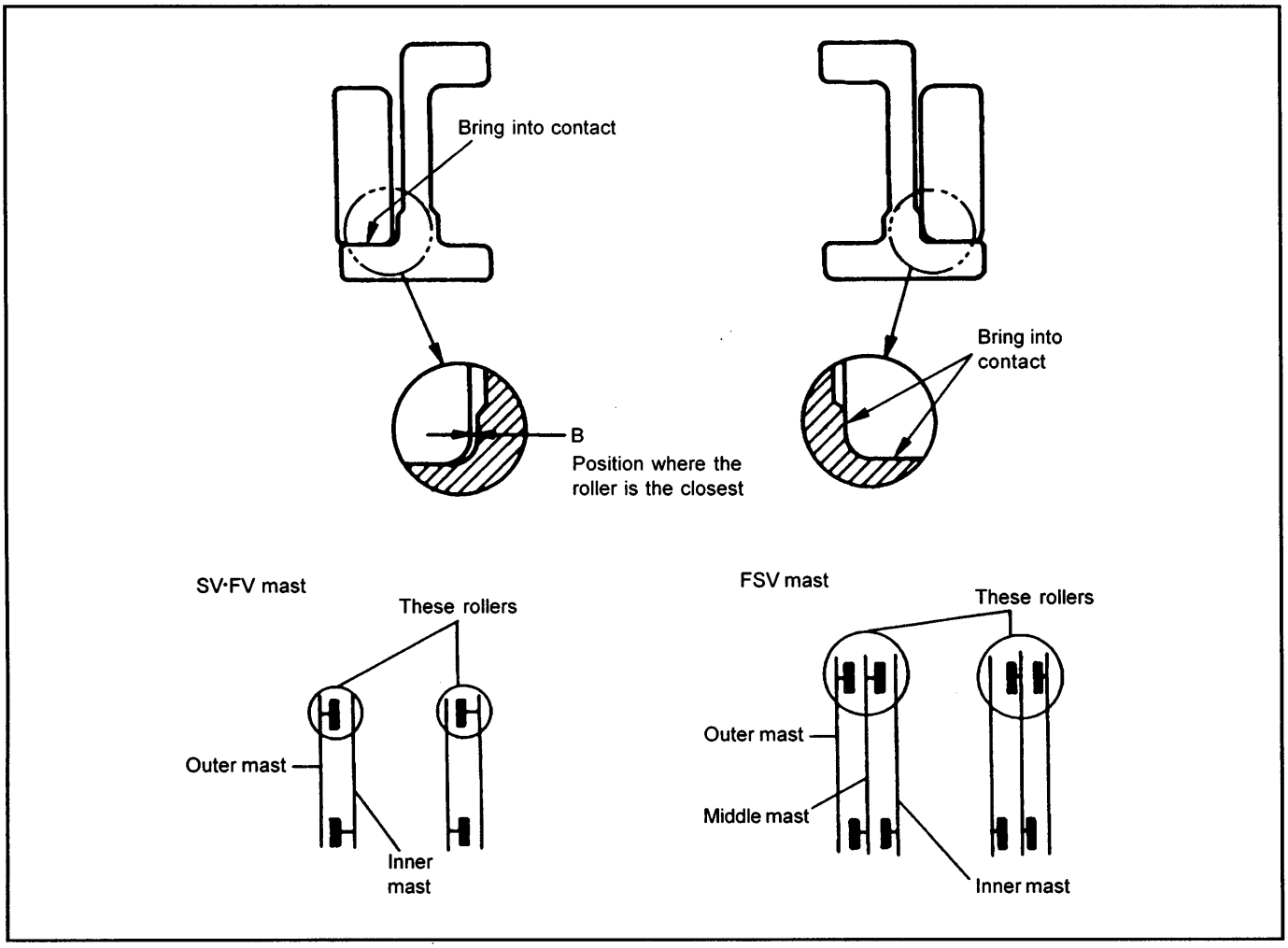
If the standard is not satisfied, make adjustment by changing the inner mast roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(3) Distribute shims equally to the rollers on the left and right sides.
(4) After the adjustment, see that mutual mast movement is smooth.

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2. Outer mast roller (SV·FV·FSV) and middle mast upper roller (FSV) clearance adjustment



(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the inner mast, and measure on the opposite side the clearance between the roller side face and mast where they are the closest.

Standard: B = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the outer mast roller shim thickness.

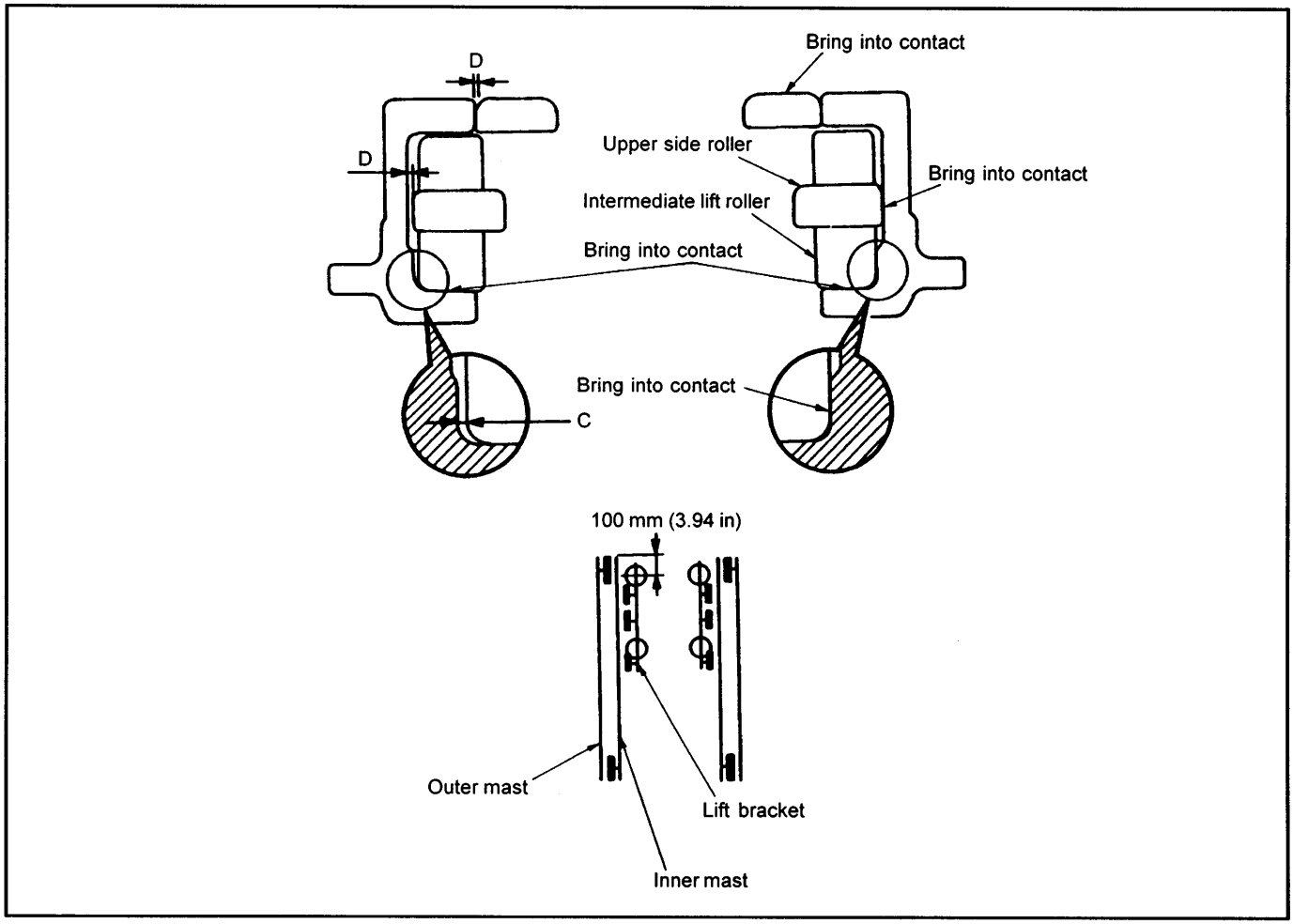
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(3) Distribute shims equally to the rollers on the left and right sides.
(4) After the adjustment, see that mutual mast movement is smooth.

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Lift/Side Roller Adjustment at Lift Bracket

1. SV mast



(1) Bring the center of the upper side roller to approx. 100 mm (3.94 in) from the top of the inner mast.
(2) No adjustment is necessary for the upper and lower lift rollers since they are fastened by snap rings.
(3) Shift the lift bracket to one side to bring the intermediate lift roller into contact with the inner mast, and measure on the opposite side the clearance between the roller side face and the mast where they are the closest.

Standard: C = 0 ~ 0.8 mm (0 ~ 0.031 in)

If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(4) After the inspection and adjustment in step (3) above, inspect and adjust the upper and lower side rollers.
Bring the side roller on one side into contact with mast side surface, measure on the opposite side the clearance between the side roller and the inner mast side surface where they are the closest.

Standard: D = 0 ~ 0.6 mm (0 ~ 0.024 in)

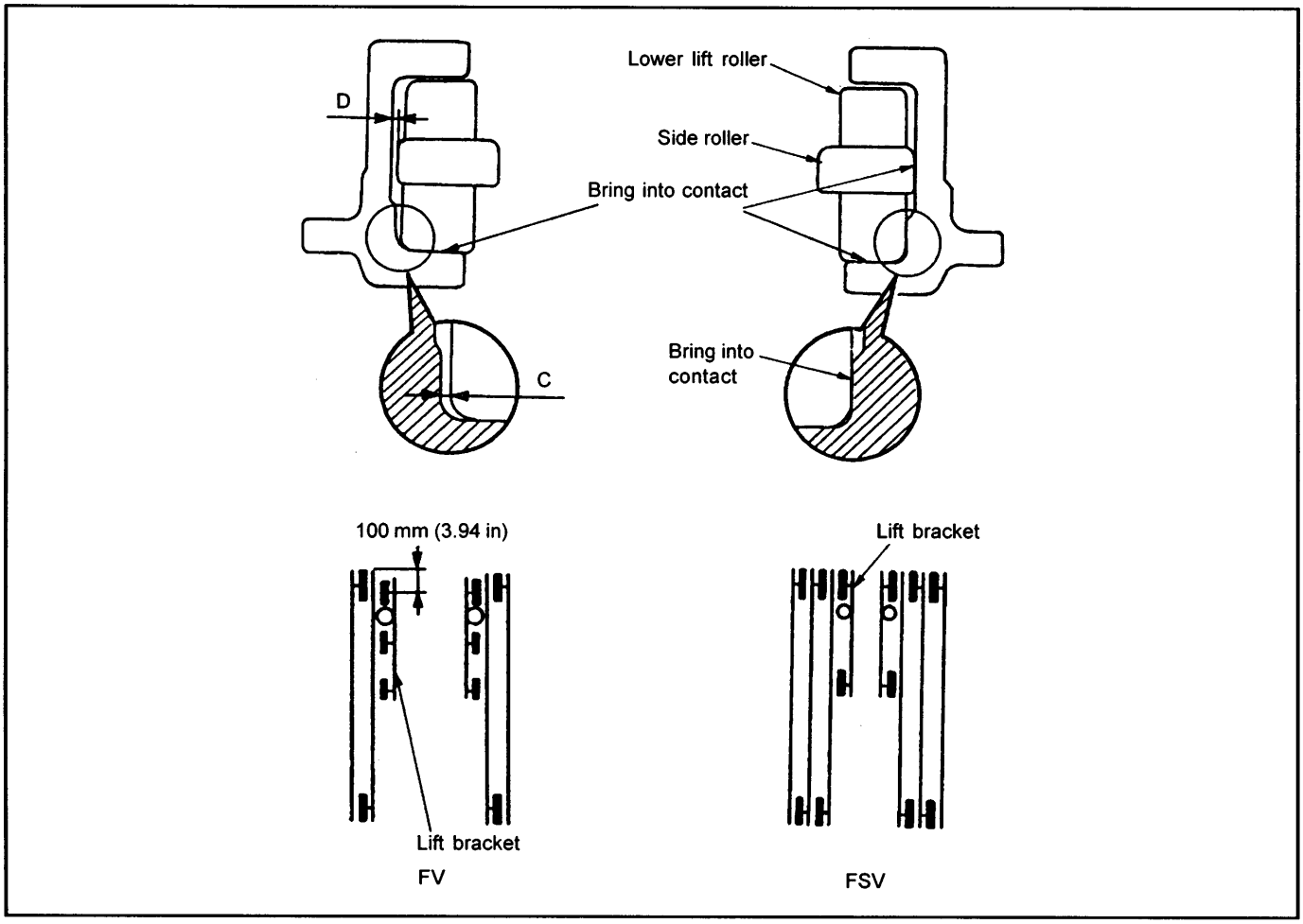
If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(5) After the adjustment, check to see that the lift bracket moves smoothly over the entire length of the mast.

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2. FV-FSV mast



(1) Raise the lift bracket to the uppermost position for the FSV mast, and bring the center of the upper lift roller to approx. 100 mm (3.94 in) from the top of the inner mast for FV mast.
(2) No adjustment is necessary for the upper lift rollers and intermediate rollers (FV only) since they are fastened by snap rings.
(3) Shift the lift bracket to one side to bring the lower lift roller and side roller, and measure on the opposite side the clearance between the roller side face and the mast where they are the closest.

Standard: C = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(4) After the inspection and adjustment in step (3) above, inspect and adjust the side rollers.
Bring the side roller on one side into contact with mast side surface, measure on the opposite side the clearance between the side roller and the inner mast side surface where they are the closest.

Standard: D = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

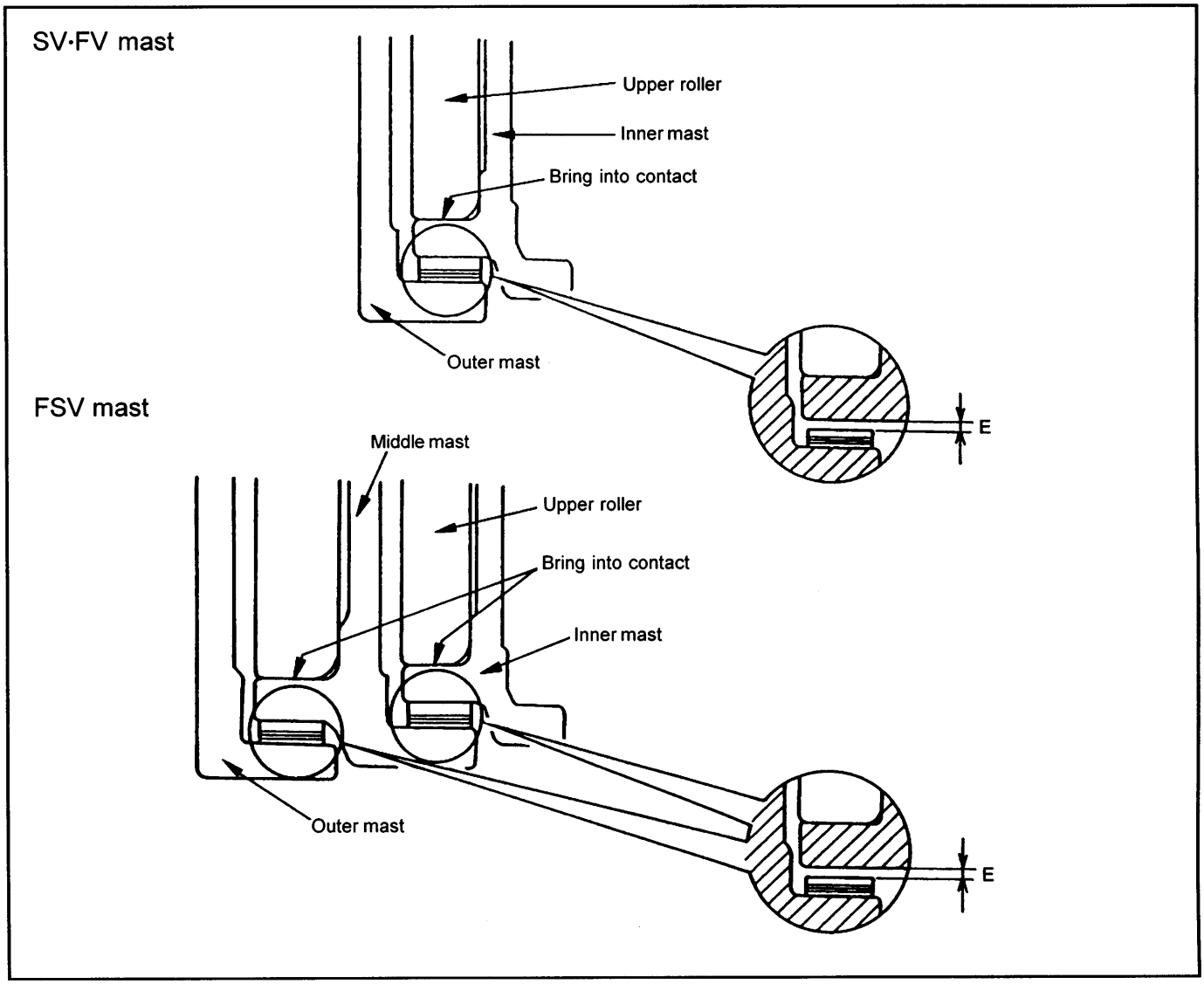
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(5) After the adjustment, check to see that the lift bracket moves smoothly over the entire length of the mast.

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Mast Strip Adjustment

1. Mast strip clearance adjustment



(1) Lower the inner (or middle) mast fully.
(2) With the inner (or middle) mast in contact with the outer mast roller (or middle mast upper roller), measure the clearance between the mast strip and mast.

Standard: E = 0 ~ 0.8 mm (0 ~ 0.031 in)

If the standard is not satisfied, make adjustment by changing the mast strip shim thickness.

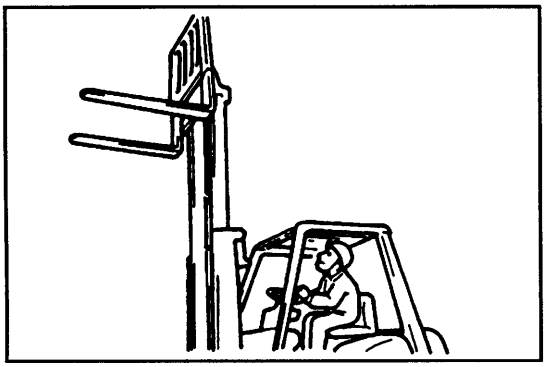
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

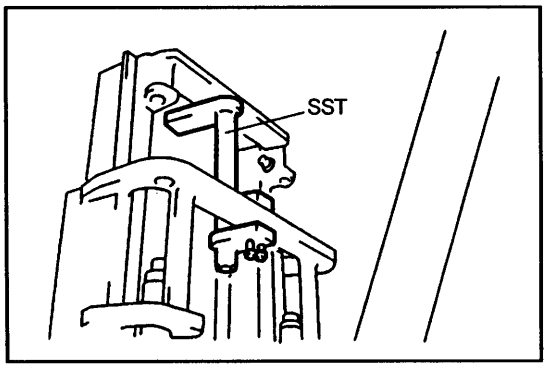
(3) After the adjustment, check the mast for smooth movement.

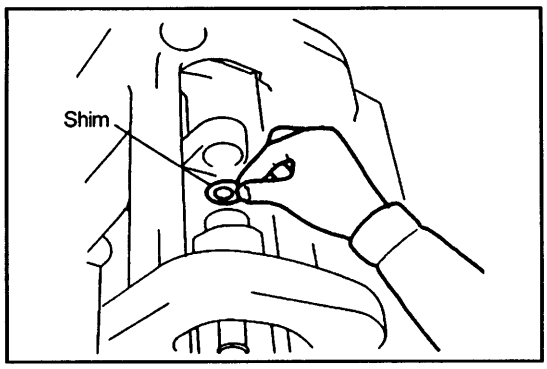
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LIFT CYLINDER ROD SHIM ADJUSTMENT (PREVENTION OF UNEVEN LIFTING)

Note:
- **For double lift cylinders, inspection and adjustment are required to prevent uneven lifting on the left and right sides due to tolerances of parts, etc.**
- **The inspection and adjustment must be made whenever any of the following parts is replaced: Lift cylinder ASSY, lift cylinder rod SUB-ASSY, lift cylinder SUB-ASSY, mast ASSY, outer mast SUB-ASSY, and inner mast SUB-ASSY**







1. Inspection method
   Slowly raise the inner mast, and observe the stopping states of the left and right cylinder rods at the moment when the inner mast reaches the maximum height.
   (1) Normal case
   Both the left and right rods stop almost simultaneously with almost no shaking of the inner mast.
   (2) Abnormal case
   The rods stop with slight difference and the top of the inner mast shakes at the time of stopping. To correct this, add shims to the cylinder that stops first.

2. Adjustment method
   (1) Raise the inner mast, set the SST to the outer mast tie beam, and lower the inner mast until it reaches the SST.
   SST 09610-22000-71
   (2) Remove the set bolt of the cylinder rod end on the side requiring shim adjustment.
   (3) Slowly lower the lift cylinder rod and disconnect the cylinder rod end.
   (4) Place shims on the cylinder rod end. Slowly raise the cylinder rod end into the inner mast.
   (5) Fix the set bolt of the cylinder rod end.
   (6) Raise the inner mast for reinspection.
   (7) Repeat the inspection and adjustment until the number of shims is determined.

   Shim thickness:
   0.5 and 1.0 mm (0.020 and 0.039 in)

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CYLINDER

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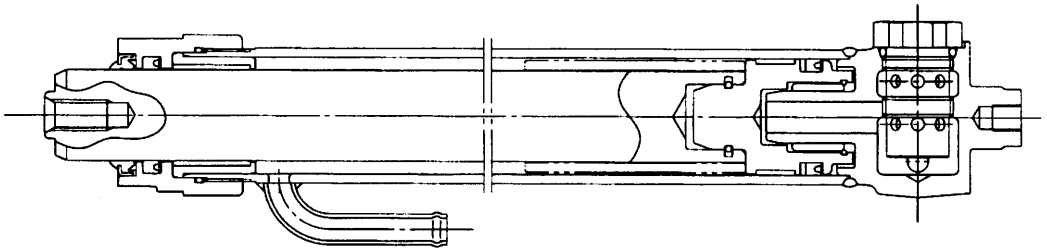
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LIFT CYLINDER (V·SV) · REAR LIFT CYLINDER (FV·FSV)

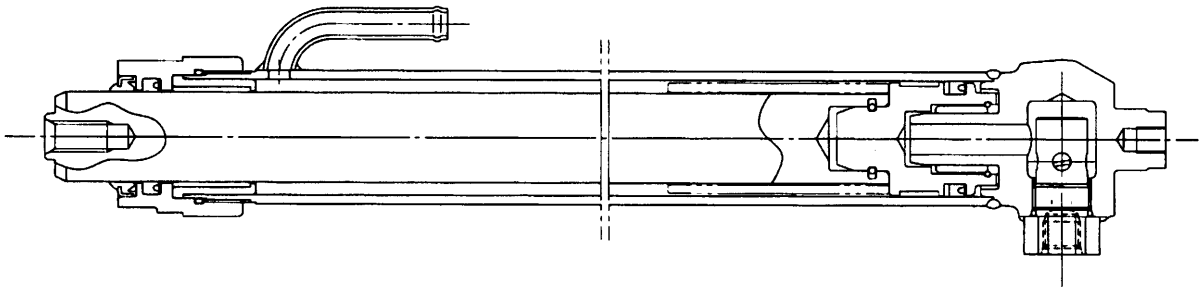
GENERAL

Lift Cylinder (V·SV/1·2 ton Series)

RH

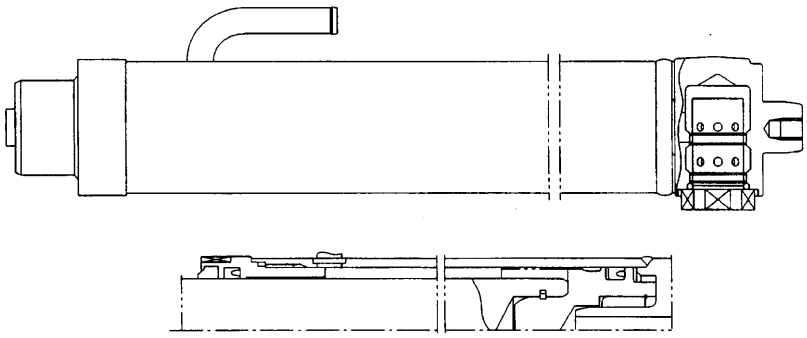


LH

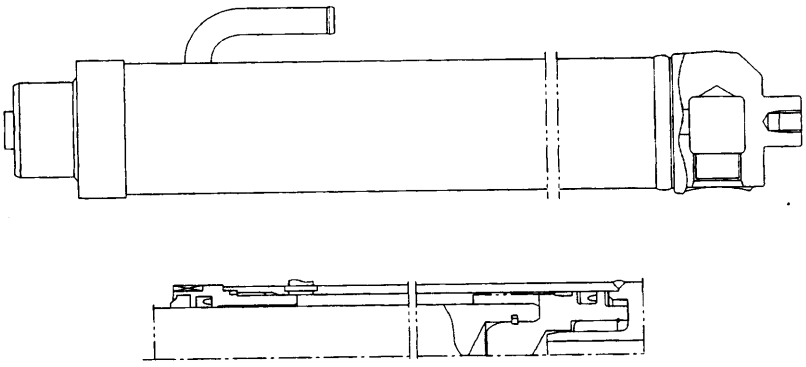


Lift Cylinder (V·SV/3 ton)

RH



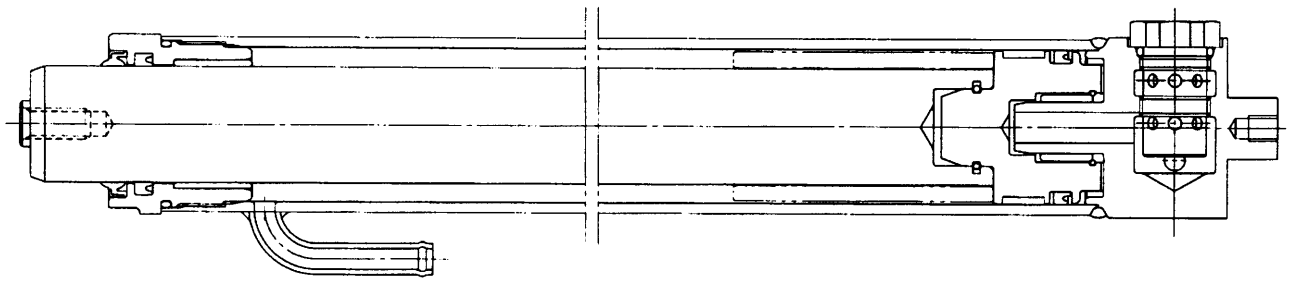
LH



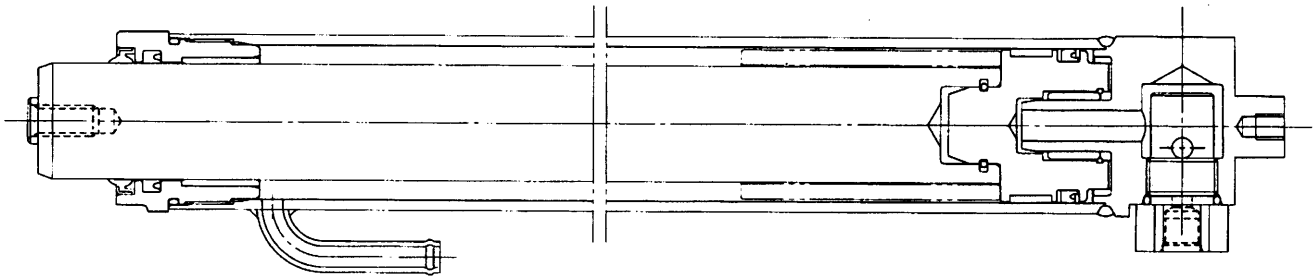
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Lift Cylinder (V/J3.5 ton)

RH

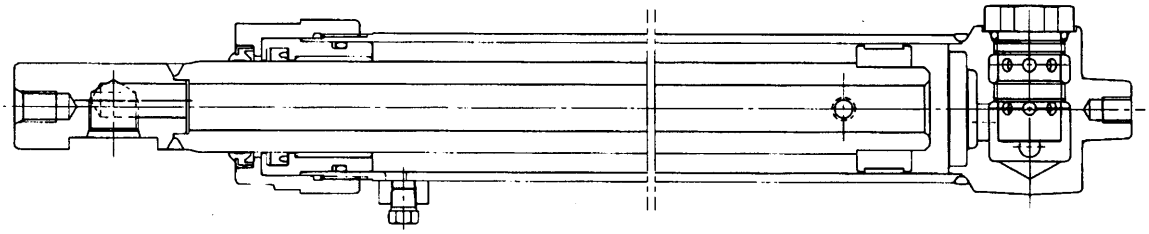


LH

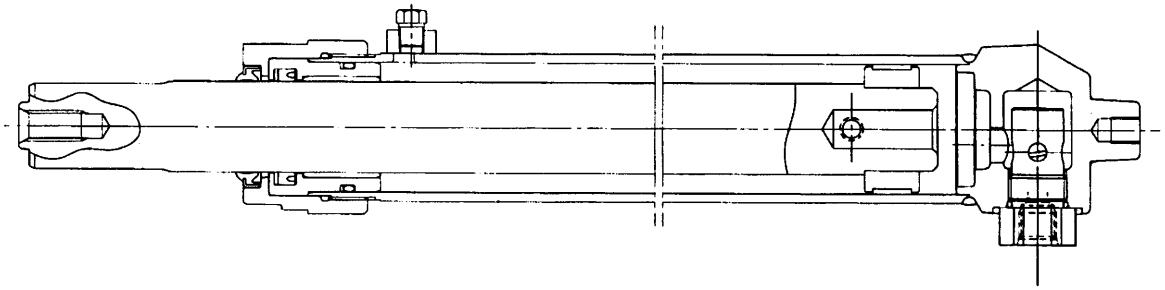


Rear Lift Cylinder (FV/1·2 ton Series)

RH



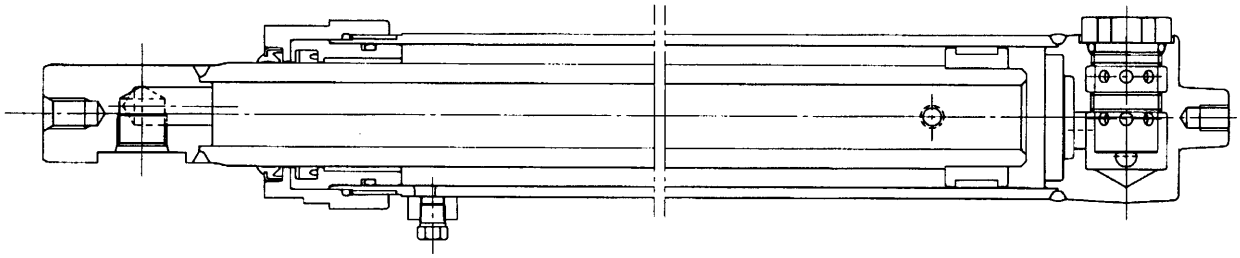
LH



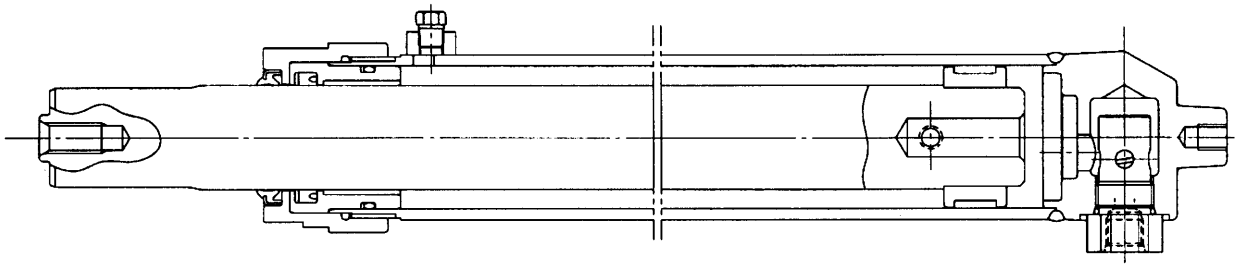
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Rear Lift Cylinder (FV/3 ton)

RH

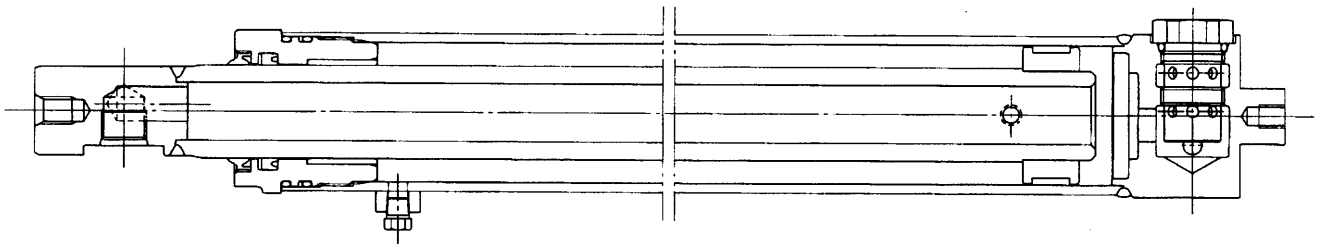


LH

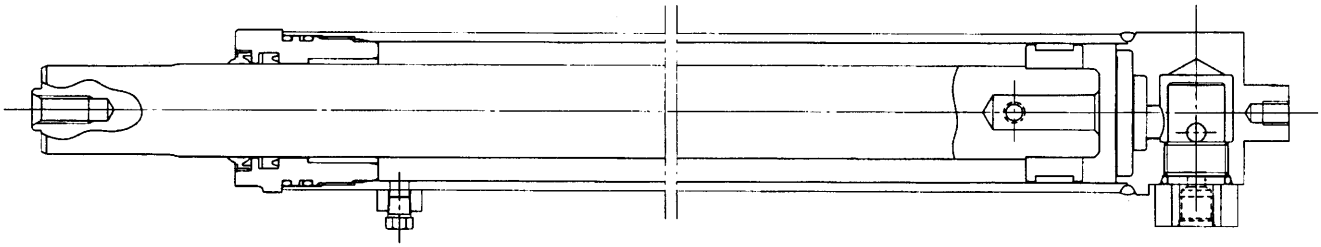


Rear Lift Cylinder (FV/J3.5 ton)

RH



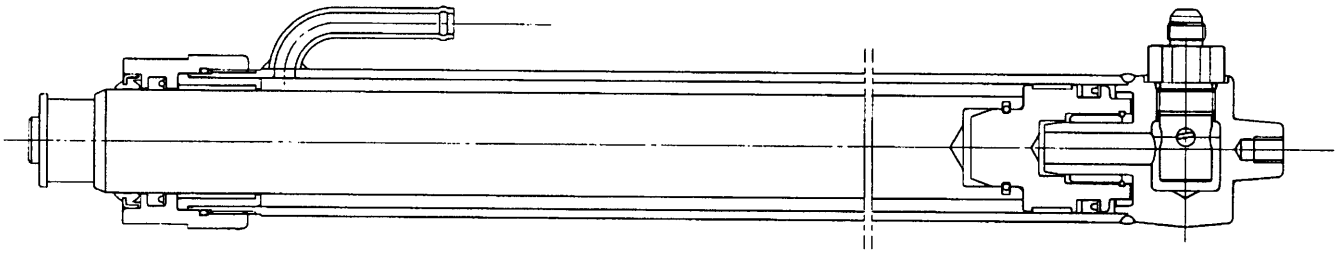
LH



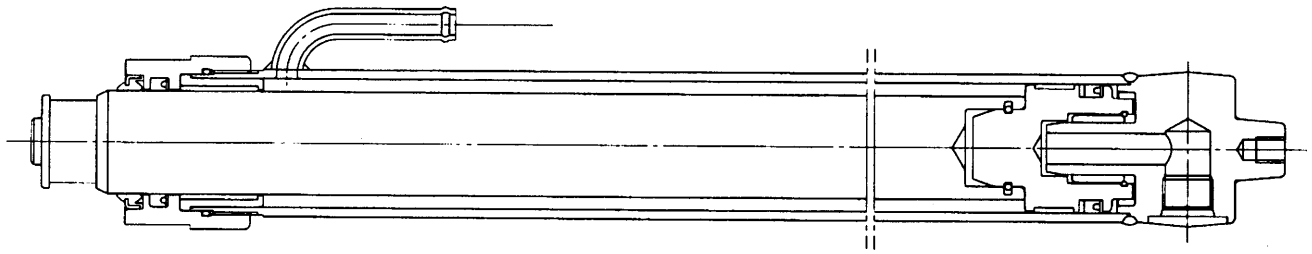
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Rear Lift Cylinder (FSV/1·2 ton Series, 3 ton)

RH

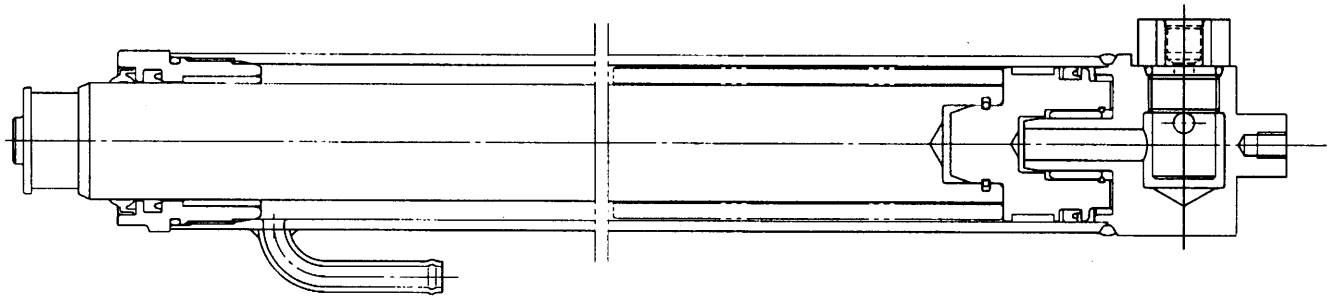


LH

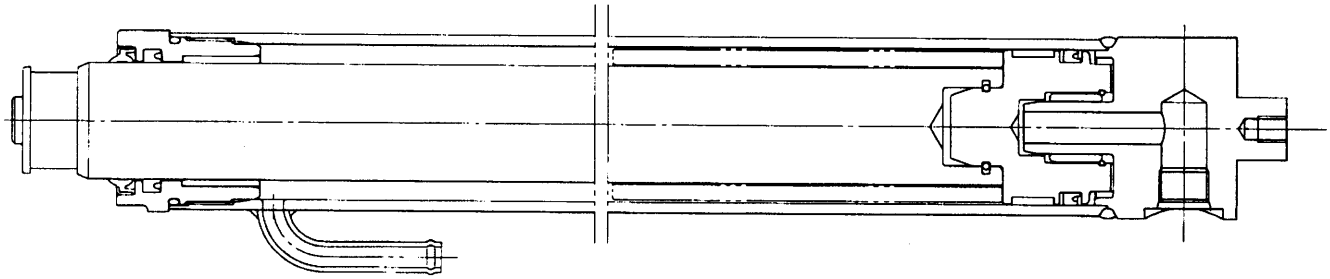


Rear Lift Cylinder (FSV/J3.5 ton)

RH



LH



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SPECIFICATIONS

Lift Cylinder (V·SV)

Item \ Vehicle model		1 ton series (excluding 40-7FB15)	2 ton series, 40-7FB15	3 ton	J3.5 ton
Cylinder type		Single-acting type	←	←	←
Cylinder bore	mm (in)	45 (1.77)	50 (1.97)	55 (2.17)	60 (2.36)
Piston rod outside diameter	mm (in)	35 (1.38)	40 (1.57)	45 (1.77)	45 (1.77)
Piston seal type		U packing	←	←	←
Rod seal type		U packing	←	←	←
Others		Built-in flow regulator valve (RH) Built-in safety down valve (LH)			

Rear Lift Cylinder (FV)

Item \ Vehicle model		1 ton series (excluding 40-7FB15)	2 ton series, 40-7FB15	3 ton	J3.5 ton
Cylinder type		Single-acting type	←	←	←
Cylinder bore	mm (in)	45 (1.77)	50 (1.97)	55 (2.17)	60 (2.36)
Piston rod outside diameter	mm (in)	32 (1.26)	35 (1.38)	40 (1.57)	←
Rod seal type		U packing	←	←	←
Others		Built-in flow regulator valve (RH) Built-in safety down valve (LH)			

Rear Lift Cylinder (FSV)

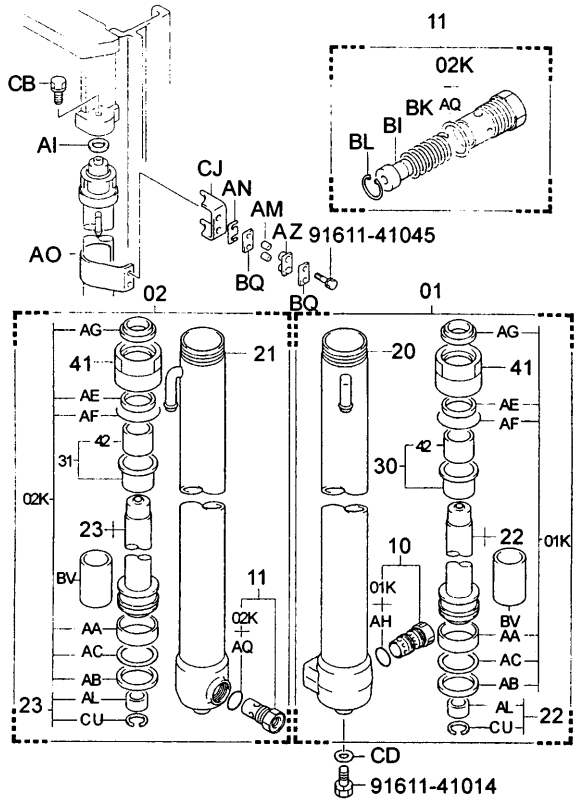
Item \ Vehicle model		1 ton series (excluding 40-7FB15)	2 ton series, 40-7FB15	3 ton	J3.5 ton
Cylinder type		Single-acting type	←	←	←
Cylinder bore	mm (in)	45 (1.77)	50 (1.97)	55 (2.17)	60 (2.36)
Piston rod outside diameter	mm (in)	35 (1.38)	40 (1.57)	45 (1.77)	←
Piston seal type		U packing	←	←	←
Rod seal type		U packing	←	←	←
Others		Built-in safety down valve (RH)			

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COMPONENTS

Lift Cylinder (V·SV/1·2 ton Series)

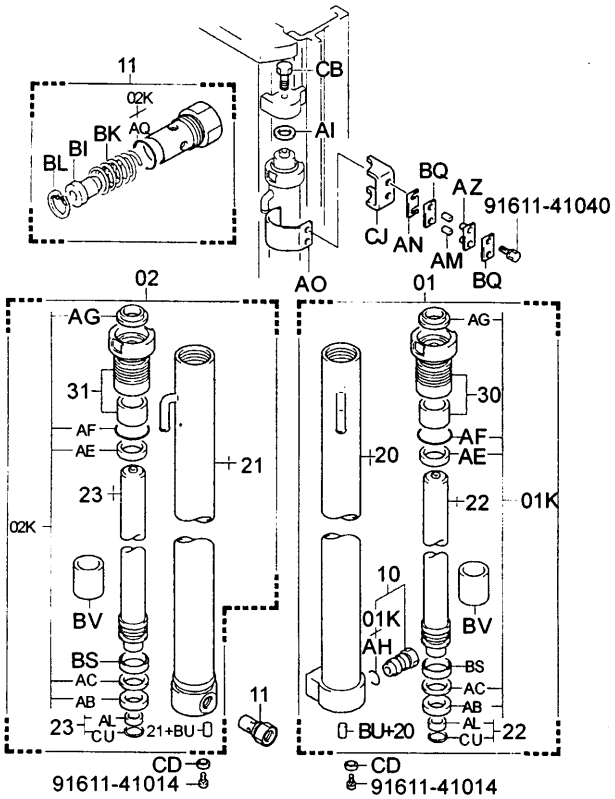
6501



6501-119B

Lift Cylinder (V·SV/3 ton)

6501

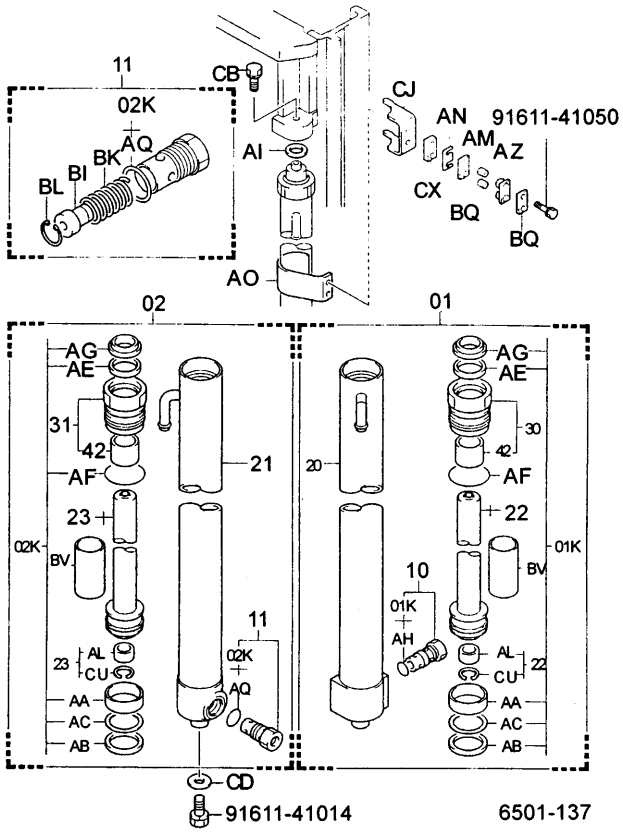


6501-136

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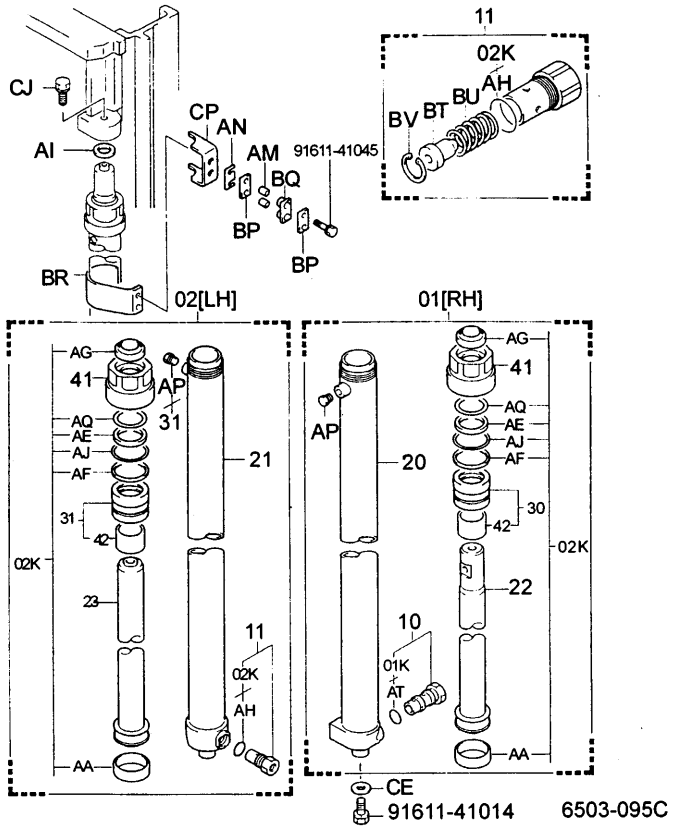
Lift Cylinder (V/J3.5 ton)

6501



Rear Lift Cylinder (FV/1·2 ton Series and 3 ton)

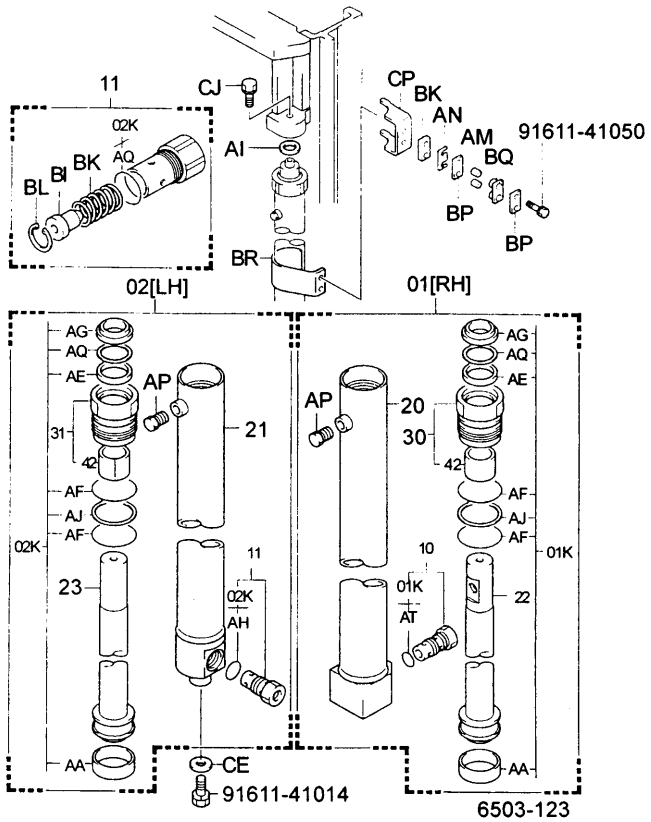
6503



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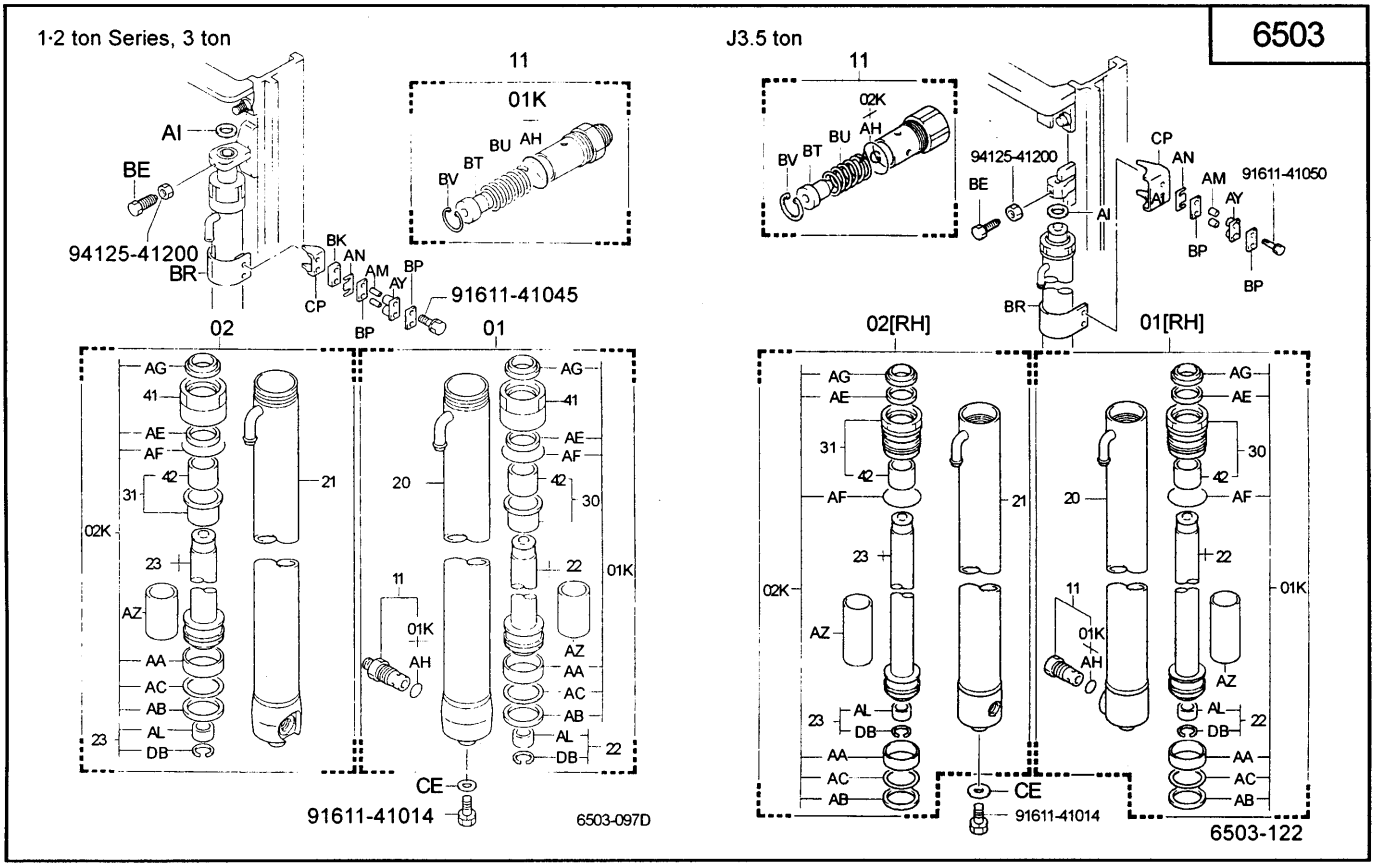
Rear Lift Cylinder (FV/J3.5 ton)

6503



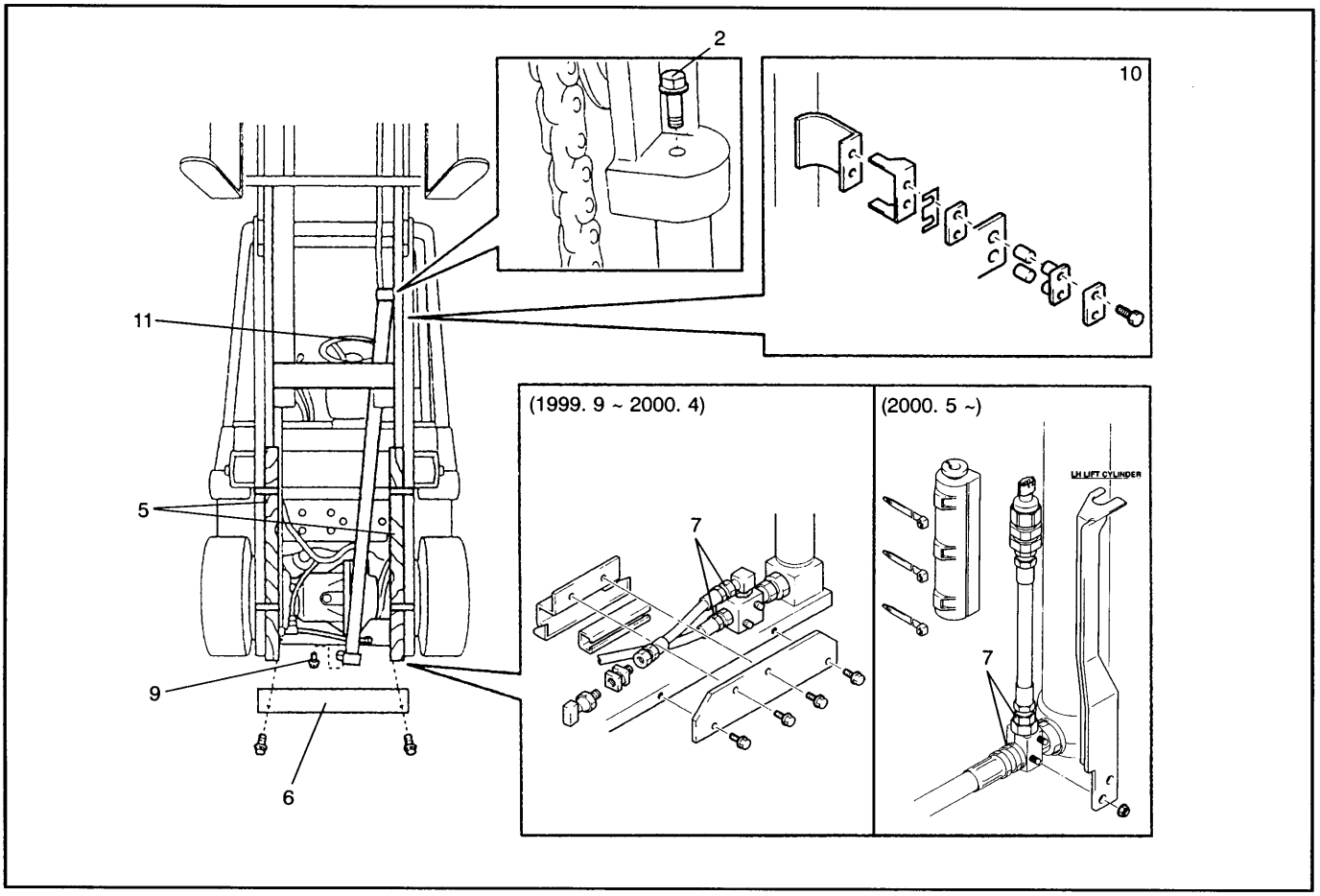
Rear Lift Cylinder (FSV)

6503



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REMOVAL·INSTALLATION



Removal Procedure

1 Set the mast vertical and lower the fork fully.

2 Remove the lift cylinder rod end set bolt.

3 Hoist the inner mast by slinging with a wire and disconnect the lift cylinder rod end. **[Point 1]**

4 Hoist the inner mast further so that the lift cylinder ASSY can be removed from the front space.

5 Support the bottom of the inner mast with wooden blocks and fix the blocks by taping onto the outer mast.

6 Remove the hose cover.

7 Disconnect the hose.

8 Disconnect the load sensor wiring. (SV·FV·FSV) (SAS spec.)

9 Remove the lift cylinder bottom end set bolt.

10 Remove the lift cylinder support. **[Point 2]**

11 Remove the lift cylinder ASSY.

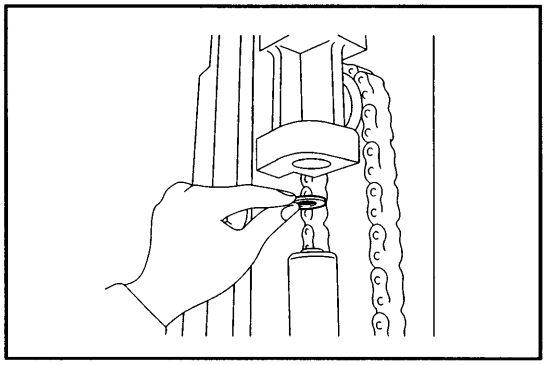
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Installation Procedure

The installation procedure is the reverse of the removal procedure.

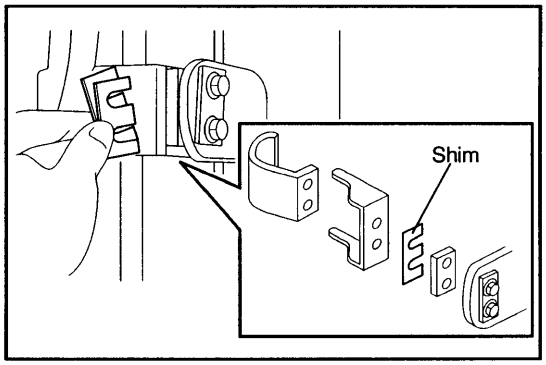
Note:
After installing the lift cylinder, follow the steps below.

1. **Repeat full-stroke raising and lowering of the cylinder to bleed air and check normal functioning.**
2. **Check the hydraulic oil level and add if insufficient.**
3. **Inspect lift cylinders for uneven lifting, and make necessary adjustment. (See page 14-36.)**



Point Operations

[Point 1]
Removal:
Shim adjustment is made at the lift cylinder rod end to prevent uneven lifting by lift cylinders LH and RH. Take a note on the cylinder where adjustment is made and the number of shims used.

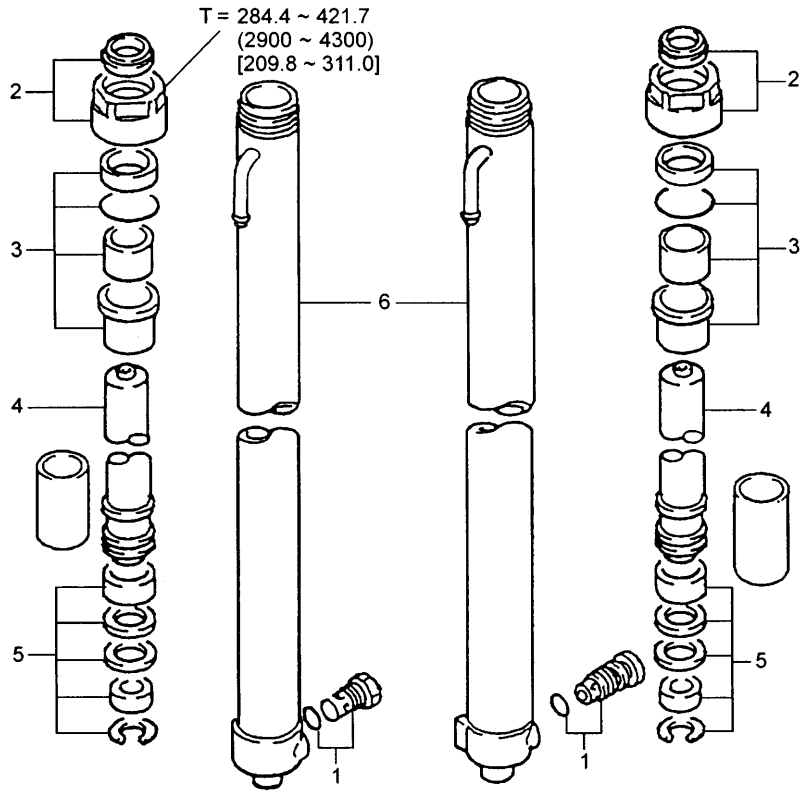


[Point 2]
Installation:
Temporarily fasten the cylinder support here, and eliminate any clearance between the cylinder support and outer mast by shim insertion after connecting the rod end. (Use shim(s) slightly thicker than the clearance.)

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Note: This illustration is for the V·SV mast on the 1·2 ton series.

Disassembly Procedure

1 Remove the flow regulator valve or safety down valve.

2 Remove the cylinder cover. **[Point 1]**

3 Remove the rod guide.

4 Remove the piston rod. **[Point 2]**

5 Remove seals on the piston side.

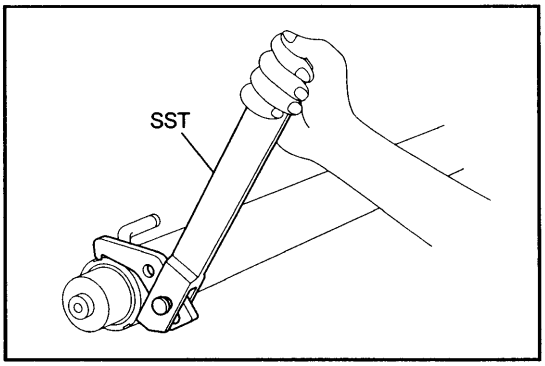
6 Remove the lift cylinder. **[Point 3]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

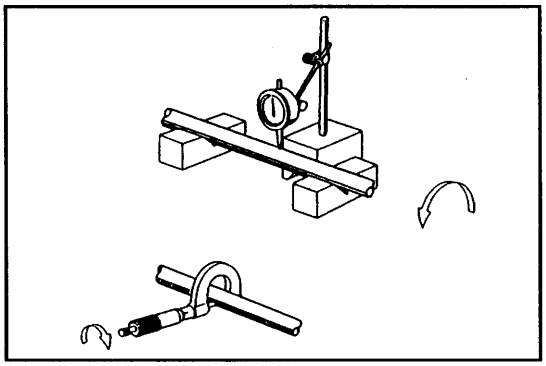
Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring, and dust seal lip portion.**
- **Apply sealant (08833-00080) on the threaded portion of the cylinder cover before tightening.**

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Point Operations

[Point 1]
Disassembly·Reassembly:
V·SV/3 ton
SST 09620-10100-71



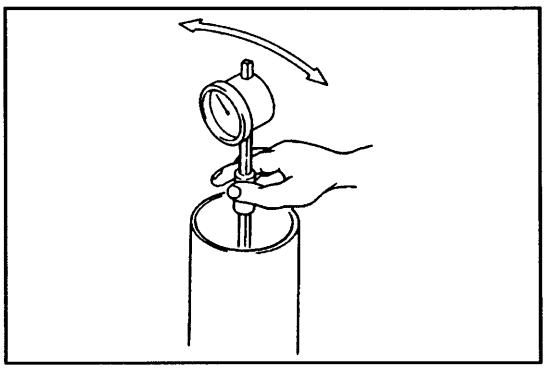
[Point 2]
Inspection:
Measure the piston rod outside diameter.

Unit: mm (in)

		Standard	Limit
V	1 ton series (excluding 40-7FB15)	35 (1.38)	34.92 (1.3748)
SV	2 ton series, 40-7FB15	40 (1.57)	39.92 (1.5717)
FSV	3·J3.5 ton	45 (1.77)	44.92 (1.7685)
FV	1 ton series (excluding 40-7FB15)	32 (1.26)	31.92 (1.3748)
	2 ton series, 40-7FB15	35 (1.38)	34.92 (1.3748)
	3·J3.5 ton	40 (1.57)	39.92 (1.5717)

Inspection:
Measure the bend of the piston rod.

Limit: 2.0 mm (0.079 in)



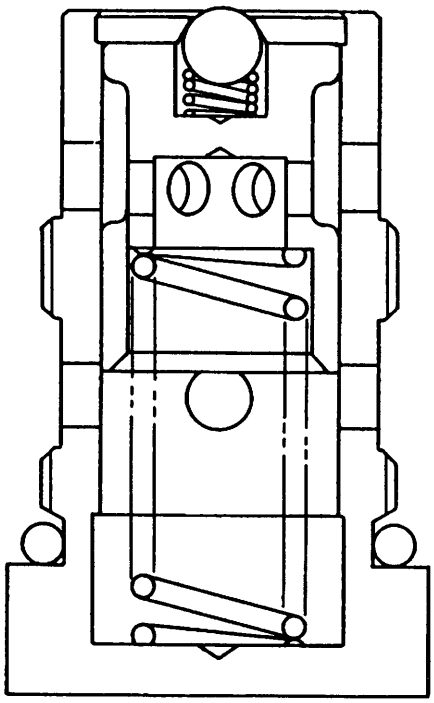
[Point 3]
Inspection:
Measure the lift cylinder bore.

Unit: mm (in)

	Standard	Limit
1 ton series (excluding 40-7FB15)	45 (1.77)	45.20 (1.7795)
2 ton series, 40-7FB15	50 (1.97)	50.20 (1.9764)
3 ton	55 (2.17)	55.35 (2.1791)
J3.5 ton	60 (2.36)	60.35 (2.3760)

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FLOW REGULATOR VALVE (V·SV·FV·FSV)



Lowering Speed Specifications

Unit: mm/sec (fpm)

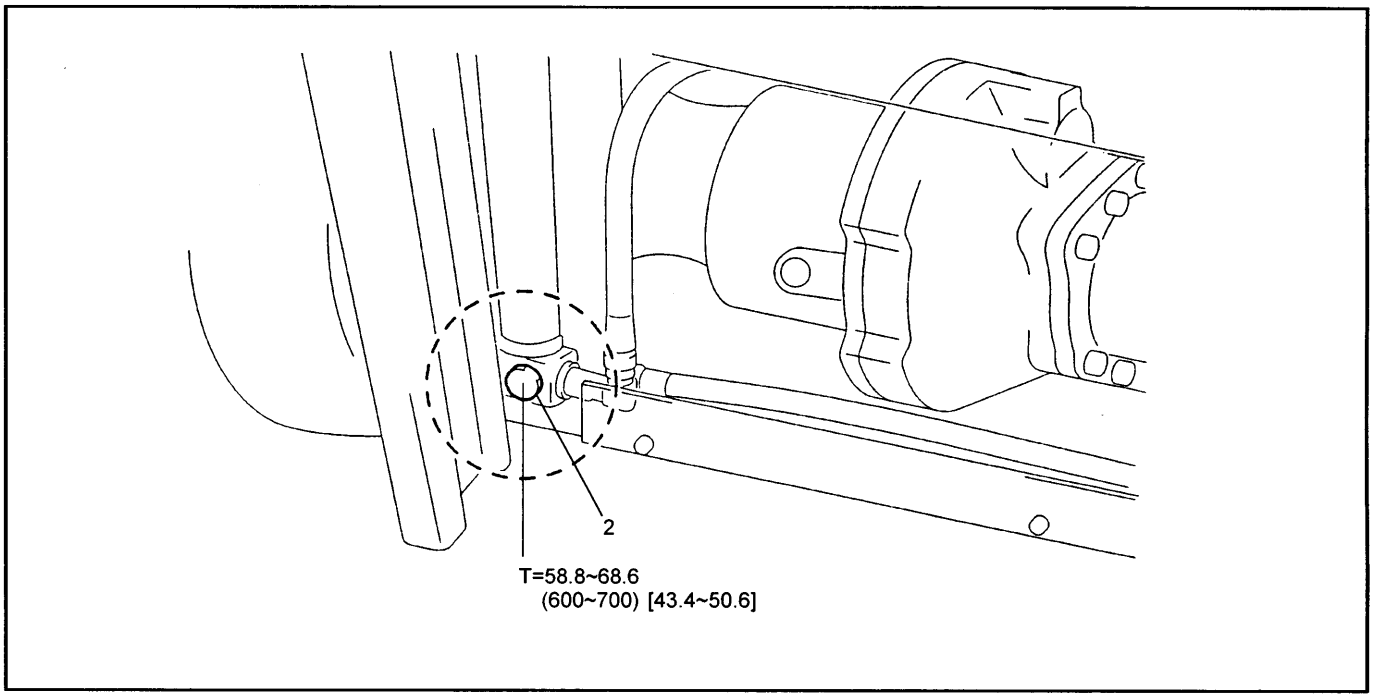
Vehicle model \ Mast type		V	SV	FV	FSV
1 ton series (excluding 40-7FB15)	No-load	550 (108)	←	420 (83)	450 (89)
	Loaded	500 (98)	←	480 (94)	480 (94)
2 ton series, 40-7FB15	No-load	500 (98)	←	420 (83)	450 (89)
	Loaded	500 (98)	←	480 (94)	480 (94)
3 ton	No-load	500 (98)	←	390 (77)	420 (83)
	Loaded	500 (98)	←	460 (91)	460 (91)
J3.5 ton	No-load	450 (89)		390 (77)	390 (77)
	Loaded	500 (98)		460 (91)	460 (91)

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REMOVAL·INSTALLATION

Note:
The explanation here is for the flow regulator valve for the V, SV or FV mast.
In the case of the FSV mast, the flow regulator valve is installed on the outer mast.

T = N·m (kgf-cm) [ft-lbf]



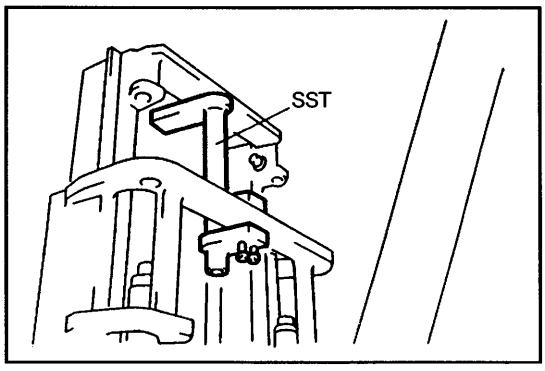
Removal Procedure

1 Hoist the inner mast. **[Point 1]**

2 Remove the flow regulator valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



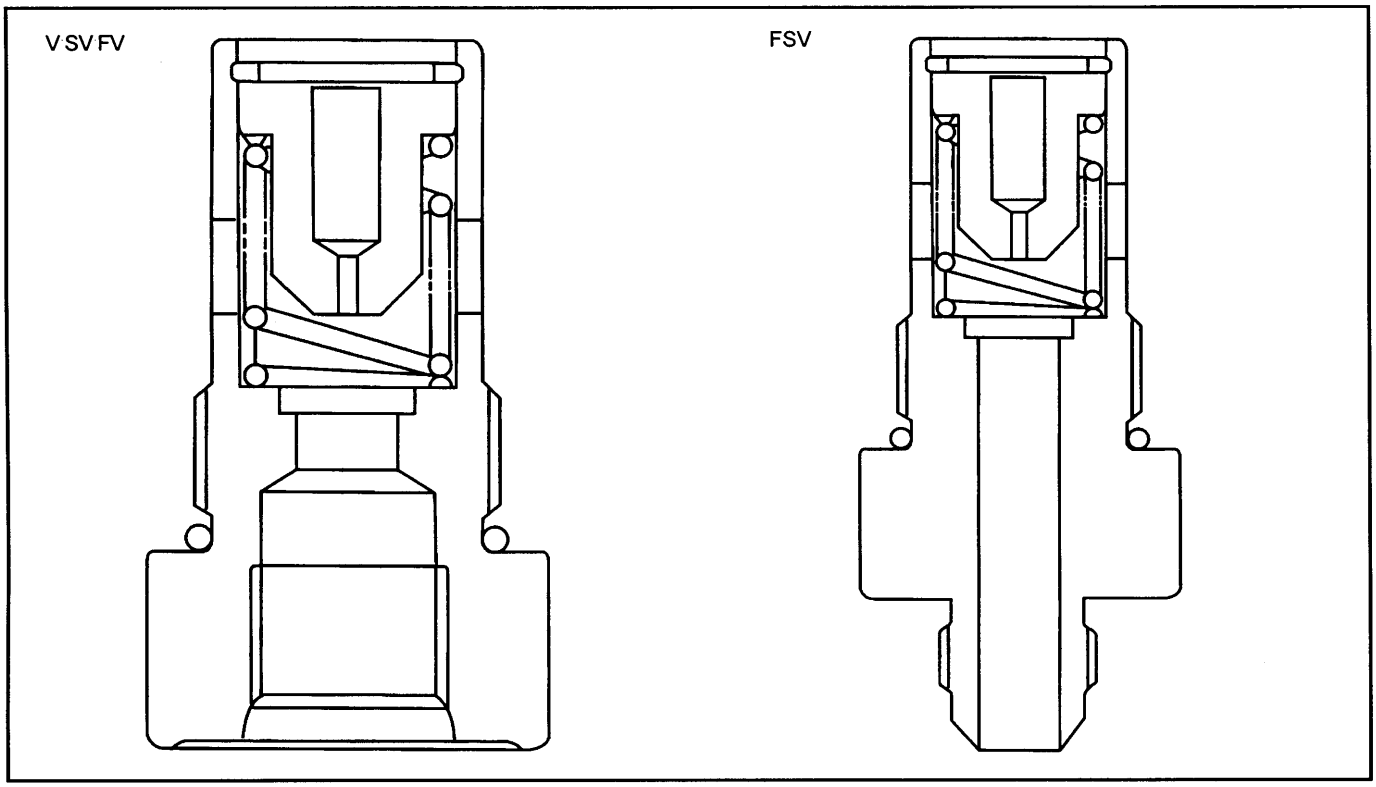
Point Operation

[Point 1]
Removal-Installation:
Hoist the inner (middle) mast by slinging with a wire, set the SST on the inner (middle) mast tie beam, and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

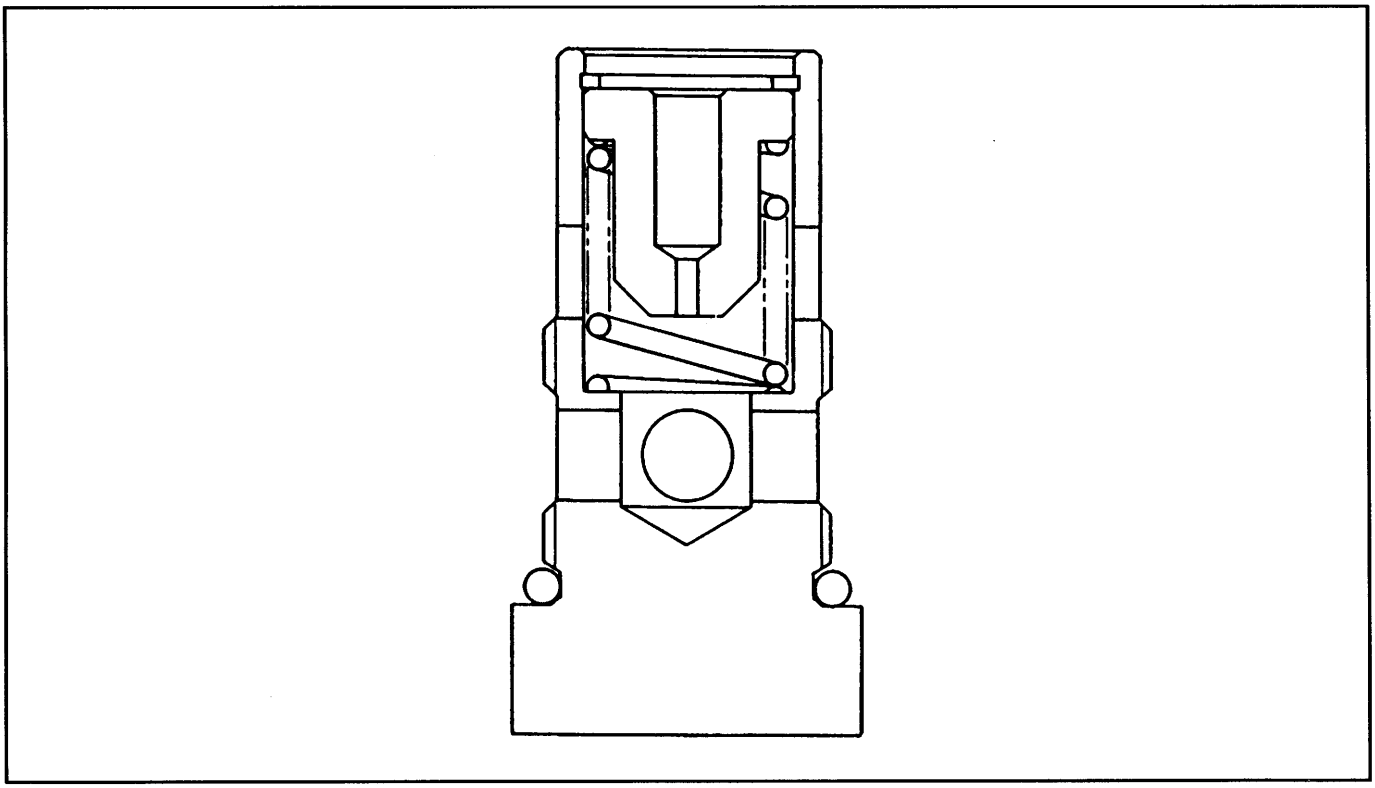
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SAFETY DOWN VALVE (V·SV·FV·FSV)

Safety Down Valve Sectional View (for V·SV) (for FV·FSV Rear Lift Cylinder)



Safety Down Valve Sectional View (for FV·FSV Front Lift Cylinder)

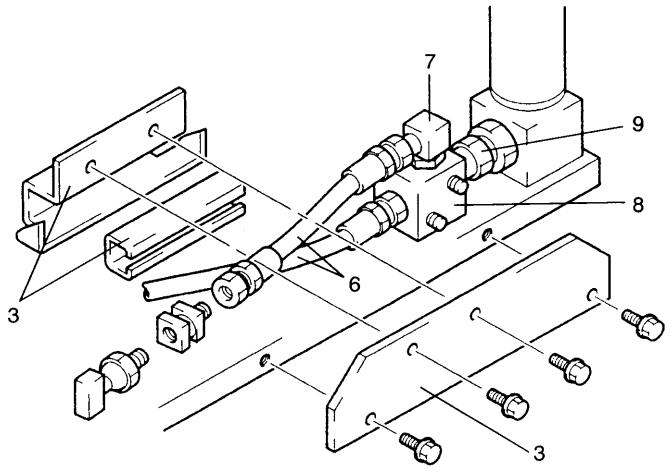


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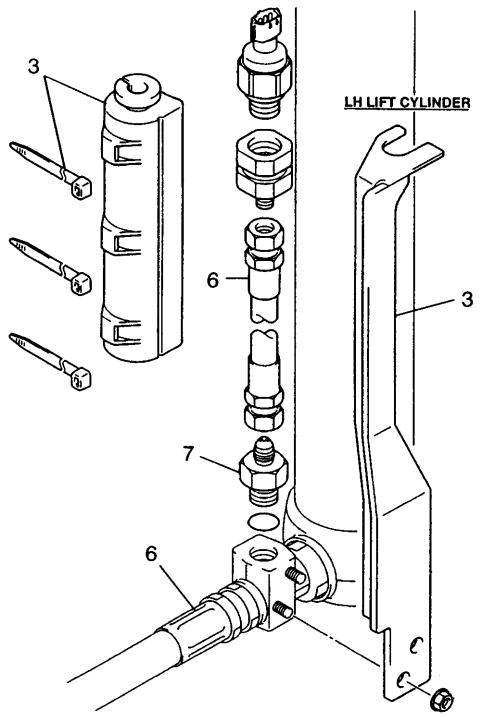
REMOVAL·INSTALLATION (V)

T = N·m (kgf-cm) [ft-lbf]

(1999. 9 ~ 2000. 4)



(2000. 5 ~)

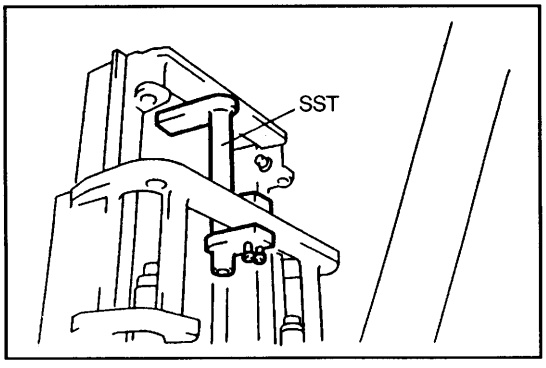


Removal Procedure

1 Remove the lift cylinder rod end set bolt.
2 Hoist the inner mast. **[Point 1]**
3 Remove the front hose cover and pressure sensor cover.
4 Remove the lift cylinder (LH) bottom end set bolt.
5 Loosen the lift cylinder (LH) support set bolt.
6 Disconnect the hose between cylinders and the pressure sensor insulating hose.
7 Remove the fitting for the pressure sensor.
8 With the lift cylinder (LH) hoisted slightly upward, remove the three-way.
9 Remove the safety down valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



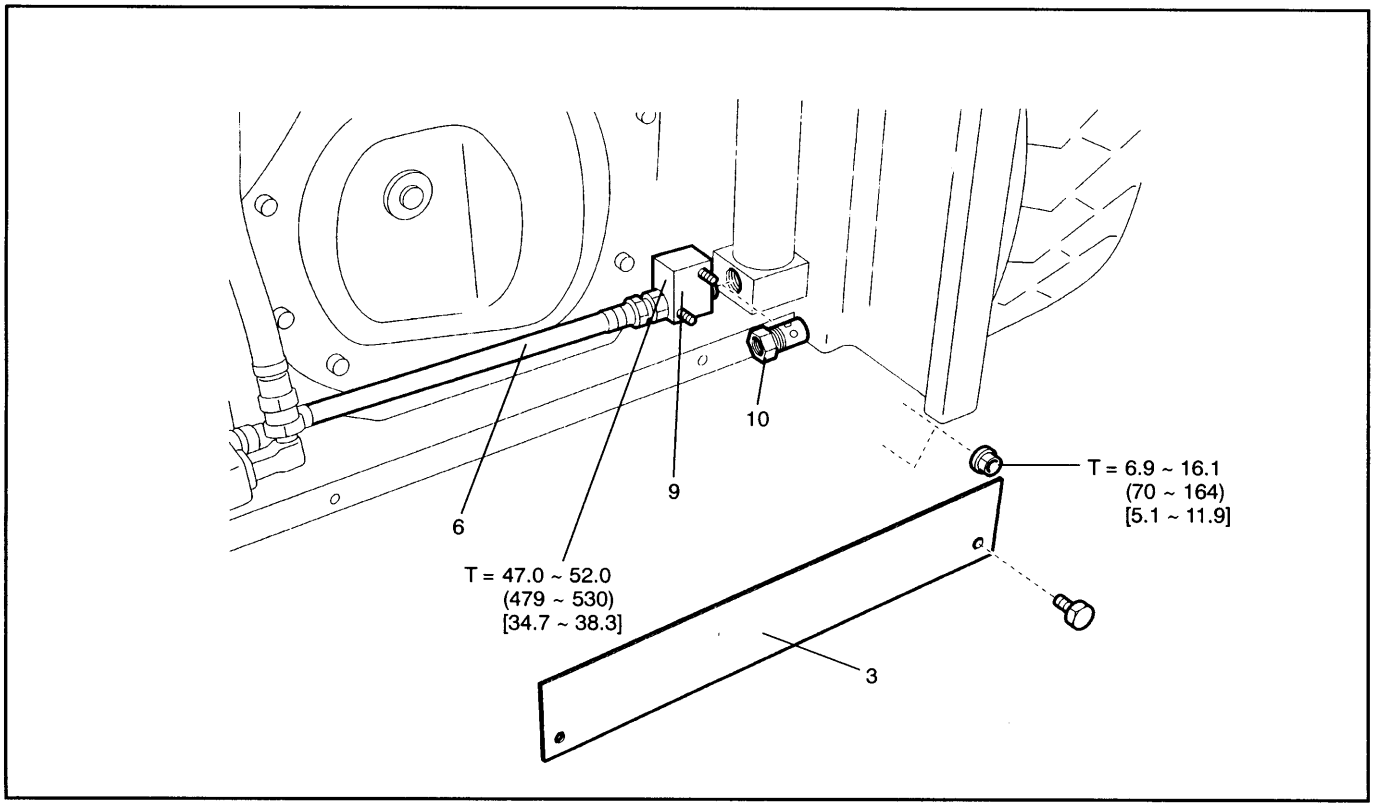
Point Operation

[Point 1]
Removal-Installation:
Hoist the inner (middle) mast by slinging with a wire, set the SST on the inner (middle) mast tie beam, and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

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REMOVAL·INSTALLATION (SV·FV·FSV)

T = N·m (kgf-cm) [ft-lbf]

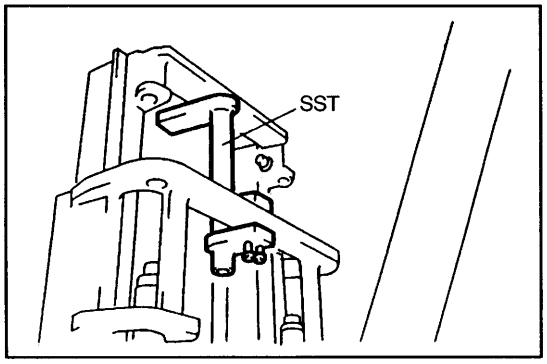


Removal Procedure

1 Remove the lift cylinder rod end set bolt.
2 Hoist the inner mast. **[Point 1]**
3 Remove the front hose cover.
4 Remove the lift cylinder (LH) bottom end set bolt.
5 Loosen the lift cylinder (LH) support set bolt.
6 Disconnect the hose.
7 With the lift cylinder (LH) hoisted slightly upward, remove the three-way.
8 Remove the safety down valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

[Point 1]
Removal-Installation:
Hoist the inner (middle) mast by slinging with a wire, set the SST on the inner (middle) mast tie beam, and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

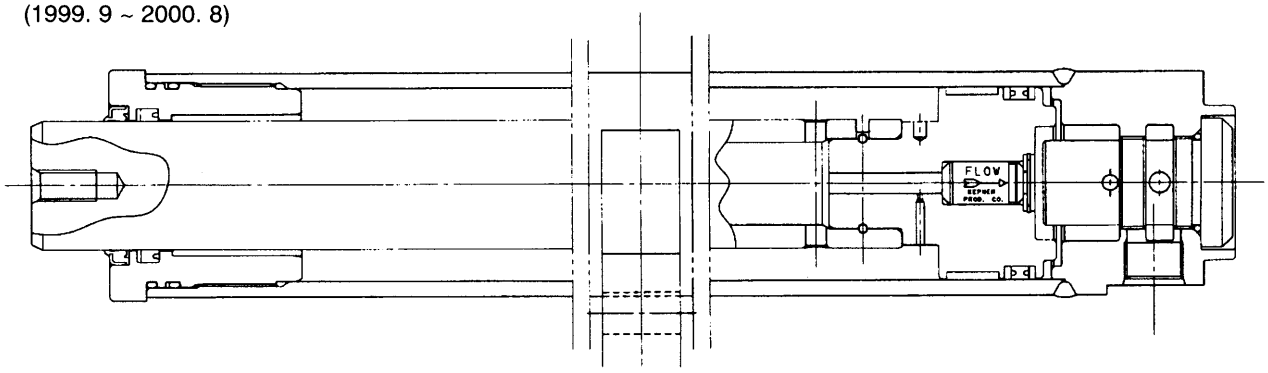
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FRONT LIFT CYLINDER (FV·FSV)

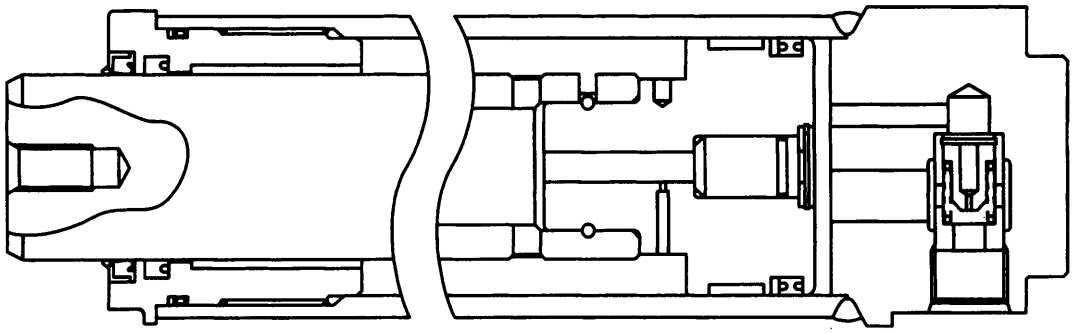
GENERAL

Front Lift Cylinder (FV·FSV)

(1999. 9 ~ 2000. 8)



(2000. 9 ~)

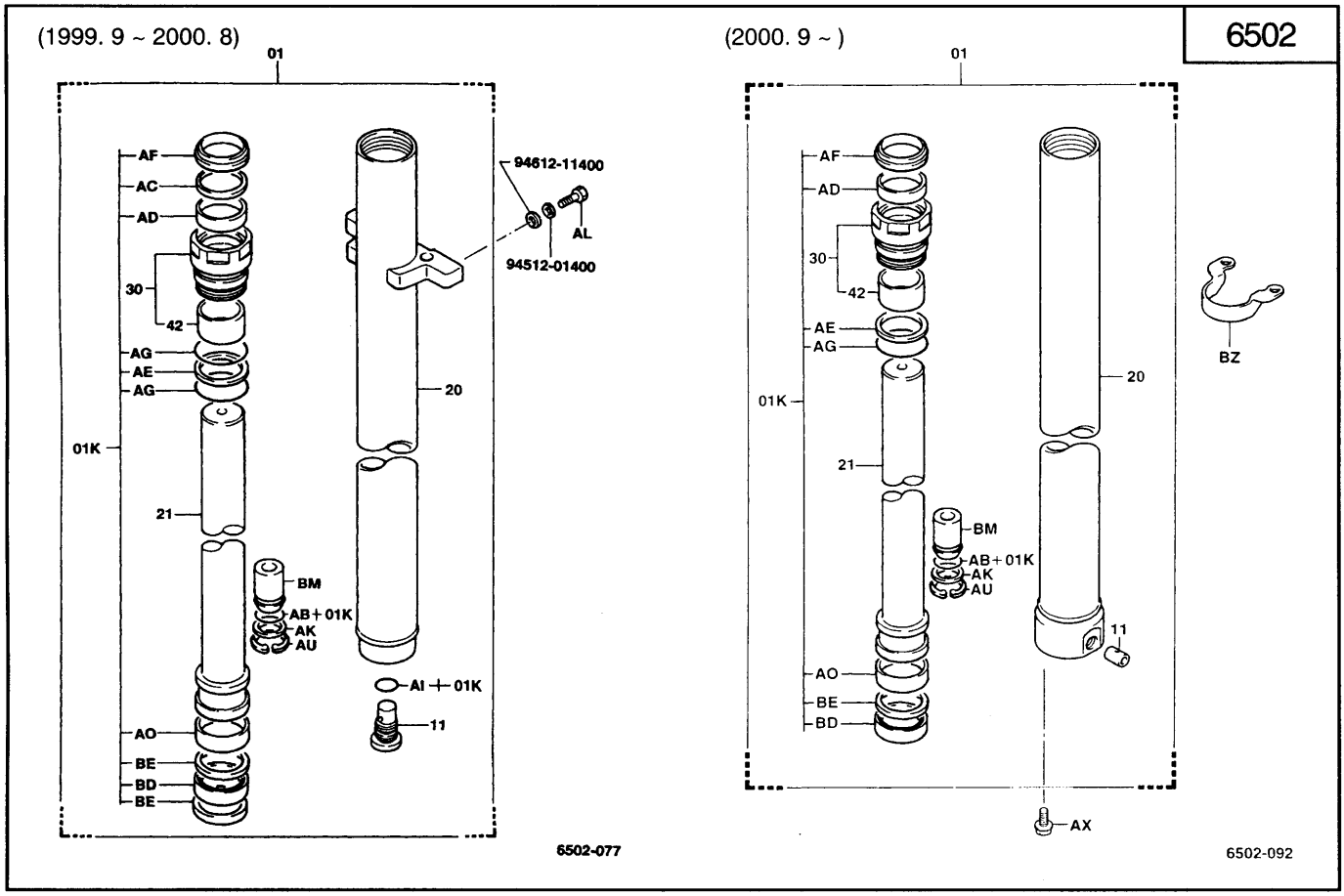


SPECIFICATIONS

Item \ Vehicle model	1 ton series (excluding 40-7FB15)	2 ton series, 40-7FB15	3 ton	J3.5 ton
Cylinder type	Single acting type	←	←	←
Cylinder bore mm (in)	7 0 (2.76)	7 5 (2.95)	8 5 (3.35)	9 0 (3.54)
Piston rod outside diameter mm (in)	5 0 (1.97)	←	6 0 (2.36)	←
Piston seal type	U packing	←	←	←
Rod seal type	U packing	←	←	←
Others	Built-in safety down valve			

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COMPONENTS



REMOVAL·INSTALLATION

Removal Procedure

1 Remove the lift bracket W/fork.

2 Disconnect the piping.

3 Remove the front lift cylinder.

Installation Procedure

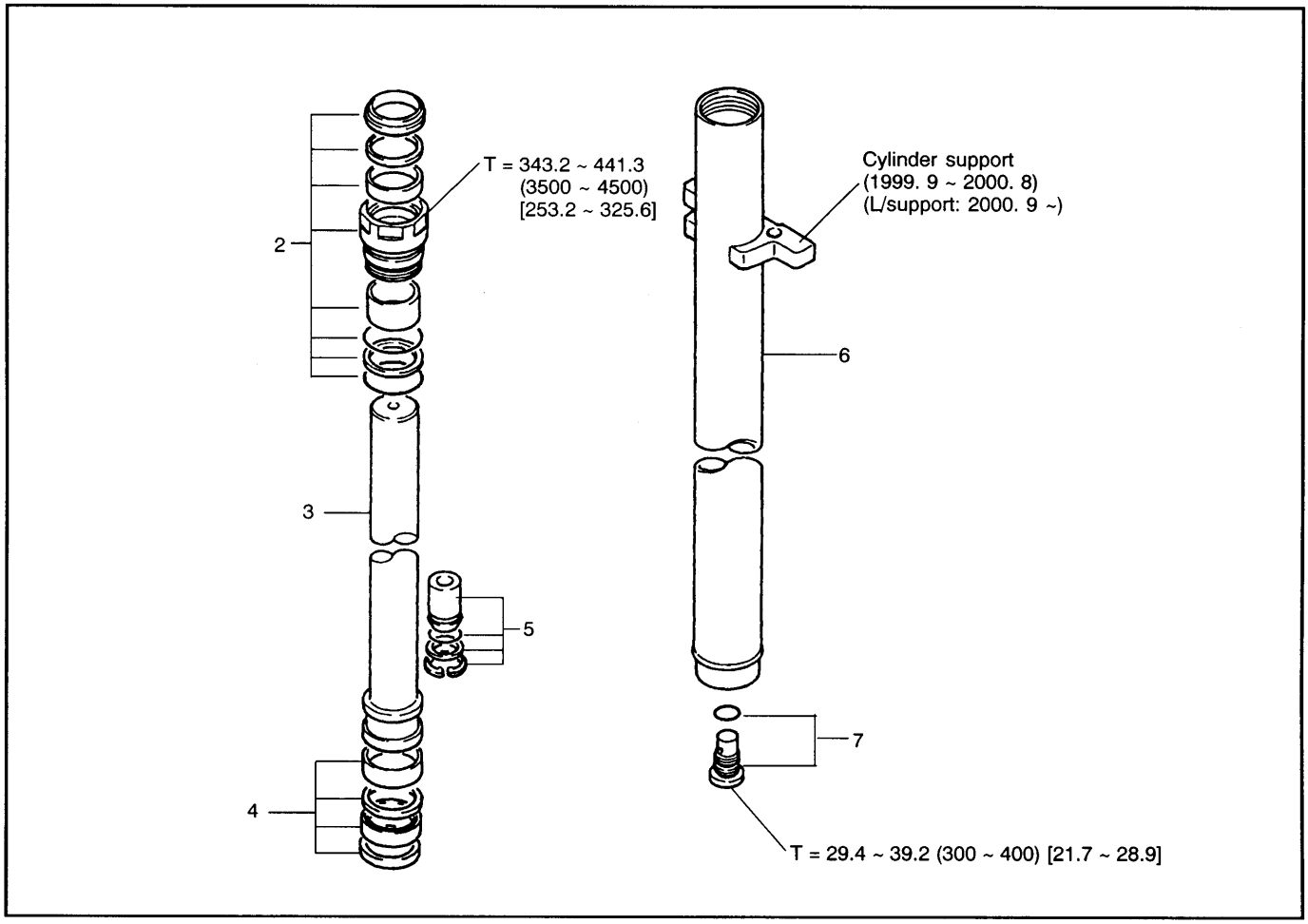
The installation procedure is the reverse of the removal procedure.

Note:
After installing the lift cylinder, follow the steps below.
(1) Repeat full-stroke raising and lowering without load to bleed air and check normal functioning.
(2) Check the hydraulic oil level, and add if insufficient.
(3) Adjust the lift chain tension equally on the left and right sides.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the chain wheel supporter.

2 Remove the cylinder rod guide.

3 Remove the piston rod. **[Point 1]**

4 Remove the wear ring and U packing.

5 Remove the check valve

6 Remove the lift cylinder. **[Point 2]**

7 Remove the safety down valve.

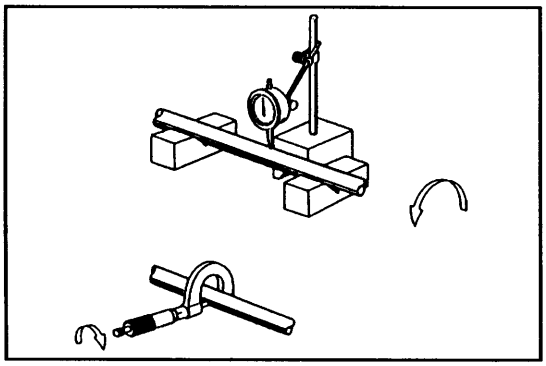
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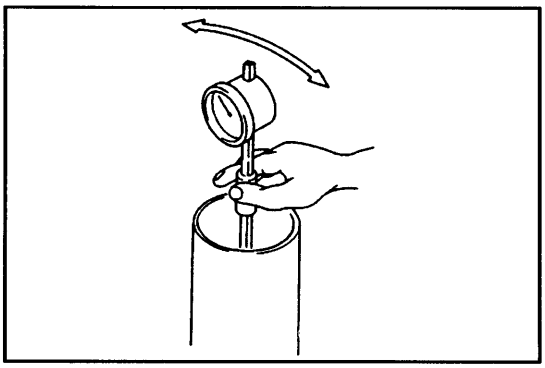
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring, and dust seal lip portion.**
- **Apply sealant (08833-00080) on the threaded portion of the rod guide before tightening.**
- **Fill the amount of hydraulic oil specified below into the cylinder from its top before installing the rod guide.**

Vehicle model	Filling amount cm^3 (in^3)
1 ton series (excluding 40-7FB15)	30 ~ 60 (1.83 ~ 3.66)
2 ton series, 40-7FB15	40 ~ 70 (2.44 ~ 4.27)
3 ton	45 ~ 75 (2.75 ~ 4.58)
J3.5 ton	55 ~ 85 (3.36 ~ 5.19)





Point Operations

[Point 1]
Inspection:
Measure the piston rod outside diameter.

Unit: mm (in)

	Standard	Limit
1 ton series (excluding 40-7FB15)	50 (1.97)	49.92 (1.9654)
2 ton series, 40-7FB15	50 (1.97)	49.92 (1.9654)
3 ton	60 (2.36)	59.91 (2.3587)
J3.5 ton	60 (2.36)	59.91 (2.3587)

Inspection:
Measure the bend of the piston rod.

Limit: 2.0 mm (0.079 in)

[Point 2]
Inspection:
Measure the lift cylinder bore.

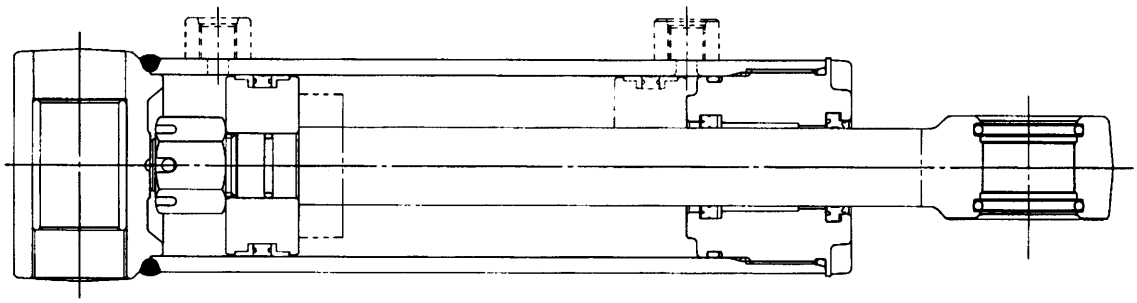
Unit: mm (in)

	Standard	Limit
1 ton series (excluding 40-7FB15)	70 (2.75)	70.35 (2.7697)
2 ton series, 40-7FB15	75 (2.95)	75.35 (2.9665)
3 ton	85 (3.35)	85.40 (3.3622)
J3.5 ton	90 (3.54)	90.40 (3.5591)

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TILT CYLINDER

GENERAL

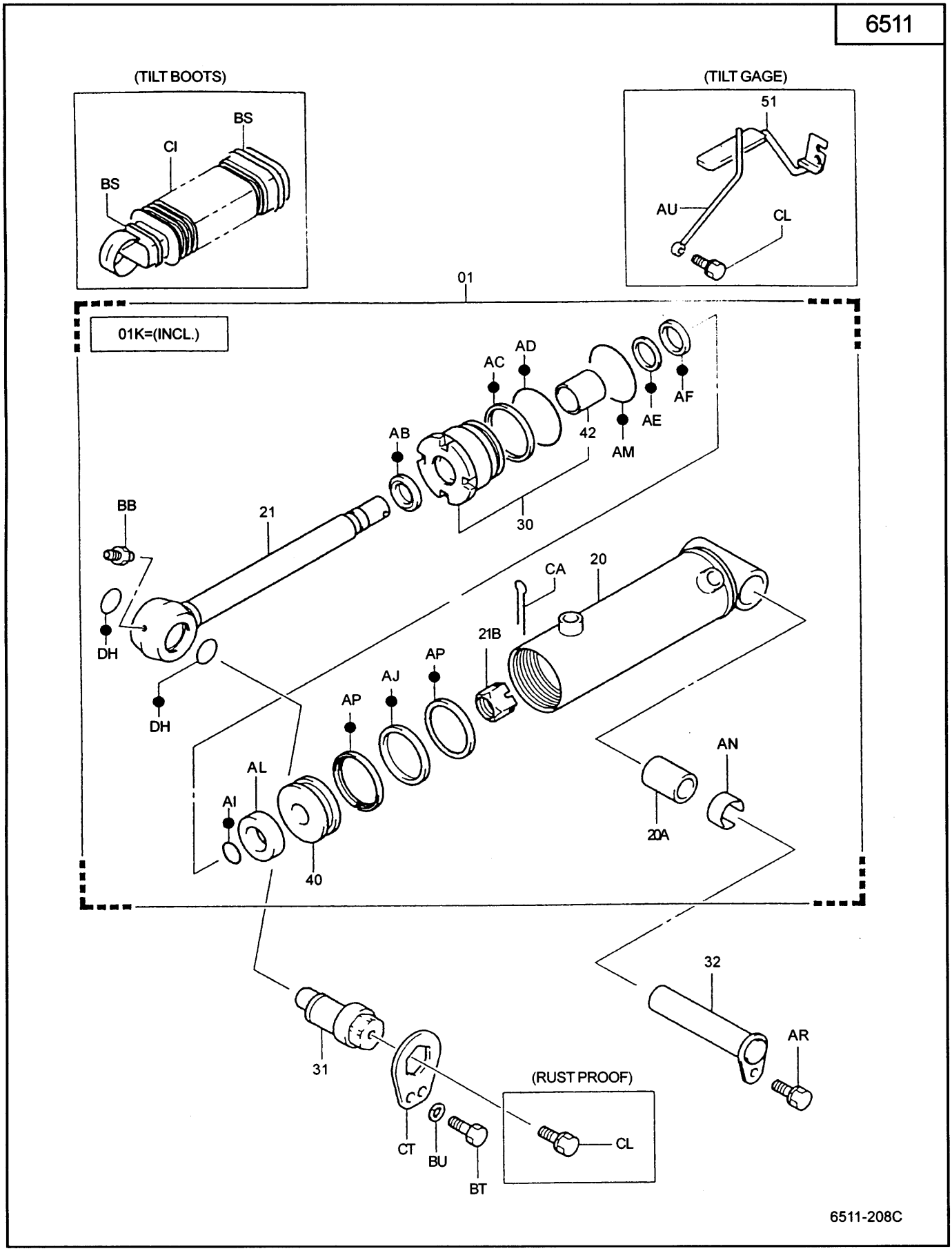


SPECIFICATIONS

Cylinder type		Double acting type
Cylinder bore	mm (in)	70 (2.76)
Piston rod outside diameter	mm (in)	30 (1.18)
Piston seal type		U packing
Rod seal type		U packing

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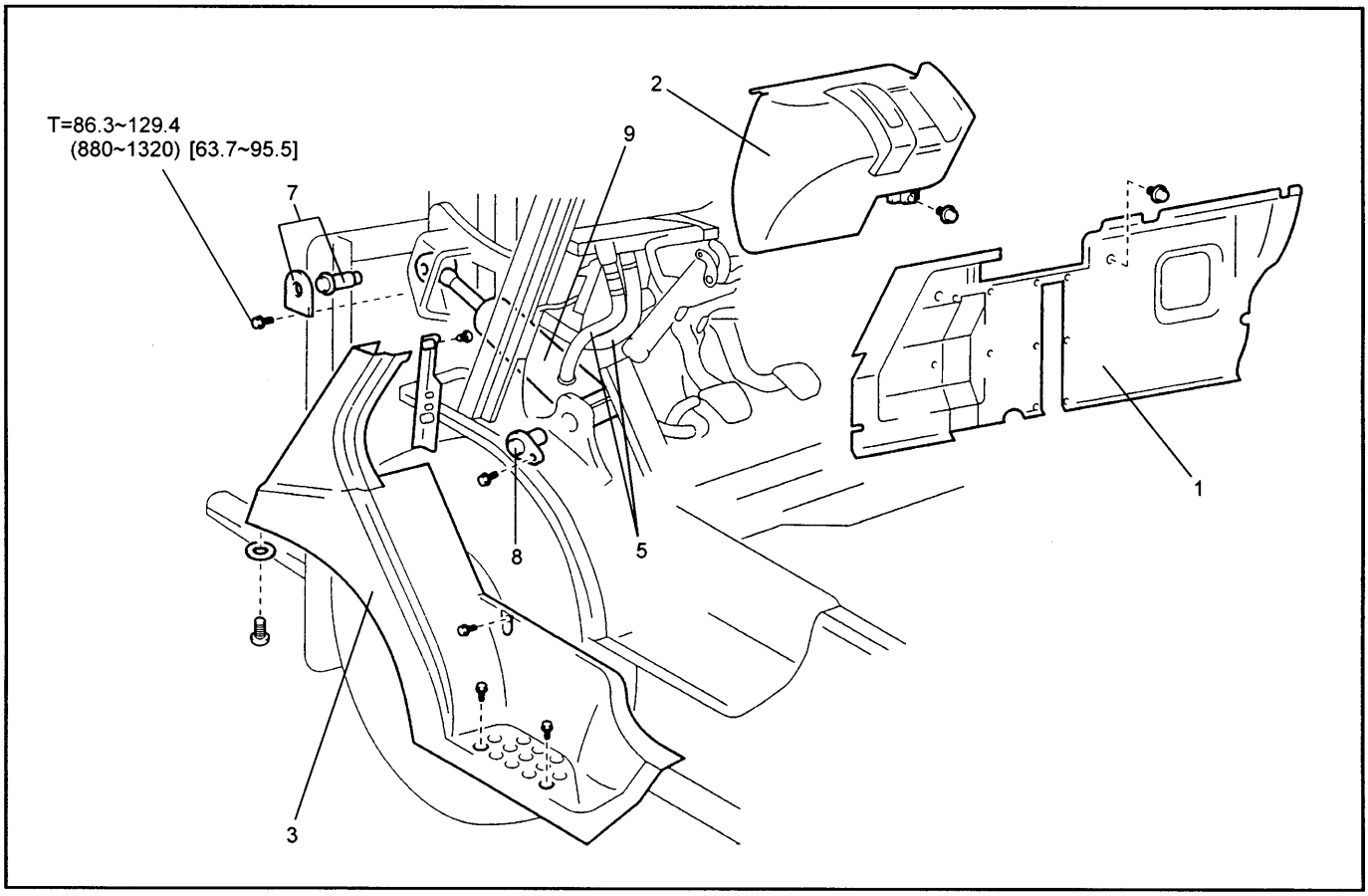
COMPONENTS



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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

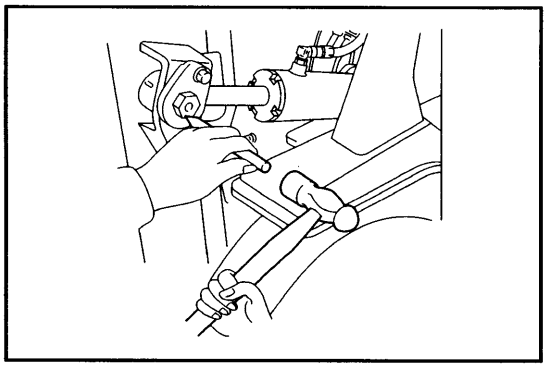
1 Remove the toe board and lower panel.
2 Remove the instrument panel.
3 Remove the fender cover and step.
4 Hoist the mast slightly.
5 Disconnect the hose (after releasing the residual pressure in the tilt cylinder by operating the tilt lever several strokes).
6 Disconnect the tilt angle sensor link (RH) (SAS spec.).
7 Remove the tilt cylinder front pin. **[Point 1]**
8 Remove the tilt cylinder rear pin.
9 Remove the tilt cylinder ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

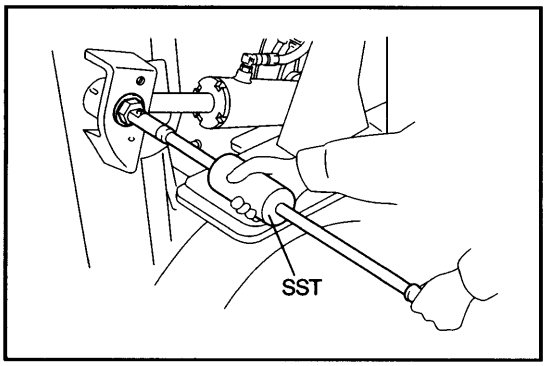
Note:
- **Apply MP grease on the portions for inserting tilt cylinder front and rear pins before installation.**
- **After installation, slowly tilt the mast forward and backward a few times to check normal functioning.**
- **Check the hydraulic oil level, and add if insufficient.**
- **After installation, perform SAS re-setting. (SAS spec.) (See section 18.)**

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Point Operations

[Point 1]
Removal:
Put a match mark to indicate relative positions of the stopper plate and tilt cylinder front pin.

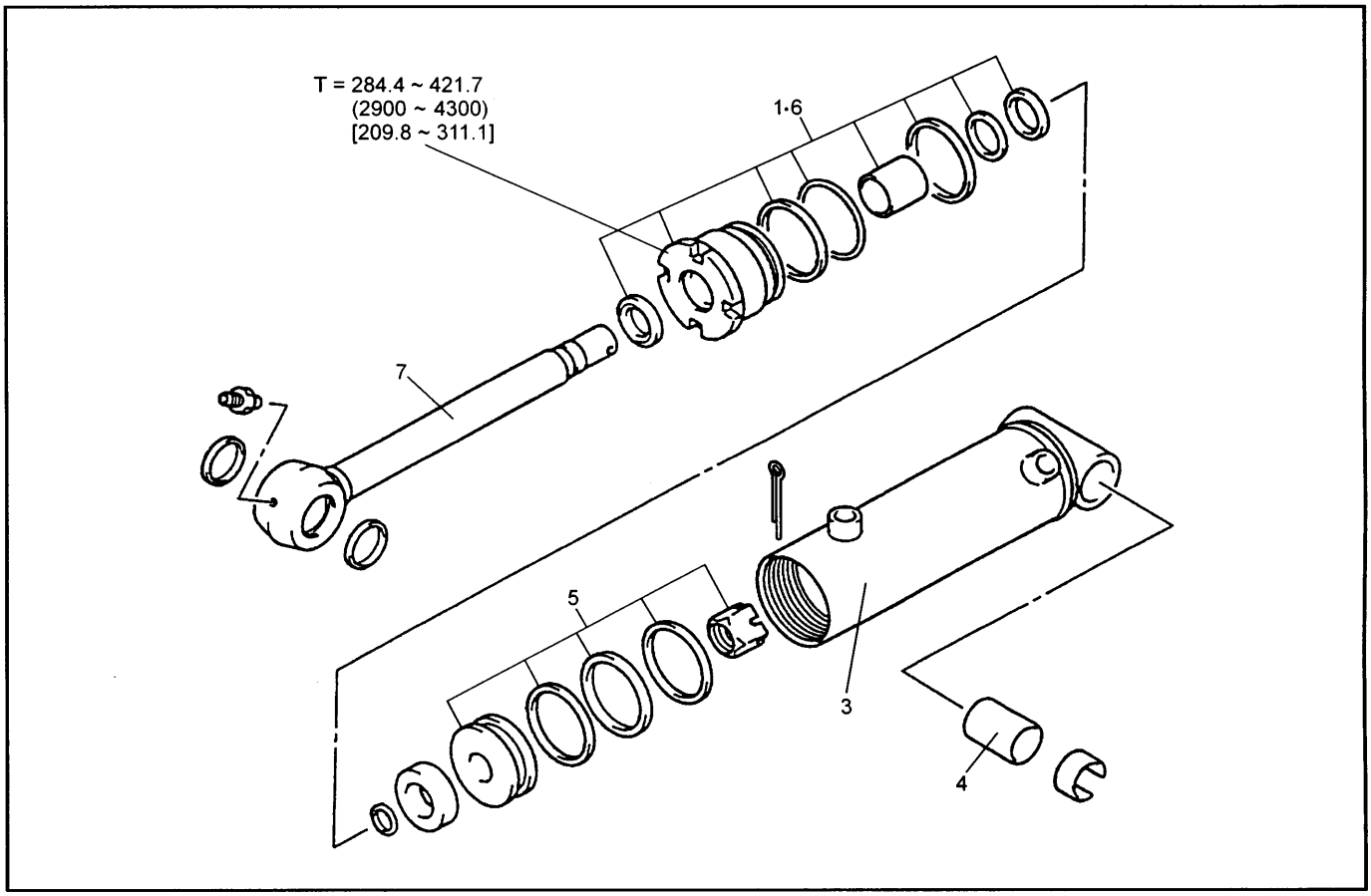


Removal:
SST 09810-20172-71

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Loosen the rod guide. **[Point 1]**

2 Extract the piston rod W/piston.

3 Remove the tilt cylinder. **[Point 2]**

4 Remove the bushing. **[Point 3]**

5 Remove the piston.

6 Remove the rod guide.

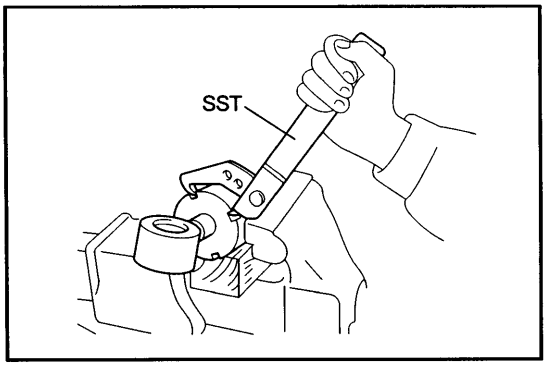
7 Remove the piston rod. **[Point 4]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

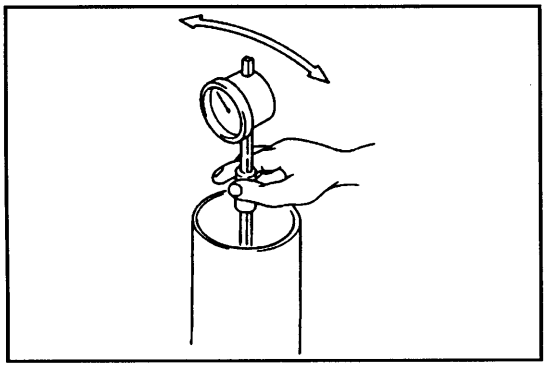
Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring,and dust seal lip portion.**
- **Apply sealant (08833-00080) on the threaded portion of the rod guide before reassembly.**

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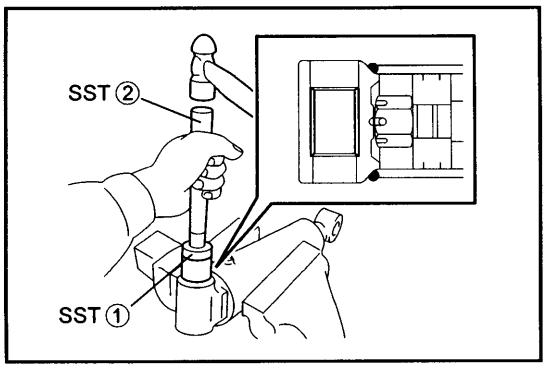
Point Operations

[Point 1]
Disassembly-Reassembly:
SST 09620-10100-71

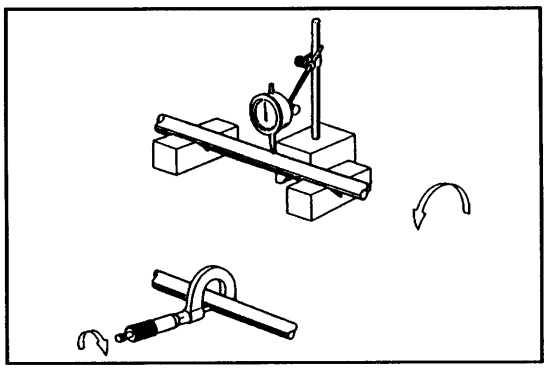


[Point 2]
Inspection:
Measure the cylinder bore.

Standard: 70.0 mm (2.756 in)
Limit: 70.35 mm (2.7697 in)



[Point 3]
Removal-Installation:
SST 09950-60010 --- ①
09950-70010 --- ②



[Point 4]
Inspection:
Measure the piston rod outside diameter.

Standard: 30.0 mm (1.181 in)
Limit: 29.92 mm (1.1780 in)

Inspection:
Measure the bend of the piston rod.

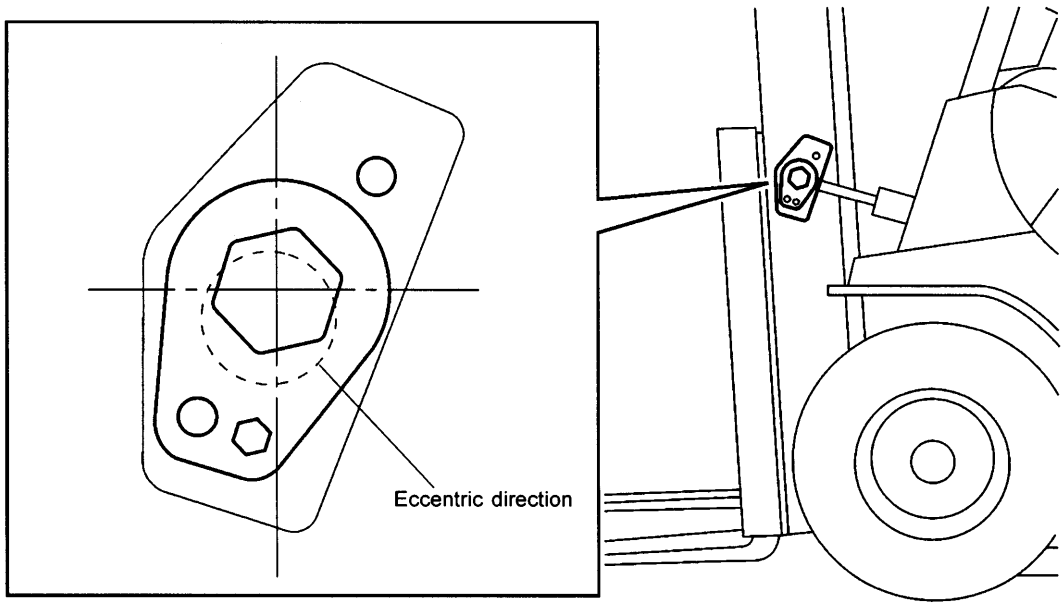
Limit: 1.0 mm (0.039 in)

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MAST FORWARD BACKWARD TILTING ANGLE ADJUSTMENT (PREVENTION OF UNEVEN TILTING)

Note:
Adjust the mast forward and backward tilting angles (to prevent uneven tilting) when the tilt cylinder and mast ASSY are replaced or overhauled.
After adjustment, perform SAS re-setting. (SAS spec.) (See section 18.)

1. With the mast in the neutral position, install the stopper with the tilt cylinder pin eccentric direction on the lower side.



Note:
The front pin eccentric direction is not in fixed relative position to the flat sides of the hexagonal head.

2. Inspect the forward and backward tilting angles and unevenness in tilting at the pin position above.

   Standard:
   Mast forward tilting angle: Standard set angle -0.6° ~ +1.6°
   Mast backward tilting angle: Standard set angle -0.8° ~ +0.6°
   Unevenness: 1 mm (0.04 in) or less

3. If the standard is not satisfied, make adjustment by changing the combination among eight types (two tapped holes in the mast side tilt bracket, two holes in pin fixing plate and front and rear sides of the plate). (The joint center axis is shifted by ± 5 mm (0.20 in) when the eccentric pin is rotated.)
4. After the adjustment, tighten the stopper set bolt to lock the front pin.

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OIL PUMP

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DISASSEMBLY·INSPECTION·REASSEMBLY (3 AND J3.5 TON) 16-8

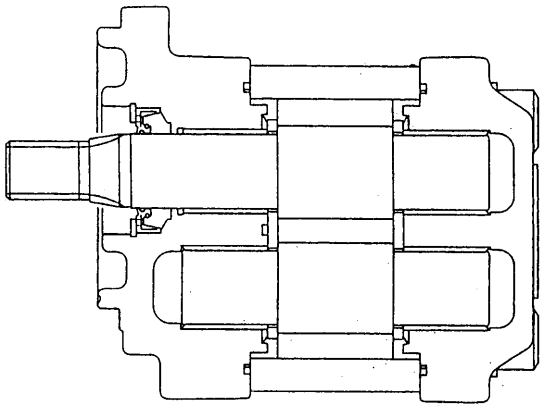
TEST METHOD 16-11

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GENERAL

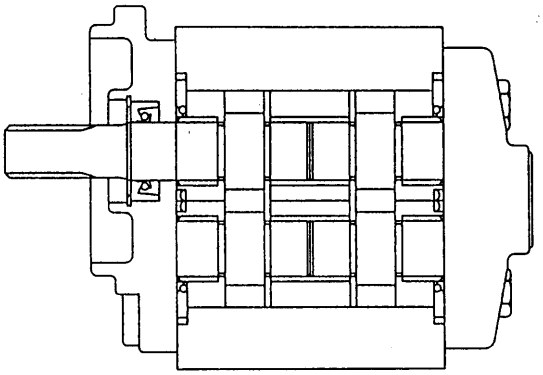
Single Gear Pump (Shimadzu)

1 and 2 ton series



Double Gear Pump (Kayaba)

3 and J3.5 ton



SPECIFICATIONS

Vehicle type		1 and 2 ton series	3 and J3.5 ton
Oil pump name		Single gear pump	Double gear pump
Oil pump type	STD	TMG1 A27L850 (Shimadzu)	DGP4-30ASCBD (Kayaba)
	Refrigerator	TMC1 A27L851 (↑)	DGP4-30ASCBB (Kayaba)
Drive system		Direct motor drive	←
Discharge (pump at 1,500 rpm) ℓ (US gal)/min		41.5 (10.96)	43.2 (11.40)
Theoretical discharge cm³ (in³)/rev		28.8 (1.757)	30.0 (1.831)

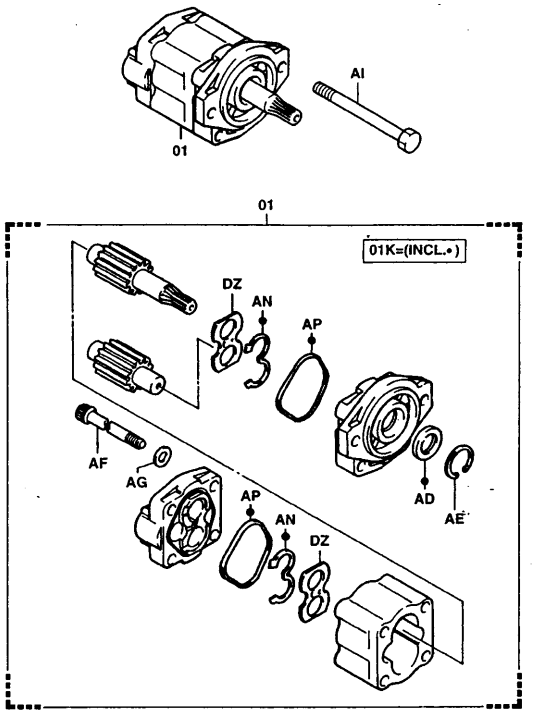
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COMPONENTS

Single Gear Pump (Shimadzu)

1 and 2 ton series

6701

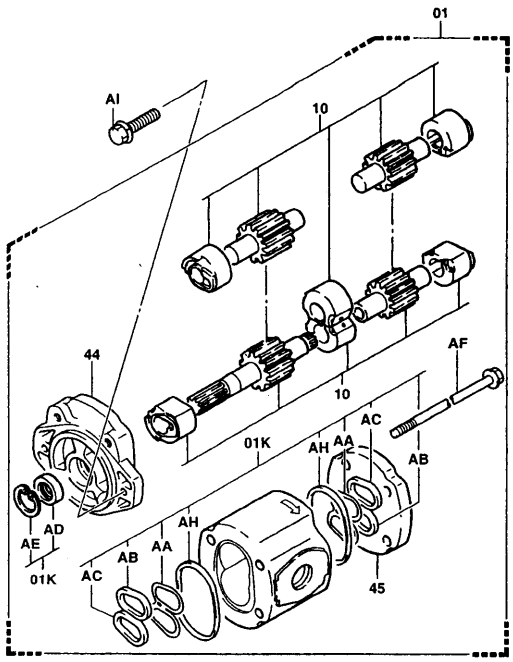


6701-178A

Double Gear Pump (Kayaba)

3 and J3.5 ton

6701

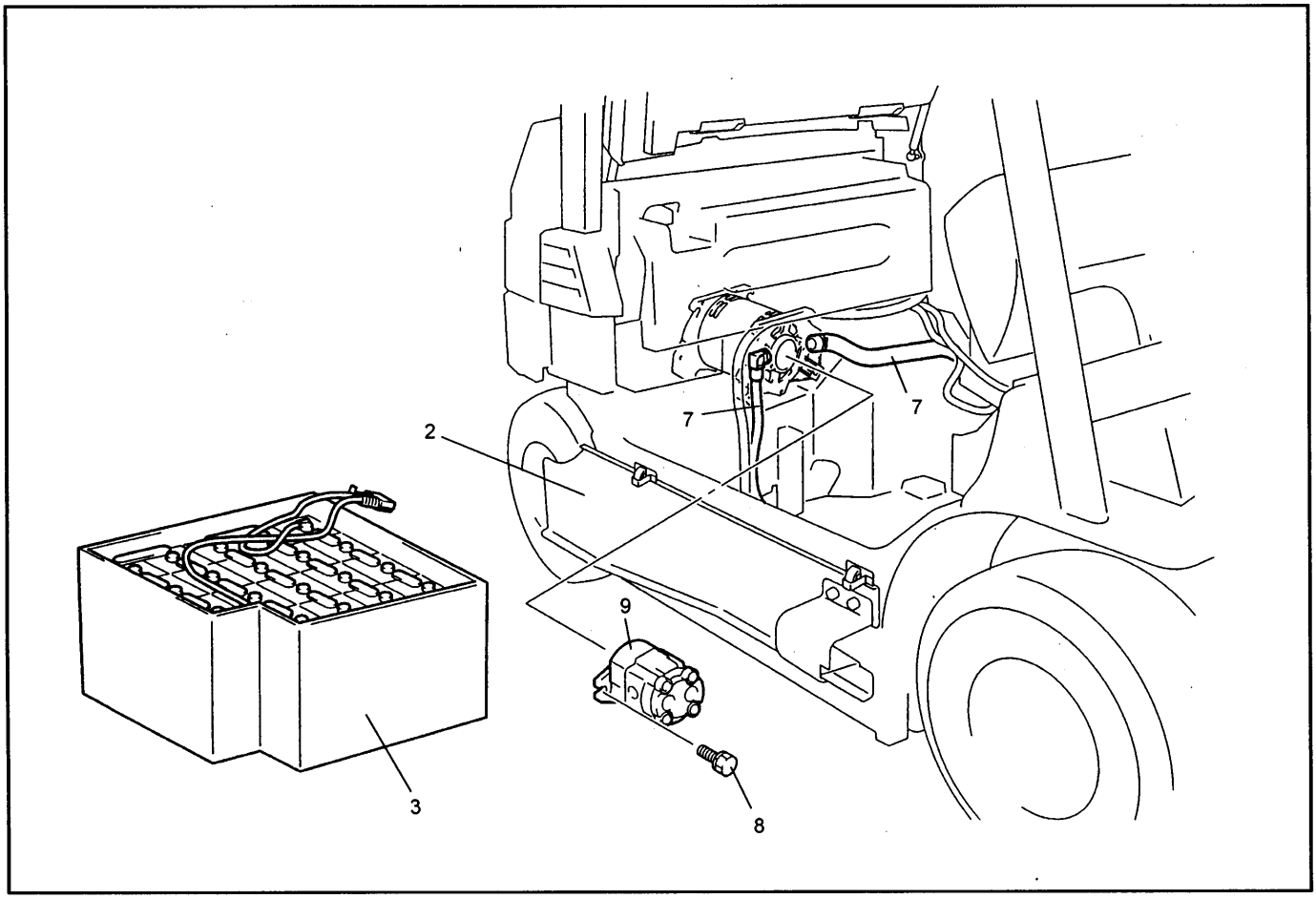


6701-177

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OIL PUMP ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.
2 Open the side hood RH.
3 Remove the battery ASSY.
4 Remove the side hood LH and louver LH.
5 Remove the seat stand lock bracket.
6 Remove the battery guard rear.
7 Disconnect the inlet and outlet hoses.
8 Remove the oil pump set bolts.
9 Remove the oil pump ASSY.

Installation Procedure

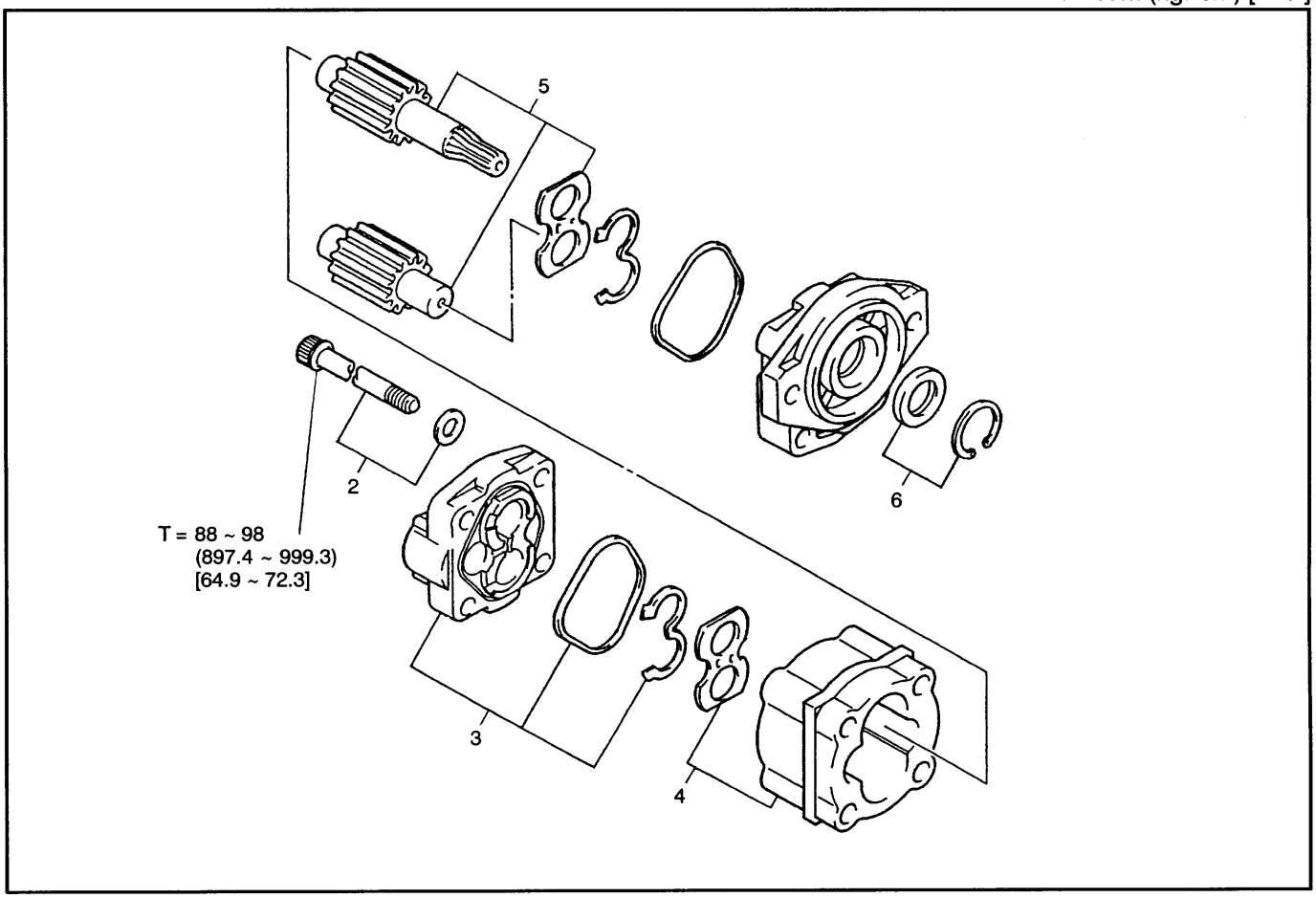
The installation procedure is the reverse of the removal procedure.

Note:
- **Apply grease on the spline portion of the pump before installation.**
- **Clean the fitting-mounting surface so as not to damage the O-ring.**

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DISASSEMBLY· INSPECTION·REASSEMBLY (1 AND 2 TON SERIES)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Put match marks between the front cover and body and between the rear cover and body. **[Point 1]**

2 Place the front cover to face downward, and remove the bolts (4 pcs.).

3 Remove the rear cover ASSY (rear cover, bushing, gasket and figure 3 gasket). **[Point 2]**

4 Remove the body and side plate. **[Point 3]**

5 Remove the drive gear, driven gear and side plate. **[Point 4]**

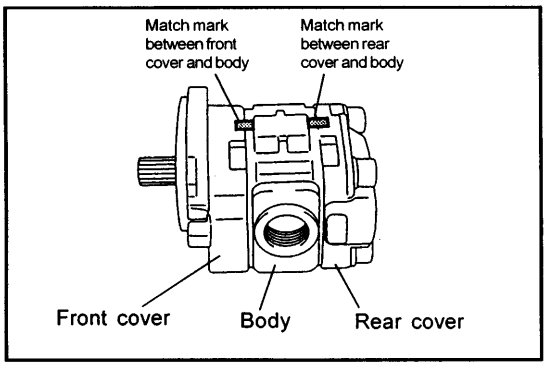
6 Remove the oil seal. **[Point 5]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Wash each part, blow compressed air and apply hydraulic oil before installation.**
- **Always use new seals for reassembly.**

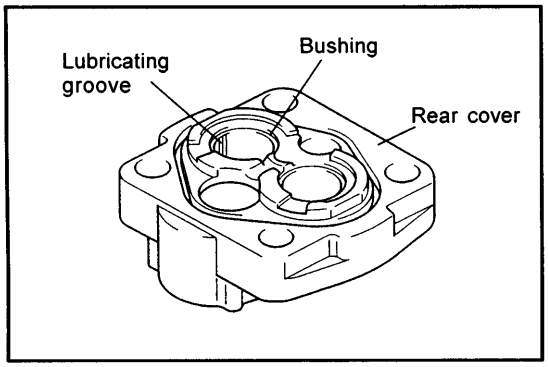
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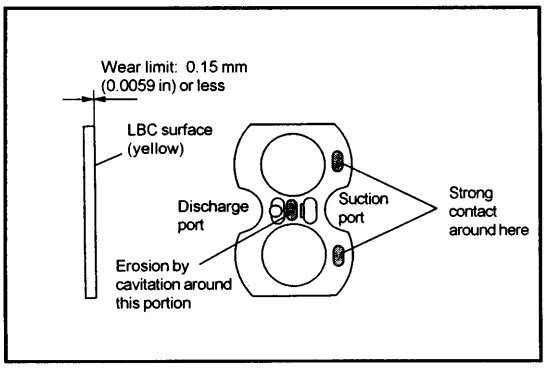
Point Operations

[Point 1]
Disassembly:
Put match marks between the front cover and body and between the rear cover and body.

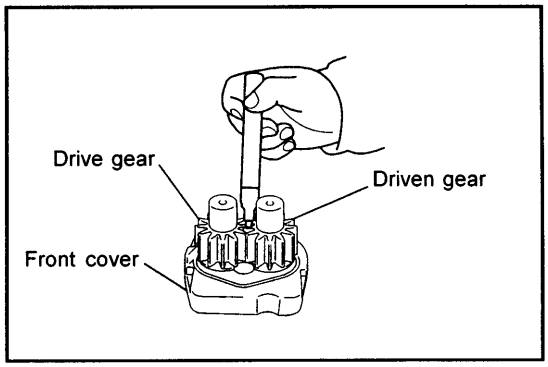
Reassembly:
Align match marks when reassembling.



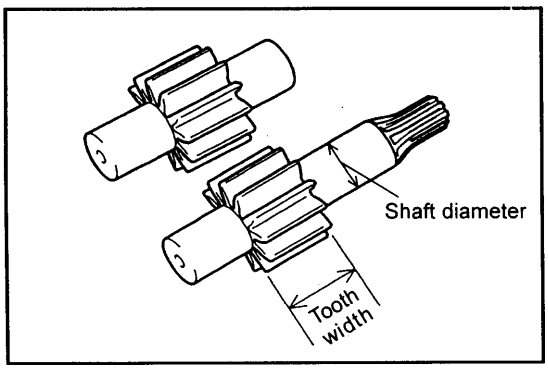
[Point 2]
Inspection:
The bushing inner surface shall not be roughened and shall not be worn to make the metal on the rear side visible.



[Point 3]
Inspection:
The side plate surface (LBC surface) in contact with gears shall not be worn beyond the limit shown at left.



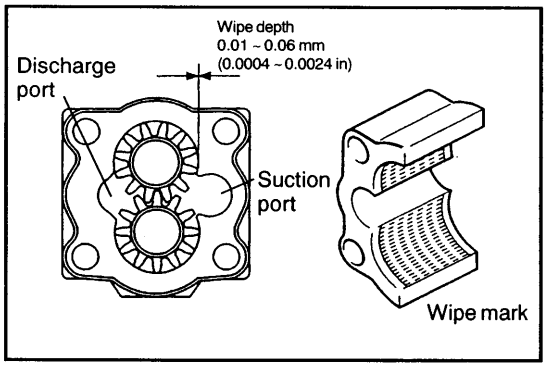
[Point 4]
Disassembly:
Put a match mark on tooth flanks of the drive and driven gears.
Reassembly:
Align match marks when reassembling.



[Point 4]
Inspection:
Check the gear side surface for no wear and the tooth flanks for no roughening.

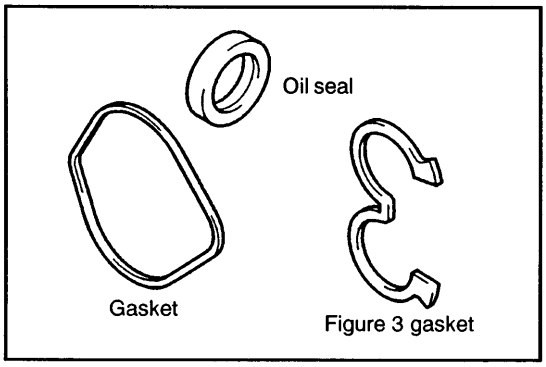
Shaft diameter wear limit: 21.997 mm (0.86602 in)
Face width wear limit: 33.3 mm (1.311 in)

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[Point 3]
Inspection:
Inspect the body inner surface for the wipe mark.

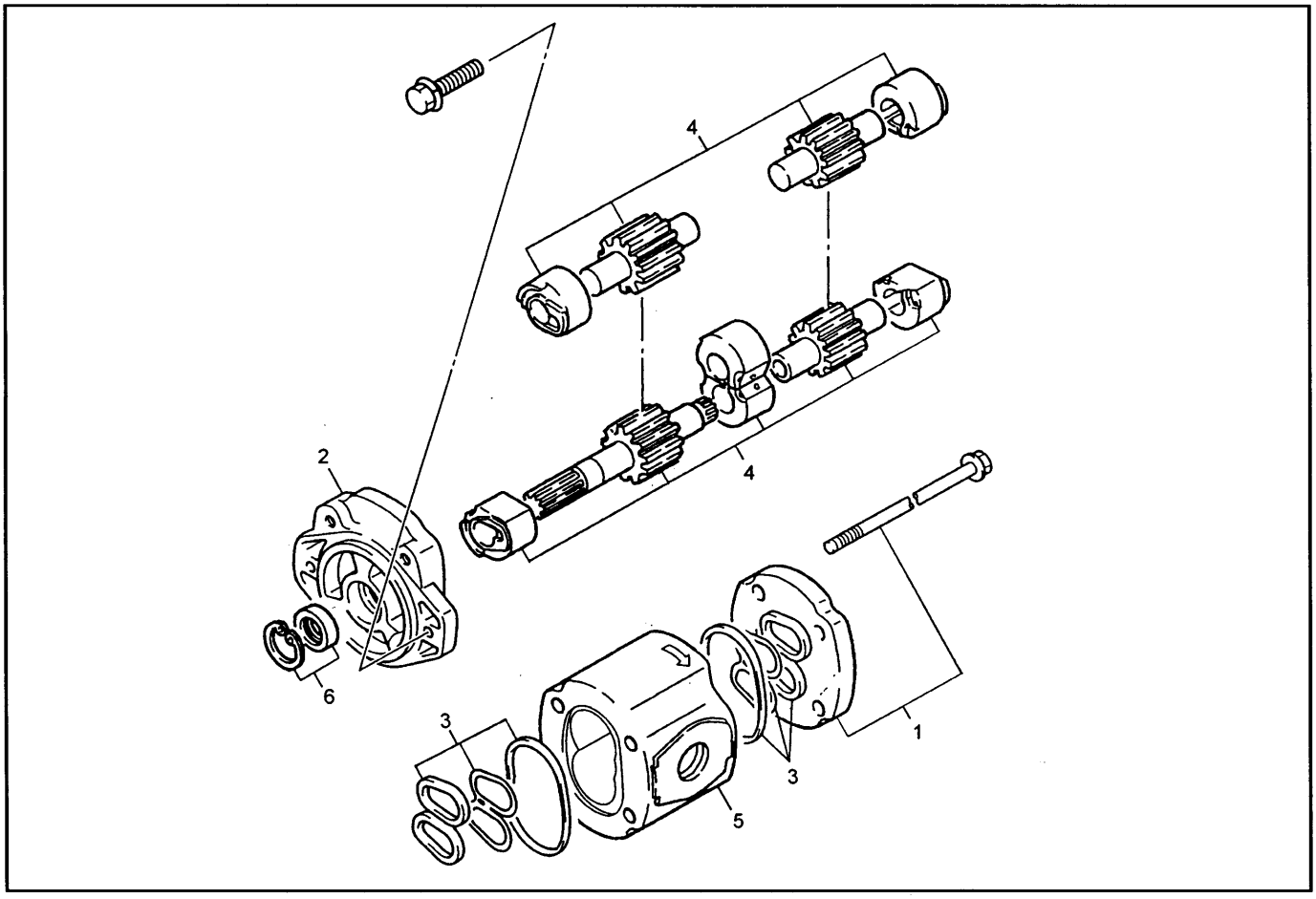
Normal wipe depth: 0.01 ~ 0.06 mm (0.0004 ~ 0.0024 in)



[Point 5]
Inspection:
1) No wear (to make edge rounded portion invisible) or no damage shall exist at oil seal lip.
2) The figure 3 gasket shall not be damaged.
3) The outward leak-preventing gasket shall not be damaged.
4) Seals shall not be swelled.

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DISASSEMBLY· INSPECTION·REASSEMBLY (3 AND J3.5 TON)



Disassembly Procedure

1 Remove the cover. **[Point 1]**

2 Remove the mounting flange. **[Point 2]**

3 Remove the backing, bushing seal and body seal.

4 Remove the gear and bushing set. **[Point 3]**

5 Remove the body. **[Point 4]**

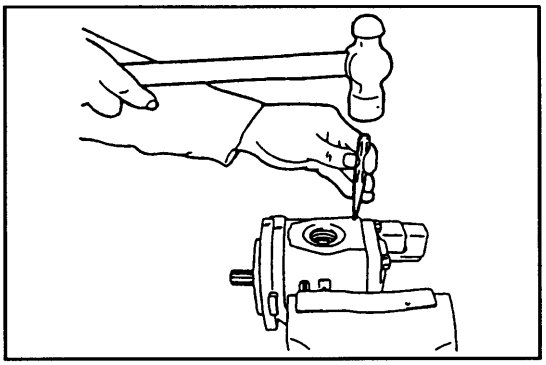
6 Remove the oil seal.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part, blow compressed air and apply hydraulic oil before installation.**
- **Always use new backing and seals for reassembly.**

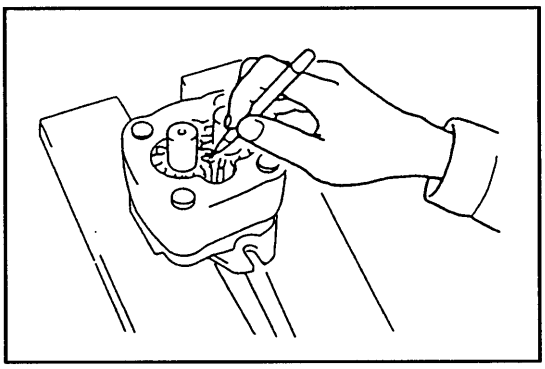
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Point Operations

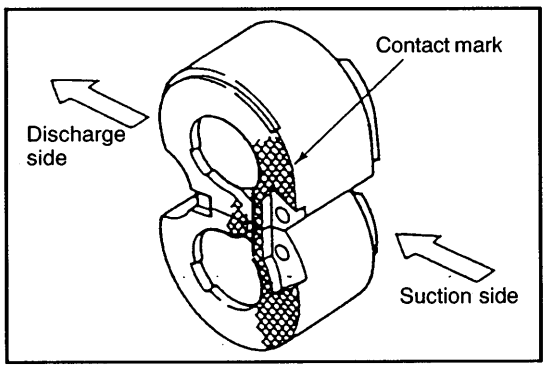
[Point 1]
Disassembly:
Put match marks between the cover and body and between the mounting flange and body.

Reassembly:
Align match marks when reassembling.



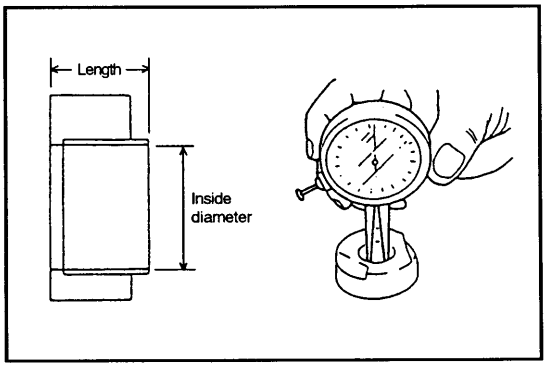
[Point 2]
Reassembly:
Put a match mark on tooth flanks of the drive and driven gears.

Reassembly:
Align match marks when reassembling.



[Point 3]
Inspection:
Inspect the side bushing contact.

Contact mark on bore sliding contact surface
Normal: Stronger on the suction side and slight on the discharge side.

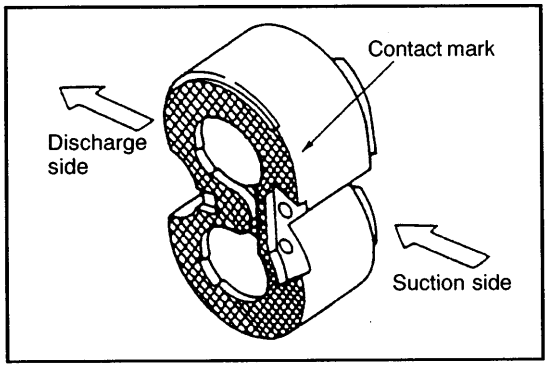


Inspection:
Measure the side bushing bore.

Limit: 19.123 mm (0.75287 in)

Inspection
Measure the side bushing axial length.

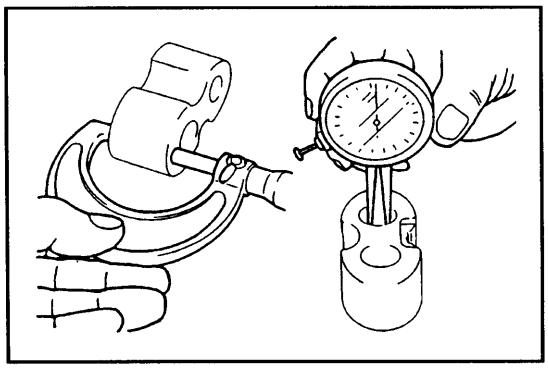
Limit: 14.77 mm (0.5815 in)



Inspection:
Inspect the center bushing contact.

Contact mark on bore sliding contact surface
Normal: Glossy in about half on the suction
Side surface contact
Normal: Contact mark in the whole area

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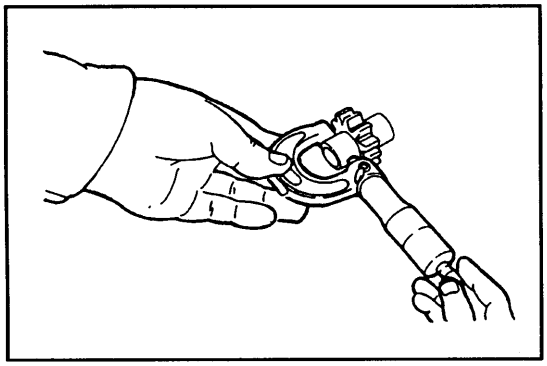


Inspection:
Measure the center bushing bore.

Limit: 19.123 mm (0.75287 in)

Inspection
Measure the side bushing axial length.

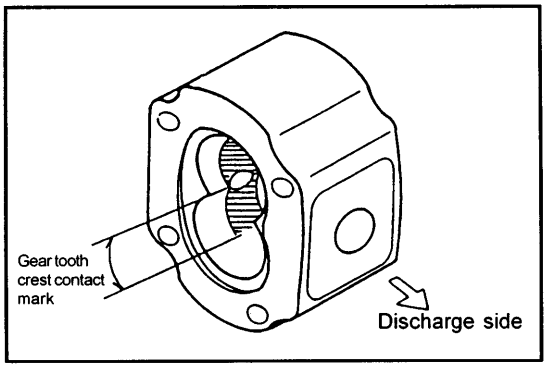
Limit: 29.67 mm (1.1681 in)



Inspection:
Measure the gear shaft outside diameter.

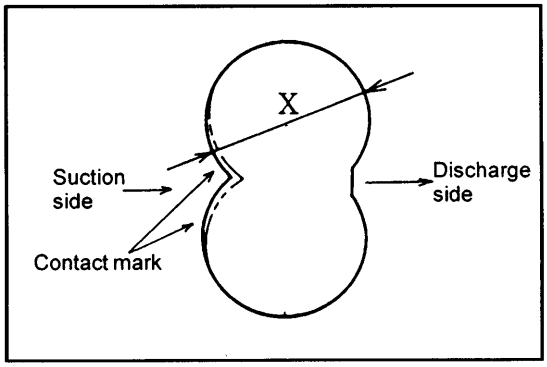
Limit: 18.935 mm (0.74547 in)

If the measured value is not within the limit, replace the gear and bushing as a set.



[Point 4]
Inspection:
Inspect the body inner surface on the suction side for the contact mark.

Limit: The contact mark is more than half of the whole circumference.



Inspection
Measure the body inside diameter (dimension X in the illustration).

Limit: 39.180 mm (1.54252 in)

Inspection:
If the body inner surface is damaged, measure the depth of the flaw.

Flaw depth limit: 0.1 mm (0.004 in)

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TEST METHOD

Note:
Though a bench test should be conducted for strict testing, it is generally impossible in practical service operation. Install the oil pump on the actual vehicle and judge the oil pump discharge performance by means of the cylinder operation.

- **Check if the battery charge is sufficient by observing the battery charge indicators.**
- **Check if the oil control valve set relief pressure is as specified. (See page 17-11.)**
- **Measure the lift cylinder full stroke operation time when the hydraulic oil temperature is 50 ~ 55°C (122 ~ 131°F), and calculate the lifting speed.**
- **Because of the soft start by the material handling chopper circuit, the lifting speed is 10 to 20 mm/sec (2.0 to 3.9 fpm) lower than the value obtained from the table below. The lifting speed can be calculated more accurately when measuring the full stroke operation time excluding the soft start period.**

If any defect is found in the inspection above, disassemble and inspect the oil pump again.

Lifting Speed Table

Vehicle model	Mode	V•SV		FSV•FV	
		Lifting speed mm/s (fpm)		Lifting speed mm/s (fpm)	
		No-load	Loaded	No-load	Loaded
7FB10 7FBH10	H	650 (128)	470 (93)	590 (116)	430 (85)
	P	560 (110)	360 (71)	510 (100)	330 (65)
	S	560 (110)	360 (71)	510 (100)	330 (65)
7FB14 7FBH14	H	650 (128)	430 (85)	590 (116)	400 (79)
	P	560 (110)	330 (65)	510 (100)	310 (61)
	S	560 (110)	330 (65)	510 (100)	310 (61)
7FB15 7FBH15	H	650 (128)	420 (83)	590 (116)	390 (77)
	P	560 (110)	320 (63)	510 (100)	300 (59)
	S	560 (110)	320 (63)	510 (100)	300 (59)
7FB18 7FBH18	H	650 (128)	370 (73)	590 (116)	340 (67)
	P	560 (110)	300 (59)	510 (100)	280 (55)
	S	560 (110)	300 (59)	510 (100)	280 (55)
40-7FB15	H	600 (118)	380 (75)	500 (98)	350 (69)
	P	500 (98)	280 (55)	420 (83)	260 (51)
	S	500 (98)	280 (55)	420 (83)	260 (51)
7FB20 7FBH20 40-7FB20	H	600 (118)	360 (71)	500 (98)	330 (65)
	P	500 (98)	270 (53)	420 (83)	250 (49)
	S	500 (98)	270 (53)	420 (83)	250 (49)
7FB25 7FBH25 40-7FB25	H	600 (118)	340 (67)	500 (98)	320 (63)
	P	500 (98)	260 (51)	420 (83)	240 (47)
	S	500 (98)	260 (51)	420 (83)	240 (47)
7FB30	H	550 (108)	320 (63)	460 (91)	280 (55)
	P	410 (81)	230 (45)	340 (67)	200 (39)
	S	410 (81)	230 (45)	340 (67)	200 (39)
7FBJ35	H	460 (91)	270 (53)	380 (75)	230 (45)
	P	340 (67)	190 (37)	280 (55)	160 (31)
	S	340 (67)	190 (37)	280 (55)	160 (31)

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OIL CONTROL VALVE

Page

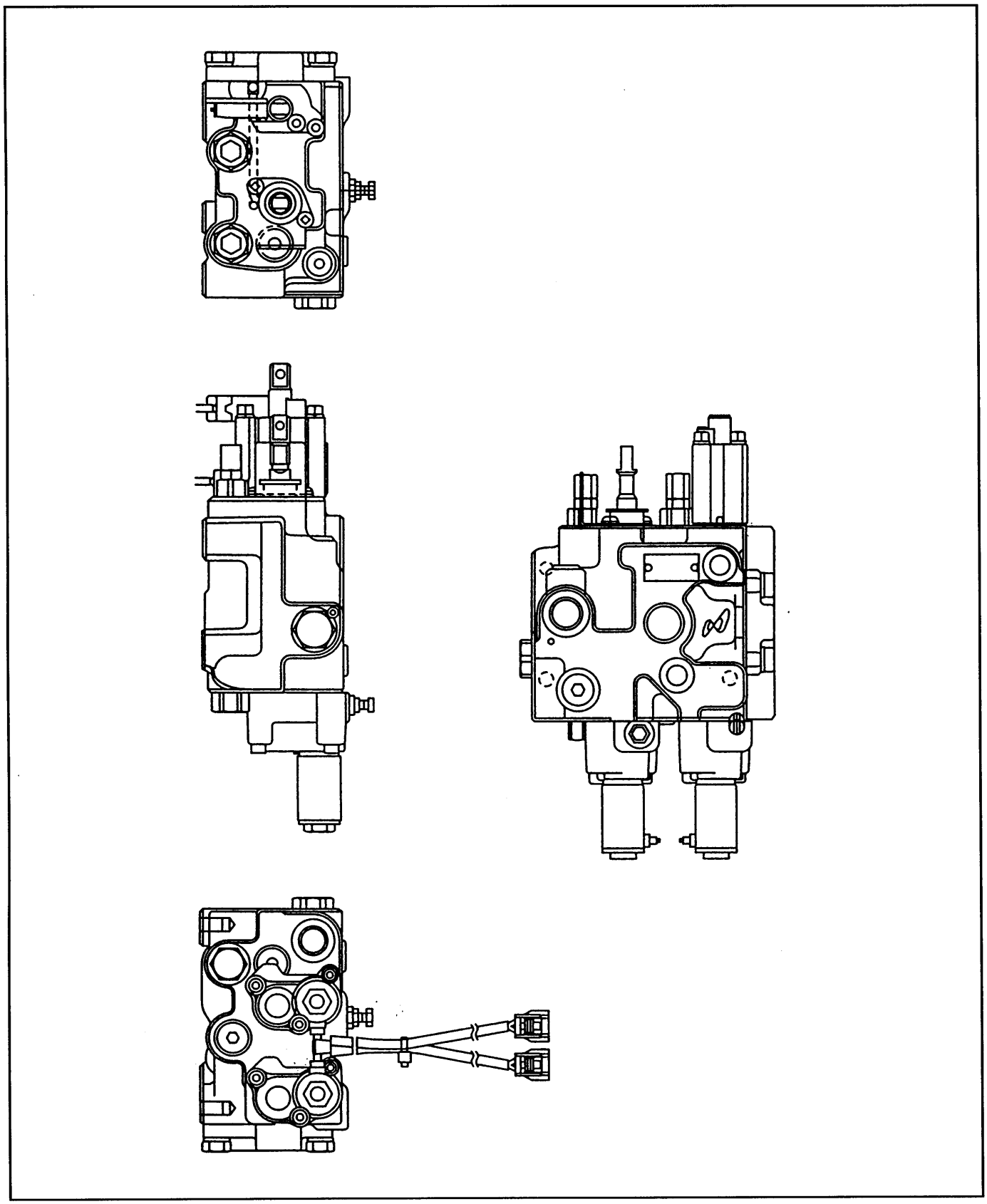
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VEHICLE W/SAS

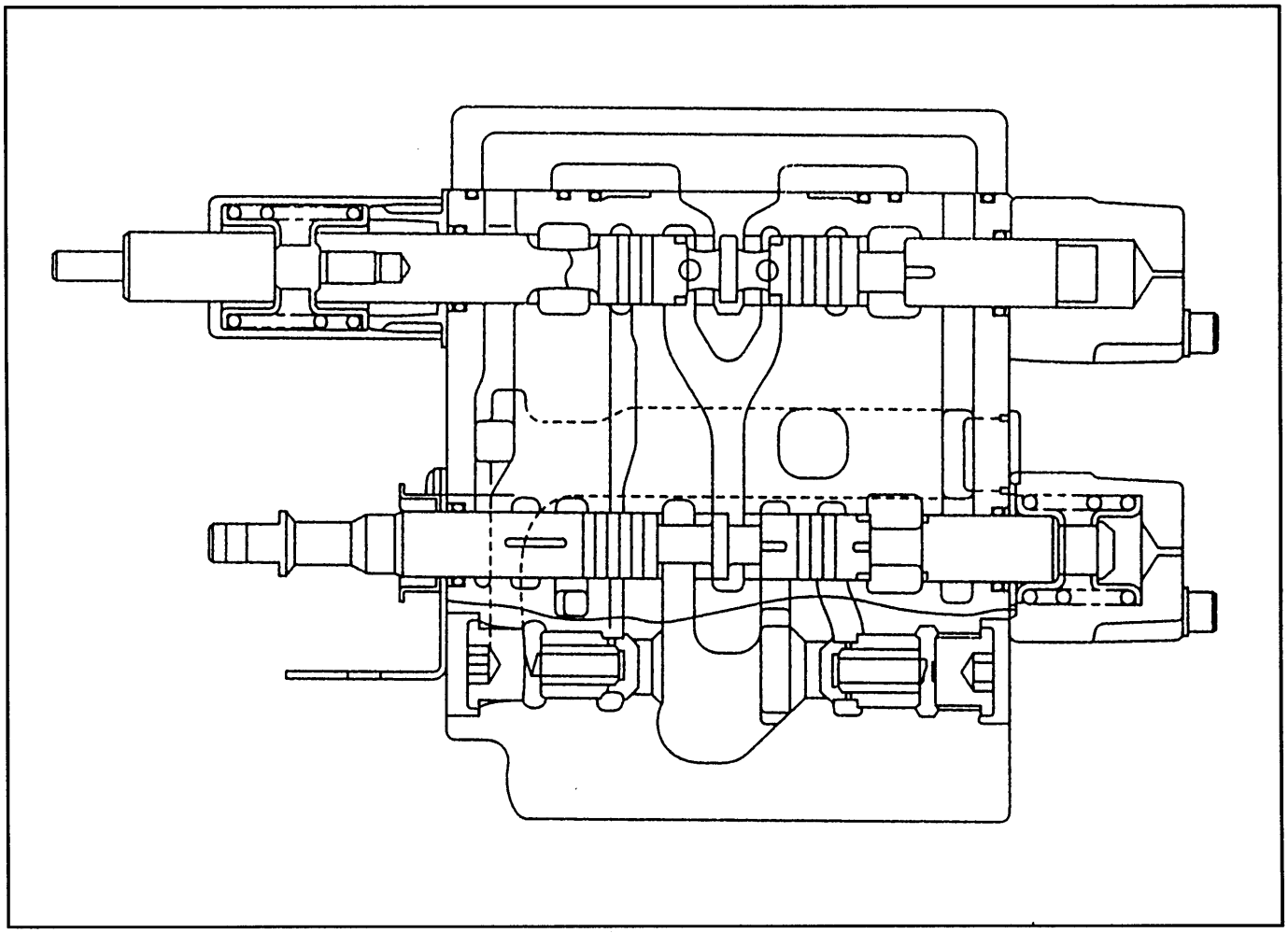
GENERAL

Oil Control Valve

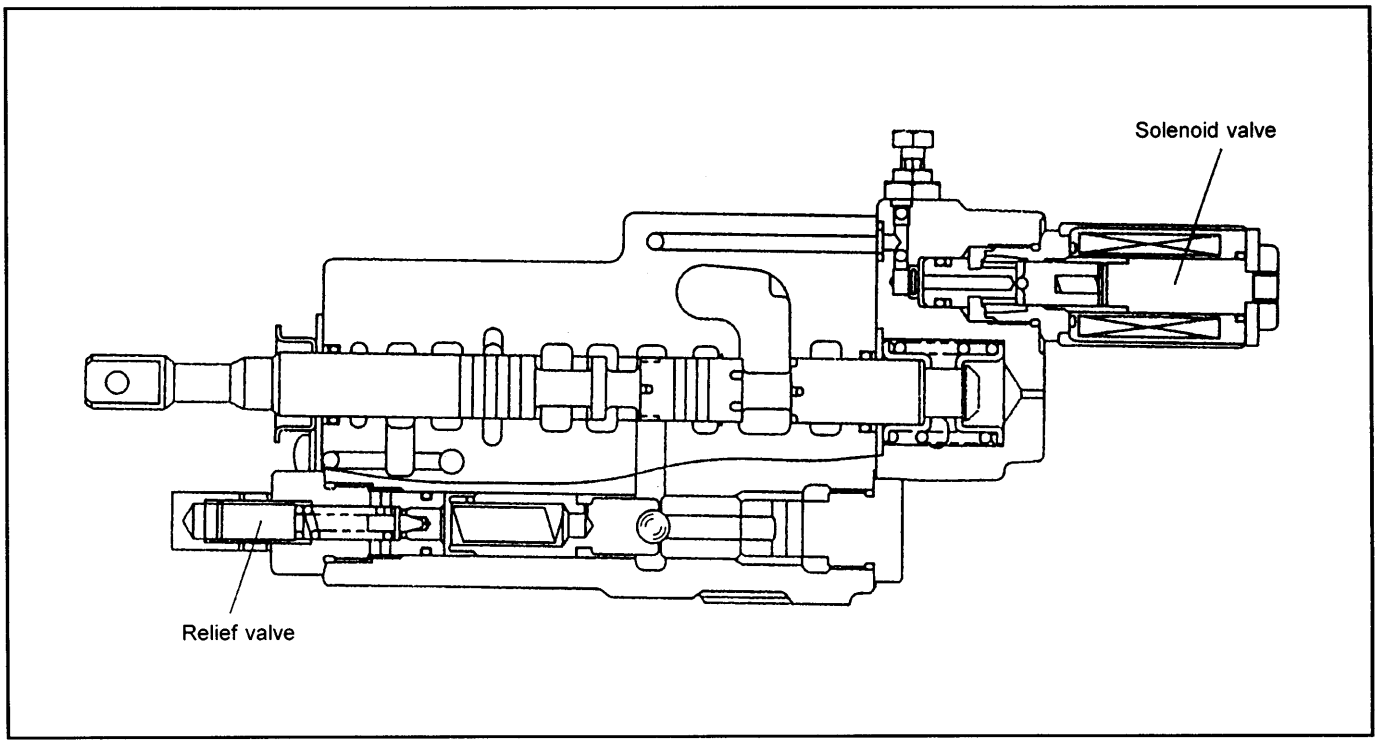


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Control Valve Section

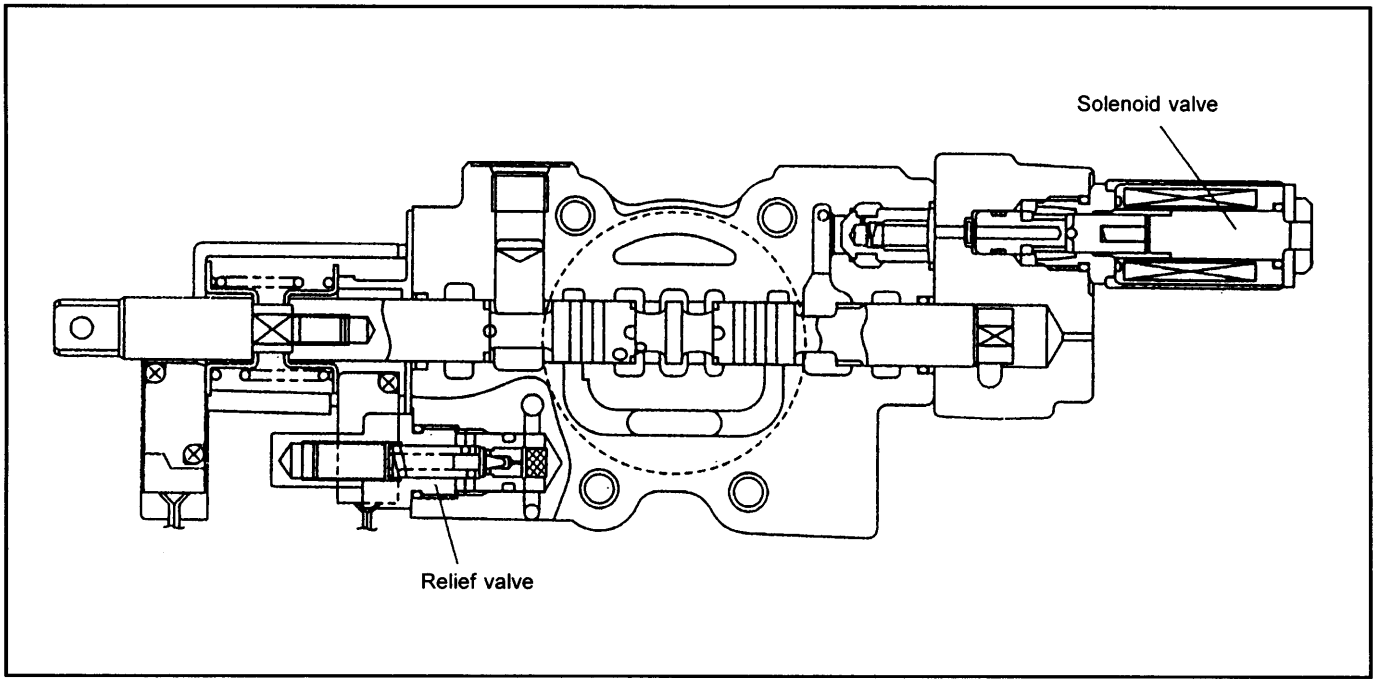


Lift Block Section

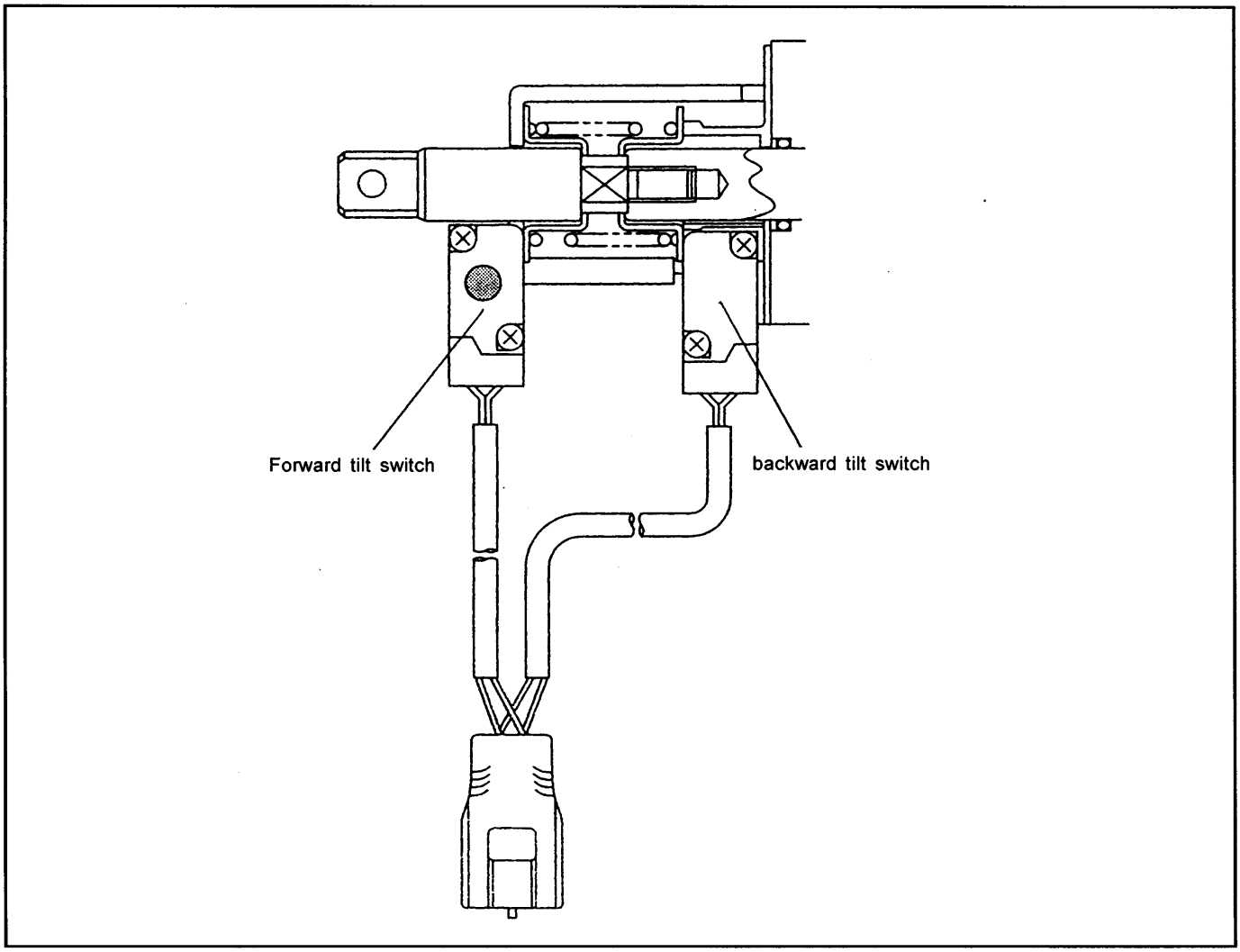


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Tilt Block Section

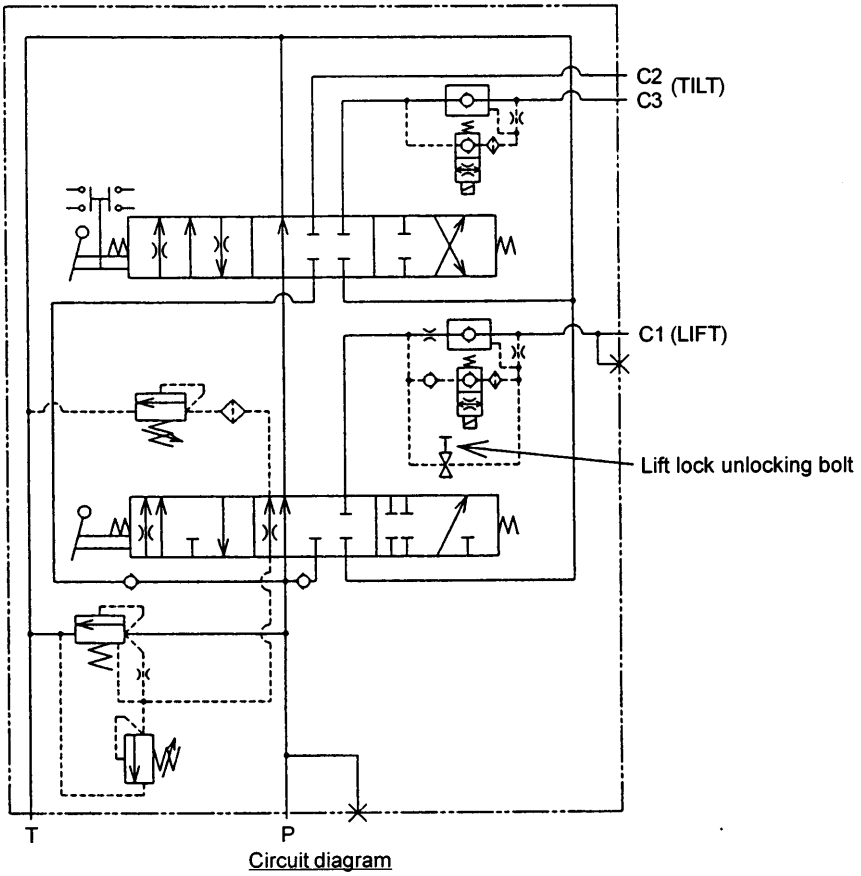


Tilt Limit Switch Portion



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Hydraulic Circuit Diagram

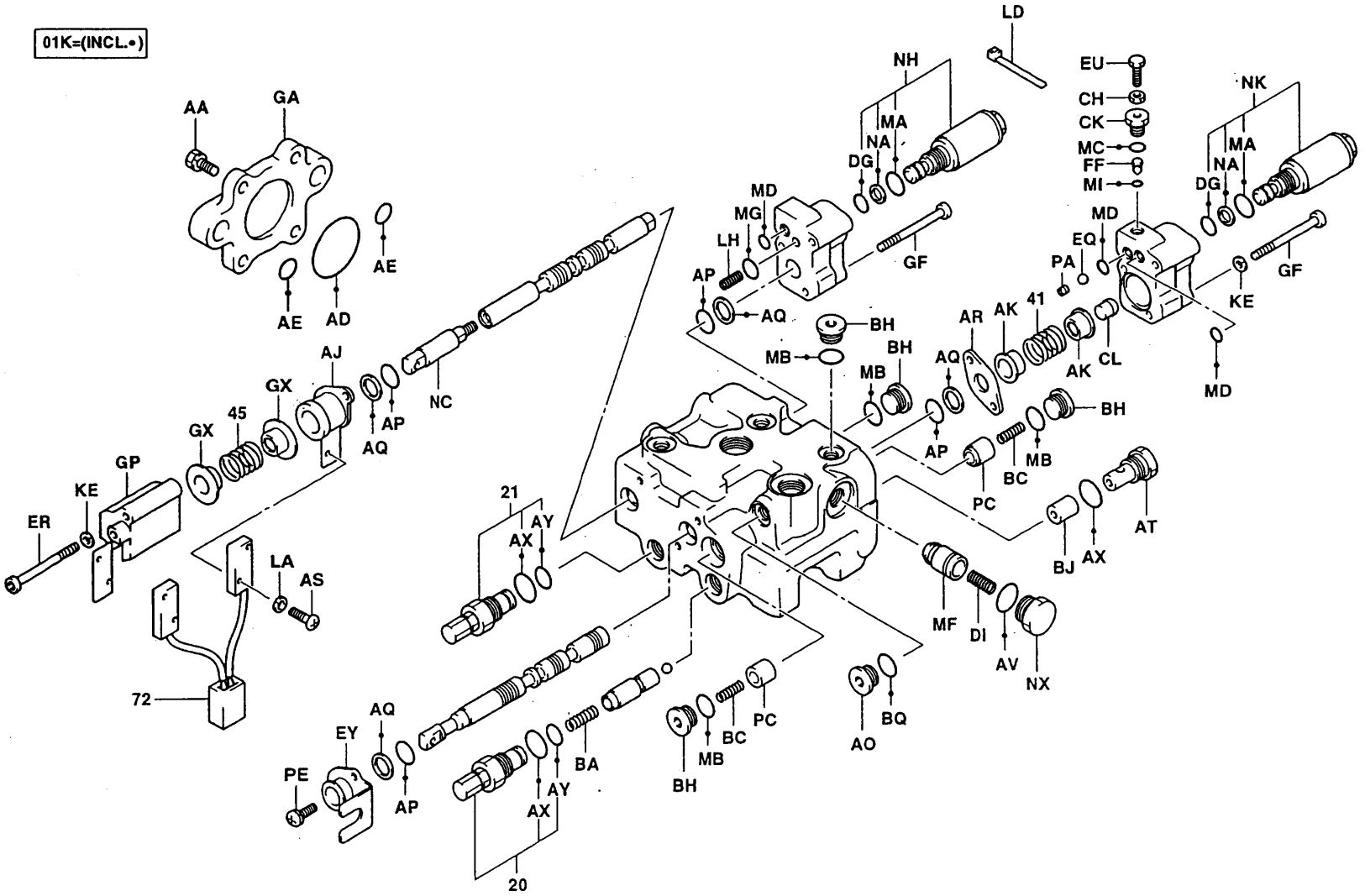


Circuit diagram

SPECIFICATIONS

Item \ Vehicle model		1.0 ton	1.35 to 1.75 ton	2 ton series	3 and J3.5 ton
Type		Add-on type (1·2spool monoblock)			
Relief pressure kPa (kgf/cm²) [psi]	Lift	12700 (130) [1840]	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
	Tilt	11800 (120) [1710]	←	14700 (150) [2130]	15700 (160) [2280]
Spool outside diameter	mm	16.0			
Stroke	mm	7.0			
Other		Built-in lift and tilt lock valves			

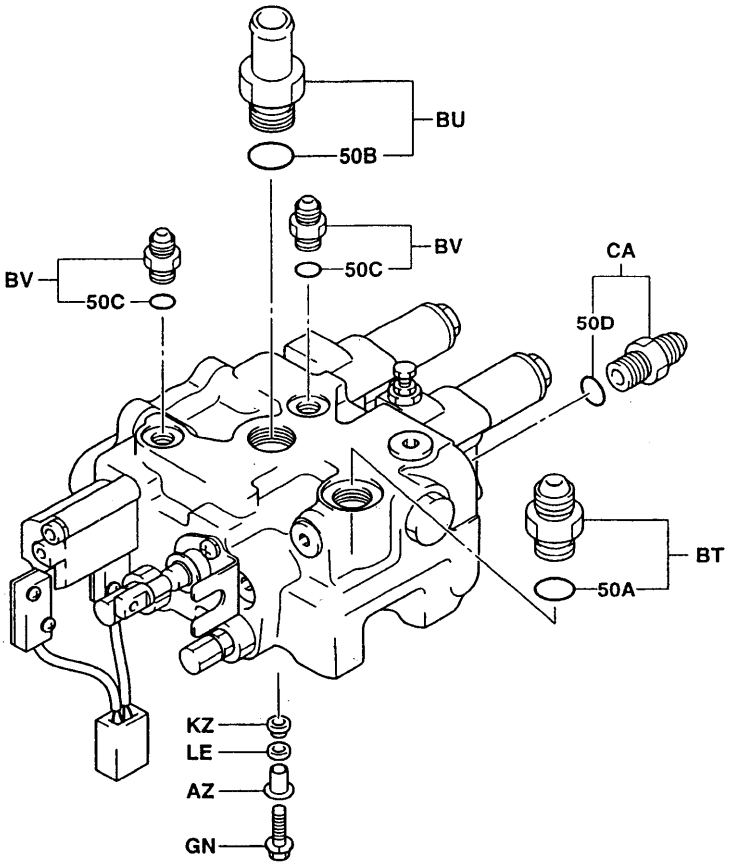
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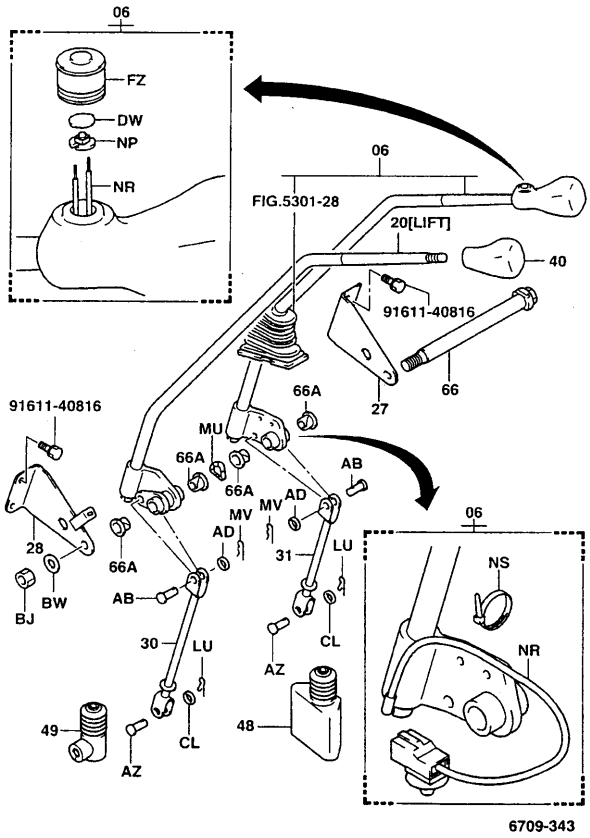
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6705



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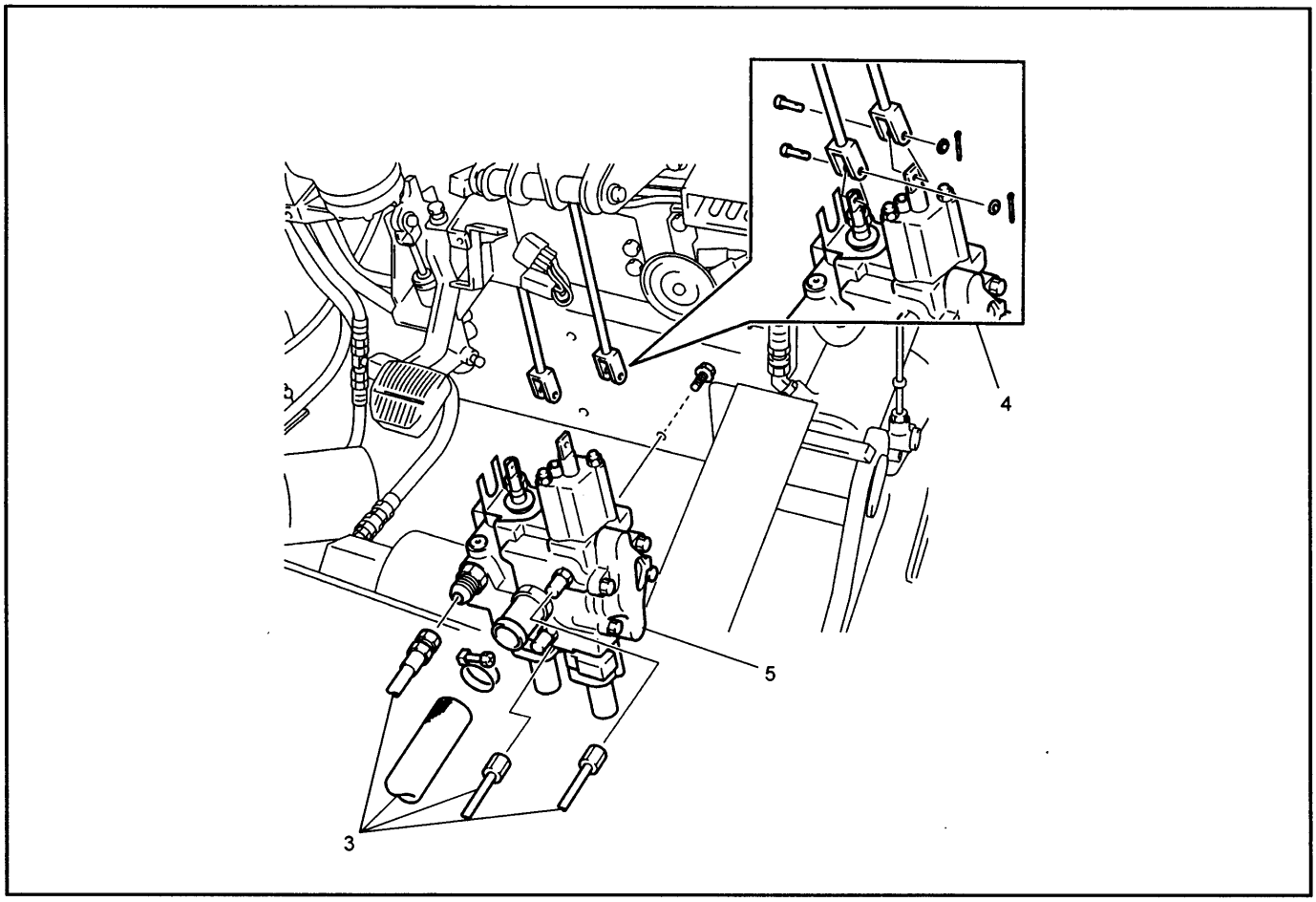


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OIL CONTROL VALVE ASSY

REMOVAL·INSTALLATION

Note:
Operate the control lever and bring the mast and fork to the vertical and lowermost positions, respectively, to release the residual pressure in the load handling system before starting removal.



Removal Procedure

1 Disconnect the battery plug.

2 Remove the toe board and lower panel.

3 Disconnect the piping and wiring.

4 Remove the set pin for the oil control valve and lever.

5 Remove the oil control valve ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

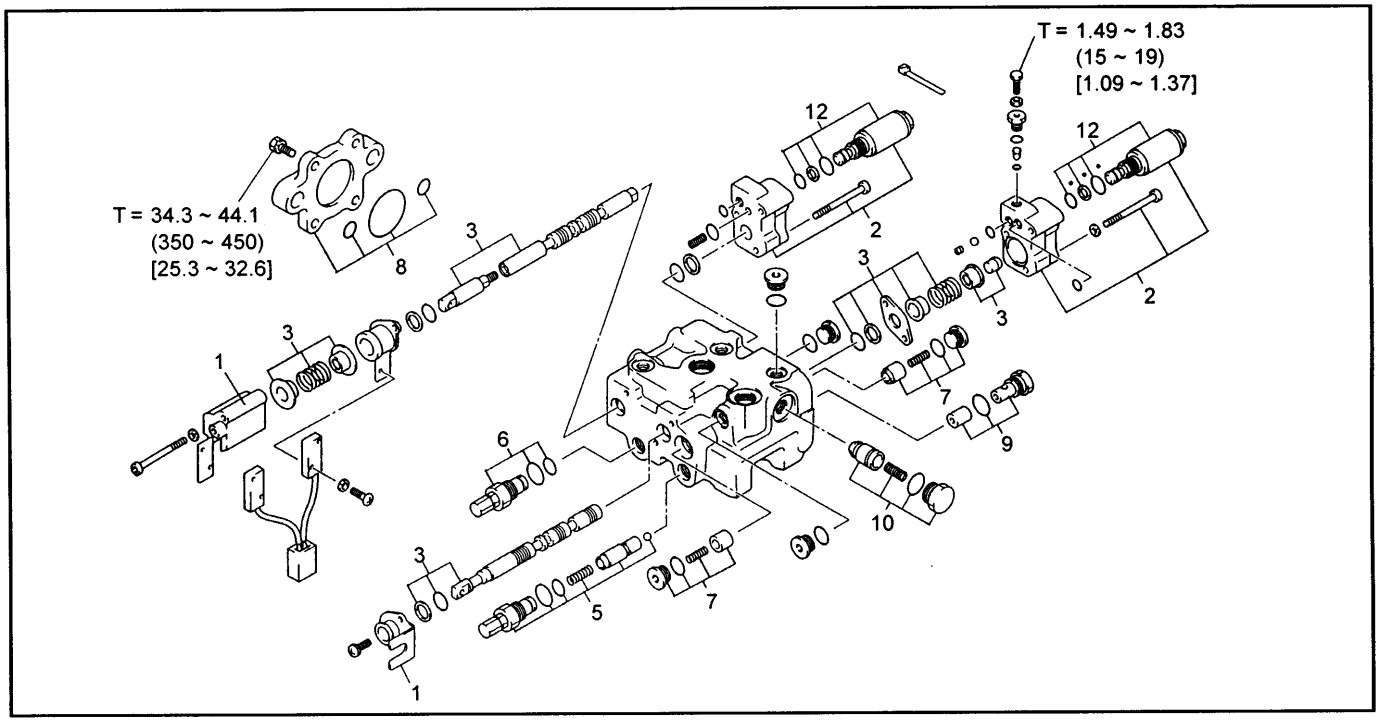
Note:
- **Adjust the limit switch after installing the oil control valve. (See page 3-50.)**
- **Apply grease at oil control valve lever link portions.**
- **Check the hydraulic oil level, and add if insufficient.**

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- **Since parts are finished with high precision, carefully disassemble and reassemble them to prevent any damage.**
- **Use a clean location for the job.**

N = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

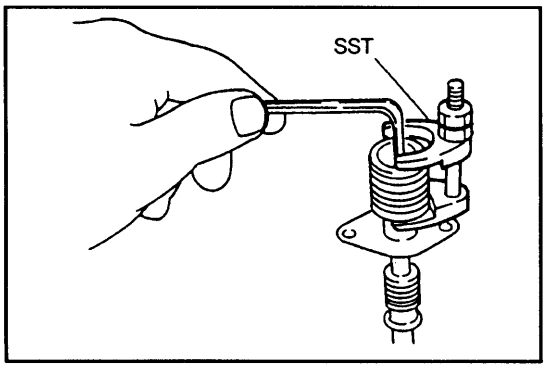
1 Remove the limit switch holder.
2 Remove the solenoid ASSY.
3 Remove the lift·tilt spool ASSY.
4 Disassemble the lift·tilt spool ASSY. **[Point 1]**
5 Remove the lift pilot relief valve set.
6 Remove the tilt pilot relief valve set.
7 Remove the check plunger.
8 Remove the outlet housing.
9 Remove the valve seat.
10 Remove the lift lock check valve.
11 Remove the tilt lock check valve.
12 Remove the solenoid valve.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part thoroughly, blow compressed air for drying and apply hydraulic oil before reassembly.**
- **Fully loosed the relief valve adjust screw at the time of reassembly.**

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Point Operation

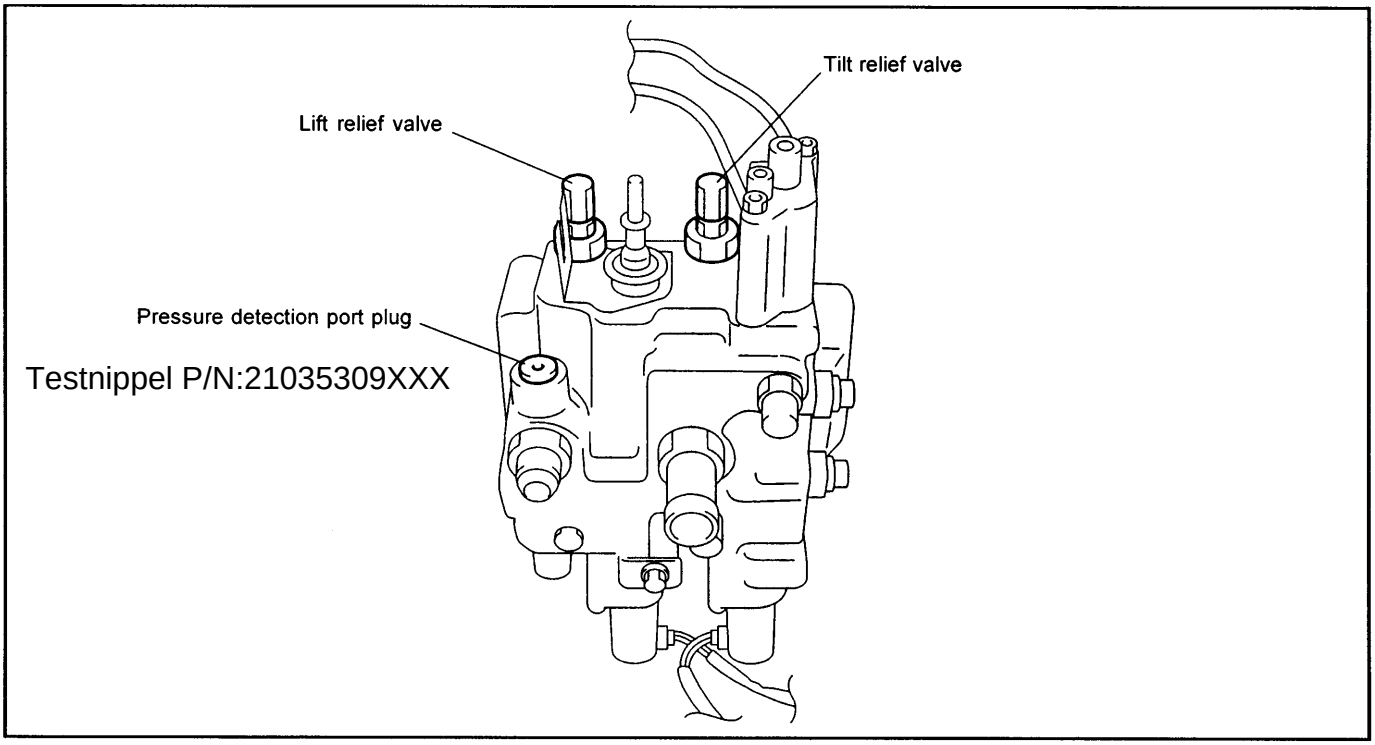
[Point 1]
Disassembly·Reassembly:
SST 09610-10160-71

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RELIEF PRESSURE ADJUSTMENT

Notes:

- **Always follow the procedure below for adjustment. Careless adjustment may cause high-pressure generation, resulting in damage to hydraulic units such as the oil pump.**
- **No adjustment is needed when the relief valve is not disassembled or is replaced with a new one.**



1. Remove the plug (9/16-18UNF-2B) from the top of the oil control valve and install a pressure gauge there.

   Pressure gauge: Pressure resistance = 19,600 kPa (200 kgf/cm²) or above

2. Loosen the lift relief valve adjusting screw.
   Loosen the lock nut and loosen the adjusting screw to just before the point where it comes off from the body.
3. Adjust the oil pressure as follows:
   (1) Turn the key switch to ON.
   (2) Slowly operate the lift lever to the up position and gradually tighten the adjusting screw until the fork starts to rise.
   (3) Lift the fork fully and read the oil pressure at the position. Tighten the adjusting screw for the normal pressure reading.
   (4) Tighten the lock nut and re-check the oil pressure.
4. Adjust the tilt relief valve oil pressure in the same was as for the lift relief valve.
   Tilt the mast fully backward in this case when measuring the oil pressure.

Relief Pressure Standards

Unit: kPa (kgf/cm²) [psi]

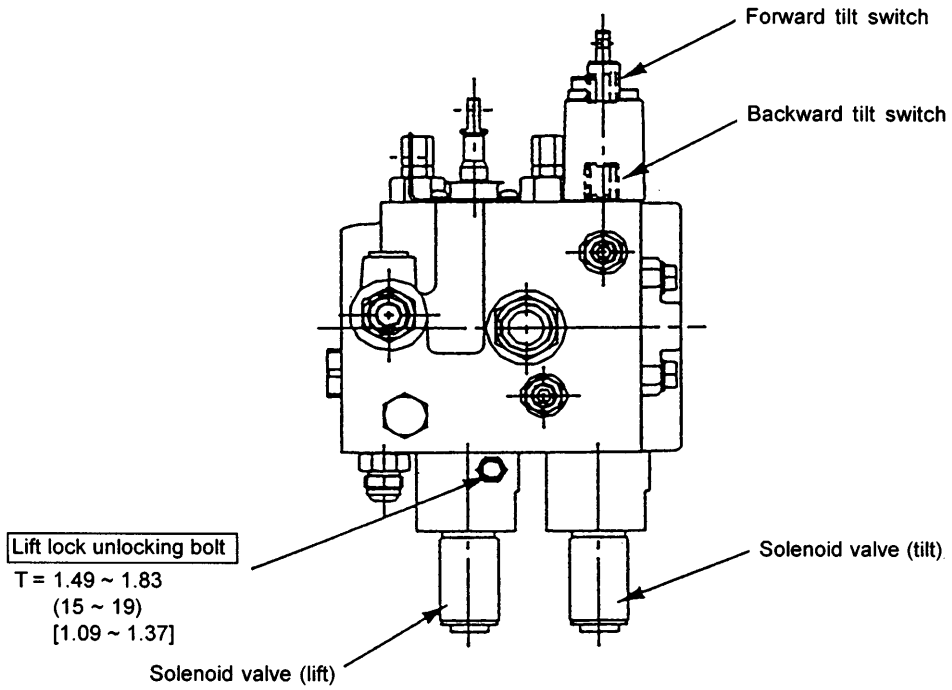
	1.0 ton	1.35 ~ 1.75 ton	2 ton series	3 and J3.5 ton
Lift relief pressure	12700 (130) [1840]	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
Tilt relief pressure	11800 (120) [1710]	←	14700 (150) [2130]	15700 (160) [2280]

5. Remove the oil pressure gauge, and install the plug.

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LIFT LOCK UNLOCKING BOLT

T = N·m (kgf-cm) [ft-lbf]

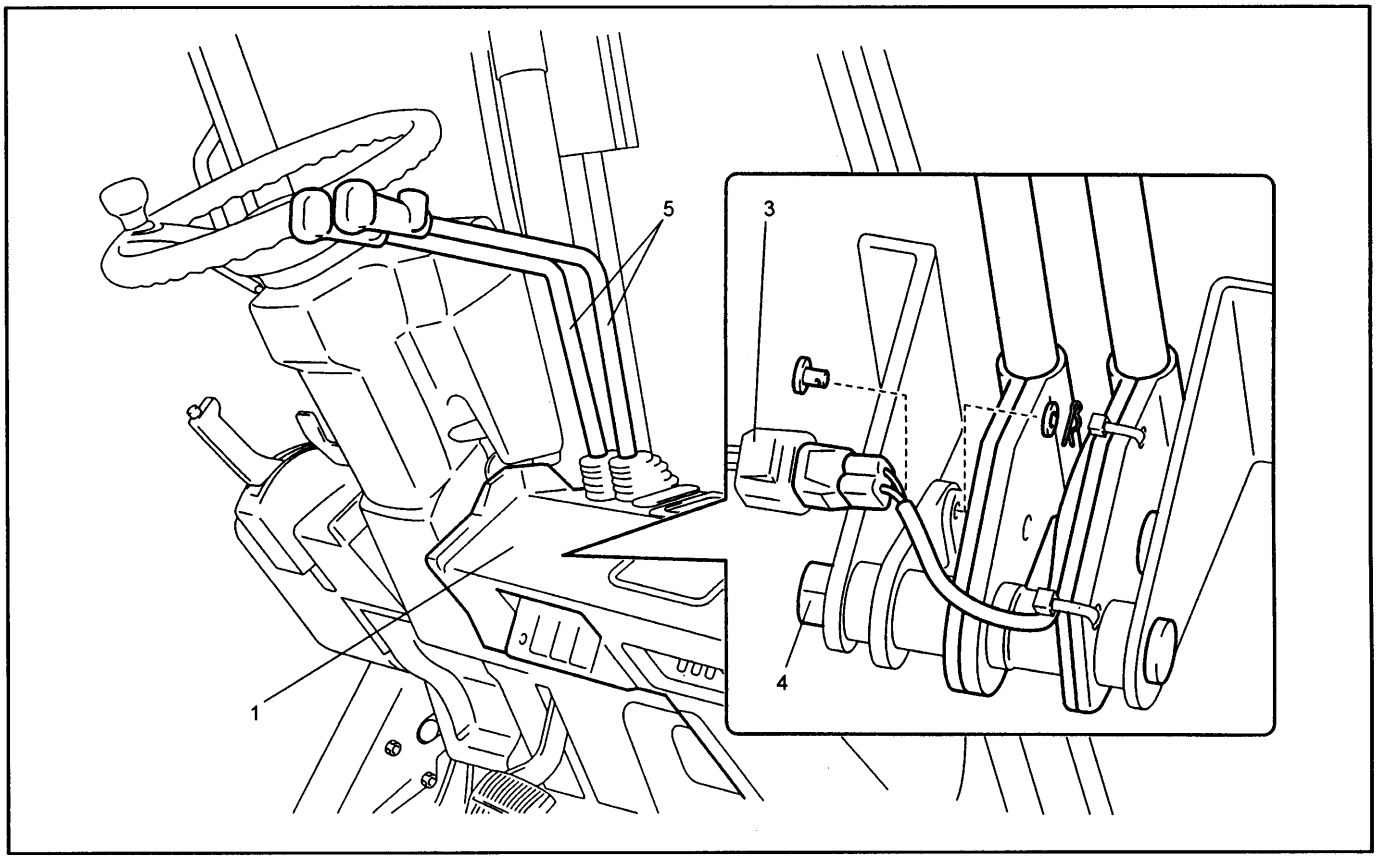


If the fork does not come down due to a failure of the solenoid valve, for example, the fork can be lowered manually by operating the lift lever to the down side after loosening the lock nut and the lift lock unlocking bolt. Always retighten the unlocking bolt and after the end of repair. Otherwise, most of the hydraulic oil from the oil pump is relieved to slow down lifting extremely, resulting in difficulty in load handling.

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CONTROL VALVE LEVER ASSY

REMOVAL·INSTALLATION



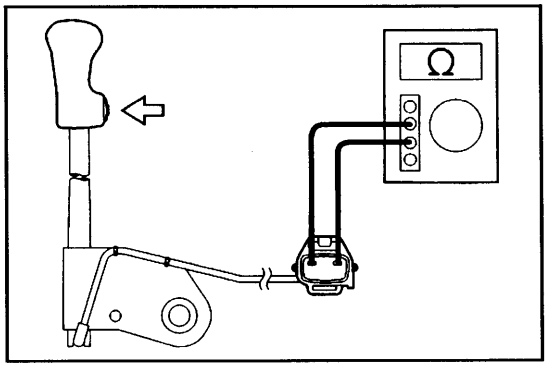
Removal Procedure

1 Remove the instrument panel.
2 Disconnect the lever rod.
3 Tilt lever: Disconnect the knob switch wiring.
4 Remove the set bolt.
5 Remove the control valve lever. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Apply grease (Chassis Grease Special) at control valve lever link portions.



Point Operation

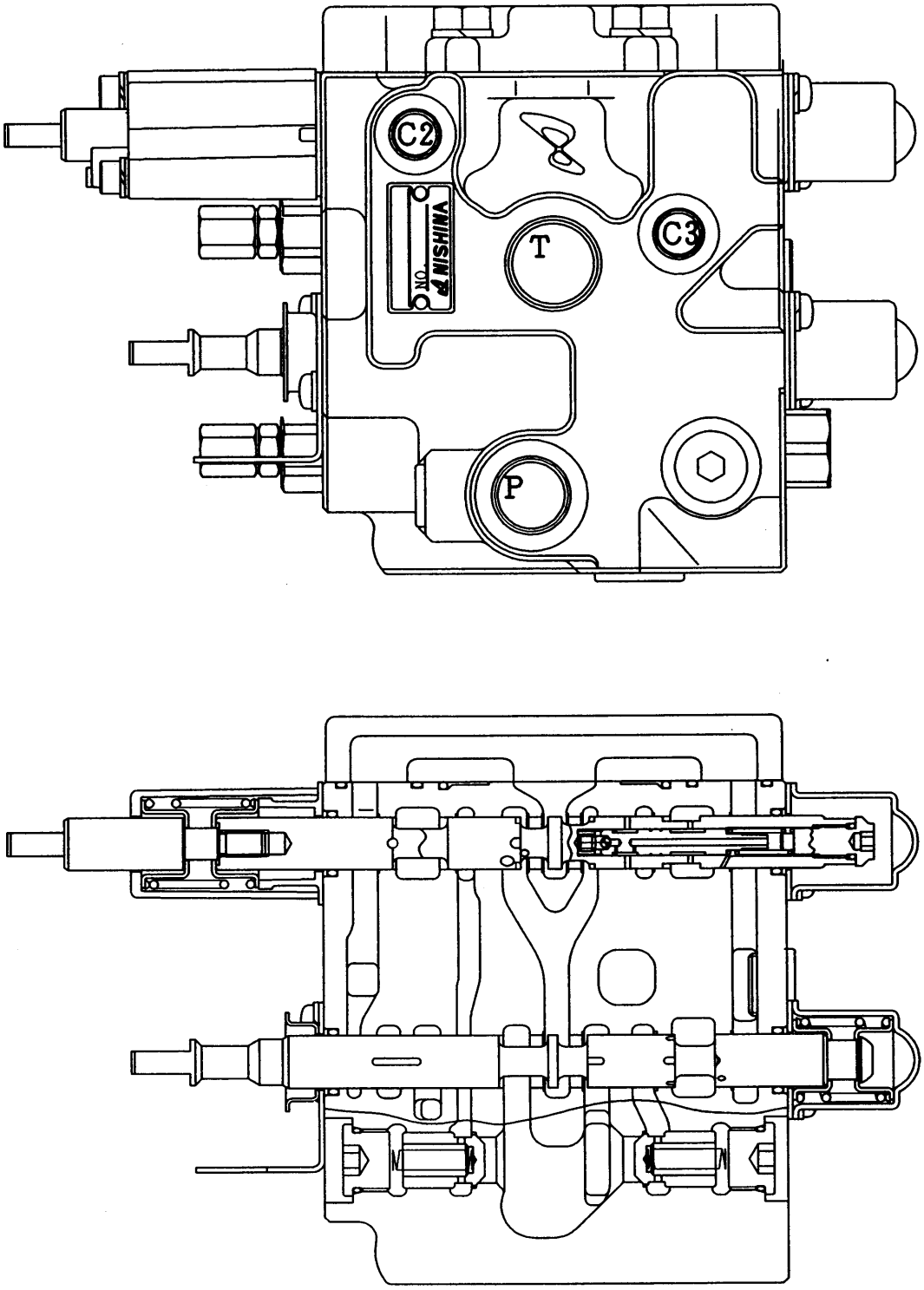
[Point 1]
Inspection:
Inspect the knob switch for continuity.

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VEHICLE WITHOUT SAS

GENERAL

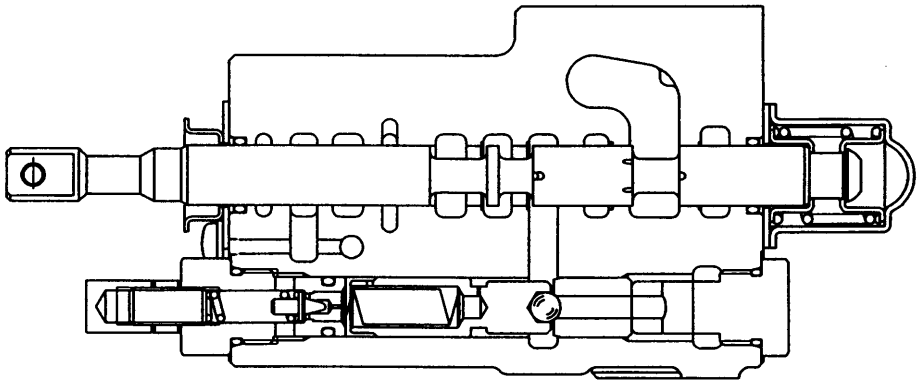
Oil Control Valve



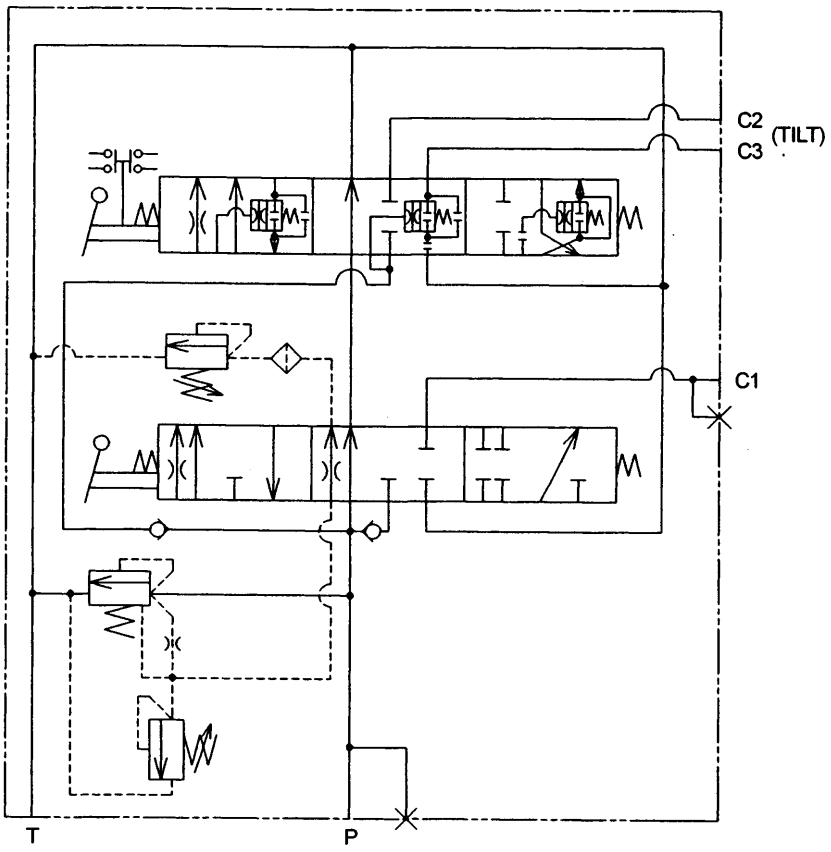
Sectional view

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Lift Block Section



Hydraulic Circuit

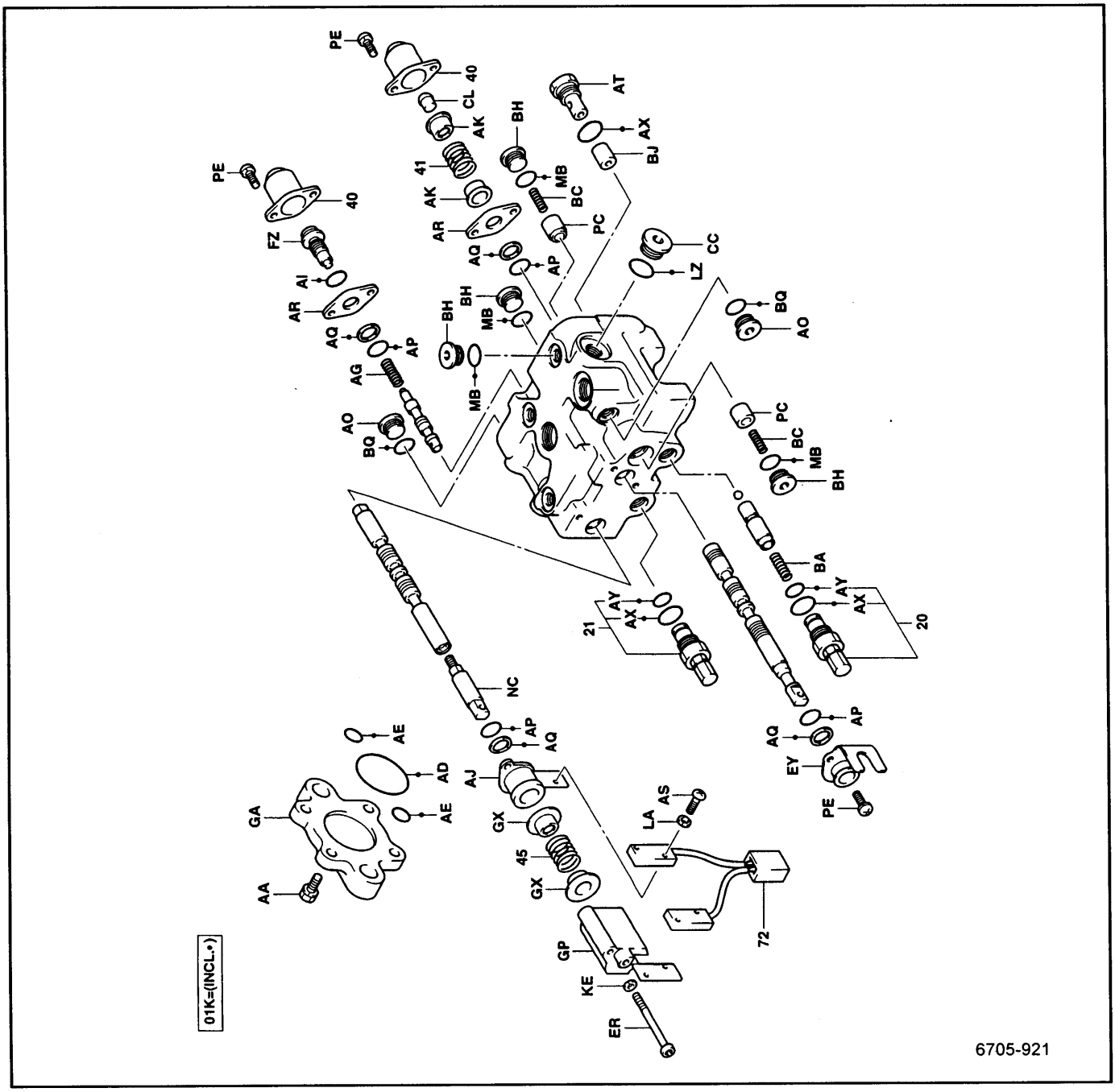


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SPECIFICATIONS

Item \ Vehicle model		1.0 ton	1.35 to 1.75 ton	2 ton series	3 and J3.5 ton
Type		Add-on type (1·2spool monoblock)			
Relief pressure kPa (kgf/cm²) [psi]	Lift	12700 (130) [1840]	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
	Tilt	11800 (120) [1710]	←	14700 (150) [2130]	15700 (160) [2280]
Spool outside diameter mm		16.0			
Stroke		7.0			
Other		Built-in tilt lock valve			

COMPONENTS



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OIL CONTROL VALVE ASSY

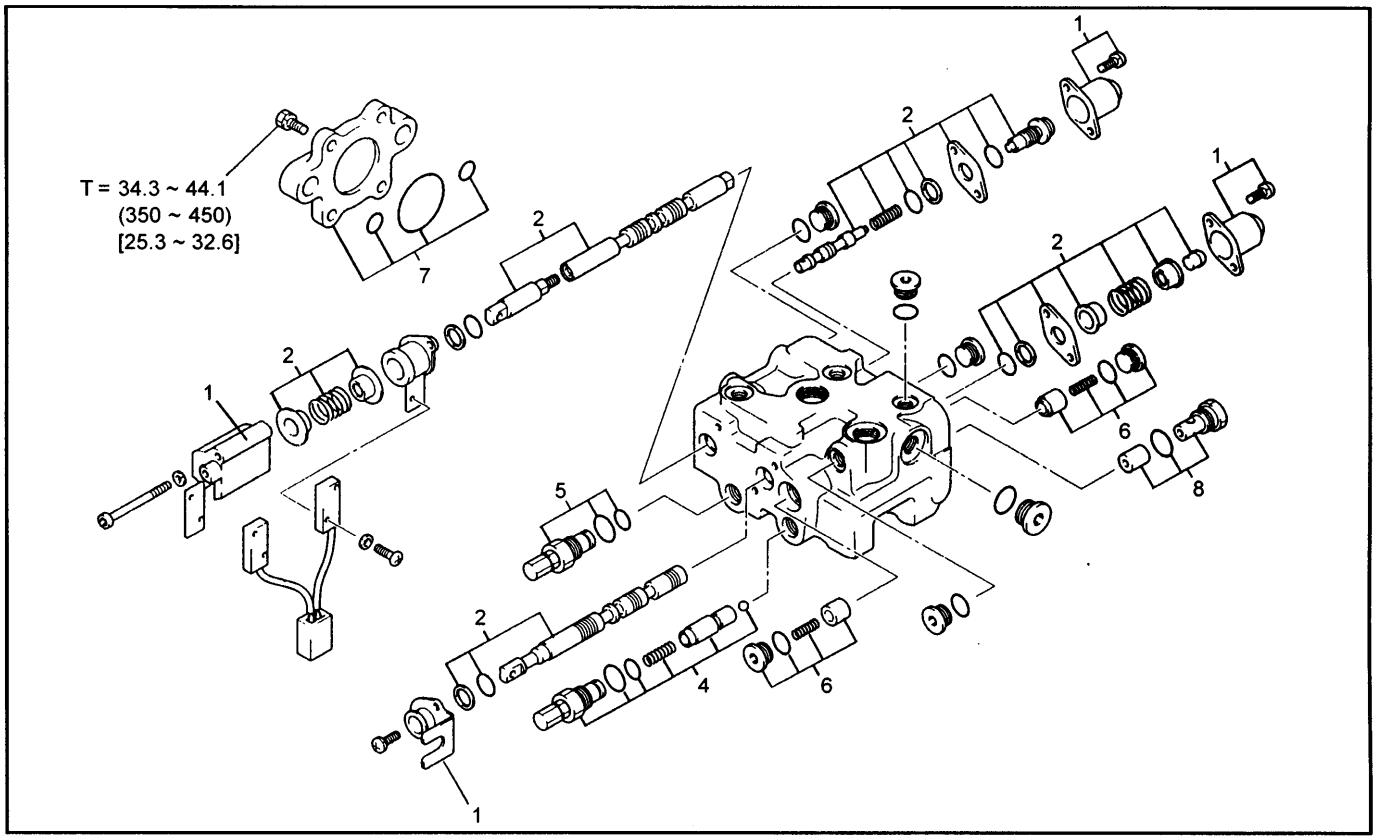
REMOVAL·INSTALLATION

Note:
Same as the case vehicle with SAS. See page 17-8.

DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- **Operate in a clean place.**
- **As each part is finished with high precision, carefully disassemble and reassemble them to prevent any damage.**

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the limit switch holder and cap.

2 Remove the lift·tilt spool ASSY.

3 Disassemble the lift·tilt spool ASSY. **[Point 1]**

4 Remove the lift pilot relief valve set.

5 Remove the tilt pilot relief valve set.

6 Remove the check plunger.

7 Remove the outlet housing.

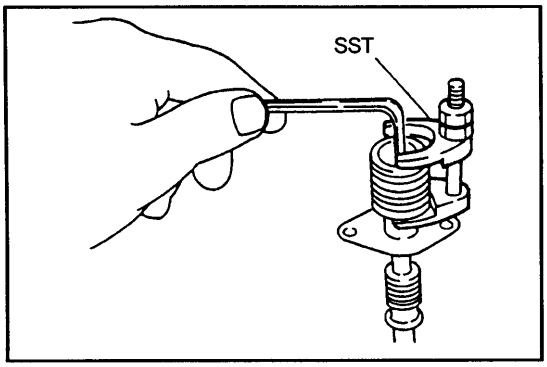
8 Remove the valve seat.

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Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part thoroughly, blow compressed air for drying and apply hydraulic oil before reassembly.**
- **Fully loosed the relief valve adjust screw at the time of reassembly.**



Point Operation

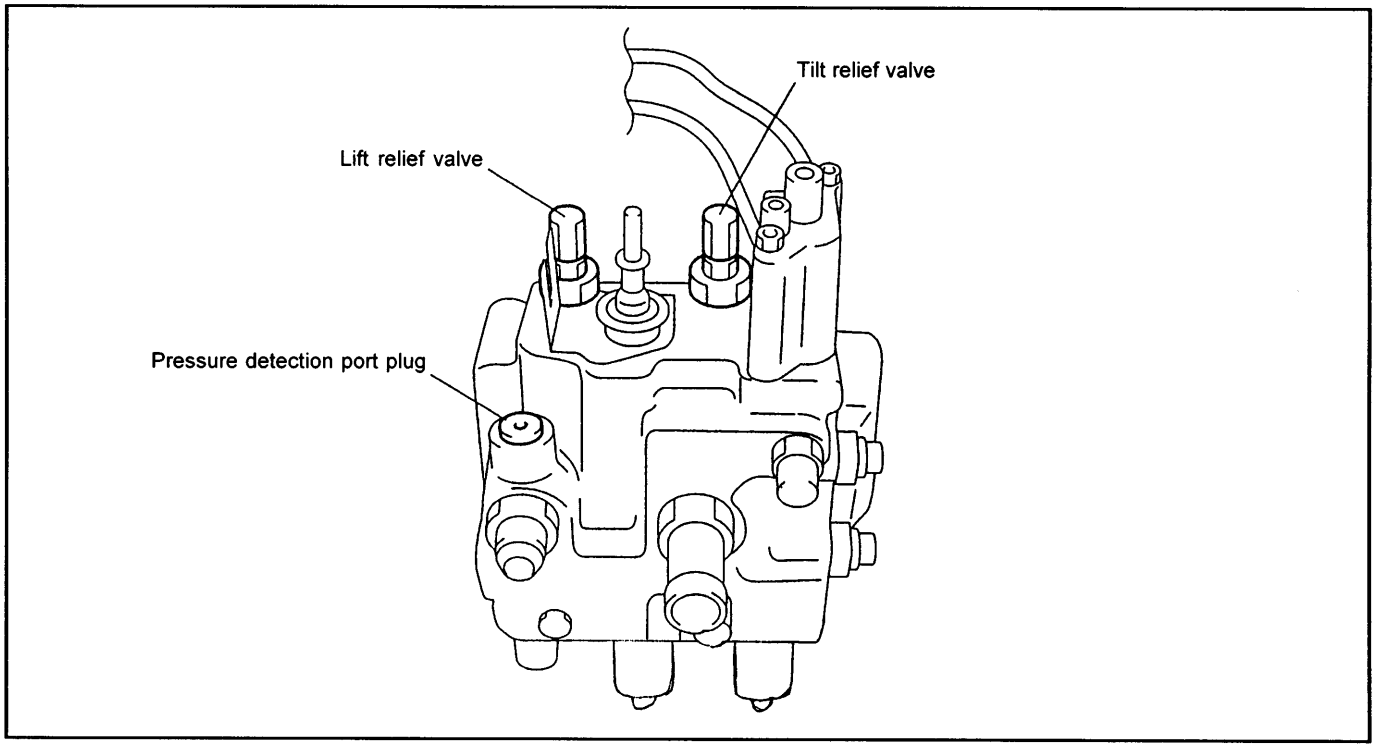
[Point 1]
Disassembly·Reassembly:
SST 09610-10160-71

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RELIEF PRESSURE ADJUSTMENT

Notes:

- **Always follow the procedure below for adjustment. Careless adjustment may cause high-pressure generation, resulting in damage to hydraulic units such as the oil pump.**
- **No adjustment is needed when the relief valve is not disassembled or is replaced with a new one.**



1. Remove the plug (9/16-18UNF-2B) from the top of the oil control valve and install a pressure gauge there.

   Pressure gauge: Pressure resistance = 19,600 kPa (200 kgf/cm²) or above

2. Loosen the lift relief valve adjusting screw.
   Loosen the lock nut and loosen the adjusting screw to just before the point where it comes off from the body.
3. Adjust the oil pressure as follows:
   (1) Turn the key switch to ON.
   (2) Slowly operate the lift lever to the up position and gradually tighten the adjusting screw until the fork starts to rise.
   (3) Lift the fork fully and read the oil pressure at the position. Tighten the adjusting screw for the normal pressure reading.
   (4) Tighten the lock nut and re-check the oil pressure.
4. Adjust the tilt relief valve oil pressure in the same was as for the lift relief valve.
   Tilt the mast fully backward in this case when measuring the oil pressure.

Relief Pressure Standards

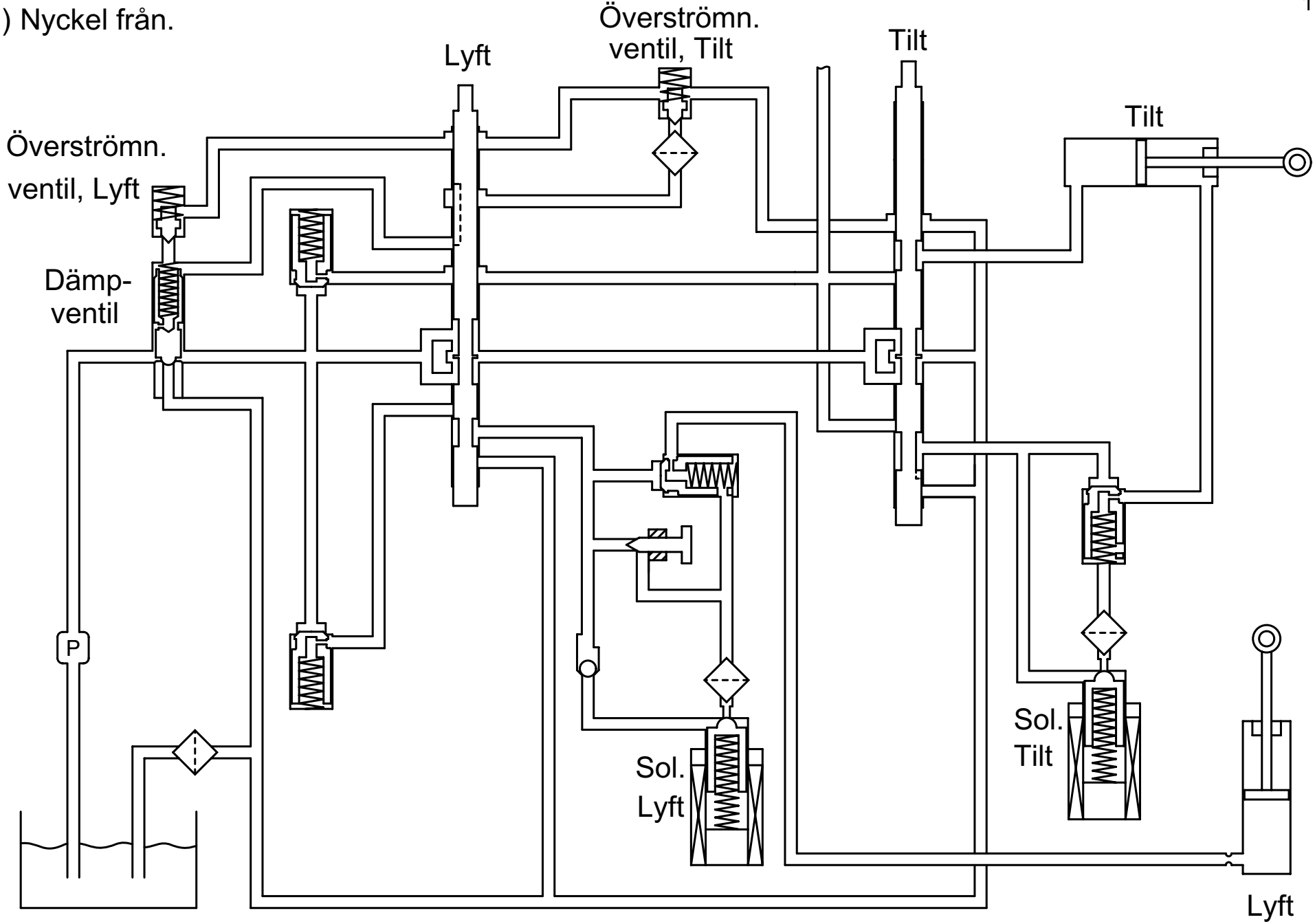
Unit: kPa (kgf/cm²) [psi]

	1.0 ton	1.35 ~ 1.75 ton	2 ton series	3 and J3.5 ton
Lift relief pressure	12700 (130) [1840]	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
Tilt relief pressure	11800 (120) [1710]	←	14700 (150) [2130]	15700 (160) [2280]

5. Remove the oil pressure gauge, and install the plug.

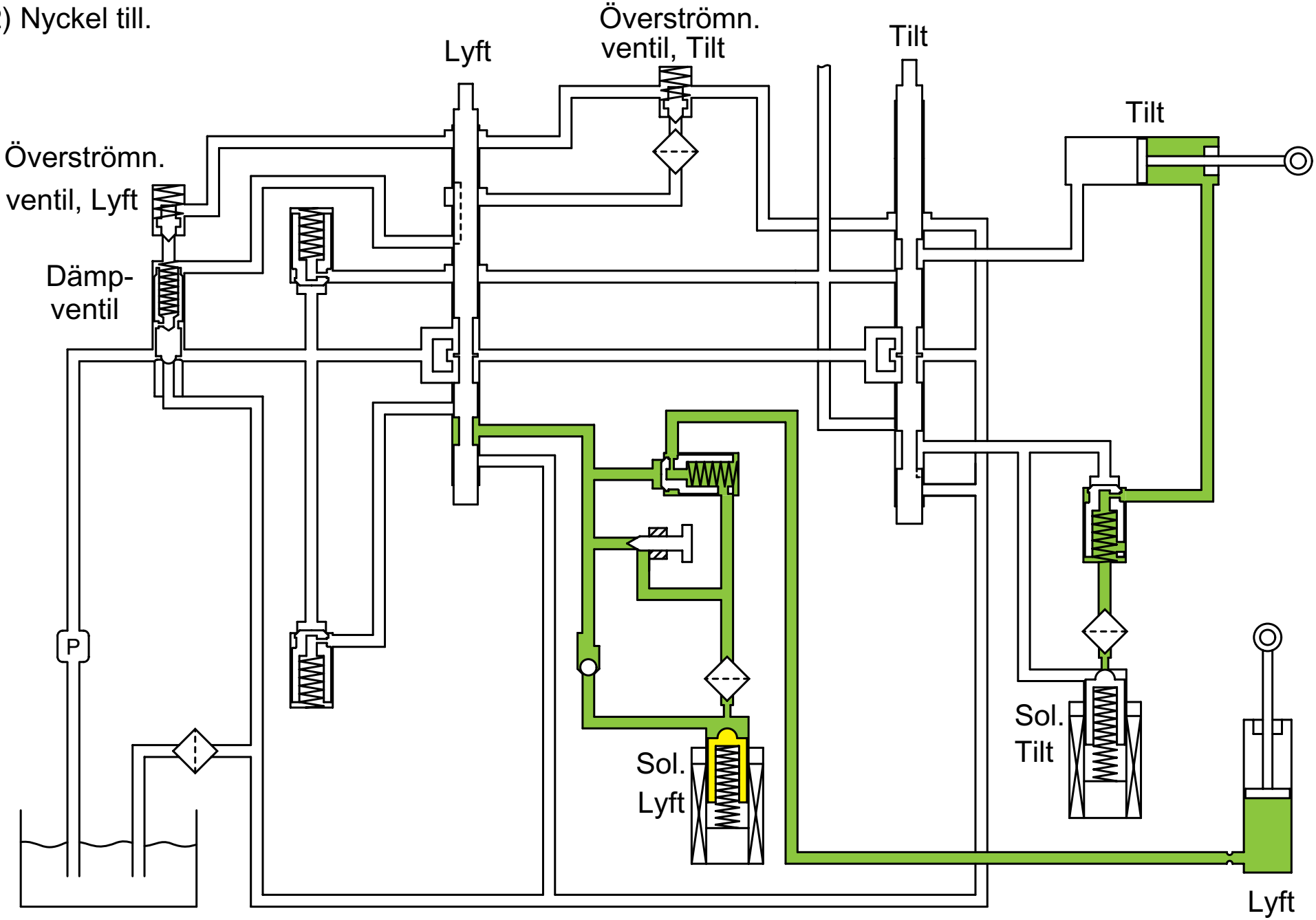
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(1) Nyckel från.



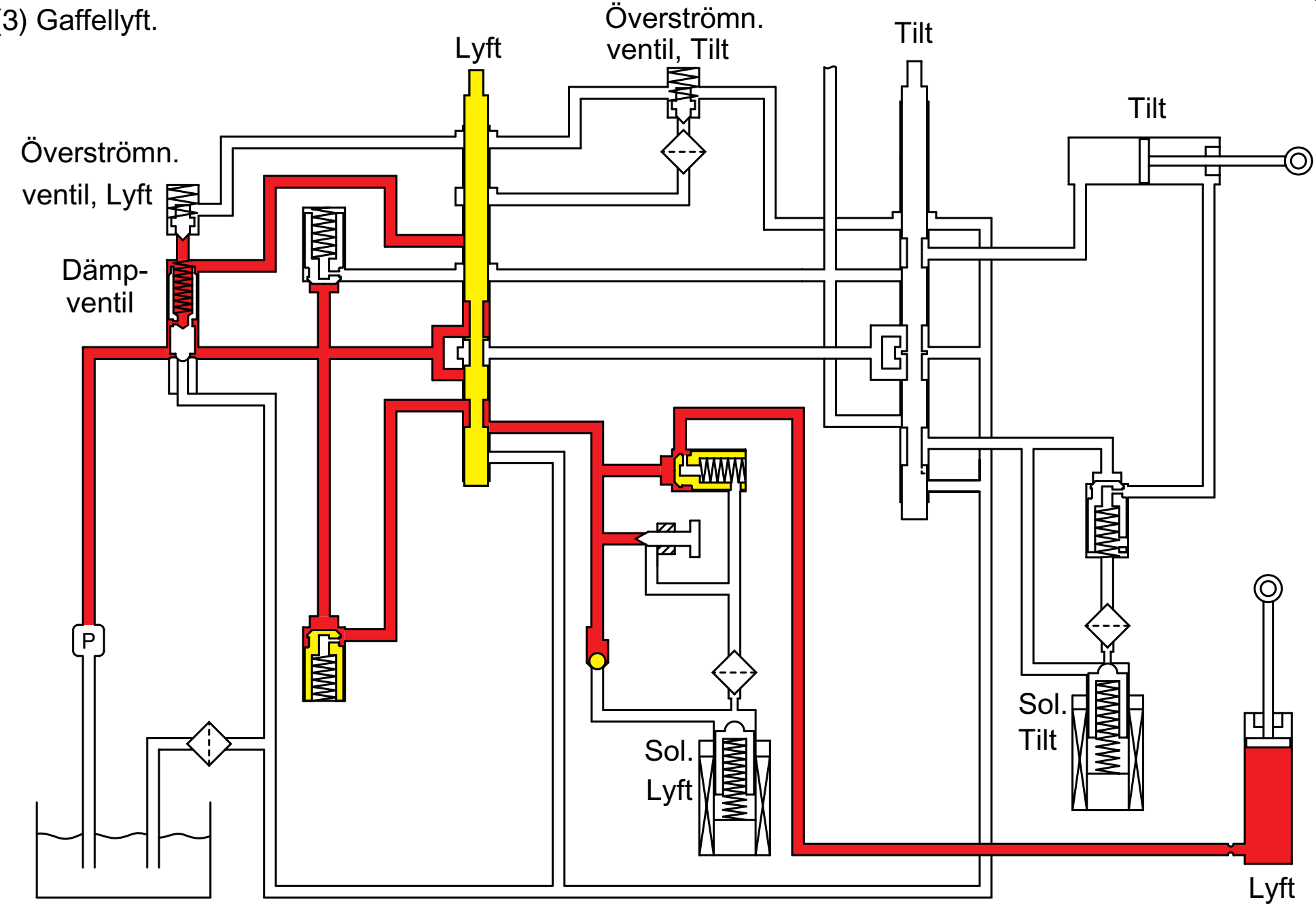
www.truck-freeworkshop.com

(2) Nyckel till.



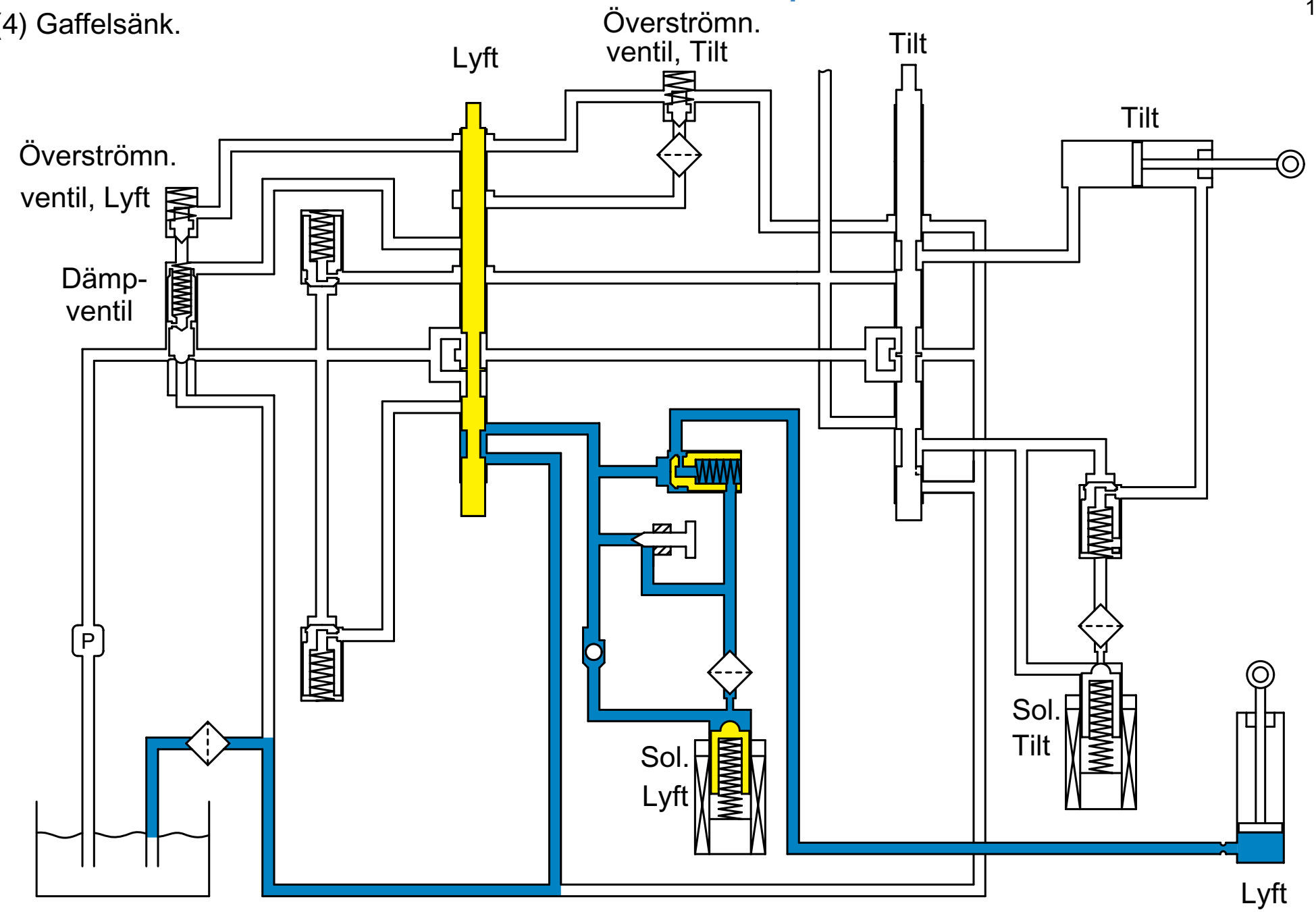
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(3) Gaffellyft.



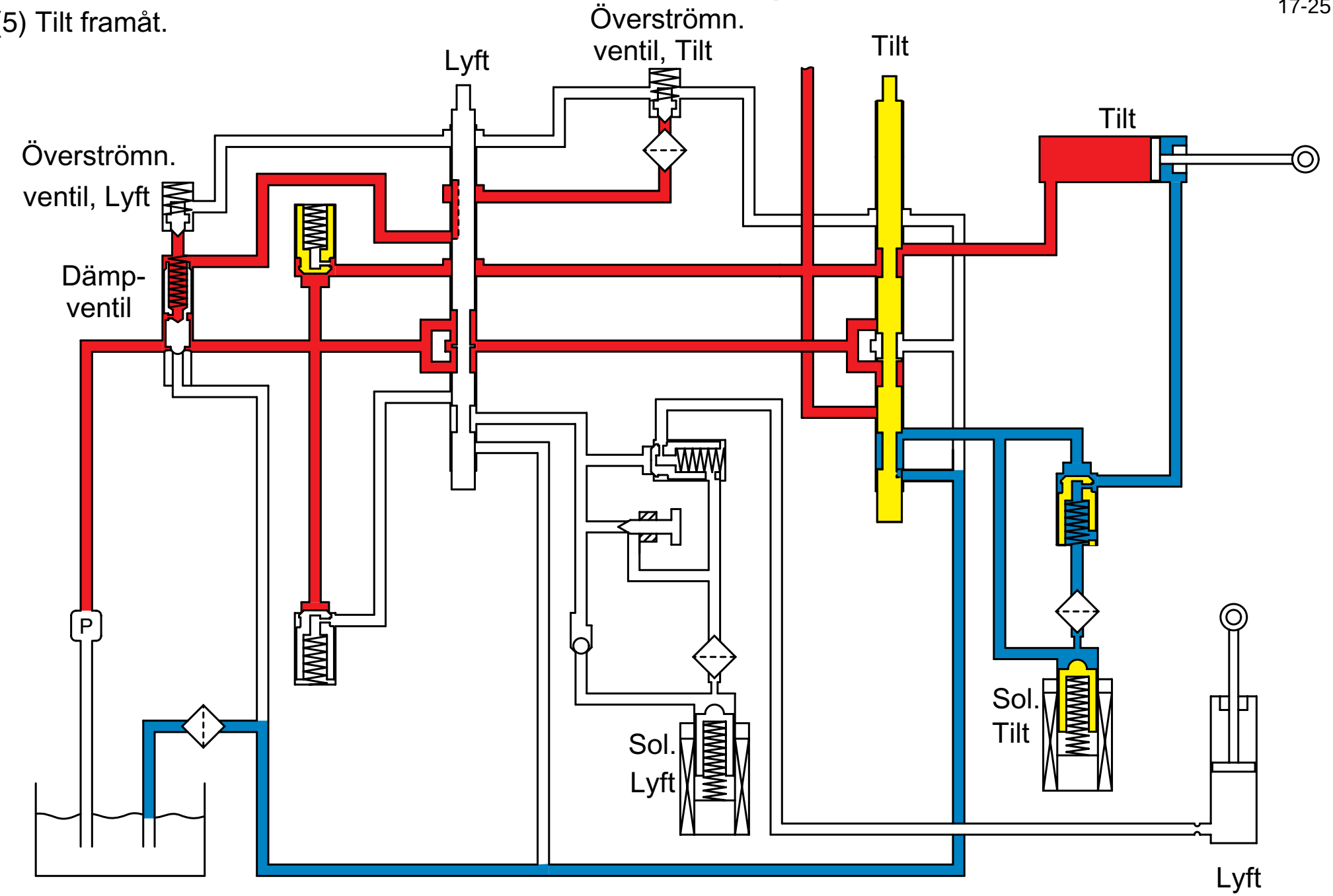
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(4) Gaffelsänk.



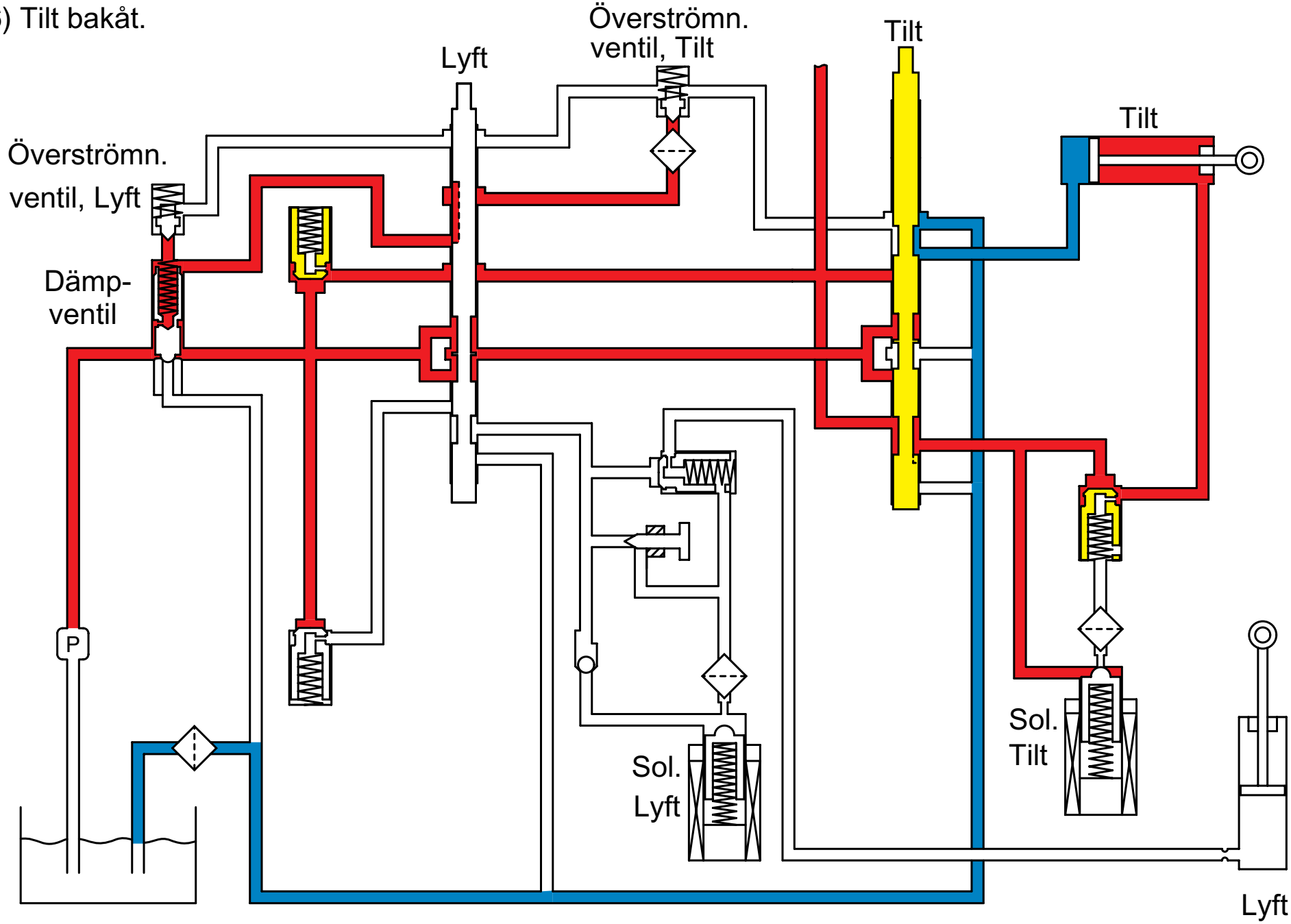
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(5) Tilt framåt.



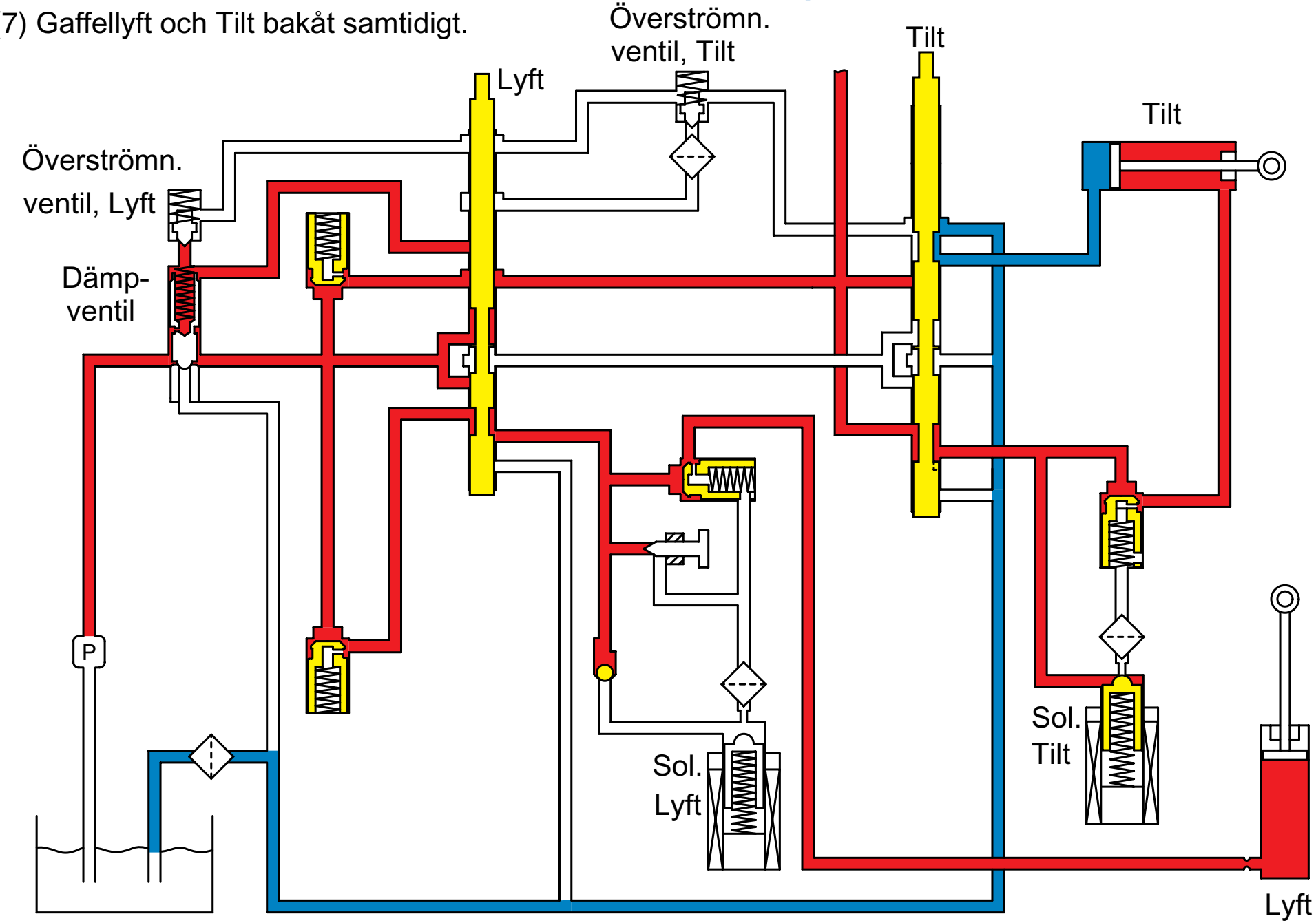
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(6) Tilt bakåt.



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(7) Gaffellyft och Tilt bakåt samtidigt.



Toyota 7FB 10-35
EPAC Arbetshydraulik
822207, 822208, 822209



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Installationskrav

För att installationen skall fungera på bästa tänkbara sätt bör följande saker beaktas vid installation:

El

Anläggningen kräver en spänning på alternativt, beroende på typ av anläggning	12 V DC (10 - 18 V) 24 V DC (20 - 30 V)

Vid stora spänningsvariationer, exempelvis vid tillfälligtvis djupa urladdningar av en eltrucks batteri bör en stabil spänningskälla installeras.

Manöverkablage mellan manöverenheten och ställdonet bör ej dras tillsamman med maskinens effektkablar eller i omedelbar närhet av effektanslutningar på elmotorer, radiosändare, portöppnare eller liknande apparater.

Reläer som används i maskinen bör vara avstörda.

Vid svetsning på maskinen skall anläggningens spänningsmatning och jordförbindning lossas från maskinen.

Vid allt arbete på anläggningen bör åtgärder vidtagas för att skydda densamma mot statisk elektricitet.

Spänningsmatningen till manöverenheten bör kopplas via säkerhetsbrytare så att manöverenheten kopplas ur när föraren fäller upp armstödet eller lämnar maskinen.

Hydraulik

Hydrauliken behöver ett pilottryck på.	25 - 35 bar

Hydraulolja

Renhetsgrad enligt	ISO 4406 kod 17/14

Filter

Filtreringsgrad	10 mikron nominellt värde

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Tekniska data

EPAC kort

Matningsspänning	12 V DC (10 - 18 V DC) 24 V DC (20 - 30 V DC)
Maximal strömuttag	0,8 A alt. 1.6 A / utgång för PWM - signal 0,8 A alt.1.6 A / utgång för AUX - signal
PWM frekvens	125 Hz
Maximal ramptid	2,25 sek
Arbetstemperatur	-40^0 C - $+70^0$ C
Ingång för ändlägesgivare	12 / 24 V DC
In- och utgångar	Kortslutningsskyddade

Linjärspak

Resistans potentiometer	5K ohm ± 15 % L. ± 1,5 %
Spakens dödband	$\pm 2^0$
Totalt spakutslag	$\pm 20^0$

Omvandlarventil

Alternativ enl. nedan

Spänning / max tryck	24 V, pA 20 bar 12 V, pA 20 bar 24 V, pA 25 bar 12 V, pA 25 bar 24 V, pA 32 bar 12 V, pA 32 bar
Resistans	24 V ventiler = 21,2 ohm 12 V ventiler = 5,3 ohm
Max ström	24 V ventiler = 0, 75 A 12 V ventiler = 1,5 A
Max internt läckage	0,1 L/min

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Ställdon

Slaglängd	8,0 mm alternativt 13,5 mm
Cylinderdiameter	25 mm
Max arbetstryck	35 bar
Max internt läckage	0, 35 L/min vid 30 bar
Arbetstemperatur	-40^0 C - $+85^0$ C
Hysteres	± 2%

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Parametrar, allmänt

Anläggningens manöveregenskaper kan justeras för att passa i en viss hantering eller för att passa en individuell förare.
För att justera anläggningen används nio parametrar för vardera spak. Parametrarna kan justeras valfritt en i taget eller flera på en gång. Gemensamt för alla parametrarna är att värdena kan justeras mellan 00 och 99.
Vid byte av elektronikkort är samtliga parametrarna från fabrik ställda på 00, varför nya värden alltid måste programmeras in i minnet.
Värdena som var aktuella när anäggningen lämnade fabriken finner du i användarmanualen eller går att få från Morse Controls AB.
Innan du ändrar värdet i någon parameter, bör du notera det gamla.

Följande justeringsmöjligheter finns tillgängliga. ***Lägesreferenser av spak, utgår från att spak är monterad i fordonets färdriktning.***

Parameterlista programversion 1.14

A0 Visar potentiometerns mekaniska nolläge (U0=Idealvärde)

I Behörighetskod 1 = 00
II Behörighetskod 2 = 00
III Behörighetskod 3 = 00
IIII Behörighetskod 4 = 35

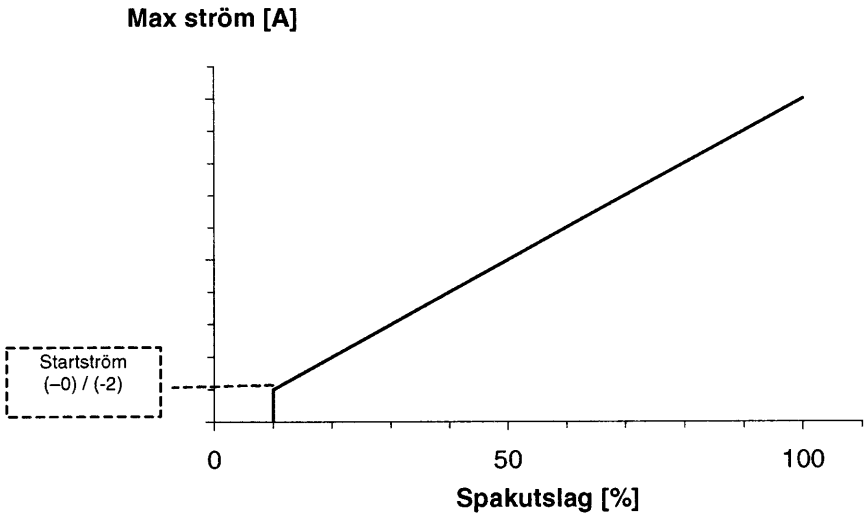
-0 Startström spak framåt
-1 Slutström spak framåt
-2 Startström spak bakåt
-3 Slutström spak bakåt
-4 Uppramp spak framåt/bakåt
-5 Nedramp spak framåt/bakåt
-6 Autofunktion
-7 Extra funktion
-8 Slow funktion
-9 Strömsteg
A1 Avsläsning mitt och ändlägen för spakpotentiometer, spak1.
A2 Avsläsning mitt och ändlägen för spakpotentiometer, spak2. obs. gäller endast när 2 spakar är kopplade till samma elektronikkort.
- - Avsluta programmering och *spara ändrade värden*
- Avsluta programmering *utan att spara ändrade värden*

OBS! Centrera alltid vid byte av spak eller kort!

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Parameterbeskrivning

Parameter	Funktion
A0	**Mekanisk justering av spakpotentiometer.** Parametern visar den mekaniska justeringen av potentiometerns mittläge. Värdet skall vara så nära U0 som möjligt. För mer information, se under avsnitt kontroll & justering av spak.
I	Inmatningsläge för accesskod 1 =00
II	Inmatningsläge för accesskod 2 =00
III	Inmatningsläge för accesskod 3 =00
IIII	Inmatningsläge för accesskod 4 =35
-0 & -2	**Startström spak framåt/bakåt** Startströmen är den ström som elektroniken styr ut till omvandlarventilen när linjärspaken kommer ur sitt dödband. Parameterns värde kan justeras i steg mellan 1 och 99 vilket motsvarar 0 mA upp till 800 mA alternativt 1600 mA, beroende på elektronikkort.

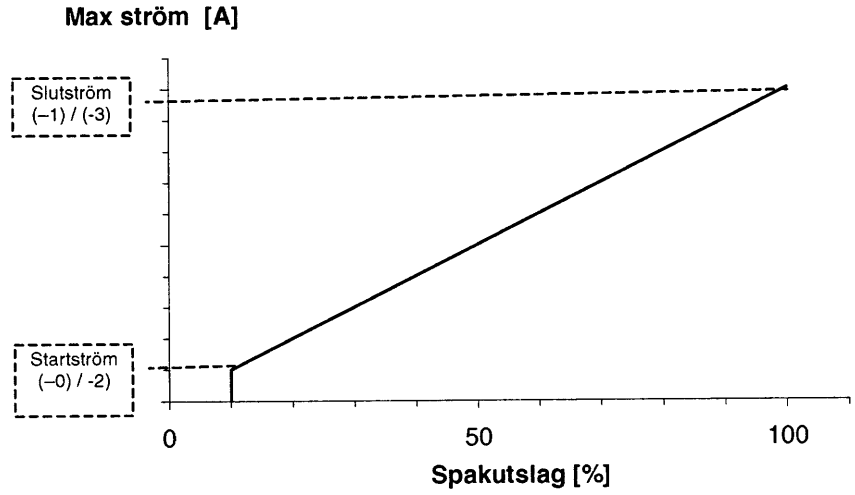


Figur 1. Diagram Startström

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-1 & -3 **Slutström spak framåt/bakåt.**

Slutströmmen är den maximala ström som elektroniken styr ut till omvandlarventilen vid fullt spakutslag. Parameterns värde kan justeras i steg mellan 1 och 99 vilket motsvarar 0 mA upp till 800 mA alternativt 1600 mA, beroende på elektronikkort.
Slutströmmen kan aldrig ställas lägre än startströmmen. Vid försök att ställa slutströmmen lägre än startströmmen, får slutströmmen samma värde som startströmmen.



Figur 2 Diagram slutström

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-4

Uppramp.
För att erhålla en mjuk start av en rörelse kan det i vissa fall erfodras en fördröjning (uppramp) av utsignalen. Upprampen justeras med parameter 4. Displayens högra siffra anger upprampvärdet när spaken förs framåt och displayens vänstra siffra anger upprampvärdet när spaken förs bakåt. Värdet är justerbart mellan 0 och 9. Det högsta upprampvärdet motsvarar en fördröjning på ca 2,25 sek.

Hö. siffra = Spak framåt
Vä. siffra = Spak bakåt

Observera att reaktionstiden för spaken ökar när upprampfunktionen används. Hur länge avläses i tabellen nedan.

0 = Ingen ramp	1 = 0,25 sek. ramp	2 = 0,5 sek. ramp
3 = 0,75 sek.ramp	4 = 1,00 sek ramp	5 = 1,25 sek. ramp
6 = 1,50 sek. ramp	7 = 1,75 sek. ramp	8 = 2,00 sek. ramp.
9 = 2,25 sek. ramp		

-5

Nedramp.
För att erhålla en mjuk avslutning av en rörelse kan det i vissa fall erfodras en fördröjning (nedramp) av utsignalen. Nedrampen justeras med parameter 5. Displayens högra siffra anger nedrampvärdet när spaken förs framåt och displayens vänstra siffra anger nedrampvärdet när spaken förs bakåt. Värdet är justerbart mellan 0 och 9. Det högsta nedrampvärdet motsvarar en fördröjning på ca 2,25 sek.

Observera att funktionen fortsätter att arbeta även efter att spaken har släppts. Hur länge avläses i tabellen nedan.

0 = Ingen ramp	1 = 0,25 sek. ramp	2 = 0,5 sek. ramp
3 = 0,75 sek.ramp	4 = 1,00 sek ramp	5 = 1,25 sek. ramp
6 = 1,50 sek. ramp	7 = 1,75 sek. ramp	8 = 2,00 sek. ramp.
9 = 2,25 sek. ramp		

-6

Auto funktionen.
Funktionen kan användas för att starta en automatisk rörelse till ett förutbestämt läge. För att få tillgång till funktionen behövs en strömställare på manöverenheten samt en eller flera givare i det redskapet man har för avsikt att styra.
Ett exempel på autofunktion är förval av lyfthöjd.

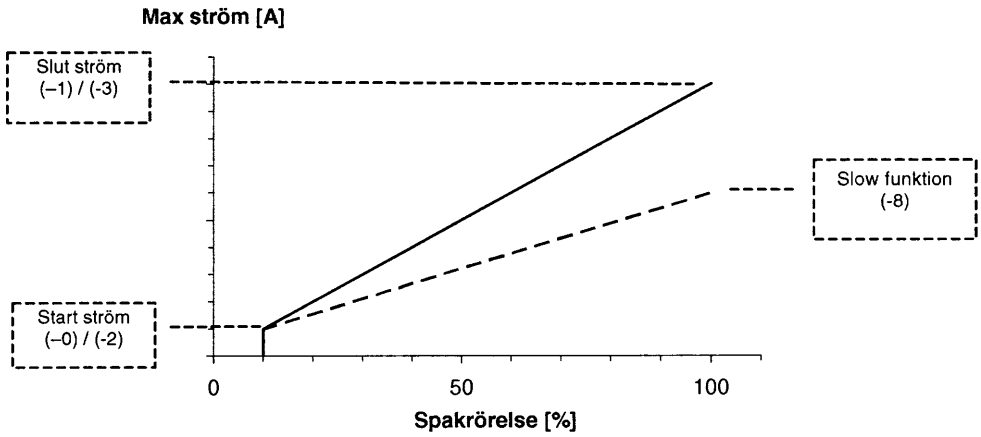
- 7

Aux funktionen
Vid ett förutbestämt spakutslag skickar eletroniken en signal från manöverenheten som kan användas för att t.ex. starta en hydraulpump eller styra en ventil

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-8 **SLOW funktionen**

Vitsen med SLOW funktionen är att med en strömställare kunna koppla in en funktion som sänker slutströmmen och därmed hastigheten på en rörelse när man så önskar. När slowfunktionen aktiveras minskas slutströmmen till en förprogrammerad procentsats. Procentsatsen styrs av parametervärdet, se tabell under diagram "slow".



Figur 3: Diagram Slow funktion

Reduceringen av slutströmmen är indelad i 9 steg där 0 = 0% d.v.s. ingen reducering och 9 = 90% är maximal reducering. Vänster siffra anger värdet för spak framåt och höger siffra anger värdet för spak bakåt

När SLOW är aktiverat kopplas ett eventuellt strömsteg ifrån.

0. ingen SLOW funktion aktiverad
1. 10% reducering av slutströmmen
2. 20% reducering av slutströmmen
3. 30% reducering av slutströmmen
4. 40% reducering av slutströmmen
5. 50% reducering av slutströmmen
6. 60% reducering av slutströmmen
7. 70% reducering av slutströmmen
8. 80% reducering av slutströmmen
9. 90% reducering av slutströmmen

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-9 **Strömsteg**

För att vara säker på att en ventil blir fullt utstyrd kan ett strömsteg läggas till. Strömsteget gör så att elektroniken styr ut maximal ström (800 mA alternativt 1600 mA beroende på elektronikkort) till omvandlarventilen när spakens utslag uppnår ett förprogrammerat värde.
Värdena är indelade i 9 steg där 0 = 0% d.v.s. inget strömsteg och 9 = 90% innebär att strömsteget aktiveras vid 90% spakutslag.
Vänster siffra anger värdet för spak framåt och höger siffra anger värdet för spak bakåt

X =0 Strömsteg avstängd	1 Aktivering vid 10% spakutslag
2 Aktivering vid 20% spakutslag	3 Aktivering vid 30% spakutslag
4 Aktivering vid 40% spakutslag	5 Aktivering vid 50% spakutslag
6 Aktivering vid 60% spakutslag	7 Aktivering vid 70% spakutslag
8 Aktivering vid 80% spakutslag	9 Aktivering vid 90% spakutslag

A1 **Elektrisk justering av spakpotentiometer 1.**
Läser in potentiometerns värden för respektive ändläge och mittläge i minnet på elektronikkortet

A2 **Elektrisk justering av spakpotentiometer 2.**
Obs A2 används endast när två spakpotentiometrar är kopplade till samma elektronikkort.
Läser in potentiometerns värden för respektive ändläge och mittläge i minnet på elektronikkortet

_ _ **Avsluta programmering och *spara värden***
I detta läge sparas ändrade parametrar efter avslutad programmering. Värdena är lagrade när displayen slocknar.

_ **Avsluta programmering och *utan att spara värden***
I detta läge ***sparas inte*** ändrade parametrar efter avslutad programmering. Programmeringen är avslutad när displayen slocknar.

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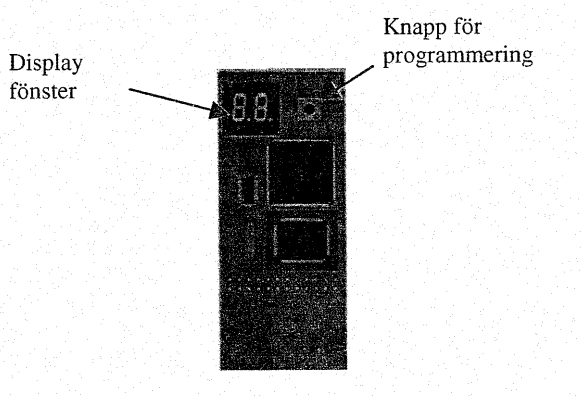
Programmering av parametrar

En grundinställning är gjord från fabrik men kan behöva kundanpassas efter leverans eller vid byte av komponenter i anläggningen. Vid behov av justering förfar enl nedan.

Lossa ena gavelstycket från manöverenheten och ta samtidigt bort bottenplåten som är inskjuten i lådans slitsar.

Slå på tändningen samt se till att manöverenhetens strömställare är tillslagen.

Accesskoder
För att få tillgänglighet till parametrarna måste först fyra tvåsiffriga accesskoder matas in. Tryck två gånger i snabb följd på knappen för programmering på det elektronikkort som hör till den aktuella spaken. I displayfönstret visas först I som efter någon sekund skiftar till 00.



Accesskod 1
Mata in kod 1 som är 00.
Koden matas in genom att spaken förs åt något håll, ena hållet räknar ner, andra hållet räknar upp. Långa slag stegar hela tiotal medan korta slag stegar ental. Bekräfta inmatningen genom att trycka in knappen en gång.
I displayfönstret visas nu II som efter någon sekund skiftar till 00.

Accesskod 2
Mata in kod 2 som är 00.
Bekräfta inmatningen genom att trycka in knappen en gång.
I displayfönstret visas nu III som efter någon sekund skiftar till 00.

Accesskod 3
Mata in kod 3 som är 00.
Bekräfta inmatningen genom att trycka in knappen en gång.
I displayfönstret visas nu IIII som efter någon sekund skiftar till 00.

Accesskod 4
Mata in kod 4 som är 35.
Bekräfta inmatningen genom att trycka in knappen en gång. Om allt gjorts på ett riktigt sätt får man nu tillgång till dom nio parametrar som går att justera.

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Efter inmatning av godkännda accesskoder visas nu i displayfönstret adressen till den första parametern som är justerbar, d.v.s. parameter -0. Efter någon sekund skiftar displayfönstret till att visa det värde som är lagrat under parametern, exempelvis 35.

Om man vill ändra en parameter, stegar man med knappen fram till önskad parameter, t.ex. parameter –3. Efter någon sekund visas det nuvarande värdet displayfönstret, t.ex. 85. Värdet kan ökas eller minskas genom att spaken påverkas. Ena hållet räknar ner, andra hållet räknar upp. Långa slag stegar hela tiotal medan korta slag stegar ental

För att spara dom nya värdena samt för att gå ur programmeringsläget, stega med knappen till parameter - -. Efter några sekunder slocknar displayen som en bekräftelse på att värdena lagrats och att man är ute ur programmeringsläget.

Det går också att avsluta och gå ur programmeringsläget utan att spara några värden genom att stega fram till parameter -. Efter någon sekund slocknar displayfönstret vilket visar man är ute ur programmeringsläget.

Obs!
Har spak, potentiometer eller elektronikkort bytts ut, måste potentiometerns mitt och ändlägen läsas in i elektroniken.
Stega fram med knappen till parameter A1 (A2 om det är spak 2 till samma kort). Efter någon sekund visar displayfönstret 00 d.v.s. mittläge.
Det är i detta läge ytterst viktigt att spaken inte påverkas under ca 1 sekund då elektroniken nu läser in potentiometerns mittläge.
Efter ca 1 sekund förs spaken fullt framåt och hålls i detta läge ca 1 sekund (minvärde). Därefter förs spaken fullt bakåt och hålls i detta läge ca 1 sekund (maxvärde). Släpp spaken och låt den gå tillbaka till sitt mittläge
Stega därefter med knappen till parameter - - för att spara dom nya värdena samt för att gå ur programmeringsläget. En bekräftelse på att värdena lagrats och att man är ute ur programmeringsläget är att displayen slocknar.

Efter avslutat programmering återmonteras manöverenhetsens lock och gavel.

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EPAC

Standardprogram

Artikelnummer: 893400-020

Benämning
822207 Toyota

Satsnummer
822207

Notering
Epacregister nr 277

Maskin / Machine
Toyota 7FB 15 - 35

☒ 12V ☐ 24V

☐ 800mA ☒ 1600mA

Program version
1.14

Anm/Notes

Zener 78637
☐ På kort/ On card
☐ I kablage/ In harness

Kortanslutning/Card con.
☒ Rak/Straight 78886
☐ 90 ° 78766
☐ Lödning/ Soldering

Datum/ Date
2002-10-10

Av /By
PM

Epac nummer / Epac number						
Ser.nr.						
Par	1	2	3	4	5	6
- 0	50	50	50	50		
- 1	80	80	80	80		
- 2	50	50	50	50		
- 3	80	80	80	80		
- 4	00	00	00	00		
- 5	00	00	00	00		
- 6	00	00	00	00		
- 7	00	00	00	00		
- 8	00	00	00	00		
- 9	99	99	99	99		
Funk.	LIFT	TILT	3:E	4:E		

Morse Controls AB
Box 153
195 24 Märsta , SWEDEN
Tel: +46 8 59178900 Fax: +46 8 59114540

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Felmeddelanden

11

Kan uppstå p.g.a låg spänning under körning!

Display blinkar
Spaken befann sig utanför mittläget vid uppstart. En säkerhetskrets har deaktiverar alla utgångar på elektronikkortet för den aktuella spaken. Funktionen återstartas genom att matarspänningen bryts under en kort stund för att sedan åter kopplas in.

12

Aktivt område 0,125V - 4,875V

Display blinkar
Spaken befann sig under eller över dom gränsvärden som är satta för spaken. En säkerhetskrets har deaktiverar alla utgångar på elektronikkortet för den aktuella spaken. Funktionen återstartas genom att matarspänningen bryts under en kort stund för att sedan åter kopplas in.

21

Display blinkar
Denna felkod uppträder endast om två spakar är kopplade till samma elektronikkort. Den visar att spak 2 befann sig utanför mittläget vid uppstart. En säkerhetskrets har deaktiverar alla utgångar på elektronikkortet för den aktuella spaken. Funktionen återstartas genom att matarspänningen bryts under en kort stund för att sedan åter kopplas in.

22

Display blinkar
Denna felkod uppträder endast om två spakar är kopplade till samma elektronikkort. Den visar att spak 2 befann sig under eller över dom gränslägen som är satta för spaken. En säkerhetskrets har deaktiverar alla utgångar på elektronikkortet för den aktuella spaken. Funktionen återstartas genom att matarspänningen bryts under en kort stund för att sedan åter kopplas in.

88

Display blinkar (eller lyser konstant)
För låg spänningsmatning till manöverenheten eller till det elektronikkort där displayen blinkar.
Efter att felet åtgärdats, återstartas funktionen genom matarspänningen åter kopplas in.

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Kontroll & justering av spak

För att erhålla en hög precision från spaken är det viktigt att 0 läget för spakens potentiometer är korrekt justerat. *OBS! Detta är normalt gjort från fabrik men kan behöva efterjusteras vid exempelvis byte av potentiometer.*
Nedan beskrivs kontroll och justering av en linjärspak. Kontroll och justering av en koordinatspak går i praktiken till på samma sätt, dock kan det vid justering vara nödvändigt att demontera hela spaken för att komma åt potentiometerns låsning och justerspår.

1. Lossa ena gavelstycket från manöverenheten och ta samtidigt bort bottenplåten som är inskjuten i lådans slitsar.

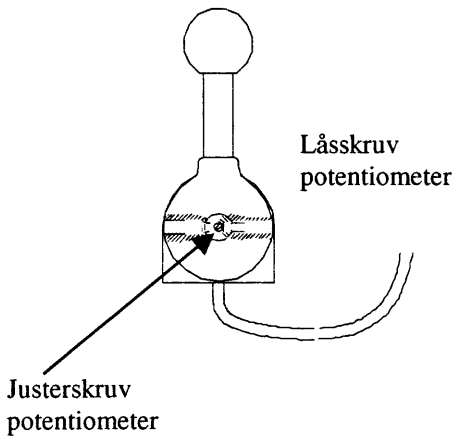
2. Vrid på tändningen samt se till att manöverenhetens strömställare är aktiverad.

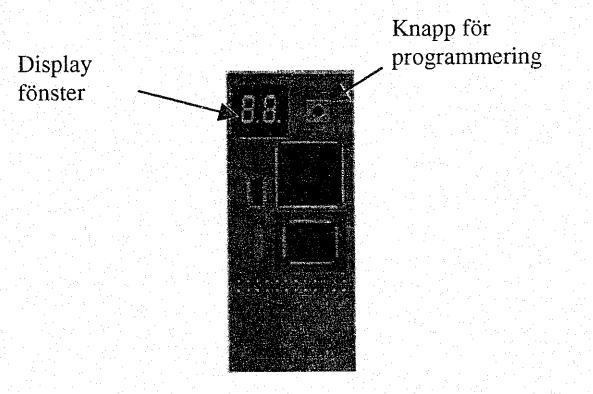
3. Tryck en gång på knappen för programmering på det elektronikkort som hör till den spak som skall justeras. I displayfönstret visas parameter A0.

4. Efter någon sekund skiftar displayfönstret till att visa potentiometerns värde, UU eller U0 till U9. Optimalt värdet är så nära U0 som möjligt. Om värdet är UU eller ligger mellan U4 till U9 måste spaken justeras.

5. Vid justering kan det vara nödvändigt att demontera en eller flera spakar för att komma åt att justera den aktuella spaken. Spakarna är monterade med två skruvar som demonteras från manöverenhetens insida. Koordinatspaken är monterad med fyra skruvar som blir åtkomliga om bälgen lossas

6. Lossa potentiometerns låsskruv med en 1,5 mm insexnyckel.

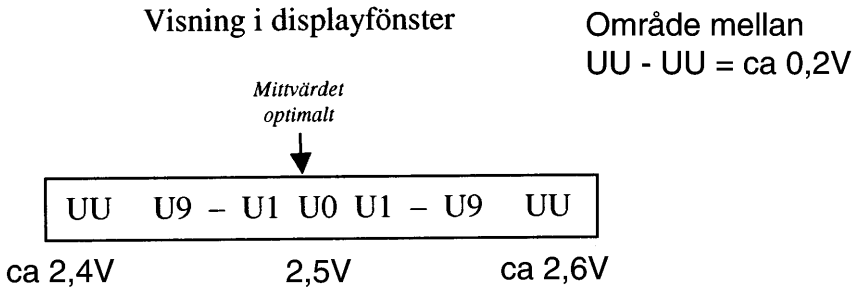




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7. Stick in en skruvmejsel med en klingbred av max 2,5 mm i genom spakens centrumaxel.

8. Justera potentiometern så nära U0 som möjligt. Glöm ej att låsa potentiometern genom att dra åt låsskruven.



Observera att potentiometern är mycket känslig. Det kan vara svårt att hinna med och se värdena i displayfönstret om man inte tar det väldigt försiktigt vid justering.

9. Efter den mekaniska justeringen av potentiometern, skall man ta som vana att läsa in potentiometerns mitt och ändlägen i elektroniken. Stega fram med knappen till parameter A1 (A2 om det är spak 2 till samma kort). Efter någon sekund visar displayfönstret 00 d.v.s. mittläge.
Det är i detta läge ytterst viktigt att spaken inte påverkas under ca 1 sekund då elektroniken nu läser in potensiometerns mittläge. Efter ca 1 sekund förs spaken fullt framåt och hålls i detta läge ca 1 sekund (minvärde). Därefter förs spaken fullt bakåt och hålls i detta läge ca 1 sekund (maxvärde). Släpp spaken och låt den gå tillbaka till sitt mittläge.Stega därefter med knappen till parameter - - för att spara dom nya värdena samt för att gå ur programmeringsläget. En bekräftelse på att värdena lagrats och att man är ute ur programmeringsläget är att displayen slocknar.

10. Efter justering återmonteras alla komponenter i omvänd ordning.

Vid minsta tveksamhet bör spaken bytas komplett eller skickas till Morse Controls AB för reparation och justering.

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Felsökning arbetshydraulik

Symtom	Orsak	Åtgärd
Manöverenheten ur funktion. Kontrollampa on/off knapp släckt.	Defekt spänningsmatning till manöverenheten.	Kontrollera säkringen i maskin. Defekt säkring byts ut. Kontrollera kablaget för spänningsmatning till manöverenheten med avseende på avbrott skador eller glapp. Skadat kablage repareras eller byts ut.
Manöverenheten ur funktion. Kontrollampa on/off knapp lyser.	Ingen spänningsmatning från on/off knapp till elektronikkorten.	Kontrollmät on/off knappen. Defekt knapp byts ut.
Manöverenheten ur funktion. Kontrollampa on/off knapp lyser, display på elektronikkort blinkar 88.	För låg spänning till ektronikkorten.	Kontrollera att det finns en stabil spänningsmatning till manöverenheten. Rengör eller byt ut skadade kablage eller kontaktdon. Om nödvändigt, monteras ett extra spännings-aggregat för att förse manöverenheten med en stabil spänning.
Enstaka funktioner utslagna, display på elektronikkort blinkar 11.	Spaken befann sig utanför mittläget vid uppstart av anläggningen. En säkerhetskrets bryter funktionen för att förhindra ofrivillig uppstart av en rörelse.	Släpp tillbaka spaken till neutralläge och återställ säkerhetskretsen genom att slå av och på manöverenheten en gång. Obs. spaken måste vara opåverkad i centrumläge.
	Ett tillfälligt spänningsfall i matningen till manöver-enheten har av säkerhets-kretsen uppfattats som om spaken befann sig utanför mittläget vid uppstart av anläggningen. Säkerhetskretsen bryter funktionen för att förhindra ofrivillig uppstart av en rörelse.	Kontrollera att det finns en stabil spänningsmatning till manöverenheten. Rengör eller byt ut skadade kablage eller kontaktdon. Om nödvändigt, monteras ett extra spännings-aggregat för att förse manöverenheten med en stabil spänning.

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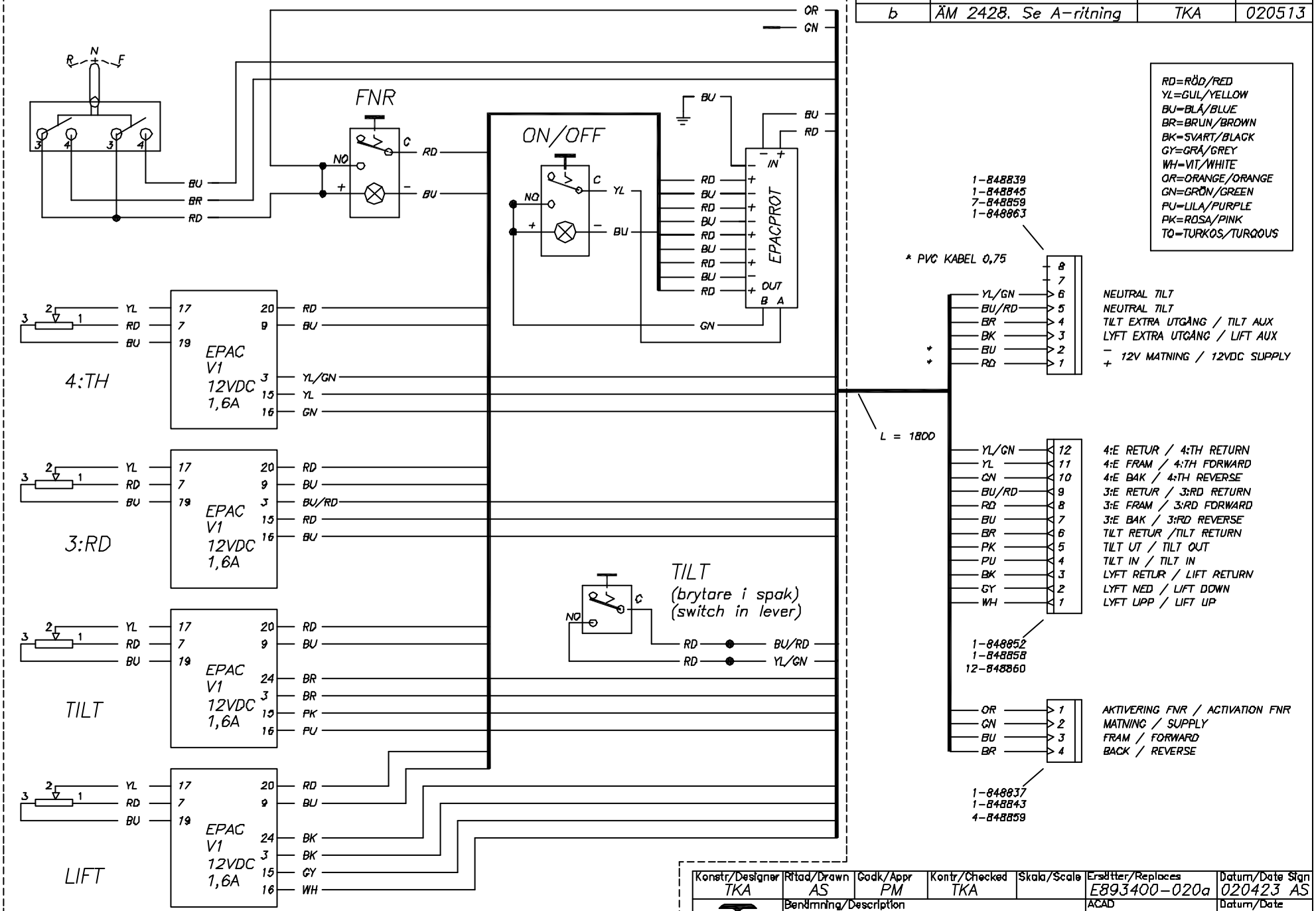
Enstaka funktioner utslagna, display på elektronikkort blinkar12.	Spaken befann sig under eller över dom gränsvärden som är satta för spaken. En säkerhetskrets bryter funktionen för att förhindra ofrivillig utstyrning om spakens kablar kortsluts eller får avbrott.	Justera den mekaniska inställningen av potentiometern i spaken. Se kontroll & justering av spak. Återställ säkerhetskretsen genom att slå av och på manöverenheten en gång.
	Spaken är ej elektriskt initierad.	Initiera spaken enligt anvisning. Se kontroll & justering av spak.
	Potentiometer defekt.	Byt potentiometer eller skicka manöverenheten till av Morse Controls AB godkänd serviceverkstad för reparation.
	Kablar mellan spakar och elektronikkort skadade.	Byt spak eller skicka manöverenheten till av Morse Controls AB godkänd serviceverkstad för reparation.
Rörelsen rycker igång när spaken kommer ur mittläget.	Startströmmen är för hög.	Sänk startströmmen parameter -0/-2.
Rörelsen långsam trots fullt spakutslag.	Slutströmmen för låg.	Öka slutströmmen parameter -1/-3.
	Slow knappen aktiverad (om sådan finns).	Deaktivera slow knappen.

Tips!
Om en enstaka funktion är utslagen, kan man på ett enkelt sätt ta reda på om felet är hydrauliskt eller elektriskt genom att skifta kontakterna mellan funktionerna nere på ställdonet eller omvandlarventilen.

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
b	ÄM 2428. Se A-ritning	TKA	020513

Nr. E 893400-020



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Denna ritning är Teleflex Morse Stockholm AB's egendom, skyddad enligt gällande lag.

A3

A	Smst.-ritning/Assembly dwg.	x	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		5	Strukturlista/Legend	
E	Principschema/Schematic	x			

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	PM	TKA		E893400-020a	020423 AS

Benämning/Description: MANÖVERENHET 12V ARBETSHYDRAULIK / CONTROL UNIT IMPLEMENT 12VDC

ACAD: 893400-020e — Datum/Date: 011009

Type: E — Ritningsnr/Drawing no: 893400-020 — Rev: c

Sats nr / Kit no:	Rev:	Benämning / Description:
822207	b	EPAC Arbetshydraulik, 4 funktioner, linjärspakar (en med brytare), FNR Toyota 7FB 15, 18, 20, 25 EPAC Implement control, 4 functions, linear levers (one with switch), FNR Toyota 7FB 15, 18, 20, 25



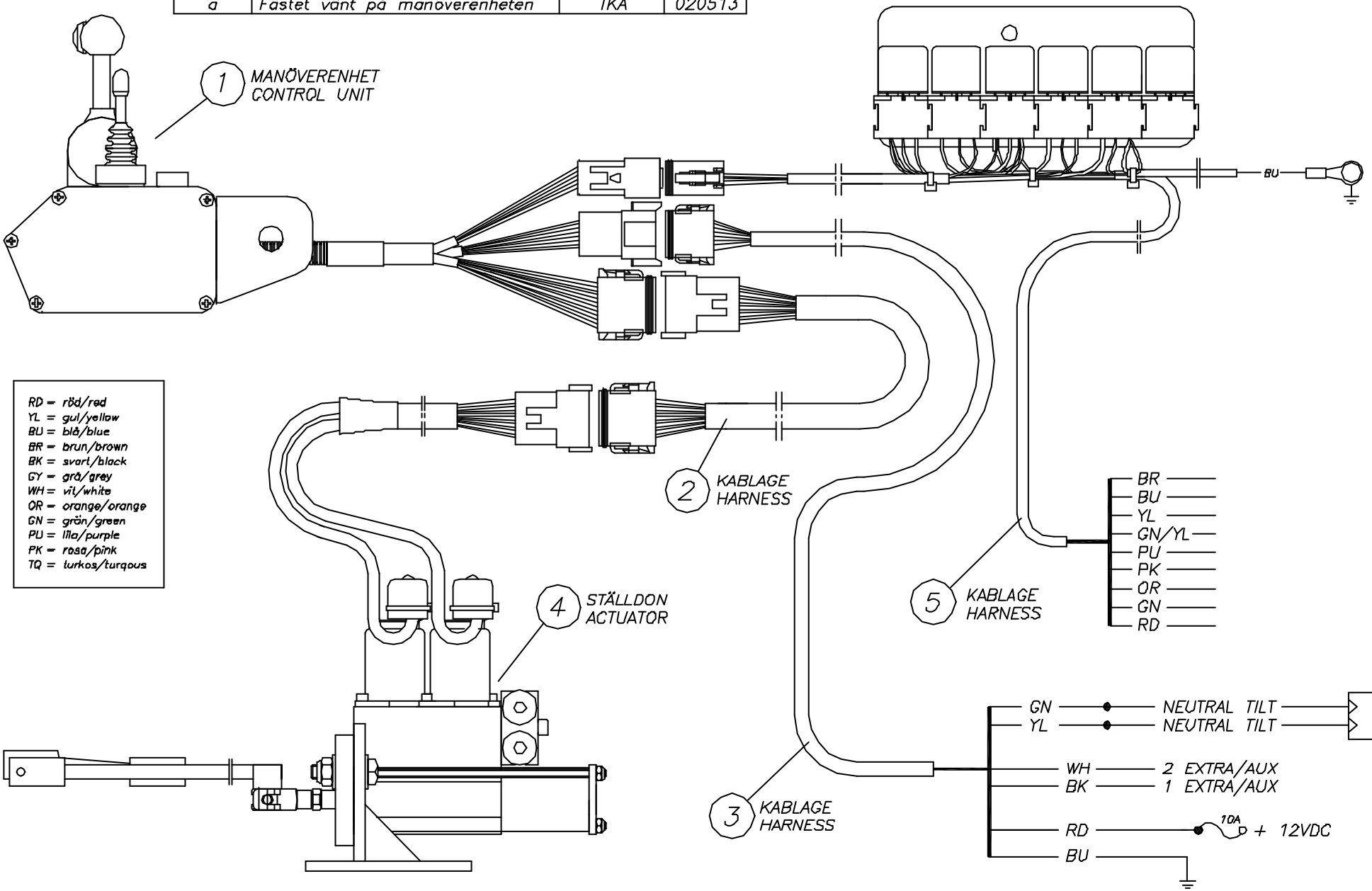
ANM/NOTE
Armstöd ingår ej.
Armrest not included.

Pos / Item	Artikel nummer / Part number:	Benämning	Description:	Antal/ Qty
	500937	Schema	Diagram	
	500946	Schema	Diagram	
	800340	Ventilfäste	Valve bracket	1
	800344	Kåpa	Cover	1
	816077	Ackumulator	Accumulator	1
	840803	Skruv till kåpa	Screw for cover	4
	846109	Slangsats	Hose kit	1
	861155	Buntband	Strap	5
	861156	Buntband	Strap	10
2	861256-030	Mellankablage	Harness	1
3	861304	Matningskablage	Harness	1
5	861309	Kablage FNR	Harness FNR	1
	861310	Kablage pumpstart	Harness	1
	868160	Tryckvakt	Pressure adj. switch	1
	868192	Pilotförsörjningsblock	Pilot valve block	1
4	868841-4038	Ställdon kpl	Actuator	1
1	893400-020	Manöverenhet m FNR	Control unit with FNR	1

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Fästet vänt på manöverenheten	TKA	020513

500937



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Denna ritning är Morse Controls AB:s egendom, skyddad enligt gällande lag.

A3

17-48

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA			500937	020423 AS
					ACAD 500937	Datum/Date 011009

MANÖVERSYSTEM ARB.HYDRAULIK
IMPLEMENT CONTROL SYSTEM

Type	Ritningsnr/Drawing no	Rev
	500937	a

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

868160

868XXX–XXXX
Ställdon
Actuator

T
P

868192

DR
P REG
P REG
DR

Riktningsventil
Directional valve
P
P OUT

P IN

Pump

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Nr. 500946

A3

17-49

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA	PM			

Benämning/Description
PILOTTRYCKSFÖRSÖRJNING
PILOT PRESSURE SUPPLY

ACAD 500946 | Datum/Date 020205

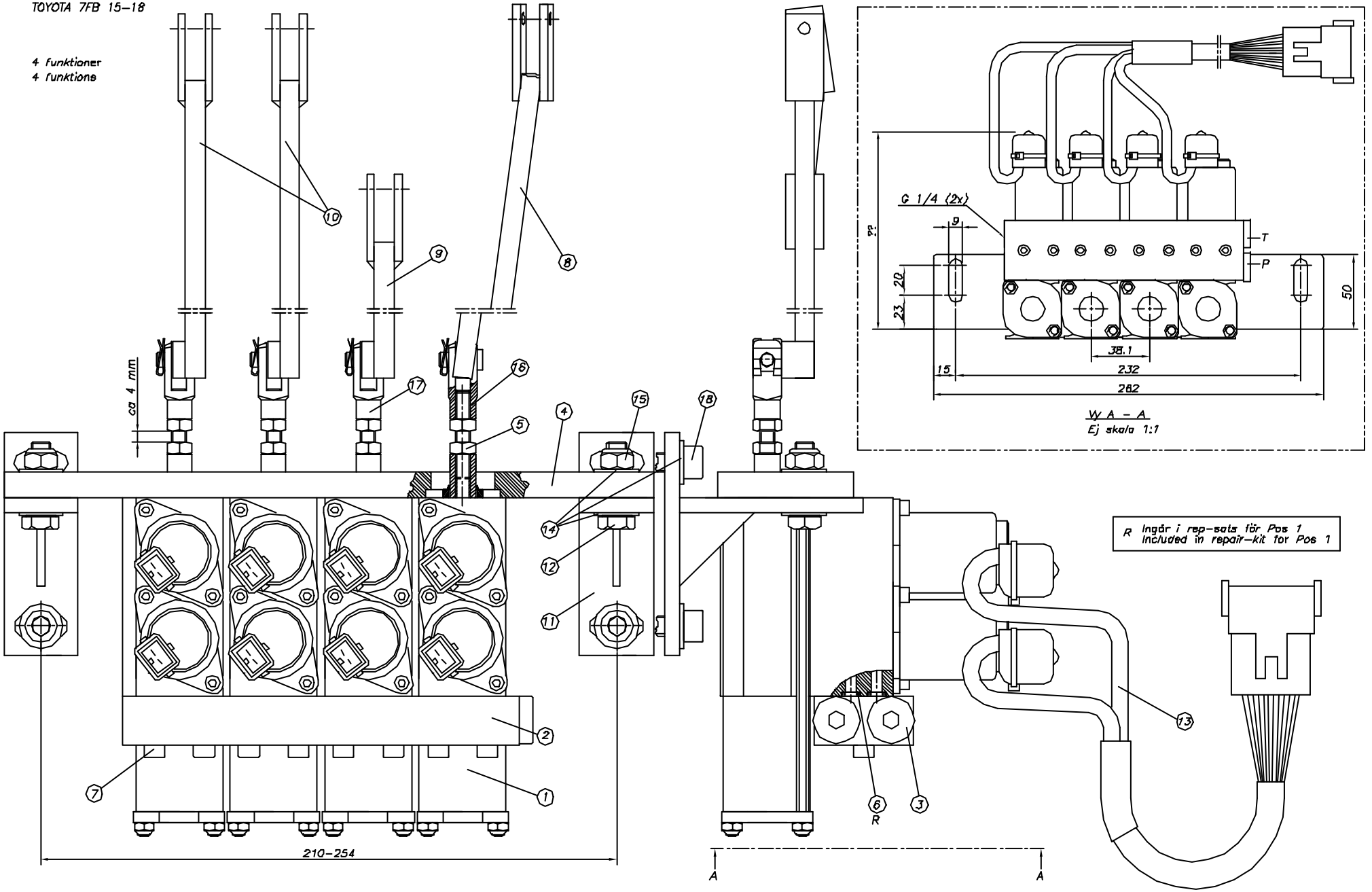
Type | Ritningsnr/Drawing no 500946 | Rev

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

TOYOTA 7FB 15–18

4 funktioner
4 funktions



Nr. 868841–4038

A2

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Denna ritning är Norma Controls AB:s egendom, skyddad enligt gällande lag.

17-50

A	Smält.–ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	ASA	TKA		1:1		

Benämning/Description
STÄLLDON KPL.12VDC
ACTUATOR ASSY. 12VDC

ADAD 868841–4038 Datum/Date 020122

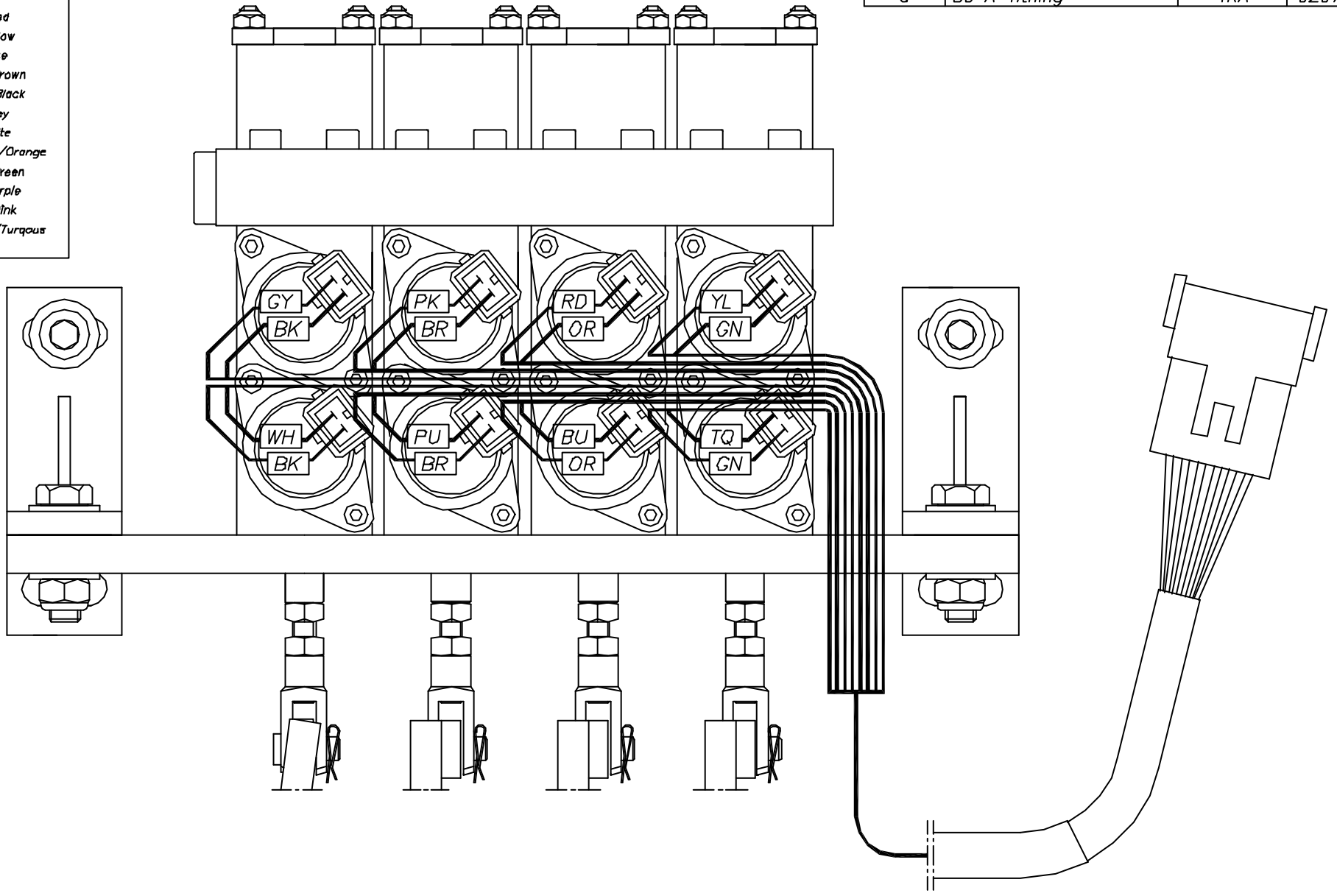
Type Ritningsnr/Drawing no A 868841–4038 Rev

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Revision	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Se A-ritning	TKA	020722

Nr E868841-4038

RD-Röd/Red
YL-Gul/Yellow
BU-Blå/Blue
BR-Brun/Brown
BK-Svart/Black
GY-Grå/Grey
WH-Vit/White
OR-Orange/Orange
GN-Grön/Green
PU-Lila/Purple
PK-Rosa/Pink
TQ-Turkos/Turqous



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A3

Denna ritning är Morse Controls AB's egendom, skyddad enligt gällande lag.

17-51

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA		1:1	868841-4038	020705 AS

Benämning/Description
STÄLLDON KPL. 12V
ACTUATOR ASSEMBLY 12VDC

ACAD 868841-4038e — Datum/Date 020705AS

Type E — Ritningsnr/Drawing no 868841-4038 — Rev a

A	Smst.-ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

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Sats nr / Kit no:	Rev:	Benämning / Description:
822208	b	EPAC Arbetshydraulik, 4 funktioner, linjärspakar (en med brytare), FNR Toyota 7FBH 15, 18, 20, 25
Morse Controls		EPAC Implement control, 4 functions, linear levers (one with switch, FNR Toyota 7FBH 15, 18, 20, 25

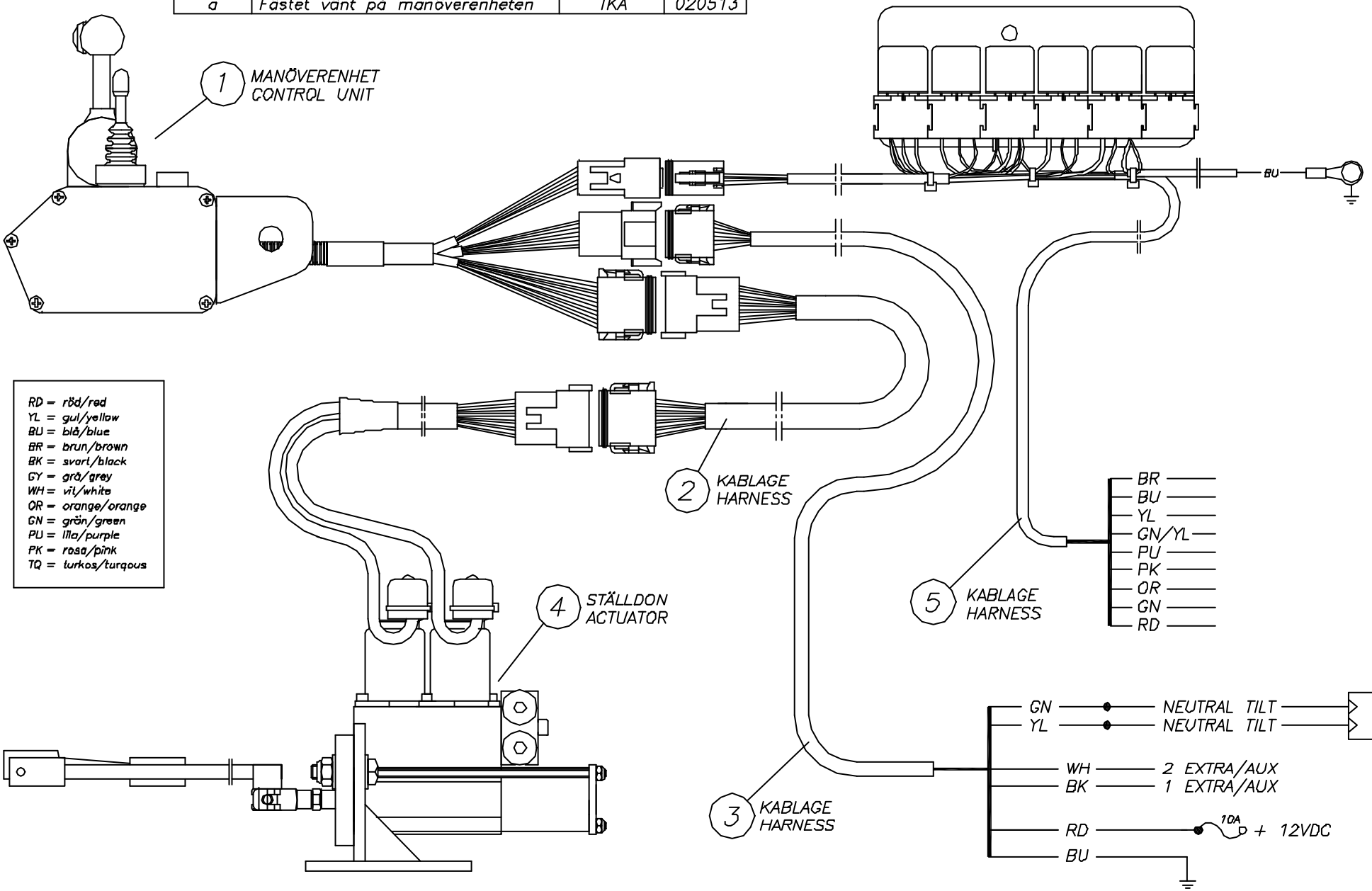
ANM/NOTE
Armstöd ingår ej.
Armrest not included.

Pos / Item	Artikel nummer / Part number:	Benämning	Description:	Antal/ Qty
	500937	Schema	Diagram	
	500946	Schema	Diagram	
	800340	Ventilfäste kpl	Valve bracket	1
	800344	Täck-kåpa	Cover	1
	816077	Ackumulator	Accumulator	1
	840803	Skruv CSS B4x9.5	Screw for cover	4
	846109	Slangsats	Hose kit	1
	861155	Buntband	Strap	5
	861156	Buntband	Strap	10
2	861256-030	Mellankablage 3m	Harness	1
3	861304	Matningskablage	Harness	1
5	861309	FNR kablage	Harness FNR	1
	861310	Kablage pumpstart	Harness	1
	868160	Tryckvakt	Pressure adj. switch	1
	868192	Pilotförsörjningsblock	Pilot valve block	1
4	868841-4041	Ställdon kpl	Actuator assembly	1
1	893400-020	Manöverenhet m FNR	Control unit m FNR	1

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Fästet vänt på manöverenheten	TKA	020513

500937



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A3

17-53

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA			500937	020423 AS
					ACAD 500937	Datum/Date 011009
					Type	Ritningsnr/Drawing no 500937	Rev a

TeleFlex Morse

MANÖVERSYSTEM ARB.HYDRAULIK
IMPLEMENT CONTROL SYSTEM

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

Nr. 500946

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A3

868160

868XXX–XXXX
Ställdon
Actuator

T
P

868192

DR
P REG
P REG
DR

Riktningsventil
Directional valve
P

P OUT

P IN

Pump

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA	PM			

Teleflex Morse

Benämning/Description
PILOTTRYCKSFÖRSÖRJNING
PILOT PRESSURE SUPPLY

ACAD 500946

Datum/Date 020205

Type | Ritningsnr/Drawing no 500946 | Rev

17-54

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Se Ämne nr 2454	TKA	020722

TOYOTA 7FB 20-25

4 funktioner
4 funktions

Mutter dras fast med 2 Nm. Verktyg V868841.

3x

ca 4 mm

B = BIPACKAS/ENCLOSED
Pos 5 (4x), 8, 9, 10, 11, 12, 14, 15, 17 & 18.

C 1/4 (2x)

T
P

38.1

262

W A - A
Ej skala 1:1

R Ingår i rep-sats för Pos 1
Included in repair-kit for Pos 1

210-254

A

A

Nr. 868841-4041

17-55

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A2

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	ASA	TKA		1:1	A868841-4041	020703 AS

Benämning/Description: STÄLLDON KPL.12VDC / ACTUATOR ASSY. 12VDC

ADAB: 868841-4041 Datum/Date: 020418

Typ/Type: A Ritningsnr/Drawing no: 868841-4041 Rev: a

Tejlefiellverse

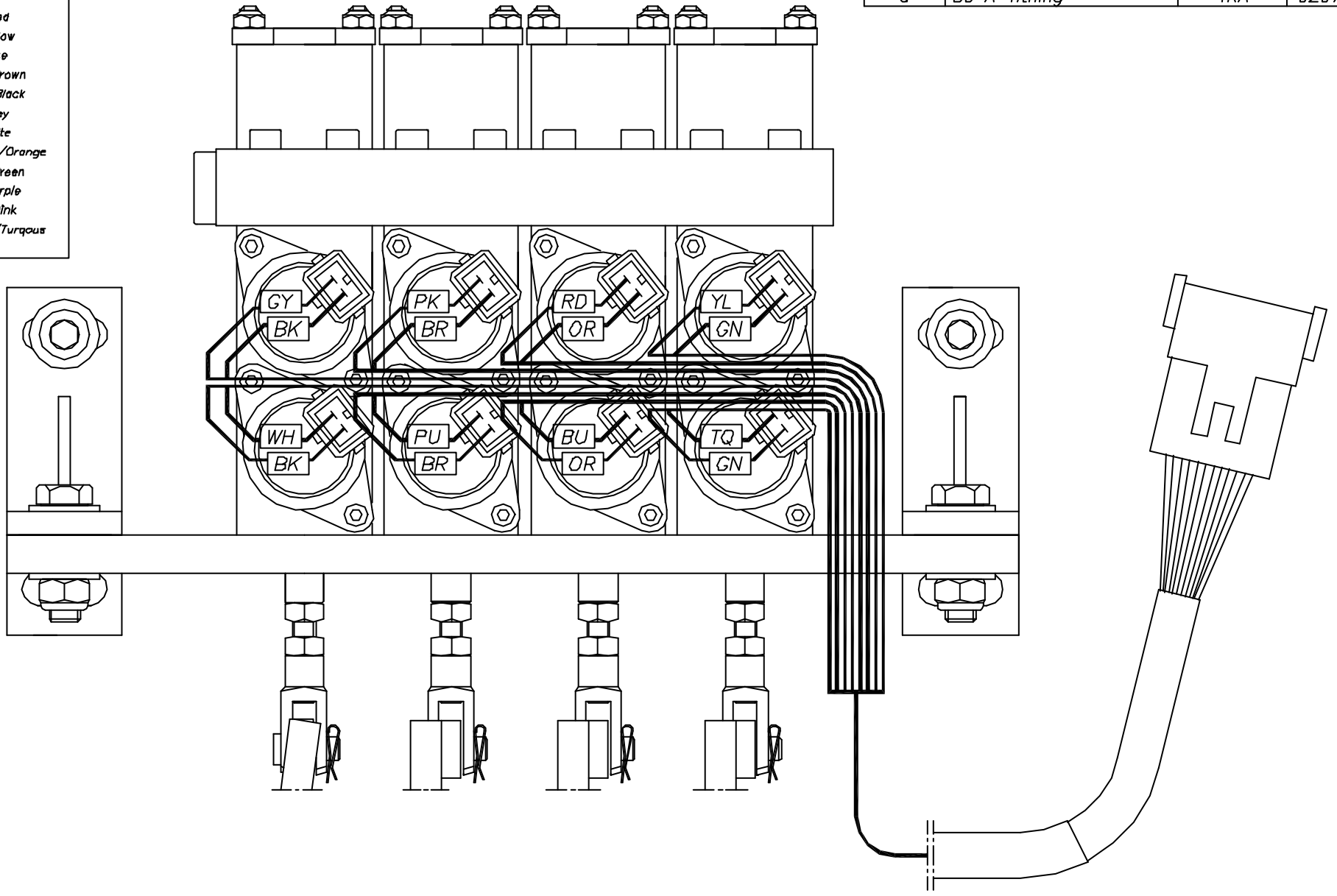
A	Smält.-ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

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Revision	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Se A-ritning	TKA	020722

Nr E868841-4041

RD-Röd/Red
YL-Gul/Yellow
BU-Blå/Blue
BR-Brun/Brown
BK-Svart/Black
GY-Grå/Grey
WH-Vit/White
OR-Orange/Orange
GN-Grön/Green
PU-Lila/Purple
PK-Rosa/Pink
TQ-Turkos/Turqous



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A3

Denna ritning är Morse Controls AB's egendom, skyddad enligt gällande lag.

17-56

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA		1:1	E 868841-4041	020705 AS

Benämning/Description
STÄLLDON KPL. 12V
ACTUATOR ASSEMBLY 12VDC

ACAD 868841-4041e — Datum/Date 020705 AS

Type E — Ritningsnr/Drawing no 868841-4041 — Rev a

A	Smst.-ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

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Sats nr / Kit no:	Rev:	Benämning / Description:
822209	a	EPAC Arbetshydraulik, 4 funktioner, linjärspakar (en med brytare), FNR Toyota 7FB 30, 35 EPAC Implement control, 4 functions, linear levers (one with switch), FNR Toyota 7FB 30, 35

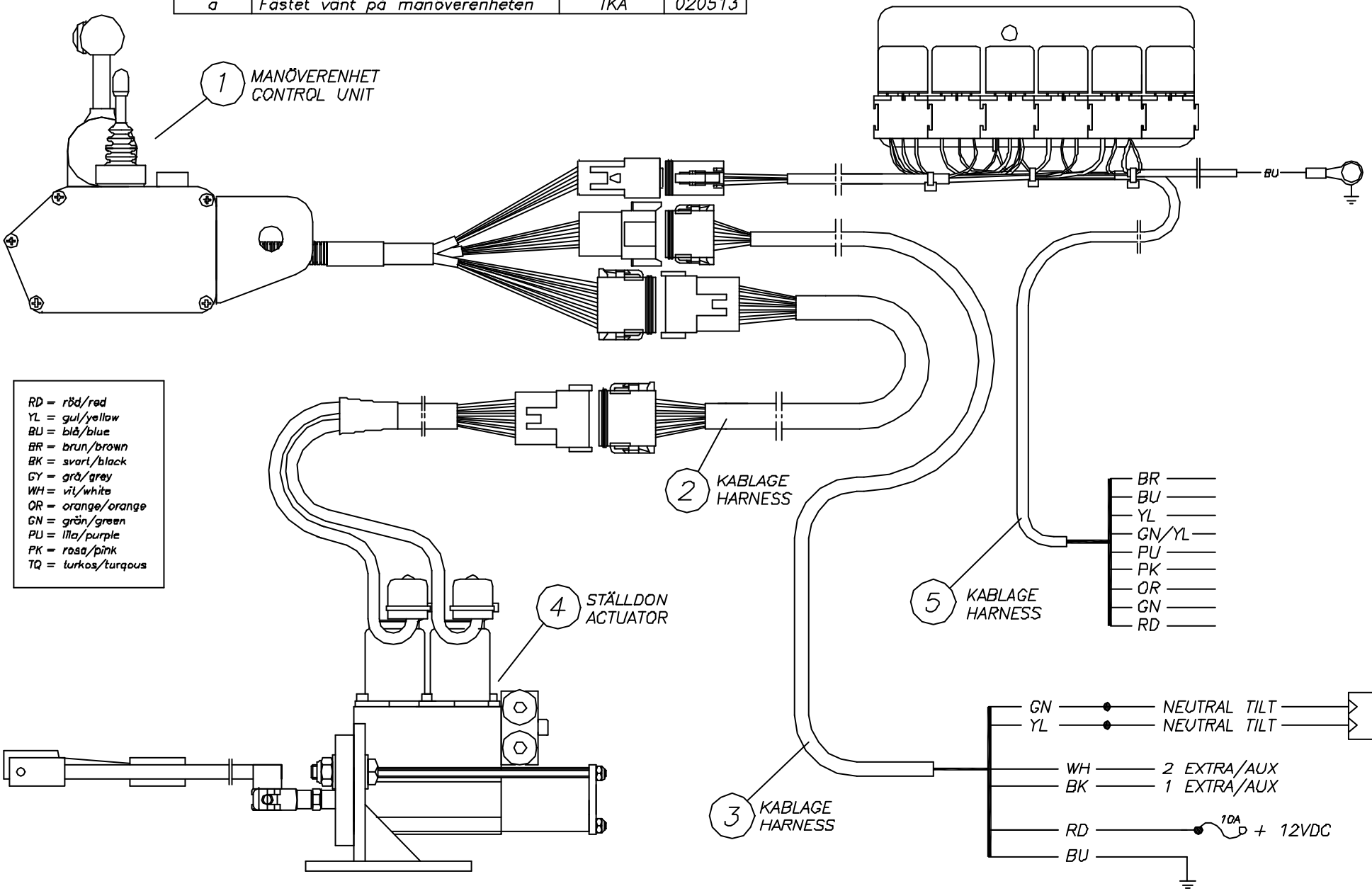
ANM/NOTE
Armstöd ingår ej.
Armrest not included.

Pos / Item	Artikel nummer / Part number:	Benämning	Description:	Antal/ Qty
	500937	Schema	Diagram	
	500946	Schema	Diagram	
	800340	Ventilfäste	Valve bracket	1
	800344	Kåpa	Cover	1
	816077	Ackumulator 10 bar	Accumulator	1
	840803	Skruv till kåpan	Screw CSS B4x9.5	4
	846109	Slangsats	Hose kit	1
	861155	Buntband	Strap	5
	861156	Buntband	Strap	10
2	861256-030	Mellankablage	Harness	1
3	861304	Matningskablage	Harness	1
5	861309	FNR kablage	Harness FNR	1
	861310	Kablage pumpstart	Harness	1
	868160	Tryckvakt	Pressure adj. switch	1
	868192	Pilotventilblock	Pilot valve block	1
4	868841-4043	Ställdon kpl	Actuator assembly	1
1	893400-020	Manöverenhet m FNR	Control unit with FNR	1

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Fästet vänt på manöverenheten	TKA	020513

500937



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A3

17-58

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA			500937	020423 AS

TeleFlex Morse	MANÖVERSYSTEM ARB.HYDRAULIK IMPLEMENT CONTROL SYSTEM	ACAD 500937	Datum/Date 011009
		Type	Ritningsnr/Drawing no 500937
			Rev a

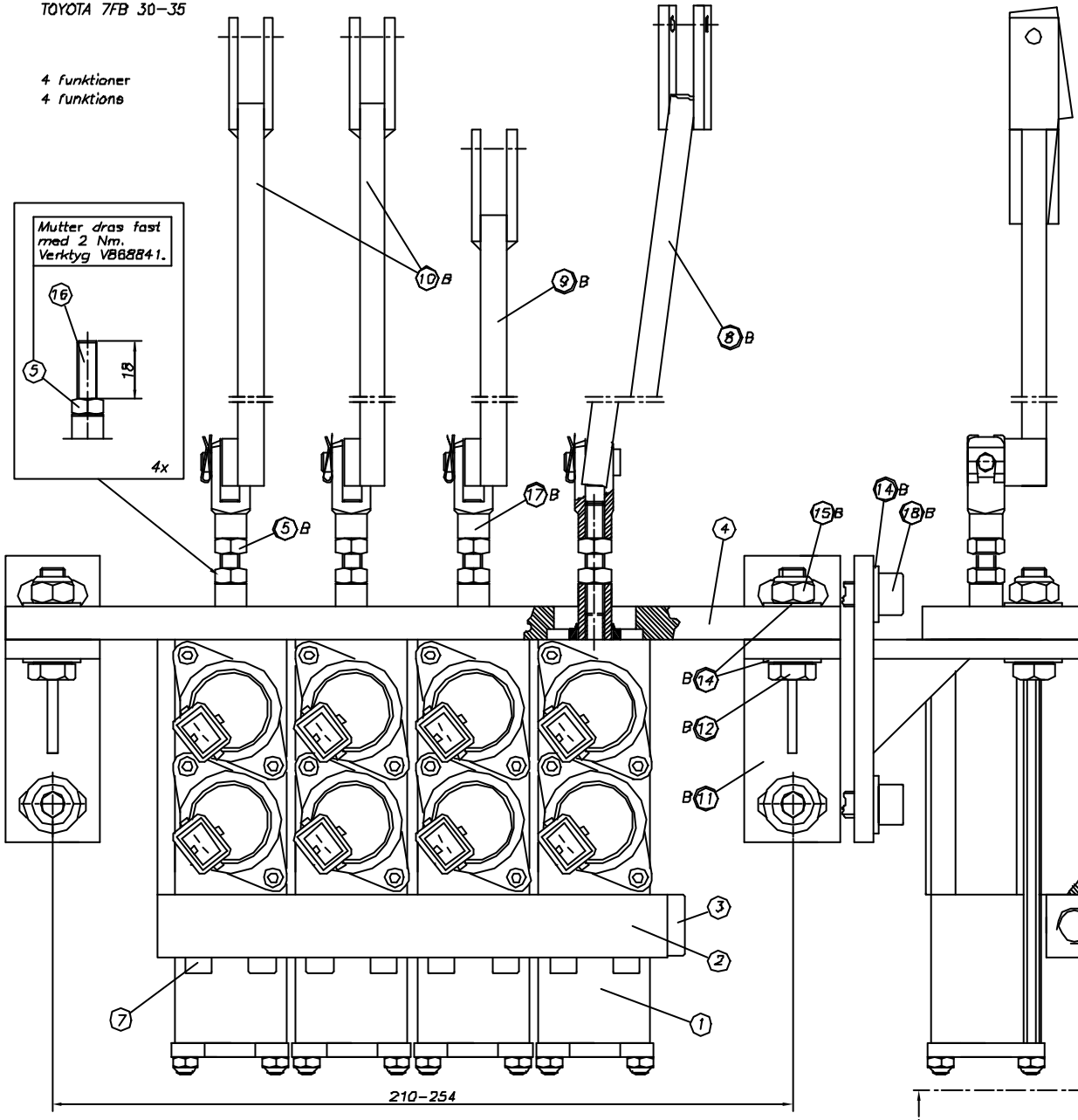
www.truck-freeworkshop.com

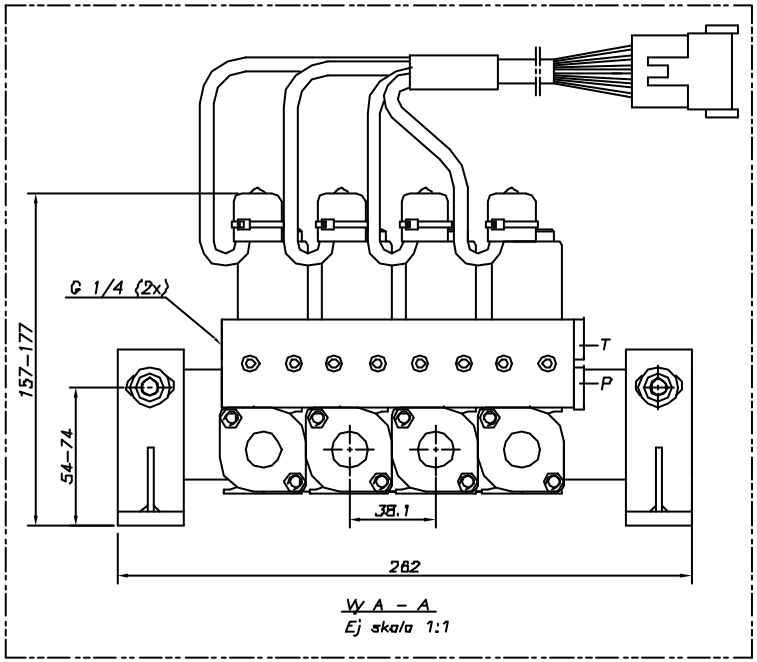
Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

TOYOTA 7FB 30–35

4 funktioner
4 funktions

Mutter dras fast med 2 Nm. Verktyg VB68841.





R Ingår i rep-sats för Pos 1
Included in repair-kit for Pos 1

B = BIPACKAS/ENCLOSED
Pos 5 (4x), 8, 9, 10, 11, 12, 14, 15, 17 & 18.

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	ASA	TKA		1:1		

Benämning/Description
STÄLLDON KPL.12VDC
ACTUATOR ASSY. 12VDC

ADAD	Datum/Date
868841–4043	020808

Typ/Type	Ritningsnr/Drawing no	Rev
A	868841–4043	

A	Smält.–fästning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

Nr. 868841–4043

A2

Denna ritning är Norma Controls AB's egendom, skyddad enligt gällande lag.

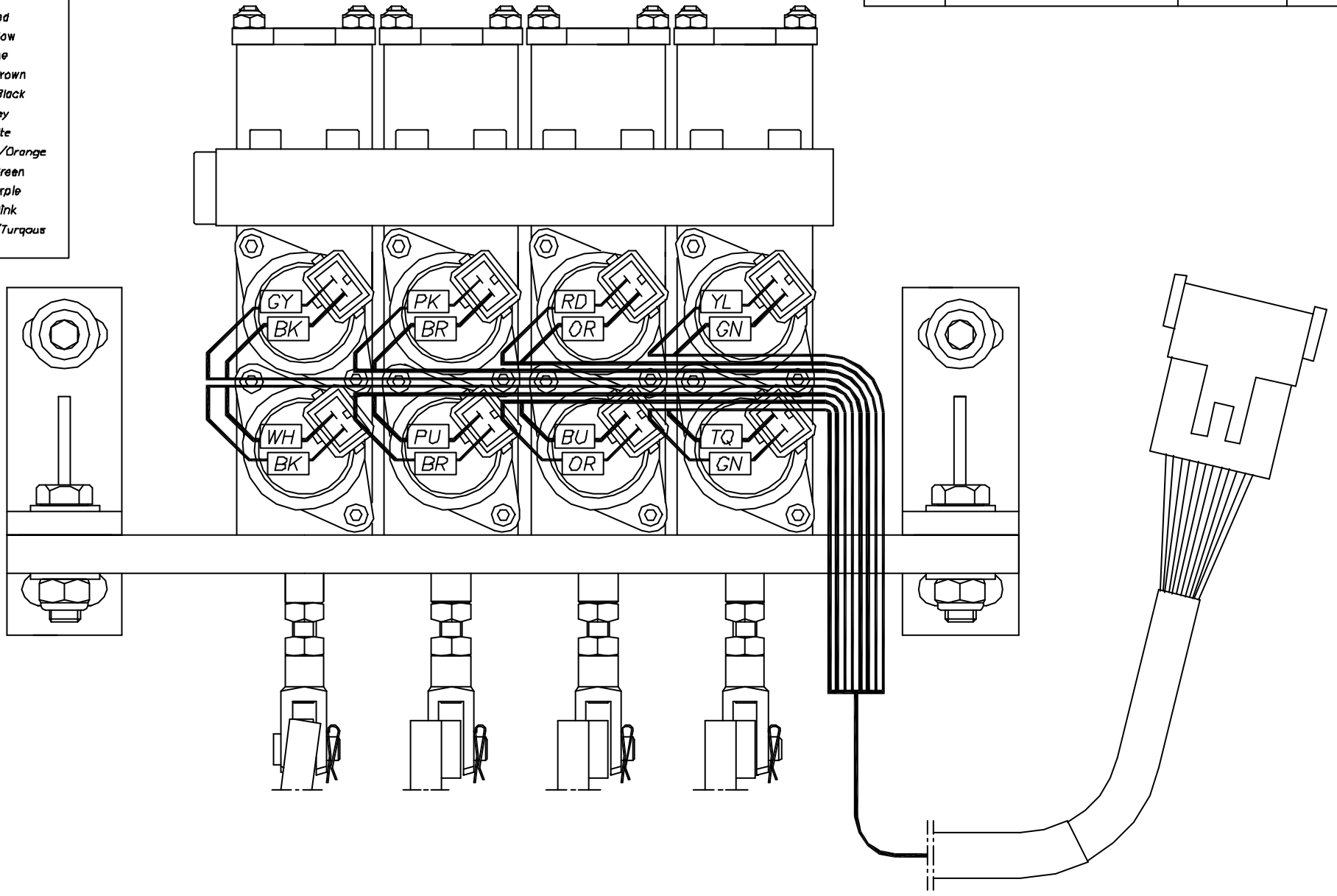
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Revision	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

Nr E868841-4043

RD–Röd/Red
YL–Gul/Yellow
BU–Blå/Blue
BR–Brun/Brown
BK–Svart/Black
GY–Grå/Grey
WH–Vit/White
OR–Orange/Orange
GN–Grön/Green
PU–Lila/Purple
PK–Rosa/Pink
TQ–Turkos/Turquous



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A3

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17-60

A	Smst.–ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA		1:1		

Benämning/Description
STÄLLDON KPL. 12V
ACTUATOR ASSEMBLY 12VDC

ACAD 868841-4043 | Datum/Date 020808

Type E | Ritningsnr/Drawing no 868841-4043 | Rev

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

500946

Nr.

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Denna ritning är Teleflex Morse Stockholm AB:s egendom, skyddad enligt gällande lag.

A3

868160

868XXX–XXXX
Ställdon
Actuator

T
P

868192

DR
P REG
P REG
DR

Riktningsventil
Directional valve
P

P OUT

P IN

Pump

17-61

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA	PM			

Benämning/Description
PILOTTRYCKSFÖRSÖRJNING
PILOT PRESSURE SUPPLY

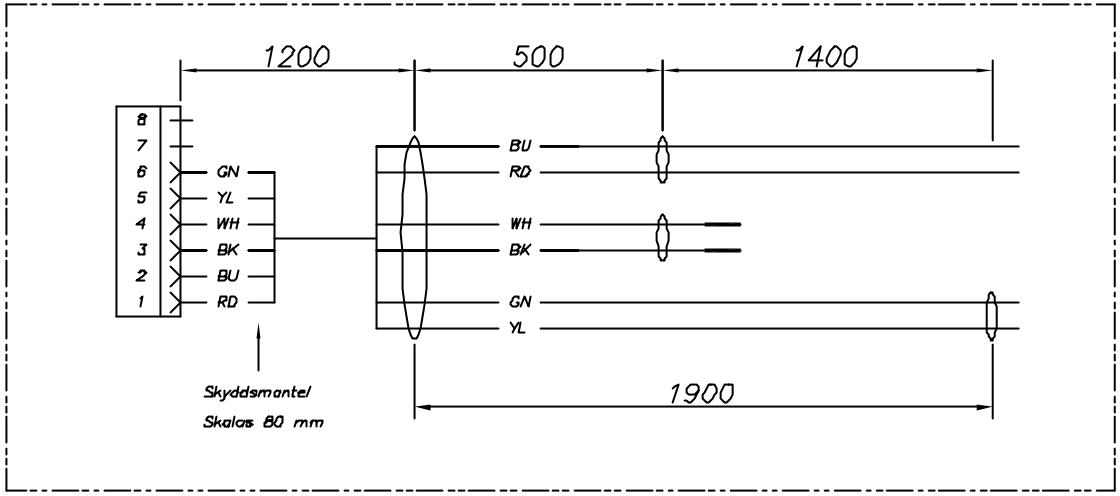
ACAD 500946
Datum/Date 020205

Type | Ritningsnr/Drawing no 500946 | Rev

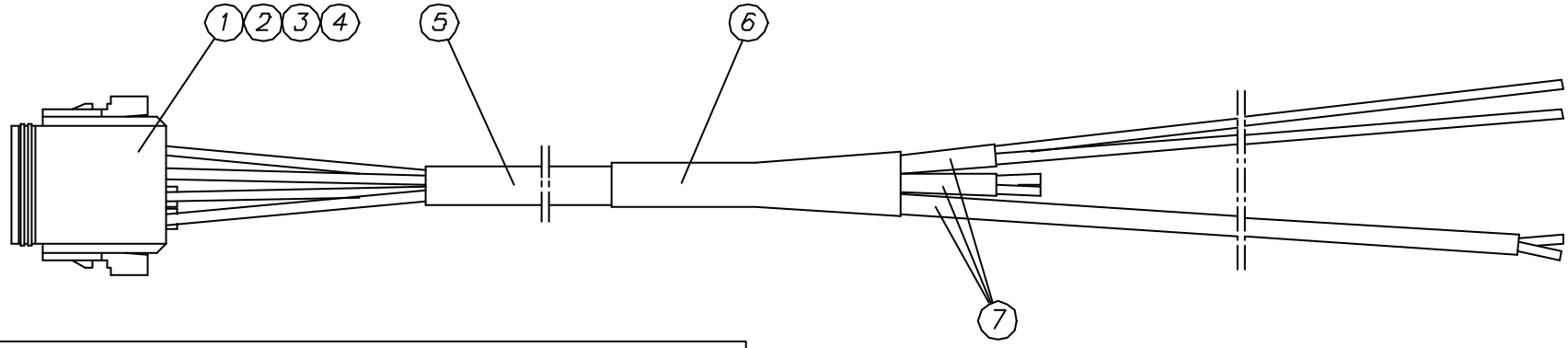
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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

Nr. 861304



RD–Röd/Red
YL–Gul/Yellow
BU–Blå/Blue
BR–Brun/Brown
BK–Svart/Black
GY–Grå/Grey
WH–Vit/White
OR–Orange/Orange
GN–Grön/Green
PU–Lila/Purple
PK–Rosa/Pink
TQ–Turkos/Turqous



BIPACKAS



861050 (1x)

849165 (1x)

861577 (2x)

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A3

17-62

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
PM	AS	TKA	X	1:1		

Benämning/Description
MATNINGSKABLAGE
SUPPLY HARNESS

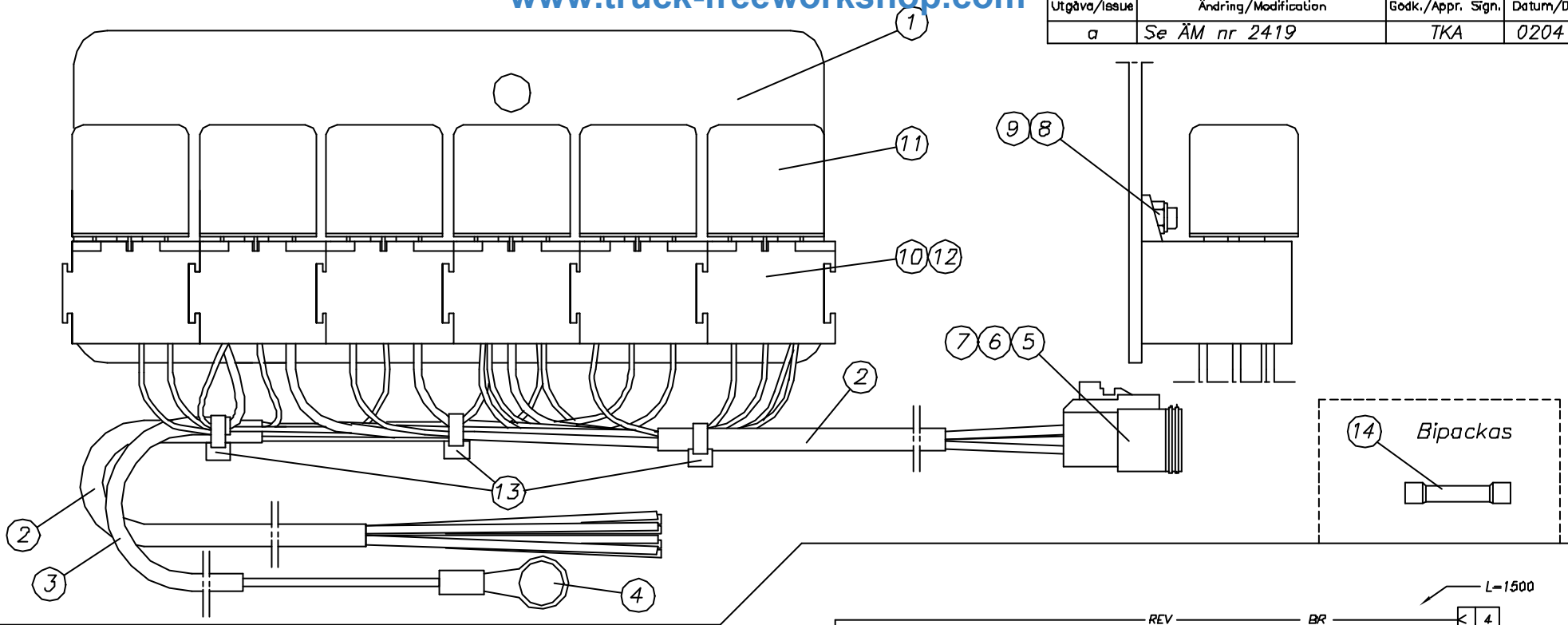
ACAD	Datum/Date
861304	011001

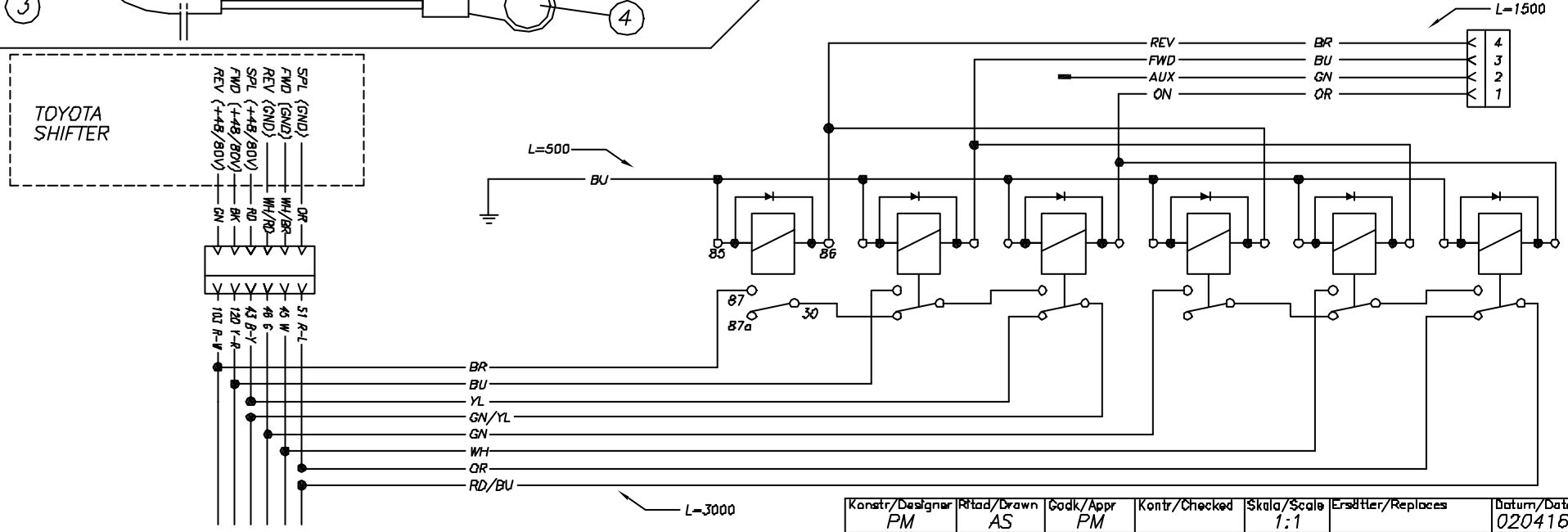
Type	Ritningsnr/Drawing no	Rev
	861304	

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Utgåva/Issue	Ändring/Modification	Godk./Appr. Sign.	Datum/Date
a	Se ÄM nr 2419	TKA	020418

Nr. A 861309





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A3

17-63

A	Smst.-ritning/Assembly dwg.	x	M	Monteringsinstr./Assembly instruction			
C	Kundritning/Customer dwg.		S	Strukturlista/Legend			
E	Principschema/Schematic	x					

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
PM	AS	PM		1:1		020416 AS

Teleflex Morse

Benämning/Description: KABLAGE/HARNESS

ACAD 861309 | Datum/Date 020104

Type A | Ritningsnr/Drawing no 861309 | Rev a

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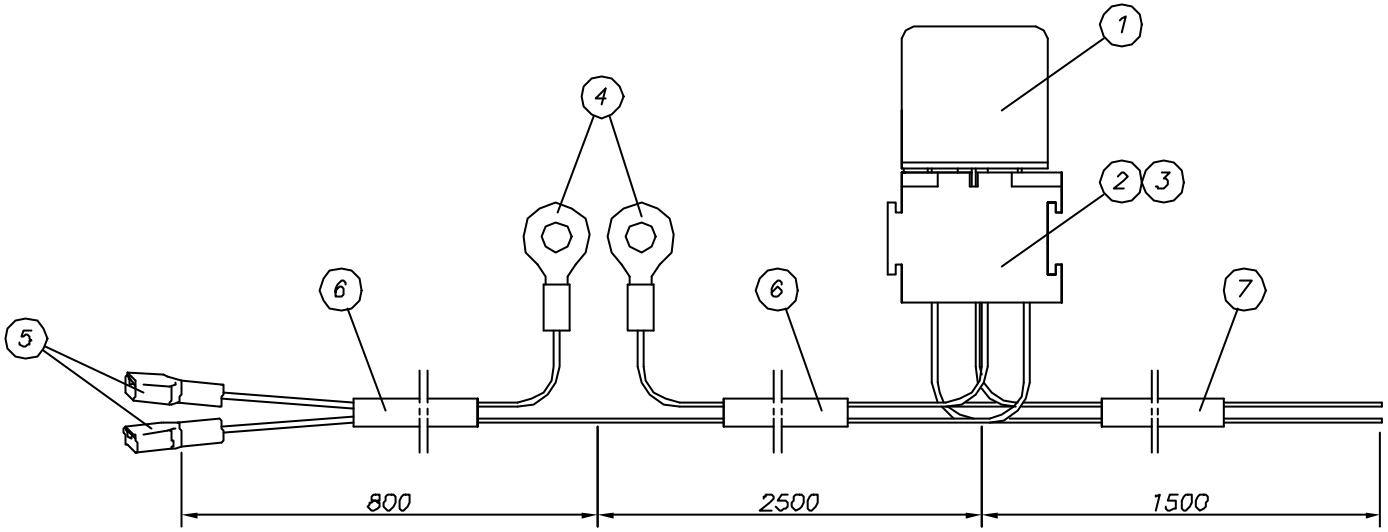
Revision	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

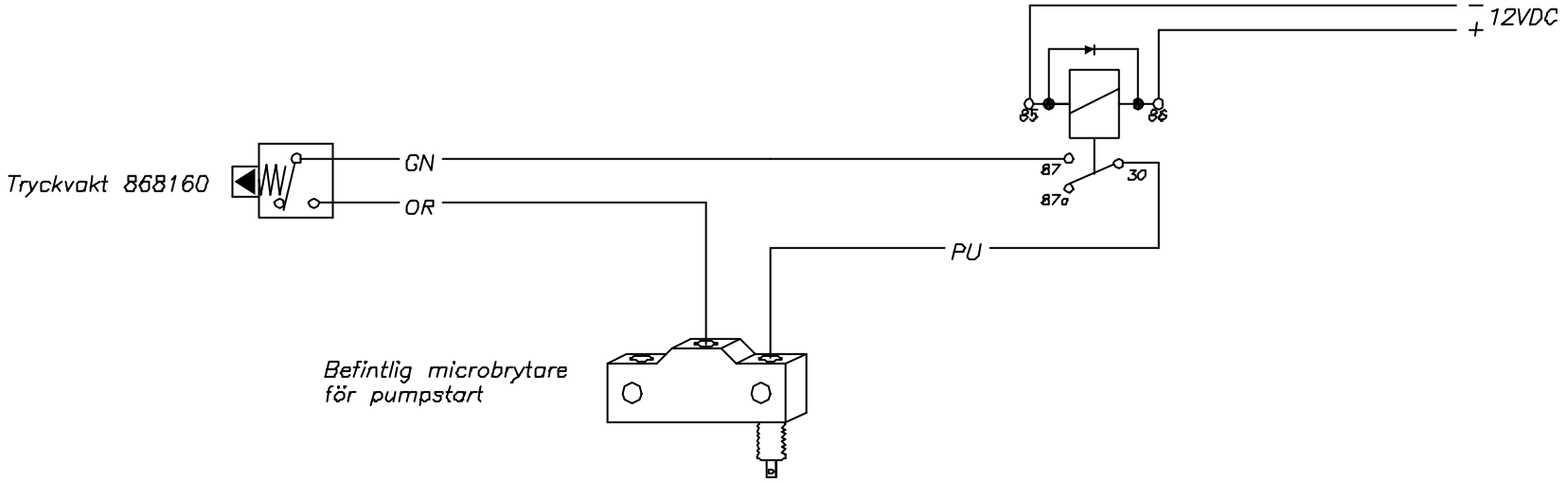
Nr. 861310

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A3





A	Smst.–ritning/Assembly dwg.	M	Monteringsinstr./Assembly instruction
C	Kundritning/Customer dwg.	S	Strukturlista/Legend
E	Principschema/Schematic		

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
TKA	AS	TKA	KR	1:1		

Benämning/Description: KABLAGE HARNESS

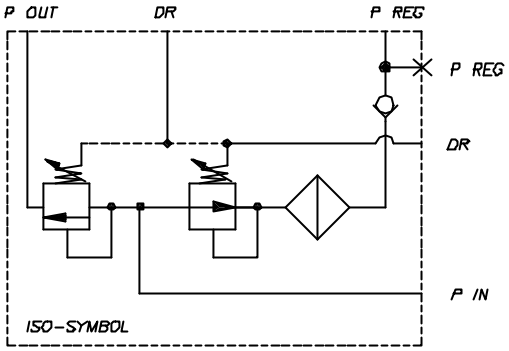
ACAD 861310 | Datum/Date 020816

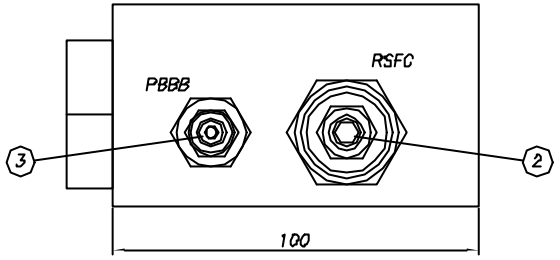
Type A | Ritningsnr/Drawing no 861310 | Rev

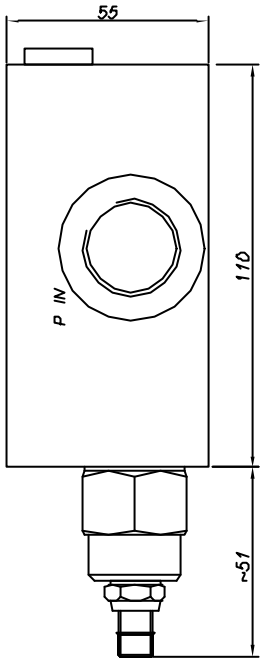
17-64

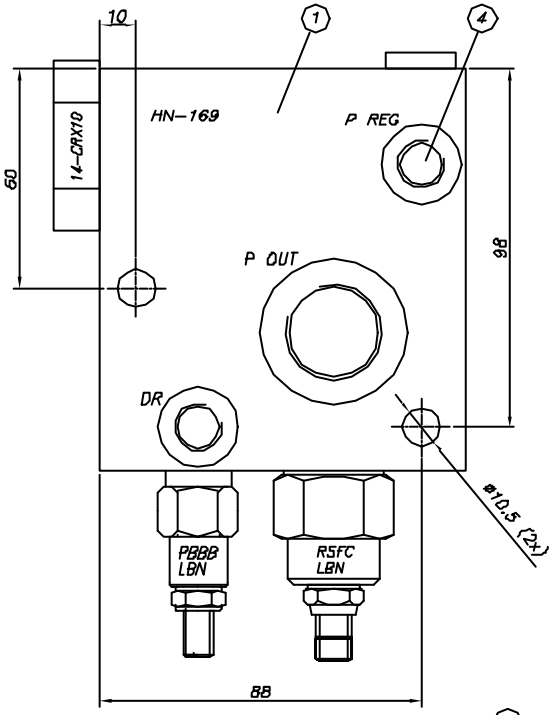
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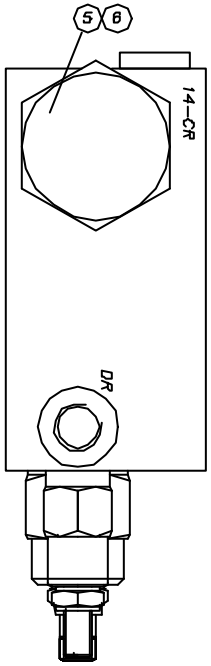
Revision	Ändring/Modification	Godk./Appr. Sign.	Datum/Date

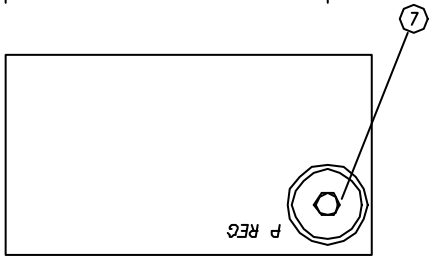












Port:
P OUT & P IN = ISO G3/4
P REG & DR = ISO G1/4

Pos nr/ Item no	Ant/ Qty	Benämning	Description
7	1	Plugg VSTI G1/4-ED	Plug
6	1	Plugg A-604-14	Plug
5	1	Filterinsats 14-CRZX10	Filter
4	1	Backventil RHR-14 G1/4	Check valve
3	1	Tryckreduceringsventil PBBB-LBN	Pressure reducing valve
2	1	Sekvensventil RSFC-LBN	Sequence valve
1	1	Ventilblock HN-169	Valve block

Konstr/Designer	Ritad/Drawn	Godk/Appr	Kontr/Checked	Skala/Scale	Ersätter/Replaces	Datum/Date Sign
011528	AS	PM		1:1		

PILOTFÖRSÖRJNINGSBLOCK MED BACKVENTIL
PILOT VALVE BLOCK ASSEMBLY

ACAD 868192 — Datum/Date 011115

Type | Ritningsnr/Drawing no | Rev.
C 868192

A	Smält.-ritning/Assembly dwg.	M	Monteringsinstr./Assembly instruction
C	Kundritning/Customer dwg.	S	Strukturlista/Legend
E	Principschema/Schematic		

Nr. 868192

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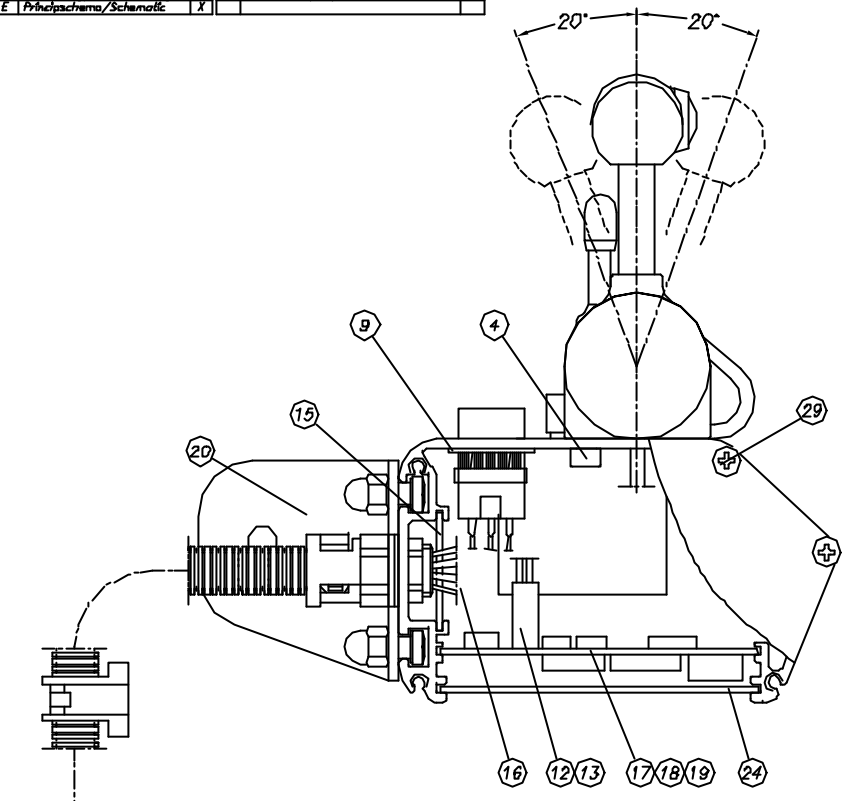
A2

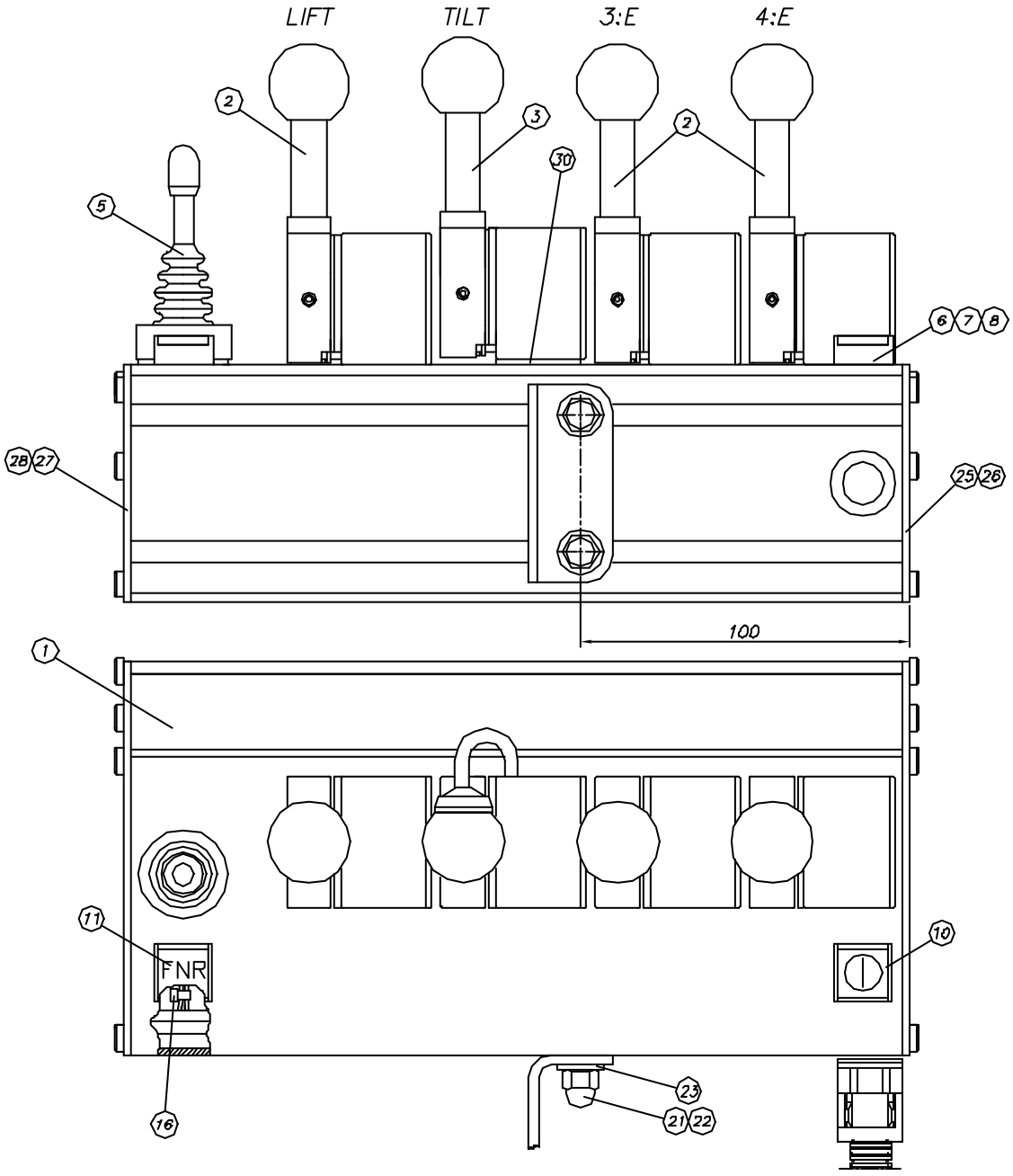
17-65

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A	Situt.-ritning/Assembly dwg.	X	M	Monteringsinstr./Assembly instruction	
C	Kundritning/Customer dwg.		S	Strukturlista/Legend	
E	Principschema/Schematic	X			

Revision	Ändring/Modification	Sign.	Datum/Date
c	Se ÄM nr 2428	TKA	020513





Konstr/Designer TKA	Ritad/Drawn AS	Godk/Appr TKA	Kontr/Checked	Skala/Scale 1:1	Ersätter/Replaces A 893400-020b	Datum/Date Sign 020423 AS
	MANÖVERENHET 12V				ADAD 893400-020	Datum/Date 011003
	ARBETSHYDRAULIK				Type Ritningsnr/Drawing no A 893400-020	Rev. c
	CONTROL UNIT IMPLEMENT 12VDC					

Nr A 893400-020

A2

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SAS FUNCTIONS (OPT)

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GENERAL

SAS (System of Active Stability) Configuration

Sensors and switches installed in various places on the vehicle detect the motions of the vehicle and send respective signals to the controller. According to these signals, each actuator is driven to effect rear wheel swing control (S), mast tilting control (T) and knob position correction (K).

Control			Functional part
S	T	K	
O	O		Lifting height switch L
	O		Tilting angle sensor
	O		Forward tilt switch
	O		Backward tilt switch
O	O		Load sensor
	O		Tilt knob switch
O		O	Speed sensor
		O	Steering wheel angle sensor
		O	Tire angle sensor
O			Yaw rate sensor

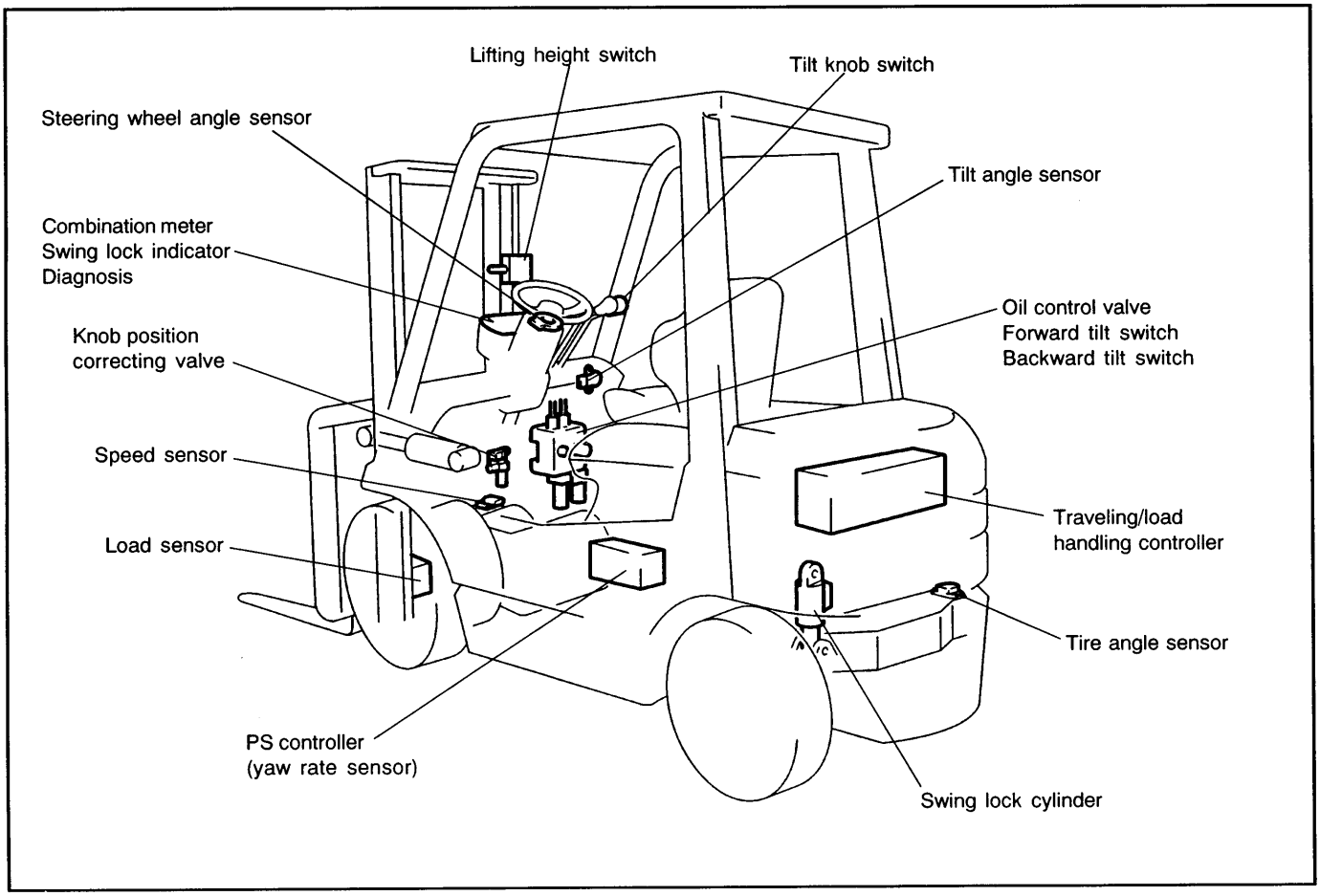
Input →

Traveling·load handling controller/PS controller

Output →

Functional part	Control		
	S	T	K
Swing lock cylinder	O		
Oil control valve SOL1, 2		O	
Knob position correcting valve			O

LCD display	O	O	O
Swing lock indicator	O		
Diagnosis	O	O	O

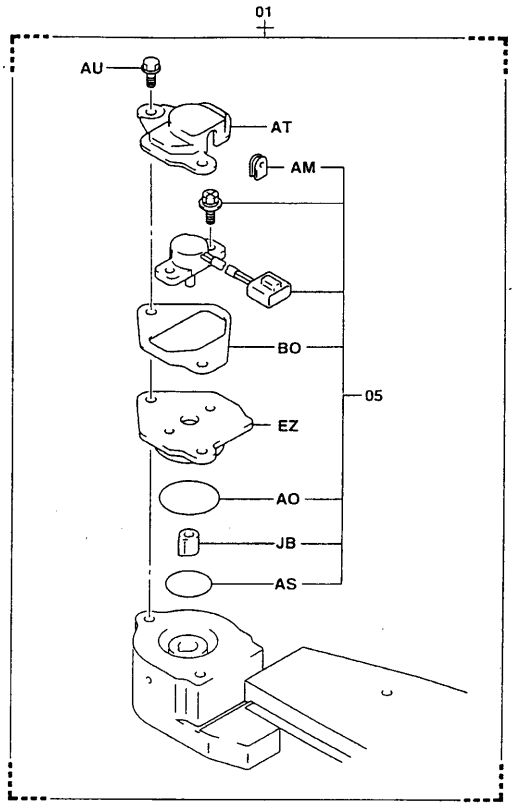


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COMPONENTS

Tire angle sensor

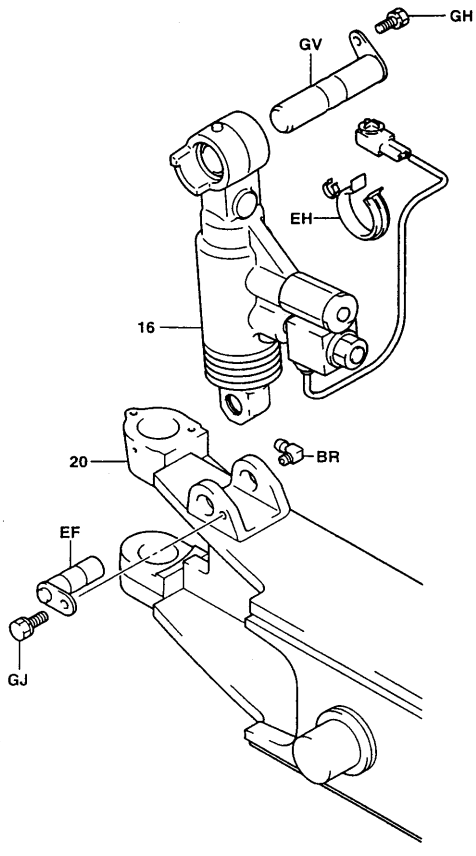
4301



4301-120B

Swing lock cylinder

4301



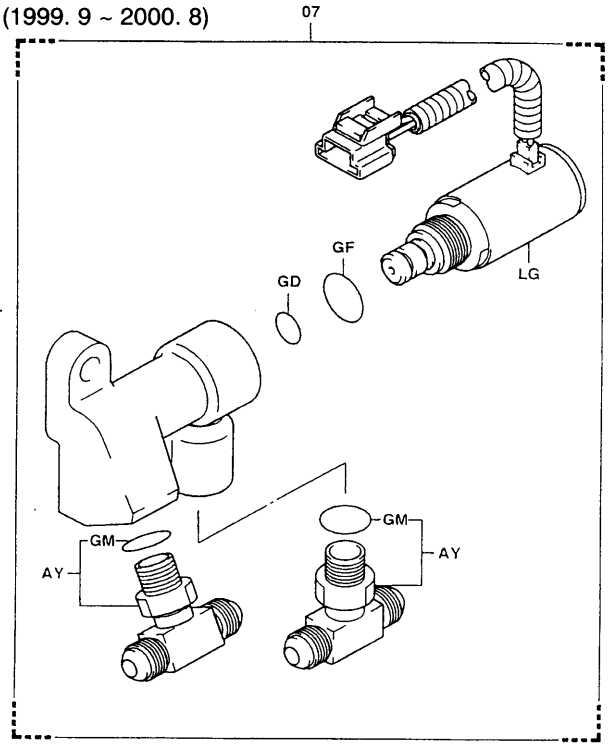
4301-133A

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Knob position correcting valve

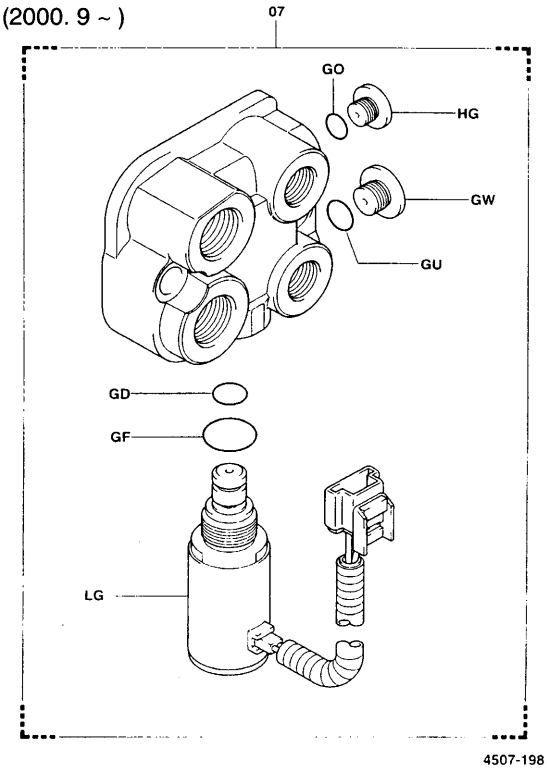
4507

(1999. 9 ~ 2000. 8)



4507-166

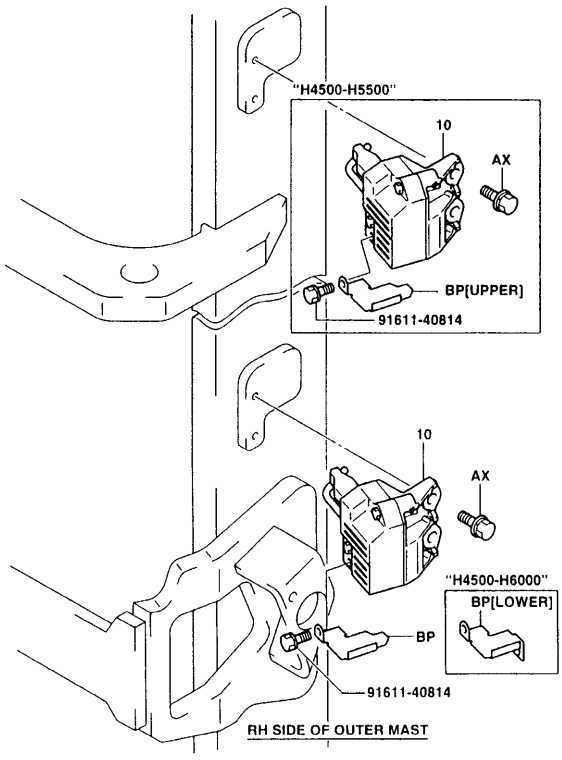
(2000. 9 ~)

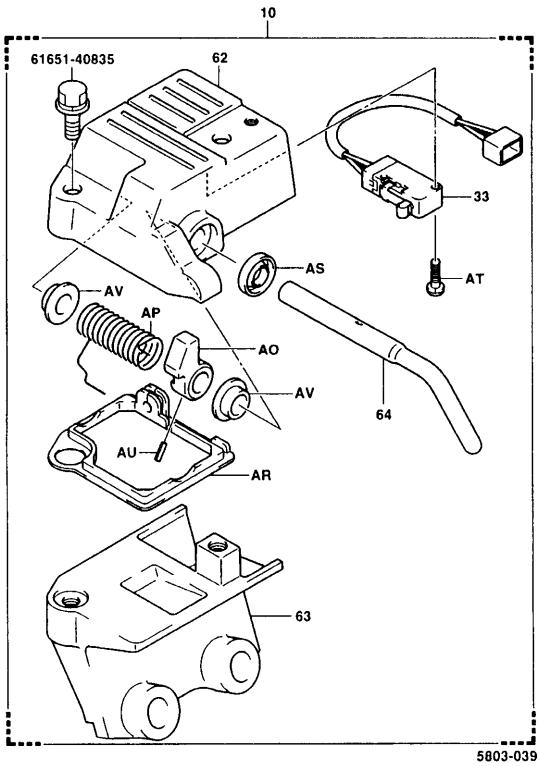


4507-198

Lifting height switch

5803





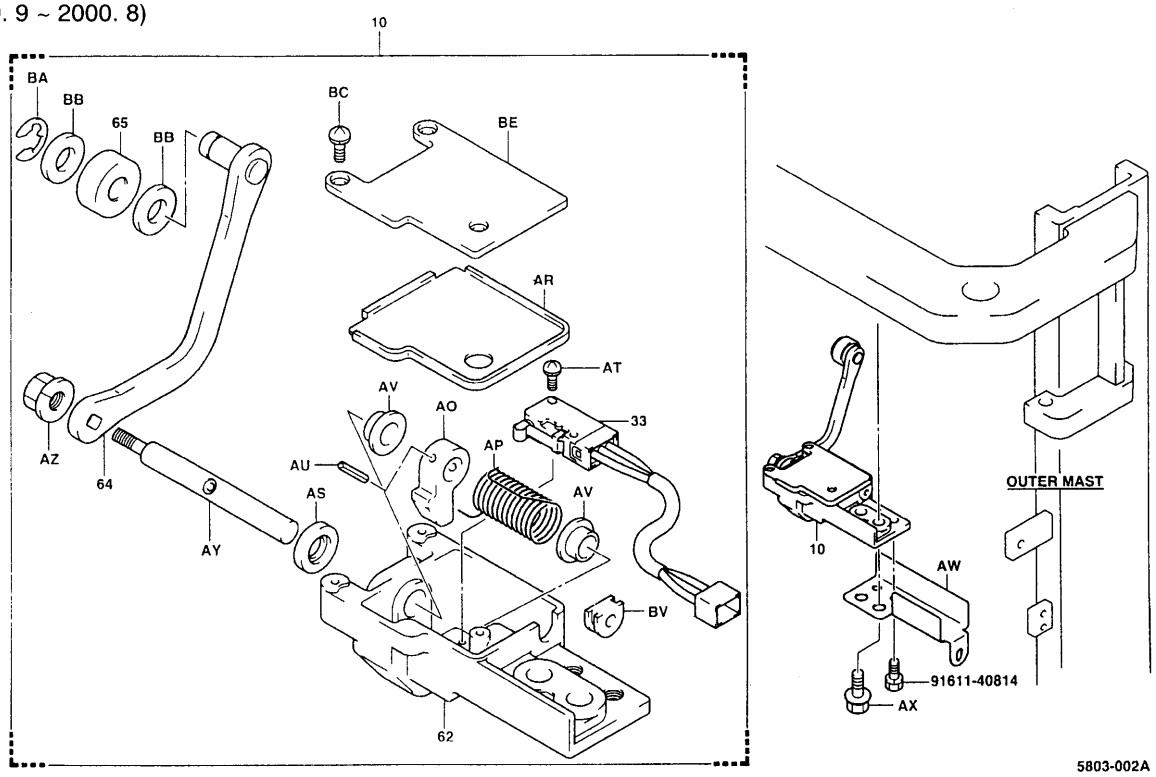
5803-039

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5803

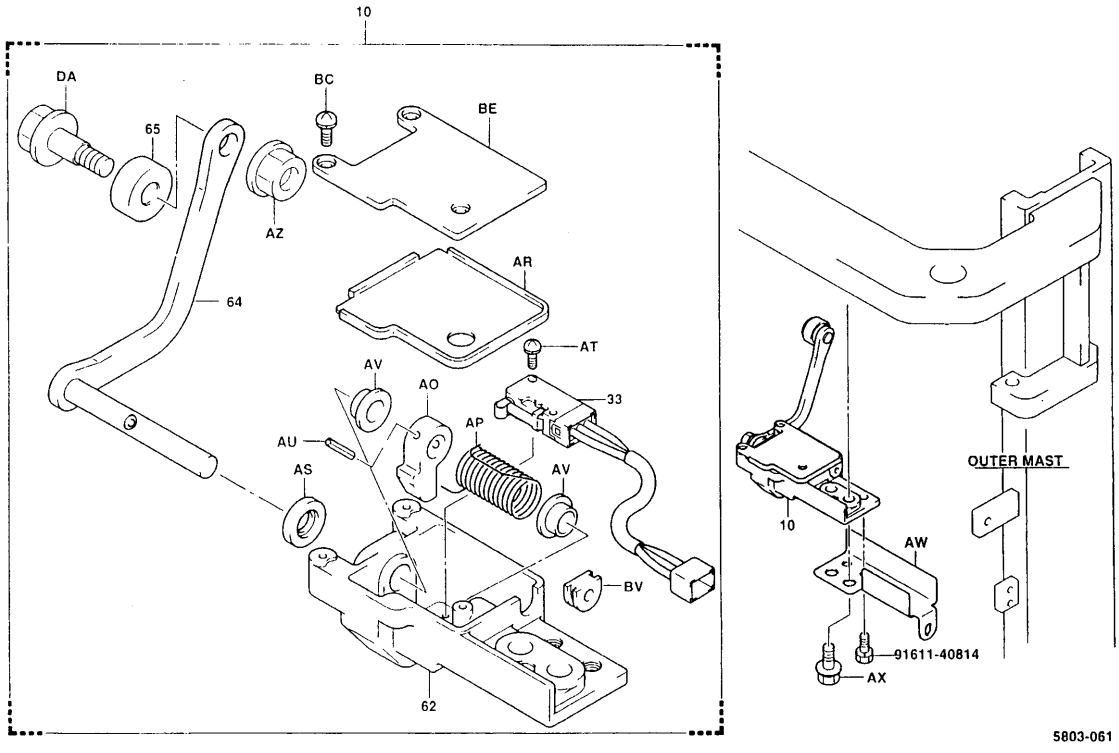
Lifting height switch (FV·FSV)

(1999. 9 ~ 2000. 8)



Lifting height switch (FV·FSV)

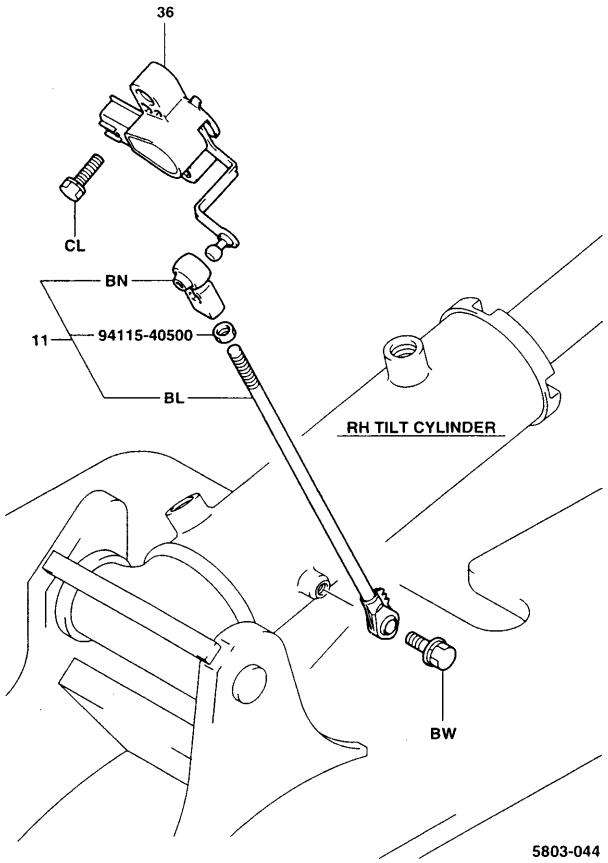
(2000. 9 ~)



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Tilt angle sensor

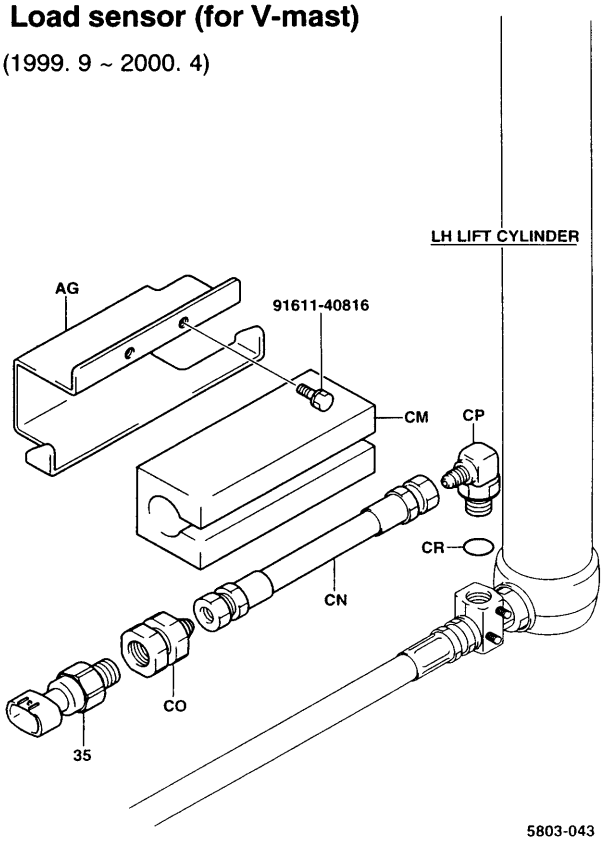
5803



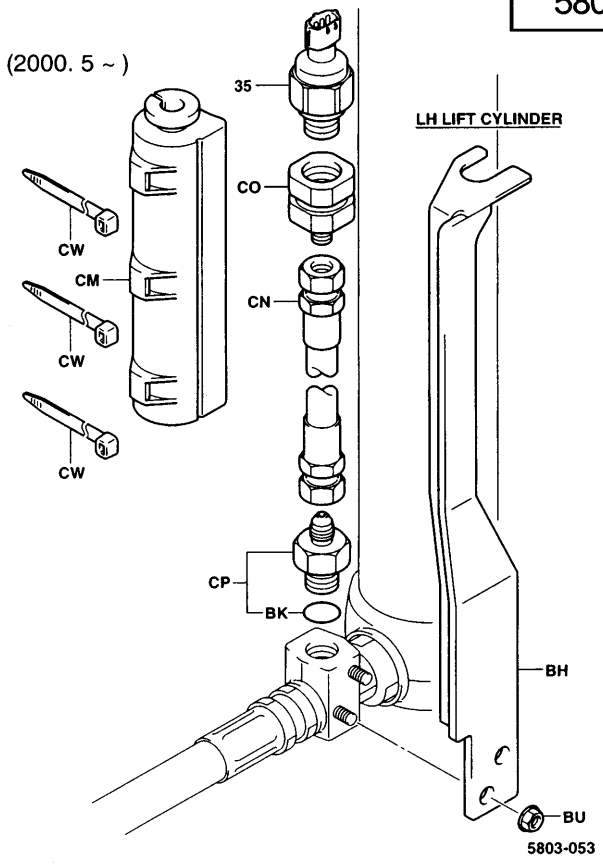
Load sensor (for V-mast)

5803

(1999. 9 ~ 2000. 4)



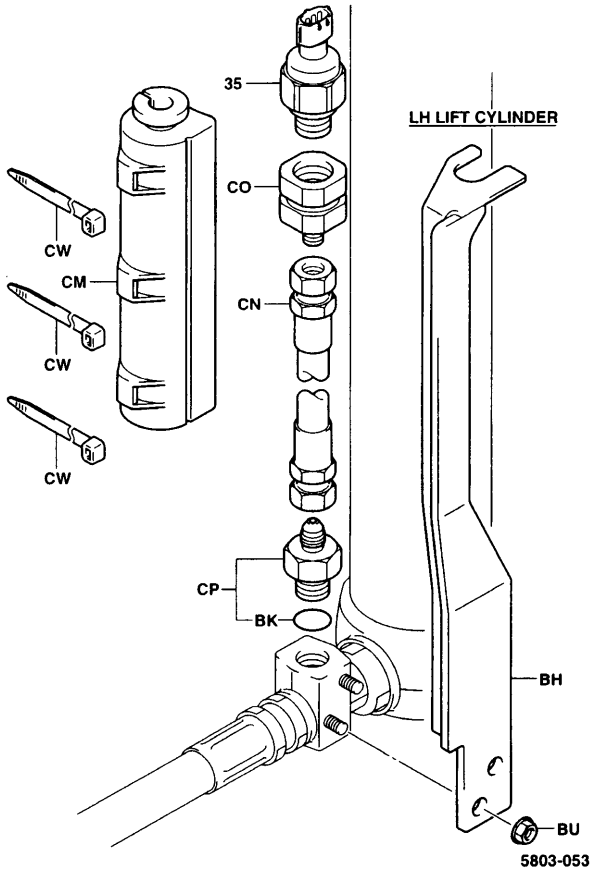
(2000. 5 ~)



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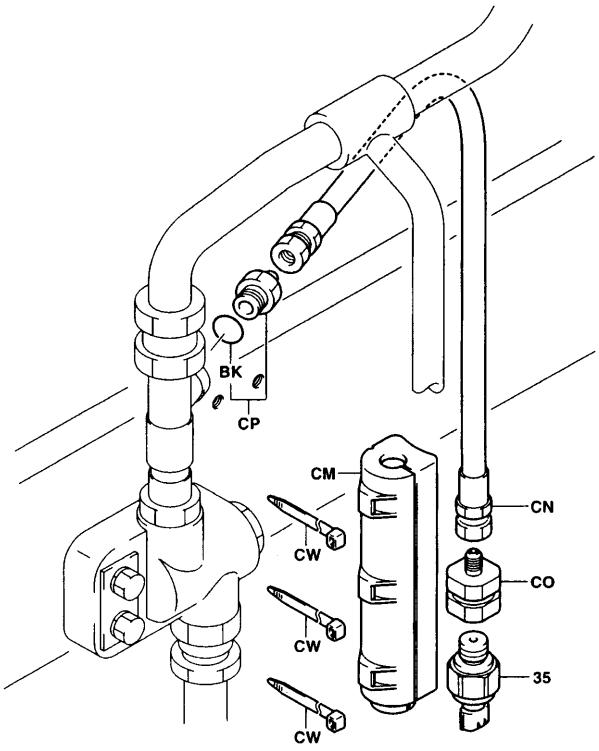
Load sensor (SV, FV)

5803



Load sensor (FSV)

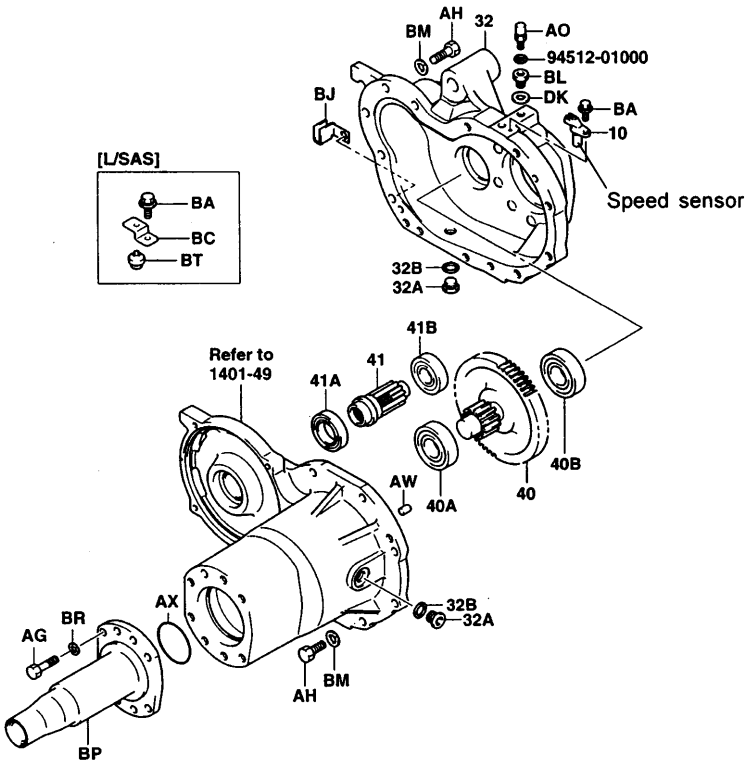
5803



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Speed sensor

3305



3305-023A

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BEFORE STARTING REPAIR WORK

Before starting SAS repair, fully understand the SAS function.

1. Preparation for repairing

   (1) Avoid vehicle washing as far as possible. For cleaning, blow compressed air. If washing with water is required, avoid water jet washing. Always blow compressed air to remove water after washing.

   (2) Transport the PS controller in packed state. Keep it packed until installation. Never transport it in exposed state. Full care should be taken not to drop the controller, allow contact with elsewhere or impact against it.

   (3) If matching is required, park the vehicle in a flat place in advance.

   (4) Provide necessary tools and instruments SST 09240-13130-71, SST 09240-24300-71, and SST 09230-13700-71.

2. During repair work

   (1) Never use an impact wrench for removing or installing the PS controller. Full care should be taken not to drop SKPS controller by mistake avoid impact from dropping that may damage parts inside.

   (2) Don't turn the key switch to ON or OFF carelessly when the sensor wiring is disconnected. Key switch ON in this state may cause an error and the error code will be stored in the controller. Error codes cannot be cleared and up to ten error codes can be stored. Beyond ten, older error codes will be eliminated sequentially.

   (3) During matching, SAS function will stop. Don't operate the vehicle.

   (4) Don't turn the key switch to ON with one side (either right- or left-hand side) of the vehicle jacked up. Turning the key switch to ON unlocks the swing lock and causes the vehicle to be tilted suddenly, leading to great danger.

   (5) When the vehicle is in tilted state for repairing a flat tire, for instance, keep the key switch at ON all the time from jacking up, tire replacement and to grounding of the vehicle.

   (6) If the hydraulic piping is disconnected, apply a cap to each fitting and hose to keep dirt off.

   (7) If the oil control valve lift lock release bolt is loosened, tighten it properly to the specified torque to the initial state before the repair work.

   (8) Tighten the set bolts of respective functional parts to the specified torque levels.

   (9) Though sensors do not require adjustment upon installation, initialize them by matching.

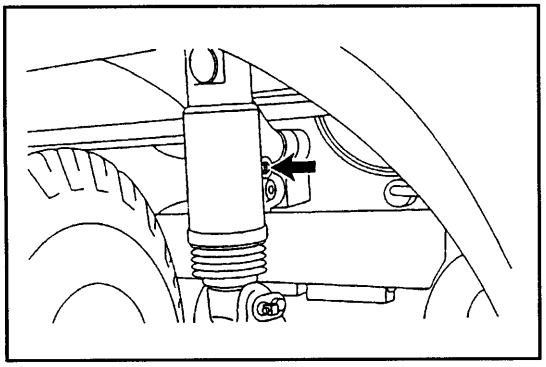
   (10) When disconnecting a connector, don't pull it at the harness.

   (11) When inspecting the harness, care should be taken not to damage the connector terminals.

   (12) Swing lock cylinder cannot be disassembled. If disassembled, the air will enter, making it non-reusable.

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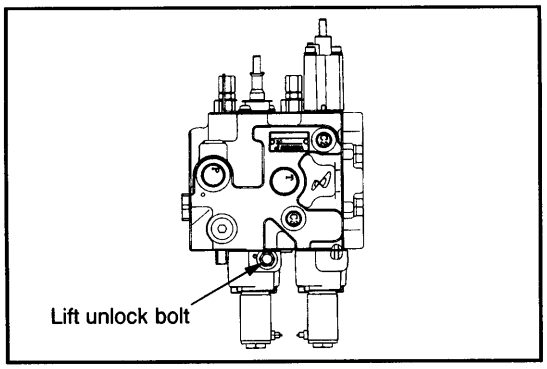
(13) Positioning of the low-, medium-, and high-lifting heights described in the troubleshooting section are as follows:
For a vehicle whose lifting height is between 2500 and 4300 mm:
Low-lifting height: Height from the bottom up to the position where lifting height switch MH1 is actuated.
High-lifting height: Height above the position where lifting height switch MH1 is actuated.
For a vehicle whose lifting height is 4500 mm or more:
Low-lifting height: Height from the bottom up to the position where lifting height switch MH1 is actuated.
Medium-lifting height: Height between actuating positions of lifting height switches MH1 and MH2.
High-lifting height: Height above the position where lifting height switch MH2 is actuated.



3. Emergency Action

(1) If swing lock cannot be unlocked because of a trouble when the key switch is turned to ON, it can manually be unlocked as an emergency action as follows: Loosen the illustrated plug of the swing lock cylinder (by 1 to 2 turns). Don't overloosen it, though.

T = 8.0 ~ 10.0 N·m 80 ~ 100 kgf-cm [5.8 ~ 7.24 ft-lbf]



(2) If the mast fails to be lowered because of a trouble when so operated, it can be lowered manually as follows:
Loosen the lift unlock bolt and operate the lift lever to the down side.
After repair, do not forget to re-tighten the lift unlock bolt. If forgotten, the lift speed becomes remarkably delayed.

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4. Precautions for vehicle modification

H (fork height): mm (in)

No.	Content of modification	Condition	Content of work
1	Single tire → Double tire	—	Change controller. (for vehicle without swing control) Remove the lock cylinder.
2	Double tire → Single tire	—	Change controller. (for vehicle with swing control) Change the rear axle beam. Install the lock cylinder.
3	Mast replacement	Between two H2000 (79) s	Change the mast.
		H2000 (79) → H2500 (98.5) or above	Change the mast. Install the lifting height switch. Install the mast harness.
		H2500 (98.5) or above → H2000 (79)	Chenge the mast. Remove the lifting height switch. Remove the mast harness.
4	Installation/Removal of attachment	—	Install or remove attachment.
5	Mast installation (Mast less spec. model)	—	Install the mast. Install the lifting height switch. Install the mast harness.

Note:

- **Proceed with the alignment (matching) procedure after the above-mentioned modification. (See page 18-19.)**
- **After modification, replace the caution label affixed on the vehicle with the one matching the new SAS function.**
- **When placing a supply order for a mast ASSY, place order for sensors (for lifting height switch, load sensor, mast harness and other SAS related parts) simultaneously if such parts are required.**

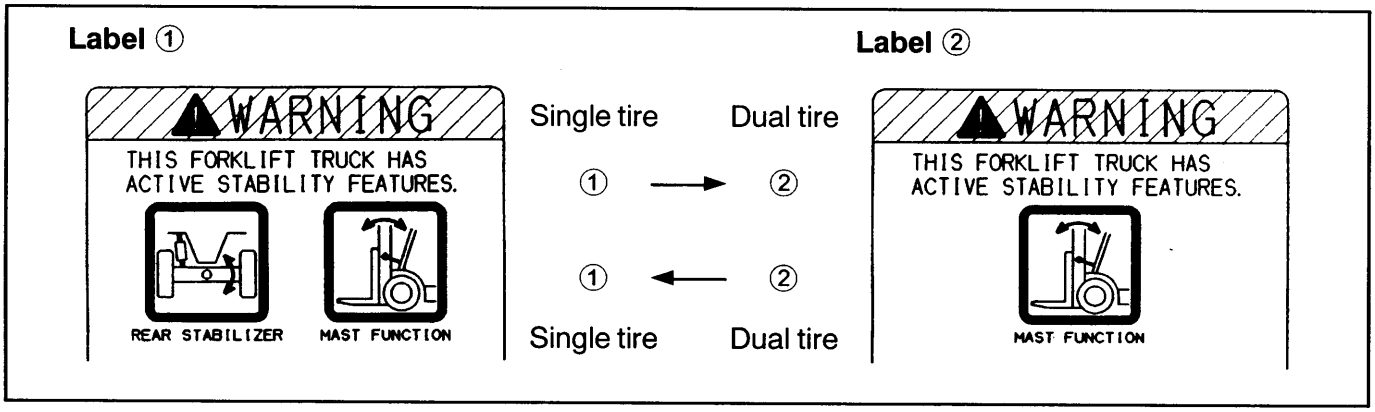
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RENEWAL OF SAS CAUTION LABEL

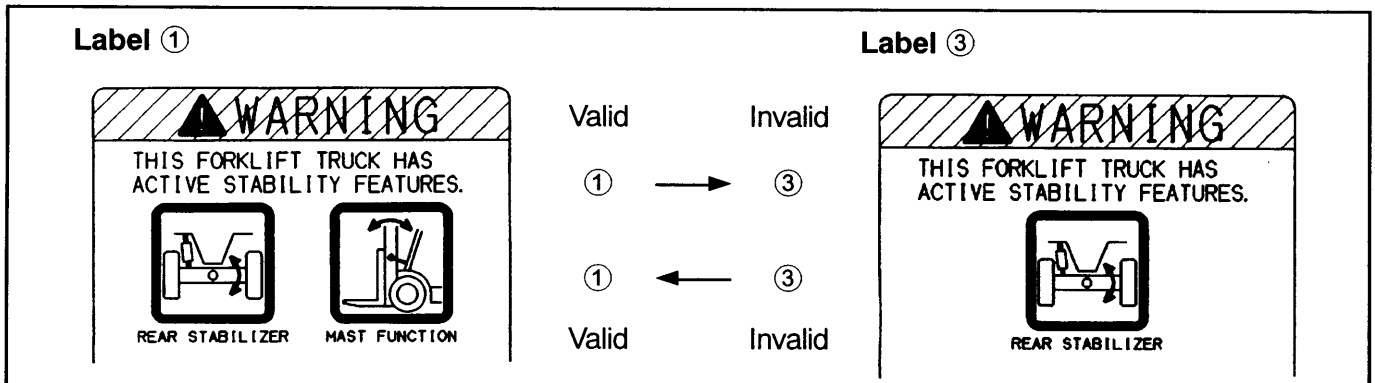
The warning instructions on the SAS caution label affixed to each truck must always agree with the SAS features that particular model owns. You must be strictly careful because the SAS caution label must be changed to the one with different warning in case that the modification on your side may vary the SAS features.
Notice that the caution label must be changed in the following cases:

(1) The modification was such as to change the original specification features, tire spec. modification done by the dealar premises for example. Depending on single or double, the SAS caution label must be changed.
(2) The selective function of the mast forward tilt angle control was switched to either of Validation and Invalidation.*
(*: See Page 15-21 Cutions on modifying vehicle.)

1. Case of Original Specification Feature Change.



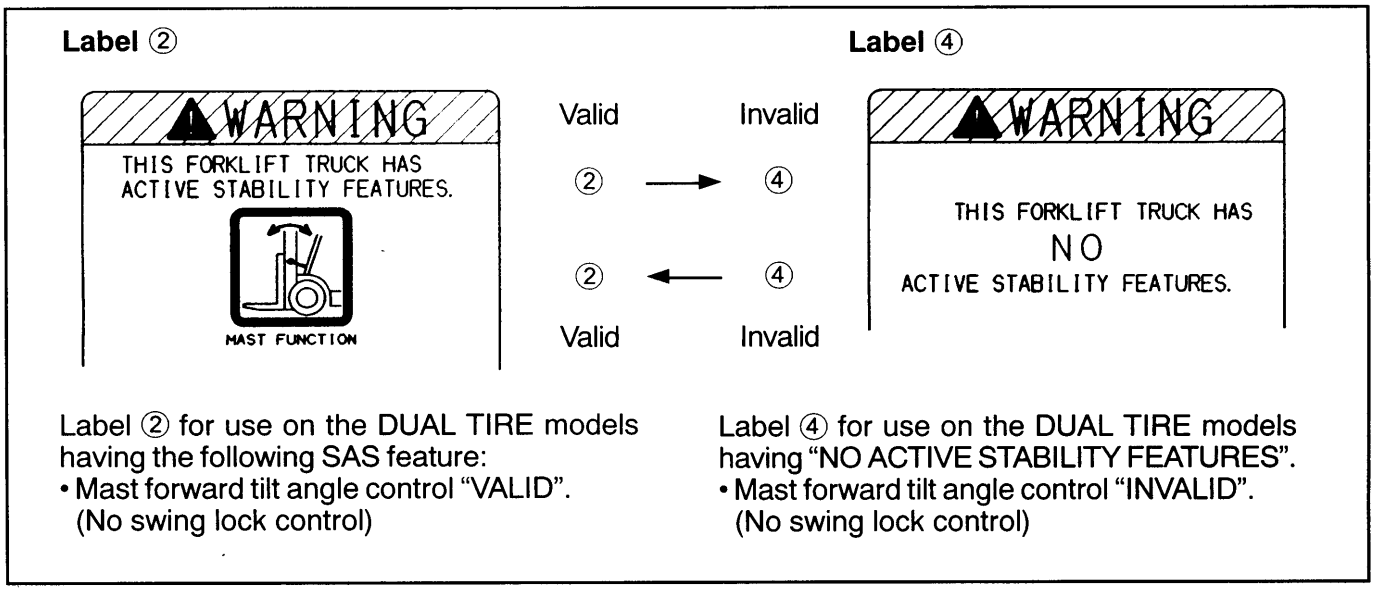
2. Case of Switching "Mast forward tilt control Valid/Invalid."



Label ① for use on the SINGLE TIRE models having the following SAS features:
• Equipped with swing lock control
• Mast forward tilt angle control "VALID".

Label ③ for use on the SINGLE TIRE models having the following SAS features:
• Equipped with swing lock control
• Mast forward tilt angle control "INVALID".

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Label ② for use on the DUAL TIRE models having the following SAS feature:
- Mast forward tilt angle control "VALID". (No swing lock control)

Label ④ for use on the DUAL TIRE models having "NO ACTIVE STABILITY FEATURES".
- Mast forward tilt angle control "INVALID". (No swing lock control)

3. Case of Mast Installation for Mast-Less Spec. models.

When you install the mast to the mastless models, make sure the specification features with the mast assembled.

Take note that the proper caution label must be chosen to be affixed to the truck.

The proper label can be found among four types of the label numbering ① - ④ in the illustration.

FUNCTIONAL PARTS

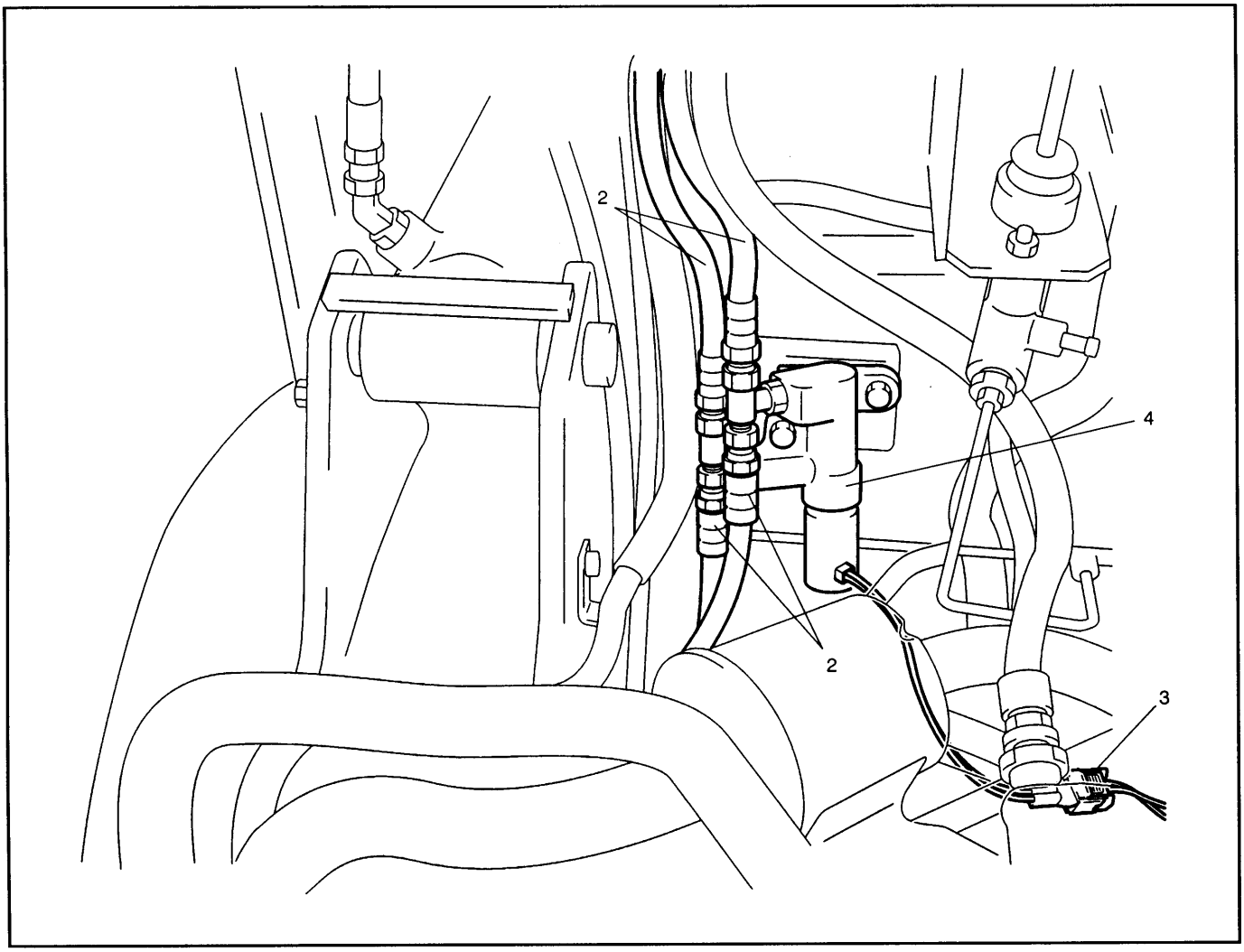
Note:

- **Read Section 17 for the oil control valve solenoids 1 and 2, forward tilt switch, backward tilt switch and the tilt lever knob switch.**
- **Checking of functional parts is described in the troubleshooting.**

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STEERING KNOB POSITION CORRECTING VALVE

REMOVAL·INSTALLATION (1999. 9 ~ 2000. 8)



Removal Procedure

1 Remove the lower panel.

2 Disconnect the piping.

3 Disconnect the wiring connector.

4 Remove the steering knob position correcting valve.

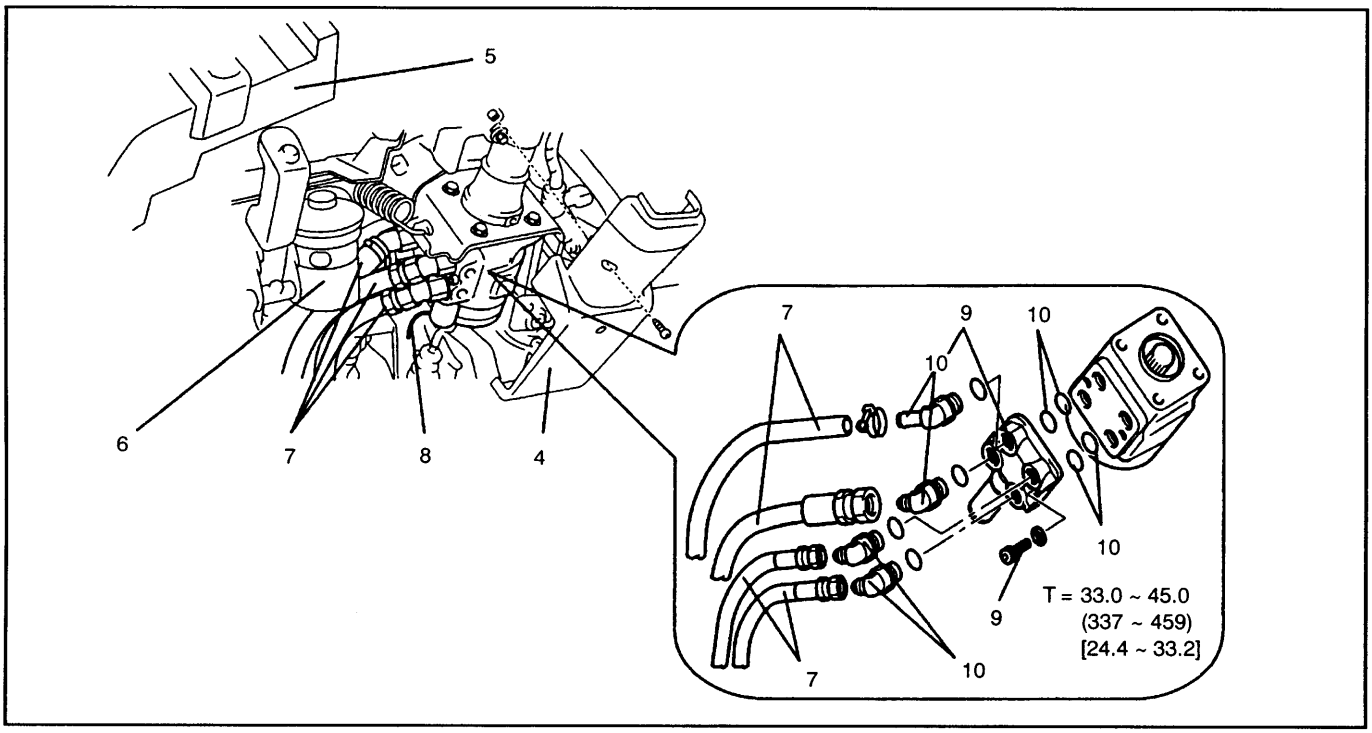
Installation Procedure

The installation procedure is the reverse of the removal procedure.

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REMOVAL·INSTALLATION (2000. 9~)

T = N·m (kgf-cm) [ft-lbf]

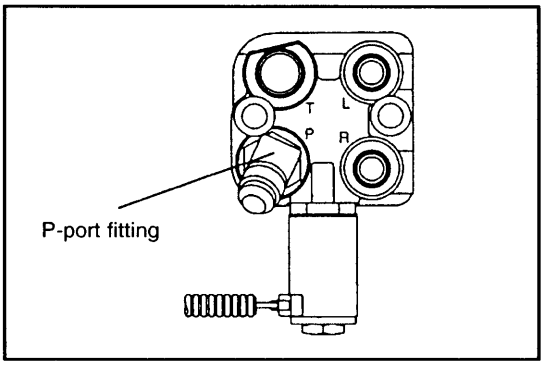


Removal Procedure

1 Disconnect the battery plug.
2 Remove the toe board.
3 Remove the lower panel.
4 Remove the column cover.
5 Remove the instrument panel.
6 Remove the brake fluid reservoir tank mounting bolts to set the reservoir tank free.
7 Disconnect the piping.
8 Remove the knob position correcting solenoid wiring.
9 Remove the knob position correcting solenoid valve ASSY W/fitting.
10 Remove the fitting and O-ring. **[Point 1]**

Installation Procedure

Follow the reverse sequence of the removal.



Point Operation

[Point 1]
Installation:
The check valve is in the P-port fitting. Don't install in wrong position.

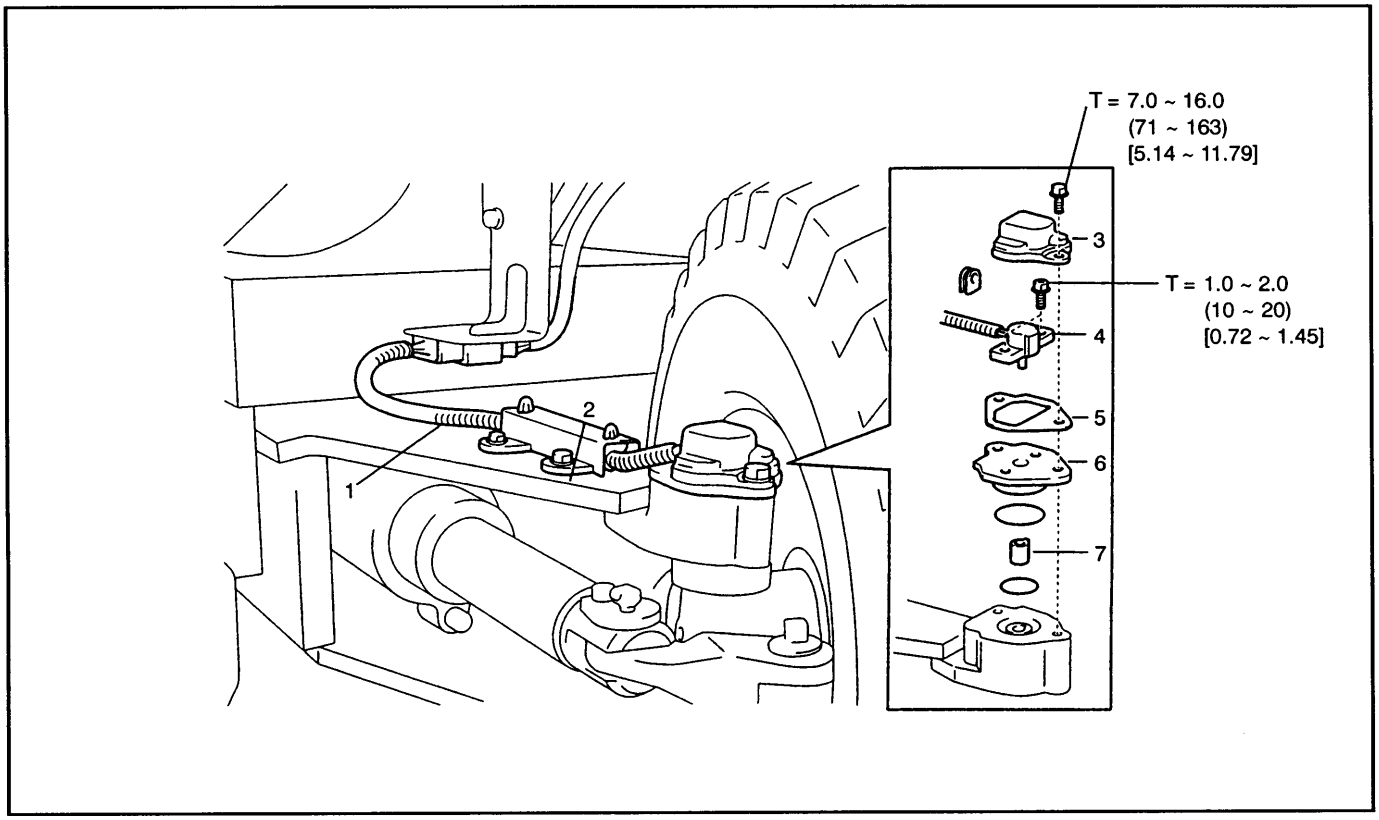
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TIRE ANGLE SENSOR

REMOVAL·INSTALLATION

Note:
Correct tire angle may not be detected if any play exists between the tire angle sensor shaft and the bushing. Remove the sensor carefully in the vertical direction. Unless necessary, don't remove the bushing.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Disconnect the connector.

2 Remove the harness protector.

3 Remove the sensor cover.

4 Remove the tire angle sensor.

5 Remove the gasket.

6 Remove the sensor base.

7 Remove the bushing.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

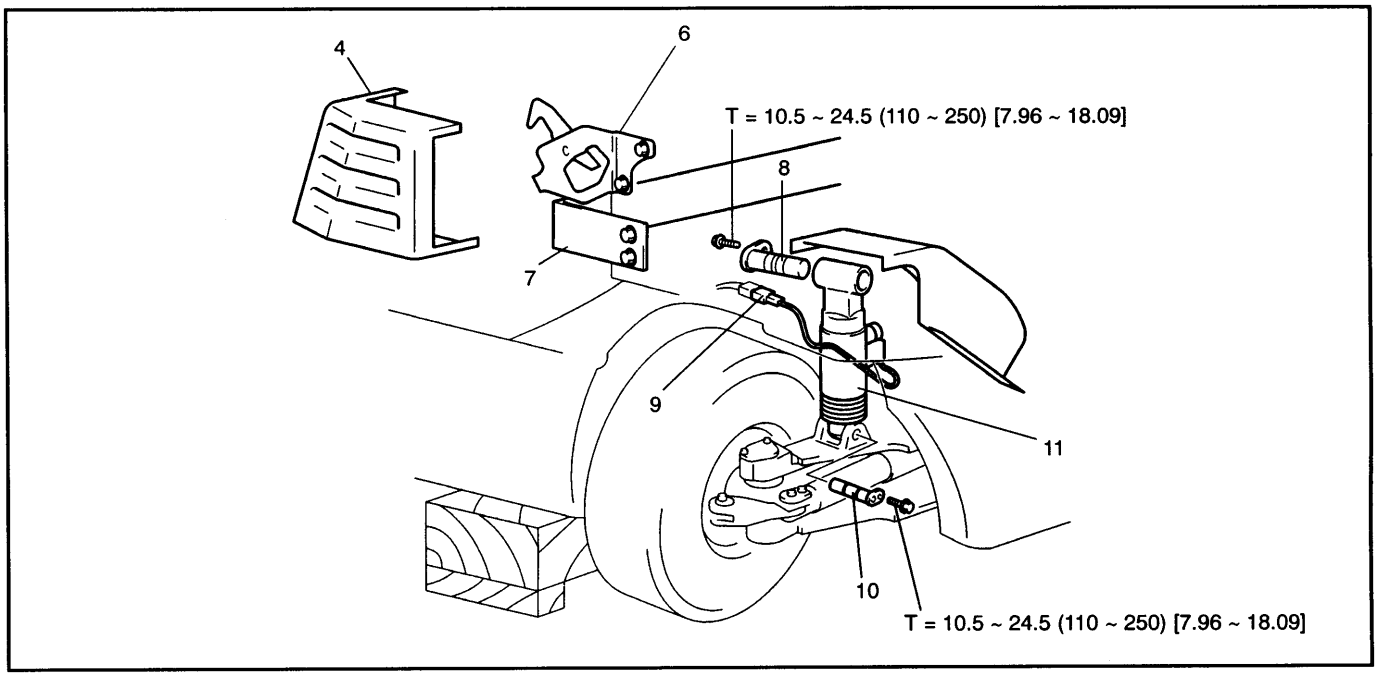
Note:
Carry out matching if the tire angle sensor or sensor cover is removed or replaced.

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SWING LOCK CYLINDER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Disconnect the battery plug.

2 Jack up the vehicle until the rear wheels leave the ground.

3 Open the seat stand.

4 Remove the LH rear louver.

5 Remove the LH side hood.

6 Remove the seat stand hook.

7 Remove the rear battery guard.

8 Remove the swing lock cylinder upper pin by inserting a hand from under the controller.

9 Disconnect the swing lock solenoid connector by inserting a hand between the rear tire and the weight.

10 Remove the swing lock cylinder lower pin.

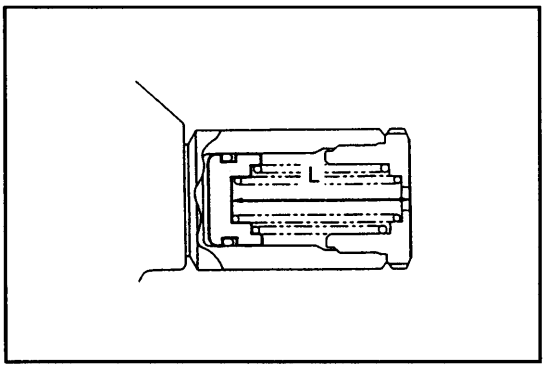
11 Remove the swing lock cylinder ASSY. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Apply chassis grease on the spherical portion of the upper pin before installation.**
- **Add chassis grease through the grease fitting after installation.**

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Point Operation

[Point 1]
Inspection:
Remove the plug at the center of the accumulator end to measure depth L of accumulator piston.

Standard: **46 mm (1.81 in) (at 20°C)**
42.5 mm (16.7 in) (at 20°C) for a refrigerator vehicle

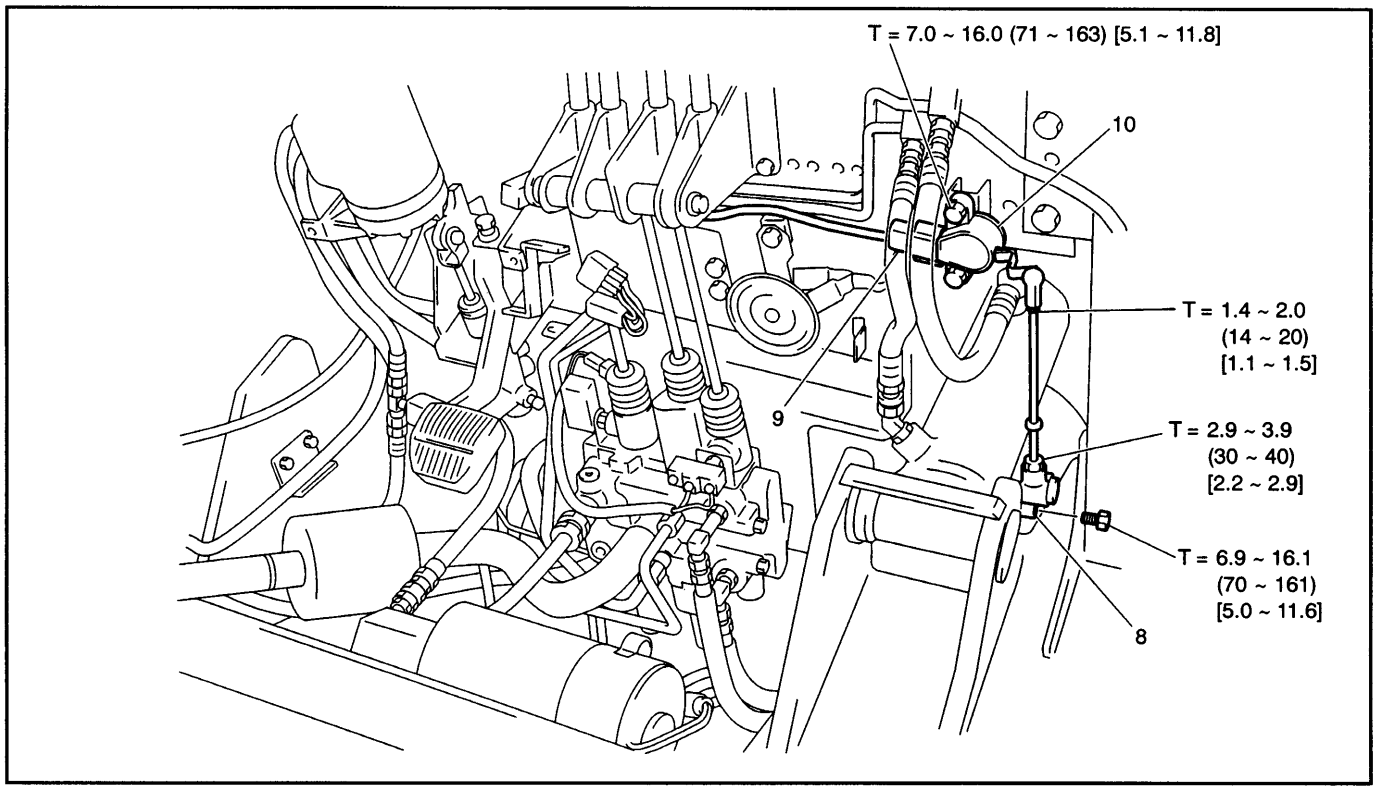
Limit: **52 mm (2.05 in) (at 20°C)**
48.5 mm (1.91 in) (at 20°C) for a refrigerator vehicle

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TILT ANGLE SENSOR

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Open the seat stand and remove the toe boards (front and rear).

2 Remove the lower panel.

3 Remove the instrument panel (RH).

4 Remove the front pillar cover (RH).

5 Remove the side cover.

6 Remove the fender cover.

7 Disconnect the tilt angle sensor link.

8 Disconnect the connector.

9 Remove the tilt angle sensor.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

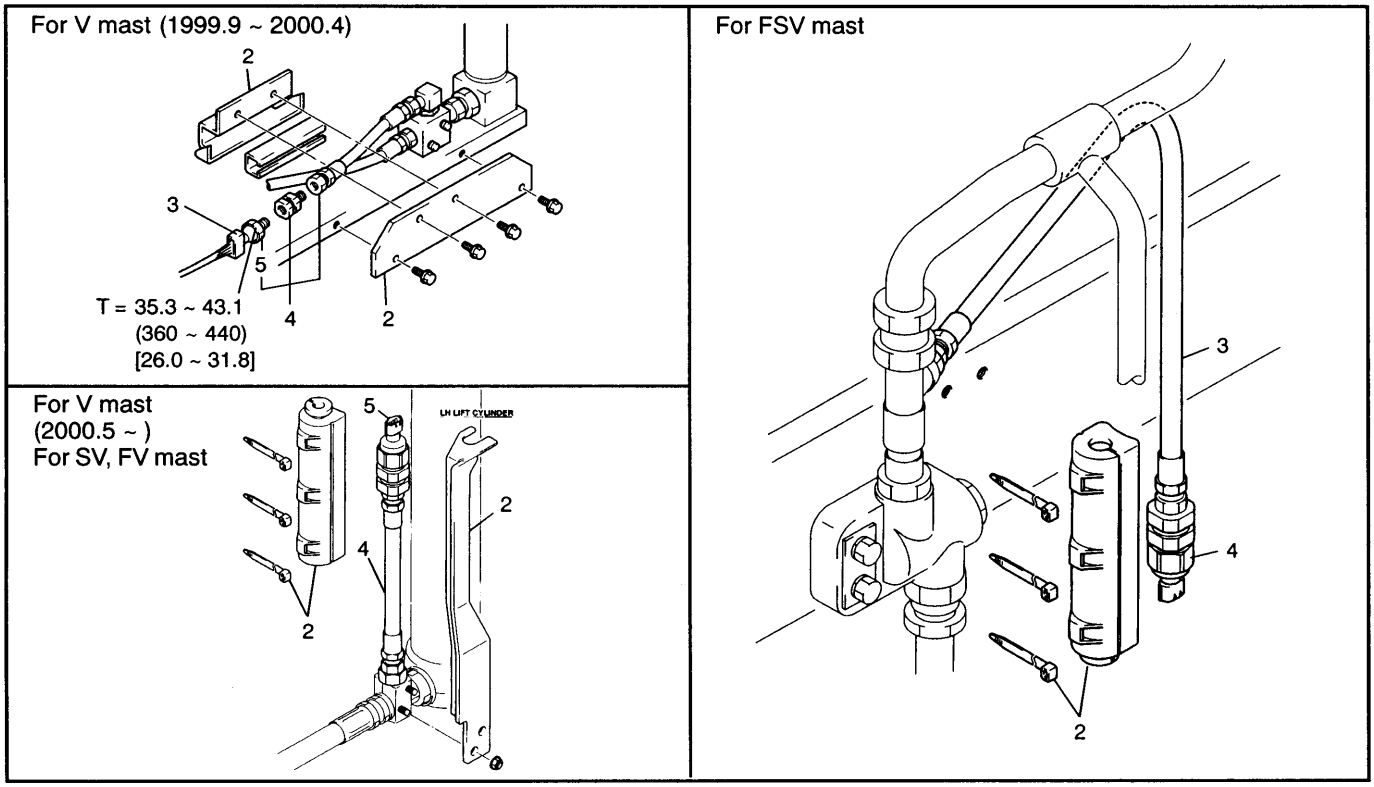
Note:
Carry out matching if the tilt angle sensor is removed or replaced or the tilt angle sensor link is adjusted in length or replaced.

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LOAD SENSOR

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure (For V, SV, FV mast)

1 Hoist the inner mast. (See page 15-10.)

2 Remove the hose cover and pressure sensor cover.

3 Disconnect the wiring of the load sensor.

4 Remove the load sensor W/hose.

5 Remove the load sensor.

(For FSV mast)

1 Hoist the inner mast. (See page 15-10.)

2 Remove the load sensor cover.

3 Disconnect the wiring of the load sensor.

4 Remove the load sensor.

Installation Procedure

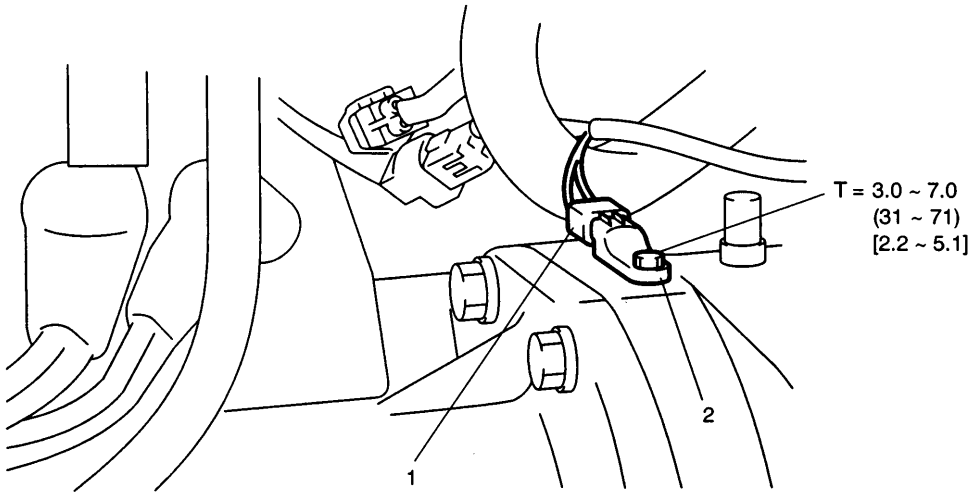
The installation procedure is the reverse of the removal procedure.

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SPEED SENSOR

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Disconnect the connector.

2 Remove the speed sensor.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

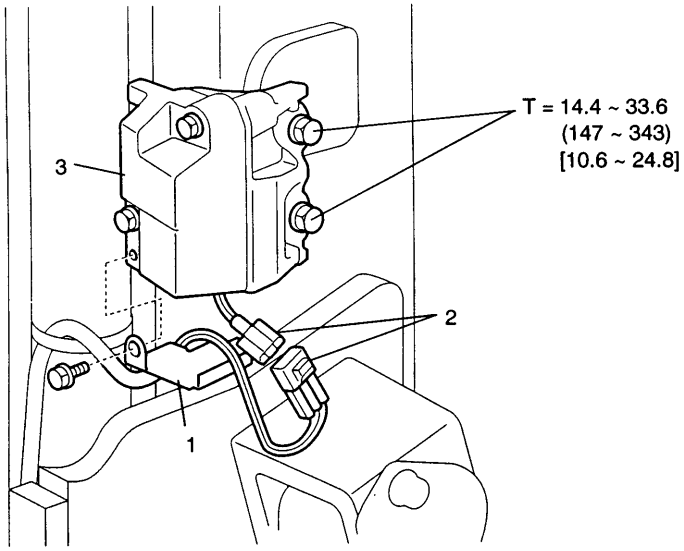
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MAST LIFTING HEIGHT SWITCH

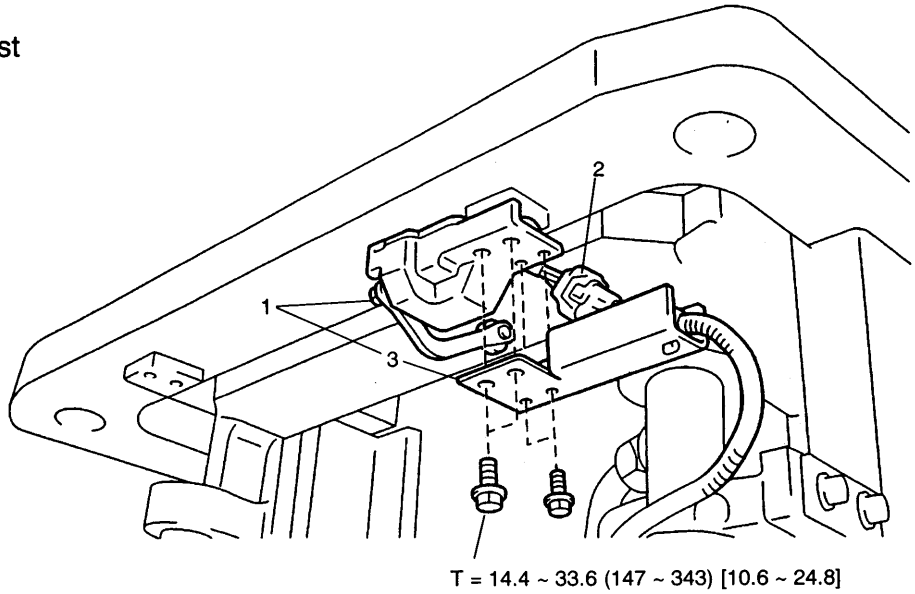
REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]

V·SV mast



FV·FSV mast



Removal Procedure

1 Remove the lower cover.

2 Disconnect the connector.

3 Remove the mast lifting height switch.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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MATCHING

For the tilt angle sensor, load sensor, tire angle sensor and swing angle sensor among sensors used for SAS, the signal voltage values for the mast vertical state, no-load state, tires in straight traveling direction and the rear axle beam in horizontal state, respectively, are stored in the SAS controller as the bases for control. Therefore, if maintenance or parts replacement related to these sensors is made, matching (updating sensor signal voltage values of the vehicle in the standard state) becomes necessary. Matching is also required for the tilt angle sensor if the vehicle posture changes greatly, and for the load sensor if the weight is changed because of addition/removal of an attachment.
Matching can be done by selecting "MATCHING" of the display service function.

Content of matching	Automatic fork leveling	Forward tilt restriction position	No-load standard load	Tire right Tire straight travel signal
Matching condition	Mast in vertical position *2	Mast in vertical position*1	No-load	Tires at straight travel angle
Analyzer indication	TILTL	TILTF	LOAD	TIRE
Object sensor	Tilt angle sensor	Tilt angle sensor	Load sensor	Tire angle sensor
Maintenance operation examples:				
1. Main controller replacement	○	○	○	
2. PS controller replacement				○
3. Tilt angle sensor removal-installation or replacement	○	○		
4. Sensor rod length change or replacement	○	○		
5. Load sensor replacement			○	
6. Tire angle sensor or sensor cover replacement				○
7. Change to another attachment	○	○	○	
8. Mast replacement	○	○	○	
9. Tilt cylinder replacement	○	○		
10. Tilt cylinder uneven movement adjustment	○	○		

*1: Since the forward tilt control stop position is calculated by the controller, carry out matching by holding the mast in vertical position.

Note:
The matching value for the tilt angle sensor determines the mast stop position in fork automatic leveling. If the fork does not stop horizontally because of the site condition (such as inclined floor), perform matching by holding the mast in vertical position (in this case the mast stop angle will be deviated on the horizontal floor surface).

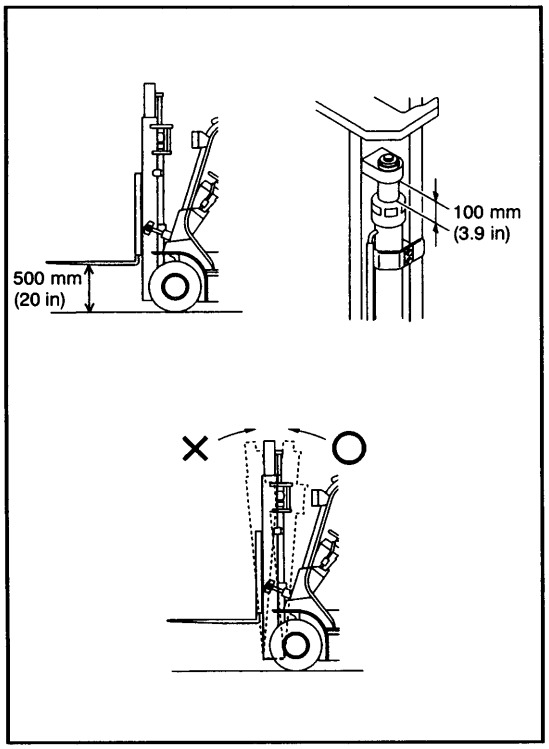
***2: Utför den här matchningen med horisontella gafflar om inte vinkeln mellan stativet och gafflarna är 90°!**

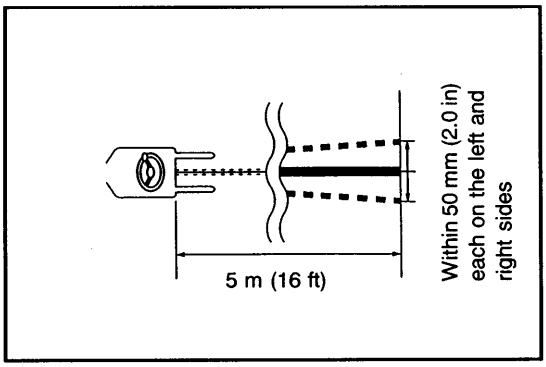
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STANDARD STATE OF VEHICLE

If the surface on which re-setting is to be performed is slanted, error occurs to the standard state. Select a level floor without irregularity for re-setting.

Note:
The finishing accuracy of the floors for factories, warehouses and buildings in general calls for the floor inclination to be 0.5° or under. Therefore, re-setting on these floors is not affected. Don't perform re-setting on a floor that is inclined for over 0.5° for draining purpose.





Fork stop position with automatic leveling and forward tilting limit position

- Set the vehicle in the following condition so as to have the tilt angle sensor signal voltage value stored with the mast held vertical to the floor surface:Load sensor

No-load standard load

- Set the vehicle in the following condition so as to have the load sensor signal voltage value stored under no-load condition:

Standard:

- **Raise the fork to a height of 500 mm (19.7 in) for the V or SV mast or raise the rear lift cylinder to a height of 100 mm (3.9 in) for the FV or FSV mast. Place a level (goniometer) at a height of 1200 to 1500 mm (47.2 to 59.1 in) on the front or rear side of the outer mast and set the mast in the vertical position.**
- **On a vehicle with attachment C241 or U61C671/681, set the mast vertical with the attachment at a height of 500 mm (19.7 in) and perform relief at the topmost position.**

Note:

- **Set the mast vertical from a backward tilted position (not from the forward tilted position).**
- **In case of a detachable attachment, keep the attachment installed on the vehicle.**

Tires in straight traveling position

- Set the vehicle in the following condition so as to have the tire angle sensor signal voltage value stored with the tire in straight position.

Standard:
Align the center of the vehicle to the line on the level road surface and drive the vehicle for 5 meters (16 ft) with the steering handle fixed. And the center of the vehicle stays within 50 mm (2.0 in) each to the left and the right.

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CAUTIONS ON MODIFYING VEHICLES

No.	Content of modification	Condition	Content of work
1	Single tire to double tire	—	PS controller replacement (For vehicle without swing control) Lock cylinder removal
2	Double tire to single tire	—	PS controller replacement (For vehicle with swing control) Rear axle beam replacement Lock cylinder installation
3	Mast replacement between single tire vehicles	Replacement between vehicles with lifting height below 2000	Mast replacement
		Lifting height: 2000 → over 2500 (inc.)	Lifting height switch installation Mast harness replacement
		Lifting height: over 2500 → 2000	Lifting height switch removal Mast harness replacement
4	Mast replacement Replacement between double-tire vehicles	Lifting height: over 2500 (inc.) → 2000	Mast replacement Lifting height switch removal Mast harness replacement
		Lifting height: 2000 → over 2500 (inc.)	Mast replacement Lifting height switch installation Mast harness replacement
5	Attachment installation·removal	—	Attachment installation·removal

Note:
- **Carry out matching after any of the above-mentioned modification.**
- **When placing an order for a mast ASSY, check the need of sensors (lifting height switch, load sensor, mast harness, and other SAS-related parts) and place an order accordingly.**

Functional parts

Note:
- **See Section 9 for the steering wheel angle sensor, and Section 16 for oil control valve solenoids 1 and 2, forward/backward tilt switch and tilt lever knob switch.**
- **For the check of functional parts, see the Troubleshooting section.**

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APPENDIX

Page

SST LIST 19-2

SERVICE STANDARDS 19-7

CONNECTOR DRAWING
(FOR VEHICLE WITHOUT SAS) 19-18

CONNECTOR DRAWING
(FOR VEHICLE WITH SAS) 19-24

CONNECTING DIAGRAM
(FOR VEHICLE WITHOUT SAS) 19-35

CONNECTING DIAGRAM
(FOR VEHICLE WITH SAS) 19-36

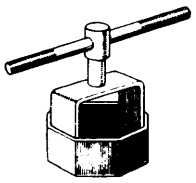
WIRING DIAGRAM
(FOR VEHICLE WITHOUT SAS) 19-37

WIRING DIAGRAM
(FOR VEHICLE WITH SAS) 19-38

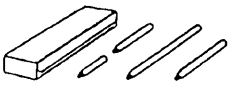
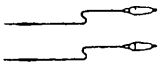
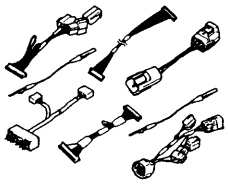
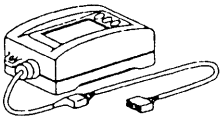
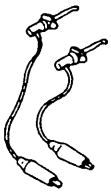
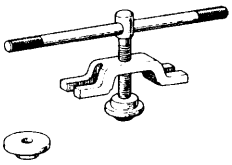
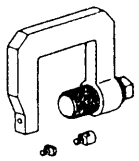
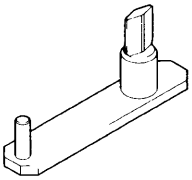
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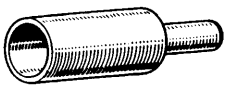
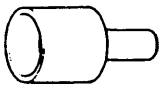
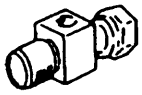
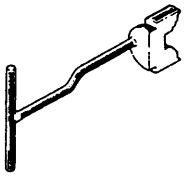
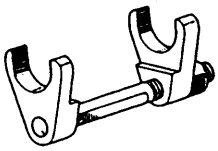
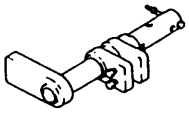
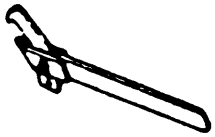
SST LIST

Illust.	Part No.	Part Name	Section																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	09509-76002-71 (09509-55020)	Rear wheel bearing nut wrench								○										
	09509-76003-71 (09509-55030)	Rear wheel bearing nut wrench								○										
	09717-76001-71 (09717-20010)	Brake shoe return spring remover											○							
	09718-76001-71 (09718-20010)	Brake shoe return spring replacer											○							
	09950-76014-71 (09950-40011)	Puller B set						○	○		○					○				
	09950-76003-71 (09550-50012)	Puller C set										○								
	09950-76018-71 (09950-60010)	Replacer set							○								○			
	09950-76019-71 (09950-60020)	Replacer set No. 2								○	○									

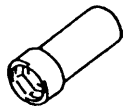
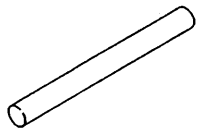
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Illust.	Part No.	Part Name	Section																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	09950-76020-71 (09950-70010)	Handle set							○	○	○						○			
	09230-13700-71	IC check pin			○		○													
	09230-13130-71	AC controller diagnosis kit					○													
	09240-13130-71	Plug-in analyzer				○	○													○
	09240-23400-71	IC clip			○		○													
	09310-10160-71	Front axle hub remover								○										
	09310-23320-71	Reamer bolt remover							○											
	09330-33130-71	Stopper pin							○											

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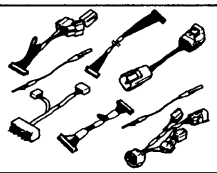
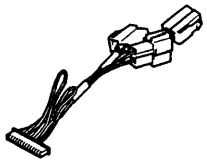
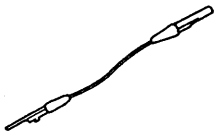
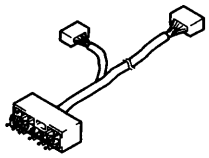
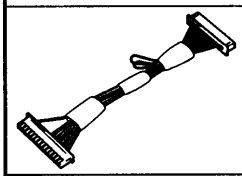
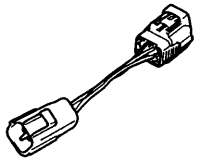
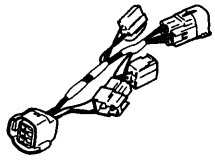
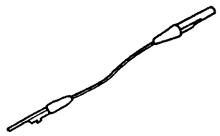
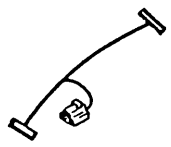
Illust.	Part No.	Part Name	Section																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	09370-10410-71	Front axle bearing replacer							○	○	○									
	09370-20270-71	Drive pinion bearing replacer									○									
	09421-33020-71	Front axle hub replacer								○										
	09450-23320-71	Adapter										○								
	09510-31960-71	Brake hold-down spring remover & replacer											○							
	09610-10161-71	Oil control valve spring remover & replacer																	○	
	09610-22000-71	Inner mast stopper														○	○			
	09620-10100-71	Cylinder cap remover & replacer															○			

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Illust.	Part No.	Part Name	Section																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	09630-23600-71	Deep socket A														○	○			
	09631-22000-71	Wear scale chain														○				
	09700-30200-71	Spring pin tool remover						○	○											
	09810-20172-71	Joint pin remover														○	○			
	25009-13201-71	Battery hanger	○					○	○	○								○		

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(BREAKDOWN OF 09230-13130-71)

Illust.	Part No.	Part Name	
	09230-13130-71	AC controller diagnosis kit	
	09231-13130-71	Sub-harness for CN105	• To check the traveling/material handling system fan ON/OFF signal • To check MOS drive power supply ON/OFF signal
	09232-13130-71	For CN20, 52, 55, 58, 86, 90 and 94	To check each CPU board to sensor harness and the CPU board itself
	09233-13130-71	Sub-harness for CN111, 112	To check if the CPU board and DC/MD drives the MOS normally
	09234-13130-71	Sub-harness for CN106, 107	To check in combination with SST3 If the check result in connection with SST3 is NG, this sub-harness is used to discriminate if the cause of NG lies in the CPU or DC/MD.
	09235-13130-71	Sub-harness for CN146	To check the ON/OFF signal of the swing lock cylinder solenoid and knob offset correcting valve solenoid
	09236-13130-71	Sub-harness for CN57	To check signals from traveling speed sensors SSD1 and SSD2 (Replaces the SSD1 and SSD2 signals.)
	09237-13130-71	Sub-harness for CN19	• To discriminate whether the steering angle sensor or the harness/CPU board is defective by replacing STS1 and STS2 signals • To check steering angle sensor power supply
	09238-13130-71	Sub-harness for CN25	To check the acceleration potentiometer short harness, harness from the CPU board to the acceleration potentiometer and the CPU board
	09239-13130-71	Sub-harness for CN106, 107	• To check the traveling/material handling system fan ON/OFF signal • To check MOS drive power supply ON/OFF signal

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SERVICE STANDARDS

BATTERY

ITEM		ALL MODELS
Specific gravity upon full charge	(at 20°C)	1,280
Specific gravity upon end of discharge	(at 20°C)	1,150
Voltage upon end of discharge	V	48 V vehicle: 42.5 80 V vehicle: 68.0
Insulation resistance	MΩ	1 or more

CHARGER

ITEM		
Magnet switch		
Insulation resistance MΩ		3 or more
Magnet switch coil resistance Ω	CLK20JT	700
	FW-1S	400
	CLK50JT	350
Thermal relay contact continuity Ω	When not operated	∞
	When operated	0
Transformer		
Insulation resistance MΩ		1 or more
Fuse A	SG3-69-60JBY-1	96V, 80
	SG3-69-80BY-1	96V, 80
	SG3-69-100BY-1	96V, 100
	SG3-69-130JBY-1	96V, 150
	SG3-69-165JBY-1	96V, 150
	SG3-115-85JBY-1	150V, 100
Primary coil continuity Ω		0
Secondary coil continuity		0
Diode continuity Ω	Forward	Continuity shall exist.
	Backward	∞
Diode tightening torque N·m (kgf-cm) [ft-lbf]	SKR71/02 SKN71/02	4 (40) [2.9]
	SKR130/02 SKN130/02	10 (100) [7.23]
	SKR240/02 SKN240/02	30 (300) [21.7]
	SKR71/04 SKN71/04	4 (40) [2.9]
No-load secondary voltage (AC) (50/60Hz) V	48 V vehicle	55/55
	80 V vehicle	94/94
No-load secondary voltage (50/60Hz) V	48 V vehicle	74/74
	80 V vehicle	127/127

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CONTROLLER

ITEM		1 ton series	2 ton series	3 ton series
F1 (fuse for traveling and load handling circuits) A		500 40-7FB15: 600	600	500
F3 (fuse for EHPS circuit) A		60	←	←
F4 (fuse for lamp circuit) A		10	←	←
F5 (fuse for control circuit) A		10	←	←
F6 (fuse for power supply circuit) A		10	←	←
F7 (fuse for power supply circuit: 3 ton 80 V vehicle) A		—	—	10
Control panel insulation MΩ		The greater, the better. the insulation resistance, however, depends greatly on the vehicle operating state, place, environment and weather. (Approx. 1 or more)		
TMD and TMP (traveling and load handling transistors) [Tester range: Ω× 1k] kΩ	D1(D2)⊕ - S1(S2)⊖ D1(D2)⊕ - G1⊖ S1(S2)⊕ - D1(D2)⊖ S1(S2)⊕ - G⊖ G⊕ - D1(D2)⊖ G⊕ - S1(S2)⊖	Approx. 2 Approx. 12 ∞ Approx. 10 ∞ Approx. 1		
MB (power supply contactor) coil resistance Ω		Approx. 20 (at 20°C)		
CO (overall capacitor) resistance		The pointer shall first deflect to 0 Ω side, shall gradually return to ∞ then, and shall indicate ∞ finally.		
TMPS (transistor for PS) kΩ	C2E1-E2	C2E1⊖ - E2⊕ : ∞ C2E1⊕ - E2⊖ : Continuity shall exist.		
	G2-E2	G2⊖ - E2⊕ : ∞ G2⊕ - E2⊖ : ∞		
	C2E1-C1	C2E1⊖ - C1⊕ : Continuity shall exist. C2E1⊕ - C1⊖ : ∞		
SH (shunt)		Continuity shall exist.		
Driver motor input voltage difference (V) between phases	1·2 ton series	2 or less		
	3·J3.5 ton	4 or less		
Pump motor input voltage difference (V) between phases	1·2 ton series	2 or less		
	3·J3.5 ton	4 or less		

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ACCELERATION POTENTIOMETER

ITEM		All vehicles
Acceleration switch (SW_{AC}) Ω	When pedal is operated	∞
	When pedal is not operated	0
Acceleration potentiometer resistance kΩ	51 - 52	Shall vary gradually from 0 to approx. 2 to 4.

DIRECTION SWITCH

	lever position		
	Forward	Neutral	Reverse
DS_F	0 Ω	∞ Ω	∞ Ω
DS_R	∞ Ω	∞ Ω	0 Ω
DS_{BU}	∞ Ω	∞ Ω	0 Ω

BRAKE LIMIT SWITCH

Limit switch ON dimension	See page 3-49.

DRIVE MOTOR

ITEM		1 ton series (excluding 40-7FB15)	2 ton series (excluding 40-7FB20·25) and 40-7FB15	40-7FB20·25 3 ton and J3.5 ton
Clearance between rpm sensor and pickup gear mm (in)	Standard	0.4 to 1.0 (0.0157 to 0.039) (1999. 9 ~ 2000. 11) 1.2 to 1.8 (0.0476 to 0.071) (2000. 11 ~)		
Stator ASSY insulation resistance MΩ	Standard	1 or more		
Motor cable continuity Ω	Standard	0		
Temperature sensor resistance KΩ	Standard	Approx. 11 to 15		

PUMP MOTOR

ITEM		1 ton series (excluding 40-7FB15)	2 ton series (excluding 40-7FB20·25 1 ton series ultrahigh capacity vehicles	40-7FB20·25 3 ton and J3.5 ton
Clearance between rpm sensor and pickup gear mm (in)	Standard	0.2 to 1.2 (0.0078 to 0.047)		
Stator ASSY insulation resistance MΩ	Standard	1 or more		
Motor cable continuity Ω	Standard	0		
Temperature sensor resistance Ω	Standard	620		

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POWER STEERING MOTOR

ITEM		All vehicles
Insulation resistance between connector terminal and motor body MΩ	Standard	1 or more
Commutator outside diameter	Standard	50 (1.97)
mm (in)	Limit	45 (1.77)
Undercut	Standard	0.8 (0.0315)
mm (in)	Limit	0.3 (0.0118)
Commutator runout mm (in)	Limit	0.05 (0.00197)
Armature coil insulation resistance MΩ	Standard	1 or more
Brush spring force	Standard	5.59 (0.57) [1.26]
N (kgf) [lbf]	Limit	2.74 (0.28) [0.62]
Insulation resistance between brush holder and bracket MΩ	Standard	1 or more
Brush length	Standard	25 (0.98)
mm (in)	Limit	14 (0.55)

DRIVE UNIT

ITEM		All vehicles
Spider outside diameter	Standard	22.00 (0.8661)
mm (in)	Limit	21.75 (0.8563)
Differential pinion inside diameter	Standard	22.12 (0.8709)
mm (in)	Limit	22.22 (0.8748)
Side gear thrust washer thickness	Standard	1.6 (0.063)
mm (in)	Limit	1.3 (0.051)
Pinion gear thrust washer thickness	Standard	1.6 (0.063)
mm (in)	Limit	1.0 (0.039)
Tightening torque N·m (kgf-cm)[ft-lbf]		
Gear case set bolt	Standard	60.8 ~ 113.8 (620 ~ 1160) [44.8 ~ 83.9]
Ring gear set bolt	Standard	127.5 ~ 176.5 (1300 ~ 1800) [94.0 ~ 13.0]

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FRONT AXLE

ITEM		1 ton series	2 ton series (excluding 40-7FB20·25)	40-7FB20·25 and 3 ton series
Hub starting force N (kgf) [lbf]	Standard	Divided rim: 19.6 ~ 35.3 (2.0 ~ 3.6) [4.41 ~ 7.94] Side ring: 24.5 ~ 44.1 (2.5 ~ 4.5) [5.51 ~ 9.92]		24.5 ~ 78.4 (2.5 ~ 8.0) [5.51 ~ 17.6]
Tightening torque N·m (kgf-cm) [ft-lbf]				
Brake drum	Standard	59 ~ 88 (600 ~ 900) [43.4 ~ 65.1]	59 ~ 88 (600 ~ 900) [43.4 ~ 65.1] 40-7FB20·25: 147 ~ 186 (1500 ~ 1900) [108.5 ~ 137.5]	167 ~ 206 (1700 ~ 2100) [123.0 ~ 152.0]
Hub bearing nut stopper bolt	Standard	8.4 ~ 12.6 (88 ~ 132) [6.37 ~ 9.55]		15 ~ 22 (150 ~ 230) [10.8 ~ 16.6]
Front axle shaft	Standard	69 ~ 88 (700 ~ 900) [50.6 ~ 65.1]		98 ~ 127 (1000 ~ 1300) [72.3 ~ 94.0]
Hub nut	Standard	See page 8-7.		

REAR AXLE

Rear axle ASSY			
Clearance in front and rear of rear axle mm (in)		Standard	0.3 or less (0.0118)
Rear axle center pin bush inside diameter mm (in)		Limit	52 (2.05)
Rear axle hub steering knuckle			
Rear axle hub starting force (at hub bolt) N (Kgf) [lbf]	1 ton series	Standard	15 ~ 39 (1.5 ~ 4.0) [3.3 ~ 8.8]
	1 ton series ultrahigh capacity vehicles and 2 ton series	Standard	20 ~ 58 (2.0 ~ 5.9) [4.4 ~ 13.0]
	2 ton series ultrahigh capacity vehicles and 3·J3.5 ton	Standard	15 ~ 44 (1.5 ~ 4.5) [3.3 ~ 9.9]
King pin outside diameter mm		Limit	27.8 (1.094)
Steering knuckle starting force (at tip end of knuckle) N (Kgf)		Standard	19.3 (2.0) [4.4] or less
Rear axle cylinder			
Rear axle cylinder piston rod outside diameter mm		Limit	49.92 (1.965)
Rear axle cylinder piston rod bend mm		Limit	0.5 (0.0197)
Rear axle cylinder bore mm (in)	1 and 2 ton series	Limit	76.35 (3.006)
	40-7FB20·25	Limit	80.35 (3.163)
	3·J3.5 ton	Limit	80.35 (3.163)

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Rear wheel alignment				
Toe-in		mm	Standard	0 ± 4
Minimum turning radius	mm (in)	1.0 ton model	Standard	1750 (68.9)
		1.35 ton model	Standard	1760 (69.29)
		1.5 ton model	Standard	1770 (69.68)
		40-7FB15	Standard	1980 (77.95)
		1.75 ton model	Standard	1780 (70.07)
		2.0 ton model	Standard	1980 (77.95)
		40-7FB20	Standard	2145 (84.44)
		2.5 ton model	Standard	2000 (78.74)
		40-7FB25	Standard	2170 (85.43)
		3.0 ton model	Standard	2210 (87.01)
		J3.5 ton model	Standard	2270 (89.37)
Tightening torque	**N·m (kgf-cm) [ft-lbf]**			
Axle bracket cap set bolt			Standard	117.7 ~ 166.7 (1200 ~ 1700) [86.8 ~ 123.0]
King pin lock bolt·nut			Standard	44.1 ~ 53.9 (450 ~ 550) [32.6 ~ 39.8]
Rear axle cylinder rod guid set nut			Standard	88 ~ 118 (500 ~ 1200) [36.2 ~ 86.5]
Rear axle cylinder set bolt			Standard	166.7 ~ 215.8 (1700 ~ 2200) [123 ~ 159]
Hub nut			Standard	See page 9-7.

STEERING

Hydrostatic steering valve ASSY				
Steering wheel play		mm (in)	Standard	20 ~ 50 (0.79 ~ 1.97)
Relief pressure		1·2 ton series	Standard	8340 (85) [1210]
	kPa (kgf/cm^2) [psi]	3 ton, J3.5 ton series	Standard	9810 (100) [1420]
Tightening torque	**Unit: N·m (kgf-cm) [ft-lbf]**			
Mast jacket set nut			Standard	34.3 ~ 53.9 (350 ~ 550) [25.3 ~ 39.8]
Steering wheel set nut			Standard	24.5 ~ 58.8 (250 ~ 600) [18.1 ~ 43.4]
Steering valve ASSY set bolt			Standard	29.4 ~ 39.2 (300 ~ 400) [21.7 ~ 28.9]
Steering valve end cap set screw			Standard	22.6 (230) [16.6]

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BRAKE

Front brake (1 ton series) (excluding 40-7FB15)			
Hold down spring free length	mm (in)	Standard	25.5 (1.004)
Anchor to shoe spring free length	mm (in)	Standard	102.2 (4.024)
		Limit	Replace if any clearance in coil exists.
Strut to shoe spring free length	mm (in)	Standard	19.7 (0.776)
Adjuster spring free length	mm (in)	Standard	99.4 (3.913)
		Limit	Replace if any clearance in coil exists.
Brake lining length	mm (in)	Standard	4.9 (0.193)
		Limit	1.0 (0.039)
Wheel cylinder to piston clearance	mm (in)	Limit	0.125 (0.00492)
Brake drum inside diameter	mm (in)	Standard	254 (10.00)
		Limit	256 (10.08)
Front brake (40-7FB15, 2 ton series, 3.0 ton)			
Hold down spring free length	mm (in)	Standard	32.3 (1.272)
		Limit	29.1 (1.146)
Actuator spring free length	mm (in)	Standard	124.5 (4.902)
		Limit	No clearance between coil turns
Anchor to shoe spring free length	mm (in)	Standard	106 (4.17)
		Limit	No clearance between coil turns
Strut to shoe spring free length	mm (in)	Standard	23 (0.91)
		Limit	20 (0.79)
Adjuster spring free length	mm (in)	Standard	86 (3.39)
		Limit	No clearance between coil turns
Brake lining thickness	mm (in)	Standard	7.0 (0.276)
		Limit	2.0 (0.079)
Wheel cylinder to piston clearance	mm (in)	Limit	0.145 (0.00571)
Brake drum inside diameter	mm (in)	Standard	310 (12.20)
		Limit	312 (12.28)
Front brake (J3.5 ton)			
Hold down spring free length	mm (in)	Standard	44.0 (1.732)
Anchor to shoe spring free length (On the side of lining W/pin)	mm (in)	Standard	138.2 (5.441)
		Limit	No clearance between coil turns
Anchor to shoe spring free length (On the side of lining W/O pin)	mm (in)	Standard	121.2 (4.772)
		Limit	No clearance between coil turns
Strut to shoe spring free length	mm (in)	Standard	31.4 (1.236)

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Adjuster spring free length mm (in)		Standard	125.4 (4.397)
		Limit	No clearance between coil turns
Brake lining thickness mm (in)		Standard	5.6 (0.220)
		Limit	1.0 (0.039)
Wheel cylinder to piston clearance mm (in)		Limit	0.15 (0.0059)
Brake drum inside diameter mm (in)		Standard	317.5 (12.500)
		Limit	319.5 (12.579)
Parking brake			
Parking brake operating force (measured at center of lever knob) N (kgf) [lbf]	J3.5 ton	Standard	196 ~ 245 (20 ~ 25) [45~55]
	Others	Standard	147 ~ 196 (15 ~ 20) [33~44]
Brake pedal			
Brake pedal height (from toe board: with pad) mm (in)		Standard	131 ~ 136 (5.16 ~ 5.35)
Brake pedal play mm (in)		Standard	5 ~ 9 (0.197 ~ 0.354)
Brake pedal depreessed height (with pad) mm (in)		Standard	71 (2.80) or more
Brake master cylinder push rod play mm (in)		Standard	1 ~ 2 (0.039 ~ 0.079)
Tightening torque Unit: N·m (kgf-cm) [ft-lif]			
Backing plate set bolt		Standard	137 ~ 196 (1400 ~ 2000) [101.3 ~ 144.7]
Wheel cylinder set bolt	1 ton series (excluding 40-7FB15)	Standard	7.85 ~ 11.77 (80 ~ 120) [5.79 ~ 8.68]
	2 ton series, 3 ton 40-7FB15	Standard	14.7 ~ 19.6 (150 ~ 200) [10.85 ~ 14.47]
	J3.5 ton	Standard	17.7 ~ 26.5 (180 ~ 270) [13.0 ~ 19.5]

MATERIAL HANDLING SYSTEM

Natural drop test			
Natural drop mm (in)		Limit	45 (1.77)
Natural forward tilt test			
Natural forward tilt mm (in)	1 ton series	Standard	15 (0.59) or less
	2 ton series	Standard	20 (0.79) or less
	3·J3.5 ton	Standard	25 (0.98) or less
Oil leak test			
Lift cylinder oil leak amount cm^3 (in^3)		Standard	8 (0.49) or less
Tilt cylinder oil leak amount (total for lift and tilt) cm^3 (in^3)		Standard	16 (0.98) or less

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MAST

Mast adjustment (V mast)				
Mast rollers	Inner mast roller clearance	mm (in)	Standard	0 ~ 0.8 (0 ~ 0.031)
	Outer mast roller clearance	mm (in)	Standard	0 ~ 0.5 (0 ~ 0.017)
Lift bracket rollers	Middle and lower lift roller clearance	mm (in)	0 ~ 0.8 (0 ~ 0.031)	
	Side roller clearance	mm (in)	0 ~ 0.6 (0 ~ 0.024)	
Mast strip to inner mast clearance		mm (in)	Standard	0 ~ 0.8 (0 ~ 0.031)
Mast strip thickness		mm (in)	Limit	1.5 (0.059)
Fork				
Fork front end misalignment		mm (in)	Limit	10 (00.39)
Tightening torque Unit: N·m (kgf-cm) [ft-lb]				
Mast support cap set bolt			Standard	68.6 ~ 107.9 (700 ~ 1100) [50.7 ~ 79.57]
Back rest set bolt			Standard	99.54 ~ 184.9 (1015 ~ 1885) [73.42 ~ 136.4]
Chain adjusting nut			Standard	49.0 ~ 78.0 (500 ~ 800) [36.2 ~ 57.9]

CYLINDER

Lift cylinder (V, SV, FSV)				
Piston rod outside diameter mm (in)	1 ton series (excluding 40-7FB15)		Limit	34.92 (1.3748)
	2 ton series, 40-7FB15		Limit	39.92 (1.5433)
	3·J3.5 ton		Limit	44.92 (1.7685)
Cylinder bore mm (in)	1 ton series (excluding 40-7FB15)		Limit	45.20 (1.7795)
	2 ton series, 40-7FB15		Limit	50.20 (1.9764)
	3 ton		Limit	55.35 (2.1791)
	J·3.5 ton		Limit	60.35 (2.3760)
Piston rod bend		mm (in)	Limit	2.0 (0.08)
Rear lift cylinder (FV)				
Piston rod outside diameter mm (in)	1 ton series (excluding 40-7FB15)	FV	Limit	31.92 (1.2567)
	2 ton series, 40-7FB15	FV	Limit	34.92 (1.3748)
	3·J3.5 ton	FV	Limit	39.92 (1.5717)
Cylinder bore mm (in)	1 ton series (excluding 40-7FB15)		Limit	45.20 (1.7795)
	2 ton series, 40-7FB15		Limit	50.20 (1.9764)
	3 ton		Limit	55.35 (2.1791)
	J·3.5 ton		Limit	60.35 (2.3760)
Piston rod bend		mm (in)	Limit	2.0 (0.08)

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Front lift cylinder (FV·FSV)			
Piston rod outside diameter mm (in)	1 ton series (excluding 40-7FB15)	Limit	49.92 (1.9654)
	2 ton series, 40-7FB15	Limit	↑
	3 ton	Limit	59.91 (2.3587)
	J·3.5 ton	Limit	↑
Cylinder bore mm (in)	1 ton series (excluding 40-7FB15)	Limit	70.35 (2.7700)
	2 ton series, 40-7FB15	Limit	75.35 (2.9665)
	3 ton	Limit	85.40 (3.3622)
	J·3.5 ton	Limit	90.40 (3.5590)
Piston rod bend mm (in)		Limit	2.0 (0.08)
Tilt cylinder			
Cylinder bore mm (in)		Limit	70.35 (2.7697)
Piston rod outside diameter mm (in)		Limit	29.92 (1.1780)
Piston rod bend mm (in)		Limit	1.0 (0.039)
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Lift cylinder cover		Standard	284.4 ~ 421.7 (2900 ~ 4300) [209.8 ~ 311.1]
Flow regulator valve		Standard	58.8 ~ 68.7 (600 ~ 700) [43.4 ~ 50.7]
Safety down valve		Standard	29.4 ~ 39.2 (300 ~ 400) [21.7 ~ 28.9]
Front lift cylinder rod guide		Standard	343.2 ~ 441.3 (3500 ~ 4500) [253.2 ~ 325.6]
Tilt cylinder piston castle nut		Standard	225.4 ~ 284.2 (2300 ~ 2900) [166.4 ~ 209.8]
Tilt cylinder rod joint set bolt		Standard	60.9 ~ 113.2 (621 ~ 1154) [44.9 ~ 83.49]
Tilt cylinder cover		Standard	284.4 ~ 421.7 (2900 ~ 4300) [209.8 ~ 311.1]

OIL PUMP

Oil pump ASSY (1·2 ton series)			
Side plate thickness mm (in)		Limit	0.15 (0.006) or less at LBC surface
Gear shaft outside diameter mm (in)		Limit	21.997 (0.86602)
Body inside surface flaw depth mm (in)		Limit	0.15 (0.006)
Oil pump ASSY (3·J3.5 ton)			
Bushing inside diameter mm (in)		Limit	19.123 (0.7529)
Bushing axial length mm (in)	Side bush	Limit	14.77 (0.5815)
	Center bush	Limit	29.67 (1.1681)
Gear shaft outside diameter mm (in)		Limit	18.935 (0.7455)
Body inside surface flaw depth mm (in)		Limit	0.1 (0.004)

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OIL CONTROL VALVE

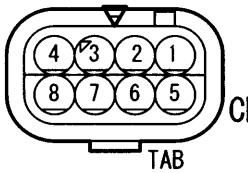
Oil control valve				
Relief set pressure kPa (kgf/cm²) [psi]	Lift	1.0 ton	Standard	12700 (130)
		1.35 ~ 1.75 ton	Standard	15200 (155)
		2 ton series	Standard	17200 (175)
		3·J3.5 ton	Standard	18100 (185)
	Tilt	1.0 ton series	Standard	11800 (120)
		2 ton series	Standard	14700 (150)
		J3.5 ton	Standard	15700 (160)

SAS

Tightening torque Unit: N·m (kgf-cm) [ft-lbf]		
SAS controller set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Tire angle sensor set bolt	Standard	1.0 ~ 2.0 (10 ~ 20) [0.72 ~ 1.4]
Tire angle sensor cover set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Swing lock cylinder pin set bolt	Standard	Upper side: 10.5 ~ 24.5 (107 ~ 250) [7.74 ~ 18.1] Lower side: 16.2 ~ 37.8 (162 ~ 378) [11.7 ~ 27.3]
Tilt angle sensor set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Load sensor	Standard	35.3 ~ 43.1 (360 ~ 440) [26.0 ~ 31.8]
Speed sensor set bolt	Standard	3.0 ~ 7.0 (31 ~ 71) [2.2 ~ 5.1]
Fork height switch ASSY set bolt	Standard	14.4 ~ 33.6 (147 ~ 343) [10.6 ~ 24.8]

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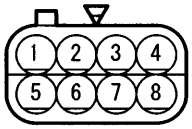
CONNECTOR DRAWING (FOR VEHICLE WITHOUT SAS)



CN1

TAB

NO	P	C	J
1	14	BR	CN2-4
2	16	R	CN2-1
3	141	R-B	CN1-8
4	144	R-Y	CN1-7
5			
6			
7	144	R-Y	CN1-4
8	141	R-B	CN1-3



REC

NO	P	C	J
1	14	BR	CN103-12
2	16	R	CN103-10
3	141	W-R	CN103-16
4	143	R-Y	CN103-14
5			
6			
7	144	G-R	CN103-13
8	142	R-B	CN103-15



CN3

TAB

NO	P	C	J
1	101	R	B
2	104	G	T
3	102	R-G	HS
4	107	R-Y	HM



REC

NO	P	C	J
1	101	R	CN29-1
2	104	G-R	CN29-2
3	102	R-G	CN29-4
4	107	R-B	CN29-5



CN4

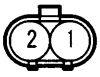
TAB

NO	P	C	J
1	41	-	AM
4	43	-	IG



REC

NO	P	C	J
1	41	Y	CN29-3
4	43	B-Y	CN29-6



CN5

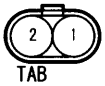
TAB

NO	P	C	J
1	101	Y	LS ST
2	111	B-Y	LS ST



REC

NO	P	C	J
1	101	R	CN22-1
2	111	R-L	CN38-2



CN6

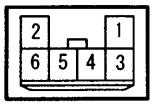
TAB

NO	P	C	J
1	51	B-W	LS B
2	65	R-L	LS B



REC

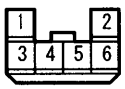
NO	P	C	J
1	51	R-L	J1
2	65	Y-G	CN45-4



CN8

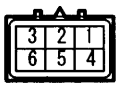
TAB

NO	P	C	J
1	41	GY	SW H(+)
2	48	WB	SW H(-)
3	110	GW	SW F(B)
4	108	G	SW F(R)
5	109	GR	SW F(L)
6			



REC

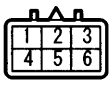
NO	P	C	J
1	41	Y	J6
2	48	P	H
3	110	GR	CN12-2
4	108	R-Y	CN38-5
5	109	G-Y	CN38-6
6			



CN9

TAB

NO	P	C	J
1	51	O	DSF, DSR
2	120	B	DSFO
3	103	G	DSBU
4	46	W-O	DSR
5	45	W-BR	DSF
6	43	R	DSFO, DSBU



REC

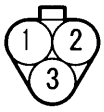
NO	P	C	J
1	51	R-L	J1
2	120	Y-R	CN24-1
3	103	R-W	CN38-3
4	46	G	CN101-2
5	45	W	CN101-1
6	43	B-Y	J7



CN11

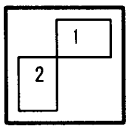
TAB

NO	P	C	J
1	60	G-W	LS L
2	51	R-L	NO
3	63	G-B	LS ATT



REC

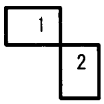
NO	P	C	J
1	60	G-W	CN101-32
2	51	R-L	J1
3	63	G-B	CN101-11



CN12

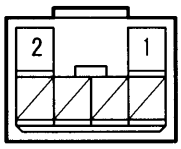
TAB

NO	P	C	J
1	43	-	FRY
2	110	-	FRY



REC

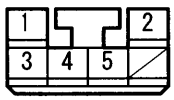
NO	P	C	J
1	43	B-Y	CN103-12
2	110	GR	CN8-3



CN13

TAB

NO	P	C	J
1	N1	W-B	LH-R
2	102	R-G	LH-R



REC

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN17-2
3	N1	W-B	J8
4	108	R-Y	J12
5	104	G-R	CN38-4



CN15

TAB

NO	P	C	J
1	51	-	LS PB
2	66	-	LS PB



REC

NO	P	C	J
1	51	R-L	J1
2	66	B-W	CN101-4

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CN16



TAB

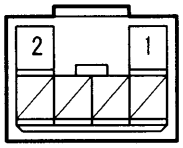
NO	P	C	J
1	107	B	PLW
2	N1	B	PLW



REC

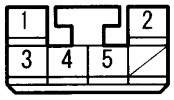
NO	P	C	J
1	107	R-B	CN29-5, CN38-7
2	N1	W-B	J8, J8

CN17



TAB

NO	P	C	J
1	N1	W-B	LH-L
2	102	R-G	LH-L



REC

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN13-2
3	N1	W-B	J8
4	109	G-Y	J11
5	104	G-R	J10

CN22



TAB

NO	P	C	J
1	101	-	F4
2	P1	-	F4, F5
3			
4	41	-	F5



REC

NO	P	C	J
1	101	R	CN5-1
2	P1	B	P1 terminal
3			
4	41	Y	J6

CN23



TAB

NO	P	C	J
1	103	R-W	BZ
2	N1	B	BZ



REC

NO	P	C	J
1	103	R-W	J13
2	N1	W-B	J8

CN24



TAB

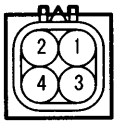
NO	P	C	J
1	120	R-W	CHI
2	N1	B	CHI



REC

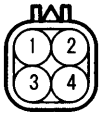
NO	P	C	J
1	120	Y-R	CN9-2
2	N1	W-B	J30

CN25



TAB

NO	P	C	J
1	52	GR	CN26-3
2	53	R-B	CN26-4
3	51	R-L	CN26-1
4	64	R-Y	CN26-2



REC

NO	P	C	J
1	52	GR	CN102-2
2	53	R-B	CN102-14
3	51	R-W	CN102-22
4	64	R-Y	CN102-1

CN26



TAB

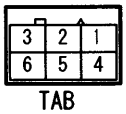
NO	P	C	J
1	51	-	E2
2	64	-	IDL
3	52	-	VTA
4	53	-	VC



REC

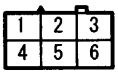
NO	P	C	J
1	51	R-L	CN25-3
2	64	R-Y	CN25-4
3	52	GR	CN25-1
4	53	R-B	CN25-2

CN29



TAB

NO	P	C	J
1	101	R	CN3-1
2	104	G-R	CN3-2
3	41	Y	CN4-1
4	102	R-G	CN3-3
5	107	R-B	CN3-4
6	43	B-Y	CN4-4



REC

NO	P	C	J
1	101	R	J9
2	104	G-R	J10
3	41	Y	CN103-7
4	102	R-G	J15
5	107	R-B	CN16-1
6	43	B-Y	J7

CN31



TAB

NO	P	C	J
1	104	L	TL
2	111	L	STP
3	109	L	TRN
4	N1	L	E

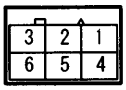


REC

NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	109	G-Y	CN38-6
4	N1	W-B	J46

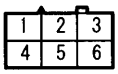
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CN31-1



TAB

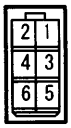
NO	P	C	J
1	104	R-W	LT-L
2	N1	W-B	GND
3	N1	Y	LF-RL
4	111	R-B	LST-L
5	103	R	LF-LR
6	109	G-W	LF-RL



REC

NO	P	C	J
1	104	G-R	J43
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	J41
5	103	R-W	J42
6	109	G-Y	J45

CN34



TAB

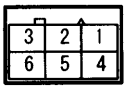
NO	P	C	J
1	104	R	TL
2	111	R	STP
3	103	R	B/U
4			
5	108	R	TRN
6	N1	R	E



REC

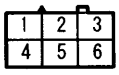
NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	103	R-W	J42
4			
5	108	R-Y	J44
6	N1	W-B	J46

CN34-1



TAB

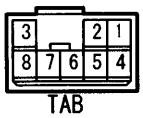
NO	P	C	J
1	104	R-W	LT-R
2	N1	W-B	GND
3	N1	Y	LF-RR
4	111	R-B	LST-R
5	103	B	LF-RR
6	108	G-W	LF-RR



REC

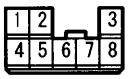
NO	P	C	J
1	104	G-R	CN38-4
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	CN38-2
5	103	R-W	J42
6	108	R-Y	CN38-5

CN38



TAB

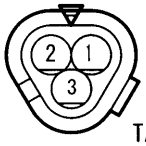
NO	P	C	J
1	120	Y-R	J14
2	111	R-L	CN5-2
3	103	R-W	CN9-3
4	104	G-R	CN13-5
5	108	R-Y	CN8-4
6	109	G-Y	CN8-5
7	107	R-B	CN16-1
8	N1	W-B	J8



REC

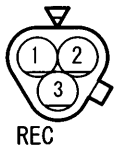
NO	P	C	J
1	120	Y-R	LF-R
2	111	R-L	CN34-1-4
3	103	R-W	LF-R
4	104	G-R	CN34-1-1
5	108	R-Y	CN34-1-6
6	109	G-Y	CN31-3
7	107	R-B	LW
8	N1	W-B	LR

CN39



TAB

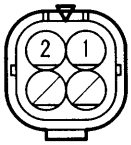
NO	P	C	J
1	145	Y-R	CN2-2
2	146	R	CN2-1
3	41	Y	HM



REC

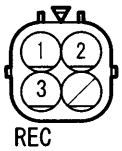
NO	P	C	J
1	145	Y-R	CN101-25
2	146	R	CN101-15
3	41	Y	J6

CN40



TAB

NO	P	C	J
1	N1	W-B	HM
2	43	B-Y	CN41
3			
4			



REC

NO	P	C	J
1	N1	W-B	N1 terminal
2	43	B-Y	J7
3	139	P	CN68-1

CN41



TAB

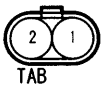
NO	P	C	J
1	43	B-Y	HM



REC

NO	P	C	J
1	43	B-Y	CN40-2

CN42



TAB

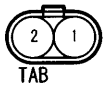
NO	P	C	J
1	67	R	CN43-1
2	51	P	CN43-2



REC

NO	P	C	J
1	67	B-Y	CN101-5
2	51	R-L	J1

CN43



TAB

NO	P	C	J
1	67	R	LS ₀
2	51	P	LS ₀



REC

NO	P	C	J
1	67	R	CN42-1
2	51	P	CN42-2

CN50



TAB

NO	P	C	J
1	P21	B	Motor A
2	P23	B	Motor B



REC

NO	P	C	J
1	P21	L	CN51-1
2	P23	W	CN51-3

CN52



TAB

NO	P	C	J
1	87	-	SW ₅
2	86	-	SW ₅



REC

NO	P	C	J
1	87	P	CN102-11
2	86	B-Y	CN102-10

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CN53



TAB

NO	P	C	J
1	81	–	SSD1
2	80	–	SSD1



REC

NO	P	C	J
1	81	G	CN57-1
2	80	B	CN57-4

CN54



TAB

NO	P	C	J
1	82	–	SSD2
2	80	–	SSD2



REC

NO	P	C	J
1	82	BR	CN57-3
2	80	B	J24

CN55



TAB

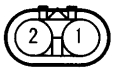
NO	P	C	J
1	89	–	STM
2	88	–	STM



REC

NO	P	C	J
1	89	W-R	CN102-13
2	88	Y-G	CN102-12

CN56



TAB

NO	P	C	J
1	85	–	SSP
2	84	–	SSP



REC

NO	P	C	J
1	85	W-G	CN58-1
2	84	B-R	CN58-2

CN57



TAB

NO	P	C	J
1	81	G	CN53-1
2			
3	82	BR	CN54-1
4	80	B	CN53-3



REC

NO	P	C	J
1	81	W-L	CN102-6
2	83	BR	CN102-19
3	82	B-W	CN102-7
4	80	G-R	CN102-18

CN58



TAB

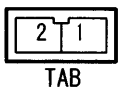
NO	P	C	J
1	85	W-G	CN56-1
2	84	B-R	CN56-2



REC

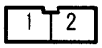
NO	P	C	J
1	85	W-G	CN102-9
2	84	B-R	CN102-8

CN59



TAB

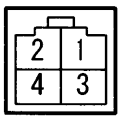
NO	P	C	J
1	5	B	MPS
2	6	B	MPS



REC

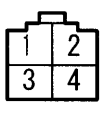
NO	P	C	J
1	5	B-R	CN103-5
2	6	R-L	CN102-6

CN79



TAB

NO	P	C	J
1	51	–	SWMODE
2	92	–	SWMODE
1	91	–	SWMODE
2	90	–	SWMODE

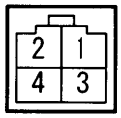


REC

NO	P	C	J
1	51	R-L	CN101-26
2	92	R-B	CN101-21
3	91	GR	CN101-20
4	90	O	CN101-19

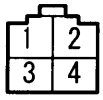
For volume selectable buzzer

CN80



TAB

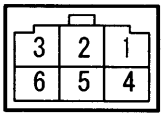
NO	P	C	J
1	125	–	BZ
2	N1	–	BZ
1	127	–	BZ
2	126	–	BZ



REC

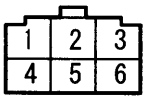
NO	P	C	J
1	125	GR	CN81-3
2	N1	W-B	CN23-2
3	127	R-Y	CN81-4
4	126	R-L	CN81-5

CN81



TAB

NO	P	C	J
1	103	–	SWBZ
2	103	–	SWBZ
3	125	–	SWBZ
4	127	–	SWBZ
5	126	–	SWBZ
6			



REC

NO	P	C	J
1	103	R-W	CN23-1
2	103	R-W	CN23-1
3	125	GR	CN80-1
4	127	R-Y	CN80-3
5	126	R-L	CN80-4
6			

For wiper

CN36



TAB

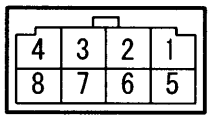
NO	P	C	J
1	124	R	DWP
2	N1	W-B	DWP



REC

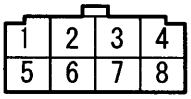
NO	P	C	J
1	124	R-B	RWP2
2	N1	W-B	CN84-2

CN83



TAB

NO	P	C	J
1	121	–	SWWIPER
2			
3			
4			
5			
6			
7	122	–	SWWIPER
8			



REC

NO	P	C	J
1	121	R-L	FWP
2			
3			
4			
5			
6			
7	122	R	CN84-1
8			

CN84



TAB

NO	P	C	J
1	122	R	RWP1
2	N1	W-B	CN36-2



REC

NO	P	C	J
1	122	R	CN83-7
2	N1	W-B	Joint with CN40-1

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CN87





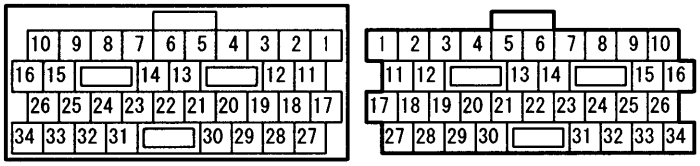
TAB

NO	P	C	J
1	61	G-R	LSTF
2	51	R-L	LS-
3	62	L	LSTR
4	51	R-L	LS-

REC

NO	P	C	J
1	61	G-R	CN101-16
2	51	R-L	J1
3	62	L	CN101-17
4	51	R-L	J1

CN101



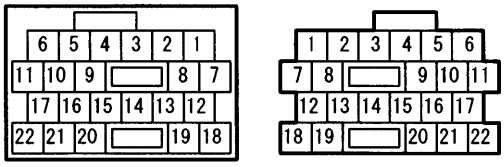
TAB

NO	P	C	J
1	45	-	DSF
2	46	-	DSR
3	65	-	LSB
4	66	-	LSPB
5	67	-	LSD
6			
7			
8			
9	307	-	SMTSA
10	308	-	SMTSK
11	63	-	LSAT1
12	307	-	SSTMA
13	308	-	SSTMK
14			
15	146	-	BIBC
16	61	-	LSTF
17	62	-	LSTR
18			
19	90	-	MH1
20	91	-	MH2-1
21	92	-	MH2-2
22			
23			
24			
25	145	-	BIBD
26	51	-	LS-
27			
28			
29			
30			
31			
32	60	-	LSL1
33			
34			

REC

NO	P	C	J
1	45	W	CN9-5
2	46	G	CN9-4
3	65	Y-G	CN6-2
4	66	B-W	CN15-2
5	67	B-Y	CN42-1
6			
7			
8			
9	307	W-G	CN101-12
10	308	G-Y	CN101-13
11	63	G-B	CN11-3
12	307	W-G	CN101-9
13	308	G-Y	CN101-10
14			
15	146	R	CN39-2
16	61	G-R	CN87-1
17	62	L	CN87-3
18			
19	90	O	CN79-4
20	91	GR	CN79-3
21	92	R-B	CN79-2
22			
23			
24			
25	145	Y-R	CN39-1
26	51	R-L	CN79-1
27			
28			
29			
30			
31			
32	60	G-W	CN11-1
33			
34			

CN102



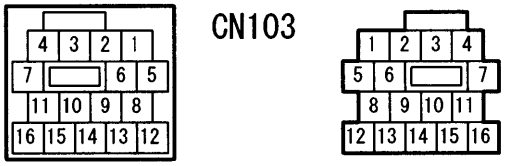
TAB

NO	P	C	J
1	64	-	SWAC
2	52	-	POTA
3			
4			
5			
6	81	-	SSD1
7	82	-	SSD2
8	84	-	SSP+
9	85	-	SSP-
10	86	-	TD+
11	87	-	TD-
12	88	-	TP+
13	89	-	TP-
14	53	-	POTA+
15			
16			
17			
18	80	-	SSD+
19	83	-	SSD-
20			
21			
22	51	-	POT-

REC

NO	P	C	J
1	64	R-Y	CN25-4
2	52	GR	CN25-1
3			
4			
5			
6	81	W-L	CN57-1
7	82	B-W	CN57-3
8	84	B-R	CN58-2
9	85	W-G	CN58-1
10	86	B-Y	CN52-2
11	87	P	CN52-1
12	88	Y-G	CN55-2
13	89	W-R	CN55-1
14	53	R-B	CN25-2
15			
16			
17			
18	80	G-R	CN57-4
19	83	BR	CN57-2
20			
21			
22	51	R-W	CN25-3

CN103



TAB

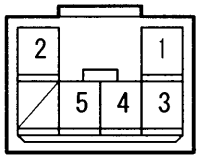
NO	P	C	J
1			
2			
3	41	-	B48V
4	43	-	VBKY
5	5	-	SOLT+
6	6	-	SOLT-
7	41	-	VBBT
8			
9			
10	16	-	D15V
11			
12	14	-	GNDD
13	144	-	SMTDK
14	143	-	SDTMK
15	142	-	SDTMA
16	141	-	SMTDA

REC

NO	P	C	J
1			
2			
3	41	Y	J6
4	43	B-Y	CN12-1
5	5	B-R	CN59-1
6	6	R-L	CN59-2
7	41	Y	CN29-3
8			
9			
10	16	R	CN1-2
11			
12	14	BR	CN1-1
13	144	G-R	CN1-7
14	143	R-Y	CN1-4
15	142	R-B	CN1-8
16	141	W-R	CN1-3

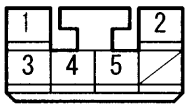
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For front combination lamp



CN13

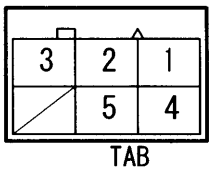
TAB



REC

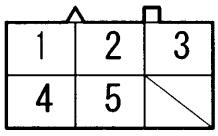
NO	P	C	J
1	N1	W-B	CN14-5
2	102	R-G	CN14-3
3	N1	W-B	CN14-1
4	108	G-Y	CN14-4
5	104	G-R	CN14-2

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN17-2
3	N1	W-B	J8
4	108	R-Y	J12
5	104	G-R	CN38-4



CN14

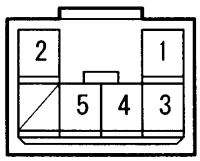
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REC

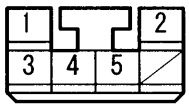
NO	P	C	J
1	N1	-	GND
2	104	-	LC-R
3	102	-	H/L
4	108	-	LF-R
5	N1	-	GND

NO	P	C	J
1	N1	W-B	CN13-3
2	104	G-R	CN13-5
3	102	R-G	CN13-2
4	108	G-Y	CN13-4
5	N1	W-B	CN13-1



CN17

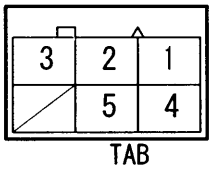
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REC

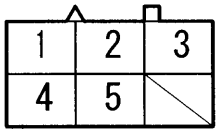
NO	P	C	J
1	N1	W-B	CN18-5
2	102	R-G	CN18-3
3	N1	W-B	CN18-1
4	109	G-Y	CN18-4
5	104	G-R	CN18-2

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN13-2
3	N1	W-B	J8
4	109	G-Y	J11
5	104	G-R	J10



CN18

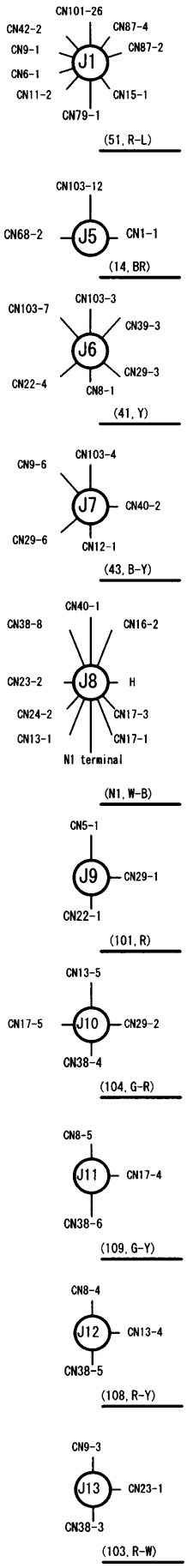
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REC

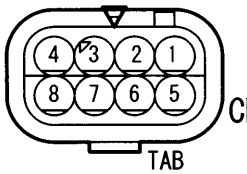
NO	P	C	J
1	N1	-	GND
2	104	-	LC-L
3	102	-	H/L
4	109	-	LF-L
5	N1	-	GND

NO	P	C	J
1	N1	W-B	CN17-3
2	104	G-R	CN17-5
3	102	R-G	CN17-2
4	109	G-Y	CN17-4
5	N1	W-B	CN17-1



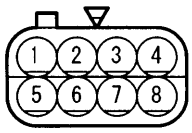
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CONNECTOR DRAWING (FOR VEHICLE WITH SAS)



CN1

TAB



REC

NO	P	C	J
1	14	BR	CN70-30
2	16	R	CN70-14
3	141	W-R	CN70-22
4	143	R-Y	CN70-24
5	138	W-L	CN70-5
6	137	R-G	CN70-4
7	144	G-R	CN70-23
8	142	R-B	CN70-21

NO	P	C	J
1	14	BR	CN103-12
2	16	R	CN103-10
3	141	W-R	CN103-16
4	143	R-Y	CN103-14
5	138	W-L	CN141-13
6	137	R-G	CN141-14
7	144	G-R	CN103-13
8	142	R-B	CN103-15



CN3

TAB



REC

NO	P	C	J
1	101	R	B
2	104	G	T
3	102	R-G	HS
4	107	R-Y	HM

NO	P	C	J
1	101	R	CN29-1
2	104	G-R	CN29-2
3	102	R-G	CN29-4
4	107	R-B	CN29-5



CN4

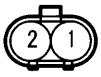
TAB



REC

NO	P	C	J
1	41	-	AM
4	43	-	IG

NO	P	C	J
1	41	Y	CN29-3
4	43	B-Y	CN29-6



CN5

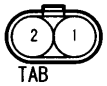
TAB



REC

NO	P	C	J
1	101	Y	LS ST
2	111	B-Y	LS ST

NO	P	C	J
1	101	R	CN22-1
2	111	R-L	CN38-2



CN6

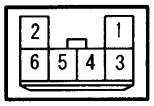
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REC

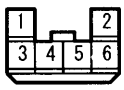
NO	P	C	J
1	51	B-W	LS B
2	65	R-L	LS B

NO	P	C	J
1	51	R-L	J1
2	65	Y-G	CN45-4



CN8

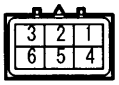
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REC

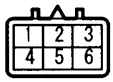
NO	P	C	J
1	41	GY	SW H(+)
2	48	WB	SW H(-)
3	110	GW	SW F(B)
4	108	G	SW F(R)
5	109	GR	SW F(L)
6			

NO	P	C	J
1	41	Y	J6
2	48	P	H
3	110	GR	CN12-2
4	108	R-Y	CN38-5
5	109	G-Y	CN38-6
6			



CN9

TAB



REC

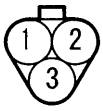
NO	P	C	J
1	51	O	DSF, DSR
2	120	B	DSFO
3	103	G	DSBU
4	46	W-O	DSR
5	45	W-BR	DSF
6	43	R	DSFO, DSBU

NO	P	C	J
1	51	R-L	J1
2	120	Y-R	CN24-1
3	103	R-W	CN38-3
4	46	G	CN101-2
5	45	W	CN101-1
6	43	B-Y	J7



CN11

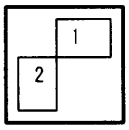
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REC

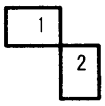
NO	P	C	J
1	60	G-W	LS L
2	51	R-L	NO
3	63	G-B	LS ATT

NO	P	C	J
1	60	G-W	CN101-32
2	51	R-L	J1
3	63	G-B	CN101-11



CN12

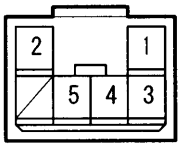
TAB



REC

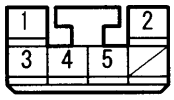
NO	P	C	J
1	43	-	FRY
2	110	-	FRY

NO	P	C	J
1	43	B-Y	CN103-12
2	110	GR	CN8-3



CN13

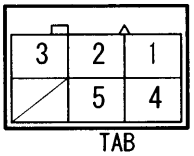
TAB



REC

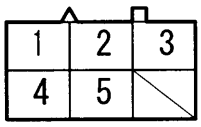
NO	P	C	J
1	N1	W-B	CN14-5
2	102	R-G	CN14-3
3	N1	W-B	CN14-1
4	108	G-Y	CN14-4
5	104	G-R	CN14-2

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN17-2
3	N1	W-B	J8
4	108	R-Y	J12
5	104	G-R	CN38-4



CN14

TAB



REC

NO	P	C	J
1	N1	-	GND
2	104	-	LC-R
3	102	-	H/L
4	108	-	LF-R
5	N1	-	GND

NO	P	C	J
1	N1	W-B	CN13-3
2	104	G-R	CN13-5
3	102	R-G	CN13-2
4	108	G-Y	CN13-4
5	N1	W-B	CN13-1



CN15

TAB



REC

NO	P	C	J
1	51	-	LS PB
2	66	-	LS PB

NO	P	C	J
1	51	R-L	J1
2	66	B-W	CN101-4

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CN16



TAB

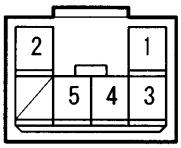
NO	P	C	J
1	107	B	PLW
2	N1	B	PLW



REC

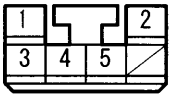
NO	P	C	J
1	107	R-B	CN29-5, CN38-7
2	N1	W-B	J8, J8

CN17



TAB

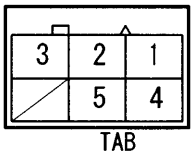
NO	P	C	J
1	N1	W-B	CN18-5
2	102	R-G	CN18-3
3	N1	W-B	CN18-1
4	109	G-Y	CN18-4
5	104	G-R	CN18-2



REC

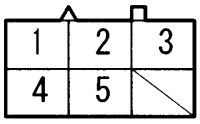
NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN13-2
3	N1	W-B	J8
4	109	G-Y	J11
5	104	G-R	J10

CN18



TAB

NO	P	C	J
1	N1	-	GND
2	104	-	LC-L
3	102	-	H/L
4	109	-	LF-L
5	N1	-	GND



REC

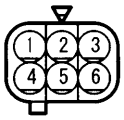
NO	P	C	J
1	N1	W-B	CN17-3
2	104	G-R	CN17-5
3	102	R-G	CN17-2
4	109	G-Y	CN17-4
5	N1	W-B	CN17-1

CN19



TAB

NO	P	C	J
1	311	R	STS+
2			
3	315	B	STS-
4	312	W	STS1
5	313	G	STS2
6	314	BR	STSC



REC

NO	P	C	J
1	311	W-R	CN141-17
2			
3	315	BR	CN141-16
4	312	G-W	CN141-6
5	313	R-Y	CN141-7
6	314	L	CN141-8

CN22



TAB

NO	P	C	J
1	101	-	F4
2	P1	-	F4, F5
3			
4	41	-	F5



REC

NO	P	C	J
1	101	R	CN5-1
2	P1	B	P1 terminal
3			
4	41	Y	J6

CN23



TAB

NO	P	C	J
1	103	R-W	BZ
2	N1	B	BZ



REC

NO	P	C	J
1	103	R-W	J13
2	N1	W-B	J8

CN24



TAB

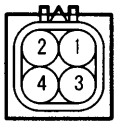
NO	P	C	J
1	120	R-W	CHI
2	N1	B	CHI



REC

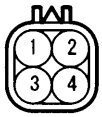
NO	P	C	J
1	120	Y-R	CN9-2
2	N1	W-B	J30

CN25



TAB

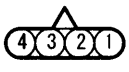
NO	P	C	J
1	52	GR	CN26-3
2	53	R-B	CN26-4
3	51	R-L	CN26-1
4	64	R-Y	CN26-2



REC

NO	P	C	J
1	52	GR	CN102-2
2	53	R-B	CN102-14
3	51	R-W	J2
4	64	R-Y	CN102-1

CN26



TAB

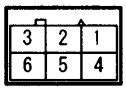
NO	P	C	J
1	51	-	E2
2	64	-	IDL
3	52	-	VTA
4	53	-	VC



REC

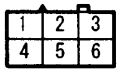
NO	P	C	J
1	51	R-L	CN25-3
2	64	R-Y	CN25-4
3	52	GR	CN25-1
4	53	R-B	CN25-2

CN29



TAB

NO	P	C	J
1	101	R	CN3-1
2	104	G-R	CN3-2
3	41	Y	CN4-1
4	102	R-G	CN3-3
5	107	R-B	CN3-4
6	43	B-Y	CN4-4



REC

NO	P	C	J
1	101	R	J9
2	104	G-R	J10
3	41	Y	CN103-7
4	102	R-G	J15
5	107	R-B	CN16-1
6	43	B-Y	J7

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CN31



TAB

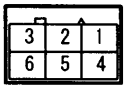
NO	P	C	J
1	104	L	TL
2	111	L	STP
3	109	L	TRN
4	N1	L	E



REC

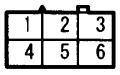
NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	109	G-Y	CN38-6
4	N1	W-B	J46

CN31-1



TAB

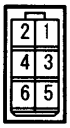
NO	P	C	J
1	104	R-W	LT-L
2	N1	W-B	GND
3	N1	Y	LF-RL
4	111	R-B	LST-L
5	103	R	LF-LR
6	109	G-W	LF-RL



REC

NO	P	C	J
1	104	G-R	J43
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	J41
5	103	R-W	J42
6	109	G-Y	J45

CN34



TAB

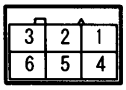
NO	P	C	J
1	104	R	TL
2	111	R	STP
3	103	R	B/U
4			
5	108	R	TRN
6	N1	R	E



REC

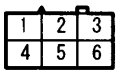
NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	103	R-W	J42
4			
5	108	R-Y	J44
6	N1	W-B	J46

CN34-1



TAB

NO	P	C	J
1	104	R-W	LT-R
2	N1	W-B	GND
3	N1	Y	LF-RR
4	111	R-B	LST-R
5	103	B	LF-RR
6	108	G-W	LF-RR



REC

NO	P	C	J
1	104	G-R	CN38-4
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	CN38-2
5	103	R-W	J42
6	108	R-Y	CN38-5

CN35



TAB

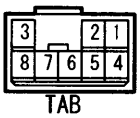
NO	P	C	J
1	140	B	SLL



REC

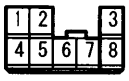
NO	P	C	J
1	140	B	CN40-4

CN38



TAB

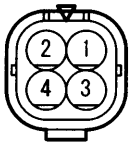
NO	P	C	J
1	120	Y-R	J14
2	111	R-L	CN5-2
3	103	R-W	CN9-3
4	104	G-R	CN13-5
5	108	R-Y	CN8-4
6	109	G-Y	CN8-5
7	107	R-B	CN16-1
8	N1	W-B	J8



REC

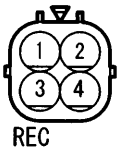
NO	P	C	J
1	120	Y-R	LF-R
2	111	R-L	CN34-1-4
3	103	R-W	LF-R
4	104	G-R	CN34-1-1
5	108	R-Y	CN34-1-6
6	109	G-Y	CN31-3
7	107	R-B	LW
8	N1	W-B	LR

CN40



TAB

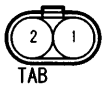
NO	P	C	J
1	N1	W-B	CN70-15
2	43	B-Y	CN70-1
3	139	P	CN70-19
4	140	B	CN70-20



REC

NO	P	C	J
1	N1	W-B	N1 terminal
2	43	B-Y	J7
3	139	P	CN68-1
4	140	B	CN35-1

CN42



TAB

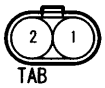
NO	P	C	J
1	67	R	CN43-1
2	51	P	CN43-2



REC

NO	P	C	J
1	67	B-Y	CN101-5
2	51	R-L	J1

CN43



TAB

NO	P	C	J
1	67	R	LS。
2	51	P	LS。

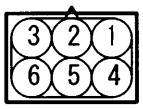


REC

NO	P	C	J
1	67	R	CN42-1
2	51	P	CN42-2

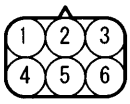
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TAB

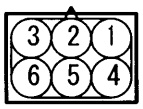
CN45



REC

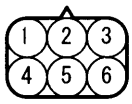
NO	P	C	J
1	180	G-W	CN46-1
2	181	G-Y	CN46-2
3	182	G-B	CN46-3
4	183	BR-W	CN46-4
5	184	BR-R	CN46-5
6	43	B-Y	CN47-1

NO	P	C	J
1	180	G-W	CN70-7
2	181	G-Y	CN70-13
3	182	G-B	CN70-12
4	183	BR-W	CN70-28
5	184	BR-R	CN70-29
6	43	B-Y	J21



TAB

CN46



REC

NO	P	C	J
1	180	G-W	CN48-1
2	181	G-Y	CN48-2
3	182	G-B	CN48-3
4	183	BR-W	CN48-4
5	184	BR-R	CN48-5
6			

NO	P	C	J
1	180	G-W	CN45-1
2	181	G-Y	CN45-2
3	182	G-B	CN45-3
4	183	BR-W	CN45-4
5	184	BR-R	CN45-5
6			



TAB

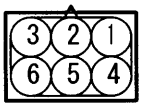
CN47



REC

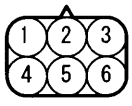
NO	P	C	J
1	43	B-Y	CN49-1
2	N1	W-B	CN49-2

NO	P	C	J
1	43	B-Y	CN45-6
2	N1	W-B	N1 terminal



TAB

CN48



REC

NO	P	C	J
1	180	-	VOICE+
2	181	-	VOICE1
3	182	-	VOICE2
4	183	-	VOICE3
5	184	-	VOICE4
6			

NO	P	C	J
1	180	G-W	CN46-1
2	181	G-Y	CN46-2
3	182	G-B	CN46-3
4	183	BR-W	CN46-4
5	184	BR-R	CN46-5
6			



TAB

CN49



REC

NO	P	C	J
1	43	-	+48V
2	N1	-	GND

NO	P	C	J
1	43	B-Y	CN47-1
2	N1	W-B	CN47-2



TAB

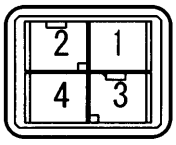
CN50

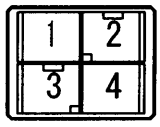


REC

NO	P	C	J
1	P21	B	Motor A
2	P23	B	Motor B

NO	P	C	J
1	P21	L	CN51-1
2	P23	W	CN51-3





TAB

CN51

REC

NO	P	C	J
1	P21	W	TMPS
2	P21	R	TMPS
3	P23	G	TMPS
4	N1	B	TMPS

NO	P	C	J
1	P21	L	CN50-1
2	P21	R	F3
3	P23	W	CN50-2
4	N1	W-B	N1 terminal



TAB

CN52



REC

NO	P	C	J
1	87	-	SW s
2	86	-	SW s

NO	P	C	J
1	87	P	CN102-11
2	86	B-Y	CN102-10



TAB

CN53



REC

NO	P	C	J
1	81	-	SSD1
2	80	-	SSD1

NO	P	C	J
1	81	G	CN57-1
2	80	B	CN57-4



TAB

CN54



REC

NO	P	C	J
1	82	-	SSD2
2	80	-	SSD2

NO	P	C	J
1	82	BR	CN57-3
2	80	B	J24



TAB

CN55



REC

NO	P	C	J
1	89	-	STM p
2	88	-	STM p

NO	P	C	J
1	89	W-R	CN102-13
2	88	Y-G	CN102-12



TAB

CN56



REC

NO	P	C	J
1	85	-	SSP
2	84	-	SSP

NO	P	C	J
1	85	W-G	CN58-1
2	84	B-R	CN58-2

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CN57



TAB

NO	P	C	J
1	81	G	CN53-1
2			
3	82	BR	CN54-1
4	80	B	CN53-2



REC

NO	P	C	J
1	81	W-L	CN102-6
2	83	BR	CN102-19
3	82	B-W	CN102-7
4	80	G-R	CN102-18

CN58



TAB

NO	P	C	J
1	85	W-G	CN56-1
2	84	B-R	CN56-2

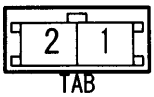


REC

NO	P	C	J
1	85	W-G	CN102-9
2	84	B-R	CN102-8

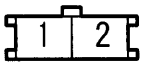
Battery capacity 48V 330 ~ 565 AH

CN60



TAB

NO	P	C	J
1	S	R	AC plug
2	T	B	AC plug

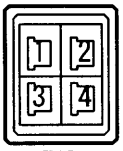


REC

NO	P	C	J
1	S	R	MSCH
2	T	B	MSCH

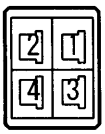
Battery capacity 48V 600 ~ 845 AH, 80V 370 ~ 470 AH

CN60



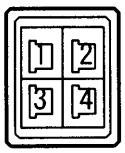
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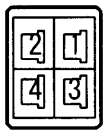
NO	P	C	J
1	T	B	MSCH
2	R	W	MSCH
3	95	L	THR
4	S	R	MSCH



REC

NO	P	C	J
1	T	B	AC plug
2	R	W	AC plug
3	95	L	CN64-1
4	S	R	AC plug





CN61

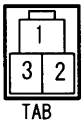
TAB

NO	P	C	J
1	U	W	THR
2	V	R	THR
3			
4	W	B	THR

REC

NO	P	C	J
1	U	-	TRANS
2	V	-	TRANS
3			
4	W	-	TRANS

CN64



TAB

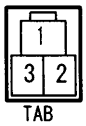
NO	P	C	J
1	95	L	CN65-1
2	R	W	CN65-2
3	S	R	CN65-3



REC

NO	P	C	J
1	95	L	CN60-3 (CN66-2)
2	R	W	AC plug
3	S	R	AC plug

CN65



TAB

NO	P	C	J
1	95	L	DISP
2	R	W	DISP
3	S	R	DISP

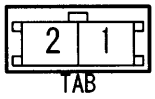


REC

NO	P	C	J
1	95	L	CN64-1
2	R	W	CN64-2
3	S	R	CN64-3

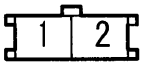
Only for battery capacity: 48V 330 ~ 565 AH

CN66



TAB

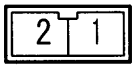
NO	P	C	J
1	R	W	MSCH
2	95	L	THR



REC

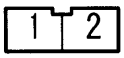
NO	P	C	J
1	R	W	AC plug
2	95	L	CN64-1

CN68



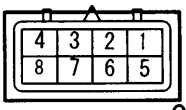
TAB

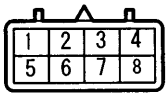
NO	P	C	J
1	139	P	STT
2	14	BR	STT



REC

NO	P	C	J
1	139	P	CN40-3
2	14	BR	J5





CN69

TAB

NO	P	C	J
1	123	O	Timer 1 terminal
2	122	Y	Timer 2 terminal
3	121	G	Timer 3 terminal
4	124	Y-R	Timer 4 terminal
5	125	Y-B	Timer 5 terminal
6	126	Y-G	Timer 6 terminal
7	127	Y-W	Timer 7 terminal
8	14	BR	Timer 8 terminal

REC

NO	P	C	J
1	123	O	CN70-25
2	122	Y	CN70-26
3	121	G	CN70-27
4	124	Y-R	CN70-8
5	125	Y-B	CN70-9
6	126	Y-G	CN70-10
7	127	Y-W	CN70-11
8	14	BR	J22

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REC

1			4	5		7		8	9	10	11	12	13	14
15				19	20	21	22	23	24	25	26	27	28	29	30

TAB

14	13	12	11	10	9	8		7		5	4			1
30	29	28	27	26	25	24	23	22	21	20	19			15

CN70

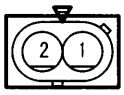
TAB

NO	P	C	J
1	43	-	48V
4	137	-	SL/L+
5	138	-	SL/L-
7	180	-	AVD(+)
8	124	-	CHG LED1
9	125	-	CHG LED2
10	126	-	CHG LED3
11	127	-	CHG LED4
12	182	-	AVD2
13	181	-	AVD1
14	16	-	D15V
15	N1	-	N1
19	139	-	STT
20	140	-	SLL
21	142	-	SDTMA
22	141	-	SMTDA
23	144	-	SMTDK
24	143	-	SDTMK
25	123	-	CHG SW3
26	122	-	CHG SW2
27	121	-	CHG SW1
28	183	-	AVD3
29	184	-	AVD4
30	14	-	GNDD

REC

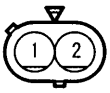
NO	P	C	J
1	43	B-Y	CN40-2
4	137	R-G	CN1-6
5	138	W-L	CN1-5
7	180	G-W	CN45-1
8	124	Y-R	CN69-4
9	125	Y-B	CN69-5
10	126	Y-G	CN69-6
11	127	Y-W	CN69-7
12	182	G-B	CN45-3
13	181	G-Y	CN45-2
14	16	R	CN1-2
15	N1	W-B	CN40-1
19	139	P	CN40-3
20	140	B	CN40-4
21	142	R-B	CN1-8
22	141	W-R	CN1-3
23	144	G-R	CN1-7
24	143	R-Y	CN1-4
25	123	O	CN69-1
26	122	Y	CN69-2
27	121	G	CN69-3
28	183	BR-W	CN45-4
29	184	BR-R	CN45-5
30	14	BR	CN1-1

CN85



TAB

NO	P	C	J
1	70	-	SW_{TK}
2	51	-	SW_{TK}



REC

NO	P	C	J
1	70	BR	CN101-18
2	51	R-L	J1

CN86



TAB

NO	P	C	J
1	57	-	VRAT
2	56	-	VRAT
3	51	-	VRAT



REC

NO	P	C	J
1	57	G-W	CN102-16
2	56	G	CN102-4
3	51	R-W	J2

CN87





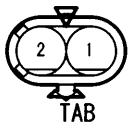
TAB

NO	P	C	J
1	61	G-R	LSTF
2	51	R-L	LS-
3	62	L	LSTR
4	51	R-L	LS-

REC

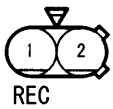
NO	P	C	J
1	61	G-R	CN101-16
2	51	R-L	J1
3	62	L	CN101-17
4	51	R-L	J1

CN88



TAB

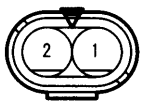
NO	P	C	J
1	3	R	SOL $_L$+
2	4	B	SOL $_L$-



REC

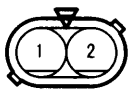
NO	P	C	J
1	3	W-G	CN103-1
2	4	GR	CN103-2

CN89



TAB

NO	P	C	J
1	5	R	SOL $_I$+
2	6	B	SOL $_I$-

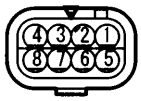


REC

NO	P	C	J
1	5	B-R	CN103-5
2	6	R-L	CN103-6

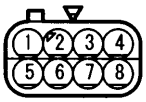
1) When the lifting height is 2,000 or more, excluding 2) and 3) below
[Note: Nos. 1, 2 and 6 on the TAB side are unconnected for FV2000.]

CN90



TAB

NO	P	C	J
1	91	L-B	CN92-3
2	51	BR-W	CN92-1
3	59	G-Y	CN91-2
4	58	G	CN91-3
5	92		
6	90	L	CN92-2
7	16		
8	51	BR	CN91-1

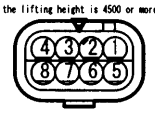


REC

NO	P	C	J
1	91	GR	CN101-20
2	51	R-L	CN101-26
3	59	Y-R	CN102-5
4	58	G-B	CN102-17
5	92	R-B	CN101-21
6	90	O	CN101-19
7	16	R	J47
8	51	R-W	CN102-22

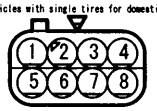
2) When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

CN90



TAB

NO	P	C	J
1	91	L-B	CN93-2
2	51	BR-W	CN92-1
3	59	G-Y	CN91-2
4	58	G	CN91-3
5	92	L-W	CN93-3
6	90	L	CN92-2
7	16		
8	51	BR	CN91-1



REC

NO	P	C	J
1	91	GR	CN101-20
2	51	R-L	CN101-26
3	59	Y-R	CN102-5
4	58	G-B	CN102-17
5	92	R-B	CN101-21
6	90	O	CN101-19
7	16	R	J47
8	51	R-W	CN102-22

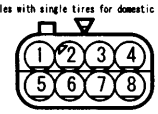
3) When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market

CN90



TAB

NO	P	C	J
1	91	L-B	CN99-2
2	51	BR-W	CN92-1
3	59	G-Y	CN91-2
4	58	G	CN91-3
5	92	L-W	CN99-3
6	90	L	CN92-2
7	16	B-R	CN99-1
8	51	BR	CN91-1

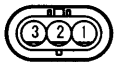


REC

NO	P	C	J
1	91	GR	CN101-20
2	51	R-L	CN101-26
3	59	Y-R	CN102-5
4	58	G-B	CN102-17
5	92	R-B	CN101-21
6	90	O	CN101-19
7	16	R	J47
8	51	R-W	CN102-22

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CN91



TAB

NO	P	C	J
1	51	–	SP L
2	59	–	SP L
3	58	–	SP L



REC

NO	P	C	J
1	51	BR	CN90-8
2	59	G-Y	CN90-3
3	58	G	CN90-4

CN92



TAB

NO	P	C	J
1	51	BR-W	CN90-2
2	90	L	CN90-6
3	91	L-B	CN90-1



REC

NO	P	C	J
1	51	–	SWMH1
2	90	–	SWMH1
3	91	–	SWMH1

3	105	L-R	CN93-1

When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

3	105	L-R	CN99-4

When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market

When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

CN93



TAB

NO	P	C	J
1	105	L-R	CN92-3
2	91	L-B	CN90-1
3	92	L-W	CN90-5



REC

NO	P	C	J
1	105	–	SWMH2
2	91	–	SWMH2
3	92	–	SWMH2

CN94



TAB

NO	P	C	J
1	316	B-Y	CN142-11
2	317	GR	CN142-3
3	320	W-R	CN142-8
4	327	G-L	CN148-1
5	328	R-L	CN148-6
6	318	G-W	CN142-10
7	319	Y-G	CN142-2



REC

NO	P	C	J
1	316	P	CN97-1
2	317	G-W	CN97-2
3	320	W-B	CN97-3
4	327	L-B	CN95-1
5	328	W-R	CN95-2
6	318	G	CN96-3
7	319	L-W	CN96-2

CN95



TAB

NO	P	C	J
1	327	–	SOL S
2	328	–	SOL S



REC

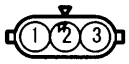
NO	P	C	J
1	327	L-B	CN94-4
2	328	W-R	CN94-5

CN96



TAB

NO	P	C	J
1	320	–	VRAM
2	319	–	VRAM
3	318	–	VRAM



REC

NO	P	C	J
1	320	BR	J25
2	319	L-W	CN94-7
3	318	G	CN94-6

CN97



TAB

NO	P	C	J
1	316	–	VRAH
2	317	–	VRAH
3	320	–	VRAH



REC

NO	P	C	J
1	316	P	CN94-1
2	317	G-W	CN94-2
3	320	W-B	CN94-3

CN98



TAB

NO	P	C	J
1	329	B-Y	CN148-2
2	330	GR	CN148-5



REC

NO	P	C	J
1	329	–	SOL ST
2	330	–	SOL ST

When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market

CN99



TAB

NO	P	C	J
1	16	–	SS(IG)
2	91	–	SS(N/C)
3	92	–	SS(N/O)
4	105	–	SS(L)
5	51	–	SS(E)

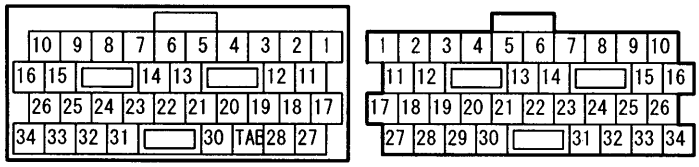


REC

NO	P	C	J
1	16	B-R	CN90-7
2	91	L-B	CN90-1
3	92	L-W	CN90-5
4	105	L-R	CN92-3
5	51	BR-W	J31

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CN101



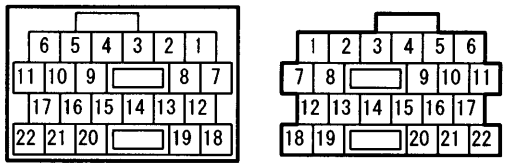
TAB

NO	P	C	J
1	45	-	DSF
2	46	-	DSR
3	65	-	LSB
4	66	-	LSPB
5	67	-	LSD
6			
7			
8			
9	307	-	SMTSA
10	308	-	SMTSK
11	63	-	LSAT1
12	309	-	SSTMA
13	310	-	SSTMK
14			
15			
16	61	-	LSTF
17	62	-	LSTR
18	70	-	SWTK
19	90	-	MH1
20	91	-	MH2-1
21	92	-	MH2-2
22			
23			
24			
25			
26	51	-	LS-
27			
28			
29			
30			
31			
32	60	-	LSL1
33	324	-	SSO+
34	325	-	SSO-

REC

NO	P	C	J
1	45	W	CN9-5
2	46	G	CN9-4
3	65	Y-G	CN6-2
4	66	B-W	CN15-2
5	67	B-Y	CN42-1
6			
7			
8			
9	307	W-G	CN141-4
10	308	G-Y	CN141-12
11	63	G-B	CN11-3
12	309	Y	CN141-3
13	310	Y-R	CN141-11
14			
15			
16	61	G-R	CN87-1
17	62	L	CN87-3
18	70	BR	CN85-1
19	90	O	CN90-6
20	91	GR	CN90-1
21	92	R-B	CN90-5
22			
23			
24			
25			
26	51	R-L	CN90-2
27			
28			
29			
30			
31			
32	60	G-W	CN11-1
33	324	W-B	CN142-4
34	325	R-L	CN142-5

CN102



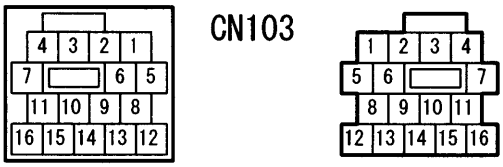
TAB

NO	P	C	J
1	64	-	SWAC
2	52	-	POTA
3			
4	56	-	POTT
5	59	-	SPL
6	81	-	SSD1
7	82	-	SSD2
8	84	-	SSP+
9	85	-	SSP-
10	86	-	TD+
11	87	-	TD-
12	88	-	TP+
13	89	-	TP-
14	53	-	POTA+
15			
16	57	-	POTT+
17	58	-	SPL+
18	80	-	SSD+
19	83	-	SSD-
20			
21			
22	51	-	POT-

REC

NO	P	C	J
1	64	R-Y	CN25-4
2	52	GR	CN25-1
3			
4	56	G	CN86-2
5	59	Y-R	CN90-3
6	81	W-L	CN57-1
7	82	B-W	CN57-3
8	84	B-R	CN58-2
9	85	W-G	CN58-1
10	86	B-Y	CN52-2
11	87	P	CN52-1
12	88	Y-G	CN55-2
13	89	W-R	CN55-1
14	53	R-B	CN25-2
15			
16	57	G-W	CN86-1
17	58	G-B	CN90-4
18	80	G-R	CN57-4
19	83	BR	CN57-2
20			
21			
22	51	R-W	CN90-8

CN103



TAB

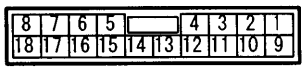
NO	P	C	J
1	3	-	SOLL+
2	4	-	SOLL-
3	41	-	B48V
4	43	-	VBKY
5	5	-	SOLT+
6	6	-	SOLT-
7	41	-	VBBT
8	44	-	VBMB
9			
10	16	-	D15V
11			
12	14	-	GNDD
13	144	-	SMTDK
14	143	-	SDTMK
15	142	-	SDTMA
16	141	-	SMTDA

REC

NO	P	C	J
1	3	W-G	CN88-2
2	4	GR	CN88-1
3	41	Y	J6
4	43	B-Y	CN12-1
5	5	B-R	CN89-2
6	6	R-L	CN89-1
7	41	Y	CN29-3
8	44	Y-G	CN148-3
9			
10	16	R	CN1-2
11			
12	14	BR	CN1-1
13	144	G-R	CN1-7
14	143	R-Y	CN1-4
15	142	R-B	CN1-8
16	141	W-R	CN1-3

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CN141



TAB

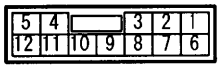
NO	P	C	J
1			
2			
3	309	-	SSTMA
4	307	-	SMTSA
5			
6	312	-	STS1
7	313	-	STS2
8	314	-	STSC
9			
10			
11	310	-	SSTMK
12	308	-	SMTSK
13	138	-	SL/L-
14	137	-	SL/L+
15			
16	315	-	STS-
17	311	-	STS+
18			



REC

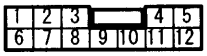
NO	P	C	J
1			
2			
3	309	Y	CN101-12
4	307	W-G	CN101-9
5			
6	312	G-W	CN19-4
7	313	R-Y	CN19-5
8	314	L	CN19-6
9			
10			
11	310	Y-R	CN101-13
12	308	G-Y	CN101-10
13	138	W-L	CN1-5
14	137	R-G	CN1-6
15			
16	315	BR	CN19-3
17	311	W-R	CN19-1
18			

CN142



TAB

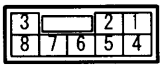
NO	P	C	J
1			
2	319	-	POTS
3	317	-	POTH
4	324	-	SSN+
5	325	-	SSN-
6			
7			
8	320	-	SPOT-
9			
10	318	-	POTS+
11	316	-	POTH+
12			



REC

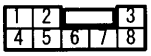
NO	P	C	J
1			
2	319	Y-G	CN94-7
3	317	GR	CN94-2
4	324	W-B	CN101-33
5	325	R-L	CN101-34
6			
7			
8	320	W-R	CN94-3
9			
10	318	G-W	CN94-6
11	316	B-Y	CN94-1
12			

CN148



TAB

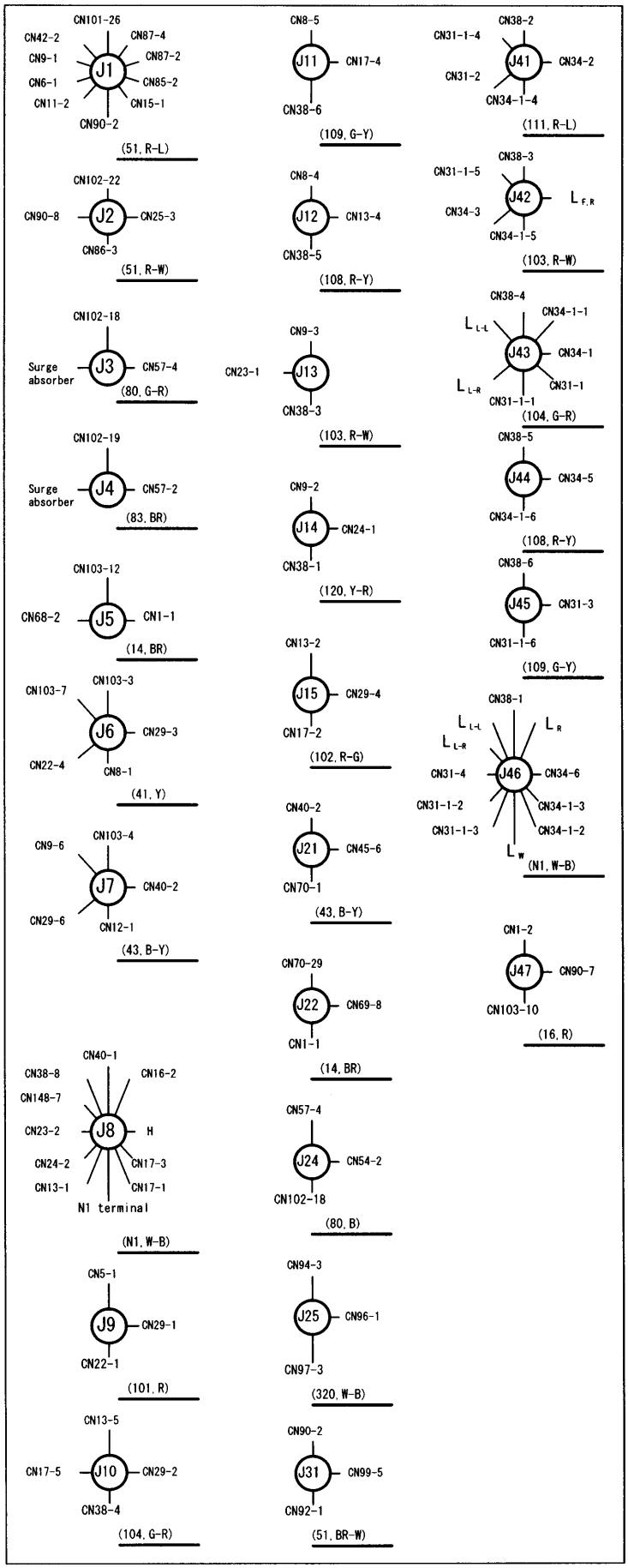
NO	P	C	J
1	327	-	SOLS+
2	329	-	SOLST+
3	44	-	VBMB
4			
5	330	-	SOLST-
6	328	-	SOLS-
7	N1	-	N1
8			



REC

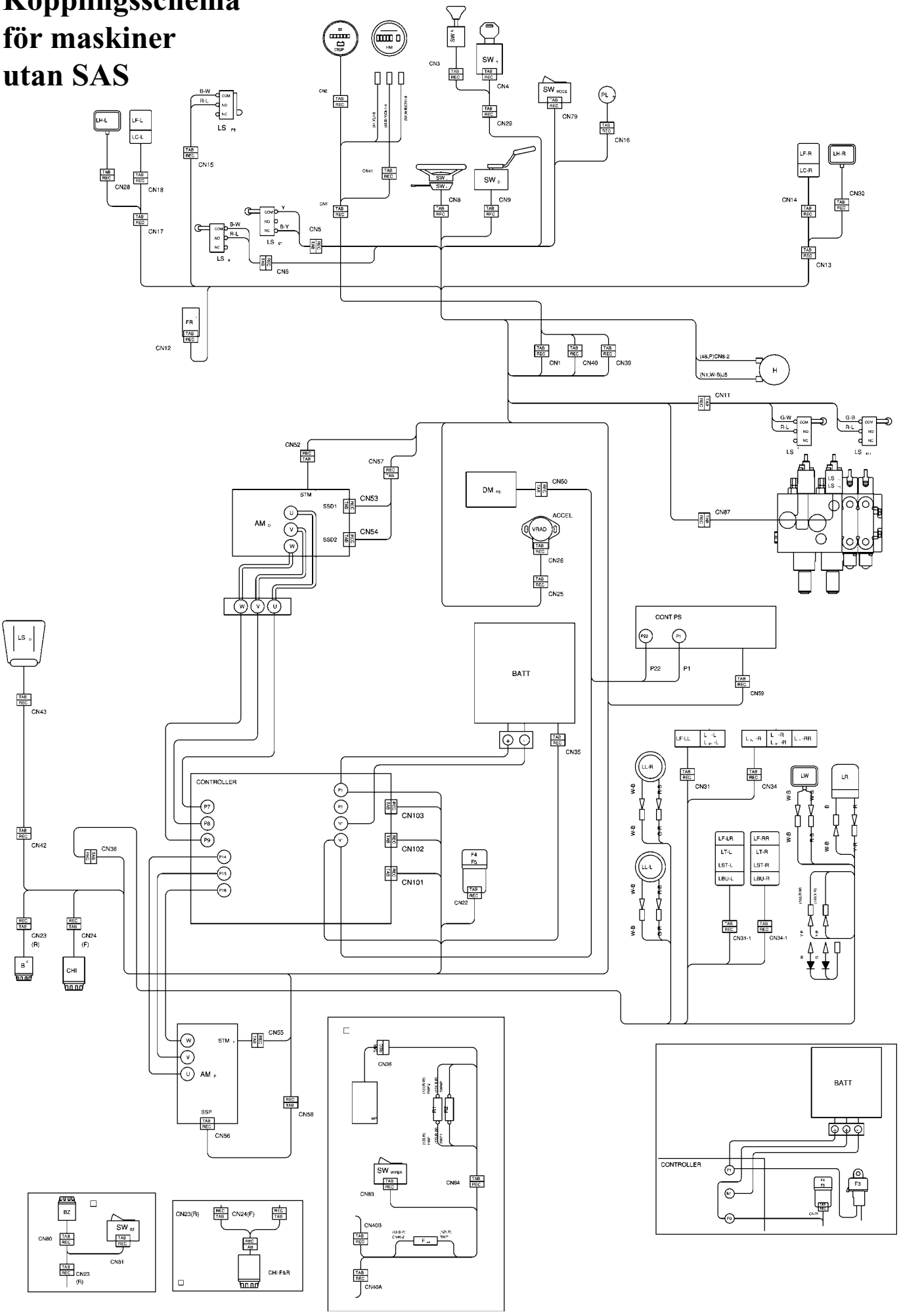
NO	P	C	J
1	327	G-L	CN94-4
2	329	B-Y	CN98-1
3	44	Y-G	CN103-8
4			
5	330	GR	CN98-2
6	328	R-L	CN94-5
7	N1	W-B	J8
8			

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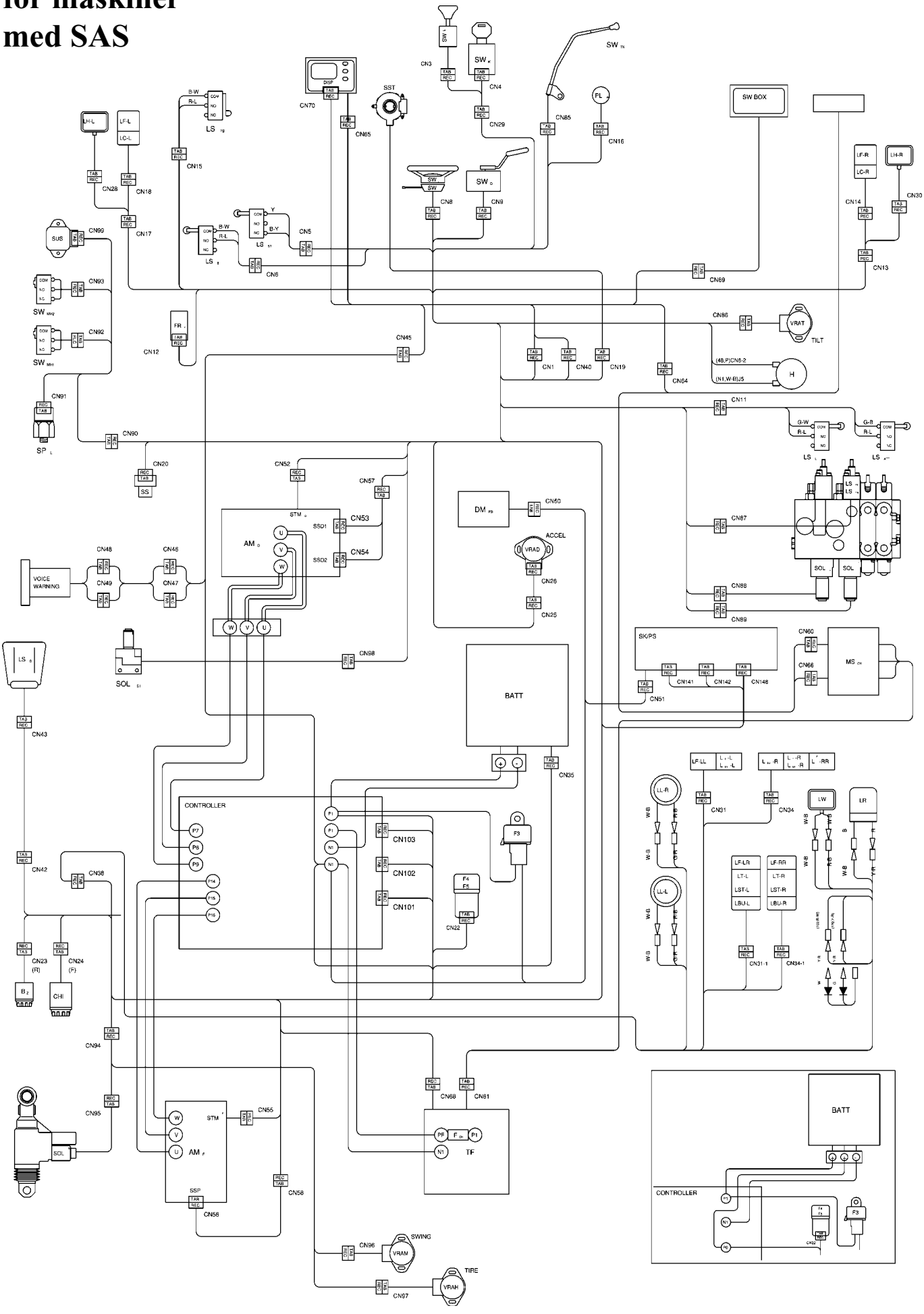
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Kopplingsschema för maskiner utan SAS



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Kopplingsschema för maskiner med SAS



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7FB 10-35 Symbolbeteckningar på elschemat

AM D	Drivmotor
AM P	Pumpmotor
B Z	Backlarm
BATT	Batteri
BOX CHG	Panel till inbyggd laddare
CH	Laddare (inbyggd)
CHI F	Varningssignal vid körning framåt
CHI R	Varningssignal vid körning bakåt
CO	Kondensator
CSBATT	Strömshunt, batteriström
CSD A	Strömshunt, drivmotor fas A
CSD B	Strömshunt, drivmotor fas B
CSP A	Strömshunt, pumpmotor fas A
CSP B	Strömshunt, pumpmotor fas B
D CH	Diod (laddare)
DM PS	Styrpumpsmotor
DS BU	Brytare, backljus
DS F	Brytare, fram
DS FO	Brytare, fram (option)
DS R	Brytare, back
F CH	Säkring, laddare
F1	Huvudsäkring
F3	Säkring, styrmotor
F4	Säkring, belysning
F5	Manöversäkring före nyckel
F6	Manöversäkring, DC/MD &DC/SD
F7	Manöversäkring, 80volt (3&3,5 ton)
FAN D	Kylfläkt, åkpanel
FAN P	Kylfläkt, hydraulpanel
FR Y	Blinkrelä
H	Signal
L BU-L	Backljus, vänster
L BU-R	Backljus, höger
L C-L	Positionsljus, vänster
L C-R	Positionsljus, höger
L F-L	Blinkerslampa, Vä fram
L F-LR	Blinkerslampa, Vä bak
L F-R	Blinkerslampa, Hö fram
L F-RR	Blinkerslampa, Hö bak
L H-L	Strålkastare, Vä fram
L H-R	Strålkastare, Hö fram
L L-L	Skyltbelysning, Vä
L L-R	Skyltbelysning, Hö
L R	Roterande varningsljus
L ST-L	Bromsljus Vä
L ST-R	Bromsljus Hö
L T-L	Bakljus Vä
L T-R	Bakljus Hö
L W	Arbetsbelysning bakåt
LCD DISP	Display
LS ATT	Brytare, extrafunktioner
LS B	Bromsbrytare
LS D	Stolsbrytare
LS L	Brytare, lyft
LS PB	Brytare, parkeringsbroms
LS ST	Brytare, bromsljus

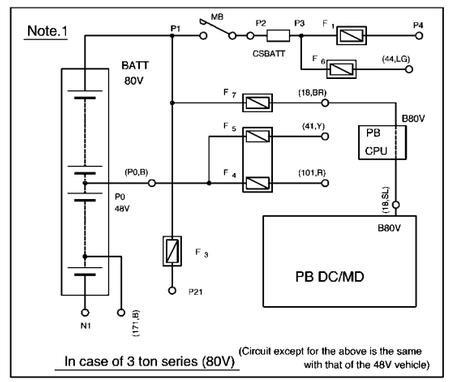
LS TF	Brytare, tilt framåt
LS TR	Brytare, tilt bakåt
MB	Huvudkontaktor
MS CH	Kontaktor (laddare)
PB CPU	CPU kort, åkning och hydraulik
PB DC/MD	DC/MD kort, åkning och hydraulik
PB DC/SD	DC/SD kort, styrning
PB SCPU	CPU kort, styrning
PL W	Indikeringslampa, arbetsljus bakåt
SH	Strömshunt, styrmotor
SLL	Sensor, syranivå i batteri (option)
SOL L	Solenoid, lyft
SOL S	Stabiliseringscylinder
SOL ST	Shuntventil, styrning
SOL T	Solenoid, tilt
SPL	Lastsensor
SS	Hastighetssensor (SAS)
SSD	Hastighetssensor, drivmotor
SSP	Hastighetssensor, pumpmotor
SST	Rattsensor
STMD	Tempsensor, drivmotor
STMP	Tempsensor, pumpmotor
STT	Thermobrytare (laddare)
SUS	Varningssummer, lyfthöjd (option)
SW F	Blinkersomkopplare
SW H	Signalknapp
SW K	Nyckelbrytare
SW L	Omkopplare, belysning
SW MH1	Brytare, lyfthöjd 1
SW MH2	Brytare, lyfthöjd 2 (option)
SW TK	Knapp på tiltspak
SWAC	Brytare, fartreglage (1 MS)
SYR	G-Kraft sensor
TF	Transformator (laddare)
THCD	Tempsensor, åkpanel
THCP	Tempsensor, hydraulpanel
THR	Thermorelä (laddare)
TMD AD	Transistor, åkning fas A (minus)
TMD AU	Transistor, åkning fas A (plus)
TMD BD	Transistor, åkning fas B (minus)
TMD BU	Transistor, åkning fas B (plus)
TMD CD	Transistor, åkning fas C (minus)
TMD CU	Transistor, åkning fas C (plus)
TMP AD	Transistor, hydraulik fas A (minus)
TMP AU	Transistor, hydraulik fas A (plus)
TMP BD	Transistor, hydraulik fas B (minus)
TMP BU	Transistor, hydraulik fas B (plus)
TMP CD	Transistor, hydraulik fas C (minus)
TMP CU	Transistor, hydraulik fas C (plus)
TMPS	Transistor, styrpumpsmotor
V W	Röstvarning (option)
VRAD	Fartreglage
VRAH	Potentiometer, styrhjulsvinkel
VRAS	Potentiometer, styrvagga (Japan)
VRAT	Potentiometer, tiltvinkel

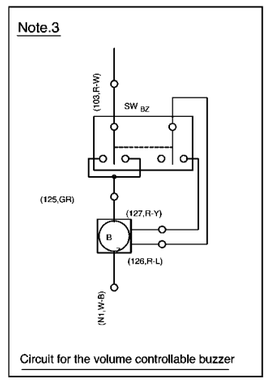
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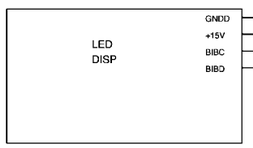
Principschema för maskiner utan SAS

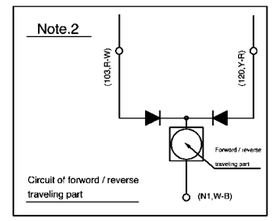
Toyota - Kabelfärger på elschemat

B = Svart	BR = Brun	DG = Mörkgrå	G = Grön	L = Ljusblå	LG = Ljusgrön
O = Orange	P = Rosa	PU = Lila	R = Röd	W = Vit	Y = Gul







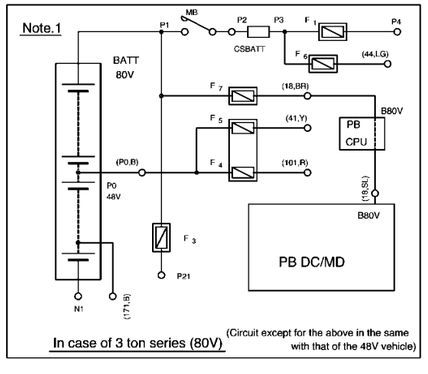


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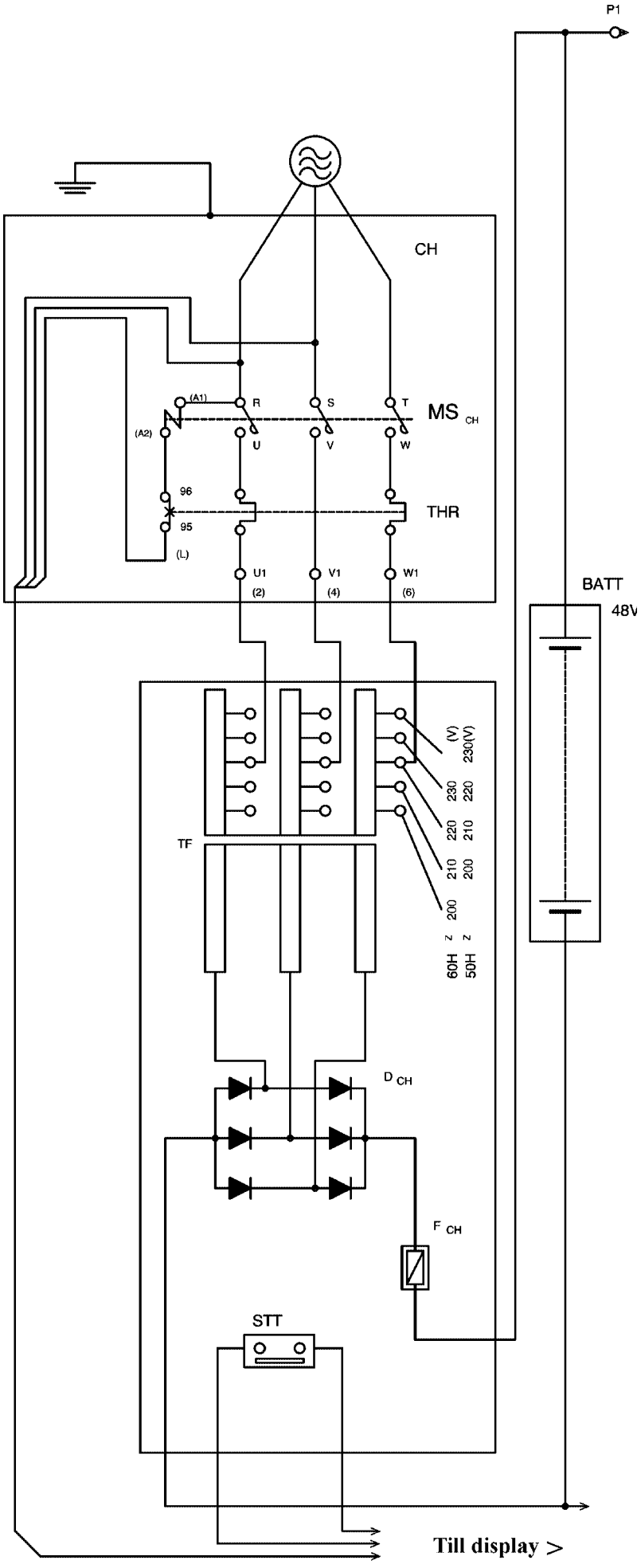
Principschema för maskiner med SAS

Toyota - Kabelfärger på elschemat

B = Svart	BR = Brun	DG = Mörkgrå	G = Grön	L = Ljusblå	LG = Ljusgrön
O = Orange	P = Rosa	PU = Lila	R = Röd	W = Vit	Y = Gul



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HYTT

MANÖVERPANEL

3X RÖD 2,5

FX1 — A B C D E F G H — F1 F2 F3 F4 F5 F6 F7 F8 — 10A — 1 2 3 4 5 6 7 8

RÖD-VIT, RÖD-VIT, VIT 2,5, VIT, VIT-SVART 2,5, VIT-GRÅ, GRÖN 2,5, GUL, ROSA, ROSA, RÖD-GRÅ, BLÅ-BRUN, GRÅ, BLÅ-RÖD, RÖD, RÖD

ARBETSLJUS FRAM K1 — 85 87 30 86 — VIOLET-GUL, GUL-BLÅ, GUL-SVART, VIT 2,5, SVART

EXTRA ARBETSLJUS PÅ TAK K2 — 85 87 30 86 — VIT-VIOLET, VIT, VIT, GRÖN 2,5, SVART

ARBETSLJUS BAK K3 — 85 87 30 86 — VIT-GRÖN, GUL-VIT, VIT-SVART 2,5, SVART

BLINKRELÄ K4 — + - R C — GRÅ, SVART, RÖD-GUL, BRUN

KONTROLLAMPA FÖR BLINKERS

ARBETSLJUS FRAM S1 — 9 10 1 5 — 511,001 — VIOLET-GUL

EXTRA ARBETSLJUS FRAM S2 — 9 10 1 5 — 511,001 — VIT, SVART, VIT-VIOLET

TORKARE FRAM S3 — 1 5 — 511019 — GUL, SVART, RÖD-VIT

VINDRUTESPOLARE S4 — 1 5 — 511007 — RÖD-VIT, BLÅ

TORKARE BAK S5 — 1 5 — 511019 — GRÖN, RÖD-VIT

VARNINGSFYR S6 — 9 10 1 5 — 511,001 — VIOLET, ROSA, GRÅ-SVART

X3

GUL-VIOLET	1	GUL-VIOLET
VIT	2	VIT
SVART	3	SVART
VIT-VIOLET	4	VIT-VIOLET
GUL	5	GUL
RÖD-VIT	6	RÖD-VIT
BLÅ	7	BLÅ
GRÖN	8	GRÖN
VIOLET	9	VIOLET
ROSA	10	ROSA
GRÅ-SVART	11	GRÅ-SVART
ORANGE	12	ORANGE
GUL	13	GUL
RÖD	14	RÖD
RÖD-GUL	15	RÖD-GUL
	16	
	17	
	18	

EXTRA VIT-BRUN

X1

GUL-BLÅ	1	GUL-BLÅ
GUL-SVART	2	GUL-SVART
GUL-VIT	3	GUL-VIT
GUL-VIT	4	GUL-VIT
RÖD-GRÅ	5	RÖD-GRÅ
RÖD-GRÅ	6	RÖD-SVART
VIT-BLÅ	7	VIT-BLÅ
VIT-BLÅ	8	VIT-BLÅ
VIT-SVART	9	VIT-SVART
GRÖN-BLÅ	10	GRÖN-BLÅ
RÖD-GRÅ	11	RÖD-GRÖN
RÖD	12	RÖD
RÖD	13	GRÅ
VIT	14	VIT
VIT	15	VIT
GUL	16	GUL
	17	
SVART	18	SVART

X2

GRÖN	1	GRÖN
RÖD-VIT	2	RÖD-VIT
BLÅ	3	BLÅ
VIOLET	4	VIOLET
ORANGE	5	ORANGE
	6	
ROSA	7	ROSA
GRÅ-SVART	8	GRÅ-SVART
BRUN	9	BRUN
VIT-SVART	10	VIT-SVART
VIT-BLÅ	11	VIT-BLÅ
BLÅ-RÖD	12	BLÅ-RÖD
VIT-GRÖN	13	VIT-GRÖN
GRÖN-BLÅ	14	GRÖN-BLÅ
VIT-GRÅ	15	VIT-GRÅ
BLÅ-BRUN	16	BLÅ-BRUN
	17	
	18	

BLÅ-BRUN	KARTLÄSARLAMPA
GUL	VARNINGSFYR
VIT	EXTRA ARBETSLJUS FRAM
VIT	EXTRA ARBETSLJUS FRAM
VIT-BRUN	EXTRA
RÖD	RADIO
GRÅ	INNERBELYSNING
RÖD-GRÅ	POSITIONSLJUS HÖGER FRAM
VIT-BLÅ	BLINKERS HÖGER FRAM
GUL-BLÅ	ARBETSLJUS HÖGER FRAM
GUL-VIT	ARBETSLJUS HÖGER BAK
GRÖN-BLÅ x2	BROMSLJUS HÖGER
RÖD-GRÖN x2	BAKLJUS HÖGER
VIT-BLÅ	BLINKERS HÖGER BAK
GRÖN-BLÅ	BROMSLJUS VÄNSTER
RÖD-GRÖN	BAKLJUS VÄNSTER
VIT-SVART x2	BLINKERS VÄNSTER BAK
RÖD-SVART	POSITIONSLJUS VÄNSTER FRAM
VIT-SVART	BLINKERS VÄNSTER FRAM
GUL-SVART	ARBETSLJUS VÄNSTER FRAM
GUL-VIT	ARBETSLJUS VÄNSTER BAK

VINDRUTETORKARE FRAM

GRÖN	GRÖN	53
RÖD-VIT	SVART	53a
BLÅ	BRUN	31b

VINDRUTETORKARE BAK

ORANGE	GRÖN	53
ROSA	SVART	53a
GRÅ/SVART	BRUN	31b

VIOLET — M — VINDRUTESPOLARE

TRUCKMASKINERI

BLINKERS-OMKOPPLARE — VIT-BLÅ, VIT-SVART, BRUN

BACKLJUS-KONTAKT — VIT-GRÅ, VIT-GRÖN

BROMSLJUS-KONTAKT — GRÖN-BLÅ, BLÅ-RÖD

X4

RÖD 2,5	1	RÖD 2,5
RÖD 2,5	2	RÖD 2,5
RÖD 2,5	3	RÖD 2,5

FÖRDELNINGSPLINT

MATNING TILL HYTTLYFT SE KRETSSCHEMA 720 631 — T15A — RÖD 6 — SÄKRING FÖR HYTTLYFT

CONVERTER 80/12 VDC, 700W

RÖD 2,5	2	+
RÖD 2,5	3	+
RÖD 2,5	4	+
	7	+
	8	+

DC/DC — UT 12 VDC STAB.

IN 80VDC: + 1, - 5 — START 6

VIT 2,5, SVART 2,5, RÖD-SVART

TVINNADE

L-CONVERTER C70012

HUVUDSÄKRINGAR GODKÄNDA FÖR 80 VDC — 2x25A, 2x25A

TVINNADE

\+ MATNING FRÅN BATTERI 80 VDC

\-

VÄRMARE 80 VDC, 2kW — M — 80VDC + -

VIT 4, SVART 4

MIN 10mm²

TVINNADE

VIT 4, SVART 4

RÖD-SVART + 80 VDC FRÅN NYCKEL FÖR START AV CONVERTER

HUVUDJORD

MIN 10mm²

ALLA KABLAR 1,5mm OM EJ ANNAT ANGES

APPARATERNAS JORDANSLUTNINGAR EJ RITADE

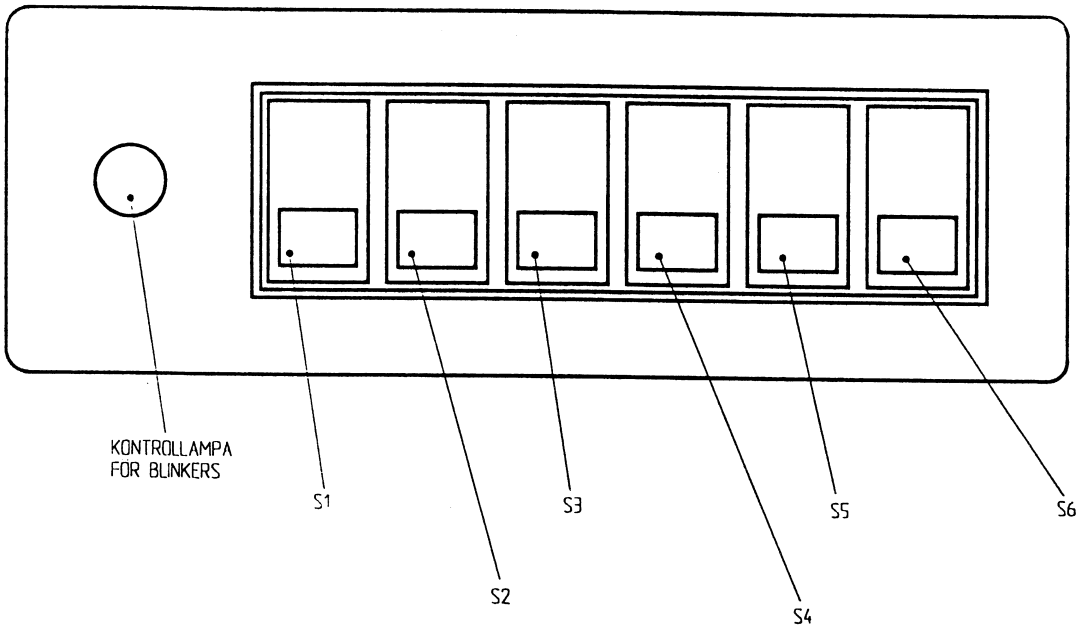
KRETSSCHEMA HYTTLYFT 720 631

KOMPONENTPLACERING MANÖVERPANEL BT-630 628

KRETSSCHEMA HYTT
TOYOTA 7FB 20-35 S02T
SYSTEMSPÄNNING 80/12 VDC, 700W

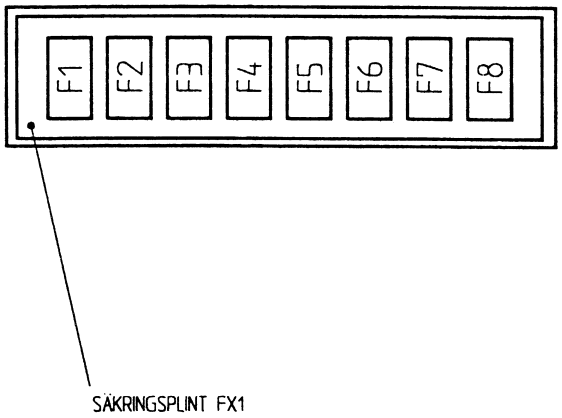
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MANÖVERPANEL I DÖRR



STRÖMSTÄLLARFUNKTIONER

S1 = ARBETSLJUS FRAM
S2 = EXTRA ARBETSLJUS FRAM
S3 = TORKARE FRAM
S4 = VINDRUTESPOLARE
S5 = TORKARE BAK
S6 = VARNINGSFYR



SÄKRINGSFÖRTECKNING

NR	AMP	FUNKTION
F1	10	TORKARE FRAM, VINDRUTESPOLARE
F2	10	ARBETSLJUS FRAM
F3	10	ARBETSLJUS BAK
F4	10	EXTRA ARBETSLJUS PÅ TAK
F5	10	TORKARE BAK
F6	10	POSLJUS, BAKLJUS
F7	10	BLINKERS, BROMSLJUS
F8	10	RADIO, INNERBELYSNING, VARNINGSFYR

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Tillägg för OPS (fr.o.m 2006)

SECTION INDEX

NAME	SECTION
GENERAL	0
OPS & IMPROVEMENT	1
BODY	2
APPENDIX	3

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GENERAL

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OPS SYSTEM 0-2

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CHANGES FOR INSTALLATION OF OPS FUNCTION 0-3

SYSTEM CONFIGURATION AND OPERATION PRINCIPLE 0-3

DIRECTION SWITCH 0-5

DRIVING POSITION 0-6

DISPLAY 0-7

SWITCH 0-8

GENERAL 0-8

OIL CONTROL VALVE 0-9

GENERAL 0-9

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PERIODIC MAINTENANCE

INSPECTION METHOD

I : Inspection. Repair or Replacement if required.
M : Measurement. Repair or Adjustment if required.
T : Retightening C : Cleaning L : Lubrication
* : For new vehicle *1 : Flaw detector

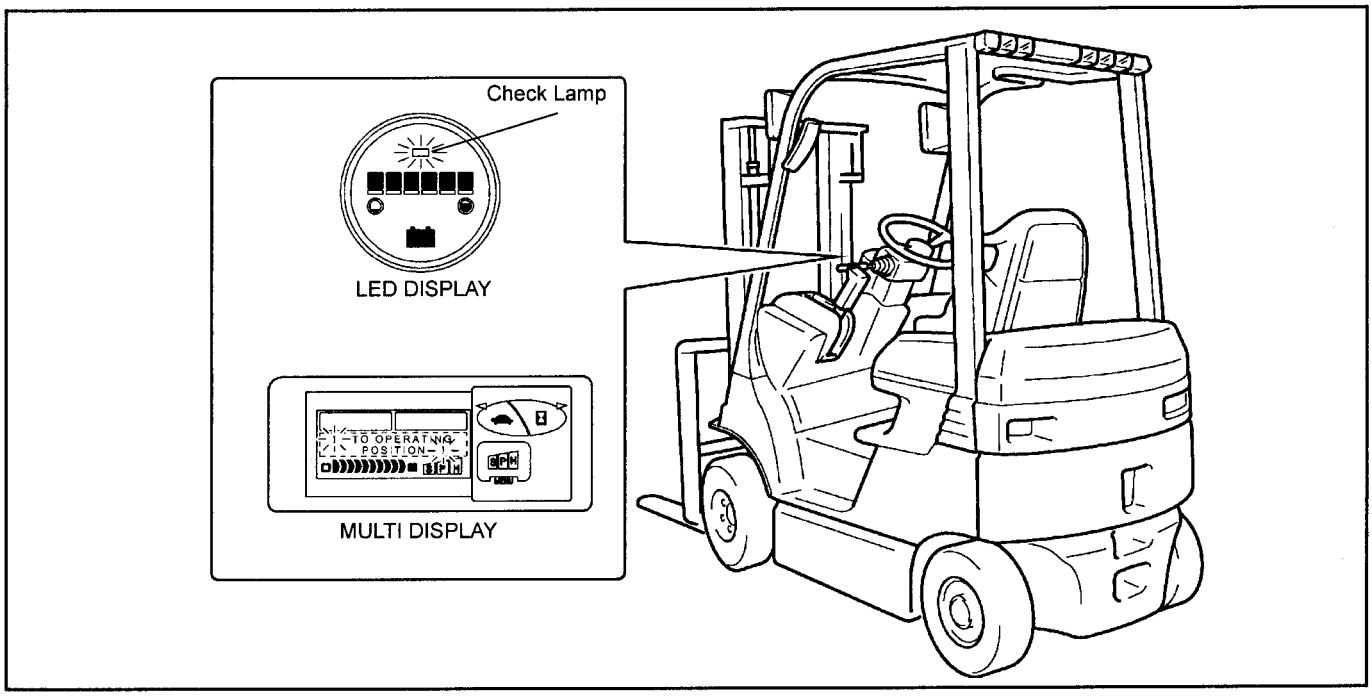
Item \ Inspection timing		Every 6 weeks / Every 250 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
SAFETY DEVICES, ETC.					
OPS	Functions	I	←	←	←

OPS SYSTEM

GENERAL

The OPS (Operator Presence Sensing) System is equipped as the standard feature on all models.
The switch installed on the seat detects the operator, and when the operator is not seated in the normal operating position (operator's seat), the OPS system interrupts the traveling power and restricts load handling operation.
When the controller detects the seat switch turned off, it informs OPS operation to the operator by sounding the buzzer (pi-)* for about 0.5 seconds (on multi-display vehicle only) and the display indication.
Moreover, the display indication keeps while turning off the seat switch.
When the controller detects malfunction, the display indicate the diagnosis error code.

* The buzzer does not sound on the USA specification vehicle.
  No buzzer sound is generated on every vehicle provided with the LED display.



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CHANGES FOR INSTALLATION OF OPS FUNCTION

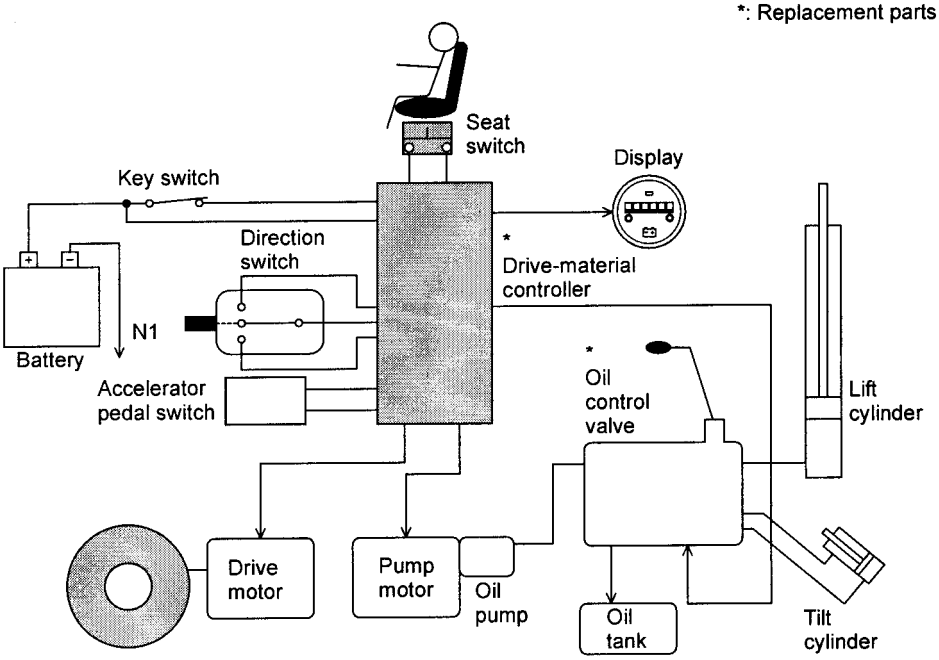
1. Standard adoption of auto-OFF function
   If the vehicle is left with the key switch set to ON, the controller is forcibly set to the key OFF state for energy saving. To use the vehicle again, turn the key switch OFF once and to ON then.

2. Change in return-to-neutral function
   When the key switch or seat switch is turned ON with the direction lever in the forward or reverse position or the accelerator pedal depressed, traveling is disabled unless the direction lever and accelerator pedal are returned to the neutral positions.

SYSTEM CONFIGURATION AND OPERATION PRINCIPLE

Standard Specification (SAS-less)

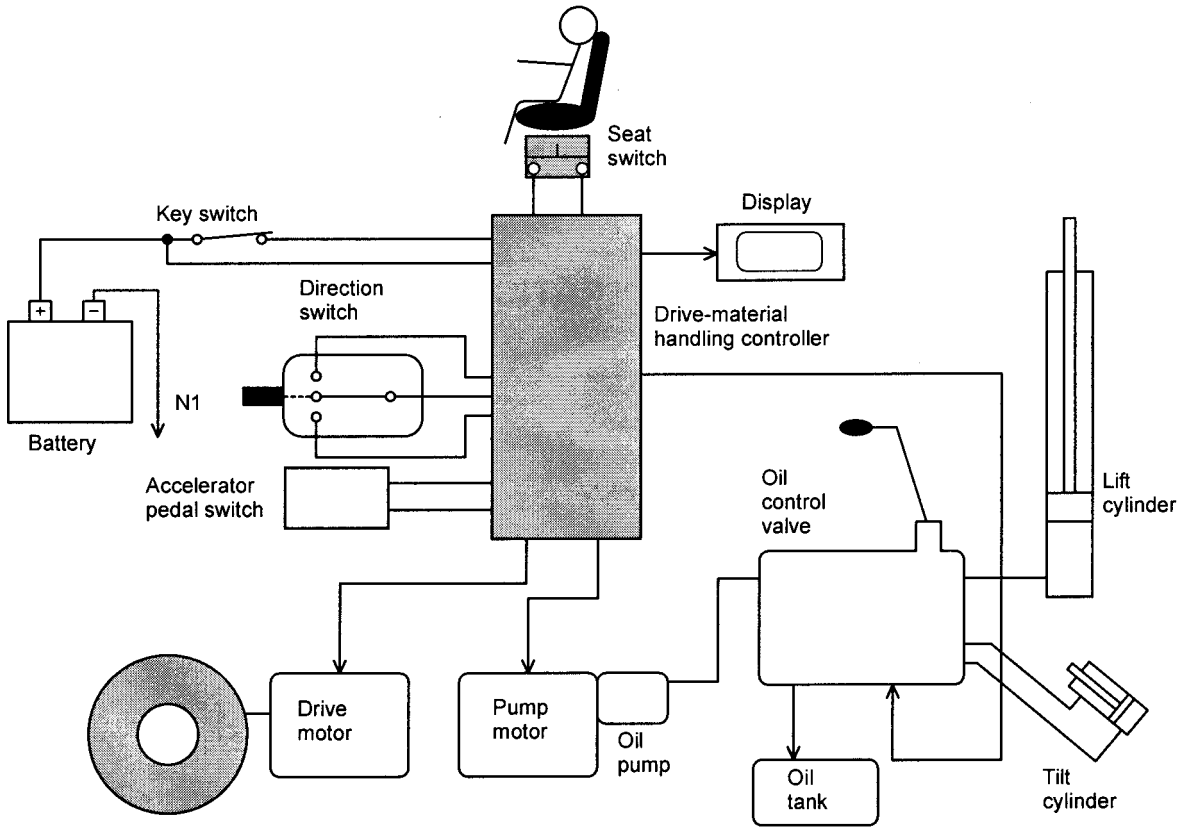
*: Replacement parts for OPS



Item	Operation explanation
Travel OPS	Drive motor control is stopped when seat switch OFF is detected for 2 seconds or more.
Material handling OPS	**Standard:** When the Controller detects the seat switch turned off for two seconds, the movement of lift down and tilt forward are stopped by controlling the lift lock valve, tilt controlling valve. The movement of tilt backward, lift up, and attachment are stopped by stopping the pump motor. Hydraulic OPS is released by passing one second after turning on the seat switch. **Note:** • **Tilt backward** **When the tilt lever is operated in the state of OPS operation, the mast might move by the self-weight in the state of backward tilting.** • **Attachment** **When the attachment lever is operated in the state of OPS operation, the attachment might move by the self-weight.**
OPS operation information	When seat switch OFF is detected, the CHECK indicator on the LED display blinks to inform OPS operation.
Return-to-neutral warning	When the key switch or seat switch is turned ON with the direction lever in the forward or reverse position or the accelerator pedal in depressed state, traveling is disabled unless the direction lever and accelerator are returned to the neutral positions.
Abnormality warning	After system abnormality detection, the LED display warns the abnormality.

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OPT Specification (with SAS)



Item	Operation explanation
Travel OPS	Drive motor control is stopped when seat switch OFF is detected for 2 seconds or more.
Material handling OPS	**Standard:** When the Controller detects the seat switch turned off for two seconds, the movement of lift down and tilt forward are stopped by controlling the lift lock valve, tilt controlling valve. The movement of tilt backward, lift up, and attachment are stopped by stopping the pump motor. Hydraulic OPS is released by passing one second after turning on the seat switch. **Note:** • **Tilt backward** **When the tilt lever is operated in the state of OPS operation, the mast might move by the self-weight in the state of backward tilting.** • **Attachment** **When the attachment lever is operated in the state of OPS operation, the attachment might move by the self-weight.**
OPS operation information	When seat switch OFF is detected, the CHECK indicator on the LED display blinks to inform OPS operation.
Return-to-neutral	When the key switch or seat switch is turned ON with the direction lever in the forward or reverse position or the accelerator pedal in depressed state, traveling is disabled unless the direction lever and accelerator are returned to the neutral positions.
Abnormality warning	After system abnormality detection, the spanner mark on the display blinks and the error code is displayed to warn the abnormality.

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DIRECTION SWITCH

1. Difference from existing model

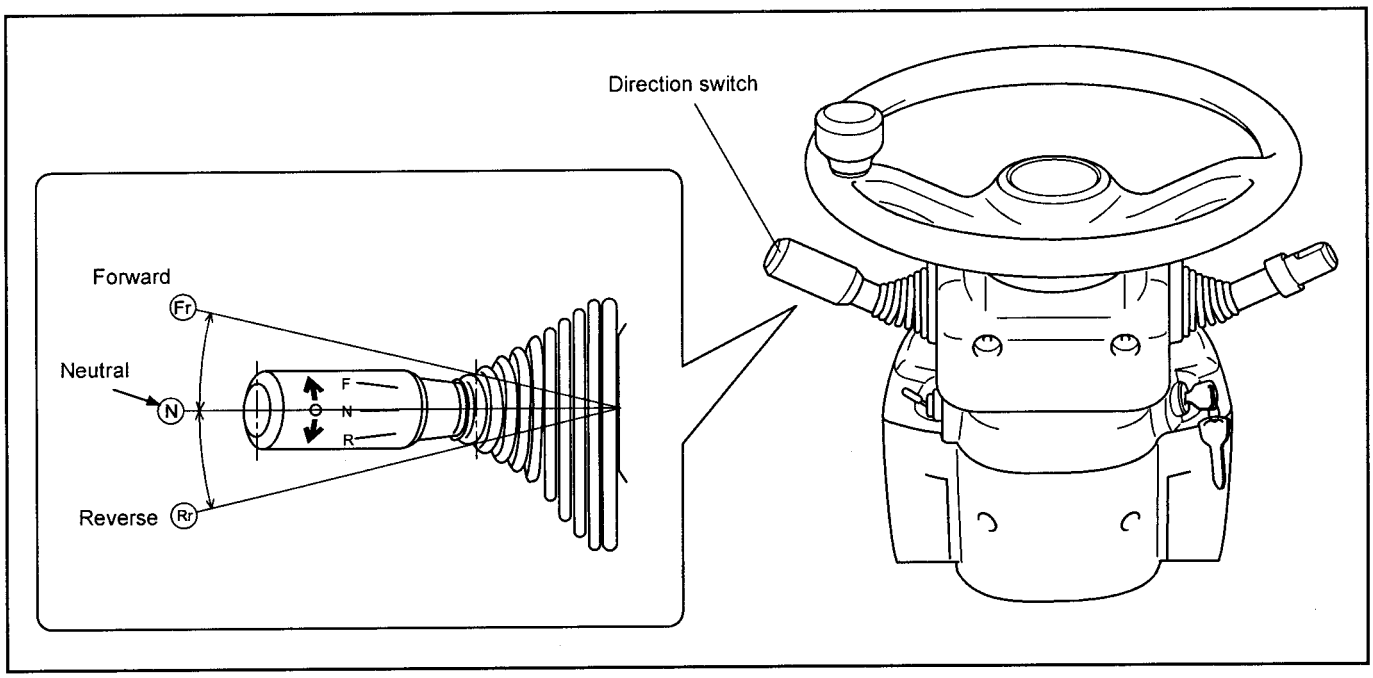
   The adopted direction switch is the same as that for the 7FG25 series.

2. Direction switch lever

   (1) The direction switch is of the lever type allowing easy operation with a finger as on the 7FG25 series.

   (2) The direction switch lever is on the left-hand side. Installation on the right-hand side is possible as an option. (Right-hand lever is not provided for SAS-less vehicles and USA specification.)

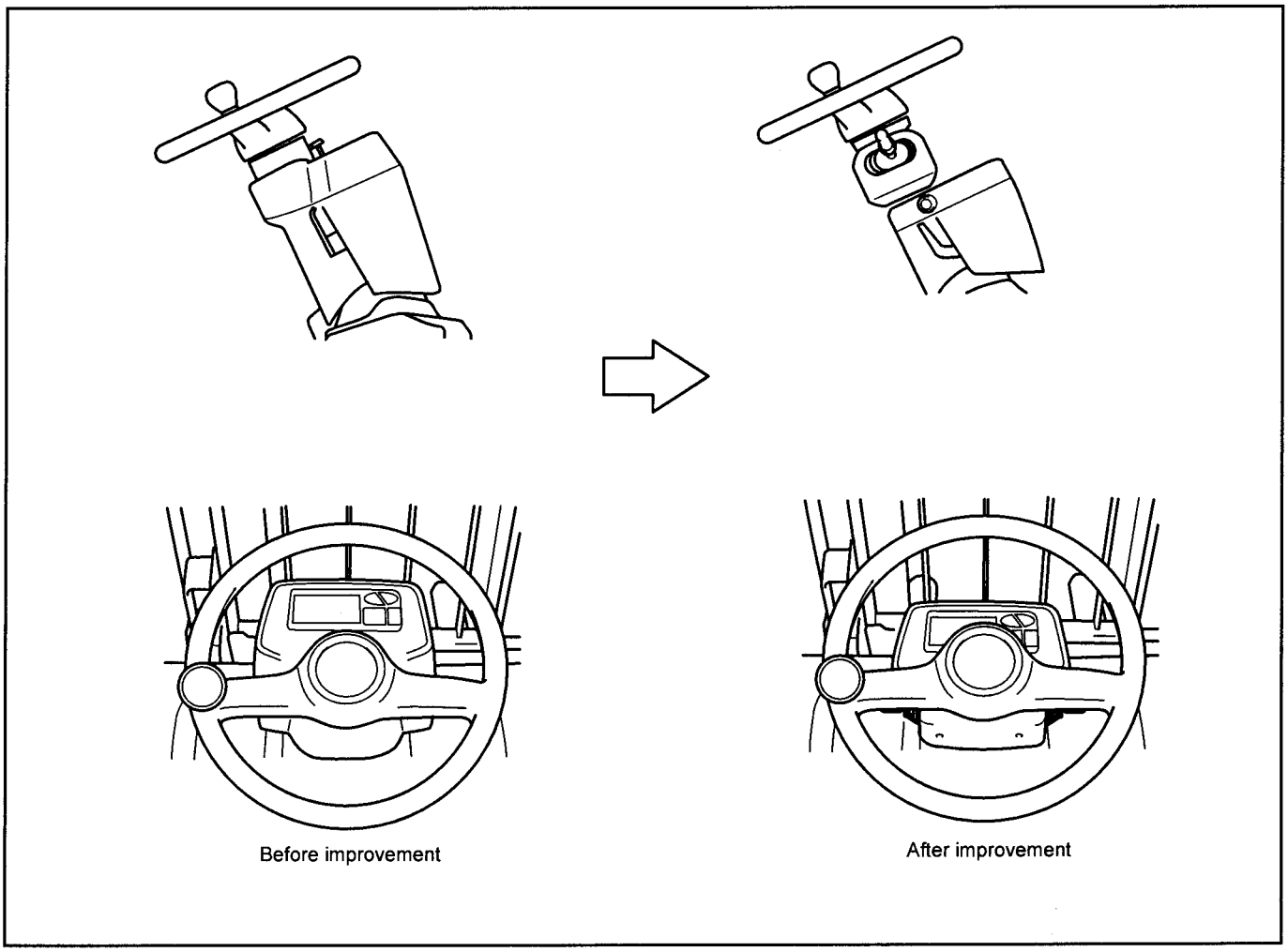
   (3) It is impossible to install the direction switch and turn signal switch levers on the same side.



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DRIVING POSITION

The display position is changed to improve the front visibility beyond the display.



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DISPLAY

GENERAL

Like the existing model, the round LED display with hour meter is adopted as the standard, and the LCD type multi-display (all-round model) is provided as an option.

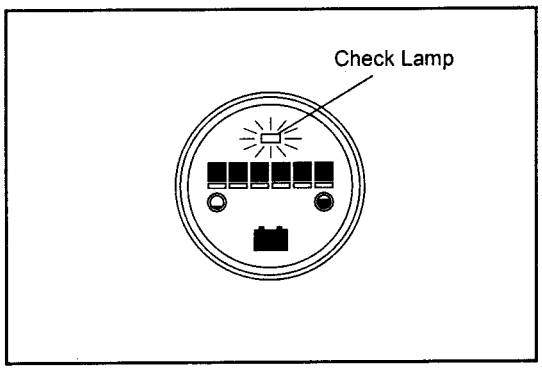
Function list

Function			LED DISPLAY + Hour meter (STD)	MULTI-DISPLAY (OPT)
Status display function	1	OPS operation display	○	○
Warning function	2	Parking brake OFF warning	○	○

OPS operation display

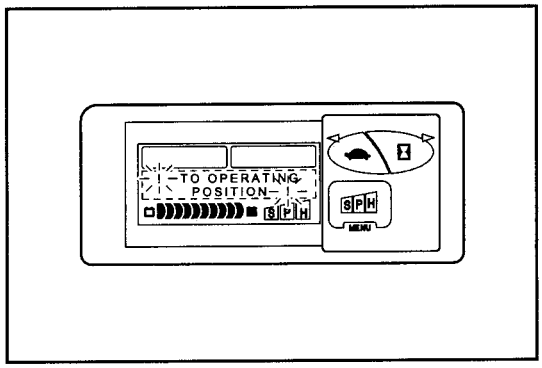
1. LED DISPLAY (STD)

   The CHECK indicator blinks when the operator leaves the seat.
   (Same display as for parking brake ON warming, parking brake OFF warning and return-to-neutral warning.)



2. MULTI-DISPLAY (OPT)

   When the operator leaves the seat, the OPS operation indication blinks and the buzzer sounds for 0.5 sec.



The buzzer sound before OPS operation is not generated on the USA specification vehicle.

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SWITCH

GENERAL

The auxiliary switches are installed under the instrument panel and the steering wheel.

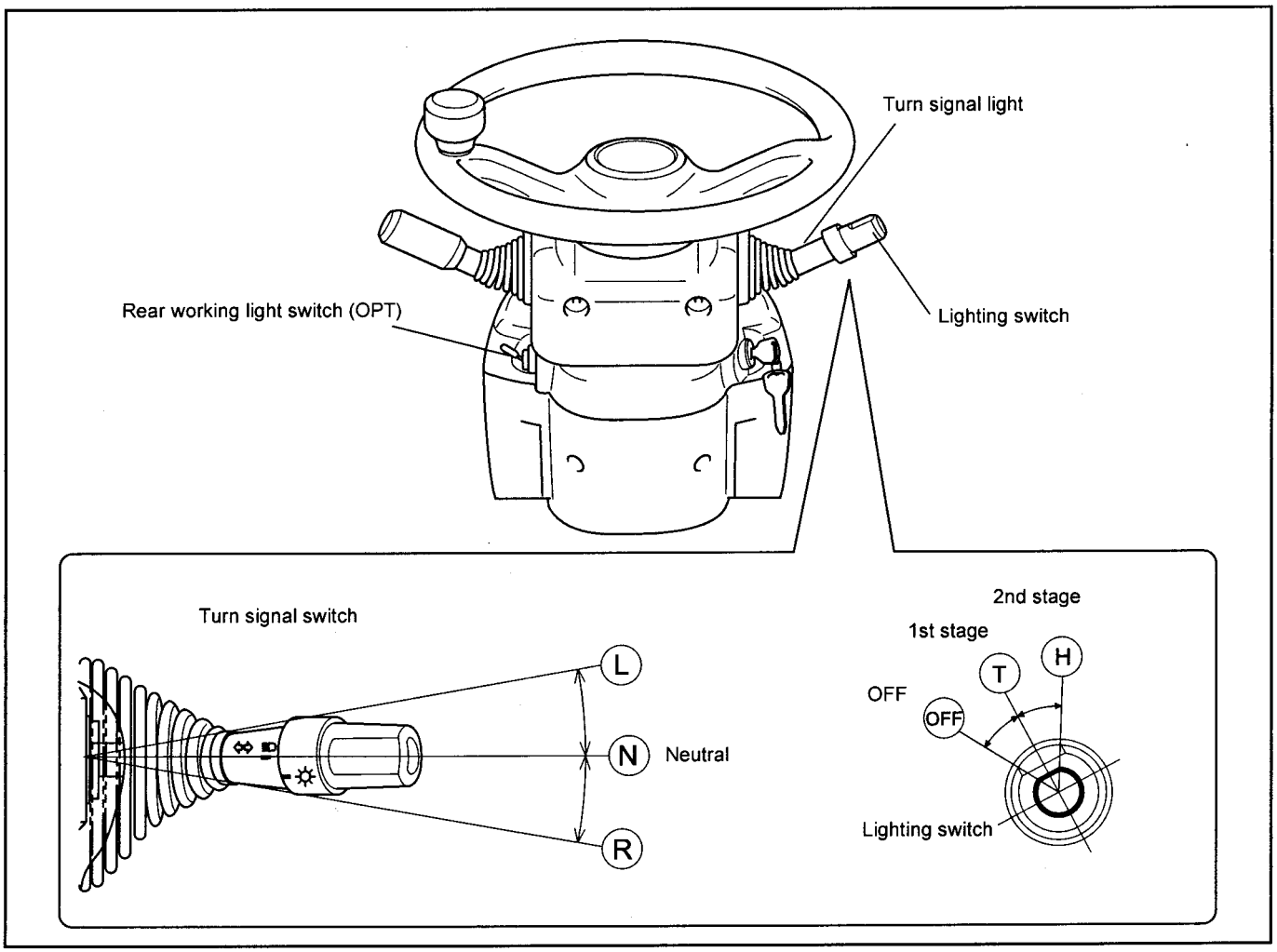
1. Power select switch (STD)
   The driving and material handling performance can be set in three levels.
   Since this switch is not provided for the vehicle with multi-display, select the level on the display.
   - H mode: Performance comparable with that on the engine vehicle
   - P mode: Maximum performance level on old model
   - S mode: Standard performance level on old model

2. Backup buzzer sound volume select switch (OPT)
   When the sound level selectable backup buzzer is installed, this switch selects the sound in any of the standard, OFF and low levels.

3. Windshield wiper switch (OPT)
   When the front shield is installed, this switch selects wiper ON/OFF.

4. Lighting switch
   The lighting switch is installed on the right side of the steering for easy operation
   This double-stage switch selects:
   - 1st stage: Side clearance light and taillight
   - 2nd stage: Head light, side clearance light and taillight

   The rear working light switch (OPT) is installed on the lower left side of the steering.



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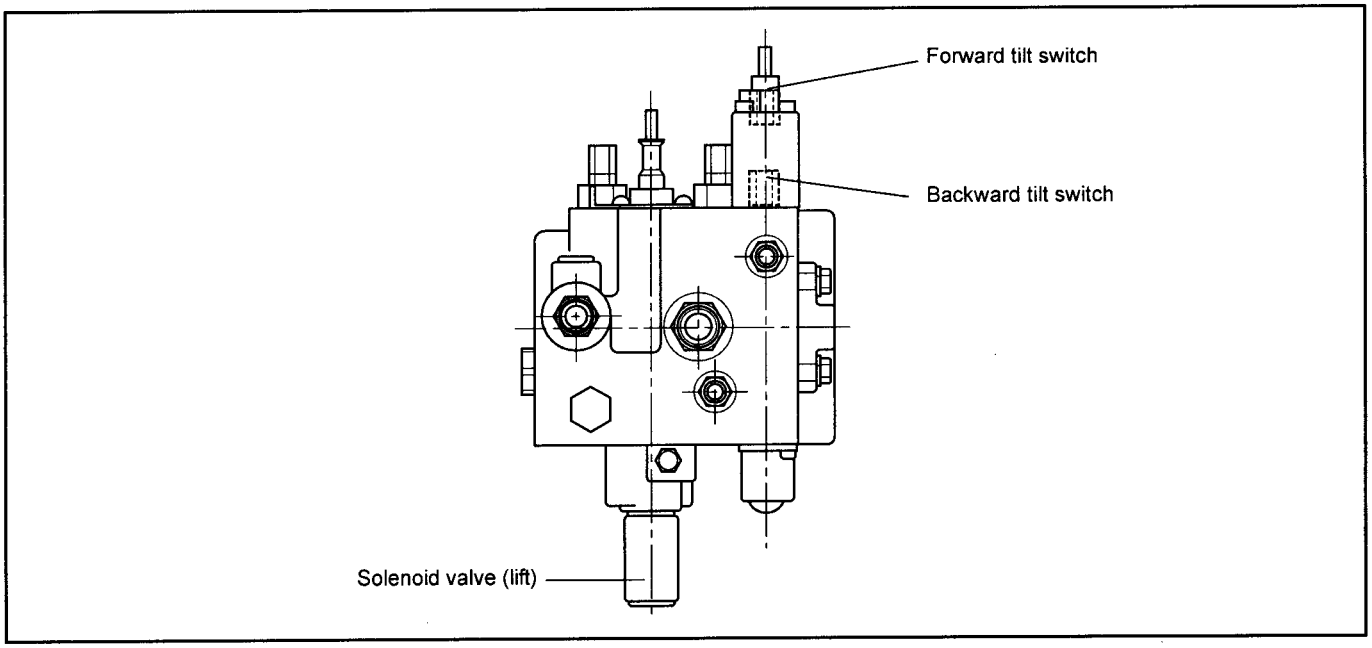
OIL CONTROL VALVE

GENERAL

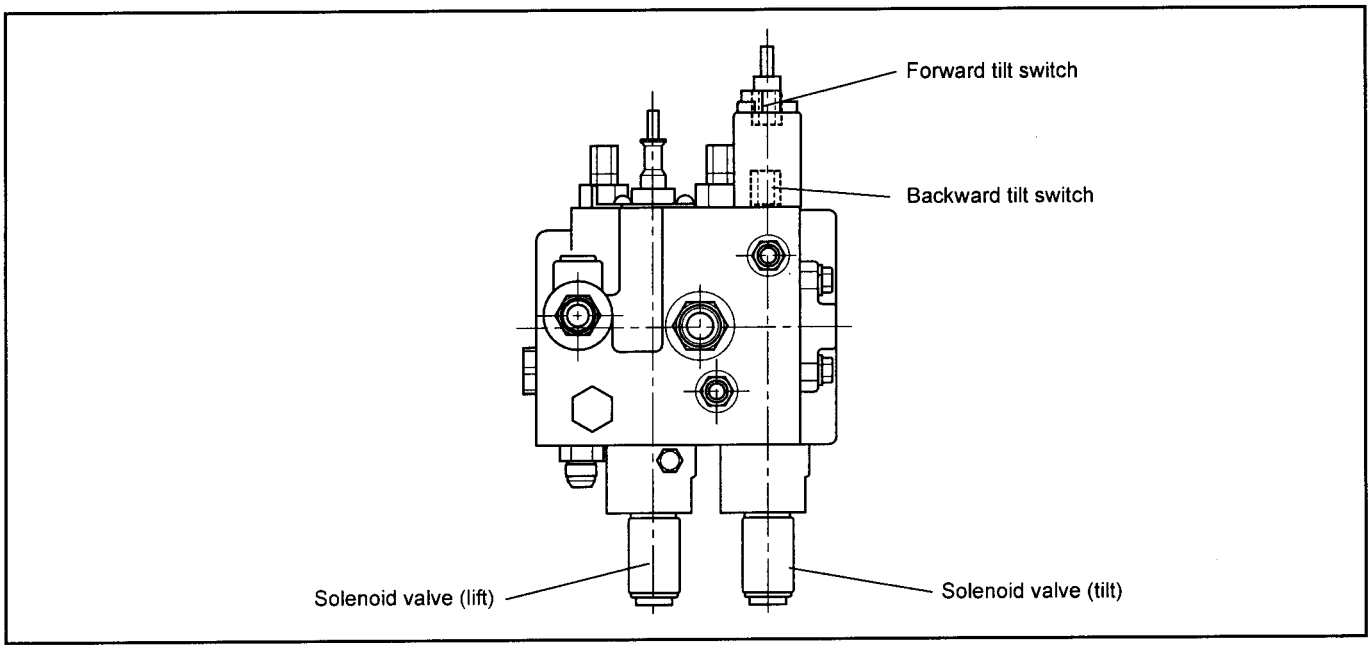
1. Standard specification (SAS-less)

   (1) A check valve and solenoid valve are provided in the lift circuit to add the lift lock function that prevents the fork from lowering when the lift lever is erroneously operated to the down side while the operator is not on the seat or when the key switch is OFF.

   (2) The check valve in the lift circuit greatly reduces natural drop.



2. OPT specification (succession from the specification with SAS control valve)
   The lift and tilt solenoids are controlled by detecting ON/OFF of the seat switch provided as an option. If the lift or tilt lever is erroneously operated while the operator is off the seat with the key switch ON, fork lowering or mast forward tilting does not occur.
   A check valve and solenoid valves are provided in the tilt circuit to restrict mast tilting operation.
   The check valve greatly reduces natural forward tilt.



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OPS & IMPROVEMENTS

Page

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GENERAL 1-10

LED DISPLAY 1-10

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ELECTRICAL SYSTEM TROUBLESHOOTING.....1-16

TROUBLESHOOTING 1-16

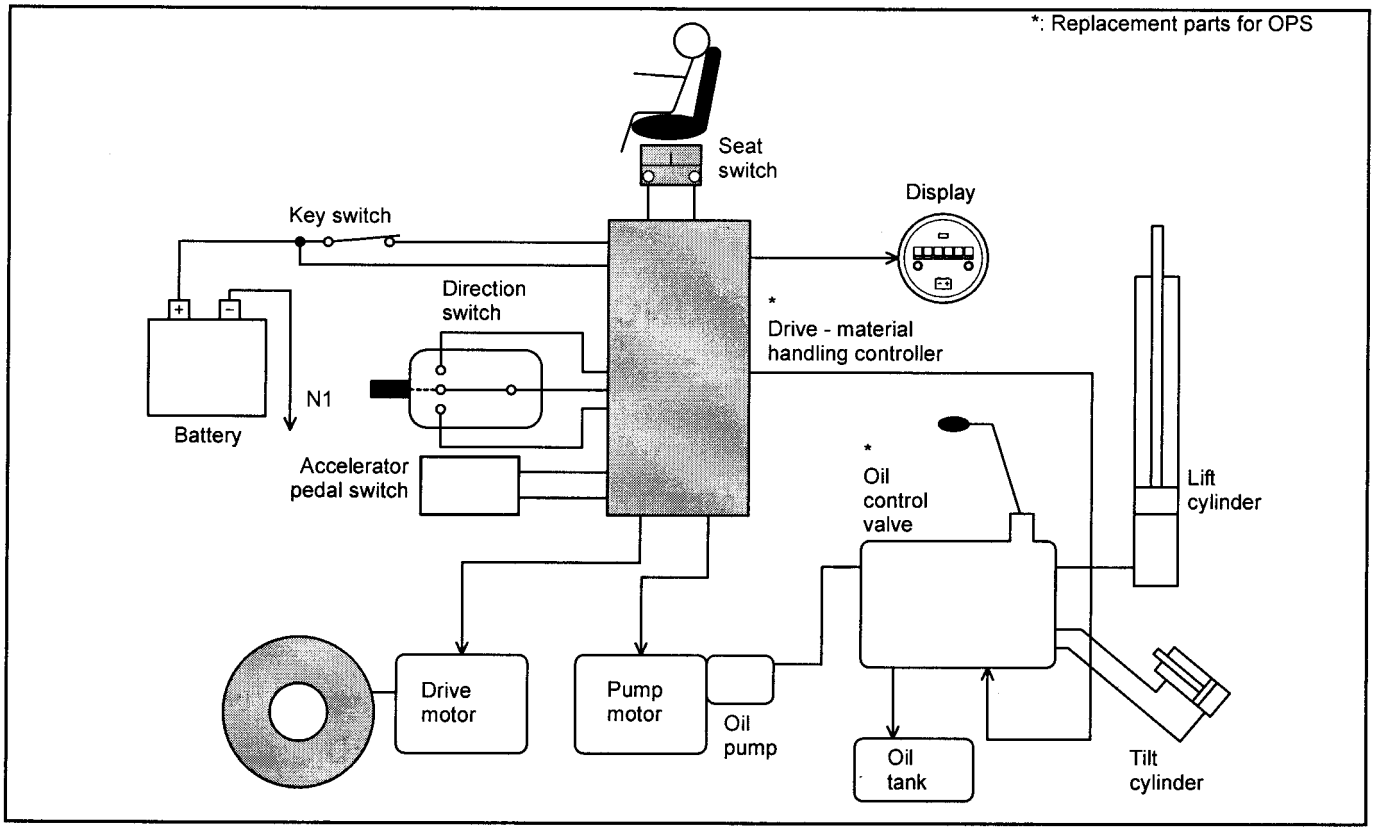
WHEN AN ERROR CODE IS DISPLAYED 1-17

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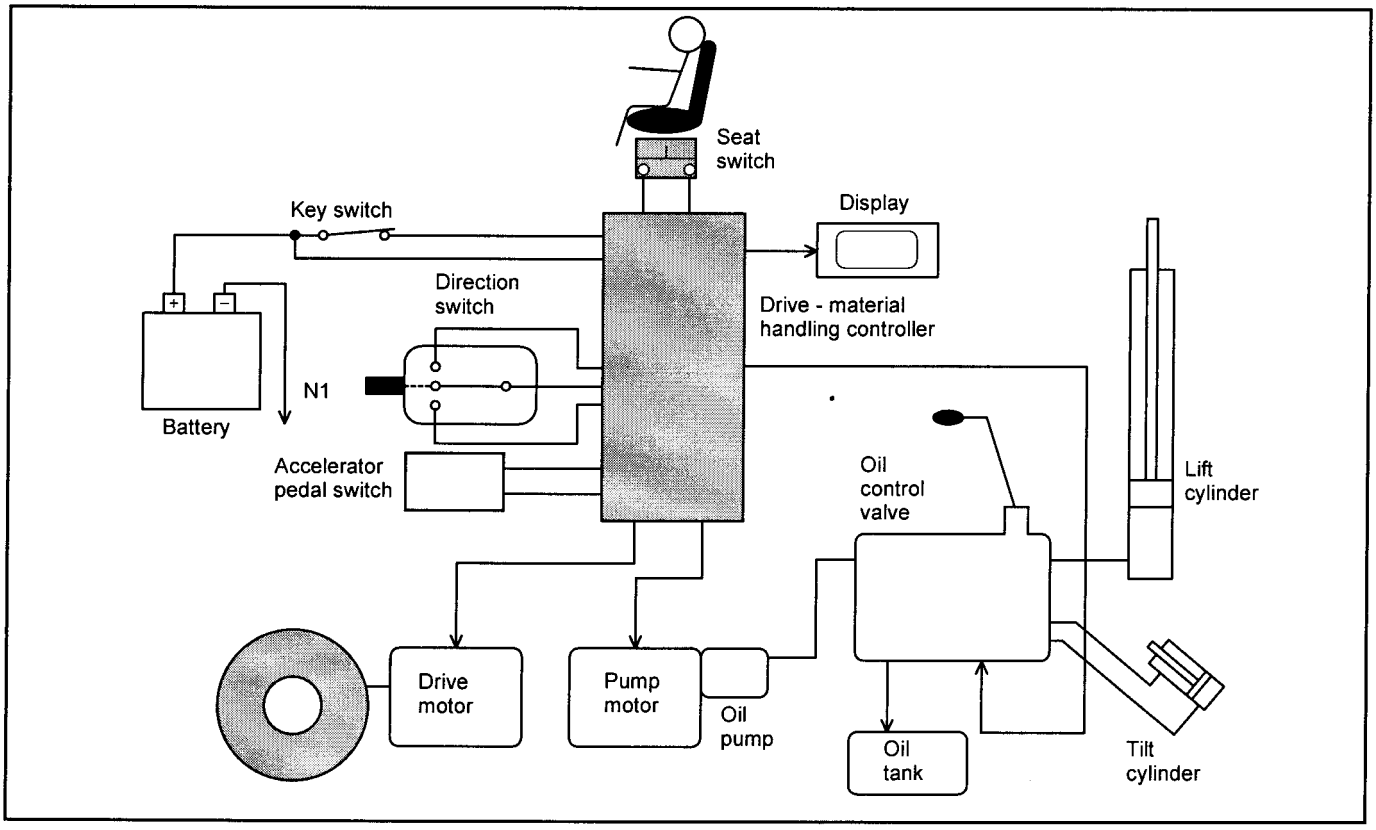
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GENERAL (OPS SYSTEM DIAGRAM)

STD specification (SAS-less vehicle)



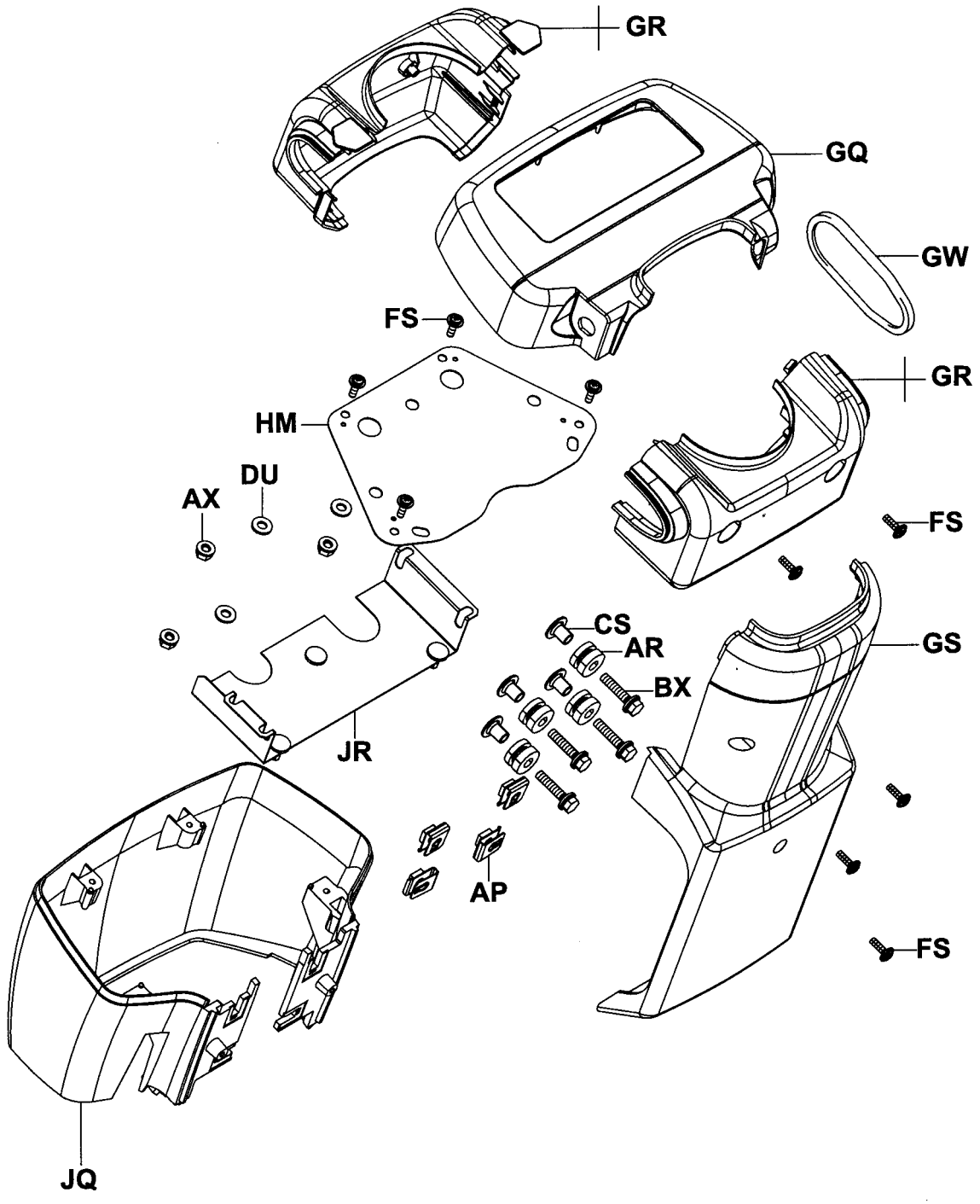
OPT specification (Vehicle with SAS)



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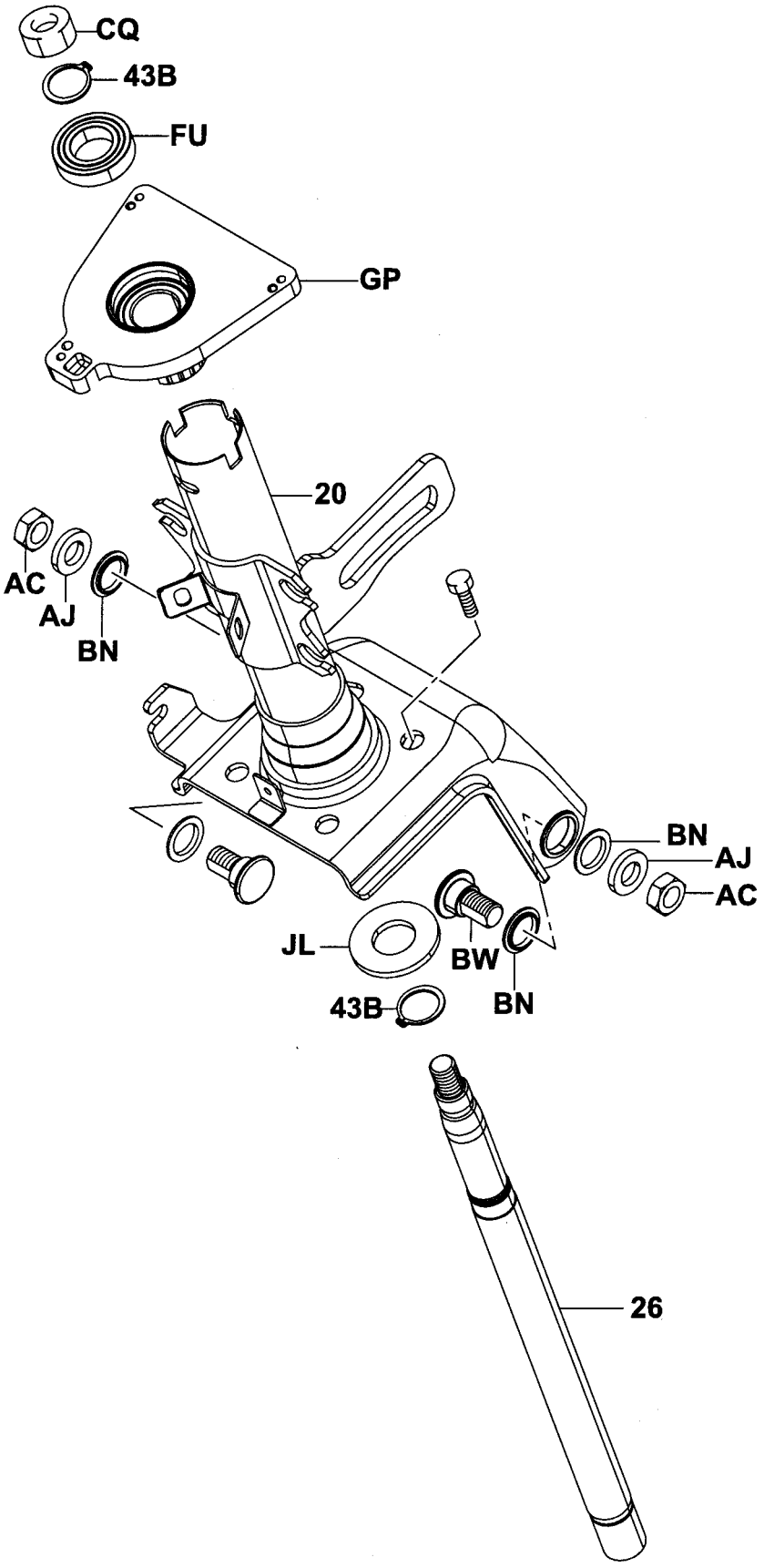
COMPONENTS (PARTS FOR IMPROVEMENT)

4502



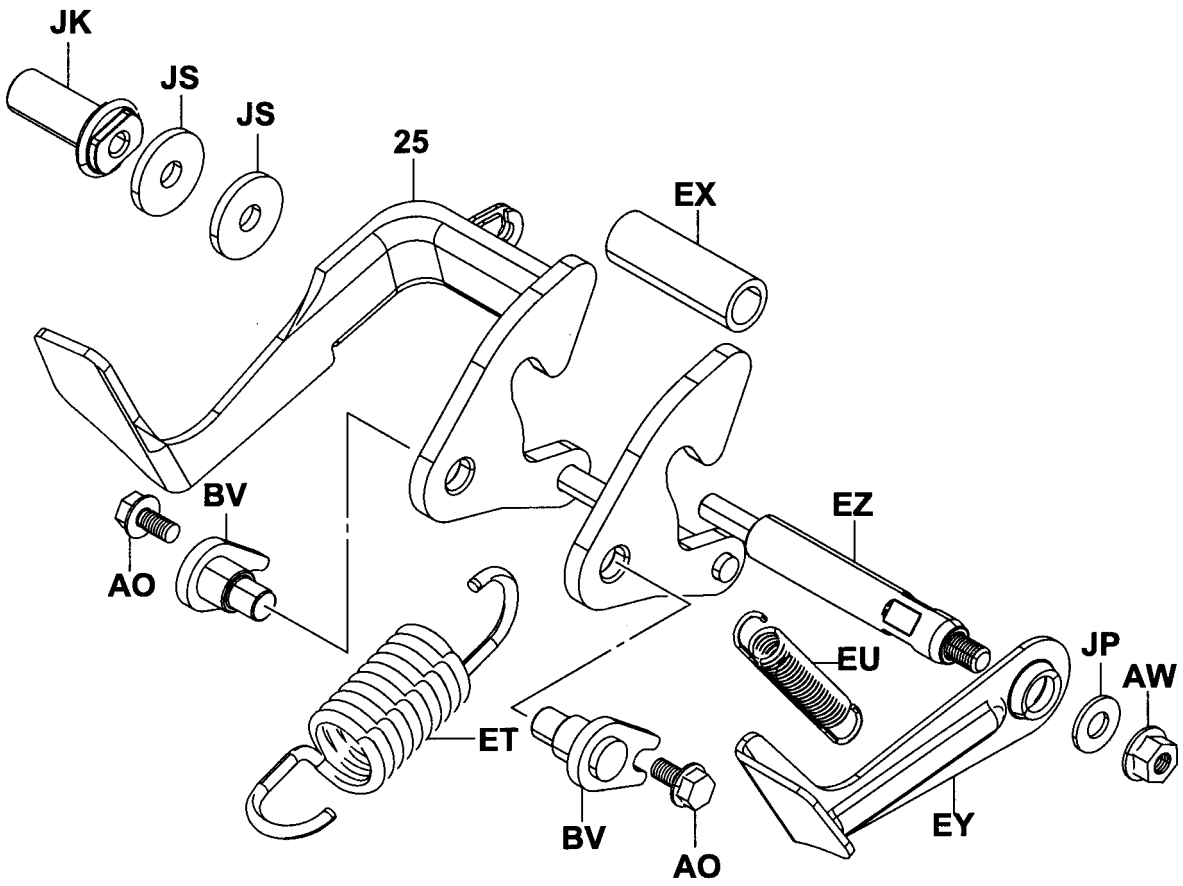
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4502



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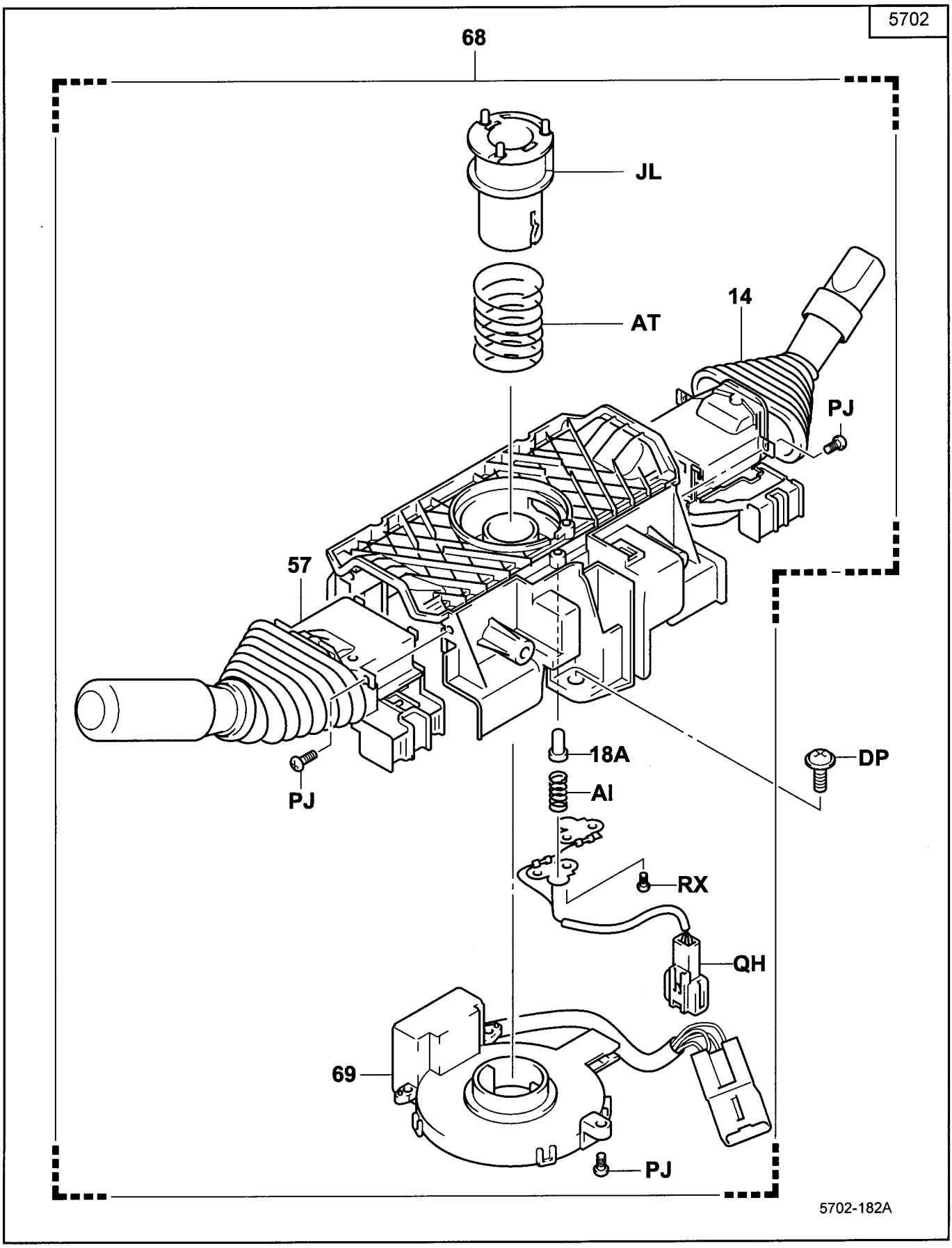
4502



4502-223

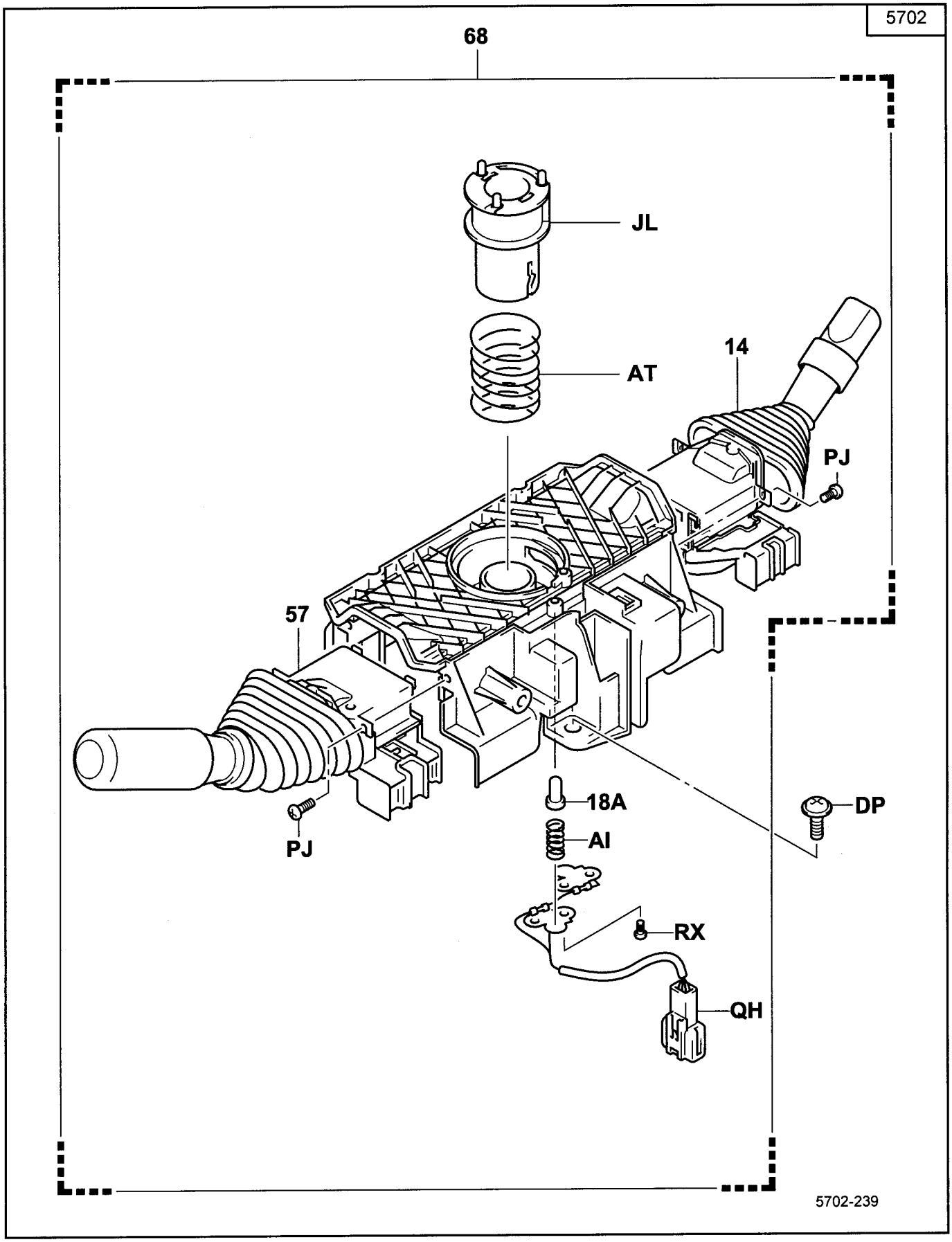
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Vehicle with SAS



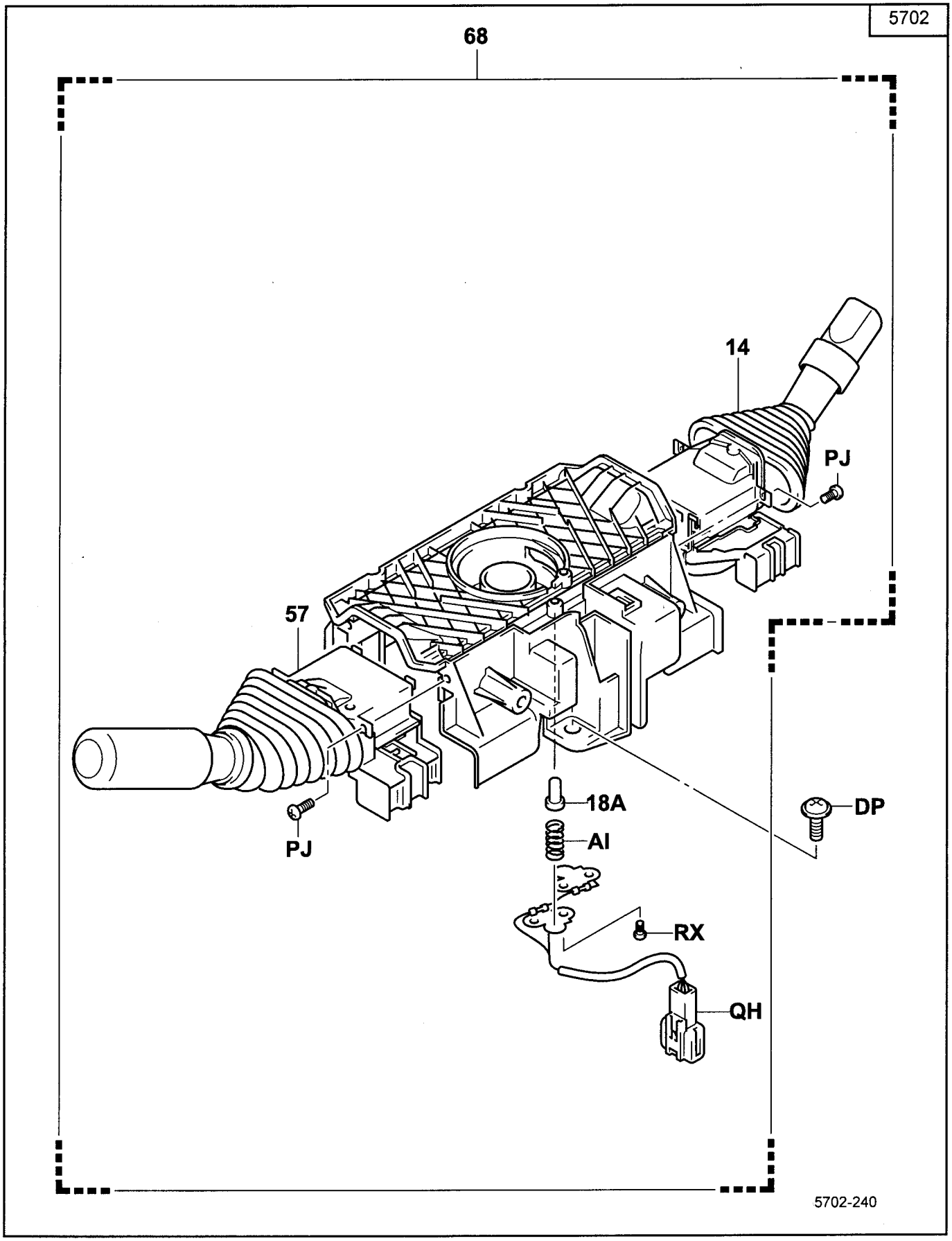
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Vehicle with Combination Light

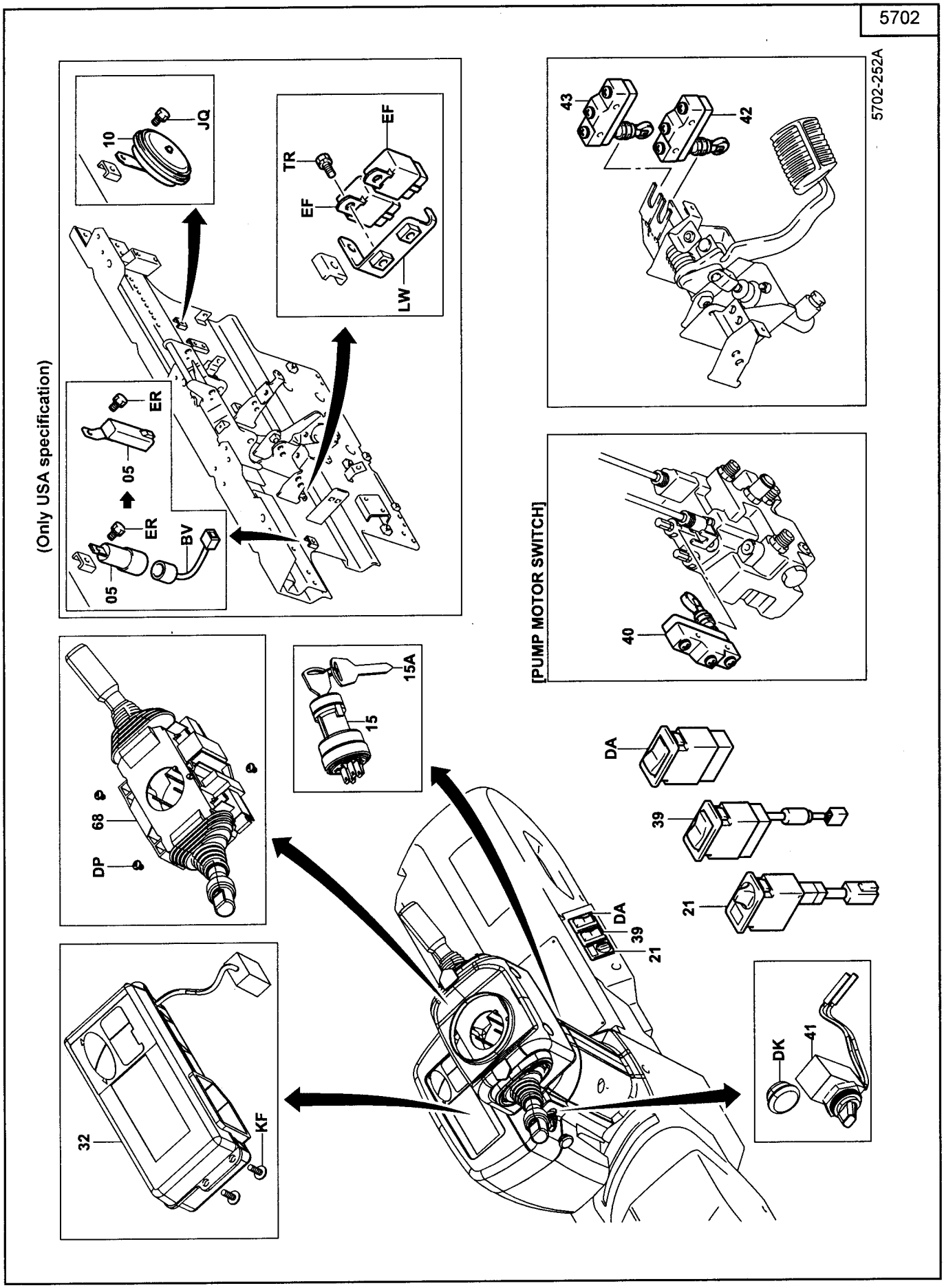


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Vehicle without Combination Light



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MULTI-DISPLAY FUNCTIONS

GENERAL

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-2

Change:

Function \ Vehicle type		LED display and hour meter (standard)	LCD display (option)
Status display function	OPS indicator	○	○
Alarm functions	Parking brake application failure alarm	○	○

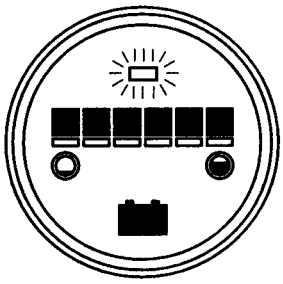
LED DISPLAY

DIAGNOSIS CODE LIST

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-9

Add:

□:ON ■:OFF ☼:Blinking *Diag memory: Indicated by the SST plug-in analyzer.

LED display	Diag memory*	Faulty position	Error mode	Phenomenon on vehicle
	–	OPS indicator	When off from the operator's seat	Traveling and material handling disabled

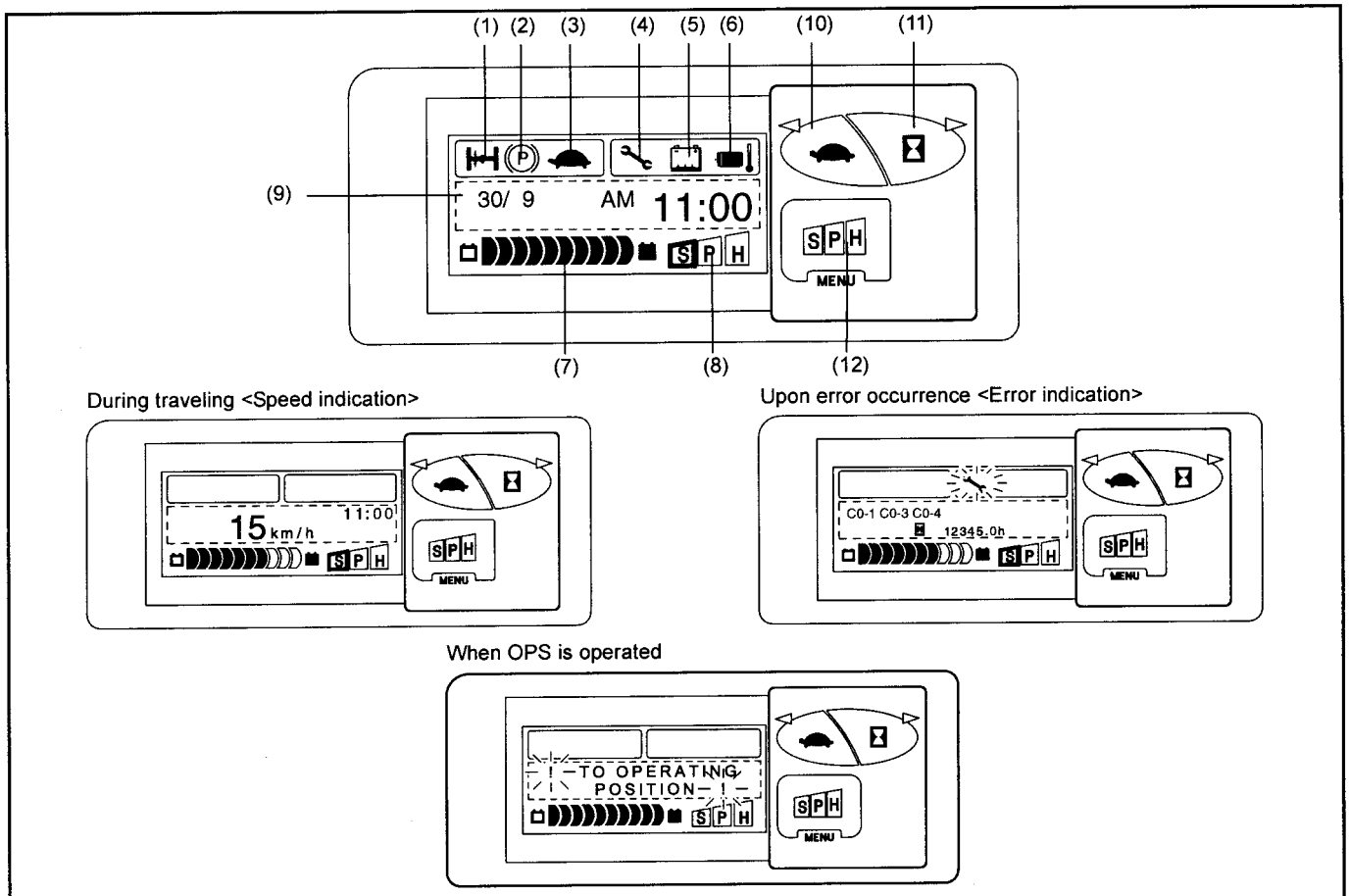
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MULTI-SCREEN, MULTI-DISPLAY (OPTION)

GENERAL

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-34

change:



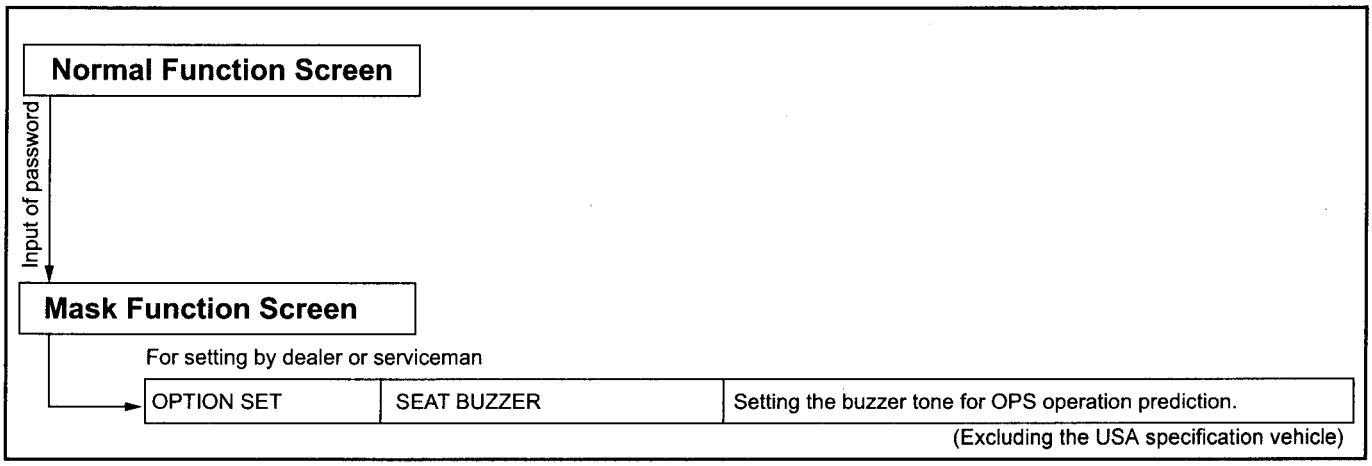
No.	Item	No.	Item
(1)	Swing lock indicator	(7)	Battery charge indicator
(2)	Parking brake ON indicator	(8)	Power select indicator
(3)	2-speed travel speed set indicator	(9)	Multiplex screen display area
(4)	Diagnosis ON indicator	(10)	2-speed travel speed control set switch
(5)	Battery electrolyte level alarm indicator	(11)	Hour meter selector switch
(6)	Overheat alarm indicator	(12)	Power select switch

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SCREEN DISPLAY (LIST)

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-37

Add:



DIAGNOSIS

Diagnosis Code List

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-43

Add:

Display indication	Diag memory	Faulty position	Defect mode	Phenomenon on vehicle
A5	A5	Seat switch	Switch switch abnormality	Error display only

ANALYZER

Vehicle Abnormalities Not Stored in Diag Memory

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-55

Change:

Alarm item	Alarm content	Symbol displayed
2. Parking lever OFF alarm Alarm occurs when the operator leaves the operator's seat without applying the parking brake (also without turning the key switch to OFF).	• Alarm sound (longer high-pitched electronic sound)	No display
4. Return to neutral alarm Alarm occurs when the key switch or seat switch is turned to ON while the direction switch is set at the forward or reverse position.	• Alarm sound (longer high-pitched electronic sound)	No display

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OPTION SET

Option Set Menu List

Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-68

Add:

No.	Indication	Description	Selection	
			Y	N
OPT-20	SEAT BUZZER	Enables/disables the buzzer tone upon OPS operation prediction buzzer. (Excluding the USA specification vehicle)	Enable (Y)	Disable (N)

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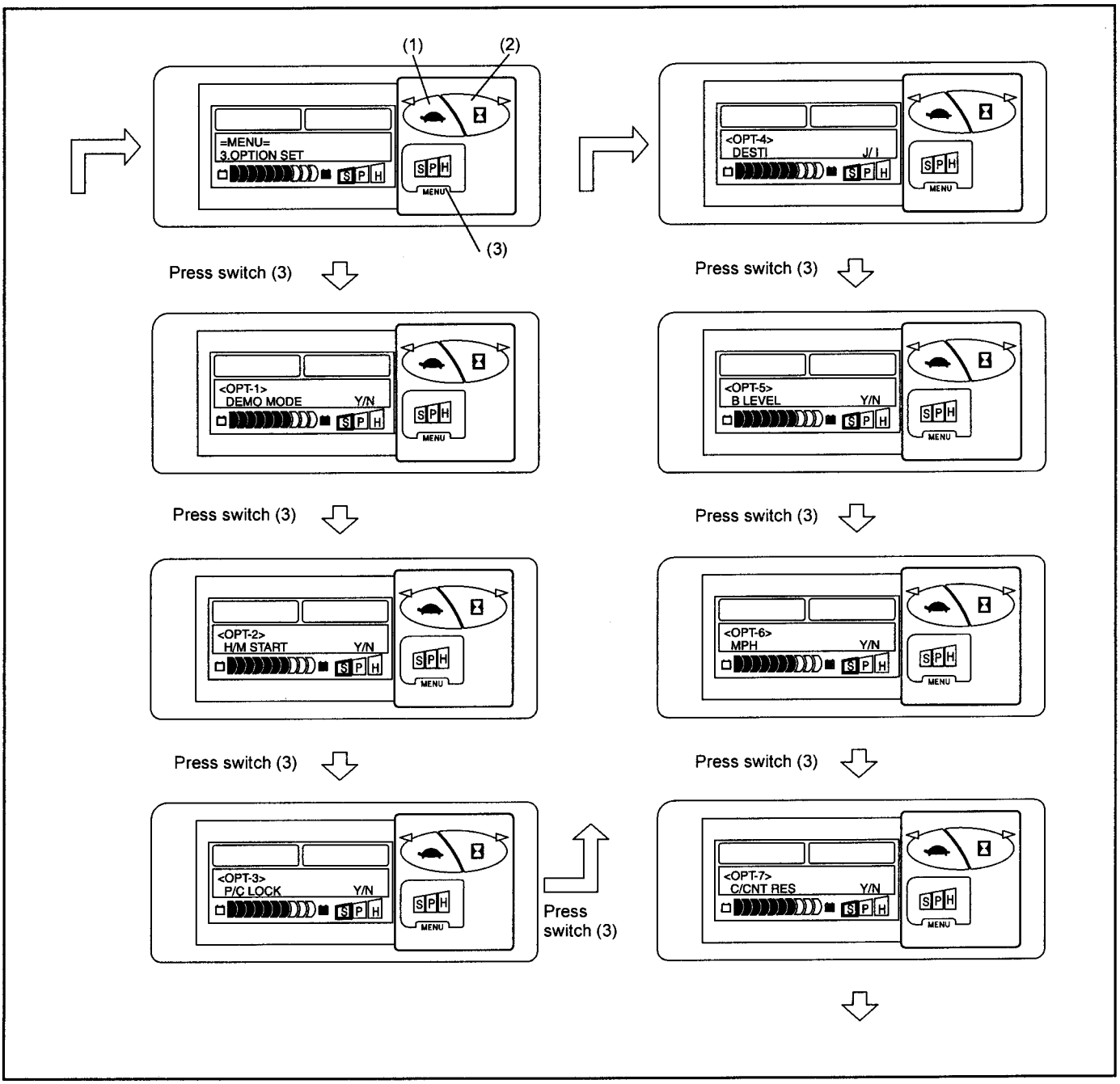
Comparison with Former Edition: Repair Manual, Pub. No. CE316-4, Page 4-69

new:

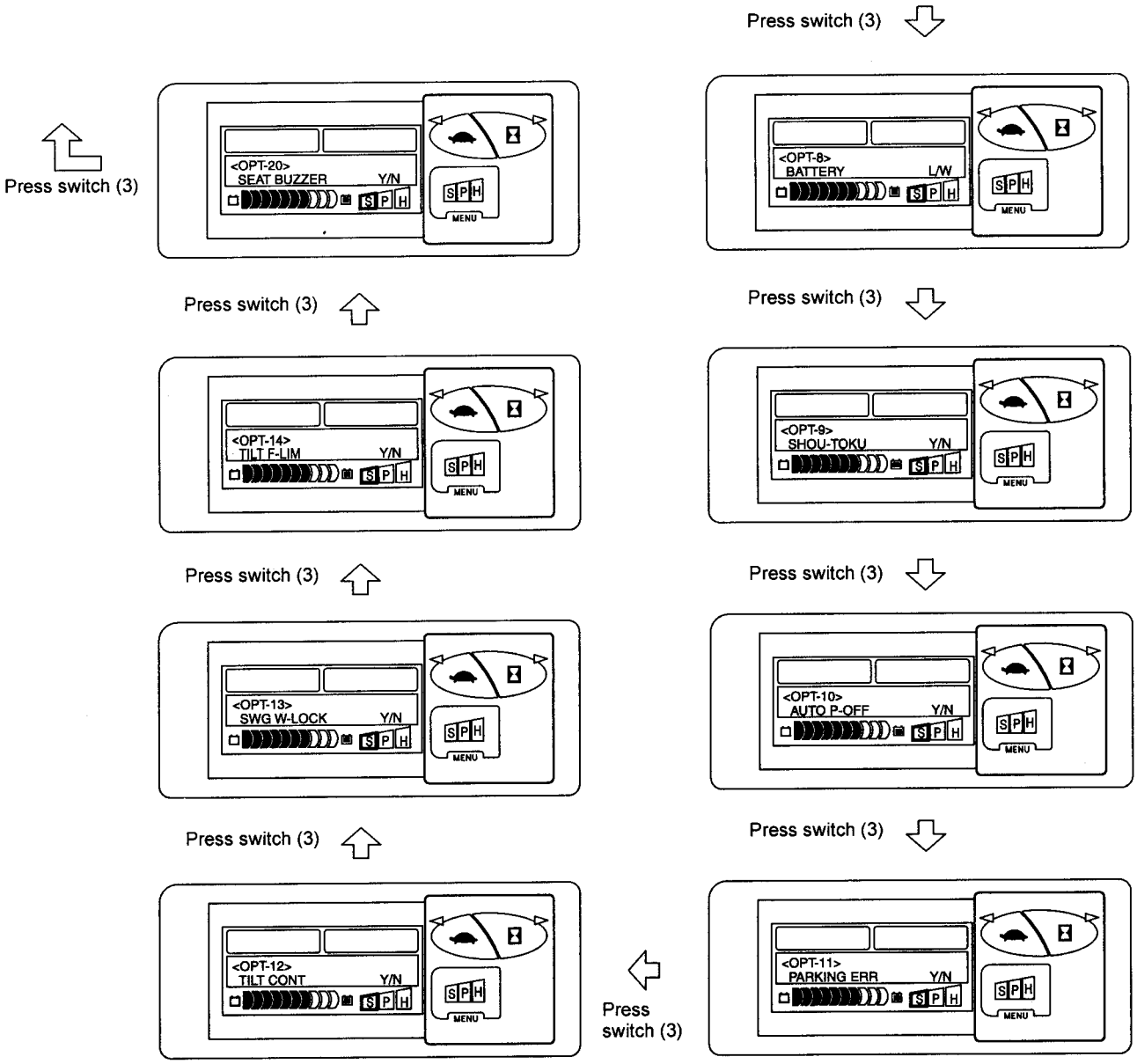
Operation Procedure Screen

1. Input the password on the normal function screen (see page 4-49) to display the MASK MENU screen.
2. Press switch (2) twice to display 3. OPTION SET. Press switch (3) (enter) to change <OPT-1> screen.
3. Select a desired option menu item using switches (3)
4. Functions of switches on the OPTION SET MENU screens are as follows:
   - Switch (1): Changes the setting from N to Y.
   - Switch (2): Changes the setting from Y to N.
   - Switch (3): Enters (changes to the next item setting screen)

Note:
Press switch (3) on the OPT-20 OPTION SET MENU screen to return to the ANALYZER MENU screen.



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*1: Hour meter starting method
(1) Press switch (1) for 2 seconds or more.
(2) Press switch (2) while pressing switch (1) (held in the state of 1 above).

*2: OPT-7 (C/CNT RES)
Charge counter resetting method
Press switch (1) for 2 seconds or more.

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ELECTRICAL SYSTEM TROUBLESHOOTING

TROUBLESHOOTING

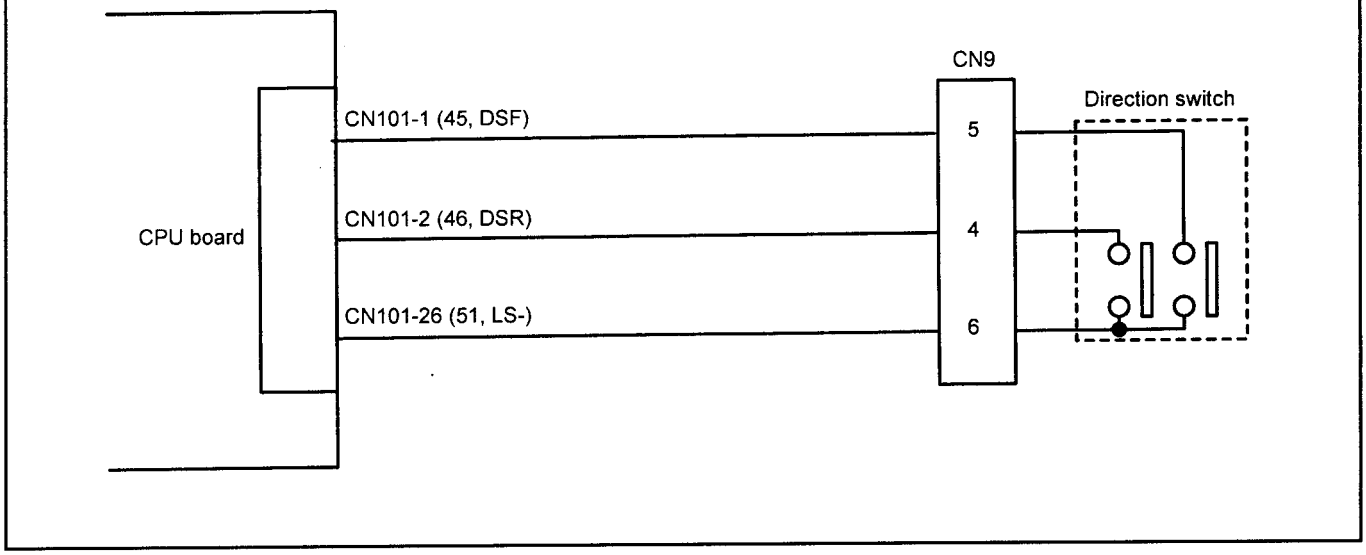
WHEN AN ERROR CODE IS DISPLAYED			
Display code	Diag memory code	Error mode	Page
C7	C7	Direction switch abnormality	1-17
72	72	Steering angle sensor abnormality	1-19
A5	A5	Seat switch abnormality	1-28
WHEN NO ERROR CODE IS DISPLAYED			
Display code	Vehicle condition		Page
–	Failure in Traveling Only or Wobbling		1-29
–	Traveling and material handling fail with OPS display even when sitting on the seat.		1-31

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WHEN AN ERROR CODE IS DISPLAYED

Error Code C7: Direction Switch Abnormality

Related Portion



Condition for Error Detection

① Short-circuiting of direction switch
② Short-circuiting of harness

ANL.: I/O MONITOR I/O2-2
Disconnect CN9 and conduct the ON/OFF check with direction switch at the neutral state.

Turns OFF → • Direction switch inspection

DSF or DSR turns ON ↓

Inspection 1:
CN101-1 (45) (at DS_F ON)
CN101-2 (46) (at DS_R ON)
↕ voltage check
N1

NG (0 V) → • Short-circuiting of main harness

OK (approx. 5V) ↓

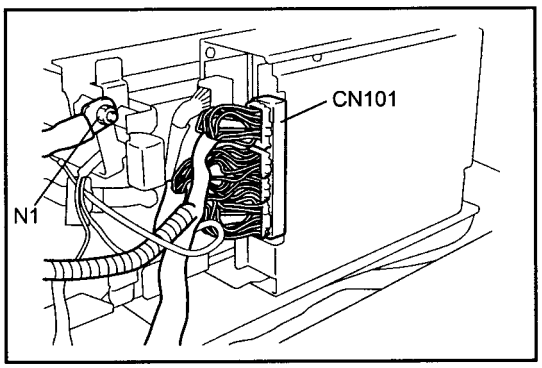
• CPU board defect

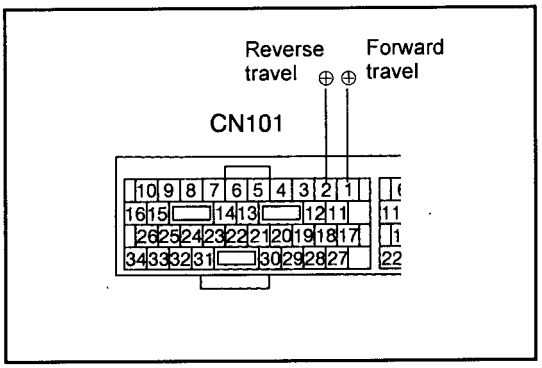
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Inspection 1:

CN101 - N1 Voltage Check
Battery plug ON, key switch ON

Measurement terminals	Forward: CN101-1 (45) ⊕ – N1⊖ Reverse: CN101-2 (46) ⊕ – N1⊖
Tester range	DC 10 V
Standard	Approx. 5 V



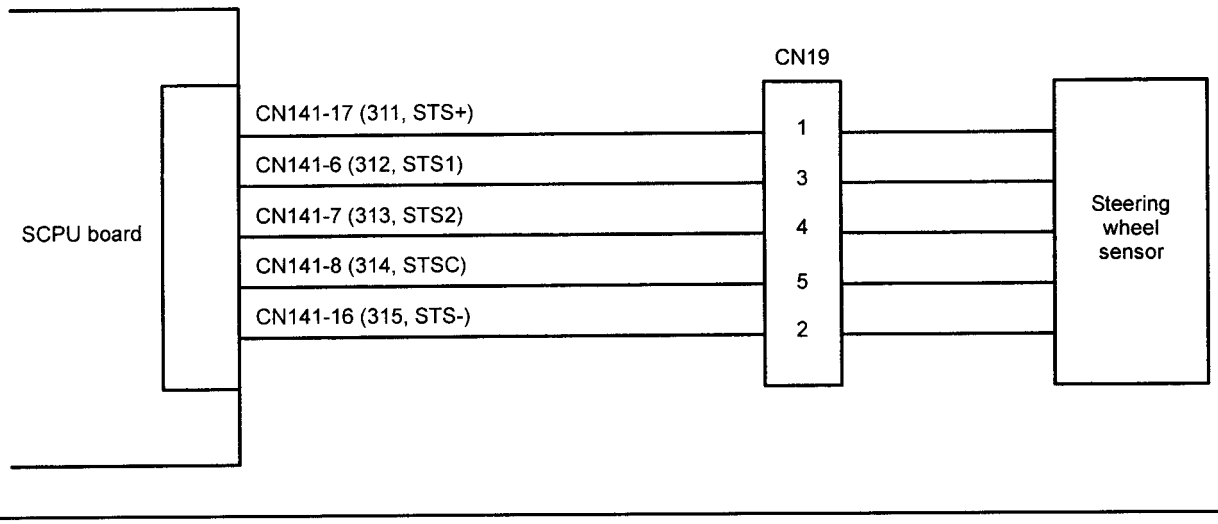


OK (approx. 5 V) → CPU board defect
NG (0 V) → Short-circuiting of main harness

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Error Code 72: Steering Angle Sensor Abnormality

Related Portion

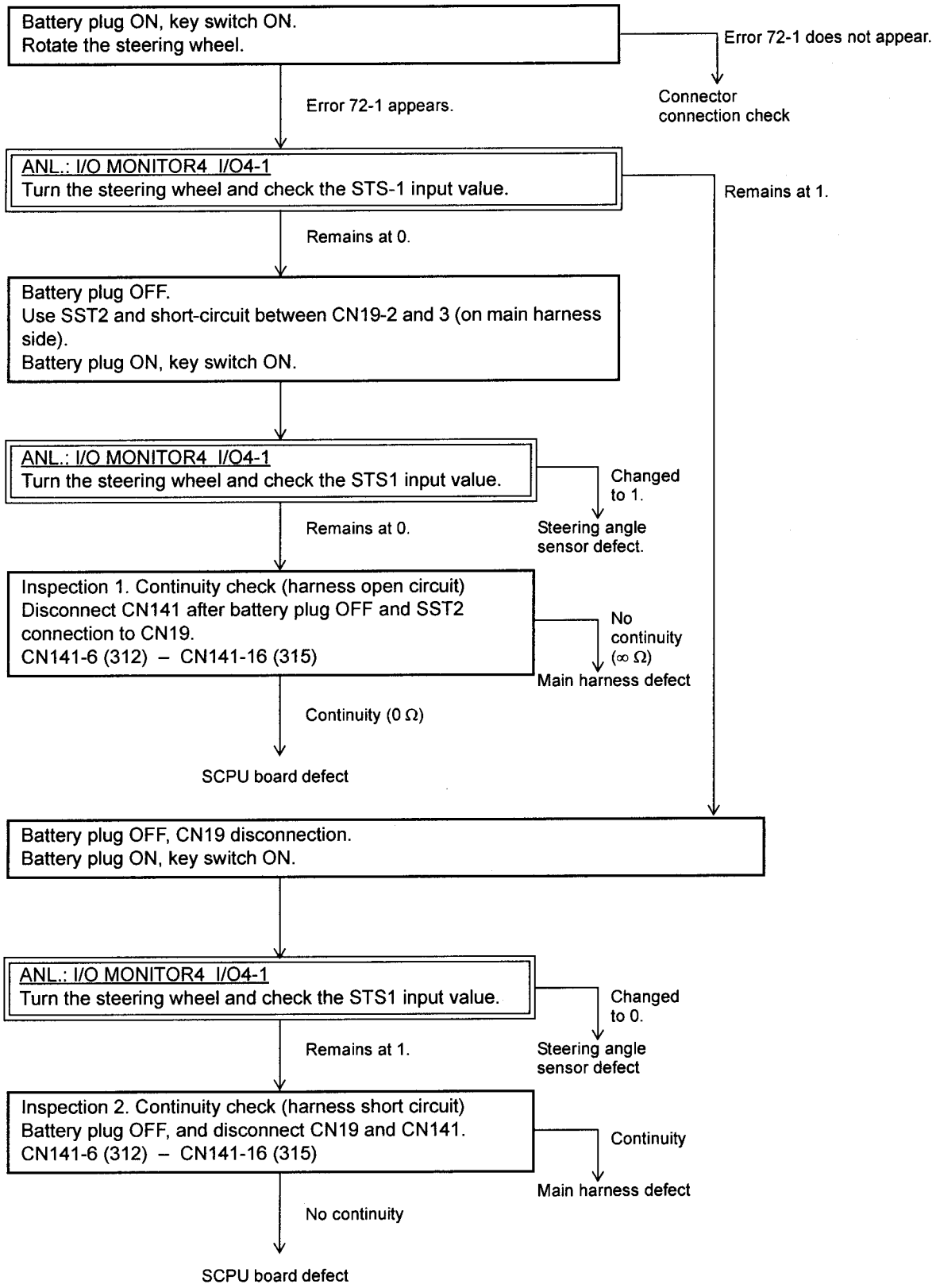


Condition for Error Detection

① Steering angle sensor defect or open of sensor harness
② Short circuit of harness

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[For 72-1]

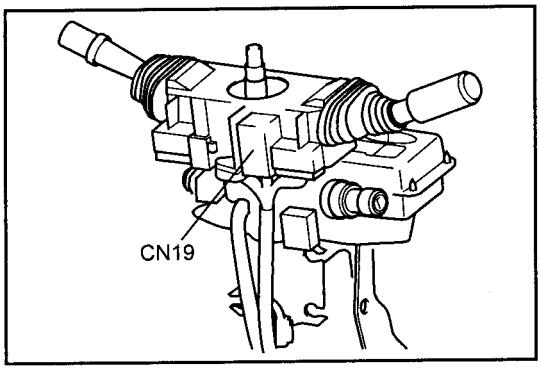


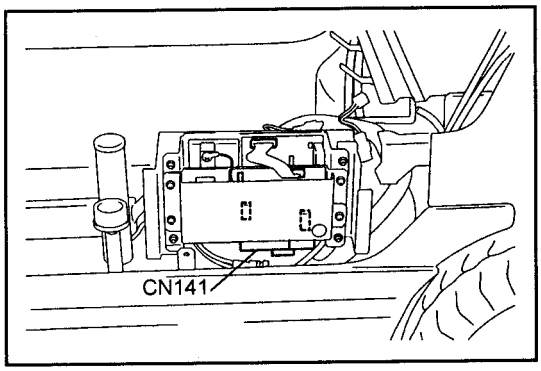
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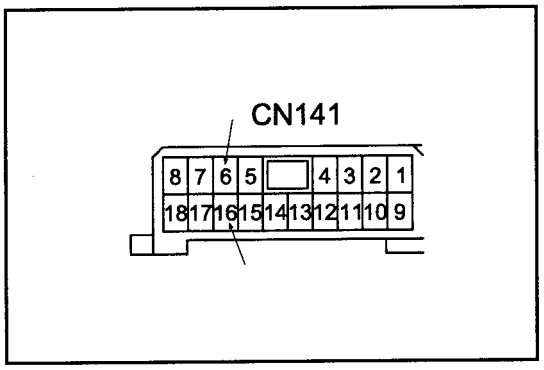
Inspection 1:

Continuity check (open circuit of harness)
Battery plug OFF, SST2 set to CN19

Measurement terminals	CN141-6 (312) – CN141-16 (315)
Tester range	Ω × 1
Standard	0 Ω





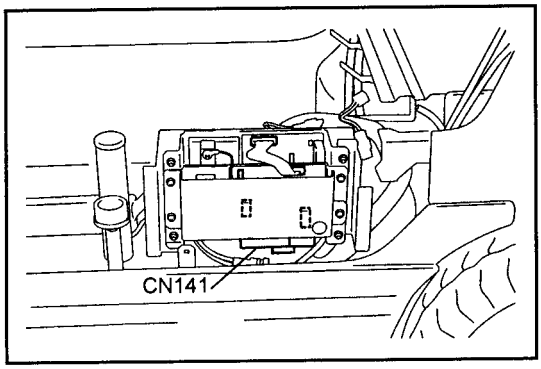


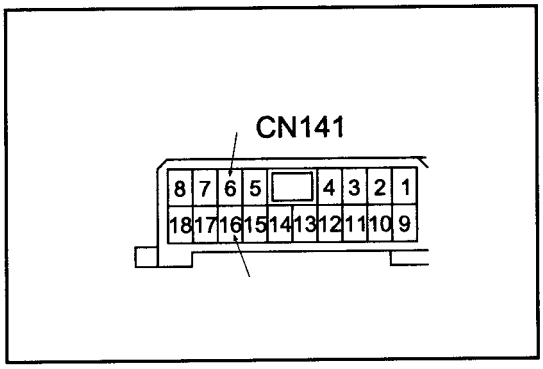
OK (0 Ω) → SCPU board defect
NG (∞ Ω) → Main harness defect

Inspection 2:

Continuity check (short-circuit of harness)
Battery plug OFF

Measurement terminals	CN141-6(312) – CN141-16(315)
Tester range	Ω × 1
Standard	∞ Ω

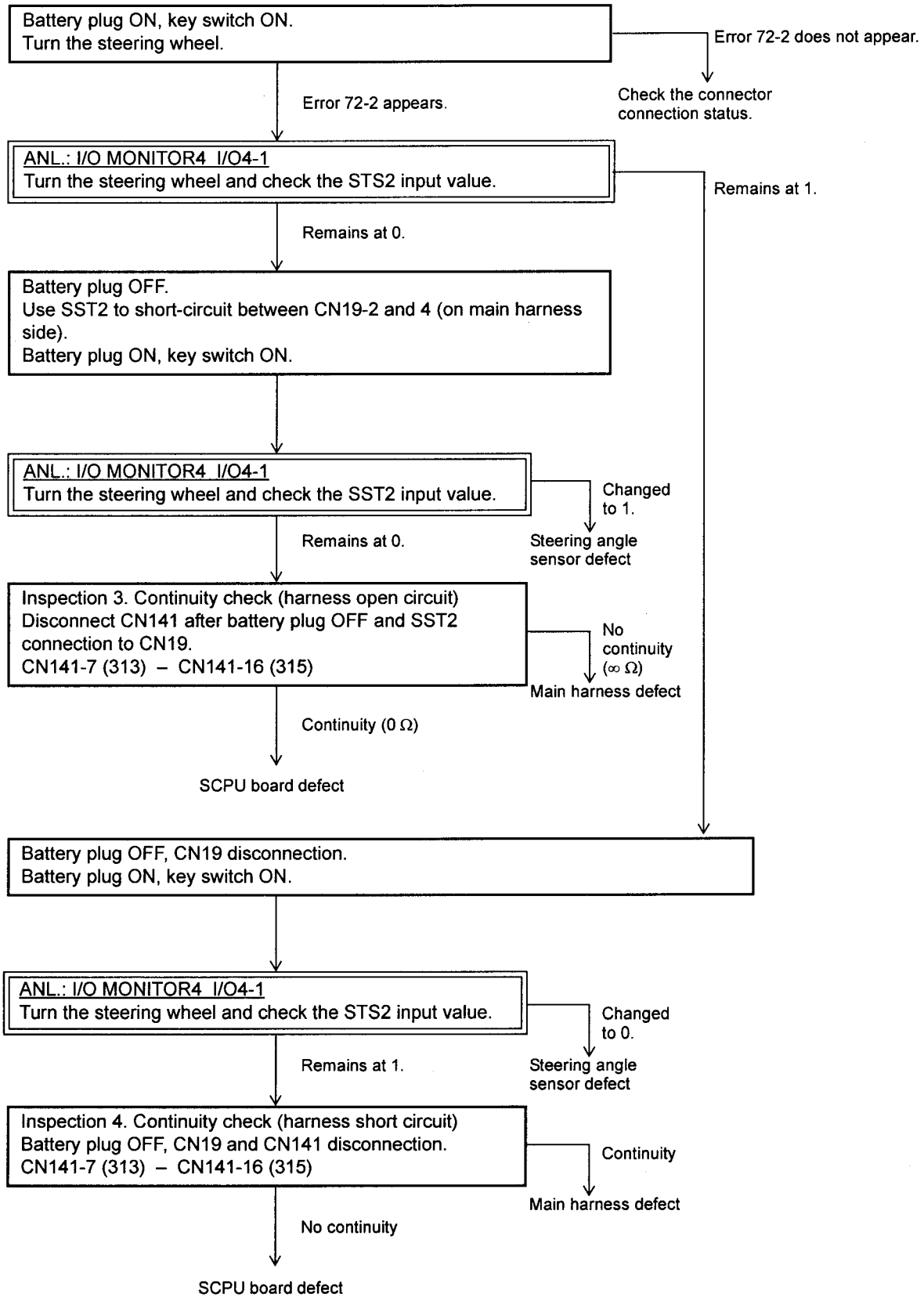




OK (∞ Ω) → SCPU board defect
NG (0 Ω) → Main harness defect

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[For 72-2]

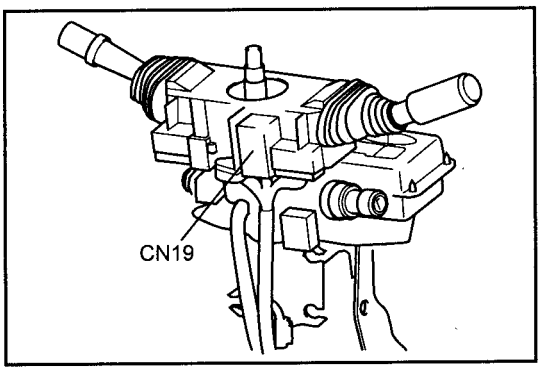


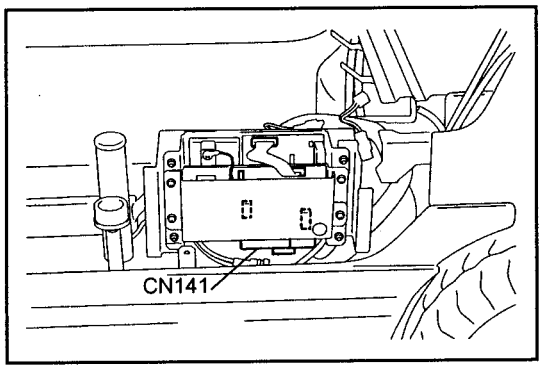
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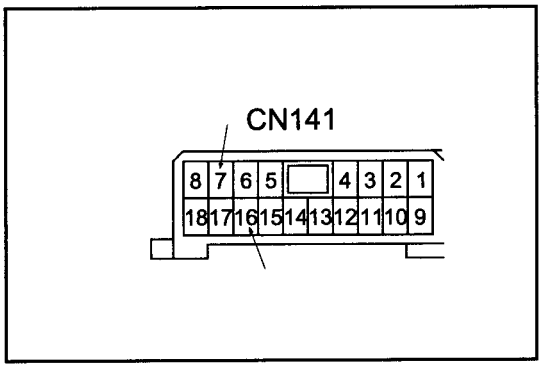
Inspection 3:

Continuity check (open circuit of harness)
Battery plug OFF, SST2 set to CN19

Measurement terminals	CN141-7 (313) – CN141-16 (315)
Tester range	Ω × 1
Standard	0 Ω





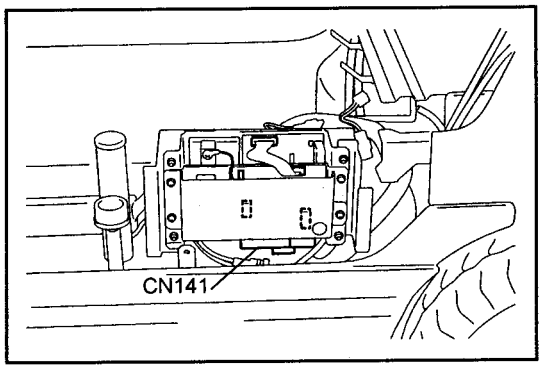


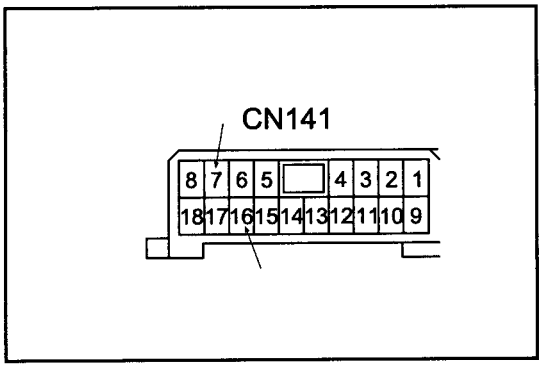
OK (0 Ω) → SCPU board defect
NG (∞ Ω) → Main harness defect

Inspection 4:

Continuity check (short-circuit of harness)
Battery plug OFF

Measurement terminals	CN141-7 (313) – CN141-16 (315)
Tester range	Ω × 1
Standard	∞ Ω

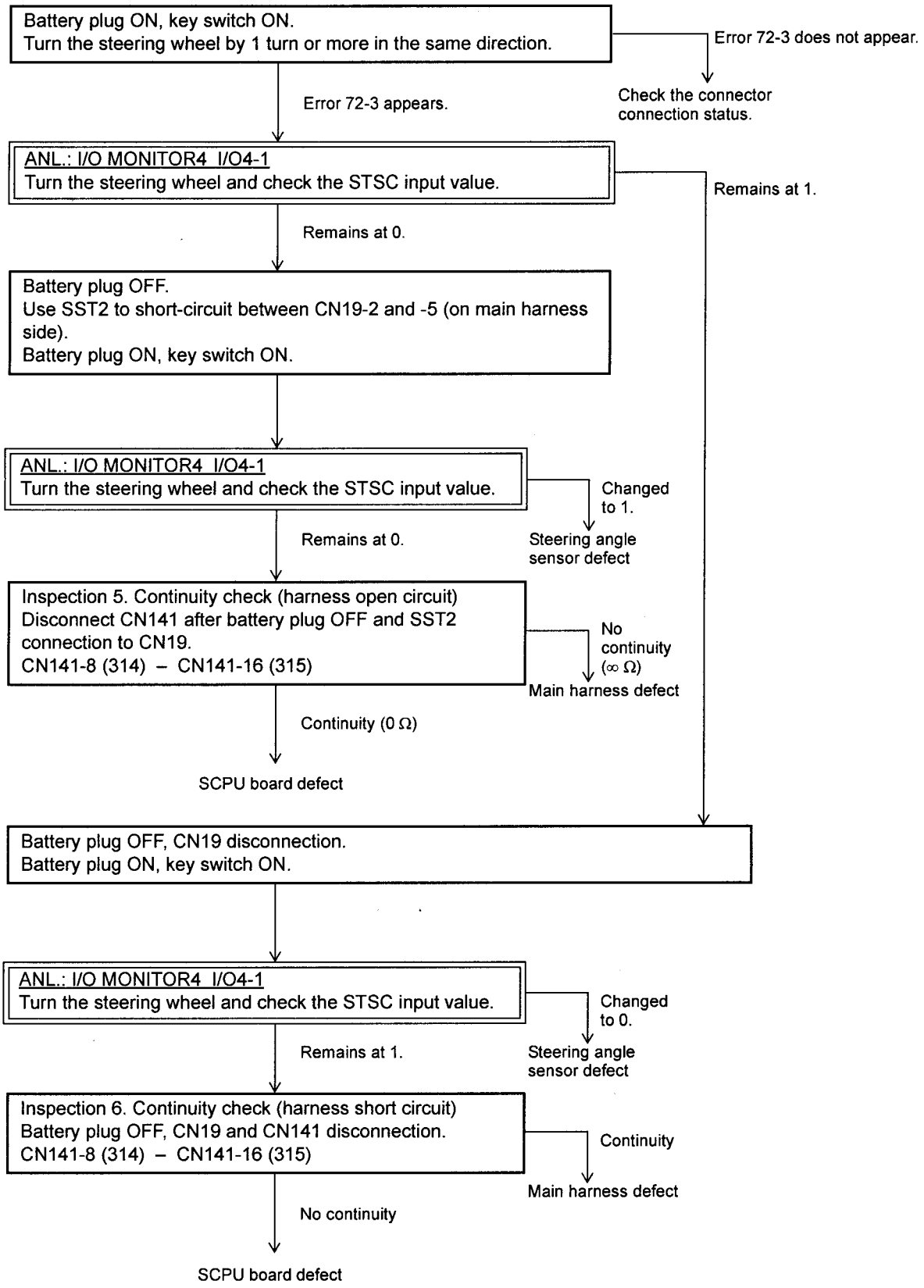




OK (∞ Ω) → SCPU board defect
NG (0 Ω) → Main harness defect

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[For 72-3]

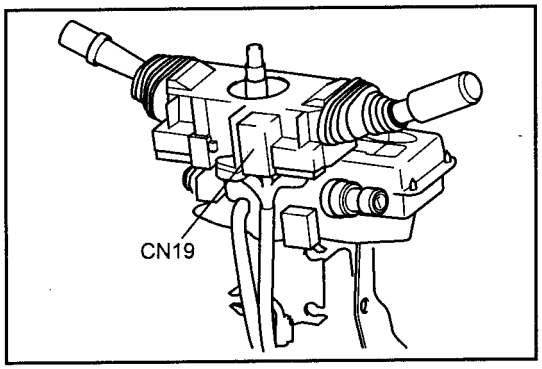


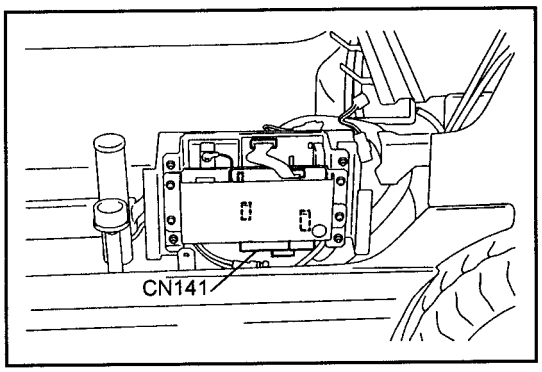
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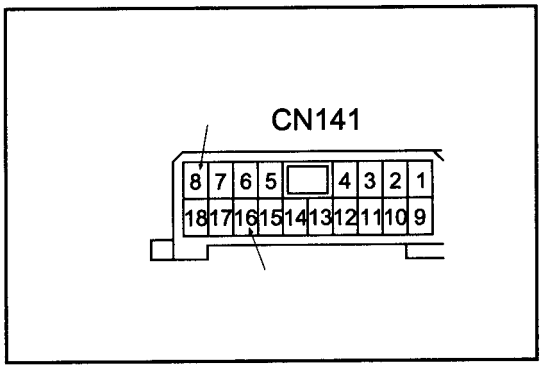
Inspection 5:

Continuity check (open circuit of harness)
Battery plug OFF, SST2 set to CN19

Measurement terminals	CN141-8 (314) – CN141-16 (315)
Tester range	Ω × 1
Standard	0 Ω





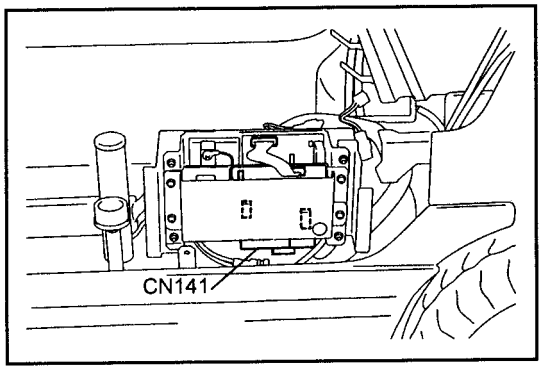


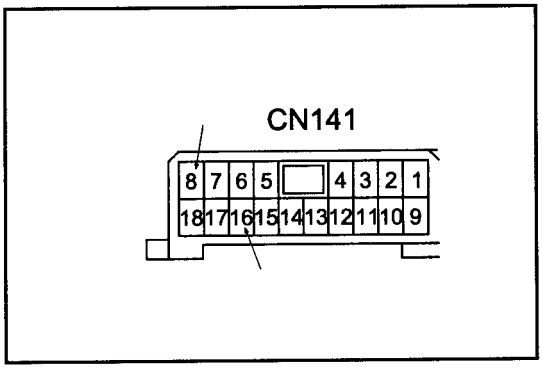
OK (0 Ω) → SCPU board defect
NG (∞ Ω) → Main harness defect

Inspection 6:

Continuity check (short-circuit of harness)
Battery plug OFF

Measurement terminals	CN141-8 (314) – CN141-16 (315)
Tester range	Ω × 1
Standard	∞ Ω

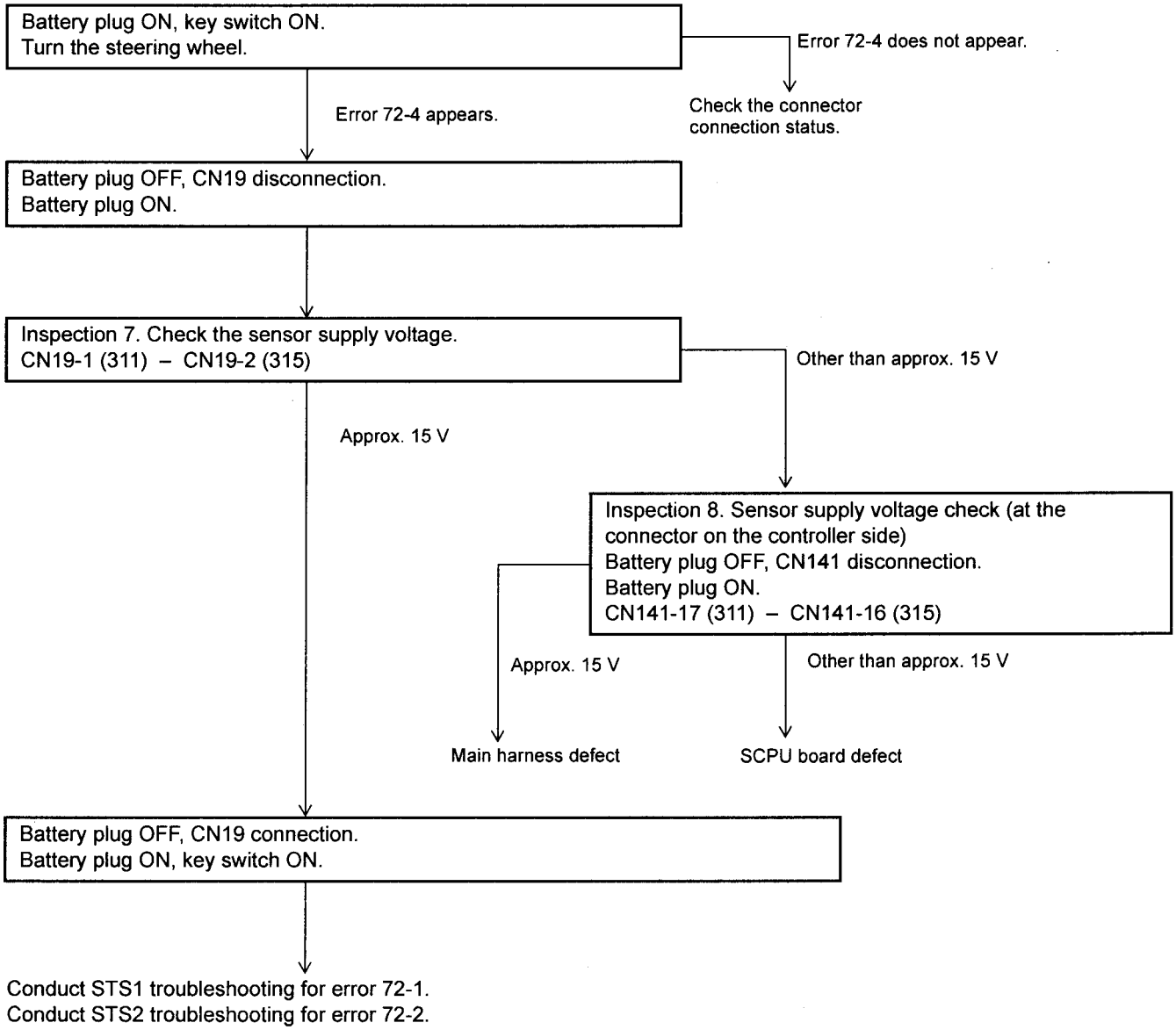




OK (∞ Ω) → SCPU board defect
NG (0 Ω) → Main harness defect

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[For 72-4]

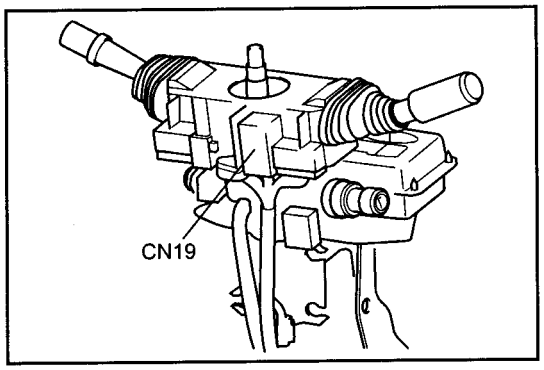


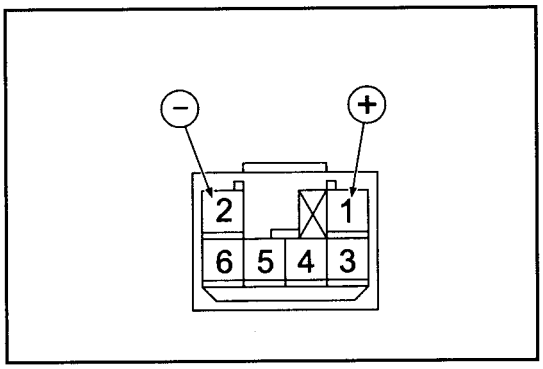
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Inspection 7:

Steering angle sensor signal voltage check 1
Battery plug ON, key switch ON

Measurement terminals	CN19-1 (311) ⊕ – CN19-2 (315) ⊖
Tester range	DC 200 V
Standard	Approx. 15 V



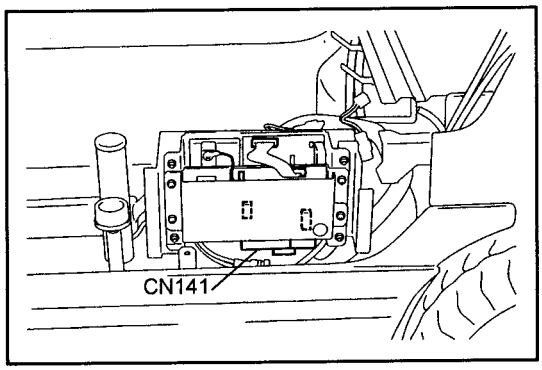


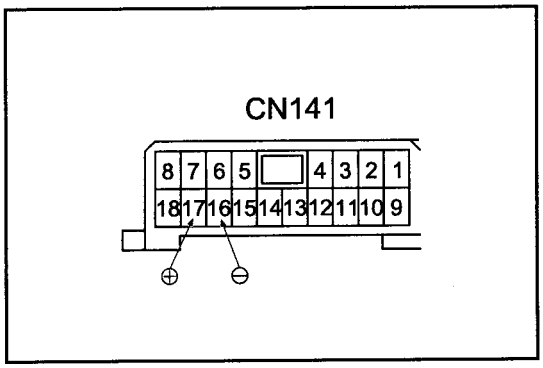
OK (Approx. 15 V) → To troubleshooting for error codes 72-1 and 72-2
NG (Other than 15 V) → Go to inspection 8

Inspection 8:

Battery plug ON, key switch ON, CN141 disconnection

Measurement terminals	CN141-17 (311) ⊕ – CN141-16(315) ⊖
Tester range	DC 200 V
Standard	Approx. 15 V



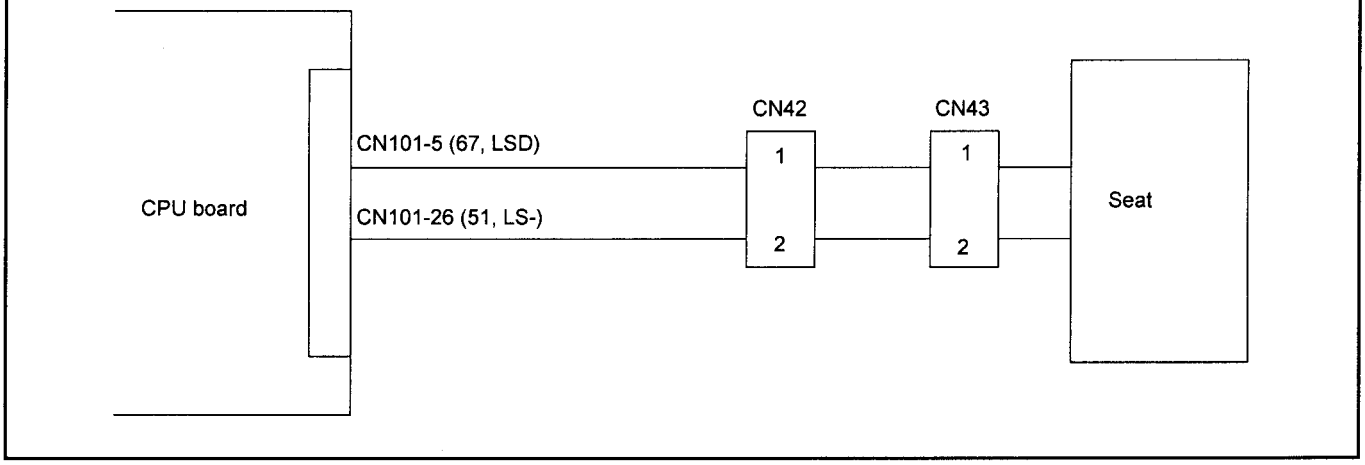


OK (Approx. 15 V) → Short-circuit of main harness
NG (Other than 15 V) → SCPU board defect

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Error Code A5: Seat switch abnormality

Related Portion



Condition for Error Detection

Output when the seat switch is kept ON.

Did the operator keep staying on the seat before key switch ON?
YES → • Normal

NO ↓

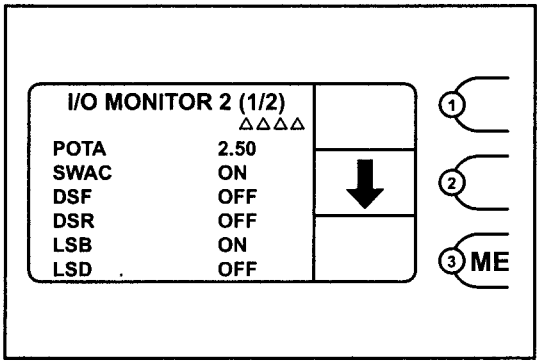
Check the LSD after disconnecting seat SW harness CN43. *1
ANL.: I/O MONITOR 2 I/O2-3
LSD ON/OFF check

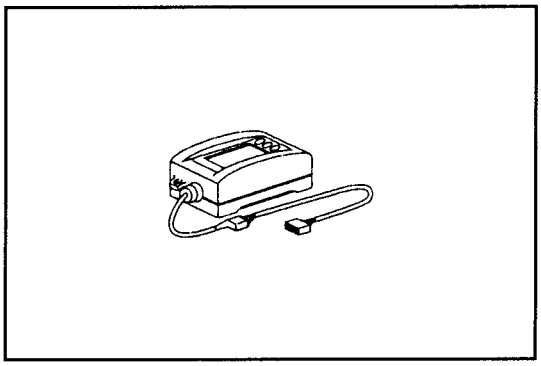
LSD : 0 → • Seat SW abnormality

LSD : 1 ↓

- CPU - CN43 harness abnormality (potential 67 grounded)
- CPU board abnormality

*1: STD vehicle (with LED display)
LSD ON/OFF check is possible by means of the plug-in analyzer.
Plug-in analyzer: 09240-13132-71



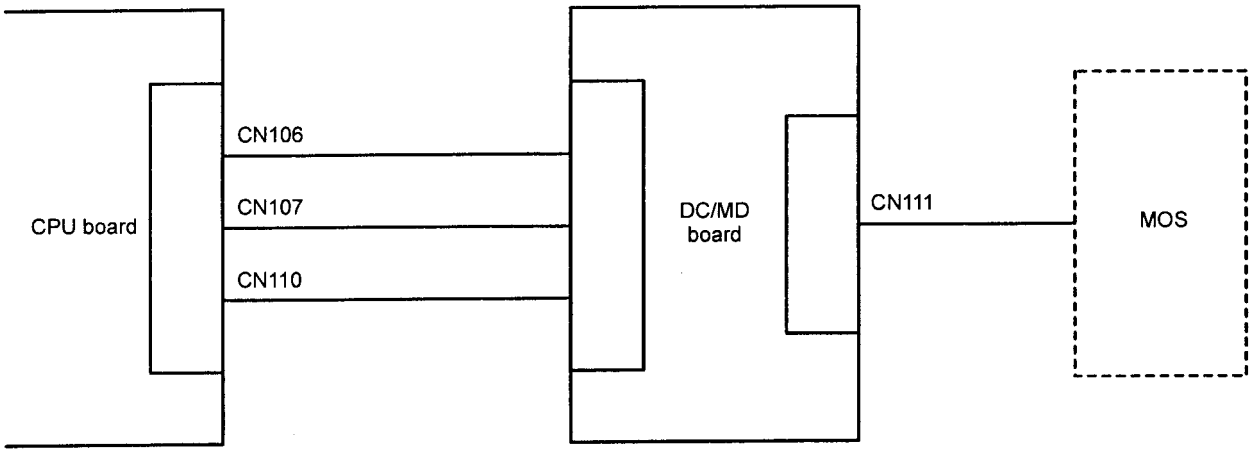


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WHEN NO ERROR CODE IS DISPLAYED

1. Failure in Traveling Only or Wobbling

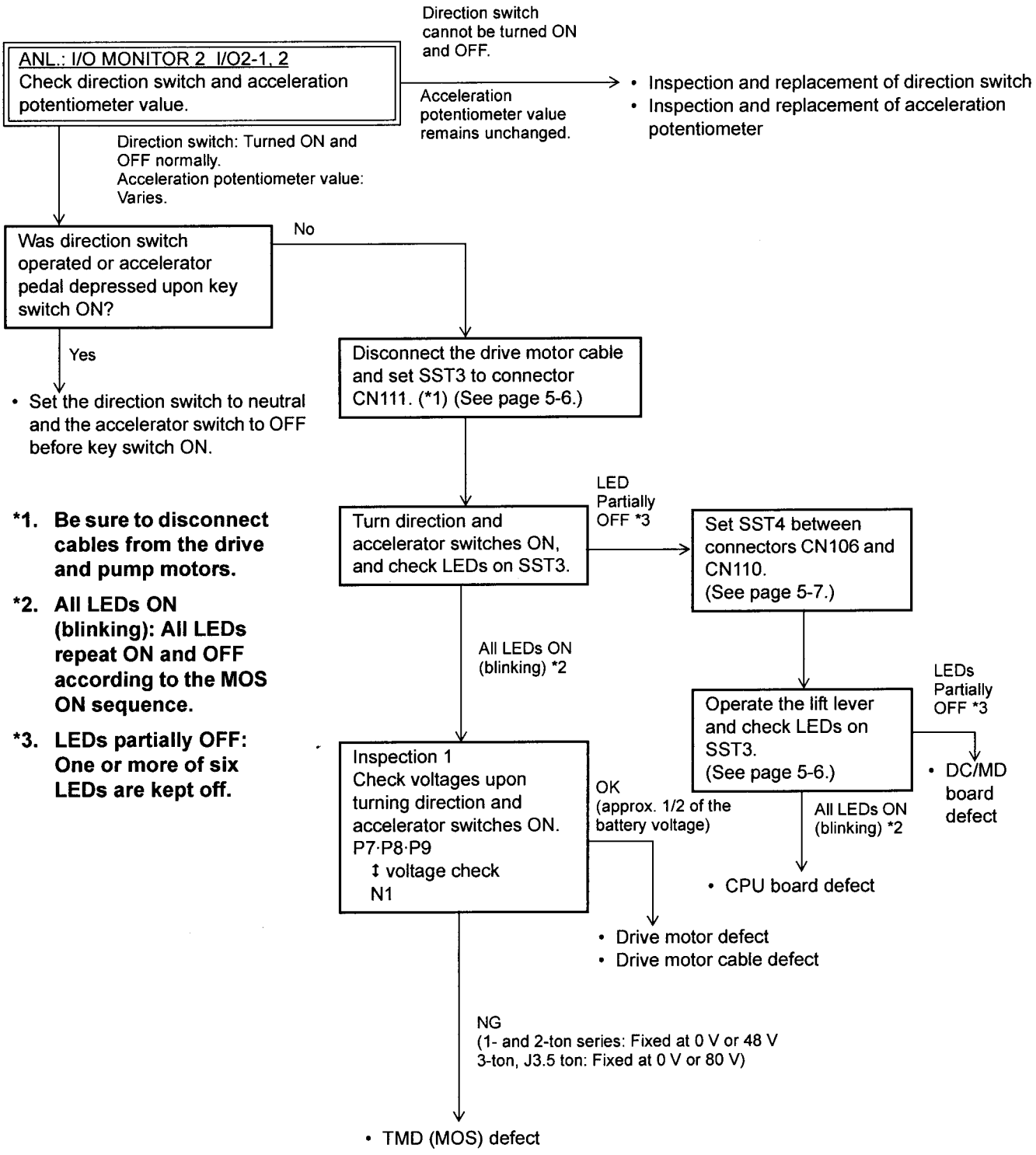
Related Portion



Condition for Error Detection

① Direction switch defect
② Acceleration potentiometer defect
③ TMD (MOS) defect
④ Drive motor defect
⑤ Drive motor cable defect
⑥ CPU board defect
⑦ DC/MD board defect

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***1. Be sure to disconnect cables from the drive and pump motors.**

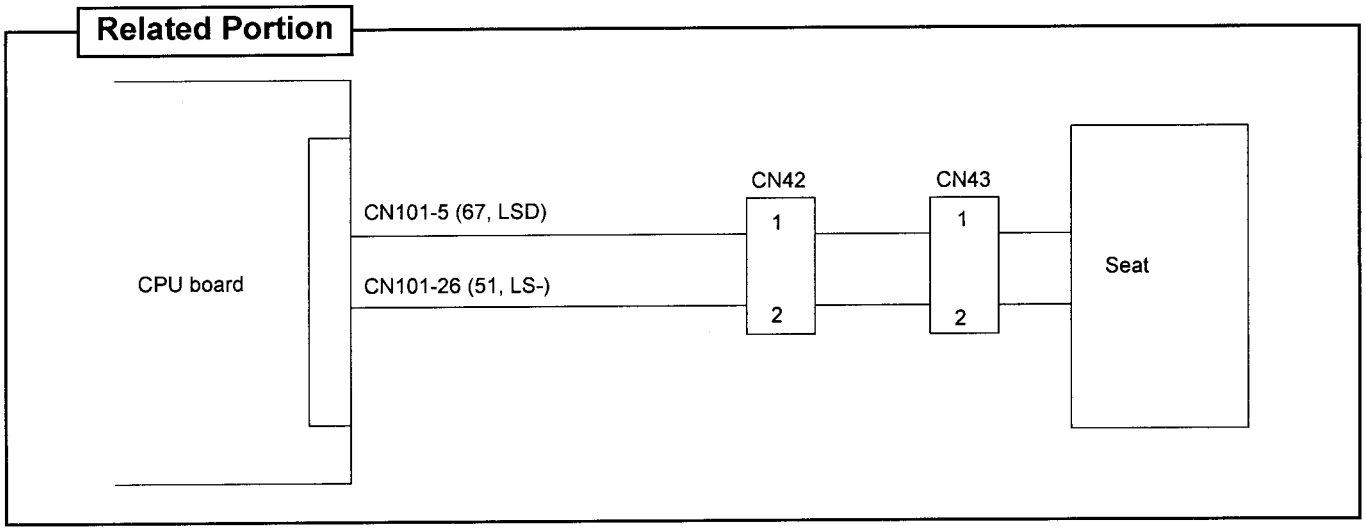
***2. All LEDs ON (blinking): All LEDs repeat ON and OFF according to the MOS ON sequence.**

***3. LEDs partially OFF: One or more of six LEDs are kept off.**

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2. Traveling and material handling fail with OPS operation display even after sitting on the seat.

Related Portion



Condition for Error Detection

This occurs when the seat switch is OFF or its wiring is disconnected.

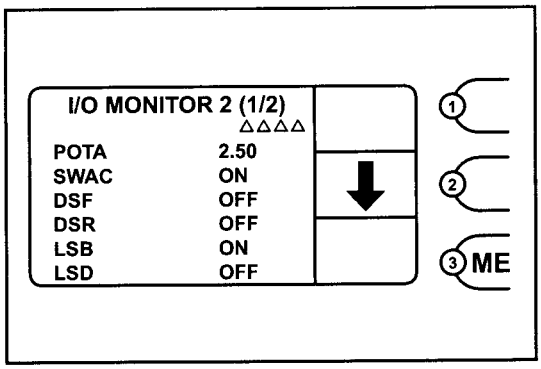
Check the LSD after CN43 disconnection and SST2 connection to CN43. *1
ANL.: I/O MONITOR 2 I/O2-3
LSD ON/OFF check

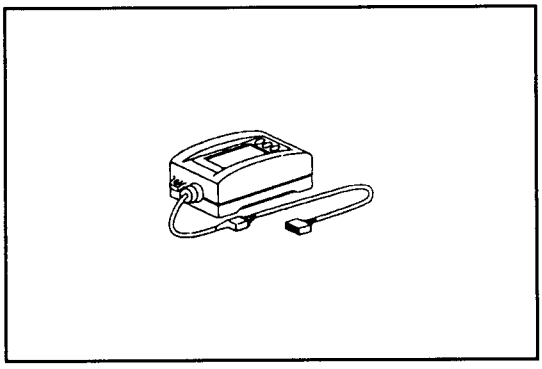
LSD : 1 → • Seat switch abnormality

LSD : 0

- CPU - CN43 harness abnormality (potential 67 line discontinuity)
- CPU board abnormality

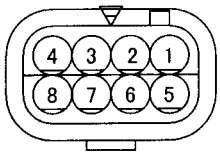
*1: STD vehicle (with LED display)
LSD ON/OFF check is possible by means of the plug-in analyzer.
Plug-in analyzer: 09240-13132-71

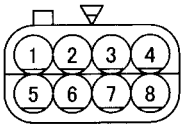




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FOR VEHICLE WITH SAS





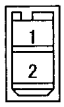
CN1

TAB

NO	P	C	J
1	14	BR	CN70-30
2	16	R	CN70-14
3	141	W-R	CN70-22
4	143	R-Y	CN70-24
5	138	W-L	CN70-5
6	137	R-G	CN70-4
7	144	G-R	CN70-23
8	142	R-B	CN70-21

REC

NO	P	C	J
1	14	BR	CN103-12
2	16	R	CN103-10
3	141	W-R	CN103-16
4	143	R-Y	CN103-14
5	138	W-L	CN141-13
6	137	R-G	CN141-14
7	144	G-R	CN103-13
8	142	R-B	CN103-15



CN3



TAB

NO	P	C	J
1	48	-	HO+
2	41	-	HO-

REC

NO	P	C	J
1	48	P	H(J16)
2	41	Y	CN103-7(J6)



CN4



TAB

NO	P	C	J
1	41	-	AM
4	43	-	IG

REC

NO	P	C	J
1	41	Y	CN29-1
4	43	B-Y	CN29-2



CN5

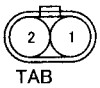


TAB

NO	P	C	J
1	101	Y	LS ST
2	111	B-Y	LS ST

REC

NO	P	C	J
1	101	R	CN22-1
2	111	R-L	CN38-2



CN6

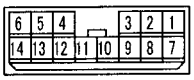


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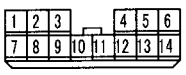
NO	P	C	J
1	51	B-W	LS B
2	65	R-L	LS B

REC

NO	P	C	J
1	51	R-L	J1
2	65	Y-G	CN101-3



CN8

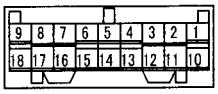


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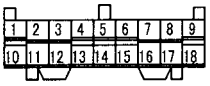
NO	P	C	J
1			
2			
3			
4			
5			
6			
7			
8	115	-	LH
9	116	-	LT
10	N1	-	EL
11			
12	108	-	TR
13	109	-	TL
14	110	-	TB

REC

NO	P	C	J
1			
2			
3			
4			
5			
6			
7			
8	115	R-B	CN225-3
9	116	G-B	CN226-3
10	N1	W-B	J8
11			
12	108	R-Y	CN38-5(J12)
13	109	G-Y	CN38-6(J11)
14	110	GR	CN12-2



CN9

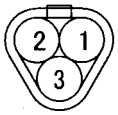


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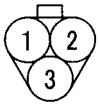
NO	P	C	J
1			
2	103	-	DSBU
3	120	-	DSFO
4	46	-	DSR
5	45	-	DSF
6	51	-	LS-
7	43	-	VBKY
8	43	-	VBKY
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

REC

NO	P	C	J
1			
2	103	R-W	CN38-3(J13)
3	120	Y-R	CN24-1
4	46	G	CN101-2
5	45	W	CN101-1
6	51	R-L	J1
7	43	B-Y	J7
8	43	B-Y	J7
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			



CN11



TAB

NO	P	C	J
1	60	G-W	LS L
2	51	R-L	NO
3	63	G-B	LS ATT

REC

NO	P	C	J
1	60	G-W	CN101-32
2	51	R-L	J1
3	63	G-B	CN101-11



CN12

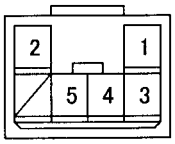


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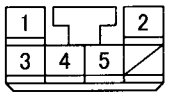
NO	P	C	J
1	N1	-	E
2	110	-	L
3			
4	43	-	B

REC

NO	P	C	J
1	N1	W-B	J8
2	110	GR	CN8-7<14>
3			
4	43	B-Y	CN103-4



CN13

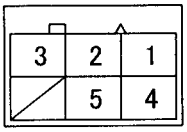


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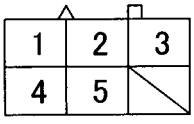
NO	P	C	J
1	N1	W-B	CN14-5
2	102	R-G	CN14-3
3	N1	W-B	CN14-1
4	108	G-Y	CN14-4
5	104	G-R	CN14-2

REC

NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN17-2
3	N1	W-B	J8
4	108	R-Y	J12
5	104	G-R	CN38-4



CN14



TAB

NO	P	C	J
1	N1	-	GND
2	104	-	LC-R
3	102	-	H/L
4	108	-	LF-R
5	N1	-	GND

REC

NO	P	C	J
1	N1	W-B	CN13-3
2	104	G-R	CN13-5
3	102	R-G	CN13-2
4	108	G-Y	CN13-4
5	N1	W-B	CN13-1

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CN15



TAB

NO	P	C	J
1	51	–	LS PB
2	66	–	LS PB



REC

NO	P	C	J
1	51	R-L	J1
2	66	B-W	CN101-4

CN16



TAB

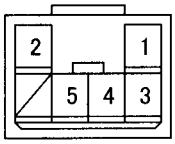
NO	P	C	J
1	107	B	PLW
2	N1	B	PLW



REC

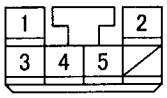
NO	P	C	J
1	107	R-B	SWR,CN38-7
2	N1	W-B	J8

CN17



TAB

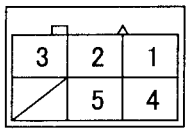
NO	P	C	J
1	N1	W-B	CN18-5
2	102	R-G	CN18-3
3	N1	W-B	CN18-1
4	109	G-Y	CN18-4
5	104	G-R	CN18-2



REC

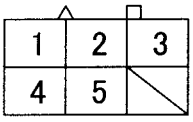
NO	P	C	J
1	N1	W-B	J8
2	102	R-G	CN13-2
3	N1	W-B	J8
4	109	G-Y	J11
5	104	G-R	J10

CN18



TAB

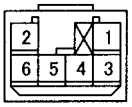
NO	P	C	J
1	N1	–	GND
2	104	–	LC-L
3	102	–	H/L
4	109	–	LF-L
5	N1	–	GND



REC

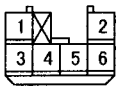
NO	P	C	J
1	N1	W-B	CN17-3
2	104	G-R	CN17-5
3	102	R-G	CN17-2
4	109	G-Y	CN17-4
5	N1	W-B	CN17-1

CN19



TAB

NO	P	C	J
1	311	–	IG
2	315	–	ESS
3	312	–	SS1
4	313	–	SS2
5	314	–	SSC
6			



REC

NO	P	C	J
1	311	W-R	CN141-17
2	315	BR	CN141-16
3	312	G-W	CN141-6
4	313	R-Y	CN141-7
5	314	L	CN141-8
6			

CN22



TAB

NO	P	C	J
1	101	–	F4
2	P1	–	F4,F5
3			
4	41	–	F5



REC

NO	P	C	J
1	101	R	CN5-1
2	P1	B	P1 terminal
3			
4	41	Y	J6

CN23



TAB

NO	P	C	J
1	103	R-W	BZ
2	N1	B	BZ



REC

NO	P	C	J
1	103	R-W	J13
2	N1	W-B	J8

CN24



TAB

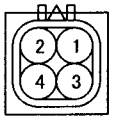
NO	P	C	J
1	120	R-W	CHI
2	N1	B	CHI



REC

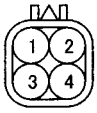
NO	P	C	J
1	120	Y-R	CN9-7<3>
2	N1	W-B	J8

CN25



TAB

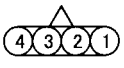
NO	P	C	J
1	52	GR	CN26-3
2	53	R-B	CN26-4
3	51	R-L	CN26-1
4	64	R-Y	CN26-2



REC

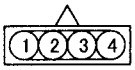
NO	P	C	J
1	52	GR	CN102-2
2	53	R-B	CN102-14
3	51	R-W	J2
4	64	R-Y	CN102-1

CN26



TAB

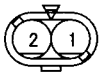
NO	P	C	J
1	51	–	E2
2	64	–	IDL
3	52	–	VTA
4	53	–	VC



REC

NO	P	C	J
1	51	R-L	CN25-3
2	64	R-Y	CN25-4
3	52	GR	CN25-1
4	53	R-B	CN25-2

CN29



TAB

NO	P	C	J
1	41	Y	CN4-1
2	43	B-Y	CN4-4



REC

NO	P	C	J
1	41	Y	J6
2	43	B-Y	J7

CN31



TAB

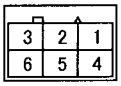
NO	P	C	J
1	104	L	TL
2	111	L	STP
3	109	L	TRN
4	N1	L	E



REC

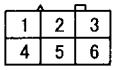
NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	109	G-Y	CN38-6
4	N1	W-B	J46

CN31-1



TAB

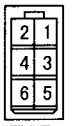
NO	P	C	J
1	104	R-W	LT-L
2	N1	W-B	GND
3	N1	Y	LF-RL
4	111	R-B	LST-L
5	103	R	LF-LR
6	109	G-W	LF-RL



REC

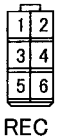
NO	P	C	J
1	104	G-R	J43
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	J41
5	103	R-W	J42
6	109	G-Y	J45

CN34



TAB

NO	P	C	J
1	104	R	TL
2	111	R	STP
3	103	R	B/U
4			
5	108	R	TRN
6	N1	R	E

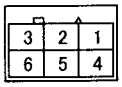


REC

NO	P	C	J
1	104	G-R	J43
2	111	R-L	J41
3	103	R-W	J42
4			
5	108	R-Y	J44
6	N1	W-B	J46

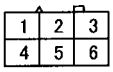
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CN34-1



TAB

NO	P	C	J
1	104	R-W	LT-R
2	N1	W-B	GND
3	N1	Y	LF-RR
4	111	R-B	LST-R
5	103	B	LF-RR
6	108	G-W	LF-RR



REC

NO	P	C	J
1	104	G-R	CN38-4
2	N1	W-B	J46
3	N1	W-B	J46
4	111	R-L	CN38-2
5	103	R-W	J42
6	108	R-Y	CN38-5

CN35



TAB

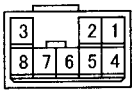
NO	P	C	J
1	140	B	SLL



REC

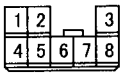
NO	P	C	J
1	140	B	CN40-4

CN38



TAB

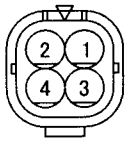
NO	P	C	J
1	120	Y-R	J14
2	111	R-L	CN5-2
3	103	R-W	CN9-8<2>
4	104	G-R	CN13-5
5	108	R-Y	CN8-8<12>
6	109	G-Y	CN8-9<13>
7	107	R-B	CN16-1
8	N1	W-B	J8



REC

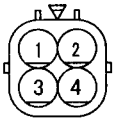
NO	P	C	J
1	120	Y-R	LF-R
2	111	R-L	CN34-1-4
3	103	R-W	LF-R
4	104	G-R	CN34-1-1
5	108	R-Y	CN34-1-6
6	109	G-Y	CN31-3
7	107	R-B	LW
8	N1	W-B	LR

CN40



TAB

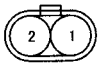
NO	P	C	J
1	N1	W-B	CN70-15
2	43	B-Y	CN70-1
3	139	P	CN70-19
4	140	B	CN70-20



REC

NO	P	C	J
1	N1	W-B	N1 terminal
2	43	B-Y	J7
3	139	P	CN68-1
4	140	B	CN35-1

CN42



TAB

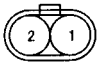
NO	P	C	J
1	67	R	CN43-1
2	51	P	CN43-2



REC

NO	P	C	J
1	67	B-Y	CN101-5
2	51	R-L	J1

CN43



TAB

NO	P	C	J
1	67	R	LS D
2	51	P	LS D



REC

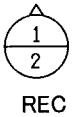
NO	P	C	J
1	67	R	CN42-1
2	51	P	CN42-2

CN50



TAB

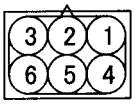
NO	P	C	J
1	P21	B	Motor A
2	P23	B	Motor B



REC

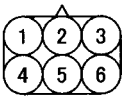
NO	P	C	J
1	P21	L	CN51-1
2	P23	W	CN51-3

CN45



TAB

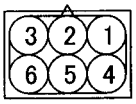
NO	P	C	J
1	180	G-W	CN46-1
2	181	G-Y	CN46-2
3	182	G-B	CN46-3
4	183	BR-W	CN46-4
5	184	BR-R	CN46-5
6	43	B-Y	CN47-1



REC

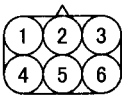
NO	P	C	J
1	180	G-W	CN70-7
2	181	G-Y	CN70-13
3	182	G-B	CN70-12
4	183	BR-W	CN70-28
5	184	BR-R	CN70-29
6	43	B-Y	J21

CN46



TAB

NO	P	C	J
1	180	G-W	CN48-1
2	181	G-Y	CN48-2
3	182	G-B	CN48-3
4	183	BR-W	CN48-4
5	184	BR-R	CN48-5
6			



REC

NO	P	C	J
1	180	G-W	CN45-1
2	181	G-Y	CN45-2
3	182	G-B	CN45-3
4	183	BR-W	CN45-4
5	184	BR-R	CN45-5
6			

CN47



TAB

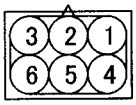
NO	P	C	J
1	43	B-Y	CN49-1
2	N1	W-B	CN49-2



REC

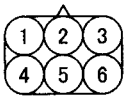
NO	P	C	J
1	43	B-Y	CN45-6
2	N1	W-B	N1 terminal

CN48



TAB

NO	P	C	J
1	180	-	VOICE+
2	181	-	VOICE1
3	182	-	VOICE2
4	183	-	VOICE3
5	184	-	VOICE4
6			



REC

NO	P	C	J
1	180	G-W	CN46-1
2	181	G-Y	CN46-2
3	182	G-B	CN46-3
4	183	BR-W	CN46-4
5	184	BR-R	CN46-5
6			

CN49



TAB

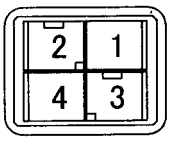
NO	P	C	J
1	43	-	+48V
2	N1	-	GND



REC

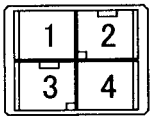
NO	P	C	J
1	43	B-Y	CN47-1
2	N1	W-B	CN47-2

CN51



TAB

NO	P	C	J
1	P21	W	TMPS
2	P21	R	TMPS
3	P23	G	TMPS
4	N1	B	TMPS



REC

NO	P	C	J
1	P21	L	CN50-1
2	P21	R	F3
3	P23	W	CN50-2
4	N1	W-B	N1 terminal

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CN52



TAB

NO	P	C	J
1	87	–	SW_S
2	86	–	SW_S



REC

NO	P	C	J
1	87	P	CN102-11
2	86	B-Y	CN102-10

CN53



TAB

NO	P	C	J
1	81	–	SSD1
2	80	–	SSD1



REC

NO	P	C	J
1	81	G	CN57-1
2	80	B	CN57-4

CN54



TAB

NO	P	C	J
1	82	–	SSD2
2	80	–	SSD2



REC

NO	P	C	J
1	82	BR	CN57-3
2	80	B	J24

CN55



TAB

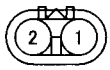
NO	P	C	J
1	89	–	STM_P
2	88	–	STM_P



REC

NO	P	C	J
1	89	W-R	CN102-13
2	88	Y-G	CN102-12

CN56



TAB

NO	P	C	J
1	85	–	SSP
2	84	–	SSP



REC

NO	P	C	J
1	85	W-G	CN58-1
2	84	B-R	CN58-2

CN57



TAB

NO	P	C	J
1	81	G	CN53-1
2			
3	82	BR	CN54-1
4	80	B	CN53-2



REC

NO	P	C	J
1	81	W-L	CN102-6
2			
3	82	B-W	CN102-7
4	80	G-R	CN102-18

CN58



TAB

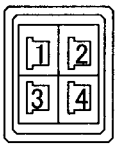
NO	P	C	J
1	85	W-G	CN56-1
2	84	B-R	CN56-2



REC

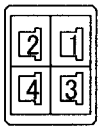
NO	P	C	J
1	85	W-G	CN102-9
2	84	B-R	CN102-8

CN60



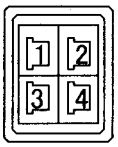
TAB

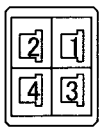
NO	P	C	J
1	T	B	MSCH
2	R	W	MSCH
3	95	L	THR
4	S	R	MSCH



REC

NO	P	C	J
1	T	B	AC plug
2	R	W	AC plug
3	95	L	CN64-1
4	S	R	AC plug





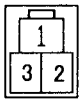
CN61

TAB

NO	P	C	J
1	U	W	THR
2	V	R	THR
3			
4	W	B	THR

REC

NO	P	C	J
1	U	–	TRANS
2	V	–	TRANS
3			
4	W	–	TRANS



CN64

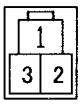
TAB

NO	P	C	J
1	95	L	CN65-1
2	R	W	CN65-2
3	S	R	CN65-3



REC

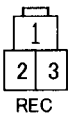
NO	P	C	J
1	95	L	CN60-3 (CN66-2)
2	R	W	AC plug
3	S	R	AC plug



CN65

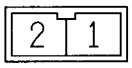
TAB

NO	P	C	J
1	95	L	DISP
2	R	W	DISP
3	S	R	DISP



REC

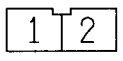
NO	P	C	J
1	95	L	CN64-1
2	R	W	CN64-2
3	S	R	CN64-3



CN68

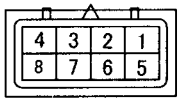
TAB

NO	P	C	J
1	139	P	STT
2	14	BR	STT



REC

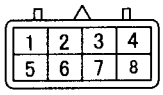
NO	P	C	J
1	139	P	CN40-3
2	14	BR	J5



CN69

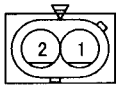
TAB

NO	P	C	J
1	123	O	Timer 1 terminal
2	122	Y	Timer 2 terminal
3	121	G	Timer 3 terminal
4	124	Y-R	Timer 4 terminal
5	125	Y-B	Timer 5 terminal
6	126	Y-G	Timer 6 terminal
7	127	Y-W	Timer 7 terminal
8	14	BR	Timer 8 terminal



REC

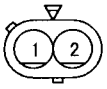
NO	P	C	J
1	123	O	CN70-25
2	122	Y	CN70-26
3	121	G	CN70-27
4	124	Y-R	CN70-8
5	125	Y-B	CN70-9
6	126	Y-G	CN70-10
7	127	Y-W	CN70-11
8	14	BR	J22



CN85

TAB

NO	P	C	J
1	70	–	SW_{TK}
2	51	–	SW_{TK}



REC

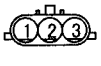
NO	P	C	J
1	70	BR	CN101-18
2	51	R-L	J1



CN86

TAB

NO	P	C	J
1	57	–	VRAT
2	56	–	VRAT
3	51	–	VRAT



REC

NO	P	C	J
1	57	G-W	CN102-16
2	56	G	CN102-4
3	51	R-W	J2

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REC

1			4	5		7		8	9	10	11	12	13	14
15				19	20	21	22	23	24	25	26	27	28	29	30

TAB

14	13	12	11	10	9	8		7		5	4			1
30	29	28	27	26	25	24	23	22	21	20	19			15

CN70

TAB

NO	P	C	J
1	43	–	48V
4	137	–	SL/L+
5	138	–	SL/L–
7	180	–	AVD(+)
8	124	–	CHG LED1
9	125	–	CHG LED2
10	126	–	CHG LED3
11	127	–	CHG LED4
12	182	–	AVD2
13	181	–	AVD1
14	16	–	D15V
15	N1	–	N1
19	139	–	STT
20	140	–	SLL
21	142	–	SDTMA
22	141	–	SMTDA
23	144	–	SMTDK
24	143	–	SDTMK
25	123	–	CHG SW3
26	122	–	CHG SW2
27	121	–	CHG SW1
28	183	–	AVD3
29	184	–	AVD4
30	14	–	GNDD

REC

NO	P	C	J
1	43	B–Y	CN40–2
4	137	R–G	CN1–6
5	138	W–L	CN1–5
7	180	G–W	CN45–1
8	124	Y–R	CN69–4
9	125	Y–B	CN69–5
10	126	Y–G	CN69–6
11	127	Y–W	CN69–7
12	182	G–B	CN45–3
13	181	G–Y	CN45–2
14	16	R	CN1–2
15	N1	W–B	CN40–1
19	139	P	CN40–3
20	140	B	CN40–4
21	142	R–B	CN1–8
22	141	W–R	CN1–3
23	144	G–R	CN1–7
24	143	R–Y	CN1–4
25	123	O	CN69–1
26	122	Y	CN69–2
27	121	G	CN69–3
28	183	BR–W	CN45–4
29	184	BR–R	CN45–5
30	14	BR	CN1–1

CN87



TAB

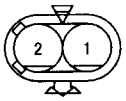
NO	P	C	J
1	61	G–R	LSTF
2	51	R–L	LS–
3	62	L	LSTR
4	51	R–L	LS–



REC

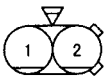
NO	P	C	J
1	61	G–R	CN101–16
2	51	R–L	J1
3	62	L	CN101–17
4	51	R–L	J1

CN88



TAB

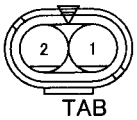
NO	P	C	J
1	3	R	SOL$_L$+
2	4	B	SOL$_L$–



REC

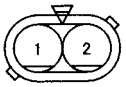
NO	P	C	J
1	3	W–G	CN103–1
2	4	GR	CN103–2

CN89



TAB

NO	P	C	J
1	5	R	SOL$_T$+
2	6	B	SOL$_T$–



REC

NO	P	C	J
1	5	B–R	CN103–5
2	6	R–L	CN103–6

CN91



TAB

NO	P	C	J
1	51	–	SP$_L$
2	59	–	SP$_L$
3	58	–	SP$_L$



REC

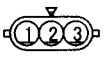
NO	P	C	J
1	51	BR	CN90–8
2	59	G–Y	CN90–3
3	58	G	CN90–4

CN92



TAB

NO	P	C	J
1	51	BR–W	CN90–2
2	90	L	CN90–6
3	91	L–B	CN90–1



REC

NO	P	C	J
1	51	–	SWMH1
2	90	–	SWMH1
3	91	–	SWMH1

When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

3	105	L–R	CN93–1

When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market.

3	105	L–R	CN99–4

When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

CN93



TAB

NO	P	C	J
1	105	L–R	CN92–3
2	91	L–B	CN90–1
3	92	L–W	CN90–5

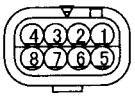


REC

NO	P	C	J
1	105	–	SWMH2
2	91	–	SWMH2
3	92	–	SWMH2

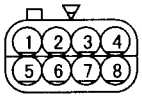
1) When the lifting height is 2000 or more, excluding 2) and 3) below.
[Note: Nos. 1, 2 and 6 on the TAB side are unconnected for FV2000.]

CN90



TAB

NO	P	C	J
1	91	L–B	CN92–3
2	51	BR–W	CN92–1
3	59	G–Y	CN91–2
4	58	G	CN91–3
5	92		
6	90	L	CN92–2
7	16		
8	51	BR	CN91–1

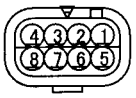


REC

NO	P	C	J
1	91	GR	CN101–20
2	51	R–L	CN101–26
3	59	Y–R	CN102–5
4	58	G–B	CN102–17
5	92	R–B	CN101–21
6	90	O	CN101–19
7	16	R	J47
8	51	R–W	CN102–22

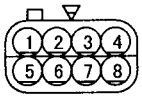
2) When the lifting height is 4500 or more for V or SV mast vehicles with single tires for domestic market

CN90



TAB

NO	P	C	J
1	91	L–B	CN93–2
2	51	BR–W	CN92–1
3	59	G–Y	CN91–2
4	58	G	CN91–3
5	92	L–W	CN93–3
6	90	L	CN92–2
7	16		
8	51	BR	CN91–1

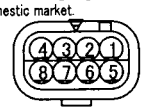


REC

NO	P	C	J
1	91	GR	CN101–20
2	51	R–L	CN101–26
3	59	Y–R	CN102–5
4	58	G–B	CN102–17
5	92	R–B	CN101–21
6	90	O	CN101–19
7	16	R	J47
8	51	R–W	CN102–22

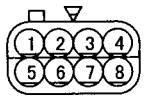
3) When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market.

CN90



TAB

NO	P	C	J
1	91	L–B	CN99–2
2	51	BR–W	CN92–1
3	59	G–Y	CN91–2
4	58	G	CN91–3
5	92	L–W	CN99–3
6	90	L	CN92–2
7	16	B–R	CN99–1
8	51	BR	CN91–1

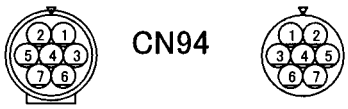


REC

NO	P	C	J
1	91	GR	CN101–20
2	51	R–L	CN101–26
3	59	Y–R	CN102–5
4	58	G–B	CN102–17
5	92	R–B	CN101–21
6	90	O	CN101–19
7	16	R	J47
8	51	R–W	CN102–22

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CN94



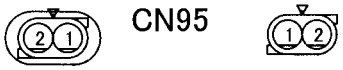
TAB

NO	P	C	J
1	316	B-Y	CN142-11
2	317	GR	CN142-3
3	320	W-R	CN142-8
4	327	L-B	CN148-1
5	328	R-L	CN148-6
6	318	G-W	CN142-10
7	319	Y-G	CN142-2

REC

NO	P	C	J
1	316	P	CN97-1
2	317	G-W	CN97-2
3	320	W-B	CN97-3
4	327	L-B	CN95-1
5	328	W-R	CN95-2
6	318	G	CN96-3
7	319	L-W	CN96-2

CN95



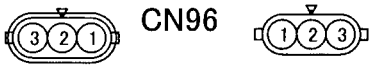
TAB

NO	P	C	J
1	327	-	SOL_S
2	328	-	SOL_S

REC

NO	P	C	J
1	327	L-B	CN94-4
2	328	W-R	CN94-5

CN96



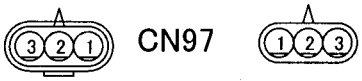
TAB

NO	P	C	J
1	320	-	VRAM
2	319	-	VRAM
3	318	-	VRAM

REC

NO	P	C	J
1	320	BR	J25
2	319	L-W	CN94-7
3	318	G	CN94-6

CN97



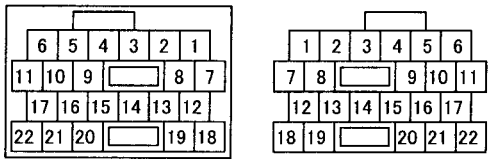
TAB

NO	P	C	J
1	316	-	VRAH
2	317	-	VRAH
3	320	-	VRAH

REC

NO	P	C	J
1	316	P	CN94-1
2	317	G-W	CN94-2
3	320	W-B	CN94-3

CN102



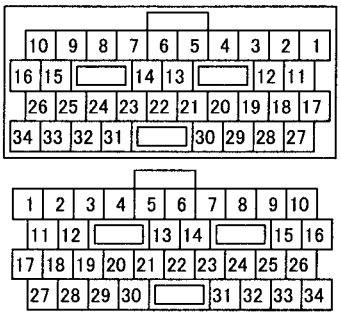
TAB

NO	P	C	J
1	64	-	SWAC
2	52	-	POTA
3			
4	56	-	POTT
5	59	-	SPL
6	81	-	SSD1
7	82	-	SSD2
8	84	-	SSP+
9	85	-	SSP-
10	86	-	TD+
11	87	-	TD-
12	88	-	TP+
13	89	-	TP-
14	53	-	POTA+
15			
16	57	-	POTT+
17	58	-	SPL+
18	80	-	SSD+
19	83	-	SSD-
20			
21			
22	51	-	POT-

REC

NO	P	C	J
1	64	R-Y	CN25-4
2	52	GR	CN25-1
3			
4	56	G	CN86-2
5	59	Y-R	CN90-3
6	81	W-L	CN57-1
7	82	B-W	CN57-3
8	84	B-R	CN58-2
9	85	W-G	CN58-1
10	86	B-Y	CN52-2
11	87	P	CN52-1
12	88	Y-G	CN55-2
13	89	W-R	CN55-1
14	53	R-B	CN25-2
15			
16	57	G-W	CN86-1
17	58	G-B	CN90-4
18	80	G-R	CN57-4
19			
20			
21			
22	51	R-W	CN90-8

CN101



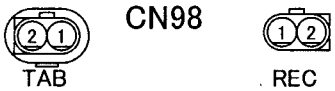
TAB

NO	P	C	J
1	45	-	DSF
2	46	-	DSR
3	65	-	LSB
4	66	-	LSPB
5	67	-	LSD
6			
7			
8			
9	307	-	SMTSA
10	308	-	SMTSK
11	63	-	LSAT1
12	309	-	SSTMA
13	310	-	SSTMK
14			
15			
16	61	-	LSTF
17	62	-	LSTR
18	70	-	SWTK
19	90	-	MH1
20	91	-	MH2-1
21	92	-	MH2-2
22			
23			
24			
25			
26	51	-	LS-
27			
28			
29			
30			
31			
32	60	-	LSL1
33	324	-	SSO+
34	325	-	SSO-

REC

NO	P	C	J
1	45	W	CN9-5
2	46	G	CN9-6<4>
3	65	Y-G	CN6-2
4	66	B-W	CN15-2
5	67	B-Y	CN42-1
6			
7			
8			
9	307	W-G	CN141-4
10	308	G-Y	CN141-12
11	63	G-B	CN11-3
12	309	Y	CN141-3
13	310	Y-R	CN141-11
14			
15			
16	61	G-R	CN87-1
17	62	L	CN87-3
18	70	BR	CN85-1
19	90	O	CN90-6
20	91	GR	CN90-1
21	92	R-B	CN90-5
22			
23			
24			
25			
26	51	R-L	CN90-2
27			
28			
29			
30			
31			
32	60	G-W	CN11-1
33	324	W-B	CN142-4
34	325	R-L	CN142-5

CN98



TAB

NO	P	C	J
1	329	B-Y	CN148-2
2	330	GR	CN148-5

REC

NO	P	C	J
1	329	-	SOL_{ST}
2	330	-	SOL_{ST}

When the lifting height is 4500 or more for FSV mast vehicles with single tires for domestic market

CN99



TAB

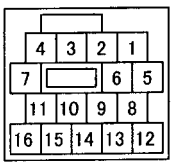
NO	P	C	J
1	16	-	SS(IG)
2	91	-	SS(N/C)
3	92	-	SS(N/O)
4	105	-	SS(L)
5	51	-	SS(E)

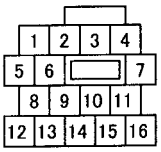
REC

NO	P	C	J
1	16	B-R	CN90-7
2	91	L-B	CN90-1
3	92	L-W	CN90-5
4	105	L-R	CN92-3
5	51	BR-W	J31

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CN103



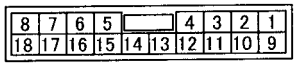


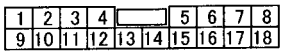
TAB

NO	P	C	J
1	3	–	SOLL+
2	4	–	SOLL–
3	41	–	B48V
4	43	–	VBKY
5	5	–	SOLT+
6	6	–	SOLT–
7	41	–	VBBT
8	44	–	VBMB
9			
10	16	–	D15V
11			
12	14	–	GNDD
13	144	–	SMTDK
14	143	–	SDTMK
15	142	–	SDTMA
16	141	–	SMTDA

REC

NO	P	C	J
1	3	W-G	CN88-1
2	4	GR	CN88-2
3	41	Y	J6
4	43	B-Y	CN12-4
5	5	B-R	CN89-1
6	6	R-L	CN89-2
7	41	Y	CN3-2
8	44	Y-G	CN148-3
9			
10	16	R	CN1-2
11			
12	14	BR	CN1-1
13	144	G-R	CN1-7
14	143	R-Y	CN1-4
15	142	R-B	CN1-8
16	141	W-R	CN1-3





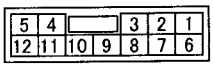
CN141

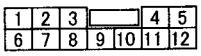
TAB

NO	P	C	J
1			
2			
3	309	–	SSTMA
4	307	–	SMTSA
5			
6	312	–	STS1
7	313	–	STS2
8	314	–	STSC
9			
10			
11	310	–	SSTMK
12	308	–	SMTSK
13	138	–	SL/L–
14	137	–	SL/L+
15			
16	315	–	STS–
17	311	–	STS+
18			

REC

NO	P	C	J
1			
2			
3	309	Y	CN101-12
4	307	W-G	CN101-9
5			
6	312	G-W	CN19-3
7	313	R-Y	CN19-4
8	314	L	CN19-5
9			
10			
11	310	Y-R	CN101-13
12	308	G-Y	CN101-10
13	138	W-L	CN1-5
14	137	R-G	CN1-6
15			
16	315	BR	CN19-2
17	311	W-R	CN19-1
18			





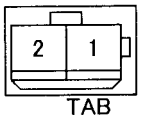
CN142

TAB

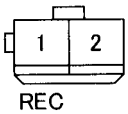
NO	P	C	J
1			
2	319	–	POTS
3	317	–	POTH
4	324	–	SSN+
5	325	–	SSN–
6			
7			
8	320	–	SPOT–
9			
10	318	–	POTS+
11	316	–	POTH+
12			

REC

NO	P	C	J
1			
2	319	Y-G	CN94-7
3	317	GR	CN94-2
4	324	W-B	CN101-33
5	325	R-L	CN101-34
6			
7			
8	320	W-R	CN94-3
9			
10	318	G-W	CN94-6
11	316	B-Y	CN94-1
12			



CN214

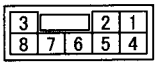


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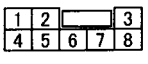
NO	P	C	J
1	N1	W-B	CN217-1
2	330	G-Y	CN217-2

REC

NO	P	C	J
1	N1	W-B	J8
2	330	G-Y	J99



CN148

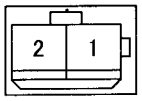


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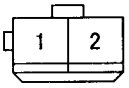
NO	P	C	J
1	327	–	SOLS+
2	329	–	SOLST+
3	44	–	VBMB
4			
5	330	–	SOLST–
6	328	–	SOLS–
7	N1	–	N1
8			

REC

NO	P	C	J
1	327	L-B	CN94-4
2	329	B-Y	CN98-1
3	44	Y-G	CN103-8
4			
5	330	GR	CN98-2
6	328	R-L	CN94-5
7	N1	W-B	J8
8			



CN213

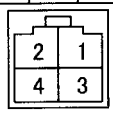


TAB

NO	P	C	J
1	N1	W-B	CN216-1
2	330	G-Y	CN216-2

REC

NO	P	C	J
1	N1	W-B	J8
2	330	G-Y	CN215-4



CN215

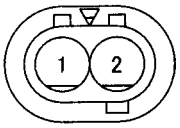


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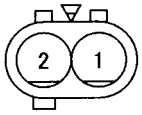
NO	P	C	J
1	N1	–	HR
2	330	–	HR
3	N1	–	HR
4	330	–	HR

REC

NO	P	C	J
1	48	P	J16
2	41	Y	J6
3	N1	W-B	J8
4	330	G-Y	CN213-2



CN216

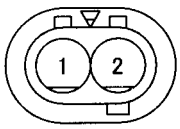


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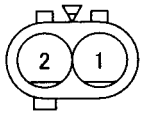
NO	P	C	J
1	N1	–	HORN
2	330	–	HORN

REC

NO	P	C	J
1	N1	W-B	CN213-1
2	330	G-W	CN213-2



CN217



TAB

NO	P	C	J
1	N1	–	HORN
2	330	–	HORN

REC

NO	P	C	J
1	N1	W-B	CN214-1
2	330	G-W	CN214-2



CN225



TAB

NO	P	C	J
1	101	–	COIL+
2	101	–	SW+
3	115	–	COIL–
4	102	–	SW–

REC

NO	P	C	J
1	101	R	J9
2	101	R	J9
3	115	R-B	CN8-13<8>
4	102	R-G	J15



CN226



TAB

NO	P	C	J
1	101	–	COIL+
2	101	–	SW+
3	116	–	COIL–
4	104	–	SW–

REC

NO	P	C	J
1	101	R	J9
2	101	R	J9
3	116	G-B	CN8-12<9>
4	104	G-R	J10

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High-load specification at traveling
with 2-ton load or a load above 2 tons



CN138

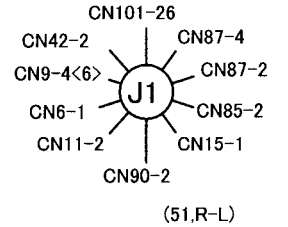


TAB FAN (VENT) REC

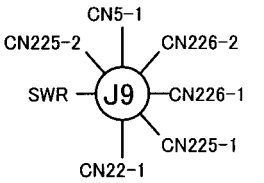
NO	P	C	J
1	44	R	FAN VENT (+)
2	N2	B	FAN VENT (−)

NO	P	C	J
1	44	LG	FAN VENT (+)
2	N2	W-B	FAN VENT (−)

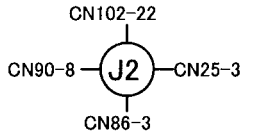
JOINT



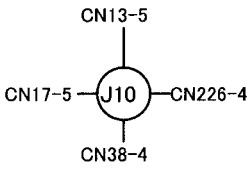
(51,R-L)



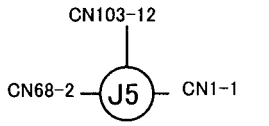
(101,R)



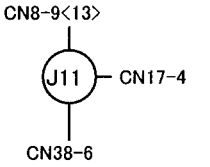
(51,R-W)



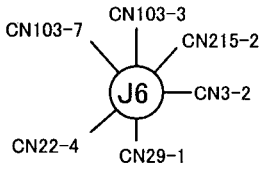
(104,G-R)



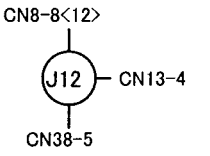
(14,BR)



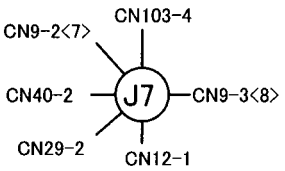
(109,G-Y)



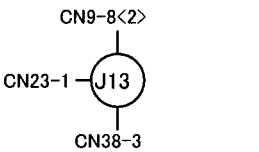
(41,Y)



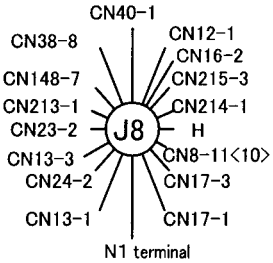
(108,R-Y)



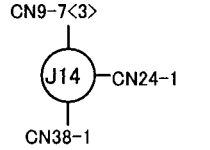
(43,B-Y)



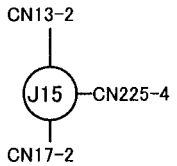
(103,R-W)



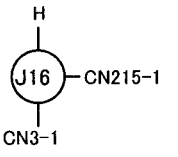
(N1,W-B)



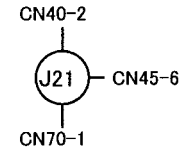
(120,Y-R)



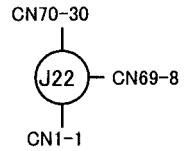
(102,R-G)



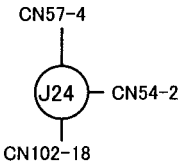
(48,P)



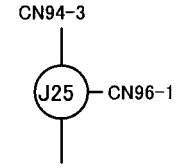
(43,B-Y)



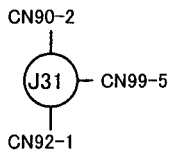
(14,BR)



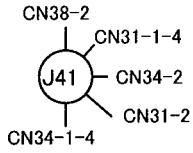
(80,B)



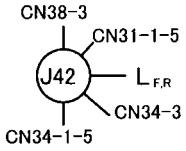
(320,W-B)



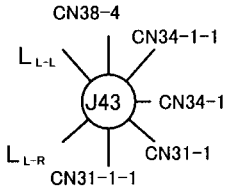
(51,BR-W)



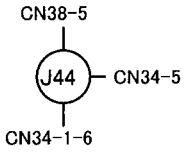
(111,R-L)



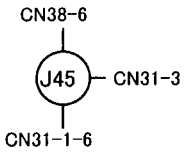
(103,R-W)



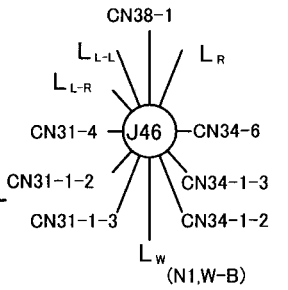
(104,G-R)



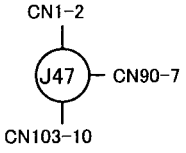
(108,R-Y)



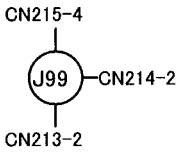
(109,G-Y)



(N1,W-B)



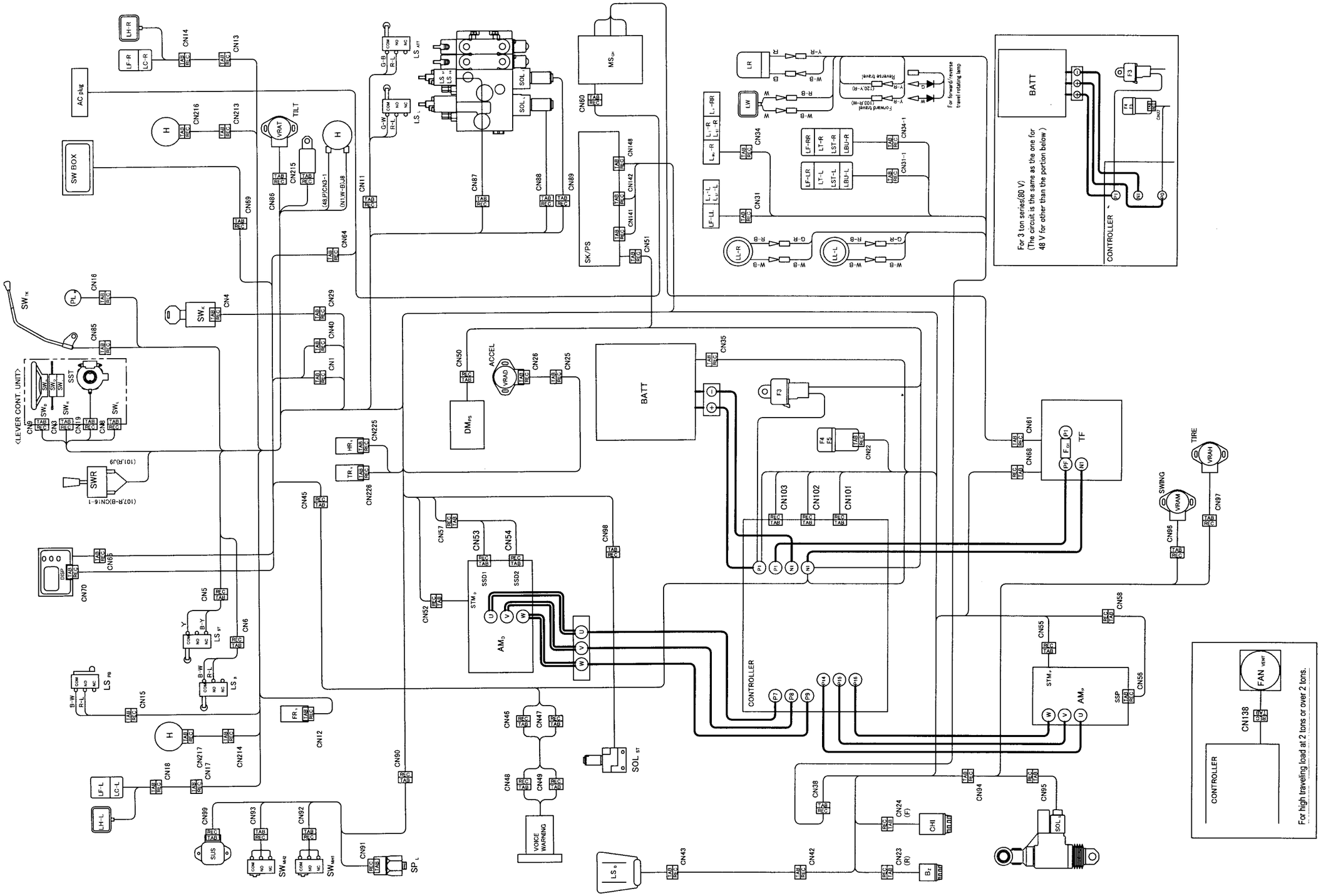
(16,R)



(330,G-Y)

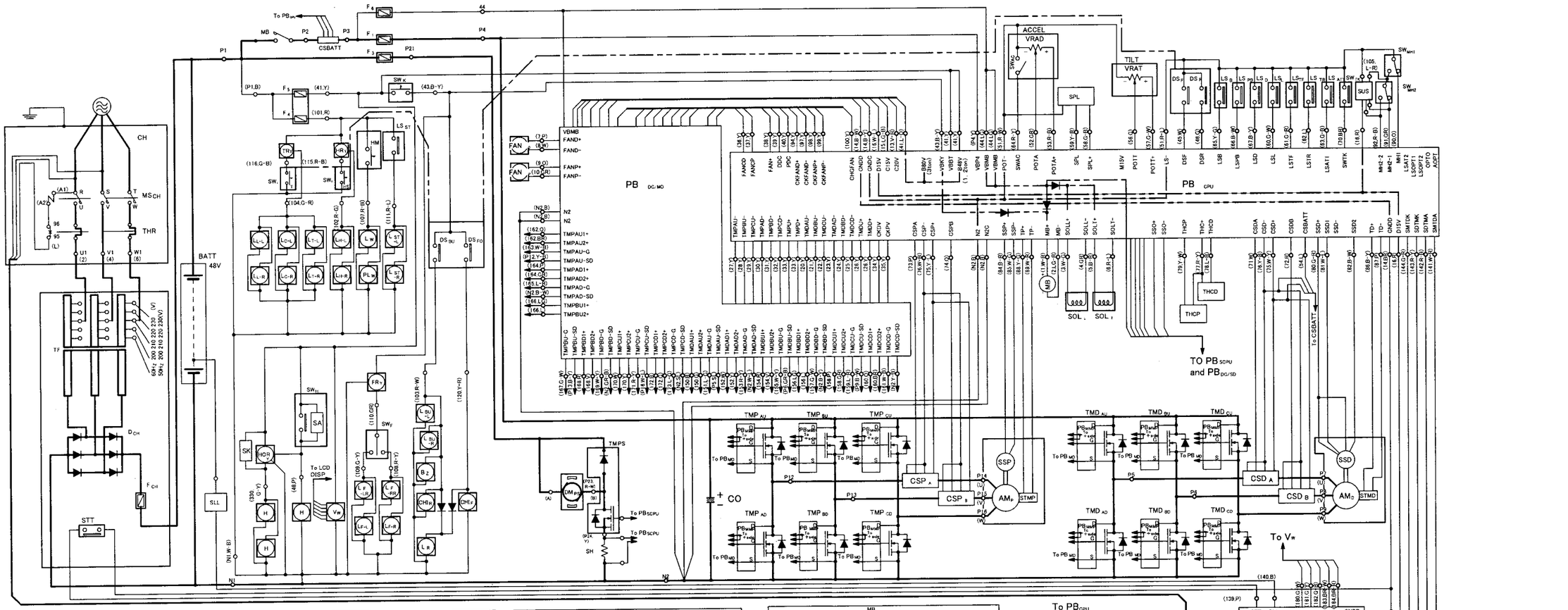
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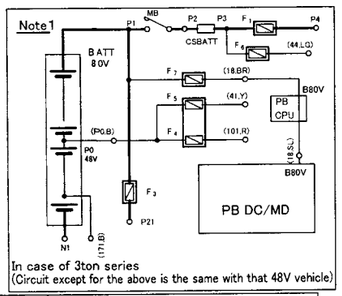


CH	CHARGER
TF	TRANSFORMER
MS CH	MAGNET SWITCH, CHARGER
THR	RELAY, THERMAL
D CH	DIODE, CHARGER
F CH	FUSE, CHARGER
STT	SWITCH, TRANS, THERMO
BATT	BATTERY
F1	FUSE, DRIVE
F3	FUSE, POWER STEERING
F4	FUSE, LAMP
F5	FUSE, CONTROL CIRCUIT
F6	FUSE, SK/PS&SOLENOID
F7	FUSE, DC-DC COMVERTER
LCD DISP	LCD DISPLAY
BOX CHG	BOX, CHARGER
THCD	THERMO, DRIVE
THCP	THERMO, PUMP
AM D	MOTOR, DRIVE
AM P	MOTOR, PUMP
DM PS	MOTOR, POWER STEERING
SOL S	SOLENOID, SWING
SOL ST	SOLENOID, STEERING
SOL L	SOLENOID, LIFT
SOL T	SOLENOID, TILT
FAN D	FAN, DRIVE
FAN P	FAN, PUMP
VRAD	VARI-OHM, ACCEL, DRIVE
VRAT	VARI-OHM, TILT
VRAH	VARI-OHM, TIRE(HANDLE)
VRAS	VARI-OHM, SWING

PB CPU	PRINT BOARD, COMPUTER
PB DC/MD	PRINT BOARD, DC/MD
PB MMP	PRINT BOARD, MMP
PB SCPU	PRINT BOARD, SK/PS COMPUTER
PB DC/SD	PRINT BOARD, DC/SD
TMD AU	TRANSISTOR, MAIN, DRIVE, PHASE A UPR
TMD BU	TRANSISTOR, MAIN, DRIVE, PHASE B UPR
TMD CU	TRANSISTOR, MAIN, DRIVE, PHASE C UPR
TMD AD	TRANSISTOR, MAIN, DRIVE, PHASE A LWR
TMD BD	TRANSISTOR, MAIN, DRIVE, PHASE B LWR
TMD CD	TRANSISTOR, MAIN, DRIVE, PHASE C LWR
TMP AU	TRANSISTOR, MAIN, PUMP, PHASE A UPR
TMP BU	TRANSISTOR, MAIN, PUMP, PHASE B UPR
TMP CU	TRANSISTOR, MAIN, PUMP, PHASE C UPR
TMP AD	TRANSISTOR, MAIN, PUMP, PHASE A LWR
TMP BD	TRANSISTOR, MAIN, PUMP, PHASE B LWR
TMP CD	TRANSISTOR, MAIN, PUMP, PHASE C LWR
TMPS	TRANSISTOR, MAIN, POWER STEERING
SH	SHANT, POWER STEERING
CO	CAPACITOR, OVERALL
CSBATT	CURRENT SENSOR, BATTERY
CSD A	CURRENT SENSOR, DRIVE, PHASE A
CSD B	CURRENT SENSOR, DRIVE, PHASE B
CSP A	CURRENT SENSOR, PUMP, PHASE A
CSP B	CURRENT SENSOR, PUMP, PHASE B
SYR	SENSOR, YAWRATE
SST	SENSOR, STEERING
SLL	SENSOR, LEQUID LEVEL
SUS	SENSOR, ULTRA SONIC
MB	CONTACTOR, BATTERY
PL W	PILOT LAMP, WORKING

DS F	DIRECTION SWITCH, FORWARD
DS R	DIRECTION SWITCH, REVERSE
DS FO	DIRECTION SWITCH, FORWARD OPTIONAL
DS BU	DIRECTION SWITCH, BACK-UP
LS L	LIMIT SWITCH, LIFT
LS ATT	LIMIT SWITCH, ATTACHMENT
LS ST	LIMIT SWITCH, STOP LAMP
LS B	LIMIT SWITCH, BRAKE
LS PB	LIMIT SWITCH, PARKIG BRAKE
LS TF	LIMIT SWITCH, TILT FR
LS TR	LIMIT SWITCH, TILT RR
SW AC	SWITCH, ACCEL
SW K	SWITCH, KEY
SW L	SWITCH, LIGHT
SW F	SWITCH, FLASHER
SW H	SWITCH, HORN
SW TK	SWITCH, TILT KNOB
SW MH1	SWITCH, HIGHT NO.1
SW MH2	SWITCH, HIGHT NO.2
L H-L	LAMP, HEAD LH
L H-R	LAMP, HEAD RH
L C-L	LAMP, CLEARANCE LH
L C-R	LAMP, CLEARANCE RH
L T-L	LAMP, TAIL LH
L T-R	LAMP, TAIL RH
L L-L	LAMP, LICENCE LH
L L-R	LAMP, LICENCE RH
L W	LAMP, WORKING
L F-LR	LAMP, FLASHER LH (REAR)
L F-RR	LAMP, FLASHER RH (REAR)
L F-L	LAMP, FLASHER LH
L F-R	LAMP, FLASHER RH

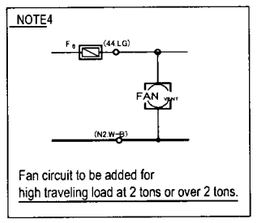
Note1



In case of 3ton series
(Circuit except for the above is the same with that 48V vehicle)

HR Y	RELAY, HEAD LAMP
TR Y	RELAY,TAIL LAMP
SA	SURGE ABSOBER
L ST-L	LAMP, STOP LH
L ST-R	LAMP, STOP RH
L R	LAMP, ROTALY
L BU-L	LAMP, BACK-UP LH
L BU-R	LAMP, BACK-UP RH
SK	SURGE KILLER
B Z	BUZZER
CHI F	CHIME, FORWARD
CHI R	CHIME, REVERSE
H	HORN
FR Y	RELAY, FLASHER
HOR Y	RELAY, HORN
V W	VOICE WARNING

NOTE4



Fan circuit to be added for high traveling load at 2 tons or over 2 tons.