



**TRANSISTORIZED INVERTER
INSTRUCTION MANUAL**

**SPEED DETECTOR
FR-FP**

Thank you for choosing this Mitsubishi transistorized Inverter option.

This instruction manual gives handling information and precautions for use of this equipment.

Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum.

Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this product until you have read through this instruction manual and appended documents carefully and can use the equipment correctly.

Do not use this product until you have a full knowledge of the equipment, safety information and instructions.

In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".



Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

WARNING

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- Do not run the inverter with the front cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- If power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, switch power off, wait for more at least 10 minutes and check for the presence of any residual voltage with a meter etc.
- Earth the option unit.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.
- Operate the switches with dry hands to prevent an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise, you may get an electric shock.

2. Fire Prevention

CAUTION

- Mount the option unit on an incombustible surface. Installing the inverter or option unit directly on or near a combustible surface could lead to a fire.
- If the inverter has become faulty, switch off the inverter power. A continuous flow of large current could cause a fire.

3. Injury Prevention

CAUTION

- Apply only the voltage specified in the instruction manual to each terminal to prevent damage etc.
- Ensure that the cables are connected to the correct terminals. Otherwise, damage etc. may occur.
- Always make sure that polarity is correct to prevent damage etc.
- While power is on and for some time after power-off, do not touch the option unit as they are hot and you may get burnt.

4. Additional instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.:

(1) Transportation and installation

CAUTION

- When carrying products, use correct lifting gear to prevent injury.
- Do not stack the inverter or option boxes higher than the number recommended.
- Ensure that installation position and material can withstand the weight of the option unit. Install according to the information in the Instruction Manual.
- Do not operate if the option unit is damaged or has parts missing.
- Do not stand or rest heavy objects on the option unit.
- Check the option unit mounting orientation is correct.
- Prevent screws, wire fragments, conductive bodies, oil or other flammable substances from entering the option unit.
- Do not drop the option unit, or subject it to impact.
- Use the inverter under the following environmental conditions:

Environment	Ambient temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90%RH or less (non-condensing)
	Storage temperature	-20°C to +65°C*
	Ambience	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude, vibration	Maximum 1000m above sea level for standard operation. 5.9 m/s ² or less (conforming to JIS C0911)

*Temperatures applicable for a short time, e.g. in transit.

(2) Trial run

CAUTION

- Check all parameters, and ensure that the machine will not be damaged by a sudden start-up.

(3) Operation

CAUTION

- Do not modify the equipment.

(4) Emergency stop

 **CAUTION**

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter or option fails.

(5) Maintenance, inspection and parts replacement

 **CAUTION**

- Do not carry out a megger (insulation resistance) test on the control circuit of the option unit.

(6) Disposing of the inverter

 **CAUTION**

- Treat as industrial waste.

(7) General instructions

Many of the diagrams and drawings in this instruction manual show the inverter without a cover, or partially open. Never run the inverter like this. Always replace the cover and follow this instruction manual when operating the inverter.

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FR-FP SPEED DETECTOR

When speed, mechanical displacement etc. of other equipment is converted into an electrical signal (using a pulse generator) and the signal is then entered into the FR-FP speed detector, the FR-FP converts it into the frequency setting signal of the inverter and can send it to the inverter.

1. STRUCTURE

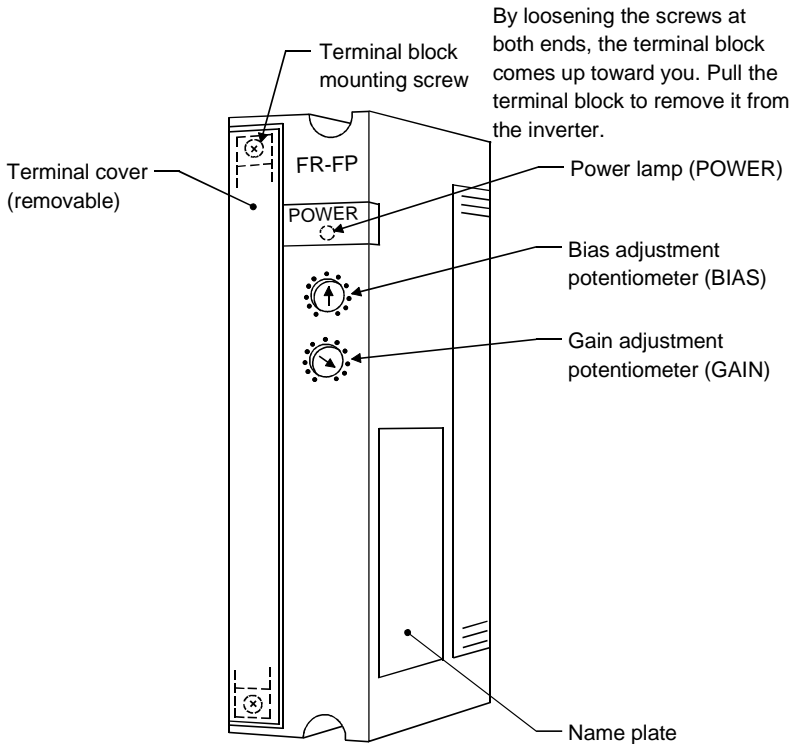


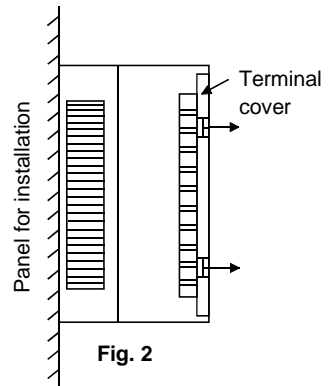
Fig. 1 Structure

2. INSTALLATION

- (1) Avoid direct sunlight, high temperature, high humidity, much dust and much gas, and select a clean, dry place to install. (The unit is not a totally enclosed type.)
- (2) Select a place of installation where heat will not build up, and install the unit with the minimal wiring distance from the inverter (e.g. install the unit within the control box where the inverter is installed).
- (3) When wiring, take the wiring space of the cables into consideration as the cables will come out on the left side.

3. WIRING

- (1) Remove the terminal cover. The terminal cover comes off by pulling the left-hand side recesses toward you as shown in Fig. 2.
- (2) You can use a power supply of either single-phase 200V or 115V. When using a 200V power supply, wire it across terminals 200V-0. When using a 115V power supply, wire it across terminals 115V-0. Note that wrong wiring may burn the internal transformer. (Refer to Fig. 3 Wiring Diagram.)
- (3) When relay contacts are required in a signal line, connect two micro-current switching relay contacts in parallel (or a twin contact) to prevent a contact fault.
- (4) Use twisted or shielded cables as signal cables and run them away from the power cables.



4. CIRCUIT STRUCTURE

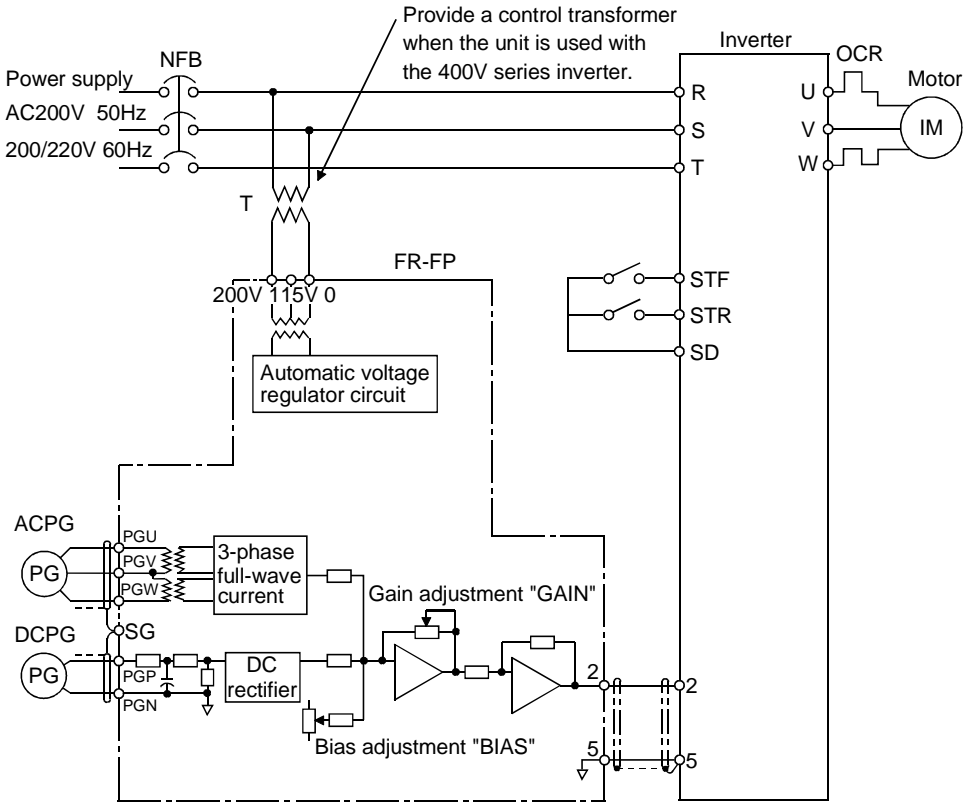


Fig. 3 Circuit Structure and Wiring Example

5. CIRCUIT EXPLANATION

The circuit can be roughly divided into the AC pulse generator input rectifier circuit, DC pulse generator input rectifier circuit and amplifier circuit.

(1) AC pulse generator input rectifier circuit

Isolates the pulse generator signal input across terminals PGU-PGV-PGW with the detection transformer, and full-wave rectifies and smooths it with the operational amplifier-based rectifier circuit.

(2) DC pulse generator input rectifier circuit

After smoothing and voltage-dividing the pulse generator signal input across terminals PGP-PGN, this circuit inverts its polarity with the operational amplifier to make full-wave rectification. Therefore, this circuit outputs the frequency setting signal of positive polarity independently of the rotation direction of the pulse generator.

(3) Amplifier circuit

Consists of operational amplifiers. This circuit amplifies the signal of the AC pulse generator input rectifier circuit or DC pulse generator input rectifier circuit, and outputs it to across terminals 2-5 as a frequency setting signal. You can make gain adjustment and bias adjustment with the front panel adjustment potentiometers.

6. ADJUSTMENT

(1) Bias adjustment of frequency setting output signal

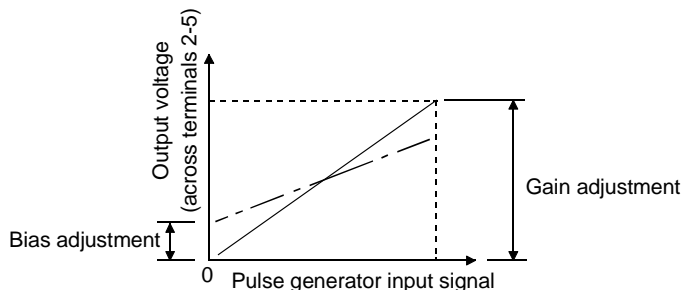
Make adjustment with the bias adjustment potentiometer "BIAS" until the voltage across terminals 2-5 is 0V with the pulse generator stopped (pulse generator output zero).

Factory setting 0V

(2) Gain adjustment of frequency setting output signal

Make adjustment with the gain adjustment potentiometer "GAIN" until the voltage across terminals 2-5 is 5V (or 10V) when the machine is run at the predetermined speed (pulse generator output is input to the inverter).

Factory setting 5V



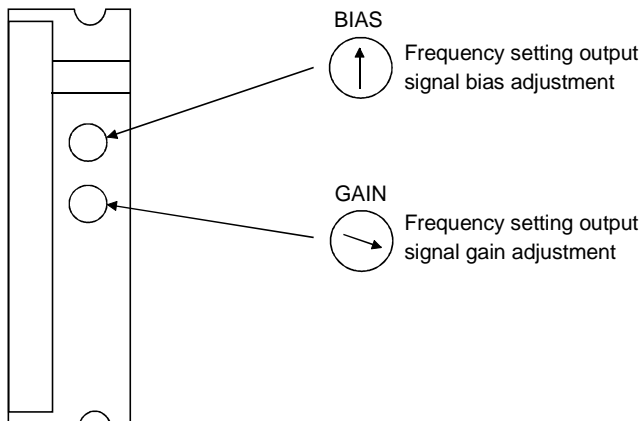


Fig. 4 Factory-Set Positions

7. OPERATING INSTRUCTIONS

(1) Output voltage of pulse generator

If the output voltage of the pulse generator used becomes excessive, the built-in transformer and circuits may be burnt. Therefore, do not input any voltage other than those given in the following specifications.

Use the pulse generator whose number of poles is equal to or greater than the one given in the specifications (page 6). If the number of poles is smaller, output voltage ripples will be bigger.

(2) Type of pulse generator

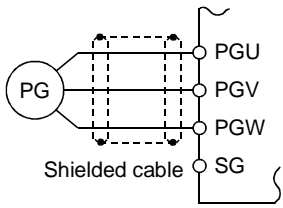
As for the number of pulse generator poles, both the AC and DC pulse generators may be used, but these two types cannot be used together.

In addition, you should connect only a pulse generator.

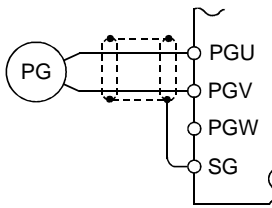
Use a shielded cable and connect the shield to terminal SG.

(Refer to Fig. 5 How to Connect the Pulse Generators.)

Connection of AC three-phase pulse generator



Connection of AC single-phase pulse generator



Connection of DC pulse generator

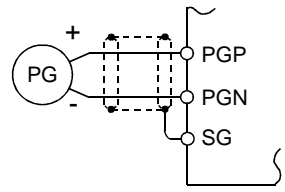
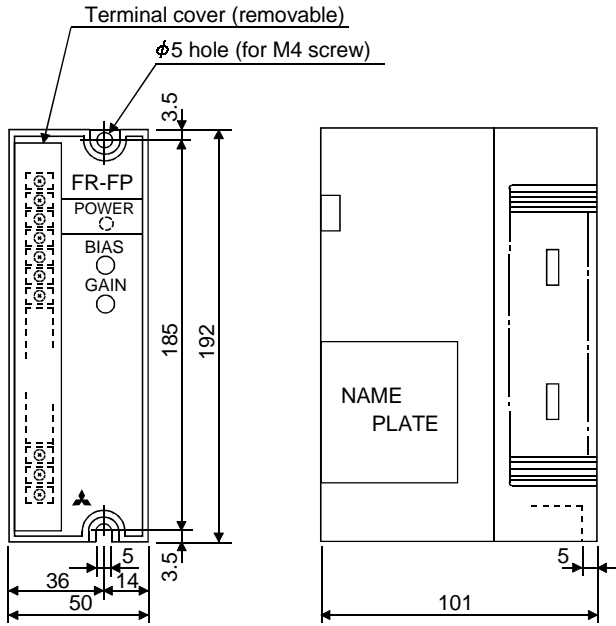


Fig. 5 How to Connect the Pulse Generators

8. SPECIFICATIONS

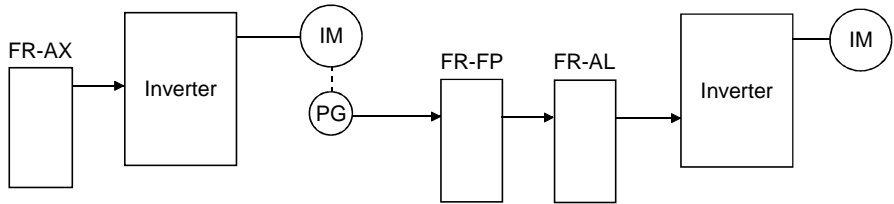
Power supply voltage	200VAC 50Hz, 200/220VAC 60Hz 115VAC 60Hz
Power consumption	2VA
Input signal	AC Three-phase 40 to 110VAC Single-phase 40 to 110VAC
(Pulse generator output)	DC 25 to 100VDC 30mA (Note) Only one of the above signals may be input.
Frequency setting output signal	Adjustable in the range 0 to 10VDC (5mA)
Pilot generator	AC three-phase 4 or more poles (Recommended model QVAH-10) AC single-phase 12 or more poles

9. OUTLINE DRAWING



10. APPLICATION EXAMPLE

The following example shows that a sub motor is run in response to the output signal of the pulse generator mounted on the rotary shaft of the main motor.



REVISIONS

*The manual number is given on the bottom left of the back cover.

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Jul., 2000	IB(NA)-0600045-A	First edition