

Foreign To

8244346



SM-FB(10-13-15)M1

LOC: AV 05 E 05

Qty: st

Ord: 0

KOMATSU

MACHINE MODEL

SERIAL NO.

FB10M, 13M

1001 and up :

FB15M

1001 and up

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SPECIFICATIONS

Model					FB10M-1	FB13M-1	FB15M-1	
Load Capacity				kg	1000	1250	1500	
Load Center				mm	500	500	500	
Rated Capacity at 24" Load Center				kg	910	1110	1350	
Max. Fork Height				mm	3000	3000	3000	
Free Lift				mm	430	430	430	
Battery Voltage				V	48	48	48	
PERFORMANCE	Speeds	Lifting	Loaded	mm/sec.	270	250	240	
			Unloaded	mm/sec.	370	370	370	
		Lowering	Loaded	mm/sec.	450	450	450	
			Unloaded	mm/sec.	450	450	450	
		Travel (Forward & Reverse)	Loaded	km/h	12.5	12.0	11.5	
			Unloaded	km/h	14.5	14.0	13.5	
	Tilting Angle		Forward	deg.	3	3	3	
			Backward	deg.	6	6	6	
	Turning Radius (Outside)				mm	1350	1350	1440
	Min. Intersecting Aisle				mm	2885	2885	2980
	Right Angle Stacking Aisle (Plug Load Length)				mm	1685	1685	1780
	Max. drawbar pull				kg	605	605	610
	Gradeability			Load	%	16	14	12
Unloaded				%	27	25	22	
WEIGHT	Service Weight (Including Battery)				kg	2325	2550	2875
	Battery and Case Weight (STD. Capacity)				kg	600	600	710
	Weight Distribution	Unloaded	Front	kg	1060	1100	1240	
			Rear	kg	1265	1450	1635	
		Loaded	Front	kg	2925	3340	3835	
			Rear	kg	400	460	540	
	Counterweight				kg	600	820	820
	MOTOR	Drive	Type			DC series wound	DC series wound	DC series wound
			Rated RPM			2250	2250	2250
			Rated Output		kW/1 hr. rating	4	4	4
Pump		Type			DC series wound	DC series wound	DC series wound	
		Rated RPM			2350	2350	2350	
		Rated Output		kW/5min. rating	5	5	5	
Drive Control System					SCR	SCR	SCR	
BRAKES								
Brakes	Foot Brake				Hydraulic	Hydraulic	Hydraulic	
	Hand Brake				Mechanical	Mechanical	Mechanical	
BATTERY (Optional)								
STD. Capacity				AH/5-h. rating	280	280	390	
Large Capacity				AH/5-h. rating	312	312	476	
TIRES								
Tire size	Front				18x7-8-10PR	18x7-8-14PR	18x7-8-14PR	
	Rear				18x7-8-10PR	18x7-8-14PR	18x7-8-14PR	

HANDLING OF REGULAR TOOLS

A SCREW DRIVER

1. Handling of screw driver

- 1) Select a screw driver best suited to the size of a screw. Inappropriate screw driver may cause break to the groove of a screw, and may chip the edge of screw driver. In addition, excessive force will be required, which leads to reduction of efficiency.
- 2) Do not use screw driver instead of bar. Screw driver is a tool used for tightening and loosening of screws.
If used as a bar, it may cause damage to parts, give cracks to the screw driver, resulting in bent and in broken-off of screw driver edge.
Sometimes you may be subject to serious injury.
- 3) Using hammer, do not strike screw driver on its handle. Do not use screw driver instead of chisel. In particular, never strike on the handle of screw driver whose shaft does not penetrate through the handle, because such handle breaks easily.
A screw driver with a split-type handle or a penetrating handle is designed tolerable to be struck upon its head depending on works.
- 4) Do not co-use with pryer.
When impossible to tighten or loosen only with a screw driver, you might co-use a pryer to get moreforce. But, never do such a thing, or you will have your screw driver broken or the head of screw driver damaged. Take care on this point.
- 5) Do not use screw driver for purpose of electrical tests at areas where large electric current is flowing. For example, screw driver is used to make a short-circuit to check battery for its capacitance, it may not only damage battery itself, but deteriorate the edge of screw driver due to heat caused by excess current.

2. Repair of screw driver

- 1) When sharpening the edge of a screw driver by grinding, take care not to help discolor the edge of screw driver by water cooling as necessary, or the edge may be annealed to lower its hardness.
- 2) For repairing a screw driver, grind its edge straight at right angle against the center line of screw driver, and then finish all sides of the driver to get proper width and thickness which meet any groove of a screw. Note here that all sides should be finished parallel as much as possible, with less taper.

GENERAL PRECAUTION FOR DISASSEMBLY

A. PREPARATIONS BEFORE DISASSEMBLY

1. Wash the machine before moving it into the repair shop.

Prior to moving the machine into the repair shop, thoroughly remove dust and dirt by washing the machine. Dust and dirt brought into the shop will decrease the cleanliness of the parts handled in the shop, will produce scratches, and will enter the inside of reassembled units.

2. Checking and inspection before disassembly

Before attempting to disassemble, check thoroughly, determine the cause of the any trouble, and record it. This will not only prevent needless disassembly and losses from needless replacement parts and man-hour costs, but will also prevent repetition of the same trouble.

It is important to keep records of troubles and replacements in order to advise users on how to prevent trouble. Items to be checked and recorded are as follows:

- Model, machine serial number and service meter readings.
- Reason for disassembly
Check for symptom, location and cause of trouble. If necessary, try reproducing the same trouble.
- Dirty air cleaner elements and air leakage.
- Oil levels in the engine oil pan and quality of oil (viscosity, color and mixed impurities).
Water mixed in the oil and oil leakage.
Clogging of the oil filter element.
- Check for departure from the standards at the designated adjusting points.
- Damaged parts and loosening of tightened fittings.
- Maintenance conditions of the machine in service, if possible.

3. Preparation for disassembly

To save unnecessary work, reserve the necessary facilities tools, and parts racks, as well as adequate floor space, depending on the extent of disassembly. Keep the area and facilities clean.

B. PRECAUTION FOR DISASSEMBLY

1. Removal of parts

- Proceed with the disassembly by confirming the fitting conditions of the relative parts; their positions fore-and-aft, left-and-right, upper-and-lower, and the sequence of their removal.
- Confirm match marks for mating joints before separating parts and where necessary, punch match marks to clearly identify their relative position to prevent confusion during reassembly.
- For disassembly of certain designated parts, use the special tools.
- When a part, after removal of fastening nuts and bolts is still found to be unremovable, never force the part; carefully check for the cause of the tightness, and remove the cause.
- Keep the disassembled parts in an orderly condition. Take special care to identify similar parts by attaching tags or markings.
- See that standard parts such as bolts and nuts are orderly stored with reference to where they are to be used and quantity.

2. Checking and inspecting during disassembly.

- The cause of the actual trouble is often discovered in the course of disassembly. Thus careful checking of sliding surfaces for any signs of seizing or interference, and their mating conditions, is important.
- Measure and record during disassembly the various end clearances, backlashes and protrusions that are necessary to determine the trouble.

3. Maintaining clearance adjustments

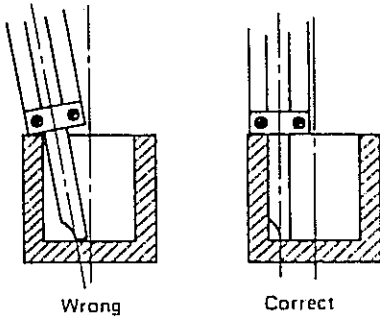
Keep each set of shims or washers stored in an orderly manner so that its original arrangement with the same clearances can be obtained at reassembly.

4. Maintaining link adjustments

Be careful to maintain the original adjustment of the rods unless some readjustment is necessary. When it is necessary to remove the rod-end for disassembly, measure and record the length of the before disassembly.

6. Micrometer

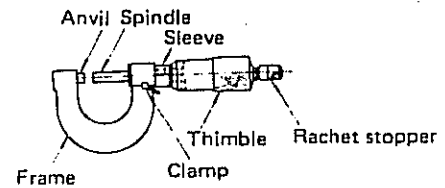
• Measurement of depth



02F018

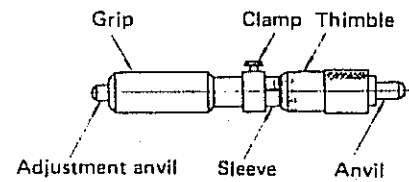
• Kind of micrometer

1) External micrometer



02F019

2) Bar-type internal micrometer



02F020

9. Inspection of finely finished parts

1) Inspection of Bearings

- Inspect bearings for rust, scratches or dents. The results should confirm the following:

Defect	Surfaces to be checked outer and side surfaces of outer race and inner race	Sliding surfaces between outer race, inner race and balls or rollers	Cage
Rusting	1/5 or more of these surfaces should not be covered with rust difficult to remove with sand-paper	No rust should be visually discernible	No rust is permitted if liable to affect the cage
Scratch	Slight scratching is permissible if it does not affect proper assembly of the bearing	No scratches should be discernible with an insect pin	A cage should be rejected if loose rivets, distortion or partial breakage if found
Pitting	Slight pitting is permissible if it does not affect proper assembly of the bearing	It is better not to use a bearing if any pitting is visually discernible	
Discoloration	A bearing should be rejected if these surfaces are discolored by burning	A bearing should be rejected if sliding surfaces are discolored by burning	

- After washing the bearings, rotate with your fingers to check for any drag. Drag may be due to dust or foreign matter entering inside or to scratches on the rolling surfaces.
- After installation, rotate the bearing with your fingers, and check whether the torque felt by hand is uniform. When uneven, there has been some error in assembling.

- 2) Inspection of O-rings and Oil Seal Rings
- Where the rubber material has hardened, replace even if it is yet unused.
 - Rings with hardened rubber have been affected by heat or by aging during storage for a long time, and will not serve as a seal.
 - Those oil seals with damage to their air-tight contacting surfaces such as their lip faces, etc., must be rejected to prevent leakage.

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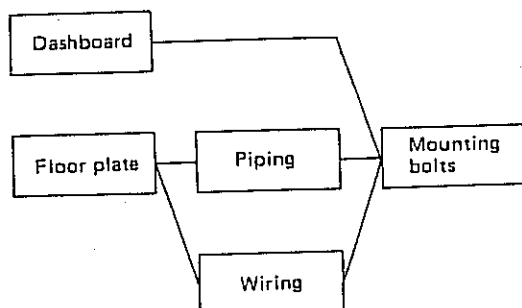
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2. UNITS INSIDE FRAME

(1) PUMP MOTOR

REMOVAL



Dashboard

No removal of the dashboard is required. It is only necessary to tilt the dashboard forward to prevent interference with the pump motor during lifting of it. The dashboard can be tilted forward after removing four mounting bolts.

Piping

Remove the hydraulic pump pipes. Also, remove the control valve pipes to prevent interference with the pump motor during lifting of it.

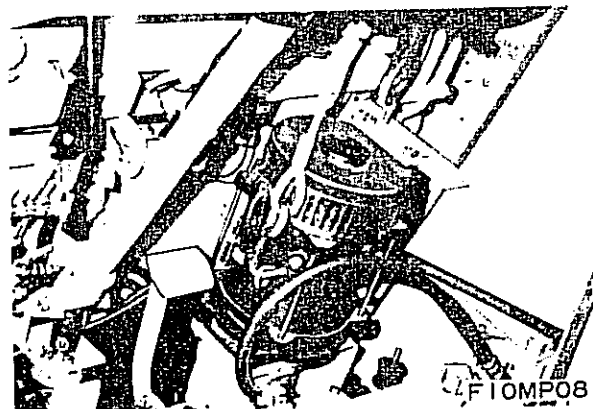


Mounting bolts

The pump motor is fixed at the upper side to the bracket and frame with two nuts and at the lower side to the frame with two bolts. Remove all nuts and bolts. Hook a sling wire rope to the upper bracket and the motor hook. Lift the pump motor and the hydraulic pump as a unit.



Weight of unit: approx. 40 kg



INSTALLATION

Each of two upper bolts is united with a cushion, just as the power steering motor mounting bolts.



Tightening torque:

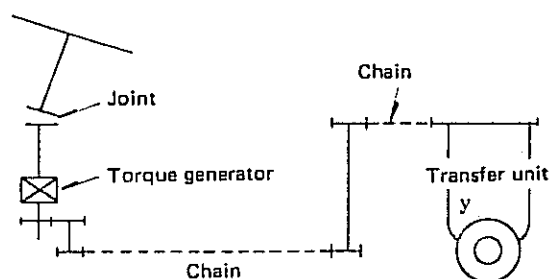
Upper 2.5 ~ 3.5 kgm

Lower 5.5 ~ 7.5 kgm

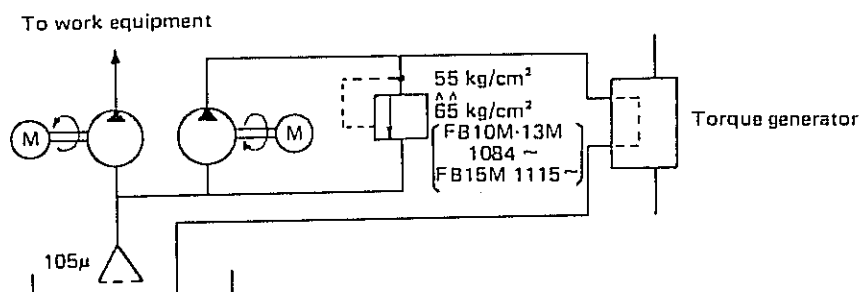
2. STEERING SYSTEM

(1) GENERAL

The steering system consists of the power steering which uses the torque generator and the steering chain which delivers rotation of the steering wheel to the transfer unit.



F10MF06



F10MF07

(2) STEERING CHAIN

See the CHECKING AND ADJUSTMENTS section.

Kind Item	Lower chain		Upper chain
	FB10M-13M	FB15M	
JIS NO.	40	40	50
Pitch (mm)	12.7	12.7	15.88
Link	163	177	73
Part No.	04100-01163	04100-01177	04100-11073

DISASSEMBLY

- When disassembly, clean the pump. Put the removed parts on clean paper or cloth to prevent them from being soiled or damaged.
- Grip the pump lightly in a vise. Remove bolts fastening the cover; remove the cover and seals.
- Pull out the bushings and gears from the pump body.
- If any hardness is felt to remove the bushing, try pressing in the gear.

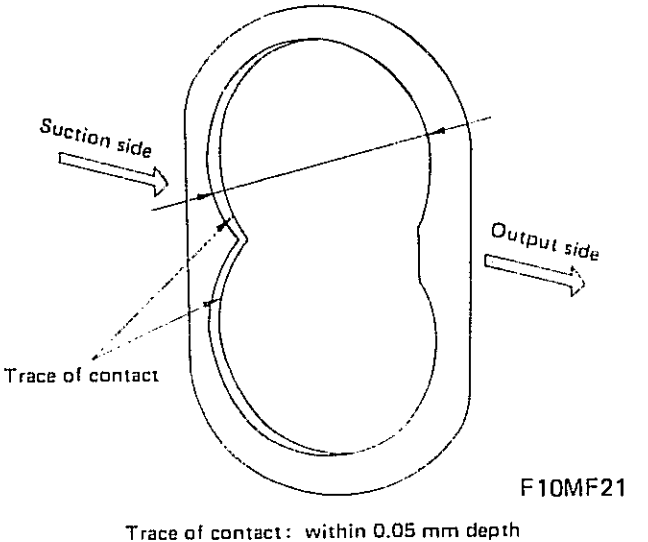
CHECKING AND INSPECTION

- Trace of contact on the body
The gear pump is so constructed that the gear teeth are kept in slight contact with the pump body during rotation to assure highly efficient pump operation. Therefore, the pump which once has been brought into operation will show a trace of gear teeth contact near the inlet port. If the trace of contact covers half or more of periphery, a considerably large wear of a bearing or a gear shaft is suspected.
- Roughness of bushing sliding surface
Roughness of inside sliding surface is mostly caused by contamination of oil. Flush the oil circuit as a whole and change oil. Roughness may also be caused by overload due to relief valve trouble, or by cavitation, aeration, excessive oil temperature rise, deteriorated oil, low oil viscosity, etc. Further, roughness of sliding surface may be accompanied by roughened or worn gear shaft and side surface. Replace the gears when bushings are replaced.

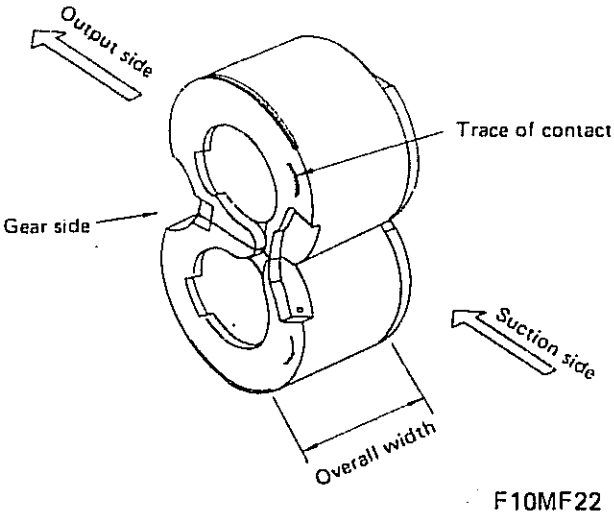
Overall width of bushing (allowable limit)

Side	PAR014	Measuring tool	Remedy
Bracket side	28.4	Vernier caliper	Replace
Cover side	30.4	Vernier caliper	Replace

- The gear shafts and gear side faces may be considered normal if hydraulic oil remains clean. Contrarily, a roughened or discolored surface is an evidence of some abnormality of the bushing and pump body. Check the bushing and pump body again.



Trace of contact: within 0.05 mm depth



F10MF22

ASSEMBLY

* Reassembly of the may be accomplished by reversing the order of disassembly. Care should be given to the following, since the control valve has been machined as precise as the unit of 1/1000.

1. Repairing the scratched spool and valve body
 - Polish the scratched surface with a fine-grain oil stone or emery cloth.
 - Be sure to replace the scratched spool to prevent damage to the U-packing.
2. Wash removed parts thoroughly. Blow off detergent and dust completely with compressed air. Coat the cleaned parts with hydraulic oil.
 - Never use rags to remove detergent and dust.
 - When using kerosene, light oil or trichloroethylene as detergent, keep it far away apart from fire.
3. Replace the dust seal, U-packing and O-ring with new ones. Coat them with grease and take care not to damage during installation. When cleaning them, use hydraulic oil for detergent.
4. When assembling a control valve with three or more spools, coat the threads of bolts for fastening blocks to each other with molybdenum disulphide. Tighten the bolts diagonally and in sequence.

 Tightening torque: 5 ~ 7 kgm

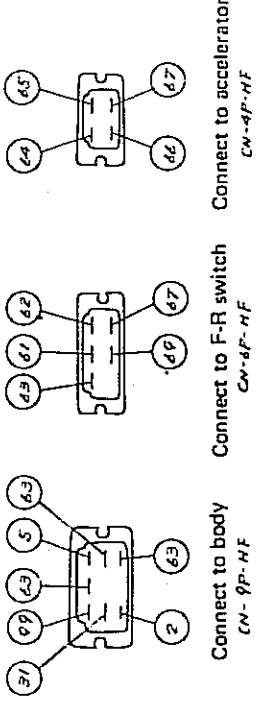
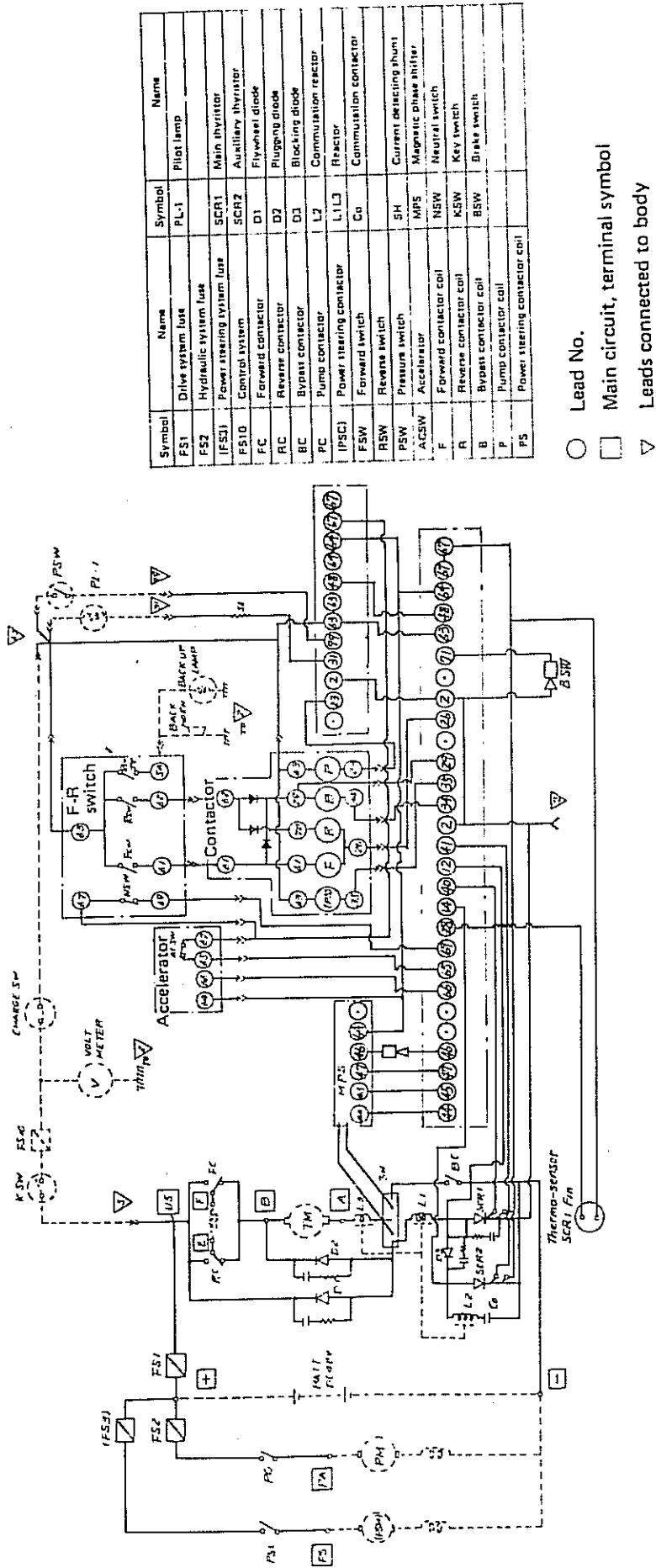


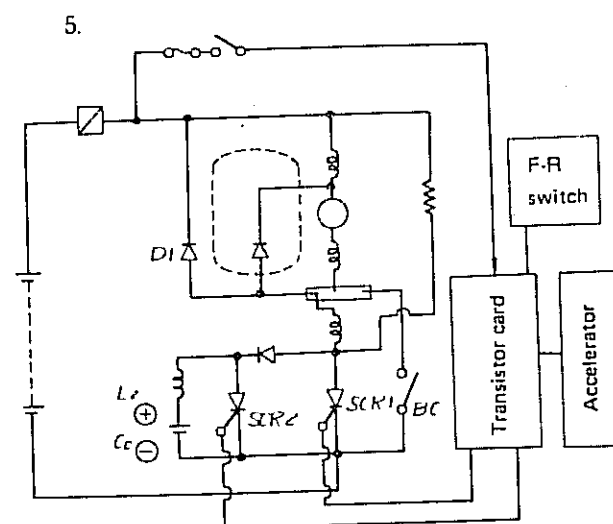
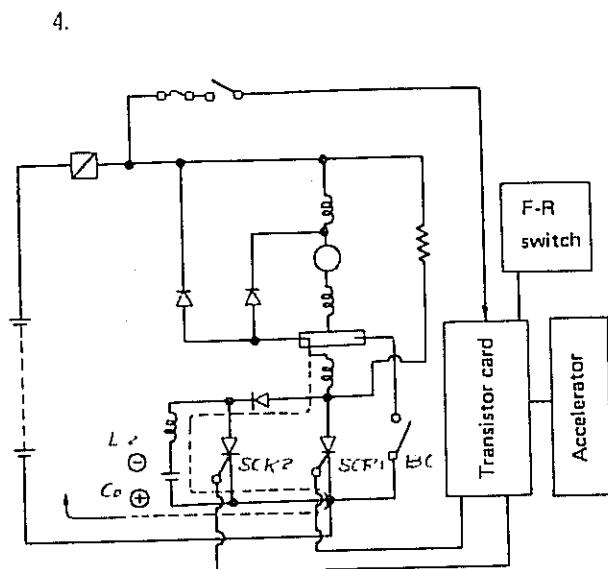
Fig. 6 Circuit drawing

4. Since the condenser C_0 and reactor L_2 form an oscillation circuit, the condenser C_0 is charged inversely and a reverse flow of current occurs. As this reverse current cancels the current flowing through the SCR_1 and SCR_2 , both thyristors are turned off.

5. Charging the condenser C_0 continues even after two thyristors have been turned off. Finally, the condenser is charged in the polarity shown in the figure. Motor current is continued flowing through the free wheel diode D_1 .

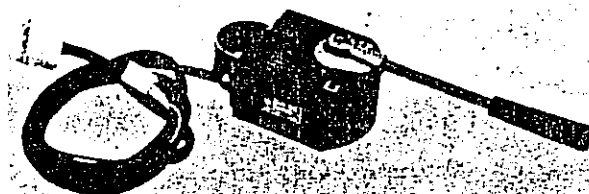
By repeating the abovementioned steps (2) to (5), chopper operation is made.

In this control system, the by-pass contactor (BC) will be thrown in automatically when conduction rate of thyristor exceeds 80 percent under full operation of the accelerator, to allow full battery voltage to apply directly to the motor.



3) FR switch

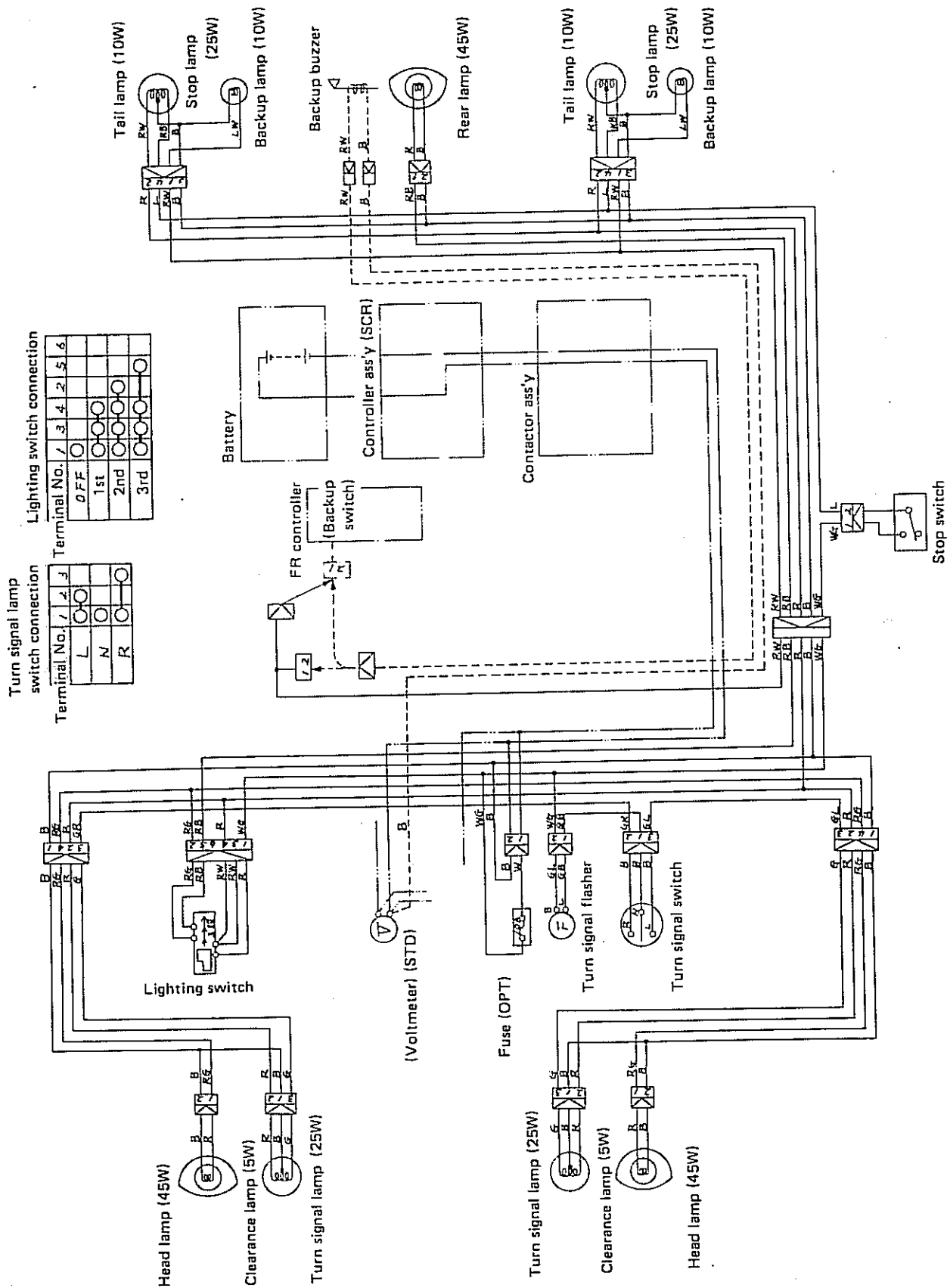
- The FR switch assembly consists of the FR switch, wire harness, 6-pin connector (female) and 2-pin connector (female).



F-R Switch Assembly

FB10M, 13M, 15M

(5) WIRING DIAGRAM FOR ELECTRICAL DEVICES ON MACHINE BODY



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