MITSUBISHI
INVERTER
Instruction Manual

PULSE TRAIN INPUT UNIT
FR-EPH

- Pulse Train Input
- Selective Relay Output
- PI Control
- Analogue Current Output

Warning symbols For your own safety please pay special attention to instructions containing these symbols:

This warning symbol indicates the presence of dangerous voltage. It informs you of high voltage conditions, situations and locations that may cause **death** or serious injury if you do not follow precautions.

This symbol indicates a **general warning.**

This warning symbol indicates an electrostatic discharge hazard.

NOTES inform you of situations or conditions which will damage machinery or cause additional down-time if you do not take the suggested steps.

Thank you for choosing this option unit for the Mitsubishi FREQROL transistorized frequency inverters.
Please read this manual carefully to make use.

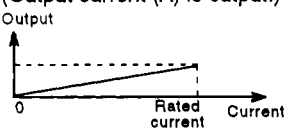
Pulse Train Input Option Unit (FR-EPH)

This option unit is a multi-function unit which allows speed to be set by pulse train input and is designed for automatic control operation. Its functions are as follows:

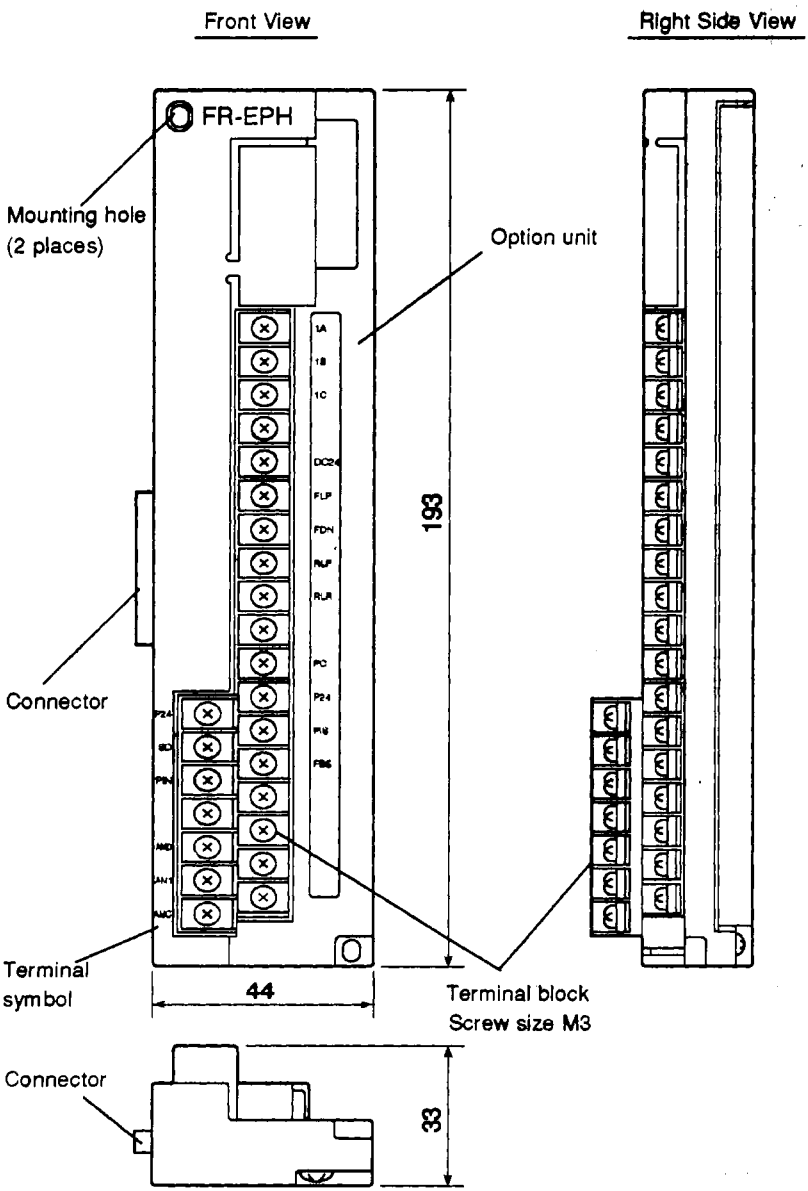
- Pulse train input
- Selective relay output
- PI control
- Analog current output

CONTENTS

CAUTION Since this option unit has multiple functions, the initial settings of its functions are as listed in the following table. To use the required function valid, set the corresponding parameters in accordance with the relevant pages.

Function	Initial Setting	Remarks	Page
Pulse train input	Invalid	The factory setting of Pr. 142 is "0". To use this function, change the setting of this parameter.	4
Selective relay output	RUN is output.	The factory setting of Pr. 134 is "0". To change the relay output setting, change the setting of this parameter.	8
PI control	Invalid	Before shipment from the factory, terminals PIS-P24 are disconnected. To use PI control, connect these terminals.	12
Analogue current output	(Output current (A) is output.) 	The factory setting of Pr. 135 is "2". To select another output, change the setting of this parameter.	24

1. STRUCTURE


Front View
Right Side View
FR-EPH
Mounting hole
(2 places)
Option unit
Connector
Terminal
symbol
193
44
Terminal block
Screw size M3
Connector
33

2. INSTALLATION

Remove the inverter cover and install the option unit in the following procedure:

2.1 Pre-Installation Checks

(1) Check the inverter type.
This option unit may only be used with the FREQROL-A200E series inverters and must not be used with any other series (e.g. A200, A100, Z and F series). If you connect forcibly, the inverter may be damaged.

(2) Make sure that the inverter input power is off.
The inverter may be damaged if the option unit is installed with the input power on. (The inverter or option unit may be damaged and the inverter may display the alarm "E. CPU".)

(3) Check the the following accessories are supplied with the option unit:
- 1 - Instruction manual
- 2 - Mounting screws M3 x 14

2.2 Installation Procedure (See page 3)

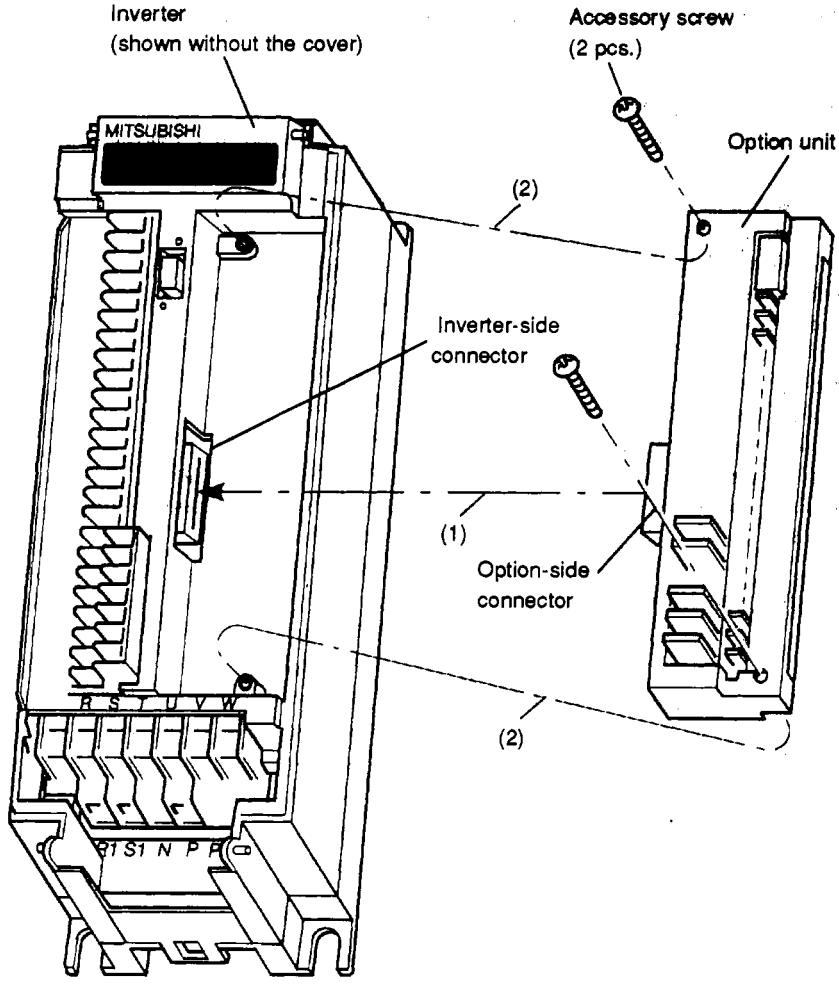
(1) Snugly insert the connector of the option unit into the connector of the inverter.

(2) Securely fix the option unit to the inverter at the top and bottom with the mounting screws.
If the screw holes in the option unit do not match those in the inverter, check that the connectors have been fitted correctly.

* The empty terminals, which are used inside the option, must not be used as relay terminals. Otherwise, the option unit may be damaged.

Note: Route the cables neatly in the wiring space so that when the front cover is reinstalled, the cables to the inverter control circuit terminals and option terminals are not caught between the inverter and cover.

Warning! Hazardous voltage present.
Always isolate the power from the inverter, and wait 5 minutes to ensure the charge lamp has gone out before inserting or removing this option unit, or touching the terminals.


Inverter
(shown without the cover)
Accessory screw
(2 pcs.)
Option unit
(2)
Inverter-side
connector
(1)
Option-side
connector
(2)
MITSUBISHI
R S T U V W
R1 S1 N P P1

3. PULSE TRAIN INPUT FUNCTION

Introduction

The pulse train input function allows speed setting to the inverter to be entered by a pulse train signal.

Advantages of this function

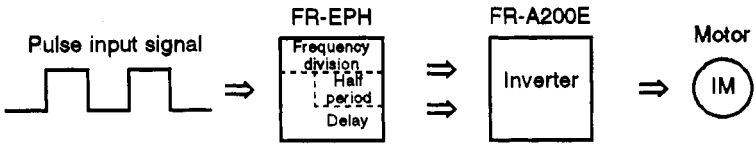
This function features easy frequency setting and has the following advantages:

- The output of terminals FM-SD can be used as the speed command of another inverter in synchronous operation.
- The speed command varies less than an analog signal.
- Because of direct input from a programmable controller, a converter is not required.

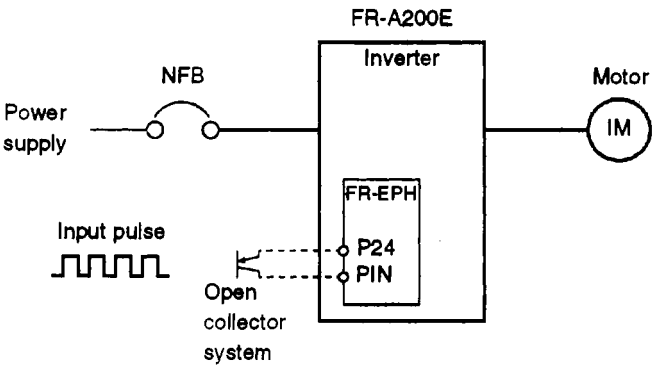
Cautions

- Install the option unit properly. (See Section 2.)
- Wire the cables carefully. (See Section 3.2.)
- Handle the option unit in accordance with the instruction manual.
- If in doubt or difficulty, consult your sales representative. (See the back cover.)

3.1 Circuit Configuration



3.2 Wiring Example



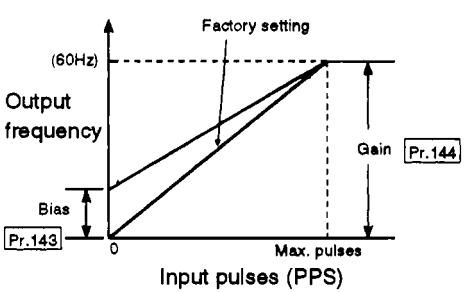
Caution

This option unit must be wired in the open collector system to operate properly.

3.3 Terminals

Symbol	Terminal	Description
P24	Built-in 24V power terminal	Output terminal for 24V, 0.1A built-in power supply
SD	Input signal common terminal	Common terminal for PIN Common to the inverter terminal SD.
PIN	Pulse input terminal	Terminal into which a pulse train of 0 to 100kpps is entered.

3.4 Adjustment



- Max. number of input pulses 100kpps
- Input pulses are multiplied by 2 internally.

PULSE TRAIN INPUT FUNCTION

3.5 Parameters

- Operation procedure 1 ..... Set "701" in Pr. 77.

Pr. Number	Function	Screen Display	Setting Range	Minimum Increment	Factory Setting
142 *1	Input pulse frequency division magnification	—	0 to 250	1	0
143	Frequency for zero input pulses	—	0 to 400Hz	0.01Hz	0
144	Frequency for maximum input pulses	—	0 to 400Hz	0.01Hz	60

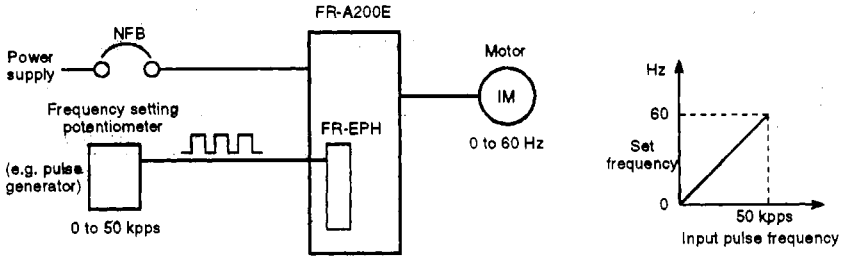
*1: Indicates the rate of frequency division to input pulses. The resolution of frequency to input pulses depends on this setting.

Caution

When Pr. 142 = "0" (factory setting), this function remains invalid even if values are set in Pr. 143 and Pr. 144.

3.6 Setting Example

Setting the frequency to 0-60Hz at the input pulse rate of 0-50kpps



1) Calculate the Pr. 142 (input pulse frequency division magnification) value from the maximum number of input pulses.

$$Pr.142 = \frac{\text{Max. number of input pulses (pps)}}{400}$$

$$= \frac{50000}{400} = 125$$

Set 125 in Pr. 142

2) Set the frequencies for zero and maximum input pulses.

Pr. 143 = 0Hz
Pr. 144 = 60Hz

<Reference>

The minimum frequency detectable in the above setting example is calculated as follows:

$$\text{Minimum frequency} = \frac{\text{Pr.144}}{2 \times 16.6\text{ms} \times 400 \times \text{Pr.142}}$$

$$= \frac{60}{2 \times 16.6\text{ms} \times 50000}$$

= Namely, the minimum frequency detectable is from the starting frequency of 0.5Hz onward.

Input example

Input Pulse Frequency Division Magnification (Pr. 142)	Max. Number of Input Pulses *1	Detectable Frequency *2
0 (factory setting)	Pulse input invalid	—
20	8 kpps	1.5 Hz ~
50	20 kpps	1.0 Hz ~
100	40 kpps	0.5 Hz ~
120	48 kpps	0.5 Hz ~
200	80 kpps	0.5 Hz ~
250	100 kpps	0.5 Hz ~

Calculation of the input pulse frequency division magnification

The input pulse frequency division magnification in Pr. 142 can be calculated by the following expression:

*1. Maximum number of input pulses (pps) = (Pr. 142) × 400

*2. Detectable frequency > $\frac{1}{2 \times 16.6\text{ms} \times (\text{Pr.142})}$

The detectable frequency depends on the maximum number of input pulses.

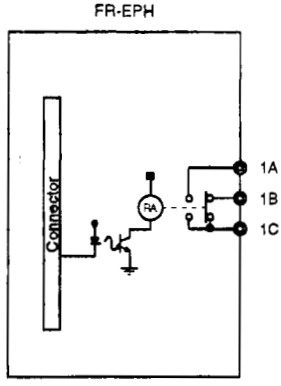
3.7 Specifications

Circuit	Open collector system
Input current	10mA
Max. permissible number of pulses	100kpps
Input pulse specifications	0f to 250f (f: variable frequency)
Response delay	16.6ms
Set frequency resolution	0.012Hz/50Hz

4. SELECTIVE RELAY OUTPUT FUNCTION

This function allows three output signals to be selected from among the 10 standard signals (RUN, SU, IPF/UVT, OL, FU1, FU2, RBP, THP, PRG and PU) of the inverter and to be output as relay contact (1C contact) signals.

4.1 Internal Block Diagram



Internal Circuit Diagram

4.2 Terminals

Terminal Symbol	Description
1A	Normally open contact terminal for relay RA
1B	Normally closed contact terminal for relay RA
1C	Common terminal for contacts of relay RA

*The operation of each relay depends on the output signal selected.

Warning! Hazardous voltage present.
Always isolate the power from the inverter, and wait 5 minutes to ensure the charge lamp has gone out before touching the terminals.

4.3 Adjustments

Set the corresponding numeral to each digit of parameter number 134 to select any of the following signals:

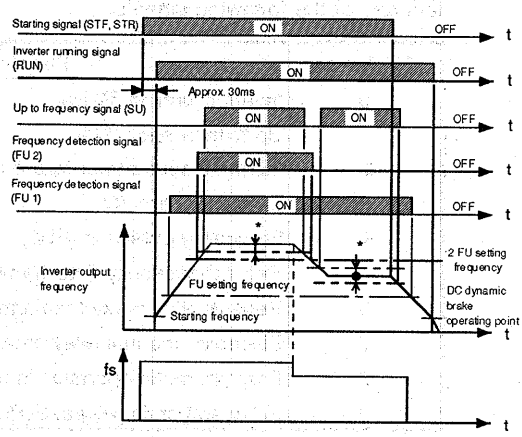
Set Value	Definition of Signal
0	Inverter running (RUN)
1	Up to frequency (SU)
2	Instantaneous power failure or undervoltage (IPF/UVT)
3	Overload alarm (OL)
4	Frequency detection (FU1)
5	Second frequency detection (FU2)
6	Regenerative brake prealarm (RBP)
7	Electronic thermal relay prealarm (THP)
8	Program mode operation in progress (PRG)
9	PU operation in progress (PU)

Example: When Pr. 134 = 0 (factory setting), the inverter running (RUN) signals are selected and output:

Note: When "9999" is set, no signal is output.

4.4 Output Signal On/Off Timings

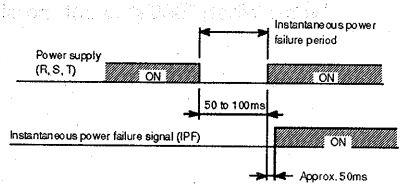
(1) Inverter running (RUN) (Set value = 0)
Switched on at not less than the starting frequency, and switched off while the inverter is at a stop or the DC dynamic brake is being operated.



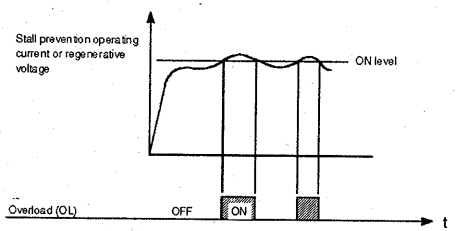
(2) Up to frequency (SU) (Set value = 1)
The ON range(*) of the up to frequency signal is adjustable between 1 and 100% of the set frequency (fs) by using the "up to frequency sensitivity" parameter.

(3) Frequency detection (FU1, FU2) (Set value = 4, 5)
Switched on when the output frequency exceeds the value set in the "output frequency detection parameter."

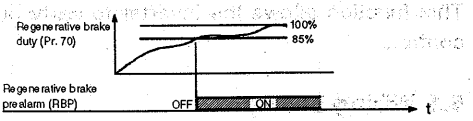
(4) Instantaneous power failure (IPF) (Set value = 2)
For more information on the IPF signal on/off timing, see the inverter catalog, technical information, etc.



(5) Overload (OL) (Set value = 3)
Switched on when the output current or regenerative voltage exceeds the predetermined value and the stall prevention is activated. Switched off when the output current or regenerative voltage falls below the predetermined value and the stall prevention is reset.

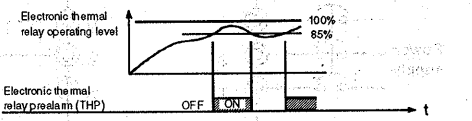


(6) Regenerative brake prealarm (RBP) (Set value = 6)
Output when the regenerative brake duty reaches 85% of the value set in Pr. 70.



Regenerative Brake Prealarm (RBP) Signal ON/OFF Timing Chart Example

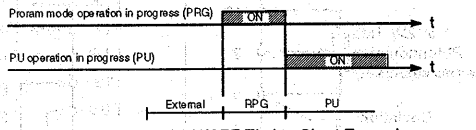
(7) Electronic thermal relay prealarm (THP) (Set value = 7)
Output when the accumulative electronic thermal relay value reaches 85% of the set level.



Electronic Thermal Relay Prealarm (THP) Signal ON/OFF Timing Chart Example

(8) Program mode operation in progress (PRG) (Set value = 8)
Output when the program mode (Pr. 75 = 5) is selected.

(9) PU operation in progress (PU) (Set value = 9)
Output when the PU operation mode is selected.



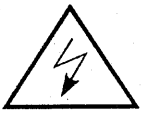
PRG and PU Signal ON/OFF Timing Chart Example

4.5 Instructions

(1) The contacts should be used within the rated capacity to ensure long contact life and prevent them from being deposited.

4.6 Specifications

(1)	Output signal type	1C contact output (one relay used)
(2)	Output signals	One of the 10 output signals may be selected for each relay (see page 5).
(3)	Contact capacity	230VAC 0.3A 30VDC 0.3A

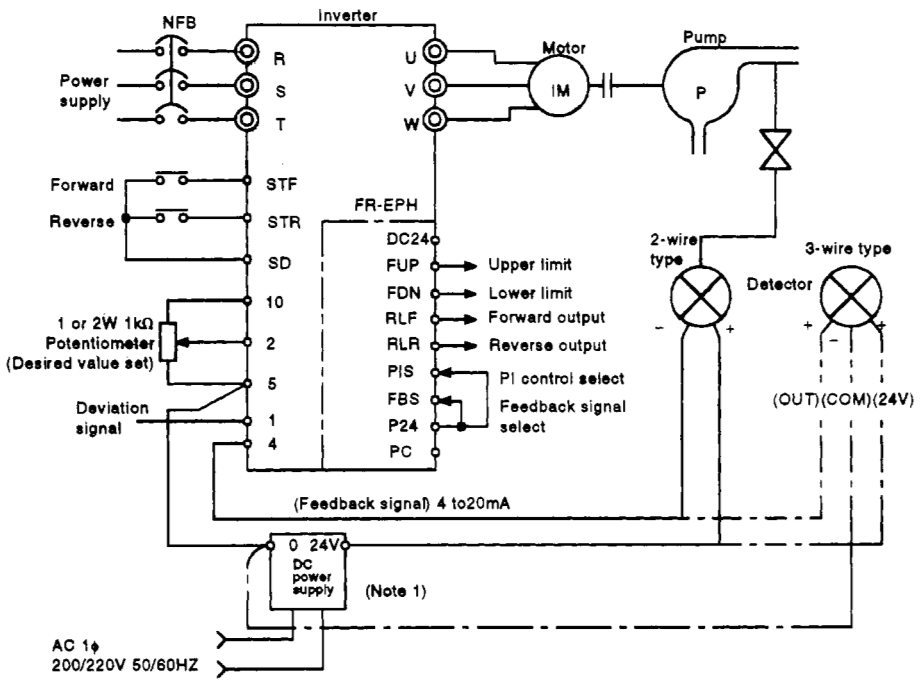


Warning! Hazardous voltage present.
Always isolate the power from the inverter, and wait 5 minutes to ensure the charge lamp has gone out before touching the terminals.

5. PI CONTROL FUNCTION

This function allows the inverter to carry out process control, e.g. flow or pressure control.

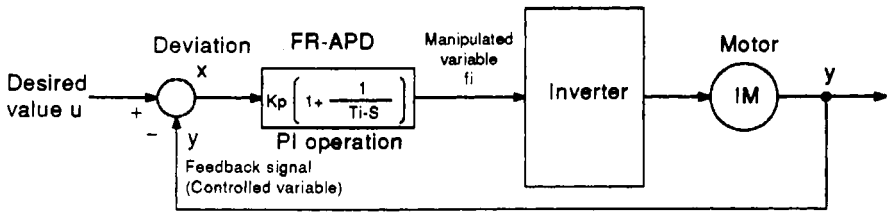
5.1 Wiring Example



Note 1: The power supply should be selected in accordance with the power specifications of the detector used.

5.2 Operation

(1) PI control system configuration



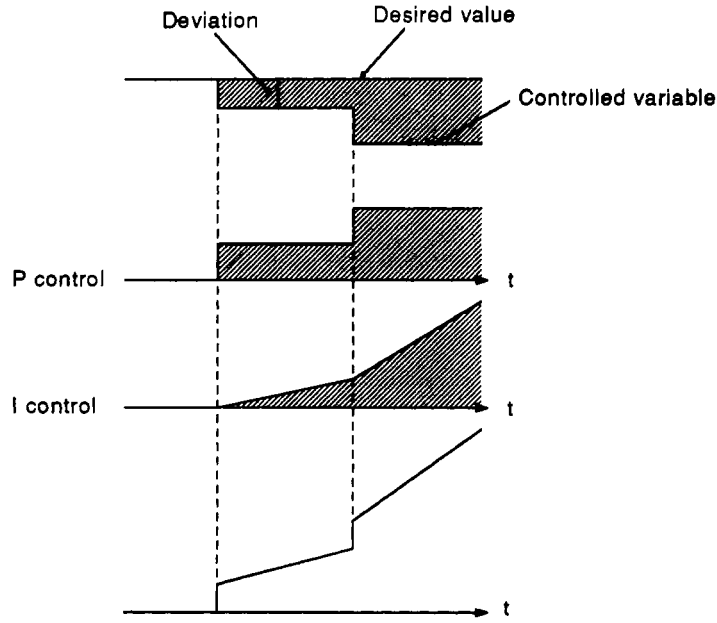
Kp: Proportional constant Ti: Integral time S: Differentiator

(2) Features of PI control

1) PI control

A combination of proportional control (P) and integral control (I) for providing a manipulated variable in response to deviation and changes with time.

(Response for stepped changes of the controlled variable)

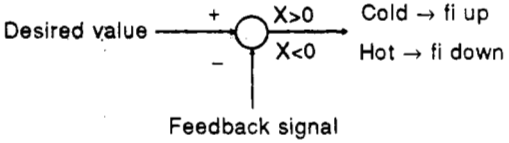


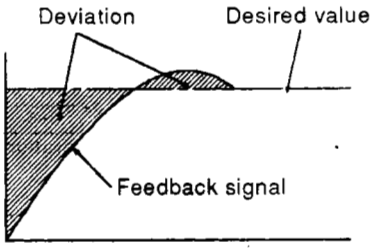
Note: The PI control is the addition of the P and I control.

PI CONTROL FUNCTION

2) Reverse action — Increases the manipulated value (output frequency) if deviation X is positive and decreases the manipulated value if deviation is negative.

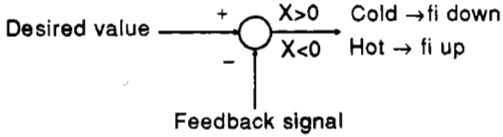
(Heating)

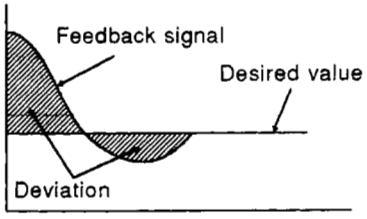




3) Forward action — Increases the manipulated value (output frequency) if deviation X is negative and decreases the manipulated value if deviation is positive.

(Cooling)





5.3 Terminals

Symbol	Terminal	Description
PIS	PI control select input terminal	Connect with terminal P24 to enable PI operation.
FBS	Feedback signal select terminal	Connect with terminal P24 to input a 4-20mA signal from the detector as a process value signal.
P24	Input signal common terminal	Common terminal for FBS.
PC	External transistor common terminal	When connecting a transistor output (open collector output) such as a programmable controller, connect a transistor outputting external power common to this terminal to prevent incorrect operation from occurring due to sneak currents.
FUP	* Upper limit output terminal	Gives output if the process value exceeds the upper limit set value. Open collector output.
FDN	* Lower limit output terminal	Gives output if the process value falls below the lower limit set value. Open collector output.
RLF	Forward output terminal	Gives output when the display of the parameter unit is forward (FWD). Open collector output.
RLR	Reverse output terminal	Gives output when the display of the parameter unit is reverse (REV). Open collector output.
DC24	Output signal common terminal	Common terminal for FUP, FDN, RLF and RLR.

Note: Allowable load of open collector output: 24VDC 0.1A

* Made valid when PI control is selected (terminals PIS and P24 are connected).

5.4 Setting Method

(1) Terminal setting

1) Before starting the PI control, connect the FR-APD terminals PIS and P24. When these terminals are disconnected, the inverter performs ordinary operations without PI control.
2) Input the desired value across the inverter terminals 2-5 or into parameter number 133 and input the feedback signal across the inverter terminals 4-5. In this case, the FR-APD terminals FBS and P24 should be connected.
3) The deviation signal calculated outside the inverter should be input across terminals 1-5 after disconnecting terminals FBS and P24.
4) Setting method

Item	Input Method	Description	
Desired value	Across inverter terminals 2-5	Define 0V as 0% 5V as 100%	When the set value of Pr. 73 (voltage selection) is 1, 3, 5, 11, 13 or 15 (5V is selected for terminal 2)
		Define 0V as 0% 10V as 100%	When the set value of Pr. 73 (voltage selection) is 0, 2, 4, 10, 12 or 14 (10V is selected for terminal 2)
	Parameter number 133	Set the desired value (%) in Pr. 133.	
Deviation signal	Across inverter terminals 1-5	Define -5V as -100% 0V as 0% +5V as +100%	When the set value of Pr. 73 (voltage selection) is 2, 3, 5, 12, 13 or 15 (5V is selected for terminal 1)
		Define -10V as -100% 0V as 0% +10V as +100%	When the set value of Pr. 73 (voltage selection) is 0, 1, 4, 10, 11 or 14 (10V is selected for terminal 1)
Feedback signal	Across inverter terminals 4-5	The feedback signal of 4mA correspond to 0% and 20mA to 100%.	

(2) Parameter

Parameter List

Parameter No.	Description	Range	Minimum Input Increment	Factory Setting	Remarks
128	PI control selection	0, 1	——	0	0: PI reverse action 1: PI forward action
129*	PI proportional band	0.1 to 1000% 9999	0.1%	100%	Set to 9999 to use integral control only.
130*	Integral time	0.1 to 3600 seconds 9999	0.1 seconds	1 second	Set to 9999 to use proportional control only.
131	Upper limit	0 to 100% 9999	0.1%	9999	FUP is output if the feedback value exceeds the upper limit value setting.
132	Lower limit	0 to 100% 9999	0.1%	9999	FDN is output if the feedback value falls below the lower limit value setting.
133*	PI control desired value for PU operation	0 to 100%	0.01%	0%	Only valid during PU or combined PU/external operation.

Note: *The set values of parameter numbers 129, 130 and 133 may be changed during operation.

(3) Parameter setting

1) PI control selection (Pr. 128)

Set the reverse or forward action in Pr. 128 in accordance with the system controlled,

e.g.: Reverse action (Pr. 128 = 0).....For heating, pressure control, etc.
Forward action (Pr. 128 = 1).....For cooling, etc.

2) PI proportional band (Pr. 129)

If Pr.129 is small, the manipulated value varies greatly with a slight change of the controlled variable.

Hence, as Pr.129 is small, the response sensitivity improves but the stability deteriorates, e.g. hunting occurs.

gain Kp.=1/(PI proportional baud value)

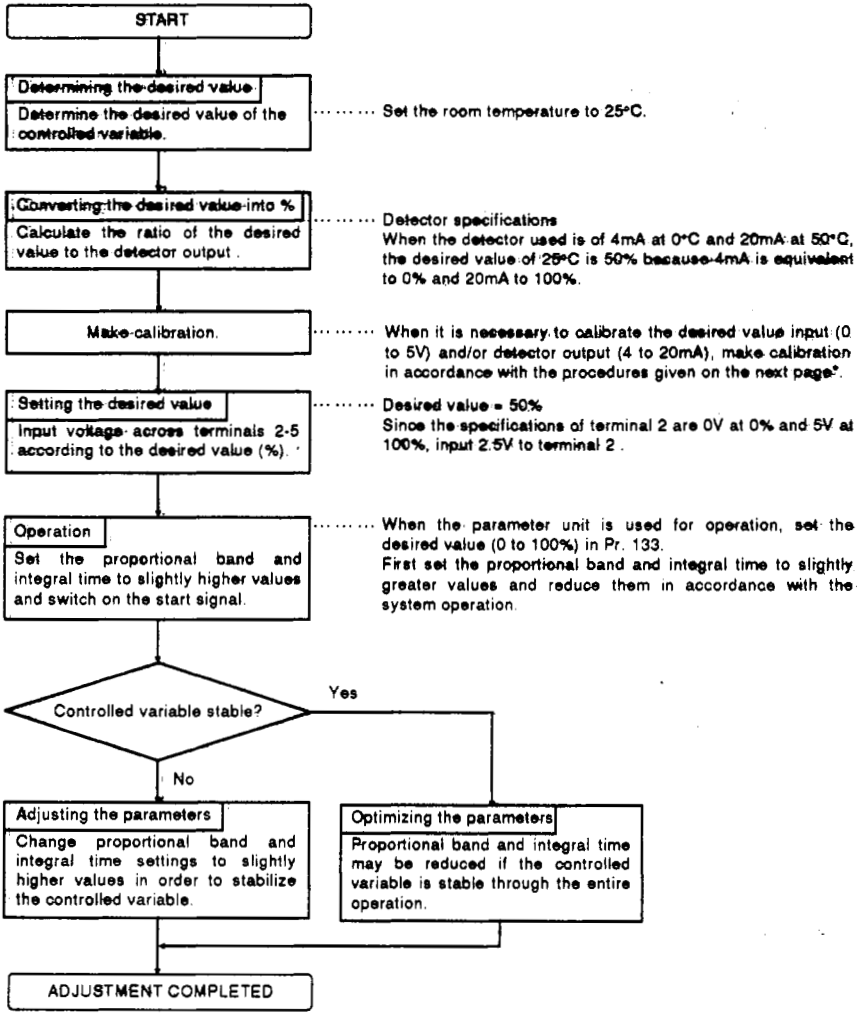
3) Integral time (Pr. 130)
Integral time = Ti.
(I/Ti) is closely related to the gain of the integration term of the PI equation.
If Pr. 130 is small, the controlled variable reaches desired value is reached earlier but hunting can occur more easily.

4) Upper limit, lower limit (Pr. 131) (Pr. 132)
An alarm can be output if the feedback signal comes out of the setting range.
Set the upper limit value in Pr. 131 and the lower limit value in Pr. 132.
The feedback signal of 4mA corresponds to 0% and 20mA to 100%.

5) PI control desired value for PU operation (Pr. 133)
Set the desired value (%) in parameter number 133. It is valid for the PU operation only.
In this case, the frequency set in Pr. 902 is equivalent to 0% and that in Pr. 903 to 100%.
For external operation, the desired value is the voltage across the inverter terminals 2-5.

5.5 Adjustment Example

In the following example, a detector of 4mA at 0°C and 20mA at 50°C is used to adjust room temperature to 25°C by PI control. The desired value is given across the inverter terminals 2 and 5 (0-5V).



PI CONTROL FUNCTION

* When calibration is required —→ Calibrate the detector output and the desired value setting input using calibration parameters 902 to 905. Make calibration in the PU mode when the inverter is at a stop.

(1) The desired value input calibration

1) Input a voltage for the desired value setting of 0% (e.g. 0V) across terminals 2-5.
2) Calibrate using Pr. 902 (frequency setting voltage bias). At this time, input the frequency which should be output by the inverter at the deviation of 0% (e.g. 0Hz).
3) Input a voltage for the desired value setting of 100% (e.g. 5V) across terminals 2-5.
4) Calibrate using Pr. 903 (frequency setting voltage gain). At this time, input the frequency which should be output by the inverter at the deviation of 100% (e.g. 60Hz).

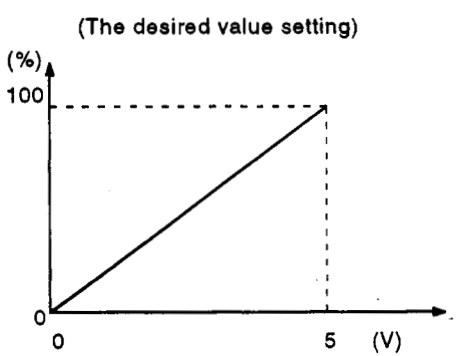
(2) Detector output calibration

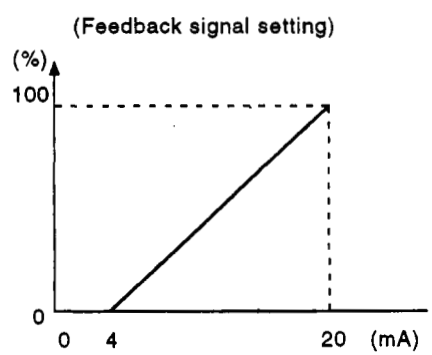
1) Input an output current for the detector setting of 0% (e.g. 4mA) across terminals 4-5.
2) Calibrate using Pr. 904 (frequency setting current bias).
3) Input an output current for the detector setting of 100% (e.g. 20mA) across terminals 4-5.
4) Calibrate using Pr. 905 (frequency setting current gain).

* The frequencies set in 904 and 905 should be identical those set in 902 and 903, respectively.

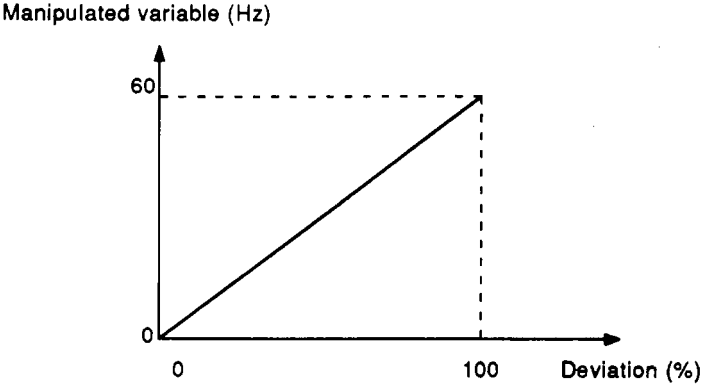
(But the frequencies set in 904 and 905 are independent of the PI control.)

The results of the above calibrations are as shown below:





(Manipulated variable-Deviation)



5.6 Instructions

(1) With terminals PIS and P24 connected, input a multi-speed (terminals RH, RM, RL) or jog operation (terminal JOG) signal to stop the PI control and start multi-speed or jog operation.

(2) When terminals FBS and P24 are connected, note that the input signal across the inverter terminals 1-5 is added to the desired value across terminals 2-5.

(3) Set 5 (programmed operation mode) in Pr. 79 to disable PI control operation and enable programmed operation.

5.7 Specifications

(1) PI setting ranges

Proportional band (P) : 0.1 to 1000%

Integral time (I) : 0.1 to 3600 seconds

(2) Input signals

(a) Desired value, feedback signal and deviation

Input Specifications		Input Terminal, Input Method	Input Signal
Feedback signal of 4 to 20mA	Desired value	Inverter terminal 2	0 to 5V, 0 to 10V (DC)
		Parameter unit	Digital setting
	Feedback signal	Inverter terminal 4	4 to 20mA (DC)
Direct input of deviation	Deviation	Inverter terminal 1 *	0 to ±5V or 0 to ±10V (DC)

*: If a deviation value has been calculated outside the inverter, enter that value into the inverter terminal 1 (±10V or ±5V).
Also, the FR-APD terminals FBS and SD must be disconnected.

(b) Select signals (Contact input)

- PI control selection
- Feedback signal (4 to 20mA) selection

(3) Output signals (Open collector output)

- Permissible load 24V, 0.1ADC
- Upper limit
- Lower limit
- Rotation direction (forward, reverse)

(4) Functions (by using parameter unit)

- Upper limit value
- Lower limit value
- PI proportional band
- Integral time
- Reverse/Forward action selection
- PI control desired value setting at PU operation

(5) Detector power supply

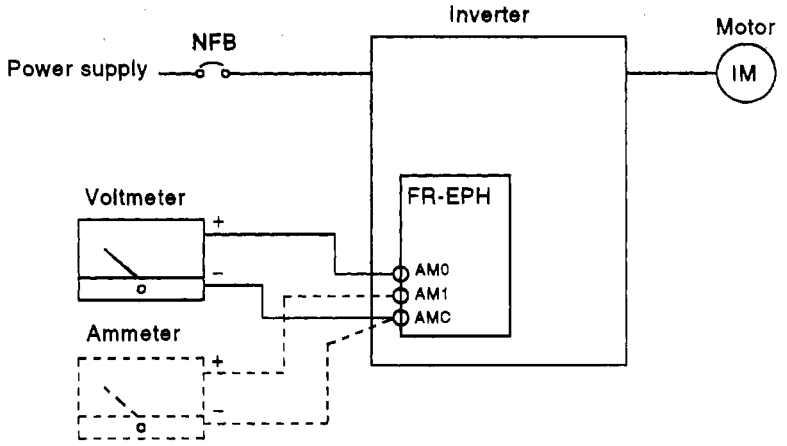
Use the appropriate power supply in accordance with the detector's power supply specifications. The detector power cannot be supplied from the inverter or the option unit.

6. ANALOGUE CURRENT OUTPUT FUNCTION

This function allows any of 16 signals, such as output frequency or output current, to be selected, output as an analog signal and indicated by an ammeter or a voltmeter connected to the terminals of the FR-EPH.
This function also allows different or same signals to be output simultaneously from the voltage output terminal (AM0) and current output terminal (AM1).

6.1 Wiring Example

Connect a voltmeter or an ammeter as shown below.



Note: The cable length of the voltmeter or ammeter must be within 10m.

6.2 Terminals

Symbol	Terminal	Description
AM0	Voltage output terminal	Connect a DC voltmeter (10VDC).
AM1	Current output terminal	Connect a DC ammeter (20mADC).
AMC	Common terminal	Common terminal for AM0 and AM1.

Always isolate the power from the inverter, and wait 5 minutes to ensure the charge lamp has gone out before touching the terminals.

6.3 Adjustments

Set the following parameters before starting inverter operation:

Function Number	Function Name	Setting Range	Minimum Increment	Factory Setting	Remarks
135	Analog output signal selection	1 to 21	1	2	4, 15, 16, 19 and 20 must not be set.
136	Setting for zero analog output	0 to 100%	0.1%	0%	
137	Setting for maximum analog output	0 to 100%	0.1%	100%	
146	Voltage/current selection for analog output signal	0, 1	1	0	
147	Analog meter voltage output selection	1 to 21	1	2	4, 15, 16, 19 and 20 must not be set.
148	Setting for zero analog meter voltage output	0 to 100%	0.1%	0%	
149	Setting for maximum analog meter voltage output	0 to 100%	0.1%	100%	

6.4 Instructions

(1) A voltmeter having smaller internal impedance (or an ammeter having larger internal impedance) than the value indicated in the Specifications (Section 5.5) may not deflect to full-scale and may not be calibrated.

(2) This option is factory-set to provide full-scale output to 10VDC and 20ADC meters. Hence, a voltmeter (7VDC or less) or an ammeter (14mADC or less) with a small full-scale value may be damaged accidentally during calibration. When calibrating a meter having a small full-scale value, first set the output of terminal AM0 (AM1) to the minimum without connecting the meter, then connect and calibrate the meter.

(3) If calibration is made without 21 (reference voltage output) set in Pr. 135, the AM terminal of the inverter is calibrated.
To make calibration for the extension analog output, 21 must be set in Pr. 135.
After the end of the calibration, select the output signal.

ANALOGUE CURRENT OUTPUT FUNCTION

[Adjustment procedures]

(1) Setting the voltage/current selection for analog output signal [Pr. 146]
Use Pr. 146 to select whether the same or different signals are output from the voltage output terminal (AM0) and current output terminal (AM1).

Voltage/Current Selection for Analog Output Signal [Pr. 146]	Description	Parameters for Setting		Parameter for Adjustment
Set value = 0 (factory setting)	The same signals are output from the voltage output terminal (AM0) and current output terminal (AM1).	AM0	Pr. 135: Select the output signal. Pr. 136: Output signal value for zero output Pr. 137: Output signal value for maximum output	Pr. 901
		AM1		
Set value = 1	Different signals are output from the voltage output terminal (AM0) and current output terminal (AM1).	AM0	Pr. 147: Select the output signal. Pr. 148: Output signal value for zero output Pr. 149: Output signal value for maximum output	Pr. 900
		AM1	Pr. 135: Select the output signal. Pr. 136: Output signal value for zero output Pr. 137: Output signal value for maximum output	Pr. 901

(2) Analog output signal selection [Pr. 135] [Pr. 147]

- Select any of the following analog signals output from terminals AM0 and AM1.
- To output the same signals from AM0 and AM1 (Pr. 146=0), select the analog signal from the following table and set the corresponding signal number in parameter 135. (The Pr. 147 setting is ignored.)
- To output different signals from AM0 and AM1 (Pr. 146=1), set the signal number of AM0 in Pr. 147 and that of AM1 in Pr. 135.

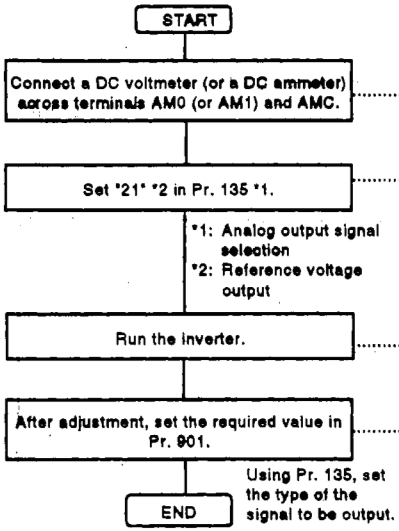
Output Signal List

Signal Number	Definition of Output Signal	Full-Scale Value
1	Output frequency (Hz)	Value set in Pr. 55
2	Output current (A)	Value set in Pr. 56
3	Output voltage (V)	400V or 800V
5	Frequency set value (Hz)	Value set in Pr. 55
6	Running speed	Value converted from the Pr. 55 value by the Pr. 37 value
8	Converter output voltage (V)	400V or 800V
9	Regenerative brake duty (%)	Value set in Pr. 70
10	Electronic overcurrent protection load factor (%)	Overcurrent protection level
11	Output current peak value (A)	Value set in Pr. 56
12	Converter output voltage peak value (V)	400V or 800V
21	Reference voltage output	Full-scale voltage or current is output to terminal LM0 or LM1.
24	Motor load factor (%) $\left(\frac{\text{Output current}}{\text{Rated inverter current}} \times 100\right)$	(Rated load of applied motor) × 2

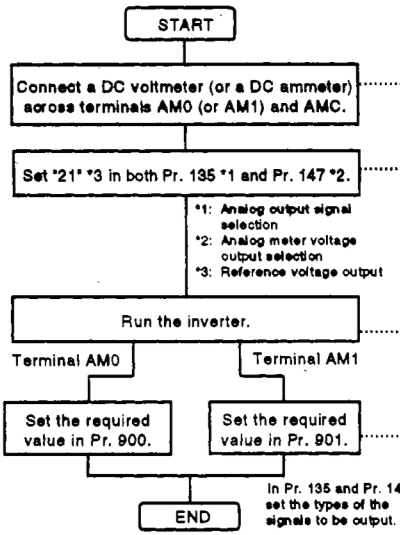
ANALOGUE CURRENT OUTPUT FUNCTION

(3) Meter calibration (Pr. 135, Pr. 147, Pr. 900, Pr. 901, [▼], [▲] keys)

1) Outputting the same selected signals from terminals AM0 and AM1



2) Outputting different selected signals from terminals AM0 and AM1

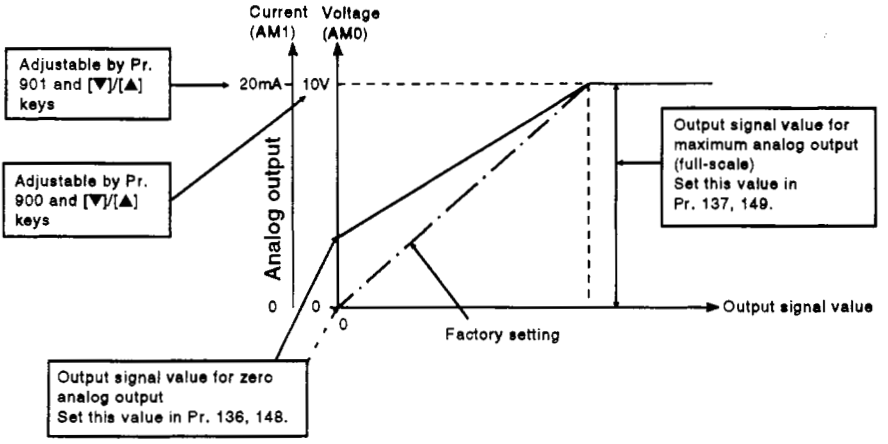


Note: When you start the [▼]/[▲] keys, the meter deflection changes slowly. Hence, it can be used for fine adjustment. Hold down the key to change the deflection faster.

(4) Analog signal adjustment [Pr. 136, Pr. 137, Pr. 148, Pr. 149]

To provide the output signal in the form of a 0-10VDC or 0-20mADC analog output signal (output signal for meter), set the zero analog output (meter zero) and maximum analog output (full-scale) points as shown below in accordance with the following table:

Pr. 146 Setting	Output Signals	Parameters for Setting		Parameter for Adjustment
0 (factory setting)	Same signals from AM0 and AM1	AM0	Pr. 136: Output signal value for zero output Pr. 137: Output signal value for maximum output	Pr. 901
		AM1		
1	Different signals from AM0 and AM1	AM0	Pr. 148: Output signal value for zero output Pr.149: Output signal value for maximum output	Pr. 900
		AM1	Pr. 136: Output signal value for zero output Pr. 137: Output signal value for maximum output	Pr. 901



Note: When the signal values set for zero and maximum analog outputs are the same, i.e. Pr. 136 = Pr. 137 and Pr. 148 = Pr. 149, in the above, the output value of output terminal AM0 or AM1 is always zero.

6.5 Specifications

(1) Output signals
Voltage output (across terminals AM0-AMC) 0 to 10VDC
Current output (across terminals AM1-AMC) 0 to 20mADC

(2) Output resolution
Voltage output 3mV
Current output 20μA

(3) Display accuracy (reference value)
±10% of the full-scale output value.
Depends on output signal types.

(4) Meters used
- Voltmeter
  DC voltmeter full-scale 10V (internal impedance 10kΩ or more)
- Ammeter
  DC ammeter full-scale 20mA (internal impedance 40Ω or less)
- Cable length
  Max. 10m

(5) Output signal types
One of the following signals can be selected and displayed (output): inverter output current (motor current), output frequency, output voltage, frequency set value, running speed, converter output voltage, regenerative brake duty, electronic overcurrent protector load factor, output current peak value, converter voltage peak value, reference voltage output and motor load factor.

REVISIONS

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

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