

ELECTRIC LIFT TRUCKS

SERVICE MANUAL

67 SERIES

FBT13P

FBT15P

FBT18P

FBT20PN

NICHYU
NIPPON YUSOKI CO.,LTD.
KYOTO, JAPAN

INTRODUCTION

- Most accident happens due to the disregard of basic safety rules or precautions. In order to prevent accidents, the factors which may cause accidents must be avoided beforehand.

For this reason, please read this manual and fully understand the precautions for safety and the proper procedures and directions for inspection and maintenance before starting operation.

Performing maintenance and repair without adequate knowledge may cause inadvertent accidents.

- It is not possible to cover all the possible cases of accidents in this "SERVICE MANUAL". Therefore, attention should be given to precautions other than the ones mentioned in this "SERVICE MANUAL". Especially, when repair and maintenance work which are not covered in this "SERVICE MANUAL" are carried out, always work under the direction of an instructor who understands the matter.

See the "FBT-65 SERVICE MANUAL" (00W-2101) for the chapters that are not contained in this manual.

■ USING THE "SERVICE MANUAL"

This Service Manual will give explanation on how to maintain and inspect NICHYU forklift trucks of FBT-67 series.

Since the parts used in this machine are subject to change for the sake of better quality, performance enhancement, and safety, some portions of the contents and illustrations of the "SERVICE MANUAL" may not be identified.

Directions with  and  marks are very important, and must be followed.

	DANGER	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. You shall observe this instruction.
	WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. You shall observe this instruction.
	CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. You shall observe this instruction.
	NOTE	Indicates suggestions, tips and hints related to the safety of a operator and maintain of truck.

1. Personnel this "SERVICE MANUAL" is aimed at:

This "SERVICE MANUAL" is directed at personnel who possess sufficient knowledge and technical expertise. If you do not understand any of the contents of this "SERVICE MANUAL", perform operation under the guidance of personnel who does.

2. Conditions of a facility

The work conditions described in the "SERVICE MANUAL" are written on the assumption that the work is performed at a shop where standard facilities and tools for the maintenance of NICHYU ELECTRIC LIFT TRUCKS are available.

For safe and reliable maintenance, the work should be performed at a shop where the facilities are equivalent to these described in the "SERVICE MANUAL" or better, and the instructions described should be strictly followed.

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See the "FBT-65 SERVICE MANUAL" (00W-2101) for the chapters whose pages are not mentioned in the "Contents".

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SAFETY WORK

1. Precautions related to safe inspection and maintenance work

Conditions of a shop (location) for inspection and maintenance

CAUTION

Facilities with adequate space and level surfaces:

- The floor area of the shop (location) where inspection and maintenance are performed must have adequate floor space, and have level surfaces without holes.
- ➔ If these conditions are not met, unexpected accidents, such as a roll-over of the forklift truck, may result.

CAUTION

WELL-VENTILATED AREA

- Work such as welding painted components or sanding down coated parts should be carried out in well-ventilated areas.
- ➔ If this is not observed, harmful toxic gas or dust may be inhaled.

CAUTION

LOCATION EQUIPPED WITH FIRE EXTINGUISHING EQUIPMENT

- Equipment such as first-aid boxes and fire extinguishers should be nearby when work is performed.

CAUTION

SAFE AND WELL-LIGHTED AREA

- The work area should be safe and well lighted. When working inside the machine or underneath of it, always use a safety lamp with a shielded light bulb.
- ➔ If this is not observed, leaked oil may catch fire when a light bulb pops.

CAUTION

PROPER ARRANGEMENT

- Arrange and clean always at a working place to work safety.
- Especially, arrange disassembled parts well.

Work clothing

CAUTION

- The worker should wear a hat, work clothes, and safety shoes that are suitable for safe work. The work clothes should be close-fitting.
- ➔ If this is not observed, loose clothing may become caught in a machine, resulting in serious injury.

Tools and gauges

CAUTION

- Always use tools that are suitable for the work being performed. Use proper size tools when tightening and loosening the parts of the forklift truck.
- ➔ Failure to observe the above could result in serious injury or damage to machines.

CAUTION

Prepare tools and gauges before starting to work.

Safety work

WARNING

- When hoisting a forklift truck or a heavy component, use ropes or cable with correct capacity.
- Do not use ropes or cables which are kinked.

WARNING

After lifting or jacking up a forklift truck, support it with safety blocks or rigid stands.

WARNING

Prevent tires from moving with wheel chocks etc.

WARNING

When working under a forklift truck, use a pit or proper safety precautions.

Parts

⚠ CAUTION

When replacing any parts, be sure to use NICHYU genuine parts.

⚠ CAUTION

When replenishing battery electrolyte, be sure to use refined or distilled water.

Repair of electrical components

⚠ CAUTION

Be sure to disconnect the battery plug when replacing electrical component.

⚠ CAUTION

Be sure to jack up the drive wheel when trouble shooting electrical operations.

📖 NOTE

Record the places of lead wire connection when disassembling.

⚠ CAUTION

CHARGING BATTERY

- Batteries produce flammable gas during charging. Do not allow batteries in the vicinity of fire or flames.
- ➡ Failure to observe the above could result in an explosion.

⚠ CAUTION

- Diluted sulfuric acid is used as the battery's electrolyte . Keep clothing and skin away from contact with battery fluid.
- ➡ If this is not observed, the fluid may corrode clothing or cause burns.

Hydraulics



When removing the hydraulic pipes, cap them to prevent dust from entering into the hydraulic components and pipes.



When disassembling and assembling the hydraulic components, work at clean place and do not damage the parts.

Tightening torque



Observe tightening torque specified in this manual.

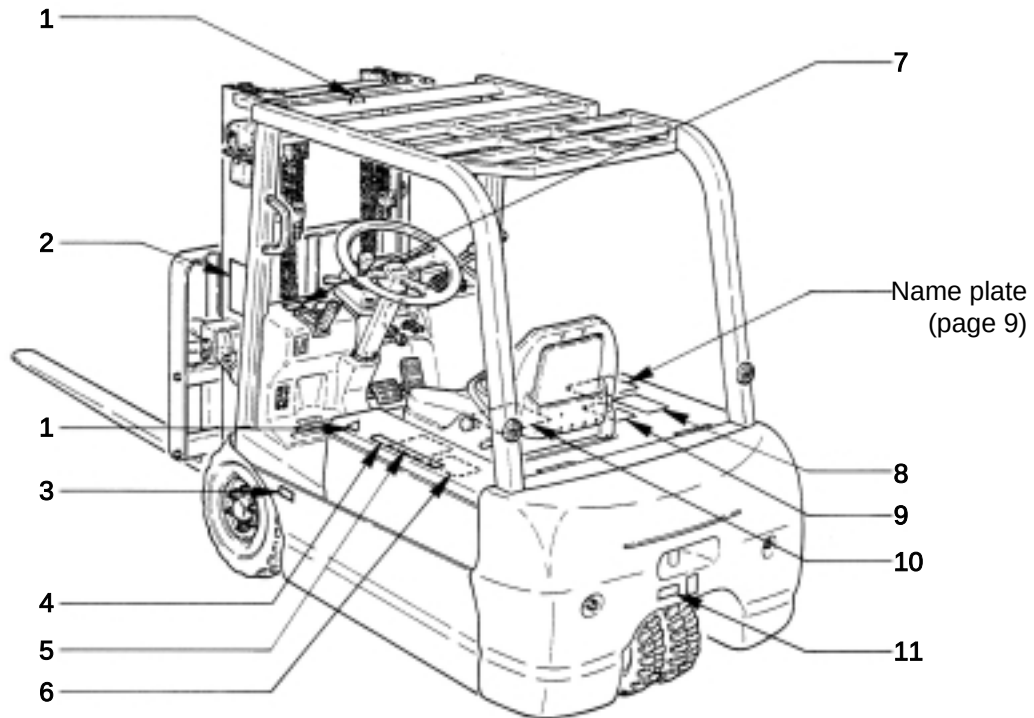
If not specified, refer to the table [Tightening torque for bolts].

→ See page 15

2. Location of safety labels

The illustration below shows the location of safety labels for safe operation.

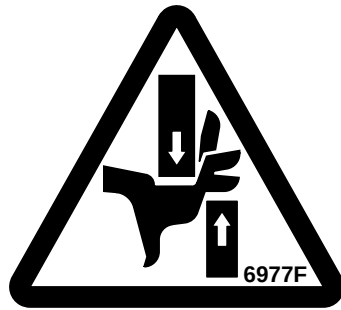
Always protect the safety labels from contamination and damage. If they are damaged or lost, replace with new ones.



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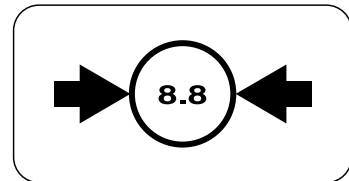
No.	Parts No.	Parts Name	Q'ty	Notes
1	0902-69774	Plate, Warning	2	Caution for fingers
2	0902-69814	Plate, Warning	2	No person on/under forks
3	0902-69964	Label, Tire	2	Air pressure (bar) FBT13, 15P
	24700-09410	Label, Tire	2	Air pressure (bar) FBT18P
4	24700-04830	Plate, Warning	1	Precaution for Safety Operation
5	0902-68434	Plate, Lubrication	1	Lubrication
6	24700-01780	Plate, Caution	1	Operation of Gas spring lock
7	24700-01850	Plate, Caution	1	Caution for Braking
8	0902-68384	Plate, Precaution	1	Precaution for Safety Operation
9	0902-69794	Plate, Caution	1	No riding except Operator
10	38540-00630	Label, Caution	1	Caution for battery
11	24700-09410	Label, Tire	1	Air pressure (bar) FBT13, 15P
	0902-69954	Label, Tire	1	Air pressure (bar) FBT20PN

1

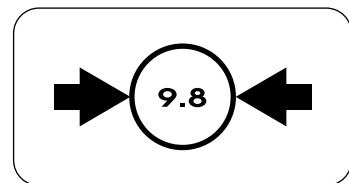


3 (For EEC)

(FBT13, 15P)

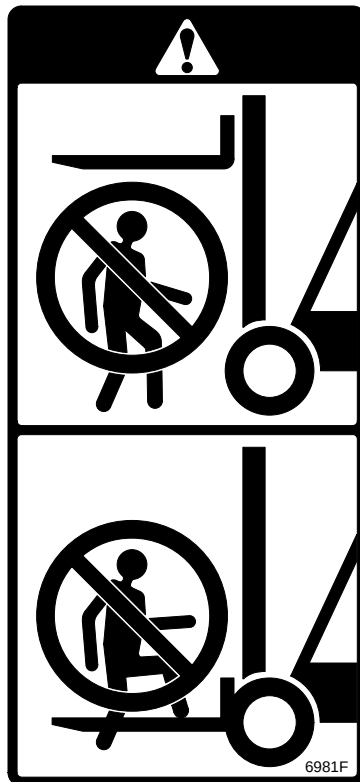


(FBT18P)



(For pneumatic tire only)

2



4



FOR SAFETY NOTICE FOLLOWING WARNINGS

1. Lateral tipover can occur when unloaded if the combination of speed and sharpness of turn produces an overturning moment which exceeds the stability of the truck.
2. Lateral tipover can occur if overloaded or loaded within capacity and the load is elevated and if turning and/or braking when traveling rearward or if turning and/or accelerating when traveling forward produces an overturning moment which exceeds the stability of the truck. Rearward tilt and/or off-center positioning of the load and/or uneven ground conditions will further aggravate the above conditions.
3. Longitudinal tipover can occur if overloaded or when loaded within capacity and the load is elevated if forward tilt, braking in forward travel, or commencing rearward travel produces an overturning moment which

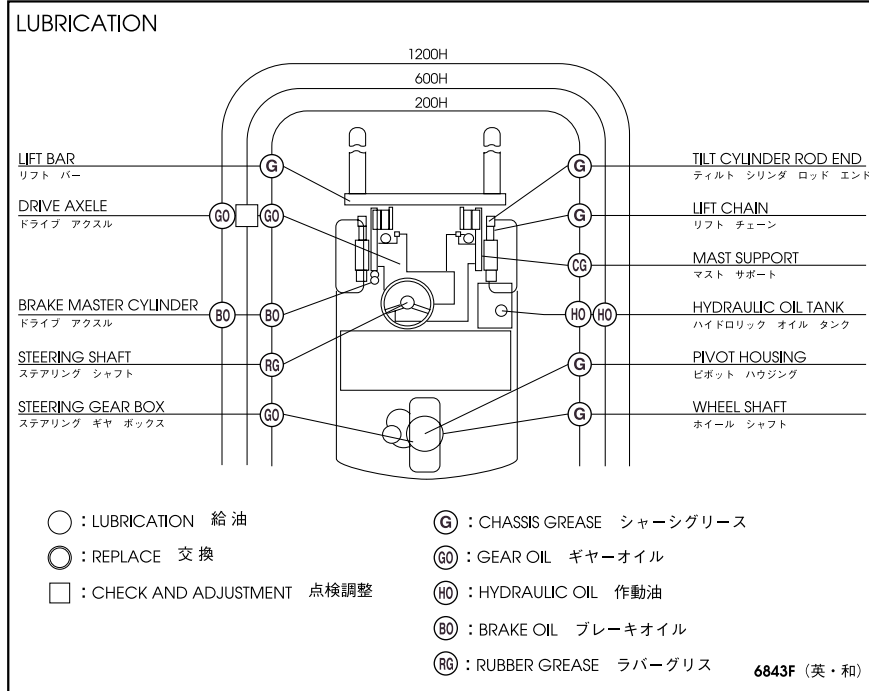
4. Serious injury or death can occur to the operator if he/she is trapped between the truck and the ground.

IN CASE OF TIPOVER

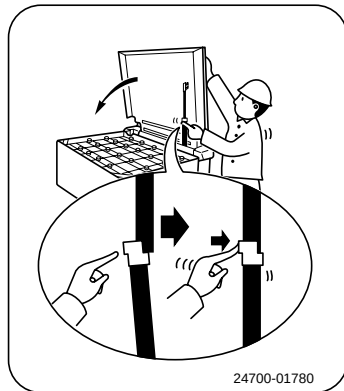
1. The operator should stay with the truck if lateral or longitudinal tipover occurs. The operator should hold on firmly and lean away from the point of impact.
2. The operator should stay with the truck if it falls off a loading dock or ramp. There are other situations where the environment of the landing area presents a severe hazard. In those incidents, it may be prudent for the operator to leave the truck.

24700-04830

5



6



7



8

NICHYU

PRECAUTIONS FOR SAFETY OPERATION

1. DO NOT OVERLOAD.
OBSERVE ALLOWABLE LOAD (BLUE ZONE).
2. PRIOR TO OPERATION, CHECK PERFORMANCE OF BRAKE.
3. DO NOT MAKE A SUDDEN START AND BRAKE OR TURN QUICKLY.
4. DO NOT MAKE A SUDDEN VALVE LEVER OPERATION AT A HIGH LIFT.
5. DO NOT RUN SIDWAYS OR HANDLE ON AN INCLINE.
6. WHEN THE RED LAMP OF BATTERY CAPACITY INDICATOR TURNS ON, CHARGE BATTERY.
7. CHECK ELECTROLYTE EVERY WEEK AND REPLENISH WATER.
8. BE SURE TO USE THE PRESCRIBED FUSES.

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9



10

DANGER

- GASES produced by this battery can be explosive. Cigarettes, flames or sparks could cause battery to explode. Make sure batteries are stored and charged in a well—ventilated area.
- Batteries contain SULFURIC ACID can cause severe burns. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.
- Wear rubber gloves to prevent ELECTRIC SHOCK during checking and maintaining.
- Keep out of reach of children.

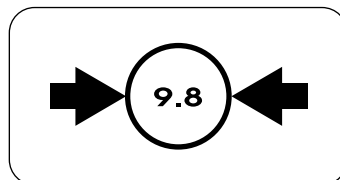
IMPORTANT POINT FOR MAINTENANCE

1. Keep the electrolyte level at proper height.
(When electrolyte decreased, fill purified water and stop filling immediately if confirmed the white line of the float as shown herein, for over—filling causes overflow.)
2. Always give the battery an adequate charge and do not use the battery at overdischarged condition.
3. Keep the surface of battery clean and dry.

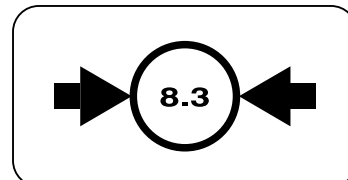
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11 (For EEC)

(FB13, 15P)



(FB18P)



(For pneumatic tire only)

■ **Model name**

(For Standard)

MODEL		NICHIBU		NIPPON YUSOKI CO., LTD.	
MAXIMUM LOAD/LC LIFT HEIGHT	mm	kg /	mm		
SERIAL NO.		MFG. YEAR			
SERVICE WEIGHT W/O BATTERY	kg	VOLTAGE	V		
BATTERY WEIGHT	MIN. kg	MAX.	kg		

		LIFT HEIGHT	
		mm	
CAPACITY kg			
		LOAD CENTER mm	

50001-60560 (英)

(For CE)

MODEL		NICHYU	NIPPON YUSOKI CO., LTD.		
MAXIMUM LOAD/LC LIFT HEIGHT		mm	kg /	mm	
		mm	kg /	mm	
SERIAL NO.		MFG. YEAR			
SERVICE WEIGHT W/O BATTERY		kg	VOLTAGE	V	
BATTERY WEIGHT	MIN.	kg	MAX.	kg	

LOAD CHART

LIFT HEIGHT mm

CAPACITY kg

LOAD CENTER mm

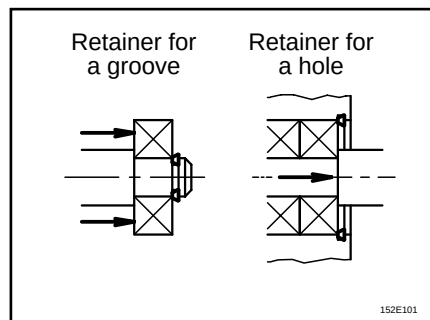
50001-32831 (英)

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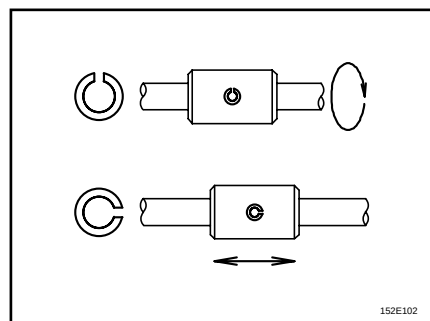
4. Cautions for maintenance

General precautions

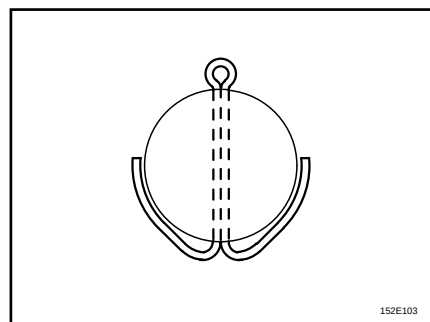
- When replacing any parts, be sure to use genuine NICHYU parts.
- When parts are assembled, always replace old packing and O-rings with new ones. In addition, be sure to apply a light coat of grease on the O-rings and oil seals before installing them.
- As shown in the illustration, face the flat side of the C-shape retainer in the direction the force is applied when installed.



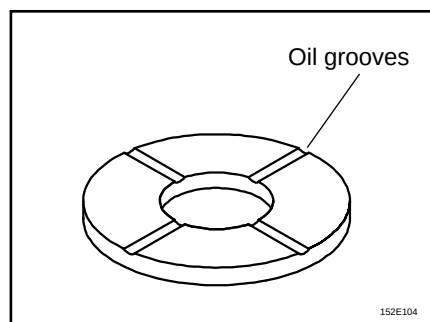
- As shown in the illustration, face the slit side in the direction the force is applied when driving in a spring pin.



- The split pin must be replaced with a new one and split so it will not come out.



- When using a thrust washer with oil grooves cut, observe the direction of installation.

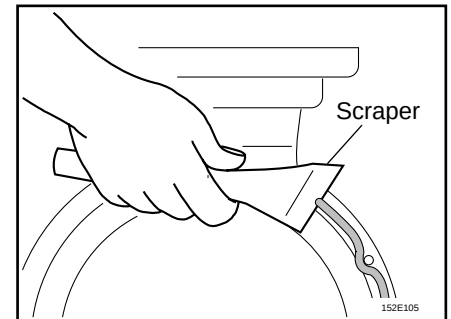


- When connecting and disconnecting couplers of electrical harnesses, always disconnect the battery plug.

■ Using liquid packing

● Scraping before application of seal

Remove the sealer adhered on the mating surface of the casing using a scraper or equivalent tool. Be careful not to make scratches of 0.3 mm or deeper. If scratches are made, repair the area using an oil stone.

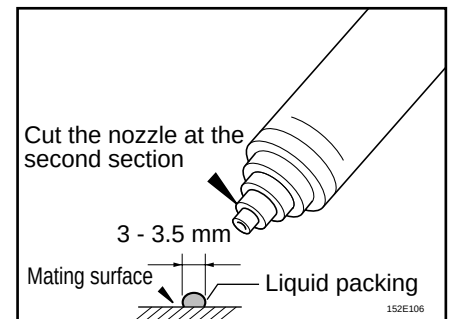


● Applying liquid packing

1. Wipe off the mating surfaces using a cloth soaked in gasoline to remove oil and contamination.

* Do not use kerosene, light oil, or crude oil.

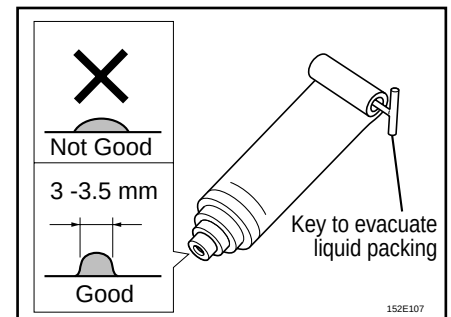
2. Cut the nozzle of the liquid gasket tube at about the second section so that the bead width will be 3 to 3.5 mm.



3. Attach a key for rolling up the tube, and apply the liquid gasket to the mating surface while rolling up the tube.

* Do not smooth out the bead; doing so may cause leakage.

When applying the liquid gasket to bolt holes, apply it on the internal portion of the mating surface.

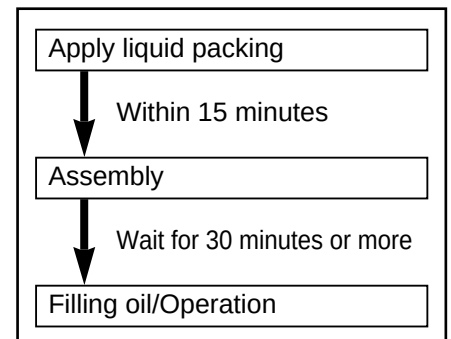


4. Close the mating surfaces within 15 minutes after the liquid gasket is applied.

5. When tightening the bolts, always tighten temporarily first, and then tighten them gradually, moving from one to the next in a diagonal pattern.

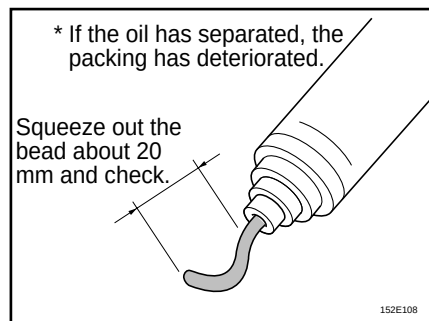
6. Wait for more than 30 minutes before adding oil or operating the machine.

* Failure to do so may cause oil leakage.



• Deterioration of liquid packing

1. Once the tube has been opened, the liquid gasket anchoring the tip part of the nozzle might be cured and deteriorated. Squeeze out that portion and discard it before reusing the gasket.



2. If oil (filler) was separated from the liquid gasket and the gasket appears shiny when it is squeezed out, this indicates that the liquid gasket has deteriorated.

* Although the oil may have been separated from a liquid gasket opened before its expiration date, this is not an indication of deterioration.

CAUTION

If the state of the gasket is normal, it will be cured within approximately 2 hours. However, a deteriorated gasket will not.

5. Tightening torque for bolts

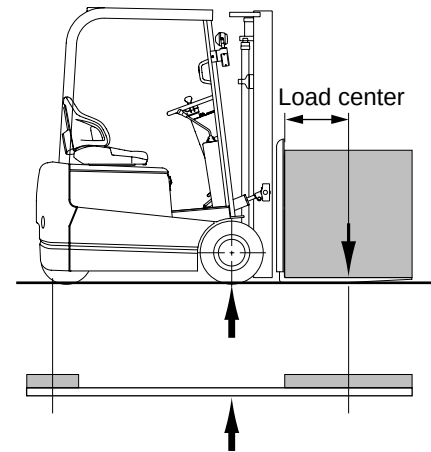
Classification of bolt		4T	8T	Brass	Stainless
Material of bolt		SS400	SCM435 (S55C)	BsBM2S-0	SUS304
Nominal of bolt (mm)	Pitch ^{*1} (mm)	Tightening torque ^{*2} Unit : N·m{kgf·m}			
M 3	0.5	0.6 {0.06}	1.3 {0.14}	0.4 {0.04}	0.5 {0.05}
M 4	0.7	1.4 {0.14}	3.2 {0.33}	1.0 {0.10}	1.0 {0.11}
M 5	0.8	2.7 {0.28}	6.4 {0.66}	1.8 {0.19}	2.0 {0.21}
M 6	1.0	4.7 {0.48}	10 {1.1}	3.1 {0.32}	3.6 {0.37}
M 8	1.25	11 {1.1}	26 {2.7}	7.8 {0.80}	9.0 {0.92}
M 10	1.25	22 {2.3}	55 {5.7}	15 {1.6}	18 {1.9}
M 12	1.25	39 {4.0}	98 {10}	29 {3.0}	33 {3.4}
(M 14)	1.5	62 {6.3}	150 {16}	47 {4.8}	53 {5.4}
M 16	1.5	97 {9.9}	240 {25}	73 {7.5}	81 {8.3}
M 20	1.5	180 {19}	500 {51}	140 {15}	150 {16}
(M 22)	1.5	250 {26}	670 {69}	200 {21}	220 {23}
M 24	2.0	320 {33}	840 {86}	250 {26}	280 {29}
M 30	2.0	640 {66}	1600 {170}	530 {54}	570 {58}

***1. In the table above, the thread pitches of bolt diameters M3 to M8 are for coarse screw threads and those of bolt diameters M10 or larger are for fine threads according to our specifications.**

***2. The tolerance range of tightening torque is to be +/- 10% of the reference values given above. (The tolerance range is determined according to experience, related standards, and records provided by other companies.)**

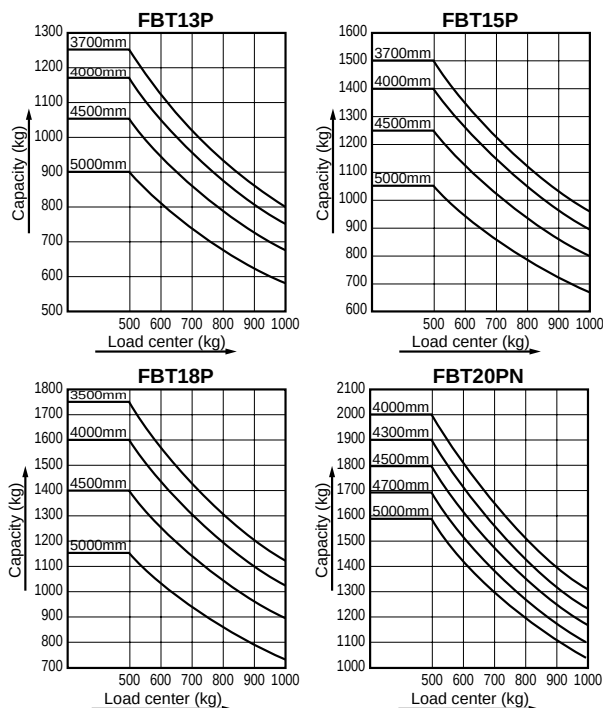
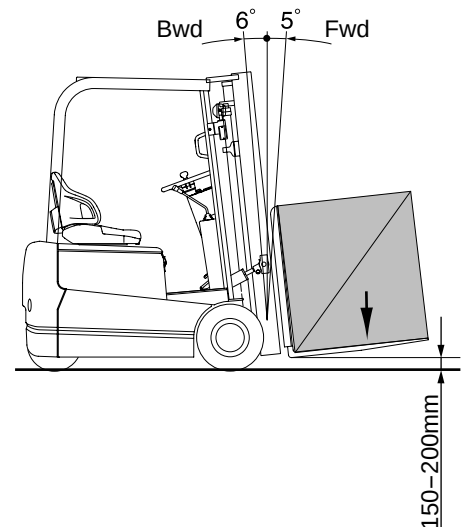
6. Stability of forklift truck

As shown in the figure, the counterbalanced forklift truck will balance on its drive wheel with a full rated capacity load on the forks. Consequently, careful attention should be paid to the load center so that truck does not unbalance. If a load should exceed the rated capacity of truck, or the rated load center, the rear steer tires will lift off the ground and the possibility of toppling the truck exists.



7. Load center and load chart

Distance from the center of gravity of a load on the forks to the surface of the truck is called load center. The LOAD CHART shows the relationship between load center and load capacity of the truck. Do not drag forks to the floor, lift up forks 150-200mm above floor when traveling with mast tilted backward fully. When traveling, do not lifting and tilting forward. This could cause overturn by changing the center of gravity for the load.



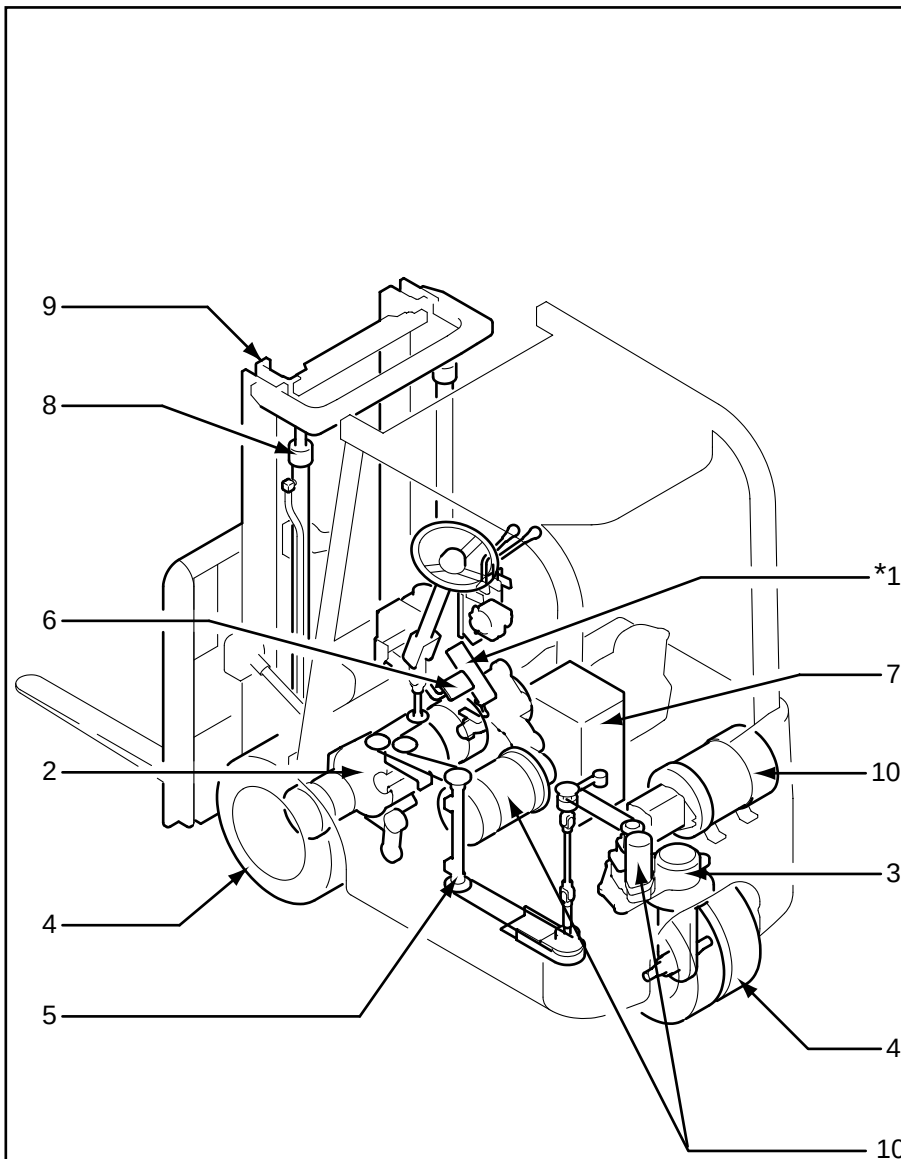


- 1) Completely insert the forks beneath the loading object.**
- 2) Applying too much load on the front portion of the forks exerts force beyond expectation and this may cause damage to the mast and forks even if the load does not exceed the maximum allowable weight.**
- 3) If the load is off-centered, it not only exerts force beyond expectation on the truck, but also causes a side slide of the loading object. Thus, off-centered loads in a lateral orientation should be avoided as well.**
- 4) When loading an object, operate the valve lever carefully.**
- 5) Abrupt operation during high stacking exerts great impacts on the truck, and may result in a tip over accident.**

[illegible]

1. GENERAL

1- 1. Appearance



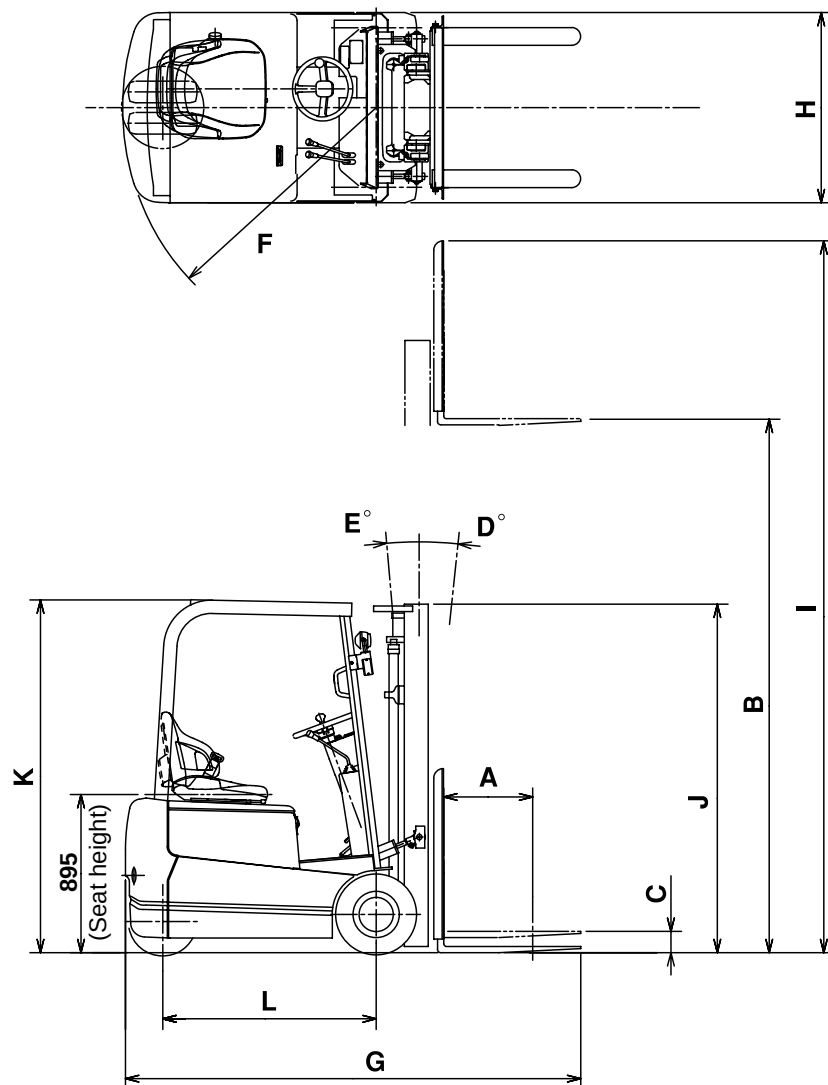
*1 : "ACCELERATOR LINKAGE" : See FBT-65.

*2 : 11. ELECTRIC PARTS : See page 27.

2	FRONT AXLE
3	REAR AXLE
4	TIRE
5	STEERING LINKAGE
6	BRAKE LINKAGE
7	HYDRAULIC SYSTEM
8	CYLINDER
9	MAST
10	MOTOR
11	ELECTRIC PARTS (*2)
12	LASER POINTER
13	TROUBLE SHOOTING
14	SERVICE DATA AND WIRING (DIAGRAMS)

461E121

1- 2. Specifications



461E132

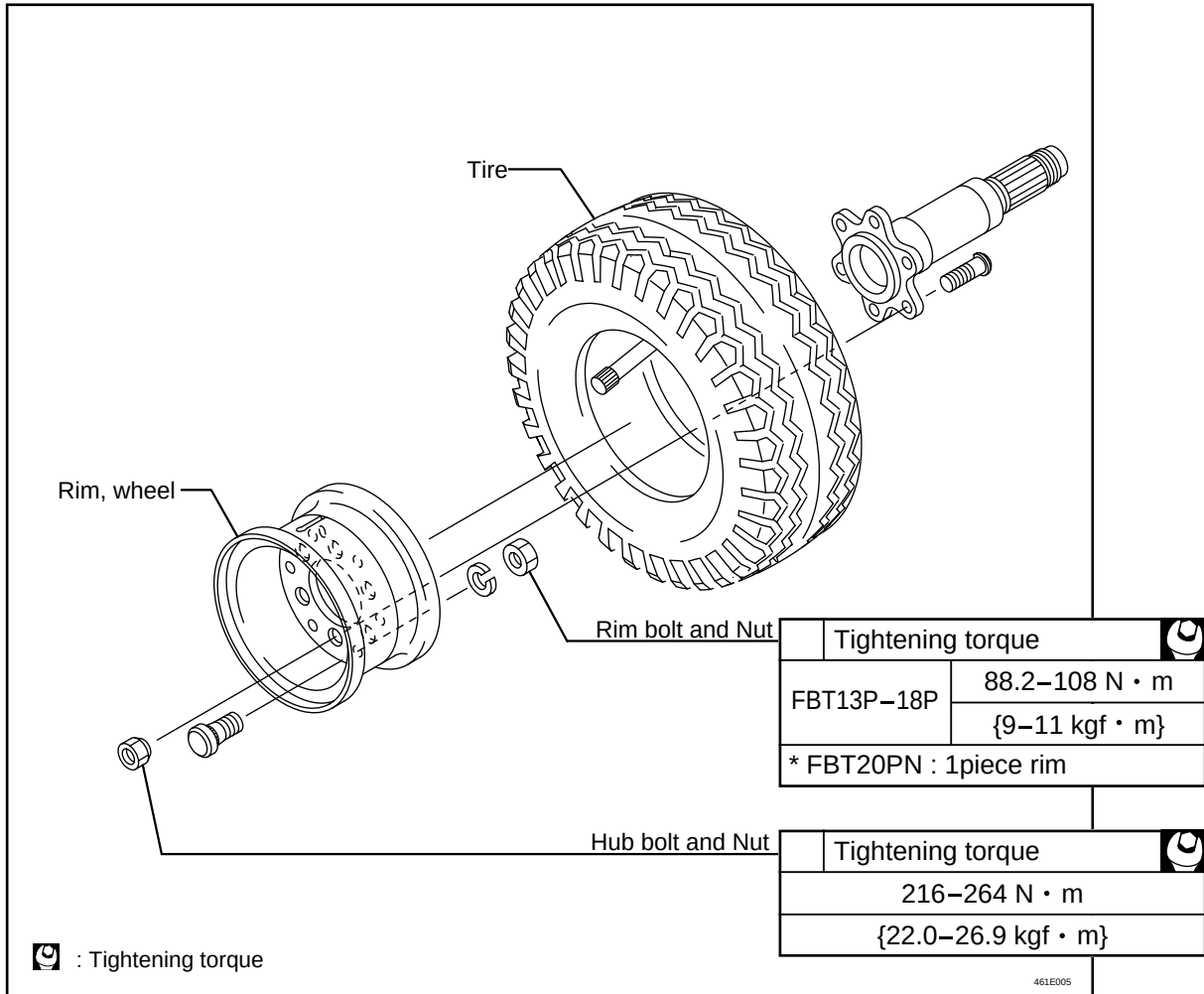
Model			FBT13P	FBT15P	FBT18P	FBT20PN
Rated capacity		kg	1250	1500	1750	2000
Load center		A mm	500			
Lift height		B mm	3000			
Free lift		C mm	120			
Lifting speed	Laden	mm/s	350	330	300	265
	Unladen	mm/s	540			465
Tilt angle	Forward	D °	5			
	Backward	E °	6			
Travel speed	Laden	km/h	13.5	13	12.5	11
	Unladen	km/h	15.5	15	14.5	13
Minimum turning radius		F mm	1400	1500	1545	1695
Overall length		G mm	2830	2930	2975	3155
Overall width		H mm	1070			
Height	Mast lifted	I mm	4000			
	Mast lowered	J mm	1960			1970
	Overhead guard	K mm	1985			
Wheelbase		L mm	1200	1300		1420
Tread (Front/Rear)		mm	895/250			895/230
Service weight (Incl. battery)		kg	2800	2970	3180	3560
Tires	Front	Pneumatic	18 X 7-8-14PR X 2		18X7-8-16PRX2	—
		Pneumatic cushion	18X7-8X2			
		Cushion	18X6X12 1/8X2			
	Rear	Pneumatic	15X4(1/2)-8-12PRX2		—	16X6-8-10PRX2
		Pneumatic cushion	15X4(1/2)-8X2			16X6-8
Control system (Travel/Hydraulic)			FET chopper			
Motor	Traction	kw	3.5X2 (60min)			
	Hydraulic		8.8 (5min)			9.6 (5min)
	EPS		0.3 (60min)			0.45 (60min)
Battery (48V)		Ah/5HR	320	350	390	
Charger			Automatic stationary charger (3 phase 200V)			
		kVA	5.2	6.4		

*Subject to change without notice for improvement.

4. TIRE

4- 1. Front tire

4-1-1. Disassembling and assembling



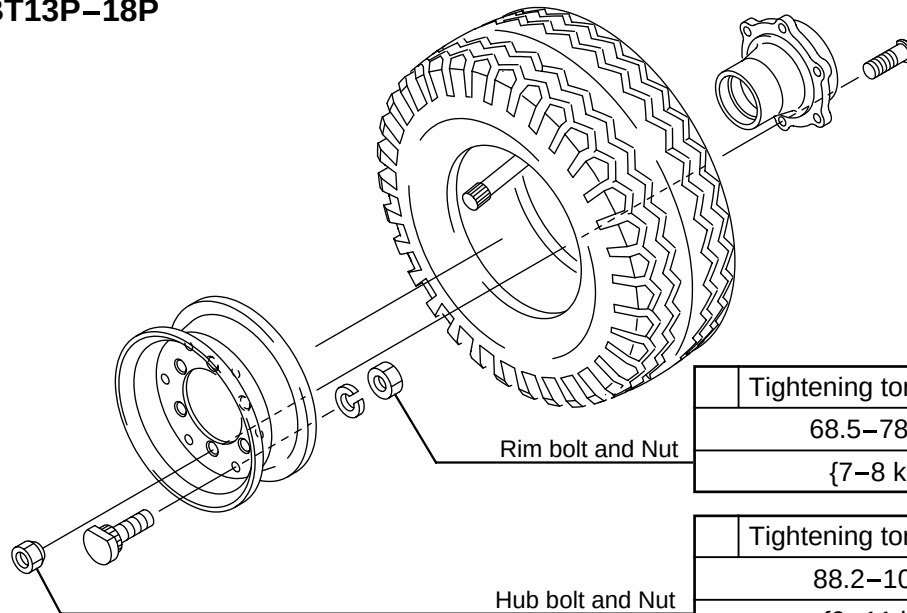
4-1-2. Tire size (Front)

Model	Size	Specified air pressure bar (kgf/cm ²)
FBT13P, 15P	18x7-8-14PR (18x7-8 SOLID : OPTION)	8.8 (9.0)
FBT18P	18x7-8-16PR (18x7-8 SOLID : OPTION)	9.8 (10.0)
FBT20PN	18x7-8 SOLID	—

4- 2. Rear tire

4-2-1. Disassembling and assembling

● FBT13P-18P



Tightening torque

68.5–78.5 N · m

{7–8 kgf · m}

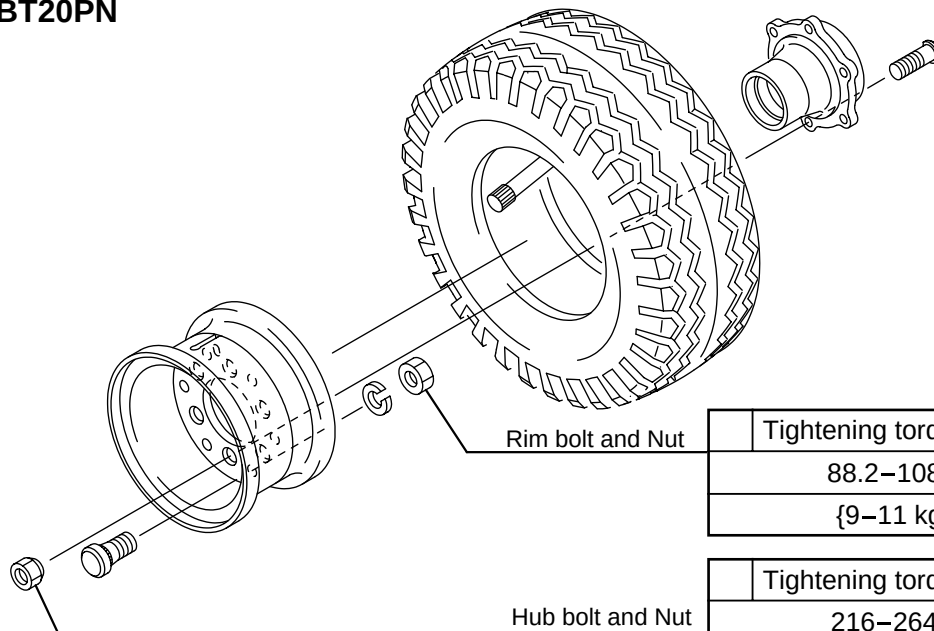
Tightening torque

88.2–108 N · m

{9–11 kgf · m}

461E036

● FBT20PN



Tightening torque

88.2–108 N · m

{9–11 kgf · m}

Tightening torque

216–264 N · m

{22–26.9 kgf · m}

461E032

 : Tightening torque

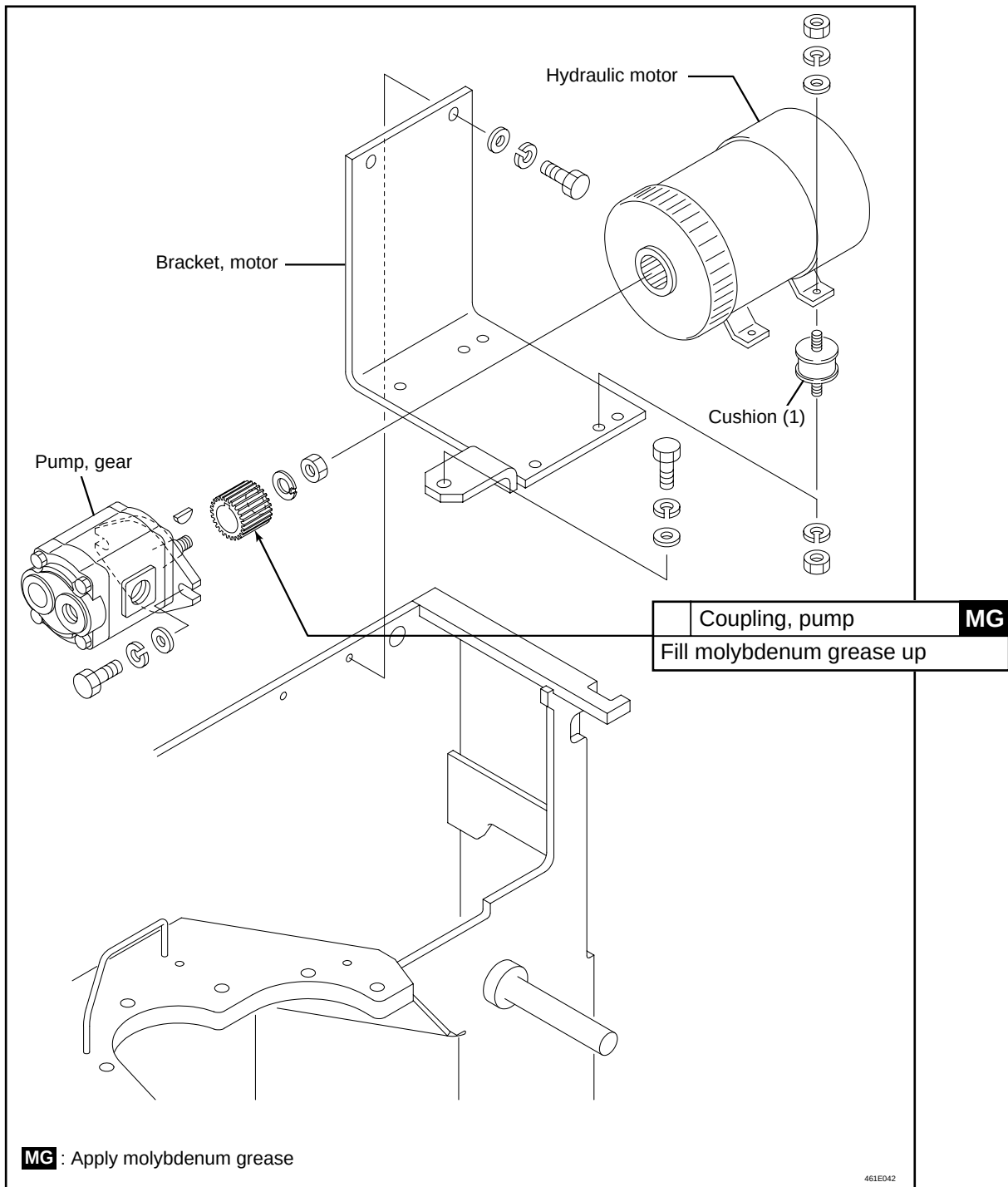
4-2-2. Tire size (Rear)

Model	Size	Specified air pressure bar (kgf/cm ²)
FBT13P, 15P	15x4 1/2-8-12PR	9.8 (10.0)
FBT18P	15x4 1/2-8 SOLID	—
FBT20PN	16x6-8-10PR	8.3 (8.5)

7. HYDRAULIC SYSTEM

7- 4. Oil pump

7-4-1. Disassembling and assembling



7-4-2. Gear pump type

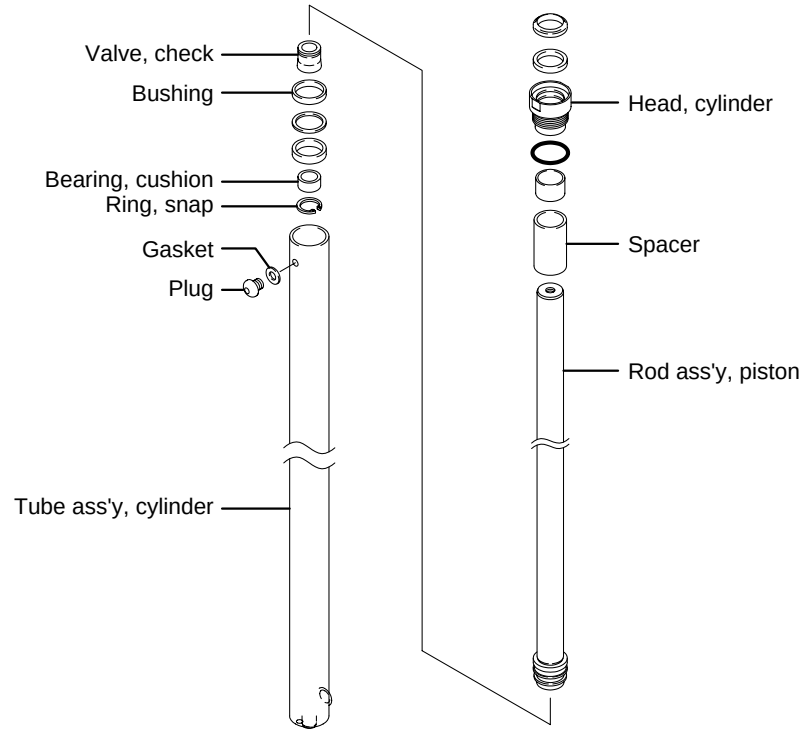
Model	Type
FBT13-18P	TMG1-17
FBT20PN	DSG 05-18

8. CYLINDER

8- 1. Lift cylinder

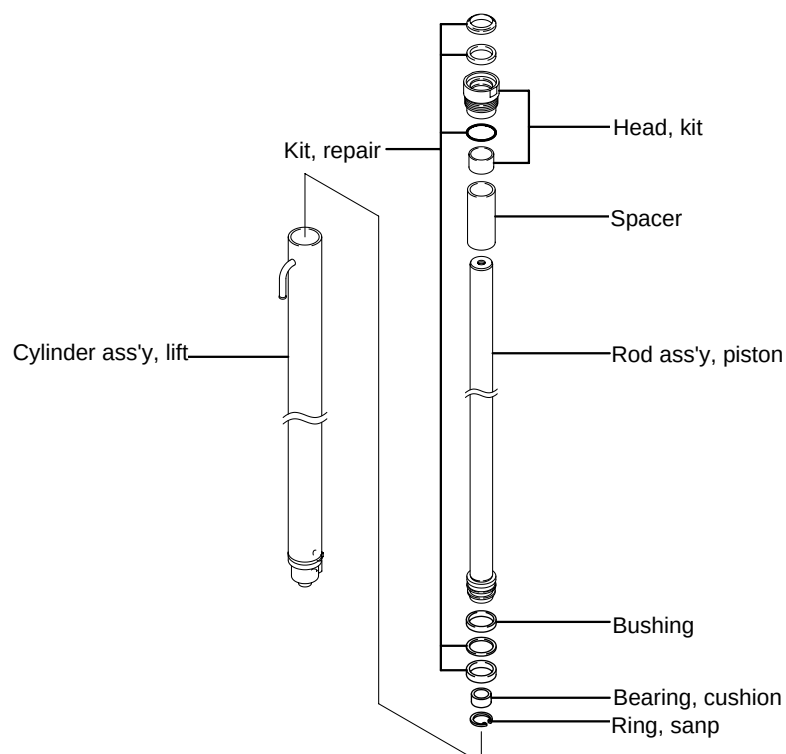
8-1-1. Disassembling and assembling

● Main parts of lift cylinder for STD (simplex) mast



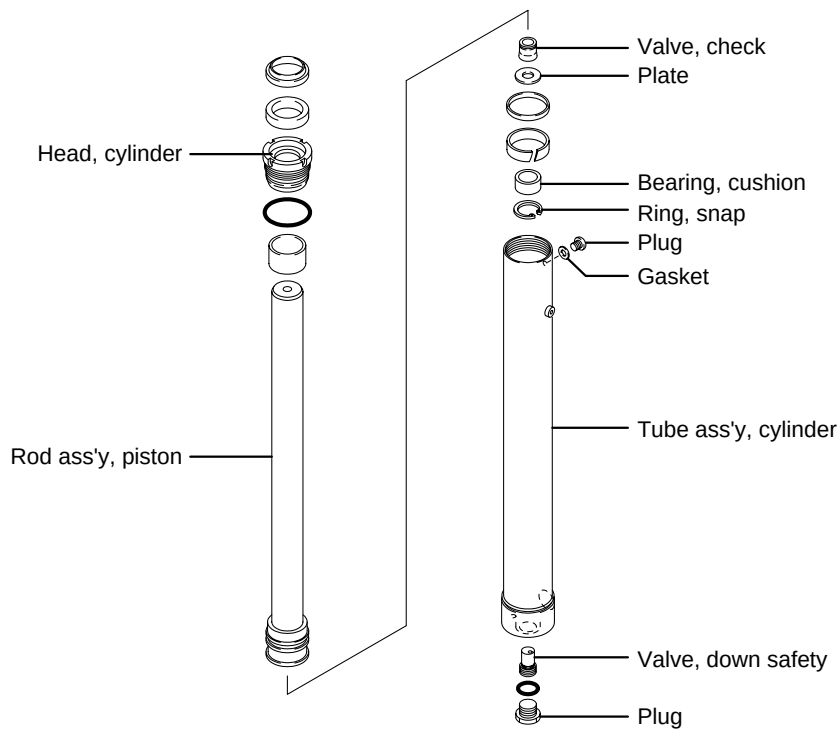
215W008E

● Main parts of lift cylinder for STD (simplex) mast of RP, and lift cylinder 2nd for M (triplex) mast



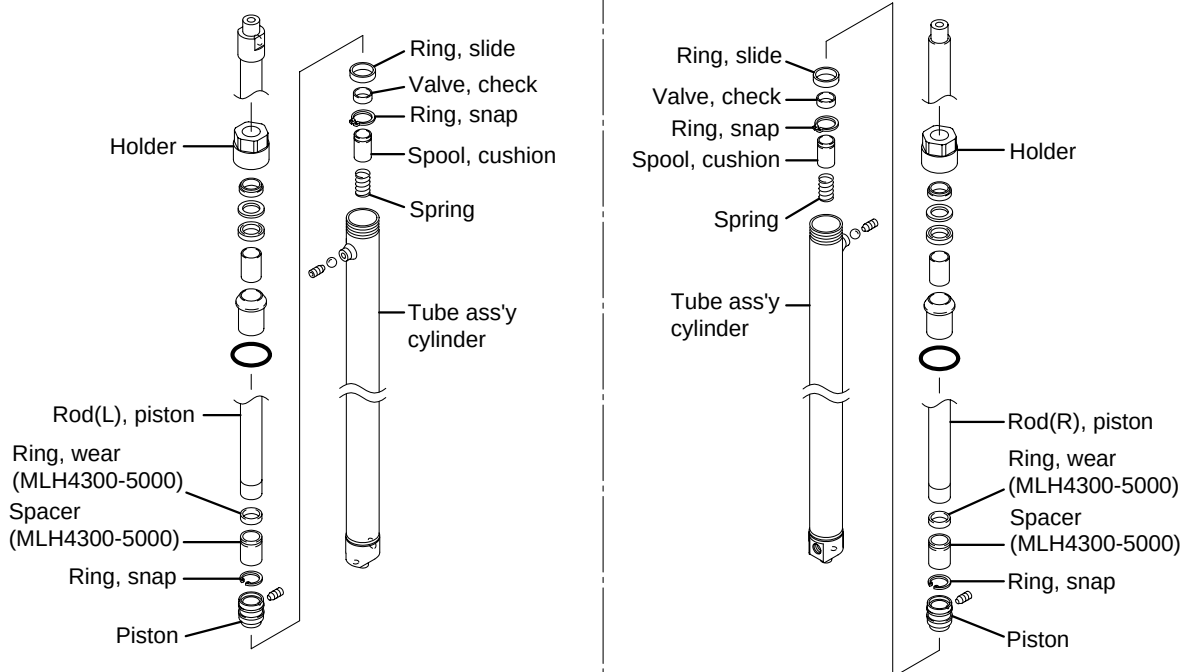
461E018

● Main parts of lift cylinder 1st for M (triplex) and PFL (duplex) masts



221W018E

● Main parts of lift cylinder 2nd for PFL (duplex) mast



121W071E

CAUTION

- Care should be taken when installing packings and seals. Apply grease on them.
- Also apply a liberal amount of grease on the ground portion.

8- 2. Tilt cylinder

8-2-1. Disassembling and assembling

head, cylinder **B**

Apply THREEBOND[#1344] on the threads when tightening.

Tightening torque

FBT13P-18P	$490 \pm 75 \text{ N} \cdot \text{m}$
	$\{50 \pm 7.5 \text{ kgf} \cdot \text{m}\}$
FBT20PN	$490 \pm 49 \text{ N} \cdot \text{m}$
	$\{50 \pm 5 \text{ kgf} \cdot \text{m}\}$

Seal, KIT

Tightening torque

FBT13P-18P	$343 \pm 49 \text{ N} \cdot \text{m}$
	$\{35 \pm 5 \text{ kgf} \cdot \text{m}\}$
FBT20PN	$735 \pm 74 \text{ N} \cdot \text{m}$
	$\{75 \pm 7.5 \text{ kgf} \cdot \text{m}\}$

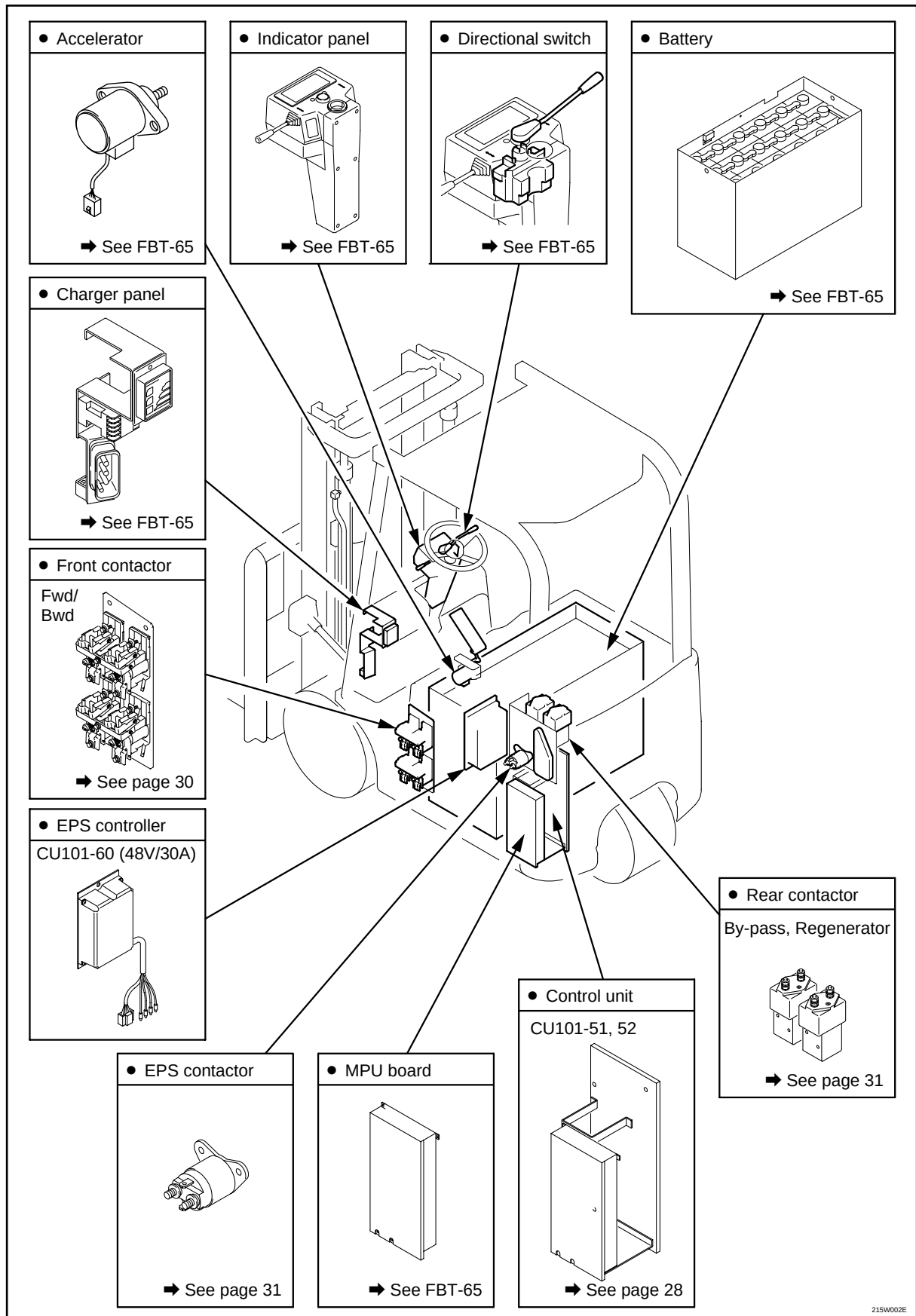
Legend:

- Tightening torque**
- B** : Apply THREEBOND
- N** : Not reusable

215W001E

11. ELECTRIC PARTS

11- 1. Location and name



215W002E

11- 2. Control unit

11-2-1. Location and name

● CU101-51(with Regenerative function) CU101-52

9. Sensor comp.,
current

* Terminal

3. Diode
Plugging (D2)

1. Contactor
Hyd. (M7)

2. Diode
Flywheel (D1)

7. FET comp.
Travel

5. Diode
* Hyd. flywheel (D4)

8. Capacitor

6. FET comp.
Hyd.

4. Diode
Regenerative (D3)

11. Board comp.,
printed

12. Resistor comp.

10. Board comp., MPU

No,	Name	Remarks
1	Contactor	Hyd. (M7)
2	Diode	Flywheel (D1)
3	Diode	Plugging (D2)
4	Diode	Regenerative (D3)
5	Diode	Hyd. flywheel (D4)
6	FET comp.	Hyd.
7	FET comp.	Travel
8	Capacitor	100V, 2200 μ F
9	Sensor comp., current	
10	Board comp., MPU	
11	Board comp., printed	PB83-64
12	Resistor comp.	

NOTE

- This illustration should be used for FBT-67 Regenerative function.
- Therefore, the parts of 4, 11, 12, and *marked terminal should be used for only the truck with Regenerative function.

11-2-2. Hydraulic contactor

Contactor	Coil resistance
Hydraulic (M7)	51 Ω – 54.5 Ω

11-2-3. Disassembling and assembling

FET comp. **C**
Apply conductive compound TSK550 (Toshiba Silicones Co., Ltd) on all surfaces between the "FET comp." and the insulator sheet, and between the insulator sheet and the base.

Diode **C**
Apply conductive compound TSK550 (Toshiba Silicones Co., Ltd) on all surfaces between the "Diode" and the heat sink, between the heat sink and the insulator sheet, and between the insulator sheet and the base.

Tightening torque **T**
9.5–12.5 N · m
{9.7–127 kgf · m}

Tightening torque (M8 terminal) **T**
8.75 N · m $\pm 10\%$
89 kgf · cm $\pm 10\%$
Only the truck with Hyd. chopper

Tightening torque **T**
9.0–11.0 N · m
{92–112 kgf · m}

Legend:
T : Tightening torque
C : Apply compound

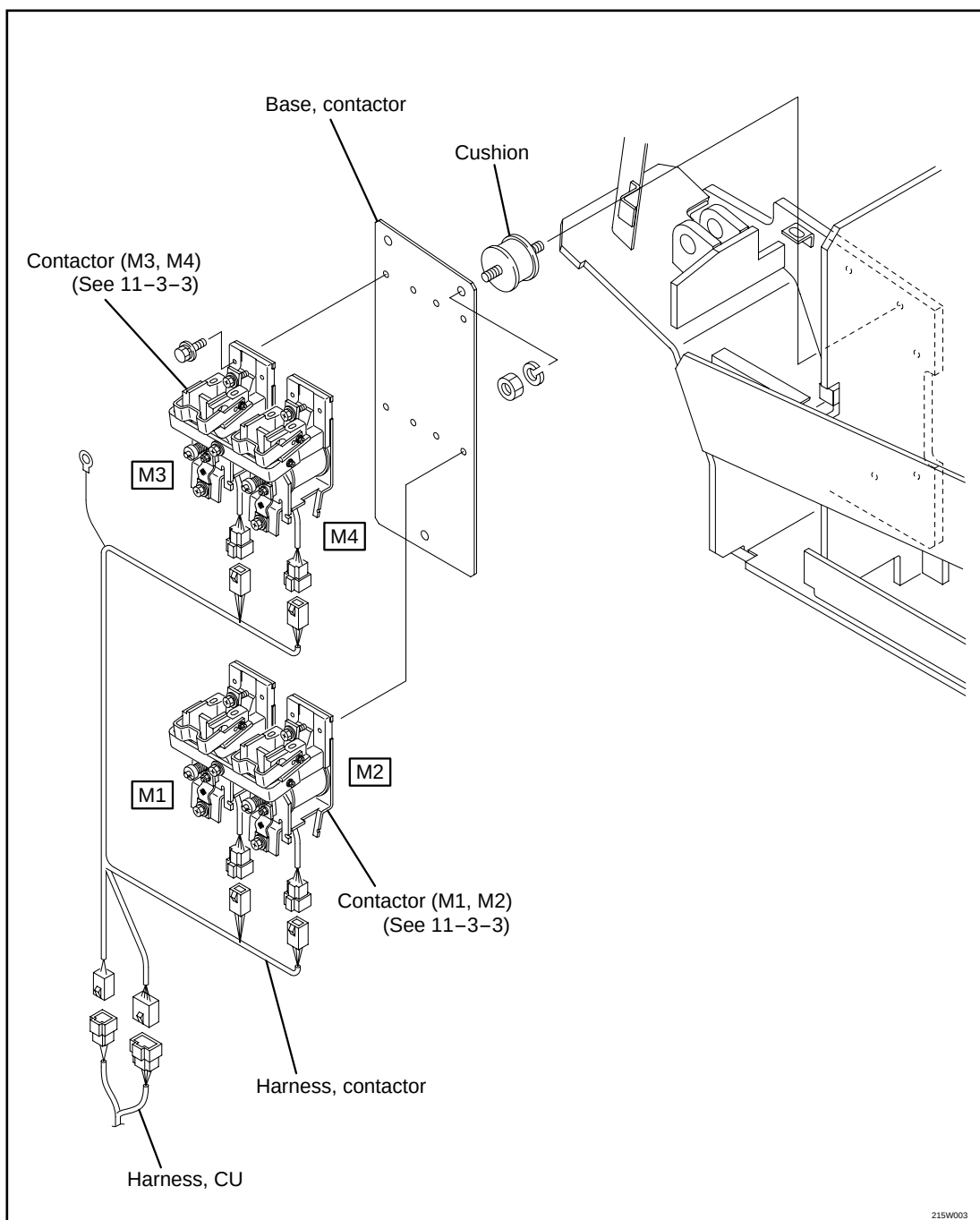
215W009E

11- 3. Forward/backward contactor

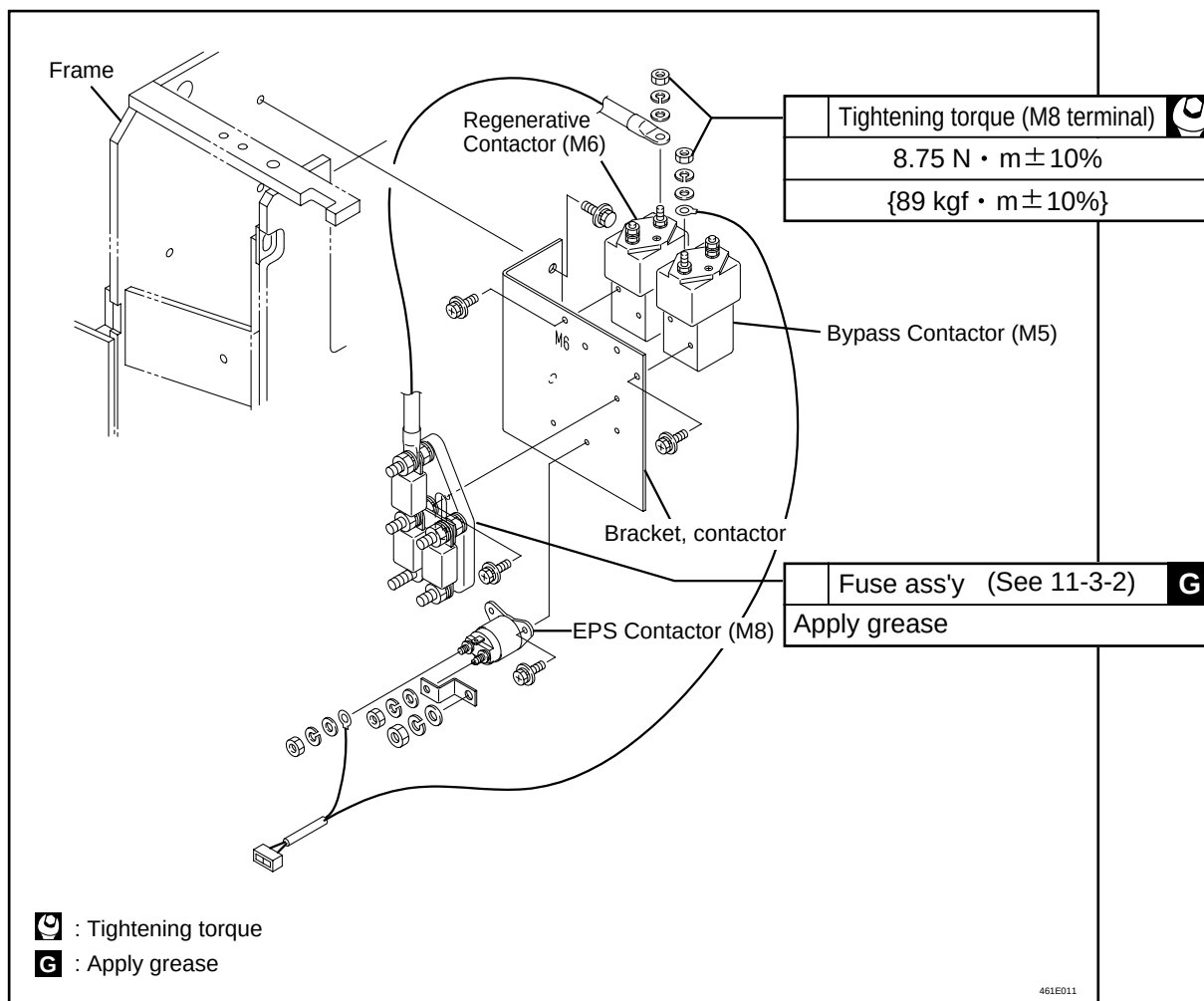
Contactor	Coil resistance
Forward/Backward (M1,M2,M3,M4)	34 Ω
By-pass (M5)	54 Ω
Regenerative (M6)	54 Ω

11-3-1. Disassembling and assembling

► 1 Forward/backward contactor

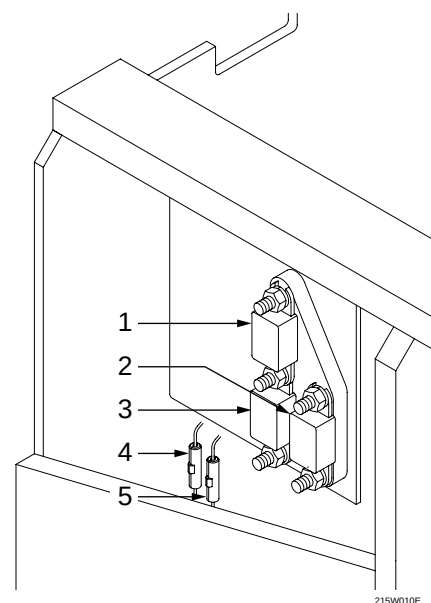


215W003

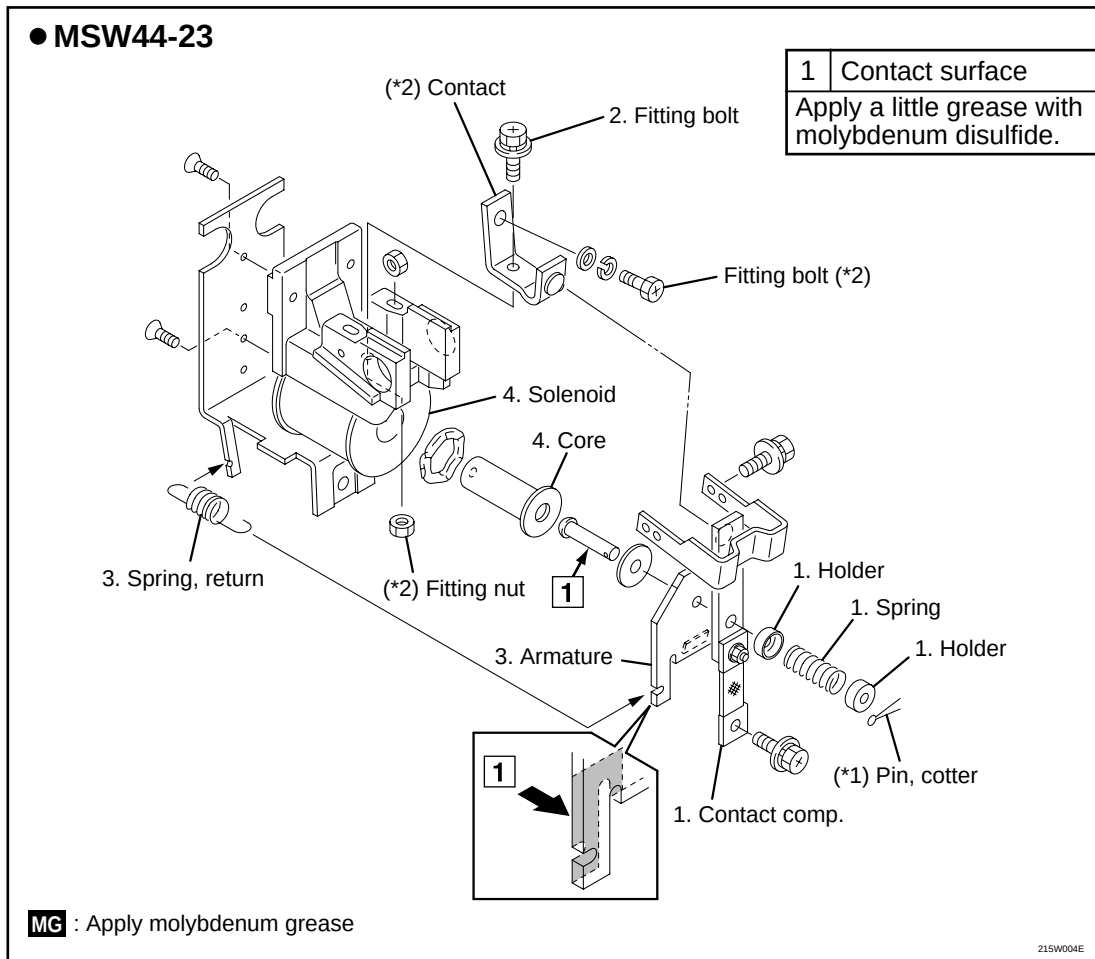
► 2 Bypass, EPS, and regenerative contactor**11-3-2. Fuse replacement procedure****⚠ CAUTION****The battery plugs must be disconnected.**

1. Fuse 40A (for EPS)
2. Fuse 40A (for Hydraulic)
3. Fuse 40A (for Travel)
4. Cartridge fuse 10A (for control circuit)
5. Cartridge fuse 10A (for accessory)

Type	Replacement procedure
Fuse	Loosen the fixing nuts and remove the fuse.
Cartridge fuse	Open the glass case and remove the cartridge fuse.
If the nuts are not properly tightened, contact failure could result. causing malfunctioning.	

⚠ CAUTION**Use only the specified fuses.**

11-3-3. Disassembling and assembling Fwd/Bwd contactor (M1, M2, M3, M4)



► 1 Description of disassembling procedure

1. Remove the "pin, cotter" (*1), holders and the spring to remove the "contact comp."
2. Remove fitting bolts and nut (*2) to remove the contact.
3. Remove the "spring, return" to remove the armature.
4. Remove the core and solenoid.



Be careful not to damage the coil terminals.

* For replacement of contactor only, see disassembling procedure 1.

12. LASER POINTER

12- 1. Adjustment

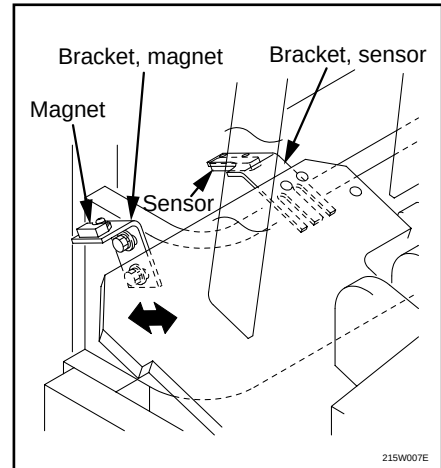
12-1-1. Fork level - adjustment

1. Raise forks to a height for easy work, and level them.
 2. Adjust the positions of the leveling sensor and the magnet so that they are struck by the laser beam.
- ➔ When the laser beam strikes the targets, the fork leveling indicator lamp will light.

Adjustment position	Within ± 1.25 degree of the fork leveling position
---------------------	--

<If the forks are not level>

Either loosen the fixing bolts of the sensor bracket to reposition it, or slightly adjust the magnet so that it is in the center of the sensor sensing element when the forks are level.



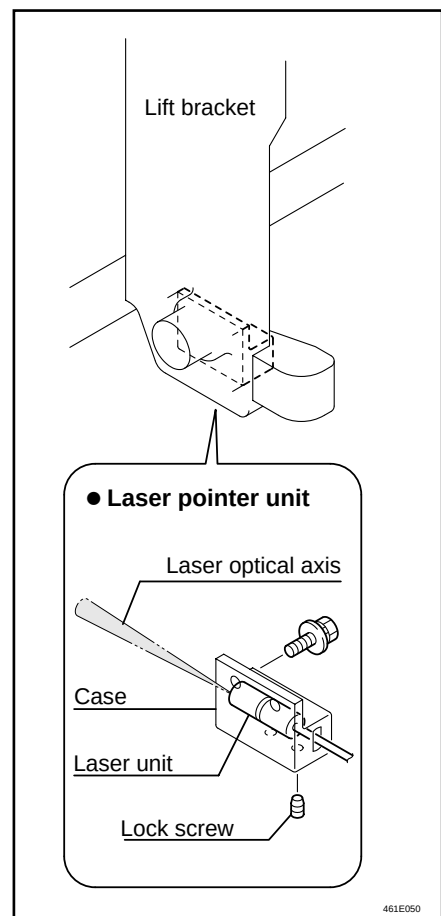
12-1-2. Laser optical axis - adjustment

1. With the forks positioned in level, adjust the height so that the optical axis of the laser is aimed at the center of the pallet insertion openings.
2. Set the distance between the fork edge and the end face of the pallet to the distance used for loading work (30mm or shorter), then park the forklift truck in line with the pallet.
3. Irradiate the pallet with the laser optical axis. Adjust the body adjustment screw so that, if a line type is used, the light is aimed at the center area of the pallet beam, and if a point type is used, at the top of the deck board.

Loosen the fixing bolts of the LASER POINTER UNIT, adjust the height by moving the case body up and down. Also adjust the horizontal direction of the optical axis by loosening the lock screw and rotating the unit (the wire portion) inside the body.

After the adjustment is complete, securely tighten the screw and fix it using a screw lock or equivalent item.

4. Drive the forklift truck forward and make sure that the forks do not hit the pallet. Also, when the forks are inserted, make sure that they do not hit the deck board. If they do, adjust the optical axis again.



13. TROUBLESHOOTING

13- 4. List of settings for FBT-67

Voltage (V)	Model	[Verification]		Rotary switch setting																		Travel speed Laden/ Unladen [km/h] [Pneumatic type]	Remarks	
				RS1																				
				RS0	3						4				5					6	8			
					Model selection		HYD LIFT-1	HYD LIFT-2	HYD TILT	HYD ATTAT-1	HYD ATTAT-2	PLUGG ING	REGENE RATE	BRAKE TRQ	TRAVEL	HYD	STEER	BATT	OIL					LOAD
48V	FBT13 type A	55±5	390±10	4.5-5.5	1	50	64	40	32	083	083	045	○	○	○	○	○	○	○	○	1	20	15.5/13.5	
	FBT15 type A	↑	↑	↑	2	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	15/13	
	FBT18 type A	↑	↑	↑	3	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14.5/12.5	
	FBT20 type A	↑	↑	↑	4	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14/12	
	FBT13 type B	↑	↑	↑	6	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	15.5/13.5	
	FBT15 type B	↑	↑	↑	7	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	15/13	
	FBT18 type B	↑	↑	↑	8	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14.5/12.5	
	FBT20 type B	↑	↑	↑	9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14/12	
	FBT13 type C	↑	↑	↑	B	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	15.5/13.5	
	FBT15 type C	↑	↑	↑	C	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	15/13	
	FBT18 type C	↑	↑	↑	D	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14.5/12.5	
	FBT20 type C	↑	↑	↑	E	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	14/12	

↑

TypeA: Equipped with no option

↑

TypeB: Equipped with regenerative braking, over discharge lift lock, and seat switch

↑

TypeC: Not either type A or B

↑

Starting current/
Current limitation

• Motor current

• Power 100%

• Gravity of electrolyte: more than 1.25

↑

Plugging brake distance

• On smooth road, loaded, full speed

• Gravity of electrolyte: more than 1.25

• Full accelerator.

↑

RS1-5 [Safety monitor symbol]

11100010

TRAVEL
HYD.
STEER
BATT

BRAKE
LOAD
OIL

↑

RS1-7 [Option set]

00100000

Option board
Spare
Hydraulic chopper
Regenerative contactor

Monitoring
Sheet switch
Over discharge lift lock
Spare

↑

GS battery only

↑

* Language should be as follows unless otherwise specified:
In Japan: Japanese [0]
Overseas: English [1]

↑

RS1-6

Language

Display when key switch is ON

[0]

Japanese

モニタリング OK

[1]

English

MONITORING OK

[2]

French

CONTROLEUR OK

[3]

Germany

UEBERWACHUNG OK

[4]

Spanish

MONITOR OK

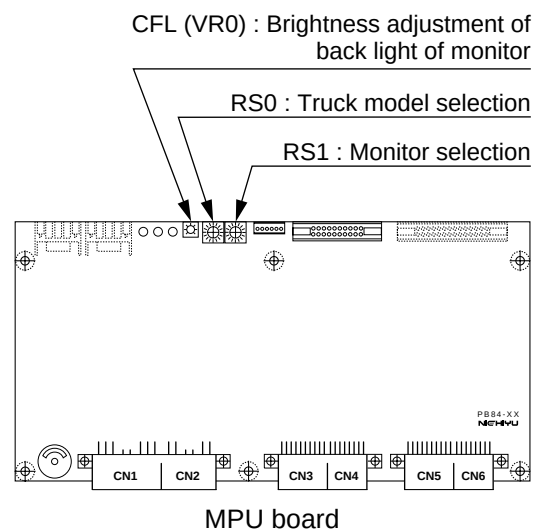
[5]

Dutch

MONITOR OK

13- 5. Setting of volume and rotary switch

When replacing MPU board, current sensor or when necessary, adjust a volume and two rotary switches on the MPU board.

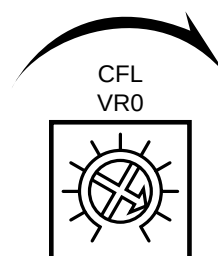


13-5-1. Volume

1. **CFL (VR0) : Brightness adjustment of back light of monitor.**

Make sure to see the display clearly even indoor.

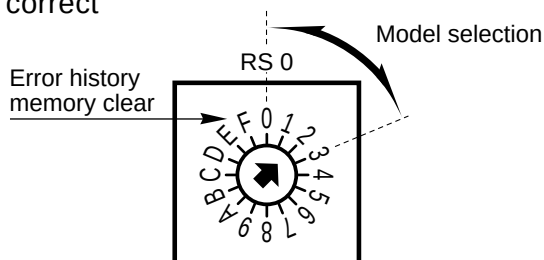
Turning clockwise
bright contrast



13-5-2. Rotary switch

1. **RS0 : Truck model selection**

The RS0 is for the truck model selection. If this selection is not match with the actual model, the truck does not operate correctly. When replacing the MPU board, the original rotary switch settings should be recorded, or refer to the setting table for RS0 to set to the correct positions.



Setting position	Applicable truck model
0	Not used
1	FBT13 type A
2	FBT15 type A
3	FBT18 type A
4	FBT20 type A
5	Not used
6	FBT13 type B
7	FBT15 type B
8	FBT18 type B
9	FBT20 type B
A	Not used
B	FBT13 type C
C	FBT15 type C
D	FBT18 type C
E	FBT20 type C
F	Clearing error history (turn the key switch on under this condition)

*Type A : Equipped with no options.

Type B : Equipped with regenerative braking, over discharge lift lock, and seat switch.

Type C : Not either type A or B.

*For the model other than type A or B, the options must be set as type C.



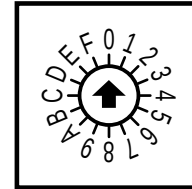
The "F" position of the RS0 is the clear function for the error history memory. Pay attention not to turn on/off the key switch to prevent the accidental clear.

2. RS1 : Monitor selection

RS1 is used for the adjustments of current level, starting current, current limitation, I / O checking, ...etc, for various adjustments.

Refer to the below table in details.

RS1 : Monitor selection

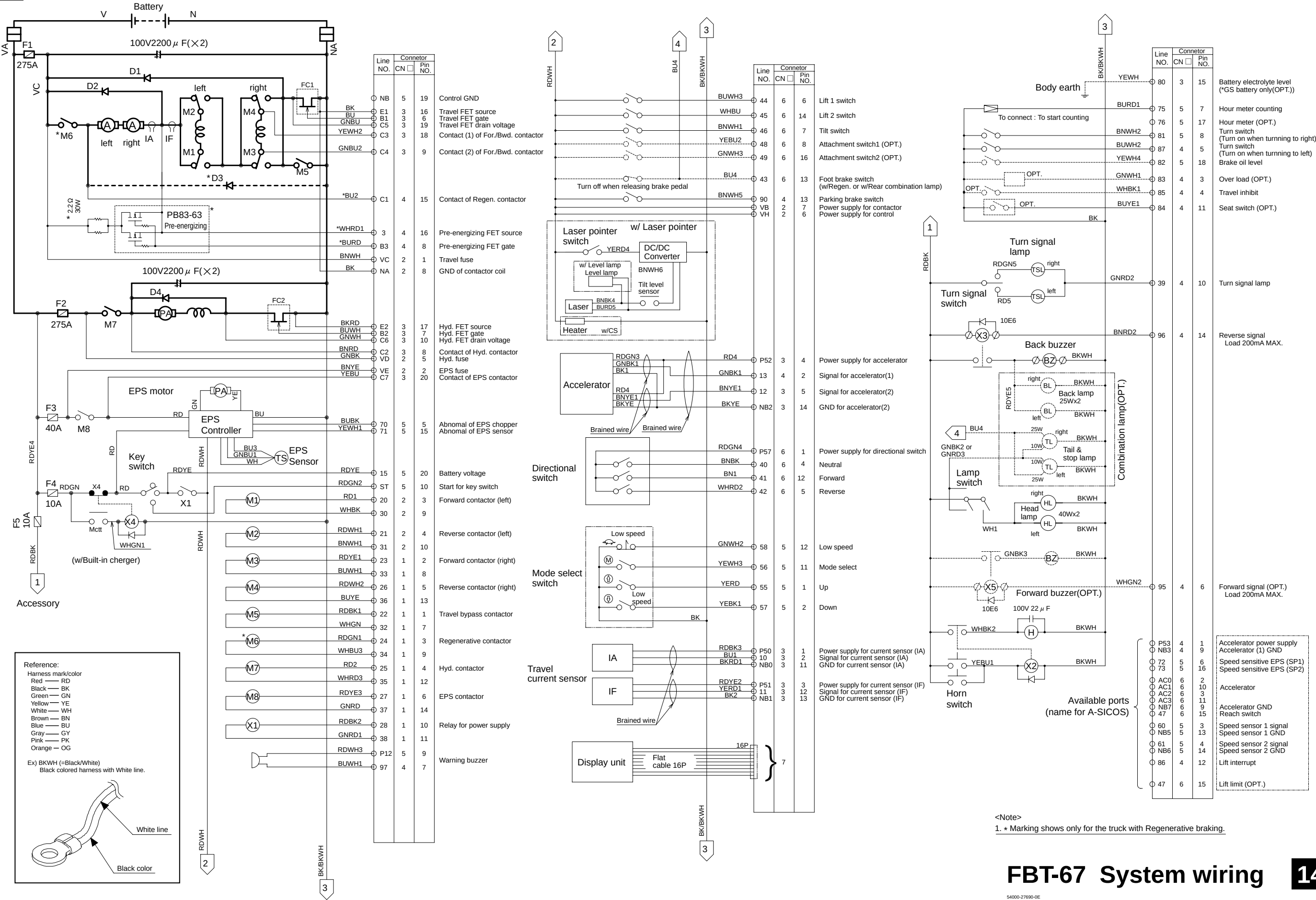


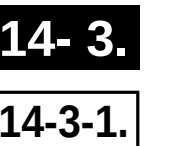
Position	Functions	Remarks
0	Normal monitor	Hour meter display (Total, Traveling, Hydraulic)
1	Current Level of If (Field)	Adjust ; (–) minus value indication : Up ▲ button
	Current Level of Ia (Armature)	(+) plus value indication : Down ▼ button
	Current Gain of If (Field)	Adjust ; (Actual current) > (Displayed value) : Up ▲ button
	Current Gain of Ia (Armature)	(Actual current) < (Displayed value) : Down ▼ button
2	Starting current	0 – approx. 50A
	Current limitation for travel	100 – 440A
3	Lift speed 1	0 ➡ 64 (Fast) : Low speed (1st micro switch)
	Lift speed 2	0 ➡ 64 (Fast) : Hight speed (2nd micro switch)
	Tilt speed	0 ➡ 64 (Fast)
	Attachment 1 speed	0 ➡ 64 (Fast)
	Attachment 2 speed	0 ➡ 64 (Fast)
4	Plugging brake distance	0 – 100
	Regenerative brake distance	0 – 100
	Regenerative brake force	0 – 100
5	Monitor symbols	TRAVEL, HYD, STEER, BATT. OIL, LOAD, BRAKE
6	Language selection	Japanese, English, French, Germany, Spanish, Duch
7	Option set	Regen. contactor / over discharge lift lock, etc
8	Level adjustment of regenerative function	0 – 30
9	Setting letters on monitoring	(Used in factory)
A	Display of battery discharge	(Used in factory)
B	Error history memory 1	Memory No : error No = Travel mode, Hyd mode ;
	Error history memory 2	Same as SICOS 50, SICOS 60
C	Display of selected model	Display of model selection by RS0
D	Address data	(Used in factory)
E	I/O memory data	(Used in factory)
F	Hour meter when troubled	Display of hour meter when troubled

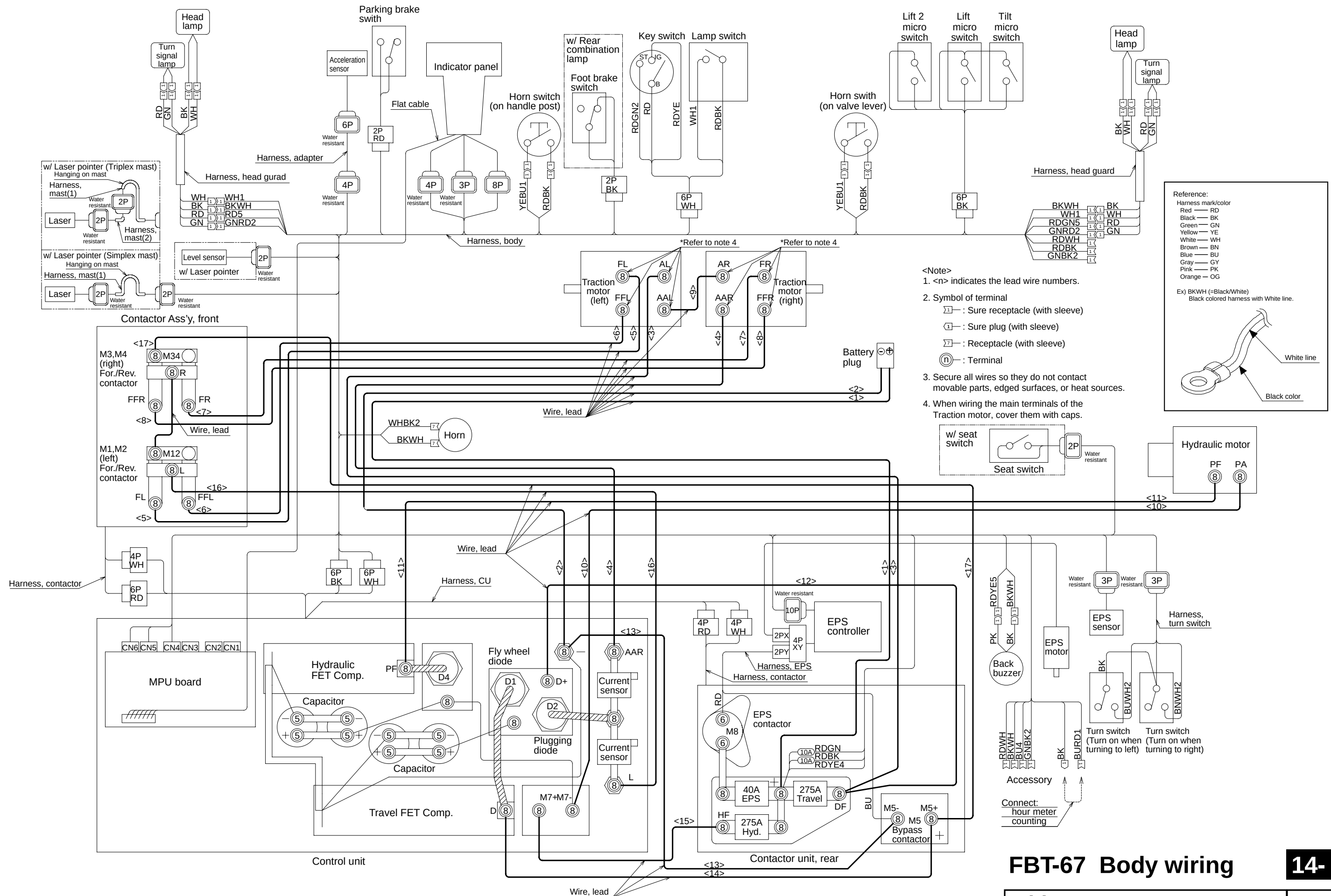
Each setting should be conforming to "List of setting values".

(See Page 34.)

14. SERVICE DATA AND WIRING (DIAGRAMS)





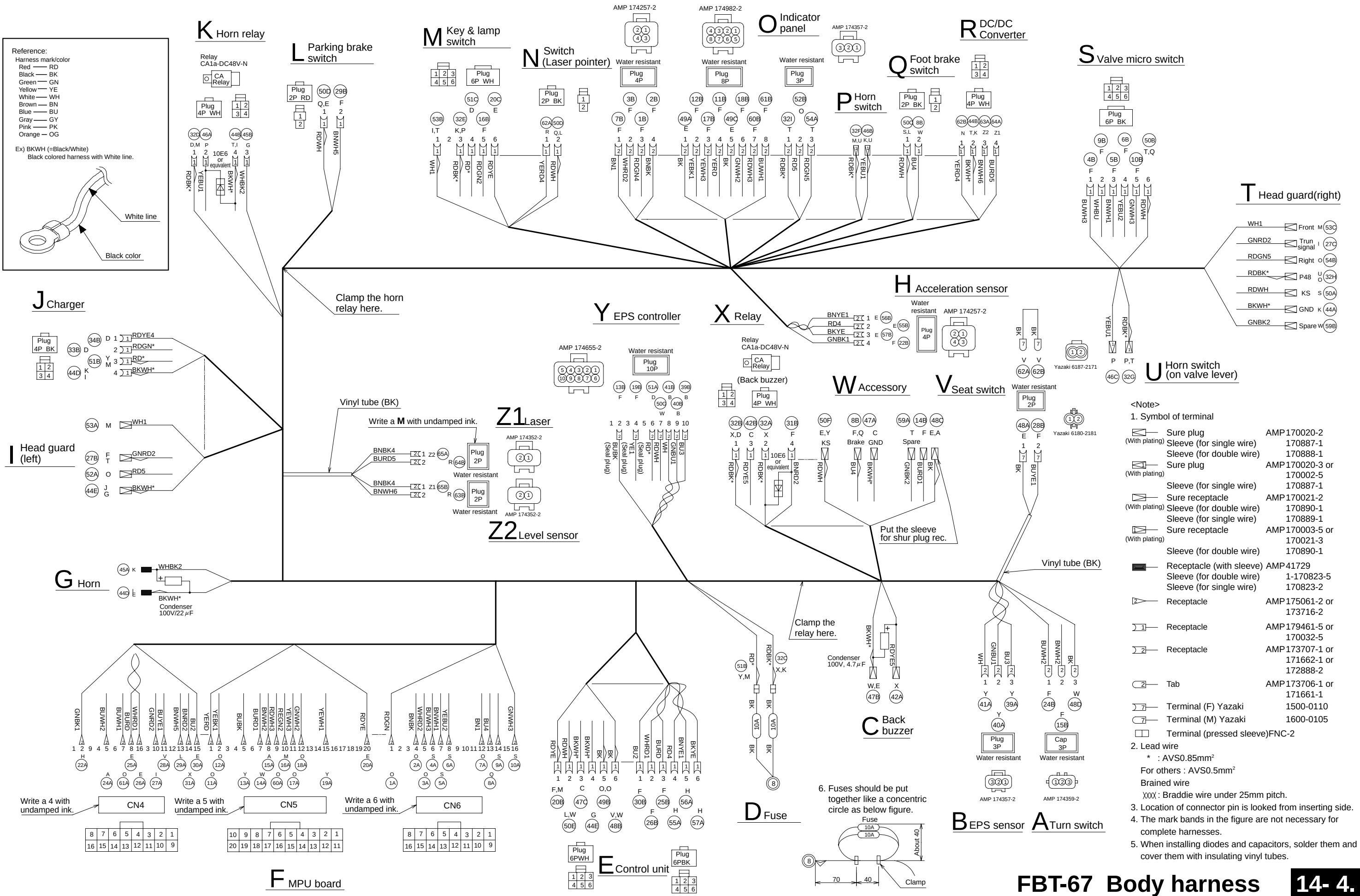


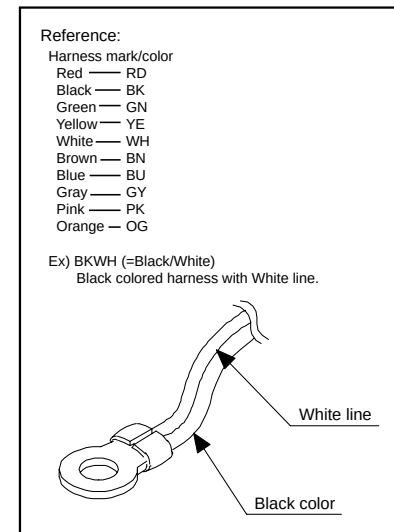
FBT-67 Body wiring

14- 3.

Without Regen.

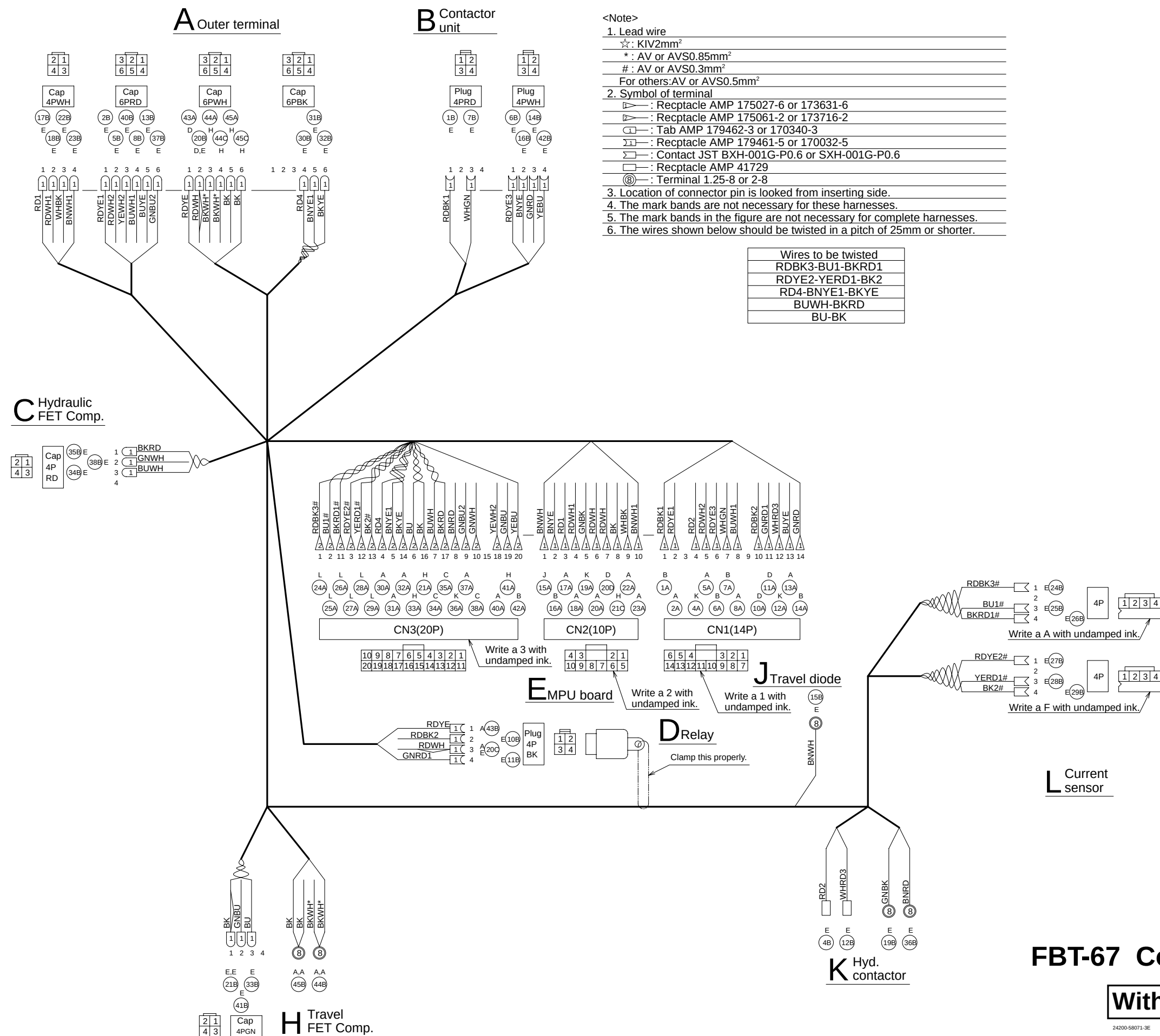
14-3-2.





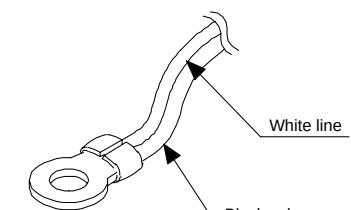
With Regen.	14-5-1.
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CU101-51E/57E



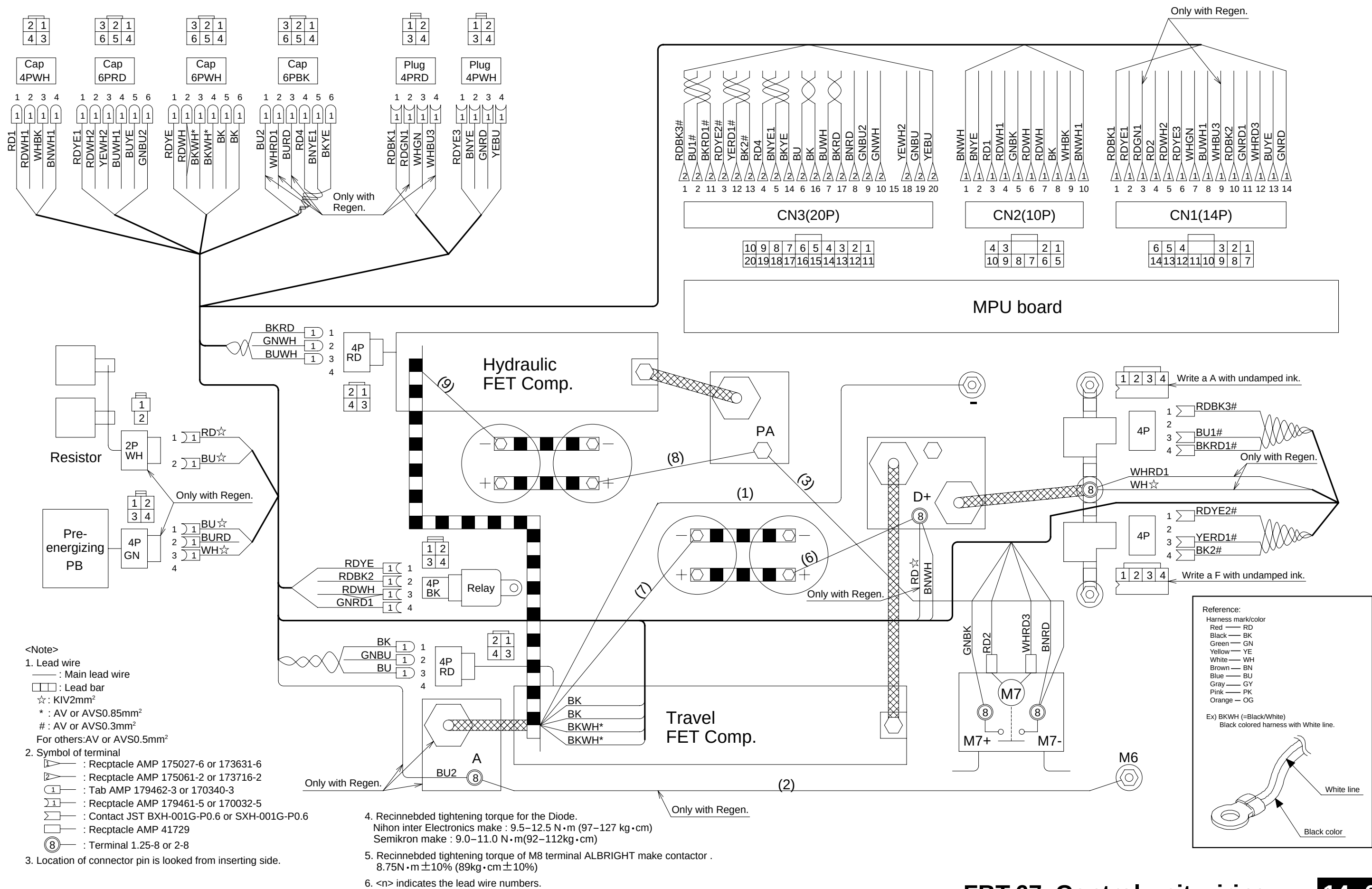
Reference:
 Harness mark/color
 Red — RD
 Black — BK
 Green — GN
 Yellow — YE
 White — WH
 Brown — BN
 Blue — BU
 Gray — GY
 Pink — PK
 Orange — OG

Ex) BKWH (=Black/White)
Black colored harness with White line.

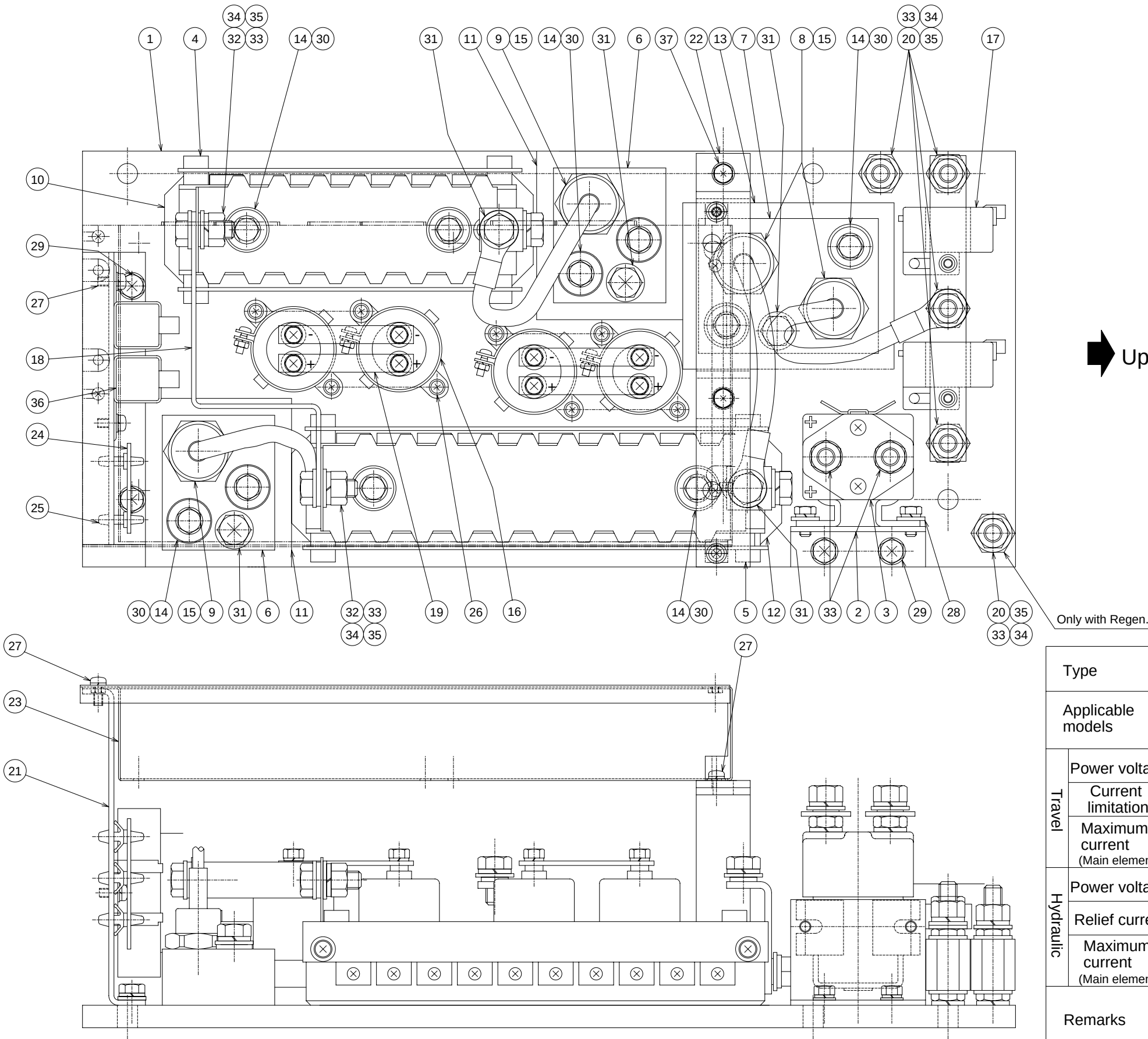
**FBT-67 Control unit harness** **14- 5.**

Without Regen.	14-5-2.
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▶ **CU101-52**



FBT-67 Control unit wiring



Part No.	54000-29310-0 CU101-52D Without regen	54000-29300-0 CU101-51E With regen	54000-29320-0 CU101-56D Without regen CS	54000-29330-0 CU101-57E With regen CS
② Bracket(1), MPU board	24200-57681	24200-57561	24200-57681	24200-57561
③ Contactor	35810-05590 SW80-643	35810-05590 SW80-643	35810-05630 SW80-704	35810-05630 SW80-704
Remarks	Lead wire SHLV	Lead wire SHLV	Lead wire WL1	Lead wire WL1



- <Note>
1. Apply conductive compound TSK550(Toshiba Silicones Co., Ltd) on all surfaces between the "FET comp.", "Diode", "Sink, heat", "Sheet, insulator", and the base.
 2. Recinnebbed tightening torque for the diode.
Nihon inter Electronics make : 9.5–12.5 N・m (97–127 kg・cm)
Semikron make : 9.0–11.0 N・m(92–112kg・cm)
 3. Recinnebbed tightening torque for the contactor M8 terminal.
8.75N・m±10% (89kg・cm±10%)

37	0077-05010	Screw, w/washer
36	24200-59260	Resistor comp.
35	0000-00008	Nut
34	0000-70008	Washer, lock
33	0000-72008	Washer, plain
32	0110-08020	Bolt
31	0016-08016	Bolt, w/washers
30	31010-02200	Bolt, w/washers
29	31010-03600	Bolt, w/washers
28	31010-03590	Bolt, w/washers
27	0075-04010	Screw, w/washers
26	0075-03006	Screw, w/washers
25	35890-00030	Spacer
24	24200-64980	Board comp., printed
23	54000-29200	Board comp., MPU
22	24200-58830	Bracket(1), MPU board
21	←→	Bracket(1), MPU board
20	24200-63030	Terminal
19	24200-14910	Bar, capacitor
18	24200-54830	Bar (2), lead
17	24200-54810	Sensor Comp., current
16	39110-01180 or 39110-01120	Capacitor
15	24200-05570	Tube
14	25200-00450	Cup, insulator
13	8432-10020	Sheet, insulator
12	24200-19610	Sheet, insulator
11	25200-00470	Sheet, insulator
10	25200-00280	Sheet, insulator
9	35010-01700	Diode
8	1911-59015	Diode
7	25200-01650	Sink, heat
6	24200-48090	Sink, heat
5	24200-36180	FET comp.
4	24200-36170	FET comp.
3	←→	Contactor
2	24200-54801	Bracket, contactor
1	24200-57921	Base, control unit

Type		CU101-51E/52D/56D/57E
Applicable models		FBT-65/67
Travel	Power voltage	48 V
	Current limitation	390 A
	Maximum current (Main element)	1000 A
Hydraulic	Power voltage	48 V
	Relief current	280 A
	Maximum current (Main element)	700 A
Remarks		When installing, make sure the arrow points up.

FBT-67 Main controller ass'y 14- 7.

CU101-51E/52D/56D/57E

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