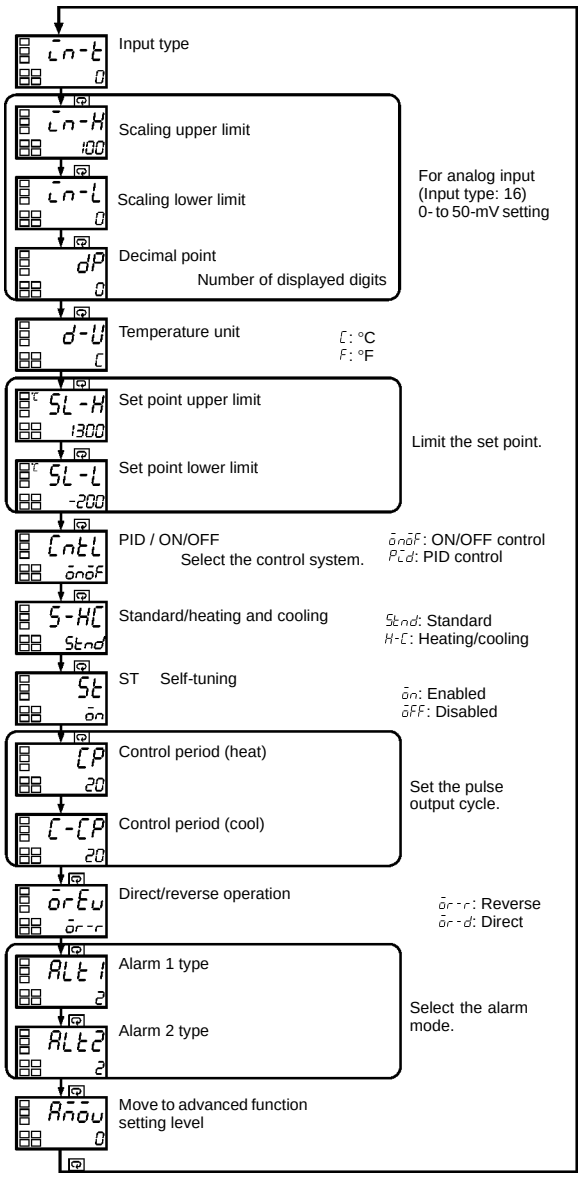
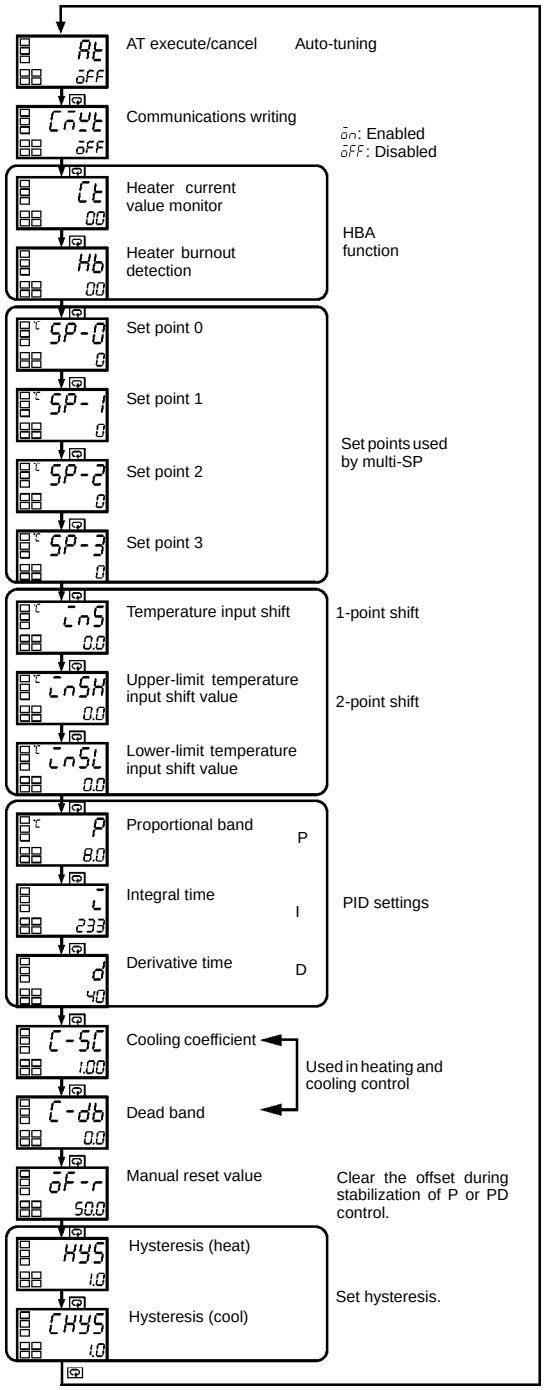
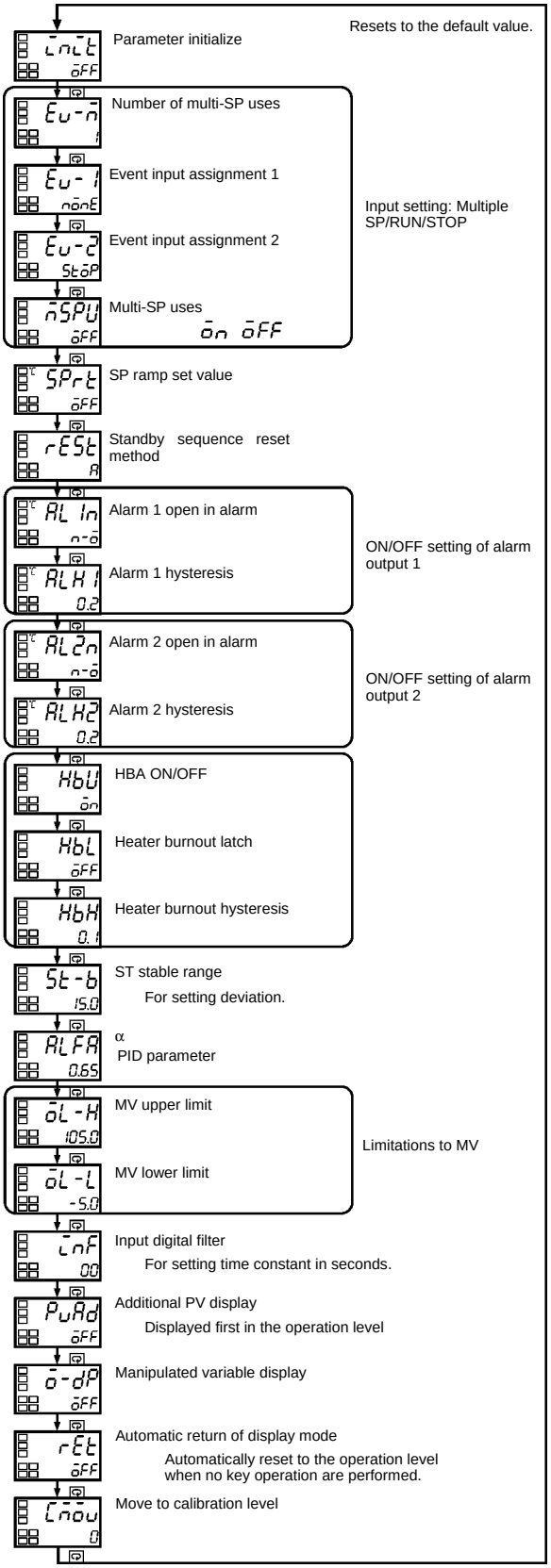
Initial Setting Level



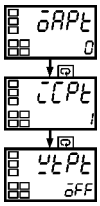
Adjustment Level



Advanced Function Setting Level



Protect Level



Operation/adjustment protection

Restricts display and modification of menus in the operation and adjustment levels.

Initial setting/communications protection

Restricts display and modification of menus in the initial setting, operation level and adjustment levels.

Setting change protection

Protects changes to setups by operating the front panel keys.

Operation/Adjustment Protection

The following table shows the relationship between set values and the range of protection.

Level		Set value			
		0	1	2	3
Operation level	PV	○	○	○	○
	PV/SP	◎	◎	◎	◎
	Other	◎	◎	X	X
Adjustment level		◎	X	X	X

When this parameter is set to “0,” parameters are not protected.

Default setting: 0

◎ : Can be displayed and changed
○ : Can be displayed
× : Cannot be displayed and move to other levels not possible

Initial Setting/Communications Protection

This protect level restricts movement to the initial setting level, communications setting level and advanced function setting level.

Set value	Initial setting level	Communications setting level	Advanced function setting level
0	○	○	○
1	○	○	X
2	X	X	X

Default setting: 1

○ : Move to other levels possible
× : Move to other levels not possible

Setting Change Protection

This protect level protects setup from being changed by operating the keys on the front panel.

Set value	Description
OFF	Setup can be changed by key operation.
ON	Setup cannot be changed by key operation. (The protect level, can be changed.)

Default setting: OFF

Communications Setting Level

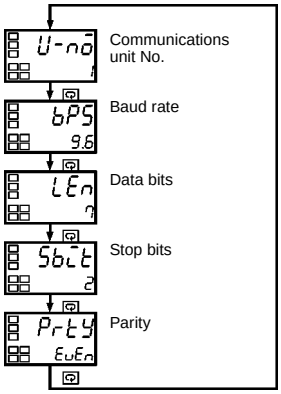
Set the E5CN/E5GN communications specifications in the communications setting level. For setting communications parameters, use the E5CN/E5GN panel. The communications parameters and their settings are listed in the following table.

Parameter	Displayed characters	Set (monitor) value	Set value
Communications unit No.	U-no	0 to 99	0.1 to 99
Baud rate	bPS	1.2/2.4/4.8/9.6/19.2 (kbps)	1.2/2.4/4.8/9.6/19.2
Data bits	LEn	7/8 (bit)	7/8 (bit)
Stop bits	Sbit	1/2	1/2 (bit)
Parity	Prty	None, even, odd	nonE/EvEn/Odd

Note: The highlighted values indicate default settings.

Before executing communications with the E5CN/E5GN, set the communications unit No., baud rate, etc., through key operations as described below. As for other operations, refer to the relevant Operation Manual.

1. Press the ◎ key for at least three seconds in the “operation level.” The level moves to the “initial setting level.”
2. Press the ◎ key for less than one second. The “initial setting level” moves to the “communications setting level.”
3. Pressing the ↵ key advances the parameters as shown in the following figure.
4. Press the ▲ or ▼ keys to change the parameter setups.



Note: On the E5GN, the ◎ Key is the ⬭ Key.

Set each communications parameter to match those of the communicating personal computer.

Communications Unit No. (U-no)

When communicating with the host computer, the unit number must be set in each Temperature Controller so that the host computer can identify each Temperature Controller. The number can be set in a range from 0 to 99 in increments of 1. The default setting is 1. When using more than one Unit, be careful not to use the same number twice. Duplicate settings will cause malfunction. This value becomes valid when the power is turned OFF and ON again.

Baud Rate (bPS)

Use this parameter to set the speed of communications with the host computer. It can be set to one of the following values; 1.2 (1200 bps), 2.4 (2400 bps), 4.8 (4800 bps), 9.6 (9600 bps), and 19.2 (19200 bps).
This setting becomes valid when the power is turned OFF and ON again.

Data Bits (LEn)

Use this parameter to change the communications data bit length to 7 bits or 8 bits.

Stop Bits (Sbit)

Use this parameter to change the communications stop bit to 1 or 2.

Parity (Prty)

Use this parameter to set the communications parity to None, Even, or Odd.

■ TROUBLESHOOTING

When an error occurs, an error code will be displayed on the No. 1 display. Check the contents of an error and take appropriate countermeasures.

No. 1 display	Type of error	Countermeasures
S.Err	Input error	Check the wiring of inputs for miswiring, disconnections, short-circuits, and the input type.
E111	Memory error	First, turn the power OFF then back ON again. If the display remains the same, the Unit must be repaired. If the display is restored, then a probable cause can be external noise affecting the control system. Check for external noise.
cccc	Display range over	Though not error, this is displayed when the process value exceeds the display range when the control range is larger than the display range. • When less than "-1999" cccc • When larger than "9999" ɔɔɔɔ
ɔɔɔɔ		
HErr	HB error	First, turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored, then a probable cause can be electrical noise affecting the control system. Check for electrical noise.

Note: Error will be displayed only when the display is set for the PV or PV/SP.

Fuzzy Self-tuning

The fuzzy self-tuning (ST) is a function that automatically calculates an optimum PID constant depending on items to be controlled.

■ FEATURE

The Temperature Controller determines when to execute this fuzzy self-tuning.

■ FUNCTIONS

SRT: Performs PID tuning according to the step response method when the SP is changed.

LCT: Performs PID tuning according to the limit cycle method when the SP is changed.

Requirements for SRT Functionality

The ST will be executed according to the step response method when the following conditions are satisfied when operation is started or when the SP is changed.

When operation is started	When SP is changed
1. The SP at the startup is different from the SP at the time the previous SRT was executed. (See Note.) 2. The temperature upon startup is smaller than the SP in the reverse operation and larger than the SP in the direct operation. 3. Restarting of operation is not due to an input error. Note: The "SP that existed when the previous SRT was executed" refers to the SP used for obtaining the PID constant in the previous SRT.	1. The SP after change is different from the SP at the time the previous SRT was executed. (See Note.) 2. In the reverse operation, the value obtained by deducting the SP before change from the SP after change is larger than the ST stable range. In the direct operation, the value obtained by deducting the SP after change from the SP before change is larger than the ST stable range. 3. The SP change width is larger than the current proportional band x 1.27 + 4. 4. The temperature is in the stable state. (It can be in the balanced state if no output is generated when the power is turned ON.)

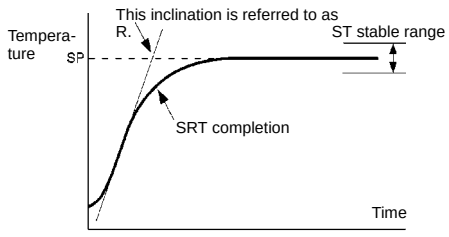
If the SP is changed while SRT is being executed and if SRT completion conditions are satisfied, no PID change will take place.

Stabilization State

Measured values remain in the stable range for a certain period of time.

Balanced State

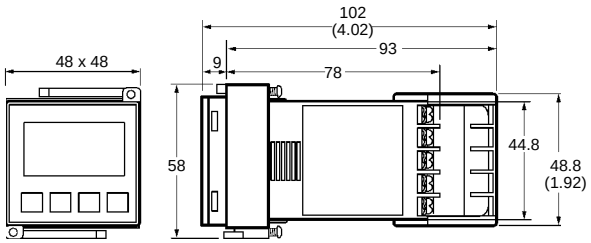
Output is 0% for 60 seconds and measured values fluctuate within the width of the stable range.



Dimensions

Unit: mm (inch)

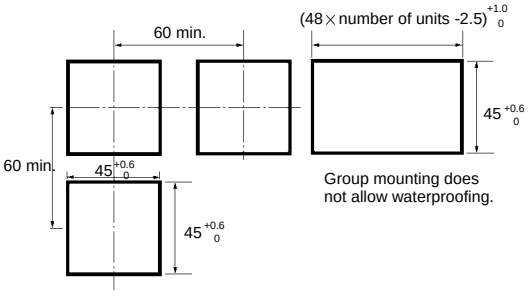
■ E5CN



Note: The suffix “500” is added to the model number of each Controller provided with a E53-COV10 Terminal Cover.

Panel Cutouts

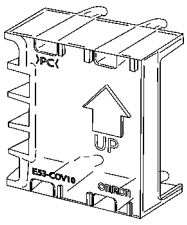
Mounted Separately **Group Mounted**

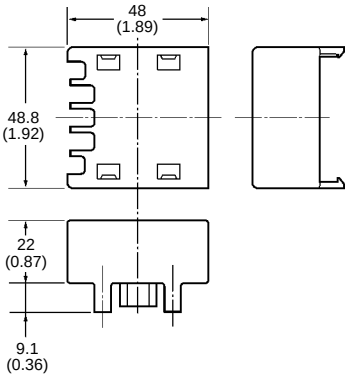


- Recommended panel thickness is 1 to 5 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers when they are group mounted.) To mount the E5CN so that it is waterproof, apply the waterproof seal to the E5CN.
- When two or more E5CNs are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature, as specified in the specifications.

■ TERMINAL COVER

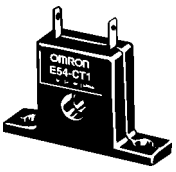
E53-COV10

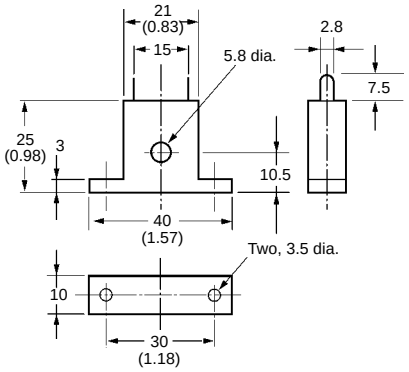




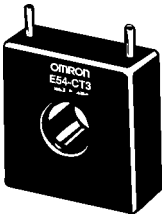
■ CURRENT TRANSFORMER (SOLD SEPARATELY)

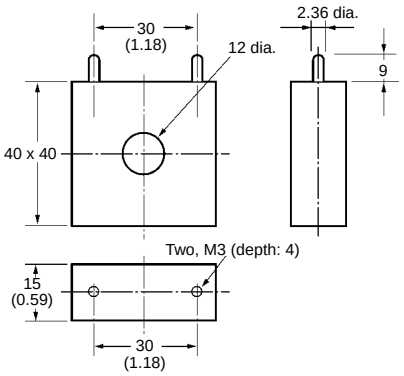
E54-CT1





E54-CT3





Installation

■ SETTING UP OPTION BOARDS

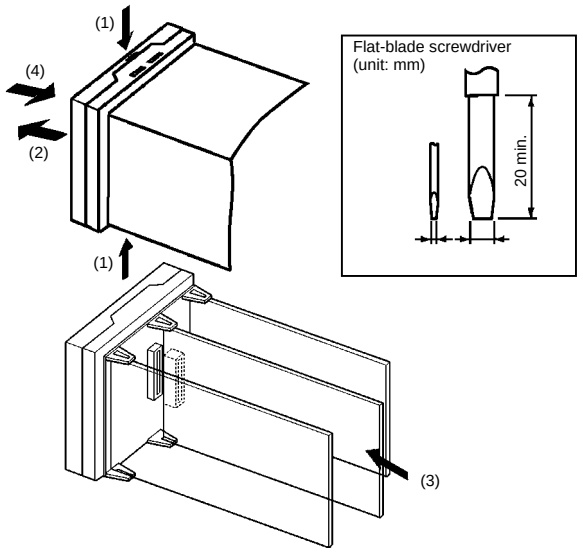
If communications, event input, or heater burnout functions are required, mount the E53-CNH03 Communications Board or the E53-CNHB Event Input Board. The heater burnout function is supported on either of these two Option Boards.

Option Boards

Name	Model	Function
Communications Board	E53-CNH03	RS-485 communications
Event Input Board	E53-CNHB	Event inputs

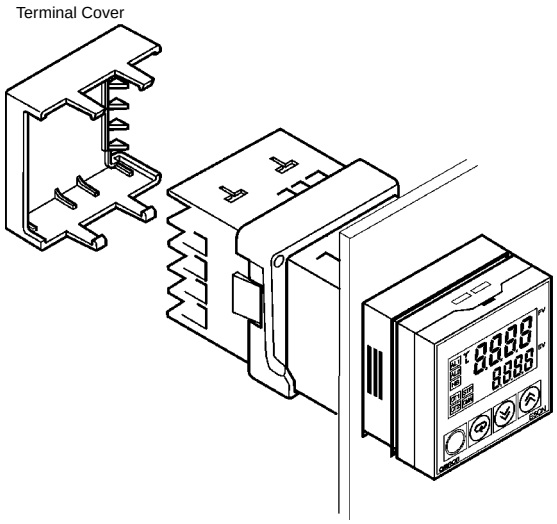
Note: Terminal label: x1

■ ASSEMBLY OF UNIT



1. Insert the tools (see drawing above) into the slots (one on the top and one on the bottom) and release the hooks.
2. Insert the tool in the space between the front and rear panels and slightly pull out the front panel. Hold the top and bottom of the front panel and pull toward yourself to remove it.
3. Match up the upper and lower claws with the connection points and insert the Option Board. Mount the Option Board in the center.
4. Before inserting the Unit, confirm that the waterproof seal is in place. Insert the Unit into the rear case until you hear a click. When inserting the Unit, press down the hooks on the top and bottom of the rear case, so they firmly hook on the board inserted.

■ MOUNTING



Attaching the E5CN to a Panel

1. Insert the E5CN into the mounting hole in the panel.
2. Push the adapter along the E5CN body from the terminals up to the panel and secure it temporarily.
3. Tighten the two screws on the adapter. When tightening screws, tighten the two screws alternately, keeping the torque to between 0.29 and 0.39 N•m (2.9 kgf•cm to 3.9 kgf•cm).

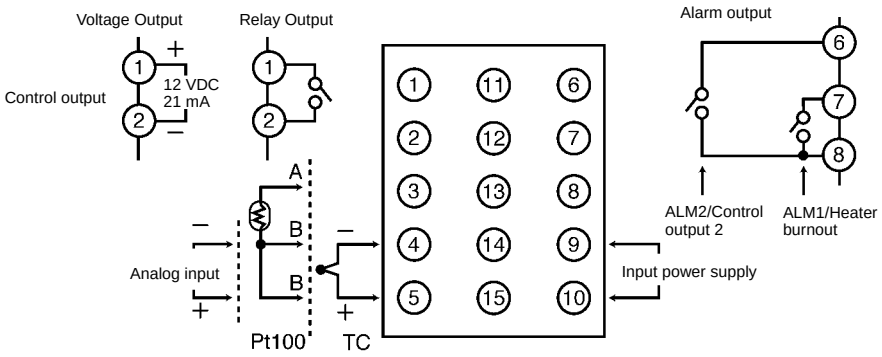
Attaching the Terminal Cover

Make sure that the “UP” mark is facing up, and then fit the Terminal Cover (E53-COV10) into the holes on the top and bottom. A E5CN-□-500 Controller is provided with a Terminal Cover.

■ WIRING TERMINALS

The voltage output (control output) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect the control output terminals to the ground. If the control output terminals are connected to the ground, errors will occur in the measured temperature values as a result of leakage current.

Standard insulation is applied to the power supply I/O sections. If reinforced insulation is required, connect the input and output terminals to a device without any exposed current-carrying parts or to a device with standard insulation suitable for the maximum operating voltage of the power supply I/O section.

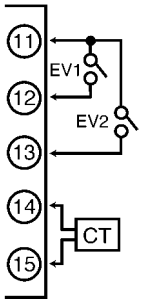


Two input power supplies are available: 100 to 240 VAC or 24 VDC.

■ E5CN OPTION BOARDS

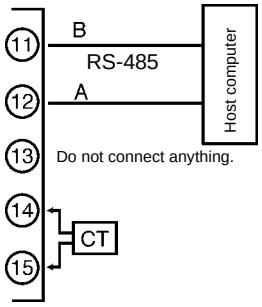
E53-CNHB Event Input Unit

Event Input/Heater Burnout Detection



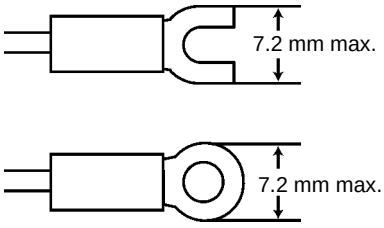
E53-CNH03 Communications Board

Communications Specification/Heater Burnout Specification



■ WIRING PRECAUTIONS

- Separate input leads and power lines to protect the E5CN and its lines from external noise.
- We recommend using solderless terminals when wiring the E5CN.
- Tighten the terminal screws using a torque no greater than 0.78 N•m.
- Use the following type of solderless terminals for M3.5 screws.



Precautions

■ OPERATING ENVIRONMENT

- Use the Temperature Controller within the rated operating temperature, storage temperature, and operating humidity specified for each model.
- Use the Temperature Controller according to the performance specifications such as vibration, shock, and degree of protection specified for each model.
- Do not use the Temperature Controller in places where it is subject to dust or corrosive gases.
- Install the Temperature Controller away from the devices that generate high-frequency noise.

■ SERVICE LIFE

The service life of relays used for the control output or alarm output varies depending on mostly switching conditions. Be sure to confirm their performance under actual operating conditions and do not use them beyond the allowable number of switchings. If they are used in a deteriorated condition, insulation between circuits may be damaged and, as a result, the Temperature Controller itself may be damaged or burned.

The service life of electronic devices such as Temperature Controllers is determined not only by the number of switchings of relays, but also by the service life of internal electronic components. The component service life is affected by the ambient temperature: the higher the temperature becomes, the shorter the service life becomes; the lower the temperature becomes, the longer the service life becomes. For this reason, the service life can be extended by lowering the internal temperature of the Temperature Controller.

When two or more Temperature Controllers are mounted horizontally close to each other or vertically next to each other, the internal temperature will increase, due to heat radiated by the Temperature Controllers, and the service life will decrease. In these situations, forced cooling by fans or other means of air ventilation will be required to cool down the Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals solely, to avoid measurement errors.

■ ORDERING PRECAUTIONS

Units separately sold, such as Control Output Units and Current Transformers, are specified for each Temperature Controller. Be sure to order appropriate units according to the application.

■ INSTALLATION

Mounting

Mount the Temperature Controller horizontally level.

Connection

When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.

When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance.

When wiring the platinum resistance thermometer to the Temperature Controller, keep the wire route as short as possible. Separate this wiring away from the power supply wiring and load wiring to avoid inductive or other forms of noise.

Do not use empty terminals.

Crimp Terminal Connection

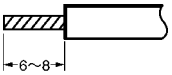
Use crimp terminals that match M3.5 screws. M3.5 x 8 self-rising screws are used.

E5CN

Be careful not to excessively tighten the terminals screws.

Soldering Connection

The self-rising screws provide easy soldering connection. Strip the lead wire by a length of 6 to 8 mm.



■ OPERATING PRECAUTIONS

For Temperature Controllers with alarm outputs, alarm output may not be generated correctly when an abnormality occurs in the device. A separate alarm device should be incorporated into the system.

To ensure proper performance, parameters of the Temperature Controllers are set to default values before they are shipped. Change these parameters depending on actual applications. If left unchanged, the Temperature Controller will operate under the default settings.

It takes several seconds for the relay to turn ON from the moment the power is turned ON. Consider this time when incorporating Temperature Controllers in a sequence circuit.

When pulling out the Temperature Controller body, do not apply excessive force. After the body is removed, be careful not to apply any shock to the connectors or other electronic components on the PCB.

Models without any specification on their degree of protection or those with IP□0 do not offer a waterproofing feature.

OMRON®

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

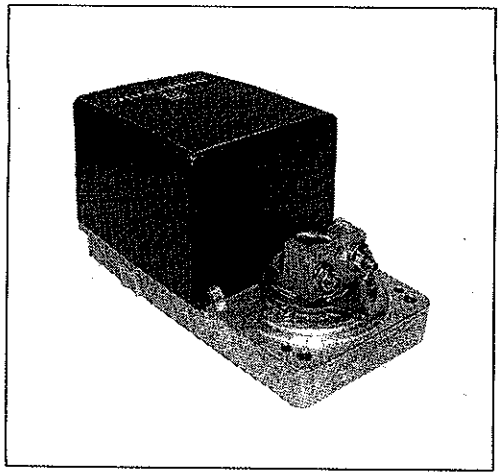
OMRON CANADA, INC.
885 Milner Avenue
Scarborough, Ontario M1B 5V8
416-286-6465

Cat. No. GCTC12 1/99 Specifications subject to change without notice. Printed in U.S.A.

neptronic®

Actuator

Specification & Installation instruction



Feature:

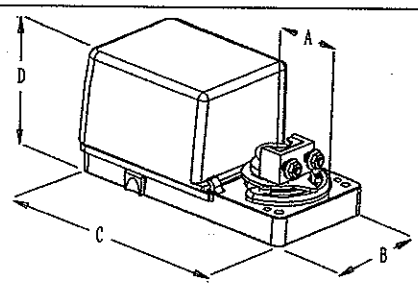
- Mounts easy on round & square shaft (with option –8).
- External clutch for manual adjustments.
- Maintenance free.
- Position indicator.
- Control signal fully programmable.
- The fastest actuator of the world (model BM_ _ _FF).
- Fail safe by *Enerdrive System* [1] (on model 060 & 080).
- Auxiliary switches (on model 020 & 080).

Old Number	
BBM2000A	BM000
BBM2021A	BM020
BBM2060A	BM060
BBM2080A	BM080
BBMF2000A	BM000F
BBMF2021A	BM020F
BBMF2060A	BM060F
BBMF2080A	BM080F
BBMFF2000A	BM000FF
BBMFF2021A	BM020FF
BBMFF2060A	BM060FF
BBMFF2080A	BM080FF

Technical Data	BM000 *BBM 2000A*	BM020 *BBM 2021A*	BM060 *BBM 2060A*	BM080 *BBM 2080A*	BM000F *BBMF 2000A*	BM020F *BBMF 2021A*	BM060F *BBMF 2060A*	BM080F *BBMF 2080A*	BM000FF *BBMFF 2000A*	BM020FF *BBMFF 2021A*	BM060FF *BBMFF 2060A*	BM080FF *BBMFF 2080A*
Auxiliary switches	No	Yes(2)	No	Yes(2)	No	Yes(2)	No	Yes(2)	No	Yes(2)	No	Yes(2)
Fail safe - *Enerdrive*	No		Yes		No		Yes		No		Yes	
Power consumption	6 VA		15VA Peak, 6VA		15 VA		24VA Peak, 15VA		15 VA		24VA Peak, 15VA	
Torque	50 in.lb. [5,6 Nm] at rated voltage				35 in.lb. [3,9 Nm] at rated voltage				25 in.lb. [2,8 Nm] at rated voltage			
Running time through 90°	20 to 30 sec torque dependant				3.5 to 4.5 sec torque dependant				1.5 to 2.5 sec torque dependant			
Feedback	4 to 20 mA or 2 to 10 VDC adjustable											
Power supply	22 to 26 VAC or 28 to 32 VDC											
Electrical connection	18 AWG [0.8 mm^2] minimum											
Inlet bushing	2 inlet bushing of 5/8 in [15.9 mm] & 7/8 in [22.2 mm]											
Control signal	Analog, Digital or Pulse with modulation (PWM) programmable (factory set with Analog control signal)											
Angle of rotation	0 to 90 degrees, mechanically adjustable (factory set with 90° stroke)											
Direction of rotation	Reversible, Clockwise (CW) or Counterclockwise (CCW) (factory set with CW direction)											
Ambient temperature	-22°F to +122°F [-30° C to +50° C]											
Storage temperature	-22°F to +122°F [-30° C to +50° C]											
Relative Humidity	5 to 95 % non condensing.											
Weight	3 lbs. [1.4 kg]											

Warning: Do not press the clutch when actuator is powered

Dimensions



Dimension		Inches	Metric (mm)
A		1.50	38.1
B		3.26	82.8
C		6.60	167.5
D	model 000 & 060	3.01	76.4
	model 020 & 080	3.72	94.5

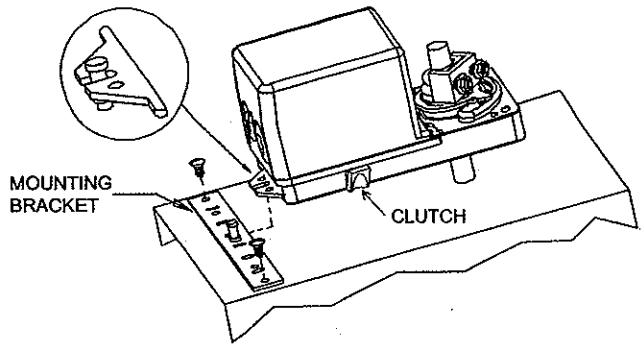
Caution

We strongly recommend that all neptronic® products be wired to a separate transformer and that transformer shall service only neptronic® products. This precaution will prevent interference with, and/or possible damage to incompatible equipment.
When multiple actuators are wired on a single transformer, polarity must be observed. Long wiring runs create voltage drop which may affect the actuator performance.

[1] *Enerdrive System* U.S.A. Patent #5,278,454

CE SP® C US UL LISTED TEMPERATURE REGULATING EQUIPMENT 41X9 CLASS 2 CIRCUIT

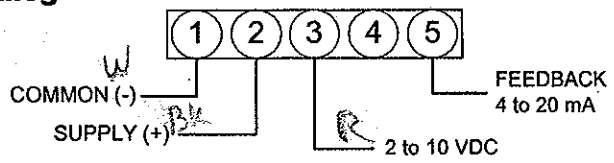
Mechanical installation



1. Manually close the damper blades and positioned the actuator at 0° or 90°.
2. Slide the actuator onto the shaft.
3. Tighten the nuts on the "U" bolt to the shaft with a 8mm wrench to a torque of 60 in.lb. [6,7 Nm].
4. Slide the mounting bracket under the actuator. Ensure free movement of the slot at the base of the actuator. The bracket pin must be placed in the mid distance of the slot.
5. Fix the bracket to the ductwork with #8 self-tapping screws.

Wiring Diagrams

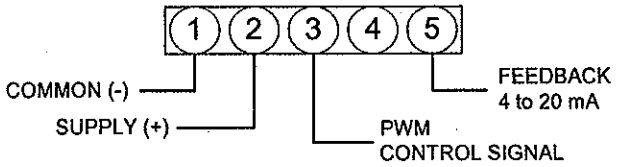
Analog



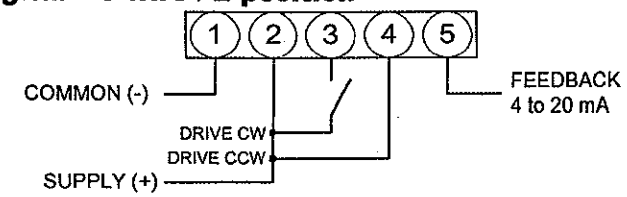
For 4 to 20 mA control signal

Connect one of the supplied 500 ohm resistors between pins 1 and 3.

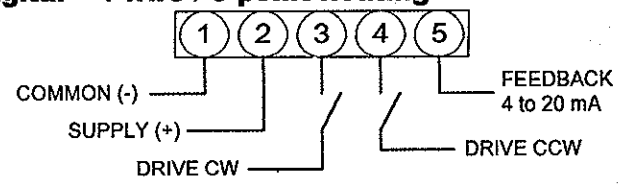
PWM



Digital – 3 wire / 2 position



Digital – 4 wire / 3 point floating



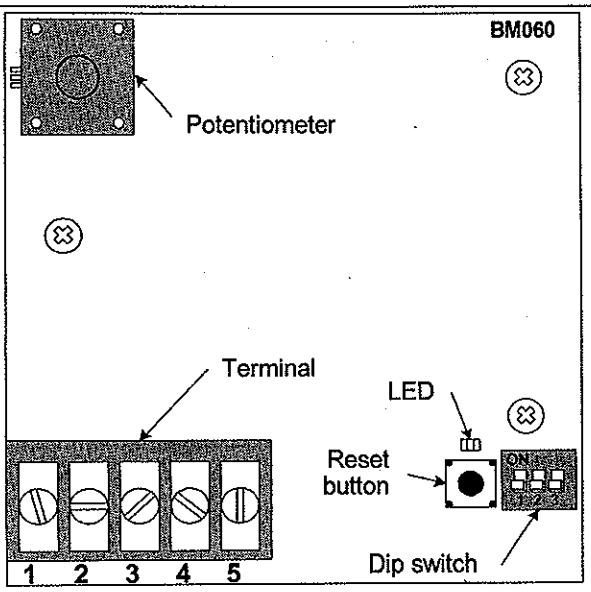
Special consideration for Digital control

In this mode, actuator is sensitive to induced electrical voltages from other sources. To prevent such interference, wire one 2.2k ohm 0.5W resistor between pins 4 and 1 and a second 2.2k ohm 0.5W resistor between pins 3 and 1. These resistors are supplied.

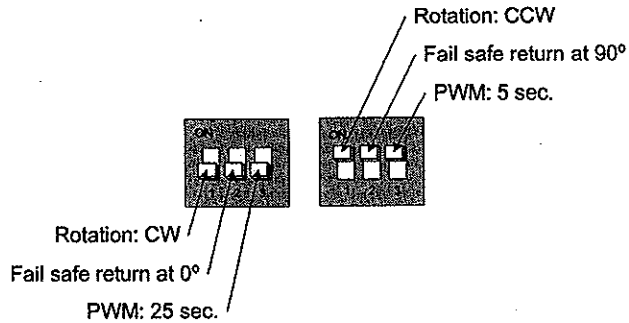
For 2 to 10 VDC output feedback

For any of above wiring configurations, connect one of the supplied 500 ohm resistors between pins 1 and 5.

PC Board



Dip switch settings



Stroke adjustment – No control signal change

1. Apply power and, **wait for at least 10 seconds.**
2. Press and release the reset button to start the auto-stroke process.
   The LED should be illuminated.
   - First option:
     The actuator will then travel in both directions to find it's limit and position itself according to the demand.
     The LED will extinguish, the process is complete.
   - Second option:
     When the desired end position is reached, press and release the reset button. The actuator will now return back to its original position. (you can also press and release the reset button when It's reaches the original position)
     The LED will extinguish, the process is complete.

Programming – Change of control signal

1. Remove power and put all dip switches "OFF". (factory preset).
2. Apply power and, **within 10 seconds**, press and release the reset button. The LED should be blinking.
3. Select the control signal with dip switches:
   - Digital (On/Off or 3 point floating)
     move switch No1 "ON" and then "OFF".
   - PWM
     move switch No2 "ON" and then "OFF".
   - Analog (factory preset)
     move switch No3 "ON" and then "OFF".
4. **Stroke adjustment**
   see the stroke adjustment section above.

Note, If PWM mode is selected:

- Time base : When programming is done,
  if switch No3 is "on" time base is 0.1 to 5 sec. (resolution 20 msec.)
  if switch No3 is "off" time base is 0.1 to 25 sec. (resolution 100 msec.)
  * For 5 sec. time base, we strongly recommend a switch common connection for better position stability.
- Switch 24 VAC: Triac or dry contact, 40mA maximum switching current.
- Switch common: NPN transistor, SCR, Triac or dry contact 75mA maximum switching current.

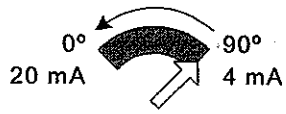
Feedback selection (CCW direction)

To select CCW direction put switch No1 "ON".

In Analog or 3 point floating mode you can program the feedback control.

If switch No3 is "OFF":

The feedback control is automatically reverse to 4 to 20 mA for 90 to 0 degrees.



If switch No3 is "ON":

The feedback control is to 20 to 4 mA for 90 to 0 degrees.

Zero and span calibration

This feature is applicable to analog control signal only.

1. Remove power and put all dip switches "OFF". (factory preset).
2. Apply power and, **within 10 seconds** press and hold the reset button until the LED blinks once.
   The Zero and span calibration process then start.
3. Release the reset button. The LED is now constantly illuminated.
4. Apply new minimum voltage.
   It can be any value between 0 to 7 VDC, with an external 0 to 10 volt supply (ex: MEP).
5. Press and release the reset button to memorize the new minimum voltage. The LED blinks once.
6. Apply new maximum voltage.
   It can be any value between 3 to 10 VDC, this value should be greater than the new minimum value.
7. Press and release the reset button to memorize the new maximum voltage. The LED blinks once.
   The Zero and span calibration process is complete.

Note: To reset zero and span to 2 to 10 VDC (factory value). You just have to re-select the analog control signal mode, see Programming.

Marathon Sensors Inc.

Oxymit™ Transmitter
Operators Manual

Marathon
Sensors Inc.

F200060

Revision: 00 04/18/2001
01 04/23/2001
02 05/08/2001
03 09/19/2001
04 11/01/2001
05 11/21/2001
06 04/19/2002
07 10/30/2002
08 11/13/2002
09 11/06/2003
10 12/03/2003
11 09/30/2004
12 04/04/2005
13 04/11/2005
14 11/14/2006

COPYRIGHT © 2004
MARATHON SENSORS INC.
3100 East Kemper Road, Cincinnati, Ohio 45241
1-800-547-1055 (513) 772-1000 FAX: (513) 326-7090

All trademarks used in this publication are duly marked and the sole property of their respective owners. No attempt at trademark or copyright infringement is intended or implied.

Marathon Sensors makes no warranties express or implied beyond the written warranty presented at initial purchase. Marathon Sensors Inc. is not responsible for any product, process, damage or injury incurred while using this equipment. Marathon Sensors makes no representations or warranties with respect to the contents hereof and specifically disclaims any warranties of merchantability or fitness for any particular application or purpose.

Table of Contents

NOTE:

Please specify the following parameters when ordering a transmitter; process type, process range (%, ppm), thermocouple type, temperature scale F/C, analog output 1 process and scale, analog output 2 process and scale.

Typical Oxygen Transmitter Calibration
(F840030)

Calibration Function	Measured Value or Input	Output / Units
Cold Junction	Room Temp	°F
Thermocouple min	800°F (B type) standard t/c type	°F
Thermocouple max	3000°F (B type) standard t/c type	°F
Millivolt	0.0 mV	Millivolts
Millivolt	2000 mV	Millivolts
Analog 1 Zero	0% O2	4.0 mA +/- 0.1
Analog 1 Span	20.9% O2	20.0 mA +/- 0.1
Analog 2 Zero	800°F +/- 5°	4.0 mA +/- 0.1
Analog 2 Span	3000°F +/- 5°	20.0 mA +/- 0.1

Typical Carbon Transmitter Calibration
(F840031)

Calibration Function	Measured Value or Input	Output / Units
Cold Junction	Room Temp	°F
Thermocouple Min	MUST BE SPECIFIED	°F
Thermocouple Max	MUST BE SPECIFIED	°F
Millivolt	0.0 mV	Millivolts
Millivolt	2000 mV	Millivolts
Analog 1 Zero	0% Carbon	4.0 mA +/- 0.1
Analog 1 Span	2.55% Carbon	20.0 mA +/- 0.1
Analog 2 Zero	MUST BE SPECIFIED	4.0 mA +/- 0.1
Analog 2 Span	MUST BE SPECIFIED	20.0 mA +/- 0.1

General Description

The Oxymit™ Transmitter has been designed to work as an analog or digital interface for any zirconia based oxygen probe used to track dew point, carbon potential, or oxygen. The transmitter connects to the temperature and millivolts outputs of an oxygen probe and can produce analog outputs proportional to the selected process value.

The features available are:

- Isolated inputs for thermocouple and probe millivolt
- 24 bit Sigma-Delta ADC for inputs.
- Serial EEPROM to store setup and calibration values.
- Two isolated self-powered 4-20mA outputs for process value and temperature.

The transmitter makes a carbon or oxygen probe an intelligent stand alone sensor. The transmitter is located near the probe, preferably mounted in an enclosure. The transmitter mounts onto a DIN rail and requires a 24VDC power supply. It measures the probe temperature and millivolts. At the time of order the transmitter can be configured to calculate percent carbon, dewpoint, or percent oxygen from these inputs. The results of any of these calculations are made available via two 4-20mA loop outputs. Typically one first loop is set up for the process value the second loop transmits probe temperature.

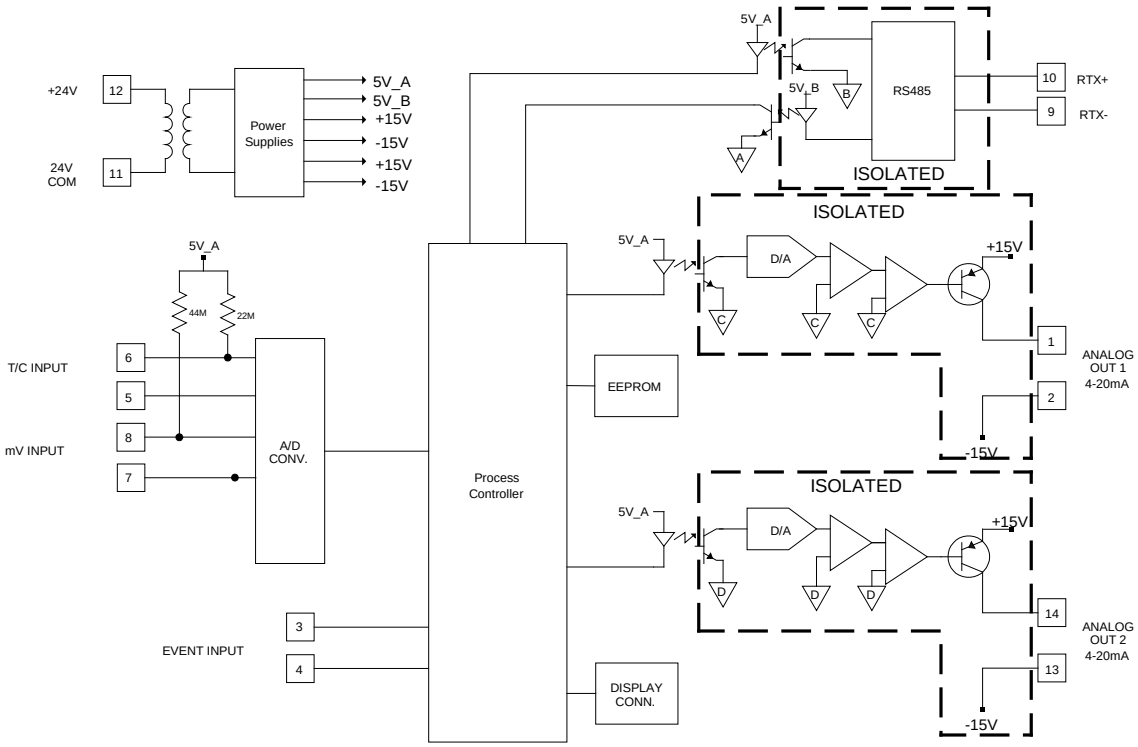


Figure 1 BLOCK DIAGRAM