MITSUBISHI
TRANSISTORIZED FREQUENCY INVERTER

MASTER CONTROLLER

TYPE FR-FG

Instruction Manual

IB (NA) 66032-A

MITSUBISHI ELECTRIC

MASTER CONTROLLER type FR-FG

The Master Controller, FR-FG*, is a variable-voltage power supply unit, and used to deliver frequency setting signal to the FREQROL inverters (up to 35 inverters), or to control a maximum of 7 ratio setters "AS-OH*" in proportional speed control operation.

*Note: A number in * is suffixed for the different power supply. Refer to the Table 1.*

1. OUTLINE DRAWING

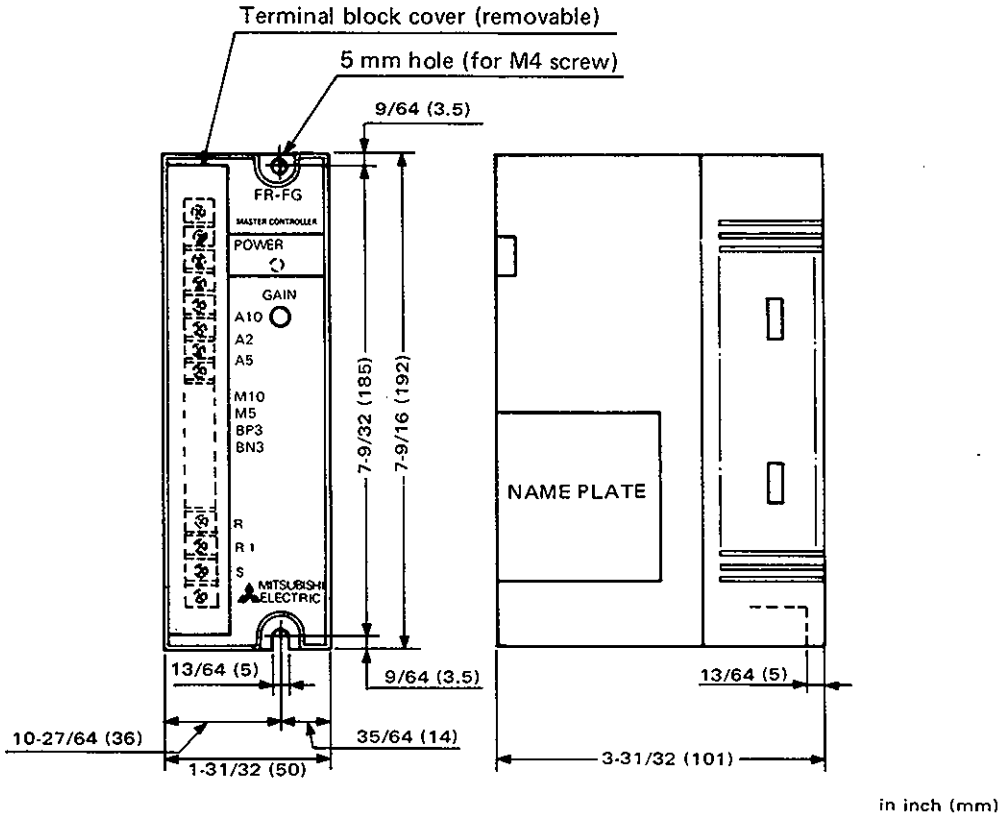


Fig. 1 Outline Drawing

2. INSTALLATION

(1) Do not install the preamplifier in a place exposed to the direct rays of the sun, and a place where temperature and humidity are high, and a place where there are a lot of dust and corrosive gases. Be sure to install the preamplifier in a clean and dry place. (The unit is not a totally enclosed type.)

(2) Install the preamplifier in a place which is not liable to be filled with heat. Install the preamplifier so that the wiring distance between the inverter and preamplifier is minimum (e.g., install them inside the same control box).

(3) Since cables protrude from the left side face of unit, install the preamplifier considering the wiring space of cables.

3. WIRING

(1) Remove the terminal cover. To remove the terminal cover, pull the recessed portions on the left side toward you as shown in Fig. 2.

(2) Connect the power supply across R and S. (For the type without suffix number, it is possible to connect the power supply across R1 and S depending on line voltage.) If incorrect wiring is done, the internal transformer may burn. (See the block diagram in Fig. 3.)

(3) When it is required to provide a relay contact to the signal line, connect two contacts of microcurrent switching relay in parallel (or twin contact) to prevent improper contact.

(4) Use twisted wire or shielded wire for signal line. Separate the signal line from the power line.

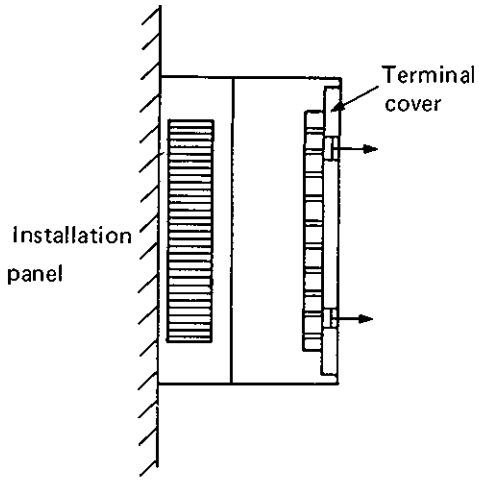


Fig. 2

4. SPECIFICATIONS

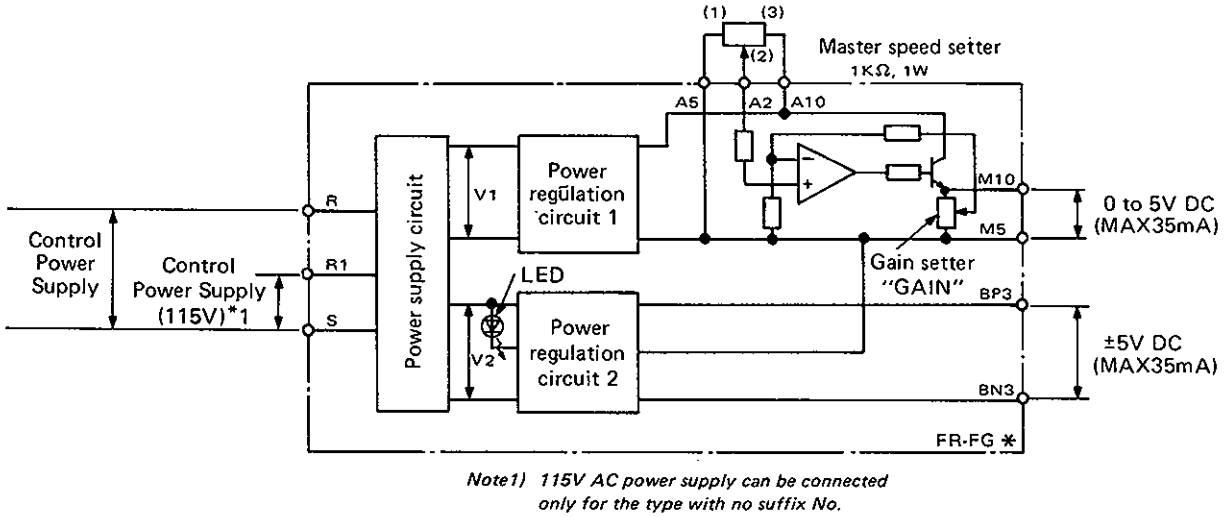
Power supply:	Refer to the Table. 1	
Allowable line voltage fluctuation range:	±10%	
Power consumption:	Approx. 5VA	
Output signal:	0 to 5V DC	17.5mA (across terminals M10 and M5)
	0 to 10V DC	35mA (across terminals M10 and M5)
	±5V DC	35mA (across terminals BP3, M5 and BN3)
Output capacity:	Capable of connecting a maximum of 35 inverters (parallel operation)	
	Capable of connecting a maximum of 7 ratio setters (ratio operation)	
Master speed setter:	A potentiometer (1kΩ, 1W or larger) should be installed externally.	
	*To select output signal of 0 to 5V or 0 to 10V, use variable resistor "GAIN" located on the front panel of unit. This VR is factory-set to 0 to 5V.	
Ambient temperature:	−10°C to +50°C (to be free from freezing)	

5. CIRCUIT CONSTRUCTION

Fig. 3 shows the block diagram of the master controller "FR-FG*". Of voltages V1 and V2 rectified in the power supply circuit, V1 is input to the power regulation circuit 1 and the output from the power regulation circuit is applied to the OP amplifier. In the OP amplifier, the gain adjust VR has been adjusted so that the output voltage across terminals M10 and M5 is $5\,^{+0.1}_{0}$ V when the master speed setter (1kΩ, 1W or larger potentiometer, or AS-OX * is applicable) is set to the position at which the controller can output the maximum frequency (the control knob is fully turned clockwise to setting "10" when AS-OX * is used). Thus produced output frequency is used as a frequency setting signal.

When the master controller is used in ratio operation (proportional speed control operation) and gradient larger than the standard characteristic ramp is required (refer to description "Ratio operation"), the gain adjust potentiometer "GAIN" should be turned clockwise. By turning the gain adjust potentiometer clockwise, the output may be increased up to 12V.

The voltage V2 is applied to the power regulation circuit 2 and its output ±5V DC serves as bias power supply when the master controller is operated together with ratio setter "AS-OH*" in ratio operation.

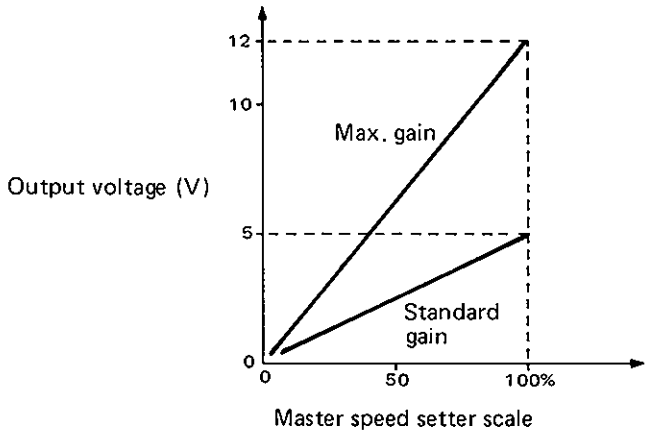


Note1) 115V AC power supply can be connected only for the type with no suffix No.

Fig. 3 Block Diagram of FR-FG * Master Controller

6. ADJUSTMENT

By use of the gain adjust VR "GAIN" of master controller, adjust the output voltage across terminals M10 and M5 until the output is 5V when the master speed setter is at fully clockwise position. (The voltage is factory-set to 5V.)



In the case of ratio operation (see Fig. 6), no readjustment is required when the operation is done within the range of the standard ratio characteristic ramp. If larger ramp gradient is necessary, the gain adjust VR must be turned and set (gradient of characteristic ramp becomes larger when the VR is turned clockwise). The output may be increased up to 12V.

7. APPLICATION

(1) Parallel operation

The parallel operation with a maximum of 35 inverters is possible when the master controller is used to output frequency setting signal to each inverter. (Terminals BP3 and BN3 are not used.)

In this operation, 1kΩ, 1W or larger potentiometer is necessary for master speed setter.

Motorized speed setter "AS-OX*" may be used in place of the potentiometer.

Fig. 4 shows an example of application, where independent operation of each inverter is also possible.

In parallel operation, the select switch "AUTO-MANUAL" of AS-OL* is set to "AUTO" position and the master speed setter is turned to set speed of each unit at the same time.

When the select switch is set to "MANUAL" position, only a specific motor may be manually and independently operated by turning the control knob on the corresponding AS-OL*.

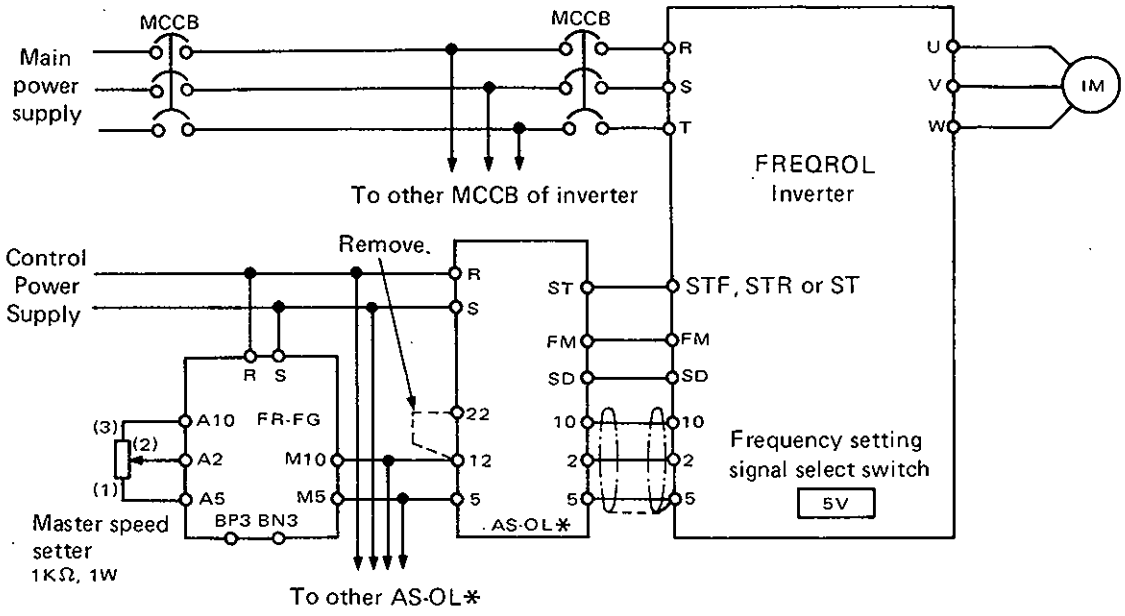


Fig. 4 Parallel Operation of Inverters

(2) Ratio operation

By using a master controller and ratio setters (quantity of which depends on the number of motors to be controlled), a maximum of 7 motors can be controlled to run at speeds individually preset on the respective inverters.

When the ratio of frequency and bias voltage are preset on each ratio setter and the output signal from the master controller is given to the ratio setters, the frequency setting signal voltage of each inverter changes in accordance with the setting on each ratio setter.

When it is desired to extend the ratio 20% over the standard setting of ratio characteristic ramp, the gain adjust VR in the master controller should be adjusted so that the output voltage of the master controller (across terminals M10 and M5) is 6V while the master speed setter is at the position fully turned clockwise. For connection, see Fig. 5. For details, see the Instruction Manual of ratio setter "AS-OH*".

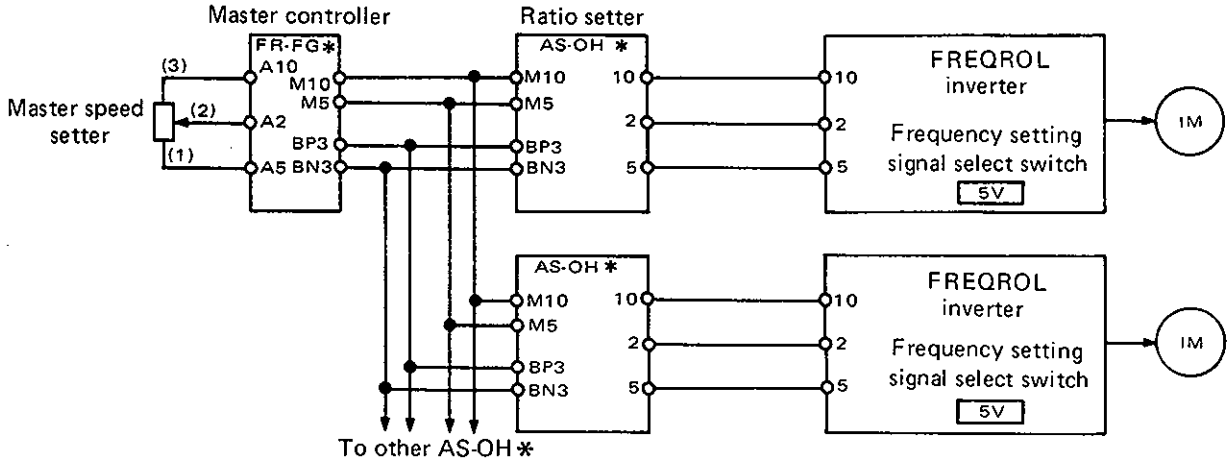


Fig. 5 Example of Wiring in Ratio Operation

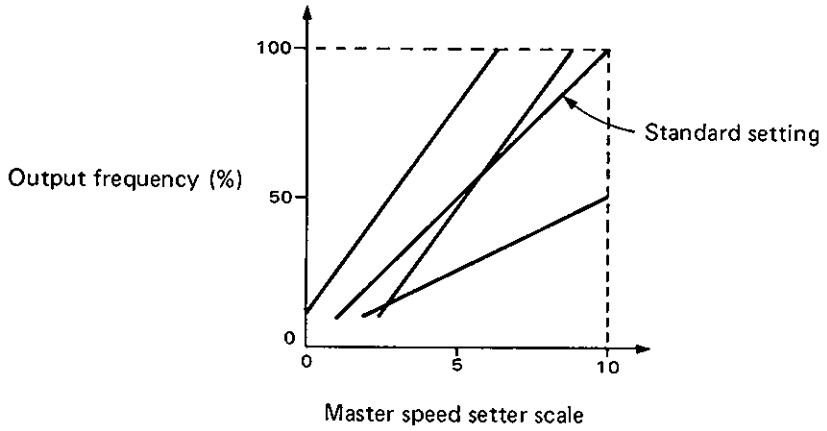
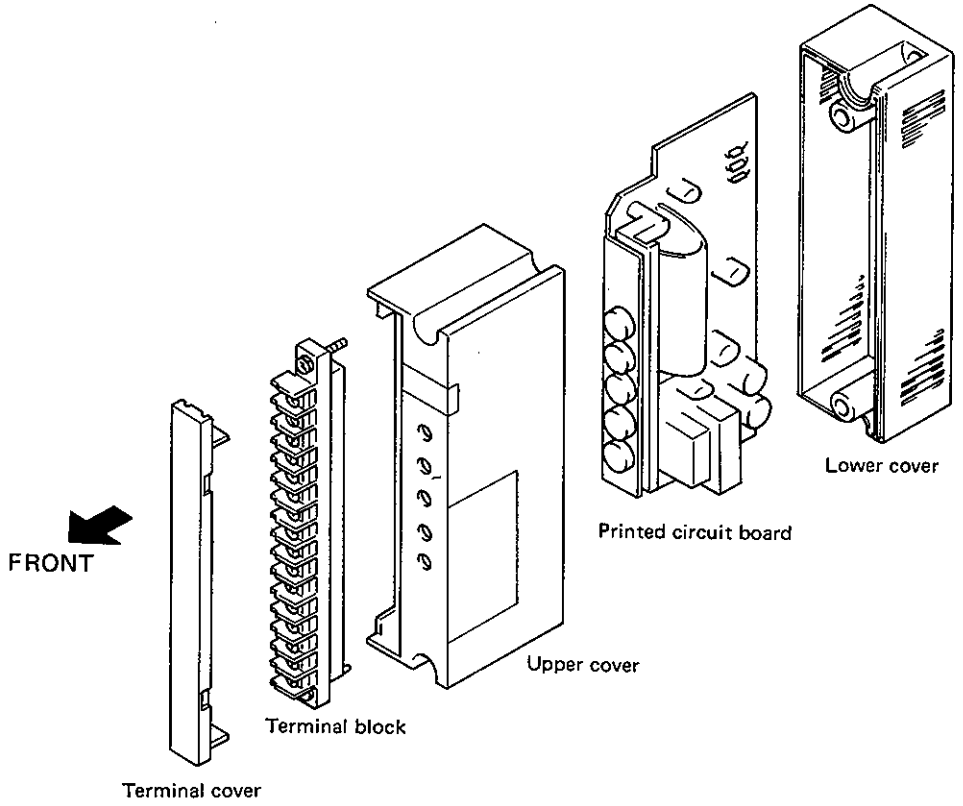


Fig. 6 Example of Ratio Setting

8. MAINTENANCE AND INSPECTION

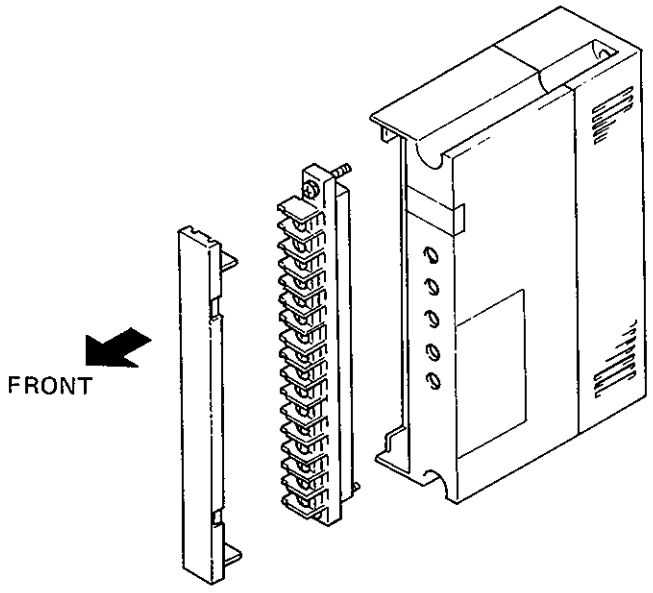
(1) Internal inspection

By removing two screws from the rear surface of unit, the case is divided into two sections and a printed circuit board is exposed. Since the printed circuit board is of a card edge type, it can be pulled out of the case.



(2) Unit replacement

Should the unit be changed due to failure, etc., replacement can be made without disconnecting the cables which have already been wired. Remove the terminal cover and loosen the terminal block fixing screws at both ends of the terminal block. Then, the terminal block is lifted toward front. With the terminal block fixing screws disconnected from the case, pull the terminal block toward front. Then, the terminal block is removed from the case.



Suffix No.	Control power supply	
	FR series FR-FC, FD, FG, FA	ASPAC series AS-OX, OK, FK, OL, OH, OT
None, 1, 2	200/200/220VAC 50/60/60Hz 115VAC 60Hz	200/200/220VAC 50/60/60Hz
4	–	115VAC 60Hz
5	220VAC 50Hz	220VAC 50Hz
6	240VAC 50Hz	240VAC 50Hz

Table 1 Control Power Supply and Suffix No.