

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Astronics / EADS / Racal 5014* at our website: *Click HERE*

OMRON

Digital Process Controller Series

E5□K

Advanced Process Digital Controllers with Fuzzy Logic





- Field configurable outputs, options
- 100 ms sampling (for analog input)
- Advanced PID, or fuzzy self-tuning
- Conforms to UL, CSA and CE standards
- Water-resistant front panel meets IP66/NEMA 4X
- Remote set point with optional event input board
- Set point ramp
- Serial communications available
- Front panel programming
- Heat only or heat/cool control
- Auxiliary outputs (SPST) standard; two for E5AK/E5EK, one for E5CK
- 3-year warranty

Ordering Information

Order Control Output Boards and Option Boards separately below.

Description	DIN size	Supply voltage	**Part number**
Standard model	1/4 DIN (96 x 96 mm)	100 to 240 VAC	**E5AK-AA2-500**
Position-proportional model (See Note 3)		100 to 240 VAC	**E5AK-PRR2-500**
Standard model		24 VAC/VDC	**E5AK-AA2-500 AC/DC24**
Position-proportional model (See Note 3)		24 VAC/VDC	**E5AK-PRR2-500 AC/DC24**
Standard model	1/8 DIN (48 x 96 mm)	100 to 240 VAC	**E5EK-AA2-500**
Position-proportional model (See Note 3)		100 to 240 VAC	**E5EK-PRR2-500**
Standard model		24 VAC/VDC	**E5EK-AA2-500 AC/DC24**
Position-proportional model (See Note 3)		24 VAC/VDC	**E5EK-PRR2-500 AC/DC24**
Standard model	1/16 DIN (48 x 48 mm)	100 to 240 VAC	**E5CK-AA1-500**
Standard model		24 VAC/VDC	**E5CK-AA1-500 AC/DC24**
Non-standard model with built-in quick auto-tune button (See *Nomenclature* section for details)		100 to 240 VAC	**E5CK-AA1-302**

Note: 1. When using the heater burnout alarm function with a standard model, the Linear Output Module cannot be used for the control outputs (heat). The Digital Controller provides transfer outputs at 4 to 20 mA for the PV and other values and control outputs at 4 to 20 mA for the current outputs.

2. E5EK-PRR2/E5AK-PRR2 controllers are supplied with relay output. The relay output is not compatible with any other module.

3. Position-proportional models are intended for motorized values (not 4-20 mA modulating valves). These use two relays (“open” and “close”) which will turn a motor clockwise or counter-clockwise, thus opening or closing the valve.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ OPTIONAL OUTPUT BOARDS

Description	Specifications	Compatible controller	Max. quantity	**Part number**
Relay	SPST, 5 A, 250 VAC	E5AK/E5EK	2	**E53-R**
SSR (solid state relay)	1 A, 75 to 250 VAC	E5AK/E5EK	2	**E53-S**
Voltage pulse	NPN, 12 VDC	E5AK/E5EK	2	**E53-Q**
	NPN, 24 VDC	E5AK/E5EK	2	**E53-Q3**
	PNP, 24 VDC	E5AK/E5EK	2	**E53-Q4**
Linear current	4 to 20 mA	E5AK/E5EK	2	**E53-C3**
	0 to 20 mA	E5AK/E5EK	2	**E53-C3D**
Linear voltage	0 to 10 VDC	E5AK/E5EK	2	**E53-V34**
	0 to 5 VDC	E5AK/E5EK	2	**E53-V35**
Relay/Relay	SPST/SPST, 5 A, 250 VAC	E5CK	1	**E53-R4R4**
Relay/Pulse	SPST, 5 A/NPN, 24 VDC	E5CK	1	**E53-Q4R4**
	SPST, 5 A/PNP, 24 VDC	E5CK	1	**E53-Q4HR4**
Relay/Linear current	SPST, 5 A/4 to 20 mA	E5CK	1	**E53-C4R4**
	SPST, 5 A/0 to 20 mA	E5CK	1	**E53-C4DR4**
Relay/Linear voltage	SPST, 5 A/0 to 10 VDC	E5CK	1	**E53-V44R4**
Pulse/Pulse	NPN/NPN, 24 VDC	E5CK	1	**E53-Q4Q4**
	PNP/PNP, 24 VDC	E5CK	1	**E53-Q4HQ4H**
Computer communications	RS-232C	E5AK/E5EK	3/1	**E53-AK01**
	RS-232C	E5CK	1	**E53-CK01**
	RS-422	E5AK/E5EK	3/1	**E53-AK02**
Computer communications	RS-485	E5AK/E5EK	3/1	**E53-AK03**
		E5CK	1	**E53-CK03**
Event input	For remote set point	E5AK/E5EK	3/1	**E53-AKB**
	For remote set point	E5CK	1	**E53-CKB**
Transfer output	4 to 20 mA	E5AK/E5EK	3/1	**E53-AKF**
	4 to 20 mA	E5CK	1	**E53-CKF**

Note: If the control period is less than 5 seconds, use an SSR (solid state relay) or pulse voltage output.

■ ACCESSORIES (ORDER SEPARATELY)

Description	Specifications	Compatible controller	Max. quantity	**Part number**
Current transformer; order only if using heater burnout alarm function	50 A load, 5.8 mm hole dia.	E5AK/E5EK	1	**E54-CT1**
	120 A load, 12 mm hole dia.	E5AK/E5EK	1	**E54-CT3**
Terminal cover (supplied with Standard models)	Provides finger protection from terminals (VDE0106 part 100)	E5AK	1	**E53-COV0809**
		E5CK	1	**E53-COV07**
		E5EK	1	**E53-COV08**
Software	For setup and monitoring; requires optional computer communications board	All	1	**SYS-CONFIG V2.0**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Input Types (selectable with input jumper connector)

Thermocouple

Input (field selectable) (See Notes)		K1	K2	J1	J2	T	E	L1	L2	U	N	R	S	B	W	PLII
Range	°C	–200 to 1,300	0.0 to 500.0	–100 to 850	0.0 to 400.0	–199.9 to 400.0	0 to 600	–100 to 850	0.0 to 400.0	–199.9 to 400.0	–200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 2,300	0 to 1,300
	°F	–300 to 2,300	0.0 to 900.0	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	0 to 1,100	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	–300 to 2,300	0 to 3,000	0 to 3,000	300 to 3,200	0 to 4,100	0 to 2,300

Note: 1. Setting number is factory-set to 2 (K1).
2. Thermocouple W is W/Re5-26 (tungsten rhenium 5, tungsten rhenium 26).

Platinum Resistance Thermometer (RTD's)

Input (field selectable)		JPt100	Pt100
Range	°C	–199.9 to 650.0	–199.9 to 650.0
	°F	–199.9 to 999.9	–199.9 to 999.9

Current/Voltage

Input (field selectable)	Current input		Voltage input		
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V

Note: When a current/voltage input is selected, the decimal point is fully adjustable.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications

■ RATINGS

Model number			E5□K Standard	E5□K 24V AC/DC
Supply voltage			100–240 VAC, 50/60 Hz	24 VAC/VDC, 50/60 Hz
Operating voltage range			85% to 110% of rated supply voltage	85% to 110% of rated supply voltage
Power consumption		E5AK	16 VA	9 VA, 6 W
		E5EK	15 VA	9 VA, 6 W
		E5CK	10 VA (at 100 VAC) 14 VA (at 240 VAC)	6 VA, 3.5 W
Input	Thermocouple		K, J, T, E, L, U, N, R, S, B, W, PLII	
	Platinum resistance thermometer (RTD)		JPt100, Pt100	
	Current input		4 to 20 mA, 0 to 20 mA	
	Voltage input		1 to 5 V, 0 to 5 V, 0 to 10 V	
Mean Time Between Failure			15.4 years (135,000 hours)	
Control output (See Note 1)	Relay		SPST, 250 VAC, 3 A (resistive load) Mechanical life expectancy: 10,000,000 operations min. Electrical life expectancy: 100,000 operations min.	
	Voltage (pulse)	NPN	20 mA at 12/24 VDC (with short-circuit protection)	
		PNP	20 mA at 24 VDC (with short-circuit protection)	
	Linear voltage	0 to 10 VDC	Permissible load impedance: 1 kΩ min. Resolution: Approximately 2600 steps	
	Linear current	4 to 20 mA	Permissible load impedance: 500 Ω max. Resolution: Approximately 2600 steps	
		0 to 20 mA	Permissible load impedance: 500 Ω max. Resolution: Approximately 2600 steps	
Auxiliary output	SPST-NO	E5AK	3 A at 250 VAC (resistive load)	
		E5EK	3 A at 250 VAC (resistive load)	
		E5CK	1A at 250 VAC (resistive load)	
Control method (See Note 2)			ON/OFF, Advanced PID Control (with auto-tuning) or Self-tuning	
Setting method			Digital setting using front panel keys or communications features	
Indication method – 7-seg. digital display and LEDs			E5AK: PV = 15 mm, SP = 10.5 mm E5EK: PV = 14 mm, SP = 9.5 mm E5CK: PV = 12 mm, SP = 8 mm	
Potentiometer for valve positioning (for E5AK-PRR and E5EK-PRR only)			100 Ω to 2.5 kΩ	
Event input	Contact input	ON	1 kΩ max.	
		OFF	100 kΩ min.	
	No-contact input	ON	residual voltage: 1.5 V max.	
		OFF	leakage current: 0.1 mA max.	
Transmission output			4 to 20 mA, permissible load impedance: 600 Ω max., resolution: Approximately 2600 steps	
Remote SP input (for E5AK and E5EK only)		Current input	4 to 20 mA (Input impedance: 150 Ω)	
Current Transformer input (for E5AK and E5EK only)			Connect only an Omron Current Transformer (E54-CT1 or E54-CT3)	
Other functions	Standard		Manual output, heating/cooling control, SP limiter, loop burnout alarm, SP ramp, MV limiter, MV change rate limiter, input digital filter, input shift, run/stop, protect functions	
	Option		Multiple SP, run/stop selection, transfer output functions, auto/manual Communications (RS-232C, RS-422, or RS-485), Loop Break Alarm, and Transfer Output.	
Standards		UL	File No.: E68481	
		CSA	File No.: LR59623	
		CE	File No.: EN50081-2; EN50082-2; IEC 1010-1	

Note: 1. All control outputs are insulated from the input circuit.
2. Fuzzy self-tuning is available only when using the Digital Controller in standard control operation with temperature input.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ CHARACTERISTICS

Indication accuracy (See Note)		Thermocouple: ±0.3% of indication value or ±1°C, whichever is greater, ±1 digit max. Platinum resistance thermometer: ±0.2% of indication value or ±0.8°C, whichever is greater, ±1 digit max. Analog input: ±0.2% (of indication value) ±1 digit max.
Hysteresis		0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		0.1% to 999.9% FS (in units of 0.1% FS)
Integral (reset) time (I)		0 to 3,999 s (in units of 1 s)
Derivative (rate) time (D)		0 to 3,999 s (in units of 1 s)
Control period		1 to 99 s (in units of 1 s)
Manual reset value		0.0% to 100.0% (in units of 0.1%)
Alarm setting range		–1,999 to 9,999 or –199.9 or 999.9 (decimal point position dependent on input type)
Sampling period	Temperature input	250 ms scan rate
	Analog input	100 ms scan rate
Insulation resistance		200 MΩ min. (at 500 VDC)
Dielectric strength		2,000 VAC, 50/60 Hz for 1 min between terminals of different polarities
Vibration resistance	Malfunction	10 to 55 Hz, 10 m/s^2 (approx. 1G) for 10 min each in X, Y, and Z directions
	Mechanical	10 to 55 Hz, 20 m/s^2 (approx. 2G) for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction	200 m/s^2 min. (approx. 20G), 3 times each in 6 directions (100 m/s^2 (approx. 10G) applied to the relay)
	Mechanical	300 m/s^2 min. (approx. 30G), 3 times each in 6 directions
Ambient temperature	Operating	–10°C to 55°C (14°F to 131°F) with no icing; with 3-year warranty period: –10°C to 50°C (14°F to 122°F)
	Storage	–25°C to 65°C (–13°F to 149°F) with no icing
Ambient humidity	Operating	35% to 85% RH
Enclosure ratings	Front panel	NEMA 4X for indoor use (equivalent to IP66)
	Rear case	IEC standard IP20
	Terminals	IEC standard IP00
Memory protection		Non-volatile memory (number of writings: 100,000 operations)
Weight	E5AK	Approx. 450 g
	E5EK	Approx. 320 g
	Mounting bracket	Approx. 65 g
	E5CK	Approx. 170 g
	Adapter	Approx. 10 g
EMC		Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2), 8 kV air discharge (level 3) Immunity RF-interference: ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3), 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3), 2 kV I/O signal-line (level 4)
Standards – Approvals		UL1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection)

Note: Indication Accuracy –
Of the K1, T, and N thermocouples at a temperature of -100°C or less: ±2°C ±1 digit maximum.
Of the U, L1, and L2 thermocouples at any temperature: ±2°C ±1 digit maximum.
Of the B thermocouple at a temperature of 400°C or less: unrestricted.
Of the R and S thermocouples at a temperature of 200°C or less: ±3°C ±1 digit maximum.
Of the W thermocouple at any temperature: ±0.3% of the indicated value or ±3°C, (whichever is greater) ±1 digit maximum.
Of the PLII thermocouple at any temperature: ±0.3% or ±2°C, whichever is greater ±1 digit maximum.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ OPTION BOARD RATINGS AND CHARACTERISTICS

Event inputs		Contact input: ON: 1 kΩ max., OFF: 100 kΩ min. No-contact input: ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
Communications	Interface	RS-232C and RS-485; RS-422 for E5AK and E5EK only
	Transmission method	Half-duplex
	Synchronization method	Start-stop synchronization (asynchronous method)
	Baud rate	1.2/2.4/4.8/9.6/19.2 kbps
Transfer output		4 to 20 mA: Permissible load impedance: E5AK and E5EK = 600 Ω max. E5CK = 500 Ω max. Resolution: E5AK and E5EK = approx. 2,600 steps E5CK = approx. 2,600 steps
		RS-232C Peer-to-peer only; maximum cable length = 15 m (49.2 feet) RS-422 and RS-485 32 controller maximum to host computer; maximum cable length = 500 m (1640 feet)

■ CURRENT TRANSFORMER RATINGS

Part number	E54-CT1	E54-CT3
Max. continuous heater current	50 amps	120 amps
Dielectric strength	1,000 VAC (for 1 min)	
Vibration resistance	50 Hz, 98 m/s^2 (10G)	
Weight	Approx. 11.5 g	Approx. 50 g
Accessories	—	Armature: 2; Plug: 2

■ HEATER BURNOUT ALARM

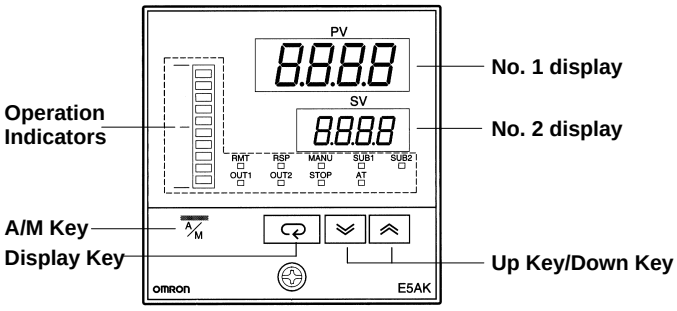
Max. heater current	Single-phase 50 A VAC (See Note 1.)
Heater current value display accuracy	±5% FS±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) (See Note 2.)
Min. detection ON time	190 ms (See Note 3.)

Note: 1. Use the K2CU-F□□A-□GS (with gate input terminals) for the detection of three-phase heater burnout.
2. The heater burnout alarm is always OFF if the alarm is set to 0.0 A and always ON if the alarm is set to 50.0 A.
3. No heater burnout detection or heater current value measurement is possible if the control output (heat) is ON for less than 190 ms.

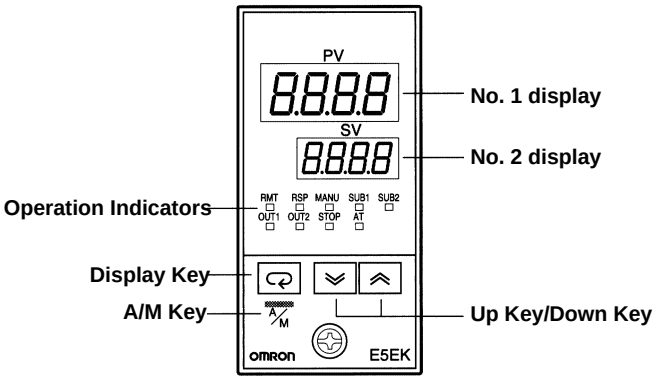
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Nomenclature

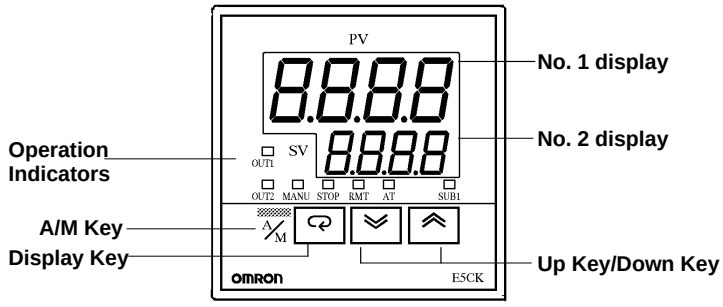
■ E5AK



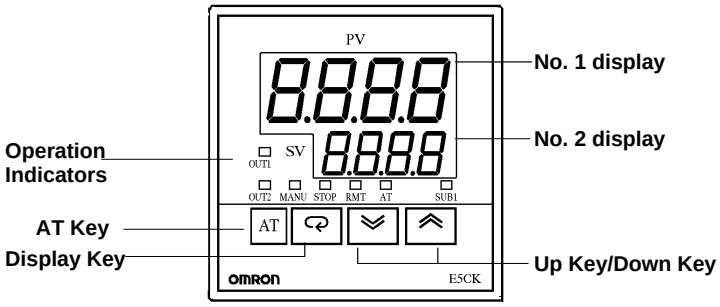
■ E5EK



■ E5CK



■ E5CK-302 (Non-standard)



Operation Indicators

- **OUT1**
  Lit when control output 1 turns ON.
- **OUT2**
  Lit when control output 2 turns ON.
- **SUB1**
  Lit when the output function assigned to auxiliary output 1 turns ON.
- **SUB2** (for E5AK and E5EK only)
  Lit when the output function assigned to auxiliary output 2 turns ON.
- **MANU**
  Lit when the manual operation mode is being used.
- **STOP**
  Lit when control operation has been stopped.
- **RMT**
  Lit during remote communications operation.
- **AT**
  Flashes during auto-tuning.
  Auto-tuning is completed when this LED stops flashing.
- **RSP** (for E5AK and E5EK only)
  Lit during remote SP operation.
- **Bar Graph** (for E5AK only)
  On a standard model (E5AK-AA2), this bar graph indicates the manipulated variable (heat) in 10% increments per single segment. On a position-proportional model (E5AK-PRR2), this bar graph indicates the valve opening in 10% increments per single segment.

No. 1 Display
Displays the process value or parameter symbols.

No. 2 Display
Displays the set point, set point during SP ramp, manipulated variable, or parameter settings.

A/M Key
Press to select the auto operation or manual operation.

Up Key/Down Key
Press to increase or decrease the value on the No.2 display.

Display Key
Press quickly (for less than 1 s) to shift the display to the next parameter. When this key is pressed for 1 s or more, the menu screen will be displayed in any case.

- **AT**
  Press key for automatic tuning.
- **A/M**
  This feature is located in level one. (Replaced AT feature in level one).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Operation

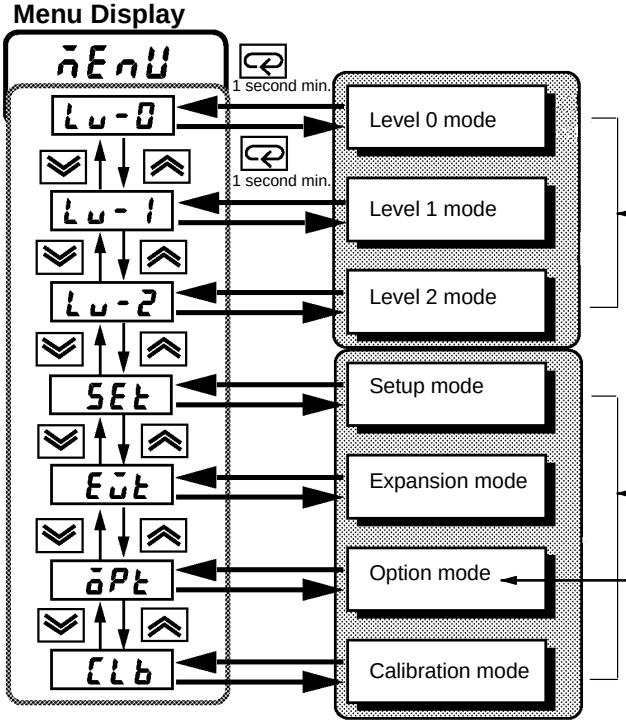
■ OPERATING PARAMETERS

Mode Selection

Press the Display Key for 1 sec. min. to switch to modes other than the manual or protect mode.

The figure below (Menu Display) shows all modes in the order that they are displayed. Some parameters are not displayed, depending on the protect mode setting and the option boards used.

Menu Display



To Access *Protect Mode*

Press and hold the A/M Key and the Display Key for more than 1 second.

To Return to the Main PV/SP Display from the *Protect Mode*

Press and hold the A/M Key and the Display Key for more than 1 second.

To Access *Manual Mode*

Press and hold the A/M Key for more than 1 second.

To switch parameters **within** a mode, use the Display Key. Press the display key for less than one second to move between parameters.

Note:
1. **In Level 0 mode, Level 1 mode, and Level 2 mode:** The controller will maintain control of the process.
2. **In Setup mode, Expansion mode, Option mode, and Calibration mode:** Control of the process is not maintained. The outputs are inactive.
3. **Option Mode** will be accessible only when an option board is installed in the controller.

■ PARAMETERS AND MENUS – FOR SETTING THE CONTROLLER

Protect Mode — **Limits use of the menu and A/M Keys.**
The protect function prevents unwanted modification of parameters and can also be used to prevent switching between the auto and manual operation.

Manual Mode — **Sets the controller to manual operation mode.**
You can only manually adjust the manipulated variable (MV) in this mode.

Level 0 Mode — **For normal operation.**
Change: the set point during operation, and start or stop Controller operation; and, (only in this mode) monitor the process value, ramp SP, and manipulated variable.

Level 1 Mode — **For adjusting primary control parameters.**
Execute: AT (auto-tuning); set alarm values; set the control period; and, set PID parameters.

Level 2 Mode — **For adjusting secondary control parameters.**
Set parameters for: limiting the manipulated variable and set point; switch between the remote and local modes; set the loop break alarm (LBA), alarm hysteresis, and the digital filter value of inputs.

Setup Mode — **For setting the basic specifications.**
Set parameters for: input type, scaling, output assignments and direct/reverse operation.

Expansion Mode — **For setting expanded functions.**
Set: ST (self-tuning), SP setting limiter. Select: advanced PID or ON/OFF control. Specify the standby sequence resetting method. Initialize parameters; and, set the time for automatic return to the monitoring display.

Option Mode — **For setting option functions.**
Set: the communications conditions; transfer: output and event input parameters to match the type of Option Board installed in the Controller. *This mode will be accessible only when an option board is installed in the controller.*

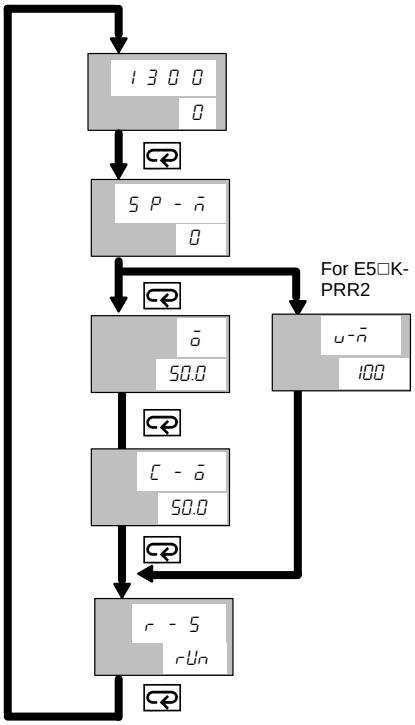
Calibration Mode — **For calibrating inputs and transfer output.**
Calibrate the selected input type. *Transfer output can be calibrated only when the Communications Unit (E53-CKF) has been installed in the Controller*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ PARAMETERS DEFINITIONS

Refer to your *User's Manual* for each parameter and the calibration mode in detail.

Level 0 Mode for E5AK and E5EK



PV/SV
The process value is displayed on the No.1 display and the set point is displayed on the No.2 display. When the multi-SP function is in use, the value of the current set point (SP0 or SPD is displayed).

Set Point During SP Ramp
Monitors the set point when the SP ramp function is used.

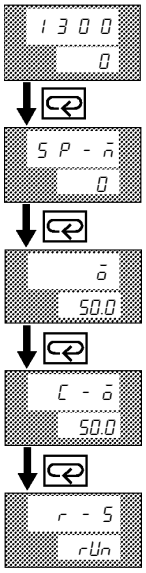
Manipulated Variable (MV) Monitor for Heat
Monitors the manipulated variable (MV) for the heating output.

Valve Opening Monitor
Displays the valve position in percentage format.
Open = 100%
Closed = 0%

Manipulated Variable (MV) Monitor for Cool
When the Controller is in heating and cooling control operation, use this display to monitor the manipulated variable of the cooling output.

Run/Stop
Places the controller in RUN mode or in STOP mode.

Level 0 Mode for E5CK



PV/SV
The process value is displayed on the No.1 display and the set point is displayed on the No.2 display. When the multi-SP function is in use, the value of the current set point (SP0 or SP1 is displayed).

Set Point During SP Ramp
Monitors the set point when the SP ramp function is used.

Manipulated Variable (MV) Monitor for Heat
Monitors the manipulated variable (MV) for the heating output.

Manipulated Variable (MV) Monitor for Cool
When the Controller is in heating and cooling control operation, use this display to monitor the manipulated variable of the cooling output.

Run/Stop
Places the controller in RUN mode or in STOP mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Security

Using the Security Level Table:

Any mode marked with an X is displayed in the Security Level indicated.



Example: Selecting Security Level 2:
Displays these modes: Level 0, Level 1 and Level 2 only.
Does NOT display these modes: Setup, Expansion, Option, Calibration

Mode	Set value							
	0	1	2	3	4	5	6	⇐ Security Level
Calibration	x							
Option	x	x						
Expansion	x	x						
Setup	x	x						
Level 2	x	x	x					
Level 1	x	x	x	x				
Level 0	x	x	x	x	x	x		
	⇑ Lowest Security Level (first column)						⇑ Highest Security Level (last column)	

When the set value is **5**:
Only the **PV/SP monitor** and **set point** parameter can be used.

When the set value is **6**:
Only the **PV/SP monitor** parameter can be used.



A/M Key Protect

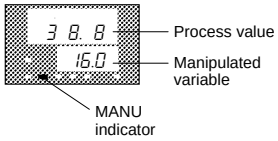
This invalidates the function of the A/M Key.

- To Access *Protect Mode*

Press and hold the A/M Key and the Display Key for more than 1 second.

To Return to the Main PV/SP Display from the *Protect Mode*
Press and hold the A/M Key and the Display Key for more than 1 second.

Note: For E5CK-302 models, this is done the same way, using the AT button.



MV Manual

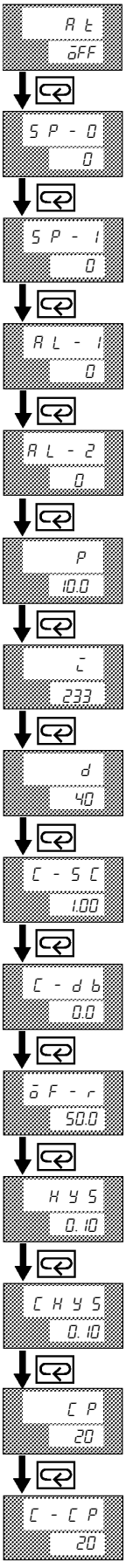
- To Access *Manual Mode*

Press and hold the A/M Key for more than 1 second.

Range = –105% to 105%

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Level 1 Mode



AT Execute/Cancel

Starts the Auto-tune function or cancels an active auto-tune. When an active auto-tune is cancelled, the original PID constants will be used again.
AT-1 = Limited MV change during Autotuning (±40% max.)
AT-2 = Full MV change during Autotuning (±100% max.)

Note: E5AK and E5EK can have up to 4 set points or 4 alarms

Set Point 0

Default set point when used with multi-SP function. This set point is active when the Event input is OFF.

Note: E5AK and E5EK can have up to 4 set points or 4 alarms

Set Point 1

Used only with multi-SP function. This set point is active when the Event input is ON.
This parameter is available only if an Event Input Option Board is installed.

Alarm Value 1

Available only when Control Output 2 is not used as a control output. This setting determines what the Alarm 1 set point will be.

Alarm Value 2

Available only when the alarm output function of the Controller is selected. This setting determines what the Alarm 2 set point will be. This alarm can be programmed to work on Control Output 2 or the SUB-1 output (user-select-able). Factory Default = Control Output 2.

Note: **Alarm Value 3** is available only when SUB-1 or Control Output No. 1 is selected as AL-3.

Proportional Band

Range = 0.1% to 999.9%

Integral Time

Range = 0 to 3999 seconds

Derivative Time

Range = 0 to 3999 seconds
See Note at right.

Note: For Valve Positioning Models E5□K–PRR2, all subsequent parameters (those after Derivative Time) listed in Level 1 Mode are **not** available. See Level 1 Valve Positioning model (provided on the following page).

Cooling Coefficient

Used when the Controller is in heat/cool control. This setting describes the ratio between the heating proportional band and the cooling proportional band.

$$C\text{-}SC = \frac{\text{cooling P band}}{\text{heating P band}}$$

Dead Band

Used when the Controller is in heating and cooling control. This setting determines the amount of overlap or dead band present in a heat/cool configuration. Range = -19.99 → 99.99.
Negative values = overlap band. Positive values = Dead band.

Manual Reset Value

Available ONLY when the integral time parameter of the Controller in standard control is set to **0**.
The Controller must be in Standard or Advanced PID control and self-tune must be set to off.

Hysteresis (Heat)

Available when the Controller is in ON/OFF control.
If PID control selected, this value will not appear on the menu.
Range = 0.01 to 99.99 FS. Default = 0.10.

Hysteresis (Cool)

Available when the Controller is in ON/OFF control in heating and cooling control.
Range = 0.01 to 99.99 FS. Default = 0.10.

Control Period (Heat)

Available only when the Controller has a relay or voltage output, or is in advanced PID control.
Range = 1 to 99 s. Default = 20 s.

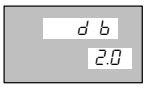
Control Period (Cool)

Available when the Controller has a relay or voltage output, or is in advanced PID control in heating and cooling control.
Range = 1 to 99 s. Default = 20 s.

Note: This level 1 Mode ends here for the E5CK models only. For all other E5□K models in this data sheet, continue with the next page.

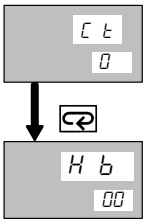
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Level 1 Valve Positioning Model (for E5AK and E5EK only)



Position Proportional Dead Band

For valve positioning units only.
Used to adjust the dead band for a valve; displayed in percentage format.
Range = 0.1–10
Default = 2.0



Heater Current Monitor

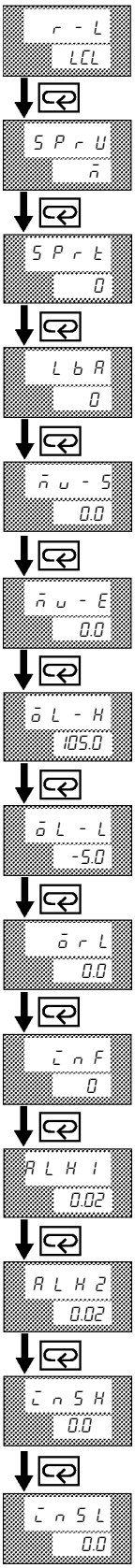
Available when the heater burnout alarm is assigned.

Heater Burnout Detection

Available when the heater burnout alarm is assigned.
Activates the Heater Burnout Alarm when the heater current falls below the set value.
Range = 0.0–50.0A
Default = 0.0

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Level 2 Mode



Remote/Local

Used for the communications function. Only accessible when communication option boards are installed. Determines whether the user will program the unit by the key pads on the face plate (local), by a computer, or PLC (remote).
Default = local.

SP Ramp Time Unit

Determines what unit of time to use on a set point ramp: minutes or hours. Self-tune must be set to OFF
Default = minutes.

SP Ramp Set Value

Determines the maximum allowable degrees of change per Time Unit.

Example: SP Ramp Time Unit = minute SP0 = 100°F
SP Ramp Set Value = 10° SP1 = 150°F
It will take 5 minutes to ramp up to 150°F from 100°F.

Default = 0.

LBA Detection Time

Available only when the LBA (loop break alarm) function of the Controller is selected.
This parameter is automatically set by Auto–tuning. Determines how long it will take the controller to detect a loop break.
Range = 0 – 9999 sec.
Default = 0

Manipulated Variable (MV) at Stop

Determines what percentage of Manipulated Variable (MV) will be when control has been stopped.
Default = 0%
Range = -5 to 105% for standard control; -105 to 105% for heat/cool control.

MV at PV Error

Determines what percentage of Manipulated Variable (MV) will be when an input error has been detected.
Default = 0%
Range = -5 to 105% for standard control; -105 to 105% for heat/cool control.

MV Upper Limit

Stops the MV from going higher than the set value. Default = 105%

MV Lower Limit

Stops the MV from going lower than the set value.
Default (heat only) = –5%
Default (heat/cool) = –105%
Default (cool only) = –105%

MV Change Rate Limit

Limits how fast the MV can change in % of FS per second.
Default = 0%
Range = 0 – 100%

Input Digital Filter

Sets the time constant for the digital filter.
Range = 0 to 9999 sec.
Default = 0

Alarm 1 Hysteresis

Available only when the Controller has an alarm output.
Range = 0 to 9999 sec.
Default = 0.2

Alarm 2 Hysteresis

Available only when the Controller has an alarm output.
Range = 0 to 9999 sec.
Default = 0.2

Alarm 3 Hysteresis (Note: An example of this display is not shown here.)

Available only when the Controller has an alarm output.
Range = 0 to 9999 sec.
Default = 0.2

Input Shift Upper Limit

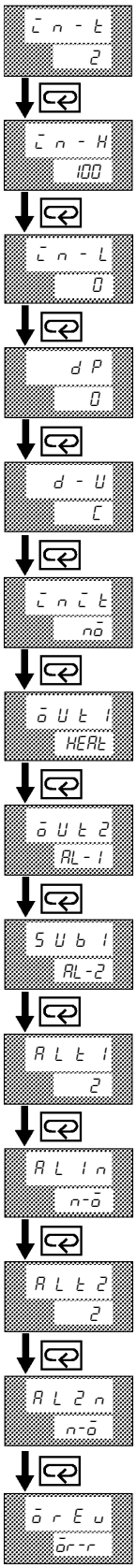
Available if the input type connected to the Controller is a thermocouple or platinum RTD.
Range = –199.9 to 999.9 °C/°F; default = 0 to 0 °C/°F

Input Shift Lower Limit

Available if the input type connected to the Controller is a thermocouple or platinum resistance thermometer.
Range = –199.9 to 999.9 °C/°F; default = 0 to 0 °C/°F

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setup Mode



Input Type

Sets the input type connected to terminals 6 through 8.
Note: Set input jumper to current, voltage, or temperature setting before changing input type.
Default = 2 (K1 type thermocouple)

Scaling Upper Limit

Used if the input type connected to the Controller is an analog input (voltage or current input).
Range = 1 to 9999
Default = 100

Scaling Lower Limit

Used if the input type connected to the Controller is an analog input (voltage or current input).
Range = –1999 to –1
Default = 0

Decimal Point

Used only if the input type connected to the Controller is an analog input (voltage or current input).
Range = 0 to 3
Default = 0

°C/°F Selection

Used if the input type connected to the Controller is a temperature input (thermocouple or platinum resistance thermometer).
Default = °C

Parameter Initialize

Returns the controller to Factory Default Settings.

Control Output 1 Assignment

Assigns the Controller to have one of the following output functions: heating control, cooling control, alarm 1, alarm 2, alarm 3, and LBA (loop break alarm).
Default = heat

Control Output 2 Assignment

Assigns the Controller to have one of the following output functions: heating control, cooling control, alarm 1, alarm 2, alarm 3, and LBA (loop break alarm).
Default = Alarm 1

Auxiliary Output 1 Assignment

Enables the Controller to have one of the following outputs: alarm 1, alarm 2, alarm 3, LBA (loop break alarm)
Default = Alarm 2
Note: The following parameters are available only when the controller has an alarm output. (See the table on the Expansion Mode table.

Alarm 1 Type

Provides a choice of 11 different alarm operations.
Default = 2 (See Alarm Summary Table for Alarm types available.)

Alarm 1 Open in Alarm

Synchronizes the alarm LED with the operation of the alarm. If the alarm is operating as a normally closed relay (open in alarm condition), this parameter should be set to 'Open in Alarm'. If the alarm is operating as a normally open relay (close in alarm condition), this parameter should be set to 'Close in Alarm'.

Alarm 2 Type

Provides a choice of 11 different alarm operations.
Default = 2 (See Alarm Summary Table for Alarm types available.)

Alarm 3 Type Note: An example of this display is not shown here.

OPEN W/Alarm

Alarm 2 Open in Alarm

Synchronizes the alarm LED with the operation of the alarm. If the alarm is operating as a normally closed relay (open in alarm condition), this parameter should be set to 'Open in Alarm'. If the alarm is operating as a normally open relay (close in alarm condition), this parameter should be set to 'Close in Alarm'.

Direct/Reverse Operation

Choose between direct (cooling) or reverse (heating) control action.
Default = reverse (heating).
Direct (cooling) = MV increases with decreasing PV.
Reverse (heating) = MV increases with increasing PV.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Selecting a Control Method

When selecting a control method, refer to the following table for correct parameter setting.

Control method	Control output 1 assignment	Control output 2 assignment	Operation
Heat	Control output (heat)	---	Reverse
Cool	Control output (heat)	---	Direct
Heat/Cool	Control output (heat)	Control output (cool)	Reverse
Heat/Cool	Control output (cool)	Control output (heat)	Direct

Selecting Input Type

Platinum Resistance Thermometer (RTD's)

Input (field selectable)		JPt100	Pt100
Range	°C	–199.9 to 650.0	–199.9 to 650.0
	°F	–199.9 to 999.9	–199.9 to 999.9
Input setting		0	1

Thermocouple

Input (field selectable) (See Notes)		K1	K2	J1	J2	T	E	L1	L2	U	N	R	S	B	W	PLII
Range	°C	–200 to 1,300	0.0 to 500.0	–100 to 850	0.0 to 400.0	–199.9 to 400.0	0 to 600	–100 to 850	0.0 to 400.0	–199.9 to 400.0	–200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 2,300	0 to 1,300
	°F	–300 to 2,300	0.0 to 900.0	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	0 to 1,100	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	–300 to 2,300	0 to 3,000	0 to 3,000	300 to 3,200	0 to 4,100	0 to 2,300
Input setting		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Note: 1. Setting number is factory-set to 2 (K1).
2. Thermocouple W is W/Re5-26 (tungsten rhenium 5, tungsten rhenium 26).

Current/Voltage

Input (field selectable)	Current input		Voltage input		
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Input setting	17	18	19	20	21

Note: When a current/voltage input is selected, the decimal point is fully adjustable.

■ CLOSE IN ALARM/OPEN IN ALARM

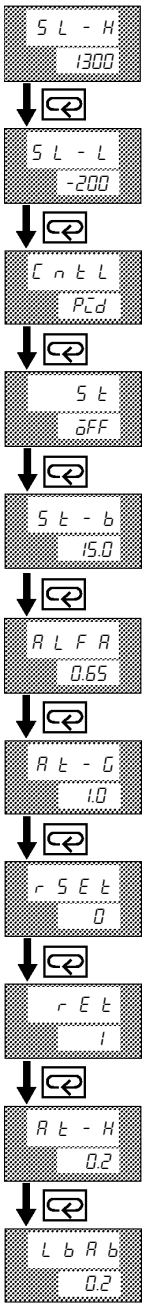
If the alarm is operating as a normally closed relay (open in alarm condition), this parameter should be set to 'Open in Alarm'. If the alarm is operating as a normally open relay (close in alarm condition), this parameter should be set to 'Close in Alarm'.

Condition	Alarm	Output LED
Close in alarm (N.O.)	ON	Lit
	OFF	Not lit
Open in alarm (N.C.)	ON	Lit
	OFF	Not lit

Factory setting is "close in alarm" [n-o].

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Expansion Mode



SP Setting Upper Limit

Stops the set point from going higher than the SP setting upper limit.
Default = 1300

This setting has no effect on the input scaling values.

SP Setting Lower Limit

Stops the set point from going any lower than the SP setting lower limit
Default = -200

This setting has no effect on the input scaling values.

PID/ON/OFF

Selects the type of control method for the controller to use.
Default = PID

Adaptive Tuning (Self Tuning)

Only available if the Controller in standard control or advanced PID control has a temperature input.
Default = OFF. If ON is selected, the controller will use fuzzy logic to self tune the PID values for optimum control.
PID values will not be seen when ST (Self Tune) is on.

ST Stable Range

Only available if the Controller is in standard control or advanced PID control with the Self Tune (ST) set to ON.

α

Only available if the Controller is in advanced PID control with the ST set to OFF.
This setting allows tailoring of the PID algorithm to emphasize control or fast response.
Default = 0.65
Fast Response = 0.0 $\rightarrow$ 0.65
Stability Emphasis = 0.65$\rightarrow$ 1

AT Calculated Gain

Allows the controller to focus the auto-tune on increased response or more stability.
Range = 0.1 (fast response) to 10 (increase stability).
Available if the Controller is in advanced PID control with the ST set to OFF.
Default = 1.0

Alarm Standby Sequence Reset Method

Used with alarm settings to have a stand-by sequence applied to the alarm.
Default = 0

Automatic Return of Display Mode

Automatically returns the display of the controller to Level 0 PV/SP display after the set amount of time has elapsed if no buttons on the face plate have been used.
Applies only in Levels 0 through 2. Default = 0. Range = 0 to 99 sec.

AT Hysteresis

Only available if the Controller is in advanced PID control with the ST set to OFF.
Default = 0.2% FS; Range = 0.1 to 9.9% FS

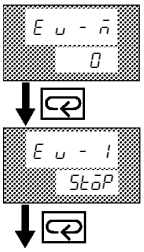
LBA Detection Width

Only available only when the LBA (Loop Break Alarm) function of the Controller is selected.
Range 0.0 $\rightarrow$ 999.9% FS
Default = 0.2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Mode – ONLY Visible if an Option Board is Installed

E5□K



Multi-SP Function

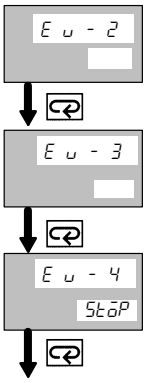
Specifies the number of set points that will be used. Must be set to one to use SP Ramp feature.

Available for the event input function. Default = 0

Event Input Assignment 1

Available for the event input function. If multi-SP is set to 0, this parameter assigns event input function as: Run/Stop, Auto/Manual, or Protect Function. Default = Stop.

E5AK and E5EK only



Event Input Assignment 2

Available for the event input function.

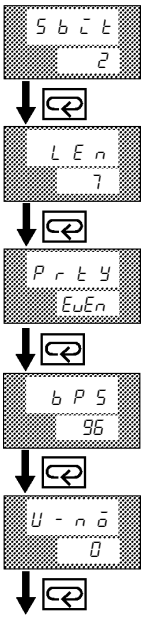
Event Input Assignment 3

Available for the event input function.

Event Input Assignment 4

Available for the event input function.

COMMUNICATIONS FUNCTION → Communications selections are ONLY available if a communications board is installed.



Communication Stop Bit

Displayed when the communications function is in use.
Range = 1 to 2
Default = 2

Communication Data Length

Displayed when the communications function is in use.
Range = 7 to 8
Default = 7

Communication Parity

Displayed when the communications function is in use.
Range = None, Even, Odd
Default = Even

Communication Baud Rate

Displayed when the communications function is in use.
Range = 1.2, 2.4, 4.8, 9.6, 19.2 k baud
Default = 9.6

Communication Unit No.

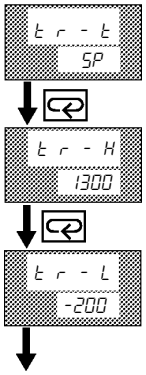
Displayed when the communications function is in use.
Range = 0 — 99
Default = 0

(continued on next page)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Mode – ONLY Visible if an Option Board is Installed, continued

TRANSFER OUTPUT SECTION → Transfer output selections are ONLY available if a transfer board is installed.



Transfer Output Type

Set when the transfer output function is in use.
Determines which function the transfer output will re-transmit as a 4-20mA signal: SP, PV, SP Ramp, MV

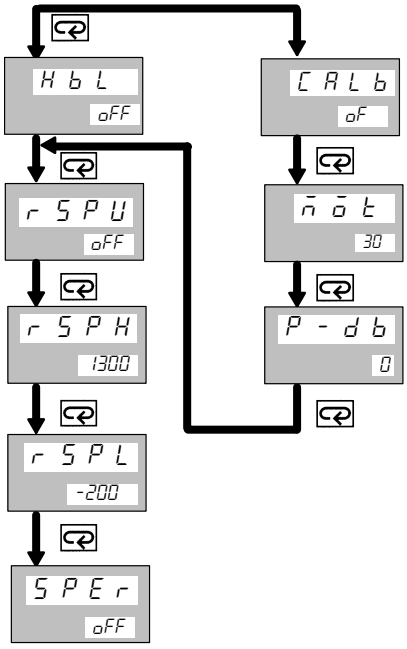
Transfer Output Upper Limit

Set when the transfer output function is in use.
Stops the transfer output from going higher than the Set Value.

Transfer Output Lower Limit

Set when the transfer output function is in use.
Stops the transfer output from going lower than the Set Value.

REMOTE SET POINT FUNCTION → Remote set point function is available on all E5AK/E5EK models, with or without an option board installed.



HBA Latch

Makes the heater burnout alarm remain activated when triggered. It must be reset manually.

Motor Calibration

Determines how long it takes a fully closed proportional valve to fully open.

Travel time

The amount of time it takes to determine the motor calibration parameter.
Range = 1–999 sec.
Default = 30 sec.

PV Dead Band

Determines the size of the dead band around the process variable in which the valve will take no control action.
Range = 0–9999
Default = 0

Remote SP Enable

Enables the controller to use a remote set point.
Default = off

Remote SP Upper Limit (Available when the remote SP is enable)

Stops the RSP from going any higher than the set value.
Default = 1300

Remote SP Lower Limit (Available when the remote SP is enable)

Stops the RSP from going any lower than the set valve.
Default = –200

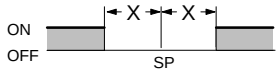
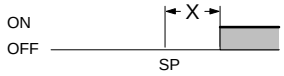
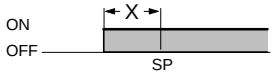
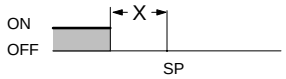
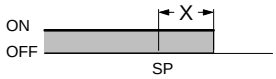
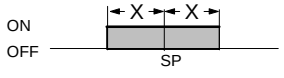
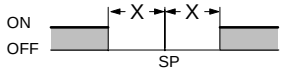
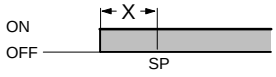
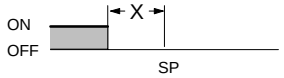
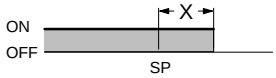
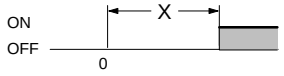
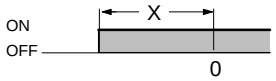
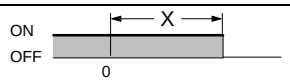
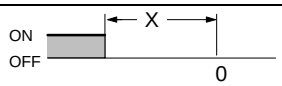
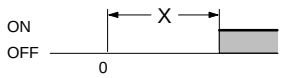
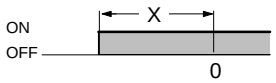
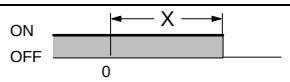
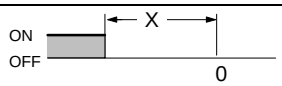
SP tracking (Available when the remote SP is enable)

Allows a smooth transition between a RSP and a local SP when enabled. When on, the LSP will become the RSP that was being used immediately before switching.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ ALARM MODE SELECTORS

Alarm outputs are available if they are allocated as outputs. Factory setting is “2: Upper-limit alarm (deviation).”

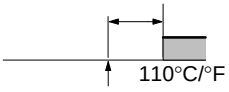
Setting number	Alarm types	Alarm output	
		When X is positive	When X is negative
1	Upper- and lower-limit alarm (deviation)		Always ON
2	Upper-limit alarm (deviation)		
3	Lower-limit alarm (deviation)		
4	Upper- and lower-limit range alarm (deviation)		Always OFF
5	Upper- and lower-limit alarm with standby sequence (deviation)		Always OFF
6	Upper-limit alarm with standby sequence (deviation)		
7	Lower-limit alarm with standby sequence (deviation)		
8	Absolute-value upper-limit alarm		
9	Absolute-value lower-limit alarm		
10	Absolute-value upper-limit alarm with standby sequence		
11	Absolute-value lower-limit alarm with standby sequence		

Note: 1. A deviation is defined as deviation from SP.
2. An absolute alarm is defined as a fixed value X with reference to 0.
3. Standby sequence is defined as having the alarm outputs inactive until SP is reached on the initial power up of the Controller. After SP has been reached, alarms will function normally.

Deviation Alarm

If the alarm mode selector is set to a number between 1 to 7, alarm values are set to the width deviated from the set point as shown in the following illustration.

Alarm value = 10°C/°F

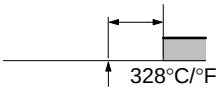


Set point (SP)
100°C/°F

Absolute Alarm

If the alarm mode selector is set to 8 or 9, alarm values are set to the absolute value based on 0°C/°F as shown in the following illustration.

Alarm value = 328°C/°F



Set point (SP)
325°C/°F

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ HOW TO USE THE ERROR DISPLAY

When an error has occurred, the No.1 display alternately indicates error codes together with the current display item.
This section describes how to check error codes on the display, and the actions that must be taken to remedy the problem.

S.Err Input Error

Meaning Input is in error.

Action Check the wiring of inputs, disconnections, and shorts, and check the input type and the input type jumper connector.

Operation at Error For control output functions, output the manipulated variable matched to the setting of the “MV at PV error” parameter (level 2 mode). Alarm output functions are activated when the upper limit is exceeded.

E111 Memory Error

Meaning Internal memory operation is in error

Action First, turn the power OFF then back ON again. If the display remains the same, the E5AK/E5EK Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.

Operation at Error Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

E333 A/D Converter Error

Meaning Internal circuits are in error.

Action First, turn the power OFF then back ON again. If the display remains the same, the E5AK/E5EK Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.

Operation at Error Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

R.Err Calibration Data Error

This error is output only during temperature input and is displayed for two seconds when the power is turned ON.

Meaning Calibration data is in error.

Action Must repair.

Operation at Error Both control output functions and alarm output functions are active. However, note that the readout accuracy is not assured.

cccc / 3333 Display Range Over

Meaning Though not an error, this is displayed when the process value exceeds the display range when the control range (setting range ±10%) is larger than the display range (–1999 to 9999).

- When less than “–1999” cccc
- When greater than “9999” 3333

Operation Control continues, allowing normal operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ FUZZY SELF-TUNING

Fuzzy self-tuning is a function that enables the E5□K to calculate the most suitable PID constants for the control output.

Features

- The E5□K determines by itself when to perform fuzzy self-tuning.
- During fuzzy self-tuning, the E5□K does not output any signal that disturbs the temperature or output value.

Fuzzy Self-tuning Function

The fuzzy self-tuning function has three modes.

- In SRT (step response tuning) mode, the PID constants are tuned using a step response method at the time the set point is changed.
- In DT (disturbance tuning) mode, the PID constants are amended so that the controlled temperature will be within the target range set in advance when there is external disturbance.
- In HT (hunting tuning) mode, when hunting occurs, the PID constants are amended to suppress the hunting.

Note: You must turn ON the power supply to the LOAD either before or simultaneously with the start of Temperature Controller operation.

Dead time will be measured from the time the Temperature Controller starts operating. If a load, such as a heater, is turned on after the Temperature Controller is turned on, dead time longer than the actual value will be measured, and inappropriate PID constants will be obtained.

If an extremely large amount of dead time is measured, the control amount will be set to 0% for a short period of time before being returned to 100%, and the constants will then be re–tuned. Re–tuning is performed only for large amounts of dead time, so be sure to follow the precaution given above when starting operation.

Startup Conditions of SRT

SRT will start if conditions 1 to 5 are satisfied when the set point is changed, or the E5□K is turned on.

1. The new set point is different from the set point used at the time SRT was last executed.
2. The difference between the new set point and the last set point is larger than the value obtained from the calculation: present proportional band value (P) x approximately 1.27+4.

Note: When the E5□K is turned on, the difference between the process value and set point is regarded as *Deviation.*

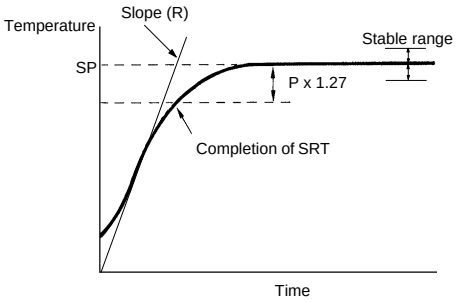
3. The temperature is stable before changing the set point, or the temperature is balanced while the E5□K is turned on before any output is obtained.
4. The set point is changed in the direction that the controlled amount increases (i.e., the control amount is in the upper direction at the time of reverse operation and in the lower direction at the time of normal operation).
5. No SRT has been executed with the current set point.

In the following cases, SRT will not be executed accurately. Therefore the E5□K must be tuned in DT or HT mode.

1. The maximum temperature slope (R) is not obtained before the process value reaches the value obtained from the calculation: present proportional band value (P) x approximately 1.27 (i.e., the maximum temperature slope (R) is not obtained before the SRT is finished). If the proportional band, obtained before SRT is finished, is larger than the previous proportional band, however, the PID constants will be renewed, so their values will be more accurate.
2. The set point is changed during SRT, and the SRT completion conditions are satisfied; and, no PID constant will be renewed.

Stable Temperature Status

If the temperature is within the stable range for a specified period, the temperature is considered *stable*.



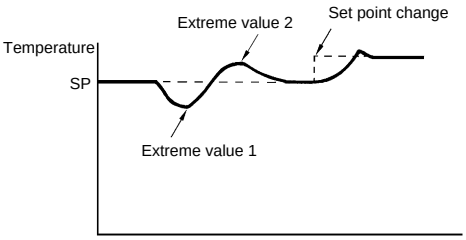
Balanced Status

If the process value is within the stable range for 60 s when there is no output, the the temperature is considered *balanced*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Startup Conditions of DT

1. DT will start if the temperature that has been stable varies due to external disturbance and the deflection of the temperature exceeds the stable range, and then the temperature becomes stable, provided that the number of maximum temperature values is less than four.
2. DT will start if the set point is changed under the condition that SRT does not start and the temperature becomes stable, provided that the number of maximum temperature values is less than four.
   If there are four or more maximum temperature values, HT will start.

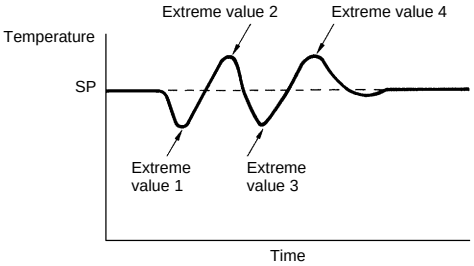


Balanced Status

If the process value is within the stable range for 60 s when there is no output, it is deemed that the the temperature is balanced.

Startup Conditions of HT

HT will be ON when there is hunting with four or more maximum temperature values (extreme values) while SRT is not being executed.



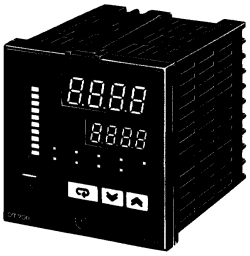
Note: In specific applications where temperature varies periodically due to disturbance, internal parameters need to be adjusted. For details, refer to your User's Manual.

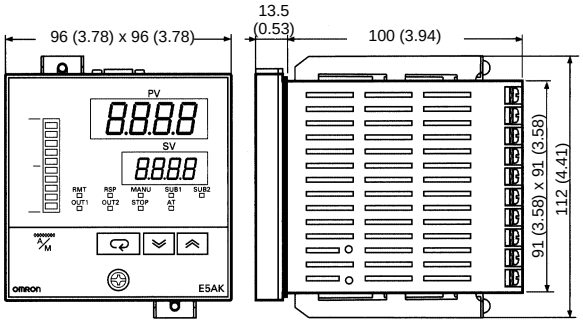
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

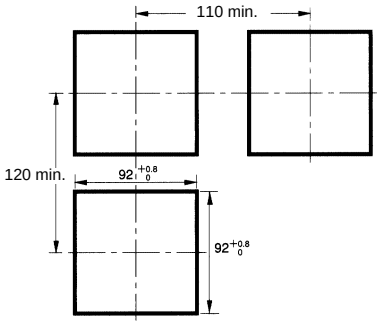
Unit: mm (inch)

■ E5AK



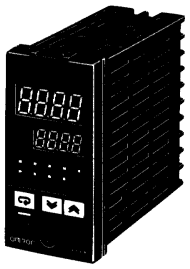


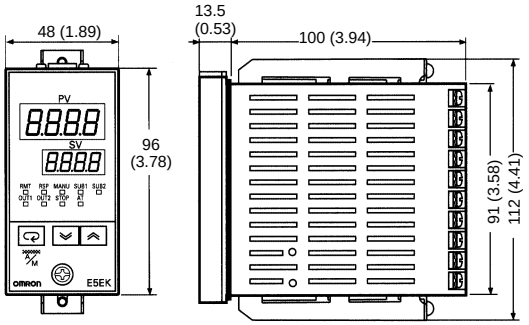
Panel Cutouts



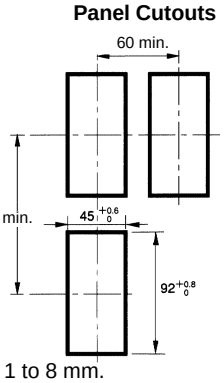
Note: 1. Recommended panel thickness is 1 to 8 mm.
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted vertically or horizontally.

■ E5EK



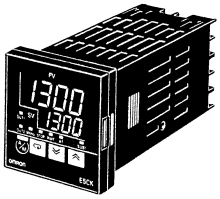


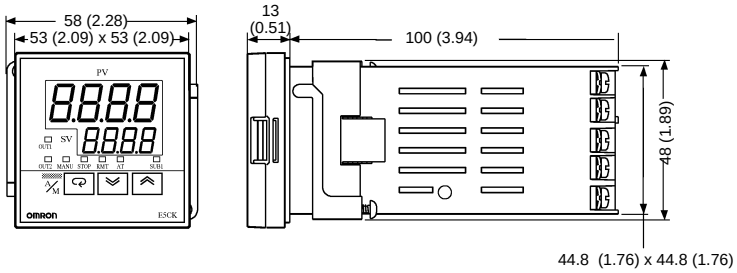
Panel Cutouts



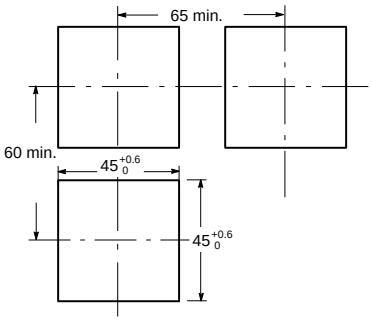
Note: 1. Recommended panel thickness is 1 to 8 mm.
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted vertically or horizontally.

■ E5CK





Panel Cutouts



Note: 1. Recommended panel thickness is 1 to 5 mm.
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted, either vertically or horizontally.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

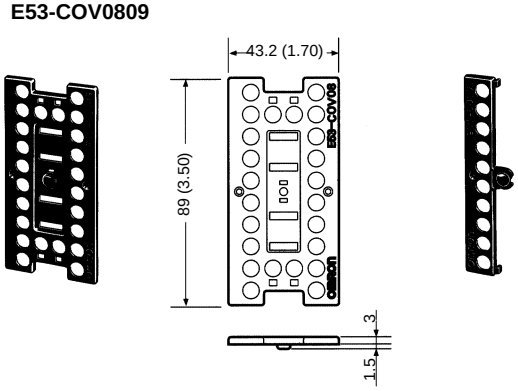
■ E5CK-302

The E5CK-302 model has the same dimension and cutouts as the E5CK.

■ ACCESSORIES (Order Separately)

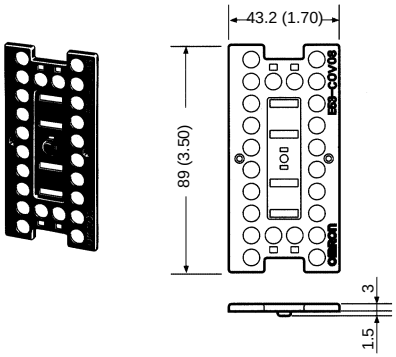
Terminal Cover for E5AK

E53-COV0809



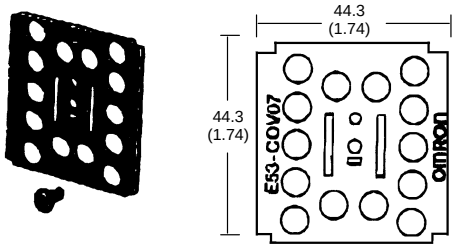
Terminal Cover for E5EK

E53-COV08



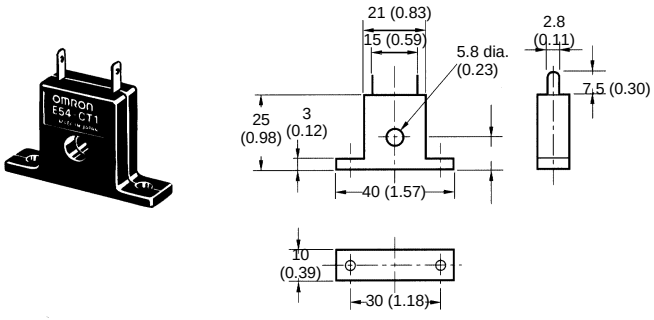
Terminal Cover for E5CK

E53-COV07

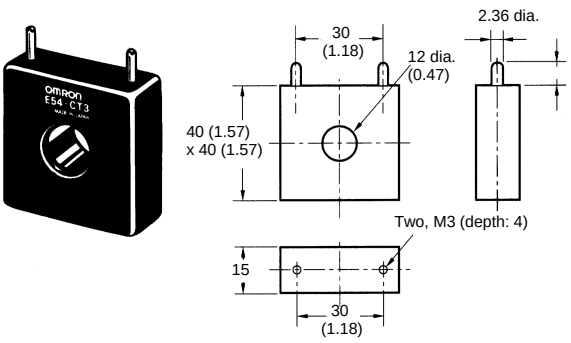


Current Transformer (E5AK and E5EK only for Heater Burnout Alarm)

E54-CT1



E54-CT3



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

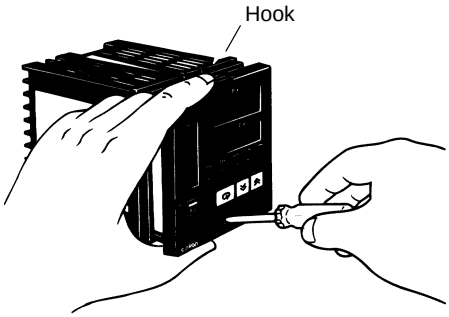
Installation

■ REMOVE CONTROLLER FROM REAR HOUSING

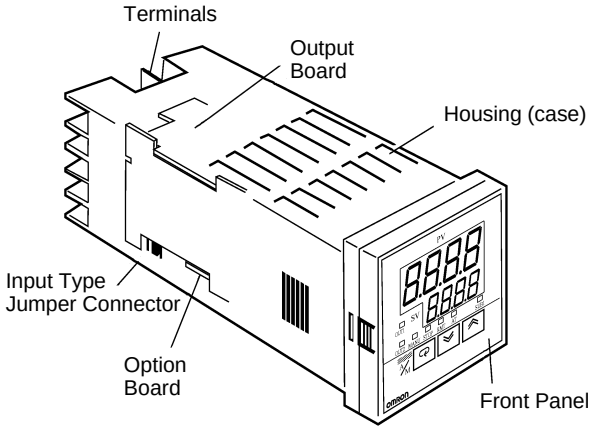
E5AK and E5EK

To pull out the internal mechanism from the housing, use a Phillips screwdriver matching the screw on the lower part of the front panel.

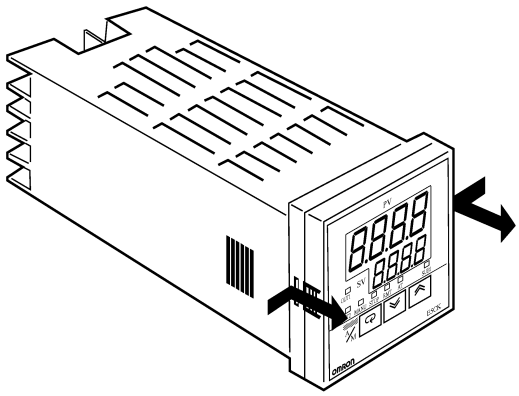
1. Turn the screw counterclockwise while pressing the hook on the upper part of the front panel.
2. Carefully pull out the internal mechanism while holding the left and right sides of the front panel.



E5CK



First, while pressing the hooks on the left and right sides of the front panel, pull the internal mechanism from the housing.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ SETTINGS

Note: Always turn off the power supply to the Digital Controller before changing any switch settings.

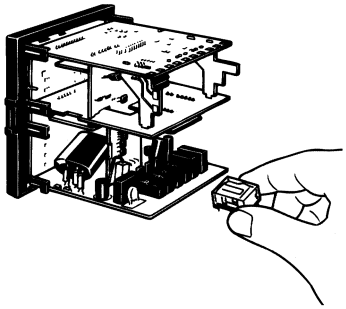
On a standard model, set up the Output Modules for control outputs 1 and 2 before mounting the Controller.

On a position-proportional model, the Relay Output Module is already set. Do not change that set-up parameter. Do not replace with other Output Modules.

Setting Up and Removing the Output Module

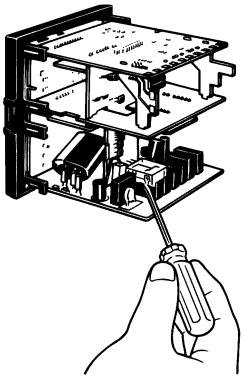
Setting Up the Output Module

When setting up the Output Modules, pull out the internal mechanism from the housing and insert the Output Modules into the sockets for control outputs 1 and 2.



Removing the Output Module

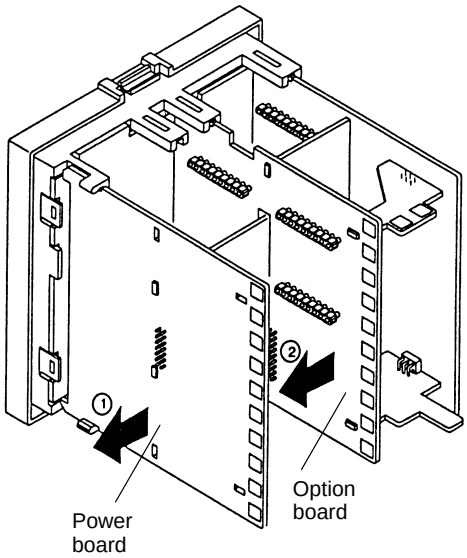
To replace the Output Module, use a flat-blade screwdriver to push up the Output Module.



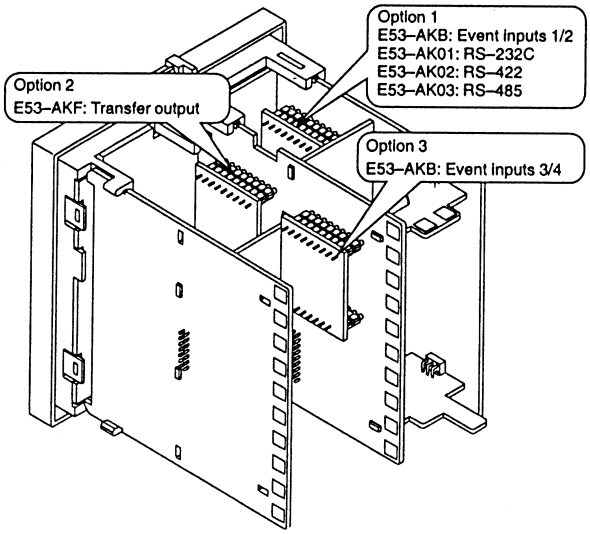
Setting Up the Option/Output Board

E5AK

1. Remove the Power Board and Option Boards in the order shown in the following diagram.



2. Insert the Option Boards into the sockets for options 1 to 3. The following diagram shows the relationship between the Option Boards and mounting positions.

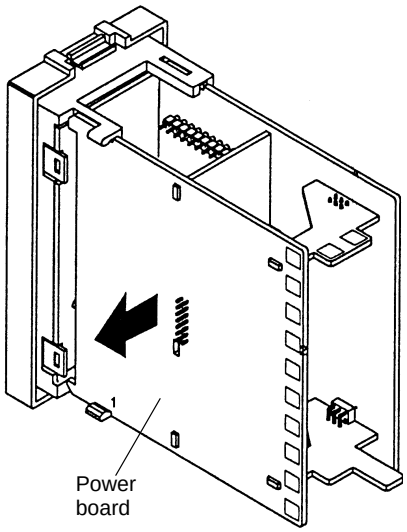


3. Mount the option boards and the power board in the order shown.

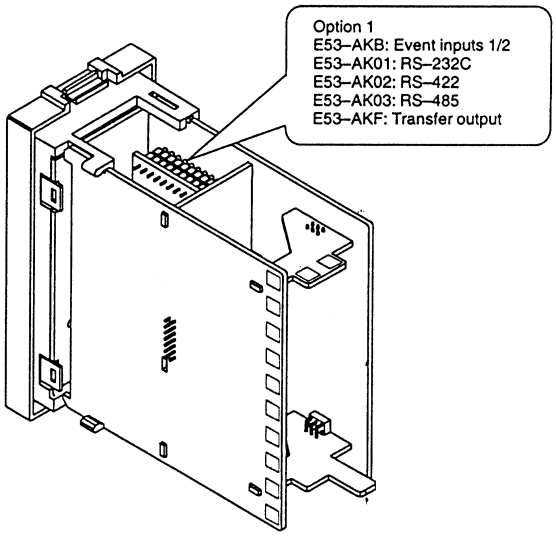
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E5EK

1. Remove the Power Board in the order shown in the following diagram.



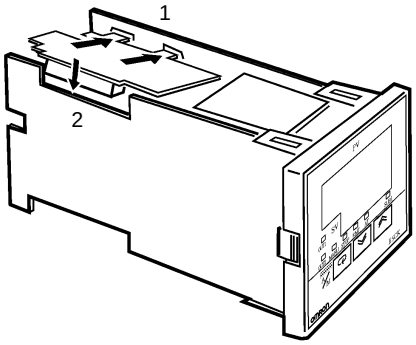
2. Insert the Option Board into the socket for option 1. The following diagram shows the relationship between the Option Board and mounting position.



3. Mount the option boards and the power board in the order shown.

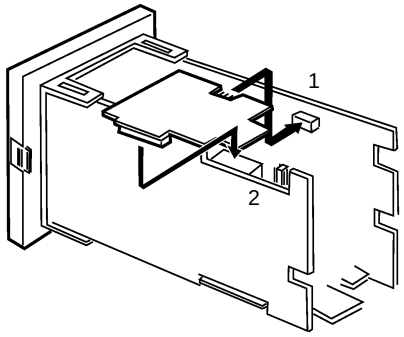
E5CK

1. Two rectangular holes are provided on the Power Board (right side of Controller). Fit the two protrusions of the output board into these two holes.
2. With the output board fitted into the Power Board, fit the output board into the connector on the control board (left side of Controller).



Set up the Option Board

1. Place the bottom of the Controller facing up, fit the board horizontally into the connector on the power board (right side of controller).
2. With the Power Board connected, fit the board vertically into the connector on the control board (left side of Controller).

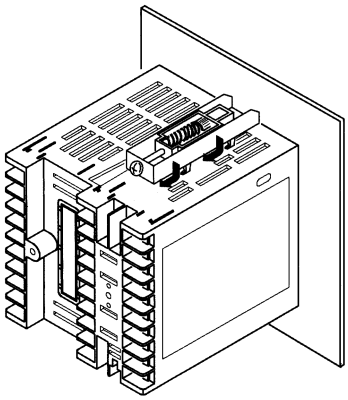


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

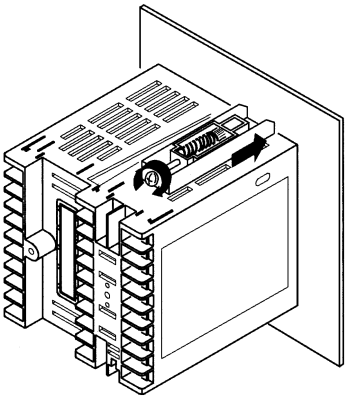
■ MOUNTING CONTROLLER

E5AK and E5EK

1. Insert the controller into the panel's mounting hole at the position shown in the figure below.
2. Fit the mounting bracket (accessory) into the mounting slots on the top and bottom of the rear case.

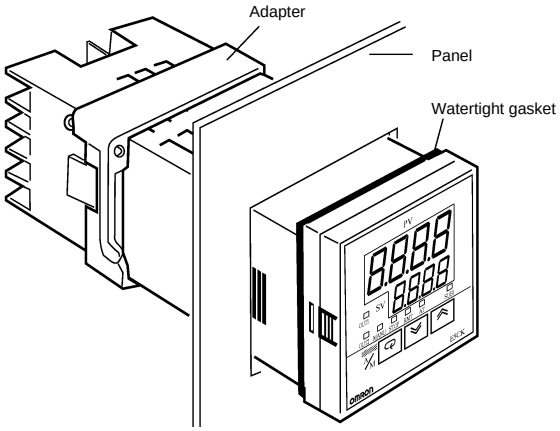


3. Tighten the mounting bracket screws on the upper and lower parts in small increments alternately and equally until the ratchet start to slide.



E5CK

1. Insert the E5CK Controller into the cutout on the panel, as shown in the figure here.
2. Push the adapter along the Controller body from the terminals up to the panel, and fasten temporarily.
3. Tighten the two mounting screws on the adapter. When tightening screws, tighten the two screws alternately keeping the torque to approximately 0.29 to 0.39 N • m, or 3 to 4 kgf • cm.

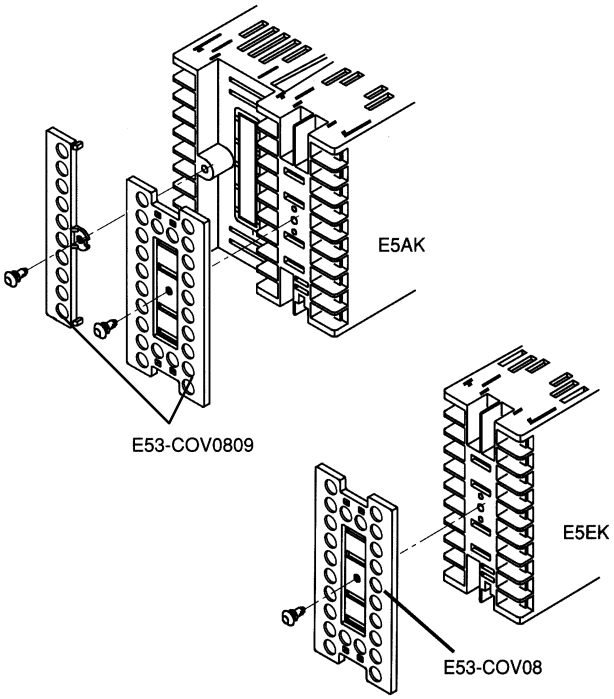


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ MOUNTING TERMINAL COVER

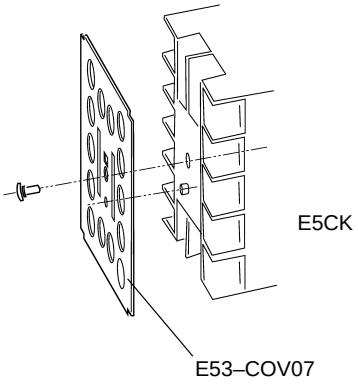
E5AK and E5EK

1. Fasten the terminals covers as follows by using the plastic pins. Plastic pins are provided with the terminal covers.



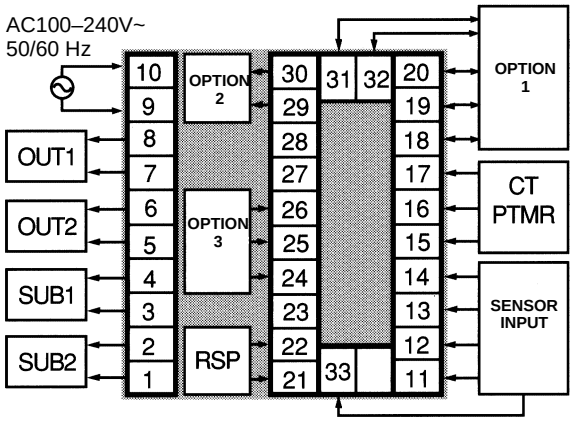
E5CK

1. The E5CK-AA1-500 Controller is provided with a Terminal Cover (E53-COV07). Fasten the Terminal Cover as follows by using the plastic pin.



■ WIRING TERMINALS FOR E5AK

E5AK Terminal Arrangement



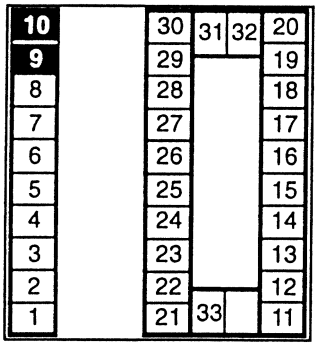
TRSF: Transfer output
EV1 to 4: Event input
PTMR: Potentiometer
RSP: Remote SP input

Wiring

In the following wiring diagrams, the left side of the terminal numbers indicate the inside of the Controller.

Power Supply

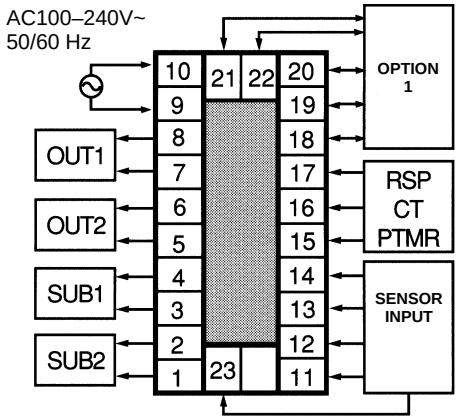
Input power to terminal numbers 9 and 10. Power specifications are as follows: 100 to 240 VAC, 50/60 Hz, approx. 16 VA



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ WIRING TERMINALS FOR E5EK

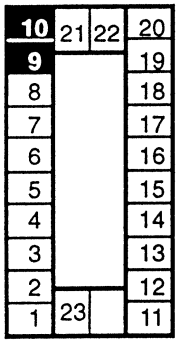
E5EK Terminal Arrangement



TRSF: Transfer output
EV1/2: Event input
PTMR: Potentiometer
RSP: Remote SP input

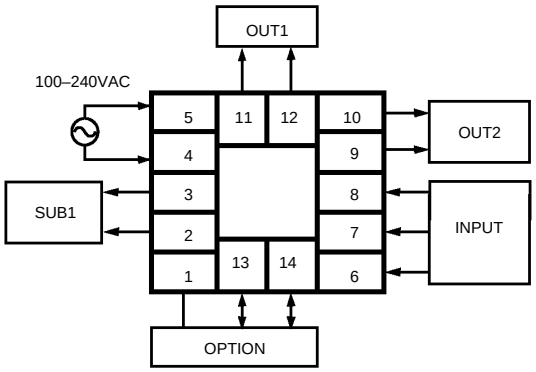
Power supply

Input power to terminal numbers 9 and 10. Power specifications are as follows: 100 to 240 VAC, 50/60 Hz, approx. 15 VA



■ WIRING TERMINALS FOR E5CK

E5CK Terminal Arrangement

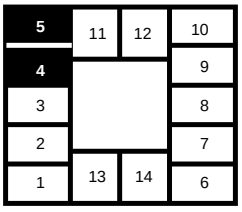


Wiring Precautions

- To protect the Controller and its lines from external noise, use the wire ducts to separate input leads and power lines.
- Use solderless terminals when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. DO NOT tighten the terminal screws too tightly.

Power Supply

Input 100 to 240 VAC to terminal numbers 4 and 5.

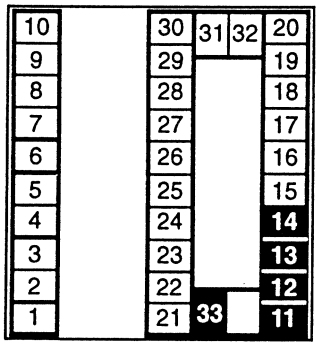


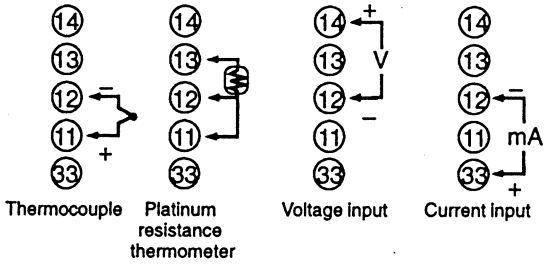
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ SENSOR INPUT WIRING

E5AK

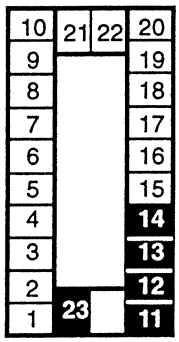
Connect the sensor input to terminal numbers 11 to 14 and 33 as follows according to the input type.

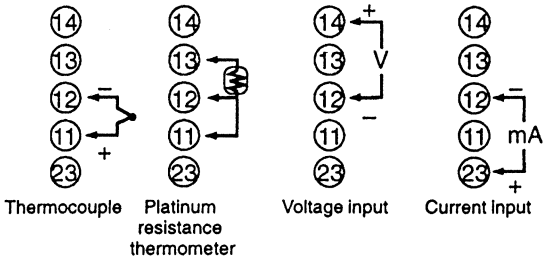




E5EK

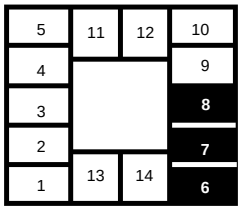
Connect the sensor input to terminal numbers 11 to 14 and 23 as follows according to the input type.

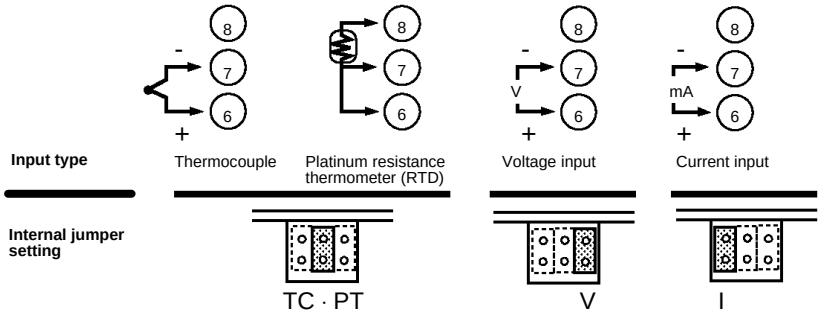




E5CK

Connect the sensor input to terminal numbers 6 to 8 as indicated here, according to the input type.





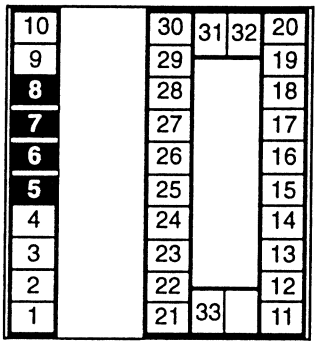
Match the inputs with the internal jumper settings for each input type. For thermocouple or platinum resistance thermometer inputs, set the internal jumper to a common position (TC/PT) as the temperature input.

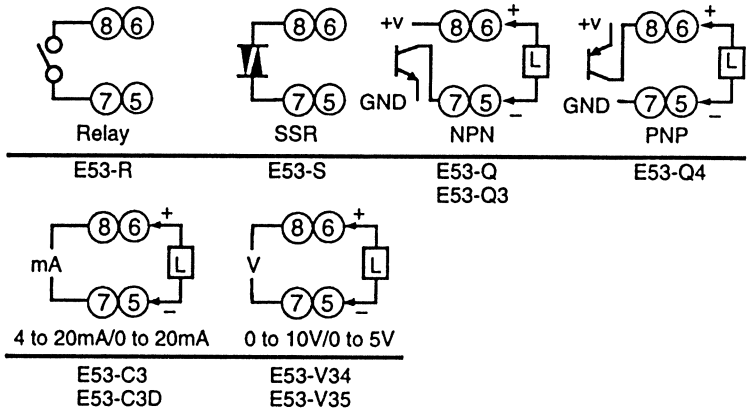
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ CONTROL OUTPUT

E5AK Control Output

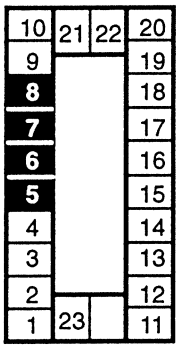
Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available Output Modules and their internal circuits.

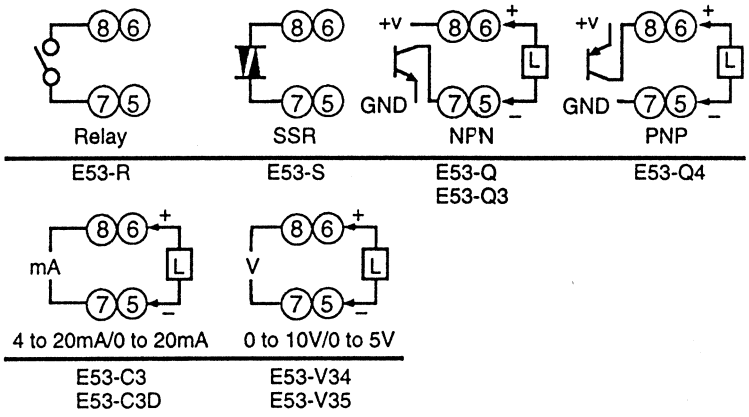




E5EK Control Output

Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available Output Modules and their internal circuits.



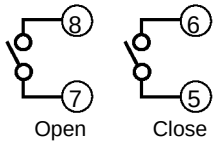


With E53-V□□ Output Modules, approx. 2 V is output for one second after the power is interrupted.

E5AK-PRR2/E5EK-PRR2 Controllers

The E5AK-PRR2 and E5EK-PRR2 Controllers are supplied with relay output. This relay output is not compatible with any other module.

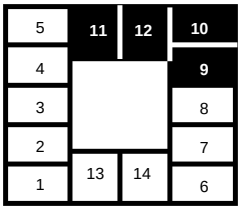
When replacing the Output Module, use the E53-R. The following diagrams show the relationship between terminals and open/close relay settings.

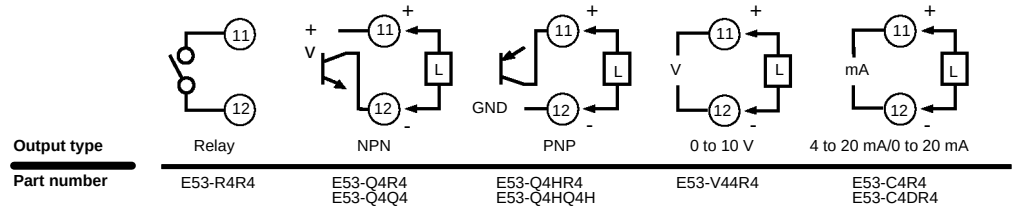


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

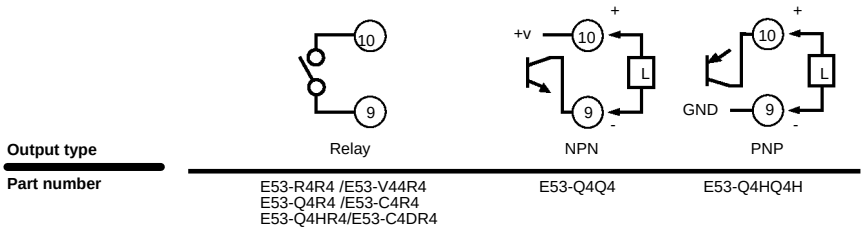
E5CK Control Output

Terminal numbers 11 and 12 are for control output 1 (OUT1). The five output types and internal circuits are available according to the Output Board.





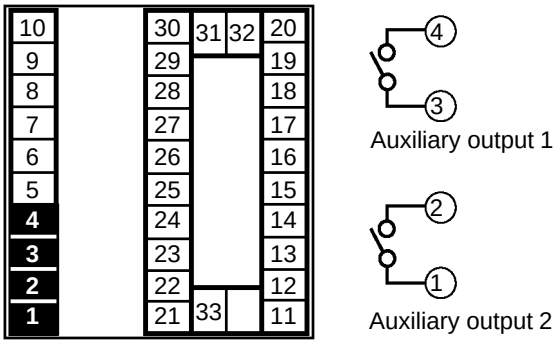
Terminal numbers 9 and 10 are for control output 2 (OUT2). The three output types and internal circuits are available according to the Output Board.



■ AUXILIARY OUTPUT

E5AK

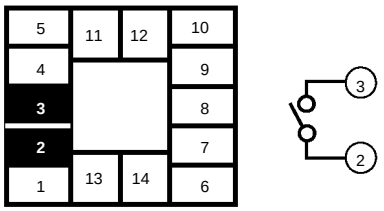
Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:



Output specifications are as follows: SPST-NO, 3 A at 250 VAC

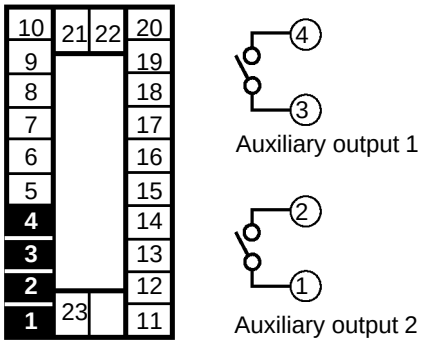
E5CK

Terminal numbers 2 and 3 are for auxiliary output 1 (SUB1). The internal equalizing circuit for auxiliary output 1 is as follows:



E5EK

Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:



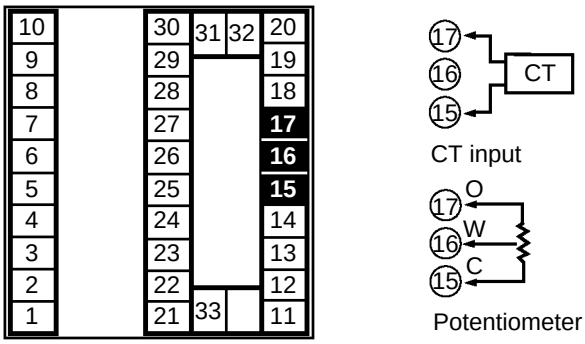
Output specifications are as follows: SPST-NO, 3A at 250 VAC

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ CT INPUT/POTENTIOMETER (FOR E5AK AND E5EK ONLY)

E5AK CT Input/Potentiometer

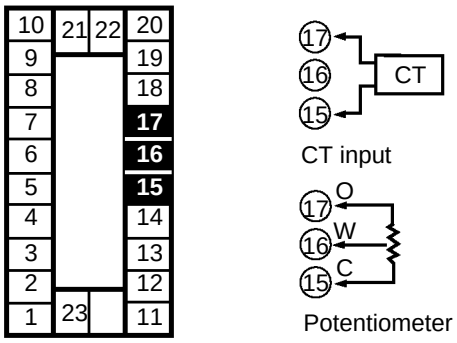
When using the HBA function on the E5AK-AA2 Controller, connect Current Transformer input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5AK-PRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:



For details on CT inputs, refer to *Appendix, About Current Transformer* in your *User's Manual*. For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100 Ω to 2.5 kΩ.

E5EK CT Input/Potentiometer

When using the HBA function on the E5EK-AA2 Controller, connect Current Transformer input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5EK-PRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:

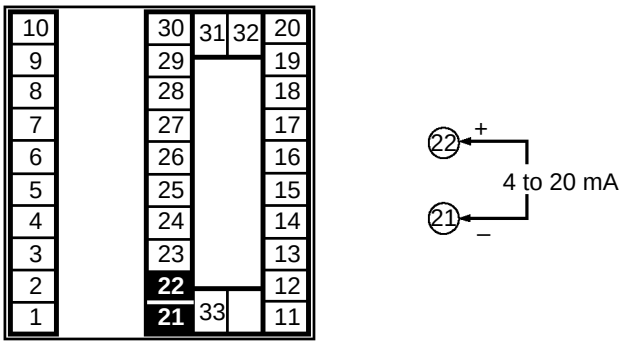


For details on CT inputs, refer to *Appendix, About Current Transformer* in your *User's Manual*. The potentiometer cannot be used simultaneously with remote SP input. For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100 Ω to 2.5 kΩ.

■ REMOTE SET POINT INPUT (FOR E5AK AND E5EK ONLY)

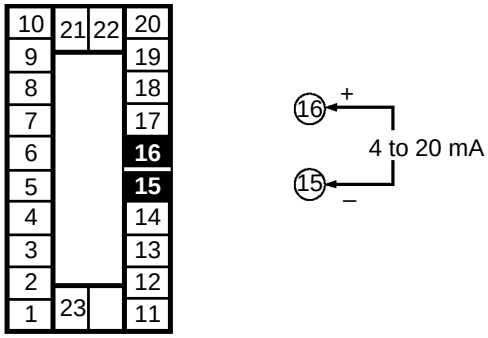
E5AK Remote SP Input

Connect the input (RSP) to be used as the remote SP to terminal numbers 21 and 22. Only 4 to 20 mA inputs can be connected. Connect the input as follows:



E5EK Remote SP Input

Connect the input (RSP) to be used as the remote SP to terminal numbers 15 and 16. However, note that the potentiometer cannot be used simultaneously with remote SP input. Only 4 to 20 mA inputs can be connected. Connect the input as follows:

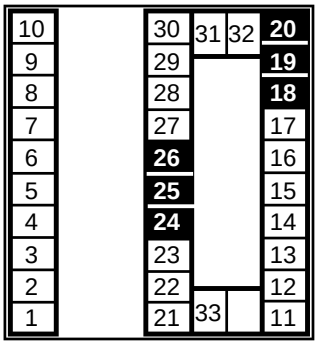


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

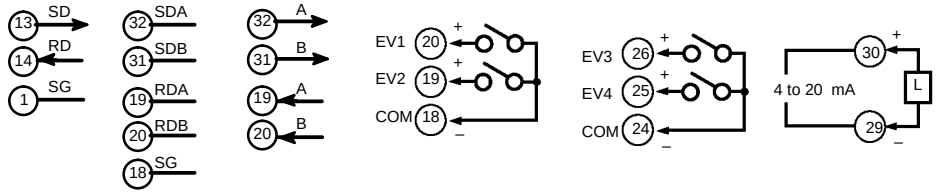
■ OPTION BOARD WIRING

E5AK

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20, and event events 3 and 4 (EV3/4) to terminal numbers 24 to 26. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:



Terminals 18 and 24 (COM) are connected internally.



Option type	RS-232C	RS-422	RS-485	Event input 1 and 2 (no contact)	Event input 3 and 4 (no contact)	Transfer output
Part number	E53-AK01	E53-AK02	E53-AK03			

Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max. OFF: 100 kΩ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

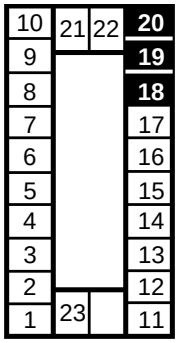
Communications

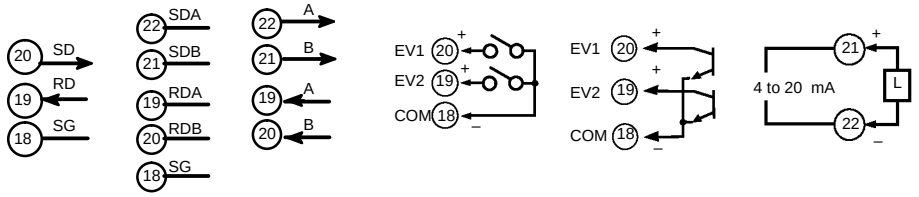
Terminal numbers 18 to 20, 31 and 32 can be used only on Controllers with Communications Units (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in your *User's Manual*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E5EK

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:





Option type	RS-232C	RS-422	RS-485	Event input 1 and 2	Event input 1 and 2 (no contact)	Transfer output
Part number	E53-AK01	E53-AK02	E53-AK03			

Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

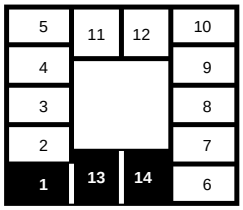
Communications

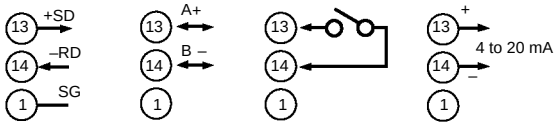
Terminal numbers 18 to 20, 31 and 32 can be used only on Controllers with Communications Units (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in your *User's Manual*.

E5CK

Terminal numbers 1, 13, and 14 are valid only when the Option Board is set in the Controller

The following four connections are possible depending on the model of the Option Board.

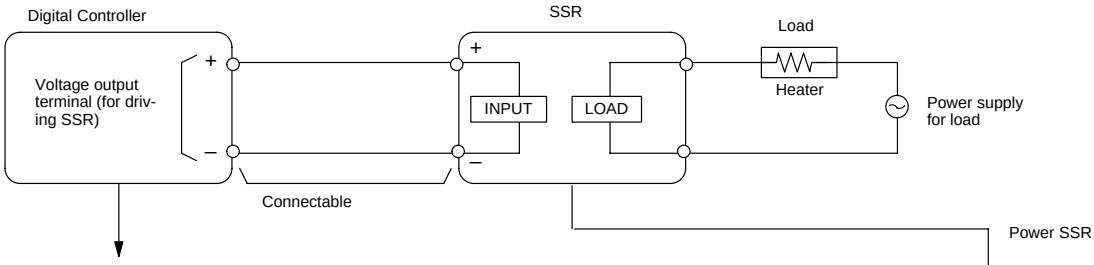




Option type	RS-232C	RS-485	Event input	Transfer output
Part number	E53-CK01	E53-CK03	E53-CKB	E53-CKF

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ CONNECTION EXAMPLE OF DIGITAL CONTROLLER AND SSR



E5AK/E5EK

Digital Controller with Voltage Output (12 VDC, 40 mA max.)





E5CK

Digital Controller with Voltage Output (12 VDC, 20 mA max.)



See the Process and Temperature Controller Catalog GCTC11 for further information on External SSR.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Precautions

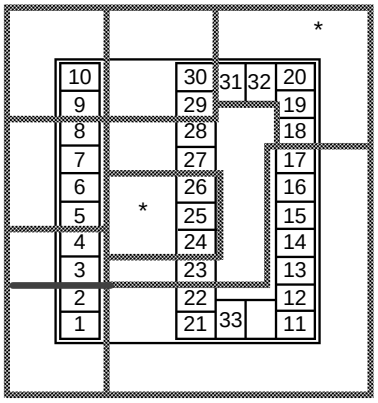
■ PRECAUTIONS WHEN WIRING

- Use wire ducts to separate input leads and power lines in order to protect the Controller and its lines from external noise.
- Solderless terminals are recommended when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. Take care not to tighten the terminal screws too tightly.

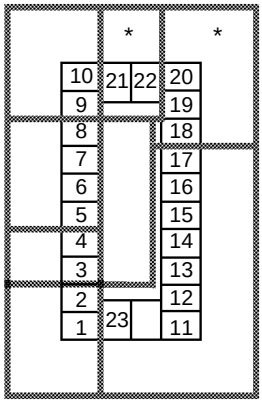
Power Blocks

The E5AK/E5EK has independent power supplies for each of the terminal blocks shown below.

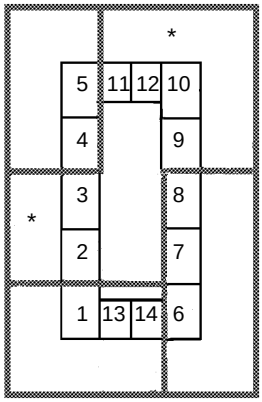
E5AK



E5EK



E5CK



* Uses same internal power supply

Note: Terminals 21 and 22 of the E5EK belong to the B block when a transfer output is set to option 1 and to the C block for other Option Boards.

■ OPERATING ENVIRONMENT

- Keep within the rated ambient operating temperature, ambient operating humidity, and storage temperature ranges.
- Use the Unit according to the vibration resistance, shock resistance, and enclosure ratings.
- Do not use the Unit in places with corrosive gas or excessive dust.
- Do not use the Unit near machines generating high-frequency noise.

■ CORRECT USE

Mounting

- The dimensions of the Digital Controller conform to DIN 43700.
- Recommended panel thickness is 1 to 8 mm.
- Mount the Unit horizontally.

Connection

- To reduce inductive noise influence, the lead wires connecting the input type to the Digital Controller must be separated from the power lines and load lines.
- Use the specified compensating conductors for thermocouples. Use lead wires having a small resistance for platinum resistance thermometers.

Connection Example

- Wire the terminals of the Unit using solderless terminals.
- The tightening torque applied to the terminal screws of the Unit must be approximately 0.78 N • m or 8 kgf • cm.

Use the following type of solderless terminals for M3.5 screws.





Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

■ OPERATION

- For models with alarm functions: The alarm outputs of a model with an alarm function may not turn ON properly when the model malfunctions. The use of alarm equipment with the model is recommended.
- The parameters and internal switch are set before shipping so that the Unit will function normally. Change the settings of the parameters and internal switch according to the application, if necessary.
- Several seconds are required until the relay is turned ON after power has been supplied to the Digital Controller. you must take this time delay into consideration when designing sequenced circuits which incorporate a Digital Controller.
- Do not use excessive force when pulling out the internal mechanism from the housing. Protect the internal connector or electronic parts of the Unit from shock. Protect against static discharge when changing the settings of the internal switch. Changing the settings on a grounded conductive mat is recommended.
- When connecting the Control Output Unit to the Temperature Controller or Digital Controller, make sure that the Control Output Unit is a suitable type. The use of an improper type of Control Output Unit may cause the system to malfunction.
- The heater burnout alarm will not be available if the Linear Output Unit is used.

C:H79E33A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OMRON

OMRON ELECTRONICS, INC.
One East Commerce Drive
Schaumburg, IL 60173
1-800-55-OMRON

OMRON CANADA, INC.
885 Milner Avenue
Scarborough, Ontario M1B 5V8
416-286-6465

Cat. No. GCTC13 8/00 Specifications subject to change without notice. Printed in U.S.A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP