Instruction Manual

Model VJX7
Universal Computing Unit

JUXTA

IM 77J01X07-01E

1. CAUTIONARY NOTES FOR SAFE USE OF THE PRODUCT

For the correct use of this product, read through this manual before use. The following safety symbol is indicated on the product to ensure safe use.

If this symbol is indicated on the product, the operator should refer to the explanation given in the instruction manual in order to avoid personnel injury or death to either themselves or other personnel, and/or damage to the instrument. The manual describes the special care the operator should exercise to avoid shock or other dangers that may result in injury or loss of life.

The following symbol marks are used only in this manual.

IMPORTANT

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

NOTE

Draws attention to information that is essential for understanding the operations and/or features of the product.

2. CHECKING PRODUCT SPECIFICATIONS AND THE CONTENTS OF PACKING

(1) Model Number and Specification Check

Check that the model number and specifications shown on the nameplate attached on the side of the product are as ordered.

(2) Contents of the Packing

Check that the packing contains the following items:

- VJX7 main unit, 1
- Instruction Manual (IM 77J01X07-01E), 1

Accessories:

- Tag number label, 1
- Renge label, 1
- Shunt registor (for specification of current input), 1

3. GENERAL

This Universal Computing Unit, which belongs to the JUXTA series of signal conditioners, receives DC current or voltage signals and converts them to pairs of isolated DC voltage or current signals.

- Output-2 signal is selectable from a DC voltage signal, DC current signal, communication function (RS-485), and alarm output (two relay contacts).

4. MOUNTING METHODS

4.1 Wall Mounting

Loosen the main unit-fixing screw of the computing unit to disconnect the main unit from the socket. Next, anchor the socket onto the wall with screws. Then, plug the main unit into the socket and secure the main unit with the main unit-fixing screw.

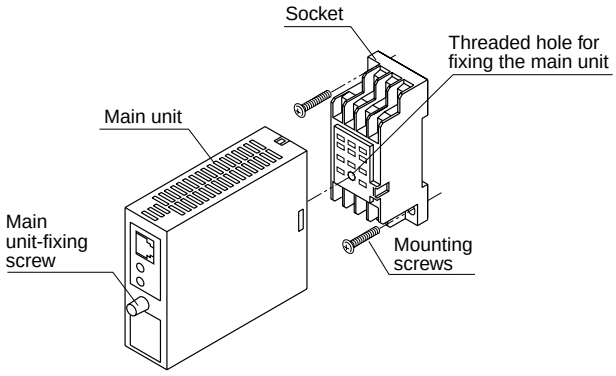

Fig. 4.1

4.1.1 Mounting Dimensions

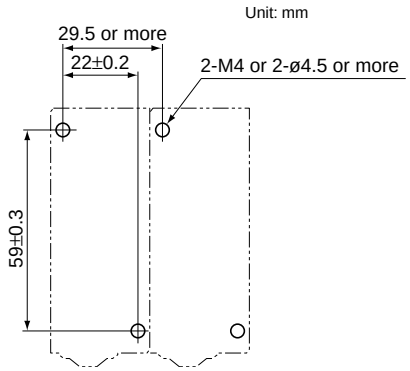

Fig. 4.2

4.2 DIN Rail Mounting

Locate the computing unit 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.

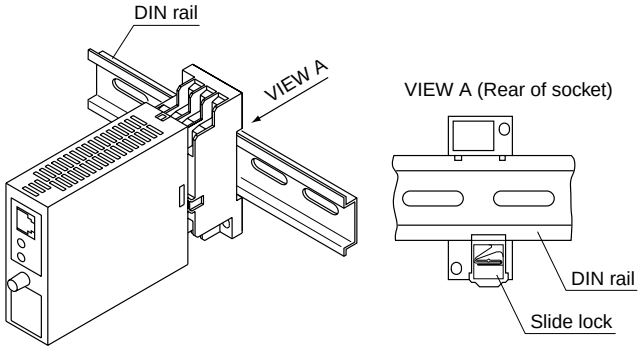

Fig. 4.3

Keep this manual in a safe place.

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4.3 Mounting Using a Multi-mounting Base

For mounting using a multi-mounting base, see the Instruction Manual for VJCE (VJ Mounting Base).

4.4 Using Ducts

Wiring ducts should be installed at least 30 mm away from the top or bottom of the main unit.

4.5 In case of top-and-bottom close mounting

Transmitter should be mounted horizontally with its top and bottom slits being vertical. The top and bottom slits should not be covered.

The area for wiring is required above and below the transmitter (the area with slant lines).

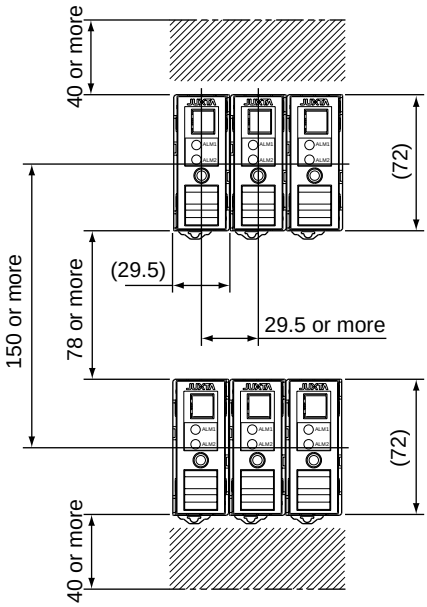


Fig. 4.4

5. INSTALLATION LOCATION

- For installation, avoid any location where the product may be subject to vibrations, corrosive gases, or large amounts of dust, or where the product is exposed to water, oil, solvents, direct sunlight, radioactive rays, or strong electric or magnetic fields.
- If there is a possibility that lightning could induce a high surge voltage on the power and signal lines, provide lightning arresters on the line between the field instrument and indoor instrument in order to protect the product. Install a dedicated arrester on the field side and another on the indoor side.

6. EXTERNAL WIRING

WARNING

Turn OFF the power supply and make sure that none of the cables are not in the hot-line state before carrying out the wiring to avoid the possibility of electric shock.

Wires are connected to the terminals of the isolator's socket. M3 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 mm^2 or thicker for signal cables, and that of 1.25 mm^2 or thicker for power cables, and shielded twisted-pair cables (AWG24) for communication wiring cables.
- For mounting, use M3 screws and crimp-on terminals with insulating sleeves appropriate for the wires used.
  Tool of the crimp-on terminals to be used should be appropriate for the crimp-on terminals.
- Mount a breaker on the external place.
  Mount a switch or 5A circuit breaker on the place near by the instrument, within operator's reach. And attach the indication that it is for disconnecting the instrument.

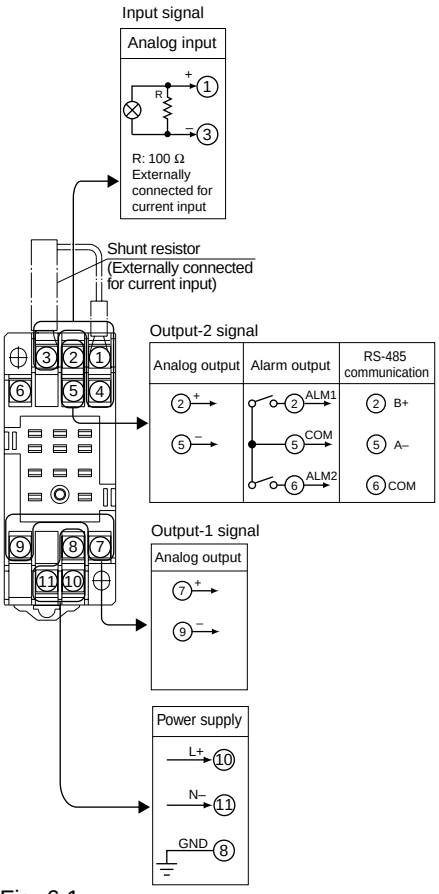


Fig. 6.1

NOTE

- Keep all sources of noise away from the power and signal cables. Otherwise, accuracy cannot be assured.
- Provide grounding to a grounding resistance of 100 Ω. The length of the grounding cable should be 20 m or less. Directly connect the lead from the ground terminal (terminal no. 8) of the isolator to the ground. Do not carry out daisy-chained inter-ground terminal wiring.
- ⎓ Direct Current
- "Overvoltage category (Installation category)" describes a number which defines a transient overvoltage condition. It implies the regulation for impulse withstand voltage. "II" applies to electrical equipment which is supplied from the fixed installation like distribution board.
- "Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation must be expected.
- Rated fuse of 125VDC, 1A is stored. However, operators can not replace the fuse.

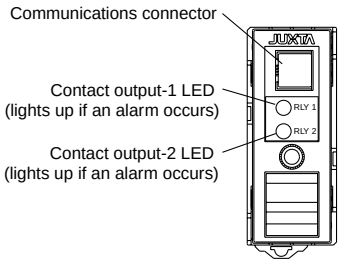
IMPORTANT

- If this instrument is used in a manner not sepecified in this manual, the protection provided by this instrument may be impaired.
- If the product is operated by a power supply exceeding the specifications, the product may become extremely hot and, as a result, damaged. To prevent this, ensure the following before turning on the power.
  (a) The voltage of the supplied power and the input signal level meet the specifications of the product.
  (b) External wires are connected to the correct terminals (refer to Chapter 5).
- 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.

7. DESCRIPTION OF FRONT PANEL AND CONNECTION OF SETTING TOOLS

7.1 Front Panel

The communications connector in the front panel is used for setting up parameters through a PC (VJ77 PC-based Parameters Setting Tool) or the Handy Terminal. The RLY1 and RLY2 LEDs light up if a contact is ON (those LEDs are provided only when the output-2 is specified for contact output.)



* The LEDs are provided only when output-2 is specified for contact output.

Fig. 7.1 Front Panel

7.2 Connecting the Setting Tools

Connect the modular jack-to-connector adapter (E9786WH) to the JUXTA communication cable with 5-pin connector (F9182EE) and then connect this adapter to the communication connector of JUXTA.

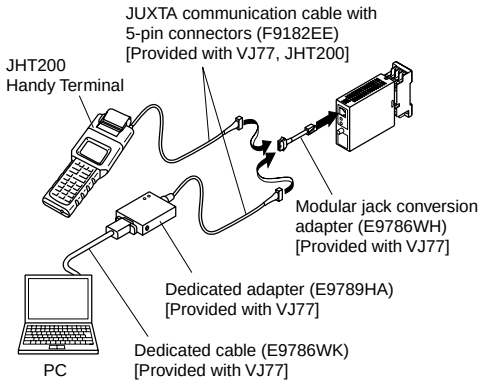


Fig. 7.2 Connecting the Handy Terminal

8. SETTING PARAMETERS

Set the parameters using a PC (VJ77 PC-based Parameters Setting Tool) or the Handy Terminal. Refer to the list of parameters in this manual and the Instruction Manual for Handy Terminal (IM JF81-02E) and VJ77 PC-based Parameters Setting Tool (IM 77J01J77-01E).

8.1 Settings Related to Inputs and Outputs

8.1.1 Input Type

Set by selecting input type from among VOLTS (DC voltage) and CURRENT (DC current) in D16: INP TYPE.

8.1.2 Input Hard Range

Set by selecting the input hard range from among AUTO, HIGH, MIDDLE, and LOW in D17: SELECT RANGE. Generally, select AUTO.

- AUTO: Sets the input hard range automatically with respect to the input range to be set.
- HIGH: For a span of 5 V or more in an input range of -10 to +10 V
- MIDDLE: For a span of 2.5 V or more in an input range of -5 to +5 V
- LOW: For a span of 0.5 V or more in an input range of -1 to +1 V

NOTE

The conditions for the input hard range (HIGH, MIDDLE, and LOW) are specified for operations within the range of accuracy rating. The input range may be set to a range not meeting these conditions, but take note of accuracy limitations. Similar accuracy limitations exist even when AUTO is selected. For more information on accuracy limitations, see the general specifications of VJH7 (GS 77J1H07-01E).

8.1.3 Input Range

Set the 0% value of input range to D22: INPUT1 L_RANGE and the 100% value of input range to D23: INPUT1 H_RANGE within the numerically specified range.

8.1.4 Selection of Program Function

Select the following communication functions in D32:PRGM SELECT.
(A) free program, (B) moving average, (C) dead time, (D) first-order lag, (E) first-order lead, (F) velocity limiter, (G) limiter, (H) velocity computation, (J) linearizer, and (K) ratio setter

8.1.5 Computation Cycle Time

Set the computation cycle time by selecting either 100 ms or 200 ms in D35:CYCLE TIME.

8.1.6 Direction of Output Action

Analog output signals can be reversed. To reverse the signal from output-1, set D38: OUT1 DR to REVERSE. For output-2, set D39 OUT2 DR to REVERSE. To return the output-1 signal to normal, set D38: OUT1 DR to DIRECT. For output-2, set D39: OUT2 DR to DIRECT.

8.2 Settings Related to Communication Function

Set the following parameters when output-2 is specified for communication function. For more information on the communication function, see the Instruction Manual for VJ Series Communication Function (IM 77J1J11-01E).

8.2.1 Communication Protocol

Set the communication protocol by selecting from among PC-LINK, PC-LINK WITH SUM, MODBUS ASCII, MODBUS RTU, and LADDER in F01: PROTOCOL.

8.2.2 Communication Address

Set the address number of the isolator numerically in a range of 1 to 99 in F02: ADDRESS.

8.2.3 Baud Rate

Set the baud rate by selecting from among 1200, 2400, 4800, and 9600 bps in F03: BAUD RATE.

8.2.4 Parity

Select and set NONE, EVEN, or ODD in F04: PARITY.

8.2.5 Data Length

Select and set 7 bits or 8 bits in F05: DATA LEN.

8.2.6 Stop Bit

Select and set 1 bit or 2 bits in F06: STOP BIT.

9. COMPUTING FUNCTION

9.1 VJX7-A (Free Program)

This computing unit is used to meet individual applications by programming the available commands using a PC (PC-based Parameters Setting Tool) or the Handy Terminal. Set the computing program in G01 to G40.

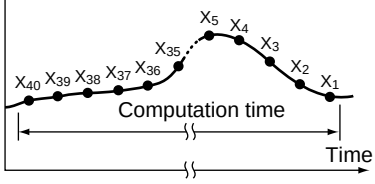
9.2 VJX7-B (Moving Average Computation)

This computing unit stores the input values sampled at intervals of one-fortieth of the moving-average time (L) into 40 buffers in order, and outputs the moving average of 40 input values (Output-1= Y1, Output-2= Y2). The output between samplings is smoothed out by interpolation. Minimum sampling time is the set computing period. Therefore, when the moving-average time is set shorter, the number of samplings is less than 40. When using a first-order lag filter for input (X), set the first-order lag time constant (T).
Set the moving-average time (L) at % value in H02: CONST. The value of 0 to 100.0% corresponds to that of 0 to 1000 seconds. For example, enter “6” to set in H02 when setting 60 seconds.

- Setting range of moving-average time:
  0 to 320,000 seconds (about 3.7 days) with 4 significant digits
  Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter).
  (e.g. 12345% is impossible, 12340% is possible.)
  First-order lag time constant (T) is set at % value in H01: CONST. The value of 0 to 100% corresponds to that of 0 to 100 seconds.
- Setting range of time constant:
  0 to 799.0 seconds; minimum unit is 0.1 second.
- Accuracy of moving average and time constant setting:
  (±5.0% of set value) ± 1 second

e.g.

$$\text{Moving average} = \frac{X1+X2+\bullet\bullet\bullet\bullet\bullet+X40}{40\ (\text{Note})}$$



Note: For the moving average times at 1, 2 and 3 second, the number of samplings is 10, 20 and 30, respectively (when the computing period is 100 ms).

9.3 VJX7-C (Dead Time Computation)

This computing unit stores the input values (X) sampled at intervals of one-fortieth of the dead time (L) into 40 buffers in order and outputs data (output-1=Y1, Output-2= Y2) after the dead time has elapsed. Minimum sampling time is the set computing period. Therefore, when the dead time is set shorter, the number of samplings is less than 40. However, for the dead times of 3, 2 and 1 second, the number of samplings is 30, 20, and 10, respectively (when the computing period is 100ms). The output between samplings is smoothed out by interpolation. When using a first-order lag filter for input (X), set the first-order lag time constant (T). Set the dead time (L) at % value in H02: CONST. The value of 0 to 100.0% corresponds to that of 0 to 1000 seconds. For example, enter “6” to set in H02 when setting 60 seconds.

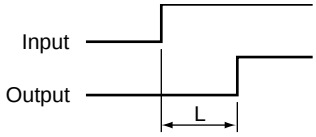
- Setting range of dead time:
  0 to 320,000 seconds (about 3.7 days) with 4 significant digits
  Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter).
  (e.g. 12345% is impossible, 12340% is possible.)

First-order lag time constant (T) is set at % value in H01: CONST. The value of 0 to 100% corresponds to that of 0 to 100 seconds.

- Setting range of time constant:
  0 to 799.0 seconds; minimum unit is 0.1 second.
- Accuracy of dead time and time constant setting:
  (±5.0% of set value) ± 1 second

$$Y1=Y2=\frac{e^{-LS}}{1+TS}X$$

e.g. 0% → 100% step input



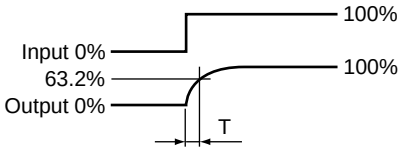
9.4 VJX7-D (First-order Lag Computation)

This computing unit provides a first-order lag computation on input (X) with a time constant (T) and outputs the result (output-1=Y1, output-2=Y2). Set the time constant (T) at % value in H01: CONST. The value of 0 to 100% corresponds to that of 0 to 100 seconds.

- Setting range of time constant:
  0 to 799.0 seconds; minimum unit is 0.1 second.
- Accuracy of time constant setting:
  (±5.0% of set value) ± 1 second

$$Y1=Y2=\frac{e^{-LS}}{1+TS}X$$

e.g. 0% → 100% step input



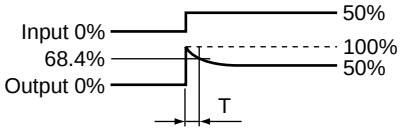
9.5 VJX7-E (First-order Lead Computation)

This computing unit provides a first-order lead computation on input (X) with a time constant (T) and outputs the result (output-1=Y1, output-2=Y2). Set the time constant (T) at % value in H01: CONST. The value of 0 to 100% corresponds to that of 0 to 100 seconds.

- Setting range of time constant:
  0 to 799.0 seconds; minimum unit is 0.1 second.
- Accuracy of time constant setting:
  (±5.0% of set value) ± 1 second

$$Y1=Y2=(1+\frac{TS}{1+TS})X$$

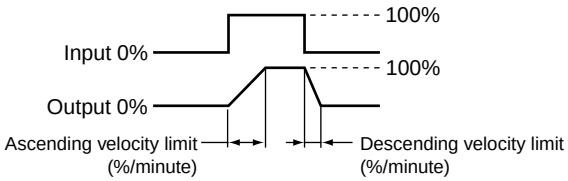
e.g. 0% → 50% step input



9.6 VJX7-F (Velocity Limiter)

This computing unit limit the input (X) velocity at the ascending velocity limit for a positive change and the descending velocity limit for a negative change, and outputs the limited value (output-1=Y1, output-2=Y2). When the input velocity (slope) is no more than the limit value, the unit outputs the input as is.
Set the ascending velocity limit at % value in H01:CONST, and the descending velocity limit at % value in H02:CONST. The value of 0 to 100.0% corresponds to that of 0 to 100.0%/minute.

e.g. 0% → 100% → 0% step input



- Setting range of velocity limit value:
  0.1% to 699.9%/minute; minimum unit is 0.1%/minute.
  Setting the limit at 700%/minute or above does not limit the input, so the unit simply outputs the input as is (i.e., works as an open limit function).
- Accuracy of velocity limit setting:
  (±5.0% of set value) ± 1 %/minute

9.7 VJX7-G (Limiter)

This computing unit serves as an ordinary converter as long as the input (X) is within the upper and lower limits. When the input exceeds the limit, the unit outputs the signal that corresponds to the limit value (output-1=Y1, output-2=Y2).
Set the upper limit at % value in H01:CONST, and the lower limit at % value in H02:CONST.

- Setting range of upper and lower limit value:
  -6.0% to 106.0%; minimum unit is 0.01%.
  However, if the setting is made so that the upper limit < lower limit, the unit outputs the upper limit value.

9.8 VJX7-H (Velocity Computation)

This computing unit calculates the input velocity by subtracting the input of the last velocity computation (XL) from the present input (X). The unit then adds a 50% bias to one-half of the obtained velocity and outputs the result (output-1=Y1, output-2=Y2). The output results is 50% when the input is not changed, 50% or more when the input increases (100% for X-XL 100%), and 50% or less when the input decreases (0% for X-XL –100%).

When using a first-order lag filter for input (X), set the first-order lag time constant (T).

$$Y1=Y2=\frac{X-X_L}{2}+50\%$$

Set the velocity computation time (L) at % value in H02: CONST. The value of 0 to 100.0% corresponds to that of 0 to 1000 seconds. For example, enter “6” to set in H02 when setting 60 seconds.

- Setting range of velocity computation time:
  0 to 320,000 seconds (about 3.7 days) with 4 significant digits
  Minimum unit is 1 second (however, 0.1 second is possible for 4 seconds or shorter).
  (e.g. 12345% is impossible, 12340% is possible.)
  First-order lag time constant (T) is set at % value in H01: CONST. The value of 0 to 100% corresponds to that of 0 to 100 seconds.
- Setting range of time constant:
  0 to 799.0 seconds; minimum unit is 0.1 second.
- Accuracy of moving average and time constant setting:
  (±5.0% of set value) ± 1 second

9.9 VJX7-J (Linearizer)

This computing unit gives an optional relationship between the input (X) and output (output-1=Y1, ouput-2=Y2) signals using an optional line-segment function. The line-segment function has 21 breakpoints, which each gives an input-output relationship as a percentage (%). Set the input (X) at % value in H01:CONST to H21:CONST, and the output (Y) at % value in H22:CONST to H42:CONST.

- Breakpoint (21 points) setting conditions:
  For input: -6.0≦X0 (H01) to X20 (H21)≦106.0%; minimum unit is 0.01%
  X0<X1<X2< ····· <X20
  For output: -6.0≦Y0 (H22) to Y20 (H42)≦106.0%; minimum unit is 0.01%
  When input≦X0 (H01), Y0 (H21) is output.
  When input≧20 (H22), Y20 (H42) is output.
- Computation accuracy:
  ±1 % (when line-segment gain is 1 or less)

9.10 VJX7-K (Ratio Setter)

This computing unit sets the ratio by the following expression.
$Y1=Y2=K1\times(X+A1)+A2$
where Y1: Output-1 signal (%)
Y2: Output-2 signal (%)
X: Input signal (%)
K1: Ratio (no unit)
A1, A2: Bias (%)
Set the ratio (K1) in H01:CONST, and the bias (A1) at % value in H02:CONST, and the bias (A2) at % value in H03:CONST.

- Setting range of ratio:
  -320 to 320 with 4 significant digits; minimum unit is 0.00001.
- Setting range of bias:
  -32,000% to 32,000% with 4 significant digits; minimum unit is 0.001%.
- Computation accuracy:
  ± 1 % (when K1=1, A1=A2=0%)

NOTE

Set the ratio or bias not to exceed $\pm 9\times10^{20}$% during the computation. The computation result of ratio or bias is 4 significant digits.

10.LIST OF PARAMETERS

No.	Item	Display	Remarks	No.	Item	Display	Remarks
01	Model	MODEL					
02	Tag No.	TAG NO					
03	Self-check result	SELF CHK					
Display items							
A	Display1	DISPLAY1		B	Display2	DISPLAY2	
A01	Input value	INPUT1		B01	Input value	INPUT1	
A03	Output value 1	OUTPUT1		B03	Output value 1	OUTPUT1	
A04	Output value 2	OUTPUT2		B04	Output value 2	OUTPUT2	
A09	Temporary memory 1	T1		B09	Temporary memory 1	T1	
A10	Temporary memory 2	T2		B10	Temporary memory 2	T2	
A11	Temporary memory 3	T3		B11	Temporary memory 3	T3	
A12	Temporary memory 4	T4		B12	Temporary memory 4	T4	
A14	Digital output	DO		B14	Digital output	DO	
A15	Load factor	LOAD		B15	Load factor	LOAD	
A54	Status	STATUS	*1	B55	Status	MENU REV	
A55	MENU REV	MENU REV		B60	Self-check result	SELF CHK	
A60	Self-check	SELF CHK		*1 The Status is displayed for service personnel to see history records.			
Setting items							
D	Setting (I/O)	SET(I/O)		F	Setting (communication)	SET (COM)	
D01	Tag no. 1	TAG NO.1		F01	Communication protocol	PROTOCOL	
D02	Tag no. 2	TAG NO.2		F02	Address	ADDRESS	
D03	Comment 1	COMMENT1		F03	Baud rate	BAUD RATE	
D04	Comment 2	COMMENT2		F04	Parity	PARITY	
D16	Input type	INP TYPE		F05	Data length	DATA LEN	
D17	Selection of input hard range	SELECT RANGE		F06	Stop bit	STOP BIT	
D18	Input resistor	IN RESIST		There are items not displayed depending on what output-2 is specified.			
D22	Input low range	INPUT1 L_RNG					
D23	Input high range	INPUT1 H_RNG					
D32	Selection of program	PRGM SELECT					
D35	Computing period	CYCLE TIME					
D38	Direction of output-1 action	OUT1 DR					
D39	Direction of output-2 action	OUT2 DR					
D60	Self-check result	SELF CHK					
Programming items				Fixed constant setting items			
G	Program of computing unit	PROGRAM		H	Fixed constant of computing unit	CONST	
G01	Program	PROGRAM		H01	Fixed constant	CONST	
↑ ↓	↑ ↓	↑ ↓		↑ ↓	↑ ↓	↑ ↓	
G40	Program	PROGRAM		H59	Fixed constant	CONST	
G60	Self-check result	SELF CHK		H60	Self-check result	SELF CHK	
Adjusting items				Test items			
P	Adjustment	ADJUST1		Q	Test	TEST	
P02	Zero adjustment of input-1	ZERO ADJ1		Q02	Forced output 1	OUT1 TEST	
P03	Span adjustment of input-1	SPAN ADJ1		Q03	Forced output 2	OUT2 TEST	
P12	0% adjustment of output-1	OUT1 0%		Q06	Forced output (relay 1)	RLY1 TEST	
P13	100% adjustment of output-1	OUT1 100%		Q07	Forced output (relay 2)	RLY2 TEST	
P14	0% adjustment of output-2	OUT2 0%		Q60	Self-check result	SELF CHK	
P15	100% adjustment of output-2	OUT2 100%					
P17	Adjustment of external input resistance	RESISTOR ADJ					
P60	Self-check result	SELF CHK					

11.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.
For cleaning the instrument, use a soft and dry cloth.

11.1 Calibration Apparatus

- A voltage and current generator (Yokogawa 7651 or the equivalent)
- A voltmeter (Yokogawa 7562 or the equivalent)
- A precision resistor of 250 Ω ± 0.01%, 1 W (for current output)

11.2 Calibration Procedure

Connect the instruments as shown in Fig. 10.1. First adjust the output-1 signal and then the output-2 signal.
Produce input signals equivalent to 0, 25, 50, 75, and 100% of the input span from the voltage and current generator to the isolator. Then, check that the isolator's output signal shows voltages corresponding to 0, 25, 50, 75, and 100% of the input span within the rated accuracy range.
If the output signal is out of the rated accuracy range, adjust the output signal level using PC (VJ77 PC-based Parameters Setting Tool) or the Handy Terminal (JHT200).

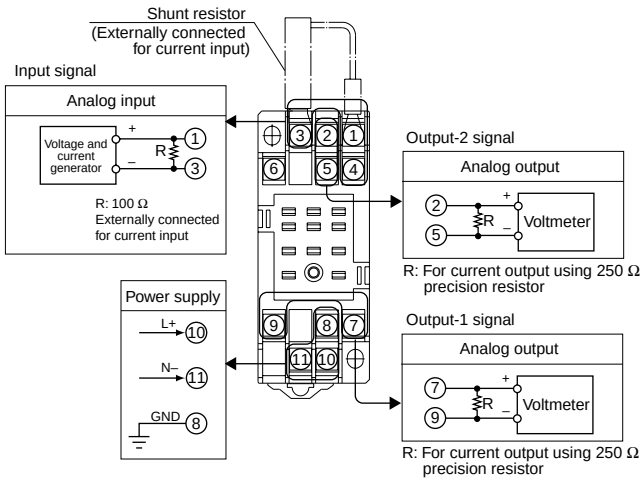


Fig. 11.1