TOTAL CONTROL CONTROLLERS

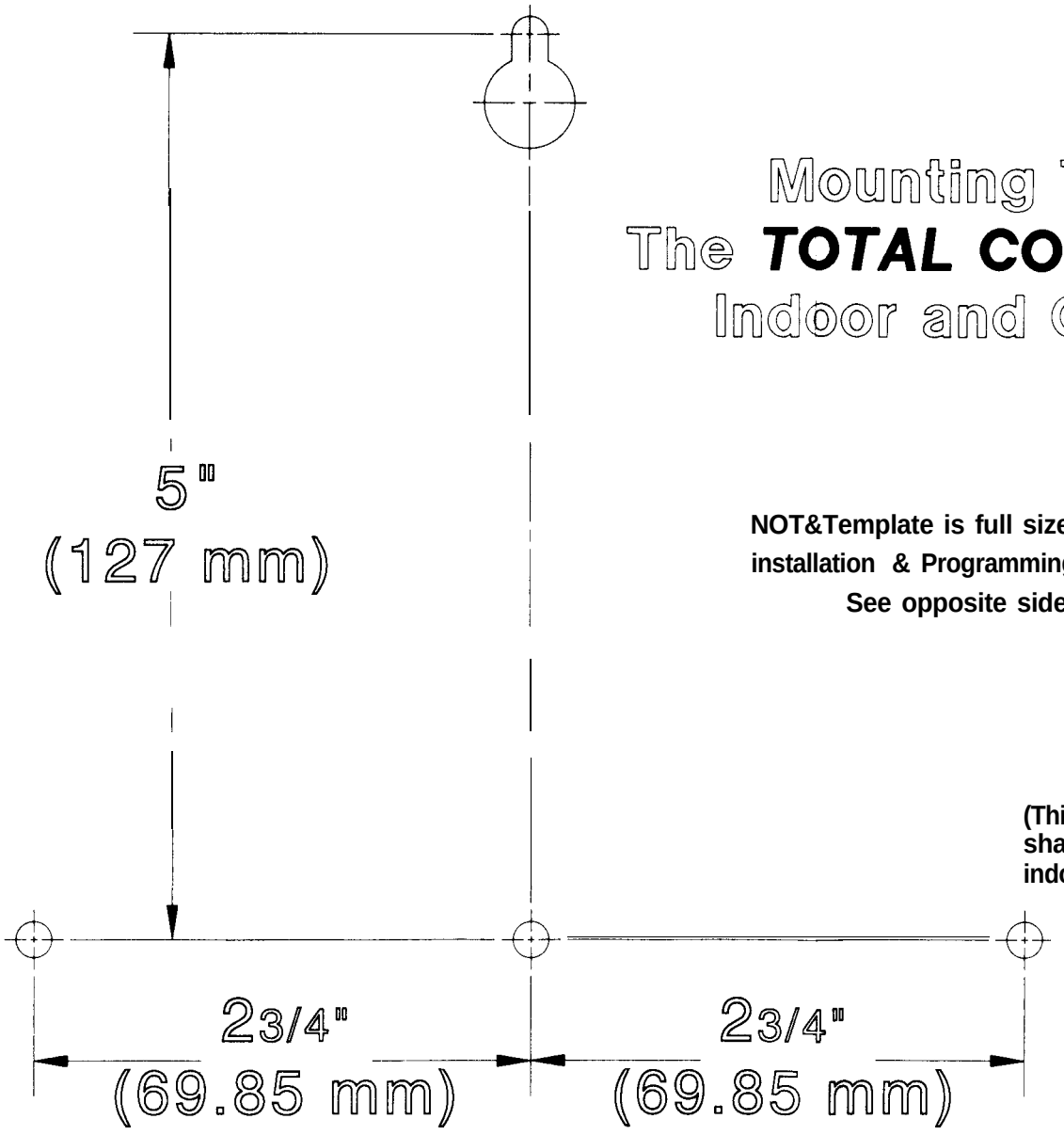
OWNER'S MANUAL

6, 9, 12, 15 AND 18 STATIONS

Hardie Irrigation

A James Hardie Company

Mounting Template for:
The TOTAL CONTROL™ Controllers
Indoor and Outdoor Models



NOT&Template is full size and to scale. Please refer to the installation & Programming Guide for detailed instructions.

See opposite side for space requirements.

(This hole and keyhole shape available on indoor model only.)

Hardie Irrigation

A James Hardie Company

PRODUCT INQUIRIES

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Rev. D

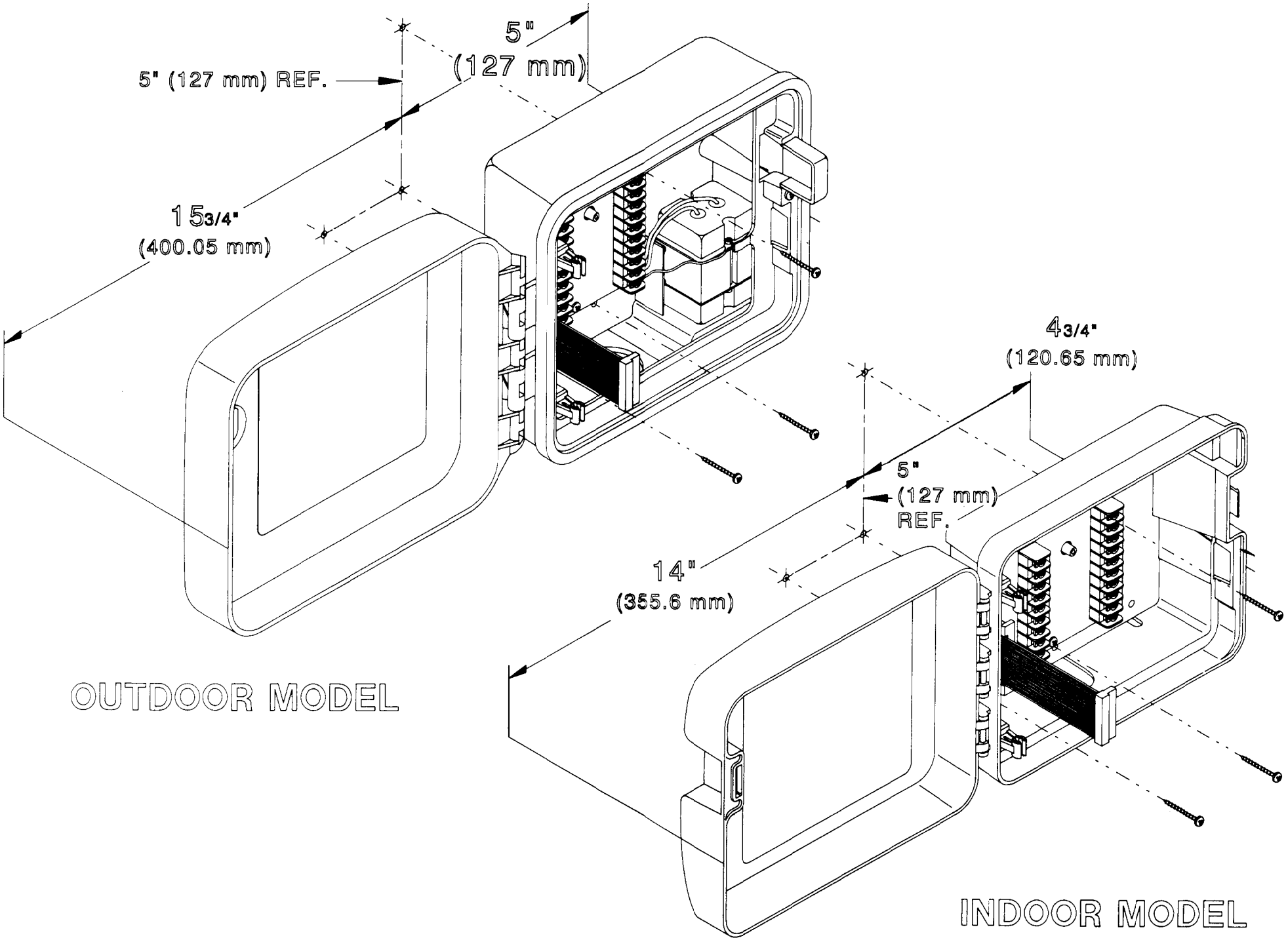

5" (127 mm) REF.
5"
(127 mm)
15 3/4"
(400.05 mm)
OUTDOOR MODEL
4 3/4"
(120.65 mm)
5"
(127 mm)
REF.
14"
(355.6 mm)
INDOOR MODEL

TABLE OF FEATURES

Thank you for purchasing a Total Control Series Controller. Listed below are some important features you should be aware of before you begin programming. Details on how to implement these features are described on the following pages.

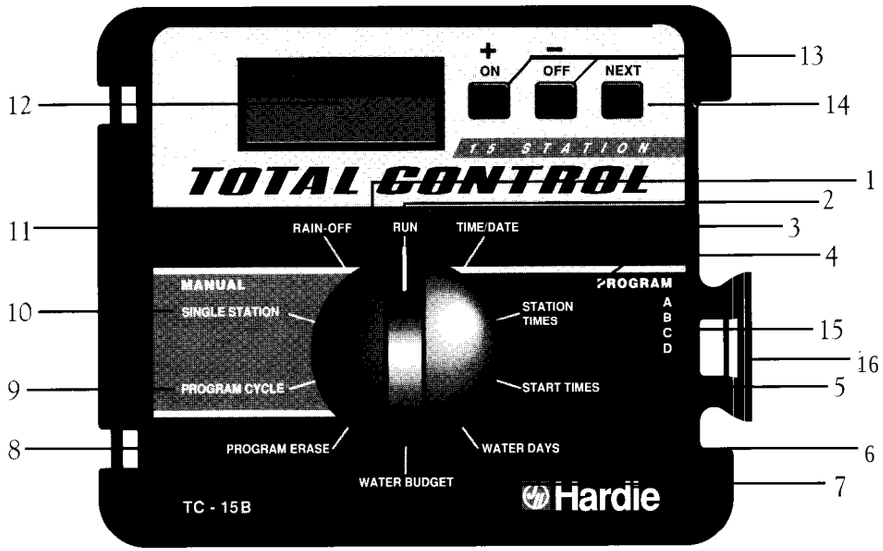
- Four fully independent programs that can run concurrently
- Watering programmable for days of the week, odd days, even days or intervals from 1 to 30 days
- 365-day calendar, with automatic compensation for leap year
- Sixteen total start times to use in any program
- Start time stacking overlap protection within each program
- Station watering time from 0 minutes to 10 hours in l-minute increments
- Program erase independent for each program
- Non-volatile memory that retains programmed information for up to 30 years in the event of a power failure
- Accurate time and date retention during power failures for up to 90 days continuous via a standard 9-volt alkaline battery
- Water budgeting from 0 to 200% in 10% increments
- Rain off programmable to 7 days
- Self-diagnostic electronic circuit breaker that identifies and overrides faulty stations
- Master valve programmable as On or Off for each program
- Semi-automatic, true manual On/Off operation and timed manual for each station in sequence
- Valve test terminal for ease of valve identification during troubleshooting and installation
- Unique modular design for easy upgrade and service
- Valve Common Switch for simple override of sensor.

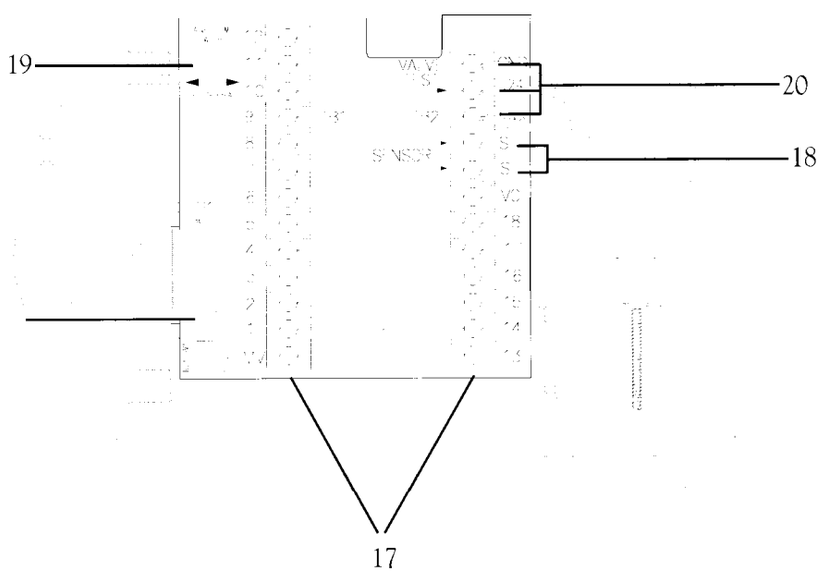
These are just a few of the many features of the Total Control Series Controllers. Please review your manual before beginning programming.

TABLE OF CONTENTS

LOCATION OF PARTS

1. **Function Dial:** For selecting programming and operating functions
2. Run: Position for automatic operation
3. Current Time/Date: For setting current time and date
4. Station Times: For setting individual watering time for each station
5. Start Times: For setting the time each program cycle will start
6. Water Days: For setting which days to water
7. Water Budget: For single entry increase or decrease of station times for all stations within a program (does not alter program)
8. Program Erase: For erasing programmed information within a program
9. Manual Program Cycle: For activating a manual program cycle that uses the programmed station times of the selected program
10. Manual Single Station: For watering a single station until manually turned off or to water up to four stations for a selected period of time
11. Rain Off: For turning off output to all stations manually or programmable to 7 days off
12. LCD Display: For viewing time, program and status information
13. +/- Buttons: For easy entry of programmed information
14. Next Button: For easy selection of information to be programmed or reviewed
15. Program Select Switch: For selection of programs A, B, C or D
16. Release Latch: To allow removal of module or access to terminal strips
17. Station Terminals: For hook-up of valves, common and master valve
18. Sensor Hook-Up: For installing a rain shut-off sensor
19. Sensor Override Switch: To override sensor input
20. 24 VAC and ground hook-up





INFORMATION

This section contains general information on:

- How the backup system works
- How the electronic circuit breaker works

HOW THE BACKUP SYSTEM WORKS

Total Control uses non-volatile memory to store watering programs. This prevents those programs from becoming lost in the event of a power failure. An additional benefit of non-volatile memory is that a factory-installed backup program is not necessary, thereby avoiding the potential for dead-heading a pump.

Because the current time and date are always changing, only the most recent date can be saved in non-volatile memory. Therefore, a battery is required to maintain the correct time and date in the event of a power failure. A 9-volt alkaline battery (not included) will maintain the correct time and date during power failures up to 90 days. In a typical installation, the battery should last from 2 to 4 years before replacement is necessary.

To install the battery:

1. Swing open the control module by depressing the module release tab.
2. Remove the battery compartment door located on the bottom back of the module.
3. Connect a 9-volt alkaline battery to the exposed battery clip.
4. Insert the battery into the compartment, and reinstall the battery compartment door.

HOW THE ELECTRONIC CIRCUIT BREAKER WORKS

The controller is equipped with an electronic circuit breaker. If the controller detects a short circuit. the shorted station (valve) will be turned off automatically. The display will then flash "SHORT" and the

shorted station number or "Master Valve." The controller continues to automatically water the other stations and the following watering programs until the shorted station is repaired. The program will be cancelled if the master valve is found shorted. Each automatic start will attempt another cycle and retest the short-circuited valve.

After repairing the short, set the dial to **Run, Manual-Program Cycle** or **Manual-Single Station;** press the Off button to return the controller and display to their normal operating mode.

Common conditions of the electronic circuit breaker include:

CONDITION:	"SHORT" and one or more station numbers are displayed.
Diagnosis:	One or more stations are shorted.
Solution:	Check station(s) for cause of shorted condition. Repair valve(s) and/or wiring on station(s). To reset, set the dial to the Run, Single Station or Program Cycle position, and press the Off button.
Diagnosis:	Too many valves operating at the same time.
Solution:	Check programs and stations, including master valve for VA output. Maximum total output is 24 V (1.0 amps). Reduce the number of valves on at the same time to below the maximum output allowance. To reset, set the dial to the Run, Single Station or Program Cycle position, and press the Off button.
CONDITION:	"SHORT" displays without any station numbers.
Diagnosis:	A short circuit has occurred with a time duration too short for the controller to determine the station.
Solution:	Check valve wiring for breaks in the insulation which may cause a station output to short to common. To reset, set the dial to the Run, Single Station or Program Cycle position, and press the Off button.
Diagnosis:	A transient surge has spiked the line
Solution:	To reset, set the dial to the Run, Single Station or Program cycle position, and press the Off button.
Diagnosis:	A short or overload occurred on one watering cycle but was no longer there on a subsequent cycle.
Solution:	Check wiring. To reset, set the dial to the Run, Single Station or Program Cycle position, and press the Off button.

HOW THE SENSOR HOOK-UP WORKS

To simplify installation, the Total Control is equipped with two terminals for hook-up to a rain switch. A standard, normally closed rain switch can be installed at this location. The Total Control also provides a bypass switch for the sensor hook-up. When sensor is not in use, Valve Common switch must be in the bypass position. To override the sensor, simply place the switch (located on the upper-left side of the terminal board) in the bypass position.

PROGRAMMING THE CONTROLLER FOR WATERING

To set up a regular watering schedule, follow the steps below. This section covers the following topics:

- Getting started
- Developing a watering plan
- Setting the current time and date
- Erasing any prior programs
- Setting the station time
- Master valve on/off
- Selecting the days to water
- Programming watering start times

GETTING STARTED

The unique modular design of the Total Control enables you to disconnect the program module easily and take it anywhere for easy programming, even at your kitchen table! Just swing the module out, disconnect the output cable, and remove the module using the easy snap-out hinges. Now you can program and review your watering schedules anywhere using a 9-volt alkaline battery.

NOTE: To save the battery, the display will automatically blank after 2 minutes when not in use. To restore the display, turn the dial to any position.

DEVELOPING A WATERING PLAN

Four watering programs are available. A program is a grouping of stations with similar watering requirements. For example, you might use one program to water lawns in full sun five days a week, another program could be used for lawns in shade Tuesdays and Thursdays, trees and shrubs on drip irrigation placed on a separate program, might water once every two weeks and the garden area requirements might include watering every other day. The availability of four programs allows you to set up unique watering programs for your varied landscape.

The start times and water days are programmed for each selected program. Stations (valve outputs) will water sequentially at the programmed start times for the water days selected. Stations are entered into a program by programming a station time.

WHAT IS A PROGRAM WATERING CYCLE?

Each watering cycle waters all the stations in a program in sequence. For example, in the sample watering plan shown, program A has six program start times that produce six watering cycles. Therefore, all four stations in the program are watered six times each day, first starting at 7 **A.M.**, then at 10 **A.M.**, and so forth, ending with a final watering at 7 **P.M.** Before you program a watering schedule, decide how to use each program.

SAMPLE WATERING PLAN

Program	Days	Water Start Times	Stations	Station Time Duration
A	Every	7 **A.M.**	1	
		10 **A.M.**	2	10 min.
		12 **P.M.**	3	10 min.
		3 P.M.	4	10 min.
		5 **P.M.**		10 min.
		7 **P.M.**		
B	Mon., once every 21 days	7 **A.M.**	5	4 hrs., 30 min.
C	Odd days	5 **A.M.**	6	30 min.
			7	30 min.

Number of Watering Cycles Available

Sixteen start times are available, for a total of 16 watering cycles. All 16 start times may be assigned to any program or combination of programs.

Preventing Program Overlap

Each Total Control program may be run concurrently. Programs may overlap, causing more than one station to water at the same time. If this is undesirable due to water pressure limitations, it is important to plan station activity carefully.

It is possible to inadvertently cause overlap using the Water Budgeting feature. Water Budgeting enables you to increase (or decrease) station

times within each program for seasonal changes. Increasing water times may cause programs to overlap and create an imbalance in water pressure. Careful preplanning and review of your planned use of water budgeting will prevent this from happening.

Total Control will "stack" start times to prevent overlap within a program. If you program two (or more) start times so that watering times overlap, the controller will stack the additional start time and run it when the first cycle finishes. The controller does not stack overlapping start times in other programs.

The enclosed station activity planning chart has been provided to help you plan your watering schedule. (Refer to page 9 .)

SETTING THE CURRENT TIME AND DATE

Before you can program the controller for watering, you must set the current time and date. This controller features a 365-day calendar with automatic leap year compensation. Once the date is set, the controller keeps track of the date and enables trouble-free odd-even day of the month watering required by some area water restrictions. The time and date apply to all programs. To set the time and date, follow the steps below.

1. HOUR: Set the dial to the Current Time/Date position.

   The hour and "AM" or "PM" flash.

   Use the + and – buttons to change the time shown in the display. (Continuous pressure on the button, longer than 2 seconds, causes rapid change.)

2. MINUTES: Press the Next button to set the minutes. Use the + and – buttons to change the minutes.

3. YEAR: Press the Next button to set the year. Use the + and – buttons to change the year.

4. MONTH: Press the Next button to set the month. Use the + and – buttons to change the month.

5. DAY: Press the Next button to set the day of the month. Use the + and – buttons to change the day of the month.

STATION ACTIVITY PLANNING CHART

Program	Stations	Description	Water Days	Start Times	Station Times at 100%	Water Budgeting	Notes
A	1	(lawns' north end)	M, W F, Th	7:00 am 9:00 am	10 min	100%	Bermuda should be cut in winter

ERASING ANY PRIOR PROGRAMS

This process erases all programmed station times, start times, water days, resets the water budgeting to 100 % and resets the master valve to On for the selected program.

To clear prior watering schedules for a selected program:

1. Select program to be erased (A, B, C or D).
2. Turn the dial to the **Program Erase** position.
3. Press the Off button and hold for 2 seconds to erase program.

   Controller displays “DONE” when program erase is complete.

SETTING THE STATION TIME

Follow the steps below to program how long each station will water.

1. Select program A, B, C or D.
2. Set the dial to the **Station Times** position.

   The controller displays station 1 and the programmed station time for station 1.
3. Use the + and – buttons to change the time shown in the display. (Continuous pressure on the button, longer than 3 seconds, causes rapid change.)

NOTE: To skip a station, set station time to OFF. Controller displays “OFF” (between 1O:OO and 00:01).

4. Press Next to select next station.

5. Repeat steps 3 and **4** for each station.

MASTER VALVE ON/OFF

Use this feature to turn master valve output on or off for each program (factory setting is ON). A common application is to use city water for drip irrigation but to pump water from another source **(such as a lake)**

for other watering requirements. With Total Control, you can turn off the master valve in the programs which do not require the pump. To turn off the master valve in a selected program, follow the steps below.

1. Select program A, B, C or D.
2. Set the dial to the **Station Times** position.
3. Press the Next button repeatedly until "Master Valve" is displayed (shown after the last station).
4. Press the Off button to turn off master valve output.
5. To turn master valve output back on, use the same steps except press the On button to turn on master valve output.
6. Repeat steps 1,3 and 4 for each program.

SELECTING THE DAYS TO WATER

The Total Control Series controller has several watering days options. Use this feature to select any one of the following calendar options for watering:

- Specific days of the week
- Odd days (new with option to exclude days of week)
- Even days (new with option to exclude days of week)
- Day interval (1 to 30 days)

SELECT DAYS TO WATER

1. Select program A, B, C or D.
2. Set the dial to the **Water Days** position. The controller displays currently programmed day information.

   This position provides four water day options: specific days of the week, odd days, even days and day interval.

To Select Specific Davs of the Week

a. Press the Next button until the **Days of the Week** are displayed.

b. Press the **On** button to select the **Days of the Week** option.

c. Press the Next button until the desired weekday flashes.

d. Press the **On** button to select that day to water, or use the Off button to turn watering off on that day.

To Select Odd or Even Days

a. Press the **Next** button until the Odd **Days** or **Even Days** option is displayed.

b. Press the On button to select the option.

NOTE: The 3 1st is always an Off day.

You may select specific days of the week not to water (Excluded Days) when using the odd or even day option.

To Select Excluded Days Of The Week

1. Press the **Next** button repeatedly until the **Weekday to** be selected flashes.
2. Press the Off button to exclude weekday. Press the On button to allow watering on that weekday.
3. Repeat steps 1 & 2 for each additional weekday.

   NOTE: After selecting an odd or even day option the display will show "odd" or "even" and **"On",** each weekday not excluded will be displayed. Any days programmed to be excluded will not be displayed.

To Select Day Interval Watering (1 to 30 Days)

a. Press the Next button until the **Day Interval** option is displayed.

b. Press the On button to select the option.

c. Press the Next button; the controller displays the currently programmed day interval.

d. Use the + or – button to select the day interval (1 to 30 days)

e. Press the Next button; the controller displays the day interval currently programmed as today. Watering will occur when Day Interval and Today are the same.

f. Use the + or – button to select the desired setting for today. This allows you to begin the day interval watering cycle on any day within the cycle. EXAMPLES: To water every third day starting today, select day interval as 3 today as day 3.To water every 5 days starting tomorrow, select day interval as 5 and today as day 4.

SETTING PROGRAM START TIMES

Use this feature to set the time for a watering program to start on the scheduled watering days. Use additional start times to water more than once per day. Each start time will begin a sequential cycle of all stations with station time in a given program.

Total Control has 16 start times which may be used in any program. When you return the dial to the Run position, start times are sorted in order by time of day regardless of the order you enter them.

You may select up to 16 start times in a single program. This, however, will leave no remaining start times for the other three programs.

1. Select program A, B, C or D.
2. Set the dial to the Start Times position.
3. Use the + and – buttons to change the start time. (Continuous pressure on the button, longer than 2 seconds, causes rapid change.)
4. Press the Next button to select the next start time.

NOTE: Total Control will “stack” start times to prevent overlap within a program. If you program two (or more) start times so that watering times overlap, the controller will stack the additional start time and run it when the first cycle finishes. The controller does not stack overlapping start times in other programs.

TO CANCEL A PROGRAM START TIME

1. Select program A, B, C or D.
2. Set the dial to the Start Times position.
3. Press the Next button to select the correct start time.
4. Use the + and -buttons to change the start time to “OFF,” which is between 1159 **P.M.** and 12:00 **A.M.**

OPERATING THE CONTROLLER

This section includes instructions for the following operations:

- Water budgeting
- Manual-single station and program cycle
- Rain off

WATER BUDGETING

Use the water budget feature to temporarily increase or decrease the amount of time all stations in a selected program will be watered. This is useful for making overall adjustments to a watering schedule without permanently changing the original program. For example, you might want to reduce the total station time for the stations in program A by 30% due to a seasonal change in the weather. Later you can return station times to their original values by setting the water budget to 100%.

Water budgets can be set from 0 to 200% in 10% increments. If the water budget for a given program is set to something other than lOO%, a "%" annunciator is displayed to indicate water budgeting is in effect.

To set a new water budget:

1. Select program A, B, C or D.
2. Set the dial to the Water Budget position. The controller displays the current water budgeting percentage.
3. Press the + or – button to increase or decrease the percentage.
4. Set the dial to the Run position.

   The controller displays the percent sign in the Run position when water budgeting is active (not 100%) for any program. This is to alert the user to a water budget status in one of the programs

Each Total Control program may be run concurrently. Programs may overlap, causing more than one station to water at the same time. If this is undesirable due to water pressure limitations, it is important to plan station activity carefully.

It is possible to inadvertently cause overlap using the Water Budgeting feature. Water Budgeting enables you to increase (or decrease) station times within each program for seasonal changes. Increasing water times may cause programs to overlap and create an imbalance in water pressure. Careful preplanning and review of your planned use of water budgeting will prevent this from happening.

NOTE: Watering run times may be returned to their original values by setting the water budget percentage to 100%.

NOTE: Station times will be displayed and remain as originally programmed.

MANUAL

SINGLE STATION

This position provides two manual options:

- True manual on/off (watering until turned off)
- Timed manual

The timed manual feature allows you to set each station to water sequentially for a timed amount.

1. Select program A, B, C or D.

NOTE: The programmed status of the master valve in the selected program determines whether the master valve will be activated.

2. Set the dial to the Single Station position.

To Select Stations for Manual Operation

a. Press Next to select the station.

b. Press the On button (Off to terminate). Stations will stay on until turned off, until midnight, or until the switch is moved from the Manual Single Station position.

To Select Stations for Timed Manual

a. Press Next to select the station.

b. Use the + and – buttons to select the amount of time to water this station.

c. Repeat steps a and b for each station as desired. (Press the – button until the display reads "OFF" to terminate.)

d. Set the dial to the Run position. Stations will water sequentially for the set time.

PROGRAM CYCLE

Use this feature to manually start a program. You can also water part of a program by selecting the starting station; all subsequent stations will be watered in sequence. Only stations with station times entered in the program will be watered.

1. Select program A, B, C or D.
2. Set the dial to the Program Cycle position.

   The controller displays the program selected.
3. Press Next until the desired starting station is displayed. That station and all subsequent stations in this cycle will water in sequence.
4. Press the On button to start the watering cycle. (Press Off to terminate.)

NOTE: You may advance through a running cycle by pressing the Next key for the next station.

5. Set the dial to the Run position.

RAIN OFF

Use this feature to turn off watering, such as when it is raining. As long as the dial is in the Rain Off position, watering programs will not be activated automatically.

1. Set the dial to the Rain Off position.

   Stations currently watering will turn off after a 2-second delay. Active programs and stacked start times are cancelled.

To return controller to normal operation, set dial to Run position.

PROGRAMMABLE RAIN OFF

Use this feature to turn off watering programs for a specific length of time, from 1 to 7 days.

1. Set the dial to the Rain Off position.
2. Use the + and -buttons to select the number of days to turn off (from 1 to 7).
3. Set dial to Run position.

   In the Run position, the display shows the number of days off and counts down. Automatic operation resumes when countdown is complete.

NOTE: You may activate manual operations in this mode.

Appendix A.
INSTALLING AND WIRING THE CONTROLLER

This section includes instructions for installing indoor and outdoor model controllers and connecting the power. To ensure safe operation, it is important to follow the instructions carefully. The following topics are covered:

- Selecting an installation site
- Reviewing lightning probability
- Mounting the controller
- Connecting the power
- Connecting the valves
- Connecting a pump start relay

SELECTING AN INSTALLATION SITE

Selecting the proper installation site for the controller is essential to safe and reliable operation. Indoor model controllers are intended for indoor installation only. Outdoor models can be installed indoors or outdoors.

For easy operation and better view of the display, install the controller so that the display is at, or slightly below, eye level.

INDOOR MODEL CONTROLLERS

Indoor controllers should be installed on a vertical wall within 5 feet of a 120-VAC grounded electrical outlet.

WARNING: Installing an INDOOR model outside or where it may he exposed to rain or water may result in an electric shock hazard.

OUTDOOR MODEL CONTROLLERS

Outdoor controllers should be installed on a vertical wall or other structure near a grounded, three-wire, 120-VAC power source. Select a location that shades the controller during the hottest hours of the day and provides as much protection from direct sunlight, rain, wind and snow as possible. Do NOT mount the controller where it will be exposed to direct spray from the irrigation system.

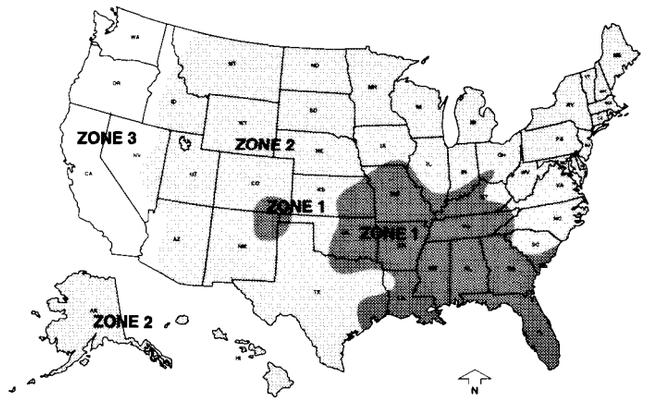
REVIEWING LIGHTNING PROBABILITY

A power surge is a sudden rise in voltage on the supply line. It is then sometimes followed by a drop in voltage as the power line equipment tries to protect area users. A lightning strike on the power grid is the most common cause of such surges and are therefore most common in areas of high lightning.

Protection is built into the controller that will bypass power surges at the input to the controller. The surge cannot be absorbed. It must be given a path to the ground.

Review the map and determine your probability of lightning. It may be worth the little extra effort to protect against surge by adding a well grounded path for the surge to bypass your controller.

LIGHTNING PROBABILITY MAP OF THE UNITED STATES

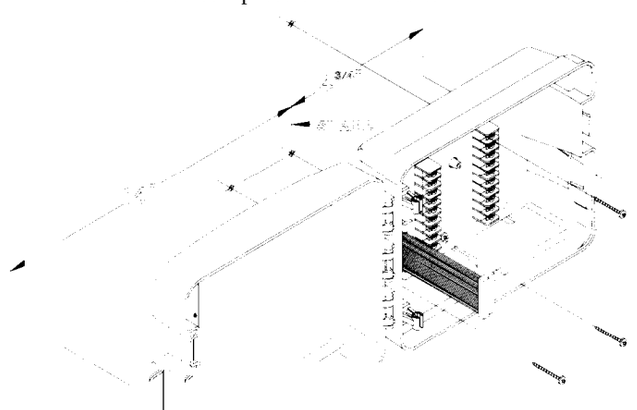


MOUNTING THE CONTROLLER

MOUNTING THE INDOOR MODEL CONTROLLER

1. Locate the “keyhole” shaped mounting hole on the back of the case as well as the three mounting holes along the bottom (see figure 1). A template is provided to aid in locating the holes.
2. Swing out the control module by pressing in on the release latch located at the right side of the module. This provides access to the mounting holes.
3. Position the controller on the wall. Remember to allow a minimum of 9” to the left of the controller so that the door can be opened fully.
4. To attach to wall studs, use a #10 wood screw of appropriate length, leaving about 1/4” of the shank exposed to slip into the keyhole slot.
5. To secure and stabilize the controller, drive additional screws through the bottom mounting holes into the stud or into the wall board.

NOTE: When attaching the controller to hollow walls, masonry or cinder blocks, use the appropriate toggle bolts, masonry shields or compression-drive bolts.



662701 Rev: A

Figure 1. Mounting the Indoor Controller

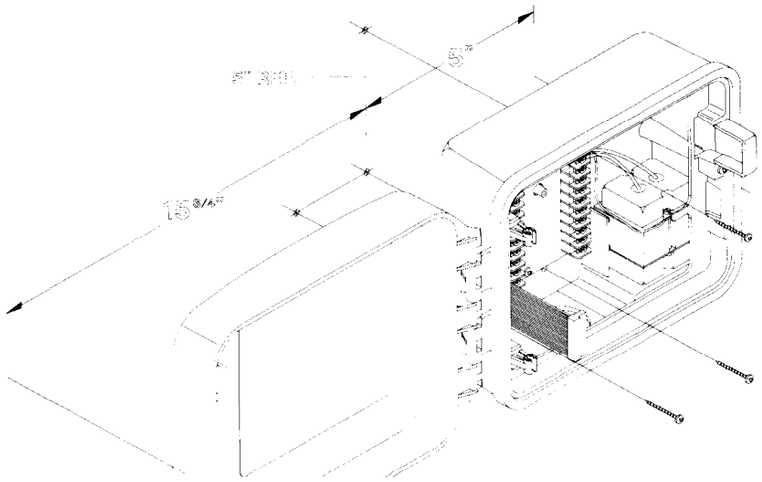
MOUNTING THE OUTDOOR MODEL CONTROLLER

1. Locate the three mounting holes on the back of the case, one on top and two along the bottom. A template is provided to aid in locating the holes.

NOTE: The mounting holes have thin webs, which you may drive a screw through. The webs may also be punched or drilled as required (see illustration on facing page).

2. Swing out the control module by pressing in on the release latch located at the right side of the module (see figure 2). This provides access to the mounting holes.
3. Position the controller on the wall. Remember to allow a minimum of 10 1/2” to the left of the controller so that the door can be opened fully.
4. To attach to wall studs, use #10 wood screws of appropriate length.
5. To secure and stabilize the controller, drive additional screws through the bottom mounting holes into the stud or into the wall board.

NOTE: When attaching the controller to hollow walls, masonry or cinder blocks, use the appropriate toggle bolts, masonry shields or compression-drive bolts. After mounting the case, for added weather protection run a bead of silicon sealer around the case between the controller case and the wall.



662702 Rev: B

Figure 2. Mounting the Outdoor Controller

CONNECTING THE POWER

INDOOR MODEL CONTROLLERS

Indoor controllers are supplied with a power transformer that plugs into a standard 12O-VAC outlet and converts the 120-VAC power to 24 VAC for connection to the controller.

CAUTION: **Do** NOT connect an indoor model controller directly to an outlet. This WILL damage the controller and could result in an electric shock or fire hazard. The supplied transformer must be used.

To connect the controller:

1. Make sure the transformer is unplugged from the 12O-VAC outlet.
2. Connect the two lead wires from the transformer to the two terminals marked "AC" on the controller terminal board located behind the control module (see figure 3). These wires may be shortened as necessary and secured near the controller.

NOTE: Make sure the power transformer is unplugged from the 120-VAC outlet while making connections to any station or master valve output terminal.

3. Plug in the transformer.
4. Check for 24 VAC power. If the voltage is not correct, unplug the transformer, and check wiring.

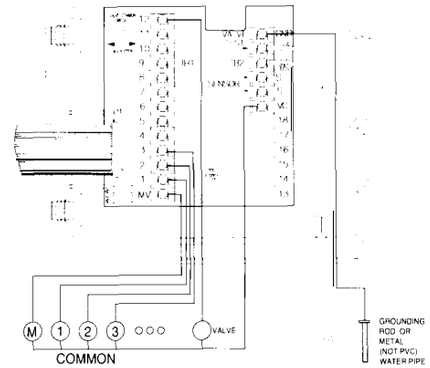


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Figure 3. Indoor Model Controller Electrical Hook-ups

NOTE: A ground wire must be connected to the "GND" terminal in areas of severe lightning or power surges. Built-in circuit protection must have a ground path to protect the controller.

OUTDOOR MODEL CONTROLLERS

Outdoor controllers have a built-in transformer which must be connected directly to a grounded, three-wire, 120-VAC power source. This connection should be made by a licensed electrical contractor in accordance with all requirements of the National Electrical Code and applicable state and local codes.

NOTE: Local building and electrical codes usually require that approved electrical conduit and fittings be used to connect exterior, wall-mounted equipment to 120-VAC power (see figure 4, page 24).

CAUTION: DO NOT connect the controller to one phase of a three-phase power system used by a pump or other electrical equipment.

To connect power to an outdoor model controller, complete the following:

1. Turn OFF installation site power at the associated circuit breaker.
2. Verify that power has been turned off at the installation site by using an appropriate AC voltage meter.
3. Install the conduit and associated fittings (see figure 4, page 24).
4. Connect power and ground wires per electrical codes.
5. Turn power on.
6. Check for 24 VAC power. If the voltage is not correct, turn off power, and check wiring.

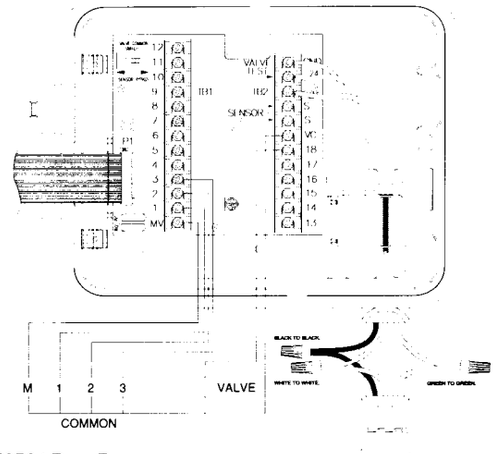

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Figure 4. Outdoor Model Controller Electrical Hook-ups

NOTE: A ground wire must be connected to the "GND" terminal in areas of severe lightning or power surges. Built-in circuit protection must have a ground path to protect the controller.

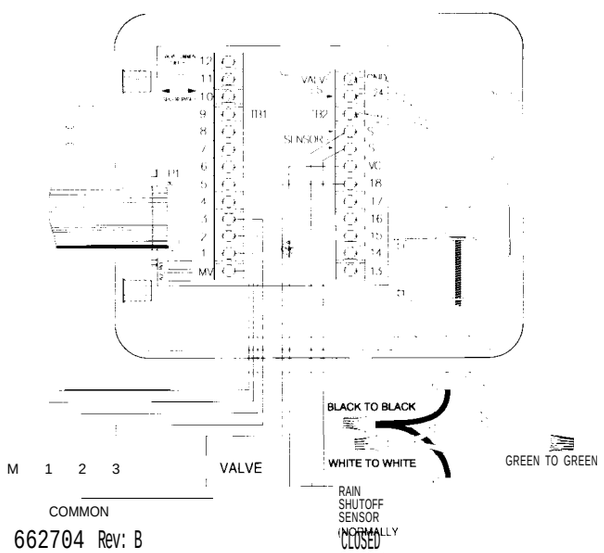
CONNECTING THE VALVES

A maximum load of **12 VA (0.5** amps, or two Hardie or Richdel valves) may be connected to each station. A maximum load of 24 **VA (1 .O amps** or four Hardie or Richdel valves) may be programmed to operate simultaneously (including master valve).

1. Strip the solenoid wires approximately 1/2 inch (do not bend exposed end).
2. Following the wiring diagram in figure 3 or 4, insert straight bare wire between the plates of the "sure grip" terminal. Connect one solenoid wire to the station terminal and the other to the valve common. Tighten screws firmly.
3. Before turning on the power, recheck all leads connected to the terminal block for shorts.

CONNECTING A RAIN SHUT-OFF DEVICE

The terminal strip hook-up on the Total Control is designed for use with a normally closed sensor. These two terminals simply break the common circuit. Install sensor or rain shut-off device as directed by manufacturer.



To bypass sensor when performing maintenance, simply place the Valve Common switch in the bypass position.

NOTE: If the sensor is not used, the Valve Common switch must be in the bypass position.

CONNECTING A PUMP START RELAY

When a pump is to be operated by the controller, a relay compatible with both must be used. The relay coil will be connected to the master valve output terminal at the controller and must be rated for 24 VAC at 250 mA maximum. The relay contacts will be connected to the pump start terminals and must be rated for use with the particular pump. Transient suppressors may be needed across the relay contacts in installations using large pumps.

CAUTION: **DO** NOT connect the master valve output terminal directly to the pump start terminals. This WILL damage the controller.

To connect the pump start relay:

1. Connect the master valve output terminal to one side of the relay coil.
2. Connect the other side of the relay coil to the valve common terminal (see figure 5).

CAUTION: Proper connection of the pump and relay contacts depends on the pump configuration and may involve HIGH VOLTAGE. This connection should be performed by a licensed electrical contractor in accordance with all requirements of the National Electrical Code, applicable state and local codes and the pump manufacturer's recommendations.

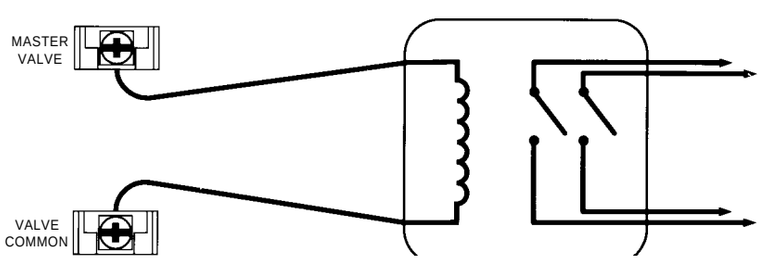


Figure 5. Installing a Relay for a Pump

Appendix B.
TROUBLESHOOTING

❖ Error	Solution
❖ All Valves Will Not Turn on Automatically	1. Verify program: station time, watering start times, watering days schedule, current time, current day, water budget and rain off. 2. Check valve common wire for proper hook-up. 3. Check for a shorted station; refer to Controller Displays "Short" troubleshooting. 4. If using sensor , check sensor. 5. If sensor is not in use Valve Common switch (on terminal board) must be in the bypass position.
❖ Cannot Program	1. Remove battery (check voltage). Disconnect power to controller for 1 minute. Reconnect power and reprogram. Reconnect good 9-volt alkaline battery. 2. Verify that all 12 start times are not in use by other programs.
❖ Controller Skips a Cycle	1. Verify watering start times, current time and water days.
❖ No Display	1. If program module has been removed, this is a normal battery-saving feature. Turn dial to any position to reactivate display. 2. If program module has not been removed, check incoming power and valve wiring. 3. Remove battery (check voltage). Disconnect power to controller for 1 min. Reconnect power and reprogram. Reconnect good 9-volt alkaline battery.
❖ Valve Stays On	1 Disconnect valve; check for manual bleed closure.

❖ Error	Solution
● :* Valve Stays On (cont'd)	2. Disconnect valve wire to valve. If still on, valve is bad. 3. Check for manual mode; place controller in Run mode. 4. Check solenoids for obstructions or wiring shorts. 5. Check station times and water budget. 6. Check valve for rocks or other obstructions or tom diaphragm.
❖ Valve Will Not Turn On	1. Make sure dial is not in Rain Off position and is not in the programmed Rain Off mode. 2. Verify program: station time, watering start times, watering days schedule, current time, current day and water budget. 3. Make sure common wire and valve wire are correctly connected. 4. Check solenoid. 5. Check valve bleed tube. 6. Check for a shorted station; refer to Controller Displays "SHORT" troubleshooting. 7. If **using** sensor, check sensor.
❖ Controller Displays "SHORT" (See also Pg. 5)	1. Note station numbers flashing. 2. Examine wiring connections for breaks or had connections. Repair and reconnect. 3. Examine solenoid for shorted connections. Repaired and reconnect. 4. Make sure solenoid rating does not exceed capacity of controller. 5. To reset, set the dial to the Run, Single Station or Program Cycle position, and press the Off button.

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