SECTION 3
Remote I/O Communications

This section provides details on remote I/O communications, including allocations in the PC, various operating statuses, flags, and applications.

3-1 Transmission Contents and Word Allocations

When remote I/O communications are used with the E5ZE, reading the process value, starting and stopping temperature control, and writing set points are possible for any control point, without requiring a special program to be executed from the Master Unit. Data is automatically refreshed at every 200-ms cycle. There are 14 input words and 9 output words allocated to the E5ZE in the Master Unit (I/O directions are in reference to the Master Unit). Each word is allocated according to the following table.

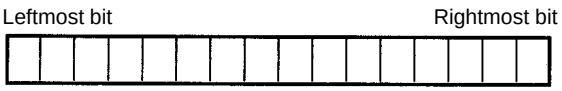
Remote I/O Allocations

Inputs		Outputs	
First word	Control point 0 process value	First word	Control point 0 set point
+ 1	Control point 1 process value	+ 1	Control point 1 set point
+ 2	Control point 2 process value	+ 2	Control point 2 set point
+ 3	Control point 3 process value	+ 3	Control point 3 set point
+ 4	Control point 4 process value	+ 4	Control point 4 set point
+ 5	Control point 5 process value	+ 5	Control point 5 set point
+ 6	Control point 6 process value	+ 6	Control point 6 set point
+ 7	Control point 7 process value	+ 7	Control point 7 set point
+ 8	Alarm 1 status	+ 8	Start/stop temperature control
+ 9	Alarm 2 status	---	
+ 10	Auto-tuning status		
+ 11	HB (heater burnout) alarm status		
+ 12	HS (SSR failure) alarm status		
+ 13	Operating status		

The first input and output words are normally determined according to the Master Unit being used and the node address. The first I/O words can be changed and a Configurator is used to change the Master Unit's settings.

3-2 Reading Process Values

The process value for each control point is expressed as 16-bit signed binary data (two's complement for negative values) in the corresponding word allocated in the Master Unit mounted to the PC. The unit used depends on the position of the decimal point in the E5ZE. The default values are 1°C/°F for thermocouples and 0.1°C/°F for platinum resistance thermometers.



Example

If the setting unit is 0.1°C/°F, and the value in the allocated word is 1111110001111100, the conversion values are as follows:

Binary	Hexadecimal	Decimal	Process value
1111110001111100	FC7C	–900	–90.0°C

If the value in the word is 0000010001001100, the values are as follows:

Binary	Hexadecimal	Decimal	Process value
0000010001001100	044C	1100	110.0°C

The following table shows the values that will be contained in the corresponding word under certain conditions.

Status details	Value (hexadecimal)
Process value overflow or input error	7FFF
Process value underflow	8000
Temperature Controller error or connection confirmation standby	0000
Outside temperature display range	CCCC

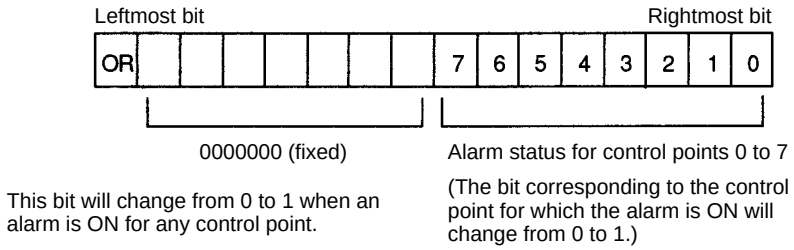
3-3 Reading Status

3-3-1 Alarm Status

Alarms 1 and 2, HB and HS Alarms

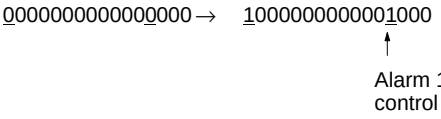
The alarm status is expressed in the corresponding word in the PC to which the Master Unit is connected as shown in the following diagram. The format is the same for the alarm 1, alarm 2, HB (heater burnout) alarm, and HS (SSR failure) alarm.

Alarm Status



Example

If the alarm 1 is OFF for all control points and then turns ON for control point 3, the contents of the corresponding word in the PC will change as follows:

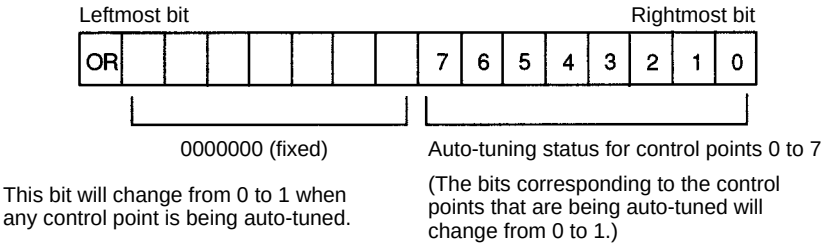


When alarm 1 turns OFF for control point 3, the contents of the corresponding word will return to 0000000000000000.

3-3-2 Auto-tuning Status

The auto-tuning status is reflected in the corresponding word in the PC to which the Master Unit is mounted.

Auto-tuning Status



Example

If no control points are being auto-tuned, and then auto-tuning begins for control point 3, the contents of the corresponding word in the PC will change as follows:

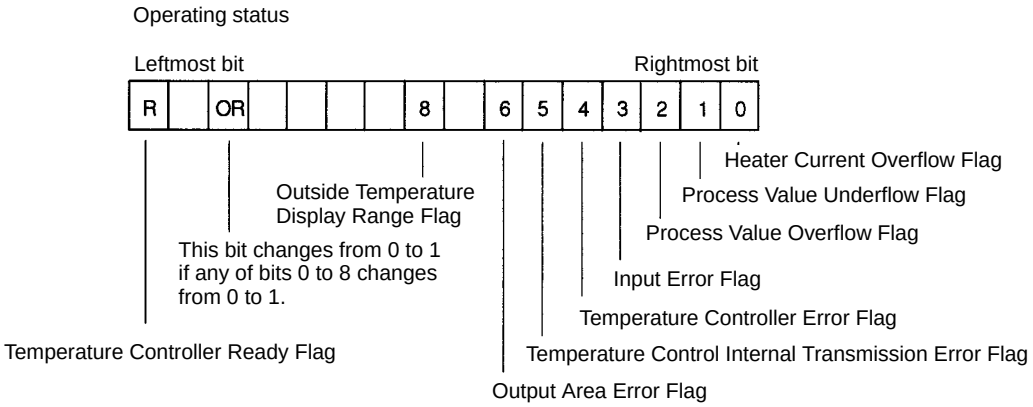
0000000000000000 → 1000000000001000

Control point 3 is being auto-tuned.

When auto-tuning for control point 3 has been completed, the contents of the corresponding word will return to 0000000000000000.

3-3-3 Operating Status

The status data showing whether an error has occurred in the E5ZE is expressed in the contents of the corresponding word in the PC to which the Master Unit is mounted.



The following table provides the meaning and operation of the operating status flags.

Flag Meanings

Flag name	Meaning
Temperature Controller Ready Flag	This flag changes from 0 to 1 when the E5ZE power is turned ON and CompoBus/D communications are enabled. After checking that this flag is ON, execute the program to start using I/O data.
Outside Temperature Display Range Flag	This flag changes from 0 to 1 if the process value exceeds 3200.0°F when a W/Re5-26 thermocouple sensor is being used and the setting unit is 0.1°C/°F.
Output Area Error Flag (See note 1.)	This flag changes from 0 to 1 if the output data from the Master is not reflected in the E5ZE due to the operating mode.
Temperature Control Internal Transmission Error Flag (See note 1.)	This flag changes from 0 to 1 if the remote I/O function has not been processed properly in the E5ZE.
Temperature Controller Error Flag	This flag changes from 0 to 1 if there is an error in the Temperature Controller, such as an AD converter error or memory error.
Input Error Flag	This flag changes from 0 to 1 if the temperature sensor is disconnected or short-circuited.
Process Value Overflow Flag	This flag changes from 0 to 1 if the process value is more than the maximum value of the setting range. (See note 2.)
Process Value Underflow Flag	This flag changes from 0 to 1 if the process value is less than the minimum value of the setting range. (See note 2.)
Heater Current Overflow Flag	This flag changes from 0 to 1 if the measured heater current exceeds 55.0 A when the HB and HS alarm are being used.

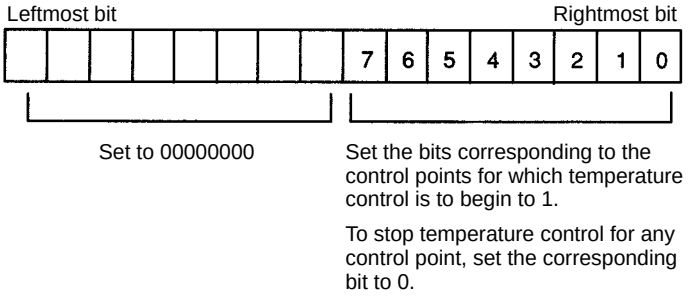
Note

1. If the Output Area Error Flag or Temperature Controller Error Flag is ON (1) for longer than 1 s, the remote I/O data will not be transmitted correctly to the E5ZE.
2. The measurement range is from the setting range lower-limit negative value (–20°C or –40°F) to the setting range upper-limit positive value (20°C or 40°F).

3-4 Temperature Control Start/Stop

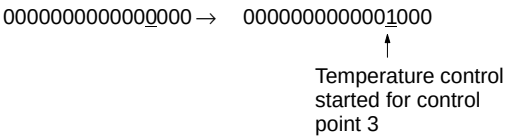
The temperature control of control points in the E5ZE is started and stopped by operating the bits in the corresponding word allocated in the PC to which the Master Unit is mounted, as follows:

Temperature Control Start/Stop



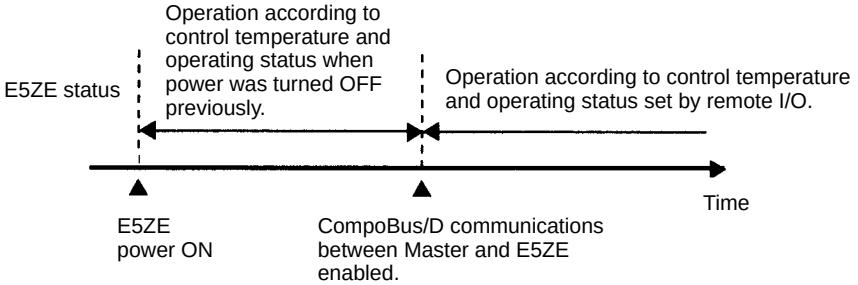
Example

If the temperature control of all control points is stopped and then starts for control point 3, the contents of the corresponding word in the PC will change, as follows:



3-4-1 Startup Operation

When pin 5 (startup operation setting) of the FUNCTION switch on the front panel of the E5ZE-8□□□D1□B Multipoint Temperature Controller is set to ON, the Unit will operate as shown in the following diagram.



The time required for CompoBus/D communications to be enabled will depend on the order in which power is supplied, the number of Slaves connected to the Master, the baud rate, and other variables.

3-4-2 Manual Operation

When the E5ZE-8□□□D1□B Multipoint Temperature Controller is being operated manually, the following procedure is required depending on the relationship to the remote I/O Temperature Control Start/Stop Bit.

Refer to page 23 for details on the relationship between remote I/O and the E5ZE operating status.

Starting Manual Operation

1, 2, 3...

1. Set the Temperature Control Start/Stop Bit to 1 for the control point to be manually operated and temperature control will start for the control point.
2. Execute the Manual Operation Start command using FINS message communications or through the RS-232C auxiliary setting jack. Manual operation will start.
3. Set the manual output using FINS message communications or through the RS-232C auxiliary setting jack.

Stopping Manual Operation

Set the Temperature Control Start/Stop Bit to 0 for the control point being manually operated and temperature control will stop for the specified control point. Temperature control can then be restarted by setting the bit to 1 again.

3-5 Writing Set Points

The set point for each control point is written as 16-bit signed binary data (two's complement for negative values) in the corresponding word in the PC to which the Master Unit is mounted. The value is automatically transmitted to the E5ZE. The data will be written according to the setting unit that is set in the E5ZE. The default value is 1°C/°F for thermocouples and 0.1°C/°F for platinum resistance thermometers.

Example

If the set point is to be set to –90.0 °C, and the setting unit is 0.1 °C, the value set in the corresponding word will be as follows:

Set Point	Decimal	Hexadecimal	Binary
–90.0 °C	–900	FC7C	1111110001111100

If the set point is to be set to 110.0 °C, and the setting unit is 0.1 °C, the value set in the corresponding word will be as follows:

Set Point	Decimal	Hexadecimal	Binary
110.0 °C	1100	044C	0000010001001100

If the set point is to be set to 110.0 °C, and the setting unit is 1 °C, the value set in the corresponding word will be as follows:

Set Point	Decimal	Hexadecimal	Binary
110.0 °C	110	006E	0000000001101110

Refer to page 20 for details on the permissible setting ranges.

3-6 Remote I/O Delay Time

- The time required for the remote I/O data reflecting the changed data to be prepared at the E5ZE after a main input to the E5ZE has changed is called the input delay time.
- The time required for the data that has been transmitted to the E5ZE using CompoBus/D communications to affect in the operation of the E5ZE is called the output delay time.
- The maximum input and output delay times are 500 ms.
- For details on how to calculate the I/O delay time, refer to the *CompoBus/D (DeviceNet) Operation Manual (W267)*.