



T W I C E™
Two Wire Integrated Communication Exchange

User Manual

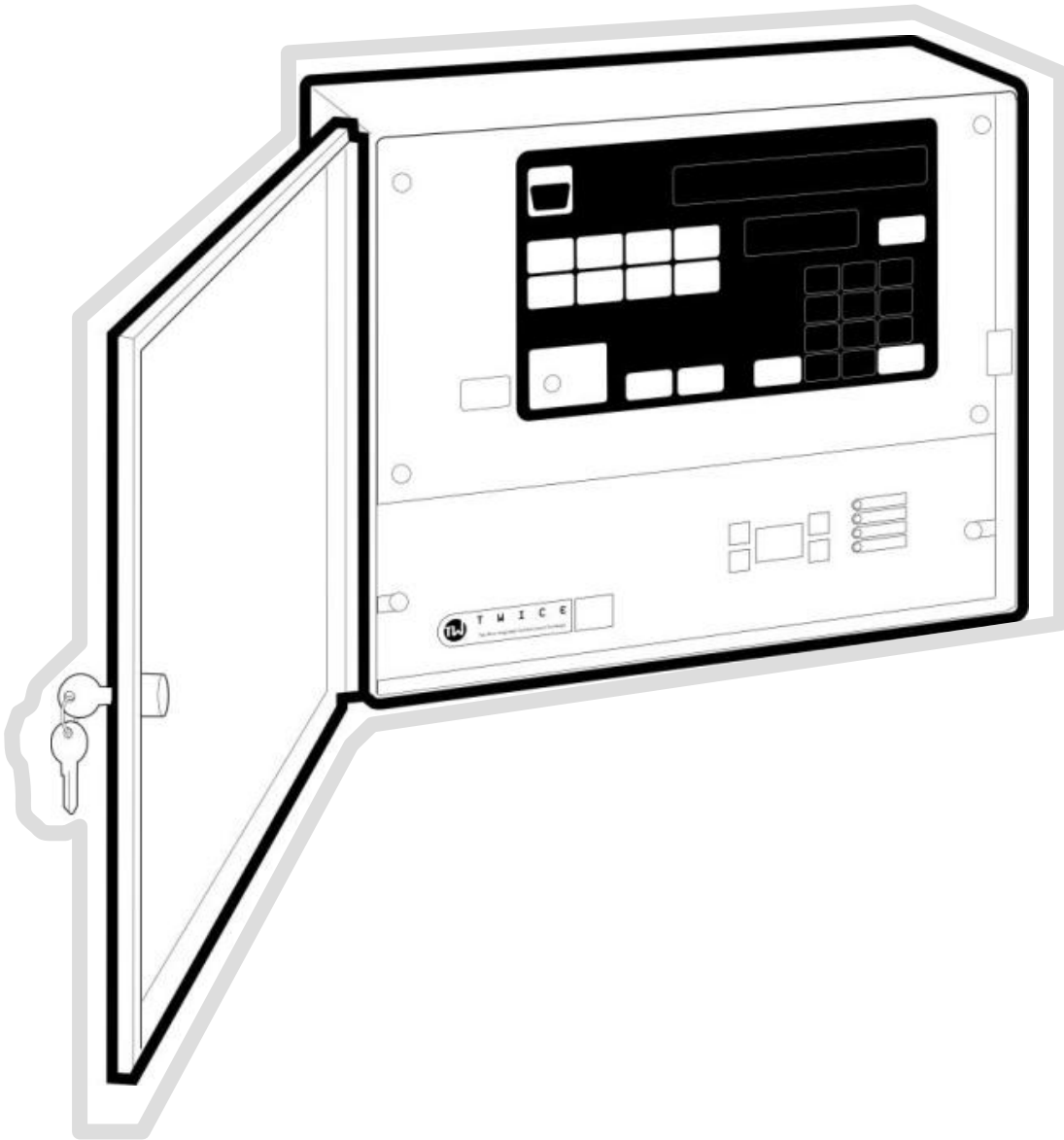


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Introduction

The TWICE family of Controllers integrates two-wire technology into the RME family of controllers and offers the following advantages:

- Reduced field wiring
- Ease of Expansion
- Reduced wiring maintenance expense.

Additionally Rain Master's TWICE protocol provides a two-way communication link between the controller, decoders and valves. This enables a means for testing and diagnostic capabilities within the two wire path.

This manual provides all the details necessary for the installation of the TWICE 2-wire system.

For a complete description of the RME EAGLE or SENTAR II Controllers and their set-up, please refer to the appropriate manuals that are included in each shipment.

Installation

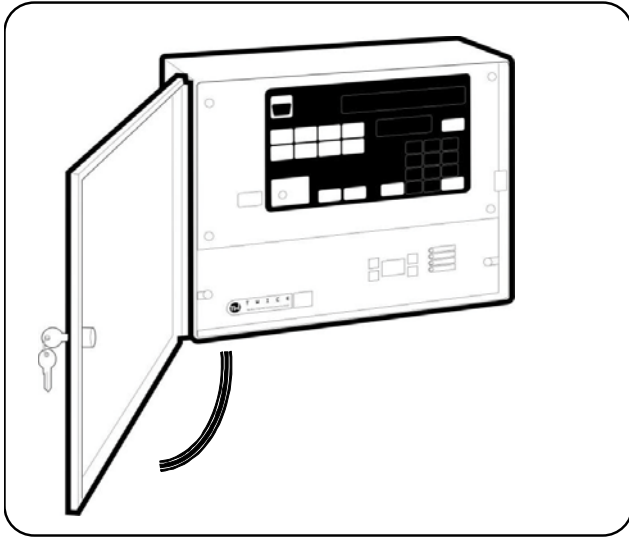
General Description:

The Two-Wire system requires a different approach to electrical wiring of components in the field, as compared to the conventional "multi-wire" method.

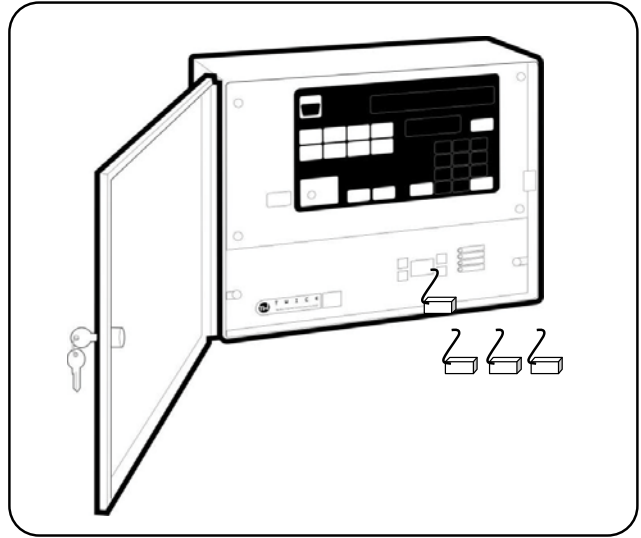
Specifically:

- Each valve solenoid is addressed (energized) by a Decoder that must be programmed to match the valve number prior to installation.
- A two-wire cable provides Power and Communication signals to the entire array of decoders.
- Subject to three conditions, the cable may be routed in one of three different ways to meet the requirements of the landscaping topography:
 1. The maximum distance from the furthest valve to the controller is 5000 feet.
 2. There must be a lightning arrestor (LA-1) installed every 600 feet or less.
 3. The maximum distance from a valve to its decoder is less than 100 feet.

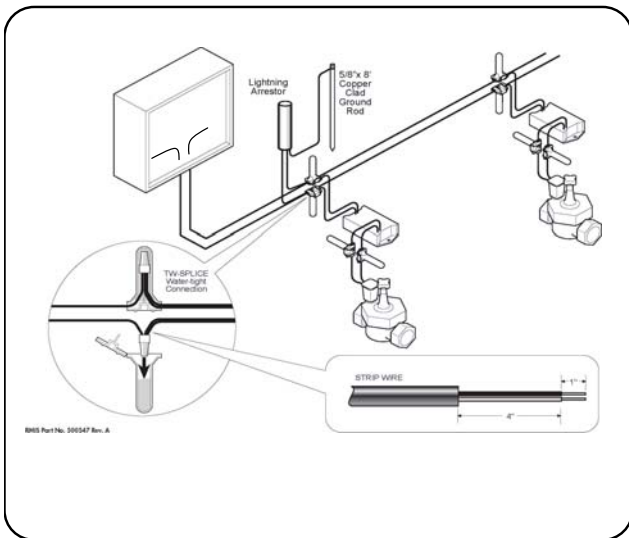
STEP 1:
Mount controller and
connect power



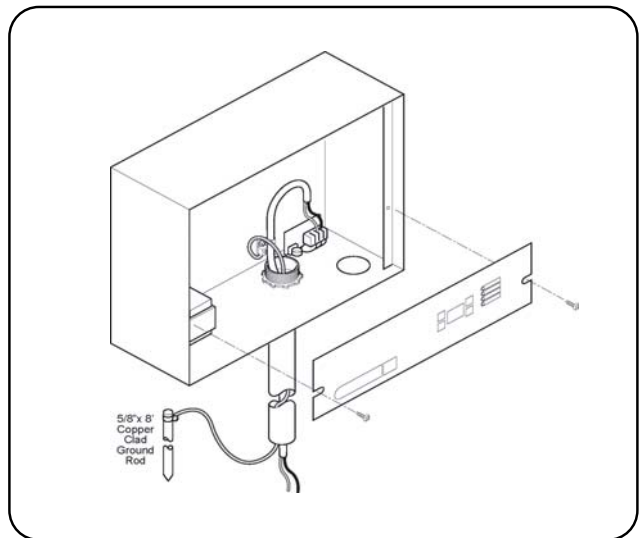
STEP 2:
Program decoders with
assigned station numbers



STEP 3:
Install decoders in the field



STEP 4:
Connect 2-wire cable to controller



The Twice Panel:

Basic introduction to the different keys, legends, display and connectors.

The Appendix contains a detailed description of programming capabilities and its advanced features.

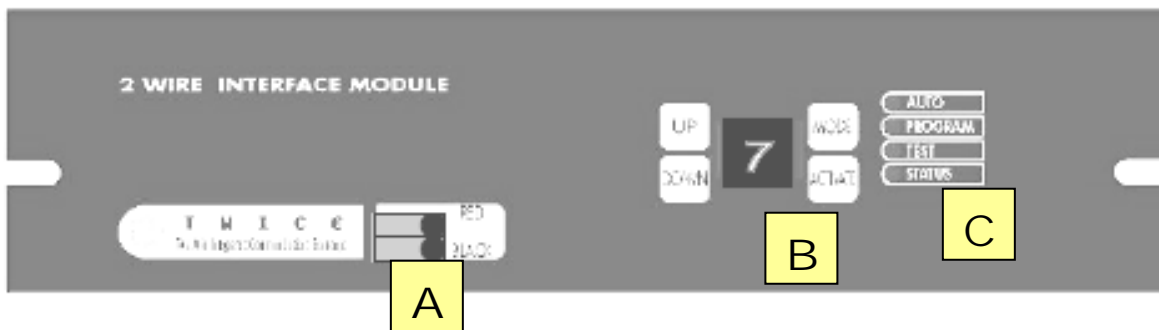
The Interface Panel has three (3) modes of programming/operation.

- **AUTO MODE** enables the RME Controller to run stations according to the scheduled programs entered. The Panel serves as a passive monitor of events.
- **PROGRAM MODE** enables the User to manually assign station numbers to the Decoders using the programming keys and connector.
- **TEST MODE** Enables the User to test all stations simultaneously or individually test a single valve or decoder, using the programming keys.

The **Mode** key allows the user to select the desired Mode of operation

The **UP** and **DOWN** keys are to be used to incrementally scroll up and down through Station Numbers in the PROGRAM or TEST Modes.

FIGURE 2: The TWICE CONTROL PANEL



The **Connector [A]** is used for assigning Station # to Decoders

The **Display [B]** shows Station Numbers, Error codes or a dash line (“—”) as it applies to program mode.

The **Activate** key allows the User to Program Decoders or to Test stations.

Status [C] light colors indicate successful entries (GREEN) or Errors (RED)

Decoder Programming:

After the Controller is powered up, individual decoders are programmed by connecting them to the connector on the panel as shown in *Figure 3*. Then press **MODE** until PROGRAM LED is illuminated. Continue to press **UP** until the desired number is displayed. Then press **ACTIVATE** if the decoder is programmed successfully the STATUS LED on the panel will turn GREEN.



Figure 3: Decoder Programming Set-Up

Figure 3 shows a successful example of Decoder programming, #7 in this case: The Decoder number “7” is displayed and the Status light is GREEN.

After the decoder is programmed the Controller Serial # and Station number must be noted on the label. (Please use permanent ink marker.)

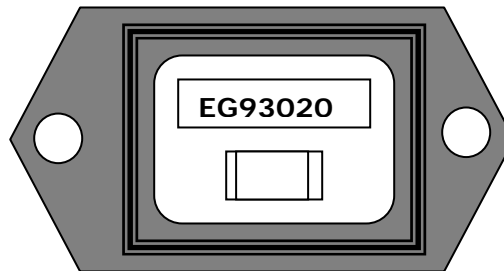


Figure 4: Decoder Identification

Two- and Four- valve decoders will use consecutive station numbers following the station number that is programmed. For example if the above decoder was a dual type, the 2nd station would automatically be assigned #8. A 4-station decoder would end up with #8, #9 and #10 for the other three stations.

Field Layout Recommendations:

Figures 4 and Figure 5 detail recommendations for field wiring and termination.

FIGURE 5: COMPONENT TERMINATION SCHEME

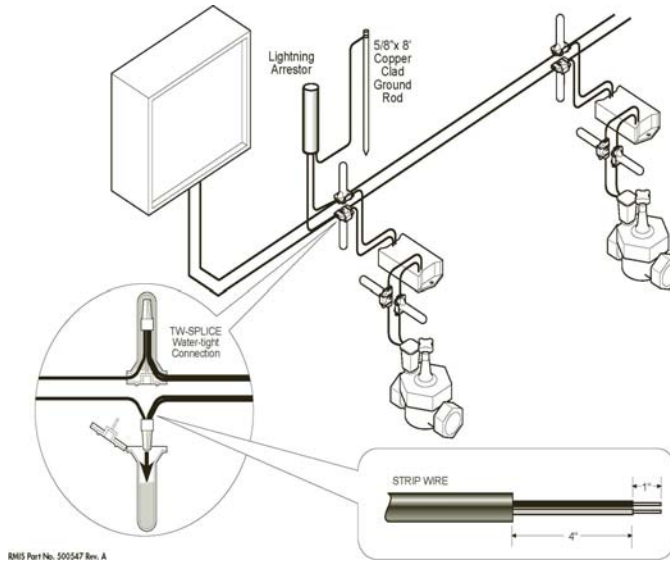
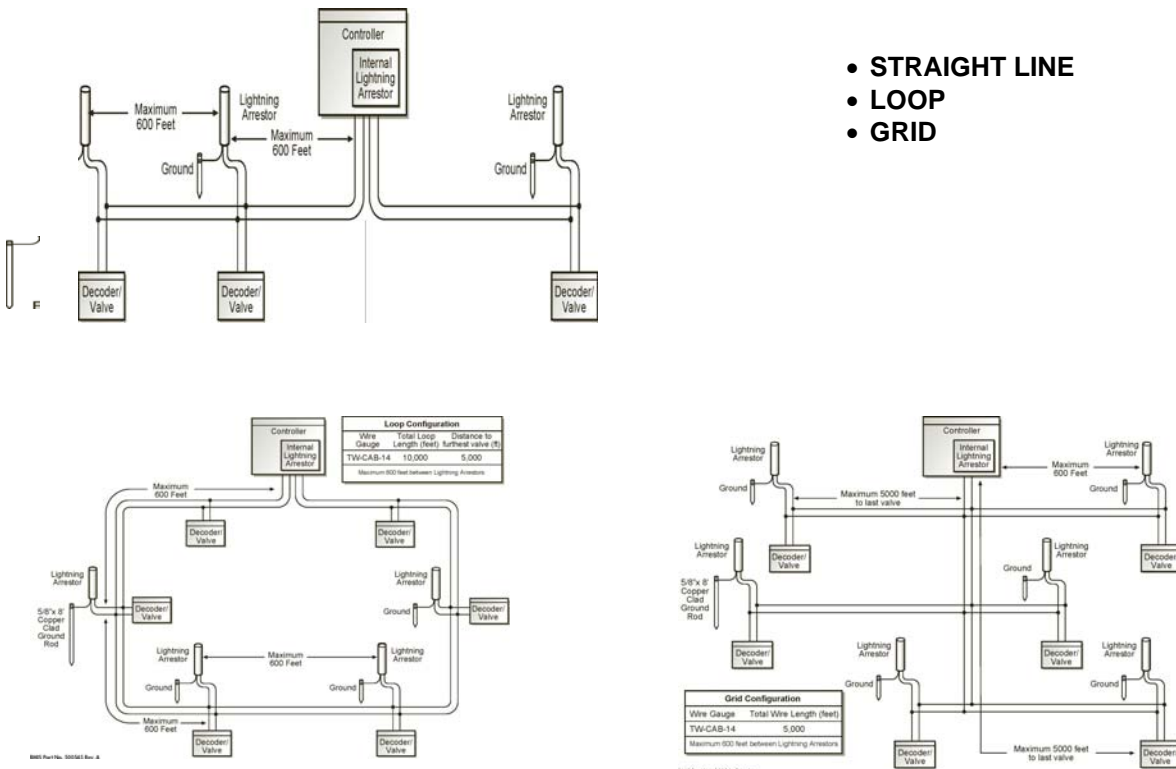
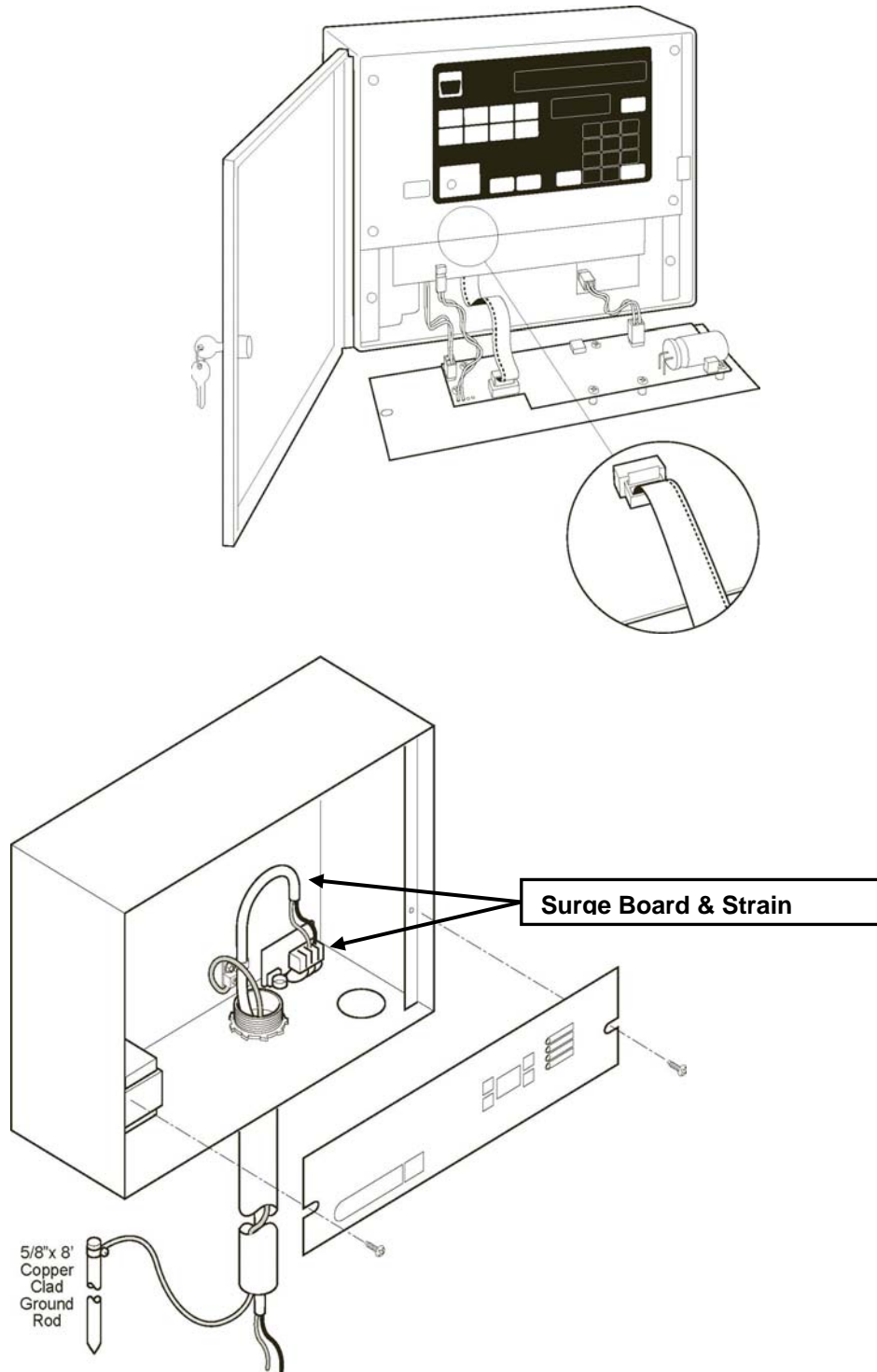


FIGURE 6: WIRING CONFIGURATIONS



Termination Into Controller:

To connect the two-wire cable (TW-CAB-14) into the Surge Board inside the back of the controller, the TWICE Front Panel has to be removed as shown in the diagrams below. Be sure to leave a sufficient loop in the cable for strain relief.



Final Test And Start Up:

Upon completion of connection of the 2-wire cable into the controller, the system is ready for final testing and operation.

To run a TEST of the system two steps should be followed:

1. Put the TWICE PANEL in the TEST MODE and test individual decoders one at a time followed by a sequential cycle of all decoders. If any error messages are observed take the necessary corrective action to resolve the problem, such as checking the wiring, or reprogramming the decoders. (see appendix for trouble shooting tips)
2. Put the TWICE panel in AUTO MODE. This enables the RME Controller to assume control of all decoder activities. Refer to the RME Controller manual to carry out all preliminary controller tests prior to automatic operation.

The system should now be fully operational.

APPENDIX A

A1: Twice Panel Programming Details

This section explains the programming capabilities by providing details related to:

- Tactile Key Functions
- Display Messages
- Error Codes
- Quick Programming Guide

Tactile Key Functions

The tactile Keys on the TWICE Control Panel perform different tasks based upon the Mode that is selected. The Table below lists the various functions of the keys depending upon the MODE that the panel set up for.

Key	Automatic Mode	Program Mode	Test Mode
MODE	Change to PROGRAM Mode	Change to TEST Mode	Change to AUTOMATIC Mode
UP	No Action	Increment decoder number	Increment decoder number
DOWN	No Action	Decrement decoder number	Decrement decoder number
ACTIVATE	If not active will clear the displayed error code	Program decoder to specific number	<ul style="list-style-type: none"> • Run test on decoder number • Test all decoders if decoder address is zero
UP + DOWN	Displays the 2-Wire Interface Module version number	Displays the 2-Wire Interface Module version number	Displays the 2-Wire Interface Module version number
ACTIVATE + UP	Displays the 2 Wire Interface Module temperature, in Centigrade	Displays the 2 Wire Interface Module temperature, in Centigrade	Displays the 2 Wire Interface Module temperature, in Centigrade

Display Messages/Interpretation

The chart below explains the different messages are displayed and the conditions that prompt them, in the three different MODES.

Automatic Mode (2-wire cable is connected to the surge board)

Display		Condition
--	=	Displayed when the Controller and 2-Wire Interface Module are in Automatic Mode, and no valves are on.
00	Then	07 =
(mode)	=	Displayed when the controller and the 2-Wire Interface Module are in Automatic Mode and a valve is active. In this example the display is blank for ½ second then the active decoder number is displayed, 07 is ON. Additionally, the STATUS LED will be RED if errors are encountered, GREEN otherwise.
		Pressing the MODE key changes the MODE from Automatic Mode to Program Mode.

Decoder Program Mode (Decoder is connected to the panel)

Display		Condition
	then	E1 =
00	=	Displayed until a decoder is attached. The display is blank for two seconds, then E1 is displayed.
07	then	E5 =
07	=	Displayed when a decoder is attached, but has not been programmed.
(mode)	=	Displayed when a decoder is attached, but has an error. In this example, decoder communications error.
		Displayed when a decoder has been programmed. In this example, decoder number 07.
		Pressing the MODE key changes the MODE from Program Mode to Test Mode.

Test Mode (Decoders are connected to the surge board)

Display		Condition
07	=	Entry and display of the decoder to Test, in this example decoder 07. The decoder numbers can be between 0 to 36, and 99 for the Master Valve. The following display will appear when the TEST key is depressed.
	then	After test is complete, the display will blank for ½ second, then the decoder number will be displayed for 2 seconds (or Error Code E1 will be displayed, in case of an Error). If no errors are detected, then the Decoder Firmware is displayed followed by the valve current draw. In this example: 1.0 for firmware rev. and 24 = 0.24 Amperes of current draw.
(mode)	=	Pressing the MODE key changes the MODE from Test Mode to Automatic Mode.

Error Code Chart

This chart discusses conditions under which certain error codes are displayed and the actions to be taken to address them.

Table 5 - Error Codes

Code	Error Description	Cause	Action
E1	No Decoder Was Found	<ul style="list-style-type: none"> • Wiring error • Bad decoder • Bad two wire circuit • Program Mode no decoder was found. 	<ul style="list-style-type: none"> • Check wiring • Move the decoder closer to the controller • Replace the decoder • Replace the 2-Wire Interface Module
E2	Two Wire Circuit is in Over Current	<ul style="list-style-type: none"> • Shorted wiring • Wire connected to earth ground • Improper wiring connections • Shorted (failed) decoder • Valve connected directly to 2-wire circuit 	<ul style="list-style-type: none"> • Troubleshooting wiring problems <ol style="list-style-type: none"> 1. Undo last item installed. 2. Break the 2-Wire network in half to isolate the problem
E3	Open Circuit at Solenoid	<ul style="list-style-type: none"> • The decoder detects no solenoid current when activated • Defective decoder • Open solenoid • Poor connections or wiring between decoder and solenoid 	<ul style="list-style-type: none"> • Check decoder to solenoid connections • Resistance check the solenoid • Replace the solenoid • Replace the decoder
E4	Short Circuit at Solenoid	<ul style="list-style-type: none"> • Decoder measures excessive current in solenoid • Shorted or failed solenoid 	<ul style="list-style-type: none"> • Check wiring • Replace solenoid • Replace decoder

Code	Error Description	Cause	Action
		<ul style="list-style-type: none"> Improper connections of solenoid wires to two wire circuit 	
E5	Decoder Communications Error	<ul style="list-style-type: none"> Poor quality wiring between the 2-Wire Interface Module and the decoder Two Wire connected to earth ground Defective decoder Defective 2-Wire Interface Module Multiple decoders with same address 	<ul style="list-style-type: none"> Test two wire resistance to ground Isolate decoder which in faulting Check for duplicate addresses Valve wire is connected to earth ground or in water
E6	High Temperature Shut Down	<ul style="list-style-type: none"> 2-Wire Interface Module has exceeded 185° F 2-Wire Interface Module has defective temperature sensor 	<ul style="list-style-type: none"> Shade controller Replace 2-Wire Interface Module Install cooling fan in enclosure
E7	Decoder Programming Failure	<ul style="list-style-type: none"> Programming multiple decoders at one time Decoder removed before programming cycle was completed Defective decoder Defective 2-Wire Interface Module 	<ul style="list-style-type: none"> Retry programming of the decoder Replace the decoder Replace the 2-Wire Interface Module

A2: Two-Wire Interface Parts List

Item #	RMIS Part #	Description
1	TW-D-1	Single valve decoder
2	TW-D-2	Dual valve decoder
3	TW-D-4	Quad valve decoder
4	PCTW-INTERFACE	2 Wire Interface Module
5	TW-CAB-14	2 conductor, direct burial 2 Wire cable
6	TW-LA-1	Lighting Arrestor
7	TW-SPLICE-14	Waterproof Wire Nut*

* NOTE: The specified wire nut is acceptable for a majority of terminations in the field. However if a requirement is encountered where a larger nut is needed, RMIS recommends that the end-user select from various other commercially available waterproof wire nuts.

A3: Twice General Specifications

Controller Programming Capabilities

- Four (4) independently controllable irrigation programs, with five (5) selectable start times for a total of 20 possible irrigation cycles per day.
- Direct control of 36 individual stations.
- Runtime(s) for each station can be set from 1 minute to 9 hours 59 minutes per station, in one-minute increments.
- Quick Station(s) programming to allow rapid programming of an entire block of stations, all with the same runtime.
- Water Days for each program can be based on a seven-day cycle or a skip-by-day cycle, which allows a program to skip from 1 to 30 days between watering cycles.
The water days can be further restricted with the selection of ODD/EVEN calendar days.
- Manually activated system Check/Syringe Cycle to sequentially run each station for a user selectable time, with a range from one minute up to nine minutes.
- Manually activated program/station cycle to execute a program/station independently of its programmed start time and water days.
- Programmable Master Valve to utilize and control a Master Valve on a per program basis.
- Programmable pump independent of the Master Valve on a per program basis.
- Programmable stacking or non-stacking operation of the programs.
- Programmable delay time between station executions.
- Flow sensing and control.
- Evapotranspiration (ET) based scheduling (RME EAGLE ONLY).
- Percentage adjustment on a per program basis to allow an increase or decrease of all station runtimes within that program. The percentage will allow adjustment from 0 to 300% in 1% increments.
- Programmable and manual rain shut down.
- Connectivity for any one of the following: rain, moisture, or freeze sensor device.
- The ability to select either ODD or EVEN day watering on a per program basis (RME EAGLE ONLY).

User Interface

- Easy to understand and use keyboard layout, provides ease of use during programming and review.
- Multiple displays provide a simple way of programming and information review.
- During program execution the controller will display the executing program number, the flow in gpm, and the station runtime countdown in hours, minutes and seconds.
- During program execution the 2-Wire Interface Module will rotate, for 2 seconds, through each active zone number.
- Programmable controller security access code to prevent unauthorized use or modifications to be made of the controller's programs.
- Review key to display all program parameters on a per program basis. Successive invocation of the key will display program parameters one by one. Depression and subsequent hold of this key will allow rapid review of program parameters.

Diagnostic And Fault Detection

- Programmable audible alarm.
- When a zone is turned on, the zone address is displayed and the Status LED will indicate an error condition by illuminating RED.

- After program execution is complete, all malfunctioning zones will be displayed, by first displaying the zone number then the corresponding error code. Each malfunctioning zone will be displayed in rotation.
- The 2-Wire Interface Module identifies system over current conditions by displaying an alternating 60 second count down timer, until cleared by the operator.
- The 2-Wire Interface Module will identify system over temperature conditions by displaying error code continuously until the temperature drops to a save level.
- The 2-Wire Interface Module will provide two test modes. MODE ONE will test all valves in sequential order. MODE TWO will test an individual valve.
- Built-in controller self-test.
- Intelligent resumption of program execution after power outages.
- Automatic detection of main line water breaks.
- Automatic detection of unscheduled water flow.
- Automatic detection of upper stations flow limit.
- Automatic detection of no ("No Flow")water flow to a station (RME EAGLE ONLY).

Available RME Eagle Options

- Ability to connect to a Rain Master Communications card (iCentral) to provide connectivity to the Internet.
- Ability to interface to a Rain Master Weather Station for direct ET measurements.

Certification And Warranty

- Underwriters and FCC approved.
- Manufacturer's limited 5-year warranty.

Electrical Specifications

- Input power: 105-130 VAC, 50/60 Hz, ½ Ampere maximum, 0.1 Ampere idle.
- Output power: 24 VAC, 1.5 Amperes maximum total output or 36 VA maximum total output 1.0 Ampere per station or Master Valve.

Mechanical Specifications

- Heavy duty 18-gauge steel enclosure jet coat and powder coated to protect it for indoor and outdoor environments.
- Addition enclosure options available.

Shipping Weight: 14 pounds

Dimensions: 13.25 inches Wide x 12.1 inches High x 4.3 inches Deep

RAIN MASTER® LIMITED TRADE WARRANTY

Rain Master Irrigation Systems Inc. warrants to the first "trade" customer purchaser that this Rain Master brand product (the "product"), when shipped in its original container, will be free from defective workmanship, and materials and agrees that it will, at its option, either repair the defect or replace the defective product or part thereof at no charge to the purchaser for parts or labor for the time period set forth below.

This warranty does not apply to any appearance items of the product nor to any product the exterior of which has been damaged, or defaced, which has been subjected to misuse, abnormal service or handling, or which has been altered or modified in design or construction. (See additional exclusion below).

In order to enforce the rights under this limited warranty, the purchaser should ship or carry the product to a Rain Master authorized service depot, or send product prepaid to Rain Master at the address below (ensuring product is packaged correctly for shipment). For nearest location, call Rain Master Service Center 1-805-527-4498.

This limited warranty described above is in addition to whatever implied warranties may be granted to purchasers by law. All implied warranties including the warranty of merchantability, and fit for use are limited to the periods from date of purchase set forth below.

Neither the sales personnel of the seller nor any other person is authorized to make any warranties other than those described above, or to extend the duration of any warranties beyond the time period described herein.

The warranties described above shall be the sole and exclusive warranties granted by Rain Master Irrigation Systems Inc. and shall be the sole and exclusive remedy available to the purchaser. Correction of defects, in the manner and period of time described herein, shall constitute complete fulfillment of all liabilities and responsibilities of Rain Master to the purchaser with respect to the product, and shall constitute full satisfaction of all claims, whether based on contract, negligence, and strict liability or otherwise.

In no event shall Rain Master be liable or in any way responsible, for any damages or defects in the product which were caused by repairs or attempted repairs performed by anyone other than a Rain Master Service dealer or center. Nor shall Rain Master be liable or in any way responsible for an incidental or consequential economic or property damage. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

This limited warranty does not apply to improper installation or grounding, acts of God, such as lightning and/or power surges, floods, earthquakes, hurricane, tornados, vandalism etc.

All "R M E" Series Controllers have a **5-year** limited warranty from date of initial "trade" purchase.

All other Rain Master Brand products carry a **2-year** limited warranty unless otherwise specified.

All Software products, which include but are not limited to, Evolution, AIM, Advanced ET, OASIS, Weather Station, etc, carry a **90-day** limited warranty.

ALL computer hardware purchased from Rain Master in conjunction with its software is NOT covered by any Rain Master warranty. Computer hardware and its subsequent operating system are specifically covered by the hardware manufacturer's warranty as provided by the hardware manufacturer.

SERVICE

Should it be necessary to service your controller, contact your local Rain Master distributor or contact Rain Master at 1-805-527-4498 for a listing of distributors in your area. When sending a controller or a component of the controller back to be serviced, ensure it is properly protected with a soft packaging material, and that the box will withstand normal shipping abuses. Enclose a complete description of the type of problem that is occurring, and be sure to put your name, address and phone number where you can be reached.

NOTE: The user is cautioned that changes and modifications made to the equipment without the express written consent of the manufacturer will void this warranty.

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