

User's Manual

Model MU5D
Universal Temperature
Converter
(2-output, Free Range Type)

JUXTA

IM 77J04U05-02E

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Please read through this User's Manual before use for correct handling.
Please keep this User's Manual for future reference.

YOKOGAWA
Yokogawa Electric Corporation

IM 77J04U05-02E
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CAUTIONARY NOTES FOR SAFE USE OF THE PRODUCT

This User's Manual should be carefully read before installing and operating the product. The following symbol is used on the product and in this manual to ensure safe use.



This symbol is displayed on the product when it is necessary to refer to the User's Manual for information on personnel and instrument safety. This symbol is displayed in the User's Manual to indicate precautions for avoiding danger to the operator, such as an electric shock.

The following symbols are used only in this manual.



IMPORTANT

Indicates that operating the hardware or software in a particular manner may cause damage or result in a system failure.



NOTE

Draws attention to essential information for understanding the operations and/or functions of the product.

CHECKING PRODUCT SPECIFICATIONS AND PACKAGED ITEMS

(1) Checking the Model and Product Specifications

Check that the model and specifications indicated on the nameplate attached to the main unit are as ordered.

(2) Packaged Items

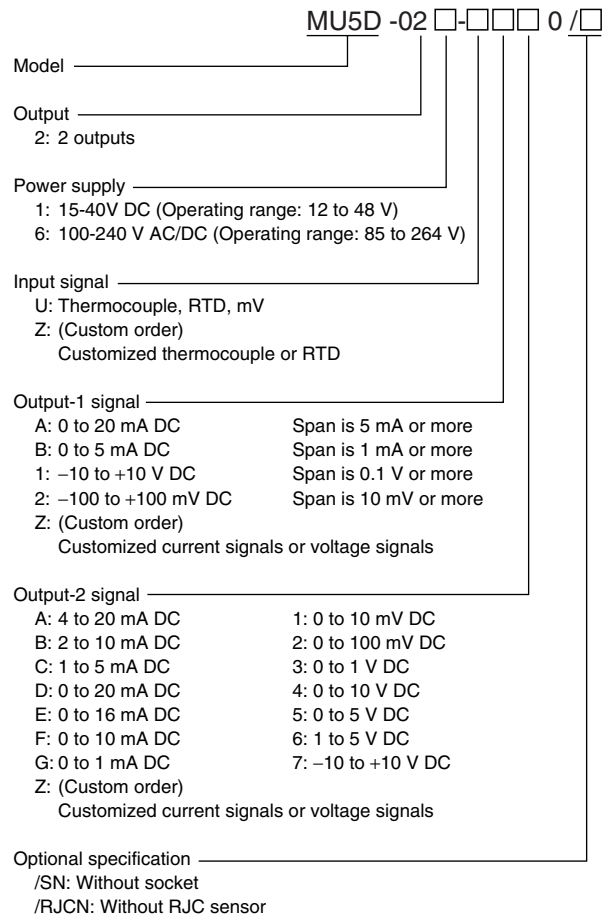
Check that the package contains the following items:

- MU5D: 1
- RJC sensor (A1167HT): 1
(RJC sensor is not attached for the optional specification "/RJCN.")
- Spacer (for DIN rail mounting): 1
- Range label: 1
- User's Manual (this manual: IM 77J04U05-02E): 1

GENERAL

The MU5D is a plug-in type universal temperature converter that is connected to an IEC/JIS-standard thermocouple, converts the temperature signals into isolated DC current or DC voltage signals.

MODEL AND SUFFIX CODES



1. MOUNTING METHOD

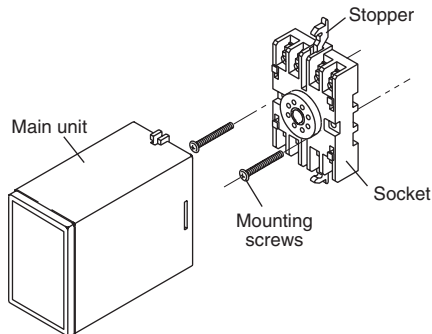


NOTE

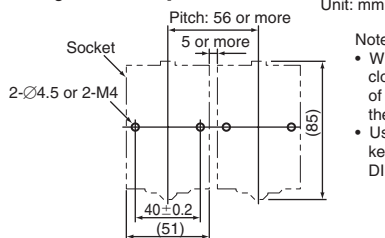
Plug/disconnect the main unit into/from the socket vertically to the socket face. Otherwise the terminals may bend and it may cause bad contact.

1.1 Wall Mounting

Unfasten the upper and lower stoppers of the converter to disconnect the main unit from the socket. Next, anchor the socket onto the wall with two M4 screws. Then, plug the main unit into the socket and secure the main unit with the upper and lower stoppers.

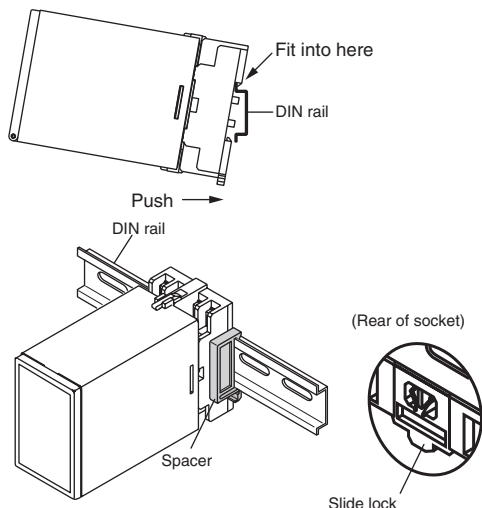


[Mounting Dimensions]



1.2 DIN Rail Mounting

Locate the converter so that the DIN rail fits into the upper part of the DIN-rail groove at the rear of the socket, and fasten the socket using the slide lock at the lower part of the socket.



1.3 Using Ducts

When using a wiring duct, install the duct at least 30 mm away from the top and bottom faces of the main unit.

2. INSTALLATION LOCATIONS

- Avoid the following environments for installation locations: Areas with vibration, corrosive gases, dust, water, oil, solvents, direct sunlight, radiation, a strong electric field, and/or a strong magnetic field
Installation altitude: 2000 m or less above sea level.
- If there is any risk of a surge being induced into the power line and/or signal lines due to lightning or other factors, a dedicated lightning arrester should be used as protection for both this converter and a field-installed device.
- Operating temperature/humidity range: 0 to 50°C/5 to 90%RH (no condensation)

3. EXTERNAL WIRING

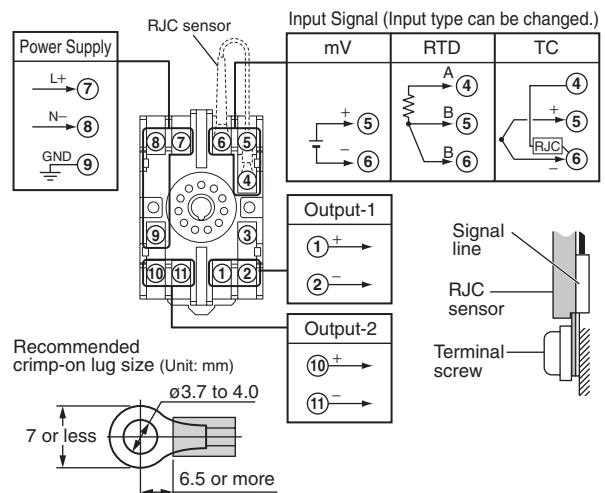


WARNING

To avoid the risk of an electric shock, turn off the power supply and use a tester or similar device to ensure that no power is supplied to a cable to be connected, before carrying out wiring work.

Wires are connected to the terminals of the converter's socket. M3.5 screw terminals are provided for the connection of external signals. Attach a crimp-on lug to each wire for connection to the terminals.

- Recommended cables: A nominal cross-sectional area of 0.5 mm² or thicker for signal cables, and that of 1.25 mm² or thicker for power cables.



* Attach the RJC sensor correctly as shown in the figure above only for thermocouple input.



IMPORTANT

- The power line and input/output signal lines should be installed away from noise-generating sources. Other wise accuracy cannot be guaranteed.
- The grounding resistance must be 100 Ω (JIS Class D grounding). The length and thickness of the grounding cable should be as short and thick as possible. Directly connect the lead from the ground terminal (terminal no. 9) of the product to the ground. Do not carry out daisy-chained inter-ground terminal wiring.
- Use of the product ignoring the specifications may cause overheating or damage. Before turning on the power, ensure the following:
 - (a) Power supply voltage and input signal value applied to the product should meet the required specifications.
 - (b) The external wiring to the terminals and wiring to ground are as specifications.
- Do not operate the product in the presence of flammable or explosive gases or vapors. To do so is highly dangerous.
- The product is sensitive to static electricity; exercise care in operating it. Before you operate the product, touch a nearby metal part to discharge static electricity.
- The RJC sensor may be damaged if an excessive force is applied. When attaching the RJC sensor, be sure not to pull it or not to bend the crimp-on terminal lugs.

Power Supply and Isolation

Power supply rated voltage:

15-40 V DC \approx or 100-240 V AC/DC \approx 50/60 Hz

Power supply input voltage:

15-40 V DC \approx ($\pm 20\%$) or 100-240 V AC/DC \approx ($-15, +20\%$) 50/60 Hz

Power consumption:

24 V DC 2.3 W, 110 V DC 2.2 W

100 V AC 4.6 VA, 200 V AC 6.4 VA

Insulation resistance:

100 M Ω at 500 V DC between input, output, power supply, and grounding terminals mutually.

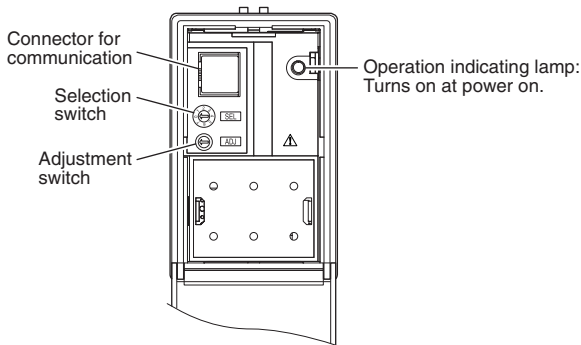
Withstand voltage:

2000 V AC for 1 minute between input, output, power supply and grounding terminals mutually.

1000 V AC for 1 minute between output-1 and output-2 terminals.

4. DESCRIPTION OF FRONT PANEL

The figure below shows the converter of which the front panel cover is open.



4.1 Operation Indicating Lamp

The operation indicating lamp shows the operation status, abnormalities in a setting, and adjustment operation status by the adjustment switch on the front panel.

(1) When the lamp is lit:

Power is turned on and the converter is in the normal status provided that the selection switch is set to the position "0."

(2) When the lamp is blinking rapidly:

The lamp repeats the rapid blinking until the internal processing is completed during output adjustment and wiring resistance correction by the adjustment switch.

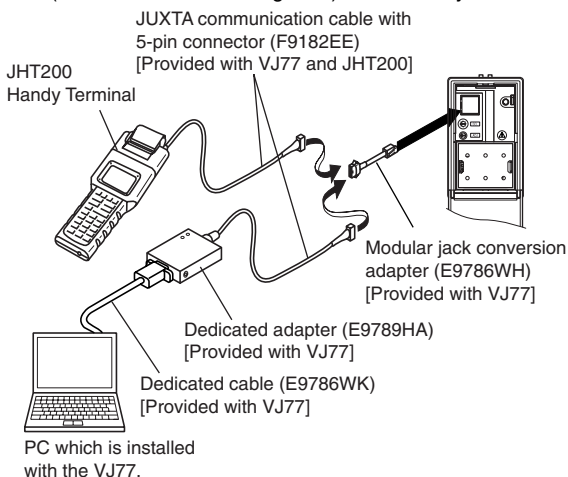
(3) When the lamp is blinking slowly:

The lamp repeats the slow blinking until the converter regains its normal status when the following abnormalities occur.

- Abnormalities in a parameter setting
- The selection switch is set to the positions other than "0."
- Input is outside of the range of -10 to 110% .
- OFF of RJC and error of RJC.

4.2 Connector for Communication

Use the connector for communication when setting the parameters using a PC (VJ77 Parameter Setting Tool) or the Handy Terminal.



*: Use the VJ77 of version R1.04 or later.

4.3 Selection Switch and Adjustment Switch

The following adjustments can be performed using the switches on the front panel (selection switch and adjustment switch) without the dedicated setting tool (refer to "4.2 Connector for Communication").

The adjusted value is saved about 1 second after operating the adjustment switch. Also when the rotation direction of the adjustment switch is changed, the adjusted value becomes effective about 1 second after the change.

| Position of selection switch | Item to be adjusted |
|------------------------------|------------------------------|
| 0 | No function |
| 1 | Output-1 zero adjustment |
| 2 | Output-1 span adjustment |
| 3 | Output-2 zero adjustment |
| 4 | Output-2 span adjustment |
| 5 | Wiring resistance correction |
| 7 | ON/OFF of RJC |

| Rotation direction of adjustment switch | Adjustment operation |
|---|--|
| Clockwise | Increase of output adjusted value, execution of wiring resistance correction and ON of RJC |
| Counterclockwise | Decrease of output adjusted value, reset of wiring resistance corrected value and OFF of RJC |

[Adjusted volume by the adjustment switch]

One click changes about 0.005% of output range.

For thermocouple input, turn off the RJC.

4.3.1 Adjusting Output Using the Switches on the Front Panel

(1) Output-1 zero adjustment

Apply the 0% input signal. Turn the selection switch to "1." Then turn the adjustment switch clockwise to increase the output, or turn it counterclockwise to decrease the output.

(2) Output-1 span adjustment

Apply the 100% input signal. Turn the selection switch to "2." Then turn the adjustment switch clockwise to increase the output, or turn it counterclockwise to decrease the output.

Output-2 can be adjusted by the same operation as the above.

(3) Output-2 zero adjustment

Apply the 0% input signal. Turn the selection switch to "3." Use the adjustment switch for adjustment.

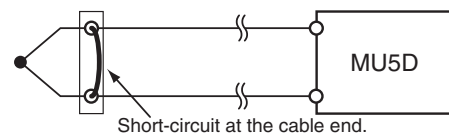
(4) Output-2 span adjustment

Apply the 100% input signal. Turn the selection switch to "4." Use the adjustment switch for adjustment.

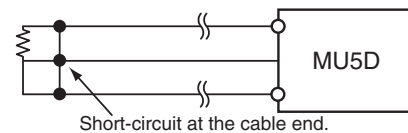
4.3.2 Correcting the Wiring Resistance Using the Switches on the Front Panel

When an error occurs due to the influence of the input wiring resistance, perform the wiring as the figure below, apply a stable input, and execute the following operations. Then the wiring resistance can be corrected automatically.

<Thermocouple>



<RTD>



Be sure to turn the adjustment switch counterclockwise to reset the corrected value before executing the wiring resistance correction.

(1) Executing the wiring resistance correction

Turn the selection switch to "5", and turn the adjustment switch clockwise. Then the wiring resistance is adjusted after 1 second automatically.

(2) Resetting the wiring resistance corrected value

Turn the selection switch to "5", and turn the adjustment switch counterclockwise. Then the adjusted value is reset after 1 second.

4.3.3 Turning on/off the RJC Using the Switches on the Front Panel.

This operation is only for thermocouple input. Turn the selection switch to "7". Turn the adjustment switch counterclockwise to turn off the RJC sensor after 1 second. Turn the adjustment switch clockwise to turn on the RJC sensor after 1 second.



NOTE

- **Be sure to set the selection switch back to the position "0" after each adjustment. Otherwise it may cause an incorrect operation or malfunction because the positions other than "0" are adjustment modes.**
- **When the selection switch is set to the positions other than "0", the setting tool can not be used for the setting.**
- **The RJC is turned on when the power is turned on again after turned off.**

5. SETTING PARAMETERS

Set the parameters using a PC (VJ77 Parameter Setting Tool) or the Handy Terminal. Refer to "6. List of Parameters" in this manual and the User's Manual for VJ77 PC-based Parameters Setting Tool (IM 77J01J77-01E) or the User's Manual for JHT200 Handy Terminal (IM JF81-02E). Parameters are indicated inside the [].

The initial value of the input range is set up according to the selected values of the input sensor type, input type and temperature unit.

Set the parameters as follows.

Setting regarding to the input: set sequentially from 1.

- (1) Set the input sensor type.
- (2) Set the input type.
- (3) Set the temperature unit for temperature input.
- (4) Set the input range.

5.1 Setting Thermocouple Type

Set the thermocouple type to be connected to the input in [D08: TC TYPE].

| Display | Measuring Range | Measuring span | Display | Measuring Range | Measuring span |
|---------|-----------------|----------------|---------|-----------------|----------------|
| TYPE K | -270 to 1372 °C | 3mV or more | TYPE R | -50 to 1768 °C | 3mV or more |
| TYPE E | -270 to 1000 °C | | TYPE S | -50 to 1768 °C | |
| TYPE J | -210 to 1200 °C | | TYPE B | 0 to 1820 °C | |
| TYPE T | -270 to 400°C | | TYPE N | -270 to 1300 °C | |

5.2 Setting RTD Type

Set the RTD type to be connected to the input in [D09: RTD TYPE].

| Display | Type of Input | Measuring range | Measuring span |
|----------|-------------------------|-----------------|-----------------|
| Pt100-68 | Pt100 (IPTS-68: JIS'89) | -200 to 660 °C | 10°C or more |
| JPt100 | JPt100 (JIS'89) | -200 to 510 °C | |
| Pt50 | Pt50 (JIS'81) | -200 to 649 °C | |
| Pt100-90 | Pt100 (ITS-90: JIS'97) | -200 to 850 °C | |

JPt100 (JIS'89) : R0 = 100 Ω, R100/R0 = 1.3916
 Pt100 (IPTS-68) : R0 = 100 Ω, R100/R0 = 1.3850
 Pt100 (ITS-90) : R0 = 100 Ω, R100/R0 = 1.3851

5.3 Setting Temperature Unit

Set the temperature unit of the input range in [D19: UNIT].

5.4 Setting Burnout Action

Set the burnout action in [D43: BURN OUT].

Set "OFF", "UP", or "DOWN."



NOTE

- **Changing the input range and the burnout action direction resets the input adjusted value and the wiring resistance corrected value.**
- **Execute the wiring resistance correction when the burnout action direction or input wiring is changed.**

5.5 Setting Input Range

Set the input range 0% in [D27: INPUT1L_RNG], and the input range 100% in [D28: INPUT1H_RNG].

5.6 Correcting Wiring Resistance

Correct the wiring resistance in [P01: WIRING R].

Select "EXECUTE" for correction, and "RESET" for resetting the corrected value.

Perform wiring as the figure shown in "4.3.2 Correcting the Wiring Resistance Using the Switches on the Front Panel" before correcting the wiring resistance.

6. LIST OF PARAMETERS

| Parameter Display | | Item |
|-------------------|------------------|------------------------------|
| | MODEL | Model |
| | TAG NO | Tag number |
| | SELF CHK | Self-check result |
| A | DISPLAY1 | Display1 |
| A01 | INPUT1 | Input-1 |
| A07 | OUTPUT1 | Output-1 |
| A08 | OUTPUT2 | Output-2 |
| A54 | STATUS | Status *1 |
| A56 | REV NO | REV No. |
| A58 | MENU REV | MENU REV |
| A60 | SELF CHK | Self-check result |
| B | DISPLAY2 | Display2 |
| B01 | INPUT1 | Input-1 |
| B07 | OUTPUT1 | Output-1 |
| B08 | OUTPUT2 | Output-2 |
| B60 | SELF CHK | Self-check result |
| D | SET (I/O) | Setting (I/O) |
| D01 | TAG NO.1 | Tag number-1 |
| D02 | TAG NO.2 | Tag number-2 |
| D03 | COMMENT1 | Comment-1 |
| D04 | COMMENT2 | Comment-2 |
| D07 | SENSOR TYPE | Input sensor type |
| D08 | TC TYPE | Thermocouple type *2 |
| D09 | RTD TYPE | RTD type *3 |
| D13 | LINEARIZE | Linearization *4 |
| D19 | UNIT | Temperature unit *2, *3 |
| D27 | INPUT1 L_RNG | Input-1 low range |
| D28 | INPUT1 H_RNG | Input-1 high range |
| D38 | OUT1 L_RNG | Output-1 low range |
| D39 | OUT1 H_RNG | Output-1 high range |
| D40 | OUT2 L_RNG | Output-2 low range |
| D41 | OUT2 H_RNG | Output-2 high range |
| D43 | BURN OUT | Burnout |
| D49 | OUT1 DR | Direction of output-1 action |
| D50 | OUT2 DR | Direction of output-2 action |
| D60 | SELF CHK | Self-check result |
| P | ADJUST | Adjustment |
| P01 | WIRING R | Wiring resistance correction |
| P02 | IN1 ZERO ADJ | Input-1 zero adjustment |
| P03 | IN1 SPAN ADJ | Input-1 span adjustment |
| P26 | OUT1ZERO ADJ | Output-1 zero adjustment |
| P27 | OUT1SPAN ADJ | Output-1 span adjustment |
| P28 | OUT2ZERO ADJ | Output-2 zero adjustment |
| P29 | OUT2SPAN ADJ | Output-2 span adjustment |
| P60 | SELF CHK | Self-check result |
| Q | TEST | Test |
| Q01 | RJC | ON/OFF of RJC *2 |
| Q03 | OUT1 TEST | Forced output-1 |
| Q04 | OUT2 TEST | Forced output-2 |
| Q60 | SELF CHK | Self-check result |

*1 The displayed status is to let the service staff know the past records of the product.

*2 Displayed only when the parameter D07: SENSOR TYPE is set to "TC".

*3 Displayed only when the parameter D07: SENSOR TYPE is set to "RTD".

*4 Displayed only when the parameter D07: SENSOR TYPE is set to "mV".

7. MAINTENANCE

The product starts running immediately when the power is turned on; however, it needs 10 to 15 minutes of warm-up before it meets the specified performance.

7.1 Calibration Apparatus

- A DC voltage/current standard (Yokogawa 7651 or the equivalent)
- A 6-dial variable resistor (Yokogawa M&C 279301 or the equivalent)
- A digital multimeter (Yokogawa 7561 or the equivalent)
- A precision resistor of $250\ \Omega \pm 0.01\%$, 1 W
- A setting tool for adjustment
(Refer to “4.2 Connector for Communication” in this manual.)

7.2 Calibration Procedure

- (1) Connect the instruments as shown below.
- (2) When the input type is thermocouple:
 - (2-1) Turn off the RJC using the switches on the front panel, or through the setting tool.
 - (2-2) Use the DC voltage/current standard and apply the electromotive force equivalent to 0, 25, 50, 75, and 100% of the measuring range to the converter.
- (3) When the input type is RTD:

Use the 6-dial variable resistor and apply the resistance equivalent to 0, 25, 50, 75, and 100% of the measuring range to the converter.
- (4) When the input type is mV DC:

Use the DC voltage/current standard and apply input signals equivalent to 0, 25, 50, 75, and 100% of the input span to the converter.
- (5) Check to see the corresponding output voltages are 0, 25, 50, 75, and 100% respectively and within the specified accuracy rating.
“ R_0 ” is used for current output.
- Use the setting tool (VJ77 Parameter Setting Tool or JHT200 Handy Terminal) or the switches on the front panel (selection switch and adjustment switch) to adjust the input/output signals.
For thermocouple input, turn off the RJC.

Input Adjustment Procedure

- (1) Input the value equivalent to 0% value of input range.
- (2) Call the display item (A: DISPLAY1) to check the input value in A01: INPUT1.
- (3) If the adjustment is necessary, call the adjustment item (P: ADJUST).
- (4) Select P02: IN1 ZERO ADJ to enter the adjustment mode. Select EXECUTE (adjustment) for adjustment. (If RESET is selected, the adjusted value is reset to the factory-set default.)
- (5) Input the value equivalent to 100% value of input range.
- (6) Call the display item (A: DISPLAY1) to check the input value in A01: INPUT1.
- (7) If the adjustment is necessary, call the adjustment item (P: ADJUST).
- (8) Select P03: IN1 SPAN ADJ to enter the adjustment mode. Select EXECUTE (adjustment) for adjustment. (If RESET is selected, the adjusted value is reset to the factory-set default.)

Output Adjustment Procedure

- (1) When adjusting 0% value of output-1, call the adjustment item (P: ADJUST) to select P26: OUT1ZERO ADJ.
 - (2) If it slips out to (+) side, set (-) value equivalent to slipout; if slips out to (-) side, set (+) value equivalent to slipout.
- *: The 100% value of output-1 and the 0% value and 100% value of output-2 can be adjusted by the same operation as the above.

For adjustment using a setting tool, refer to the User's Manual for each setting tool and “6. List of Parameters” in this manual.

For adjustment using the switches on the front panel, refer to “4.3 Selection Switch and Adjustment Switch.”

User's Manual for VJ77 [Document No.: IM 77J01J77-01E]; however, use the VJ77 of version R1.04 or later.

User's Manual for JHT200 [Document No.: IM JF81-02E]

