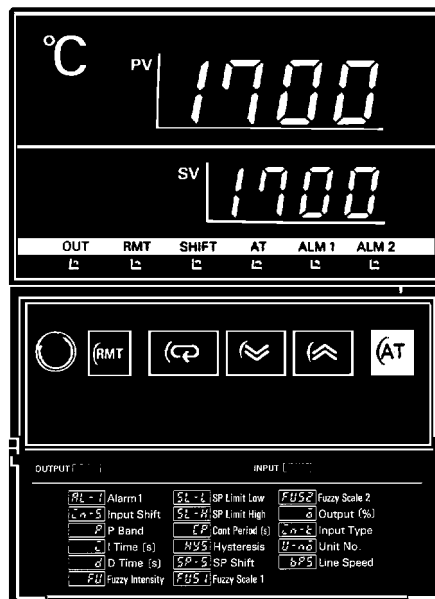


E5AX

PID Temperature Controller

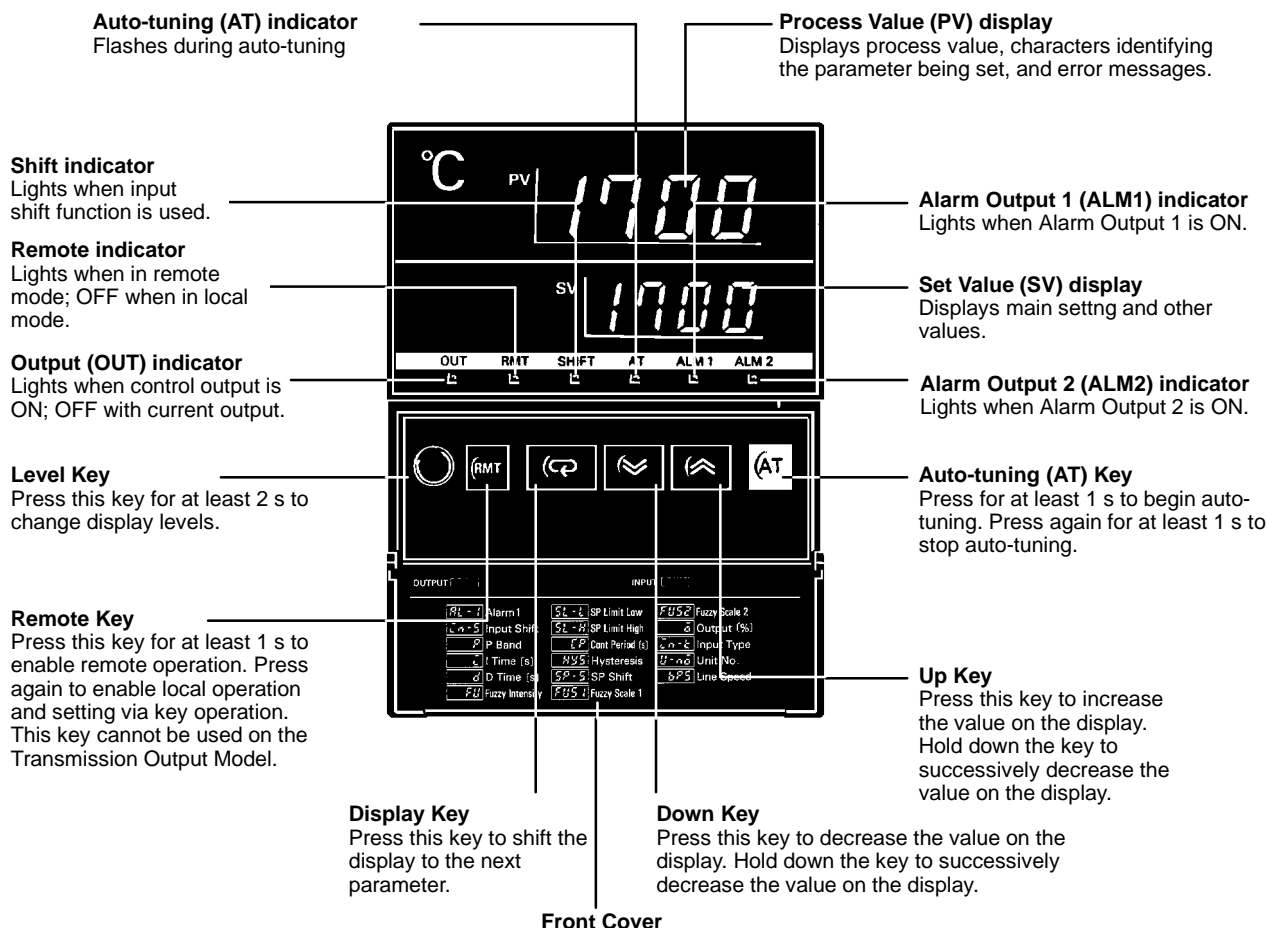
Communications Manual



1-1 Front Panel

The following diagram identifies the major features found on the Fuzzy Temperature Controller front panel and gives a brief description of the function of each front panel feature.

E5AX-



1-2 Remote Mode and Local Mode

Remote mode

Pressing the Remote Key puts the E5AX in remote mode. In remote mode, the keys on the front panel of the E5AX cannot be used, except for monitoring the set value with the Display Key, Level Key, and Remote Key.

Local mode

Pressing the Remote Key again puts the E5AX in local mode and enables settings via keys on the front panel. In the local mode, the E5AX cannot be remotely controlled, except for reading of the process temperature.

The changing from one mode to the other cannot be remotely controlled.

Depending upon the requirements, one of several connector/terminals can be used.

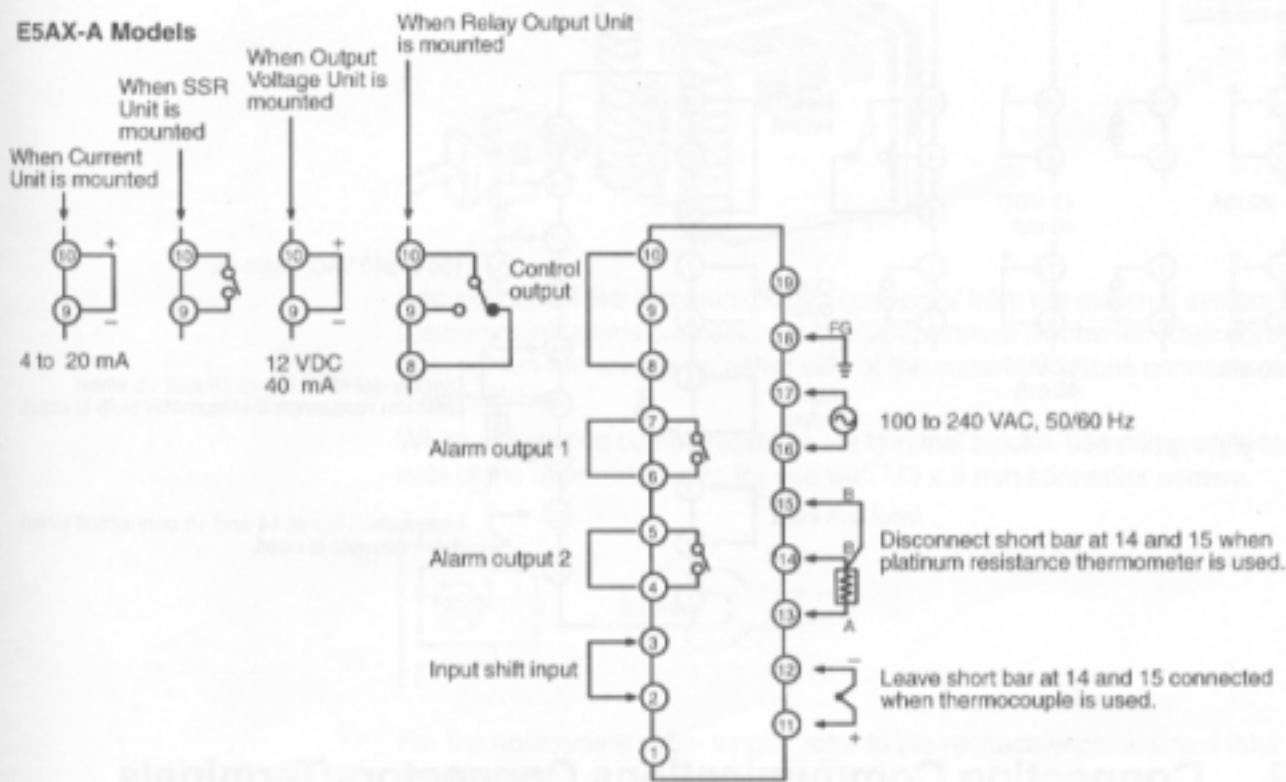
The diagram shows the rear panel of the HP DesignJet 5000C printer. It includes a large parallel port (DB25) in the center, a serial port (DB9) to its right, and a series of smaller ports (USB, FireWire, etc.) along the bottom edge. A power cord is shown plugged into a power jack on the left side.

The diagram shows the 40-pin DIP package layout for the 8255 PPI. The pins are numbered 1 through 40. The central vertical column of pins (pins 1 through 20) is labeled with their functions: 1 (A0), 2 (A1), 3 (A2), 4 (A3), 5 (A4), 6 (A5), 7 (A6), 8 (A7), 9 (A8), 10 (A9), 11 (A10), 12 (A11), 13 (A12), 14 (A13), 15 (A14), 16 (A15), 17 (A16), 18 (A17), 19 (A18), and 20 (A19). The pins are arranged in a 40-pin DIP package with pins 1 and 20 at the top and pins 40 and 1 at the bottom. The diagram also shows the internal logic connections between the pins and the internal components of the chip.

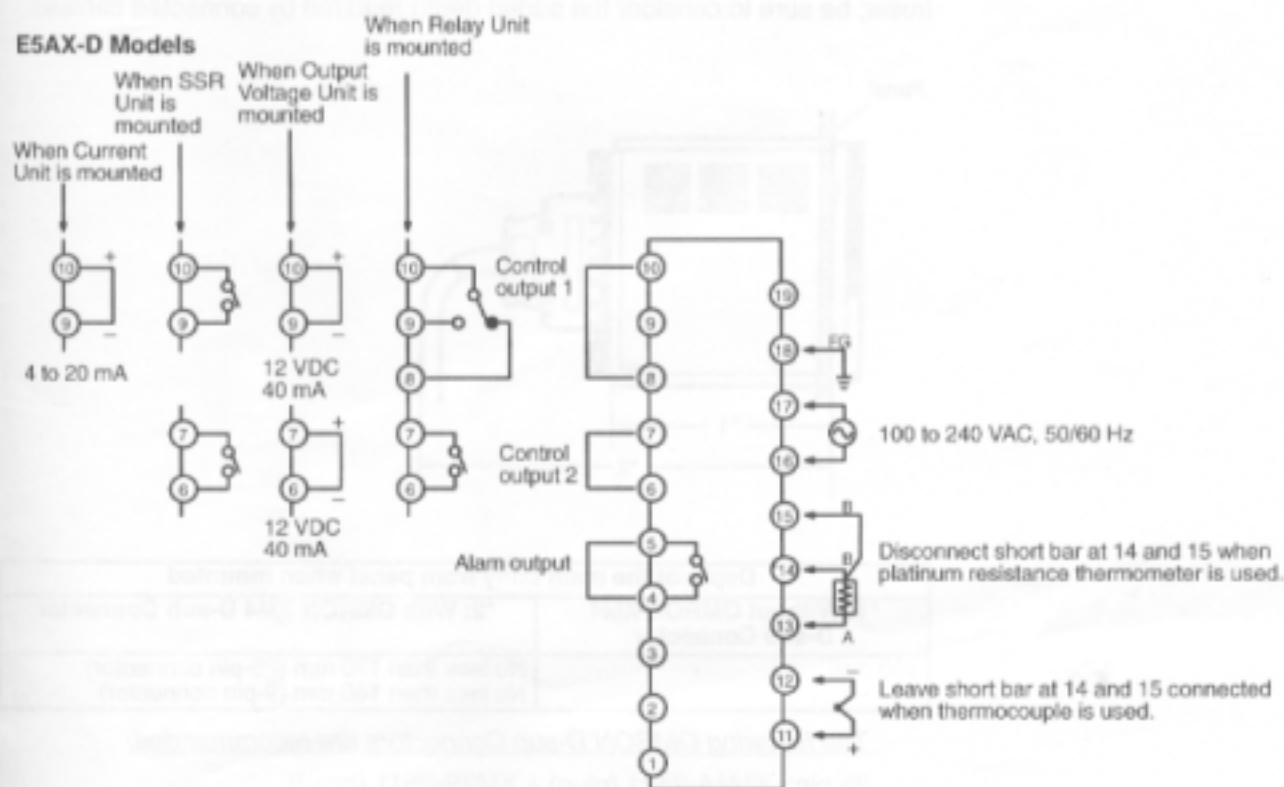
Terminal Connections

The following are the terminal connections for the E5AX-A/V/D Models.

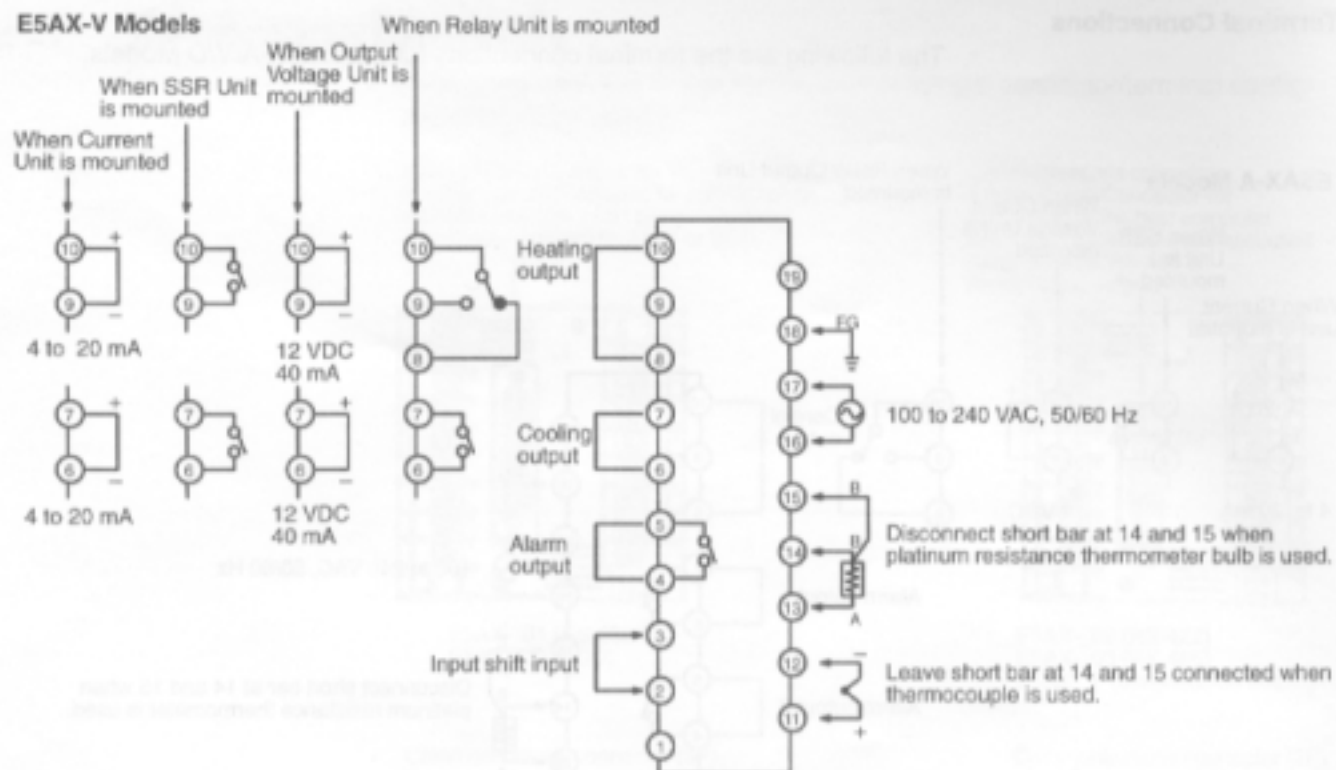
E5AX-A Models

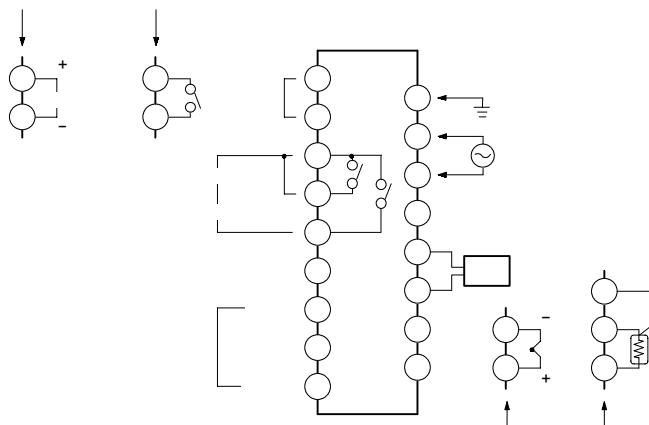


E5AX-D Models



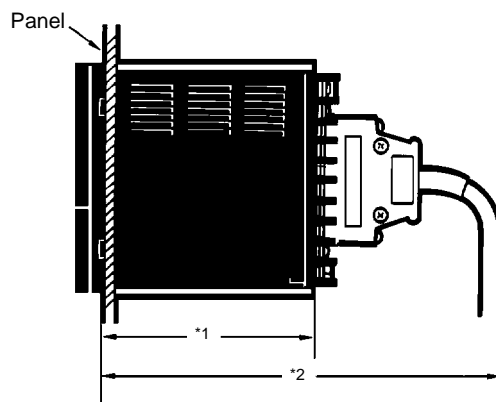
E5AX-V Models





2-2 Connecting Communications Connectors/Terminals

Connect a host system or peripheral device to the appropriate communications connector; confirm that the system or device conforms to that connector's communications specifications. Before mounting the Fuzzy Temperature Controller, be sure to consider the added depth required by connected cables.



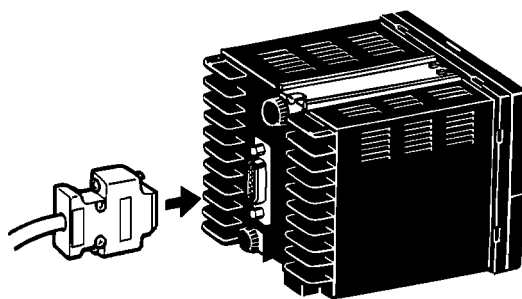
Depth of the main body from panel when mounted	
*1: Without OMRON XM4 D-sub Connector	*2: With OMRON XM4 D-sub Connector
100 mm	No less than 170 mm (25-pin connector) No less than 160 mm (9-pin connector)

The following OMRON D-sub Connectors are recommended:

25 pin: XM4A-2521 (plug) + XM2S-2511 (hood)

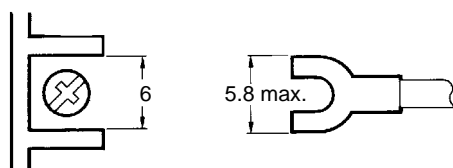
9 pin: XM4A-0921 (plug) + XM2S-0911 (hood)

If using an equivalent connector, make sure that the connector screws are the following metric size: M2.6 x 0.45 mm.



Securely insert the communications connector from the external system into the communications connector on the Temperature Controller. After connection, tighten the screws on either side of the communications connector with a screwdriver.

When connecting communications via terminal blocks, use crimp-style terminals of the appropriate size for use with M3 x 8 mm connector screws.



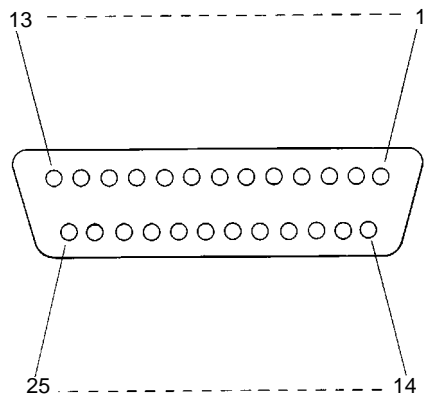
For the appropriate cable length, refer to the respective communications specifications.

3-1 Interface Specifications

3-1-1 RS-232C

This interface is for the E5AF only. Electrical characteristics conform to EIA RS-232C.

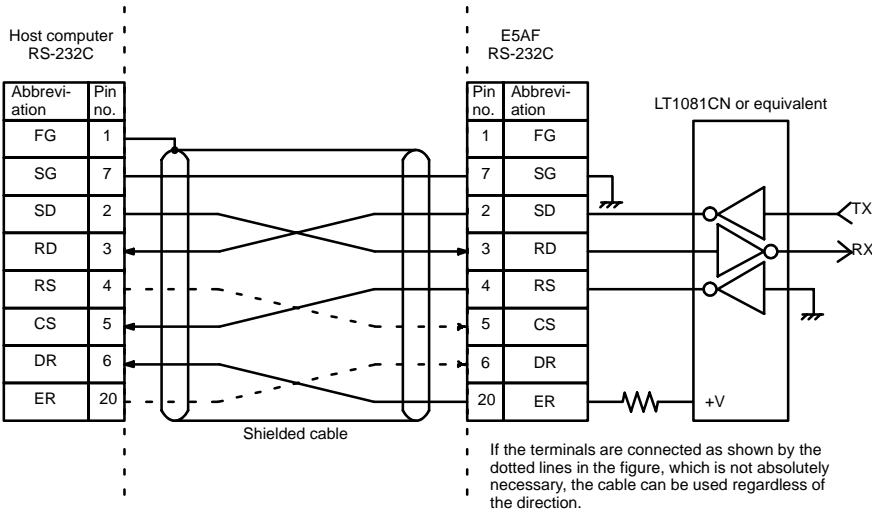
Communications Signals



Signal	Abbreviation	Signal direction	Pin no.
Frame ground (safety ground)	FG	---	1
Signal ground or common return	SG	---	7
Send data	SD	Output	2
Receive data	RD	Input	3
Request to send	RS	Output	4
Clear to send	CS	Input	5
Data set ready	DR	Input	6
Data terminal ready	ER	Output	20

Connection Diagram

The following diagram shows how the E5AF is connected to the host computer using the RS-232C.



Synchronization: Internal clock

Cable length: 15 m maximum. To increase the cable length, use OMRON's RS-232C optical interface (Z3RN).

Applicable connectors: Plug: XM4A-2521 (OMRON) or equivalent
Hood: XM2S-2511 (OMRON) or equivalent

Connection method (RS-232C direct connection): 1:1 connection only

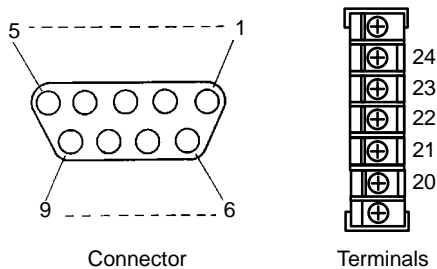
A carrier detect (CD) signal for the host computer is not supported by the E5AF via its RS-232C port since the E5AF's RS-232C is defined as DTE (Data Terminal Equipment). If a CD signal is needed, it must be provided a the host computer.

3-1-2 RS-422

Electrical characteristics conform to EIA RS-422.

Communications Signals

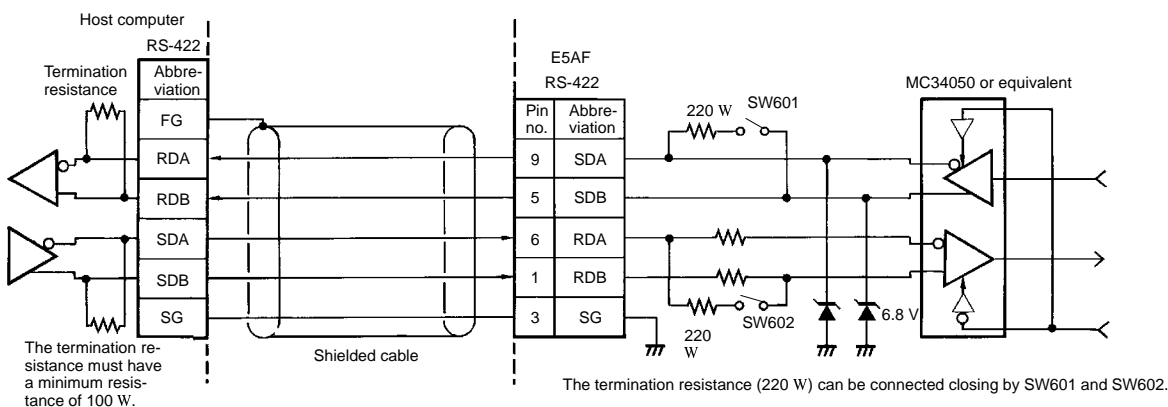
The following information identifies the input/output signals of the interface.



Signal	Abbreviation	Signal direction	Connector pin no.	Terminal no.
Send Data A	SDA	Output	9	21
Send Data B	SDB	Output	5	20
Receive Data A	RDA	Input	6	23
Receive Data B	RDB	Input	1	24
Signal Ground	SG	---	3	22
Frame Ground (safety ground)	FG	---	7	---

Connection Diagram

The following illustration shows how the E5AF is connected to the host computer via RS-422.



Synchronization: Internal clock

Cable length: 500 m maximum (total)

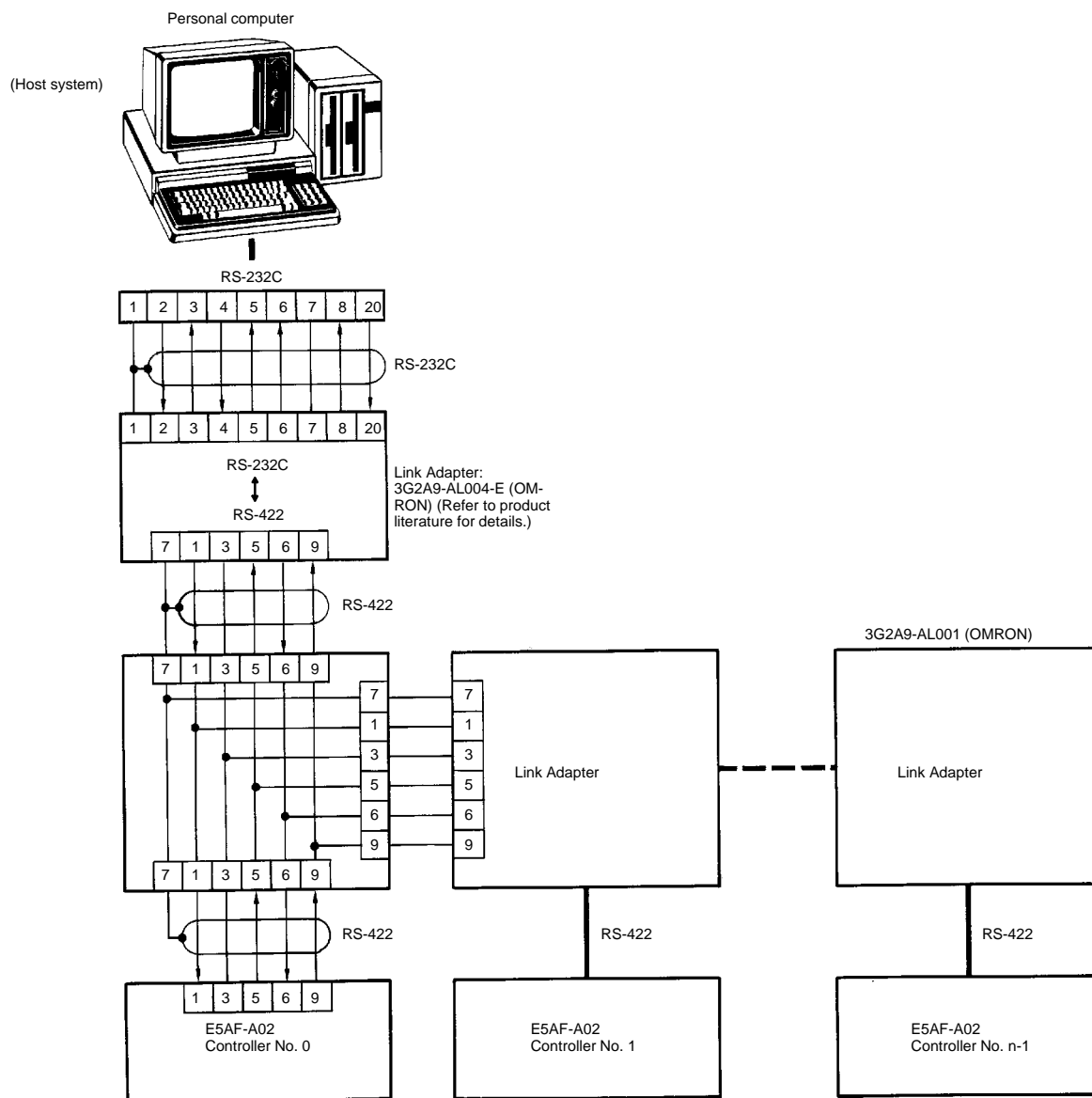
Applicable connectors: Plug: XM2A-0901 (OMRON) or equivalent
 XM4A-0921 (OMRON) or equivalent
 Hood: XM2S-0911 (OMRON) or equivalent

Connection method (RS-422 connection): Maximum 1:32 connection

Note SW601 and SW602 of the terminator must be turned on. SW601 and SW602 of the Controllers other than the terminator must be turned off.

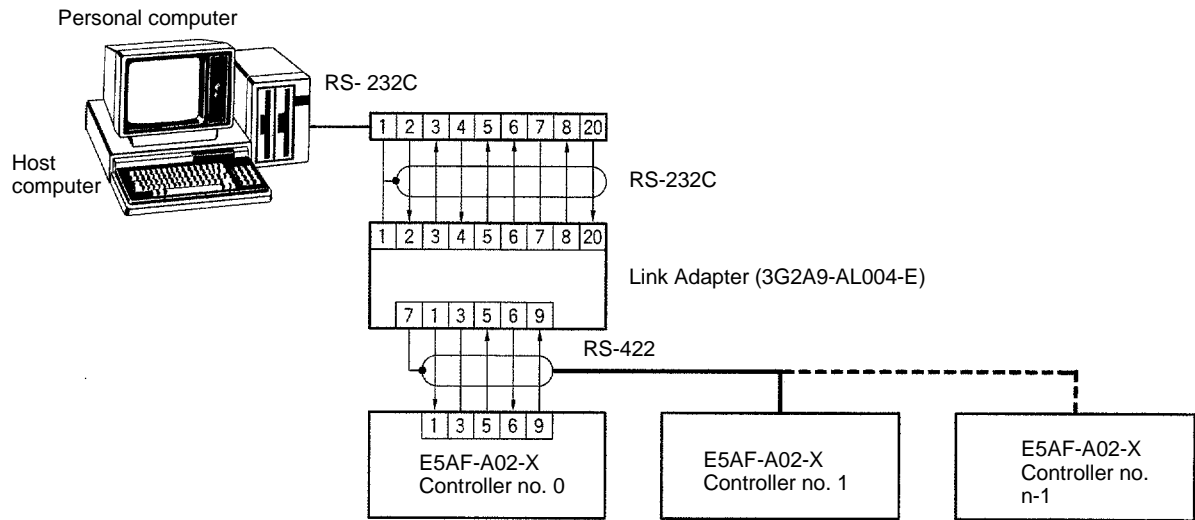
RS-422 System Examples

The following example shows several E5AF-A02's connected to a personal computer using the RS-422 connection method with Link Adapters.



Up to 32 Controllers (n) can be connected. The maximum extended cable length is 500 m.

The following example shows several E5AF-A02-X's connected to a personal computer. Only one Link Adapter is required (to convert to RS-232C at the computer) because the Controllers are connected directly to each other.



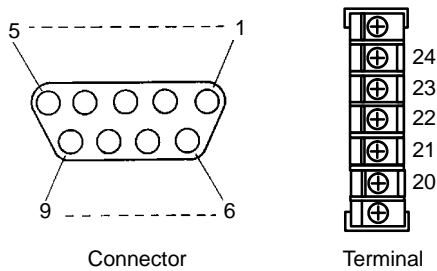
The maximum number of connecting Controllers (n) is 32 with a total cable length of 500 m maximum.

3-1-3 RS-485

Electrical characteristics conforms to EIA RS-485.

Communications Signals

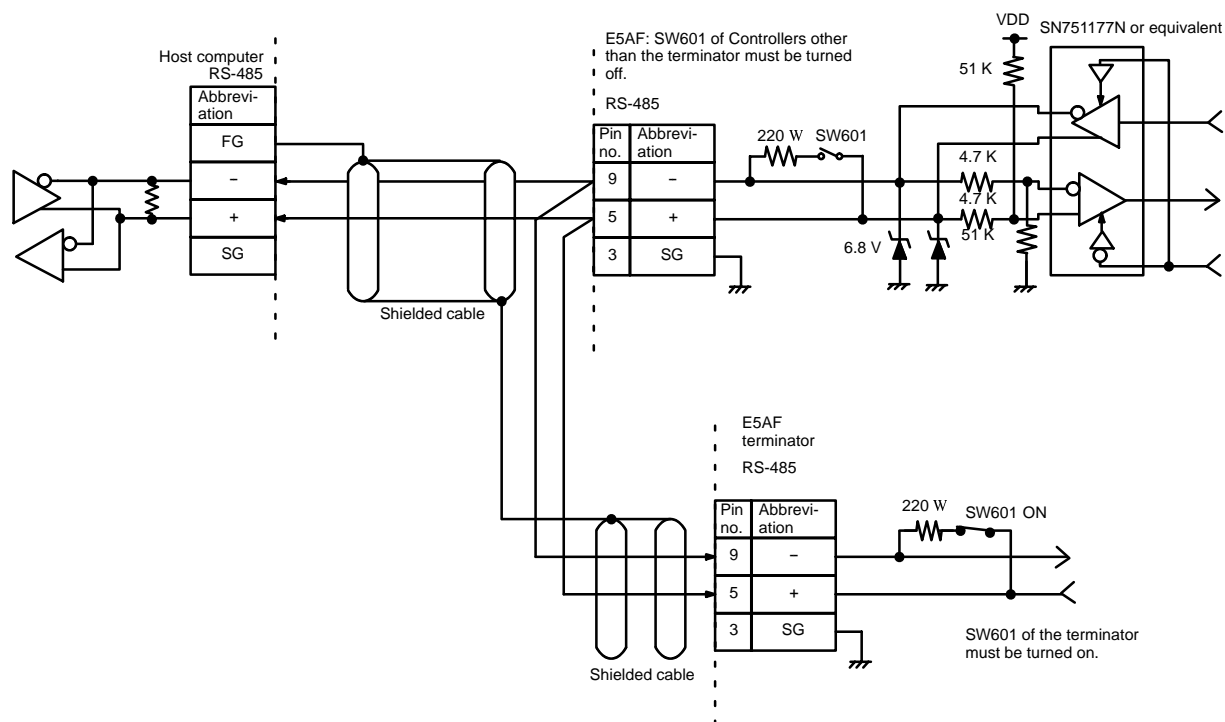
The following information identifies the input/output signals of the interface.



Signal	Abbreviation	Signal direction	Connector pin no.	Terminal no.
Inverted output	Negative (-) side	Input/output	9, 6 (common)	21, 23 (common)
Non-inverted output	Positive (+) side	Input/output	5, 1 (common)	20, 24 (common)
Signal ground	SG	---	3	22

Connection Diagram

The following diagram shows how the E5AF is connected to the host computer using RS-485.



Synchronization: Internal clock

Cable length: 500 m maximum (total)

Applicable connectors: Plug: XM4A-0921 (OMRON) or equivalent
Hood: XM2S-0911 (OMRON) or equivalent

Connection method (RS-485 connection): Maximum 1:32 connection

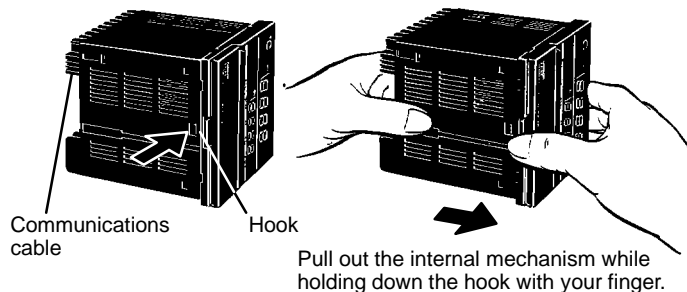
Note In the connection diagram above, the Temperature Controllers cannot be connected to a SYSMAC Wired Remote I/O System (SYSMAC BUS).

3-2 Before Applying Power

Before switching on power to the E5AX, set the switches by following the procedures below.

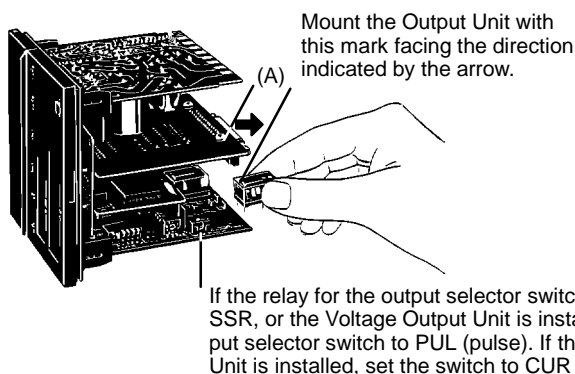
Opening the E5AF

Disconnect the communications cable from the E5AX. Lift the internal mechanism while pressing the hook at the bottom of the front panel.



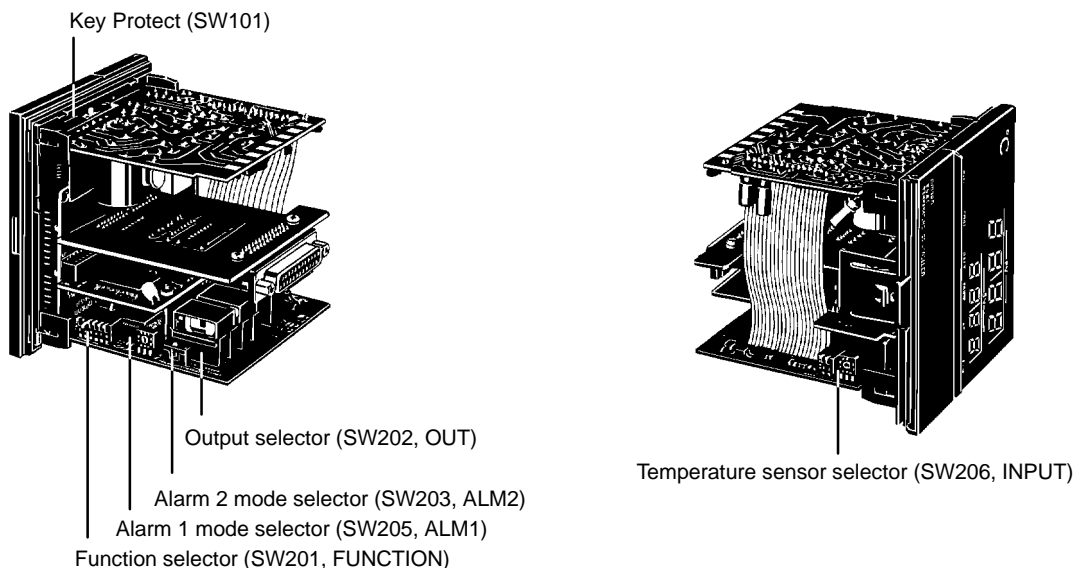
Mounting or Removing the Output Unit

To mount the Output Unit, insert it in the direction shown by the arrow. To remove it, first remove the communications board (A) by pulling it in the direction of the arrow (➡). Then remove the Output Unit.



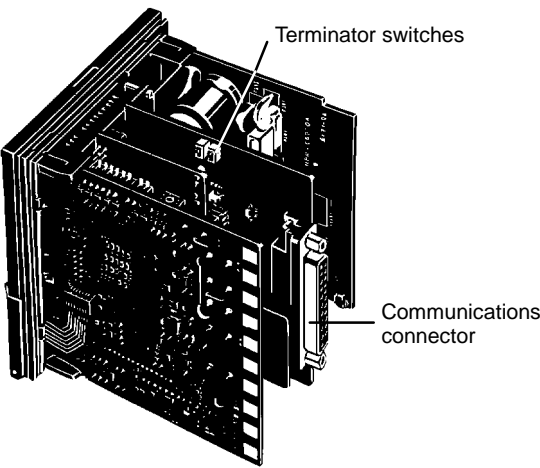
Function Switches

Refer to the E5AX instruction manual or the operating procedures in the datasheet for detailed information about setting the switches shown in the following diagram.



Terminator Designation

For the RS-422 (E5AX-A02) and RS-485 (E5AX-A03) Models, designate the E5AX located at both ends of the transmission line as an terminator by setting the terminator switch of that Controller to ON. (Terminator designation is not required for the RS-232C Models.)



Terminator Switches

SW601 and SW602 are factory set to OFF. SW601 and SW602 of Controllers other than the terminator must be OFF.



Terminator	SW602	SW601
RS-422 designation	ON	ON
RS-485 designation	There is no SW602.	ON

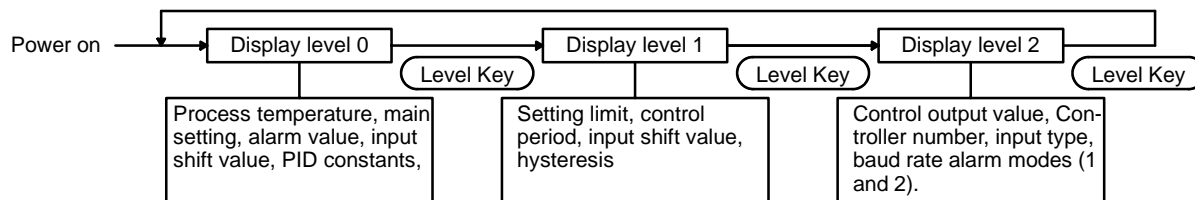
Caution If a wrong Controller is designated as the terminator, the operating current will increase, thus causing the Fuzzy Temperature Controller to malfunction.

3-3 Key Operation

Before attempting communications when using RS-232C, RS-422, and RS-485 Models, set the baud rate (communications speed) and Controller number according to the following procedures; use the keys on the front of the Controller to make the settings. For operation procedures other than the following, refer to the operation manual supplied with the Controller or the operating procedures listed in the datasheet.

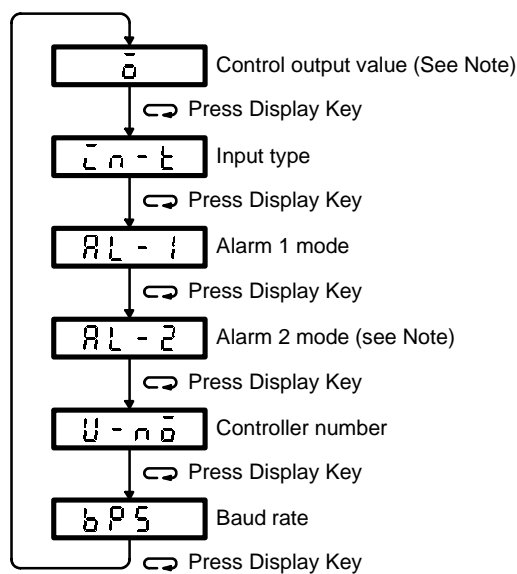
Display Levels

The E5AF/E5EF goes to display level 0 when power is turned on. The display level changes when the level key is pressed for two seconds or more. The displayed contents at each level are shown in the following diagram. The baud rate and Controller numbers can be set at display level 2.



Setting the Controller Number and Baud Rate

Character Display:



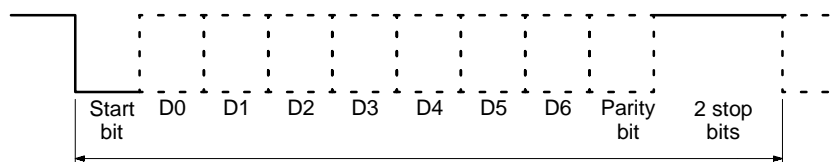
Note Heater Burnout Detection Models do not have a Alarm 2 mode display.

Controller Number (no): This setting assigns a Controller number (integers from 0 to 99) to each Fuzzy Temperature Controller to allow the host computer to distinguish one Fuzzy Temperature Controller from the others in the same system during communications. When no appears on the process value display, use the Up Key or Down Key to input a set value. The Controller number is set to 0 before shipment. Do not give identical Controller numbers to Temperature Controllers in the same system, as this will interfere with communications.

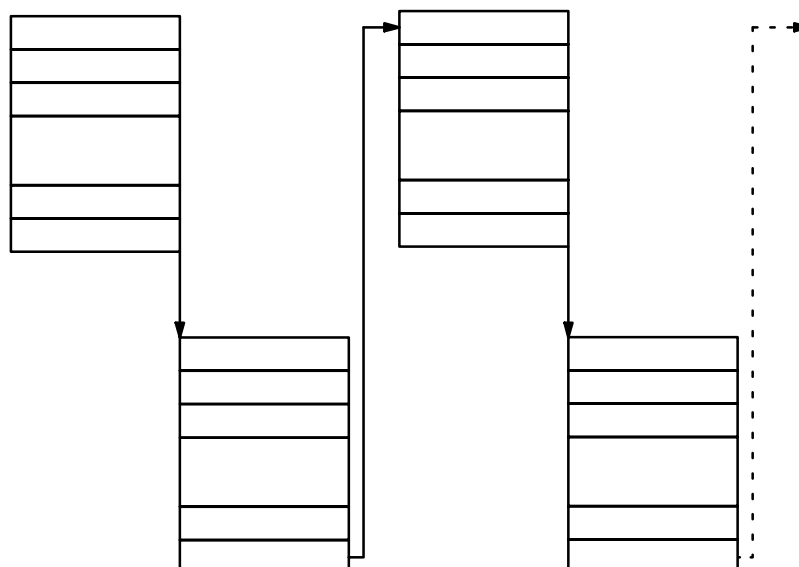
Baud Rate (bps): This sets the speed for communications with the host computer. When bps appears on the process value display, use the Up Key or Down Key to input a set value. The rate is set to 9600 bps before shipment. The baud rate can be set to 150, 300, 600, 1200, 2400, 4800, or 9600 bps. The set value becomes effective only after the E5AX power is switched off once and then on again.

3-4 General RS-232C/RS-422/RS-485 Specifications

Transmission line connection:	Multiple point
Communications system:	RS-232C/RS-422 (4-wire, half-duplex), RS-485 (2-wire, half-duplex)
Synchronization system:	Start-stop synchronization (2 stop bits)
Communications speed:	150/300/600/1200/2400/4800/9600 bps
Communications code:	ASCII (7 bits)
Error detection:	Vertical parity (even) and FCS (frame check sequence)
Interface:	RS-232C/RS-422/RS-485
Definition of Terminal:	DTE (Data Terminal Equipment)



The E5AX RS-232C is defined as DTE (Data Terminal Equipment). This means that a carrier detect (CD) signal for the host computer is not supported. If a CD signal is needed, it must be provided (via the +12 V terminal) on the host computer side.



SECTION 5

Transmission Output Models

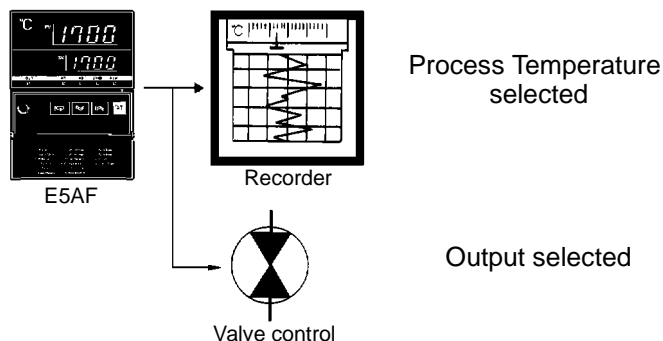
This section provides the basic elements relating to the connections and the settings of the Transmission Output Models.

5-1	Connection of Output Connector	68
5-1-1	Connection Example	68
5-1-2	Terminals	68
5-1-3	Connection	68
5-2	Settings Before Switching Power On	69

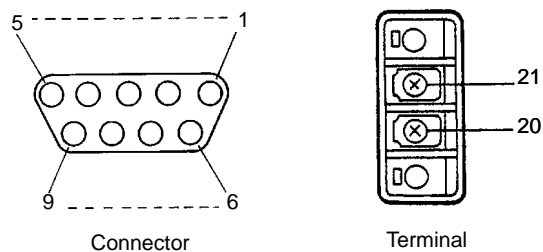
5-1 Connection of Output Connector

5-1-1 Connection Example

Process temperature or process value opening that are output by the E5AF Transmission Output Models is in a range of 4 to 20 mA. This enables smooth valve control and the output can be easily recorded by inputting it to an external recorder.



5-1-2 Terminals

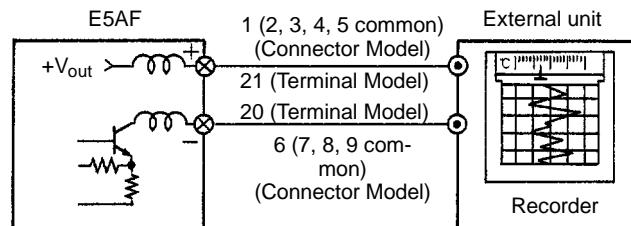


Signal name	Terminal number	
	Connector connection	Terminal connection
Transmission output (positive)	1, 2, 3, 4, and 5 are common	21
Transmission output (negative)	6, 7, 8, and 9 are common	20

Plug: XM4A-0921 (OMRON) or equivalent one.

Hood: XM2S-0911 (OMRON) or equivalent one.

5-1-3 Connection



Output: 4 to 20 mA DC with a load resistance of 600Ω max.

Output contents: Process temperature/output value or process value opening (selected by internal switch)

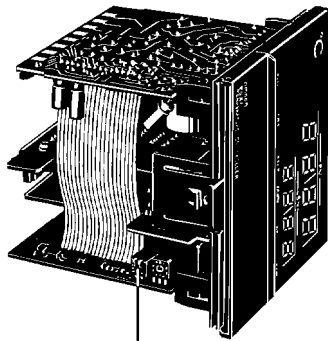
Resolution when outputting process temperature:
Approx. 1/3,200 resolution or 0.1% C/F , whichever is larger.
When outputting output value: 0.1% (1% in manual operation)
Output updating time: 500 ms
Normal-reverse switching function: Yes

Note The output specifications of the E5AF Transmission Output Models and those of the E5AX Transmission Output Models are identical.

5-2 Settings Before Switching Power On

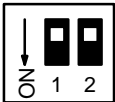
Set all switches as described here before switching on power to the Fuzzy Temperature Controller. For mounting or removing the Output Unit or setting each function switch, refer to 3-2 Before Applying Power. However, no terminator designation is necessary.

Selection of Output Data With the E5AF-AF Transmission Output Models, the contents of its output can be set.



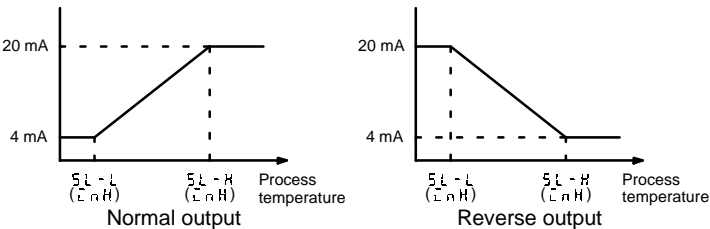
Transmission output selector switch (SW207)

Transmission Output Selector (SW207)

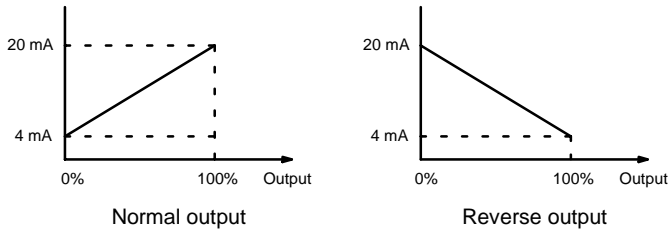


Items		Selector position	
		1	2
Output contents	Output value	ON	---
	Process temperature	OFF	
Operation	Reverse output	---	ON
	Normal output	---	OFF
Settings before shipment		OFF	OFF

Note 1. Process temperature



2. Control Output



Output Data vs. Output Current

Output value	Process temperature		Output amount	
	Normal	Reverse	Normal	Reverse
20 mA to 4 mA	sl-h to sl-l	sl-l to sl-h	100.0 to 0.0%	0.0 to 100.0%

- Note**
1. The upper limit of the set value is expressed by sl-h and the lower limit of it is expressed by sl-l.
 2. In the case of A/D error, memory error, or abnormal input, 1 mA (safety side) is output in the same manner as the Electrical Current Output Unit.
 3. If the process temperature exceeds either edge of the set limit, the transferoutput will either be 4 mA or 20 mA.

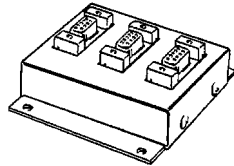
Appendix B

List of Optional Accessories

Link Adapters

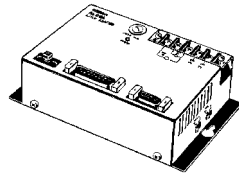
3G2A9-AL001

Three RS-422 connectors for RS-422 line distribution.



3G2A9-AL004-E

One RS-232C connector and two RS-422 connectors for RS-232C and RS-422.



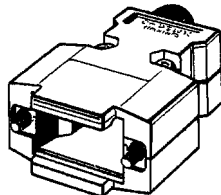
Connectors

XM4A-0921, XM4A-2521 (Plug)

D-sub connectors. Use in combination with XM2S.



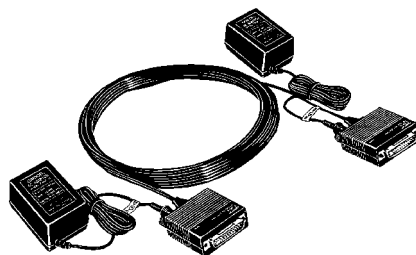
XM2S-0911, XM2S-2511 (Hood)



Optical Link Adapter

Z3RN

To extend RS-232C line.



Recorder

E55A-A6_C, E55A-B__C (4 to 20 mA input)

In conjunction with E5AF-_F, the process temperature can be recorded.

