

SonicMax™ 39-Gallon Ultrasonic Cleaning System

Operations and Maintenance
Instructions


WARNINGS/CAUTIONS


Read all of these SAFETY INSTRUCTIONS and those in the manual BEFORE installing or using this equipment. Keep this manual handy for reference/training.

SAFETY

You will find various types of safety information on the following pages and on the labels attached to Graymills equipment. The following Safety Statements explain their meaning:

 The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

 **DANGER** The **DANGER** Symbol means that failure to follow this safety statement **WILL** result in serious personal injury or death.

 **WARNING** The **WARNING** Symbol means that failure to follow this safety statement **might** result in serious personal injury or death.



 **CAUTION** The **CAUTION** Symbol means failure to follow this safety statement **might** result in personal injury or property damage.

NOTE The **NOTE** Symbol means that failure to follow these instructions could cause damage to the equipment or cause it to operate improperly.

 **CAUTION**

Never work with equipment you feel may be unsafe. Contact your Supervisor immediately if you feel a piece of equipment is in an unsafe condition.

 **DANGER**

Never use a flammable or combustible fluid in this unit. Use only nonflammable, non-combustible, water-based, low foaming cleaning compounds in this machine. We recommend our low foaming Aquatene. Contact Graymills for specific details on the formula best suited for your application.

WARNING

Do NOT contaminate cleaning fluid with any flammable or combustible material such as gasoline, alcohol, mineral spirits, etc. Drain parts to be cleaned of any flammable material or combustible material before placing inside cleaning tank. Even small quantities can create a dangerous fire hazard.

Follow all directions, Warnings and Cautions for the cleaning material being used. If any cleaning solutions are splashed on clothing, remove wet clothing promptly and thoroughly wash body areas that have been in contact with the solution. Do NOT permit saturated clothing to remain in contact with skin. Industrial cleaners can cause irritation to some individuals. Cleaning solutions may irritate skin and eyes. If splashed in eyes, flush thoroughly with water. Consult Material Safety Data Sheet (MSDS) and a physician. Always wear appropriate safety items such as gloves, apron, safety glasses or goggles when loading or unloading unit.

If you have any questions regarding the correct cleaning fluids to use in this unit, call Graymills at 773-248-6825 and ask for Customer Service.

POWER SUPPLY, WIRING AND GROUNDING

WARNING

Install ground and wiring according to local and National Electrical Code requirements.

- Install a fused disconnect switch on all power legs near the unit
- Disconnect and lockout electrical supply before installing or servicing unit.

DANGER

Failure to permanently ground the unit and controls before connecting to electrical power can cause shock, burns or death.

Unit must be properly grounded to prevent electric shock hazard. Connect only to three prong outlet. Should cord become cracked, frayed or damaged in any way, it should be repaired/replaced immediately by a qualified electrician. Never use an extension cord. Since operator safety is at all times a priority, this unit is equipped with a Ground Fault Interrupter (GFI). Should plug or cord require replacement, it should be

wired by a licensed electrician to the GFI in the control box. All electrical connections should conform to national/local codes and be made by qualified personnel.

Prior to changing cleaning fluid or servicing the unit, make sure that that heating element and cleaning solution have cooled.

WARNING

Keep pump and motor clean and free of all contaminants. Never allow any liquids to come into contact with motor or electrical systems as an electric shock hazard could result. Care should be taken to avoid clogging the air intake for the ultrasonic generators, located on the bottom of the unit, with dust or dirt. Do NOT add any additional screens or filters to the air intake.

Excessive ambient temperature (over 105⁰ F) can permanently damage the ultrasonic generator circuits.

DESCRIPTION/SPECIFICATIONS

The ultrasonic cleaning system described in the following sections has been designed for a wide variety of applications including both maintenance and production applications. The information contained herein will assist the machine operator/technician to get the system's maximum cleaning potential.

The system is comprised of one portable, self contained, all stainless steel console. The system's ultrasonic power is supplied by one (1) 500 watt, and (1) 1000W, 40 kHz ultrasonic generator circuits within the console.

The Ultrasonic cleaning tank is 32" by 18" by 16". Filled to the top, this tank will hold 39 gallons.

In a typical cleaning application, the unit will be filled with about 25 to 30 gallons of water and detergent. This is approximately 13 to 14 inches of water.

INSTALLATION AND OPERATION

SITE PREPARATION

Before installing, careful consideration should be given to the place of operation. Place unit on a smooth, level surface.

CAUTION

The work area should be well ventilated.

Provide adequate lighting in the work area to permit viewing of the cleaning process and of the floor area around the machine. Be sure to allow adequate room to bring work to and from the machine. Use flooring or floor covering that does not become slippery when wet. Provide sufficient clearance around the machine for fluid changeovers and servicing.

INSTALLATION

UNPACKING

Check containers for any sign of external damage. Carefully unpack cartons. If any damage is determined, immediately notify carrier.

LOCATING THE MACHINE

The machine should be placed in a dry location free from water mist or spray. The internal electronic components can be damaged by high humidity or water spray. When filling the machine and rinsing any parts after ultrasonic cleaning avoid water spray on the intake lovers, back and underside of the ultrasonic cleaning system.

MAIN POWER

There is one (1) main power switch that allows power to the machine.

ULTRASONICS

Ultrasonics provides scrubbing cavitation for precision cleaning. This system features ultrasonic generators and employs transducers immersed in the fluid. On the control panel, there is one (1) switch that controls the timer for the ultrasonics. Start, starts the timer cycle and reset stops and resets the time on the timer. See section on timer for explanation on how to set the timer.

HEATER

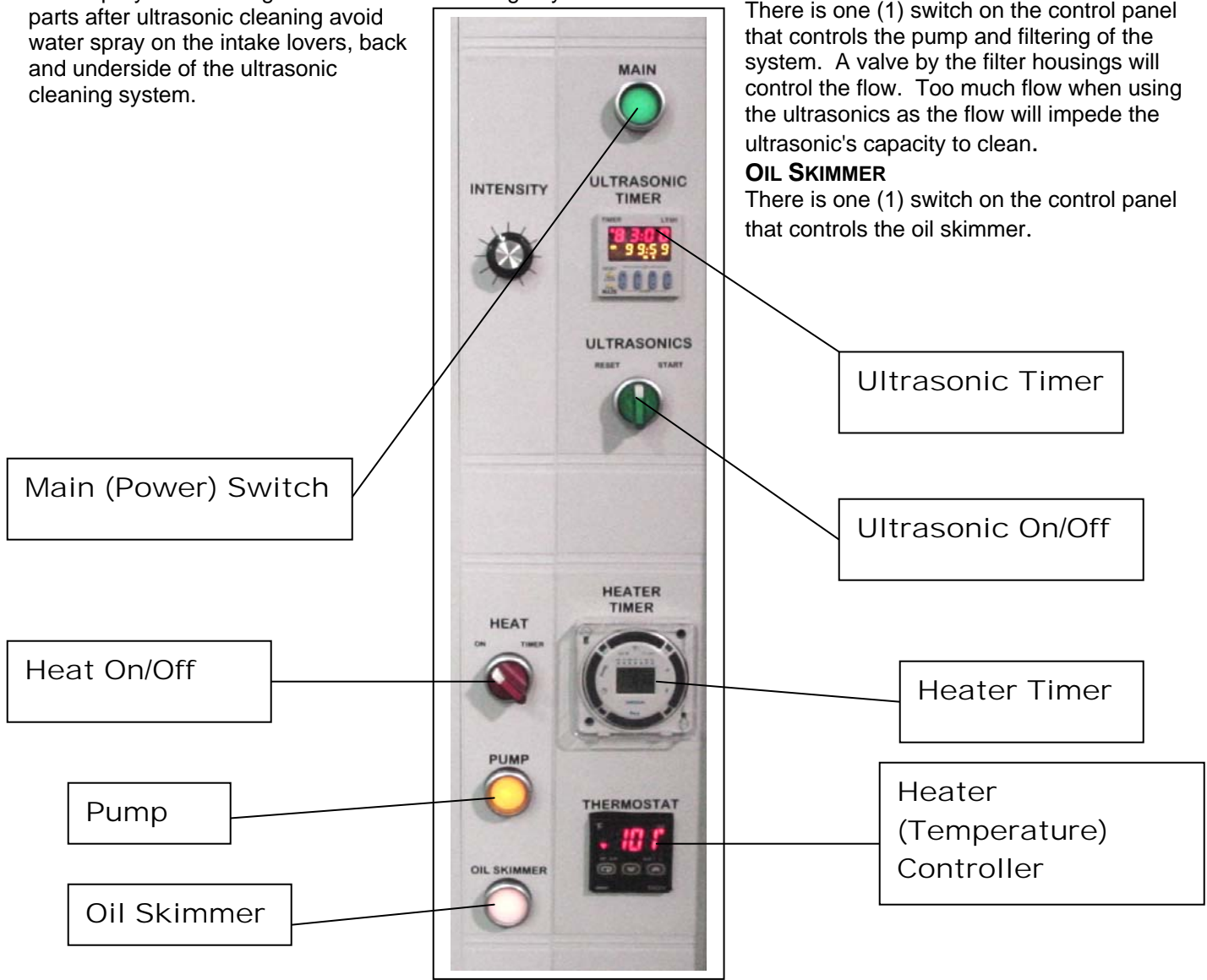
There are four (4) 500-watt (120V) heaters attached to the side of the ultrasonic tank. The temperature control thermostat controls the temperature. See section on digital thermostat on an explanation on how to set the thermostat. The switch on the control panel turns on the heater. Turning the switch to the right activates the heater timer; turning to the left overrides the timer and continuously activates the heater. See section on heater timer (Appendix A) for an explanation on how to set the day timer.

PUMP

There is one (1) switch on the control panel that controls the pump and filtering of the system. A valve by the filter housings will control the flow. Too much flow when using the ultrasonics as the flow will impede the ultrasonic's capacity to clean.

OIL SKIMMER

There is one (1) switch on the control panel that controls the oil skimmer.



ULTRASONIC CLEANING SETUP

WARNING

DO NOT OPERATE THE ULTRASONIC GENERATOR WITHOUT LIQUID IN THE ULTRASONIC TANK. PERMANENT DAMAGE WILL RESULT IF THE SYSTEM IS RUN DRY. THIS SYSTEM REQUIRES A MINIMUM OF 12 INCHES OF LIQUID TO PROTECT THE HEATERS AND ULTRASONIC TRANSDUCERS.

Filling the Unit - Check to be sure the drain valve (located on the inside the drain access door) to insure it is tightly closed. Fill the tank with 13" (approximately 24 gallons) of warm to hot water. Warm water increases the efficiency of the cleaning process; with the optimum water temperature being 90 - 100°F some chemicals will require higher temperatures for proper cleaning.

Adding Chemicals - Depending upon the chemical makeup of the water supply in your area, you may start by adding a slightly reduced amount of chemical as recommended by the manufacturer. After cleaning one or two items, you may choose to increase the chemical ratio. The amount of chemical will be based on the condition of the water being used and how much contamination is to be removed. Detergents that are used in this ultrasonic cleaning system must be compatible with 304 and 316L stainless steel. **You will void the warranty if chemical attack to the stainless steel occurs.**

Power On - Engage the ultrasonic start switch. The ultrasonic generators will start the ultrasonic action in the tank. Both generator circuits are controlled by switch on the control panel.

System Degassing – At startup or after fluid changes, the unit has to be run to eliminate air in the fluid before parts washing. The system should be run for approximately 10 minutes with the ultrasonic generators at full power an tank temperature at 100 F to allow the water in the cleaning tank to properly degas. Typically, the sound of the unit in operation will change from a high pitch "squeal" to a lower tone when de-gassing is completed. (The de-gassing process removes unwanted air molecules from the cleaning tank, thus maximizing the efficiency of the cavitation/cleaning process.)

Cleaning - Place materials to be cleaned into the degassed cleaning tank. Be sure that all parts and components are fully submerged into the cleaning solution. Check to be sure that no air pockets are present on the item(s) being cleaned, as the cavitation process will only operate in the liquid solution. Some initial testing will allow you to determine the proper settings for the optimum time and temperature. Also discuss the application with the chemical supplier. Typically, due to the extreme efficiency of the unit, only 2 to 3 minutes of immersion time is required to thoroughly clean the average job.

WARNING

When first learning the capabilities of this system, do not leave items unattended in the wash tank for periods longer than four (4) minutes! The system may damage surfaces if allowed to remain in the ultrasonic bath for extended periods of time! Longer cleaning times can be used after thorough testing has been completed.

Do not place items to be cleaned directly on the tank bottom. Always suspend parts or use baskets that place the weight of the parts on the edges of the ultrasonic tank. Do not attempt to clean aluminum in a caustic solution. Do not use bleach or ammonia as a cleaning chemical.

MAINTENANCE



WARNING

Before performing any maintenance on this unit, be sure to disconnect electric power.

This unit utilizes high voltage to operate the ultrasonic transducers. Only qualified trained personnel should attempt any repairs or servicing of the ultrasonic components.

Several routine maintenance procedures should be followed to enhance the performance of the equipment and to ensure long term reliability.

ULTRASONIC GENERATOR

The ultrasonic generators have fans to cool the electronic components. These fans may become blocked with lint or debris that will inhibit the free flow of air. Periodically (every 1 to 3 months) under normal conditions, the generator intake grill/screen should be inspected (for debris build-up), cleaned and placed back into the housing. Access to the generators is via a screen inside the underside

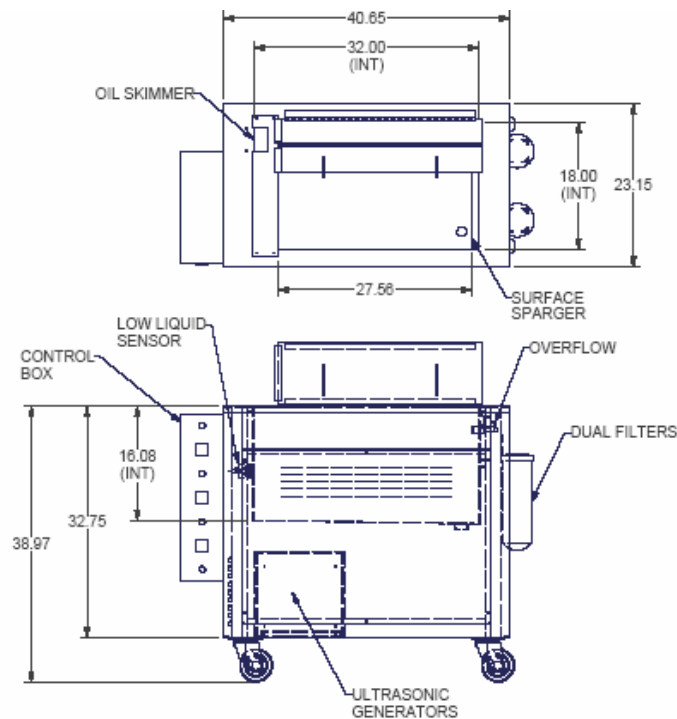
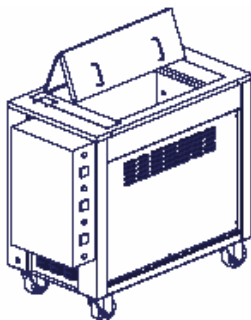
of the machine. Should it be necessary to remove the ultrasonic generator there are several connections from the generator to the system. If any connections are disconnected be sure all connections are re-connected prior to restarting the machine. Only a qualified technician should perform this maintenance. The ultrasonic generator utilizes high voltage.

While the unit is out of the housing, the electronics can be visually inspected to determine any areas of abnormality (discoloration etc.). At this time, any build-up of dust or debris on the electronics should be gently brushed off or removed by using a gentle blast of air.

GENERAL CLEANING

To prevent build-up of contamination on tank walls, it is advisable to periodically drain the tank solution and wash out the tank.

Be careful when cleaning the ultrasonic tank to not scratch or abrade the ultrasonic radiating surface, as this will reduce the life of the radiating surface.



Graymills Corporation warrants that the equipment manufactured and delivered, when properly installed and maintained, shall be free from defects in workmanship and will function as quoted in the published specification. **Graymills** does not warrant process performance, nor assume any liability for equipment selection, adaptation, or installation.

Warranty does not apply to damages or defects caused by shipping, operator carelessness, misuse, improper application or installation, abnormal use, use of add-on-parts or equipment which damages or impairs the proper function of the unit, and modifications made to the unit. Warranty does not apply to expendable parts needing replacement periodically due to normal wear and tear.

A new Warranty period shall not be established for repaired or replaced materials or products. Such items shall remain under Warranty for only the remainder of the Warranty period of the original material or product.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY. **GRAYMILLS CORPORATION** MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESTATED OBLIGATION ARE HEREBY DISCLAIMED BY **GRAYMILLS CORPORATION** AND EXCLUDED FROM THIS SALE. **Graymills** warranty obligations and Buyer remedies (except to title), are solely and exclusively stated herein. In no case will **Graymills** be liable for consequential damages, loss of production, or any other loss incurred due to interruption of service.

Graymills' obligation under this Warranty shall be limited to:

1. Repairing or replacing (at **Graymills** sole discretion) any non-conforming or defective component within one year from the date of shipment from **Graymills**.
2. **ULTRASONIC EQUIPMENT** – On parts cleaners equipped with ultrasonics, the ultrasonic transducers are guaranteed against cracking, depolarizing or becoming detached from the radiating surface for a period of ten (10) years from the date of shipment from **Graymills**. This warranty does not cover transducer failure that results from operating the equipment with insufficient liquid in the tank as evidenced by inspection by **Graymills**.
3. Repairing or replacing (at **Graymills** sole discretion), components supplied by, but not manufactured by **Graymills**, to the extent of the warranty given by the original manufacturer.
4. This warranty does not cover rusting of a mild-steel parts cleaner used with aqueous (water-based) materials. On ultrasonic equipment, the finish of the stainless steel tank interior or the immersible transducer radiating surface is excluded from this warranty as erosion of these surfaces occurs normally during the course of operation.

Buyer must give **Graymills** prompt notice of any defect or failure.

If you believe you have a Warranty claim, contact **Graymills** at (773) 248-6825. Any return material must have an RMA number on the outside of the package and shipping prepaid or shipment will be refused. **Graymills** will promptly examine the material and determine if it is defective and within the Warranty period.

Graymills[®] 3705 N. Lincoln Ave. Chicago, IL 60613
773-248-6825 1-888-GRAYMILLS
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Specifications may change without notice

Operating Instructions



Digi 20 Series One Circuit Electronic 24 Hour or 7 Day Time Switches



Digi 20A
(surface mounting)



Digi 20E
(flush mounting)



FILE: E83486

APPLICATION

Time based control of lighting, ventilating, heating, cooling or other electrical loads in commercial and industrial applications. The Digi 20 time switches are programmable for 24-hour or 7-day schedules.

The Digi 20A is intended for either surface or rail mounting. The control is completely enclosed in a plastic housing and includes a terminal cover and sub-base for installation and hard wiring.

The Digi 20E is intended for flush (panel) mounting.

All units are supplied with a clear plastic dust cover. They are also available with an enclosure for stand-alone applications. (GM and GMX models)

TECHNICAL DATA

Output-1 SPDT relay with dry contacts

Switch Rating: 16A/277VAC resistive

1000W tungsten @ 240VAC; 500W @ 120VAC

1/2 hp @ 120VAC; 1 hp @ 240VAC

100 hour capacitor back-up of memory and display

Supply voltages: Separate Models - 24VAC/DC, 120VAC, 208/240VAC, all 50/60Hz (refer to product label)

Shortest switch time-1 minute

Ambient Temperature Range -20°F to 140°F (-28°C to 60°C)

VA required: 120V & 240V models: 4VA

24V model: 2VA @ 24VAC, 1VA @ 24VDC

Screw terminal connections (Digi 20A)

1/4" quick connects (Digi 20E)

Accuracy ± 4 minutes per year

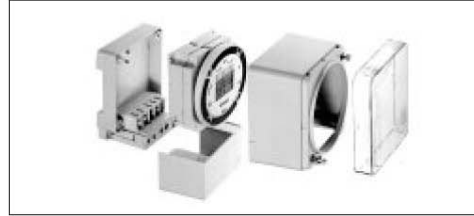
Installation

To the installer:

1. Read operating instructions carefully.
2. Check the input and output ratings marked on the unit to make sure this product is suitable for your power supply and application.
3. Disconnect power supply prior to installation to prevent electrical shock.
4. Wire in accordance with National and Local electrical code requirements.

SURFACE MOUNTING—Digi 20A

Remove dust cover, loosen two screws on opposite corners. Remove the housing that surrounds the time switch and the terminal cover away from the base. Remove timer module by pulling straight out.



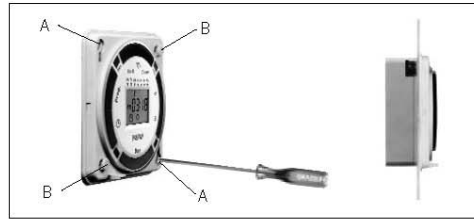
Place screws through 3 mounting holes in base and screw to back panel or wall.

Wire in accordance with instructions. Replace terminal cover and push timer firmly onto base. Now replace housing and secure with screws.

NOTE: The Digi 20A is also suitable for DIN rail mounting. Break out housing part on each side that fits over rail.

PANEL MOUNTING—Digi 20E

Cut a square hole 2-5/8" x 2-5/8" (66mm x 66mm) in the front of the panel. Insert the time switch through the opening. With a screwdriver, press down and turn outer screws (A) until flanges are in position to fasten the unit in front panel, then release. Insert plugs into holes (B).



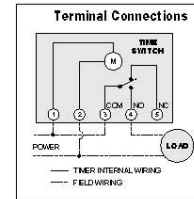
Use 1/4" quick connects and make connections in accordance with the wiring diagram shown and applicable code requirements.

WIRING

1. Disconnect the power.

2. Wire input to timer, (1, with the proper voltage marked on the unit. Wiring to incorrect voltage will void the warranty.

3. Connect wiring according to the wiring diagram. The terminals on the Digi 20A sub-base will accommodate 10 to 24 AWG wire.



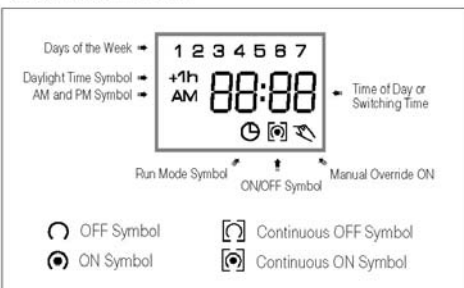
KEYPAD DESCRIPTION

- Setting the Time/Automatic Run Mode
- Prog.** Program Mode
- Res.*** Reset: Clears all programs and time
- Select ON or OFF in Prog. Mode, Manual Override in Run Mode
- ±1h*** Manual Daylight Change Key
- h** Setting the Hour (12-- AM)
- m** Setting the Minute (12:01 AM)
- Day** Set Day(s) for time and programs

*Recessed keys; use a pen point to press

LCD DISPLAY ELEMENTS

The LCD incorporates a number of different elements to display various data and information.



PROGRAMS

The Digi 20 will accept up to 20 programs

A program consists of:

1. An ON or OFF command
2. Time of day (Hour and Minute)
3. Single day or multiple days

A program is required for each ON event, and a program is required for each OFF event.

NOTE: MULTIPLE ON OR OFF EVENTS MAY BE PROGRAMMED. For example, Program 1 may turn the office air conditioning ON at 8AM Mon.-Fri. Program 2 may turn the air conditioning OFF at 5PM Mon.-Fri.

If someone is working late, they may press the override key to turn on the air conditioning. If they forget to press the override key again when they leave, the air conditioning will stay on all night (or all weekend).

To prevent this from occurring, **additional OFF times may be programmed.**

- Program 3 can turn the air conditioning OFF at 6PM.
- Program 4 can turn the air conditioning OFF at 7PM.
- Program 5 can turn the air conditioning OFF at 8PM., etc.

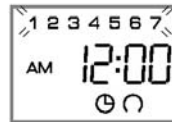
IMPORTANT: BEFORE PROCEEDING WITH SETTING THE TIME AND PROGRAMMING THE UNIT, PRESS THE RESET KEY TO CLEAR ALL DATA FROM THE MEMORY.

SELECTING AM/PM OR MILITARY TIME

After pressing reset, the display may show AM (right). The numbered day symbols will be flashing on and off.

If the display does not show AM, it is in military time mode (24:00 hr.) To change to AMPM mode, press and hold the **h** key and press the **±1h** key once. AM will appear in display.

If display is in AM mode and military mode is desired, press and hold the **h** key, press the **±1h** key once.



SETTING THE TIME

NOTE: If the **h** and **m** keys are held down longer than 2 seconds, the numbers will advance rapidly.

Press and hold the key during the following:
(If Daylight Savings Time is in effect, press **±1h** first)

1. Press **h** to advance to the current hour (while holding down the key)
2. Press **m** to advance to the current minute (while holding down the key)
3. Press **Day** repeatedly to advance to current day (while holding down the key)

NOTE: If the days are flashing, it indicates the day of the week was not set when setting the time. The timer cannot be programmed unless the day of the week is entered.

MANUAL DAYLIGHT TIME CHANGEOVER

Each year, in the Spring, press **±1h** to advance the time an hour. In the Fall, press **±1h** to set back an hour.

PROGRAMMING 24 HOUR OR 7 DAY SCHEDULES

It is helpful to write out the program schedules *before* beginning. See last page.

IMPORTANT: THE CURRENT TIME OF DAY AND DAY OF WEEK MUST BE SET PRIOR TO PROGRAMMING. SEE "SETTING THE TIME"

Example

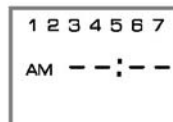
Program 1: ON at 7:00AM Monday thru Saturday

Program 2: OFF at 5:00PM Monday thru Friday

Program 3: OFF at 7:00PM Saturday

Three programs need to be entered.

Press **Prog.** key only once. Display shows:



Program 1 (ON at 7:00AM Monday thru Saturday)

- Press key once ON symbol appears
- Press **h** key to 07AM
- Press **m** key once to 00
- Press **Day** key once 1 2 3 4 5 6 is displayed
- Press **Prog.** key to enter

Program 2 (OFF at 5:00PM Monday thru Friday)

Press key twice OFF symbol appears
Press **h** key to 05PM
Press **m** key once to 00
Press **Day** key two times 1 2 3 4 5 is displayed
Press **Prog.** key to enter

Program 3 (OFF at 7:00PM Saturday)

Press key twice OFF symbol appears
Press **h** key to 07PM
Press **m** key once to 00
Press **Day** key 9 times until only 6 is displayed
Press **Prog.** key to enter
Press key to enter Run Mode

IMPORTANT: IF AN "ON" TIME WAS PROGRAMMED THAT IS EARLIER IN THE DAY THAN THE CURRENT TIME, PRESS ONCE TO TURN THE TIMER "ON". (IT DOES NOT "LOOK BACK" TO DETERMINE IF IT SHOULD BE ON OR OFF AFTER PROGRAMMING)

NOTE: If 24 hour time control (same schedule every day of the week) is desired, ignore **Day** key.

If a ON or OFF symbol is not entered, the ON symbol will flash, and program will not be accepted.

DAY KEY SELECTIONS

Press Day Key	Display Shows	Days
0 times	1 2 3 4 5 6 7	Every Day
1 time	1 2 3 4 5 6	Mon.-Sat.
2 times	1 2 3 4 5	Mon.-Fri.
3 times	6 7	Sat. & Sun.
4 times	1	Monday
5 times	2	Tuesday
6 times	3	Wednesday
7 times	4	Thursday
8 times	5	Friday
9 times	6	Saturday
10 times	7	Sunday

REVIEWING PROGRAMS

To review the programs at any time, press **Prog.** key. Programs will appear in the order they were entered with repeated presses of the **Prog.** key. After all programs have been reviewed, the blank display will appear to allow entering another program. Another press of the **Prog.** key will display the number of free programs available, such as **Fr 16** if 4 programs have been entered.

MANUAL OVERRIDE

TEMPORARY: While in the Run Mode, pressing the key once will reverse the output, ON to OFF or OFF to ON. The symbol appears in the display to indicate a temporary override. At the next scheduled switching time, automatic control resumes, eliminating the override.

CONTINUOUS: While in the Run Mode...

- Pressing the key twice will turn the output to ON permanently. symbol appears in display.
- Pressing the key three times will turn the output OFF permanently. symbol appears in display.
- To terminate a continuous override, press the key until appears in the display.

CHANGING A PROGRAM

Select the program to be changed with the **Prog.** key. A new set of days may be selected with the **Day** key just as in initial programming. Hour and minute can be changed with the **h** and **m** keys.

Press **Prog.** or key to store the new program.

DELETING A PROGRAM

To delete only one or a few programs: Press **Prog.** key until the desired program is displayed.

Press **m** key to **:59** and press once more to blank out.

Press **h** key to **11PM** and press once more to blank out.

Press key, display will flash for several seconds and then enter the Run Mode.

Using the reset key will delete ALL programs, the time of day, and day of the week.

TROUBLESHOOTING

PROBLEM: Days are flashing, pressing any key does nothing except key turns output ON and OFF.

SOLUTION: **Time of Day** and **Day of Week** have not been set. See "SETTING THE TIME"

NOTE: This is the condition after a reset. If the timer is found in this condition after it has been installed, programmed and operating for a while, it may indicate that electrical noise or voltage transients have disrupted the microprocessor causing a loss of program information. Call 1-800-272-1115 and request that a no-charge "Snubber Filter" be sent to you to place across the input to the timer, which may solve the problem.

A second, but very unlikely cause of loss of program is a power failure with the backup capacitor low or dead. Check by disconnecting power and monitoring how long the capacitor keeps the time of day in the display. Typically, the capacitor will maintain the time and programs for 4 days, but not more than 5 days.

PROBLEM: Time of day was set while holding the key down, but days are still flashing.

SOLUTION: Current day of week was not set **while holding down the key.** See "SETTING THE TIME"

PROBLEM: It is 10AM and a ON program for 8AM was entered, but the output is not ON. Display shows the and symbols.

SOLUTION: After programming, the timer does not "look back" to determine if it should be ON. Press the key (temporary override) to turn the output ON; appears in display. The timer will assume automatic operation at the next programmed event.

PROBLEM: A program for 8AM Monday thru Friday was entered, but it will not accept it and is flashing.

SOLUTION: The ON or OFF was not entered as part of the program. ON or OFF **must be selected.**

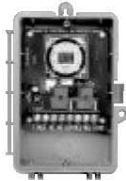
Digi 20 Program Schedules

Prog	ON/OFF	h	m	Day(s)
1	On	7 am	30	Mon., Tue., Wed., Thurs, Fri.

Other Grasslin Time Control Products



MIL 72 Series
ELECTROMECHANICAL 24 HOUR & 7 DAY TIME SWITCHES
Same panel or flush mount configuration as the Digi 20.
21Amp, 2HP SPDT Switch.



GM & GMX Series
MECHANICAL & ELECTRONIC 24 HOUR AND 7 DAY TIME SWITCHES
30Amp & 21Amp in NEMA 1 or NEMA 3R Enclosures.



KM2 In-Wall Timer
24 HOUR OR 7 DAY
Replaces standard wall switch.
20Amp, 120VAC.



FrostKing Refrigeration Defrost Timers
Two models replace all standard Paragon or Precision models.



Digi 42
7 DAY ELECTRONIC TIME SWITCH
Similar to Digi 20, except has Holiday program and automatic daylight time changeover.

Digi 42/2
TWO CHANNEL TIME SWITCH
Same features as Digi 42 except it has two channels.



Digi 322
ONE, TWO OR FOUR CHANNEL 365 DAY ELECTRONIC PROGRAMMABLE TIME CONTROL
Automatic Daylight Time changeover and many other features.



KLT 2005
MECHANICAL SPRING WOUND COUNTDOWN TIMER
Mounts in single or multi-gang electrical boxes with standard or decorator wallplates

GRASSLIN GmbH & Co. KG is ISO 9001 Certified
GRASSLIN CONTROLS CORPORATION
31 Industrial Ave. • Mahwah, New Jersey 07430 • Tel.: 201-825-9696 • Fax: 201-825-8694
E-mail: GCCsales@grasslin.com • www.grasslin.com

<h1>NAIS</h1>	DIN 48 SIZE DIGITAL TIMER	<h1>LT4H Timers</h1>
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Compact, Easy-to-read, Easy-to-use...
A digital timer made to meet the market's needs.



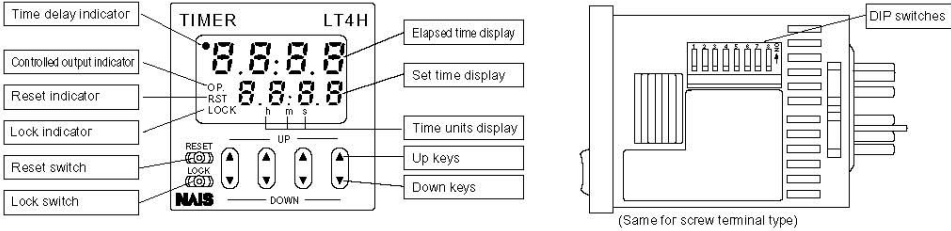
Features

- 1. Bright and Easy-to-Read Display**
A brand new bright 2-color back-lit LCD display. The screen is easy-to-read in any location, makes checking and setting procedures a cinch.
- 2. Simple Operation**
Seesaw buttons make setting and operation simple and easy.
- 3. Short Body of only 64.5 mm 2.54 inch (screw terminal type) or 70.1 mm 2.76 inch (pin type)**
With a short body, it is easy to install even in shallow control panels.
- 4. Conforms to IP66's Weather Resistant Standards**
The water-proof front panel keeps out water and dirt for reliable operation even in poor environments.
- 5. Screw terminal and Pin Type are Both Standard**
The two terminal types are standard to support either through-panel installation or embedded installation.
- 6. Changeable Panel Cover**
A black panel cover is also available to meet your design requirements.
- 7. Conforms With EMC and Low Voltage Directives**
Conforms with EMC directives (EN50081-2/EN50082-2) and low-voltage directives (VDE0435/Part 2021) for CE certification vital for use in Europe.
- 8. EE-PROM Power Failure Memory**
EE-PROM memory retains setting and time data. Eliminates the need for battery replacement.

Product types

Time range	Operation mode	Output	Operation voltage	Power down insurance	Terminal	Part No.
9 999 s (0.001 s~) 99 99 s (0.01 s~) 999.9 s (0.1 s~) 9999 s (1 s~) 99 m 99 s (1 s~) 999.9 min (0.1 m~) 99 h 59 min (1 m~) 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)	100-240 V AC	Available	11 pin	LT4H-AC240V
			12-24 V DC		Screw	LT4H-AC240VS
		Transistor (1 a)	100-240 V AC		11 pin	LT4HT-AC240V
			12-24 V DC		Screw	LT4HT-AC240VS
		11 pin	LT4H-DC24V			
		Screw	LT4H-DC24VS			
		11 pin	LT4HT-DC24V			
		Screw	LT4HT-DC24VS			

Part names

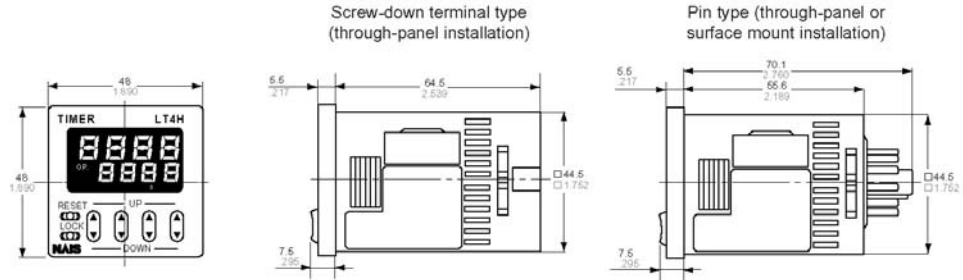


Specifications

Item	Relay output type		Transistor output type								
	AC type	DC type	AC type	DC type							
Operating voltage	100 to 240 V AC	12 to 24 V DC	100 to 240 V AC	12 to 24 V DC							
Frequency	50/60 Hz common	—	50/60 Hz common	—							
Power consumption	Max. 10 V A	Max. 3 W	Max. 10 V A	Max. 3 W							
Control capacity (resistive)	5 A, 250 V AC		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), A2 (Power ON delay), B (Signal ON delay), C (Signal OFF delay), D (Pulse one-shot), E (Self-hold), F (Flicker), G (Totalizing) (Selectable by DIP switch)										
Signal, Reset, Stop input	Min. input signal width: 1 ms, 20 ms (2 directions by selected by DIP switch)										
Lock input	Min. input signal width: 20 ms										
Input signal	Open collector input Input impedance: Max. 1 k Ω , Residual voltage: Max. 2 V Open impedance: 100k Ω or less, Max. energized voltage: 40V DC										
Indication	7-segment LCD, Elapsed value (backlight red LED), Setting value (backlight yellow LED)										
Power failure memory method	EE-PROM (Min. 10 ⁵ overwriting)										
Time accuracy (max.)	<table border="1"> <tr> <td>Operating time fluctuation</td> <td rowspan="4">± (0.005 % + 50 ms) in case of power on start ± (0.005 % + 20 ms) in case of reset or input signal start (at fixed power off time)</td> </tr> <tr> <td>Temperature error</td> </tr> <tr> <td>Voltage error</td> </tr> <tr> <td>Setting error</td> </tr> <tr> <td>Power off time change error</td> <td>100 ms</td> </tr> </table>				Operating time fluctuation	± (0.005 % + 50 ms) in case of power on start ± (0.005 % + 20 ms) in case of reset or input signal start (at fixed power off time)	Temperature error	Voltage error	Setting error	Power off time change error	100 ms
Operating time fluctuation	± (0.005 % + 50 ms) in case of power on start ± (0.005 % + 20 ms) in case of reset or input signal start (at fixed power off time)										
Temperature error											
Voltage error											
Setting error											
Power off time change error	100 ms										
Contact	Contact arrangement: Timed-out 1 Form C		Timed-out 1 Form A (Open collector)								
Initial contact resistance	100 m Ω (at 1 A 6 V DC)		—								
Contact material	Ag alloy/Au flash		—								
Life	Mechanical: 2.0 × 10 ⁶ ope. (Except for switch operation parts)		—								
	Electrical: 1.0 × 10 ⁶ ope. (At rated control voltage)		1.0 × 10 ⁶ ope. (At rated control voltage)								
Electrical	Operating voltage range: 85 to 110 % of rated operating voltage										
	Initial breakdown voltage		2,000 Vrms for 1 min: Between live and dead metal parts 2,000 Vrms for 1 min: Between input and output 1,000 Vrms for 1 min: Between contacts								
	Initial insulation resistance (At 500 V DC)		Min. 100 M Ω : Between live and dead metal parts Between input and output Between contacts								
	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./s ² (4 times on 3 axes) Destructive: Min. 294 m 994.567 ft./s ² (5 times on 3 axes)									
	Ambient temperature	-10° C to 55° C +14° F to +131° F									
Operating conditions	Ambient humidity	Max. 85 % RH									
	Air pressure	860 to 1,060 h Pa									
	Ripple rate	—	20 % or less	—							
Connection	11-pin/screw terminal										
Protective construction	IP66 (front panel with rubber gasket)										

Dimensions (units: mm inch)

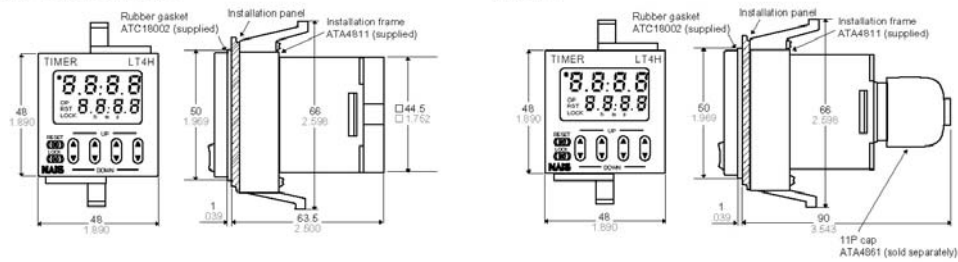
• LT4H digital timer



• Dimensions for through-panel installation (with adapter installed)

Screw-down terminal type

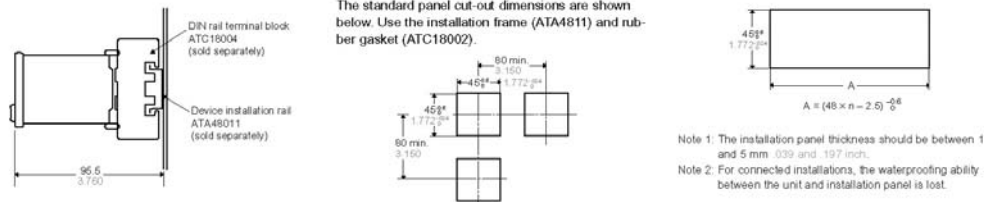
Pin type



• Dimensions for surface mount installations

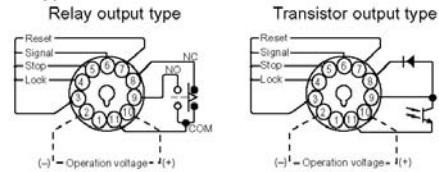
• Installation panel cut-out dimensions

• For connected installations

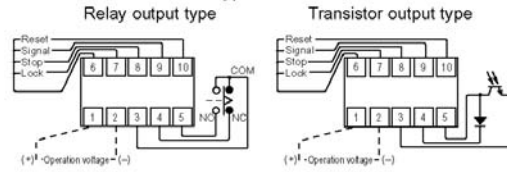


Terminal layout and wiring

• Pin type



• Screw-down terminal type



Setting the operation mode, timer range, and time

Setting procedure 1) Setting the operation mode and timer range

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

DIP switches

Note: Set the DIP switches before installing the unit.

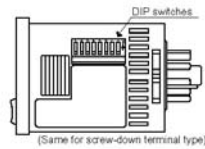
Item	DIP switch		
	OFF	ON	
1	Refer to table 1		
2	Refer to table 1		
3	Refer to table 1		
4	Minimum input reset, signal, and stop signal width	20 ms	1 ms
5	Time delay direction	Addition	Subtraction
6	Refer to table 2		
7	Refer to table 2		
8	Refer to table 2		

Table 1: Setting the operation mode

DIP switch No.			Operation mode
1	2	3	
ON	ON	ON	A: Power on delay
OFF	OFF	OFF	A2: Power on delay
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 timer range

DIP switch No.			Timer 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

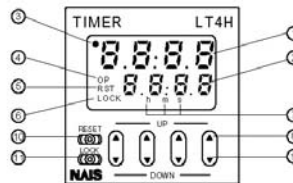


Setting procedure 2) Setting the time

Set the set time with the keys on the front of the unit.

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) or A2 (power on delay), the output will turn on when the power supply is turned on. However, the output

will be off while reset is being input.

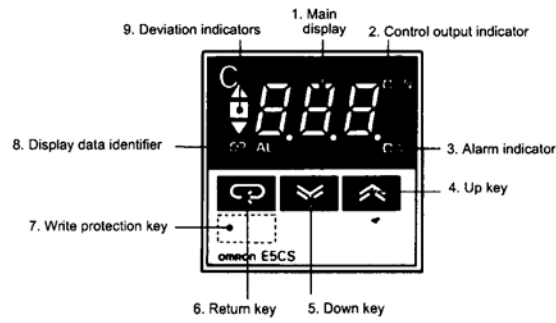
2) In the other modes, the output turns on when the signal is input. When the operation mode is C (signal off delay), D (one shot), or F (flicker), only when the signal input is on does the output turn on. Also, when the reset is being input, the output is off.

Operation mode

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

Operation type	Explanation	Time chart						
Power on delay (1) (A)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" style="margin-left: 20px;"> <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 time-out, stops at the display of the set value (addition), or stops at "0" (subtraction). Ignores signal input. Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. 	1	2	3	ON	ON	ON	
1	2	3						
ON	ON	ON						
Power on delay (2) (A2)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" style="margin-left: 20px;"> <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 time-out, stops at the display of the set value (addition), or stops at "0" (subtraction). Ignores signal input. Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. 	1	2	3	OFF	OFF	OFF	
1	2	3						
OFF	OFF	OFF						
Signal on delay (B)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" style="margin-left: 20px;"> <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 signal ON and elapsed time value or output resets at signal OFF. Instantaneous time delay start at reset OFF and power ON while signal 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, jumper the signal input beforehand. 	1	2	3	ON	OFF	OFF	
1	2	3						
ON	OFF	OFF						
Signal off delay (C)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" style="margin-left: 20px;"> <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 signal ON and time delay start at signal OFF. Elapsed time value clears when signal goes ON again during time delay. Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. 	1	2	3	OFF	ON	OFF	
1	2	3						
OFF	ON	OFF						

Operation type	Explanation	Time chart						
Pulse One-Shot (D)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" data-bbox="690 317 813 363"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> </table> Clears elapsed time value at power ON. Time delay starts and output control ON at signal ON. Ignores signal input during time delay. Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. 	1	2	3	ON	ON	OFF	
1	2	3						
ON	ON	OFF						
Pulse On delay (E)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" data-bbox="690 646 813 693"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> </table> Clears elapsed time value at power ON. Time delay starts at signal ON. Ignores signal 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, jumper the signal input beforehand. 	1	2	3	OFF	OFF	ON	
1	2	3						
OFF	OFF	ON						
Signal Flicker (F)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" data-bbox="690 976 813 1022"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> </table> Clears elapsed time value at power ON. Time delay starts at signal ON. Ignores signal 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, jumper the signal input beforehand. 	1	2	3	ON	OFF	ON	
1	2	3						
ON	OFF	ON						
Totalizing On delay (G)	<ul style="list-style-type: none"> Set the operation mode section of the DIP switches (no.'s 1, 2, and 3) on the side of the timer as shown. <table border="1" data-bbox="690 1306 813 1352"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>ON</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. Stops delay time operation at stop ON. Restarts delay time operation at stop OFF. 	1	2	3	OFF	ON	ON	
1	2	3						
OFF	ON	ON						



Key	Description	Key	Description
1	Main display sequentially displays the present temperature, set temperature, and an alarm value each time the return key is pressed.	7	The hidden write protection key provides protection against unauthorized setting of temperature and is used in conjunction with the internal "protection" switch. If the internal protection switch is set to ON, then to obtain Up and Down operation, the hidden key must be pressed simultaneously with the Up and Down keys. If the internal protection switch is set to OFF, changes can be made simply by pressing the Up and Down keys.
2	Control output indicator lights when the output is ON.		
3	Alarm indicator lights when the alarm output is ON.		
4	Up key increases the set temperature or alarm value when pressed. Increases the value quickly when held down.		
5	Down key decreases the set temperature or alarm value when pressed. Decreases the value quickly when held down.	8	Display data identifier lights SP when the set temperature is displayed on the main display and AL when an alarm value is displayed.
6	Return key changes the value displayed on the main display each time pressed.	9	Red deviation indicators light up an arrow when the present temperature is higher than the set temperature and light a down arrow when the present value is lower than the set temperature. The green block indicates the temperature deviation is within $\pm 1\%$ of the full scale.