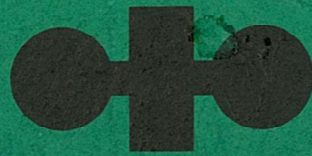


# SHOP MANUAL

## KOMATSU

# FB10M, 13M-1

# FB15M-1



SHOP MANUAL

FB10M, 13M, 15M-1

BE1

MACHINE MODEL

FB10M, 13M

FB15M

SERIAL NO.

1001 and up

1001 and up

 **KOMATSU FORKLIFT CO., LTD.**

# CORRECTION OF SHOP MANUAL

## 1. Purpose

This correction is to correct mistakes in the shop manual.

Please note these correction in your shop manual.

## 2. Details

The incorrect sentences are showed until underline.

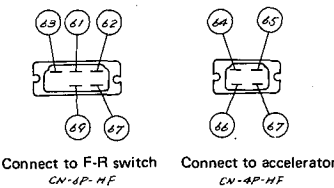
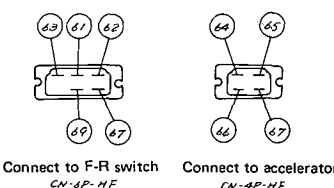
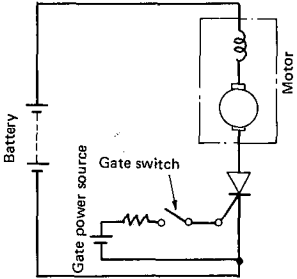
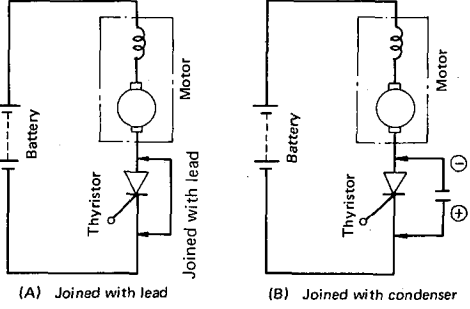
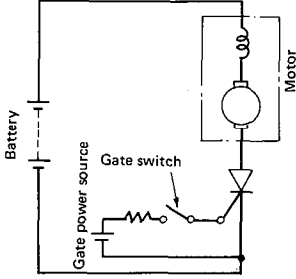
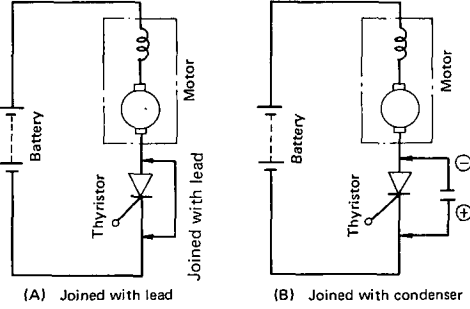
Please correct them according to the below tables.

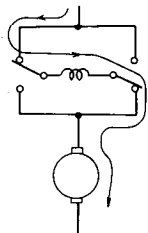
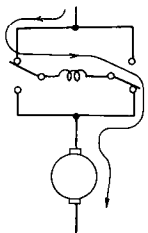
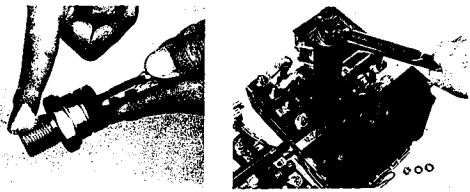
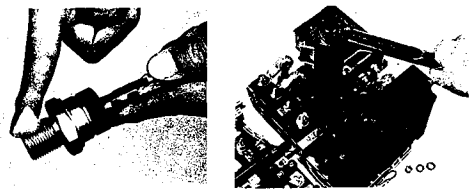
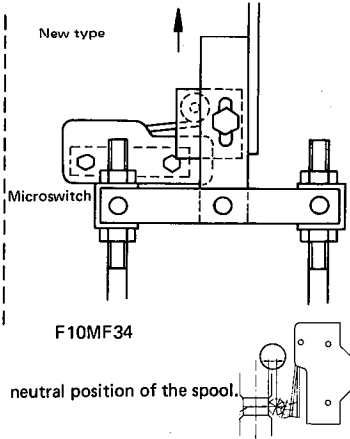
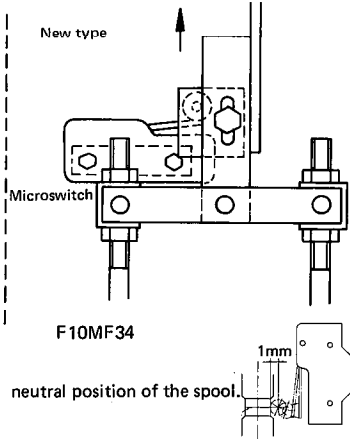
Index No.	Incorrect	Correct
13-32	<p>Referring to (A) of figure <u>4</u>, let us assume that the switch is turned on and off repeatedly at a short period. Due to inertia of the rotating parts, the motor cannot follow up such a quick repetition of switching operation. Let "t" denote the switch ON time and "T" denote the period of switching operation. Average voltage applied to the motor can be expressed by the formula <math>V_M</math> (average voltage applied to motor) = <math>V_B</math> (battery voltage) x t/T. t/T indicates the rate of conduction.</p> <p>(B) and (C) of figure <u>4</u> correspond to low motor speed and high motor speed, respectively. Since the control circuit is opened and closed very frequently, the switch shown in (A) of figure <u>4</u> must be durable enough to withstand such a highly frequent switching operation. Thyristor (SCR) is the most suitable for this purpose.</p>	<p>Referring to (A) of figure <u>1</u>, let us assume that the switch is turned on and off repeatedly at a short period. Due to inertia of the rotating parts, the motor cannot follow up such a quick repetition of switching operation. Let "t" denote the switch ON time and "T" denote the period of switching operation. Average voltage applied to the motor can be expressed by the formula <math>V_M</math> (average voltage applied to motor) = <math>V_B</math> (battery voltage) x t/T. t/T indicates the rate of conduction.</p> <p>(B) and (C) of figure <u>1</u> correspond to low motor speed and high motor speed, respectively. Since the control circuit is opened and closed very frequently, the switch shown in (A) of figure <u>1</u> must be durable enough to withstand such a highly frequent switching operation. Thyristor (SCR) is the most suitable for this purpose.</p>
	<p>(C) High revolutions</p> <p style="text-align: center;"><u>Fig. 4</u> Principle of speed change in drive motor</p>	<p>(C) High revolutions</p> <p style="text-align: center;"><u>Fig. 1</u> Principle of speed change in drive motor</p>
13-33	<p>(Code)</p> <p>SCR<sub>1</sub> : Main thyristor                      SCR<sub>2</sub> : Aux. thyristor                      D<sub>1</sub> : Free wheel diode                      D<sub>2</sub> : Plugging diode                      D<sub>3</sub> : Blocking diode                      L<sub>2</sub> : Commutation reactor                      L<sub>1</sub>, L<sub>3</sub> : Reactor                      Co : Commutation condenser                      PS : Power steering contactor coil                      PSC : Power steering contactor</p> <p>Detailed circuit is shown in <u>Figure 7</u>.</p> <p>FB10M, 13M, 15M</p>	<p>(Code)</p> <p>SCR<sub>1</sub> : Main thyristor                      SCR<sub>2</sub> : Aux. thyristor                      D<sub>1</sub> : Free wheel diode                      D<sub>2</sub> : Plugging diode                      D<sub>3</sub> : Blocking diode                      L<sub>2</sub> : Commutation reactor                      L<sub>1</sub>, L<sub>3</sub> : Reactor                      Co : Commutation condenser                      PS : Power steering contactor coil                      PSC : Power steering contactor</p> <p>Detailed circuit is shown in <u>Figure 2</u>.</p> <p>FB10M, 13M, 15M</p>

**❁ KOMATSU FORKLIFT CO., LTD.**

2-3-4, Akasaka, Minato-ku, Tokyo

SERVICE MATERIAL SECTION, SERVICE DEPARTMENT

Index No.	Incorrect	Correct
13-34	 <p style="text-align: center;">Connect to F-R switch    Connect to accelerator CN-AP-HF                      CN-AP-HF</p> <p style="text-align: center;"><u>Fig. 6</u> Circuit drawing</p>	 <p style="text-align: center;">Connect to F-R switch    Connect to accelerator CN-AP-HF                      CN-AP-HF</p> <p style="text-align: center;"><u>Fig. 2</u> Circuit drawing</p>
13-35	<p>Assume that the battery, motor and thyristor are connected in series with each other as shown in figure 8. The thyristor is in "OFF" condition and no motor current flows. When an additional circuit is made between the gate and cathode of the thyristor and the gate switch is closed to feed a signal current to the gate, conduction between the anode and cathode will be made immediately ("turn on" condition) and motor current will start flowing. The turn on condition will remain even after the gate current is stopped. The signal current given to the gate is called the gate trigger signal.</p>  <p style="text-align: center;"><u>Fig. 7</u> Action of thyristor switch</p> <p>To return the thyristor from "turn on" condition to "turn off" condition, two methods are used. One method is shown in figure 9(A). In this method, a short-circuit wiring is made between the anode and cathode of the thyristor so that motor current by-passes the thyristor. The other method is shown in figure 9(B). In this method, a condenser with its charge of reversed polarity is connected across the thyristor so that the motor current flowing through the thyristor is canceled by the reverse current flowing out of the condenser. The "turn off" method for the actual chopper is similar to that shown in figure 9(B).</p>  <p style="text-align: center;"><u>Fig. 8</u> Methods of turning thyristor OFF</p>	<p>Assume that the battery, motor and thyristor are connected in series with each other as shown in figure 3. The thyristor is in "OFF" condition and no motor current flows. When an additional circuit is made between the gate and cathode of the thyristor and the gate switch is closed to feed a signal current to the gate, conduction between the anode and cathode will be made immediately ("turn on" condition) and motor current will start flowing. The turn on condition will remain even after the gate current is stopped. The signal current given to the gate is called the gate trigger signal.</p>  <p style="text-align: center;"><u>Fig. 3</u> Action of thyristor switch</p> <p>To return the thyristor from "turn on" condition to "turn off" condition, two methods are used. One method is shown in figure 4(A). In this method, a short-circuit wiring is made between the anode and cathode of the thyristor so that motor current by-passes the thyristor. The other method is shown in figure 4(B). In this method, a condenser with its charge of reversed polarity is connected across the thyristor so that the motor current flowing through the thyristor is canceled by the reverse current flowing out of the condenser. The "turn off" method for the actual chopper is similar to that shown in figure 4(B).</p>  <p style="text-align: center;"><u>Fig. 4</u> Methods of turning thyristor OFF</p>

Index No.	Incorrect	Correct																								
13-38	<p>motor to rotate in the normal direction as shown in figure 10(B). When the RC is actuated, direction of the current flow is reversed, and the motor is rotated in the reverse direction as shown in figure 10(C).</p> <p>(B) Forward (FC closed)</p>  <p>Fig. 9 Action of F-R contactors</p>	<p>motor to rotate in the normal direction as shown in figure 5(B). When the RC is actuated, direction of the current flow is reversed, and the motor is rotated in the reverse direction as shown in figure 5(C).</p> <p>(B) Forward (FC closed)</p>  <p>Fig. 5 Action of F-R contactors</p>																								
14-09	<p>(b) Conduction test Remove lead wire from the gate. Using the circuit tester set to "1R" range, check the resistance between the gate and cathode. In this case, connect the negative lead of tester to the gate and the positive lead to the cathode. The tester must indicate some resistance other than infinity (<math>\infty</math>) and zero. Otherwise, the SCR gate lead is disconnected or the SCR is defective. When installing a new SCR, coat the SCR threads with alkane grease (Fig. 12) and tighten to the specified torque using a torque wrench.</p>	<p>(b) Conduction test Remove lead wire from the gate. Using the circuit tester set to "1R" range, check the resistance between the gate and cathode. In this case, connect the negative lead of tester to the gate and the positive lead to the cathode. The tester must indicate some resistance other than infinity (<math>\infty</math>) and zero. Otherwise, the SCR gate lead is disconnected or the SCR is defective. When installing a new SCR, coat the SCR threads with alkane grease _____ and tighten to the specified torque using a torque wrench.</p>																								
14-10	 <p>(4) Checking the diode Table 3 indicates part number and tightening torque for diodes being used.</p> <p>Table 3 Diodes and tightening torque</p> <table border="1" data-bbox="392 1402 810 1536"> <thead> <tr> <th>Diode</th> <th>Part.No.</th> <th>Tightening torque</th> </tr> </thead> <tbody> <tr> <td>D<sub>1</sub></td> <td>SCMA4-1401</td> <td>220 kg.cm</td> </tr> <tr> <td>D<sub>2</sub></td> <td>SCMA4-1402</td> <td>220 kg.cm</td> </tr> <tr> <td>D<sub>3</sub></td> <td>SCMA4-1502</td> <td>140 kg.cm</td> </tr> </tbody> </table>	Diode	Part.No.	Tightening torque	D <sub>1</sub>	SCMA4-1401	220 kg.cm	D <sub>2</sub>	SCMA4-1402	220 kg.cm	D <sub>3</sub>	SCMA4-1502	140 kg.cm	 <p>(4) Checking the diode Table ___ indicates part number and tightening torque for diodes being used.</p> <p>Table ___ Diodes and tightening torque</p> <table border="1" data-bbox="967 1402 1385 1536"> <thead> <tr> <th>Diode</th> <th>Part No.</th> <th>Tightening torque</th> </tr> </thead> <tbody> <tr> <td>D<sub>1</sub></td> <td>SCMA4-1401</td> <td>220 kg.cm</td> </tr> <tr> <td>D<sub>2</sub></td> <td>SCMA4-1402</td> <td>220 kg.cm</td> </tr> <tr> <td>D<sub>3</sub></td> <td>SCMA4-1502</td> <td>140 kg.cm</td> </tr> </tbody> </table>	Diode	Part No.	Tightening torque	D <sub>1</sub>	SCMA4-1401	220 kg.cm	D <sub>2</sub>	SCMA4-1402	220 kg.cm	D <sub>3</sub>	SCMA4-1502	140 kg.cm
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D <sub>3</sub>	SCMA4-1502	140 kg.cm																								
14-14	 <p>New type</p> <p>Microswitch</p> <p>F10MF34</p> <p>neutral position of the spool.</p>	 <p>New type</p> <p>Microswitch</p> <p>F10MF34</p> <p>neutral position of the spool.</p> <p>1mm</p>																								



# SHOP MANUAL

## KOMATSU

# FB10M, 13M-1

# FB15M-1

MACHINE MODEL

SERIAL NO.

FB10M, 13M

1001 and up

FB15M

1001 and up

 **KOMATSU FORKLIFT CO., LTD.**

