OPTIONAL ULTRASONICS

If the ultrasonic cleaning option for the T-Series Liftkleen is purchased, the machine controls are located in a control enclosure on the side of the cleaning tank. The following controls are found on the enclosure control panel:

Control	Function
Temp/Time Controller	Sets the tank operating temperature and the cleaning cycle time.
Platform Up Pushbutton	Raises the cleaning platform.
Platform Down Pushbutton	Lowers the cleaning platform.
Main Power Selector Switch	Turns the control power on or off.
Ultrasonics On/Off Selector Switch	Turns the ultrasonic power on or off.
Oil Skimmer On/Off Selector Switch	Turns the belt-type oil skimmer on or off.
Heat On/Off Selector Switch	Turns the heater power on or off.
Heat Enabled Lamp	Indicates that the 7-day timer is allowing power to be supplied to the tank heaters.
7-Day Timer	Programmed to turn the tank heaters on and off according to a pre-set schedule. Can be set to turn on the heaters in advance of the workday so that the fluid is up to temperature when the shift starts. Turns off the heaters at the end of the workday to prevent excessive loss of cleaning fluid due to evaporation. Can be programmed to skip weekends.

INSTALLATION AND SETUP

MAKE SURE THAT THE ELECTRIC POWER AND THE COMPRESSED AIR SUPPLY TO THE MAIN CONTROL PANEL ARE DISCONNECTED.

1. Unpack the ultrasonic generator modules and place in the enclosure at the rear of the cleaning tank.
2. Connect the four RF cables from the cleaning tank to the connectors on the rear of the generator module enclosures.
3. Connect the power cables from the rear of the generator modules to the receptacles inside of the generator enclosure.
4. Turn on the power switches on the generator enclosures.
5. Turn the POWER and FREQUENCY SWEEP controls on the generator modules to the maximum (fully clockwise) position.

INSTALLATION AND SETUP (CONT'D.)

6. Fill the cleaning tank with the proper cleaning fluid. Follow the fluid manufacturer's recommendation when diluting the cleaning fluid with water. Make sure to leave approximately 6" of freeboard between the fluid surface and the top of the tank to prevent splashing.

NOTE:

Always start with the lowest concentration of cleaning fluid. Additional concentrate can be added during operation to achieve the required cleaning performance.

7. Connect the electrical power and compressed air supply to the Liftkleen control panel.
8. Turn on the Main Power selector switch.
9. Using the Temp/Time controller on the main control panel, set the desired fluid temperature. REFER TO THE TEMP/TIME CONTROLLER INSTRUCTION MANUAL INCLUDED WITH THIS EQUIPMENT.

NOTE:
The proper cleaning temperature will be in the range of 115° F. to 160° F. Always use the lowest cleaning temperature that will produce the desired cleaning performance.

10. Set the 7-day timer to allow heater power to be supplied. The Heat Enabled pilot lamp should illuminate. Turn on the Heat On/Off selector switch, the fluid should begin heating up.
11. Using the Platform Up and Platform Down pushbuttons, raise and lower the work platform.

NOTE:

FOR ULTRASONIC OPERATION, THE PLATFORM AGITATION SPEED MUST BE SET SLOWER THAN NORMAL. USING THE PLATFORM SPEED CONTROLS AT THE REAR OF THE LIFTING CYLINDER, SET THE PLATFORM AGITATION TO NO MORE THAN 6 STROKES PER MINUTE.

EXCESSIVE PLATFORM AGITATION SPEED WILL PREVENT THE ULTRASONICS FROM OPERATING PROPERLY AND RESULT IN DECREASED CLEANING PERFORMANCE

INSTALLATION AND SETUP (CONT'D.)

12. Turn on the Ultrasonics selector switch. It is necessary to de-gas the fluid in the tank before cleaning parts so the unit can operate efficiently. Degassing is done by running the ultrasonics with the new fluid in the tank for approximately 20 minutes. Using the Temp/Time controller, set the time for 20 minutes. REFER TO THE TEMP/TIME CONTROLLER INSTRUCTION MANUAL INCLUDED WITH THIS EQUIPMENT.
13. Press the START button on the Temp/Time controller. During this time you will notice a change in the pitch and volume of the sound of the unit that indicates de-gassing is taking place. At the end of the pre-set cycle, the ultrasonics will shut off and the unit will be ready for use.
14. Turn on the Oil Skimmer selector switch. The skimmer belt should begin moving. Make sure that the lower pulley of the skimmer is completely submerged in the cleaning fluid. Attach a ½" I.D. tube to the skimmer oil discharge and direct the other end to a pail or other receptacle to contain the separated oil for eventual disposal.

OPERATION

1. Load parts to be cleaned in parts baskets or directly on the work platform. Arrange parts to allow free fluid flow to all areas of the work. Make sure that concave or hollow parts can fill and drain completely when lowered into or raised from the cleaning fluid.

CAUTION:
DO NOT EXCEED THE LIFTING CAPACITY OF THE WORK PLATFORM – 120 LBS FOR THE 24" MODEL, 200 LBS FOR THE 36" MODEL.

2. Set the Temp/Time controller for the desired cycle time or for continuous operation. REFER TO THE TEMP/TIME CONTROLLER INSTRUCTION MANUAL INCLUDED WITH THIS EQUIPMENT.
3. Press the Platform Down pushbutton. The platform will lower into the cleaning tank and begin agitating.
4. **NOTE: IF AGITATION IS NOT REQUIRED DURING THE CLEANING CYCLE, SIMPLY HOLD THE PLATFORM DOWN BUTTON UNTIL THE PLATFORM RESTS AT THE BOTTOM OF THE TANK. THIS WILL PREVENT AGITATION.**
5. Press the Start pushbutton on the Temp/Time controller. The ultrasonics will start operation.
6. At the end of the pre-set cycle time the ultrasonics will shut off. The platform will stay submerged and remain agitating.
7. Press the Platform Up pushbutton. The platform will stop agitating and raise the work out of the cleaning fluid.
8. Allow the work to drain completely into the cleaning tank before removal.

⚠ WARNING

This machine utilizes dangerous high voltage to operate the ultrasonic transducers. Only qualified trained personnel should attempt any repairs or servicing of the ultrasonic components. Disconnect all power before servicing the ultrasonic generators or tank heaters.
If in doubt about any servicing procedures, contact Graymills' customer service department at (773) 248-6825.

PRINCIPLES OF ULTRASONIC CLEANING

Ultrasonics is defined as a mechanical vibration above the range of human hearing (i.e., above 18,000 Hz.). Ultrasonic cleaning refers to the use of ultrasonic energy to assist in the cleaning of soiled objects while they are immersed in a cleaning fluid. Typical frequencies used in ultrasonic cleaning are: 20 kHz, 25 kHz, 40 kHz and 80 kHz.

Every ultrasonic cleaning system consists of three basic components:

An **Ultrasonic Generator** that converts 50 or 60 Hz. electric power from the electric utility supply to a high frequency electric signal in the ultrasonic range.

Ultrasonic Transducers to convert the ultrasonic electrical signal into mechanical vibrations.

A **tank** with the ultrasonic transducers bonded to its exterior and that contains the cleaning fluid and workpieces.

The tank is filled with a fluid suitable for the cleaning application. When the ultrasonic generator is activated, the transducers begin to vibrate at their natural frequency and couple the ultrasonic energy into the cleaning fluid. If sufficient energy is produced, the fluid molecules are pulled apart, creating microscopic "voids" or bubbles. This phenomenon is called **cavitation.** These cavitation bubbles increase and shrink in size in step with the ultrasonic frequency. Above a certain energy threshold, the bubbles will grow to an unstable size and then suddenly collapse, releasing a tremendous amount of energy into the fluid. If a soiled workpiece is immersed in the fluid, the cavitation bubbles will tend to collapse on the surfaces of the parts. This creates a scrubbing action that literally "blasts" away the contaminants from the parts.

TIPS AND GUIDELINES FOR EFFECTIVE CLEANING

1. Choose a workbasket with the largest openings possible without allowing the parts to fall through.
2. For extremely small parts, a solid bottom basket with weep holes is preferred.
3. If the parts tend to "nest" or stick together, gentle agitation or tumbling will insure that the cleaning fluid reaches all the surfaces.
4. Hollow or concave parts should be positioned so that they fill and drain completely during the cleaning cycle.

NOTE:
Remember that the ultrasonics can only reach where the cleaning fluid reaches.

CAUTION:
Always test a cleaning fluid with a sample part before cleaning a large workload.

5. Choose a detergent or cleaning fluid that is effective against the soil without damaging the parts or part surfaces.
6. Use the mildest cleaning fluid that will be effective in your application. Start with the weakest dilution ratio recommended by the detergent manufacturer and gradually add more concentrate until satisfactory cleaning is obtained.
7. Gentle heating usually improves the cleaning performance. The optimum cleaning range is between 120°F and 140°F. Higher temperatures may be required in some applications.

CAUTION:

Excessive Temperatures (Above 180^0 F) will decrease the effectiveness of ultrasonic cavitation.

MAINTENANCE

WARNING

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If in doubt about any servicing procedures, contact Graymills' customer service department at (773) 248-6825.

CAUTION

Be sure to unplug the power cord and allow the tank to cool for 15 minutes before draining the fluid. Operating the heaters or the ultrasonics with a dry tank or with insufficient fluid level will permanently damage the heaters or the ultrasonic transducers.

CLEANING TANK

The cleaning tank should be cleaned periodically to remove accumulated debris from the sides and bottom. This should be done at least weekly, or more often if soil accumulation is high.

Place the **HEATER** and **ULTRASONIC GENERATOR** switches in the **OFF** position.

1. Unplug the power cord from the electrical outlet.
2. Open the drain valve and allow the tank to empty.

3. Using a stiff brush or sponge, wash out the tank interior using a mild detergent solution. Rinse thoroughly and repeat as needed.
4. Close the drain valve and re-fill the tank with fresh water and cleaning solution.
5. Re-connect the power cord and resume parts cleaning operations.

ULTRASONIC GENERATORS

CAUTION

Turn off the ultrasonic generators and heaters, and allow the cleaning solution to cool to room temperature before immersing your hands into the cleaning fluid. Use rubber gloves to protect your hands.

GENERAL

Daily

1. Inspect the power cords and connector for deterioration or damage. Repair or replace a damaged power cord or connector immediately.
2. Do not allow the Sonic Liftkleen to sit on a wet surface. Wipe or mop up spilled water or cleaning fluid.
3. Remove any parts that may drop into the tank.

Weekly

1. Clean the tank interior as described above.
2. Inspect the drain valve and fitting for leaks. Repair any leaks immediately. Replace the drain valve if necessary.
3. Wipe the tank cabinet with a damp **(NOT WET)** cloth to remove accumulated detergent residues and soils. If left on the cabinet, the detergent residues may produce a permanent stain on the metal surfaces.

As Required

The ultrasonic generators have fans to cool the electronic components. The fans may become blocked with lint or debris that will inhibit the free flow of air. Periodically (every 2-3 months) under normal conditions, the fans should be inspected (for debris build-up), cleaned and placed back into service.

Installation Instructions

INTERMATIC®

FM1D Series

One Circuit Electronic 24 Hour or 7 Day Time Switches

FM1D20A
(surface mounting)

FM1D20E
(flush mounting)

APPLICATION

Time based control of lighting, ventilating, heating, cooling or other electrical loads in commercial and industrial applications. The FM1D Series time switches are programmable for 24-hour or 7-day schedules.

The FM1D20A and FM1D50A Series Time Switches are intended for either surface or Din 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 FM1D20E Series and FM1D50E Series Time Switches are intended for flush (panel) mounting.

Both models are supplied with a clear plastic dust cover. (Part #DC-FME for replacement order)

TECHNICAL DATA

Output–1 SPDT relay with dry contacts
Switch Rating:

N.O. Contact:
- -1/2hp, 120 V ac
- -1hp, 240 V ac
- -8 A, 24 V dc resistive
- -16 A, 277 V ac resistive
- -12 A Ballast, 120 V ac
- -8 A Ballast, 240 V ac
- -720 VA 240 V ac Pilot Duty
- -360 VA 120 V ac Pilot Duty
- -1000W Tungsten,240 V ac
- -600W Tungsten,120 V ac

N.C. Contact
- -16 A, 277 V ac resistive
- -8 A, 24 V dc Pilot Duty
- -360 VA, 120 V ac Pilot Duty

3 year Reserve (Non-Replaceable Battery)

Supply voltages: Separate Models –

FM1D20Series:	FM1D50 Series:
24VAC/DC,	12 VAC/DC,
120VAC,	24 VAC/DC,
208/240VAC,	120 VAC,
	208/240 VAC.

All Models 60Hz (refer to product label)

Shortest switch time–1 minute
Ambient Temperature Range –14°F to 131°F (–10°C to 55°C)
VA required: 120V & 240V models: 4VA
24V model: 2VA @ 24VAC, 1VA @ 24VDC
Screw terminal connections (FM1D20A and FM1D50A)
1/4" quick connects (FM1D20E and FM1D50E)
Accuracy ± 4 minutes per year
Agency Approvals: UL Recognized

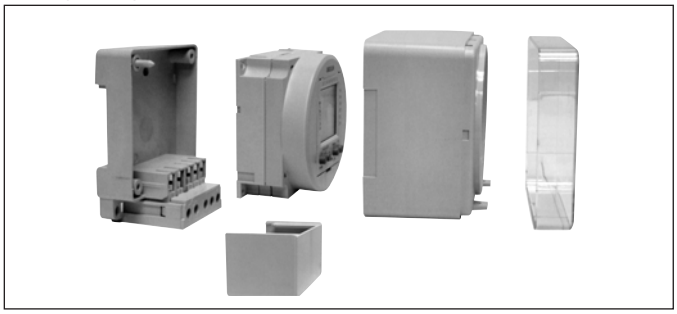
INSTALLATION

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—FM1D20A and FM1D50A

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.



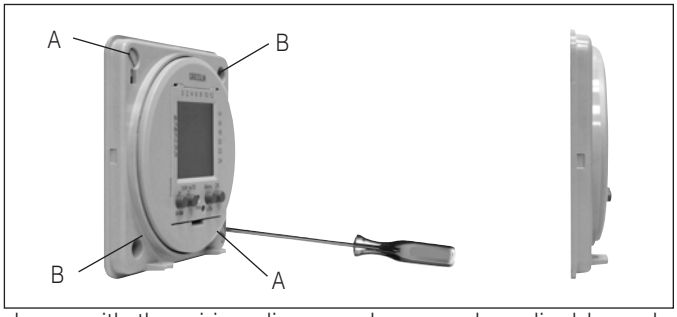
Place screws through 3 mounting holes in base and screw to back panel or wall.

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

PANEL MOUNTING—FM1D20E and FM1D50E

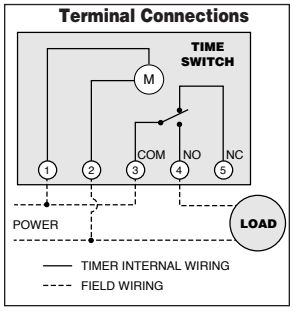
Cut a square hole 2-5/8" x 2-5/8" (66mm x 66mm) in the front of the panel. Insert the time switch through the opening. With a screwdriver, press down and turn outer screws (A) until flanges are in position to fasten the unit in front panel, then release. Insert plugs into holes (B).

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, Ⓜ, 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.



FM1D Series Program Schedules

Prog	ON/OFF	h	m	Day(s)
Ex	On	7 am	30	Mon., Tue., Wed., Thurs, Fri.
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3				
4				
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Temptimer ® Controls

www.indeeco.com

Operation

The Temptimer Series combines temperature control and electronic batch timer into one microprocessor-based unit. Temperature control can be on/off or proportional, heating or cooling, °F or °C. Features include high and low alarms, fan outputs and open/shorted sensor protection. J or K thermocouple, RTD and thermistor inputs are available. The pilot duty outputs are triacs to drive contactors or pulsed-DC to drive solid-state relays. The electronic timer can be count up or countdown, hours or hours/minutes or minutes/seconds. Status leds indicate mode of operations and output status.

Catalog and Part Numbers:

530 - TT - 1 T T N - N

Series	Output 1 (OP1)	Output 2 (OP2)	Output 3 (OP3)	Options
530-TT-1 = on/off	T = triac	T = triac	T = triac	3 = J thermocouple
530-TT-2 = proportional	S = pulsed DC	S = pulsed DC	S = pulsed DC	4 = K thermocouple
		N = none	N = none	5 = options 3 & 7
				6 = options 4 & 7
				7 = 103 dB beeper
				N = none

Note: RTD and thermistor inputs are standard.
Triac outputs should be used with on/off control.

Specifications

Storage Temp: -40° to 185°F
Operating Temp: 32°F to 149°F
UL Recognized: File E52105
Enclosure: ¼ DIN, plastic, NEMA 1 rating
Panel Cutout: 3.622" square
Front bezel: 3.780" square
Depth: 4.675" total, 4.15" inside panel
Terminal Wires: 18-22 AWG copper only

Line Voltage: 120VAC or 240VAC, +/– 10%
Frequency: 47 to 63 Hertz, sinewave only
Power Consumption: 6VA maximum
J or K Thermocouple input: 35 to 880°F
385 platinum 100Ω RTD input: -60 to 999°F
10K R-T Curve 16, Thermistor input: 32 to 400°F
Triac output: 750mA max, up to 240VAC, pilot-duty
Pulsed DC output: 12VDC typical, 50mA max.
Timer range: 1 second to 240 hours
Standard beeper: 72 dB at a distance of 6 inches

Button	***User Mode -*** Actual temperature and timer displayed. Status leds on.	
Down Arrow	Decrease the value.	When actual temperature is displayed, the timer is changed.
Up Arrow	Increase the value.	When setpoint is displayed, the setpoint is changed.
Mode	Toggles the actual or setpoint temperature and steps through the programming menus.	
Start/Reset	Starts & stops a timer cycle. Mutes a alarm . Resets high and low alarms.	

Program Mode	In user mode, press & hold **Up** and **Down** simultaneously until ***prog*** appears. Step through the parameters with **Mode**. To exit, press & hold **Up** and **Down.**	
Parameter	***Menu Item***	***Description***
Sd range: 2-100°F	Switching Differential	On/off control only. Centered around setpoint.
Pb range: 2-100°F	Proportional Band	Proportional control only. Centered around setpoint
tP range: 1-100°F	Timer Pause Band	If the input is outside of this band, the timer stops.
AHi (input range)	Absolute High Alarm	The actual temperature at which the high alarm occurs.
ALo (input range)	Absolute Low Alarm	The actual temperature at which the low alarm occurs.
dHi range: 1-250°F	Deviation Hi Alarm	Added to the setpoint to calculate the alarm.
dLo range: 1-250°F	Deviation Lo Alarm	Subtracted from the setpoint to calculate the alarm.
Fan range: 0-255	Fan Delay	Seconds the fan will be on after a timed cycle ends.
Off range: +/–50°F	Sensor Offset	Added to or subtracted from the input temperature.
Soft	Software Version	Non-programmable number for identification only.

Configure Mode	In program mode, press & hold **Mode** and **Start/Reset** until ***cnfg*** appears. Step through with **Mode**. To exit, press & hold **Mode** and **Start/Reset**.	
Parameter	***Menu Item***	***Description***
OP1 range: 1-8	Temperature Control Type	1,2,3,4 = on/off 1,3,5,7 = °F 1,2,5,6 = heating 5,6,7,8 = proportional 2,4,6,8 = °C 3,4,7,8 = cooling
OP2 range: 1-8 OP3 range: 1-8	Alarm and Fan Outputs	1 = none, 3 = high alarm, 4 = low alarm, 5 = high and low alarm 6 = fan on during timer, 7 = fan off during timer, 8 = remote beeper
Al range: 1-9	Alarm Type (see above)	1 = none, 2 = AHi, 3 = ALo, 4 = dHi, 5 = dLo, 6 = AHI & ALo 7 = dHi & dLO, 8 = AHi & dLo, 9 = dHi & ALo
nPut range: 1-4	Input Type	1 = thermistor, 2 = rtd, 3 = J type T/C, 4 = K type T/C
tt range: 1-8	User Mode	(see table below)
tine range: 1-12	Timer Type and End of Cycle Beeper	1,2,3,4,5,6 = down 1,2,7,8 = MM:SS 1,3,5,7,9,11 = short beep 7,8,9,10,11,12 = up 3,4,9,10 = HH:MM 2,4,6,8,10,12 = beep 5,6,11,12 = HHH until **Start/Reset** pushed
beep range: 1-6	Beeper Rate	1 = on, 2 = 1/sec, 3 = 2/sec, 4 = 4/sec, 5 = 8/sec, 6 = off

User Mode - Temperature and Timer Relationships	
1 = temperature control and timer are independent	5 = timer completely disabled
2 = temperature control runs during timer	6 = 1 with the timer pause feature (see above)
3 = timer starts automatically after setpoint is reached.	7 = 2 with the timer pause feature (see above)
Pre Heat will flash until the timer starts	8 = 3 with the timer pause feature (see above)
4 = same as 3 except the timer will not start until the	9 = 4 with the timer pause feature (see above)
Start/Reset button is pressed. **Push Strt** will flash	

INDEECO CONTROLS
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phone: 314-644-4300
fax: 314-644-5332
www.indeeco.com

Rear Terminal Wiring (see Configure Mode for output setup)	
17 & 18 = RTD or thermistor input	10 = OP1, triac or DC pulse "-"
1 = J or K thermocouple "-"	11 = OP1, triac or DC pulse "+"
2 = J or K thermocouple "+"	15 = OP2, triac or DC pulse "+"
13 & 14 = 120VAC power input	16 = OP2, triac or DC pulse "-"
12 & 14 = 240VAC power input	8 = OP3, triac or DC pulse "-"
	9 = OP3, triac or DC pulse "+"

Note: Triac outputs do not have power connected nor sourced internally.