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TOYOTA
INDUSTRIAL EQUIPMENT

REPAIR MANUAL

6FB10 , 14 , 15 , 18 , 20 , 25 , 30

Pub. No. C2310-1

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FOREWORD

This manual covers the service procedures of the TOYOTA BATTERY FORKLIFT 6FB10 ~ 30 series. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

This manual deals with the above models as of November 1995. Please understand that disagreement can take place between the descriptions in the manual and actual vehicles due to change in design and specifications. Any change or modifications thereafter will be informed by Toyota Industrial Vehicles' Parts & Service News.

TOYOTA MOTOR CORPORATION

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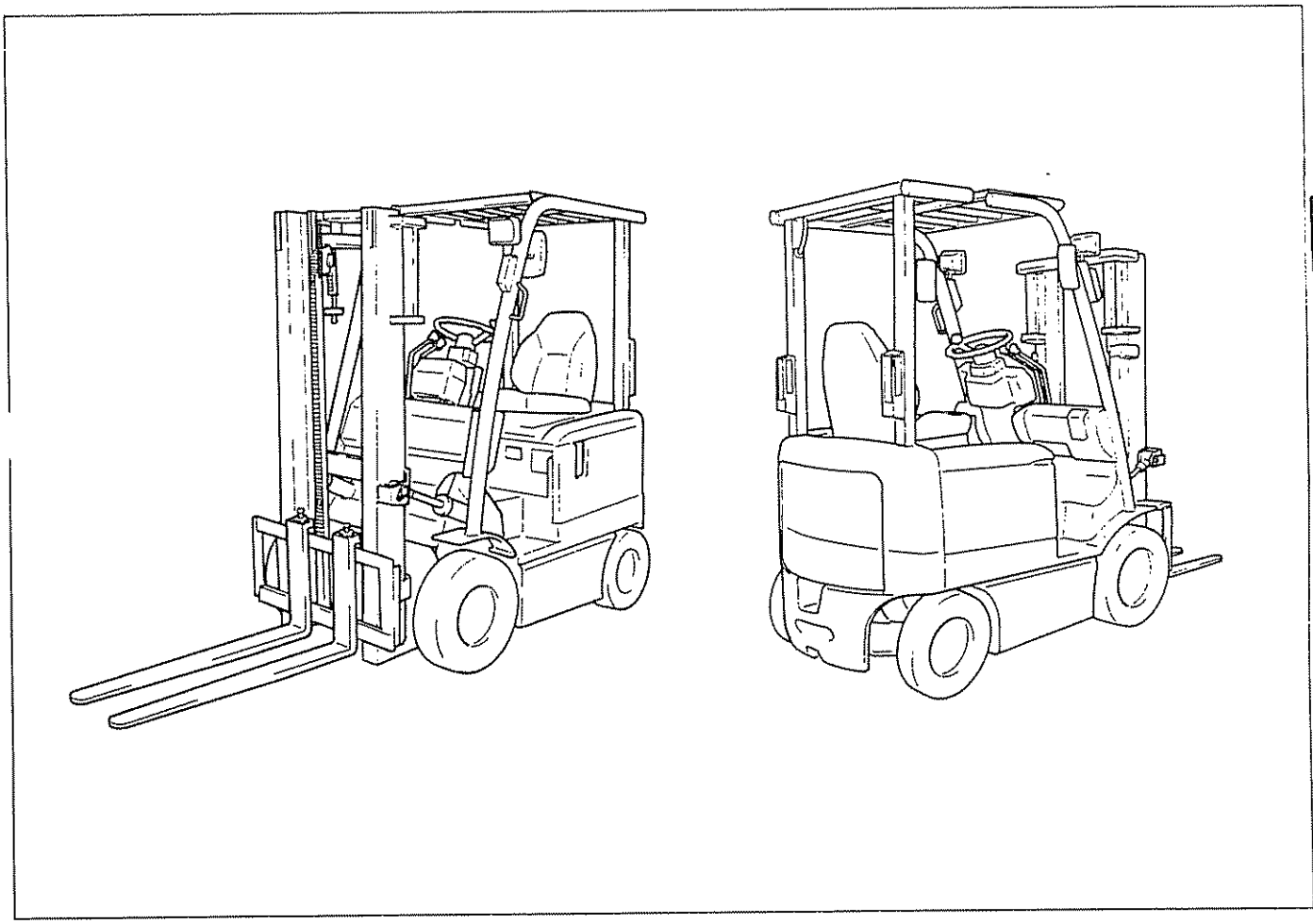
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EXTERIOR VIEWS



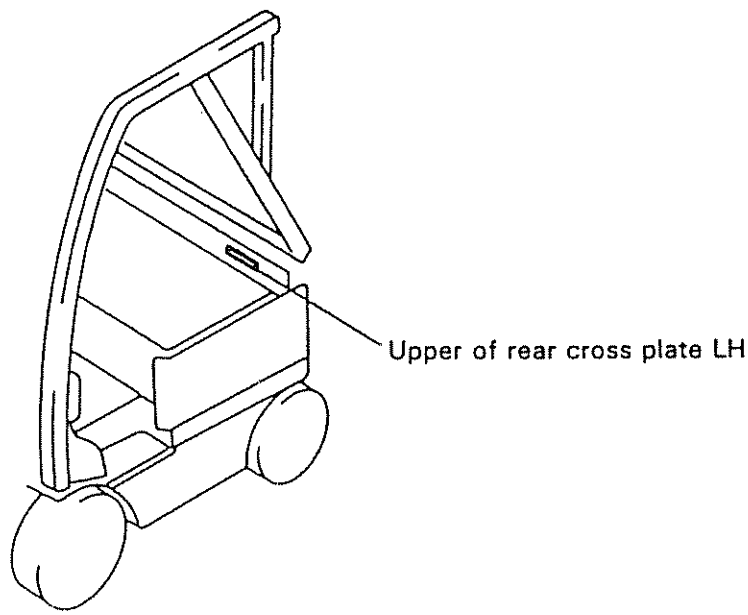
VEHICLE MODELS

Model			Specification	Voltage	Controller type
1-ton series	1.0 ton	6FB10	Standard	48 V	Microcomputer control
		30-6FB10	Dustproof	48 V	Microcomputer control
	1.35 ton	6FB14	Standard	48 V	Microcomputer control
		30-6FB14	Dustproof	48 V	Microcomputer control
	1.5 ton	6FB15	Standard	48 V	Microcomputer control
		30-6FB15	Dustproof	48 V	Microcomputer control
		40-6FB15	Large capacity	48 V	Microcomputer control
	1.75 ton	6FB18	Standard	48 V	Microcomputer control
		30-6FB18	Dustproof	48 V	Microcomputer control
2-ton series	2.0 ton	6FB20	Standard	48 V	Microcomputer control
		30-6FB20	Dustproof	48 V	Microcomputer control
		40-6FB20	Large capacity	48 V	Microcomputer control
	2.5 ton	6FB25	Standard	48 V	Microcomputer control
		30-6FB25	Dustproof	48 V	Microcomputer control
		40-6FB25	Large capacity	48 V	Microcomputer control
3-ton series	3.0 ton	6FB30	Standard	72 V	Microcomputer control
		30-6FB30	Dustproof	72 V	Microcomputer control

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FRAME NUMBER

FRAME NO. PUNCHING POSITION



PUNCHING FORMAT

Standard Models (~ 1997. 1)

	Series	Motor punching format	Models	Punching format
Standard	1 ton series	DM12	6FB10	6FB18-10001
			6FB14	
			6FB15	
			6FB18	
		DK12	30-6FB10	306FB18-10001
			30-6FB14	
			30-6FB15	
			39-6FB18	
	2 ton series	DK12	6FB20	6FB25-10001
			6FB25	
		DF09	30-6FB20	306FB25-10001
			30-6FB25	
	3 ton series	DF11	6FB30	6FB30-10001
			30-6FB30	
Ultrahigh capacity	1.5 ton series	DK12	40-6FB15	406FB25-10001
	2 ton series		40-6FB20	406FB30-10001
			40-6FB25	

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Standard Models (1997. 2 ~)

	Series	Motor punching format	Models	Punching format
Standard	1 ton series	DM12	6FB10	6FB18-20001
			6FB14	
			6FB15	
			6FB18	
		DK12	30-6FB10	306FB18-20001
			30-6FB14	
			30-6FB15	
			30-6FB18	
	2 ton series	DK12	6FB20	6FB25-20001
			6FB25	
		DF09	30-6FB20	306FB25-20001
			30-6FB25	
	3 ton series	DF11	6FB30	6FB30-20001
			30-6FB30	
Ultrahigh capacity	1.5 ton series	DK12	40-6FB15	406FB15-20001
			40-6FB20	406FB25-20001
	2 ton series		40-6FB25	

EEC Models

Series	Motor punching format	Models	Punching format
1 ton series	DM12	6FB10	6FB18Ⓔ20001
		6FB14	
		6FB15	
		6FB18	
2 ton series	DK12	6FB20	6FB25Ⓔ20001
		6FB25	

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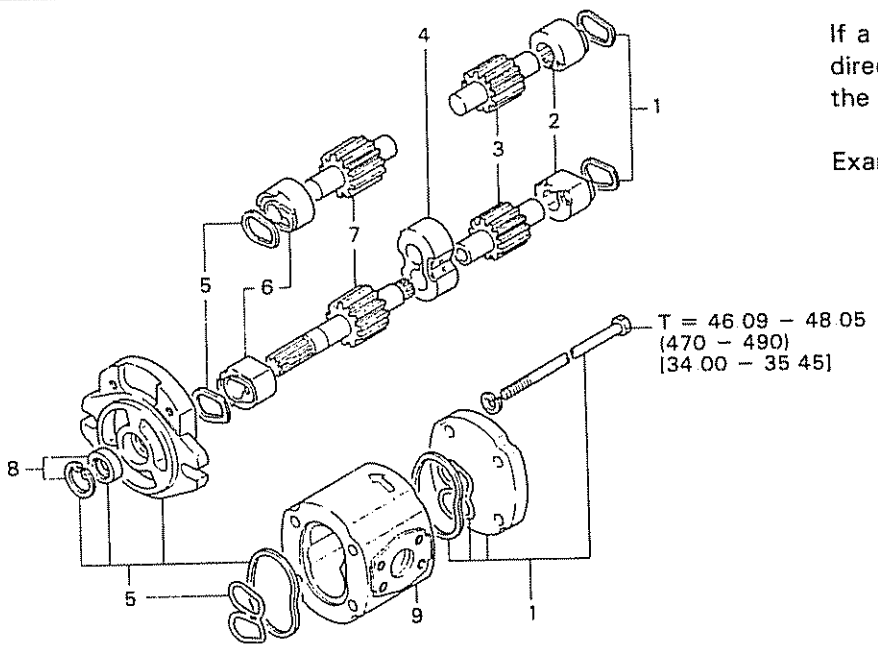
HOW TO READ THIS MANUAL

EXPLANATION METHOD

1. Operation procedure
   (1) This 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]



If a place or part cannot be indicated directly, the part name is described on the either side of the illustration.

Example: 1 Piping

Disassembly Procedure

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

2 Remove the bush. **[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.

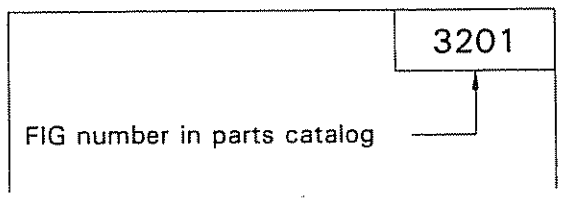
[Point 2]
Inspection: Measure the bush inside diameter.
Bush inside diameter limit: 19.12mm (0.7528 in)

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2. How to read components figures

(1) The components figure use 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 procedures 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	RR	Rear
EPS	Electrical power steering	SAE	Society of automotive engineers (USA)
FR	Front	SST	Special service tool
L/	Less	STD	Standard
LH	Left hand	T =	Tightening torque
OPT	Option	OOT	Number of teeth (○ ○)
O/S	Oversize	U/S	Undersize
PS	Power steering	W/	With
RH	Right hand		

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Symbol	Meaning	Symbol	Meaning
BATT	Battery	MF	Forward contactor
CH	Charger	MR	Reverse contactor
TF	Transformer	MP	Pump contactor
TU	Timer unit	MG	Regenerative contactor
MS_{CH}	Charger magnet switch		
THR	Thermal relay	DS_F	Forward direction switch
STT	Thermo trans switch	DS_R	Reverse direction switch
FAN	Charger fan	DS_{FO}	Forward optional direction switch
		DS_{BV}	Back-up direction switch
D_{CH}	Charger diode	LS_L	Lift limit switch
F_{CH}	Charger fuse	LS_T	Tilt limit switch
F_1	Drive fuse	LS_{ATT}	Attachment limit switch
F_2	Pump fuse	LS_{ST}	Stop lamp limit switch
F_3	Power steering fuse	LS_B	Brake limit switch
F_4	Lamp fuse	LS_{PB}	Parking brake limit switch
F_5	Control circuit fuse	SW_{AC}	Accel switch
		SW_K	Key switch
PB_{cpu}	Computer print boad	SW_L	Light switch
$PB_{DC/BD}$	DC/BD print boad	SW_F	Flasher switch
LCD_{DISP}	LCD display	SW_H	Horn switch
LED_{DISP}	LED display		
		PL_W	Working pilot lamp
DM_D	Drive motor	$L_{H\cdot L}$	Head lamp LH
DM_P	Pump motor	$L_{H\cdot R}$	Head lamp RH
DM_{PS}	Power steering motor	$L_{C\cdot L}$	Clearance lamp LH
		$L_{C\cdot R}$	Clearance lamp RH
TM_D	Drive circuit main transistor	$L_{T\cdot L}$	Tail lamp LH
TM_P	Pump circuit main transistor	$L_{T\cdot R}$	Tail lamp RH
TM_{PS}	Power steering main transistor	$L_{L\cdot L}$	Licence lamp LH
TG	Regenerative transistor	$L_{L\cdot R}$	Licence lamp RH
RAD	Drive absorber resistor	L_W	Working lamp
RAP	Pump absorber resistor	$L_{F\cdot LR}$	Flasher lamp LH (rear)
RG	Regenerative resistor	$L_{F\cdot RR}$	Flasher lamp RH (rear)
VRAD	Drive accel VARI-OHM	$L_{F\cdot L}$	Flasher lamp LH
VRAP	Pump accel VARI-OHM	$L_{F\cdot R}$	Flasher lamp RH
DF1	Flywheel diode No. 1	L_R	Rotaly lamp
DF2	Flywheel diode No. 2	$L_{ST\cdot L}$	Stop lamp LH
DF3	Flywheel diode No. 3	$L_{ST\cdot R}$	Stop lamp RH
DAD	Drive absorber diode	$L_{BU\cdot L}$	Back-up lamp LH
DAP	Pump absorber diode	$L_{BU\cdot R}$	Back-up lamp RH
DG	Regeneration diode		
CAD	Drive circuit absorber capacity	B_Z	Buzzer
CAP	Material handling circuit absorber capacity	CHI_F	Forward drive
SS1/2	Speed sensor No. 1/2	CHI_R	Reverse chime
SST	Steering torque sensor	H	Horn
SLL	Lequid level sensor	FR_Y	Flasher relay
		DISP	Display
		HM	Hour meter
		CSD	Drive circuit current sensor
		CSP	Material handling circuit current sensor

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OPERATIONAL TIPS

1. Safe operation
   (1) After jacking up, always support with 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 plugs before the inspection or servicing of electrical parts.

2. Protection of functional parts
   (1) After the end of vehicle inspection and/or maintenance, carefully check each connector for perfect connection without ommission before battery plug connection.
   Ommission of connection of any connector related to the controller, especially, may cause damage of controller internal elements.

3. 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 functioinal 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, packings and O-rings with new ones each time of disassembly.

   (7) Use genuine Toyota parts for replacement.

   (8) Use specified bolt and nuts. Observe the specified tightening torque at the time of reassembly.
   If no tightening torque is specified, tighten the bolt or nut according to the standard tightening torque table.

4. Grasping the trouble state
   When a trouble occurs, do not attempt immediate disassembly or replacement but first check if the trouble requires disassembly or replacement for remedying.

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CIRCUIT TESTER

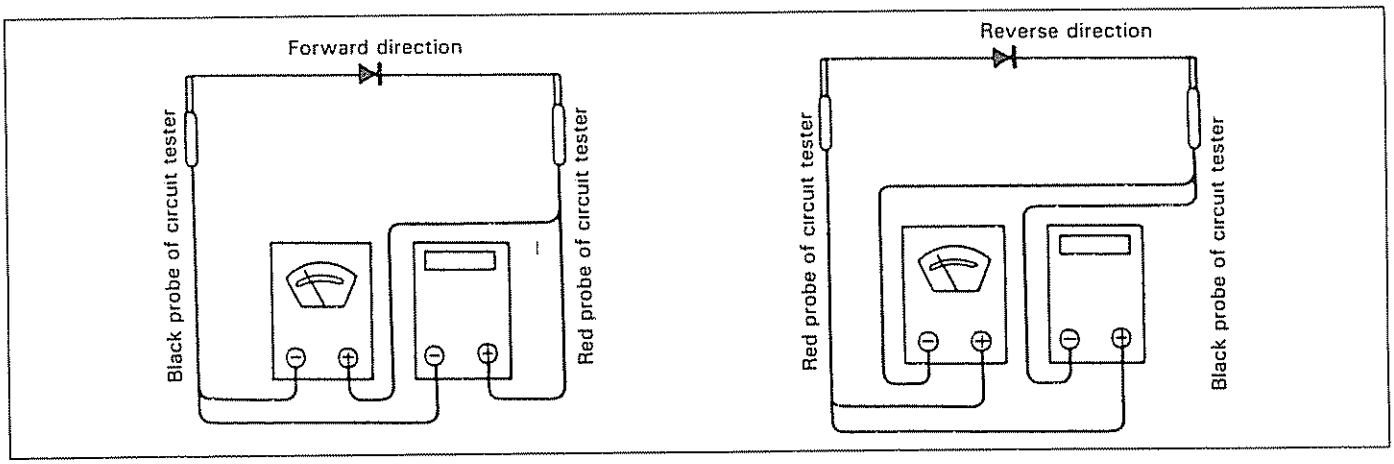
Circuit testers are vailable in both the analog and digital types. They should be used selectively according to the purpose of measurement.

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.

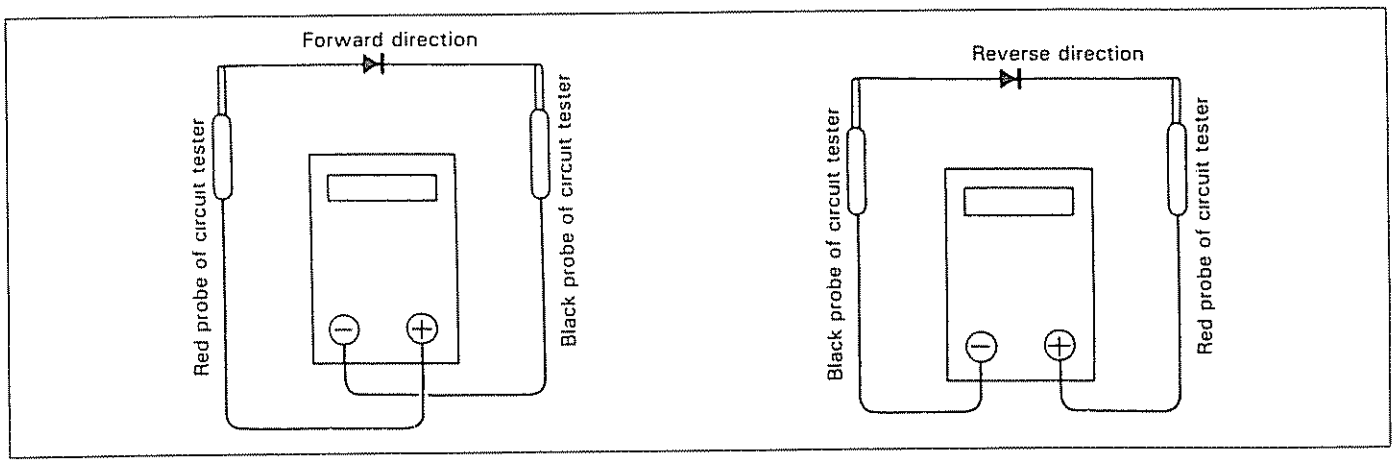
   Circuit tester range
   Analog type → kΩ range Digital type → 2 MΩ range



Measurement result example

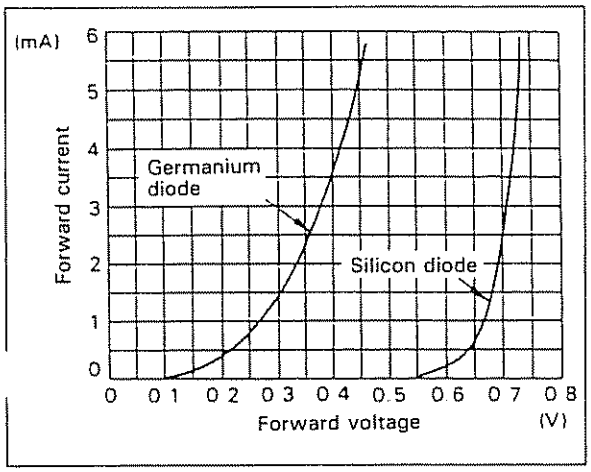
	Analog	Digital type
Forward	Continuity shall exit	No continuity
	11 kΩ	1
Reverse	No continuity	Continuity shall exist
	∞	2 MΩ

As seen from the example above, the measurement results with the analog and digital types are reverse. In measurement with a digital type circuit tester, therefore, use the tester probes as shown below.



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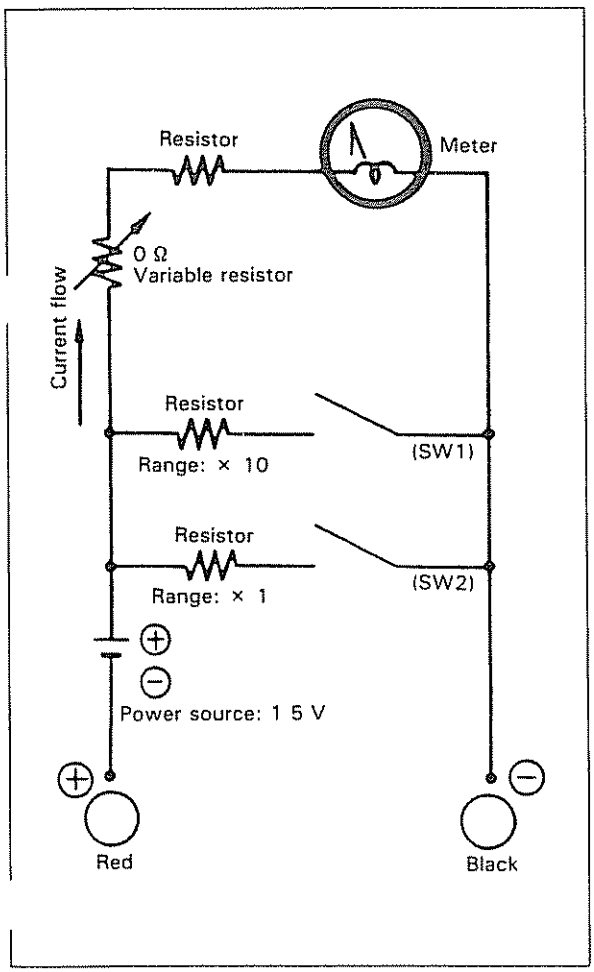
2. Difference in result of measurement with circuit tester
The circuit tester power supply voltage depends on the tester type. 1.5 V, 3.0 V or 6.0 V is used.
The resistance of a semiconductor such as a diode varies with the circuit tester power supply voltage.
The diode characteristics are shown in the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

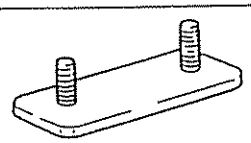
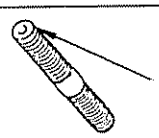
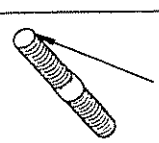
Standard bolt and tightening torques are not indicated.
Judge the standard tightening torque as shown below.

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 judged from the mating bolt type.

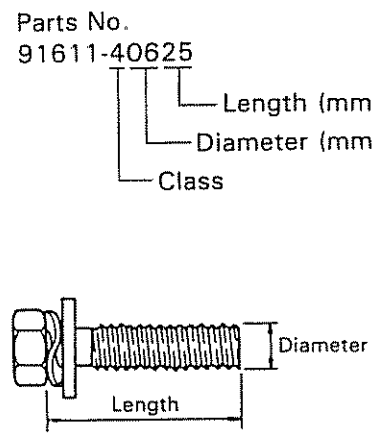
BOLT STRENGTH TYPE IDENTIFICATION METHOD

1. Identification by bolt shape

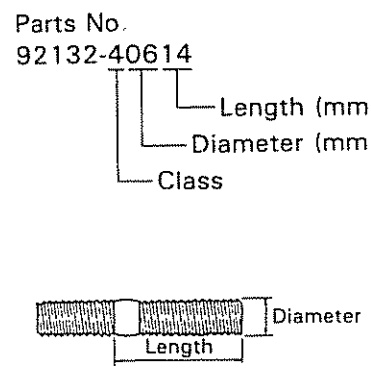
	Shape and class	Class
Hexagon head bolt	 Bolt head No.	4 = 4T 5 = 5T 6 = 6T 7 = 7T 8 = 8T
	 No mark	4T
Hexagon flange bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding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

2. Identification by part No.

Hexagon head bolt

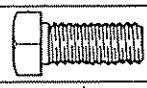
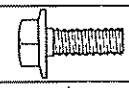


Stud bolt



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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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PERNOS REVESTIDOS PREVIAMENTE

(Pernos con un revestimiento de agente de seguridad de sellado en las roscas)

1. No use tal como está un perno revestido previamente en cualquiera de los casos siguientes:
   (a) Después de haberlo sacado.
   (b) Cuando el perno revestido previamente se mueve (aflojándolo o apretándolo al realizar una comprobación de apretamiento, etc.

*Fig. Agente de sellado de seguridad

Nota:
Para la comprobación del par, use el límite inferior del alcance del par de apretamiento permisible. Si el perno se mueve, vuelva a apretarlo siguiendo estas etapas.

2. Método para volver a usar los pernos revestidos previamente
   (1) Lave el perno y el orificio roscado. (La parte del orificio roscado debe lavarse perfectamente para el recambio del perno).
   (2) Seque perfectamente las partes lavadas soplando con aire comprimido.
   (3) Recubra con agente de sellado de seguridad especificado la parte roscada del perno.

PAR DE APRETAMIENTO DEL ACOPLAMIENTO DE LAS TUBERIAS FLEXIBLES DE ALTA PRESION

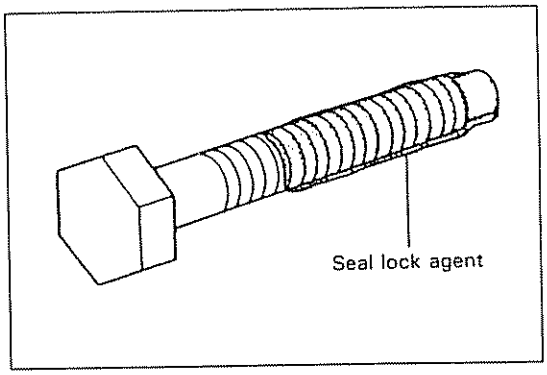
1. Cuando conecte una tubería flexible de alta presión, limpie las superficies de contacto del acoplamiento de la tubería flexible y de la boquilla roscada correspondiente con un trapo limpio para quitar las materias extrañas y la suciedad. Compruebe también que no hay dentados ni ningún deterioro en las superficies de contacto antes de la instalación.

2. Cuando conecte una tubería flexible de alta presión, sujétela para alinear el acoplamiento con la boquilla roscada y apriete el acoplamiento.

3. El par de apretamiento máximo no debe exceder el doble del par de apretamiento estándar.

Diámetro nominal del tornillo	Par de apretamiento estándar N.m (kgf-cm)		Diámetro del interior de la tubería flexible mm
	Estándar	Alcance de apretamiento	

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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 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, retighten 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.

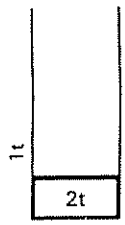
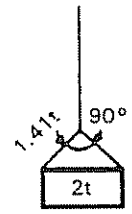
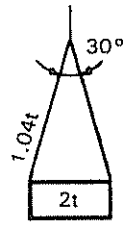
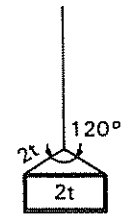
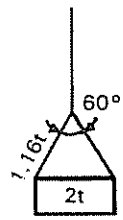
2. When connecting a high pressure hose, hold the hose to align the fitting with the nipple and tighten the fitting.

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)
7/8 — 14UNF	78 (800) [57.9]	74 ~ 82 (760 ~ 840) [55.0 ~ 60.8]	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

Suspension angle	Tension	Compression	Suspension method	Suspension 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 (ton) [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) [11069]	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

Unit: kg (lb)

Component		Vehicle model	Weight
Motor	Drive motor	6FB10 ~ 18	~ 1998. 1 : 70 (154), 1998. 2 ~ : 64 (141)
		30-6FB10 ~ 18	110 (243)
		6FB20·25,40-6FB15 ~ 25	80 (176)
		30-6FB20·25	110 (243)
		6FB30	120 (265)
		30-6FB30	↑
	Material handling pump motor	6FB10	30 (66)
		(40-)6FB14 ~ 18	38 (84)
		30-6FB10 ~ 18	46 (101)
		(40-)6FB20·25	45 (99)
		30-6FB20·25	53 (117)
		6FB30	61 (135)
		30-6FB30	62 (137)
Front axle & drive unit ASSY L/motor		1-ton series	Approx. 235 (518)
		2-ton series	Approx. 245 (540)
		3-ton series	Approx. 295 (650)
Rear axle ASSY		1-ton series	85 (187)
		2-ton series	77 (170)
		3-ton series	90 (198)
Counterweight		1.0-ton model	385 (849)
		1.35-ton model	480 (1058)
		1.5-ton model	↑
		1.75-ton model	700 (1544)
		2.0-ton model	↑
		2.5-ton model	965 (2129)
		3.0-ton model	1070 (2359)
V mast ASSY W/lift bracket (W/lift cylinder, L/fork max. lifting height: 3000 mm)		1-ton series	410 (904)
		2-ton series	465 (1025)
		3-ton series	500 (1103)
Battery ASSY		See the Battery section on page 1-2.	

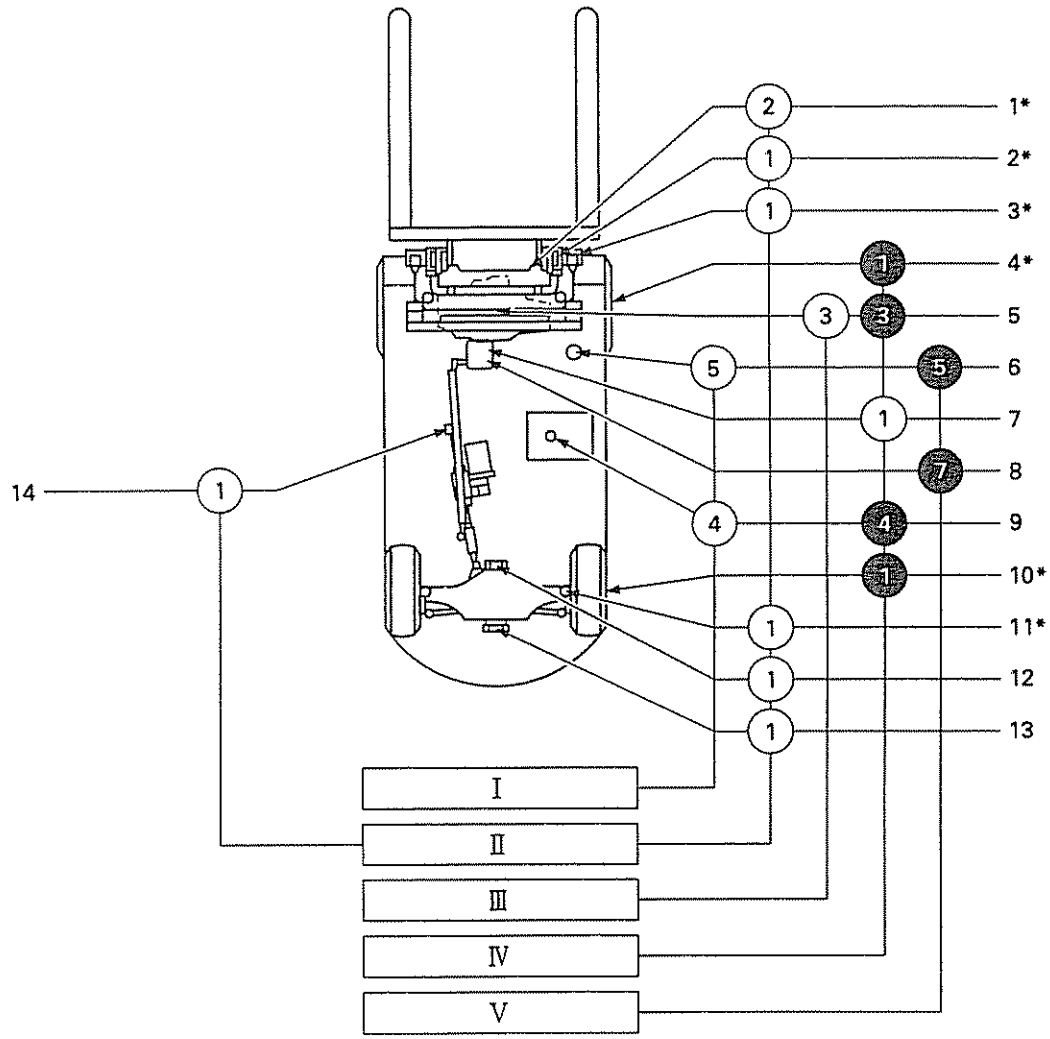
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RECOMMENDED LUBRICANTS AND CAPACITIES

Application	Class	Type	Capacity	
Differential & transmission	API GL-4 GL-5	STD: Hypoid gear oil SAE 85W-90 45S: Hypoid gear oil SAE 75W-80	1·2 ton series (STD) 2 ton series (Dust proof)	5.0 ℓ (1.32 US gal.)
			3 ton series (STD) 2·3 ton series (Dust proof)	5.5 ℓ (1.45 US gal.)
Steering gear box	—	Grease for sensor portion 45783-13500-71 Grease for gear box STD: 45781-13500-71 45S: 45782-13500-71	Proper quantity	
EPS actuator	—	TOYOTA Part: 45699-13400-71	Proper quantity	
Hydraulic (total) (Max. lifting height: 3000 mm)	ISO VG32	STD: Hydraulic oil ISO VG32 45S: MIL-H-5606-D	1 ton series	16 ℓ (4.2 US gal.)
			2 ton series	16 ℓ (4.2 US gal.)
			3 ton series	20 ℓ (5.3 US gal.)
Brake line	—	STD: SAE J-1703 DOT-3 45S: Brake fluid arctic S	Proper quantity	
Chassis part	—	STD: MP grease 45S: MIL-G-3278-A	Proper quantity	
Battery electrolyte	—	Distilled water	Proper quantity	

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LUBRICATION CHART



1 Chain
2 Mast support busing
3 Tilt cylinder front pin
4 Front wheel bearing
5 Differential & drive unit
6 Brake fluid reservoir tank
7 Tilt steering locking mechanism
8 Tilt steering universal joint
9 Oil tank
10 Rear wheel bearing
11 Steering knuckle king pin
12 Rear axle beam, front
13 Rear axle beam, rear
14 Steering actuator ball joint

❶ MP grease
❷ Engine oil
❸ Hypoid gear oil
❹ Hydraulic oil
❺ Brake fluid
❻ Gear oil
❼ Disulfide molybdemum for coating

I Inspect every 8 hours (daily)
II Inspect every 40 hours (weekly)
III Inspect every 170 hours (monthly)
IV Inspect every 1000 hours (every 6-months)
V Inspect every 2000 hours (annually)

* : Located on right and left side
○ : Inspect and service
● : Replacement

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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			I	←
	Commutator contamination, damage			I	←
	Brush, spring wear				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
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	←	←	←

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Item \ Inspection Period		Every month	Every 3 months	Every 6 months	Every 12 months
		Every 170 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Controller	Operation condition	I	←	←	←
	Interior contamination, damage	C	←	←	←
	Overcurrent limit value				M
Fuse	Looseness	I	←	←	←
Wiring (including charging cord)	Harness deterioration, clamp damage and looseness	I	←	←	←
	Looseness in connecting parts, taping condition	I	←	←	←
	Connecting condition and damage of the battery connector	I	←	←	←
POWER TRANSFER SYSTEM					
Differential Transmission	Oil leakage	I	←	←	←
	Oil level	I	←	←	←
	Bolt or nut loosenss				T
RUNNING EQUIPMENT					
Wheels	Tire air pressure	M	←	←	←
	Tire cuts, damage and uneven treads	I	←	←	←
	Loose rim and hub nuts	T	←	←	←
	Tread depth	M	←	←	←
	Metal fragments, stones or other foreign objects in tires	I	←	←	←
	Rim, side ring and disc wheel damage	I	←	←	←
	Front wheel bearing unusual noise and looseness	I	←	←	←
	Rear wheel bearing unusual noise and looseness	I	←	←	←
Front axle	Housing cracks and damage				I
Rear axle	Beam cracks, damage and deformation				I
	Axle beam forward and backward direction looseness	M*			M

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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
STEERING SYSTEM					
Steering wheel	Play and looseness	I	←	←	←
	Operating condition	I	←	←	←
Gear box	Grease leakage	I	←	←	←
	Mounting looseness	T	←	←	←
	Clogging of relief valve filter			C	←
Rods, links and arm	Wear, looseness and damage	I	←	←	←
	Linkage wear and mounting condition				I
Power steering	Operating condition	I	←	←	←
	Mounting and linkage looseness				I
	Abnormal sound during operation	I	←	←	←
Knuckle	King pin looseness	I	←	←	←
	Cracking and deformation				I
Steering wheel shaft	Wheel alignment				M
	Left and right turning angle				M
BRAKING SYSTEM					
Brake pedal	Play and reserve	M	←	←	←
	Braking effect	I	←	←	←
Parking brake	Pull margin	I	←	←	←
	Braking effect	I	←	←	←
	Rod and cable looseness and damage	I	←	←	←
	Ratchet wear and damage				I
Brake pipe and hose	Leakage, damage, and mounting condition	I	←	←	←
Brake oil	Level	I	←	←	←
Master cylinder or brake valve and wheel cylinder	Function, wear, damage, mounting looseness				I
Brake drum and brake shoes	Clearance between drum and lining	M	←	←	←
	Shoe sliding position and lining wear				I
	Drum wear and damage				I
	Operating condition of the shoe				I
	Rust on the anchor pin				I
	Return spring wear				I
	Function of the automatic control system				M I
Backing plate	Deformation, crack, damage				I
	Looseness in mounting parts				T

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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
LOAD HANDLING SYSTEM					
Forks	Fork and stopper pin condition	I	←	←	←
	Left and right fork uniformity	I	←	←	←
	Cracks in fork base and welded portion				I*1
Mast and lift bracket	Deformation, damage and cracks in welded portion	I	←	←	←
	Mast and lift bracket looseness	I	←	←	←
	Mast support bushing wear and damage				I
	Roller wear, damage and rotating condition	I	←	←	←
	Roller pin wear and damage				I
	Mast strip wear and damage	I	←	←	←
Chain and chain wheel	Chain tension, deformation and damage	I	←	←	←
	Chain lubrication	I	←	←	←
	Chain anchor bolt condition	I	←	←	←
	Chain wheel wear, damage and rotating condition	I	←	←	←
Various attachments	Abnormalities and mounting condition	I	←	←	←
HYDRAULIC SYSTEM					
Cylinder	Cylinder mounting looseness and damage	T	←	←	←
	Rod and rod screw and rod end deformation and damage	I	←	←	←
	Cylinder operation	I	←	←	←
	Natural drop and natural forward tilt	M	←	←	←
	Oil leakage and damage	I	←	←	←
	Pin and cylinder shaft support wear and damage	I	←	←	←
	Lifting speed	M	←	←	←
	Uneven movement	I	←	←	←
Oil pump	Oil leakage and unusual noise	I	←	←	←
Hydraulic oil tank	Oil level and contamination	I	←	←	←
	Tank and oil strainer			C	←
	Oil leakage	I	←	←	←

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Item \ Inspection Period		Every month	Every 3 months	Every 6 months	Every 12 months
		Every 170 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Control lever	Linkage looseness	I	←	←	←
	Operation	I	←	←	←
Oil control valve	Oil leakage	I	←	←	←
	Relief pressure measurement				M
	Relief valve and tilt lock valve function	I	←	←	←
Hydraulic piping	Oil leakage	I	←	←	←
	Deformation and damage	I	←	←	←
	Linkage looseness	T	←	←	←
SAFETY DEVICES, ETC.					
Head guard	Welded part crack	I	←	←	←
	Deterioration, damage	I	←	←	←
Back rest	Looseness in mounting parts	T	←	←	←
	Deterioration, crack, damage	I	←	←	←
Lighting system	Operation, mounting condition	I	←	←	←
Horn	Operation, mounting condition	I	←	←	←
Turn signal	Operation, mounting condition	I	←	←	←
Instruments	Operation	I	←	←	←
Reversing alarm	Operation, mounting condition	I	←	←	←
Rear view mirror	Contamination, damage	I	←	←	←
	Reflection	I	←	←	←
Seat	Mounting looseness, damage	I	←	←	←
Body	Frame, cross member, etc. Damage cracking				I
	Bolts and nuts looseness				T
Others	Lubrication	L	←	←	←

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PERIODIC REPLACEMENT OF PARTS AND LUBRICANTS

Replace the parts and lubricants at the specified timing in months or operation hours whichever is earlier.

Item \ Replacement timing	Every month	Every 3 months	Every 6 months	Every 12 months
	Every 170 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Brake fluid			●	←
Hydraulic oil			●	←
Hydraulic oil filter	● (New vehicle)		●	←
Differential and drive unit oil			●	←
Wheel bearing grease				●
Master cylinder rubber parts				●
Wheel cylinder rubber parts				●
Reserve tank hose				● (Every 2 years)
Tilt steering universal joint grease				●
EPS actuator grease				● (Every 4 years)
Chain				● (Every 3 years)
Material handling hose				● (Every 2 years)

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BATTERY

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DISPLAY (OPT) 1-4

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BATTERY ASSY 1-6

REMOVAL•INSTALLATION 1-6

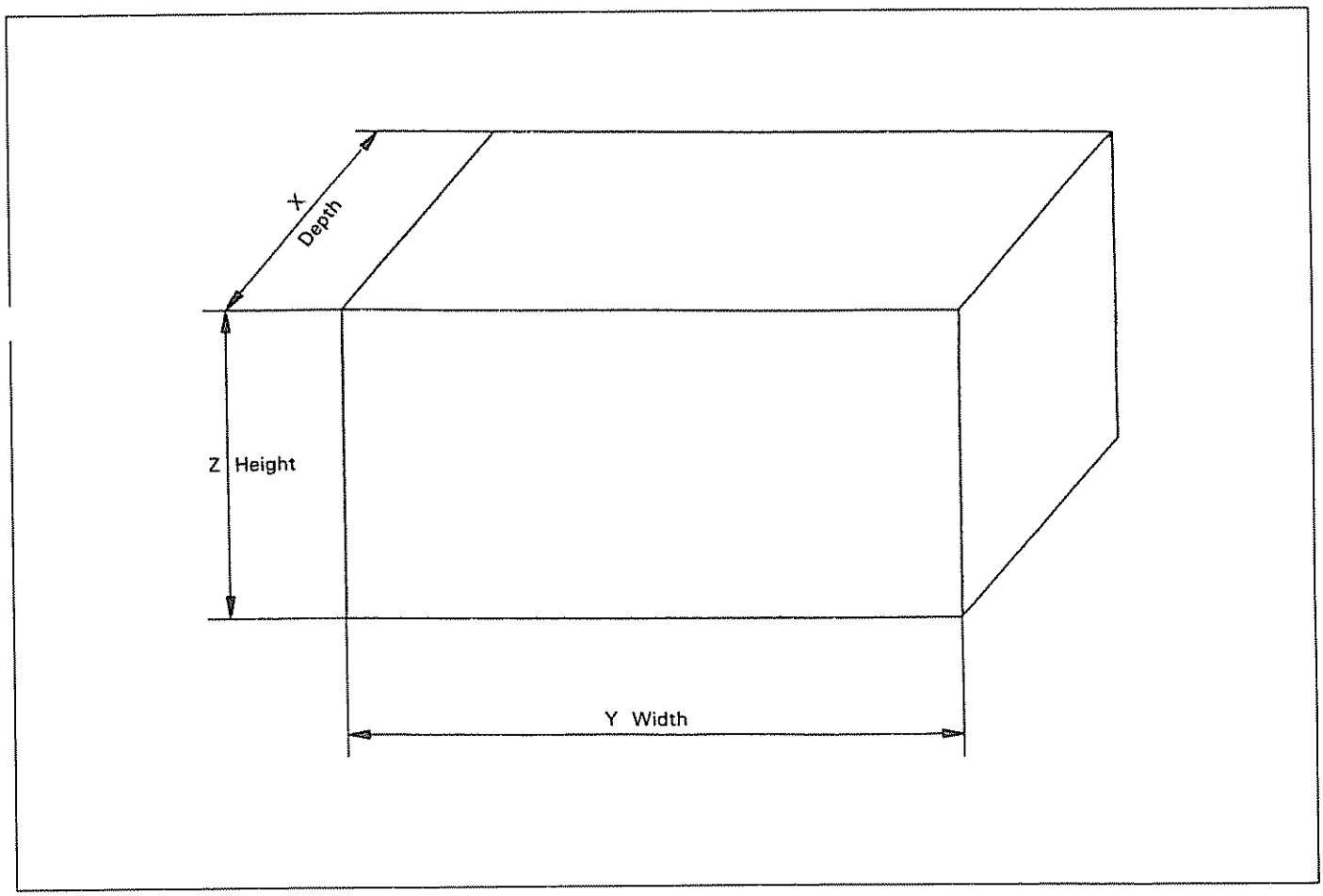
INSPECTION 1-7

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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.

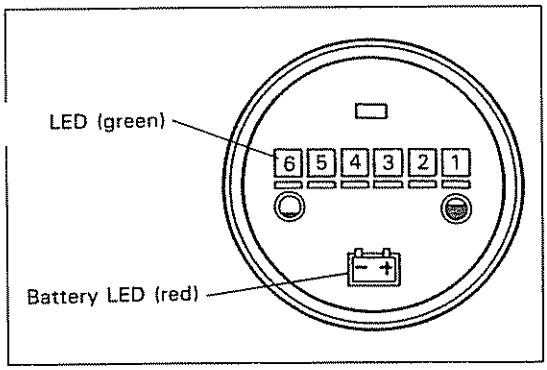
Vehicle model	Compartment Dimensions mm (in)			Minimum required battery weight (with case) kg (lb)
	Depth X	Width Y	Height Z	
6FB10·14 30-6FB10·14	665 (26.2)	980 (38.6)	465 (18.3)	615 (1350)
6FB15·18 30-6FB15·18	↑	↑	↑	715 (1577)
40-6FB15	845 (33.3)	1030 (40.6)	↑	945 (2084)
6FB20 30-6FB20	↑	↑	↑	815 (1790)
6FB25 30-6FB25	↑	↑	↑	945 (2084)
40-6FB20·25	990 (39.0)	1080 (42.5)	545 (21.5)	1125 (2481)
6FB30 30-6FB30	↑	↑	465 (18.3)	1165 (2560)



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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
	72 V specification	61 V
Electrolyte		Refined dilute sulfuric acid
Added fluid		Distilled (deionized) water
Insulation resistance		1 MΩ or more



Display

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

(Note) ○: On, ×: Off

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

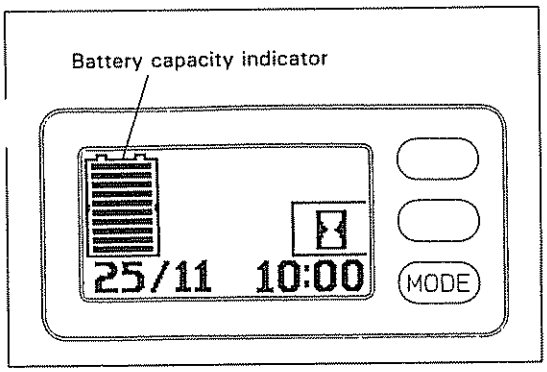
1. When this function is activated, it becomes impossible to operate for traveling and material handling at a time. Simultaneous operation, if attempted, priority is given to traveling and material handling fails. (This prevent the battery from being damaged by large current flow.)

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

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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
	72 V specification	61 V
Electrolyte		Refined dilute sulfuric acid
Added fluid		Distilled (deionized) water
Insulation resistance		1 MΩ or more



Battery discharged state (%)	LCD display									
	10 F	9	8	7	6	5	4	3	2	1 E
0 to 10 (exclusive)	○	○	○	○	○	○	○	○	○	○
10 to 20 〃	—	○	○	○	○	○	○	○	○	○
20 to 30 〃	—	—	○	○	○	○	○	○	○	○
30 to 40 〃	—	—	—	○	○	○	○	○	○	○
40 to 50 〃	—	—	—	—	○	○	○	○	○	○
50 to 60 〃	—	—	—	—	—	○	○	○	○	○
60 to 70 〃	—	—	—	—	—	—	○	○	○	○
70 to 80 〃	—	—	—	—	—	—	—	○	○	○
80 to 90 〃	—	—	—	—	—	—	—	—	○	○
90 to 100 〃	—	—	—	—	—	—	—	—	—	○
100 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

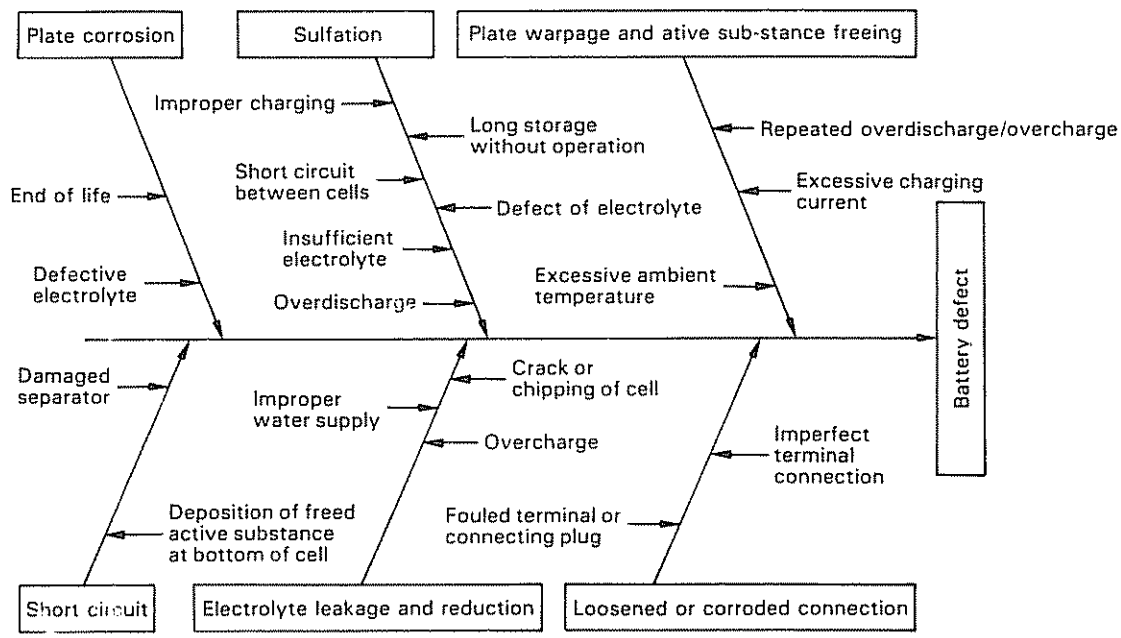
When the remaining battery capacity drops below the set level, the capacity display blinks and the alarm sounds for 5 seconds after the key switch is set to ON.

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.

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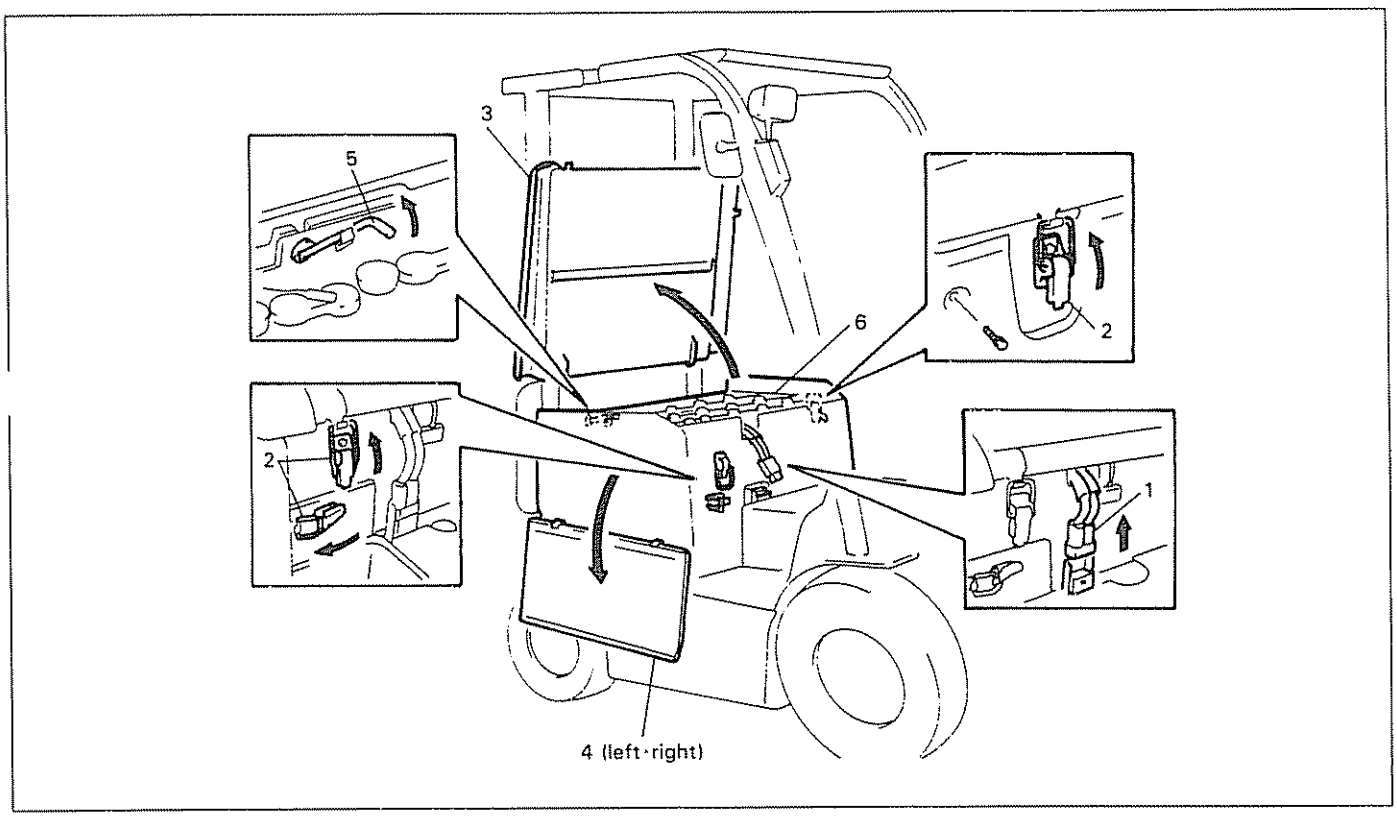
TROUBLESHOOTING



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BATTERY ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Release the battery hood catch.

3 Open the battery hood.

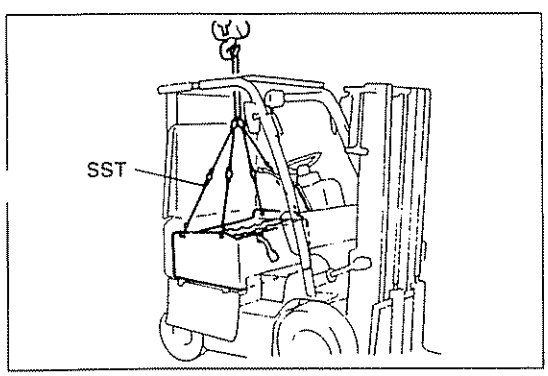
4 Open the battery side covers.

5 Remove the battery stopper.

6 Remove the battery ASSY. **[Point 1]**

Installation Procedure

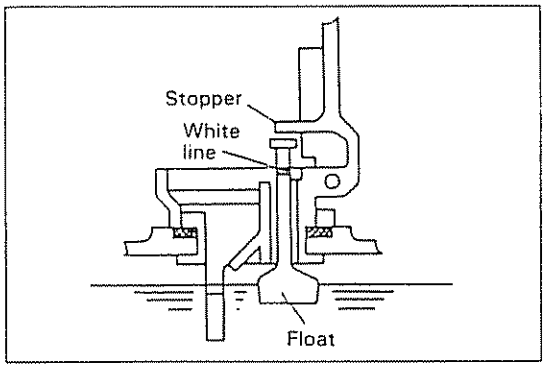
The installation procedure is the reverse of the removal procedure.

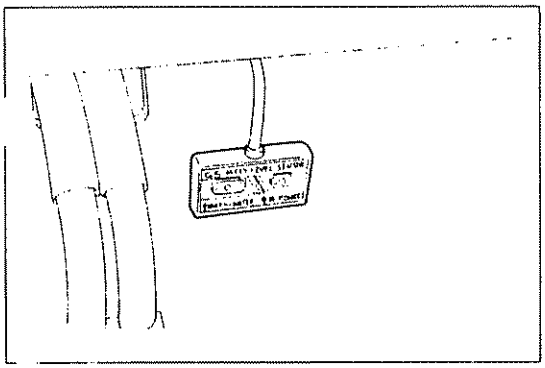


Point Operations

[Point 1]
Removal·installation: SST 80201-10250-71

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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.

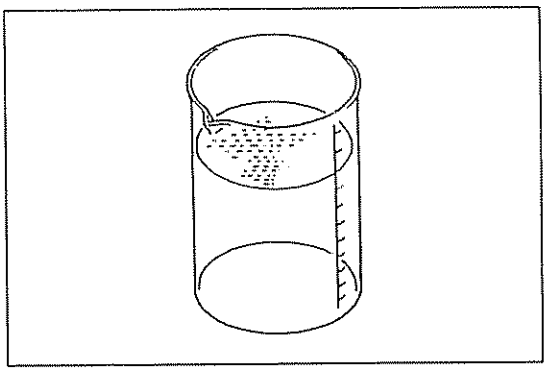
	Red lamp	Green lamp
Normal electrolyte level	Off	On
Insufficient electrolyte level	Flashing	On

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

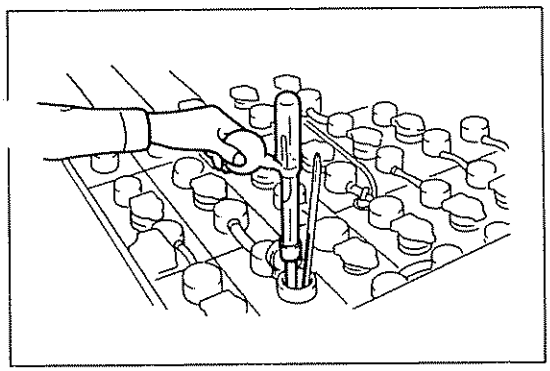
Reference
The consumption of the electrolyte can be calculated by the following equation:
Consumption (cc) = 5 hour capacity × 0.0336 × number of cells × number of charges

	Number of cells	Battery capacity (AH/5HR)
6FB10·14 30-6FB10·14	24	330
6FB15·18 30-6FB15·18	↑	400
6FB20 30-6FB20	↑	450
6FB25 30-6FB25	↑	565
6FB30 30-6FB30	36	450
40-6FB15	24	600
40-6FB20·25	↑	730

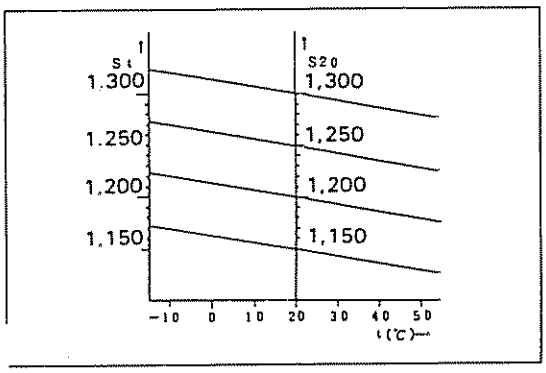
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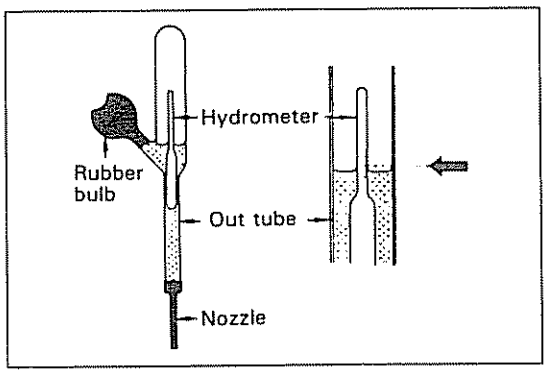
2. Electrolyte inspection
The battery electrolyte is colorless and transparent in normal state. Inspect any turbidity at the time of specific gravity inspection. If not checked clearly, put the electrolyte in a beaker for inspection.



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.

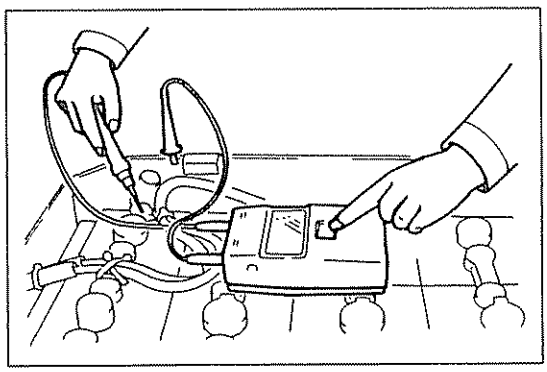


Equation for converting specific gravity
$S_{20} = St + 0.0007 (t-20)$
S_{20}: Specific gravity at 20°C
St : Specific gravity at t°C
t : Electrolyte temperature (°C) at the time of measurement



* 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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CONTROLLER

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NEW MCS CONTROLLER

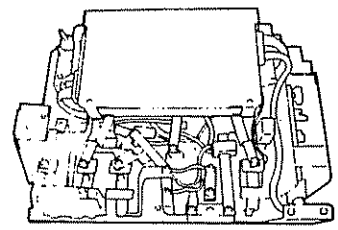
GENERAL

The 6FB series is installed with an integrated multi functional microcomputer controller for traveling, material handling and EPS.
It has a diagnosis (self-diagnostic) function which automatically detects abnormalities in the main drive, material handling and EPS circuits as well as the accelerator and other operating systems and sensors, and indicates the corresponding error codes and faulty portions on the display with the buzzer sound.

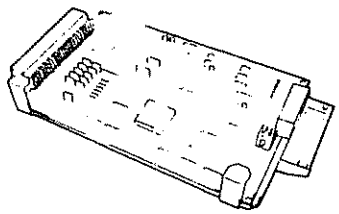
At the same time, such actions as traveling stop, material handling stop and traveling speed restriction are taken automatically to ensure safety.

When the plug-in analyzer as an SST is connected, the analyzer (fault analysis) mode can be selected for detecting the defective portion and checking the functions of the main drive and material handling circuits, operating systems and sensors. In the vehicle with the optional all-round display, these checks are possible by setting the display to the analyzer mode.

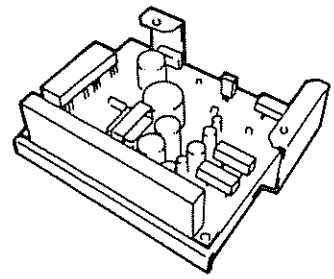
For the diagnosis and the analyzer, see Display function section.



Controller ASSY



CPU board



DC-BD board

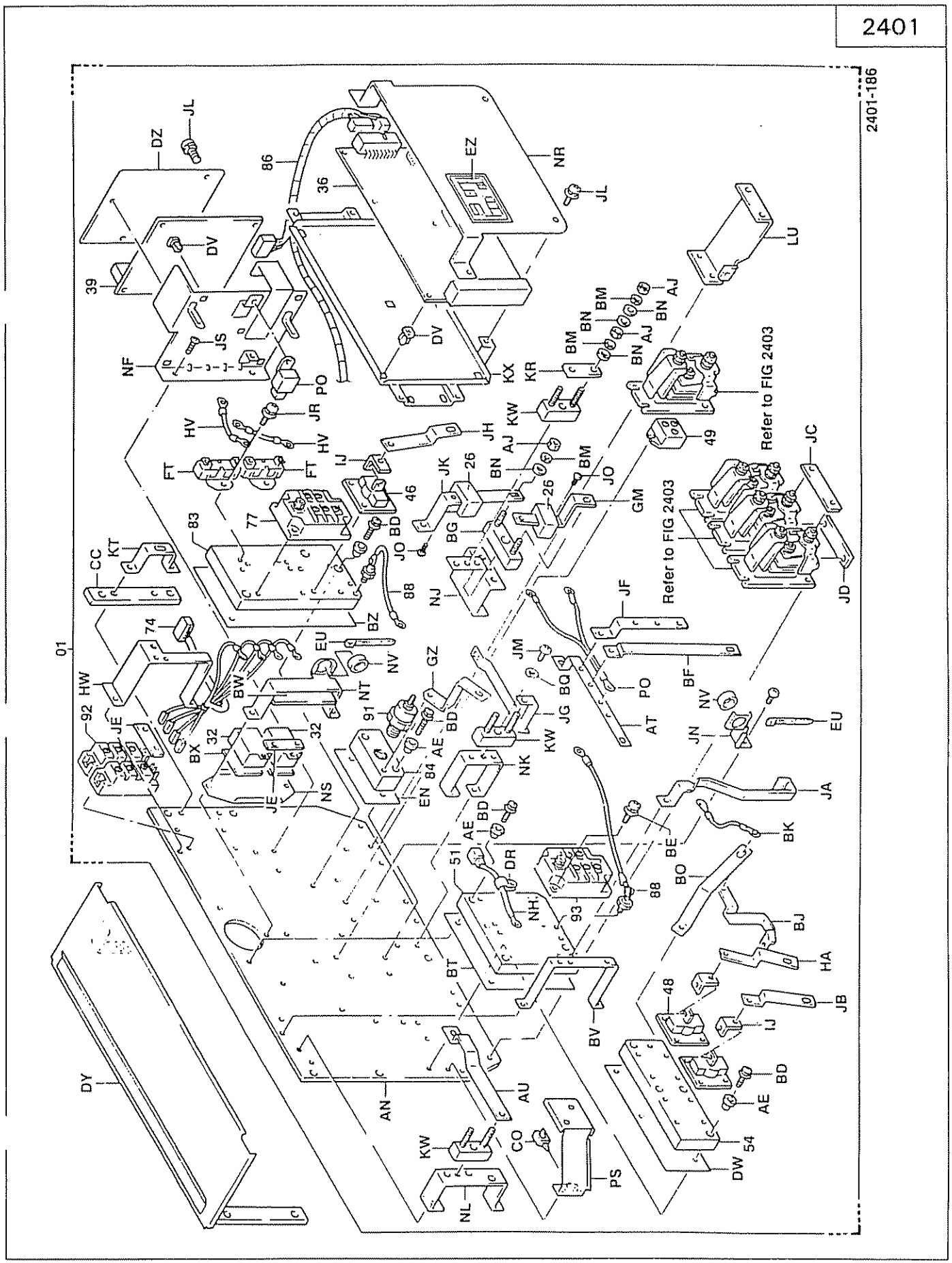
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SPECIFICATIONS

Item		1-ton series	2-ton series	3-ton series
Fuse	F1 fuse (for drive circuit)	350 A	400 A	←
	F2 fuse (for material handling circuit)	200 A	←	←
	F3 (for PS circuit)	60 A	←	←
	F4 (for lamps)	10 A	←	←
	F5 (for control circuit)	10 A	←	←
	F6 (for power supply circuit)	—	—	10 A
Transistor	TMD (for traveling)	1D600A-030-03	1D600A-030-02 (2pcs)	←
	TMP (for material handling)	1D600A-030-03	←	←
	TMPS (for PS)	MG75J2YS50	←	←
	TG (for auxiliary excitation for regeneration)	ETK85-050	←	←
Diode	DAD (traveling absorber)	ERE24-04	ERG24-04	ERE24-04
	DAP (material handling absorber)	ERE24-04	←	←
	DG (for regeneration)	70M30	←	←
	DF1 (DM flywheel)	SR170L-6S	SR250L-6S	←
	DF2 (DM flywheel)	SR170L-6S	SR250L-6S	←
	DF3 (PM flywheel)	SR170L-6R	SR250L-6R	SR170L-6R
Current sensor	CSD (for traveling)	HC-T800V8P12	←	←
	CSP (for material handling)	HC-T800V8P12	←	←
	SH (for PS)	MBP20A-10MJN	←	←
Capacitor	CAD (traveling absorber)	75 μF	75 μF (2 pcs.)	60 μF (2 pcs)
	CAP (material handling absorber)	75 μF	←	←
Contactor	MF (for forward traveling)	CM16T2-TC52	←	←
	MR (for reverse traveling)	CM16T2-TC52	←	←
	MG (for regeneration)	CM16T2-A52	←	←
	MP (for material handling)	CM16T2-AC52	←	←
Resistor	RAD (traveling absorber)	1.5 Ω 220 W	1.2 Ω 220 W	1.5 Ω 220 W
	RAP (material handling absorber)	1.5 Ω 220 W	1.2 Ω 200 W	1.5 Ω 220 W
	RG (for regeneration)	1 Ω 120 W	←	1.5 Ω 120 W

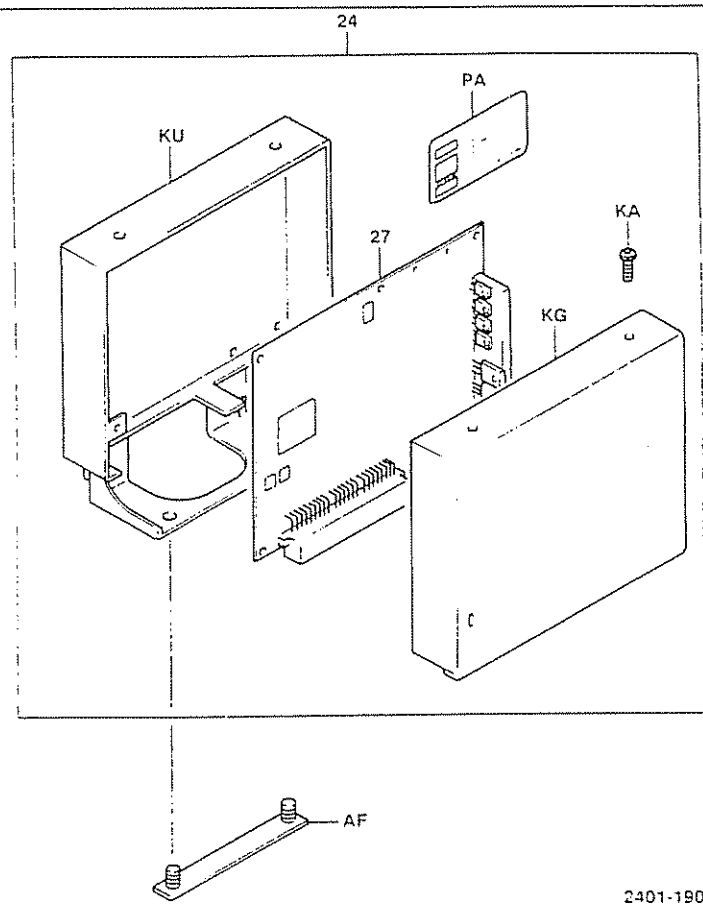
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COMPONENTS

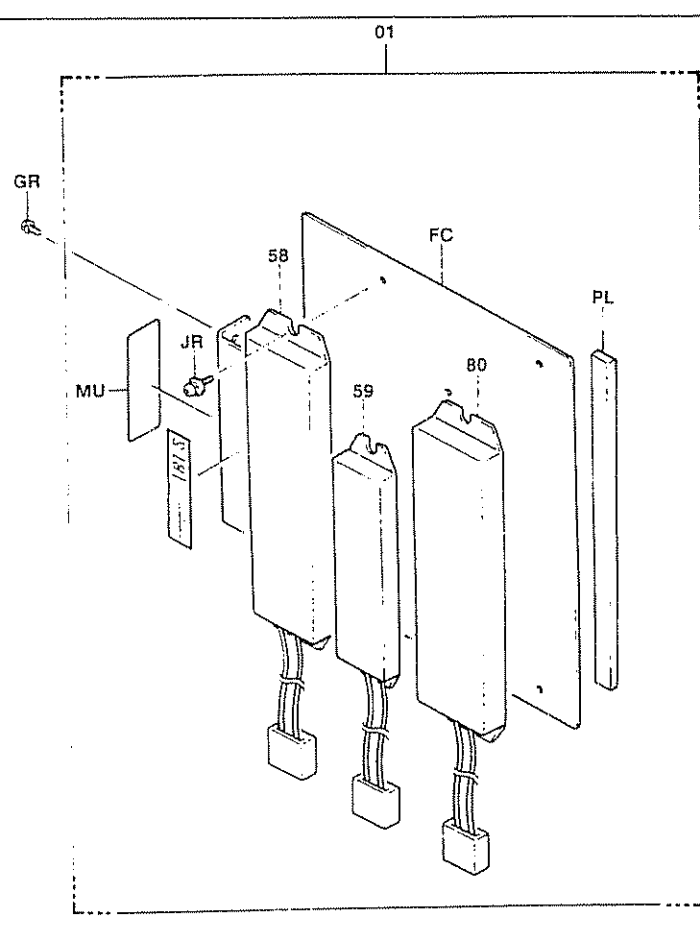


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2401



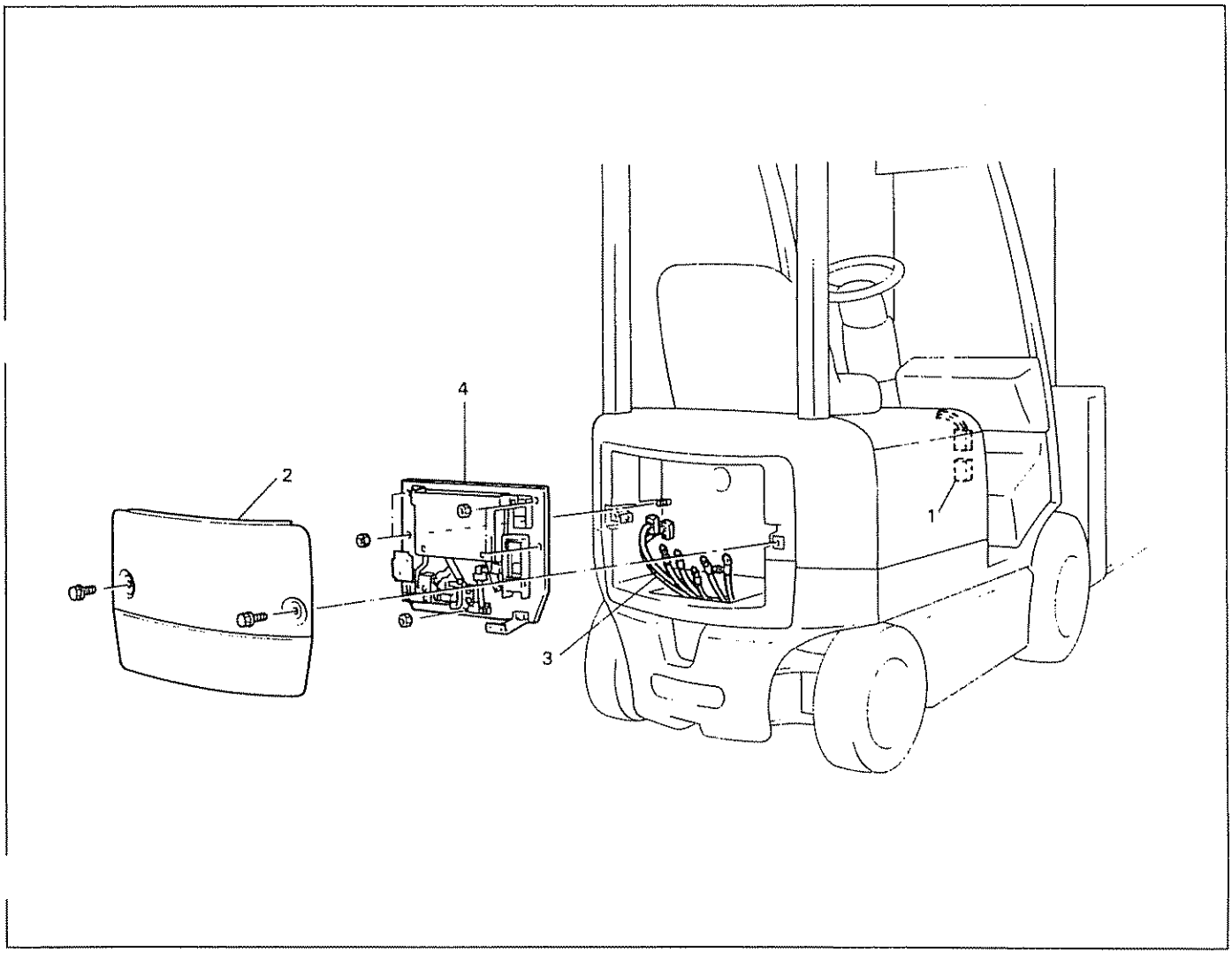
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CONTROL PANEL ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the control panel cover.

3 Disconnect the wiring from the control panel ASSY. (Disconnect the back-up lamp connector in the 3-ton series.)

4 Remove the control panel ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:

- **Before connecting the battery plug, check any omission or insufficient tightening of cable connections. If loose, elements in the control panel may be damaged.**
- **Check any incorrect wiring after the end of installation work. (See page 2-25.)**

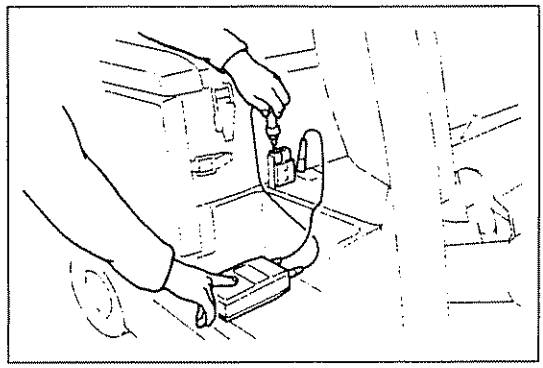
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INSPECTION

Some components can be inspected after removal from the vehicle while others cannot be inspected if removed.
Since the battery voltage must be applied to the CPU board, etc., they must be inspected on the vehicle.
The explanation here is mainly for inspection after removal from the control panel ASSY.

1. Insulation resistance measurement (Be sure to check before control panel inspection.)
   (1) Disconnect the battery plug and measure the insulation resistance between the battery plug and body.

Measurement terminals	Between controller side of battery plug and body
Standard	The resistance value should be as high as possible, but it varies greatly depending on the vehicle operating conditions, place and weather. (Approx. 1 MΩ or more)



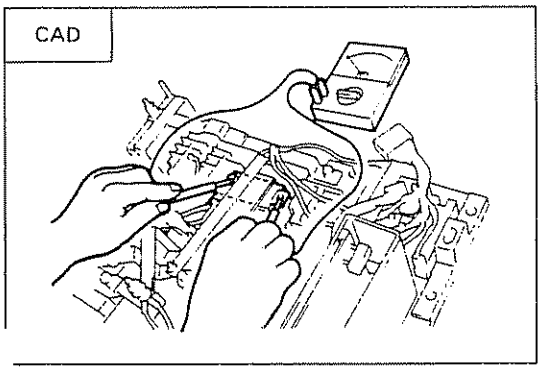
2. CAD (traveling absorber capacitor) and CAP (material handling absorber capacitor)
   After discharging the CAD/CAP with a resistor of around 100 Ω, disconnect the CAD/CAP wiring.

Inspection potion	Measurement terminals	Circuit tester range
CAD	Both terminals of CAD (DAD side — TMD side)	Ω × 1 K
CAP	Both terminals of CAP (DAP side — TMP side)	

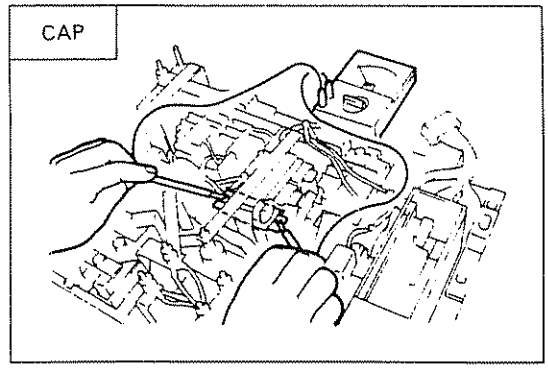
Standard

Bring the tester probes into contact with the CAD/CAP terminals. The pointer once deflects to the 0 Ω side, then gradually returns to ∞, and finally indicates ∞ since the capacitor is charged by the circuit tester current.

CAD



CAP

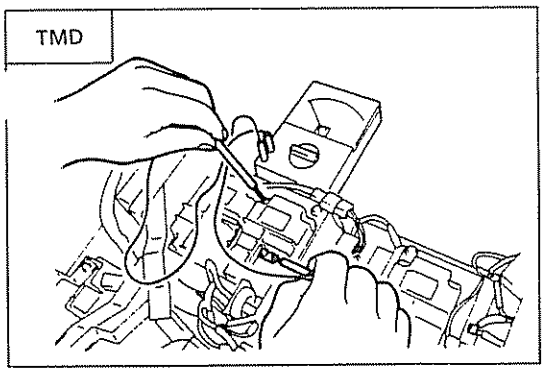


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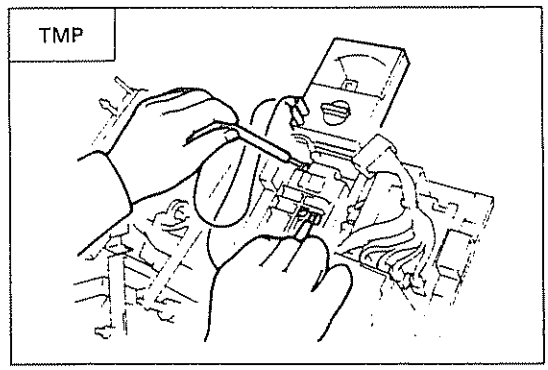
3. TMD (drive circuit main transistor)/TMP (material handling circuit main transistor)
Disconnect each wiring from the TMD/TMP.

Inspection portion	Measurement terminals		Standard	Circuit tester range
TMD TMP	Between B and C	B: ⊖ probe — C: ⊕ probe B: ⊕ probe — C: ⊖ probe	Continuity shall exist. ∞ Ω	Ω × 1 K
	Between C and E	C: ⊖ probe — E: ⊕ probe C: ⊕ probe — E: ⊖ probe	∞ Ω Continuity shall exist.	
	Between B and E	B: ⊖ probe — E: ⊕ probe B: ⊕ probe — E: ⊖ probe	Continuity shall exist. Continuity shall exist.	

TMD



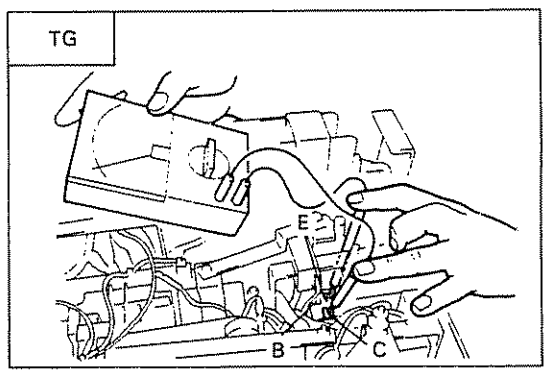
TMP



4. TG (Regeneration transistor)
Disconnect the TG wiring.

Inspection portion	Measurement terminals		Standard	Circuit tester range
TG	Between B and C	B: ⊖ probe — C: ⊕ probe B: ⊕ probe — C: ⊖ probe	Continuity shall exist. ∞ Ω	Ω × 1 K
	Between C and E	C: ⊖ probe — E: ⊕ probe C: ⊕ probe — E: ⊖ probe	∞ Ω Continuity shall exist.	

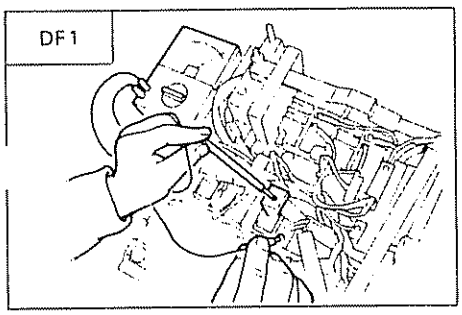
TG

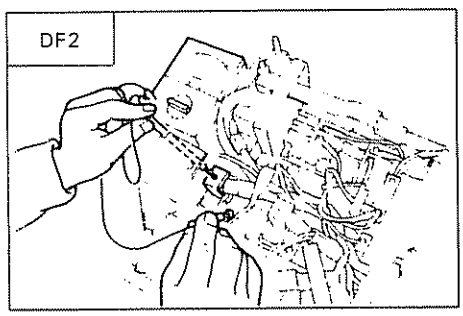


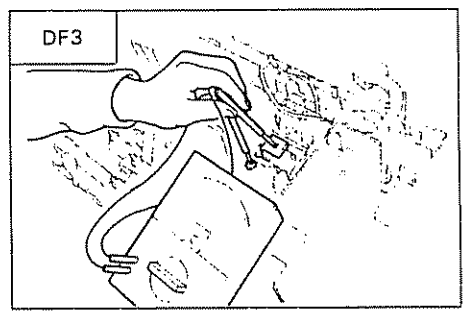
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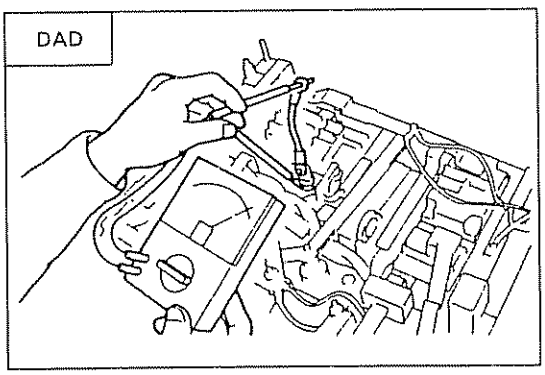
5. DF1·DF2·DF3 (flywheel diode No.1·No.2 No.3), DAD and DAP
Disconnect the DF1·DF2·DF3 wiring.

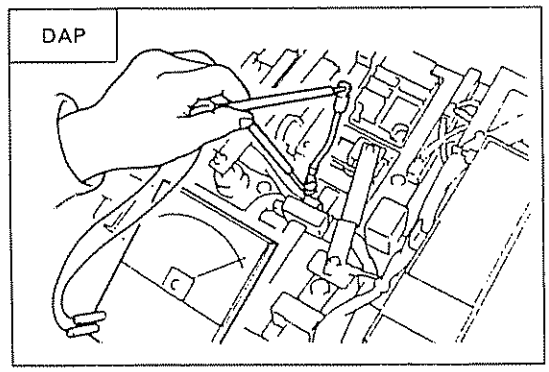
Inspection portion	Measurement terminals	Standard	Circuit tester range
DF1·DF2·DF3 DAD·DAP	Forward direction: Anode: ⊖ probe — Cathode: ⊕ probe	Approx. 6 kΩ	Ω × 1 K
	Reverse direction: Anode: ⊕ probe — Cathode: ⊖ probe	∞ Ω	





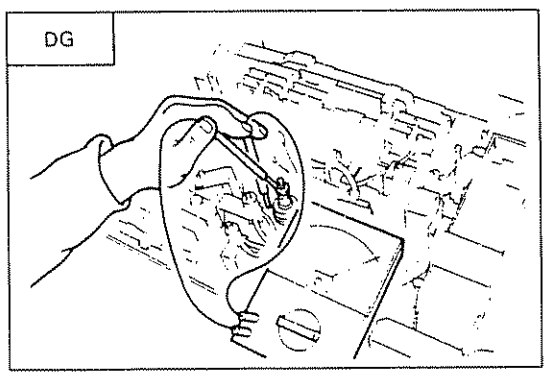






6. DG (regeneration diode)
Disconnect the DG wiring.

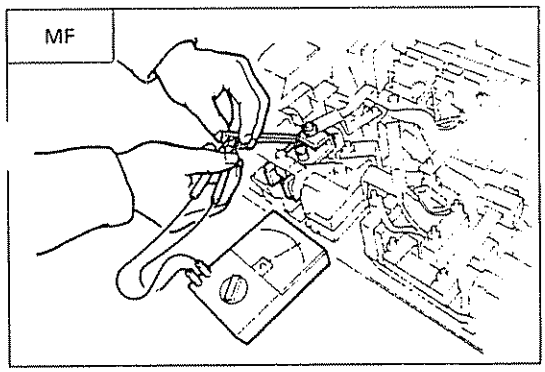
Inspection portion	Measurement terminals	Standard	Circuit tester range
DG	Forward direction: Anode: ⊖ probe — Cathode: ⊕ probe	Approx. 3 kΩ	Ω × 1 K
	Reverse direction: Anode: ⊕ probe — Cathode: ⊖ probe	∞ Ω	

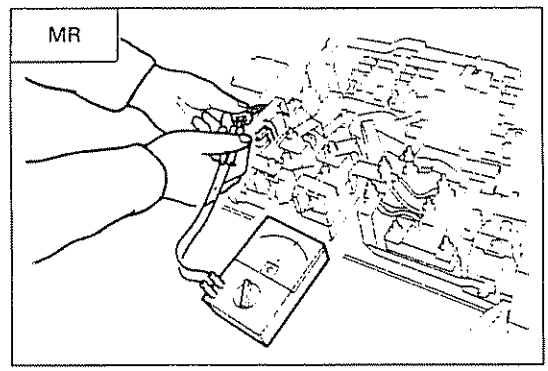


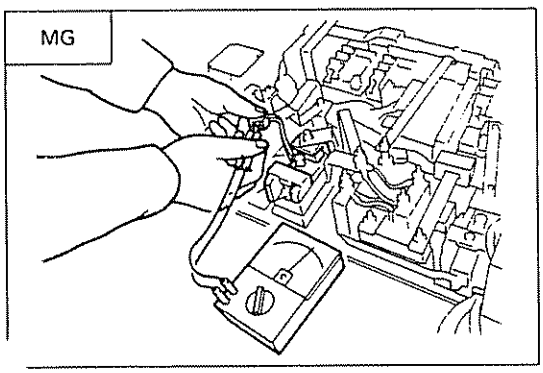
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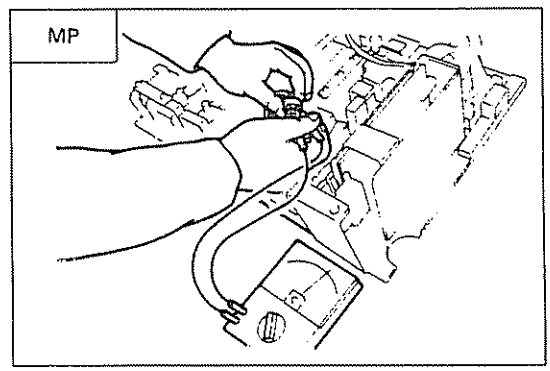
7. MF (forward contactor) MR (reverse contactor) MG (regeneration contactor) MP (material handling contactor)
   (1) Measure the resistance of each of MF, MR, MG and MP coils.

Inspection portion	Measurement terminals	Standard	Circuit tester range
MF coil MR coil MG coil MP coil	MF coil connector MR coil connector MG coil connector MP coil connector	Approx. 37 Ω (28°C (68°F))	Ω × 1





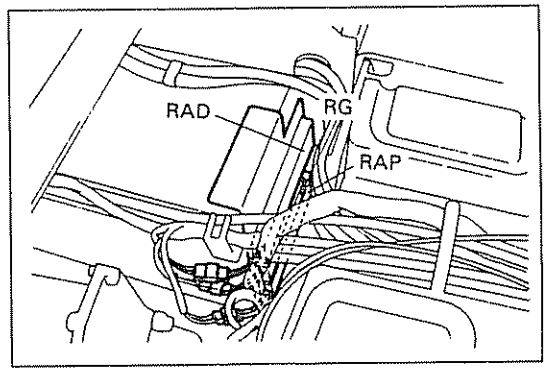


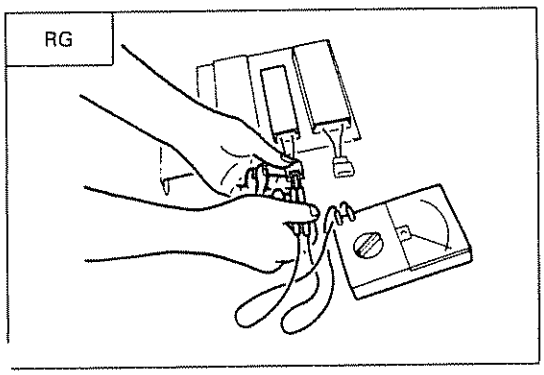


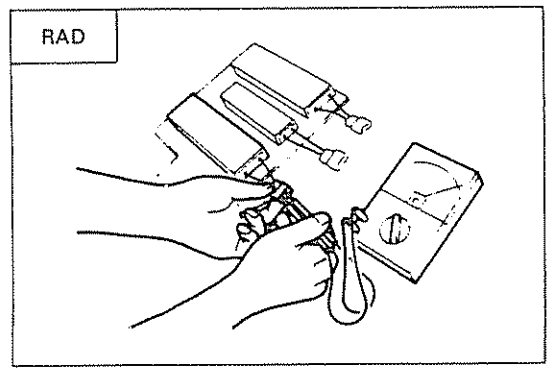
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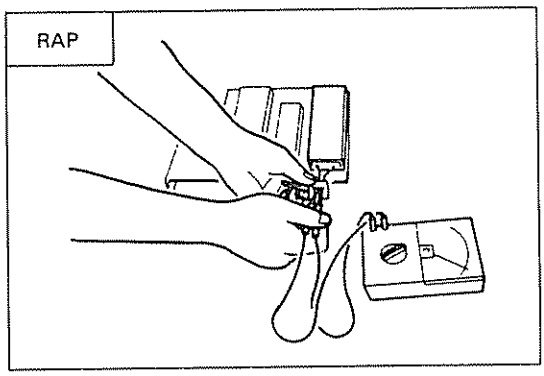
8. Resistor panel
RG (regeneration resistor)·RAD (traveling absorber resistor)·RAP (material handling absorber resistor)
Disconnect the RG·RAD·RAP wiring.

Inspection portion	Measurement terminals	Standard	Circuit tester range
RG	Both terminals of RG	1 and 2-ton series: 10Ω 3-ton series: 15Ω	Ω × 1
RAD RAP	Both terminals of RAD/RAP	1 and 3-ton series: 15Ω 2-ton series: 12Ω	





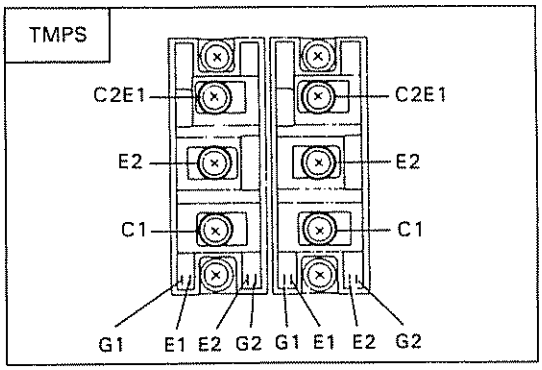


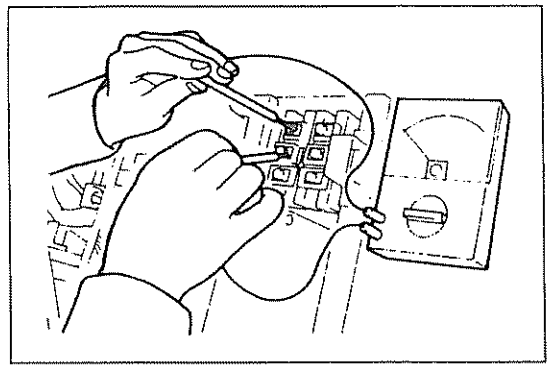


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9. TMPS (power steering circuit main transistor)
Disconnect the TMPS wiring.

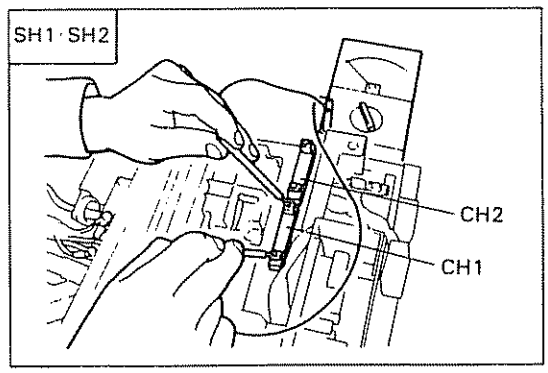
Inspection portion	Measurement terminals		Standard	Circuit tester range
TMPS	C1-E1	C1: ⊕ probe — E1: ⊖ probe C1: ⊖ probe — E1: ⊕ probe	Several kΩ ∞ Ω	Ω × 1 K
	C2-E2	C2: ⊕ probe — E2: ⊖ probe C2: ⊖ probe — E2: ⊕ probe	Several kΩ ∞ Ω	
	G1-E1	G1: ⊕ probe — E1: ⊖ probe G1: ⊖ probe — E1: ⊕ probe	∞ Ω ∞ Ω	
	G2-E2	G2: ⊕ probe — E2: ⊖ probe G2: ⊖ probe — E2: ⊕ probe	∞ Ω ∞ Ω	
	C1-G1	C1: ⊕ probe — G1: ⊖ probe C1: ⊖ probe — G1: ⊕ probe	∞ Ω ∞ Ω	
	C2-G2	C2: ⊕ probe — G2: ⊖ probe C2: ⊖ probe — G2: ⊕ probe	∞ Ω ∞ Ω	





10. SH1·SH2 (shunt 1, 2)
Disconnect the SH1·2 wiring.

Inspection portion	Measurement terminals	Standard	Circuit tester range
SH1·SH2	Both terminals of SH1 Both terminals of SH2	10 mΩ (1 Ω or less for quality judgment)	Ω × 1



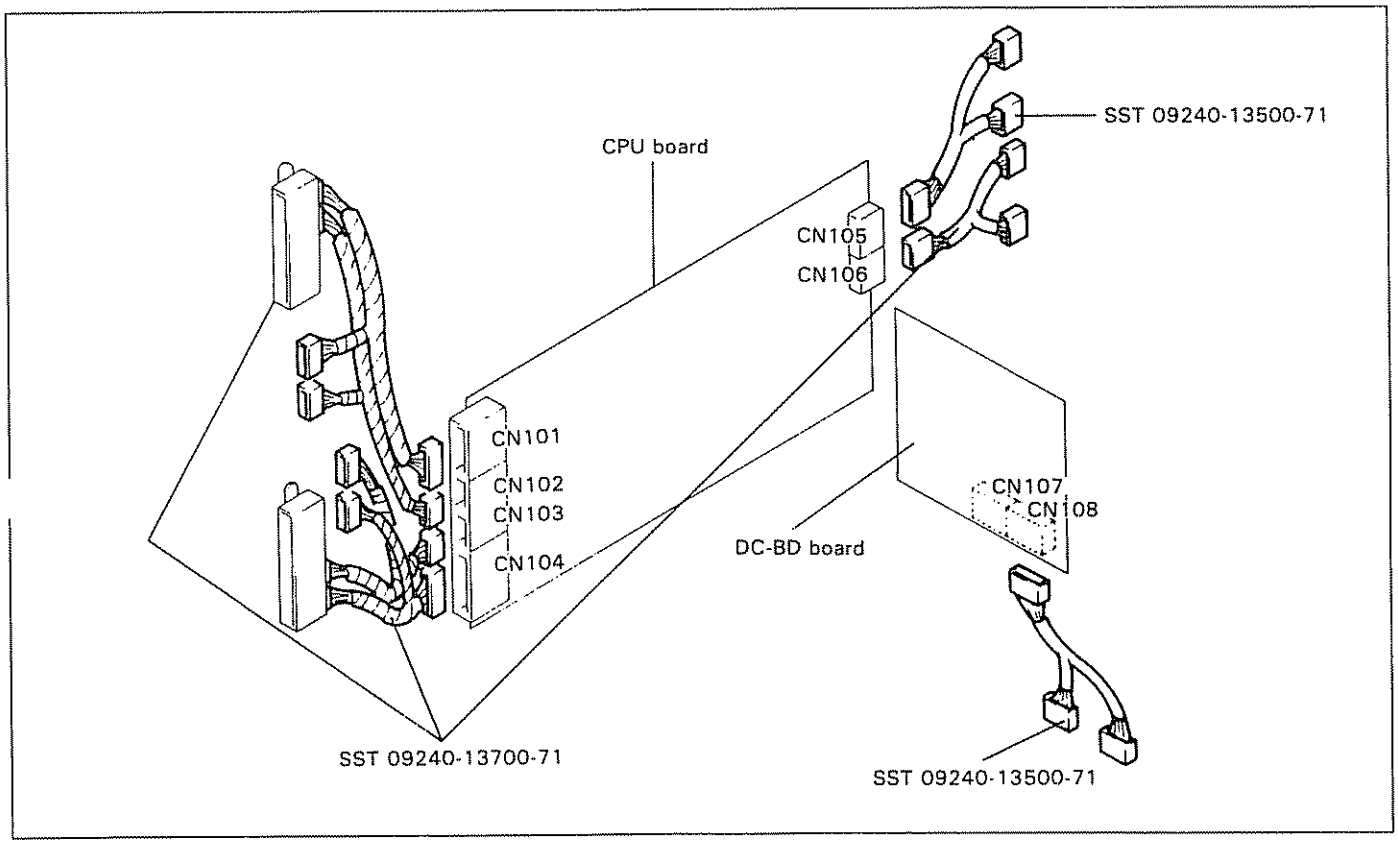
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11. CPU board·DC-BD board
If the cause of a trouble is judges to exist in the CPU or DC-BD board, apply the battery voltage, connect SST 09240-13700-71 and 09240-13500-71 and measure the applied voltage and resistance at each connector.

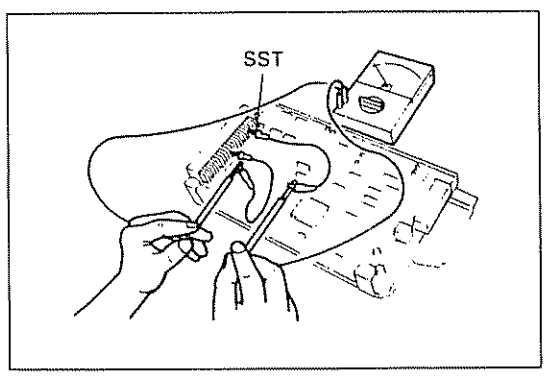
Caution:
Before mounting or removing the CPU or DC-BD board, be sure to disconnect the battery plug.

Note:
- **When a trouble is judged to have been caused by the CPU or DC-BD board to require replacement of the board, be sure to measure the applied voltage and resistance at related portions before replacement.**
- **Use SST 09240-13700-71 and 09240-13500-71 for measurement.**

(1) SST connection method
① Turn the key switch to OFF.
② Disconnect the battery plug.
③ Disconnect the connector (CN101 ~ CN108) for the CPU board and DC-BD board.
④ Connect the SST.



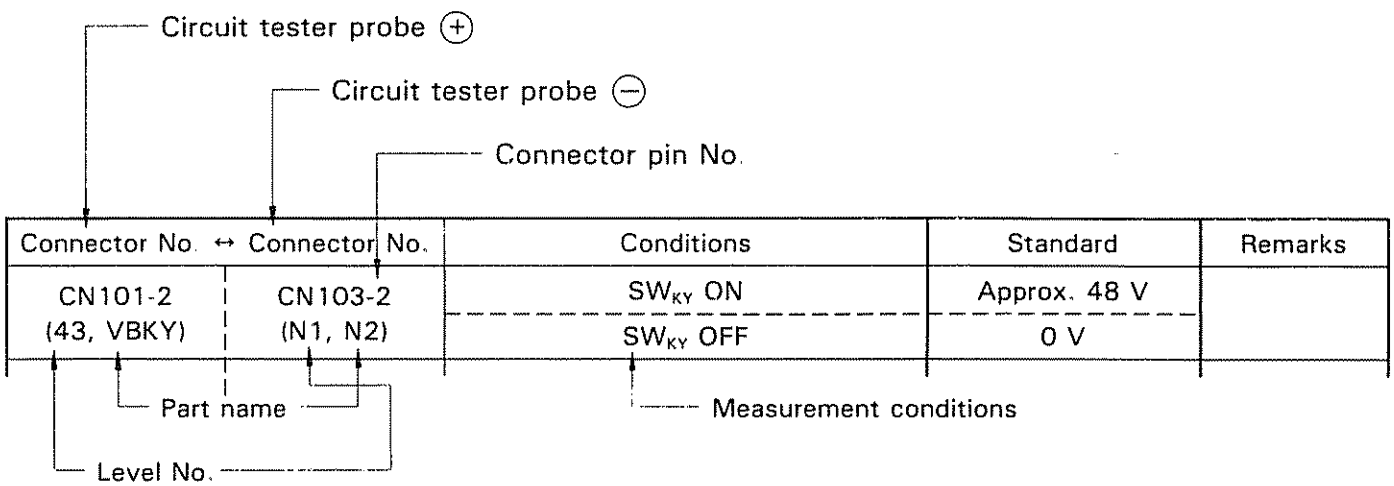
⑤ SST 09240-24300-71 may be used for the inspection of CN101 ~ 108.



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(2) List of measurement methods and standards

① How to read the list



Traveling and material handling systems

CN101 connector: Basic conditions (Battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Condition	Standard	Remarks
CN101-1		Unused		
CN101-2 (43, VBKY)	CN106-1 (N2, N2)	Key switch ON	Approx. 48 V	
		Key switch OFF	0 V	
CN101-3		Unused		
CN101-4		Unused		
CN101-5 (41, VBBT)	CN106-1 (N2, N2)		Approx. 48 V	
CN101-6		Unused		
CN101-7		Unused		
CN101-8 (41, VBBT2)	CN106-1 (N2, N2)		Approx. 48 V	
CN101-9 (43, VBKY2)	CN106-1 (N2, N2)	Key switch ON	Approx. 48 V	
		Key switch OFF	0 V	
CN101-10 (41, B48V/ 18, B72V)	CN106-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN101-11 (162, S2)	CN106-1 (N2, N2)	Upon steering wheel position change from right stroke end to left stroke end	0.4 V ~ 4.5 V	
CN101-12 (— —, OP POT)		Unused		
CN101-13 (17, GND D)	CN106-1 (N2, N2)		0 V	
CN101-14 (16, D12V)	CN106-1 (N2, N2)		13 V ~ 16 V	

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CN101 connector: Basic conditions (Battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN101-15 (55, POTL)	CN106-1 (N2, N2)	The voltage shall vary smoothly according to the lift lever operation.	0 V ~ 4.7 V	
CN101-16 (52, POTA)	CN106-1 (N2, N2)	The voltage shall vary smoothly according to the degree of accelerator pedal depression.	0.4 V ~ 4.7 V	
CN101-17 (143, SDTMK)		Not measurable		
CN101-18 (146, BIBC)		Not measurable		
CN101-19 (142, SDTMA)		Not measurable		
CN101-20		Unused		
CN101-21		Unused		
CN101-22		Unused		
CN101-23		Unused		
CN101-24 (141, SMTDA)		Not measurable		
CN101-25 (145, BIBD)		Not measurable		
CN101-26 (144, SMTDK)		Not measurable		
CN101-27 (163, S3)	CN106-1 (N2, N2)		0 V	
CN101-28 (51, POT−)	CN106-1 (N2, N2)		0 V	
CN101-29 (−−, OP POT+)		Unused		
CN101-30 (161, S1)	CN106-1 (N2, N2)		4.6 V ~ 5.25 V	
CN101-31 (54, POTL+)	CN106-1 (N2, N2)		4.4 V ~ 5.25 V	
CN101-32 (53, POTA+)	CN106-1 (N2, N2)		4.2 V ~ 5.25 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 (45, DSF)	CN106-1 (N2, N2)	DSF OFF	5 ± 0.25 V	
		DSF ON	0 V	
CN102-2		Unused		
CN102-3 (61, LST)	CN106-1 (N2, N2)	LST OFF	5 ± 0.25 V	
		LST ON	0V	
CN102-4 (——, LSL2)		Unused		
CN102-5 (60, LSL)	CN106-1 (N2, N2)	LSL OFF	5 ± 0.25 V	
		LSL ON	0 V	
CN102-6 (64, SW_{AC})	CN106-1 (N2, N2)	SW_{AC} OFF	5 ± 0.25 V	
		SW_{AC} ON	0 V	
CN102-7 (65, LSB1)	CN106-1 (N2, N2)	LSB OFF	0 V	
		LSB ON	5 ± 0.25 V	
CN102-8 (——, LSAT2)		Unused		
CN102-9 (46, DSR)	CN106-1 (N2, N2)	DSR OFF	5 ± 0.25 V	
		DSR ON	0 V	
CN102-10 (63, LSATT)	CN106-1 (N2, N2)	LSATT OFF	5 ± 0.25 V	
		LSATT ON	0 V	
CN102-11 (——, SOPT)		Unused		
CN102-12 (——, LSD)		Unused		
CN102-13 (82, SS1−)	CN102-14 (81, SS1+)	Upon stopping traveling	Approx. 0 V	
CN102-14 (81, SS1+)	CN102-13 (82, SS1−)	Upon stopping traveling	Approx. 0 V	
CN102-15 (——, ROPT)		Unused		
CN102-16 (——, LSOPT)		Unused		
CN102-17 (66, LSPB)	CN106-1 (N2, N2)	LSPB OFF	5 ± 0.25 V	
		LSPB ON	0 V	
CN102-18 (84, SS2−)	CN102-22 (83, SS2+)	Upon stopping traveling	Approx. 0 V	
CN102-19		Unused		
CN102-20 (51, LS−)	CN106-1 (N2, N2)		0 V	
CN102-21		Unused		
CN102-22 (83, SS2+)	CN102-18 (84, SS2−)	Upon stopping traveling	Approx. 0 V	

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CN103 connector: Basic conditions (Battery plug ON, key switch OFF)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN103-1 (2, MF−)	CN104-13 (1, M+)	Battery plug OFF and resistance measurement with CN104-13 as the ⊕ side (circuit tester ⊖ probe).	Approx. 37 Ω	MF coil resistance at 20°C
CN103-1 (2, MF−)	CN106-1 (N2, N2)	Key switch ON and voltage measurement with CN103-1 as the ⊕ side (circuit tester ⊕ probe)	Approx. 55 V	
CN103-2 (N2, N2C)	CN106-1 (N2, N2)		0 V	
CN103-3 (3, MR−)	CN104-13 (1, M+)	Battery plug OFF and resistance measurement with CN104-13 as the ⊕ side (circuit tester ⊖ probe)	Approx. 37 Ω	MR coil resistance at 20°C
CN103-3 (3, MR−)	CN106-1 (N2, N2)	Key switch ON and voltage measurement with CN103-3 as the ⊕ side (circuit tester ⊕ probe)	Approx. 55 V	
CN103-4 (P2, PLG2)	CN106-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN103-5 (4, MG−)	CN104-13 (1, M+)	Battery plug OFF and resistance measurement with CN104-13 as the ⊕ side (circuit tester ⊖ probe)	Approx. 37 Ω	MG coil resistance at 20°C
CN103-5 (4, MG−)	CN106-1 (N2, N2)	Key switch ON and voltage measurement with CN103-5 as the ⊕ side (circuit tester ⊕ probe)	Approx. 55 V	
CN103-6 (N2, N2C)	CN106-1 (N2, N2)		0 V	
CN103-7 (P3, PLG2−)	CN106-1 (N2, N2)	Key switch ON	Approx. 48 V	1- and 2-ton series
		MG ON	Approx. 72 V	3-ton series
CN103-8 (P11, VBP11)	CN106-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN103-9 (41, B48V, 18, B72V)	CN106-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN103-10		Unused		
CN103-11 (76, THCD)	CN106-1 (N2, N2)		2.5 V ~ 4.8 V	
CN103-12		Unused		
CN103-13		Unused		
CN103-14 (75, THC+)	CN106-1 (N2, N2)		5 ± 0.25 V	
CN103-15		Unused		
CN103-16		Unused		

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CN104 connector: Basic conditions (Battery plug ON, key switch OFF)

Connector No. ↔ Connector No		Conditions	Standard	Remarks
CN104-1		Unused		
CN104-2 (P14, TMPC)	CN106-1 (N2, N2)	Key switch OFF	Approx. 27 V	
		Key switch ON MP ON	Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN104-3 (P8, TMC)	CN106-1 (N2, N2)	Key switch OFF	Approx. 27 V	
		Key switch ON MG ON, MF or MR ON	Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN104-4		Unused		
CN104-5 (5, MP−)	CN104-4 (9, MP+)	Battery plug OFF and resistance measurement with CN104-14 as the ⊕ side (circuit tester ⊖ probe)	Approx. 37 Ω	MP coil resistance at 20°C
CN104-5 (5, MP−)	CN106-1 (N2, N2)	Key switch ON and voltage measurement with CN104-5 as the ⊕ side (circuit tester ⊕ probe)	Approx. 35 V	
CN104-6		Unused		
CN104-7 (72, CSP)	CN106-1 (N2, N2)	Key switch ON and material handling in stop state	1.2 ±0.1 V	
CN104-8 (71, CSD)	CN106-1 (N2, N2)	Key switch ON and traveling in stop state	1.2 ± 0.1 V	
CN104-9 (91, TGB)	CN106-1 (N2, N2)		Approx. 15 V	1- and 2-ton series
			Approx. 33 V	3-ton series
CN104-10 (P10, TGE)	CN106-1 (N2, N2)		Approx. 15 V	1- and 2-ton series
			Approx. 33 V	3-ton series
CN104-11		Unused		
CN104-12		Unused		
CN104-13 (1, M+)	CN106-1 (N2, N2)	Key switch ON	Approx. 55 V	
CN104-14 (9, MP+)	CN106-1 (N2, N2)		Approx. 48 V	
CN104-15 (7, MOPT−)		Unused		
CN104-16 (6, MS−)		Unused		
CN104-17		Unused		
CN104-18		Unused		
CN104-19		Unused		
CN104-20 (P3, VBP3)	CN106-1 (N2, N2)	Key switch ON	Approx. 48 V	1- and 2-ton series
		MG ON	Approx. 72 V	3-ton series

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN104-21 (P2, VBP2)	CN106-1 (N2, N2)		Approx. 48 V	
CN104-22		Unused		
CN104-23		Unused		
CN104-24		Unused		
CN104-25 (73, CSP+)	CN106-1 (N2, N2)	Key switch OFF	0 V	
		Key switch ON	12 ± 0.5 V	
CN104-26 (73, CSD+)	CN106-1 (N2, N2)	Key switch OFF	0 V	
		Key switch ON	12 ± 0.5 V	
CN104-27 (74, CSP−)	CN106-1 (N2, N2)		0 V	
CN104-28 (74, CSD−)	CN106-1 (N2, N2)		0 V	

CN105 connector: Basic conditions (F3 fuse removal, TMPS gate connectors 1～4 disconnection (see page 2-12), battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN105-1		Unused		
CN105-2		Unused		
CN105-3 (172, SH1+)		Not measurable		
CN105-4 (174, SH2+)		Not measurable		
CN105-9		Unused		
CN105-10 (0− CHK)	CN105-11 (N2, N2)		Approx. 12 V	
CN105-11 (N2, N2)	Panel N1 terminal	Battery plug OFF, Key switch OFF	Approx. 0 Ω	CPU N2↔N1 continuity check
CN105-11 (N2, N2)	CN107-1 (N2, N2)	Battery plug OFF, Key switch OFF	Approx. 0 Ω	CPU N2 ↔ DC-BD N2 continuity check
CN105-12		Unused		
CN105-13		Unused		
CN105-14 (173, SH1−)		Not measurable		
CN105-15 (175, SH2−)		Not measurable		
CN105-16 (168, TMPS1G)	CN105-5 (169, TMPS1E)	Battery plug OFF, key switch OFF (circuit tester range: Ω × 1 K)	Approx. 100 kΩ	TMPS1 gate-emitter circuit
CN105-16 (168, TMPS1G)	CN105-5 (169, TMPS1E)	Steering wheel in left turn or neutral position	Approx. 0 V	Upper arm TMPS1 gate voltage
		Steering wheel in right turn position	Approx. 15.5 V	

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Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN105-17 (164, TMPS3G)	CN105-6 (165, TMPS3E)	Battery plug OFF, key switch OFF (circuit tester range: Ω × 1 K)	Approx. 100 kΩ	TMPS3 gate emitter-circuit
CN105-17 (164, TMPS3G)	CN105-6 (165, TMPS3E)	Steering wheel in right turn or neutral position	Approx. 0 V	TMPS3 gate voltage
		Steering wheel in left turn position	Approx. 15.5 V	
CN105-18 (170, TMPS2G)	CN105-7 (171, TMPS2E)	Battery plug OFF, key switch OFF (circuit tester range: Ω × 1 K)	Approx. 100 kΩ	TMPS2 gate emitter-circuit
CN105-18 (170, TMPS2G)	CN105-11 (N2, N2)	Steering wheel in right turn or neutral position	Approx. 0 V	1-ton series: Approx. 0 to 13 V 2- and 3-ton series: Approx. 0 to 12 V
		The voltage shall change smoothly when the steering wheel is operated to the left turn position.	See Remarks	
CN105-19 (166, TMPS4G)	CN105-8 (167, TMPS4E)	Battery plug OFF, key switch OFF (circuit tester range: Ω × 1 K)	Approx. 100 kΩ	TMPS4 gate emitter-circuit
CN105-19 (166, TMPS4G)	CN105-11 (N2, N2)	Steering wheel in left turn or neutral position	Approx. 0 V	1-ton series: Approx. 0 to 13 V 2- and 3-ton series: Approx. 0 to 12 V
		The voltage shall change smoothly when the steering wheel is operated to the right turn position.	See Remarks	
CN105-20		Unused		
CN105-21		Unused		
CN105-22 (N2, N2)	Panel N1 terminal	Battery plug OFF, Key switch OFF	Approx. 0 Ω	CPU N2 ↔ N1 continuity check

CN106 connector: Basic conditions (Battery plug ON, key switch OFF)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN106-1 (N2, N2)				
CN106-2 (15, C18V)	CN106-1 (N2, N2)		18 ± 1 V	
CN106-3 (16, D12V)	CN106-1 (N2, N2)		13 V ~ 16 V	
CN106-4		Unused		
CN106-5 (32, TMDR1)	CN106-1 (N2, N2)		18 ± 1 V	
CN106-6 (37, TMPDR1)	CN106-1 (N2, N2)		18 ± 1 V	
CN106-7 (N2, N2)	CN106-1 (N2, N2)		0 V	
NC106-8		Unused		
CN106-9 (14, GNDC)	CN106-1 (N2, N2)		0 V	
CN106-10		Unused		
CN106-11		Unused		
CN106-12		Unused		

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CN107 connector: Basic conditions (Battery plug ON, key switch ON)

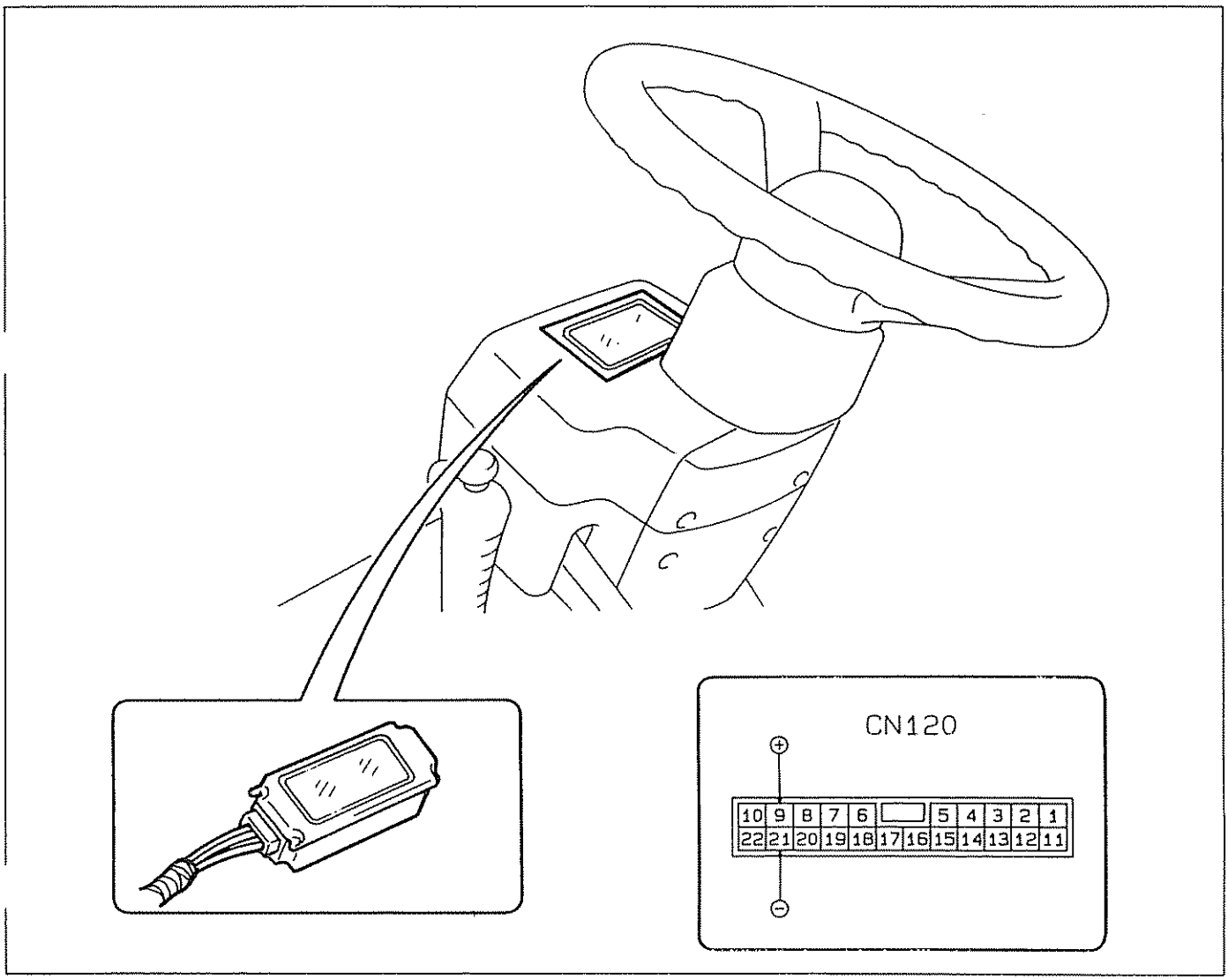
Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN107-1 (N2, N2)				
CN107-2 (15, C18V)	CN107-1 (N2, N2)		18 ± 1 V	
CN107-3 (14, GNDC)	CN107-1 (N2, N2)		0 V	
CN107-4 (P11, P11)	CN107-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN107-5 (N1, N1)	CN107-1 (N2, N2)		0 V	
CN107-6 (P21, P21)	CN107-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN107-7 (41, B48V, 18, B72V)	CN107-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN107-8 (16, D12V)	CN107-1 (N2, N2)		13 V ~ 16 V	
CN107-9 (32, TMDR1)	CN107-1 (N2, N2)		18 ± 1 V	
CN107-10 (37, TMPDR1)	CN107-1 (N2, N2)		18 ± 1 V	
CN107-11		Unused		
CN107-12		Unused		
CN107-13		Unused		
CN107-14		Unused		

CN-108 connector: Basic conditions (Battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN108-1 (92, TMB)		Not measurable		
CN108-2		Unused		
CN108-3		Unused		
CN108-4 (93, TMPB)		Not measurable		
CN108-5 (P9, P9)	CN107-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN108-6 (P8, TMC)	CN107-1 (N2, N2)	Key switch OFF	Approx. 27 V	
		MG ON, MF or MR ON	Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN108-7		Unused		
CN108-8		Unused		
CN108-9 (P15, P15)	CN107-1 (N2, N2)		Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series
CN108-10 (P14, TMPC)	CN107-1 (N2, N2)	Key switch OFF	Approx. 27 V	
		MP ON	Approx. 48 V	1- and 2-ton series
			Approx. 72 V	3-ton series

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15. Display (Option)
When the cause of a trouble is judged to exist in the display, apply the battery voltage and measure the voltage applied to each connector.



CN 120 connector: Basic condition (battery plug ON, key switch ON)

Connector No. ↔ Connector No.		Conditions	Standard	Remarks
CN120-9 (16, D12V)	CN120-21 (N2, N2)		Approx. 13 – 16 V	
CN120-10 (43, 48V)	CN120-22 (N1, N1)		Approx. 48 V	

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DISASSEMBLY

The control panel rarely requires overhaul. In most cases, defective parts are replaced after checking the trouble cause through inspection.
Thus, perform correct operation by referring to the component diagrams and assembly drawings.

Precautions for Parts Replacement

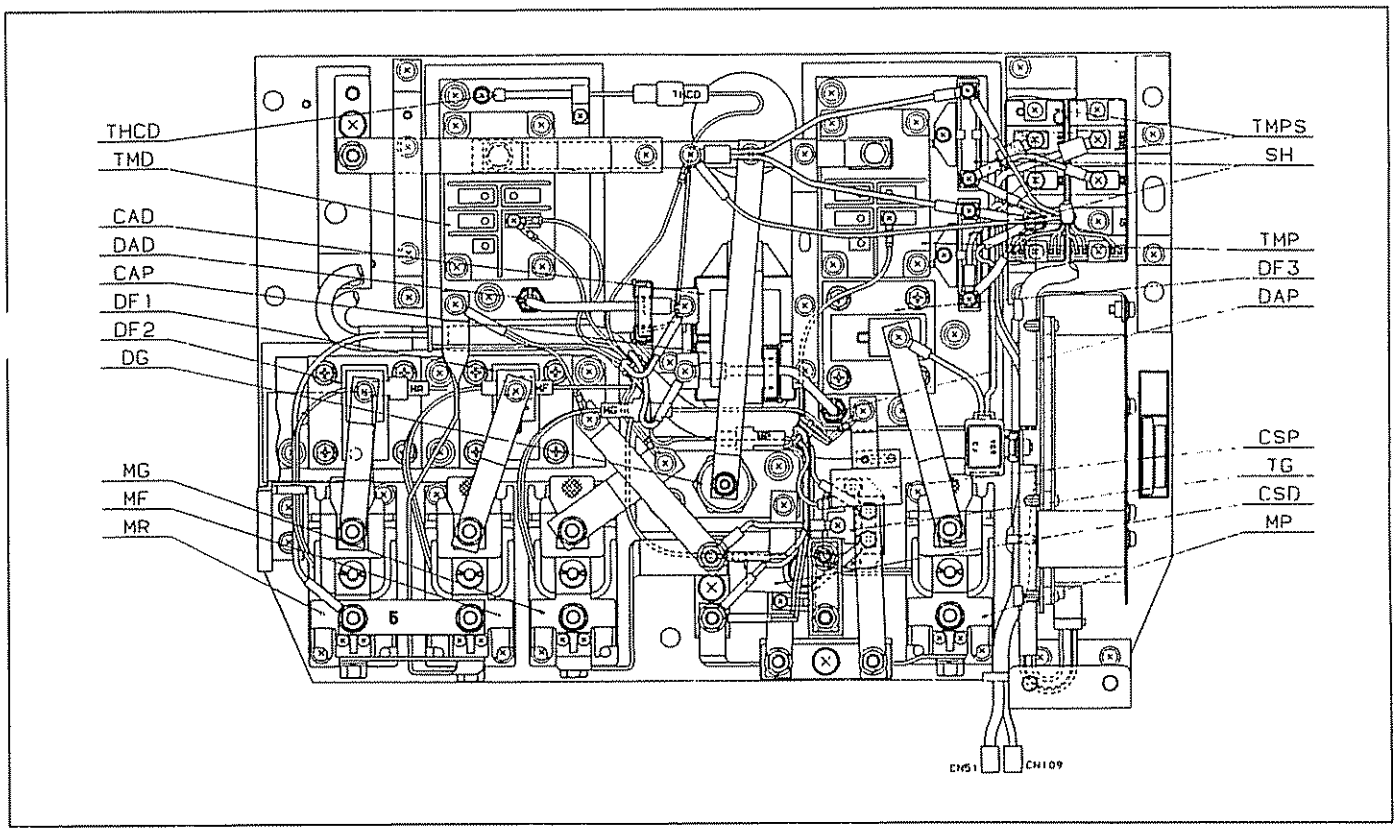
- Tighten bar and harness mounting nuts and screws to the specified torque. Looseness or omission of tightening will cause troubles.
- When a bar or harness is to be disconnected, be sure to note the mounting position or put a tag. When it is reconnected, check the note or tag to prevent wrong installation or wiring. Wrong installation or wiring may cause another trouble.
- Parts coated with silicone grease must be recoated before installation. Omission of silicone grease application may cause overheating.
- After reassembly, make sure that the non-contact portion of a bar or wiring is not in erroneous contact.

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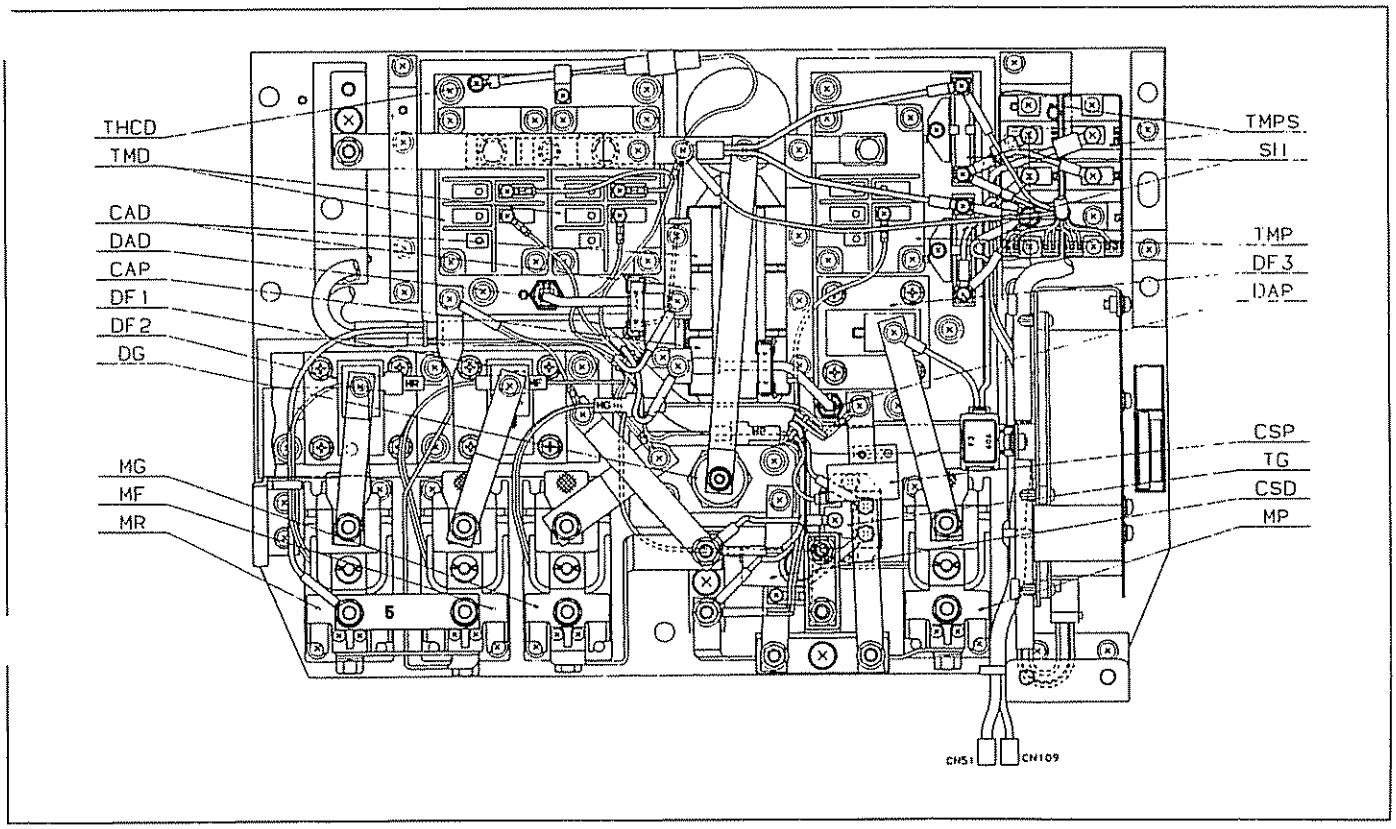
REASSEMBLY

Control Panel Assembly Drawing

1-ton series



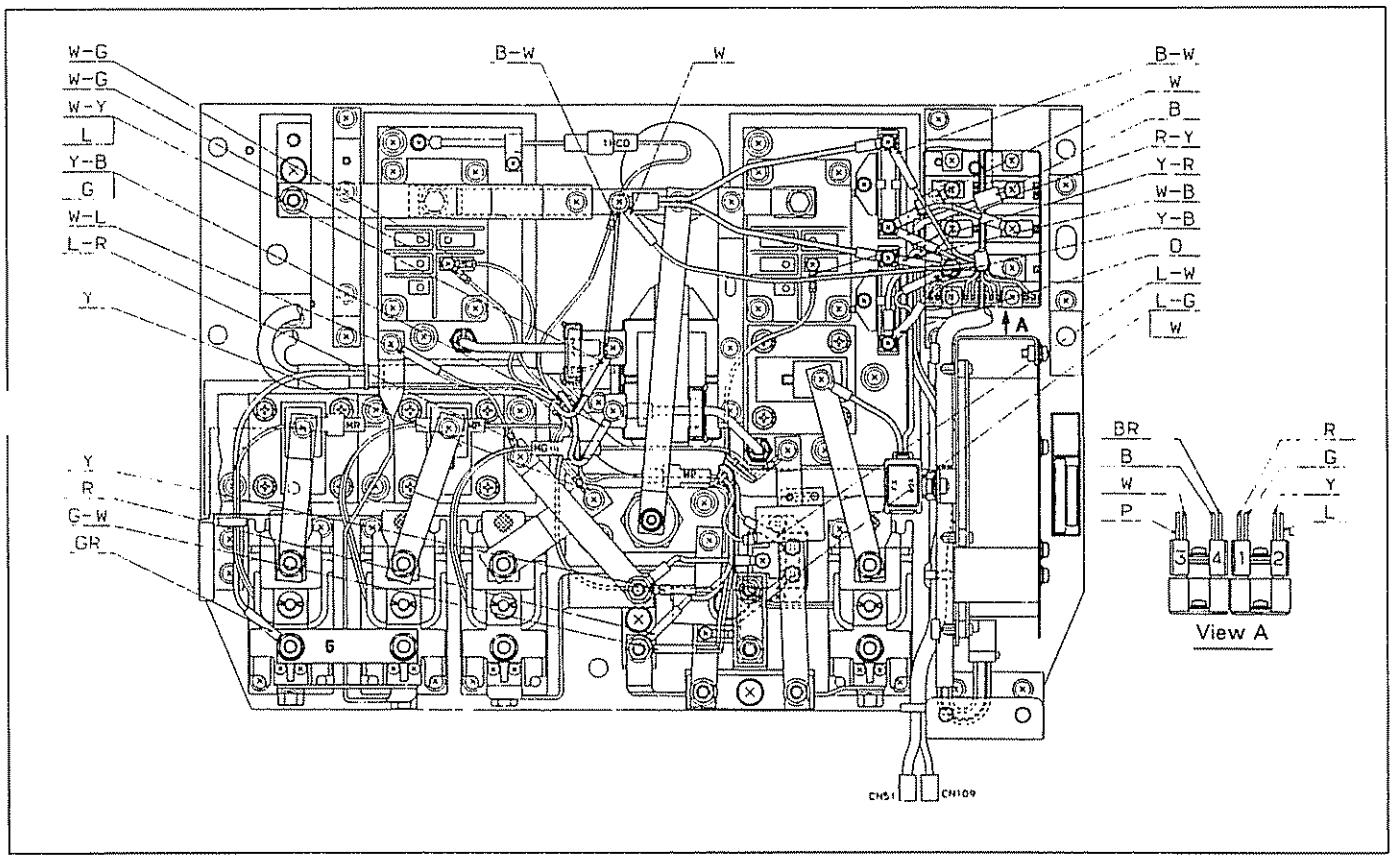
2·3-ton series



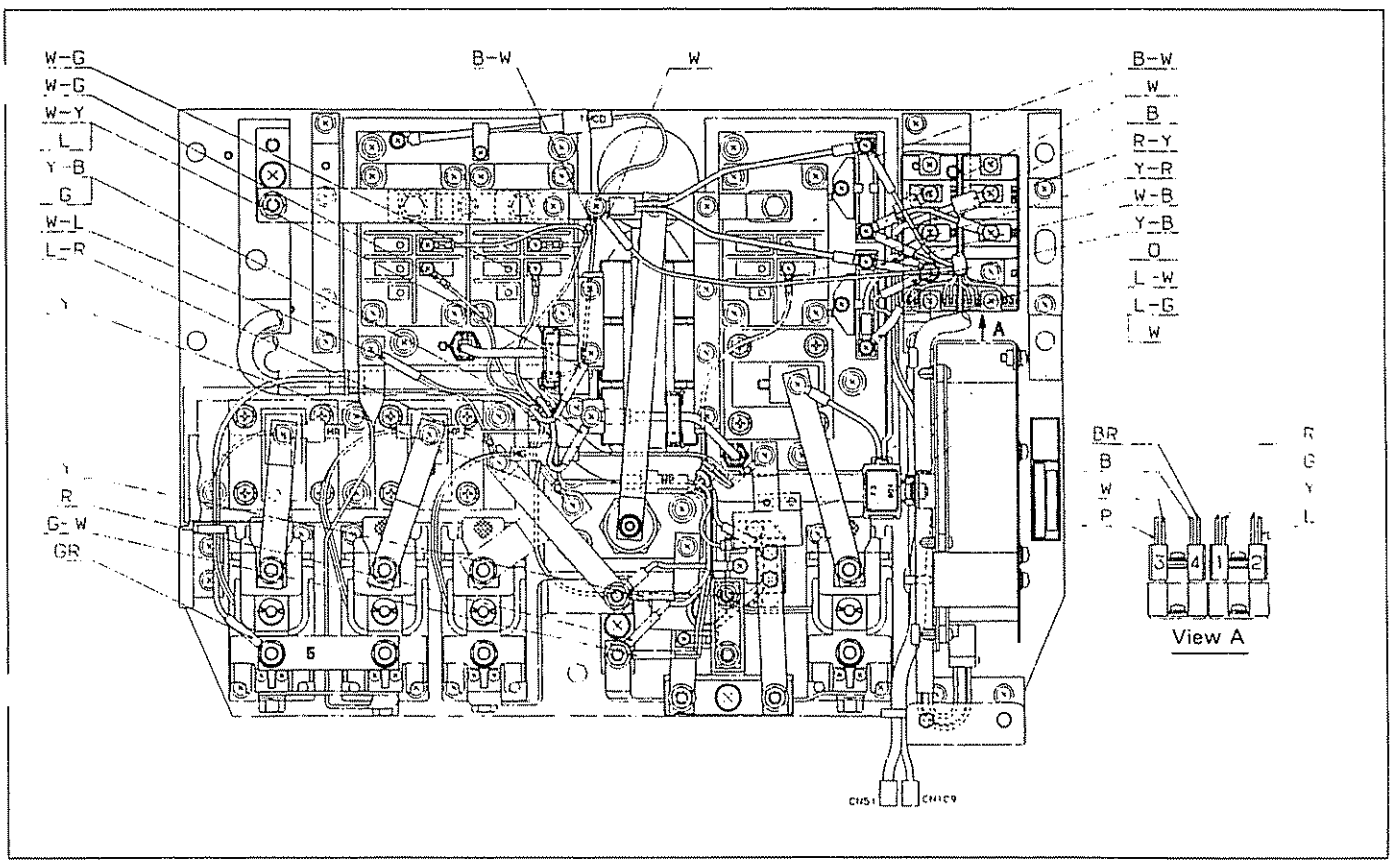
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Control Panel Internal Wiring Diagram

1-ton series



2·3-ton series

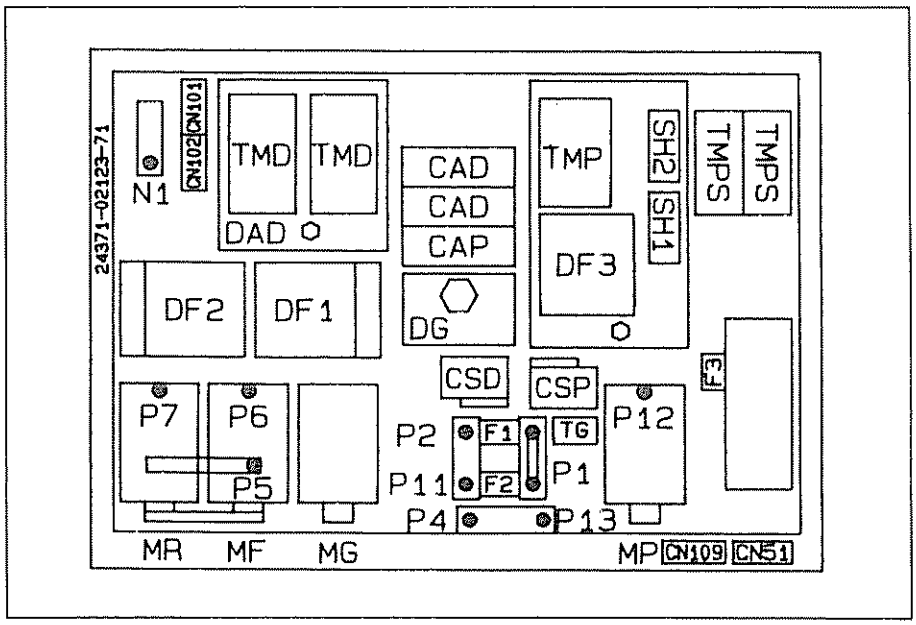


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Control Panel Parts Tightening Torques

Item			Tightening torque N·m (kgf-cm) [ft-lbf]
TMD TMP	Main terminal	M8	9.8 ± 2 (100 ± 20) [7.2 ± 1.4]
		M4	1.5 ± 0.2 (15 ± 2) [1.09 ± 0.14]
	For installation	M5	2.5 ± 0.5 (25.5 ± 5) [1.84 ± 0.36]
DF1·DF2·DF3 DG	Main terminal	M5	4.9 ± 0.5 (50 ± 5) [3.62 ± 0.36]
	For installation	M5	4.9 ± 0.5 (50 ± 5) [3.62 ± 0.36]
DAD·DAP	Main terminal	M6	2.9 ± 0.5 (30 ± 0.5) [2.17 ± 0.04]
TG	Main terminal	M4	1.5 ± 0.2 (15 ± 2) [1.09 ± 0.14]
	For installation	M5	2.5 ± 0.5 (25 ± 5) [1.81 ± 0.36]
TMPS	Main terminal	M5	2.5 ± 0.5 (25 ± 5) [1.81 ± 0.36]
	For installation	M5	2.5 ± 0.5 (25 ± 5) [1.81 ± 0.36]
SH1·SH2	Main terminal	M4	1.3 ± 0.2 (13 ± 2) [0.94 ± 0.14]
Heat sink	For installation	M5	2.5 ± 0.5 (25 ± 5) [1.81 ± 0.36]
Terminal bolt for external wiring connection		M8	9.8 ± 2 (100 ± 20) [7.2 ± 1.4]

Continuity check with a circuit tester



Inspection Method

Inspection portion		Standard	Circuit tester range
P2 — N1	P2: ⊕ probe — N1: ⊖ probe	Approx. 10 to 30 Ω	Ω × 1 K
	P2: ⊖ probe — N1: ⊕ probe	*∞ Ω	
P11 — N1	P11: ⊕ probe — N1: ⊖ probe	Approx. 10 to 30 Ω	Ω × 1 K
	P11: ⊖ probe — N1: ⊕ probe	* ∞ Ω	
P2 — frame	Tester probes may be used in either direction.	∞ Ω	Ω × 1 K
N1 — frame	Tester probes may be used in either direction.	∞ Ω	Ω × 1 K

* Because the capacitor is charged in the first inspection, the pointer indicates the capacitor characteristic.
Capacitor characteristic: The pointer deflects to 0 Ω once and returns to ∞ Ω.

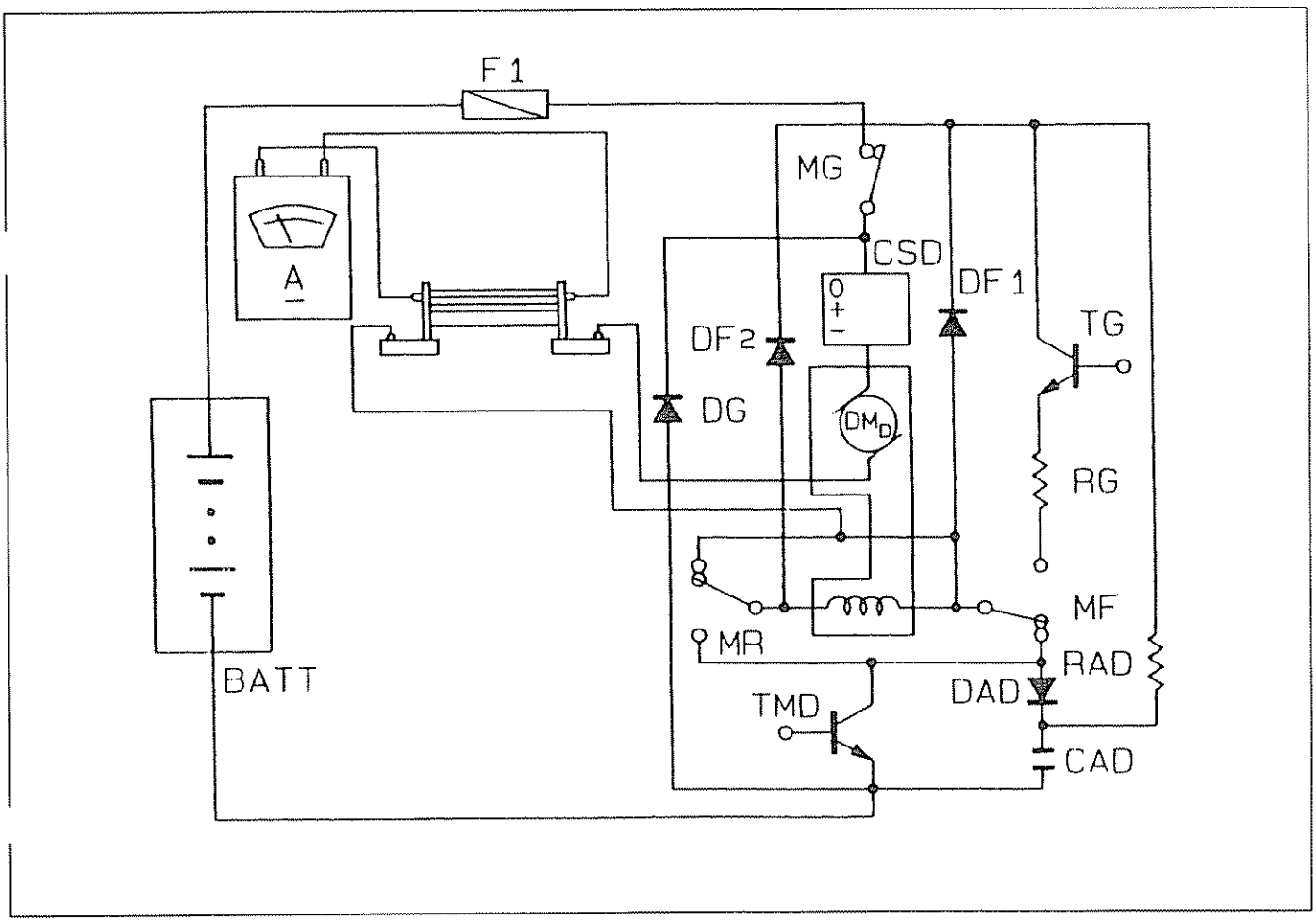
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OCL (OVERCURRENT LIMIT) VALUES

1. Drive circuit OCL value measurement

(1) Measurement

Lock the drive wheel in the operated state, and connect an ammeter and shunt to the drive motor circuit to measure the OCL value. (The parking and foot brakes must both be released before this measurement.)



Shunt to be used: 50 mV, 750 A

	1-ton series	2-ton series	3-ton series
Standard OCL value	370A ± 35A	490A ± 45A	380A $^{+45A}_{-35A}$

(2) Judgment method

If the measured OCL value is not within the standard, the drive circuit current sensor (CSD) or CPU board may be defective. Make judgment as follows:

① Jack up the vehicle until drive wheels leave the ground and support both sides of the frame with wooden blocks.

② Measure the output voltage of the current sensor. (Offset voltage: Measured value B)
Condition: Battery plug ON, key switch ON
Measurement terminals: CN104-8(11): ⊕ probe – CN104-28(74): ⊖ probe
Standard: Approx. 1.2 V
*Use a digital voltmeter for measurement.

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③ With the accelerator in operated state, read the ammeter and measure the current sensor output voltage on the CPU board side at the same time.
(Ammeter reading: A)
(Measured current sensor output voltage: C)
Measurement terminals: CN104-8(71): ⊕ probe — CN104-28(74): ⊖ probe
* Use a digital voltmeter for measurement.

④ Calculation
Measured value C — Measured value B = D
Convert calculated value D according to the following equation. (Converted value: E)
1 V = 100 A (E = 100 × D)

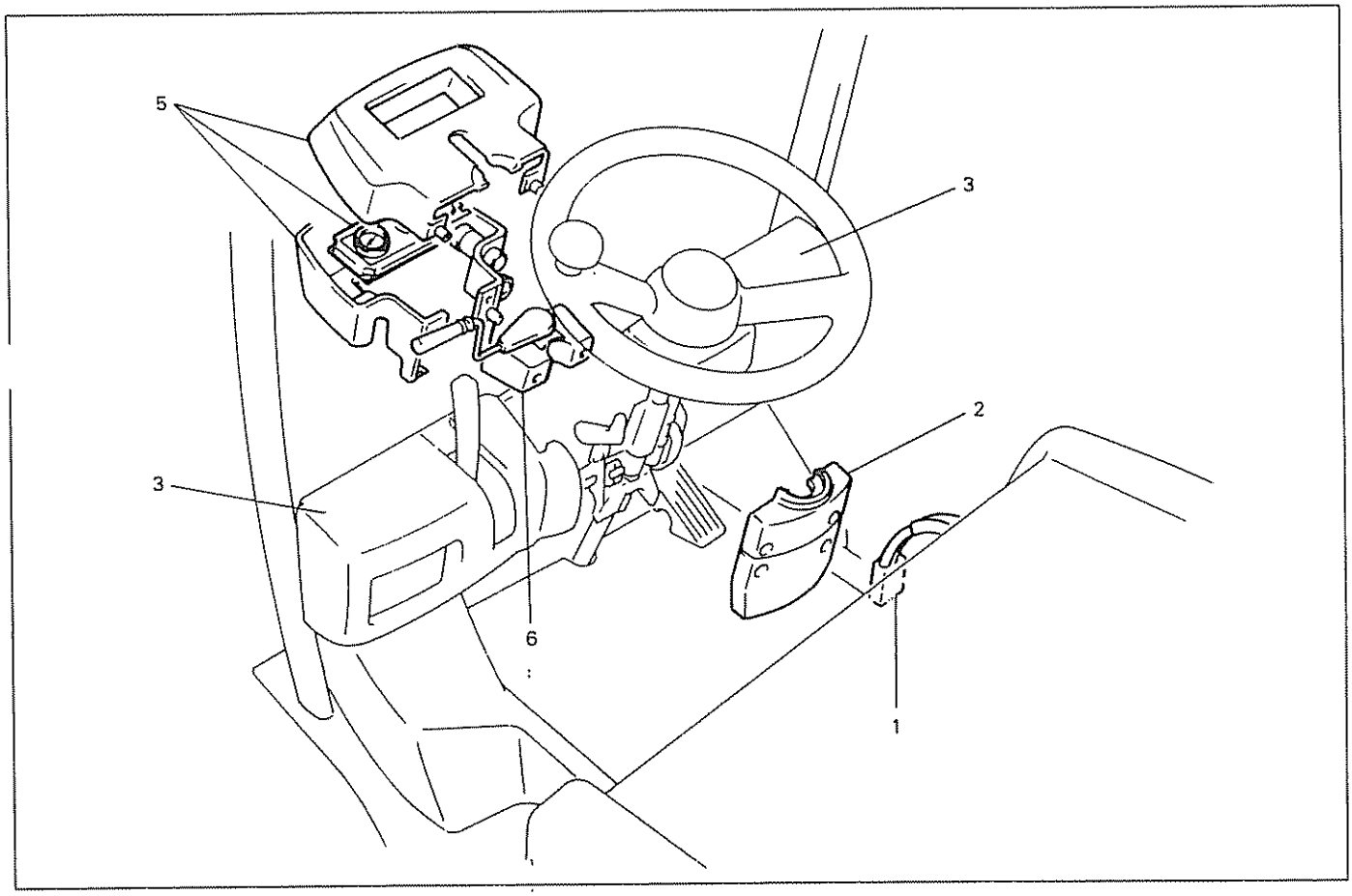
⑤ Judgment
Compare converted value E with measured value A in step ③. The current sensor is judged normal if the result is within ±5%. The CPU board may be defective if the current sensor is judged normal. Replace the CPU board in that case.

2. Measurement of material handling circuit OCL value
The OCL value of the material handling circuit cannot be measured because of the following reasons:
In the material handling system, the relief valve in the control valve is operated at each cylinder stroke end.
The OCL value of the material handling circuit is set to a level higher than the current at the relief valve set pressure.
The OCL value, therefore, cannot be measured since relief in the hydraulic circuit occurs before the current of the material handling circuit reaches the OCL value.

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DIRECTION SWITCH

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the steering cover.

3 Remove the instrument panel LH and RH.

4 Disconnect the wiring of the display and direction switch.

5 Remove the meter cover W/display.

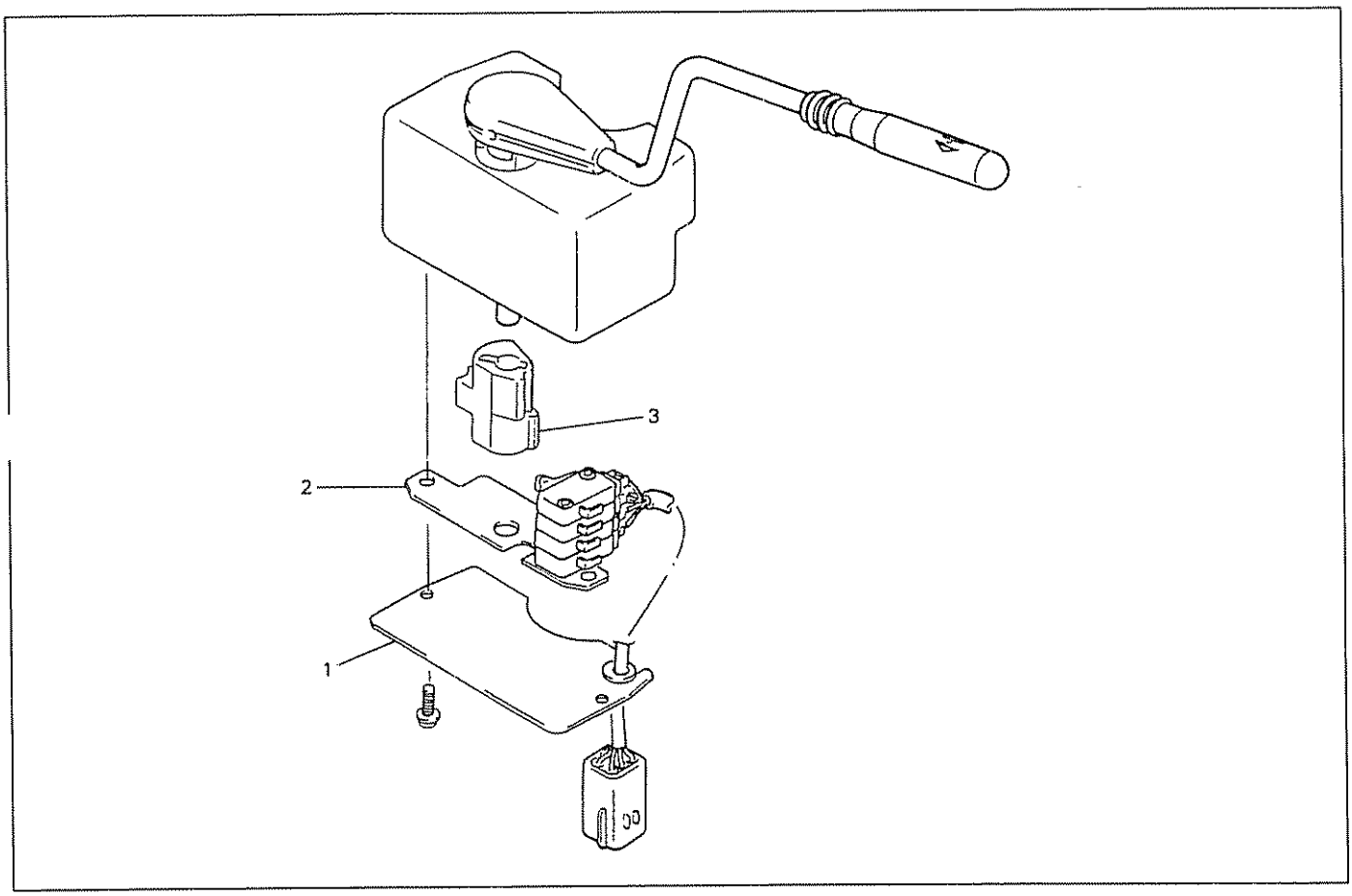
6 Remove the direction switch.

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.

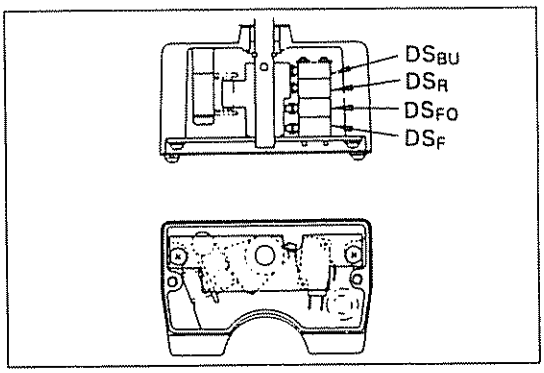
2 Remove the base W/microswitch. **[Point 1]**

3 Remove the cam.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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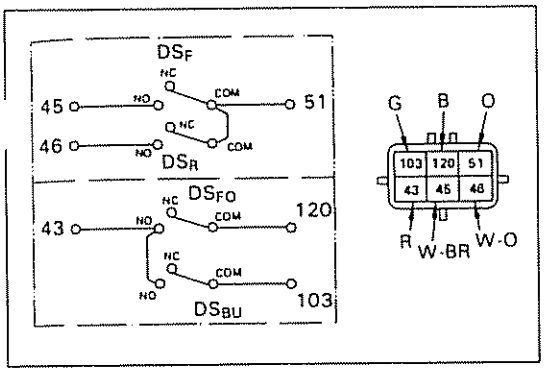


Point Operation

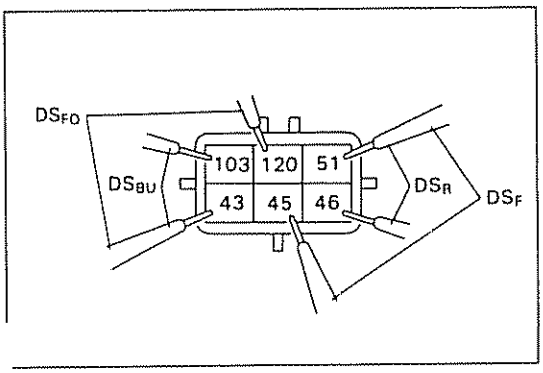
[Point 1]

Reassembly:

1. Install the microswitch in the correct position.



2. When replacing the microswitch, perform wiring according to the cable colors in the illustration.

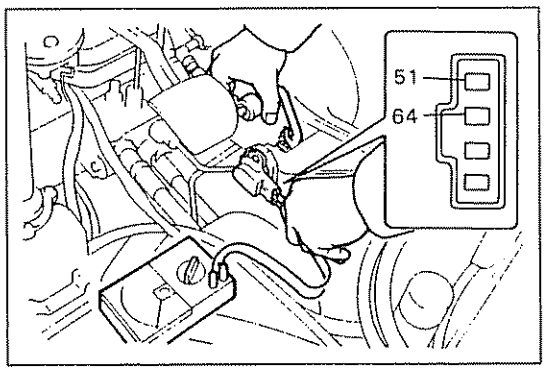


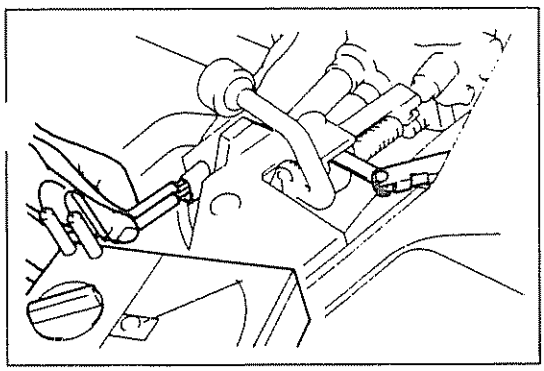
INSPECTION

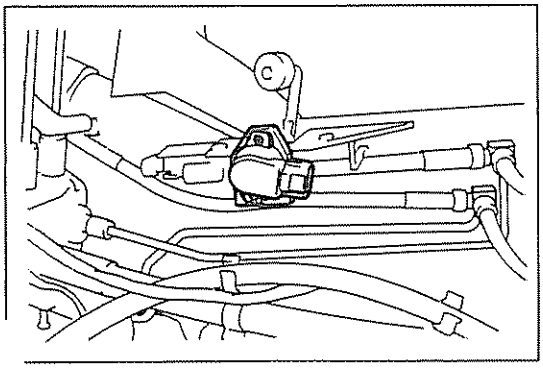
After reassembling the direction switch, check each switch for continuity before installation.

Standards	Lever position		
Inspection portion	Neutral	Forward	Reverse
DS_F	∞ Ω	0 Ω	∞ Ω
DS_R	∞ Ω	∞ Ω	0 Ω
DS_{FO}	∞ Ω	0 Ω	∞ Ω
DS_{BU}	∞ Ω	∞ Ω	∞ Ω

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ACCELERATION POTENTIOMETER ADJUSTMENT

1. Operate the accelerator pedal and inspect if the switch is turned on and off.

Measurement terminals		51 — 64
Standard	When the pedal is not operated	∞ Ω
	When the pedal is operated	Approx. 2.6 kΩ

2. Adjust installation of the acceleration potentiometer.

(1) Insert a 1.5 mm (0.059 in) thickness gage between the acceleration link stopper and accelerator bracket.

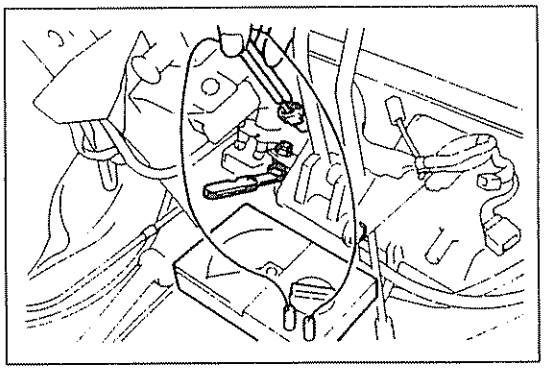
(2) Temporarily install the potentiometer so that the acceleration switch (SW_{AC}) is turned ON.

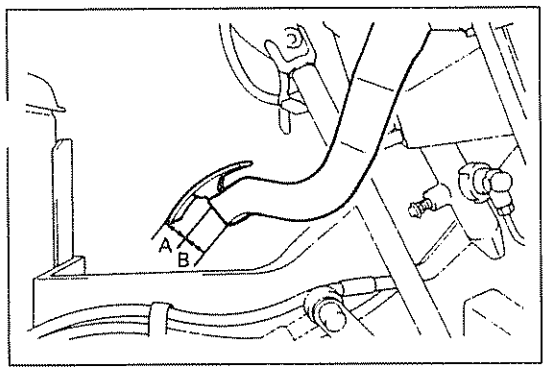
(3) Inspect the acceleration switch (SW_{AC}) ON and OFF switching points.

When a 1.0 mm (0.039 in) thickness gage is inserted: ON (∞ Ω)
When a 2.0 mm (0.079 in) thickness gage is inserted: OFF (0 Ω)

(4) After switch ON-OFF adjustment, coat 08833-00070 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 ~ 10 mm (0.20 ~ 0.39 in)

2. Adjust the limit switch roller protrusion.

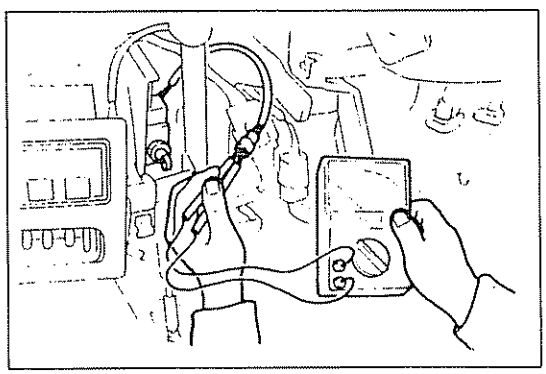
3. Operate the brake pedal and inspect the limit switch continuity.

   Standard
   When not operated: OFF (0 Ω)
   When operated: ON (∞ Ω)

4. Adjust the brake pedal arm and limit switch ON/OFF timings.

   Standard
   RH side (for stop lamp):
   The switch is turned ON at 5 to 10 mm (0.20 to 0.39 in) (dimension A in the figure) in the brake pedal play range.
   LH side (for regenerative braking):
   The switch is turned ON when the brake pedal is depressed by 3 to 8 mm (0.12 to 0.31 in) (dimension B in the figure) from the end of its play range.

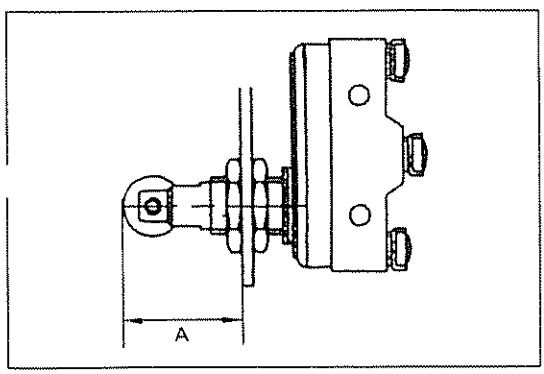
5. If the standard is not satisfied, make adjustment by bending the switch bracket.



PARKING BRAKE ADJUSTMENT

1. Inspect the ON-OFF state of the parking brake switch.

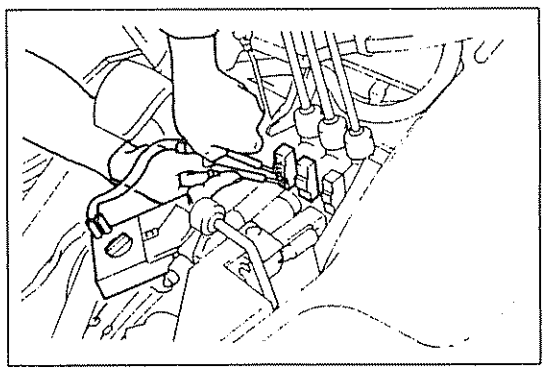
   Standard
   When the lever is returned: OFF (0 Ω)
   When the lever is pulled: ON (∞ Ω)

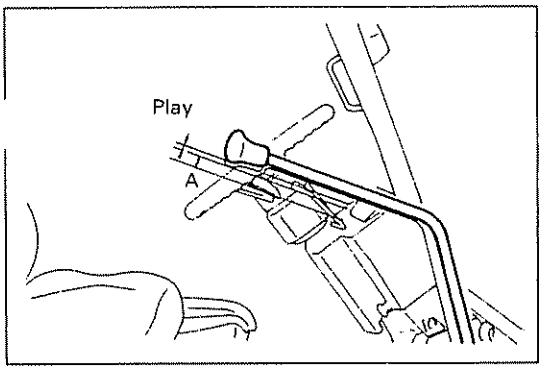


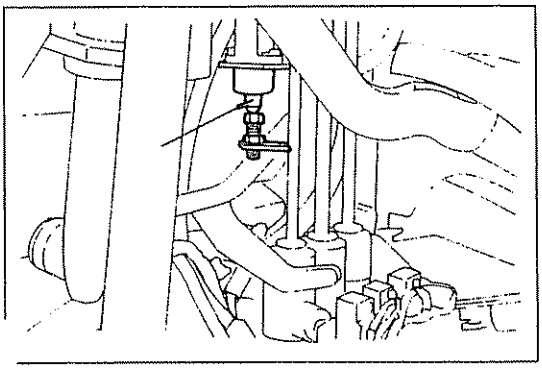
2. Make adjustment so that the limit switch is turned OFF when the lever is fully returned and turned ON before it is gradually pulled and the pawl rides over the first notch.
   Adjust the limit switch roller out-length to "A":

   A = 27 ~ 30 mm (1.06 ~ 1.18 in)

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MATERIAL HANDLING LEVER SWITCH ADJUSTMENT

1. Operate the lift lever, and inspect the limit switch for continuity.

   Standard
   When not operated: OFF (∞ Ω)
   When operated: ON (0 Ω)

2. Operate the lift lever, and inspect if the limit switch is turned ON at dimension A after the play is eliminated.

   A = 10 ~ 20 mm (0.39 ~ 0.79 in) (The same applies to the tilt lever.)

3. When the ON timing of the limit switch is not within dimension A above, adjust the limit switch installed position.

Make the same adjustment for the tilt lever.

LIFT POTENTIOMETER ADJUSTMENT

1. Inspect if the lift potentiometer is turned ON and OFF by the lift lever operation.

   Standard
   When not operated: OFF (∞ Ω)
   When operated: ON (Approx. 5 kΩ)

2. Push the stroke sensor cap in fully to the depth.

3. Pull the lift lever as much as its play, and adjust the stopper bolt length so that the gap between the stroke sensor cap and stopper becomes standard.

   Standard : ~ 1998. 1 0 ± 1 mm (0 ± 0.039 in)
   1998. 2 ~ $0^{+0.5}_{-0}$ mm ($0^{+0.020}_{-0}$ in)

4. Coat MP grease on the arrow portion in the figure.

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ALL-ROUND DISPLAY FUNCTIONS

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DIAGNOSIS

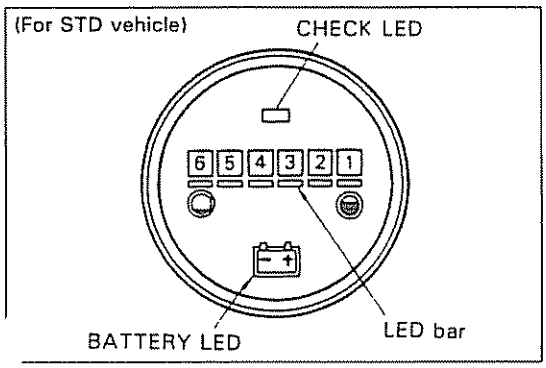
GENERAL

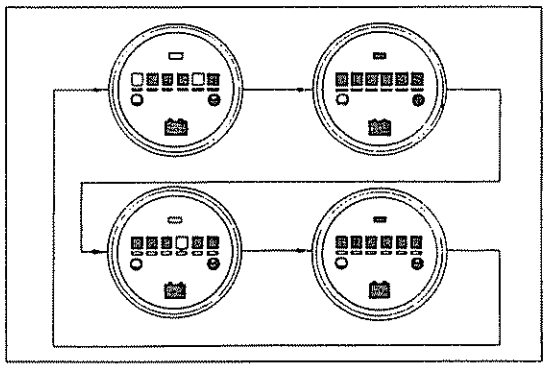
The 6FB series has the diagnostic function, which automatically detects errors in the main drive and material handling circuits, operation systems such as the accelerator, sensors, etc., and displays these errors by ON/OFF patterns of the LEDs on the all-round display.

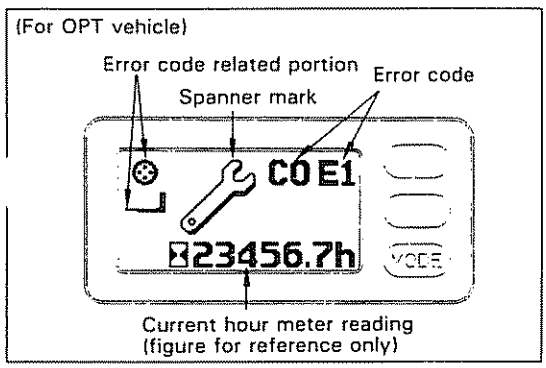
At the same time, safe operation is ensured by automatically stopping traveling, material handling and EPS or by controlling the traveling speed.
Depending on the trouble, the error is only displayed. Although the vehicle may be operated in this state, make necessary repairs as soon as possible.

It is also possible to connect an SST (plug-in analyzer) to the controller to change the vehicle feeling, detect a defective portion and to check the functions of the main drive and material handling circuits, ,ch operation system, sensors, etc.

Use these functions fully for early detection and elimination of electrical system troubles.







1. Diagnostic display

   The defective portion is indicated by the ON/OFF pattern of the LEDs on the display.
   All occurred errors are displayed.
   One error is indicated for three seconds followed by all off for one second, the next error is indicated for three seconds followed by all off for one second, and so on until all errors are indicated.

   (Ex.)
   The figure at left shows the case where the main drive circuit and drive current sensor are defective.

   Make necessary repairs soon according to the error indication on the display while referring to the Troubleshooting section in this manual.

   The vehicle with the all-round display is provided as an option.

   In the OPT vehicle (with the all-round display), up to five errors are displayed on one screen.

   This section mainly explains the method for operating the all-round display.

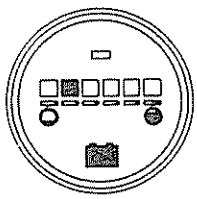
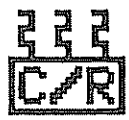
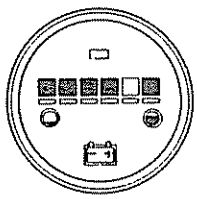
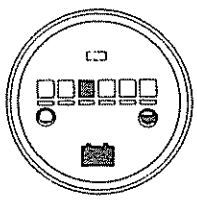
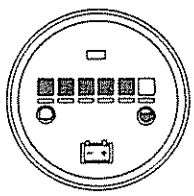
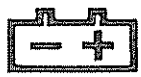
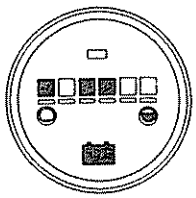
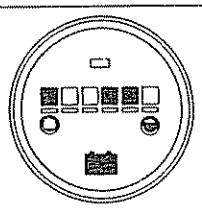
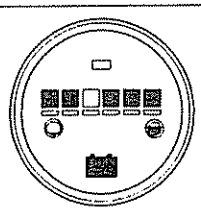
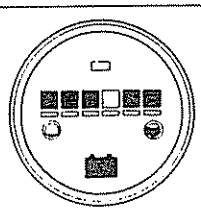
   Note:
   The SST (plug-in analyzer) operation method is partially different from the operation method on the OPT vehicle. Refer to the manual packed with the SST.

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Diagnostic error code list

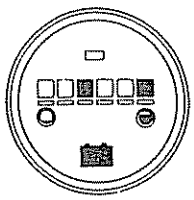
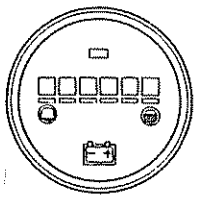
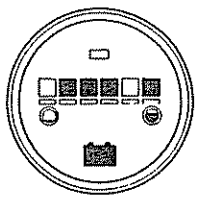
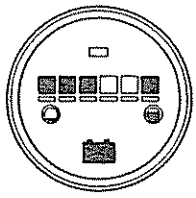
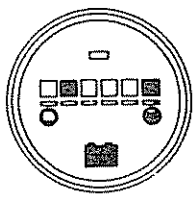
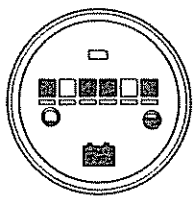
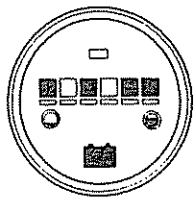
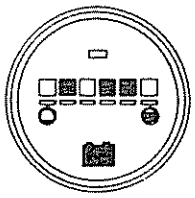
□: On ■: Off

When equipped with a all-round display (OPT)

LEDs	LCD	Analyzer memory	Faulty portion	Fault mode	Phenomenon observed in vehicle
		A0-1	MCS main circuit	Over heat	Travel speed goes down
	A1	A1	MCS main circuit	Overvoltage	Traveling, material handling, and EPS stop
		A2	CPU board	Abnormal temperature rise	Travel speed goes down
		A3	Battery	Abnormally high voltage	Traveling, material handling, and EPS stop
	A4	A4	Traveling accelerator	Accelerator potentiometer fault	Traveling stops
	A6	A6-1 A6-3 A6-5 A6-6	Material handling system switch	Lift switch 1 fault Tilt switch fault Attachment switch 1 fault Attachment switch 2 fault	Material handling stops
	A8	A8	Traveling system fuse F1	Fuse open	Traveling stops
	A9	A9	Material handling system fuse F2	Fuse open	Material handling stops

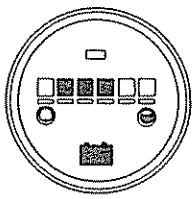
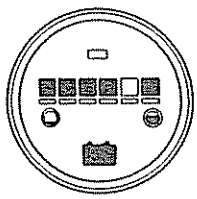
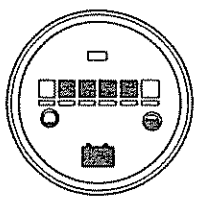
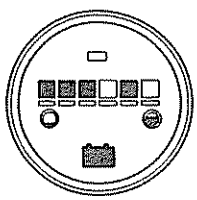
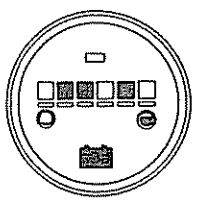
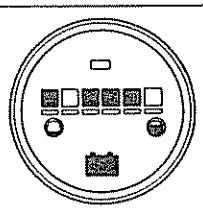
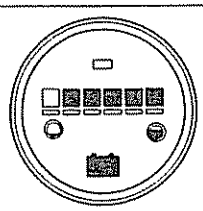
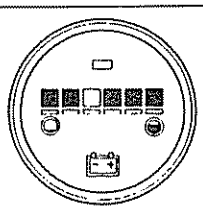
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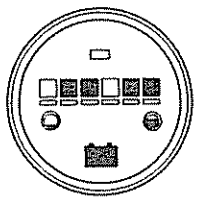
LEDs	LCD	Analyzer memory	Faulty portion	Fault mode	Phenomenon observed in vehicle
	AA	AA	CPU board	Faulty temperature sensor on CPU board	(Display only)
	AF	AF-1 AF-2 AF-3 AF-4	CPU board	CPU processing data error ROM error RAM error Too long analog input detection and processing time	Traveling, material handling, and EPS stop
	C0	C0-1 C0-2	Drive main circuit	Drive transistor open circuit Drive transistor short circuit	Traveling stops
	C1	C1-1 C1-2 C1-3	Traveling current sensor	Current sensor harness open circuit Current sensor harness short circuit Current sensor fault	Traveling stops
	C3	C3	Heat sensor for travel	Travel heat sensor harness open circuit Travel heat sensor harness short circuit	Travel speed goes down
	C4	C4-1 C4-2 C4-3 C4-4	Traveling accelerator potentiometer	Accelerator potentiometer open circuit Accelerator potentiometer short circuit Accelerator switch open Accelerator potentiometer fault	Traveling stops (Display only)
	C7	C7	Direction switch	Direction switch short circuit * 1	Traveling stops
	C8	C8-1 C8-2	Speed sensor	Sensor harness open circuit Sensor harness short circuit	Traveling stops

* 1 When either DSF or DSR is turned ON, "C7" is displayed if the other one is short-circuited. In other word, both DSF and DSR are ON.

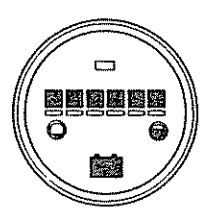
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LEDs	LCD	Analyzer memory	Faulty portion	Fault mode	Phenomenon observed in vehicle
	C9	C9	MG contactor	Contactor short circuit	Traveling stops
	CA	CA	Drive contactor drive circuit	Contactor coil chopper transistor short circuit	Traveling stops
	E0	E0-1 E0-2	Material handling main circuit	Material handling transistor open circuit Material handling transistor short circuit	Material handling stops
	E1	E1-1 E1-2 E1-3	Material handling current sensor	Current sensor harness open circuit Current sensor harness short circuit Current sensor fault	Material handling stops
	E5	E5	Regeneration diode	Regeneration diode short circuit	Traveling stops
	E6	E6-1 E6-2	Lift potentio	Lift potentiometer open circuit Lift potentiometer short circuit	Material handling accelerator runs max speed
	EA	EA-1	Material handling/EPS contactor drive circuit	Contactor coil chopper transistor short circuit	(Display only)
–	EE	EE-1 EE-2 EE-3	Display~MCS communication circuit	Communication stop Communication data error Tuning value data error	(LCD display only)
	EF	EF-1 EF-2 EF-3	CPU board	Memory value error End of memory IC service life Too long CPU processing time	(Display only)

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LEDs	LCD	Analyzer memory	Faulty portion	Fault mode	Phenomenon observed in vehicle
	F0	F0-1 F0-2 F0-3	EPS main circuit Torque sensor	EPS transistor short circuit Sensor harness disconnection Sensor harness short circuit	EPS stops
–	F1	F1-1 F1-2 F1-3	Display~MCS communication circuit	Communication stop Communication data error Power control value echo back error	(LCD display only)
–	F6	F6-1 F6-2	Charger (only for on-track type)	Charge safety timer actuated Abnormal heat rise on trans	Charging stops
–	F7	F7	↑	Impossible to start charging	(LCD display only)
–	F8	F8	↑	Impossible to stop charging	(LCD display only)

Error with warning buzzer sound

LEDs	LCD	Analyzer memory	Faulty portion	Fault mode	Phenomenon observed in vehicle
 (Flashing)	–	–	Charging alarm (LCD only)	Traveling or material handlings is attemped before disconnecting the AC plug.	Traveling, material handling and EPS 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 *2

*1 No alarm buzzer sounds on a vehicle with the LED display.
*2 On vehicle with the LCD-display, the parking brake operation indicator is displayed for the parking brake release failure alarm.

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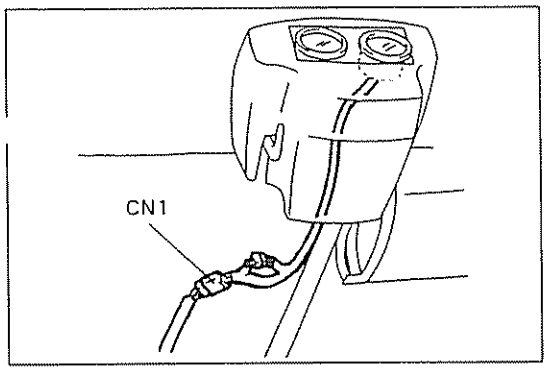
SST (PLUG-IN ANALYZER) SETTING AND OPERATION PROCEDURES

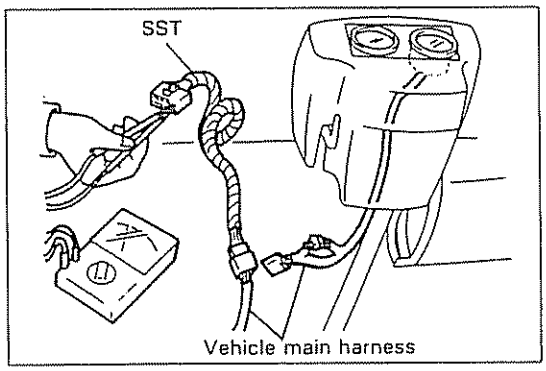
When the LED display is used for display, vehicle tuning and troubleshooting are disabled.

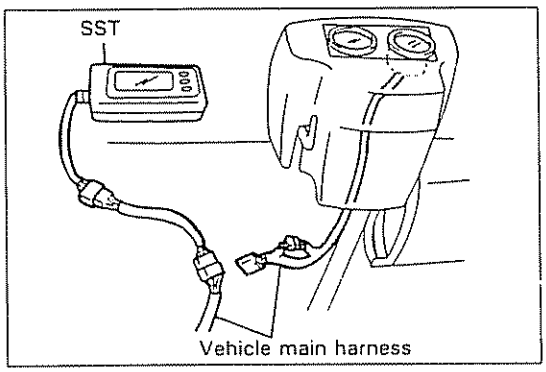
Therefore, set the SST (09240-12400-71) according to the procedure below for these operations.

When the SST (plug-in analyzer) is used, ''Error code: EE-1'' is memorized in the CPU board. (''EE-1'' is displayed on the diagnosis monitor screen.)

This, however, should not be interpreted as an error in the vehicle or SST.







SST SETTING PROCEDURE

1. Disconnect the battery plug.
2. Remove the instrument panel LH cover.
3. Disconnect the LED display connector (CN1).
4. Connect the extension cable to the connector on the main harness side.
5. Connect the battery plug to check the supply voltage to the SST.

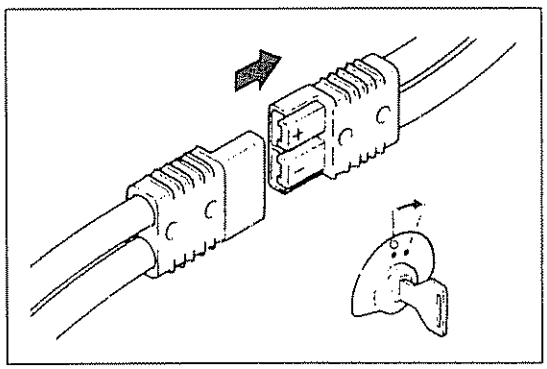
Terminal	Standard voltage
(+) 1 – 6 (–)	5 ± 0.5 V
(+) 2 – 6 (–)	11 ~ 16 V
(+) 3 – 6 (–)	0.5 V or below
(+) 4 – 6 (–)	↑
(+) 5 – 6 (–)	↑

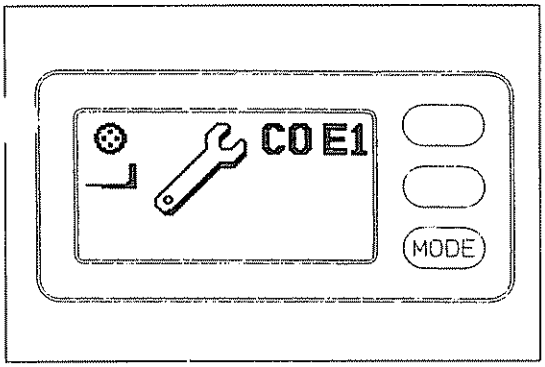
Caution:
If the voltage is not within the standard range, the plug-in analyzer cannot be used.
Check the CPU board, DC-BD board and wiring of the MCS, and repair if faulty.
Connect the SST.

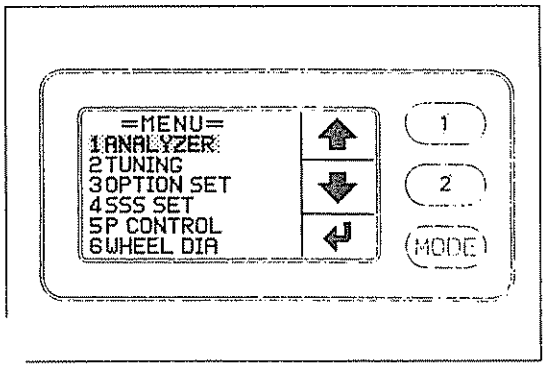
After using the plug-in analyzer, if it is disconnected without removing the battery plug, and LED display is connected, MCS CPU board will memorize the error codes ''EE-1'', and ''EE-2''. (''EE-1, EE-2'' is displayed on the diagnosis monitor screen at the time of next operation.)

This, however, should not be interpreted as an error in the vehicle or SST.

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SST OPERATION PROCEDURE

1. Connect the battery plug and set the key switch to ON.

   If the SST display is as shown below when the key switch is set to ON, make the necessary repair first.

Display	Vehicle phenomenon	Action
No display at all	The vehicle does not move.	Replace the CPU board of the MCS.
	The vehicle moves	Repair communication wiring.
Fixed at error code: EE screen	——	See EE error code section in Troubleshooting in the repair manual.

2. The MCS ROM version is displayed (for approx. 2 seconds).

3. • An error exists in vehicle. → Diagnosis error display screen
   • The vehicle is normal. → Press the "MODE" switch.

4. The MENU screen appears.

5. Use the selector switch ① or ② to move the cursor to the desired function and press the MODE switch to use the selected function.

Note:
Refer to the Mask Functions section (see page 3-9) for the operation procedure for each function.

Notes for use:
1. If the plug-in analyzer is connected when an abnormal voltage is applied to the main harness connector on the vehicle side due to an abnormality or fault of the vehicle, the analyzer will be damaged.
   Always check the voltage level at the voltage check connector before connecting the analyzer.
2. As the plug-in analyzer uses internal parts weak to shocks, do not apply impacts by throwing or dropping the analyzer.
3. Do not leave the analyzer under the blazing sun.

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MASK FUNCTIONS

The LCD type all-round display has built-in mask functions to be used by the service staff in performing vehicle maintenance and specification setting aside from the general functions described in the operator's manual for use by general customers.

The mask functions cannot be used unless the password is input from the switch panel for protecting the important internal data from being destroyed by incorrect use of any mask function by the customer.
The password is described in this manual but not in the operator's manual of the vehicle.

Display Mask Functions

Item		Function	To be used		
			Upon vehicle delivery	Upon board replacement	On other occasion
Analyzer		Checking the vehicle electrical system and displaying the result			When a vehicle abnormality is found
Tuning		Fine adjustment of the traveling and material handling functions		○*2	When requested from the customer
Option setting	Specification setting	Selecting presence/absence of optional vehicle specifications*1		○*2 *3	
	Hour meter starting	Starting counting by the hour meter	○	○*3	
	Demonstration mode	Enabling/disabling the demonstration mode			For demonstration of a new vehicle
Tire constant setting		Making the speedometer indication appropriate		○*2	

*1: This function is for matching the control to the option installation state of the vehicle and not for enabling/disabling the installed option itself.
*2: Control board of the new MCS
*3: Control board of the all-round display

Traveling, material handling and EPS operations at each mode screen

○: Operable
×: Inoperable

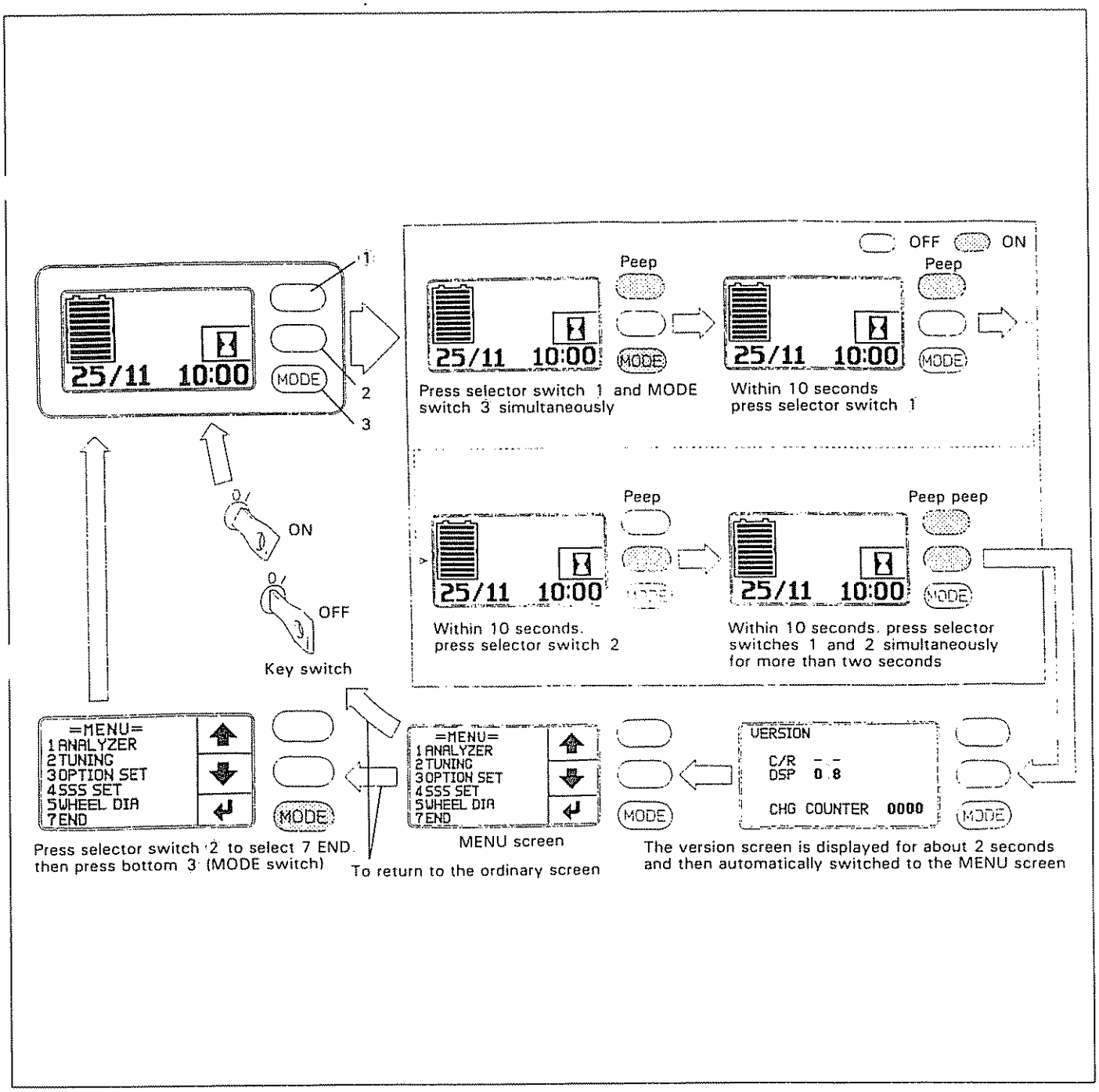
Each mode screen	Traveling	Material handling	EPS
MENU screen (After password acceptance)	○	○	○
ANALYZER MENU screen	×	×	×
Analyzer mode screen (Other than test run mode)	×	×	×
Analyzer mode screen (Test run mode)	○	○	○
TUNING screen	○	○	○
OPTION SET screen	×	×	○
Tire constant setting	○	○	○

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PASSWORD INPUT METHOD

Notes on password input

- Always operate the display switches with finger tips. Use of any pointed item may damage the switches.
- If an error is made while inputting the password, retry the procedure from the beginning after turning the key switch OFF once.
  If the mask menu screen does not appear after several retries, the system may be abnormal.

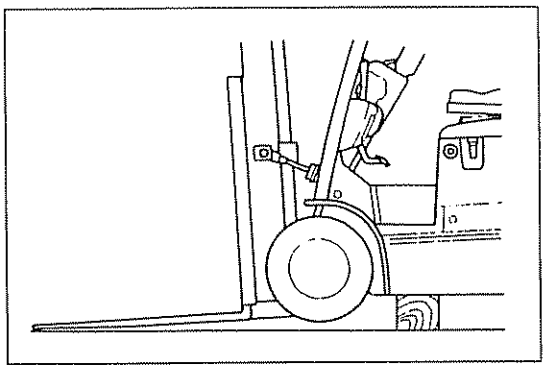


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ABBREVIATIONS DISPLAYED ON THE ANALYZER SCREEN

Abbreviation	Meaning	Abbreviation	Meaning
DIAG	Diagnosis monitor	MFR	Forward traveling contactor RH (unused)
A/D	Analog input test	MRR	Reverse traveling contactor RH (unused)
CON	Contactor test	MFL	Forward traveling contactor LH (unused)
RUN	Test run	MRL	Reverse traveling contactor LH (unused)
SW	Switch input test	3MF	Front wheel drive forward traveling contactor (unused)
END	End	3MR	Front wheel drive reverse traveling contactor (unused)
VBBT	Battery voltage (voltage before key switch)	3MRH	Front wheel drive contactor RH (unused)
VBKY	Voltage after key switch	3MLH	Front wheel drive contactor LH (unused)
VBP2	P2 terminal voltage	CSD	Drive motor current sensor
VBP11	P11 terminal voltage	CSF	Front wheel drive motor current sensor (unused)
TEMP	Temperature of CPU board	CSP	Material handling motor current sensor
POTA	Accelerator potentiometer voltage	SS1	rpm sensor value 1
THCD	Main drive circuit temperature sensor voltage	SS2	rpm sensor value 2
DSF	Forward traveling switch	AVE	Average value
DSR	Reverse traveling switch	LSB	Brake switch
SWAC	Accelerator switch	LSPB	Parking brake switch
POTL	Material handling potentiometer voltage	LSD	Foot switch (unused)
LSL	Lift switch No 1	LST	Tilt switch
LSL2	Lift switch No.2 (unused)	LSR	Reach switch (unused)
POTST	Steering stroke sensor voltage	LSAT1	Attachment switch No.1
POTSP	Steering potentiometer voltage (unused)	LSAT2	Attachment switch No 2
MF	Forward traveling contactor	LSOPT	Option switch
MR	Reverse traveling contactor	3SW	Front wheel drive switch (unused)
MG	Regeneration contactor	LSBT	Battery pull-out switch (unused)
MFW	Field weakening contactor (unused)	ALL OFF	All contactors in OFF state
S	Bypass contactor (unused)	Others	
MP	Material handling-power steering contactor	SSS SET	Steering neutral adjustment (unused)
MPS	Power steering contactor (unused)		

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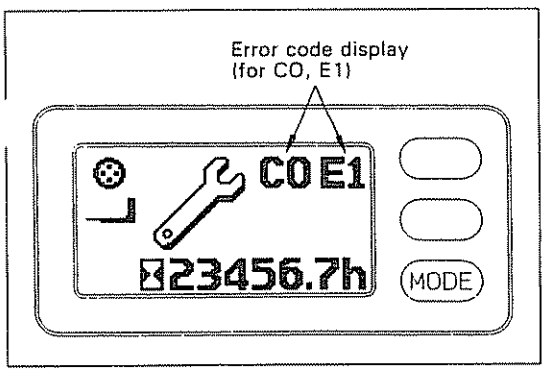


USING THE ANALYZER MODE

Preparation for Analyzer Mode

Caution:
Always jack up the frame until the front wheels leave the ground and stabilize the vehicle by supporting both ends of the frame with stands before starting the operation.

Tilt the mast forward and lower the mast fully.



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

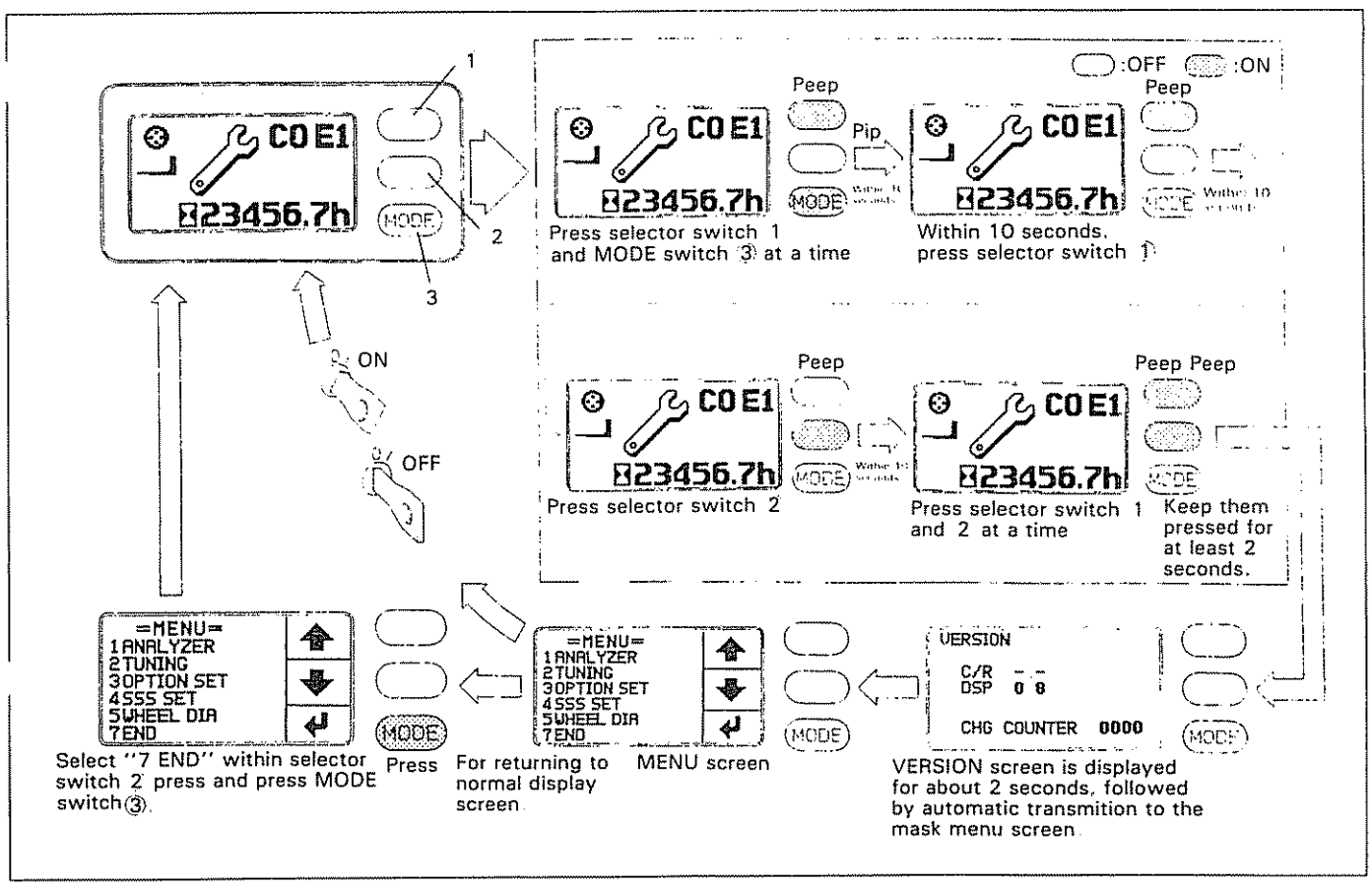
Note:
If diagnostic result code AF, EE or F1 is indicated on the display, the analyzer mode cannot be used.

Method for Switching to Analyzer Mode

The all-round display is generally set to the diagnosis mode.

This display is protected by mask functions to protect the important internal data from loss by incorrect operation by general users.

For switching to the analyzer mode, therefore, password input from the ordinary screen is necessary.

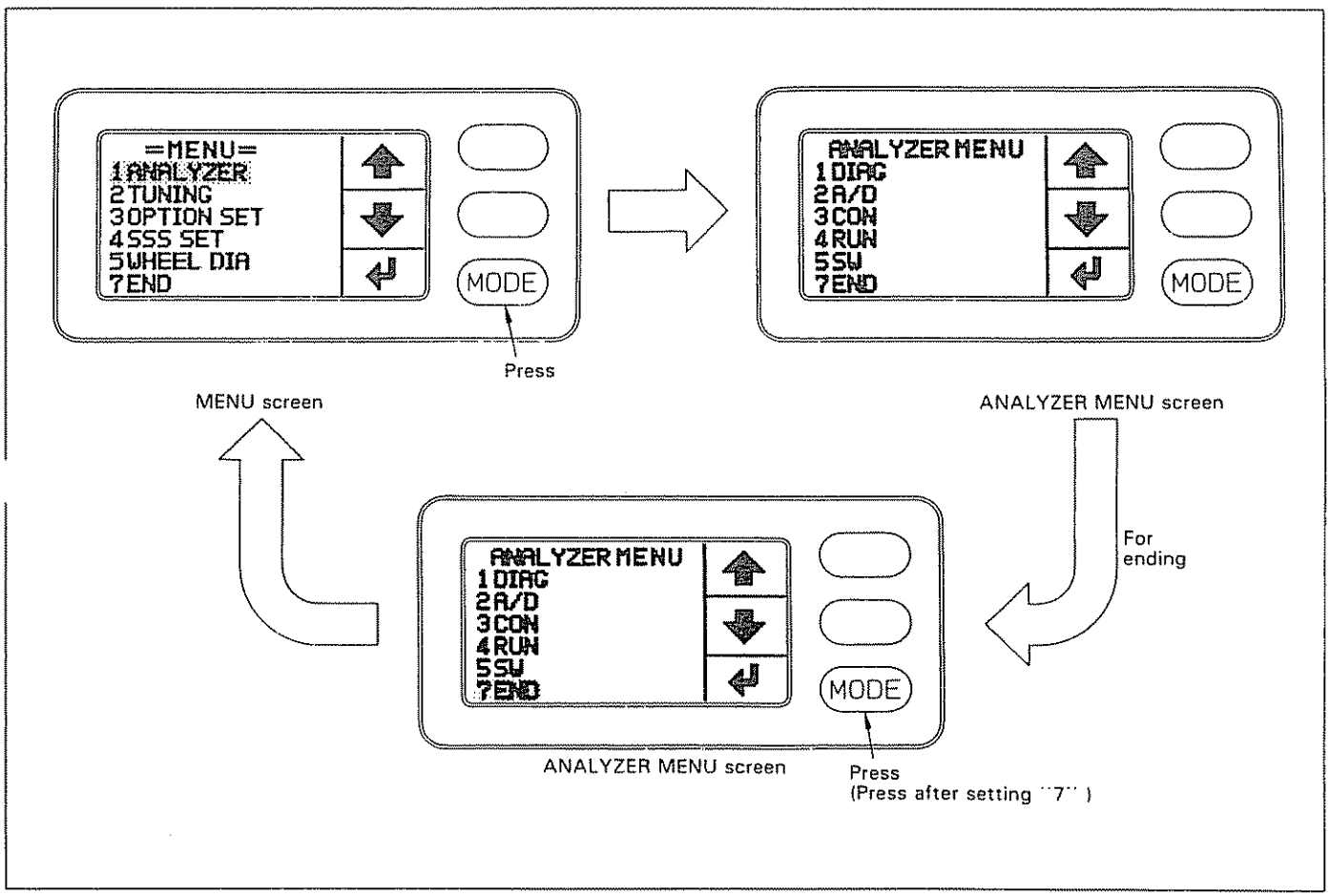


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TEST ITEMS BY ANALYZER

No.	Item	Description
1	Diagnosis monitor	Error codes of past errors are displayed with the sub-codes corresponding to the failure modes and the hour meter readings upon error occurrences.
2	Analog input test	Analog input values from traveling, material handling and EPS sensors are displayed with judgment on whether they are allowable or not.
3	Contactor test	The qualities of the contactors and their driving circuits are judged by outputting the contactor ON/OFF signals and visually checking attraction/release of respective contactors.
4	Test run	Test run while checking the analog input values from the drive, material handling and EPS sensors and occurrences of errors
5	Switch input test	The ON/OFF states of various switches are displayed while the ON/OFF state of one selected switch is indicated by the alarm sound.

Operation Method for Switchover Between MENU Screen and ANALYZER MENU Screen

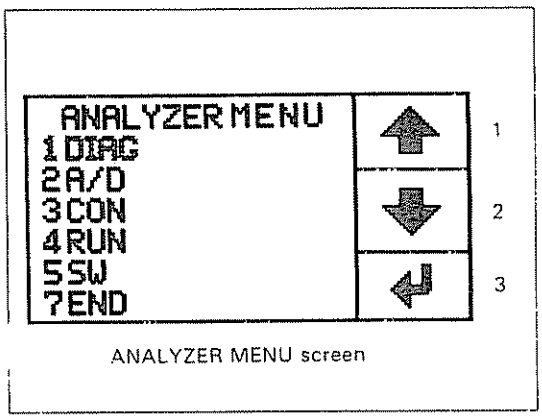


Note:
It is impossible to directly transit from one analyzer test item to another. The next test item must be selected after returning to the ANALYZER MENU screen once.

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SELECTING METHOD FOR EACH ITEM

A test item can be selected on the ANALYZER MENU screen. When a test item other than diagnosis monitor is selected, it is displayed on the next screen for judgment.

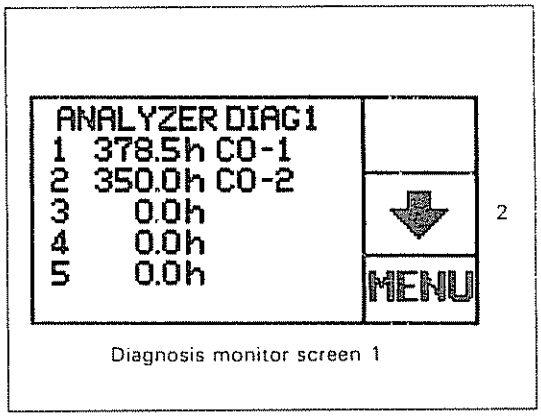


ANALYZER MENU screen

Test Item Selection

1. When the ANALYZER MENU screen is displayed after password input, the cursor is placed at 1 DIAG.
   *When the ANALYZER MENU screen is displayed by pressing the MENU switch (MODE switch) after test completion, the cursor remains at the preceding test code.

2. Keep the selector switch 2 pressed to move the cursor downward (1, 2, 3, 4, .. 7, 1..). When switch 3 (MODE switch) is pressed with the cursor at the desired menu, transition to the first screen of the selected menu occurs.



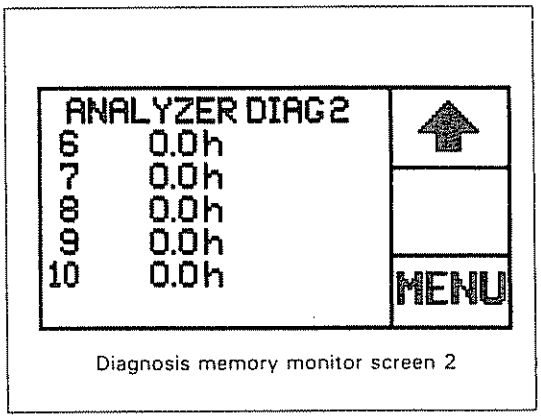
Diagnosis monitor screen 1

Diagnosis Menu Selection

1. Select 1 DIAG on the ANALYZER MENU screen, and press switch 3 (MODE switch). The ANALYZER DIAG 1 screen appears.
   This screen displays past errors along with sub-codes corresponding to fault modes and hour meter readings upon error occurrence, starting with the most recent error. Ten errors are displayed on two screens. To switch from the first to the second screen, press the selector switch 2.

[Action]
Examine the error portion according to the troubleshooting chart.

2 After checking on the diagnosis monitor, press the MENU switch (MODE switch) to return to the ANALYZER MENU screen.

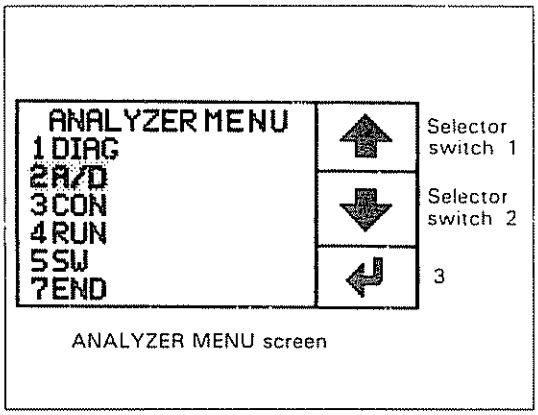


Diagnosis memory monitor screen 2

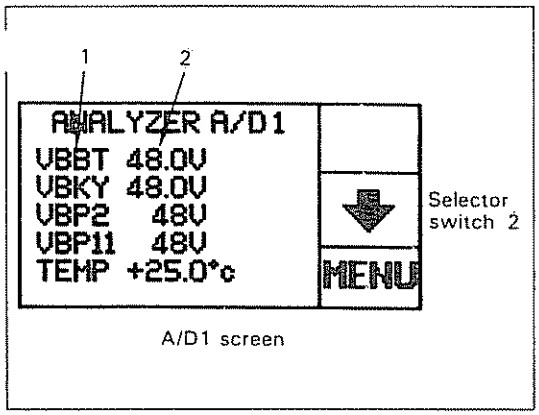
Hour meter reading 0.0 h with no sub-code indicates no error occurrence.

Note:
Direct transition from the diagnosis monitor screen to another test item is disabled. Return to the ANALYZER MENU screen once before selecting another test item.

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ANALYZER MENU screen



A/D1 screen

TEMP +25.0 °C is not the atmospheric (ambient) temperature but the temperature of the CPU board.

Analog Input Test Selection

1 Select 2 A/D on the ANALYZER MENU screen, and press the MODE switch. The ANALYZER A/D1 screen appears.
This screen displays analog input values of traveling, material handling and EPS sensors for judgment of correctness. Analog input values of voltage/temperature, traveling, material handling and EPS sensors are displayed on four screens.

2. Press the selector switch ② to switch from A/D1 screen to A/D2, A/D3 or A/D4 screen.
Transition in the order of A/D4, A/D3, A/D2 and A/D1 occurs each time selector switch ① is pressed.

3. Contents of each screen
(1) A/D1 screen
Detected analog input values of voltage/temperature sensors are displayed.

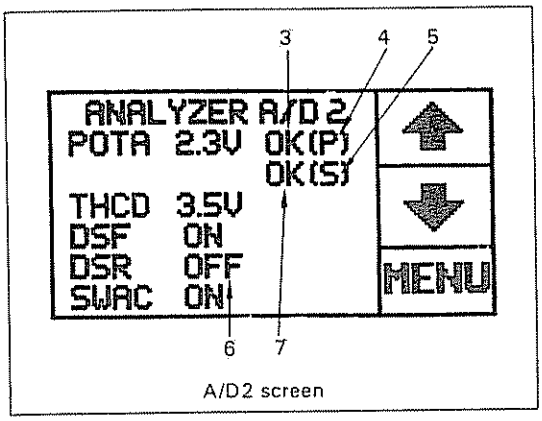
[Explanation of displayed contents]
①: Checked portion
②: Value detected by the analyzer
Standards
VBBT·VBKY: Within ±1% of the actually measured value
VBP2·VBP11: Within ±5% of the actually measured value
When the displayed voltage is 54 V or less, check the difference between the VBBT and VBKY values.

[Action]
① Abnormal trimmer potentiometer in CPU
→ Replace the CPU board.

Note:
Never adjust the trimmer potentiometer.

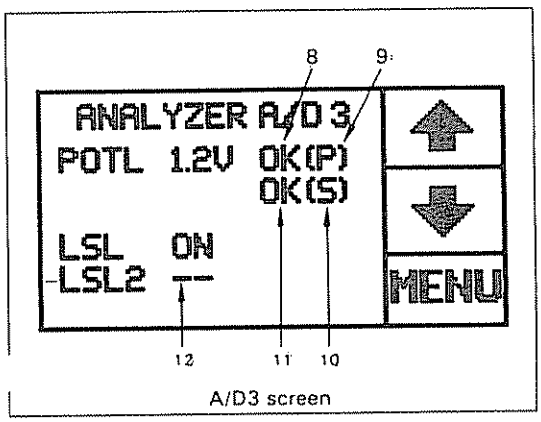
② When the displayed value is 0 V, check the harness.

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A/D2 screen

[Action]
1. Check the installation condition of the potentiometer.
2. Check the harness.
3. Replace the potentiometer.
4. Replace the CPU board.



A/D3 screen

(2) A/D2 screen
The detected analog input value of the acceleration potentiometer is displayed. Check any abnormality or adjustment error by operating the accelerator.

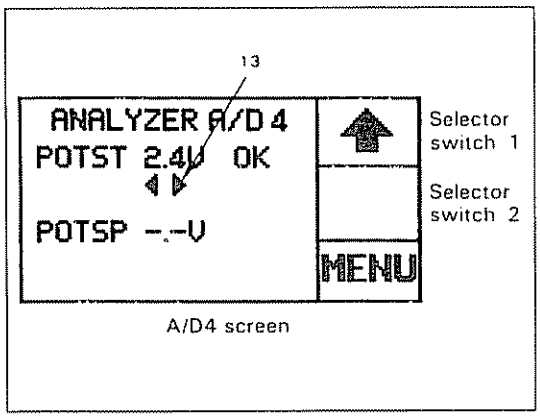
[Explanation of displayed data]
3. Detected value judgment
Potentiometer voltage (between 0.3 V and 2.4 V = OK) judgment when the SW_{KY} is OFF
4. Acceleration potentiometer
5. Accelerator switch
6. Limit switch ON/OFF judgment
7. SWAC short circuit check result judgment NG if SWAC is shorted when the A/D2 screen is displayed

Acceleration Potentiometer Judgment
1. Depress the accelerator pedal (switch) and read the voltage (A) when SWAC is ON.
2. Read voltage (B) when the accelerator pedal is depressed to its stroke end.
3. Calculate B − A = C
4. Standard
C = 1.6 V or more

(3) A/D3 screen
The detected analog input value of the material handling potentiometer is displayed. Check any abnormality or adjustment error of the material handling potentiometer by operating the material handling lever.

8. Potentiometer voltage
Between 0.2 V and 4.8 V = OK
9. Lift potentiometer
10. Lift switch
11. LSL short circuit check result judgment
NG if the lift switch is shorted when the A/D3 screen is displayed.
12. Not set

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A/D4 screen

Stroke Sensor Judgment
POTST: Stroke sensor voltage
Steering in neutral state:
2.2 to 2.6 V
Steering for right turn:
0.5 to 2.1 V
Steering for left turn:
2.7 to 4.4 V

(4) A/D4 screen

The detected analog input value of the stroke sensor is displayed.
Check any abnormality or incorrect adjustment of the stroke sensor by operating the steering wheel.

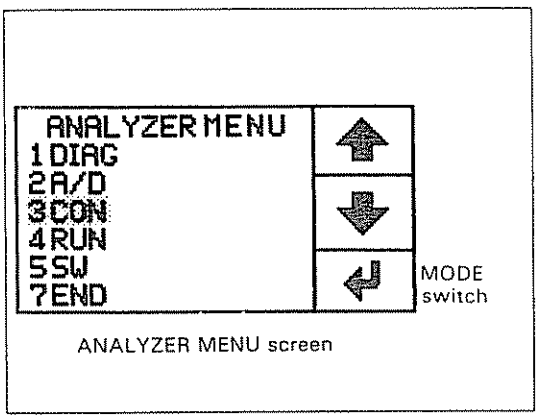
[Explanation of displayed data]
13 Stroke sensor voltage
◀ ▶ Steering in neutral state
▶ Detection of steering torque for right turn
◀ Detection of steering torque for left turn

[Actions]
① Adjust the stroke sensor neutral setting.
② Check the harness.
③ Replace the steering potentiometer.
④ Replace the CPU board.

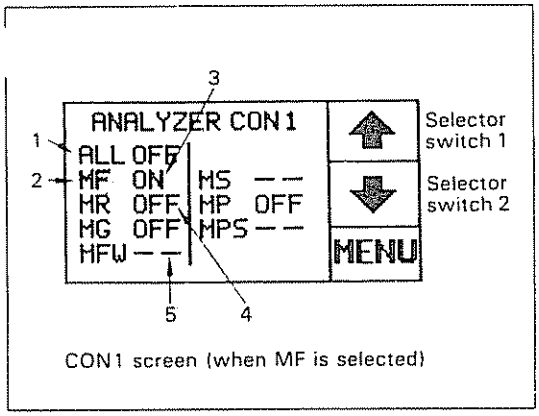
4. For switching to each screen, press the selector switch ① and/or ②.

5. When the analog input test ends, press the MENU switch (MODE switch) to return to the ANALYZER MENU screen.

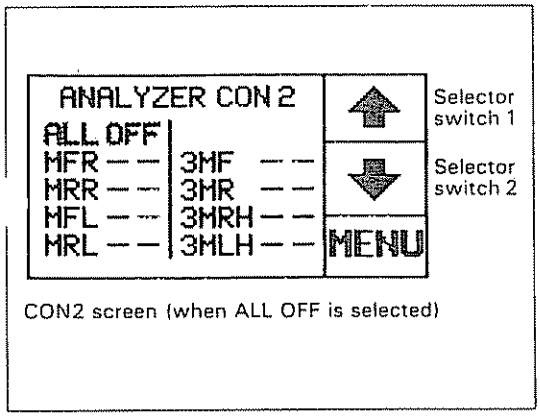
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ANALYZER MENU screen



CON1 screen (when MF is selected)



CON2 screen (when ALL OFF is selected)

[Actions]

① Check the contactor for welding.
② Check the contactor coil resistance. Check the voltage when the contactor is made (contactor defective if 30 V or more).

Contactor Test Selection

1. Select 3 CON on the ANALYZER MENU screen and press the MODE switch for transition to the ANALYZER CON1 screen. The cursor is placed at ALL OFF.
   This screen allows judgment of the selected contactor and its drive circuit by visually checking the contactor for proper making and breaking.
   *Contactors used for the controller are displayed on two screens.

2. Select the contactor to be tested by pressing the selector switch ① and/or ②. The selected contactor is made by the ON command from the controller in 1 to 2 seconds. The display then changes from OFF to ON. OFF to ON displayed here, however, is according to the signal from the CPU. Make sure that the contactor is set from OFF to ON by listening for the actuation sound.

[Explanation of displayed data]

① All contactors OFF
   Not related to the test item
② Contactor name
③ Contactor ON state
④ Contactor OFF state
⑤ No setting

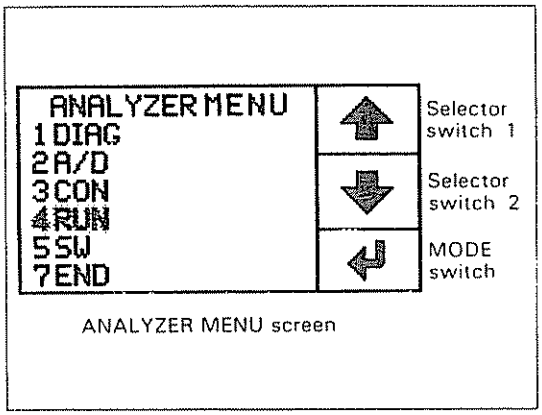
MF:	Forward traveling contactor
MR:	Reverse traveling contactor
MG:	Regeneration contactor
MFW:	Field weakening contactor (unused)
MS:	Bypass contactor (unused)
MP:	Pump-EPS contactor
MPS:	EPS contactor (unused)

3. To switch from contactor test screen 1 to 2, press the selector switch ② after the selecting MPS.

4. To switch from contactor test screen 2 to 1, press the selector switch ① after selecting ALL OFF.
   Unused contactors are displayed on screen 2.

5. When the contactor test ends, press the MENU switch (MODE switch).
   The ANALYZER MENU screen appears.

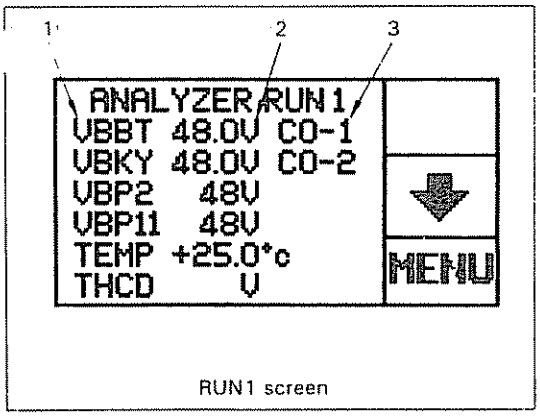
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ANALYZER MENU screen

Test Run Selection

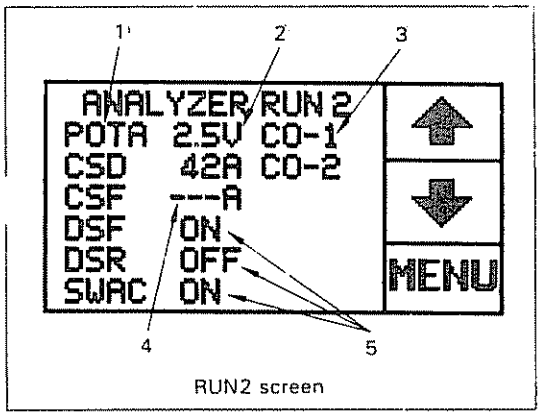
1. Select 4 RUN on the ANALYZER MENU screen and press the MODE switch for transition to the ANALYZER RUN1 screen.
   This screen allows the traveling and material handling operation test to be conducted while observing the analog input values of traveling, material handling and EPS sensors.
   If a diagnosis error occurs during traveling or material handling, the error display is held to allow the operator to check problems that rarely occur. Values related to voltage/temperature, traveling, material handling, EPS and vehicle speed are displayed on five screens.



RUN1 screen

2. Explanation of each screen
   (1) RUN1 screen
   This screen is used to check any abnormality in the voltage detection circuit (too large battery charge meter indication error).

[Explanation of displayed data]
1 Inspected portion
2 Value detected by analyzer
The detected value of POTA-CSD is not related to 3 error code.
3 Error code
CO-1 and CO-2 are diagnosis display examples.

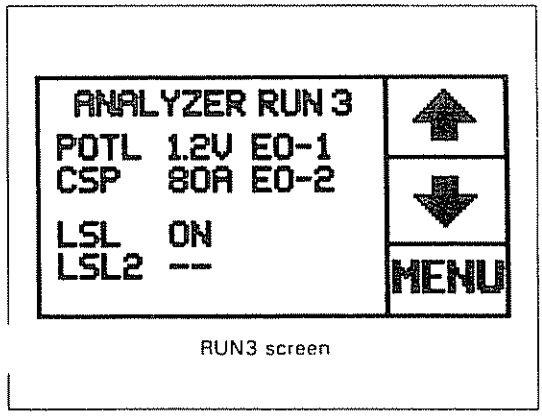


RUN2 screen

   (2) RUN2 screen
   This screen is used to check the accelerator sensor, accelerator potentiometer detecting circuit, drive current sensor current detecting circuit and OCL value for any abnormality.

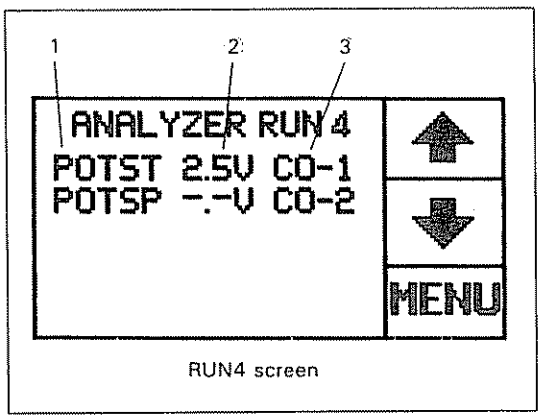
[Explanation of displayed data]
5 Switch ON/OFF state

   (3) RUN3 screen
   This screen is to check the material handling sensor and current detection circuit for any abnormality.
   EO-1 and EO-2 are diagnosis display examples not related to the detected values of POTL and CSP.



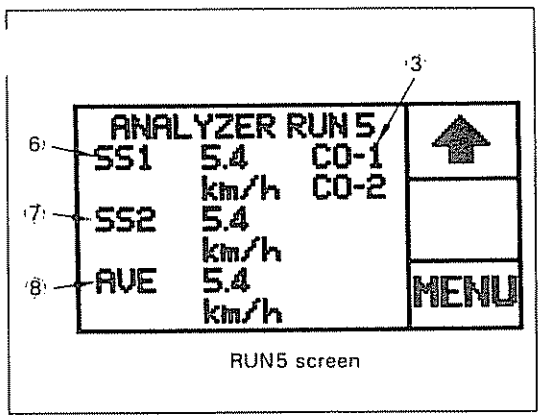
RUN3 screen

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RUN4 screen

(4) RUN4 screen
This screen is used to check the stroke sensor and steering potentiometer for voltage abnormality or detection circuit abnormality.
CO-1 and CO-2 are diagnosis display examples not related to the detected value.



RUN5 screen

(5) RUN5 screen
This screen is to check the vehicle speed sensor and detection circuit for any abnormality.

[Explanation of displayed data]

⑥ Vehicle speed data detected by traveling speed sensor 1

⑦ Vehicle speed data detected by traveling speed sensor 2

⑧ Average of the vehicle speed data detected by traveling speed sensors 1 and 2

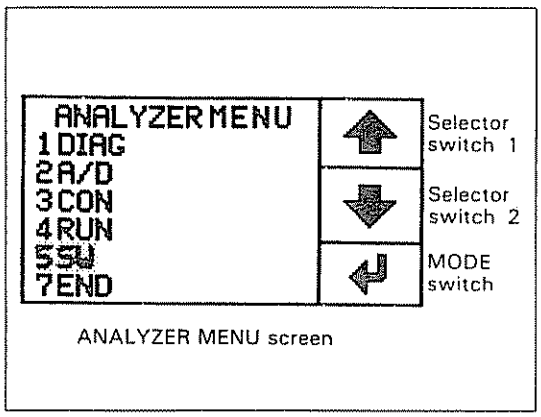
CO-1 and CO-2 are diagnosis display examples not related to detected values of SS1, SS2 and AVE.

3. If a diagnosis error is displayed due to an abnormality during traveling or material handling during the test operation, keep the MENU switch (MODE switch) pressed until the analyzer menu appears.

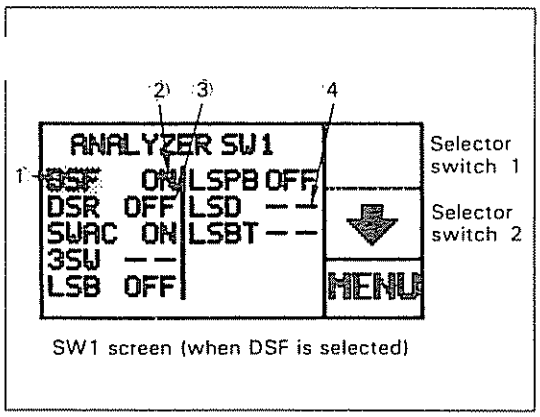
4. To switch from one test run screen to another, press the selector switch ① or ②.

5. When test run ends, press the MENU switch (MODE switch) to return to the ANALYZER MENU screen.

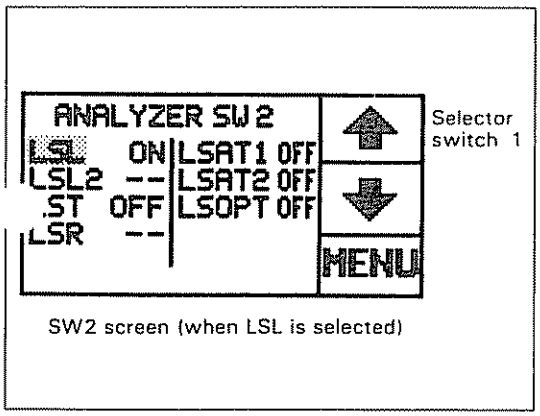
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ANALYZER MENU screen



SW1 screen (when DSF is selected)



SW2 screen (when LSL is selected)

[Actions]
① Check the switch.
② Check the switch harness.
③ Check the CPU board.
④ Replace the CPU board.

Switch Input Test

1. Select 5 SW on the ANALYZER MENU screen and press the MODE switch. The ANALYZER SW1 screen appears.
   The cursor is placed at DSF.
   This screen along with the buzzer displays switch ON/OFF states to allow the operator to check the selected switch and its detection circuit for proper functioning. Switches used on the vehicle are displayed on two screens.

2. The ON/OFF state of the selected switch can be checked.
   When the desired switch is selected using selector switch ① or ②, its name is turned. When the switch is turned ON, the buzzer sounds and the state display is changed from OFF to ON.

[Explanation of displayed data]
① Switch name
② Switch ON state
③ Switch OFF state
④ No setting

DSF: Forward traveling switch
DSR: Reverse traveling switch
SWAC: Accelerator switch etc.

3. For transition from switch input test screen 1 to 2, press selector switch ② after selecting LSBT.

4. For transition from switch input test screen 2 to 1, press selector switch ① after selecting LSL.

5. When the switch input test ends, press the MENU switch (MODE switch) to return to the ANALYZER MENU screen.

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TUNING

GENERAL

When a user demands limitation of the maximum traveling speed or reduction of the regenerative braking force, the sensing level may be changed after tuning screen display as in the case of power control. Fifteen items including reserve items can be tuned.

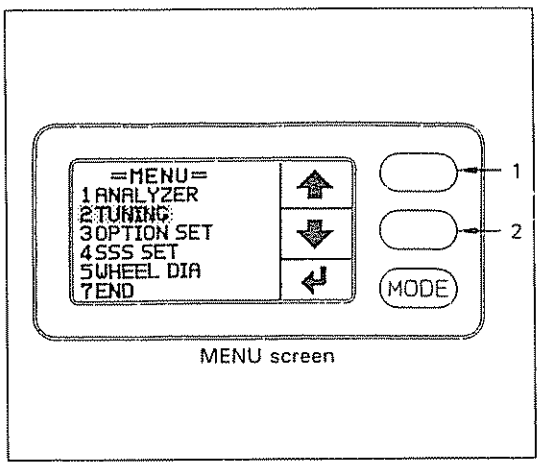
Tuning No.	Item
1	Regenerative braking torque
2	Material handling chopper soft start
3	Material handling chopper start duty
4	Battery charge meter correction
5	Maximum traveling speed limiter
6	Attachment power control
7	Reserved
8	Lifting power control
9	Tilting power control
10	Lift interrupt level setting
11	Reserved
12	Reserved
13	LCD contrast adjustment
14	Reserved
15	Reserved

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TUNING MODE INITIAL SETTING VALUES LIST

Tuning No.	Item	Level (● default value) 1	2	3	4	5	6	7	8
1	Regenerative braking torque: Changing the regenerative braking torque in switchback operation.	Weak			●				Strong
2	Material handling chopper soft start: Changing the rate of change in the material handling chopper duty at startup.	Small				●			Large
3	Material handling chopper start duty: Changing the default duty in soft start of the material handling chopper.	Small		●					Large
4	Battery charge meter correction: Correcting the decreasing rate of battery charge meter indication.	Slow					●		Quick
5	Maximum traveling speed limiter: Limiting the maximum traveling speed.	Low							No limit ●
6	Attachment power control No.1: Changing the pump motor speed when attachment switch No.1 is ON.	Low							High ●
7	Reserved								
8	Lifting power control: Changing the pump motor speed when the lift switch is ON.	Low							High ●
9	Tilting power control: Changing the pump motor speed when the tilt switch is ON.	Low					●		High
10	Lift interrupt level setting: Changing the operation timing (discharge level) for overdischarge alarm function.	Small						●	Large Alarm ineffective
11	Reserved								
12	Reserved								
13	LCD contrast: Adjusting the contrast of the LCD screen.	Low				●			High
14	Reserved								
15	Reserved								

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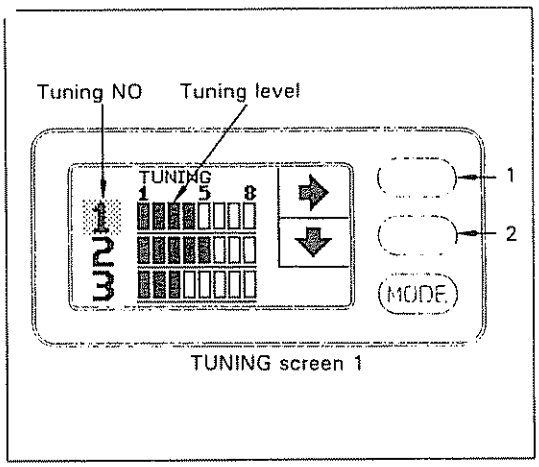


MENU screen

USING THE TUNING MODE

1. Input the password to display the MENU screen.

2. Move the cursor to 2 TUNING by pressing selector switch ① or ②, and press the MODE switch. TUNING screen 1 appears.

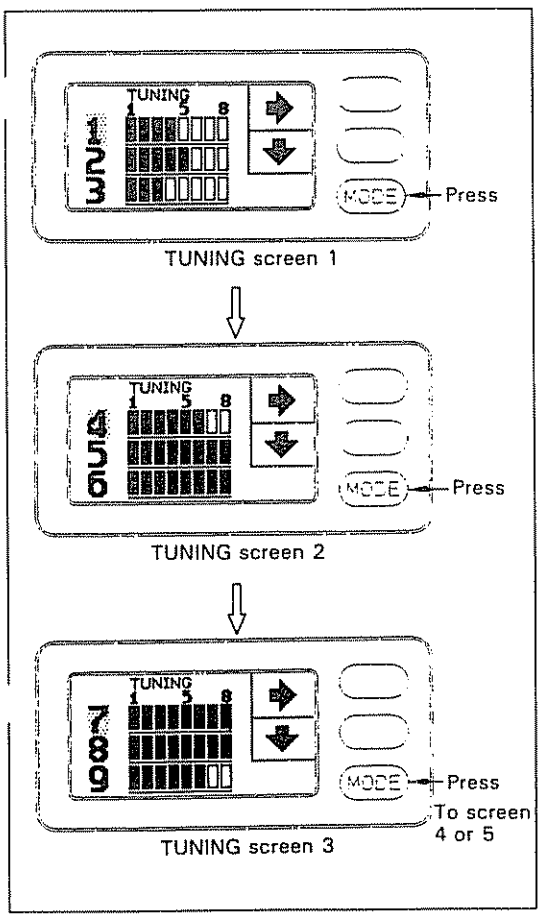


TUNING screen 1

3. Fifteen tuning items are displayed on five screens each of which includes three tuning items.
[Tuning level changing method]
   - The tuning level following the tuning number at the cursor position can be changed.
   - Use selector switch ① to change the level.
     The level can be changed sequentially each time selector switch ① is pressed (1, 2, 3, 4, 5, 6, 7, 8, 1, 2, ...).

   [Tuning item selection method]
   - Move the cursor to the desired tuning number using selector switch ②.
     The cursor moves to the next tuning item each time selector switch ② is pressed (1, 2, 3, 1, 2, ...).
   - When selecting other than tuning Nos. 1 to 3, press the MODE switch to change to another screen and select the necessary tuning number there.

4. Press the MODE switch on TUNING screen 5 to return to the MENU screen.

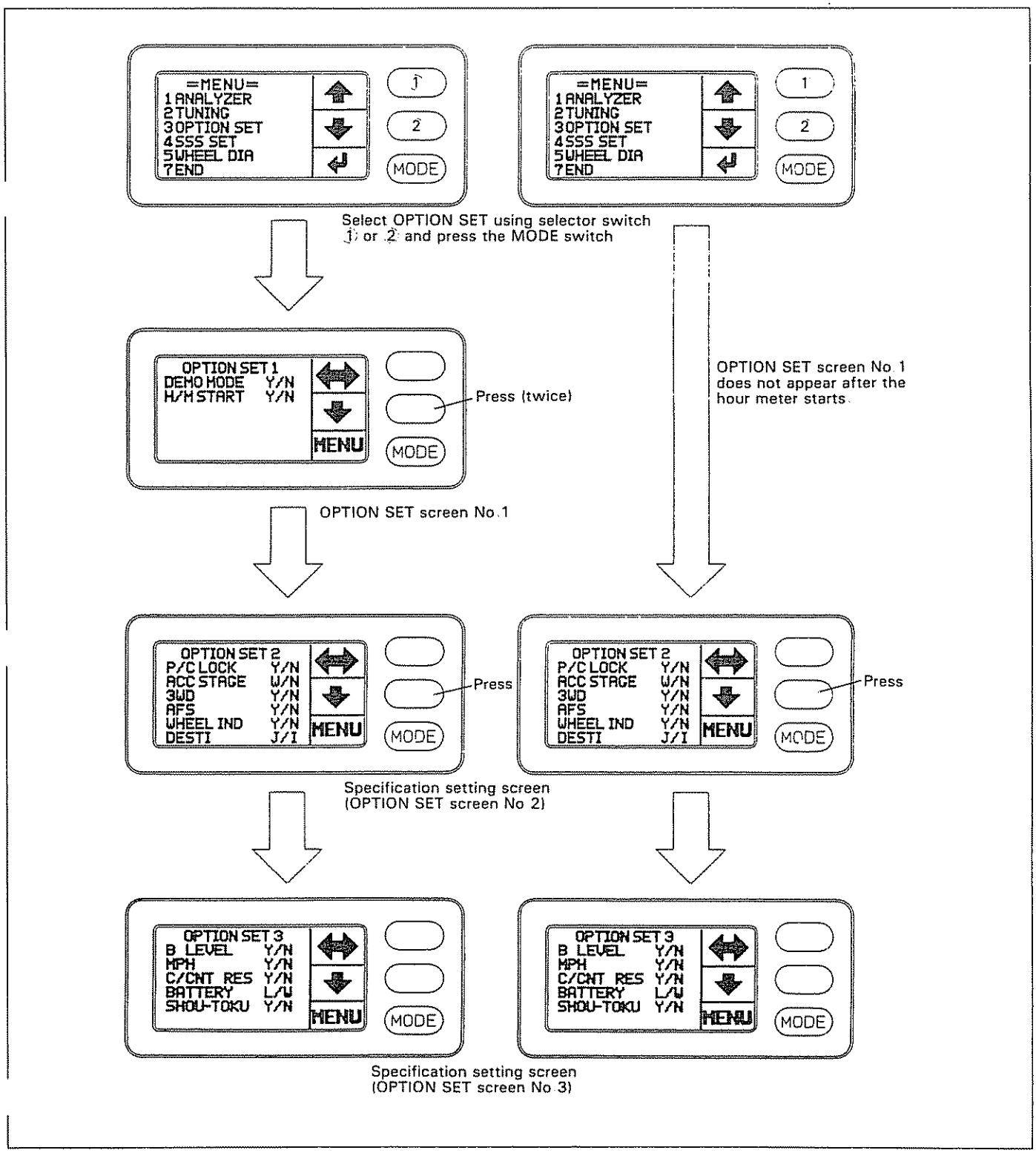


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OPTION SETTING

Demonstration, hour meter start and specification setting modes can be selected for OPTION SETTING. The way the specification setting mode is displayed varies with the vehicle condition (before or after hour meter starting).

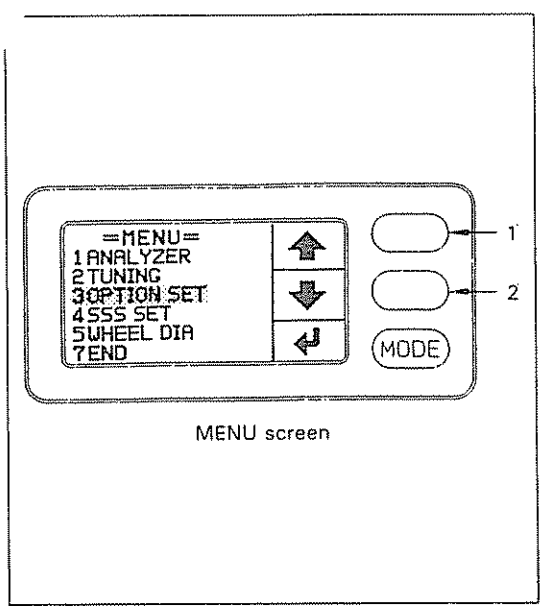
Display in Specification Setting Mode



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OPTION SETTING SCREEN NO. 1

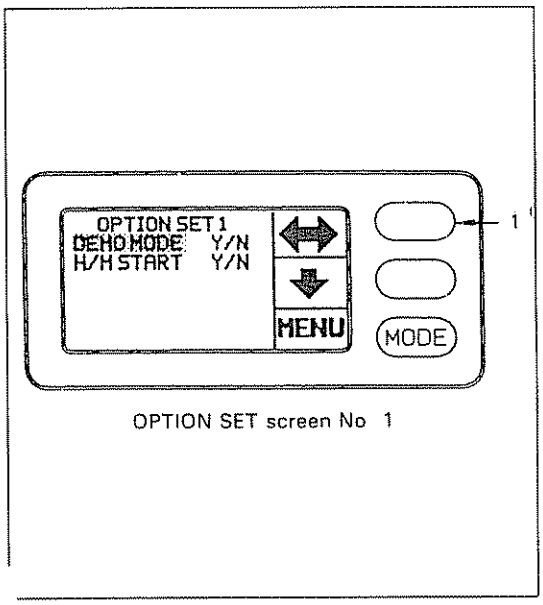
Item (displayed data)	Setting change (displayed data)	Description
Demonstration mode (DEMO MODE)	Set ↔ Cancel (Y/N)	Allows traveling and material handling to be performed simultaneously before the hour meter starts.
Hour meter start (H/M START)	Start ↔ No start (Y/N)	Starts integration by the hour meter.



MENU screen

Starting and Canceling the Demonstration Mode

1. Input the password to display the MENU screen.
2. Move the cursor to 3 OPTION SET using selector switch ① or ② and press the MODE switch. The OPTION SET screen No. 1 appears.
3. If the hour meter has not been started, the demonstration mode and hour meter start can be set or canceled. (This screen is not displayed after the hour meter starts.)
4. Press selector switch ① to move the cursor for Y/N selection to choose set or cancel.
   Y: Demonstration mode set
   N: Demonstration mode cancel
5. Press the MODE switch to return to the MENU screen.



OPTION SET screen No. 1

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STARTING THE HOUR METER

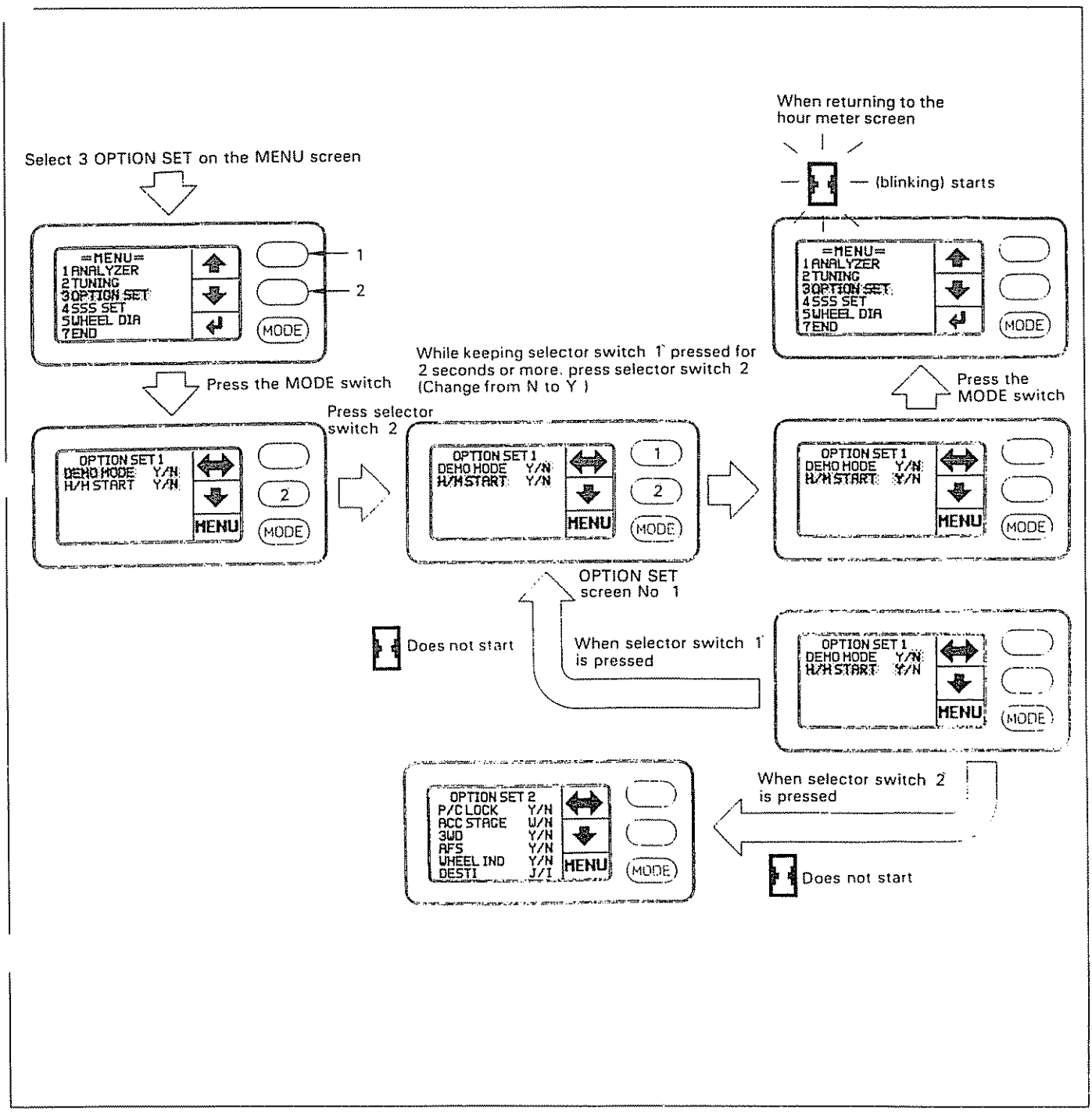
When a new vehicle is delivered from the factory, the hour meter is not started. The dealer must always start the hour meter before delivery to each customer.
Start the hour meter after inputting the password.

Note:
Once the hour meter starts, it cannot be stopped or reset to 0.
The hour meter must also be started after replacement of the display ASSY.

Hour Meter Starting Method

1. Input the password to display the MENU screen (See page 3-10).

2. Start the hour meter (according to the procedure shown below).



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OPTION SETTING SCREENS NO.2 · NO.3

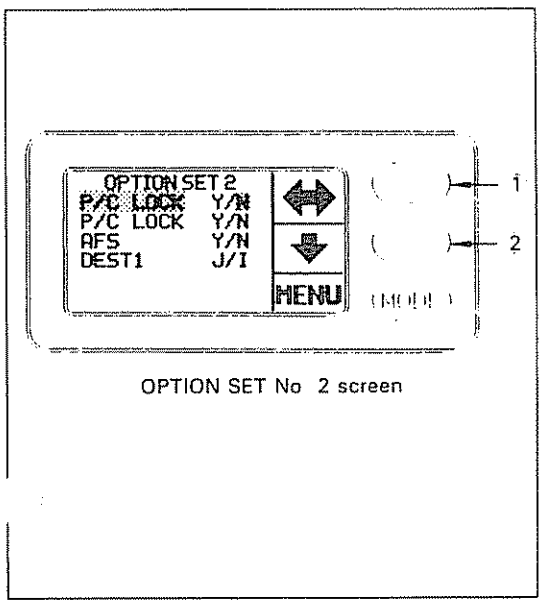
	Item (displayed data)	Setting change (displayed data)	Description
Option setting 2	Power control lock (P/C LOCK)	Valid/Invalid (Y/N)	Prevents the operator from changing the traveling and material handling power control, traveling second speed control and speed alarm setting levels.
	AFS (AFS) * 1	Valid/Invalid (Y/N)	Allows data to be set for the AFS option.
	Destination (DESTI) * 2	Japan/International (J/I)	Allows data to be set for each destination
Option setting 3	Battery electrolyte level alarm (B LEVEL)	Valid/Invalid (Y/N)	Validates the battery electrolyte level alarm.
	Speed display in mph (MPH) * 2	Valid/Invalid (Y/N)	Changes the speed display unit to mph.
	Charging counter reset (C/CNT RES)	Valid/Invalid (Y/N)	Resets the charging counter value to 0.
	Battery (BATTERY)	Provided/Not provided (L/W)	Changes the charge meter calculation constant.
	Small specialized vehicle data set (SHOU-TOKU) * 1	Valid/Invalid (Y/N)	Limits the vehicle speed to 15 km/h (9.321 mile/h) for a small specialized vehicle.

* 1: As this option is not provided, setting is unnecessary.
* 2: Because these are set upon shipment, no more setting is necessary.

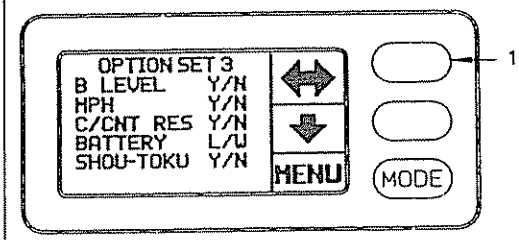
Notes:

- This function is used to match the control for each option installation state and not to validate or invalidate each option itself.
- Since the screen display is common with the 6FBR series, other items are also displayed. Y or N selection does not affect the vehicle status.

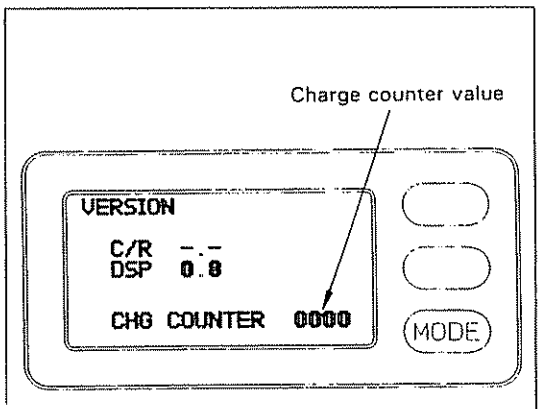
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OPTION SET No 2 screen



OPTION SET No 3 screen



VERSION screen

Switching Between Settings in the Specification Setting Mode

1. Input the password to display the MENU screen (see page 3-10).
2. Display the specification setting screen (see OPTION SET screen No. 2 on page 3-26).
3. Press selector switch ② to move the cursor for item selection.
   The cursor moves down item by item each time selector switch ② is pressed. When selector switch ② is pressed while the cursor is at the bottom item, the cursor moves to the top item.
4. When selector switch ② is kept pressed, OPTION SET screen No. 3 appears. If selector switch ② is kept pressed further, OPTION SET screen No. 2 re-appears.
5. Press selector switch ① to shift the item selection cursor between Y (set) and N (cancel).
6. Press the MODE switch to return to the MENU.
   [Setting status check]
   The setting change cursor position on the screen shows the option setting status irrespective of whether or not selection is made using the item selection cursor.

Notes

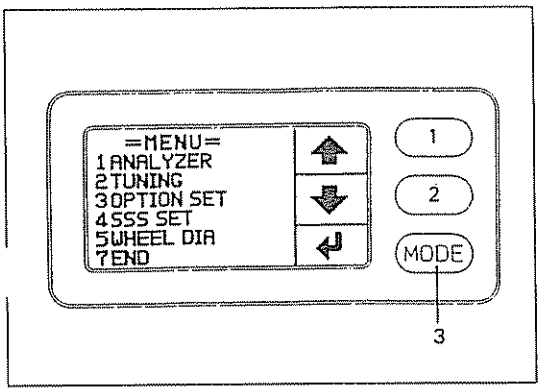
*1: When selector switch ① (↔) is kept pressed for 2 seconds or more, C/CNT RES is set from N to Y to reset the charging counter value to 0. Display at Y is the reset state.

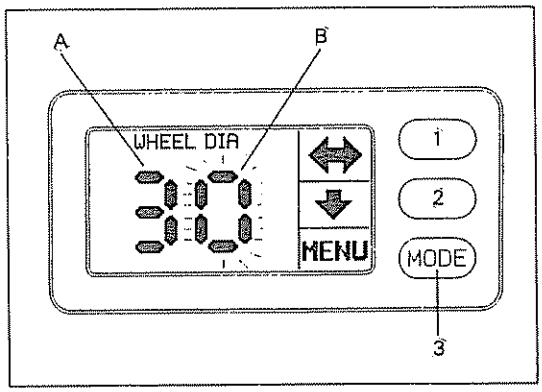
*2: The BATTERY setting is on-truck battery when set to W, and off-truck battery charge meter when set to L.

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WHEEL DIA

The constant matching the radius of the installed tire is set at the time of new vehicle delivery from the factory.
When the tires are replaced to the same or different size's tires, check ''tire contrast value'' which is shown in the repair manual, and set it into the display.





Wheel Diameter Setting

1. Display the MENU screen.
2. Press selector switch ① or ② to select 6 WHEEL DIA.
3. Press the MODE switch for transition to the WHEEL DIA screen.

   Ⓑ blinks when the wheel diameter setting screen is selected.
   When selector switch ① is pressed, the blinking position moves to Ⓐ. (The blinking position alternates between Ⓐ and Ⓑ each time selector switch ① is pressed.)
   When selector switch ② is pressed, the figure at the blinking position changes repeatedly in the order of 0, 9, 8, 7,... 2 and 1.
   Press switch ③ (MODE switch) to return to the MENU screen.

Tire Constant Table

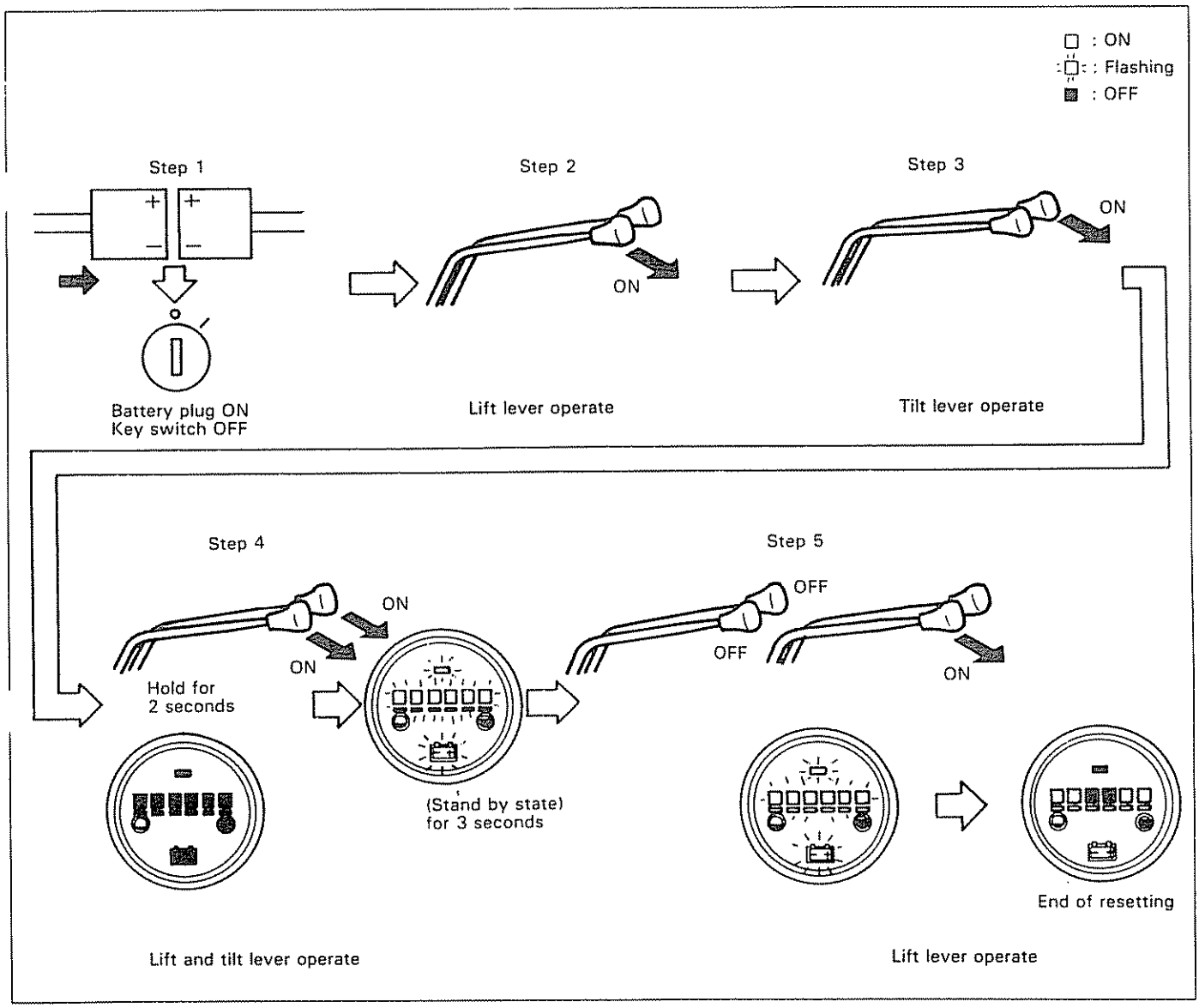
Tire			6FB10·14	6FB15·18 40-6FB15	6FB20·25	40-6FB20·25	6FB30
Pneumatic	Single	Standard single	34 (6.00-9-10)	34 (21×8-9-10)	39 (21×8-9-14)	71 (7.00-12-12)	82 (28×9-15-14)
		Oversize single	55 (6.50-10-12)	54 (6.50-10-12)	51 (23×9-10-16)		
	Double	Standard double	42 (4.50-12-8)	41 (4.50-12-8)		79 (5.50-15-8)	81 (6.00-15-10)
		Special double	38 (6.00-9-10)	37 (6.00-9-10)	37 (6.00-9-10)	81 (7.00-12-12)	85 (28×8-15-12)
Pneumatic Cushion	Single	Standard single	39 (6.00-9)	36 (21×8-9)	35 (21×8-9)	72 (7.00-12)	84 (28×9-15)
		Oversize single	50 (6.50-10)	48 (6.50-10)	57 (23×9-10)		
	Double	Standard double	44 (4.50-12)	44 (4.50-12)			85 (6.00-15)
		Special double	42 (6.00-9)	42 (6.00-9)	42 (6.00-9)	75 (7.00-12)	94 (7.00-15)

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METHOD FOR RESETTING LIFT INTERRUPT IN STD VEHICLE (WITH LED DISPLAY)

As the vehicle before delivery is set to disable material handling operation during traveling, it is necessary to input the password to enable traveling and material handling by operating the lift and tilt levers.

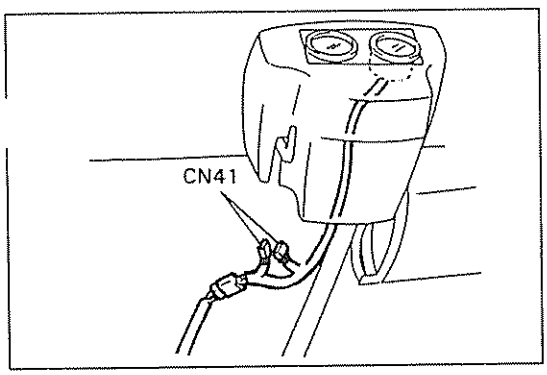
The input password shall be checked by bit display of the LED display.



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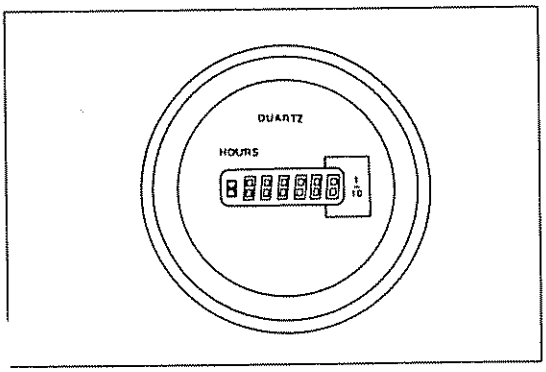
STARTING THE HOUR METER (FOR STD VEHICLE)

The hour meter is not started for counting when a new vehicle is shipped. Always start the hour meter upon delivery of a vehicle.

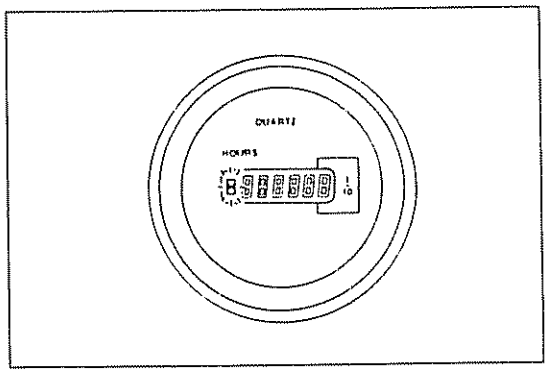


When a new vehicle is shipped, connector (CN41) is disconnected.

1. Disconnect the battery plug.
2. Remove the instrument panel LH cover.
3. Connect the connector (CN41) show at left.
4. Install the instrument panel LH cover.



5. Connect the battery plug and check the meter indication.



6. Turn the key switch to ON and see that the hour meter is operating. The hourglass mark blinks during operation.

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ELECTRICAL SYSTEM TROUBLESHOOTING

Page

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GENERAL 4-4

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- WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED (MATERIAL HANDLING SYSTEM) 4-104

STEERING SYSTEM TROUBLESHOOTING 4-108

- WHEN DIAGNOSTIC ERROR CODE IS DISPLAYED 4-108
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DISPLAY — MCS COMMUNICATION SYSTEM TROUBLESHOOTING 4-126

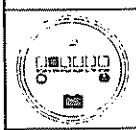
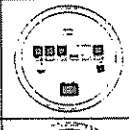
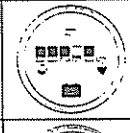
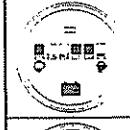
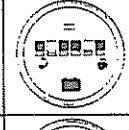
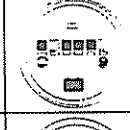
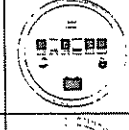
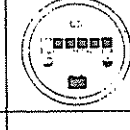
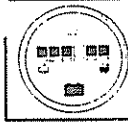
- WHEN DIAGNOSTIC ERROR CODE IS DISPLAYED 4-126
- WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED 4-127

OTHER TROUBLESHOOTING 4-138

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TROUBLESHOOTING REFERENCE

With Error Code Display

LEDs	LCD	Refer page	LEDs	LCD	Refer page	LEDs	LCD	Refer page	LEDs	LCD	Refer page
	C/R	4-7		AA	4-22		C9	4-49		EF	4-79
	A1	4-9		AF	4-22		CA	4-51		F0	4-108
	C/R	4-11		C0	4-23		E0	4-53	—	F1	4-126
	− +	4-12		C1	4-31		E1	4-63	—	F6	4-128
	A4	4-14		C3	4-40		E5	4-70	—	F7	4-132
	A6	4-16		C4	4-42		E6	4-73	—	F8	4-133
	A8	4-18		C7	4-45		EA	4-76			
	A9	4-20		C8	4-46	—	EE	4-78			

Without Error Code Display

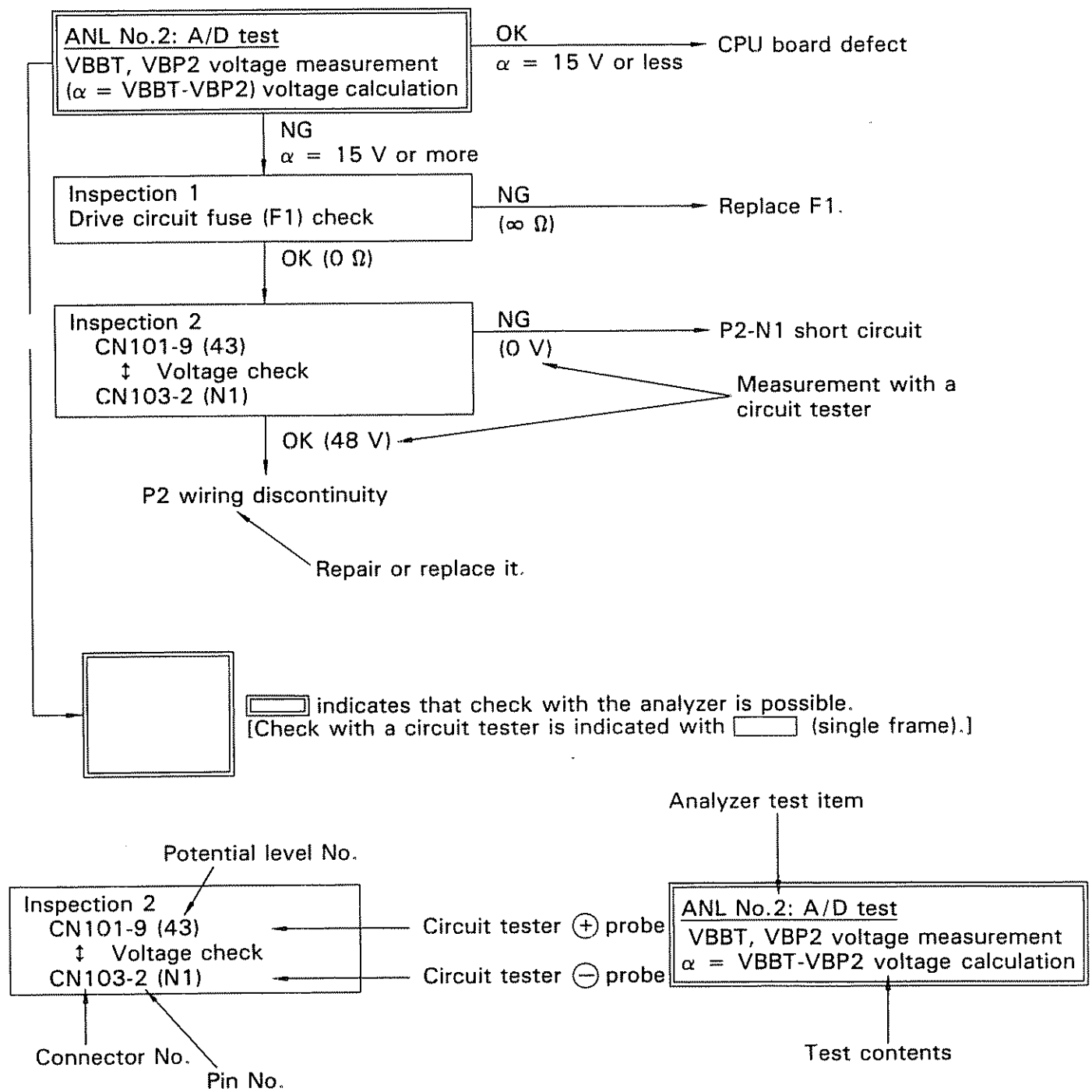
Troubleshooting item		Reference page
Traveling System	The vehicle does not move at all. (The display is kept off when the key switch is turned ON.)	4-83
	The vehicle does not move at all. (The MF (or MR) and MG contactors are not closed when the direction lever is set to forward (or reverse).)	4-90
	The vehicle does not move at all. (The MG and MF/MR contactors are closed.)	4-94
	Normal speed control fails. (No acceleration or non-attainment of the maximum speed)	4-96
	The vehicle travels in either the forward or reverse direction.	4-98
	Regenerative braking fails in switchback operation.	4-100
Material Handling System	The material handling motor does not run.	4-104

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Troubleshooting item		Reference page
Steering System	Power assist fails.	4-113
	Power assist is effective but the steering wheel is heavy.	4-118
	The steering wheel vibrates.	4-121
	The steering wheel moves by itself.	4-124
Display – MCS Communication System	No indication on the display. (No error display)	4-126
Other Troubleshooting	The battery charge indication involves much error.	4-138

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5. Troubleshooting explanation

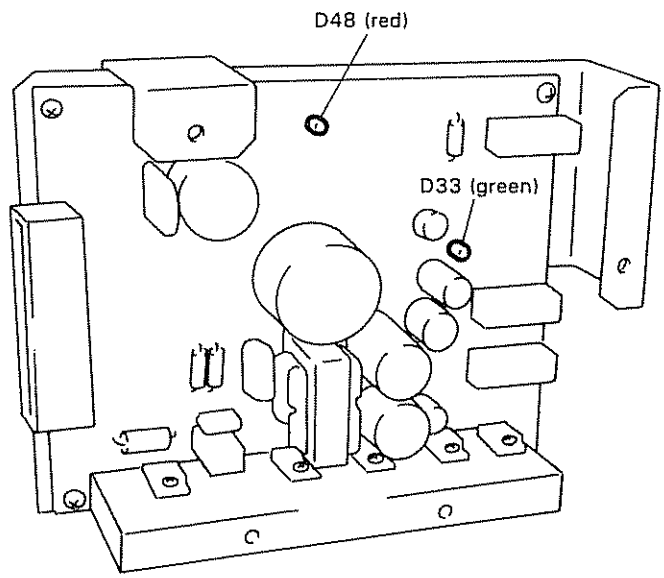


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DC-BD BOARD INSPECTION

Two LEDs are installed on the DC-BD board for easy recognition of the trouble position in the DC-BD board internal circuit by means of the LED on/off patterns.

Drive circuit: D33 (green LED)
12 V power supply circuit (display operating circuit): D48 (red LED)



DC-BD board

LED on/off pattern

	D33 (green) off	D33 (green) on
D48 (red) on	Ⓐ	Ⓑ
D48 (red) off	Ⓒ	Ⓓ

Ⓐ Short circuit of drive and 12 V power supply circuits
Phenomenon:
- The vehicle does not move at all.
- Display off (no indication) and charger inoperable

Ⓑ Short circuit of 12 V power supply circuit
Phenomenon:
- Display off (no indication) and charger inoperable

Ⓒ DC-BD board input voltage check
Measurement terminals CN107-7 – CN107-1
0 V: Input power supply defect (defect of other than the DC-BD board)
48 V (1- or 2-ton series) 72 V (3-ton series): DC-BD board defect

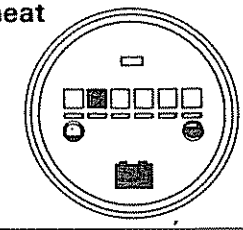
Ⓓ Normal pattern

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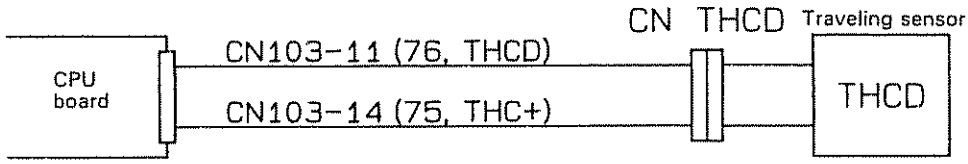
TRAVELING SYSTEM·MATERIAL HANDLING SYSTEM TROUBLESHOOTING

WHEN DIAGNOSTIC ERROR CODE IS DISPLAYED

Error code A0: MCS main circuit overheat



Related portion



Estimated causes

① Overheat (continuous use in overloaded state)

② Drive circuit temperature sensor defect

③ Drive circuit temperature sensor wiring or connector defective contact

④ CPU board defect

The vehicle is used continuously in overloaded state.

YES → Traveling and material handling operations with normal load 30 minutes after stopping the vehicle

NO

NG

Inspection 1
Measurement of drive circuit temperature sensor resistance after disconnecting the CN THCD

NG (2.2 kΩ or more) → Drive circuit temperature sensor defect

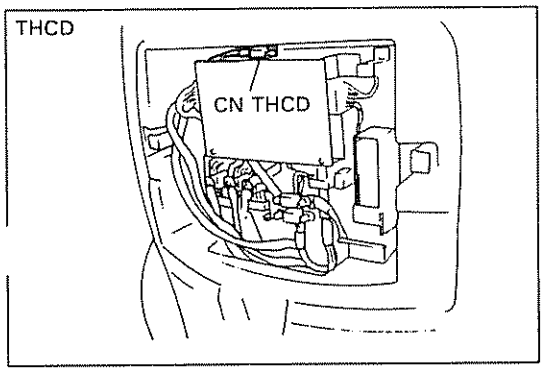
OK (2.2 kΩ or less)

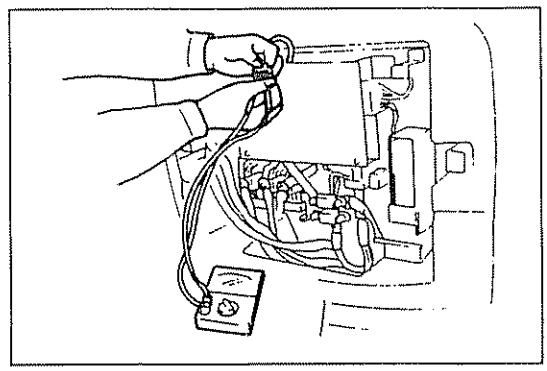
- Defective contact of connector
- CPU board defect

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Inspection 1. Individual drive circuit temperature sensor check
Battery plug OFF, CN THCD disconnection

Measurement terminals	Both terminals of THCD connector (on THCD side)
Circuit tester range	Ω × 1 K
Standard	Less than 2.2 kΩ

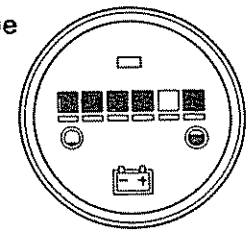




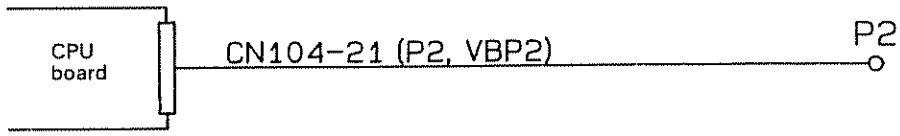
OK (less than 2.2 kΩ) → Defective contact of connector, or CPU board defect
NG (2.2 kΩ or more) → Drive circuit temperature sensor defect

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Error code A1: MCS main circuit overvoltage



Related portion



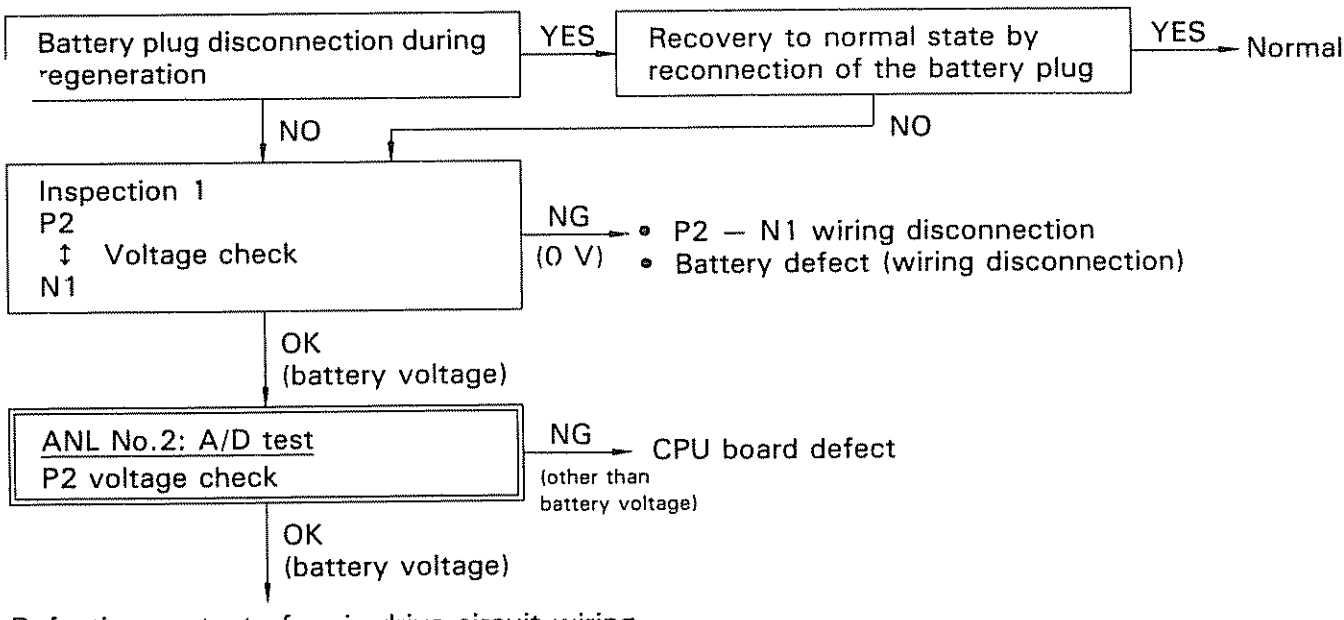
Estimated causes

① Battery plug disconnection or blown drive circuit fuse during regeneration

② Battery defect (wiring disconnection)

③ P2 — N1 wiring disconnection

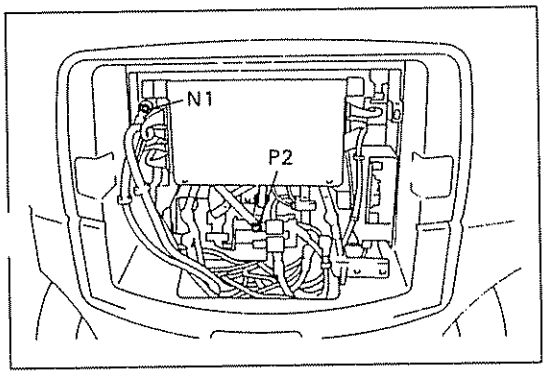
(When A8 is displayed in 1 to 2 seconds after A1 display, see troubleshooting for A8 first.)

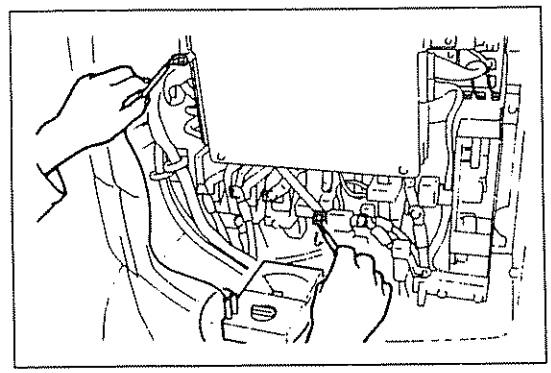


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Inspection 1. P2 — N1 voltage check
Battery plug ON, key switch ON

Measurement terminals	P2 ⊕ — N1 ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage





OK (battery voltage) → ANL No.2: A/D test
NG (0 V) → P2 — N1 wiring disconnection, or battery defect (wiring disconnection)

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Código de error A2: Aumento anormal de la temperatura del tablero de CPU

Parte relacionada

Tablero de CPU

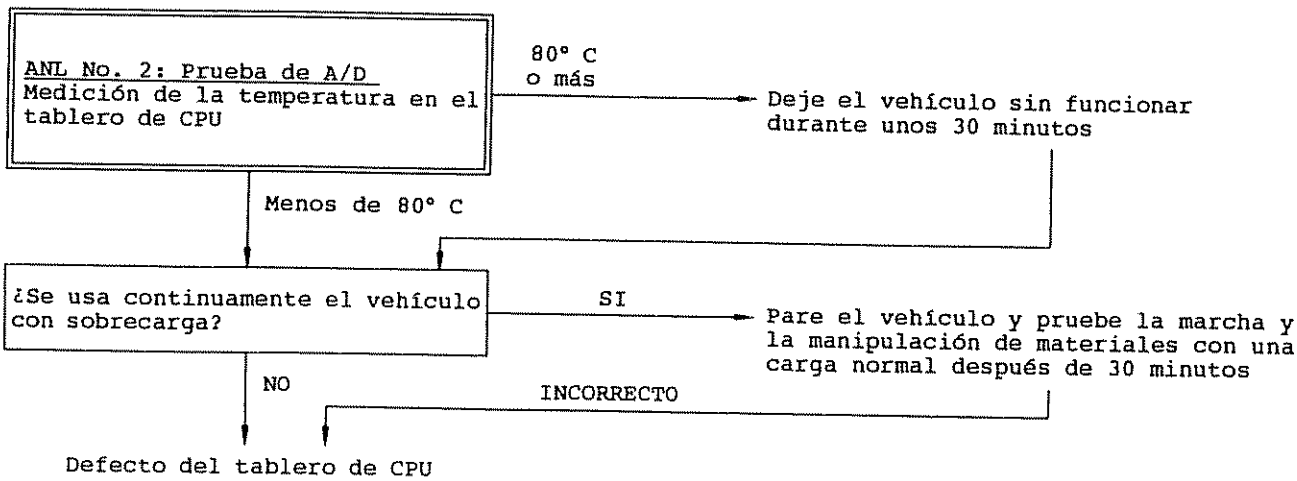
Sensor de la temperatura (TH1)

Causas estimadas

1 Temperatura ambiente del tablero de CPU a 80° C o más

2 Sobrecalentamiento (uso continuo con sobrecarga)

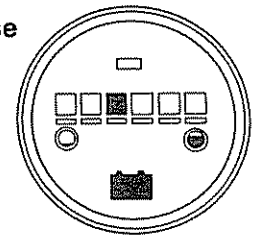
3 Defecto del sensor de la temperatura (defecto del tablero de CPU)



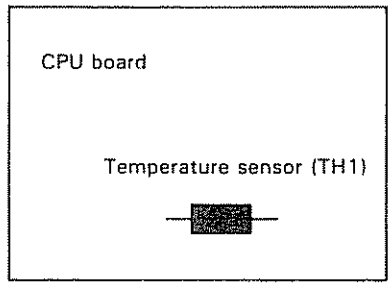
Nota: El sensor de la temperatura de CPU se incluye en el tablero de CPU. El defecto del tablero de CPU es concebible cuando aparece este aviso de sobrecalentamiento del regulador.

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Error code A2: CPU board abnormal temperature rise



Related portion

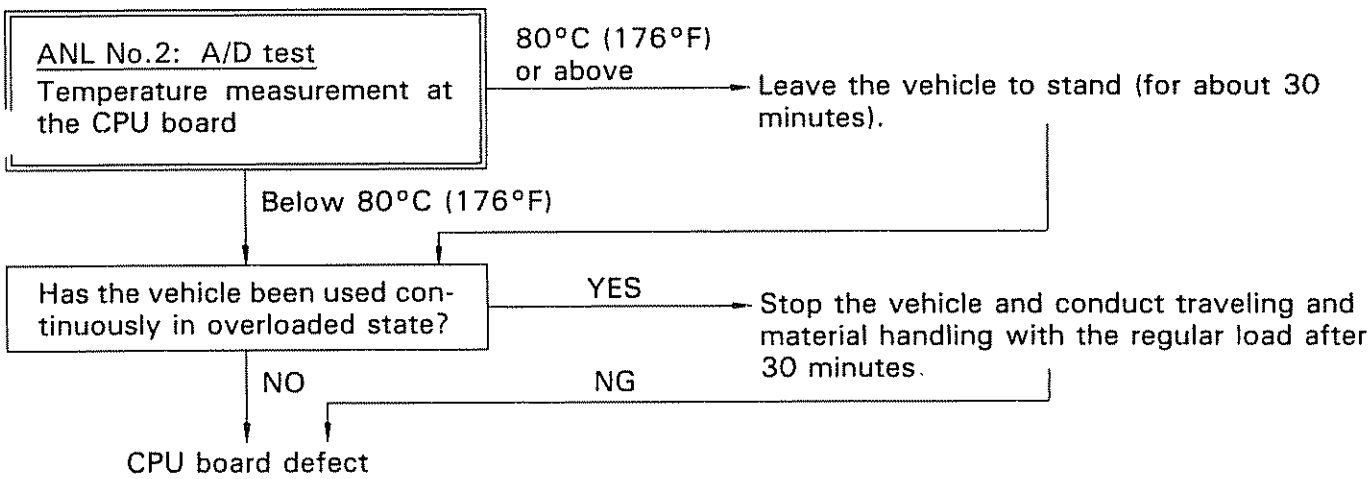


Estimated causes

① Temperature around CPU board at 80°C (176°F) or above

② Overheat (continuous use in overloaded state)

③ Temperature sensor defect (CPU board defect)



Note: The CPU temperature sensor is included in the CPU board. Thus, if this controller overheat warning is displayed, the CPU board may be defective.

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Código de error A3: Voltaje de la batería anormalmente alto

Parte relacionada

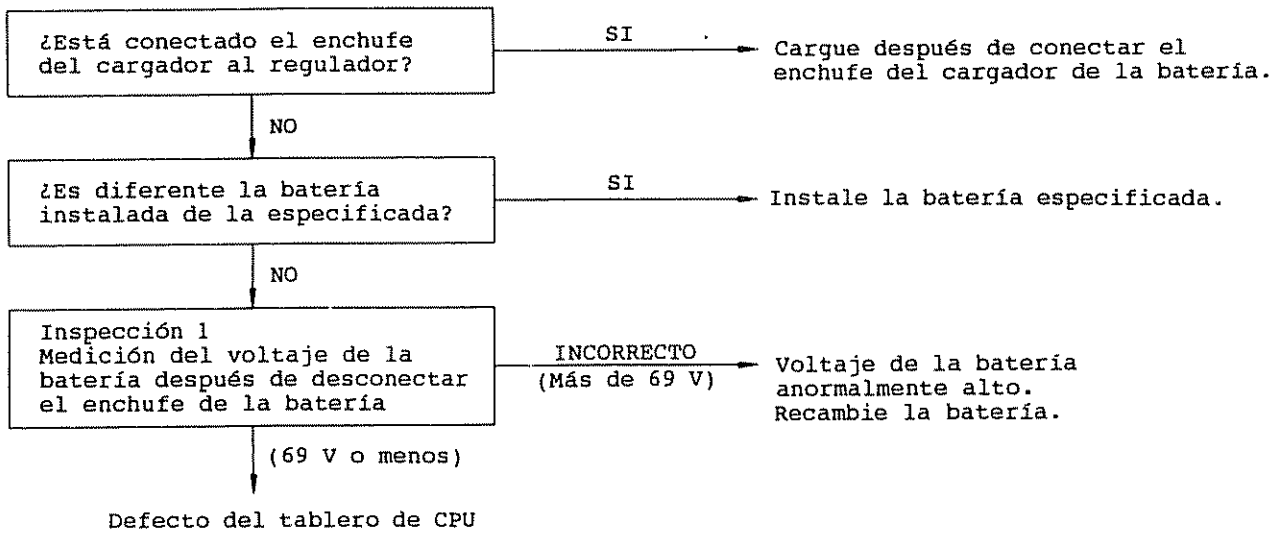
Tablero de CPU

Causas estimadas

1 Conexión de un voltaje de la batería especificado diferente al enchufe de la batería

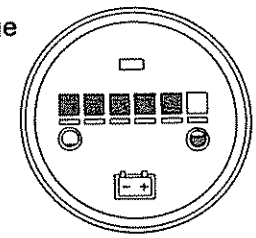
2 Conexión errónea del enchufe del cargador al regulador.

3 Defecto del tablero de CPU

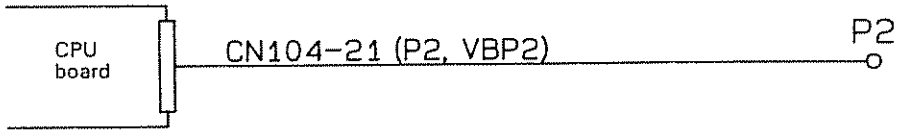


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Error code A3: Abnormally high battery voltage



Related portion

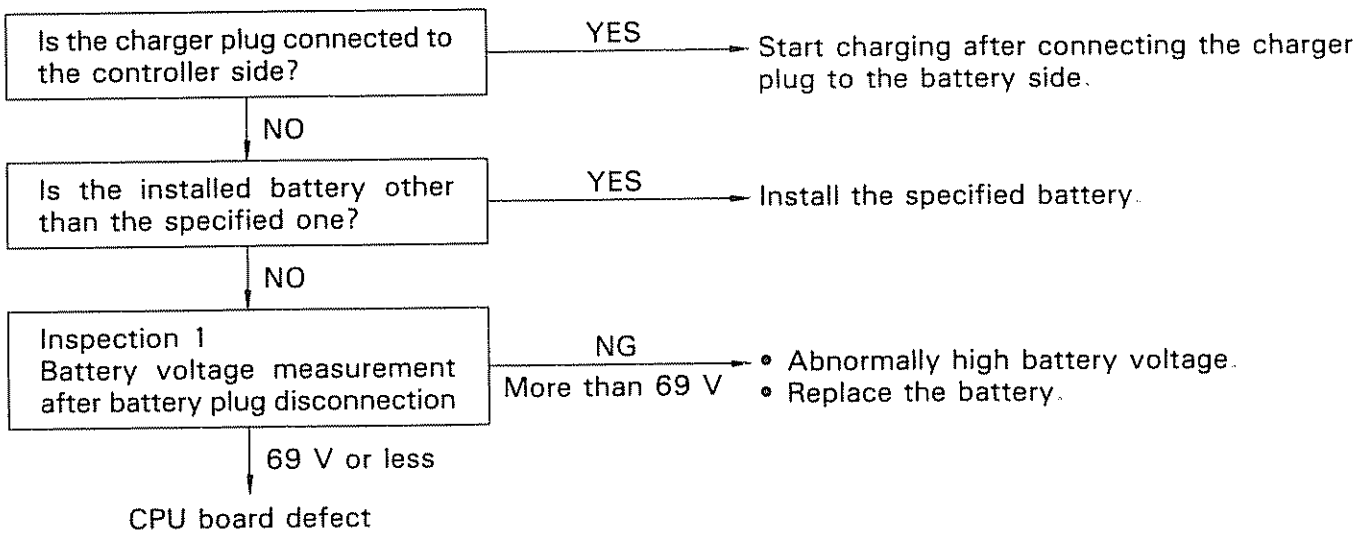


Estimated causes

① Connection of other than specified battery voltage to battery plug

② Wrong connection of charger plug to controller

③ CPU board defect



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Inspección 1. Medición del voltaje de la batería
Enchufe de la batería desconectado

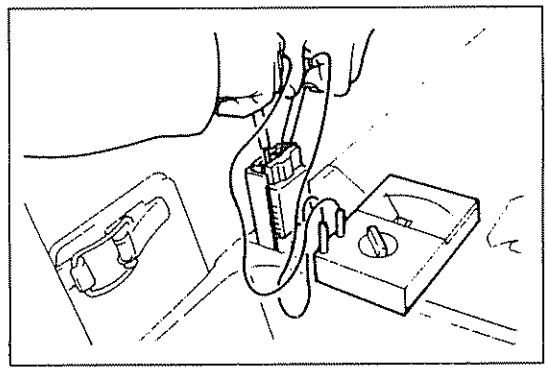
Terminales de medición	Ambos terminales del enchufe de la batería
Alcance del probador de circuitos	CC 250 V
Estándar	69 V o menos

CORRECTO (69 V o menos) -- Defecto del tablero de CPU
INCORRECTO (más de 69 V) -- Voltaje e la batería anormalmente alto.
Recambie la batería.

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Inspection 1. Battery voltage measurement
Battery plug OFF

Measurement terminals	Both terminals of battery plug
Circuit tester range	DC 250 V
Standard	69 V or less



OK (69 V or less) → CPU board defect
NG (more than 69 V) → Abnormally high battery voltage. Replace the battery.

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Código de error A4: Anormalidad de instalación del potenciómetro de aceleración

Parte relacionada

Potenciómetro de aceleración

Tablero de CPU

Causas estimadas

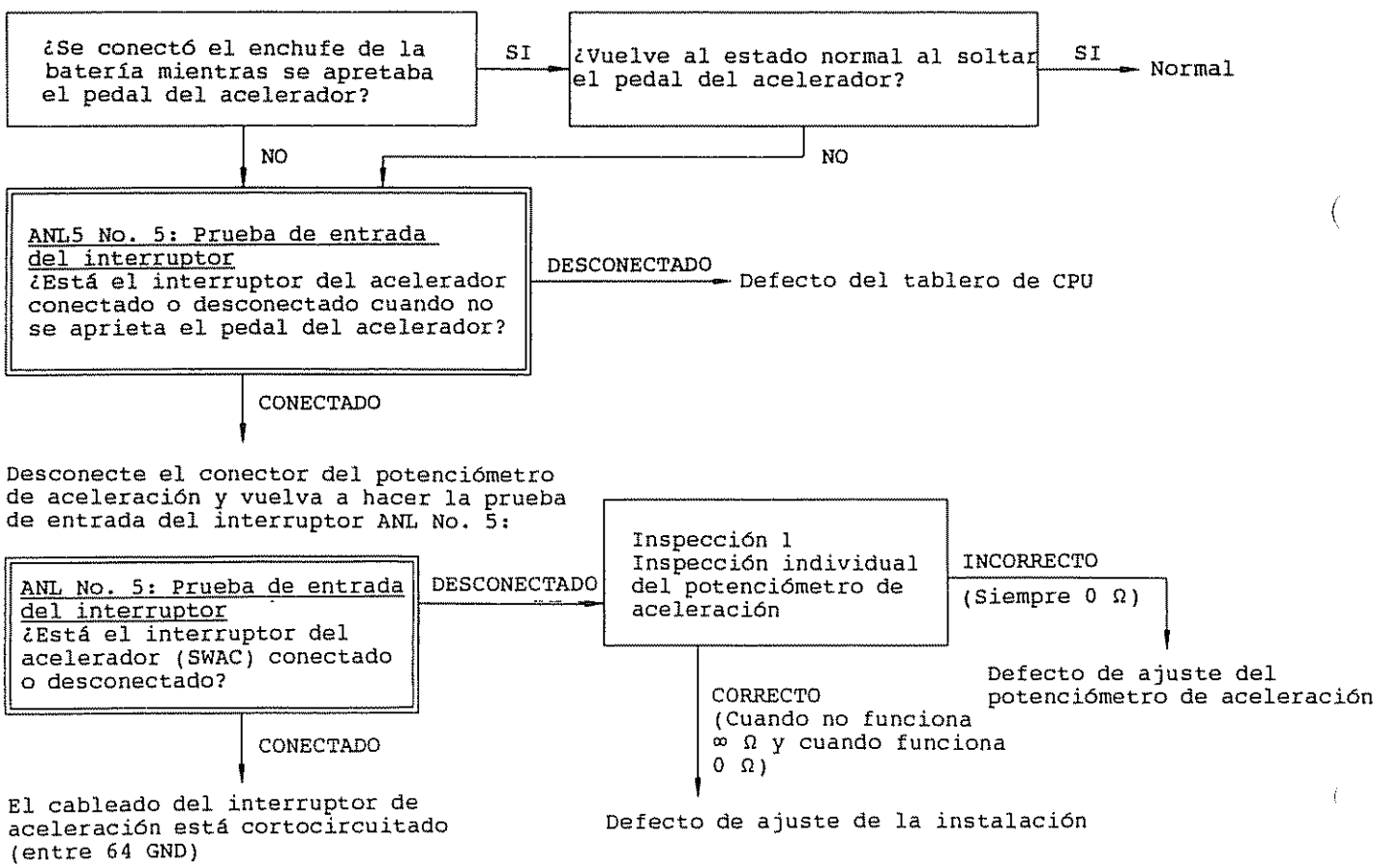
1 Defecto del potenciómetro de aceleración (entre 64 y 51)

2 Defecto de ajuste de instalación del potenciómetro de aceleración

3 Cortocircuito del cableado del interruptor de aceleración (entre 64 y GND)

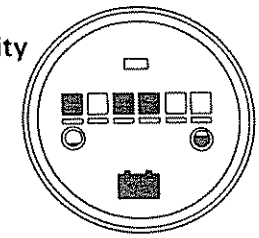
4 Defecto del tablero de CPU

(Si A4 aparece uno o dos segundos después de aparecer AF o A1, dé prioridad a la búsqueda de averías de AF o A1)

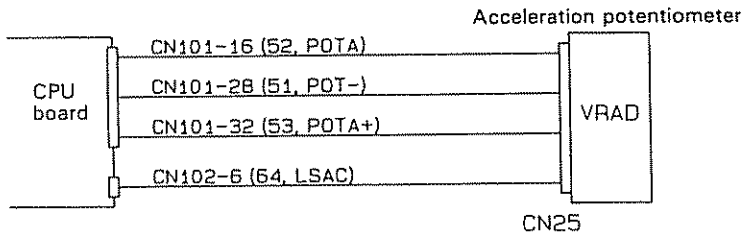


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Error code A4: Acceleration potentiometer installation abnormality



Related portion



Estimated causes

① Acceleration potentiometer defect (between 64 and 51)

② Acceleration potentiometer installation adjustment defect

③ Acceleration potentiometer wiring short circuit (between 64 and GND)

④ CPU board defect

(If A4 is displayed in one or two seconds after AF or A1 is displayed, first perform troubleshooting for AF or A1.)

Was the battery plug connected while depressing the accelerator pedal?

YES → Is normal state recovered after releasing the accelerator pedal?

YES → Normal

NO

NO

ANL No.5: Switch input test
Is the acceleration switch ON or OFF when the acceleration pedal is not depressed?

OFF → CPU board defect

ON

Disconnect the acceleration potentiometer connector and conduct the ANL No.5: Switch input test again.

ANL No.5: Switch input test
Is the acceleration switch (SWAC) ON or OFF?

OFF → Inspection 1
Acceleration potentiometer individual inspection

NG (always 0 Ω) → Acceleration potentiometer defect

OK (∞ Ω when not operated and 0 Ω when operated) → Installation adjustment defect

ON

Short circuit of acceleration switch wiring (between 64 and GND)

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Inspección 1. Inspección individual del potenciómetro de aceleración
Enchufe de la batería desconectado, CN25 desconectado

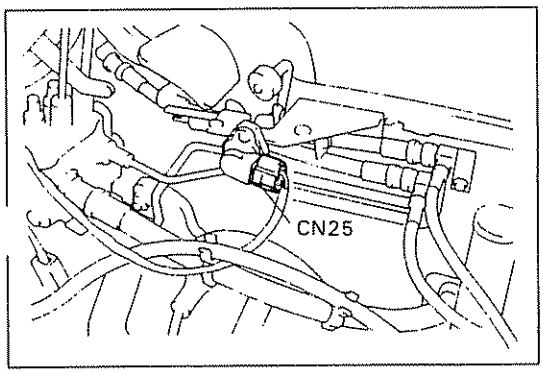
Terminales de medición	Potenciómetro de aceleración SWAC (64) - GND (51)
Alcance del probador de circuitos	Ω x 1
Estándar	∞ Ω en estado ordinario y 0 Ω en estado de funcionamiento

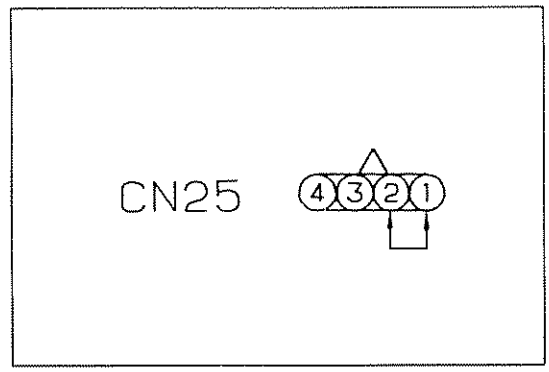
CORRECTO (∞ Ω en estado ordinario y 0 Ω en estado de funcionamiento)
-- Defecto de ajuste de la instalación
INCORRECTO (siempre 0 Ω) -- Defecto del potenciómetro de aceleración

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Inspection 1. Acceleration potentiometer individual inspection
Battery plug OFF, CN25 disconnection

Measurement terminals	Acceleration potentiometer SWAC (64) — GND (51)
Circuit tester range	Ω × 1
Standard	∞ Ω when not operated, and 0 Ω when operated





OK (∞ Ω when not operated and 0 Ω when operated) → Installation adjustment defect
NG (always 0 Ω) → Acceleration potentiometer defect

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Código de error A6: Anormalidad de la instalación del interruptc de manipulación de materiales

Parte relacionada

Tablero de CPU	Interruptor de basculación Interruptor de elevación Interruptor del accesorio

Causas estimadas

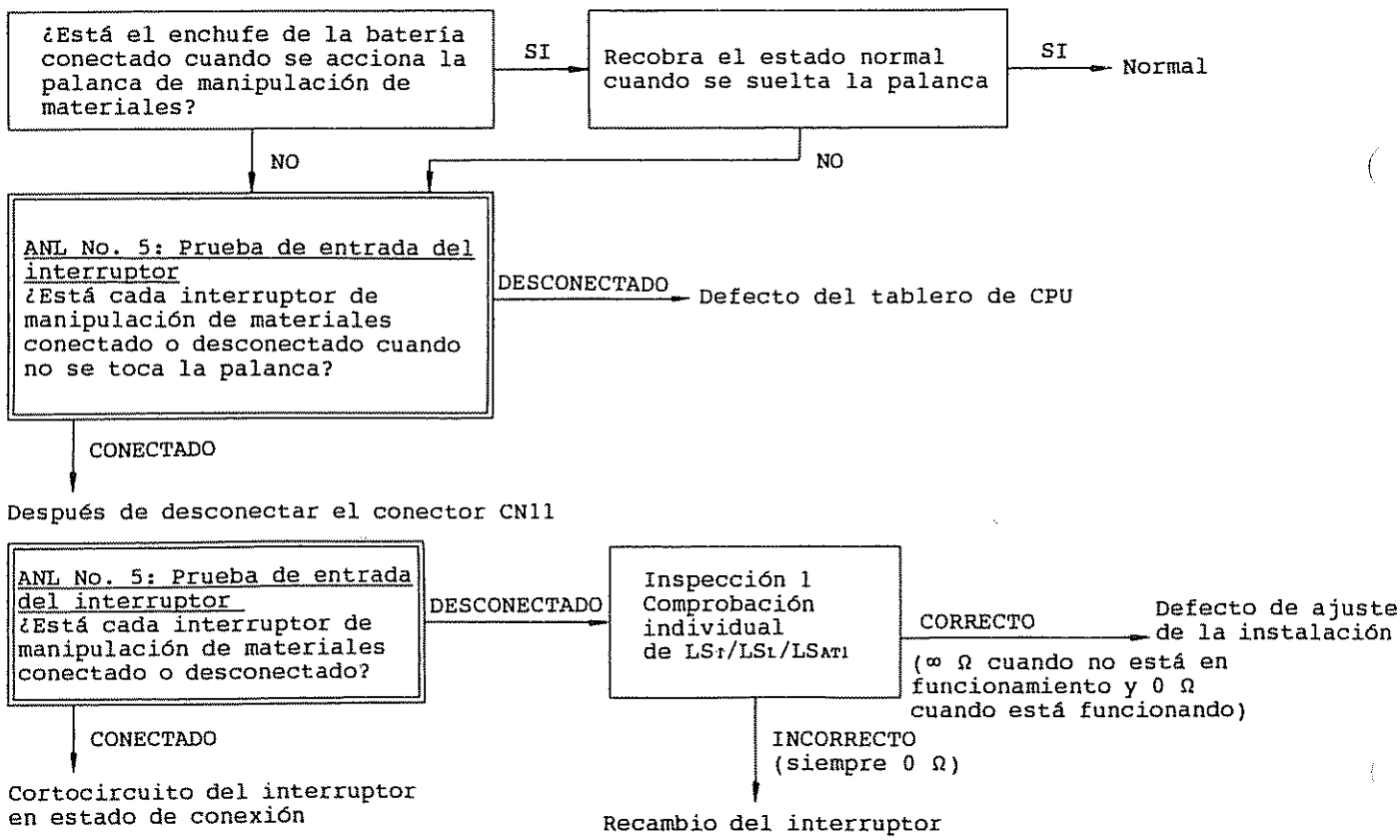
1 Defecto de cada interruptor de manipulación de materiales

2 Defecto de instalación/ajuste de cada interruptor de manipulación de materiales

3 Cortocircuito de cada cable del interruptor de manipulación de materiales

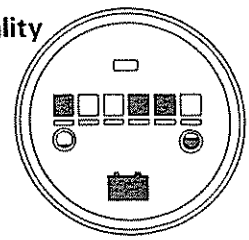
4 Defecto del tablero de CPU

Si A6 aparece uno o dos segundos después de aparecer A6, dé prioridad a la búsqueda de averías de AF o A1.

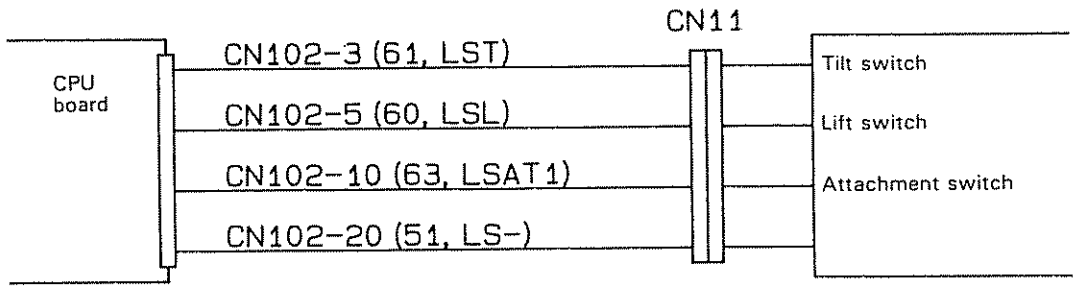


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Error code A6: Material handling switch installation abnormality



Related portion



Estimated causes

① Defect of each material handling limit switch

② Defective installation adjustment of each material handling limit switch

③ Short circuit of each material handling limit switch wiring

④ CPU board defect

(If A6 is displayed in about 1 to 2 seconds after AF or A1 troubleshooting.)

Was the battery plug connected while a material handling lever is operated?

YES → Is the normal state recovered when the material handling lever is released?

YES → Normal

NO

NO → ANL No.5: Switch input test
Is each material handling switch ON or OFF when the corresponding material handling lever is not pulled?

OFF → CPU board defect

ON

After CN11 connector disconnection

ANL No.5: Switch input test
Is each material handling limit switch ON or OFF?

OFF → Inspection 1
LS_T·LS_L·LS_{AT1}
individual inspection

OK (∞ Ω when not operated and 0 Ω when operated) → Installation adjustment defect

NG (always 0 Ω) → Switch replacement

ON → Short circuit of the switch in ON state

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Inspección 1. Inspección individual de $LS_T/LS_L/LS_{AT1}$
Enchufe de la batería desconectado, remoción individual de $LS_T/LS_L/LS_{AT1}$

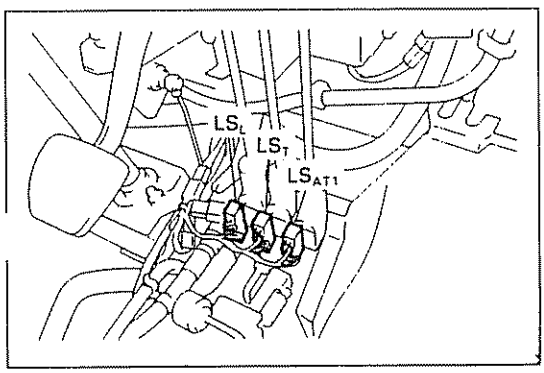
Terminales de medición	Ambos terminales de cada conector del interruptor limitador
Alcance del probador de circuitos	Ω x 1
Estándar	Normalmente ∞ Ω y 0 Ω cuando funciona

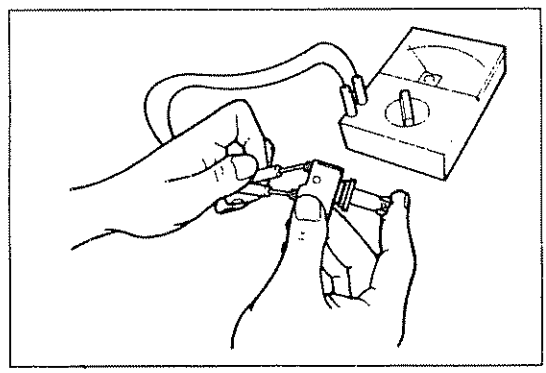
CORRECTO (∞ Ω cuando no funciona y 0 Ω cuando funciona) -- Defecto de ajuste de la instalación
INCORRECTO (siempre 0 Ω) -- Recambie el interruptor

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Inspection 1. LS_T·LS_L·LS_{AT1} individual inspection
Battery plug OFF, LS_T·LS_L·LS_{AT1} individual removal

Measurement terminals	Both terminals of each limit switch connector
Circuit tester range	Ω × 1
Standard	Normally ∞ Ω and 0 Ω when operated





OK (∞Ω when not operated, and 0 Ω when operated) → Installation adjustment defect
NG (always 0 Ω) → Replace switch

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Código de error A8: Anormalidad del fusible de marcha

Parte relacionada

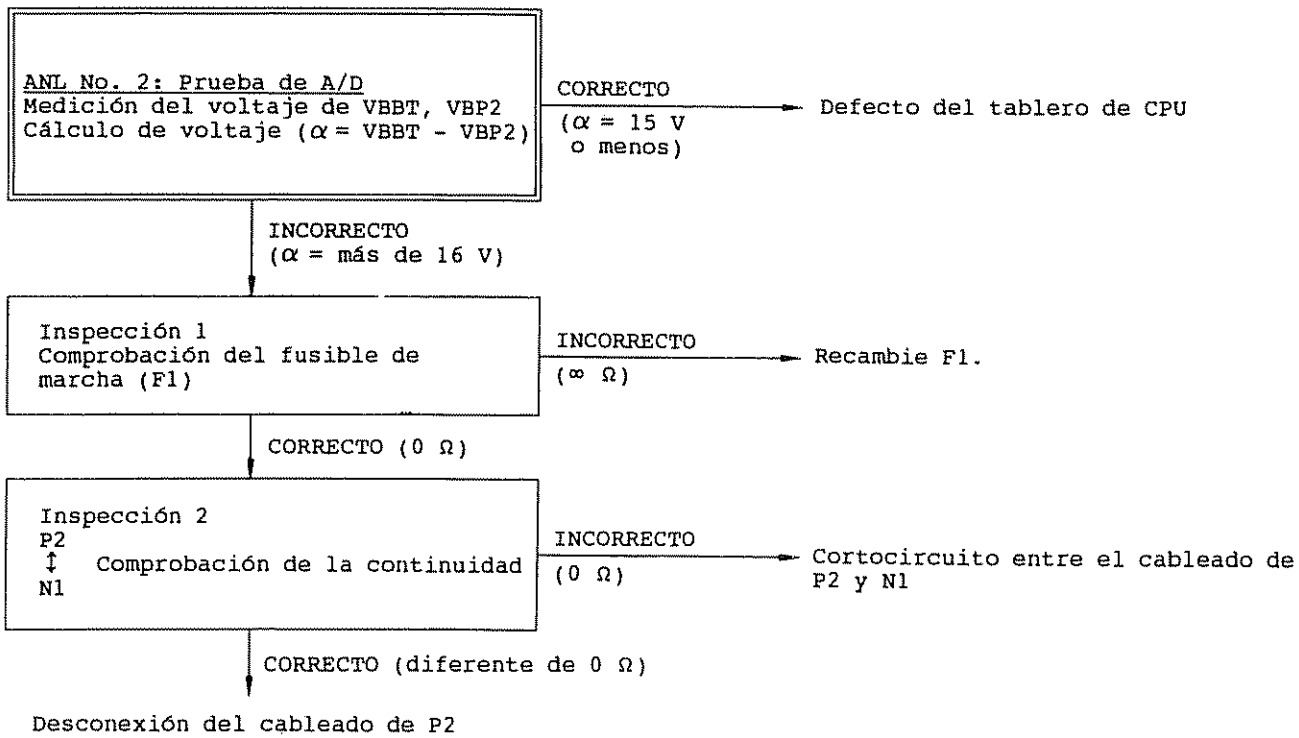
Series de 1-2 ton.	Tablero de CPU
Series de 3 ton.	Tablero de CPU

Causas estimadas

1 Fusible de marcha (F1) abierto

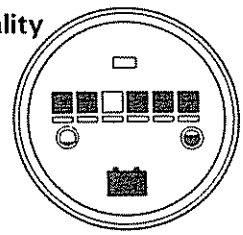
2 Desconexión del cableado de P2

3 Defecto del tablero de CPU

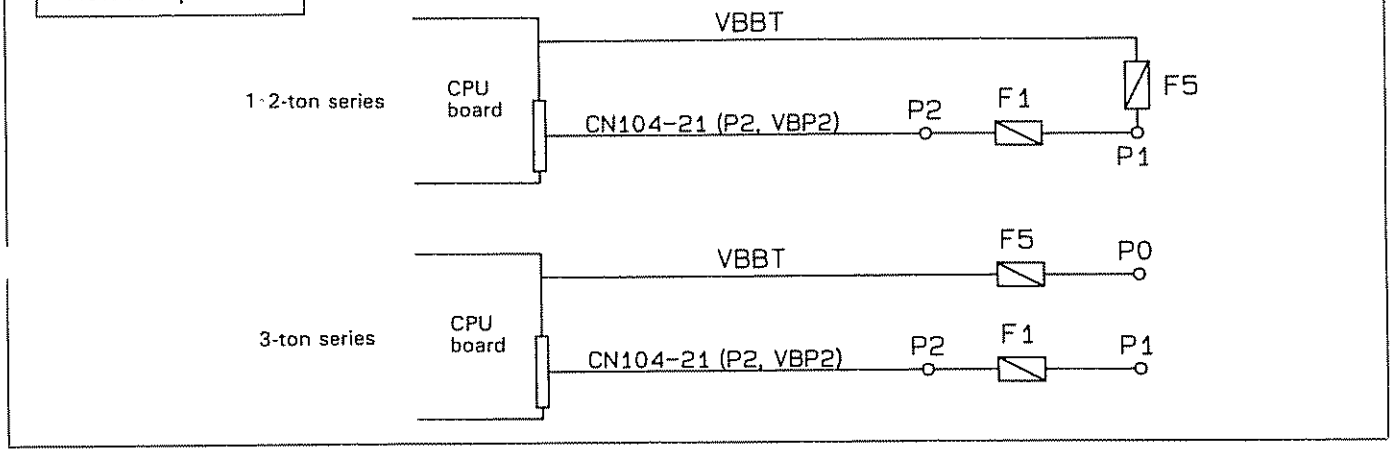


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Error code A8: Drive circuit fuse abnormality



Related portion



Estimated causes

① Drive circuit fuse (F1) open

② P2 wiring disconnection

③ CPU board defect

ANL No.2: A/D test
VBBT, VBP2 voltage measurement
(α = VBBT − VBP2) voltage calculation

OK (α = 15 V or less) → CPU board defect

NG (α = more than 16 V)

Inspection 1
Drive circuit fuse (F1) inspection

NG (∞ Ω) → Replace F1.

OK (0 Ω)

Inspection 2
P2
↕ continuity check
N1

NG (0 Ω) → Short circuit between P2 and N1

OK (other than 0 Ω)

P2 wiring disconnection

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Inspección 1. Comprobación del fusible de marcha (F1)
Enchufe de la batería desconectado, remoción individual de F1

Terminales de medición	Ambos terminales de F1
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Recambie F1.

Inspección 2. Comprobación de la continuidad de P2 - N1
Enchufe de la batería desconectado, remoción individual de F1

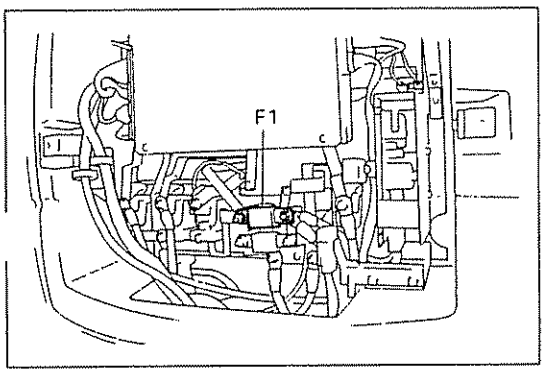
Terminales de medición	P2 - N1
Alcance del probador de circuitos	Ω x 1
Estándar	Diferente de 0 Ω

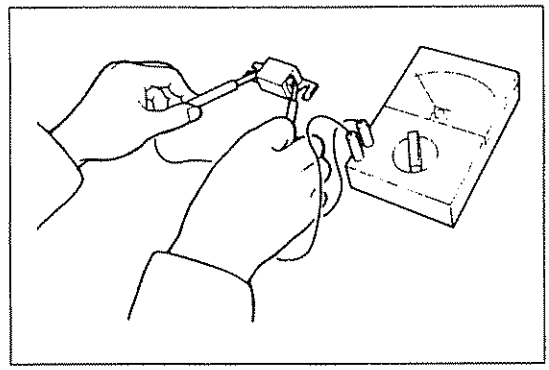
CORRECTO (diferente de 0 Ω) -- Desconexión del cableado de P2
INCORRECTO (0 Ω) -- Cortocircuito entre P2 y N1

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Inspection 1. Drive circuit fuse (F1) check
Battery plug OFF, F1 individual removal

Measurement terminals	Both terminals of F1
Circuit tester range	Ω × 1
Standard	0 Ω

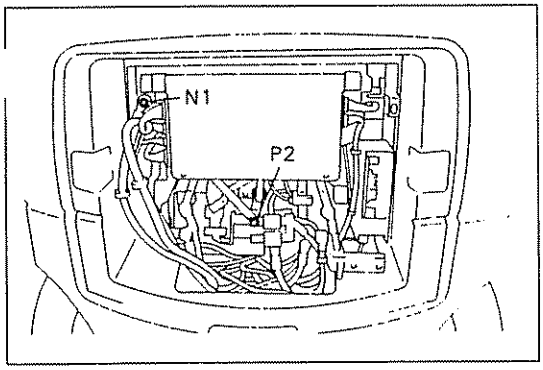


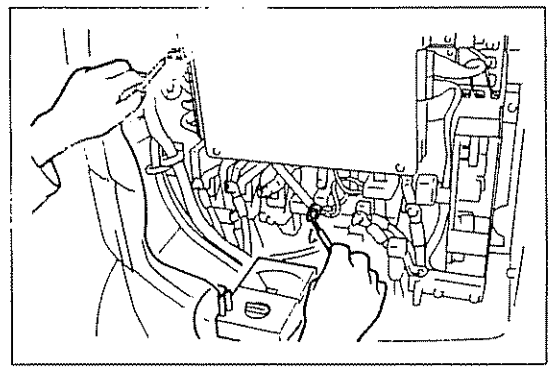


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Replace F1.

Inspection 2. P2 — N1 continuity check
Battery plug OFF, F1 individual removal

Measurement terminals	P2 — N1
Circuit tester range	Ω × 1
Standard	Other than 0 Ω





OK (other than 0 Ω) → P2 wiring disconnection
NG (0 Ω) → Short circuit between P2 and N1

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Inspección 1. Comprobación del fusible de manipulación de materiales (F2)
Enchufe de la batería desconectado, remoción individual de F2

Terminales de medición	Ambos terminales de F2
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Recambie F2.

Inspección 2. Comprobación de la continuidad de P11 - N1
Enchufe de la batería desconectado, remoción individual de F2

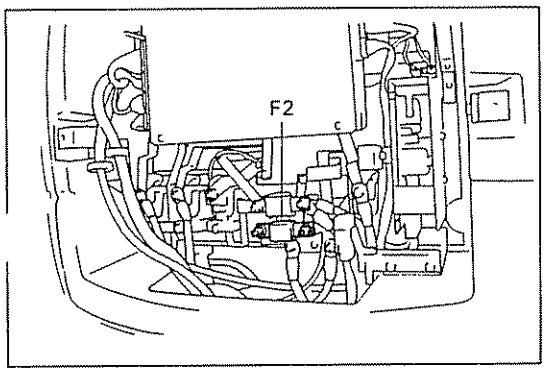
Terminales de medición	P11 - N1
Alcance del probador de circuitos	Ω x 1
Estándar	Diferente de 0 Ω

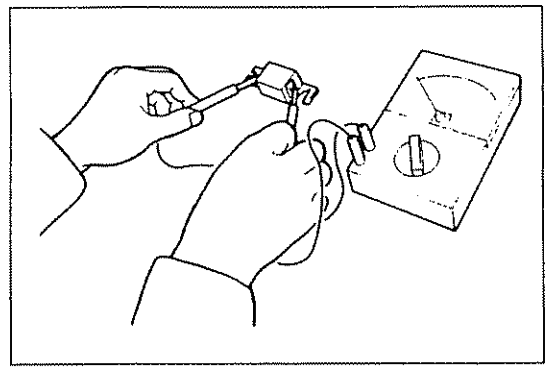
CORRECTO (diferente de 0 Ω) -- Desconexión del cableado de P11
INCORRECTO (0 Ω) -- Cortocircuito entre P11 y N1

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Inspection 1. Material handling fuse (F2) check
Battery plug OFF, F2 individual removal

Measurement terminals	Both terminals of F2
Circuit tester range	Ω × 1
Standard	0 Ω

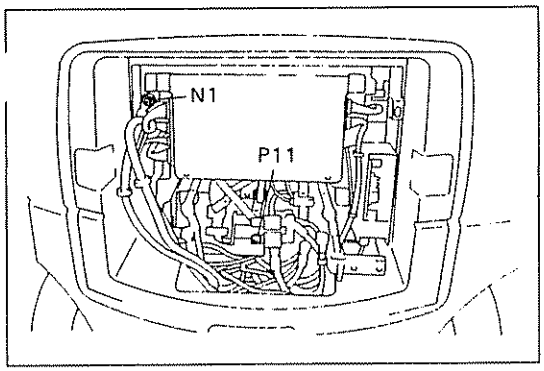


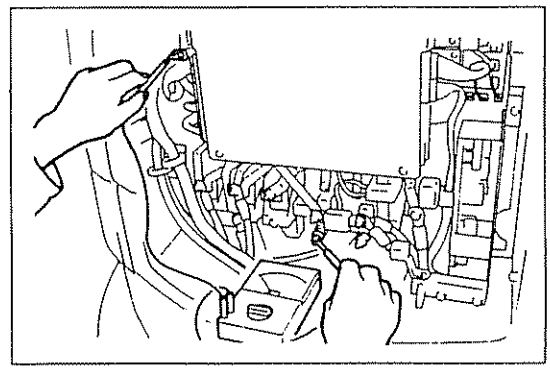


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Replace F2.

Inspection 2. P11 — N1 continuity check
Battery plug OFF, F2 individual removal

Measurement terminals	P11 — N1
Circuit tester range	Ω × 1
Standard	Other than 0 Ω





OK (other than 0 Ω) → P11 wiring disconnection.
NG (0 Ω) → Short circuit between P11 and N1.

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Código de error AA: Anormalidad de salida del sensor de la temperatura del tablero de CPU

Parte relacionada

Tablero de CPU

Sensor de la temperatura (TH1)

Causas estimadas

1 Defecto del tablero de CPU

Recambie el tablero de CPU para la exposición de AA.

Código de error AF: Anormalidad de CPU

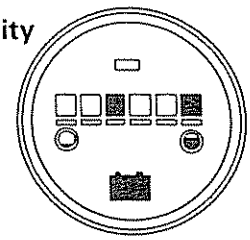
Causas estimadas

1 Defecto del tablero de CPU

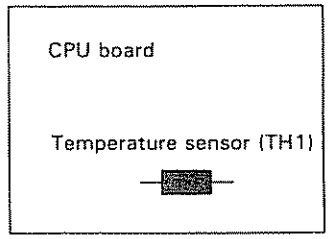
Recambie el tablero de CPU para la exposición de AF.

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Error code AA: CPU board temperature sensor output abnormality



Related portion

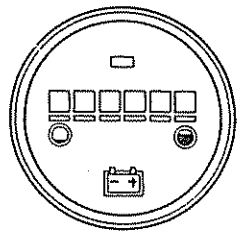


Estimated causes

① CPU board defect

Replace the CPU board upon AA display.

Error code AF: CPU abnormality



Estimated causes

① CPU board defect

Replace the CPU board upon AF display.

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Código de error C0: Anormalidad del circuito de marcha principal

Parte relacionada

Tablero de CPU

Tablero de DC-BD

Causas estimadas

1 Defecto de TMD (Compruebe DF1, DF2, DAD, CAD y RAD sin falta, ya que cualquiera de ellos puede ser la causa primaria del defecto de TMD)

2 Defecto del sensor de corriente de marcha (CSD), desconexión del cableado o contacto defectuoso del conector

3 Desconexión del cableado del tablero de DC-BD a TMD

4 Desconexión del cableado del tablero de CPU a TMD

5 Desconexión del cableado del tablero de CPU al tablero de DC-BD o contacto defectuoso del conector

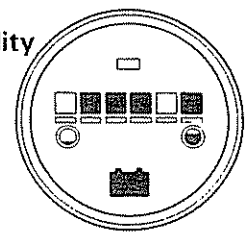
6 Defecto del tablero de DC-BD

7 Defecto del tablero de CPU

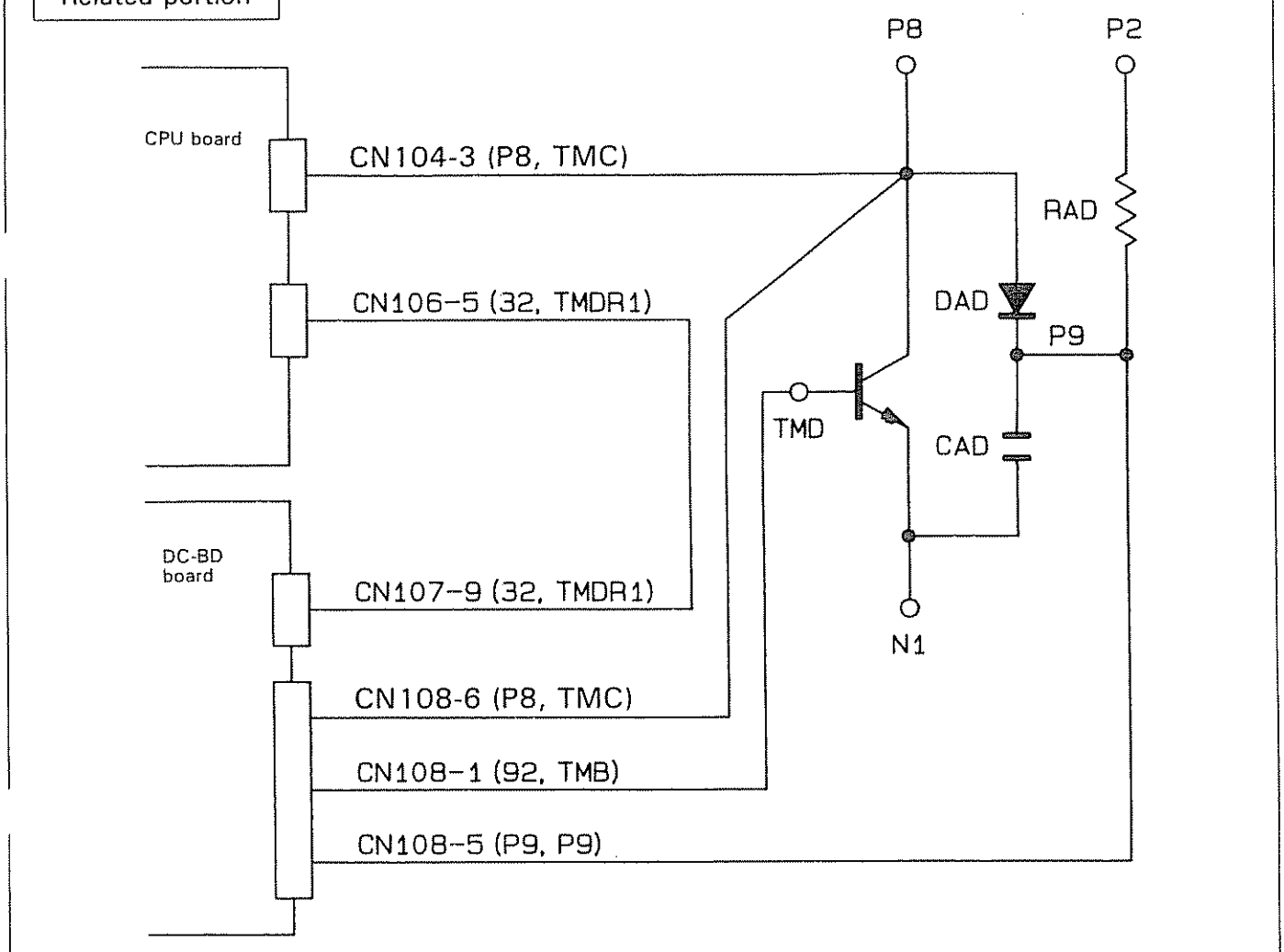
(Si C0 y A8 aparecen al mismo tiempo, lleve a cabo primero la búsqueda de averías de A8)

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Error code C0: Main drive circuit abnormality



Related portion



Estimated causes

① TMD defect (Since DF1, DF2, DAD, CAD and RAD may be the primary cause of the TMD defect, be sure to inspect them, too.)

② Traveling current sensor (CSD) defect, wiring disconnection, or connector contact defect

③ DC-BD board — TMD wiring disconnection

④ CPU board — TMD wiring disconnection

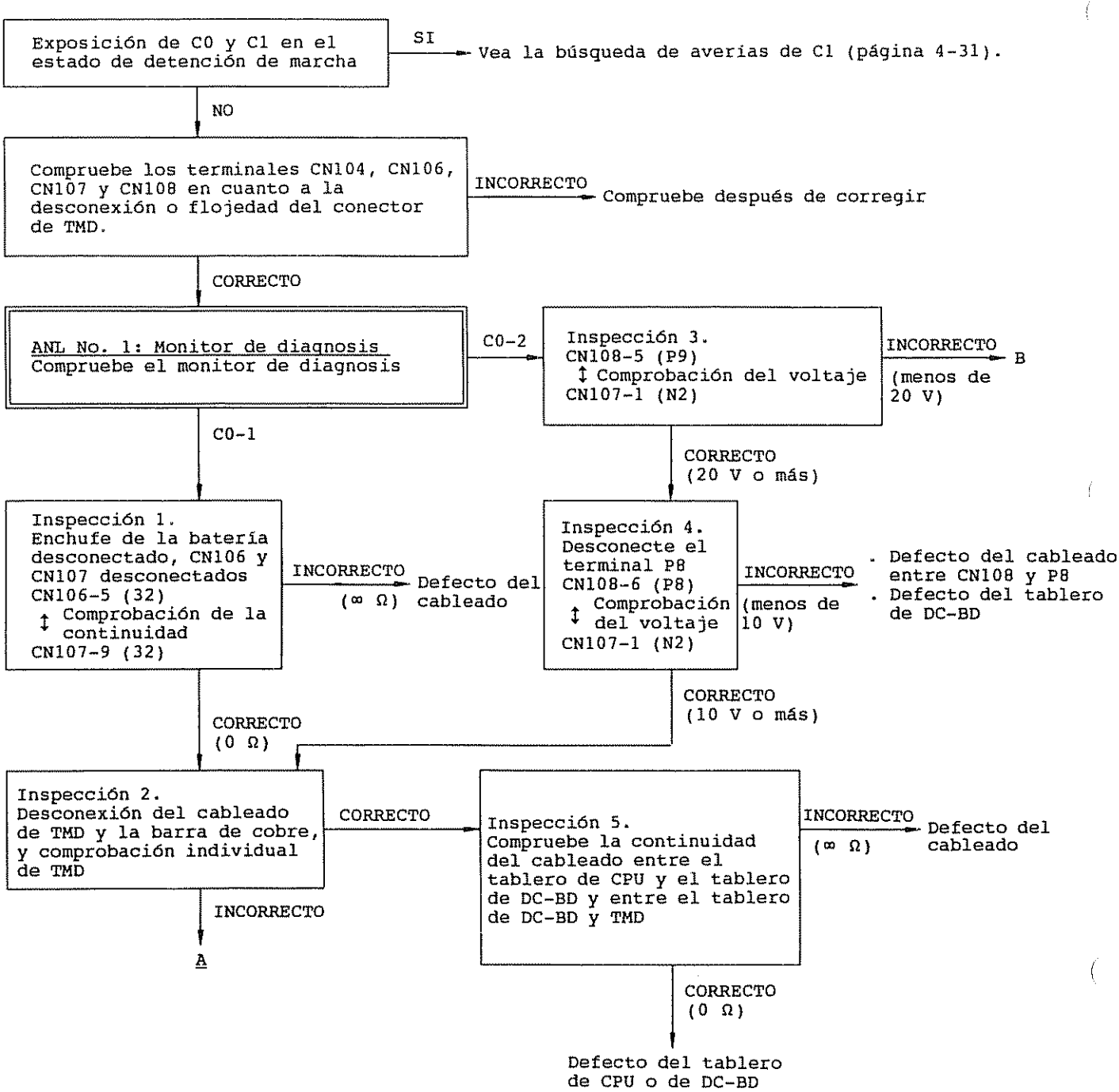
⑤ CPU board — DC-BD board wiring disconnection, or defective connector contact

⑥ DC-BD board defect

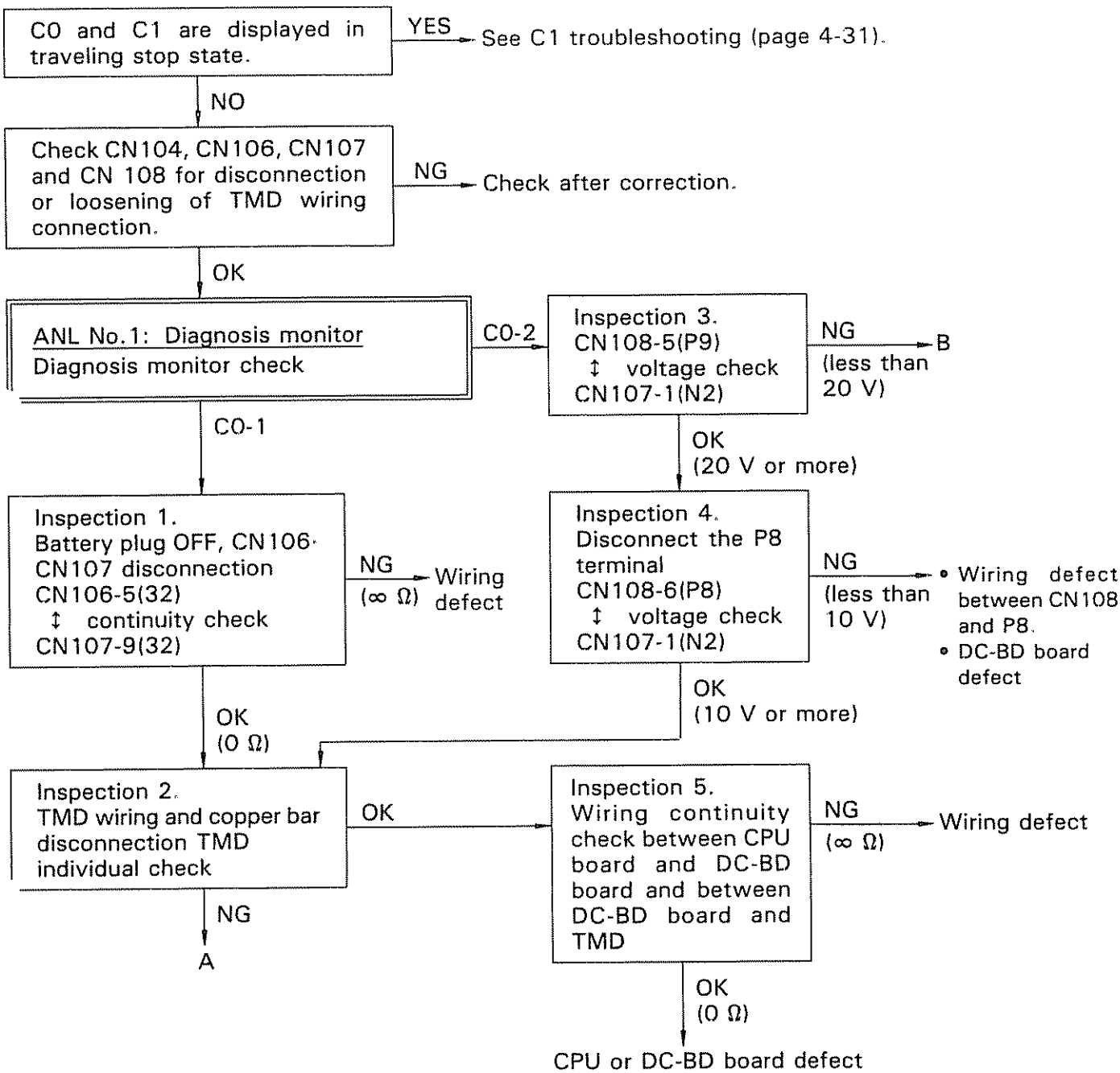
⑦ CPU board defect

(If C0 and A8 are displayed at the same time, first perform A8 troubleshooting.)

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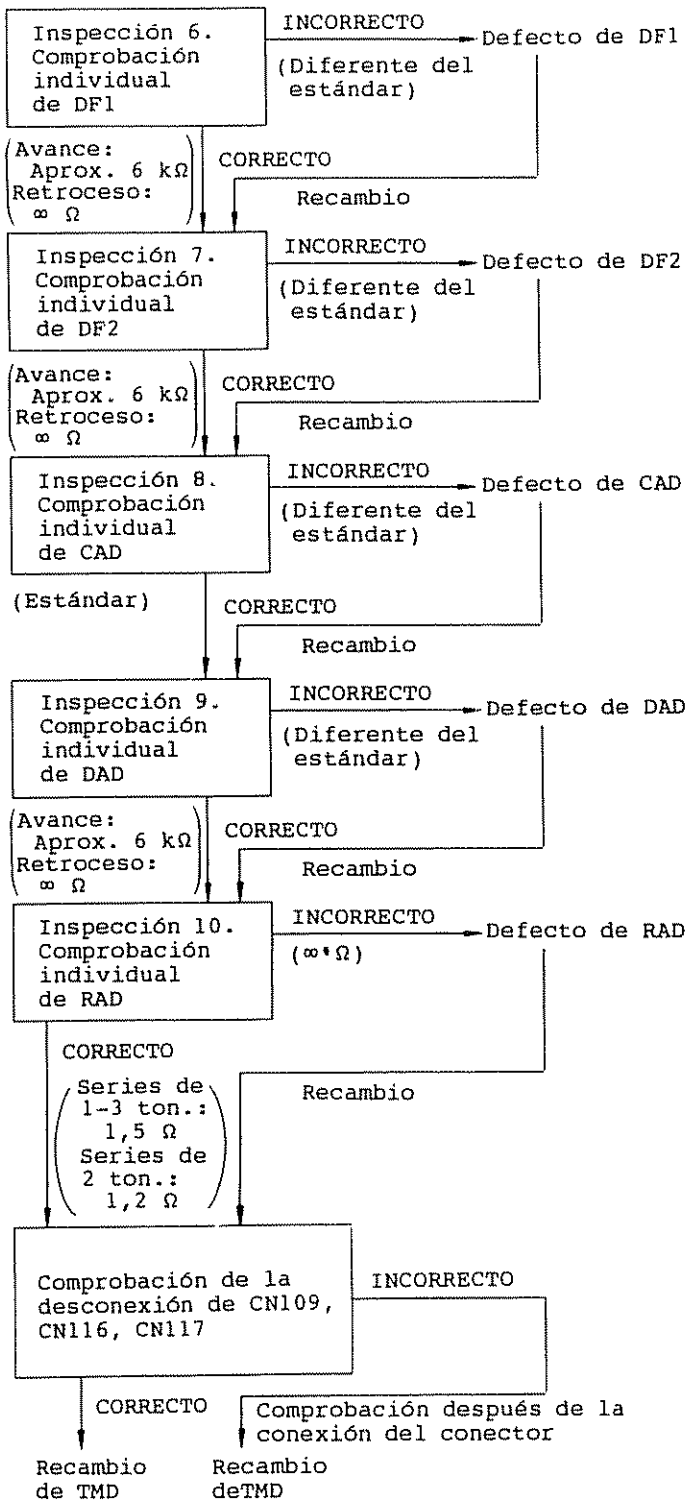


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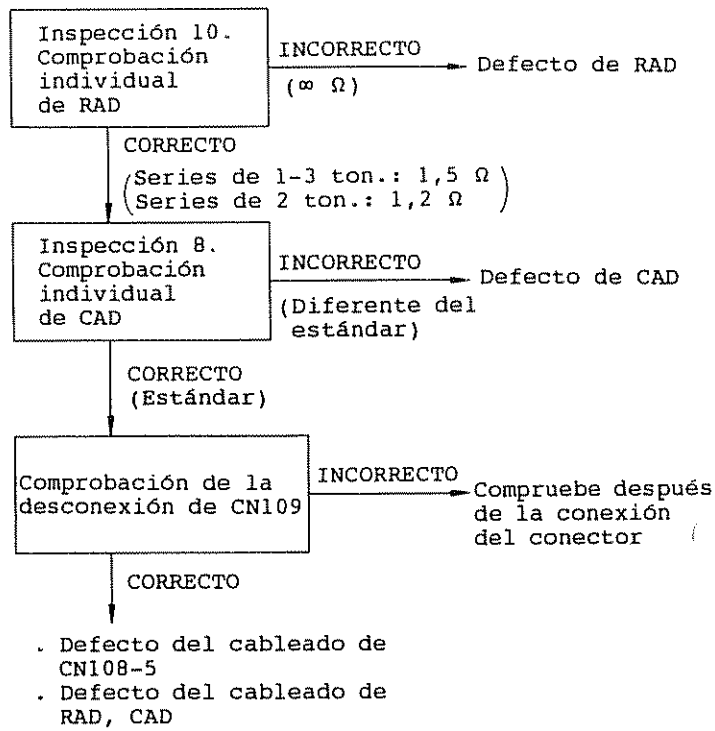


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A



B

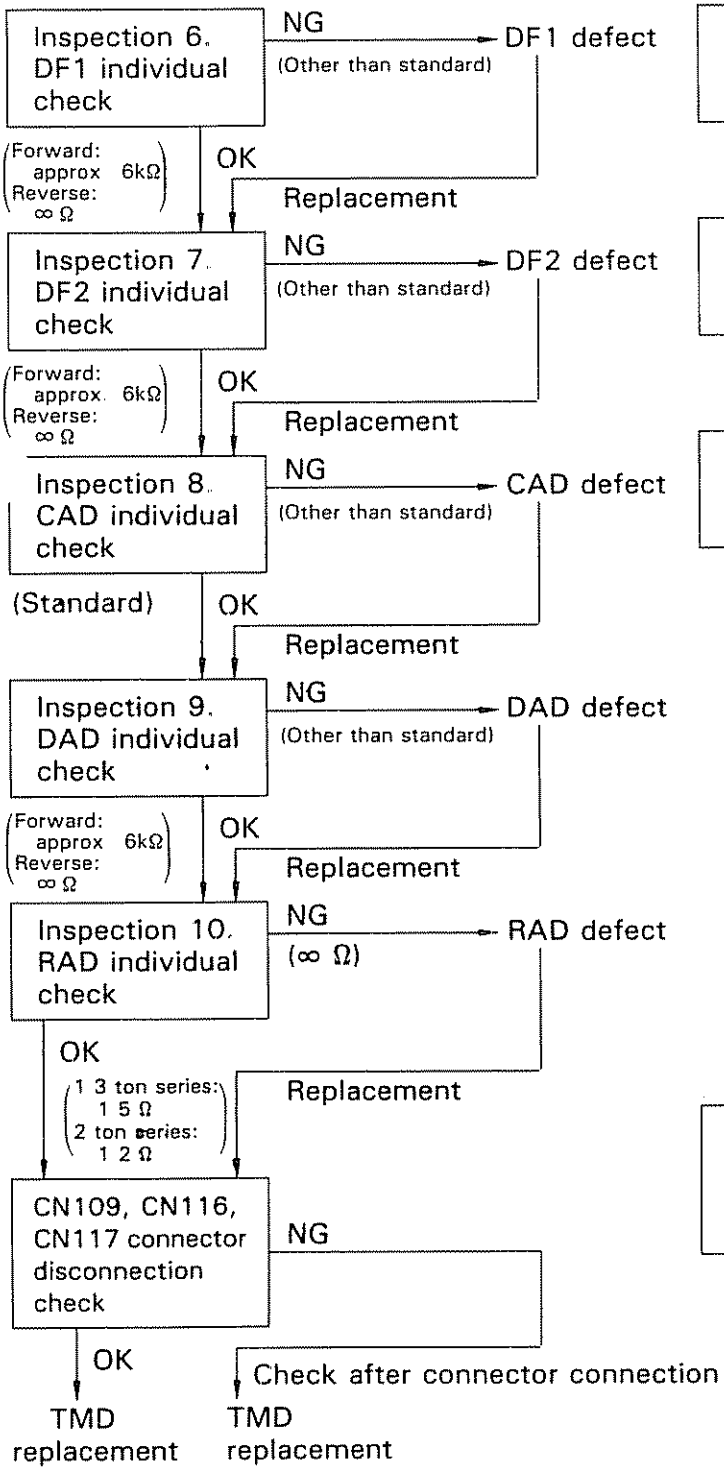


Referencia

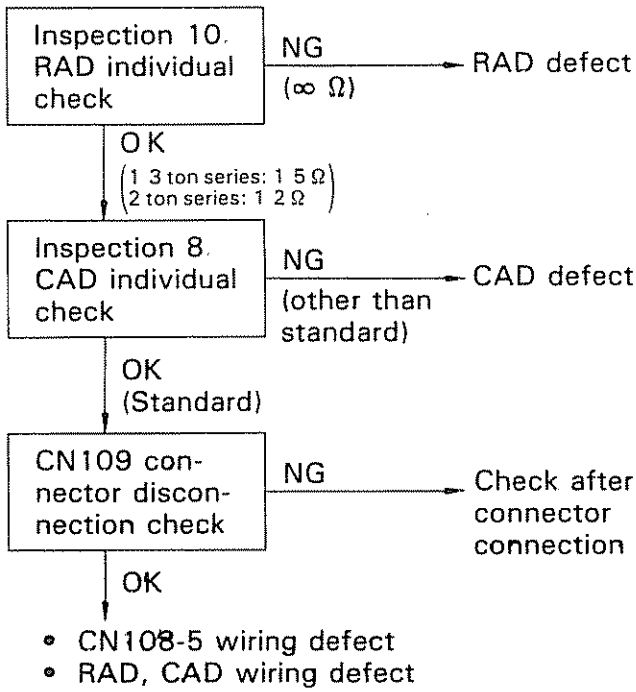
20 V para el juicio de correcto en la inspección 3 y 10 V para el juicio de correcto en la inspección 4 son los valores límite inferiores del voltaje de funcionamiento de MCS.

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A



B



Reference

20 V in inspection 3 and 10 V in inspection 4 for OK judgments are the lower limit values of the MCS operating voltage.

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Inspección 1. Comprobación de la continuidad del cableado entre el table de CPU y el tablero de DC-BD
Enchufe de la batería desconectado, CN106/CN107 desconectados

Terminales de medición	CN106-5 (32) -- CN107-9 (32) (conector en el lado REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación individual de TMD
Enchufe de la batería desconectado, desconexión del cableado de TMD y clavija de cobre

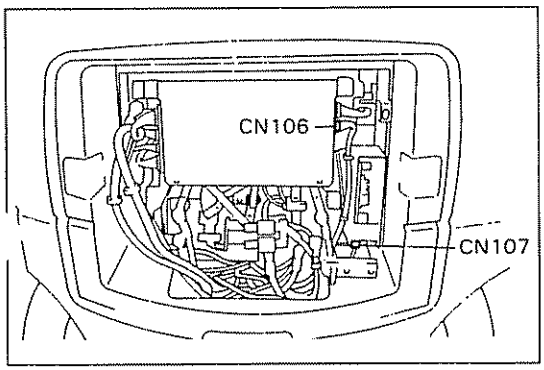
Terminales de medición	1	Colector: clavija - -- Emisor: clavija + Colector: clavija + -- Emisor: clavija -	
	2	Colector: clavija - -- Base: clavija + Colector: clavija + -- Base: clavija -	
	3	Base: clavija - -- Emisor: clavija + Base: clavija + -- Emisor: clavija -	
Alcance del probador de circuitos		Ω x 1 K	
Estándar	1	Colector: clavija - -- Emisor: clavija +:	∞ Ω
		Colector: clavija + -- Emisor: clavija -:	Hay continuidad
	2	Colector: clavija - -- Base: clavija +:	∞ Ω
		Colector: clavija + -- Base: clavija -:	Hay continuidad
	3	Base: clavija - -- Emisor: clavija +:	Hay continuidad
		Base: clavija + -- Emisor: clavija -:	Hay continuidad

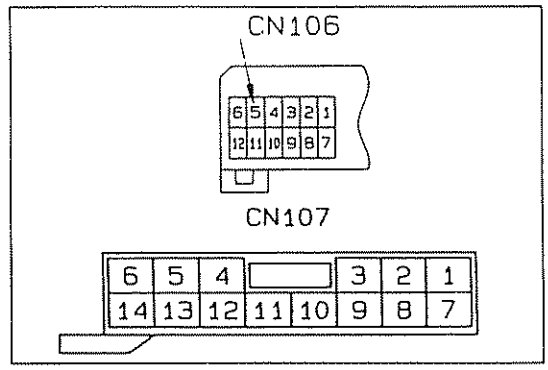
CORRECTO (valor estándar) -- A la inspección 5.
INCORRECTO (diferente del valor estándar) -- A la inspección 6.

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Inspection 1. Wiring continuity check between CPU board and DC-BD board
Battery plug OFF, CN106·CN107 disconnection

Measurement terminals	CN106-5 (32) — CN107-9 (32) (connector on REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

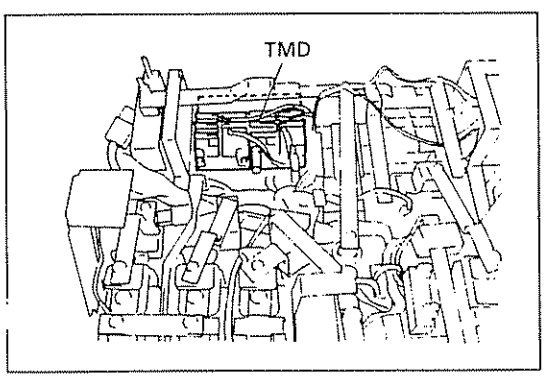


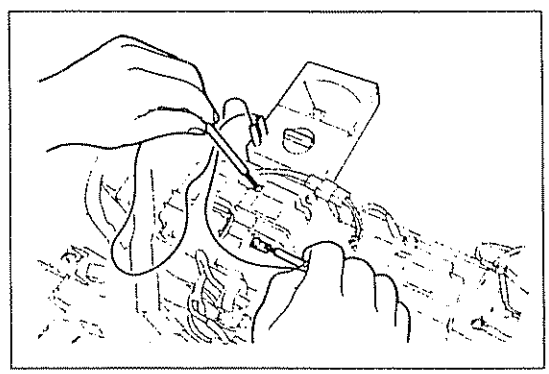


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect.

Inspection 2. TMD individual check
Battery plug OFF, TMD wiring and copper bar disconnection

Measurement terminals	① Collector: ⊖ probe — Emitter: ⊕ probe Collector: ⊕ probe — Emitter: ⊖ probe ② Collector: ⊖ probe — Base: ⊕ probe Collector: ⊕ probe — Base: ⊖ probe ③ Base: ⊖ probe — Emitter: ⊕ probe Base: ⊕ probe — Emitter: ⊖ probe	
Circuit tester range	Ω × 1 K	
Standard	① Collector: ⊖ probe — Emitter: ⊕ probe Collector: ⊕ probe — Emitter: ⊖ probe ② Collector: ⊖ probe — Base: ⊕ probe Collector: ⊕ probe — Base: ⊖ probe ③ Base: ⊖ probe — Emitter: ⊕ probe Base: ⊕ probe — Emitter: ⊖ probe	: ∞ Ω : Continuity shall exist. : ∞ Ω : Continuity shall exist. : Continuity shall exist. : Continuity shall exist.





OK (standard value) → To inspection 5.
NG (other than standard value) → To inspection 6.

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Inspección 3. Comprobación del voltaje de P9 (lado del tablero de DC-BD)
Enchufe de la batería conectado, interruptor de la llave conectado

Terminales de medición	CN108-5 (P9) + -- CN107-1 (N2) -
Alcance del probador de circuitos	Series de 1 ó 2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería (20 V o más para juicio de correcto)

CORRECTO (20 V o más) -- A la inspección 4.
INCORRECTO (menos de 20 V) -- A la inspección 10.

Inspección 4. Comprobación del voltaje de P8 (lado del tablero de DC-BD)
Terminal P8 desconectado, enchufe de la batería conectado, interruptor de la llave conectado

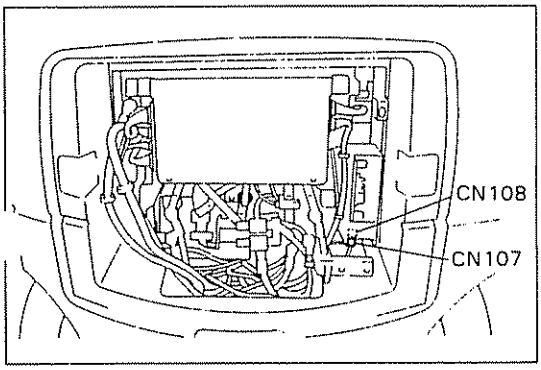
Terminales de medición	CN108-6 (P8) + -- CN107-1 (N2) -
Alcance del probador de circuitos	Series de 1 ó 2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería (10 V o más para juicio de correcto)

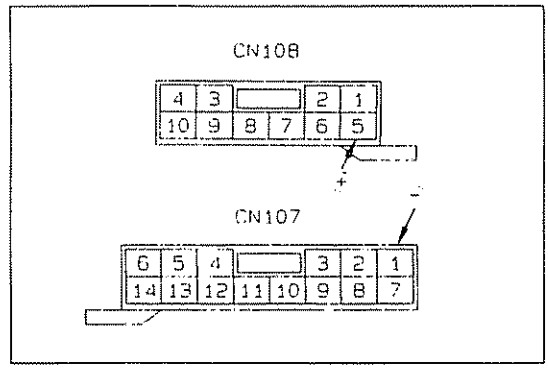
CORRECTO (10 V o más) -- A la inspección 2.
INCORRECTO (menos de 10 V) -- . Defecto del tablero de DC-BD.
. Defecto del cableado entre CN108 y P8.

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Inspection 3. P9 voltage check (DC-BD board side)
Battery plug ON, key switch ON

Measurement terminals	CN108-5 (P9) ⊕ — CN107-1 (N2) ⊖
Circuit tester range	1- or 2-ton series: DC 50 V, 3-ton series: DC 250 V
Standard	Battery voltage (20 V or more for OK judgment)

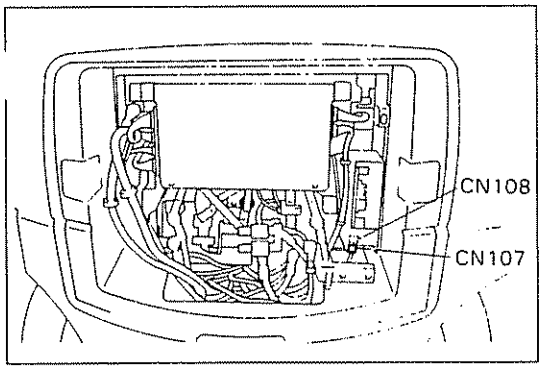


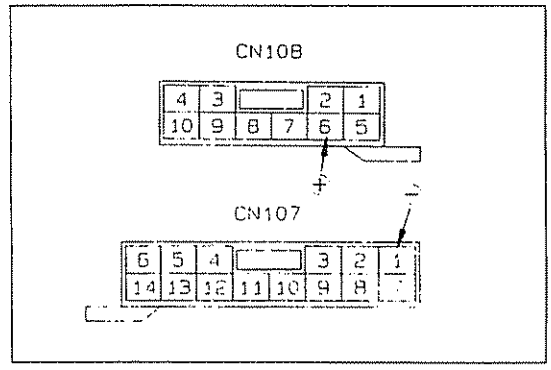


OK (20 V or more) → To inspection 4.
NG (less than 20 V) → To inspection 10.

Inspection 4. P8 voltage check (DC-BD board side)
Disconnect the P8 terminal, battery plug ON, key switch ON.

Measurement terminals	CN108-6 (P8) ⊕ — CN107-1 (N2) ⊖
Circuit tester range	1- or 2-ton series: DC 50 V, 3-ton series: DC 250 V
Standard	Battery voltage (10 V or more for OK judgment)



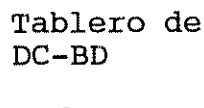


OK (10 V or more) → To inspection 2.
NG (less than 10 V) → • DC-BD board defect.
• Wiring defect between CN108 and P8.

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Inspección 5. Comprobación de la continuidad entre el tablero de CPU y el tablero de DC-BD y entre el tablero de DC-BD y TMD
Enchufe de la batería conectado, todos los cables desconectados

Terminales de medición	Ambos terminales de cada uno de los cables
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω



CORRECTO (0 Ω) -- Defecto del tablero de CPU, defecto del tablero de DC-BD.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 6. Comprobación individual de DF1
Enchufe de la batería desconectado, desconexión de la barra de cobre de DF1

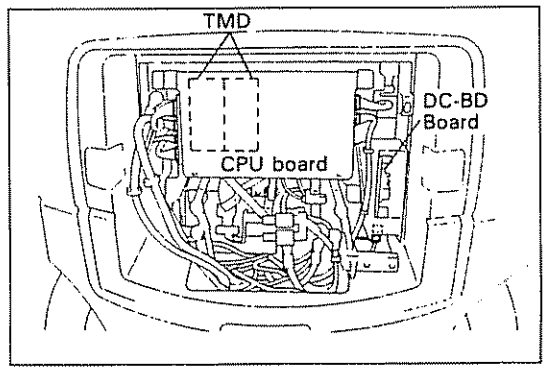
Terminales de medición	Avance:	Anodo: clavija - --- Cátodo: clavija +
	Retroceso:	Anodo: clavija + --- Cátodo: clavija -
Alcance del probador de circuitos		Ω x 1 K
Estándar	Avance:	Aprox. 6 kΩ
	Retroceso:	∞ Ω

CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 7.
INCORRECTO (diferente del estándar) -- Defecto de DF1 (a la inspección 7 después del recambio)

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Inspection 5. Wiring continuity check between CPU board and DC-BD board and between DC-BD board and TMD
Battery plug ON, each wiring disconnection

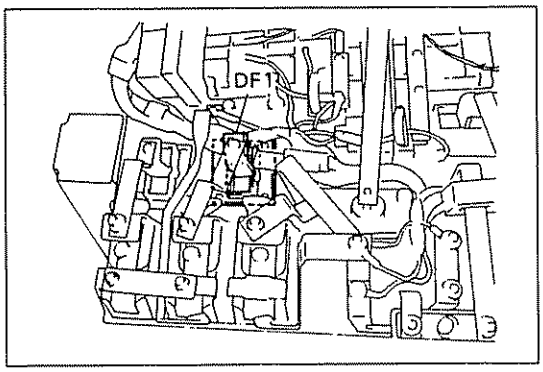
Measurement terminals	Both terminals of each wiring
Circuit tester range	Ω × 1
Standard	0 Ω

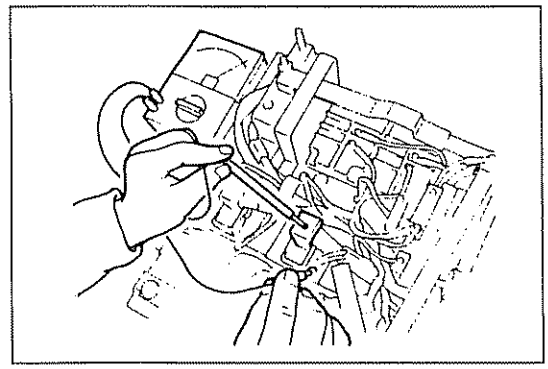


OK (0 Ω) → CPU board defect, or DC-BD board defect.
NG (∞ Ω) → Wiring defect.

Inspection 6. DF1 individual check
Battery plug OFF, DF1 copper bar disconnection

Measurement terminals	Forward : Anode: ⊖ probe — Cathode: ⊕ probe Reverse : Anode: ⊕ probe — Cathode: ⊖ probe
Circuit tester range	Ω × 1 K
Standard	Forward : Approx. 6 k Ω Reverse : ∞ Ω





OK (forward: approx. 6 kΩ, reverse: ∞ Ω) → To inspection 7.
NG (other than standard) → DF1 defect (to inspection 7 after replacement).

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Inspección 7. Comprobación individual de DF2
Enchufe de la batería desconectado, desconexión de la barra de cobre de DF2

Terminales de medición	Avance:	Anodo: clavija - --- Cátodo: clavija +
	Retroceso:	Anodo: clavija + --- Cátodo: clavija -
Alcance del probador de circuitos		Ω x 1 K
Estándar	Avance:	Aprox. 6 kΩ
	Retroceso:	∞ Ω

CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 8.
INCORRECTO (diferente de la estándar) -- Defecto de DF2 (a la inspección 8 después del recambio)

Inspección 8. Comprobación individual de CAD
Enchufe de la batería desconectado, desconexión del cableado de CAD

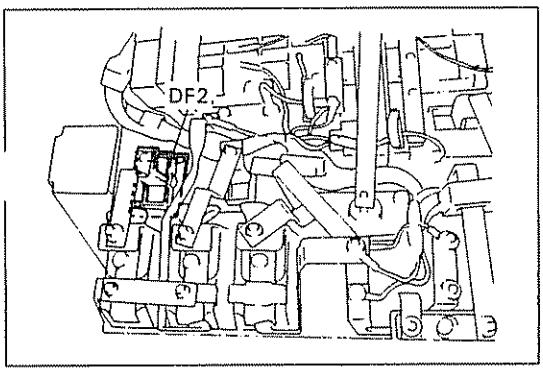
Terminales de medición	Ambos terminales de CAD
Alcance del probador de circuitos	Ω x 1 K
Estándar	La aguja del probador de circuitos se desvía una vez hacia el lado de 0 Ω cuando las clavijas entran en contacto con ambos terminales de CAD, luego gradualmente vuelve a lado de ∞, y finalmente indica ∞ Ω porque el capacitor está cargado por la corriente del probador.

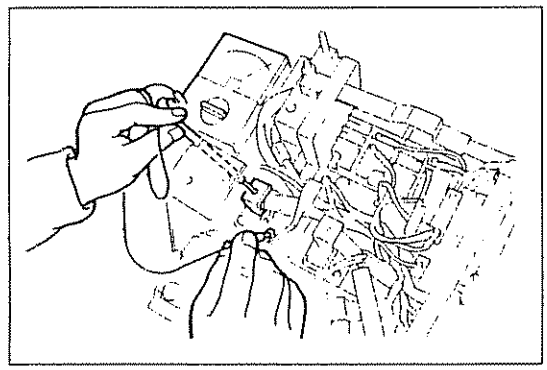
CORRECTO (estándar) -- A la inspección 9.
INCORRECTO (diferente del estándar) -- Defecto de CAD (a la inspección 9 después del recambio)

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Inspection 7. DF2 individual check
Battery plug OFF, DF2 copper bar disconnection

Measurement terminals	Forward : Anode: ⊖ probe — Cathode: ⊕ probe Reverse : Anode: ⊕ probe — Cathode: ⊖ probe
Circuit tester range	Ω × 1 K
Standard	Forward : Approx. 6 kΩ Reverse : ∞ Ω

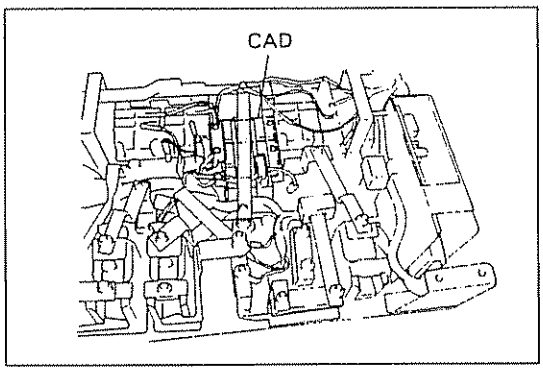


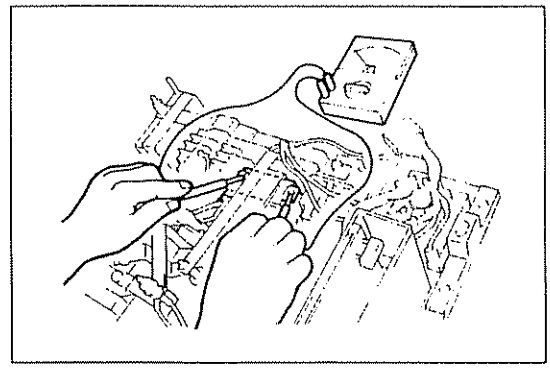


OK (forward: approx. 6 kΩ, reverse: ∞ Ω) → To inspection 8.
NG (other than standard) → DF2 defect (to inspection 8 after replacement).

Inspection 8. CAD individual check
Battery plug OFF, CAD wiring disconnection

Measurement terminals	Both terminals of CAD
Circuit tester range	Ω × 1 K
Standard	The circuit tester pointer deflects once to the 0 Ω side when the probes are brought into contact with both terminals of CAD, then gradually returns to the ∞ side, and finally indicates ∞ Ω because the capacitor is charged by the tester current.





OK (standard) → To inspection 9.
NG (other than standard) → CAD defect (to inspection 9 after replacement).

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Inspección 9. Comprobación individual de DAD
Enchufe de la batería desconectado, desconexión del cableado de DAD

Terminales de medición	Avance:	Anodo: clavija - --- Cátodo: clavija +
	Retroceso:	Anodo: clavija + --- Cátodo: clavija -
Alcance del probador de circuitos		Ω x 1 K
Estándar	Avance:	Aprox. 6 kΩ
	Retroceso:	∞ Ω

CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 10.
INCORRECTO (diferente del estándar) -- Defecto de DAD (a la inspección 10 después del recambio)

Inspección 10. Comprobación individual de RAD
Enchufe de la batería desconectado, desconexión del cableado de RAD

Terminales de medición	Ambos terminales de CAD
Alcance del probador de circuitos	Ω x 1 K
Estándar	Series de 1-3 ton.: 1,5 Ω Series de 2 ton.: 1,2 Ω

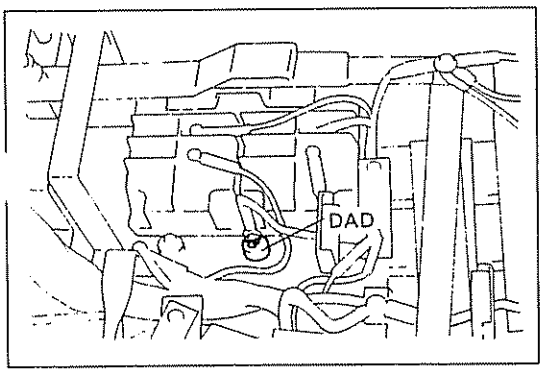
Flujo A:
CORRECTO (series de 1-3 ton.: 1,5Ω, series de 2 ton.: 1,2 Ω) -- Defecto de TMD
INCORRECTO (∞ Ω) -- Defecto de RAD (inspección CN109, CN116, CN117 y recambie TMD después del recambio de RAD)

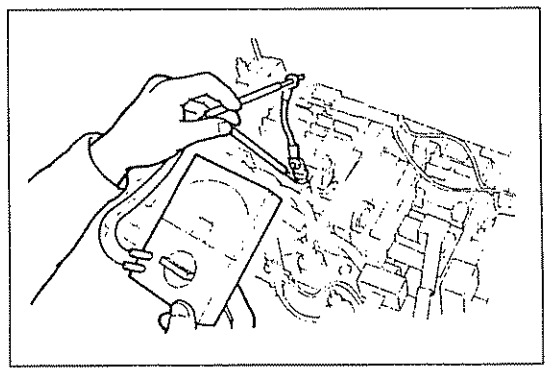
Flujo B:
CORRECTO (series de 1-3 ton.: 1,5Ω, series de 2 ton.: 1,2 Ω) -- A la inspección 8.
INCORRECTO (∞ Ω) -- Defecto de RAD

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Inspection 9. DAD individual check
Battery plug OFF, DAD wiring disconnection

Measurement terminals	Forward : Anode: ⊖ probe — Cathode: ⊕ probe Reverse : Anode: ⊕ probe — Cathode: ⊖ probe
Circuit tester range	Ω × 1 K
Standard	Forward : approx. 6 kΩ Reverse : ∞ Ω

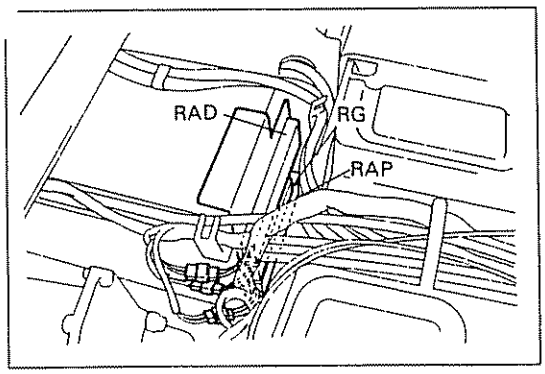


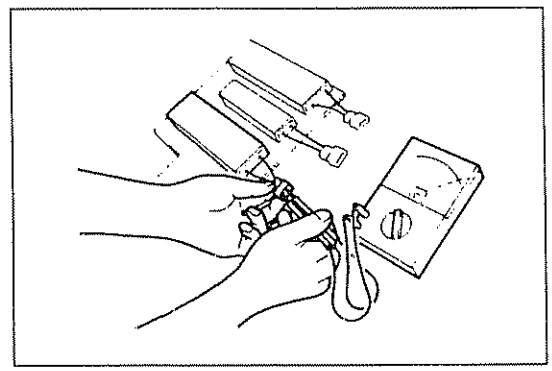


OK (forward: approx. 6 kΩ, reverse: ∞ Ω) → To inspection 10.
NG (other than standard) → DAD defect (to inspection 10 after replacement).

Inspection 10. RAD individual check
Battery plug OFF, RAD wiring disconnection

Measurement terminals	Both terminals of RAD
Circuit tester range	Ω × 1
Standard	1·3 ton series: 1.5 Ω, 2 ton series: 1.2 Ω





Flow A:
OK (1·3 ton series: 1.5 Ω, 2 ton series: 1.2 Ω) → TMD defect
NG (∞ Ω) → RAD defect (CN109, CN116, CN117 connector inspection and TMD replacement after RAD replacement).

Flow B:
OK (1·3 ton series: 1.5 Ω, 2 ton series: 1.2 Ω) → To inspection 8.
NG (∞ Ω) → RAD defect

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Código de error C1: Anormalidad del sensor de corriente de marc

Parte relacionada

Sensor de corriente de marcha

Tablero de CPU

Causas estimadas

1 Defecto del sensor de corriente de marcha

2 Desconexión del conector entre CN104 y el sensor de corriente de marcha

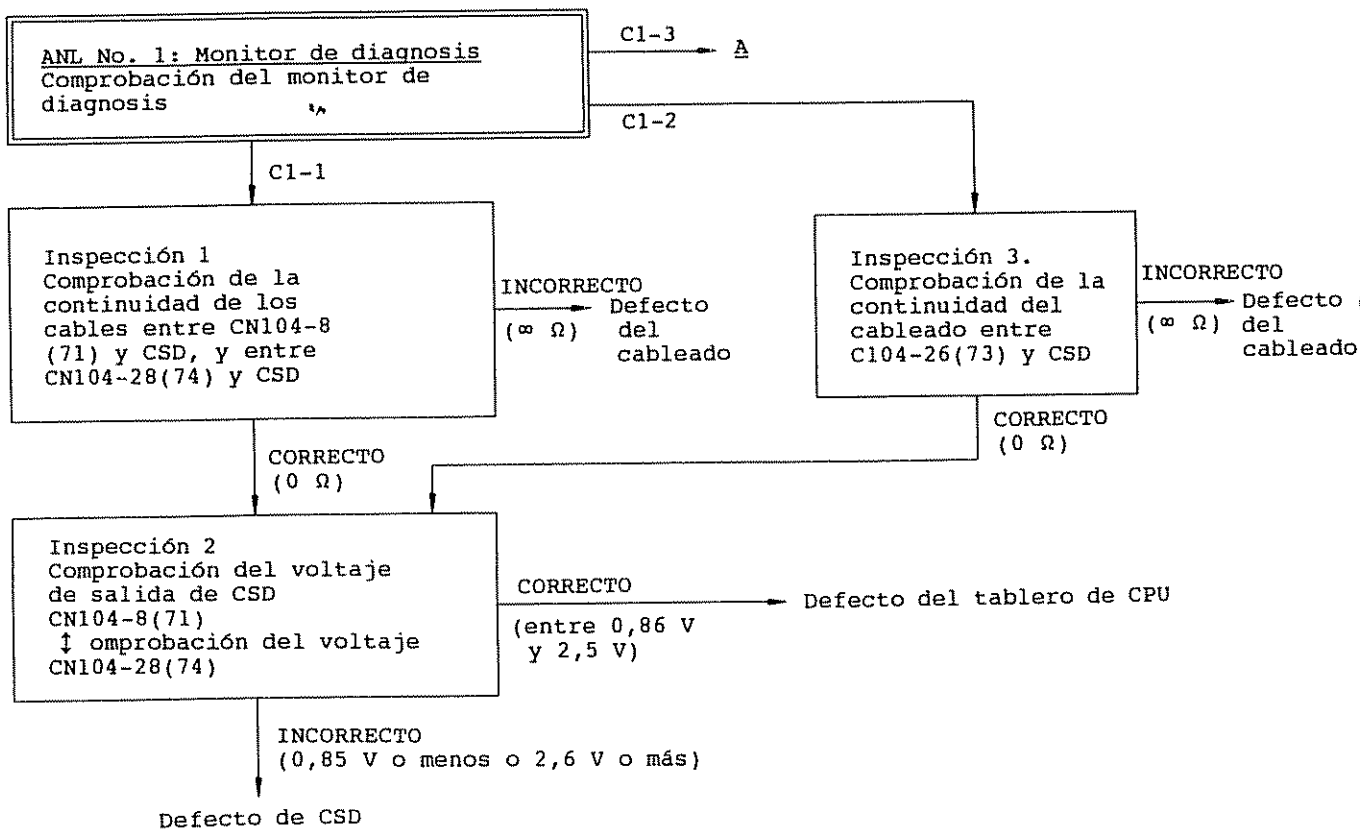
3 Defecto de contacto del conector CN104, CN CSD

4 Defecto de conexión del circuito principal de marcha

5 Defecto del tablero de CPU

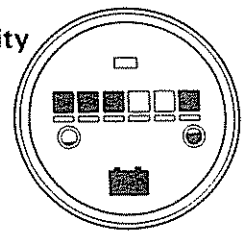
6 Defecto del motor de marcha

(Si se han puesto en la memoria simultáneamente C1-2 y C1-3, dé prioridad a C1-2 para la búsqueda de averías)

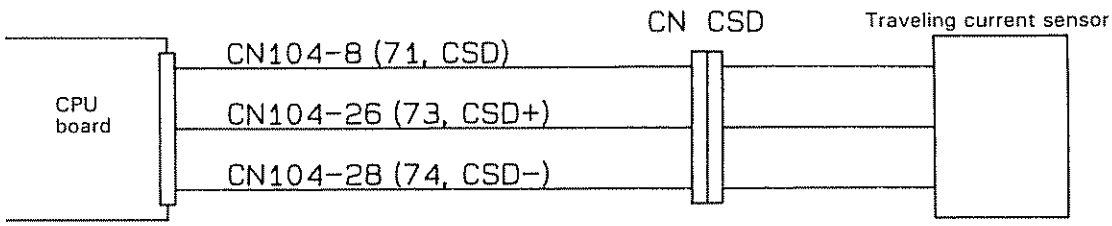


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Error code C1: Traveling current sensor abnormality



Related portion



Estimated causes

① Traveling current sensor defect

② Wiring disconnection between CN104 and traveling current sensor

③ CN104, CN CSD connector contact defect

④ Main drive circuit connection defect

⑤ CPU board defect

⑥ Drive motor defect

(If C1-2 and C1-3 are both memorized, first conduct C1-2 troubleshooting.)

ANL No. 1: Diagnosis monitor
Diagnosis monitor check

C1-3 → A

C1-2

C1-1

Inspection 1.
Battery plug ON, key switch ON
Wiring continuity check between CN104-8(71) and CSD and between CN104-28(74) and CSD

NG (∞ Ω) → Wiring defect

OK (0 Ω)

Inspection 3.
Wiring continuity check between CN104-26(73) and CSD

NG (∞ Ω) → Wiring defect

OK (0 Ω)

Inspection 2.
CSD output voltage check
CN104-8(71)
↕ voltage check
CN104-28(74)

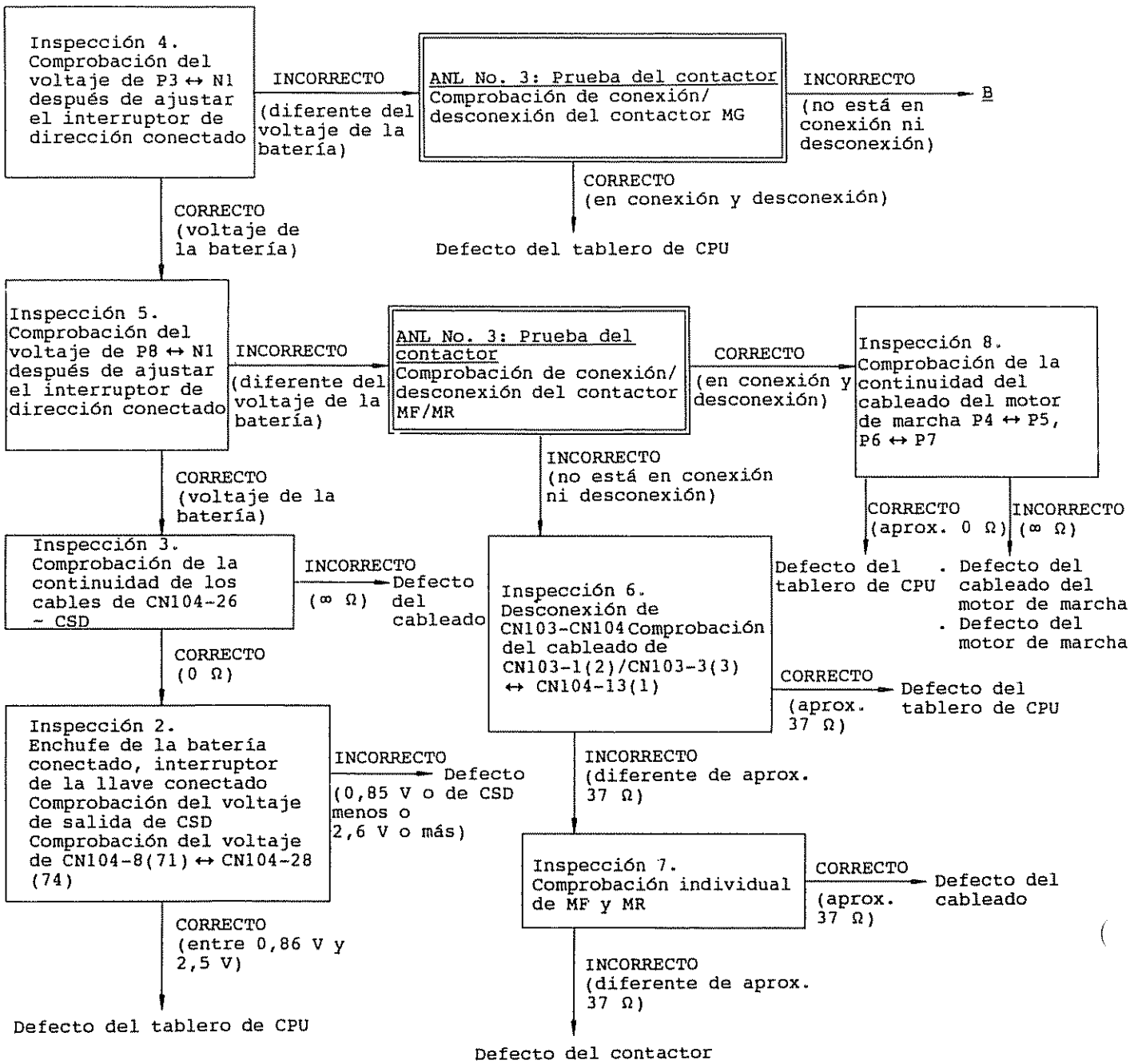
OK (between 0.86 V and 2.5 V) → CPU board defect

NG (0.85 V or less or 2.6 V or more)

CSD defect

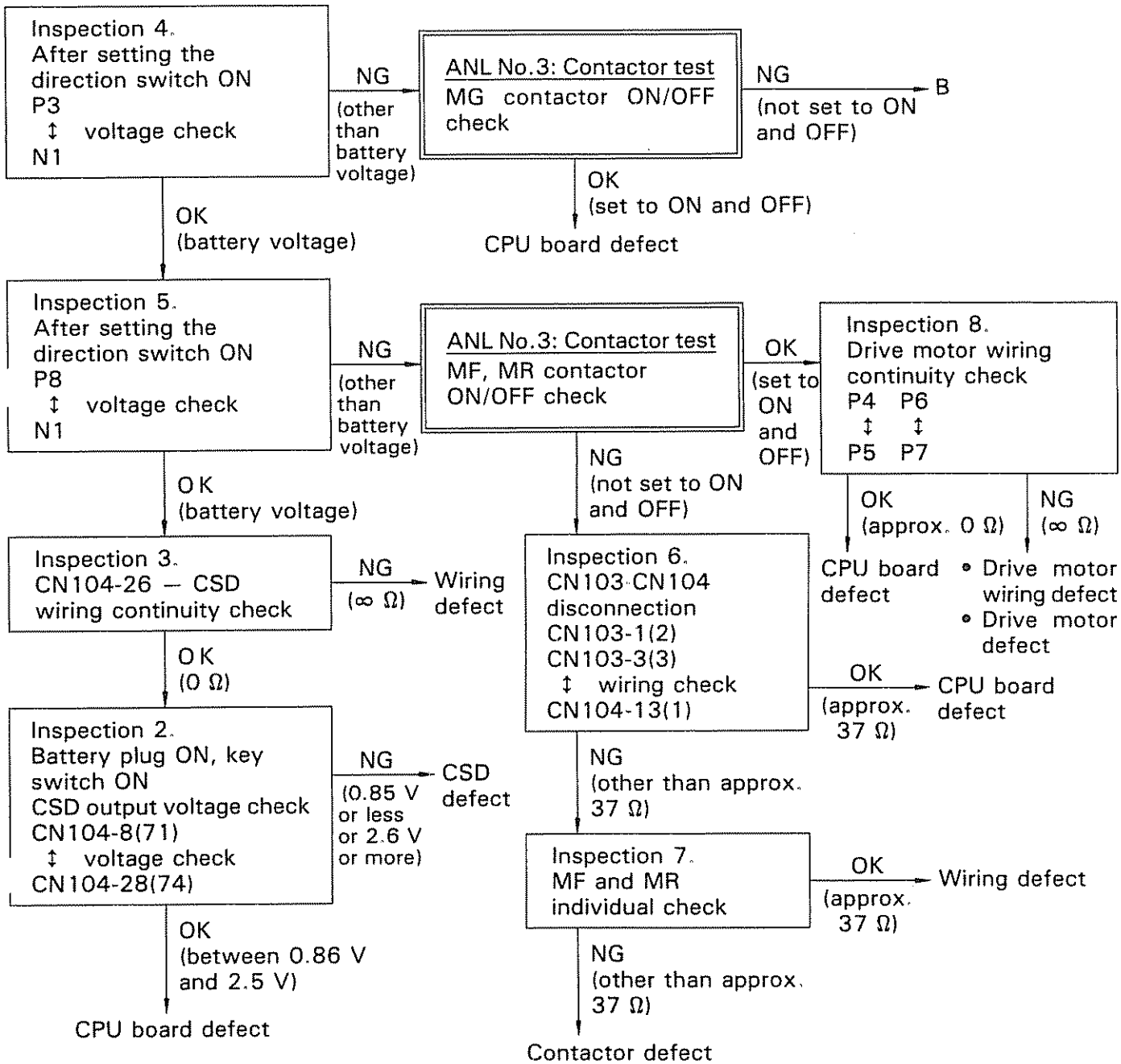
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A



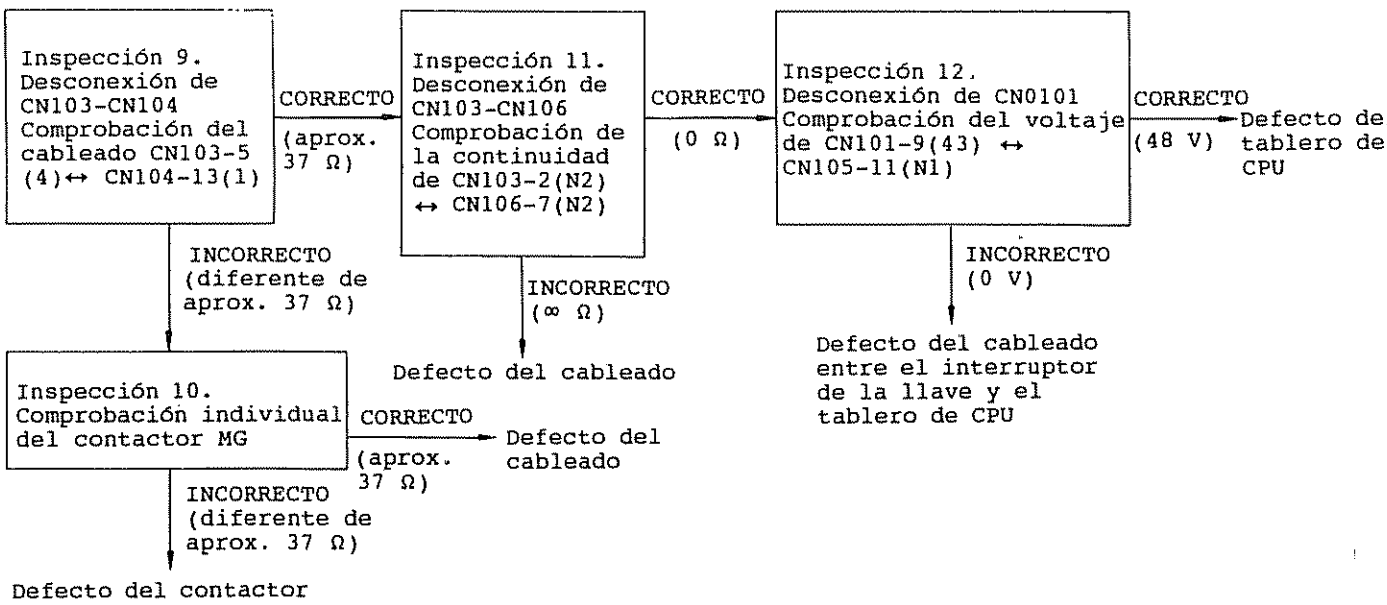
truck-freeworkshop.com

A



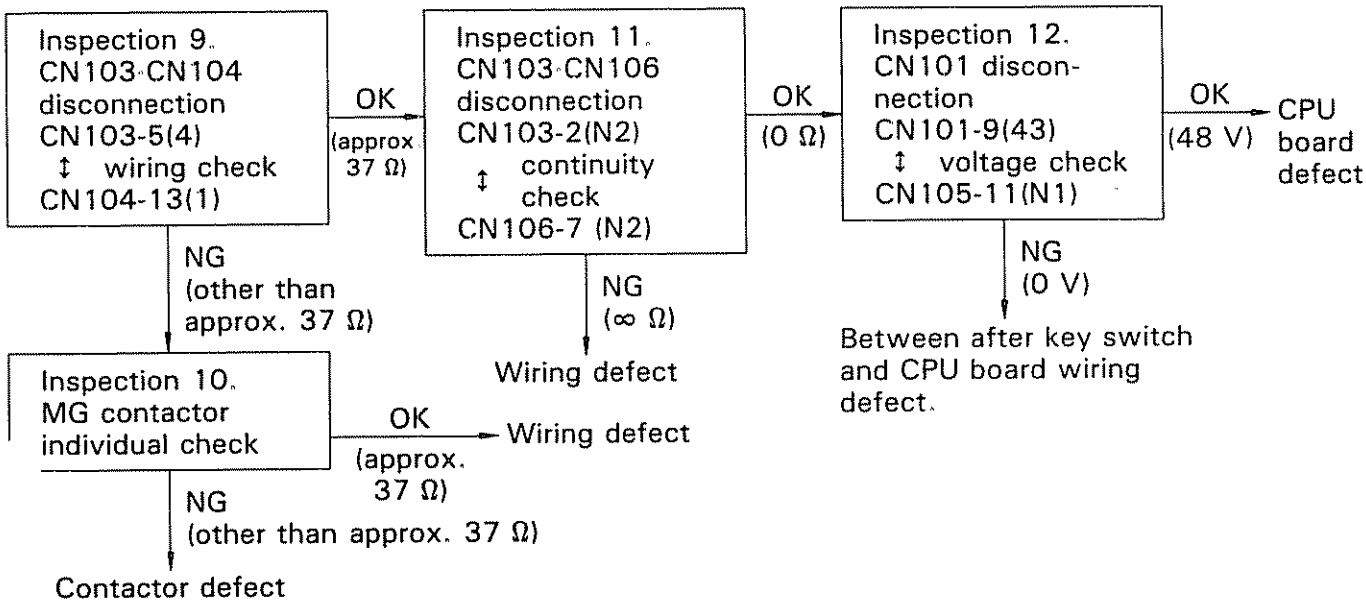
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B



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B



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Inspección 1. Comprobación de la continuidad del cableado de CSD
Enchufe de la batería desconectado, desconexión del cableado de CN104/CSD

Terminales de medición	CN104-8 (71)	-- Conector de CSD (conector del lado de REC)
	CN104-28 (74)	-- Conector de CSD (conector del lado de REC)
Alcance del probador de circuitos		Ω x 1
Estándar		0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación del voltaje de salida de CSD
Enchufe de la batería conectado, interruptor de la llave conectado

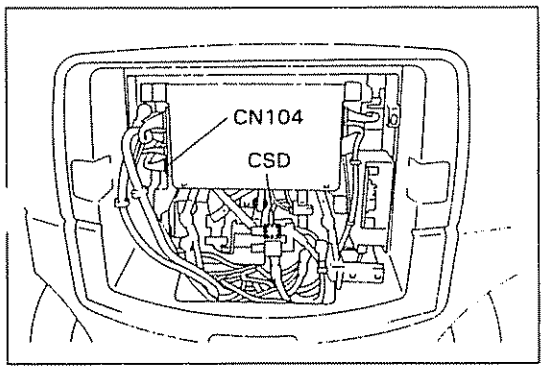
Terminales de medición	CN104-8 (71) + -- CN104-28 (74) -
Alcance del probador de circuitos	CC 10 V (probador de circuitos digital)
Estándar	Entre 0,86 V y 2,5 V

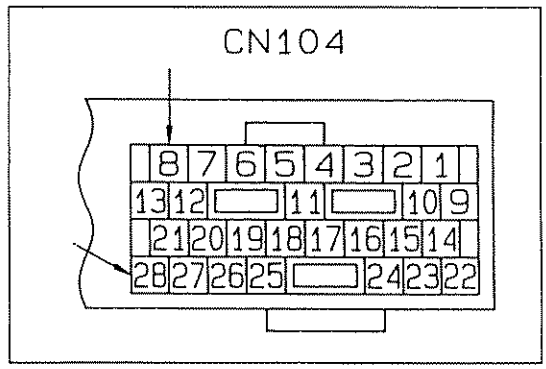
CORRECTO (entre 0,86 V y 2,5 V) -- Defecto del tablero de CPU.
INCORRECTO (0,85 V o menos o 2,6 V o más) -- Defecto de CSD

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Inspection 1. CSD wiring continuity check
Battery plug OFF, CN104-CSD wiring disconnection

Measurement terminals	CN104-8(71) — CSD connector (connector of REC side) CN104-28(74) — CSD connector (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

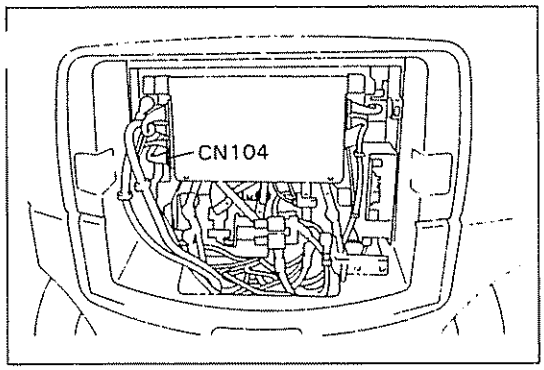


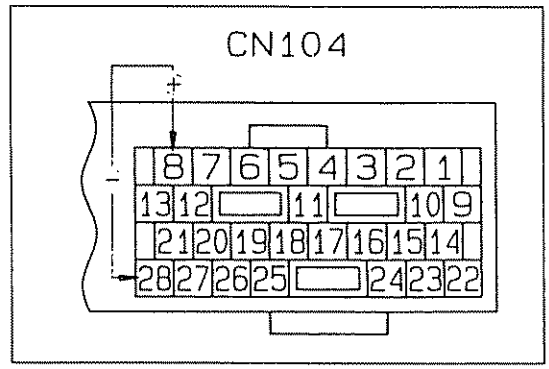


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect

Inspection 2. CSD output voltage check
Battery plug ON, key switch ON

Measurement terminals	CN104-8(71) ⊕ — CN104-28(74) ⊖
Circuit tester range	DC 10 V (digital circuit tester)
Standard	Between 0.86 V and 2.5 V





OK (between 0.86 V and 2.5 V) → CPU board defect.
NG (0.85 V or less or 2.6 V or more) → CSD defect

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Inspección 3. Comprobación de la continuidad del cableado de CSD
Enchufe de la batería desconectado, desconexión del cableado de CN104/CSD

Terminales de medición	CN104-26(73)	-- Conector de CSD (conector del lado de REC)
Alcance del probador de circuitos		Ω x 1
Estándar		0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 4. Comprobación del voltaje de P3 - N1
Enchufe de la batería conectado, interruptor de la llave conectado, interruptor de dirección conectado

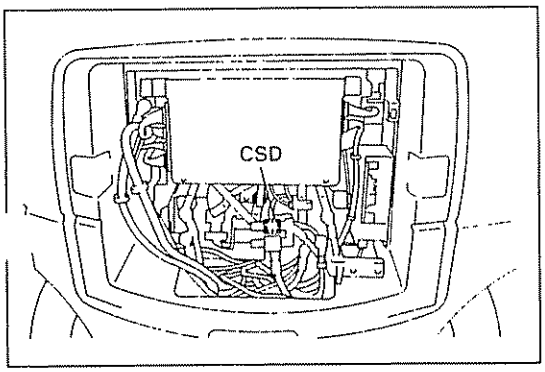
Terminales de medición	P3 + -- N1 -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

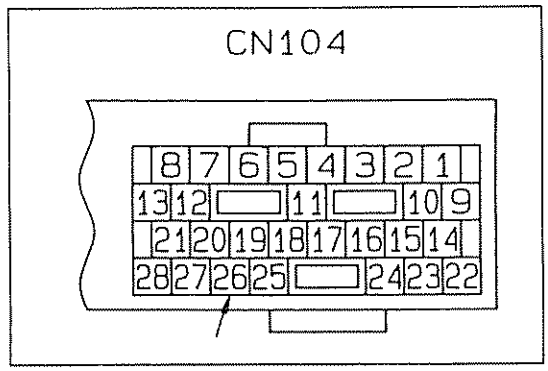
CORRECTO (voltaje de la batería) -- A la inspección 5.
INCORRECTO (diferente del voltaje de la batería) -- Prueba del contactor ANL No. 3

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Inspection 3. CSD wiring continuity check
Battery plug OFF, CN104·CSD wiring disconnection

Measurement terminals	CN104-26(73) — CSD connector (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

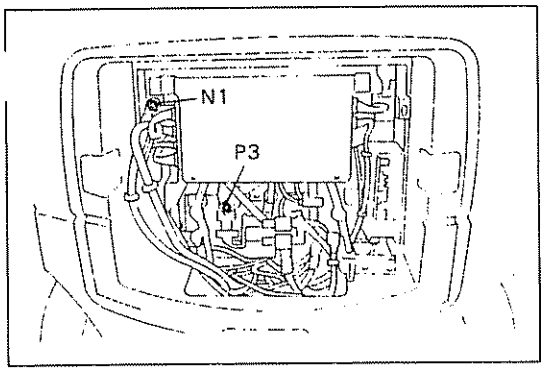


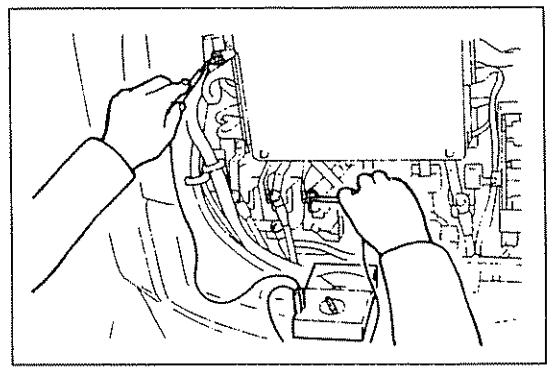


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect

Inspection 4. P3 — N1 voltage check
Battery plug ON, key switch ON, direction switch ON.

Measurement terminals	P3 ⊕ — N1 ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage





OK (battery voltage) → To inspection 5.
NG (other than battery voltage) → ANL No.3 contactor test

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Inspección 5. Comprobación del voltaje de P8 - N1
Enchufe de la batería conectado, interruptor de la llave conectado, interruptor de dirección conectado

Terminales de medición	P8 + -- N1 -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

CORRECTO (voltaje de la batería) -- A la inspección 3.
INCORRECTO (diferente del voltaje de la batería) -- Prueba del contactor ANL No. 3.

Inspección 6. Comprobación de cortocircuito del cableado del tablero de CPU
Enchufe de la batería desconectado, desconexión de CN103/CN104

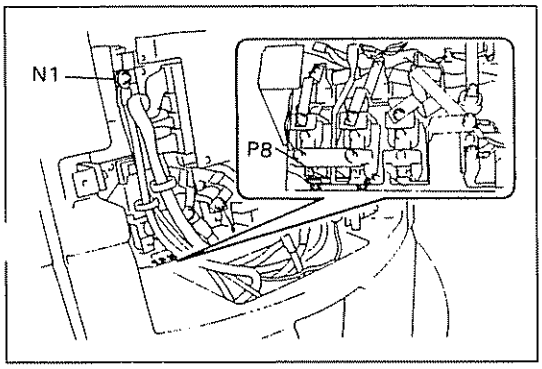
Terminales de medición	CN103-1 (2) -- CN104-13 (1) (conector del lado de REC) CN103-3 (3) -- CN104-13 (1) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

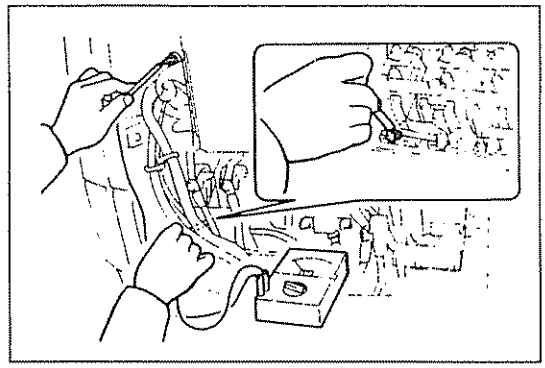
CORRECTO (aprox. 37 Ω) -- Defecto del tablero de CPU.
INCORRECTO (diferente de aprox. 37 Ω) -- A la inspección 7.

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Inspection 5. P8 — N1 voltage check
Battery plug ON, key switch ON, direction switch ON

Measurement terminals	P8 ⊕ — N1 ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage

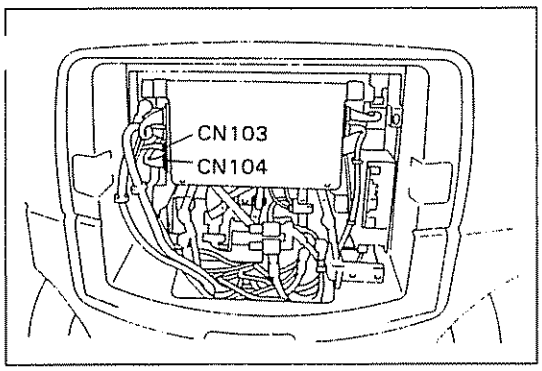


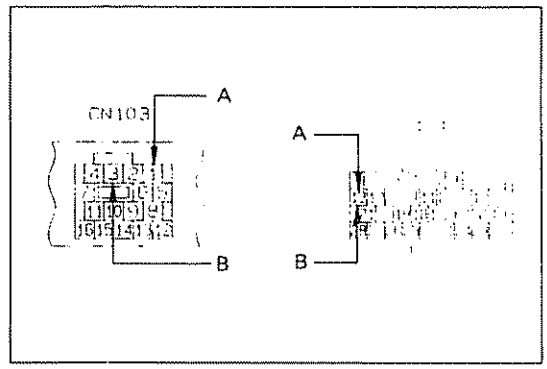


OK (battery voltage) → To inspection 3.
NG (other than battery voltage) → To ANL No.3 contactor test.

Inspection 6. CPU board wiring short circuit check
Battery plug OFF, CN103·CN104 disconnection

Measurement terminals	A: CN103-1 (2) — CN104-13 (1) (connector of REC side) B: CN103-3 (3) — CN104-13 (1) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → CPU board defect.
NG (other than approx. 37 Ω) → To inspection 7.

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Inspección 7. Comprobación individual del contactor MF/MR
Enchufe de la batería desconectado, desconexión del cableado de MF/MR y barra de cobre

Terminales de medición	Ambos terminales de cada bobina
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto del contactor

Inspección 8. Comprobación de la continuidad del cableado del motor de marcha
Enchufe de la batería desconectado, desconexión del cableado de P4/P5, P6/P7

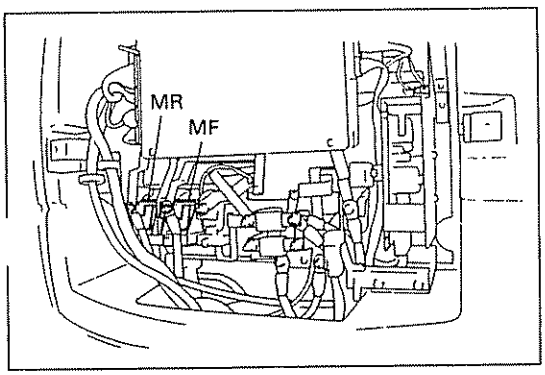
Terminales de medición	P4 -- P5 (bobina del inducido) P6 -- P7 (bobina inductora)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

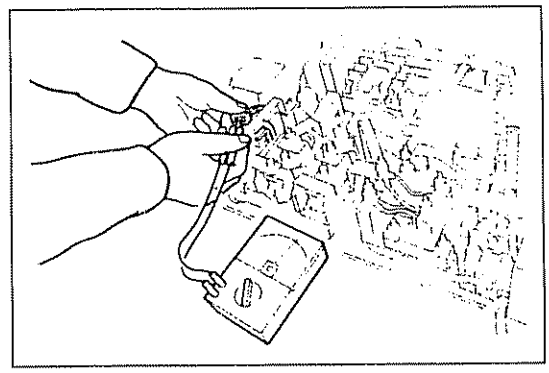
CORRECTO (0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Defecto del cableado del motor de marcha o defecto del motor de marcha

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Inspection 7. MF/MR contactor individual check
Battery plug OFF, MF/MR wiring and copper bar disconnection

Measurement terminals	Both terminals of each coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

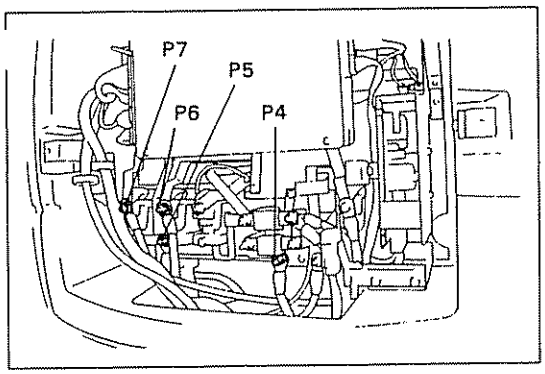


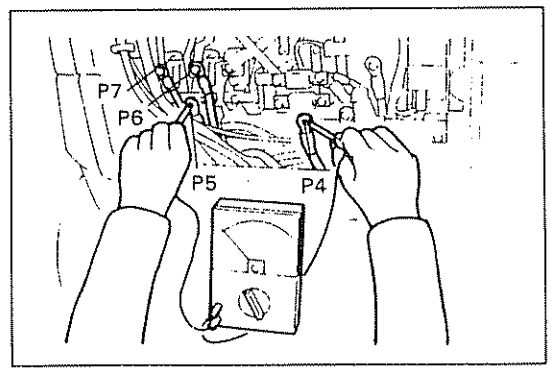


OK (approx. 37 Ω) → Wiring defect.
NG (other than approx. 37 Ω) → Contactor defect

Inspection 8. Drive motor wiring continuity check
Battery plug OFF, P4-P5·P6-P7 wiring disconnection

Measurement terminals	P4 — P5 (armature coil) P6 — P7 (field coil)
Circuit tester range	Ω × 1
Standard	0 Ω





OK (0 Ω) → CPU board defect.
NG (∞ Ω) → Drive motor wiring defect or drive motor defect

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Inspección 9. Comprobación del cableado
Enchufe de la batería desconectado, desconexión de CN103/CN104

Terminales de medición	CN103-5 (4) -- CN104-13 (1) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- A la inspección 11.
INCORRECTO (diferente de aprox. 37 Ω) -- A la inspección 10.

Inspección 10. Comprobación individual del contactor MG
Enchufe de la batería desconectado, desconexión del cableado de MG y barra de cobre

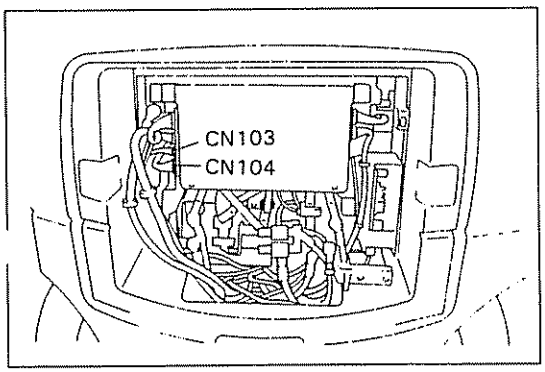
Terminales de medición	Ambos terminales de la bobina de MG
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

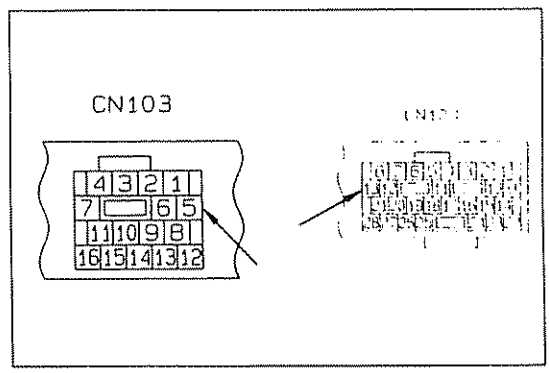
CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto del contactor

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Inspection 9. Wiring check
Battery plug OFF, CN103·CN104 disconnection

Measurement terminals	CN103-5(4) — CN104-13(1) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

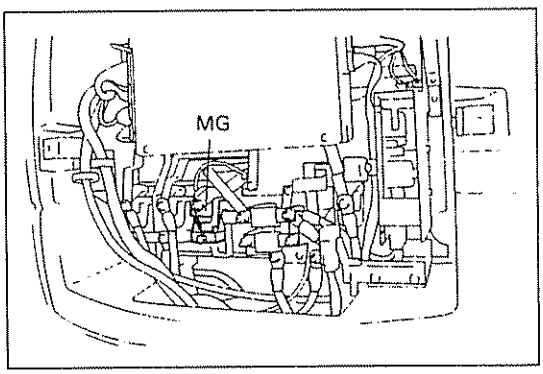


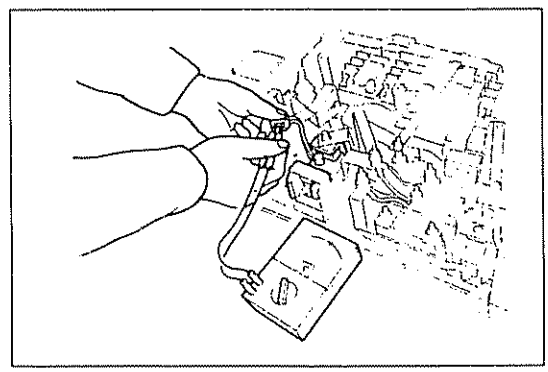


OK (approx. 37 Ω) → To inspection 11.
NG (other than approx. 37 Ω) → To inspection 10.

Inspection 10. MG contactor individual check
Battery plug OFF, MG wiring and copper bar disconnection ,

Measurement terminals	Both terminals of MG coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring defect
NG (other than approx. 37 Ω) → Contactor defect

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Inspección 11. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN103/CN106

Terminales de medición	CN103-2 (N2) -- CN106-7 (N2) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 12.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 12. Comprobación de cortocircuito del cableado del tablero de CPU
Enchufe de la batería conectado, interruptor de la llave conectado, desconexión de CN101

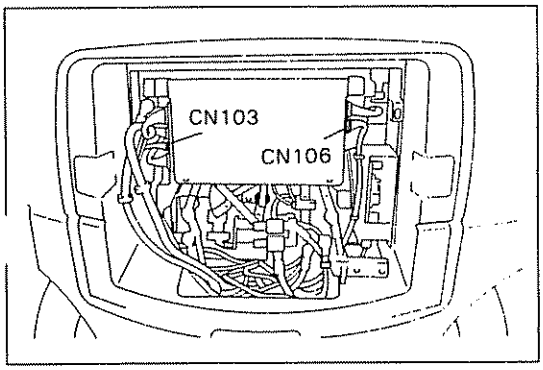
Terminales de medición	CN101-9 (43) -- CN105-11 (N1) (conector del lado de REC)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

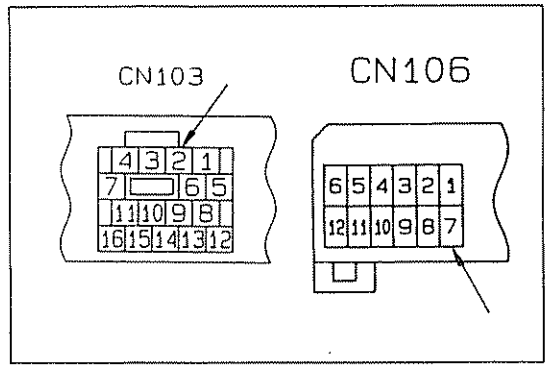
CORRECTO (48 V) -- Defecto del tablero de CPU
INCORRECTO (0 V) -- Defecto del cableado entre el interruptor de la llave y el tablero de CPU

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Inspection 11. Wiring continuity check
Battery plug OFF, CN103-CN106 disconnection

Measurement terminals	CN103-2(N2) – CN106-7(N2) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

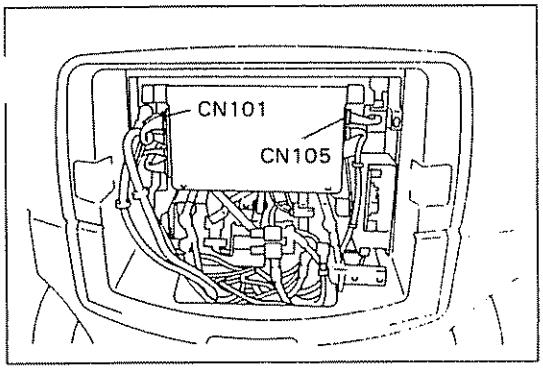


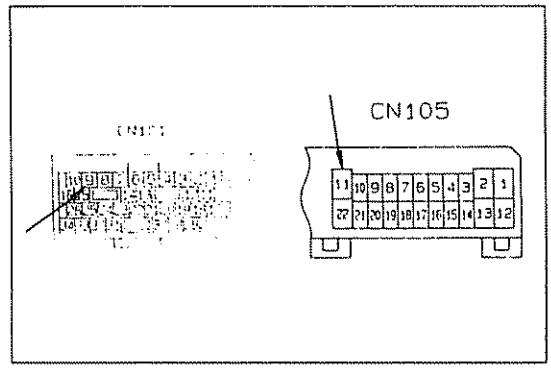


OK (0 Ω) → To inspection 12.
NG (∞ Ω) → Wiring defect

Inspection 12. CPU board wiring short circuit check
Battery plug ON, key switch ON, CN101 disconnection

Measurement terminals	CN101-9(43) – CN105-11(N1) (connector of REC side)
Circuit tester range	50 V DC
Standard	48 V





OK (48 V) → CPU board defect
NG (0 V) → Between after key switch and CPU board wiring defect

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Código de error C3: Anormalidad del sensor de la temperatura de marcha del regulador

Parte relacionada

Sensor de marcha

Tablero de CPU

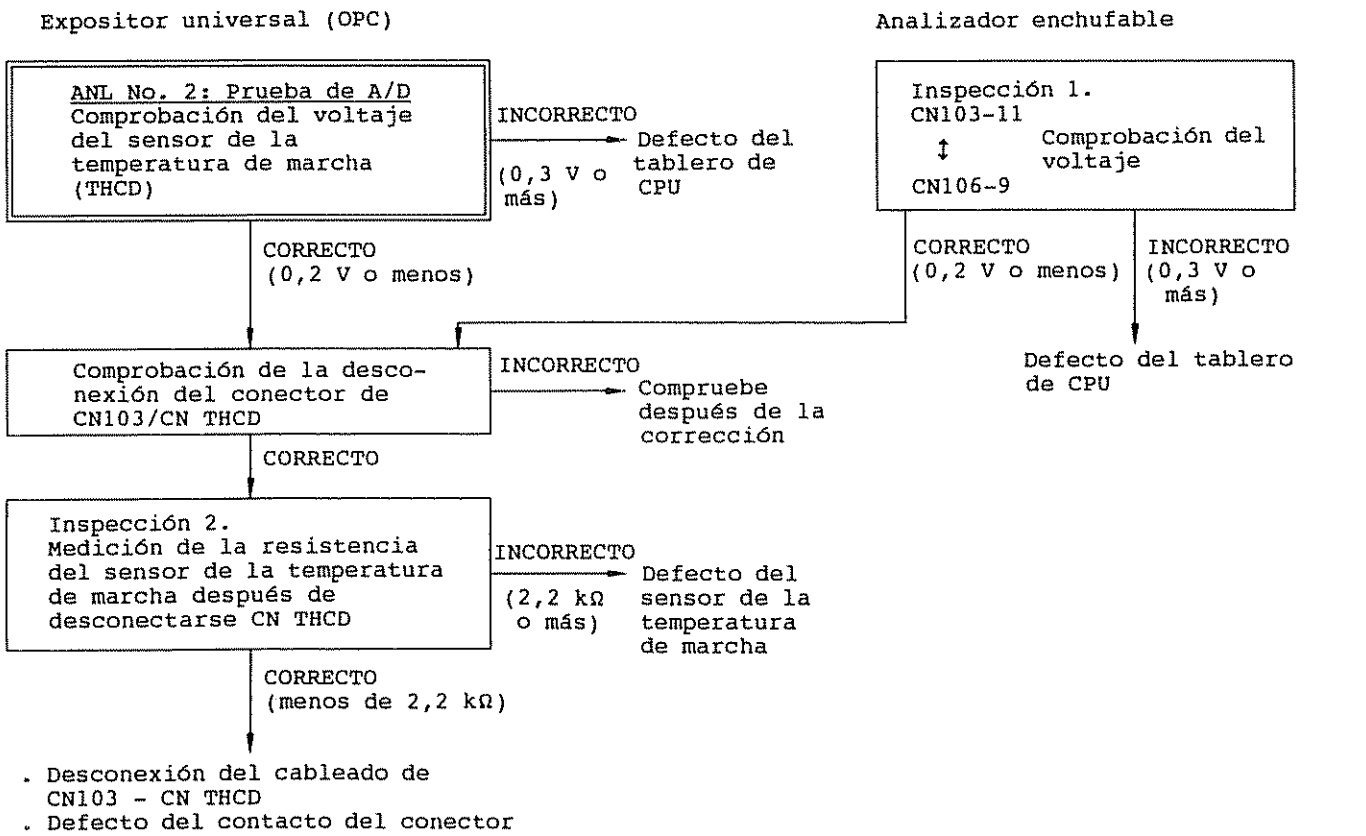
Causas estimadas

1 Defecto del sensor de la temperatura de marcha del regulador

2 Defecto de contacto de CN103/CN THCD

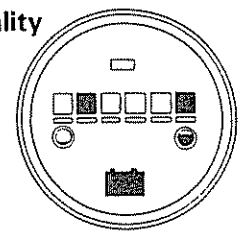
3 Falta de continuidad entre CN103 y el sensor de la temperatura de marcha del regulador

4 Defecto del tablero de CPU

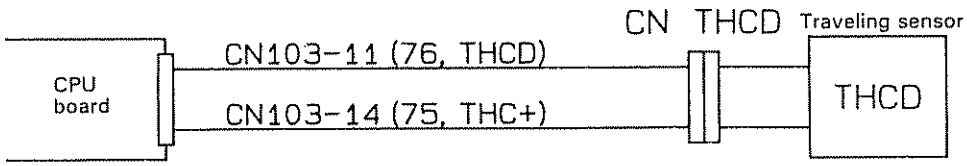


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Error code C3: Controller traveling temperature sensor abnormality



Related portion



Estimated causes

① Controller traveling temperature sensor defect

② CN103·CN THCD contact defect

③ Discontinuity between CN103 and controller traveling temperature sensor

④ CPU board defect

All-round display (OPT)

ANL No.2: A/D test
Traveling temperature sensor (THCD) voltage check

NG (0.3 V or more) → CPU board defect

OK (0.2 V or less)

CN103·CN THCD connector disconnection check

NG → Check after correction

OK

Inspection 2.
Measurement of traveling temperature sensor resistance after disconnecting CN THCD

NG (2.2 kΩ or more) → Traveling temperature sensor defect

OK (less than 2.2 kΩ)

- CN103 — CN THCD wiring disconnection
- Connector contact defect

Plug-in analyzer

Inspection 1:
CN103-11
↕ voltage check
CN106-9

OK (0.2 V or less)

NG (0.3 V or more) → CPU board defect

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Inspección 1. Comprobación del voltaje del sensor de la temperatura de marcha

Enchufe de la batería desconectado, interruptor de la llave desconectado

Terminales de medición	CN103-11 (76) -- CN106-9 (14)
Alcance del probador de circuitos	CC 10 V
Estándar	0,2 V o menos

CORRECTO (0,2 V o menos) -- Comprobación de la desconexión del conector CN103, CN THCD
INCORRECTO (0,3 V o más) -- Defecto del tablero de CPU

Inspección 2. Comprobación individual del sensor de la temperatura del sistema de marcha
Enchufe de la batería desconectado, CN THCD desconectado

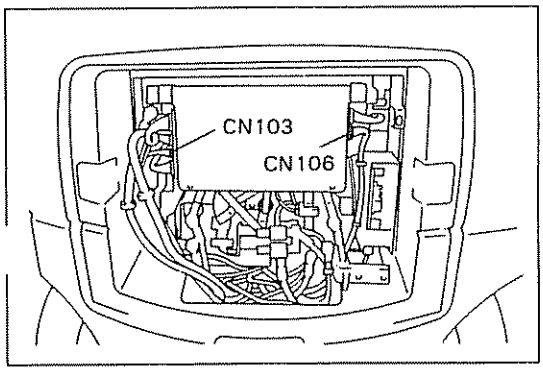
Terminales de medición	Ambos terminales del conector THCD (en el lado de THCD)
Alcance del probador de circuitos	Ω x 1 K
Estándar	Menos de 2,2 kΩ

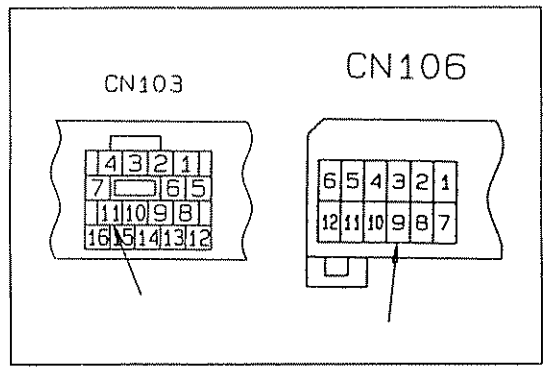
CORRECTO (menos de 2,2 kΩ) -- Desconexión del cableado o defecto de contacto del conector entre CN103 y CN THCD
INCORRECTO (2,2 kΩ o más) -- Defecto del sensor de la temperatura del sistema de marcha

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Inspection 1. Traveling temperature sensor voltage check
Battery plug OFF, key switch OFF

Measurement terminals	CN103-11(76) — CN106-9(14)
Circuit tester range	DC 10 V
Standard	0.2 V or less

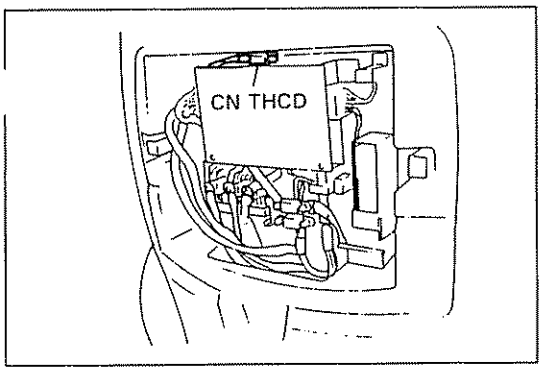


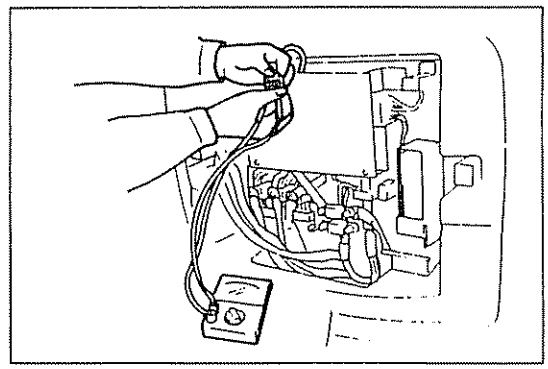


OK (0.2 V or less) → CN103·CN THCD connector disconnection check
NG (0.3 V or more) → CPU board defect

Inspection 2. Traveling system temperature sensor individual check
Battery plug OFF, CN THCD disconnection

Measurement terminals	Both terminals of THCD connector (on THCD side)
Circuit tester range	Ω × 1 K
Standard	Less than 2.2 kΩ





OK (less than 2.2 kΩ) → Wiring disconnection or connector contact defect between CN103 and CN THCD
NG (2.2 kΩ or more) → Traveling system temperature sensor defect

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Código de error C4: Anormalidad del acelerador de marcha

Parte relacionada

Potenciómetro del acelerador

Tablero
de CPU

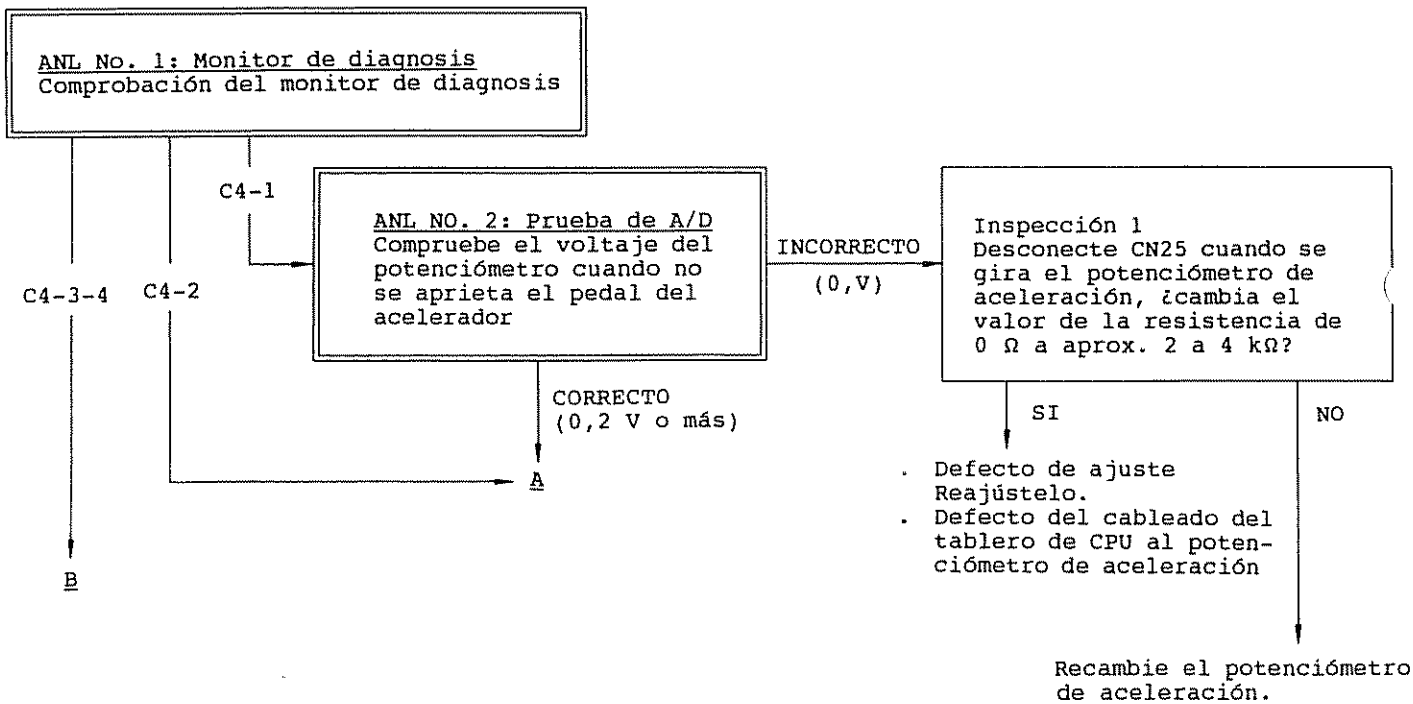
Causas estimadas

1 Defecto del potenciómetro de aceleración

2 Cortocircuito o desconexión del cableado entre el tablero de CPU y el potenciómetro de aceleración

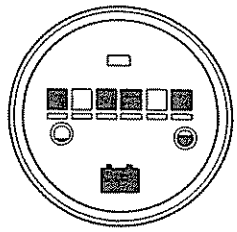
3 Contacto defectuoso de CN101/CN102/CN25

4 Defecto del tablero de CPU

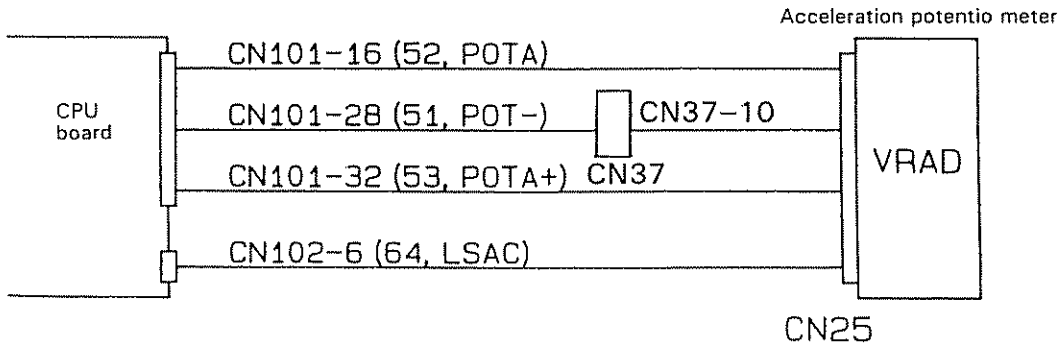


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Error code C4: Drive accelerator abnormality



Related portion



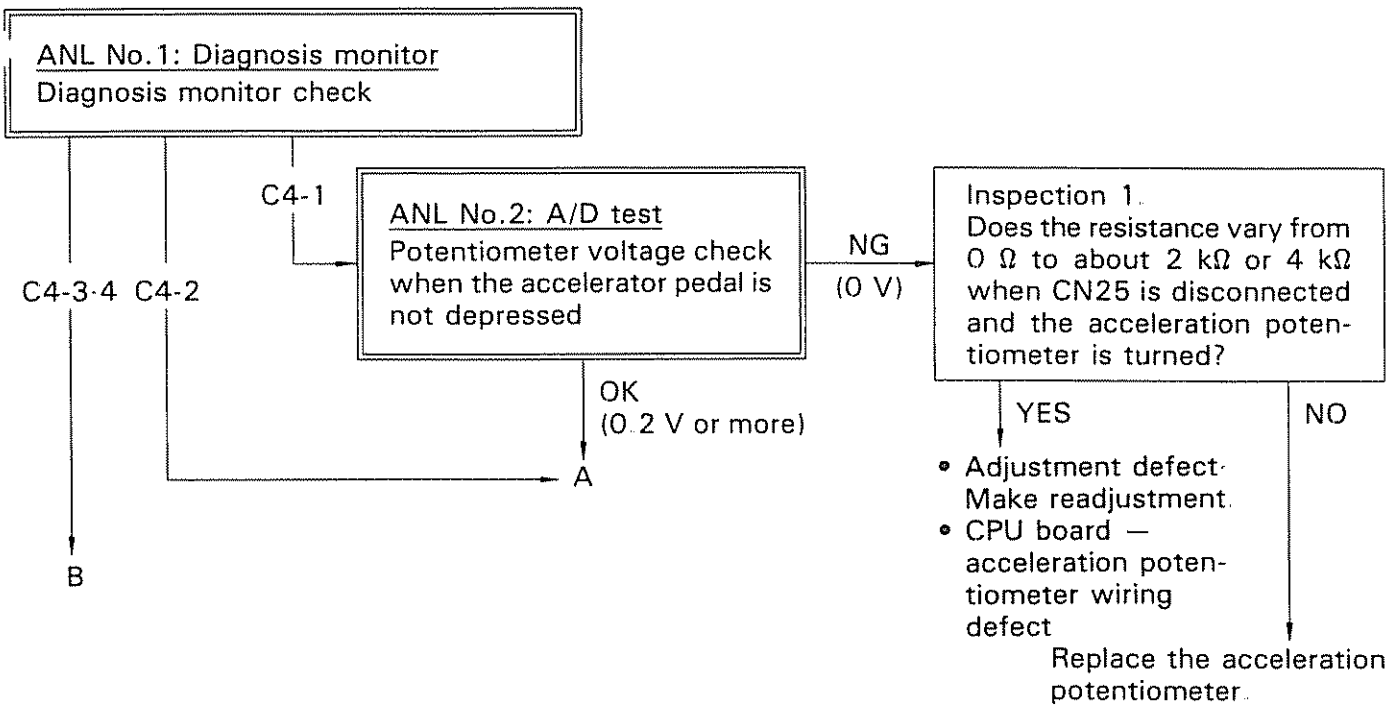
Estimated causes

① Acceleration potentiometer defect

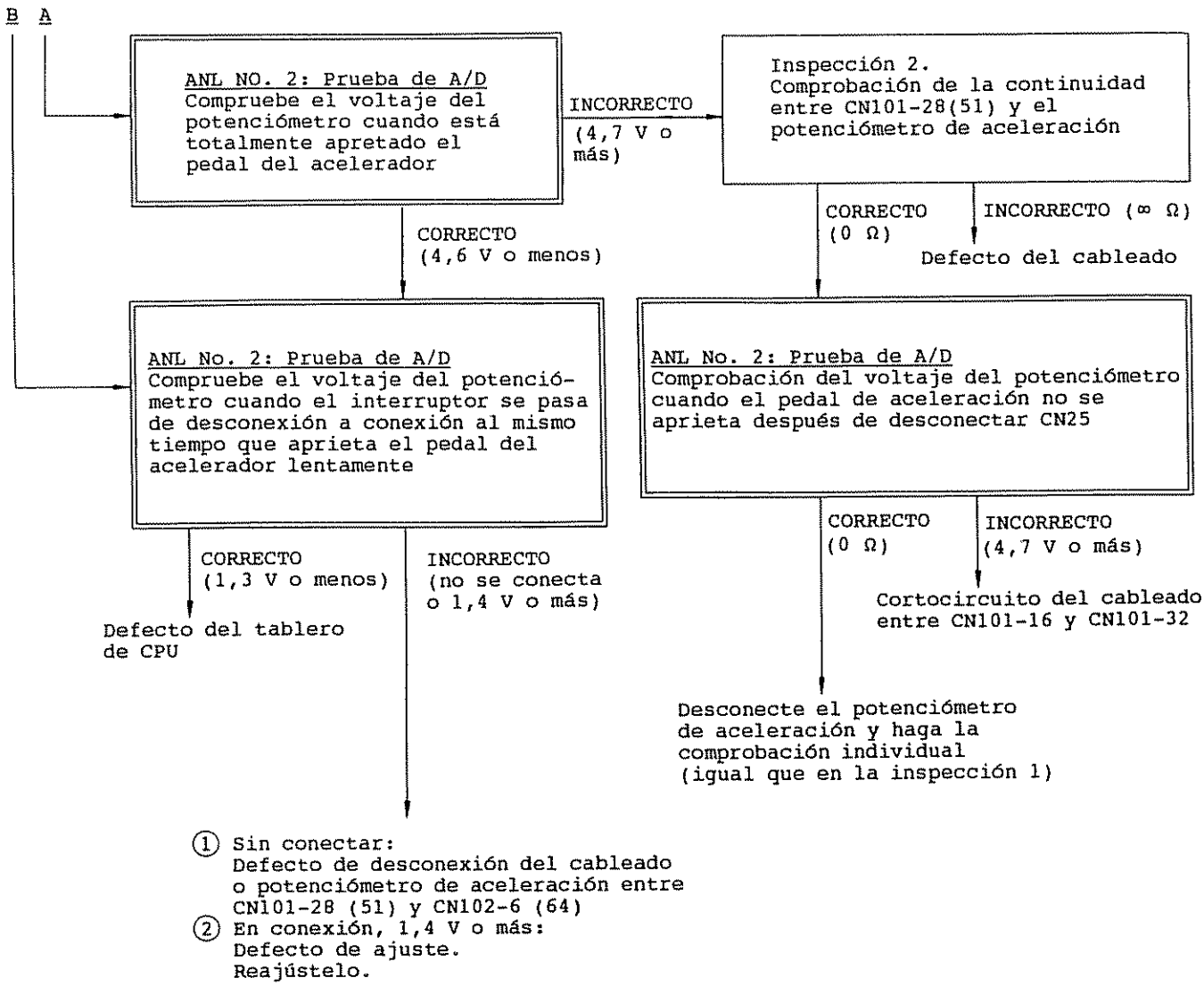
② Short circuit or disconnection of wiring between CPU board and acceleration potentiometer

③ CN101·CN102·CN25 contact defect

④ CPU board defect



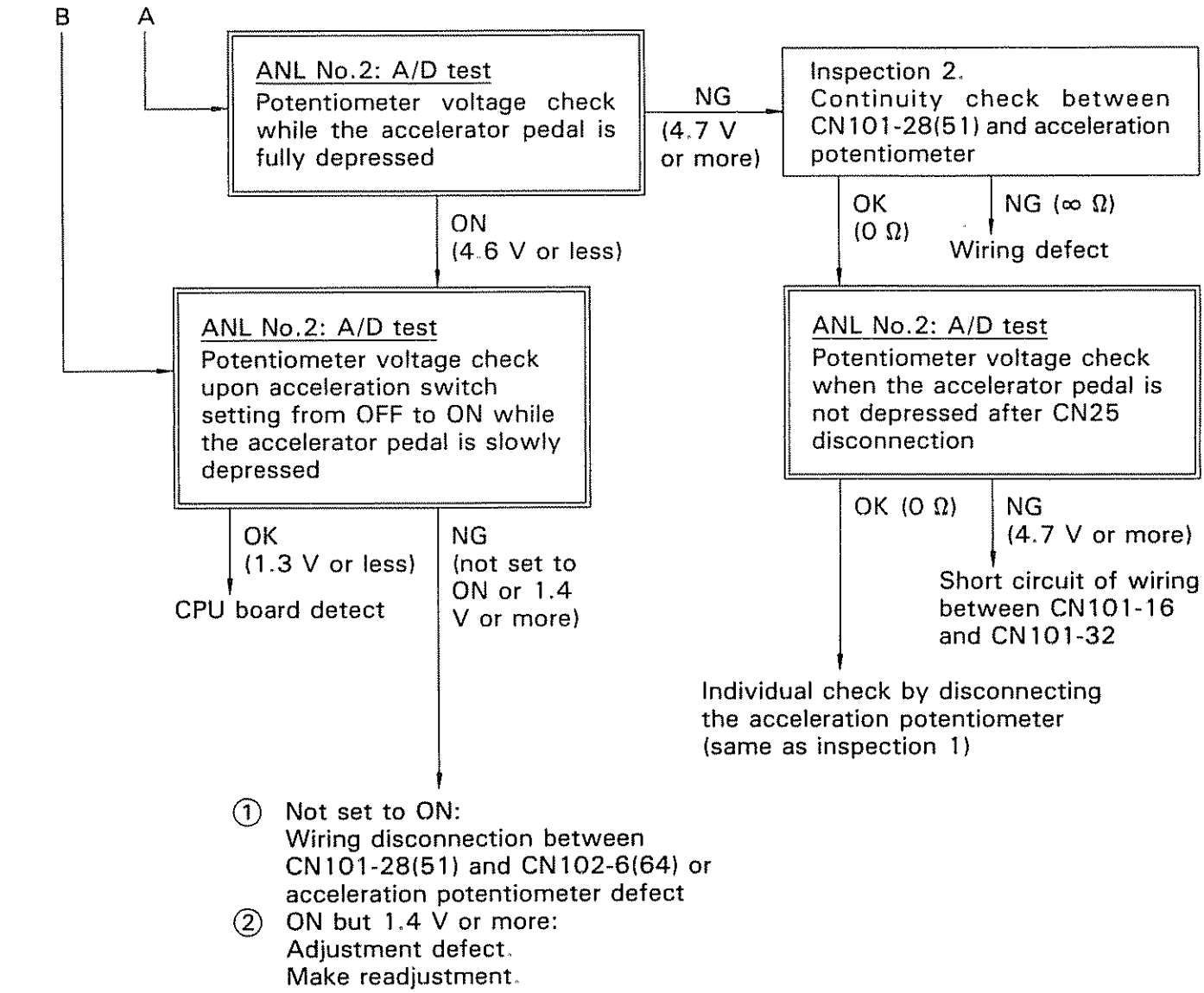
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① Sin conectar:
Defecto de desconexión del cableado o potenciómetro de aceleración entre CN101-28 (51) y CN102-6 (64)

② En conexión, 1,4 V o más:
Defecto de ajuste.
Reajústelo.

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Inspección 1. Comprobación individual del potenciómetro de aceleración
Enchufe de la batería desconectado, desconexión de CN25

Terminales de medición	Terminales del conector del potenciómetro de aceleración (52 y 51)
Alcance del probador de circuitos	Ω x 1 K
Estándar	Variará de 0 Ω a aprox. 2 kΩ o 4 kΩ

CORRECTO (estándar) -- Defecto de ajuste, o defecto del cableado del tablero de CPU al potenciómetro de aceleración.
INCORRECTO (diferente del estándar) -- Recambie el potenciómetro de aceleración.

Inspección 2. Comprobación de la continuidad del cableado del potenciómetro de aceleración
Enchufe de la batería desconectado, desconexión de CN25/CN101

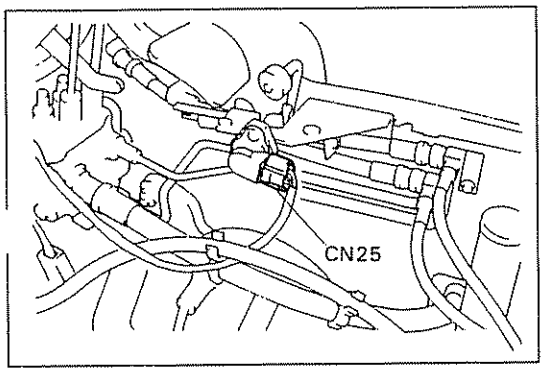
Terminales de medición	CN1010-28 (51) -- CN25-1 (51)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

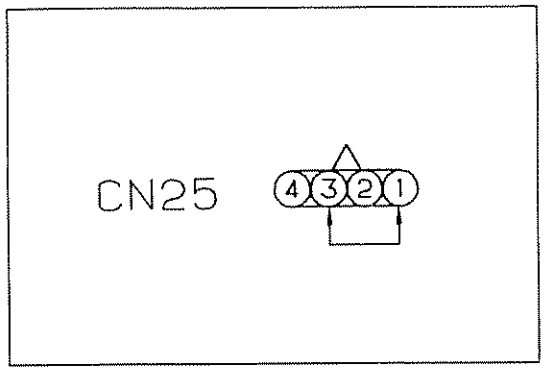
CORRECTO (0 Ω) -- A ANL No. 2: Prueba de A/D.
INCORRECTO (∞ Ω) -- Defecto del cableado.

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Inspection 1. Acceleration potentiometer individual check
Battery plug OFF, CN25 disconnection

Measurement terminals	Acceleration potentiometer connector terminals (52 and 51)
Circuit tester range	Ω × 1 K
Standard	Shall vary from 0 Ω to approx. 2 kΩ or 4 kΩ.

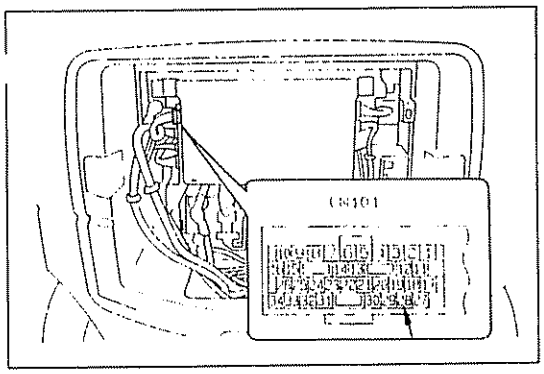


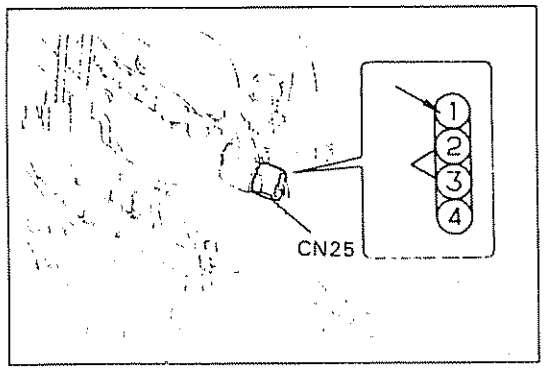


OK (standard) → Adjustment defect, or CPU board — acceleration potentiometer wiring defect.
NG (other than standard) → Replace the acceleration potentiometer.

Inspection 2. Acceleration potentiometer wiring continuity check
Battery plug OFF, CN25·CN101 disconnection

Measurement terminals	CN101-28(51) — CN25-1(51)
Circuit tester range	Ω × 1
Standard	0 Ω





OK (0 Ω) → To ANL No.2: A/D test.
NG (∞ Ω) → Wiring defect.

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Código de error C7: Anormalidad del interruptor de dirección

Parte relacionada

Interruptor de dirección

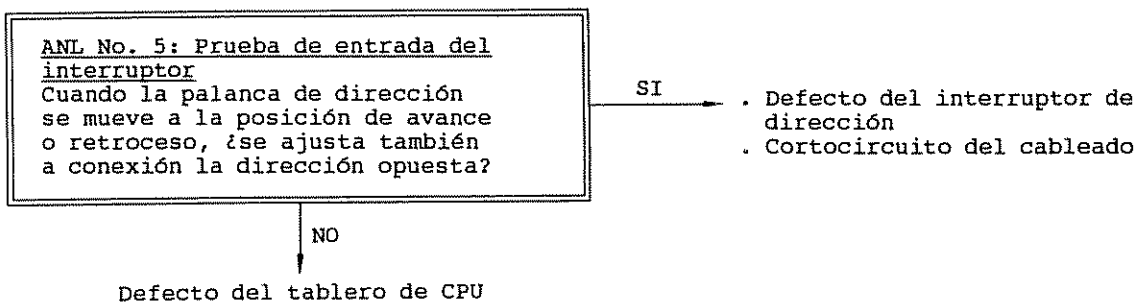
Tablero de CPU

Causas estimadas

1 Defecto del interruptor de dirección

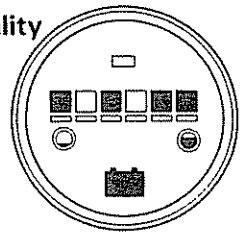
2 Cortocircuito del cableado entre CN102 y el interruptor de dirección

3 Defecto del tablero de CPU

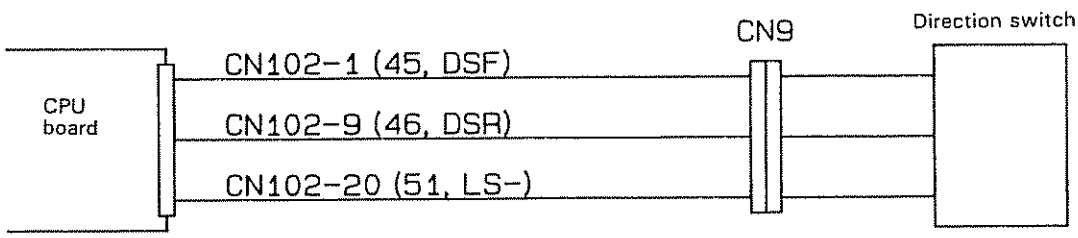


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Error code C7: Direction switch abnormality



Related portion



Estimated causes

① Direction switch defect

② Short circuit of wiring between CN102 and direction switch

③ CPU board defect

ANL No.5: Switch input test
When the direction lever is operated to the forward or reverse direction, is the opposite side also set to ON?

YES → • Direction switch defect
• Short circuit of wiring

NO → CPU board defect

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Código de error C8: Anormalidad del sensor de velocidad

Parte relacionada

Sensor de velocidad 1

Tablero de CPU

Sensor de velocidad 2

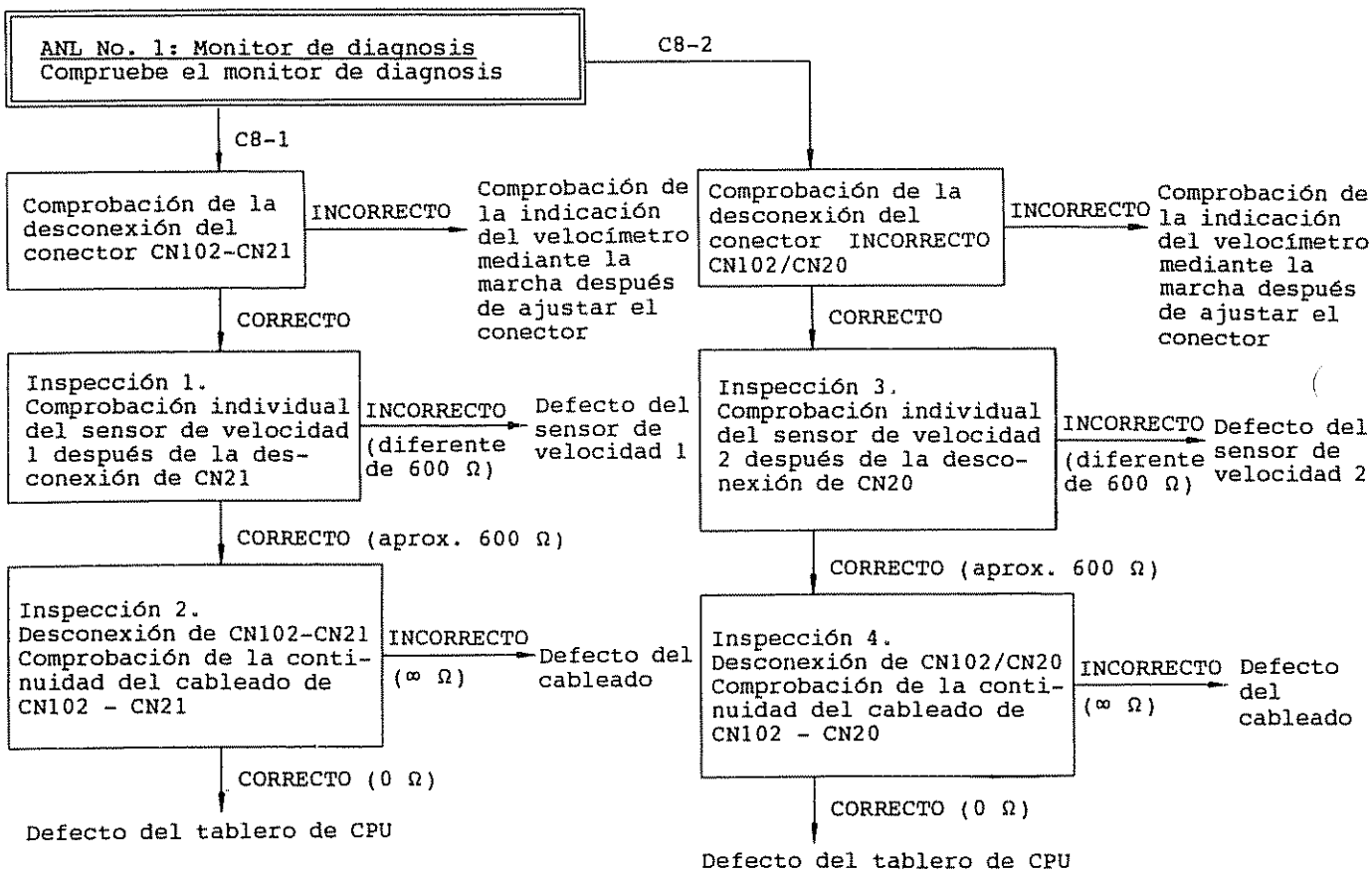
Causas estimadas

1 Defecto del sensor de velocidad (desconexión de la bobina)

2 Desconexión del cableado del sensor de velocidad CN102

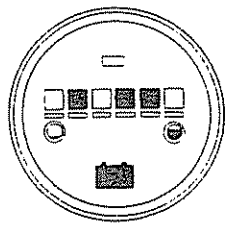
3 Defecto de contacto del conector

4 Defecto del tablero de CPU

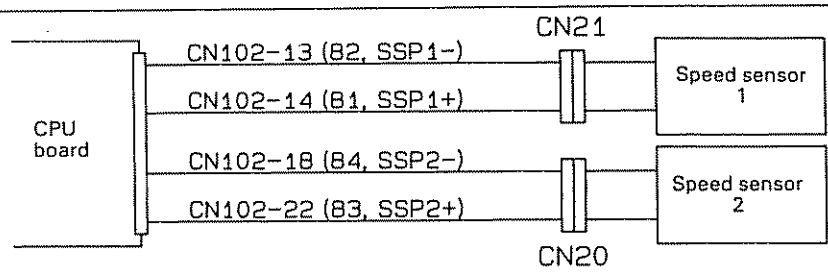


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Error code C8: Speed sensor abnormality



Related portion



Estimated causes

① Speed sensor defect coil disconnection)

② CN102 — speed sensor wiring disconnection

③ Connector contact defect

④ CPU board defect

ANL No.1: Diagnosis monitor
Diagnosis monitor check

C8-2

C8-1

CN102·CN21 connector disconnection check — NG → Speedometer indication check by traveling after connector setting

OK

Inspection 1. Speed sensor 1 individual check after CN21 disconnection — NG (other than approx. 600 Ω) → Speed sensor 1 defect

OK (approx. 600 Ω)

Inspection 2. CN102·CN21 disconnection CN102 — CN21 wiring continuity check. — NG (∞ Ω) → Wiring defect.

OK (0 Ω)

CPU board defect

CN102·CN20 connector disconnection check — NG → Speedometer indication check by traveling after connector setting

OK

Inspection 3. Speed sensor 2 individual check after CN20 disconnection — NG (other than approx. 600 Ω) → Speed sensor 2 defect

OK (approx. 600 Ω)

Inspection 4. CN102·CN 20 disconnection CN102 — CN20 wiring continuity check — NG (∞ Ω) → Wiring defect.

OK (0 Ω)

CPU board defect

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Inspección 1. Comprobación individual del sensor de velocidad 1
Enchufe de la batería desconectado, desconexión de CN21

Terminales de medición	Ambos terminales del conector del sensor de velocidad 1 (en el lado del sensor de velocidad)
Alcance del probador de circuitos	Ω x 100
Estándar	600 Ω

CORRECTO (600 Ω) -- A la inspección 2.
INCORRECTO (diferente de 600 Ω) -- Defecto del sensor de velocidad 1

Inspección 2. Comprobación de la continuidad del cableado del sensor de velocidad 1
Enchufe de la batería desconectado, desconexión de CN21/CN102

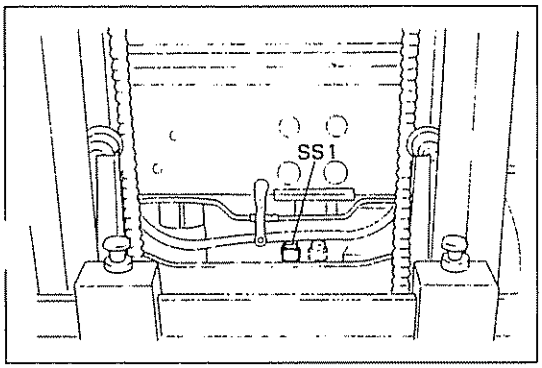
Terminales de medición	A: CN102-13 (82) -- CN21-1 (82) (conector del lado de REC) A: CN102-14 (81) -- CN21-2 (81) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

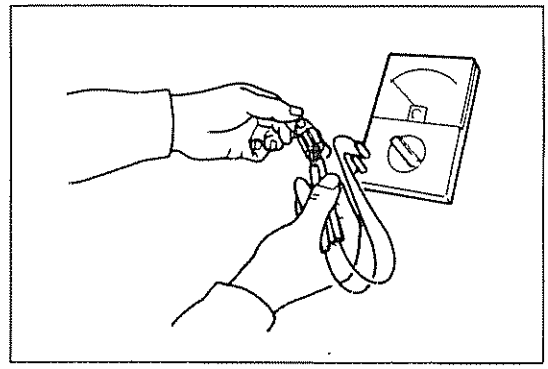
CORRECTO (0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Defecto del cableado

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Inspection 1. Speed sensor 1 individual check
Battery plug OFF, CN21 disconnection

Measurement terminals	Both terminals of speed sensor 1 connector (on speed sensor side)
Circuit tester range	Ω × 100
Standard	Approx. 600 Ω

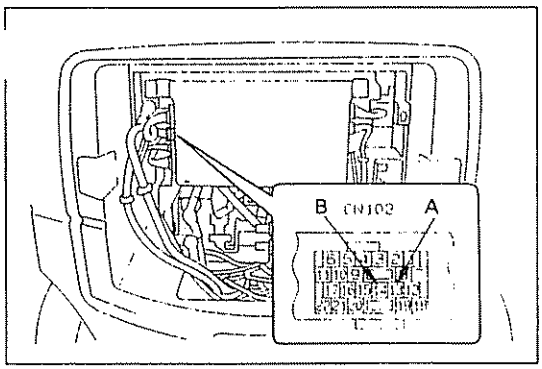


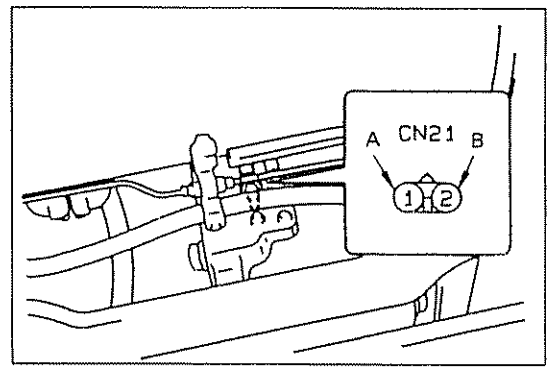


OK (Approx. 600 Ω) → To inspection 2.
NG (other than approx. 600 Ω) → Speed sensor 1 defect

Inspection 2. Speed sensor 1 wiring continuity check
Battery plug OFF, CN21·CN102 disconnection

Measurement terminals	A: CN102-13(82) – CN21-1(82) (connector of REC side) B: CN102-14(81) – CN21-2(81) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω





OK (0 Ω) → CPU board defect.
NG (∞ Ω) → Wiring defect.

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Inspección 3. Comprobación individual del sensor de velocidad 2
Enchufe de la batería desconectado, desconexión de CN20

Terminales de medición	Ambos terminales del conector del sensor de velocidad 2 (en el lado del sensor de velocidad)
Alcance del probador de circuitos	Ω x 100
Estándar	600 Ω

CORRECTO (600 Ω) -- A la inspección 4.
INCORRECTO (diferente de 600 Ω) -- Defecto del sensor de velocidad 2

Inspección 4. Comprobación de la continuidad del cableado del sensor de velocidad 2
Enchufe de la batería desconectado, desconexión de CN102/CN20

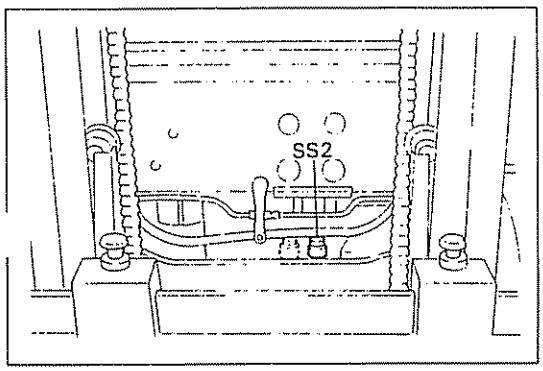
Terminales de medición	A: CN102-18 (84) -- CN20-1 (84) A: CN102-22 (83) -- CN20-2 (83)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

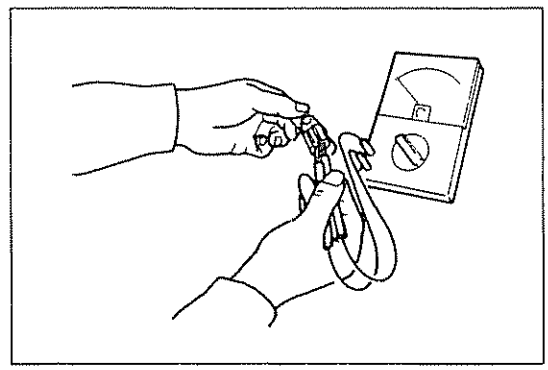
CORRECTO (0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Defecto del cableado

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Inspection 3. Speed sensor 2 individual check
Battery plug OFF, CN 20 disconnection

Measurement terminals	Both terminals of speed sensor 2 connector (on speed sensor side)
Circuit tester range	Ω × 100
Standard	Approx. 600 Ω

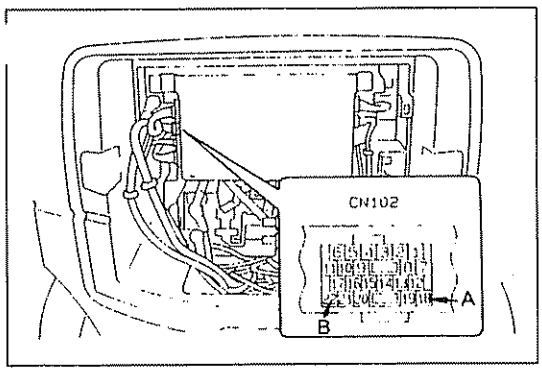


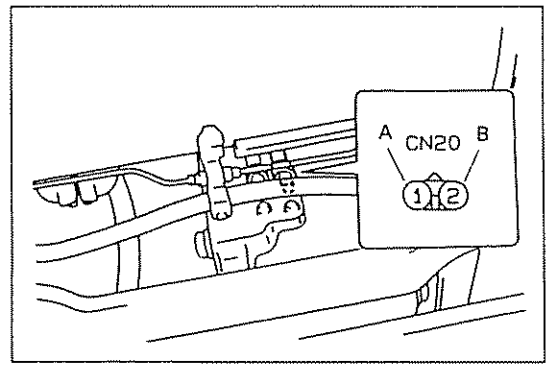


OK (Approx. 600 Ω) → To inspection 4.
NG (other than approx. 600 Ω) → Speed sensor 2 defect

Inspection 4. Speed sensor 2 wiring continuity check
Battery plug OFF, CN102·CN20 disconnection

Measurement terminals	A: CN102-18(84) — CN20-1(84) B: CN102-22(83) — CN20-2(83)
Circuit tester range	Ω × 1
Standard	0 Ω





OK (0 Ω) → CPU board defect.
NG (∞ Ω) → Wiring defect

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Código de error C9: Anormalidad del contactor para regeneración

Parte relacionada

Tablero
de CPU

Bobina de MG

Causas estimadas

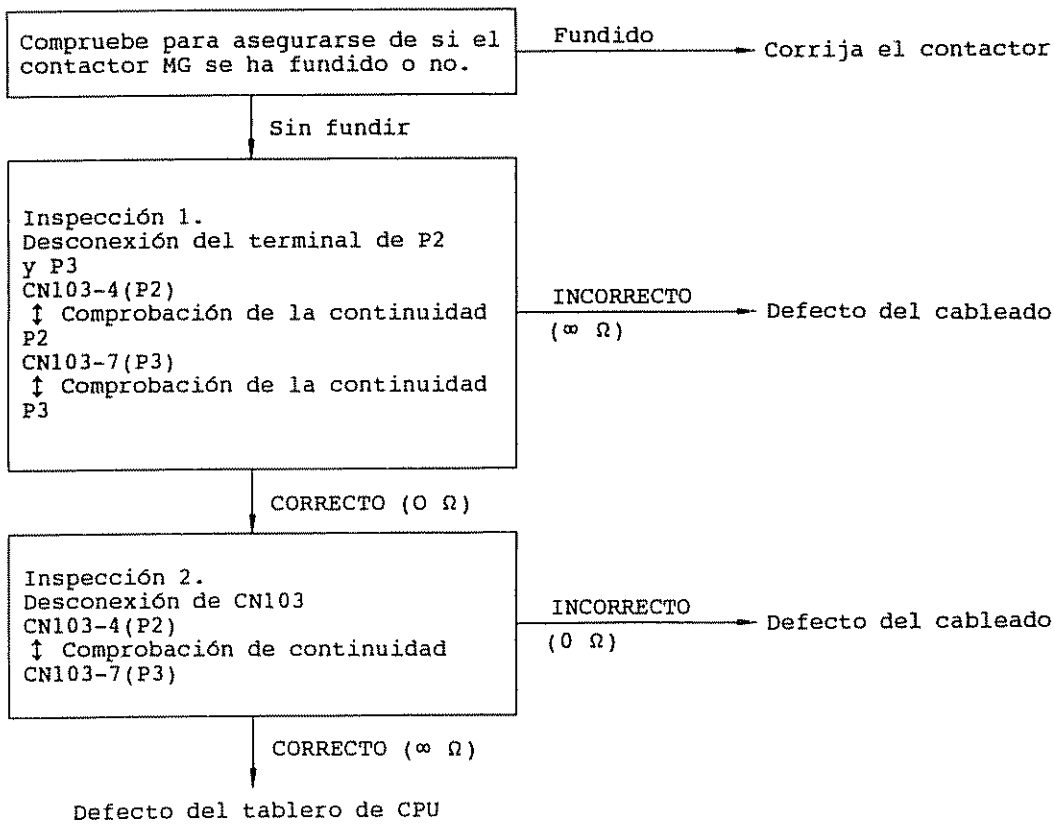
1 Defecto de MG

2 Defecto del cableado de CN103 a P2/P3

3 Cortocircuito entre P2 y P3

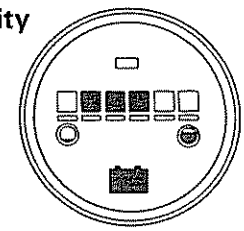
4 Defecto del tablero de CPU

Si aparece al mismo tiempo A8,primero lleve a cabo la búsqueda de averías de A8.

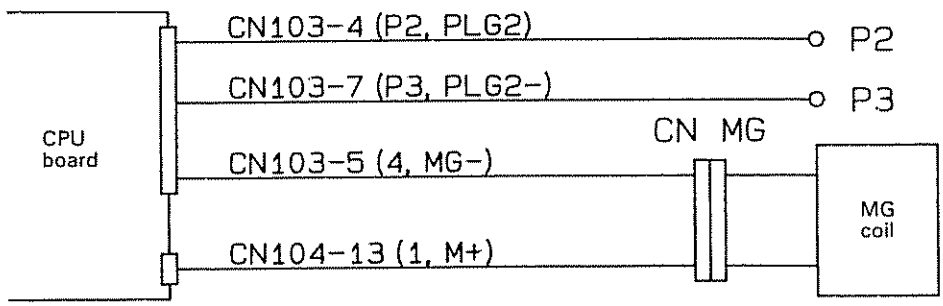


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Error code C9: Regeneration contactor abnormality



Related portion



Estimated causes

① MG defect

② CN103 – P2 and P3 wiring disconnection

③ Short circuit between P2 and P3

④ CPU board defect

If A8 is displayed at the same time, first conduct A8 troubleshooting.

Check if the MG contactor is welded.
→ Welded. → Contactor correction.
↓ Not welded.

Inspection 1.
P2 and P3 round terminal disconnection
CN103-4(P2)
↕ continuity check
P2
CN103-7(P3)
↕ continuity check
P3
→ NG (∞ Ω) → Wiring defect
↓ OK (0 Ω)

Inspection 2.
CN103 disconnection
CN103-4(P2)
↕ continuity check
CN103-7(P3)
→ NG (0 Ω) → Wiring defect
↓ OK (∞ Ω)

CPU board defect

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Inspección 1. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión del terminal P2/P3

Terminales de medición	CN103-4 (P2) -- P2 (CN103 es el conector del lado de REC) CN103-7 (P3) -- P3
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación de la continuidad del cableado del tablero de CPU
Enchufe de la batería desconectado

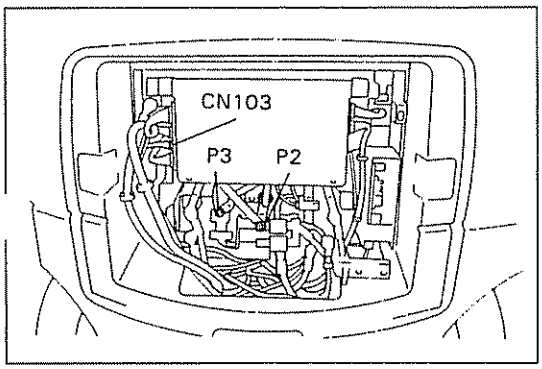
Terminales de medición	CN103-4 (P2) -- CN103-7 (P3) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	∞ Ω

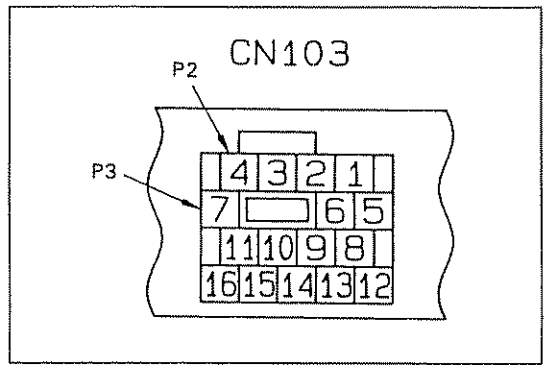
CORRECTO (∞ Ω) -- Defecto del tablero de CPU
INCORRECTO (0 Ω) -- Defecto del cableado

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Inspection 1. Wiring continuity check
Battery plug OFF, P2 and P3 terminal disconnection

Measurement terminals	CN103-4(P2) — P2 (CN103 is connector of REC side.) CN103-7(P3) — P3 (CN103 is connector of REC side.)
Circuit tester range	Ω × 1
Standard	0 Ω

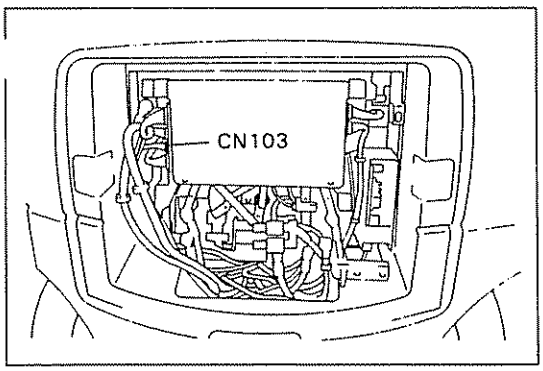


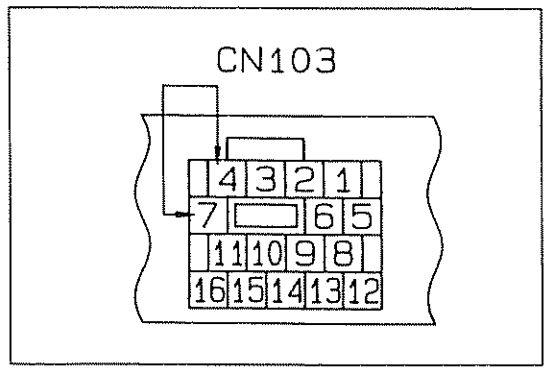


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect.

Inspection 2. CPU board wiring continuity check
Battery plug OFF

Measurement terminals	CN103-4(P2) — CN103-7(P3) (connector of REC side)
Circuit tester range	Ω × 1
Standard	∞ Ω





OK (∞ Ω) → CPU board defect
NG (0 Ω) → Wiring defect

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Código de error CA: Anormalidad del circuito de marcha del contactor de marcha

Parte relacionada

Bobina de MF

Tablero de CPU

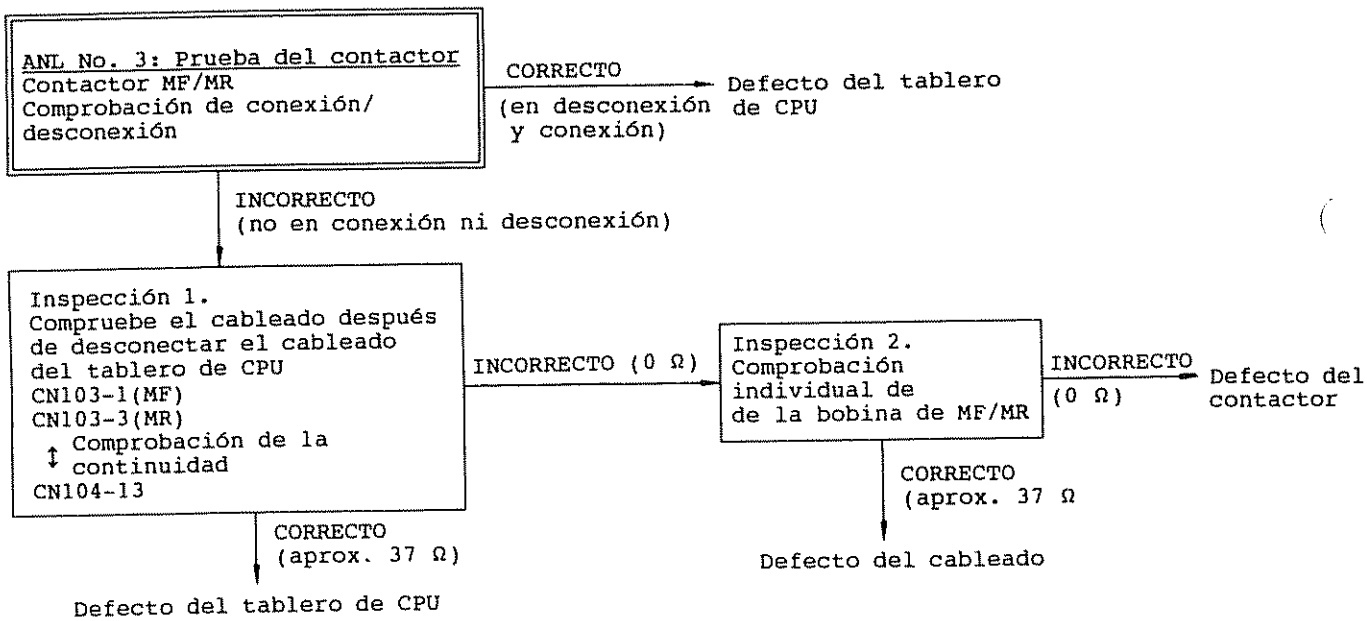
Bobina de MR

Causas estimadas

1 Defecto de la bobina de MF/MR

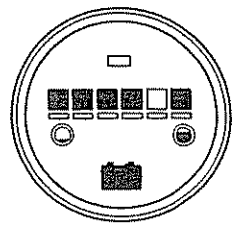
2 Cortocircuito del cableado de la bobina del contactor

3 Defecto del tablero de CPU

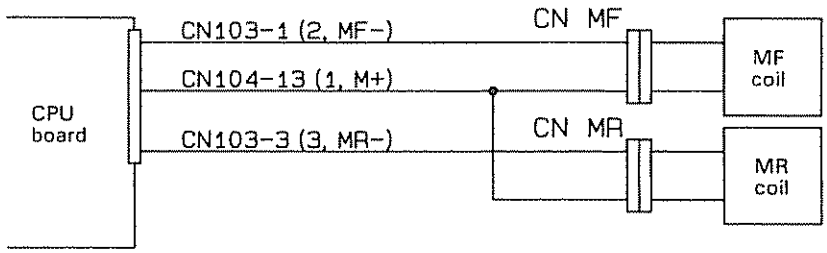


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Error code CA: Traveling contactor drive circuit abnormality



Related portion



Estimated causes

① MF/MR coil defect

② Each contactor coil wiring short circuit

③ CPU board defect

ANL No.3: Contactor test
MF/MR contactor
ON/OFF check

OK (set to OFF and ON) → CPU board defect

NG (not set to ON and OFF)

Inspection 1.
Wiring check after disconnecting CPU board wiring
CN103-1(MF)
CN103-3(MR)
↕ continuity check
CN104-13

NG (0 Ω) → Inspection 2.
MF/MR coil individual check

NG (0 Ω) → Contactor defect

OK (approx 37 Ω) → Wiring defect

OK (approx. 37 Ω) → CPU board defect

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Inspección 1. Comprobación de la continuidad del cableado del contactor MF/MR
Enchufe de la batería desconectado, desconexión del conector del tablero de CPU

Terminales de medición	CN103-1 -- CN104-13 (conector del lado de REC)	
	CN103-3 -- CN104-13 (conector del lado de REC)	
Alcance del probador de circuitos		Ω x 1
Estándar		Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- Defecto del tablero de CPU
INCORRECTO (0 Ω) -- A la inspección 2.

Inspección 2. Comprobación individual del contactor MF/MR
Enchufe de la batería desconectado, desconexión del cableado de MF/MR y barra de cobre

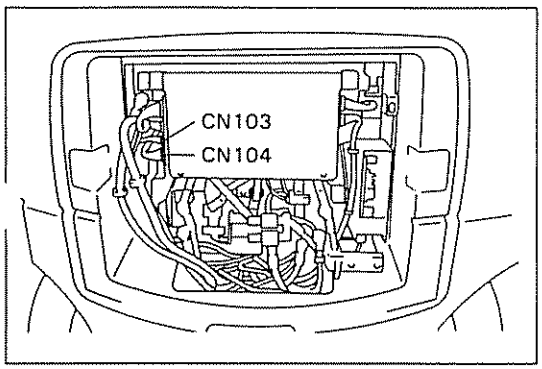
Terminales de medición	Ambos terminales de cada bobina
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

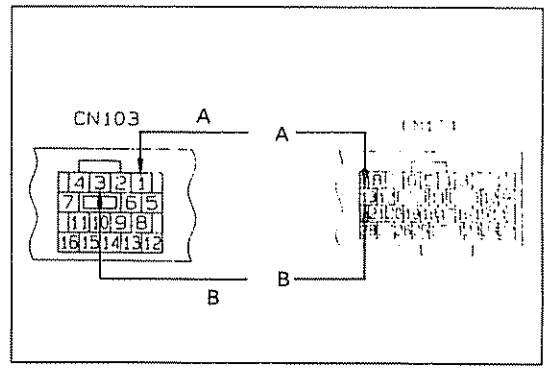
CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (0 Ω) -- Defecto del contactor

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Inspection 1. MF·MR contactor wiring continuity check
Battery plug OFF, CPU board connector disconnection

Measurement terminals	A: CN103-1 – CN104-13 (connector of REC side) B: CN103-3 – CN104-13 (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

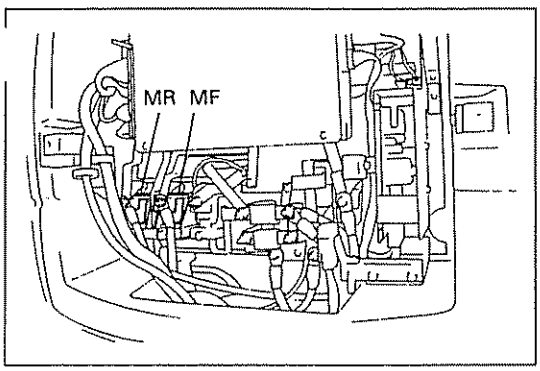


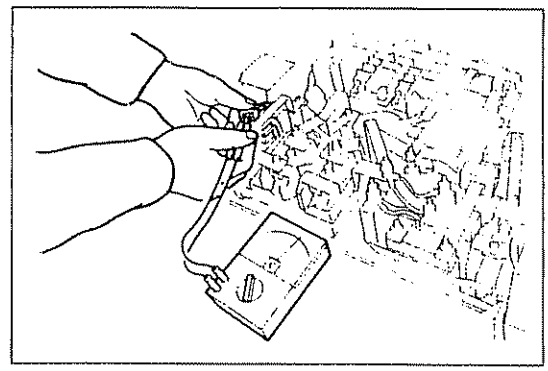


OK (approx. 37 Ω) → CPU board defect
NG (0 Ω) → To inspection 2.

Inspection 2. MF·MR contactor individual check
Battery plug OFF, MF·MR wiring copper bar disconnection

Measurement terminals	Both terminals of each coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring defect
NG (0 Ω) → Contactor defect

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Código de error E0: Anormalidad del circuito de manipulación de materiales

Parte relacionada

Tablero de CPU

Tablero
de DC-BD

Causas estimadas

1 Defecto de TMP (Compruebe también DF3, DAP, CAP y RAP sin falta, ya que cualquiera de ellos puede ser la causa principal del defecto de TMP)

2 Defecto del sensor de corriente de manipulación de materiales (CSP), desconexión del cableado o defecto del cableado del contactor

3 Desconexión del cableado entre el tablero de DC-BD y TMP

4 Desconexión del cableado entre el tablero de CPU y TMP

5 Desconexión del cableado entre el tablero de CPU y el tablero de DC-BD o defecto de contacto del conector

6 Defecto del tablero de DC-BD

7 Defecto de la bobina de MP

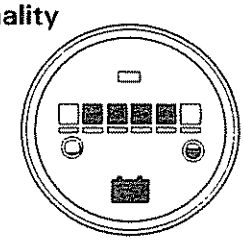
8 Defecto del cableado del contactor MP

9 Defecto del tablero de CPU

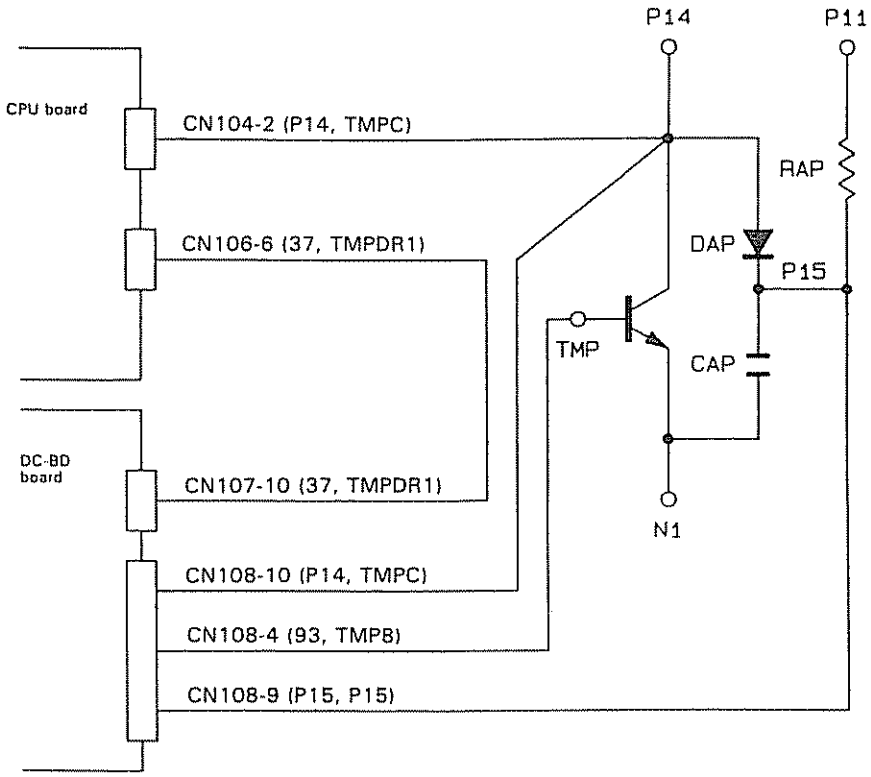
(Cuando aparecen al mismo tiempo E0 y A9, dé prioridad a la búsqueda de averías de A9. Si aparece F0, lleve a cabo primero la búsqueda de F0.)

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Error code E0: Main material handling circuit abnormality



Related portion



Estimated causes

① TMP defect (Always inspect DF3, DAP, CAP and RAP since they may be the primary cause of the TMP defect.)

② Material handling current sensor (CSP) defect, wiring disconnection, or connector contact defect

③ Disconnection of wiring between DC-BD board and TMP

④ Disconnection of wiring between CPU board and TMP

⑤ Disconnection of wiring between CPU board and DC-BD board, or connector contact defect

⑥ DC-BD board defect

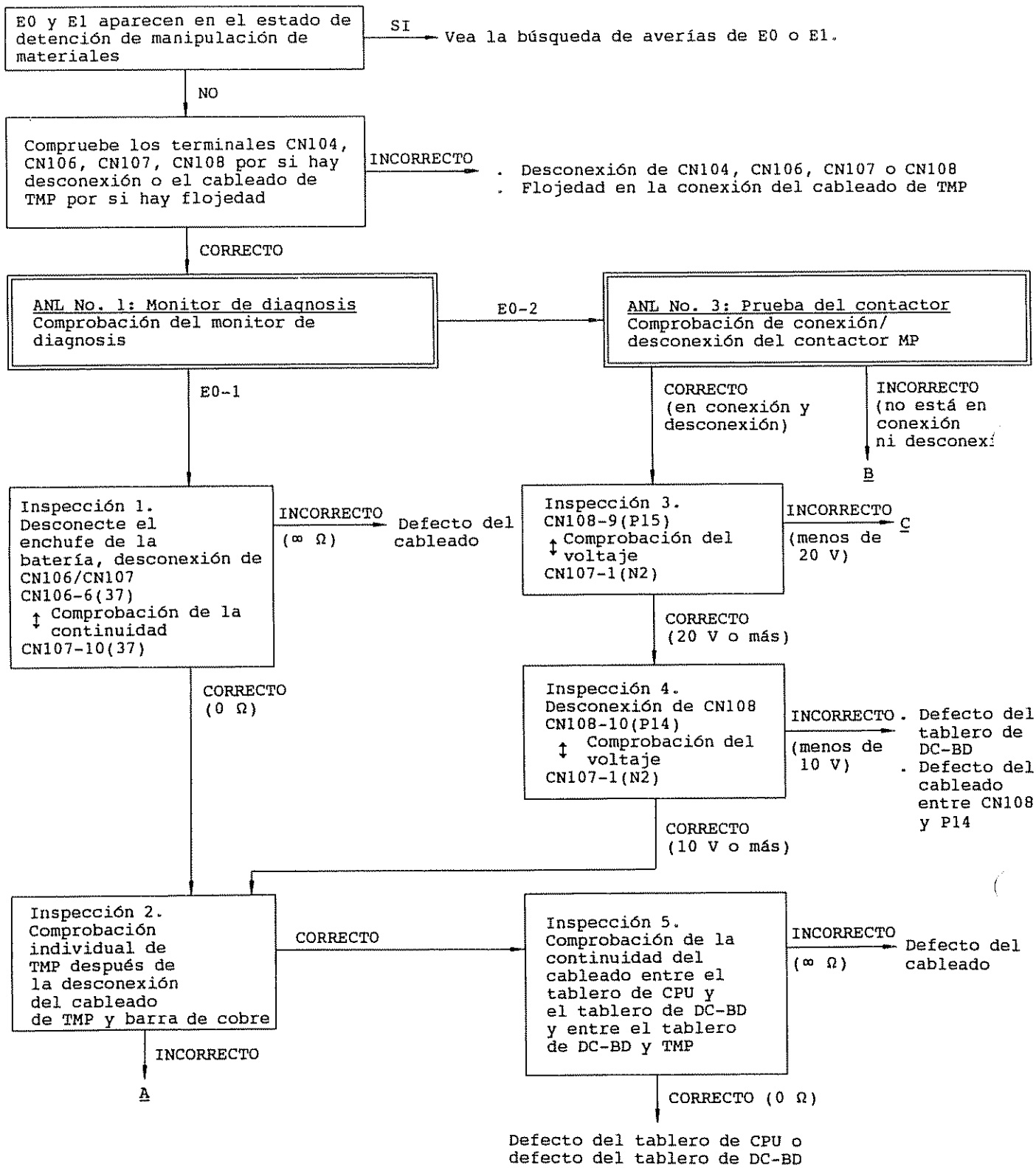
⑦ MP coil defect

⑧ MP contactor wiring defect

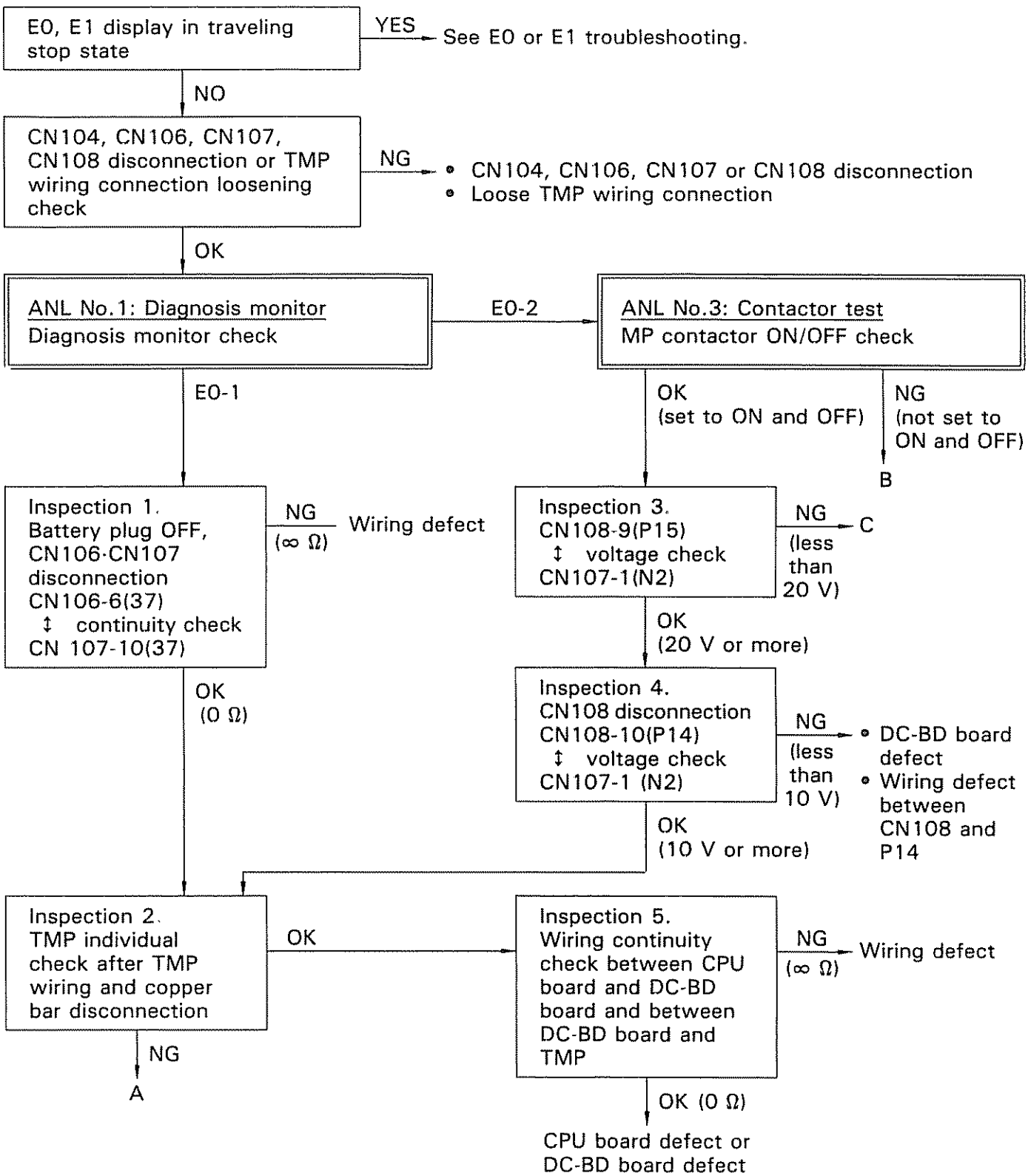
⑨ CPU board defect

(When E0 and A9 are displayed at the same time, first conduct A9 troubleshooting. If F0 is displayed, first conduct F0 troubleshooting.)

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A

Inspección 6. Comprobación individual de DF3
INCORRECTO (diferente del estándar) → Defecto de DF3
(Avance: Aprox. 6 kΩ Retroceso: ∞Ω)
CORRECTO → Recambio

Inspección 7. Comprobación individual de CAP
INCORRECTO (diferente del estándar) → Defecto de CAP
(Estándar)
CORRECTO → Recambio

Inspección 8. Comprobación individual de DAP
INCORRECTO (diferente del estándar) → Defecto de DAP
(Avance: Aprox. 6 kΩ Retroceso: ∞Ω)
CORRECTO → Recambio

Inspección 9. Comprobación individual de RAP
INCORRECTO (∞ Ω) → Defecto de RAP
(Series de 1-3 ton.: 1,5 Ω Series de 2 ton.: 1,2 Ω)
CORRECTO → Recambio

Compruebe la desconexión del conector CN109, CN118
INCORRECTO → Conexión del conector
CORRECTO

Recambio de TMP

Recambio de TMP

C

Inspección 9. Comprobación individual de RAP
INCORRECTO (∞ Ω) → Defecto de RAP
CORRECTO (Series de 1-3 ton.: 1,5 Ω Series de 2 ton.: 1,2 Ω)

Inspección 7. Comprobación individual de CAP
INCORRECTO (diferente del estándar) → Defecto de CAP
CORRECTO (estándar)

Compruebe la desconexión del conector CN109
INCORRECTO → Conexión del conector
CORRECTO

. Defecto del cableado de CN108-9
. Defecto del cableado de RAP/CAP

B

Inspección 10.
Desconexión de CN104
CN104-5(5)
↕ Comprobación de desconexión del cableado
CN104-14(9)
INCORRECTO (diferente de aprox. 37 Ω)

Inspección 13. Comprobación individual de la bobina de MP
INCORRECTO (diferente de aprox. 37 Ω) → Defecto de bobina del contactor
CORRECTO (aprox. 37 Ω)

Defecto del cableado

CORRECTO (aprox. 37 Ω)

Inspección 11.
Desconexión de CN103/CN106
CN103-2
↕ Comprobación de la continuidad
CN106-7
INCORRECTO (∞ Ω) → Defecto del cableado

CORRECTO (0 Ω)

Inspección 12.
Desconexión de CN101
CN101-8(41)
↕ Comprobación del voltaje
CN105-11
INCORRECTO (0 V) → Defecto del cableado entre el interruptor de la llave y el tablero de CPU

CORRECTO (48 V)

Defecto del tablero de CPU

Referencia

20 V en la inspección 3 y 10 V en la inspección 4 para el juicio de correcto son los valores límite inferiores del voltaje de funcionamiento de MCS.

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A

Inspection 6. DF3 individual check
NG (other than standard) → DF3 defect
(Forward: Approx. 6 kΩ, Reverse: ∞ Ω) OK → Replacement

Inspection 7. CAP individual check
NG (other than standard) → CAP defect
(standard) OK → Replacement

Inspection 8. DAP individual check
NG (other than standard) → DAP defect
(Forward: Approx. 6 kΩ, Reverse: ∞ Ω) OK → Replacement

Inspection 9. RAP individual check
NG (∞ Ω) → RAP defect
(1.3 ton series: 1.5 Ω, 2 ton series: 1.2 Ω) OK → Replacement

CN109·CN118 connector disconnection check
NG → Connector connection
OK → TMP replacement

TMP replacement

C

Inspection 9. RAP individual check
NG (∞ Ω) → RAP defect
OK (∞ Ω) (1.3 ton series: 1.5 Ω, 2 ton series: 1.2 Ω)

Inspection 7. CAP individual check
NG (other than standard) → CAP defect
OK (standard)

CN109 connector disconnection check
NG → Connector connection.
OK

- CN108-9 wiring defect
- RAP·CAP wiring defect

Inspection 10.
CN104 disconnection
CN104-5(5)
↕ wiring disconnection check
CN104-14(9)
NG (other than approx. 37 Ω)
OK (approx. 37 Ω)

Inspection 13. MP coil individual check
NG (other than approx. 37 Ω) → Contactor coil defect
OK (approx. 37 Ω) → Wiring defect

Inspection 11.
CN103·CN106 disconnection
CN103-2
↕ continuity check
CN106-7
NG (∞ Ω) → Wiring defect
OK (0 Ω)

Inspection 12.
CN101 disconnection
CN101-8(41)
↕ voltage check
CN105-11
NG (0 V)
- Wiring defect between before key
- Switch and CPU board.

OK (48 V)
CPU board defect

Reference

20 V in inspection 3 and 10 V in inspection 4 for OK judgment are lower limit values of the MCS operating voltage.

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Inspección 1. Comprobación de la continuidad del cableado entre el tablero de CPU y el tablero de DC-BD
Enchufe de la batería desconectado, desconexión de CN106/CN107

Terminales de medición	CN106-6 (37) -- CN107-10 (37)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación individual de TMP
Enchufe de la batería desconectado, desconexión del cableado de TMP y barra de cobre

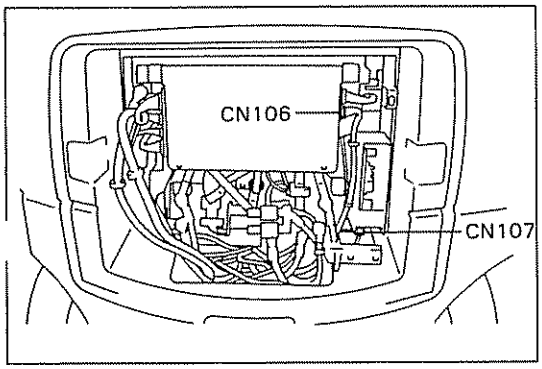
Terminales de medición	1 Colector: clavija - -- Emisor: clavija +	
	Colector: clavija + -- Emisor: clavija -	
	2 Colector: clavija - -- Base: clavija +	
	Colector: clavija + -- Base: clavija -	
	3 Base: clavija - -- Emisor: clavija +	
	Base: clavija + -- Emisor: clavija -	
Alcance del probador de circuitos	Ω x 1 K	
Estándar	1 Colector: clavija - -- Emisor: clavija +:	∞ Ω
	Colector: clavija + -- Emisor: clavija -:	Hay continuidad.
	2 Colector: clavija - -- Base: clavija +:	∞ Ω
	Colector: clavija + -- Base: clavija -:	Hay continuidad.
	3 Base: clavija - -- Emisor: clavija +:	Hay continuidad.
	Base: clavija + -- Emisor: clavija -:	Hay continuidad.

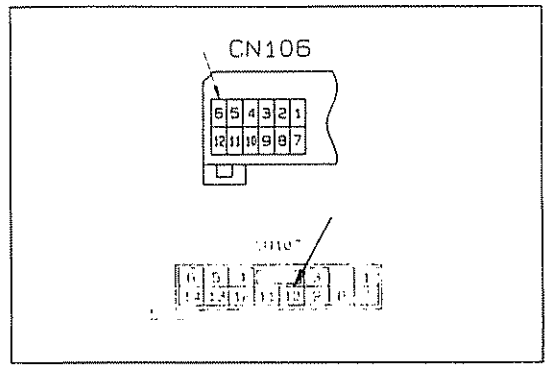
CORRECTO (estándar) -- A la inspección 5.
INCORRECTO (diferente del estándar) -- A la inspección 6.

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Inspection 1. Wiring continuity check between CPU board and DC-BD board
Battery plug OFF, CN106·CN107 disconnection

Measurement terminals	CN106-6(37) — CN107-10(37)
Circuit tester range	Ω × 1
Standard	0 Ω

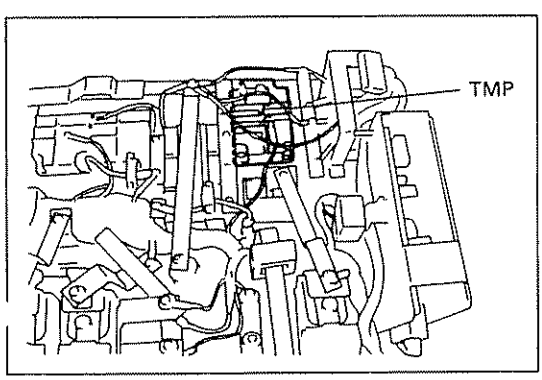


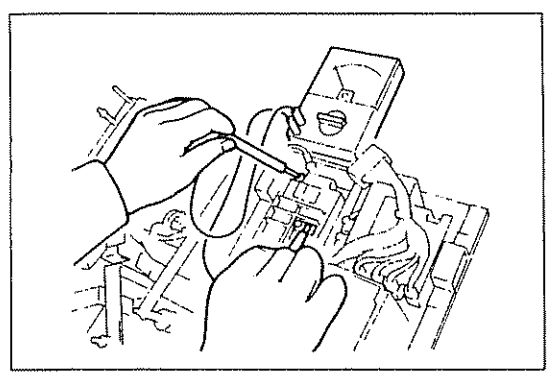


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect.

Inspection 2. TMP individual check
Battery plug OFF, TMP wiring·copper bar disconnection

Measurement terminals	① Collector: ⊖ probe — Emitter ⊕ probe Collector: ⊕ probe — Emitter ⊖ probe	
	② Collector: ⊖ probe — Base ⊕ probe Collector: ⊕ probe — Base ⊖ probe	
	③ Base: ⊖ probe — Emitter ⊕ probe Base: ⊕ probe — Emitter ⊖ probe	
Circuit tester range	Ω × 1 K	
Standard	① Collector: ⊖ probe — Emitter ⊕ probe	: ∞ Ω
	Collector: ⊕ probe — Emitter ⊖ probe	: Continuity shall exist.
	② Collector: ⊖ probe — Base ⊕ probe	: ∞ Ω
	Collector: ⊕ probe — Base ⊖ probe	: Continuity shall exist.
	③ Base: ⊖ probe — Emitter ⊕ probe	: Continuity shall exist.
	Base: ⊕ probe — Emitter ⊖ probe	: Continuity shall exist.





OK (standard) → To inspection 5.
NG (other than standard) → To inspection 6.

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Inspección 3. Comprobación del voltaje de P15
Enchufe de la batería conectado, interruptor de la llave conectado

Terminales de medición	CN108-9 (P15) + -- CN107-1 (N2) -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería (20 V o más para el juicio de correcto)

CORRECTO (20 V o más) -- A la inspección 4.
INCORRECTO (menos de 20 V) -- A la inspección 9.

Inspección 4. Comprobación del voltaje de P14 (lado del tablero de DC-BD)
Desconexión de P13, enchufe de la batería conectado, interruptor de la llave conectado

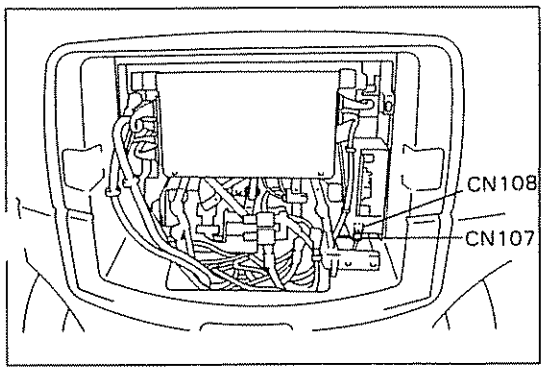
Terminales de medición	CN108-10 (P14) + -- CN107-1 (N2) -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería (10 V o más para el juicio de correcto)

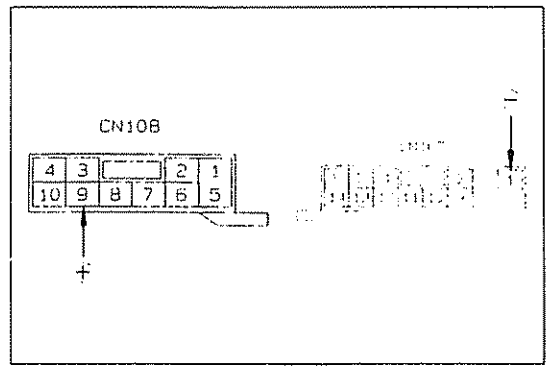
CORRECTO (10 V o más) -- A la inspección 2.
INCORRECTO (menos de 10 V) -- Defecto del cableado entre CN108 y P14

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Inspection 3. P15 voltage check
Battery plug ON, key switch ON

Measurement terminals	CN108-9(P15) ⊕ — CN107-1(N2) ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage (20 V or more for OK judgment)

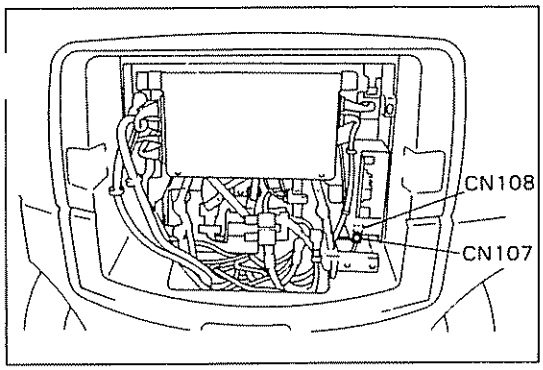


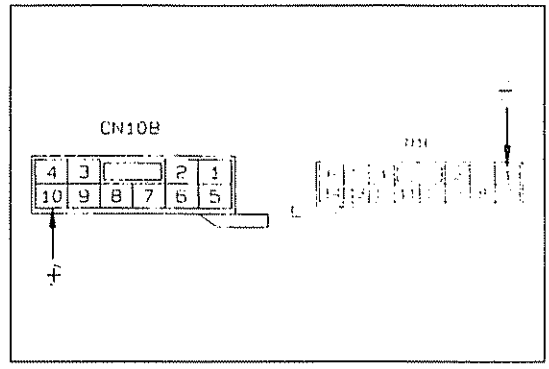


OK (20 V or more) → To inspection 4.
NG (less than 20 V) → To inspection 9.

Inspection 4. P14 voltage check (DC-BD board side)
P13 disconnection, battery plug ON, key switch ON

Measurement terminals	CN108-10(P14) ⊕ — CN107-1(N2) ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage (10 V or more for OK judgment)





OK (10 V or more) → To inspection 2.
NG (less than 10 V) → Wiring defect between CN108 and P14.

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Inspección 5. Comprobación de la continuidad del cableado entre el table de CPU y el tablero de DC-BD y entre el tablero de DC-BD y TMP
Enchufe de la batería desconectado, desconexión de cada cableado

Terminales de medición	Ambos terminales de cada cableado
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- Defecto del tablero de CPU, defecto del tablero de DC-BD
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 6. Comprobación individual de DF3
Enchufe de la batería desconectado, desconexión de la barra de cobre de DF2

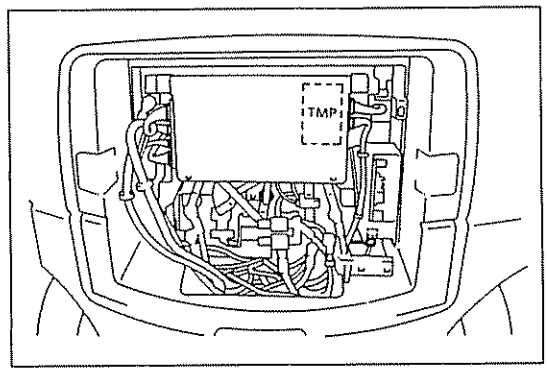
Terminales de medición	Avance:	Anodo: clavija - -- Cátodo: clavija +
	Retroceso:	Anodo: clavija + -- Cátodo: clavija -
Alcance del probador de circuitos		Ω x 1 K
Estándar	Avance:	Aprox. 6 kΩ
	Retroceso:	∞ Ω

CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 7.
INCORRECTO (diferente del estándar) -- Recambio de DF3 (a la inspección 7 después del recambio)

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Inspection 5. Wiring continuity check between CPU board and DC-BD board and between DC-BD board and TMP
Battery plug OFF, each wiring disconnection

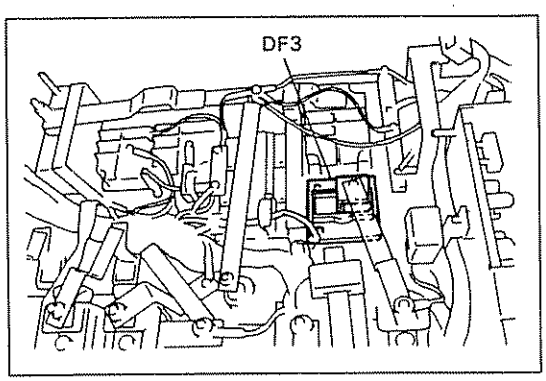
Measurement terminals	Both terminals of each wiring
Circuit tester range	Ω × 1
Standard	0 Ω

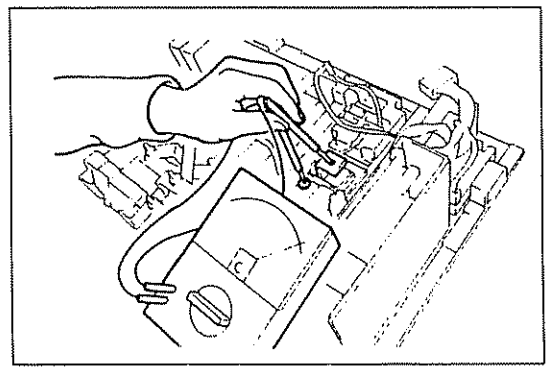


OK (0 Ω) → CPU board defect, or DC-BD board defect.
NG (∞ Ω) → Wiring defect.

Inspection 6. DF3 individual check
Battery plug OFF, DF3 copper bar disconnection

Measurement terminals	Forward: Anode: ⊖ probe — Cathode: ⊕ probe Reverse: Anode: ⊕ probe — Cathode: ⊖ probe
Circuit tester range	Ω × 1 K
Standard	Forward: Approx. 6 kΩ Reverse: ∞ Ω





OK (forward: approx. 6 kΩ, reverse: ∞ Ω) → To inspection 7.
NG (other than standard) → DF3 replacement (to inspection 7 after replacement)

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Inspección 7. Comprobación individual de CAP
Enchufe de la batería desconectado, desconexión del cableado de CAP

Terminales de medición	Ambos terminales de CAP
Alcance del probador de circuitos	Ω x 1 K
Estándar	La aguja se desvía a 0 Ω una vez cuando las clavijas del probador de circuitos entran en contacto con ambos terminales de CAP, luego gradualmente vuelve a ∞, y finalmente indica ∞ Ω porque el capacitor es cargado por la corriente del probador.

Flujo A
CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 8.
INCORRECTO (diferente del estándar) -- Defecto de CAP (a la inspección 8 después del recambio)

Flujo C
CORRECTO (avance: 6 kΩ, retroceso: ∞ Ω) -- Defecto de CAP.
INCORRECTO (diferente del estándar) -- Comprobación de desconexión del conector de CN109

Inspección 8. Comprobación individual de DAP
Enchufe de la batería desconectado, desconexión del cableado de DAP

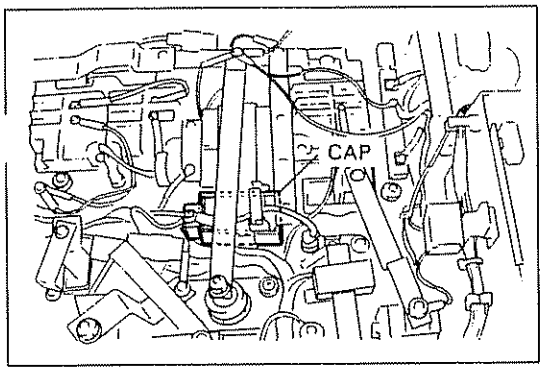
Terminales de medición	Avance: Anodo: clavija - -- Cátodo: clavija + Retroceso: Anodo: clavija + -- Cátodo: clavija -
Alcance del probador de circuitos	Ω x 1 K
Estándar	Avance: Aprox. 6 kΩ Retroceso: ∞ Ω

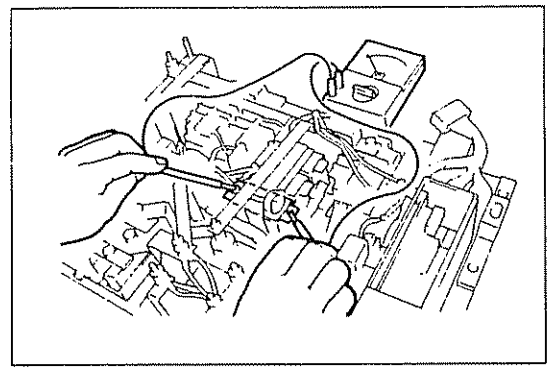
CORRECTO (avance: aprox. 6 kΩ, retroceso: ∞ Ω) -- A la inspección 9.
INCORRECTO (diferente del estándar) -- Recambio de DAP (a la inspección 9 después del recambio)

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Inspection 7. CAP individual check
Battery plug OFF, CAP wiring disconnection

Measurement terminals	Both terminals of CAP
Circuit tester range	Ω × 1 K
Standard	The pointer deflects to 0 Ω once when circuit tester probes are brought into contact with moth terminals of CAP, then gradually returns to ∞, and finally indicates ∞ Ω because the capacitor is charged by the tester current.

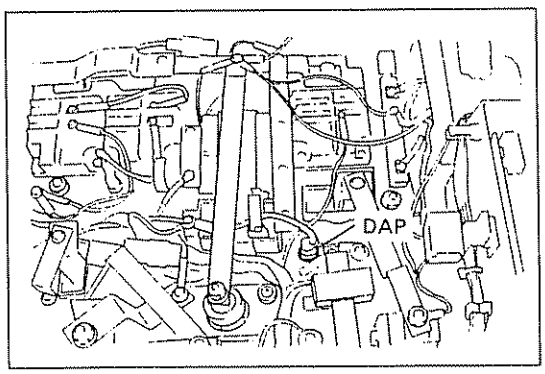


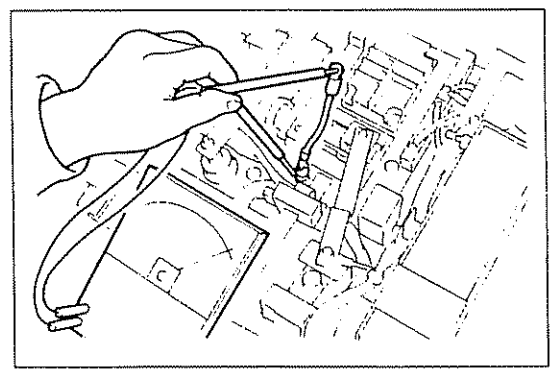


Flow A
OK (standard) → To inspection 8.
NG (other than standard) → CAP defect (to inspection 8 after replacement).
Flow C
OK (standard) → CAP defect.
NG (other than standard) → CN109 connector disconnection check

Inspection 8. DAP individual check
Battery plug OFF, DAP wiring disconnection

Measurement terminals	Forward: Anode: ⊖ Probe — Cathode: ⊕ probe Reverse: Anode: ⊕ probe — Cathode: ⊖ probe
Circuit tester range	Ω × 1 K
Standard	Forward: Approx. 6 kΩ Reverse: ∞ Ω





OK (forward: approx. 6 kΩ, reverse: ∞ Ω) → To inspection 9.
NG (other than standard) → DAP defect (to inspection 9 after replacement)

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Inspección 9. Comprobación individual de RAP

Terminales de medición	Ambos terminales de RAP
Alcance del probador de circuitos	Ω x 1
Estándar	Series de 1-3 ton.: aprox. 1,5 Ω Series de 2 ton.: aprox. 1,2 Ω

Flujo A
CORRECTO (aprox. 1,5 Ω) -- Defecto de TMP (comprobación del conector CN109/CN118, y recambio de TMP)
INCORRECTO (∞ Ω) -- Recambio de RAP (comprobación del conector CN109/CN118 después del recambio, y recambio de TMP)

Flujo C
CORRECTO (aprox. 1,5 Ω) -- A la inspección 7.
INCORRECTO (∞ Ω) -- Defecto de RAP

Inspección 10. Comprobación del cableado
Enchufe de la batería desconectado, desconexión de CN104

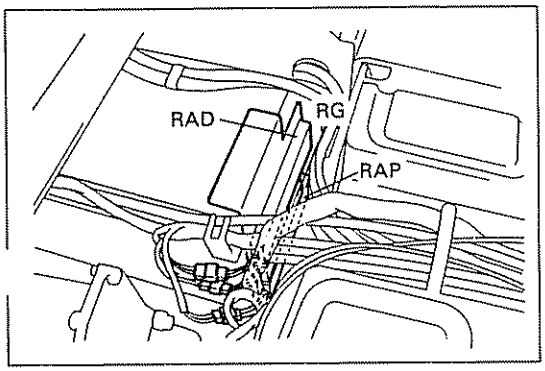
Terminales de medición	CN104-5 (5) -- CN104-14 (9) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

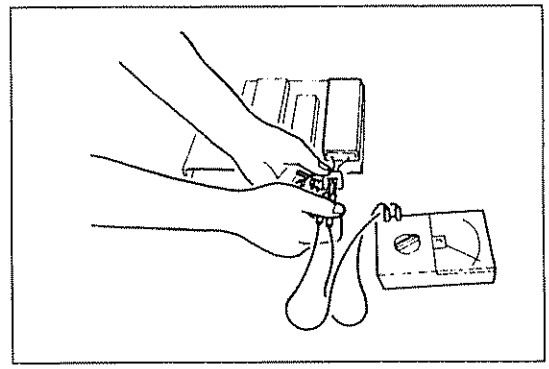
CORRECTO (aprox. 37 Ω) -- A la inspección 11.
INCORRECTO (diferente del estándar) -- A la inspección 13.

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Inspection 9. RAP individual check

Measurement terminals	Both terminals of RAP
Circuit tester range	Ω × 1
Standard	1-3 ton series: Approx. 1.5 Ω, 2 ton series: Approx: 1.2 Ω



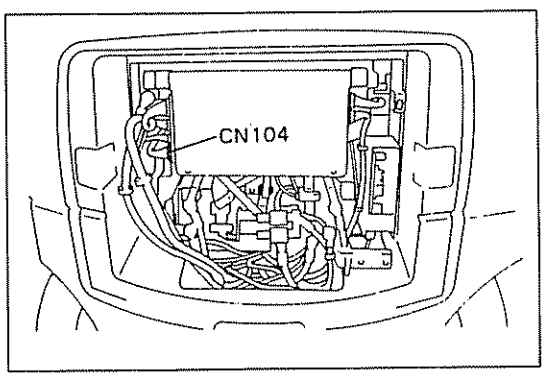


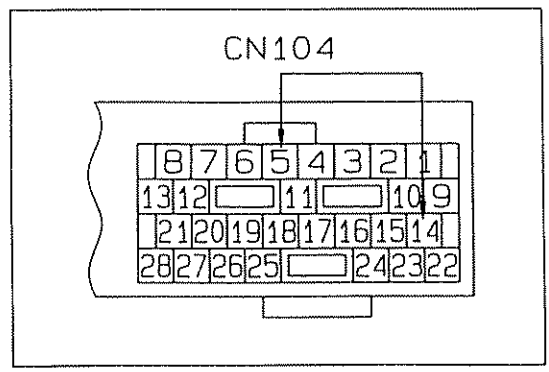
Flow A
OK (1-3 ton series: approx. 1.5 Ω, 2 ton series: approx. 1.2 Ω) → TMP defect (CN109/CN118 connector check, and TMP replacement).
NG (∞ Ω) → RAP replacement (CN109/CN118 connector check after replacement, and TMP replacement).

Flow C
OK (1-3 ton series:approx. 1.5 Ω, 2 ton series: approx. 1.2 Ω) → To inspection 7.
NG (∞ Ω) → RAP defect

Inspection 10. Wiring check
Battery plug OFF, CN104 disconnection

Measurement terminals	CN104-5(5) — CN104-14(9) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → To inspection 11.
NG (other than standard) → To inspection 13.

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Inspección 11. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN103/CN106

Terminales de medición	CN103-2 (N2) -- CN106-7 (N2) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 12.
INCORRECTO (diferente de 0 Ω) -- Defecto del cableado

Inspección 12. Comprobación del voltaje del cableado del tablero de CPU
Enchufe de la batería conectado, desconexión de CN101

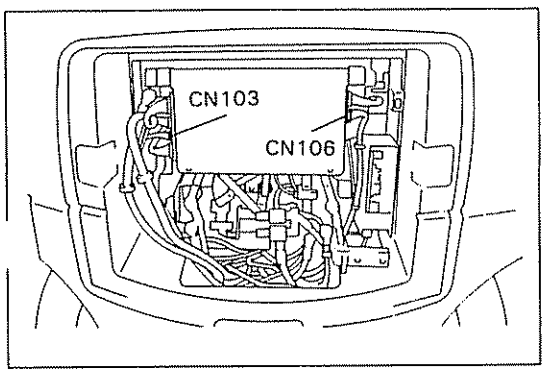
Terminales de medición	CN101-8 (41) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

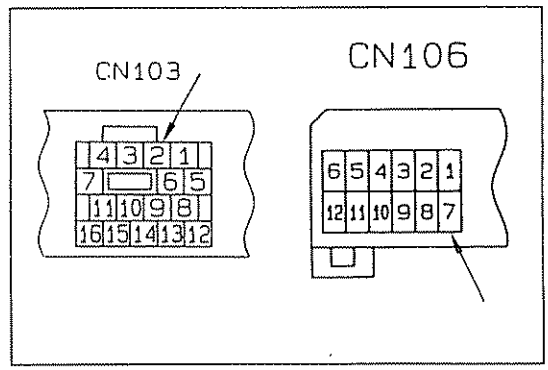
CORRECTO (48 V) -- Defecto del tablero de CPU
INCORRECTO (0 V) -- Defecto del cableado entre la parte delantera del interruptor de la llave y el tablero de CPU

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Inspection 11. Wiring continuity check
Battery plug OFF, CN103-CN106 disconnection

Measurement terminals	CN103-2 (N2) — CN106-7(N2) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

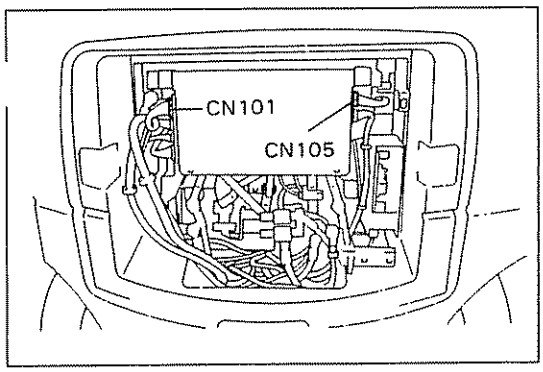


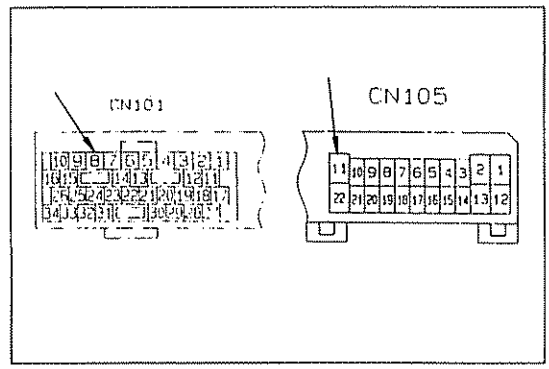


OK (0 Ω) → To inspection 12.
NG (other than 0 Ω) → Wiring defect.

Inspection 12. CPU board wiring voltage check
Battery plug ON, CN101 disconnection

Measurement terminals	CN101-8(41) — CN105-11(N1)
Circuit tester range	DC 50 V
Standard	48 V





OK (48 V) → CPU board defect
NG (0 V) → Wiring defect between front of key switch and CPU board

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Inspección 13. Comprobación individual del contactor de MP
Enchufe de la batería desconectado, desconexión del cableado de MP y barra de cobre

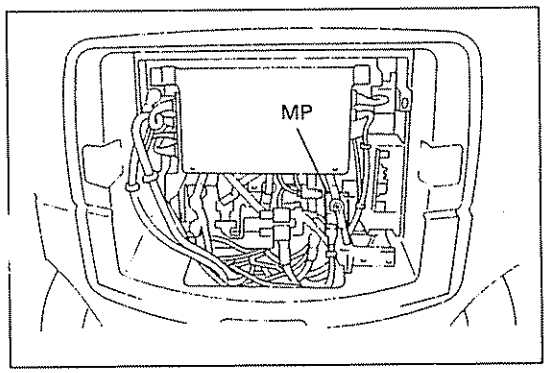
Terminales de medición	Ambos terminales de la bobina de MP
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

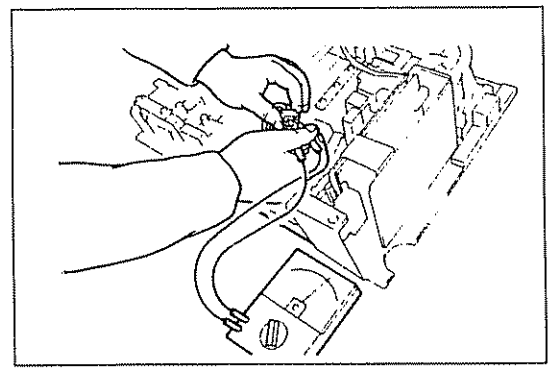
CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto del contactor de MP

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Inspection 13. MP contactor individual check
Battery plug OFF, MP wiring and copper bar disconnection

Measurement terminals	Both terminals of MP coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring defect
NG (other than approx. 37 Ω) → MP contactor defect

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Código de error E1: Anormalidad del sensor del circuito de manipulación de materiales

Parte relacionada

Sensor de corriente de manipulación de materiales

Tablero de CPU

Causas estimadas

1 Defecto del sensor de corriente de manipulación de materiales

2 Desconexión del cableado entre el sensor de corriente de manipulación de materiales y CN104

3 Defecto de contacto del conector CN104/CN CSP

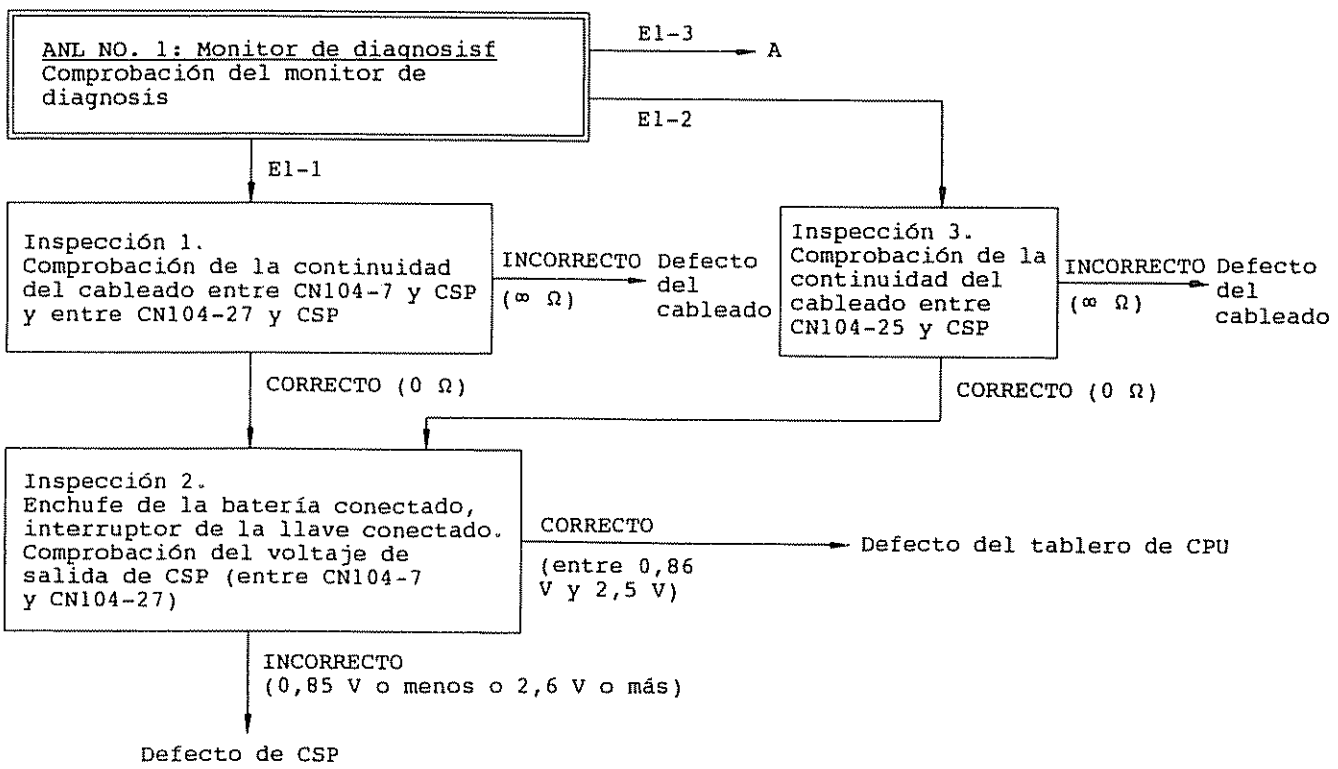
4 Defecto de conexión del circuito principal de manipulación de materiales

5 Defecto del tablero de CPU

6 Defecto de la bobina de MP

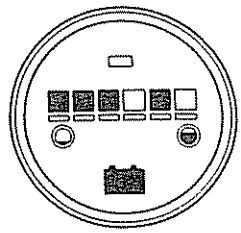
7 Defecto del cableado del contactor MP

Cuando se ponen en la memoria E1-2 y E1-3, dé prioridad a E1-2 para la búsqueda de averías)

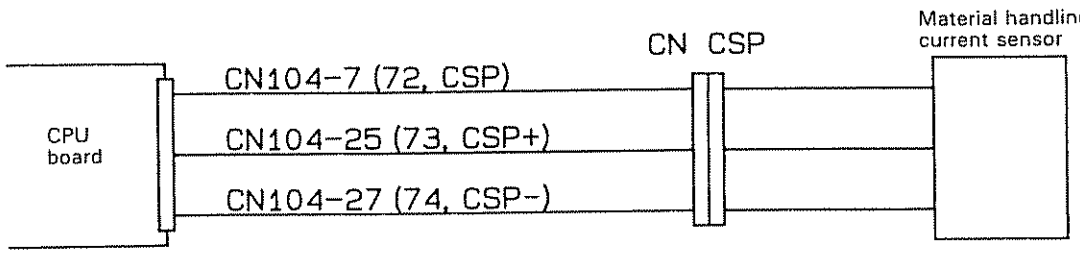


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Error code E1: Material handling current sensor abnormality



Related portion



Estimated causes

① Material handling current sensor defect
② Wiring disconnection between CN104 and material handling current sensor
③ CN104·CN CSP connector contact defect
④ Main material handling circuit connection defect
⑤ CPU board defect
⑥ MP coil defect
⑦ MP contactor wiring defect

(When E1-2 and E1-3 are both memorized, first conduct E1-2. troubleshooting.)

ANL No.1: Diagnosis monitor
Diagnosis monitor check

E1-3 → A

E1-2

E1-1

Inspection 1.
Wiring continuity check between CN104-7 and CSP and between CN104-27 and CSP

NG (∞ Ω) → Wiring defect

OK (0 Ω)

Inspection 3.
Wiring continuity check between CN104-25 and CSP

NG (∞ Ω) → Wiring defect

OK (0 Ω)

Inspection 2.
Battery plug ON, key switch ON
CSP output voltage check (between CN104-7 and CN104-27)

OK (between 0.86 V and 2.5 V) → CPU board defect

NG (0.85 V or less or 2.6 V or more)

CSP defect

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A

Inspección 4.
Interruptor de la llave conectado
P12
↕ Comprobación del voltaje
N1

INCORRECTO (diferente del voltaje de la batería)

ANL No. 3: Prueba del contactor
Comprobación de conexión/ desconexión del contactor
MP

INCORRECTO (no está en conexión ni desconexión) → B

CORRECTO (en conexión y desconexión)

Defecto del tablero de CPU

CORRECTO (voltaje de la batería)

Inspección 5.
Interruptor de la llave conectado
P14
↕ Comprobación del voltaje
N1

INCORRECTO (diferente del voltaje de la batería)

Inspección 6.
Desconexión del cableado del motor de la bomba P12/P13
P12
↕ Comprobación de la continuidad
P13

INCORRECTO (∞ Ω)

. Desconexión del cableado del motor de la bomba
. Defecto del motor de la bomba

CORRECTO (voltaje de la batería)

CORRECTO (aprox. 0 Ω)

Inspección 3.
Comprobación de la continuidad del cableado de CN104-25 -- CSP

INCORRECTO (∞ Ω) → Defecto del cableado

Defecto de conexión de la barra de cobre

CORRECTO (0 Ω)

Inspección 2.
Interruptor de la llave conectado
Comprobación del voltaje de salida de CSP (entre CN104-7 y CN104-27)

CORRECTO (entre 0,86 V y 2,5 V) → Defecto del tablero de CPU

INCORRECTO (0,85 V o menos o 2,6 V o más)

Defecto de CSP

B

B
Inspección 7.
Desconexión de CN104
CN104-5(5)
↕ Comprobación de la continuidad
CN104-14(9)

CORRECTO (aprox. 37 Ω)

Inspección 9.
Desconexión de CN103, CN106
CN103-2(N2)
↕ Comprobación de la continuidad
CN106-7(N2)

CORRECTO (0 Ω)

Inspección 10.
Desconexión de CN101
CN101-8(41)
↕ Comprobación del voltaje
CN105-11(N1)
INCORRECTO (0 V)

CORRECTO (48 V) → Defecto del tablero de CPU

INCORRECTO (diferente de aprox. 37 Ω)

INCORRECTO (∞ Ω)

Defecto del cableado

INCORRECTO (0 V)

Defecto del cableado entre el interruptor de la llave y el tablero de CPU

Inspección 8.
Comprobación individual de la bobina de MP

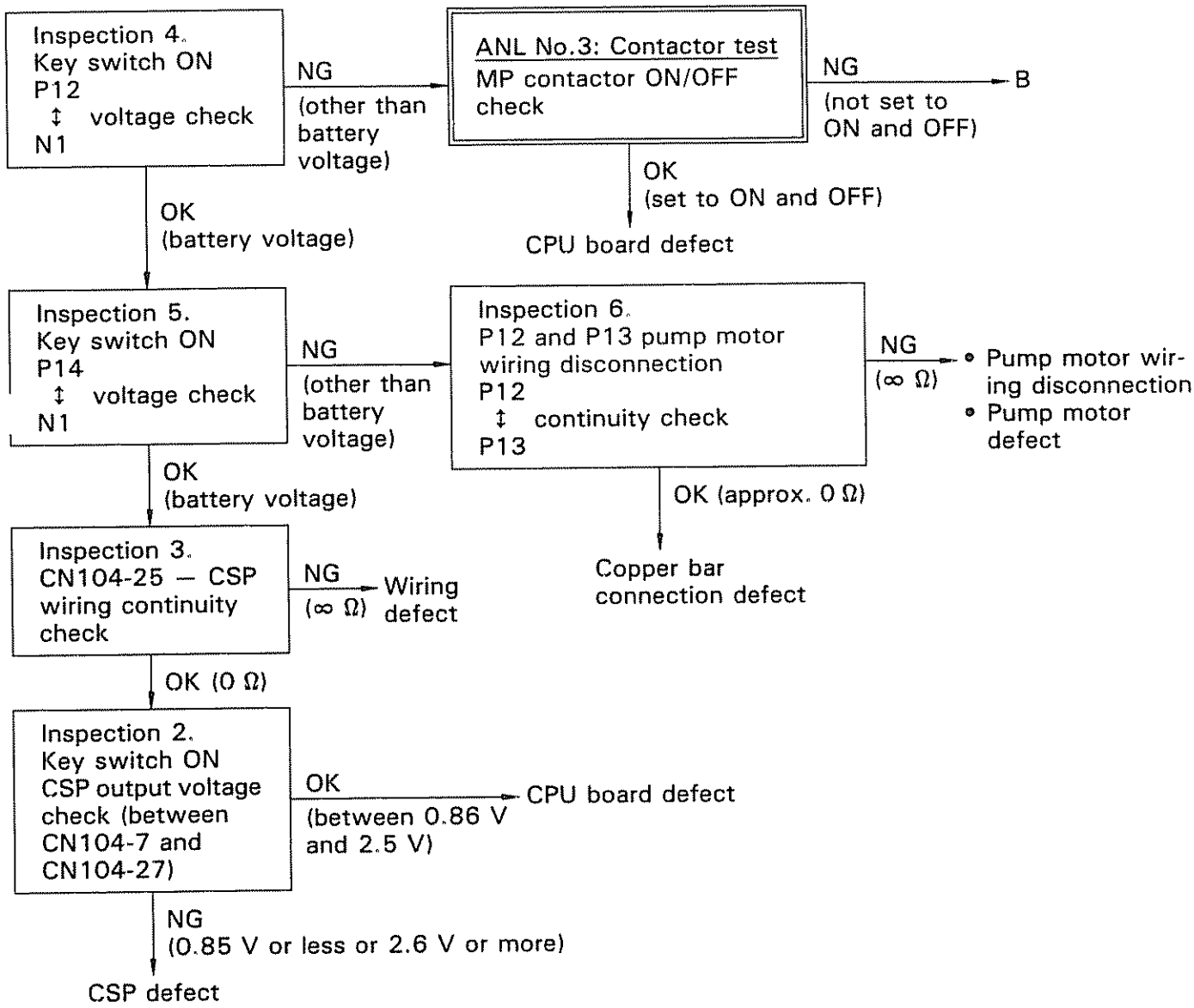
CORRECTO (aprox. 37 Ω) → Defecto del cableado

INCORRECTO (diferente de aprox. 37 Ω)

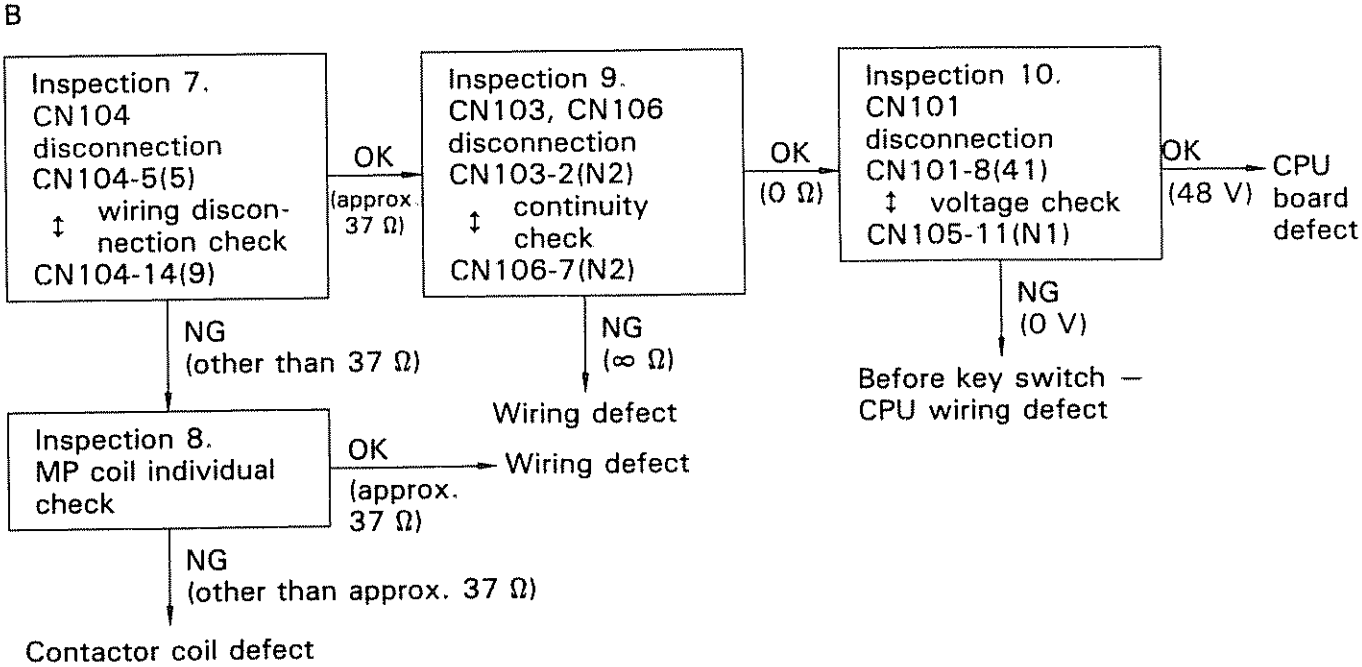
Defecto de la bobina del contactor

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A



B



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Inspección 1. Comprobación de la continuidad del cableado del tablero de CPU
Enchufe de la batería desconectado, desconexión del cableado de CN104/CSP

Terminales de medición	CN104-7 (72) -- Conector de CSP (conector del lado de REC) CN104-27 (74) -- Conector de CSP (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación del voltaje de salida de CSP
Enchufe de la batería conectado, interruptor de la llave conectado

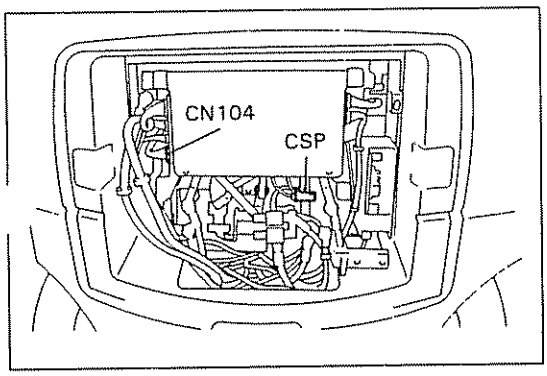
Terminales de medición	CN104-7 (72) + -- CN104-27 (74) -
Alcance del probador de circuitos	CC 10 V (probador de circuitos digital)
Estándar	Entre 0,86 V y 2,5 V

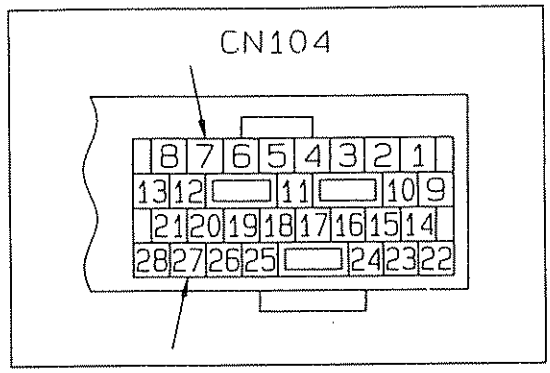
CORRECTO (entre 0,86 V y 2,5 V) -- Defecto del tablero de CPU
INCORRECTO (0,85 V o menos o 2,6 V o más) -- Defecto de CSP

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Inspection 1. CPU board wiring continuity check
Battery plug OFF, CN104-CSP wiring disconnection

Measurement terminals	CN104-7(72) — CSP connector (connector of REC side) CN104-27(74) — CSP connector (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

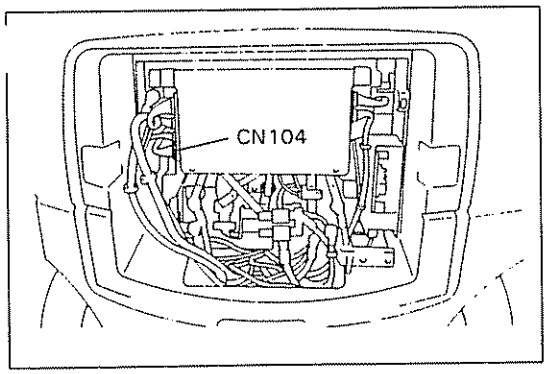


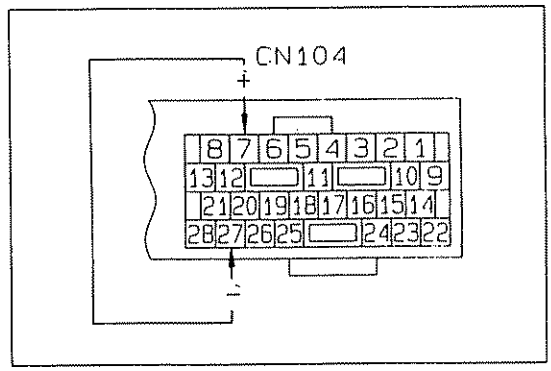


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect.

Inspection 2. CSP output voltage check
Battery plug ON, key switch ON

Measurement terminals	CN104-7(72) ⊕ — CN104-27(74) ⊖
Circuit tester range	DC 10 V (digital circuit tester)
Standard	Between 0.86 V and 2.5 V





OK (between 0.86 V and 2.5 V) → CPU board defect
NG (0.85 V or less or 2.6 V or more) → CSP defect

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Inspección 3. Comprobación de la continuidad del cableado de CSP
Enchufe de la batería desconectado, desconexión del cableado de CN104/CSP

Terminales de medición	CN104-25 (73) -- Conector de CSP (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 2.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 4. Comprobación del voltaje de P12/N1
Enchufe de la batería conectado, interruptor de la llave conectado

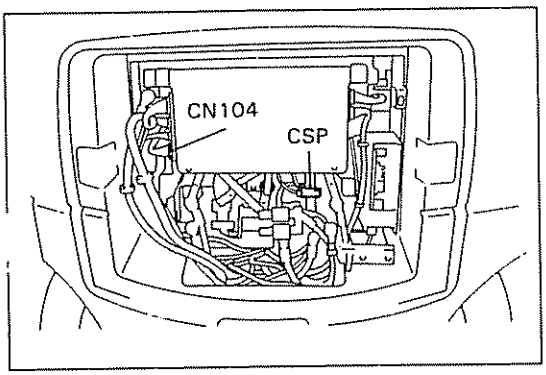
Terminales de medición	P12 + -- N1 -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V Series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

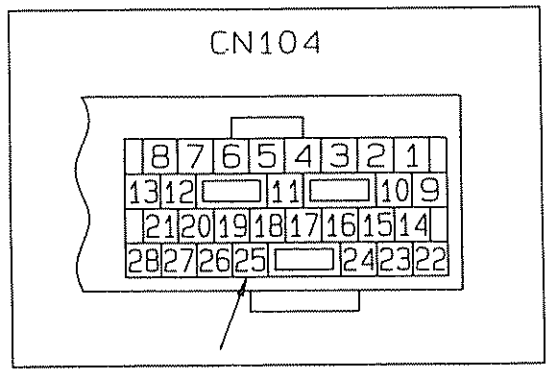
CORRECTO (voltaje de la batería) -- A la inspección 5.
INCORRECTO (diferente del voltaje de la batería) -- A la prueba del contactor ANL No. 3.

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Inspection 3. CSP wiring continuity check
Battery plug OFF, CN104-CSP wiring disconnection

Measurement terminals	CN104-25(73) — CSP connector (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

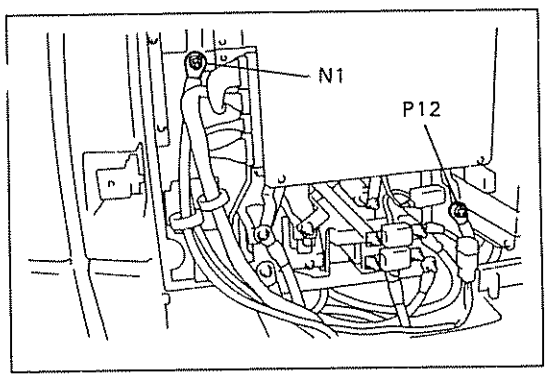


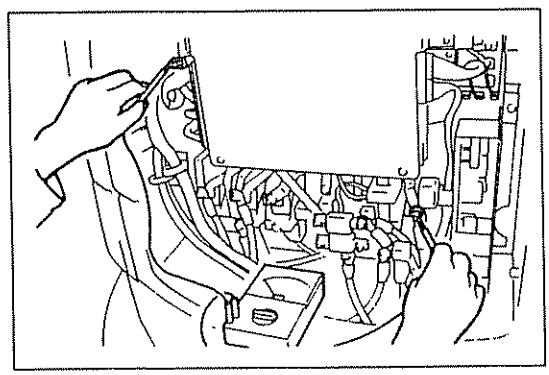


OK (0 Ω) → To inspection 2.
NG (∞ Ω) → Wiring defect.

Inspection 4. P12 — N1 voltage check
Battery plug ON, key switch ON

Measurement terminals	P12 ⊕ — N1 ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage





OK (battery voltage) → To inspection 5.
NG (other than battery voltage) → To ANL No.3 contactor test.

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Inspección 5. Comprobación del voltaje de P14/N1
Enchufe de la batería conectado, interruptor de la llave conectado

Terminales de medición	P14 + -- N1 -
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V Series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

CORRECTO (voltaje de la batería) -- A la inspección 3.
INCORRECTO (diferente del voltaje de la batería) -- A la inspección 6.

Inspección 6. Comprobación de la continuidad del cableado del motor de la bomba
Enchufe de la batería desconectado, desconexión del cableado del motor de la bomba P12/P13

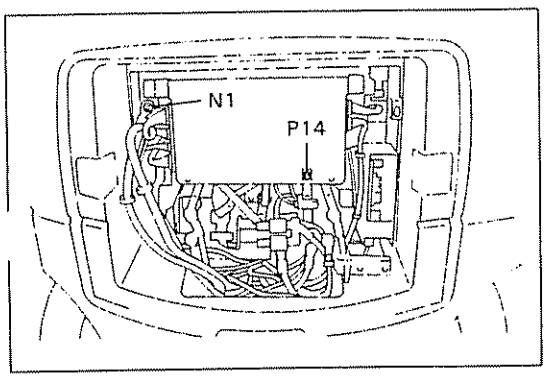
Terminales de medición	P12 -- P13
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

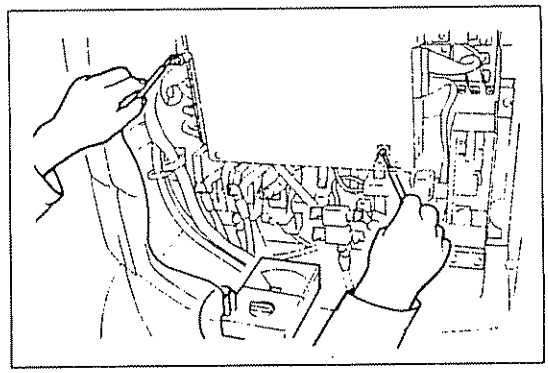
CORRECTO (aprox. 0 Ω) -- Defecto de la instalación de la barra de cobre
INCORRECTO (∞ Ω) -- Defecto del cableado del motor de la bomba o defecto del motor de la bomba

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Inspection 5. P14 — N1 voltage check
Battery plug ON, key switch ON

Measurement terminals	P14 ⊕ — N1 ⊖
Circuit tester range	1·2 ton series: DC 50 V, 3 ton series: DC 250 V
Standard	Battery voltage

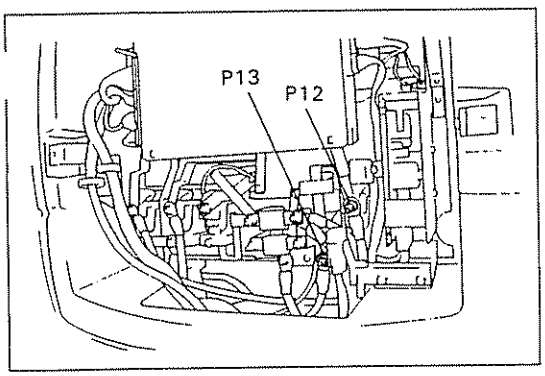


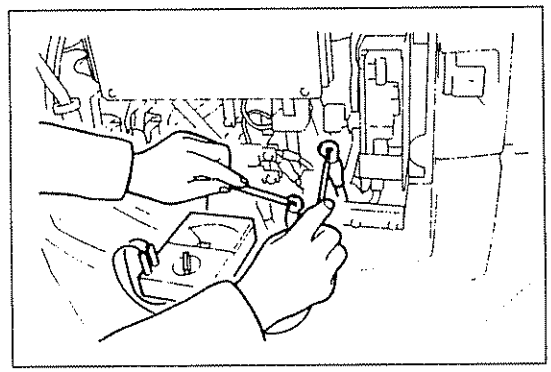


OK (battery voltage) → To inspection 3.
NG (other than battery voltage) → To inspection 6.

Inspection 6. Pump motor wiring continuity check
Battery plug OFF, P12 and P13 pump motor wiring disconnection

Measurement terminals	P12 — P13
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω





OK (approx. 0 Ω) → Copper bar installation defect
NG (∞ Ω) → Pump motor wiring defect, or pump motor defect

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Inspección 7. Comprobación del cableado
Enchufe de la batería desconectado, desconexión de CN104

Terminales de medición	CN104-5 (5) -- CN104-14 (9) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- A la inspección 9.
INCORRECTO (diferente del estándar) -- A la inspección 8.

Inspección 8. Comprobación individual del contactor MP
Enchufe de la batería desconectado, desconexión del cableado de MP y barra de cobre

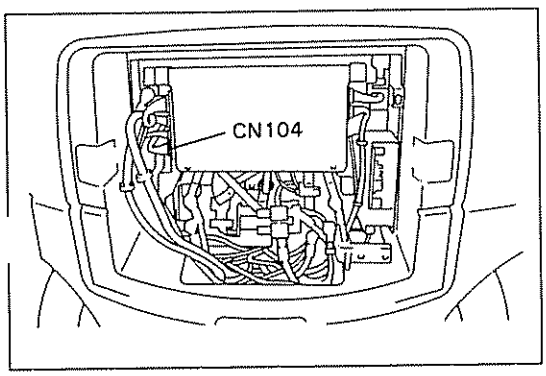
Terminales de medición	Ambos terminales de la bobina de MP
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

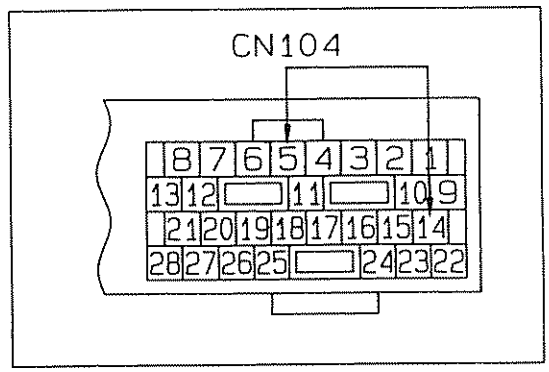
CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto de la bobina del contactor

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Inspection 7. Wiring check
Battery plug OFF, CN104 disconnection

Measurement terminals	CN104-5(5) — CN104-14(9) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

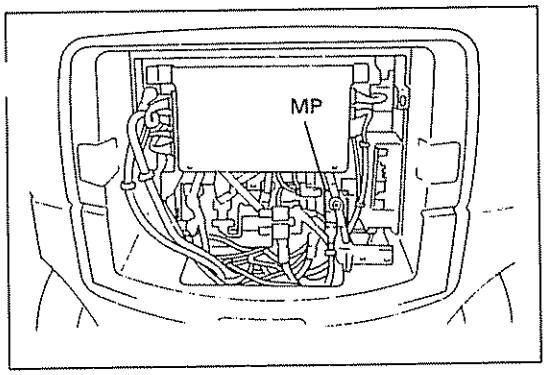


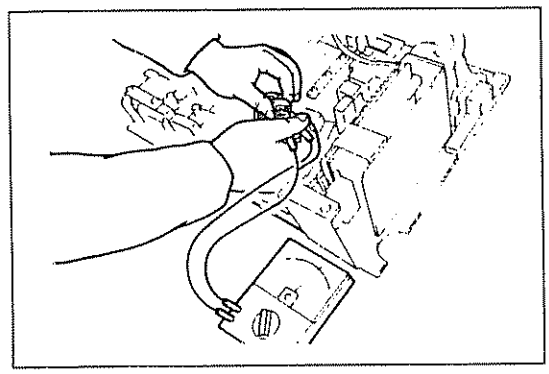


OK (approx. 37 Ω) → To inspection 9.
NG (other than standard) → To inspection 8.

Inspection 8. MP contactor individual check
Battery plug OFF, MP wiring and copper bar disconnection

Measurement terminals	Both terminals of MP coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring defect.
NG (other than approx. 37 Ω) → Contactor coil defect.

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Inspección 9. Comprobación de la continuidad del cableado
Enchufe e la batería desconectado, desconexión de CN103/CN106

Terminales de medición	CN103-2 (N2) -- CN106-7 (N2) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 10.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 10. Comprobación del voltaje de entrada del tablero de CPU
Enchufe de la batería conectado, interruptor de la llave conectado, desconexión de CN101

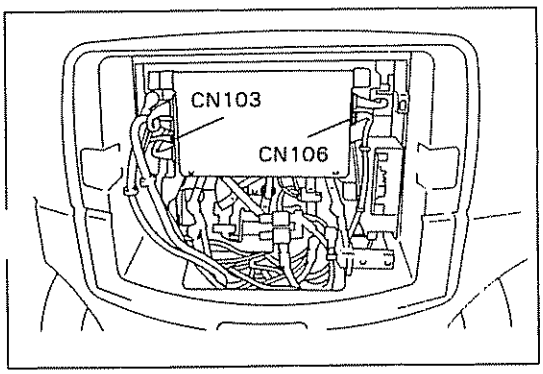
Terminales de medición	CN101-8 (41) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

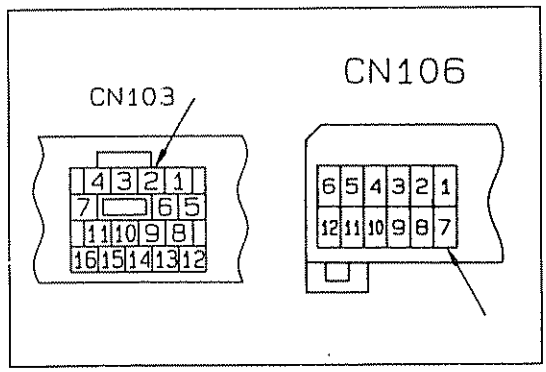
CORRECTO (48 V) -- Defecto del tablero de CPU
INCORRECTO (0 V) -- Defecto del cableado entre el interruptor de la llave y el tablero de CPU

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Inspection 9. Wiring continuity check
Battery plug OFF, CN103·CN106 disconnection

Measurement terminals	CN103-2(N2) — CN106-7(N2) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

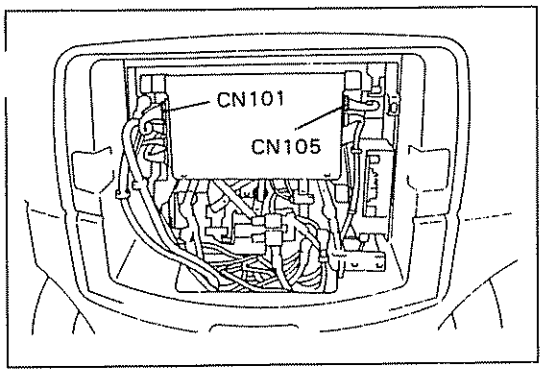


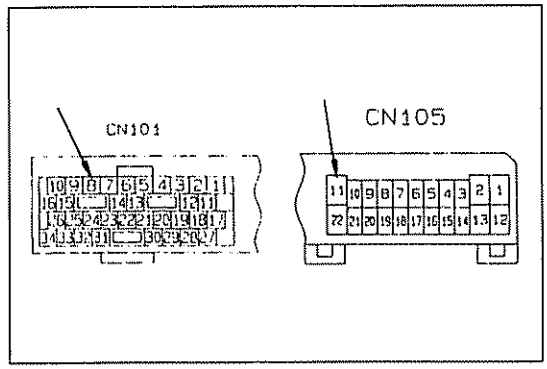


OK (0 Ω) → To inspection 10.
NG (∞ Ω) → Wiring defect

Inspection 10. CPU board input voltage check
Battery plug ON, key switch ON, CN101 disconnection

Measurement terminals	CN101-8(41) — CN105-11(N1)
Circuit tester range	DC 50 V
Standard	48 V





OK (48 V) → CPU board defect.
NG (0 V) → Wiring defect between before key switch and CPU board.

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Código de error E5: Anormalidad del diodo para regeneración

Parte relacionada

Tablero de CPU

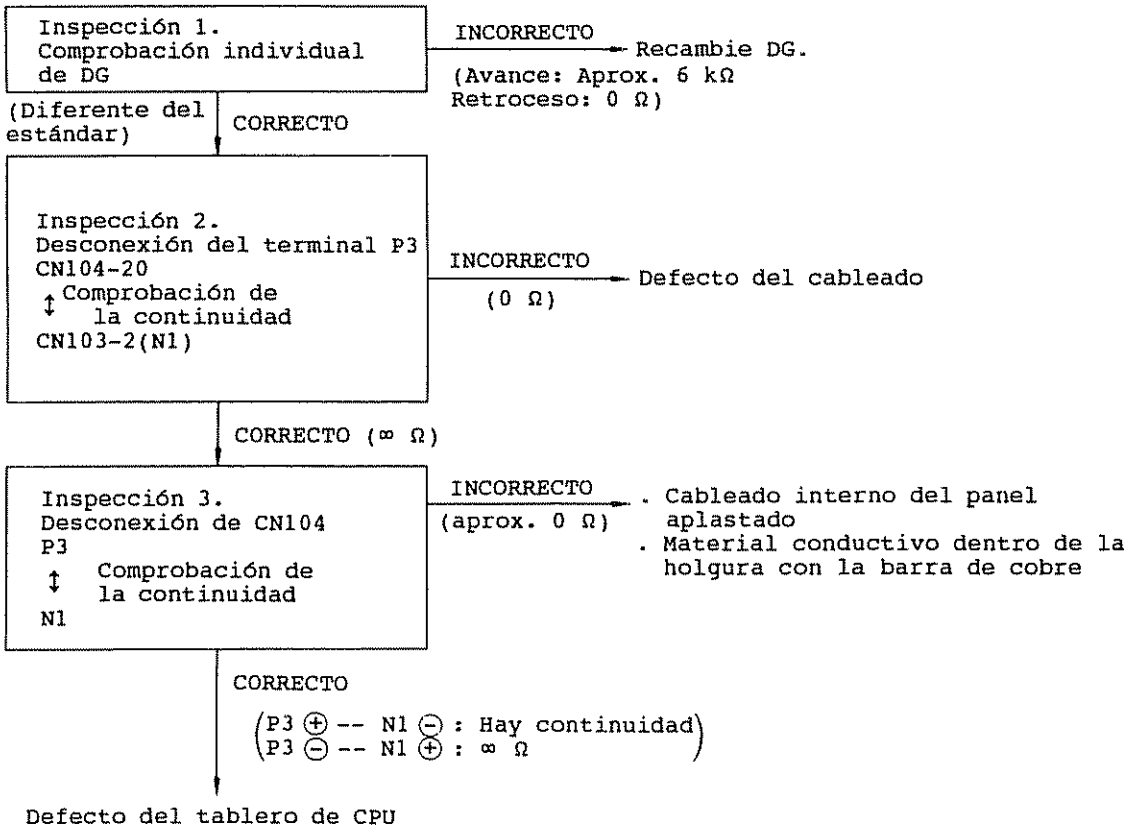
Causas estimadas

1 Defecto de DG (cortocircuito)

2 Cortocircuito del cableado de P3 a N1

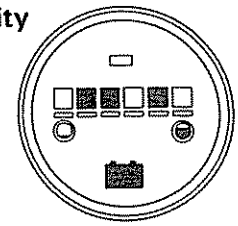
3 Defecto del tablero de CPU

(Cuando A8 aparece al mismo tiempo, dé prioridad a la búsqueda de averías de A8)

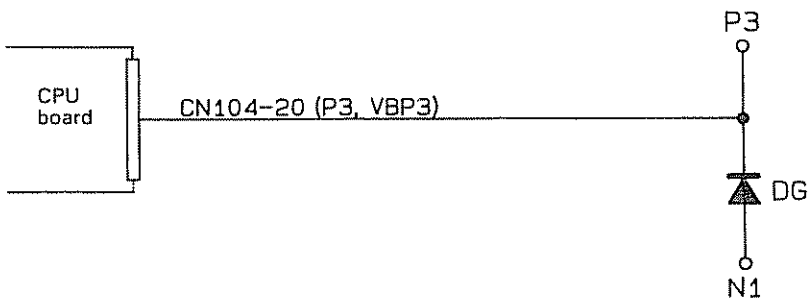


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Error code E5: Regeneration diode abnormality



Related portion



Estimated causes

① DG defect (short circuit)

② P3 – N1 wiring short circuit

③ CPU board defect

(When A8 is displayed at the same time, first conduct A8 troubleshooting.)

Inspection 1.
DG individual check

NG → DG replacement.
(Forward: Approx. 6 kΩ
Reverse: 0 Ω)

(other than standard) OK

Inspection 2.
P3 terminal disconnection
CN104-20
↕ continuity check
CN103-2(N1)

NG (0 Ω) → Wiring defect

OK (∞ Ω)

Inspection 3.
CN104 disconnection
P3
↕ continuity check
N1

NG (approx. 0 Ω) →
- Pinched panel internal wiring
- Conductive material invasion in the clearance with copper bar

OK

(P3⊕ – N1⊖: Continuity shall exist.
P3⊖ – N1⊕: ∞ Ω)

CPU board defect.

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Inspección 1. Comprobación individual de DG
Enchufe de la batería desconectado, desconexión del cableado de DG y barra de cobre

Terminales de medición	Avance: Anodo: - --- Cátodo + Retroceso: Anodo + -- Cátodo -
Alcance del probador de circuitos	Ω x 1
Estándar	Avance: Aprox. 6 kΩ, retroceso: 0 Ω

CORRECTO (Avance: 6 kΩ, retroceso: 0 Ω) -- A la inspección 2.
INCORRECTO (diferente del estándar) -- Defecto de DG

Inspección 2. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión del terminal P3

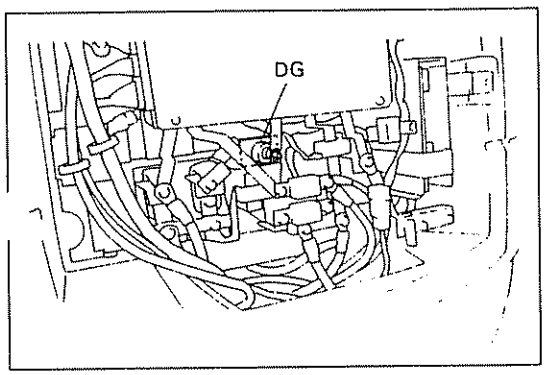
Terminales de medición	CN104-20 (P3) -- CN103-2 (N1) (conector CN104 en el lado REC)
Alcance del probador de circuitos	Ω x 1
Estándar	∞ Ω

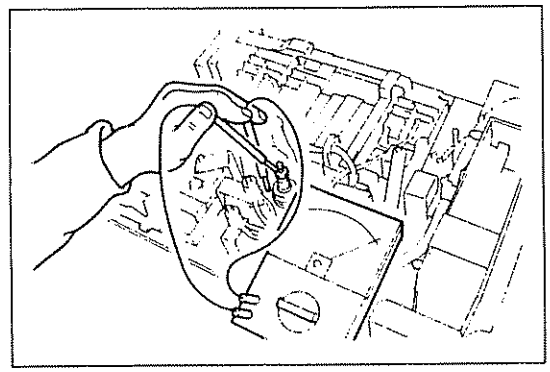
CORRECTO (∞ Ω) -- A la inspección 3.
INCORRECTO (0 Ω) -- Defecto del cableado

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Inspection 1. DG individual check
Battery plug OFF, DG wiring and copper bar disconnection

Measurement terminals	Forward: Anode: ⊖ — Cathode: ⊕ Reverse: Anode: ⊕ — Cathode: ⊖
Circuit tester range	Ω × 1
Standard	Forward: Approx. 6 kΩ, Reverse: 0 Ω

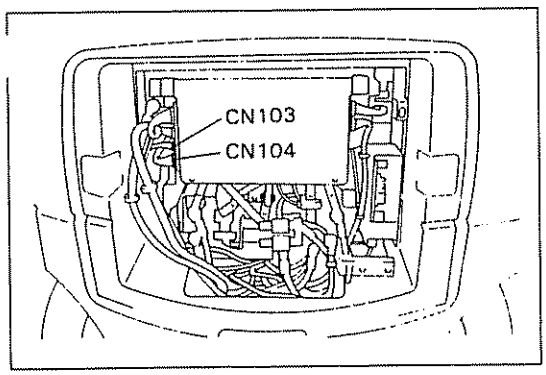


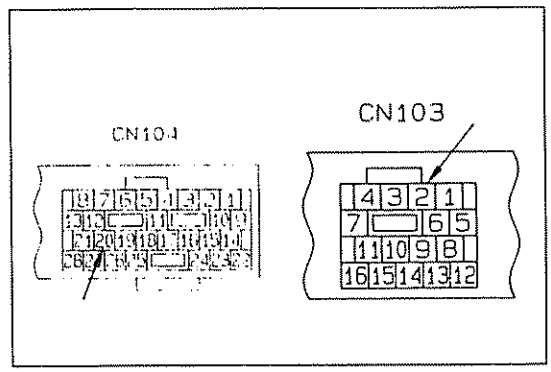


OK (Forward: Approx. 6 kΩ Reverse: 0 Ω) → To inspection 2.
NG (other than standard) → DG defect

Inspection 2. Wiring continuity check
Battery plug OFF, P3 terminal disconnection

Measurement terminals	CN104-20(P3) — CN103-2(N1) (CN104 is connector of REC side)
Circuit tester range	Ω × 1
Standard	∞ Ω





OK (∞ Ω) → To inspection 3.
NG (0 Ω) → Wiring defect.

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Inspección 3. Comprobación de la continuidad del cableado de P3 -- N1
Enchufe de la batería desconectado, desconexión del conector CN104

Terminales de medición
A: P3 + -- N1 -
B: P3 - -- N1 +

Alcance del probador de Ω x 1 K

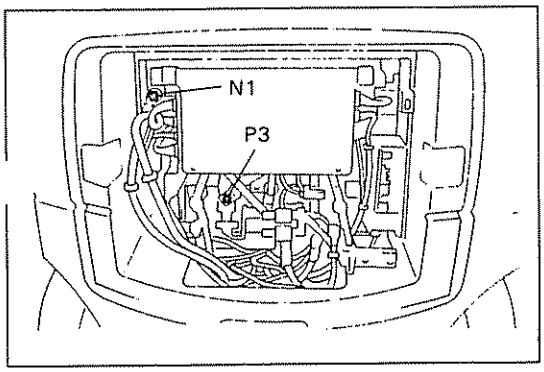
Estándar
A: P3 + -- N1 -: Hay continuidad.
B: P3 - -- N1 +: ∞ Ω

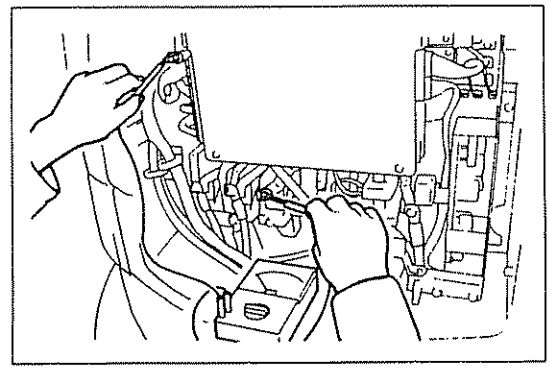
CORRECTO (P3 + -- N1 -: Hay continuidad, P3 - -- N1 +: ∞ Ω) -- Defecto del tablero de CPU
INCORRECTO (aprox. 0 Ω) -- Cableado interno del panel aplastado o material conductivo dentro de la holgura con la barra de cobre

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Inspection 3. P3 — N1 wiring continuity check
Battery plug OFF, CN104 disconnection

Measurement terminals	A: P3 ⊕ — N1 ⊖ B: P3 ⊖ — N1 ⊕
Circuit tester range	Ω × 1 K
Standard	A: P3 ⊕ — N1 ⊖ : Continuity shall exist. B: P3 ⊖ — N1 ⊕ : ∞ Ω





OK (P3 ⊕ — N1 ⊖ : Continuity shall exist P3 ⊖ — N1 ⊕ : ∞ Ω) → CPU board defect
NG (approx. 0 Ω) → Pinched control panel internal wiring, or conductive material invasion in the clearance with copper bar.

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Código de error E6: Anormalidad del potenciómetro de elevación

Parte relacionada

Tablero de CPU	Potenciómetro de elevación

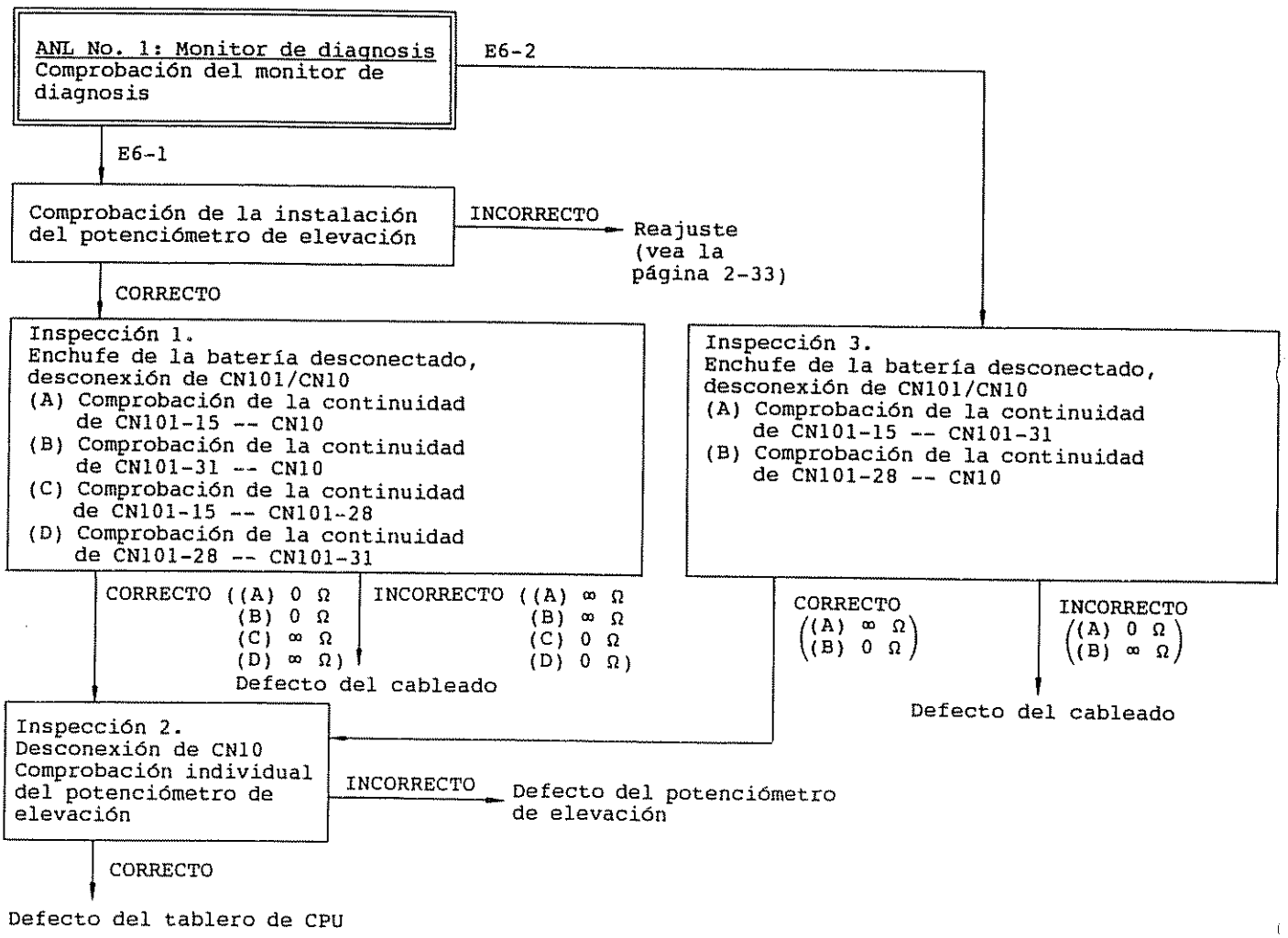
Causas estimadas

1 Defecto del potenciómetro de elevación

2 Cortocircuito o desconexión del cableado del potenciómetro de elevación

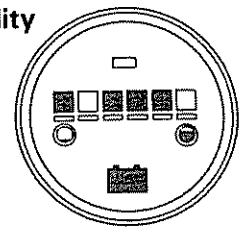
3 Defecto de contacto del conector

4 Defecto del tablero de CPU

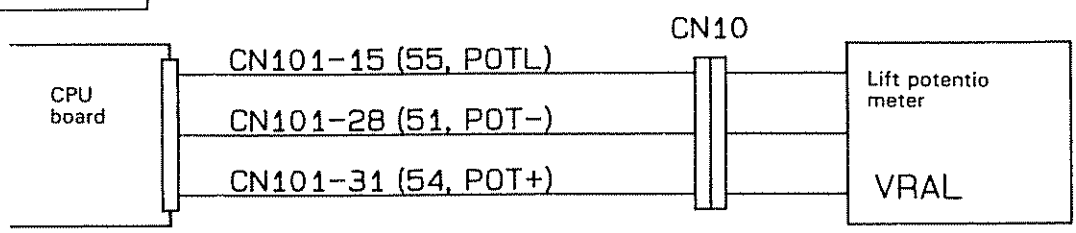


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Error code E6: Lift potentiometer abnormality



Related portion



Estimated causes

① Lift potentiometer defect

② Lift potentiometer wiring short circuit or disconnection

③ Connector contact defect

④ CPU board defect

ANL No.1: Diagnosis monitor
Diagnosis monitor check

E6-2

E6-1

Lift potentiometer installed state check

NG → Readjustment (see page on 2-34)

OK

Inspection 1.
Battery plug OFF, CN101·CN10 disconnection
(A) CN101-15 — CN10 continuity check
(B) CN101-31 — CN10 continuity check
(C) CN101-15 — CN101-28 continuity check
(D) CN101-28 — CN101-31 continuity check

OK (A) 0 Ω (B) 0 Ω (C) ∞ Ω (D) ∞ Ω

NG (A) ∞ Ω (B) ∞ Ω (C) 0 Ω (D) 0 Ω

Wiring defect

Inspection 3.
Battery plug OFF, CN101·CN10 disconnection
(A) CN101-15 — CN101-31 continuity check
(B) CN101-28 — CN10 continuity check

OK (A) ∞ Ω (B) 0 Ω

NG (A) 0 Ω (B) ∞ Ω

Wiring defect

Inspection 2.
CN10 disconnection
Lift potentiometer individual check

NG → Lift potentiometer defect

OK

CPU board defect

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Inspección 1. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN10/CN101

Terminales de medición	(A) CN101-15 -- CN10 (conector del lado de REC) (B) CN101-31 -- CN10 (conector del lado de REC) (C) CN101-15 -- CN101-28 (conector del lado de REC) (D) CN101-28 -- CN101-31 (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	(A) 0 Ω (B) 0 Ω (C) ∞ Ω (D) ∞ Ω

CORRECTO (estándar) -- A la inspección 2.
INCORRECTO (diferente del estándar) -- Defecto del cableado

Inspección 2. Comprobación individual del potenciómetro de elevación
Enchufe de la batería desconectado, desconexión de CN10

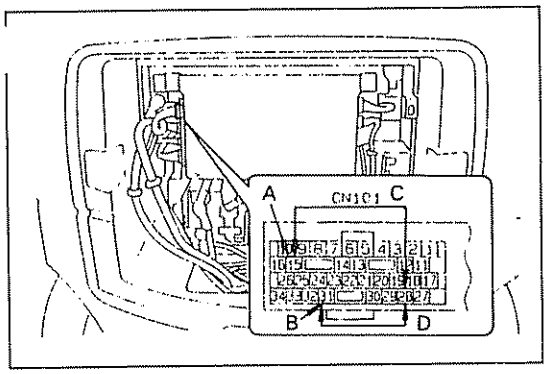
Terminales de medición	Ambos terminales de CN10 (en el lado del potenciómetro)
Alcance del probador de circuitos	Ω x 1
Estándar	Variará de 0 Ω a aprox. 5 kΩ

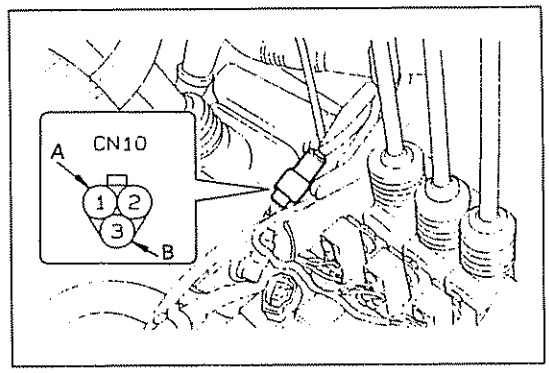
CORRECTO (variará de 0 Ω a 5 kΩ) -- Defecto del tablero de CPU
INCORRECTO (diferente del estándar) -- Defecto del potenciómetro de elevación

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Inspection 1. Wiring continuity check
Battery plug OFF, CN10·CN101 disconnection

Measurement terminals	(A) CN101-15 — CN10-1 (connector of REC side) (B) CN101-31 — CN10-3 (connector of REC side) (C) CN101-15 — CN101-28 (connector of REC side) (D) CN101-28 — CN101-31 (connector of REC side)
Circuit tester range	Ω × 1
Standard	(A) 0 Ω (B) 0 Ω (C) ∞ Ω (D) ∞ Ω

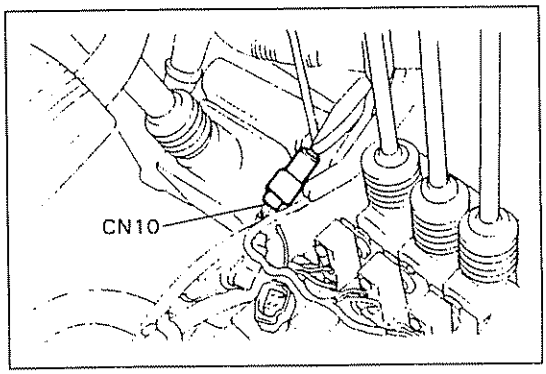


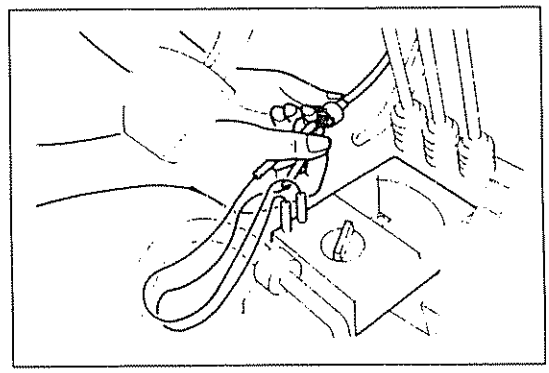


OK (standard) → To inspection 2.
NG (other than standard) → Wiring defect.

Inspection 2. Lift potentiometer individual check
Battery plug OFF, CN10 disconnection

Measurement terminals	Both terminals of CN10 (on lift potentiometer side)
Circuit tester range	Ω × 1
Standard	Shall vary from 0 Ω to approx. 5 kΩ





OK (shall vary from 0 Ω to approx. 5 kΩ) → CPU board defect
NG (other than standard) → Lift potentiometer defect

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Inspección 3. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN10/CN101

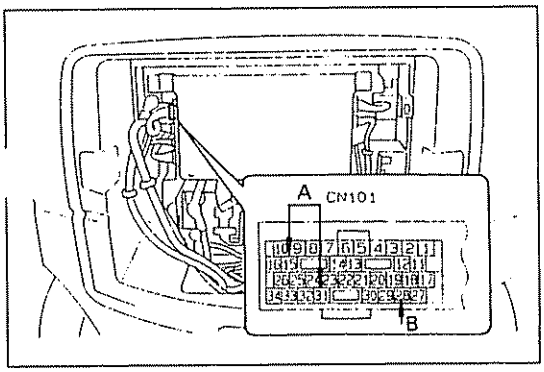
Terminales de medición	(A) CN101-15 -- CN101-31 (conector del lado de REC) (B) CN101-28 -- CN10-2 (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	(A) ∞ Ω (B) 0 Ω

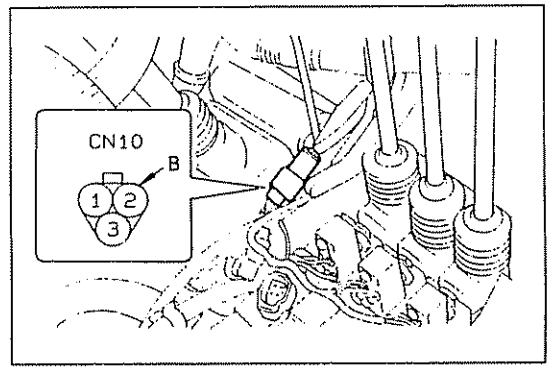
CORRECTO ((A) ∞ Ω, (B) 0 Ω) -- A la inspección 2.
INCORRECTO ((A) 0 Ω, (B) ∞ Ω) -- Defecto del cableado

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Inspection 3. Wiring continuity check
Battery plug OFF, CN10-CN101 disconnection

Measurement terminals	(A) CN101-15 – CN101-31 (CN101 is connector of REC side) (B) CN101-28 – CN10-2 (CN101 is connector of REC side)
Circuit tester range	Ω × 1
Standard	(A) ∞ Ω (B) 0 Ω





OK ((A) ∞ Ω (B) 0 Ω) → To inspection 2.
NG ((A) 0 Ω (B) ∞ Ω) → Wiring defect.

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Código de error EA: Anormalidad del circuito de marcha del contactor EPS/manipulación de materiales

Parte relacionada

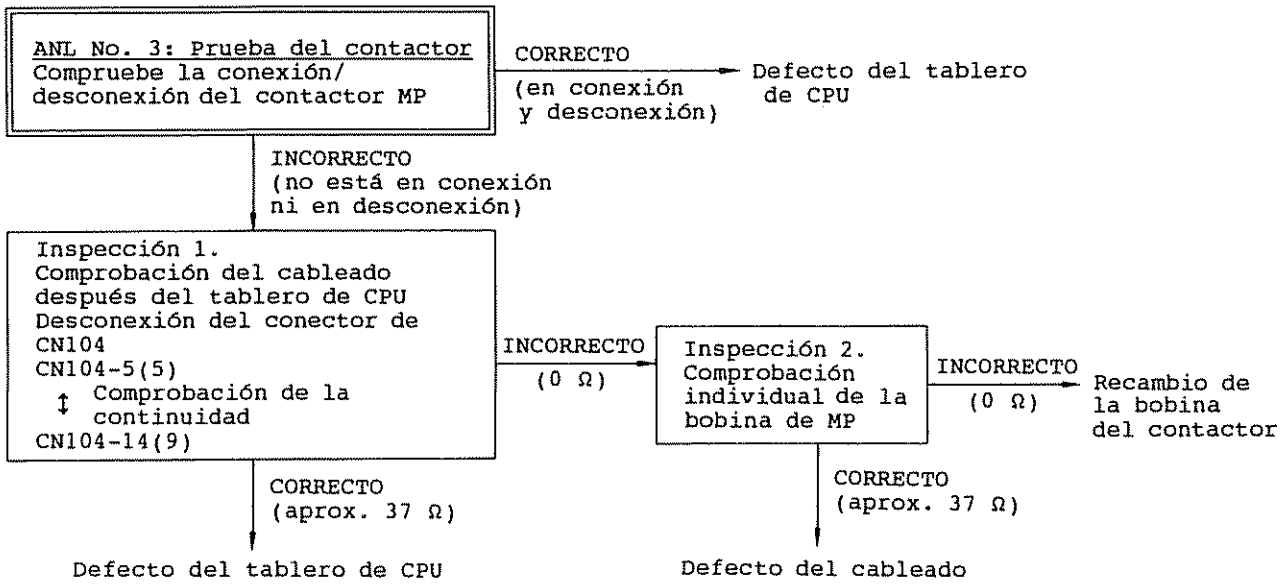
Tablero de CPU — Bobina de MP

Causas estimadas

1 Defecto de la bobina de MP

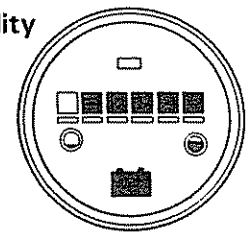
2 Cortocircuito del cableado de la bobina del contactor MP

3 Defecto del tablero de CPU

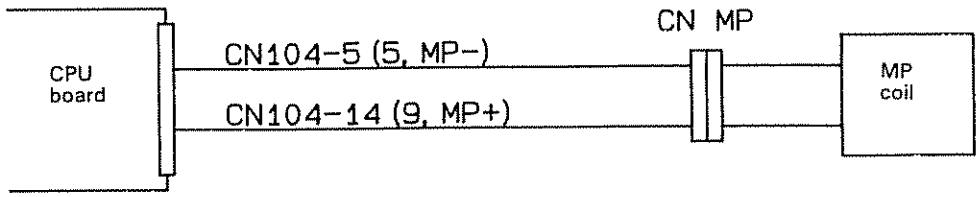


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Error code EA: Material handling/EPS contactor driving circuit abnormality



Related portion



Estimated causes

① MP coil defect

② MP contactor coil wiring short circuit

③ CPU board defect

ANL No.3: Contactor test
MP contactor ON/OFF check
→ OK (set to ON and OFF) → CPU board defect

↓ NG (not set to ON and OFF)

Inspection 1.
Wiring check after CPU board CN104 connector disconnection
CN104-5(5)
↕ continuity check
CN104-14(9)

→ NG (0 Ω)

Inspection 2.
MP coil individual check
→ NG (0 Ω) → Contactor coil replacement.

↓ OK (approx. 37 Ω)

CPU board defect.

↓ OK (approx. 37 Ω)

Wiring defect.

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Inspección 1. Comprobación de la continuidad del cableado del contactor MP
Enchufe de la batería desconectado, desconexión del conector CN104

Terminales de medición	CN104-5 (5) + -- CN104-14 (9) - (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- Defecto del tablero de CPU
INCORRECTO (0 Ω) -- A la inspección 2.

Inspección 2. Comprobación individual del contactor MP
Enchufe de la batería desconectado, desconexión del cableado de MP/barra de cobre

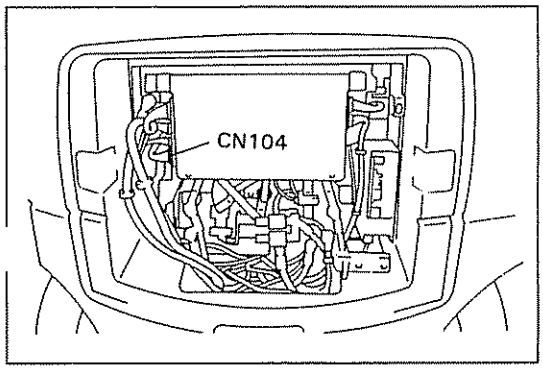
Terminales de medición	Ambos terminales de la bobina de MP
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

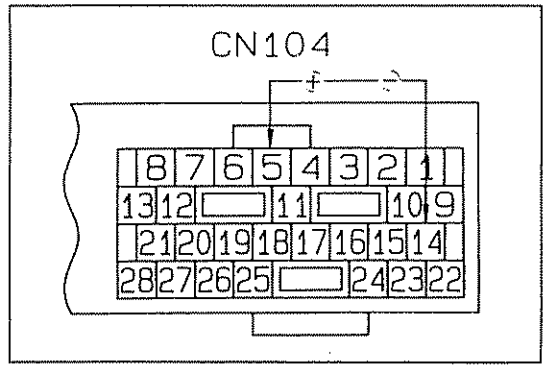
CORRECTO (aprox. 37 Ω) -- Defecto del cableado
INCORRECTO (0 Ω) -- Defecto de la bobina del contactor

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Inspection 1. MP contactor wiring continuity check
Battery plug OFF, CN104 connector disconnection

Measurement terminals	CN104-5(5) ⊕ — CN104-14(9) ⊖ (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

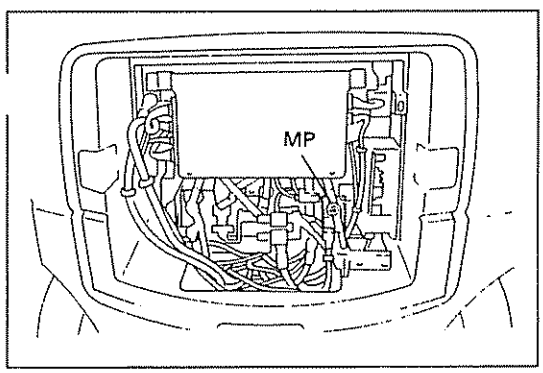


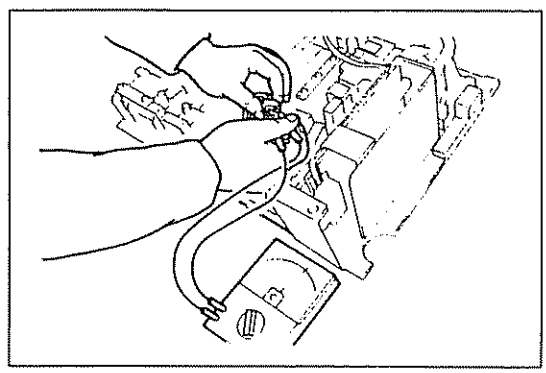


OK (approx. 37 Ω) → CPU board defect.
NG (0 Ω) → To inspection 2.

Inspection 2. MP contactor individual check
Battery plug OFF, MP wiring·copper bar disconnection

Measurement terminals	Both terminals of MP coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring defect
NG (0 Ω) → Contactor coil defect

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Código de error EE: Anormalidad de los datos de recepción de MCS

Parte relacionada

Tablero de CPU — Expositor

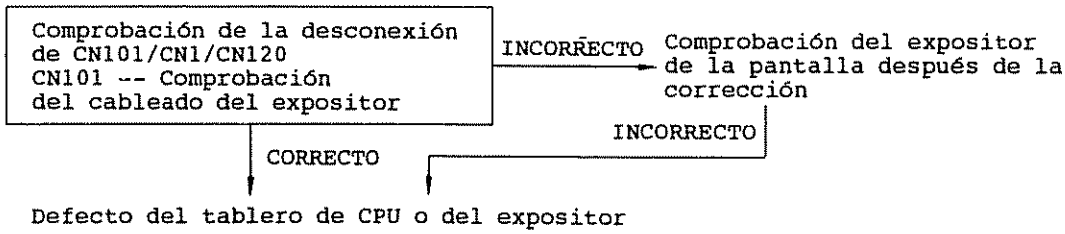
Causas estimadas

1 Defecto del expositor

2 Desconexión del cableado entre CN101 y el expositor

3 Defecto de contacto de CN101, CN1 o CN120

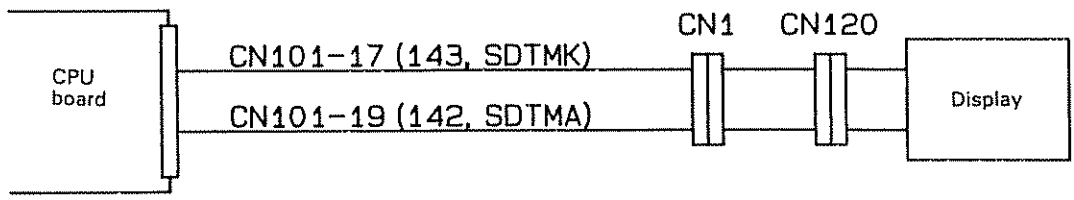
4 Defecto del tablero de CPU



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Error code EE: MCS received data abnormality

Related portion



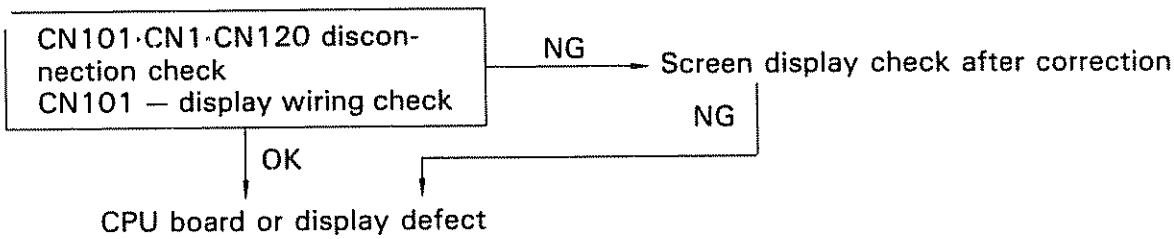
Estimated causes

① Display defect

② Disconnection of wiring between CN101 and display

③ CN101, CN1, or CN120 contact defect

④ CPU board defect



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Código de error EF: Anormalidad del tablero de CPU

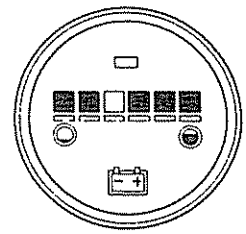
Parte relacionada

1 Defecto del tablero de CPU

Recambio del tablero de CPU para la exposición de EF.

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Error code EF: CPU board abnormality



Estimated causes

① CPU board defect

CPU board replacement for EF display.

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BUSQUEDA DE AVERIAS CON AVISO ACUSTICO

Sonido de aviso

Parte relacionada

Tablero
de CPU

Interruptor del freno
de estacionamiento

Potenciómetro de
aceleración
VRAD

Interruptor de dirección

Causas estimadas

1 Defecto del interruptor del freno de estacionamiento o desconexión del cableado

2 Defecto del potenciómetro de aceleración (cortocircuito entre 64 y 51)

3 Defecto de ajuste de instalación del potenciómetro de aceleración

4 Cortocircuito del cableado del interruptor de aceleración (entre CN102-6 y GND)

5 Defecto del interruptor de dirección (cortocircuito entre 45 y 51 o entre 46 y 51)

6 Cortocircuito del cableado del interruptor de dirección (entre CN102-1 y CN102-20 o entre CN102-9 y CN102-20)

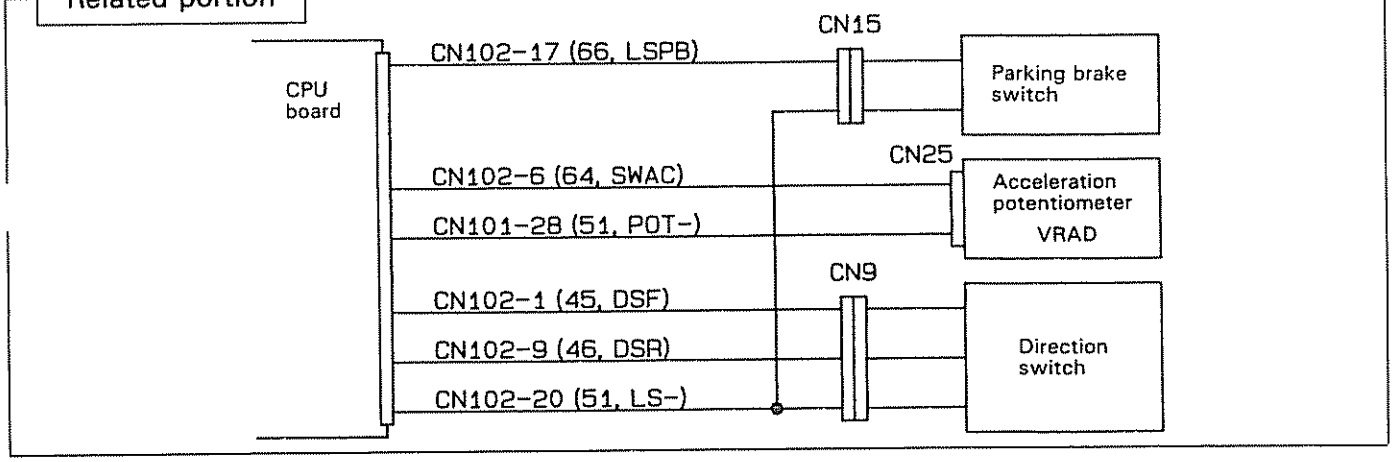
7 Defecto del tablero de CPU

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TROUBLESHOOTING FOR WARNING BUZZER SOUNDING (FOR ALL ROUND DISPLAY)

Warning Sound

Related portion



Estimated causes

① Parking brake switch defect or wiring disconnection

② Acceleration potentiometer defect (short circuit between 64 and 51)

③ Acceleration potentiometer installation adjustment defect

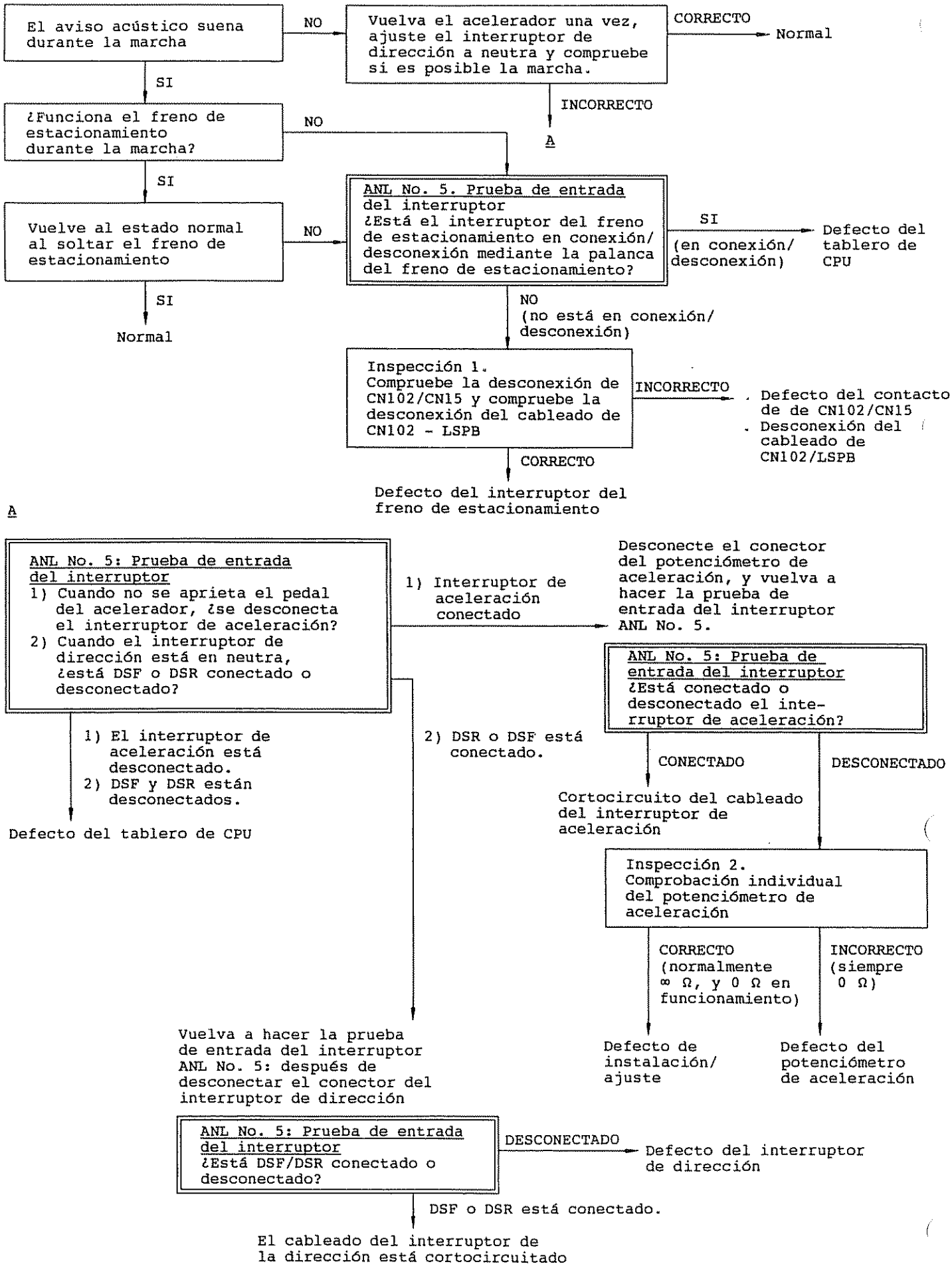
④ Acceleration switch wiring short circuit (between CN102-6 and GND)

⑤ Direction switch defect (short circuit between 45 and 51 or between 46 and 51)

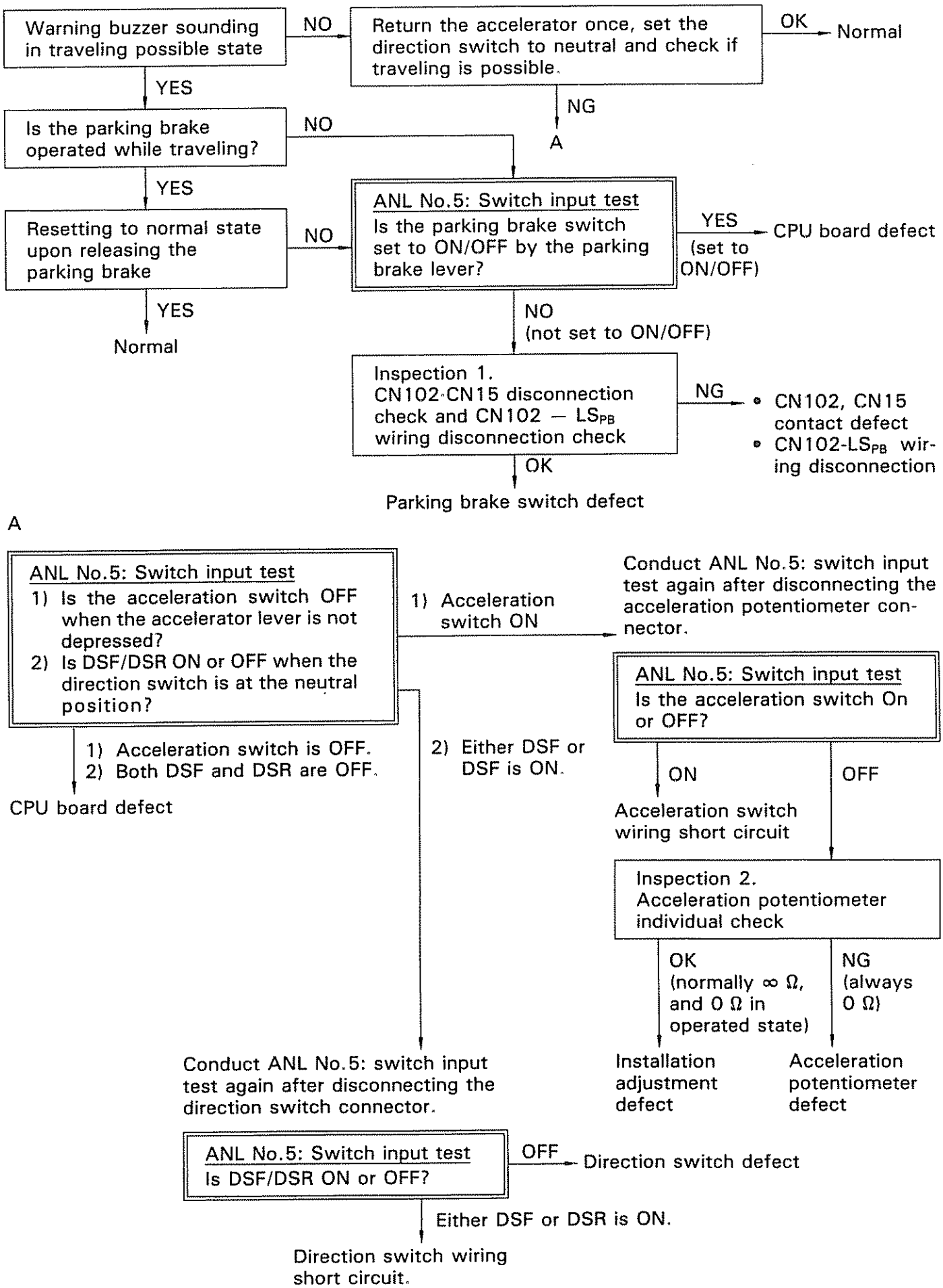
⑥ Direction switch wiring short circuit (between CN102-1 and CN102-20 or between CN102-9 and CN102-20)

⑦ CPU board defect

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Inspección 1. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN102/CN15

Terminales de medición	CN102-17 (66) -- CN15-1 (66) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- Defecto del interruptor del freno de estacionamiento
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 2. Comprobación individual del potenciómetro de aceleración
Enchufe de la batería desconectado, desconexión de CN25

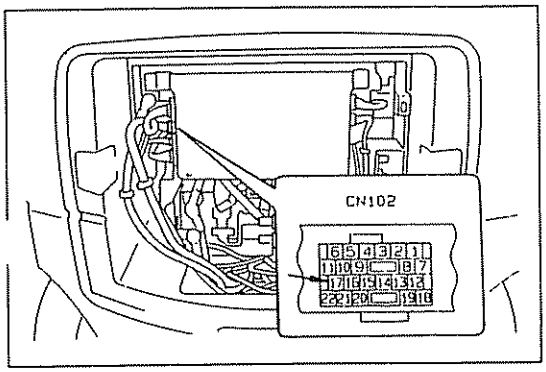
Terminales de medición	Ambos terminales del potenciómetro de aceleración (entre 51 y 64)
Alcance del probador de circuitos	Ω x 1
Estándar	Cuando no está en funcionamiento: ∞ Ω, cuando está en funcionamiento: 0 Ω

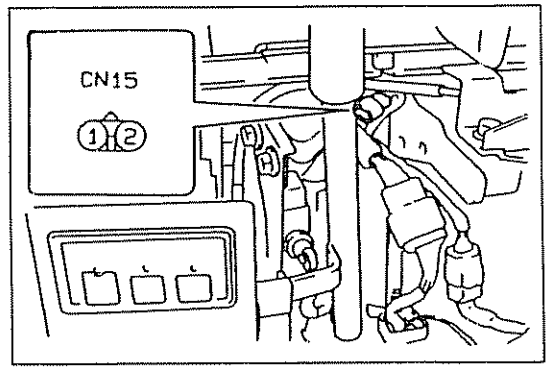
CORRECTO (cuando no está en funcionamiento: ∞ Ω, cuando está en funcionamiento: 0 Ω) -- Defecto de instalación
INCORRECTO (siempre 0 Ω) -- Defecto del potenciómetro de aceleración

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Inspection 1. Wiring continuity check
Battery plug OFF, CN102·CN15 disconnection

Measurement terminals	CN102-17 (66) — CN15-1 (66) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

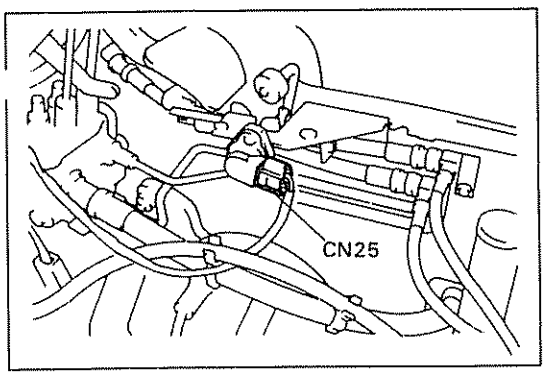


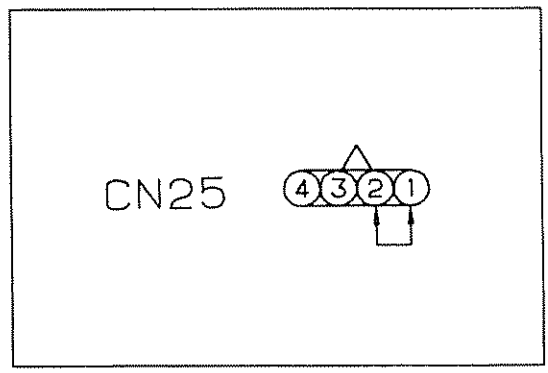


OK (0 Ω) → Parking brake switch defect
NG (∞ Ω) → Wiring defect

Inspection 2. Acceleration potentiometer individual check
Battery plug OFF, CN25 disconnection

Measurement terminals	Both terminals of acceleration potentiometer (between 51 and 64)
Circuit tester range	Ω × 1
Standard	When not operated: ∞ Ω, When operated: 0 Ω





OK (∞ Ω when not operated, and 0 Ω when operated) → Installation defect.
NG (always 0 Ω) → Acceleration potentiometer defect

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CUANDO NO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO (SISTEMA DE MARCHA)

1. El vehículo no se mueve en absoluto. (El expositor aparece desconectado aunque el interruptor de la llave está en conexión)

Parte relacionada

Tablero
de CPU

Tablero
de DC-BD

Causas estimadas

1 No se aplica voltaje de la batería

2 No se aplica voltaje después de conectar el interruptor de la llave

3 Sobredescarga de la batería

4 Defecto del tablero de DC-BD

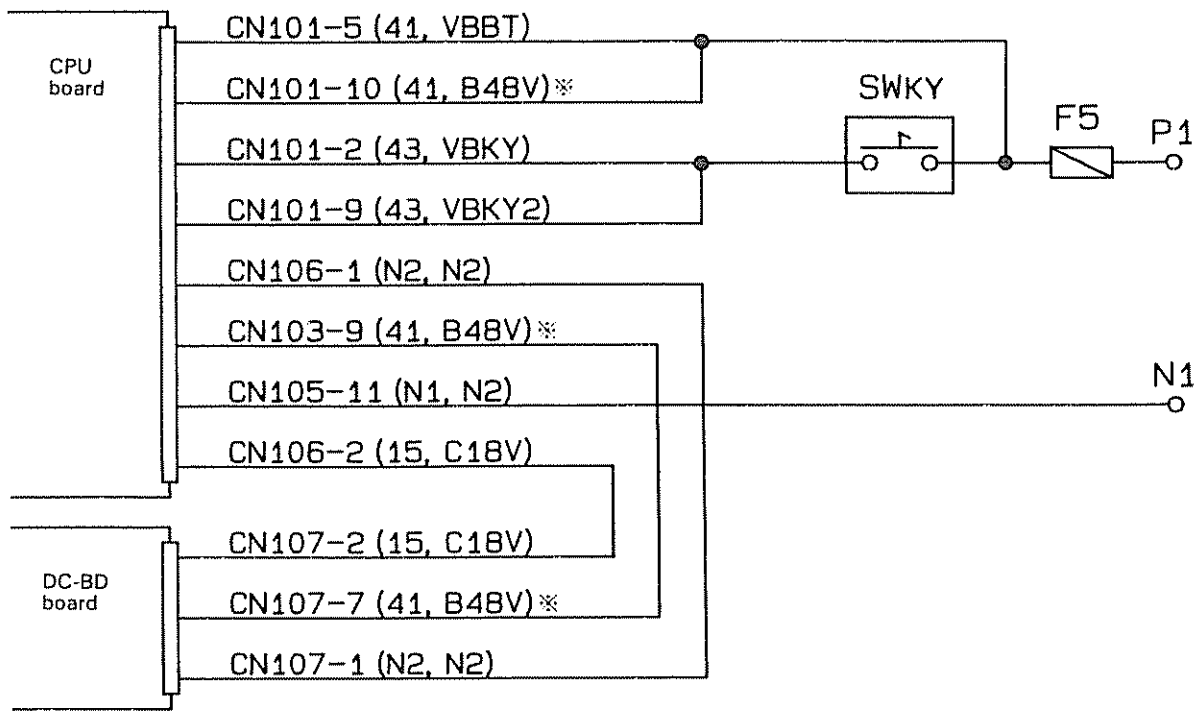
5 Defecto del tablero de CPU

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WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED (TRAVELING SYSTEM)

1. The vehicle does not move at all. (The display remains OFF when the key switch is turned ON.)

Related portion



※3 ton series : (18, B72 V)

Estimated causes

① The battery voltage is not applied.

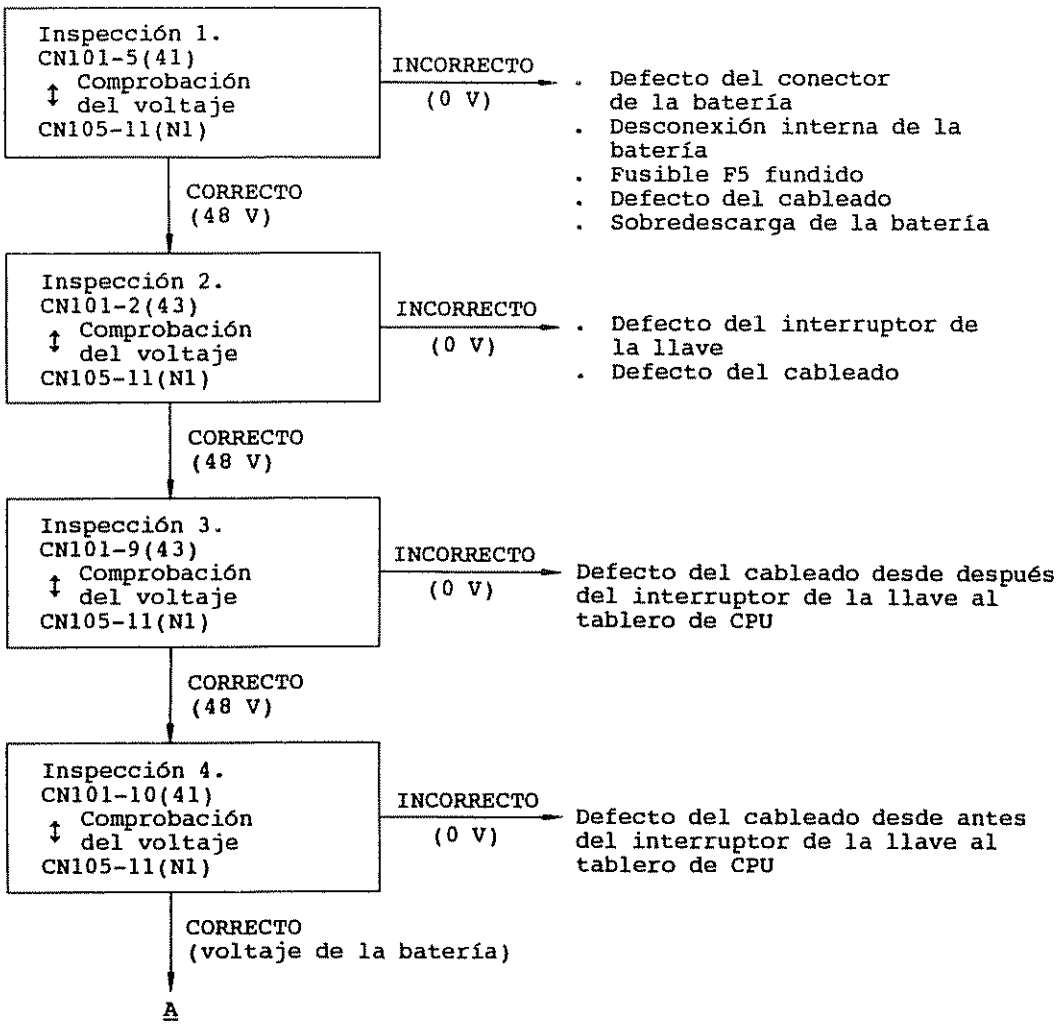
② The voltage after the key switch is not applied.

③ Battery over-discharge

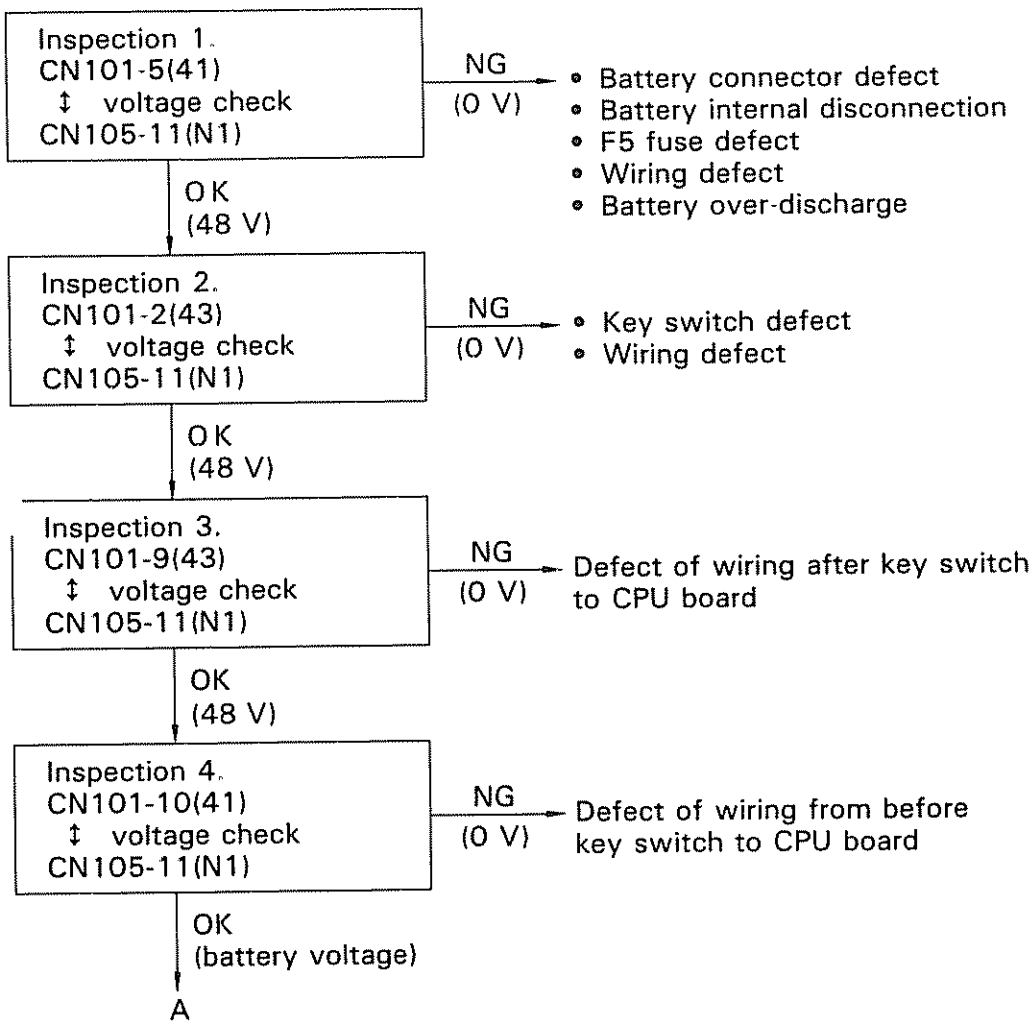
④ DC-BD board defect

⑤ CPU board defect

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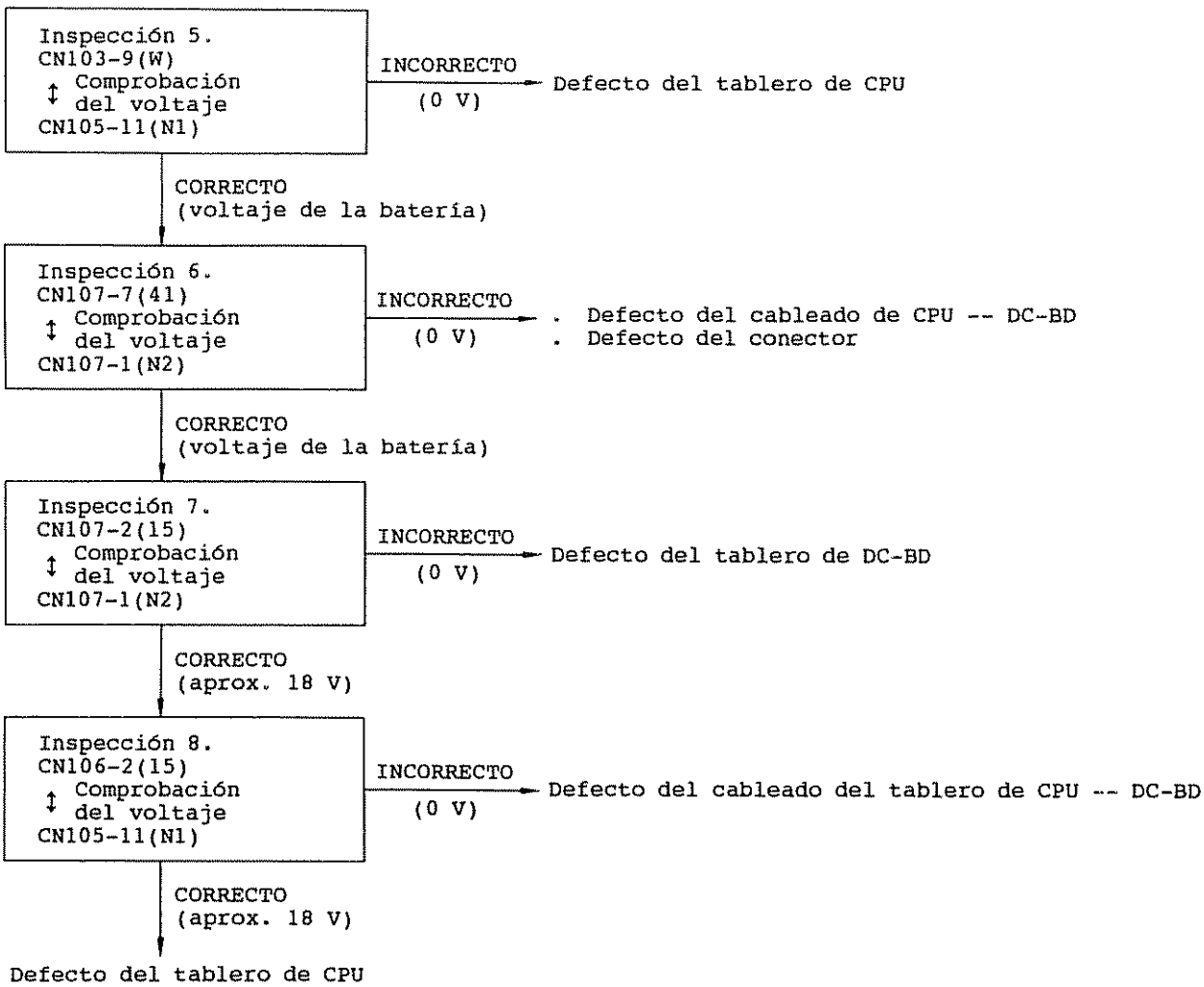


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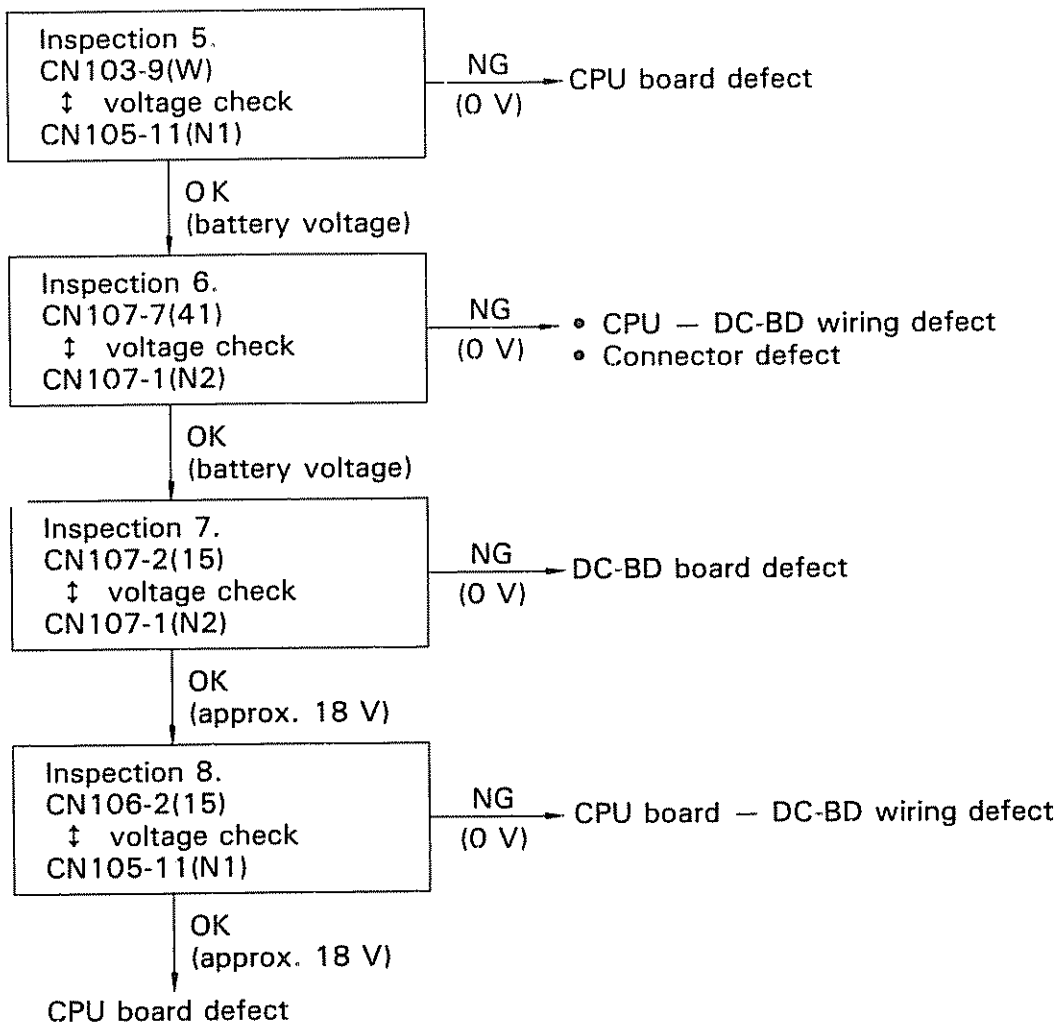
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Inspección 3. Comprobación del voltaje de después del interruptor de la llave (2)
Enchufe de la batería conectado, interruptor de la llave conectado

Terminales de medición	CN101-9 (43) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

CORRECTO (48 V) -- A la inspección 4.
INCORRECTO (0 V) -- Defecto del cableado de CPU -- antes del interruptor de la llave

Inspección 4. Comprobación del voltaje de antes del interruptor de la llave (3)
Enchufe de la batería conectado

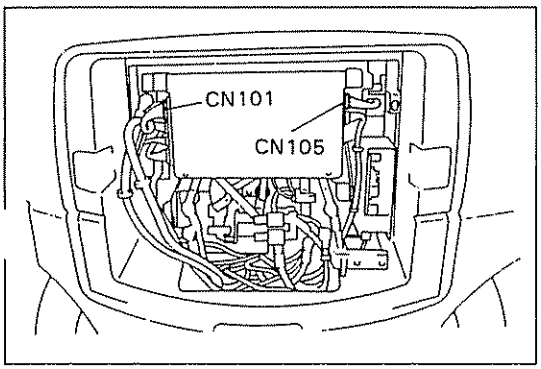
Terminales de medición	CN101-10 (41) -- CN105-11 (N1)
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

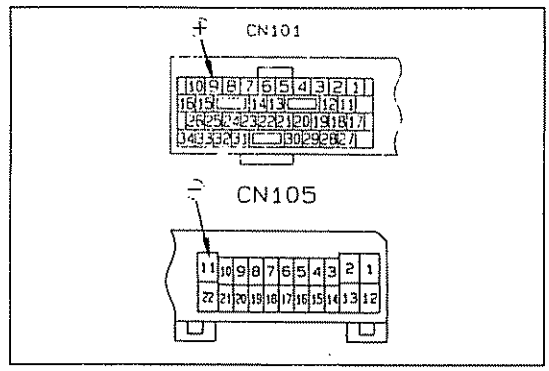
CORRECTO (voltaje de la batería) -- A la inspección 5.
INCORRECTO (0 V) -- Defecto del cableado del tablero de CPU después del interruptor de la llave

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Inspection 3. After key switch voltage check (2)
Battery plug ON, key switch ON

Measurement terminals	CN101-9(43)⊕ – CN105-11(N1)⊖
Circuit tester range	DC 50 V
Standard	48 V

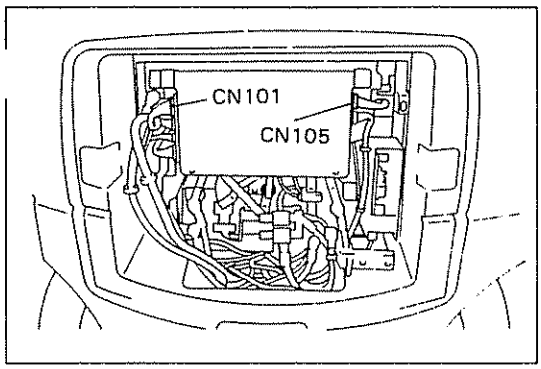


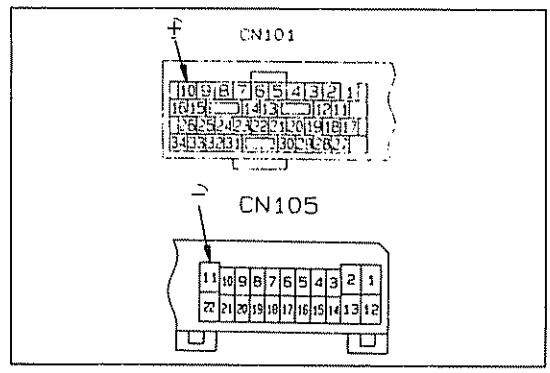


OK (48 V) → To inspection 4.
NG (0 V) → After key switch - CPU board wiring defect

Inspection 4. Before key switch voltage check
Battery plug ON

Measurement terminals	CN101-10(41)⊕ – CN105-11(N1)⊖
Circuit tester range	1-2 ton series: DC 50 V, 3-ton series: DC 250 V
Standard	Battery voltage





OK (battery voltage) → To inspection 5.
NG (0 V) → Before key switch – CPU board wiring defect

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Inspección 5. Comprobación del voltaje de salida del tablero de CPU
Enchufe de la batería conectado

Terminales de medición	CN103-9 (41) -- CN105-11 (N1)
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

CORRECTO (voltaje de la batería) -- A la inspección 6.
INCORRECTO (0 V) -- Defecto del tablero de CPU

Inspección 6. Comprobación del voltaje de entrada del tablero de DC-BD
Enchufe de la batería conectado

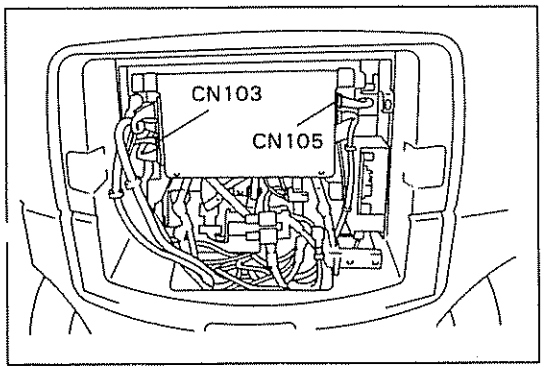
Terminales de medición	CN107-7 (41) -- CN107-1 (N2)
Alcance del probador de circuitos	Series de 1-2 ton.: CC 50 V, series de 3 ton.: CC 250 V
Estándar	Voltaje de la batería

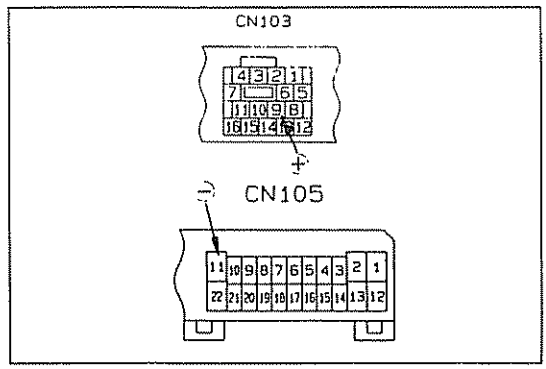
CORRECTO (voltaje de la batería) -- A la inspección 7.
INCORRECTO (0 V) -- Defecto del cableado del tablero de CPU/DC-BD o defecto de contacto del conector

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Inspection 5. CPU board output voltage check
Battery plug ON

Measurement terminals	CN103-9(41)⊕ – CN105-11(N1)⊖
Circuit tester range	1·2 ton series: DC 50 V, 3-ton series: DC 250 V
Standard	Battery voltage

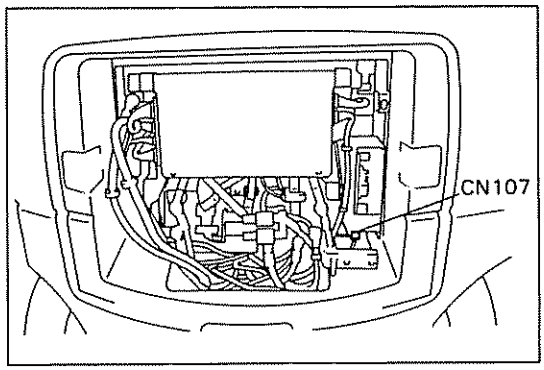


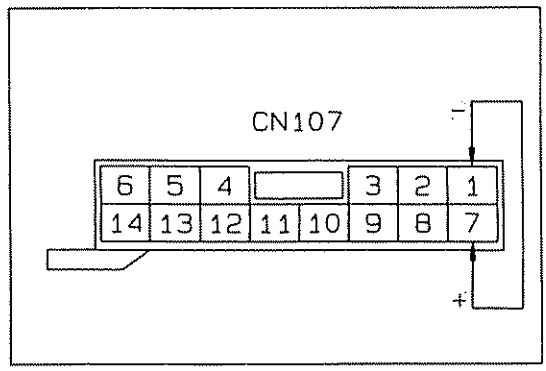


OK (battery voltage) → To inspection 6.
NG (0 V) → CPU board defect

Inspection 6. DC-BD board input voltage check
Battery plug ON

Measurement terminals	CN107-7(41) – CN107-1(N2)
Circuit tester range	1-2 ton series: DC 50 V, 3-ton series: DC 250 V
Standard	Battery voltage





OK (battery voltage) → To inspection 7.
NG (0 V) → CPU board – DC-BD wiring defect, or connector contact defect

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Inspección 7. Comprobación del voltaje de salida del tablero de DC-BD
Enchufe de la batería conectado, interruptor de la llave conectado

Terminales de medición	CN107-2 (15) -- CN107-1 (N2)
Alcance del probador de circuitos	CC 50 V
Estándar	Aprox. 18 V

CORRECTO (aprox. 18 V) -- A la inspección 8.
INCORRECTO (0 V) -- Defecto del tablero de DC-BD

Inspección 8. Comprobación del voltaje de entrada del tablero de CPU
Enchufe de la batería conectado, interruptor de la llave conectado

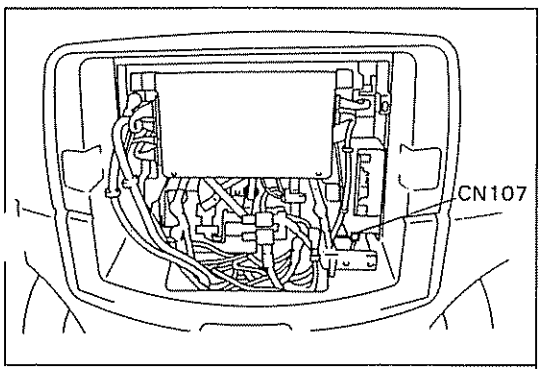
Terminales de medición	CN106-2 (15) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	Aprox. 18 V

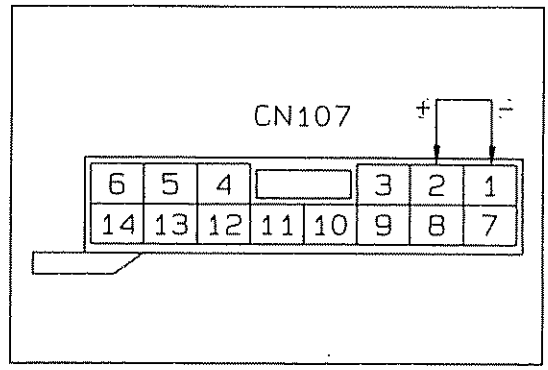
CORRECTO (aprox. 18 V) -- Defecto del tablero de CPU
INCORRECTO (0 V) -- Defecto del cableado del tablero de CPU/DC-BD

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Inspection 7. DC-BD board output voltage check
Battery plug ON, key switch ON

Measurement terminals	CN107-2(15)⊕ – CN107-1(N2)⊖
Circuit tester range	DC 50 V
Standard	Approx. 18 V

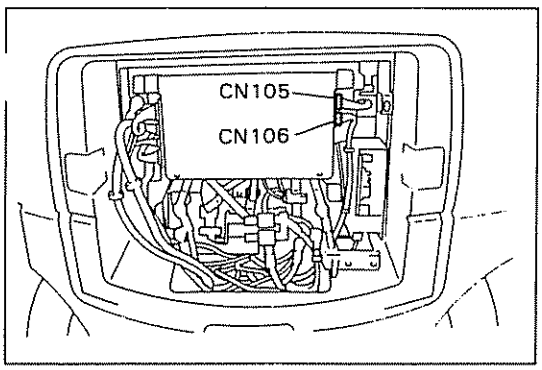


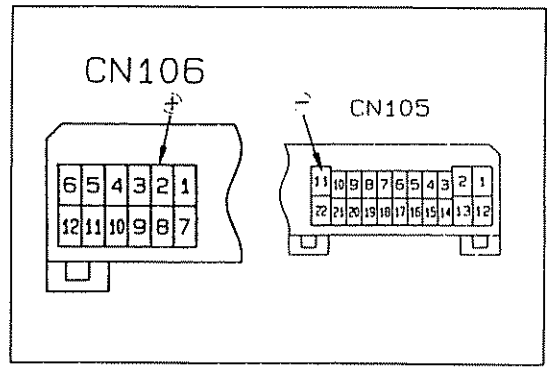


OK (approx. 18 V) → To inspection 8.
NG (0 V) → DC-BD board defect.

Inspection 8. CPU board input voltage check
Battery plug ON, key switch ON

Measurement terminals	CN106-2(15)⊕ – CN105-11(N1)⊖
Circuit tester range	DC 50 V
Standard	Approx. 18 V





OK (approx. 18 V) → CPU board defect.
NG (0 V) → CPU board – DC-BD wiring defect

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2. El vehículo no se mueve en absoluto. (Cuando la palanca de dirección se pone en avance (o retroceso), los contactores MF (o MR) y MG no están cerrados).

Parte relacionada

Tablero de CPU	Interruptor de dirección
	Bobina de MF
	Bobina de MR
	Bobina de MG

Causas estimadas

1 Sobredescarga de la batería

2 Defecto del interruptor de dirección y desconexión del cableado

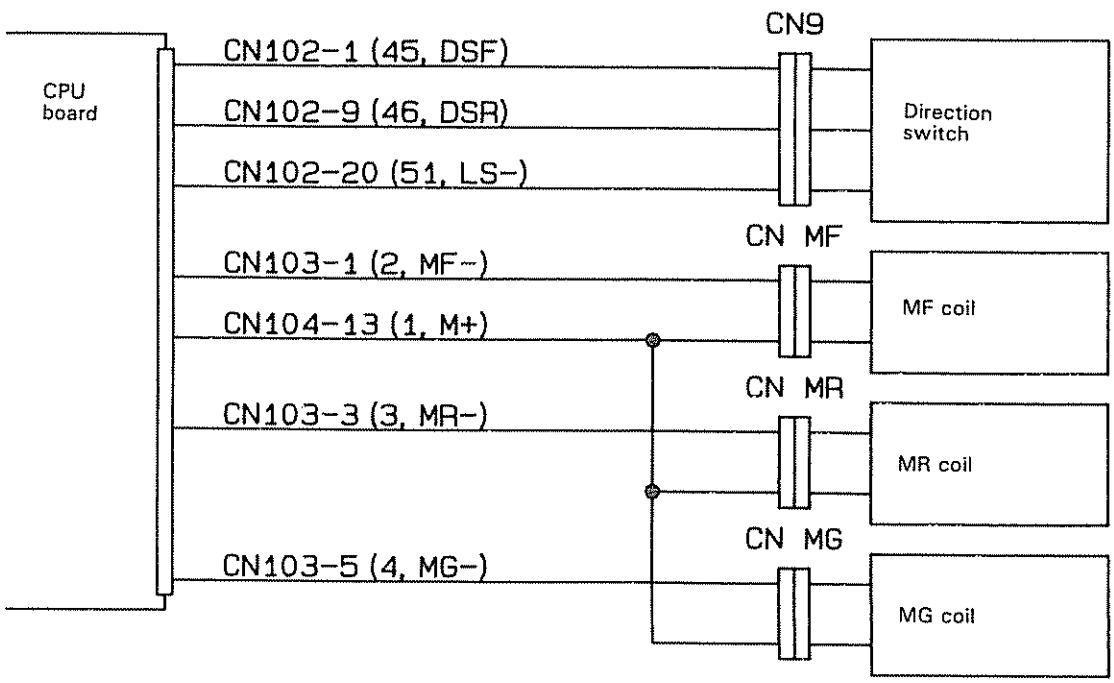
3 Defecto del contactor MF, MR o MG, o desconexión del cableado

4 Defecto del tablero de CPU

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2. The vehicle does not move at all. (When the direction lever is set to forward (or reverse), the MF (or MR) and MG contactors are not closed.)

Related portion



Estimated causes

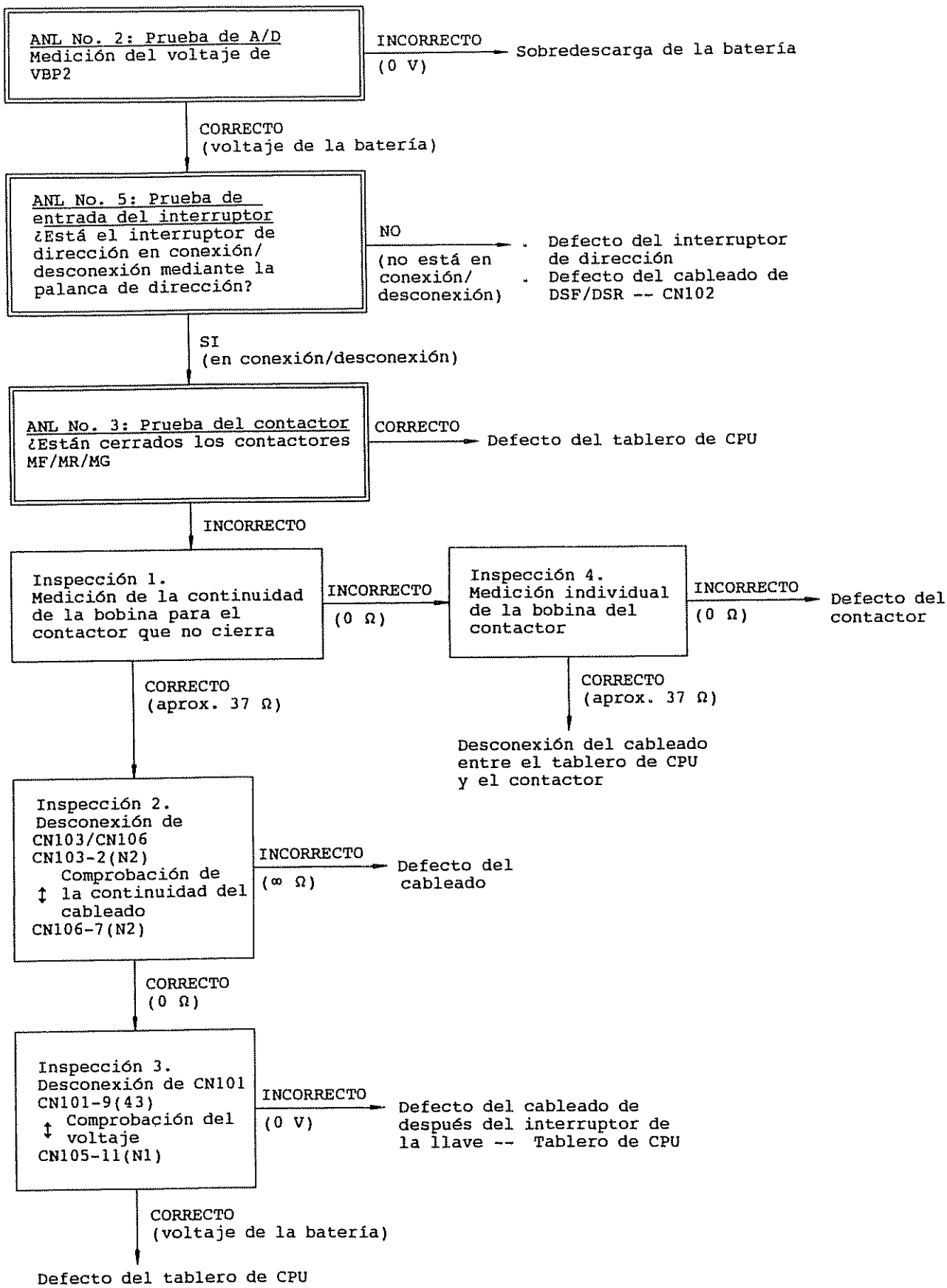
① Battery overdischarge

② Direction switch defect or wiring disconnection

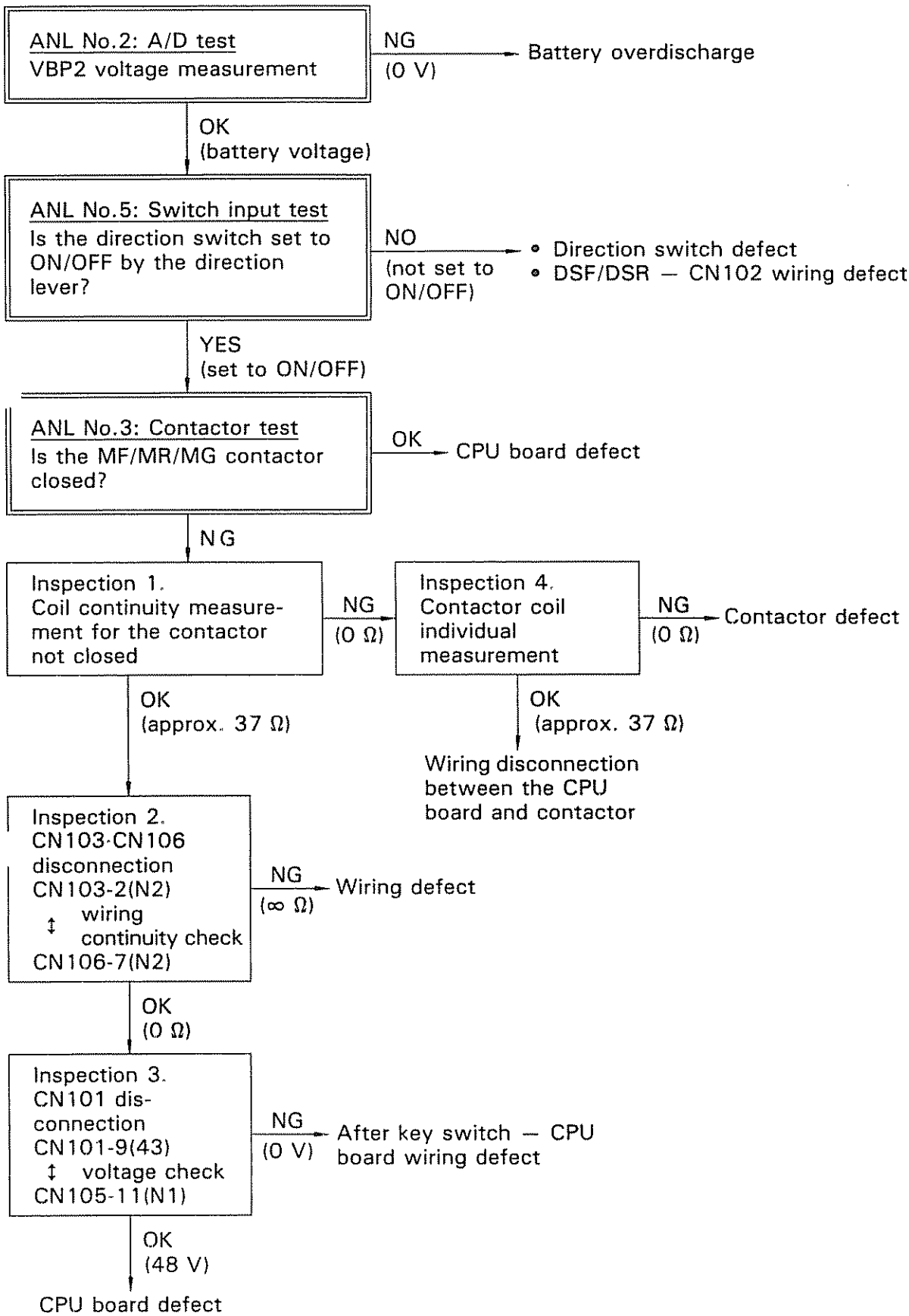
③ MF, MR or MG contactor defect, or wiring disconnection

④ CPU board defect

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Inspección 1. Comprobación de la continuidad de la bobina del contactor
Enchufe de la batería desconectado, desconexión de CN103/CN104

Terminales de medición	MF: CN103-1 (2) -- CN104-13 (1) (conector del lado de REC) MR: CN103-3 (3) -- CN104-13 (1) (conector del lado de REC) MG: CN103-5 (4) -- CN104-13 (1) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

CORRECTO (aprox. 37 Ω) -- A la inspección 2.
INCORRECTO (0 Ω) -- A la inspección 4.

Inspección 2. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN103/CN106

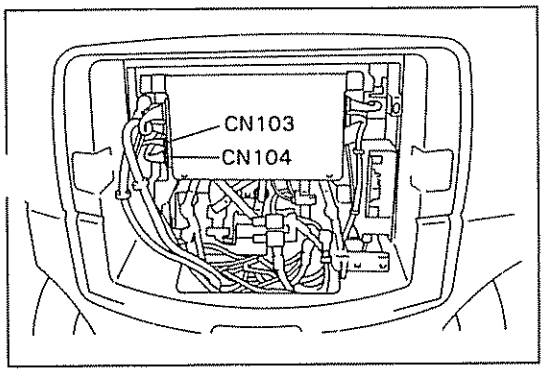
Terminales de medición	CN103-2 (N2) -- CN106-7 (N2) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

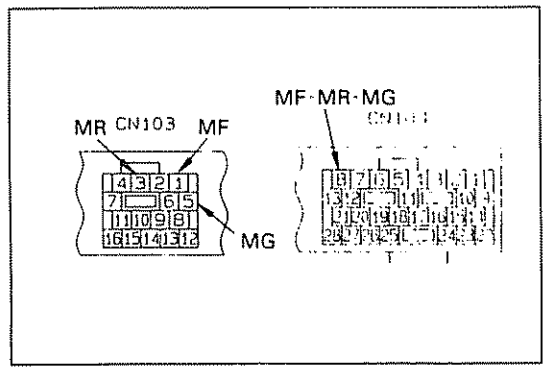
CORRECTO (0 Ω) -- A la inspección 3.
INCORRECTO (∞ Ω) -- Defecto del cableado

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Inspection 1. Contactor coil continuity check
Battery plug OFF, CN103·CN104 disconnection

Measurement terminals	MF: CN103-1(2) — CN104-13(1) (connector of REC side) MR: CN103-3(3) — CN104-13(1) (connector of REC side) MG: CN103-5(4) — CN104-13(1) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω

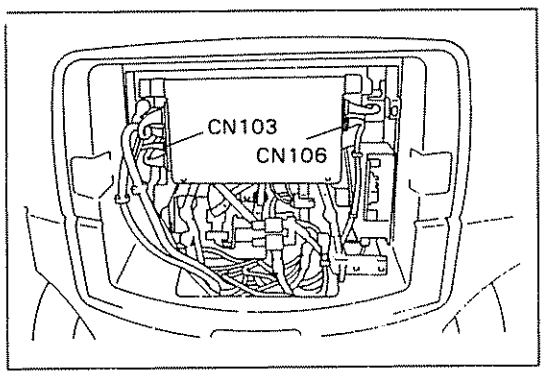


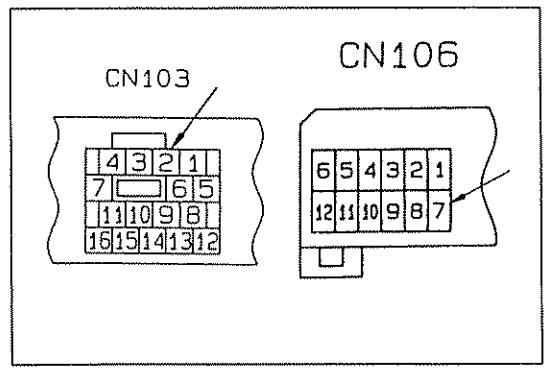


OK (approx. 37 Ω) → To inspection 2.
NG (0 Ω) → To inspection 4.

Inspection 2. Wiring continuity check
Battery plug OFF, CN103·CN106 disconnection

Measurement terminals	CN103-2(N2) — CN106-7(N2) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω





OK (0 Ω) → To inspection 3.
NG (∞ Ω) → Wiring defect.

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Inspección 3. Comprobación del voltaje de después del interruptor de la llave
Enchufe de la batería conectado, interruptor de la llave conectado, desconexión de CN101

Terminales de medición	CN101-9 (43) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

CORRECTO (48 V) -- Defecto del tablero de CPU
INCORRECTO (0 Ω) -- Defecto del cableado entre el interruptor después de la llave y el tablero de CPU

Inspección 4. Comprobación individual del contactor MF/MR/MG
Enchufe de la batería desconectado, cableado de MF/MR/MG y desconexión de la barra de cobre

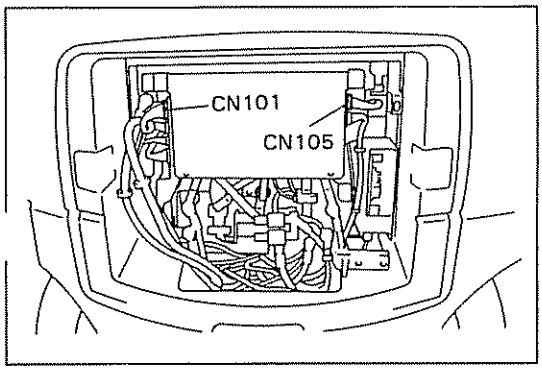
Terminales de medición	Ambos terminales de cada bobina
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

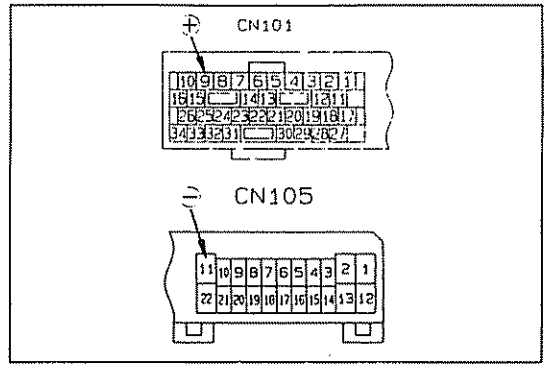
CORRECTO (aprox. 37 Ω) -- Desconexión del cableado entre el tablero de CPU y el contactor
INCORRECTO (0 Ω) -- Defecto del contactor

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Inspection 3. After key switch voltage check
Battery plug ON, key switch ON, CN101 disconnection

Measurement terminals	CN101-9(43)⊕ – CN105-11(N1)⊖
Circuit tester range	DC 50 V
Standard	48 V

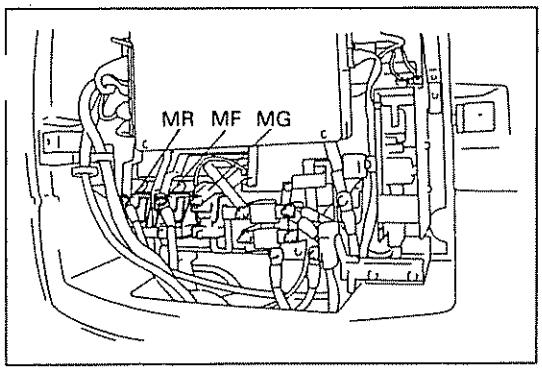


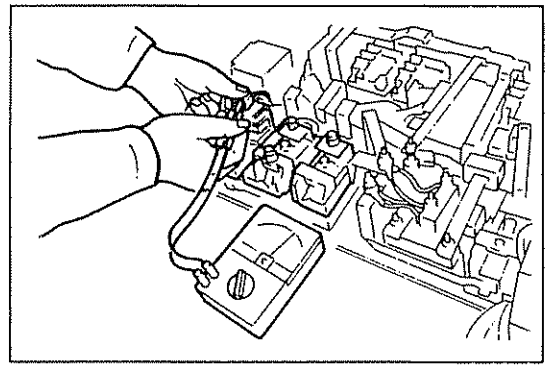


OK (48 V) → CPU board defect.
NG (0 V) → Wiring defect between after key switch and CPU board.

Inspection 4. MF·MR·MG contactor individual check
Battery plug OFF, MF·MR·MG wiring and copper bar disconnection

Measurement terminals	Both terminals of each coil
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → Wiring disconnection between CPU board and contactor
NG (0 Ω) → Contactor defect.

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3. El vehículo no se mueve en absoluto. (Los contactores MG, MF y MR están cerrados)

Parte relacionada

Potenciómetro de aceleración

Tablero de CPU

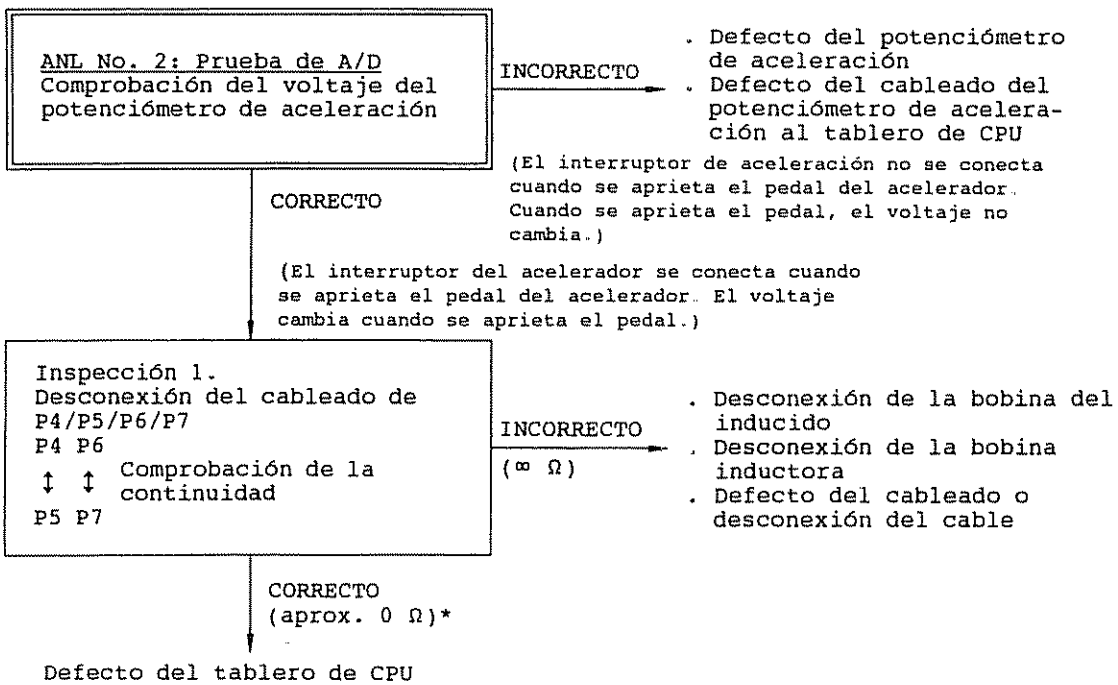
Causas estimadas

1 Defecto del potenciómetro de aceleración o desconexión del cableado

2 Defecto del motor de marcha

3 Defecto del cableado del circuito de marcha principal

4 Defecto del tablero de CPU

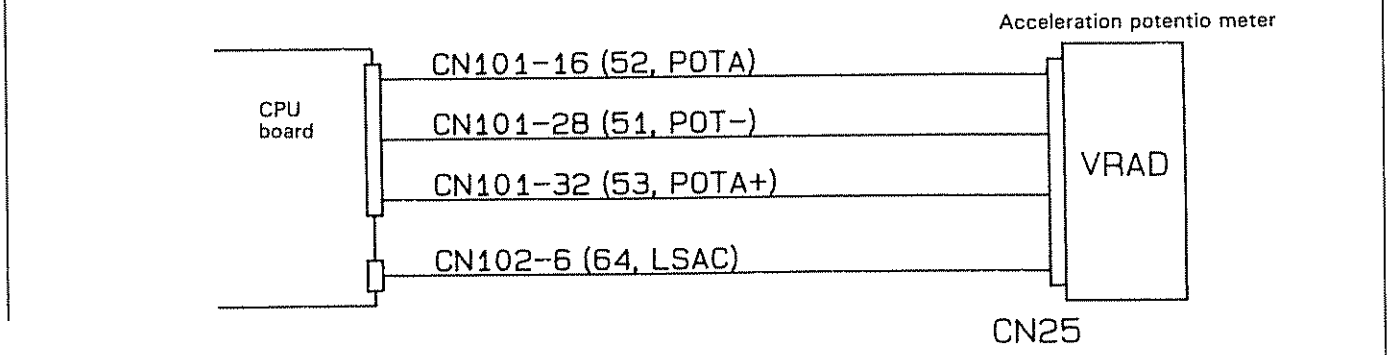


* Aprox. 0 Ω es la resistencia de la bobina del motor muy cercana a 0 Ω.

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3. The vehicle does not move at all. (MG, MF and MR contactors are closed.)

Related portion



Estimated causes

① Acceleration potentiometer defect or wiring disconnection

② Drive motor defect

③ Main drive circuit wiring defect

④ CPU board defect

ANL No.2: A/D test
Acceleration potentiometer voltage check

NG →
- Acceleration potentiometer defect
- Acceleration potentiometer — CPU board wiring defect

(The acceleration switch is not set to ON when the accelerator pedal is depressed. The voltage does not change as the pedal is depressed.)

OK

(The acceleration switch is set to ON when the accelerator pedal is depressed. The voltage changes as the pedal is depressed.)

Inspection 1.
P4·P5·P6·P7 wiring disconnection
P4 P6
↕ ↕ continuity check
P5 P7

NG (∞ Ω) →
- Armature coil disconnection
- Field coil disconnection
- Cable disconnection or connection defect

OK
(approx. 0 Ω)*

CPU board defect

* Approx. 0 Ω is the motor coil resistance very close to 0 Ω.

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Inspección 1. Comprobación de la continuidad del cableado de P4/P5/P6/P7
Enchufe de la batería desconectado, desconexión del cableado de P4/P5/P6/P7 y barra de cobre

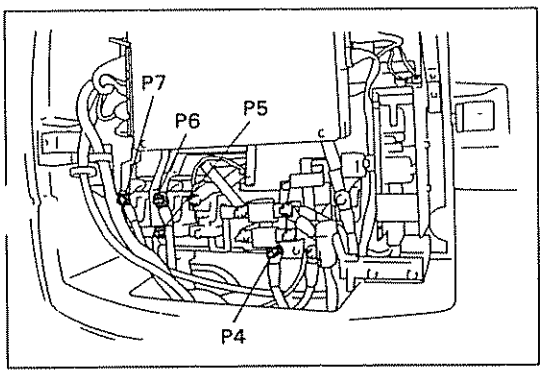
Terminales de medición	P4 -- P5 (bobina del inducido) P6 -- P7 (bobina inductora)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

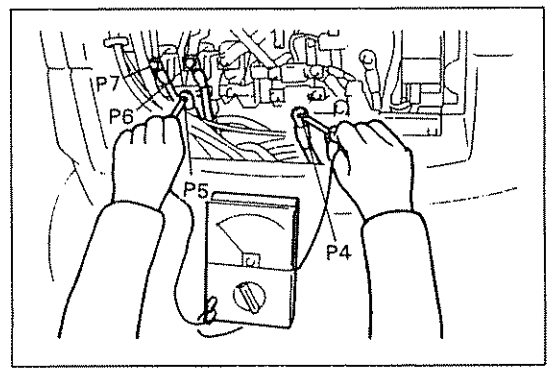
CORRECTO (aprox. 0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Desconexión de la bobina del inducido, desconexión de la bobina inductora, desconexión del cableado o defecto de conexión

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Inspection 1. P4·P5·P6·P7 wiring continuity check
Battery plug OFF, P4-P5 and P6-P7 wiring and copper bar disconnection

Measurement terminals	P4 — P5 (armature coil) P6 — P7 (field coil)
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω





OK (approx. 0 Ω) → CPU board defect
NG(∞ Ω) → Armature coil disconnection, field coil disconnection, cable disconnection or connection defect

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4. Falla el control de velocidad normal (fallo de aceleración o no se obtiene la velocidad máxima).

- Si el valor de control de potencia como punto No. 5 de puesta a punto del expositor no se ajusta a 8, no se podrá obtener la velocidad máxima. Tampoco se puede obtener la velocidad máxima cuando aparece el indicador de velocidad de marcha de 2 velocidades.
- La indicación de velocidad varía con el ajuste del diámetro de la rueda y del neumático. Compruebe si el diámetro real del neumático coincide con el ajuste del diámetro de la rueda.

Parte relacionada

	Potenciómetro de aceleración
	Interruptor del freno
Tablero de CPU	Interruptor del freno de estacionamiento
	Sensor de velocidad 1
	Sensor de velocidad 2

Causas estimadas

1 Señal del potenciómetro de aceleración insuficiente

2 Valor OCL de marcha bajo

3 Defecto del sensor de corriente de marcha (CSD)

4 Defecto del motor de marcha

5 Defecto del tablero de CPU

6 Defecto del interruptor del freno o defecto de ajuste de la instalación
Defecto del cableado del interruptor del freno -- Tablero de CPU

7 Defecto del interruptor del freno de estacionamiento o defecto de ajuste de la instalación
Defecto del cableado del interruptor del freno de estacionamiento -- tablero de CPU

8 Defecto de ajuste del diámetro de la rueda

9 Defecto del sensor de velocidad

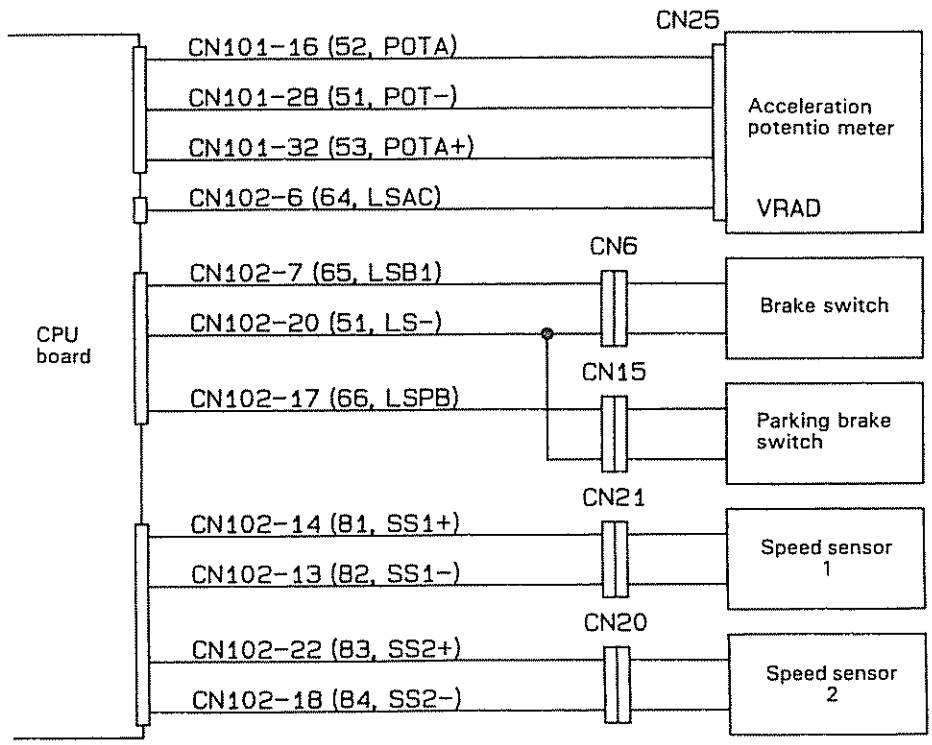
10 Conexión inversa del conector del sensor de velocidad 1/2

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4. Normal speed control fails (acceleration failure or non-attainment of the maximum speed).

- If the power control value as display tuning item No.5 is not set to 8, the maximum speed cannot be attained. The maximum speed cannot be attained also when 2-speed traveling speed indicator is displayed.
- The speed indication varies with the tire wheel diameter setting. Check if the actual tire diameter matches the wheel diameter setting.

Related portion



Estimated causes

① Insufficient acceleration potentiometer signal

② Low traveling OCL value

③ Traveling current sensor (CSD) defect

④ Drive motor defect

⑤ CPU board defect

⑥ Brake switch defect or installation adjustment defect
Brake switch — CPU board wiring defect

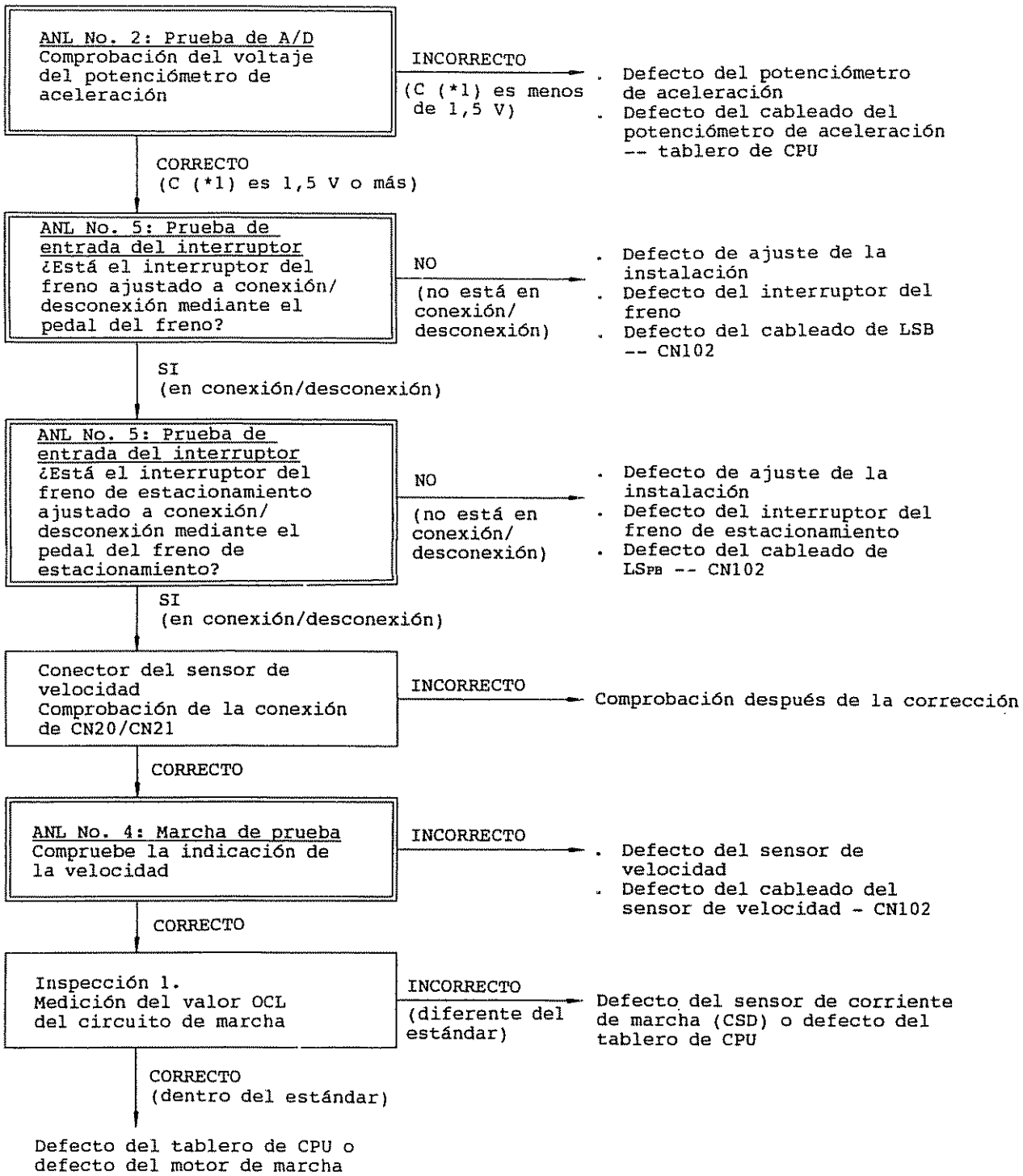
⑦ Parking brake switch defect or installation adjustment defect
Parking brake switch — CPU board wiring defect

⑧ Wheel diameter setting defect

⑨ Speed sensor defect

⑩ Speed sensor 1·2 connector reverse connection

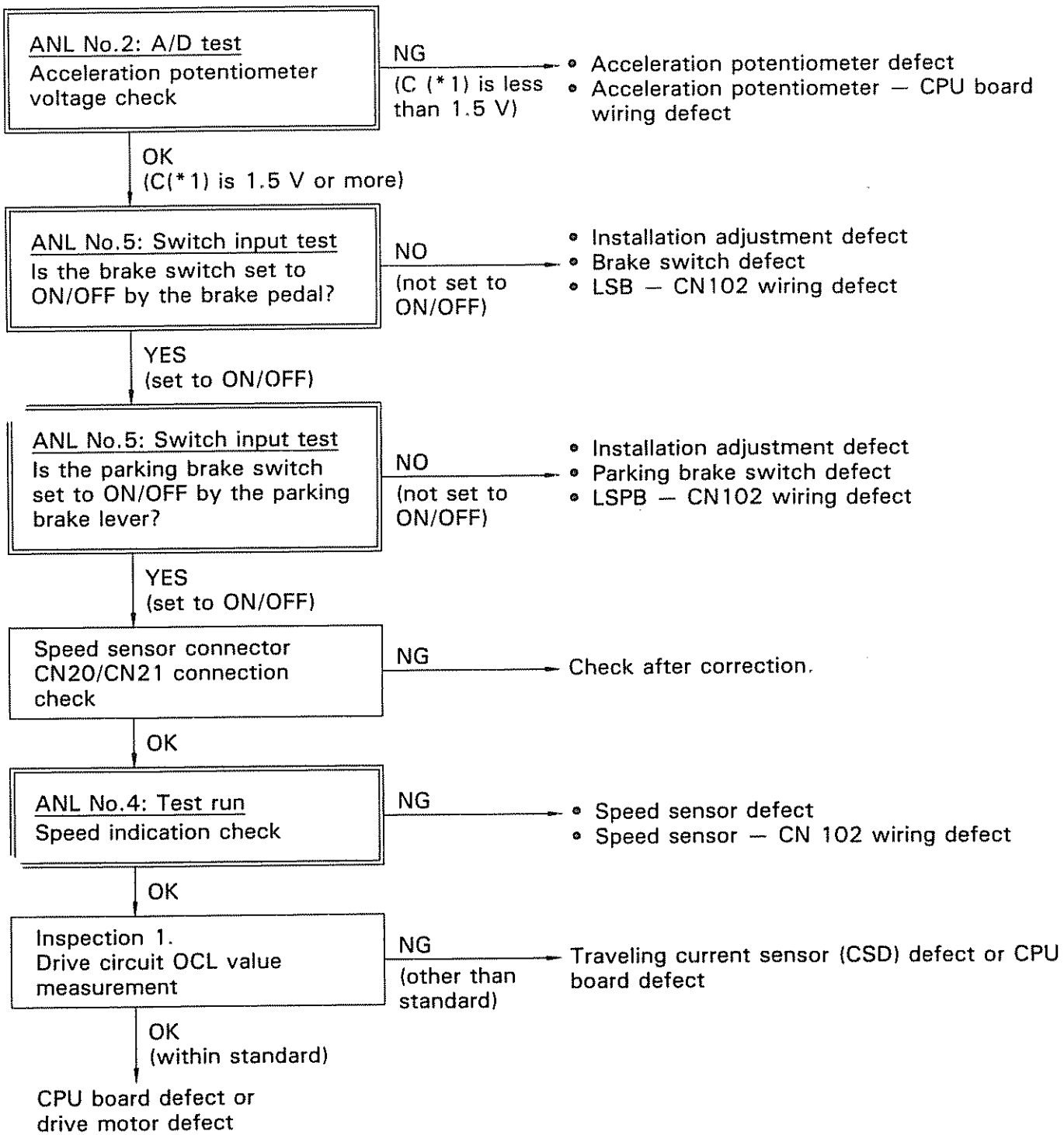
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*1: Voltaje del potenciómetro (A) con el interruptor de aceleración conectado
Voltaje del potenciómetro (B) al apretar el pedal del acelerador hasta el final de su carrera
Calcule C = B - A

Inspección 1. Comprobación del valor OCL del circuito de marcha
Para medir el valor OCL del circuito de marcha, vea la página 2-27.

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*1: Potentiometer voltage (A) upon acceleration switch ON
Potentiometer voltage (B) upon accelerator pedal depression to its stroke end
Calculate C = B — A.

Inspection 1. Drive circuit OCL value check
See page 2-27 for the drive circuit OCL value measurement.

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5. El vehículo marcha sólo en avance o en retroceso.

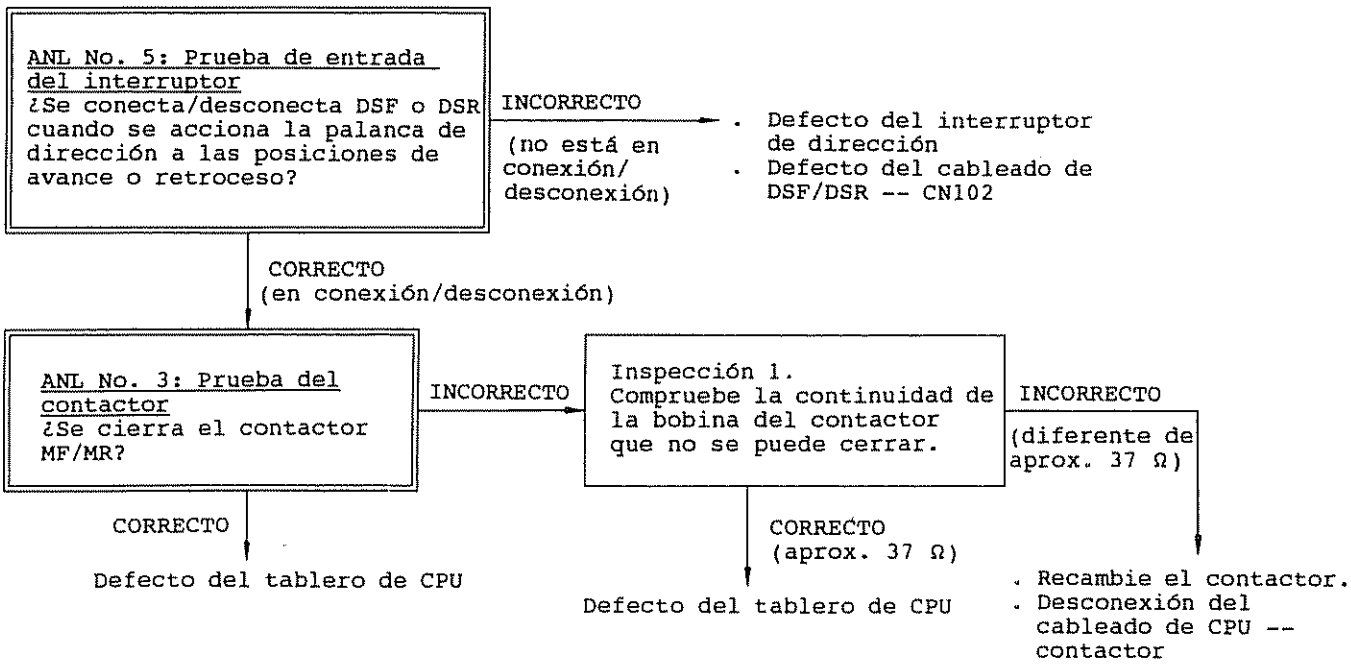
Parte relacionada

Causas estimadas

1 No hay entrada de señal del interruptor de dirección

2 Defeco del contactor MF o MR, o desconexión del cableado

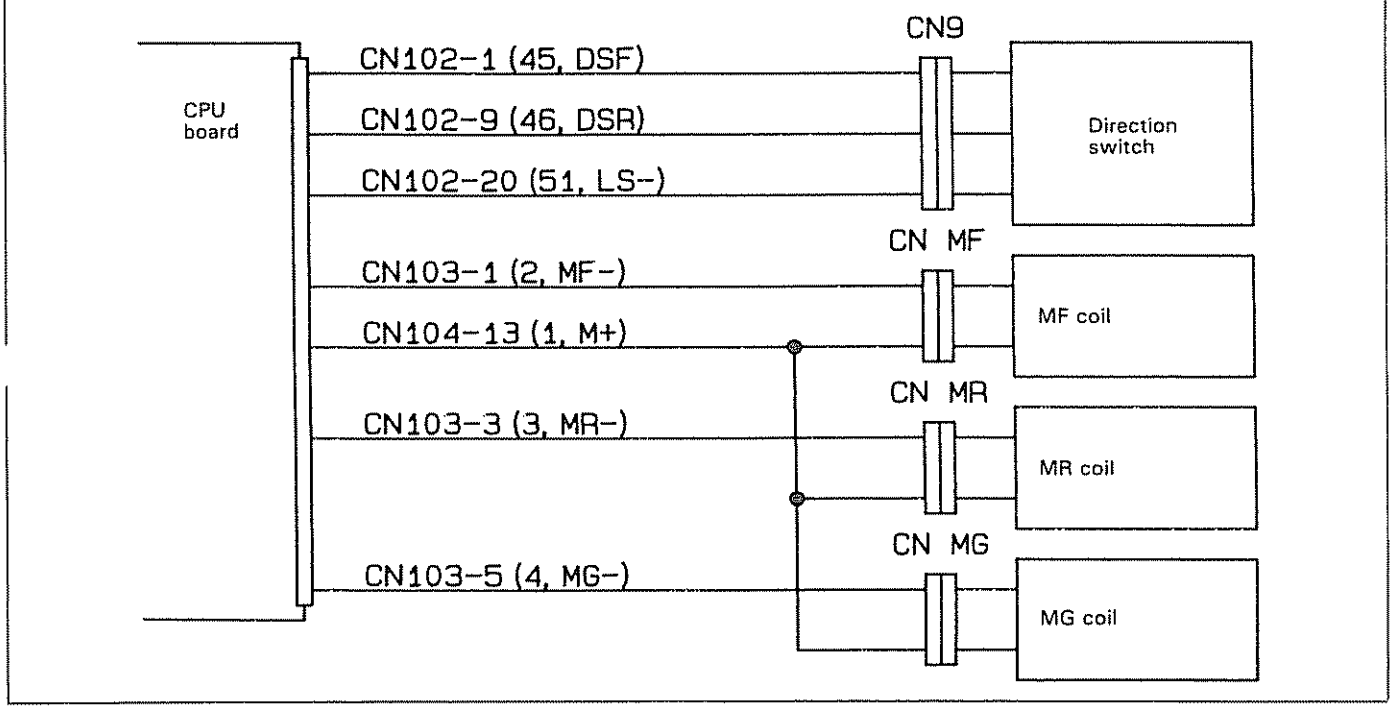
3 Defecto del tablero de CPU



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5. The vehicle travels in either the forward or reverse direction.

Related portion

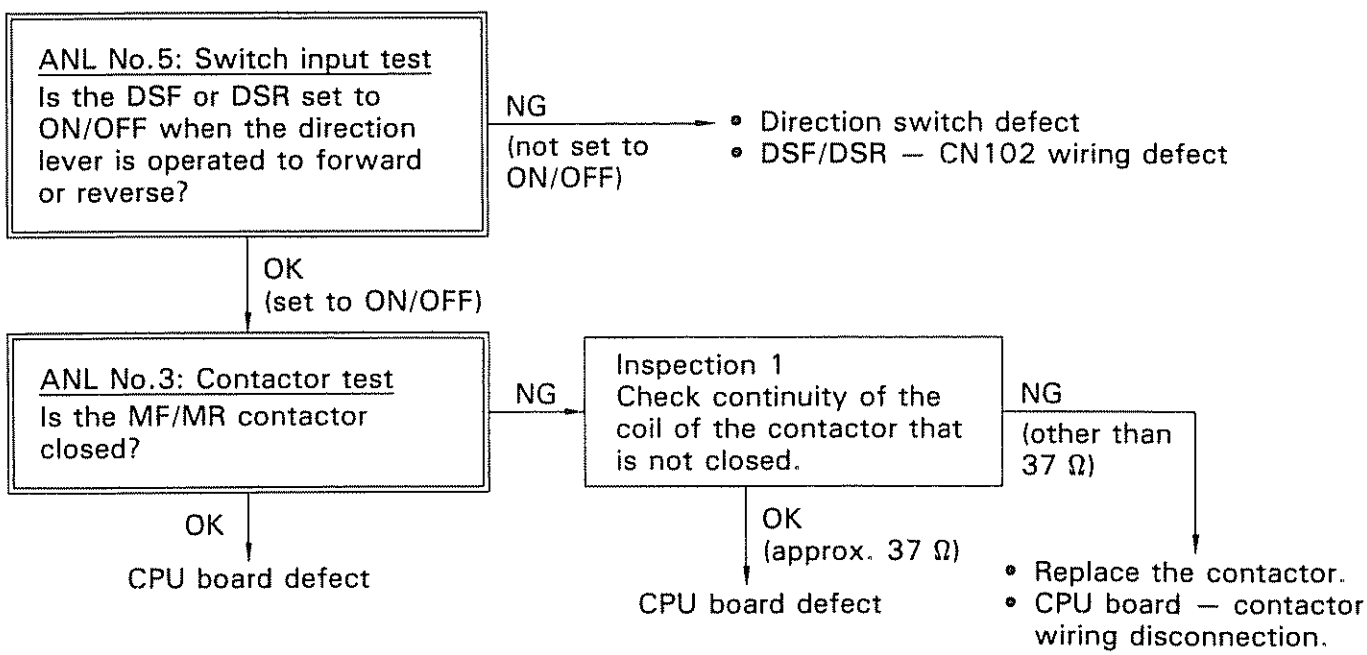


Estimated causes

① No direction switch signal input

② MF or MR contactor defect or wiring disconnection

③ CPU board defect



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Inspección 1. Comprobación de la continuidad de la bobina del contactor
Enchufe de la batería desconectado, desconexión de CN103/CN104

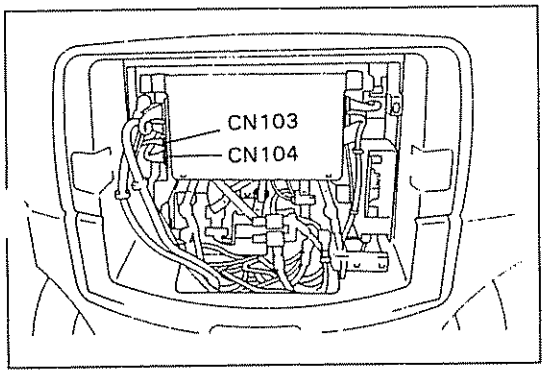
Terminales de medición	MF: CN103-1 (2) -- CN104-13 (1) (conector del lado de REC) MR: CN103-3 (3) -- CN104-13 (1) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

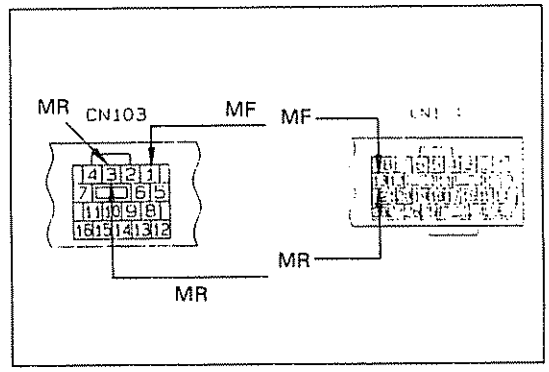
CORRECTO (aprox. 37 Ω) -- Defecto del tablero de CPU
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto del contactor, o desconexión del cableado del tablero de CPU -- contactor

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Inspection 1. Contactor coil continuity check
Battery plug OFF, CN103·CN104 disconnection

Measurement terminals	MF: CN103-1(2) – CN104-13(1) (connector of REC side) MR: CN103-3(3) – CN104-13(1) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → CPU board defect
NG (other than approx. 37 Ω) → Contactor defect, or CPU board – contactor wiring disconnection.

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6. El frenado para regeneración es ineficaz en conmutación de retroceso.
Inmediatamente se cambia a inversión. (Desconecte el contactor MG una vez)

Parte relacionada

Tablero
de CPU

Sensor de velocidad
1

Sensor de velocidad
2

Causas estimadas

1 Defecto del circuito de excitación preliminar

2 Diodo para regeneración (DG) abierto

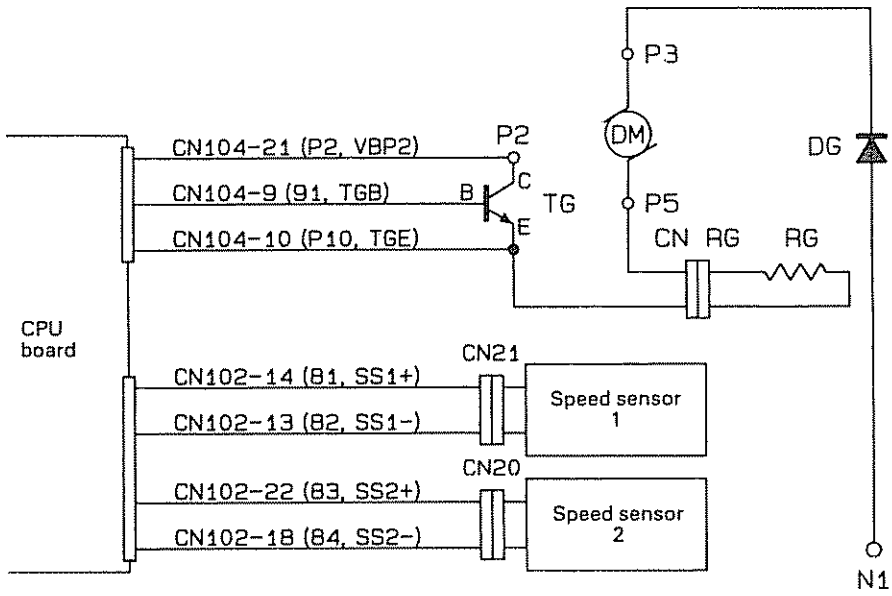
3 Defecto del tablero de CPU

4 Defecto del sensor de velocidad
Defecto del cableado del sensor de velocidad -- CN102

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6. Regenerative braking is ineffective in a switchback operation. Immediate transition to plugging occurs. (The MG contactor is turned OFF once.)

Related portion



Estimated causes

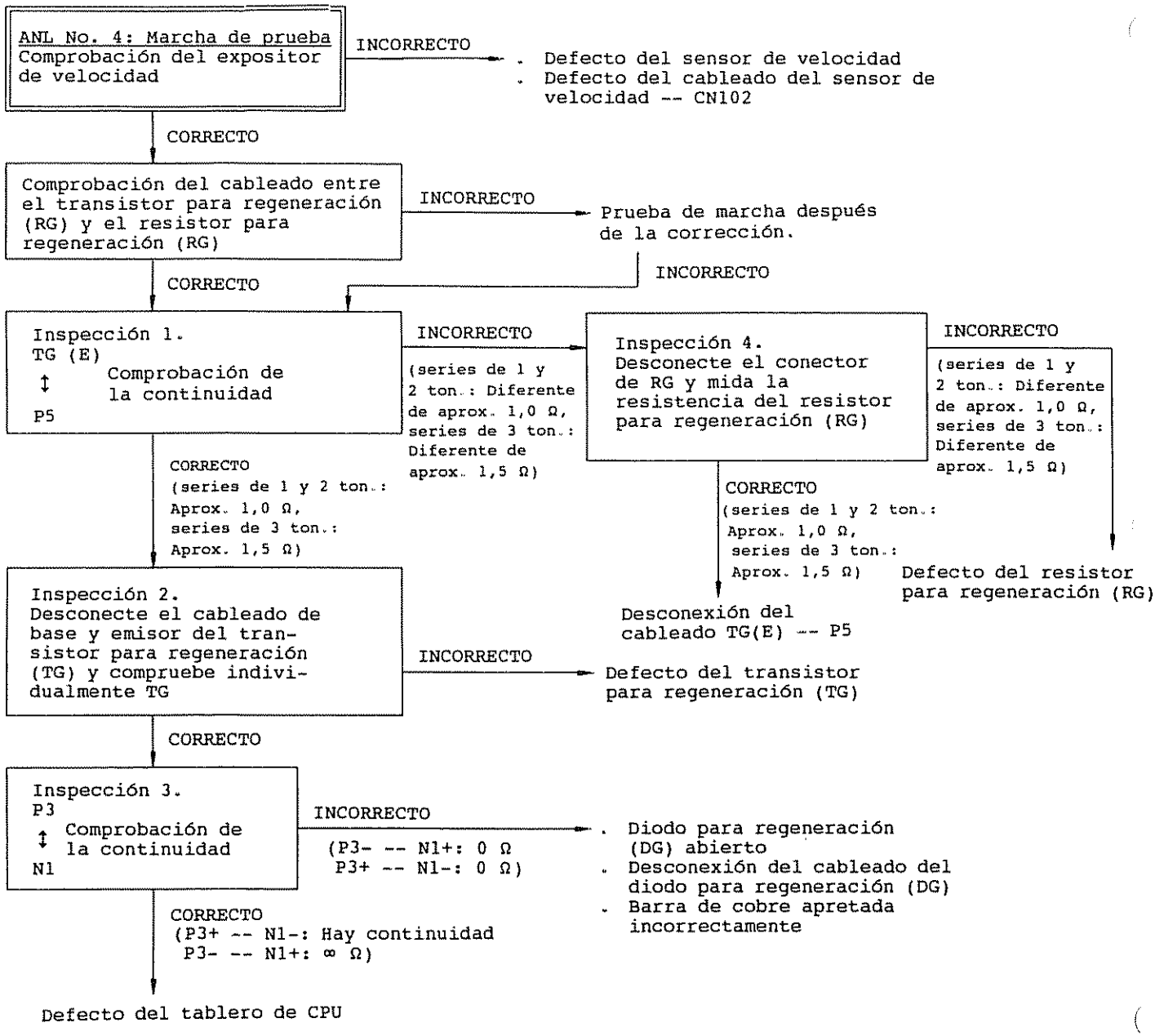
① Preliminary excitation circuit defect

② Regeneration diode (DG) open

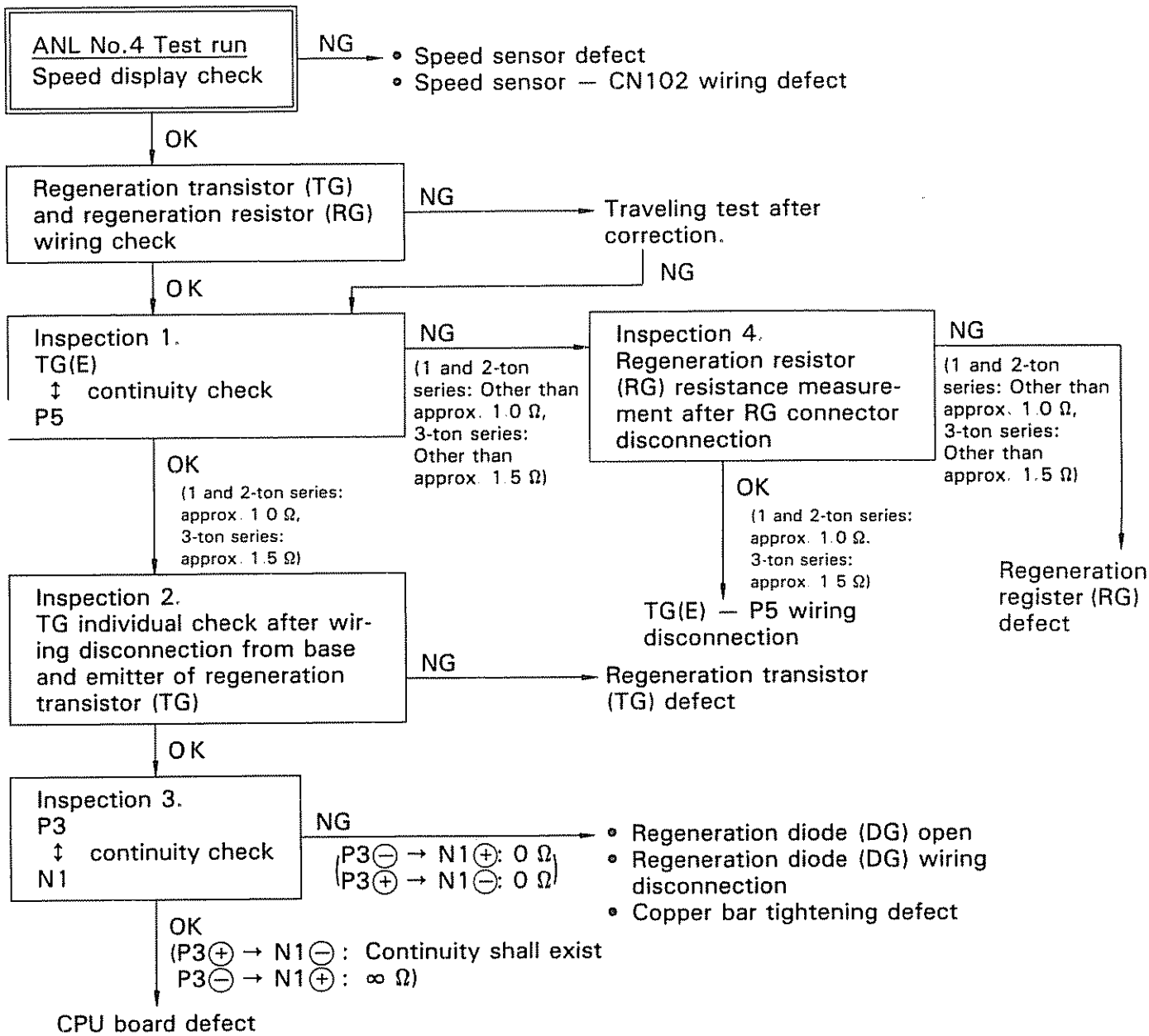
③ CPU board defect

④ Speed sensor defect
Speed sensor — CN102 wiring defect

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Inspección 1. Comprobación de la continuidad entre TG (emisor) -- P5
Enchufe de la batería desconectado

Terminales de medición	TG(E) -- P5
Alcance del probador de circuitos	Ω x 1
Estándar	Series de 1 y 2 ton.: Aprox. 1,0 Ω, series de 3 ton.: Aprox. 1,5 Ω

CORRECTO (estándar) -- A la inspección 2.
INCORRECTO (diferente del estándar) -- A la inspección 4.

Inspección 2. Comprobación individual del transistor para regeneración (TG)
Enchufe de la batería desconectado, desconexión del cableado de base TG y emisor

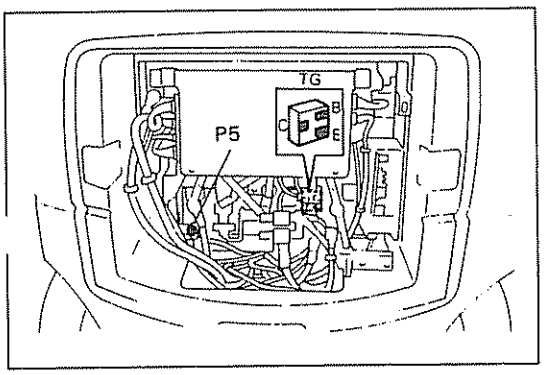
Terminales de medición	Entre B y C	B: Clavija - -- C: Clavija + B: Clavija - -- C: Clavija -
	Entre C y E	C: Clavija - -- E: Clavija + C: Clavija - -- E: Clavija +
Alcance del probador		Ω x 1 K
Estándar	Entre B y C	B: Clavija - -- C: Clavija +: Hay continuidad B: Clavija -- C: Clavija -: ∞ Ω
	Entre C y E	C: Clavija - -- E: Clavija +: Hay continuidad C: Clavija - -- E: Clavija -: ∞ Ω

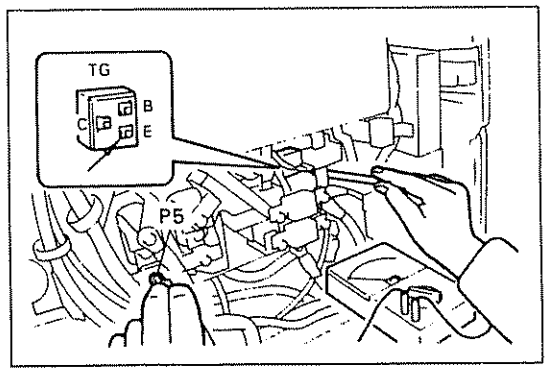
CORRECTO (estándar) -- A la inspección 3.
INCORRECTO (diferente del estándar) -- Defecto del transistor para regeneración (TG)

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Inspection 1. TG (emitter) — P5 continuity check
Battery plug OFF

Measurement terminals	TG(E) — P5
Circuit tester range	Ω × 1
Standard	1 and 2-ton series: Approx. 1.0 Ω, 3-ton series: Approx. 1.5 Ω

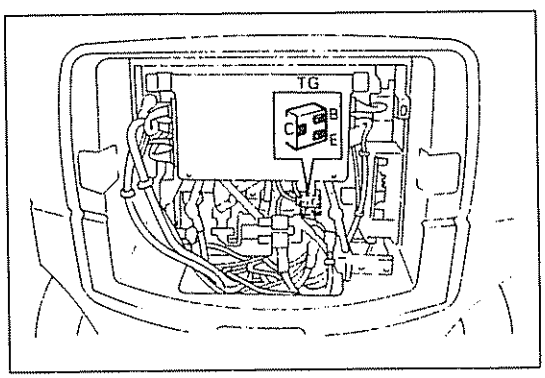


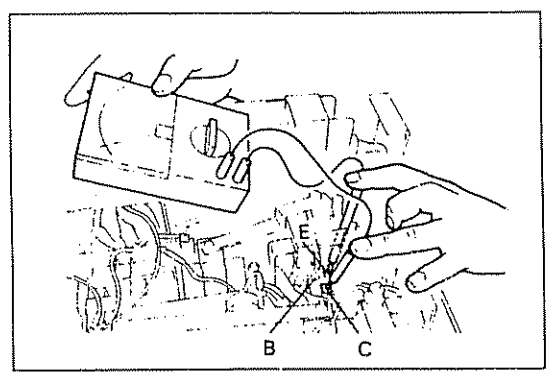


OK (standard) → To inspection 2.
NG (other than standard) → To inspection 4.

Inspection 2. Regeneration transistor (TG) individual check
Battery plug OFF, TG base and emitter wiring disconnection

Measurement terminals	Between B and C	B: ⊖ probe — C: ⊕ probe B: ⊕ probe — C: ⊖ probe
	Between C and E	C: ⊖ probe — E: ⊕ probe C: ⊖ probe — E: ⊕ probe
Circuit tester range	Ω × 1 K	
Standard	Between B and C	B: ⊖ probe — C: ⊕ probe: Continuity shall exist. B: ⊕ probe — C: ⊖ probe: ∞ Ω
	Between C and E	C: ⊖ probe — E: ⊕ probe: Continuity shall exist. C: ⊕ probe — E: ⊖ probe: ∞ Ω





OK (standard) → To inspection 3.
NG (other than standard) → Regeneration transistor (TG) defect.

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Inspección 3. Comprobación de la continuidad del circuito del diodo para regeneración (DG) (entre P3 y N1)
Enchufe de la batería desconectado

Terminales de medición	P3 - -- N1 + P3 + -- N1 -
Alcance del probador de circuitos	Ω x 1
Estándar	P3 + -- N1 -: Hay continuidad. P3 - -- N1 +: ∞ Ω

CORRECTO (estándar) -- Defecto del tablero de CPU
INCORRECTO (diferente del estándar) -- El diodo para regeneración (DG) está abierto, el cableado de DG está desconectado y la barra de cobre está apretada incorrectamente

Inspección 4. Comprobación individual del resistor para regeneración (RG)
Enchufe de la batería desconectado, desconexión del conector RG

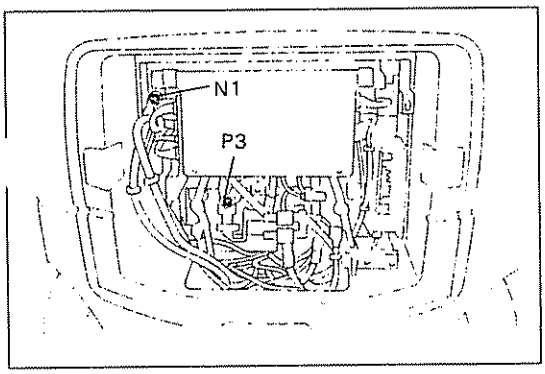
Terminales de medición	Ambos terminales del conector RG (en el lado de RG)
Alcance del probador de circuitos	Ω x 1
Estándar	Series de 1 y 2 ton.: Aprox. 1,0 Ω, series de 3 ton.: Aprox. 1,5 Ω

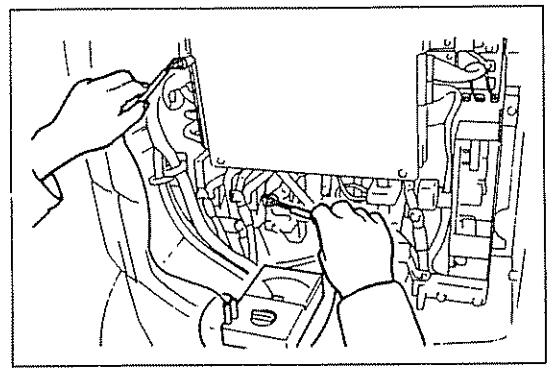
CORRECTO (estándar) -- Desconexión del cableado de TG(E) -- P5
INCORRECTO (diferente del estándar) -- Defecto del resistor para regeneración (RG)

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Inspection 3. Regeneration diode (DG) circuit continuity check (between P3 and N1)
Battery plug OFF

Measurement terminals	P3⊖ – N1⊕ P3⊕ – N1⊖
Circuit tester range	Ω × 1
Standard	P3⊕ – N1⊖: Continuity shall exist. P3⊖ – N1⊕: ∞ Ω

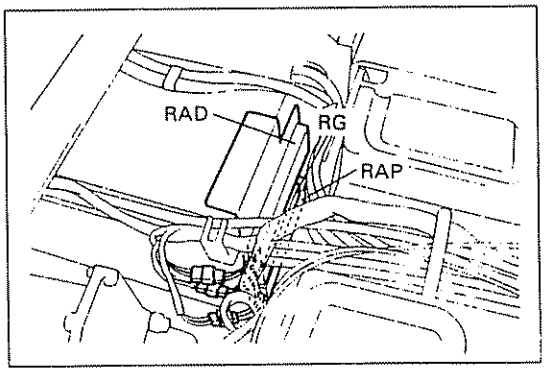


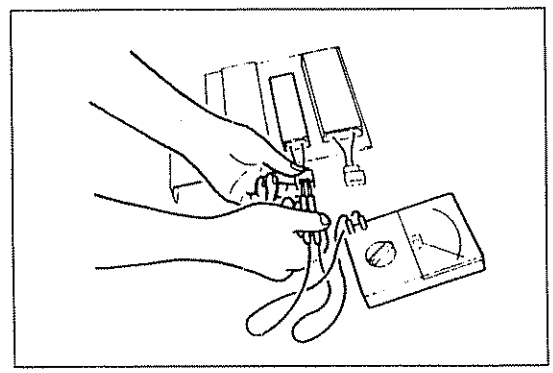


OK (standard) → CPU board defect.
NG (other than standard) → Regeneration diode (DG) open, DG wiring disconnection, or copper bar tightening defect

Inspection 4. Regeneration resistor (RG) individual check
Battery plug OFF, RG connector disconnection

Measurement terminals	Both terminals of RG connector (on RG side)
Circuit tester range	Ω × 1
Standard	1 and 2-ton series: Approx. 1.0 Ω, 3-ton series: Approx. 1.5 Ω





OK (standard) → TG(E) – P5 wiring disconnection
NG (other than standard) → Regeneration register (RG) defect

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CUANDO NO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO (SISTEMA DE MANIPULACION DE MATERIALES)

1. El motor de manipulación de materiales no funciona.

Parte relacionada

Tablero de CPU

- Interruptor de basculación
- Interruptor de elevación
- Interruptor del accesorio
- Bobina de MP

Causas estimadas

1 Defecto del interruptor del sistema de manipulación de materiales

2 Defecto del motor de manipulación de materiales

3 Defecto del contactor MP o defecto del cableado

4 Defecto de conexión del circuito principal de manipulación de materiales

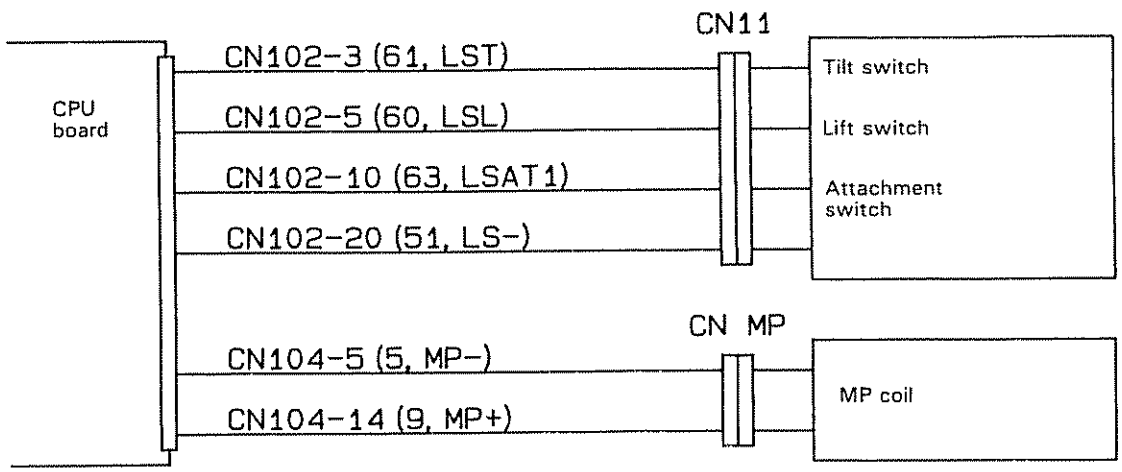
5 Defecto del tablero de CPU

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WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED (MATERIAL HANDLING SYSTEM)

1. The material handling pump motor does not run.

Related portion



Estimated causes

① Material handling system switch defect

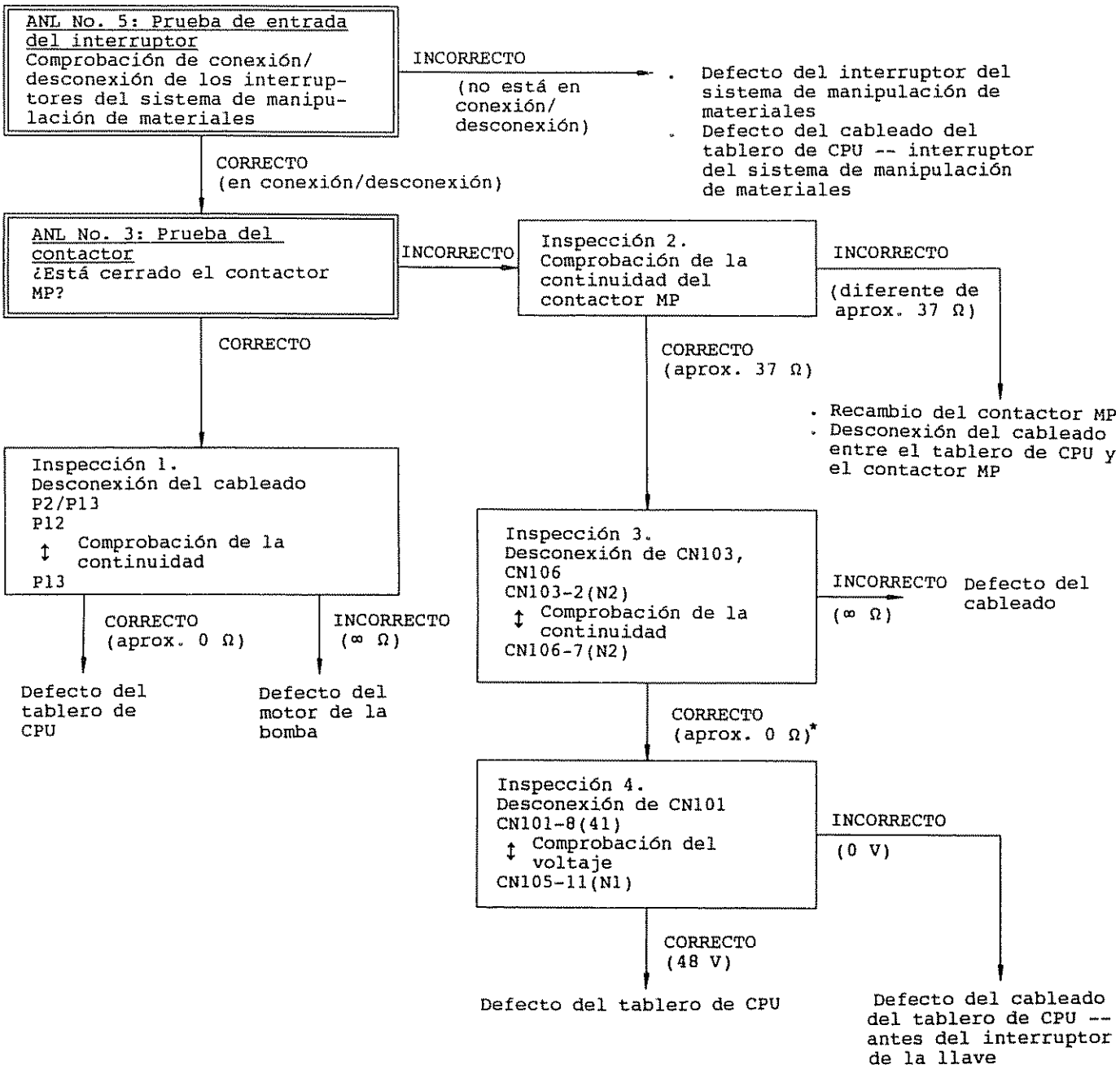
② Material handling motor defect

③ MP contactor defect or wiring defect

④ Material handling main circuit connection defect

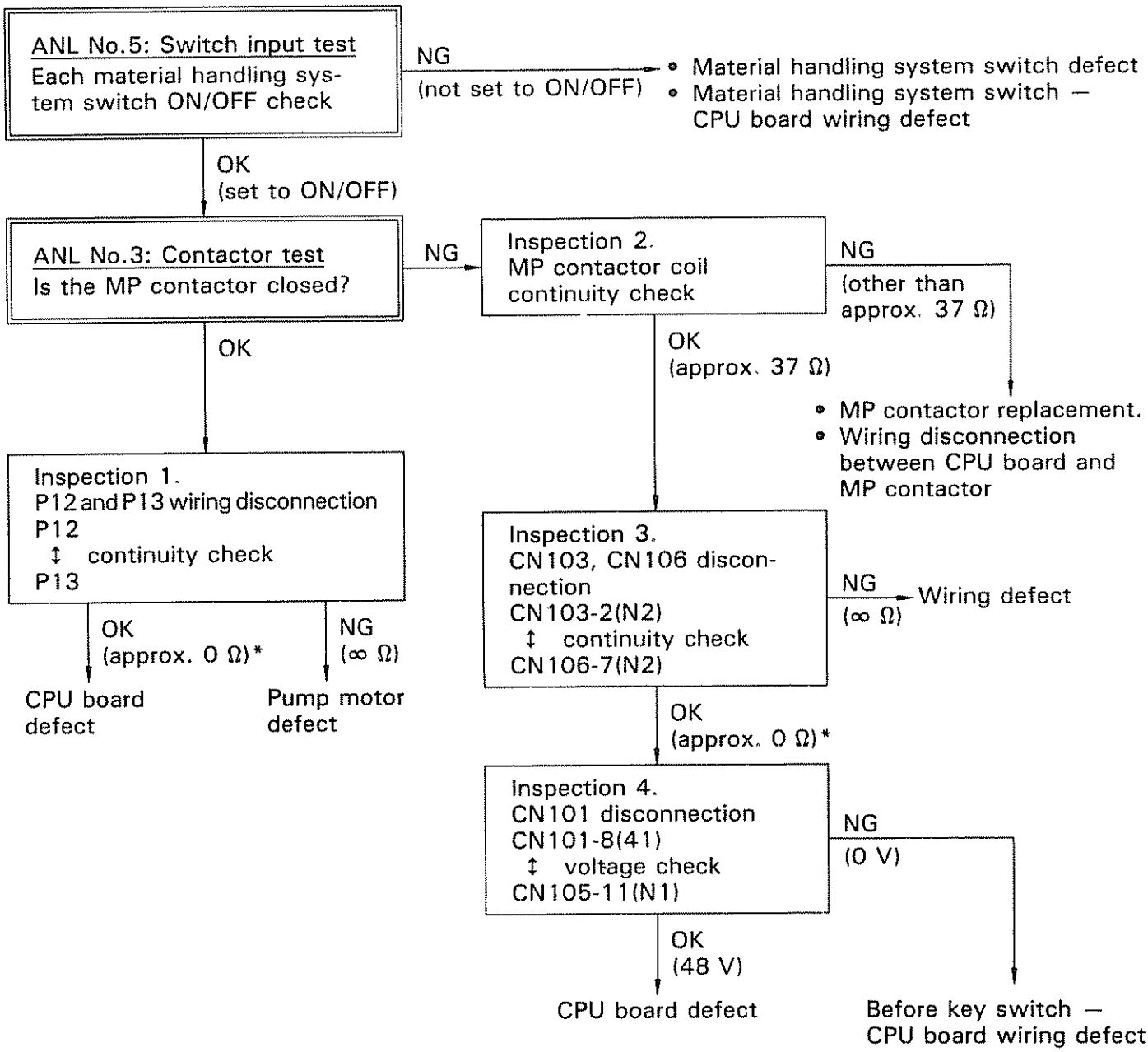
⑤ CPU board defect

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* Aprox. 0 Ω es la resistencia de la bobina del motor muy cercana a 0 Ω.

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* Approx. 0 Ω is the motor coil resistance very close to 0 Ω.

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Inspección 1. Comprobación de la continuidad del cableado de P12 -- P13
Enchufe de la batería desconectado, desconexión del cableado de P12 y P13 y de la barra de cobre

Terminales de medición	P12 -- P13
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

CORRECTO (aprox. 0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Defecto del motor de la bomba

Inspección 2. Comprobación de la continuidad de la bobina del contactor MP
Enchufe de la batería desconectado, desconexión de CN104

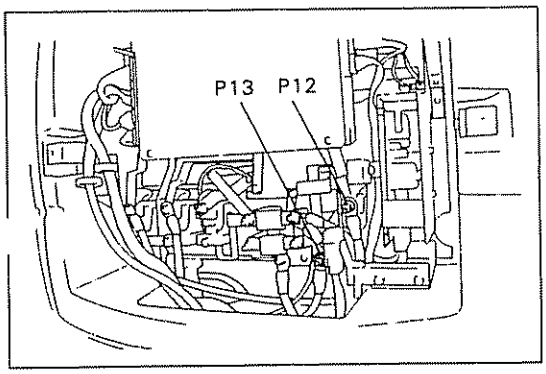
Terminales de medición	CN104-5 (5) -- CN104-14 (9) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

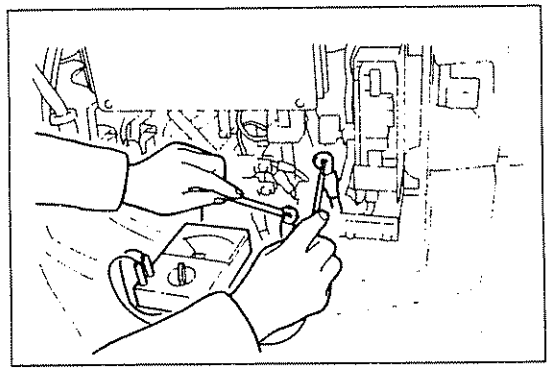
CORRECTO (aprox. 37 Ω) -- A la inspección 3.
INCORRECTO (diferente de aprox. 37 Ω) -- Defecto del contactor MP, desconexión del cableado del tablero de CPU/contactor MP

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Inspection 1. P12 — P13 wiring continuity check
Battery plug OFF, P12 and P13 wiring and copper bar disconnection

Measurement terminals	P12 — P13
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω

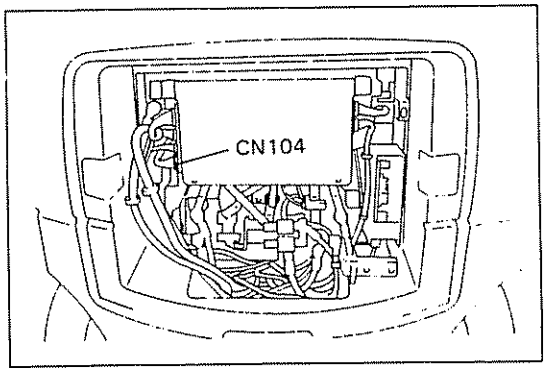


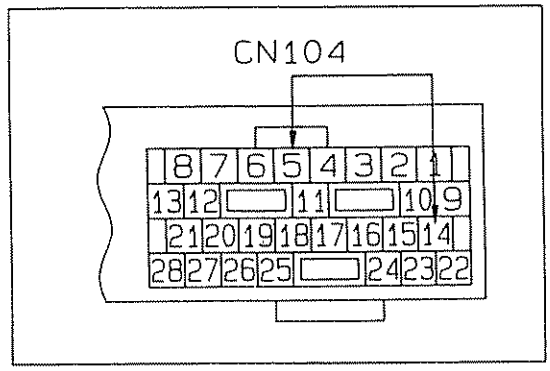


OK (approx. 0 Ω) → CPU board defect
NG (∞ Ω) → Pump motor defect

Inspection 2. MP contactor coil continuity check
Battery plug OFF, CN104 disconnection

Measurement terminals	CN104-5(5) — CN104-14(9) (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → To inspection 3.
NG (other than approx. 37 Ω) → MP contactor defect, CPU board — MP contactor wiring disconnection

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Inspección 3. Comprobación de la continuidad del cableado
Enchufe de la batería desconectado, desconexión de CN103/CN106

Terminales de medición	CN103-2 (N2) -- CN106-7 (N2) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A la inspección 4.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 4. Comprobación del voltaje de antes del interruptor de la llave
Enchufe de la batería conectado, interruptor de la llave conectado, desconexión de CN101

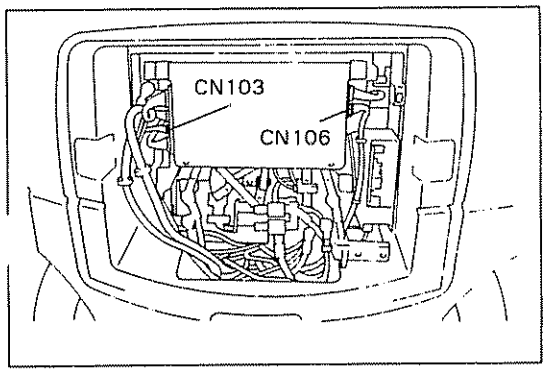
Terminales de medición	CN101-8 (41) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	48 V

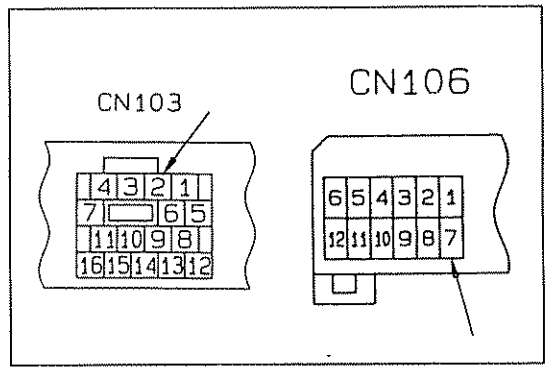
CORRECTO (48 V) -- Defecto del tablero de CPU
INCORRECTO (0 V) -- Defecto del cableado de antes del interruptor de la llave -- tablero de CPU

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Inspection 3. Wiring continuity check
Battery plug OFF, CN103·CN106 disconnection

Measurement terminals	CN103-2(N2) — CN106-7(N2) (connector of REC side)
Circuit tester range	Ω × 1
Standard	0 Ω

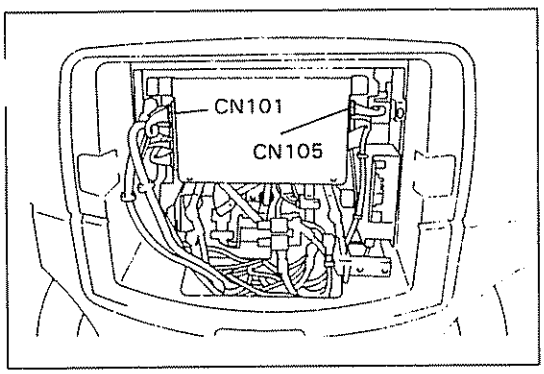


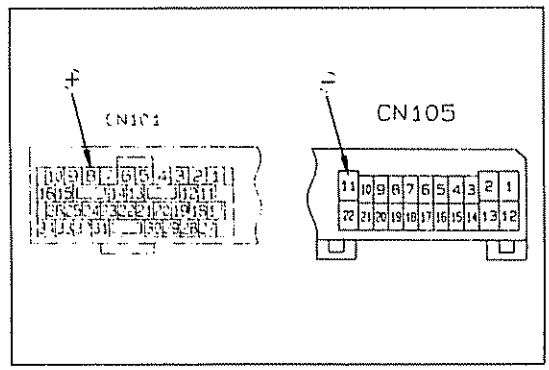


OK (0 Ω) → To inspection 4.
NG (∞ Ω) → Wiring defect.

Inspection 4. Before key switch voltage check
Battery plug ON, key switch ON, CN101 disconnection

Measurement terminals	CN101-8(41)⊕ — CN105-11(N1)⊖
Circuit tester range	DC 50 V
Standard	48 V





OK (48 V) → CPU board defect.
NG (0 V) → Before key switch — CPU board wiring defect.

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BUSQUEDA DE AVERIAS DEL SISTEMA DE LA DIRECCION

CUANDO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

Código de error F0: Anormalidad de la dirección de potencia asistida

El código de error F0 resume la búsqueda de averías para cada código de segmentación de la memoria del analizador.

F0: Anormalidad de la PS	F0-1: Anormalidad del circuito principal de la PS
	F0-2: Detección de desconexión del sensor
	F0-3: Detección de cortocircuito del sensor

Código de error F0-1: Anormalidad del circuito principal de la PS

El código de error F0-1 puede causar una parte defectuosa afectando a las otras partes. Si se capta incluso una parte defectuosa en el cuadro, el trabajo de inspección debe realizarse hasta el último punto.

Parte relacionada

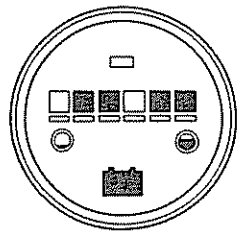
Tablero de CPU

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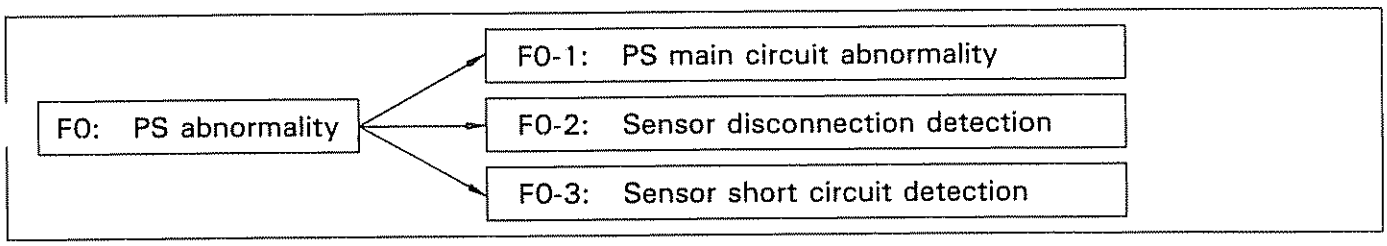
STEERING SYSTEM TROUBLESHOOTING

WHEN DIAGNOSTIC ERROR CODE IS DISPLAYED

Error code F0: Power steering abnormality

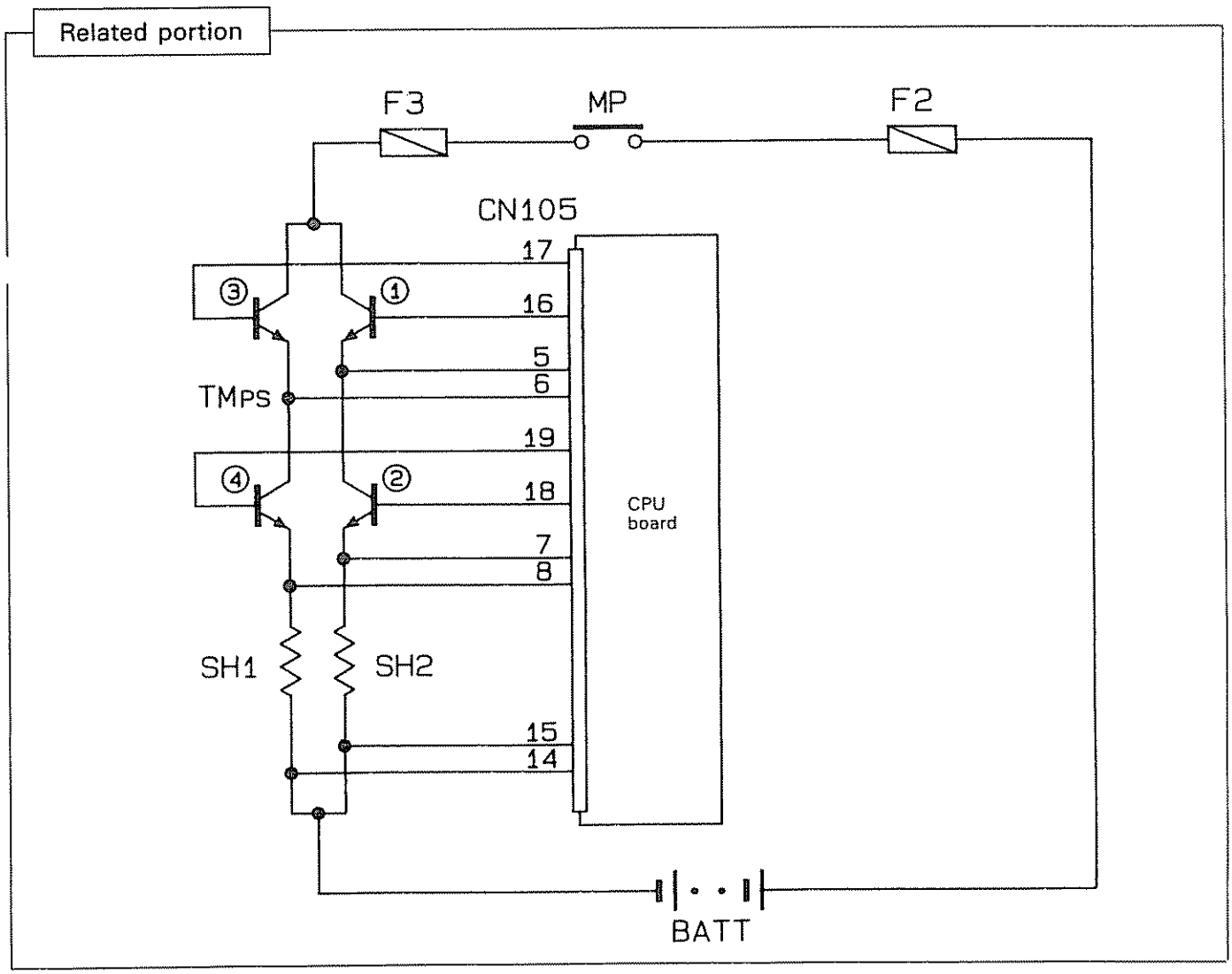


Error code F0 summarizes troubleshooting for each segmentation code of the analyzer memory.



Error code F0-1: PS main circuit abnormality

Since error code F0-1 involves possible influence of the defective portion on other portions, the inspection work must be done to the final item even if the defective portion is identified midway of the flowchart.



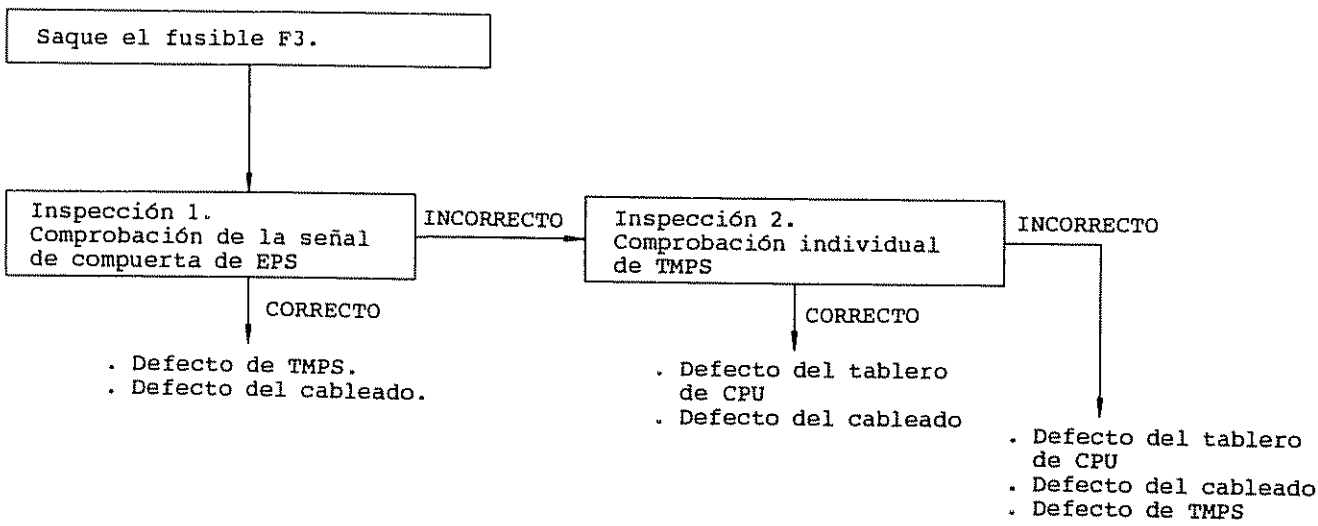
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Causas estimadas

1 Defecto del tablero de CPU

2 Conector o cableado desconectado o cortocircuitado

3 MPS (IGBT) 1 -- 2 cortocircuitado o abierto



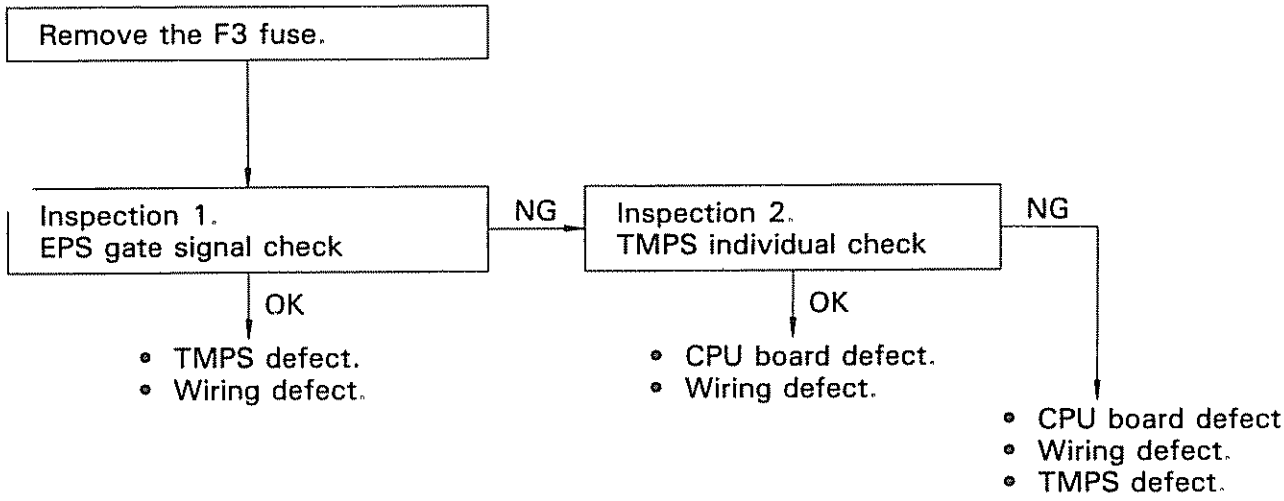
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Estimated causes

① CPU board defect

② Connector or wiring disconnection or short circuit

③ TMPS (IGBT) ① – ② short or open circuit



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Inspección 1. Comprobación de la señal de compuerta de EPS
Enchufe de la batería conectado, interruptor de la llave conectado, desconexión del conector de compuerta del lado TMPS y funcionamiento del volante de dirección

(1) Tablero de CPU

[Explicación] 1E: emisor TMPS1 4G: compuerta TMPS4

A: CN105-16 (1G) + -- CN105-5 (1E) -:
Cuando se gira el volante hacia la derecha: Aprox. 15,5 V
Cuando se gira el volante hacia la izquierda o en posición neutra: 1 V o menos

B: CN105-18 (2G) + -- CN105-11 (N1) -:
Cuando se gira el volante hacia la izquierda: Cambio suave de voltaje entre 0 y aprox. 13 V en las series de 1 tonelada o entre 0 y aprox. 12 V en las series de 2 y 3 toneladas
Cuando se gira el volante hacia la derecha o en posición neutra: 1 V o menos

C: CN105-17 (3G) + -- CN105-6 (3E) -:
Cuando se gira el volante hacia la izquierda: Aprox. 15,5 V
Cuando se gira el volante hacia la derecha o en posición neutra: 1 V o menos

D: CN105-19 (4G) + -- CN105-11 (N1) -:
Cuando se gira el volante hacia la derecha: Cambio suave entre 0 y aprox. 13 V en las series de 1 tonelada o entre 0 y aprox. 12 V en las series de 2 y 3 toneladas
Cuando se gira el volante de dirección hacia la izquierda o en posición neutra: 1 V o menos

(2) Comprobación del cableado
Compruebe la continuidad en las partes siguientes:
SH1 - -- CN105-14 (SH1-)
SH1 - -- N1
SH2 - -- CN105-15 (SH2-)
SH2 - -- N1
CN105 es conector del lado de REC
CORRECTO: (0 Ω)
INCORRECTO: (∞ Ω)

Inspección 2. Comprobación individual de TMPS (IGBT)
Para comprobación individual de TMPS, vea la página 2-12.

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Inspection 1. EPS gate signal check
Battery plug ON, key switch ON, TMPS side gate connector disconnection, and steering wheel operation

(1) CPU board

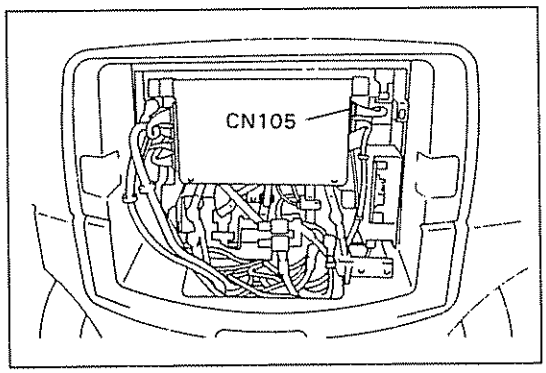
[Explanation] 1E: TMPS1 emitter 4G: TMPS4 gate

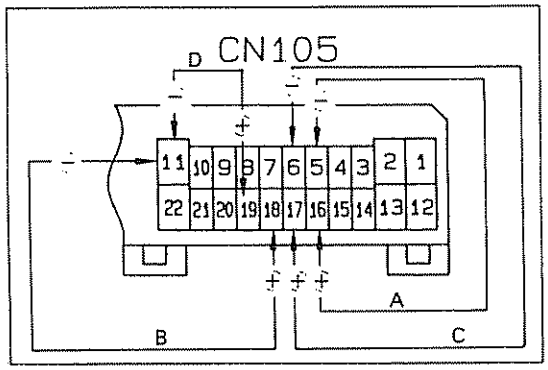
A: CN105-16(1G) ⊕ — CN105-5(1E) ⊖ :
When the steering wheel is rotated clockwise: Approx. 15.5 V
When the steering wheel is rotated counterclockwise or at the neutral position: 1 V or less

B: CN105-18(2G) ⊕ — CN105-11(N1) ⊖ :
When the steering wheel is rotated counterclockwise: Smooth change between 0 and approx. 13 V in 1-ton series or between 0 and approx. 12 V in 2 and 3-ton series
When the steering wheel is rotated clockwise or at the neutral position: 1 V or less

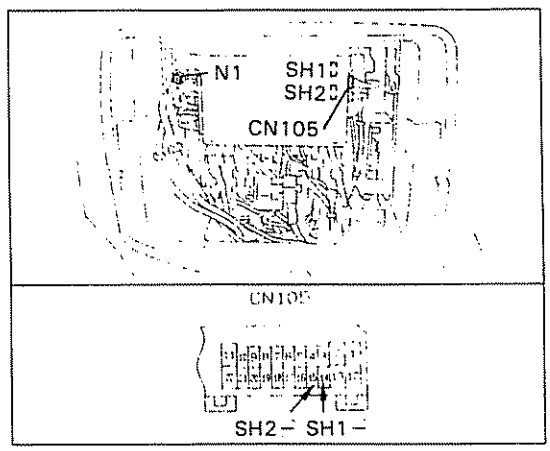
C: CN105-17(3G) ⊕ — CN105-6(3E) ⊖ :
When the steering wheel is rotated counterclockwise: Approx. 15.5 V
When the steering wheel is rotated clockwise or at the neutral position: 1 V or less

D: CN105-19(4G) ⊕ — CN105-11(N1) ⊖ :
When the steering wheel is rotated clockwise: Smooth change between 0 and approx. 13 V in 1-ton series or between 0 and approx. 12 V in 2 and 3-ton series
When the steering wheel is rotated counterclockwise or at the neutral position: 1 V or less





(2) Wiring check
Check continuity at the following portions:
SH1⊖ — CN105-14(SH1-)
SH1⊖ — N1
SH2⊖ — CN105-15(SH2-)
SH2⊖ — N1
CN105 is connector of REC side
OK: 0 Ω
NG: ∞ Ω



Inspection 2. TMPS (IGBT) individual check
For the TMPS individual check,
see page 2-12.

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Código de error F0-2: Detección de la desconexión del sensor
Código de error F0-3: Detección del cortocircuito

Parte relacionada

Tablero de CPU

Sensor de par (torque)

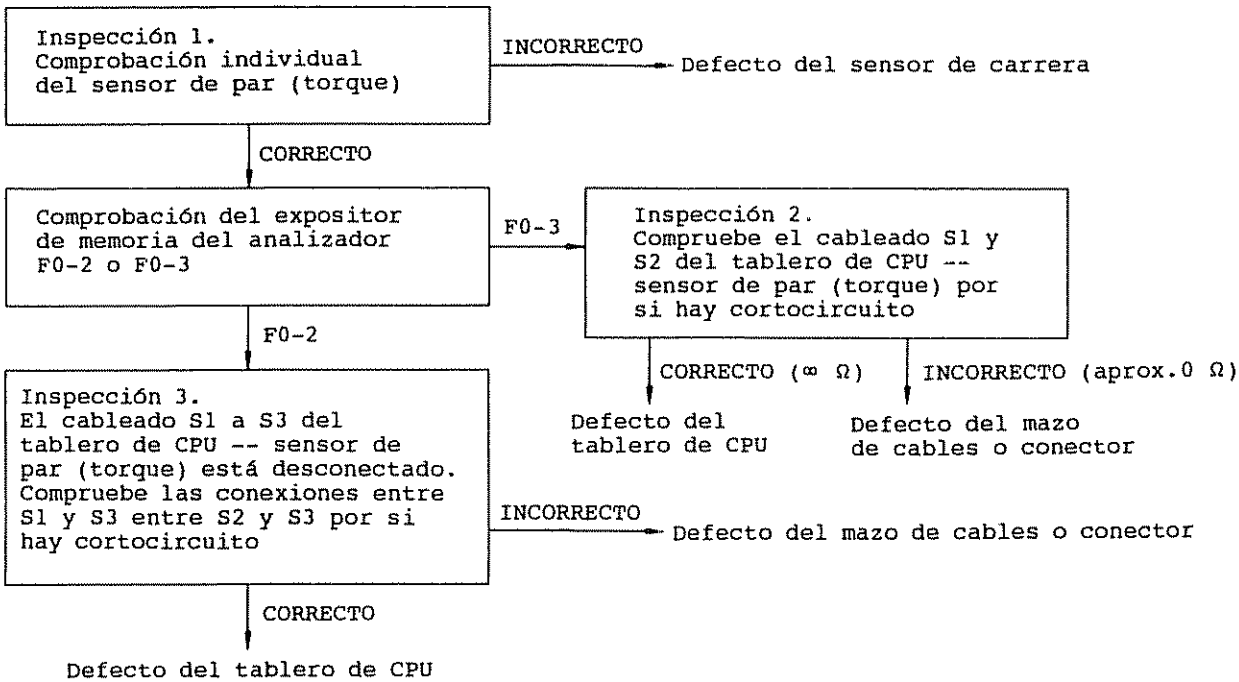
Causas estimadas

1 Defecto del sensor de par (torque)

2 Desconexión del mazo de cables o cortocircuito

3 Defecto de contacto del conector

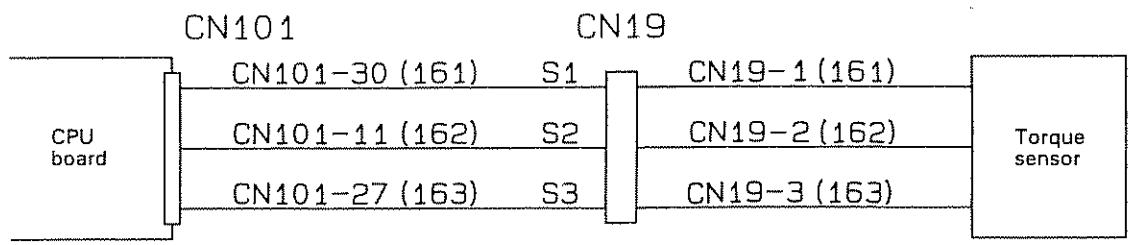
4 Defecto del tablero de CPU



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Error code F0-2: Sensor disconnection detection
Error code F0-3: Short circuit detection

Related portion



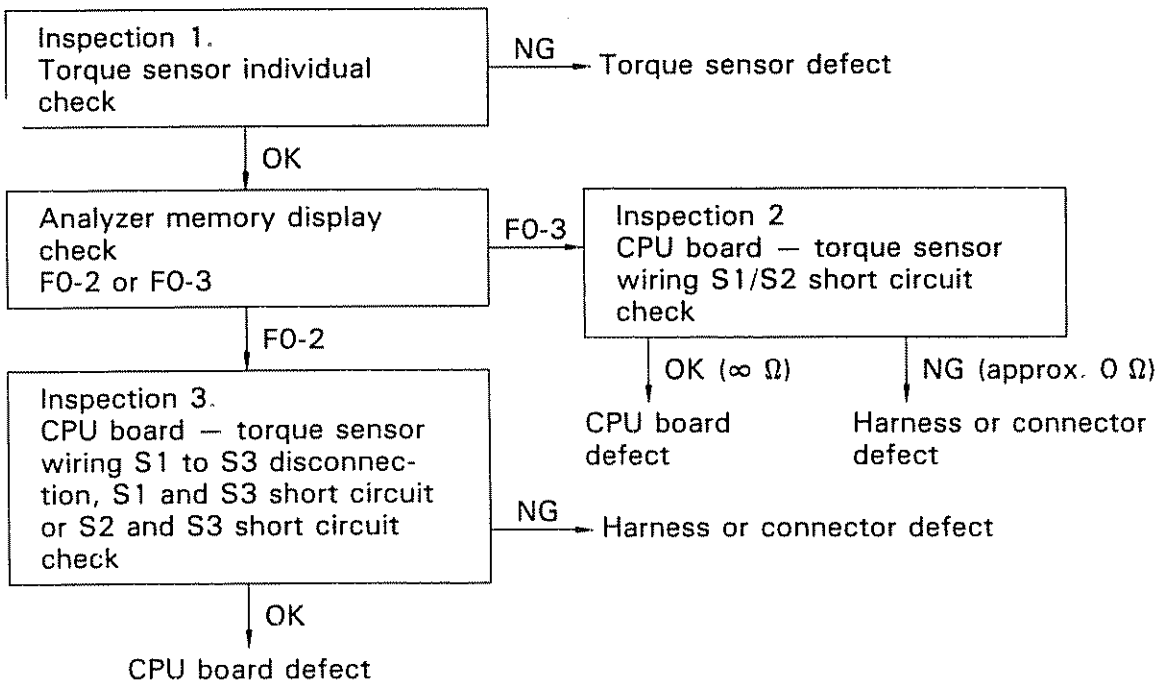
Estimated causes

① Torque sensor defect

② Harness disconnection or short circuit

③ Connector contact defect

④ CPU board defect



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Inspección 1. Comprobación individual del sensor de par (torque)
Enchufe de la batería desconectado

Terminales de medición	A: CN101-30 (161) -- CN101-11 (162) (conector del lado de REC) B: CN101-27 (163) -- CN101-11 (162) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1 K
Estándar	Cambio suave entre 0 y aprox. 5 kΩ

CORRECTO (estándar) -- Comprobación de la memoria del analizador (F0-2 o F0-3)
CORRECTO (diferente del estándar) -- Defecto del sensor de par (torque)

Inspección 2. Comprobación del cableado del tablero de CPU -- sensor de par (torque) (1)
Enchufe de la batería desconectado, desconexión del conector del sensor de par (torque)

Terminales de medición	CN101-30 (161) -- CN19-2 (162) (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	∞ Ω

CORRECTO (∞ Ω) -- Defecto del tablero de CPU
INCORRECTO (0 Ω) -- Defecto del mazo de cables o conector

Inspección 3. Comprobación del cableado del tablero de CPU -- sensor de par (torque) (2)
Enchufe de la batería desconectado, desconexión del conect del sensor de par (torque)

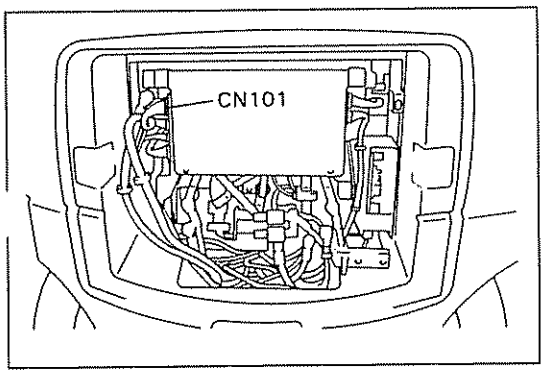
Terminales de medición	Conector CN101 -- Conector CN19 (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	CN101-30 (161) -- CN19-1 (161): 0 Ω CN101-11 (162) -- CN19-2 (162): 0 Ω CN101-27 (163) -- CN19-3 (163): 0 Ω CN101-30 (161) -- CN19-3 (163): ∞ Ω CN101-11 (162) -- CN19-3 (163): ∞ Ω

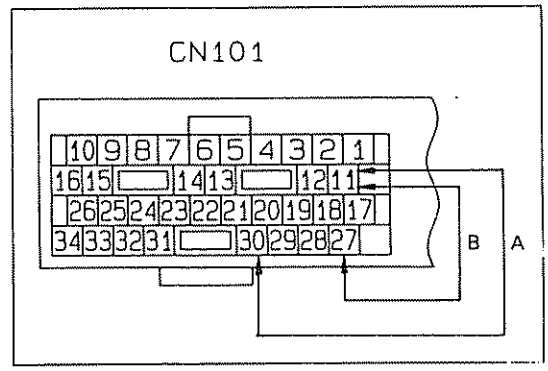
CORRECTO (estándar) -- Defecto del tablero de CPU
INCORRECTO (diferente del estándar) -- Defecto del mazo de cables o conector

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Inspection 1. Torque sensor individual check
Battery plug OFF

Measurement terminals	A: CN101-30(161) — CN101-11(162) (connector of REC side) B: CN101-27(163) — CN101-11(162) (connector of REC side)
Circuit tester range	Ω × 1 K
Standard	Smooth change between 0 and approx. 5 kΩ





OK (standard) → Analyzer memory (F0-2 or F0-3) check
NG (other than standard) → Torque sensor defect

Inspection 2. CPU board — torque sensor wiring check (1)
Battery plug OFF, torque sensor connector disconnection

Measurement terminals	CN101-30(161) — CN19-2(162) (connector of REC side)
Circuit tester range	Ω × 1
Standard	∞ Ω

OK (∞ Ω) → CPU board defect
NG (0 Ω) → Harness or connector defect

Inspection 3. CPU board — torque sensor wiring check (2)
Battery plug OFF, torque sensor connector disconnection

Measurement terminals	CN101 connector — CN19 connector (connector of REC side)
Circuit tester range	Ω × 1
Standard	CN101-30(161) — CN19-1(161): 0 Ω CN101-11(162) — CN19-2(162): 0 Ω CN101-27(163) — CN19-3(163): 0 Ω CN101-30(161) — CN19-3(163): ∞ Ω CN101-11(162) — CN19-3(163): ∞ Ω

OK (standard) → CPU board defect
NG (other than standard) → Harness or connector defect

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CUANDO NO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

1. Falla la potencia asistida

Parte relacionada

Causas estimadas

1 Defecto del contactor MP

2 Defecto de TMPS (IGBT)

3 Desconexión del mazo de cables o cortocircuito

4 Defecto del motor

5 Defecto del tablero de CPU

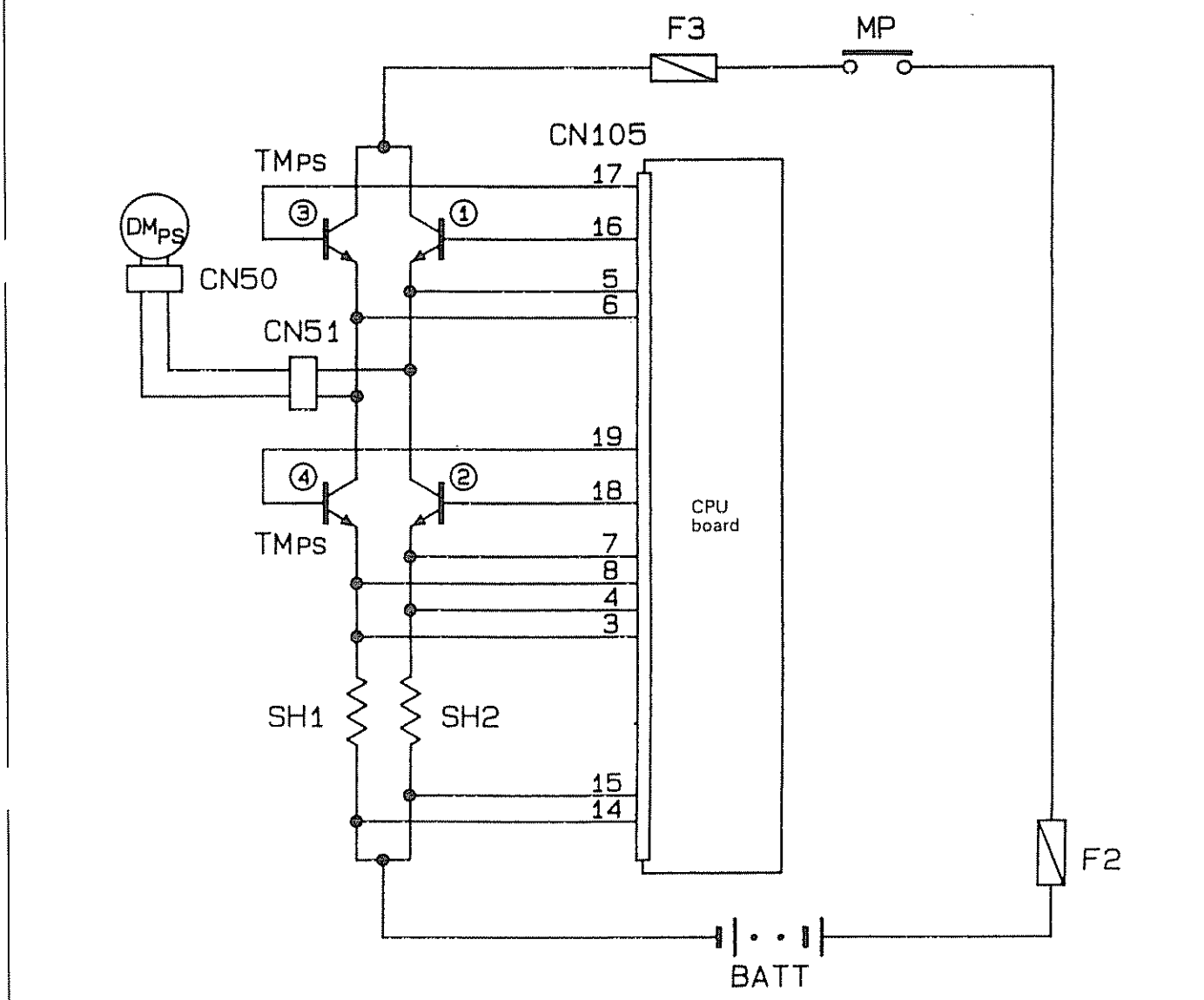
6 Defecto del fusible F3

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WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED

1. Power assist fails.

Related portion



Estimated causes

① MP contactor defect

② TMPS (IGBT) defect

③ Harness disconnection or open circuit

④ Motor defect

⑤ CPU board defect

⑥ F3 fuse defect

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Inspección 1. Comprobación de continuidad del fusible F3
Enchufe de la batería desconectado, fusible F3 sacado

Terminales de medición	Ambos extremos del fusible F3
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- ANL No. 3: Prueba del contactor
INCORRECTO (∞ Ω) -- Después del recambio del fusible F3, vuelva a comprobar el funcionamiento.

Inspección 2. Comprobación de la continuidad del motor de la dirección de potencia asistida (PS)
Enchufe de la batería desconectado, desconexión del conector CN50

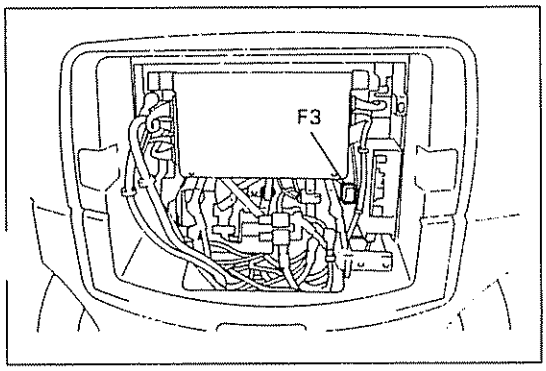
Terminales de medición	CN50-1 (P24) -- CN50-2 (P23)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

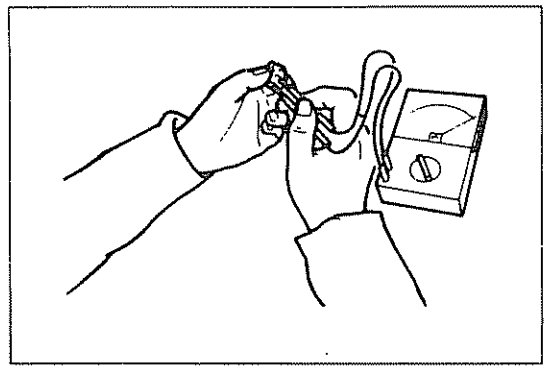
CORRECTO (aprox. 0 Ω) -- A la inspección 3.
INCORRECTO (∞ Ω) -- Defecto del motor de la PS

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Inspection 1. F3 fuse continuity check
Battery plug OFF, F3 fuse removal

Measurement terminals	Both ends of F3
Circuit tester range	Ω × 1
Standard	0 Ω

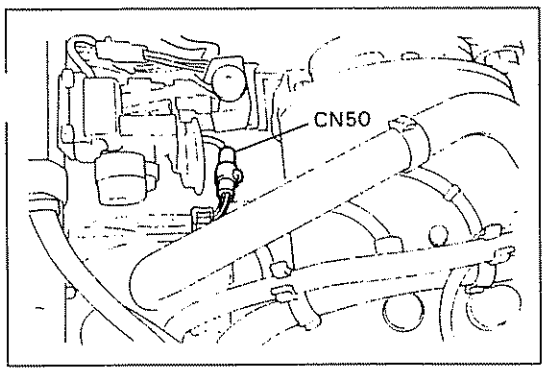


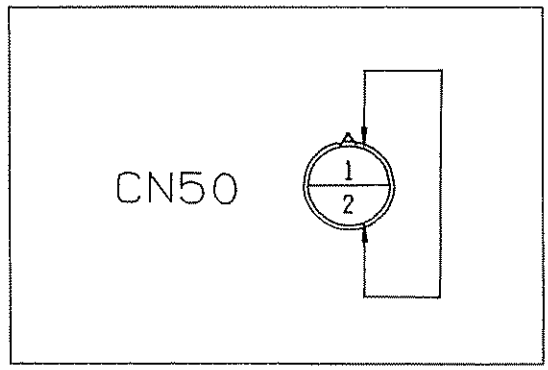


OK (0 Ω) → ANL No.3: Contactor test
NG (∞ Ω) → Recheck the operation after F3 fuse replacement.

Inspection 2. Power steering (PS) motor continuity check
Battery plug OFF, CN50 disconnection

Measurement terminals	CN50-1(P24) — CN50-2(P23)
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω





OK (approx. 0 Ω) → To inspection 3.
NG (∞ Ω) → PS motor defect.

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Inspección 3. Comprobación de la continuidad del cableado del tablero de CPU -- motor de la PS
Enchufe de la batería desconectado, desconexión de CN50/CN105

Terminales de medición	CN105-5 -- CN50-1 (conector del lado de REC) CN105-6 -- CN50-2 (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

CORRECTO (aprox. 0 Ω) -- A la inspección 6.
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 4. Comprobación de la continuidad de la bobina del contactor (MP) de la dirección de potencia asistida
Enchufe de la batería desconectado

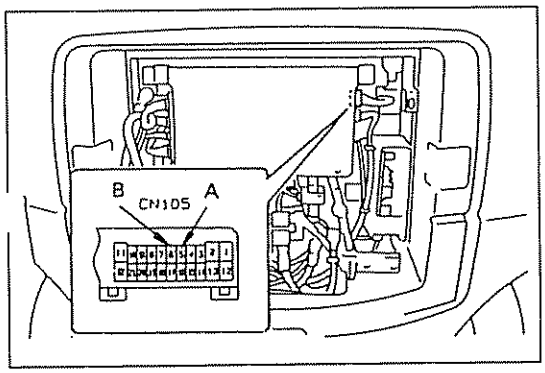
Terminales de medición	Terminales de la bobina MP
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 37 Ω

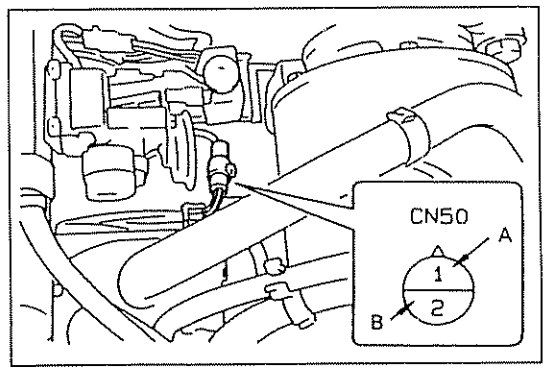
CORRECTO (aprox. 37 Ω) -- a la inspección 5.
INCORRECTO (∞ Ω) -- Defecto de MP

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Inspection 3. CPU board — PS motor wiring continuity check
Battery plug OFF, CN50·CN105 disconnection

Measurement terminals	CN105-5 — CN50-1 (connector of REC side) CN105-6 — CN50-2 (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω

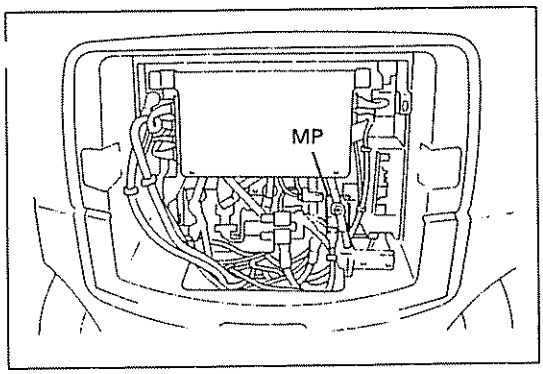


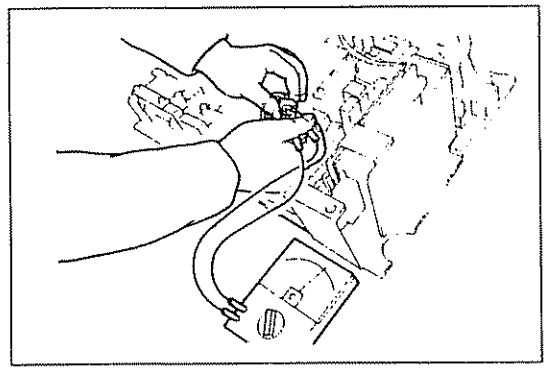


OK (approx. 0 Ω) → To inspection 6.
NG (∞ Ω) → Wiring defect.

Inspection 4. Power steering contactor (MP) coil continuity check
Battery plug OFF

Measurement terminals	MP coil terminals
Circuit tester range	Ω × 1
Standard	Approx. 37 Ω





OK (approx. 37 Ω) → To inspection 5.
NG (∞ Ω) → MP defect.

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Inspección 5. Comprobación de la continuidad del cableado del tablero de CPU
Enchufe de la batería desconectado

Terminales de medición	CN104-14 (9) -- Terminales MP + (conector del lado de REC) CN104-5 (5) -- Terminales MP - (conector del lado de REC)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

CORRECTO (aprox. 0 Ω) -- Defecto del tablero de CPU
INCORRECTO (∞ Ω) -- Defecto del cableado

Inspección 6. Comprobación de la señal de confirmación de OCL
Enchufe de la batería conectado, interruptor de la llave conectado

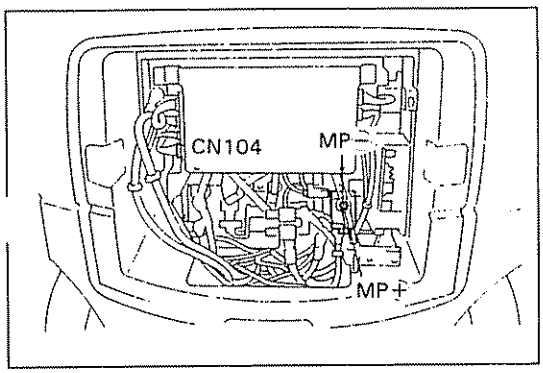
Terminales de medición	CN105-10 (OCHK) -- CN105-11 (N1)
Alcance del probador de circuitos	CC 50 V
Estándar	Aprox. 12 V

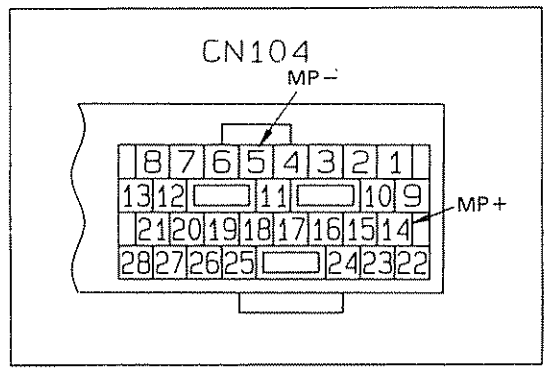
CORRECTO (aprox. 12 V) -- A la inspección 7.
INCORRECTO (0 V) -- Defecto del tablero de CPU

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Inspection 5. MP — CPU board wiring continuity check
Battery plug OFF

Measurement terminals	CN104-14(9) — MP ⊕ terminals (connector of REC side) CN104-5(5) — MP ⊖ terminals (connector of REC side)
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω

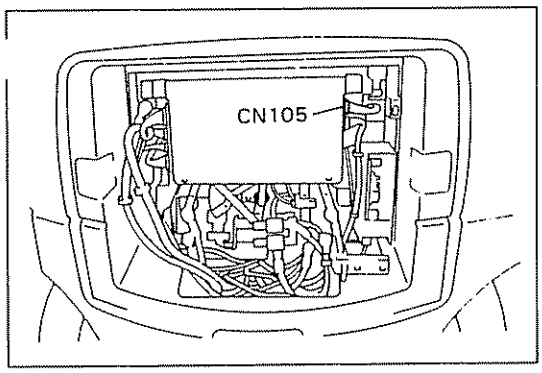


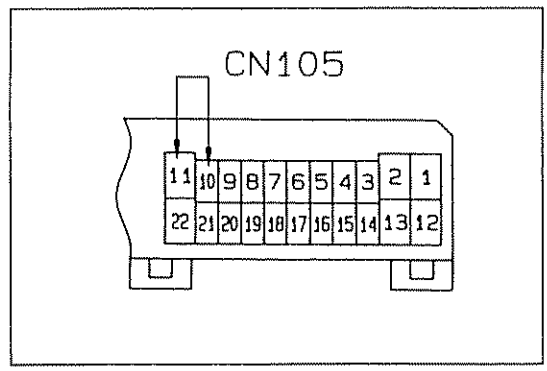


OK (approx. 0 Ω) → CPU board defect.
NG (∞ Ω) → Wiring defect.

Inspection 6. OCL confirmation signal check
Battery plug ON, key switch ON

Measurement terminals	CN105-10(OCHK) — CN105-11(N1)
Circuit tester range	DC 50 V
Standard	Approx. 12 V





OK (approx. 12 V) → To inspection 7.
NG (0 V) → CPU board defect.

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2. Dirección de potencia asistida eficaz, pero volante de dirección pesado.

Parte relacionada

Causas estimadas

1 Defecto del sensor de par (torque)

2 Defecto del mazo de cables del sensor

3 Defecto del motor

4 Defecto del cable del motor

5 Defecto del tablero de CPU

6 Defecto de TMPS (IGBT)

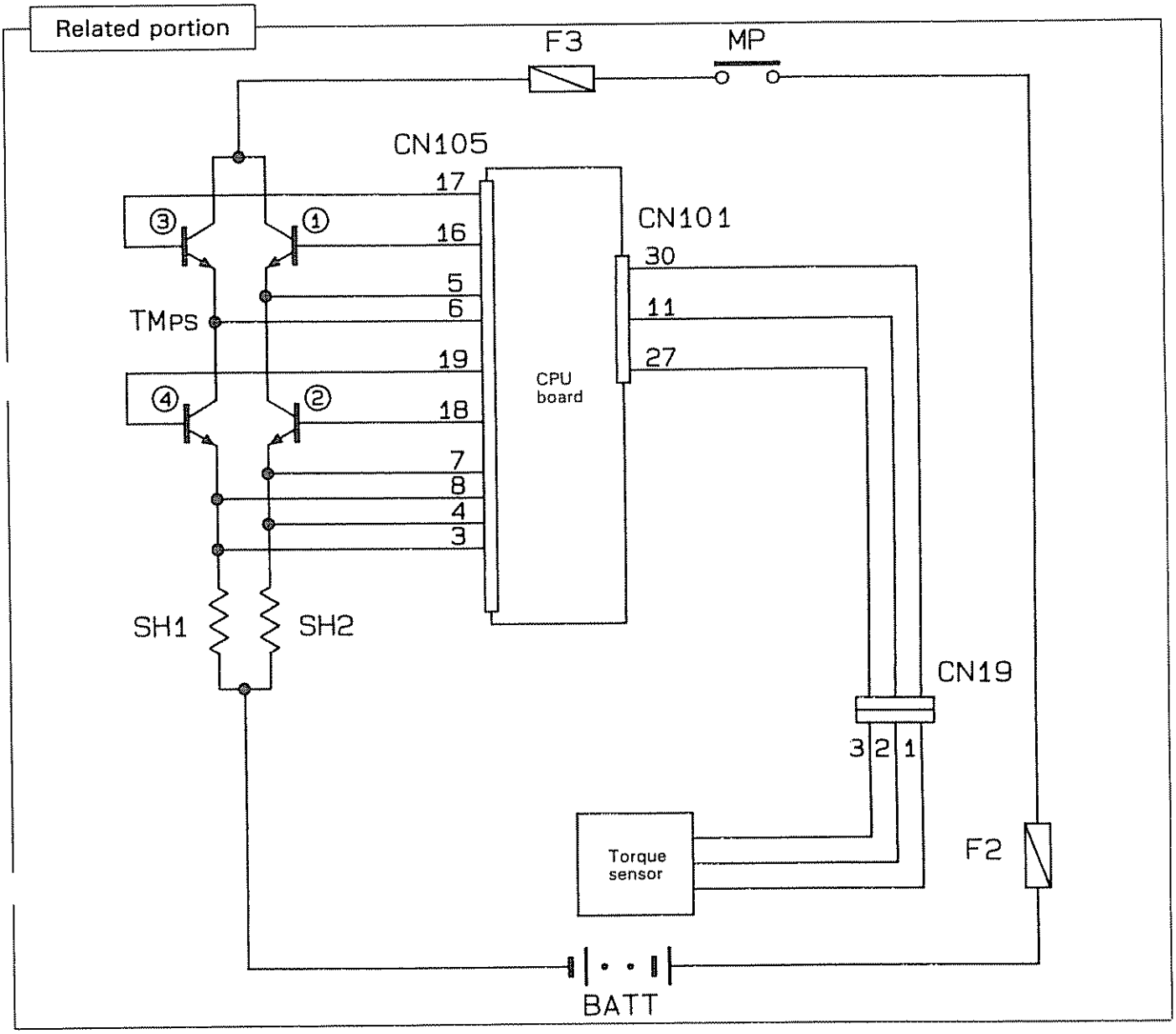
7 Defecto del cableado alrededor de la derivación "shunt" TMPS

8 Defecto mecánico del volante de dirección, etc.

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2. Power assist is effective, but the steering wheel is heavy.

Related portion



Estimated causes

① Torque sensor defect

② Sensor harness defect

③ Motor defect

④ Motor cable defect

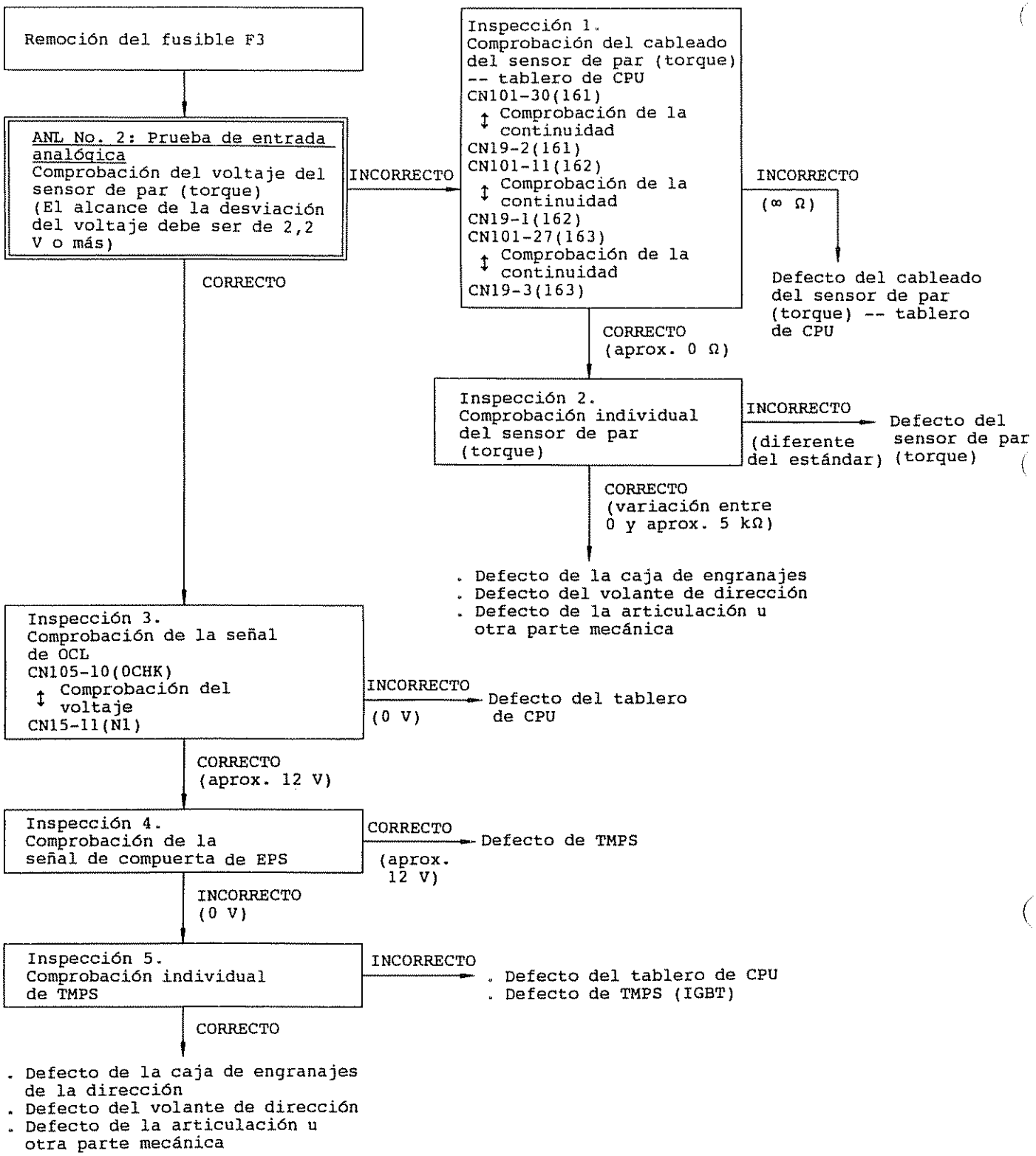
⑤ CPU board defect

⑥ TMPS (IGBT) defect

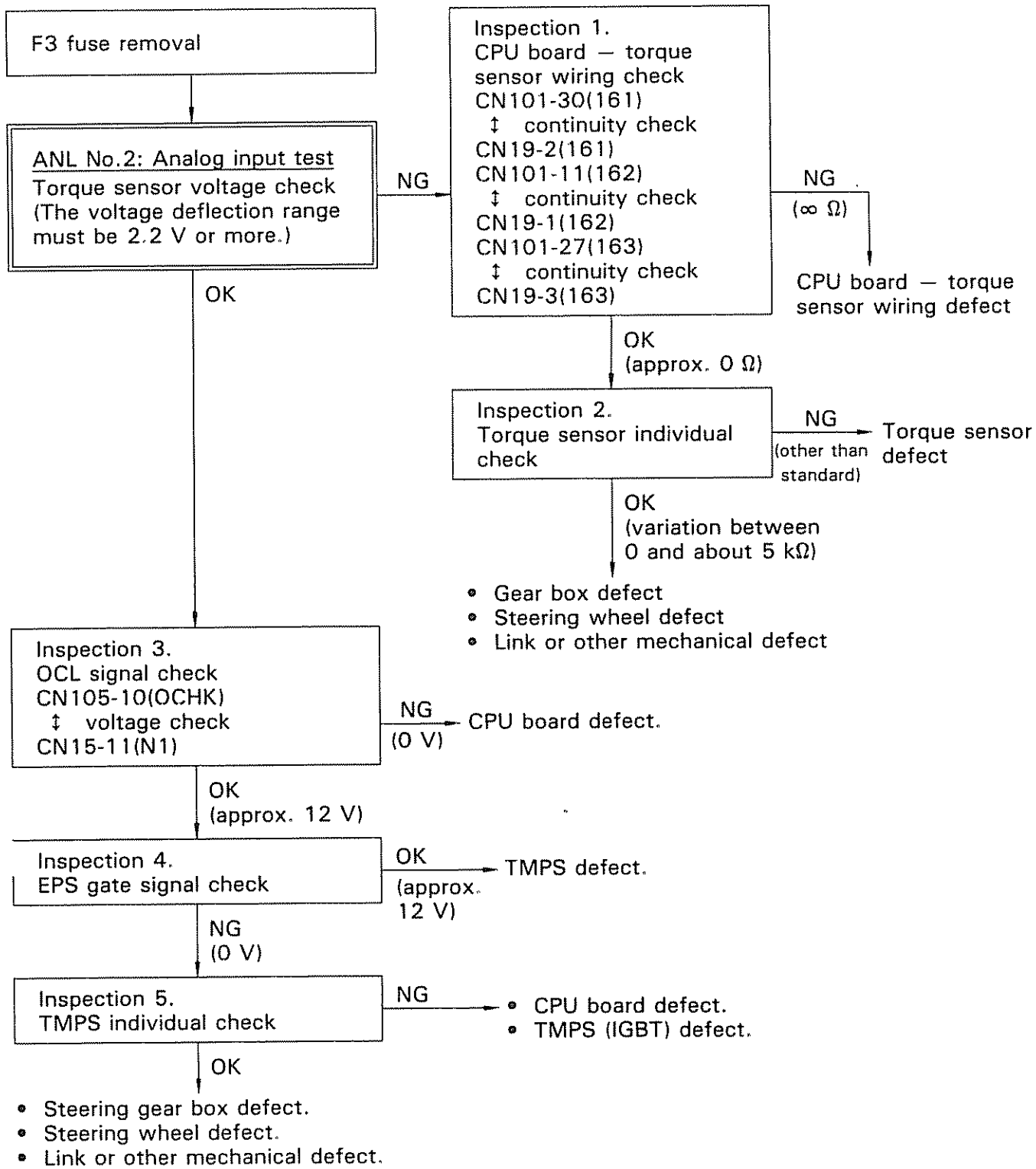
⑦ Wiring defect around TMPS shunt

⑧ Mechanical defect of steering wheel, etc.

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Inspección 1. Comprobación del cableado del sensor de par (torque) -- tablero de CPU
Enchufe de la batería desconectado, desconexión de CN19

Terminales de medición	A: CN101-30 (161) -- CN19-1 (161) B: CN101-11 (162) -- CN19-2 (162) C: CN101-27 (163) -- CN19-3 (163)
Alcance del probador de circuitos	Ω x 1
Estándar	Aprox. 0 Ω

Cada cable: CORRECTO (aprox. 0 Ω) -- A la inspección 2.
Cada cable: INCORRECTO (∞ Ω) -- Defecto del cableado del sensor de par (torque) -- tablero de CPU

Inspección 2. Comprobación individual del sensor de par (torque)
Vea la inspección 1 en la búsqueda de averías para el código de error F0-2/3 (en la página 4-111).

CORRECTO (estándar) -- Defecto de la caja de engranajes de la dirección, articulación u otro defecto mecánico.
INCORRECTO (diferente del estándar) -- Defecto del sensor de par (torque).

Inspección 3. Comprobación de la señal de confirmación de OCL
Vea la inspección 6 en el expositor 1 para el sistema de dirección (en la página 4-117)

CORRECTO (aprox. 12 V) -- A la inspección 4.
INCORRECTO (0 V) -- Defecto del tablero de CPU

Inspección 4. Comprobación del tablero de la señal de compuerta de EPS
Vea la inspección 1 en la búsqueda de averías para el código de error F0-1 (en la página 4-108).
CORRECTO (estándar) -- Defecto de TMPS
INCORRECTO (diferente del estándar) -- A la inspección 5.

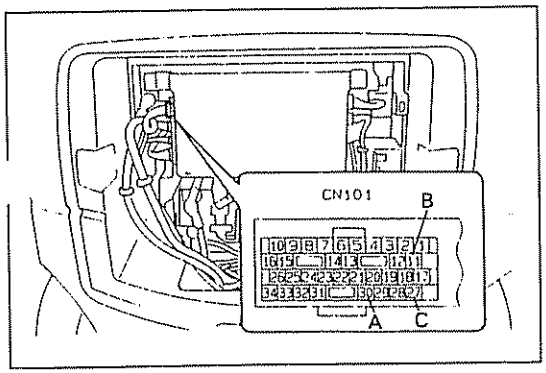
Inspección 5. Comprobación individual de TMPS (IGBT)
Vea la página 2-12 en la comprobación individual de TMPS.

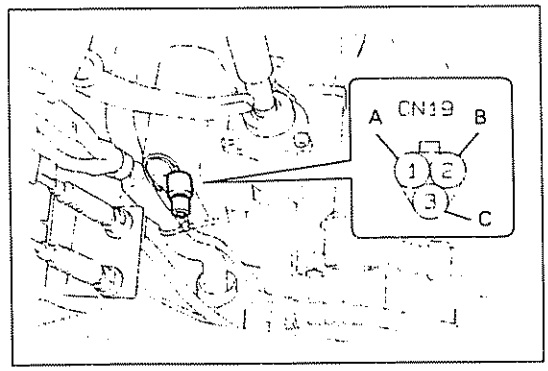
CORRECTO (estándar) -- Defecto de la caja de engranajes de la dirección, defecto del volante de dirección u otro defecto mecánico
INCORRECTO (diferente del estándar) -- Defecto del tablero de CPU o defecto de TMPS

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Inspection 1. CPU board — torque sensor wiring check
Battery plug OFF, CN19 disconnection

Measurement terminals	A: CN101-30(161) — CN19-1(161) B: CN101-11(162) — CN19-2(162) C: CN101-27(163) — CN19-3(163)
Circuit tester range	Ω × 1
Standard	Approx. 0 Ω





Each wiring: OK (approx. 0 Ω) → To inspection 2.
Each wiring: NG (∞ Ω) → CPU board — torque sensor wiring defect

Inspection 2. Torque sensor individual check
See inspection 1 in the troubleshooting for error code F0-2·3 (on page 4-111).

OK (standard) → Steering gear box defect, link or other mechanical defect.
NG (other than standard) → Torque sensor defect.

Inspection 3. OCL confirmation signal check
See inspection 6 in 1. no display for the steering system (on page 4-117).

OK (approx. 12 V) → To inspection 4.
NG (0 V) → CPU board defect.

Inspection 4. EPS gate signal Board check
See inspection 1 in troubleshooting for error code F0-1 (on page 4-108).

OK (standard) → TMPS defect.
NG (other than standard) → To Inspection 5.

Inspection 5. TMPS (IGBT) individual check
See page 2-12 for the TMPS individual check.

OK (standard) → Steering gear box defect, Steering wheel defect, or other mechanical defect.
NG (other than standard) → CPU board defect or TMPS defect

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3. El volante de dirección vibra

Parte relacionada

Sensor de par
(torque)

Causas estimadas

1 Defecto del sensor de par (torque)

2 Defecto del cableado del sensor de par (torque)

3 Defecto de ajuste de neutra

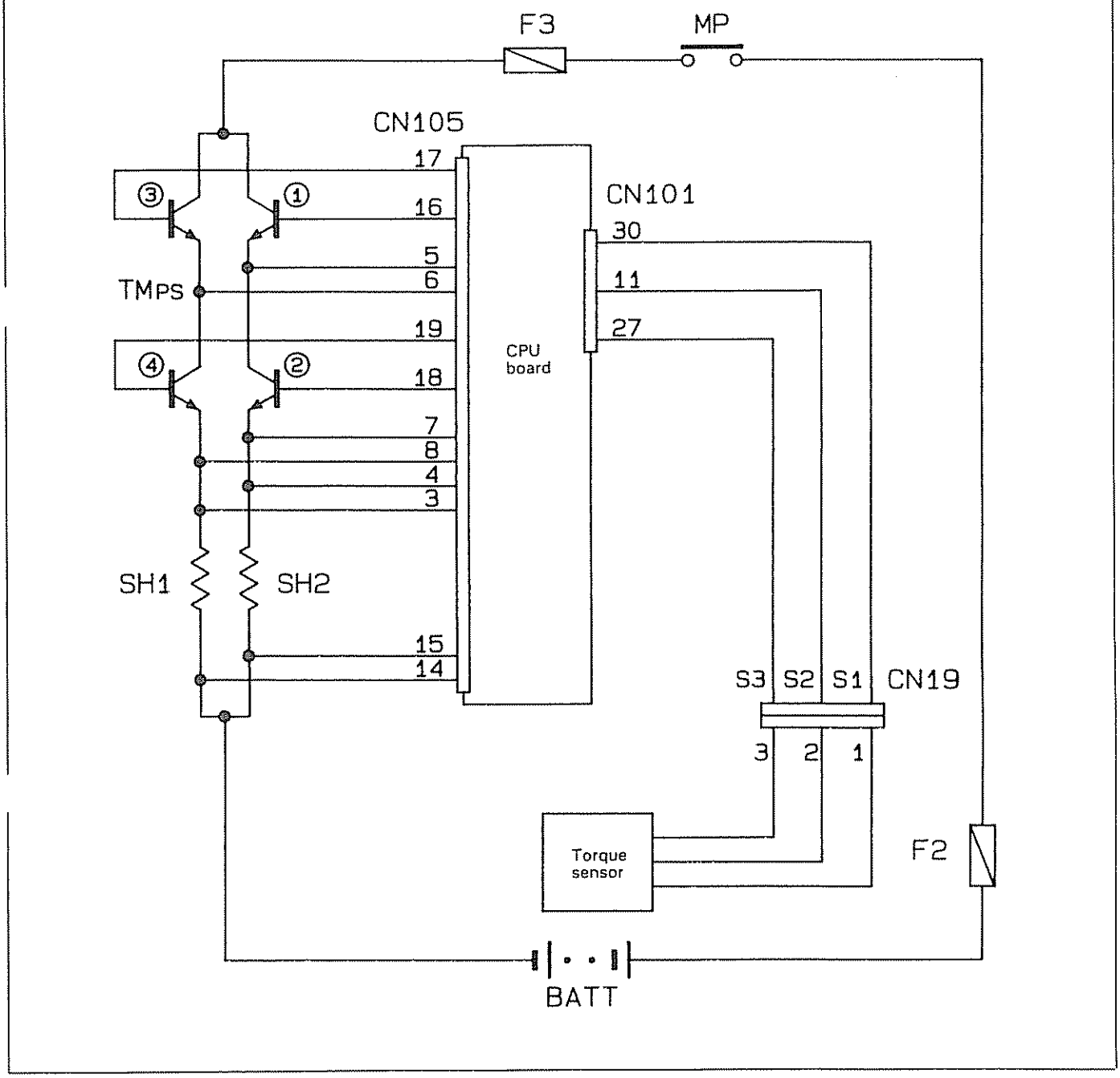
4 Defecto del tablero de CPU

5 Defecto del cableado de TMPS (IGBT) -- tablero de CPU

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3. The steering wheel vibrates.

Related portion



Estimated causes

① Torque sensor defect

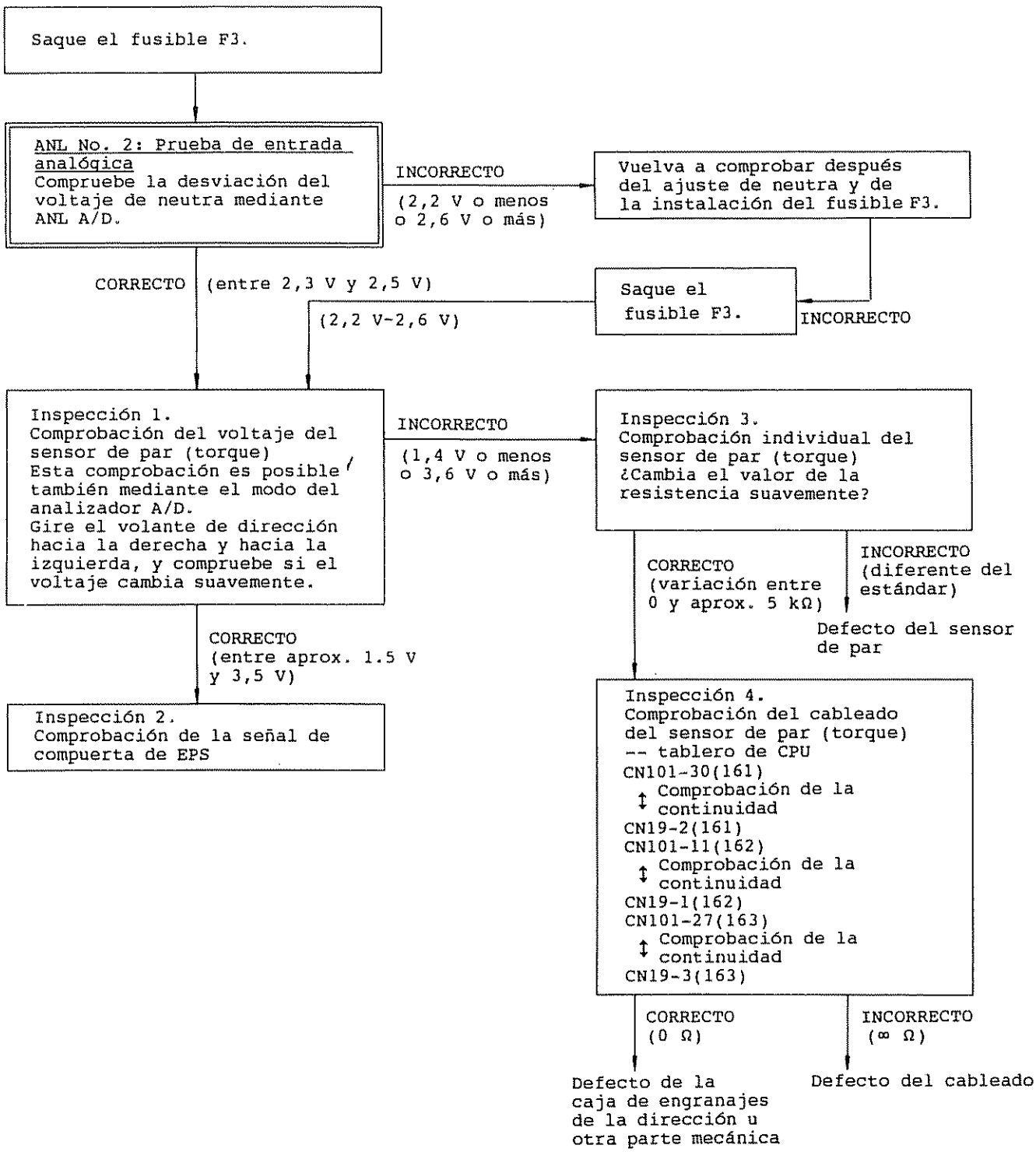
② Torque sensor wiring defect

③ Neutral adjustment defect

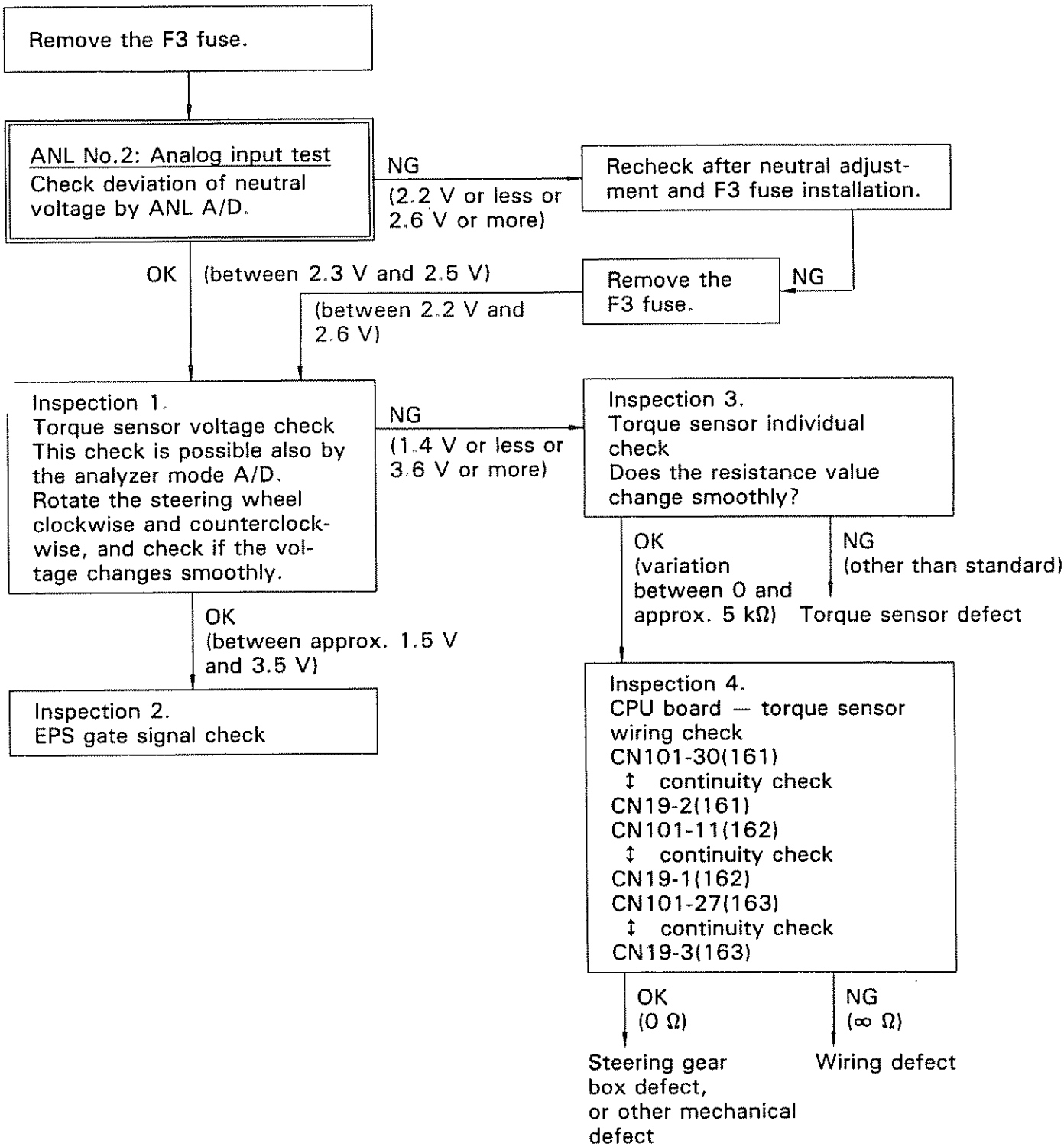
④ CPU board defect

⑤ CPU board — TMPS (IGBT) wiring defect

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Inspección 1. Comprobación del voltaje del sensor de par (torque)
Enchufe de la batería conectado, interruptor de la llave conectado, funcionamiento del volante de dirección hacia la derecha y hacia la izquierda

Terminales de medición	CN101-11 (162) + -- CN103-2 (N1) -
Alcance del probador de circuitos	CC 10 V
Estándar	Aprox. 1,5 a 3,5 V

CORRECTO (indicación de correcto mediante A/D por 1,5 a 3,5 V) -- A la inspección 2.
INCORRECTO (indicación de incorrecto mediante A/D si es diferente del estándar) -- A la inspección 3.

Inspección 2. Comprobación del voltaje de compuerta de EPS
Vea la inspección 1 en cuanto al código de error F0-1 en la página 4-108.

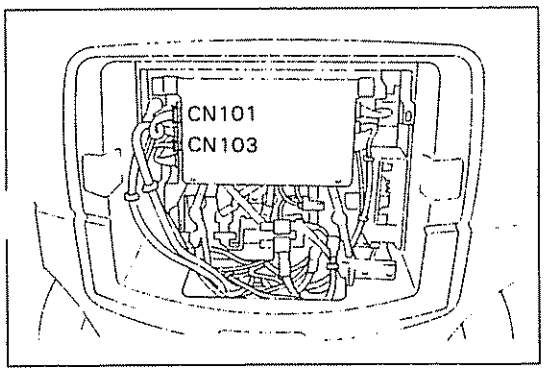
Inspección 3. Comprobación individual del sensor de par (torque)
Vea la inspección 1 en cuanto al código de error F0-2-3 en la página 4-111.

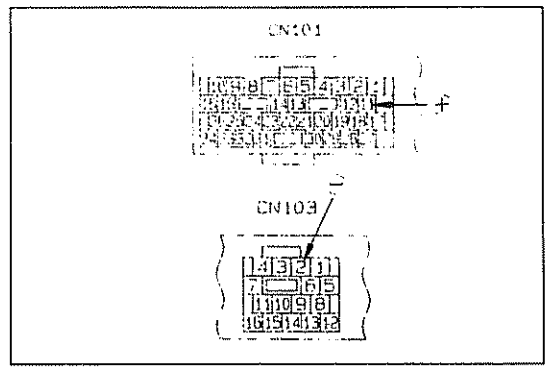
Inspección 4. Comprobación del cableado del sensor de par (torque) -- tablero de CPU
Vea la inspección 1 (en la página 4-120) de cuando no hay exposición del código de error de diagnosis.

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Inspection 1. Torque sensor voltage check
Battery plug ON, key switch ON, steering wheel operation in clockwise and counter-clockwise directions

Measurement terminals	CN101-11(162) ⊕ – CN103-2(N1) ⊖
Circuit tester range	DC 10 V
Standard	About 1.5 to 3.5 V





OK (OK indication by A/D for about 1.5 to 3.5 V) → To inspection 2
NG (NG indication by A/D for other than the standard) → To inspection 3

Inspection 2. EPS gate voltage check
See inspection 1 for error code F0-1 on page 4-108.

Inspection 3. Torque sensor individual check
See inspection 1 for error code F0-2·3 on page 4-111.

Inspection 4. CPU board – torque sensor wiring check
See inspection 1 for no diagnosis error code is displayed No.2 on page 4-120.

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4. El volante de dirección gira arbitrariamente.

Parte relacionada

Tablero de CPU

Sensor de par (torque)

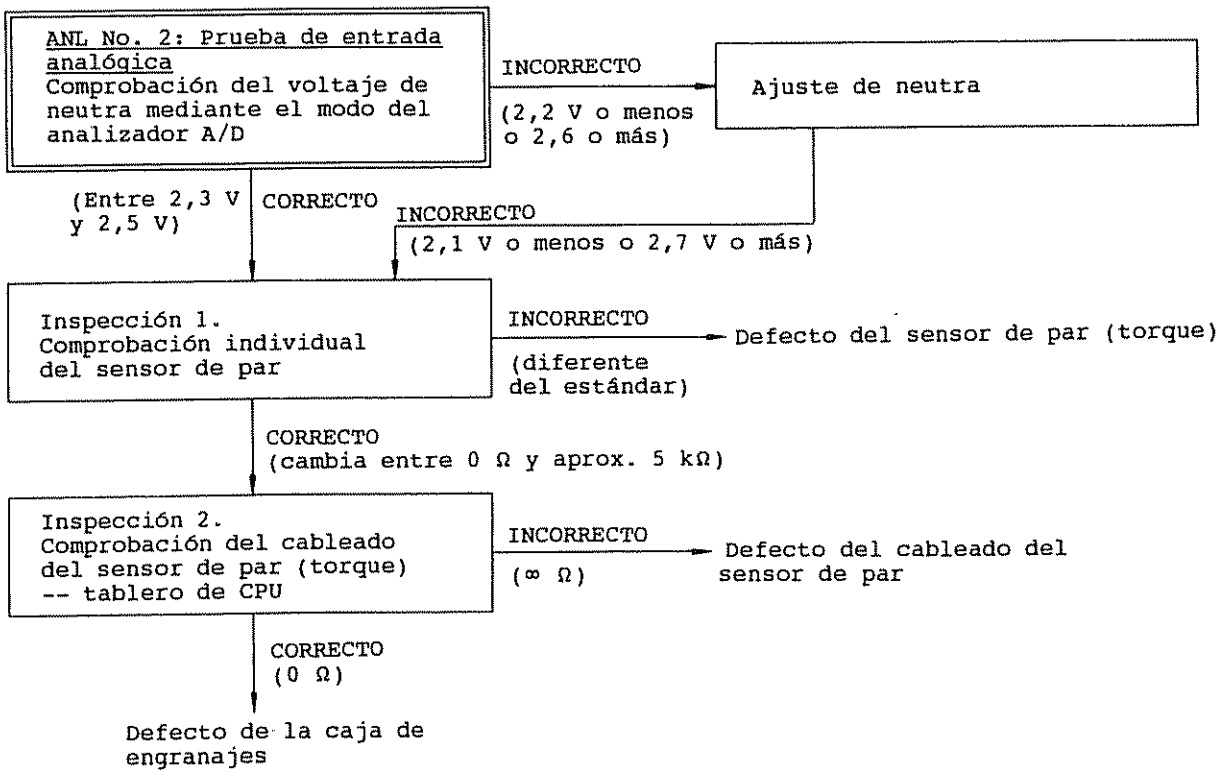
Causas estimadas

1 Desplazamiento de la posición neutra

2 Defecto del sensor de carrera

3 Defecto del mazo de cables (fuga)

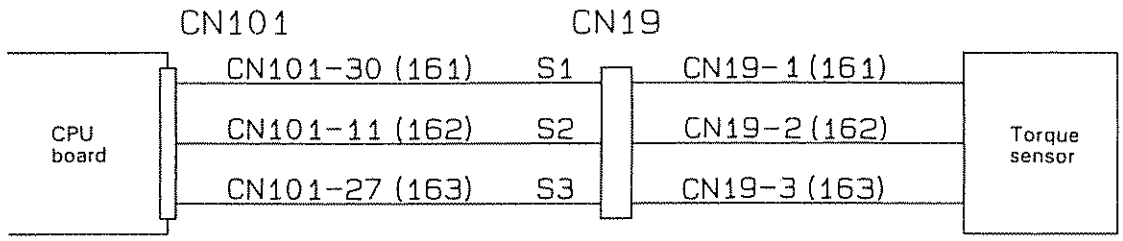
4 Conjunto de la caja de engranajes de la dirección



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4. The steering wheel moves by itself.

Related portion



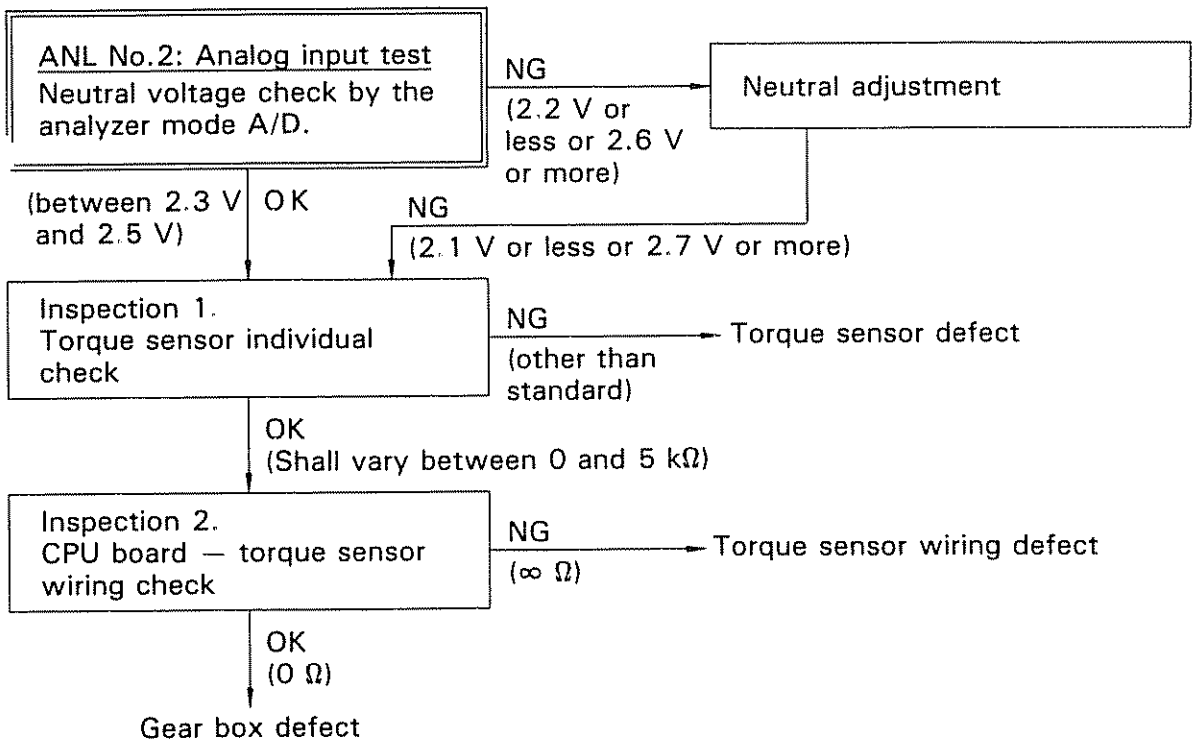
Estimated causes

① Neutral voltage offset

② Torque sensor defect

③ Harness defect (leak)

④ Steering gear box assy.



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Inspección 1. Comprobación individual del sensor de par
Vea la inspección 1 (en la página 4-111) en cuanto al código de error F0-2/3.

Inspección 2. Comprobación de la continuidad del cableado del sensor de par (torque) -- tablero de CPU
Vea la inspección 1 (en la página 4-120) en la inspección 2 de cuando no hay exposición del código de error de diagnosis.

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Inspection 1. Torque sensor individual check
See inspection 1 (on page 4-111) for error code F0-2-3.

Inspection 2. CPU board — torque sensor wiring continuity check
See inspection 1 (on page 4-120) in 2. for no diagnosis error code display.

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EXPOSITOR -- BUSQUEDA DE AVERIAS DEL SISTEMA DE COMUNICACION DE MCS/CARGADOR

CUANDO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

Código de error F1: Sistema de comunicación de MCS a expositor

Parte relacionada

Tablero de CPU	Expositor

Causas estimadas

1 Desconexión del cableado de CN101 -- expositor

2 Defecto de contacto de CN101, CN1 o CN120

3 Defecto del expositor

4 Defecto del tablero de CPU

El código de error F1 resume la búsqueda de averías para cada código de segmento de la memoria del analizador.

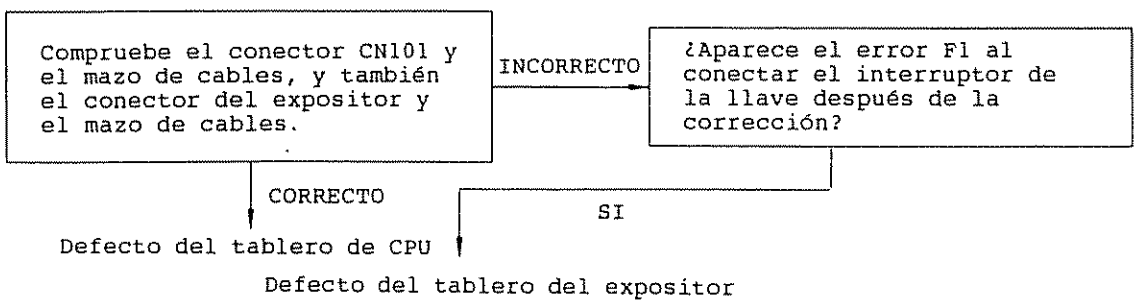
F1: Sistema de comunicación de MCS a expositor	F1-1: Fallo de comunicación de MCS a expositor F1-2: Datos de comunicación de MCS a expositor incorrectos F1-3: Datos de comunicación de MCS a expositor incompatibles

Código de error F1-1: Fallo de comunicación de MCS al expositor universal

Al ocurrir el error F1-1, falla la comunicación de MCS al expositor. El código de error F1-1 se mantiene en el expositor esté el interruptor d la llave en conexión o en desconexión.

Código de error F1-2: Datos de comunicación de MCS a expositor -- incorrectos

Código de error F1-3: Datos de comunicación de MCS a expositor -- incompatibles



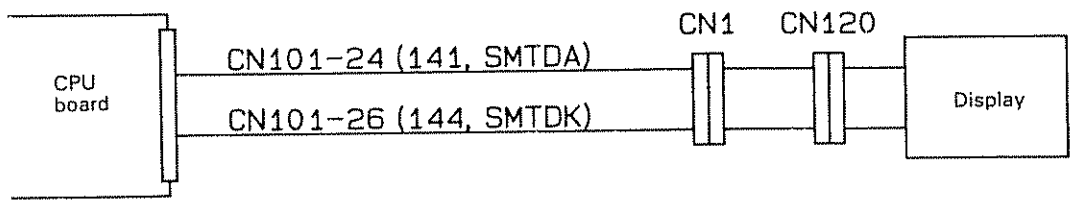
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DISPLAY — MCS COMMUNICATION SYSTEM TROUBLESHOOTING

WHEN DIAGNOSTIC ERROR CODE IS DISPLAYED

Error code F1: Display to MCS communication system

Related portion



Estimated causes

① CN101 — display wiring disconnection

② CN101, CN1 or CN120 contact defect

③ Display defect

④ CPU board defect

Error code F1 summarizes troubleshooting for each segmentation code of the analyzer memory.

F1: Display to MCS communication system

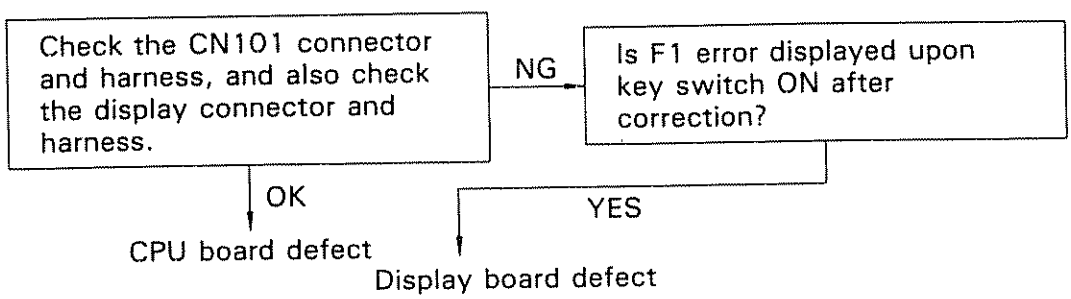
- F1-1: Display to MCS communication failure
- F1-2: Display to MCS communication data error
- F1-3: Display to MCS communication data invalid

Error code F1-1: All-round display to MCS communication failure

Upon F1-1 error occurrence, communication from MCS to display fails. Error code F1-1 is kept displayed irrelevant to key switch ON/OFF.

Error code F1-2: Display — MCS communication data error

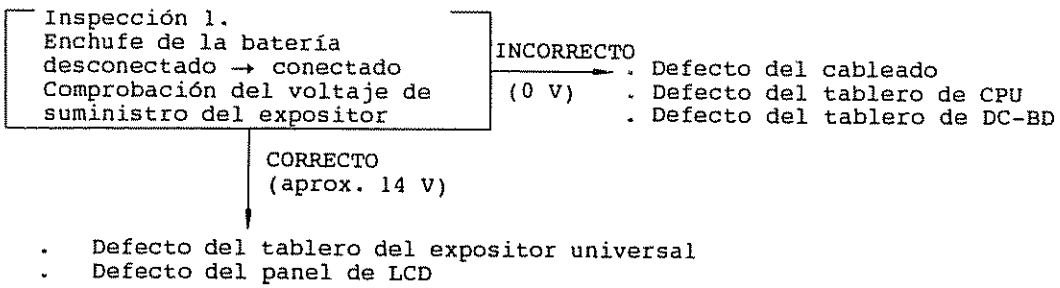
Error code F1-3: Display — MCS communication data invalid



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CUANDO NO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

1. No hay exposición en el expositor universal (y no hay exposición de error)



Inspección 1. Comprobación del voltaje de suministro del expositor universal
Enchufe de la batería conectado

Terminales de medición	CN120-9 (16) + -- CN120-21 (N2) -
Alcance del probador de circuitos	CC 50 V
Estándar	Aprox. 14 V

CORRECTO (aprox. 14 V) -- Defecto del tablero del expositor universal, defecto del panel de LCD
INCORRECTO (0 V) -- Defecto del cableado, defecto del tablero de CPU o defecto del tablero de DC-BD

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WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED

1. No display on the all-round display (and no error display)

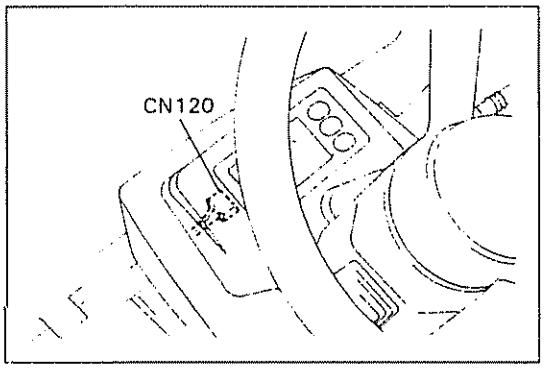
Inspection 1.
Battery plug OFF → ON
Display supply voltage check

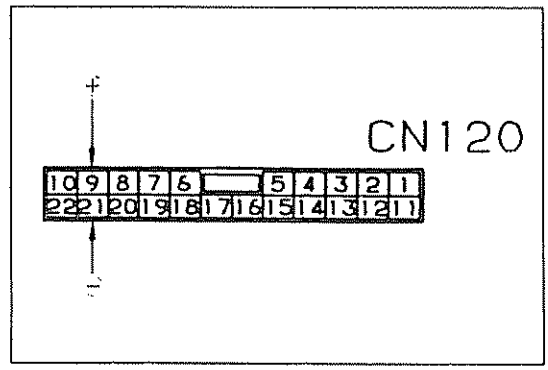
NG (0 V) →
- Wiring defect
- CPU board defect
- DC-BD board defect

OK (approx. 14 V)
- All-round display board defect
- LCD panel defect

Inspection 1. Display supply voltage check
Battery plug ON

Measurement terminals	CN120-9(16) ⊕ – CN120-21(N2) ⊖
Circuit tester range	DC 50 V
Standard	Approx. 14 V





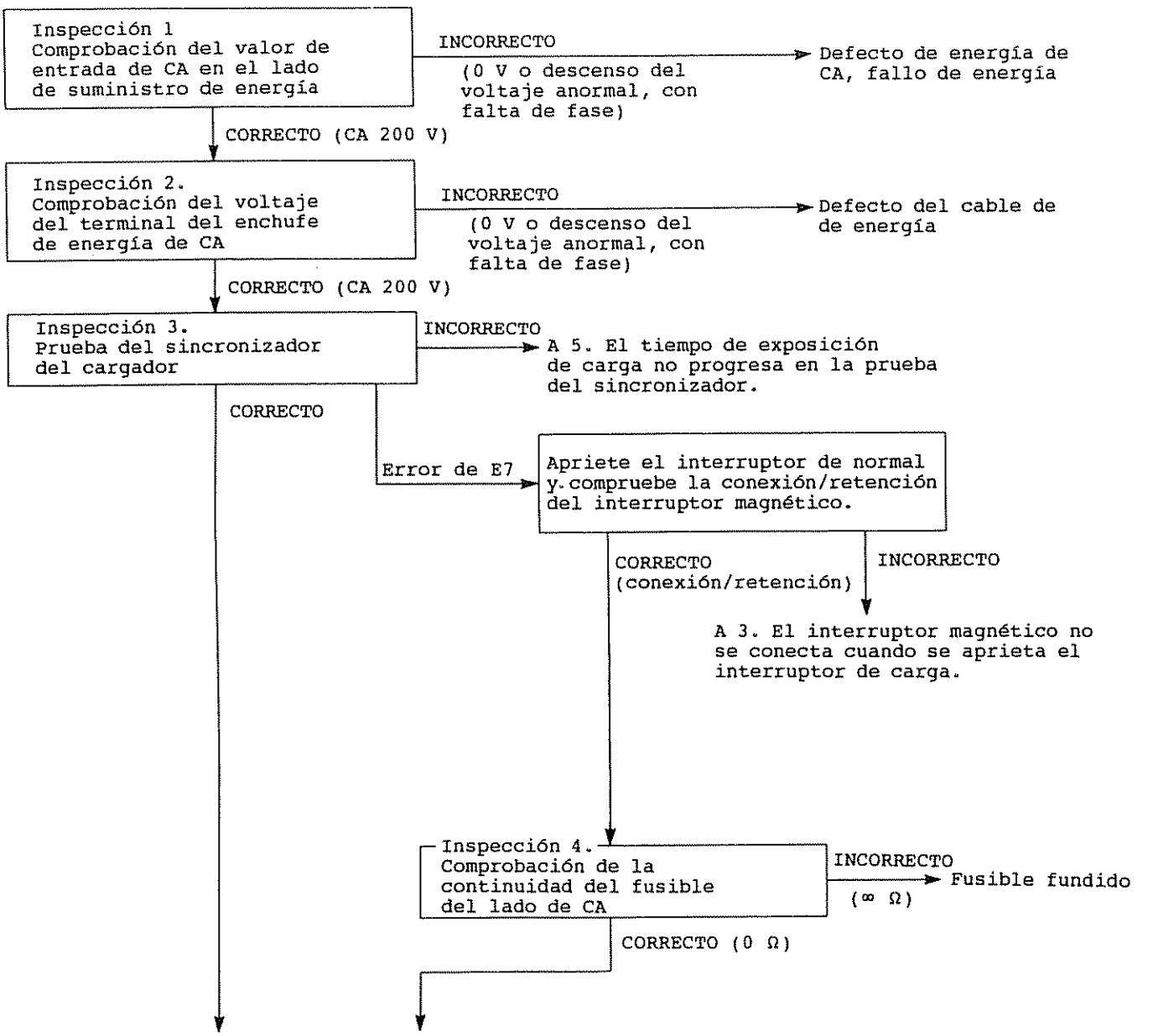
OK (approx. 14 V) → All-round display board defect or LCD panel defect
NG (0 V) → Wiring defect, CPU board defect or DC-BD board defect

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AVERIAS RELACIONADAS CON EL CARGADOR (APLICABLE AL CARGADOR EN E MONTACARGAS)

CUANDO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

Código de error F6-1: Función del tiempo de seguridad



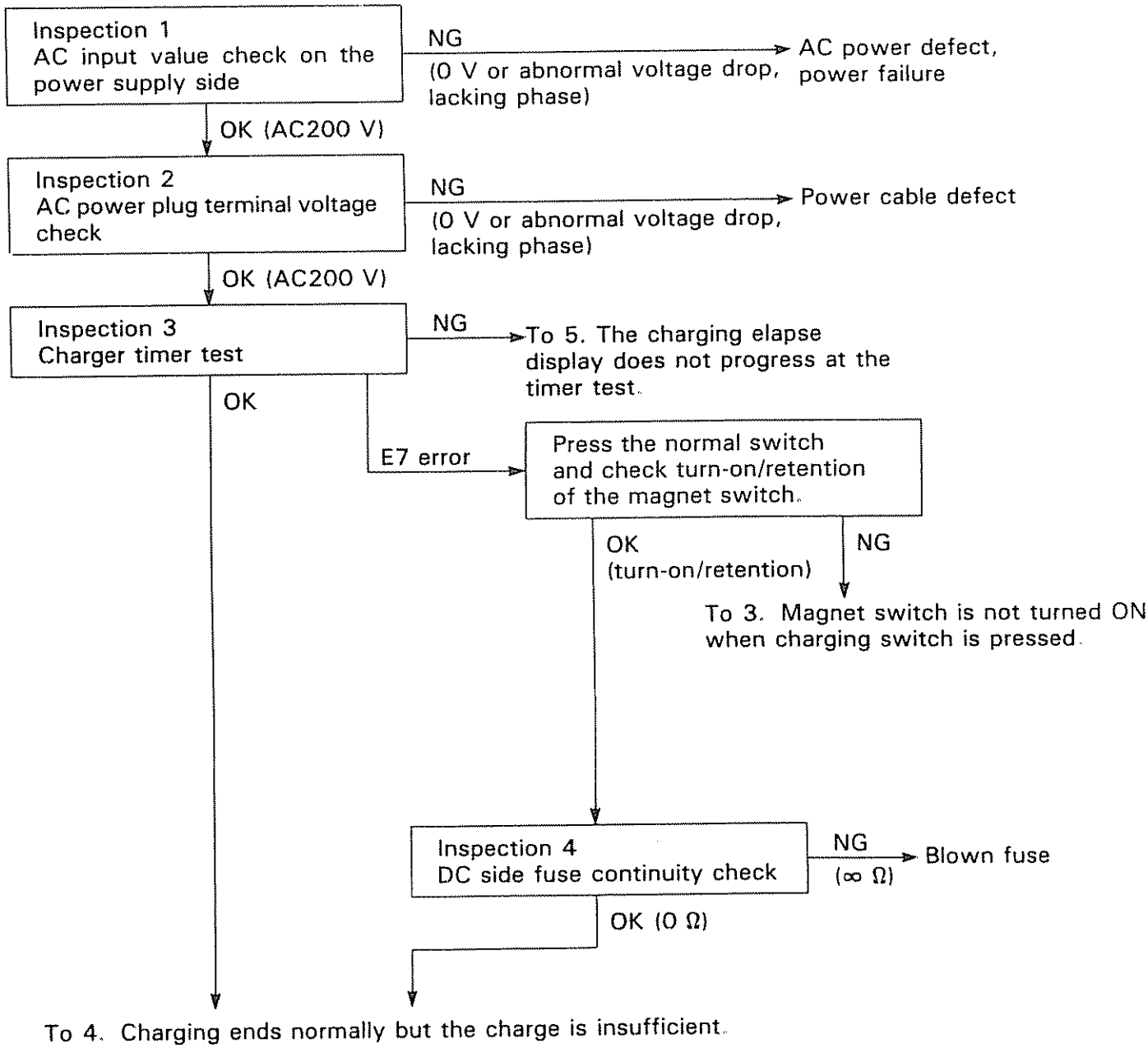
A 4. La carga termina normalmente pero es insuficiente.

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CHARGER RELATED TROUBLES (APPLICABLE TO THE ON-TRUCK CHARGER)

WHEN A DIAGNOSTIC ERROR CODE IS DISPLAYED

Error code F6-1: Safety time function



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Inspección 1. Comprobación del voltaje de entrada de CA

Terminales de medición	Terminal de energía de CA
Alcance del probador de circuitos	CA 250 V
Estándar	200 - 230 V

CORRECTO (200 a 230 V) -- A la inspección 2.
INCORRECTO (0 V o descenso de voltaje anormal, falta de fase) -- Defecto de energía de CA

Inspección 2. Comprobación del voltaje del terminal del enchufe de energía de CA

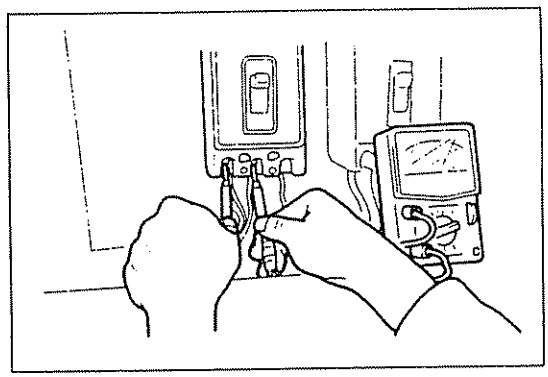
Terminales de medición	Terminal del enchufe de energía
Alcance del probador de circuitos	CA 250 V
Estándar	200 - 230 V

CORRECTO (200 a 230 V) -- A la inspección 3.
INCORRECTO (0 V o descenso de voltaje anormal, falta de fase) -- Defecto del cable de energía

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Inspection 1. AC input voltage check

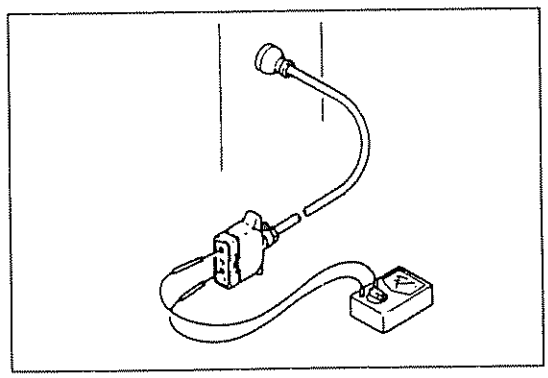
Measurement terminals	AC power terminal
Circuit tester range	AC250 V
Standard	200 – 230 V



OK (200 to 230 V) → To Inspection 2.
NG (0 V or abnormal voltage drop, lacking phase) → AC power defect

Inspection 2. AC power plug terminal voltage check

Measurement terminals	Power plug terminal
Circuit tester range	AC250 V
Standard	200 – 230 V



OK (200 to 230 V) → To Inspection 3.
NG (0 V or abnormal voltage drop, missing phase) → power cable defect

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Inspección 3. Prueba del sincronizador del cargador
Vea la parte de prueba del sincronizador (página 4-142).

CORRECTO -- A 4 en "Cuando no hay exposición del código de error de diagnóstico".
INCORRECTO -- A 5 en "Cuando no hay exposición del código de error de diagnóstico".

Inspección 4. Comprobación de la continuidad del fusible del lado de CC
Enchufe de energía de CA desconectado, interruptor de carga desconectado, remoción del fusible

Terminales de medición	Ambos extremos del fusible de CC
Alcance del probador de circuitos	Ω x 1
Estándar	0 Ω

CORRECTO (0 Ω) -- A 4 en "Cuando no hay exposición del código de error de diagnóstico"
INCORRECTO (∞ Ω) -- Fusible fundido

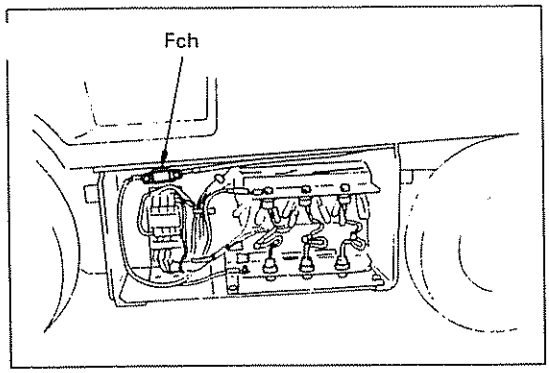
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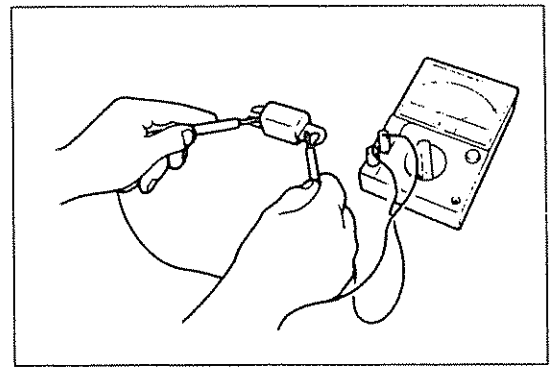
Inspection 3. Charger timer test
Refer to the Timer test section (P4-142).

OK → To 4 in ''when no diagnostic error code is displayed.''
NG → To 5 in ''when no diagnostic error code is displayed.''

Inspection 4. DC side fuse continuity check
AC power plug OFF, Charging switch OFF, fuse removal

Measurement terminals	DC fuse both ends
Circuit tester range	Ω × 1
Standard	0 Ω

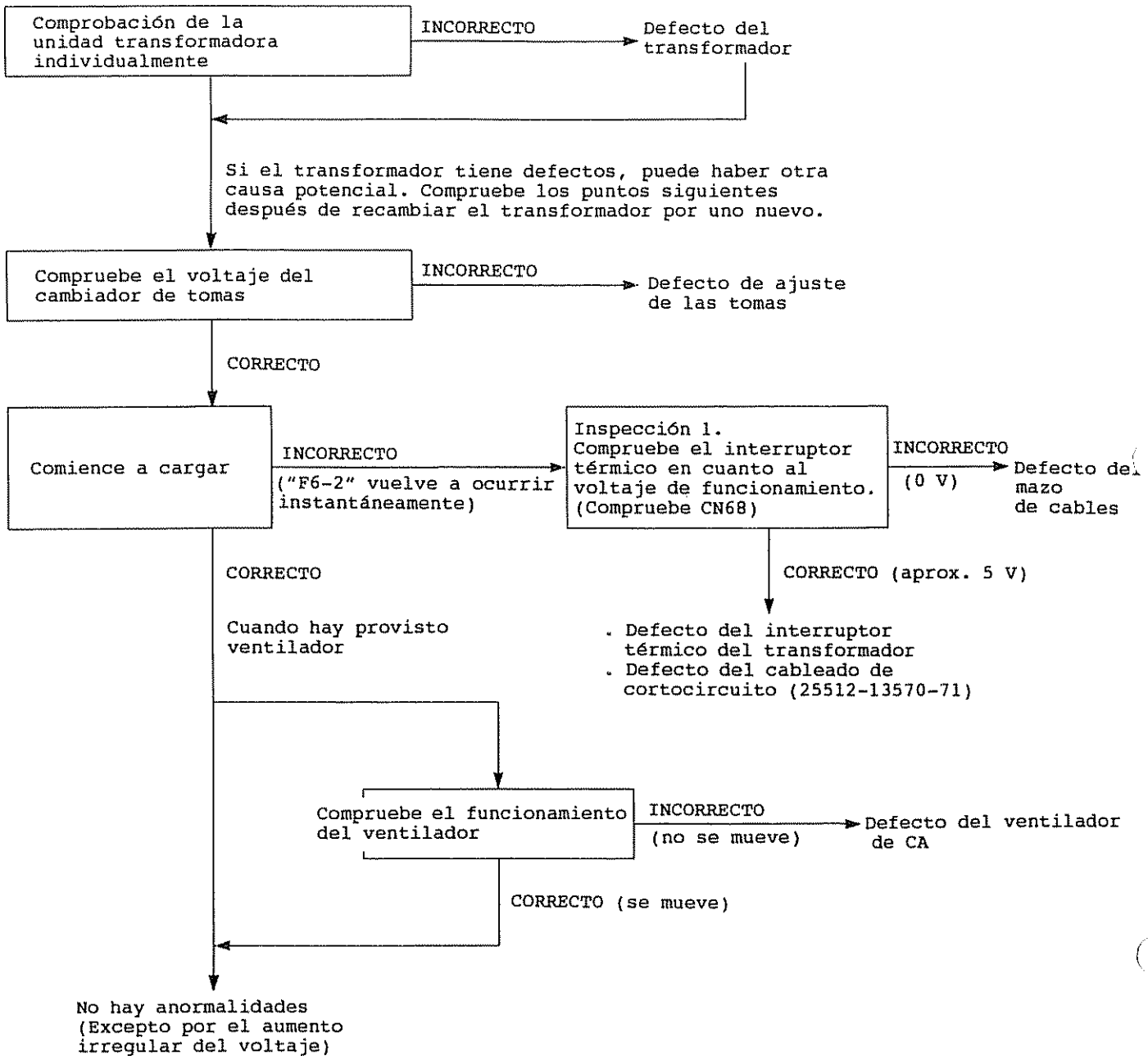




OK (0 Ω) → To 4 in ''when no diagnostic error code is displayed.''
NG (∞ Ω) → Blown fuse

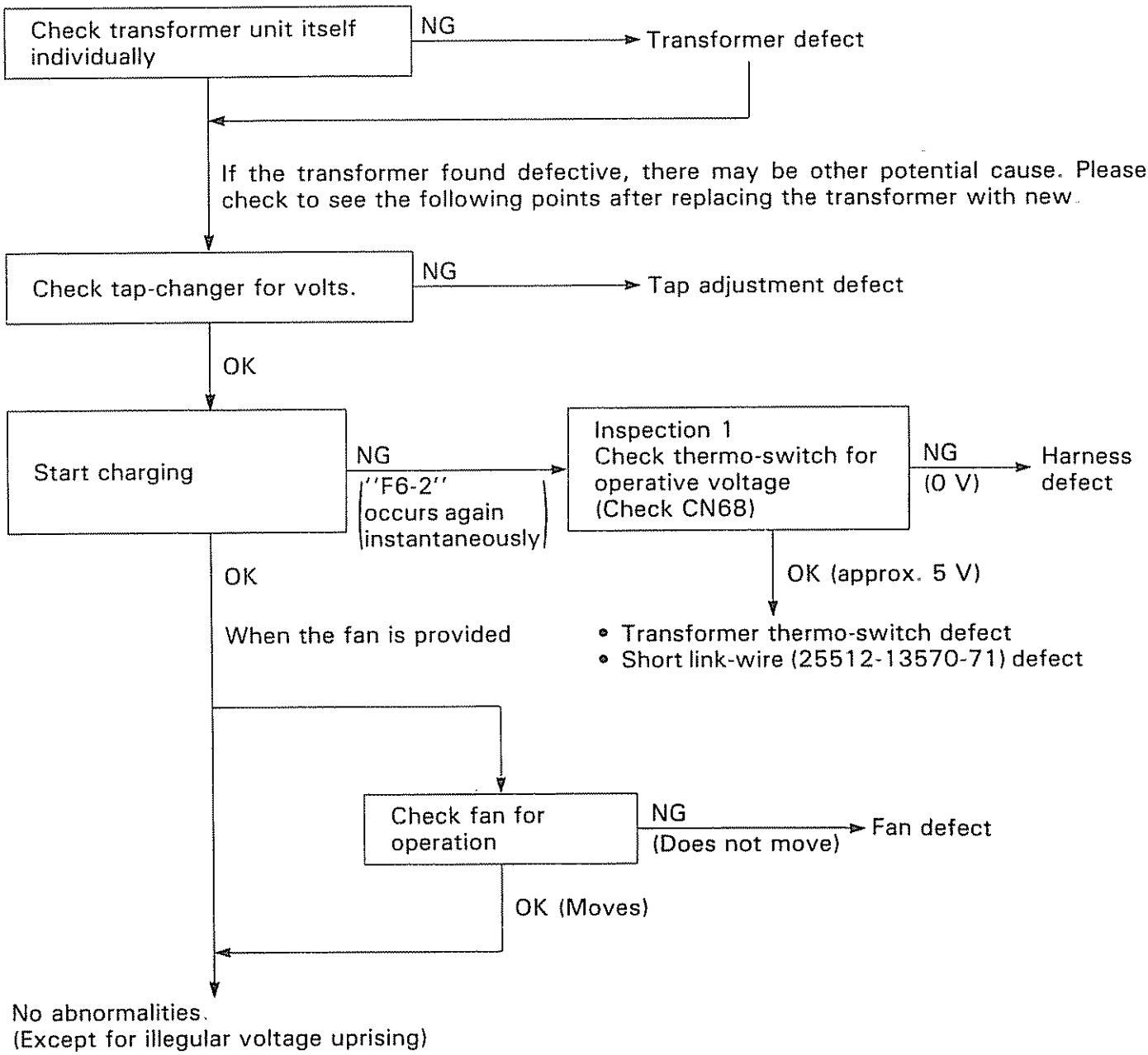
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Código de error F6-2: Comprobación de sobrecalentamiento



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Error code F6-2: Overheat check



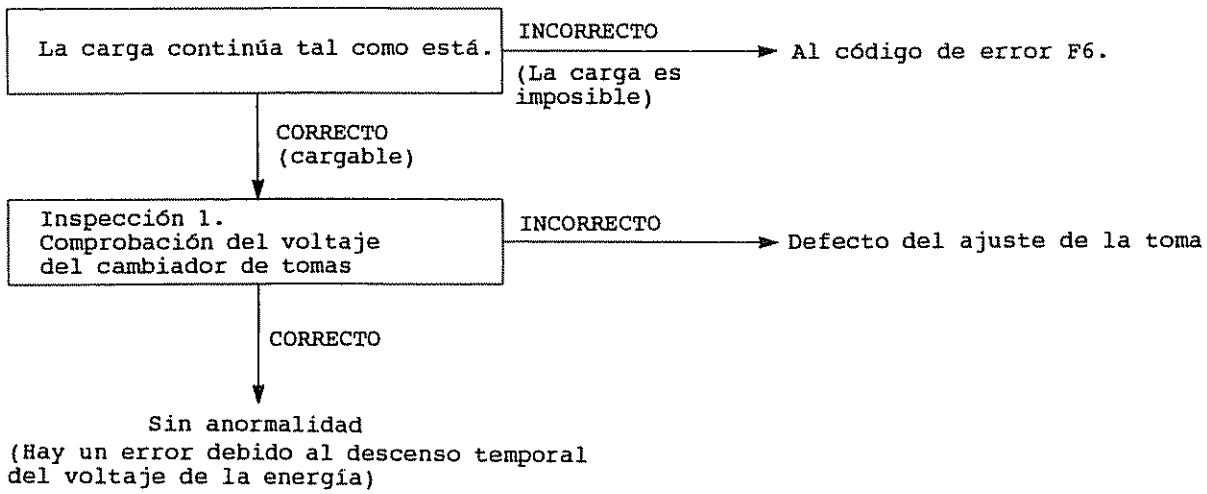
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Inspección 1. Compruebe el interruptor térmico en cuanto al voltaje de funcionamiento.

Terminales de medición	CN68-1 (139) + -- CN68-2 (17) -
Alcance del probador de circuitos	CC 10 V
Estándar	Aprox. 5 V

CORRECTO (aprox. 5 V) -- Defecto del interruptor térmico del transformador, defecto del cableado de cortocircuito (25512-13570-71)
INCORRECTO (0 V) -- Defecto del mazo de cables

Código de error F7: No se puede comenzar a cargar

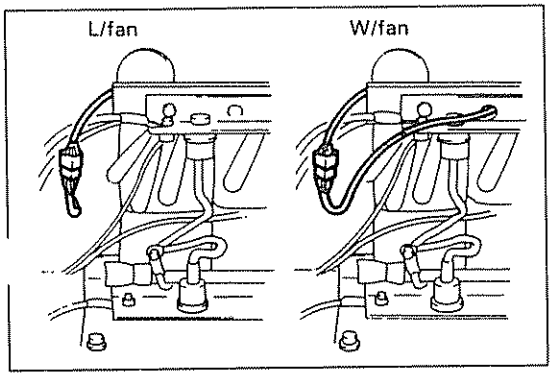


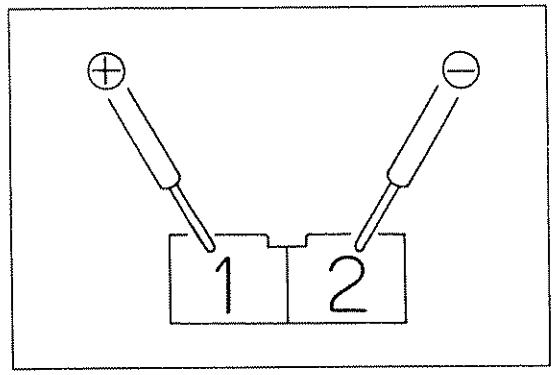
Inspección 1. Comprobación del voltaje del cambiador de tomas
Vea la parte del cambiador de tomas (página 4-139)

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Inspection 1. Check thermo-switch for operative voltage.

Measurement terminals	CN68-1 (139) ⊕ – CN68-2 (17) ⊖
Circuit tester range	DC 10 V
Standard	Approx. 5 V





OK (Approx. 5 V) → Transformer thermo-switch defect,
short link-wire (25512-13570-71) defect
NG (0 V) → Harness improper

Error code F7: Charging start disabled

Charging continues as it stands.
→ NG (Charging is impossible.) → To error code F6-1.
↓ OK (Chargeable)

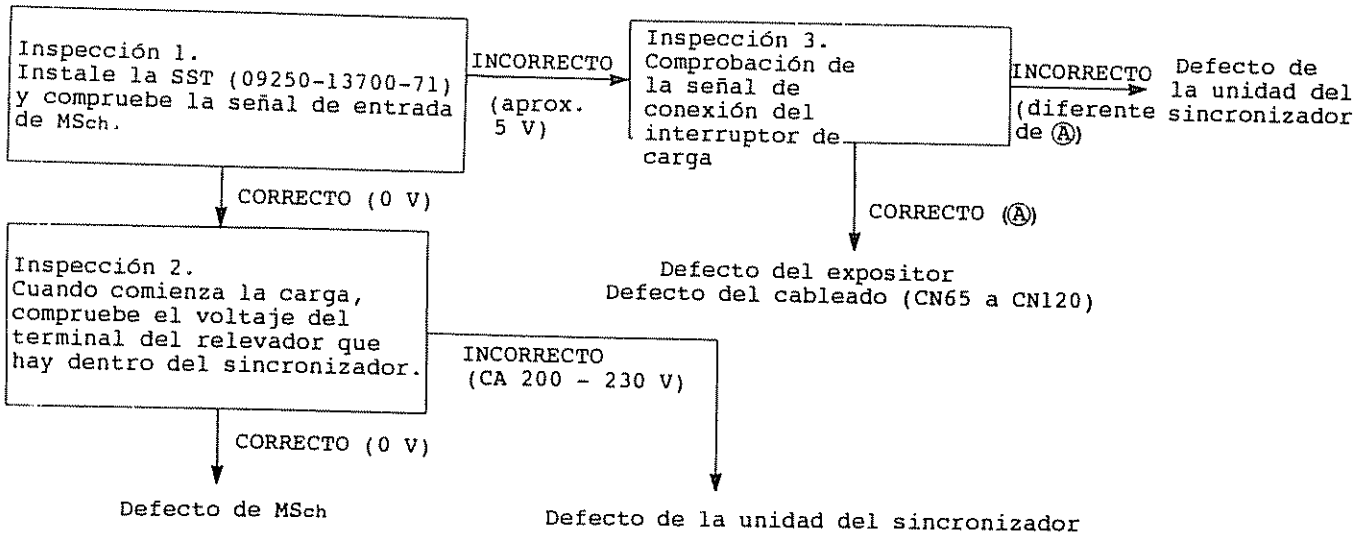
Inspection 1
Tap changer voltage check
→ NG → Tap adjustment defect
↓ OK

No abnormality
(An error occurred due to temporary drop of the power voltage.)

Inspection 1. Tap changer voltage check
Refer to the tap changer item (P4-139)

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Código de error F8: Terminación de la carga imposible



Ⓐ

Interruptor	CN65	En conexión	En desconexión
Interruptor normal	4 - 8	0 V	Aprox. 5 V
Interruptor igual	5 - 8	0 V	Aprox. 5 V

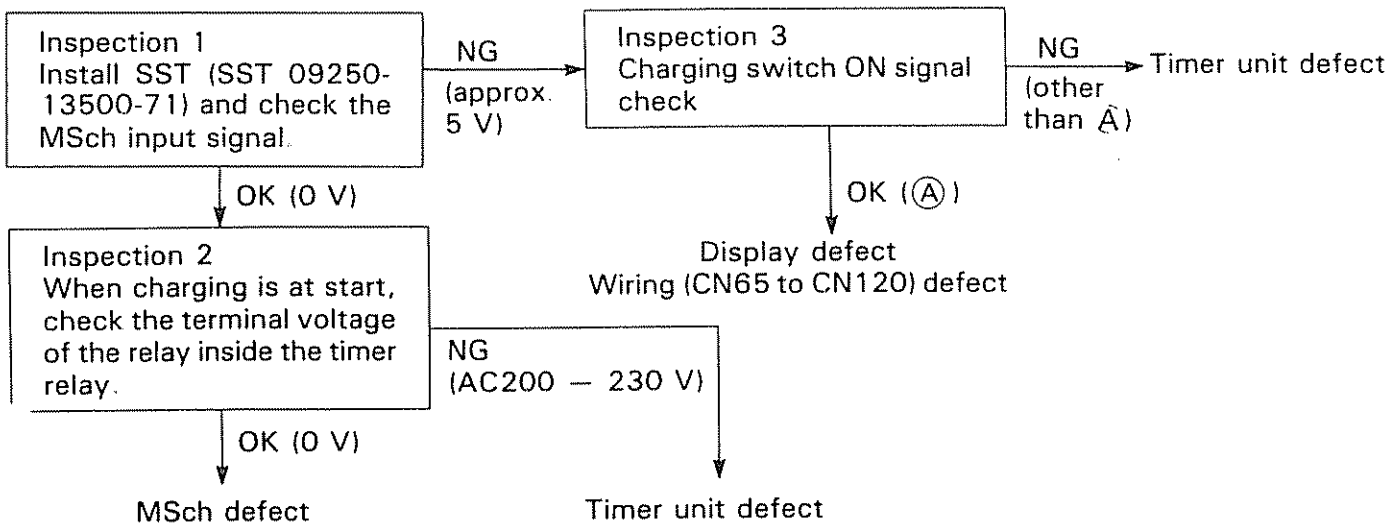
Inspección 1. Comprobación de la señal de entrada de MSCH
Enchufe del voltaje de CA conectado, interruptor de carga (normal o igual) conectado

Terminales de medición	CN65-7 (133) + -- CN65-8 (18) -
Alcance del probador de circuitos	CC 10 V
Estándar	0 V

CORRECTO (0 V) -- A la inspección 2.
INCORRECTO (aprox. 5 V) -- A la inspección 3.

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Error code F8: Charging completion disabled

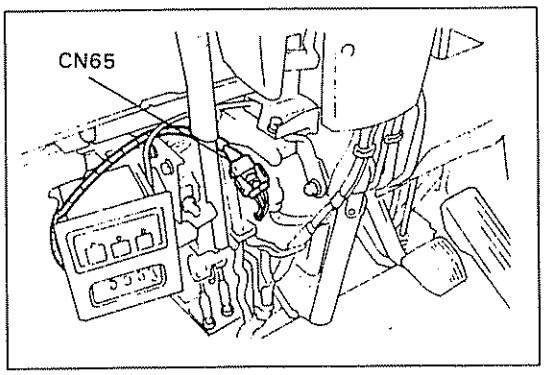


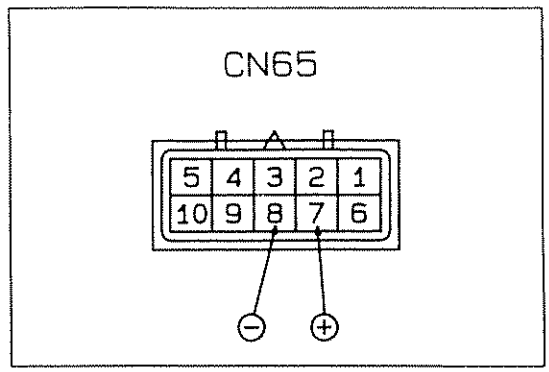
Ⓐ

Switch	CN65	At ON	At OFF
Normal switch	4 — 8	0 V	Approx. 5 V
Equal switch	5 — 8	0 V	Approx. 5 V

Inspection 1. MSch input signal check
AC voltage plug ON, charging switch (normal or equal) ON

Measurement terminals	CN65-7(133) ⊕ — CN65-8(18) ⊖
Circuit tester range	DC10 V
Standard value	0 V





OK (0 V) → To Inspection 2.
NG (approx. 5 V) → To Inspection 3.

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Inspección 2. Compruebe el voltaje del terminal del relevador que hay dentro de la unidad el sincronizador

Terminales de medición	CN62-1 (B) + -- Enchufe de CA fase S (clavija central del enchufe de CA)
Alcance del probador de circuitos	CA 250 V
Estándar	0 V

Enchufe de CA fase S

CORRECTO (0 V) -- Defecto de MSch
INCORRECTO (200 a 230 V) -- Defecto de la unidad del sincronizador

Inspección 3. Comprobación de la señal de conexión del interruptor de carga
Enchufe de la batería conectado, interruptor de carga (normal o igual) conectado

Terminales de medición	CN65-1 (134) + -- CN65-8 (18) -
Alcance del probador de circuitos	CC 10 V
Estándar	Vea la tabla siguiente.

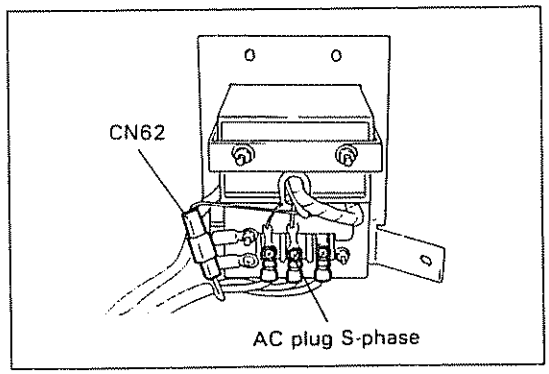
CORRECTO (dentro del valor estándar) -- Defecto del expositor, defecto del cableado (entre CN65 y CN120)
INCORRECTO (fuera del valor estándar) -- Defecto de la unidad del sincronizador

Interruptor	CN65	En conexión	En desconexión
Interruptor normal	4 - 8	0 V	Aprox. 5 V
Interruptor igual	5 - 8	0 V	Aprox. 5 V

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Inspection 2. Check of the terminal voltage of the relay inside the timer unit

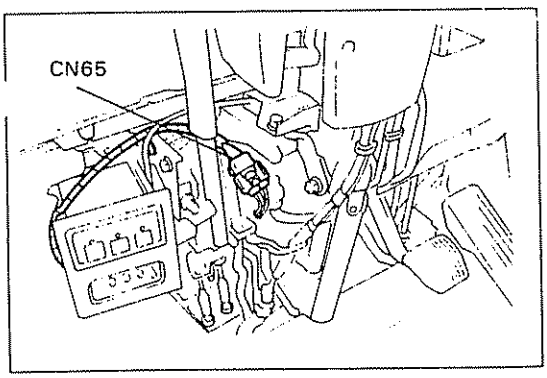
Measurement terminals	CN62-1(B) ⊕ — AC plug S-phase (AC plug center pin)
Circuit tester range	AC 250 V
Standard	0 V

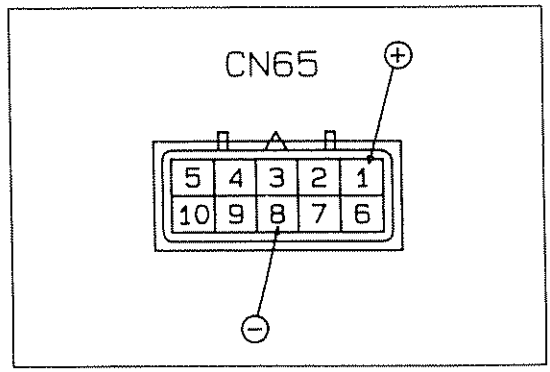


OK (0 V) → MSch defect
NG (200 to 230 V) → Timer unit defect

Inspection 3. Charging switch ON signal check
Battery plug ON, charging switch (normal or equal) ON

Measurement terminals	CN65-1(134) ⊕ — CN65-8(18) ⊖
Circuit tester range	DC 10 V
Standard	See the table below.





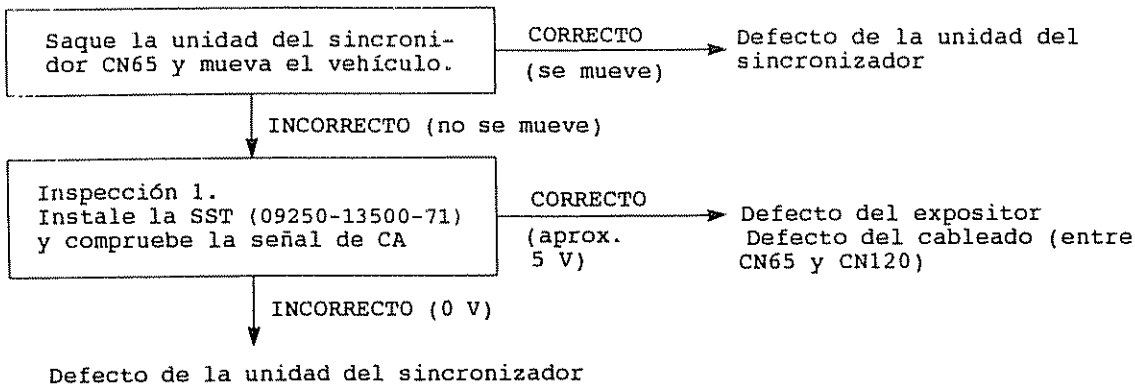
OK (within the standard value) → Display defect, wiring defect (between CN65 and CN120)
NG (outside the standard value) → Timer unit defect

Switch	CN65	At ON	At OFF
Normal switch	4 — 8	0 V	Approx. 5 V
Equal switch	5 — 8	0 V	Approx. 5 V

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CUANDO NO HAY EXPOSICION DEL CODIGO DE ERROR DE DIAGNOSTICO

1. El vehículo no se mueve en absoluto. (El enchufe de energía de CA no está conectado, pero aparece la pantalla del expositor de CA)



Inspección 1. Comprobación del voltaje de la señal de CA
Enchufe de energía de CA desconectado

Terminales de medición	CN65-3 (136) + -- CN65-8 (18) -
Alcance del probador de circuitos	CC 10 V
Estándar	Aprox. 5 V

CORRECTO (aprox. 5 V) -- Defecto del expositor. Defecto del cableado (entre CN65 y CN120)
INCORRECTO (0 V) -- Defecto de la unidad del sincronizador

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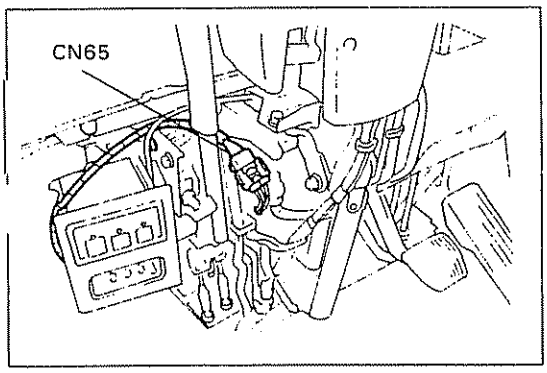
WHEN NO DIAGNOSTIC ERROR CODE IS DISPLAYED

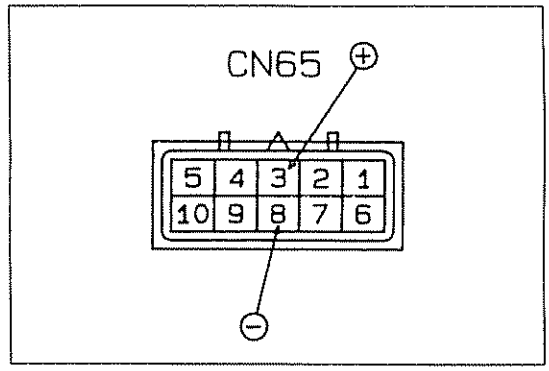
1. **The vehicle does not move at all. (The AC power plug is not connected, but the AC display screen appears.)**

Remove the timer unit CN65, and move the vehicle.
→ OK (moves) → Timer unit defect
↓ NG (does not move)
Inspection 1
Install SST (09250-13500-71), and check the AC signal.
→ OK (approx. 5 V) → Display defect. Wiring defect (between CN65 and CN120)
↓ NG (0 V)
Timer unit defect

Inspection 1. AC signal voltage check
AC power plug OFF

Measurement terminals	CN65-3(136) ⊕ — CN65-8(18) ⊖
Circuit tester range	DC10 V
Standard	Approx. 5 V

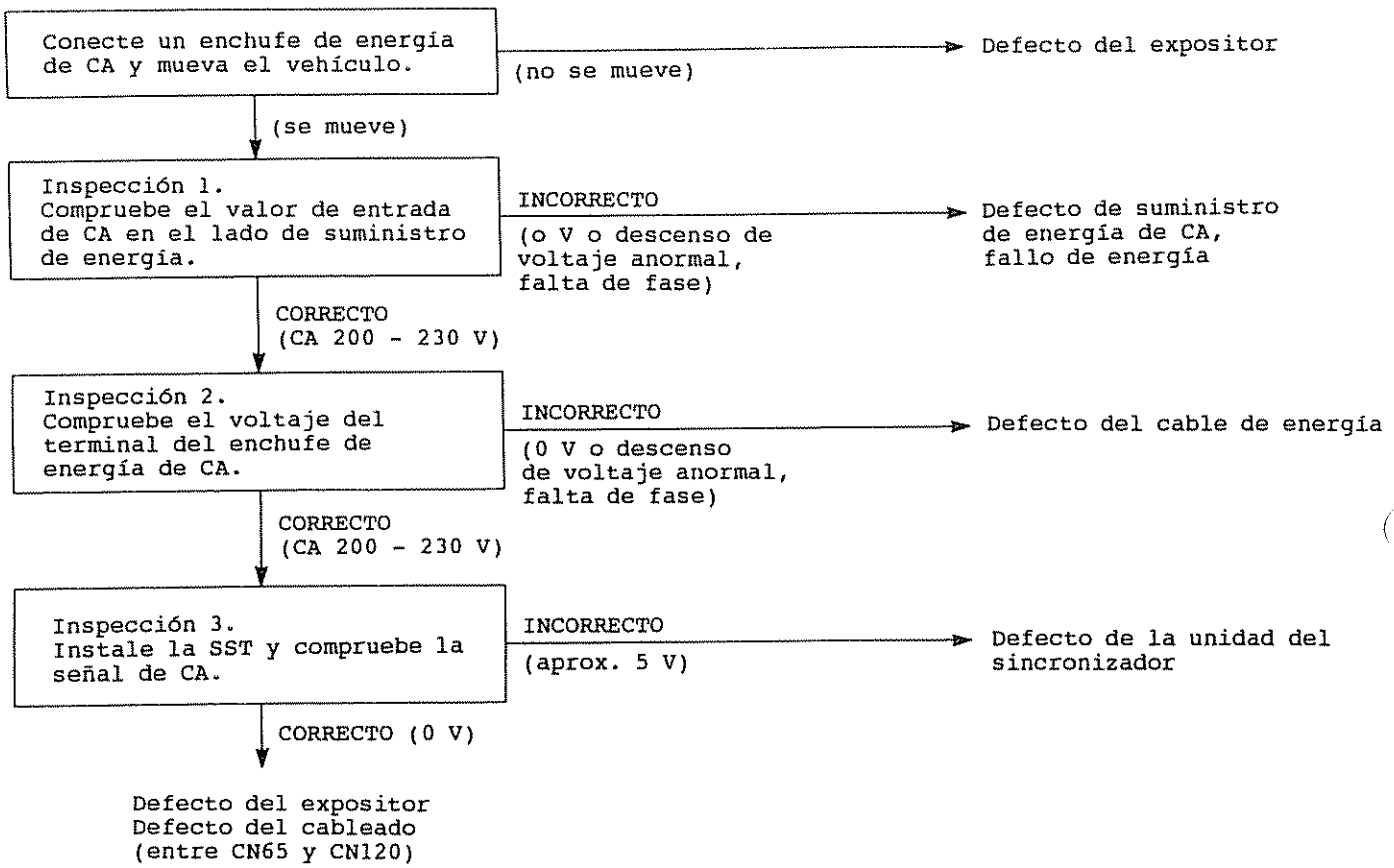




OK (approx. 5 V) → Display defect. Wiring defect (between CN65 and CN120).
NG (0 V) → Timer unit defect

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2. Aunque se conecte el enchufe de energía de CA, la pantalla del expositor de CA no aparece.



Inspección 1. Comprobación del valor de entrada de CA en el lado de suministro de energía
Vea la inspección 1 (página 4-129) del código de error de diagnóstico F6.

CORRECTO (200 a 230 V, CA) -- A la inspección 2.
INCORRECTO (0 V o descenso de voltaje anormal, falta de fase) -- Defecto de energía de CA, fallo de energía

Inspección 2. Comprobación del voltaje del terminal del enchufe de energía de CA
Vea la inspección 2 (página 4-129) del código de error de diagnóstico F6.

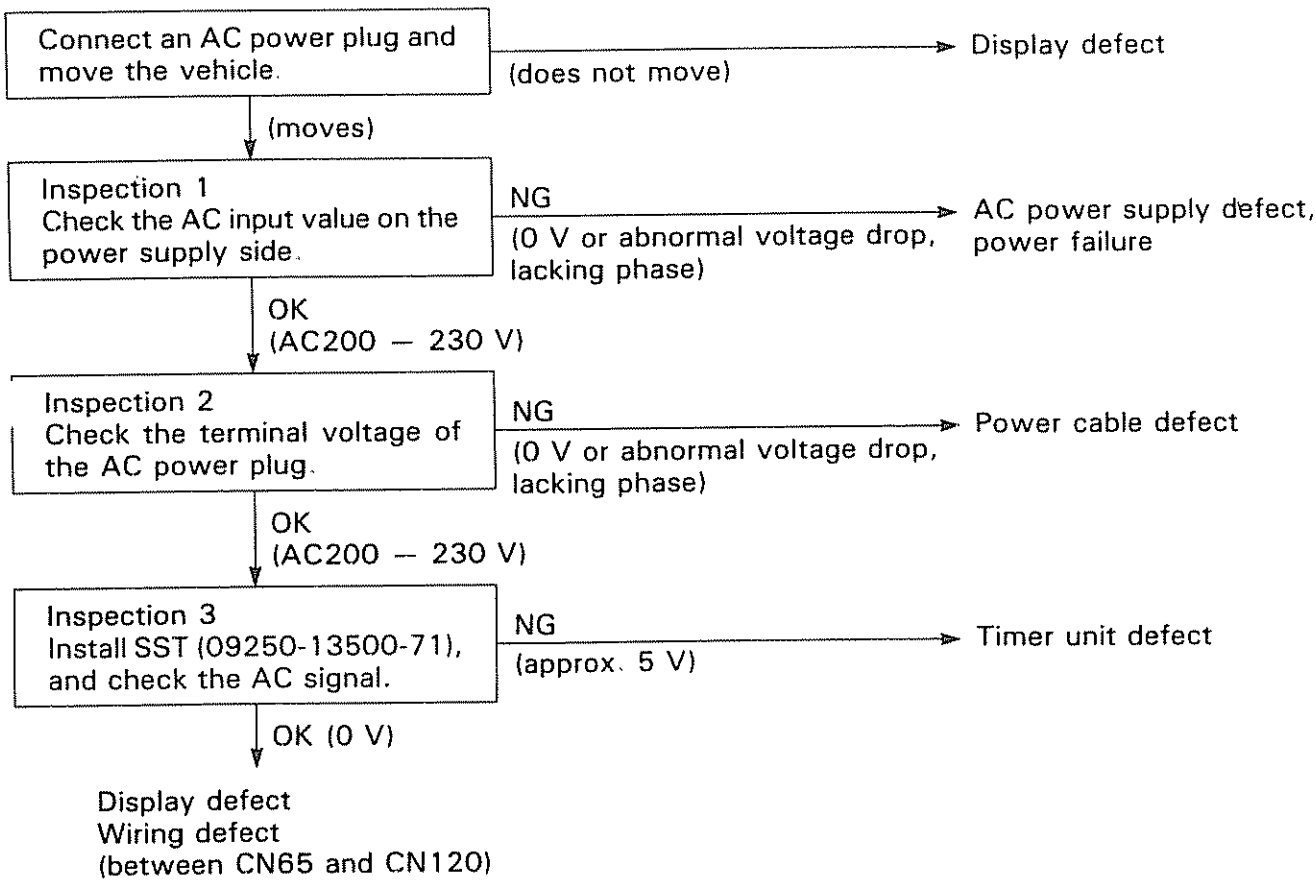
CORRECTO (200 a 230 V, CA) -- A la inspección 3.
INCORRECTO (0 V o descenso de voltaje anormal, falta de fase) -- Defecto del cable de energía

Inspección 3. Comprobación del voltaje de la señal de CA
Cuando no aparece código de error de diagnóstico, vea la inspección 1 (página 4-135).

CORRECTO (0 V) -- Defecto del expositor
INCORRECTO (aprox. 5 V) -- Defecto de la unidad del sincronizador

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2. Even if the AC power plug is connected, the AC display screen does not appear.



Inspection 1. AC input value check on the power supply side
See the Inspection 1 (P4-129) of diagnostic error code F6-1.

OK (200 to 230 VAC) → To Inspection 2.
NG (0 V or abnormal voltage drop, missing phase) → AC power defect, power failure

Inspection 2. AC power plug terminal voltage check
See Inspection 2 (P4-129) of the diagnostic error code F6-1.

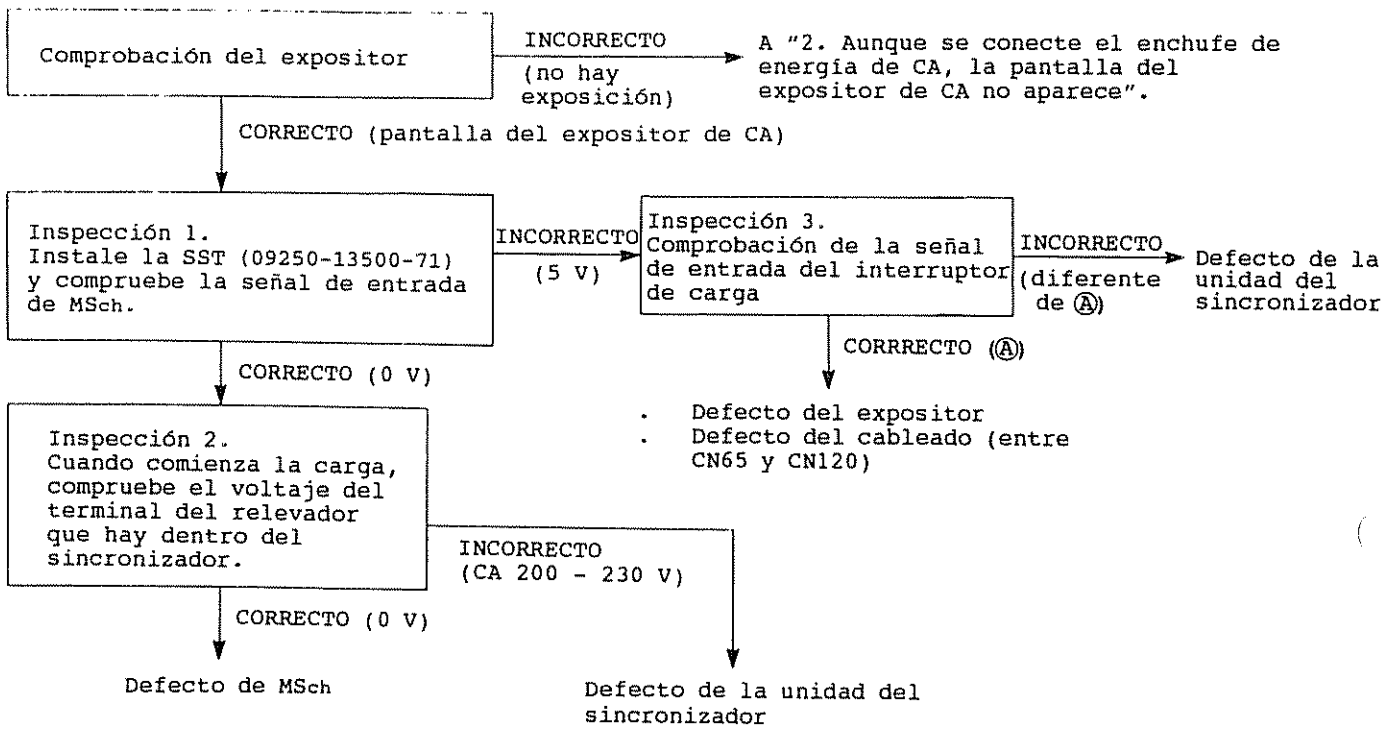
OK (200 to 230 VAC) → To Inspection 3.
NG (0 V or abnormal voltage drop, missing phase) → Power cable defect

Inspection 3. AC signal voltage check
When no diagnostic error code is displayed, see the Inspection 1 (P4-135).

OK (0 V) → Display defect
NG (approx. 5 V) → Timer unit defect

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3. El interruptor magnético no se conecta cuando se aprieta el interruptor de carga.



A

Interruptor	CN65	En conexión	En desconexión
Interruptor normal	4 - 8	0 V	Aprox. 5 V
Interruptor igual	5 - 8	0 V	Aprox. 5 V

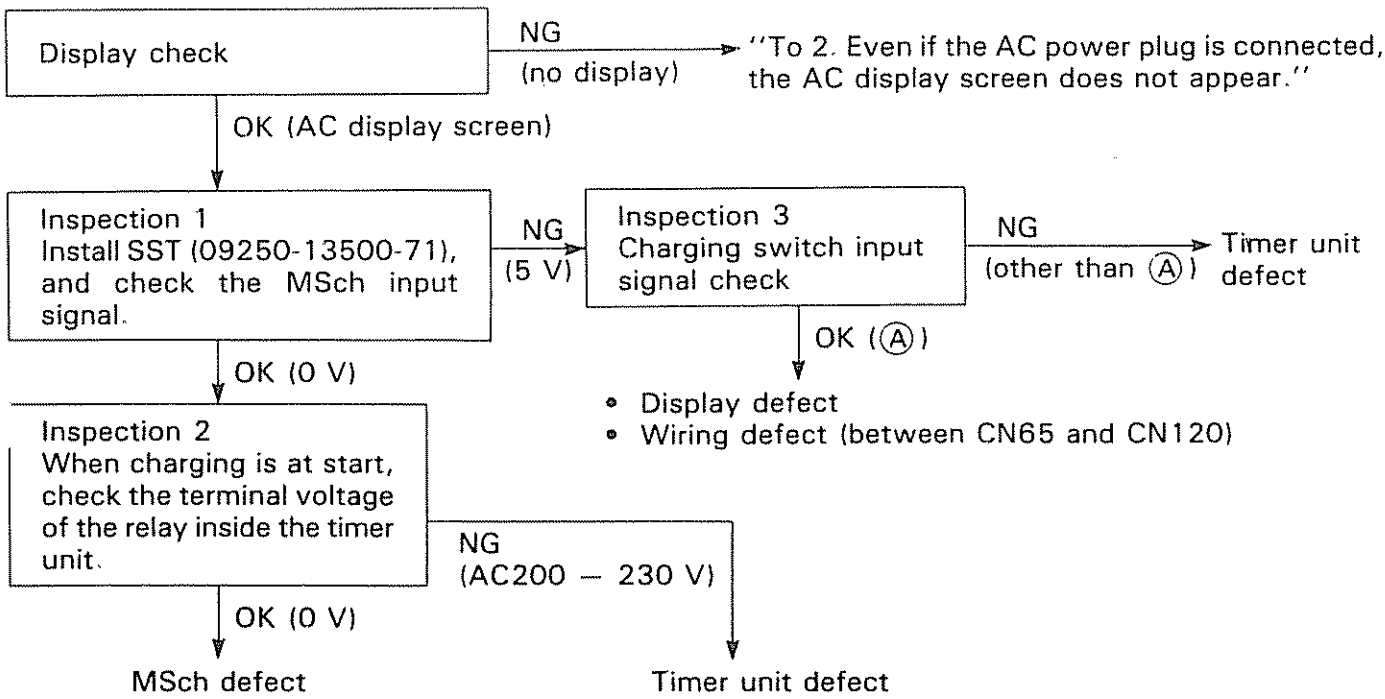
Inspección 1. Comprobación de la señal de entrada de MSch
Vea la Inspección 1 (página 4-133) del código de error de diagnóstico F8.

Inspección 2. Comprobación del voltaje del terminal para el relevador que hay dentro del sincronizador
Vea la Inspección 2 (página 4-134) del código de error de diagnóstico F8.

Inspección 3. Comprobación de la señal de conexión del interruptor de carga
Vea la Inspección 3 (página 4-134) del código de error de diagnóstico F8.

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3. The magnet switch is not turned ON when the charging switch is pressed.



Ⓐ

Switch	CN 65	At ON	At OFF
Normal switch	4 — 8	0 V	Approx. 5 V
Equal switch	5 — 8	0 V	Approx. 5 V

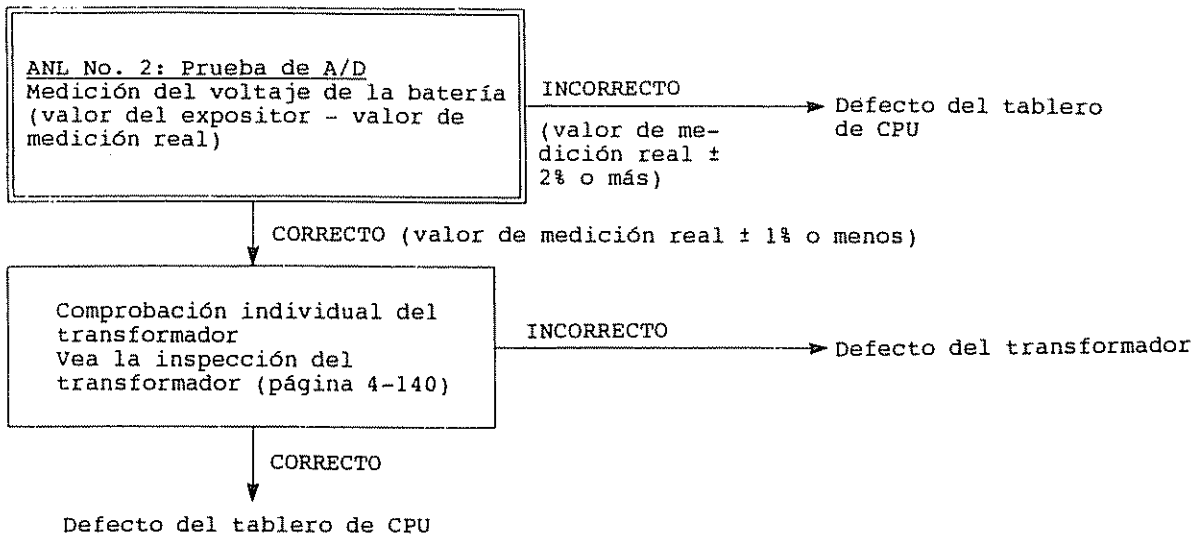
Inspection 1. MSch input signal check
See Inspection 1 (P4-133) of diagnostic error code F8.

Inspection 2. Terminal voltage check for the relay inside the timer unit
See the Inspection 2 (P4-134) of diagnostic error code F8.

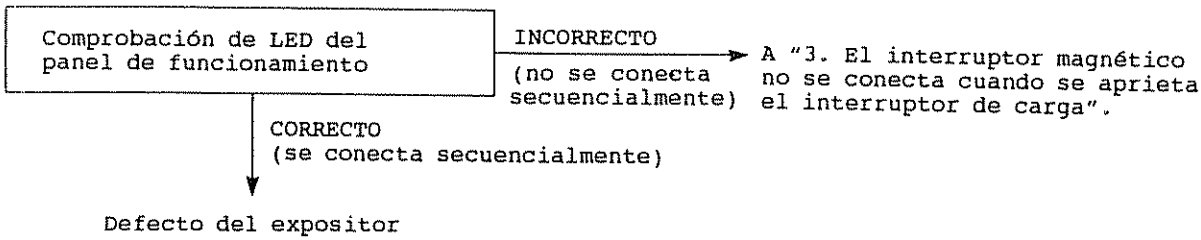
Inspection 3. Charging switch ON signal check
See Inspection 3 (P4-134) of diagnostic error code F8.

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4. La carga termina normalmente pero es insuficiente



5. El indicador de carga no cambia en la prueba del sincronizador.



OTRA BUSQUEDA DE AVERIAS

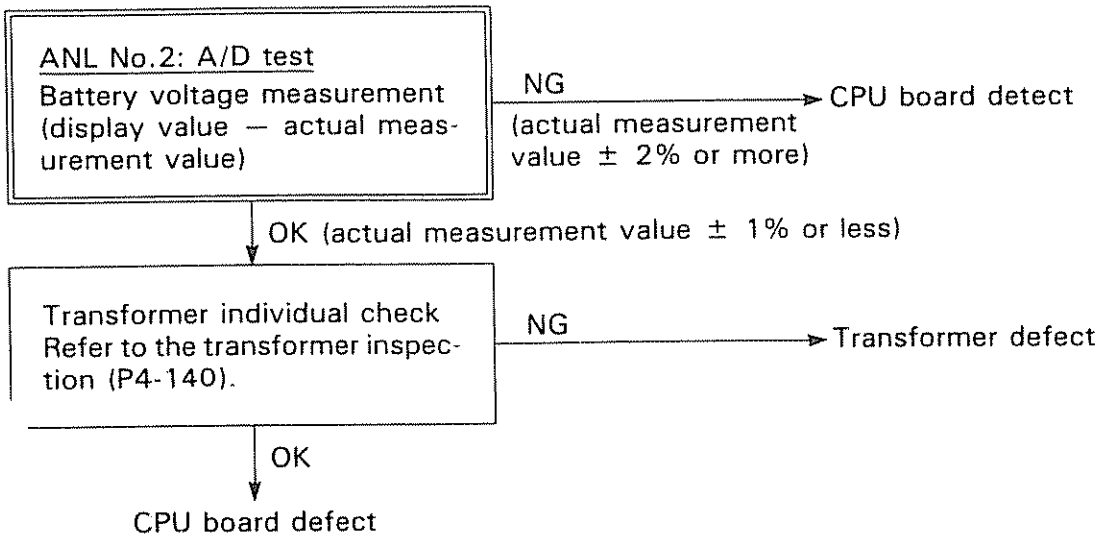
El error del expositor de capacidad de la batería es grande.

El expositor se conecta cuando la batería se descarga --- Vea el Ajuste 8 de la puerta a punto No. 4.

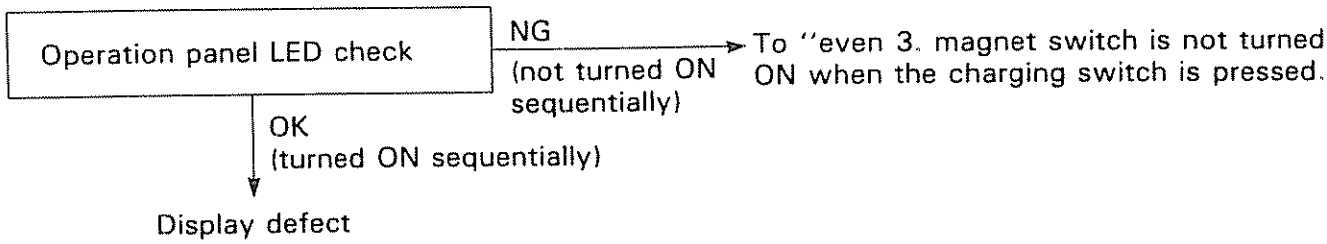
Aunque la capacidad de la batería no se ha consumido del todo, se apaga el expositor --- Vea el Ajuste 1 de la puesta a punto No. 4.

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4. **Charging ends normally but the charge is insufficient.**



5. **The charging indicator does not change in the timer test.**



OTHER TROUBLESHOOTING

The error in the battery capacity display is great.

The display is turned on when the battery is discharging. ⟶ See Adjustment 8 of tuning item No.4

Even though the battery capacity has not been consumed up yet, the display is turned off ⟶ See Adjustment 1 of tuning item No.4.

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INSPECCION Y REPARACION DE LAS PARTES RELACIONADAS CON EL CARGADOR

Conmutador de tomas

1. Mida el voltaje del usuario del suministro de energía para la carga.

   Alcance del probador de circuitos: CA (250 ó 1000 V)

   Nota:
   Mida el voltaje de suministro de energía por la noche. (Si es imposible, mídalo en el descanso de mediodía cuando no se hacen funcionar las partes eléctricas).

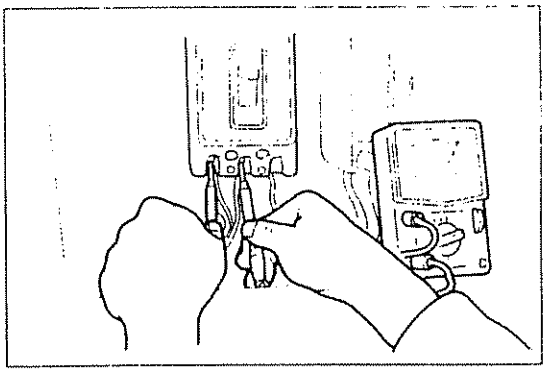
2. Coloque el conmutador de tomas.

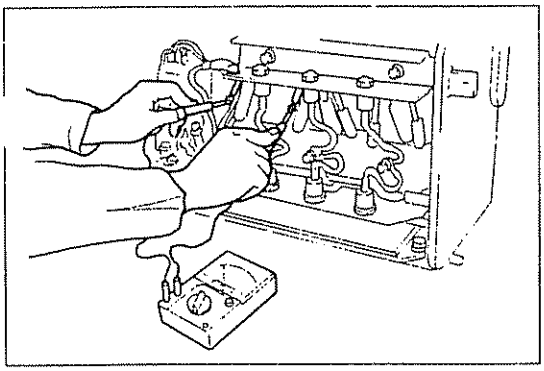
   (1) Corte la cinta de sujeción y saque la cubierta de cada toma.
   (2) Seleccione y ajuste la toma para el voltaje medido en la etapa 1.
   (3) Conecte el receptáculo del conmutador a suministro de energía y cierre manualmente a la fuerza el interruptor magnético.
   (4) Compruebe el voltaje entre las tomas.

Voltaje medido	Toma
199 V o menos	200 V
200 - 209 V	210 V
210 - 219 V	220 V
220 - 229 V	230 V

Notas:
- La toma se ajusta a 220 V en el momento del envío.
- Ajuste el conmutador de tomas para las fases U, V y W sin falta.
- Después de ajustar el conmutador de tomas, compruebe el estado de carga de la batería (gravedad específica y nivel del electrólito) durante una semana para confirmar que el ajuste de las tomas es correcto.

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INSPECTING AND REPAIRING CHARGER RELATED PARTS

Tap Changer

1. Measure the voltage of the power supply user for charging

   Circuit tester range: AC (250 or 1000 V)

   Note:
   Measure the power supply voltage at night. (If impossible, measure in the noon recess when electrical parts are not operated.)

3. Set the tap changer.

   (1) Cut the Tie-wrap and remove each tap cover.
   (2) Select and set the tap for the voltage measured in step 1.
   (3) Connect the charger receptacle to the power supply and manually close the magnet switch forcibly.
   (4) 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
220 ~ 229 V	230 V

Note:
- **The tap is set to 220 V at the time of shipment.**
- **Set the tap changer for the U, V and W phases without fail.**
- **After setting the tap changer, check the battery charging state (specific gravity and electrolyte level) for about a week to confirm that the tap setting is appropriate.**

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INSPECCION DEL CONJUNTO DEL TRANSFORMADOR

1. Mida la resistencia de aislamiento.

Instrumento de medición	CC 500 V megóhmetro
Terminales de medición	Cada terminal de la bobina - bastidor
Valor estándar	3 MΩ o más

2. Mida la continuidad de la bobina primaria.

Alcance del probador de circuitos	Ω x 1
Terminales de medición	U1-V1, V1-W1, W1-U1
Valor estándar	0 Ω

3. Mida la continuidad de la bobina secundaria.

Alcance del probador de circuitos	Ω x 1
Terminales de medición	U2-V2, V2-W2, W2-U2
Valor estándar	0 Ω

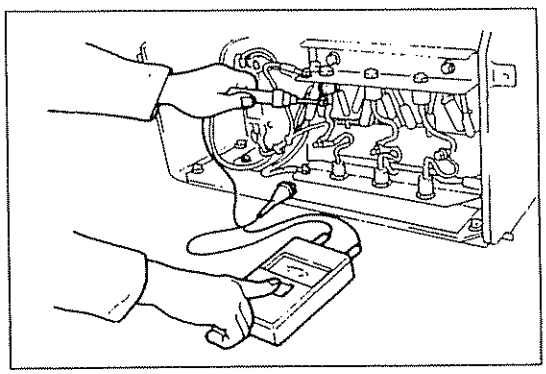
4. Mida la continuidad del fusible.

Alcance del probador de circuitos	Ω x 1
Terminales de medición	Ambos extremos del fusible
Valor estándar	0 Ω

5. Mida la continuidad del diodo.
El diodo se probará al instalarse en el sumidero térmico de aletas, y se sacará solamente cuando se encuentre alguna anormalidad.

Alcance del probador de circuitos		Ω x 1
Terminales de medición	Avance	Anodo - -- Cátodo +
	Retroceso	Anodo + -- Cátodo -
Valor estándar	Avance	25 Ω
	Retroceso	∞ Ω

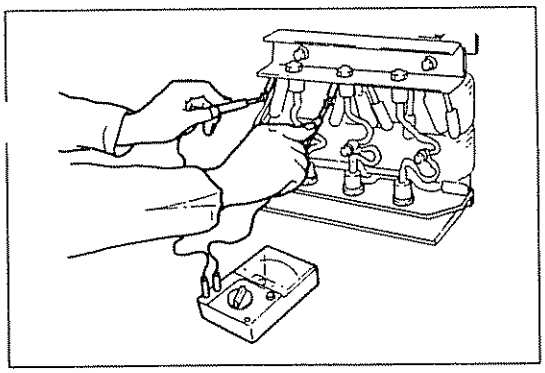
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INSPECTING THE TRANSFORMER ASSY

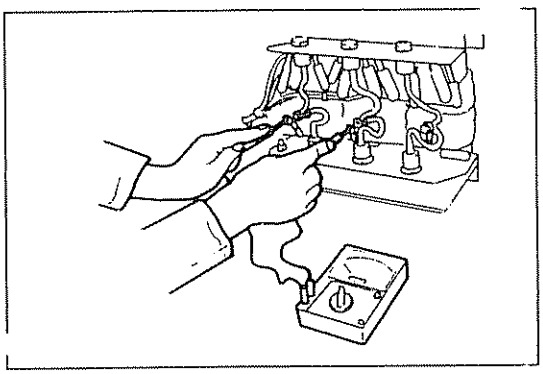
1. Measure the insulation resistance.

Measuring instrument	DC500 V megger
Measurement terminals	Each coil terminal — frame
Standard	3 MΩ or more



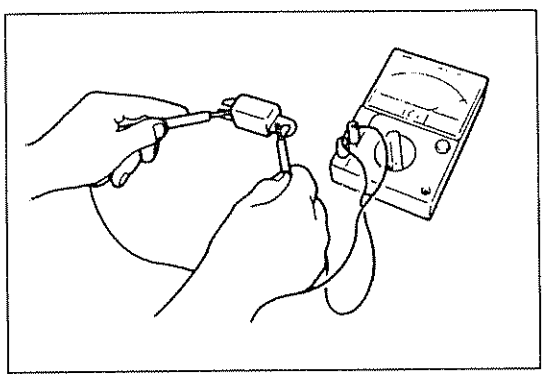
2. Measure the continuity of the primary coil.

Circuit tester range	Ω × 1
Measurement terminals	U1-V1, V1-W1, W1-U1
Standard	0 Ω



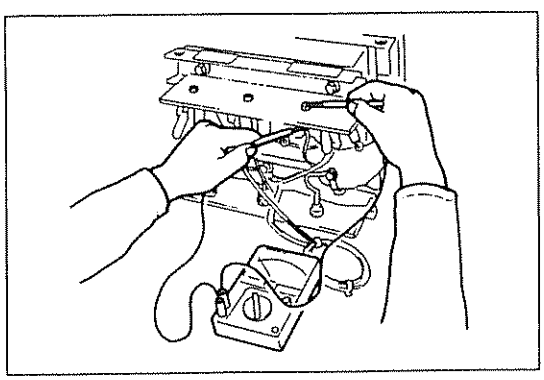
3. Measure the continuity of the secondary coil.

Circuit tester range	Ω × 1
Measurement terminals	U2-V2, V2-W2, W2-U2
Standard	0 Ω



4. Measure the continuity of the fuse.

Circuit tester range	Ω × 1
Measurement terminals	Both end of fuse
Standard	0 Ω



5. Measure the continuity of the diode.
The diode shall be tested as installed on the fin heat sink, and remove it only when an abnormality is found.

Circuit tester range		Ω × 1 K
Measurement terminals	Forward	Anode ⊖ — Cathode ⊕
	Reverse	Anode ⊕ — Cathode ⊖
Standard	Forward	25 Ω
	Reverse	∞ Ω

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6. Como se usan dos diodos con diferente polaridad, no se equivoque en la dirección de instalación

7. Apriete al par especificado cuando instale el diodo.

Unidad: N.m (kg-cm)

Inspección después de la instalación

1. Inspeccione la conexión de cada cableado.

   Nota:
   Compruebe la conexión de cada cableado consultando el diagrama del cableado del cargador.

2. Mida la resistencia de aislamiento.

Instrumento de medición	CC 500 V megóhmetro
Terminales de medición	Cada terminal de la bobina - bastidor
Valor estándar	3 MΩ o más

3. Mida el voltaje secundario sin carga.

   Conecte el enchufe del cargador a suministro de energía de CA (con el enchufe de la batería desconectado), accione manualmente el sincronizador y mida los puntos siguientes:

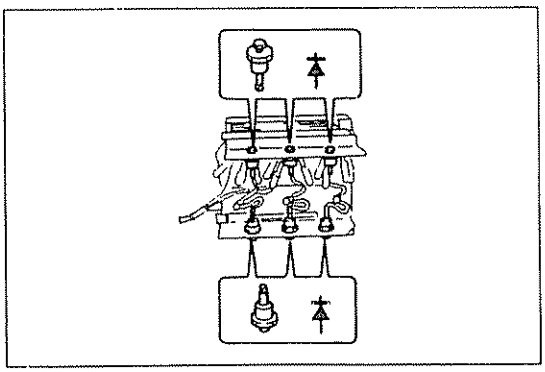
Voltaje de CA

Alcance del probador de circuitos	CA 250 V/CA 500 V
Terminales de medición	U2-V2, V2-W2, W2-U2
Valor estándar 50/60 (Hz)	Vehículo de 48 V: 55/55 V Vehículo de 72 V: 82/82 V

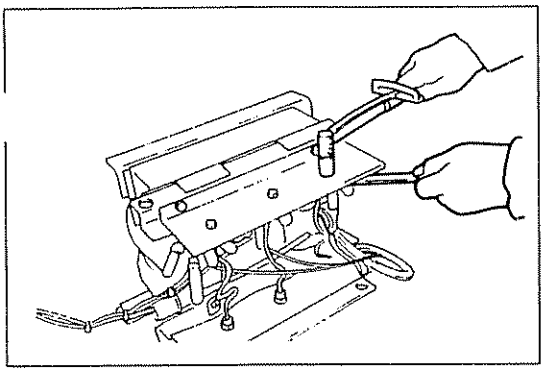
Voltaje de CC

Alcance del probador de circuitos	CC 250 V/CC 500 V
Terminales de medición	Ambos terminales del enchufe del cargador Terminal positivo +: clavija + Terminal negativo -: clavija -
Valor estándar 50/60 (Hz)	Vehículo de 48 V: 74/74 V Vehículo de 72 V: 111/111 V

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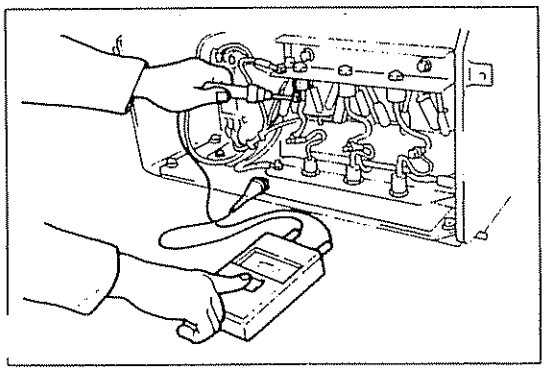
6. As two diode different in polarities are used, do not mistake the installing direction.



7. Tighten to the specified torque when installing the diode.

Unit: N·m (kg-cm)[ft-lb]

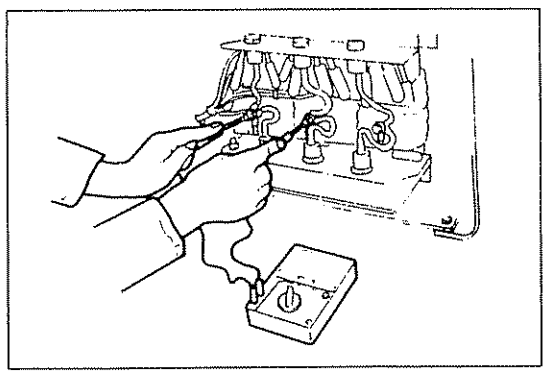
20M20, 20MA20	2.35 (24) [1.74]
45M20, 45MA20	16.7 (170) [12.3]
45M30, 45MA30	16.7 (170) [12.3]
70M20, 70MA20	22.0 (224) [16.2]



Inspection after Installation

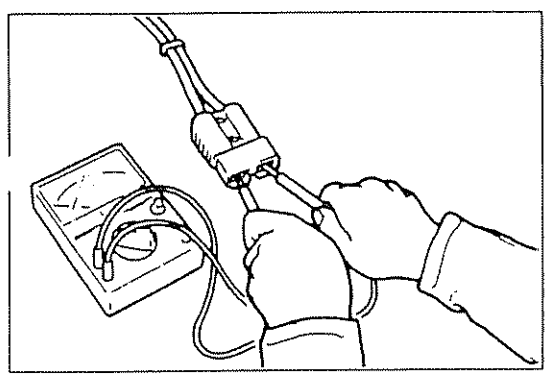
1. Inspect the connection of each wiring.

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



2. Measure the insulation resistance.

Measuring instrument	DC500 V megger
Measurement terminals	Each coil terminal – frame
Standard	3 MΩ or more



3. Measure the no-load secondary voltage.

Connect the charger plug to the AC power supply (with the battery plug disconnected), manually operate the timer and measure the following items:

AC Voltage

Circuit tester range	AC250 V
Measurement terminals	U2-V2, V2-W2, W2-U2
Standard 50/60 (Hz)	48 V vehicle: 55 / 55V 72 V vehicle: 82 / 82V

DC Voltage

Circuit tester range	DC250 V
Measurement terminals	Both terminals of charger plug Positive ⊕ terminal: ⊕ probe Negative ⊖ terminal: ⊖ probe
Standard 50/60 (Hz)	48 V vehicle: 74 / 74V 72 V vehicle: 111 / 111V

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PRUEBA DEL SINCRONIZADOR

Procedimiento de la prueba

1. Conecte el enchufe de energía al cargador.
2. La pantalla de la figura de la izquierda aparece en el expositor.

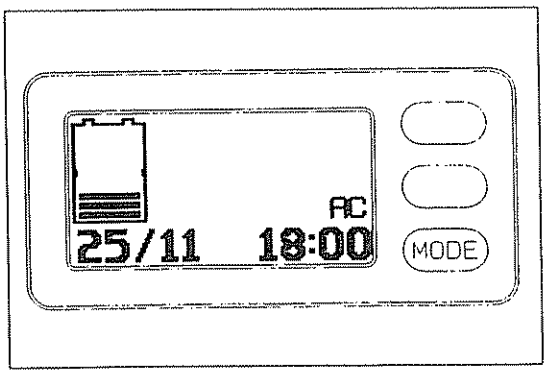
3. Apriete el interruptor “NORMAL” 1 y el interruptor “EQUAL” 2 al mismo tiempo.
4. LED 3 del interruptor “NORMAL” se enciende. (Comienza la prueba)
5. Los LED 3,4 y el UP LED 6 se encienden en orden uno tras otro.

   La prueba termina en 10 segundos. Si hay alguna anormalidad en el cargador, “UP LED” 6 parpadea.

   Nota:
   La barra indicadora de carga se enciende según progresa la prueba. Se enciende un LED cada segundo, y los diez LED en diez segundos (final de la prueba).

6. Apriete cualquiera de los interruptores “NORMAL” o “EQUAL” para desconectar “UP LED”. En la pantalla aparece de nuevo la de CA.

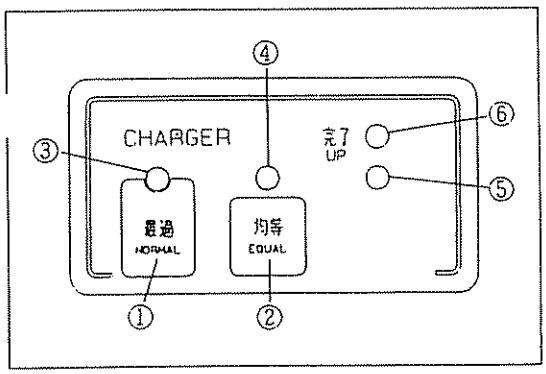
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TIMER TEST

Operation Procedure

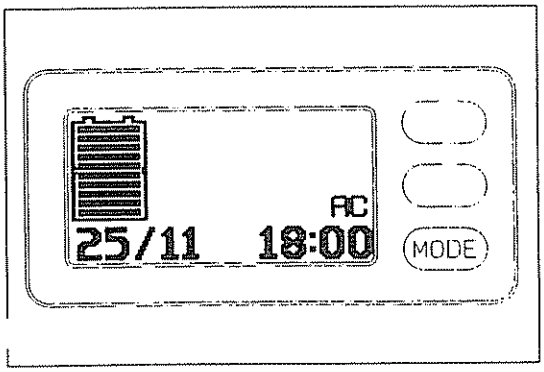
1. Connect the power plug to the charger.
2. The screen at left appears on the display.



3. Press NORMAL switch ① and EQUAL switch ② at the same time.
4. The LED ③ at the NORMAL switch comes on. (Test start)
5. LEDs ③, ④ and ⑤ and UP LED ⑥ come on sequentially.

   The test ends in 10 seconds. If there is any abnormality in the charger, UP LED ⑥ flashes.

   Note:
   The charge indicator bar is lit according to the test progress. One LED is lit every second, and ten LEDs are lit in ten seconds (end of test).



6. Press any of the NORMAL, EQUAL switches to turn off the UP LED. The screen displays the AC screen again.

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MOTOR

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MOTOR DE MARCHA

GENERALIDADES

Terminal E

Terminal A

Terminal F

Terminal B

ESPECIFICACIONES

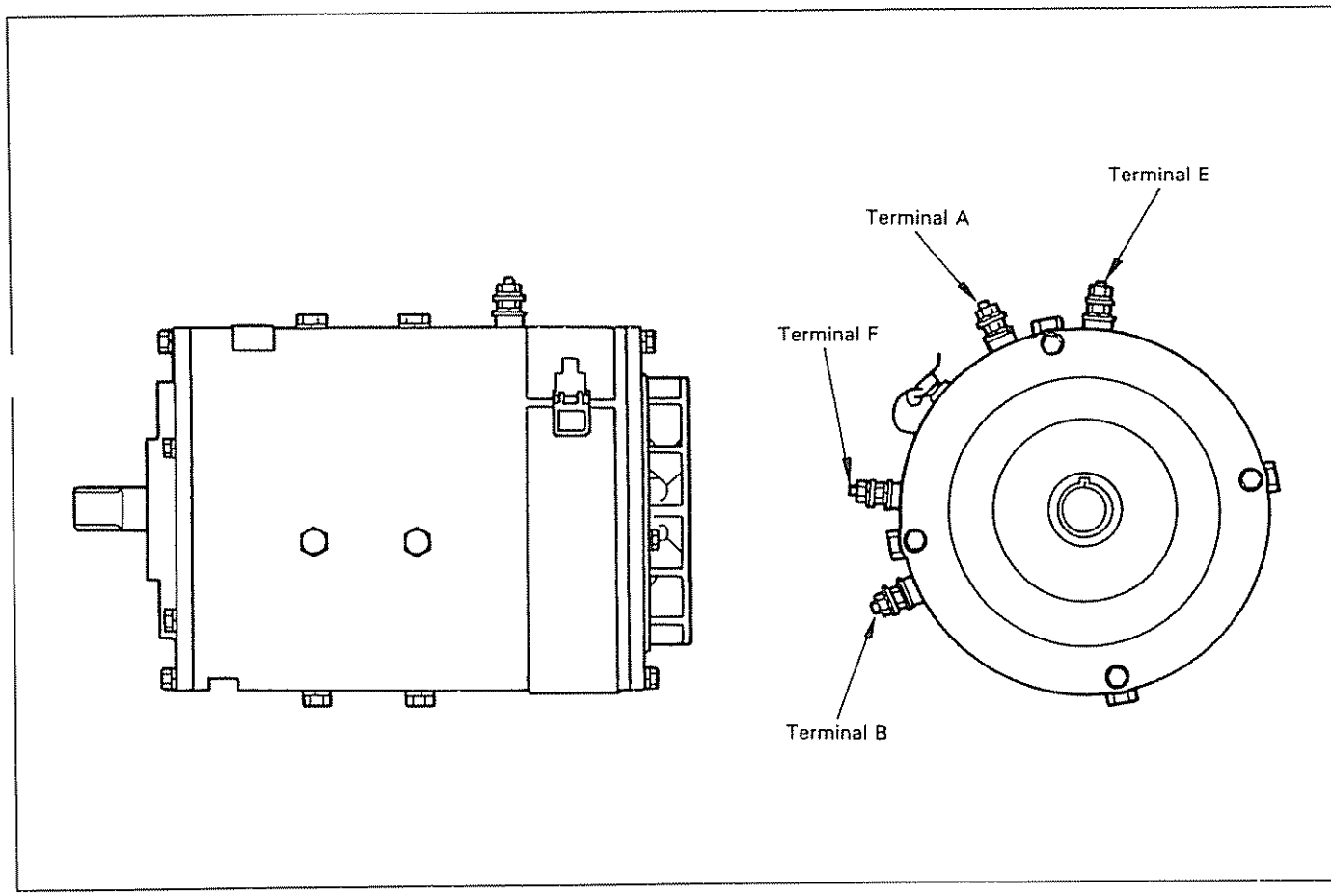
6FB10 ~ 18 (~1998. 1), 6FB20 ~ 30, 40-6FB15 ~ 25

Modelo del vehículo			6FB20~25 40-6FB15~25	6FB30
Punto				
Tipo		Autoventilado CC en serie	--	Encerrado CC en serie
Voltaje nominal	V	48	--	72
Potencia de régimen	kW	6,6	8,1	10,1
Clase de aislamiento		F	--	--
Tamaño de la escobilla (grosor x anchura x longitud)	mm	12,5x40,0x34,0	16,0x40,0x34,0	--
Número de escobillas		4	--	--

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DRIVE MOTOR

GENERAL



SPECIFICATIONS

6FB10 ~ 18 (~ 1998. 1), 6FB20 ~ 30, 40-6FB15 ~ 25

Item \ Vehicle model		6FB 10 ~ 18	6FB 20 25 40-6FB 15 ~ 25	6FB 30
Type		DC series-wound self-ventilated type	←	←
Nominal voltage	V	48	←	72
Rated output	kW	6.6	8.1	10.1
Insulation class		F	←	←
Brush size (thickness × width × length)	mm (in)	12.5 × 40.0 × 34.0 (0.492 × 1.575 × 1.339)	16.0 × 40.0 × 34.0 (0.630 × 1.575 × 1.339)	←
Number of brushes		4	←	←

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30-6FB10 ~ 30

Modelo del vehículo		30-6FB10~18	30-6FB20~25	30-6FB30
Punto				
Tipo		Autoventilado CC en serie	--	--
Voltaje nominal	V	48	--	72
Potencia de régimen	kW	6,4	7,6	9,2
Clase de aislamiento		F	--	--
Tamaño de la escobilla (grosor x anchura x longitud)	mm	16,0x40,0x34,0	--	--
Número de escobillas		4	--	--

6FB10 ~ 18 (1998. 2~)

Modelo del vehículo		6FB10~18
Punto		
Tipo		CC de devanado en serie, del tipo autoventilado
Voltaje nominal	V	48
Potencia de régimen	kW	6,8
Clase de aislamiento		F
Tamaño de la escobilla (grosor x anchura x longitud)	mm	12,5x40,0x34,0
Número de escobillas		4

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30-6FB10 ~ 30

Item \ Vehicle model		30-6FB 10 ~ 18	30-6FB 20 25	30-6FB 30
Type		DC series-wound, enclosed type	←	←
Nominal voltage	V	48	←	72
Rated output	kW	6.4	7.6	9.2
Insulation class		F	←	←
Brush size (thickness × width × length)	mm (in)	16.0 × 40.0 × 34.0 (0.630 × 1.575 × 1.339)	←	←
Number of brushes		4	←	←

6FB10 ~ 18 (1998. 2 ~)

Item \ Vehicle model		6FB10 ~ 18
Type		DC series-wound self-ventilated type
Nominal voltage	V	48
Rated output	kW	6.8
Insulation class		F
Brush size (thickness × width × length)	mm (in)	12.5 × 40.0 × 34.0 (0.492 × 1.575 × 1.339)
Number of brushes		4

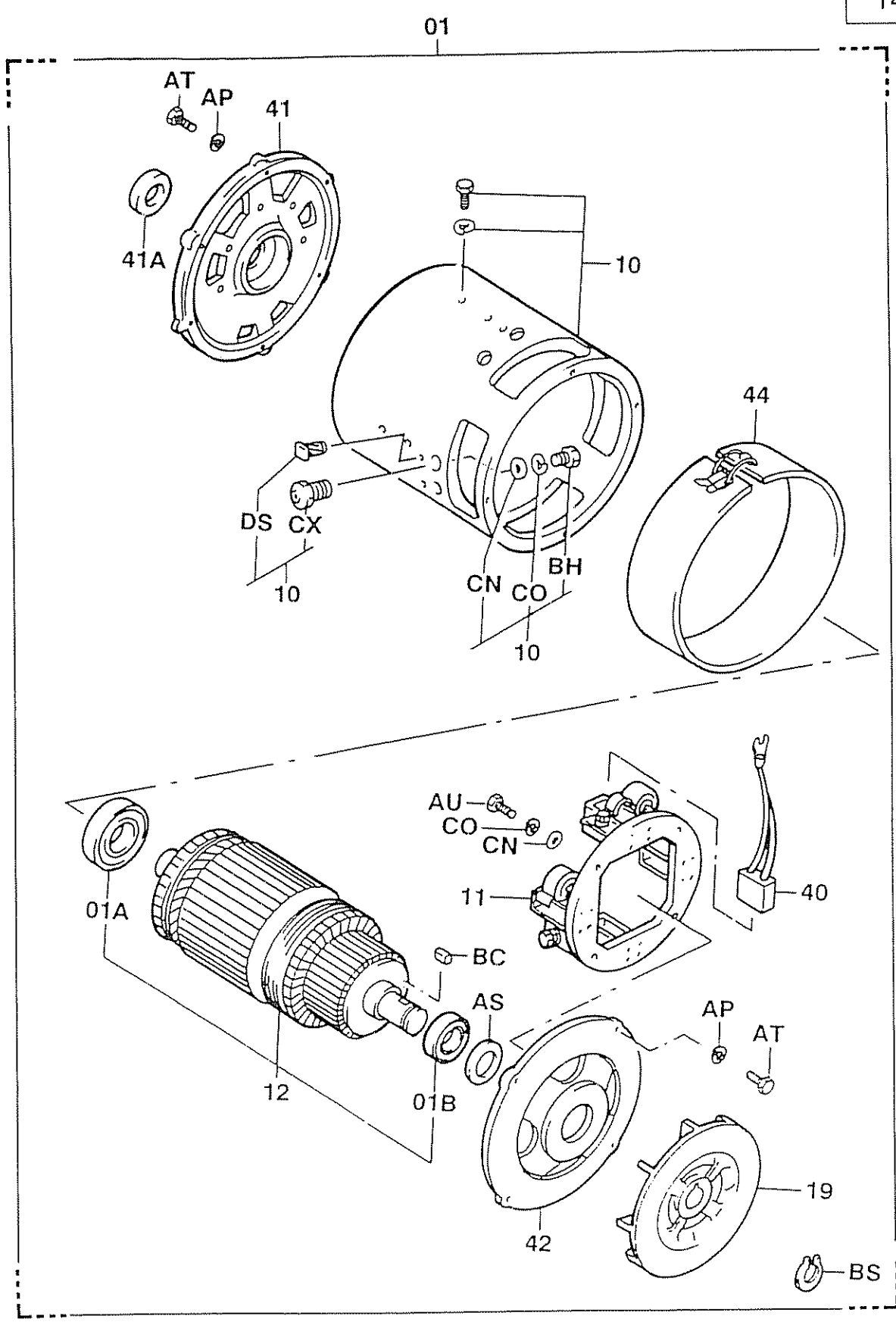
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COMPONENTES

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COMPONENTS

1401



1401-102

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CONJUNTO DEL MOTOR DE MARCHA

REMOCION/INSTALACION

T = N.m (kgf-cm)

Procedimiento de remoción

1 Saque el conjunto del eje delantero con el motor de marcha. (Vea as etapas 1 a 12 en la página 7-12)

2 Saque el motor de marcha fuera del conjunto del eje delantero. [Punto 1]

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Punto de trabajo

[Punto 1]

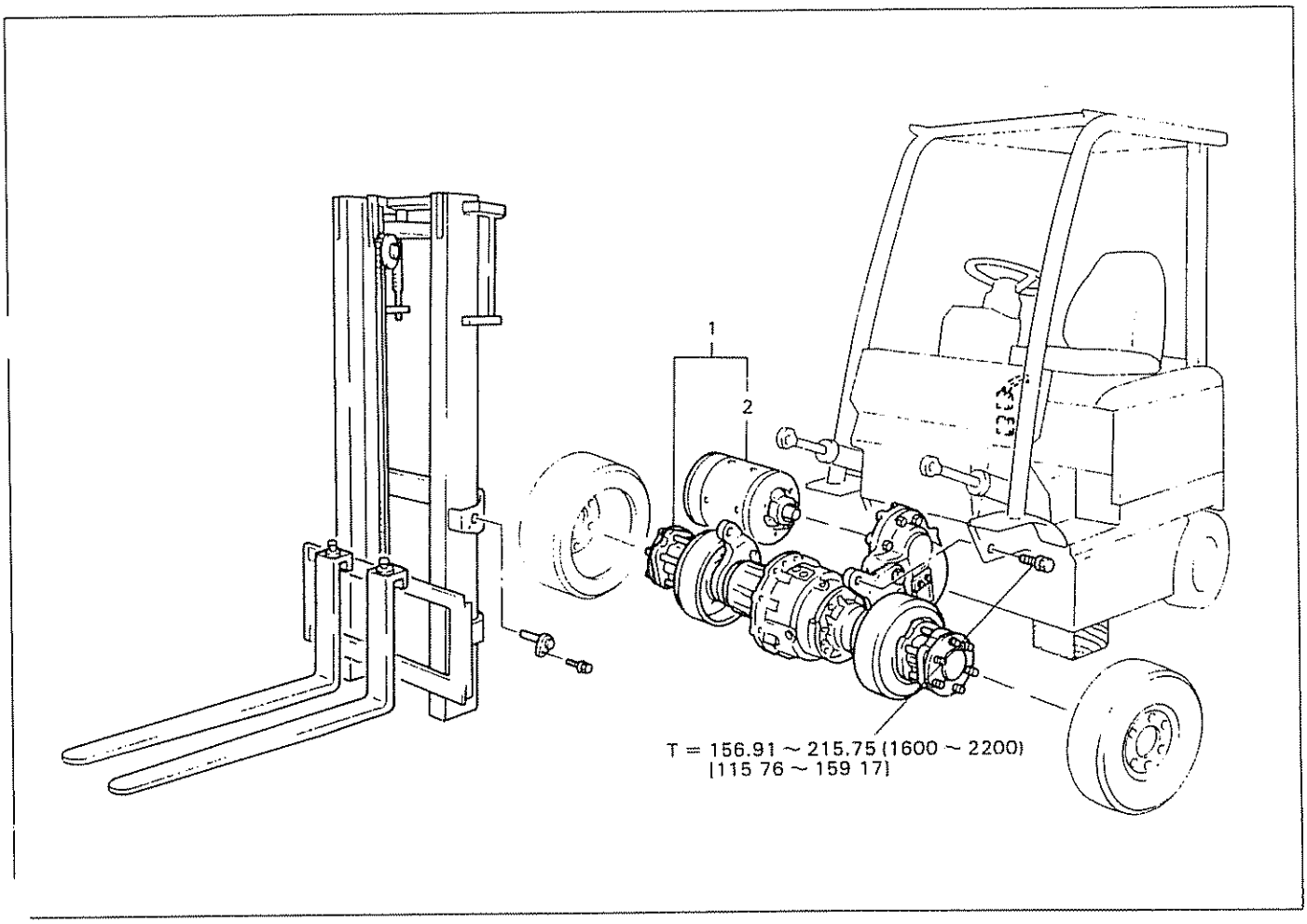
Remoción/instalación: SST 09010-10260-71

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DRIVE MOTOR ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



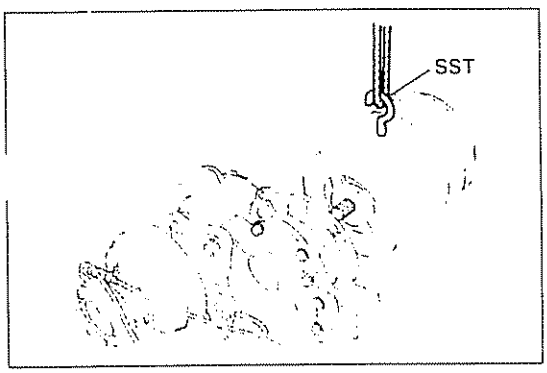
Removal Procedure

1 Remove the front axle ASSY W/drive motor. (See steps 1 to 12 on page 7-12.)

2 Remove the drive motor from the front axle ASSY. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

[Point 1]
Removal·installation: SST 09010-10260-71

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DESMONTAJE/INSPECCION/REMONTAJE

Procedimiento de desmontaje

1 Saque el ventilador. [Punto 1]

2 Saque el soporte No. 1. [Punto 2]

3 Saque la cubierta de la escobilla.

4 Separe las escobillas.

5 Saque la bobina del inducido. [Punto 3]

6 Desconecte la armazón de la escobilla en dos lugares.

7 Saque el soporte No. 2. [Punto 4]

8 Saque las 4 escobillas fuera del conjunto del casco. [Punto 5]

9 Saque el sujetador de la escobilla fuera del soporte No. 2.

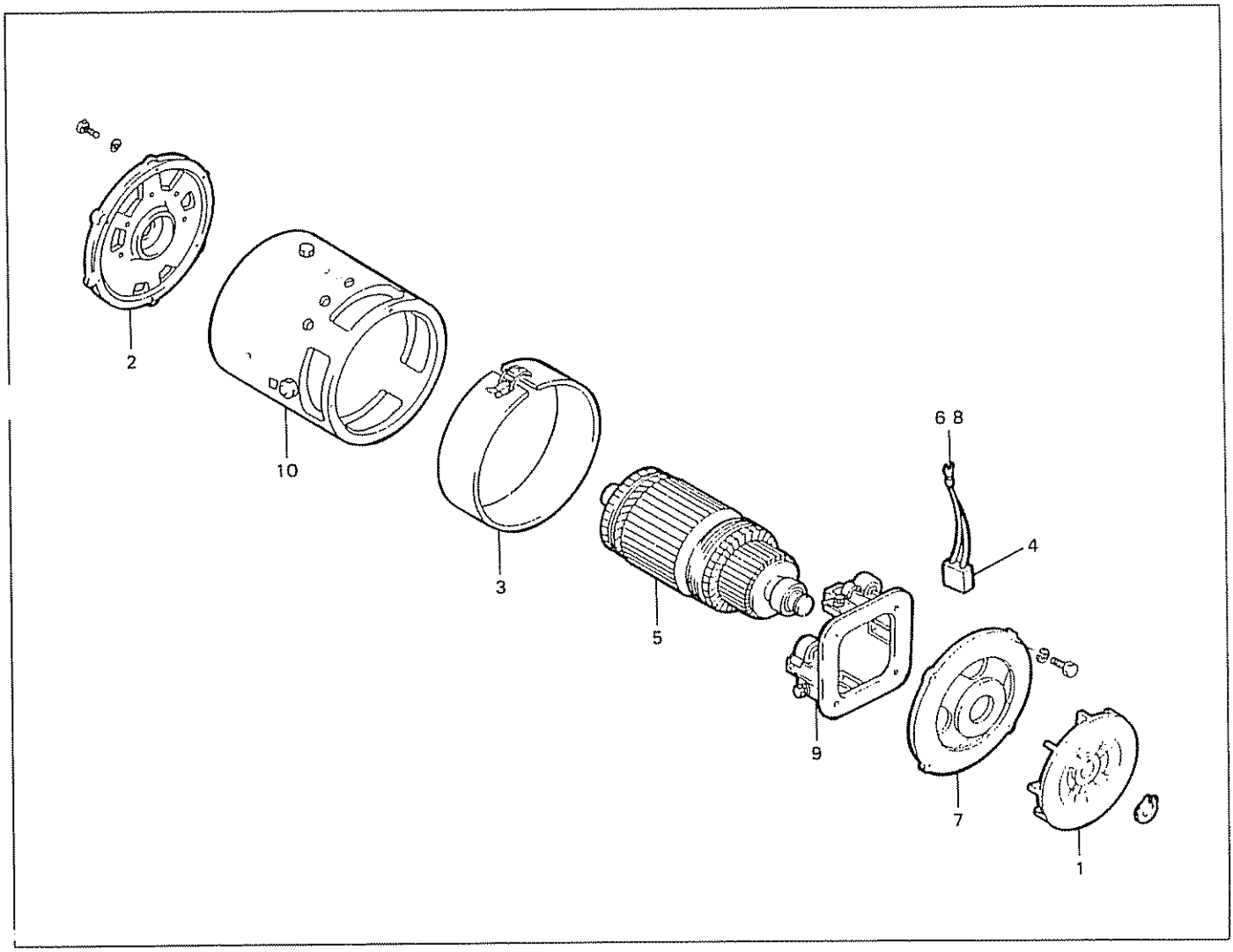
10 Saque el conjunto del casco. [Punto 6]

Procedimiento de remontaje

El procedimiento de remontaje es inverso al del desmontaje.

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DISASSEMBLY•INSPECTION•REASSEMBLY



Disassembly Procedure

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

2 Remove bracket No. 1. **[Point 2]**

3 Remove the brush cover.

4 Set the brushes free.

5 Remove the armature coil. **[Point 3]**

6 Disconnect the brush harness at two places.

7 Remove bracket No.2. **[Point 4]**

8 Remove 4 brushes from the yoke ASSY. **[Point 5]**

9 Remove the brush holder from bracket No.2.

10 Remove the yoke ASSY. **[Point 6]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Notas:
Realice las inspecciones siguientes antes del desmontaje y después del remontaje:

- Mida la resistencia de aislamiento entre cada cableado del motor y el cuerpo del motor.
  Estándar: 1 MΩ o más (con un megóhmetro de 500 V CC)
- Inspeccione la continuidad de la bobina inductora midiendo entre los terminales E y F.
  Estándar: 0 Ω (alcance del probador de circuitos x 1 Ω)

Puntos de trabajo

[Punto 1]

Desmontaje: SST 09950-50010

Remontaje: Use una barra de latón para la instalación.

[Punto 2]

Desmontaje: Ponga una marca de acoplamiento en el soporte No. 1 y en el casco (lo mismo para el soporte No. 2 y el casco).

[Punto 3]

Desmontaje/remontaje: Tire recto para no deteriorar la bobina del inducido ni la inductora.

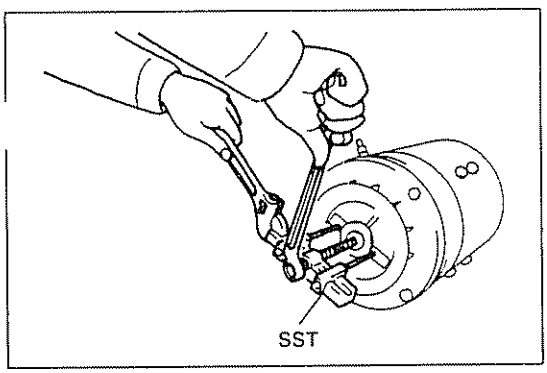
Inspección: SST 09950-40010

Remontaje: Cojinete del lado del soporte No. 1:
SST 09608-35014
Cojinete del lado del soporte No. 2:
SST 09608-30012

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Note:
Perform following inspections before disassembly and after reassembly:

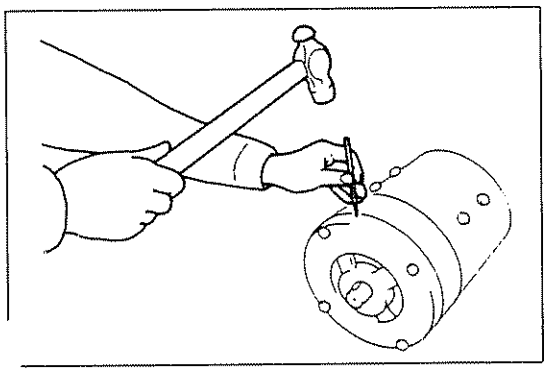
- Measure the insulation resistance between each motor wiring and motor body.
  Standard: 1 MΩ or more (with a 500 V DC megger)
- Inspect the field coil continuity by measurement between terminals E and F.
  Standard: 0 Ω (circuit tester range × 1 Ω)



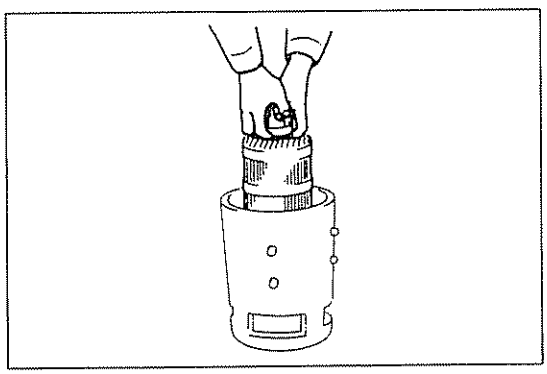
Point Operations

[Point 1]
Disassembly: SST 09950-50010

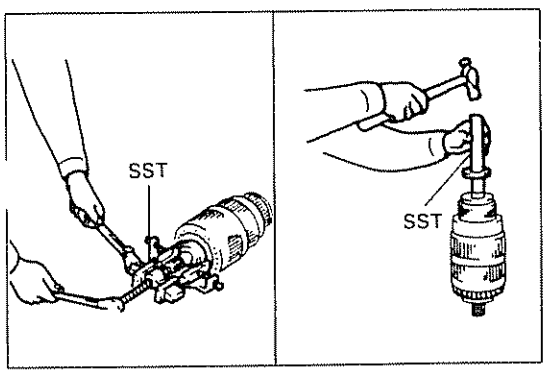
Reassembly: Use a brass bar for installation.



[Point 2]
Disassembly: Put a match mark on bracket No. 1 and the yoke (also on bracket No.2 and yoke).



[Point 3]
Disassembly·reassembly: Pull straight so as not to damage the armature and field coils.



Inspection: SST 09950-40010

Reassembly: Bracket No.1 side bearing:
SST 09608-35014
Bracket No.2 side bearing:
SST 09608-30012

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Inspección: Si la superficie del conmutador está áspera, corríjala con papel de lija (de aproximadamente #600) y límpiela.
Si está muy áspera, corrija con un torno.

Diámetro exterior del conmutador
~1998. 1
Estándar: (40-) 6FB10~18 105 mm
(40-) 6FB20~25, 30-6FB10~18
115 mm
6FB30, 30-6FB20~30
150 mm
Límite: (40-) 6FB10~18
102 mm
(40-) 6FB20~25, 30-6FB10~18
112 mm
6FB30, 30-6FB20~30
147 mm
1998. 2~
Estándar: 6FB10~18
100 mm
Límite : 6FB10~18
97 mm
Los otros modelos quedan sin modificación.

Inspección: Después de corregir con el conmutador, recorte la mica.

Recorte
Estándar: 1,0 mm
Límite: 0,5 mm

*Fig. Recorte
Mica

Inspección: Mida la resistencia de aislamiento de la bobina del inducido.

Estándar: 1 MΩ o más

Inspección: Mida el descentramiento del conmutador.

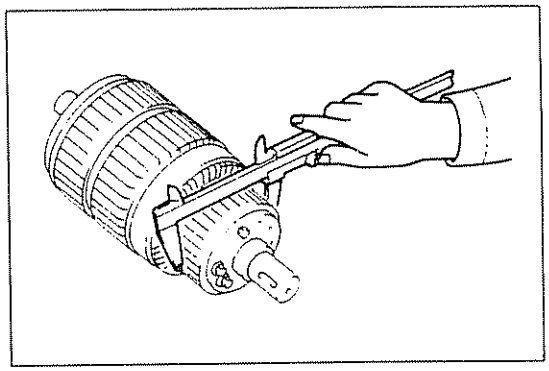
Estándar: 0,03 mm

[Punto 4]

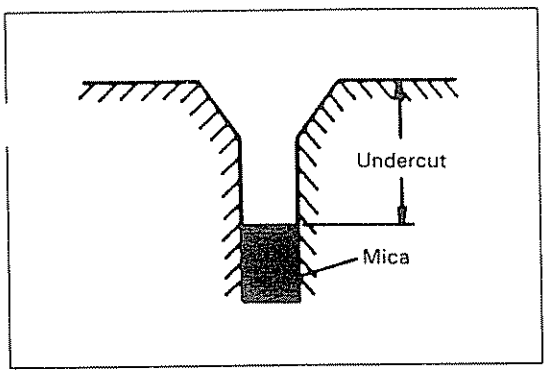
Inspección: Instale el inducido y las escobillas. Coloque una balanza de resorte y mida la fuerza del resorte en el instante en que el resorte se separa de la escobilla.
Estándar: (40-) 6FB10~18
11,915 ~ 14,653 N (1215 ~ 1485 gf)

(40-) 6FB20~30, 30-6FB10~30
14,122 ~ 17,260 N (1440 ~ 1760 gf)

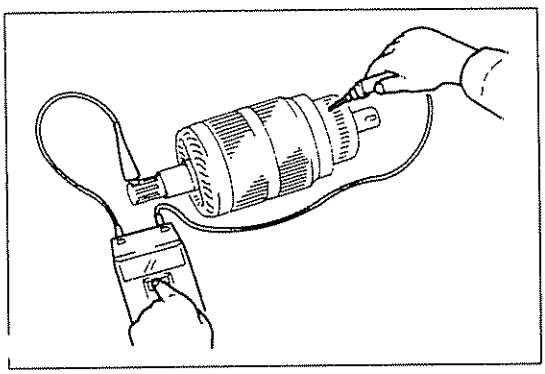
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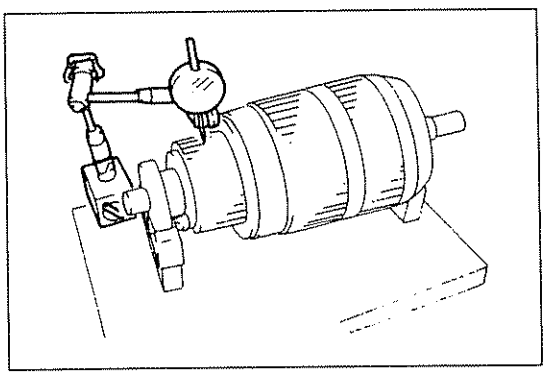
Inspection: If the commutator surface is roughened, correct with sandpaper (#600) and clean it.
If heavily roughened, correct with a lathe.
Commutator outside diameter
~ 1998. 1
Standard: (40-)6FB 10 ~ 18
105 mm (4.13 in)
(40-)6FB 20·25, 30-6FB 10 ~ 18
115 mm (4.53 in)
6FB 30, 30-6FB 20 ~ 30
150 mm (5.91 in)
Limit: (40-)6FB 10 ~ 18
102 mm (4.02 in)
(40-)6FB 20·25, 30-6FB 10 ~ 18
112 mm (4.41 in)
6FB 30, 30-6FB 20 ~ 30
147 mm (5.79 in)
1998. 2 ~
Standard: 6FB10 ~ 18
100 mm (3.94 in)
Limit: 6FB10 ~ 18
97 mm (3.82 in)
The other models have been unchanged.



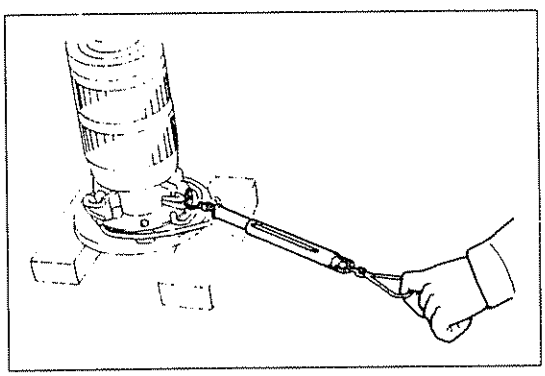
Inspection: After commutator correction, undercut the mica portion.
Undercut amount
Standard: 1.0 mm (0.039 in)
Limit: 0.5 mm (0.020 in)



Inspection: Measure the insulation resistance of the armature coil.
Standard: 1 MΩ or more



Inspection: Measure the commutator runout.
Standard: 0.03 mm (0.0012 in)



[Point 4]
Inspection: Install the armature coil and brushes. Set a spring scale on a brush spring and measure the spring force on the instant when the spring leaves the brush.
Standard: (40-)6FB 10 ~ 18
11.915 ~ 14.653 N
(1215 ~ 1485 gf)
[2.6791 ~ 3.2744 lbf]
(40-)6FB 20 ~ 30, 30-6FB 10 ~ 30
14.122 ~ 17.260 N
(1440 ~ 1760 gf)
[3.1752 ~ 3.8808 lbf]

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Inspección: Mida la resistencia de aislamiento entre el sujetador de l escobilla y el soporte No. 2.

Estándar: 1 MΩ o más

[Punto 5]

Inspección: Inspeccione cada escobilla en cuanto al desgaste y el contacto.

Estándar: 34 mm
Límite: 13 mm

[Punto 6]

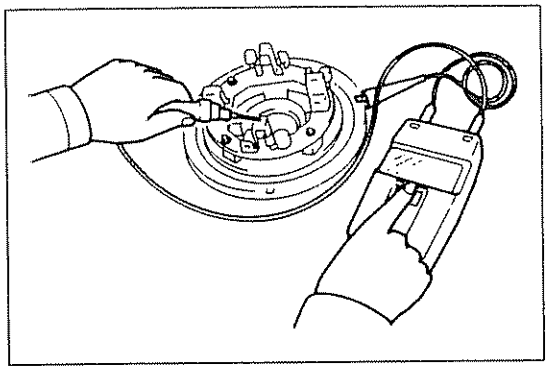
Inspección: Inspeccione la continuidad de la bobina inductora.
Terminales a medir: E y F

Estándar: 0 Ω (alcance del probador de circuitos x 1 Ω)

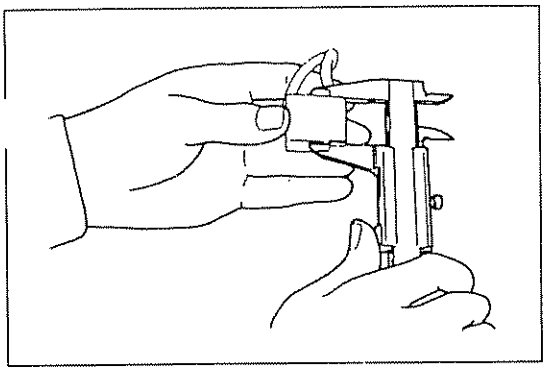
Inspección: Mida la resistencia de aislamiento de la bobina inductora.
Terminales a medir: Entre el casco y el terminal E/F

Estándar: 1 MΩ o más

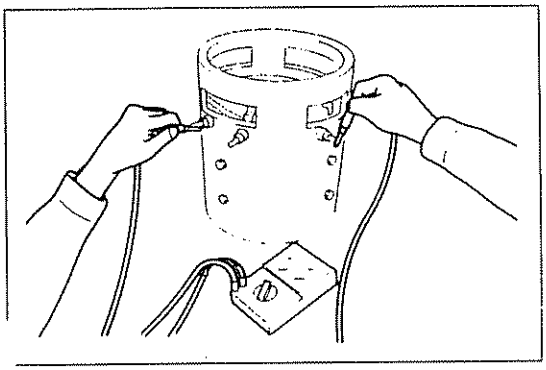
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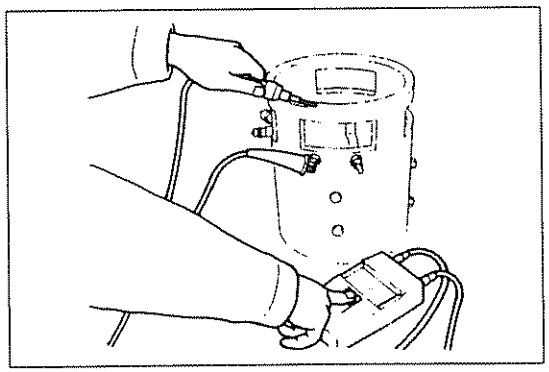
Inspection: Measure the insulation resistance between the brush holder and bracket No.2.
Standard: 1 MΩ or more



[Point 5]
Inspection: Inspect each brush for wear and contact state.
Standard: 34 mm (1.34 in)
Limit: 13 mm (0.51 in)



[Point 6]
Inspection: Inspect the field coil continuity.
Measurement terminals: E and F
Standard: 0 Ω (circuit tester range × 1 Ω)



Inspection: Measure the field coil insulation resistance.
Portion to be measured: Between yoke and terminal E/F
Standard: 1 MΩ or more

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MOTOR DE LA BOMBA

GENERALIDADES

Terminal F Terminal A

ESPECIFICACIONES

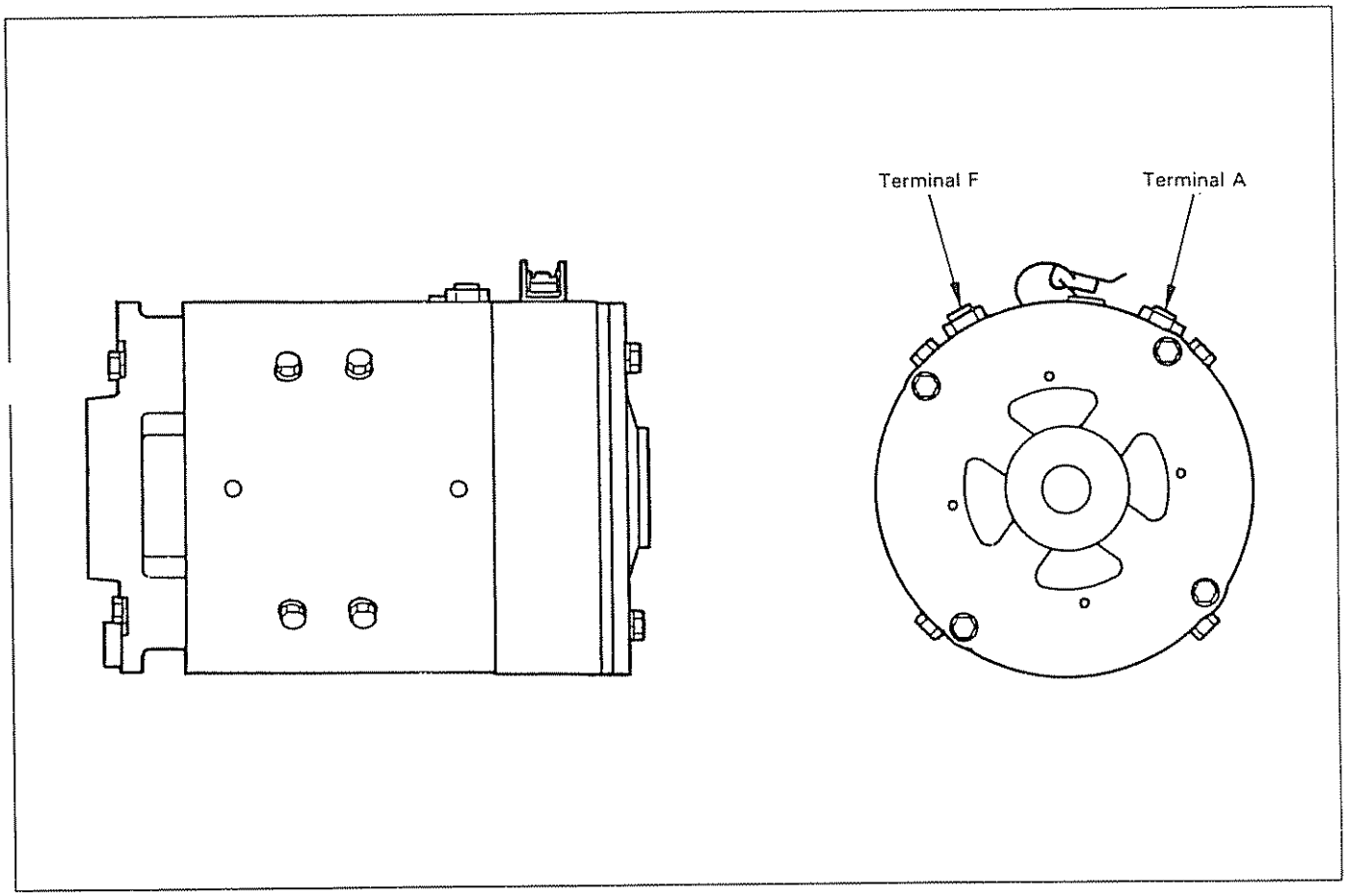
6FB10 ~ 18

Modelo del vehículo		6FB10	6FB14 ~ 18 40-6FB15
Punto			
Tipo		Autoventilado CC en serie	--
Voltaje nominal	V	48	--
Potencia de régimen	kW	6,2	8,6
Clase de aislamiento		F	--
Tamaño de la escobilla (grosor x anchura x longitud)	mm	12,5 x 40,0 x 27,0	--
Número de escobillas		4	--

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PUMP MOTOR

GENERAL



SPECIFICATIONS

6FB 10 ~ 18, 40-6FB 15

Item \ Vehicle model		6FB 10	6FB 14 ~ 18 40-6FB 15
Type		DC series-wound self-ventilated type	←
Nominal voltage	V	48	←
Rated output	kW	6.2	8.6
Insulation class		F	←
Brush size (thickness × width × length)	mm (in)	12.5 × 40.0 × 27.0 (0.492 × 1.575 × 1.063)	←
Number of brushes		4	←

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6FB20 - 30

Modelo del vehículo / Punto		6FB20 - 25 40-6FB20 - 25	6FB30
Tipo		Autoventilado CC en serie	--
Voltaje nominal	V	48	72
Potencia de régimen	kW	9,6	12,6
Clase de aislamiento		F	--
Tamaño de la escobilla (grosor x anchura x longitud)	mm	12,5 x 40,0 x 27,0	--
Número de escobillas		4	--

30-6FB10 - 30

Modelo del vehículo / Punto		30-6FB10-18	30-6FB20-25	30-6FB30
Tipo		Blindado CC en serie	--	--
Voltaje nominal	V	48	--	72
Potencia de régimen	kW	8,5	9,2	12,0
Clase de aislamiento		F	--	--
Tamaño de la escobilla (grosor x anchura x longitud)	mm	12,5x40,0x27,0	16,0x40,0x34,0	--
Número de escobillas		4	--	--

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6FB 20 ~ 30, 40-6FB 20·25

Item \ Vehicle model		6FB 20·25 40-6FB 20·25	6FB 30
Type		DC series-wound self-ventilated type	←
Nominal voltage	V	48	72
Rated output	kW	9.6	12.6
Insulation class		F	←
Brush size (thickness × width × length)	mm (in)	12.5 × 40.0 × 27.0 (0.492 × 1.575 × 1.063)	←
Number of brushes		4	←

30-6FB 10 ~ 30

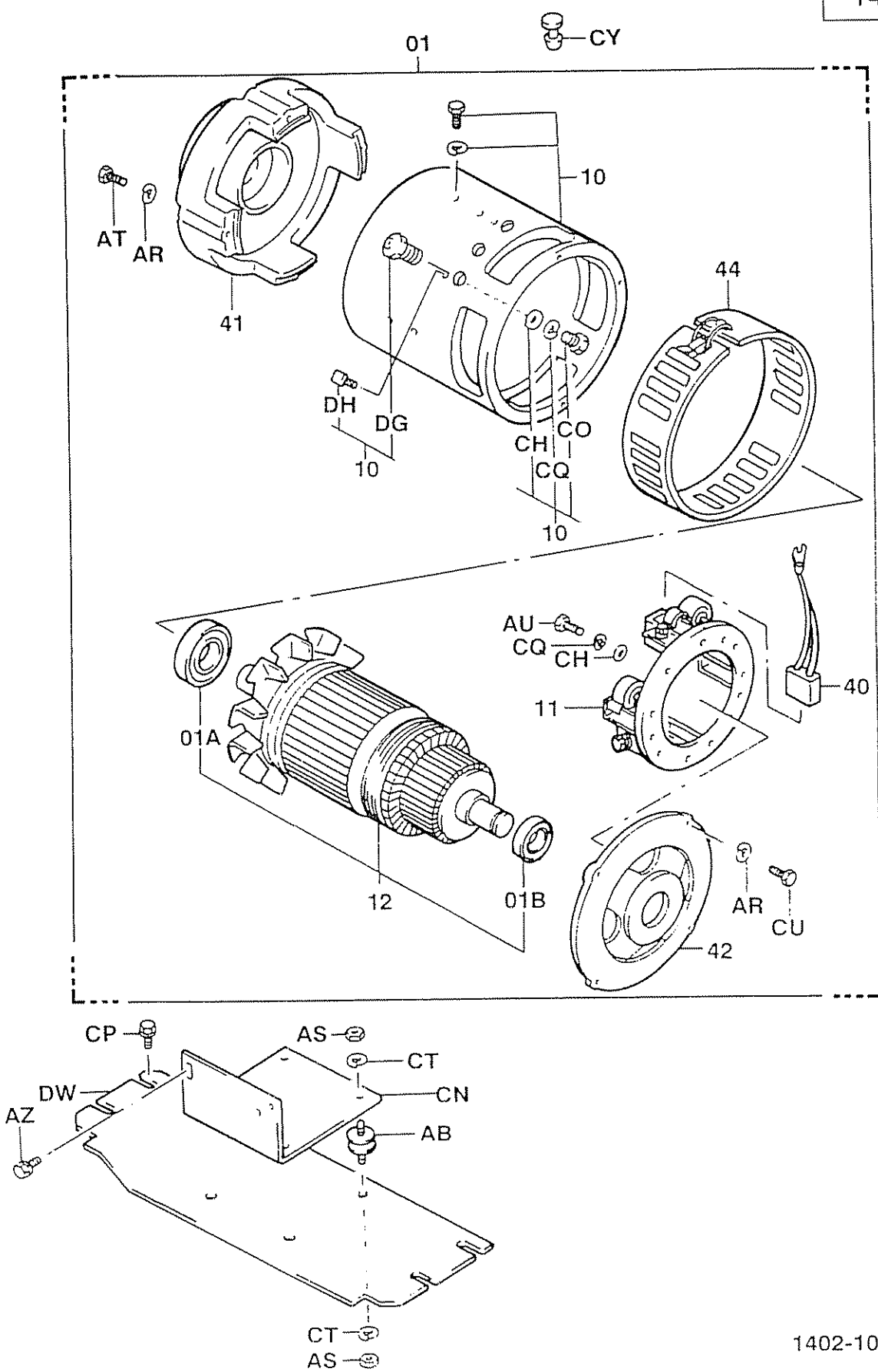
Item \ Vehicle model		30-6FB 10 ~ 18	30-6FB 20·25	30-6FB 30
Type		DC series-wound enclosed type	←	←
Nominal voltage	V	48	←	72
Rated output	kW	8.5	9.2	12.0
Insulation class		F	←	←
Brush size (thickness × width × length)	mm (in)	12.5 × 40.0 × 27.0 (0.492 × 1.575 × 1.063)	16.0 × 40.0 × 34.0 (0.630 × 1.575 × 1.339)	←
Number of brushes		4	←	←

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COMPONENTS

1402



1402-109

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CONJUNTO DEL MOTOR DE LA BOMBA

REMOCION/INSTALACION

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque la cubierta derecha lateral del bastidor.

3 Desconecte la bomba de aceite del conjunto del motor de la bomba.

4 Desconecte el cableado del motor de la bomba.

5 Saque el conjunto del motor de la bomba con el soporte de montaje.

6 Saque el motor de la bomba fuera del soporte de montaje.

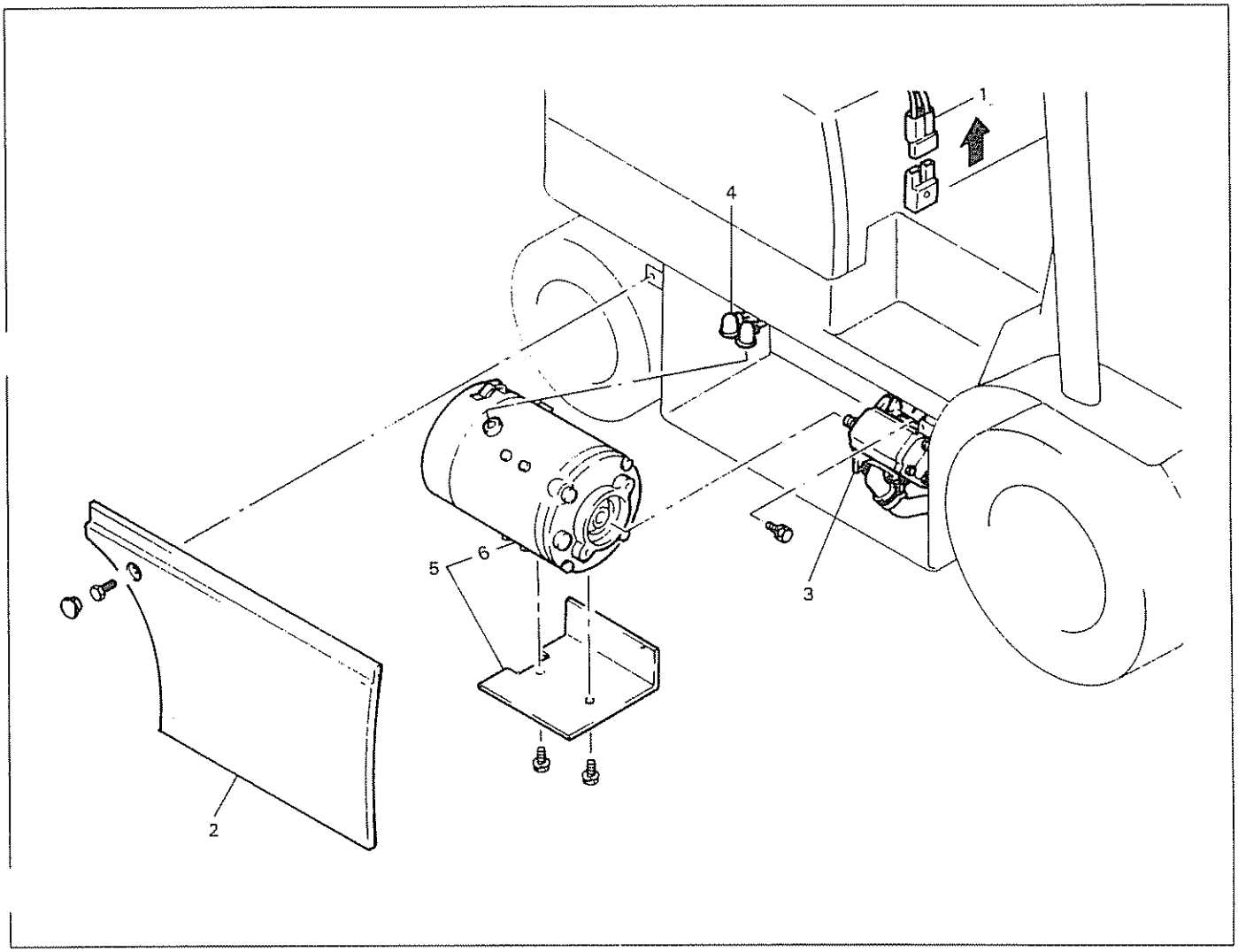
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

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PUMP MOTOR ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the frame side cover RH.

3 Disconnect the oil pump from the pump motor ASSY.

4 Disconnect the pump motor wiring.

5 Remove the pump motor ASSY W/mounting bracket.

6 Remove the pump motor from the mounting bracket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Procedimiento de desmontaje

1 Saque el soporte No. 1. [Punto 1]

2 Saque la cubierta de las escobillas.

3 Separe las escobillas.

4 Saque la bobina del inducido. [Punto 2]

5 Desconecte la armazón de las escobillas en dos lugares.

6 Saque el soporte No. 2. [Punto 3]

7 Saque las 4 escobillas fuera del conjunto del conmutador. [Punto 4]

8 Saque el sujetador de la escobilla fuera del soporte No. 2.

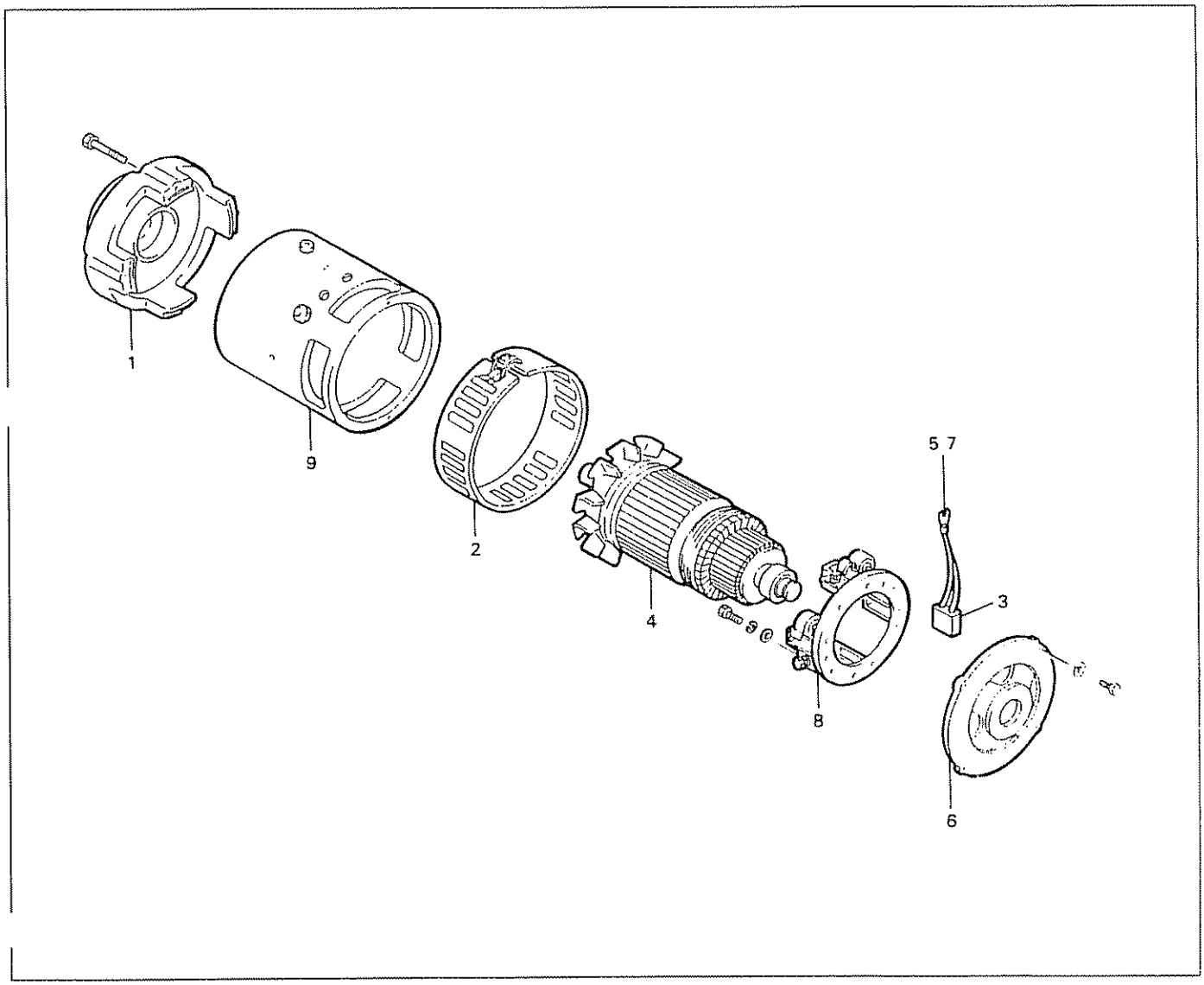
9 Saque el conjunto del casco. [Punto 5]

Procedimiento de remontaje

El procedimiento de remontaje es inverso al del desmontaje.

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DISASSEMBLY•INSPECTION•REASSEMBLY



Disassembly Procedure

1 Remove bracket No. 1. **[Point 1]**

2 Remove the brush cover.

3 Set the brushes free.

4 Remove the armature coil. **[Point 2]**

5 Disconnect the brush harness at two places.

6 Remove bracket No.2. **[Point 3]**

7 Remove four brushes from the yoke ASSY. **[Point 4]**

3 Remove the brush holder from bracket No.2.

9 Remove the yoke ASSY. **[Point 5]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Notas:
Realice las inspecciones siguientes antes del desmontaje y después del remontaje:

. Mida la resistencia de aislamiento entre cada cableado del motor y el cuerpo del motor.
  Estándar: 1 MΩ o más (con un megóhmetro de 500 V CC)
. Inspeccione la continuidad de la bobina inductora.
  Terminales de medición: E y F.
  Estándar: 0 Ω (alcance del probador de circuitos x 1 Ω)

Puntos de trabajo

[Punto 1]

Desmontaje: Ponga una marca de acoplamiento en el soporte No. 1 y en el casco (lo mismo para el soporte No. 2 y conjunto del casco).

[Punto 2]

Desmontaje/remontaje: Lleve a cabo el desmontaje y remontaje de tal manera que no deteriore la bobina del inducido ni la inductora.

Desmontaje: SST 09950-40010

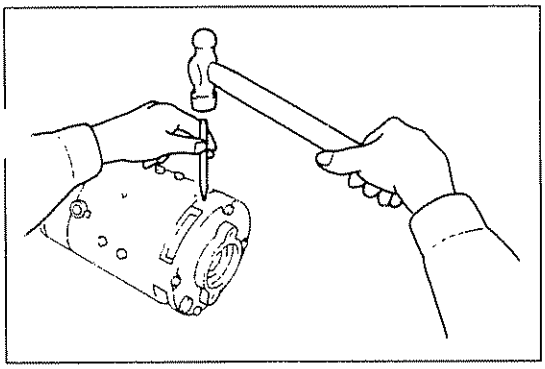
Remontaje: Cojinete del lado del soporte No. 1:
SST 09411-41800-71
Cojinete del lado del soporte No. 2:
SST 09381-41950-71

Inspección: Si la superficie del conmutador está áspera, corrijala con papel de lija (de aproximadamente #600) y límpiela.
Si está muy áspera, corrija con un torno.

Diámetro exterior del conmutador
Estándar: (40-) 6FB10-18 80 mm
(40-) 6FB20-25, 30-6FB10-18
85 mm
6FB30, 30-6FB20-30
100 mm
Límite: (40-) 6FB10-18 77 mm
(40-) 6FB20-25, 30-6FB10-18
82 mm
6FB30, 30-6FB20-30
mm

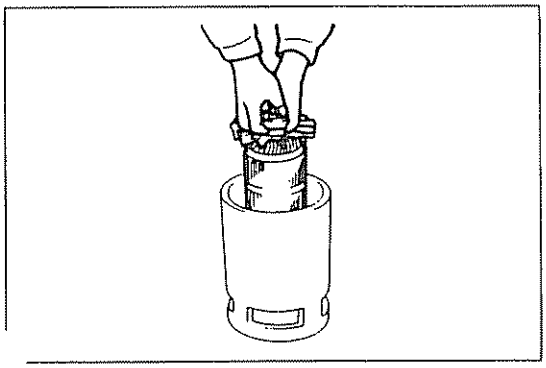
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Note:
Conduct the following inspections before disassembly and after reassembly:
- Measure the insulation resistance between each motor wiring and motor body.
  Standard: 1 MΩ or more (with a 500 V DC megger)
- Inspect the field coil continuity.
  Measurement terminals: E and F
  Standard: 0 Ω (circuit tester range x 1 Ω)

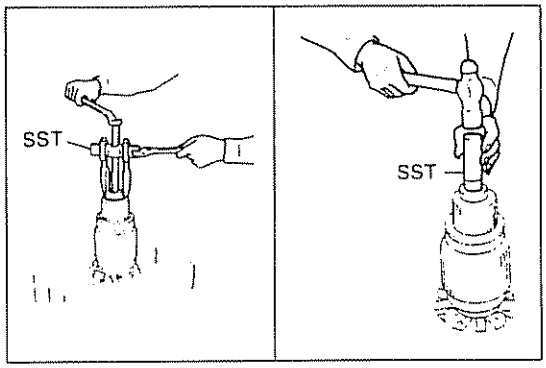


Point Operations

[Point 1]
Disassembly: Put a match mark on bracket No. 1 and the yoke (and also on bracket No.2 and yoke ASSY).

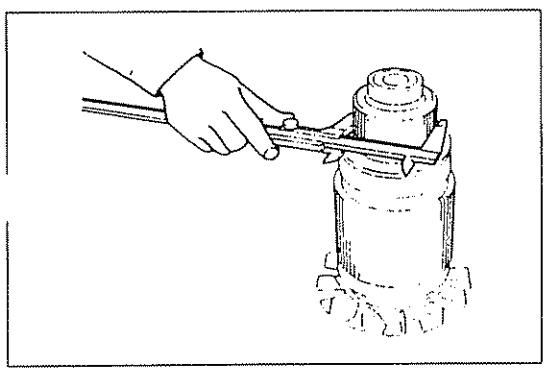


[Point 2]
Disassembly-reassembly: Perform disassembly and reassembly so as not to damage the armature and field coils.



Disassembly: 09950-40010

Reassembly: Bracket No.1 side bearing
SST 09411-41800-71
Bracket No.2 side bearing
SST 09381-41950-71



Inspection: If the commutator surface is roughened, correct with sandpaper (#600) and clean it. If heavily roughened, correct with a lathe.
Commutator outside diameter
Standard: (40-)6FB 10 ~ 18
80 mm (3.15 in)
(40-)6FB 20 ~ 25, 30-6FB 10 ~ 18
85 mm (3.35 in)
6FB 30, 30-6FB 20 ~ 30
100 mm (3.94 in)
Limit: (40-)6FB 10 ~ 18
77 mm (3.03 in)
(40-)6FB 20 ~ 25, 30-6FB 10 ~ 18
82 mm (3.23 in)
6FB 30, 30-6FB 20 ~ 30
97 mm (3.82 in)

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Inspección: Recorte la parte de la mica después de corregir con el conmutador.
Recorte
Estándar: 1,0 mm
Límite: 0,5 mm

*Fig. Recorte
Mica

Inspección: Mida la resistencia de aislamiento de la bobina del inducido.
Estándar: 1 MΩ o más

Inspección: Mida el descentramiento del conmutador.
Estándar: 0,03 mm

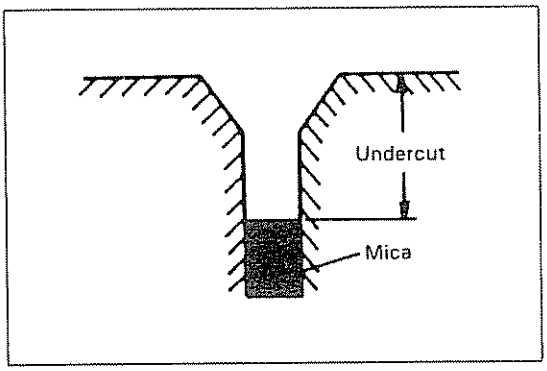
[Punto 3]

Inspección: Instale la bobina del inducido y las escobillas. Coloque una balanza de resorte y mida la fuerza del resorte en el instante en que el resorte se separa de la escobilla.
Estándar: 11.74 ~ 14.024 N (1170 ~ 1430 gf)
(Excepto 30-6FB20-25-30)
14.122 ~ 17.260 N (1440 ~ 1760 gf)
(30-6FB20-25-30)

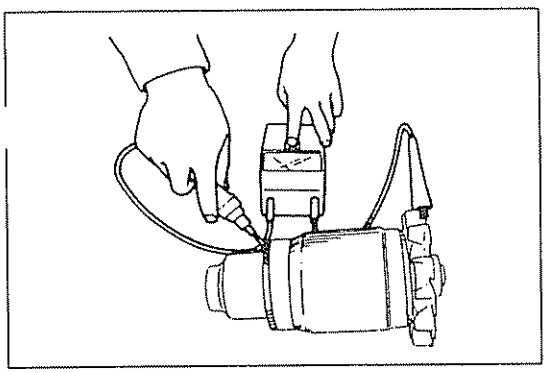
Inspección: Mida la resistencia de aislamiento entre el sujetador de la escobilla y el soporte.

Estándar: 1 MΩ o más

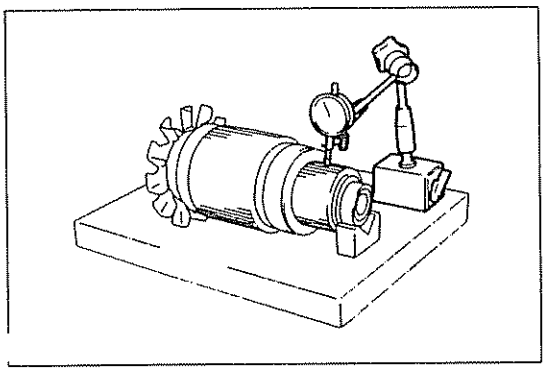
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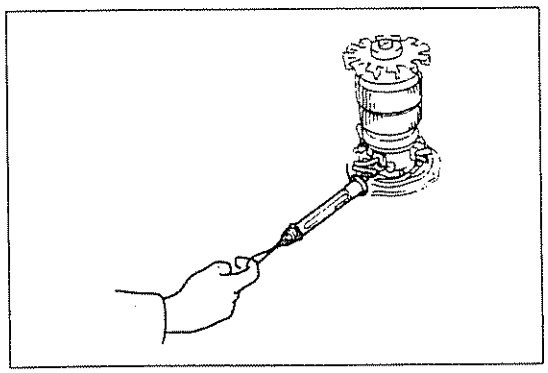
Inspection: Undercut the mica portion after correcting the commutator.
Undercut amount
Standard: 1.0 mm (0.039 in)
Limit: 0.5 mm (0.020 in)



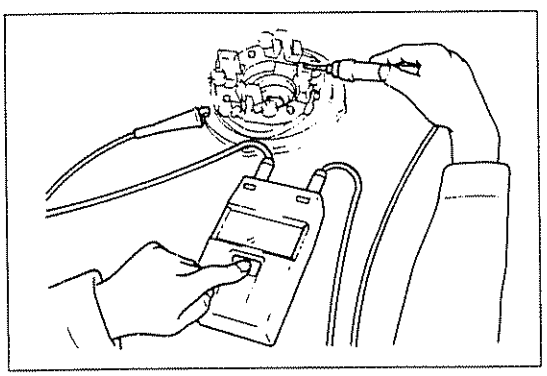
Inspection: Measure the armature coil insulation resistance.
Standard: 1 MΩ or more



Inspection: Measure the commutator runout.
Standard: 0.03 mm (0.0012 in) or less



[Point 3]
Inspection: Install the armature coil and brushes. Set a spring scale on a brush spring and measure the spring force on the instant when the spring leaves the brush.
Standard: 11.74 ~ 14.024 N
(1170 ~ 1430 gf)
[2.5799 ~ 3.1532 lbf]
(Without 30-6FB 20·25·30)
14.122 ~ 17.260 N
(1440 ~ 1760 gf)
[3.1752 ~ 3.8808 lbf]
(30-6FB 20·25·30)



Inspection: Measure the insulation resistance between the brush holder and bracket.
Standard: 1 MΩ or more

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[Punto 4]

Inspección: Inspeccione cada escobilla por si tiene desgaste y el contacto.

Estándar: 27 mm
Límite: 13 mm

[Punto 5]

Inspección: Inspeccione la continuidad de la bobina inductora.

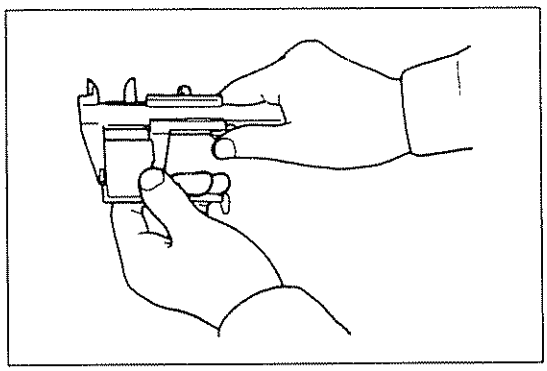
Terminales de medición: Terminal E/F y terminal del extremo de la bobina inductora

Estándar: 0 Ω (alcance del probador de circuitos x 1 Ω)

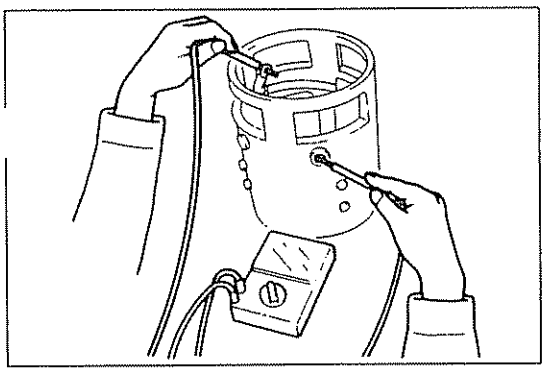
Inspección: Mida la resistencia de la bobina inductora.

Parte a medir: Entre el casco y el terminal E/F
Estándar: 1 MΩ o más

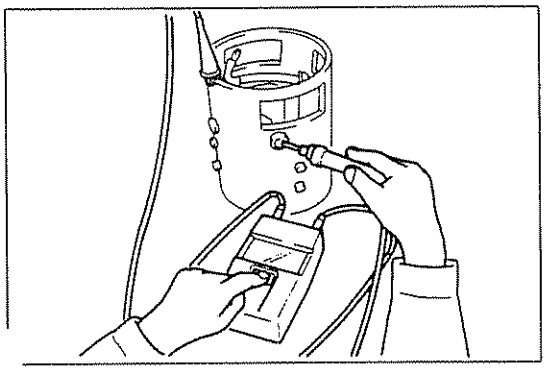
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[Point 4]
Inspection: Inspect the brush for wear and contact state.
Standard: 27 mm (1.06 in)
Limit: 13 mm (0.51 in)



[Point 5]
Inspection: Inspect the field coil continuity.
Measurement terminals:
Terminal E/F and field coil end terminal
Standard: 0 Ω (circuit tester range × 1 Ω)



Inspection: Measure the field coil insulation resistance.
Portion to be measured:
Between terminal E/F and yoke
Standard: 1 MΩ or more

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UNIDAD DE MARCHA

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DRIVE UNIT

Page

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DRIVE UNIT ASSY 6-5

REMOVAL•INSTALLATION 6-5

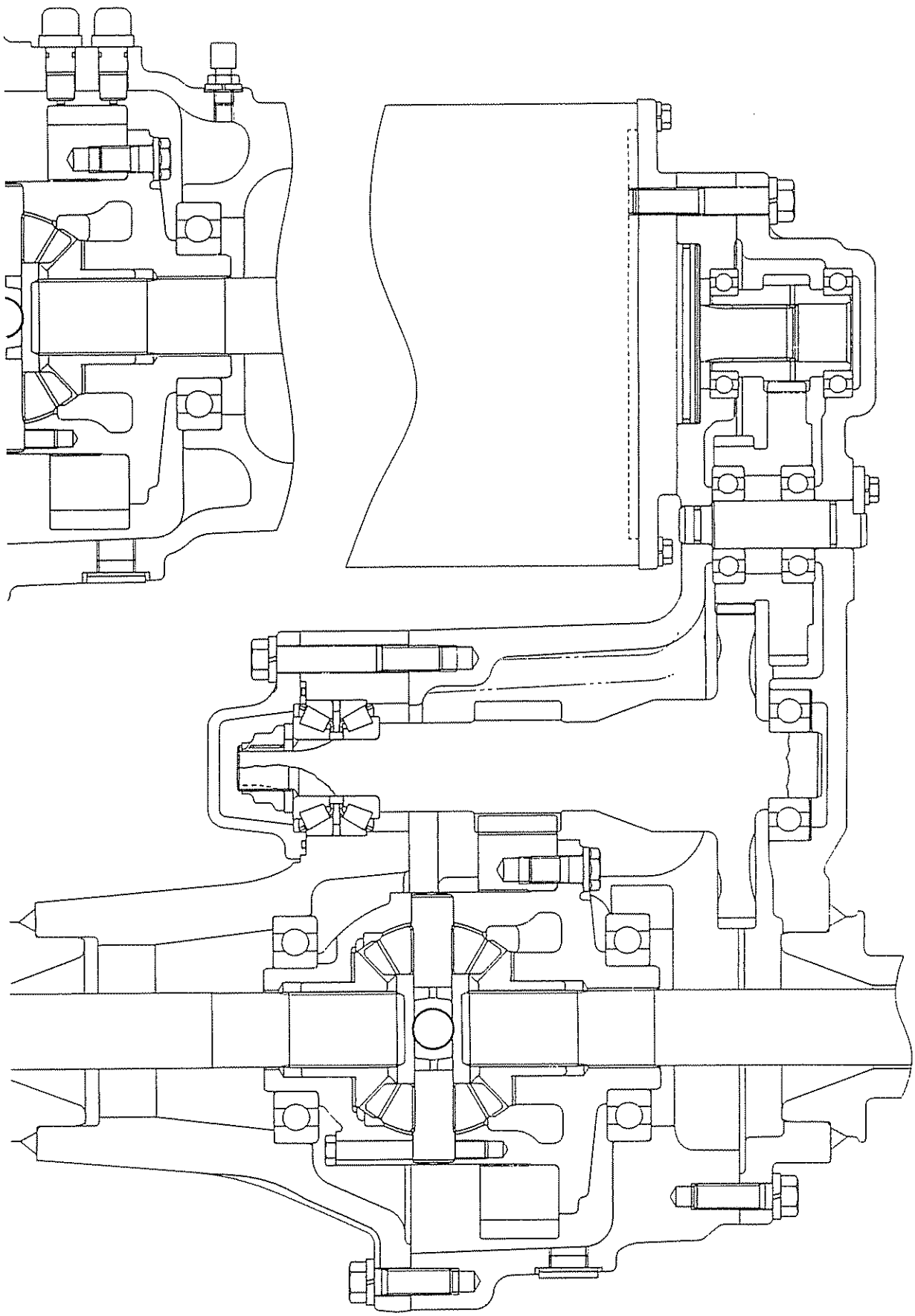
DISASSEMBLY•INSPECTION•REASSSEMBLY 6-5

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GENERALIDADES

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GENERAL



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ESPECIFICACIONES

Modelo del vehículo Punto	6FB10-18 (~1998. 1) 40-6FB15	6FB10~18 (1998. 2~) 30-6FB10-18	6FB20-25	30-6FB20-25 (~1998. 1) 40-6FB20-25 (~1998. 1)	6FB30 30-6FB20 25 (1998. 2~) 40-6FB20·25 (1998 2~) 30-6FB30
Relación de reducción total	18,117	20,766	15,929	18,117	20,766
Número de dientes del engranaje impulsor	21	19	23	21	19
Número de dientes del engranaje de reducción	Grande 54 Pequeño 33	Grande 56 Pequeño 33	Grande 54 Pequeño 33	Grande 54 Pequeño 33	Grande 56 Pequeño 33
Número de dientes del engranaje de salida	Grande 62 Pequeño 12	--	--	--	--
Número de dientes del engranaje anular	45	--	--	--	--
Cantidad de aceite del diferencial litros	5,0	--	--	5,5	--

COMPONENTES

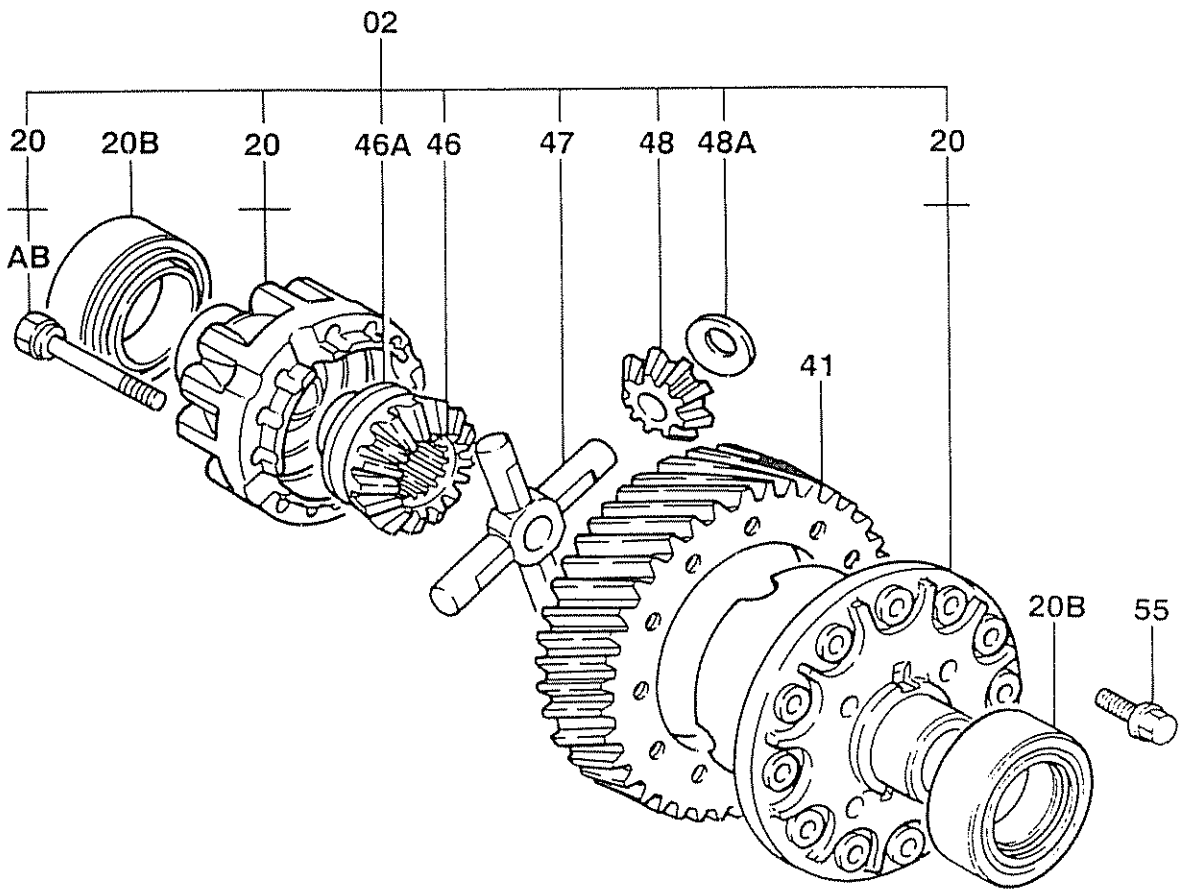
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SPECIFICATIONS

Item \ Vehicle model	6FB 10 ~ 18 (~ 1998. 1) 40-6FB 15	6FB 10 ~ 18 (1998. 2 ~) 30-6FB10 ~ 18	6FB 20·25	30-6FB 20·25 (~ 1998. 1) 40-6FB 20·25 (~ 1998. 1)	6FB 30 30-6FB 20·25 (1998. 2 ~) 40-6FB 20·25 (1998. 2 ~) 30-6FB 30
Total reduction ratio	18.117	20.766	15.929	18.117	20.766
Number of drive gear teeth	21	19	23	21	19
Number of reduction gear teeth	Large 54 Small 33	Large 56 Small 33	Large 54 Small 33	Large 54 Small 33	Large 56 Small 33
Number of output gear teeth	Large 62 Small 12	←	←	←	←
Number of ring gear teeth	45	←	←	←	←
Differential oil quantity ℓ (USgal)	5.0 (1.32)	←	←	5.5 (1.45)	←

COMPONENTS

4101

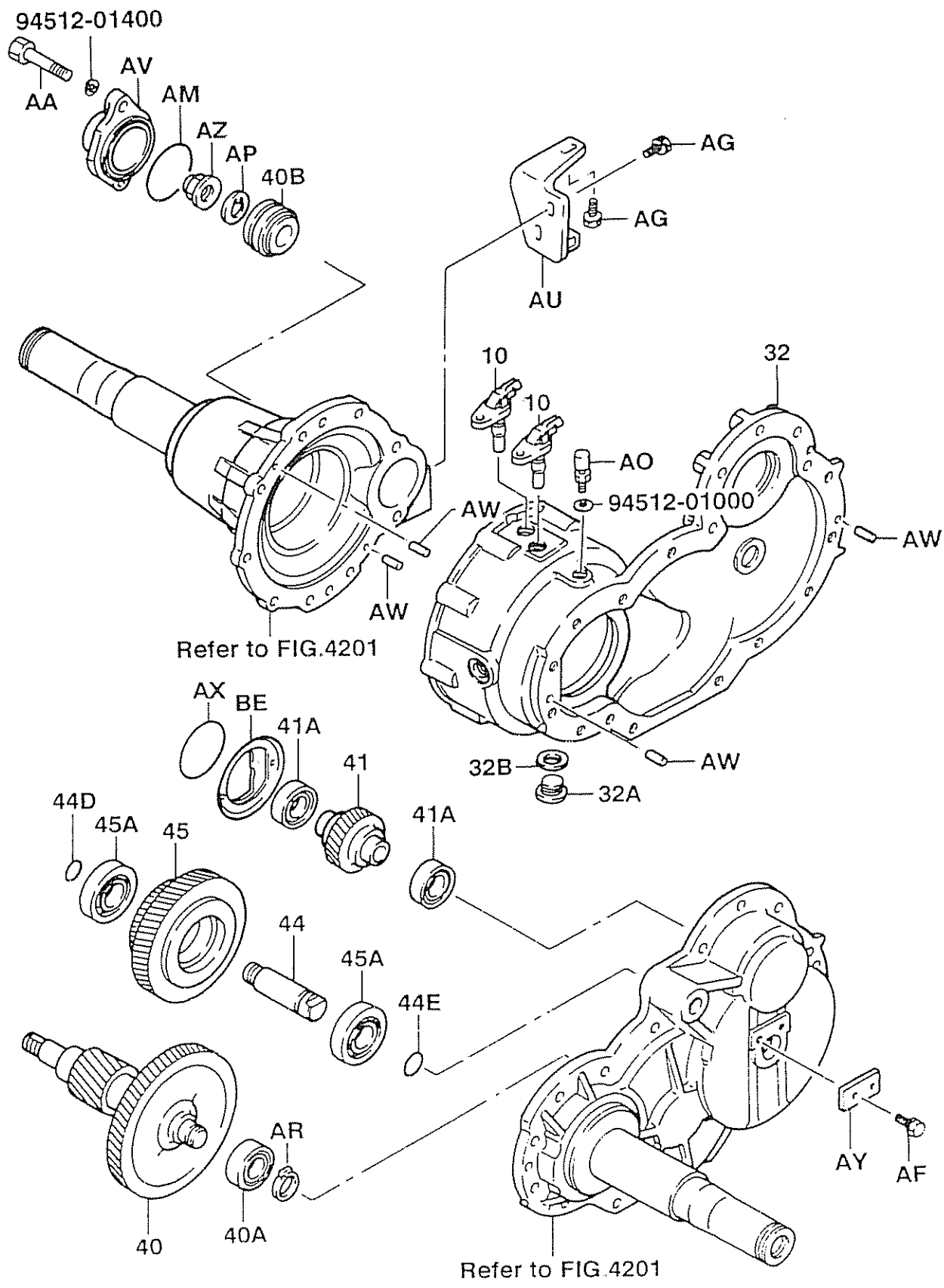


4101-131

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3305



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CONJUNTO DE LA UNIDAD DE MARCHA

REMOCION/INSTALACION

Siga el procedimiento descrito en la parte de remoción/instalación del eje delantero (página 7-12).

DESMONTAJE/INSPECCION/REMONTAJE

Procedimiento de desmontaje

1 Saque la tapa de la unidad de marcha.

2 Saque la tuerca de seguridad del engranaje impulsor. [Punto 1]

3 Saque el cárter derecho del eje delantero. [Punto 2]

4 Saque el conjunto del diferencial con el engranaje anular.

5 Saque la placa de la chaveta del engranaje de reducción.

6 Saque el cárter izquierdo del eje delantero. [Punto 2]

7 Saque el engranaje impulsor. [Punto 3]

8 Saque el engranaje de reducción.

9 Saque el engranaje de salida. [Punto 4]

10 Saque el engranaje anular fuera del conjunto del diferencial.

11 Saque el cárter del diferencial. [Punto 5]

Procedimiento de remoción

El procedimiento de remoción es el inverso al del desmontaje.

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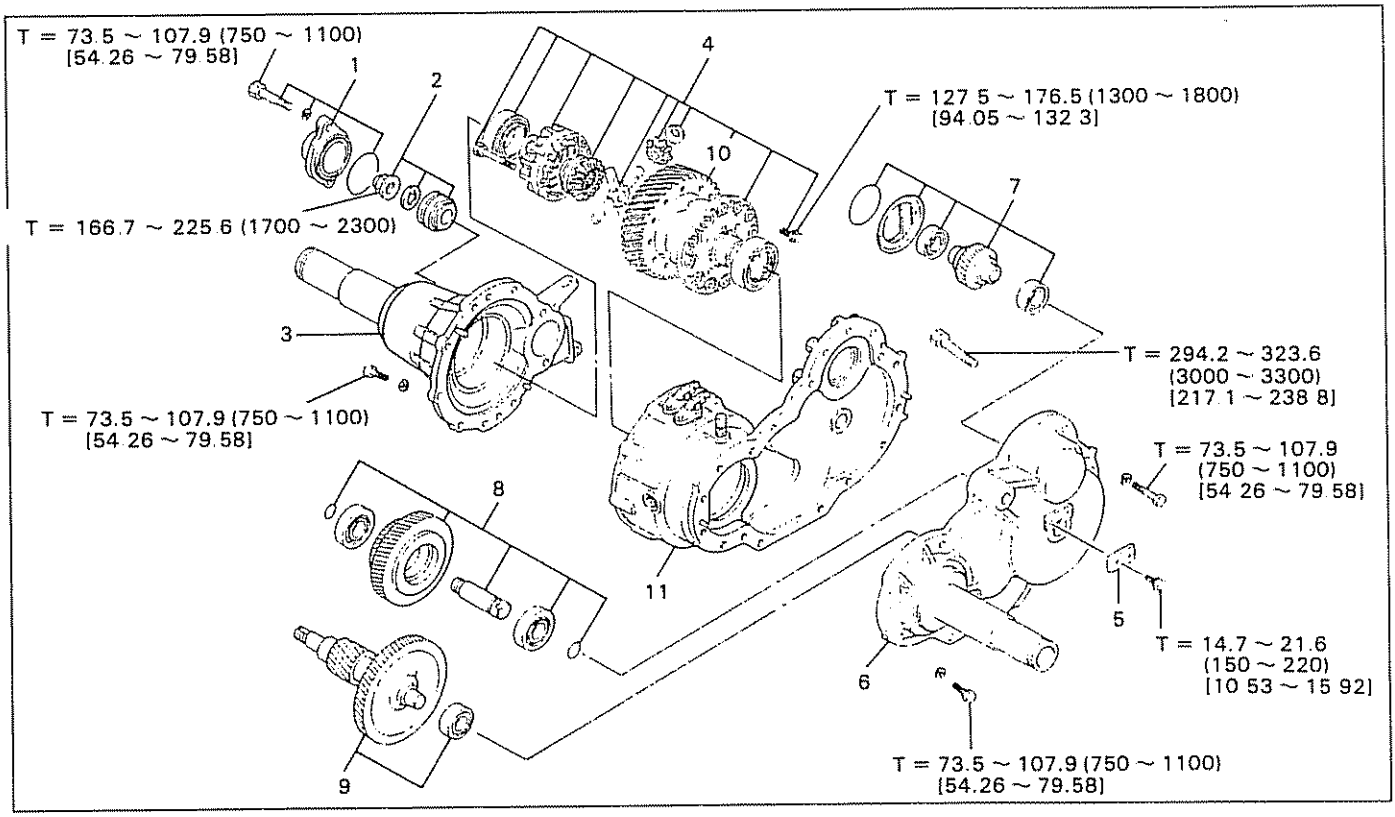
DRIVE UNIT ASSY

REMOVAL·INSTALLATION

Follow the procedure described in the Front Axle Removal·Installation section (on page 7-12).

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the drive unit cap.

2 Remove the drive gear lock nut. **[Point 1]**

3 Remove the front axle housing RH. **[Point 2]**

4 Remove the differential ASSY W/ring gear.

5 Remove the reduction gear key plate.

6 Remove the front axle housing LH. **[Point 2]**

7 Remove the drive gear. **[Point 3]**

8 Remove the reduction gear.

9 Remove the output gear. **[Point 4]**

10 Remove the ring gear from the differential ASSY.

11 Remove the differential case. **[Point 5]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Puntos de trabajo

[Punto 1]

Desmontaje/remontaje: Instale la SST siguiente a las estrías del engranaje y saque la tuerca de seguridad.
SST 09330-13200-71

Remontaje: Use un destornillador o una herramienta similar e inmovilice bien la tuerca de seguridad. (Dos lugares)

[Punto 2]

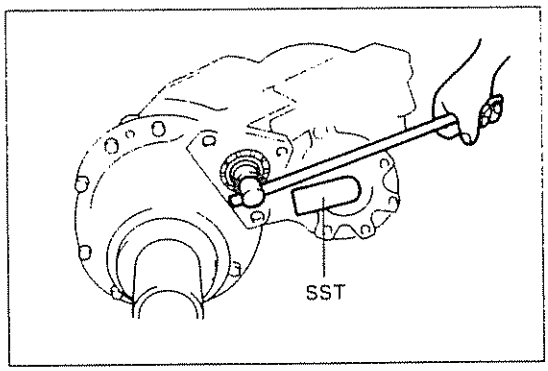
Desmontaje: Use un perno de servicio y saque el cárter derecho del eje delantero.
Tamaño del perno de servicio: M14 x 1,5

Remontaje: Cubra con sellador la superficie de unión con el cárter del engranaje.
Sellador: 08826-00090

[Punto 3]

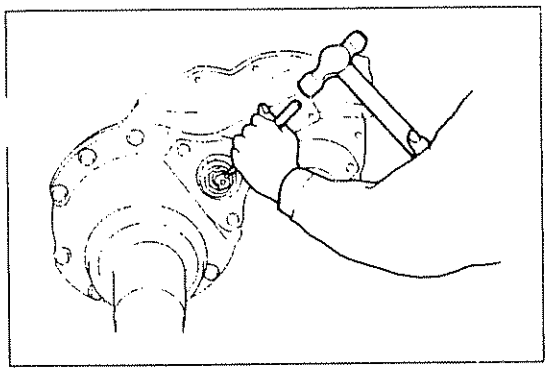
Desmontaje: SST 09308-10010

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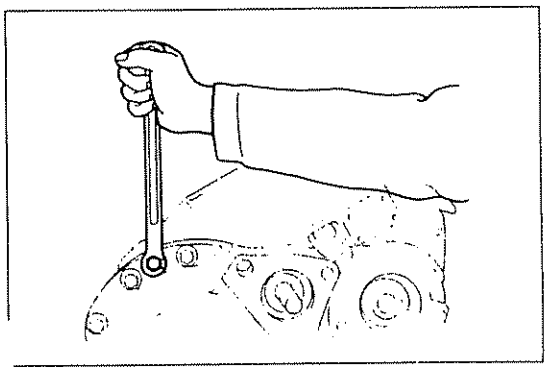


Point Operations

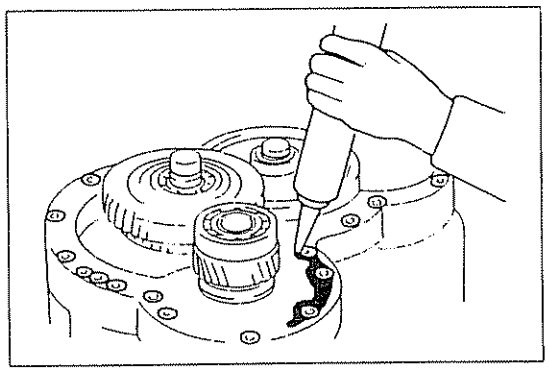
[Point 1]
Disassembly·reassembly: Install the following SST to the gear spline and remove the lock nut.
SST 09330-13200-71



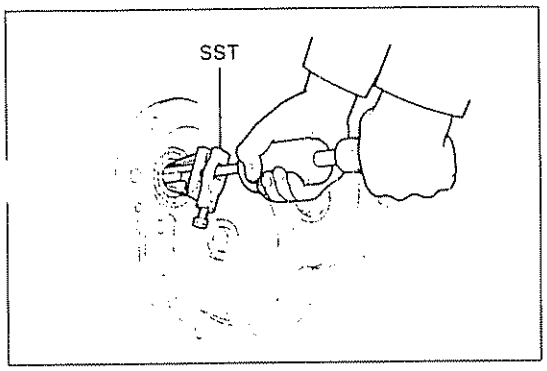
Reassembly: Use a screwdriver or a similar tool and securely lock the lock nut. (2 places)



[Point 2]
Disassembly: Use a service bolt and remove the front axle housing RH.
Service volt size: M14 × 1.5



Reassembly: Coat sealant on the joint face with the gear case.
Sealant: 08826-00090



[Point 3]
Disassembly: SST 09308-10010

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[Punto 4]

Desmontaje: 09950-40010

Remontaje: 09700-30200-71

[Punto 5]

Desmontaje: SST 09950-40010

Remontaje: Use una barra de cobre para el remontaje.

Inspección: Inspeccione el diámetro exterior de la estrella.

Estándar: 22,00 mm
Límite: 21,75 mm

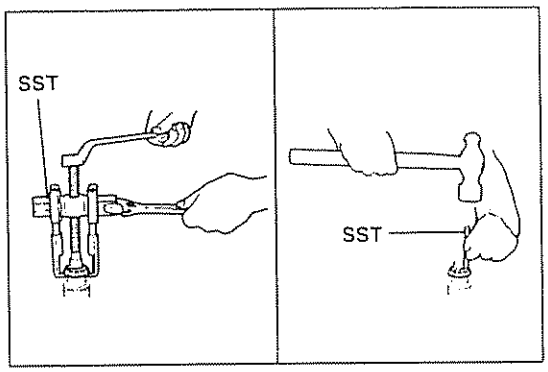
Recambie si se excede el límite.

Inspección: Medición del juego libre

1. Instale el piñón y la arandela de empuje del piñón en la estrella.
2. Instale el engranaje lateral y la arandela de empuje del engranaje lateral en el cárter del diferencial.
3. Empuje el centro de la estrella con una prensa manual para fijar el piñón en un lado y mida el movimiento del piñón en el lado opuesto.
   Estándar: 0,2 a 0,3 mm
4. Si no se satisface el estándar, recambie la arandela de empuje.

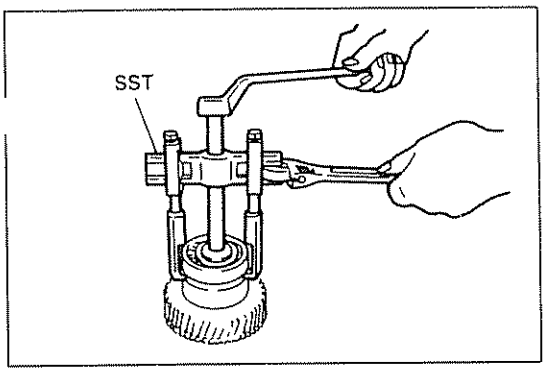
Remontaje: Instale la arandela de empuje con el lado de su ranura de aceite hacia el engranaje.

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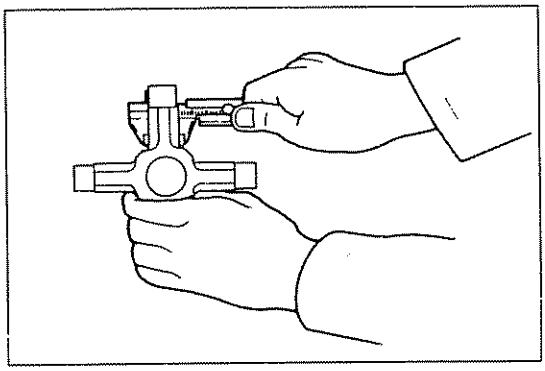
[Point 4]
Disassembly: SST 09950-40010

Reassembly: SST 09700-30200-71

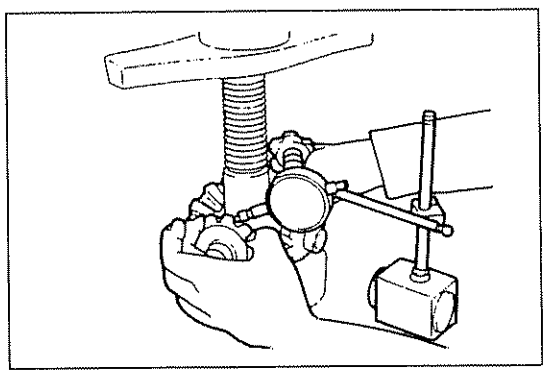


[Point 5]
Disassembly: SST 09950-40010

Reassembly: Use a brass bar for reassembly.

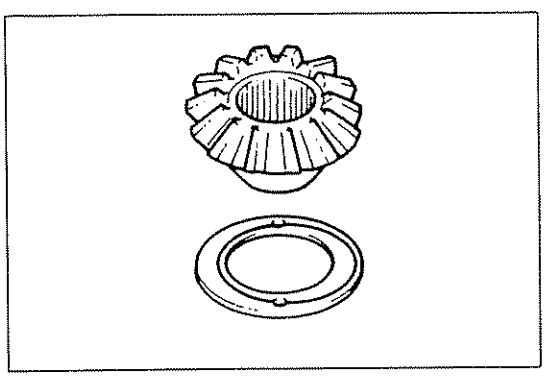


Inspection: Inspect the spider outside diameter.
Standard: 22.00 mm (0.8661 in)
Limit: 21.75 mm (0.8563 in)
Replace if the limit is exceeded.



Inspection: Backlash measurement

1. Install the pinion and pinion thrust washer on the spider.
2. Install the side gear and side gear thrust washer on the differential case.
3. Push the center of the spider with a hand press to fix the pinion on one side and measure the movement of the pinion on the opposite side.
   Standard: 0.2 ~ 0.3 mm (0.0079 ~ 0.0118 in)
4. If the standard is not satisfied, replace the thrust washer.



Reassembly: Install the thrust washer, with its oil groove side facing the gear.

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EJE DELANTERO

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FRONT AXLE

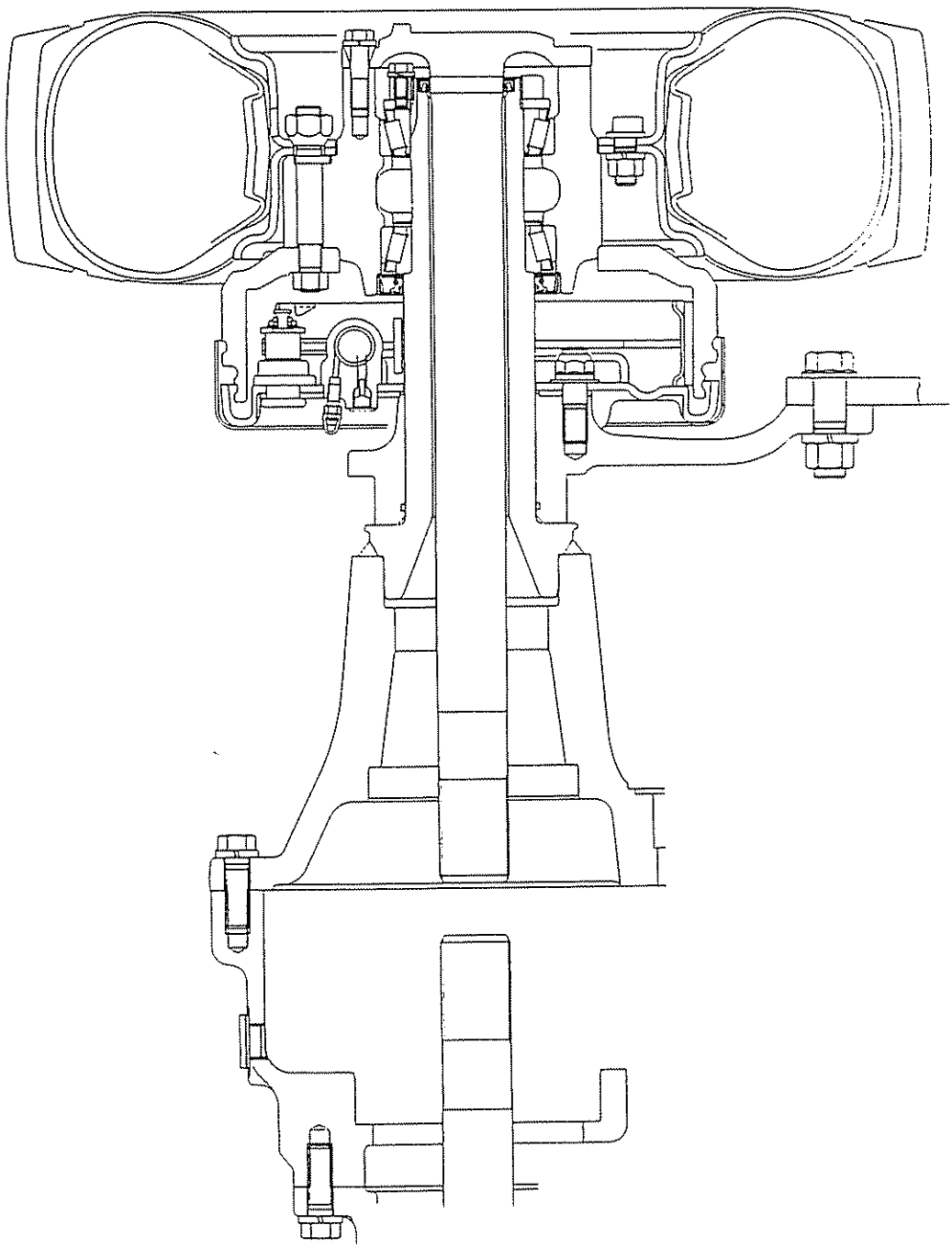
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FRONT AXLE ASSY	7-12
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GENERAL

1-ton Series

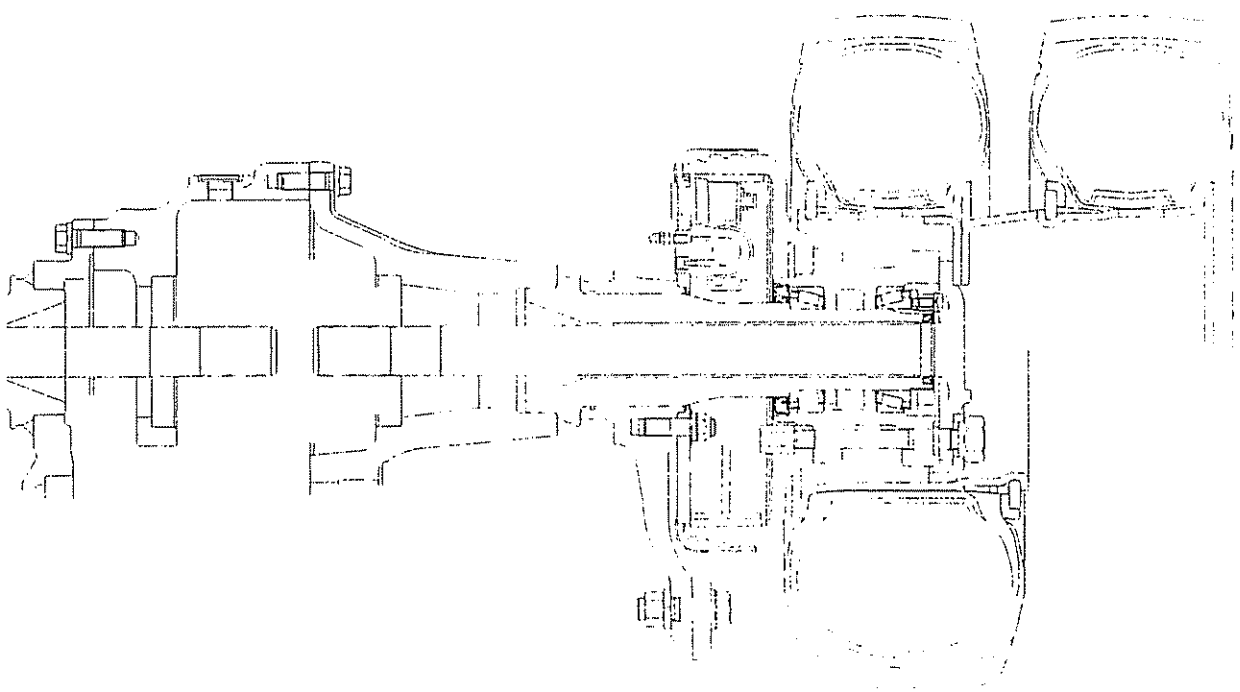


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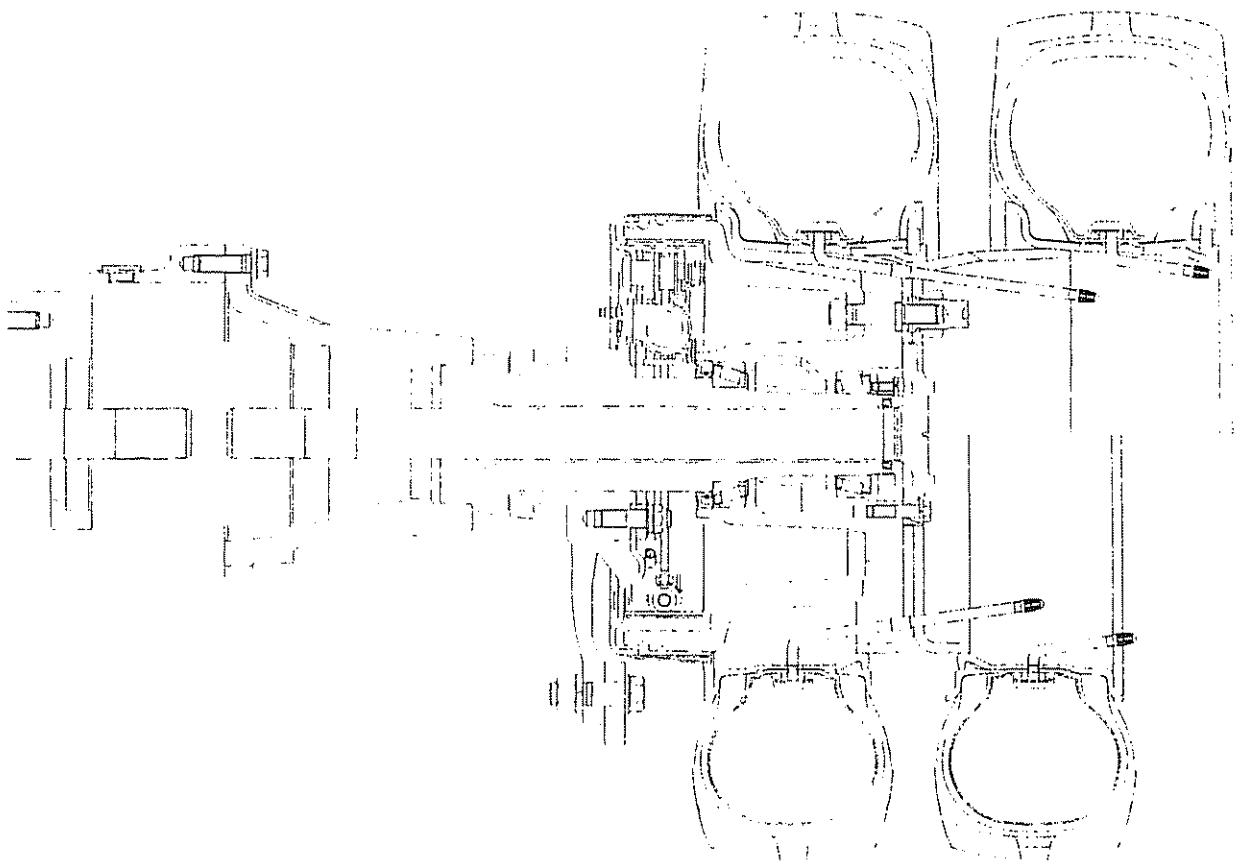
Series de 2 toneladas

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2-ton series



Standard model



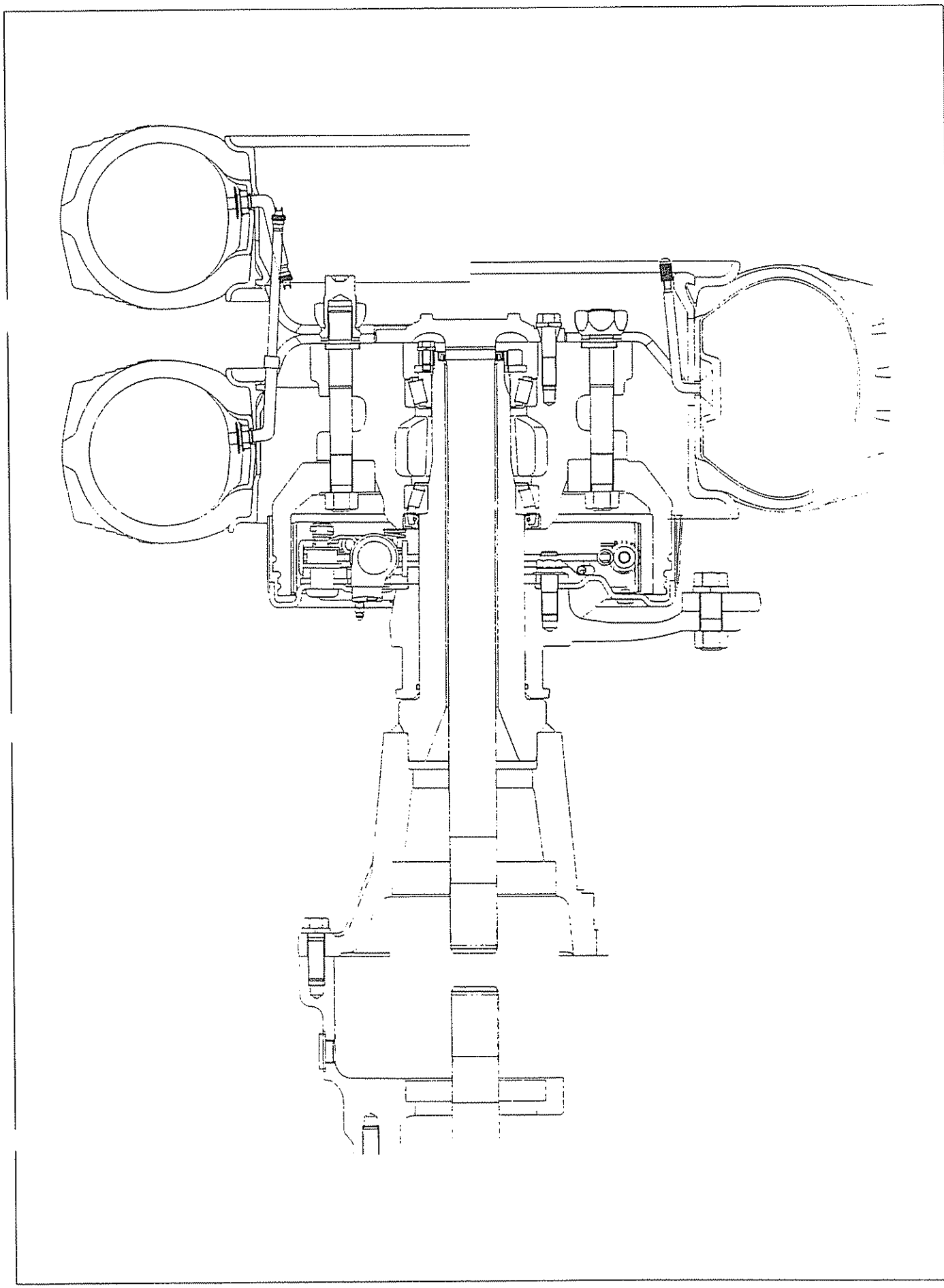
Large capacity model

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Series de 3 toneladas

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3-ton Series



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ESPECIFICACIONES

Eje delantero

Punto	Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Tipo de eje delantero		Todo flotante	--	--
Tipo de suspensión		Fija al bastidor	--	--
Diámetro del semieje	mm	40	--	--
Diámetro del semieje (parte estriada)	mm	40	--	--

Ruedas (neumáticos - aros)

	Tipo	Tamaño de los neumáticos	Tamaño del aro	Presión de inflado kPa (kgf/cm²)
1,0 Y 1,35 ton.	Sencilla estándar Sencilla de sobretamaño Doble estándar Doble especial	6,00-9-10PR	9x4,00E DT Dividida	686 (7,0) 100
1,5 ton.	Sencilla estándar Sencilla de sobretamaño Doble estándar Doble especial			
1,75 ton.	Sencilla estándar Sencilla de sobretamaño Doble estándar Doble especial			
2,0 ton.	Sencilla estándar Sencilla de sobretamaño Doble			
2,5 ton	Sencilla estándar Sencilla de sobretamaño Doble			
2,0 Y 2,5 ton.	Sencilla Doble estándar Doble especial			
3,0 ton.	Sencilla Doble estándar Doble especial			

Divided = Dividida
Side ring = Anillo lateral

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SPECIFICATIONS

Front Axle

Item \ Vehicle model	1-ton series	2-ton series	3-ton series
Front axle type	Full-floating type	←	←
Suspension type	Frame fixed type	←	←
Axle shaft diameter mm (in)	40 (1.57)	←	←
Axle shaft diameter (spline portion) mm (in)	40 (1.57)	←	←

Tires-Rims

	Type	Tire size	Rim size	Inflating pressure kPa (kgf/cm²)[psi]
1.0 and 1.35-ton	Standard single	6.00 – 9 – 10PR	9 × 4.00E DT Divided 9 × 4.00E TB Side ring	686 (7.0) 100
	Oversize single	6.50 – 10 – 12PR	10 × 5.00F TB Side ring	882 (9.0) [128]
	Standard double	4.50 – 12 – 8PR	12 × 3.50D DC	686 (7.0) 100
	Special double	6.00 – 9 – 10PR	9 × 4.00E TB Side ring	↑
1.5-ton	Standard single	21 × 8 – 9 – 10PR	9 × 6.00E TB Side ring	613 (6.25) [88.8]
	Oversize single	6.50 – 10 – 12PR	10 × 5.00F TB Side ring	882 (9.0) [128]
	Standard double	4.50 – 12 – 8PR	12 × 3.50D DC	686 (7.0) [100]
	Special double	6.00 – 9 – 10PR	9 × 4.00E TB Side ring	↑
1.75-ton	Standard single	21 × 8 – 7 – 10PR	9 × 6.00E TB Side ring	613 (6.25) [88.8]
	Oversize single	6.50 – 10 – 12PR	10 × 5.00F TB Side ring	882 (9.0) [128]
	Standard double	4.50 – 12 – 8PR	12 × 3.50D DC	686 (7.0) 100
	Special double	6.00 – 9 – 10PR	9 × 4.00E TB Side ring	↑
2.0-ton	Standard single	21 × 8 – 9 – 14PR	9 × 6.00E TB Side ring	882 (9.0) [128]
	Oversize single	23 × 9 – 10 – 16PR	10 × 6.50F TB Side ring	↑
	Double	6.00 – 9 – 10PR	9 × 4.00E TB Side ring	686 (7.0) 100
2.5-ton	Standard single	21 × 8 – 9 – 14PR	9 × 6.00E TB Side ring	882 (9.0) [128]
	Oversize single	23 × 9 – 10 – 16PR	10 × 6.50F TB Side ring	↑
	Double	6.00 – 9 – 10PR	9 × 4.00E TB Side ring	686 (7.0) [100]
2.0 and 2.5-ton	Single	7.00 – 12 – 12PR	12 × 5.00S DT Divided 12 × 5.00S TB Side ring	↑
	Standard double	5.50 – 15 – 8PR	15 × 4.50E SDC	↑
	Special double	7.00 – 12 – 12PR	12 × 5.00S TB Side ring	↑
3.0-ton	Single	28 × 9 – 15 – 14PR	15 × 7.00T JR Side ring	784 (8.0) [113]
	Standard double	6.00 – 15 – 10PR	15 × 4.50E SDC Side ring	686 (7.0) [100]
	Special double	28 × 8 – 15 – 12PR	15 × 6.00S JR Side ring	↑

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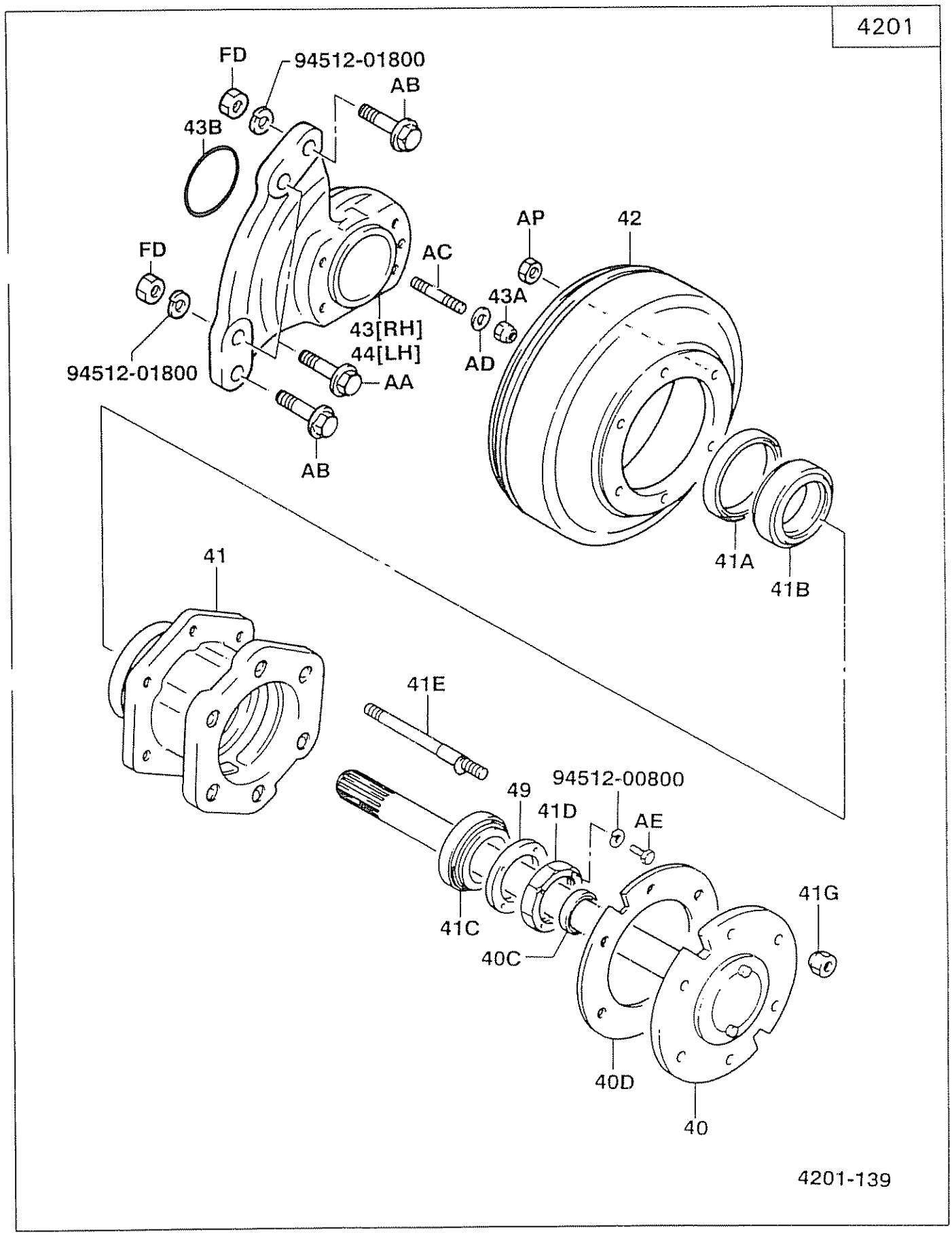
COMPONENTES

Series de 1 tonelada

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COMPONENTS

1-ton Series



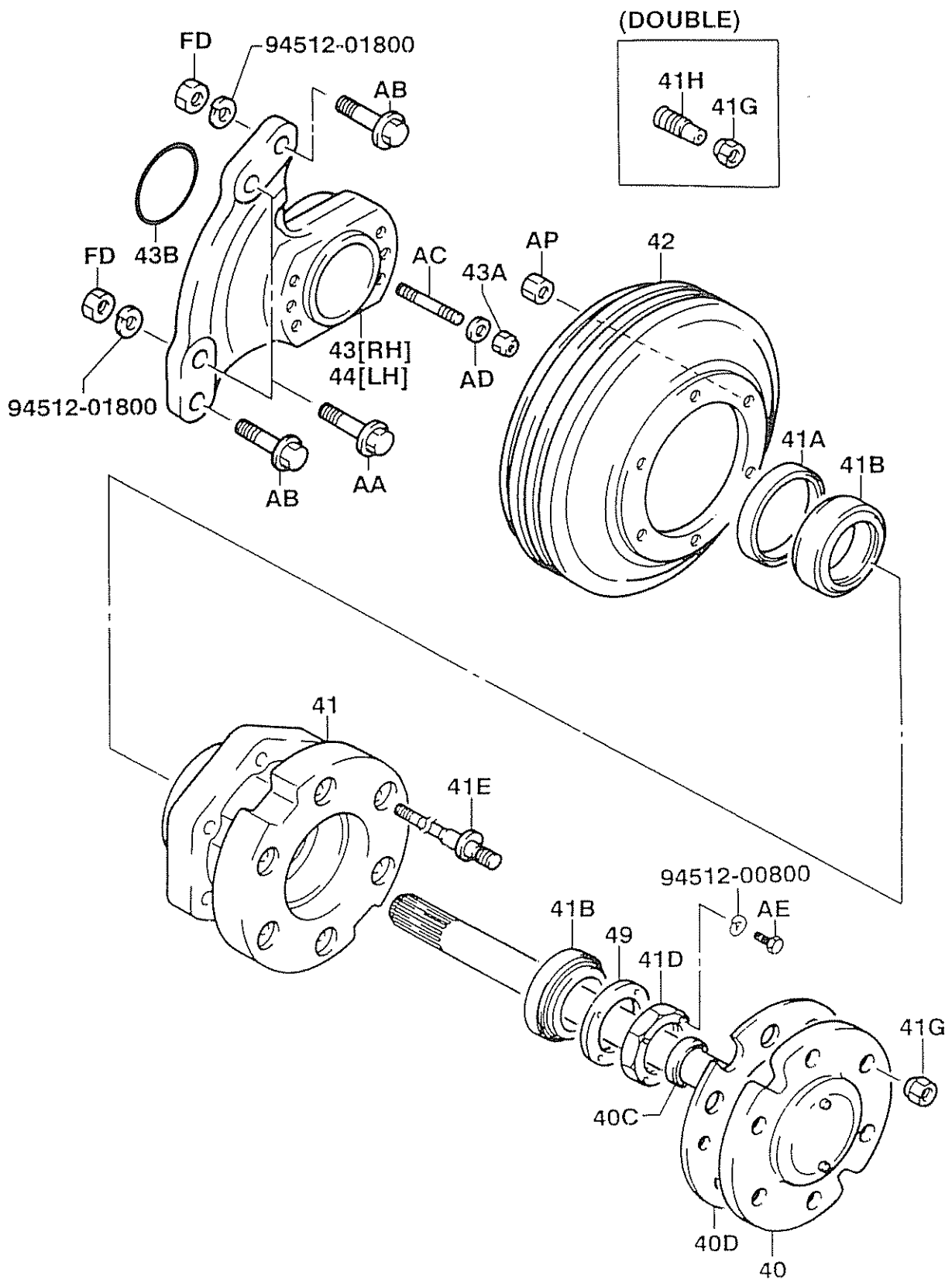
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Series de 2 toneladas

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2-ton Series

4201



4201-145

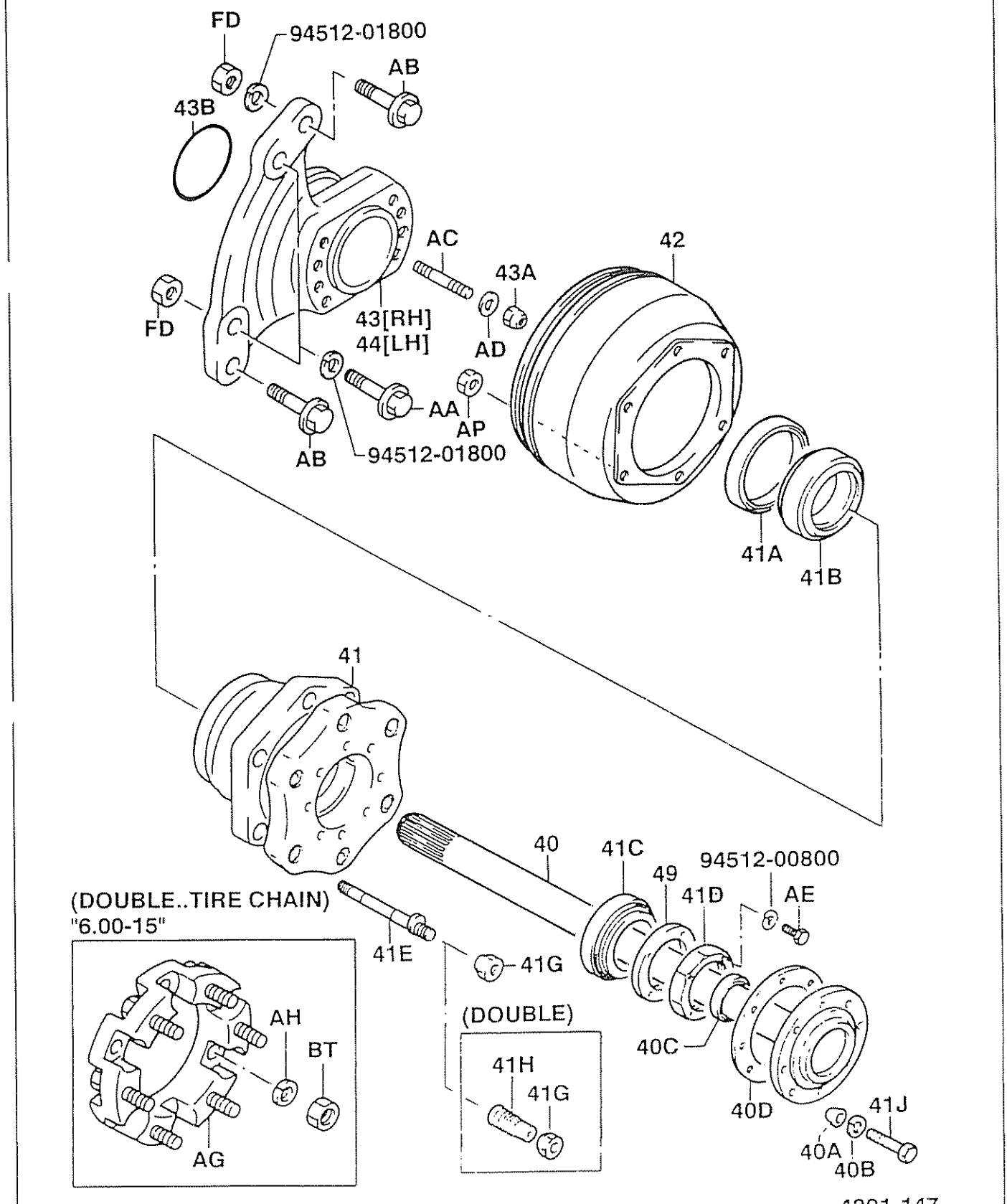
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Series de 3 toneladas

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3-ton Series

4201



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SEMIEJE DELANTERO Y CUBO

REMOCION/INSTALACION

T = N.m (kgf-cm)

Series de 1 - 2 toneladas
T = 177 ~ 392 (1800 ~ 4000)
Series de 3 toneladas
T = 294 ~ 588 (3000 ~ 6000)

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque las ruedas delanteras. [Punto 1]

3 Drene el aceite del diferencial.

4 Saque el semieje delantero.

5 Saque la tuerca de seguridad del cojinete y la placa de la tuerca de seguridad. [Punto 2]

6 Saque el cubo del eje delantero con el tambor del freno. [Punto 3]

7 Saque el tambor del freno fuera del cubo del eje delantero.

Procedimiento de instalación

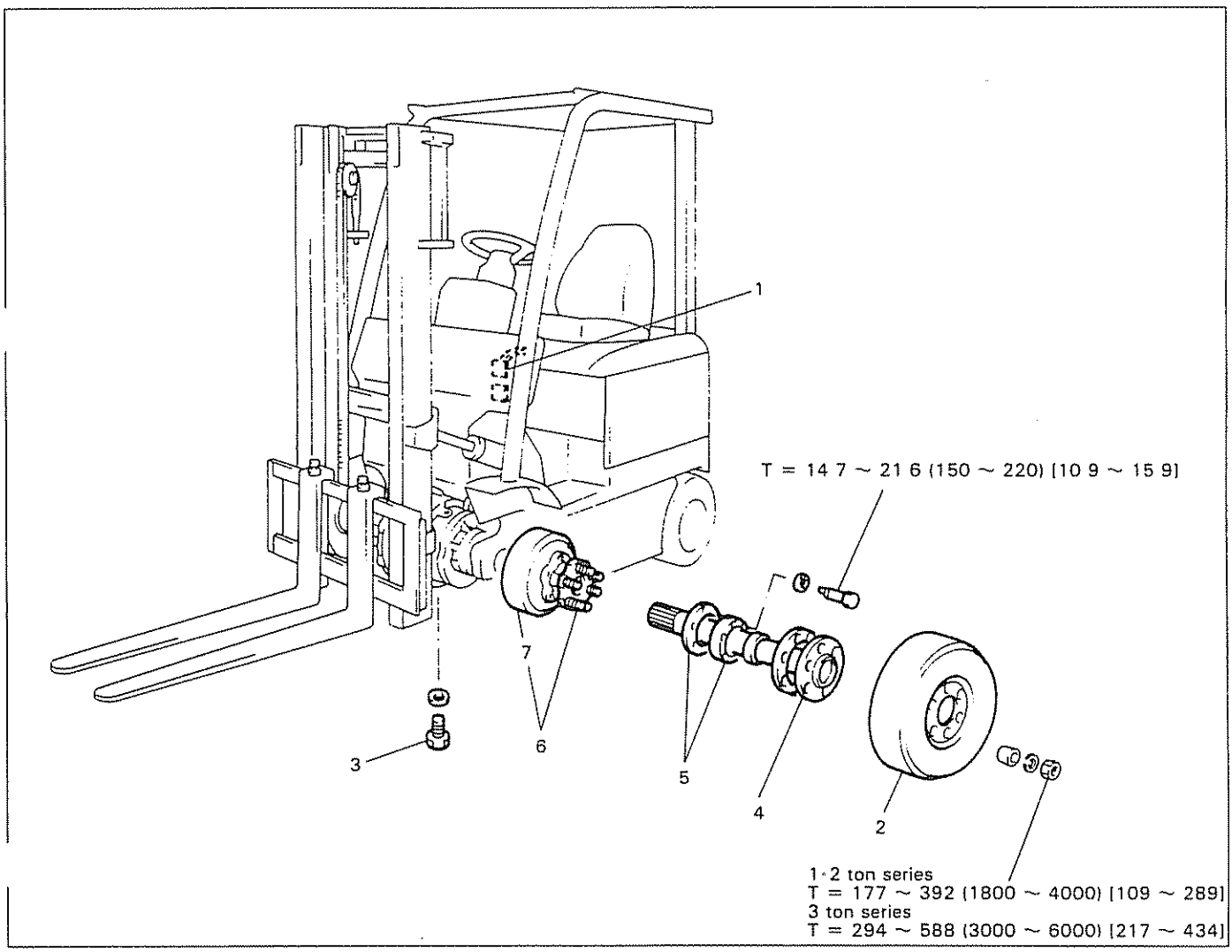
El procedimiento de instalación es el inverso al de remoción.
Nota:
Cubra con apretador de roscas (08833-00070) la tuerca de sujeción del tambor del freno antes de apretarla.

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FRONT AXLE SHAFT & HUB

REMOVAL·INSTALLATION

T = N·m (kgf-cm)[ft-lbf]



Removal Procedure

1 Disconnect the battery plug.

2 Remove front wheels. **[Point 1]**

3 Drain differential oil.

4 Remove the front axle shaft.

5 Remove the bearing lock nut and lock nut plate. **[Point 2]**

6 Remove the front axle hub W/brake drum. **[Point 3]**

7 Remove the brake drum from the front axle hub.

Installation Procedure

The installation procedure is the reverse of the removal procedure.
Note:
Coat thread tightener (08833-00070) on the breake drum set nut before tightening.

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Puntos de trabajo

[Punto 1]

Remoción: Levante el bastidor con el gato mecánico y apoye su lado delantero en bloques de madera en ambos extremos.

[Punto 2]

Remoción/instalación: Series de 1 y 2 toneladas:
SST 09509-55020
Series de 3 toneladas:
SST 09509-55030

Inspección: Mida la fuerza inicial del cubo del eje delantero.

1. Apriete la tuerca de seguridad. Aflójela aproximadamente de 1/12 a 1/6 de vuelta y golpéela suavemente con un martillo blando.

2. Coloque una balanza de resorte en el perno del cubo, y mida la fuerza inicial del cubo del eje delantero.
   Estándar: 24,5 ~ 44,1 N (2,5 ~ 4,5 kgf)

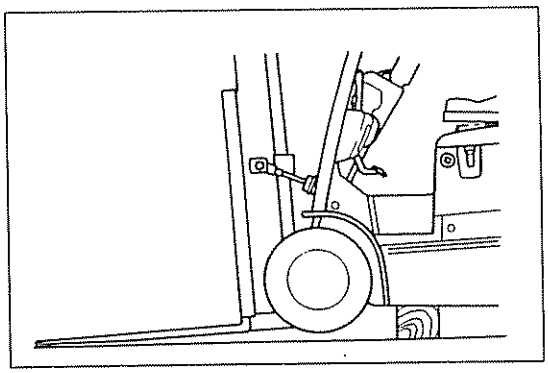
3. Si la fuerza inicial no satisface el estándar, ajústela apretando o aflojando la tuerca de seguridad del cojinete.
   Alinee también los orificios roscados de la tuerca de seguridad del cojinete y de la placa de la tuerca de seguridad mientras la fuerza inicial está dentro del alcance estándar.

4. Cubra con 08833-00070 el perno de retén de la tuerca de seguridad.

[Punto 3]

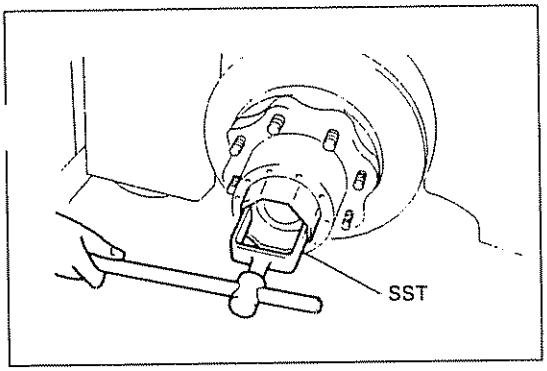
Instalación: Cubra con grasa MP la parte inferior del cubo del eje delantero.

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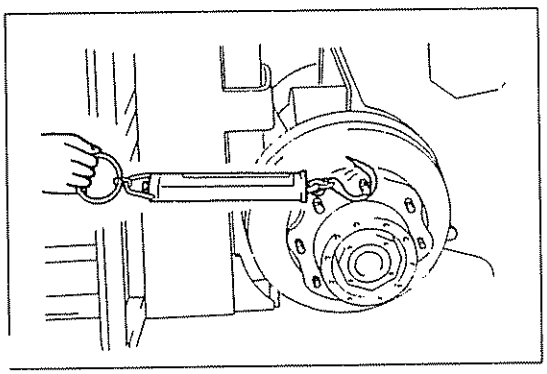


Point Operations

[Point 1]
Removal: Jack up the frame and support its front side with wooden blocks at both ends.



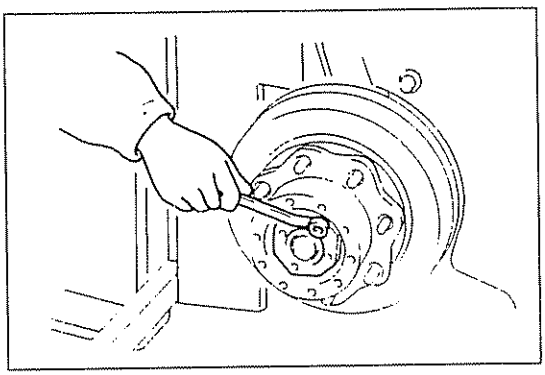
[Point 2]
Removal-installation: 1 and 2-ton series:
SST 09509-55020
3-ton series:
SST 09509-55030



Inspection: Measure the front axle hub starting force.

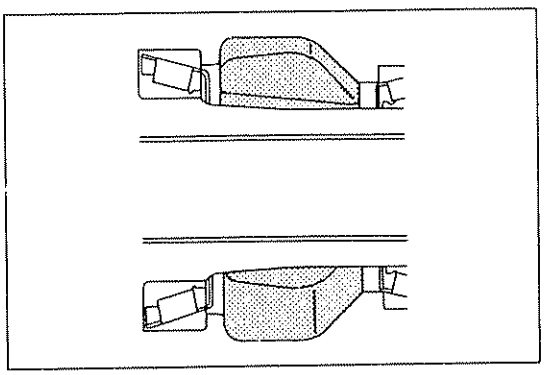
1. Tighten the lock nut. Loosen it by approx. 1/12 to 1/6 turn and tap it lightly with a soft hammer.

2. Set a spring scale on the hub bolt, and measure the front axle hub starting force.
Standard: 24.5 ~ 44.1 N (2.5 ~ 4.5 kgf) [5.5 ~ 9.9 lbf]



3. If the starting force does not satisfy the standard, adjust it by tightening or loosening the bearing lock nut. Also align the threaded holes of the bearing lock nut and lock nut plate while the starting force is within the standard range.

4. Coat 08833-00070 on the lock nut stopper bolt.



[Point 3]
Installation: Coat MP grease inside the front axle hub.

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Instalación: Gire el tornillo del ajustador automático del freno para contraer ligeramente la zapata del freno y facilitar la instalación del tambor del freno.

Instalación: SST 09130-30200-71

Instalación: Cubra con grasa MP el borde de la junta hermética de aceite después de la instalación.

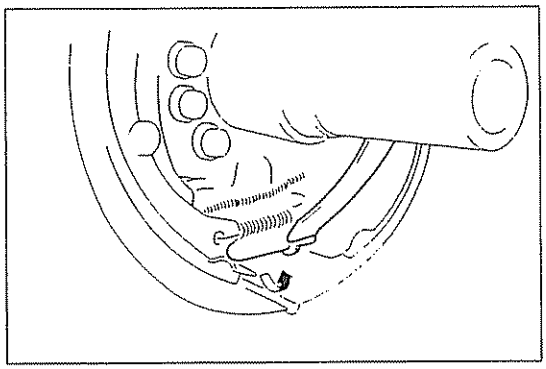
Remoción: Use una barra de latón para sacar el rodamiento exterior del cojinete.

Instalación: SST 09130-30200-71

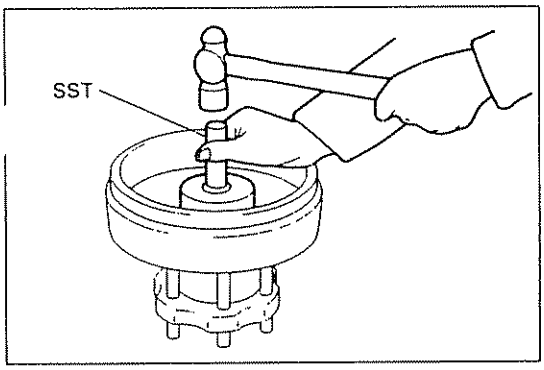
Instalación: Series de 1 y 2 toneladas: SST 09370-10410-71
Series de 3 toneladas: SST 09421-33020-71

Instalación: Después de instalar cubra con grasa MP la parte del rodillo.

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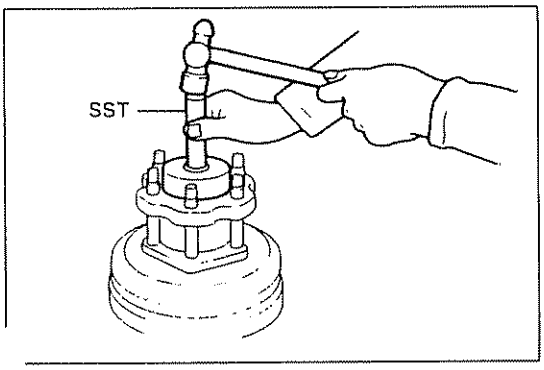


Installation: Turn the brake auto adjuster screw to contract the brake shoe slightly to make brake drum installation easy.



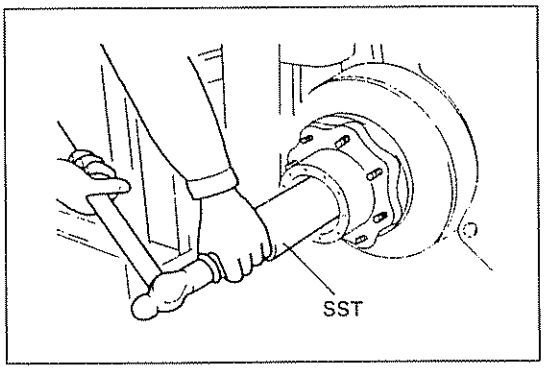
Installation: SST 09130-30200-71

Installation: Coat MP grease on the oil seal lip after installation.



Removal: Use a brass bar to remove the bearing outer race.

Installation: SST 09130-30200-71



Installation: 1 and 2-ton series: SST 09370-10410-71
3-ton series: SST 09421-33020-71

Installation: After installation coat MP grease on the roller portion.

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CONJUNTO DEL EJE DELANTERO

REMOCION/INSTALACION

T = N.m (kgf-cm)

2. Ruedas traseras
4. Aceite del diferencial

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Ponga calzas en las ruedas traseras.

3 Saque el mástil (vea la página 13-5).

4 Drene el aceite del diferencial.

5 Saque las ruedas delanteras. [Punto 1]

6 Desconecte las tuberías del freno. [Punto 2]

7 Desconecte el conector del sensor por encima del diferencial.

8 Saque el tablero del piso.

9 Saque la parte izquierda del panel instrumental.

10 Desconecte el cable del freno de estacionamiento (vea la página 11-29).

11 Desconecte el cableado del motor de marcha.

12 Saque el conjunto del eje delantero con el motor de marcha. [Punto 3]

13 Saque el conjunto del eje delantero. [Punto 4]

Procedimiento de instalación

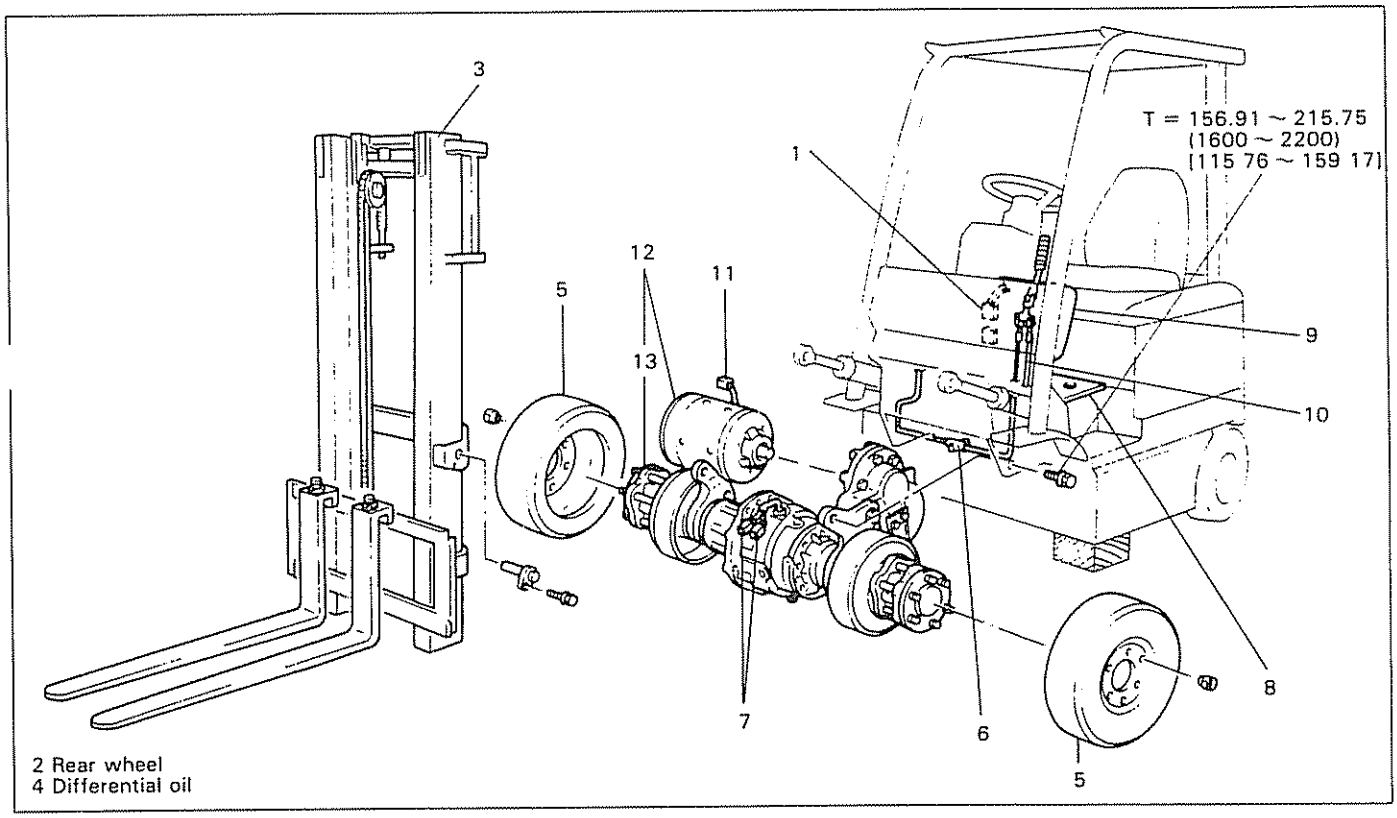
El procedimiento de instalación es el inverso al de remoción.

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FRONT AXLE ASSY

REMOVAL•INSTALLATION

T = N·m (kgf-cm)[ft-lbf]



Removal Procedure

1 Disconnect the battery plug.

2 Chock the rear wheels.

3 Remove the mast (see page 13-5).

4 Drain differential oil.

5 Remove the front wheels. **[Point 1]**

6 Disconnect the brake piping. **[Point 2]**

7 Disconnect the sensor connector above the differential.

8 Remove the toe board.

9 Remove the instrument panel LH.

10 Disconnect the parking brake wire (see page 11-29).

11 Disconnect the drive motor wiring.

12 Remove the front axle ASSY W/drive motor. **[Point 3]**

13 Remove the front axle ASSY. **[Point 4]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Puntos de trabajo

[Punto 1]

Remoción: Levante el bastidor con el gato mecánico y apóyelo en la parte delantera sobre bloques de madera en los lados izquierdo y derecho.

[Punto 2]

Remoción: Desconecte las tuberías del freno ilustradas.

Instalación: Purgue el aire del sistema del freno (según el procedimiento descrito en la página 11-24).

[Punto 3]

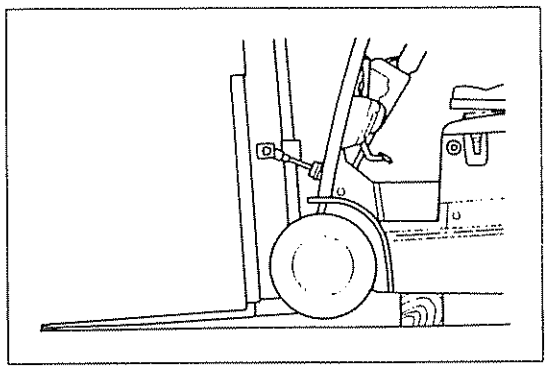
Remoción: Saque el conjunto del eje delantero con el motor de marcha fuera del vehículo.

1. Levante el conjunto del eje delantero con el motor de marcha y apóyelo en bloques de madera con un espacio para levantarlo usando un gato mecánico.

2. Saque los pernos de montaje del soporte delantero (dos en un lado en el centro).

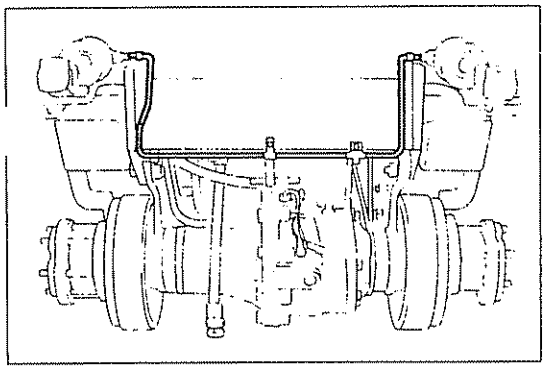
3. Saque los pernos fijos (dos en un lado en la parte superior e inferior).
SST 09310-22000-71

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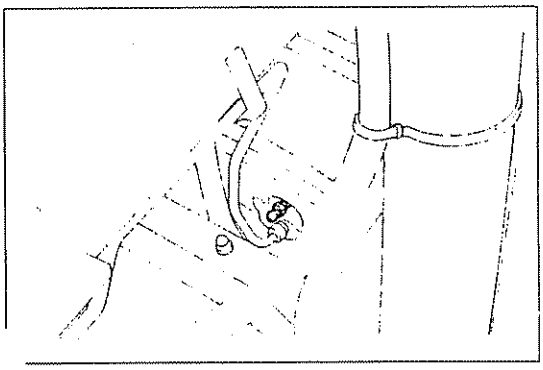


Point Operations

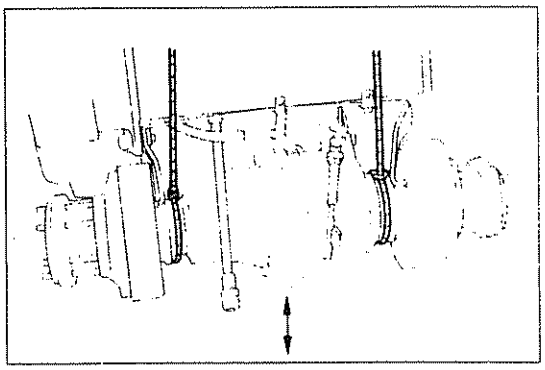
[Point 1]
Removal: Jack up the frame and support the front side with wooden blocks at left and right.



[Point 2]
Removal: Disconnect the brake piping as illustrated.

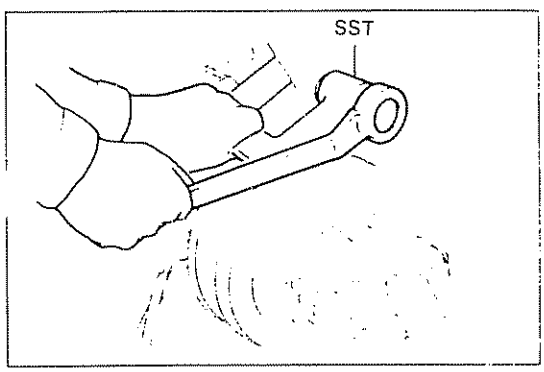


Installation: Bleed air from the brake system (according to the procedure described on page 11-24).



[Point 3]
Removal: Remove the front axle ASSY W/drive motor from the vehicle.

1. Hoist the front axle ASSY W/drive motor and support it with wooden blocks with a space for lifting with a garage jack.



2. Remove the front bracket mounting bolts (2 pcs. on one side at the center).

3. Remove reamer bolts (2 pcs. on one side at the top and bottom).
SST 09310-22000-71

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4. Apoye la parte inferior del conjunto del eje delantero con el motor de marcha usando un gato mecánico, y sáquelo con cuidado hacia adelante tirando de él.

Instalación: Instale el conjunto del eje delantero con el motor de marcha en el vehículo.

1. Levante con una grúa el conjunto del eje delantero con el motor de marcha y apóyelo en un gato mecánico. Acople con cuidado los orificios del soporte del eje delantero y el bastidor.

Nunca meta ningún dedo al alinear los orificios del perno.

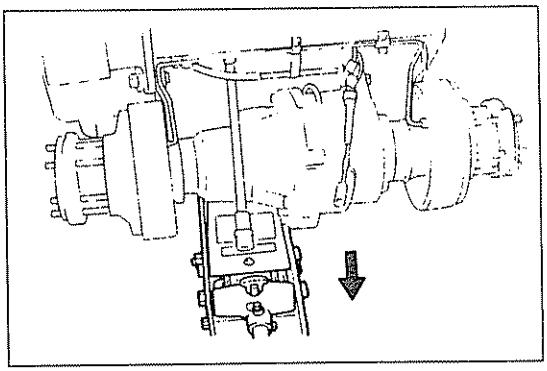
2. Meta los pernos fijos (dos en un lado en la parte superior e inferior),.

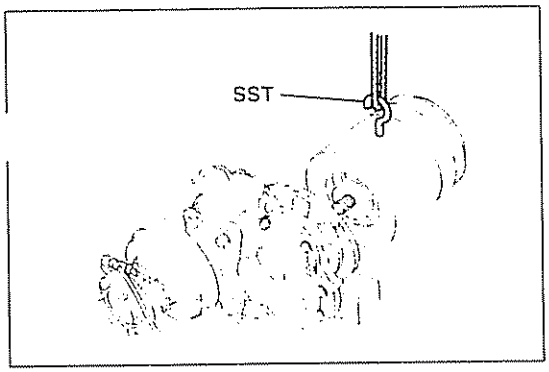
3. Apriete los pernos de sujeción del soporte del eje delantero.

[Punto 4]

4. Remoción/instalación: Levante con una grúa ligeramente el motor de marcha.
SST 09010-10260-71

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4. Support the bottom of the front axle ASSY W/drive motor with a garage jack, and pull it out carefully forward.

Installation: Install the front axle ASSY W/drive motor onto the vehicle.

1. Hoist the front axle ASSY W/drive motor and support it with a garage jack. Carefully match the holes in the front axle bracket and frame.
   Never put a finger in when aligning the bolt holes.

2. Drive in reamer bolts (2 pcs. on one side at the top and bottom).

3. Tighten the front axle bracket set bolts.

[Point 4]
Removal·installation: Hoist the drive motor slightly.
SST 09010-10260-71

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EJE TRASERO

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REAR AXLE

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TOE-IN ADJUSTMENT 8-14

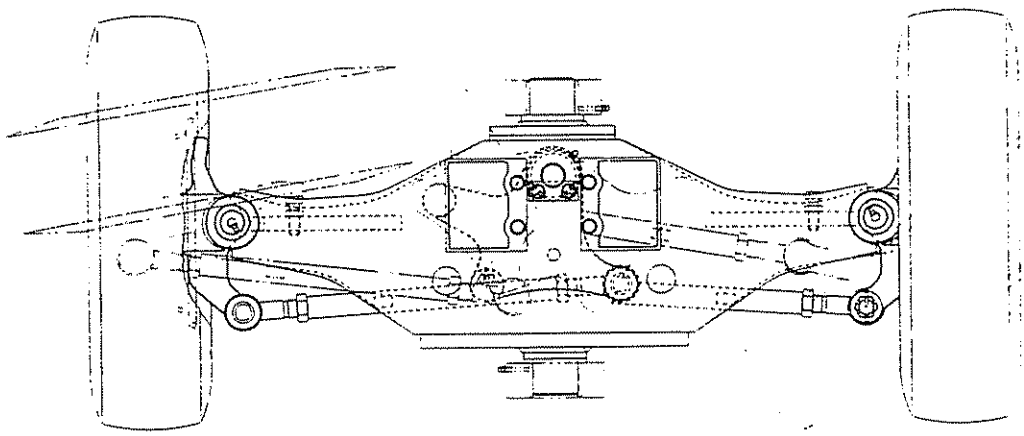
MINIMUM TURNING RADIUS ADJUSTMENT 8-14

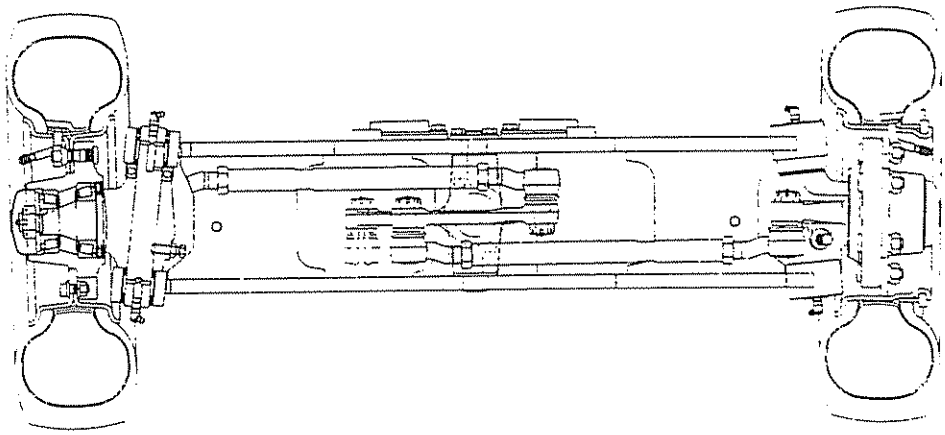
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GENERALIDADES

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GENERAL





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ESPECIFICACIONES

Eje trasero

Descripción	Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Tipo del eje trasero		Elliot		
Tipo de suspensión del eje trasero		Con apoyo central y oscilación lateral		
Alineación de las ruedas	Convergencia mm	0		
	Caída grados	1°		
	Avance grados	0°		
	Angulo del pivote de dirección grados	6°		
Radio de giro mínimo (exterior) mm		1,0 ton.: 1750 1,35 ton.: 1760 1,5 ton.: 1770 1,75 ton.: 1780 1,5 ton.: 1980 (gran capacidad)	2,0 ton.: 1980 2,0 ton.: 1980 (gran capacidad) 2,5 ton.: 2000 2,5 ton.: 2170 (gran capacidad)	3,0 ton.: 2000

Neumáticos/Aros

	Tamaño del neumático	Tamaño del aro	Presión de inflado kPa (kgf/cm²)
1,0 a 1,5 ton.	5,00-8-8PR	8x3,00D DT (Dividido) 8x3,00D TB (Anillo lateral)	784 (8,0)
1,75 ton.	5,00-8-10PR	8x3,00D TB (Anillo lateral)	882 (9,0)
2,0 ton.	18x7-8-14PR	8x4,25DT (Dividido) 8x4,33R TB (Anillo lateral)	686 (7,0)
2,5 ton.	18x7-8-14PR	8x4,33R TB (Anillo lateral)	882 (9,0)
2,0 - 2,5 ton.	6,00-9-10PR	9x4,00E DT (Dividido) 9x4,00E TB (Anillo lateral)	686 (7,0)
3,0 ton.	6,50-10-10PR	10x5,00F DT (Dividido) 10x5,00F TB (Anillo lateral)	

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SPECIFICATIONS

Rear Axle

Item / Vehicle model			1-ton series	2-ton series	3-ton series
Rear axle type			Elliot type		
Rear axle suspension type			Center supported lateral oscillation type		
Wheel alignment	Toe-in	mm (in)	0 (0)		
	Camber	degree	1°		
	Caster	degree	0°		
	King pin angle		6°		
Minimum turning radius (outermost)		mm (in)	1 0-ton: 1750 (68 90) 1 35-ton: 1760 (69 29) 1 5-ton: 1770 (69 68) 1 75-ton: 1780 (70 09) 1 5-ton: 1980 (70 09) (Large capacity)	2 0-ton: 1980 (77 95) 2 0-ton: 1980 (77 95) (Large capacity) 2 5-ton: 2000 (78 74) 2 5-ton: 2170 (85 43) (Large capacity)	3 0-ton: 2210 (87 00)

Tires-Rims

	Tire size	Rim size	Inflating pressure kPa (kgf/cm²) [psi]
1 0 to 1 5-ton	5 00-8-8PR	8 × 3 00D DT (Divided) 8 × 3 00D TB (Side ring)	784 (8 0) [113]
1 75-ton	5 00-8-10PR	8 × 3 00D TB (Side ring)	882 (9 0) [128]
2 0-ton	18 × 7-8-14PR	8 × 4 25DT (Divided) 8 × 4 33R TB (Side ring)	686 (7 0) [100]
2 5-ton	18 × 7-8-14PR	8 × 4 33R TB (Side ring)	882 (9 0) [128]
2 0 and 2 5-ton	6 00-9-10PR	9 × 4 00E DT (Divided) 9 × 4 00E TB (Side ring)	686 (7 0) [100]
3 0-ton	6 50-10-10PR	10 × 5 00F DT (Divided) 10 × 5 00F TB (Side ring)	↑

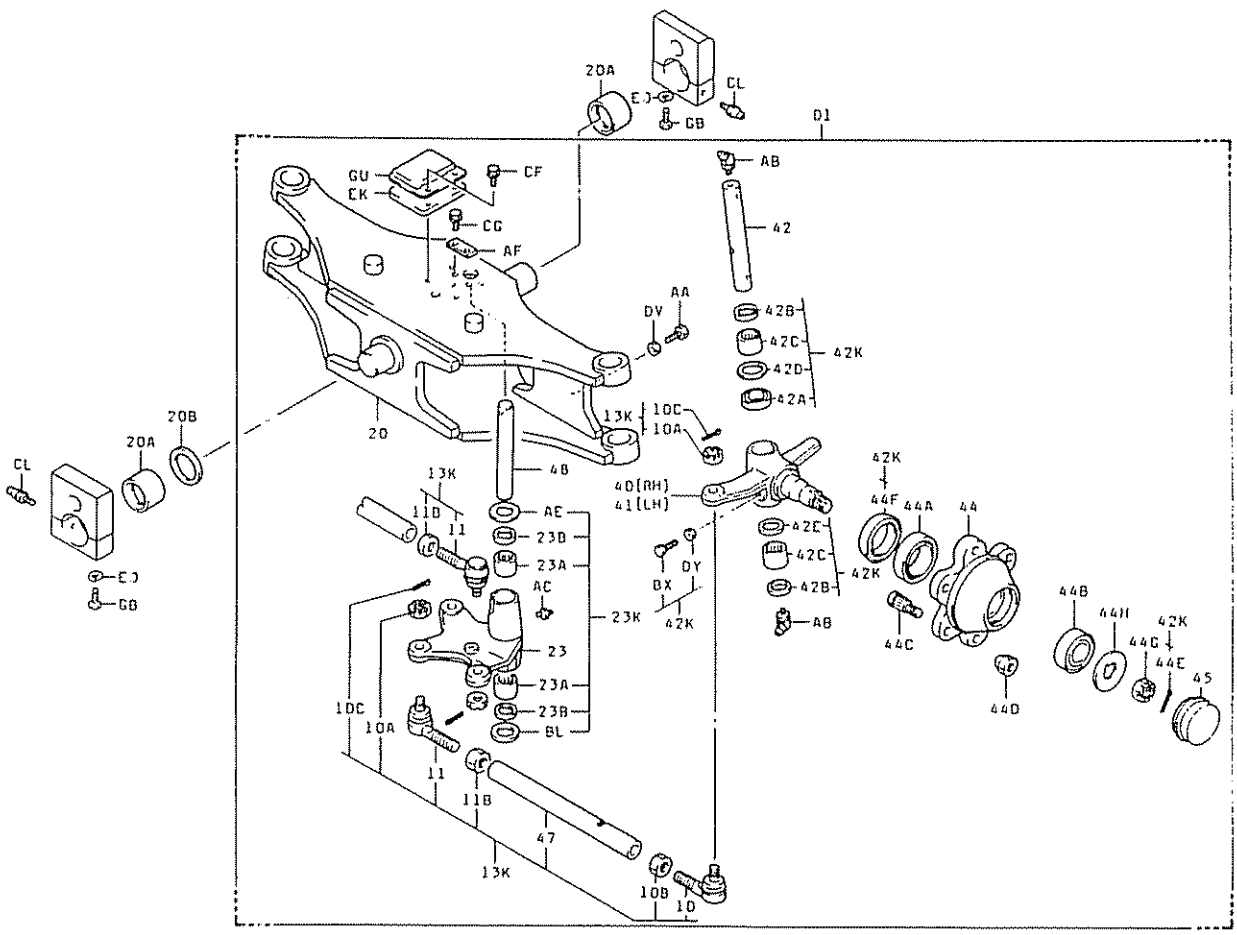
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COMPONENTES

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COMPONENTS

4301



4301-090

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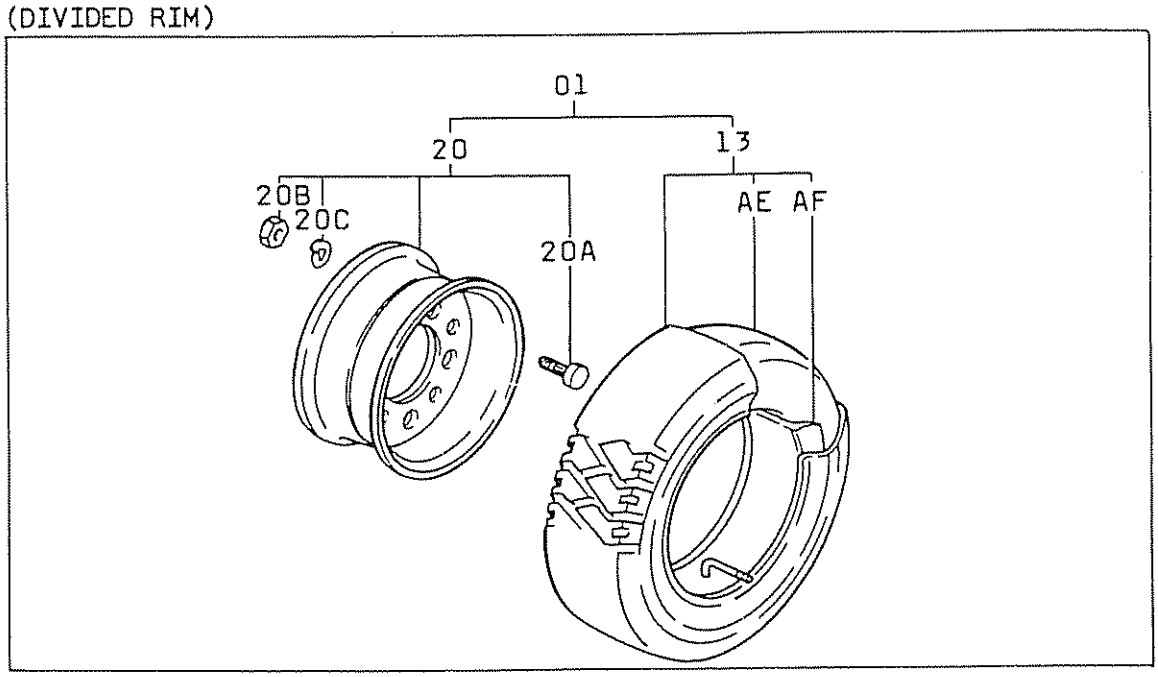
Aro dividido

Aro del anillo lateral

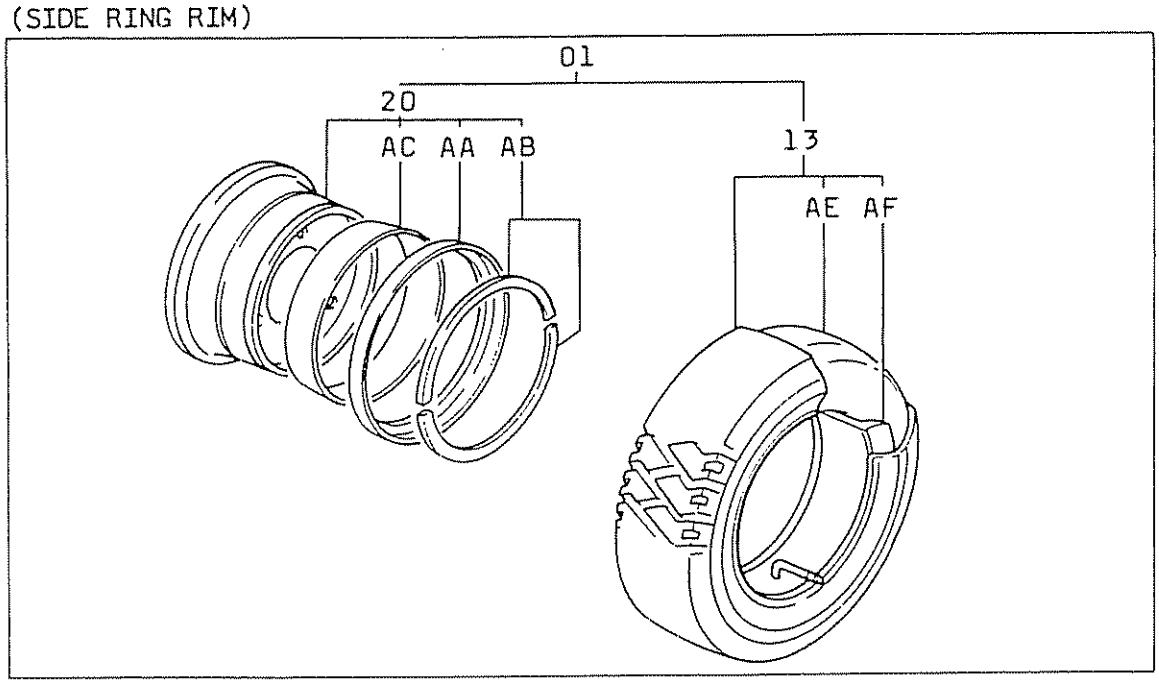
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4403

(DIVIDED RIM)



(SIDE RING RIM)



4403-064A

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CONJUNTO DEL EJE TRASERO

REMOCION/INSTALACION

T = N.m (kgf-cm)

Series de 1 ton. 147,10 ~ 196,13 (1500 ~ 2000)
Series de 2-3 ton. 245,17 ~ 294,20 (2500 ~ 3000)

Series de 1 ton. T = 88,26 ~ 156,91 (900 ~ 1600)
Series de 2 ton. T = 117,68 ~ 147,10 (1200 ~ 1500)
Series de 3 ton. T = 117,68 ~ 196,13 (1200 ~ 2000)

3 Freno de estacionamiento

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Gire el volante de dirección del todo hacia la derecha.

3 Tire de la palanca del freno de estacionamiento.

4 Saque el contrapeso (vea la página 0-14).

5 Saque las ruedas delanteras.

6 Saque las ruedas traseras. [Punto 1]

7 Desconecte el extremo de la articulación de arrastre del actuador de la PS. [Punto 2]

8 Saque el conjunto del eje trasero. [Punto 3]

9 Saque el casquillo del pasador central del eje trasero. [Punto 4]

Procedimiento de instalación

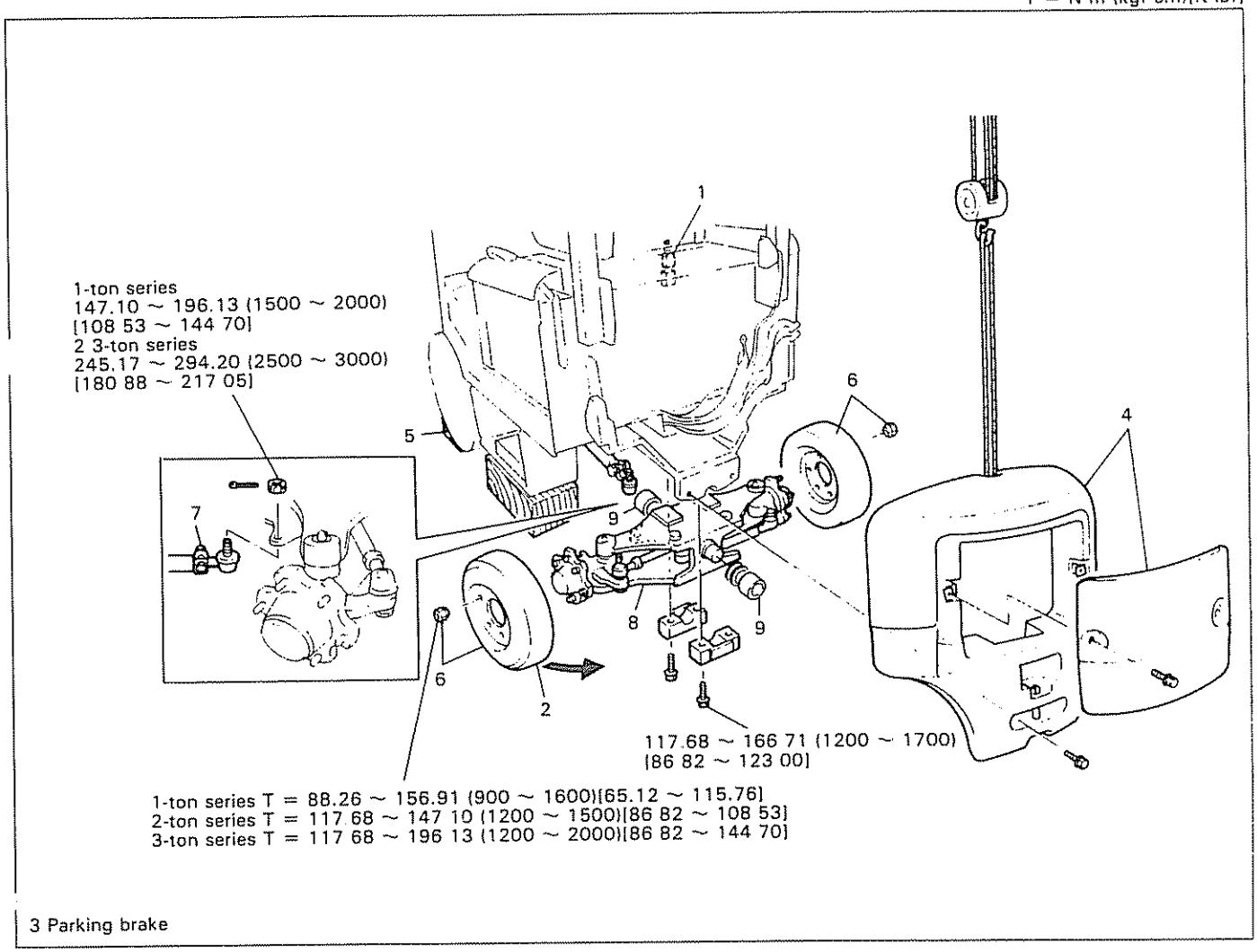
El procedimiento de instalación es el inverso al de remoción.

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REAR AXLE ASSY

REMOVAL•INSTALLATION

T = N m (kgf-cm)[ft-lbf]



3 Parking brake

Removal Procedure

1 Disconnect the battery plug.

2 Rotate the steering wheel fully clockwise.

3 Pull the parking brake lever.

4 Remove the counterweight (see page 0-14).

5 Remove the front wheels.

6 Remove the rear wheels. **[Point 1]**

7 Disconnect the PS actuator drag link end. **[Point 2]**

3 Remove the rear axle ASSY. **[Point 3]**

9 Remove the rear axle center pin bush. **[Point 4]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Puntos de trabajo

[Punto 1]

Remoción: Levante el vehículo con el gato de taller y apoye la parte trasera del bastidor en bloques de madera en la izquierda y en la derecha.

[Punto 2]

Remoción: SST 09430-23600-71

[Punto 3]

Remoción: Ponga marcas de acoplamiento en el eje central trasero, tapa del soporte delantero y tapa del soporte trasero.

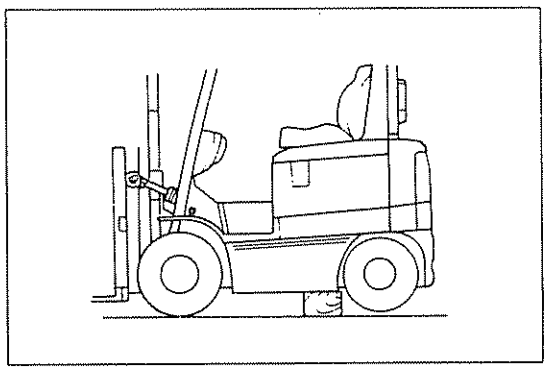
Instalación: Alinee las marcas de acoplamiento para instalar.

Remoción: Levante con el gato de taller el conjunto del eje trasero, saque el perno de sujeción, y tire del conjunto del eje trasero hacia la parte posterior con cuidado para evitar que entre en contac con el bastidor u otras partes.

Inspección: Mida la holgura de la parte delantera del eje trasero a la trasera.

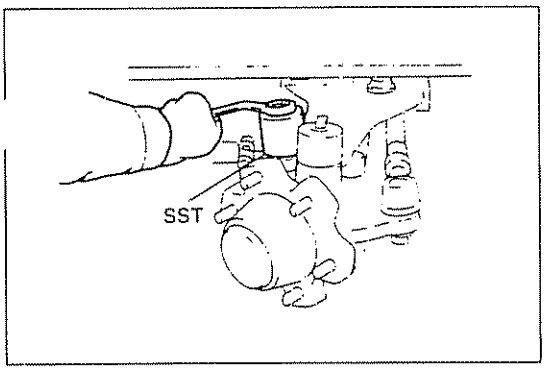
1. Antes de la remoción, empuje del todo hacia adelante el eje central trasero, y mida la holgura en el lado trasero.
   Estándar: 0,5 mm o menos
   Si no se satisface el estándar, ajuste cambiando los espaciadores.
   Tipos de espaciadores:
   3,0, 3,5, 4,0, 4,5, 5,0 y 5,5 mm

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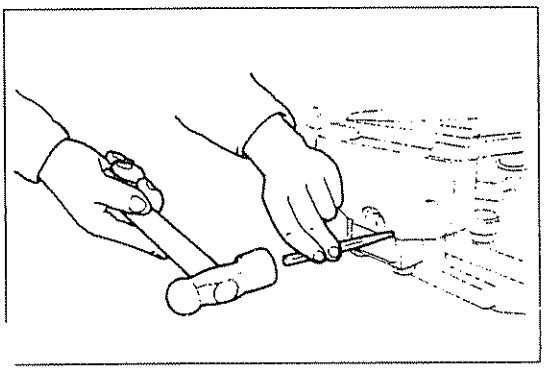


Point Operations

[Point 1]
Removal: Jack up the vehicle and support the rear side of the frame with wooden blocks at left and right.

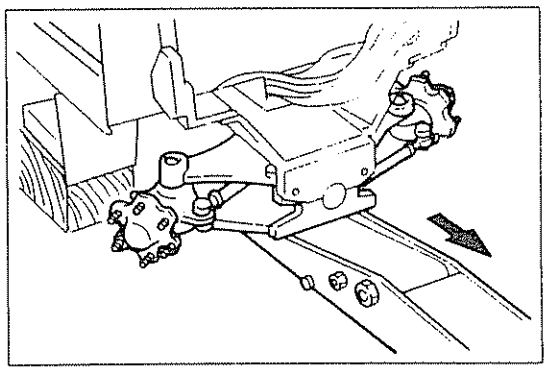


[Point 2]
Removal: SST 09430-23600-71

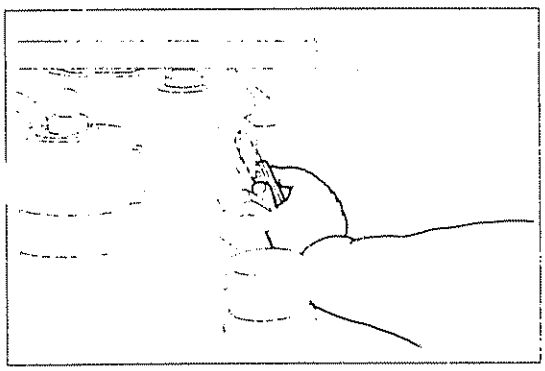


[Point 3]
Removal: Put match marks on the rear axle beam, front bracket cap and rear bracket cap.

Installation: Align the match marks for installation.



Removal: Jack up the rear axle ASSY, remove the set bolt, and pull the rear axle ASSY toward the rear carefully to avoid contact with the frame or other parts.



Inspection: Measure the rear axle front to rear clearance

1. Before removal, push the rear axle beam fully forward, and measure the clearance on the rear side.
   Standard: 0.5 mm (0.020 in) or less
   If the standard is not satisfied, adjust by changing the spacer.
   Spacer types:
   3.0, 3.5, 4.0, 4.5, 5.0 and 5.5 mm
   (0.118, 0.138, 0.157, 0.177, 0.197 and 0.217 in)

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2. Instale los espaciadores en el pasador central en el lado trasero. Para el primer espaciador, el lado biselado del borde del orificio deberá estar en contacto con el centro del núcleo del pasador.

*Fig. Biselado
Primero
Segundo

[Punto 4]

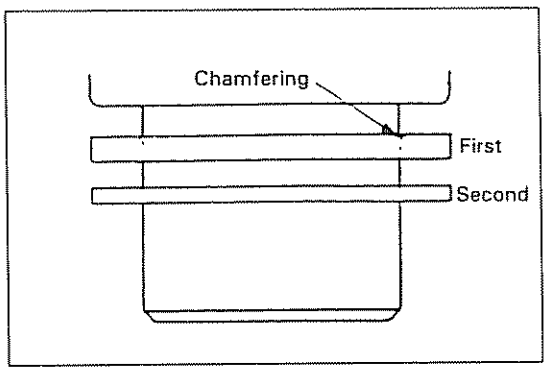
Inspección: Inspeccione el diámetro interior del casquillo del pasador central del eje trasero.
Límite: 52,0 mm

Instalación: Instale el casquillo del pasador central del eje trasero después de revestir con grasa MP la ranura destinada a la grasa.

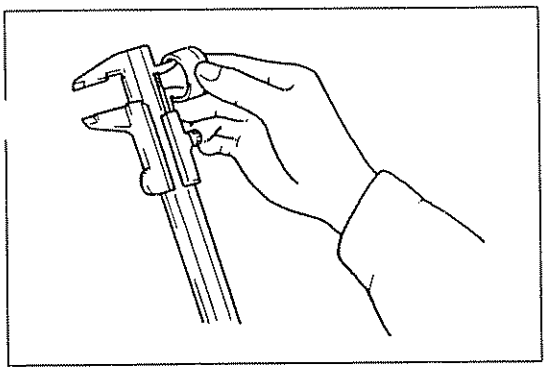
Instalación: La ranura destinada a la grasa que hay en el casquillo deberá estar encarada hacia el orificio de engrase de la tapa del soporte.

*Fig. Ranura para la grasa

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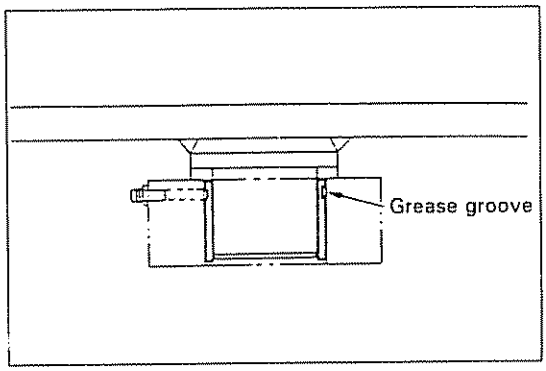


2. Install spacers on the center pin on the rear side. For the first spacer, the chamfered side at the hole edge shall be in contact with the center pin boss.



[Point 4]

Inspection: Inspect the inside diameter of the rear axle center pin bush.
Limit: 52.0 mm (20.47 in)



Installation: Install the rear axle center pin bush after coating MP grease on the grease groove.

Installation: The grease groove of the bush shall face the grease fitting hole of the bracket cap.

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DESMONTAJE/INSPECCION/REMONTAJE

Nota:
El cubo del eje trasero y el muñón de dirección se pueden desmontar, inspeccionar y volver a montar en el vehículo. En este manual se describe la serie de trabajos que hay que hacer después de la remoción del conjunto del eje trasero.

T = N.m (kgf-cm)

A: Series de 1-2 ton.: 68,65-98,067 (700-1000)
Series de 3 ton.: 147,10-196,13 (1500-2000)
B: 20-31 (200-320)
C: 19-30 (190-310)
D: 19-30 (190-310)

Procedimiento de desmontaje

1 Saque la tapa del cubo. [Punto 1]

2 Saque el cubo del eje trasero. [Punto 2]

3 Saque el cojinete interior y la junta hermética de aceite. [Punto 3]

4 Desconecte la barra de acoplamiento del lado del muñón de dirección. [Punto 4]

5 Desenrosque el perno de inmovilización del pivote de dirección y saque el pivote de dirección.

6 Saque el muñón de dirección.

7 Saque el pasador de la palanca acodada.

8 Saque el conjunto de la palanca acodada con la barra de acoplamiento.

9 Saque la barra de acoplamiento fuera del conjunto de la palanca acodada. [Punto 5]

10 Saque el cojinete y la junta hermética de aceite fuera de la palanca acodada. [Punto 6]

11 Saque el amortiguador del eje trasero fuera del eje central trasero.

12. Saque el cojinete y la junta hermética de aceite fuera del eje central trasero. [Punto 7]

(Las etapas 1 a 6 se pueden llevar a cabo en el vehículo)

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

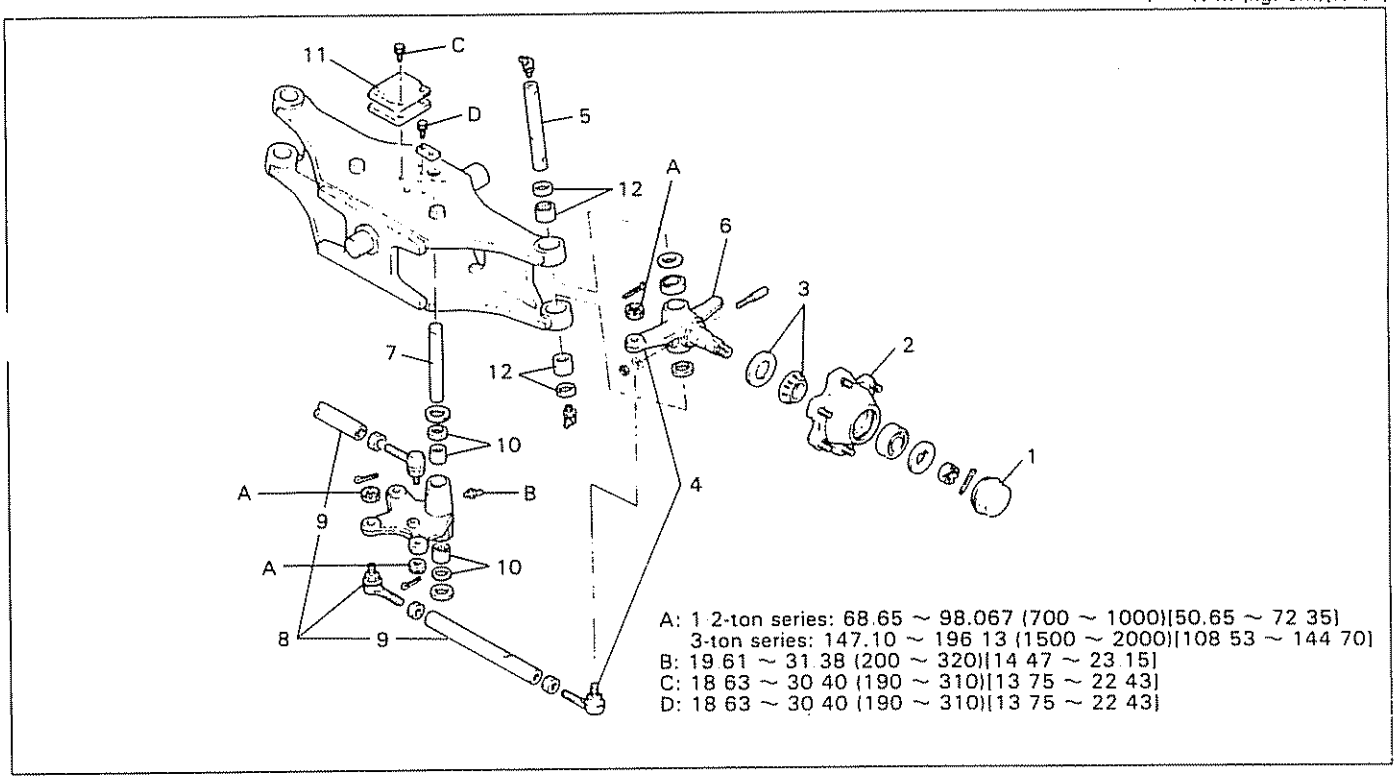
Nota:
Después del remontaje, mida y ajuste la alineación de las ruedas traseras (vea la página 8-13).
(Mida y ajuste la convergencia después de sacar el eje trasero.

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DISASSEMBLY•INSPECTION•REASSEMBLY

Note:
The rear axle hub and steering knuckle can be disassembled, inspected and reassembled on the vehicle. A series of jobs after removal of the rear axle ASSY are described in this manual.

T = N m (kgf-cm)[ft-lbf]



Disassembly Procedure

1 Remove the hub cap. **[Point 1]**
2 Remove the rear axle hub. **[Point 2]**
3 Remove the inner bearing and oil seal. **[Point 3]**
4 Disconnect the tie rod from the steering knuckle. **[Point 4]**
5 Unscrew the king pin lock bolt and remove the king pin.
6 Remove the steering knuckle.
7 Remove the bell crank pin.
8 Remove the bell crank ASSY W/tie rod.
9 Remove the tie rod from the bell crank ASSY. **[Point 5]**
10 Remove the bearing and oil seal from the bell crank. **[Point 6]**
11 Remove the rear axle damper from the rear axle beam.
12 Remove the bearing and oil seal from the rear axle beam. **[Point 7]**

(Steps 1 to 6 can be performed on the vehicle.)

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
After reassembly, measure and adjust the rear wheel alignment (see page 8-13).
(Measure and adjust the toe-in after removing the rear axle.)

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Puntos de trabajo

[Punto 1]

Remontaje: Rellene con grasa MP la tapa del cubo antes del remontaje.

Remontaje: Golpee la parte del reborde de la tapa para la instalación.

[Punto 2]

Desmontaje: SST 09950-40010

Remontaje: SST 09370-20270-71

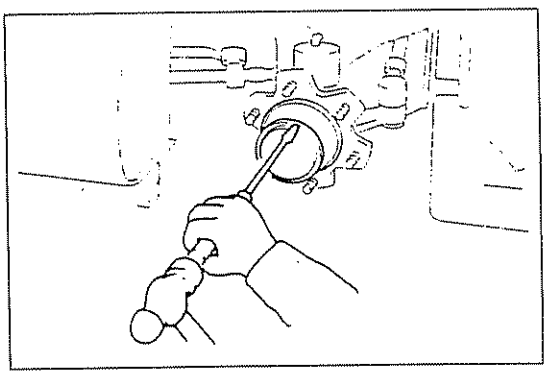
Desmontaje: Use una barra de latón y saque el rodamiento exterior del cojinete.

Remontaje: Instale los rodamientos exteriores del cojinete.
Rodamiento exterior del cojinete interior
SST 09370-10170-71
SST 09608-20012

Desmontaje: Use una barra de latón y saque el rodamiento exterior del cojinete.

Remontaje: Rodamiento exterior del cojinete exterior
SST 09608-20012

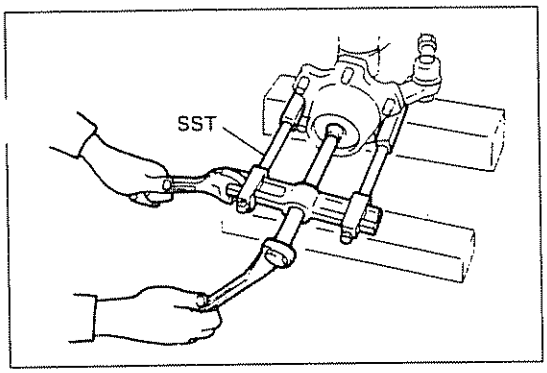
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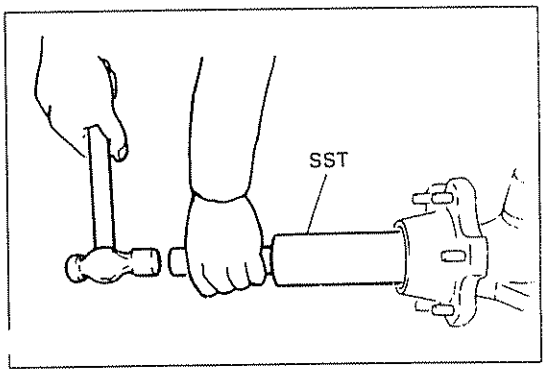
Point Operations

[Point 1]
Reassembly: Fill MP grease in the hub cap before reassembly.

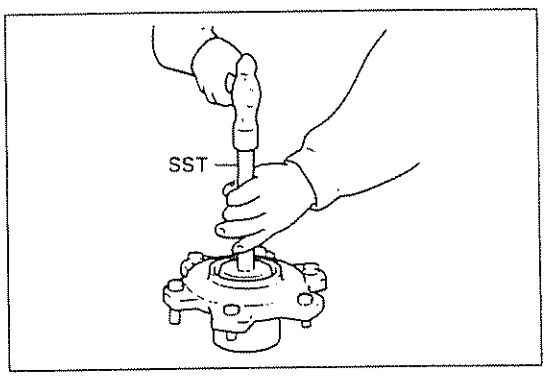
Reassembly: Tap the cap flange portion for installation.



[Point 2]
Disassembly: SST 09950-40010

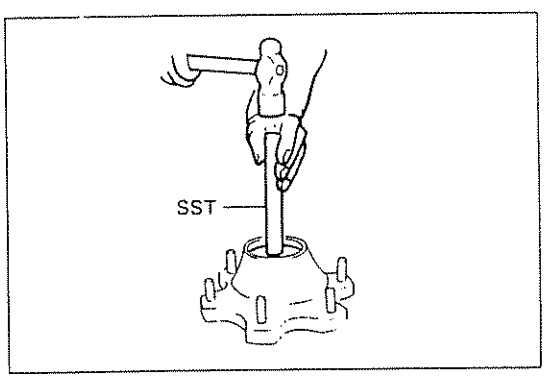


Reassembly: SST 09370-20270-71



Disassembly: Use a brass bar and remove the bearing outer race.

Reassembly: Install the bearing outer races.
Inner bearing outer race
SST 09370-10170-71
SST 09608-20012



Disassembly: Use a brass bar and remove the bearing outer race.

Reassembly: Outer bearing outer race
SST 09608-20012

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Remontaje: Mida la fuerza inicial del cubo del eje trasero.
1. Apriete temporalmente la tuerca de seguridad del cojinete a un par de 0,98 N.m (10 kgf-cm).
2. Vuelva a apretar la tuerca ranurada mientras golpea suavemente la periferia del cubo del eje con un martillo de cabeza blanda.
3. Coloque una balanza de resorte en el perno del cubo y mida la fuerza inicial.
   Fuerza inicial estándar
   Series de 1 ton.: 14,7 a 39,2 N (1,5 a 4,0 kgf)
   Series de 2 y 3 ton.: 14,7 a 44,1 N (1,5 a 4,5 kgf)

[Punto 3]

Desmontaje: SST 09950-40010

Remontaje: Cubra con grasa MP el cojinete exterior e instálelo con el cubo del eje en el muñón de dirección.
SST 09370-20270-71

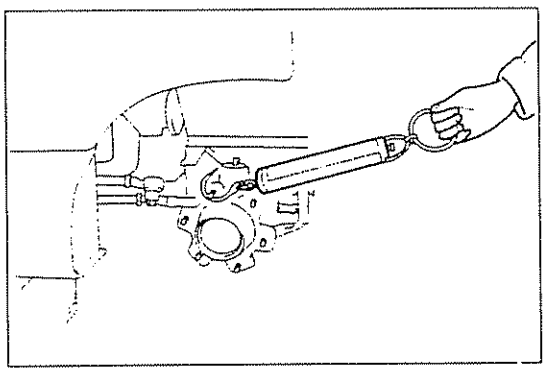
[Punto 4]

Desmontaje: SST 09610-20012

Inspección: Mida el diámetro exterior del pivote de dirección.
Estándar: 28,0 mm
Límite: 27,8 mm

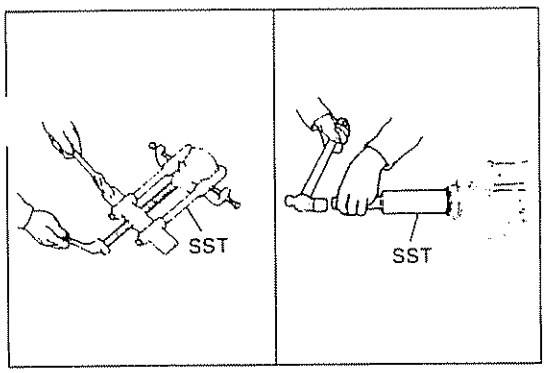
Remontaje: Instale el cojinete de empuje en la parte superior del muñón de dirección.

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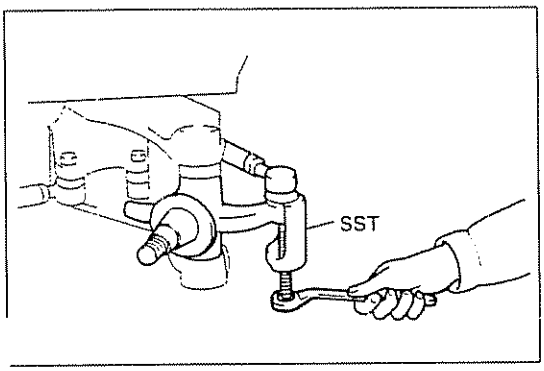
Reassembly: Measure the rear axle hub starting force.
1. Temporarily tighten the bearing lock nut to a torque of 0.98 N·m (10 kgf-cm) [72 ft-lbf].
2. Retighten the slotted nut while tapping the outer periphery of the axle hub with a soft hammer.
3. Set a spring scale on the hub bolt and measure the starting force.

Standard starting force
1-ton series: 14.7 to 39.2 N (1.5 to 4.0 kgf) [3.3 to 8.8 lbf]
2 and 3-ton series: 14.7 to 44.1 N (1.5 to 4.5 kgf) [3.3 to 9.9 lbf]

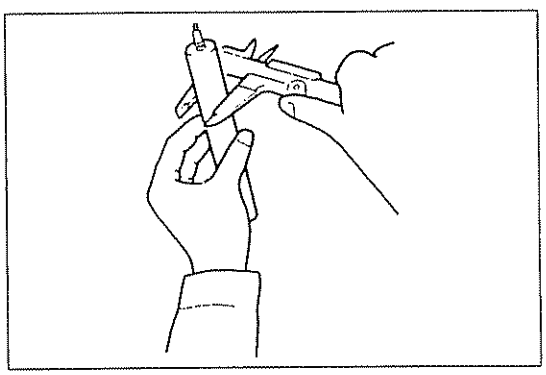


[Point 3]
Disassembly: SST 09950-40010

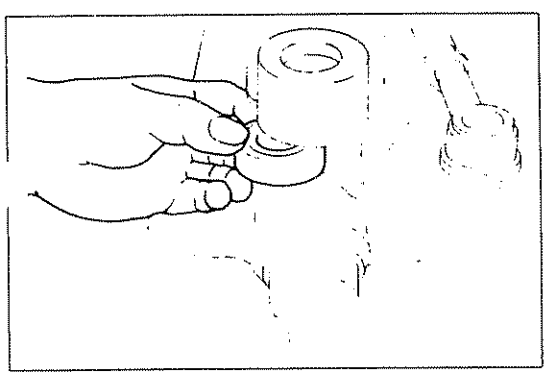
Reassembly: Coat MP grease on the outer bearing and install it with the axle hub in the steering knuckle.
SST 09370-20270-71



[Point 4]
Disassembly: SST 09610-20012



Inspection: Measure the king pin outside diameter.
Standard: 28.0 mm (1.102 in)
Limit: 27.8 mm (1.094 in)



Reassembly: Install the thrust bearing on top of the steering knuckle.

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Remontaje: Mida la fuerza inicial del muñón de dirección.

1. Coloque una balanza de resorte en el extremo del muñón de dirección y mida la fuerza inicial del muñón de dirección.
   Estándar: 29,4 a 49,0 N (3,0 a 5,0 kgf)

2. Si la fuerza inicial no satisface el estándar, ajuste la fuerza inicial del muñón de dirección mediante cuñas.
   Grosor de las cuñas:
   0,1, 0,2, 0,5 y 1,0 mm

*Fig. Cuña

[Punto 5]

Remontaje Ajuste la holgura de instalación de la palanca acodada cambiando el grosor de las cuñas.

1. Instale una arandela de empuje de 3,0 mm debajo de la palanca acodada.

2. Realice el ajuste del lado superior de la palanca acodada.
   Holgura estándar: 0 a 0,5 mm
   Grosor de la cuña: 0,5 mm y 1,0 mm

*Fig. Cuña
Arandela de empuje

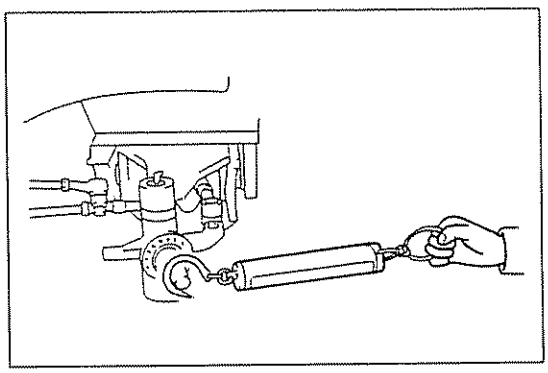
3. Compruebe si se mueve ligeramente la palanca acodada.

[Punto 6]

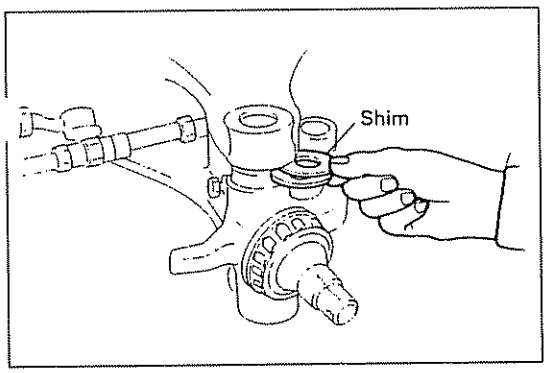
Desmontaje: SST 09610-20012

Remontaje: Vuelva a montar la junta hermética de aceite.
SST 09620-30010

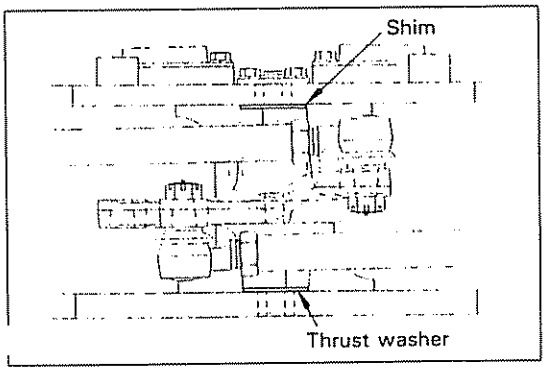
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Reassembly: Measure the steering knuckle starting force.
1. Set a spring scale at the end of the steering knuckle and measure the steering knuckle starting force.
Standard: 29.4 to 49.0 N (3.0 to 5.0 kgf) [6.6 to 11.0 lbf]

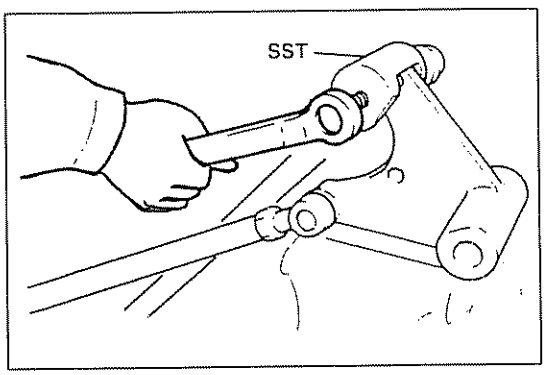


2. If the starting force does not satisfy the standard, adjust the steering knuckle starting force by means of shims.
Shim thickness:
0.1, 0.2, 0.5, and 1.0 mm (0.004, 0.008, 0.020, and 0.039 in)

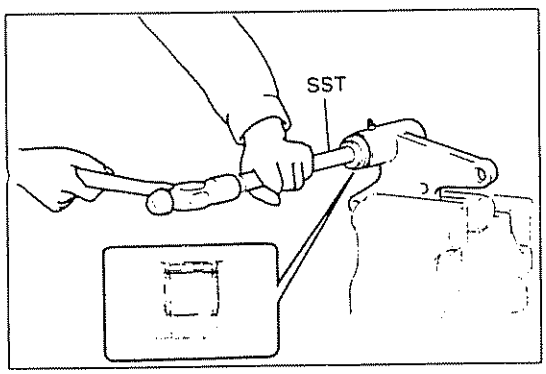


[Point 5]
Reassembly: Adjust the bell crank installation clearance by changing the shim thickness.
1. Install a 3.0 mm thrust washer under the bell crank.
2. Make shim adjustment on the upper side of the bell crank.
Standard clearance: 0 to 0.5 mm
Shim thickness: 0.5 mm and 1.0 mm (0.020 in, 0.039 in)
3. Check if the bell crank moves lightly.

[Point 6]
Disassembly: SST 09610-20012



Reassembly: Reassembly the oil seal.
SST 09620-30010



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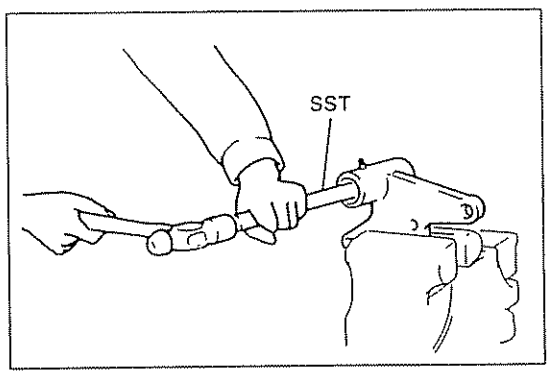
Desmontaje/remontaje: Desmonte y vuelva a montar el cojinete.
SST 09620-30010

[Punto 7]

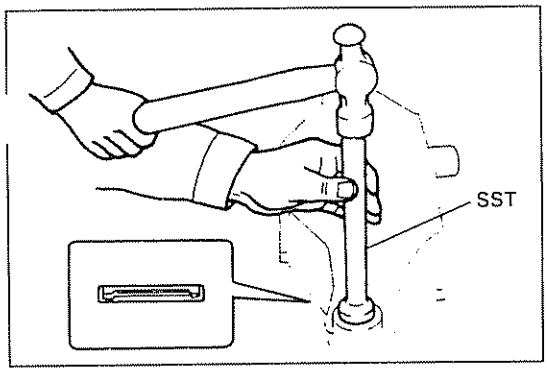
Remontaje: Vuelva a montar la junta hermética de aceite.
SST 09620-30010

Desmontaje/remontaje: Desmonte y vuelva a montar el cojinete.
SST 09620-30010

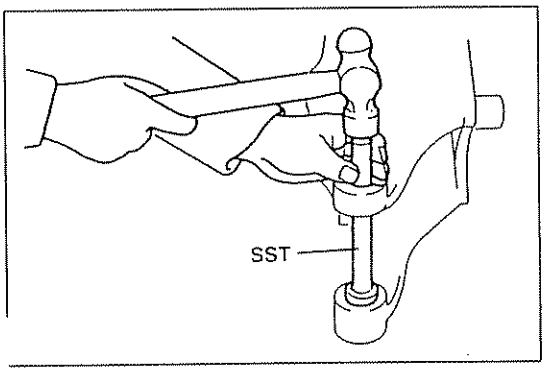
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Disassembly·reassembly: Disassembly and reassembly the bearing.
SST 09620-30010



[Point 7]
Reassembly: Reassembly the oil seal.
SST 09620-30010



Disassembly·reassembly: Disassembly and reassembly the bearing.
SST 09620-30010

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ALINEACION DE LAS RUEDAS TRASERAS

AJUSTE DE LA CONVERGENCIA

Nota:
Saque el eje trasero cuando mida o ajuste la convergencia.

1. Coloque las ruedas en dirección recta hacia adelante.
   (1) Alinee el orificio central del eje central trasero y el orificio lateral de la palanca acodada, e inserte la barra redonda apropiada en los orificios.

2. Ponga marcas de acoplamiento en el centro de las ruedas izquierda y derecha.

3. Mida la distancia entre las marcas en ambas ruedas con un un medidor de convergencias o una regla convexa en paralelo con la superficie del suelo. (En el lado delantero)
   Valor medido = A
   Luego gire las ruedas media vuelta y mida la distancia entre las marcas en ambas ruedas en el lado trasero.
   Valor medido = B
   Convergencia = A - B
   Convergencia estándar: 0 ± 4 mm

4. Si la convergencia no satisface el estándar, afloje la tuerca de seguridad de la barra de acoplamiento y cambie la longitud de la barra de acoplamiento girándola para ajustarla.
   En este caso, la longitud de la barra de acoplamiento tiene que ser igual en los lados izquierdo y derecho.

AJUSTE DEL RADIO DE GIRO MINIMO

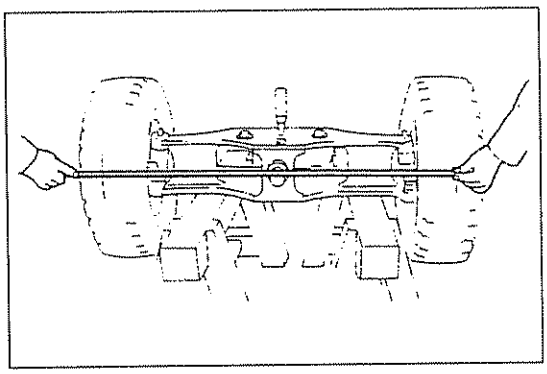
1. Ajuste el ángulo de la dirección de las ruedas traseras mediante la proyección del perno de tope del muñón (dimensión C).

   Proyección del perno de tope del muñón (valor de referencia)
   Series de 1 ton. C = 22,6 mm
   Series de 2 ton. C = 23,0 mm

2. Mida el radio de giro mínimo para confirmar el ángulo de dirección.

   Radio de giro mínimo
   Modelo de 1,0 ton.: 1750 mm
   Modelo de 1,35 ton.: 1760 mm
   Modelo de 1,5 ton.: 1770 mm
   Modelo de 1,75 ton.: 1780 mm
   Modelo de 2,0 ton.: 1980 mm
   Modelo de 2,5 ton.: 2000 mm
   Modelo de 3,0 ton.: 2210 mm
   Modelo de gran capacidad
   Modelo de 1,5 ton.: 1980 mm
   Modelo de 2,0 ton.: 2145 mm
   Modelo de 2,5 ton.: 2170 mm

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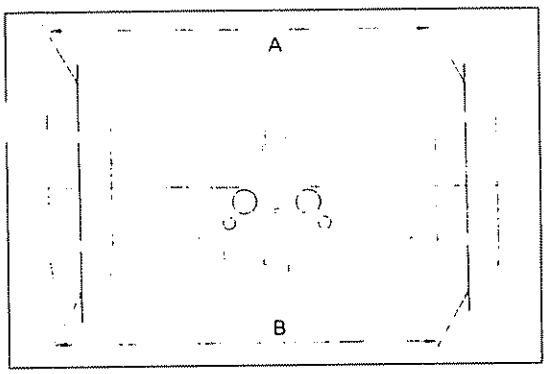


REAR WHEEL ALIGNMENT

TOE-IN ADJUSTMENT

Note:
Remove the rear axle when measuring or adjusting the toe-in.

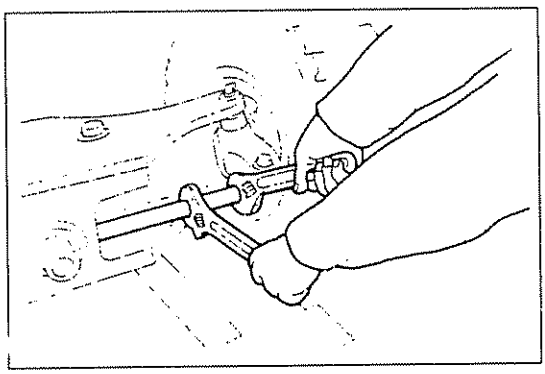
1. Set the wheels to the straight traveling state.
   (1) Align the rear axle beam center hole and bell crank side hole, and insert an appropriate round bar in the holes.



2. Put marks on the center of wheels on the left and right sides.

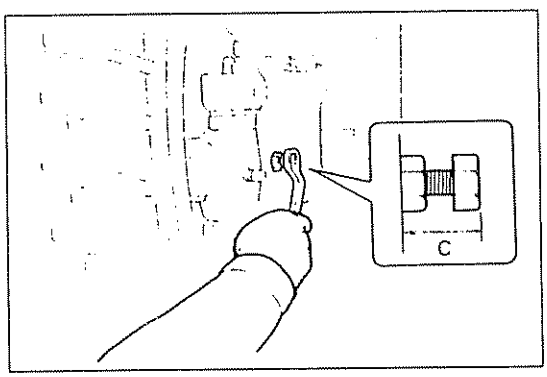
3. Measure the distance between the marks on both wheels with a toe-in gage or a convex rule in parallel with the ground surface. (One the front side)
   Measured value = A
   Then rotate the wheels by a half turn and measure the distance between marks on both wheels on the rear side.
   Measured value = B
   Toe-in = A − B

   Standard toe-in: 0 ± 4 mm (0 ± 0.16 in)



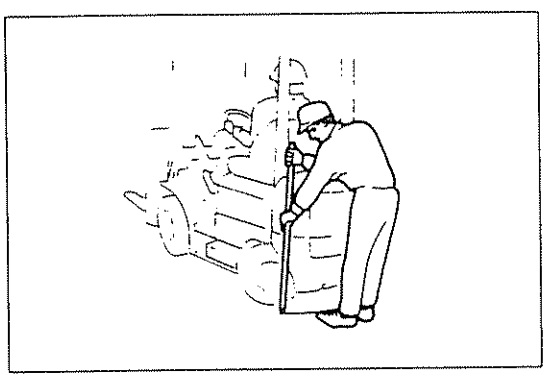
4. If the toe-in does not satisfy the standard, loosen the tie rod lock nut and change the tie rod length by turning the tie rod for adjustment.
   In this case, make the tie rod length equal on the left and right sides.

MINIMUM TURNING RADIUS ADJUSTMENT



1. Adjust the rear wheel steering angle by the knuckle stopper bolt protrusion (dimension C).

   Knuckle stopper bolt protrusion (reference value)
   1-ton series C = 22.6 mm (0.890 in)
   2-ton series C = 23.0 mm (0.905 in)



2. Measure the minimum turning radius to confirm the steering angle.

   Minimum turning radius
   1.0-ton model: 1750 mm (68.90 in)
   1.35-ton model: 1760 mm (69.29 in)
   1.5-ton model: 1770 mm (69.68 in)
   1.75-ton model: 1780 mm (70.09 in)
   2.0-ton model: 1980 mm (77.95 in)
   2.5-ton model: 2000 mm (78.74 in)
   3.0-ton model: 2210 mm (87.00 in)
   Large capacity model
   1.5-ton model: 1980 mm (70.09 in)
   2.0-ton model: 2145 mm (84.45 in)
   2.5-ton model: 2170 mm (85.43 in)

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STEERING

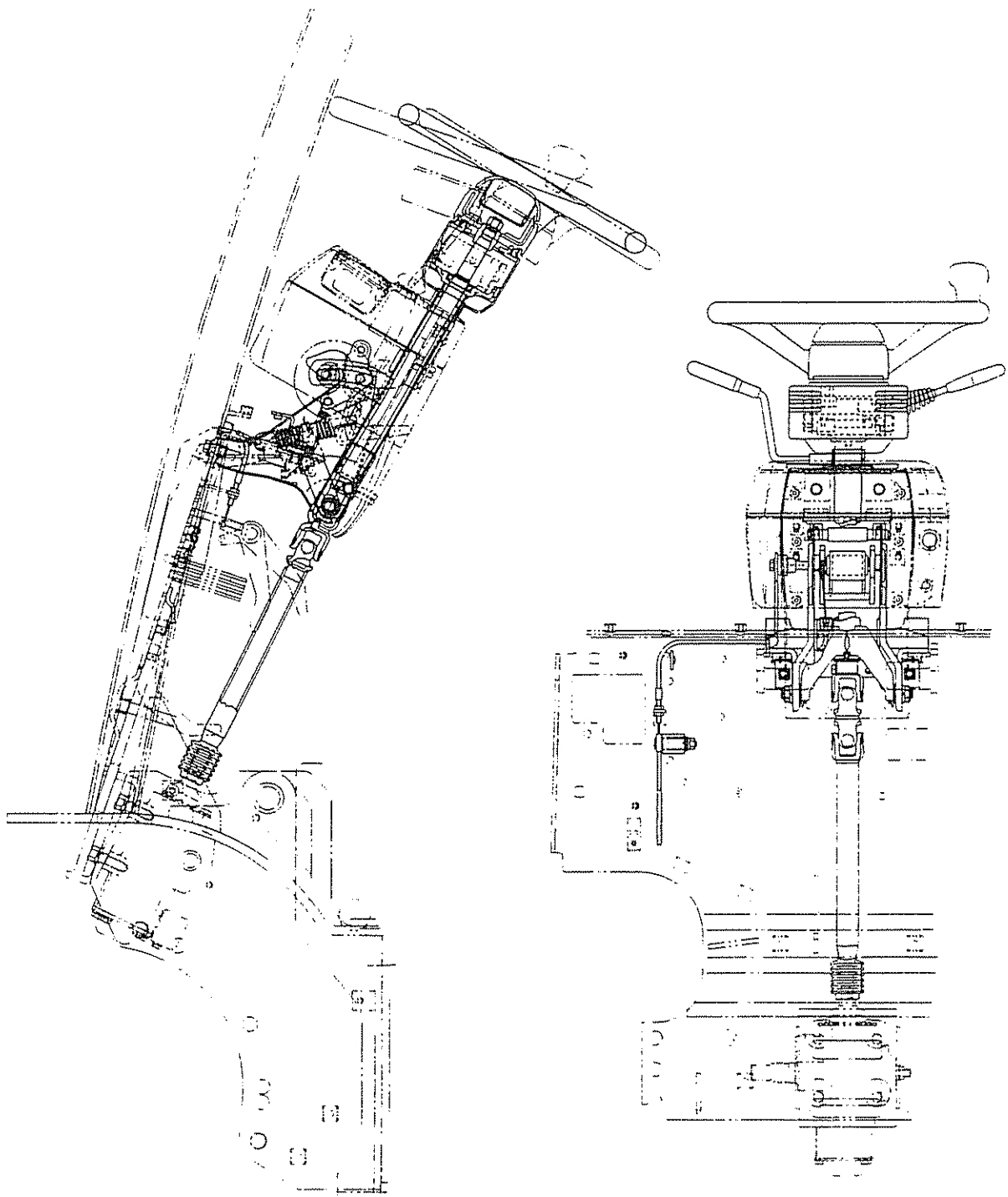
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GENERALIDADES

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GENERAL



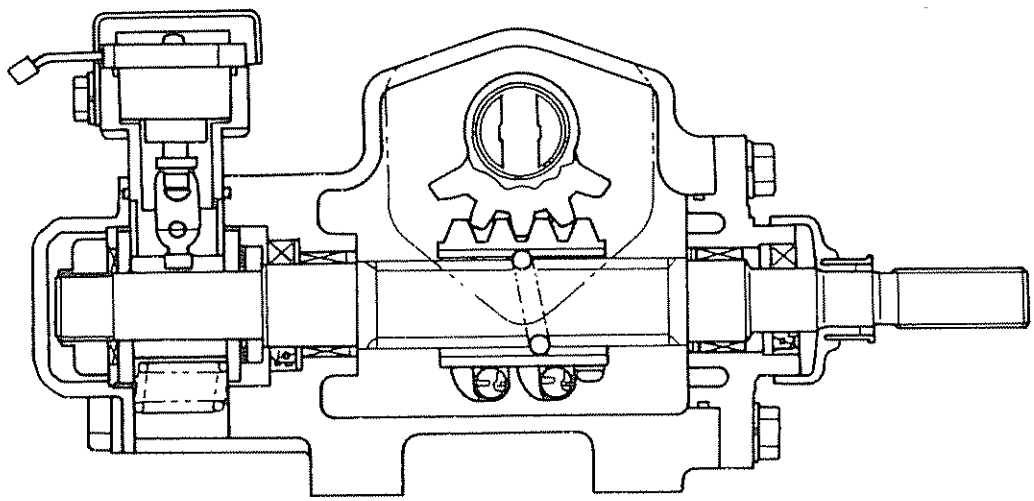
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CONJUNTO DE LA CAJA DE ENGRANAJES DE LA DIRECCION

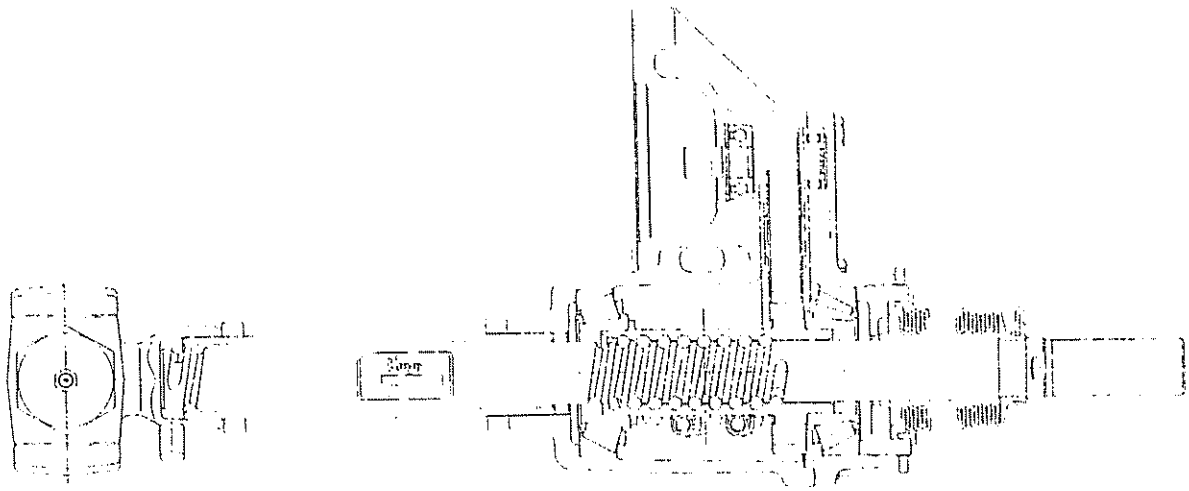
CONJUNTO DEL ACTUADOR DE LA PS

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STEERING GEAR BOX ASSY



PS ACTUATOR ASSY



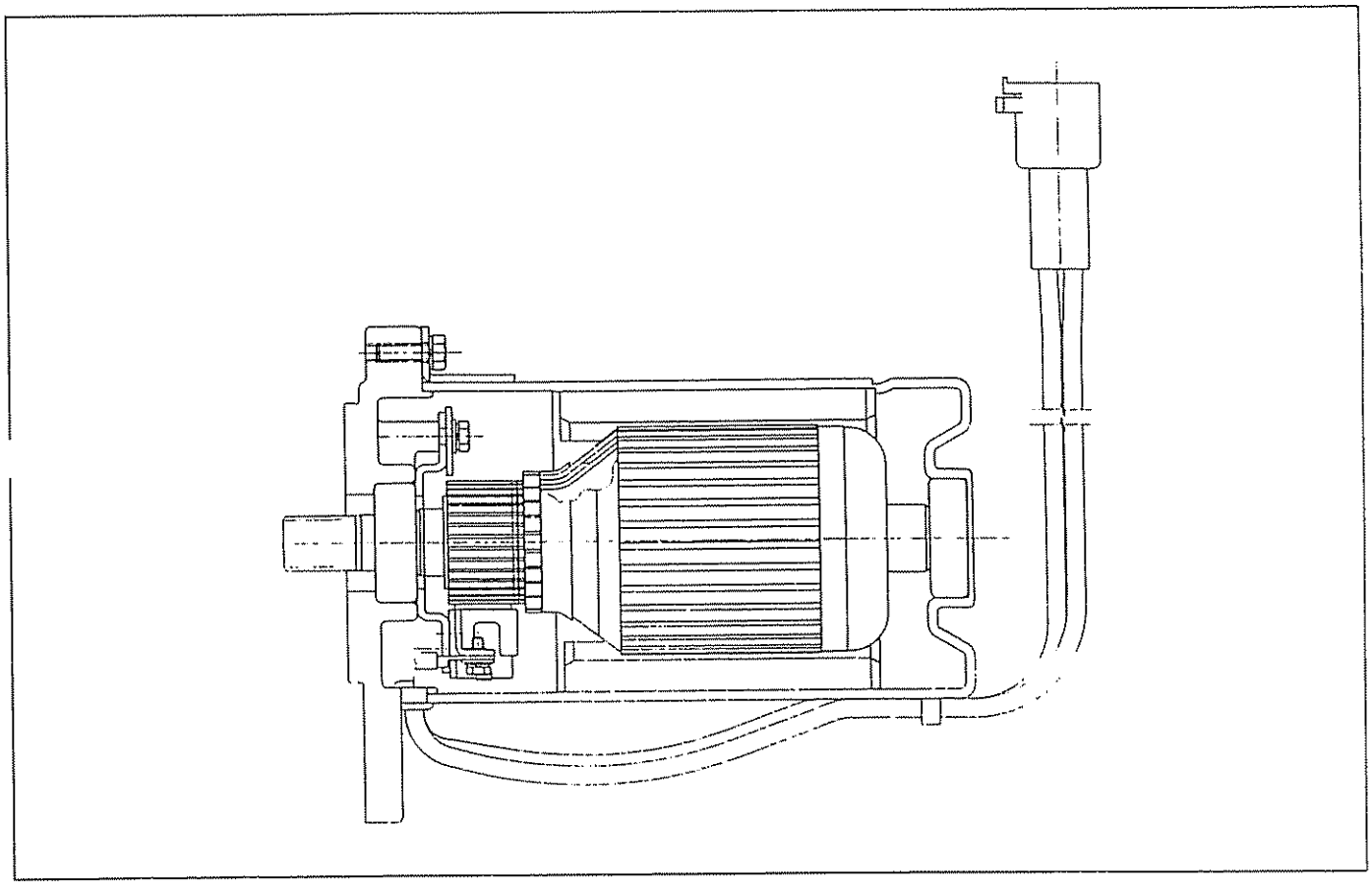
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CONJUNTO DEL MOTOR DE LA EPS

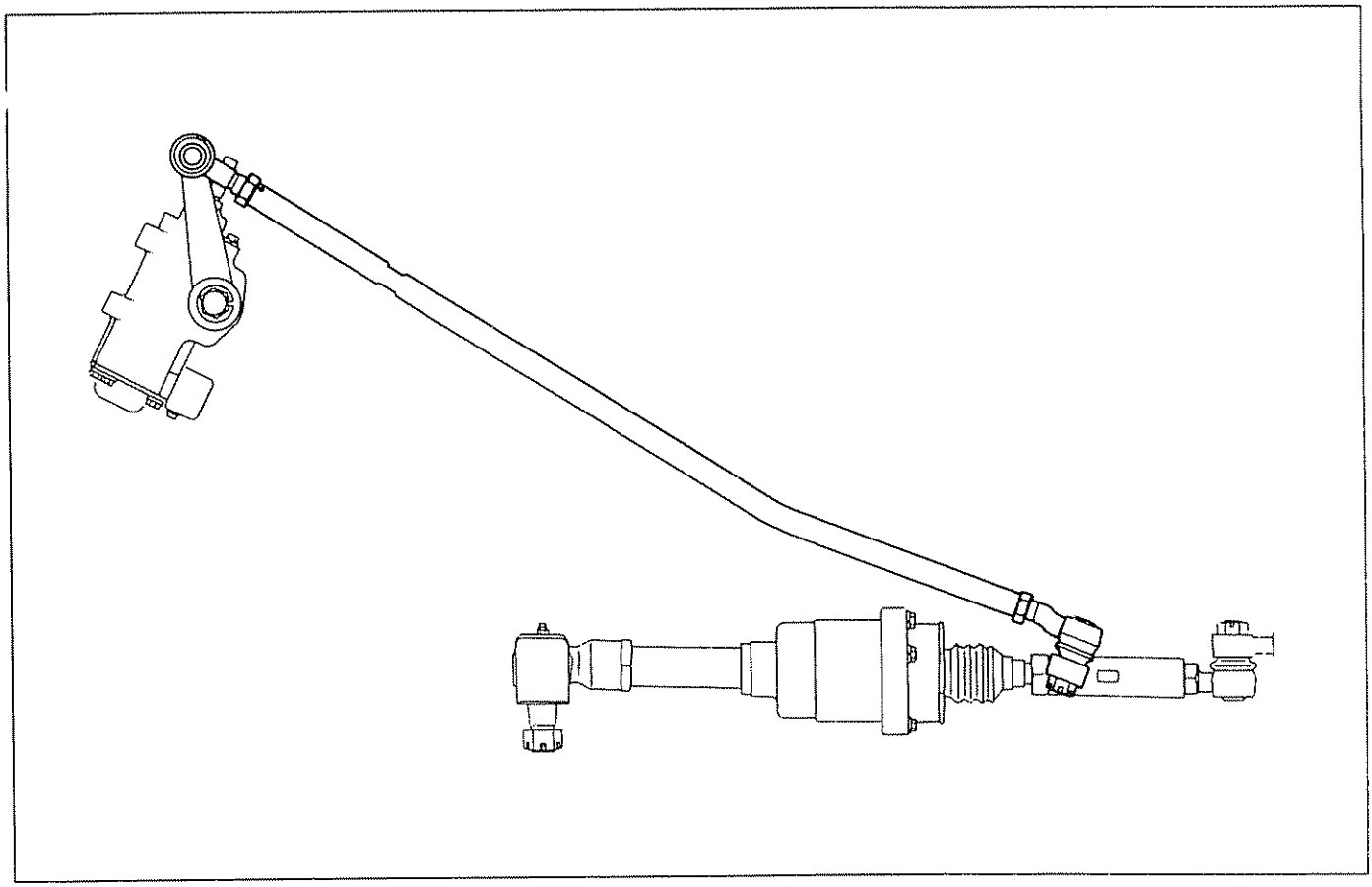
VARILLA DE DIRECCION

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EPS MOTOR ASSY



DRAG LINK



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ESPECIFICACIONES

Descripción	Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Diámetro del volante de dirección mm			360	
Engranajes de la dirección	Tipo		Semiintegral	
	Tipo de engranajes		Tornillo de bolas recirculantes	
	Relación de engranajes		1: 18,9	
	Tope a tope	4,2	4,3	4,2
	Dirección del giro de las bolas		A la derecha	
Reforzador	Tipo		Dirección de potencia asistida eléctrica	
	Mecanismo		Actuador de la PS del tipo de tornillo de bolas de engranaje	
	Mecanismo de control		Regulador del sensor del par (torque)	

CONJUNTO DEL MOTOR DE LA PS

Descripción	Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 2 ton. Modelo de gran capacidad	Series de 3 ton.
Tipo		Imán permanente	-	-	-
Voltaje nominal V		48	-	-	72
Potencia de régimen kW		0,37	0,5	0,49	0,75
Clase de aislamiento		F	-	-	-
Tamaño de la escobilla (grosor x anchura x longitud) mm		6 x 15 x 20	8x30x22	8x30x25	8x30x25
Cantidad de escobillas		2	-	-	-

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SPECIFICATIONS

		1-ton series	2-ton series	3-ton series
Steering wheel diameter mm (in)		360 (14.17)		
Steering gear	Type	Semi-integral		
	Gear type	Recirculating ball screw type		
	Gear ratio	1:18.9		
	Lock to lock	4.2	4.3	4.2
	Ball twist direction	Clockwise		
Booster	Type	Electrical power steering		
	Mechanism	Gear-ball screw type PS actuator		
	Control mechanism	Torque sensor controller		

EPS MOTOR ASSY

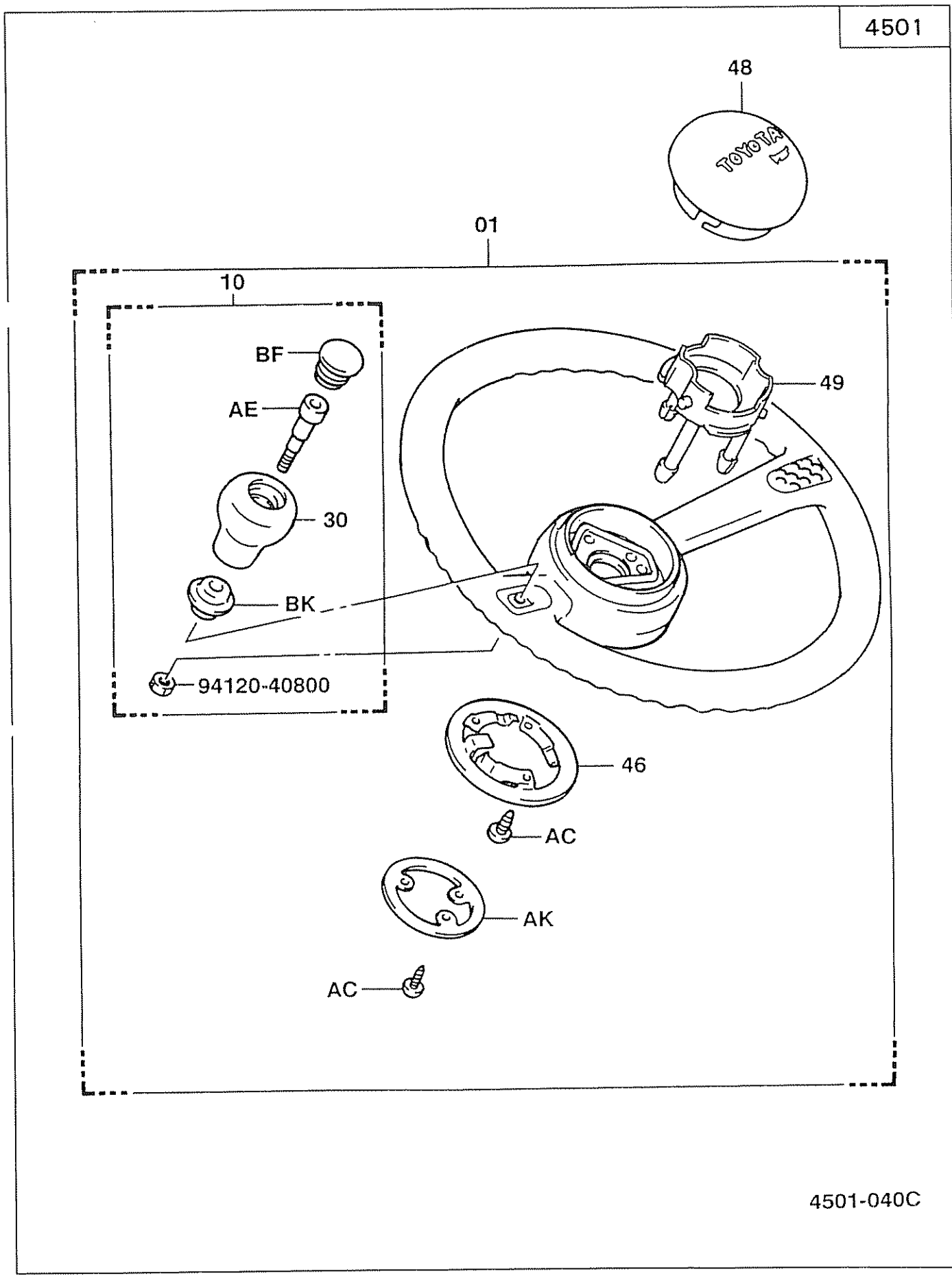
Item \ Vehicle model	1-ton series	2-ton series	2-ton series Large capacity model	3-ton series
Type	Permanent magnet type	←	←	←
Nominal voltage V	48	←	←	72
Rated output kW	0.37	0.5	0.49	0.75
Insulation class	F	←	←	←
Brush size (thickness × width × length) mm (in)	6×15×20 (0.23×0.59 ×0.79)	8×30×22 (0.31×1.18 ×0.87)	8×30×25 (0.31×1.18 ×0.98)	8×30×25 (0.31×1.18 ×0.98)
Brush quantity	2	←	←	←

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COMPONENTES

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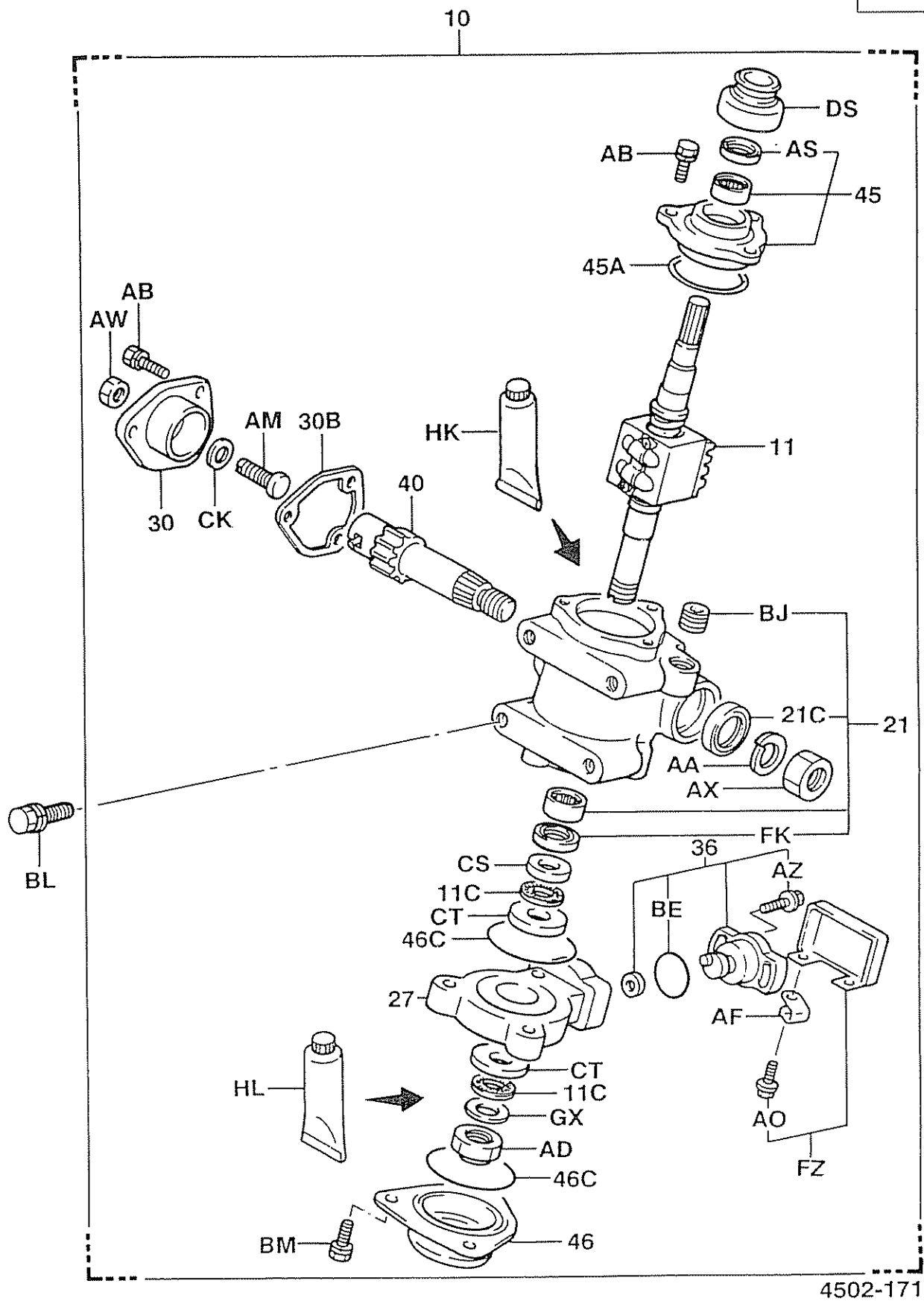
COMPONENTS



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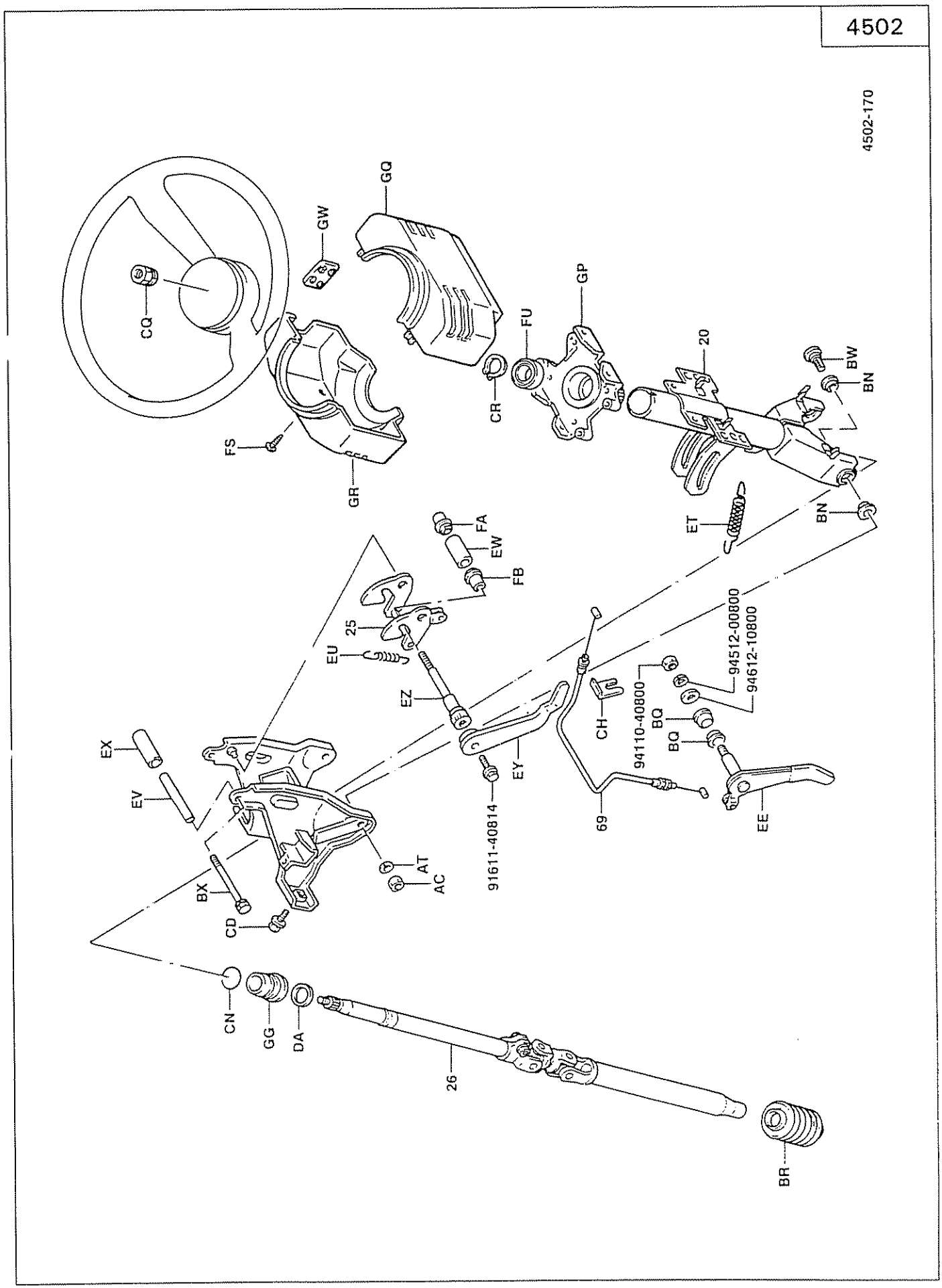
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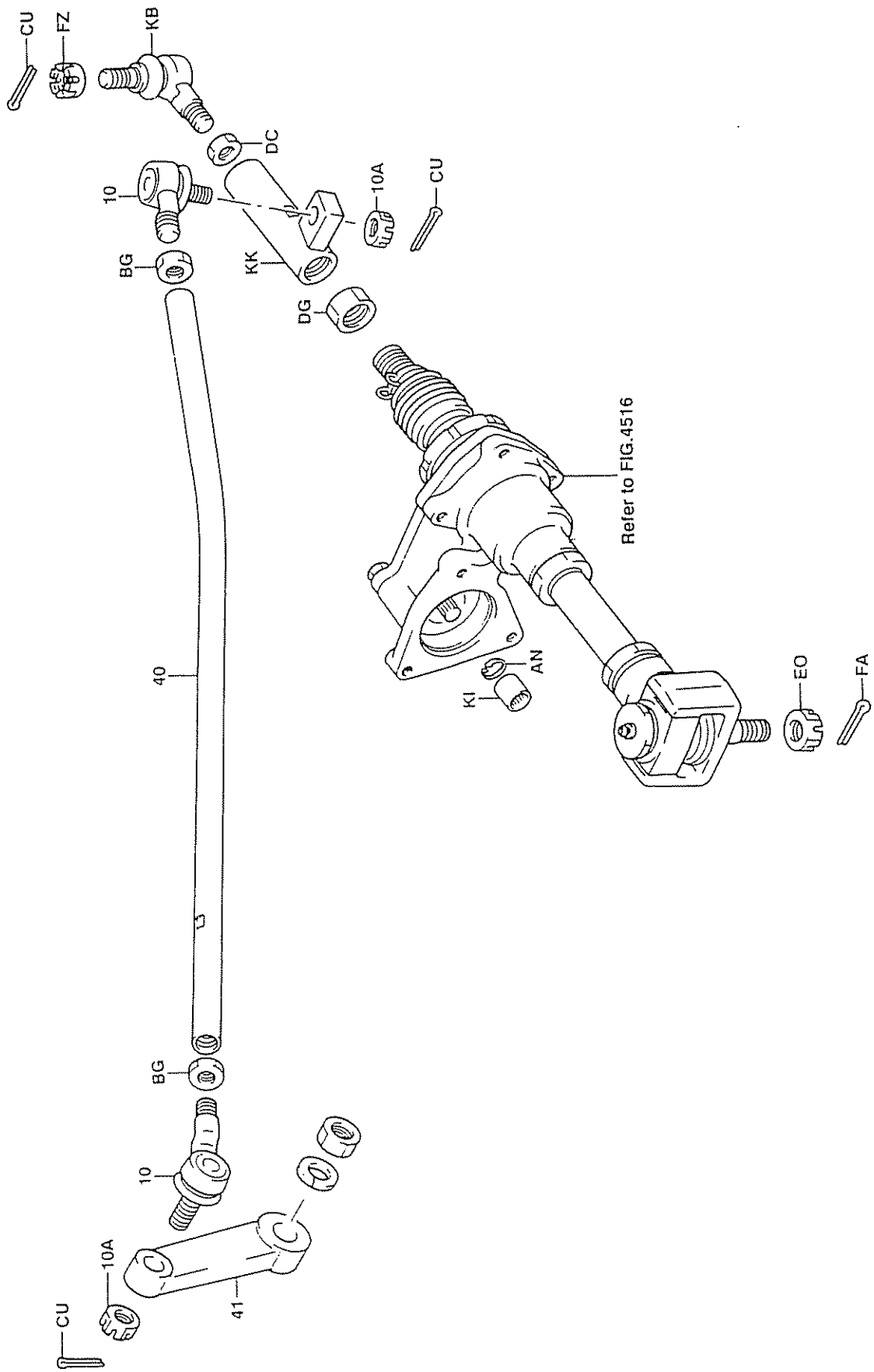


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Consulte la Fig. 4516

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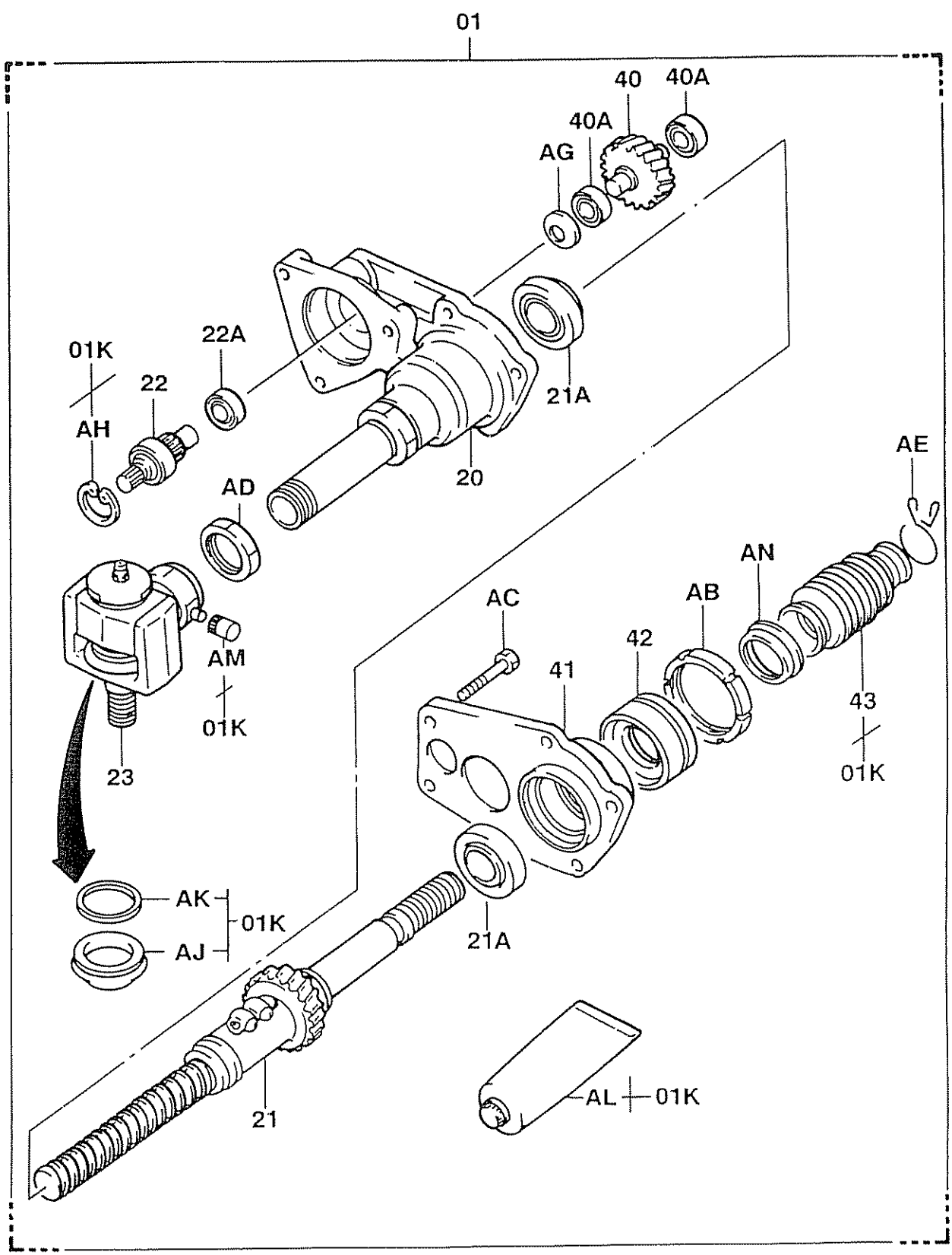
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4516

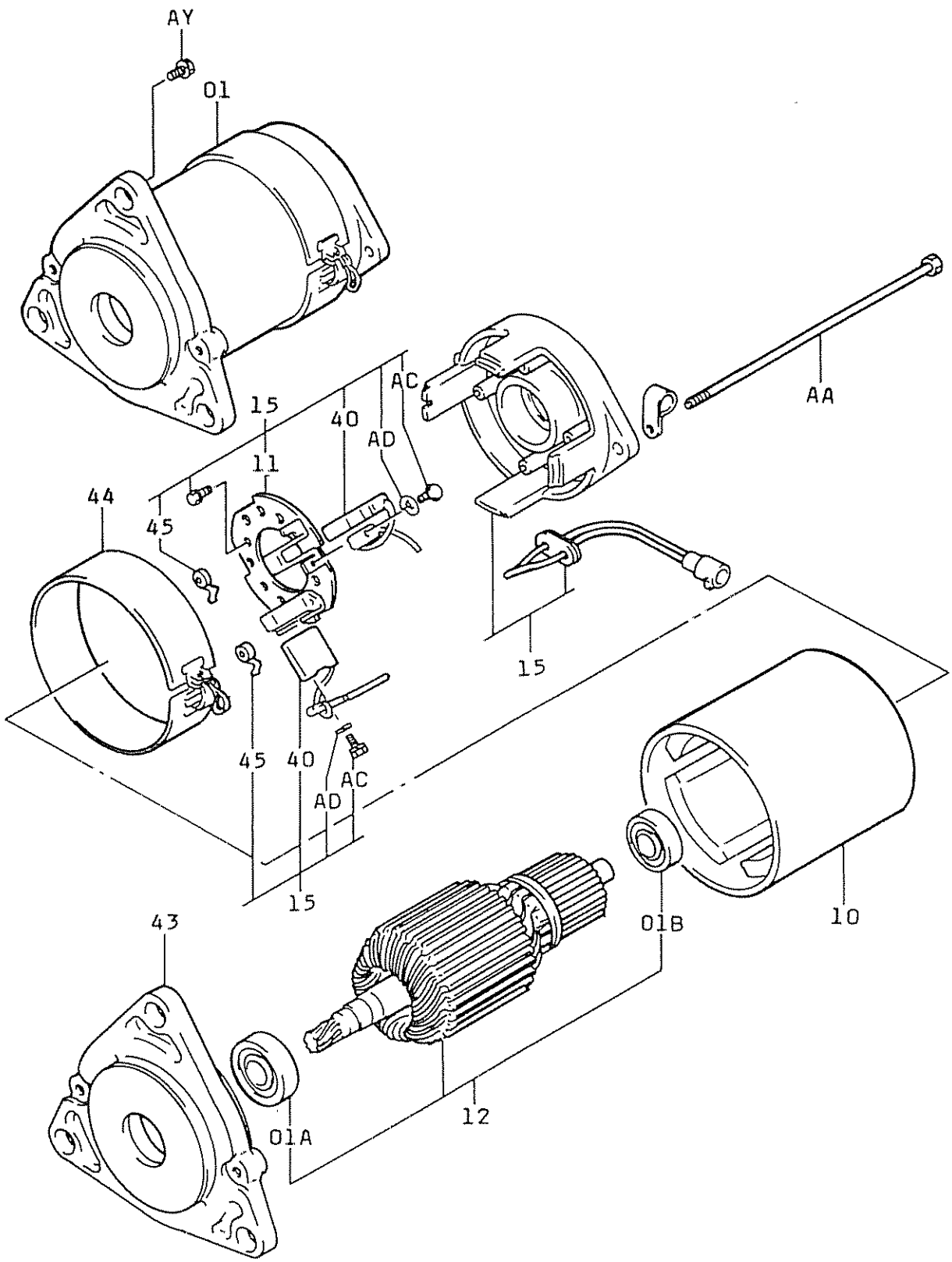


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1403



1403-026B

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VOLANTE DE DIRECCION/CAMISA DEL MASTIL

REMOCION/INSTALACION

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2. Saque el volante de dirección. [Punto 1]

3 Saque el panel instrumental.

4 Saque la cubierta del medidor combinado.

5 Saque el interruptor de la señal de giro.

6 Saque el conjunto del medidor combinado.

7 Desconecte el cable de desenganche de basculación.

8 Saque la camisa del mástil.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Notas:
- Cubra con grasa MP el dispositivo de inmovilización de basculación y cada parte deslizante.
- Cubra con bisulfuro de molibdeno la parte estriada del árbol de dirección.

Punto de trabajo

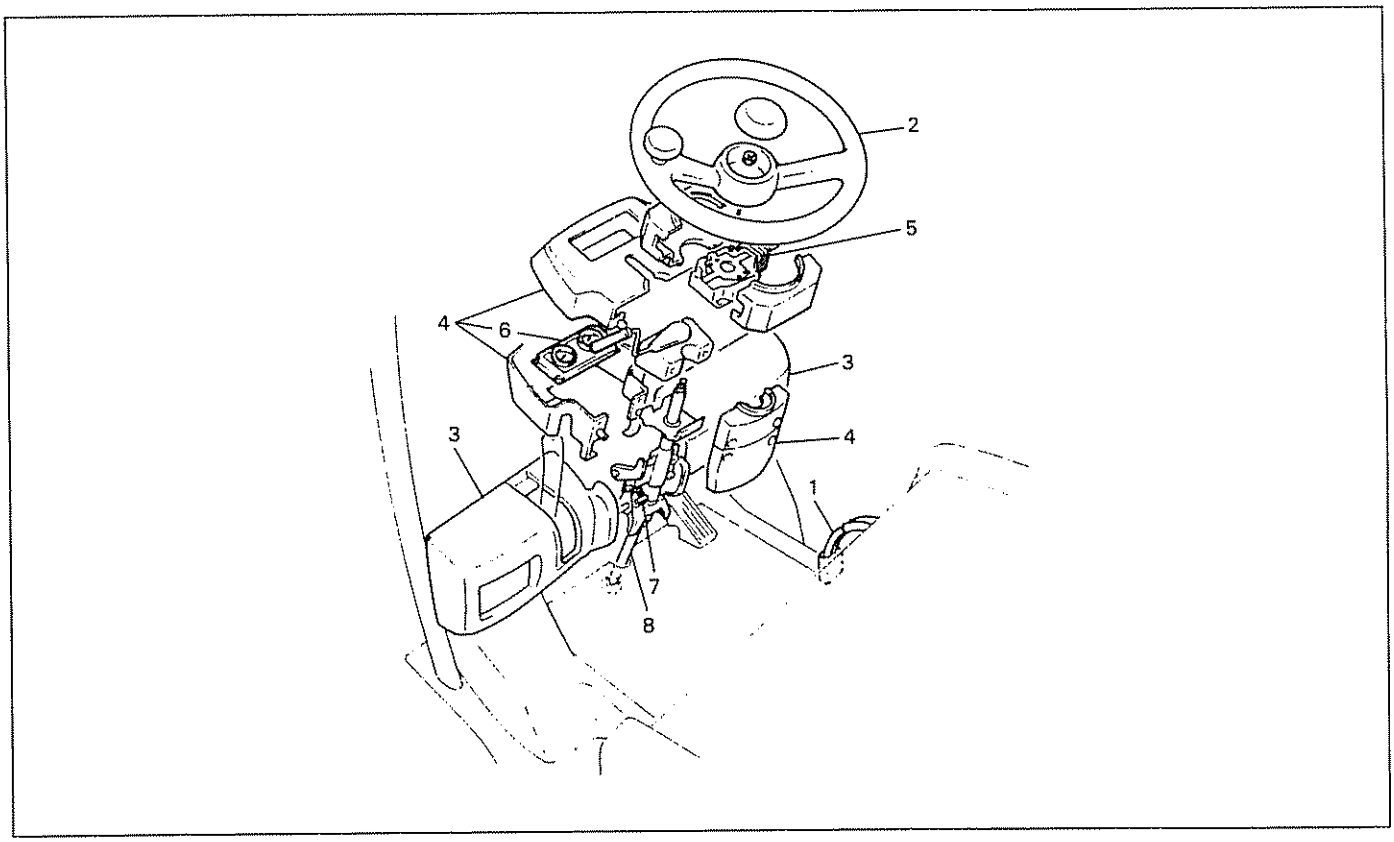
[Punto 1]

Remoción: SST 09950-50010

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STEERING WHEEL·MAST JACKET

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the steering wheel. **[Point 1]**

3 Remove the instrument panel.

4 Remove the combination meter cover.

5 Remove the turn signal switch.

6 Remove the combination meter ASSY.

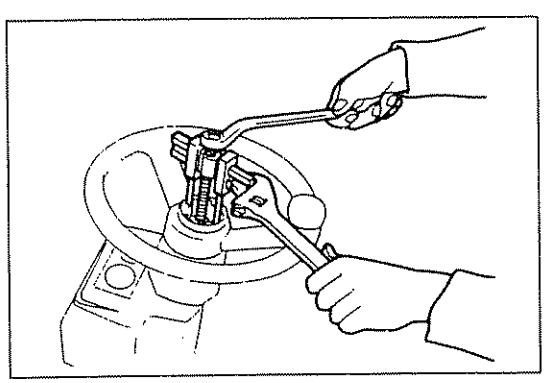
7 Disconnect the tilt lock release wire.

8 Remove the mast jacket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat MP grease on the tilt lock device and each sliding portion.**
- **Coat molybdenum disulfide on the spline portion of the steering shaft.**



Point Operation

[Point 1]

Removal: SST 09950-50010

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Procedimiento de desmontaje

1 Desconecte la unión universal.

2 Saque el dispositivo de inmovilización de basculación. [Punto 1]

3 Saque el retén de la dirección.

4 Saque la dirección regulable con el soporte.

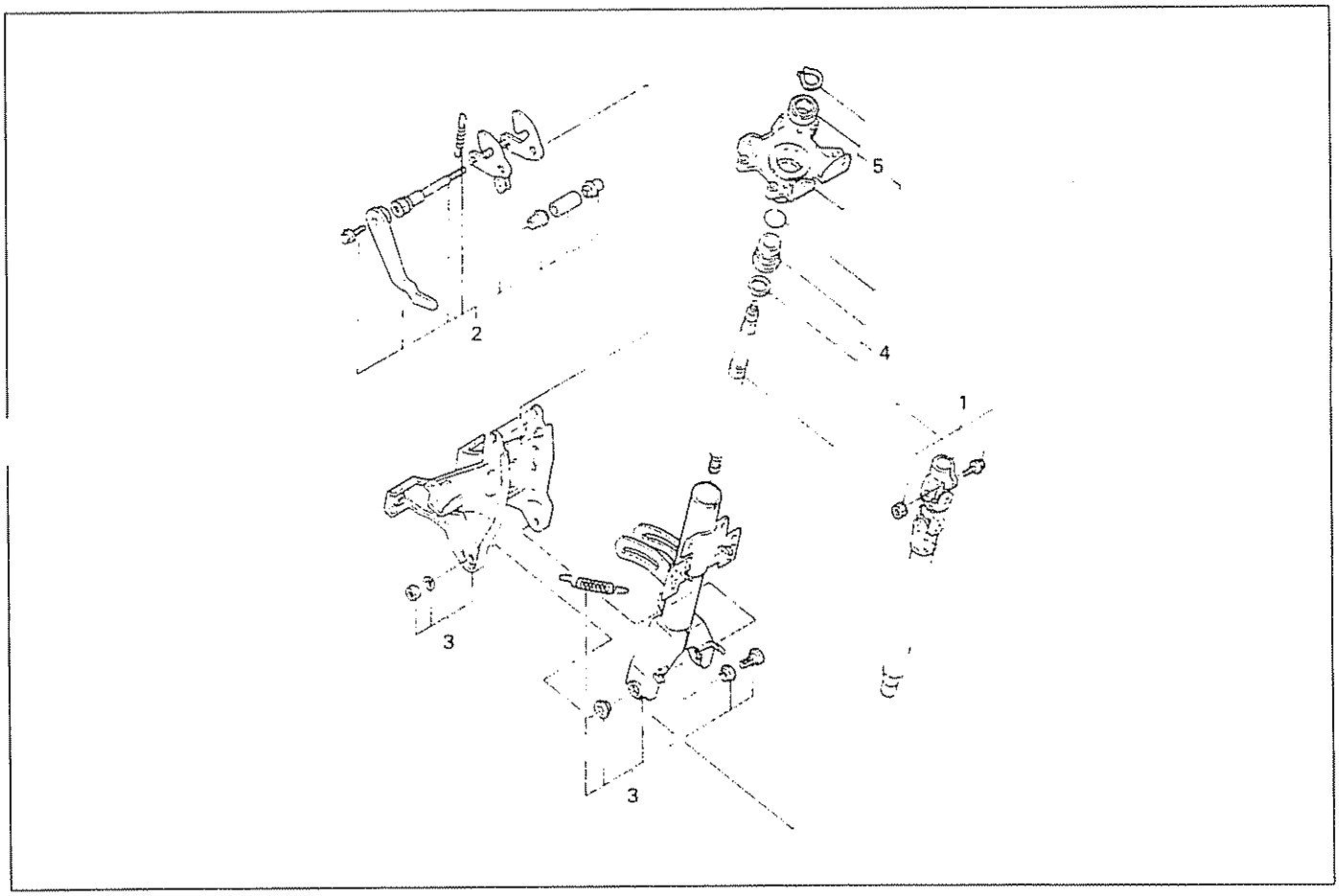
5 Saque el soporte fuera del árbol de la dirección regulable. [Punto 2]

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Disconnect the universal joint.

2 Remove the tilt lock device. **[Point 1]**

3 Remove the steering stopper.

4 Remove the tilt steering W/bracket.

5 Remove the bracket from the tilt steering shaft. **[Point 2]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Puntos de trabajo

[Punto 1]

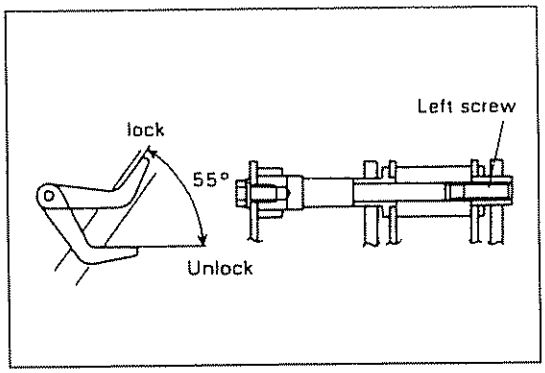
Remontaje: Compruebe el dispositivo de inmovilización de basculación para ver si funciona correctamente.

* Fig. Tornillo a la izquierda
Inmovilizar
Desinmovilizar

[Punto 2]

Desmontaje: SST 09331-23000-71
Remontaje: SST 09608-30012

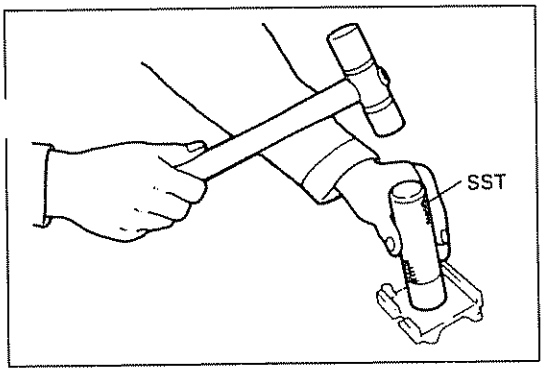
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Point Operations

[Point 1]

Reassembly: Check the tilt lock device for proper functioning.



[Point 2]

Disassembly: SST 09331-23000-71
Reassembly: SST 09608-30012

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CAJA DE ENGRANAJES DE LA DIRECCION

REMOCION/INSTALACION

T = N.m (kgf-cm)

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque el tablero del piso.

3 Desconecte la varilla de dirección No. 1 del lado del brazo de dirección. [Punto 1]

4 Desconecte el cableado del sensor de par (torque).

5 Saque la caja de engranajes de la dirección con el brazo de dirección.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Punto de trabajo

[Punto 1]

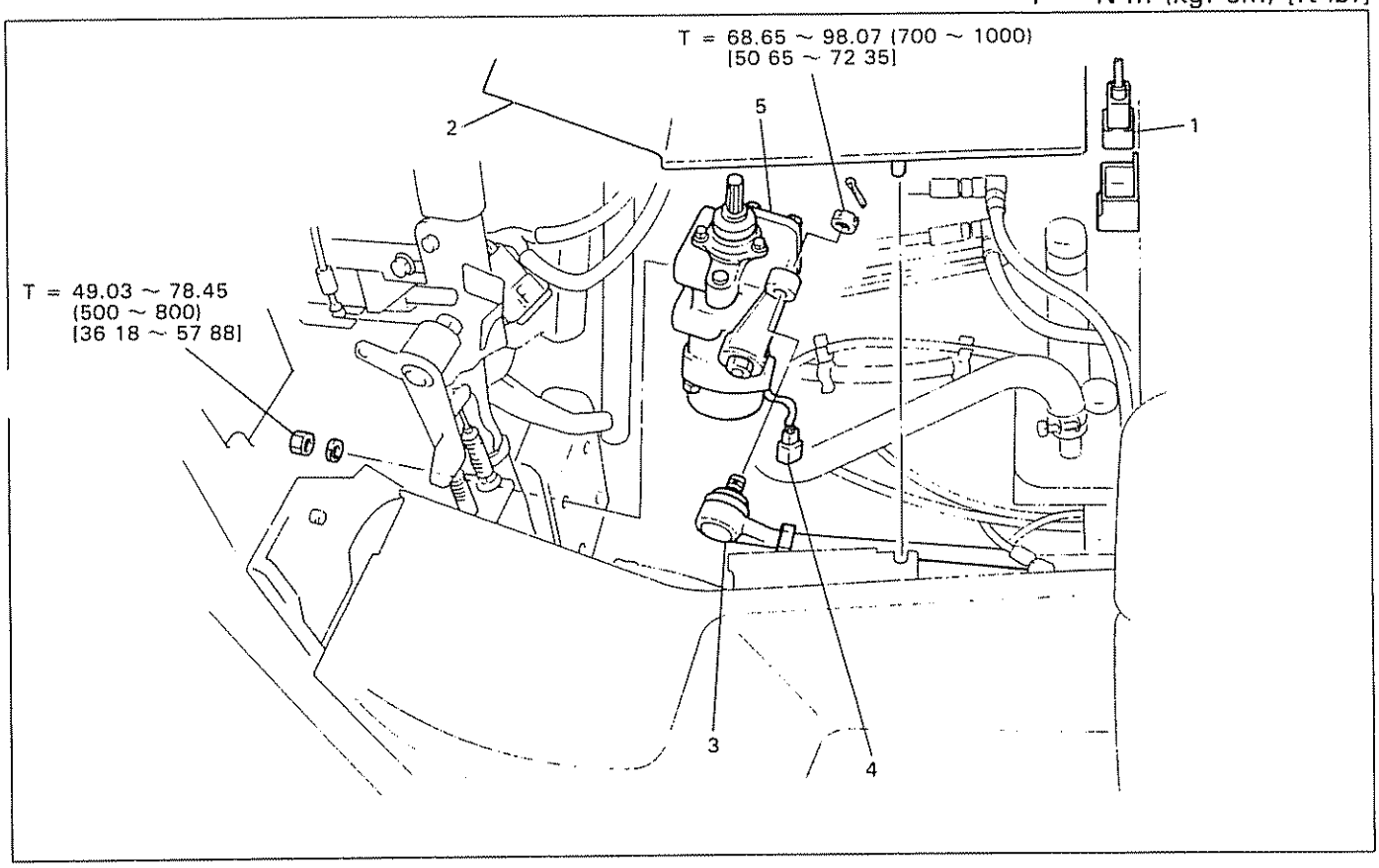
Remoción: SST 09610-20012

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STEERING GEAR BOX

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

- Disconnect the battery plug.

2 Remove the toe board.

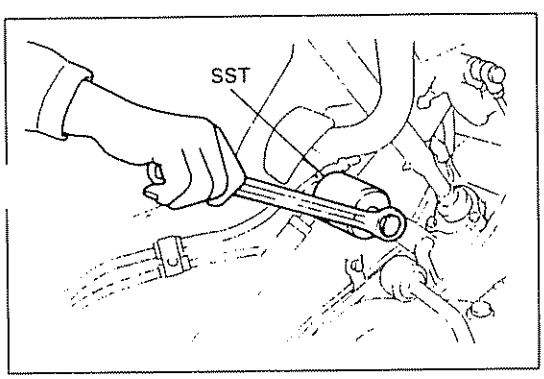
3 Disconnect the drag link rod No.1 from the pitman arm. **[Point 1]**

4 Disconnect the torque sensor wiring.

5 Remove the steering gear box W/pitman arm.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

[Point 1]

Removal: SST 09610-20012

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T = N.m (kgf-cm)

Procedimiento de desmontaje

1 Saque el brazo de dirección. [Punto 1]

2 Saque el sensor de par (torque). [Punto 2]

3 Saque la cubierta del extremo. [Punto 3]

4 Saque la tuerca de seguridad. [Punto 4]

5 Saque el cárter del sensor de par (torque). [Punto 5]

6 Saque la cubierta lateral con el árbol del sector. [Punto 6]

7 Saque el árbol del sector fuera de la cubierta lateral. [Punto 7]

8 Saque la cubierta superior.

9 Saque el árbol del sinfín. [Punto 8]

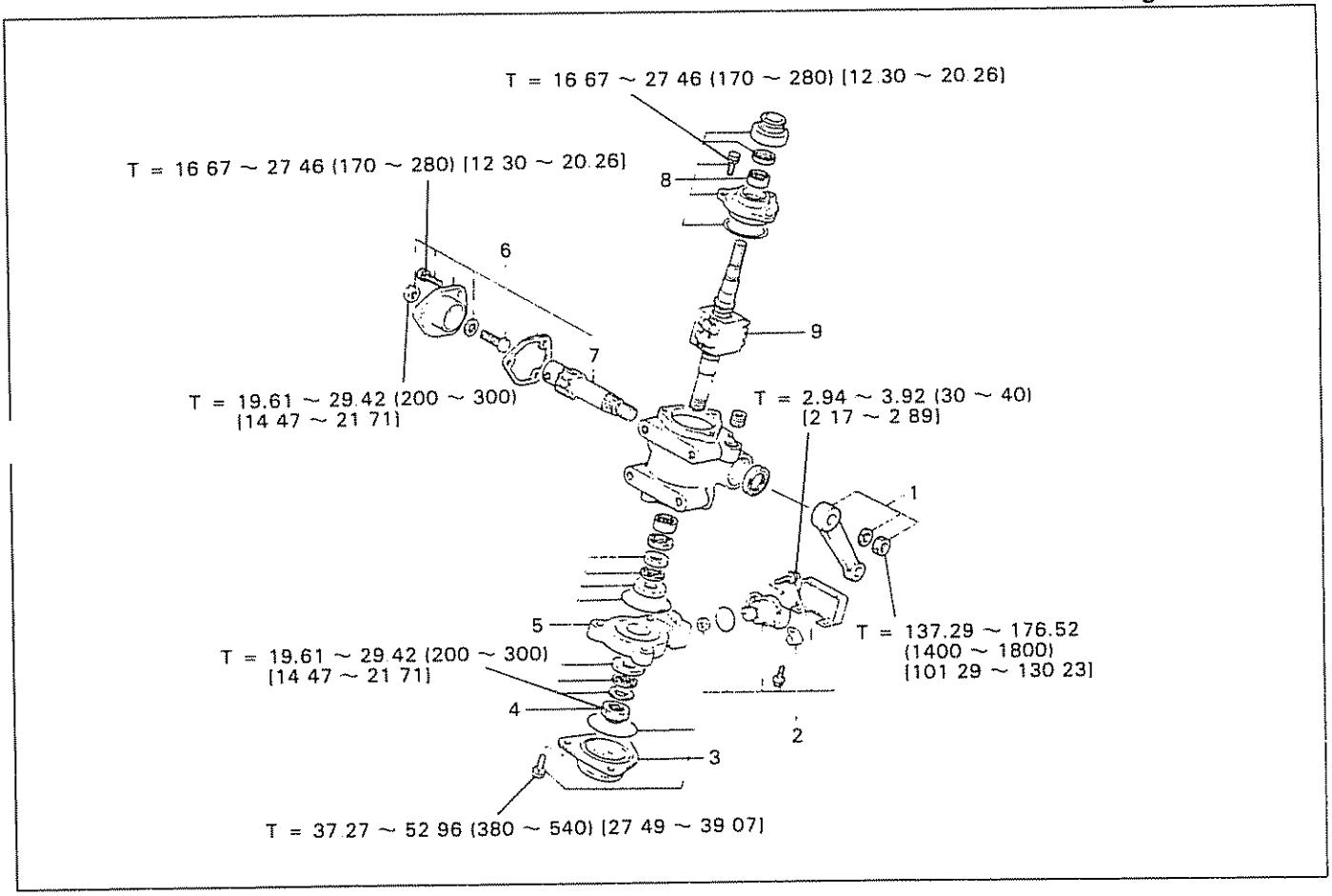
Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the pitman arm. **[Point 1]**

2 Remove the torque sensor. **[Point 2]**

3 Remove the end cover. **[Point 3]**

4 Remove the lock nut. **[Point 4]**

5 Remove the torque sensor housing. **[Point 5]**

6 Remove the side cover W/sector shaft. **[Point 6]**

7 Remove the sector shaft from the side cover. **[Point 7]**

8 Remove the top cover.

9 Remove the worm shaft. **[Point 8]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Notas:
- Después del remontaje, gire el árbol del tornillo de bolas 3 ó 4 vueltas para ver si gira suavemente.
- Gire el árbol del sinfín hasta su posición de tope, y vea si vuelve suavemente mediante la fuerza del resorte de amortiguamiento trasero.
- Después de terminar el trabajo, inyecte grasa a través del orificio roscado PT 3/8".
- Aplique grasa (45783-13500-71) en el rodillo en el extremo de la punta del sensor de par (torque) en el momento del remontaje.
- Después de la instalación en el vehículo, ajuste la posición de neutra del sensor de par (torque). (Vea la página 9-20)

Puntos de trabajo

[Punto 1]

Desmontaje: No lleve el árbol del sinfín de dirección hasta cerca de cada extremo del alcance de su movimiento porque podría deteriorar las partes internas.
SST 09950-40010

Remontaje: Alinee las marcas ranuradas de la cara del extremo del árbol del sector y del brazo de dirección.

*Fig. Marcas de acoplamiento

Remontaje: Ajuste el juego libre del engranaje del sector después de instalar el brazo de dirección.

1. Coloque el brazo de dirección en el centro de tope a tope y ponga un calibrador de esfera a 150 mm del centro del brazo de dirección instalado.

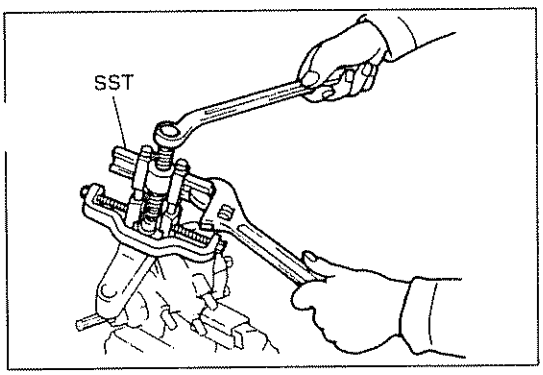
2. Apriete el tornillo de ajuste hasta que el juego libre satisfaga el estándar.

   Estándar: 0,32 mm o menos

3. Cubra con 08833-00080 la tuerca de seguridad del tornillo de ajuste y apriétela al par especificado.

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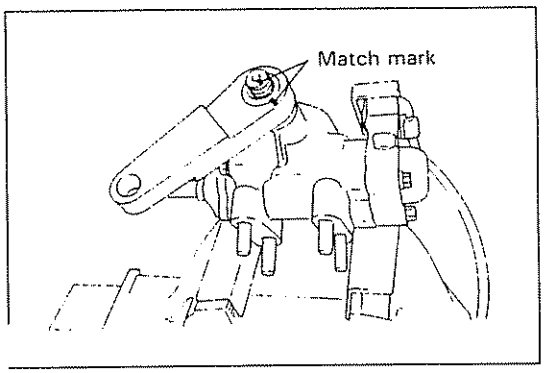
Notes:
- After assembly, turn the ball screw shaft 3 to 4 times to see if it turns smoothly.
- Turn the worm shaft to its lock position, and see that it is returned smoothly by the rear cushion spring force.
- After the end of the job, inject grease through the PT 3/8'' threaded hole.
- Apply grease (45783-13500-71) on the roller at the tip end of the torque sensor at the time of reassembly.
- After installation on the vehicle, adjust the torque sensor neutral position. (See page 9-20.)



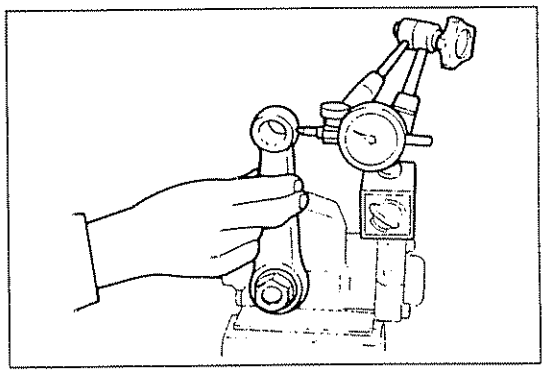
Point Operations

[Point 1]

Disassembly: Do not operate with the steering worm shaft near each end of its operating range because it may damage internal parts.
SST 09950-40010

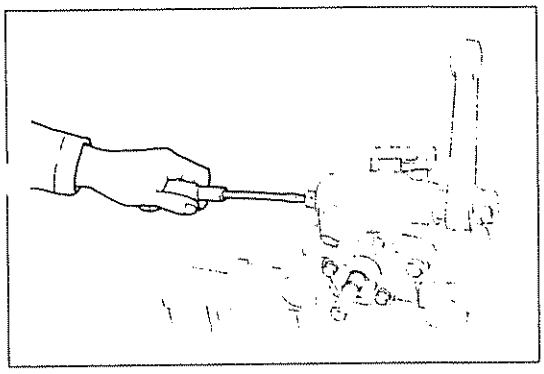


Reassembly: Align the match marks on the sector shaft end face and the pitman arm for reassembly.



Reassembly: Adjust the sector gear backlash after installing the pitman arm.

1. Position the pitman arm at the lock-to-lock center and set a dial gage at 150 mm (5.9 in) from the center of the installed pitman arm.



2. Tighten the adjusting screw until the backlash satisfies the standard.

   Standard: 0.32 mm (0.0126 in) or less

3. Coat 08833-00080 on the adjusting screw lock nut and tighten it to the specified torque.

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4. Gire el árbol del sinfín 3 ó 4 veces, luego compruebe que el alcance de tope a tope es de 4,8 vueltas o más.
Si la rotación es inferior, vuelva a instalar el árbol del sector desde el principio.

5. Coloque el brazo de dirección en el centro de tope a tope y mida la fuerza inicial colocando la SST en el árbol del sinfín.
SST 09470-10171-71

   Estándar: 5,3 N (0,54 kgf) o menos

6. Si la fuerza inicial no satisface el estándar, vuelva a colocar el brazo de dirección en la posición central de tope a tope y haga el ajuste apretando o aflojando la tuerca de seguridad.

[Punto 2]

Desmontaje: No desmonte si no es absolutamente necesario.

[Punto 3]

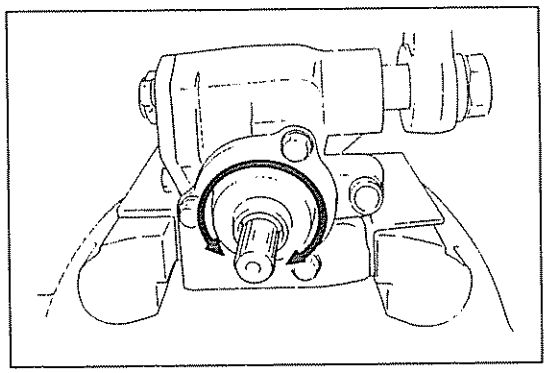
Desmontaje: Saque la cubierta del extremo e instale la SST 09451-13500-71.
Perno de montaje T de la SST = 44 N.m (450 kgf-cm)

Remontaje: Saque la SST 09451-13500-71 e instale la cubierta del extremo.

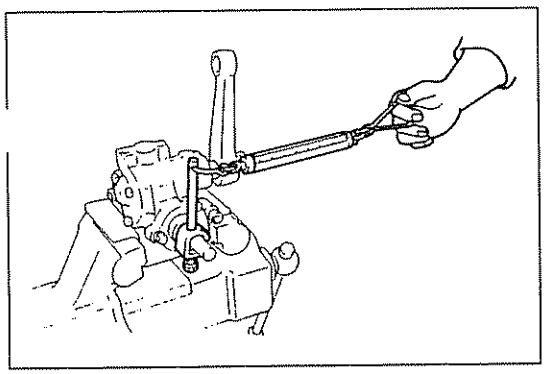
[Punto 4]

Desmontaje: Use un punzón para quitar el calafateado de la tuerca de seguridad con el fin de sacarla.
Coloque hacia abajo la marca ranurada del árbol del sector, y fije las estrías del árbol del sinfín para sacar la tuerca de seguridad.

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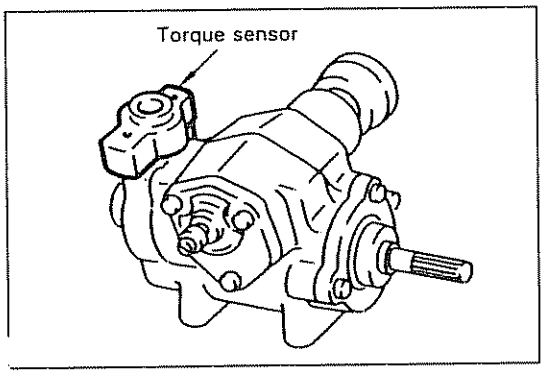
4. Turning the worm shaft 3 to 4 times, then check that the lock-to-lock range is 4.8 turns or more.
If the rotation range is less, try the sector shaft installation again.



5. Position the pitman arm at the lock-to-lock center and measure the starting force by setting the SST on the worm shaft.
SST 09470-10171-71

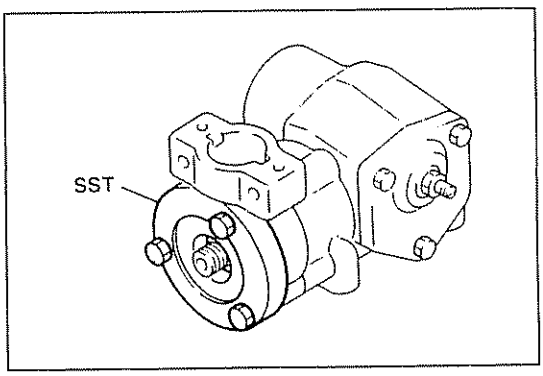
Standard: 5.30 N (0.54 kgf) [1.19 lbf] or less

6. If the starting force does not satisfy the standard, set the pitman arm in the lock-to-lock center position again and make adjustment by tightening or loosening the lock nut.



[Point 2]

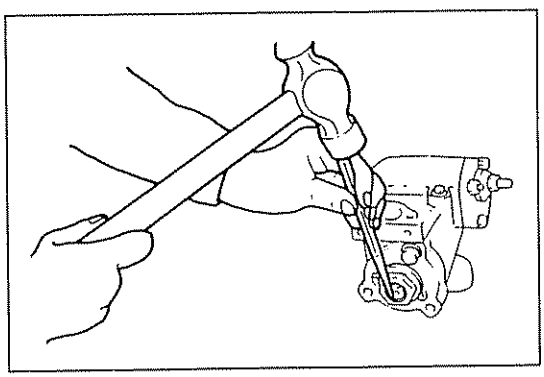
Disassembly: Do not remove unless it is absolutely necessary.



[Point 3]

Disassembly: Remove the end cover and install SST 09451-13500-71.
SST mounting bolt T = 44 N·m (450 kgf-cm) [33 ft-lbf]

Reassembly: Remove SST 09451-13500-71 and install the end cover.



[Point 4]

Disassembly: Use a punch to uncaulk the lock nut for removal.
Position the sector shaft slit mark down, and fix the worm shaft spline to remove the lock nut.

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Remontaje: Calafatee la tuerca de seguridad en dos lugares.

[Punto 5]

Desmontaje: Saque la SST 09451-13500-71 y el cárter del sensor.

Remontaje: Después de instalar el cárter del sensor, instale la SST 09451-13500-71.

*Fig. Cárter del sensor

[Punto 6]

Remontaje: Alinee el centro del engranaje de la tuerca de bolas, el centro del orificio y el centro del engranaje del árbol del sector para el remontaje.

[Punto 7]

Inspección: Coloque una cuña en el tornillo de ajuste e insértelos en la ranura del árbol del sector "T" para medir la holgura axial.

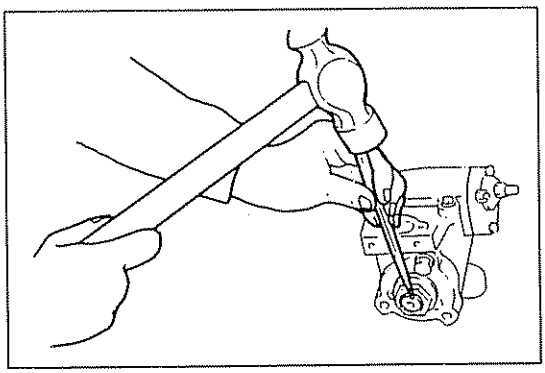
Estándar: 0,05 mm o menos

Nota:
Cuando ajuste la cuña, el lado biselado mayor deberá estar hacia el lado de la rosca del tornillo.

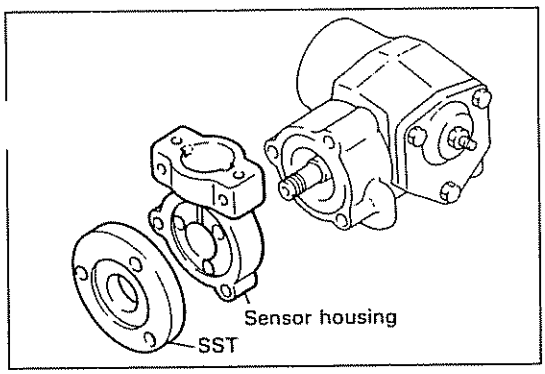
Tipos de cuñas:

Remontaje: Aplique grasa (STD: 45781-13500-71, 45S: 45782-13500-71) en la parte del cojinete de la cubierta lateral, aplique empaquetadura de sellado (08833-00080) en la parte roscada e instale el árbol del sector. Después de apretar completamente el tornillo, apriete la tuerca hexagonal.

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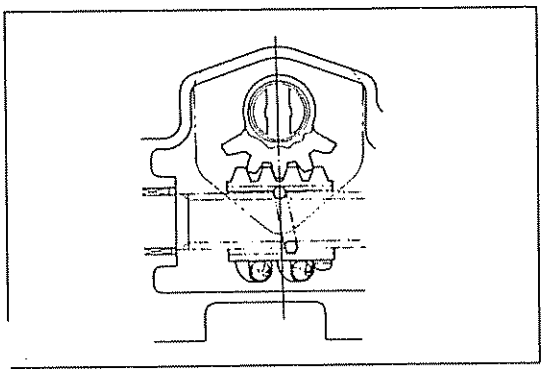
Reassembly: Caulk the lock nut at two places.



[Point 5]

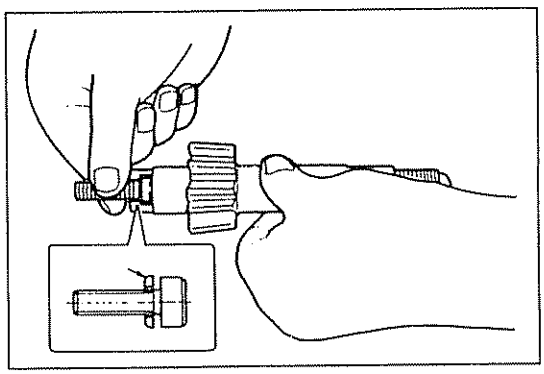
Disassembly: Remove SST 09451-13500-71 and remove the sensor housing.

Reassembly: After installing the sensor housing, install SST 09451-13500-71.



[Point 6]

Reassembly: Align the ball nut gear center, hole center and sector shaft gear center for reassembly.



[Point 7]

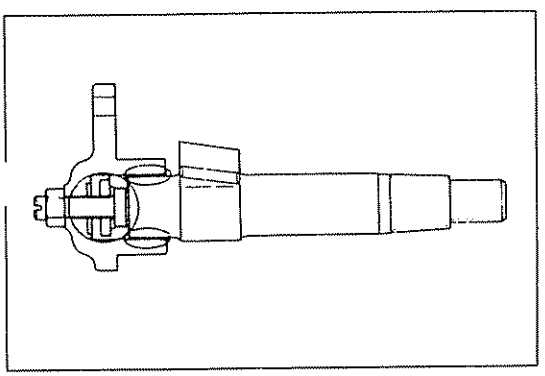
Inspection: Set a shim on the adjusting screw and insert them in the sector shaft T groove for axial clearance measurement.

Standard: 0.05 mm (0.0020 in) or less

Note:
When setting the shim, the greater chamfering side must face the screw thread side.

Shim types:

$1.5^{+0.035}_{+0.015}$, $1.5^{+0.065}_{+0.045}$, $1.5^{+0.095}_{+0.075}$, $1.5^{+0.125}_{+0.105}$, $1.5^{+0.155}_{+0.135}$ mm
($0.059^{+0.00138}_{+0.0059}$, $0.059^{+0.00256}_{+0.00177}$, $0.059^{+0.00374}_{+0.00295}$, $0.059^{+0.00492}_{+0.00413}$,
$0.059^{+0.00670}_{+0.00531}$ in)



Reassembly: Apply grease (STD: 45781-13500-71, 45S: 45782-13500-71) on the side cover bearing portion, apply seal packing (08833-00080) on the threaded portion and install the sector shaft. After fully tightening the screw, tighten the hexagon nut.

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[Punto 8]

Remontaje: Instale los dientes de sujeción del tornillo de bolas hacia arriba.

Remontaje: Aplique grasa (STD: 45781-13500-71, 45S: 45782-13500-71) en el borde de la junta hermética de aceite y en las partes del cojinete antes del remontaje.

AJUSTE DE NEUTRA DEL SENSOR DE PAR (TORQUE)

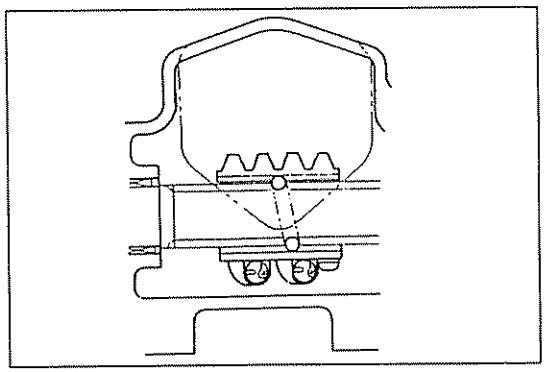
Notas:
- El error F0 se puede memorizar en el momento del ajuste de neutra.
- La indicación de OK (correcto) en el expositor no está relacionada con el valor del voltaje a ajustar.

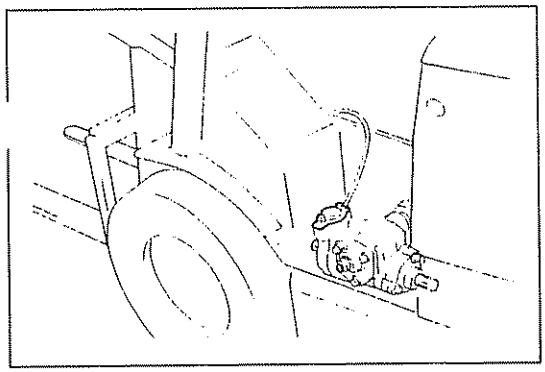
1. Apriete temporalmente el tornillo del sensor de par (torque).
2. Saque el fusible F3.
3. Saque la caja de engranajes de la dirección con el cableado.
4. Conecte el analizador de fuera del montacargas. (Esto no es necesario para el vehículo que tenga expositor universal)
5. Gire el interruptor de la llave a “ON” y deje que aparezca en la pantalla del analizador el modo A/D4.
6. Gire el sensor de par (torque) de la dirección hacia la flecha para ajustar el voltaje del potenciómetro.

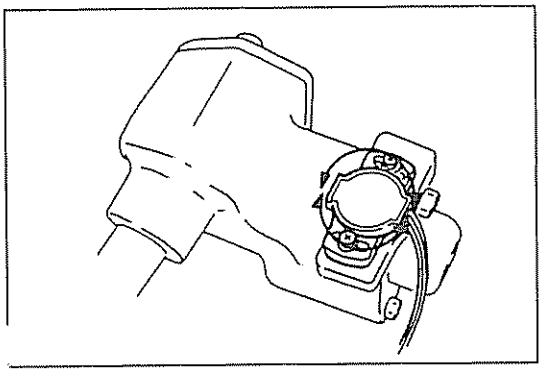
   Estándar: 2,4 ± 1 V
7. Después de aplicar Locktite (08833-00080), apriete el tornillo del sensor de par (torque).

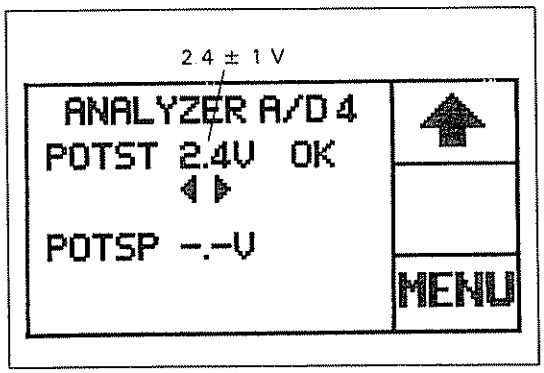
   T = 2,9 ~ 3,9 N.m (30 ~ 40 kgf-cm)

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[Point 8]

Reassembly: Install with the ball screw set teeth side facing upward.

Reassembly: Apply grease (STD: 45781-13500-71, 45S: 45782-13500-71) on the oil seal lip and bearing portions before reassembly.

TORQUE SENSOR NEUTRAL ADJUSTMENT

Note:
- **F0 error may be memorized at the time of neutral adjustment.**
- **OK indication on the display is not related to the voltage value to be adjusted.**

1. Tighten the torque sensor screw temporarily.
2. Remove the F3 fuse.
3. Remove the steering gear box W/wiring.
4. Connect the off-truck analyzer. (This is unnecessary for a vehicle with the all-round display.)
5. Turn the key switch to ON and let the analyzer mode A/D4 screen be displayed.
6. Turn the steering torque sensor in the direction of the arrow to adjust the potentiometer voltage.

   Standard: 2.4 ± 1 V
7. After coating Locktite (08833-00080), tighten the torque sensor screw.

   T = 2.9 ~ 3.9 N·m (30 ~ 40 kgf-cm) [2.2 ~ 2.9 ft-lbf]

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CONJUNTO DEL ACTUADOR DE LA PS

REMOCION/INSTALACION

T = N.m (kgf-cm)

Series de 1 ton.: T = 147,1 - 196,1 (1500 - 2000)
Series de 2-3 ton.: T = 245,2 - 294,2 (2500 - 3000)

Procedimiento de remoción

1 Gire el volante de dirección hacia la izquierda y saque el conjunto de la batería. [Punto 1]

2 Saque el tablero del piso.

3 Saque la rueda trasera izquierda.

4 Desconecte el cableado del motor de la EPS.

5 Desconecte la varilla de articulación No. 1. [Punto 2]

6 Desconecte el extremo del actuador de la PS (en lado del bastidor). [Punto 3]

7 Desconecte el extremo del actuador de la PS (en el lado de la palanca acodada de dirección). [Punto 4]

8 Desconecte el cableado de la bocina y el avisador acústico.

9 Saque el conjunto del soporte de la bocina y el avisador acústico.

10. Saque el conjunto del actuador de la PS.

11 Saque el motor de la EPS. [Punto 5]

Procedimiento de instalación

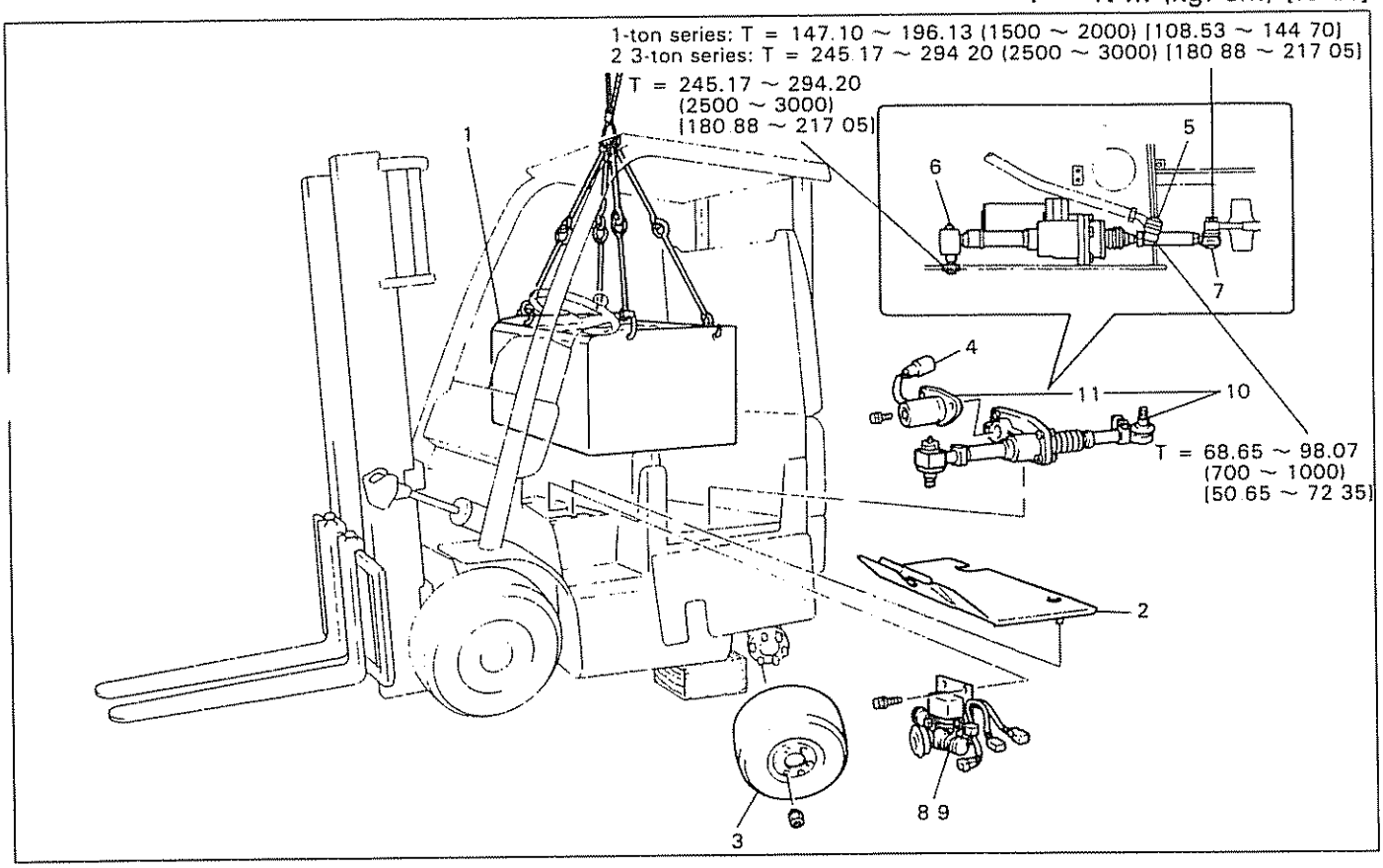
El procedimiento de instalación es el inverso al de remoción.

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PS ACTUATOR ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Turn the steering wheel counterclockwise and remove the battery ASSY. **[Point 1]**

2 Remove the toe board.

3 Remove the rear wheel LH.

4 Disconnect the EPS motor wiring.

5 Disconnect the drag link rod No.1. **[Point 2]**

6 Disconnect the PS actuator end (on the frame side). **[Point 3]**

7 Disconnect the PS actuator end (on the steering bellcrank side). **[Point 4]**

8 Disconnect the horn and buzzer wiring.

9 Remove the horn and buzzer bracket ASSY.

10 Remove the PS actuator ASSY.

11 Remove the EPS motor. **[Point 5]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Puntos de trabajo

[Punto 1]

Remoción: Mueva el volante de dirección del todo hacia la izquierda para dejar espacio para usar la SST cuando desconecte el extremo del actuador de la PS del lado de la palanca acodada de dirección.

[Punto 2]

Remoción: SST 09610-20012

[Punto 3]

Remoción: Use la barra de latón para sacar la tuerca por el lado inferior del vehículo y desconectar la articulación de rótula.

[Punto 4]

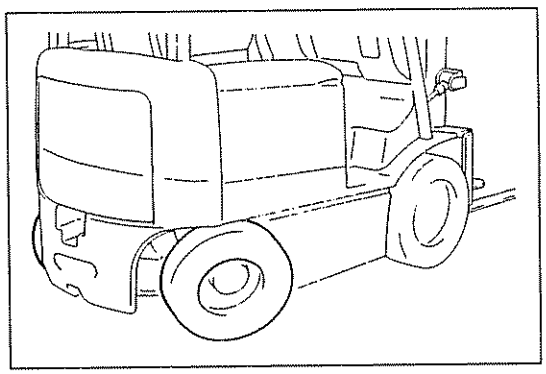
Remoción: SST 09430-23600-71

[Punto 5]

Remoción: Ponga una marca en el motor de la EPS y en el actuador de la PS.

Instalación: Alinee las marcas de acoplamiento para el remontaje.

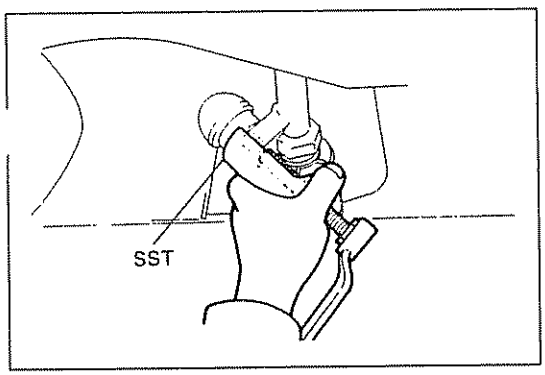
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Point Operations

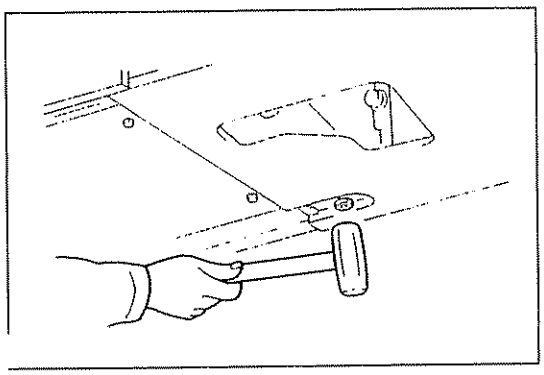
[Point 1]

Removal: Operate the steering wheel fully counterclockwise to ensure the space for using the SST when disconnecting the PS actuator end from the steering bellcrank.



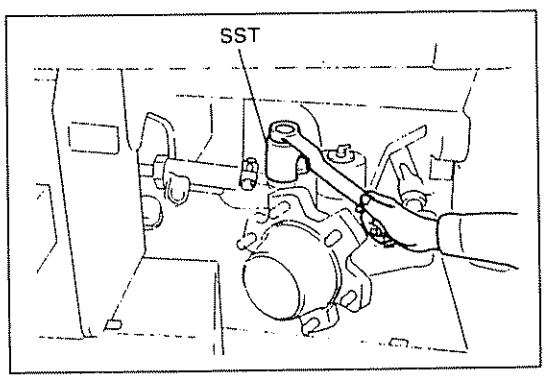
[Point 2]

Removal: SST 09610-20012



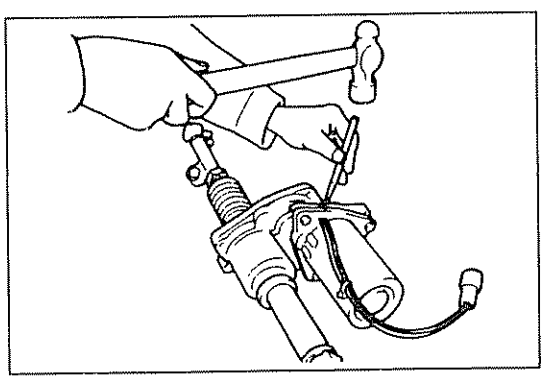
[Point 3]

Removal: Use the brass bar to top the nut from the under side of the vehicle and disconnect the ball joint.



[Point 4]

Removal: SST 09430-23600-71



[Point 5]

Removal: Punch a match mark on the EPS motor and PS actuator.

Installation: Align the match marks for reassembly.

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DESMONTAJE/INSPECCION/REMONTAJE

Nota:
Mida la flojedad de la varilla y la precarga del tornillo de bolas antes del desmontaje y después del remontaje (vea la página 9-27).
No llegue hasta el final del tope a tope.

Procedimiento de desmontaje

1 Saque el guardapolvo. [Punto 1]

2 Saque el tapón superior. [Punto 2]

3 Saque la cubierta superior. [Punto 3]

4 Saque el piñón. [Punto 4]

5 Saque el contraengranaje. [Punto 5]

6 Saque la articulación de rótula. [Punto 6]

Procedimiento de remontaje

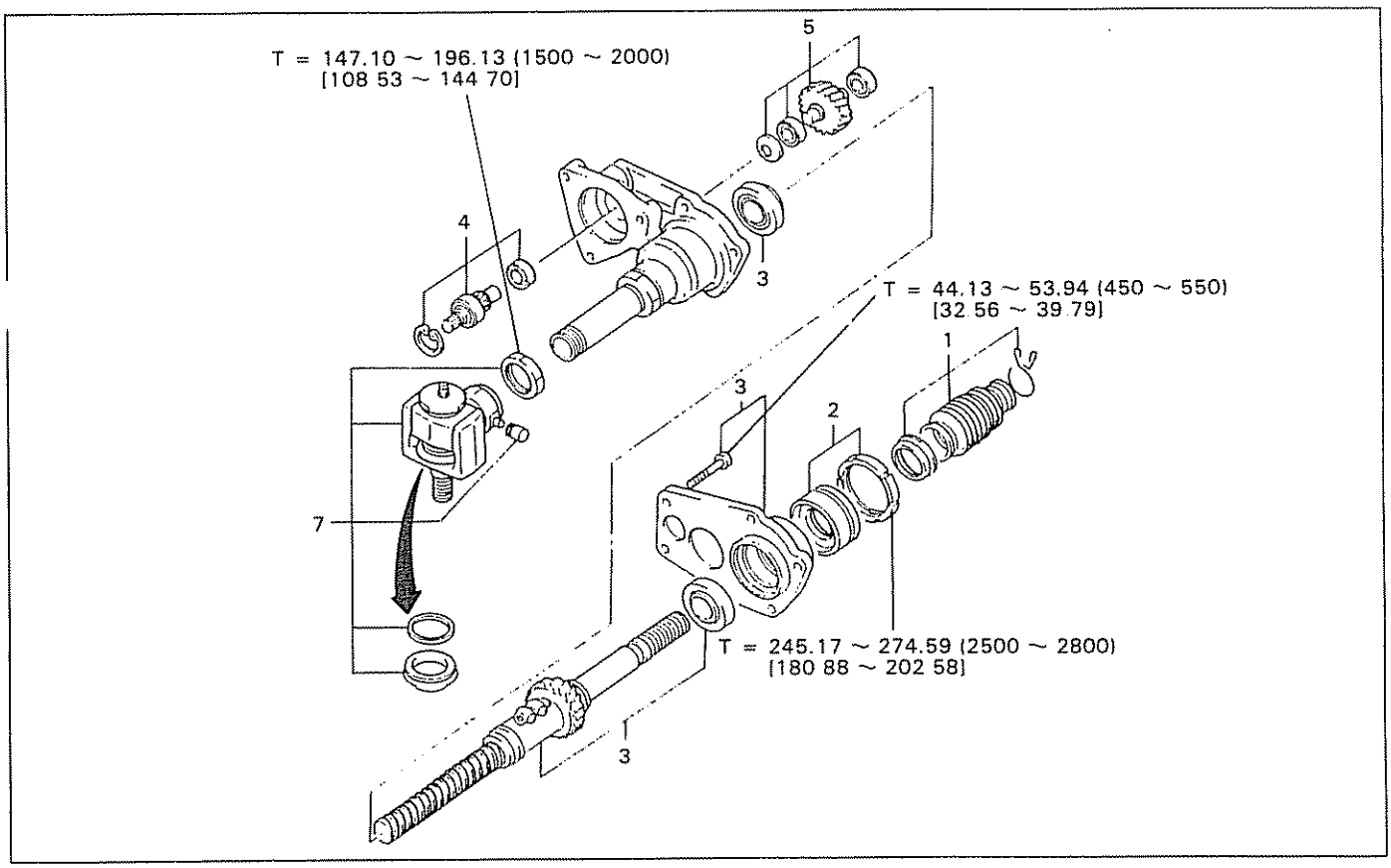
El procedimiento de remontaje es el inverso al del desmontaje.

Notas:
- Rellene con 45781-13500-71 la caja de engranajes. (Rellene con 45782-13500-71 para el vehículo con especificaciones para almacenes frigoríficos)
- Rellene con 45783-13500-71 la parte del sensor.
- Rellene con grasa MP la articulación de rótula.

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- Measure the rod looseness and ball screw preload before disassembly and after reassembly. (See page 9-27).
- Don't operate nearly the end of the lock-to-lock.



Disassembly Procedure

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

2 Remove the top plug. **[Point 2]**

3 Remove the top cover and ball screw rod. **[Point 3]**

4 Remove the pinion. **[Point 4]**

5 Remove the counter gear. **[Point 5]**

6 Remove the ball joint. **[Point 6]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Fill 45781-13500-71 in the gear box. (Fill 45782-13500-71 for a cold storage specification vehicle.)
- Fill 45783-13500-71 in the sensor portion.
- Fill MP grease in the ball joint.

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Puntos de trabajo

[Punto 1]

Desmontaje: Saque el anillo usando un destornillador de cabeza recta en la parte roscada del tapón superior.

Remontaje: Use siempre un anillo nuevo.

Remontaje: Cuando acople el guardapolvos en el orificio del tapón superior, instale el anillo de fijación después de comprobar de que la parte del diámetro principal del guardapolvos está bien fija en la ranura interior del tapón superior.

[Punto 2]

Desmontaje/remontaje: 09452-13500-71

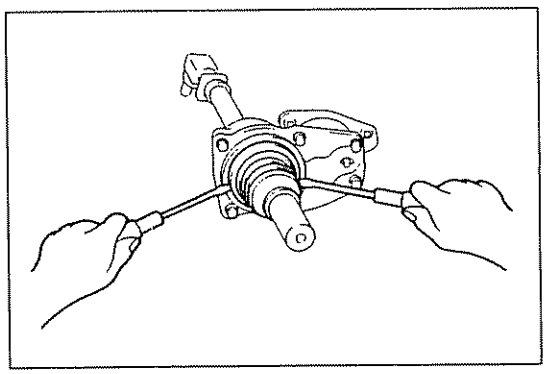
Desmontaje/remontaje: Sacuda ligeramente la varilla del tornillo de bolas mientras aprieta para evitar que el cojinete funcione solamente en un lado.
SST 09452-13500-71

[Punto 3]

Desmontaje: Rodamiento exterior del cojinete de rodillos cónicos
SST 09320-23000-71

Remontaje: Rodamiento exterior del cojinete de rodillos cónicos
SST 09608-35014

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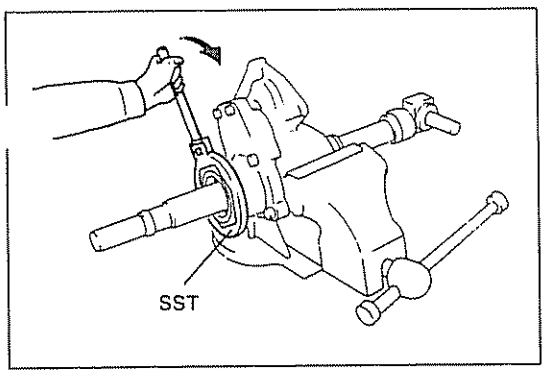
Point Operations

[Point 1]

Disassembly: Remove the ring by using a straight head screwdriver at the notched portion of the top plug.

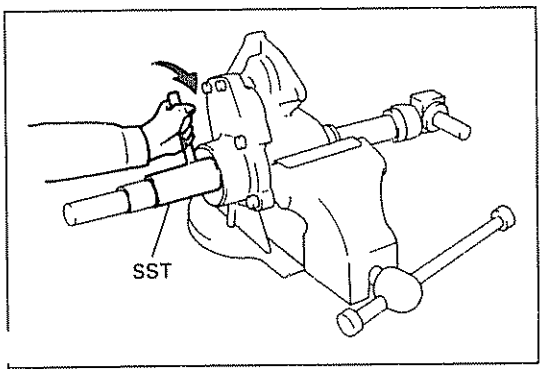
Reassembly: Always use a new ring.

Reassembly: When fitting the boot in the top plug bore, install the fixing ring after checking that the major diameter portion of the boot is securely fit in the top plug inside groove.

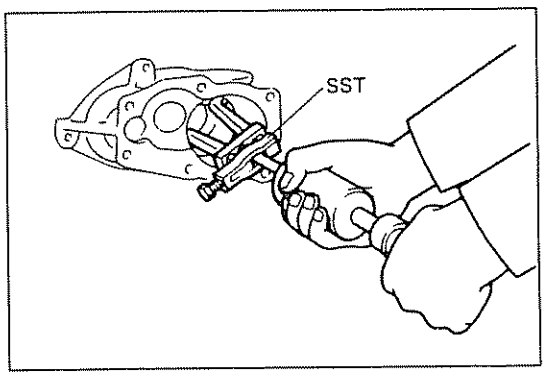


[Point 2]

Disassembly·Reassembly: 09452-13500-71

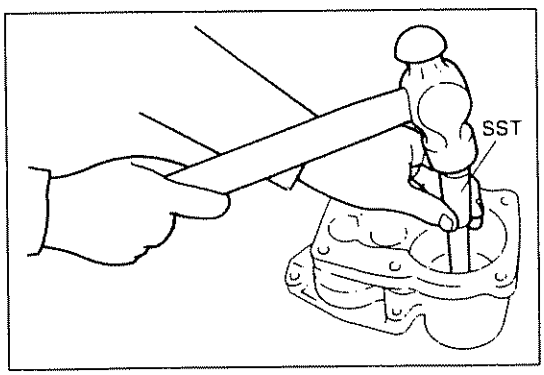


Disassembly·Reassembly: Shake the ball screw rod slightly while tightening to prevent the bearing from being effective only on one side.
SST 09452-13500-71



[Point 3]

Disassembly: Taper roller bearing outer race
SST 09320-23000-71



Reassembly: Taper roller bearing outer race
SST 09608-35014

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Desmontaje: Cojinete de rodillos cónicos (lado delantero)
SST 09950-40010, 09608-00040

Remontaje: Cojinete de rodillos cónicos (lado delantero)
SST 09527-21011, 09620-30010

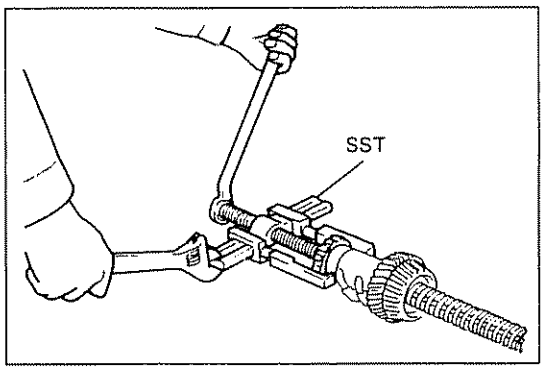
Desmontaje: Cojinete de rodillos cónicos (lado trasero)
SST 09527-21011, 09420-23000-71

Remontaje: Cojinete de rodillos cónicos (lado trasero)
SST 09527-21011, 09700-30200-71

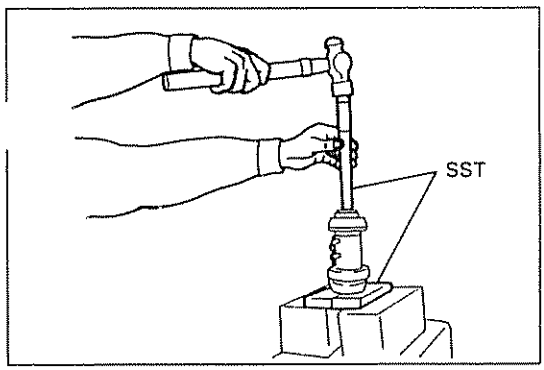
[Punto 4]

Desmontaje: SST 09950-40010

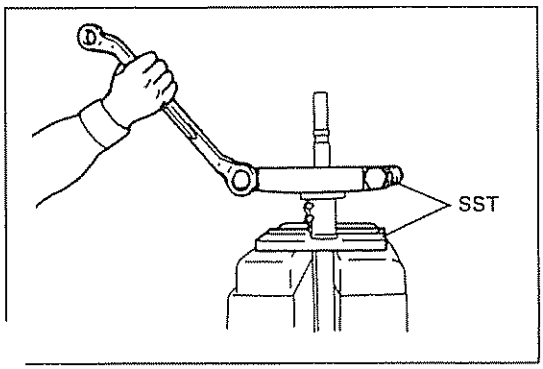
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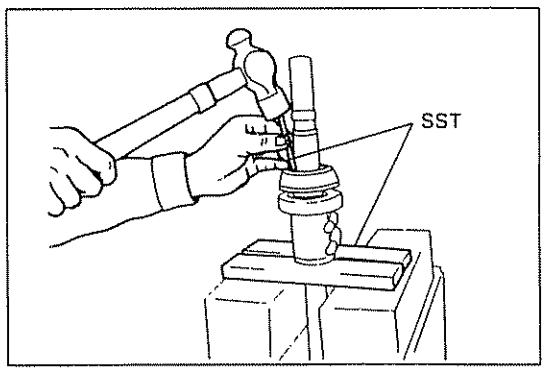
Disassembly: Taper roller bearing (front side)
SST 09950-40010, 09608-00040



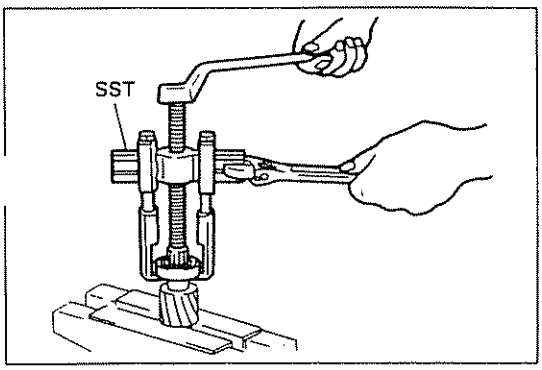
Reassembly: Taper roller bearing (front side)
SST 09527-21011, 09620-30010



Disassembly: Taper roller bearing (rear side)
SST 09527-21011, 09420-23000-71



Reassembly: Taper roller bearing (rear side)
SST 09527-21011, 09700-30200-71



[Point 4]

Disassembly: SST 09950-40010

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Remontaje: SST 09700-30200-71

[Punto 5]

Remontaje: Instale de tal manera que el anillo exterior de la arandela de resorte esté en contacto con el cojinete.

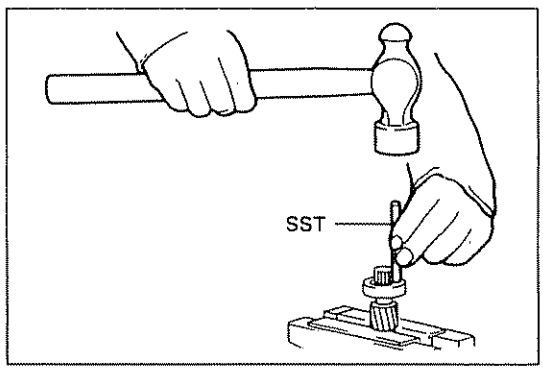
[Punto 6]

Desmontaje: Desmonte la varilla del tornillo de bolas solamente cuando encuentre alguna anormalidad.

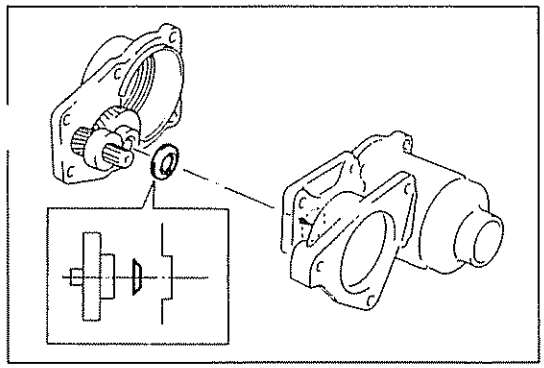
Remontaje: Coloque el conjunto de la articulación de rótula en la dimensión y ángulo especificados.

Estándar: 273 ± 1 mm
Angulo estándar: 115°

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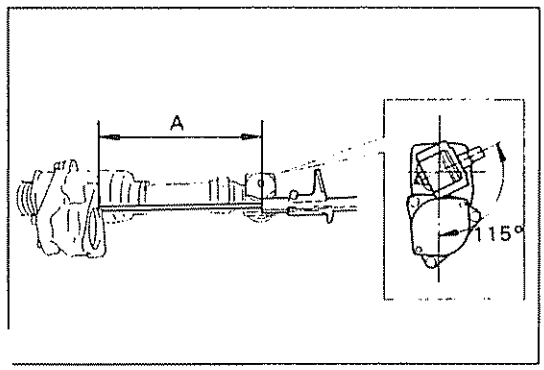


Reassembly: SST 09700-30200-71



[Point 5]

Reassembly: Install so that the outer periphery of the spring washer is in contact with the bearing.



[Point 6]

Disassembly: Disassemble the ball screw rod only when an abnormality is found.

Reassembly: Set the ball joint ASSY to the specified dimension and angle.

Standard: A = 273 ± 1 mm (10.75 ± 0.04 in)
Standard angle: 115°

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INSPECCION DEL ACTUADOR DE LA PS

1. Inspeccione la varilla del tornillo de bolas por si hay flojedad.
   (1) Fije el conjunto del actuador en un tornillo de banco.

   (2) Coloque la varilla del tornillo de bolas en posición neutra.

   (3) Coloque un calibrador de esfera a 23 mm de la cara del extremo de la tuerca de seguridad que es más grande.

   (4) Mueva ligeramente el extremo de la varilla con la mano y mida la flojedad de la varilla (holgura).

   Límite: 2,5 mm

   (5) Si se excede el límite, desmonte e inspeccione el actuador.

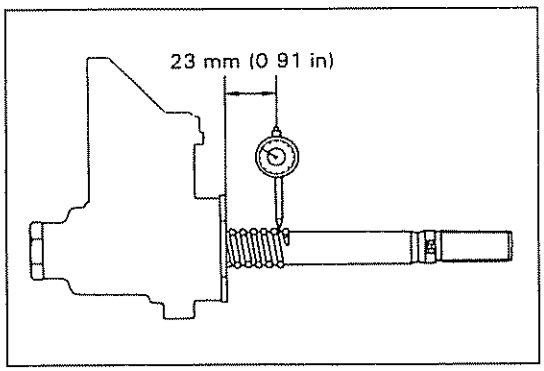
2. Mida la precarga del tornillo de bolas.
   (1) Fije el actuador en un tornillo de banco.

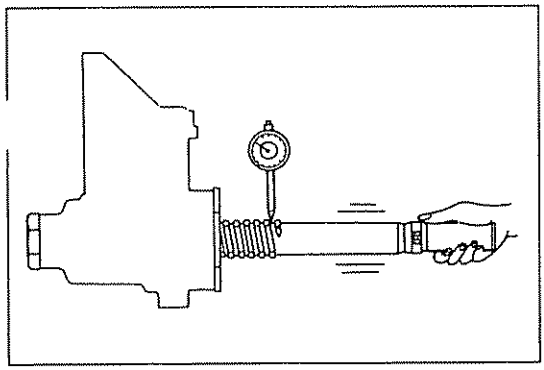
   (2) Coloque la SST en la varilla del tornillo y mida la precarga.
   SST 09470-10171-71

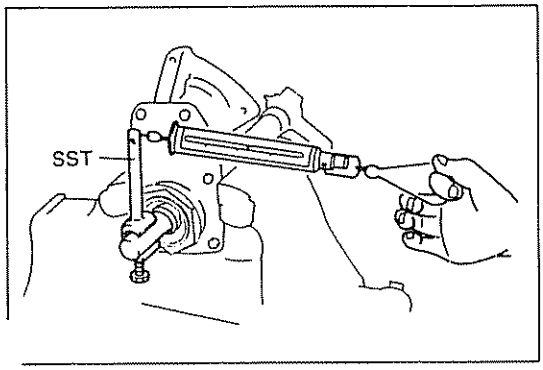
   Estándar: 2,942 ~ 4,903 N

   (3) Si no se satisface el estándar, desmonte e inspeccione el actuador.

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PS ACTUATOR INSPECTION

1. Inspect the ball screw rod for any looseness.
   (1) Fix the actuator ASSY in a vise.

   (2) Set the ball screw rod in the neutral position.

   (3) Set a dial gage at 23 mm (0.91 in) from the end face of the very large lock nut.

   (4) Move the rod end lightly with a hand and measure the rod looseness (clearance).

   Limit: 2.5 mm (0.098 in)

   (5) If the limit is exceeded, disassemble and inspect the actuator.

2. Measure the ball screw preload.
   (1) Fix the actuator in a vise.

   (2) Set the SST on the screw rod and measure the preload.
   SST 09470-10171-71

   Standard: 2.942 ~ 4.903 N (300 ~ 500 gf) [0.662 ~ 1.103 lbf]

   (3) If the standard is not satisfied, disassemble and inspect the actuator.

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CONJUNTO DEL MOTOR DE LA EPS

REMOCION/INSTALACION

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque el tablero del piso.

3 Desconecte el cableado de la bocina y el avisador acústico.

4 Saque el conjunto del soporte de la bocina y el avisador acústico.

5 Desconecte el cableado del motor de la EPS.

6 Saque el conjunto del motor de la EPS.

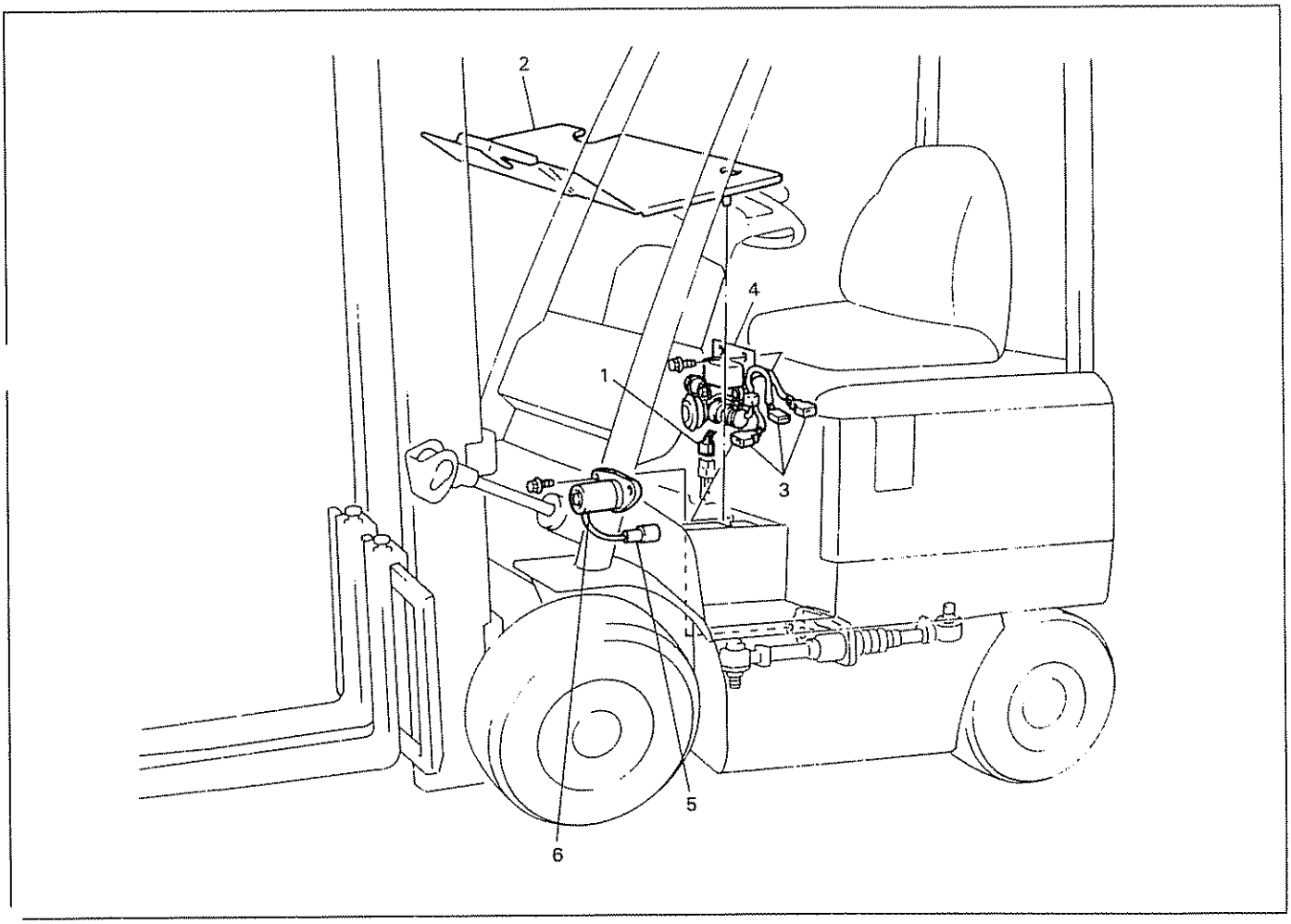
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

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EPS MOTOR ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the toe board.

3 Disconnect the horn and buzzer wiring.

4 Remove the horn and buzzer bracket ASSY.

5 Disconnect the EPS motor wiring.

6 Remove the EPS motor ASSY.

Installation procedure

The installation procedure is the reverse of the removal procedure.

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Procedimiento de desmontaje

1 Saque el casco. [Punto 1]

2 Separe las escobillas.

3 Saque la bobina del inducido. [Punto 2]

4 Saque el tornillo de sujeción del sujetador de la escobilla fuera del soporte. [Punto 3]

5 Saque la escobilla fuera del sujetador de la escobilla. [Punto 4]

6 Saque el sujetador de la escobilla fuera del soporte.

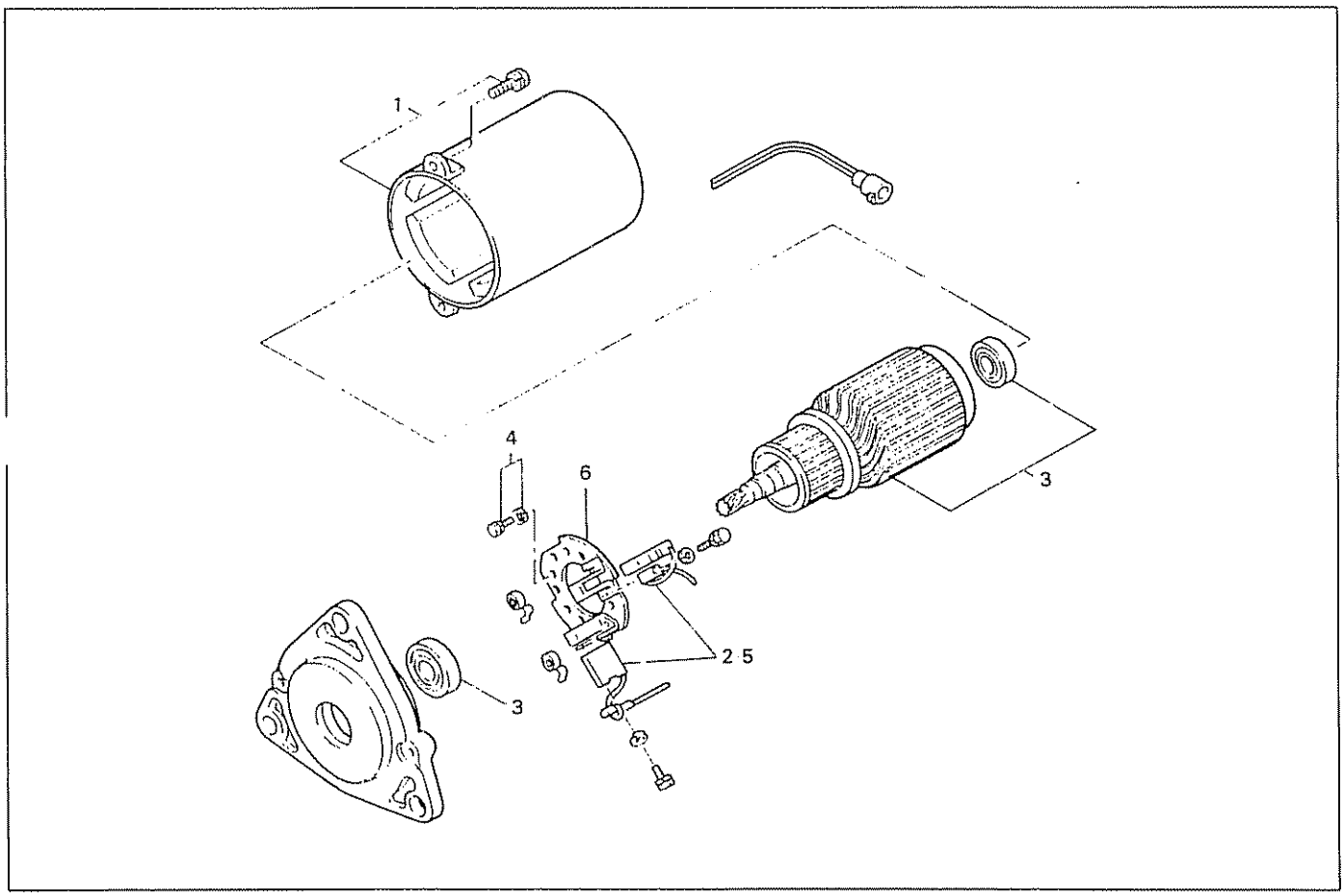
Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

Notas:
Inspeccione los lugares siguientes antes del desmontaje y después del remontaje:
. Mida la resistencia de aislamiento entre cada cableado del motor y el cuerpo del motor.
  Estándar: 1 MΩ o más (con un megóhmetro de 500 V CC)
. Inspeccione la continuidad de la bobina inductora (entre los terminales E y F).
  Estándar: 0 Ω (alcance del probador de circuitos: x 1 Ω)

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

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

2 Set the brush free.

3 Remove the armature coil. **[Point 2]**

4 Remove the brush holder set screw from the bracket. **[Point 3]**

5 Remove the brush from the brush holder. **[Point 4]**

6 Remove the brush holder from the bracket.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Inspect the following places before disassembly and after reassembly:
- **Measure the insulation resistance between each motor wiring and the motor body.**
  Standard: 1 MΩ or more (with a 500 VDC megger)
- **Inspect the field coil continuity (between terminals E and F).**
  Standard: 0 Ω (circuit tester range: × 1 Ω)

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Puntos de trabajo

[Punto 1]

Desmontaje/remontaje: Tire recto para no deteriorar la bocina del inducido y el imán que hay dentro del casco.

[Punto 2]

Desmontaje: Saque la bobina del inducido fuera del soporte golpeando suavemente la parte del árbol con un martillo blando.

Remontaje: Instale la bobina del inducido en el soporte.
SST 09620-30010

Desmontaje: Cojinete del lado del casco
SST 09110-41830-71 .... (2)
SST 09700-30200-71 .... (1)
Cojinete del lado del soporte
SST 09950-40010

Remontaje: Cojinete del lado del casco
SST 09285-76010
Cojinete del lado del soporte
SST 09620-30010

Inspección: Si el conmutador está áspero, corrija con papel de lija (#600) y limpie toda la superficie.
Si está muy áspero, corrija con un torno.

Diámetro exterior del conmutador

Series de 1 ton.
Estándar: 33,0 mm
Límite: 31,5 mm
Series de 2-3 ton.
Estándar: 40 mm
Límite: 35 mm

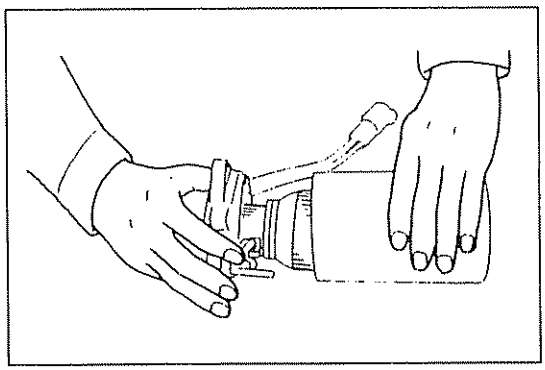
Inspección: Recorte la parte de la mica después de corregir el conmutador.

Recorte

Estándar: 0,8 mm
Límite: 0,3 mm

*Fig. Recorte
Mica

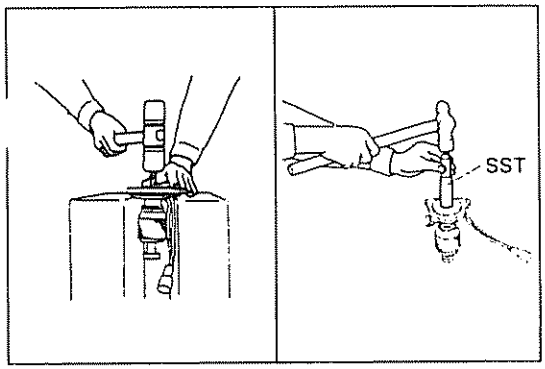
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Point Operations

[Point 1]

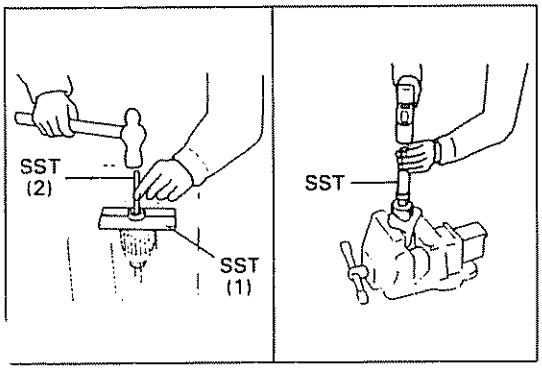
Disassembly·Reassembly: Pull out straight so as not to damage the armature coil and the magnet inside the yoke.



[Point 2]

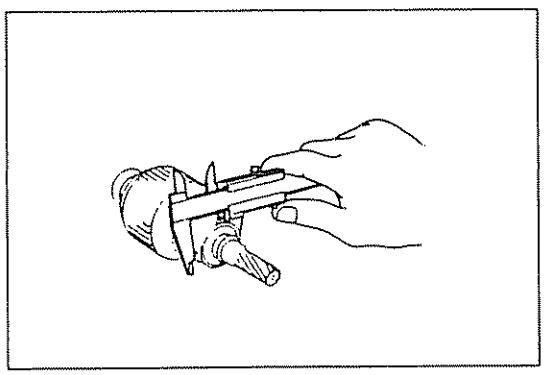
Disassembly: Remove the armature coil from the bracket by tapping the shaft portion with a soft hammer.

Reassembly: Install the armature coil on the bracket.
SST 09620-30010



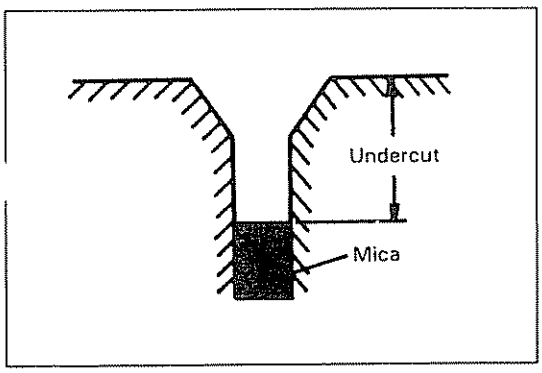
Disassembly: Bearing on yoke side
SST (1) . . . 09110-41830-71
SST (2) . . . 09700-30200-71
Bearing on bracket side
SST 09950-40010

Reassembly: Bearing on yoke side
SST 09285-76010
Bearing on bracket side
SST 09620-30010



Inspection: If the commutator is roughened, correct with sandpaper (#600) and clean the surface thoroughly.
If heavily roughened, correct with a lathe.

Commutator outside diameter
1 ton series
Standard: 33.0 mm (1.299 in)
Limit: 31.5 mm (1.240 in)
2·3 ton series
Standard: 40.0 mm (1.575 in)
Limit: 35.0 mm (1.378 in)



Inspection: Undercut the mica after correcting the commutator.

Undercut
Standard: 0.8 mm (0.031 in)
Limit: 0.3 mm (0.012 in)

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Inspección: Mida la resistencia de aislamiento de la bobina del inducido.

Estándar: 1 MΩ o más

Inspección: Mida el descentramiento del conmutador.

Estándar: 0,3 mm o menos

[Punto 3]

Inspección: Mida la resistencia de aislamiento entre el sujetador de la escobilla y el soporte.

Estándar: 1 MΩ o más

Inspección: Instale la bobina del inducido. Enganche una báscula de resorte en el resorte de la escobilla y mida la fuerza del resorte en el instante en que el resorte de la escobilla se separa de la escobilla.

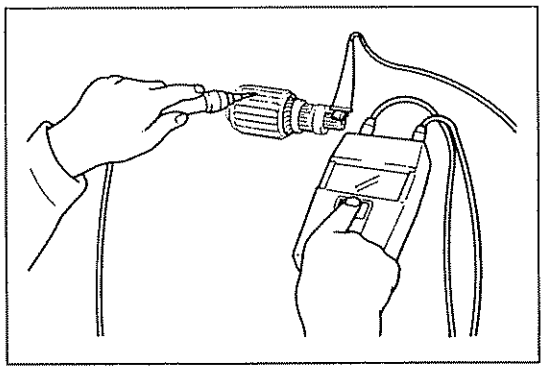
Estándar: 5,59 N (0,57 kgf)

[Punto 4]

Inspección: Compruebe la escobilla por si hay desgaste y su estado de contacto.

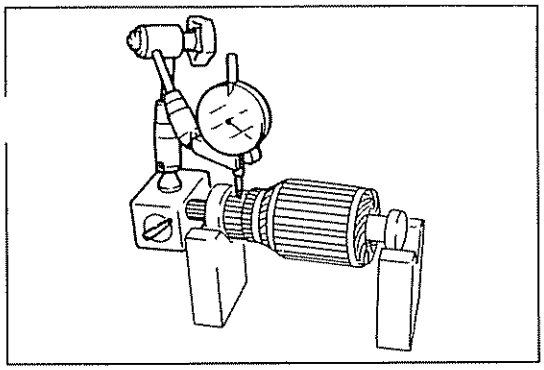
Series de 1 ton.
Estándar: 20 mm
Límite: 11 mm
Series de 2-3 ton.
Estándar: 22 mm
Límite: 11 mm

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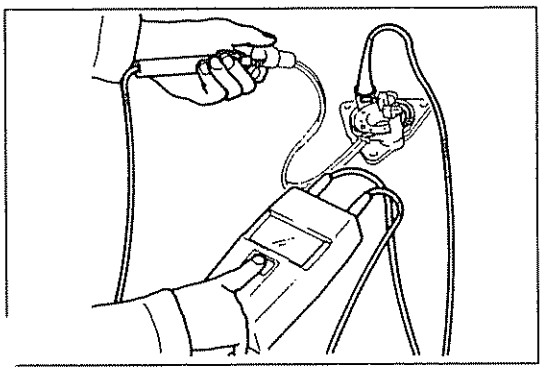
Inspection: Measure the armature coil insulation resistance.

Standard: 1 MΩ or more



Inspection: Measure the commutator runout.

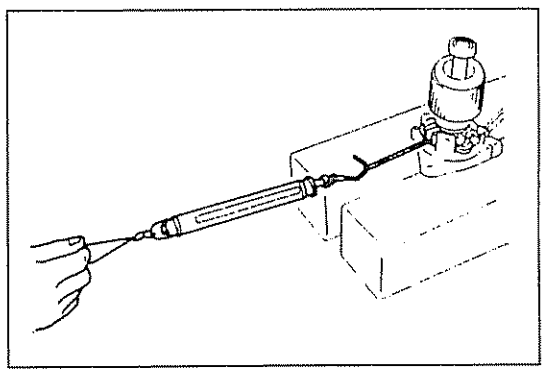
Standard: 0.3 mm (0.012 in) or less



[Point 3]

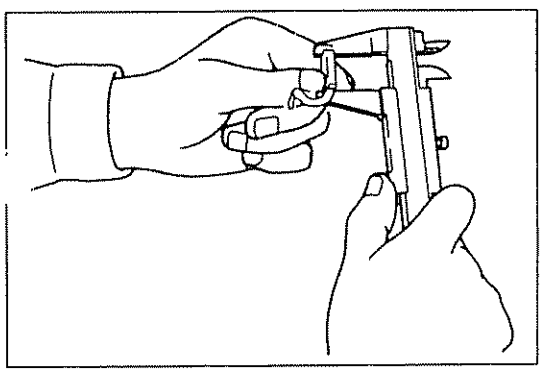
Inspection: Measure the insulation resistance between the brush holder and the bracket.

Standard: 1 MΩ or more



Inspection: Install the armature coil. Hook a spring scale at the brush spring and measure the spring force on the instant when the brush spring leaves the brush.

Standard: 5.59 N (0.57 kgf) [1.26 lbf]



[Point 4]

Inspection: Check the brush for wear and contact state.

1 ton series
Standard: 20 mm (0.79 in)
Limit: 11 mm (0.43 in)
2·3 ton series
Standard: 22 mm (0.87 in)
Limit: 11 mm (0.43 in)

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AJUSTE DE LA ARTICULACION DE DIRECCION

Dimensiones del actuador de la PS instalado

1. Contraiga totalmente el actuador de la PS.

2. Ajuste las dimensiones indicadas a continuación ajustando la cantidad de enroscado del extremo del actuador en cada uno de los extremos.

Notas:
- La cantidad de enroscado del extremo del actuador debe ser igual en ambos lados.
- Si el ángulo del extremo del actuador es incorrecto cuando se instala el actuador de la PS en el vehículo, ajuste el ángulo aflojando la tuerca de seguridad del extremo del actuador.
- Par de apretamiento de la tuerca de seguridad del extremo del actuador
  Lado delantero
  T = 245 ~ 294 N.m (2500 ~ 3000 kgf-cm)
  Lado trasero
  Series de 1 ton.: T = 147 ~ 196 N.m (1500 ~ 2000 kgf-cm)
  Series de 2-3 ton.: T = 245 ~ 294 N.m (2500 ~ 3000 kgf-cm)
- No extienda el actuador hasta el extremo de su carrera antes de instalarlo en el vehículo.

	L mm	A mm	B mm	C mm	D mm	E Angulo de instalación	F mm
Series de 1 ton.	691	411	150	85	45	115°	273±1
Series de 2-3 ton. Series de 1-2 ton. Modelos de gran capacidad	748	408	210				

Nota:
Las dimensiones de la tabla anterior son las del estado totalmente contraído antes de la instalación en el vehículo.
Cada una de las dimensiones L y A después de la instalación en el vehículo es aproximadamente 10 mm mayor que la de la tabla anterior, pero no significa anormalidad.

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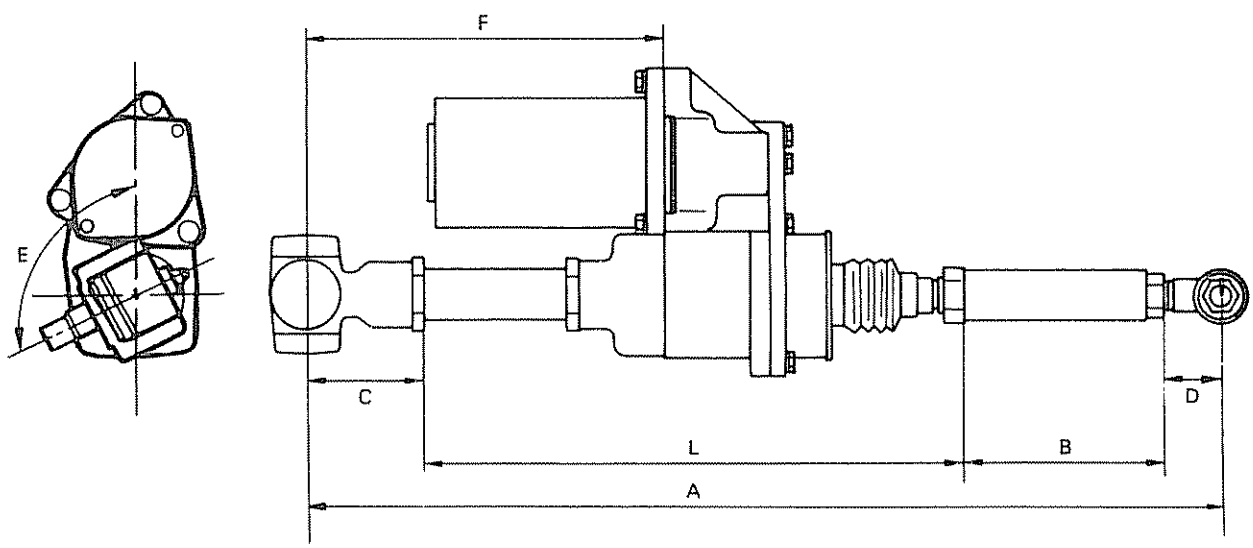
STEERING LINK ADJUSTMENT

PS ACTUATOR INSTALLED DIMENSIONS

1. Fully contract the PS actuator.

2. Make adjustment to the dimensions shown below by adjusting the screw-in amount of the actuator end at each end.

Note:
- **The screw-in amount of the actuator end must be equal on both sides.**
- **If the actuator end angle is incorrect when the PS actuator is installed on the vehicle, adjust the angle by loosening the actuator end lock nut.**
- **Actuator end lock nut tightening torque**
  Front side
  T = 245.17 ~ 294.20 N·m (2500 ~ 3000 kgf-cm) [180.88 ~ 217.05 ft-lbf]
  Rear side
  1-ton series: T = 147.10 ~ 196.13 N·m (1500 ~ 2000 kgf-cm) [108.53 ~ 144.70 ft-lbf]
  2·3-ton series:T = 245.17 ~ 294.20 N·m (2500 ~ 3000 kgf-cm) [180.88 ~ 217.05 ft-lbf]
- **Do not extend the actuator to its stroke end before installation on the vehicle.**



	L mm (in)	A mm (in)	B mm (in)	C mm (in)	D mm (in)	E Installation angle	F mm (in)
1-ton series	691 (27.20)	411 (16.18)	150 (5.91)	85 (3.35)	45 (1.77)	115°	273±1 (10.75±0.04)
2·3-ton series 1·2-ton series Large capacity models	748 (29.45)	408 (18.90)	210 (8.28)	↑	↑	↑	↑

Note:
Dimensions in the table above are those in fully contracted state before installation on the vehicle. Each of dimensions L and A after installation on the vehicle is approx. 10 mm (0.39 in) greater than in the table above, but it is not an abnormality.

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DIMENSIONES DEL EXTREMO DE LA VARILLA DE DIRECCION INSTALADA

1. Ajuste a las dimensiones indicadas a continuación ajustando la cantidad de enroscado del extremo de la varilla de dirección en cada uno de los extremos.

Notas:

- La cantidad de enroscado del extremo de la varilla de dirección debe ser igual en ambos lados.
- Si el ángulo del extremo es incorrecto cuando se instala la varilla de dirección en el vehículo, ajuste el ángulo aflojando la tuerca de seguridad del extremo.
- Par de apretamiento de la tuerca de seguridad del extremo de la varilla de dirección
  T = 117,68 ~ 147,10 N.m (1200 ~ 1500 kgf-cm)
- Después de la instalación, accione la varilla de dirección y confirme que no está en contacto con el bastidor, etc.

	L mm	A mm	B mm	C mm	D mm
Series de 1 ton.	996±1	996	855	55	70
Series de 2 ton. Series de 1 ton. Modelo de gran capacidad	1116±1	1120	977	115	
Series de 3 ton. Series de 2 ton. Modelo de gran capacidad	1333±1	1343	1195	169	

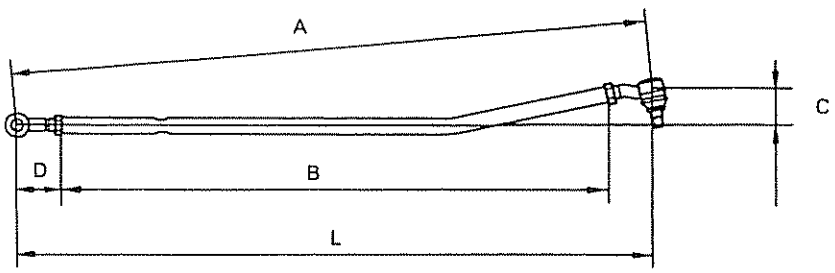
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DRAG LINK END INSTALLED DIMENSIONS

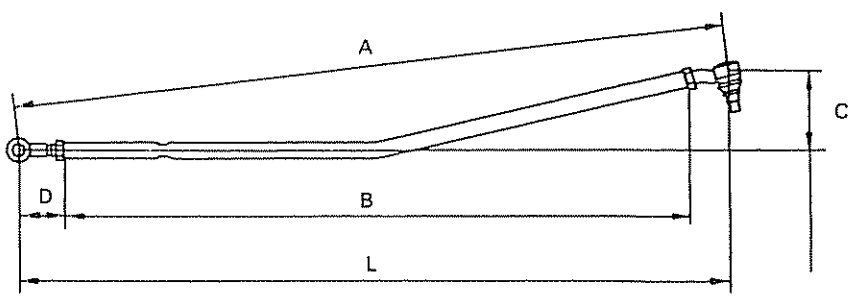
1. Make adjustment to the dimensions shown below by adjusting the screw-in amount of the drag link end at each end.

Note:
- **The screw-in amount of the drag link end must be equal on both sides.**
- **If the end angle is incorrect when the drag link is installed on the vehicle, adjust the angle by loosening the end lock nut.**
- **Drag link end lock nut tightening torque**
  T = 117.68 ~ 147.10 N·m (1200 ~ 1500 kgf-cm) [86.82 ~ 108.53 ft-lbf]
- **After installation, operate the drag link and confirm no contact with the frame, etc.**

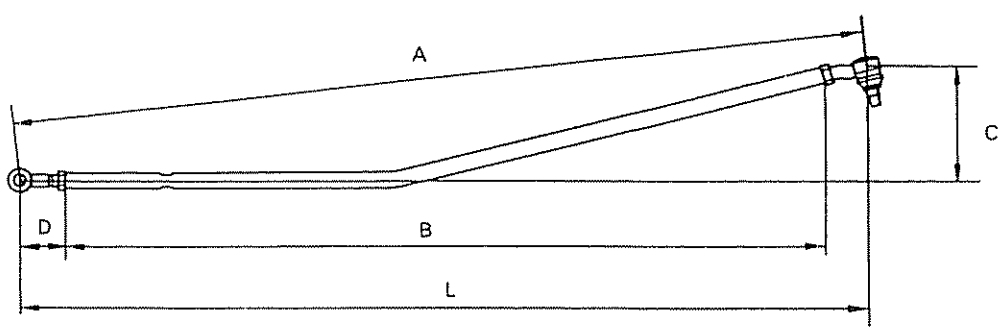
1-ton series



2-ton series



3-ton series



	L mm (in)	A mm (in)	B mm (in)	C mm (in)	D mm (in)
1-ton series	996 ± 1 (39.21 ± 0.04)	996 (39.21)	855 (33.66)	55 (2.17)	70 (2.76)
2-ton series 1-ton large-capacity model	1116 ± 1 (43.94 ± 0.04)	1120 (44 09)	977 (38.46)	115 (4.53)	↑
3-ton series 2-ton large-capacity model	1333 ± 1 (52.48 ± 0.04)	1343 (52.87)	1195 (47.05)	169 (6.65)	↑

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FRENOS

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BRAKE

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GENERALIDADES

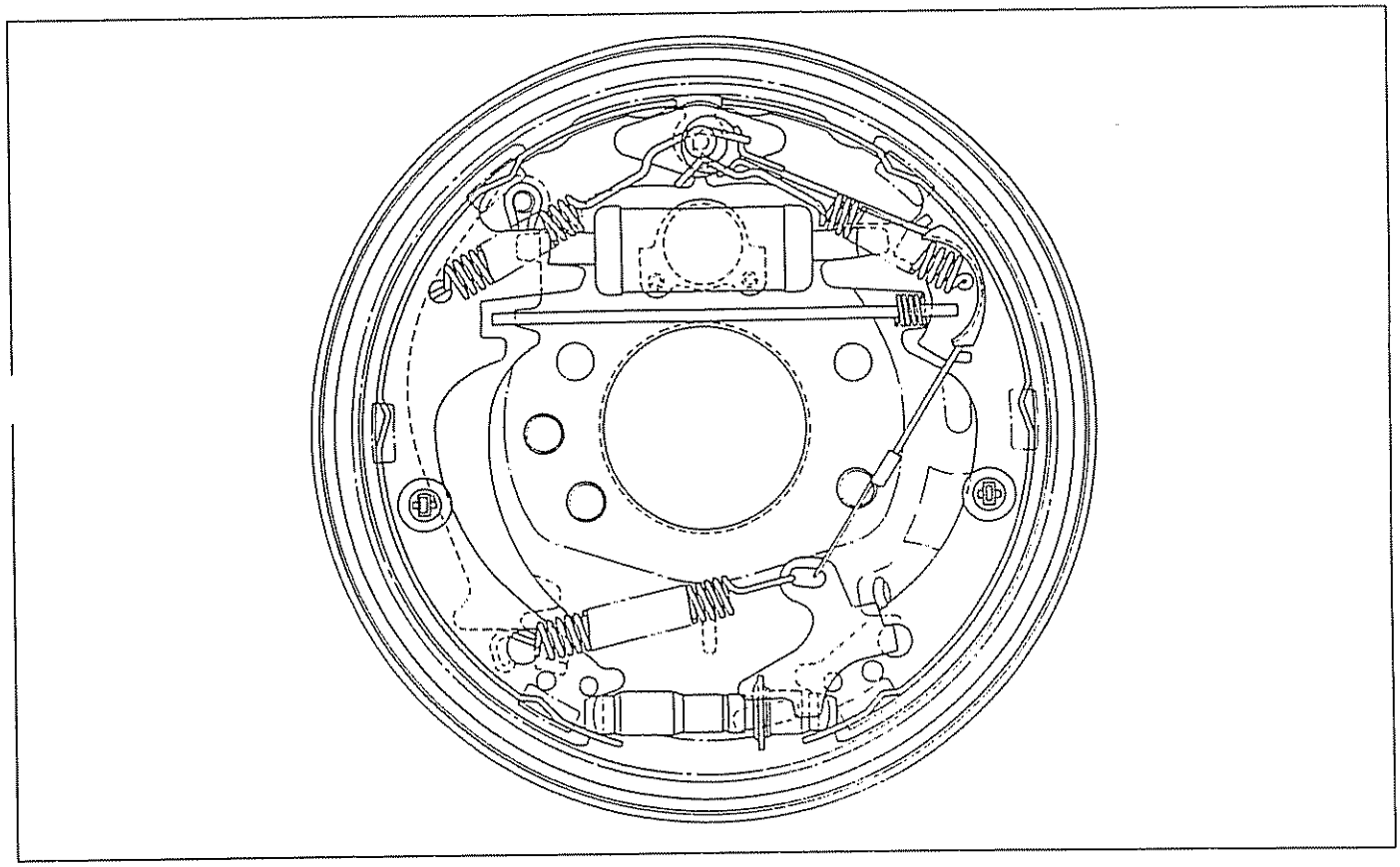
Freno delantero (series de 1 tonelada)

Cilindro de la rueda (series de 1 tonelada)

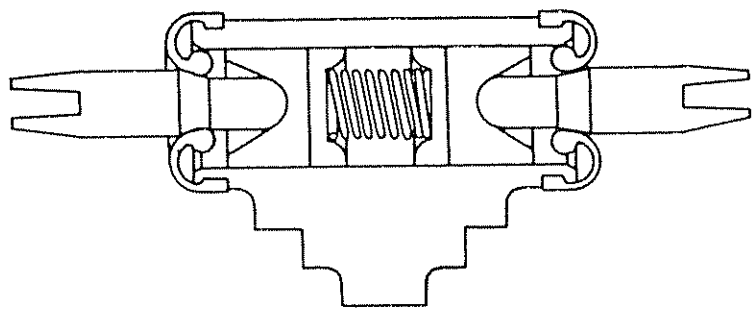
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GENERAL

Front Brake (1-ton Series)



Wheel Cylinder (1-ton Series)



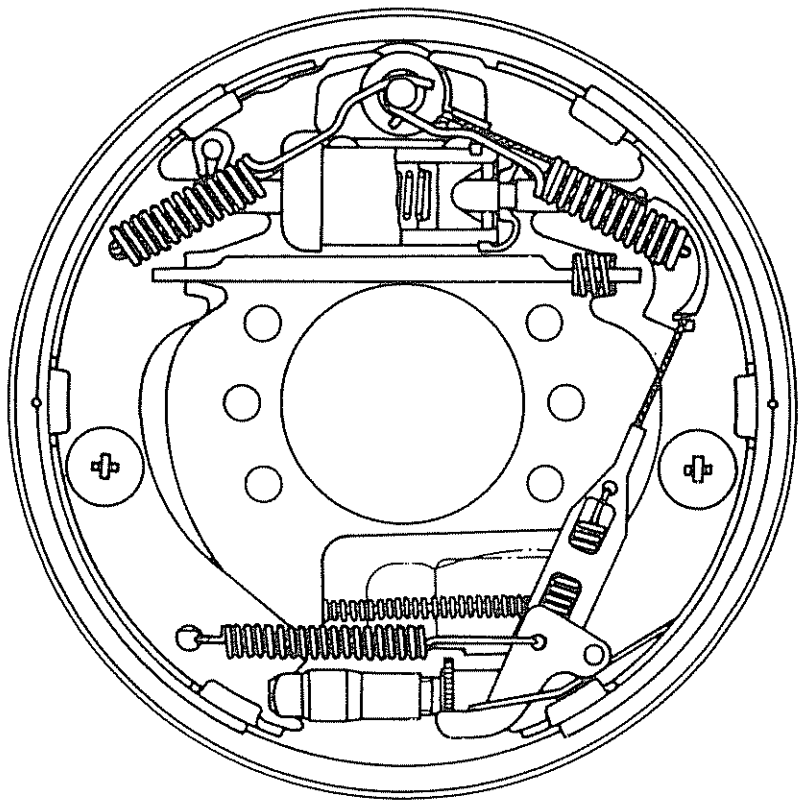
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Freno delantero (series de 2 toneladas)

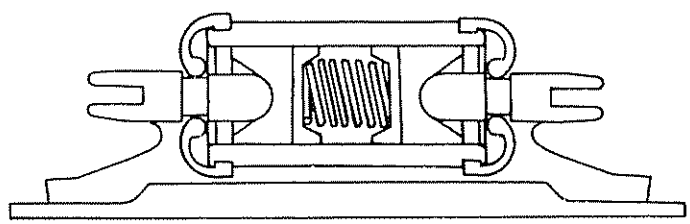
Cilindro de la rueda (series de 2 toneladas)

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Front Brake (2-ton Series)



Wheel Cylinder (2-ton Series)



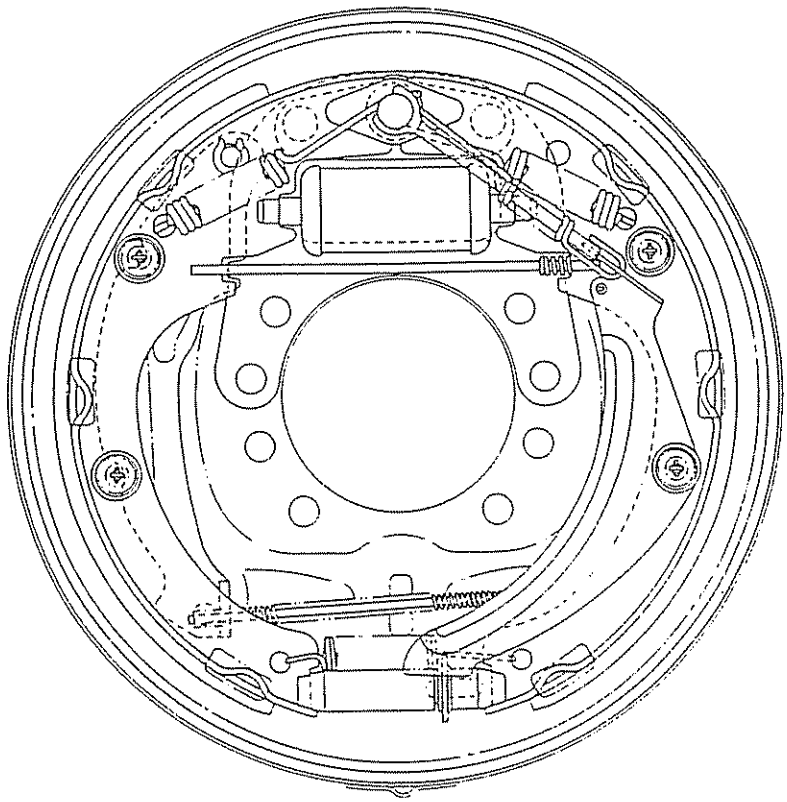
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Freno delantero (series de 3 toneladas)

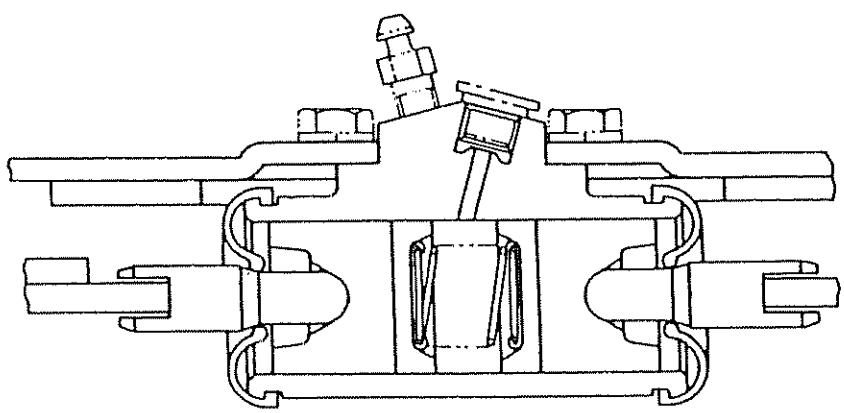
Cilindro de la rueda (series de 3 toneladas)

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Front Brake (3-ton Series)



Wheel Cylinder (3-ton Series)



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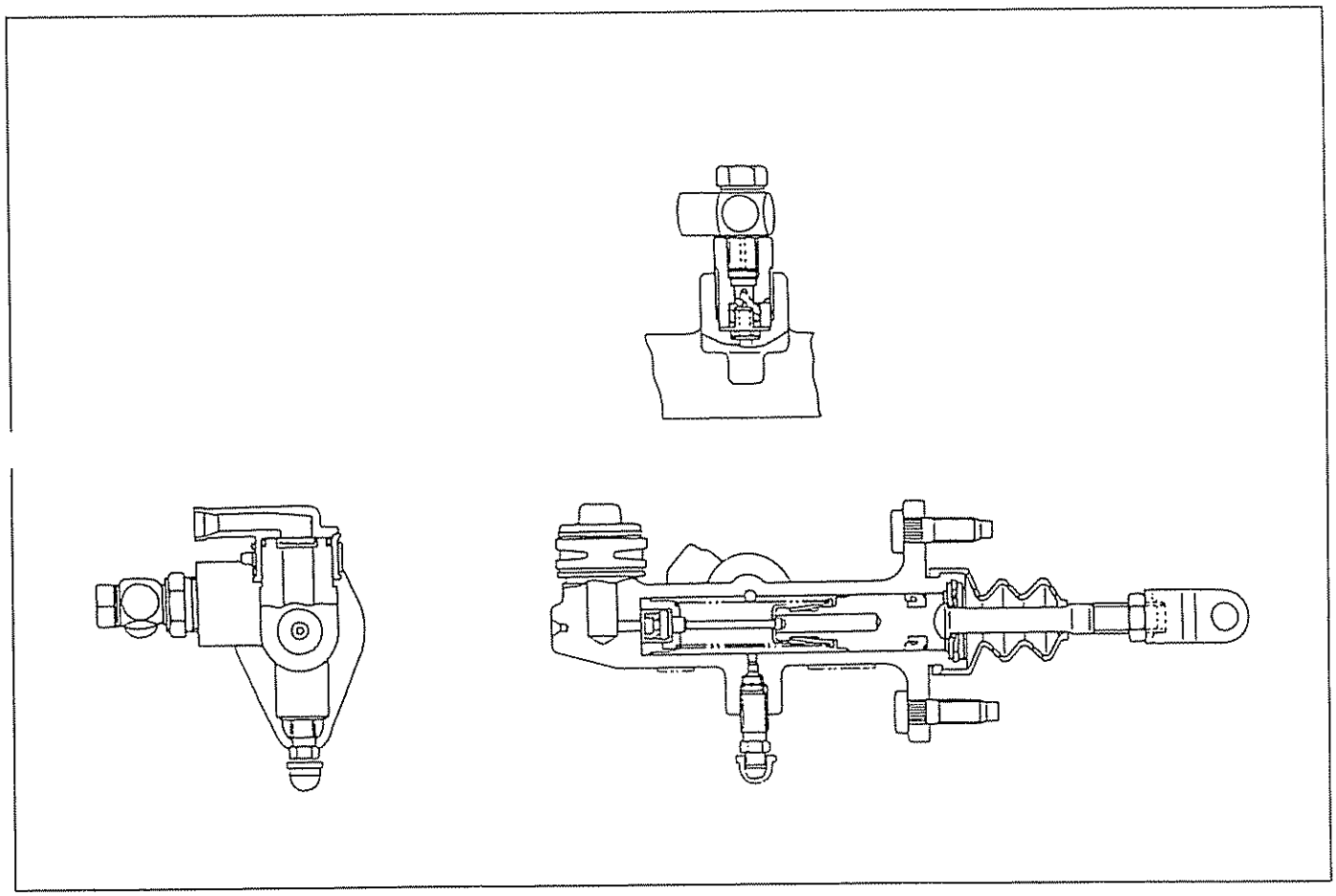
Cilindro maestro

ESPECIFICACIONES

Modelo del vehículo Descripción		Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Tipo del freno de pie		Duoservo de expansión interna, hidráulico		
Tipo del freno de estacionamiento		Mecánico de expansión interna		
Diámetro interior del tambor del freno	mm	254	279,4	310
Material del forro del freno		Resina moldeada (sin asbesto)		
Dimensiones de los forros del freno (Grosor x anchura x longitud)	mm	4,87x48,5x279	5,10x55,0x302	7,0x60,0x343
Superficie	cm^2	135x2x2	166x2x2	205x2x2
Calibre del cilindro de la rueda	mm	22,22	25,4	28,58
Calibre del cilindro maestro	mm	19,05	-	-
Aceite aplicable		STD: SAEJ-1703DOT-3 45S: Fluido del freno ártico S		

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Master Cylinder



SPECIFICATIONS

Item \ Vehicle model		1-ton series	2-ton series	3-ton series
Foot brake type		Hydraulic internal expanding duo servo brake		
Parking brake type		Internal expanding mechanical brake		
Brake drum inside diameter	mm (in)	254 (10.00)	279.4 (11.00)	310 (12.20)
Brake lining material		Resin mold (asbestos-free)		
Brake lining dimensions Thickness × width × length	mm (in)	4.87 × 48.5 × 279 (0.1882 × 19.09 × 10.98)	5.10 × 55.0 × 302 (0.2008 × 2.165 × 11.89)	7.0 × 60.0 × 343 (0.276 × 2.362 × 13.50)
Area	cm^2 (in^2)	135 × 2 × 2 (0.209 × 0.75 × 0.75)	166 × 2 × 2 (0.257 × 0.0031 × 0.0031)	205 × 2 × 2 (0.317 × 0.0031 × 0.0031)
Wheel cylinder bore	mm (in)	22.22 (0.8748)	25.4 (1.000)	28.58 (1.1252)
Master cylinder bore	mm (in)	19.05 (0.7500)	←	←
Applicable oil		STD: SAEJ-1703DOT-3 45S: Brake fluid arctic S		

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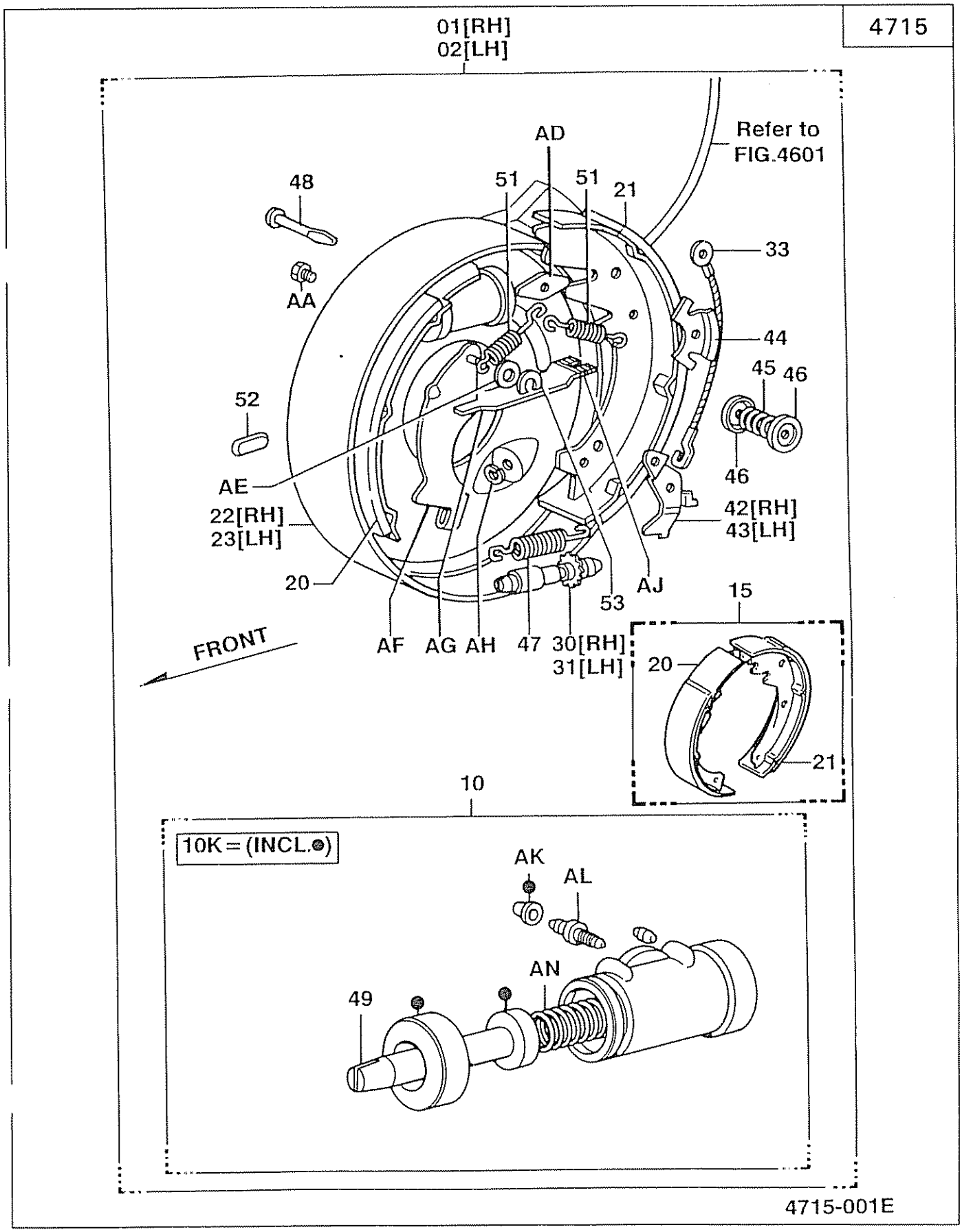
COMPONENTES

Freno delantero (series de 1 tonelada)

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COMPONENTS

Front Brake (1-ton Series)



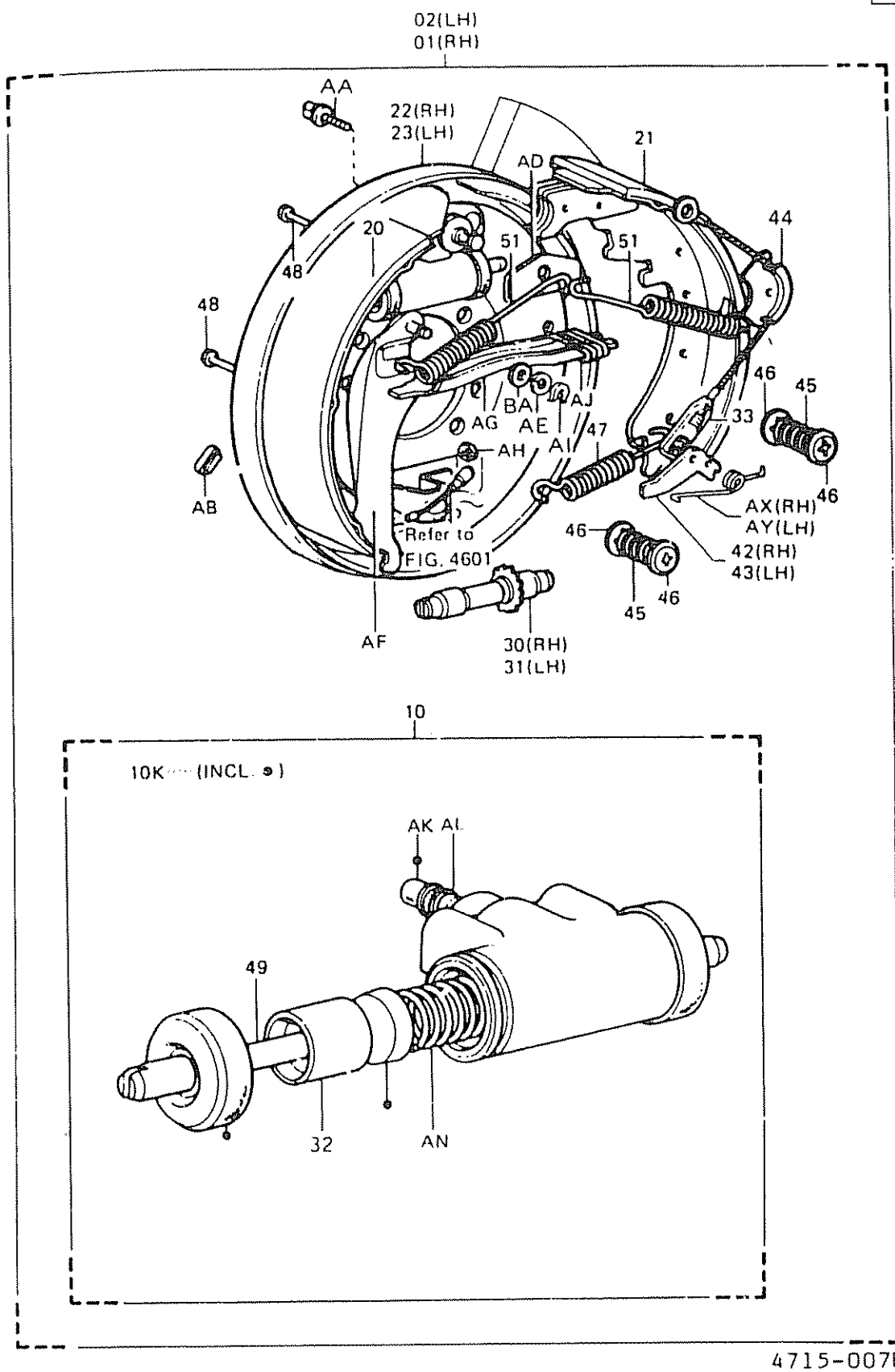
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Freno delantero (series de 2 toneladas)

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Front Brake (2-ton Series)

4715



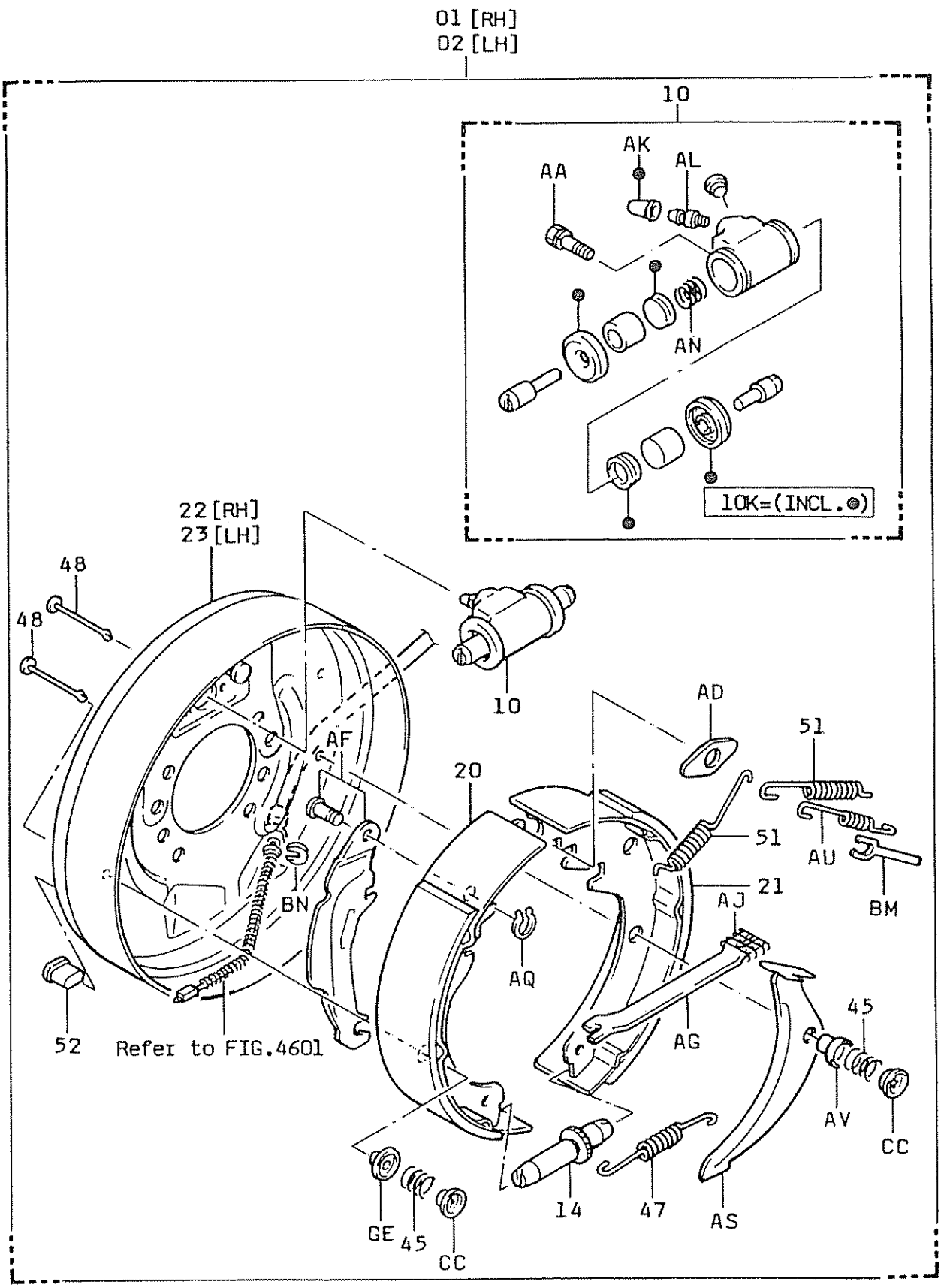
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Freno delantero (series de 3 toneladas)

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Front Brake (3-ton Series)

4715

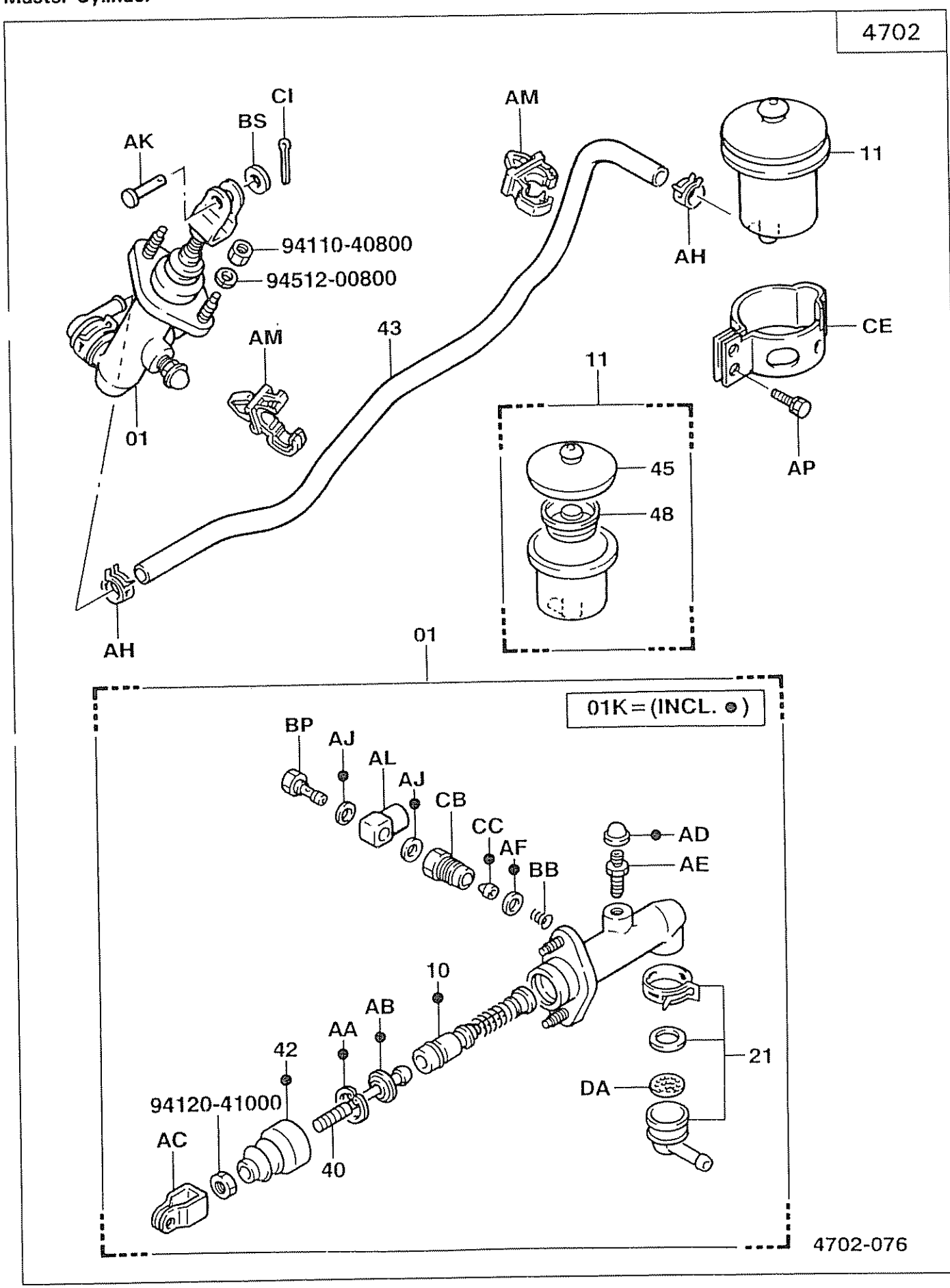


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Cilindro maestro

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Master Cylinder

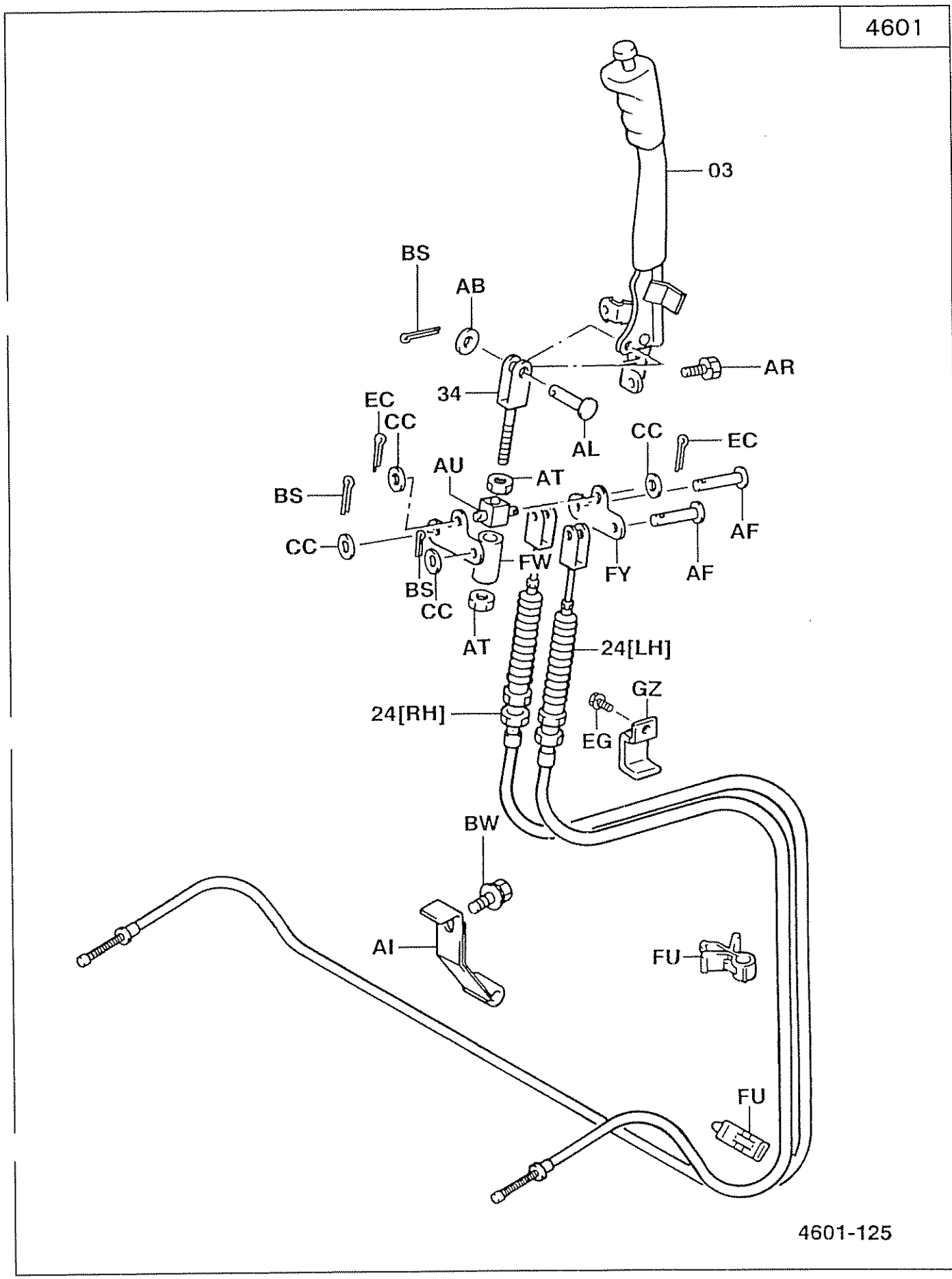


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Freno de estacionamiento

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Parking Brake



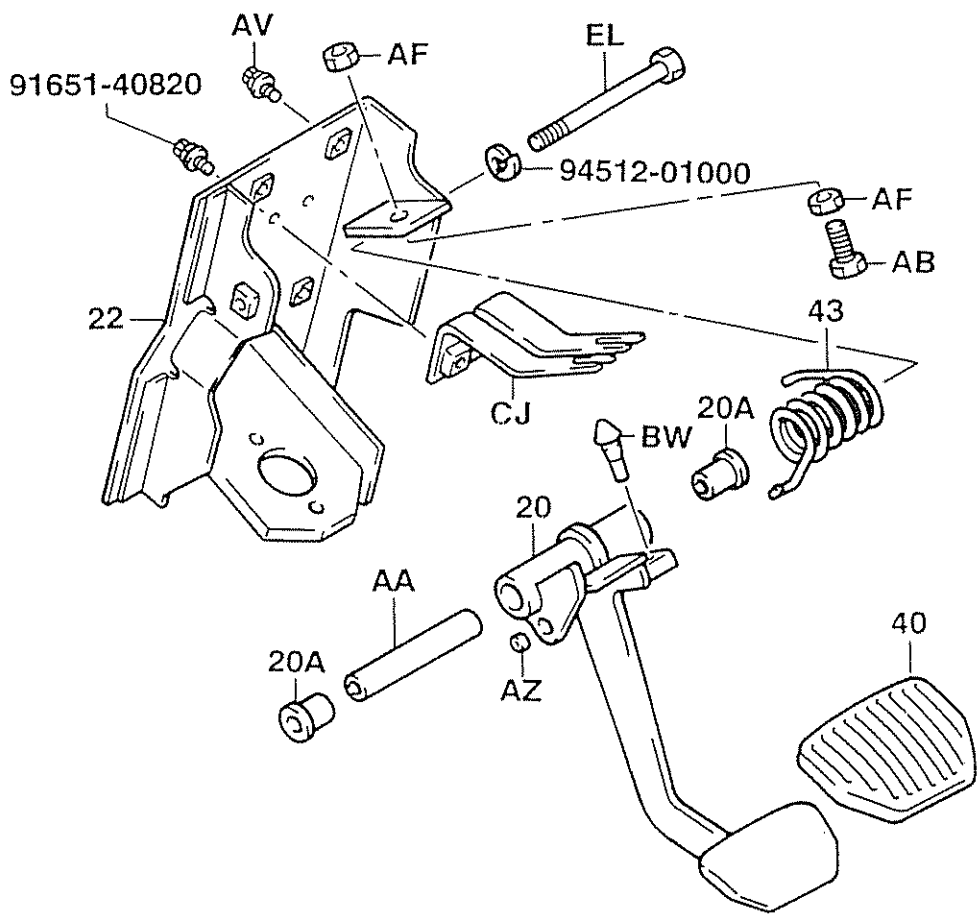
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Pedal del freno

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Brake Pedal

4701



4701-162

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FRENO DELANTERO (SERIES DE 1-2 TONELADAS)

DESMONTAJE/INSPECCION/REMONTAJE

Series de 1 tonelada

1 Cubo del eje delantero

9 Fluido del freno

10 Tubería del freno

13 Tambor del freno

Series de 2 toneladas

1 Cubo del eje delantero

9 Fluido del freno

10 Tubería del freno

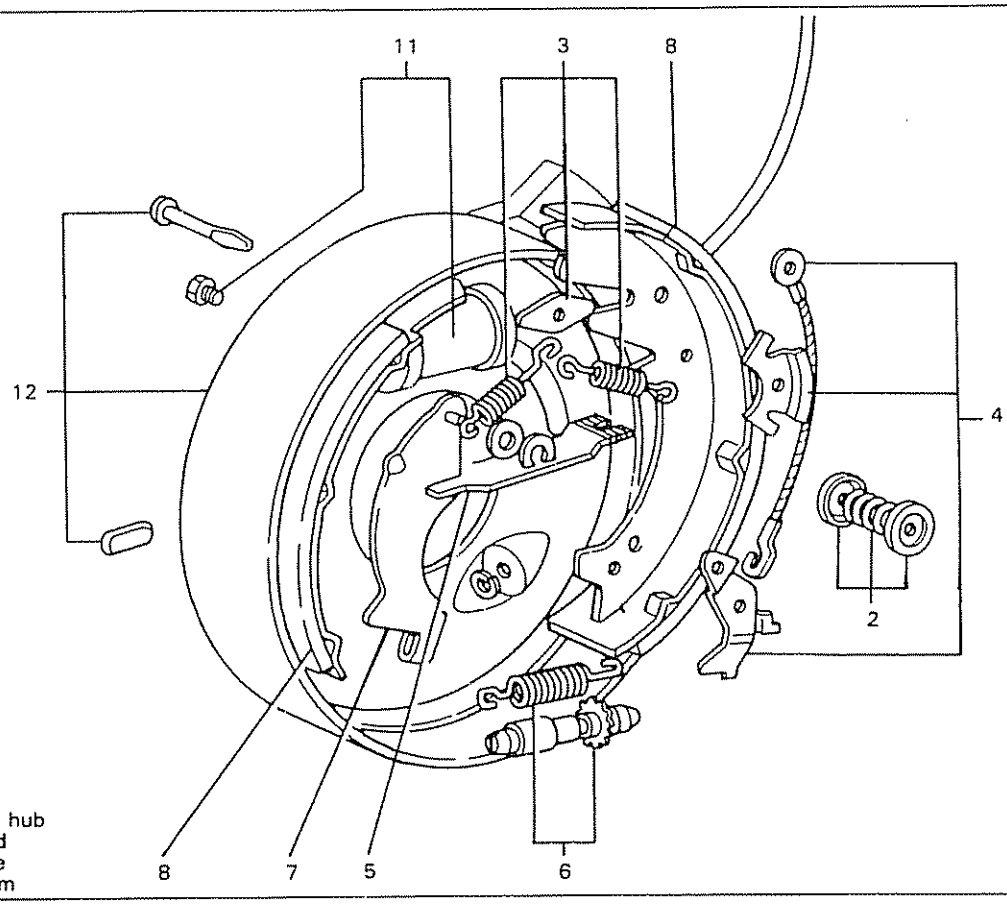
13 Tambor del freno

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FRONT BRAKE (1·2-TON SERIES)

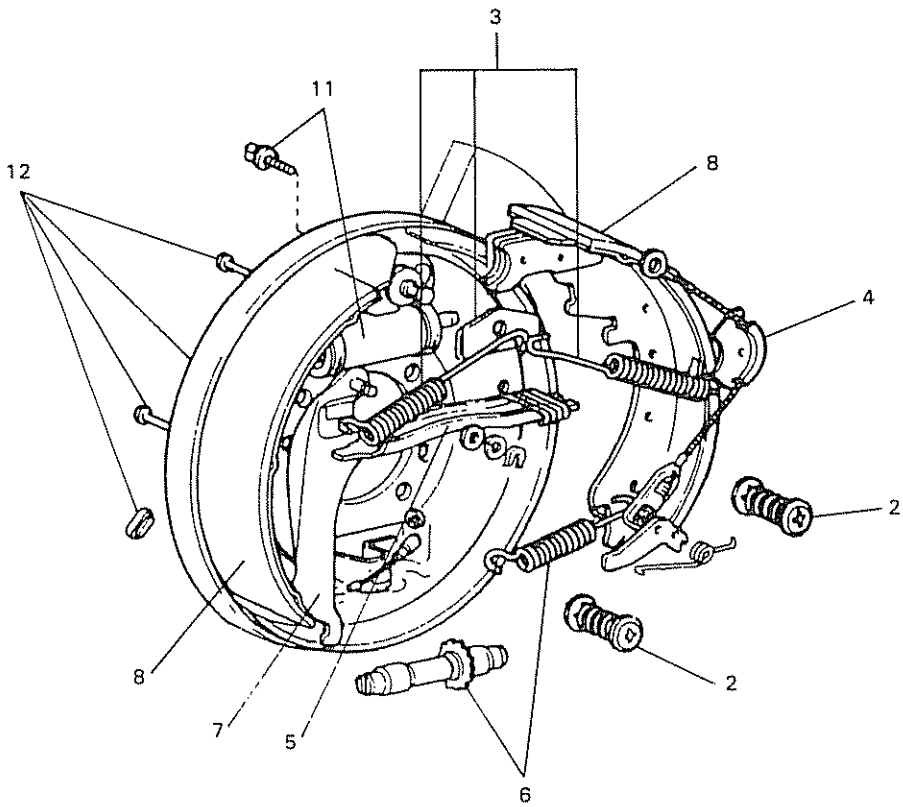
DISASSEMBLY·INSPECTION·REASSEMBLY

1-ton series



1 Front axle hub
9 Brake fluid
10 Brake pipe
13 Brake drum

2-ton series



1 Front axle hub
9 Brake fluid
10 Brake pipe
13 Brake drum

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Procedimiento de desmontaje

1 Saque el cubo del eje delantero. (Vea la página 9-11)

2 Saque el resorte de sujeción. [Punto 1]

3 Saque el resorte del anclaje a la zapata. [Punto 2]

4 Saque el cable y la guía del cable.

5 Saque la palanca del tirante. [Punto 3]

6 Saque el resorte del ajustador y el tornillo de ajuste. [Punto 4]

7 Desconecte el cable del freno de estacionamiento. [Punto 5]

8 Saque la zapata del freno. [Punto 6]

9 Drene el fluido del freno.

10 Desconecte la tubería del freno.

11 Saque el conjunto del cilindro de la rueda. [Punto 7]

12 Saque la contraplaca. [Punto 8]

13 Desconecte el tambor del freno del lado del cubo. [Punto 9]

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

Notas:

- Compruebe antes del remontaje que los forros del freno y las paredes interiores del tambor del freno no tienen grasa ni aceite.
- Antes de instalar el cubo con el tambor del freno, ajuste el diámetro exterior de la zapata del freno instalado a la dimensión siguiente (aprox. 1 mm menos que el diámetro interior del tambor del freno) apretando el tornillo de ajuste:
  Diámetro exterior de la zapata del freno instalado
  Series de 1 ton.: 253 mm
  Series de 2 ton.: 278,9 mm
- Cubra con apretador de roscas (08833-00070) las tuercas del tambor del freno antes de apretar (cuando el cubo y el tambor del freno se han desconectado).
- Purgue el aire del sistema de frenos antes del remontaje.
- Ajuste el rendimiento del freno después del remontaje. Para el ajuste, avance y retroceda el vehículo varias veces y apriete el pedal del freno cada vez.
- El par de apretamiento de cada parte es el siguiente:

Unidad: N.m (kgf-cm)

Tuerca de sujeción del tambor del freno (tuerca de sujeción del perno del cubo)	Series de 1 ton.:
	Series de 2 ton.:
Tuerca automática de seguridad de la contraplaca	
Perno de sujeción del cilindro de la rueda	Series de 1 ton.
	Series de 2 ton.

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Disassembly Procedure

1 Remove the front axle hub. (See page 9-11.)

2 Remove the holddown spring. **[Point 1]**

3 Remove the anchor-to-shoe spring. **[Point 2]**

4 Remove the cable and cable guide.

5 Remove the strut lever. **[Point 3]**

6 Remove the adjuster spring and adjusting screw. **[Point 4]**

7 Disconnect the parking brake cable. **[Point 5]**

8 Remove the brake shoe. **[Point 6]**

9 Drain the brake fluid.

10 Disconnect the brake pipe.

11 Remove the wheel cylinder ASSY. **[Point 7]**

12 Remove the backing plate. **[Point 8]**

13 Disconnect the brake drum from the hub. **[Point 9]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:

- **Check to see that the brake lining and brake drum interior wall are free from grease or oil before reassembly.**
- **Before installing the hub W/brake drum, adjust the installed brake shoe outside diameter to the following dimension (approx. 1 mm (0.039 in) smaller than the brake drum bore) by tightening the adjusting screw:**
  Installed brake shoe outside diameter
  1-ton series: 253 mm (9.96 in)
  2-ton series: 278.9 mm (10.180 in)
- **Coat thread tightener (08833-00070) on the brake drum set nuts before tightening (when the hub and brake drum have been disconnected).**
- **Bleed air from the brake system after reassembly.**
- **Adjust the brake performance after reassembly. For adjustment, make the vehicle travel in the forward and reverse directions repeatedly and depress the brake pedal each time.**
- **The tightening torque for each part is as follows:**

Unit: N·m (kgf-cm) [ft-lbf]

Brake drum set nut (hub bolt set nut)	1-ton series: 68.65 ~ 88.26 (700 ~ 900) [50.65 ~ 65.12] 2-ton sereis: 78.45 ~ 107.87 (800 ~ 1100) [57.90 ~ 79.59]
Backing plate self-lock nut	117.68 ~ 137.29 (1200 ~ 1400) [86.82 ~ 101.29]
Wheel cylinder set bolt	1-ton series: 7.85 ~ 11.77 (80 ~ 120) [5.79 ~ 8.68] 2-ton series: 17.65 ~ 26.48 (180 ~ 270) [13.02 ~ 19.53]

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Puntos de trabajo

[Punto 1]

Desmontaje/remontaje: SST 09510-31960-71

Inspección: Mida la longitud libre del resorte de sujeción.

Estándar
Series de 1 ton.: 25,7 mm
Series de 2 ton.: 35,9 mm
Límite
Series de 1 ton.: 23,0 mm
Series de 2 ton.: 33,2 mm

Remontaje: Cubra con sellador (08826-00080) la parte posterior de la contraplaca que va a estar en contacto con el resorte de sujeción de la zapata para eliminar cualquier holgura.

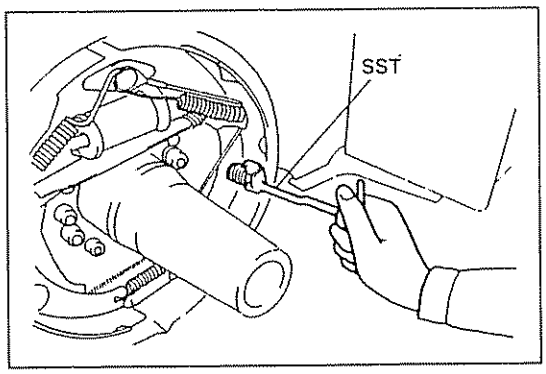
[Punto 2]

Desmontaje: SST 09717-20010

Inspección: Mida la longitud libre del resorte del anclaje a la zapata.

Estándar
Series de 1 ton.: 102 mm
Series de 2 ton.: 106 mm
Límite: Recambie el resorte si hay separación entre las espirales del resorte.

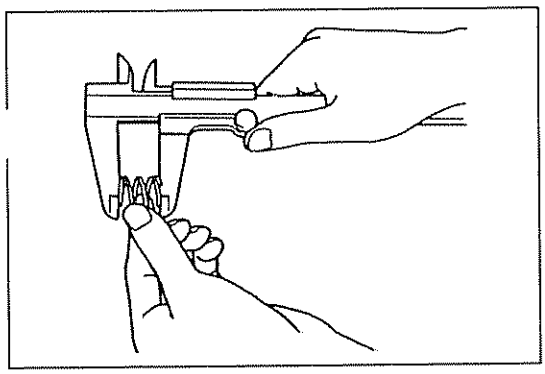
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Point Operations

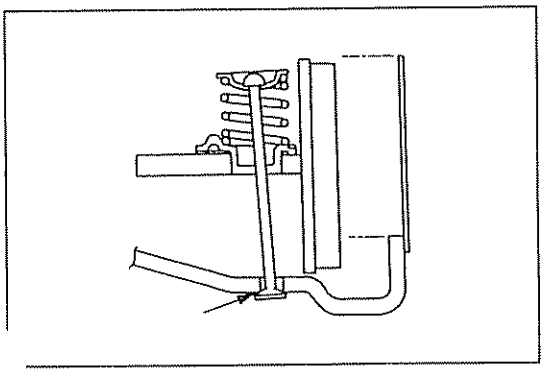
[Point 1]

Disassembly·Reassembly: SST 09510-31960-71



Inspection: Measure the free length of the holddown spring.

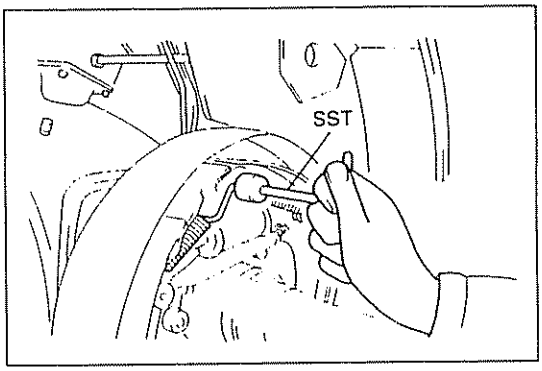
Standard
1-ton series: 25.7 mm (1.012 in)
2-ton series: 35.9 mm (1.412 in)
Limit
1-ton series: 23.0 mm (0.906 in)
2-ton series: 33.2 mm (1.307 in)

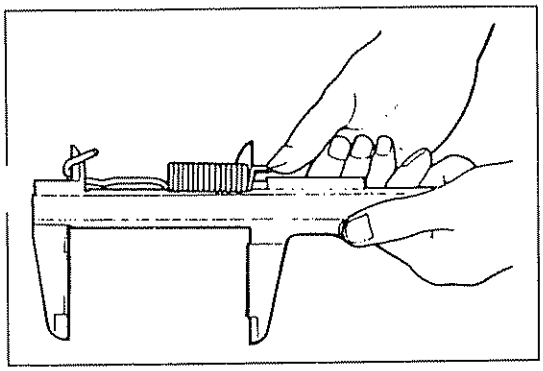


Reassembly: Coat sealant (08826-00080) on the rear side of the backing plate to be in contact with the shoe holddown spring to eliminate any clearance.

[Point 2]

Disassembly: SST 09717-20010





Inspection: Measure the free length of the anchor-to-shoe spring.

Standard
1-ton series: 102 mm (4.02 in)
2-ton series: 106 mm (4.17 in)
Limit: Replace the spring if there is a gap between coil turns.

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Remontaje: SST 09718-20010

[Punto 3]

Inspección: Mida la longitud libre del resorte del tirante a la zapata.

Estándar
  Series de 1 ton.: 20,0 mm
  Series de 2 ton.: 29,8 mm
Límite
  Series de 1 ton.: 17,0 mm
  Series de 2 ton.: 27,5 mm

[Punto 4]

Inspección: Mida la longitud libre del resorte del ajustador.

Estándar
  Series de 1 ton.: 79,0 mm
  Series de 2 ton.: 98,4 mm
Límite: Recambie el resorte si hay cualquier separación entre las espirales del resorte.

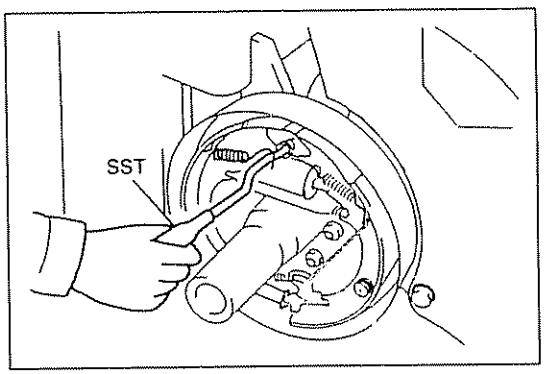
Remontaje: Aplique grasa a la parte roscada del tornillo de ajuste y rellene con grasa la tapa.

Remontaje: Ate un cable al extremo delantero del resorte del ajustador y tire del resorte con un destornillador para ajustar.

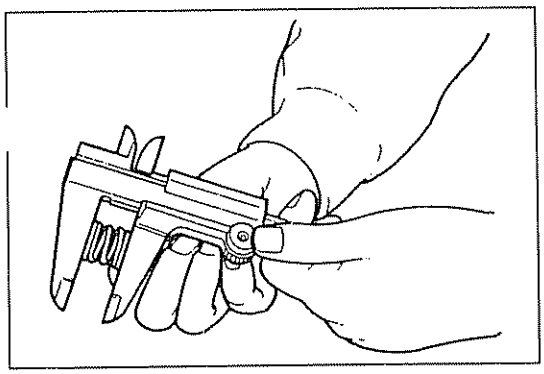
[Punto 5]

Remontaje: Cubra con sellador (08826-00080) el orificio del cable del freno de estacionamiento de la contraplaca para eliminar cualquier holgura.

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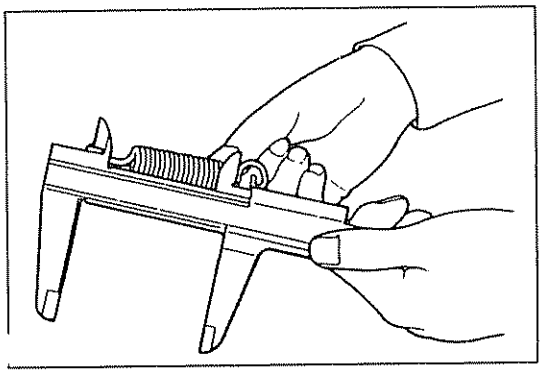
Reassembly: SST 09718-20010



[point 3]

Inspection: Measure the free length of the strut-to-shoe spring.

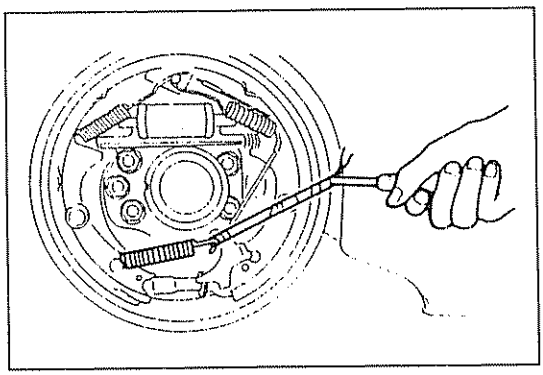
Standard
1-ton series: 20.0 mm (0.787 in)
2-ton series: 29.8 mm (1.173 in)
Limit
1-ton series: 17.0 mm (0.669 in)
2-ton series: 27.5 mm (1.083 in)



[Point 4]

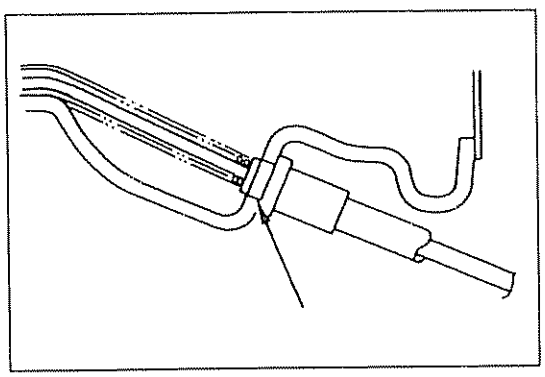
Inspection: Measure the free length of the adjuster spring.

Standard
1-ton series: 79.0 mm (3.11 in)
2-ton series: 98.4 mm (3.874 in)
Limit: Replace the spring if there is any gap between coil turns.



Reassembly: Apply grease to the threaded portion of the adjusting screw and fill grease in the cap.

Reassembly: Tie a wire at the front end of the adjuster spring and pull the spring with a screwdriver for setting.



[Point 5]

Reassembly: Coat sealant (08826-00080) on the parking brake cable outlet of the backing plate to eliminate any clearance.

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[Punto 6]

Inspección: Mida el grosor de los forros del freno.

Estándar
Series de 1 ton.: 4,9 mm
Series de 2 ton.: 5,1 mm
Límite
Series de 1 ton.: 1,0 mm
Series de 2 ton.: 1,0 mm

Remontaje: Cubra con grasa las posiciones ilustradas (6 lugares en contacto con la zapata y el aro además del pasador de anclaje) antes de montar la zapata del freno.

[Punto 7]

Inspección: Mida la holgura entre el cilindro de la rueda y el pistón.

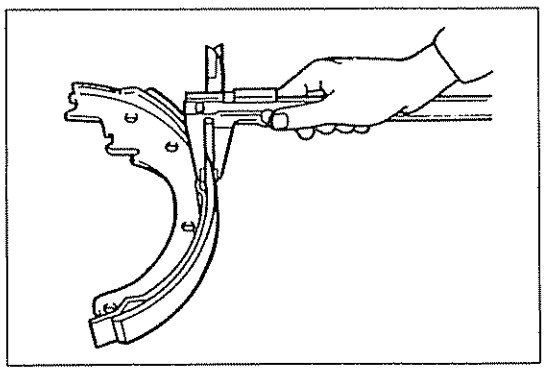
Límite: 0,125 mm

Remontaje: Cubra con sellador (08826-00080) la parte del cilindro de la rueda que se acopla a la contraplaca y todo alrededor de los pernos de sujeción para eliminar cualquier holgura.

[Punto 8]

Remontaje: Cubra con sellador (08826-00080) la contraplaca que va a estar en contacto con el soporte del eje delantero para eliminar cualquier holgura.

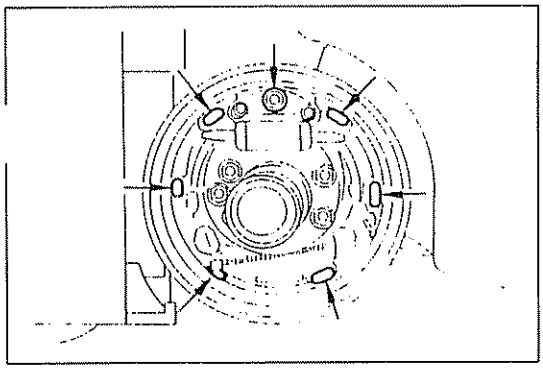
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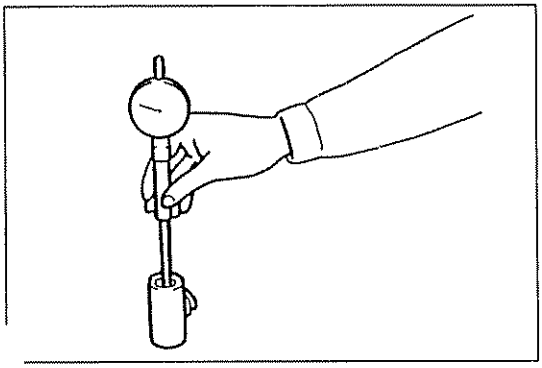
[Point 6]

Inspection: Measure the brake lining thickness.

Standard
1-ton series: 4.9 mm (0.193 in)
2-ton series: 5.1 mm (0.201 in)
Limit
1-ton series: 1.0 mm (0.04 in)
2-ton series: 1.0 mm (0.04 in)



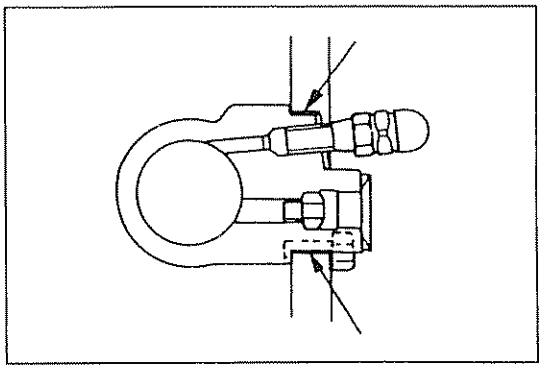
Reassembly: Coat grease on the illustrated positions (6 places in contact with the shoe and rim as well as the anchor pin) before assembling the brake shoe.



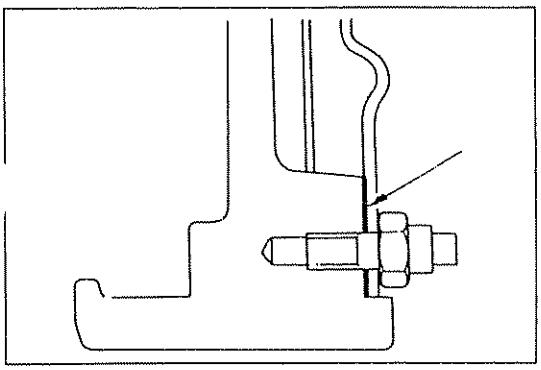
[Point 7]

Inspection: Measure the clearance between the wheel cylinder and piston.

Limit: 0.125 mm (0.00492 in)



Reassembly: Coat sealant (08826-00080) on the wheel cylinder portion to fit into the backing plate and all around the set bolts to eliminate any clearance.



[point 8]

Reassembly: Coat sealant (08826-00080) on the backing plate to be in contact with the front axle bracket to eliminate any clearance.

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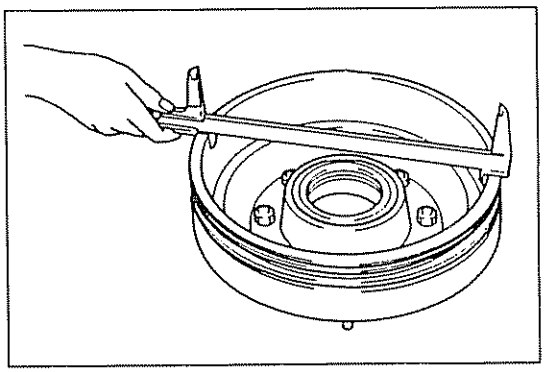
[Punto 9]

Inspección: Mida el diámetro interior del tambor del freno.

Estándar
- Series de 1 ton.: 254 mm
- Series de 2 ton.: 279,4 mm

Límite
- Series de 1 ton.: 256 mm
- Series de 2 ton.: 281,4 mm

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[Point 9]

Inspection: Measure the brake drum inside diameter.

Standard

1-ton series:	254.0 mm (10.00 in)
2-ton series:	279.4 mm (11.00 in)

Limit

1-ton series:	256.0 mm (10.08 in)
2-ton series:	281.4 mm (11.08 in)

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FRENO DELANTERO (SERIES DE 3 TON.)

DESMONTAJE/INSPECCION/REMONTAJE

1 Cubo del eje delantero
10 Fluido del freno
11 Tubería del freno
14 Tambor del freno

Procedimiento de desmontaje

1 Saque el cubo del eje delantero. (Vea la página 9-11)

2 Saque el resorte de sujeción. [Punto 1]

3 Saque el retén de la palanca de sujeción. [Punto 2]

4 Saque la palanca del trinquete.

5 Saque el resorte del anclaje a la zapata. [Punto 3]

6 Saque la palanca del tirante. [Punto 4]

7 Saque el resorte del ajustador y el tornillo de ajuste. [Punto 5]

8 Desconecte el cable del freno de estacionamiento. [Punto 6]

9 Saque la zapata del freno. [Punto 7]

10 Drene el fluido del freno.

11 Desconecte la tubería del freno.

12 Saque el conjunto del cilindro de la rueda. [Punto 8]

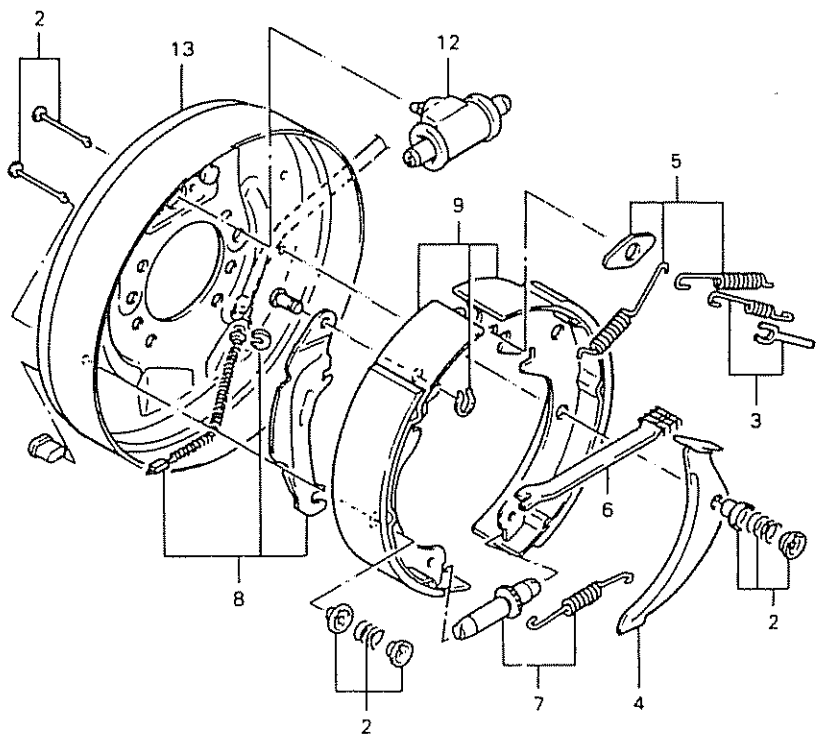
13 Saque la contraplaca. [Punto 9]

14 Desconecte el tambor del freno del lado del cubo. [Punto 10]

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FRONT BRAKE (3-TON SERIES)

DISASSEMBLY·INSPECTION·REASSEMBLY



1 Front axle hub
10 Brake fluid
11 Brake pipe
14 Brake drum

Disassembly Procedure

1 Remove the front axle hub. (See page 9-11.)

2 Remove the holddown spring. **[Point 1]**

3 Remove the hold lever stopper. **[Point 2]**

4 Remove the pole lever.

5 Remove the anchor-to-shoe spring. **[Point 3]**

6 Remove the strut lever. **[Point 4]**

7 Remove the adjuster spring and adjusting screw. **[Point 5]**

8 Disconnect the parking brake cable. **[Point 6]**

9 Remove the brake shoe. **[Point 7]**

10 Drain the brake fluid.

11 Disconnect the brake pipe.

12 Remove the wheel cylinder ASSY. **[Point 8]**

13 Remove the backing plate. **[Point 9]**

14 Disconnect the brake drum from the hub. **[Point 10]**

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Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.
Las etapas 2 y 3 del procedimiento de desmontaje, sin embargo, deberán invertirse en el procedimiento de remontaje. (En otras palabras, instale el retén de la palanca del trinquete después de instalar el resorte de sujeción)

Notas:

- Compruebe antes del remontaje que los forros del freno y las paredes interiores del tambor del freno no tienen grasa ni aceite.
- Antes de instalar el cubo con el tambor del freno, ajuste el diámetro exterior de la zapata del freno instalado a la dimensión siguiente (aprox. 1 mm menos que el diámetro interior del tambor del freno) apretando el tornillo de ajuste:
  Diámetro exterior de la zapata del freno instalado: 309 mm
- Cubra con apretador de roscas (08833-00070) las tuercas del tambor del freno antes de apretar (cuando el cubo y el tambor del freno se han desconectado).
- Purgue el aire del sistema de frenos antes del remontaje.
- Ajuste el rendimiento del freno después del remontaje. Para el ajuste, avance y retroceda el vehículo varias veces y apriete el pedal del freno cada vez.
- El par de apretamiento de cada parte es el siguiente:

Unidad: N.m (kgf-cm)

Tuerca de sujeción del tambor del freno (tuerca de sujeción del perno del cubo)	166,71 ~ 205,94 (1700 ~ 2100)
Tuerca automática de seguridad de la contraplaca	117,68 ~ 137,29 (1200 ~ 1400)
Perno de sujeción del cilindro de la rueda	14,71 ~ 19,61 (150 ~ 200)

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Puntos de trabajo

[Punto 1]

Desmontaje/remontaje: SST 09510-31960-71

Inspección: Mida la longitud libre del resorte de sujeción de la zapata.

Estándar: 31,3 mm
Límite: 28,2 mm

Remontaje: Cubra con sellador (08826-00080) la parte posterior de la contraplaca que va a estar en contacto con el pasador de sujeción de la zapata para eliminar cualquier holgura.

[Punto 2]

Inspección: Mida la longitud libre del resorte del actuador.

Estándar: 124,5 mm
Límite: Recambie el resorte si hay separación entre las espirales del resorte.

Remontaje: Use alicates de anillos de resorte e instale el retén de la palanca del trinquete y el resorte del actuador.

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Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.
Steps 2 and 3 in the disassembly procedure, however, should be reversed in the reassembly procedure. (In other word, install the pole lever stopper after installing the holddown spring.)

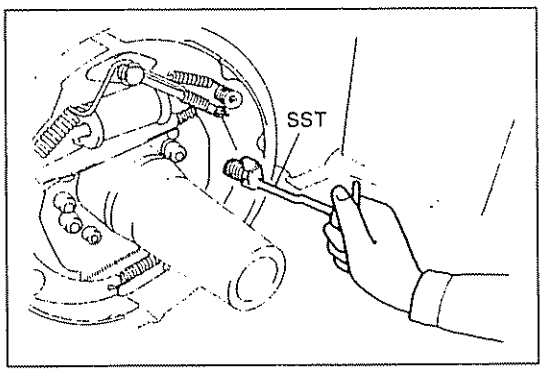
Note:

- **Check to see that the brake lining and brake drum interior wall are free from grease or oil before reassembly.**
- **Before installing the hub W/brake drum, adjust the installed brake shoe outside diameter to the following dimension (approx. 1 mm (0.039 in) smaller than the brake drum inside diameter) by tightening the adjusting screw:**
  Installed brake shoe outside diameter: 309 mm (12.17 in)
- **Coat thread tightener (08833-00070) on the brake drum set nuts before tightening (when the hub and brake drum have been disconnected).**
- **Bleed air from the brake system after reassembly.**
- **Adjust the brake performance after reassembly. For adjustment, make the vehicle travel in the forward and reverse directions repeatedly and depress the brake pedal each time.**
- **The tightening torque for each part is as follows:**

Unit: N·m (kgf-cm) [ft-lbf]

Brake drum set nut (hub bolt set nut)	166.71 ~ 205.94 (1700 ~ 2100) [23.00 ~ 151]
Backing plate self-lock nut	117.68 ~ 137.29 (1200 ~ 1400) [86.82 ~ 101.29]
Wheel cylinder set bolt	14.71 ~ 19.61 (150 ~ 200) [10.85 ~ 14.47]

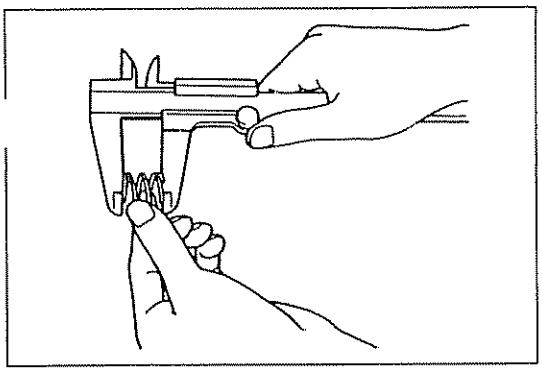
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Point Operations

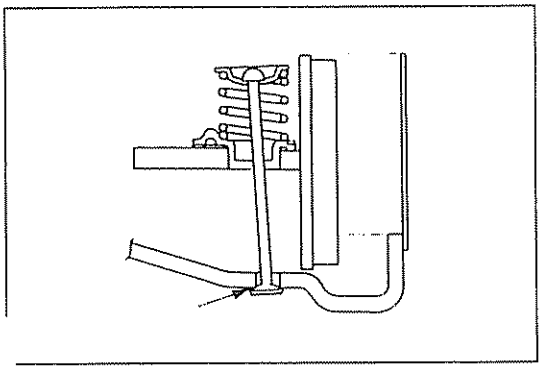
[Point 1]

Disassembly·Reassembly: SST 09510-31960-71

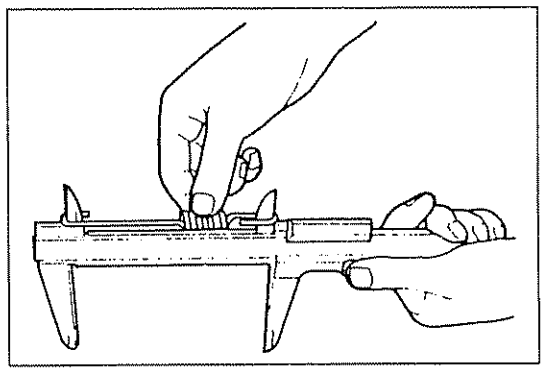


Inspection: Measure the free length of the shoe holddown spring.

Standard: 31.3 mm (1.232 in)
Limit: 28.2 mm (1.110 in)



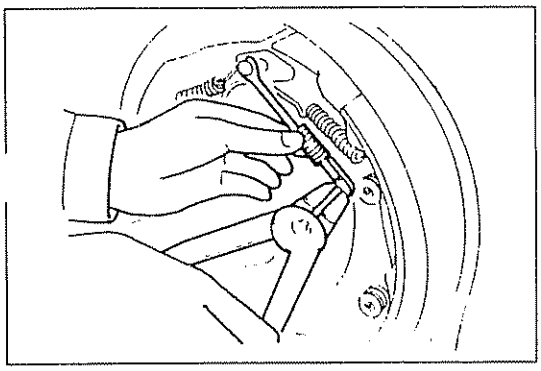
Reassembly: Coat sealant (08826-00080) on the rear side of the backing plate to be in contact with the shoe holddown pin to eliminate any clearance.



[Point 2]

Inspection: Measure the free length of the actuator spring.

Standard: 124.5 mm (4.902 in)
Limit: Replace the spring if there is any clearance between coil turns.



Reassembly: Use snap ring pliers and install the pole lever stopper and actuator spring.

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[Punto 3]

Desmontaje: SST 09717-20010

Inspección: Mida la longitud libre del resorte del anclaje a la zapata.

Estándar: 106 mm
Límite: Recambie el resorte si hay separación entre las espirales del resorte.

Remontaje: SST 09718-20010

[Punto 4]

Inspección: Mida la longitud libre del resorte del tirante a la zapata.

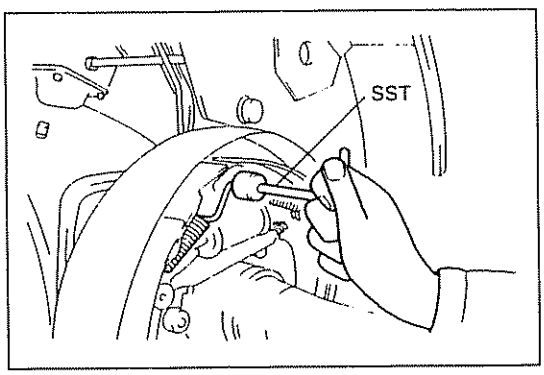
Estándar: 23 mm
Límite: 20 mm

[Punto 5]

Inspección: Mida la longitud libre del resorte del ajustador.

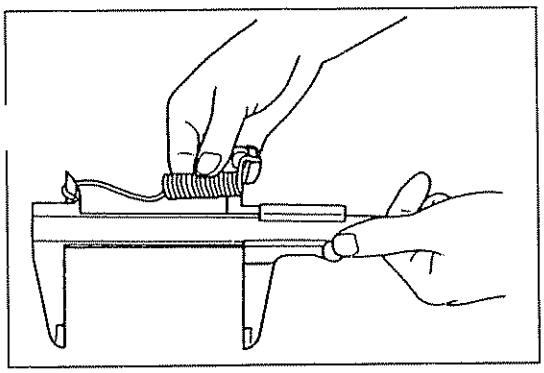
Estándar: 86 mm
Límite: Recambie el resorte si hay separación entre las espirales del resorte.

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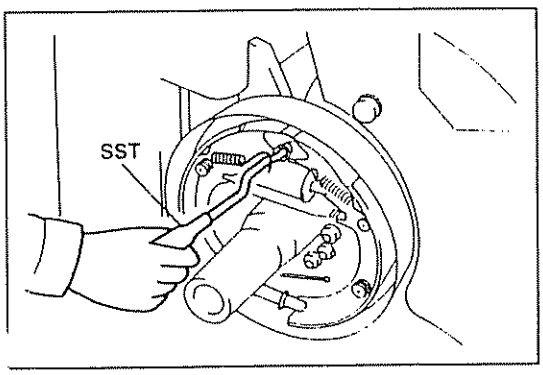
[Point 3]

Disassembly: SST 09717-20010

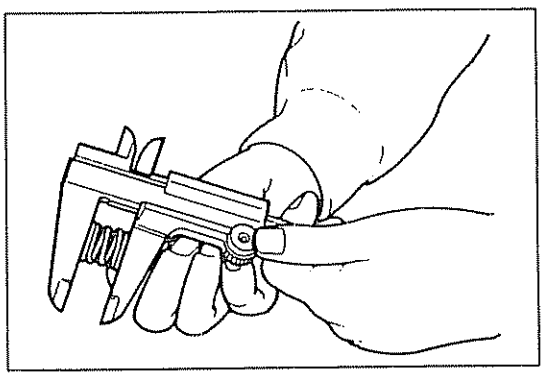


Inspection: Measure the free length of the anchor-to-shoe spring.

Standard: 106 mm (4.17 in)
Limit: Replace the spring when there is a clearance between coil turns.



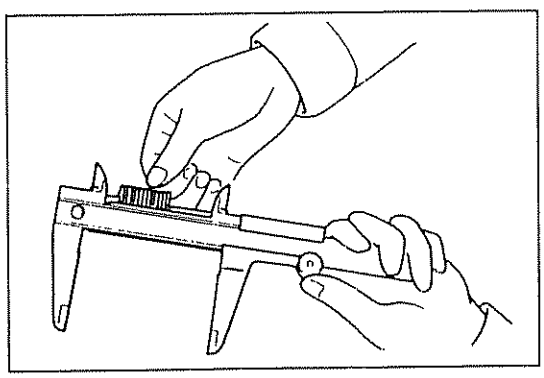
Reassembly: SST 09718-20010



[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: Replace the spring when there is a clearance between coil turns.

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Remontaje: Cubra con grasa a la parte roscada del tornillo de ajuste y rellene con grasa la tapa.

[Punto 6]

Remontaje: Cubra con sellador (08826-00080) el orificio del cable del freno de estacionamiento de la contraplaca para eliminar cualquier holgura.

[Punto 7]

Inspección: Mida el grosor de los forros del freno.

Estándar: 7,0 mm
Límite: 2,0 mm

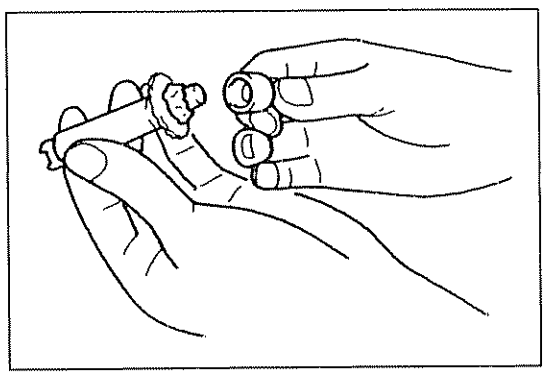
Remontaje: Cubra con grasa las posiciones ilustradas de la contraplaca (6 lugares en contacto con la zapata y el aro además del pasador de anclaje) antes de montar la zapata del freno.

[Punto 8]

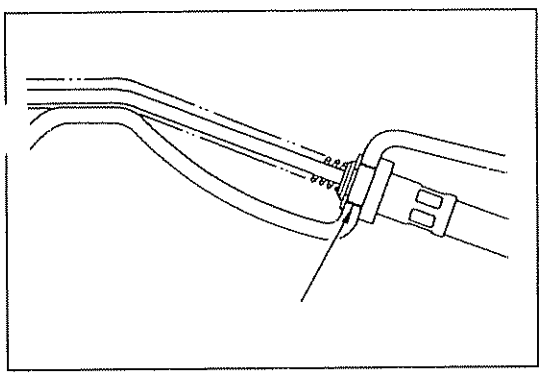
Inspección: Mida la holgura entre el cilindro de la rueda y el pistón.

Límite: 0,145 mm

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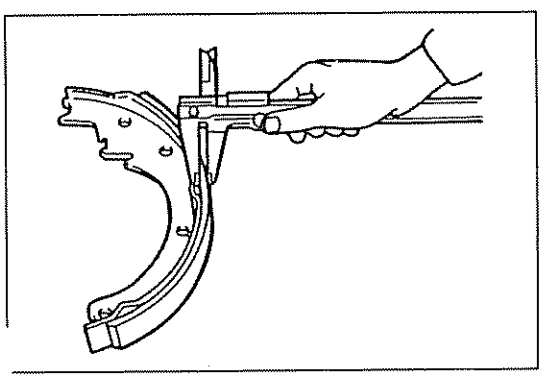


Reassembly: Coat grease on the adjusting screw threaded portion and fill grease in the cap.



[Point 6]

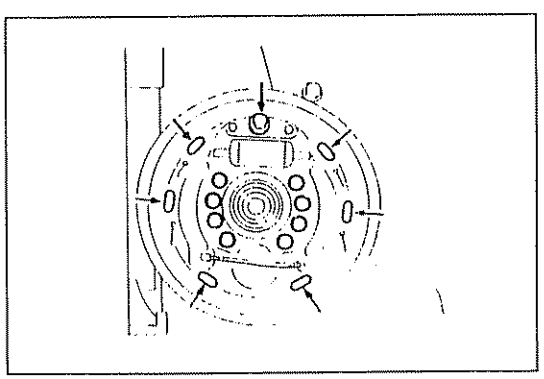
Reassembly: Coat sealant (08826-00080) on the parking cable outlet of the backing plate to eliminate any clearance.



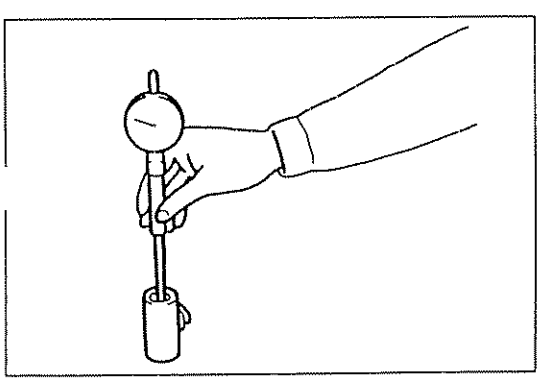
[Point 7]

Inspection: Measure the brake lining thickness.

Standard: 7.0 mm (0.276 in)
Limit: 2.0 mm (0.079 in)



Reassembly: Coat grease on the illustrated portions (6 places in contact with the shoe as well as the anchor pin) of the backing plate before brake shoe reassembly.



[Point 8]

Inspection: Measure the clearance between the wheel cylinder and piston.

Limit: 0.145 mm (0.00571 in)

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Remontaje: Cubra con sellador (08826-00080) la parte del cilindro de la rueda que se acopla a la contraplaca y todo alrededor de los pernos de sujeción para eliminar cualquier holgura.

[Punto 9]

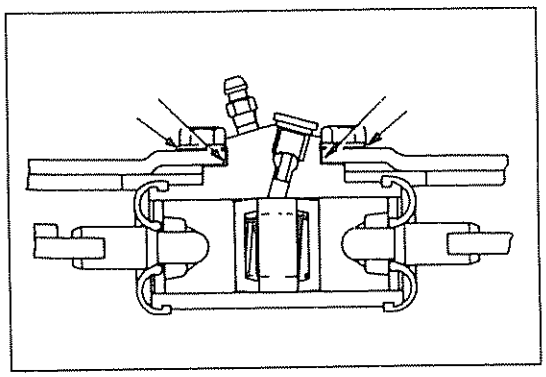
Remontaje: Cubra con sellador (08826-00080) la contraplaca que va a estar en contacto con el soporte del eje delantero para eliminar cualquier holgura.

[Punto 10]

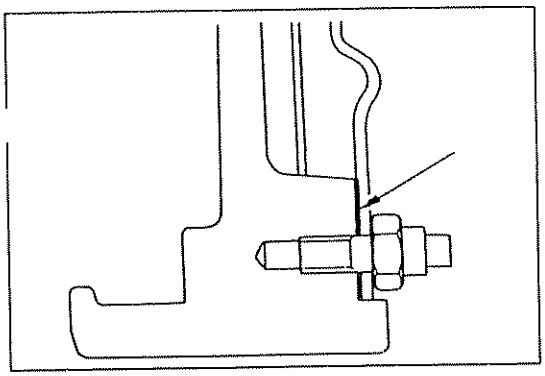
Inspección: Mida el diámetro interior del tambor del freno.

Estándar: 310 mm
Límite: 312 mm

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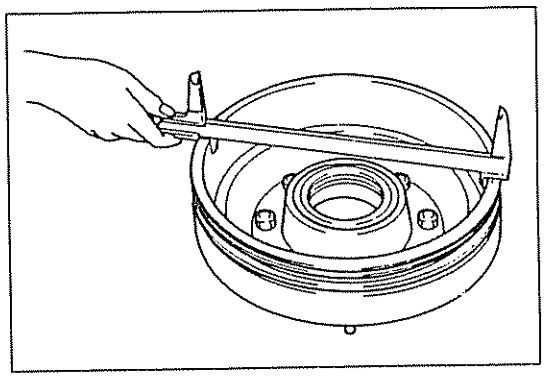


Reassembly: Coat sealant (08826-00080) on the wheel cylinder to fit to the backing plate and all around the set bolt to eliminate any clearance.



[Point 9]

Reassembly: Coat sealant (08826-00080) on the backing plate surface to be in contact with the front axle bracket to eliminate any clearance.



[Point 10]

Inspection: Measure the brake drum inside diameter.

Standard: 310 mm (12.20 in)
Limit: 312 mm (12.28 in)

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PURGA DE AIRE DEL SISTEMA DE FRENOS

Nota:
Mientras purga el aire del sistema de frenos, añada fluido del freno para que el nivel del fluido del depósito de reserva sea suficiente.

1. Purgue el aire del cilindro maestro del freno.
   (1) Bombee el pedal del freno varias veces para comprimir el aire en las tuberías y manténgalo apretado.

   (2) Afloje el tapón respirador para probar el aire de las tuberías con el fluido del freno, y apriete el tapón inmediatamente en cuanto se detenga el flujo de fluido.

   (3) Repita las etapas (1) y (2) anteriores hasta que no haya ninguna burbuja de aire en el aceite descargado.

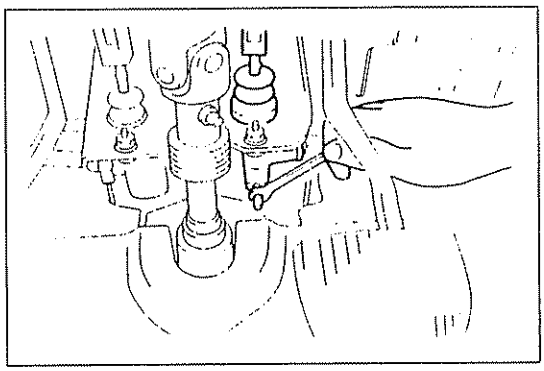
2. Purgue el aire de los cilindros de la rueda derecho e izquierdo.
   (1) Lleve a cabo la misma operación de la purga de aire que en el 1 anterior para cada uno de los cilindros derecho e izquierdo a la vez.

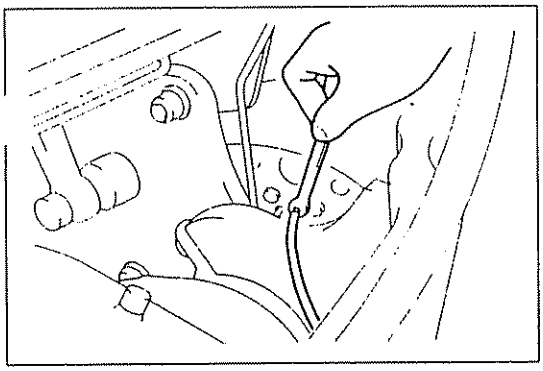
3. Añada fluido del freno hasta el nivel especificado.
   (1) Añada fluido del freno a través del filtro provisto en el depósito de reserva.

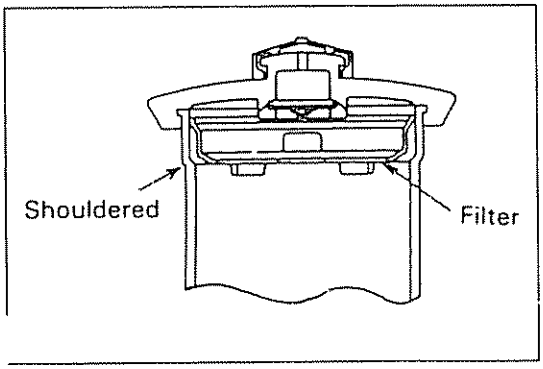
   (2) Añada fluido del freno en la parte saliente del depósito de reserva.

*Fig. Saliente Filtro

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BRAKE AIR BLEEDING

Note:
While bleeding air from the brake system, add brake fluid so as not to let the fluid level in the reservoir tank insufficient.

1. Bleed air from the brake master cylinder.
   (1) Pump the brake pedal several times to compress the air in the piping and hold it depressed.

   (2) Loosen the breather plug to bleed the air in the piping with the brake fluid, and tighten the plug immediately before the fluid flow stops.

   (3) Repeat steps (1) and (2) above until no air bubble is seen in the discharged oil.

2. Bleed air from the wheel cylinders RH and LH.
   (1) Perform air bleeding in the same way as in 1 above for each of the cylinders RH and LH 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 to the shouldered portion of the reservoir tank.

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INSPECCION/AJUSTE DE LA FUERZA DE FRENADO

1. Inspeccione la fuerza de frenado usando un probador de frenos o mediante la prueba de marcha.

   Distancia de frenado (sin carga)

		Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Velocidad inicial de frenado	km/h	16,0	17,0	15,0
Distancia de frenado	m	5,0 o menos	-	-

2. Ajuste la fuerza de frenado.
   (1) Repita el avance y retroceso y ajuste la holgura de la zapata del freno. El tornillo de ajuste automáticamente realiza el ajuste cuando se aprieta el pedal del freno marchando hacia atrás.

   (2) Si la fuerza de frenado es insuficiente, saque e inspeccione el tambor del freno porque la razón puede ser mal funcionamiento del ajustador, defecto de contacto de los forros, adhesión de materia extraña en los forros o filtraciones del fluido del freno.

   (3) Cuando se recambia la zapata del freno por una nueva, repita el avance y retroceso para que se adapte.

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BRAKING FORCE INSPECTION·ADJUSTMENT

1. Inspect the braking force by means of a brake tester or a traveling test.

Braking Distance (No Load)

	1-ton series	2-ton series	3-ton series
Initial speed of braking km/h (mph)	16.0 (9.93)	17.0 (10.56)	15.0 (9.32)
Braking distance m (in)	5.0 (19.7) or less	←	←

2. Adjust the braking force.
   (1) Repeat traveling in the forward and reverse directions and adjust the brake shoe clearance. The adjusting screw makes automatic adjustment when the brake pedal is depressed in reverse traveling.

   (2) If the braking force is insufficient,remove and inspect the brake drum because adjuster malfunction, lining contact defect, foreign matter adhesion on lining or brake fluid leakage may be the reason.

   (3) When the brake shoe is replaced with a new one, repeat traveling in the forward and backward directions for breaking in.

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CILINDRO MAESTRO

REMOCION/INSTALACION

Procedimiento de remoción

1 Desconecte la tubería del freno del lado del depósito de reserva y drene el fluido del freno.

2 Saque el tablero del piso y el panel instrumental.

3 Desconecte las tuberías.

4 Saque el pasador de horquilla de la varilla de empuje.

5 Saque el cilindro maestro del freno.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

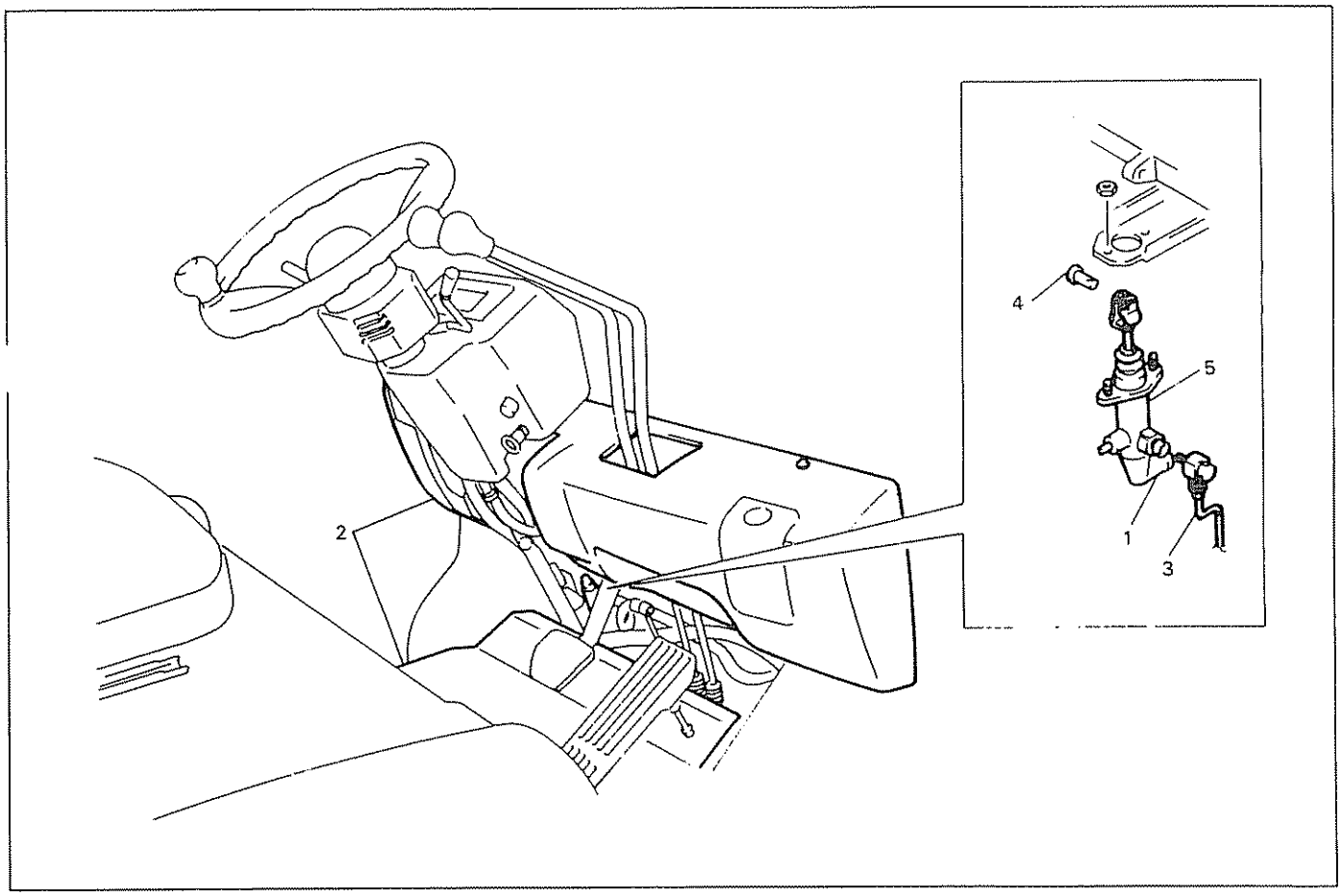
Notas:

- Vea la parte de ajuste del pedal freno (en la página 10-31) en cuanto al ajuste después de la instalación.
- Lleve a cabo la purga de aire (vea la página 10-24).

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MASTER CYLINDER

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the brake side hose from the reservoir tank and drain brake fluid.

2 Remove the toe board and instrument panel.

3 Disconnect the piping.

4 Remove the push rod clevis pin.

5 Remove the brake master cylinder.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **See the brake pedal adjustment section (on page10-31) for the adjustment after installation.**
- **Perform air bleeding (by referring to page 10-24).**

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DESMONTAJE/INSPECCION/REMONTAJE

T = N.m (kgf-cm)

Procedimiento de desmontaje

1 Dele la vuelta al guardapolvo, saque el anillo de resorte y después la varilla de empuje. [Punto 1]

2 Saque el pistón.

3 Saque el recodo de admisión del fluido. [Punto 2]

4 Saque el tapón de salida y la válvula.

Procedimiento de remontaje

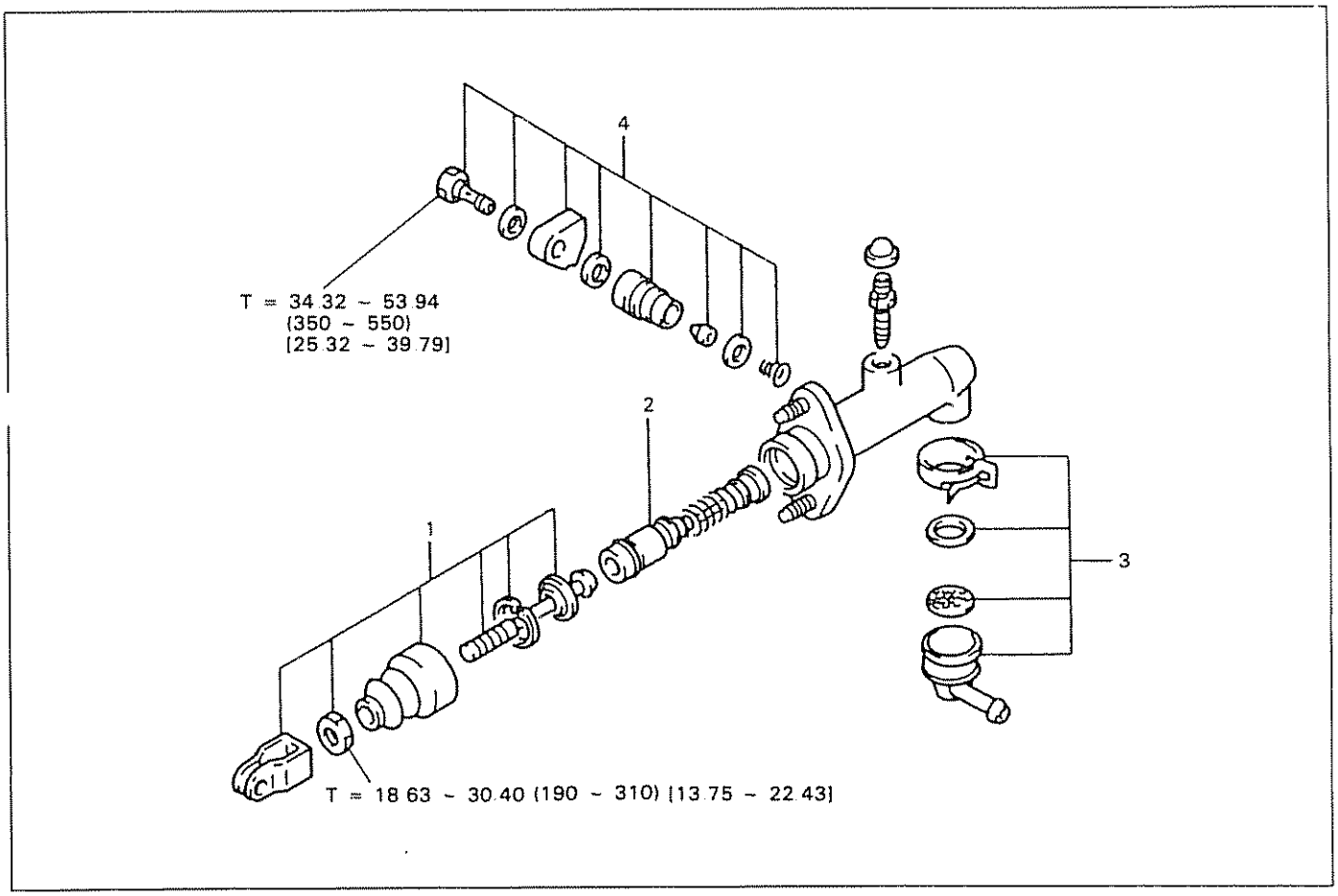
El procedimiento de remontaje es el inverso al del desmontaje.

Nota:
Cubra con grasa de caucho la taza del pistón antes del remontaje.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Turn the boot up, remove the snap ring and remove the push rod. **[Point 1]**

2 Remove the piston.

3 Remove the fluid inlet elbow. **[Point 2]**

4 Remove the outlet plug and valve.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Coat rubber grease on the piston cup before reassembly.

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Puntos de trabajo

[Punto 1]

Remontaje: Ajuste temporalmente la longitud de la varilla de empuje a la dimensión de la ilustración, y ajústela después de la instalación.

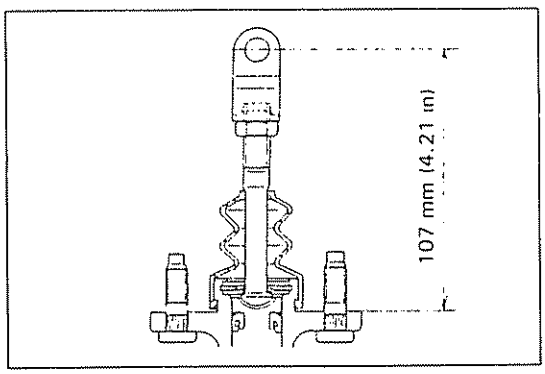
Valor de referencia: 107 mm

[Punto 2]

Inspección: Compruebe el filtro por si está taponado.

* Fig. Filtro

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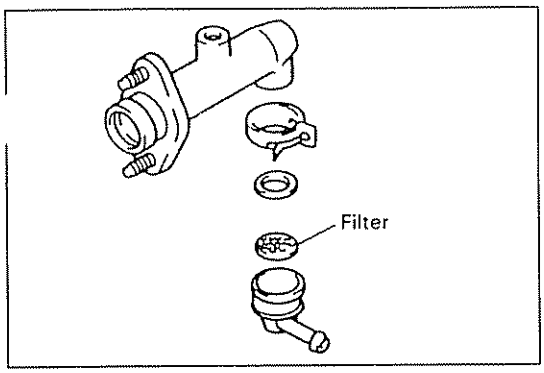


Point Operations

[Point 1]

Reassembly: Temporarily set the push rod length to the illustrated dimension, and adjust it after installation.

Reference value: 107 mm (4.21 in)



[Point 2]

Inspection: Check the filter for clogging.

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FRENO DE ESTACIONAMIENTO

REMOCION/INSTALACION

Procedimiento de remoción

1 Saque la parte izquierda del panel instrumental.

2 Saque el tablero del piso.

3 Afloje la tuerca de seguridad de la varilla de tracción del freno de estacionamiento.

4 Saque el conjunto de la palanca del freno de estacionamiento.

5 Saque el compensador.

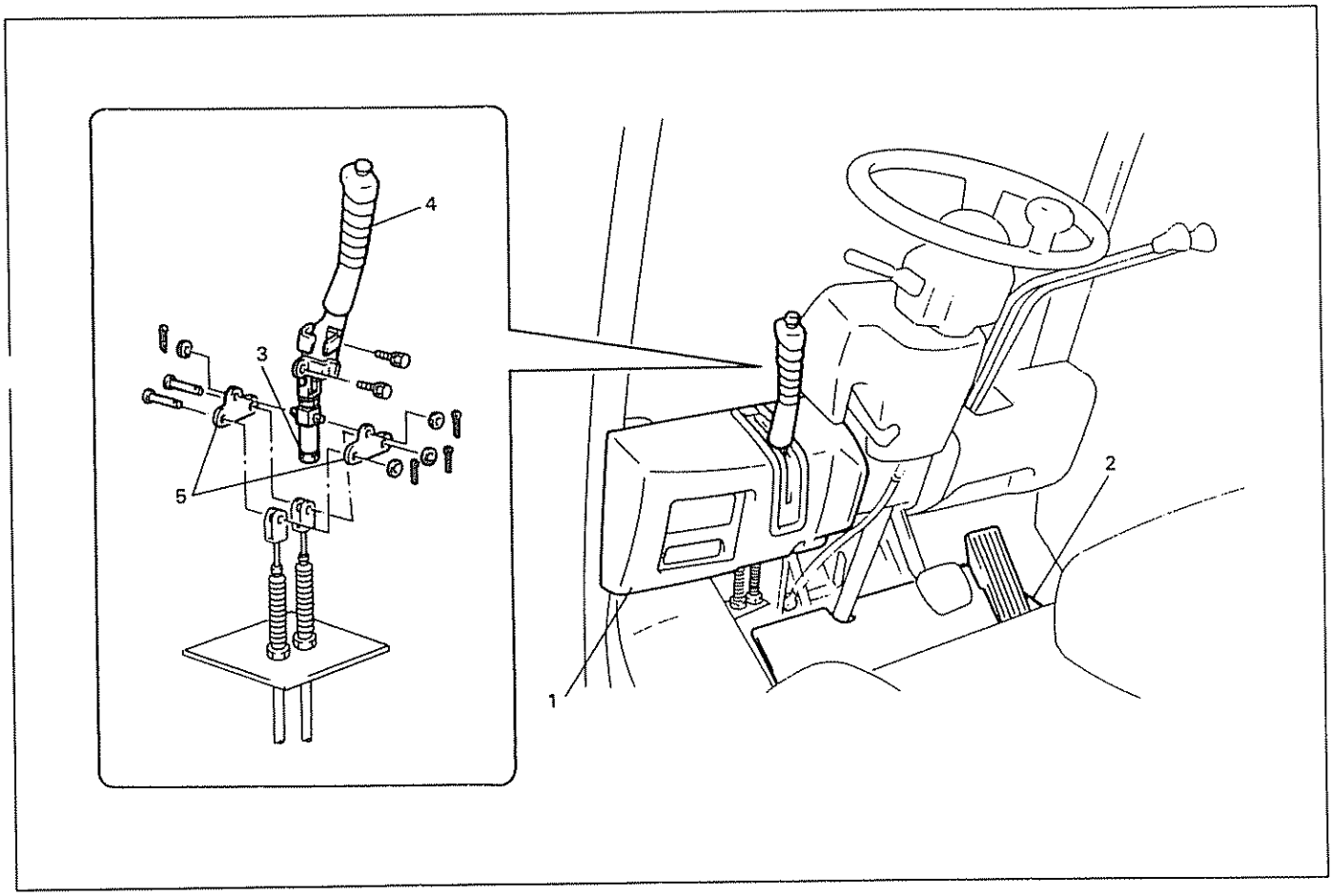
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

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PARKING BRAKE

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the instrument panel LH.

2 Remove the toe board.

3 Loosen the parking brake pull rod lock nut.

4 Remove the parking brake lever ASSY.

5 Remove the equalizer.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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1. Cubra con grasa MP la parte A en la posición ilustrada.

2. Apriete la tuerca de seguridad en la parte B de la ilustración al par especificado.
   T = 0,147 ~ 0,216 N.m (1,5 ~ 2,2 kgf-cm)

3. Ajuste la dimensión C de la ilustración a 13 ~ 14 mm.

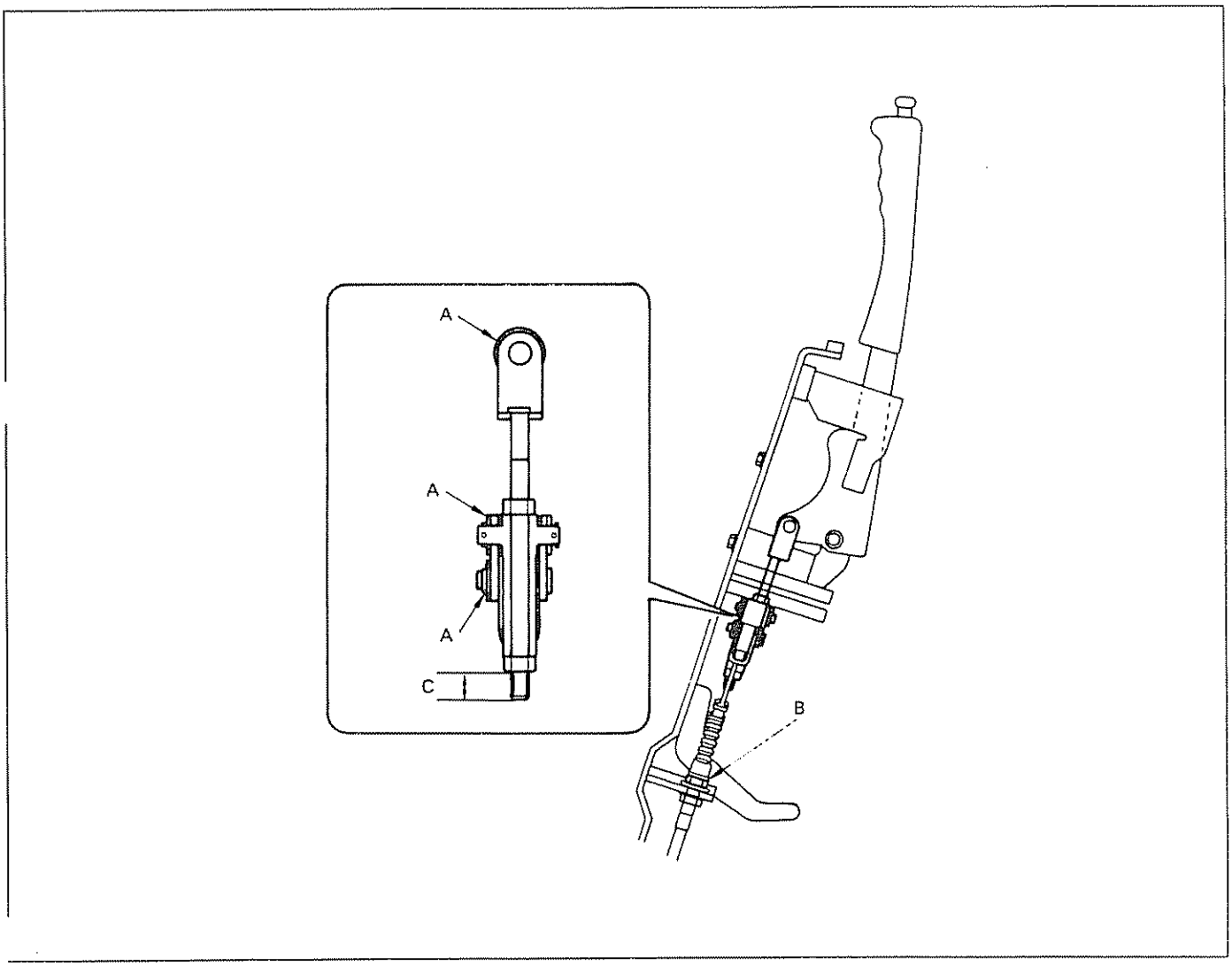
Ajuste

1. Ajuste la longitud de la varilla de tal manera que el trinquete engrane con la quinta o sexta muesca del sector cuando la fuerza de funcionamiento de la palanca de estacionamiento en la posición ilustrada es de 147 N (15 kgf).

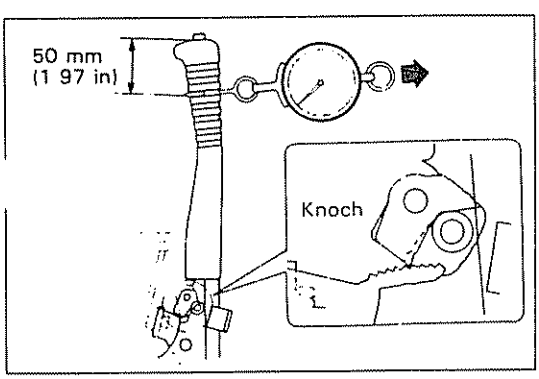
*Fig. Muesca

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NOTES FOR MAINTENANCE



1. Coat MP grease on portion A in the illustrated position.
2. Tighten the lock nut at portion B in the illustration to the specified torque.
   T = 0.147 ~ 0.216 N·m (1.5 ~ 2.2 kgf-cm) [11.3 ~ 15.9 ft-lbf]
3. Set dimension C in the illustration to 13 ~ 14 mm (0.51 ~ 0.55 in).

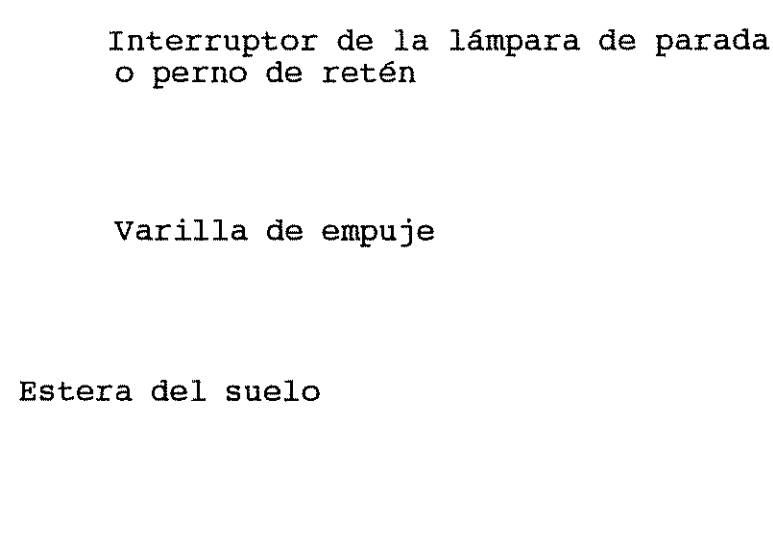


ADJUSTMENT

1. Adjust the rod length so that the pawl is in mesh with the 6 to 8th notch of the sector when the operating force of the parking lever at the illustrated position is 147 N (15 kgf) [33 lbf].

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AJUSTE DEL PEDAL DEL FRENO



1. Ajuste la altura y el juego del pedal del freno.
   (1) Ajuste el interruptor de la lámpara de parada o la longitud del perno de retén (dimensión C) para que la altura del pedal del freno (dimensión A o B) satisfaga el estándar siguiente.

   (2) Ajuste la longitud de la varilla de empuje para que el juego del pedal del freno (dimensión D) satisfaga el valor siguiente.

   (3) Compruebe que la altura del pedal por encima del suelo (dimensión E) satisface el valor siguiente.

Unidad: mm

A	B	C Referencia	D	E
133-138	138-143	20	5-10	60 o más

A: Dimensión sin relleno
B: Dimensión con relleno
C: Valor de referencia
D: Juego del pedal correspondiente al juego de la varilla de empuje (G)
E: Altura del pedal por encima del suelo (con relleno)

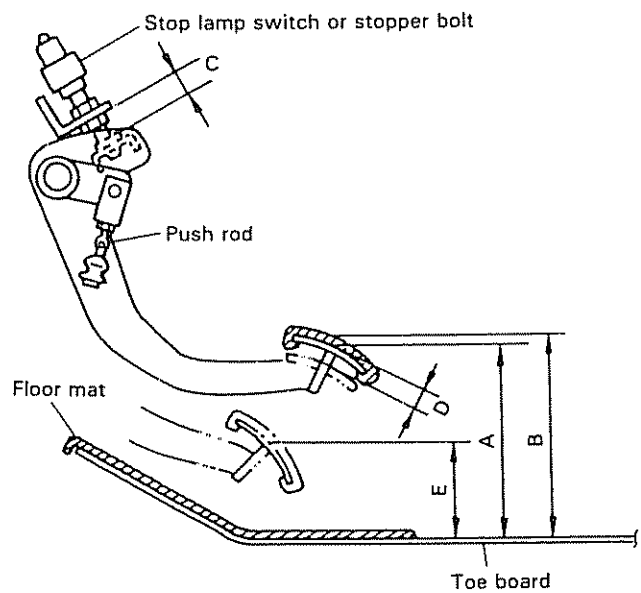
Juego de la varilla empuje Unidad: mm

G
1 - 2

Nota:
Siempre deberá haber juego de la varilla de empuje (G).

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BRAKE PEDAL ADJUSTMENT



1. Adjust the brake pedal height and play.
   (1) Adjust the stop lamp switch or stopper bolt length (dimension C) so that the brake pedal height (dimension A or B) satisfies the value shown below.

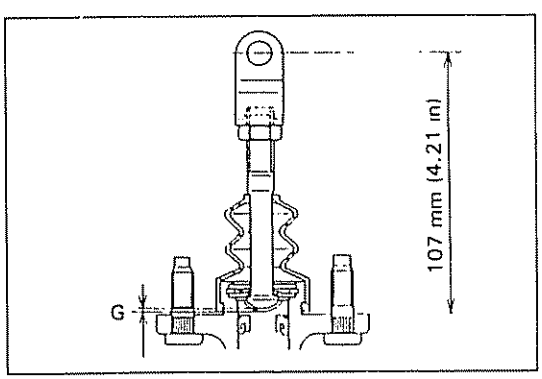
   (2) Adjust the push rod length so that the brake pedal play (dimension D) satisfies the value shown below.

   (3) Check the pedal height above the floor (dimension E) satisfies the value below.

Unit: mm (in)

A	B	C Reference	D	E
133 ~ 138 (5.24 ~ 5.43)	138 ~ 143 (5.43 ~ 5.63)	20 (0.79)	5 ~ 10 (0.20 ~ 0.39)	60 (2.36) or more

A: Dimension without pad
B: Dimension with pad
C: Reference value
D: Pedal play corresponding to the push rod play (G)
E: Pedal height above the floor (with pad)



Push rod play

Unit: mm (in)

G
1 ~ 2 (0.04 ~ 0.08)

Note: Always provide the push rod play (G).

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CARROCERIA

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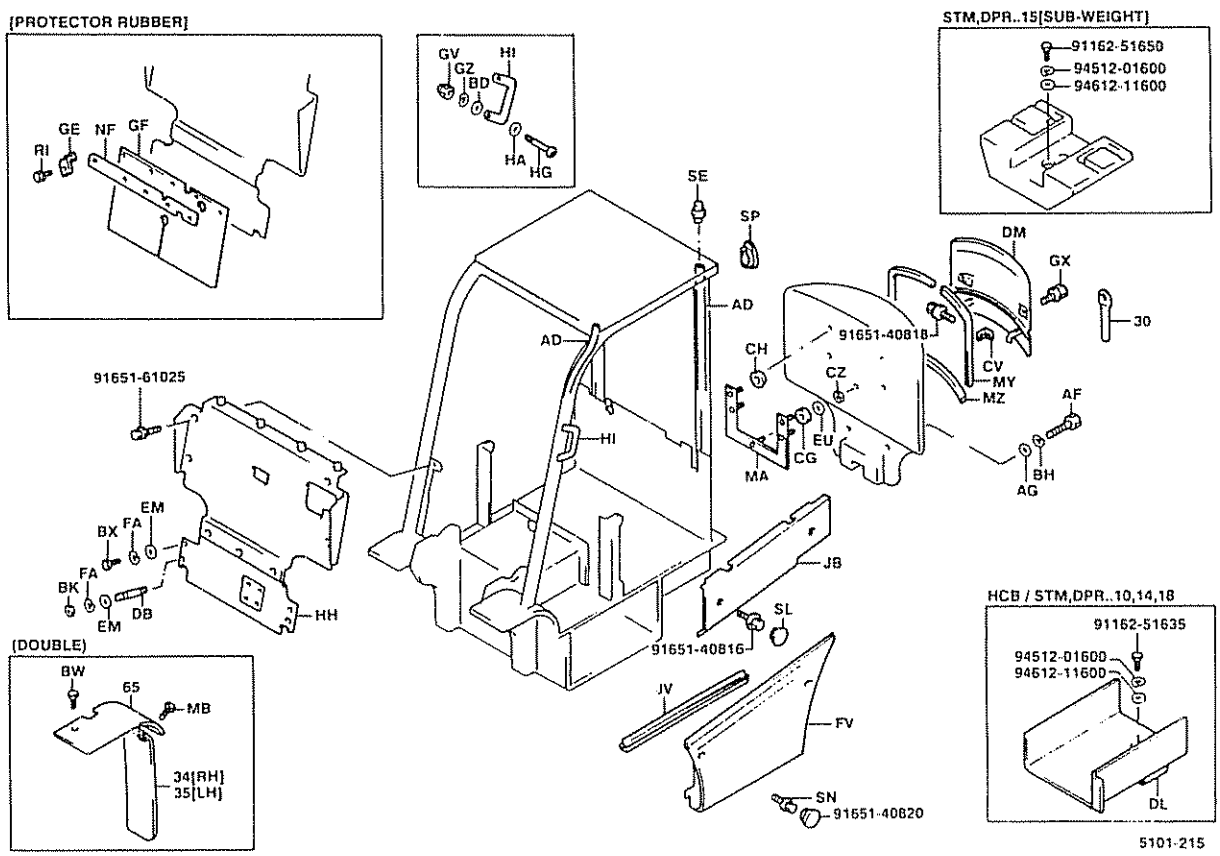
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COMPONENTES

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COMPONENTS

5101

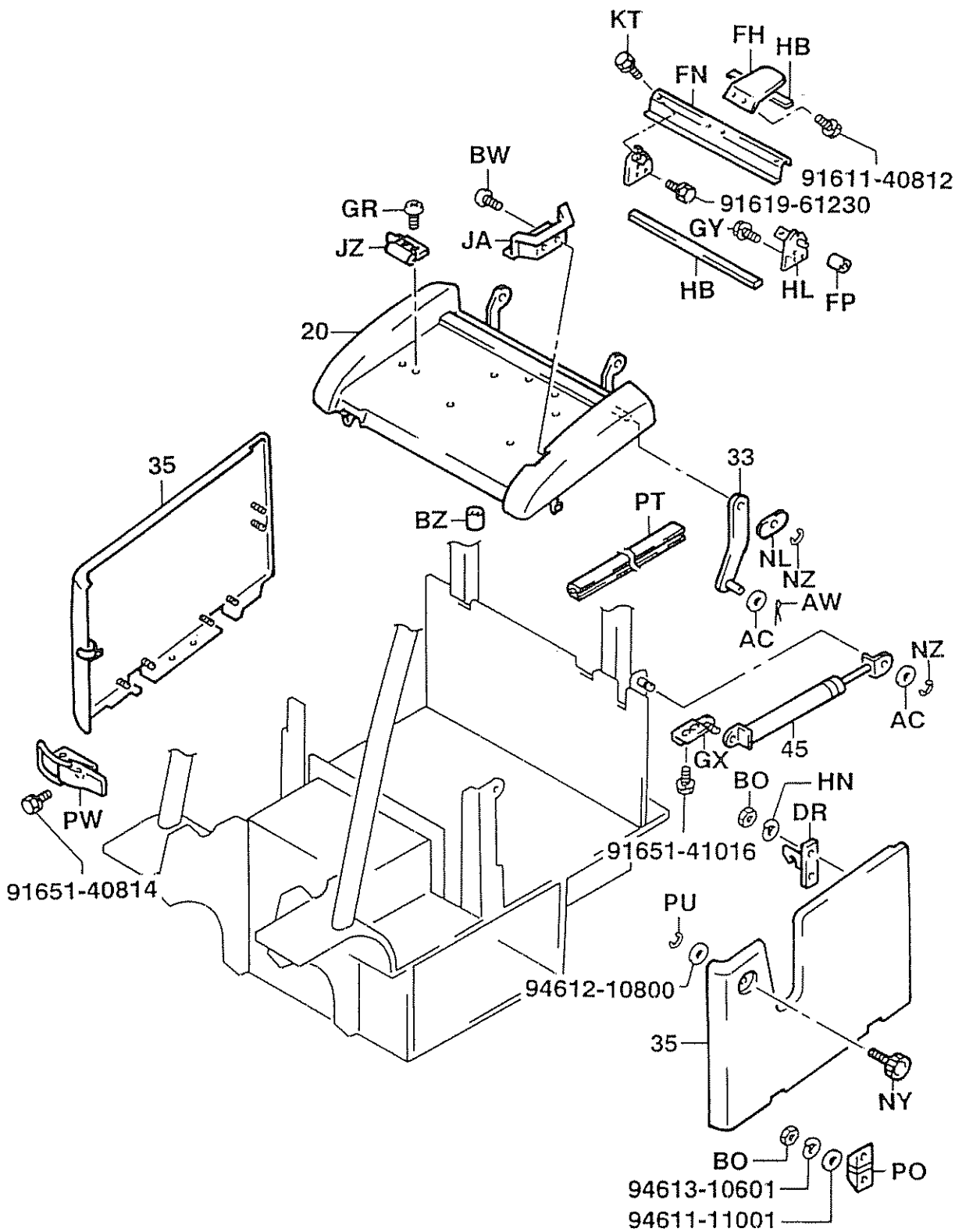


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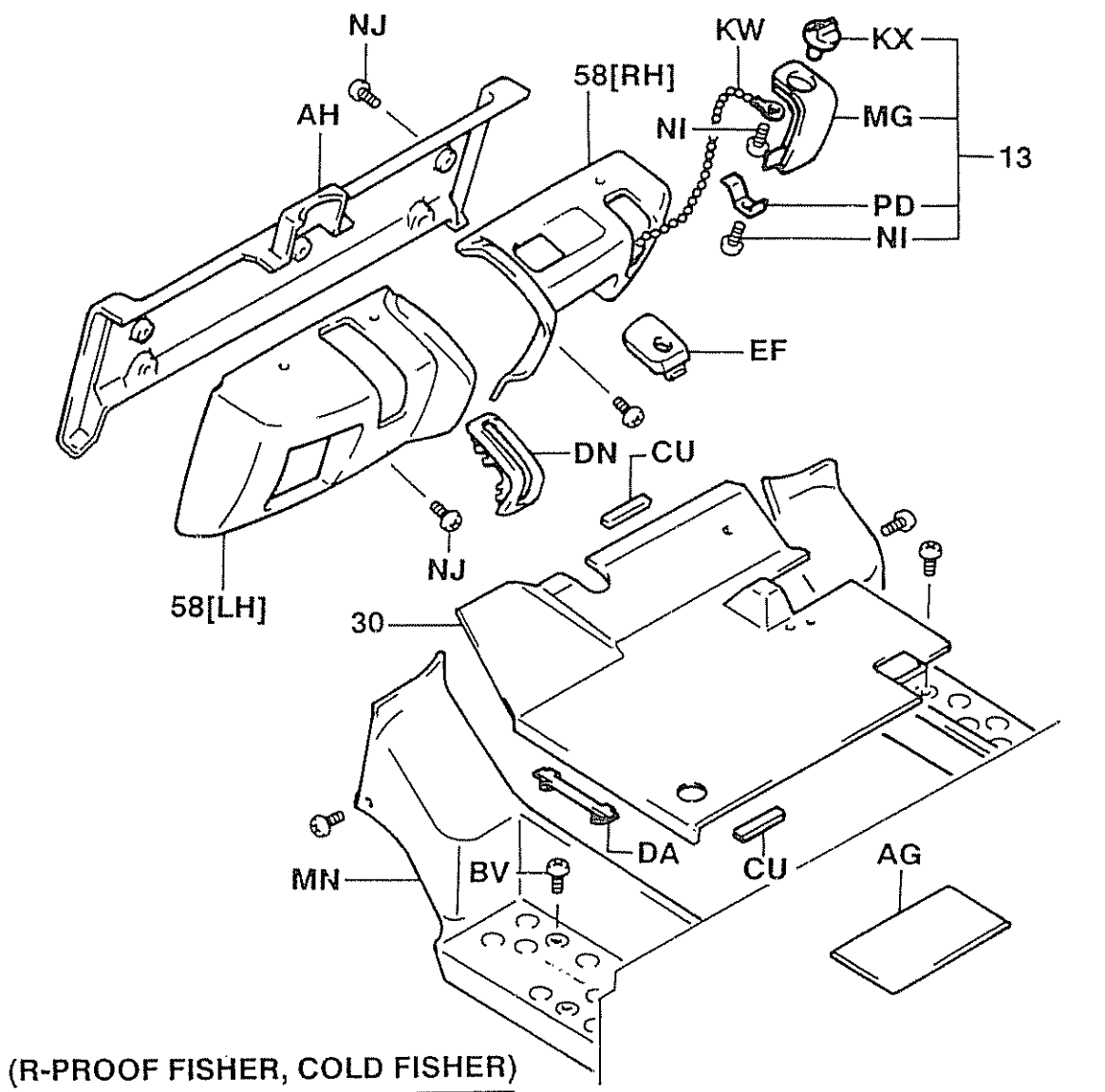


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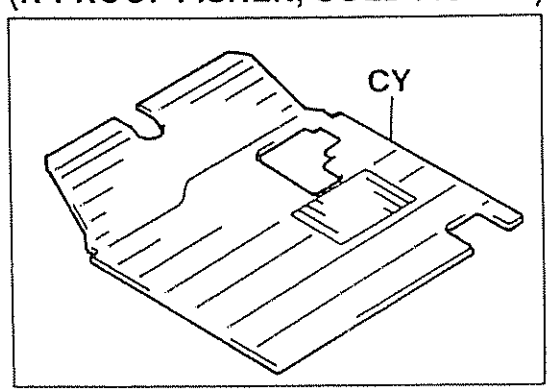
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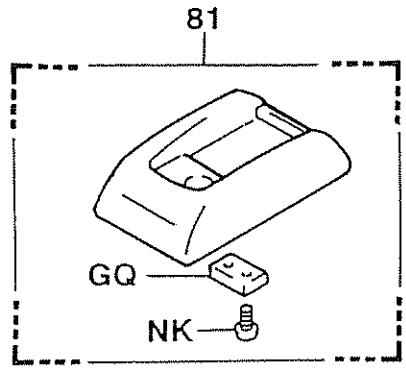
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5301



(R-PROOF FISHER, COLD FISHER)



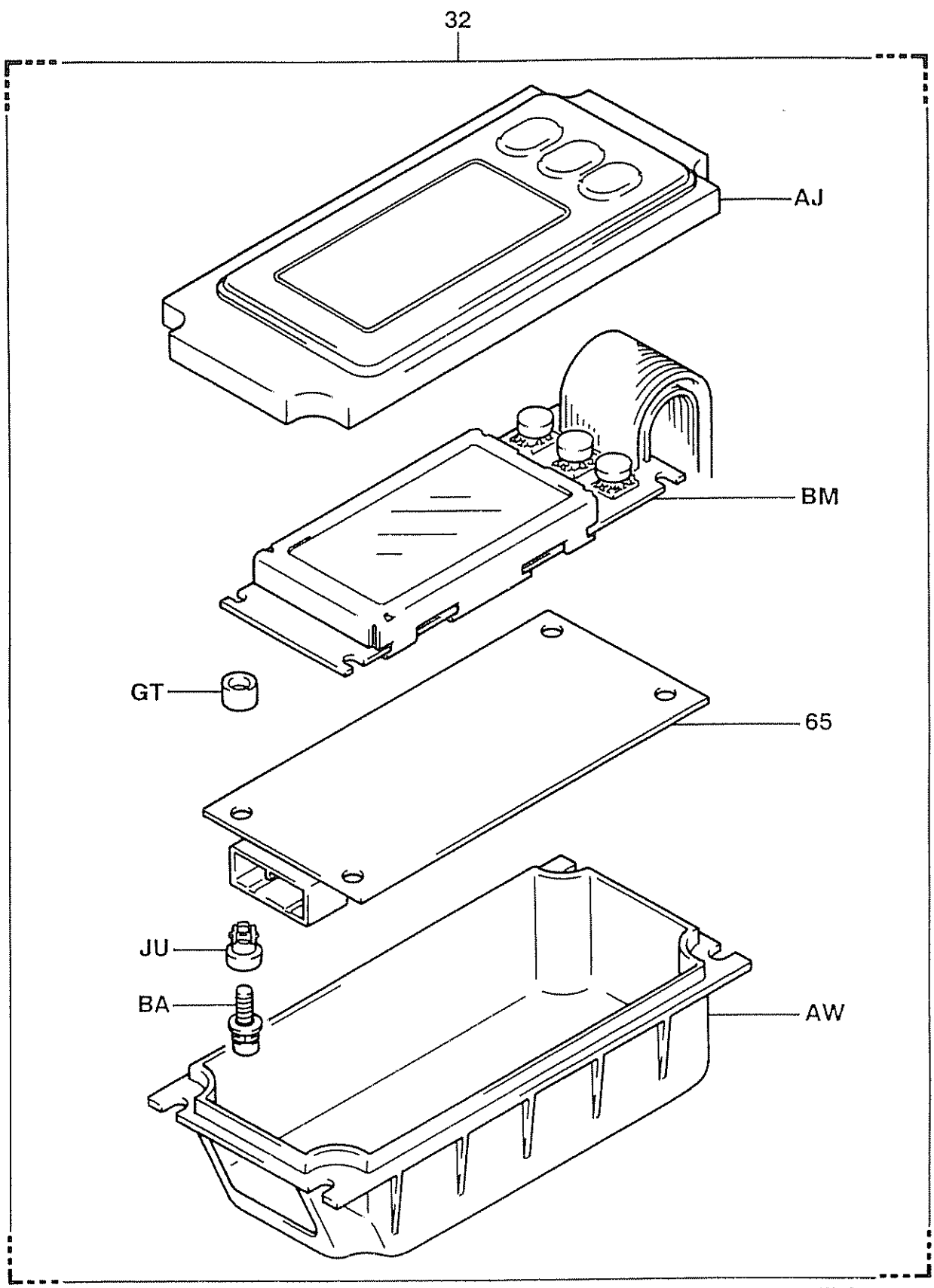


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5702



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CAPO DE LA BATERIA

REMOCION/INSTALACION

Procedimiento de remoción

1 Tire de la palanca de desenganche de la dirección regulable e incline el volante de dirección hacia adelante.

2 Saque la cubierta superior trasera.

3 Saque el enganche de la tapa de la batería.

4 Saque el soporte de la tapa de la batería y el amortiguador de este capó.

5 Saque el soporte de la tapa de la batería.

6 Saque la tapa de la batería.

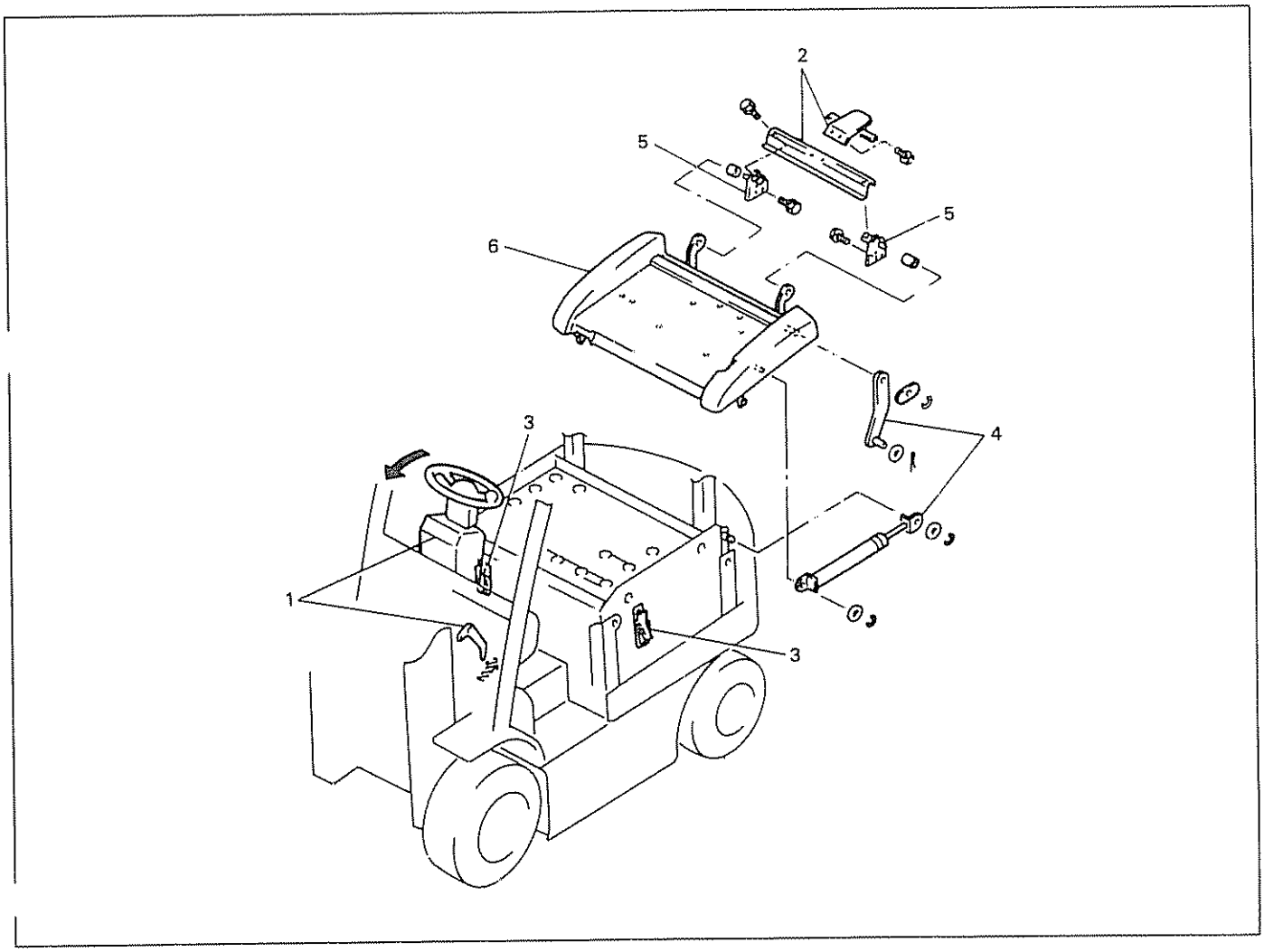
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

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BATTERY HOOD

REMOVAL·INSTALLATION



Removal Procedure

1 Pull the tilt steering release lever and tilt the steering wheel forward.

2 Remove the rear upper cover.

3 Release the battery food catch.

4 Remove the battery hood stay and battery hood damper.

5 Remove the battery hood bracket.

6 Remove the battery hood.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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CONTRAPESO

REMOCION/INSTALACION

Procedimiento de remoción

1 Saque la cubierta superior trasera.

2 Saque la cubierta del regulador.

3 Desconecte el cableado del regulador.

4 Saque el conjunto del regulador.

5 Levante temporalmente el contrapeso usando cables.

6 Saque los pernos de sujeción del contrapeso.

7 Saque el contrapeso.

Procedimiento de instalación

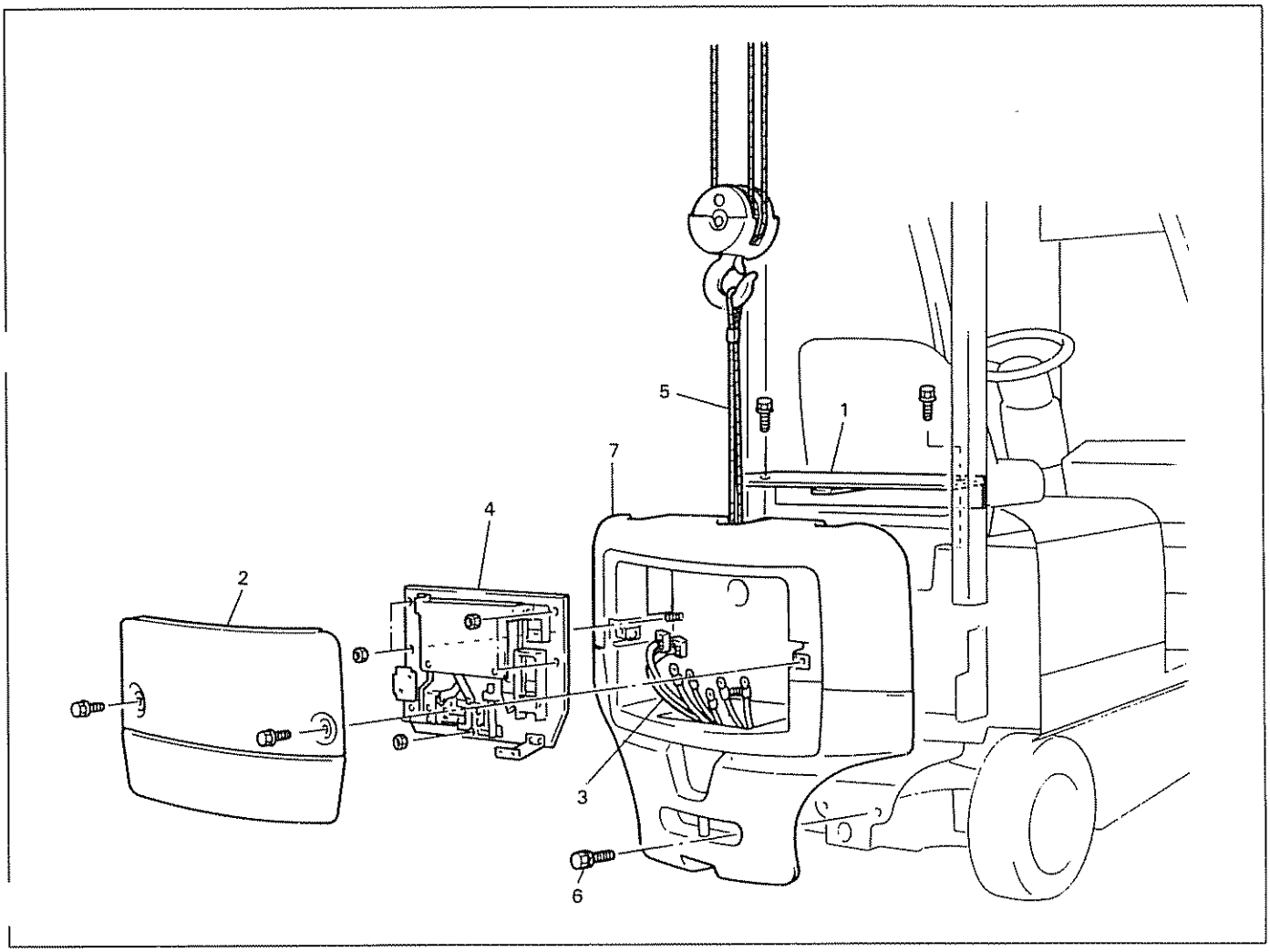
El procedimiento de instalación es el inverso al de remoción.

Nota:
Vea la página 0-15 en cuanto al peso del contrapeso.

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COUNTERWEIGHT

REMOVAL•INSTALLATION



Removal Procedure

1 Remove the rear upper cover.

2 Remove the controller cover.

3 Disconnect the controller wiring.

4 Remove the controller ASSY.

5 Temporarily hoist the counterweight using a wire rope.

6 Remove the counterweight set bolts.

7 Remove the counterweight.

,stallation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
See page 0-15 for the weight of the counterweight.

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SISTEMA DE MANIPULACION DE MATERIALES

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MATERIAL HANDLING SYSTEM

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GENERALIDADES

Cilindro de elevación

Válvula de control de aceite

Depósito de aceite

Filtro de retorno

Filtro de succión

Cilindro de basculación

Motor de la bomba

Bomba de aceite

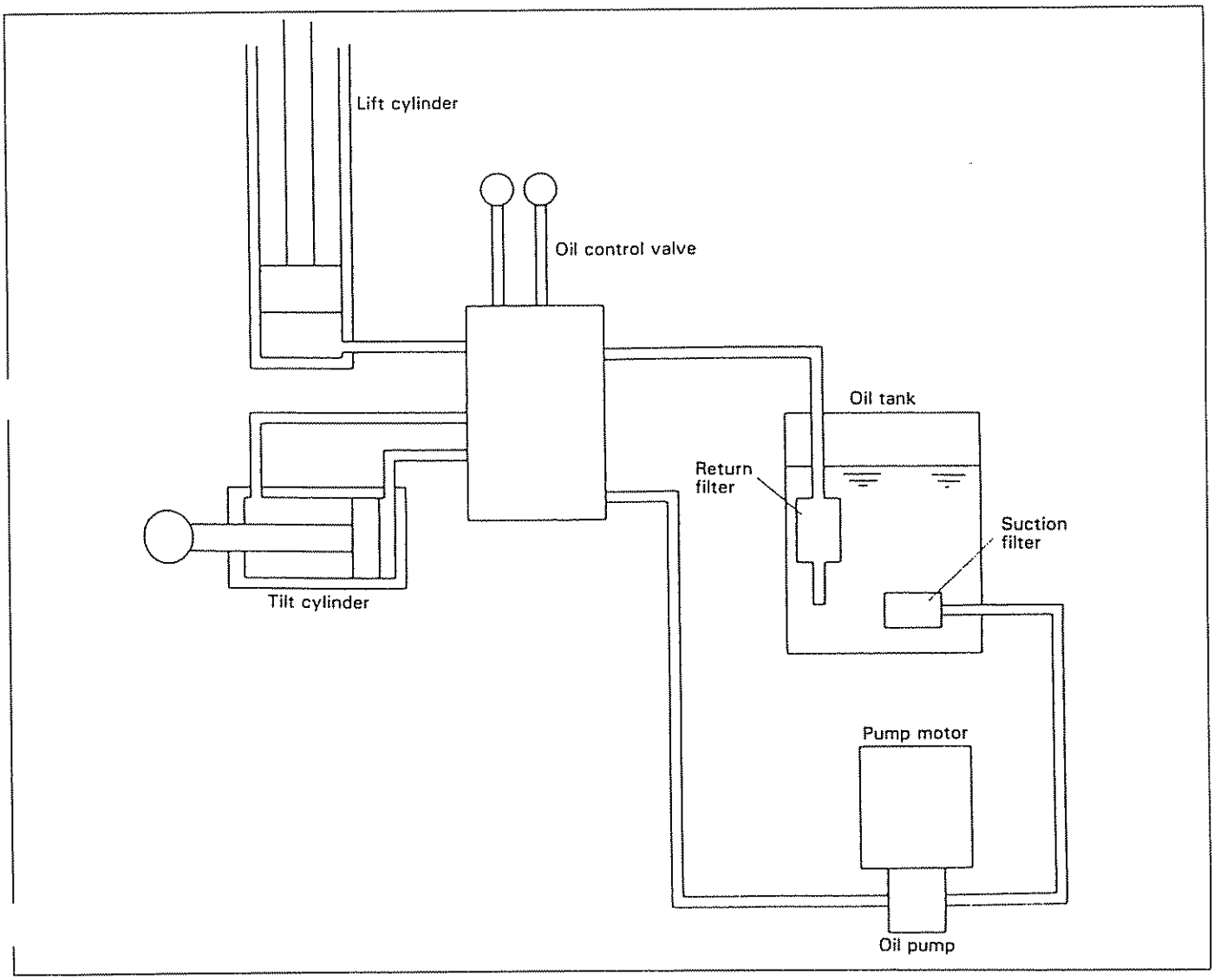
ESPECIFICACIONES

Filtro de aceite

Filtro de succión	Precisión de filtrado		100 mallas
	Superficie de filtrado	cm^2	Aprox. 2900
Filtro de retorno	Precisión de filtrado		30 µm
	Superficie de filtrado	cm^2	Aprox. 2000

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GENERAL



SPECIFICATIONS

Oil Filter

Suction filter	Filtering precision	100 mesh
	Filtering area cm² (in²)	Approx. 2900 (449.5)
Return filter	Filtering precision	30 μm
	Filtering area cm² (in²)	Approx. 2000 (310)

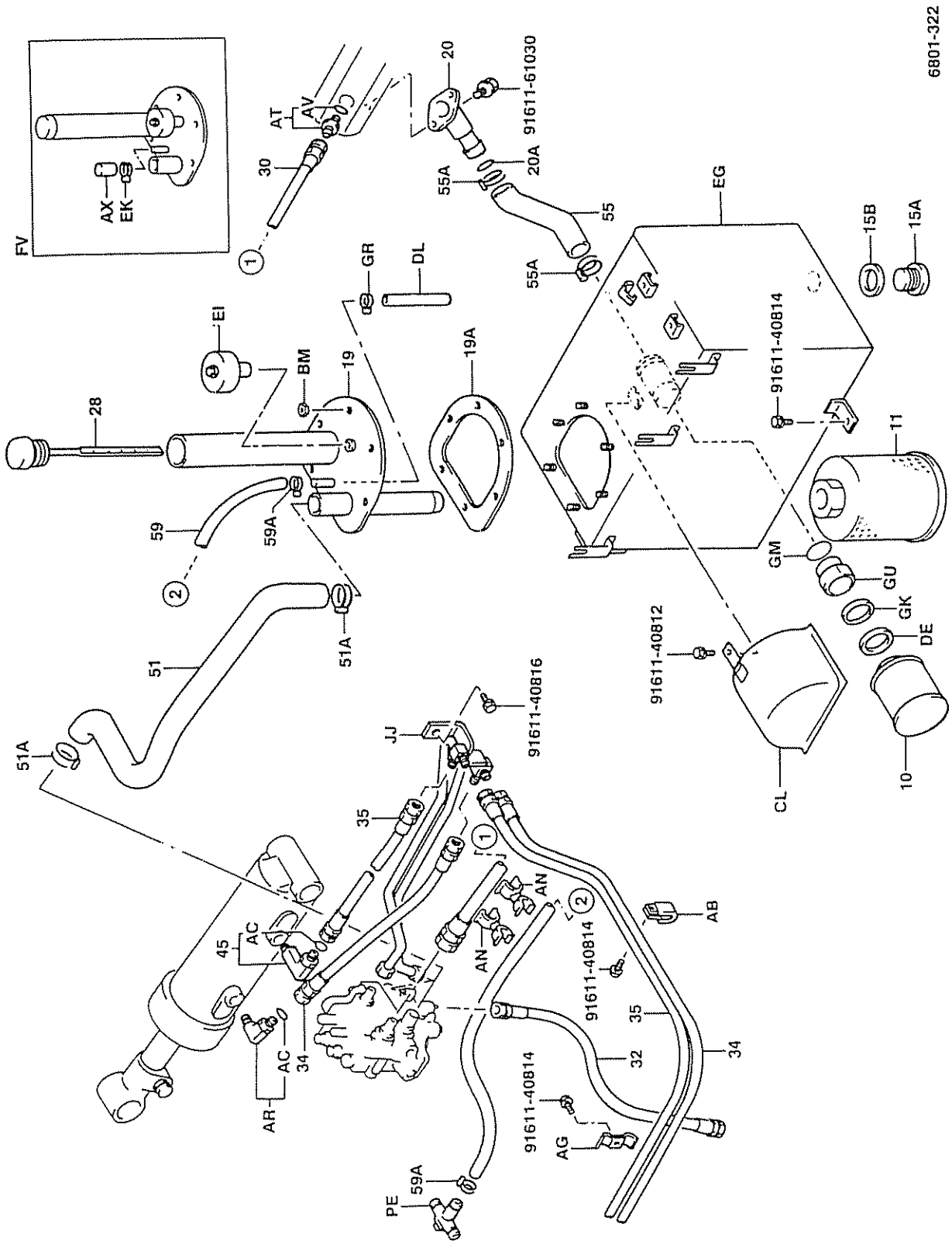
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COMPONENTES

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COMPONENTS

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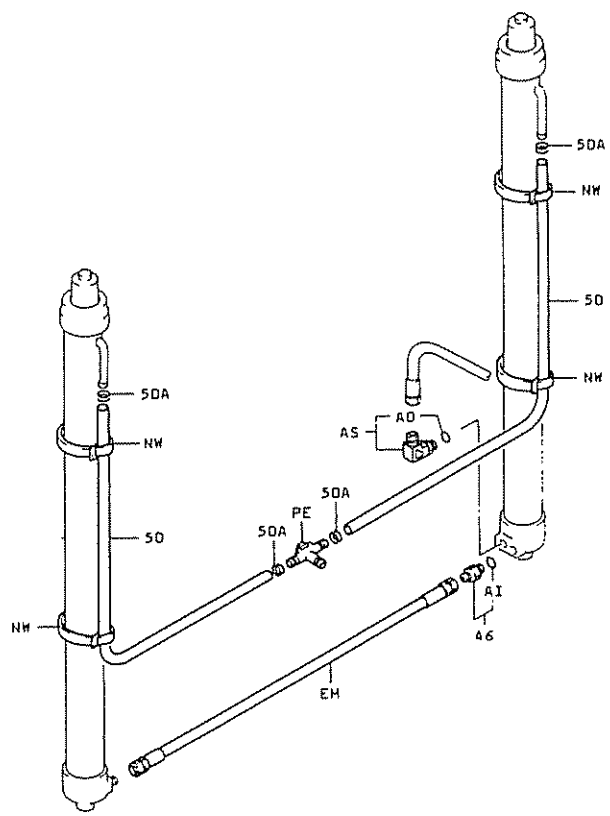
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Mástil FV

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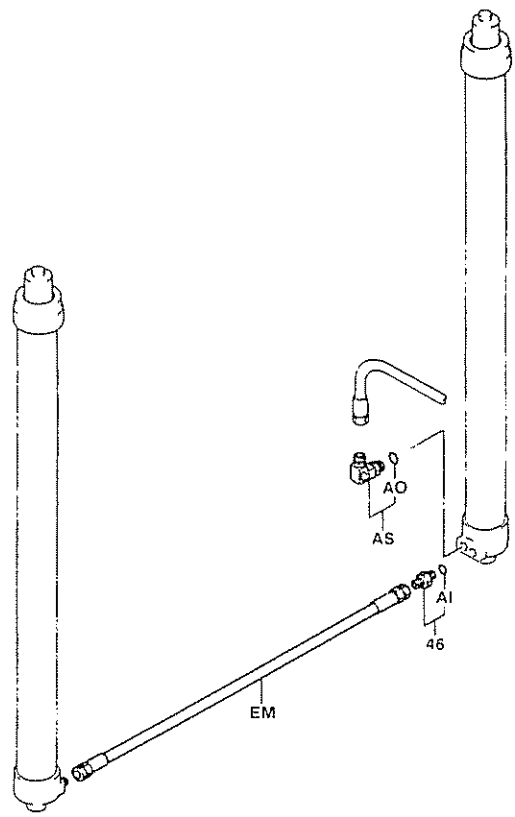
V•SV Mast

6801



FV Mast

6801



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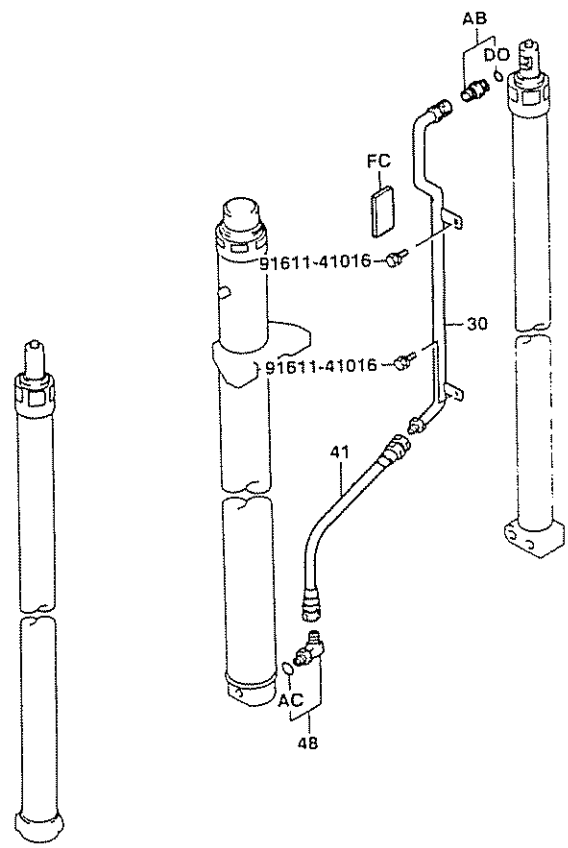
Mástil FSV

Mástil FV

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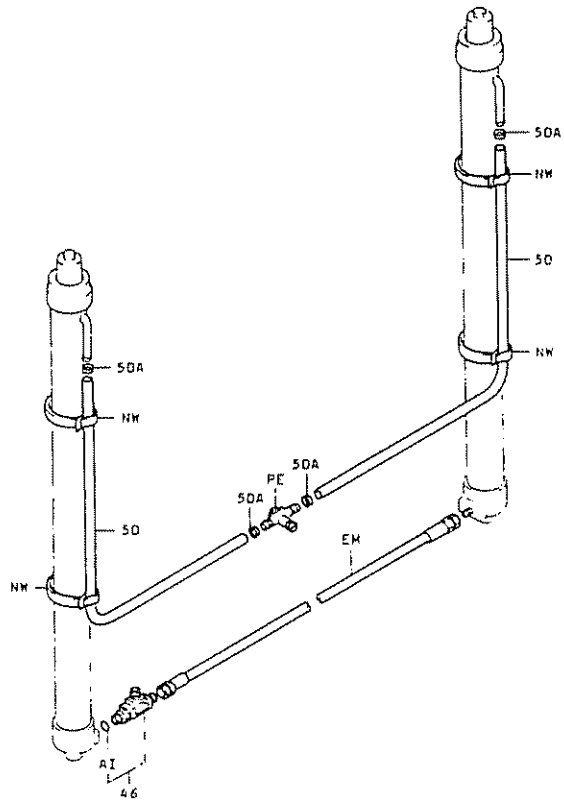
FSV Mast

6801



FV Mast

6802



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CONJUNTO DEL FILTRO DE RETORNO/SUCCION

REMOCION/INSTALACION

2 Batería

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque la batería (vea la página 1-6).

3 Drene el aceite hidráulico.

4 Desconecte la tubería flexible de retorno.

5 Saque la cubierta del depósito hidráulico con el filtro de retorno.

6 Saque el filtro de retorno fuera de la cubierta del depósito hidráulico.

7 Saque la cubierta del depósito de aceite con el filtro de succión.

8 Saque el filtro de succión fuera de la cubierta del depósito de aceite.

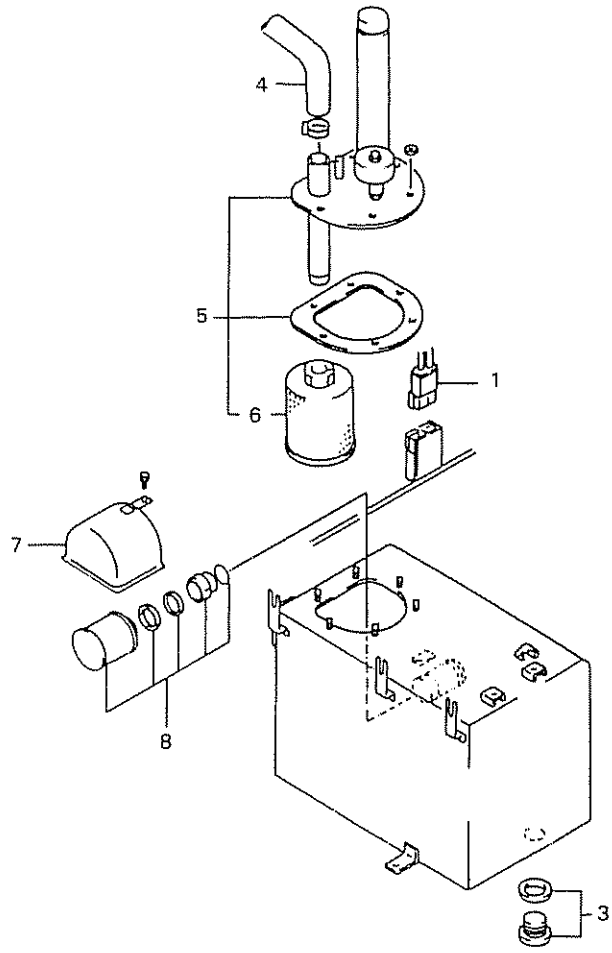
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

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RETURN•SUCTION FILTER ASSY

REMOVAL•INSTALLATION



2 Battery

Removal Procedure

1 Disconnect the battery plug.

2 Remove the battery (see page 1-6).

3 Drain hydraulic oil.

4 Disconnect the return hose.

5 Remove the hydraulic tank cover W/return filter.

6 Remove the return filter from the hydraulic tank cover.

7 Remove the suction filter cover.

8 Remove the suction filter.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

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PRUEBA DE DESCENSO NATURAL

1. Coloque el mástil con la carga estándar en estado vertical, levante la horquilla aproximadamente de 1 a 1,5 metros y gire el interruptor de la llave a desconexión.

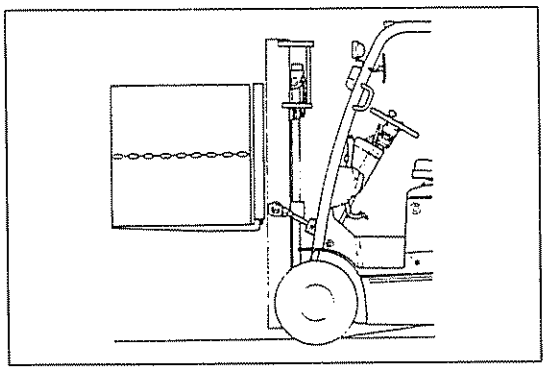
2. Dibuje una línea de referencia en los mástiles exterior e interior, y mida el descenso en 15 minutos.
   Límite de descenso natural: 90 mm o menos

PRUEBA DE BASCULACION ADELANTE NATURAL

1. Coloque el mástil en posición vertical con la carga normal en la horquilla, levante la horquilla aproximadamente 50 cm, y gire el interruptor de la llave a desconexión.

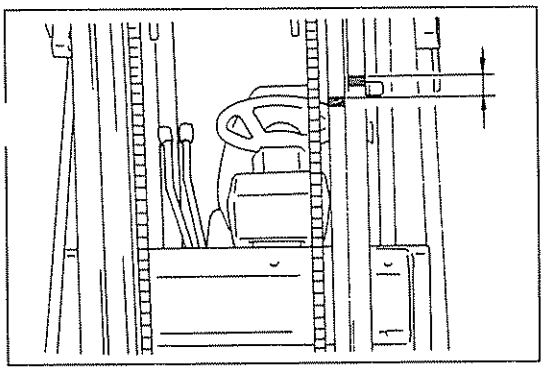
2. Mida la extensión de la varilla del cilindro de basculación en 15 minutos.
   Límite de extensión: 32 mm

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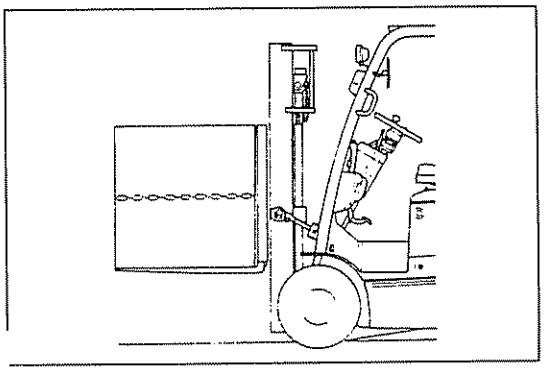


NATURAL DROP TEST

1. Set the mast with the standard load vertical, raise the fork by about 1 to 1.5 m (40 to 60 in) and turn the key switch OFF.

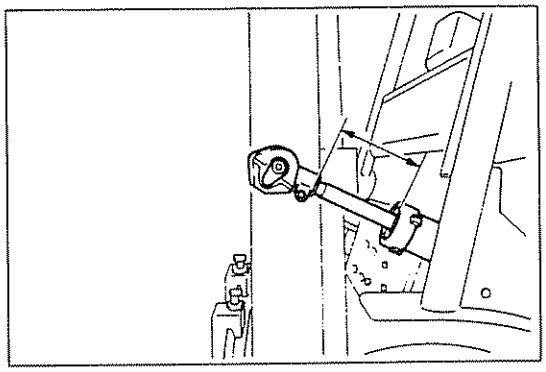


2. Draw a reference line on the outer and inner masts, and measure the drop in 15 minutes.
Natural drop limit: 90 mm (3.54 in) or less



NATURAL FORWARD TILT TEST

1. Set the mast in vertical position with the standard load on the fork, raise the fork by approx. 50 cm (20 in), and turn the key switch OFF.



2. Measure the extension of the tilt cylinder rod in 15 minutes.
Limit extension: 32 mm (1.26 in)

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PRUEBA DE FILTRACIONES DE ACEITE

Cilindro de elevación

1. Coloque el mástil en posición vertical con la carga estándar en la horquilla, y levante la horquilla de 1 a 1,5 metros.

2. Gradualmente bascule el mástil del todo hacia adelante, gire el interruptor de la llave a desconexión, y desconecte la tubería flexible de retorno del depósito hidráulico que viene de la válvula de control de aceite 5 minutos después.

3. Coloque un cilindro de medición debajo del acoplamiento y mida la cantidad de filtración de aceite en 1 minuto.

   Cantidad de filtración de aceite
   Límite: 16 cc o menos

Nota:
Si el descenso natural es mayor aunque la cantidad de filtración de aceite no exceda el límite, la empaquetadura del cilindro de elevación puede tener defectos.

Cilindro de basculación

1. Coloque el mástil en posición vertical con la carga estándar en la horquilla, levante la horquilla aproximadamente 50 cm, y gire el interruptor de la llave a desconexión.

2. Desconecte la tubería flexible de retorno del depósito de aceite que viene de la válvula de control de aceite 5 minutos después.

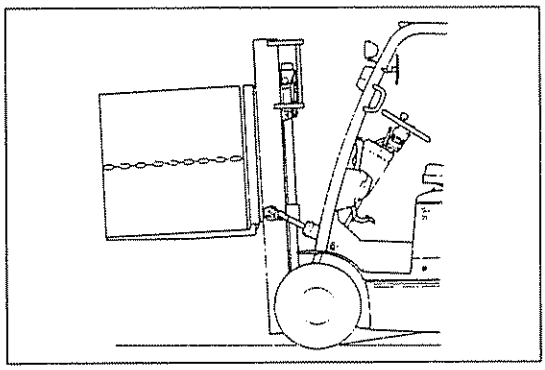
3. Coloque un cilindro de medición debajo del acoplamiento y mida la cantidad de filtración de aceite en 1 minuto.

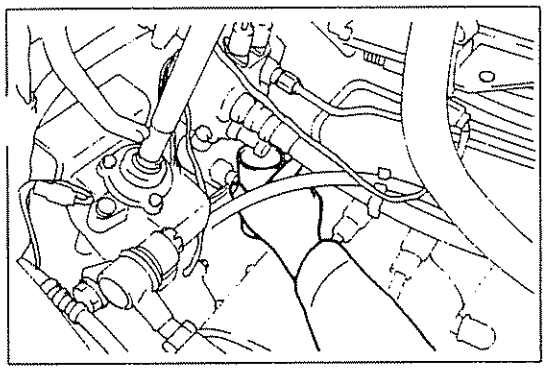
   Cantidad de filtración de aceite
   Límite (total de elevación y basculación): 34 cc o menos

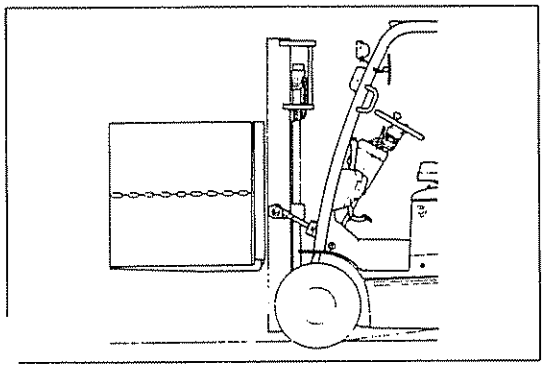
4. La cantidad de filtración de la lumbrera de basculación se obtiene deduciendo de la cantidad total medida de elevación y basculación la cantidad de filtración en la lumbrera de basculación.

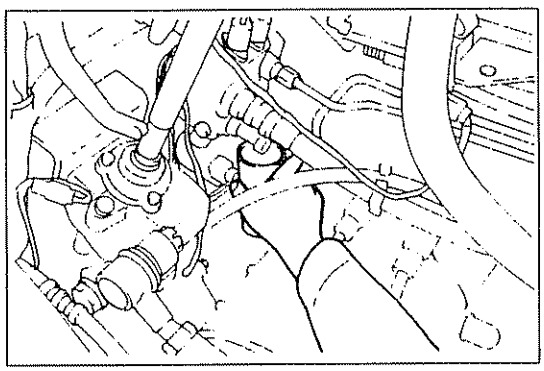
Nota:
Si la basculación adelante natural es mayor aunque la cantidad de filtración no exceda el límite, inspeccione la válvula de inmovilización de basculación o la empaquetadura de cilindros porque pueden tener defectos.

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OIL LEAK TEST

Lift Cylinder

1. Set the mast in vertical position with the standard load on the fork, and raise the fork by 1 to 1.5 m (40 to 60 in).
2. Gradually tilt the mast fully forward, turn the key switch OFF, and disconnect the hydraulic tank return hose from the oil control valve 5 minutes later.
3. Place a measuring cylinder under the fitting and measure the oil leak amount in 1 minute.
   Oil leak amount
   Limit: 16 cc (0.976 cu-in) or less

Note:
If the natural drop is great although the oil leak amount is within the limit, the lift cylinder packing may be defective.

Tilt Cylinder

1. Set the mast in vertical position with the standard load on the fork, raise the fork by about 50 cm (20 in), and turn the key switch OFF.
2. Disconnect the oil tank return hose from the oil control valve 5 minutes later.
3. Place a measuring cylinder under the fitting and measure the oil leak amount in 1 minute.
   Oil leak amount
   Limit (total of lift and tilt): 34 cc (2.075 cu-in) or less
4. The leak amount from the tilt port is obtained by deducting the leak amount at the tilt port from the total amount of lift and tilt.

Note:
If natural forward tilt is great although the oil leak amount is within the limit, inspect the tilt lock valve or cylinder packing because it may be defective.

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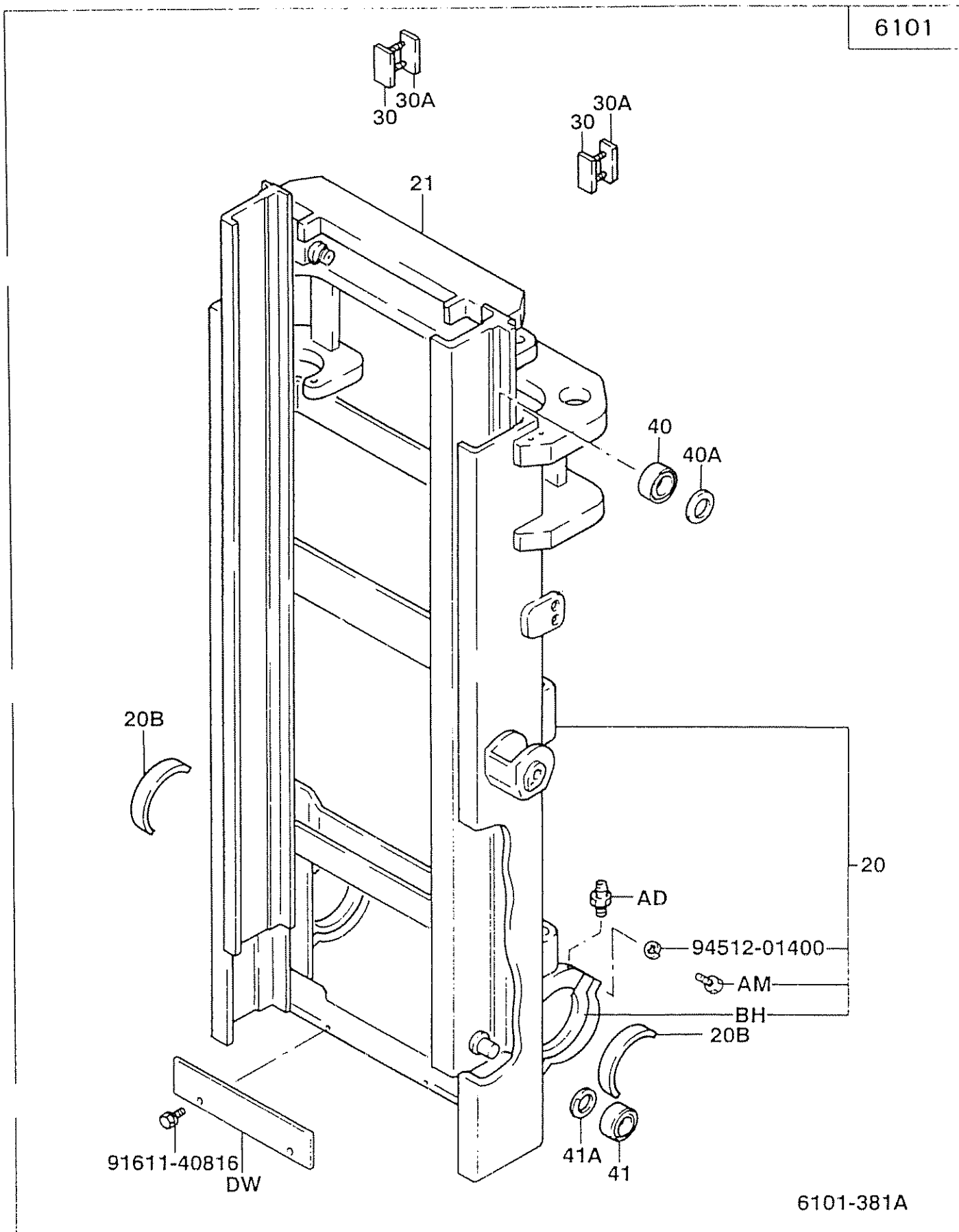
CONJUNTO DEL MASTIL V

COMPONENTES

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V MAST ASSY

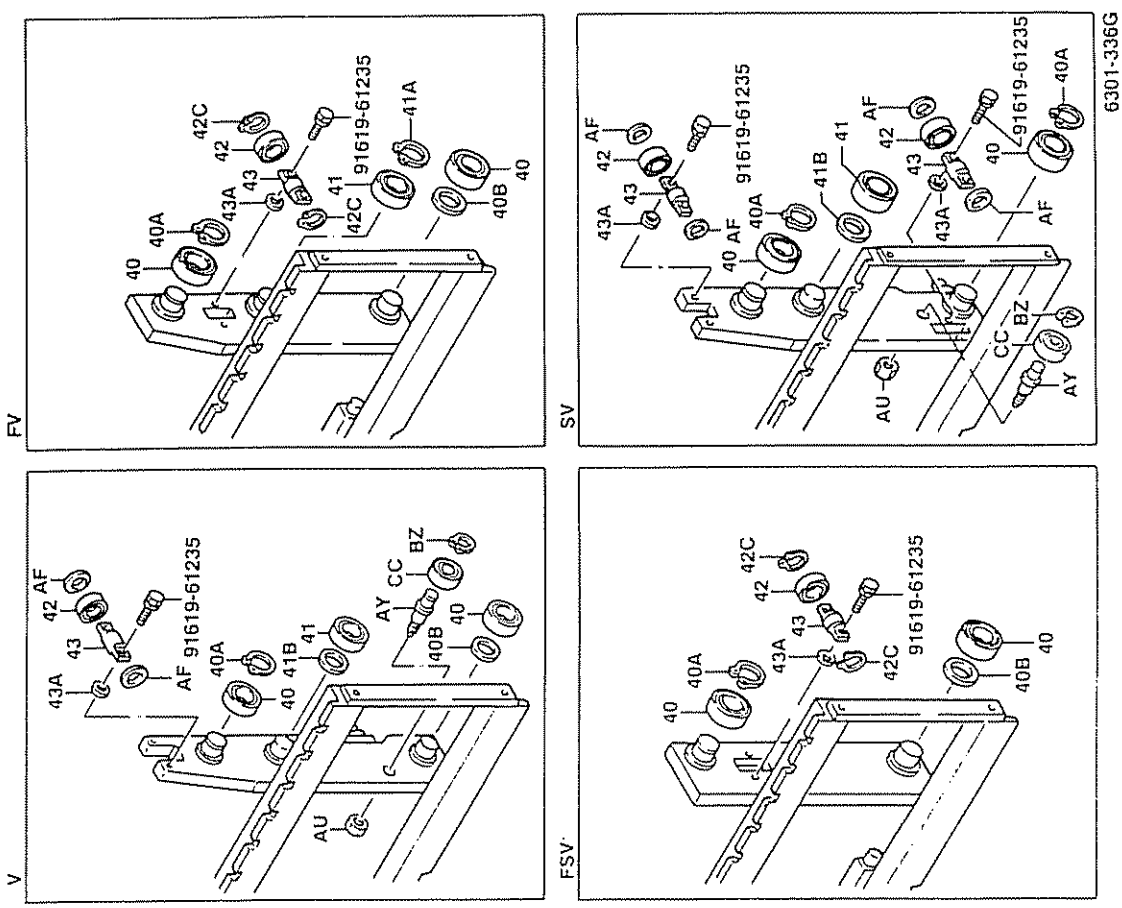
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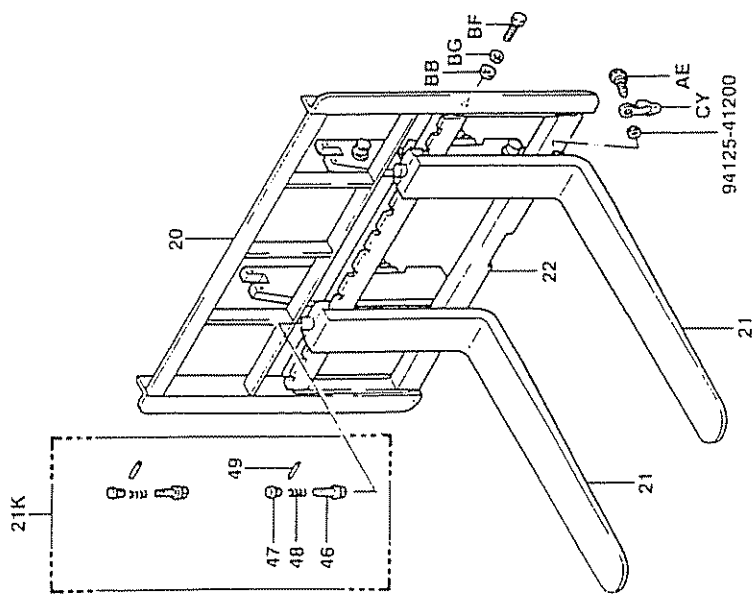


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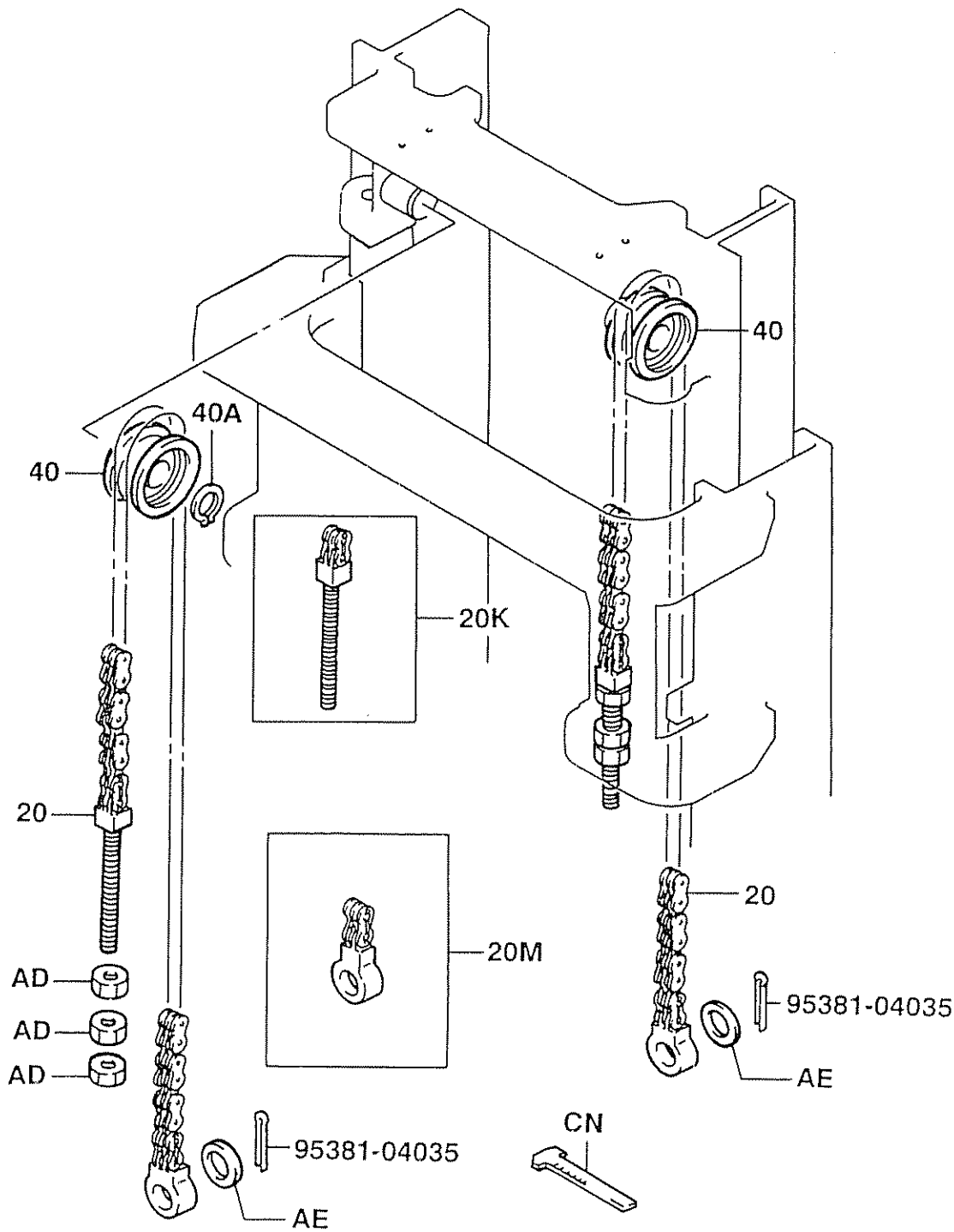


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6302



6302-268A

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REMOCION/INSTALACION

T=N.m (kgf-cm)

1 Mástil en posición vertical y horquilla en la posición más baja
5 Tubería flexible

Procedimiento de remoción

1 Coloque el mástil vertical y baje la horquilla a la posición más baja.

2 Desconecte la cadena.

3 Saque la rueda de la cadena. [Punto 1]

4 Saque el soporte de elevación. (Levante el mástil interior hasta que se separa del soporte de elevación, y mueva el vehículo lentamente hacia atrás para separarlo del soporte de elevación. Luego pare el motor). [Punto 2]

5 Desconecte la tubería flexible de rebose y la tubería flexible de alta presión. (Baje el mástil interior a la posición más baja y accione la palanca de elevación varias veces para que desaparezca la presión residual del cilindro de elevación antes de desconectar las tuberías flexibles).

6 Suspenda ligeramente el mástil.

7 Saque las tapas de apoyo del mástil.

8 Saque el pasador delantero del cilindro de basculación. [Punto 3]

9 Saque el conjunto del mástil.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

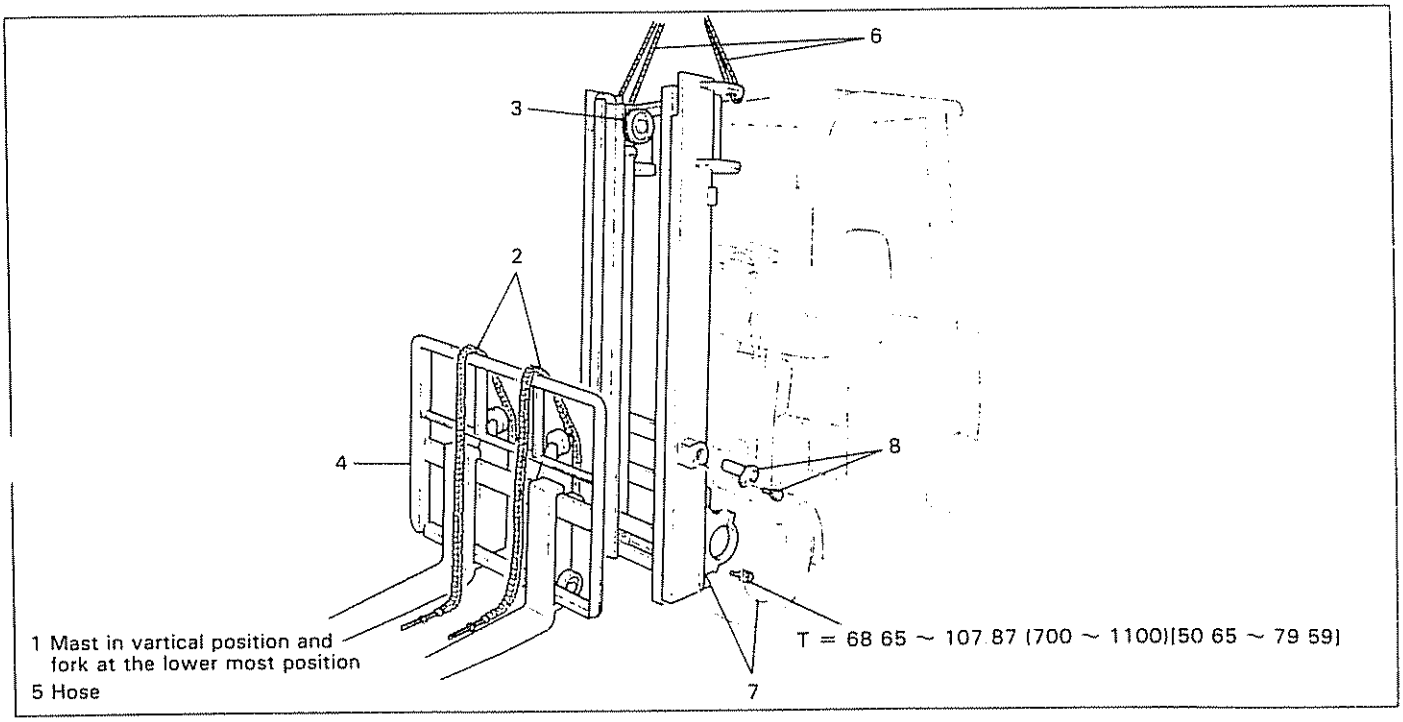
Notas:

- Aplique grasa MP a la superficie interior del casquillo de apoyo del mástil, la superficie interior de la tapa de apoyo del mástil y el pasador delantero del cilindro de basculación.
- Si se recambia el conjunto del mástil, el mástil exterior, el mástil interior o el cilindro de elevación, es necesario inspeccionar y ajustar el movimiento irregular del cilindro de elevación. Vea la sección de ajuste de la cuña de la varilla del cilindro de elevación (en la página 13-31) en cuanto al método de inspección y ajuste.
- Ajuste la tensión de la cadena. (Vea la página 13-17)

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REMOVAL·INSTALLATION

T = N·m (kgf-cm)[ft-lbf]



Removal Procedure

1 Set the mast vertical and lower the fork to the bottom position.

2 Disconnect the chain.

3 Remove the chain wheel. **[Point 1]**

4 Remove the lift bracket. (Raise the inner mast until it comes off from the lift bracket, and slowly move the vehicle in the reverse direction to depart from the lift bracket.
[Point 2]

5 Disconnect the overflow hose and high pressure hose. (Lower the inner mast to the bottom position and operate the lift lever several times to release the residual pressure in the lift cylinder before disconnecting the hoses)

6 Slightly hoist the mast.

7 Remove the mast support caps.

8 Remove the tilt cylinder front pin. **[Point 3]**

9 Remove the mast ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- Apply MP grease on the interior surface of the mast support bushing, inner surface of the mast support cap and tilt cylinder front pin.
- If any of the mast ASSY, outer mast, inner mast and lift cylinder is replaced, it is necessary to inspect and adjust uneven motion of the lift cylinder. See the lift cylinder rod shim adjustment section (on page 13-31) for the inspection and adjustment method.
- Adjust the chain tension. (See page 13-17.)

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Puntos de trabajo

[Punto 1]

Remoción: Use la SST para la remoción si está muy apretado.
SST 09950-40010

Instalación: Instale la rueda de la cadena con el lado que tiene mayor radio en la periferia de su orificio hacia la parte central del pasador lateral del mástil.

[Punto 2]

Instalación: Ajuste el rodillo excéntrico (opcional) después de instalar el soporte de elevación. (Común para los mástiles V y SV)

1. Gire el pasador del rodillo excéntrico en la dirección mostrada en la ilustración, e inmovilice la tuerca de seguridad en la posición en que el rodillo entra en contacto con el mástil interior.
   La dirección de giro de los pasadores de los lados izquierdo y derecho es la misma que la de la ilustración.

*Fig. Dirección de apretamiento

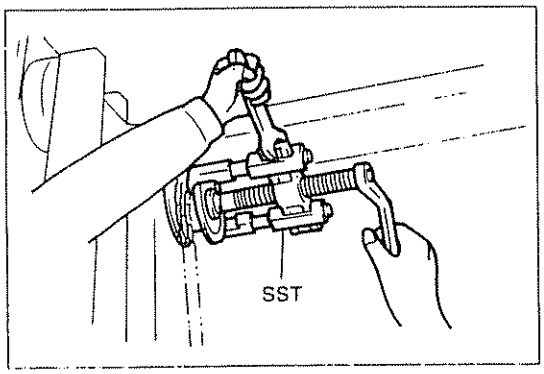
2. El pasador del lado izquierdo está punzonado con la marcha "L" mientras que el del derecho no tiene marca.

3. Como el pasador de los lados derecho e izquierdo tiene rosca a la izquierda y a la derecha, respectivamente, la dirección de apretamiento de la tuerca de sujeción es la misma que la dirección de giro del pasador del rodillo indicada en la etapa 1 anterior.

[Punto 3]

Remoción: SST 09810-20172-71

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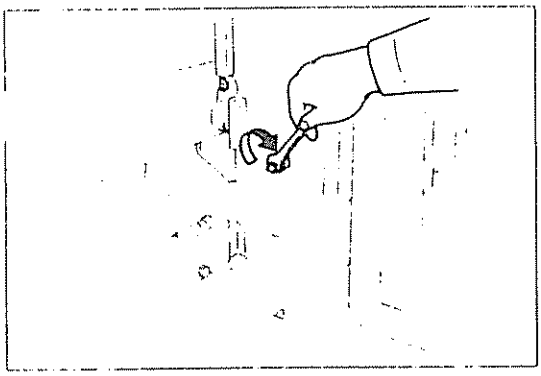


Point Operations

[Point 1]

Removal: Use the SST for removal if the fitting is tight.
SST 09950-40010

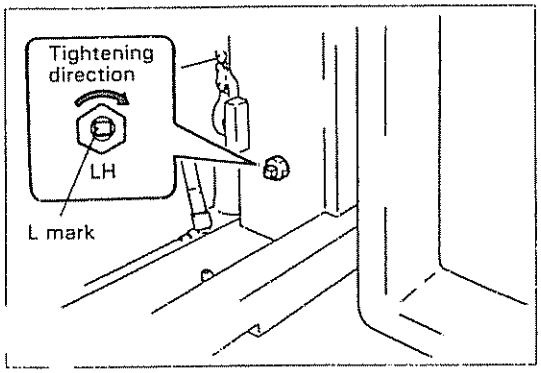
Installation: Install the chain wheel with its side having greater radius at the periphery of its hole facing the boss of the mast side pin.

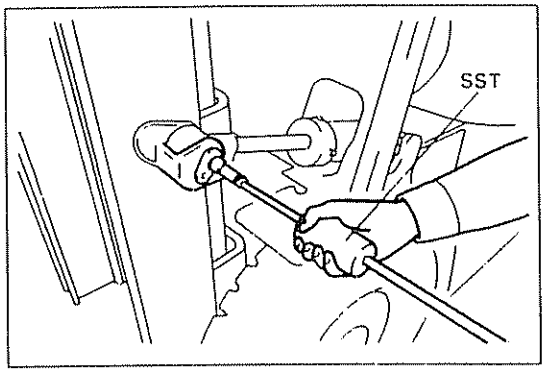


[Point 2]

Installation: Adjust the eccentric roller (OPT) after lift bracket installation. (Common to the V and SV masts.)

1. Turn the eccentric roller pin in the direction shown in the illustration, and lock with the set nut at the position where the roller comes into contact with the inner mast.
   The direction for turning the pins on the left and right sides are the same as illustrated.
2. The pin on the left side is punched with punched "L" mark while the one on the right side has no mark.
3. As the pin on the right and left sides use lefthand screw and righthand screw, respectively, the set nut tightening direction is the same as the roller pin turning direction in step 1 above.





[Point 3]

Removal: SST 09810-20172-71

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DESMONTAJE/INSPECCION/REMONTAJE DEL MASTIL

Procedimiento de desmontaje

1 Saque la cubierta de la tubería flexible.

2 Desconecte la tubería flexible de rebose y la tubería flexible de alta presión.

3 Saque el perno de sujeción del extremo de la varilla del cilindro y desconecte el extremo de la varilla. [Punto 1]

4 Saque el apoyo del cilindro. [Punto 2]

5 Saque los pernos de sujeción de la parte inferior del cilindro y saque el cilindro de elevación.

6 Deslice el mástil interior en la dirección de descenso y saque los rodillos de elevación.

7 Saque la banda del mástil. [Punto 3]

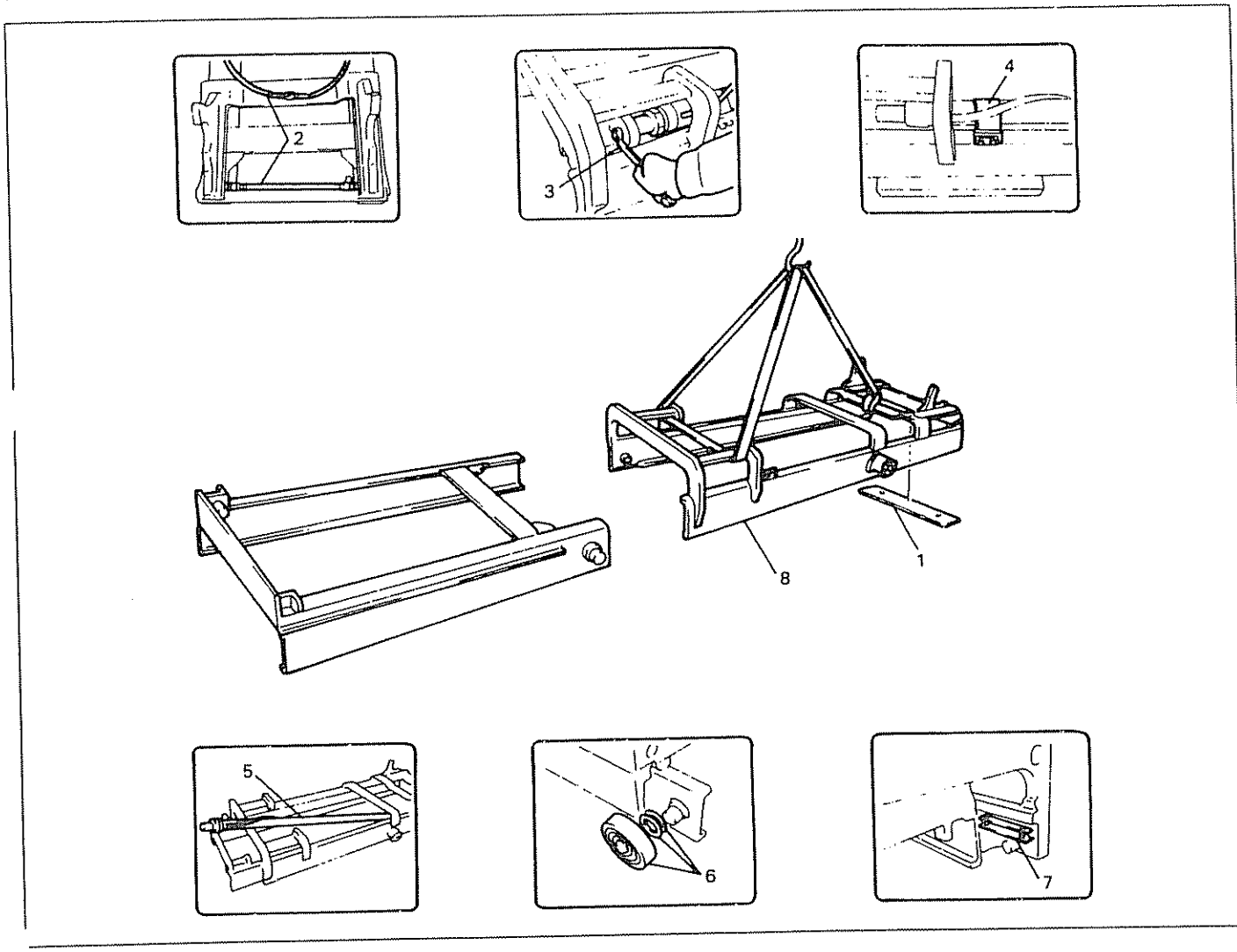
8 Saque el mástil exterior.

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al de desmontaje.

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MAST DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the hose cover.

2 Disconnect the overflow hose and high pressure hose.

3 Remove the cylinder rod end set bolt and disconnect the rod end. **[Point 1]**

4 Remove the cylinder support. **[Point 2]**

5 Remove the cylinder bottom set bolts and remove the lift cylinder.

6 Slide the inner mast in the lowering direction and remove the lift rollers.

7 Remove the mast strip. **[Point 3]**

8 Remove the outer mast.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Puntos de trabajo

[Punto 1]

Desmontaje: El ajuste de la cuña se ha hecho en el extremo de la varilla del cilindro de elevación para evitar el movimiento irregular del cilindro entre los lados izquierdo y derecho. Anote en qué lado se realiza el ajuste de la cuña y el número de cuñas que se usan.

*Fig. Cuña

[Punto 2]

Desmontaje: Anote el número de cuñas de apoyo del cilindro que se usan.

Remontaje: Cuando se recambia el mástil o el cilindro, ajuste las cuñas en el apoyo del cilindro. Con el extremo de la varilla del cilindro insertado en el mástil interior, elimine la holgura entre el apoyo del cilindro y el mástil exterior insertando cuñas. El grosor de la cuña deberá ser ligeramente más grueso.

*Fig. Cuña

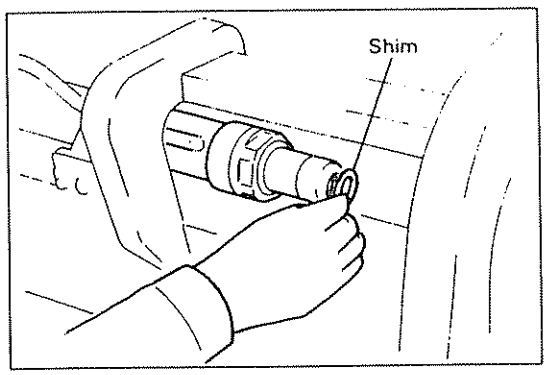
Cuña

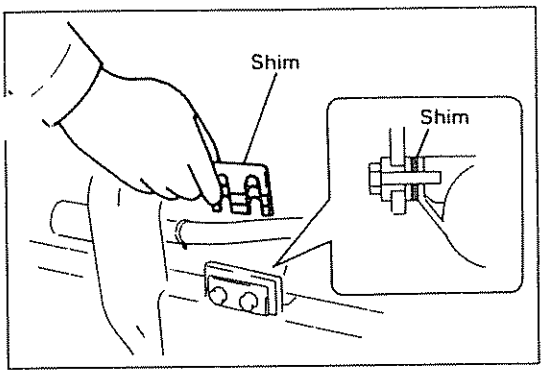
[Punto 3]

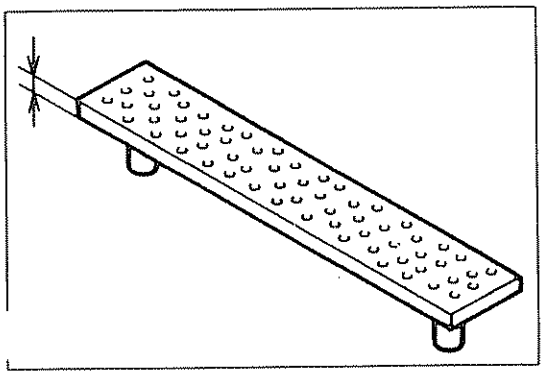
Inspección: Mida el grosor de la banda del mástil.

Límite del grosor: 1,5 mm

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Point Operations

[Point 1]

Disassembly: Shim adjustment has been made at the lift cylinder rod end for prevention of cylinder uneven motion between the left and right sides. Take a note on which side the shim adjustment is made and the number of shims used.

[Point 2]

Disassembly: Take a note on the number of cylinder support shims used.

Reassembly: When the mast or cylinder is replaced, make shim adjustment at the cylinder support. With the cylinder rod end inserted to the inner mast, eliminate the clearance between the cylinder support and outer mast by inserting shims. The shim thickness should be slightly thicker.

[Point 3]

Inspection: Measure the mast strip thickness.

Thickness limit: 1.5 mm (0.059 in)

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DESMONTAJE/INSPECCION/REMONTAJE DEL SOPORTE DE ELEVACION

Procedimiento de desmontaje

1 Saque los rodillos de elevación. [Punto 1]

2 Saque los rodillos laterales. [Punto 2]

3 Saque los rodillos excéntricos (OPC.). [Punto 3]

4 Saque el apoyacargas.

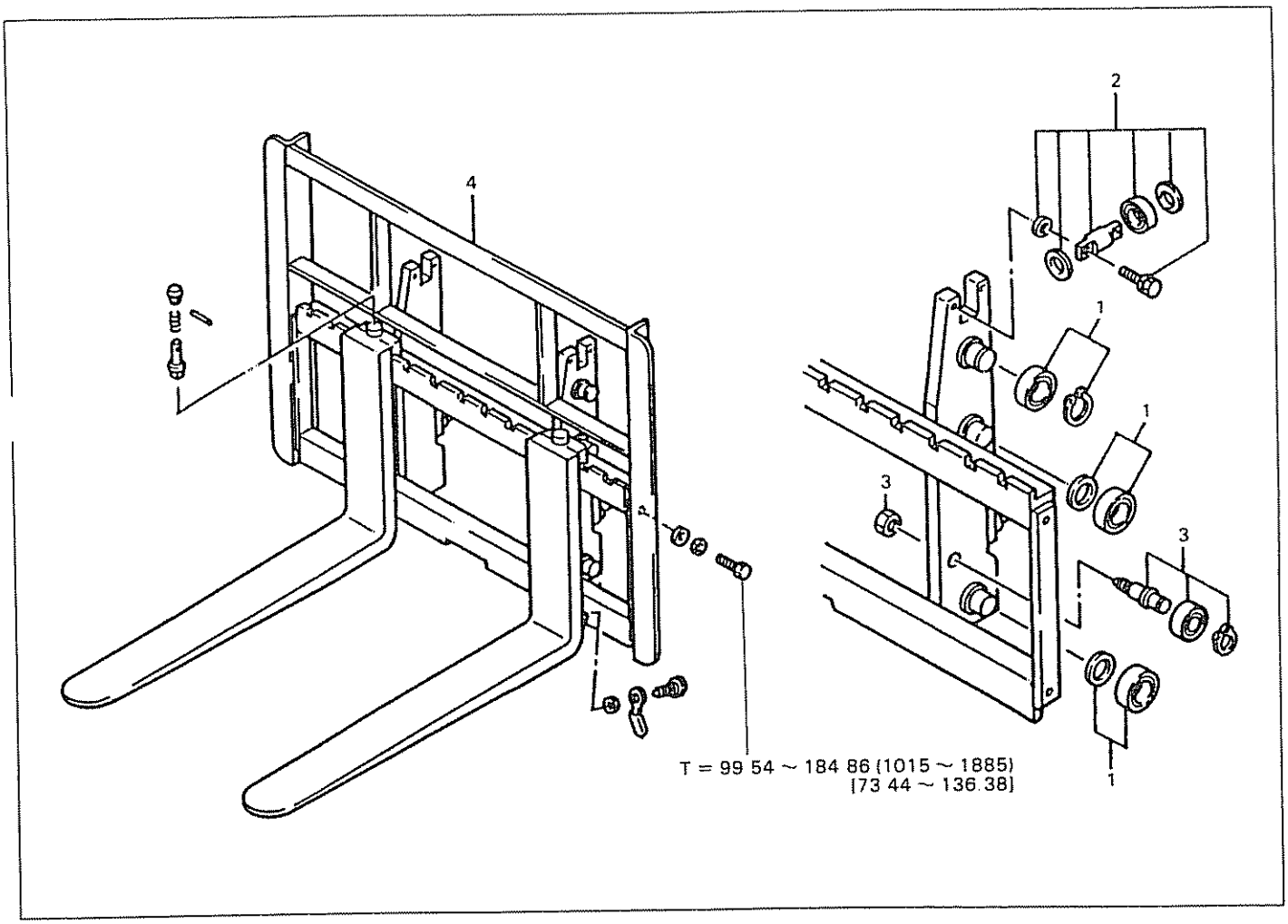
Procedimiento de remontaje

El procedimiento de remontaje es el inverso al de desmontaje.

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LIFT BRACKET DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm)[ft-lbf]



Disassembly Procedure

1 Remove the lift rollers. **[Point 1]**

2 Remove the side rollers. **[Point 2]**

3 Remove the eccentric rollers (OPT). **[Point 3]**

4 Remove the back rest.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Puntos de trabajo

[Punto 1]

Desmontaje: SST 09950-20017

[Punto 2]

Remontaje: No confunda la dirección de montaje del rodillo lateral. El lado de la parte redondeada de la circunferencia exterior del rodillo deberá estar hacia el lado delantero.

*Fig. Lado delantero
Redondeado

[Punto 3]

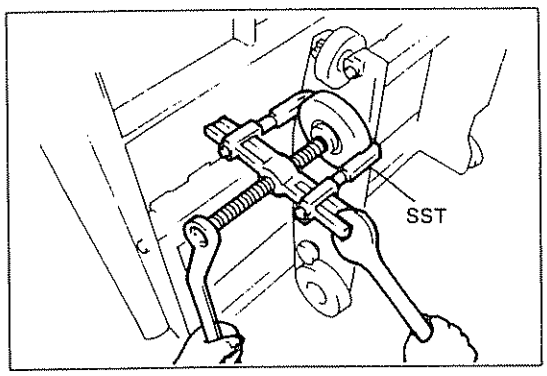
Desmontaje: Las tuercas de sujeción del pasador del rodillo excéntrico usan roscas a la izquierda en el lado derecho y roscas a la derecha en el lado izquierdo.

Remontaje: Instale el pasador del rodillo excéntrico punzonado con la marca "L" en el lado izquierdo y el que no tiene marca en el lado derecho.

Remontaje: Mantenga sin apretar las tuercas de sujeción del pasador del rodillo excéntrico en este momento y ajuste los rodillos excéntricos después de instalar el soporte de elevación en el vehículo.

*Fig. Lado delantero
Marca punzonada "R"
(RH)

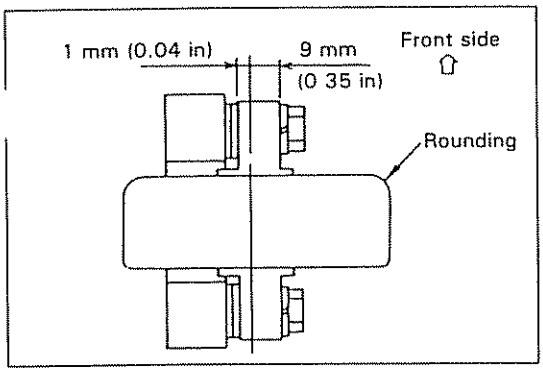
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Point Operations

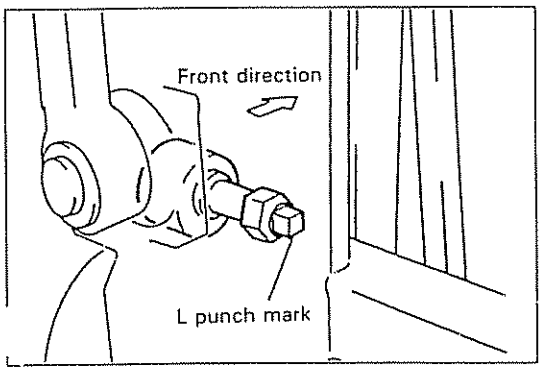
[Point 1]

Disassembly: SST 09950-40010



[Point 2]

Reassembly: Do not mistake the side roller mounting direction.
The side where the chamfering radius of the roller outer circumference shall face the front side.



[Point 3]

Disassembly: The eccentric roller pin set nuts use lefthand screw on the right side and right-hand screw on the left side.

Reassembly: Install the eccentric roller pin punched with the "L" mark on the left side and the one without a punch mark on the right side.

Reassembly: Keep the eccentric roller pin set nuts not tightened here and adjust the eccentric rollers after installing the lift bracket on the vehicle.

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AJUSTE DEL MASTIL (MASTIL V)

Ajuste del rodillo de elevación del mástil

Mástil interior

Mástil exterior

Ponga en contacto

Este rodillo

Ponga en contacto

1. Ajuste de la holgura del rodillo del mástil interior
   (1) Mida la holgura con el mástil superpuesto cerca de 450 mm.
   (2) Cambie el mástil interior a un lado para que entre en contacto el rodillo con el mástil exterior, y ajuste la holgura entre la cara lateral del rodillo y el mástil en la posición más estrecha en el lado opuesto al valor siguiente insertando la cuña del rodillo del mástil interior.

       Holgura estándar A = 0 - 0,8 mm

       Grosor de la cuña: 0,5 - 1,0 mm

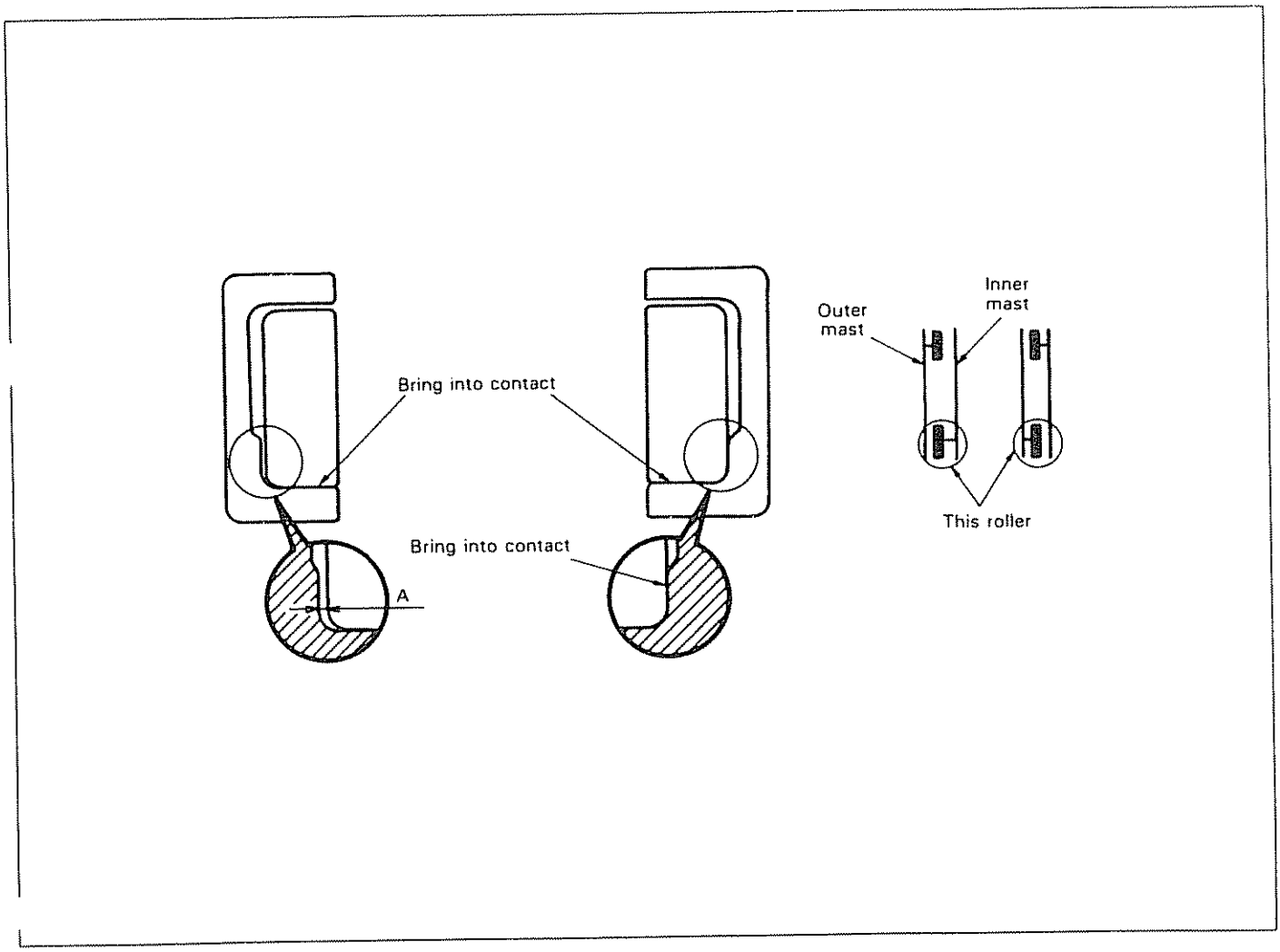
   (3) Distribuya el grosor de la cuña de forma igual en los rodillos izquierdo y derecho. (Vea la parte de "Remoción e instalación del rodillo del mástil" en cuanto al procedimiento de recambio de la cuña)
   (4) Después del ajuste, compruebe que el mástil interior se mueve suavemente en el mástil exterior.

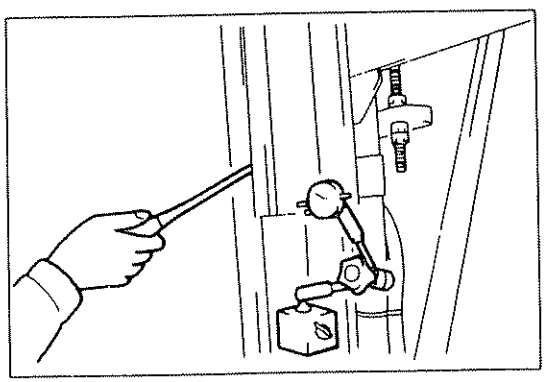
*Fig. Cuña

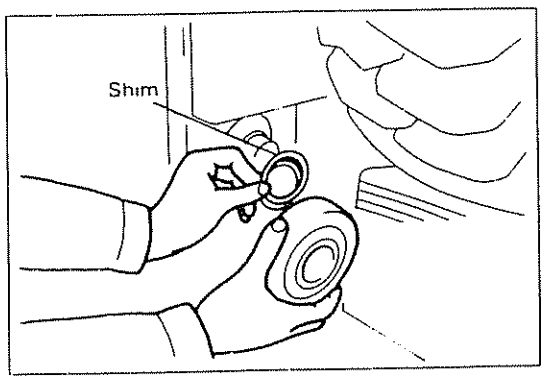
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MAST ADJUSTMENT (V MAST)

Mast Lift Roller Adjustment







1. Inner mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim.

   Standard clearance **A = 0 ~ 0.8 mm (0 ~ 0.031 in)**
   Shim thickness: **0.5 and 1.0 mm (0.020 and 0.039 in)**

   (3) Distribute the shim thickness equally to the left and right rollers. (See the "mast roller removal installation" section for the shim replacement procedure.)
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.

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Este rodillo

Ponga en contacto

Mástil exterior

Mástil interior

Ponga en contacto

2. Ajuste de la holgura del rodillo del mástil exterior
   (1) Mida la holgura con el mástil superpuesto cerca de 450 mm.
   (2) Cambie el mástil interior a un lado para que entre en contacto el rodillo con el mástil exterior, y ajuste la holgura entre la cara lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando la cuña del rodillo del mástil exterior.

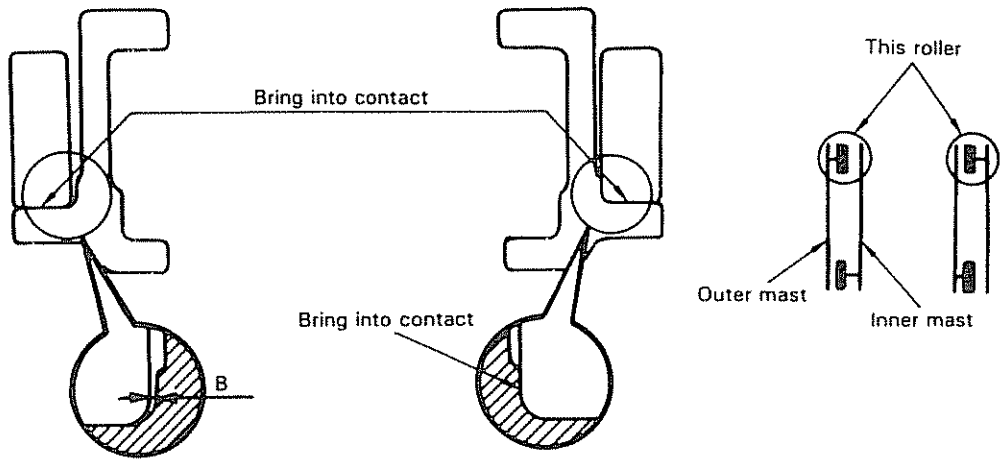
       Holgura estándar B = 0 - 0,8 mm

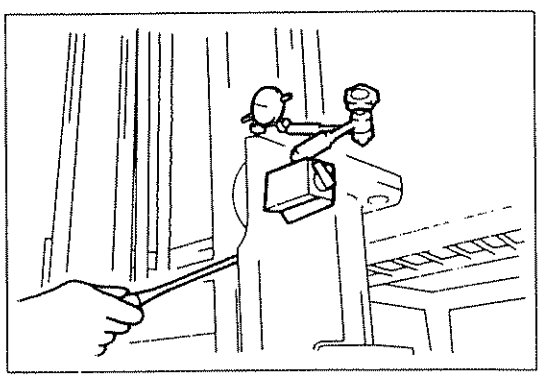
       Grosor de la cuña: 0,5 y 1,0 mm

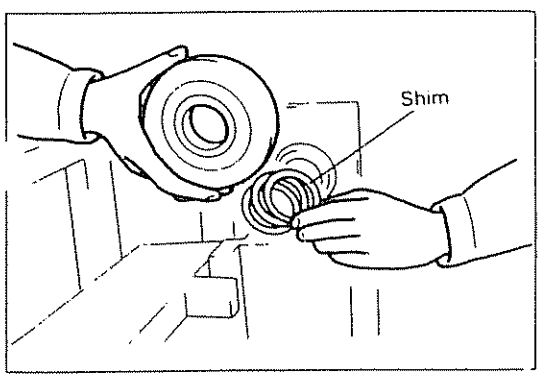
   (3) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho. (Vea la parte de "Remoción e instalación del rodillo del mástil" en cuanto al procedimiento de recambio de la cuña)
   (4) Después del ajuste, compruebe que el mástil interior se mueve suavemente en el mástil exterior.

*Fig. Cuña

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2. Outer mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim:

   Standard clearance B = 0 ~ 0.8 mm (0 ~ 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right sides. (See the "mast roller removal installation" section for the shim replacement procedure.)
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast

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Remoción e instalación del rodillo del mástil

1. Saque el soporte de elevación. (Vea las etapas 1 a 4 del procedimiento de remoción del conjunto del mástil en la página 13-5)

2. Levante el vehículo con el gato mecánico y apoye los neumáticos en bloques de madera. Bloquee las ruedas delanteras y traseras para evitar que giren.

3. Incline el cilindro de elevación.
   (1) Saque la cubierta de la tubería flexible en la parte inferior del mástil y desconecte la tubería flexible del cilindro de elevación en el lado izquierdo.
   (2) Saque los pernos de sujeción de la parte inferior del cilindro de elevación.
   (3) Suspenda el larguero superior del mástil interior con un cable y c levántelo ligeramente.
   (4) Saque los pernos de sujeción del extremo de la varilla del cilindro de elevación, y desconecte el extremo de la varilla levantando el mástil interior.
   (5) Saque el apoyo del cilindro de elevación.
   (6) Levante los cilindros de elevación izquierdo y derecho y sujételos con sogas al larguero del mástil exterior.

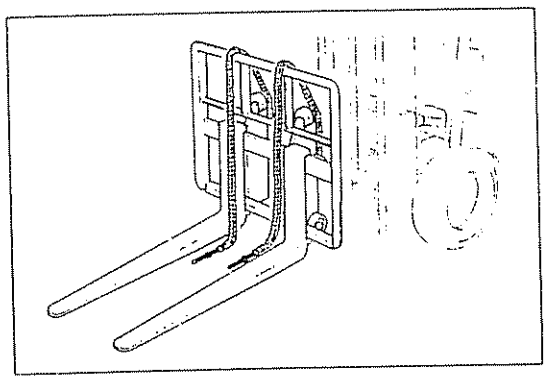
4. Saque los rodillos del mástil.
   (1) Baje el mástil interior levantado lentamente hasta que se vean los rodillos del mástil, y apoye la parte inferior en bloques de madera.
   (2) Saque los rodillos del mástil interior y las cuñas.
   (3) Saque los rodillos del mástil exterior y las cuñas.

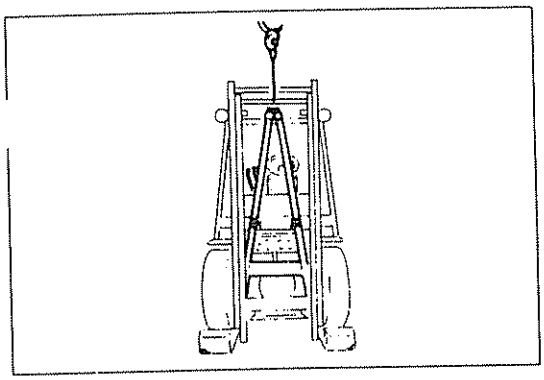
*Fig. Cuña

5. El procedimiento de instalación es el inverso al de remoción.

*Fig. Cuña

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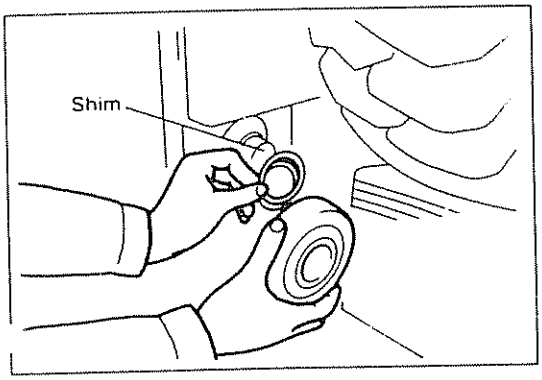


Mast Roller Removal·Installation

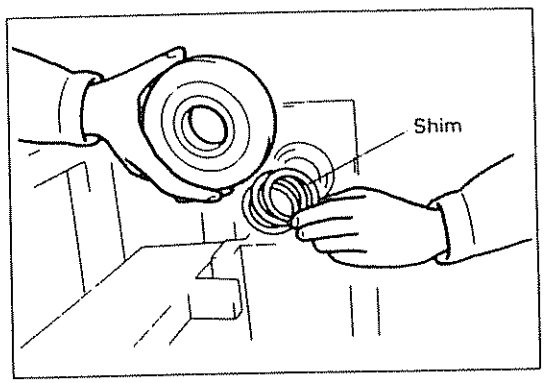
1. Remove the lift bracket. (See the mast ASSY removal procedure steps 1 to 4 on page 13-5.)

2. Jack up the vehicle and support the tires with wooden blocks. Lock the front and rear tires to prevent rotation.

3. Tilt the lift cylinder.
   (1) Remove the hose cover at the bottom of the mast and disconnect the lift cylinder hose on the LH side.
   (2) Remove the lift cylinder bottom set bolts.
   (3) Sling the inner mast upper tie beam with a wire and slightly hoist it.
   (4) Remove the lift cylinder rod end set bolts, and disconnect the rod end by hoisting the inner mast.
   (5) Remove the lift cylinder support.
   (6) Tilt the lift cylinders LH and RH and tie them with ropes to the outer mast tie beam.



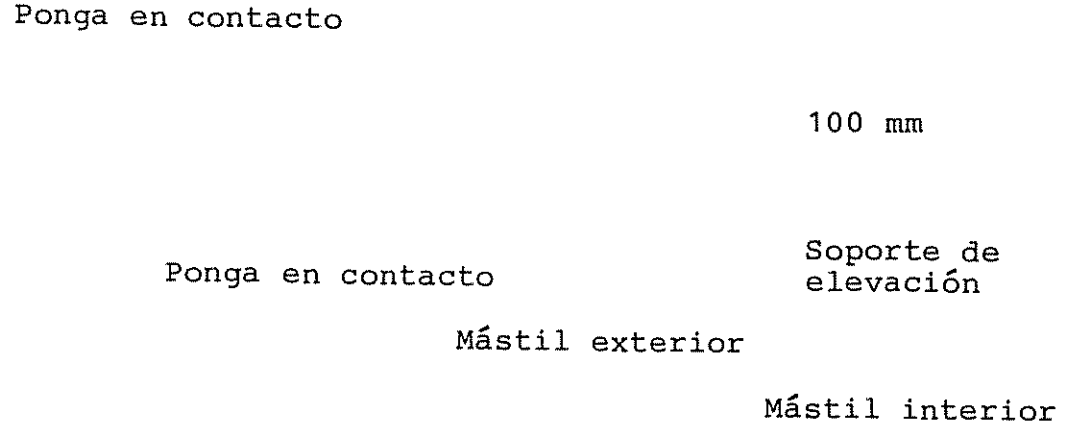
4. Remove the mast rollers.
   (1) Lower the hoisted inner mast slowly until mast rollers are visible, and support the bottom with wooden blocks.
   (2) Remove the inner mast rollers and shims.
   (3) Remove the outer mast rollers and shims.



5. The installation procedure is the reverse of the removal procedure.

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Ajuste del rodillo del soporte de elevación



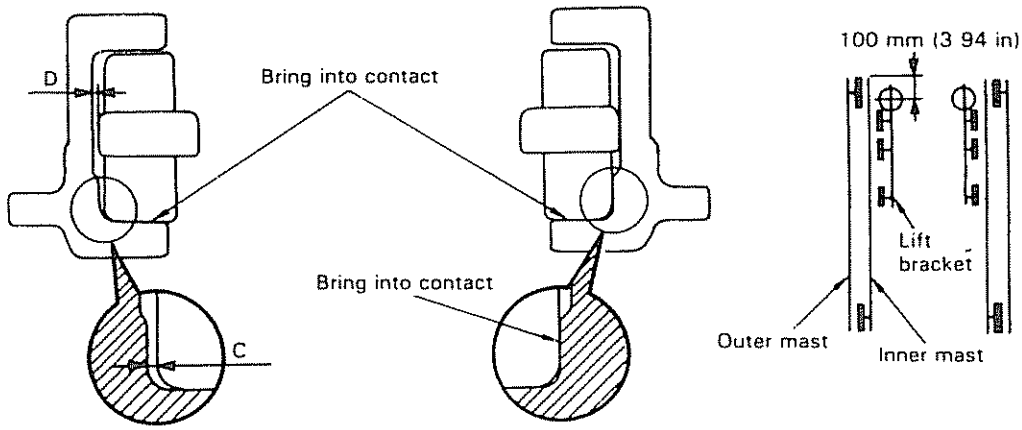
1. Ajuste de la holgura del rodillo de elevación y el rodillo lateral
   (1) Mida la holgura cuando el centro del rodillo lateral superior del soporte de elevación está a 100 mm de la parte superior del mástil interior.
   (2) Los rodillos de elevación superiores no necesitan ajustarse porque están fijos mediante los anillos de resorte.
   (3) Mida las holguras en los rodillos de elevación central e inferior después de sacar los rodillos laterales.
   Cambie el soporte de elevación a un lado para que entre en contacto el rodillo con el mástil interior, y mida la holgura entre la cara lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando la cuña del rodillo de elevación.

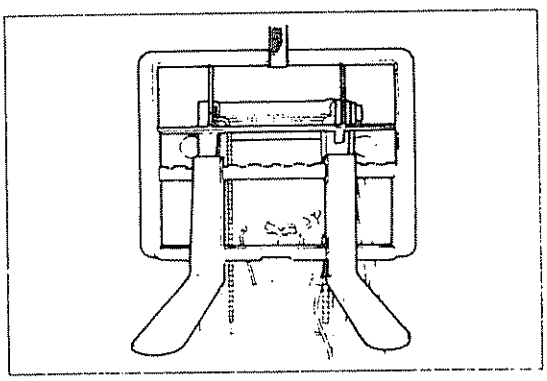
   Holgura estándar C = 0 - 0,8 mm

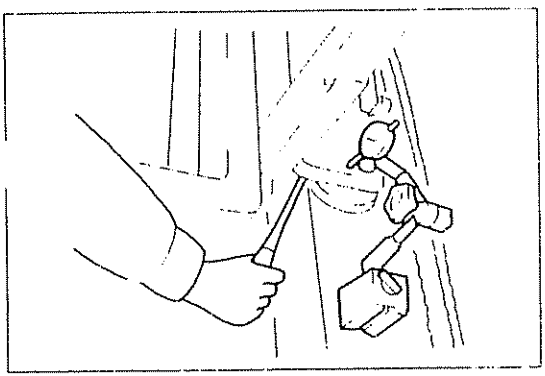
   Grosor de la cuña: 0,5 y 1,0 mm

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Lift Bracket Roller Adjustment







1 Lift roller and side roller clearance adjustment

(1) Measure the clearance when the center of the lift bracket upper side roller is 100 mm (3.93 in) from the top of the inner mast.

(2) The upper lift rollers need no adjustment because they are fixed by snap rings.

(3) Measure the clearances at the middle and lower lift rollers after removing the side rollers.
Shift the lift bracket to one side to bring the roller into contact with the inner mast, and measure the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

Standard clearance C = 0 ~ 0.8 mm (0 ~ 0.031 in)
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

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(4) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho. (En cuanto al procedimiento de recambio de la cuña vea la sección de desmontaje del soporte de elevación en la página 13-9)

(5) Instale los rodillos laterales.

(6) El ajuste del rodillo lateral se hará después de ajustar los rodillos de elevación central e inferior.
Ponga en contacto el rodillo lateral de un lado con la superficie lateral del mástil, y haga el ajuste insertando cuñas para que la holgura entre el rodillo lateral y la superficie lateral del mástil interior en el lado opuesto satisfagan el estándar siguiente.

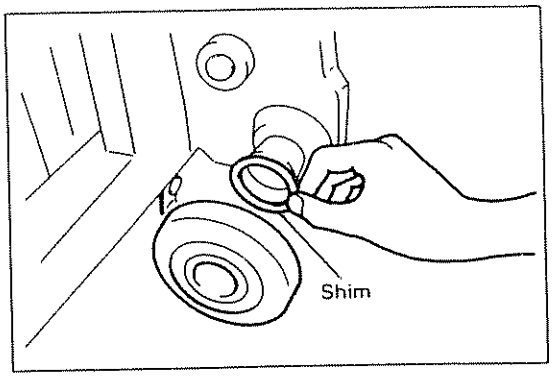
Holgura estándar D = 0 - 0,6 mm
Grosor de la cuña: 0,5 y 1,0 mm

(7) El grosor de la cuña se distribuirá igualmente en los lados izquierdo y derecho. (El recambio de la cuña es posible en el vehículo. En cuanto a la instalación del rodillo lateral, vea la sección de desmontaje del soporte de elevación en la páagina 13-10)

2. Después del ajuste, el soporte de elevación deberá moverse suavemente a lo largo de toda la longitud del mástil.

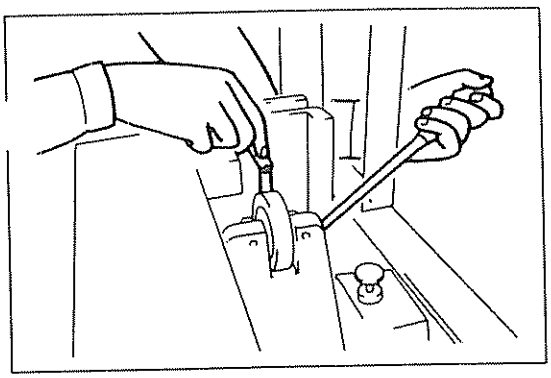
*Fig. Cuña

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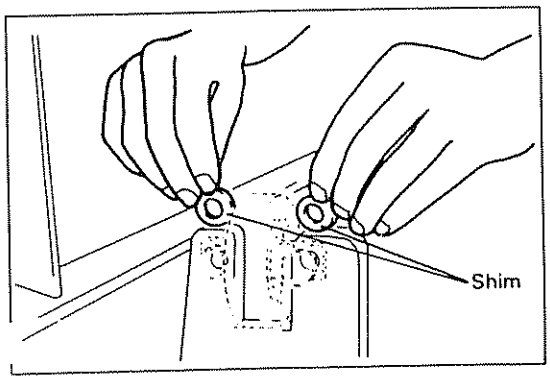
(4) Distribute the shim thickness equally to the left and right sides. (For the shim replacement procedure, see the lift bracket disassembly section on page 13-9.)

(5) Install the side rollers.



(6) Side roller adjustment shall be made after adjusting the middle and lower lift rollers.
Bring the side roller on one side into contact with the mast side surface, and make adjustment by shim insertion to make the clearance between the side roller and inner mast side surface on the opposite side satisfy the following standard.

Standard clearace **D = 0 ~ 0.6 mm (0 ~ 0.024 in)**
Shim thickness: **0.5 and 1.0 mm (0.020 and 0.039 in)**



(7) The shim thickness shall be distributed equally into the left and right sides. (Shim replacement is possible on the vehicle. For the side roller installation, see the lift bracket disassembly section on page 13-10.)

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

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Ajuste de la banda del mástil

Rodillo

Mástil interior

Ponga en contacto

E

Mástil exterior

1. Ajuste de la holgura de la banda del mástil
   (1) Mida la holgura con el mástil interior en la posición más baja.
   (2) Con el mástil interior en contacto con el rodillo del mástil exterior, ajuste la holgura entre la banda del mástil y el mástil interior al valor siguiente insertando la cuña de la banda del mástil. (El procedimiento de recambio de la cuña es el mismo que el descrito en la parte de "Remoción e instalación del rodillo del mástil" en la página 13-13).

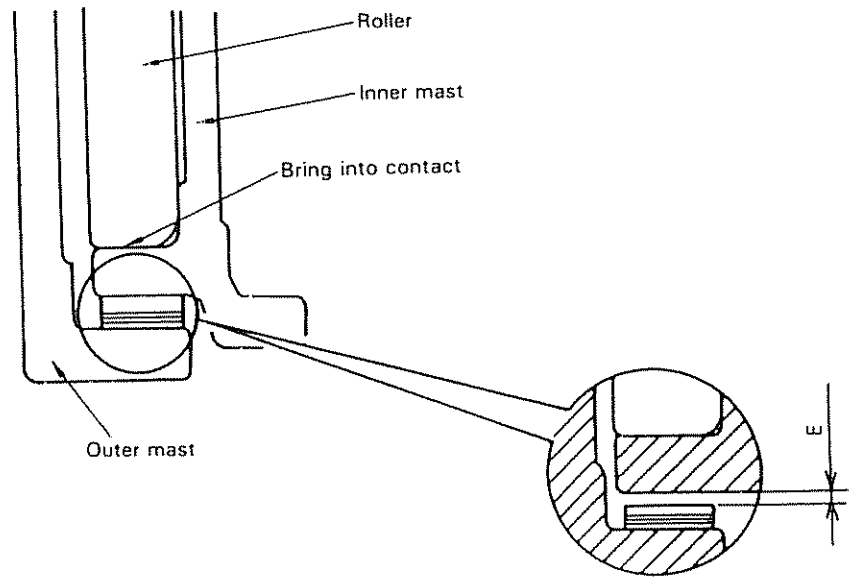
       Holgura estándar E = 0,5 - 1,0 mm
       Grosor de la cuña: 0,5 y 1,0 mm

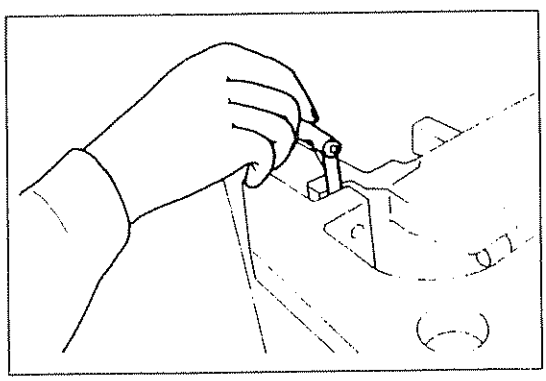
   (3) Después del ajuste, el mástil deberá moverse suavemente.

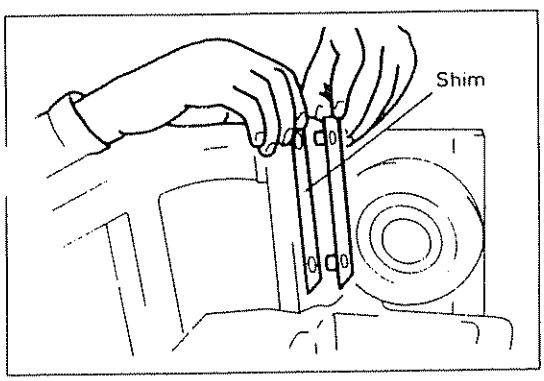
*Fig. Cuña

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Mast Strip Adjustment







1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast at the bottom position.
   (2) With the inner mast in contact with the outer mast roller, adjust the clearance between the mast strip and inner mast to the following value by inserting the mast strip shim. (The shim replacement procedure is the same as that described in the "mast roller removal·installation" section on page 13-13.)

   Standard clearance E = 0.5 ~ 1.0 mm (0.020 ~ 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) After the adjustment, the mast should move smoothly.

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CADENA

INSPECCION

1. Inspeccione el estiramiento de la cadena.
   SST 09631-22000-71

Notas:
- Cuando inspeccione el estiramiento de la cadena, use la SST anterior e inspeccione sin sacarla del vehículo.
- Paso de la articulación de la cadena estándar
  Series de 1 tonelada : 15,88 mm (Tipo: BL534)
  Series de 2 toneladas: 19,05 mm (Tipo: BL634)
  Series de 3 toneladas: 25,4 mm (Tipo: BL823)

REMONTAJE

Mástil aplicable y parte	V: Soporte de elevación SV: Soporte de elevación	FV: Soporte de elevación FSV: Soporte de elevación	FSV: Mástil interior
	Centro del vehículo	Exterior del vehículo	Lado trasero del vehículo
Dibujo	Pasador de chaveta	Pasador de chaveta	Pasador de chaveta
	Instale con el pasador de chaveta en el lado del centro del vehículo	Instálelo con el pasador de chaveta en el exterior del vehículo.	Instálelo con el pasador de chaveta en la parte trasera del vehículo.

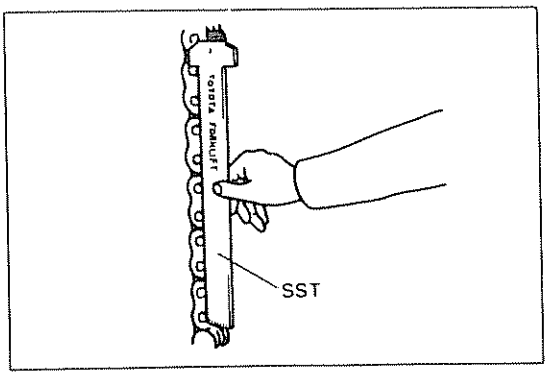
Secuencia de apretamiento de la tuerca de ajuste de la cadena

1 Apriete las tuercas 1 y 2 . Par de apretamiento T = 49,03 - 78,45 N.m (500 - 800 kgf-cm)

2 Apriete la tuerca 3 .

Mástil aplicable y parte	V: Mástil exterior	FV: Cilindro delantero FSV: Cilindro delantero SV: Mástil exterior (altura máxima de la horquilla a 2700 mm o menos)	Mástil exterior: FSV SV: Mástil exterior (altura máxima de la horquilla a 3000 mm o más)
		Abrazadera	Abrazadera
Dibujo			La abrazadera se usa solamente para el mástil SV.

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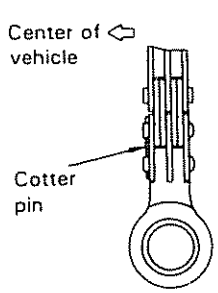
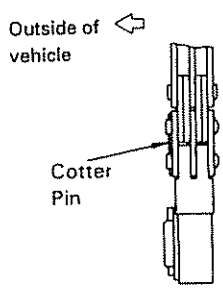
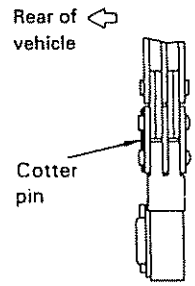
CHAIN

INSPECTION

1 Inspect the chain elongation.
SST 09631-22000-71

Note:
- **When inspecting the chain elongation, use the SST above and inspect without removal from the vehicle.**
- **Standard chain link pitch**
  1 ton series: 15.88 mm (0.6252 in) (Type: BL534)
  2 ton series: 19.05 mm (0.7500 in) (Type: BL634)
  3 ton series: 25.4 mm (1.000 in) (Type: BL823)

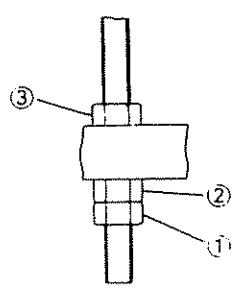
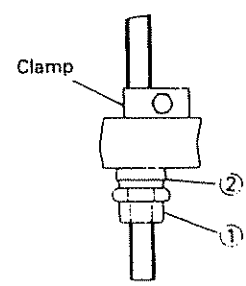
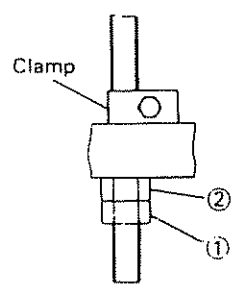
REASSEMBLY

Applicable mast and portion	V: Lift bracket SV: Lift bracket	FV: Lift bracket FSV: Lift bracket	FSV: Inner mast
Sketch	 Install with the cotter pin on the vehicle center side.	 Install with the cotter pin on the vehicle outside.	 Install with the cotter pin on the vehicle rear side.

Chain Adjusting Nut Tightening Sequence

1 Tighten nuts ① and ②. Tightening torque **T = 49.03~78.45 N·m (500~800 kgf-cm) [36.18~57.88 ft-lbf]**

2 Tighten nut ③.

Applicable mast and portion	V: Outer mast	FV: Front cylinder FSV: Front cylinder SV: Outer mast (maximum fork height at 2700 mm (106 in) or less)	FSV: Outer mast SV: Outer mast (maximum fork height at 3000 mm (118 in) or more)
Sketch		 The clamp is used only for the SV mast	

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AJUSTE

1 Coloque el vehículo en un lugar nivelado, y el mástil en posición vertical.

2 Después de mover la horquilla hacia arriba y hacia abajo varias veces sin carga, compruebe que es igual la tensión de la cadena en los lados izquierdo y derecho.

3 Gire la tuerca de ajuste de tal manera que la superficie inferior de la horquilla esté casi en contacto con la superficie del suelo sin que la cadena esté floja.

4 Compruebe las cadenas para que tengan igual tensión en los lados izquierdo y derecho.

5 Compruebe que las cadenas no están retorcidas.

6 Compruebe que la altura máxima de la horquilla es la especificada.

HORQUILLA

REMOCION

1. Afloje los pernos de sujeción para evitar que se afloje la horquilla.

Nota:
Coloque siempre la palanca para evitar que la horquilla se afloje en la posición horizontal después de usarla.

2. Coloque la horquilla a 20 cm por encima del suelo.

3. Coloque un bloque de madera debajo de la parte con muescas del raíl de la horquilla.

4. Desinmovilice después de levantar el pasador de retén de la horquilla, y cambie las púas de la horquilla una a una al centro.

5. Baje gradualmente la horquilla y sáquela.

INSTALACION

El procedimiento de instalación es el inverso al de remoción.

INSPECCION

1. Inspeccione la horquilla.

Desalineamiento límite del extremo de la punta de la horquilla: 10 mm

Nota:
Si se excede el desalineamiento límite del extremo de la punta, inspeccione por si hay alabeo, si la horquilla está montada con flojedad o si hay deformación de la barra de garra del soporte de elevación en cada púa.

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ADJUSTMENT

1 Place the vehicle on a flat ground, and set the mast in the vertical position.

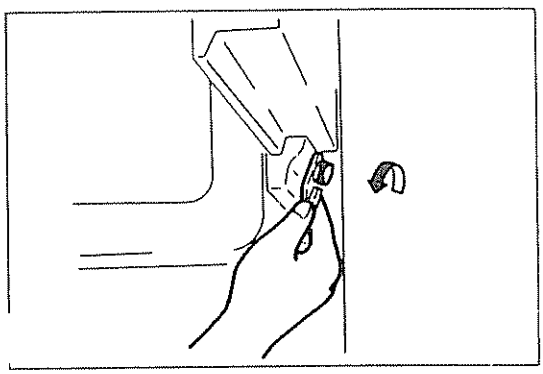
2 After moving the fork up and down several times without a load, check that the chain tension on the left and right sides are equal.

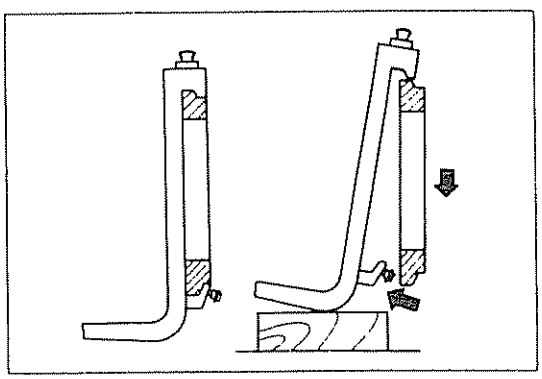
3 Turn the adjusting nut so that the fork bottom surface is about to come into contact with the ground surface without slackening the chain.

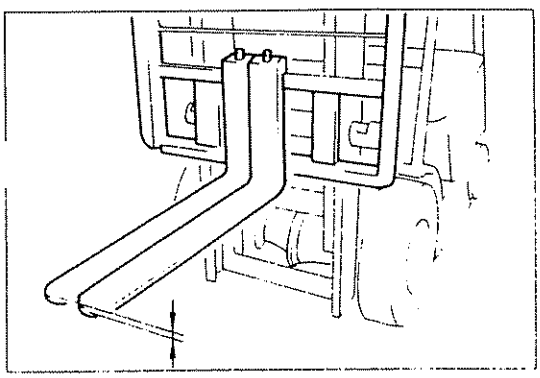
4 Check the chains for equal tension on the left and right sides.

5 Check that the chains are not twisted.

6 Check that the maximum fork height is as specified.







FORK

REMOVAL

1. Loosen the set bolts (OPT) for preventing the fork from loosening.

Note:
Always set the lever for preventing the fork from loosening in the horizontal position after it is used.

2. Position the fork at 20 cm (7.9 in) above the ground.

3. Place a wooden block under the notched portion of the fork rail.

4. Unlock after lifting the fork stopper pin, and shift the fork blades one by one to the center.

5. Gradually lower the fork and remove it.

INSTALLATION

The installation procedure is the reverse of the removal procedure.

INSPECTION

1 Inspect the fork.

Fork tip end limit misalignment: 10 mm (0.39 in)

Note:
If the tip end limit misalignment is exceeded, inspect the bend, fork mounting looseness and lift bracket finger bar distortion for each blade.

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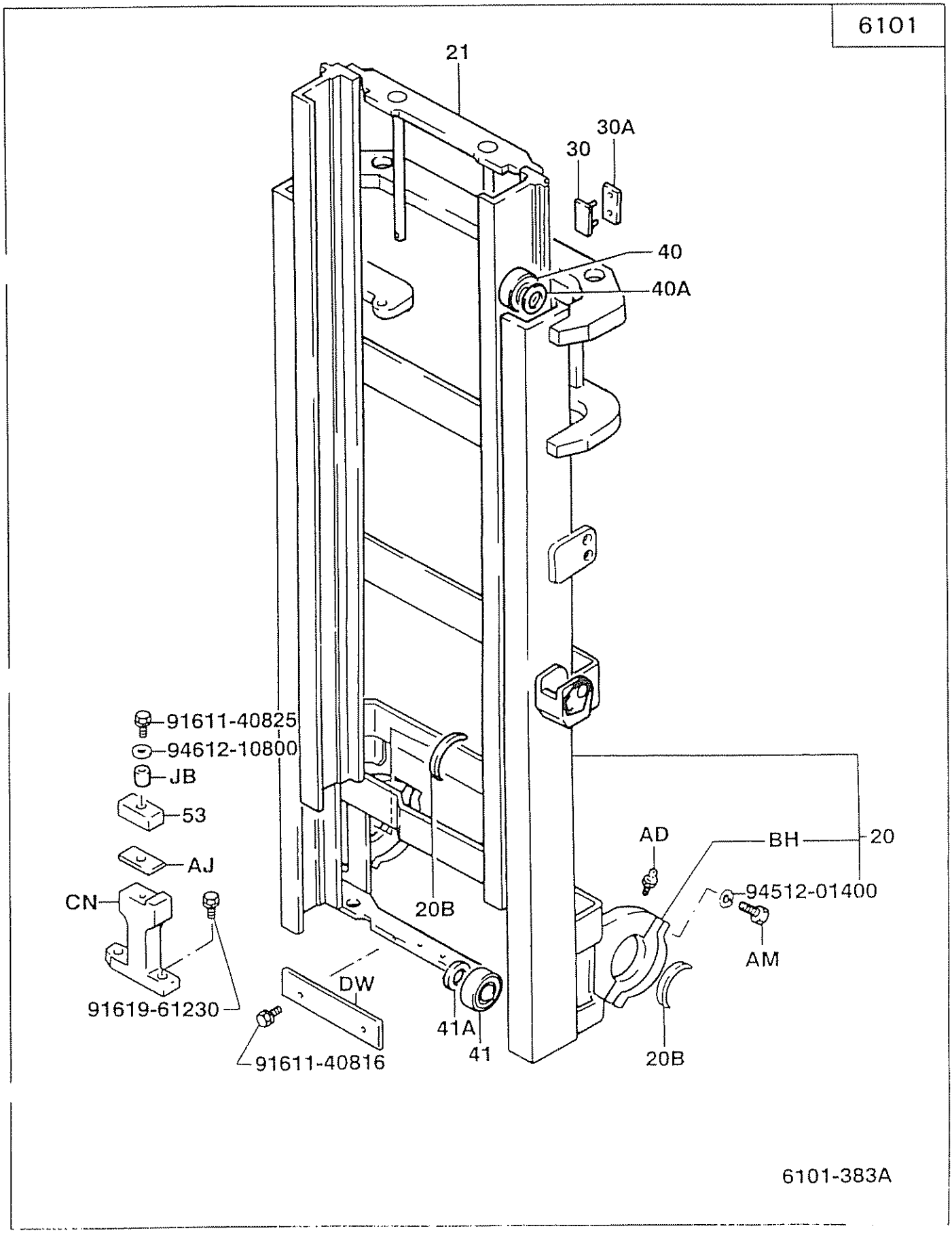
CONJUNTO DEL MASTIL SV

COMPONENTES

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SV MAST ASSY

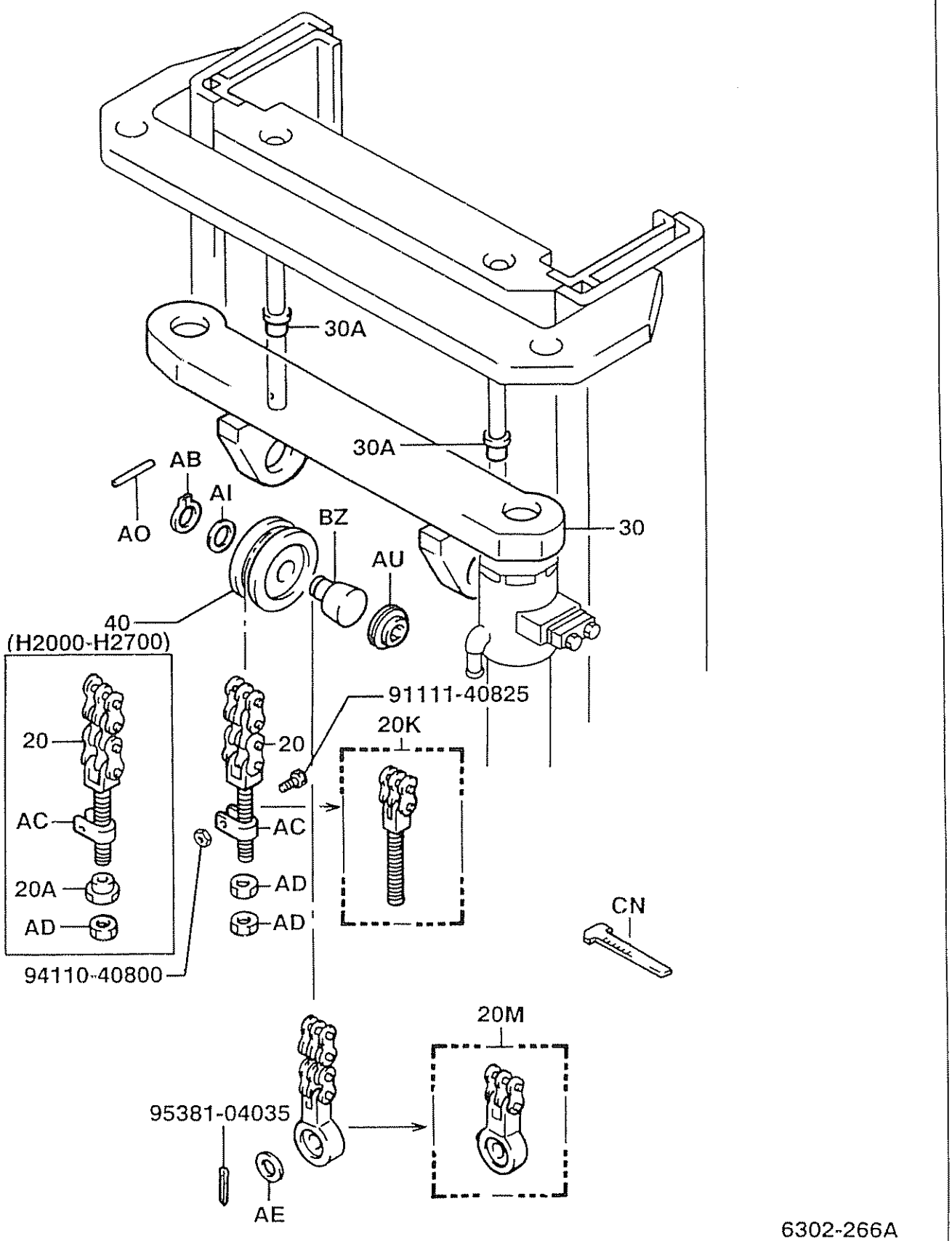
COMPONENTS



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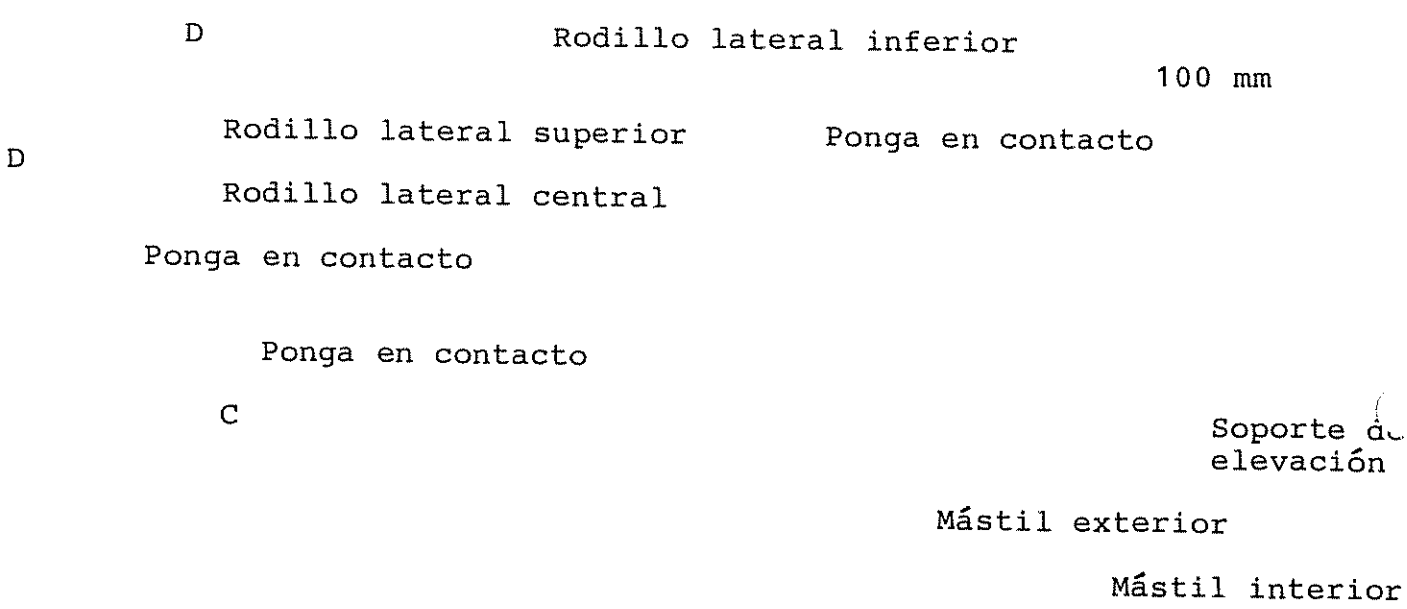
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AJUSTE DEL MASTIL (MASTIL SV)
Vea el procedimiento de ajuste del mástil V (en las página 13-11) en cuanto al ajuste del rodillo del mástil y ajuste de la banda del mástil.

Ajuste del rodillo del soporte de elevación (SV)



1. Ajuste de la holgura del rodillo de elevación y rodillo lateral
   (1) Mida la holgura cuando el centro del rodillo lateral superior del soporte de elevación esté a 100 mm de la parte superior del mástil interior.
   (2) Los rodillos de elevación superior e inferior no necesitan ajuste porque están fijos mediante anillos de resorte.
   (3) Ajuste las holguras de los rodillos de elevación centrales de la manera siguiente: Mueva el soporte de elevación a un lado para que el rodillo entre en contacto con el mástil interior, y ajuste la holgura entre la cara lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando una cuña del rodillo de elevación.

   Holgura estándar C = 0- 0,8 mm
   Grosor de la cuña: 0,5 y 1,0 mm

   (4) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho.
   (5) Ajuste los rodillos del lado superior e inferior después de ajustar los rodillos de elevación centrales. Ponga en contacto el rodillo lateral en un lado con la superficie lateral del mástil y ajuste la holgura entre el rodillo lateral y la superficie del mástil interior al valor siguiente insertando la cuña del rodillo lateral.

   Holgura estándar D = 0 - 0,6 mm
   Grosor de la cuña: 0,5 y 1,0 mm

   (6) Distribuya el grosor de la cuña de igual manera en los rodillos del lado izquierdo y derecho.

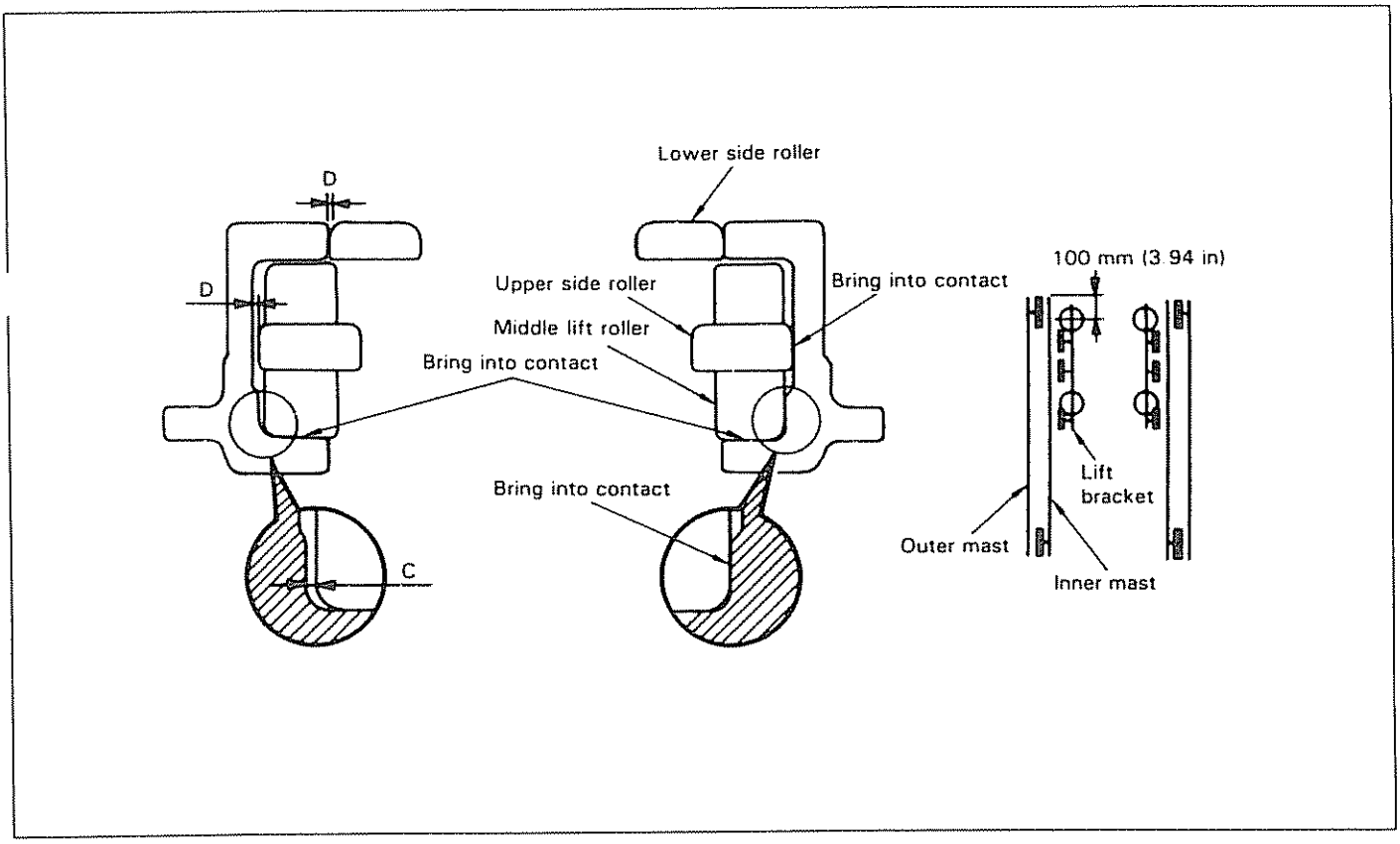
2. Después del ajuste, el soporte de elevación deberá moverse suavemente a lo largo de toda la longitud del mástil.

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MAST ADJUSTMENT

See the V mast adjustment procedure (on page 13-11) for the lift roller adjustment and mast strip adjustment (on page 13-16).

Lift Bracket Roller Adjustment (SV)



1. Lift roller and side roller clearance adjustment
   (1) Measure the clearance when the center of the lift bracket upper side roller is 100 mm (3.94 in) from the top of the inner mast.
   (2) The upper and lower lift rollers need no adjustment because they are fixed by snap rings.
   (3) Adjust the clearances at the middle lift rollers as follows: Shift the lift bracket to one side to bring the roller into contact with the inner mast, and adjust the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

   Standard clearance C = 0 ~ 0.8 mm (0 ~ 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (4) Distribute the shim thickness equally to the left and right sides.
   (5) Adjust the upper and lower side rollers after adjusting the middle lift rollers. Bring the side roller on one side into contact with the mast side surface and adjust the clearance between the side roller and inner mast surface to the following value by inserting the side roller shim.

   Standard clearance D = 0 ~ 0.6 mm (0 ~ 0.024 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (6) Distribute the shim thickness equally to the left and right side rollers.

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

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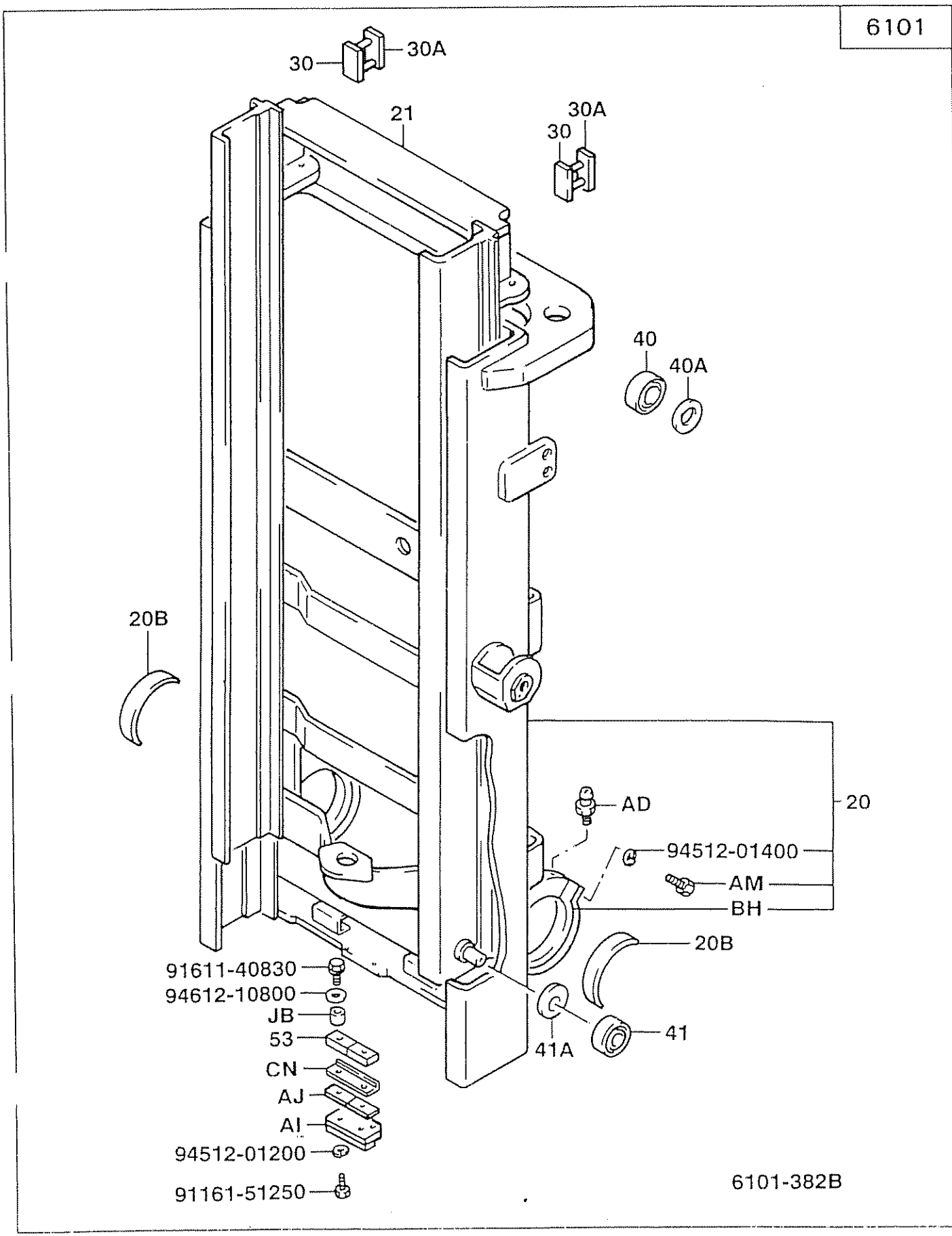
CONJUNTO DEL MASTIL FV

COMPONENTES

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FV MAST ASSY

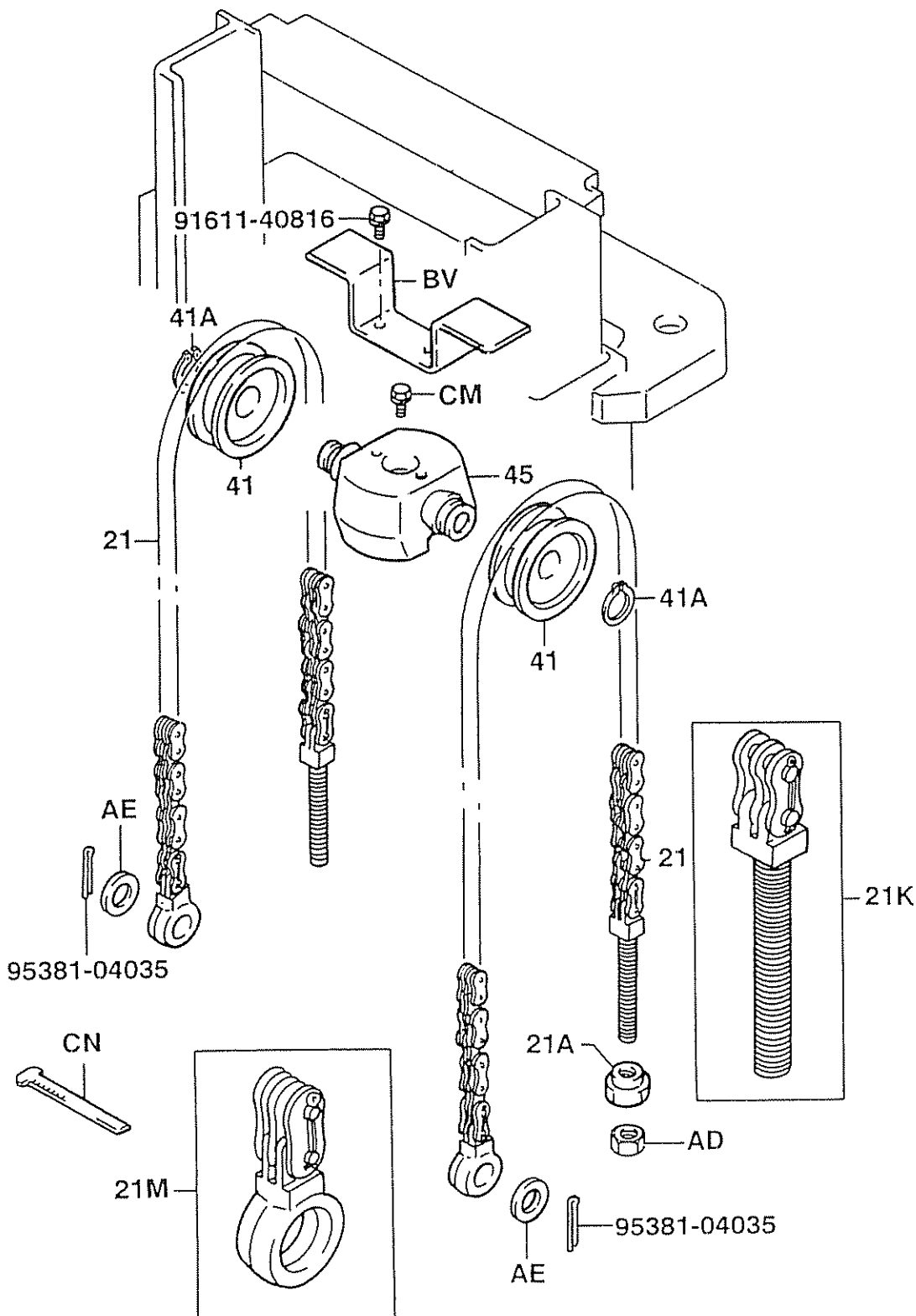
COMPONENTS



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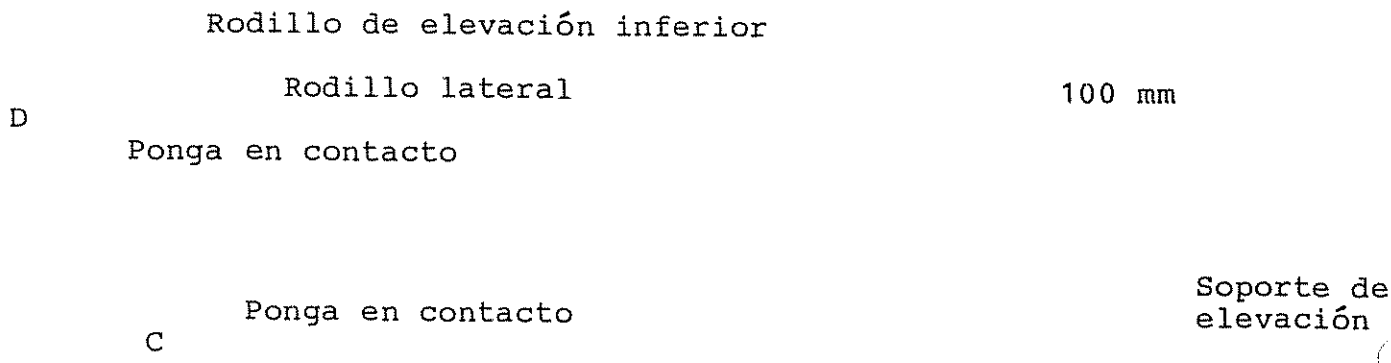
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AJUSTE DEL MASTIL (MASTIL FV)

Procedimiento de ajuste del rodillo de elevación y de la banda del mástil (Ver 13-11)

Ajuste del rodillo del soporte de elevación (FV)



1. Ajuste de la holgura del rodillo de elevación y rodillo lateral
   (1) Mida la holgura cuando el centro del rodillo lateral superior del soporte de elevación esté a 100 mm de la parte superior del mástil interior.
   (2) Los rodillos de elevación superior y central no necesitan ajuste porque están fijos mediante anillos de resorte.
   (3) Para el rodillo de elevación inferior, mueva el soporte de elevación a un lado para que el rodillo entre en contacto con el mástil interior, y ajuste la holgura entre la cara lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando una cuña del rodillo de elevación.

      Holgura estándar C = 0 - 0,5 mm
      Grosor de la cuña: 0,5 y 1,0 mm

   (4) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho.
   (5) Ajuste los rodillos laterales después de ajustar los rodillos de elevación inferiores. Ponga en contacto el rodillo lateral en un lado con la superficie lateral del mástil y ajuste la holgura entre el rodillo lateral y el mástil interior en el lado opuesto al valor siguiente insertando la cuña del rodillo lateral:

      Holgura estándar D = 0 - 0,6 mm
      Grosor de la cuña: 0,5 y 1,0 mm

   (6) Distribuya el grosor de la cuña de forma igual en los rodillos izquierdo y derecho.

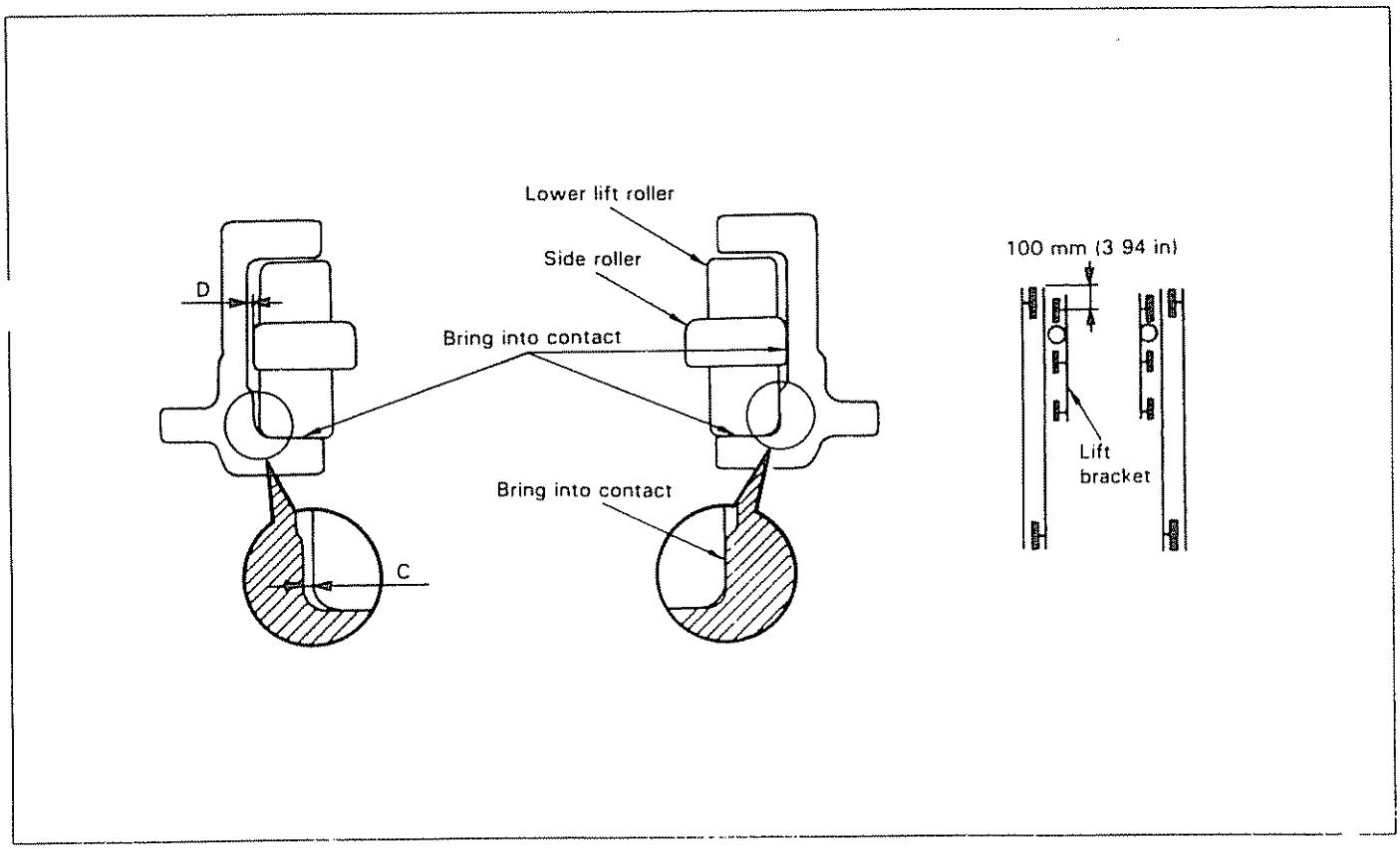
2. Después del ajuste, el soporte de elevación deberá moverse suavemente a lo largo de toda la longitud del mástil.

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MAST ADJUSTMENT

See the V mast adjustment procedure (on page 13-11) for the lift roller adjustment and mast strip adjustment (on page 13-16).

Lift Bracket Roller Adjustment (FV)



Lift roller and side roller clearance adjustment

(1) Measure the clearance when the center of the lift bracket upper side roller is 100 mm (3.94 in) from the top of the inner mast.

(2) The upper and middle lift rollers need no adjustment because they are fixed by snap rings.

(3) For the lower lift roller, shift the lift bracket to one side to bring the roller into contact with the inner mast, and adjust the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

Standard clearance C = 0 ~ 0.5 mm (0 ~ 0.020 in)
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(4) Distribute the shim thickness equally to the left and right sides

(5) Adjust the side rollers after adjusting the lower lift rollers. Bring the side roller on one side into contact with the mast side surface and adjust the clearance between the side roller and inner mast on the opposite side to the following value by inserting the side roller shim:

Standard clearance D = 0 ~ 0.6 mm (0 ~ 0.024 in)
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(6) Distribute the shim thickness equally to the left and right side rollers.

2 After the adjustment, the lift bracket should move smoothly along the overall mast length.

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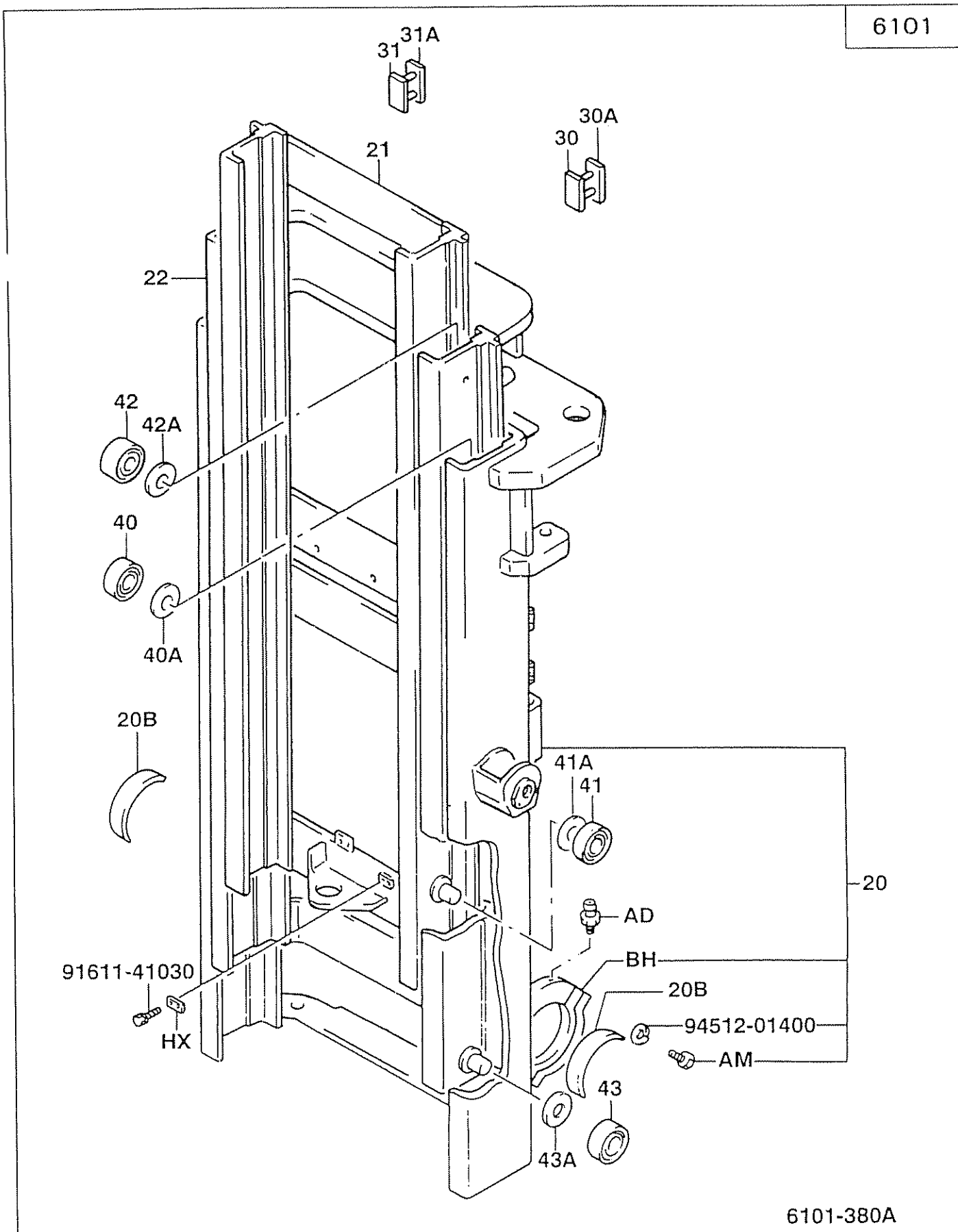
CONJUNTO DEL MASTIL FSV

COMPONENTES

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FSV MAST ASSY

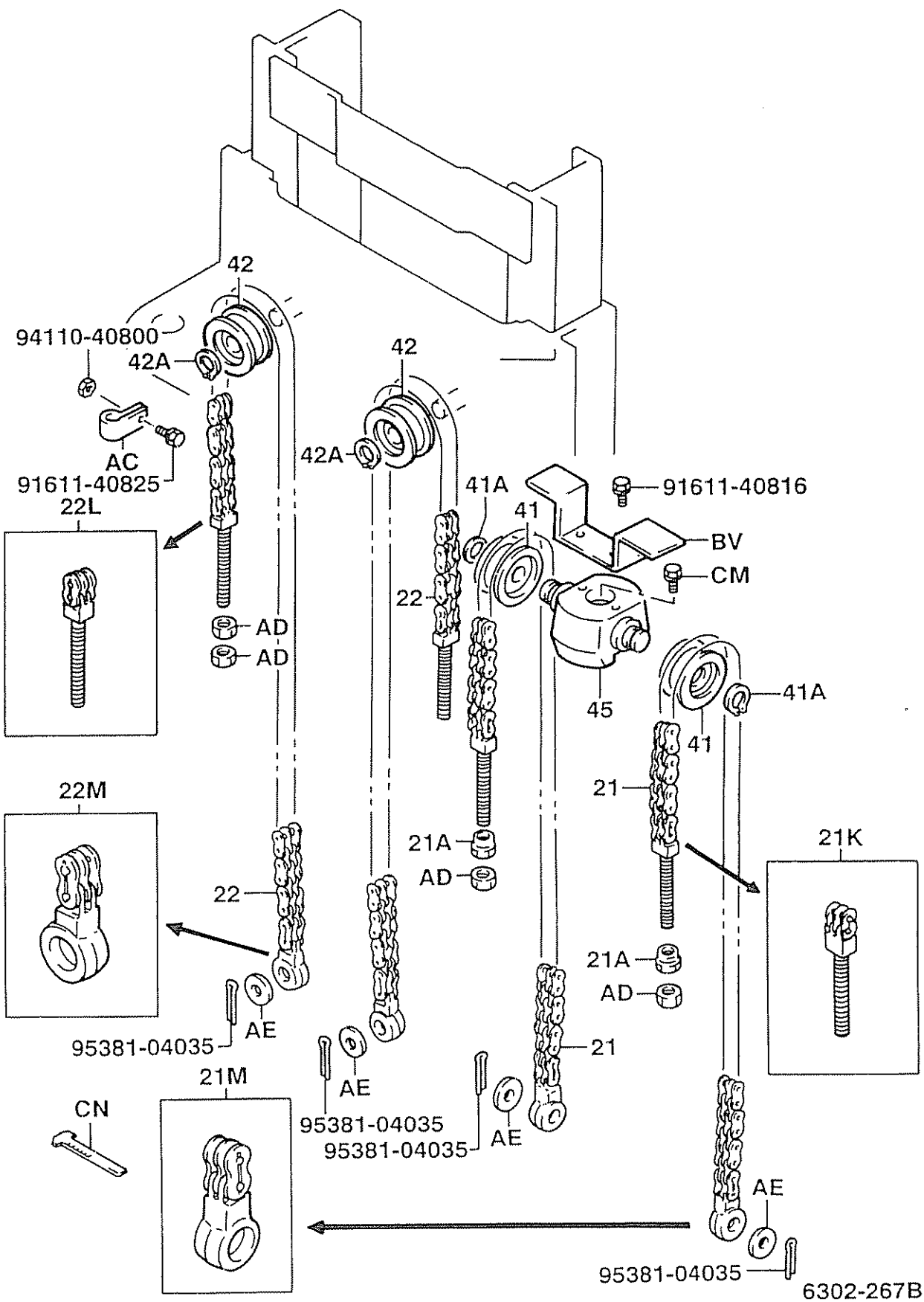
COMPONENTS



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AJUSTE DEL MASTIL (MASTIL FSV)

Ajuste del rodillo de elevación del mástil (FSV)

Mástil exterior

Ponga en contacto — Mástil central

Mástil interior

Ponga en contacto — Este rodillo

1. Ajuste de la holgura del rodillo del mástil interior y rodillo inferior del mástil central
   (1) Mida la holgura con el mástil superpuesto cerca de 450 mm.
   (2) Cambie el mástil interior a un lado para que el rodillo entre en contacto con el mástil exterior y el mástil central, y ajuste la holgura entre la superficie lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando la cuña del rodillo del mástil interior y la cuña del rodillo inferior del mástil central, respectivamente.

      Holgura estándar A = 0 - 0,8 mm

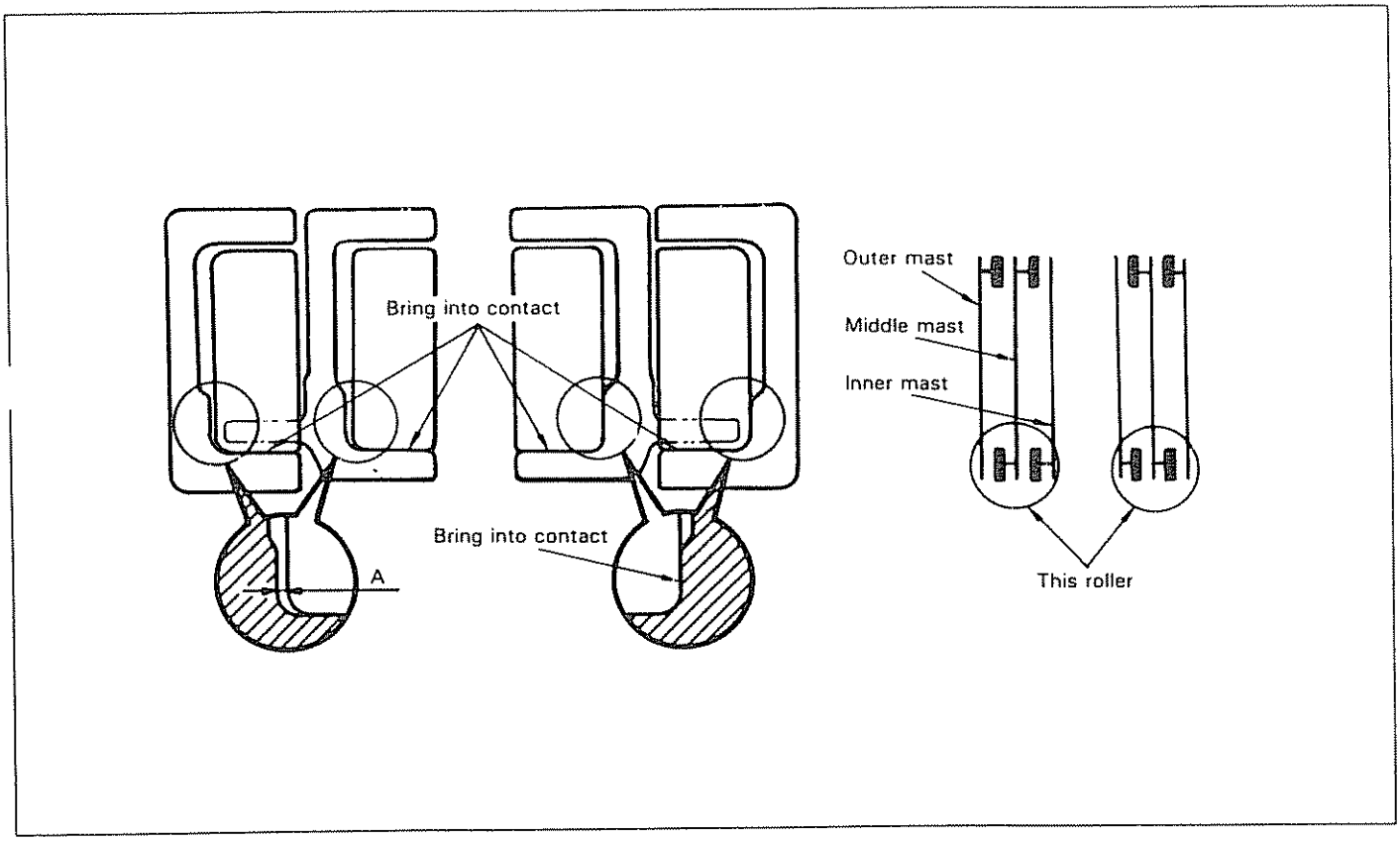
      Grosor de la cuña: 0,5 y 1,0 mm

   (3) Distribuya el grosor de la cuña de forma igual en los rodillos izquierdo y derecho.
   (4) Después del ajuste, compruebe que el mástil interior se mueve suavemente en el mástil central, y que el mástil central se mueve suavemente en el mástil exterior.

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MAST ADJUSTMENT

Mast Lift Roller Adjustment (FSV)



1. Inner mast roller and middle mast lower roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast and the middle mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim and middle mast lower roller shim, respectively.

   Standard clearance A = 0 ~ 0.8 mm (0 ~ 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers.
   (4) After the adjustment, check that the inner mast moves smoothly in the middle mast, and the middle mast moves smoothly in the outer mast.

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Este rodillo

Ponga en contacto

Mástil exterior

Ponga en contacto Mástil central

Mástil interior

B

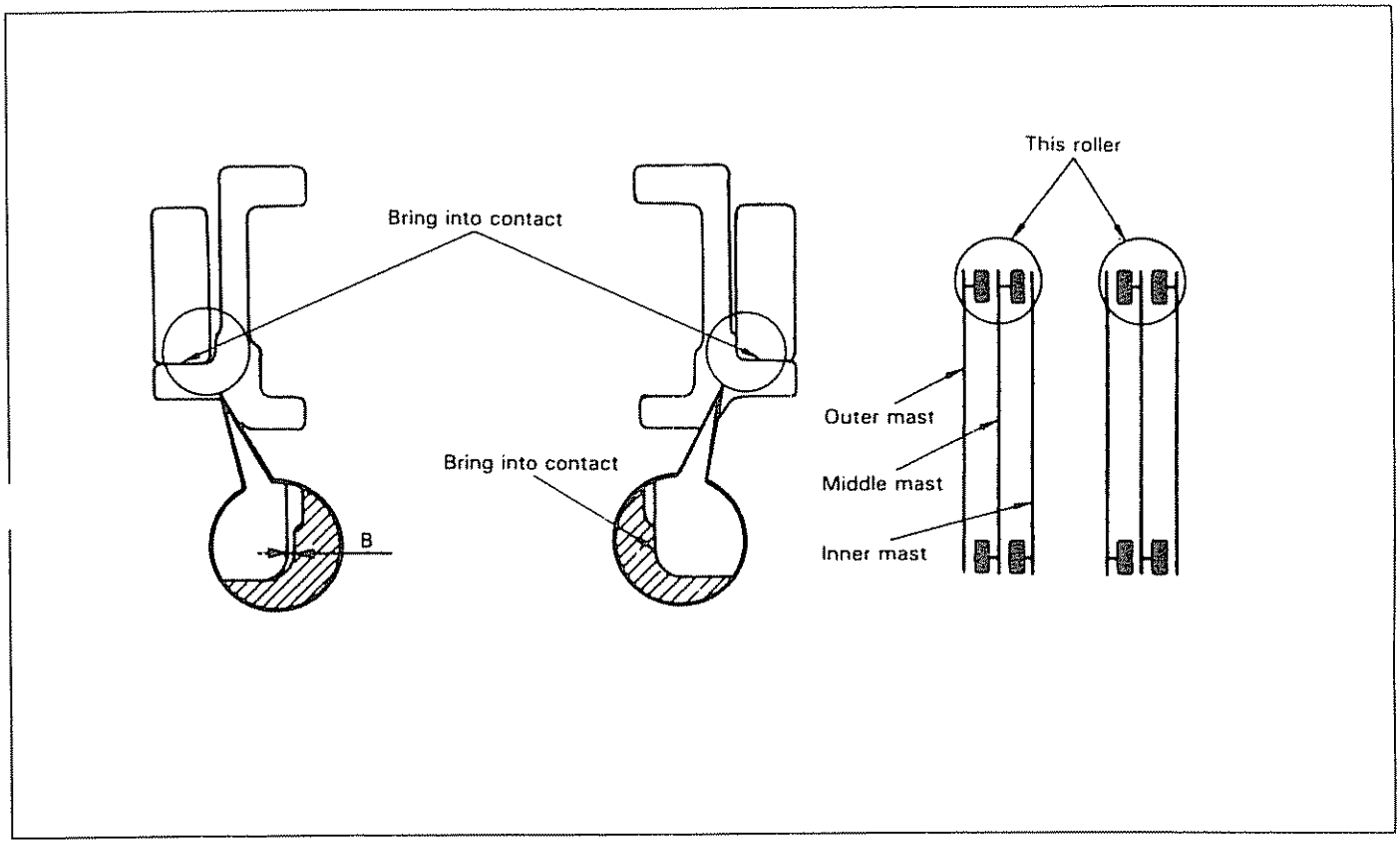
2. Ajuste de la holgura del rodillo del mástil exterior y rodillo superior del mástil central
   (1) Mida la holgura con el mástil superpuesto cerca de 450 mm.
   (2) Cambie el mástil interior a un lado para que entre en contacto el rodillo con el mástil interior y el mástil central, y ajuste la holgura entre el rodillo y el mástil a la posición más cercana en el lado opuesto al valor siguiente insertando la cuña del rodillo del mástil exterior y la cuña del rodillo superior del mástil central respectivamente.

       Holgura estándar B = 0 - 0,8 mm

       Grosor de la cuña: 0,5 y 1,0 mm

   (3) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho.
   (4) Después del ajuste, compruebe que el mástil interior se mueve suavemente en el mástil central y que éste se mueve suavemente en el mástil exterior.

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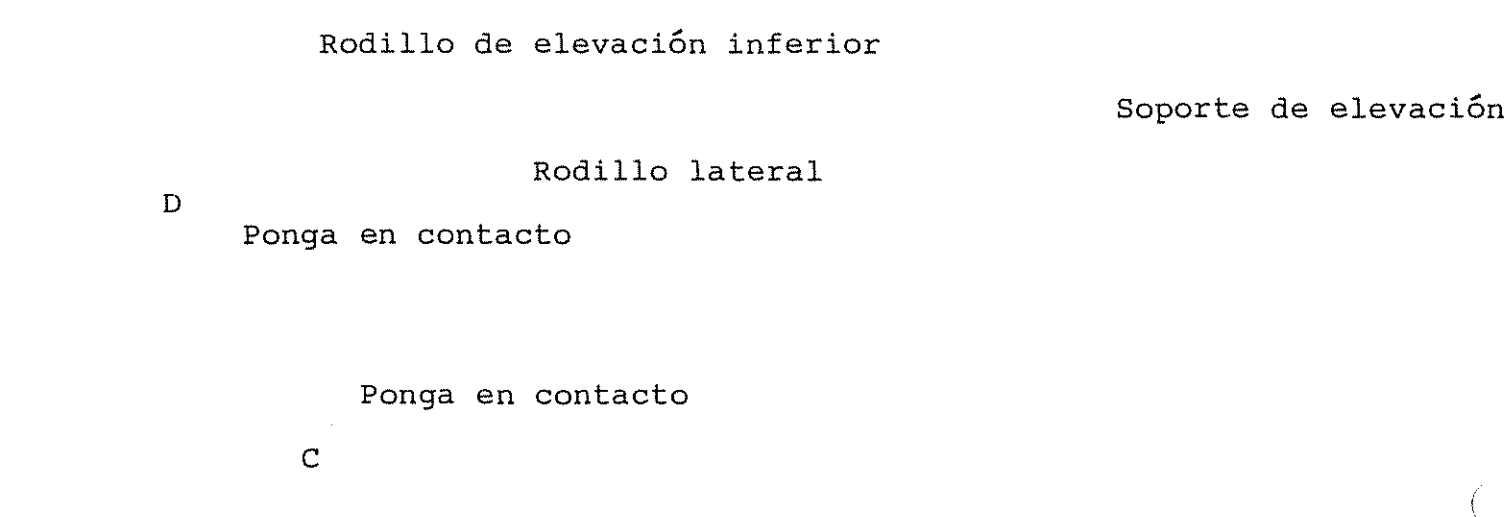
2. Outer mast roller and middle mast upper roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the inner mast and middle mast, and adjust the clearance between the roller and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim and middle mast upper roller shim respectively.

   Standard clearance B = 0 ~ 0.8 mm (0 ~ 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right sides.
   (4) After the adjustment, check that the inner mast moves smoothly in the middle mast and the middle mast moves smoothly in the outer mast.

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Ajuste del rodillo del soporte de elevación (FSV)



1. Ajuste de la holgura del rodillo de elevación y rodillo lateral
   (1) Mida la holgura con el soporte de elevación en la posición más alta.
   (2) Los rodillos de elevación superiores no necesitan ajuste porque están fijos mediante anillos de resorte.
   (3) Para los rodillos de elevación inferiores, cambie el soporte de elevación a un lado para que entre en contacto el rodillo con el mástil interior, y mida la holgura entre la cara lateral del rodillo y el mástil en la posición más cercana en el lado opuesto al valor siguiente insertando la cuña del rodillo de elevación.

       Holgura estándar C = 0 - 0,5 mm
       Grosor de la cuña: 0,5 y 1,0 mm

   (4) Distribuya el grosor de la cuña de igual manera en los rodillos izquierdo y derecho.
   (5) Ajuste los rodillos laterales después de ajustar los rodillos de elevación inferiores.
       Ponga en contacto el rodillo lateral en un lado con la superficie lateral del mástil y ajuste la holgura entre el rodillo lateral y la superficie lateral del mástil interior al valor siguiente insertando una cuña del rodillo lateral:

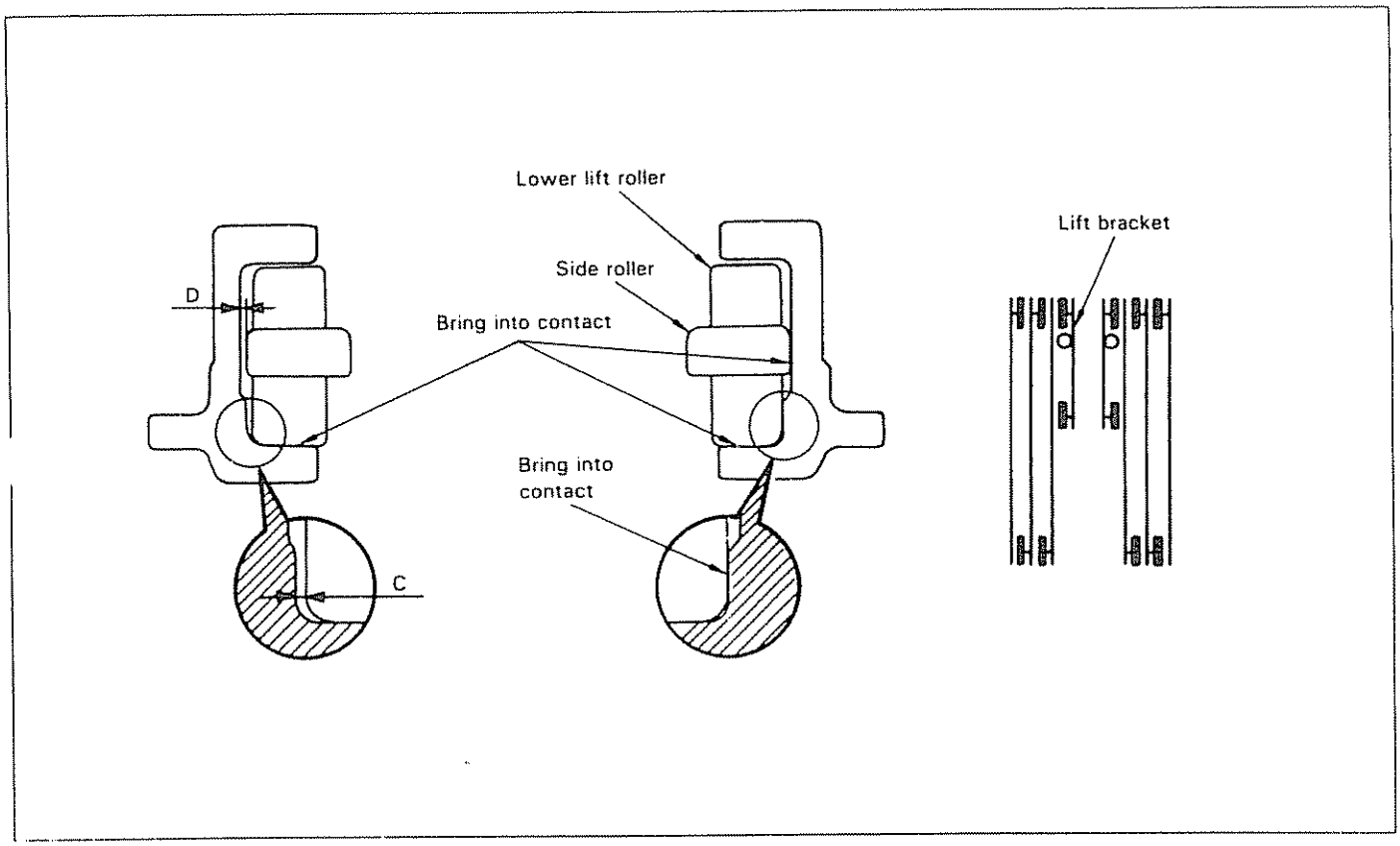
       Holgura estándar D = 0 - 0,6 mm
       Grosor de la cuña: 0,5 y 1,0 mm

   (6) Distribuya el grosor de la cuña de forma igual en los lados izquierdo y derecho.

2. Después del ajuste, el soporte de elevación deberá moverse suavemente a lo largo de toda la longitud del mástil.

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Lift Bracket Roller Adjustment (FSV)



1. Lift roller and side roller clearance adjustment
   (1) Measure the clearance with the lift bracket at the uppermost position.
   (2) The upper lift rollers need no adjustment because they are fixed by snap rings.
   (3) For the lower lift rollers, shift the lift bracket to one side to bring the roller into contact with the inner mast, and measure the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

   Standard clearance C = 0 ~ 0.5 mm (0 ~ 0.020 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (4) Distribute the shim thickness equally to the left and right rollers.
   (5) Adjust the side rollers after adjusting the lower lift rollers.
   Bring the side roller on one side into contact with the mast side surface, and adjust the clearance between the side roller and inner mast side surface to the following value by inserting the side roller shim:

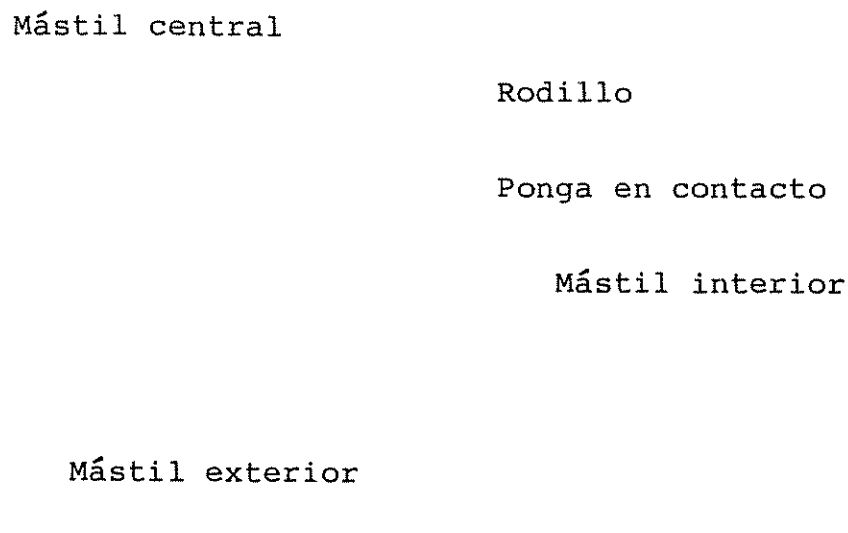
   Standard clearance D = 0 ~ 0.6 mm (0 ~ 0.024 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 ~ 0.039 in)

   (6) Distribute the shim thickness equally to the left and right sides.

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

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Ajuste de la banda del mástil (FSV)



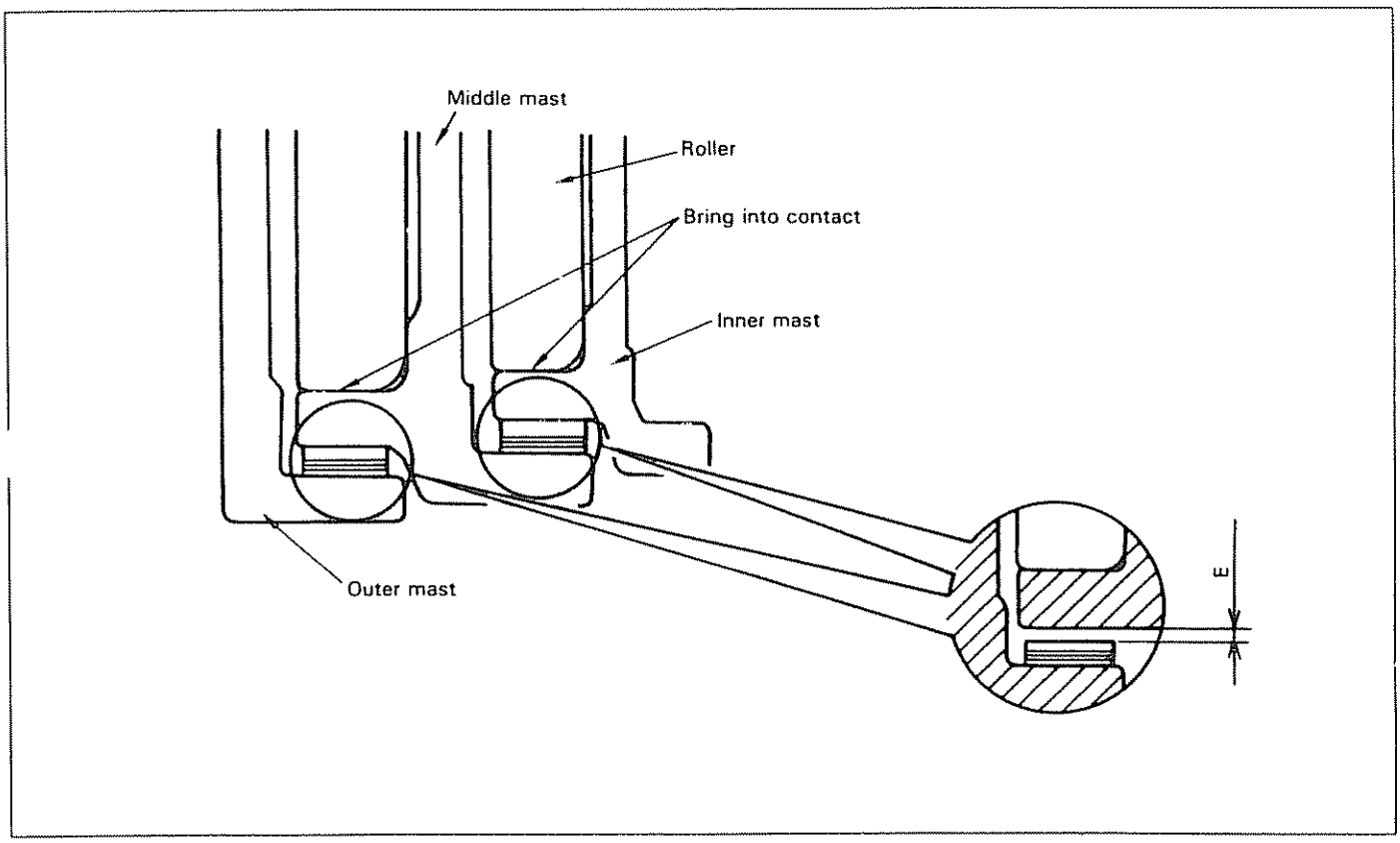
1. Ajuste de la holgura de la banda del mástil
   (1) Mida la holgura con el mástil interior o mástil central en la posición más baja.
   (2) Con el mástil interior en contacto con el rodillo superior del mástil central, ajuste la holgura entre la banda del mástil y el mástil interior al valor siguiente insertando una cuña de la banda del mástil.
   Luego, con el mástil central en contacto con el rodillo del mástil exterior, ajuste la holgura entre la banda del mástil y el mástil central al valor siguiente insertando una cuña de la banda del mástil.

   Holgura estándar E = 0,5 - 1,0 mm
   Grosor de la cuña: 0,5 y 1,0 mm

   (3) Después del ajuste, el mástil deberá moverse suavemente.

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Mast Strip Adjustment (FSV)



1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast or middle mast at the bottom position.
   (2) With the inner mast in contact with the middle mast upper roller, adjust the clearance between the mast strip and inner mast to the value shown below by inserting the mast strip shim. Then, with the middle mast in contact with the outer mast roller, adjust the clearance between the mast strip and the middle mast to the value shown below by inserting the mast strip shim.

   Standard clearance E = 0.5 ~ 1.0 mm (0.020 ~ 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 ~ 0.039 in)

   (3) After the adjustment, the mast should move smoothly.

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AJUSTE DE LA CUÑA DE LA VARILLA DEL CILINDRO DE ELEVACION (PREVENCION D ELEVACION IRREGULAR)

Notas:

- Para los cilindros de elevación doble, la inspección y el ajuste se requieren para evitar una elevación irregular en los lados izquierdo y derecho debido a la tolerancia de las partes, etc.
- La inspección y el ajuste deberá realizarse siempre que se recambien una de las partes siguientes:
  Conjunto del cilindro de elevación, subconjunto de la varilla del cilindro de elevación, subconjunto del cilindro de elevación, conjunto del mástil, subconjunto del mástil exterior y subconjunto del mástil interior.

1. Método de inspección
   Levante lentamente el mástil interior, y observe el estado de parada de las varillas del cilindro izquierdo y derecho en el momento en que el mástil interior alcanza la altura máxima.
   (1) Caso normal
   Tanto las varillas izquierda y derecha se detienen casi simultáneamente sin casi vibración del mástil interior.
   (2) Caso anormal
   Las varillas se detienen con una ligera diferencia y la parte superior del mástil interior vibra en el momento de parar. Para corregir esto, añada cuñas al cilindro que se para primero.

2. Método de ajuste
   (1) Levante el mástil interior, coloque la SST en el larguero del mástil exterior, y baje el mástil interior hasta que alcance la SST.
   SST 09610-22000-71
   (2) Saque el perno de sujeción del extremo de la varilla del cilindro en el lado que requiera el ajuste con cuñas.
   (3) Baje lentamente la varilla del cilindro de elevación y desconecte el extremo de la varilla del cilindro.
   (4) Coloque cuñas en el extremo de la varilla del cilindro. Levante lentamente el extremo de la varilla del cilindro hasta el mástil interior.
   (5) Fije el perno de sujeción del extremo de la varilla del cilindr(
   (6) Levante el mástil interior para volverlo a inspeccionar.
   (7) Repita la inspección y el ajuste hasta que se determine el número de cuñas.

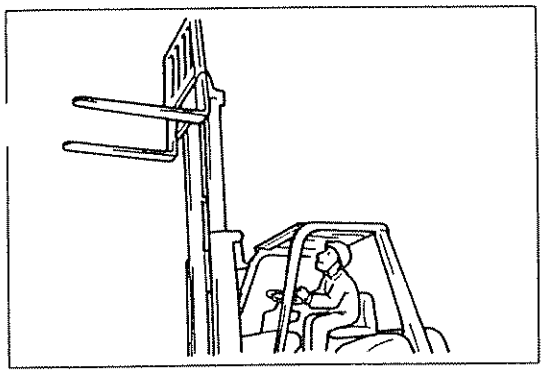
   Grosor de las cuñas:
   0,5 y 1,0 mm

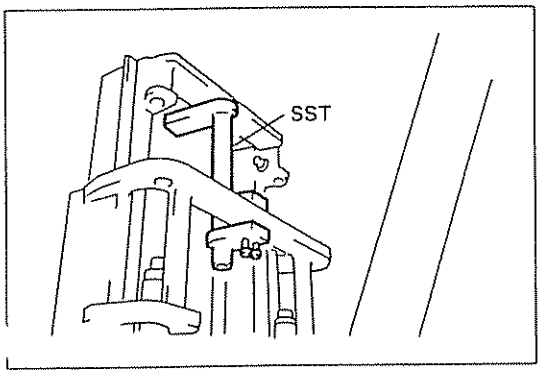
*Fig. Cuña

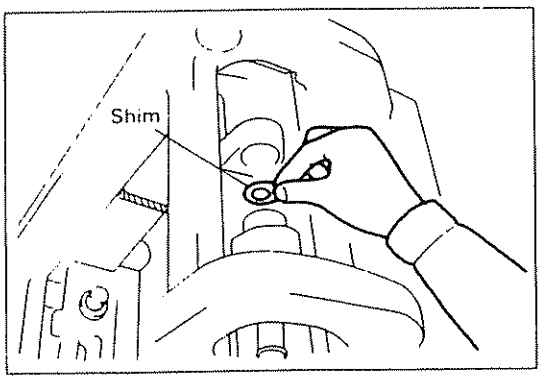
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LIFT CYLINDER ROD SHIM ADJUSTMENT (PREVENTION OF UNEVEN LIFTING)

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 adjustments 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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CILINDRO DE ELEVACION (V/SV)/CILINDRO DE ELEVACION TRASERO (FV/FSV)

GENERALIDADES

Cilindro de elevación (V)

Derecho

Izquierdo

Cilindro de elevación (Amortiguador inferior de la horquilla) (V/SV)

Derecho

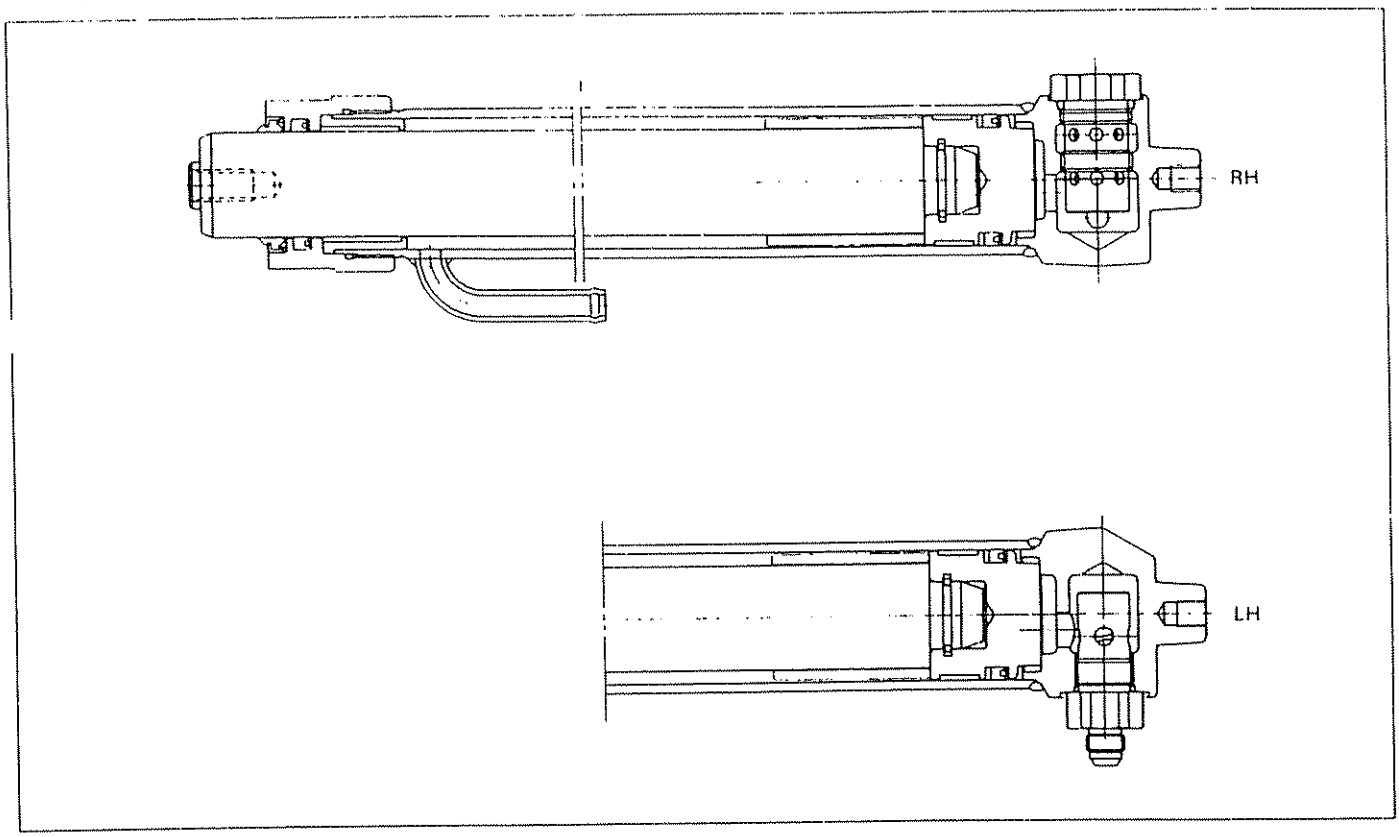
Izquierdo

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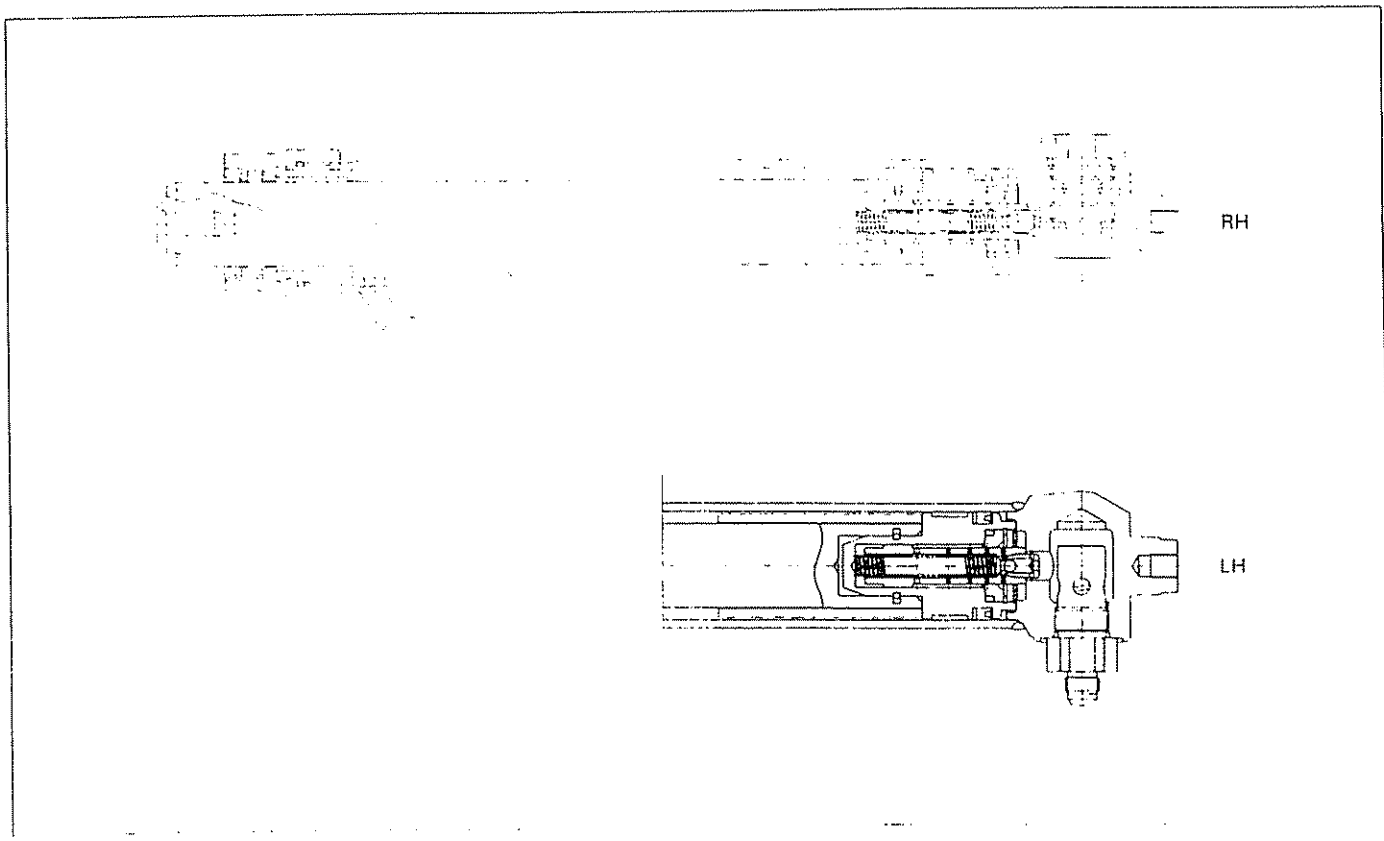
LIFT CYLINDER (V·SV)· REAR LIFT CYLINDER (FV·FSV)

GENERAL

Lift Cylinder (V)



Lift Cylinder (Fork bottom damper) (V·SV)



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Cilindro de elevación trasero (FV)

Derecho

Izquierdo

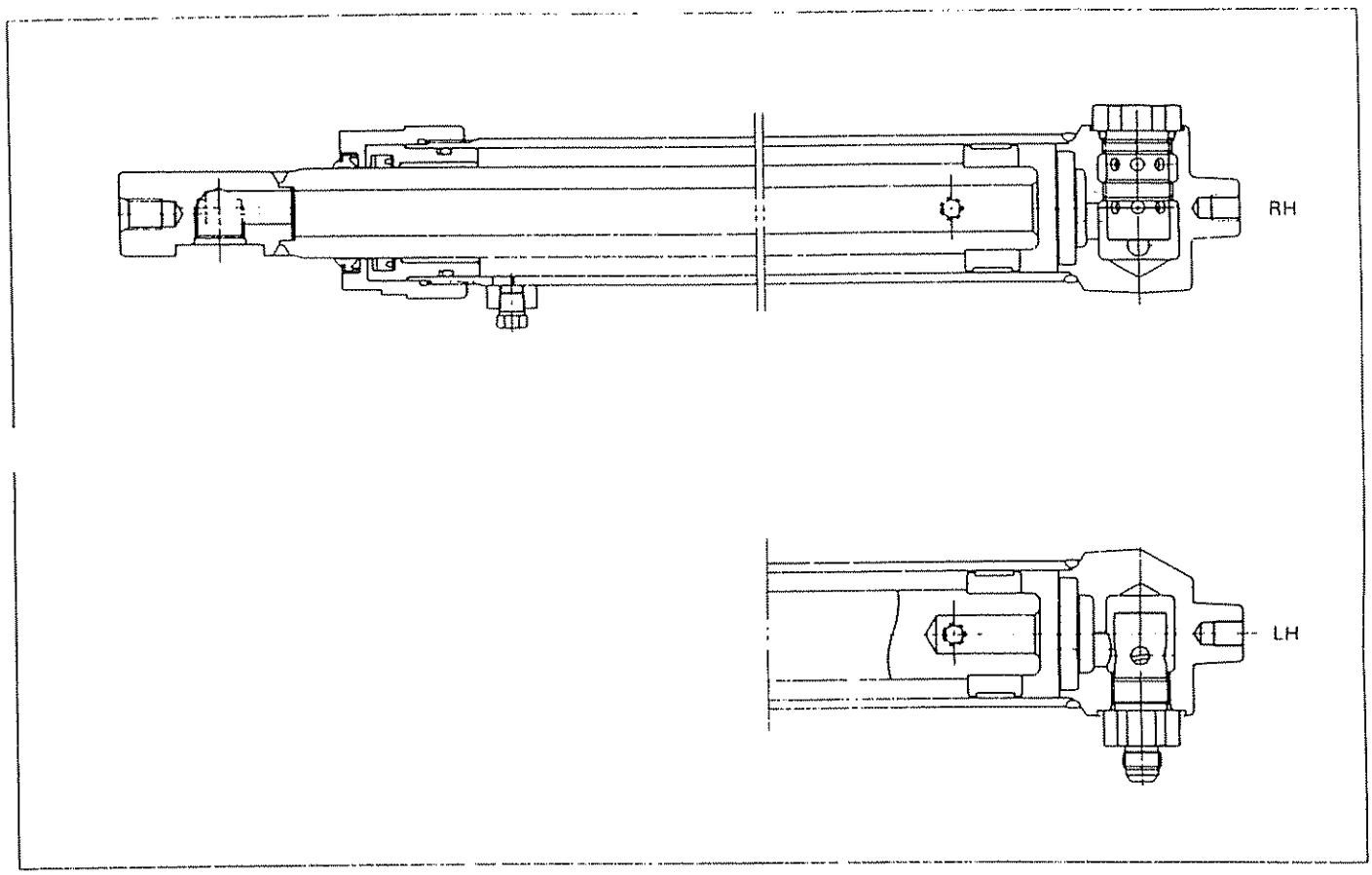
Cilindro de elevación trasero (FSV)

Derecho

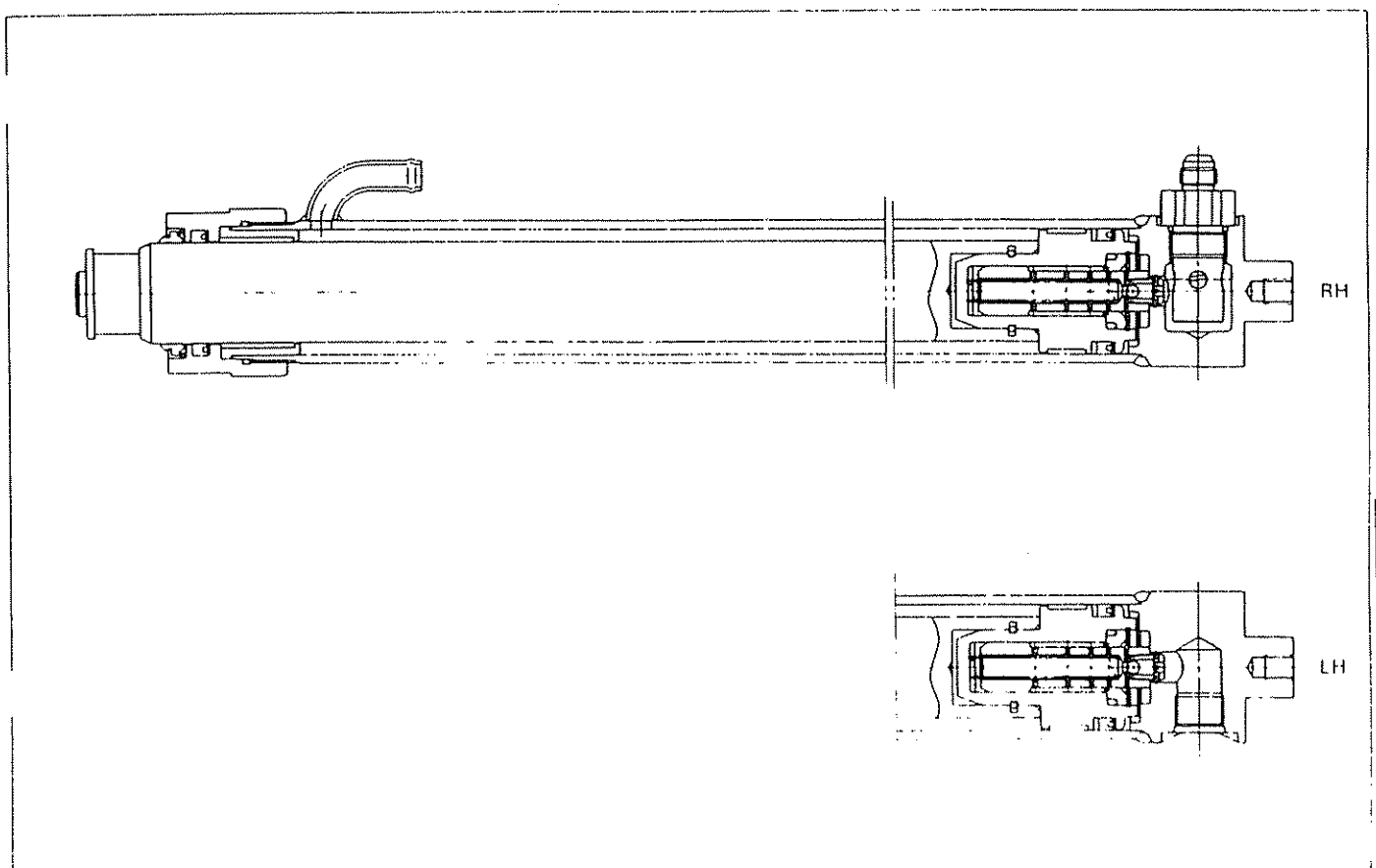
Izquierdo

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Rear Lift Cylinder (FV)



Rear Lift Cylinder (FSV)



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ESPECIFICACIONES

Cilindro de elevación (V/SV)

Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Descripción			
Tipo del cilindro de elevación	Actuación sencilla		
Calibre del cilindro de elevación mm	45	50	55
Diámetro exterior de la varilla del cilindro de elevación mm	35	40	45
Tipo de sellado del pistón	Empaquetadura en "U"		
Tipo de sellado de la varilla	Empaquetadura en "U"		
Otros	Con válvula reguladora de flujo (RH) Con válvula de descenso de seguridad (LH)		

Cilindro de elevación trasero (FV)

Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Descripción			
Tipo del cilindro de elevación	Actuación sencilla		
Calibre del cilindro de elevación mm	45	50	55
Diámetro exterior de la varilla del cilindro mm	32	35	40
Tipo de sellado de la varilla	Empaquetadura en "U"		
Otros	Con válvula reguladora de flujo (RH) Con válvula de descenso de seguridad (LH)		

Cilindro de elevación trasero (FSV)

Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Descripción			
Tipo del cilindro de elevación	Actuación sencilla		
Calibre del cilindro de elevación mm	45	50	55
Diámetro exterior de la varilla del cilindro mm	35	40	45
Tipo de sellado del pistón	Empaquetadura en "U"		
Tipo de sellado de la varilla	Empaquetadura en "U"		
Otros	Con válvula de descenso de seguridad (RH)		

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SPECIFICATIONS

Lift Cylinder (V·SV)

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Lift cylinder 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	With flow regulator valve (RH) With safety down valve (LH)	←	←

Rear Lift Cylinder (FV)

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Cylinder rod outside diameter mm (in)	32 (1.26)	35 (1.38)	40 (1.57)
Rod seal type	U packing	←	←
Others	With flow regulator valve (RH) With safety down valve (LH)	←	←

Rear Lift Cylinder (FSV)

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Cylinder 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	With safety down valve (RH)	←	←

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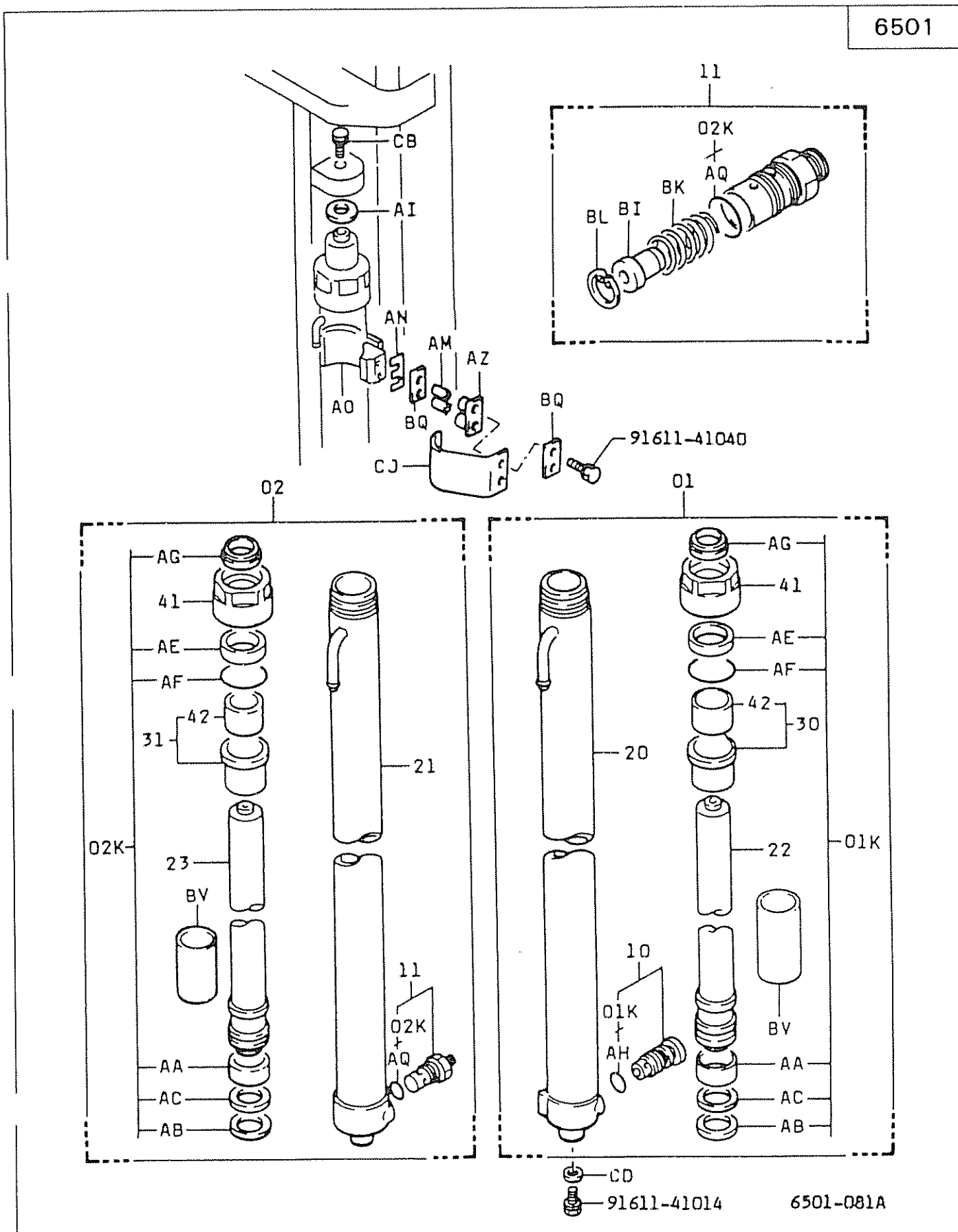
COMPONENTES

Cilindro de elevación (V/SV)

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COMPONENTS

Lift Cylinder (V)

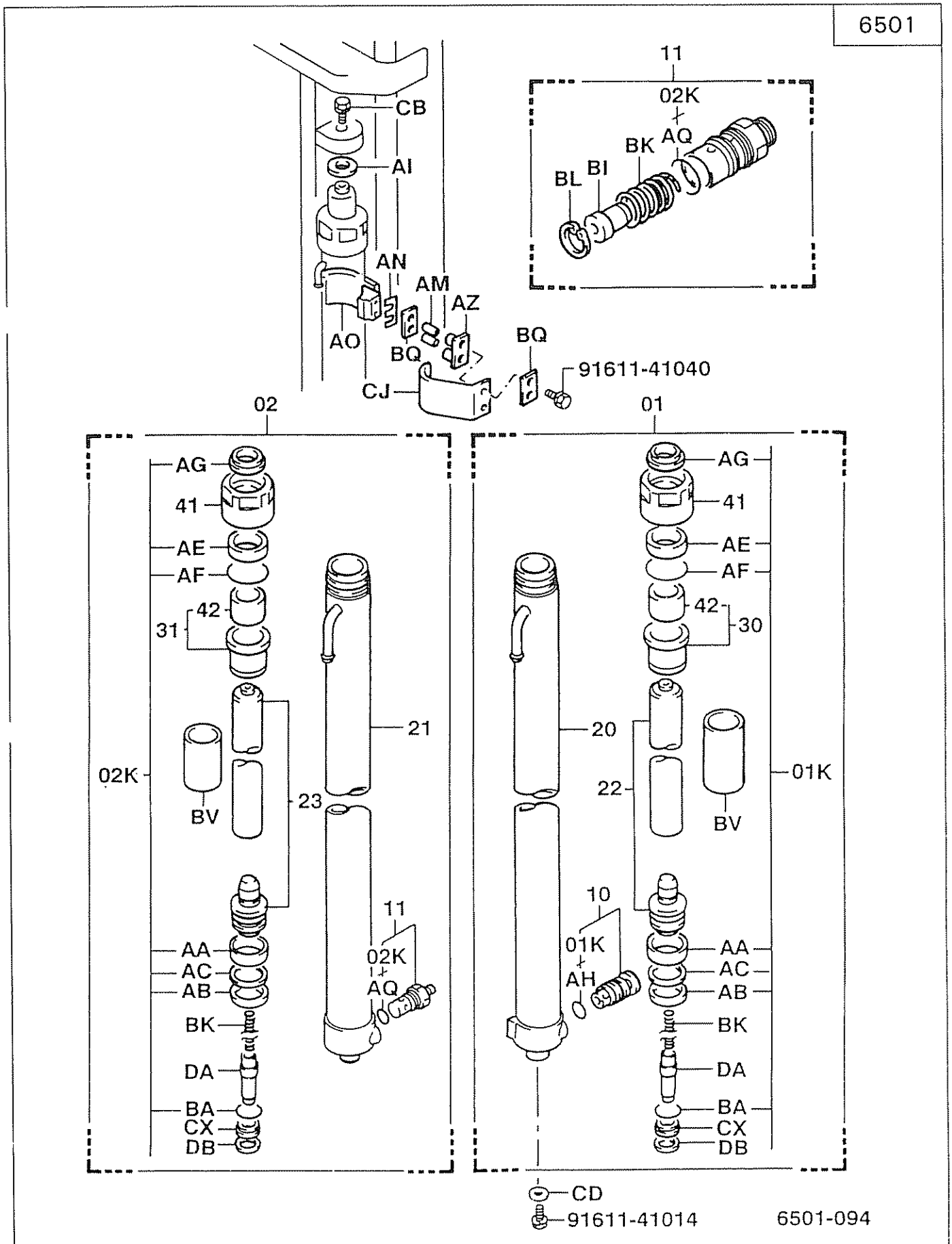


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Cilindro de elevación trasero ((V/SV)Amortiguador inferior de la hoquil .)

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Lift Cylinder ((V•SV) Fork Bottom Damper)



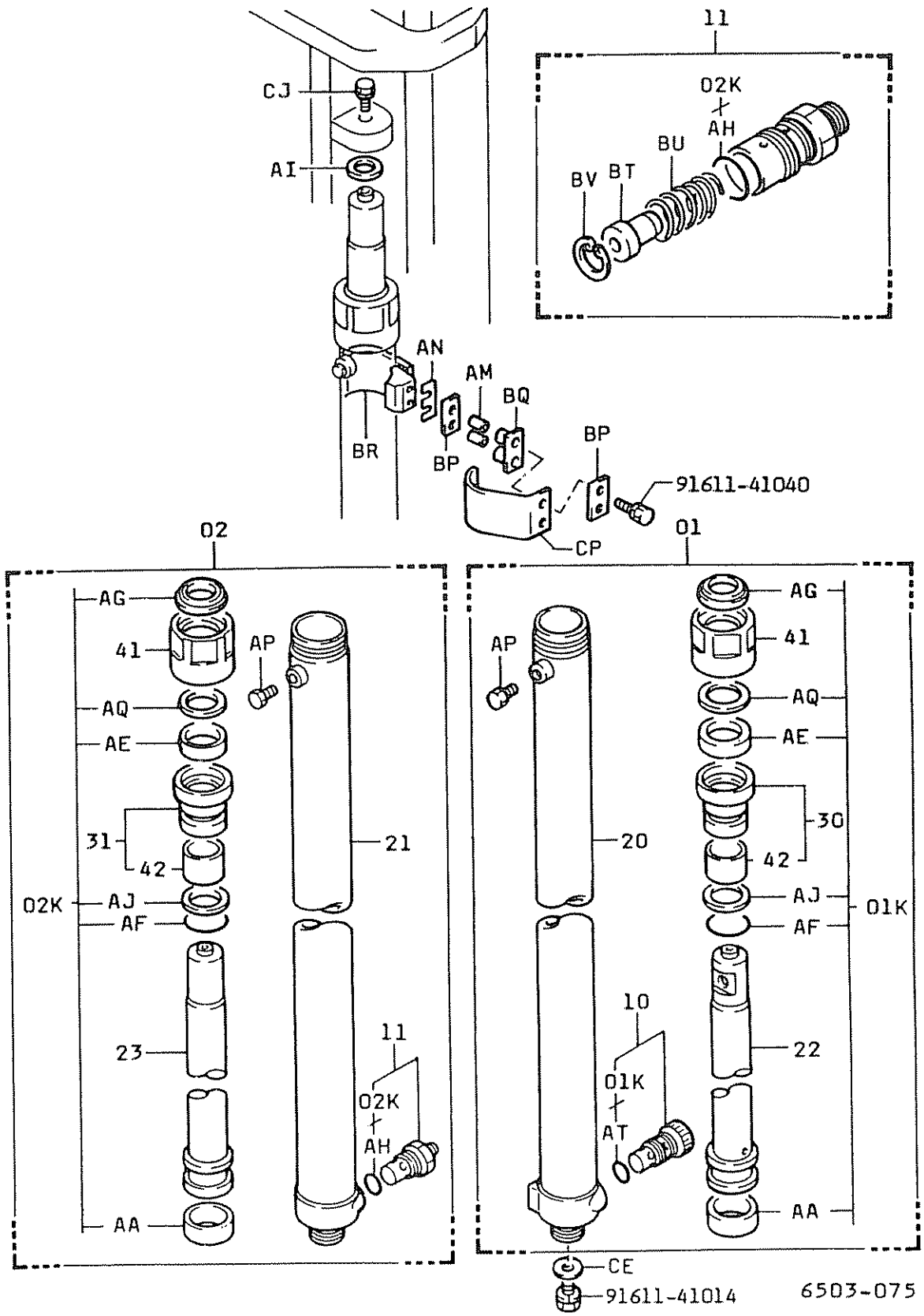
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Cilindro de elevación trasero (FV)

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Rear Lift Cylinder (FV)

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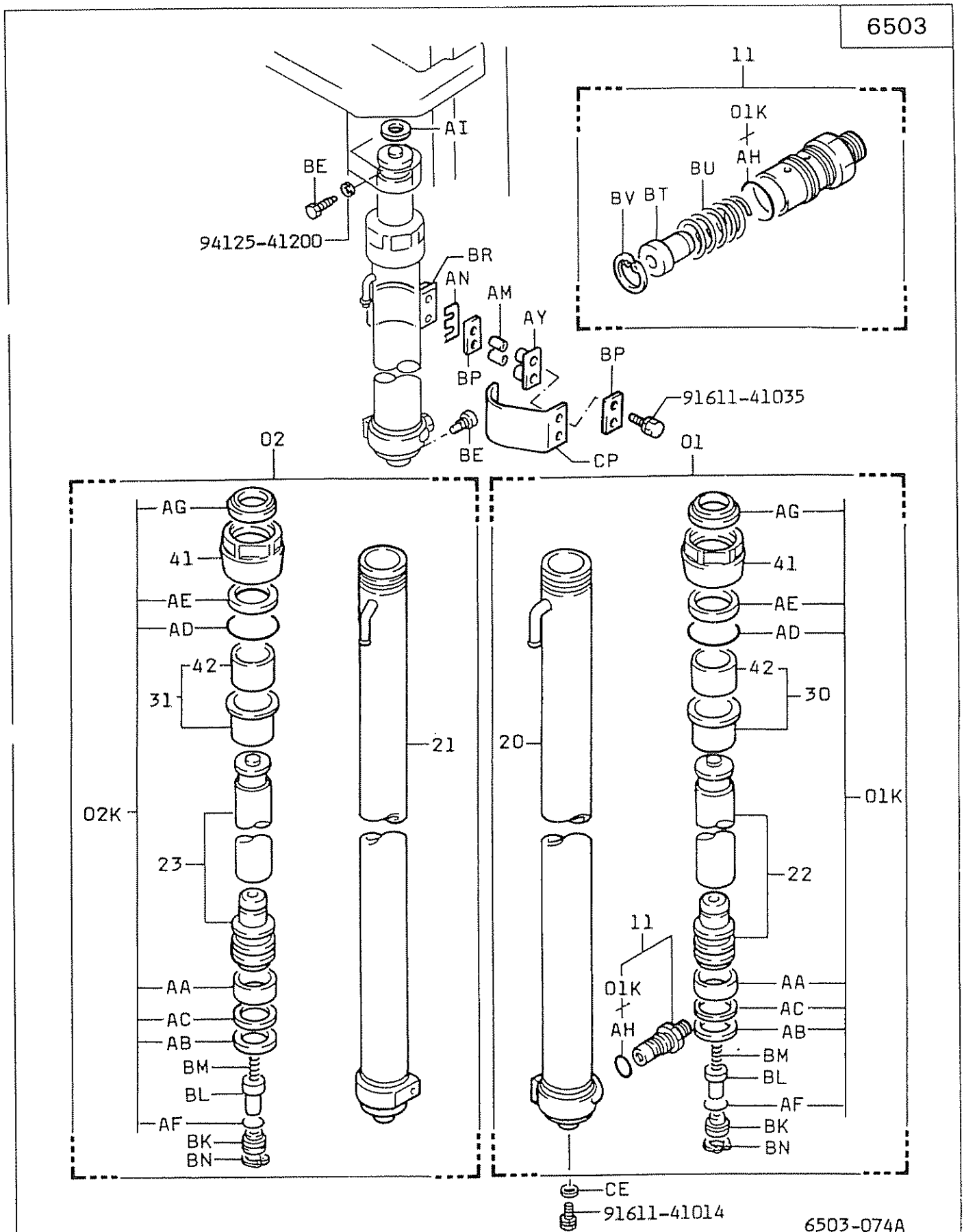


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Cilindro de elevación trasero (FSV)

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Rear Lift Cylinder (FSV)



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1 Soporte de elevación

Procedimiento de remoción

1 Saque el soporte de elevación. (Vea las etapas 1 a 4 del procedimiento de remoción en la parte de remoción e instalación del mástil en la página 13-5)

2 Saque el perno de sujeción del extremo de la varilla del cilindro y el perno de sujeción de la parte inferior del cilindro.

3 Desconecte el extremo de la varilla del cilindro. [Punto 1]

4 Saque la cubierta de la tubería flexible.

5 Desconecte la tubería flexible.

6 Saque el apoyo del cilindro de elevación. [Punto 2]

7 Saque el conjunto del cilindro de elevación.

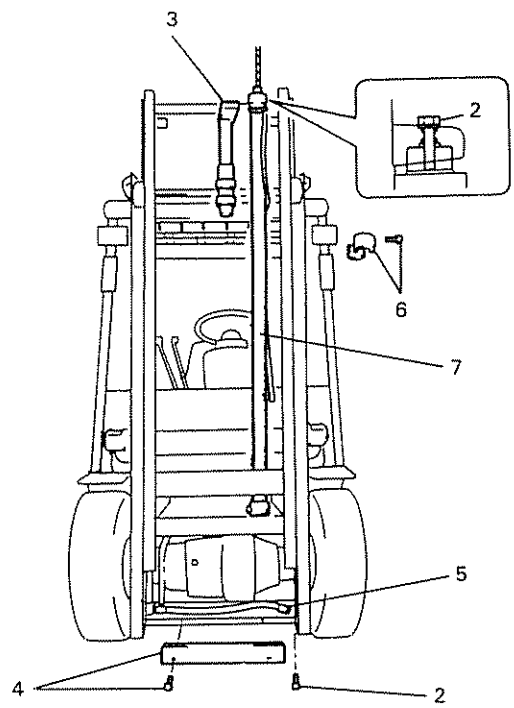
Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Notas:
Lleve a cabo las operaciones siguientes después de instalar el cilindro de elevación:
- Repita la elevación y descenso hasta los extremos de la carrera sin carga para purgar el aire y comprobar el funcionamiento normal.
- Después de comprobar el funcionamiento, compruebe el nivel del aceite hidráulico y añada aceite si es insuficiente.
- Inspeccione los cilindros de elevación por si hay movimientos desiguales y haga los ajustes necesarios. (Vea la sección de ajuste de la cuña de la varilla del cilindro de elevación en la página 13-31)

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REMOVAL·INSTALLATION



1 Lift bracket

Removal Procedure

1 Remove the lift bracket. (See removal procedure steps 1 to 4 in mast removal·installation section on page 13-5).

2 Remove the cylinder rod end set bolt and cylinder bottom set bolt.

3 Disconnect the cylinder rod end **[Point 1]**

4 Remove the hose cover.

5 Disconnect the hose.

6 Remove the lift cylinder support. **[Point 2]**

7 Remove the lift cylinder ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Perform the following operations after installing the lift cylinder:
- **Repeat lifting and lowering to stroke ends without load to bleed the air and to check normal operation.**
- **After the operation check, check the hydraulic oil level and add oil if insufficient.**
- **Inspect the lift cylinders for uneven movements and make adjustment if necessary (See the lift cylinder rod shim adjustment section on page 13-31.)**

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Puntos de trabajo

[Punto 1]

Remoción: Suspenda el mástil interior (mástil central) y sujete la SST al larguero del mástil interior (mástil central).
SST 09610-22000-71

Remoción: El ajuste con cuñas se hace en el extremo de la varilla del cilindro de elevación para evitar movimientos irregulares de los cilindros de elevación derecho e izquierdo. Anote en qué lado se hace el ajuste y el número de cuñas que se usan.

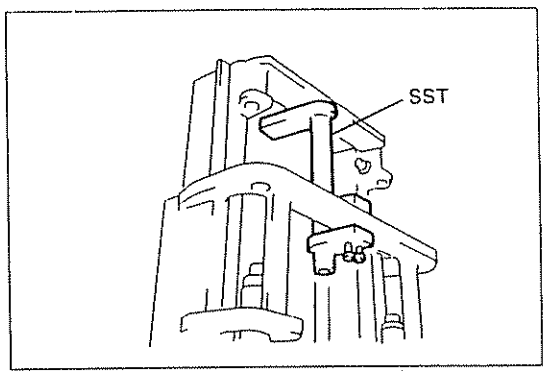
[Punto 2]

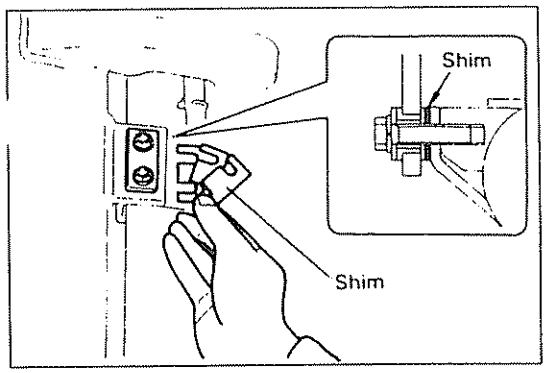
Instalación: El apoyo del cilindro se apretará temporalmente y se realizará el ajuste de las cuñas después de la conexión del extremo de la varilla.

Ajuste: Con el extremo de la varilla conectado, inserte cuñas ent el apoyo del cilindro y el mástil exterior para eliminar la holgura. El grosor de las cuñas será ligeramente más grueso.

*Fig. Cuña
Cuña

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Point Operations

[Point 1]

Removal: Hoist the inner mast (middle mast) and set the SST to the inner mast (middle mast) tie beam.
SST 09610-22000-71

Removal: Shim adjustment is made at the lift cylinder rod end to prevent uneven movements of the lift cylinders RH and LH. Take a note on which side the adjustment is made and the number of shims used.

[Point 2]

Installation: The cylinder support shall be tightened temporarily here and make shim adjustment after rod end connection.

Adjustment: With the rod end connected, insert shims between the cylinder support and outer mast to eliminate the clearance. The shim thickness shall be slightly on the thicker side.

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DESMONTAJE/INSPECCION/REMONTAJE

Notas:
- El aceite se filtrará si tienen defectos la empaquetadura en "U" o la junta hermética de polvo en la parte de la guía de la varilla.
- Habrá descenso natural si tiene defectos la empaquetadura en "U" de la parte del pistón.

Procedimiento de desmontaje

1 Saque la cubierta del cilindro.

2 Saque la guía de la varilla.

3 Saque la varilla del pistón. [Punto 1]

4 Saque las juntas herméticas por el lado del pistón.

5 Saque la válvula reguladora de flujo o la válvula de descenso de seguridad.

6 Saque el cilindro de elevación. [Punto 2]

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al de desmontaje.

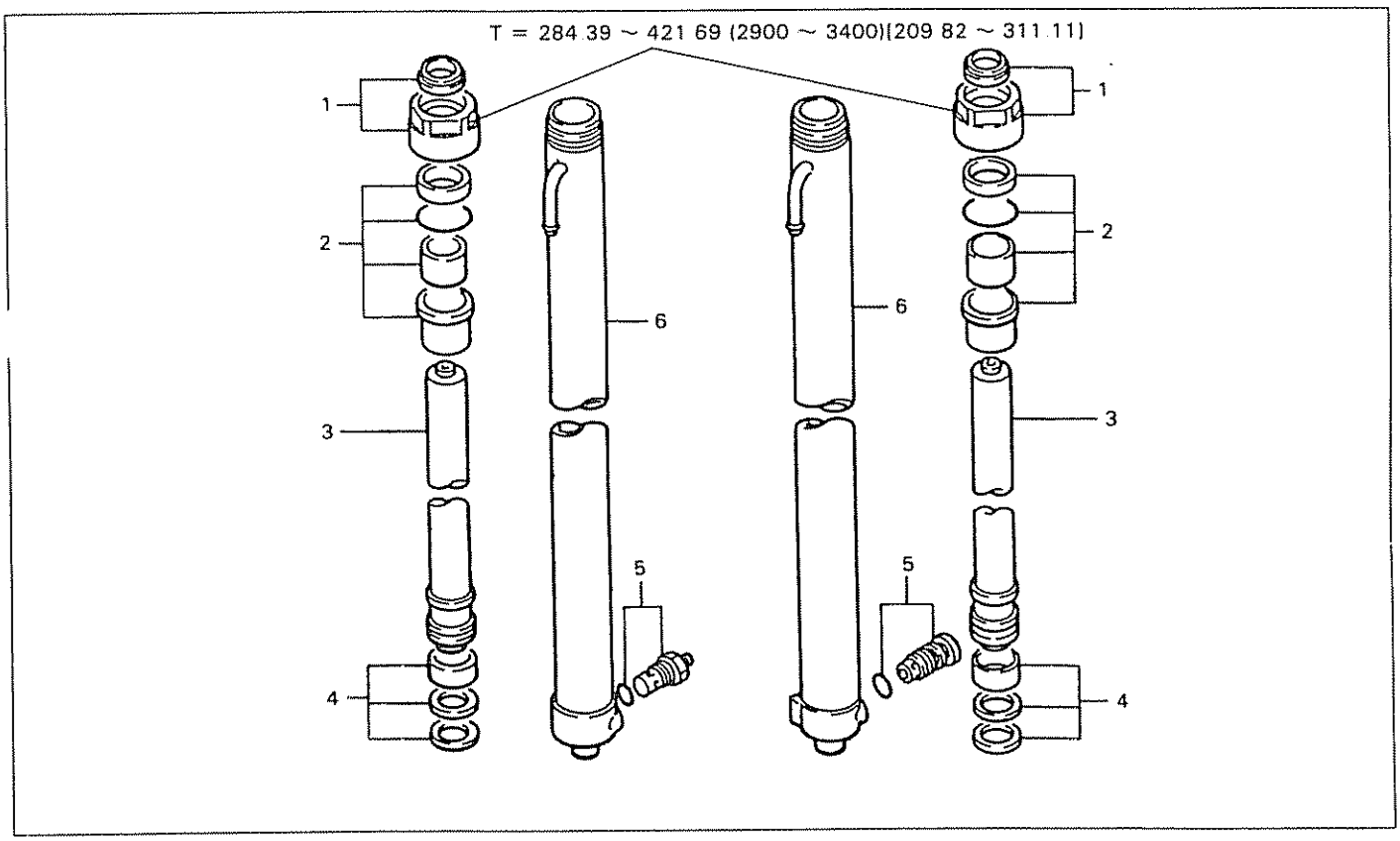
Notas:
- No instale las partes secas; aplique aceite hidráulico antes del remontaje.
- Aplique empaquetadura líquida (08833-00080) en la parte roscada de la cubierta del cilindro antes de apretar.

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- Oil will leak if the U packing or dust seal at the rod guide portion is defective.
- Natural drop will occur if the U packing at the piston portion is defective.

T = N·m (kgf-cm)[ft-lbf]



Disassembly Procedure

1 Remove the cylinder cover.

2 Remove the rod guide.

3 Remove the piston rod. **[Point 1]**

4 Remove seals from the piston side.

5 Remove the flow regulator valve or safety down valve

6 Remove the lift cylinder. **[Point 2]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- Do not install dry parts but apply hydraulic oil before reassembly.
- Apply sealant (08833-00080) on the threaded portion of the cylinder cover before tightening.

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Puntos de trabajo

[Punto 1]

Inspección: Mida el diámetro exterior de la varilla del pistón.

Unidad: mm

		Diámetro exterior estándar	Límite del diámetro exterior
V	Series de 1 ton.	35	34,92
SV	Series de 2 ton.	40	39,92
FSV	Series de 3 ton.	45	44,92
	Series de 1 ton.	32	31,92
FV	Series de 2 ton.	35	34,92
	Series de 3 ton.	40	39,92

Inspeción: Mida el alabeo de la varilla del pistón.

Límite del alabeo: 2,0 mm

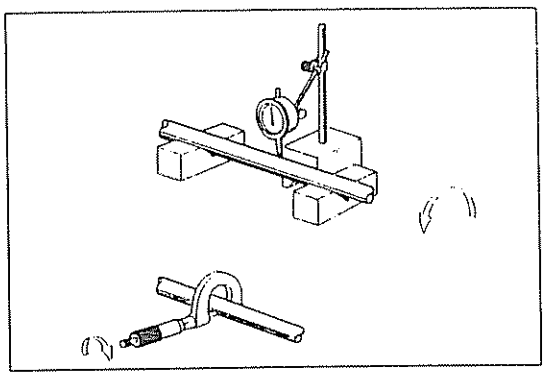
[Punto 2]

Inspección: Mida el calibre del cilindro de elevación.

Unidad: mm

	Calibre estándar	Límite del calibre
Series de 1 ton.	45	45,20
Series de 2 ton.	50	50,20
Series de 3 ton.	55	50,35

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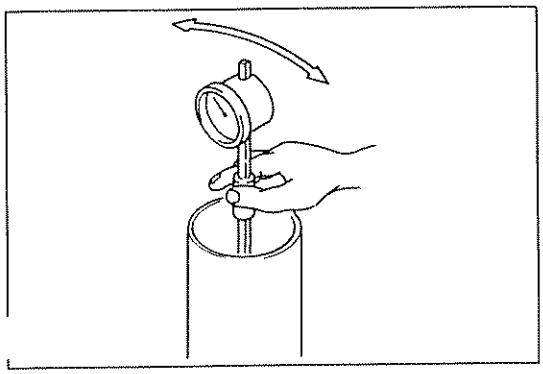
Point Operations

[Point 1]

Inspection: Measure the piston rod outside diameter

Unit: mm (in)

		Standard outside diameter	Limit outside diameter
V SV FSV	1 ton series	35 (1.38)	34.92 (1.3748)
	2 ton series	40 (1.57)	39.92 (1.5717)
	3 ton series	45 (1.77)	44.92 (1.7685)
FV	1 ton series	32 (1.26)	31.92 (1.2567)
	2 ton series	35 (1.38)	34.92 (1.3748)
	3 ton series	40 (1.57)	39.92 (1.5717)



Inspection: Measure the piston rod bend.

Limit bend: 2.0 mm (0.079 in)

[Point 2]

Inspection: Measure the lift cylinder bore.

Unit: mm (in)

	Standard bore	Limit bore
1 ton series	45 (1.77)	45.20 (1.7795)
2 ton series	50 (1.97)	50.20 (1.9764)
3 ton series	55 (2.17)	55.35 (2.1791)

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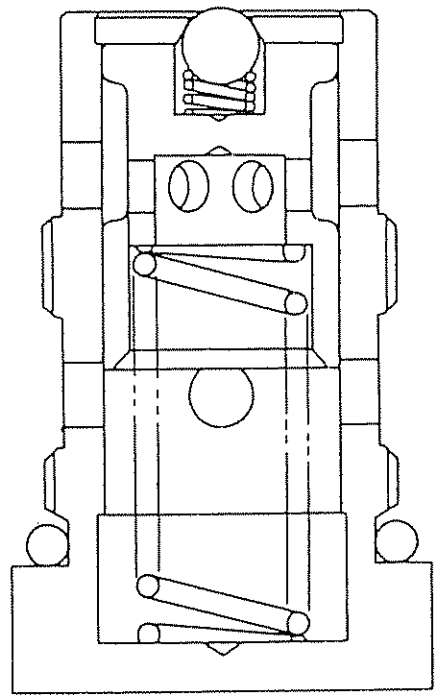
VALVULA REGULADORA DE FLUJO

Especificaciones de la velocidad de descenso Unidad: mm/seg.

Modelo del vehículo	Mástil	V	SV	FV	FSV
Series de 1 ton.	Sin carga	550		420	450
	Cargado	500		480	480
Series de 2 ton.	Sin carga	500		420	450
	Cargado	500		480	480
Series de 3 ton.	Sin carga	500		390	420
	Cargado	500		460	460

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FLOW REGULATOR VALVE



Lowering Speed Specifications

Unit: mm/sec (fpm)

Vehicle model \ Mast		V	SV	FV	FSV
1 ton series	No load	550 (108)	←	420 (83)	450 (89)
	Loaded	500 (98)	←	480 (94)	480 (94)
2 ton series	No load	500 (98)	←	420 (83)	450 (89)
	Loaded	500 (98)	←	480 (94)	480 (94)
3 ton series	No load	500 (98)	←	390 (77)	420 (83)
	Loaded	500 (98)	←	460 (91)	460 (91)

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REMOCION E INSTALACION

Notas:
- Aquí se describe la válvula reguladora de flujo para el mástil V/SV/FV.
- La válvula reguladora de flujo está instalada en el lado del mástil exterior en el caso del mástil FSV.

T= N.m (kgf-cm)

1 Mástil interior

Procedimiento de remoción

1 Suspenda el mástil interior. [Punto 1]

2 Saque la válvula reguladora de flujo.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Punto de trabajo

[Punto 1]

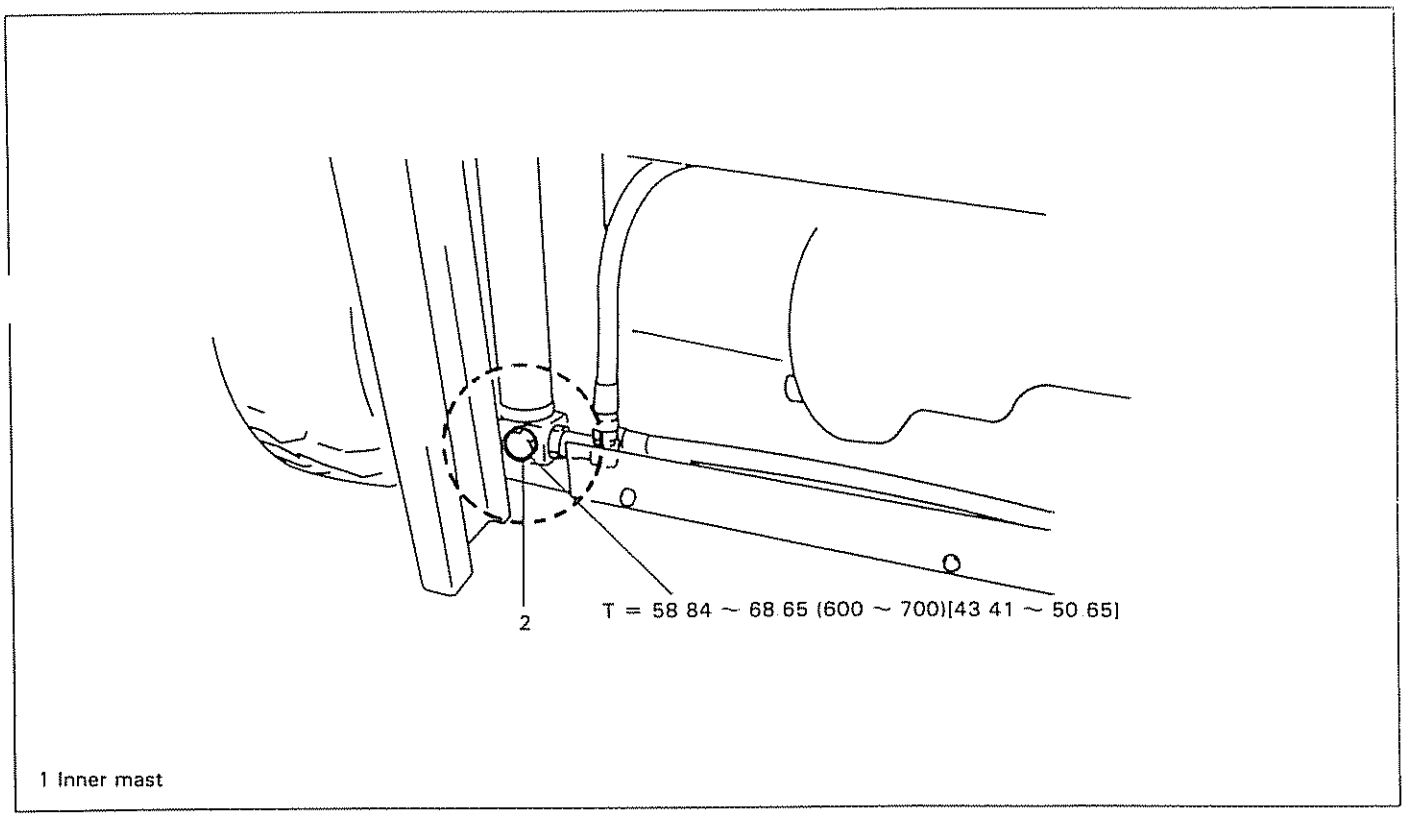
Remoción/instalación: Suspenda el mástil interior (mástil central) con un cable y levántelo. Coloque la SST en el larguero del mástil interior (mástil central) y baje el mástil interior hasta que entre en contacto con la SST.
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REMOVAL·INSTALLATION

Note:
- **The description here is for the flow regulator valve for the V·SV·FV mast.**
- **The flow regulator valve is installed on the outer mast side in case of the FSV mast.**

T = N·m (kgf-cm)[ft-lbf]



1 Inner mast

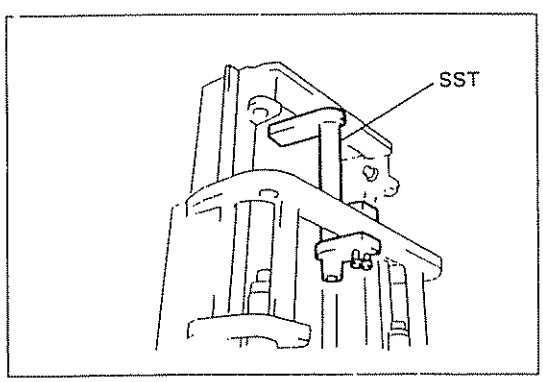
Removal Procedure

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: Sling the inner mast (middle mast) with a wire rope and hoist it. Set the SST on the inner mast (middle mast) tie beam and lower the inner mast until it comes into contact with the SST
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VALVULA DE DESCENSO DE SEGURIDAD (V/SV/FV/FSV)

Vista seccional de la válvula de descenso de seguridad (para V/SV) (para el cilindro de elevación trasero de FV/FSV)

Vista seccional de la válvula de descenso de seguridad (para el cilindro de elevación delantero de FV/FSV)

Especificaciones

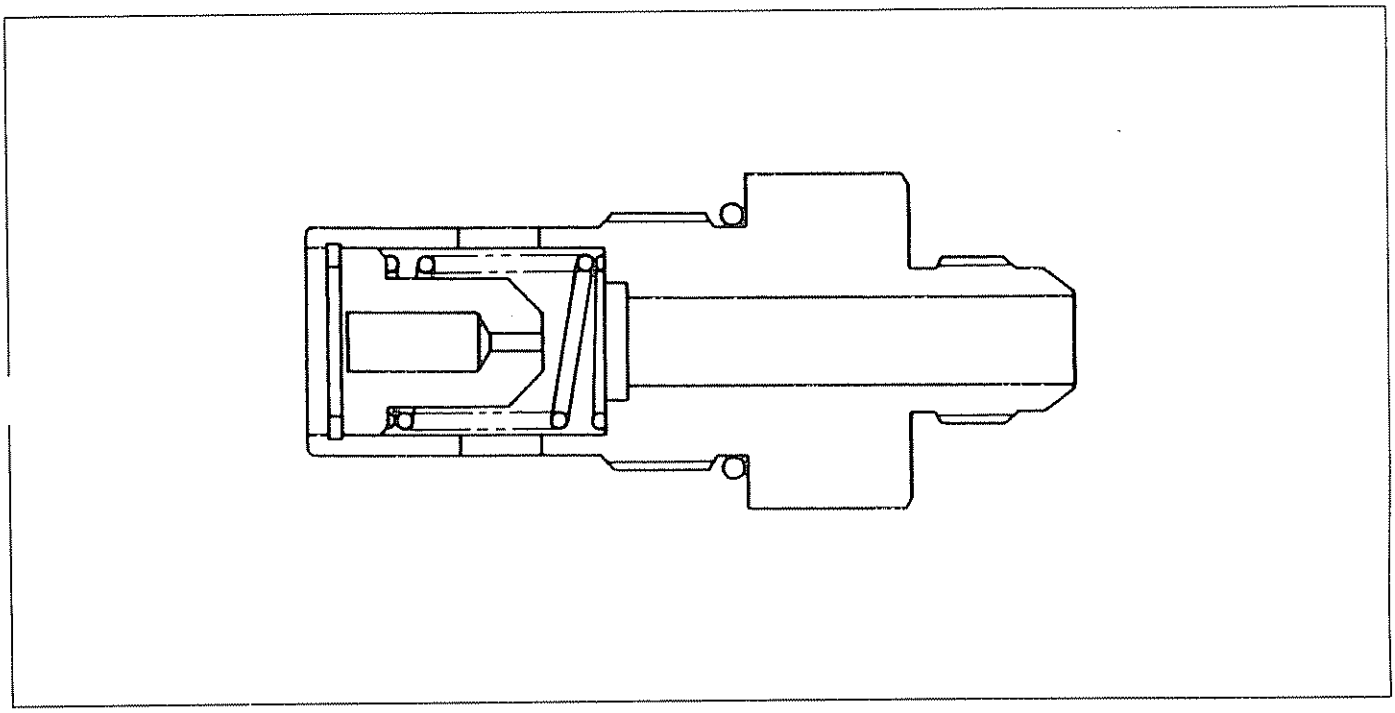
Unidad: litros/min.

		Series de 1-2 ton.	Series de 3 ton.
Cilindro de elevación V/SV	Régimen de flujo del asiento del pistón	60	70
Cilindro de elevación trasero FV/FSV	Control después del asiento del pistón	15	--
Cilindro de elevación delantero FV/FSV	Régimen de flujo del asiento del pistón	95	120
	Control después del asiento del pistón	15	--

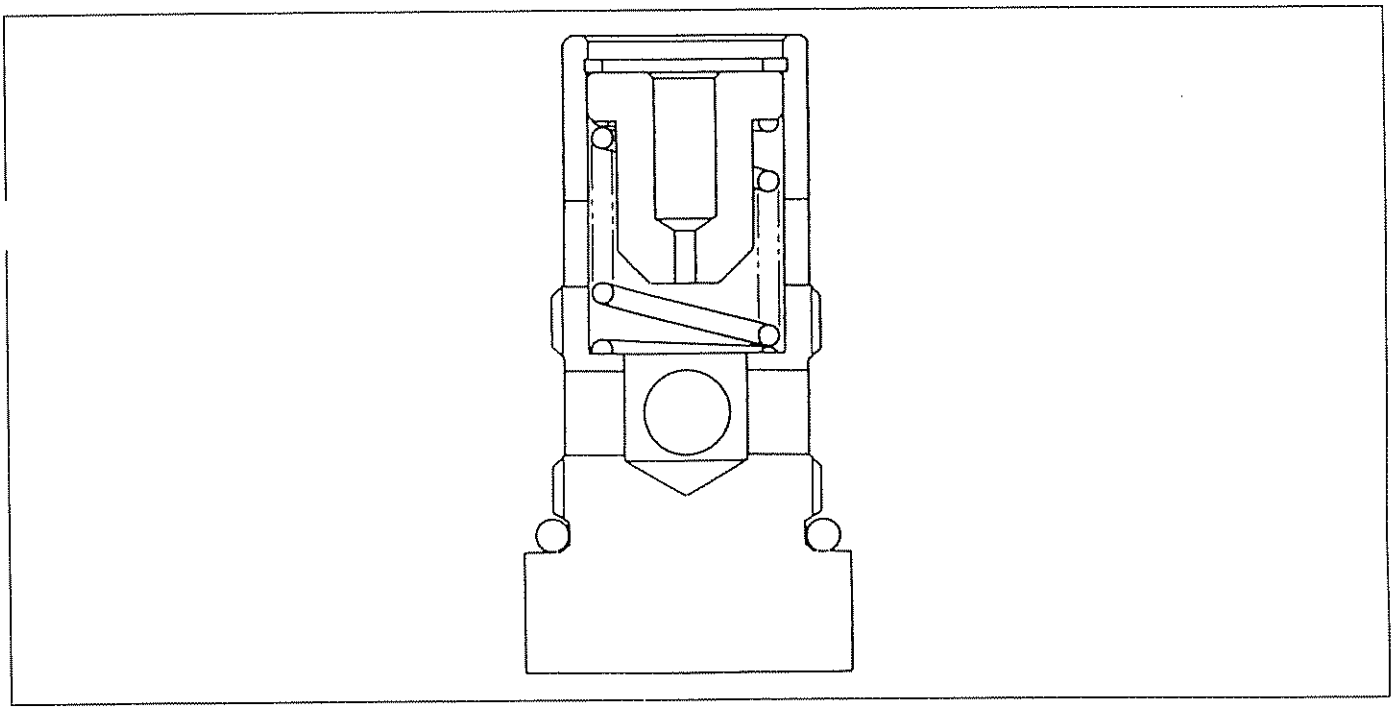
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SAFETY DOWN VALVE

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)



Specifications

Unit: ℓ /min (USgal/min)

		1.2 ton series	3 ton series
V·SV lift cylinder	Piston seat flow rate	60 (15.8)	70 (185)
FV·FSV rear-lift cylinder	Control after piston seat	15 (4.0)	←
FV·FSV front-lift cylinder	Piston seat flow rate	95 (25.1)	120 (31.7)
	Control after piston seat	15 (4.0)	←

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REMOCION/INSTALACION

T= N.m (kgf-cm)

1 Suspenda el mástil interior

Procedimiento de remoción

1 Suspenda el mástil interior. [Punto 1]

2 Saque la cubierta de la tubería flexible delantera.

3 Saque la válvula de descenso de seguridad.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Punto de trabajo

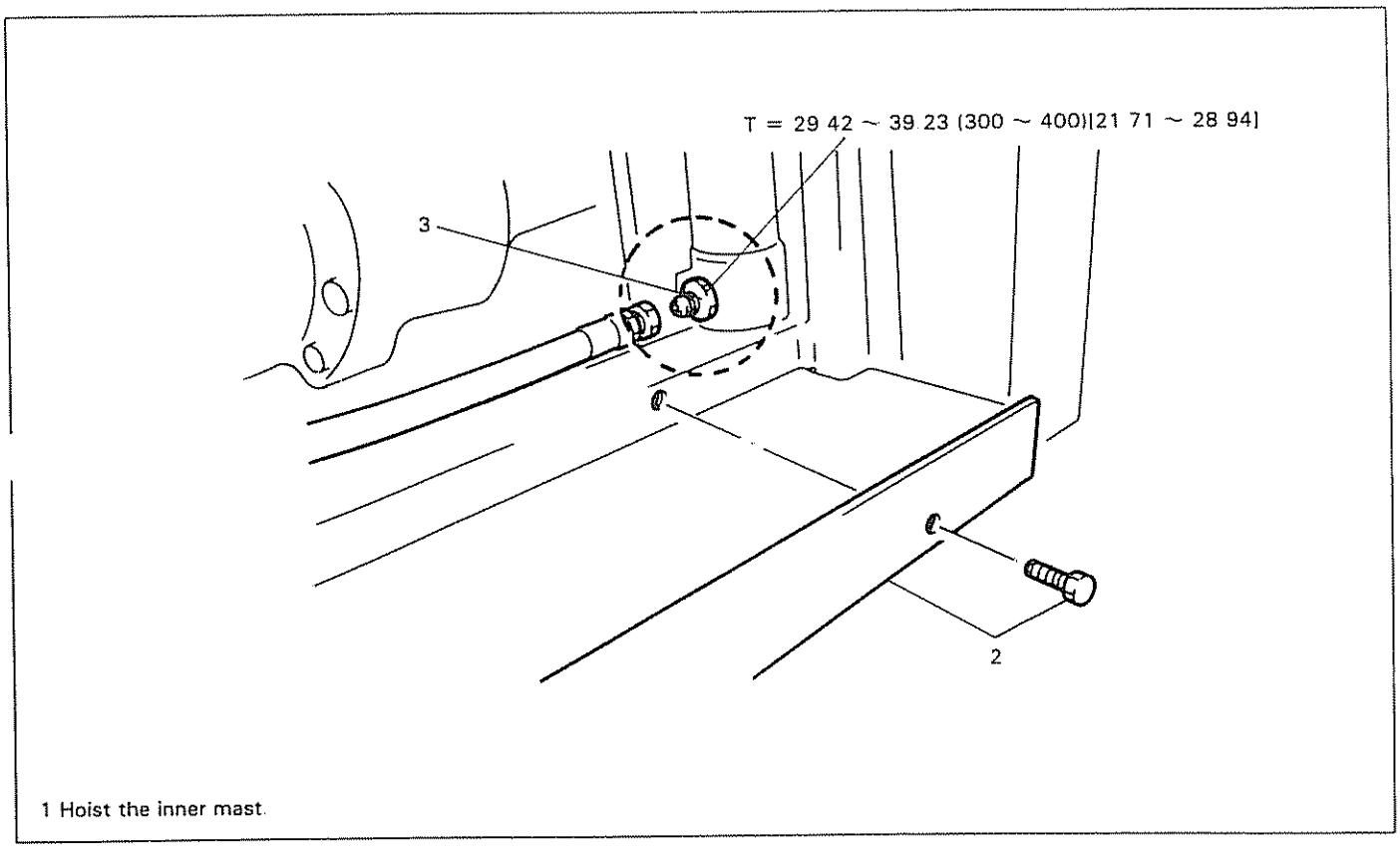
[Punto 1]

Remoción/instalación: Suspenda el mástil interior (mástil central) con un cable y levántelo. Coloque la SST en el larguero del mástil interior (mástil central) y baje el mástil interior hasta que entre en contacto con la SST.
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REMOVAL·INSTALLATION

T = N·m (kgf-cm)[ft-lbf]



1 Hoist the inner mast.

Removal Procedure

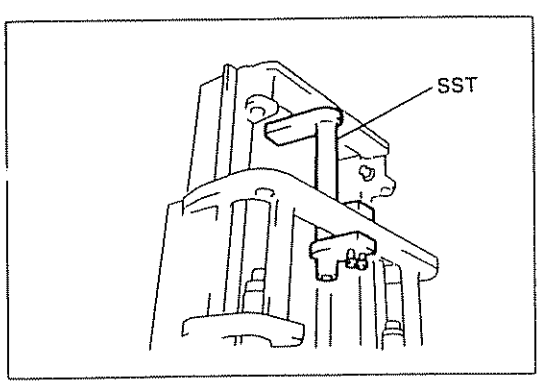
1 Hoist the inner mast. **[Point 1]**

2 Remove the front hose cover.

3 Remove the safety down valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

[Point 1]

Removal·installation: Sling the inner mast (middle mast) with a wire rope, and hoist it. Set the SST on the inner mast (middle mast) tie beam and lower the inner mast until it comes into contact with the SST.
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CILINDRO DE ELEVACION DELANTERO (FV/FSV)

GENERALIDADES

Cilindro de elevación delantero (FV)

Cilindro de elevación delantero (FSV)

ESPECIFICACIONES

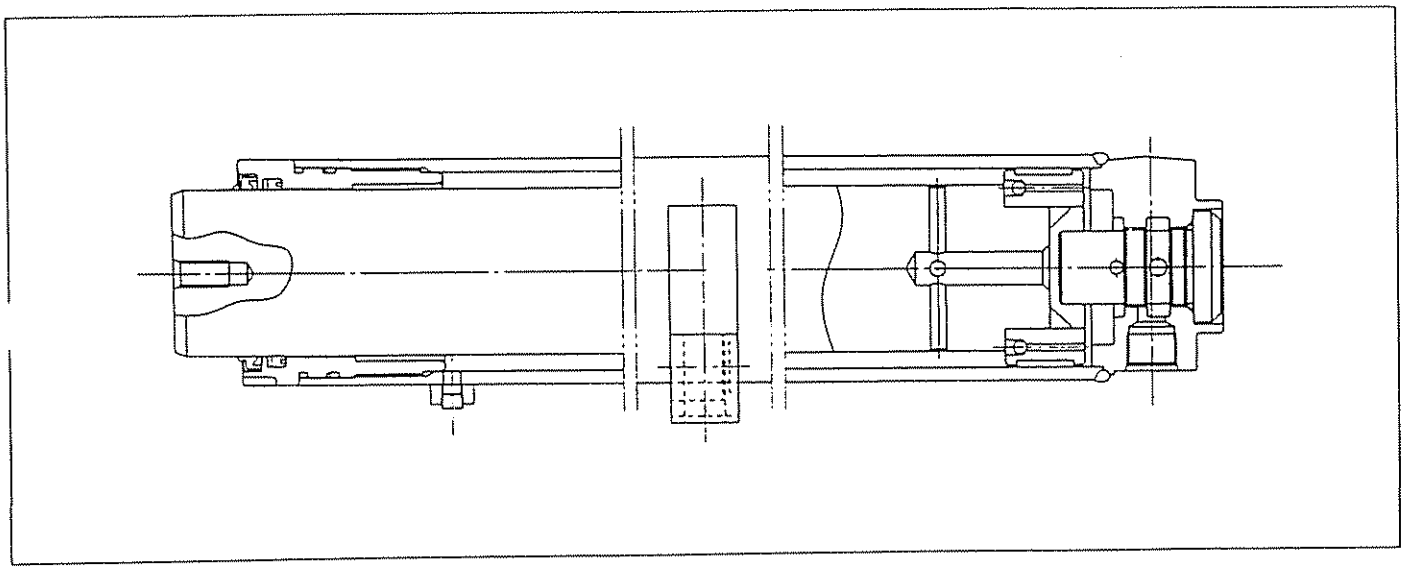
Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Descripción			
Tipo del cilindro	Actuación sencilla		
Calibre del cilindro de elevación mm	85	90	105
Diámetro exterior de la varilla del cilindro mm	70	75	85
Tipo de sellado del pistón	Anillo de desgaste		
Tipo de sellado de la varilla	Empaquetadura en "U"		
Otros	Con válvula de descenso de seguridad		

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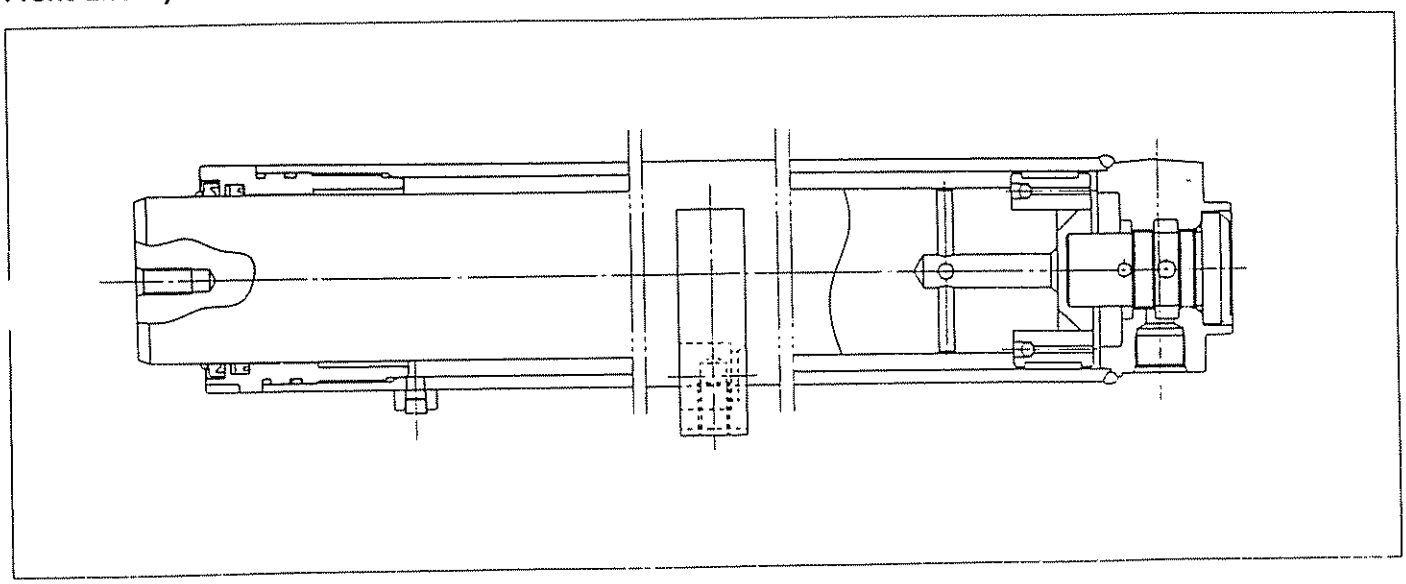
FRONT LIFT CYLINDER (FV·FSV)

GENERAL

Front Lift Cylinder (FV)



Front Lift Cylinder (FSV)



SPECIFICATIONS

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	85 (3.35)	90 (3.54)	105 (4.13)
Cylinder rod outside diameter mm (in)	70 (2.76)	75 (2.95)	85 (3.35)
Piston seal type	Wear ring	←	←
Rod seal type	U packing	←	←
Others	With safety down valve	←	←

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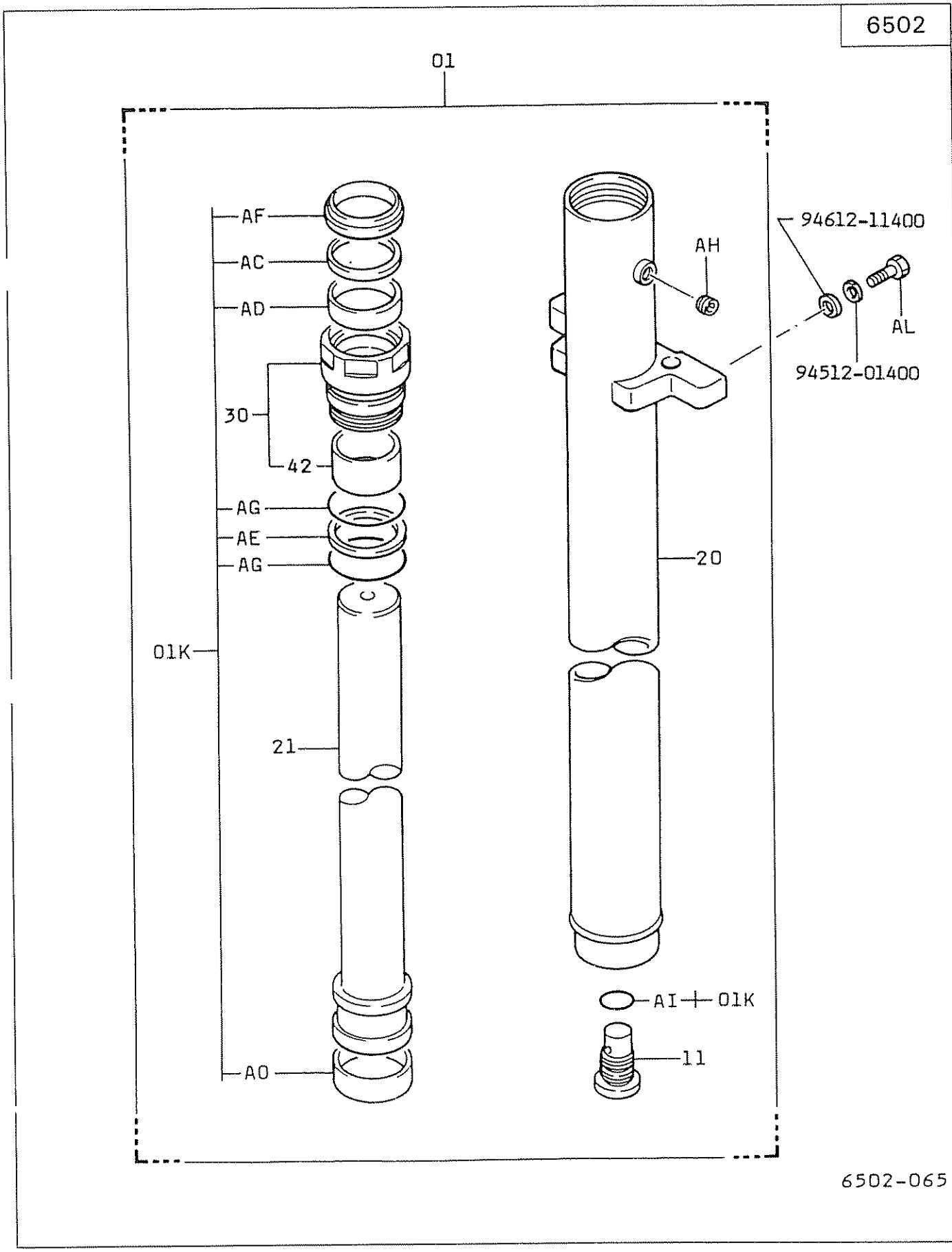
COMPONENTES

Mástil FV

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COMPONENTS

FV Mast

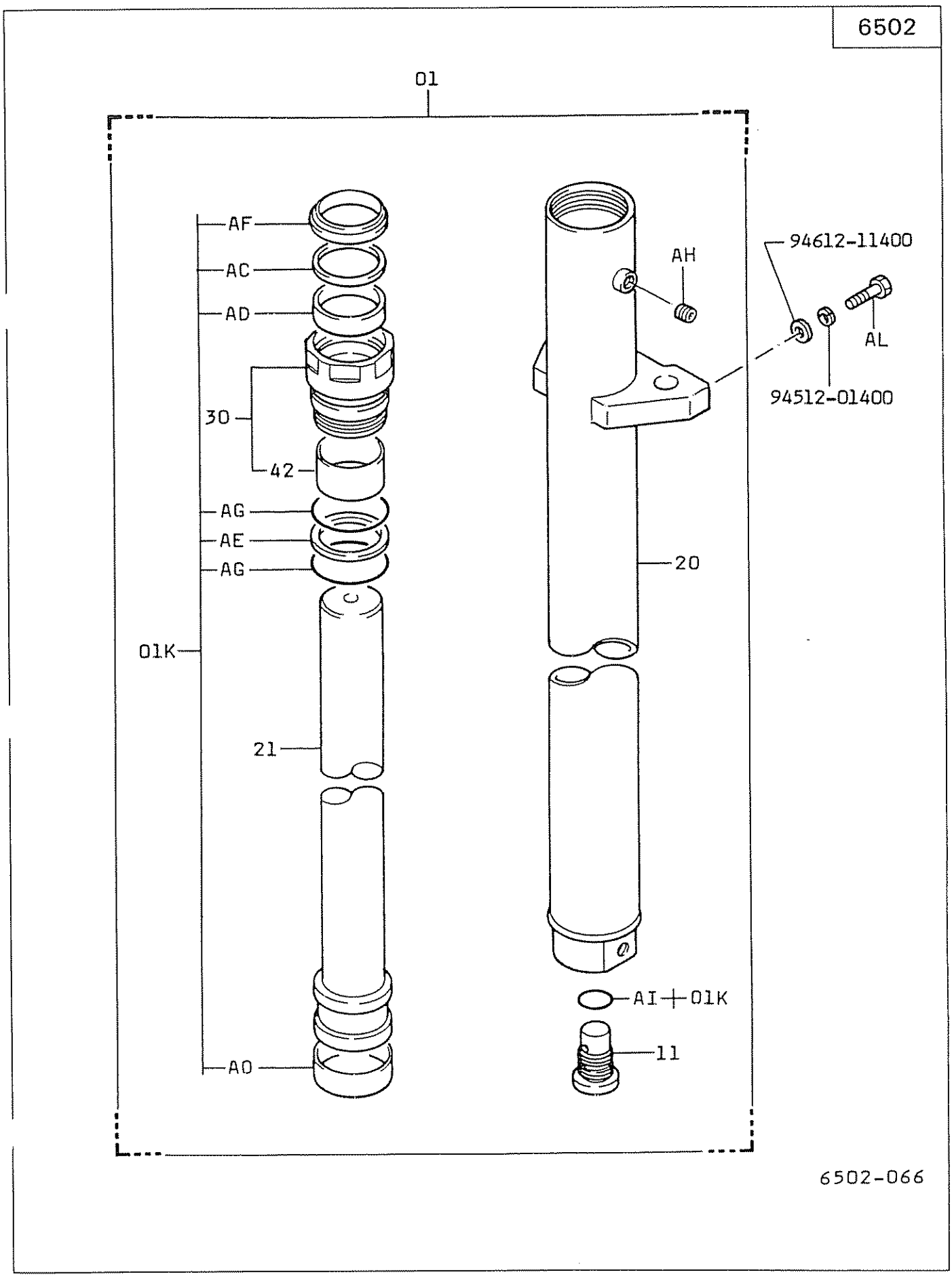


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Mástil FSV

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FSV Mast



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REMOCION/INSTALACION

Notas:

- Vea la parte de remoción del conjunto del cilindro (V/SV) para la remoción del conjunto del cilindro de elevación delantero.
  Lleve a cabo las operaciones siguientes antes de la instalación:
- Repita la elevación y descenso hasta los extremos de la carrera sin carga para purgar el aire y compruebe el funcionamiento normal.
- Después de comprobar el funcionamiento, compruebe el nivel del aceite hidráulico y añada si es insuficiente.
- Ajuste la tensión de la cadena de elevación de igual manera en los lados izquierdo y derecho.

DESMONTAJE/INSPECCION/REMONTAJE

Procedimiento de desmontaje

1 Saque el apoyador de la rueda de la cadena.

2 Saque la guía de la varilla del cilindro.

3 Saque la varilla del pistón. [Punto 1]

4 Saque el anillo de desgaste.

5 Saque el cilindro de elevación. [Punto 2]

6 Saque la válvula de descenso de seguridad.

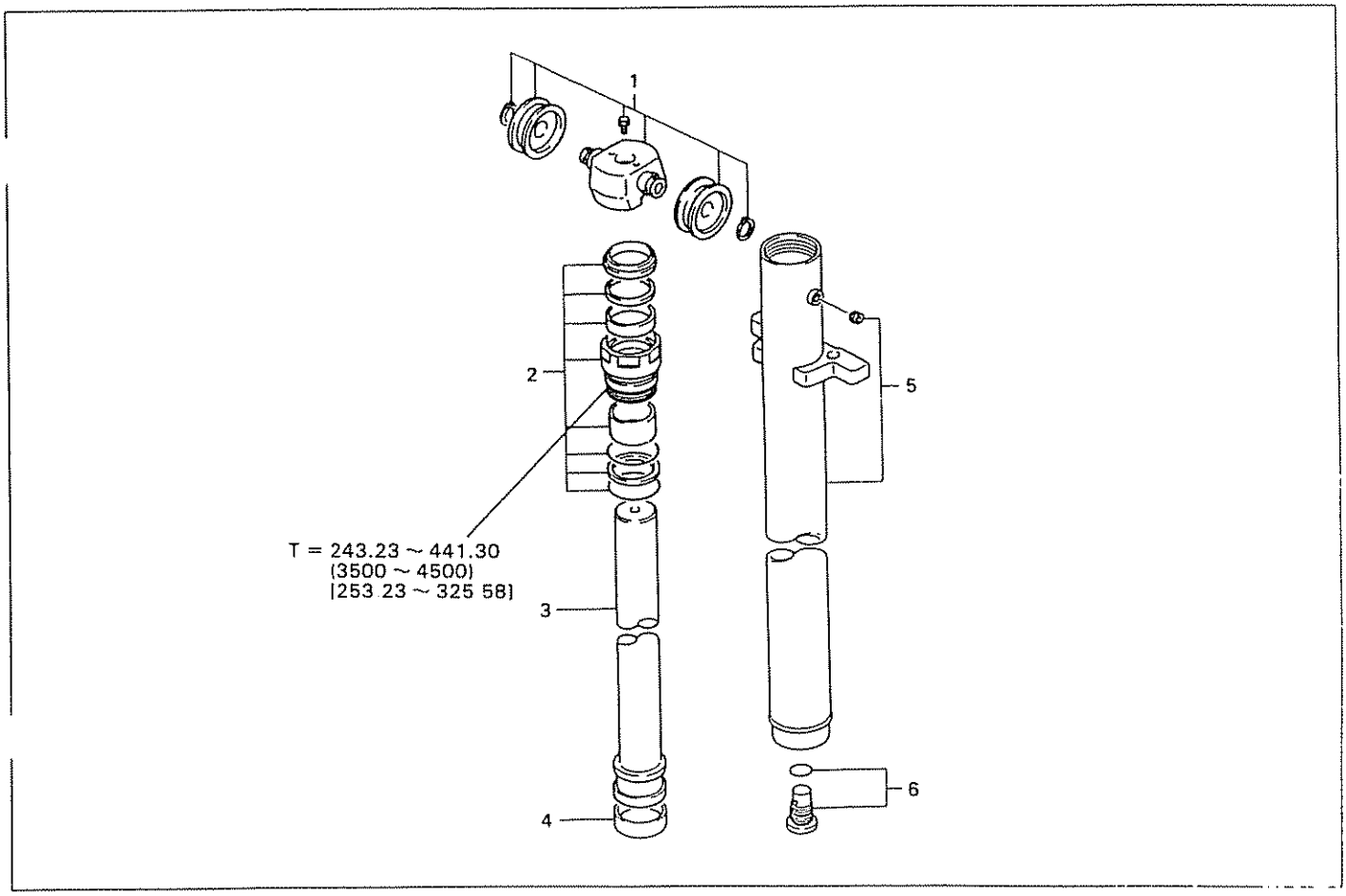
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REMOVAL·INSTALLATION

Note:
- See the lift cylinder ASSY (V·SV) removal section for the removal of the front lift cylinder ASSY. Perform the following operations after installation:
- Repeat lifting and lowering to stroke ends without load for air bleeding and check normal operation.
- After the operation check, check the hydraulic oil level and add if insufficient.
- Adjust the lift chain tension equally on the left and right sides.

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.

5 Remove the lift cylinder. **[Point 2]**

6 Remove the safety down valve.

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Procedimiento de remontaje

El procedimiento de remontaje es el inverso al de desmontaje.

Notas:
- No instale las partes secas; aplique aceite hidráulico antes del remontaje.
- Aplique empaquetadura líquida (08833-00080) en la parte roscada de la guía de la varilla.

Puntos de trabajo

[Punto 1]

Inspección: Mida el diámetro exterior de la varilla del pistón.

Unidad: mm

	Diámetro exterior estándar	Límite del diámetro exterior
Series de 1 ton.	70	69,91
Series de 2 ton.	75	74,91
Series de 3 ton.	85	84,90

Inspección: Mida el alabeo de la varilla del pistón.

Límite del alabeo: 2,0 mm

[Punto 2]

Inspección: Mida el calibre del cilindro de elevación.

Unidad: mm

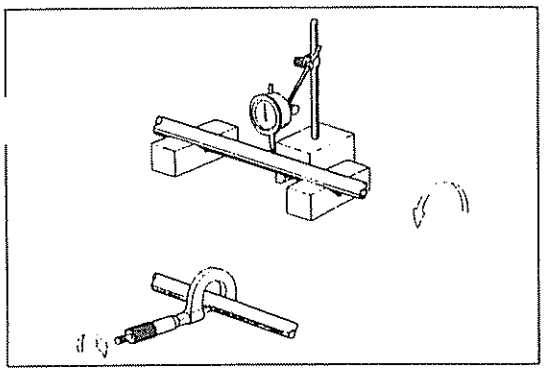
	Calibre estándar	Límite del calibre
Series de 1 ton.	85	80,40
Series de 2 ton.	90	90,40
Series de 3 ton.	105	105,40

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Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Do not reassemble dry parts, but apply hydraulic oil before reassembly.**
- **Apply liquid packing (08833-00080) on the threaded portion of the rod guide.**



Point Operations

[Point 1]

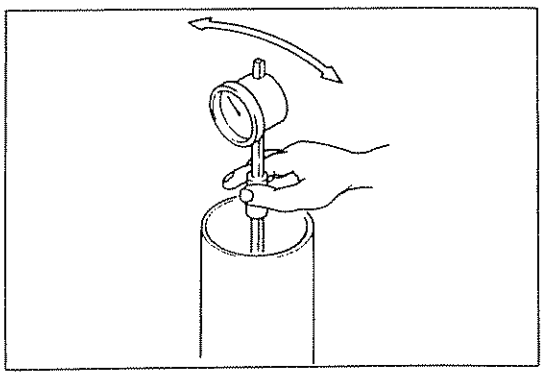
Inspection: Measure the piston rod outside diameter.

Unit: mm (in)

	Standard outside diameter	Limit outside diameter
1 ton series	70 (2.76)	69.91 (2.7524)
2 ton series	75 (2.95)	74.91 (2.9492)
3 ton series	85 (3.35)	84.90 (3.3425)

Inspection: Measure the piston rod bend.

Limit bend: 2.0 mm (0.079 in)



[Point 2]

Inspection: Measure the lift cylinder bore.

Unit: mm (in)

	Standard bore	Limit bore
1 ton series	85 (3.35)	80.40 (3.1654)
2 ton series	90 (3.54)	90.40 (3.5591)
3 ton series	105 (4.13)	105.40 (4.1496)

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CILINDRO DE BASCULACION

GENERALIDADES

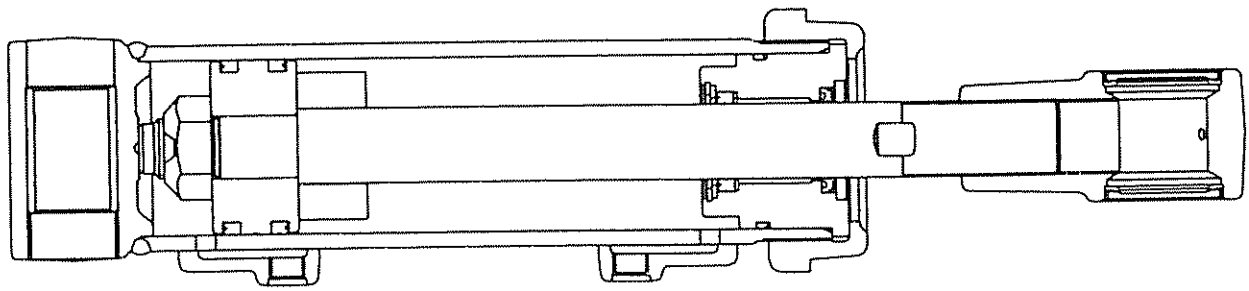
ESPECIFICACIONES

Tipo del cilindro		Actuación doble
Calibre del cilindro	mm	70
Diámetro exterior de la varilla del pistón	mm	30
Tipo de sellado del pistón		Empaquetadura en "U"
Tipo de sellado de la varilla		Empaquetadura en "U"

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TILT CYLINDER

GENERAL



SPECIFICATIONS

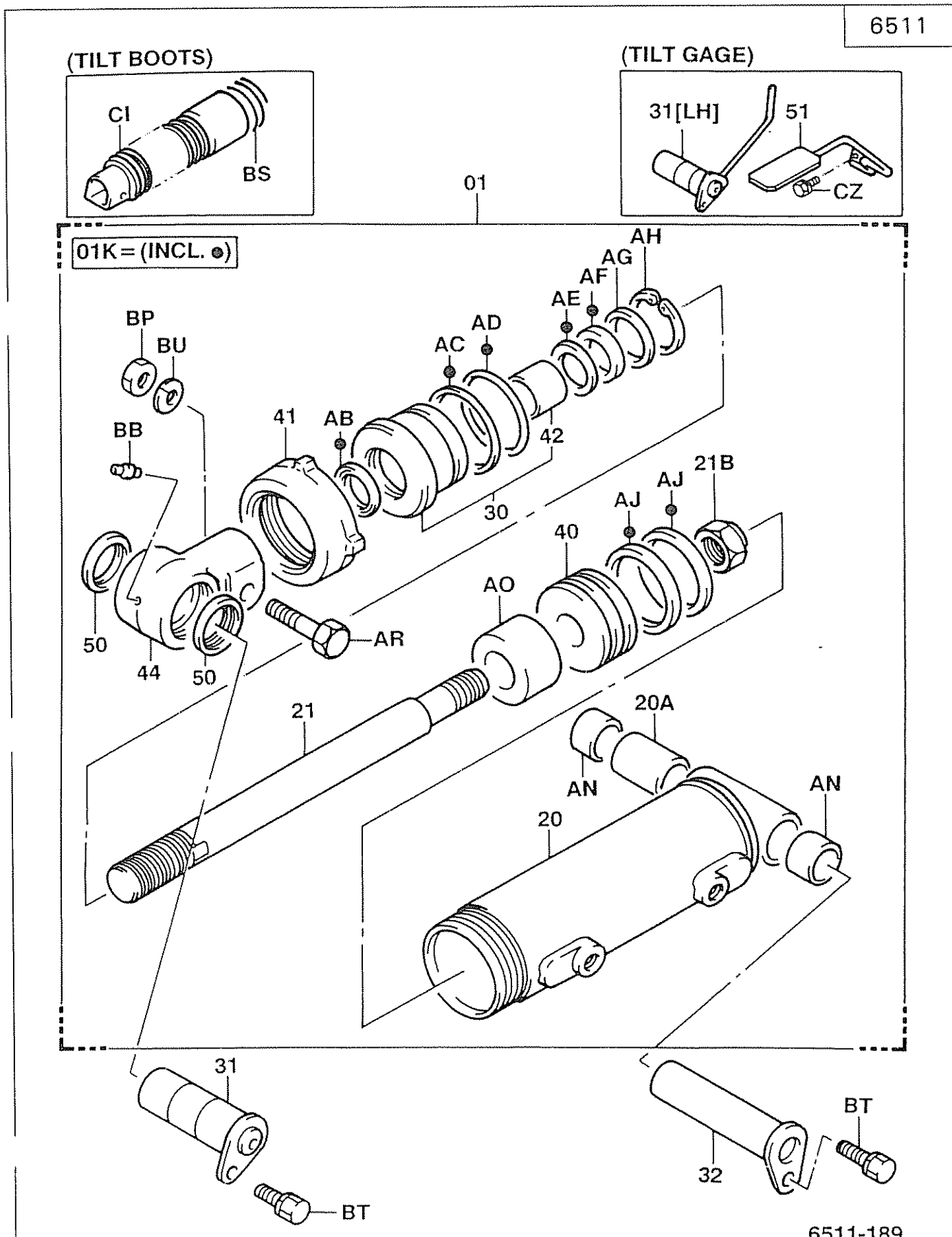
Cylinder type		Double acting
Cylinder bore	mm (in)	70 (2.76)
Piston rod outside diameter	mm (in)	30 (1.18)
Piston seal type		U packing
Rod seal type		U packing

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COMPONENTES

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COMPONENTS



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REMOCION/INSTALACION

1 Mástil

Procedimiento de remoción

1 Suspenda el mástil.

2 Saque la cubierta del estribo.

3 Desconecte la tubería flexible.

4 Saque el pasador delantero del cilindro de basculación. [Punto 1]

5 Saque el pasador trasero del cilindro de basculación.

6 Saque el conjunto del cilindro de basculación.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

Notas:

- Aplique grasa MP a las partes de inserción del pasador delantero del cilindro de basculación y del pasador trasero.
- Incline el mástil lentamente hacia adelante y hacia atrás unas cuantas veces para confirmar el funcionamiento normal.
- Compruebe el nivel del aceite hidráulico y añada si es insuficiente.
- Incline el mástil del todo hacia adelante y hacia atrás para comprobar si hay movimientos irregulares entre los lados izquierdo y derecho. Para ajustar el movimiento irregular, tiene que enroscar o desenroscar la unión de la varilla.

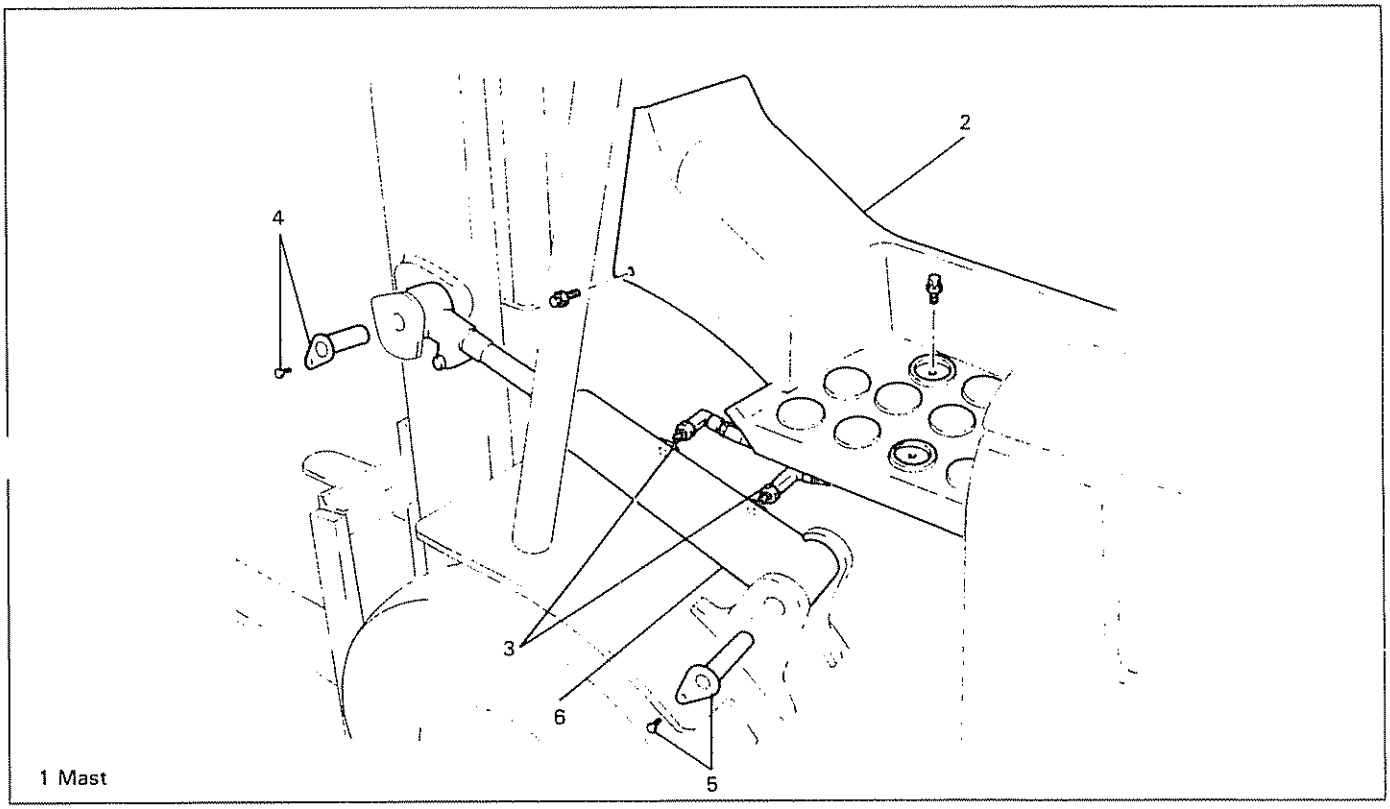
Punto de trabajo

[Punto 1]

Remoción: SST 09810-20172-71

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REMOVAL · INSTALLATION



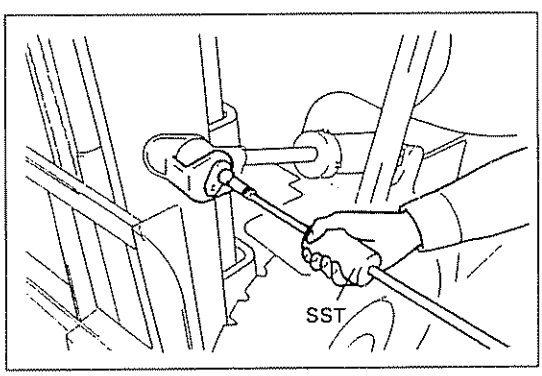
Removal Procedure

1 Hoist the mast.
2 Remove the step cover.
3 Disconnect the hose.
4 Remove the tilt cylinder front pin. **[Point 1]**
5 Remove the tilt cylinder rear pin.
6 Remove the tilt cylinder ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Apply MP grease on the tilt cylinder front pin and rear pin inserting portions.**
- **Tilt the mast slowly forward and backward a few times to confirm normal operation.**
- **Check the hydraulic oil level and add if insufficient.**
- **Tilt the mast fully forward and backward to check no uneven movements between the left and right sides. To adjust uneven movements, change the screw-in amount of the rod joint.**



Point Operation

[Point 1]
Removal: SST 09810-20172-71

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T=N.m (kgf-cm)

2 Pistón con varilla del pistón

Procedimiento de desmontaje

1 Afloje la cubierta del cilindro de basculación. [Punto 1]

2 Extraiga la varilla del pistón con el pistón.

3 Saque el cilindro de basculación. [Punto 2]

4 Saque el pistón.

5 Saque la guía de la varilla.

6 Saque la varilla del pistón. [Punto 3]

7 Saque la unión de la varilla del pistón. [Punto 4]

Procedimiento de instalación

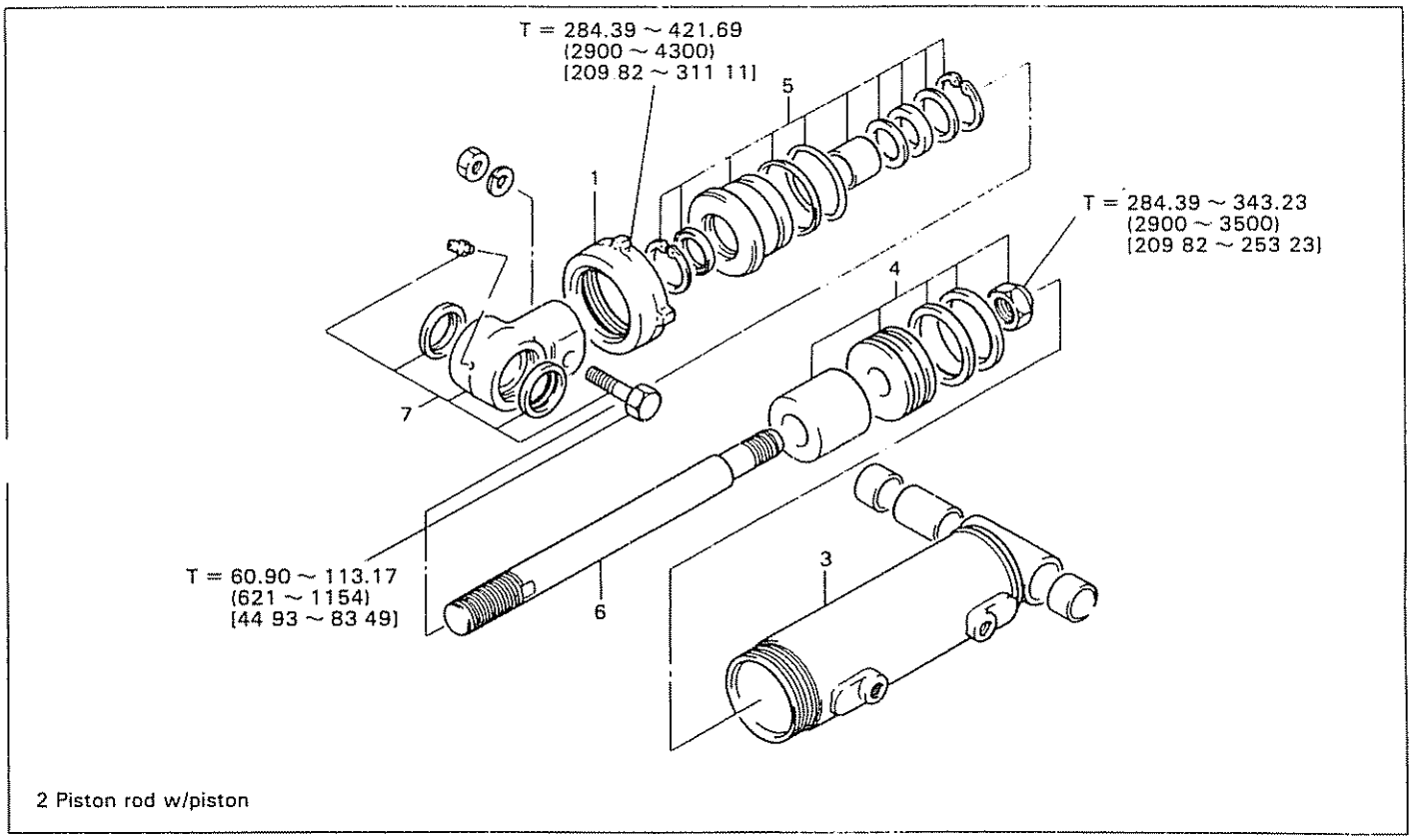
El procedimiento de instalación es el inverso al de remoción.

Notas:
- No desmonte las partes secas; aplique aceite hidráulico antes del remontaje.
- Aplique empaquetadura líquida (08833-00080) a la parte roscada de la cubierta del cilindro antes de apretar.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm)[ft-lbf]



2 Piston rod w/piston

Disassembly Procedure

1 Loosen the tilt cylinder cover. **[Point 1]**

2 Extract the piston rod W/piston.

Remove the tilt cylinder. **[Point 2]**

4 Remove the piston.

5 Remove the rod guide.

6 Remove the piston rod. **[Point 3]**

7 Remove the piston rod joint. **[Point 4]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Do not disassemble dry parts but apply hydraulic oil before reassembly.**
- **Apply sealant (08833-00080) on the threaded portion of the cylinder cover before tightening.**

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Puntos de trabajo

[Punto 1]

Desmontaje/remontaje: SST 09620-10160-71

[Punto 2]

Inspección: Mida el calibre del cilindro.

Calibre estándar: 70,0 mm
Límite del calibre: 70,35 mm

[Punto 3]

Inspección: Mida el diámetro exterior de la varilla del pistón.

Diámetro exterior estándar:
30 mm
Límite del diámetro exterior:
29,92 mm

Inspección: Mida el alabeo de la varilla del pistón.

Límite del alabeo: 1,0 mm

[Punto 4]

Desmontaje: Ponga marcas de acoplamiento.

Remontaje: Compruebe las marcas de acoplamiento.

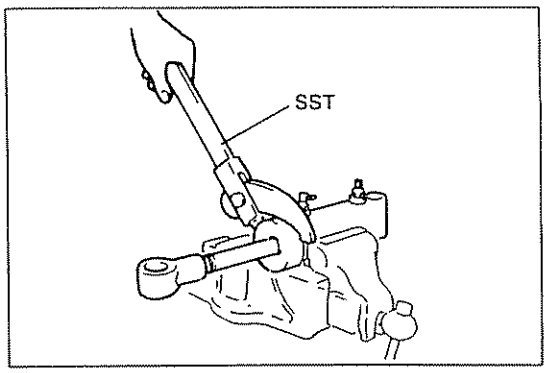
Remontaje: Cuando se recambia la varilla o la unión de la varilla, ajuste las dimensiones instaladas para que sean iguales en los lados izquierdo y derecho.

*Fig. Marcas de acoplamiento

Unidad: mm

Basculación adelante/ atrás	Series de 1-2 ton. (excluye 40-6FB20-25)		Series de 3 ton. (incluye 40-6FB20-25)	
	Dimensión L (valor de referencia)	Dimensión A (espaciador)	Dimensión L (valor de referencia)	Dimensión A (espaciador)
6°/12°				
6°/10°				
6°/6°				
3°/12°				
3°/10°				
3°/6°				

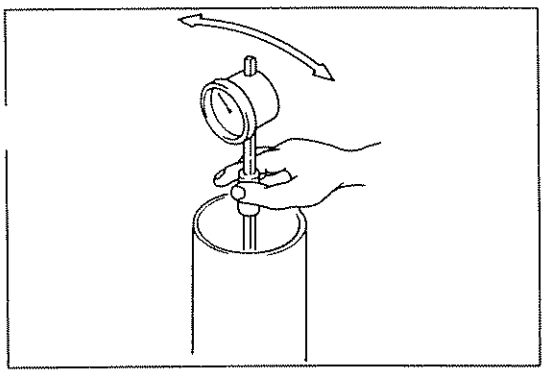
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Point Operations

[Point 1]

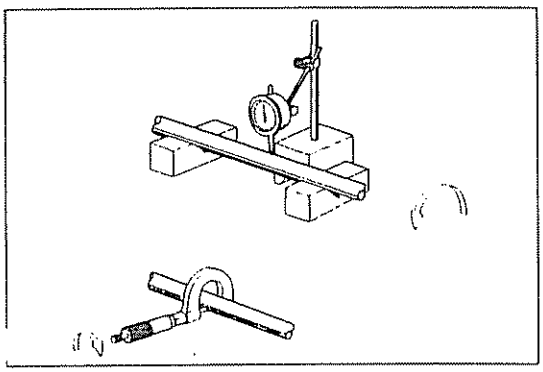
Disassembly·reassembly: SST 09620-10160-71



[Point 2]

Inspection: Measure the cylinder bore.

Standard bore: 70.0 mm (2.756 in)
Limit bore: 70.35 mm (2.7697 in)



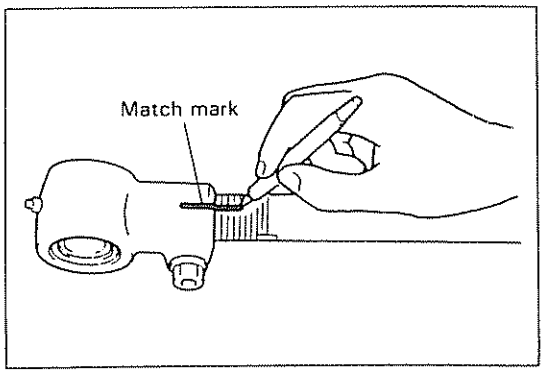
[Point 3]

Inspection: Measure the piston rod outside diameter.

Standard outside diameter:
30.0 mm (1.181 in)
Limit outside diameter:
29.92 mm (1.1780 in)

Inspection: Measure the piston rod bend.

Limit bend: 1.0 mm (0.039 in)

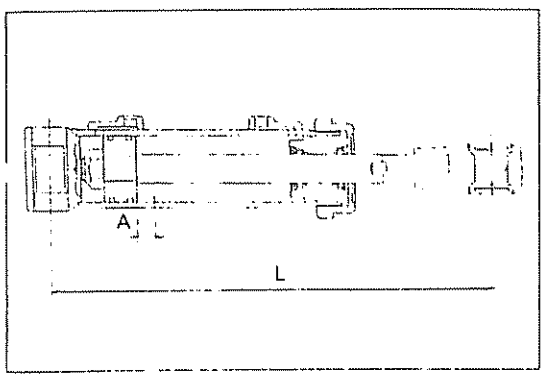


[Point 4]

Disassembly: Put a match mark.

Reassembly: Check the match mark.

Reassembly: When the rod or rod joint is replaced, adjust the installed dimensions to be equal on the left and right sides.



Unit: mm (in)

Forward backward tilt	1·2-ton series (Excluding 40-6FB20 25)		3-ton series (Including 40-6FB20 25)	
	Dimension L (reference value)	Dimension A (spacer)	Dimension L (reference value)	Dimension A (spacer)
6° 12°	438 (17 24)	28 (1 10)	460 (18 11)	–
6° 10°	453 (17 83)	43 (1 69)	478 (18 82)	19 (0 75)
6° 6°	483 (19 02)	73 (2 87)	513 (20 20)	55 (2 17)
3° 12°	438 (17 24)	50 (1 97)	460 (18 11)	27 (1 06)
3° 10°	453 (17 83)	65 (2 56)	478 (18 82)	45 (1 77)
3° 6°	483 (19 02)	95 (3 74)	513 (20 20)	81 (3 19)

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BOMBA DE ACEITE

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CONJUNTO DE LA BOMBA DE ACEITE	15-4
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OIL PUMP

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OIL PUMP ASSY 15-4

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GENERALIDADES

Admisión — 1/2 paso

Salida

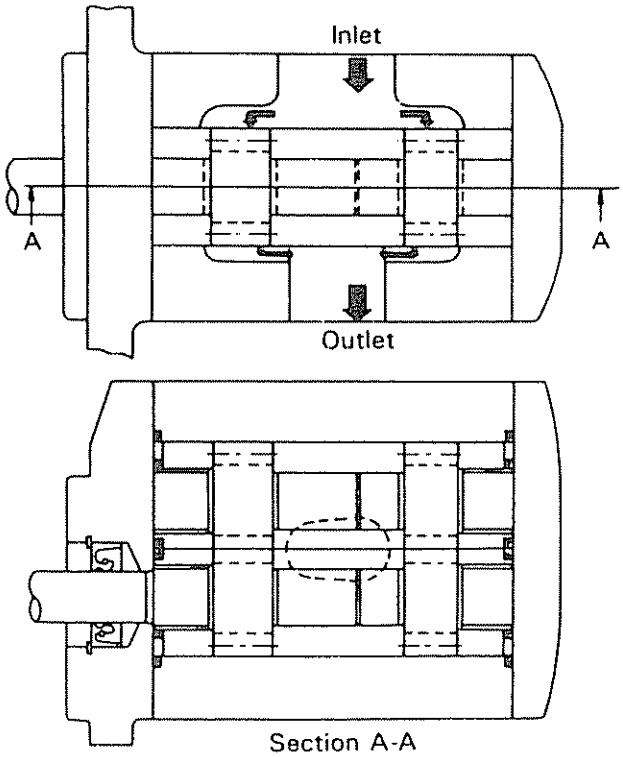
Sección A-A — Descentramiento entre los engranajes delantero y trasero

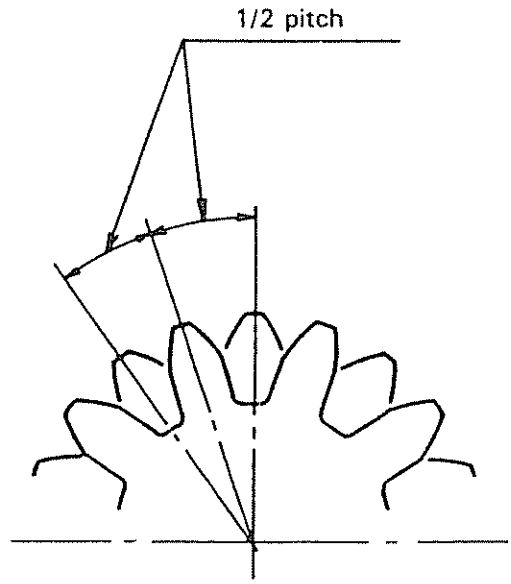
ESPECIFICACIONES

Modelo del vehículo		1,0 ton.	1,35-1,75 ton.	2,0-2,5 ton.	3,0 ton.
Clase de la bomba de aceite		Bomba de engranajes (engranaje doble)			
Tipo de la bomba de aceite	Estándar	DGP4-16CSGBZ	DGP4-18CSGBZ	-	DGP4-19CSGBZ
	Herméticos al polvo	DGP4-14CSGBZ	-	-	DGP4-16CSGBZ
Método de impulsión		Mediante acoplamiento directo con el motor			
Descarga litros/min. (bomba funcionando a 1500 rpm)	Estándar	23	26	-	28
	Herméticos al polvo	20	-	-	23
Descarga teórica cc/rev	Estándar	16,0	17,8	17,8	19,5
	Herméticos al polvo	14,2	14,2	14,2	16,0

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GENERAL





SPECIFICATIONS

Vehicle model		1.0-ton	1.35 ~ 1.75-ton	2.0 ~ 2.5-ton	3.0-ton
Oil pump name		Gear pump (double gear)			
Oil pump type	STD·Large capacity	DGP4-16CSGBZ	DGP4-18CSGBZ	←	DGP4-19CSGBZ
	Dust proof	DGP4-14CSGBZ	←	←	DGP4-16CSGBZ
Drive method		Driving by direct coupling with the motor			
Delivery (pump operating at 1500 rpm) ℓ/min (US gal/min)	STD·Large capacity	23 (6.1)	26 (6.9)	←	28 (7.4)
	Dust proof	20 (5.3)	←	←	23 (6.1)
Theoretical delivery cc/rev (in^3/rev)	STD·Large capacity	16.0 (0.976)	17.8 (1.086)	←	19.5 (1.190)
	Dust proof	14.2 (0.867)	←	←	16.0 (0.976)

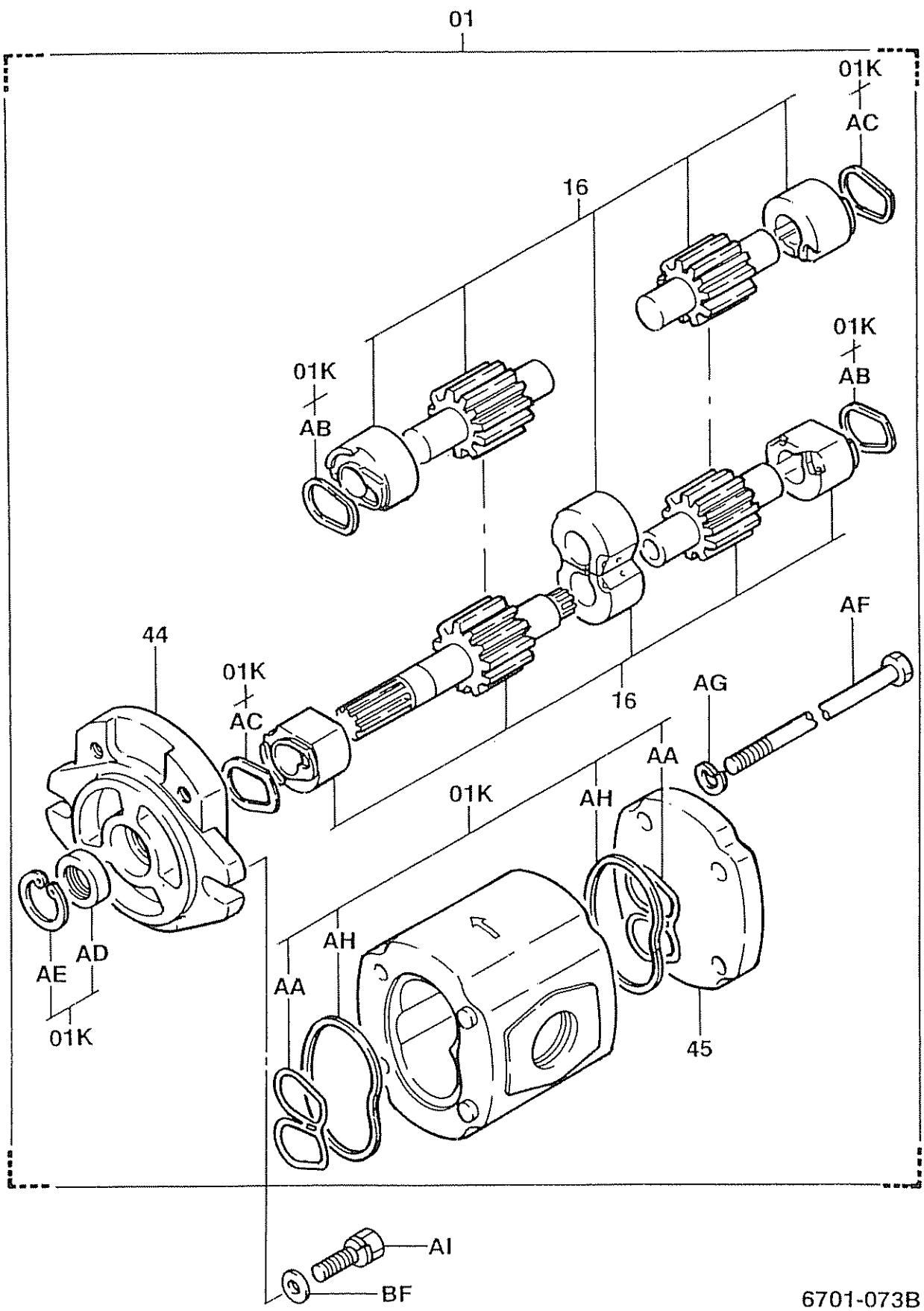
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COMPONENTES

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COMPONENTS

6701



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JUNTO DE LA BOMBA DE ACEITE

OCION/INSTALACION

ocedimiento de remoción

Desconecte el enchufe de la batería.

Saque la cubierta derecha del bastidor.

Drene el aceite hidráulico del depósito hidráulico.

Desconecte la tubería flexible de alta presión.

Desconecte la tubería flexible de admisión.

Saque los pernos de sujeción de la bomba de aceite.

Saque la bomba de aceite.

ocedimiento de instalación

procedimiento de instalación es el inverso al de remoción.

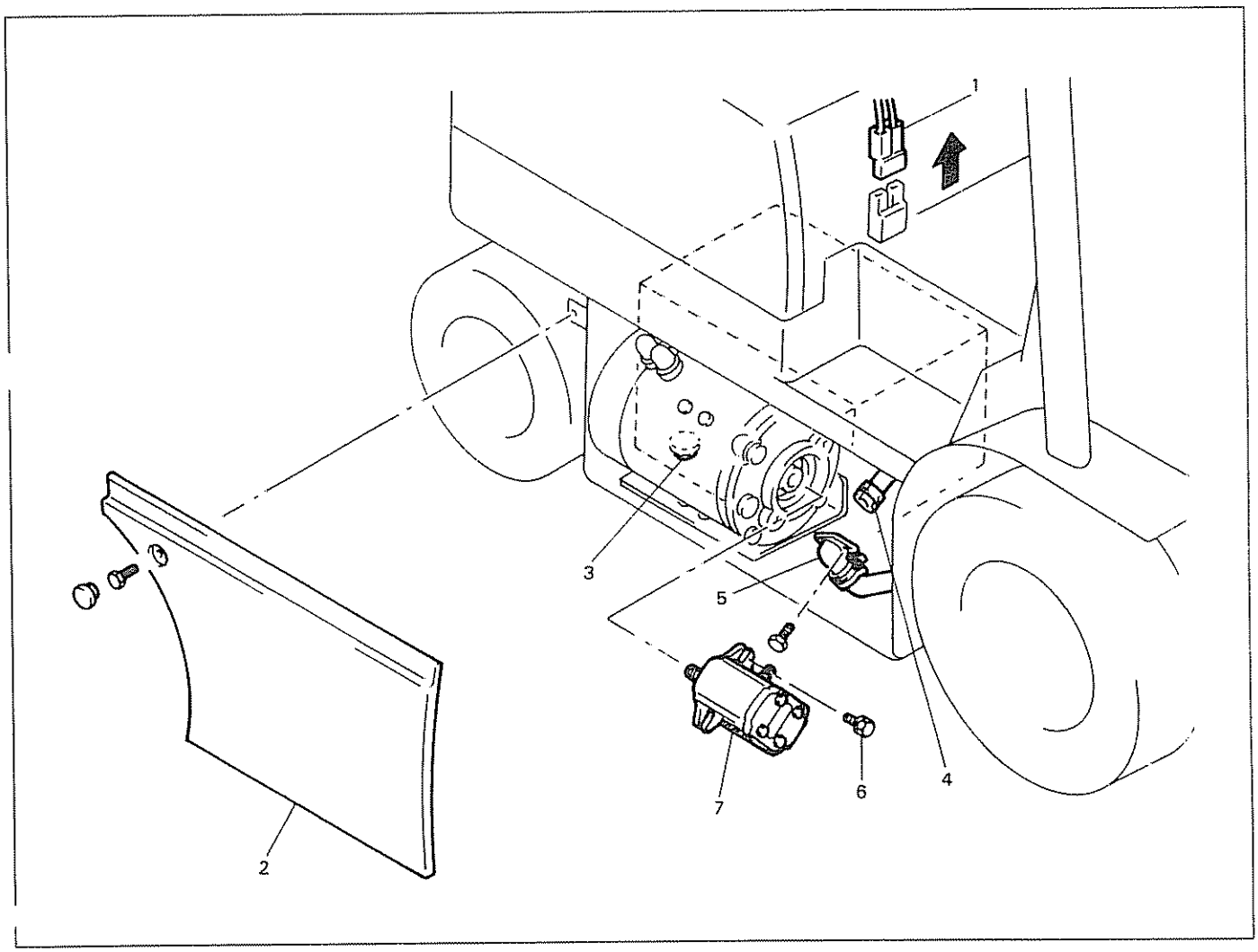
tas:

Cubra con grasa la parte estriada de la bomba antes de la instalación.
Limpie la parte de montaje del acoplamiento para evitar que se deteriore el anillo en "O".

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OIL PUMP ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery plug.

2 Remove the flame side cover RH.

3 Drain hydraulic oil from the hydraulic tank.

4 Disconnect the high pressure hose.

5 Disconnect the inlet hose.

6 Remove the oil pump set bolts.

7 Remove the oil pump.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat grease on the pump spline portion before installation.**
- **Clean the fitting mounting portion to prevent the O-ring from being damaged.**

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Procedimiento de desmontaje

1 Saque la cubierta. [Punto 1]

2 Saque el reborde de montaje. [Punto 2]

3 Saque el anillo de refuerzo, la junta hermética del casquillo y la junta hermética del cuerpo.

4 Saque el engranaje y el conjunto del casquillo. [Punto 3]

5 Saque la junta hermética de aceite.

Procedimiento de remontaje

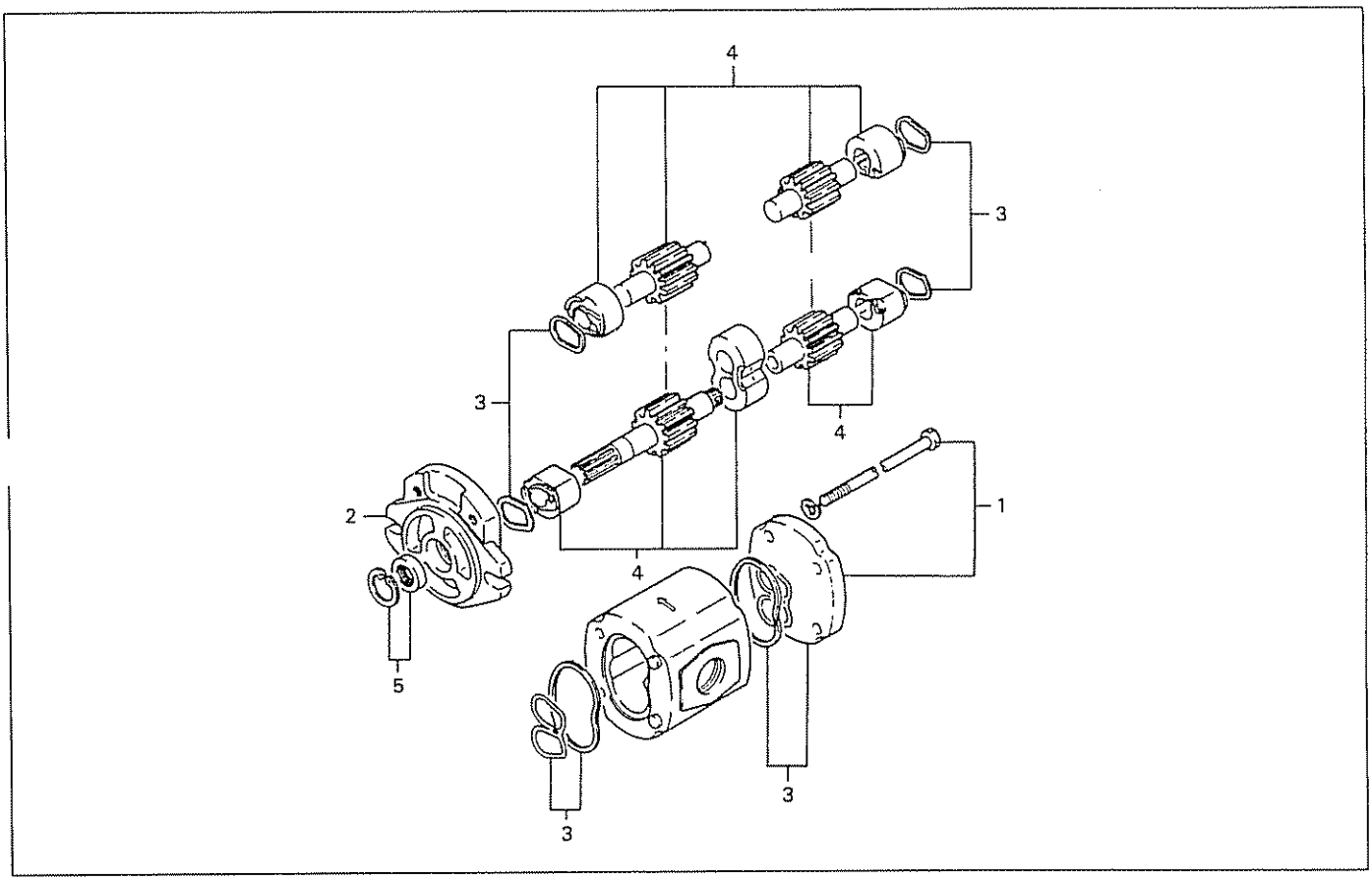
El procedimiento de remontaje es el inverso al del desmontaje.

Notas:

- Lave las partes, sóplelas con aire comprimido, y vuélvalas a montar después de aplicar aceite hidráulico.
- Use siempre juntas de empaquetadura y anillos de refuerzo nuevos en el remontaje.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

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

2 Remove the mounting flange. **[Point 2]**

3 Remove the backing ring, bush seal and body seal.

4 Remove the gear and bush set. **[Point 3]**

5 Remove the oil seal.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part, blow with compressed air, and coat hydraulic oil before reassembly.**
- **Always use new seals and backing ring for reassembly.**

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Puntos de trabajo

[Punto 1]

Desmontaje: Ponga una marca de acoplamiento.

Remontaje: Confirme la marca de acoplamiento.

[Punto 2]

Desmontaje: Ponga una marca de acoplamiento en las caras laterales de los dientes del engranaje impulsor e impulsado.
Tenga cuidado de no deteriorar los engranajes.

Remontaje: Monte los engranajes impulsor e impulsado con las marcas de acoplamiento alineadas.

[Punto 3]

Inspección: Mida la señal de contacto del engranaje del lado de succión en la superficie interior del cuerpo.

Límite: 39,180 mm

Inspección: Inspeccione la profundidad de la fisura en la superficie interior del cuerpo.

Límite de la profundidad de la fisura: 0,1 mm

*Fig.



Inspección:

Inspeccione la señal de contacto del casquillo lateral.

Contacto en la superficie de deslizamiento del calibre

Normal Señal de contacto relativamente más fuerte en el lado de succión y ligera en el lado de descarga.

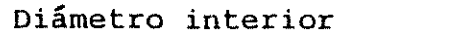
Inspección: Mida el calibre del casquillo lateral.

Límite: 19,123 mm

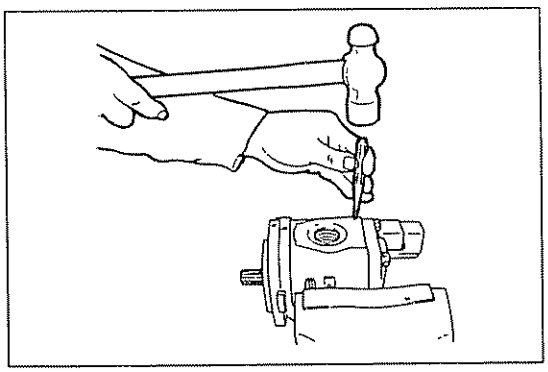
Inspección: Mida la longitud del casquillo lateral en dirección axial.

Límite: 14,77 mm

*Fig. Longitud



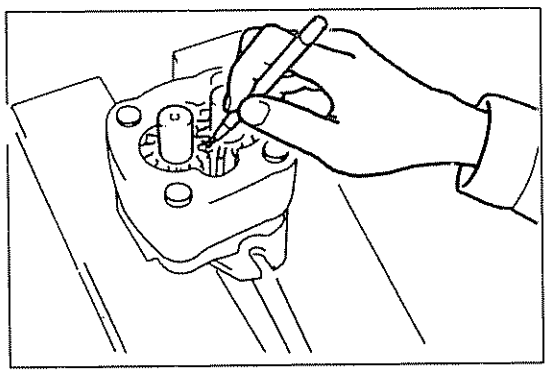
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Point Operations

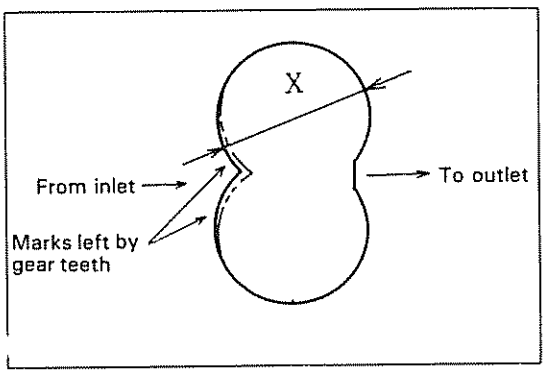
[Point 1]
Disassembly: Put a match mark.

Reassembly: Align the match marks.



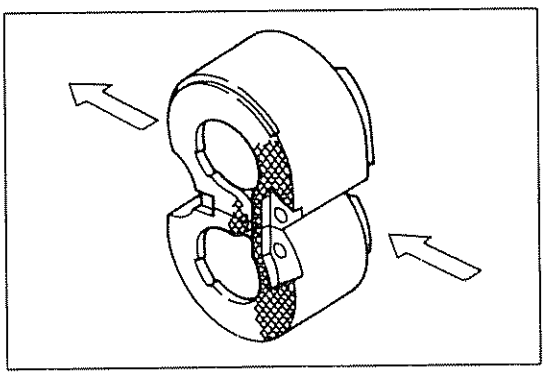
[Point 2]
Disassembly: Put a match mark on the teeth of the drive and driven gears.
Do not damage with a punch.

Reassembly: Align the match marks.

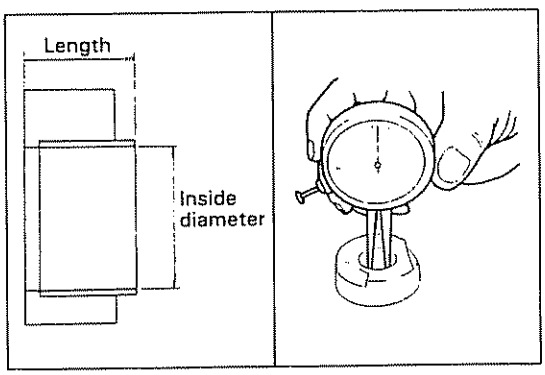


[Point 3]
Inspection: Measure the body inside diameter (X).
Limit: 39.180 mm (1.54252 in)

Inspection: Inspect the body for any interior surface flow.
Flow depth limit: 0.1 mm (0.004 in)



Inspection: Inspect the contact trace of the side busing.
Contact on bore sliding surface
Normal
Contact trace relatively stronger on the suction side and slight on the discharge side.



Inspection: Measure the side bush inside diameter.
Limit: 19.123 mm (0.75287 in)

Inspection: Measure the side bush length in axial direction.
Limit: 14.77 mm (0.58159 in)

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Inspección: Inspeccione la superficie interior del casquillo central.

Límite: 19,123 mm

Inspección: Mida la longitud del casquillo central en dirección axial.

Límite: 29,68 mm

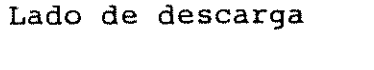
Inspección:

Inspeccione la señal de contacto del casquillo central.

Contacto de la superficie de deslizamiento del calibre
Normal Señal de contacto aproximadamente la mitad del lado de succión.

Contacto lateral
Normal Señal de contacto total.

*Fig.

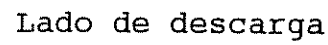


Inspección: Mida el diámetro exterior del árbol del engranaje.
Límite: 18,935 mm

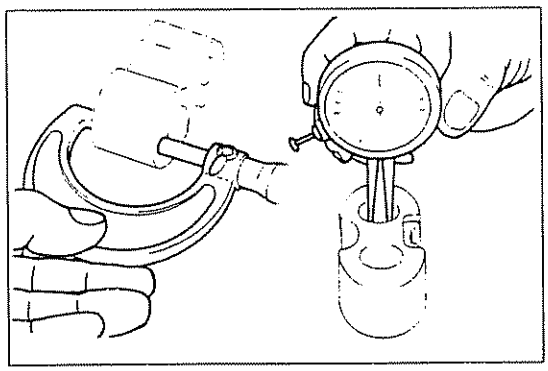
Inspección: Inspeccione el estado de contacto del engranaje en la superficie interior del cuerpo en el lado de admisión.

Límite: Señal de contacto en más de la mitad de la superficie interior del cuerpo

*Fig. Impresión de contacto de la punta de los dientes del engranaje

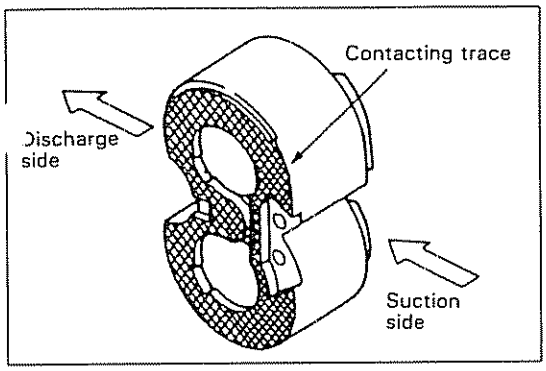


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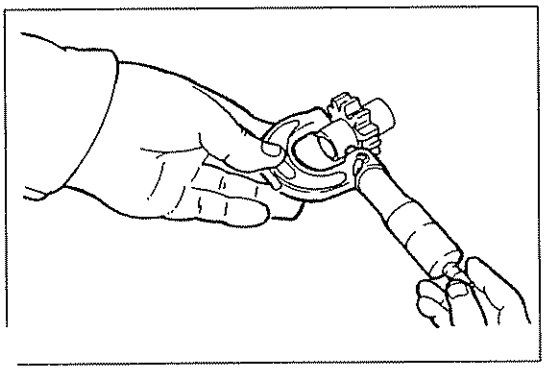


Inspection: Inspect the center bush inside diameter.
Limit: 19.123 mm (0.75287 in)

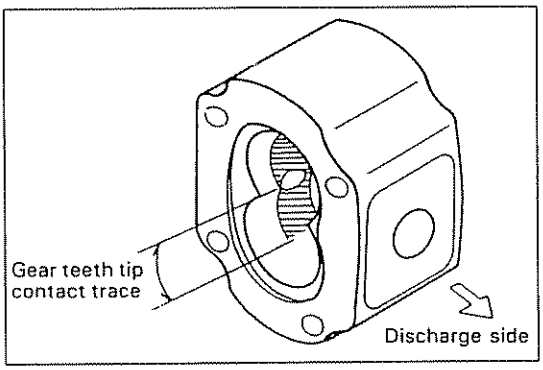
Inspection: Measure the center bush length in axial direction.
Limit: 29.68 mm (1.1685 in)



Inspection: Inspect the contact trace of the center busing.
Contact on bore sliding surface
Normal
Contact trace about 1/2 on the suction side.
Side contact
Normal
Overall contact trace.



Inspection: Measure the gear shaft outside diameter.
Limit: 18.935 mm (0.74547 in)



Inspection: Inspect the gear contact state on the body interior surface on the inlet side.
Limit: Contact trace at more than half of the body interior surface

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PROCEDIMIENTO DE PRUEBA

Se necesita una prueba de banco para una inspección estricta, pero es imposible en el servicio real. Instale la bomba de aceite en el vehículo y juzgue el estado de la bomba de aceite comprobando el funcionamiento del cilindro.

- Compruebe en el indicador de la batería si la carga de la batería es suficiente.
- Compruebe si la presión límite de la válvula de control de aceite es como se especifica (vea la página 16-9).
- Mida el tiempo de funcionamiento de la carrera total del cilindro de elevación cuando la temperatura del aceite hidráulico es de 50 a 55° C, y calcule la velocidad de elevación.
- Sin embargo, el arranque suave apoyado por el circuito del interruptor periódico reduce las velocidades de elevación de 10 a 20 mm/seg. por debajo de los valores indicados en la tabla siguiente. Para medir las velocidades de elevación con mayor precisión, hágalo cuando no tenga lugar el arranque suave.
  Si se encuentra cualquier fallo, vuelva a desmontar e inspeccionar la bomba de aceite.

Tabla de la velocidad de elevación

Velocidad de elevación mm/seg.	
Sin carga	Cargado

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TEST PROCEDURE

A bench test is required for strict inspection, but it is impossible in actual service. Install the oil pump on the actual vehicle and judge the properness of the oil pump delivery by checking the cylinder operation.

- Check on the battery charge indicator to see if the battery charge is sufficient.
- Check if the oil control valve relief set pressure is as specified (see page on 16-8).
- Measure the lift cylinder full stroke operation time when the hydraulic oil temperature is 50 to 55°C (122 to 131°F), and calculate the lifting speed.
- Because of the soft start by the material handling chopper circuit, however, the lifting speed is 10 to 20 mm/sec (2.0 to 3.4 fpm) slower than the speed shown in the table below. The lifting speed can be obtained more accurately by measurement excluding the soft start period.
  If any defect is found in the test above, disassemble and inspect the oil pump again.

Lifting Speed Table

		Lifting speed mm/sec (fpm)	
		No-load	Loaded
6FB10	V-SV	560 (110)	350 (69)
	FV-FSV	510 (100)	320 (63)
6FB14	V-SV	560 (110)	330 (65)
	FV-FSV	510 (100)	310 (61)
6FB15	V-SV	560 (110)	350 (69)
	FV-FSV	510 (100)	300 (59)
6FB18	V-SV	560 (110)	330 (65)
	FV-FSV	510 (100)	280 (55)
6FB20	V-SV	560 (110)	↑
	FV-FSV	420 (82)	260 (51)
6FB25	V-SV	560 (110)	250 (49)
	FV-FSV	420 (82)	240 (47)
6FB30	V-SV	410 (81)	230 (45)
	FV-FSV	340 (67)	200 (39)

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VALVULA DE CONTROL DE ACEITE

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OIL CONTROL VALVE

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GENERALIDADES

Válvula de control de aceite

Válvula limitadora de presión

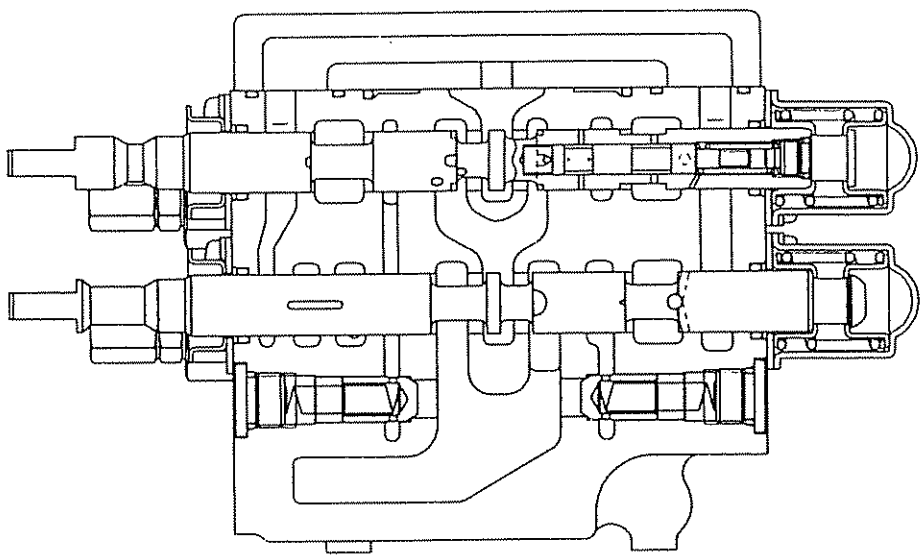
Válvula limitadora de presión de elevación

Válvula limitadora de presión de basculación

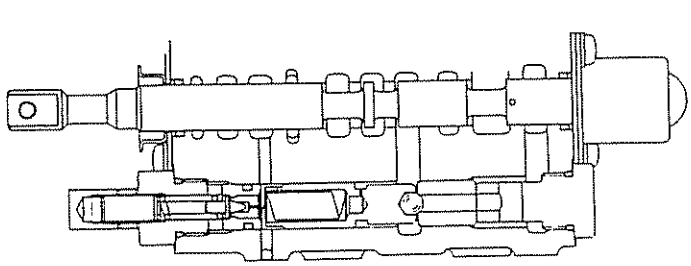
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GENERAL

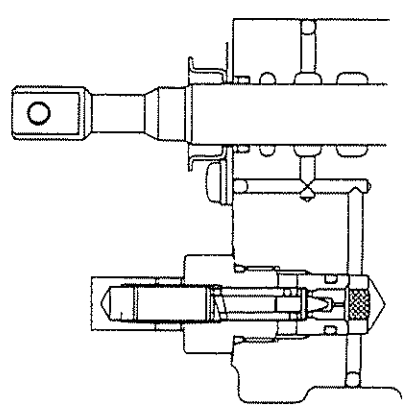
Oil Control Valve



Relief Valve



Lift relief valve



Tilt relief valve

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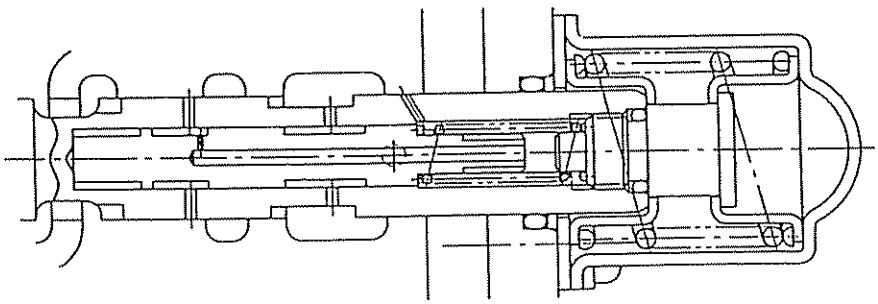
Válvula de inmovilización de basculación

ESPECIFICACIONES

Descripción	Modelo del vehículo	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Tipo		Adicional montable (monobloque de 1 ó 2 carretes)		
Límite de presión kPa (kgf/cm²)	Elevación	15200 (155)	17200 (175)	18100 (185)
	Basculación	11800 (120)	14700 (150)	-
Diámetro exterior del carrete mm		16,0		
Carrera mm		7,0		
Otros		Válvula de inmovilización de basculación incorporada		

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Tilt Lock Valve



SPECIFICATIONS

Item \ Vehicle model		1-ton series	2-ton series	3-ton series
Type		Add-on (1, 2-spool monoblock)		
Relief pressure kPa (kgf/cm²) [psi]	Lift	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
	Tilt	11800 (120) [1710]	14700 (150) [2130]	←
Spool outside diameter mm (in)		16 0 (0.63)		
Stroke mm (in)		7.0 (0.28)		
Other		Built-in tilt lock valve		

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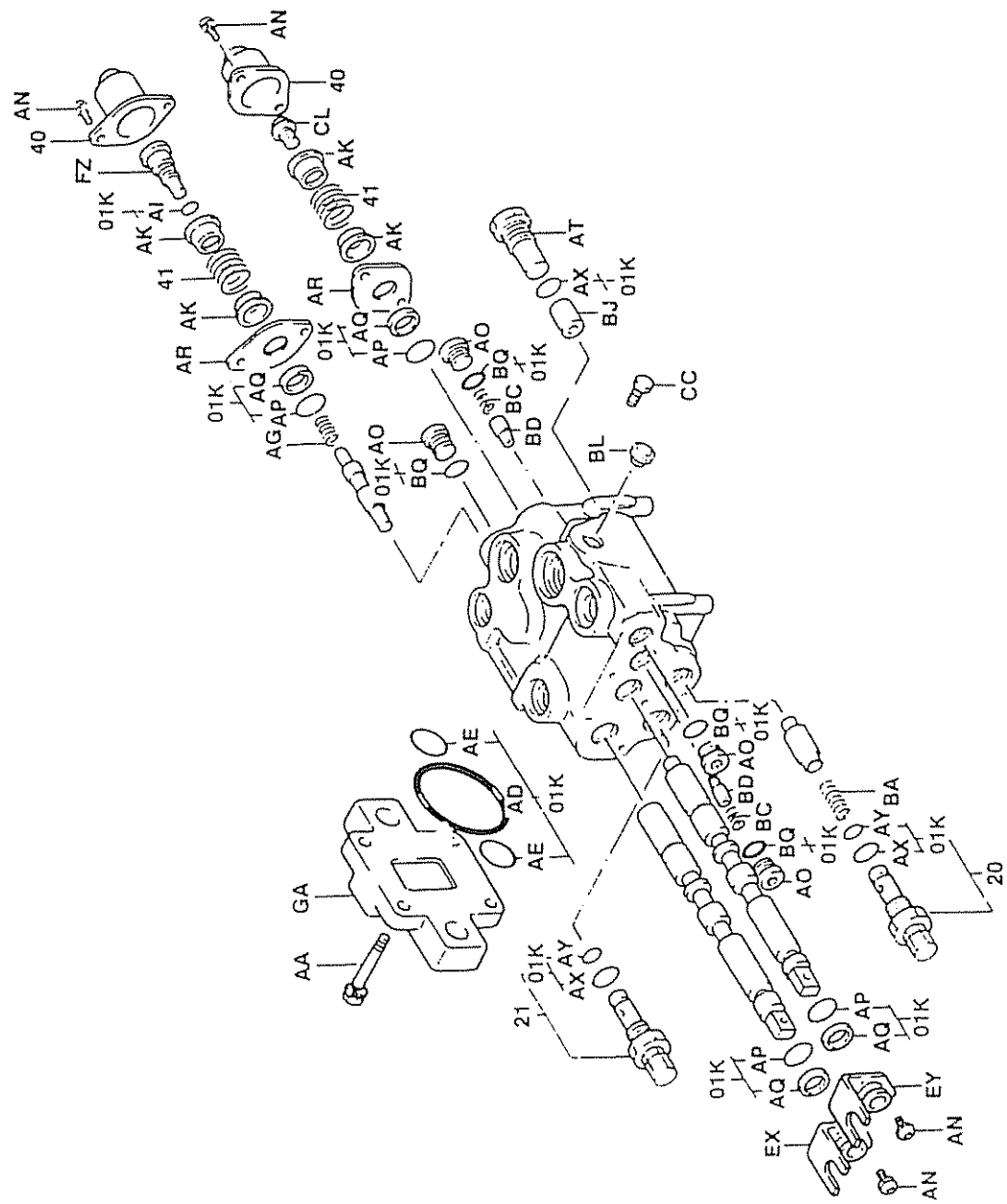
COMPONENTES

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COMPONENTS

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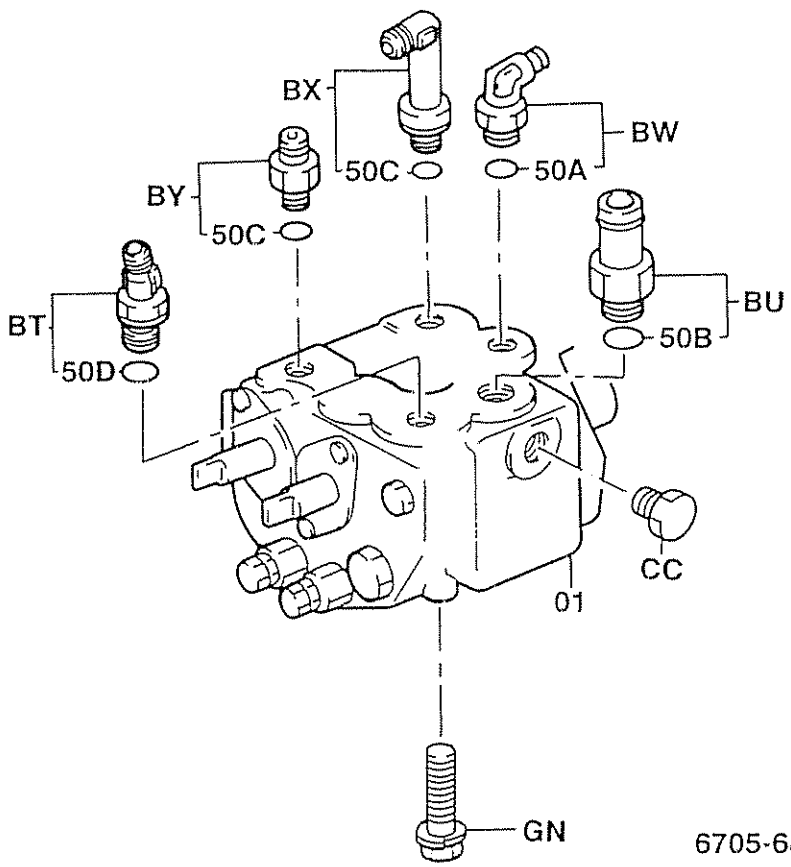
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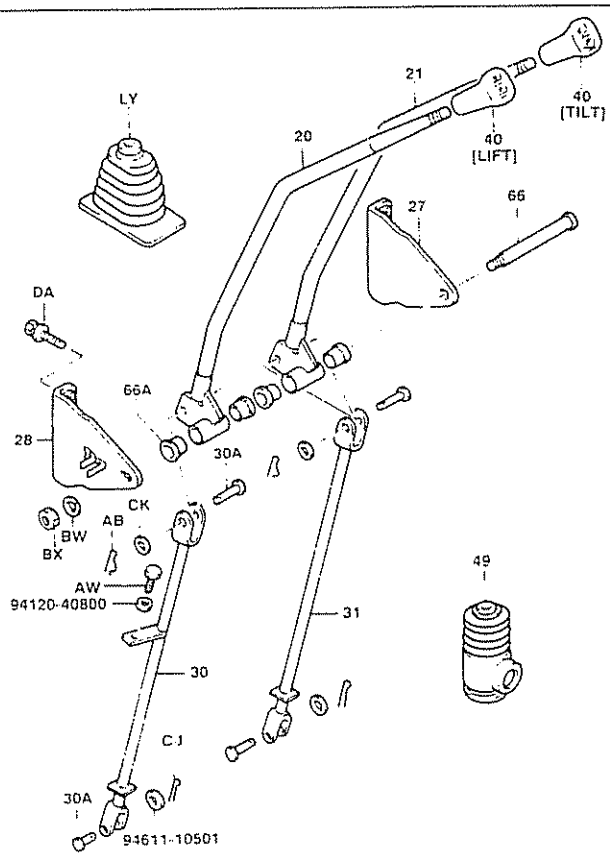
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6705



6709



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CONJUNTO DE LA VALVULA DE CONTROL DE ACEITE

REMOCION/INSTALACION

Nota:
Antes de la remoción, accione la palanca de la válvula de control. Coloque el mástil en posición vertical y baje la horquilla del todo para eliminar la presión remanente en las tuberías del mecanismo de manipulación de materiales.

Procedimiento de remoción

1 Desconecte el enchufe de la batería.

2 Saque el tablero del piso

3 Desconecte las tuberías.

4 Saque el pasador de sujeción que une la palanca y la válvula de control de aceite.

5 Saque la válvula de control de aceite.

Procedimiento de instalación

El procedimiento de instalación es el inverso al de remoción.

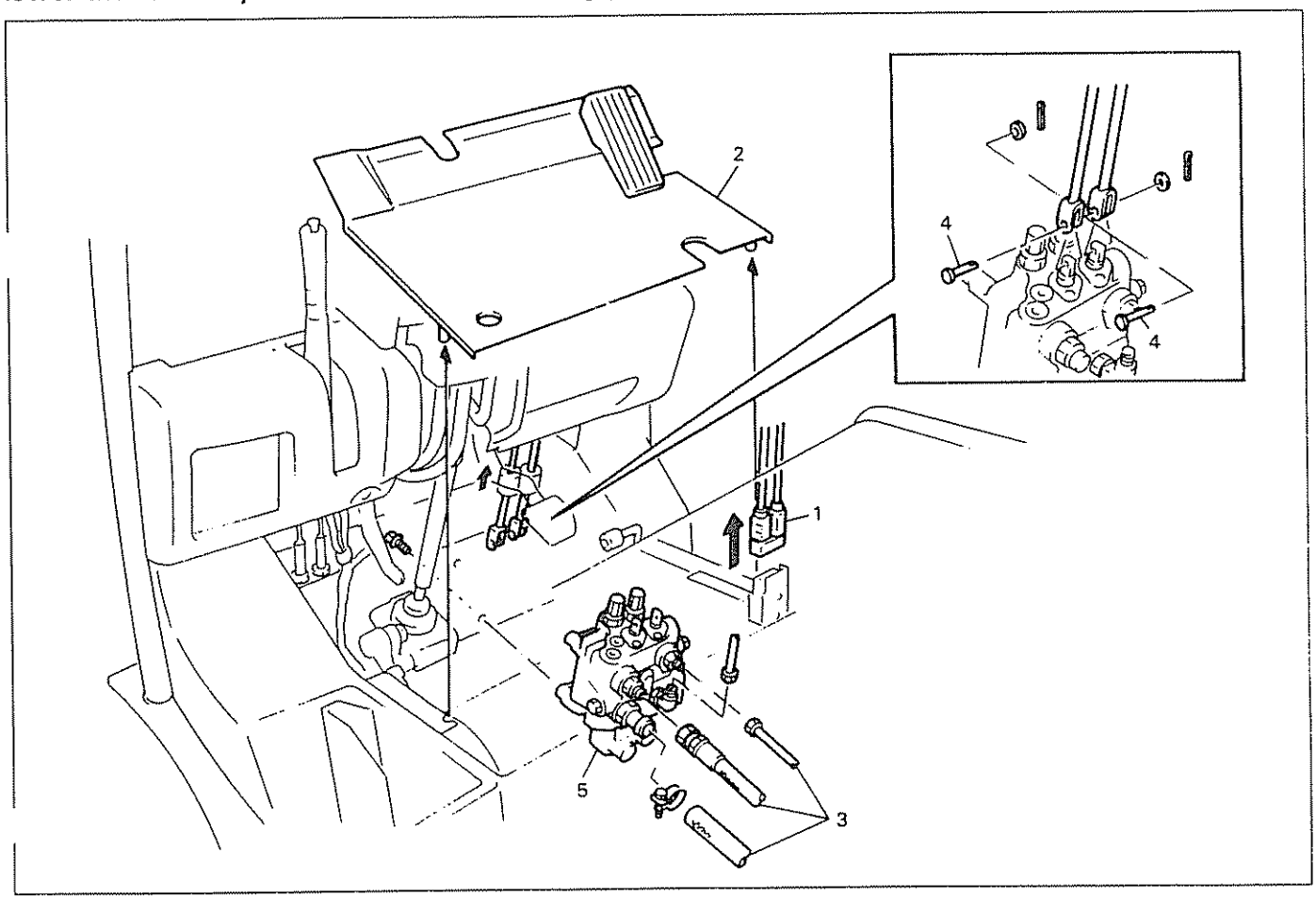
Notas:
- Después de instalar la válvula de control de aceite, ajuste el interruptor limitador y el potenciómetro de elevación (según el procedimiento de la página 2-34).
- Cubra con grasa las partes de la articulación de la palanca de la válvula de control de aceite.
- Inspeccione el nivel del aceite hidráulico y añada si es insuficiente.

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OIL CONTROL VALVE ASSY

REMOVAL·INSTALLATION

Note:
Before starting removal operation, operate the control valve lever. Set the mast in vertical position and lower the fork fully to eliminate the remaining pressure in the material handling mechanism piping.



Removal Procedure

1 Disconnect the battery plug.

2 Remove the toeboard.

3 Disconnect the piping.

4 Remove the set pin linking the oil control valve and lever.

5 Remove the oil control valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **After installing the oil control valve, adjust the limit switch and lift potentiometer (according to the procedure on page 2-34).**
- **Coat grease on the oil control valve lever link parts.**
- **Inspect the hydraulic oil level and add if insufficient.**

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DESMONTAJE/INSPECCION/REMONTAJE

Nota:
Seleccione un lugar limpio para el trabajo.
Como todas las partes componentes están acabadas con alta precisión, haga el trabajo con cuidado durante el desmontaje y el remontaje para evitar deteriorarlos.

Procedimiento de desmontaje

1 Quite el sujetador de la junta hermética.

2 Saque la cubierta del resorte.

3 Saque el conjunto del carrete de elevación y basculación.

4 Desmonte el conjunto del carrete de elevación y basculación. [Punto 1]

5 Saque el conjunto de la válvula limitadora de presión de elevación.

6 Saque el conjunto de la válvula limitadora de presión de basculación.

7 Saque la válvula de retención.

8 Saque el cárter de salida.

9 Saque el asiento de la válvula.

Procedimiento de remontaje

El procedimiento de remontaje es el inverso al del desmontaje.

Notas:
- Antes del remontaje limpie bien cada parte, sople con aire comprimido y cubra con aceite hidráulico.
- Afloje del todo el tornillo de ajuste de la válvula limitadora de presión.

Punto de trabajo

[Punto 1]

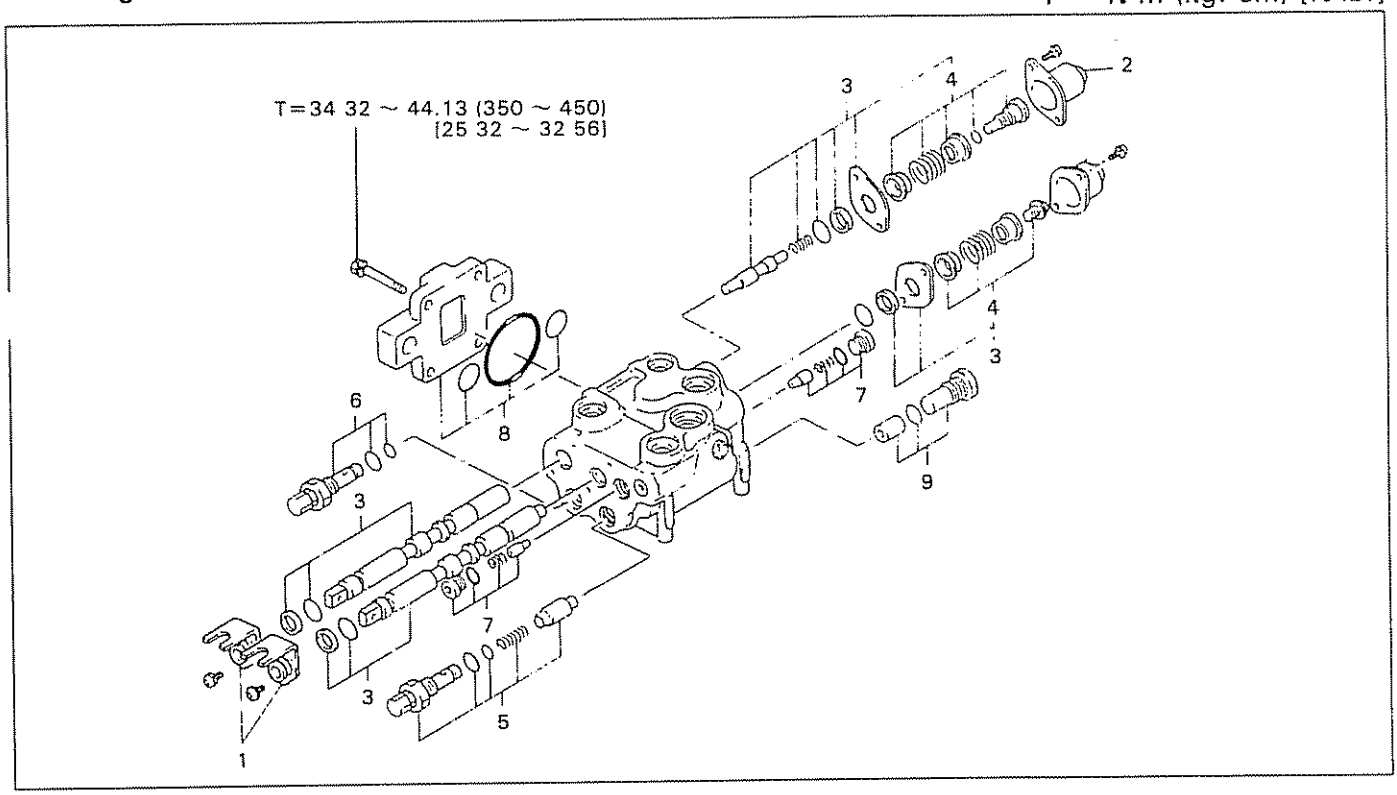
Desmontaje/remontaje: SST 09610-10160-71

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
Select a clean location for the job.
Because each part is finished with high precision, carefully disassemble and reassemble them so as not to damage them.

T = N·m (kgf-cm) [ft-lbf]



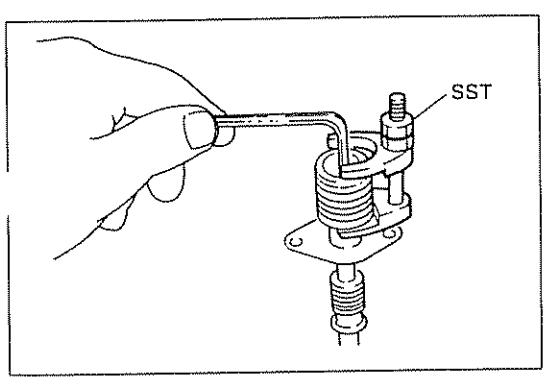
Disassembly Procedure

1 Remove the seal holder.
2 Remove the spring cover.
3 Remove the lift·tilt spool ASSY.
4 Disassemble the lift·tilt spool ASSY. **[Point 1]**
5 Remove the lift relief valve set.
6 Remove the tilt relief valve set.
7 Remove the check valve.
8 Remove the outlet housing.
9 Remove the valve seat.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part thoroughly, blow compressed air, and coat hydraulic oil before reassembly.**
- **Fully loosen the relief valve adjusting screw.**



Point Operation

[Point 1]
Disassembly·reassembly: SST 09610-10160-71

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AJUSTE DE LA PRESION LIMITE

Notas:
- Haga siempre el ajuste de acuerdo con el procedimiento descrito a continuación. Si ajusta al azar, puede generar una alta presión deteriorando la bomba de aceite u otro equipo hidráulico.
- No se necesita el ajuste cuando no se desmonta la válvula limitadora de presión ni se recambia por una nueva.

1. Saque el tapón (9/16-18UNF-2B) por la parte superior de la válvula de control de aceite, e instale un manómetro de aceite.

   Resistencia de la presión del manómetro de aceite: 19600 kPa (200 kgf/cm²) o más

2. Afloje el tornillo de ajuste de la válvula limitadora de presión de elevación.
   Afloje la tuerca de seguridad y afloje el tornillo de ajuste hasta un punto en que no se salga del cuerpo.

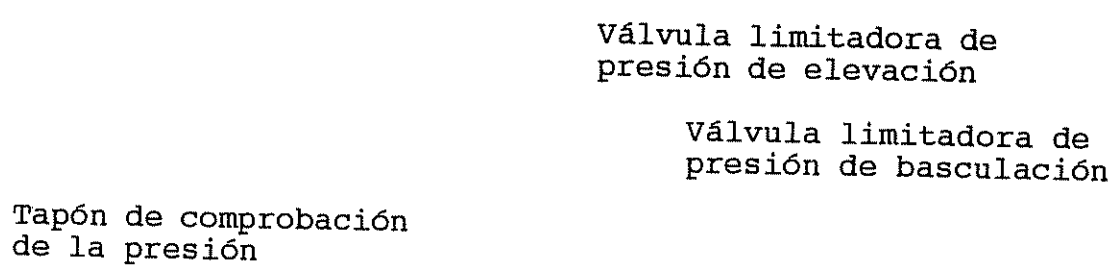
3. Ajuste la presión hidráulica.
   (1) Gire el interruptor de la llave a conexión.
   (2) Accione lentamente la palanca de elevación a la posición de elevación, y apriete el tornillo de ajuste gradualmente hasta que la horquilla comience a subir.
   (3) Suba la horquilla hasta la altura máxima y lea la presión de aceite en ese momento. Apriete el tornillo de ajuste a la lectura especificada del manómetro.
   (4) Apriete la tuerca de seguridad y compruebe de nuevo la presión de aceite.
   Ajuste la presión límite de la válvula limitadora de presión de basculación de la misma manera excepto que el mástil debe bascularse del todo hacia adelante en el momento de la medición de la presión de aceite.

Presión límite estándar

Unidad: kPa (kgf/cm²)

	Series de 1 ton.	Series de 2 ton.	Series de 3 ton.
Elevación	15200 (155)	17200 (175)	18100 (185)
Basculación	11800 (120)	14700 (150)	-

(5) Saque el manómetro de aceite e instale el tapón.



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RELIEF PRESSURE ADJUSTMENT

Note:
- **Always make adjustment according to the following procedure. Thoughtless adjustment may generate a high pressure that may damage the oil pump and other hydraulic equipment.**
- **No adjustment is required 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 an oil pressure gage.

   Pressure resistance of oil pressure gage: 19600 kPa (200 kgf/cm^2) [2840 psi] or more

2. Loosen the lift relief valve adjusting screw.
   Loosen the lock nut, and loosen the adjusting screw to a degree not coming off from the body.

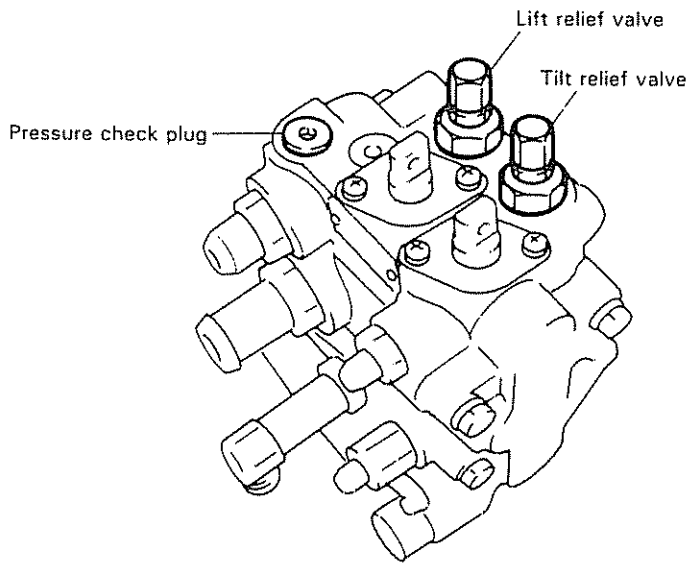
3. Adjust the hydraulic pressure.
   (1) Turn the key switch to ON.
   (2) Slowly operate the lift lever to the lift position, and tighten the adjusting screw gradually until the fork starts to rise.
   (3) Raise the fork to the maximum height and read the oil pressure at the time. Tighten the adjusting screw for the specified pressure gage reading.
   (4) Tighten the lock nut and check the oil pressure again.
   Adjust the relief pressure of the tilt relief valve in the same way except that the mast should be tilted fully backward at the time of oil pressure measurement.

Standard Relief Pressure

Unit: kPa (kgf/cm^2) [psi]

	1-ton series	2-ton series	3-ton series
Lift	15200 (155) [2200]	17200 (175) [2490]	18100 (185) [2630]
Tilt	11800 (120) [1710]	14700 (150) [2130]	←

(5) Remove the oil pressure gage, and install the plug.



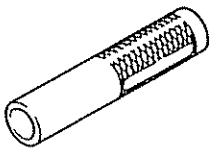
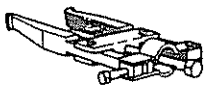
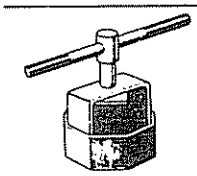
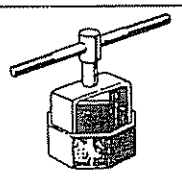
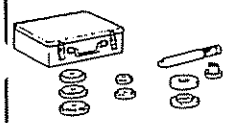
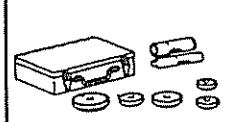
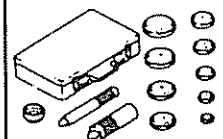
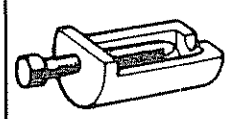
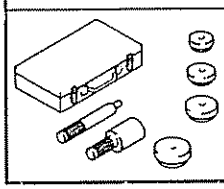
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APPENDIX

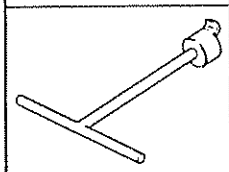
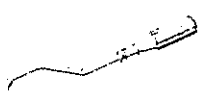
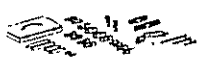
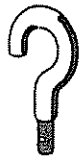
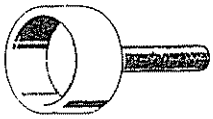
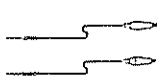
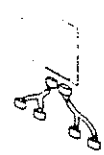
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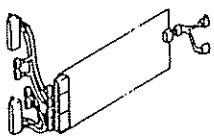
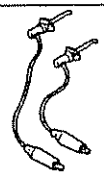
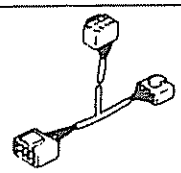
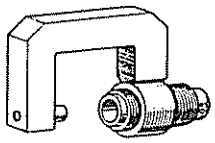
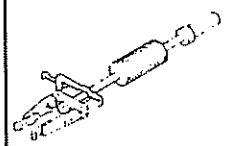
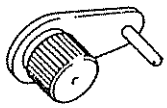
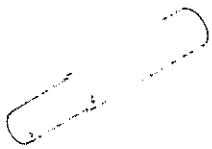
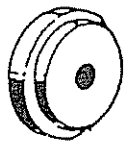
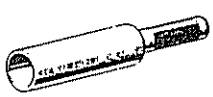
SST LIST

Illustration	Part No.	Part name	Section											
			1	2	3	5	6	7	8	9	10	11	13	14	16
	09285-76010	Injection pump camshaft bearing cone replacer								○					
	09308-10010	Oil seal puller					○								
	09509-55020	Rear wheel bearing nut wrench						○							
	09509-55030	Rear wheel bearing nut wrench						○							
	09527-21011	Rear axle shaft bearing remover								○					
	09608-20012	Front hub and drive pinion bearing replacer set							○						
	09608-30012	Front hub and drive pinion bearing tool set				○				○					
	09608-35014	Axle hub and drive pinion bearing tool set				○				○					
	09610-20012	Pitman arm puller							○	○					
	09620-30010	Steering gear box replacer set							○	○					

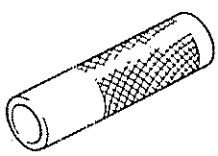
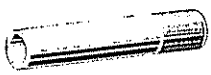
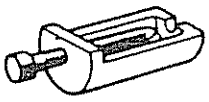
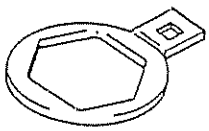
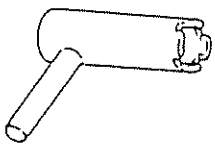
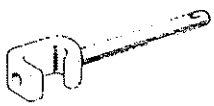
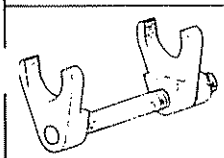
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Illustration	Part No.	Part name	Section												
			2	3	4	5	6	7	8	9	10	11	13	14	16
	09717-20010	Brake shoe return spring remover									○				
	09718-20010	Brake shoe return spring replacer									○				
	09950-40010	Universal puller				○	○		○	○			○		
	09950-50010	Puller "C" set				○				○					
	09010-10260-71	Motor hook				○		○							
	09110-41830-71	Bearing anvil								○					
	09130-30200-71	Oil tight mission case replacer						○							
	09230-12400-71	Plug-in analyzer		○											
	09230-13700-71	IC check pin	○		○										
	09240-13500-71	New MCS check harness	○		○										

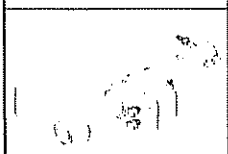
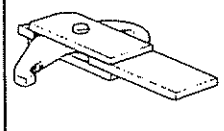
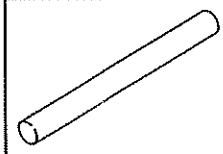
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Illustration	Part No.	Part name	Section												
			1	2	3	4	6	7	8	9	10	11	13	14	16
	09240-13700-71	New MCS check harness		○		○									
	09240-23400-71	IC clip		○		○									
	09250-13500-71	Check sub harness (for charger)				○									
	09310-22000-71	Reamer bolt remover						○							
	09320-23000-71	Bearing remover								○					
	09330-13200-71	Input gear lock plate					○								
	09331-23000-71	Shift fork oil seal replacer								○					
	09370-10170-71	Front axle bearing replacer							○						
	09370-10410-71	Front axle bearing replacer						○							
	09370-20270-71	Drive pinion bearing replacer							○						

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Illustration	Part No.	Part name	Section												
			1	2	3	5	6	7	8	9	10	11	13	14	16
	09381-41950-71	HST pump bearing replacer				○									
	09411-41800-71	2nd drive shaft dust seal replacer				○									
	09420-23000-71	Bearing remover								○					
	09430-23600-71	Tire-rod end puller							○	○					
	09451-13500-71	Steering gear box rock plate								○					
	09452-13500-71	Lock nut wrench								○					
	09453-13500-71	Plug remover and replacer								○					
	09470-10171-71	Main shaft preload tool								○					
	09510-31960-71	Brake hold down spring remover and replacer									○				
	09610-10160-71	Oil control valve spring remover and replacer													○

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Illustration	Part No.	Part name	Section												
			1	2	3	5	6	7	8	9	10	11	13	14	16
	09610-22000-71	Inner mast stopper											○	○	
	09620-10160-71	Cylinder cap remover and replacer												○	
	09631-22000-71	Wear scale chain											○		
	09700-30200-71	Spring pin tool remover					○			○					○
	09810-20172-71	Joint pin remover											○	○	
	80201-10250-71	Battery hanger	○												

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SERVICE STANDARDS LIST

BATTERY

Item	All vehicle models
Specific gravity in perfectly charged state (at 20°C (68°F))	1.280
Specific gravity upon full discharge (at 20°C (68°F))	1.150
Discharge end voltage	48 V vehicle: 42.5 V 72 V vehicle: 61 V
Insulation resistance	1 MΩ or more

CONTROLLER

Item		1 ton series	2 ton series	3 ton series
F1 (drive circuit fuse) A		350	400	400
F2 (material handling circuit fuse) A		200		
F3 (PS circuit fuse) A		60		
F4 (lamp circuit fuse) A		10		
F5 (control circuit fuse) A		10		
F6 (power circuit fuse) A		—	—	10
CPU and DC-BD boards		See page 2-13.		
Display		See page 2-22.		
Control panel insulation		The greater the resistance, the better the insulation. This value, however, varies greatly with the vehicle use status, place and weather. (Approx. 1 MΩ)		
TMD·TMP [Circuit tester range: Ω × 1 K] kΩ	B ⊖ — C ⊕	Continuity shall exist.		
	B ⊕ — C ⊖	∞		
	C ⊖ — E ⊕	∞		
	C ⊕ — E ⊖	Continuity shall exist.		
	B ⊖ — E ⊕	Continuity shall exist.		
	B ⊕ — E ⊖	Continuity shall exist.		
TG [Circuit tester range: Ω × 1 K] kΩ	B ⊖ — C ⊕	Continuity shall exist.		
	B ⊕ — C ⊖	∞		
	C ⊖ — E ⊕	∞		
	C ⊕ — E ⊖	Continuity shall exist.		
DF1·DF2·DF3·DAD·DAP kΩ [Circuit tester range: Ω × 1 K]	Forward	Anode ⊖ — Cathode ⊕ : Approx. 6		
	Reverse	Anode ⊕ — Cathode ⊖ : ∞		
DG kΩ [Circuit tester range: Ω × 1 K]	Forward	Anode ⊖ — Cathode ⊕ : Approx. 3		
	Reverse	Anode ⊕ — Cathode ⊖ : ∞		
CAD·CAP [Circuit tester range: Ω × 1 K] Ω		When the tester probes are brought into contact with the CAD and CAP terminals, the pointer once deflects toward the 0 Ω side, and gradually returns finally to indicate ∞. (The pointer indicates ∞ Ω as the capacitor is charged by the tester current.)		

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Item		1 ton series	2 ton series	3 ton series
RG [Circuit tester range: Ω × 1] Ω		1.0	1.0	1.5
RAD·RAP [Circuit tester range: Ω × 1] Ω		1.5	1.2	1.5
MF·MR·MG·MP coil resistance [Circuit tester range: Ω × 1] Ω		Approx. 37		
TMPS kΩ [Circuit tester range: Ω × 1 K]	C1 ⊕ – E1 ⊖ C1 ⊖ – E1 ⊕	Several (kΩ) ∞		
	C2 ⊕ – E2 ⊖ C2 ⊖ – E2 ⊕	Several (kΩ) ∞		
	G1 ⊕ – E1 ⊖ G1 ⊖ – E1 ⊕	∞ ∞		
	G2 ⊕ – E2 ⊖ G2 ⊖ – E2 ⊕	∞ ∞		
	C1 ⊕ – G1 ⊖ C1 ⊖ – G1 ⊕	∞ ∞		
	C2 ⊕ – G2 ⊖ C2 ⊖ – G2 ⊕	∞ ∞		
SH1·SH2 [Circuit tester range: Ω × 1] mΩ	SH1	10 or less (1 Ω or less for quality judgment)		
	SH2	10 or less (1 Ω or less for quality judgment)		
OCL value (drive circuit) A		370±35	490±45	380^{+45}_{-35}

Control Panel Parts Tightening Torque

Item			N·m (kgf-cm) [ft-lbf]
TMD TMP	Main terminal	M8	9.8±2 (100±20) [7.24±1.45]
		M4	1.5±0.2 (15±2) [1.09±0.14]
	Mounting bolt	M5	2.5±0.5 (25.5±5) [1.845±0.36]
DF1·DF2·DF3 DG	Main terminal	M6	4.9±0.5 (50±5) [3.62±0.36]
	Mounting bolt	M6	4.9±0.5 (50±5) [3.62±0.36]
2 ton series DAD	Main terminal	M8	5.9±0.5 (60±5) [4.34±0.36]
DAD·DAP	Main terminal	M6	2.9±0.5 (30±5) [2.17±0.04]
TG	Main terminal	M4	1.5±0.2 (15±2) [1.09±0.14]
	Mounting bolt	M5	2.5±0.5 (25±5) [1.81±0.36]
TMPS	Main terminal	M5	2.5±0.5 (25±5) [1.81±0.36]
	Mounting bolt	M5	2.5±0.5 (25±5) [1.81±0.36]
SH1·SH2	Main terminal	M4	1.3±0.2 (13±2) [0.94±0.14]
Heat sink	Mounting bolt	M5	2.5±0.5 (25±5) [1.81±0.36]
External wiring connection terminal bolt		M8	9.8±2 (100±2) [7.24±1.45]

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ACCELERATION POTENTIOMETER

Item	All vehicle models
Clearance between pedal stopper and accelerator bracket mm (in)	1.0 (0.0394): Switch OFF 2.0 (0.0787): Switch ON

DIRECTION SWITCH

Item	All vehicle models
Limit switch continuity [Circuit tester range: Ω × 1] Ω	See page 2-31.

BRAKE LIMIT SWITCH

Item		All vehicle models
Limit switch ON dimension (brake pedal operating dimension) mm (in)	LS_{ST}	5 ~ 10 (0.20 ~ 0.394)
	LS_B	3 ~ 8 (0.12 ~ 0.31)

CONTROL LEVER LIMIT SWITCH

Item		All vehicle models
Limit switch ON dimension (control lever operating dimension) mm (in)	LS_L, LS_T	10 ~ 20 (0.394 ~ 0.787)
	VRAP	0 ~ 1 (0 ~ 0.04)

DRIVE MOTOR

Item		1 ton series*	2 ton series 1 ton series (dustproof) 1·2 ton series (large capacity)	3 ton series 2 ton series (dustproof)
Armature coil insulation resistance MΩ		1 or more		
Field coil insulation resistance MΩ		1 or more		
Brush holder insulation resistance MΩ		1 or more		
Commutator outside diameter mm (in)	Standard	105 (4.13)	115 (4.53)	150 (5.91)
	Limit	102 (4.02)	112 (4.41)	147 (5.79)
Commutator runout mm (in)		0.03 (0.0012)		
Undercut mm (in)	Standard	1.0 (0.039)		
	Limit	0.5 (0.0197)		
Brush length mm (in)	Standard	34 (1.34)		
	Limit	13 (0.51)		
Brush pressure N (gf) [lbf]		11 915 ~ 14 563 (1215 ~ 1485) [2 679 ~ 3 274]	14 122 ~ 17 260 (1440 ~ 1760) [3 175 ~ 3 881]	

* Excluding dustproof models and large capacity model

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PUMP MOTOR

*1 6FB10
*2 2 and 3-ton series dustproof models

Item		1 ton series	2 ton series (Excluding dust-proof models)	3 ton series 2 ton series (dustproof)
Armature coil insulation resistance MΩ		1 or more		
Field coil insulation resistance MΩ		1 or more		
Brush holder insulation resistance MΩ		1 or more		
Commutator outside diameter mm (in)	Standard	85(3.35) *1 77(3.03)	85 (3.35)	100 (3.94)
	Limit	82(3.23) *1 80(3.15)	82 (3.23)	97 (3.82)
Commutator runout mm (in)		0.03 (0.0012) or less		
Undercut mm (in)	Standard	1.0 (0.039)		
	Limit	0.5 (0.0197)		
Brush length mm (in)	Standard	27 (1.06) (*2 34 (1.34))		
	Limit	13 (0.51)		
Brush pressure N (gf) [lbf]		11.474 ~ 14.024 (1170 ~ 1430) [2.580 ~ 3.153] *2 14.122 ~ 17.260 (1440 ~ 1760) [3.175 ~ 3.811]		

DRIVE UNIT

Item		All vehicle models
Spider outside diameter mm (in)	Standard	22.00 (0.8661)
	Limit	21.75 (0.8563)
Backlash mm (in)	Standard	0.2 ~ 0.3 (0.0079 ~ 0.0118)
Tightening torque		**N·m (kgf·cm) [ft-lbf]**
Differential case		44.13 ~ 53.94 (450 ~ 550) [32.56 ~ 39.79]
Ring gear		127.49 ~ 176.52 (1300 ~ 1800) [94.06 ~ 130.23]
Front axle housing		73.55 ~ 107.87 (750 ~ 1100) [54.26 ~ 79.59]
Drive gear lock nut		166.71 ~ 225.55 (1700 ~ 2300) [123.00 ~ 166.41]
Drive unit cap		73.55 ~ 108.87 (750 ~ 1100) [54.26 ~ 79.59]

FRONT AXLE

Item		1 ton series	2 ton series	3 ton series
Hub starting force N (kgf) [lbf]		24.5 ~ 44.1 (2.5 ~ 4.5) [5.5 ~ 9.9]		
Tightening torque				**N·m (kgf·cm) [ft-lbf]**
Brake drum		68.65 ~ 88.26 (700 ~ 900) [50.65 ~ 65.12]	78.45 ~ 107.87 (800 ~ 1100) [57.88 ~ 79.59]	166.71 ~ 205.94 (1700 ~ 2100) [123.00 ~ 151.94]
Hub bearing nut stopper bolt		14.71 ~ 21.57 (150 ~ 220) [10.85 ~ 15.92]		
Front axle shaft		29.42 ~ 44.13 (300 ~ 450) [21.71 ~ 32.56]		58.84 ~ 78.45 (600 ~ 800) [43.41 ~ 57.88]
Front axle bracket		156.91 ~ 215.75 (1600 ~ 2200) [115.76 ~ 159.17]		
Hub nut	Devided rim	107.87 ~ 196.13 (1100 ~ 2000) [79.59 ~ 144.70]	176.52 ~ 392.27 (1800 ~ 4000) [130.23 ~ 289.40]	—
	Side ring rim	176.52 ~ 392.27 (1800 ~ 4000) [130.23 ~ 289.40]	←	294.20 ~ 588.40 (3000 ~ 6000) [217.05 ~ 434.10]

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REAR AXLE

Item		1 ton series	2 ton series	3 ton series
Rear axle front-to-rear clearance mm (in)		0.5 (0.0197) or less		
King pin outside diameter mm (in)	Standard	28.0 (1.102)		
	Limit	27.8 (1.094)		
Support pin bush inside diameter mm (in)	Limit	52.0 (2.047)		
Steering knuckle starting force N (kgf) [lbf]	Standard	29.4 ~ 49.0 (3.0 ~ 5.0) [6.6 ~ 11.0]		
Bell crank clearance mm (in)	Standard	0 ~ 0.5 (0 ~ 0.0197)		
Toe-in adjustment mm (in)	Standard	0 ± 4 (0 ± 0.16)		
Hub starting force N (kgf) [lbf]	Standard	14.7 ~ 39.2 (1.5 ~ 4.0) [3.3 ~ 8.8]	14.7 ~ 44.1 (1.5 ~ 4.5) [3.3 ~ 9.9]	
Tightening torque				**N·m (kgf-cm) [ft-lbf]**
Tie rod end castle nut		69 ~ 78.4 (700 ~ 800) [50.65 ~ 57.88]		
King pin lock nut		18.6 ~ 30.4 (190 ~ 310) [13.75 ~ 22.43]		
Bell crank stopper plate set bolt		18.6 ~ 30.4 (190 ~ 310) [13.75 ~ 22.43]		
Rear axle bracket set bolt		118 ~ 167 (1200 ~ 1700) [86.82 ~ 123]		
Hub nut		88.26 ~ 107.87 (900 ~ 1100) [65.12 ~ 79.89]	117.68 ~ 147.1 (1200 ~ 1500) [86.82 ~ 108.53]	117.68 ~ 196.13 (1200 ~ 2000) [86.82 ~ 144.70]

WHEELS

6FB10, 30-6FB10		Tire size	Inflating pressure
Front kPa (kgf/cm²) [psi]	Standard single	6.00-9-10PR	690 (7.0) [100]
	Oversize single	6.50-10-12PR	880 (9.0) [128]
	Standard double	4.50-12-8PR	690 (7.0) [100]
	Special double	6.00-9-10PR	690 (7.0) [100]
Rear kPa (kgf/cm²) [psi]		5.00-8-8PR	780 (8.0) [114]

6FB14, 30-6FB14		Tire size	Inflating pressure
Front kPa (kgf/cm²) [psi]	Standard single	6.00-9-10PR	690 (7.0) [100]
	Oversize single	6.50-10-12PR	880 (9.0) [128]
	Standard double	4.50-12-8PR	690 (7.0) [100]
	Special double	6.00-9-10PR	690 (7.0) [100]
Rear kPa (kgf/cm²) [psi]		5.00-8-8PR	780 (8.0) [114]

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6FB15, 30-6FB15, 40-6FB15			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	21×8-9-10PR	612.9 (6.25) [88.9]
		Oversize single	6.50-10-12PR	880 (9.0) [128]
		Standard double	4.50-12-8PR	690 (7.0) [100]
		Special double	6.00-9-10PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	5.00-8-8PR	780 (8.0) [114]

6FB18, 30-6FB18			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	21×8-9-10PR	612.9 (6.25) [88.9]
		Oversize single	6.50-10-12PR	880 (9.0) [128]
		Standard double	4.50-12-8PR	690 (7.0) [100]
		Special double	6.00-9-10PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	6.00-9-10PR	780 (8.0) [114]

6FB20, 30-6FB20			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	21×8-9-14PR	880 (9.0) [128]
		Oversize single	23×9-10-16PR	880 (9.0) [128]
		Double	6.00-9-10PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	18×7-8-14PR	690 (7.0) [100]

6FB25, 30-6FB25			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	21×8-9-14PR	880 (9.0) [128]
		Oversize single	23×9-10-16PR	880 (9.0) [128]
		Double	6.00-9-10PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	18×7-8-14PR	880 (9.0) [128]

40-6FB30, 40-6FB25			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	7.00-12-12PR	690 (7.0) [100]
		Standard double	5.50-15-8PR	690 (7.0) [100]
		Special double	7.00-12-12PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	6.00-9-10PR	690 (7.0) [100]

6FB30			Tire size	Inflating pressure
Front	kPa (kgf/cm²) [psi]	Standard single	28×9-15-14PR	780 (8.0) [114]
		Standard double	6.00-15-10PR	690 (7.0) [100]
		Special double	28×8-15-12PR	690 (7.0) [100]
Rear		kPa (kgf/cm²) [psi]	6.50-10-10PR	690 (7.0) [100]

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Steering

Item		1 ton series*	2 ton series 1 ton large capacity model	3 ton series 2 ton large capacity model
Steering gear ratio		1 : 18.9		
Steering wheel revolutions (lock to lock)		4.2	4.3	4.2
Sector shaft adjust plate clearance mm (in)		0.05 (0.002) or less		
Worm shaft starting force N (kgf) [lbf]		5.30 (0.54) [1.19]		
Sector gear backlash standard mm (in)		0.32 (0.0126) or less		
Neutral adjustment voltage V		2.4 ± 1		
Tightening torque		**N·m (kgf-cm) [ft-lbf]**		
Steering gear box	Top cover	16.67 ~ 27.46 (170 ~ 280) [12.30 ~ 20.26]		
	Side cover	16.67 ~ 27.46 (170 ~ 280) [12.30 ~ 20.26]		
	End cover	37.27 ~ 52.96 (380 ~ 540) [27.49 ~ 39.07]		
	Adjusting screw lock nut	19.61 ~ 29.42 (200 ~ 300) [14.47 ~ 21.71]		
	Torque sensor screw	2.94 ~ 3.92 (30 ~ 40) [2.17 ~ 2.89]		
	Pitman arm	137.29 ~ 176.52 (1400 ~ 1800) [101.29 ~ 130.23]		
Steering gear box Assy		49.03 ~ 78.45 (500 ~ 800) [36.18 ~ 57.88]		

* Excluding large capacity models

PS ACTUATOR

Item	All vehicle models
PS actuator rod looseness (clearance) limit mm (in)	2.5 (0.098)
Ball screw standard preload N (kgf) [lbf]	2.9 ~ 4.9 (0.3 ~ 0.5) [0.66 ~ 1.10]
From motor mounting face to center of ball joint mm (in)	273 ± 1 (10.75 ± 0.04)
Tightening torque	**N·m (kgf-cm) [ft-lb]**
Top cover	44.13 ~ 53.94 (450 ~ 550) [32.56 ~ 39.78]
Ball joint plug	49.03 ~ 68.65 (500 ~ 700) [36.18 ~ 50.65]
Ball screw rod lock nut	245.17 ~ 274.59 (2500 ~ 2800) [180.88 ~ 202.58]
Gear box lock nut	196.13 ~ 245.17 (2000 ~ 2500) [144.7 ~ 202.58]

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PS MOTOR

Item		1 ton series	2 ton series	3 ton series
Armature coil insulation resistance MΩ		1 or more		
Field coil insulation resistance MΩ		1 or more		
Brush holder insulation resistance MΩ		1 or more		
Commutator outside diameter mm (in)	Standard	33 (1.3)	40 (1.57)	←
	Limit	31.5 (1.24)	35 (1.38)	←
Commutator runout mm (in)		0.3 (0.012) or less		
Undercut mm (in)	Standard	0.8 (0.031)		
	Limit	0.3 (0.012)		
Brush length mm (in)	Standard	20 (0.79)	22 (0.87)	←
	Limit	11 (0.43)	←	←
Brush pressure N (gf) [lbf]		5.590 (570) [1.257]		

BRAKE

Item		1 ton series	2 ton series	3 ton series
Front Brake				
Shoe holddown spring mm (in)	Standard	25.7 (1.012)	35.9 (1.413)	31.3 (1.232)
	Limit	23 (0.91)	33.2 (1.307)	28.2 (1.110)
Anchor-to-shoe spring standard length mm (in)		102 (4.02)	106 (4.17)	106 (4.17)
Strut-to-shoe spring length mm (in)	Standard	20 (0.79)	29.8 (1.173)	23 (0.91)
	Limit	17 (0.67)	27.5 (1.083)	20 (0.79)
Adjuster spring standard length mm (in)		79 (3.11)	98.4 (3.874)	86 (3.39)
Brake lining thickness mm (in)	Standard	4.9 (0.193)	5.1 (0.201)	7.0 (0.276)
	Limit	1.0 (0.039)	1.0 (0.039)	2.0 (0.079)
Wheel cylinder to piston clearance limit mm (in)		0.125 (0.00492)		0.145 (0.00571)
Brake drum inside diameter mm (in)	Standard	254 (10)	279.4 (11)	310 (12.2)
	Limit	256 (10.08)	281.4 (11.079)	312 (12.28)
Parking Brake				
Number of notches until parking brake lever application		6 ~ 8		
Brake Pedal				
Pedal height above toe board (W/pad) mm (in)		138 ~ 143 (5.43 ~ 5.63)		
Pedal play mm (in)		5 ~ 10 (0.20 ~ 0.39)		
Depressed pedal height mm (in)		60 (2.36) or more		
Push rod play mm (in)		1 ~ 2 (0.04 ~ 0.08)		
Tightening torque				**N·m (kgf-cm) [ft-lbf]**
Wheel cylinder set bolt		7.85 ~ 11.77 (80 ~ 120) [5.79 ~ 8.68]	17.65 ~ 26.48 (180 ~ 270) [13.02 ~ 19.53]	14.71 ~ 19.61 (150 ~ 200) [10.85 ~ 14.47]
Parking brake set nut		117.68 ~ 137.29 (1200 ~ 1400) [86.82 ~ 101.29]		
Brake drum set nut		68.65 ~ 88.26 (700 ~ 900) [50.65 ~ 65.12]	78.45 ~ 107.87 (800 ~ 1100) [57.88 ~ 79.59]	166.71 ~ 205.94 (1700 ~ 2100) [123 ~ 151.94]

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MATERIAL HANDLING SYSTEM

Item		All vehicle models
Natural drop mm (in)/15 min		90 (3.54) or less
Natural forward tilt mm (in)/15 min		32 (1.26) or less
Oil leak test cc (cu-in)/min	Lift cylinder oil leak amount	16 (0.98) or less
	Tilt cylinder oil leak amount	34 (2.07) or less

MAST

Item		All vehicle models
Mast adjustment (V mast)		
Mast rollers mm (in)	Inner mast to roller clearance	0 ~ 0.8 (0 ~ 0.031)
	Outer mast to roller clearance	0 ~ 0.8 (0 ~ 0.031)
Lift bracket rollers mm (in)	Middle and lower lift roller clearance	0 ~ 0.8 (0 ~ 0.031)
	Side roller clearance	0 ~ 0.6 (0 ~ 0.024)
Mast strip to inner mast clearance mm (in)		0.5 ~ 1.0 (0.02 ~ 0.039)
Mast strip thickness limit mm (in)		1.5 (0.059)
Fork		
Fork individual bend limit mm (in)		15 (0.59)
Fork front end misalignment mm (in)		10 (0.39)
Tightening torque		**N·m (kgf-cm) [ft-lbf]**
Mast support cap set bolt		68.65 ~ 107.87 (700 ~ 1100) [50.65 ~ 79.59]
Back rest set bolt		99.54 ~ 184.86 (1015 ~ 1885) [73.44 ~ 136.38]
Chain adjusting nut		49.03 ~ 78.45 (500 ~ 800) [36.18 ~ 57.88]

CYLINDERS

Item			1 ton series	2 ton series	3 ton series
Lift Cylinder					
Piston rod outside diameter mm (in)	V SV FSV	Standard	35 (1.378)	40 (1.575)	45 (1.772)
		Limit	34.92 (1.3748)	39.92 (1.5717)	44.92 (1.7685)
	FV	Standard	32 (1.26)	35 (1.3780)	40 (1.5748)
		Limit	31.92 (1.2567)	34.92 (1.3748)	39.92 (1.5717)
Cylinder bore mm (in)	Standard		45 (1.772)	50 (1.968)	55 (2.165)
	Limit		45.20 (1.780)	50.20 (1.976)	55.35 (2.179)
Front Lift Cylinder (FV·FSV)					
Piston rod outside diameter mm (in)	Standard		70 (2.756)	75 (2.953)	85 (3.346)
	Limit		69.91 (2.7523)	74.91 (2.9492)	84.90 (3.3425)
Cylinder bore mm (in)	Standard		85 (3.346)	90 (3.543)	105 (4.134)
	Limit		85.40 (3.362)	90.40 (3.559)	105.40 (4.150)

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Item		1 ton series	2 ton series	3 ton series
Tilt Cylinder				
Piston rod outside diameter mm (in)	Standard	30.0 (1.181)		
	Limit	29.92 (1.1779)		
Cylinder bore mm (in)	Standard	70.0 (2.756)		
	Limit	70.35 (2.7697)		
Piston rod bend limit mm (in)		1.0 (0.039)		
Tightening torque		**N·m (kgf-cm) [ft-lbf]**		
Lift cylinder cover		284.39 ~ 421.69 (2900 ~ 4300) [209.82 ~ 311.10]		
Flow regulator valve		58.84 ~ 68.65 (600 ~ 700) [43.41 ~ 50.65]		
Safety down valve		29.42 ~ 39.23 (300 ~ 400) [21.71 ~ 28.94]		
Front lift cylinder rod guide		343.23 ~ 441.30 (3500 ~ 4500) [253.23 ~ 325.58]		
Tilt cylinder piston castle nut		284.39 ~ 343.23 (2900 ~ 3500) [209.82 ~ 311.10]		
Tilt cylinder rod joint set bolt		60.90 ~ 113.17 (621 ~ 1154) [44.93 ~ 83.492]		
Tilt cylinder cover		284.39 ~ 421.69 (2900 ~ 4300) [209.82 ~ 311.10]		

OIL PUMP

Item		All vehicle models
Body inside diameter limit	mm (in)	39.180 (1.54252)
Body interior flaw depth limit	mm (in)	0.1 (0.0039)
Side bushing inside diameter limit	mm (in)	19.123 (0.752860)
Side bushing axial length limit	mm (in)	14.77 (0.5815)
Center bushing inside diameter limit	mm (in)	19.123 (0.752860)
Center bushing axial length limit	mm (in)	29.68 (1.1685)
Gear shaft diameter	mm (in)	18.935 (0.74547)

OIL CONTROL VALVE

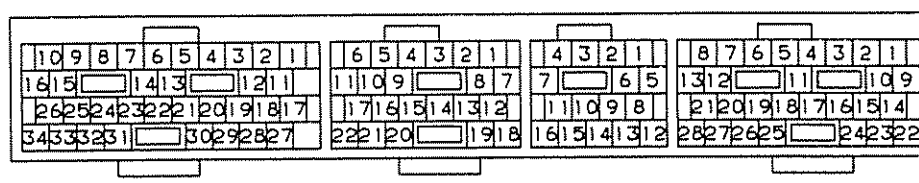
Item		1 ton series	2 ton series	3 ton series
Relief pressure kPa (kgf/cm²) [psi]	Lift	15200 (155) [2204]	17200 (175) [2489]	18100 (185) [2631]
	Tilt	11800 (120) [1710]	14700 (150) [2133]	
Spool outside diameter	mm (in)	16.0 (0.6299)		
Stroke	mm (in)	7.0 (0.276)		
Tightening torque		**N·m (kgf-cm) [ft-lbf]**		
Pump cover set bolt		34.32 ~ 44.13 (350 ~ 450) [25.32 ~ 32.56]		

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CPU BOARD & DC-BD BOARD CONNECTOR DIAGRAM

CPU Board

CN101 CN102 CN103 CN104



CN101

NO	Potential No.	Junction
1	———	OPT
2	43	VBKY
3	———	———
4	———	———
5	41	VBBT
6	———	———
7	———	———
8	41	VBBT2
9	43	VBKY2
10	41(18)	B48V(B72V)
11	162	S2
12	———	OP POT
13	17	GNDD
14	16	D12V
15	55	POTL
16	52	POTA
17	143	SDTMK
18	146	BIBC
19	142	SDTMA
20	———	———
21	———	———
22	———	———
23	———	———
24	141	SMTDA
25	145	BIBD
26	144	SMTDK
27	163	S3
28	51	POT−
29	———	OP POT+
30	161	S1
31	54	POTL+
32	53	POTA+
33	———	———
34	———	T-KILL

CN102

NO	Potential No.	Junction
1	45	DSF
2	———	———
3	61	LST
4	———	LSL2
5	60	LSL1
6	64	LSAC
7	65	LSB1
8	———	LSAT2
9	46	DSR
10	63	LSAT1
11	———	SOPT
12	———	LSD
13	82	SS1−
14	81	SS1+
15	———	ROPT
16	———	LSOPT
17	66	LSPB
18	84	SS2−
19	———	———
20	51	LS−
21	———	———
22	83	SS2+

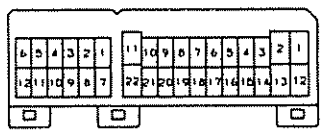
CN103

NO	Potential No.	Junction
1	2	MF−
2	N2	N2C
3	3	MR−
4	P2	PLG2
5	4	MG−
6	N2	N2C
7	P3	PLG2−
8	P11	VBP11
9	41(18)	B48V(B72V)
10	———	———
11	76	THCD
12	———	———
13	———	———
14	75	THC+
15	———	———
16	———	———

CN104

NO	Potential No.	Junction
1	———	———
2	P14	TMPC
3	P8	TMC
4	———	———
5	5	MP−
6	———	———
7	72	CSP
8	71	CSD
9	91	TGB
10	P10	TGE
11	———	———
12	———	———
13	1	M+
14	9	MP+
15	———	MOPT−
16	———	MS−
17	———	———
18	———	———
19	———	———
20	P3	VBP3
21	P2	VBP2
22	———	———
23	———	———
24	———	———
25	73	CSP+
26	73	CSD+
27	74	CSP−
28	74	CSD−

CN106 CN105



CN105

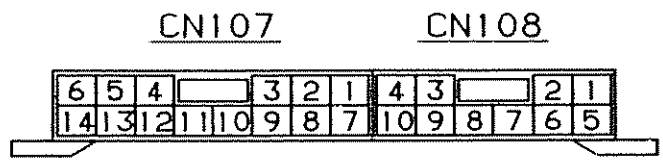
NO	Potential No.	Junction
1	———	———
2	———	———
3	172	SH1+
4	174	SH2+
5	169	TMPS1E
6	165	TMPS3E
7	171	TMPS2E
8	167	TMPS4E
9	———	———
10	———	OCHK
11	N1	N2
12	———	———
13	———	———
14	173	SH1−
15	175	SH2−
16	168	TMPS1G
17	164	TMPS3G
18	170	TMPS2G
19	166	TMPS4G
20	———	———
21	———	———
22	N1	N2

CN106

NO	Potential No.	Junction
1	N2	N2
2	15	C18V
3	16	D12V
4	———	———
5	32	TMDR1
6	37	TMPDR1
7	N2	N2C
8	———	———
9	14	GNDC
10	———	———
11	———	———
12	———	———

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DC-BD Board (1·2-ton)



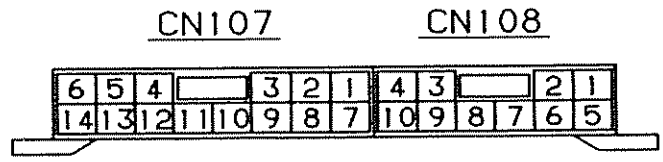
CN107

NO	Potential No.	Junction
1	N2	N2
2	15	C18V
3	14	GNDC
4	P11	P11
5	N1	N1
6	P21	P21
7	41	B48V
8	16	D12V
9	32	TMDR1
10	37	TMPDR1
11	---	---
12	---	---
13	---	---
14	---	---

CN108

NO	Potential No.	Junction
1	92	TMB
2	---	---
3	---	---
4	93	TMPB
5	P9	P9
6	P8	TMC
7	---	---
8	---	---
9	P15	P15
10	P14	TMPC

DC-BD Board (3-ton)



CN107

NO	Potential No.	Junction
1	N2	N2
2	15	C18V
3	14	GNDC
4	P11	P11
5	N1	N1
6	P21	P21
7	18	B72V
8	16	D12V
9	32	TMDR1
10	37	TMPDR1
11	---	---
12	---	---
13	---	---
14	---	---

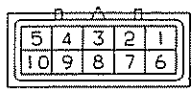
CN108

NO	Potential No.	Junction
1	92	TMB
2	---	---
3	---	---
4	93	TMPB
5	P9	P9
6	P8	TMC
7	---	---
8	---	---
9	P15	P15
10	P14	TMPC

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CONNECTOR DIAGRAM

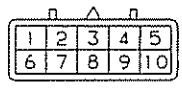
6FB10 ~ 25 (excluding 40-6FB20 and 25)



CN1

TAB

NO	P	C	J
1	141	R-W	CN120-2
2	142	R-B	CN120-11
3	16	R	CN120-9
4	43	B-Y	CN120-10
5			
6	143	R-Y	CN120-1
7	144	R-G	CN120-12
8	17	BR	CN120-21
9	N1	W-B	CN120-22
10			



REC

NO	P	C	J
1	141	R-W	CN101-24
2	142	R-B	CN101-19
3	16	R	CN101-14
4	43	B-Y	CN37-17
5	146	L	CN101-18
6	143	R-Y	CN101-17
7	144	R-G	CN101-26
8	17	BR	CN101-13
9	N1	W-B	J2
10	145	L-W	CN101-25



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	B-Y	LS_{GT}
2	111	Y	LS_{GT}

REC

NO	P	C	J
1	101	R	CN22-1
2	111	R-L	CN38-4



CN6

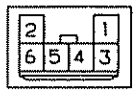


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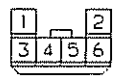
NO	P	C	J
1	51	B-W	LS_B
2	65	R-L	LS_B

REC

NO	P	C	J
1	51	R-L	CN37-12
2	65	Y-G	CN102-7



CN8

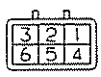


TAB

NO	P	C	J
1	41	GY	SW HI(+)
2	48	WB	SW HI(-)
3	43	GW	SW FI(B)
4	108	G	SW FI(R)
5	109	GR	SW FI(L)
6			

REC

NO	P	C	J
1	41	Y	CN22-4
2	48	P	H
3	43	B-Y	CN37-7
4	108	R-Y	CN13-4
5	109	G-Y	CN17-4
6			



CN9

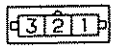


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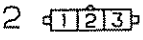
NO	P	C	J
1	51	O	DSF. DSR
2	120	B	DSFO
3	103	G	DSBU
4	46	W-O	DSR
5	45	W-BR	DSF
6	43	R	DSFO. DSBU

REC

NO	P	C	J
1	51	R-L	CN37-3
2	120	Y-R	CN24-1
3	103	R-W	CN23-1
4	46	W	CN102-9
5	45	G	CN102-1
6	43	B-Y	CN37-15



CN12



TAB

NO	P	C	J
1	N1	B	FRY
2	110	GR	FRY
3	43	R	FRY

REC

NO	P	C	J
1	N1	W-B	J2
2	110	GR	CN38-3
3	43	B-Y	CN37-16



CN10



TAB

NO	P	C	J
1	55	G	VRAP
2	54	B-R	VRAP
3	51	O	VRAP

REC

NO	P	C	J
1	55	R-W	CN101-15
2	54	R-G	CN101-31
3	51	R-L	CN37-9



CN11

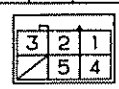


TAB

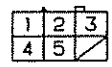
NO	P	C	J
1	60	G-W	LS_L
2	61	G-R	LS_T
3	63	G-B	LS_{ATT}
4	51	R-L	NO

REC

NO	P	C	J
1	60	G-W	CN102- 5
2	61	G-R	CN102- 3
3	63	G-B	CN102-10
4	51	R-L	CN37-1



CN13



TAB

NO	P	C	J
1	N1	W-B	CN14-3
2	104	G-R	CN14-4
3	102	R-G	LH
4	108	G-Y	CN14-1
5	110	GR	CN14-2

REC

NO	P	C	J
1	N1	W-B	N1
2	104	G-R	J4
3	102	R-G	CN29-4
4	108	R-Y	CN8-4. CN38-6
5	110	GR	J6



CN14



TAB

NO	P	C	J
1	108	G-W	LF-R
2	110	Y	LF-R
3	N1	W-B	LC-R
4	104	R-W	LC-R

REC

NO	P	C	J
1	108	G-Y	CN13-4
2	110	GR	CN13-5
3	N1	W-B	CN13-1
4	104	G-R	CN13-2



CN15



TAB

NO	P	C	J
1	66	B-W	LS_{PB}
2	51	R-L	LS_{PB}

REC

NO	P	C	J
1	66	B-W	CN102-17
2	51	R-L	CN37-2



CN16

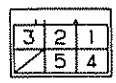


TAB

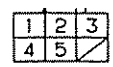
NO	P	C	J
1	107	B	PL_W
2	N1	B	PL_W

REC

NO	P	C	J
1	107	R-B	CN29-5. CN38-8
2	N1	W-B	J2. CN17-1



CN17



TAB

NO	P	C	J
1	N1	W-B	CN18-3
2	104	G-R	CN18-4
3	102	R-G	LH
4	109	G-Y	CN18-1
5	110	GR	CN18-2

REC

NO	P	C	J
1	N1	W-B	CN16-2
2	104	G-R	J4
3	102	R-G	J10
4	109	G-Y	CN8-5. CN38-7
5	110	GR	J6



CN18



TAB

NO	P	C	J
1	109	G-W	LF-L
2	110	Y	LF-L
3	N1	W-B	LC-L
4	104	R-W	LC-L

REC

NO	P	C	J
1	109	G-Y	CN17-4
2	110	GR	CN17-5
3	N1	W-B	CN17-1
4	104	G-R	CN17-2

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CN19



TAB

NO	P	C	J
1	161	G-R	+5 V
2	162	G-Y	ST
3	163	G-B	GND



REC

NO	P	C	J
1	161	G-R	CN101-30
2	162	G-Y	CN101-11
3	163	G-B	CN101-27

CN20



TAB

NO	P	C	J
1	84	W	SSP2
2	83	B	SSP2



REC

NO	P	C	J
1	84	W-G	CN102-18
2	83	B-R	CN102-22

CN21



TAB

NO	P	C	J
1	82	W	SSP1
2	81	B	SSP1



REC

NO	P	C	J
1	82	W-R	CN102-13
2	81	B-Y	CN102-14

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	CN29-1, CN5-1
2	P1	B	P1 terminal
3			
4	41	Y	CN8-1, J1

CN23



TAB

NO	P	C	J
1	103	R-W	BZ
2	N1	B	BZ



REC

NO	P	C	J
1	103	R-W	CN9-3
2	N1	W-B	CN24-2

CN24



TAB

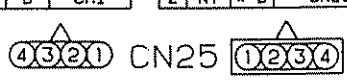
NO	P	C	J
1	120	R-W	CHI
2	N1	B	CHI



REC

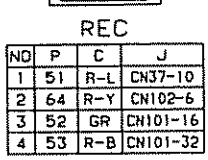
NO	P	C	J
1	120	Y-R	CN9-2, CN38-9
2	N1	W-B	CN23-2

CN25



TAB

NO	P	C	J
1	51	–	E2
2	64	–	IDL
3	52	–	VTA
4	53	–	VC



REC

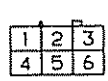
NO	P	C	J
1	51	R-L	CN37-10
2	64	R-Y	CN102-6
3	52	GR	CN101-16
4	53	R-B	CN101-32

CN29



TAB

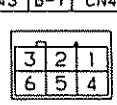
NO	P	C	J
1	101	R	CN3-1
2	104	G-R	CN3-2
3	41	Y	CN4-1
4	102	R-G	CN3-3
5	107	R-B	CN3-4
6	43	B-Y	CN4-4



REC

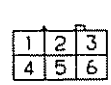
NO	P	C	J
1	101	R	CN22-1
2	104	G-R	CN38-2
3	41	Y	J1
4	102	R-G	CN13-3
5	107	R-B	CN16-1
6	43	B-Y	CN37-19

CN31



TAB

NO	P	C	J
1	104	R-W	LT-L
2	N1	W-B	GND
3	110	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	J5 CN32-1
2	N1	W-B	J3
3	110	GR	J7
4	111	R-L	J8
5	103	R-W	CN34-5
6	109	G-Y	CN38-7

CN32



TAB

NO	P	C	J
1	104	G-R	LL-R, LL-L
2	N1	W-B	LL-R, LL-L



REC

NO	P	C	J
1	104	G-R	J5, CN31-1
2	N1	W-B	J3, CN33-2

CN33



TAB

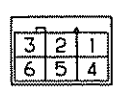
NO	P	C	J
1	107	R-B	LW
2	N1	W-B	LR, LW
3	103	R-W	LR
4	120	Y-R	LR



REC

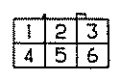
NO	P	C	J
1	107	R-B	CN38-8
2	N1	W-B	CN32-2
3	103	R-W	CN38-5
4	120	Y-R	CN38-9

CN34



TAB

NO	P	C	J
1	104	R-W	LT-R
2	N1	W-B	GND
3	110	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	CN38-2
2	N1	W-B	CN38-1
3	110	GR	CN38-3
4	111	R-L	CN38-4
5	103	R-W	J9, CN31-5
6	108	R-Y	CN38-6

CN35



TAB

NO	P	C	J
1	152	B	SLL



REC

NO	P	C	J
1	152	B	CN38-10

CN36



TAB

NO	P	C	J
1	43	–	DM..
2	N1	–	DM..

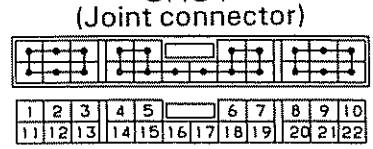


REC

NO	P	C	J
1	43	R-L	SW.
2	N1	W-B	CN12

CN37 (~ 1998. 1)

CN37
(Joint connector)



1	2	3	4	5		6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	21	22

REC

NO	P	C	J
1	51	R-L	CN11-4
2	51	R-L	CN15-2
3	51	R-L	CN9-1
4			
5	43	B-Y	CN101-2
6	43	B-Y	CN101-9
7	43	B-Y	CN8-3
8			
9	51	R-L	CN10-3
10	51	R-L	CN25-1
11	51	R-L	CN102-20
12	51	R-L	CN6-1
13			
14			
15	43	B-Y	CN9-6
16	43	B-Y	CN12-3
17	43	B-Y	CN1-4
18			
19	43	B-Y	CN29-6
20			
21			
22	51	R-L	CN101-28

CN40



TAB

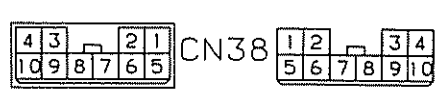
NO	P	C	J
1	152	B	CN120-16
2	139	P	CN120-17



REC

NO	P	C	J
1	152	B	CN38-10
2	139	P	CN68- 1

CN38



TAB

NO	P	C	J
1	N1	W-B	CN34-2
2	104	G-R	CN34-1
3	110	GR	CN34-3
4	111	R-L	CN34-4
5	103	R-W	CN33-3
6	108	R-Y	CN34-6
7	109	G-Y	CN31-6
8	107	R-B	CN33-1
9	120	Y-R	CN33-4
10	152	B	CN35-1

REC

NO	P	C	J
1	N1	W-B	J2
2	104	G-R	CN29-2
3	110	GR	CN12-2
4	111	R-L	CN5-2
5	103	R-W	CN23-1
6	108	R-Y	CN13-4
7	109	G-Y	CN17-4
8	107	R-B	CN16-1
9	120	Y-R	CN24-1
10	152	B	CN40-1

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CN50

TAB

NO	P	C	J
1	P23	B	motor A
2	P24	B	motor B

REC

NO	P	C	J
1	P23	R-B	CN51-1
2	P24	R-W	CN51-2

CN51

TAB

NO	P	C	J
1	P23	R-B	CN50-1
2	P24	R-W	CN50-2

REC

NO	P	C	J
1	P23	B	IGBT
2	P24	B	IGBT

CN101

TAB

NO	P	C	J
1			
2	43	—	VBKY
3			
4			
5	41	—	VBBT
6			
7			
8	41	—	VBBA
9	43	—	VBKY2
10	41	—	B48V
11	162	—	S2
12			
13	17	—	GNDD
14	16	—	D12V
15	55	—	POTL
16	52	—	POTA
17	143	—	SDTMK
18	146	—	BIBC
19	142	—	SDTMA
20			
21			
22			
23			
24	141	—	SMTDA
25	145	—	BIBD
26	144	—	SMTDK
27	163	—	S3
28	51	—	POT-
29			
30	161	—	S1
31	54	—	POTL+
32	53	—	POTA+
33			
34			

REC

NO	P	C	J
1			
2	43	B-Y	CN37-5
3			
4			
5	41	Y	J1
6			
7			
8	41	Y	J1
9	43	B-Y	CN37-6
10	41	Y	J1
11	162	G-Y	CN19-2
12			
13	17	BR	CN1-8
14	16	R	CN1-3
15	55	R-W	CN10-1
16	52	GR	CN25-3
17	143	R-Y	CN1-6
18	146	L	CN1-5
19	142	R-B	CN1-2
20			
21			
22			
23			
24	141	R-W	CN1-1
25	145	L-W	CN1-10
26	144	R-G	CN1-7
27	163	G-B	CN19-3
28	51	R-L	CN37-22
29			
30	161	G-R	CN19-1
31	54	R-G	CN10-2
32	53	R-B	CN25-4
33			
34			

CN116

TAB

NO	P	C	J
1	P2	—	RAD
2	P9	—	RAD

REC

NO	P	C	J
1	P2	Y	CN109-2
2	P9	B	CN109-3

CN117

TAB

NO	P	C	J
1	P10	—	RG
3	P5	—	RG

REC

NO	P	C	J
1	P10	W	CN109-5
3	P5	GR	CN109-6

CN118

TAB

NO	P	C	J
1	P15	—	RAP
2	P11	—	RAP

REC

NO	P	C	J
1	P15	G	CN109-1
2	P11	V	CN109-4

CN102 (~ 1998. 1)

TAB

NO	P	C	J
1	45	—	DSF
2			
3	61	—	SWTILT
4			
5	60	—	SWLIFT
6	64	—	LSAC
7	65	—	LSB1
8			
9	46	—	DSR
10	63	—	LSAT1
11			
12			
13	82	—	SSP1-
14	81	—	SSP1+
15			
16			
17	66	—	LSPB
18	84	—	SSP2-
19			
20	51	—	LS-
21			
22	83	—	SSP2+

REC

NO	P	C	J
1	45	G	CN9-5
2			
3	61	G-R	CN11-2
4			
5	60	G-W	CN11-1
6	64	R-Y	CN25-2
7	65	Y-G	CN6-2
8			
9	46	W	CN9-4
10	63	G-B	CN11-3
11			
12			
13	82	W-R	CN21-1
14	81	B-Y	CN21-2
15			
16			
17	66	B-W	CN15-1
18	84	W-G	CN20-1
19			
20	51	R-L	CN37-11
21			
22	83	B-R	CN20-2

CN109

TAB

NO	P	C	J
1	P15	G	CN118-1
2	P2	Y	CN116-1
3	P9	B	CN116-2
4	P11	V	CN118-2
5	P10	W	CN117-1
6	P5	GR	CN117-3

REC

NO	P	C	J
1	P15	—	RAP
2	P2	—	RAD
3	P9	—	RAD
4	P11	—	RAP
5	P10	—	RG
6	P5	—	RG

CN120

TAB

NO	P	C	J
1	143	—	SDTMK
2	141	—	SMTDA
3	136	—	AC input
4	131	—	CHG SW1
5	132	—	CHG SW2
6	137	—	CHG SW3
7			
8			
9	16	—	12V
10	43	—	48V
11	142	—	SDTMA
12	144	—	SMTDK
13	135	—	CLOCK
14	134	—	DATA
15	133	—	MSon
16	152	B	SLL input
17	139	P	STT input
18			
19			
20			
21	17	—	N2
22	N1	—	N1

REC

NO	P	C	J
1	143	R-Y	CN1-6
2	141	R-W	CN1-1
3	136	G	CN65-3
4	131	GR	CN65-9
5	132	Y-R	CN65-5
6	137	L	CN65-4
7			
8			
9	16	R	CN1-3
10	43	B-Y	CN1-4
11	142	R-B	CN1-2
12	144	R-G	CN1-7
13	135	Y-B	CN65-6
14	134	O	CN65-1
15	133	Y-G	CN65-7
16	152	B	CN40-1
17	139	P	CN40-2
18			
19			
20			
21	17	BR	CN1-8
22	N1	W-B	CN1-9

※ LCD display

CN1-3 — CN65-2 — J13 — CN120-9 (16. R)

CN1-8 — CN65-8 — J17 — CN120-21 (17. BR)

※ LED display

CN4-1 — HM — J18 — CN29-3 (41. B-Y)

Joint

CN22-4 — CN101-5 — CN101-10 — CN101-8 — J1 — CN29-3 (41. Y)

CN3-1 — CN1-9 — CN38-1 — CN12-1 — J2 — CN16-2 — N1 (N1. W-B)

CN34-2 — CN31-2 — J3 — CN32-2 — CN38-1 (N1. W-B)

CN29-2 — CN13-2 — J4 — CN17-2 — CN38-2 (104. G-R)

CN34-1 — CN31-1 — J5 — CN32-1 — CN38-2 (104. G-R)

CN12-2 — CN13-5 — J6 — CN17-5 — CN38-3 (110. GR)

CN34-3 — J7 — CN31-3 — CN38-3 (110. GR)

CN34-4 — J8 — CN31-4 — CN38-4 (111. R-L)

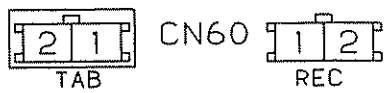
CN33-3 — CN34-5 — J9 — CN38-5 (103. R-W)

CN13-3 — CN17-3 — J10 — CN29-4 (102. R-G)

CN101-13 — CN65-2 — J11 — CN1-8 (17. BR)

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Battery capacity 330 ~ 565AH

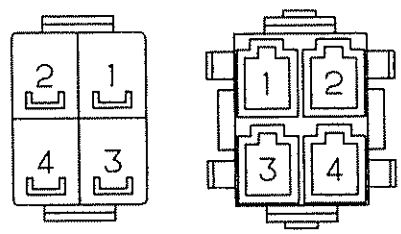


NO	P	C	J
1	S	R	AC plug
2	T	B	AC plug

NO	P	C	J
1	S	R	MS_{CH}
2	T	B	MS_{CH}

CN60 (~ 1998. 1)

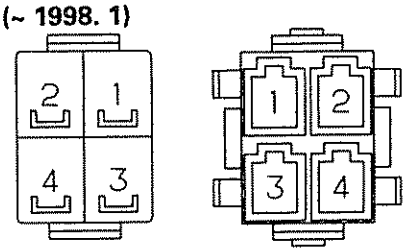
Battery capacity 600 ~ 700AH



NO	P	C	J
1	T	B	AC plug
2	R	W	AC plug
3	95	L	CN62-1
4	S	R	AC plug

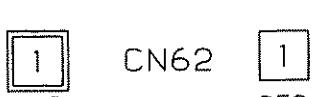
NO	P	C	J
1	T	B	MS_{CH}
2	R	W	MS_{CH}
3	95	L	THR
4	S	R	MS_{CH}

CN61 (~ 1998. 1)



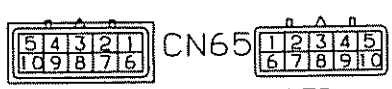
NO	P	C	J
1	U	W	TRANS
2	V	R	TRANS
3			
4	W	B	TRANS

NO	P	C	J
1	U	—	THR
2	V	—	THR
3			
4	W	—	THR



NO	P	C	J
1	(B)	L	TU

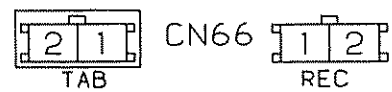
NO	P	C	J
1	(B)	L	CN66-2



NO	P	C	J
1	134	O	TU
2	16	R	TU
3	136	G	TU
4	137	L	TU
5	132	Y-R	TU
6	135	Y-B	TU
7	133	Y-G	TU
8	17	BR	TU
9	131	GR	TU
10			

NO	P	C	J
1	134	O	CN120-14
2	16	R	J13
3	136	G	CN120-3
4	137	L	CN120-6
5	132	Y-R	CN120-5
6	135	Y-B	CN120-13
7	133	Y-G	CN120-15
8	17	BR	J17
9	131	GR	CN120-4
10			

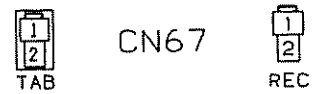
Battery capacity 330 ~ 565AH



NO	P	C	J
1	R	W	MS_{CH}
2	95	L	THR

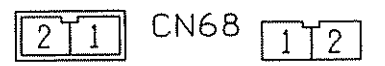
NO	P	C	J
1	R	W	AC plug
2	95	L	CN62-1

Battery capacity 485 ~ 935AH



NO	P	C	J
1	V	R	AC FAN
2	U	W	AC FAN

NO	P	C	J
1	V	—	THR
2	U	—	THR

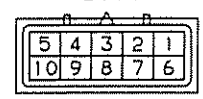


NO	P	C	J
1	139	P	STT
2	17	BR	STT

NO	P	C	J
1	139	P	CN40-2
2	17	BR	J11

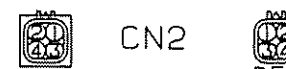
※LED display

CN1



NO	P	C	J
1	141	R-W	CN1-2
2	141	R-W	CN1-1
3	16	R	CN2-3
4	43	B-Y	CN41-1
5	146	L	CN2-1
6	144	R-G	CN1-7
7	144	R-G	CN1-6
8	17	BR	CN2-4
9	N1	W-B	HM
10	145	L-W	CN2-2

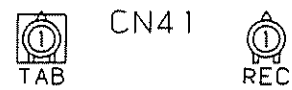
CN2



NO	P	C	J
1	146	L	CLOCK
2	145	L-W	DATA
3	16	L-R	12V
4	17	W-B	N2

NO	P	C	J
1	146	L	CN1- 5
2	145	L-W	CN1-10
3	16	R	CN1- 3
4	17	BR	CN1- 8

CN41



NO	P	C	J
1	43	B-Y	HM

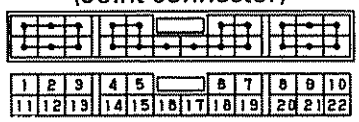
NO	P	C	J
1	43	B-Y	CN1-4

REC is the same

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Connectors modified or added from February, 1998.
Modification : CN37, CN60 (Battery capacity 600 ~ 700 AH), CN61, CN102
Addition : CN39, CN41

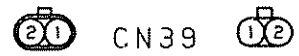
CN37 (Joint connector)



REC

NO	P	C	J
1	51	R-L	CN11-4
2	51	R-L	CN15-2
3	51	R-L	CN9-1
4			
5	43	B-Y	CN101-2
6	43	B-Y	CN101-9
7	43	B-Y	CN8-3
8			
9	51	R-L	CN10-3
10	51	R-L	CN25-1
11	51	R-L	CN102-20
12	51	R-L	CN8-1
13	51	R-L	CN39-2
14			
15	43	B-Y	CN9-8
16	43	B-Y	CN12-3
17	43	B-Y	CN1-4
18			
19	43	B-Y	CN29-8
20			
21			
22	51	R-L	CN101-28

CN39



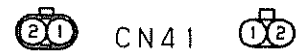
TAB

NO	P	C	J
1	67	G-L	CN41- 1
2	51	R-L	CN41- 2

REC

NO	P	C	J
1	67	G-L	CN102-12
2	51	R-L	CN37-13

CN41



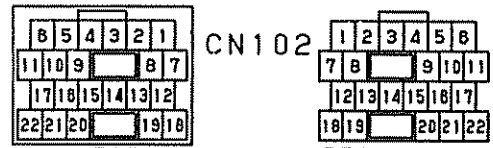
TAB

NO	P	C	J
1	67	-	LS_{IN}
2	51	-	LS_{IN}

REC

NO	P	C	J
1	67	G-L	CN39- 1
2	51	R-L	CN39- 2

CN102



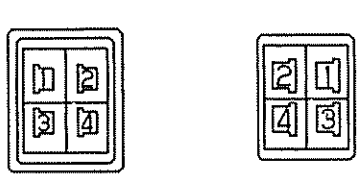
TAB

NO	P	C	J
1	45	—	DSF
2			
3	61	—	SWTILT
4			
5	60	—	SWLIFT
6	64	—	LSAC
7	65	—	LSB1
8			
9	48	—	DSR
10	63	—	LSAT1
11			
12	67	—	LSDS
13	62	—	SSP1-
14	61	—	SSP1+
15			
16			
17	66	—	LSPB
18	64	—	SSP2-
19			
20	51	—	LS-
21			
22	63	—	SSP2+

REC

NO	P	C	J
1	45	G	CN9-5
2			
3	61	G-R	CN11-2
4			
5	60	G-W	CN11-1
6	64	R-Y	CN25-2
7	65	Y-G	CN8-2
8			
9	48	W	CN9-4
10	63	G-B	CN11-9
11			
12	67	G-L	CN39-1
13	62	W-B	CN21-1
14	61	B-Y	CN21-2
15			
16			
17	66	B-W	CN15-1
18	64	W-G	CN20-1
19			
20	51	R-L	CN37-11
21			
22	63	B-R	CN20-2

Battery capacity 600 ~ 700 AH



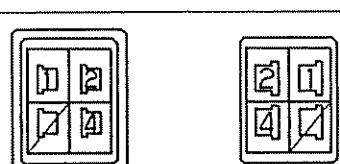
CN60

TAB

NO	P	C	J
1	T	B	AC plug
2	R	W	AC plug
3	95	L	CN62-1
4	S	R	AC plug

REC

NO	P	C	J
1	T	B	HS_{IN}
2	R	W	HS_{IN}
3	95	L	THR
4	S	R	HS_{IN}



CN61

TAB

NO	P	C	J
1	U	W	TRANS
2	V	R	TRANS
3			
4	W	B	TRANS

REC

NO	P	C	J
1	U	-	THR
2	V	-	THR
3			
4	W	-	THR

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40-6FB20·25

Connectors same as 6FB10 ~ 25 a not shown here. (See page on 17-19)



CN39

TAB

NO	P	C	J
1	103	R-L	LBU
2	N1	W-B	LBU



REC

NO	P	C	J
1	103	R-W	J11
2	N1	W-B	J2



CN67

TAB

NO	P	C	J
1	V	—	THR
2	U	—	THR



REC

NO	P	C	J
1	V	R	AC FAN
2	U	W	AC FAN



CN62

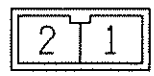
TAB

NO	P	C	J
1	B	L	Timer PB10 terminal
2	GND	G	GND
3	S	R	Timer PB11 terminal
4	R	W	Timer PB12 terminal



REC

NO	P	C	J
1	B	L	AC plug
2	GND	G	AC plug
3	S	R	95 terminal
4	R	W	AC plug



CN68

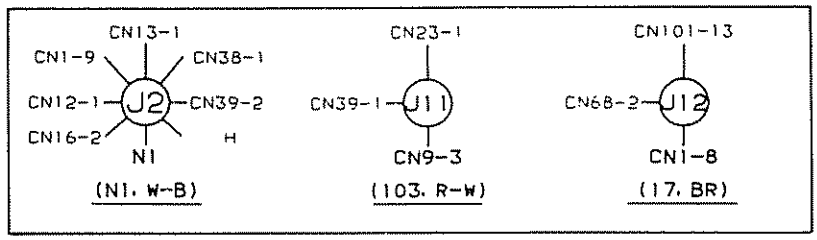
TAB

NO	P	C	J
1	139	P	STT
2	17	BR	STT



REC

NO	P	C	J
1	139	P	CN40-2
2	17	BR	J12



6FB30

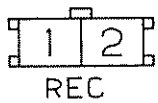
Connectors same as 6FB10 ~ 25 a not shown here. (See page on 17-19)



CN30

TAB

NO	P	C	J
1	18	B	F6
2	P1	R	F6



REC

NO	P	C	J
1	18	R-W	CN101-10
2	P1	R	P1



CN62

TAB

NO	P	C	J
1	(B)	L	TU



REC

NO	P	C	J
1	(B)	L	CN60-3



CN39

TAB

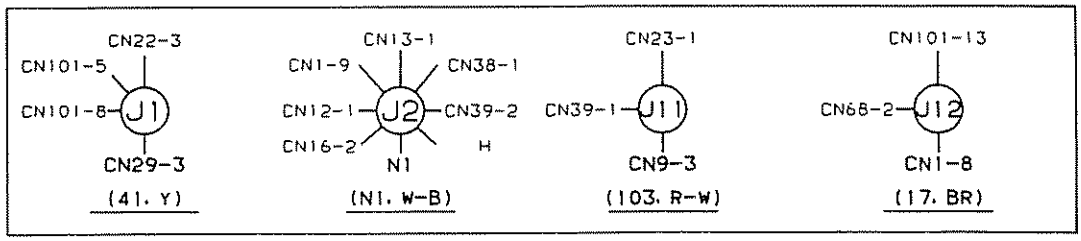
NO	P	C	J
1	103	R-L	LBU
2	N1	W-B	LBU



REC

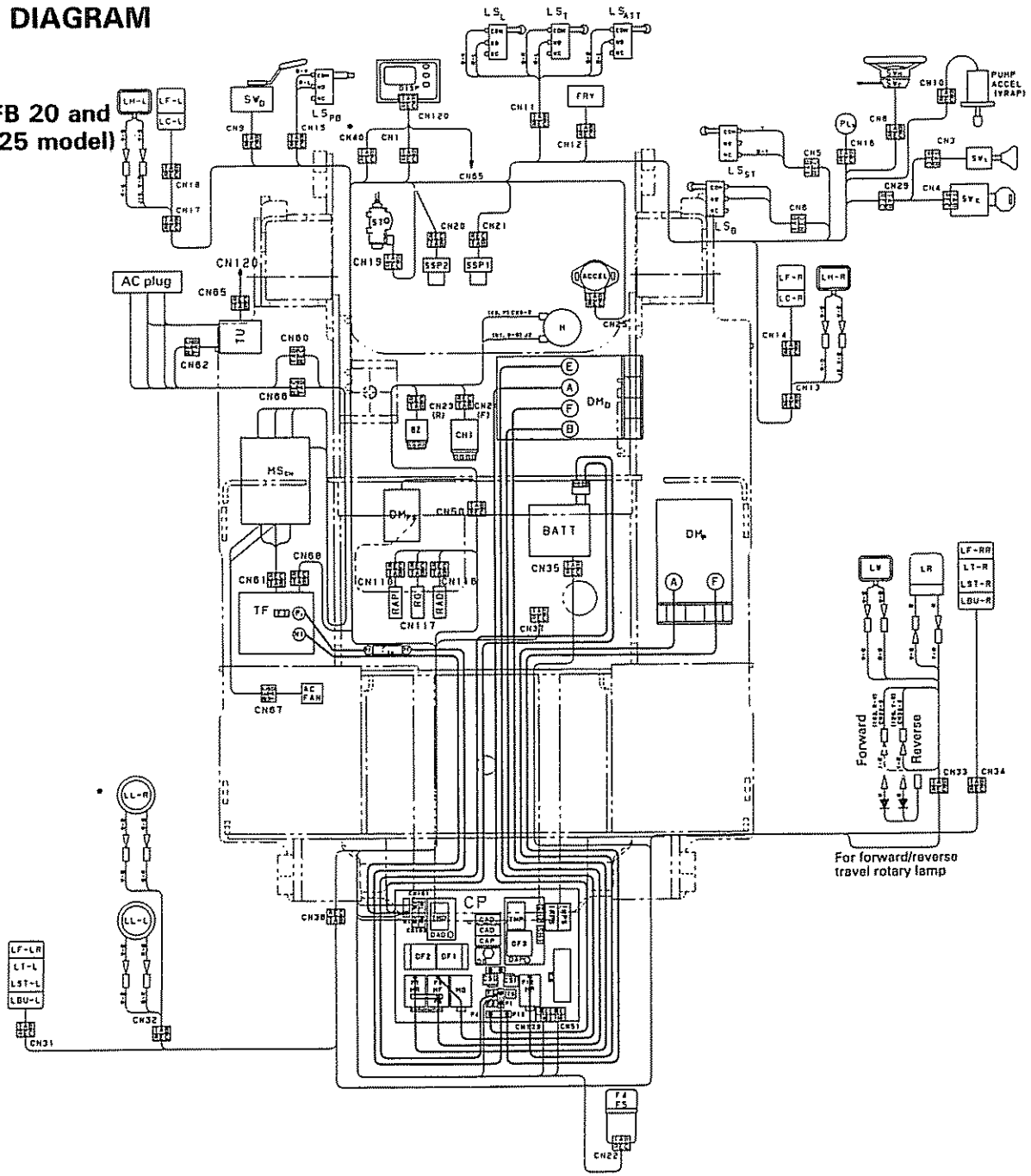
NO	P	C	J
1	103	R-W	J11
2	N1	W-B	J2

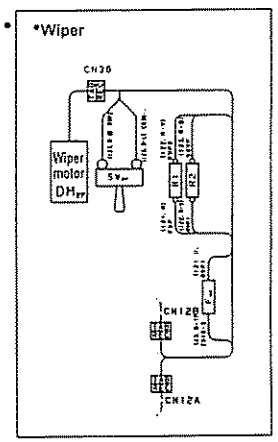
*There is not CN39 after 1998. 1.

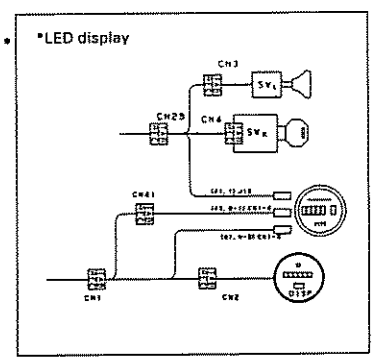


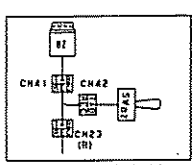
CONNECTING DIAGRAM

~ 1998. 1
6FB10 ~ 25
(Excluding 40-6FB 20 and 25 model)

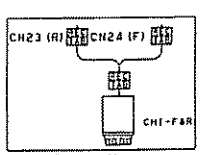








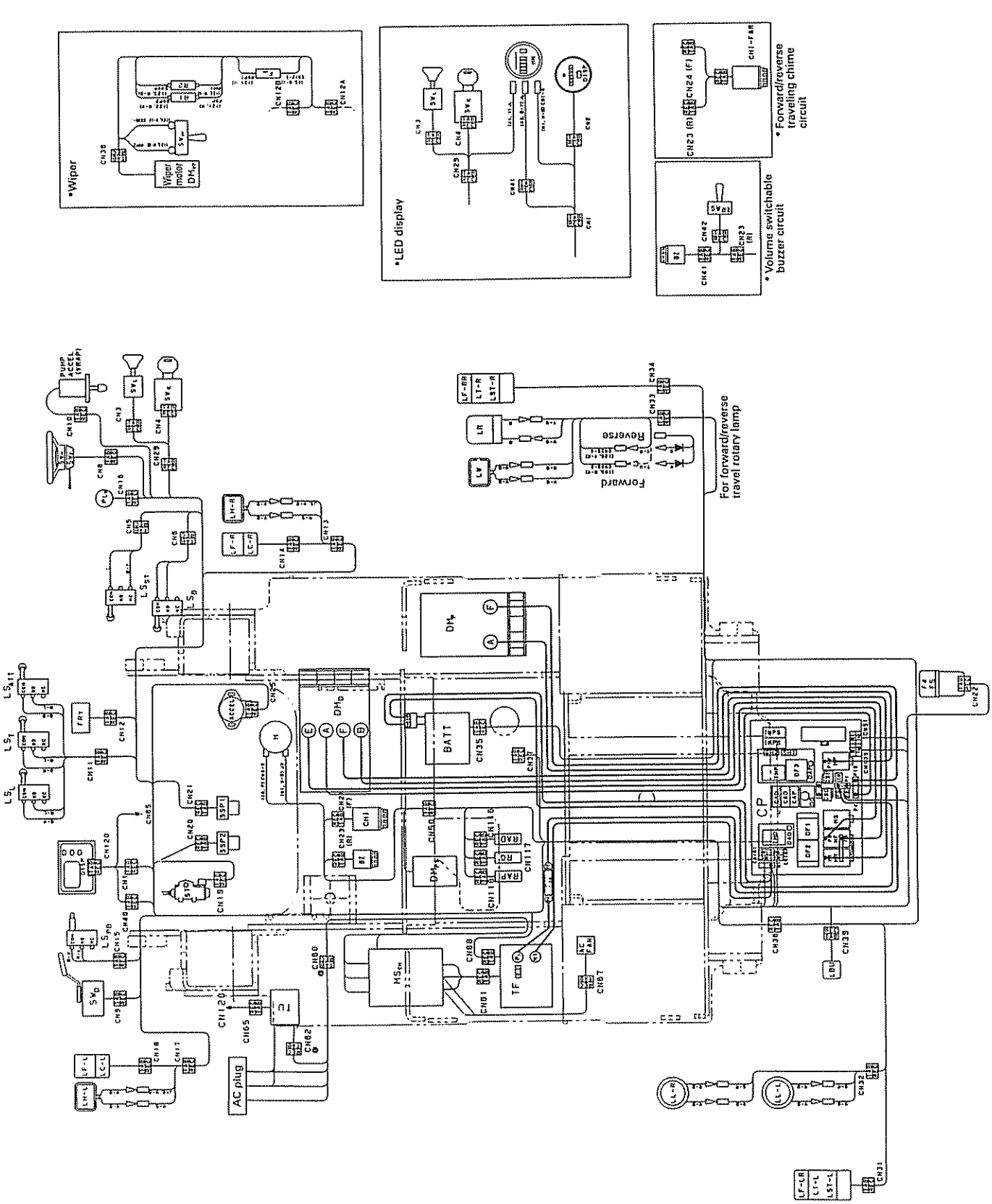
* Volume switchable buzzer circuit



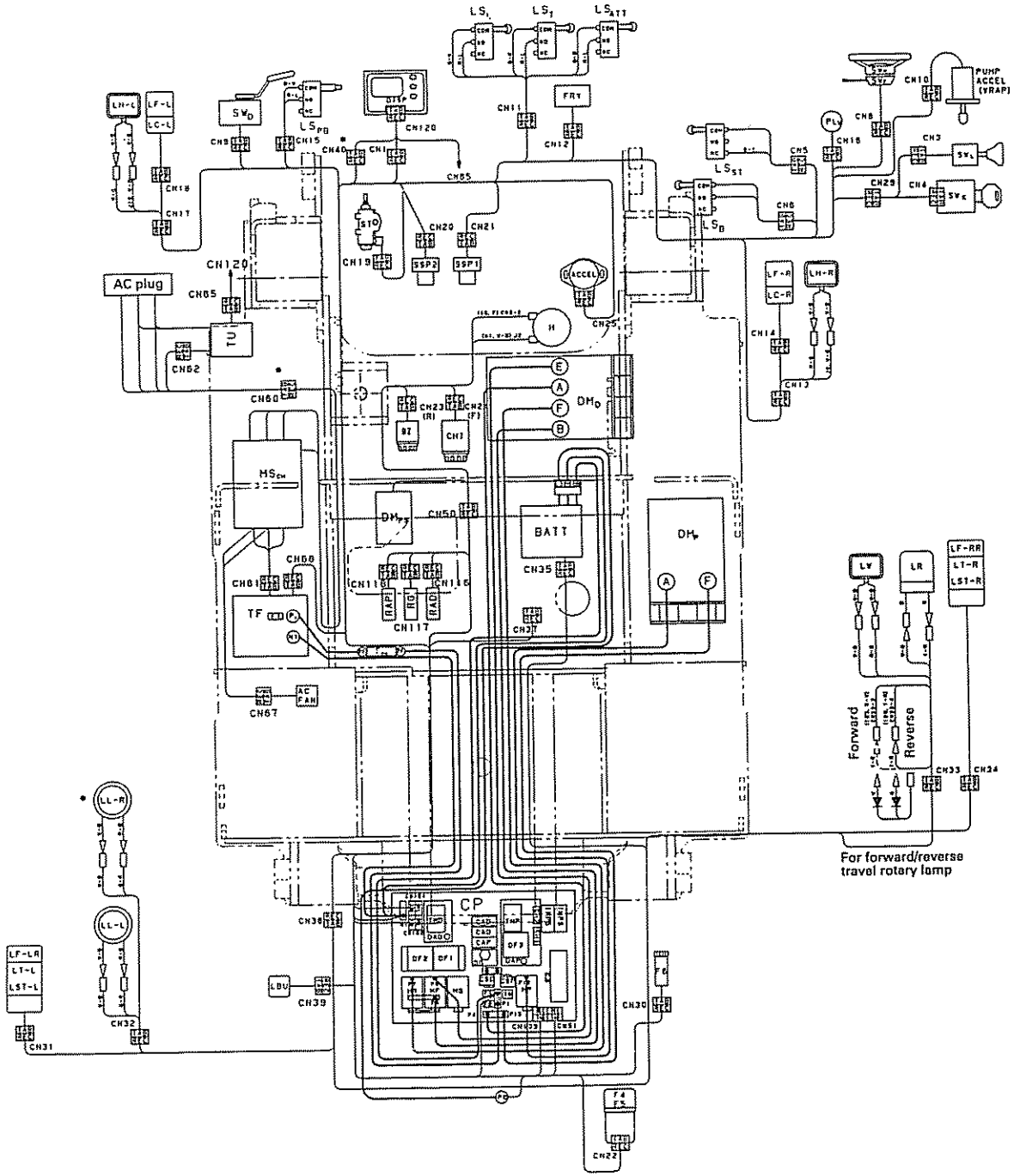
* Forward/reverse traveling chime circuit

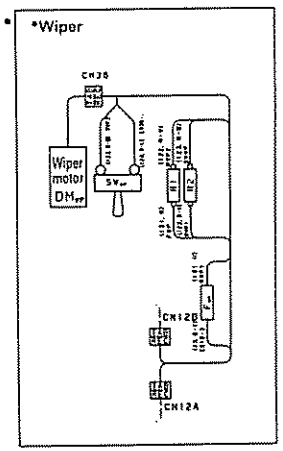
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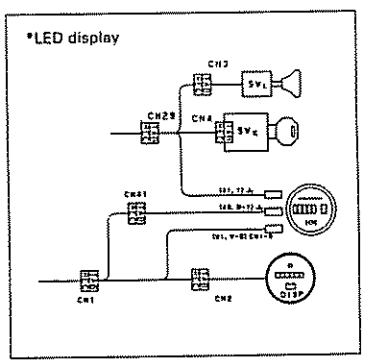
truck-freeworkshop.com

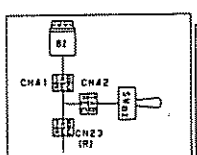


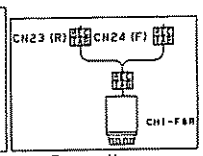
~ 1998. 1
6FB30








* Volume switchable buzzer circuit

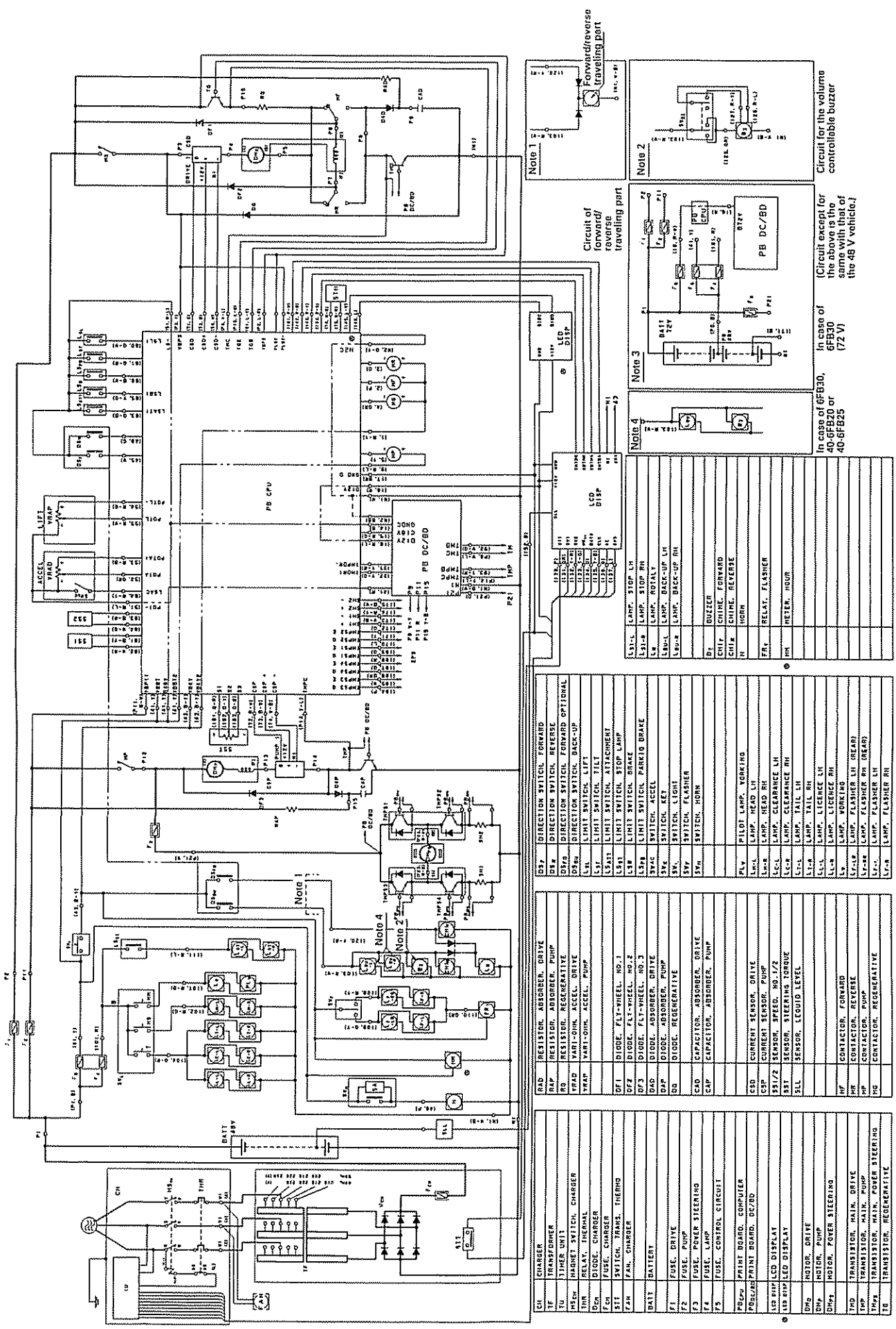

* Forward/reverse traveling chime circuit

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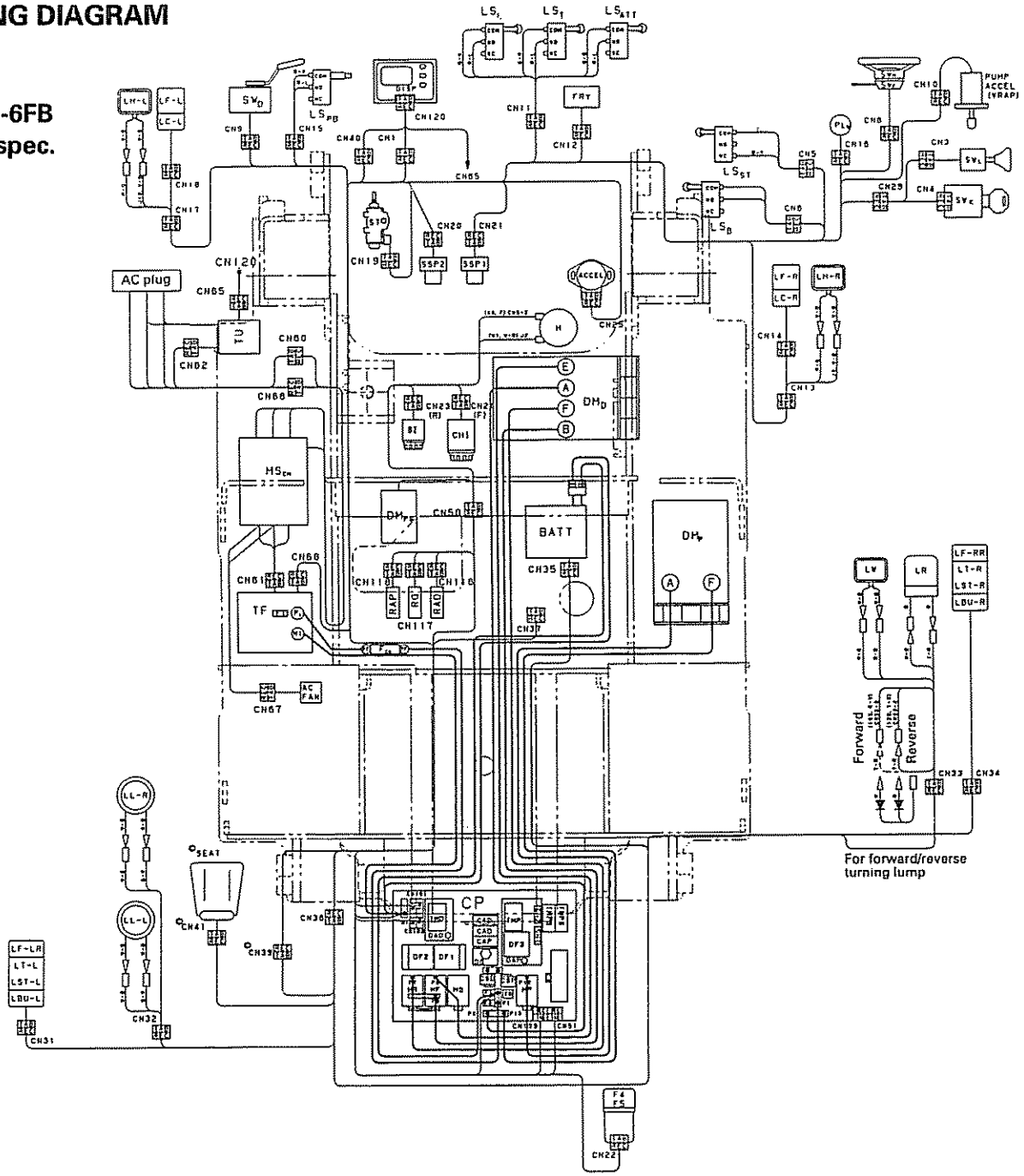
WIRING DIAGRAM

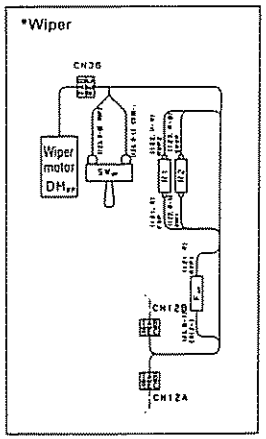
~ 1998. 1

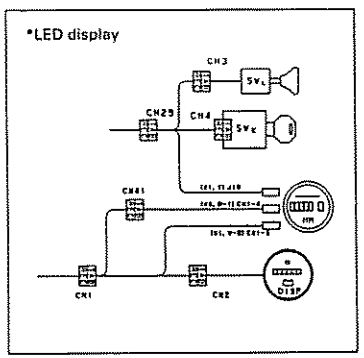


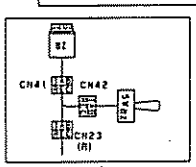
CONNECTING DIAGRAM

1998. 2 ~
6FB10-25
(Including 40-6FB 20, 25: ECC spec. vehicles)

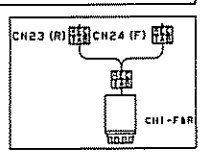








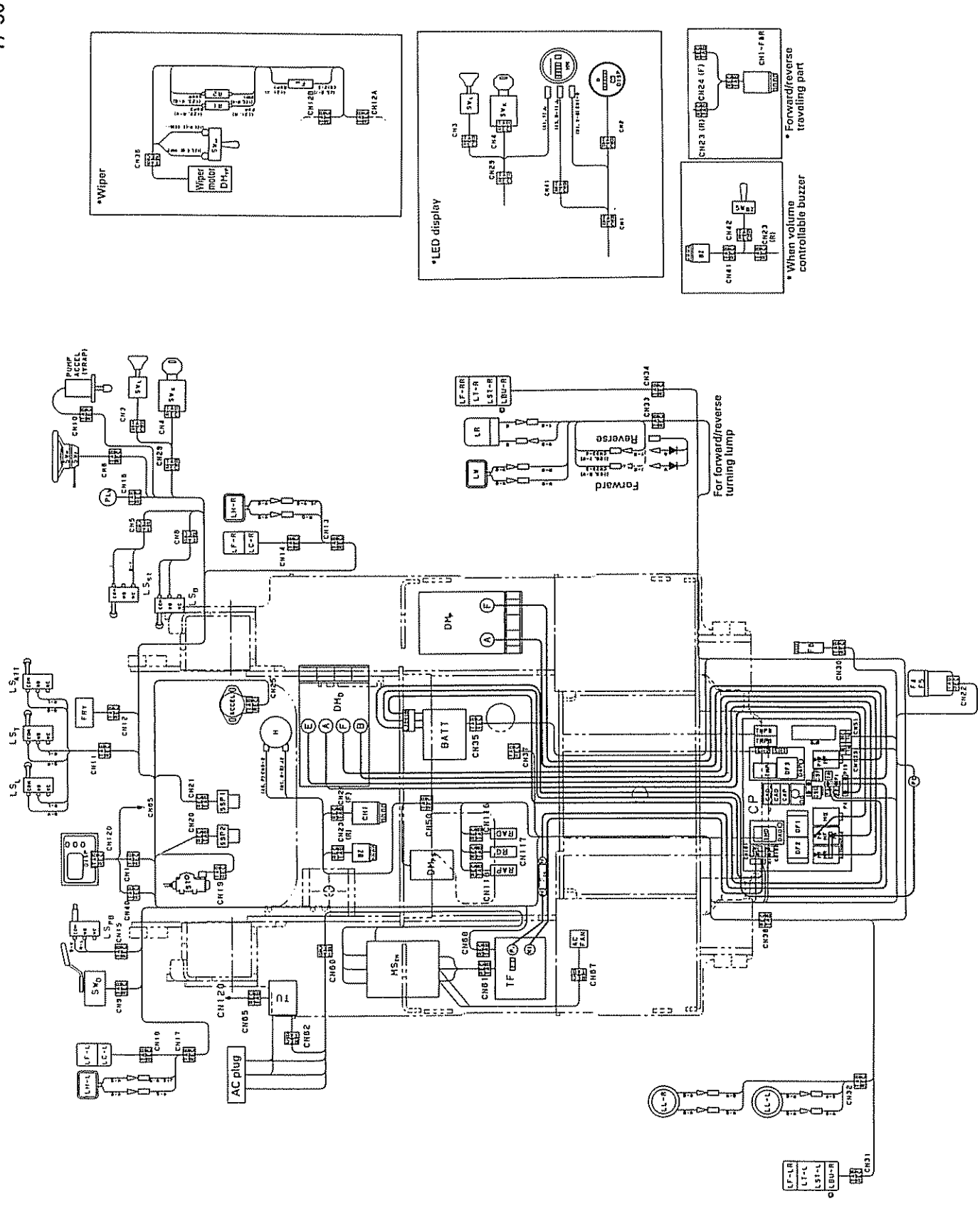
* When volume controllable buzzer



* Forward/reverse traveling part

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WIRING DIAGRAM

1998. 2 ~

