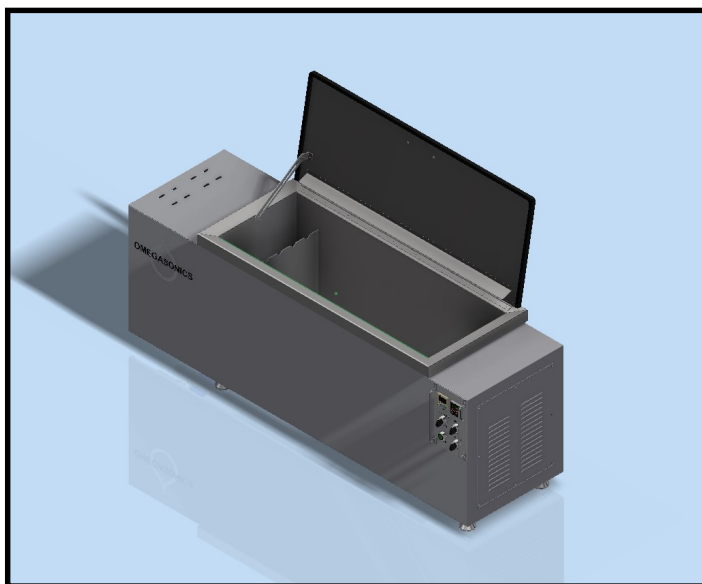# Omegasonics

Operation & Instruction Manual

Ultrasonic Cleaning Equipment

3814BT-EXT Bench Top Unit

Read all instructions thoroughly before operating this equipment

INTRODUCTION

Congratulations! You have purchased an Omegasonics Ultrasonic Parts Washer. The Omegasonics Parts Washer provides increased cleaning power and reliability versus competitive brands. The units are skirted with a powder coated steel frame for greater durability and chemical resistance.

ULTRASONIC CLEANING PROCESS

When ultrasonic energy is introduced into a cleaning solution, cavitation, the foundation of ultrasonic cleaning occurs. Ultrasonic energy causes alternating patterns of low- and high-pressure phases, which form microscopic vacuum bubbles. During the subsequent high-pressure phases, the bubbles implode violently. This is called cavitation.

Cavitation provides an intense scrubbing action that leads to unsurpassed cleaning speed and consistency when compared with simple soaking or immersion with agitation. Additionally, the bubbles are small enough to penetrate even microscopic crevices, cleaning them thoroughly and consistently. As a result, ultrasonic cleaning is one of the most highly effective and efficient methods you can use for cleaning a wide array of parts.

Omegasonics provides a complete line of quality ultrasonic cleaning washers developed for industries that have historically used obsolete technology and environmentally unsafe cleaning solvents. We provide state-of-the-art, labor saving, fast, efficient and environmentally safe cleaning alternative.

WARNINGS

Failure to read these warnings may cause the unit to fail.

Failure to read these warnings may cause personal injury or property damage.

- Equipment should only be operated on a single phase, 120VAC, 15 or 20 Amp **grounded** electrical system.
- The 3814BT-EXT requires two (2) separate circuits. One circuit is for the heat and one for the ultrasound. The ultrasonic generator is separately mounted and has its own power plug.
- Place the ultrasonic generator as far away from the tank to avoid splashing water on the electrical circuitry.
- Never operate the unit (heat or ultrasound) without the appropriate liquid level in the tank.
- Never plug in the machine power cord until the unit has been filled with the appropriate level of water.
- Never use flammable liquids or solvents in the unit.
- Due to the heated liquid in the tank, use racks, baskets, tongs or wires to insert or remove parts from the tank.
- Do not operate the unit with wet hands.
- Use only biodegradable cleaning agents. Never use solvents or flammable cleaning solvents.
- Do not rest parts to be cleaned directly on the immersible transducer pack. Severe transducer erosion will occur.
- Do not open the internal circuitry of the equipment, disassemble any part or parts, or move or remove any components or electrical devises.
- Never attempt to perform maintenance on the equipment when the unit is energized.
- Never attempt to perform maintenance on the unit when the cleaning solution is hot.
- Disconnect the power source when moving the unit to a new location.
- Avoid splashing water outside the tank.

CLEANING TIMES

- Most parts can be cleaned within minutes. Cleaning times will vary depending on the condition of the parts being cleaned, the level of heat in the tank and the cleaning agent used. Aluminum parts will clean faster than other metal parts. Never leave aluminum parts in the ultrasonic bath longer than five (5) minutes without inspection.
- It is not necessary to move the parts by hand or in the basket when cleaning.
- Keep the bath free of oils, grease and any foreign materials.
- Skim off oil and grease residue periodically if necessary.
- Cleaning agents should be changed periodically depending on usage.
- When discharging bath and waste, follow all environmental and regulatory requirements. A reputable and licensed waste transportation firm should perform removal of all waste materials. Omegasonics is not liable for improper handling of waste materials.

SET-UP

- Fill the wash tank approximately 2/3 full with the proper dilution ratio of soap and water. Using hot water will shorten the amount of time required to heat the water. Check drain assembly to ensure that there is no leakage.
- Plug the heat power cord into a proper electrical outlet.
- Plug the generator power cord into a separate, proper electrical outlet.
- Use of a lid (optional) maximizes insulation efficiency.
    - The OMG-3814BT-EXT utilizes two (2) 900-Watt built-in silicone heating element and is well insulated. The time required to heat the machine initially will vary between two (2) and four (4) hours depending on the initial fill water temperature, ambient temperature and final desired temperature. The unit heats water at approximately fifteen (15) degrees per hour. After the initial heating period, the temperature will remain constant with very limited electrical draw. Use of a lid when not in use minimizes heat loss and evaporation.
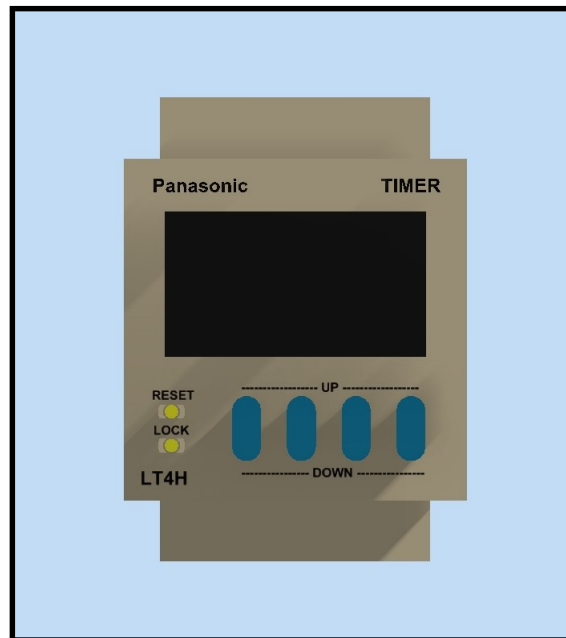
Control Panel

- Timer – Controls the length of time the Ultrasonics is on.
- Temperature – Controls the temperature of the water
- Sonics – Turns on the Sonics or Resets the Sonics
- Heat – Turns on/off the heaters
- Pump – Turns on/off the pump
- Power – Turns on/off the washer

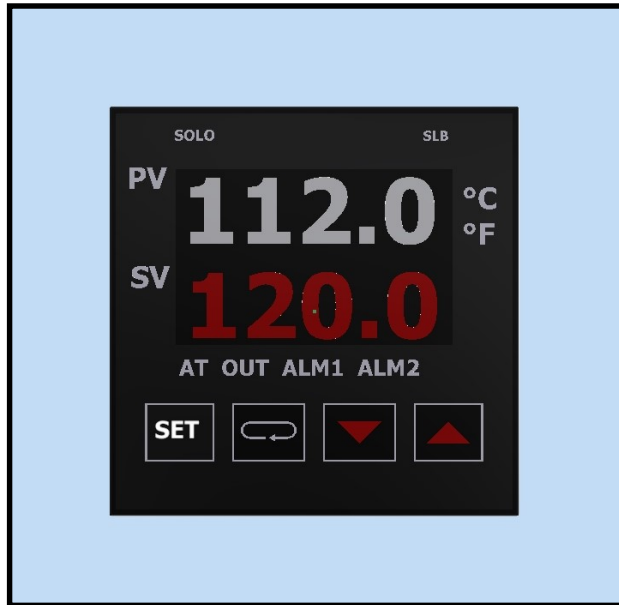# Ultrasonic Timer

Knowing your Ultrasonic Timer

See *Panasonic LT4H Timer User Manual in the Appendix*

Digital Temperature

Knowing Your Temperature Controller

See SOLO Basic Temperature Controller User Manual in the Appendix
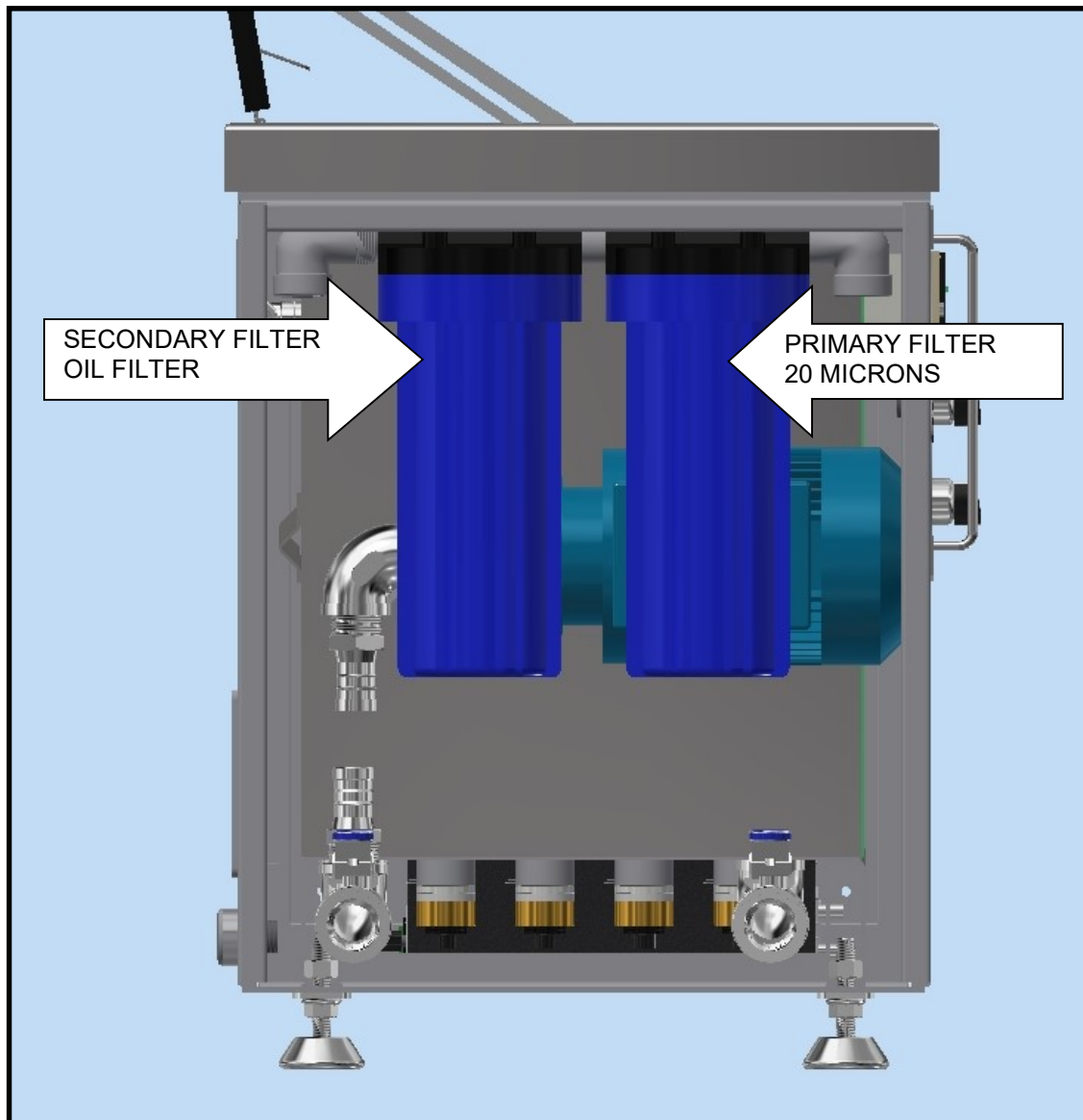

Factory Temperature set value

- The temperature controller is factory set at 150˚F.

Filtration

- Primary Filter – 20 microns
- Secondary Filter – Oil Filter

SECONDARY FILTER
OIL FILTER

PRIMARY FILTER
20 MICRONS

General Cleaning Process

- Arrange parts to be cleaned so they are not touching the bottom of the tank. Use racks, baskets or tongs to insert and remove parts from the tank. The volume of parts to be cleaned should not exceed thirty percent (30%) of the total tank volume.
- Lower the parts to be cleaned into the tank.
- Activate the ultrasound by turning on the power switch on the generator.
- Cleaning times will vary depending on the temperature of the solution, the number of parts to be cleaned, the amount of contamination and the amount and type of cleaning agent used. Generally, small parts should be cleaned with the ultrasound operating for three (3) to five (5) minutes.
- Parts being cleaned do not require continuous supervision or labor-intensive cleaning. Parts should however be inspected during the cleaning process.
- Visually inspect each part for desired decontamination after the parts have dried completely. If parts must be handled, wear gloves when touching surfaces to protect against heated parts.
- Assorted Parts should be arranged so as not to stack the parts too densely and operate the ultrasound for the necessary period of time. The amount of time required is dependent upon the density of the parts being cleaned, the type and amount of thickness of the oil, grease, dirt or carbon being removed. Customer experimentation is necessary for most applications, though it is best to use five (5) minute testing increments.

WATER QUALITY

The quality of the customer's water source can have an important effect on the performance of the ultrasonic equipment. This can be due to high levels of calcium, magnesium, sulfur and other contaminants in the water source that can have a negative effect on the type of cleaning soap used. High levels of calcium and/or magnesium (constitutes hard water) can cause the soap to work less efficiently and less effectively as intended and can also leave a white, flaky residue on the parts once dried. If this white spotting occurs and is not desired, it will be necessary to use soft water, drinking water or distilled water in the machine. The level of final cleanliness will dictate the water source used in the machine.

CLEANING AGENTS – OMEGASONICS

Omegasonics carries a full line of cleaning agents for the fire restoration and mold remediation industries. Each cleaning agent has a unique cleaning specialty and use. The products are as follows.

- **OmegaClean** – general to heavy-duty degreaser which will remove carbon, oil, grease and dirt from a variety of metals and will not harm aluminum finishes. Especially formulated for the aerospace industry as well as for automotive applications. Has built in conditioners for hard water (high calcium and magnesium content) sources and good quality rust inhibitors.
- **OmegaBrite** – heavy-duty degreaser removes carbon, oil, dirt, grease and dirt from a variety of metals. It is excellent for cleaning and brightening ferrous and nonferrous metals. Product may cause aluminum to scar if left in contact with aluminum part for an extended period of time. Should not be used with copper or copper alloy substrates. Product contains a short-term flash rust inhibitor.
- **OmegaZyme** – ideal for industrial applications cleaning oil and grease from aluminum, stainless steel and titanium parts. Does not remove carbon. Will cause cast iron and cold rolled steel parts to rust if not used in conjunction with silicate, nitrate or trisodium phosphate rust inhibitors or with another cleaning agent containing rust inhibitors.
- **OmegaCitriSurf** – designed for industrial and aerospace applications where stainless-steel passivation (the removing of free iron from the surface) is required. Also useful in removing calcium deposits from a variety of metals including brass and steel.

OPERATING HINTS

- Starting with hot water will allow the unit to reach optimum operating temperature quicker.
- For best results, add a cleaning agent to the water. This will improve the cavitation performance of the unit.
- Do not use de-ionized water in the unit. DI water will accelerate cavitation erosion in the tank.
- Never place items to be cleaned or beakers on the bottom of the tank. Items to be cleaned should be suspended at least ½" above the tank bottom.
- Never allow the unit to operate without liquid. This will cause the unit to fail.
- After frequent use, the tank should be emptied, rinsed out and wiped with a non-abrasive cloth.

EQUIPMENT MAINTENANCE

- Turn equipment off and unplug the power cord.
- Wait at least twenty (20) minutes after the heat circuit is turned off before emptying the tank.
- Drain the contaminated cleaning solution from the tank.
- Rinse the inside of the tank with clean water.
- Buff the inside of the tank with a clean, soft cloth. Do not use steel wool cleaning pads as they are too abrasive and will scratch the tank surface.
- Rinse the tank again.
- Wipe the inside and the outside of the tank dry with a dry, clean, soft cloth.
- This tank cleaning procedure should be performed every time the bath is changed.   Thoroughly inspect drain areas for leaks.

REPAIRS

If you experience problems with your equipment, please call Omegasonics at: (800) 669-8227

LIMITED WARRANTY

Omegasonics warrants the OMG-3814BT ultrasonic cleaner for a period of one year from the date of purchase, when used in accordance with the manufacturer's instructions. During the warranty period, Omegasonics will repair or replace free of charge at an authorized repair service center all parts that are defective because of material or workmanship. Freight charges to an authorized service centers are the responsibility of the user.

This warranty does not include damage or product failure, which results from cavitation erosion, misuse, abuse or transportation damage. This warranty is limited to the original purchaser and is not transferable. Total liability for any reason whatsoever, shall not in any case exceed the cost of repair or replacement of the defective part. In no case shall Omegasonics be responsible for any incidental or consequential damages.

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Suite A
Simi Valley, CA 93065
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(805) 583-0561 fax
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SOLO Basic

Temperature Controller
User Manual

Manual Number: SLB-USER-M

SOLO Basic Temperature Controller
USER MANUAL

Please include the Manual Number and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

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To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

At a minimum, you should follow all applicable sections of the National Fire Code, National Electrical Code, and the codes of the National Electrical Manufacturer's Association (NEMA). There may be local regulatory or government offices that can also help determine which codes and standards are necessary for safe installation and operation.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.

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For additional warranty and safety information, see the Terms and Conditions section of our catalog. If you have any questions concerning the installation or operation of this equipment, or if you need additional information, please call us at 770-844-4200.

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Afin de réduire au minimum le risque d'éventuels problèmes de sécurité, vous devez respecter tous les codes locaux et nationaux applicables régissant l'installation et le fonctionnement de votre équipement. Ces codes diffèrent d'une région à l'autre et, habituellement, évoluent au fil du temps. Il vous incombe de déterminer les codes à respecter et de vous assurer que l'équipement, l'installation et le fonctionnement sont conformes aux exigences de la version la plus récente de ces codes.

Vous devez, à tout le moins, respecter toutes les sections applicables du Code national de prévention des incendies, du Code national de l'électricité et des codes de la National Electrical Manufacturer's Association (NEMA). Des organismes de réglementation ou des services gouvernementaux locaux peuvent également vous aider à déterminer les codes ainsi que les normes à respecter pour assurer une installation et un fonctionnement sûrs.

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Cette publication s'appuie sur l'information qui était disponible au moment de l'impression. À la société AutomationDirect, nous nous efforçons constamment d'améliorer nos produits et services. C'est pourquoi nous nous réservons le droit d'apporter des modifications aux produits ou aux publications en tout temps, sans préavis ni quelque obligation que ce soit. La présente publication peut aussi porter sur des caractéristiques susceptibles de ne pas être offertes dans certaines versions révisées du produit.

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Chapter 3: Keypad Operation and Setup Parameters

Chapter 4: Controller Inputs and Outputs

Chapter 5: Control Modes

GETTING STARTED

CHAPTER
1

In this Chapter...

Manual Overview

Overview of this Publication

The SOLO Basic Temperature Controller User Manual describes the installation, configuration, and methods of operation of the SOLO Basic Temperature Controller.

Who Should Read This Manual

This manual contains important information for those who will install, maintain, and/or operate any of the SOLO Basic Temperature Controllers.

Technical Support

By Telephone: 770-844-4200
(Mon.-Fri., 9:00 a.m.-6:00 p.m. E.T.)
On the Web: support.automationdirect.com

Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call technical support at **770-844-4200**. We are available weekdays from 9:00 a.m. to 6:00 p.m. Eastern Time.

We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company. Visit us at **www.automationdirect.com**.

Supplemental Manuals

If you are familiar with industrial control type devices, you may be able to get up and running with just the aid of the Quick Start Guide that is included with each SOLO Basic Temperature Controller.

Special Symbols

When you see the "notepad" icon in the left-hand margin, the paragraph to its immediate right will be a special note.

When you see the "exclamation mark" icon in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death (in extreme cases).

SOLO Basic Temperature Controller Introduction

General Description

AutomationDirect's SOLO Basic is a single loop temperature controller that can control heating or cooling processes. Depending upon the particular model of controller, the available outputs include relay, voltage pulse or current. On select models there are two alarm outputs available with nine selectable alarm types. SOLO Basic controllers have a single control output that can be used for control of a heating or cooling application. Models with alarm outputs can also be configured to use one of the alarm outputs as a second control output allowing both heating and cooling control or two stage heating or two stage cooling control. There are three types of control modes: PID, ON/OFF and Manual. SOLO Basic can accept various types of thermocouple and RTDs.

Other features include:

- Auto Tuning (AT) function with PID control
- 1/16 DIN panel size
- 2 line x 4 character 7-segment LCD display for Process Value (PV): Red color, and Set Point (SV): Green color
- Selectable display decimal point XXX.X or XXXX
- Selectable between °C and °F
- UL, CUL and CE agency approvals

Unpacking

After receiving the SOLO Basic Temperature Controller, please check for the following:

- Make sure that the package includes the Controller, the mounting bracket and hardware and the Quick Start Guide.
- Inspect the unit to insure it was not damaged during shipment.
- Make sure that the part number indicated on the serial number label corresponds with the part number of your order.

Temperature Controller

Mounting Bracket and Hardware

Quick Start Guide
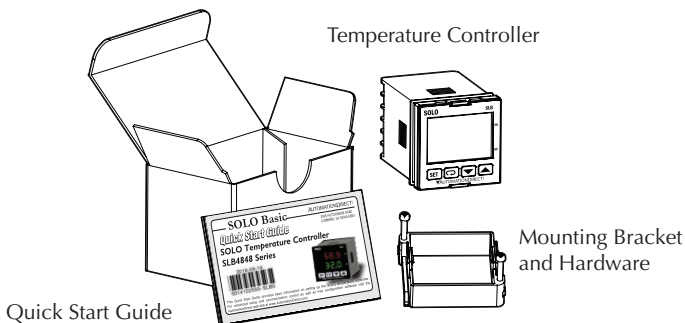
Model Number Explanation

SLB 4848 - R0

Alarm Relay Output
0: None
2: 2 Alarm outputs

Output
R: Relay output
V: Voltage Pulse output
C: DC Current output

Panel Size (W x H)
4848: 1/16 DIN W48 x H48mm

Solo Basic Temperature Controller
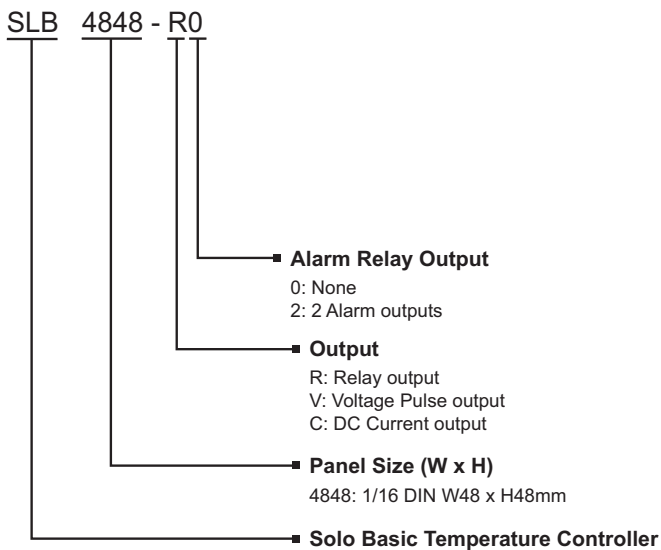
SOLO Basic Temperature Controller Specifications

Specifications	
Input Power Requirements	100 to 240 VAC 50 / 60 Hz
Operation Voltage Range	85 to 264 VAC
Power Consumption	5 VA Max
Control Mode	PID, ON/OFF or Manual
Input Accuracy	TC temperature indication accuracy: ±(0.3% of span + 1 digit) at 25°C ambient after 20 minutes warm up. Including NIST conformity, cold junction effect, A/D conversion errors and linearization conformity RTD temperature indication accuracy: ±(0.2% of span +1 digit)
Vibration Resistance	10 to 55 Hz, 10 m/s^2 for 10 min, each in X, Y and Z directions
Display	2 line x 4 character, 7-segment LED display PV: 11mm red SV: 9.2 mm green
Shock Resistance	Max. 300 m/s^2, 3 times in each 3 axes, 6 directions
Ambient Temperature Range	32°F to 122°F (0°C to 50°C)
Storage Temperature Range	-4°F to 149°F (-20°C to 65°C)
Altitude	2000m or less
Relative Humidity	35% to 80% (non-condensing)
IP Rating	IP66: Complete protection against dust and powerful water jets from all directions. (**inside suitable enclosure)
Agency Approvals	UL, CUL, CE (UL file number E311366)
Pollution Degree	Degree 2 - Normally, only non-conductive pollution occurs. Temporary conductivity caused by condensation is to be expected.
Input Types	
• Thermocouple*	K, J, T, E, N, R, S, B, L, U, TXK (Sampling Rate: 100 ms / per scan)
• Platinum RTD	3-wire Pt100, JPt100 (Sampling Rate: 100 ms / per scan)
RTDs **• Copper, Nickel**	Cu50, Ni120 (Sampling Rate: 100 ms / per scan)
Control Output Options	
• Relay (R)	SPST max. 5A @ 250 VAC resistive load
• Voltage Pulse (V)	DC 12V±15%, output current 40mA Max
• Current (C)	DC 4-20 mA output (sourcing) (Load resistance: Max 600Ω)
Alarm Output Option	(2) SPST relays with shared common, 3A @ 250VAC resistive load

*Note: Use only ungrounded thermocouples.
** No corrosive gases

CHAPTER
2

INSTALLATION AND WIRING

In this Chapter...

Ambient Conditions

Ambient Conditions	
Ambient Temperature Range	32°F to 122°F (0°C to 50°C)
Storage Temperature Range	-4°F to 149°F (-20°C to 65°C)
Relative Humidity	35% to 80% (non-condensing)
Altitude	2000m or lower above sea level, keep from corrosive gas, liquid and dust
Pollution Degree	Degree 2 - Normally, only non-conductive pollution occurs. Temporary conductivity caused by condensation is to be expected.
Vibration Resistance	10 to 55 Hz, 10 m/s2 for 10 min, each in X, Y and Z directions
Shock Resistance	Max. 300 m/s2, 3 times in each 3 axes, 6 directions
IP Rating	IP66: Complete protection against dust and powerful water jets from all directions. (*inside suitable enclosure)
*No corrosive gases	

Installation Considerations

Improper installation of the controller will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location:

⚠ **Warning: Failure to observe these precautions may damage the controller and void the warranty!**

- Do not mount the controller near heat-radiating elements or in direct sunlight.

- Do not install the controller in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.

- Do not restrict the air flow to the vent opening on the controller housing

- This controller is an open-type unit and must be placed in an enclosure to ensure proper operation and maintain the IP66 rating.

Mounting Instructions

SLB4848 Series

SOLO Basic temperature controllers should be mounted through a cutout in an enclosure or panel by using the dimensions shown on page 2–4. The directions for mounting the controller through a cutout are:

1. Insert the temperature controller through the panel cutout.

2. Slide the M3X0.5 nut into the opening in the top of the mounting bracket and insert the M3X0.5 X 30mm mounting screw in the mounting bracket.

3. Insert the mounting bracket into the mounting groove at the right and left of the controller, and push the mounting bracket forward until the bracket stops.

4. Tighten top and bottom screws evenly to secure temperature controller in place (The screw torque should be 0.4 to 0.5 N.m).
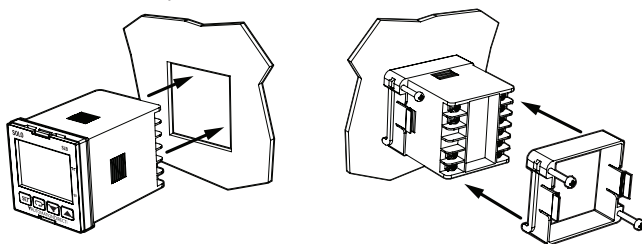
Controller and Panel Cutout Dimensions

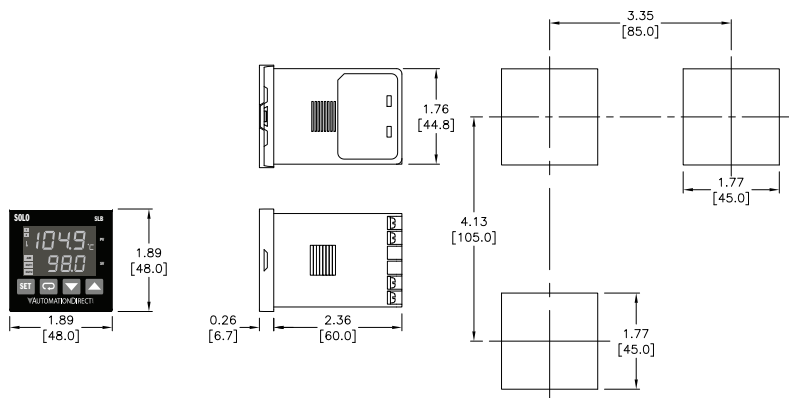**SLB4848 Series**   Minimum Cutout and Spacing

3.35
[85.0]

1.76
[44.8]

1.77
[45.0]

4.13
[105.0]

1.89
[48.0]

1.89
[48.0]

0.26
[6.7]

2.36
[60.0]

1.77
[45.0]

SOLO   SLB

104.9
98.0

SET

AUTOMATIONDIRECT

Safety Information

DANGER!

Warning: To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and it is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes

Warning: To prevent electric shock, do not touch the AC terminals while power is supplied to the controller.

Warning: This controller is an open-type temperature controller. Make sure to evaluate any dangerous application in which a serious human injury or serious property damage may occur.

Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.

If you have any questions concerning the installation or operation of this equipment, or if you need additional information, please call us at 1-800-633-0405 or 770-844-4200.

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1. Always use recommended solder-less terminals: Fork terminal with isolation (M3 screw, width is 5.8mm, hole diameter 3.2mm). Screw size: M3 x 4.5 (With 6 x 6 square washer). Recommended tightening torque: 0.4 Nm (4kgfcm). Applicable wire: Solid/twisted wire 14AWG to 22AWG.

2. Protect the controller from dust or foreign objects as they can cause the controller to malfunction.

3. Never modify or disassemble the controller.

4. Do not connect anything to the "Not used" terminals.

5. Make sure all wires are connected to the correct polarity of terminals.

6. Do not install and/or use the controller in places subject to: (a) Dust or corrosive gases and liquid (b) High humidity (c) Vibration or shock (d) EMI / RFI (e) high temperature.

7. Power must be turned off when wiring or changing a sensor.

8. Be sure to use wires that match the thermocouple types when extending or connecting thermocouple wires.

9. Use wires with correct resistance when extending or connecting a RTD.

10. Keep the wire as short as possible when wiring a RTD to the controller and route power wires as far as possible from sensor wires to prevent interference and induced noise.

11. This controller is an open-type unit and must be placed in an enclosure to ensure proper operation and maintain the **IP66 rating.**

12. Make sure power cables and signals from instruments are all installed properly before energizing the controller, otherwise serious damage may occur.

13. To prevent electric shock, do not touch the terminals on the controller or try to repair the controller when power is applied.

14. Do not use acid or alkaline liquids for cleaning. Use a soft, dry cloth to clean the controller.

15. This instrument is not furnished with a power switch or fuse. Therefore, if a fuse or power switch is required, install the protection close to the instrument. Recommended fuse rating: Rated voltage 250 V, Rated current 1 A. Fuse type: Time-delay fuse. See the AutomationDirect catalog for the appropriate fuse for the specific application.

16. Note: This controller does not provide overcurrent protection. Use of this product requires that suitable overcurrent protection device(s) must be added to ensure compliance with all relevant electrical standards and codes. (Rated 250 V, 15 Amps max). A suitable disconnecting device should be provided near the controller in the end-use installation.

Terminal Identification
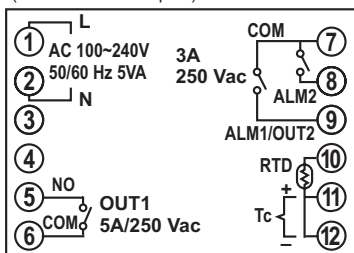
SLB4848 Series Wiring

SLB4848-R0

(No alarm output)
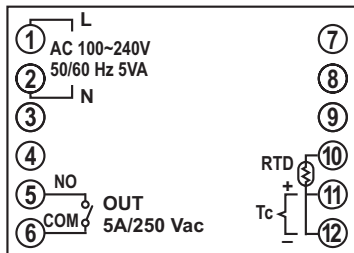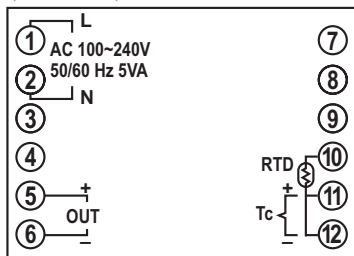

SLB4848-R2

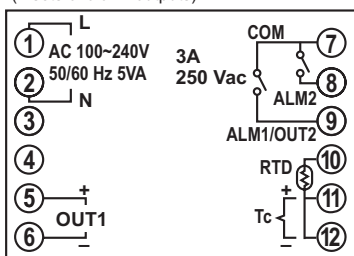(2 sets of alarm outputs)

SLB4848-C0
SLB4848-V0

(No alarm output)

SLB4848-C2
SLB4848-V2

(2 sets of alarm outputs)

KEYPAD OPERATION AND SETUP PARAMETERS

CHAPTER

3

In this Chapter...

Display, LCD and Keypad

The SOLO temperature controller has a two color seven segment LCD display and four function buttons.
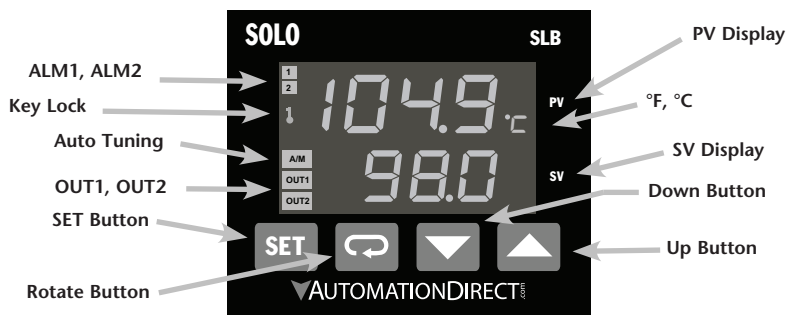
PV Display

The Process Value Display. Displays the value from the input source or the parameter source.

SV Display

The Set Value Display. Displays the set point of the process, the parameter operation read value, manipulated variable, or the set value of the parameter.

A/M Indicator

A/M indicator flashes when the Auto Tuning operation is ON and is solid when the controller is in Manual Mode.

OUT1, OUT2 Indicators

Output indicators light when the output is ON.

°F, °C Indicator

Temperature unit indicator. °C: Celsius, °F: Fahrenheit

1, 2 Indicators

Alarm output indicators light when appropriate alarm is activated.

Key Indicator

Key indicator lights when key lock is enabled.

Keypad Operation

Function Buttons

SET Button

Press the SET button to select the desired function mode and confirm the setting value.

Rotate Button

Press the Rotate button to select parameters within the function mode.

Down Button

Press the Down button to decrease values displayed on the SV display. Hold down this button to speed up the decrement.

Up Button

Press the Up button to increase values displayed on the SV display. Hold down this button to speed up the increment.

Initial Power up

When power is first applied to the temperature controller, the module information splash screen appears. This screen shows the firmware version on the PV displays and the output type for that particular model and the current input setting on the SV display. After three seconds, the controller will automatically proceed to the Operation mode main screen.

Keypad Operation

The temperature controller has three function modes: Initial Setting mode, Operation mode and Regulation mode. Press and hold the SET button for three seconds to go into the Initial Setting mode. Press the SET button for less than three seconds to access the Regulation mode. Press the Rotate button while inside any of the three function modes to scroll through the individual parameters for each function mode. Use the Up and Down buttons to change the individual parameter values. Pressing the SET button saves the parameter values. Press the SET button again to return the controller to the Operation mode main screen.
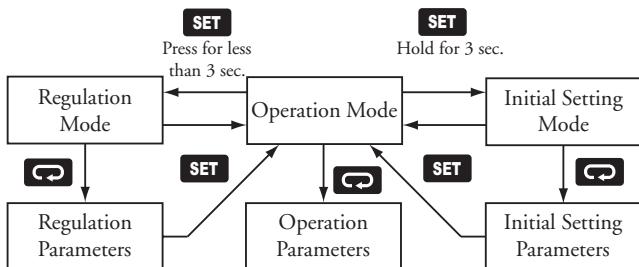
Setup Parameter Listing

Regulation Mode Parameters

Press the **SET** button to access these parameters.

		Controller Type						Control Mode			Heating / Cooling					
Display	Parameter Name	RO	VO	CO	R2	V2	C2	PID	ON /OFF	Manual	Heating	Cooling	Heating/Cooling	Cooling/Heating	Heating/Heating	Cooling/Cooling
At	Auto Tuning	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔
P	Proportion Band	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔
I	Integral Time	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔
d	Derivative Time	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔
PdoF	PD Control Offset	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔
o1-S	Output 1 Hysteresis	✔	✔	✔	✔	✔	✔	-	✔	-	✔	✔	✔	✔	✔	✔
o1-H	Output 1 Heating Period	✔	✔	✔	✔	✔	✔	✔	-	✔	✔	-	✔	-	✔	-
o1-C	Output 1 Cooling Period	✔	✔	✔	✔	✔	✔	✔	-	✔	-	✔	-	✔	-	✔
o2-S	Output 2 Hysteresis	-	-	-	✔	✔	✔	-	✔	-	-	-	✔	✔	✔	✔
o2-H	Output 2 Heating Period	-	-	-	✔	✔	✔	✔	-	✔	-	-	-	✔	✔	-
o2-C	Output 2 Cooling Period	-	-	-	✔	✔	✔	✔	-	✔	-	-	✔	-	-	✔
CoEF	Proportional Band Coefficient	-	-	-	✔	✔	✔	-	-	-	-	-	✔	✔	-	-
dEAd	Deadband	-	-	-	✔	✔	✔	✔	✔	-	-	-	✔	✔	-	-
Pv-F	PV Filter	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Pv-r	PV Filter Range	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
PvoF	PV Offset	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Pv6A	PV Gain	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
A InA	Analog High Adjustment	-	-	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
A InL	Analog Low Adjustment	-	-	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Operation Mode Parameters

Press the 🔄 button to access these parameters.

Operation Mode Parameter Availablity																
		Controller Type						Control Mode			Heating / Cooling					
Display	**Parameter Name**	R0	V0	C0	R2	V2	C2	PID	ON /OFF	Manual	Heating	Cooling	Heating/Cooling	Cooling/Heating	Heating/Heating	Cooling/Cooling
`r-S`	Run / Stop	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`SP`	Decimal Point Position	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`LoC`	Lock Mode	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`AL1H`	Alarm 1 High Limit	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	-	-	-	-
`AL1L`	Alarm 1 Low Limit	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	-	-	-	-
`AL2H`	Alarm 2 High Limit	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`AL2L`	Alarm 2 Low Limit	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`oUt1`	Output 1 Level	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`oUt2`	Output 2 Level	-	-	-	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔
`o1AH`	Output 1 Upper Limit	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`o1AL`	Output 1 Lower Limit	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`o2AH`	Output 2 Upper Limit	-	-	-	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔
`o2AL`	Output 2 Lower Limit	-	-	-	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔

Initial Setting Parameters

Press the [SET] button for more than three seconds to access these parameters.

Initial Setting Mode Parameter Availablity															
		Controller Type						Control Mode			Heating / Cooling					
Display	Parameter Name	R0	V0	C0	R2	V2	C2	PID	ON /OFF	Manual	Heating	Cooling	Heating/Cooling	Cooling/Heating	Cooling/Cooling	Heating/Heating
`InPt`	Input Type	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`tPUn`	Temperature Unit	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`tP-H`	Input Range High	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`tP-L`	Input Range Low	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`Ctrl`	Control Mode	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`S-HC`	Heating / Cooling	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`ALA1`	Alarm 1	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	-	-	-	-
`AL1o`	Alarm 1 Options	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	-	-	-	-
`AL1d`	Alarm 1 Delay	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	-	-	-	-
`ALA2`	Alarm 2	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`AL2o`	Alarm 2 Options	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
`AL2d`	Alarm 2 Delay	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Regulation Mode Parameters

Press the **SET** button for less than three seconds to access
these parameters.

�ⒶⓉ **Auto Tuning**

Range: On - Auto Tuning activated
Off - Auto Tuning deactivated

When this parameter is set to On, the controller begins auto tuning.
After auto tuning is complete, the parameter is set to Off automatically.
If this parameter is set to Off during the auto tuning process, the
controller stops the auto tuning process immediately and does not
change any PID parameter. A/M indicator will flash while Auto Tuning
is in process.

P **Proportion Band**

Range: 0.1 to 999.9

The Proportion Band is a parameter used for PID control.

Ⓘ **Integral Time**

Range: 0 to 9999 (Sec)

The Integral Time is a parameter used for PID control.

d **Derivative Time**

Range: 0 to 9999 (Sec)

The Derivative Time is a parameter used for PID control.

PdoF **PD Control Offset**

Range: 0.0 to 100.0 (%)

The PD Control Offset parameter is available when the P or PD
control is selected [Integral Time parameter **Ⓘ** is zero].

This parameter defines the offset of the output. When the P or PD
control is used, the control cannot stabilize the PV at the SV because
the output is zero when the PV is equal to the SV. This parameter
modifies the output level when the PV is equal to the SV.

o1-S / o2-S   **Output 1 / Output 2 Hysteresis**

Range: 0.0 to 999.9

The Output Hysteresis parameter defines the amount that the PV must go below or above the SV before the output turns on. This parameter is available only for On / Off control and hysteresis direction will be dependent on whether the output is set for heating or cooling.
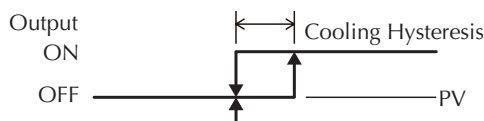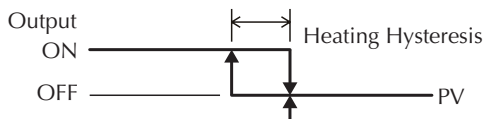
o1-H / o2-H   **Output 1 / Output 2 Heating Period**

Range: 0.1 to 60 seconds (R0/R2 relay models - 5 to 60 seconds)

The Output Heating parameter defines one output period or the duration of one on / off cycle for the Output.

This parameter is available when the Output is programmed as a heating output. Available in PID and Manual mode.

o1-C / o2-C   **Output 1 / Output 2 Cooling Period**

Range: 0.1 to 60 seconds (R0/R2 relay models - 5 to 60 seconds)

The Output Cooling parameter defines one output period or the duration of one on / off cycle for the Output.

This parameter is available when the Output is programmed as a cooling output. Available in PID and Manual mode.

`CoEF`   **Proportional Band Coefficient**

The PID proportional coefficient between Output 1 and Output 2 when a dual output control is selected. The P value of Output 2 equals the P value of Output 1 PID * `CoEF`. The I and D value of Output 2's PID are the same as Output 1's. Defualt value is 1.00.

`dEAd`   **Deadband**

The deadband around the SV value. For example, if SV = 100 degrees and `dEAd` = 2.0, there will be no output when the temperature is between 99~101°C. See PID and On/Off control sections in chapter 5. Default value is 0.

`Pv-F`   **PV Filter**

The process value filter takes the input and applies a rolling average to compensate for noisy signals. Filter equation: (Last displayed PV * `Pv-F` + Current Measurement) / (`Pv-F`+1). Range of 0 to 50 with a system default of 2.

`Pv-r`   **PV Filter Range**

Process value filter range is the plus or minus range from the last displayed PV that PV Filtering will be applied. For very noisy signals the number must be large enough to capture large oscillations in signal. Range of 0.10 to 10.00 degrees with a system default of 1.

`PvoF`   **PV Offset**

The PV Offset is the amount added to the current process value. Range of -99.9 to 99.9 with a system default of 0.

`PvGA`   **PV Gain**

The PV Gain is the multiplier applied to the current process value. Range of -0.999 to 0.999 with a system default of 0. Gain equation: PV = Current Measurement * (1 + `PvGA` / 1.000) + `PvoF`.

`A IHA`   **Analog High Adjustment**

The Analog High Adjustment value is added to the maximum analog output of 20ma in 1uA increments. If set to 500 the output will be 20.5ma at 100 percent output. Range of -3895 to 659 with a system default of 0. This parameter is only available on Current Output models.

`A IHL`   **Analog Low Adjustment**

The Analog Low Adjustment value is added to the minimum analog output of 4ma in 1uA increments. If set to -100 the output will be 3.9ma at 0 percent output. Range of -964 to 3895 with a system default of 0.

This parameter is only available on Current Output models.

Operation Mode Parameters

Press the   button to access these parameters.

`r-S` Run / Stop

The Run / Stop parameter is used to control the operational status of the SOLO Basic Controller. The controller can either be in run mode or stop mode. During stop mode the output is turned off but alarms remain active.

`rUn` Run mode
`StoP` Stop mode

`SP` Decimal Point Position

Range: 0 (****)
      1 (***.*) Note: Maximum temperature displayed (PV) will be limited to "999.9".

This parameter defines the decimal point position on the PV and SV display.

`LoC` Lock Mode

Range: `oFF` The Lock feature is disabled.
       `LoC1` Lock Mode 1
       `LoC2` Lock Mode 2

Lock Mode 1: All key pad operation is ignored.

Lock Mode 2: All key pad operation is ignored except changing the SV. To unlock press the `SET` key and the `⟳` key at the same time to display `USEP` parameter. Enter the password to unlock the key. Default password is 0000.

`AL1H` Alarm 1 High Limit

This parameter is used to set the high limit for Alarm 1. The range and availability are dependent on the selected alarm mode.

`AL1L` Alarm 1 Low Limit

This parameter is used to set the low limit for Alarm 1. The range and availability are dependent on the selected alarm mode.

`AL2H` Alarm 2 High Limit

This parameter is used to set the high limit for Alarm 2. The range and availability are dependent on the selected alarm mode.

`AL2L` Alarm 2 Low Limit

This parameter is used to set the low limit for Alarm 2. The range and availability are dependent on the selected alarm mode.

`oUt 1` / `oUt2`	**Output 1 / Output 2 Level**

Range: 0.0 to 100 (%)

The value for this parameter can be changed in the Manual control mode. In other control modes, this parameter is read-only.

`o 1AA` / `o2AA`	**Output 1 / Output 2 Upper Limit**

Upper output percentage. Linear calculation is done between the upper and lower limit. Range of 0.0 to 100 with a system default of 100.

`o 1AL` / `o2AL`	**Output 1 / Output 2 Lower Limit**

Lower output percentage. Linear calculation is done between the lower and upper limit. Range of 0.0 to 100 with a system default of 0.0.

Initial Setting Parameters

Press the **SET** button for more than three seconds to access these parameters.

`InPt` **Input Type**

This parameter defines the input signal type.

Thermocouple* Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Thermocouple TXK type	`tXK`	-238 ~ 1472°F (-150 ~ 800°C)
Thermocouple U type	`U`	-328 ~ 932°F (-200 ~ 500°C)
Thermocouple L type	`L`	-328 ~ 1562°F (-200 ~ 850°C)
Thermocouple B type	`b`	212 ~ 3272°F (100 ~ 1800°C)
Thermocouple S type	`S`	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple R type	`r`	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple N type	`n`	-328 ~ 2372°F (-200 ~ 1300°C)
Thermocouple E type	`E`	32 ~ 1112°F (0 ~ 600°C)
Thermocouple T type	`t`	-328 ~ 752°F (-200 ~ 400°C)
Thermocouple J type	`J`	-148 ~ 2192°F (-100 ~ 1200°C)
Thermocouple K type	`K`	-328 ~ 2372°F (-200 ~ 1300°C)
RTD Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Platinum (Pt100)	`Pt`	-328 ~ 1562°F (-200 ~ 850°C)
Platinum (JPt100)	`JPt`	-148 ~ 752°F (-100 ~ 400°C)
Copper (Cu50)	`CU`	-58 ~ 302°F (-50 ~ 150°C)
Nickel (Ni120)	`nL`	-112 ~ 572°F (-80 ~ 300°C)
Note: Use only ungrounded thermocouples.		

`tPUn` **Temperature Unit**

Range: F, C
Sets controller units to Celsius or Fahrenheit.

`tP-H` **Input Range High**

This is the maximum value of the set point temperature range. The SV value cannot exceed the **`tP-H`** value. This parameter cannot be lower than the Input Range Low parameter (**`tP-L`**).

`tP-L` **Input Range Low**

This is the minimum value of the set point temperature range. The SV value cannot be set lower than the **`tP-L`** value. This parameter cannot be higher than the Input Range High parameter (**`tP-H`**).

`Etrl` **Control Mode**

Range: **`PId`** PID control mode
`onoF` On / Off control mode
`AAnU` Manual control mode

This parameter is used to select one of the control modes. See Chapter 5 for a complete discription of each control mode.

`S-HC` **Heating / Cooling**

Range:

`H1` Output = Heating   **`H1C2`** Output 1 = Heating 2 = Cooling   **`H1H2`** Output 1 / 2 = Heating

`C1` Output = Cooling   **`C1H2`** Output 1 = Cooling 2 = Heating   **`C1C2`** Output 1 / 2 = Cooling

The Heating / Cooling parameter defines whether one or two outputs will be controlled and what type of control they will perform.

`ALA1` **Alarm 1**
`ALA2` **Alarm 2**

Range: 0 to 9

The SOLO Basic models equipped with alarms support 2 alarm outputs. The Alarm1 and Alarm2 parameters are used to select the alarm type. Refer to Chapter 4 for details.

`AL1o` **Alarm 1 Options**

Alarm standby until process value is within +/-5 of set point to prevent false triggers on startup xxxY (When Y=0: Normal, Y=1: Standby)

Alarm output normally open or normally closed xxYx (When Y=0: NO, Y=1: NC)

Hold alarm till power cycle or controller is stopped xYxx (When Y=0: Normal Reset, Y=1: Hold Alarm)

Not used Yxxx

`AL1d` **Alarm 1 Delay**

Length of time alarm condition must be active in seconds before alarm condition is triggered.

`AL2o` **Alarm 2 Options**

Alarm standby until process value is within +/-5 of set point to prevent false triggers on startup xxxY (When Y=0: Normal, Y=1: Standby)

Alarm output normally open or normally closed xxYx (When Y=0: NO, Y=1: NC)

Hold alarm till power cycle or controller is stopped xYxx (When Y=0: Normal Reset, Y=1: Hold Alarm)

Not used Yxxx

> **AL2d**   **Alarm 2 Delay**
> Length of time alarm condition must be active in seconds before alarm condition is triggered.

Reset to Factory Default

Note: Resetting the Temperature Controller back to factory default erases all of the values entered by the user. Record any necessary settings before proceeding

Warning: Erasing the user entered values may result in a safety hazard and system malfunction.

The following instructions reset the controller to the factory default.

❶ Press the ⮂ button until the parameter **LoC** appears. Use the ▲ button to select **LoC1**. Press the **SET** button.

❷ Press and hold the **SET** and ▲ buttons simultaneously for three seconds and release.

❸ Use the ▲ button to change the value on the SV display to **1357**. Press the **SET** button.

❹ Display will change from **PASS** to **PArE**. Press ▲ to change value from no to yes and press set button.

❺ Display will be fully lit and then controller will reboot.

Key Lock Function

Adjusting paramber of **LoC** to **LoC1** in Operation Mode to lock all keys. **LoC2** allows the SV value to be adjusted.

To unlock:

❶ Press the **SET** and ⮂ keys simultaneously in LOCK mode to display **KEYP**. Enter the password to unlock the key. Default password is 0000.

To change key lock password:

❶ Press the ⮂ key when **KEYP** is displayed to enter the password change screen **CHGP**.

❷ Enter the current password. If the password is correct, **nEGP** will be displayed. If the password is incorrect, the screen will return to PV/SV display mode.

❸ Once ⬛⬛⬛⬛ is displayed enter the new password two times. The screen will return to PV/SV display mode with the keys unlocked. If two password entries do not match, the screen will return to step 2.

Note: If the password is lost or fogotten, restore the factory settings to reset lock condition.

CONTROLLER INPUTS AND OUTPUTS

CHAPTER 4

In this Chapter...

Control Input Types

Thermocouple or RTD Input

The SOLO Basic temperature controller can accept input from eleven types of thermocouples and four types of RTD sensors.

Thermocouple* Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Thermocouple TXK type	ᵗᵞᵏ	-328 ~ 1472°F (-200 ~ 800°C)
Thermocouple U type	ᵤ	-328 ~ 932°F (-200 ~ 500°C)
Thermocouple L type	ᴸ	-328 ~ 1562°F (-200 ~ 850°C)
Thermocouple B type	ᵇ	212 ~ 3272°F (100 ~ 1800°C)
Thermocouple S type	ᵟ	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple R type	ᵣ	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple N type	ᵑ	-328 ~ 2372°F (-200 ~ 1300°C)
Thermocouple E type	ᴱ	32 ~ 1112°F (0 ~ 600°C)
Thermocouple T type	ᵗ	-328 ~ 752°F (-200 ~ 400°C)
Thermocouple J type	ᴶ	-148 ~ 2192°F (-100 ~ 1200°C)
Thermocouple K type	ᵏ	-328 ~ 2372°F (-200 ~ 1300°C)
RTD Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Platinum (Pt100)	ᴾᵗ	-328 ~ 1562°F (-200 ~ 850°C)
Platinum (JPt100)	ᴶᴾᵗ	-148 ~ 752°F (-100 ~ 400°C)
Copper (Cu50)	ᶜᵘ	-58 ~ 302°F (-50 ~ 150°C)
Nickel (Ni120)	ᵑᵗ	-112 ~ 572°F (-80 ~ 300°C)
Note - Use only ungrounded thermocouples		

Control Output Types

The SOLO temperature controller supports three types of control outputs depending on the model chosen. The available outputs are Relay, Voltage Pulse and Current as shown in the controller part number.

SLB4848 - V 2

Output Type
R: Relay output
V: Voltage Pulse output
C: DC Current output

Relay Output

The relay used for the relay output in the SLB4848 is rated at a maximum 250 VAC and 5A resistive load. A secondary 250 VAC 3A resistive load output is available when using a model with alarms in one of the dual output modes.

The operation cycle of the Relay output is controlled by two factors, Output Level and Output Period.
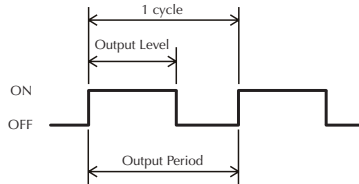
For example, when the Output Level is 60% and the Output Period is 10 seconds, the output relay is turned on for 6 seconds in the cycle.

There are six parameters that define these two factors.

Output Level

Output 1 Level (ᴏᵁᵗ ı), Range: 0.0 to 100%
Output 2 Level (ᴏᵁᵗ₂), Range: 0.0 to 100%

Output Period

Output 1 Heating Period (ᴏ ı-ᴴ), Range: 5 to 60 seconds
Output 1 Cooling Period (ᴏ ı-ᶜ), Range: 5 to 60 seconds
Output 2 Heating Period (ᴏ₂-ᴴ), Range: 5 to 60 seconds
Output 2 Cooling Period (ᴏ₂-ᶜ), Range: 5 to 60 seconds

Note: The electrical life expectancy of the relay output is 100,000 cycles. To maximize the life of the relay output, set a longer time value for the Output Period.

Voltage Pulse Output

The Voltage Pulse output generates a high level pulse of 12 VDC nominal and low level pulse of 0VDC. It can supply up to 40ma.

The operation cycle of the Voltage Pulse output is controlled by two factors, Output Level and Output Period.
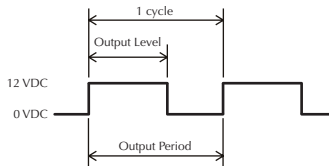
For example, when the Output Level is 60% and the Output Period is 10

seconds, the Voltage Pulse output is turned on for 6 seconds in the cycle.

There are three parameters that define these two factors.

Output Level

Output Level 1 (**⌐Ⅎ𝖻 ꓔ**), Range: 0.0 to 100%

Output Period

Output 1 Heating Period (**ᖯ ꓔ-Ⴙ**), Range: 0.1 to 60 seconds
Output 1 Cooling Period (**ᖯ ꓔ-ᘿ**), Range: 0.1 to 60 seconds

Current Output

The Current output generates analog DC current with a range of 4-20 mA. The maximum load resistance is 600 Ω.

The output current is controlled by four factors, Analog High Adjustment, Analog Low Adjustment, Output Level and Output Period.
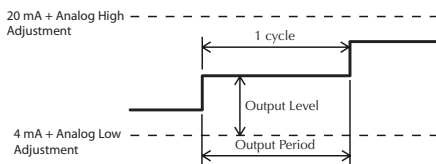
The Analog High Adjustment value may be changed to adjust the output current when the Output Level is 100%.

The Analog Low Adjustment value may be changed to adjust the output current when the Output Level is 0%.

The Output Level determines the output current level between "20mA + Analog High Adjustment" and "4mA + Analog Low Adjustment".

The Output Period sets how often the SOLO controller updates the output value.

There are seven parameters that define these four factors.

Analog High Adjustment

Analog High Adjustment (**ᖇ ꓔᥒᖇ**). Range -3895 to 659 uA.

Analog Low Adjustment

Analog Low Adjustment (**ᖇ ꓔᥒᒪ**). Range -964 to 3895 uA.

Output Level

Output 1 Level (⬛**out 1**). Range: 0.0 to 100%
Output 1 Upper Limit (⬛**1 oA**). Range of 0.0 to 100%
Output 1 Lower Limit (⬛**1 oL**). Range of 0.00 to 100%

Output Period

Output 1 Heating Period (⬛**1-H**). Range: 0.1 to 60 seconds
Output 1 Cooling Period (⬛**1-C**). Range: 0.1 to 60 seconds

Alarm Outputs

The SOLO Basic controller can support two alarms on select models.

See the Alarm Output Chart on the following page.

Alarm Output Types

Set Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled	Output is OFF
1	Deviation upper- and lower-limit: Alarm output activates when PV value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	
2	Deviation upper limit: Alarm output activates when PV value is higher than the setting value SV+(AL-H).	
3	Deviation lower limit: Alarm output activates when PV value is lower than the setting value SV-(AL-L).	
4	Absolute value upper and lower limit: Alarm output activates when PV value is higher than the setting value AL-H or lower than the setting value AL-L.	
5	Absolute value upper limit: Alarm output activates when PV value is higher than the setting value AL-H.	
6	Absolute value lower limit: Alarm output activates when PV value is lower than the setting value AL-L.	
7	Hysteresis upper limit alarm output: Alarm output activates when PV value is higher than the setting value SV+(AL-H). The alarm output turns OFF when the PV value is lower than the setting value SV+(AL-L).	
8	Hysteresis lower limit alarm output: Alarm output activates when PV value is lower than the setting value SV-(AL-H). The alarm output turns OFF when the PV value is higher than the setting value SV-(AL-L).	
9	Disconnection Alarm: This alarm output is enabled if the sensor connection is incorrect or has been disconnected.	
Note: Alarm types 1-9 will enable the alarm output if a sensor disconnect or incorrect connection is detected.		

CHAPTER 5

CONTROL MODES

In this Chapter...

The SOLO Basic controller can be configured for any of the following control modes.

- PID control
- On / Off control
- Manual control

PID Control

Auto Tuning

The SOLO Basic controllers support an Auto Tuning feature to set up the following PID parameters automatically.

P   Proportional Band

L   Integral Time

d   Derivative Time

PdoF   PD Control Offset

Use the ▼ and ▲ buttons to set the desired setpoint and press **SET** to save before starting the auto-tune process.

To start the Auto Tuning, set the parameter Auto Tuning (**AL**) to On. The controller automatically controls the output to change the PV as shown below.
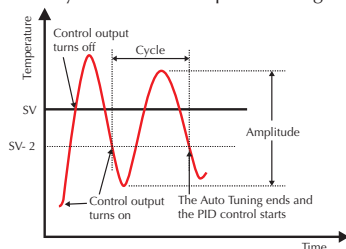
Once the Auto Tuning process is completed, the SOLO Basic controller calculates the above PID parameters and starts the PID control with the new parameter values immediately.

Deadband

The range around the PV in which the heating/cooling outputs remain off. A negative deadband has the opposite effect allowing both outputs to be on in the area around the PV.

Dual control with PID positive deadband

Dual control with PID negative deadband
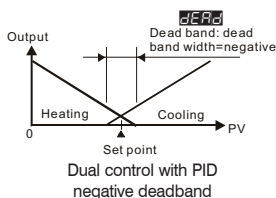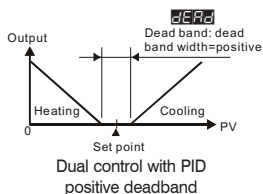
On / Off Control

In the On / Off control mode the output is controlled according to the difference between the SV and the PV. If the PV is lower than the SV and the output is set for heating, the heating output is turned on. If the PV is higher than the SV and the output is set for cooling, the cooling output is turned on. Hysteresis can be used to avoid output chatter and when in dual output mode Deadband will help prevent bouncing between heating and cooling.

Dual loop ON / OFF control output operation
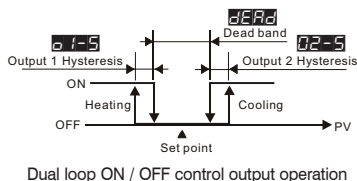
Hysteresis

If heating, this is the value below the set temperature that the PV must fall to before the output will turn on. If cooling, this is the value above the set temperature that the PV must rise to before the output will turn on.

Deadband

The range around the PV in which the heating/cooling outputs remain off. A negative deadband has the opposite effect allowing both outputs to be on in the area around the PV.

Manual Control

In the Manual control, the output of the controller is manipulated manually by the operator. Adjust the values of the Output Level parameters (`oUt 1` , `oUt2`) to control the output levels.

Error Display Information

The chart below illustrates the possible error displays shown on the SOLO Basic Temperature controller.

Controller Error Display				
Display Position	**Display**	**Meaning**	**Cause**	**Corrective Action**
PV	no	No sensor input	The input terminals are open.	Check the input wiring. If the problem still exists, replace the sensor or the controller.
SV	Cont			
PV	SEn	Sensor Type Error	Temperature is out of range for sensor type	Check sensor type and it's condition. If damaged or wrong replace and update settings. Check actual condition to make sure temperature is within sensor range.
SV	Err			
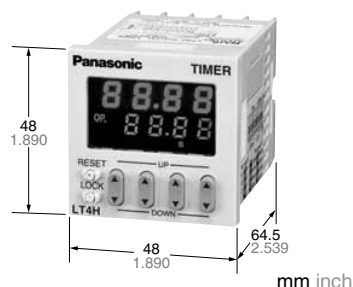
LT4H Timers

48
1.890

RESET
LOCK
LT4H

UP

DOWN

48
1.890

64.5
2.539

mm inch

Pin type

Screw terminal type

RoHS Directive compatibility information
http://www.nais-e.com/

UL File No.: E122222
C-UL File No.: E122222

Features
1. Bright and Easy-to-Read Display
A brand new bright 2-color back light LCD display. The easy-to-read screen in any location makes checking and setting procedures a cinch.
2. Simple Operation
Seesaw buttons make operating the unit even easier than before.
3. Short Body of only 64.5 mm 2.539 inch (screw terminal type) or 70.1 mm 2.760 inch (pin type)
With a short body, it is easy to install in even narrow control panels.
4. Conforms to IP66's Weather Resistant Standards
The water-proof panel keeps out water and dirt for reliable operation even in poor environments.

5. Screw terminal (M3.5) and Pin Types are Both Standard Options
The two terminal types are standard options to support either front panel installation or embedded installation.
6. Changeable Panel Cover
Also offers a black panel cover to meet your design considerations.
7. Compliant with UL, c-UL and CE.

Product types

Time range	Operating mode	Output	Operating voltage	Power down insurance	Terminal type	Part number
9.999 s (0.001 s~) 99.99 s (0.01 s~) 999.9 s (0.1 s~) 9999 s (1 s~) 99 min 59 s (1 s~) 999.9 min (0.1 min~) 99 h 59 min (1 min~) 999.9 h (0.1 h~)	Power ON delay (1) Power ON delay (2) Signal ON delay Signal OFF delay Pulse One-shot Pulse ON-delay Signal Flicker Totalizing ON-delay (8 modes)	Relay (1 c)	100 to 240 V AC	Available	8 pins	LT4H8-AC240V
					11 pins	LT4H-AC240V
					Screw terminal	LT4H-AC240VS
			24 V AC		8 pins	LT4H8-AC24V
					11 pins	LT4H-AC24V
					Screw terminal	LT4H-AC24VS
			12 to 24 V DC		8 pins	LT4H8-DC24V
					11 pins	LT4H-DC24V
					Screw terminal	LT4H-DC24VS
		Transistor (1 a)	100 to 240 V AC		8 pins	LT4HT8-AC240V
					11 pins	LT4HT-AC240V
					Screw terminal	LT4HT-AC240VS
			24 V AC		8 pins	LT4HT8-AC24V
					11 pins	LT4HT-AC24V
					Screw terminal	LT4HT-AC24VS
			12 to 24 V DC		8 pins	LT4HT8-DC24V
					11 pins	LT4HT-DC24V
					Screw terminal	LT4HT-DC24VS

* A rubber gasket (ATC18002) and a mounting frame (AT8-DA4) are included.

LT4H-L Timers

UL File No.: E122222
C-UL File No.: E122222

Features

1. Economically priced in anticipation of market needs.
• Economically priced to provide excellent cost performance.
2. Display is a bright reflective-type LCD.
3. Inherits all of the characteristics of the LT4H digital timer.
• Seesaw switches ensure easy operation.
• IP66 environmental protection.
• Shortened body (70.1 mm 2.760 inch underhead).

4. Compliant with UL, c-UL and CE.
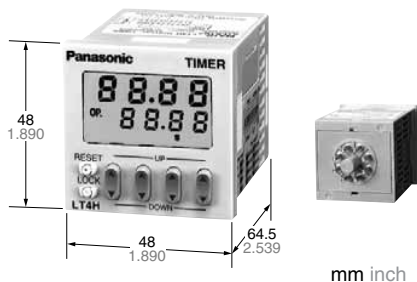
48 1.890
48 1.890
64.5 2.539
mm inch

Product types

Product name	Time range	Operating mode	Output	Operating voltage	Power down insurance	Terminal type	Part number
LT4H-L digital timer	9.999 s (0.001 s~) 99.99 s (0.01 s~) 999.9 s (0.1 s~) 9999 s (1 s~) 99 min 59 s (1 s~) 999.9 min (0.1 min~) 99 h 59 min (1 min~) 999.9 h (0.1 h~)	Power ON delay (1) Power ON delay (2) Signal ON delay Signal OFF delay Pulse One-shot Pulse ON-delay Signal Flicker Totalizing ON-delay (8 modes)	Relay (1 c)	100 to 240 V AC	Available	8 pins	LT4HL8-AC240V
				24 V AC/DC			LT4HL8-AC24V
				12 to 24 V DC			LT4HL8-DC24V
			Transistor (1 a)	100 to 240 V AC			LT4HLT8-AC240V
				24 V AC/DC			LT4HLT8-AC24V
				12 to 24 V DC			LT4HLT8-DC24V

Part names

Time delay indicator
Controlled output indicator
Reset indicator
Lock indicator
Reset switch
Lock switch

(Countdown time display)
Elapsed time display
Set time display
Time units display
Up keys
Down keys

DIP switches
(Same for screw terminal type and 8-pin type)

LT4H/-L

Specifications

Item	Type	Ralay output type		Transistor output type	
		AC type AC/DC type	DC type	AC type AC/DC type	DC type
Rating	Rated operating voltage	100 to 240 V AC, 24 V AC, 24 V AC/DC	12 to 24 V DC	100 to 240 V AC, 24 V AC, 24 V AC/DC	12 to 24 V DC
	Rated frequency	50/60 Hz common	—	50/60 Hz common	—
	Rated power consumption	Max. 10 V A	Max. 3 W	Max. 10 V A	Max. 3 W
	Rated control capacity	5 A, 250 V AC (resistive load)		100 mA, 30 V DC	
	Time range	9.999 s, 99.99 s, 999.9 s, 9999 s, 99 min 59 s, 999.9 min, 99 h 59 min, 999.9 h (selected by DIP switch)			
	Time counting direction	Addition (UP)/Subtraction (DOWN) (2 directions selectable by DIP switch)			
	Operation mode	A (Power ON delay 1), A2 (Power ON delay 2), B (Signal ON delay), C (Signal OFF delay), D (Pulse one-shot), E (Pulse ON delay), F (Signal Flicker), G (Totalizing ON delay) (selectable by DIP switch)			
	Start/Reset/Stop input	Min. input signal width: 1 ms, 20 ms (2 directions by selected by DIP switch) (The 8-pin type does not have a stop input.)			
	Lock input	Min. input signal width: 20 ms (The 8-pin type does not have a lock input.)			
	Input signal	Open collector input Input impedance: Max. 1 kΩ; Residual voltage: Max. 2 V Open impedance: 100kΩ or less, Max. energized voltage: 40V DC			
	Indication	7-segment LCD (LT4H, LT4H-L common), Elapsed value (backlight red LED), Setting value (backlight yellow LED)			
	Power failure memory method	EEP-ROM (Min. 10⁵ overwriting)			
Time accuracy (max.)	Operating time fluctuation	± (0.005 % + 50 ms) in case of power on start ± (0.005 % + 20 ms) in case of input signal start		[Operating voltage: 85 to 110% Temperature: −10 to +55°C +14 to +131°F Min. input signal width: 1ms]	
	Temperature error				
	Voltage error				
	Setting error				
Contact	Contact arrangement	Timed-out 1 Form C		Timed-out 1 Form A (Open collector)	
	Contact resistance (Initial value)	100 mΩ (at 1 A 6 V DC)		—	
	Contact material	Ag alloy/Au flash		—	
Life	Mechanical (contact)	Min. 2×10^7 ope. (Except for switch operation parts)		—	
	Electrical (contact)	1.0×10^5 ope. (At rated control voltage)		Min. 10^7 ope. (At rated control voltage)	
Electrical	Allowable operating voltage range	85 to 110 % of rated operating voltage			
	Breakdown voltage (Initial value)	2,000 Vrms for 1 min: Between live and dead metal parts (11-pin) 2,000 Vrms for 1 min: Between input and output 1,000 Vrms for 1 min: Between contacts		2,000 Vrms for 1 min: Between live and dead metal parts (Pin type) 2,000 Vrms for 1 min: Between input and output	
	Insulation resistance (Initial value)	Between live and dead metal parts Min. 100 MΩ: Between input and output (At 500V DC) Between contacts		Min. 100 MΩ: Between live and dead metal parts (At 500V DC) Between input and output	
	Operating voltage reset time	Max. 0.5 s			
	Temperature rise	Max. 65° C (under the flow of nominal operating current at nominal voltage)		—	
Mechanical	Vibration resistance Functional	10 to 55 Hz: 1 cycle/min single amplitude of 0.35 mm .014 inch (10 min on 3 axes)			
	Vibration resistance Destructive	10 to 55 Hz: 1 cycle/min single amplitude of 0.75 mm .030 inch (1 h on 3 axes)			
	Shock resistance Functional	Min. 98 m 321.522 ft./s² (4 times on 3 axes)			
	Shock resistance Destructive	Min. 294 m 964.567 ft./s² (5 times on 3 axes)			
Operating conditions	Ambient temperature	−10° C to 55° C +14° F to +131° F			
	Ambient humidity	Max. 85 % RH (non-condensing)			
	Air pressure	860 to 1,060 h Pa			
	Ripple rate	—	20 % or less	—	20 % or less
Connection		8-pin/11-pin/screw terminal			
Protective construction		IP66 (front panel with rubber gasket)			

Applicable standard

Safety standard	EN61812-1	Pollution Degree 2/Overvoltage Category II
EMC	(EMI)EN61000-6-4 Radiation interference electric field strength Noise terminal voltage (EMS)EN61000-6-2 Static discharge immunity RF electromagnetic field immunity EFT/B immunity Surge immunity Conductivity noise immunity Power frequency magnetic field immunity Voltage dip/Instantaneous stop/Voltage fluctuation immunity	EN55011 Group1 ClassA EN55011 Group1 ClassA EN61000-4-2 4 kV contact 8 kV air EN61000-4-3 10 V/m AM modulation (80 MHz to 1 GHz) 10 V/m pulse modulation (895 MHz to 905 MHz) EN61000-4-4 2 kV (power supply line) 1 kV (signal line) EN61000-4-5 1 kV (power line) EN61000-4-6 10 V/m AM modulation (0.15 MHz to 80 MHz) EN61000-4-8 30 A/m (50 Hz) EN61000-4-11 10 ms, 30% (rated voltage) 100 ms, 60% (rated voltage) 1,000 ms, 60% (rated voltage) 5,000 ms, 95% (rated voltage)	

Dimensions

• LT4H digital timer

Screw terminal type
(Flush mount)

Pin type
(Flush mount/Surface mount)

□48
□1.890

Panasonic   TIMER

OP.
RST.
LOCK   h m s

RESET   UP
LOCK
LT4H   DOWN

5.5 .217   64.5 2.539

□44.5 □1.752

7.5 .295

5.5 .217   55.6 2.189   14.5 .571

□44.5 □1.752

7.5 .295
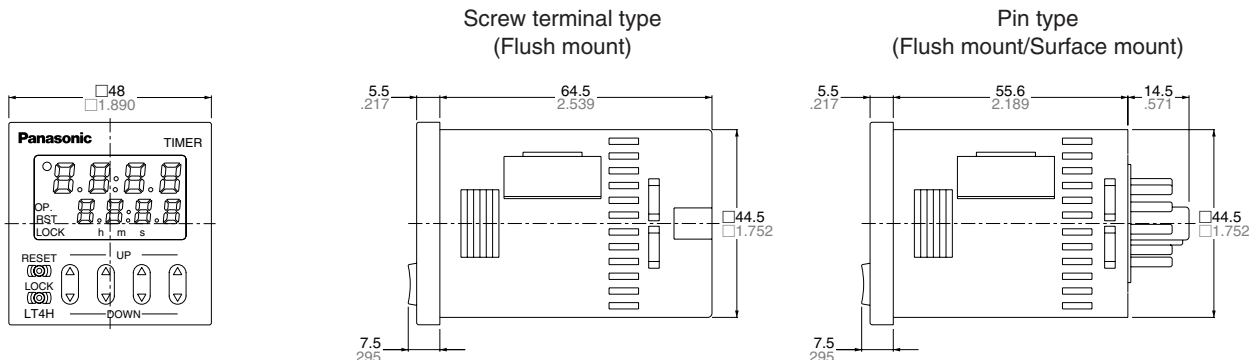
• Dimensions for embedded installation (with adapter installed)
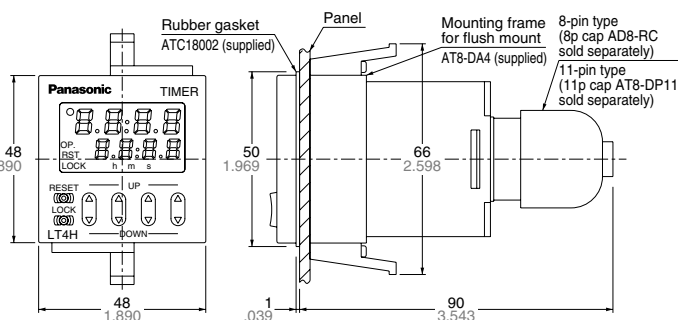
Screw terminal type

Pin type

Rubber gasket
ATC18002 (supplied)

Panel

Mounting frame
for flush mount
AT8-DA4 (supplied)

48 1.890

Panasonic   TIMER

OP.
RST.
LOCK   h m s

RESET   UP
LOCK
LT4H   DOWN

50 1.969   66 2.598

□44.5 □1.752

48 1.890

1 .039   63.5 2.500

Rubber gasket
ATC18002 (supplied)

Panel

Mounting frame
for flush mount
AT8-DA4 (supplied)

8-pin type
(8p cap AD8-RC
sold separately)
11-pin type
(11p cap AT8-DP11
sold separately)

48 1.890

Panasonic   TIMER

OP.
RST.
LOCK   h m s

RESET   UP
LOCK
LT4H   DOWN

50 1.969   66 2.598

48 1.890

1 .039   90 3.543

• Dimensions for front panel installations

DIN rail terminal block
(8-pin type AT8-DF8K
sold separately)
(11-pin type AT8-DF11K
sold separately)

Device installation rail
AT8-DLA1
(sold separately)

95.5
(90.0)
3.760
(3.543)

( ) dimension is for 8-pin type.

• Installation panel cut-out dimensions

The standard panel cut-out dimensions are shown
below. Use the mounting frame (AT8-DA4) and rub-
ber gasket (ATC18002).

80 min.
3.150

45 +0.6 0   1.772 +.024 0

45 +0.6 0
1.772 +.024 0

80 min.
3.150

• For connected installations

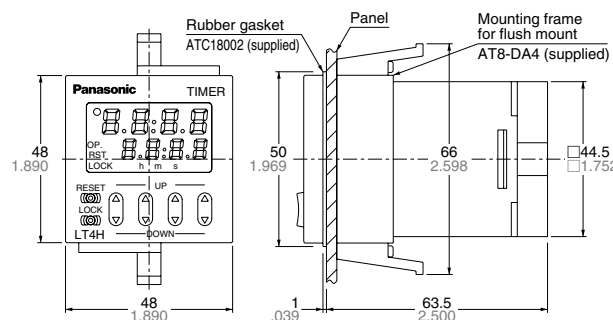45 +0.6 0
1.772 +.024 0

A

A = (48 × n − 2.5) +0.6 0
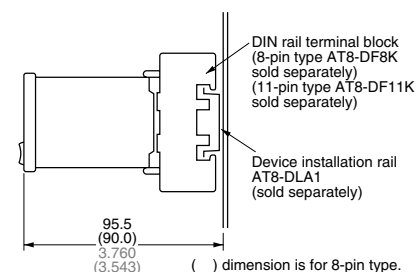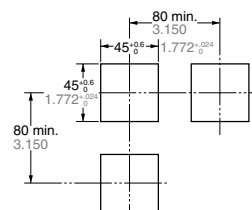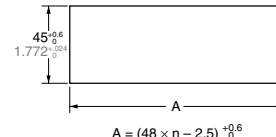
Note) 1: The installation panel thickness should be between 1
and 5 mm .039 and .197 inch.
2: For connected installations, the waterproofing ability
between the unit and installation panel is lost.

Terminal layouts and Wiring diagrams
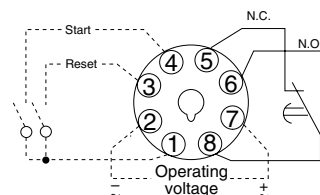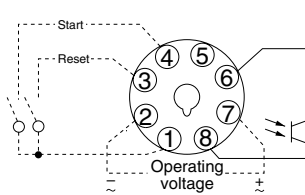
• 8-pin type

Relay output type

Start
Reset

N.C.

④ ⑤
③   ⑥
②   ⑦
① ⑧

N.O.

~ Operating +
voltage

Transistor output type

Start
Reset

④ ⑤
③   ⑥
②   ⑦
① ⑧

~ Operating +
voltage

• 11-pin type

Relay output type

Reset
Start
Stop
Lock

⑤ ⑥
④   ⑦
③   ⑧
②   ⑨
① ⑪ ⑩

N.C.
N.O.

~ Operating +
voltage

Transistor output type

Reset
Start
Stop
Lock

⑤ ⑥
④   ⑦
③   ⑧
②   ⑨
① ⑪ ⑩

~ Operating +
voltage

• Screw terminal type

Relay output type

Reset
Start
Stop
Lock

6 7 8 9 10

1 2 3 4 5

N.O.

N.C.

~ Operating ~
voltage

Transistor output type

Reset
Start
Stop
Lock

6 7 8 9 10

1 2 3 4 5

+ Operating ~
voltage

Note) For connecting the output leads of the transistor output type, refer to
5) Transistor output on page 48.

LT4H/-L
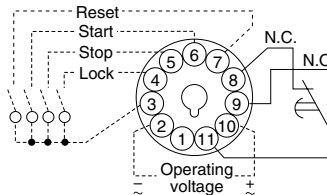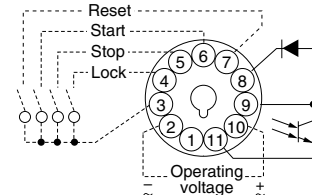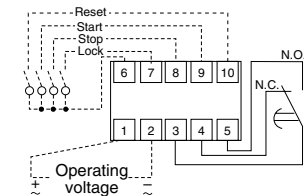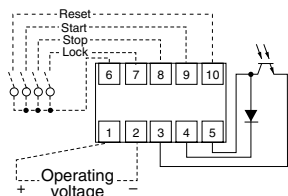
Setting the operation mode, time range, and time

Setting procedure 1) Setting the operation mode and time range

Set the operation mode and time range with the DIP switches on the side of the LT4H timer.

DIP switches

	Item	DIP switch	
		OFF	ON
1	Operation mode	Refer to table 1	
2			
3			
*4	Minimum input reset, start, and stop signal width	20 ms	1 ms
5	Time delay direction	Addition	Subtraction
6	Time range	Refer to table 2	
7			
8			

* The 8-pin type does not have the stop input, so that the dip switch can be changed over between reset and start inputs. The signal range of the lock input is fixed (minimum 20 ms).
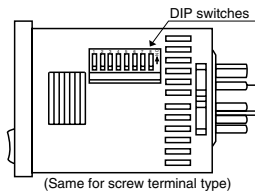
Table 1: Setting the operation mode

DIP switch No.			Operation mode
1	2	3	
ON	ON	ON	A: Power on delay 1
OFF	OFF	OFF	A2: Power on delay 2
ON	OFF	OFF	B: Signal on delay
OFF	ON	OFF	C: Signal off delay
ON	ON	OFF	D: Pulse One shot
OFF	OFF	ON	E: Pulse On delay
ON	OFF	ON	F: Signal Flicker
OFF	ON	ON	G: Totalizing On delay

Table 2: Setting the time range

DIP switch No.			Time range
6	7	8	
ON	ON	ON	0.001 s to 9.999 s
OFF	OFF	OFF	0.01 s to 99.99 s
ON	OFF	OFF	0.1 s to 999.9 s
OFF	ON	OFF	1 s to 9999 s
ON	ON	OFF	0 min 01 s to 99 min 59 s
OFF	OFF	ON	0.1 min to 999.9 min
ON	OFF	ON	0 h 01 min to 99 h 59 min
OFF	ON	ON	0.1 h to 999.9 h

DIP switches

(Same for screw terminal type)

Notes: 1) Set the DIP switches before installing the timer.
2) When the DIP SW setting is changed, turn off the power once.
3) The DIP switches are set as ON before shipping.

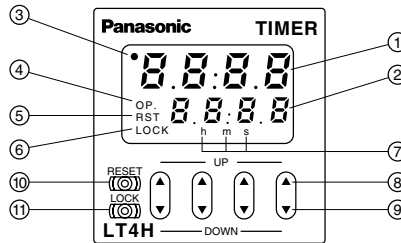**Setting procedure 2) Setting the time**

Set the set time with the keys (UP and DOWN keys) on the front of the LT4H timer.

Front display section
① Elapsed time display
② Set time display
③ Time delay indicator
④ Controlled output indicator
⑤ Reset indicator
⑥ Lock indicator
⑦ Time units display

⑧ UP keys
Changes the corresponding digit of the set time in the addition direction (upwards)
⑨ DOWN keys
Changes the corresponding digit of the set time in the subtraction direction (downwards)
⑩ RESET switch
Resets the elapsed time and the output
⑪ LOCK switch
Locks the operation of all keys on the unit

• Changing the set time

1. It is possible to change the set time with the up and down keys even during time delay with the timer. However, be aware of the following points.

1) If the set time is changed to less than the elapsed time with the time delay set to the addition direction, time delay will continue until the elapsed time reaches full scale, returns to zero, and then reaches the new set time. If the set time is changed to a time above the elapsed time, the time delay will continue until the elapsed time reaches the new set time.
2) If the time delay is set to the subtraction direction, time delay will continue until "0" regardless of the new set time.

2. If the set time is changed to "0," the unit will operate differently depending on the operation mode.

1) If the operation mode is set to A (power on delay 1) or A2 (power on delay 2), the output will turn on when the power supply is turned on. However, the output will be off while reset is being input.
2) In the other modes, the output turns on when the start is input. When the operation mode is C (signal off delay), D (Pulse one shot), or F (Signal flicker), only when the start input is on does the output turn on. Also, when the reset is being input, the output is off.

• Power failure memory

The EEPROM is used for power failure memory. It has a life of Min. 10^5 over-writings.
The EEPROM is overwriting with the following timing.

Output mode	Overwrite timing
Power ON delay (2) A2	When power is OFF
Addition G	Change of preset value or start, reset input When power is OFF after being ON
Other modes	When power is OFF after changing preset value

* Be aware that the contents of EEPROM for all modes will be overwritten when power is turned OFF during input to external lock terminals ④ to ③ and ⑦ to ⑥. Such an action does not exist by doing lock operation from the front.
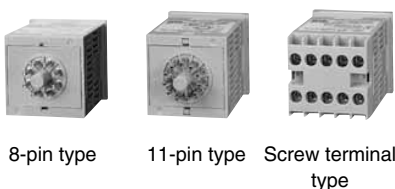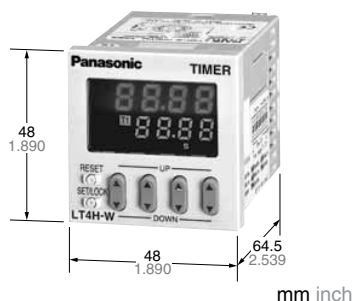
Operation mode

T: Set time   t1, t2, t3, ta<T

Operation type	Explanation	Time chart
Power on delay (1) Ⓐ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>ON</td><td>ON</td><td>ON</td></tr></table> • **Clears elapsed time value and starts time delay at power ON.** • After timer completion, stops at the display of the set value (addition), or stops at "0" (subtraction). • Ignores start input. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF.	
Power on delay (2) Ⓐ2	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td></tr></table> • **Elapsed time value does not clear at power ON. (power outage countermeasure function)** • The output remains ON even after the power is cut and restarted. • After timer completion, stops at the display of the set value (addition), or stops at "0" (subtraction). • Ignores start input. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF.	
Signal on delay Ⓑ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td></tr></table> • Clears elapsed time value at power ON. • Time delay starts at start ON and elapsed time value or output resets at start OFF. • Instantaneous time delay start at reset OFF and power ON while start is ON. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. • In order to have the time delay start at power ON or reset at power OFF, short out the start input beforehand.	
Signal off delay Ⓒ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td></tr></table> • Clears elapsed time value at power ON. • Output control ON at start ON and time delay start at start OFF. • Elapsed time value clears when start goes ON again during time delay. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF.	

Notes: 1) Each signal input (start, reset, stop, and lock) is applied by shorting their input terminal to the common terminal (terminal ① for the 8-pin type, terminal ③ for the 11-pin type, and terminal ⑥ for the screw terminal type).
2) The 8-pin type does not have a stop input or lock input.

LT4H/-L

T: Set time   t1, t2, t3, ta<T

Operation type	Explanation	Time chart
Pulse One-shot ⓓ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. | 1	2	3
ON	ON	OFF | • Clears elapsed time value at power ON. • Time delay starts and output control ON at start ON. • Turns output control OFF and clears elapsed time value at time-up. • Ignores start input during time delay. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. • In order to have the time delay start at power ON or reset at power OFF, short out the start input beforehand.	
Pulse On delay ⓔ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. | 1	2	3
OFF	OFF	ON | • Clears elapsed time value at power ON. • Time delay starts at start ON. • Ignores start input during time delay. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. • In order to have the time delay start at power ON or reset at power OFF, short out the start input beforehand.	
Signal Flicker ⓕ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. | 1	2	3
ON	OFF	ON | • Clears elapsed time value at power ON. • Time delay starts at start ON. • Ignores start input during time delay. • Output control reverses, elapsed time value clears, and timer delay starts at timer completion. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. • In order to have the time delay start at power ON or reset at power OFF, short out the start input beforehand.	
Totalizing On delay ⓖ	• Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. | 1	2	3
OFF	ON	ON | • Elapsed time value does not clear at power ON. (power outage countermeasure function) • The output remains ON even after the power is off and restarted. • Stops delay time operation at stop ON. Restarts delay time operation at stop OFF.	

Notes: 1) Each signal input (start, reset, stop, and lock) is applied by shorting their input terminal to the common terminal (terminal ① for the 8-pin type, terminal ③ for the 11-pin type, and terminal ⑥ for the screw terminal type).
2) The 8-pin type does not have a stop input or lock input.

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Panasonic
ideas for life

UL File No.: E122222
C-UL File No.: E122222

c**UL**us CE

Features

1. Wide time range
The operation time range covers from 0.01 sec. to 9999 hours.
The individual setting can be performed on each of 1 and 2 timers.

99.99s	99min59s	99h59min
999.9s	999.9min	999.9h
9999s		9999h

2. Bright and Easy-to-Read Display
A brand new bright 2-color back light LCD display. The easy-to-read screen in any location makes checking and setting procedures a cinch.

3. Simple Operation
Seesaw buttons make operating the unit even easier than before.

4. Short Body of only 64.5 mm 2.539 inch (screw terminal type) or 70.1 mm 2.760 inch (pin type)
With a short body, it is easy to install in even narrow control panels.

5. Conforms to IP66's Weather Resistant Standards
The water-proof panel keeps out water and dirt for reliable operation even in poor environments.

6. Screw terminal (M3.5) and Pin Types are Both Standard Options
The two terminal types are standard options to support either front panel installation or embedded installation.

7. Changeable Panel Cover
Also offers a black panel cover to meet your design considerations.

8. Compliant with UL, c-UL and CE.

9. Low Price
All this at an affordable price to provide you with unmatched cost performance.

48
1.890

48
1.890

64.5
2.539

mm inch

8-pin type   11-pin type   Screw terminal type

RoHS Directive compatibility information
http://www.nais-e.com/

Product types

Time range	Operating mode	Output	Operating voltage	Power down insurance	Terminal type	Part number
99.99s 999.9s 9999s 99min59s 999.9min 99h59min 999.9h 9999h	Pulse input: • Delayed one shot • OFF-start flicker • ON-start flicker Integrating input: • Delayed one shot • OFF-start flicker • ON-start flicker	Relay (1 c)	100 to 240 V AC	Available	8 pins	LT4HW8-AC240V
					11 pins	LT4HW-AC240V
					Screw terminal	LT4HW-AC240VS
			24 V AC		8 pins	LT4HW8-AC24V
					11 pins	LT4HW-AC24V
					Screw terminal	LT4HW-AC24VS
			12 to 24 V DC		8 pins	LT4HW8-DC24V
					11 pins	LT4HW-DC24V
					Screw terminal	LT4HW-DC24VS
		Transistor (1 a)	100 to 240 V AC		8 pins	LT4HWT8-AC240V
					11 pins	LT4HWT-AC240V
					Screw terminal	LT4HWT-AC240VS
			24 V AC		8 pins	LT4HWT8-AC24V
					11 pins	LT4HWT-AC24V
					Screw terminal	LT4HWT-AC24VS
			12 to 24 V DC		8 pins	LT4HWT8-DC24V
					11 pins	LT4HWT-DC24V
					Screw terminal	LT4HWT-DC24VS

* A rubber gasket (ATC18002) and a mounting frame (AT8-DA4) are included.

LT4H-W

Part names

T1/T2 Operation display
Display for change-over between T1/T2 settings
Controlled output indicator
Lock indicator
Reset switch
Set/Lock switch

Panasonic   TIMER

(Subtraction elapsed time display)
Elapsed time display
Set time display

Time units display
Up keys
Down keys

Fourth digit   First digit

DIP switches

(Same for 8-pin and screw terminal type)

Specifications

	Type	Ralay output type		Transistor output type	
Item		AC type	DC type	AC type	DC type
Rating	Rated operating voltage	100 to 240 V AC, 24 V AC	12 to 24 V DC	100 to 240V AC, 24V AC	12 to 24 V DC
	Rated frequency	50/60 Hz common	—	50/60 Hz common	—
	Rated power consumption	Max. 10 V A	Max. 3 W	Max. 10 V A	Max. 3 W
	Rated control capacity	5 A, 250 V AC		100 mA, 30 V DC	
	Time range	99.99s, 999.9s, 9999s, 99min59s, 999.9min, 99h59min, 999.9h, 9999h (selected by DIP switch)			
	Time counting direction	Addition (UP)/Subtraction (DOWN) (2 directions selectable by DIP switch)			
	Operation mode	Pulse input: Delayed one shot, OFF-start flicker or ON-start flicker Integrating input: Delayed one shot, OFF-start flicker or ON-start flicker			
	Start/Reset/Stop input	Min. input signal width: 1 ms, 20 ms (2 directions by selected by DIP switch) (The 8 pin type does not have a stop input.)			
	Lock input	Min. input signal width: 20 ms (The 8-pin type does not have a lock input.)			
	Input signal	Open collector input Input impedance: Max. 1 kΩ; Residual voltage: Max. 2V Open impedance: 100 kΩ or less, Max. energized voltage: 40 V DC			
	Indication	7-segment LCD, Elapsed value (backlight red LED), Setting value (backlight yellow LED)			
	Power failure memory method	EEP-ROM (Min. 10^5 overwriting)			
Time accuracy (max.)	Operating time fluctuation	± (0.005% + 50 ms) in case of power on start ± (0.005% + 20 ms) in case of input signal start		Operating voltage: 85% to 110% Temperature: −10°C to +55°C +14°F to +131°F Min. input signal width: 1ms	
	Temperature error				
	Voltage error				
	Setting error				
Contact	Contact arrangement	Timed-out 1 Form C		Timed-out 1 Form A (Open collector)	
	Contact resistance (Initial value)	100 mΩ (at 1 A 6 V DC)		—	
	Contact material	Ag alloy/Au flash		—	
Life	Mechanical (contact)	Min. 2 × 10^7 ope. (Except for switch operation parts)		—	
	Electrical (contact)	Min. 10^5 ope. (At rated control voltage)		Min. 10^7 ope. (At rated control voltage)	
Electrical	Allowable operating voltage range	85 to 110 % of rated operating voltage			
	Breakdown voltage (Initial value)	2,000 Vrms for 1 min: Between live and dead metal parts (11-pin type only) 2,000 Vrms for 1 min: Between input and output 1,000 Vrms for 1 min: Between contacts		2,000 Vrms for 1 min: Between live and dead metal parts (Pin type only) 2,000 Vrms for 1 min: Between input and output	
	Insulation resistance (Initial value)	Between live and dead metal parts Min. 100 MΩ: Between input and output (At 500V DC) Between contacts		Min. 100 MΩ: Between live and dead metal parts Between input and output (At 500V DC)	
	Operating voltage reset time	Max. 0.5 s			
	Temperature rise	Max 65° C (under the flow of nominal operating current at nominal voltage)		—	
Mechanical	Vibration resistance	Functional	10 to 55 Hz: 1 cycle/ min single amplitude of 0.35 mm .014 inch (10 min on 3 axes)		
		Destructive	10 to 55 Hz: 1 cycle/ min single amplitude of 0.75 mm .030 inch (1 h on 3 axes)		
	Shock resistance	Functional	Min. 98 m 321.522 ft./s² (4 times on 3 axes)		
		Destructive	Min. 294 m 964.567 ft./s² (5 times on 3 axes)		
Operating conditions	Ambient temperature	−10° C to 55° C +14° F to +131° F			
	Ambient humidity	Max. 85 % RH (non-condensing)			
	Air pressure	860 to 1,060 h Pa			
	Ripple rate	—	20 % or less	—	20 % or less
Connection		8-pin/11-pin/screw terminal			
Protective construction		IP66 (front panel with rubber gasket)			

Applicable standard

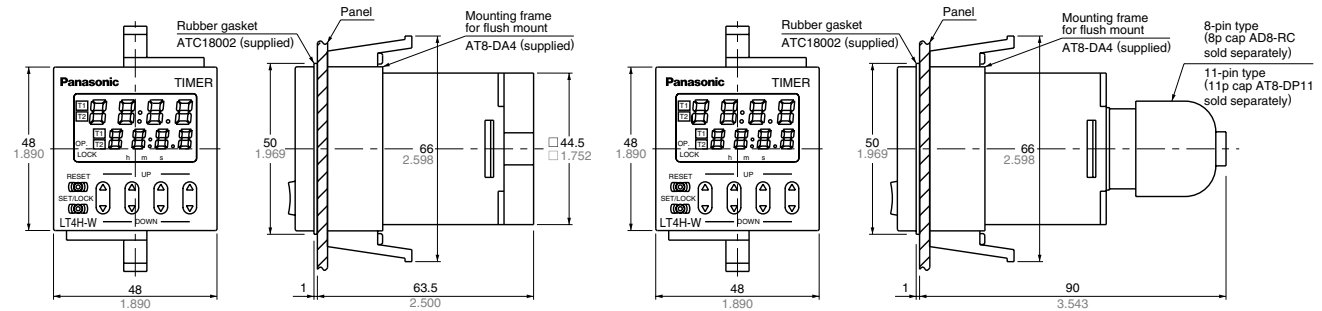| Safety standard	EN61812-1	Pollution Degree 2/Overvoltage Category II

EMC	(EMI)EN61000-6-4
	Radiation interference electric field strength
	Noise terminal voltage
	(EMS)EN61000-6-2
	Static discharge immunity
	
	RF electromagnetic field immunity
	
	EFT/B immunity
	
	Surge immunity
	Conductivity noise immunity
	Power frequency magnetic field immunity
	Voltage dip/Instantaneous stop/Voltage fluctuation immunity
		
		EN55011 Group1 ClassA
		EN55011 Group1 ClassA
		
		EN61000-4-2 4 kV contact
		              8 kV air
		EN61000-4-3 10 V/m AM modulation (80 MHz to 1 GHz)
		              10 V/m pulse modulation (895 MHz to 905 MHz)
		EN61000-4-4 2 kV (power supply line)
		              1 kV (signal line)
		EN61000-4-5 1 kV (power line)
		EN61000-4-6 10 V/m AM modulation (0.15 MHz to 80 MHz)
		EN61000-4-8 30 A/m (50 Hz)
		EN61000-4-11 10 ms, 30% (rated voltage)
		              100 ms, 60% (rated voltage)
		              1,000 ms, 60% (rated voltage)
		              5,000 ms, 95% (rated voltage)

Dimensions

(units: mm inch)
Tolerance: ±1.0 ±.039

• **LT4H-W digital timer**

Screw terminal type
(Flush mount)

Pin type
(Flush mount/Surface mount)

(Same for 8-pin type)
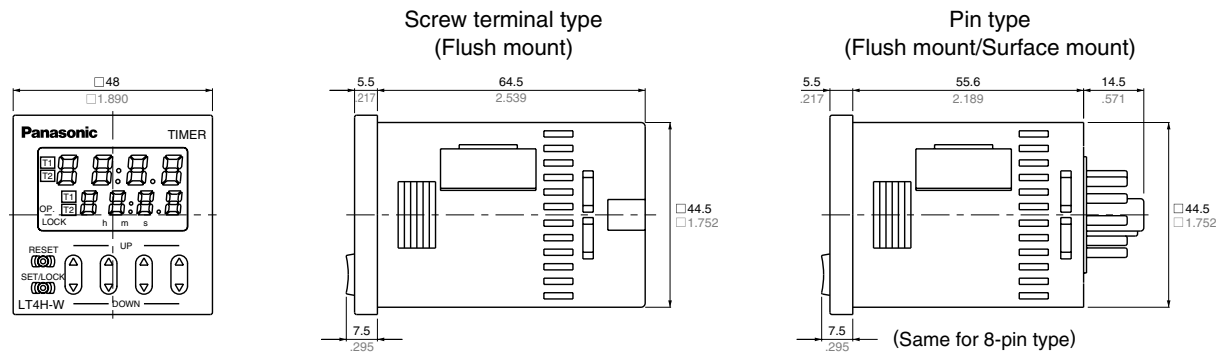
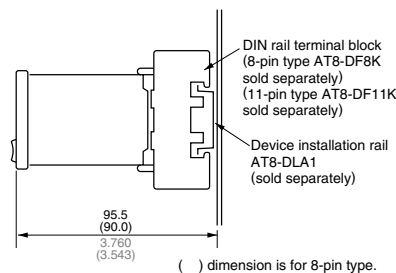• **Dimensions for flush mount (with adapter installed)**

Screw terminal type

Pin type

• **Dimensions for front panel installations**

DIN rail terminal block
(8-pin type AT8-DF8K
sold separately)
(11-pin type AT8-DF11K
sold separately)

Device installation rail
AT8-DLA1
(sold separately)

95.5
(90.0)
3.760
(3.543)

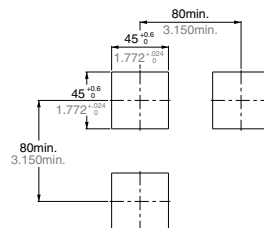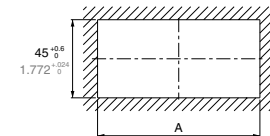( ) dimension is for 8-pin type.

• **Installation panel cut-out dimensions**

The standard panel cut-out dimensions are shown below. Use the mounting frame (AT8-DA4) and rubber gasket (ATC18002).

80min.
3.150min.

45 +0.6 / 0
1.772 +.024 / 0

45 +0.6 / 0
1.772 +.024 / 0

80min.
3.150min.

• **For connected installations**

45 +0.6 / 0
1.772 +.024 / 0

A

When n timers are continuously installed, the dimension (A) is calculated according to the following formula (n: the number of the timers to be installed):
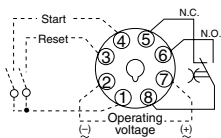$A = (48 \times n - 2.5)^{+0.6}_{0}$ $A = (1.890 \times n - .098)^{+.024}_{0}$

Note) 1: The installation panel thickness should be between 1 and 5 mm .039 and .197 inch.
2: For connected installations, the waterproofing ability between the unit and installation panel is lost.
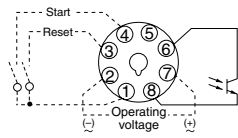
LT4H-W

Terminal layouts and Wiring diagrams

• 8-Pin type

Relay output type

Start
Reset
N.C.
N.O.
③ ④ ⑤ ⑥
② ⑦
① ⑧
Operating voltage
(−) (+)

Transistor output type

Start
Reset
③ ④ ⑤ ⑥
② ⑦
① ⑧
Operating voltage
(−) (+)

• 11-Pin type

Relay output type

Reset
Start
Stop
Lock
N.C.
N.O.
⑤ ⑥ ⑦
④ ⑧
③ ⑨
② ⑩
① ⑪
Operating voltage
~ ±

Transistor output type

Reset
Start
Stop
Lock
⑤ ⑥ ⑦
④ ⑧
③ ⑨
② ⑩
① ⑪
Operating voltage
~ ±

• Screw terminal type

Relay output type

Reset
Start
Stop
Lock
| 6 | 7 | 8 | 9 | 10 |
N.O.
N.C.
| 1 | 2 | 3 | 4 | 5 |
Operating voltage
± ~

Transistor output type

Reset
Start
Stop
Lock
| 6 | 7 | 8 | 9 | 10 |
| 1 | 2 | 3 | 4 | 5 |
Operating voltage
± ~

Note) For connecting the output leads of the transistor output type, refer to
5) Transistor output on page 48.

44
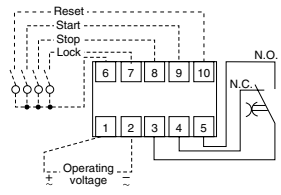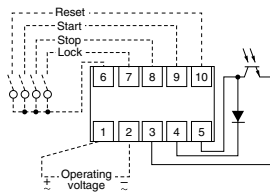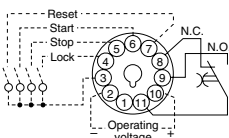
Setting the operation mode and time range

Setting procedure 1) Setting the time range (Timer T₁/Timer T₂)

Set the time range with the DIP switches on the side of the LT4H-W timer.

	Item	DIP switch	
		OFF	ON
1	Time range (Timer T₁)	Refer to table 1	
2			
3			
*4	Minimum input reset, start, and stop signal width	20 ms	1 ms
5	Time delay direction	Addition	Subtraction
6	Time range (Timer T₂)	Refer to table 2	
7			
8			

* The 8-pin type does not have the stop input, so that the dip switch can be changed over between reset and start inputs. The signal range of the lock input is fixed (minimum 20 ms).
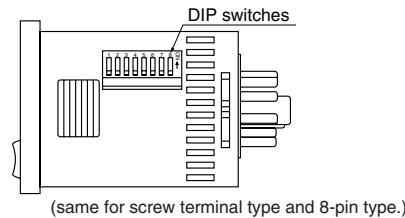
DIP switches

(same for screw terminal type and 8-pin type.)

Table 1: Setting the time range (Timer T₁)

DIP switch No.			Time range
1	2	3	
ON	ON	ON	0.01 s to 99.99 s
OFF	OFF	OFF	0.1 s to 999.9 s
ON	OFF	OFF	1 s to 9999 s
OFF	ON	OFF	0 min 01 s to 99 min 59 s
ON	ON	OFF	0.1 min to 999.9 min
OFF	OFF	ON	0 h 01 min to 99 h 59 min
ON	OFF	ON	0.1 h to 999.9 h
OFF	ON	ON	1 h to 9999 h

Table 2: Setting the time range (Timer T₂)

| DIP switch No.			Time range
6	7	8	
ON	ON	ON	0.01 s to 99.99 s
OFF	OFF	OFF	0.1 s to 999.9 s
ON	OFF	OFF	1 s to 9999 s
OFF	ON	OFF	0 min 01 s to 99 min 59 s
ON	ON	OFF	0.1 min to 999.9 min
OFF	OFF	ON	0 h 01 min to 99 h 59 min
ON	OFF	ON	0.1 h to 999.9 h
OFF	ON	ON	1 h to 9999 h

Notes: 1) Set the DIP switches before installing the timer.
2) When the DIP SW setting is changed, turn off the power once.
3) The DIP switches are set as ON before shipping.

Setting procedure 2) Setting the operation mode

Set the operation mode with the keys on the front of the LT4H-W timer.

Front display section

① Elapsed time display
② Set time display
③ T₁/T₂ operation indicator
④ T₁/T₂ setting value selectable indicator
⑤ Controlled output indicator
⑥ Lock indicator
⑦ Time units display
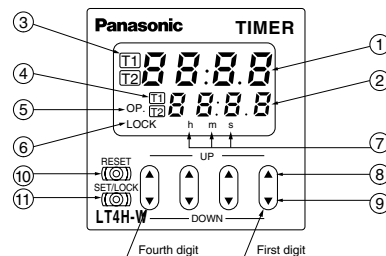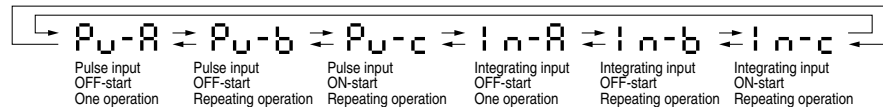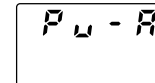
⑧ UP keys
Changes the corresponding digit of the set time in the addition direction (upwards)
⑨ DOWN keys
Changes the corresponding digit of the set time in the subtraction direction (downwards)
⑩ RESET switch
Resets the elapsed time and the output
⑪ SET/LOCK switch
Changes over the display between T₁/T₂ settings, sets the operation mode, checks the operation mode and locks the operation of each key (such as up, down or reset key).

1) Setting or changing the operation mode
(1) When the UP or DOWN key at the first digit is pressed with the SET/LOCK switch pressed, the mode is changed over to the setting mode.
(2) Now release the SET/LOCK switch.
(3) The operation mode in the setting mode is changed over sequentially in the left or right direction by pressing the UP or DOWN key at the first digit, respectively.

Ex: Setting operation mode display (PULSE-A example)

$Pu-A$

$Pu-A \rightleftarrows Pu-b \rightleftarrows Pu-c \rightleftarrows In-A \rightleftarrows In-b \rightleftarrows In-c$

| Pulse input OFF-start One operation | Pulse input OFF-start Repeating operation | Pulse input ON-start Repeating operation | Integrating input OFF-start One operation | Integrating input OFF-start Repeating operation | Integrating input ON-start Repeating operation |

(4) The operational mode displayed at present is set by pressing the RESET switch, and the display returns to the normal condition.

2) Setting (changing) the time
(1) Pressing the SET/LOCK key switches the set value display between T1 and T2. Display the timer (T1 or T2) which is to be set (or changed).
(2) After displaying the timer (T1 or T2) which is to be set, press the UP or DOWN key to change the time.

• Checking the operation mode
When the UP or DOWN key at the second digit is pressed with the SET/LOCK switch pressed, the operational mode can be checked.
The display returns to the normal condition after indicating the operational mode for about two seconds. (While the display indicates the operational mode for about two seconds, the other indicators continue to operate normally.)

• Setting the lock
When the UP or DOWN key at the fourth digit is pressed with the SET/LOCK switch pressed, all keys on the unit are locked.
The timer does not accept any of UP, DOWN and RESET keys.
To release the lock setting, press the UP or DOWN key at the fourth digit again with the set/lock switch pressed.
* Operational mode, adding and subtracting and minimum input signal range cannot be set at T₁ and T₂, respectively.
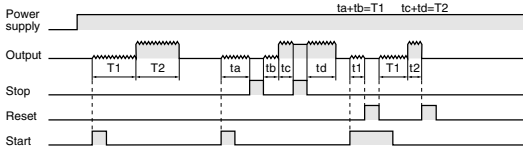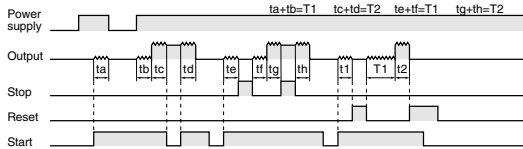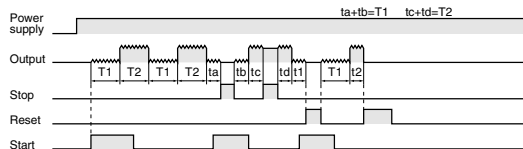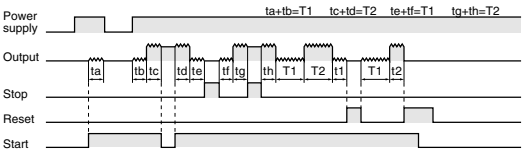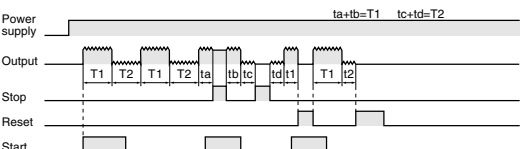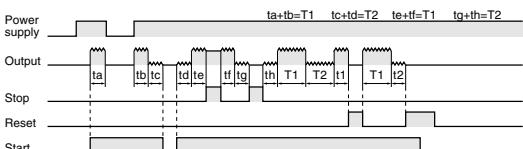
• Changing over the T₁/T₂ setting display
The T1/T2 setting display is changed over by pressing the SET/LOCK switch. (This operation gives no effect on the other operations. The set time and elapsed time (residual time) at T₁ are linked with those at T₂.)

• Changing the set time
1) It is possible to change the set time with the UP and DOWN keys even during time delay with the timer. However, be aware of the following points.
　(1) If the set time is changed to less than the elapsed time with the time delay set to the addition direction, time delay will continue until the elapsed time reaches full scale, returns to zero, and then reaches the new set time. If the set time is changed to a time above the elapsed time, the time delay will continue until the elapsed time reaches the new set time.
　(2) If the time delay is set to the subtraction direction, time delay will continue until "0" regardless of the new set time.
2) When the set times at T₁ and T₂ are set to 0, the output becomes ON only while the start input is carried out. However, while the reset input is carried out, the output becomes OFF.

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OPERATION MODE

	PULSE : Pulse input	INTEGRATION : Integrating input
A **Delayed one shot**	PULSE A OFF-start/1 operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 T1 T2 ta tb tc td t1 T1 t2 • Elapsed value cleared when power is turned on. • Time limit start initiated when start input goes on; start input ignored if time limit interval is in progress. • Elapsed value cleared when one operation has been completed.	INTEGRATION A OFF-start/1 operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 te+tf=T1 tg+th=T2 ta tb tc td te tf tg th t1 T1 t2 • Elapsed value not cleared when power is turned on (power failure backup function). • When power is turned back on, same status is maintained for output as that previous to power going off. • Elapsed value cleared when one operation has been completed.
B **OFF-start flicker**	PULSE B OFF-start/repeating operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 T1 T2 T1 T2 ta tb tc td t1 T1 t2 • Elapsed value cleared when power is turned on. • Time limit start initiated when start input goes on; start input ignored if time limit interval is in progress.	INTEGRATION B OFF-start/repeating operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 te+tf=T1 tg+th=T2 ta tb tc td te tf tg th T1 T2 t1 T1 t2 • Elapsed value not cleared when power is turned on (power failure backup function). • When power is turned back on, same status is maintained for output as that previous to power going off.
C **ON-start flicker**	PULSE C ON-start/repeating operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 T1 T2 T1 T2 ta tb tc td t1 T1 t2 • Elapsed value cleared when power is turned on. • Time limit start initiated when start input goes on; start input ignored if time limit interval is in progress.	INTEGRATION C ON-start/repeating operation t₁<T₁, t₂<T₂ Power supply / Output / Stop / Reset / Start ta+tb=T1 tc+td=T2 te+tf=T1 tg+th=T2 ta tb tc td te tf tg th T1 T2 t1 T1 t2 • Elapsed value not cleared when power is turned on (power failure backup function). • When power is turned back on, same status is maintained for output as that previous to power going off.
Remarks and notes	• The pulse input mode starts the operation by starting the start input. • When using the unit by starting it with the power on, short-circuit the start terminal (8-pin: ① to ④, 11-pin: ③ to ⑥ and screw terminal: ⑥ to ⑨).	• The integrating input mode is operated by the integrated time of the start input. In other word, the timer operates only when the start input is performed. • When the elapsed value is cleared by the reset input, the output is reset. • When using the unit by starting it with the power on, short-circuit the start terminal (8-pin: ① to ④, 11-pin: ③ to ⑥ and screw terminal: ⑥ to ⑨).
	• Each signal input such as start, reset, stop and lock inputs is applied by short-circuiting its input terminal and common terminal (8-pin type: terminal ①, 11-pin type: terminal ③ and screw terminal: terminal ⑥) respectively. • The 8-pin type does not have a stop input or lock input.	

PRECAUTIONS IN USING THE LT4H SERIES

1. Terminal wiring

1) When wiring the terminals, refer to the terminal layout and wiring diagrams and be sure to perform the wiring properly without errors.

2) When using the instrument with an flush mounting, the screw-down terminal type is recommended. For the pin type, use either the rear terminal block (AT78041) or the 8P cap (AD8-RC) for the 8-pin type, and the rear terminal block (AT78051) or the 11P cap (AT8-DP11) for the 11-pin type. Avoid soldering directly to the round pins on the unit. When using the instrument with a front panel installation, use the DIN rail terminal block (AT8-DF8K) for the 8-pin type and the DIN rail terminal block (AT8-DF11K) for the 11-pin type.

3) After turning the unit off, make sure that any resulting induced voltage or residual voltage is not applied to power supply terminals ② through ⑦ (8-pin type) ② through ⑩ (11-pin type) or [1] and [2] (screw terminal type). (If the power supply wire is wired parallel to the high voltage wire or power wire, an induced voltage may be generated between the power supply terminals.)

4) Have the power supply voltage pass through a switch or relay so that it is applied at one time. If the power supply is applied gradually, the counting may malfunction regardless of the settings, the power supply reset may not function, or other such unpredictable occurrence may result.

2. Input connections

The power circuit has no transformer (power and input terminals are not insulated). When an input signal is fed to two or more timers at once, do not arrange the power circuit in an independent way. If the timer is powered on and off independently as shown in Fig. A, the timer's internal circuitry may get damaged.Be careful never to allow such circuitry. (Figs. A, B and C show the circuitry for the 11-pin type.)
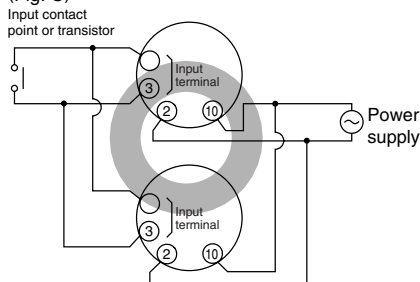
(Fig. A)
Input contact
point or transistor
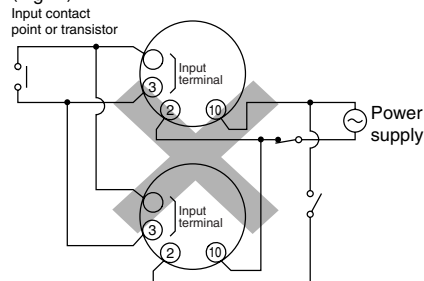
If independent power circuitry must be used, keep the input contacts or transistors separate from each other, as shown in Fig. B.

(Fig. B)
Input contact
point or transistor
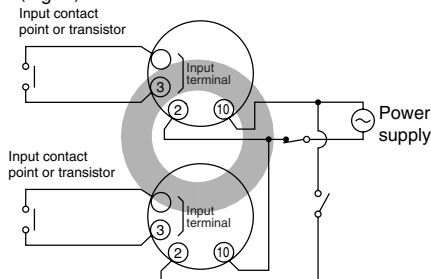
When power circuitry is not independent, one input signal can be fed to two or more counters at once, as shown in Fig. C.

(Fig. C)
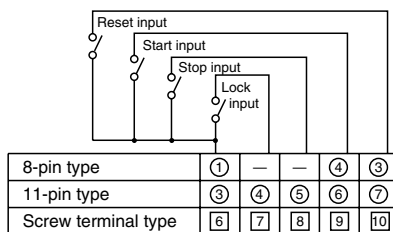Input contact
point or transistor

3. Input and output

1) Signal input type

(1) Contact point input
Use highly reliable metal plated contacts. Since the contact point's bounce time leads directly to error in the timer operations, use contacts with as short a bounce time as possible. Also, select a minimum input signal width of 20 ms.

|					
8-pin type	①	—	—	④	③
11-pin type	③	④	⑤	⑥	⑦
Screw terminal type	6	7	8	9	10

(2) Non-contact point input
Connect with an open collector. Use transistors whose characteristics satisfy the criteria given below.
V_{CEO} = 20 V min.
I_C = 20 mA min.
I_{CBO} = 6μA max.
Also, use transistors with a residual voltage of less than 2 V when the transistor is on.

|					
8-pin type	①	—	—	④	③
11-pin type	③	④	⑤	⑥	⑦
Screw terminal type	6	7	8	9	10
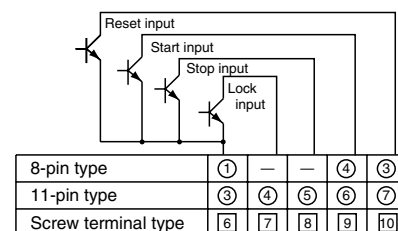
* The short-circuit impedance should be less than 1 kΩ.

[When the impedance is 0 Ω, the current coming from the start input and stop input terminals is approximately 12 mA, and from the reset input and lock input terminals is approximately 1.5 mA.]

Also, the open-circuit impedance should be more than 100 kΩ.

* As shown in the diagram below, from a non-contact point circuit (proximity switches, photoelectric switches, etc.) with a power supply voltage of between 12 and 40 V, the signal can be input without using an open collector transistor. In the case of the diagram below, when the non-contact point transistor Q switches from off to on (when the signal voltage goes from high to low), the signal is input.

8-pin type	①	—	—	④	③
11-pin type	③	④	⑤	⑥	⑦
Screw terminal type	6	7	8	9	10
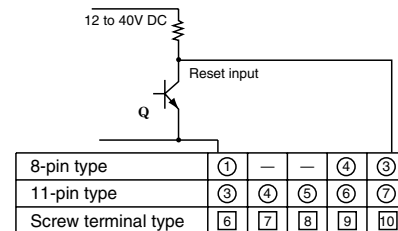
(The above example is for reset input)

2) The input mode and output mode change depending on the DIP switch settings. Therefore, before making any connections, be sure to confirm the operation mode and operation conditions currently set.

3) The LT4H series use power supply without a transformer (power and input terminals are not insulated). In connecting various kinds of input signals, therefore, use a power transformer in which the primary side is separated from the ungrounded secondary side as shown in Fig. A, for the power supply for a sensor and other input devices so that short-circuiting can be prevented.

PRECAUTIONS IN USING THE LT4H SERIES

Once the wiring to be used is completely installed and prior to installing this timer, confirm that there is complete insulation between the wires connected to the power terminals (2 each) and the wires connected to each input terminal. If the power and input lines are not insulated, a short-circuit may occur inside the timer and result in internal damage.
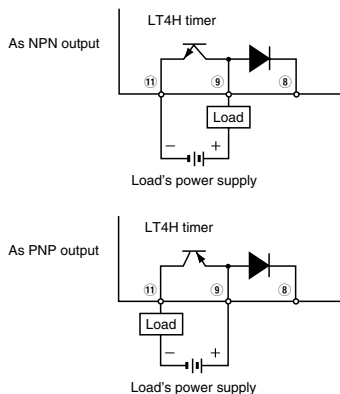In addition, when moving your equipment to a new installation location, confirm that there is no difference in environmental conditions as compared to the previous location.

(Fig. A) Good example

(Fig. B) Bad example
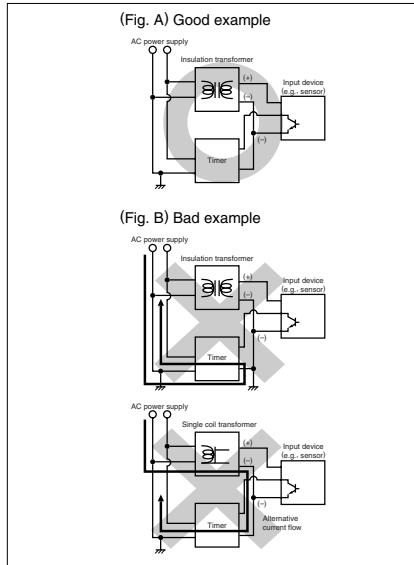
4) The input signal is applied by the shorting of each input terminal with the common terminal (terminal ① for 8-pin types, terminal ③ for 11-pin types and terminal ⑥ for screw terminal types). Never connect other terminals or voltages higher than 40V DC, because it may destroy the internal circuitry.
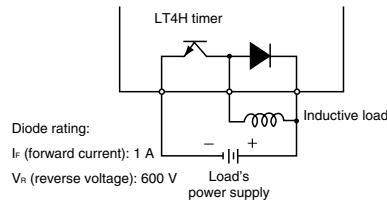5) Transistor output
(1) Since the transistor output is insulated from the internal circuitry by a photocoupler, it can be used as an NPN output or PNP (equal value) output. (The above example is 11-pin type)

As NPN output

LT4H timer

⑪ ⑨ ⑧

Load

Load's power supply

As PNP output

LT4H timer

⑪ ⑨ ⑧

Load

Load's power supply

Note: With the 8-pin type, there is no diode between points ⑧ and ⑨.

(2) Use the diode connected to the output transistor's collector for absorbing the reverse voltage from induced loads.

LT4H timer

Inductive load

Diode rating:
IF (forward current): 1 A
VR (reverse voltage): 600 V
Load's power supply

6) When wiring, use shielded wires or metallic wire tubes, and keep the wire lengths as short as possible.
7) For the load of the controlled output, make sure that it is lower than the rated control capacity.

4. Operation of LT4H digital timer
1) Turning on and off the power supply while operating in A2* (Power on delay 2) or G (Totalizing On delay) will result in a timer error to be generated due to the characteristics of the internal circuitry. Therefore, use the start input or stop input.
* Not related to the start input.
2) When controlling the timer by turning on the power supply, use only A (Power on delay 1) or A2 (Power on delay 2). Use of other modes in this situation will result in timer errors. When using the other modes, control the timer with the start input or stop input.

5. Operation mode and time range setting
The operation mode and time range can be set with the DIP switches on the side of the timer. Make the DIP switch settings before installing the timer on the panel.
The operation mode of LT4H-W series can be set with the keys and switches on the front of the timer.

6. Conditions of usage
1) Avoid locations subject to flammable or corrosive gases, excessive dust, oil, vibrations, or excessive shocks.
2) Since the cover of the timer is made of polycarbonate resin, avoid contact with or use in environments containing methyl alcohol, benzene, thinners, and other organic solvents; and ammonia, caustic sodas, and other alkaline substances.
3) If power supply surges exceed the values given below, the internal circuits may become damaged. Be sure to use surge absorbing element to prevent this from happening.

Operating voltage	Surge voltage (peak value)
AC type	6,000V
DC type 24V AC type	1,000V

• **Surge wave form**
[± (1.2 × 50) μs uni-polar full wave voltage]
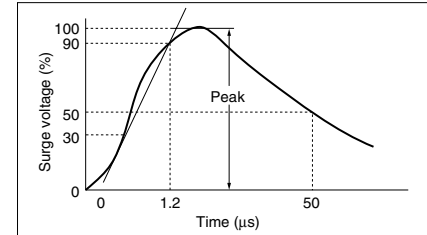
4) Regarding external noise, the values below are considered the noise-resistant voltages. If voltages rise above these values, malfunctions or damage to the internal circuitry may result, so take the necessary precautions.

	Power supply terminals		Input terminals
	AC type	DC type 24V AC type	
Noise voltage	1,500V	1,000V	600V

Noise wave form (noise simulator)
Rise time: 1 ns
Pulse width: 1 μs, 50 ns
Polarity: ±
Cycle: 100 cycles/second
5) When connecting the operating power supply, make sure that no leakage current enters the timer. For example, when performing contact protection, if set up like that of fig. A, leaking current will pass through C and R, enter the unit, and cause incorrect operation. The fig. B shows the correct setup.

Leakage current

Operating power supply

(Fig. A)

Operating power supply
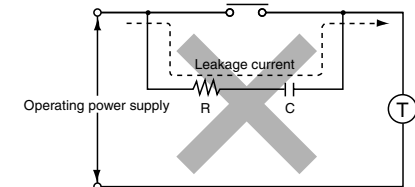
(Fig. B)

6) Long periods of continuous operation in the time-up completed condition (one month or more) will result in the weakening of the internal electrical components from the generated heat and, therefore, should be avoided. If you do plan to use the unit for such continuous operation, use in conjunction with a relay as shown in the circuit in the diagram below.

7. Acquisition of CE marking
Please abide by the conditions below when using in applications that comply with EN61812-1.
1) Overvoltage category III, pollution level 2
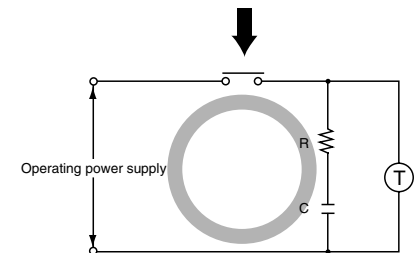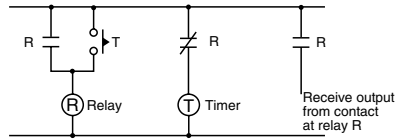2) This timer employs a power supply without a transformer, so the power and input signal terminals are not insulated.
(1) When a sensor is connected to the input circuit, install double insulation on the sensor side.
(2) In the case of contact input, use dual-insulated relays, etc.
3) The load connected to the output contact should have basic insulation.
This timer is protected with basic insulation and can be double-insulated to meet EN/IEC requirements by using basic insulation on the load.

4) Please use a power supply that is protected by an overcurrent protection device which complies with the EN/IEC standard (example: 250 V 1 A fuse, etc.).
5) You must use a terminal socket or socket for the installation. Do not touch the terminals or other parts of the timer when it is powered. When installing or un-installing, make sure that no voltage is being applied to any of the terminals.
6) Do not use this timer as a safety circuit. For example when using a timer in a heater circuit, etc., provide a protection circuit on the machine side.

7. Self-diagnosis function
If a malfunction occurs, one of the following displays will appear.

Display	Contents	Output condition	Restoration procedure	Preset values after restoration
Err-00	Malfunctioning CPU.	OFF	Enter reset input, RESET key, or restart unit.	The values at start-up before the CPU malfunction occurred.
Err-01	Malfunctioning memory. See note.			0

Note: Includes the possibility that the EEPROM's life has expired.

DIN SIZE TIMERS COMMON OPTIONS

Terminal sockets (Unit: mm inch, Tolerance: ±1 ±.039)

Type	Appearance	Dimensions	Terminal wiring (Top view)	Mounting hole dimensions
PM4H-S PM4H-M PM4H-SD PM4H-F8 PM4H-F8R PM4H-W LT4H LT4H-L LT4H-W QM4H PM4S (8-pin type)	• DIN rail socket (8-pin) ATC180031		Note: Terminal No. on the main body are identical to those on the terminal socket.	
PM4H-A PM4H-F11R LT4H LT4H-W (11-pin type)	• DIN rail socket (11-pin) ATC180041		Note: Terminal No. on the main body are identical to those on the terminal socket.	

Note: The socket's numbering system matches that of the timer terminals.

Sockets (Unit: mm inch, Tolerance: ±1 ±.039)

Type	Appearance	Dimensions	Terminal wiring (Top view)	Mounting hole dimensions
PM4H-S PM4H-M PM4H-SD PM4H-F8 PM4H-F8R PM4H-W LT4H LT4H-L LT4H-W (8-pin type) PM4S QM4H	• Rear terminal socket AT78041			—
	• 8P cap AD8-RC			—
PM4H-A PM4H-F11R LT4H LT4H-W (11-pin type)	• Rear terminal socket AT78051			—
	• 11P cap AT8-DP11			—

Note: The terminal socket's numbering system matches that of the timer terminals.

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MOUNTING PARTS

• Rubber gasket

ATC18002

50.0 / 1.969
50.0 / 1.969
1.0 / .039

Applicable for PM4H series and LT4H series

The rubber gasket is enclosed in the PM4H (screw terminal type) and the LT4H series.

• Mounting frame

AT8-DA4

48 / 1.890
48 / 1.890
68 / 2.677

Applicable for PM4H series LT4H series and QM4H series

• Mounting rails (Applicable for DIN and IEC standards)

AT8-DLA1
Length: 1 m
aluminum

1.000 ±1 / 39.37 ±.039
5.5 / .217
2.75R / .108R
5-15-40-15 / .197 .591 .394 .591
15-40-15-5 / .591 .394 .591 .197
Oval hole, 40-5.5x15 / 40-.217x.591
35 / 1.378
24 / .945
1.5 / .059
27 / 1.063
7.5 / .295

• Fastening plate

ATA4806

50 / 1.969
12 / .472
M4 / M.157
10 / .394
ATA4806
10 / .394

For holding DIN rails

• Protective cover for DIN 48 size: LT4H, QM4H series
Flexible type

AQM4803

11 / .433
50 / 1.969
50 / 1.969

• Protective cover for DIN 48 size: QM4H series
Hard type

AQM4801

17.2 / .677
50.6 / 1.992
50.6 / 1.992

Accessories

PM4H series
• Panel cover (Black)

PM4H-A	PM4H-S	PM4H-M
ATC18011	ATC18012	ATC18013
PM4H-W	PM4H-SD	PM4H-F
ATC18014	ATC18015	ATC18016

LT4H series
• Panel cover (Black)

LT4H	LT4H-W
ATL58011	ATL68011

The black panel cover is also available so that you can change the appearance of the panel by changing the panel cover. The color of the standard panel cover is ash gray.

• Set ring

ATC18001

When you control the fixed time range, the setting rings (a set of 2 pcs.) make it easy to do the time setting and keep the time range all the time. (Excluding PM4H-W)

# INSTALLING DIN SIZE TIMER

Installations

1. Surface mount

1) For the timers of PM4H and LT4H series, use the pin type timer. With the PM4S and QM4H series, only pin-type timers are available.
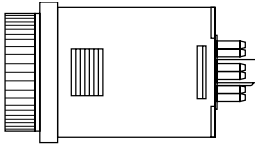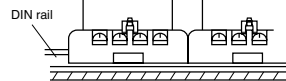

2) Put the terminal socket on the board directly or put it on the DIN rail (Fig. 1).
3) Insert the timer into the terminal socket and fix it with clip (Fig. 2)
4) On DIN rail mounting, mount the timer on the DIN rail tightly to get the proper dimension (Fig. 3).

(Fig. 1)   (Fig. 2)

Terminal socket
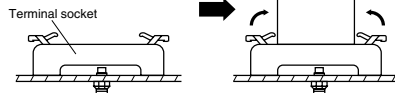
(Fig. 3)

DIN rail

5) 8-pin type should be connected with terminal socket (AT8-DF8K). 11-pin type should be connected with terminal socket (AT8-DF11K).
6) DIN rail (AT8-DLA1) is also available (1 m).

2. Flush mount

1) For the timers of PM4H and LT4H series, it is recommended to use the built-in screw terminal type for flush mount. (Mounting frame and rubber gasket are provided when timer is shipped.)
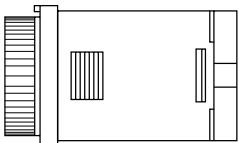

If the pin type is used, the mounting frame (AT8-DA4) and rubber gasket (ATC18002 for surface waterproofing) that are available at extra costs are necessary. If the pin connection socket is the 8-pin type, use the 8P cap (AD8-RC); or if it is the 11-pin type, use the 11P cap (AT8-DP11).

2) How to mount the timer
From the panel front, pass the timer through the square hole. Fit the mounting frame from the rear, and then push it in so that the clearance between the mounting frame and the panel surface is minimized. In addition, lock the mounting frame with a screw.

• **Screw terminal type**

Panel cover
Mounting frame
Push in
Screw
Rubber gasket

• **Pin type**

Push in
Panel
Screw
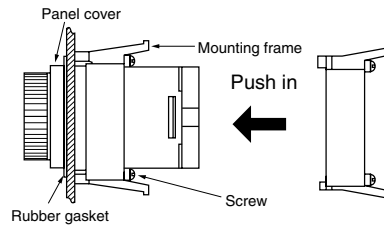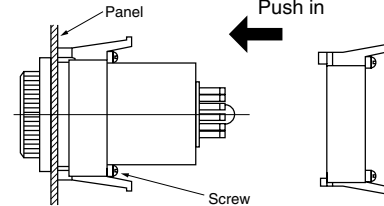
3) Caution in mounting the timer
• PM4H, and LT4H series
(a) If the PM4H and the LT4H series are used as the waterproof types, tighten the reinforcing screws on the mounting frames so that the timers, the rubber gaskets, and the panel surfaces are tightly contacted with each other.
(Tighten the two screws with uniform force and make sure that there is no rattling. If the screws are tightened too excessively, the mounting frame may come off.)
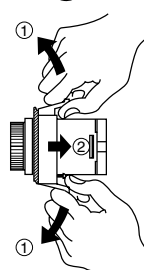(b) If the timer is installed with the panel cover and the rubber gasket removed, the waterproofing characteristic is lost.
4) Installation
Loosen the screws on the mounting frame, spread the edge of frame and remove it.
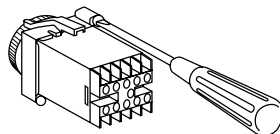
Pull the mounting frame backward while spreading out its hooks with your thumbs and index fingers.

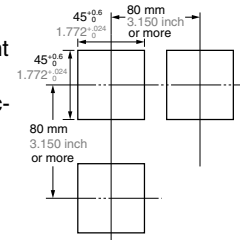5) Correctly connect the pins while seeing the pin connection diagram.
Tighten the terminal screws with a torque of 0.8 N·cm or less. The screws are M3.5. (screw-tightened terminal type)
6) If the pin type is used, the rear terminal block (ATC78041) or the 8P cap (AD8-RC) is necessary to connect the pins. For the 11-pin type, use the rear terminal block (ATC78051) or the 11P cap (AT8-DP11) and avoid directly soldering the round pins on the timer.
7) Panel cutout dimensions

$45^{+0.6}_{0}$
$1.772^{+.024}_{0}$

$45^{+0.6}_{0}$
$1.772^{+.024}_{0}$

The standard panel cutout dimensions are shown in the left figure. (Panel thickness: 1 to 5 mm .039 to .197 inch)

8) Although the timers can be mounted adjacent to each other in this case, it is recommended to arrange the mounting holes as shown in the right figure to facilitate attaching and detaching the mounting frame.

$45^{+0.6}_{0}$
$1.772^{+.024}_{0}$
80 mm
3.150 inch
or more

$45^{+0.6}_{0}$
$1.772^{+.024}_{0}$

80 mm
3.150 inch
or more

9) Adjacent mounting
Although the timers can be

$45^{+0.6}_{0}$
$1.772^{+.024}_{0}$

A

mounted adjacent to each other, remember that the panel surface of PM4H or LT4H series timer will lose its water-resistant effect. (Panel thickness: 1 to 5 mm .039 to .197 inch)
$A = (48 \times n - 2.5)^{+0.6}_{0}$ (mm)
When lining up the timers horizontally, set the frames in such a position so the formed spring areas are at the top and bottom.
When lining up the timers vertically, set the frames in such a position as the formed spring areas are at the right and left.

Formed spring

Formed spring