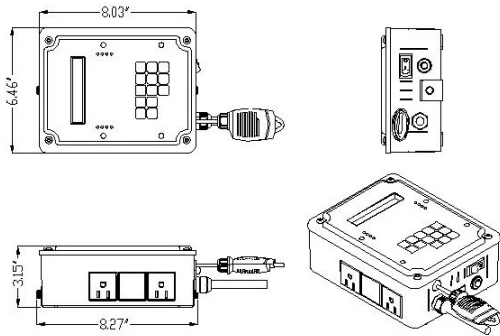


Specifications

MDT-1

Amps / Volts requirements	15 amps @ 120 volts
Min / Max operating temperature	32 to 120° F
Min / Max Humidity	0-99% RH
Minimum time setting	1 second
Maximum time setting	23 Hours 59Min 59Sec
Recycle Timer Modes	Day, Night, 24-hour
24-hour Timeclock Accuracy	+/- 30 seconds / year
Weight / Dimensions	7 lbs / 8" x 6.5" x 3.1"
Life Expectancy	> 10 years



All Sentinel Timers and controllers offer a **3-year** warranty.

Ask your retailer for details.

Sentinel products are distributed by:



Global Product Solutions
Arizona City, AZ. 85223
Phone 800-???-???? • Fax

Instruction Manual

MDT-1

Master Digital Timer



Welcome to the future... The MDT-1 Master Digital Timer represents a new level of intelligent design and function in a simple to use and reliable timer. It is 100% digital and programmable. The MDT-1 combines two timer functions, a 24-hour timeclock AND a recycling timer. It also features a “Hi-temp shutdown” to protect plants from overheating by disabling HID lights.

The MDT-1 has been designed to control supplemental lighting AND 120 volt devices that have to be “recycled” ON and OFF at precise intervals. Unlike old “analog” timers that must be set using dials that turn, you enter EXACTLY the time range you need to have in Hours, minutes and seconds. Mechanical timeclocks don’t allow settings less than 15 minute intervals. Other “digital” timers only allow you to set a few cycles and programming them can be a complicated process.

CONTENTS

A quick look at the MDT-1
Installation of the MDT-1
Explaining the MDT-1
Recycling Settings
Light Settings
What the MDT-1 controls
Connection Examples
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Problem: I want to manually over-ride or test the Recycle timer.
Press the **TEST RECYCLE DEVICE** button for 1 second to activate the Recycle receptacle and start the Recycle ON time. When the ON time completes, the Recycle receptacle will turn OFF completing the test. If the user wants to end the test, pressing the **TEST RECYCLE DEVICE** button a second time will return the unit to normal operation.

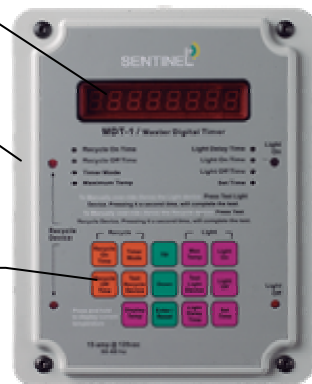
Problem: The timeclock is not keeping the correct time.
The timeclock is backed-up with a long-life lithium battery that only needs to be replaced every 5 years or so. If the clock does not retain the time after a power failure, chances are the battery must be replaced. The battery required is a lithium CR2032 3 volt.
Contact the factory for assistance.

A quick look at the MDT-1...

7 digit LED display provides easy interface

(4) 120 volt receptacles makes connections easy

(14) Color-coded buttons are simple to understand and makes adjustments easy



Heavy duty power switch and 15-amp re-settable circuit breaker

Troubleshooting

Problem: The unit does not power up at all.

Check and reset the circuit breaker. A small red button will pop out at the bottom of the unit, press it in to reset. If the problem continues, reduce the number of devices connected to the unit.

Problem: The green LED next to Light Delay Timer Set is blinking. The HID lights are not turning on after a power failure.

The “Hot-start” prevention feature has been activated. The Light Delay Timer allows time for the HID lamps to cool properly before trying to restart them. The Light Delay Timer can be set by the user.

Problem: The recycling timer is not working when I want it to.

The Digital Recycling Timer can be set to work during the “Day”, “Night” or 24-hours a day. Select the mode the best suits your needs.

Problem: The display is flashing Hot __ F

The Maximum-temperature protection feature has disabled the HID light receptacle to keep the area from getting too hot. The air temperature exceeded the user setpoint for Max Temp. The green LED for Maximum Temperature blinks On & Off until the temp has dropped below the Max Temp setting. The display also records the actual time that the fault occurred to aid in troubleshooting the problem. Check ventilation equipment for proper operation. To reset the error, press the **Enter / Reset** pushbutton. If the Light Delay timer has not yet expired, the light output will not be allowed to turn ON until the timer times out. (Green LED Light Delay Timer Set blinks)

Problem: The display reads Err SEn

The remote temperature probe has been disconnected or is not communicating with the unit. Check the cable and the remote sensor. If resetting (OFF / ON) the power does not help, contact the factory.

Problem: I want to manually over-ride the Lights.

Press the **TEST LIGHT DEVICE** button for 1 second to activate / de-activate the devices connected to the Light ON and Light OFF receptacles. The Light timer will return to normal operation when **TEST LIGHT DEVICE** button is pressed again. If the test button is not pressed a second time, the test will continue until the next timed light event occurs.

***Note:** Activating the Test Light Device may also cause the Recycle device to begin functioning IF the Recycle mode is set to Daytime.

Installing the MDT-1

The MDT-1 is simple to install. We recommend reading the manual before attempting to operate the unit so that all of it’s features are understood. The MDT-1 is a powerful unit that has many useful features.

1) Locate a suitable location. First secure the provided bracket to the wall. Next snap the controller into place and tighten the (2) thumb-screws on the top & bottom of the bracket.

NOTE: *Note: Make sure the thumb-screws are in place before attempting to use the controller. The thumb screws securely fasten the unit to the bracket.

2) The device(s) that will be controlled must be 15-amps or less COMBINED load. There are four outlets (receptacles) on the MDT-1. Two of them are used to control the Recycling devices like pumps or fans. The other two receptacles allow both Day and Night devices to be connected so they are activated during the Daytime or Nighttime. Connect HID lights to the Light On (Day) outlet so they run during the Day. Other devices like dehumidifiers, exhaust fans etc. can be connected to the Light Off (Night) outlet to be activated only during the Night when the lights are turned OFF. Refer to **Connection Examples** for more information.

3) The unit requires a 120 volt, 15-amp power supply. Plug the power cable into a standard Nema 5-15 wall outlet. The built-in circuit breaker will protect the unit from overloads.

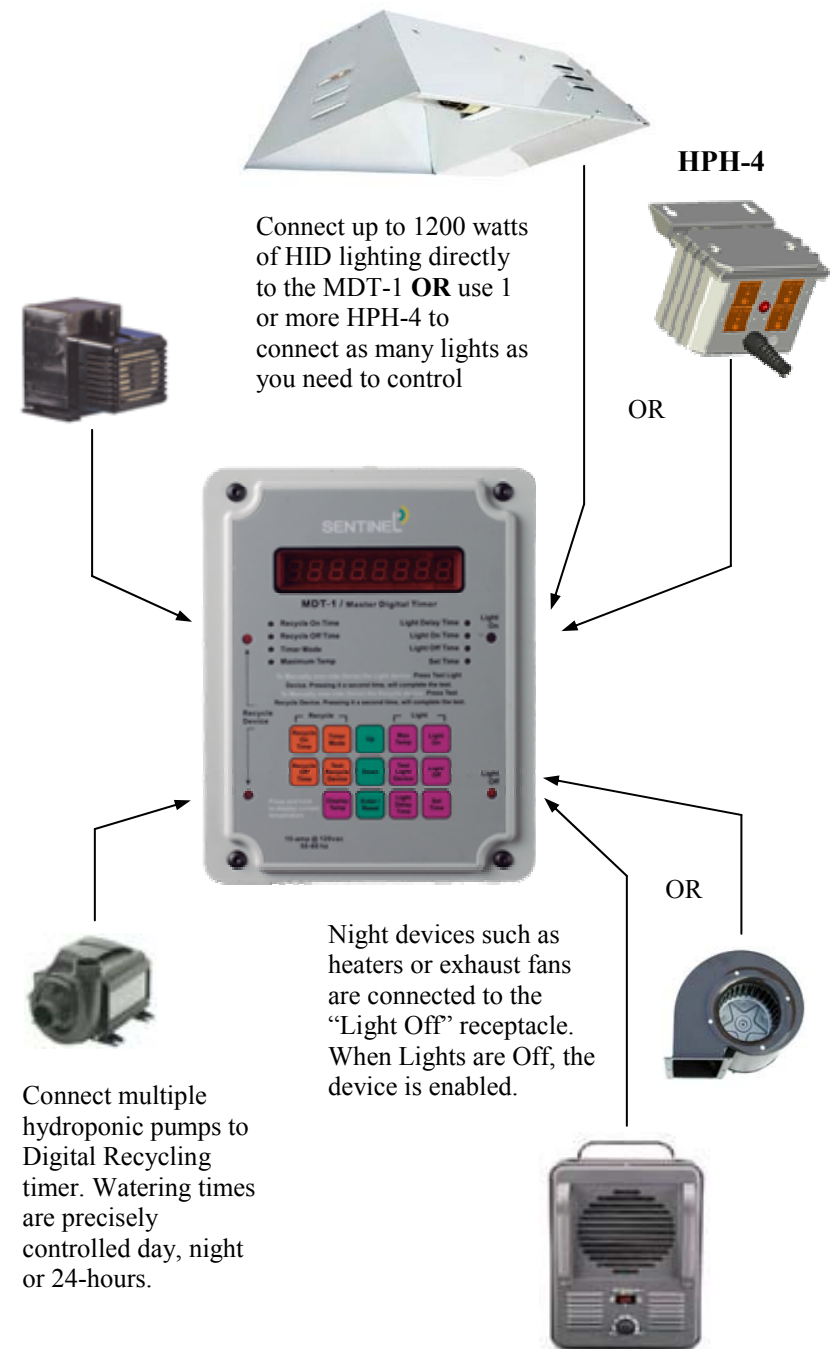
4) Verify all connections are secure, turn the power switch to the ON position and you are ready to go.

5) Programming the unit is simple. Become familiar with the unit by customizing the setpoints for YOUR application. The following pages explain the available setpoints and other special functions.

There are 14 push-buttons on the unit that control all the functions. They are divided into two sections, **Recycle timer** and **Light timer**.

- **Recycle On Time:** Press this button for 1 second to display and change the current recycling On timer setting.
- **Recycle Off Time:** Press this button for 1 second to display and change the current recycling Off timer setting.
- **Timer Mode (Recycle) :** Press this button for 1 second to display the recycling timer mode. You can select Day, Night or 24-hour.
- **Test Recycle Device:** Press this button for 1 second to activate the Recycle receptacle and start the Recycle ON time. When the ON time completes, the Recycle receptacle will turn OFF. Pressing Enter/Reset will also complete the test and return the unit to normal operation.
- **UP:** Press this button to display to increase the setting.
- **Down:** Press this button to display to increase the setting.
- **Enter/Reset:** Press this button enter the new setpoint or to reset a Recycle or Light timer test.
- **Light On Time:** Press this button for 1 second to set the Light On time. This is the time the Light outlet will be energized once each “day”.
- **Light Off Time:** Press this button for 1 second to set the Light Off time. This is the time the Light outlet will be turned OFF once each 24 - hour period.
- **Set Time:** Press this button for 1 second to set the 24-hour timeclock. Once set, an internal battery will keep time even when power is removed from the unit.
- **Max Temp:** Press this button for 1 second to set the Maximum temperature. If the temp goes above this level, the Light(s) are disabled.
- **Light Delay Time:** Press this button for 1 second to set the Light delay timer. The Delay timer prevents “hot-starts” by allowing your HID lamps to cool before trying to re-fire them when power is interrupted.
- **Test Light Device:** Press this button for 1 second to activate the devices connected to the Light ON and Light OFF receptacles. The Light timer will return to normal operation when Enter/Reset is pressed or the next timed event occurs.
- **Display Temp:** Press this button to display the current temp.

Connection examples



Light Off receptacle:

1 provided

The light Off receptacle is used to control any device that needs to be turned On only at night. The MDT-1's digital timeclock will turn Off the lights before the night device is turned On. Any 120 volt AC device can be connected to the Light Off receptacle as long as it is 1200 watts (12-amps) or below. Some users have to operate small space heaters only at night to keep plants from freezing. Since all heaters have an internal thermostat, simply set the heater thermostat at the minimum level and plug it into the Light Off receptacle. When the lights turn Off and the area begins to cool, the heater will take over until "morning" when the lights are again activated.

Other users may want to activate a small exhaust fan at night to keep humidity levels for getting too high during transpiration by the plants at night. There may be other devices only used at night which will work great with the MDT-1.

The MDT-1 has been designed to be reliable and user friendly. It can also be connected to a variety of devices making it a very flexible and useful tool. We have attempted to explain the most common uses and methods used to control HID lights, hydroponic pumps, heaters, fans and other devices. However, no two installations are identical. Spending some time to properly set-up your growing environment will produce better results.

The example on the next page is only for reference. You can use your imagination to envision YOUR set-up and how the MDT-1 will best be utilized.

Explaining the MDT-1

Other digital timers can be difficult to set-up and "Program". The MDT-1 has been designed to be simple and easy to use. Separate buttons for each setting make changes easy.

The MDT-1 Master Digital Timer has two timing functions that are coordinated to work together. The **24-hour timeclock** keeps track of the actual time in hours, minutes and seconds and primarily controls supplemental HID lighting. It also determines whether it is "Day" or "Night" so that the recycling timer can be set to be active during the day, night or 24-hours a day. The 24-hour Light(s) timeclock has two setpoints, one to turn ON the lights, the other to turn OFF the lights. Normally, HID lights are used for 12 to 18 hours each day.

The second timing function is the **Digital Recycling timer**. It works by turning On and Off a pump, or fan, or other device that only needs to run once in a while. The Recycling timer "cycle" is set with two timers, one to control how long the device will be ON for and the other timer determines how long the device will be OFF for. The timer continues to "recycle" over and over again. The recycling timer can be selected to operate during the day or night or 24-hours.

The MDT-1 also has a "**Hi-temp**" function which is used to protect the plants from excessive temperatures by turning OFF supplemental HID lights if the temperature inside the growing area gets above safe levels. High temps can be then result of failed ventilation equipment or high heat loads inside the area. The user can set the maximum temperature to whatever level they would like to have. Once activated, the Light outlet remains OFF until the user "resets" the unit by pressing the Enter / Reset button for 3-seconds.

To protect your HID lamps from "Hot-starts", the MDT-1 also has an intelligent function that allows the HID lamps to cool properly in the event of a power outage. The "**Light Delay Time**" setpoint is preset to allow the lights to cool for 10 minutes after a power failure. This timer is not activated during normal operation. Hot-starts can shorten the lifetime of your lamp and can burn out the igniters in HPS systems prematurely.

NOTE: The display has been programmed to "count down" the time remaining. When the On time is counting down, a "N" is displayed on the right of the digital readout. When the Off time is counting down, a "F" is displayed on the right of the digital readout.

Recycling Timer settings

Setting the Recycling On timer: Lets set the Recycle On time. The On time is the amount of time you want the recycling device to be On for. Later we will change the Off time. The Off time is the amount of time the device will be Off.

Press and hold the **On Time** button for 1-second. The display changes to show you the current setpoint. Use the **Up** or **Down** button to change the setting. Press **Enter** to accept the new setpoint.

Setting the Recycling Off timer: Now lets set the Recycle Off time. The Off time is the amount of time you want the recycling device to be Off for.

Press and hold the **Off Time** button for 1-second. The display changes to show you the current setpoint. Use the **Up** or **Down** button to change the setting. Press **Enter** to accept the new setpoint.

Setting the Recycling Timer Mode: You have the choice of having the Recycling timer operate only during the day, only at night or 24 hours a day. The 24-hour Light timeclock coordinates with the Recycling timer to determine Day or Night operation.

Press and hold the **Timer Mode** button for 1-second. The display changes to show you the current setpoint either Day, Night or 24-hour. Use the **Up** or **Down** button to change the setting. Press **Enter** to accept the new setpoint.

Testing the Recycling timer: In order to easily test the device connected to the Recycle receptacles, press the **Test Recycle Device** button. The recycling timer always starts with the On time first. The timer will energize the Recycle receptacles immediately and begin to count down the On time. While the test is in process, the green “Recycle On time Set” LED will be flashing. When the timer times out, the unit will return to normal operation. To end the test early, press the **Test Recycle Device** button.

NOTE: If power is interrupted to the DRT-1 while the Recycle ON timer is functioning, (Recycle device energized) the timer will retain the remaining time and complete the On cycle when power is reapplied. If power fails while the Off timer is active and timing, the timer will continue to time out and start up with the Recycle ON time.

What the MDT-1 controls...

The MDT-1 has been designed to control 2 of the most important functions for indoor gardening.

- 1) **HID lights** that must turn ON and OFF at the proper times. The MDT-1 also protects your HID lights from “Hot-starts”. Even more important is the MDT-1’s ability to monitor the temperature inside the growing area and turn off the HID lights if the temp rises above a safe setpoint, saving crop loss in the event of a ventilation failure.
- 2) **Hydroponic watering pumps** that must turn on at precise intervals. The built-in digital recycling timer is the most accurate recycling timer available.

There is also a 3rd output controlled by the MDT-1. It is used for devices that need to operate only at Night when the lights are Off. The section below describes what devices can be connected to the (4) receptacles on the MDT-1

Recycle On receptacles: 2 provided

The recycle On receptacles are used to connect hydroponic pumps or watering pumps. Any 120 volt AC pump less than 1/2 HP can be connected to the unit. If more than 1 pump is connected, the total load can be up to 10-amps. The user sets the duration of the watering cycle (recycling On time) and the interval between the watering cycle (recycling Off time). The pumps are turned on precisely at those intervals during the Day, Night or 24-hours a day depending on the system being used. (See setting the Recycle timer mode on page 6)

Light On receptacle: 1 provided

The light On receptacle is used to control your HID or other supplemental lighting. Any 120 volt lighting less than 1200 watts combined can be connected to the Light On receptacle. To control more than one light, a power splitter can be used. If multiple high wattage lights are to be controlled, an optional HPH-4 lighting controller can be connected to control as many HID lights as required. Each HPH-4 can control up to (4) 1000 watt HID lights. The safety functions built into the MDT-1 keeps your expensive HID lamps safe and protects against ventilation failures.

(See Max Temp / Hot-start on pages 7 & 8)

Setting the Light Delay Time / “Hot-Start”: The Light Delay function only activates if power is interrupted WHILE the Light On outlet is ON. The timer is not activated during normal operation.

The Light Delay timer is used to allow the HID lamps to properly cool before attempting to re-fire them. A minimum of 10-minutes is generally acceptable for most light systems. Should you want to change the factory setpoint, press and hold the **Light Delay Time** button for 1-second. The unit will display the current setpoint. Use the **Up** or **Down** button to change the setting. Press **Enter** to accept the new setting.

Testing (Over-riding) the Light Device: Normally, the Light ON and Light OFF outputs are controlled by the timeclock and the user setpoints. Occasionally the user may want to test or override the Light output for testing purposes. This is easily accomplished using the **Test Light Device** button. When the **Test Light Device** button is pressed for 1 second, the Light Output will be “forced” to change state.

Let’s assume it is “night” and the Light OFF output is ON. If the user wants to “force” the Lights to turn ON, press and hold the **Test Light Device** button. The Light OFF output will be turned Off and the Light On output will be turned On. The Lights On output will remain On until the next scheduled Off cycle occurs and then the unit will return to normal operation. Once the “test” is activated, it can also be reset to allow the timeclock to continue normally by pressing the **Test Light Device** pushbutton. While the test is in process, the green “Light On time Set” LED will be flashing.

The same thing can be done to force the Lights OFF. Let’s assume now it is “day” and the Light On output is ON. If the user wants to “force” the Lights to turn Off, press and hold the **Test Light Device** button for 1 second. The Light On output will be turned Off and the Light Off output will be turned On. The Lights Off output will remain On until the next scheduled On cycle occurs and then the unit will return to normal operation. Once the “test” is activated, it can also be reset to allow the timeclock to continue normally by pressing the **Test Light Device** pushbutton. While the test is in process, the green “Light Off time Set” LED will be flashing.

***Note:** Activating the Test Light Device may also cause the Recycle device to begin functioning IF the Recycle mode is set to Daytime.

Displaying the current temperature: In order to see what the current temperature being measured by the remote probe is, the **Display Temp** button can be pressed momentarily in order to display the temperature. This can help verify the correct setting for the Hi-temp setpoint.

24-hour Timeclock settings (Lights)

Setting the Time: The time on the 24-hour timeclock displays hours, minutes, seconds and AM or PM. Once the time is set, a battery backup will continue to keep time even with power removed.

Press and hold the **Set Time** button for 1-second. The first 2 digits (hours) flash. Use the **Up** or **Down** button to change the setting. Press **Enter** to move to the next 2 digits (minutes). Repeat for the minutes and seconds and also the AM or PM.

Setting the Light On timer: The Light On Time activates the lights connected to the Light On outlet and also determines that it is “Daytime” for the recycling timer. If the lights are to be on from 6:00 AM to 6:00 PM, the Light On Time should be set to 6:00 AM.

Press and hold the **Light On Time** button for 1-second. The first 2 digits (hours) flash. Use the **Up** or **Down** button to change the setting. Press **Enter** to move to the next 2 digits (minutes). Repeat for the minutes and seconds and also the AM or PM.

Setting the Light Off timer: The Light Off Time activates the Light Off outlet and also determines that it is “Nighttime” for the recycling timer. If the lights are to be on from 6:00 AM to 6:00 PM, the Light Off Time should be set to 6:00 PM.

Press and hold the **Light Off Time** button for 1-second. The first 2 digits (hours) flash. Use the **Up** or **Down** button to change the setting. Press **Enter** to move to the next 2 digits (minutes). Repeat for the minutes and seconds and also the AM or PM.

Setting the Max Temp: The Max Temp setpoint is the maximum temperature the area can be at. If the temperature rises above the level you set, the temperature probe mounted outside the MDT-1 will sense the area is getting to hot and disable the Light On outlet. Shutting off the lights allows the area to cool down.

To change the Max Temp setting, press and hold the **Max Temp** button for 1-second. The unit will display the current setpoint. Use the **Up** or **Down** button to change the setting. Press **Enter** to accept the new setting.

Resetting the Max Temp error: Once the Max Temp function is activated, the lights will remain off with the display reading “**Hi Temp**” and the time that the Hi-temp occurred until reset by the user. Press and hold the Enter / Reset button for 3 seconds to reset the error. You will then need to determine why the temperature raised beyond safe levels and correct the problem.