Commands and Responses

This section describes commands and response in detail. The conventions used in this section and data restrictions are as follows:

- Data is expressed in 1-byte units and in ASCII code.
- When the read or write data is a numerical value, the data to be set must conform to the following conditions:

(1) The decimal point "." is not indicated in fractions.

(2) The leftmost bit of minus numerical data must be expressed as fol

lows:

A: -1, F: - (minus)

[example]

10.0=[0100], -150.0=[A500], -15=[F015]

Reading/writing parameters

Reading parameters

Command

	2B	2B	2B	4B				2B	2B
@	Unit No.	1	Parameter No.	0	0	0	0	FCS	* CR

Response

	2B	2B	2B	2B	4B				2B	2B
@	Unit No.	1	Parameter No.	End code	Read data				FCS	* CR

Writing parameters

Command

	2B	2B	2B	4B				2B	2B
@	Unit No.	2	Parameter No.	Write data				FCS	* CR

Response

	2B	2B	2B	2B	4B				2B	2B
@	Unit No.	2	Parameter No.	End code	Write data				FCS	* CR

Parameters of a specified controller are read or written.

- Writing is possible only during remote operation.
- Reading is impossible during execution of auto-tuning.
- The following are set aside as special commands. For details, see Below
- "Remote/local", AT execute/cancel", "Hold/Hold cancel" and "Advance"
- For details on parameters in each setting level, see the tables below.

Parameter No.	Parameter	Data Setting and Monitor Range	Mode
00	PV monitor *1 *2	Scaling lower limit -10% to scaling upper limit +10%	Level 0
01	Set point *1	Set point lower limit to set point upper limit	
04	MV monitor (heat) *1	-5.0 to 105.0 *3	
42	MV monitor (cool) *1	0.0 to 105.0	
14	Valve opening monitor *1	-10.0 to 110.0	
02	Alarm value 1	-1999 to 9999	Program
03	Alarm value 2	-1999 to 9999	
41	Alarm value 3	-1999 to 9999	
19	Proportional band	0.1 to 999.9	Level 1
20	Integral time	0 to 3999 *5	
21	Derivative time	0 to 3999	
22	Cooling coefficient	0.01 to 99.99	
09	Dead band	-19.99 to 99.99	
87	Position-proportional dead band	0.1 to 10.0	
23	Manual reset value	0.0 to 100.0	
06	Hysteresis (heat)	0.01 to 99.99	
43	Hysteresis (cool)	0.01 to 99.99	
07	Control period (heat)	1 to 99	
08	Control period (cool)	1 to 99	
17	Heater current monitor *1	0.0 to 55.0	
18	Heater burnout alarm	0.0 to 50.0	
46	LBA detection time	0 to 9999	Level 2
47	MV at reset *6	-5.0 to 105.0	
48	MV at PV error *6	-5.0 to 105.0	
50	MV upper limit *3	MV lower limit +0.1 to 105.0	
49	MV lower limit *4	-5.0 to MV upper limit -0.1	
51	MV change rate limit	0.0 to 100.0	
56	Input digital filter	0 to 9999	
88	Open/close hysteresis	0.1 to 20.0	
25	Alarm 1 hysteresis	0.01 to 99.99	
26	Alarm 2 hysteresis	0.01 to 99.99	
52	Alarm 3 hysteresis	0.01 to 99.99	
53	Input shift upper limit	-199.9 to 999.9	
54	Input shift lower limit	-199.9 to 999.9	

*1 Possible only during reading
*2 During temperature input, the range becomes the range of use of the selected sensor.
*3 During heating and cooling control, the range becomes 0.0 to 105.0.
*4 During heating and cooling control, the range becomes -105.0 to 0.0.
*5 During position-proportional control, the range becomes 1 to 3999.
*6 During heating and cooling control, the range becomes -105.0 to 105.0.
During position-proportional control, you can select between 0: Hold/1: Open/2: Close. (Defaults is “0 : Hold”.)

Parameter No.	Parameter	Data Setting Range	Mode
57	Input type	0 to 21 *7	Set up
59	Scaling upper limit	Scaling lower limit +1 to 9999	
58	Scaling lower limit	-1999 to scaling upper limit -1	
60	Decimal point	0 to 3	
30	°C/°F selection	0: °C, 1: °F	
61	Control output 1 assignment	0 to 6, 10 to *13	
62	Control output 2 assignment	0 to 6, 10 to *13	
63	Auxiliary output 1 assignment	2 to 8, 10 to *13	
64	Auxiliary output 2 assignment	2 to 8, 10 to *13	
65	Alarm 1 type	1 to 11	
66	Alarm 1 open in alarm	0: Closed in alarm, 1: Open in alarm *9	
67	Alarm 2 type	1 to 11	
68	Alarm 2 open in alarm	0: Closed in alarm, 1: Open in alarm *9	
69	Alarm 3 type	1 to 11	
70	Alarm 3 open in alarm	0: Closed in alarm, 1: Open in alarm *9	
71	Direct/Reverse operation	0: Reverse operation, 1: Direct operation	
28	Set point upper limit *1	Set point lower limit +1 to scaling upper limit	Expansion
27	Set point lower limit *1	Scaling lower limit to Set point upper limit -1	
72	PID / ON/OFF	0: Advanced PID, 1: ON/OFF	
35	α	0.00 to 1.00	
85	AT calculated gain	0.1 to 10.0	
36	Automatic return of display mode	0 to 99	
93	AT hysteresis	0.1 to 9.9	
55	LBA detection width	0.0 to 999.9	
77	Event input assignment 3	-1 to 2, 4 to 18 *11	Option
78	Event input assignment 4	-1 to 2, 4 to 18 *11	
79	Transfer output type	0 to 5 *12	
81	Transfer output upper limit	*12	
80	Transfer output lower limit	*12	
82	HBA latch	0: OFF, 1: ON	
89	Travel time	1 to 999	
38	PV dead band	0 to 9999	

*7 See page 5-31.

*8 0: Control output (heat), 1: Control output (cool), 2 to 4: Alarms 1 to 3, 5: HBA, 6: LBA, 7 and 8: Errors 1 to 2, 10 to 11: Time signal 1 to 2, 12: Program end, 13: Stage output

*9 See page 5-37.

*10 During temperature input, the range becomes the range of use of the selected sensor instead of the scaling upper/lower limit values.

*11 -1: No specification, 0: Run/Reset, 1: Remote/Local, 2: Auto/Manual, 4: Hold/Hold cancel, 5: Advance, 6 to 8: Pattern select 0 to 2

*12 The following table shows the output ranges of the transfer output lower and upper limits.

Transfer Output Type	Transfer Output Lower Limit to Transfer Output Upper Limit
0: Present SP	-1999 to 9999
2: Process value	-1999 to 9999
3: Manipulated variable (heat)	-5.0 to 105.0% (standard control), 0.0 to 105.0% (heating and cooling control)

Transfer Output Type	Transfer Output Lower Limit to Transfer Output Upper Limit
4: Manipulated variable (cool)	0.0 to 105.0%
5: Valve opening	-10.0 to 110.0%

Issuing special commands

Command

	2B		2B	4B	2B	2B
@	Unit No.	3	Command code	Instruction code	FCS	* CR

Response

	2B		2B	2B	4B	2B	2B
@	Unit No.	3	Command code	End code	Instruction code	FCS	* CR

The following functions are issued as special commands.

- Run/Reset
  Runs or stops programs. This command cannot be issued in setting level 1.
- Remote/Local (maximum number of writes: 100,000)
  Selects remote operation or local operation.
- AT Execute/Cancel
  Executes or cancels auto-tuning. This command cannot be issued in setting level 1.
- Move to setting level 1
  Issue this command when writing parameters in the setup, expansion and option modes. On the E5AK-T, the parameter switches to the top parameter "in-t : input type" of the setup mode, and control is stopped.
- Software reset
  Resets E5AK-T operation (same as turning power ON) by communications. A response is not returned to this command. Also, communications with the E5AK-T cannot be carried out for five seconds after reset.
- Status
  Monitors the status of the E5AK-T. Two command groups are available, A and B, depending on the instruction code. The response is returned in bit units to the instruction code (4B) of the response frame. For details on the monitoring details of each group, see below.
- Hold
  Holds program execution or cancels hold. This command cannot be issued in setting level 1.
- Advance
  Advances execution of steps in the program. This command cannot be issued in setting level 1.

00	Run/Reset	0000: Run, 0001: Reset
02	Remote/Local	0000: Local, 0001: Remote
07	AT Execute/Cancel	0000: Cancel, 0001: 40% AT execution, 0002: 100% AT execution
09	Move to setting level 1	0000
11	Software reset	0000
14	Status	0000: A group, 0001: B group
15	Hold	0000: Hold cancel, 0001: Hold
16	Advance	0000

In the case of the “Run/Reset” or “Advance” command, issue command when the response of the previous command was returned and passed for 0.5 seconds.

A group

Bit	Description	[1]	[0]	
0	Heating side output *3	ON	OFF	*1
1	Cooling side output *4	ON	OFF	*1
2	Alarm output 1	ON	OFF	*2
3	Alarm output 2	ON	OFF	*2
4	Alarm output 3	ON	OFF	*2
5	LBA output	ON	OFF	*2
6	HBA output	ON	OFF	*2
7	Run/Reset	Reset	Run	
8	Auto/Manual	Manual	Auto	
9	Remote/Local	Remote	Local	
10				
11	AT	AT execution	OFF	
12	Hold	During hold	OFF	
13	Wait	During wait	OFF	
14	Event input 3	ON	OFF	
15	Event input 4	ON	OFF	

B group

Bit	Description	[1]	[0]	
0	Setting level	1	0	
1				
2	Control output 1 type	Linear	Pulse	
3	Control output 2 type	Linear	Pulse	
4				
5	Input error	ON	OFF	
6	A/D converter error	ON	OFF	
7	CT overflow	ON	OFF	
8	CT hold	ON	OFF	*5
9	Potentiometer error	ON	OFF	
10				
11	Time signal 1 output	ON	OFF	*2
12	Time signal 2 output	ON	OFF	*2
13	Ramp/soak	Ramp	Soak	
14	Program end	ON	OFF	*6
15	During standby	ON	OFF	

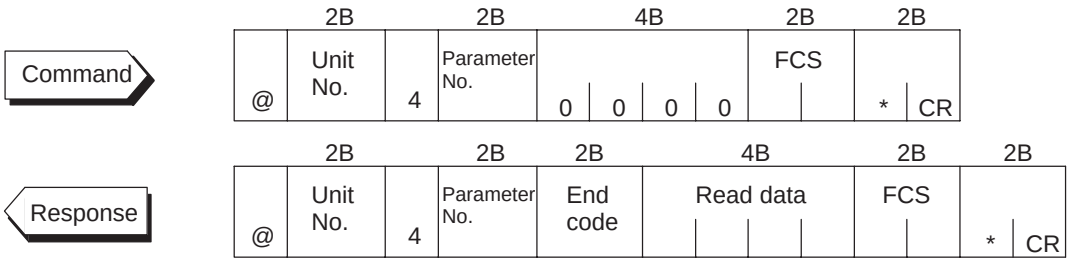
*1 Always “OFF” at linear output
*2 Always “OFF” when output is not assigned
*3 During position-proportional control, output is Open.
*4 During position-proportional control, output is Close.
*5 When the ON time during control output is less than 190 ms, the heater current to which
“ 1” is set and the previous current value is held.
*6 “ON” while the No.2 display indicates [PEnd]. For details on the [PEnd] indication, see page 4-15.

About Setting Levels

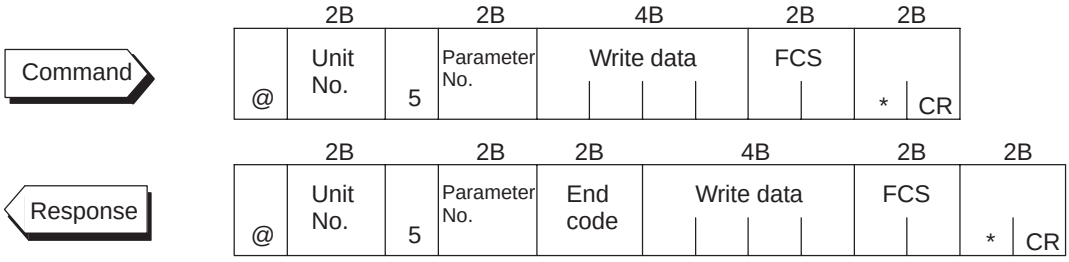
To return to setting level 0 from setting level 1, issue the “software reset” comm
If the parameter write command is issued for the setup, expansion and option m
in setting level 0, an error occurs, and the end code (0D = Command canno
executed) is returned.

Reading/writing program parameters

Reading parameters



Writing parameters



Parameters relating to the program of the specified unit are read or written.

- Writing is possible only during remote operation.
- Reading is impossible during execution of auto-tuning.
- For details on parameters in each setting level, see the lists for each setting level below.

Parameter No.	Parameter	Data Setting and Monitor Range	Mode
00	Pattern No. *2	0 to 7	*2
01	Step No. monitor *1	0 to number of steps -1	Level 0
63	Standby time monitor *1	0.00 to 99.59	
02	Pattern elapsing time monitor *1	0.00 to 99.59	
03	Pattern execution count monitor *1	0 to 9999	
60	Number of steps	1 to 16	Program
05	Step 0 SP/Target SP 0	SP lower limit to SP upper limit	
06	Ramp rate 0	0 to 9999	
07	Step 0 time/Soak time 0	0.00 to 99.59	
08	Step 1 SP/Target SP 1	SP lower limit to SP upper limit	
09	Ramp rate 1	0 to 9999	
10	Step 1 time/Soak time 1	0.00 to 99.59	
11	Step 2 SP/Target SP 2	SP lower limit to SP upper limit	
12	Ramp rate 2	0 to 9999	
13	Step 2 time/Soak time 2	0.00 to 99.59	
14	Step 3 SP/Target SP 3	SP lower limit to SP upper limit	
15	Ramp rate 3	0 to 9999	
16	Step 3 time/Soak time 3	0.00 to 99.59	
17	Step 4 SP/Target SP 4	SP lower limit to SP upper limit	
18	Ramp rate 4	0 to 9999	
19	Step 4 time/Soak time 4	0.00 to 99.59	
20	Step 5 SP/Target SP 5	SP lower limit to SP upper limit	
21	Ramp rate 5	0 to 9999	
22	Step 5 time/Soak time 5	0.00 to 99.59	
23	Step 6 SP/Target SP 6	SP lower limit to SP upper limit	
24	Ramp rate 6	0 to 9999	
25	Step 6 time/Soak time 6	0.00 to 99.59	
26	Step 7 SP/Target SP 7	SP lower limit to SP upper limit	
27	Ramp rate 7	0 to 9999	
28	Step 7 time/Soak time 7	0.00 to 99.59	
29	Step 8 SP	SP lower limit to SP upper limit	
30	Step 8 time	0.00 to 99.59	
31	Step 9 SP	SP lower limit to SP upper limit	
32	Step 9 time	0.00 to 99.59	
33	Step 10 SP	SP lower limit to SP upper limit	
34	Step 10 time	0.00 to 99.59	
35	Step 11 SP	SP lower limit to SP upper limit	
36	Step 11 time	0.00 to 99.59	
37	Step 12 SP	SP lower limit to SP upper limit	
38	Step 12 time	0.00 to 99.59	
39	Step 13 SP	SP lower limit to SP upper limit	
40	Step 13 time	0.00 to 99.59	

*1 Reading only is possible.

*2 Can be used in either the level 0 or program modes.
Read only during program run

Parameter No.	Parameter	Data Setting and Monitor Range	Mode
41	Step 14 SP	SP lower limit to SP upper limit	Program
42	Step 14 time	0.00 to 99.59	
43	Step 15 SP	SP lower limit to SP upper limit	
44	Step 15 time	0.00 to 99.59	
04	Pattern execution count	0 to 9999	
45	Time signal 1 enabled step	0 to 15	
46	Time signal 1 ON time	0.00 to 99.59	
47	Time signal 1 OFF time	0.00 to 99.59	
48	Time signal 2 enabled step	0 to 15	
49	Time signal 2 ON time	0.00 to 99.59	
50	Time signal 2 OFF time	0.00 to 99.59	
62	Standby time	0.00 to 99.59	Level 2
54	Operation at power ON	*3	Expansion
55	End condition	0: Reset, 1: Final step SP	
51	Program time unit	0: Hour, minute, 1: Minute, second	
56	Step time/Rate of rise programming	0: Step time, 1: Rate of rise programming	
57	Time unit of ramp rate	0: Minute, 1: Hour	
58	PV start	0: SP start, 1: PV start	
59	Wait width	0 to 9999	
52	Alarm during ramp step enable	0 : OFF, 1 : ON	
53	Run all enable	0 : OFF, 1 : ON	

*3 0: Continue, 1: Reset, 2: Run, 3: Manual