

SHOP MANUAL

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KOMATSU

FB10/14/15/18-5

FB15H/18H-5

FB15H1/18H1-5

Sevcontrol

FB10/18.5ES

BE1

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KOMATSU FORKLIFT

SETTING UP PROCEDURE

Set VR1, VR2 and VR3 anticlockwise (min. speed) and link A7 to A10 (wiper of VR4 to bottom of Potentiometer). Close SW1 and adjust VR1 clockwise to give minimum motor speed required to maintain hydraulic flow. Open SW1, remove link from A7 to A10 and check operation of VR4 by closing SW1 and adjusting VR4. The motor speed should increase from the minimum previously set up to maximum. On units not using VR4 the motor should run up to maximum speed in a controlled fashion. SW1 is now set.

SW1 and SW3 open. Close SW2. Adjust VR2 until motor is operating at a speed sufficient to maintain a flow correct for the function selected. SW2 is now set.

SW1 and SW2 open. Close SW3. Adjust VR3 until motor is operating at a speed sufficient to maintain a flow correct for the function selected. SW3 is now set.

SYNCHRONISING FEEDS

If two or more Sevcontrollers are used from the same battery problems may arise due to 'OFF' and 'ON' pulses being fired simultaneously by different controllers thus removing energy from the commutation capacitor and causing a failure to commute. The pump logics delays the firing of an 'ON' pulse for a few microseconds after an 'OFF' pulse is fired. The external connection to this circuit is simple buss pin (Pin 11 Plug A). This pin should be connected to similar pins on other units e.g., second pump control unit, MCF traction units etc. If no other controllers are fitted the pin is left unconnected. If controllers from other manufacturers are used with a SEVCONTROLLER refer to SEVCON for advice.

SETTING OF SPEED POTENTIOMETERS

Set VR1, VR2 and VR3 anticlockwise (minimum speed) link A7 to A10 (wiper of VR4 to bottom of Potentiometer) close SW1 and adjust VR1 clockwise to give minimum speed required on motor to maintain hydraulic flow. Open SW1, remove link from A7 and A10 and check operation of VR4 by closing SW1 and operating VR4. Speed should increase from minimum previously set to maximum. SW1 operation is now set.

SW1 and SW3 open, close SW2. Adjust VR2 clockwise until motor is operating at a speed sufficient to maintain a flow correct for the function selected. SW2 operation is now set.

SW1 and SW2 open, close SW3. Adjust R3 clockwise until motor is operating at a speed sufficient to maintain a flow correct for the function selected. SW3 operation is now set.

PRELIMINARY CHECKS AND COMMISSIONING

Check:

All tools, nuts, washers, swarf and other debris has been cleared from the vicinity of all electrical parts. All electrical connections are tight and terminated correctly. VR1, VR2 and VR3 fully anti-clockwise.

Using a suitable ohmmeter ensure that there are no short circuits between battery positive and negative of the controller (battery disconnected).

Disconnect one of the motor leads on the controller and insulate the bare cable lug. Fit output Plug A to the controller.

Connect the battery and close the keyswitch.

With a suitable multimeter set on the appropriate voltage ranges, check the following Pin numbers of Plug A with respect to negative:-

<u>Pin Number</u>	<u>Correct Voltage</u>
A1	Battery Voltage
A2	Battery Voltage
A3	Battery Voltage
A4	Battery Voltage
A5	Battery Voltage
A6	0v
A7	4-8v
A8	4-8v
A9	-
A10	9-11v

Carry out the following checks:-

Close SW1
Line contactor pulls in
Open SW1
Line contactor drops out
Close SW2 (if fitted)
Line contactor pulls in
Open SW2
Line contactor drops out
Close SW3 (if fitted)
Line contactor pulls in
Open SW3
Line contactor drops out
Open keyswitch
Disconnect Battery
Reconnect Motor Lead
Connect Battery
Close Keyswitch
Close SW1
Check Unit Pulses
Operate VR4
Motor speed should increase as VR4 is adjusted

IMPORTANT

Before commencing any work on the truck this section must be carefully read.

1.

WARNING

ELECTRIC VEHICLES CAN BE DANGEROUS. REPAIRS AND ADJUSTMENTS TO THIS CONTROLLER MUST ONLY BE CARRIED OUT BY COMPETENT PERSONNEL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. ANY ATTEMPT TO MAKE UNAUTHORISED ADJUSTMENTS, TO BREAK THE SEALS, OR FIT NON-APPROVED PARTS, WILL VOID WARRANTY.

2.

FAULT FINDING - DANGER

DURING ALL FAULT FINDING OPERATIONS THE DRIVE WHEELS OF THE VEHICLES MUST BE CLEAR OF THE GROUND AND FREE TO ROTATE. THE VEHICLE MUST BE STABLE. ANY WIRING MODIFICATIONS INTRODUCED DURING THE COURSE OF FAULT FINDING MUST BE REMOVED BEFORE THE VEHICLE IS RE-COMMISSIONED.

FAILURE TO DO THIS COULD RESULT IN THE SAFETY CIRCUIT BECOMING DISABLED.

3.

IMPORTANT SAFETY NOTICE

AT THE END OF EVERY SERVICE INSPECTION ON VEHICLES FITTED WITH THE SEVCON CHOPPER CONTROLLER THE FAILSAFE CIRCUIT MUST BE CHECKED AS DETAILED IN SECTION 30. PARAGRAPH 1.

4.

LOGIC TYPE

TO SATISFY THE MANY REQUIREMENTS OF DIFFERENT ELECTRIC VEHICLES SEVERAL VARIANTS OF THE 'MC400G' LOGIC UNIT HAVE BEEN PRODUCED. IT IS VITAL THAT THE CORRECT TYPE IS IDENTIFIED BEFORE ATTEMPTING ADJUSTMENT. SUBSTITUTION OF AN INCORRECT PART NUMBER LOGIC CAN CAUSE DAMAGE OR IMPAIR PERFORMANCE.

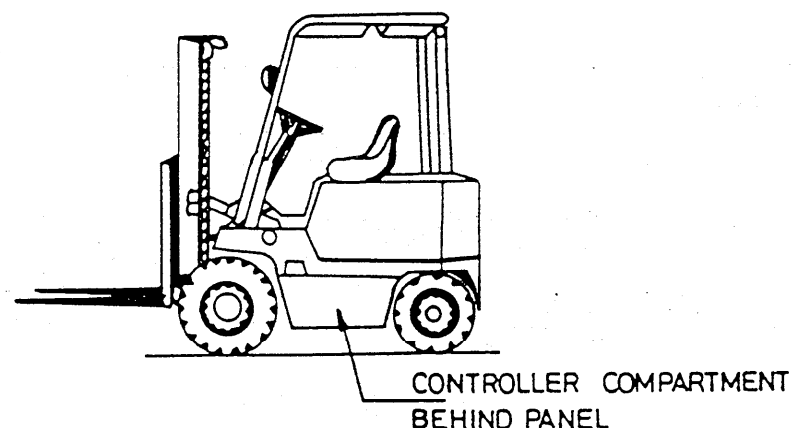


FIG. 1 Controller Compartment

1. The drive controller is fitted in the controller compartment on the left side of the truck, below the battery. Access is via a removable door. If a Hydrocon is fitted it is also housed on the panel in this compartment. All chopper functions are contained on one panel.
2. A 3 thyristor (SCR) chopper circuit is used.
3. The chopper uses both variable frequency and pulse width to control the speed of the motor.
4. When the accelerator is fully depressed, and all the bypass demand conditions are fulfilled the logic box closes the bypass contactor, which applies battery voltage directly to the motor. Refer to Page 7 Sections 2-7 for full bypass operating rules.

WIRING

The control should be wired using 35mm² cable for the power connections with crimped cable lugs and 16/.02mm² cable for the light connections.

BAT+VE TO POWER FUSE (500 AMP) LIVE SIDE.

POWER FUSE (DEAD SIDE) TO LINE CONTACTOR.

LINE CONTACTOR TO ONE END OF MOTOR FIELD AND CATHODE OF PD1.

ONE END OF MOTOR ARMATURE TO HEATSINK CONNECTION ON PUMP CONTROL.

BAT-VE TO BAR CLAMP NEGATIVE CONNECTION

Light Wiring

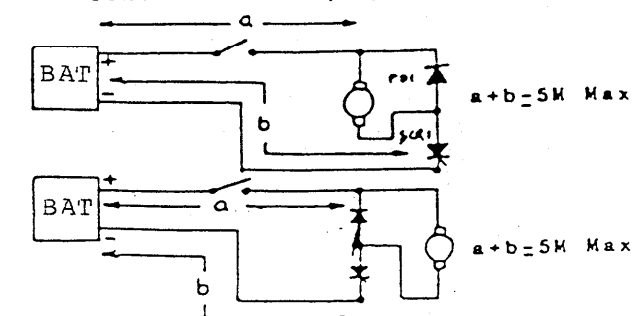
Pump Logic Output Plug 'A'

Destination

Pin 1	- Neg. side of line Cont. Coil
Pin 2	- One side of SW3
Pin 3	- One side of SW2
Pin 4	- Pos. side of line Cont. Coil
Pin 5	- One side of SW1
Pin 6	- Common side SW1,2,3
Pin 7	- Wiper of VR4
Pin 8	- Bottom of VR4
Pin 9	- Omit
Pin 10	- Top of VR4
Pin 11	- Suppression Output

NOTE: Motor Inductance
Min. 25mH - Max. 1mH
Power Cable length
5 Metres Battery Lead

(Only used in conjunction with other Sevcon equipment)



INSTALLATION

Panel Mounting

The baseplate of the Controller is electrically isolated from the circuit. To achieve the specified rating it must be mounted in total surface contact with a continuous flat metal section of the vehicle frame or other heavy metal part. The surface onto which the control is to be mounted must be flat and have a good surface finish.

It should be perfectly clean and free of foundry scale, paint, weld splatter or other substances which might prevent the two surfaces coming together. (Maximum gap between panel and surface at any one point is 0.2mm)

Special care should be taken around mounting studs or bolt holes to ensure that a weld bead or raised tapping burr does not prevent the panel from lying flat against the surface.

Before fitting the panel, the mounting surface should be smeared with a thin layer of silicon grease or other thermally conductive compound to eliminate any air voids and improve thermal contact.

Sevcon can supply MS4 silicon grease.

Finally the controller should be fastened down using all mounting bolts, evenly tightened, taking care not to trap any loose wires or other foreign objects behind the panel. Recommended fixing is M8 or 5/16" bolt size.

Neglect of any of the above points could cause general or local overheating on the SCR control which would result in premature semiconductor failure after a period of operation.

The Controller, mounted in any position and in the prescribed manner, will operate without ventilation. Care should be taken to protect the panel from dirt and moisture. If necessary a cover may be fitted to prevent the entry of foreign objects.

SPECIFICATIONS

Item	Unit	Drive motor		Pump motor		Power steering motor	
		FB10/14 FB15/18	FB15H/18H FB15H1/18H1 FB15SH/18SH	FB10/14 FB15/18 FB15H1/18H1	FB15H/18H FB15SH/18SH	FB10/14 FB15H/18H FB15H1/18H1	FB15SH/18SH
Rated voltage	V	48	(36) 48	48	(36) 48	48	47
Output	kW	4.5	(4.7) 6.5	7.5	(7.4) 10	0.45	0.5
Time rating	min.	60	60	5	5	60	60
Excitation	—	Series	Series	Series	Compound	Permanent magnet	Permanent magnet
Insulation	—	F	F	F	F	F	B
Casing	—	Open self-ventilating	Open self-ventilating	Open self-ventilating	Open self-ventilating	Fully sealed	Fully sealed
Weight	kg(lb)	68 (150)	87 (191)	36 (79)	47 (103)	16 (35)	10 (22)

CHECK AND INSPECTION

FB10/14/15/18

Check item		Criteria		Remedy
		Standard size	Repair limit	
Diameter of commutator	Drive	φ110 (4.3)	φ107 (4.2)	Repair
	Pump	φ90 (3.5)	φ87 (3.4)	
	P. S.	φ58 (2.3)	φ55 (2.2)	
Height of brush	Drive	11 x 40 x 33 (0.4 x 1.6 x 1.3)	16 (0.6)	Repair
	Pump	11 x 40 x 33 (0.4 x 1.6 x 1.3)	16 (0.6)	
	P. S.	10 x 20 x 20 (0.4 x 0.8 x 0.8)	10 (0.4)	

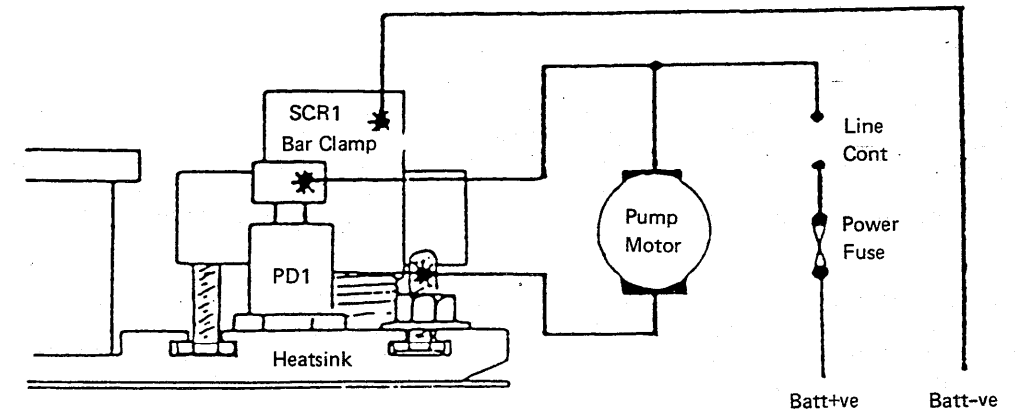
FB15H/18H, FB15H1/18H1

Check item		Criteria		Remedy
		Standard size	Repair limit	
Diameter of commutator	Drive	φ130 (5.1)	φ127 (5)	Replace
	Pump	φ90 (3.5) (φ58)* (2.3")	φ87 (3.4)	
	P. S.	φ58 (2.3)	φ55 (2.2)	
Height of brush	Drive	16 x 56 x 33 (0.6 x 2.2 x 1.3)	16 (0.6)	Replace
	Pump	11 x 30 x 33 (0.4 x 1.2 x 1.3)	16 (0.6)	
	P. S.	10 x 20 x 20 (0.4 x 0.8 x 0.8)	10 (0.4)	

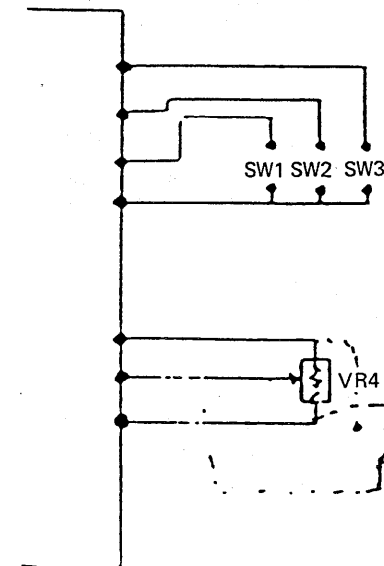


M10 stud bolt: 1.6 — 2.0 kgm (16 — 20 Nm) [12 — 14 ft.lb]

* FB15H1/18H1 only



POWER WIRING



SWITCH FUNCTIONS

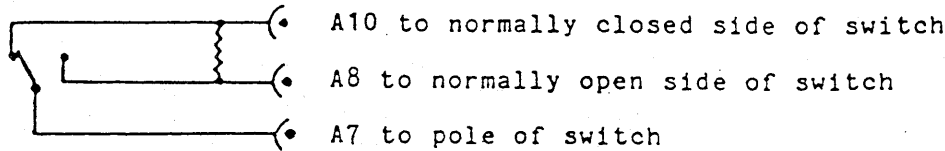
- SW1 - Use in conjunction with VR4 (Speed Pot). Typically hoist function.
- SW2 - Fixed speed controlled by speed set on VR2. Typically medium to fast flow used on tilt function.
- SW3 - Fixed speed controller by speed set on VR3. Typically slow flow used on side shift or slow tilt function.

Options

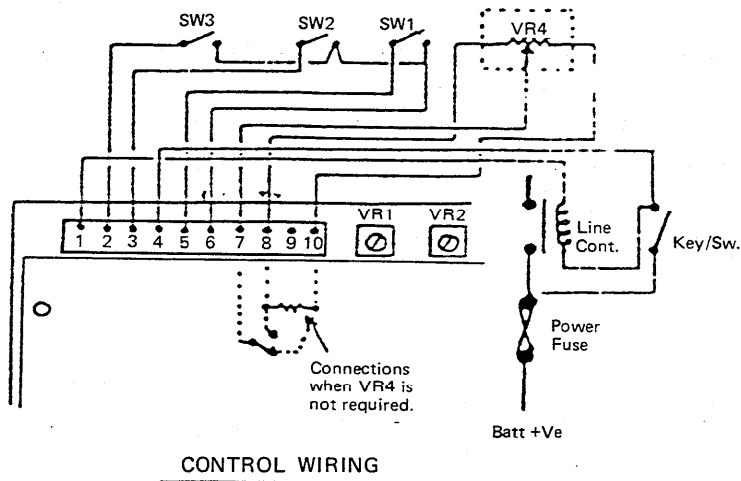
Cut D1 from logics. The motor speed set by VR2 and VR3 will be added together when using SW2 and SW3 simultaneously.

Cut R1 from logics. With SW1 closed and SW2 and/or SW3 operated the motor will run at the highest speed selected. SW1 and VR4 will not override SW2 and SW3.

If a variable speed is not required (VR4), then a 5K Ohm resistor must be connected across logic Pins A10 and A8. A microswitch must be used to switch on logic output A7 between A10 and A8 as shown. This switch to operate with SW1 on the hoist lever.



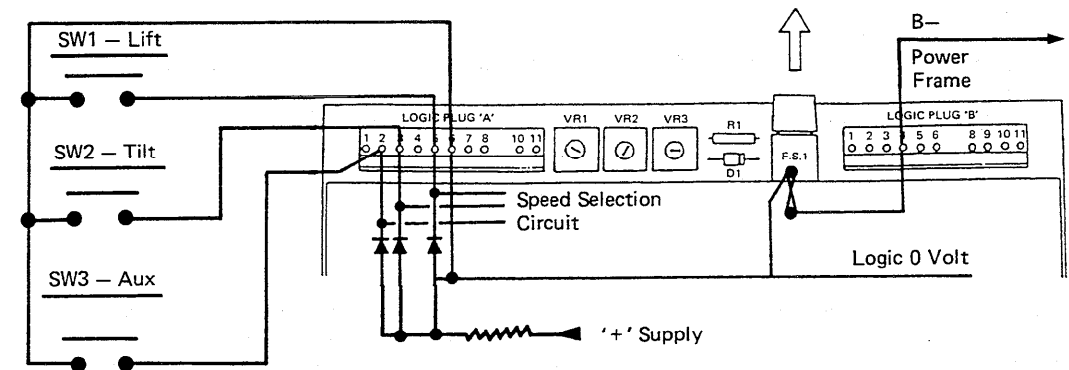
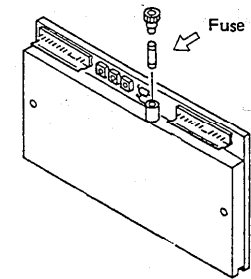
If the controller is required as a 'soft start' (no VR4) but it is not required to run at full speed then output Pin A7 and A10 must be connected together. Motor speed is then controlled by the setting on VR1.



20 STRUCTURE & FUNCTION OF CONTROLLER

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- Hydrocon unit & pump system

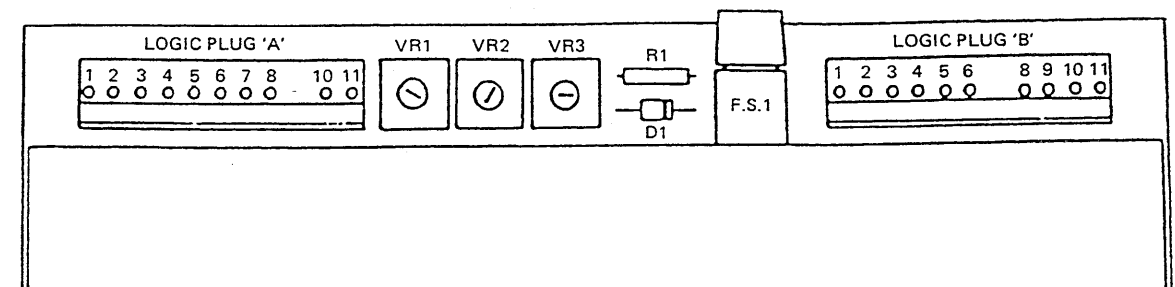
The hydrocon unit is activated by 3 switches fitted to the hydraulic valve block. These switches are supplied from the hydrocon logic via plug PA 2, 3, 5 and their negative return goes to PA6. NO OTHER WIRES MUST BE ATTACHED TO THESE PINS. The hydrocon negative line is protected by the 20mm 2A quick-blow fuse on the logic brick.



The adjusting potentiometers operate as follows:-

1. Lift speed (SW1 closed) is set by the external pump speed pot. The minimum value of lift speed is set by VR1 on the logic brick. This also sets the minimum value of the other pots.
2. Tilt speed (SW2 closed) is set by VR2.
3. Attachment speed (SW3 closed) is set by VR3.

Note that the speeds are prioritised and operating SW1 and SW2 together will give the speed selected by SW1. Similarly, SW2 has priority over SW3.



2.1 BLOCK DIAGRAM OF LOGIC BOX

