RME EAGLE™

USER MANUAL *For EG Series Controllers*
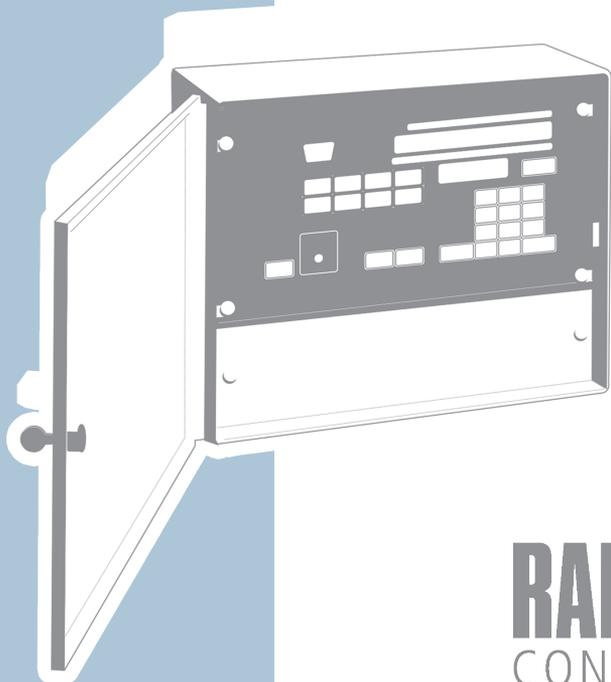
RAIN MASTER®
CONTROL SYSTEMS

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1.0 Introduction

Congratulations! You have selected one of the most advanced irrigation controllers available. Rain Master has taken great pride and patience in developing and building the most trouble-free controllers in the irrigation industry. Your Rain Master EAGLE has many high-quality features including:

- Economical flow sensing
- Cycle and soak programming
- Complete independent control of Pumps and Master Valves
- Evapotranspiration adjusted water cycles
- The ability to interface to a weather station and rain sensors
- Internet communication option

To take full advantage of the many features available in your Rain Master EAGLE controller, please take a few minutes and read through your User's Manual. For those who do not have the time, a Quick Reference sheet is provided. This sheet will allow you to perform some of the basic functions required in programming and operating your Rain Master EAGLE controller.

Figure 1 - Rain Master Eagle Advanced ET Controller

2.0 Specifications

2.1 PROGRAMMING CAPABILITY

- Four (4) independently controllable irrigation programs, with five (5) selectable start times, for a total of 20 possible irrigation cycles per day.

- 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 cycle to execute a program independently of its programmed start time and water days.

- Manually activated station cycle to operate a single station for a selectable period of time from 1 minute to 9 hours 59 minutes.

- Programmable Master Valve to utilize and control a Master Valve on a per program basis.

- Configurable Master Valve Type to select either a Normally Open Master Valve or a Normally Closed Master Valve.

- Programmable pump independent of the Master Valve on a per program basis.

- Programmable stacking or non-stacking operation of the programs.
In the event that programmed start times either within a program or between programs should overlap, or coincide, the controller can either be programmed to sequentially execute one program after the other program has completed (Stack Mode) or to simultaneously execute all programs as their programmed start times occur (No Stack Mode).

- Programmable delay time between station executions.
The programmed delay time can be between 0 to 255 seconds (4 minutes 15 seconds). This capability allows slow-closing valves to completely shut off, before the next valve turns on.

2.1.1 Water Conservation Features

- Flow sensing and control.
- Evapotranspiration (ET) based scheduling.
- 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 rain shut off in order to delay the start of irrigation after a rain storm. The controller will not water during the programmed shut off period (from one to seven days). After the shut off period has expired the controller will return to the Automatic Mode of operation.

- Manual Rain Switch (Automatic Watering – No Watering) provides a means of quickly turning off all irrigation programs without disturbing the stored program(s). When the switch is placed in the No Watering position the display will show "RAIN OFF".
- Connectivity for any one of the following: rain, moisture, or freeze sensor device. The enabling of these devices can be performed on a per program basis. When the sensor is "active" irrigation will stop and the display will indicate that the sensor is active. This feature allows non-irrigation programs to execute independent of these devices.
- The ability to select either ODD or EVEN day watering on a per program basis. (When either of these features is selected, the controller will not water on the 31st day of the month.)
- Selectable Cycle and Soak irrigation programming or conventional programming on a preprogram basis.
- Programmable cycle runtime, Max Cycle Time, and Soak time on a per station basis.
- Automatic minimization of the water window by intelligently scheduling station starts when other stations are satisfying their SOAK TIMES.
- Controller supports Quick Station programming in the Cycle and Soak programming mode.
- The controller provides a display of the total runtime of the program using the REVIEW feature of the controller. The Cycle and Soak feature intelligently displays the total runtime of the program, the controller considers all soak delays, optimized program features, water budget percentage and inter-station delays.
- Optimized water savings, all station run times are calculated and executed to the nearest second.

2.1.2 Convenience Features

- 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.
- Programmable Controller Security Access code to prevent unauthorized use or modifications to be made of the controller's programs. This feature is enabled by entering a security access code from 1 to 4 digits in length.
- 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.

2.1.3 Diagnostic and Fault Detection

- Programmable audible alarm. When enabled this alarm will "chirp" once every six seconds for either an electrical field wire fault or any flow fault condition. The alarm will continue until reset by the user.

- Automatic field wire fault detection enables the controller to sense a short in the field wire and instantly turn off that station. The display will report the fault condition any time a field wire fault occurs. Additionally an audible alarm will "chirp" (if enabled, once every six seconds) until it is reset. The controller will automatically advance the fault station to the next programmed station.

- Built-in self-test allows you to test various internal circuitries utilizing built-in test capability.

- Non-volatile memory to retain the program(s) and controller information during power outages or seasonal shut downs. This information is maintained indefinitely.

- A "real time" clock with non-volatile backup to maintain the actual date and time during power outages without the need of batteries. This eliminates the need to reprogram the controller every time there is a power outage.

- Advanced circuitry to automatically monitor internal voltages and reset on-board microprocessor circuitry during power "brown-out" or error conditions.

- Automatic electronic fuse which resets intelligently based upon need. (No user fuses or circuit breakers to reset or fail.)

- Intelligent resumption of program execution after power outages to ensure that program starts are not lost. The controller intelligently schedules irrigation after any outage while preserving the original water window.

- Automatic detection of main line water breaks. Upon detection the controller will shutdown all active irrigation, energize a Normally Open Master Valve (if selected), condemn any future start times, and trigger audible and visual alarm indicators.

- Automatic detection of unscheduled water flow. Upon detection the controller will activate the Normally Open Master Valve (if selected), condemn any future start times, and trigger audible and visual alarm indicators.

- Automatic detection of upper stations flow limit. Upon detection the controller will turn off the fault station, advance the program to the next station, condemn the station from any future watering times, and trigger audible and visual alarm indicators.

- Automatic detection of no water flow to a station ("No Flow"). Upon detection the controller will turn off the fault station, advance the program to the next station, condemn the station from any future watering times, and trigger audible and visual alarm indicators.

2.2 FLOW CAPABILITIES

2.2.1 Flow Rate Monitoring

- Programmable flow to enable or disable the flow sensor features.

- Programmable flow sensor pipe sizes for standard Rain Master flow sensors (10, 125, 15, 20, 30, and 40 inch). Non-standard pipe sizes are also programmable.

- Inputs for connectivity to a flow sensor. The controller will read the frequency of the sensor by sensing each time a contact closure appears at the input. The controller will source +8 VDC to the sensor.

- Programmable main line flow limit from 1-999 GPM defines the maximum allowable flow during scheduled irrigation.

- Automatic detection of main line water breaks. Upon detection the controller will shutdown all active irrigation, energize a Normally Open Master Valve (if selected), condemn any future start times, trigger audible and visual alarm indicators.

- Programmable unscheduled flow limit from 0-999 GPM defines the maximum amount of flow which will be tolerated during unscheduled irrigation periods.

- Automatic detection of unscheduled water flow. Upon detection the controller will energize the Normally Open Master Valve (if selected), condemn any future start times, and trigger audible and visual alarm indicators.

- Automatic detection of no water flow ("No Flow") on a per station basis. Upon detection the controller will turn off the fault station, advance the program to the next station, condemn the station from any future watering times, and trigger audible and visual alarm indicators.

- Programmable station upper flow limits from 0-500 GPM.

- Automatic detection of upper station flow limit. Upon detection the controller will turn off the fault station, advance the program to the next station, condemn the station from any future watering times, and trigger audible and visual alarm indicators.

- Programmable flow check delays between one and six minutes (one minute increments).

- This delay allows stations to stabilize each time a station is turned on/off before limit checks are applied.

- Automatic monitoring and display of measured station flow in Gallons-Per-Minute (GPM) from 0 to 999 GPM.

- Controller utilizes automatic LEARN mode for setting individual station flow limits for the entire controller. A global percentage adjustment from 5% to 80% is used to automatically factor upper flow limits for all stations once the nominal values have been measured.

- Single station flow limits can be setup based upon the measured nominal flow or a manually entered value (0-500 GPM).

- Intelligent upper-limit processing for concurrent station operation.

- A water usage meter indicates total water used by the controller. The water usage meter can be reset at any time.

2.3 EVAPOTRANSPIRATION (ET) FEATURES

• Ability to enable or disable ET processing on a per program basis.

• The ability to use any one of four different ET sources as the basis for its ET calculations:

1. Historical ET data

2. Manually entered ET data

3. Rain Master ET measurement device or compatible equivalent

4. Downloaded ET data from the Internet (requires optional hardware)

• The ability to input and store Historical ET data on a monthly basis (12 months); the data is based on a daily average, at the geographic location of the controller.

• The ability to store an ET reference value. This value is used during the adjusted station runtime ET calculations.

• The ability to automatically re-compute the user entered station runtime, at the moment of irrigation, utilizing the current ET information. The station runtime is evaluated and adjusted based on days since last irrigation. The controller automatically compensates for changes in weather patterns between irrigation days.

• Accept a manual operator entered weekly ET value. The manual entry will override previously entered or accumulated ET data. At the end of the seven day period the controller will automatic revert to utilizing Historical, Weather Station device, or Internet provided daily ET data.

• Connectivity to an ET measuring device such as a Rain Master Weather Station. The controller will record .01 of an inch (ET) each time a contact closure appears at the input.

• The controller will source +5 VDC to the device.

• The ability to display the last ET daily value including the data source (Historical, measured, manually entered, or Internet provided).

• Ability to display the current adjusted runtime as a percent of the base runtime for all ET enabled programs.

2.4 AVAILABLE RAIN MASTER 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.

• Ability to connect to a Rain Master Flow sensor or other flow sensor device.

• Built-in remote control capability for compatibility with all Rain Master remote control systems.

• Connectivity for a number of sensor types, including: rain, freeze, or moisture sensor device. The device can be enabled on a per program basis. This allows non-irrigation programs to execute independent of the sensor device.

• Availability in a variety of enclosure types including: standard cold roll steel enclosure with powder coat paint, extended size cold roll steel enclosure with station screw terminals, extended size stainless steel enclosure with station screw terminals.

• All extended size enclosures are available with optional heavy duty lightning protection.

2.5 CERTIFICATION AND WARRANTY

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

2.6 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

Table 1 - Electrical Calculations

Valve solenoids are rated in either Amperes or VA. The term VA stands for Volt-Amps, which is obtained by multiplying the Amperes required by the 24 VAC operating voltage.

Most modern solenoids require approximately .25 Ampere, which is equivalent to 6 VA. This allows up to six solenoids to be energized at the same time.

EXAMPLE: You are using a Master Valve and Pump; you have configured the system to use the NO STACK option. This configuration would allow all four programs to run simultaneously, as depicted in Figure 6 – Master Valve and Pump Electrical Connections.

Four programs	(.25 A times 4)	1.00 Ampere
Master Valve	(.25 A times 1)	.25 Ampere
Pump using Rain Master RLY1	(.20 Amps)	.20 Ampere
Total Current		**1.45 Amperes**

This configuration would not exceed the 1.5 Amperes maximum allowable limit.

If higher current solenoids are used or if more than one solenoid is connected to any one station output, caution should be used when operating in the NO STACK configuration mode.

2.7 MECHANICAL SPECIFICATIONS

- Heavy duty 18-gauge steel enclosure jet coated and powder coated to protect it for indoor and outdoor environments.
- Outdoor pedestal mount available for all models.
- Two convenient sized enclosures for easy installation of field wires.
- Outdoor pedestal mount available for all models.
- Extra heavy-duty lightning and surge protected models available for areas where lightning is a concern.

Shipping Weight: 14 pounds

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

2.8 DOCUMENTATION

- Rain Master Eagle User Manual - Part Number 500042
- Rain Master Eagle Quick Reference Guide – Part Number 500045
- Rain Master Eagle Historical ET Data Tables – Part Number 500018
- Grounding Instructions (Option)
- Multiple Controller Installation Instructions - Technical Bulletin 018 (Option)
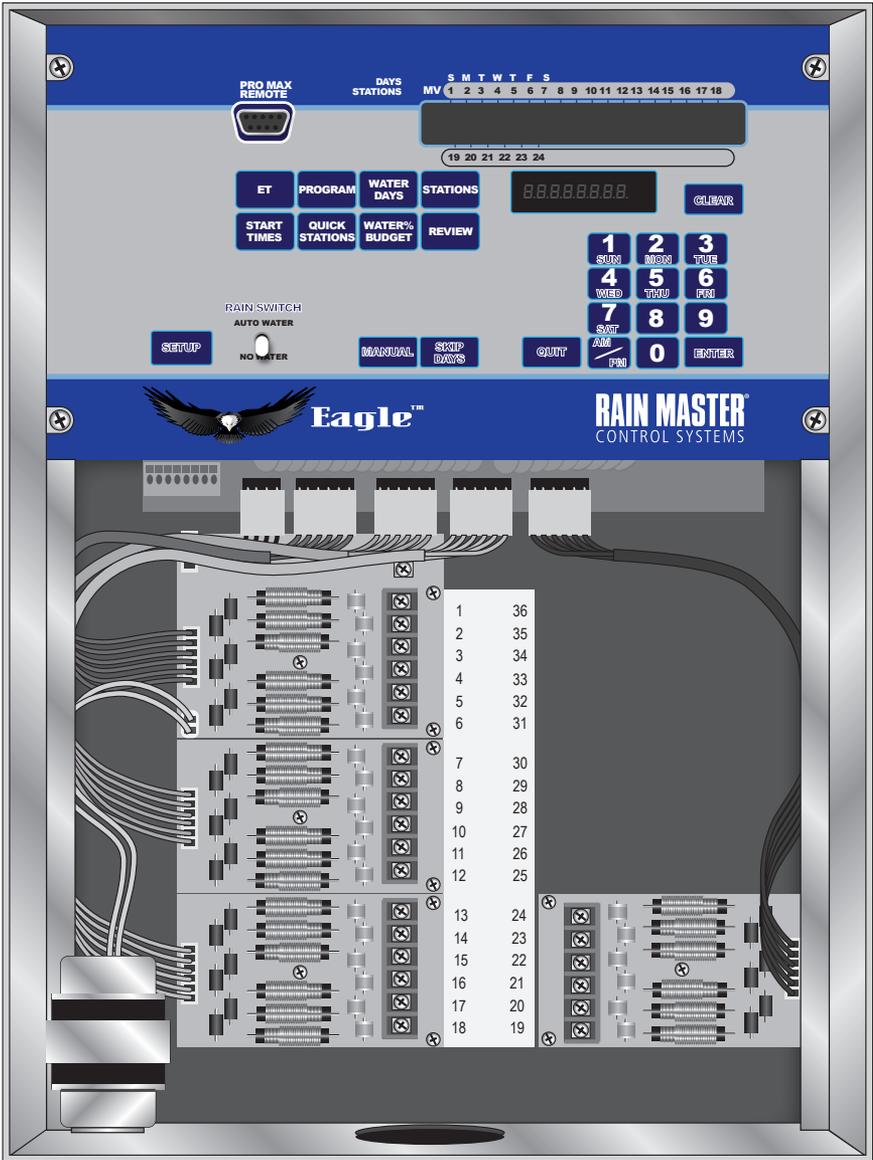
Figure 2 - Rain Master Eagle RME24EG-B

3.0 Mounting and Installation

3.1 CONTROLLER PLACEMENT

The Rain Master Eagle controller is suitable for indoor or outdoor environment. It is lockable, dust and rain resistant. Outdoors the controller should be placed in a shaded and dry environment. Do not subject the controller to direct sprinkler spray or continuous heavy moisture. A free standing pedestal mounting (PED 1) is available for outdoor controllers; contact your Rain Master distributor.

Do not drill holes in the controller's case. It has all the holes necessary for mounting it on a wall or to a pedestal. Drilling holes in the unit will cause metal chips to mix with the electronics and this will cause the unit to malfunction. If, for some reason, it is absolutely necessary to drill additional holes in the unit, carefully remove all the electronics prior to doing so.

Side View
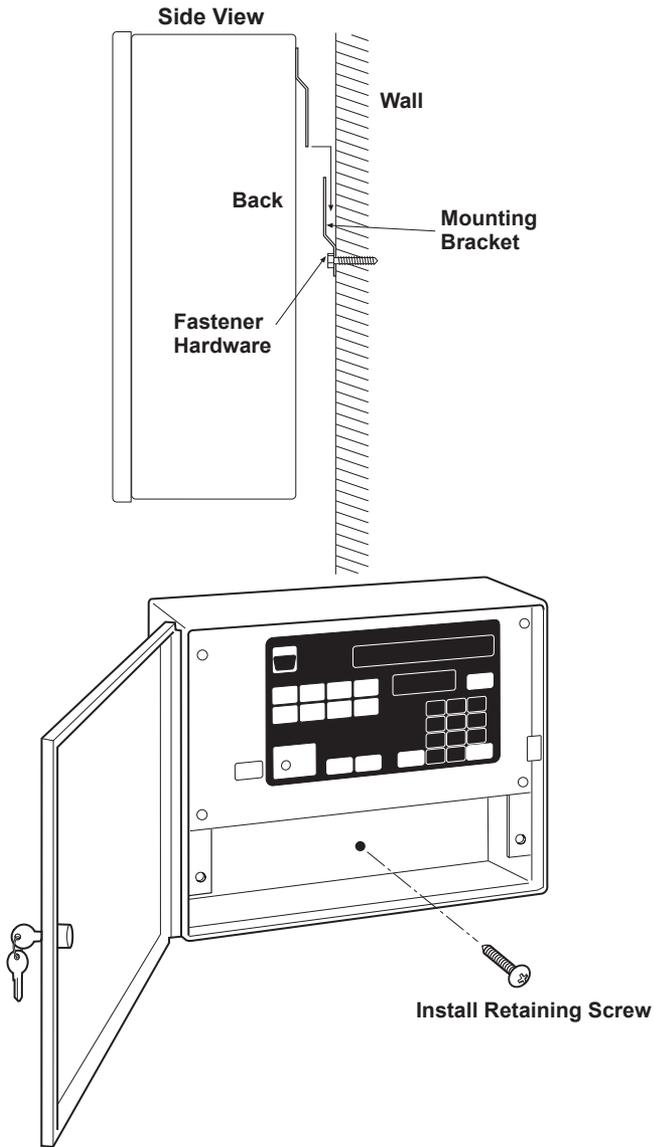
Figure 3 – Controller Mounting

3.1.1 Mounting the Controller

1. Locate a flat vertical surface, place the mounting bracket at eye level and fasten securely using the appropriate fastener hardware.

2. Mate the bracket on the back of the controller to the mounting bracket on the wall and hang the controller.

3. Secure the bottom of the controller by placing a screw through the hole, located in the center, towards the bottom of the controller cabinet.

3.1.2 Electrical Power to the Controller Connections

4. Refer to Figure 4 - Power and Grounding Connections.

5. Place Rain Switch in "No Watering" position.

6. Remove lower panel.

7. Refer to paragraph 313 Electrical Grounding of the Controller.

8. Thread the provided Conduit Body onto the transformers threaded connector.

9. Connect the supply line grounded conduit to the Conduit Body.

10. Connect the 120 VAC 50/60Hz supply line to the transformer wires within the Conduit Body.

11. Install the gasket and cover onto Conduit Body and secure with the two provided screws.

12. Be sure to follow all local electrical wiring codes.

13. Replace the lower panel and move the Rain Switch to the "Automatic Watering" position after the installation of the field valve wiring is complete.

3.1.3 Electrical Grounding of the Controller

Proper electrical grounding is required to ensure safety to you, as well as to protect the controller electronics in the event of electrical line surges, such as lightning. In areas where lightning is a common occurrence; it is strongly recommended to use the Rain Master Eagle model EG-T.

3.1.4 Grounding Instructions

1. Mount the controller as close as possible to the grounding rod, using 10 AWG grounding wire, attach one end of the wire to the controller ground lug and the other end to the ground rod. The wire should be as short as possible. Ensure the grounding wire is free of any nicks or sharp bends.

2. Use a ground rod clamp to secure the ground wire to the ground rod. Be sure all surfaces are clean of oxides and dirt, and that all connections are solid and secure.

3. In areas of very dry soil or sand, it may be necessary to "Dope" the grounding rod. Contact your local Rain Master distributor or Rain Master Irrigation Systems for a pamphlet on grounding techniques titled "RMIS Grounding".

4. It is important that the ground rod be a full 8 feet into the ground, with only enough of the rod exposed to clamp the ground wire. The 8 foot ground rod should completely penetrate the soil at a right angle. If this is not possible, it is acceptable to put the ground rod into the soil at a slight angle (slightly less than 90 degrees).

5. Should other grounding installation requirements be necessary, contact your local distributor or Rain Master Irrigation Systems.

It is important to periodically check the ground resistance to ensure it is not greater than 10 ohms. Contact your local Rain Master Distributor for details.
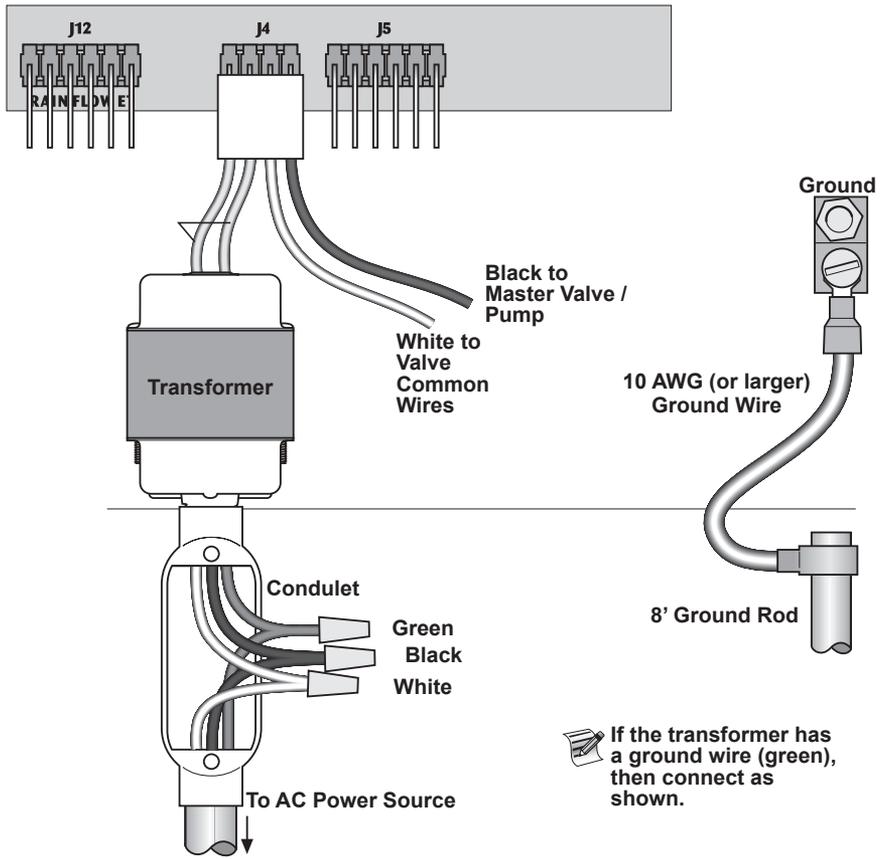
Figure 4 - Power and Grounding Connections

3.2 FIELD WIRING CONNECTIONS TO THE CONTROLLER

The controller utilizes a quick connect/disconnect style of connector. Each wiring harness is 24 inches long and color coded. To use the harness the non-connector end must be stripped back and attached to the corresponding field wire using a wire nut or soldered together, then taped off.

Rain Master Eagle EG series controllers come equipped with terminals to which the field wires are directly connected. Unused wires should be taped off to prevent shorting.

Behind the lower panel of the controller, the station numbers are labeled next to each connector. Simply match the station wire to the appropriate field wire.

⚠️ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

📝 *The controller's COMMON wire is WHITE and the MASTER VALVE/PUMP is BLACK.*

If it becomes necessary to remove the Quick Connector blocks from the printed circuit board,

hold the plastic assembly and pull down-ward gently but with firm pressure.

> *When reattaching the Quick Connector, be sure that the lip at the top of the plastic connector is facing you as you push the connector onto the pins. Additionally, be sure to match the Quick Connector blocks with the corresponding color as labeled on the bottom edge of the printed circuit board.*

3.2.1 Master Valve and Pump Wiring Options

The Rain Master Eagle provides a variety of control options when selecting a Master Valve and Pump.

Because the Master Valve and Pump can be assigned to any program, and the Master Valve can be either a Normally Open or a Normally Closed valve configuration, virtually any system configuration can be accommodated.

For example, drip irrigation programs, which don't use a pump, may be setup in one or more of the available programs. Irrigation systems which use large rotors may be programmed to use a pump.

The following table summarizes the configuration options, which are available. The installation diagrams required to achieve these options are described in greater detail in the following paragraphs and the corresponding SETUP function. For detailed information on SETUP functions, please refer to 6.0 SETUP KEY OPERATIONS.

Table 2 - Master Valve and Pump Wiring Options

Option	Normally Closed Master Valve	Normally Open Master Valve	Pump Used	Reference Wiring Figure	SETUP Master Valve Usage per Program	SETUP Master Valve Type	SETUP Pump Usage per Program
1*	CH	-	Never	3	1, 2, 3, 4	NC	None
2*	CH	-	Always	6 or 7	1, 2, 3, 4	NC	None
3	CH	-	Sometime	8	1, 2, 3, 4	NC	As needed
4	-	CH	Never	5	1, 2, 3, 4	NO	None
5	-	CH	Always	9	1, 2, 3, 4	NO	1, 2, 3, 4
6	-	CH	Sometime	9	1, 2, 3, 4	NO	As needed

* No SETUP programming required (factory default settings).

> *Option 2 shows that a pump is used in the program, the SETUP programming indicates that the PUMP should not be programmed. This preserves Station 1 as a station output.*

> ⚠️ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorte*d.

3.2.1.1 Electrical Connections for a Master Valve

The Rain Master Eagle allows you to select the type of Master Valve (MV), either a Normally Open or Normally Closed configuration.

When the Master Valve is a Normally Closed configuration, the Master Valve line on connector J4 is supplying 24 VAC power. The power is available to this connection whenever any station in the controller is on.

For Normally Open Master Valves, the controller supplies 24 VAC only when there is a Main Line Fault or Unscheduled Flow Fault detected.

⚠️ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

3.2.1.2 Normally Closed Master Valve Operation

If you have a Master Valve, which requires power to open the valve, but uses no pump, then connect the Master Valve solenoid to the MV pin and the common wire to the white wire of J4, as depicted in Figure 5 - Master Valve Electrical Connection.

If more than one controller will control the Master Valve, then the controllers must be isolated from one another. Contact your local distributor or Rain Master Irrigation Systems for the pamphlet on how to install multiple controllers (RMIS Technical Bulletin 018). Using the SETUP function, select the NC (Normally Closed) Valve type for all programs (1, 2, 3, and 4).

Figure 5 - Master Valve Electrical Connection

⚠️ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

3.2.1.2.1 Simultaneous Use - Normally Closed Master Valve and Pump

If you have a Master Valve which requires activation to open, and a Pump which is always needed when irrigating, connect BOTH the Master Valve solenoid and Pump starter to the MV and Master Valve common terminals as shown in Figure 6 – Master Valve and Pump Electrical Connections.

If the Pump starter operates on 24 volts AC and the combination of the Master Valve Solenoid and Pump starter require more than 1 ampere of current, you will need an isolation relay and an additional source of 24 volts AC, as depicted in Figure 7 – Master Valve and Pump Electrical Connections with Isolation Relay. During configuration SETUP, select the Normally Closed Valve type for all programs which require the Master Valve and Pump DO NOT select pump operation.

If the Pump starter requires 120 VAC power, you will also need to use an isolation relay (RMIS part # RLY1). Contact your local distributor or Rain Master Irrigation Systems for installation assistance of this configuration.

If more than one Rain Master Eagle controller will control the Master Valve and Pump, the controllers must be isolated from one another. Contact your local distributor or Rain Master Irrigation Systems for a pamphlet on multiple controller installations (RMIS Technical Bulletin 018).
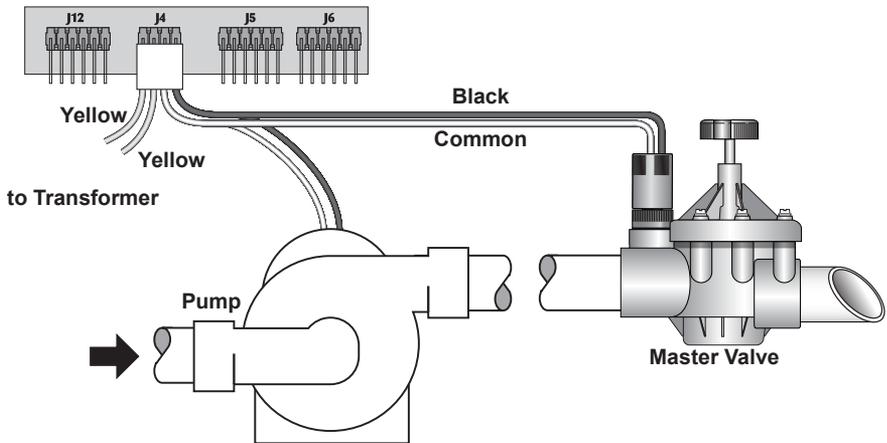
Figure 6 – Master Valve and Pump Electrical Connections
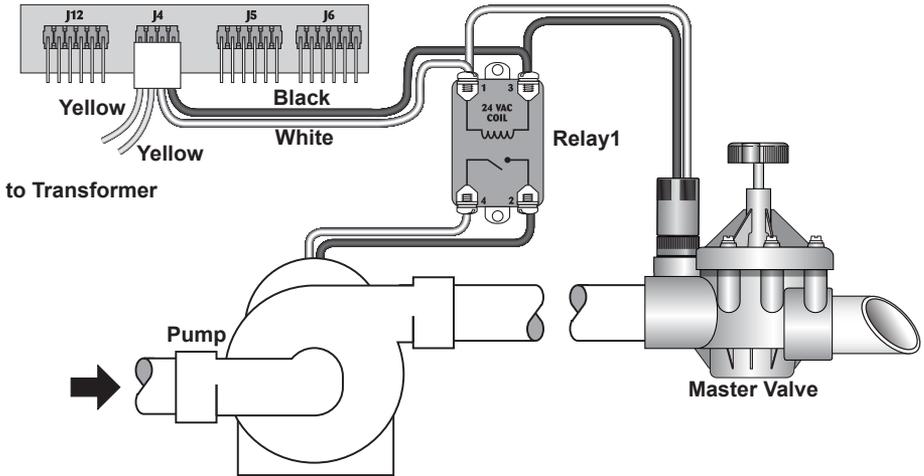
Figure 7 – Master Valve and Pump Electrical Connections with Isolation Relay

⚠ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

3.2.1.2.2 Independent Use - Normally Closed Master Valve and Pump

If you use a Master Valve which requires activation to open, and a pump which is periodically needed for irrigation, connect the Master Valve Solenoid to the MV and the Master Valve Common terminals and the Pump starter wire to the Station 1 terminals.

If the Pump starter DOES NOT operate on 24 VAC or the combination of the Master Valve Solenoid and Pump starter running together uses more than 1 Ampere of current, you will need an isolation relay (RMIS part # RLY1 or equivalent) as depicted in Figure 8 - Independent Control of Master Valve and Pump using Isolation Relay. During configuration SETUP, select the Normally Closed (NC) Valve type for all programs which require the Master Valve and select Pump operation for all programs which require the pump.

If more than one Rain Master Eagle controller will control the Master Valve and Pump, the controllers must be isolated from one another. Contact your local distributor or Rain Master Irrigation Systems for a pamphlet on multiple controller installations (RMIS Technical Bulletin 018).
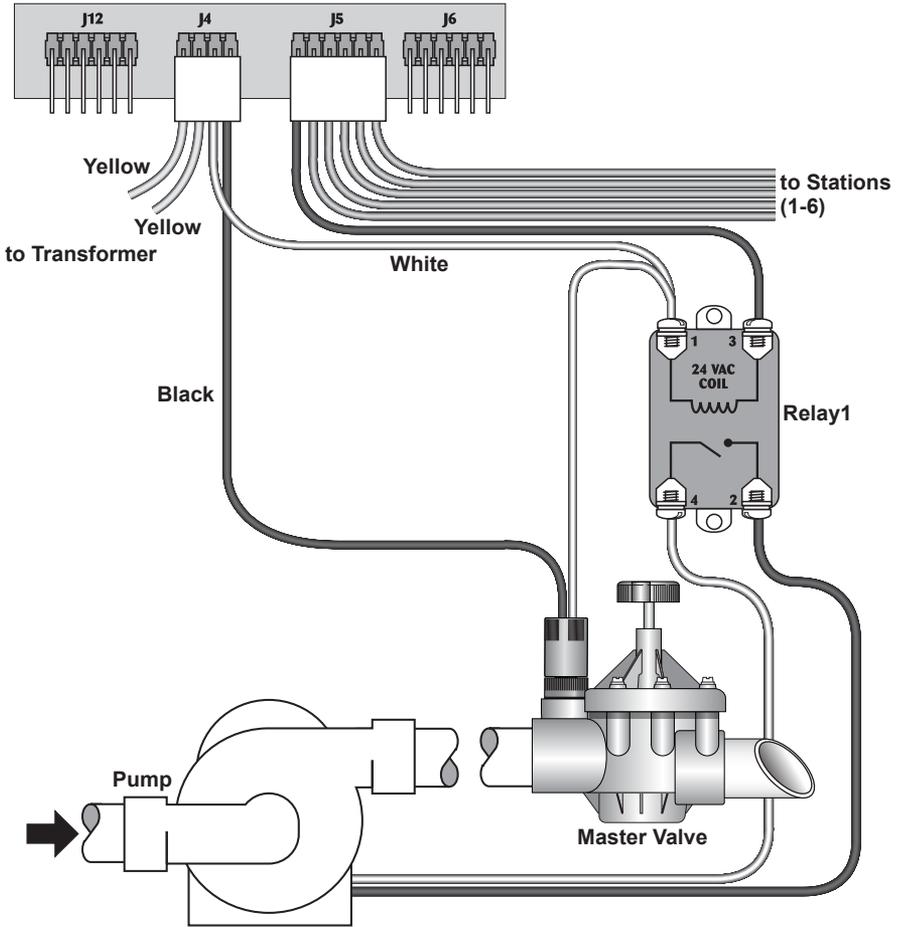
Figure 8 - Independent Control of Master Valve and Pump using Isolation Relay

ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.

3.2.1.3 Normally Open Master Valve

If you use a Master Valve that is Normally Open until energized, connect the Master Valve solenoid to the MV and Master Valve Common terminals as depicted in Figure 5 - Master Valve Electrical Connection.

During configuration SETUP, select valve type Normally Open (NO). The Master Valve will only activate when the controller detects a Main Line Break fault or an Unscheduled Flow condition. In this case, a fault condition will exist until manually cleared by the operator.
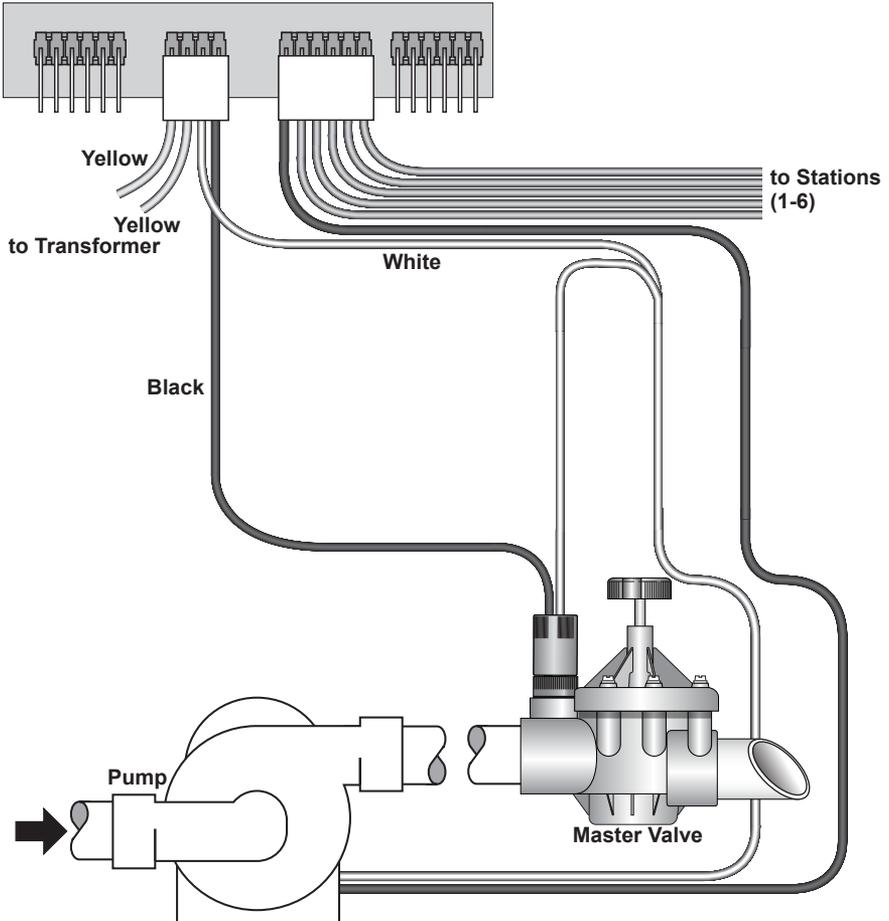
Figure 9 - Normally Open Master Valve and Pump

⚠ *ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

3.2.1.3.1 Simultaneous Use - Normally Open Master Valve and Pump

If you have a Master Valve which is Normally Open until energized and you utilize a pump, connect the solenoid to the MV and Master Valve Common terminals and the Pump to Station 1 as depicted in Figure 9 - Normally Open Master Valve and Pump.

During configuration SETUP, select valve type Normally Open (NO). The Master Valve will only be activated when the controller detects a Main Line Break fault or an Unscheduled Flow condition.

In this case, a fault condition will exist until manually cleared by the operator During SETUP, assign which programs (1-4) will utilize the pump during irrigation.

⚠️ **ALWAYS TURN-OFF POWER** *before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

3.2.2 Flow Sensor Installation

Install the Flow Sensor in the Main Line as depicted in Figure 10 - Flow Sensor Electrical Connections, making sure that there are at least 10 pipe diameters upstream and 5 pipe diameters downstream of the sensor from any valve, reducer, elbow, or other obstruction or device which may cause turbulence in the water flow. As an example if the pipe is 2 inches in diameter, then 10 pipe diameters would be 20 inches before the sensor and 5 pipe diameters would be 10 inches after the sensor.

Observe the proper direction of flow according to the flow indicator (arrow) on the sensor body.

Install a valve box around the sensor and make the electrical connections inside the box. Use waterproof wire nuts for all splices.

The use of Rain Master EV-CAB-SEN or other shielded cable is required to ensure proper operation. Polarity must be observed when connecting the sensor to the controller.
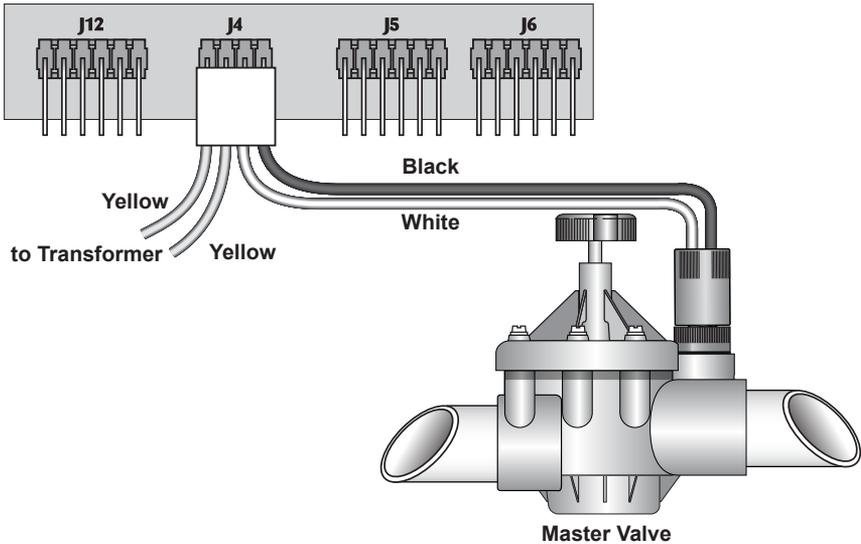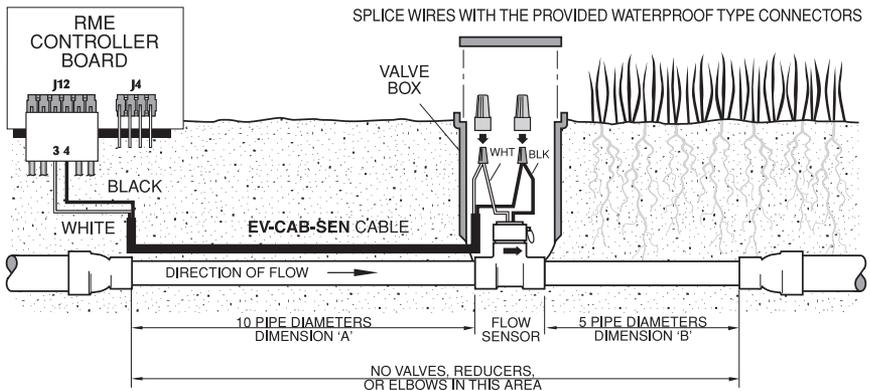

Figure 10 - Flow Sensor Electrical Connections

⚠️ **ALWAYS TURN-OFF POWER** *before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.*

EXAMPLE: FOR 3" FLOW SENSOR, DIMENSION 'A' MINIMUM 30" DIMENSION 'B' MINIMUM 15"

After completing the physical installation of the flow sensor, make the necessary wiring connection from the flow sensor to the Rain Master Eagle controller as follows:

1. TURN THE POWER OFF AT THE CONTROLLER.

2. At the Flow Sensor:

- Connect the BLACK wire of the Flow Sensor to the BLACK wire of the "EVCAB-SEN" sensor cable.

- Connect the WHITE wire of the Flow Sensor to the WHITE wire of the "EV-CABSEN" sensor cable.

📝 *Use the weatherproof wire nut connectors provided with the Flow Sensor to make the splice.*

3. At the Rain Master Eagle controller:

- Connect the BLACK wire of "EV-CAB-SEN" cable to Pin 4 (FLOW-) of the Rain Master Eagle Controller.

- Connect WHITE wire of "EV-CAB-SEN" to Pin 3 (FLOW+) of the Rain Master Eagle Controller.

4. Turn POWER ON at the Controller.

5. Using the SETUP key, enable the Flow Sensor and select the pipe size for the Flow Sensor installed.

3.2.3 Sensor Wiring

The Rain Master Eagle controller supports most modern 2-wire Rain or Moisture sensor configurations.

The 2 wire sensors are connected to pins 1 and 2 on the sensor connector, as depicted in Figure 11 – Sensor Interface Electrical Connections.
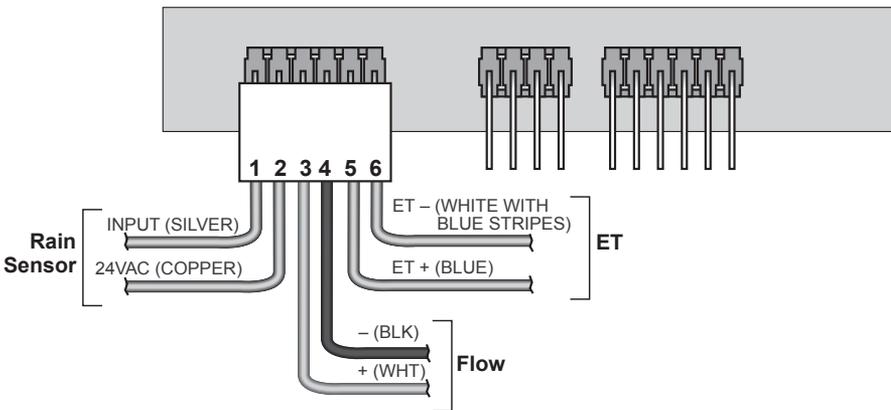
Figure 11 – Sensor Interface Electrical Connections

Table 3 - Sensor Connections

Sensor Name	Connector Number (J-12)	Color Code
Rain input	1	Silver
Rain 24 VAC	2	Copper
Flow +	3	White
Flow -	4	Black
ET +	5	Blue
ET -	6	White w/ blue stripe

ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.

3.2.4 Valve Wiring

Table 4 - Valve Color Code

Valve Number	Connector Number	Color Code
1 - 6	J-5	Red
7 - 12	J-6	Orange
13 - 18	J-7	Yellow
19 - 24	J-8	Green
25 - 30	J-9	Blue
31 - 36	J-10	Violet

3.2.4.1 Locating Valves in the Field

Do not turn on a controller station and then tap a wire to the station terminal to see what valve the field wire is connected to.

This procedure may damage solid state controllers and will cause the controller to go into a field-wire fault detection mode. The simple method shown below is safe and will work for this type of controller.

ALWAYS TURN-OFF POWER before changing or modifying field, sensor or power wiring within the controller. Dangerous voltage and current exist within the controller which may damage the controller if improperly connected or shorted.

1. Using the MANUAL key, select S (for Stations) to turn on Station 1, select a runtime of one (1) hour.
2. Place the Rain Switch to the "No Watering" position.
3. Touch the wire from the unknown field valve to the controller's Station 1 terminal/wire.
4. Place the Rain Switch to the "Automatic Watering" position and the valve on that wire will be activated.
5. When you know what valve it is, place the Rain Switch to the "No Watering" position prior to removing the field wire from the controller's station terminal/wire.
6. Repeat the procedure for the next field wire starting at Step 2 above.
7. When all checks are complete, turn Station 1 off, by pressing the CLEAR key, then pressing the QUIT key.

3.3 GETTING STARTED – POWERING-UP THE CONTROLLER

When the Rain Master Eagle controller is first powered up the controller will display "HELLO".

```
HELLO
```

When the HELLO prompt is displayed there are NO user programs in the Rain Master Eagle controller.

If the controller is left in the HELLO mode the controller will automatically start to water every station within its configuration for ten (10) minutes (default watering program).

This process will start automatically after the controller has been in the HELLO mode for six (6) hours. Once the watering cycle starts each station will be on for ten (10) minutes. The cycle will repeat every twenty-four (24) hours.

If you press any key on the Rain Master Eagle controller keyboard, the controller will exit the HELLO mode and remove the default watering program.

The Rain Master Eagle controller comes from Rain Master with certain parameters already configured, these default parameters are noted in Table 6 - Setup Options and Controller Defaults.

Before the Rain Master Eagle controller can be used to control the irrigation system, some basic operator entries must be made. The Date and the Time-of -Day must be entered prior to running a manual station, the System Check/Syringe Cycle, or configuring any irrigation programs.

The following example will demonstrate how to enter the Date and the Time-of-Day.

3.3.1 Set Time and Date

To set the date and the current time-of-day into your controller, use the following procedure:

EXAMPLE 1: The time is 2:00 PM, Saturday, June 16, 2001

Press: [SETUP] [2 MON] [0] [0] [AM / PM] [ENTER]

[0] [6 FRI] [1 SUN] [6 FRI] [0] [1 SUN]

[ENTER] [QUIT]

The controller will return to the Automatic Mode.

EXAMPLE 2: The time is 10:35 AM, Tuesday, December 12, 2002

Press: [SETUP] [1 SUN] [0] [3 TUE] [5 THU] [ENTER]

[1 SUN] [2 MON] [1 SUN] [2 MON] [0] [2 MON]

[ENTER] [QUIT]
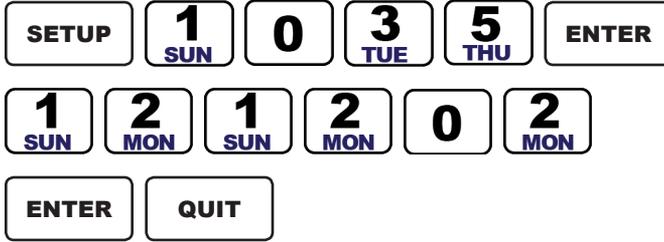
The controller will return to the Automatic Mode.

The Rain Master Eagle controller is now ready for operational use. Refer to the various sections of your User Manual to configure programs and set the various parameters of your new controller.

3.4 AC POWER FAILURES

In the event of an AC power failure, all irrigation stations are turned off and the display goes blank.

The Rain Master Eagle controller is equipped with non-volatile RAM (NVRAM) in order to protect user entered programs as well as important setup information during power loss. This data will be retained for an indefinite period of time regardless of the length of the power outage. Additionally, your Rain Master Eagle is also able to maintain the time and date for a period of up to 30 days (continuous) without the use of a battery. If the power is off for longer than 30 days, the user will be notified by a flashing time display, when power is reapplied. The correct time can then be reentered using the SETUP function. Regardless of the number of power failures, the date and time will be maintained for up to 30 days.

In the event that a program is executing or a scheduled start time is missed when a power failure occurs, the controller will intelligently resume execution where it would have been if the outage had not occurred. The Rain Master Eagle will complete its program execution preserving the original water window.

3.5 CONNECTION WITH A REMOTE CONTROL DEVICE

All Rain Master Controllers feature a patented built-in remote control capability which allows you to operate the controller from a distance of up to one (1) mile via a hand held transmitter. Refer to the Rain Master Remote Manual for installation procedures and additional operating instructions.

Never connect any device other than an approved Rain Master remote control receiver to the controller's front panel connector, as damage may result. Connecting a non-Rain Master remote control device to the Rain Master Eagle controller will void the equipment warranty and may cause damage.

Rainmaster Remote Control connector

Days / Station Number Display (LEDs)

Message and Prompt Display

Rain Switch

Function and Setup Keys

Data Entry Keys

Execution Keys
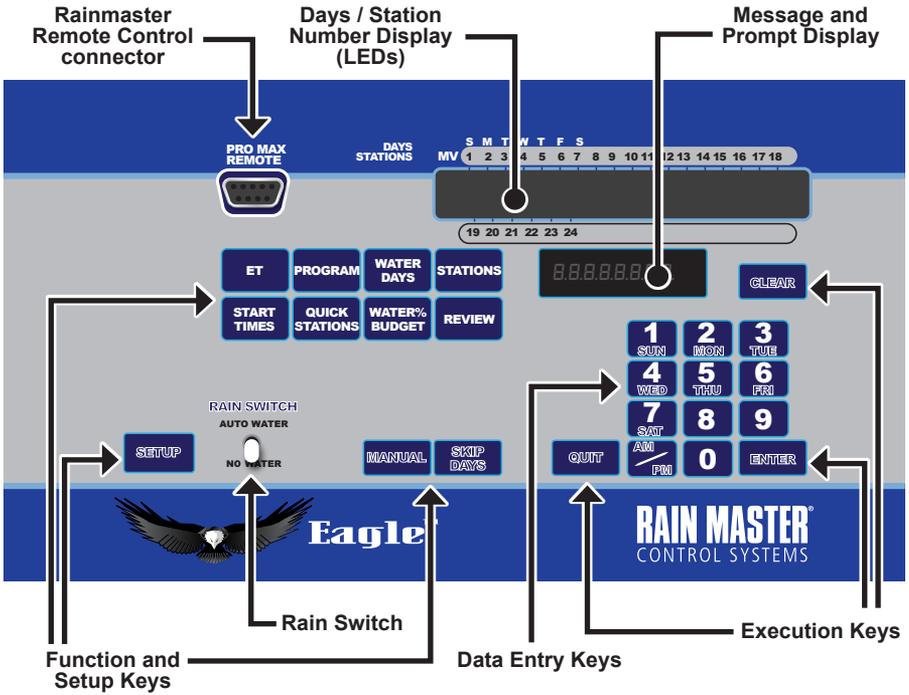
Figure 12 - Rain Master Eagle Keyboard Configuration

4.0 Operation
4.1 CONTROLLER OPERATIONAL MODES

4.1.1 Automatic Mode

The controller is in the Automatic Mode when the display is alternating between the time-of-day and the date. The time-of-day is displayed for 10 seconds, then the date is displayed for 10 seconds and the cycle will continue to repeat.

| 9:30 PM | Then | 02/ 15/0 1 |

Pressing **QUIT** will always return the controller to the automatic mode.

When a program is watering in the Automatic Mode, the station and program number will be displayed as a convenience. If the controller has been setup to enable flow sensing, the measured flow (GPM) will alternately appear in the display at a 3 second rate.

| 2   04:30 | | 1 14 GPM |
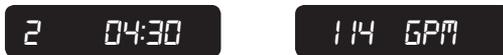
An * in place of the program number indicates a program is running but all stations are off because the rain sensor is enabled and a wet condition exists.

| *   04:30 |

A ▦ in place of the program number indicates a program is running but all stations are off because the ODD/EVEN Watering schedule is in affect.

| ▦   04:30 |

To advance to the next station in a program, when a program is already watering,

Press: **MANUAL**

To stop and cancel a program that is watering,

Press: **QUIT**   **ENTER**

The controller will return to the Automatic Mode.

4.1.2 Rain Modes

4.1.2.1 Manually Activated Rain Mode

The controller has a Rain Switch. The switch MUST BE in the "Auto Watering" position anytime watering is required. In the "Auto Watering" position, watering will occur if the controller is programmed to do so.

The switch should be placed in the "No Watering" position when no watering is desired, such as when it is raining or in strong wind conditions. In the "No Watering" position, no watering will occur and RAIN OFF will appear in the display to indicate that all programs are inhibited from watering. The stored user's program will not be affected.

```
RAIN OFF
```

4.1.2.2 Programmable Rain Mode

The Programmable Rain Mode is used in place of the Rain Switch when you know how many days you want the controller to stay off. It allows you to select the number of days, from 1-7, that the controller will stay in the Rain Mode after which it will automatically return to the Automatic Mode.

EXAMPLE: Program the controller to stay off for 6 days.

Press: | CLEAR | | 6 | | ENTER |

Display will indicate: ```RAIN 6```

Each day at midnight the controller will count down by one day until it reaches zero and returns to the Automatic Mode.

EXAMPLE: To clear the programmable Rain Mode,

Press: | QUIT |

The controller will return to the Automatic Mode.

No watering will occur when the controller returns to the Automatic Mode if you have also placed the Rain Switch in the "NO WATERING" position.

4.1.3 Programmable Operations Mode

In the Programmable Operations Mode the controller is running the user entered irrigation programs. The controller will display the irrigation program number in the PROMPT/MESSAGE display and the current station will be displayed in the STATIONS/DAYS display.

The lapsed time of the station will be displayed and continue to be displayed until the count-down eaches zero, the station will turn off and the next station will start.

If flow sensing is enabled, the display will alternately display the flow rate for 3 seconds and then the station's lapsed time will be displayed for 3 seconds and the cycle will repeat.

```
 2  1:44:30              114 GPM
```

4.1.4 Programming Mode

In the Programming Mode the controller is awaiting programming parameters to be provided. The controller is in this mode during program, configuration, and setup data entry.

The Rain Master Eagle keyboard is organized into three major key categories, as depicted in Figure 12 - Rain Master Eagle Keyboard Configuration. Each keyboard groups assists you in programming, controlling, and reviewing the various functions of the Rain Master Eagle controller.

4.2 KEYBOARD OPERATIONS

4.2.1 Function and Setup Keys

The Function and Setup key category is used to configure and program the controller. The operator can enable and disable operational modes and enter, modify, and review the four irrigation programs of the controller. The following paragraphs describe the operation of each key

| ET | PROGRAM | WATER DAYS | STATIONS |
| START TIMES | QUICK STATIONS | WATER % BUDGET | REVIEW |

| SETUP | | MANUAL | SKIP DAYS |
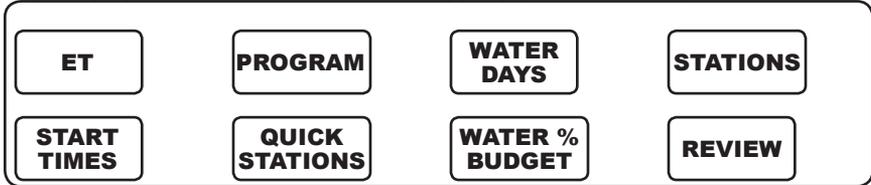
4.2.2 Data Entry Keys

The DATA ENTRY KEYS are used to support the selection of the various parameters used and needed by the FUNCTION AND SETUP KEYS. The parameters would include entering the timeof- day, the date, station numbers, start times, program number and various other values.

DATA ENTRY KEY number one (1) is used as a toggle key for a number of ON/OFF parameters, Valve Types, Pipe Size rotation, and Enable/Disable functions.

1 SUN	2 MON	3 TUE
4 WED	5 THU	6 FRI
7 SAT	8	9
AM / PM	0	
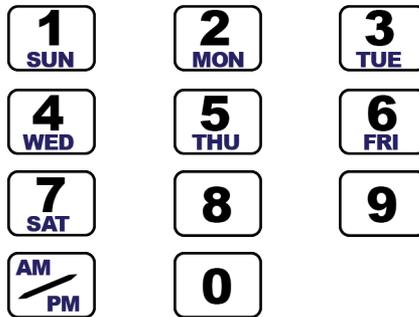
All Data Entry actions are completed only after you press the ENTER key. The controller will process the data, check the data validity and then accepted or rejected the data. If the data is acceptable the controller will display "OK", if the data is unacceptable the controller will display "NO" and you will be required to re-enter the correct data value.

4.2.3 Command Execution Keys

The Command Execution Keys are used to complete the entry of data values, terminate data entry and to clear unwanted parameters.

| CLEAR | QUIT | ENTER |

5.0 FUNCTION AND EXECUTION KEY OPERATIONS

The Rain Master Eagle controller is capable of running conventional irrigation programs, as well as sophisticated Evapotranspiration (ET) based irrigation programs. The Rain Master Eagle controller utilizes inputs provided by weather sensors; Internet provided adjustment factors, and Historical trend data that were derived from years of weather data collection and analysis.

In this section of the manual we will explore the use of the Rain Master Eagle in the roll of a conventional irrigation controller. Conventional irrigation is programs that have been entered by you. They do not change or adjust automatically due to changes in the weather conditions. The Rain Master Eagle controller will store and execute these entered programs without fail for as long as you may wish.

In Chapter 60 - SETUP Key Operations of the manual we will expand the knowledge and experience gained here to utilize additional features of the Rain Master Eagle Controller, including the use of water measurement sensors and irrigation control methods.

In Chapter 70 - ET Key Operations and Chapter 80 - ET Programming of this manual we will explore the features of Evapotranspiration program control. Your Rain Master Eagle Controller is capable of interfacing to weather sensors and will automatically adjust watering cycles due to hot and windy days and changes in the seasons (from Summer to Fall to Winter). Theses Chapters will cover water conservation methods using the state-of-the-art technology of your Rain Master Eagle Controller.

5.1 PROGRAM FUNCTION KEY

PROGRAM

Usage: The PROGRAM key is used to select the program you want to enter, modify or review. Once selected, you need not change the Program Number until you want to enter or review information in a different program. The Rain Master Eagle Controller has four (4) programs available for your use. They are referred to as 1, 2, 3, and 4.

You may clear all information in a program using this function. To select a program press the PROGRAM key; press keys 1 – 4 for the program number, then press ENTER to complete the selection.

While programming other functions of the controller, the selected program number is displayed as a convenience.

EXAMPLE: Select Program Number 2.

Press: PROGRAM   2 MON   ENTER

The controller will return to the Automatic Mode.

5.1.1 PROGRAM Clear

Select a program and clear all information.

EXAMPLE: Select Program Number One and clear all information.

Press: **PROGRAM**   **1 SUN**   **CLEAR**

The controller will return to the Automatic Mode.

5.2 WATER DAYS FUNCTION KEY

WATER DAYS

Usage: This key is used to select the water days to be used in each irrigation program. The Water Days function is based on a seven-day cycle. Each day selected (Sunday – Saturday) is displayed in the DAYS/STATION NUMBER DISPLAY. Press the WATER DAYS key; press keys 1 – 7 to select the water day desired, and then press ENTER to complete the action.

If you wish to terminate the Water Days entry at any point, press the QUIT key to return to the Automatic Mode.

EXAMPLE: Set the Controller to water every day.
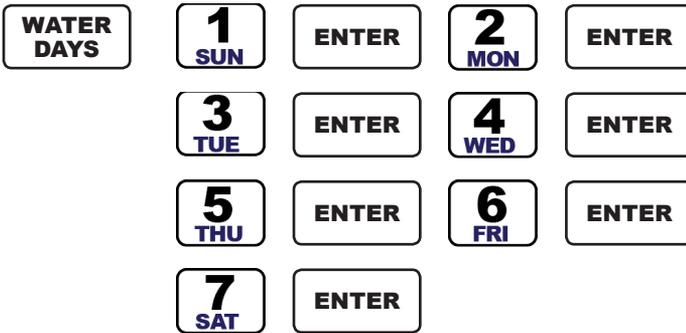
Press:

WATER DAYS   **1 SUN**   **ENTER**   **2 MON**   **ENTER**

3 TUE   **ENTER**   **4 WED**   **ENTER**

5 THU   **ENTER**   **6 FRI**   **ENTER**

7 SAT   **ENTER**

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered. The display will indicate Sunday – Saturday has been selected (S – S).

EXAMPLE: Set the Controller to water Monday, Wednesday and Friday.

Press:

WATER DAYS   **2 MON**   **ENTER**   **4 WED**   **ENTER**

6 FRI   **ENTER**

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered. The display will indicate Monday, Wednesday and Friday have been selected (M, W, and F).

EXAMPLE: Remove Monday as a Water Day and add Tuesday.

Press:

WATER DAYS	**2** MON	CLEAR	**3** TUE	ENTER

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered and removed.

EXAMPLE: Review the Water Days for Program 1.

Press:

PROGRAM	**1** SUN	ENTER	WATER DAYS

The Watering Days will be indicated in the STATIONS/DAYS display.

Press: QUIT

The Controller returns to the Automatic Mode.

5.3 STATIONS FUNCTION KEY

STATIONS

Usage: This key is used to select the stations and the associated runtimes to be used in each irrigation program. The Stations function is based on the configuration of the controller, the Rain Master Eagle controller can be purchased as an 8, 12, 16, 24, 30, or 36 station configurations.

Each station selected (1 – 36) is displayed in the DAYS/STATIONS display.

Press the STATIONS key; use the DATA ENTRY KEYS to select the station number desired, press ENTER to accept the station. The display will then prompt for the station runtime length; using the DATA ENTRY KEYS, enter a value between 0 and 9:59 (0 to 9 hours 59 minutes), and then press ENTER to complete the action.

If you wish to terminate the station entry at any point, press the QUIT key to return to the Automatic Mode.

5.3.1 Stations and Watering Length

Stations (or valves) may be programmed into more than one program at a time. Within each program, each station can have a different runtime. Individual programs can be configured to be a conventional irrigation program or a Cycle and Soak program, this is accomplished using the SETUP function. Depending upon the configuration selected, the Rain Master Eagle will prompt you for the appropriate information whenever the STATION key is pressed.

5.3.1.1 Conventional Station Programming

Conventional Station Programming is used to select the stations and set the runtime, on a per program basis. After selecting the STATIONS function, the controller will briefly display the Global Percentage Value and then prompt you for the Station Number. Enter the Station Number using the Data Entry keys and then press ENTER. The controller will then prompt for the length of the watering (runtime) cycle. Selected stations are shown in the DAYS/STATIONS display. As a convenience, the Program Number is shown in the PROMPT/MESSAGE display, during station entry.

EXAMPLE: Program Station 1 for 10 minutes, Station 2 for 10 minutes, Station 6 for 1 hour and 15 minutes, and Station 7 for 8 minutes. Press:

STATIONS	1 SUN	ENTER	1 SUN	0	ENTER
2 MON	ENTER	1 SUN	0	ENTER	
6 FRI	ENTER	1 SUN	1 SUN	5 THU	ENTER
7 SAT	ENTER	8	ENTER		
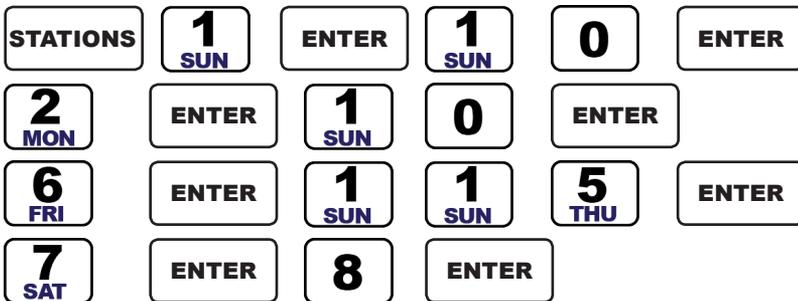
Press: **QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: To clear Station 7 and it's associated runtime,

Press: **STATIONS**   **7** SAT   **QUIT**

Press: **QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: To review the selected Station information,

Press: **STATIONS**   **An LED will illuminate on the STATIONS/DAYS display for every station with a valid runtime.**

Press: **QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: To review the runtime Station Number 6,

Press: **STATIONS**   **6** FRI   **ENTER**   **The Station runtime is displayed.**

Press: **ENTER**   **Press Enter to leave the current value and continue the review process.**

Press: **QUIT**

The controller will return to the Automatic Mode.

5.3.1.2 Cycle and Soak Programming

A Cycle and Soak program can be used to eliminate water runoff. Runoff occurs whenever the precipitation rate of the irrigation system exceeds the percolation rate of the soil. The Cycle and Soak feature allows each individual station to be programmed to eliminate the wasteful effect of water runoff, thereby maximizing water savings. In a conventional program each station in the program will water for the full runtime and then the next station will run, this will repeat for the entire program.

> *To configure a program for Cycle and Soak operations, refer to the SETUP section on Cycle and Soak programming.*

In a Cycle and Soak program, in addition to the runtime, there are two additional times associated with each station; the maximum watering time and the soak time. The maximum watering time is the maximum time that the station will be on before runoff starts to occur.

The soak time is the amount of time that the station must be off before it starts watering again. The soak time allows the water to percolate into the root zone of the plant material.

In a Cycle and Soak program the Rain Master Eagle Controller calculates a profile to run the stations that minimizes the total watering time for the program and intelligently schedules stations to run while other stations are satisfying their soak times. At the end of the profile each station will have run for its full runtime but the runtime may not be contiguous. Based on the calculated profile, there may be times that no stations will be on.

Table 5 - Cycle and Soak Parameters

Cycle and Soak Station Parameters			
Parameter	**Minimum**	**Maximum**	**Increment**
Runtime	1 minute	9 hours 59 minutes	1 minute
Maximum Watering Time	1 minute	4 hours	1 minute
Soak Time	1 minute	4 hours	1 minute

5.3.1.3 Cycle and Soak Station Programming

Cycle and Soak Station Programming is used to select the stations, set the runtime, set the maximum watering time, and set the soak time for each station. After selecting the STATIONS function, the controller will briefly display the Global Percentage Value. The controller will first prompt for station number, then the runtime value, followed by the maximum watering time, and finally the soak time. The Global Percentage Value only applies to the runtime and not to the maximum watering time or soak time. Selected stations are shown in the STATIONS/DAYS display. As a convenience, the Program Number is shown in the PROMPT/MESSAGE display, during station entry.

Before you use the Cycle and Soak feature in a program, you must configure the program, using the SETUP key. The entire program is then configured to use Cycle and Soak.

If a pump is assigned to any program, using the SETUP key, then station 1 cannot be selected as a station, it is reserved for the pump.

EXAMPLE: Program Station 1 for a runtime of 1 hour and 5 minutes, a maximum time of 35 minutes and a soak time of 45 minutes. Set Station 6 for a runtime of 2 hours, a maximum time of 1 hour and a soak time of 20 minutes.

Press: **QUIT**

The controller will return to the Automatic Mode.

If the same station appears in multiple Cycle and Soak programs, only one value for the maximum time is allowed across programs. The same holds true for soak times.

EXAMPLE: To clear Station Number 7 and its associated runtime,

Press: | **STATIONS** | | **7** SAT | | **CLEAR** |

Press: | **QUIT** |

The controller will return to the Automatic Mode.

EXAMPLE: To review selected Stations information,

Press: | **STATIONS** |

Press: | **QUIT** |

The controller will return to the Automatic Mode.

EXAMPLE: To review the runtime, maximum time and soak time of Station Number 7,

Press: | **STATIONS** | | **7** SAT | | **ENTER** | (The "RUN TIME" is displayed.)

Press: | **ENTER** | (Leave "RUN TIME unchanged, display "MAX TIME".)

Press: | **ENTER** | (Leave "MAX TIME unchanged, display "SOAK TIME".)

Press: | **QUIT** |

The controller will return to the Automatic Mode.

5.4 START TIMES FUNCTION KEY

CLEAR

Usage: This key is used to select and set each of the five start times available in each irrigation program. The Rain Master Eagle controller can have as many as twenty start times a day, if all irrigation programs are used. The Start Times function is based on a 12-hour cycle, using the AM/PM key, allows the controller to start at any time, day or night.

Press the START TIMES key; the controller will display and prompt for the first Start Time, using the DATA ENTRY KEYS enter a time (0 – 1200 AM/PM), then press ENTER to complete the action. The controller will advance to the second start time and continue through all five start times using this same display and prompt method. At the completion of the fifth start time entry, the controller will return to Automatic Mode.

If you wish to terminate the Start Times entry at any point, press the QUIT key to return to the Automatic Mode.

5.4.1 Start Times and Automatic Program Overlap Protection

There are five start times available for each of the four programs. They are referred to as Start Time 1 through Start Time 5.

The controller can be configured, using SETUP, to allow programs to run sequentially (Stack Mode) or run concurrently (No Stack Mode), if start times overlap with one another. Using Stack mode the controller ensures that only one program (eg one station) is on at a time regardless of conflicting start times. The next program(s) will wait for completion of the currently executing program before it will start the execution of the next program. The following examples describe STACK operations.

EXAMPLE: Program 1 is one hour in duration, based on the stations and watering times selected.

Three start times are set, all at 7:00 AM. The controller will water three times, first from 7:00AM to 8:00AM, second from 8:00AM to 9:00AM and finally from 9:00AM to 10:00AM

EXAMPLE: Program 1 is one hour in duration, with a start time of 7:00 AM Monday. Program 3 has a start time of 7:30 AM on Monday and 7:30 AM on Tuesday. On Monday, Program 1 would run starting at 7:00 AM and Program 3 would run at the completion of Program 1 or 8:00 AM. However, on Tuesday, Program 3 would start at 7:30 AM

The Stack operation ensures that you will always get the number of watering cycles you have programmed and the system will never be under-pressurized because two programs are running simultaneously.

✎ *The controller is shipped with Stack mode on. The controller may be programmed so that multiple programs can be run simultaneously (No Stack mode). See SETUP for details.*

EXAMPLE: Program watering to start at 7:10 AM and 4:30 PM,

Press: [START TIMES] [7 SAT] [1 SUN] [0] [ENTER]

(The controller will automatically rotate to Start Time 2.)

[4 WED] [3 TUE] [0] [AM/PM] [ENTER]

(The controller will automatically rotate to Start Time 3.)

Press: [QUIT]

The controller will return to the Automatic Mode.

EXAMPLE: To review the Start Times,

Press: [**START TIMES**]   (Start Time 1 is displayed.)

EXAMPLE: To review Start Time 2,

Press: [**ENTER**]

Press: [**QUIT**]

The controller will return to the Automatic Mode.

EXAMPLE: To clear a start time, such as Start Time 2,

Press: [**START TIMES**]   (Start Time 1 is displayed.)

To rotate to the second start time

Press: [**ENTER**]   (Start Time 2 is displayed.)

EXAMPLE: To clear Start Time 2,

Press: [**CLEAR**] [**QUIT**]

The controller will return to the Automatic Mode.

5.5 QUICK STATIONS FUNCTION KEY

Usage: This key is used to program a block of stations, all with the same runtime. Use the PROGRAM key to select the irrigation program to be used, then press the QUICK STATIONS key; the display will prompt for the lowest station (LO) number of the block, using the DATA ENTRY KEYS enter a value between 1 – 36 (based on station configuration of the controller), then press ENTER.

The display will prompt for the highest station (HI) number of the block, using the DATA ENTRY KEYS enter a value between 1 – 36 (based on station configuration of the controller), then press ENTER.

The display will prompt for the runtime length (LN) of all selected stations, using the DATA ENTRY KEYS, enter a value between 0 – 9:59 (0 to 9 hours 59 minutes), then press ENTER to complete the action. The controller returns to the Automatic Mode.

If you wish to terminate the Quick Stations programming entry at any point, press the QUIT key to return to the Automatic Mode.

5.5.1 Conventional Quick Station Programming

This feature is used to rapidly program a block of stations, which will all have the same runtime

After selecting the QUICK STATIONS function, the controller will briefly display the Global Percentage Value, the controller will first prompt for the lowest station number, then the highest station number and lastly for the station runtime. This runtime length (Watering Time) is applied to all the stations within the block, from the lowest through the highest. Selected stations are shown in the STATIONS/DAYS display. As a convenience, the Program Number is shown in the PROMPT/MESSAGE display, during station entry.

EXAMPLE: Program Stations12 through Station 34 for a runtime of 56 minutes

Press:

QUICK STATIONS	**1** SUN	**2** MON	ENTER
	3 TUE	**4** WED	ENTER
	5 THU	**6** FRI	ENTER

The controller returns to the Automatic Mode.

5.5.2 Cycle and Soak Quick Station Programming

Cycle and Soak Quick Station Programming is used to program a block of stations, which all have the same runtime, maximum watering time, and soak time for each station. After selecting the QUICK STATIONS function, the controller will briefly display the Global Percentage Value. The controller will first prompt for station number, then the runtime value, followed by the maximum watering time, and finally the soak time. The Global Percentage Value only applies to the runtime and not to the maximum watering time or soak time Selected stations are shown in the STATIONS/DAYS display. As a convenience, the Program Number is shown in the PROMPT/ MESSAGE display, during station entry.

> *If a pump is assigned to any program using SETUP then Station 1 cannot be selected as part of the block of stations as it is reserved for the pump.*

Before you use the Cycle and Soak feature in a program, you must configure the controller, using the SETUP key. The entire program is then configured to use Cycle and Soak.

EXAMPLE: Program Station 12 through Station 34 for a runtime of 1 hour and 56 minutes, a maximum time of 20 minutes and a soak time of 15 minutes.

Press: [QUICK STATIONS] [1 SUN] [2 MON] [ENTER]   [1 SUN] [2 MON] [ENTER]

(Momentarily display "RUN TIME".)

[1 SUN] [5 THU] [6 FRI] [ENTER]

(Momentarily display "MAX TIME".)

[2 MON] [0] [ENTER]

(Momentarily display "SOAK TIME")

[1 SUN] [5 THU] [ENTER]

The controller will return to the Automatic Mode.

> *The maximum time and soak time entered will be used for all the stations in the block, as well as all other Cycle and Soak programs within the controller.*

5.6 WATER % BUDGET FUNCTION KEY

```
WATER%
BUDGET
```

Usage: The Water % Budget key is used in conventional irrigation programs to change or review the global increase or decreases in an irrigation program's base watering schedule.

The Water Percentage Budget function provides an easy method of increasing or decreasing the station runtimes within a program with one simple entry. The Water Percentage Budget function is particularly useful during abnormally dry, hot, cold or wet periods.

The Water Percentage Budget is, by default, set to 100 percent in all four programs. Unless changed, each station in a program will run for 100 percent of its programmed time (the station runtime length entered by you).

The Water Percentage Budget may be set from 0 to 300 percent, in increments of 1 percent and can be independently applied on a per program basis.

As an example, setting the Water Percentage Budget in a program to 161 will increase the base runtime of each station by 61 percent. Setting the Percentage to 70 will decrease the base runtime of each station by 30 percent.

> *In ET irrigation controller mode this key provides a review of the global increase or decreases in base watering schedule. In ET irrigation controller mode the operator cannot change this value; it is automatically calculated by the controller.*

Press the WATER % BUDGET key; then using the DATA ENTRY KEYS enter a value between 0 - 300 to increase or decrease the programs base watering runtime, then press ENTER to complete the action. The controller returns to the Automatic Mode.

If you wish to terminate the Water % Budget entry at any point, press the QUIT key to return to the Automatic Mode.

> *If Water Percentage Budget is set to a value other than 100 percent, the watering lengths of all stations in a program will be changed; the modified station runtime can be viewed using the REVIEW key feature.*

> *For a cycle and soak program the Percentage only applies to the runtimes and not to the maximum watering times or soak times.*

EXAMPLE: Set a Water Percentage Budget of 110 percent, this will increase the watering times of all stations in a program, by 10 percent.

Press: [WATER% BUDGET] [**1** SUN] [**1** SUN] [**0**] [ENTER]

The controller will return to the Automatic Mode.

EXAMPLE: To clear a Water Percentage Budget,

Press: [WATER% BUDGET] [CLEAR]

The Water Percentage Budget is reset to 100 percent and the controller will return to the Automatic Mode.

EXAMPLE: To review the Water Percentage Budget,

Press: [WATER% BUDGET]

Press: **QUIT**

The controller will return to the Automatic Mode.

Percent calculations which result in fractional portions of minutes will irrigate for the precise time. For example, assume a 5 minute runtime with a percentage of 50 percent. This station will irrigate for 2 minutes and 30 seconds.

5.7 MANUALLY ACTIVATED FUNCTIONS

| MANUAL |

Usage: The MANUAL key is used to manually execute a previously stored irrigation program, start a selected station, activate the Master Valve, or run the System Check/Syringe Check. The Rain Master Eagle controller provides these four features in the Manual Mode of operation.

Press the MANUAL key; the controller will display a prompt to select either a program or a station.

To select a program press the PROGRAM key; press DATA ENTRY keys 1 – 4 to select the irrigation program number, then press ENTER to complete the action.

To select a station press the STATION key; press DATA ENTRY keys 1 – 36 (depending on station configuration) to select the station number, then press ENTER.

The controller will prompt for the station runtime, enter a value between 0 – 959 (0 – 9 hours 59 minutes), then press ENTER to complete the action. The controller will turn on the selected station.

To activate the Master Valve press the STATION key; press key 0 to select the Master Valve, then press ENTER to complete the action.

To select the System Check/Syringe Cycle, Press the MANUAL key; press DATA ENTRY keys 1 – 9 to set the runtime of the System Check/Syringe Cycle. DO NOT press the ENTER key.

If you wish to terminate the Manual process at any point, press the QUIT key to return to the Automatic Mode.

5.7.1 MANUAL Program

Manual Program mode is used to run a previously defined program and assumes that stations have been defined in the program.

EXAMPLE: Manually run Program 1,

Press: | MANUAL | | PROGRAM | | **1** SUN | | ENTER |

The display indicates that Program 1 is running, the lapsed time of the program and the STATIONS/DAYS display will indicate the station that is running.

| 1   14:03 |
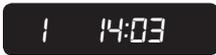
Upon completion of the program the controller will return to Automatic Mode.

EXAMPLE: To advance to the next station when the program is already watering,

Press: | MANUAL |

EXAMPLE: To stop the program that is currently running,

Press: | CLEAR | | QUIT |

The controller will return to the Automatic Mode.

5.7.2 MANUAL Station

Manual Station is used to run a selected station for a specified time

EXAMPLE: Manually activate Station 6 for 25 minutes,

Press:

| MANUAL | STATIONS | **6** FRI | ENTER |

| **2** MON | **5** THU | ENTER |

The STATIONS/DAYS display shows the station number 6 and the Master Valve on The PROMPT/MESSAGE display shows the watering time. As time elapses, the displayed watering time will count down. When the controller reaches zero, the station shuts off and the controller will return to the Automatic Mode.

```
25:00
```

EXAMPLE: To stop a station that is currently watering,

Press: **QUIT**

The controller will return to the Automatic Mode.

📝 *If a pump is assigned to any program (using SETUP) then Station 1 is reserved for the pump, but it can still be turned on manually by specifying Station 1.*

📝 *If the Valve type is a Normally Closed Master Valve (selected using SETUP) then the Master Valve will come on with the station. If the manually activated station is assigned to any program, which has a pump assigned to it, (using SETUP) then the pump (Station 1 output) will also come on with the station.*

5.7.3 MANUAL Master Valve

The Manual Master Valve is used to turn on the Master Valve for a selected time. The Master Valve is designated as Station 0.

EXAMPLE: Turn on the Master Valve for 4 minutes,

Press:

| MANUAL | STATIONS | **0** | ENTER |

| **4** WED | ENTER |

EXAMPLE: To turn off the Master valve,

Press: **QUIT**

The controller will return to the Automatic Mode.

5.7.4 MANUAL System Check/Syringe Cycle

As a convenience for "walk-through" service work and to measure the flow rate of a particular station, the controller has a system check feature built-in. This feature will run each station, from the first to the last, for a selectable time interval of 1 to 9 minutes.

EXAMPLE: Run a System Check for 3 minutes,.

Press: | **MANUAL** | **3** TUE   **DO NOT PRESS ENTER.**

If the flow features have been enabled, (using SETUP) then the display will show the current measured flow rate in Gallons-Per-Minute. If the flow features are not enabled then CHECK will appear in the display.

EXAMPLE: To advance one station at a time,

Press: | **MANUAL** |

EXAMPLE: To stop the System Check,

Press: | **QUIT** |

The controller will return to the Automatic Mode.

⚠ *This mode sequentially runs every station in the controller. For example if you have a 24 station unit but only use 23 stations, the controller will still apply power to Station 24 and while doing so, will apply power to the Master Valve/Pump terminal.*

This may be a problem for a system configured to use the Master Valve output to drive a pump.

During the period that Station 24 is activated, the pump will be pumping against a closed system. If the system uses a Master Valve, it will be activated during the period that Station 24 is active and this could cause heating of the Master Valve's solenoid (especially if the valve depends on water flow to cool it).

Therefore, if all stations are not used, cancel the System Check/Syringe cycle after the last used station has completed watering.

5.8 SKIP DAYS FUNTION KEY

```
SKIP
DAYS
```

Usage: The SKIP DAYS key is used to select a watering schedule based on a thirty-day (30) cycle. The thirty-day irrigation cycle is selectable on an individual irrigation program basis, you enter the days between watering cycles and the number of days before the cycle is to start.

Press the SKIP DAYS key; the controller prompts for the number of days between watering cycles (SD = Skip Days) press DATA ENTRY keys 1 – 30, and then press ENTER. The controller will then prompt for the days before the start of the cycle (LFT = Days Left) press DATA ENTRY keys 0 - 30 and then press ENTER to complete the action.

If you wish to terminate the Skip Days process at any point, press the QUIT key to return to the Automatic Mode.

EXAMPLE: In Program number four (4), set the Controller to water every fourteen (14) days and the cycle will start tomorrow.

Press: [SKIP DAYS]   Controller will display: `4 SD -`

Press: [1 SUN] [3 TUE] [ENTER]

Controller will display: `4 LFT -`

Press: [1 SUN] [ENTER]

EXAMPLE: In Program number one (1), set the Controller to water every other day and have the cycle start tomorrow.

Press: [SKIP DAYS]   Controller will display: `1 SD -`

Press: [1 SUN] [ENTER]

Controller will display: `1 LFT -`

Press: [1 SUN] [ENTER]

EXAMPLE: To review the Skip Days setup for Program number two (2),

Press: [SKIP DAYS]   Controller will display: [2 SD - 03]

The controller indicates that every third day is a water day.

Press: [ENTER]

Controller will display: [2 LFT - 01]

The controller indicates that there is one day left before the water day.

Press: [QUIT]

The Controller returns to the Automatic Mode.

5.9 REVIEW FUNCTION KEY

REVIEW

Usage: A unique feature of the Rain Master Eagle controller is its REVIEW feature. At the press of a key, all program related information will be displayed. Each press of the REVIEW key will advance to the next program parameter. Another way of reviewing program information is to press and hold the REVIEW key; the information will automatically advance at a readable rate. Removing your finger causes the information scrolling to stop. Pressing QUIT at any time will return the controller to the Automatic Mode.

The information review will start with the last program selected by the use of the PROGRAM function key and will continue until all information in Program 4 has been presented. As an example, if Program 1 was the last selected program then information in Program 1 will be displayed first, followed by Program 2, 3 and 4. If Program 3 was the last selected program then information in Program 3 will be displayed first, followed by the information in Program 4.

The information is presented as follows:

1. The Total Watering time of the program is displayed. This is the actual watering time of the program and takes into account all factors including the percentage adjust, any delay time between stations (which is configured using SETUP) and any adjustments due to the program being a Cycle and Soak program.

    The displayed value is rounded up; for instance a total time of 2 hours, 12 minutes and 14 seconds will be displayed as 2 hours and 13 minutes. The display will momentarily display TOTAL, then the watering time in hours and minutes.

    TOTAL   04H 30M

2. If the flow feature was enabled, using the SETUP feature; the total gallons of water used will be displayed next.

    TOTAL   GALLONS   3400

    When using the REVIEW function, the total gallons screen records and updates measured gallons every 10 seconds. It can be used to check for unscheduled flow.

3. If the Rain Sensor has been enabled using SETUP for this program then: SNSR-WET or SNSR-DRY will be displayed.

    SNSR-WET   - OR -   SNSR-DRY

4. Each of the program START TIMES will be displayed if set. If not set only the valid Start Times will be displayed.

    START   TIME 1   1   3:00PM

5. Selected Water Days will be displayed in the STATIONS/DAYS display. The Program Number and the WDAY will be displayed in the PROMPT/MESSAGE display.

    1 WDAY -

6. Skip Days, displayed as SD and the number of days left until the next watering day,

displayed as LFT.

| `1 SD - 23` | `1 LFT-01` |

7. ODD/EVEN Watering Days, if selected, is displayed as O/E and either ODD of EVEN.

| `O/E ODD` | `O/E EVEN` |

8. Water Percentage Budget is display if program is a conventional program. If the program is an ET based program, then the ET Adjustment Percentage is displayed.

CONVENTIONAL PROGRAM:　　　　`1 PT- 100`

ET ADJUSTMENT PERCENTAGE:　　`1 ET- 100`

9. Stations and their associated runtimes are displayed. The STATIONS are displayed in the STATIONS/DAYS display and the runtimes are displayed in the PROMPT/MESSAGE display. If the program is a Cycle and Soak program (selected using SETUP), the maximum watering time and soak time will also be displayed for each station.

(CONVENTIONAL PROGRAM)　　　`STATIONS`　`1  12- :15`

(CYCLE AND SOAK PROGRAM)　　`RUNTIME`　`3  27- :10`

　　　　　　　　　　　　　　　`MAX TIME`　`3  27- 0:02`

　　　　　　　　　　　　　　　`SOAK TIME`　`3  27- 0:01`

✎ *The runtime shown for each station is the adjusted runtime length and will be changed by the value you may have set for the percentage adjusts function. If the program is ET based, then the station runtimes are the times calculated by the controller.*

Press:　**QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: To review all program parameters of program number three (3) only,

Press: **PROGRAM**　**3 TUE**　**ENTER**

Continue to Press: **REVIEW**

Press: **QUIT**

The controller will return to the Automatic mode.

5.10 CLEAR EXECUTION KEY

CLEAR

Usage: The controller's CLEAR key has a number of uses, they are as follows:

1. The CLEAR key is used to remove unwanted parameters during irrigation program entry.

2. In flow monitoring operations, the CLEAR key will restart the water Totalizer counter.

3. To set the programmable Rain Shutdown Mode, press the CLEAR key; select the number of days, from 1 to 7 that the controller will stay in Rain Shutdown Mode, and then press ENTER to complete the action.

4. If you wish to terminate an executing irrigation program, press CLEAR, then press the QUIT key to return to the Automatic Mode.

5. An entire program may be cleared from the controller's memory as follows:

   Press the PROGRAM key and then select a number key 1 – 4 to select the program to clear and then press CLEAR. The entire selected program will be removed.

⚠️ *Please ensure you are clearing the proper program number prior to pressing the CLEAR key.*

⚠️ *The Programmable Rain Mode is disabled if the Rain Master Eagle Controller is in the Communications enabled Mode. (iCentral installed and COMM is ON.)*

5.11 QUIT EXECUTION KEY

QUIT

Usage: The QUIT key is used to terminate a function or program after it has already started execution. Pressing the QUIT key will also terminate any parameter entry process and return the controller to the Automatic Mode of operation.

5.12 ENTER EXECUTION KEY

ENTER

Usage: The ENTER key is used to complete data entry operations during setup and program preparation. The ENTER key will inform the controller that the data entered is ready for processing, the controller will validate the data for proper format and range and display an "OK" if correct or a "NO" response, then re-prompt you for the correct values to be entered.

6.0 Setup Key Operations

SETUP

Usage: The SETUP key is used to enable, disable and configure advanced features of the Rain Master Eagle controller. Pressing the SETUP key will sequentially rotate through the various options and display the next configuration parameter.

If you wish to terminate the Setup process at any point, press the QUIT key to return to the Automatic Mode.

Table 6 - Setup Options and Controller Defaults

Function	Option	Default Option
Set Time of Day	Numeric Value, plus AM or PM	12:00 AM
Set Date	Numeric value	N/A
Use a Master Valve	Enabled or Disabled	All programs are enabled.
Type of Master Valve	Normally Closed = NC; Normally Open = NO	NC
Pump	Enabled or Disabled	All programs are disabled.
Stack	Stack, No Stack	Stack
Delay (seconds)	0 - 255	000
Security Code	0 - 9999	0000
Rain Sensor	Enabled or Disabled	All programs are disabled.
Alarm	On, Off	On
Cycle and Soak	Enabled or Disabled	All programs are disabled.
Odd/Even Watering	Enabled or Disabled	All programs are disabled.
Communications Enabling	On, Off	Off
Flow Sensor Features	On, Off	Off
Pipe Size (inches)	1, 1.25, 1.5, 2, 3, 4	1.5 inches
Main Line Flow Limit	1 - 999 GPM	500 GPM
Unscheduled Flow Limit	0 - 999 GPM	200 GPM
Flow Check Delay	1 - 6 minutes	2 minutes
Total Gallons	N/A	N/A
Flow Percentage	5 - 80%	20%
Station Upper Flow Limits	0 - 500 GPM	200 GPM for all stations

By simply pressing the SETUP key, you can program, review and modify the various parameters. Successive presses of the SETUP key will allow you to advance to the next setup feature.

Some of the setup functions will be skipped depending on what you have configured for previous setup functions. The conditions for which a setup function will be skipped are noted in the applicable paragraphs for those functions.

⚠ ***When entering SETUP information the display will change but the controller will not actually accept the information until ENTER or CLEAR (for those SETUP functions that accept CLEAR) is pressed.***

6.1 SET TIME OF DAY/DATE

This feature allows you to program the Time-of-Day and the Date. The Rain Master Eagle Controller is a real-time device, all irrigation programs and functions are based on the Date and the Time of day. It is important that the Rain Master Eagle Controller have a correct time and date established upon initial installation and power–up. The Rain Master Eagle Controller, at initial power-up, will display a flashing prompt for the time-of-day to be entered by the operator.

EXAMPLE: It is Tuesday June 22, 2004 and the Time is 7:30 AM.

Press: [**SETUP**]   Until display indicates: [SET TIME]

Display indicates current Time-of-Day: [8:23 AM]

- Or -

Initial Power-up condition: [12:00 AM]

Press: [**7** SAT] [**3** TUE] [**0**] [AM / PM] [ENTER]

Display will flash: [SET DATE]   Then: [MMDDYY]

Press: [**0**] [**6** FRI] [**3** TUE] [**7** SAT] [**0**] [**6** FRI] [ENTER]

Display will alternate between: [7:30 AM]   And [6/22/04]

Press: [**QUIT**]

The controller will return to the Automatic Mode.

6.2 MASTER VALVE (MV)

This feature allows you to program a Master Valve to be activated when program 1, 2, 3 or 4 is activated. If you use a pump and it is connected to the Master Valve output of the controller, then use this feature to activate the pump when program 1, 2, 3 or 4 is activated.

EXAMPLE: The pump is to go on when Programs 1 and 3 are running.

Press: [SETUP]   Until display indicates: `MV 1234`

Press: [**2** MON] [**4** WED] [ENTER]   **Removes Programs 2 and 4 from the Master Valve Configuration.**

Display will indicate: `MV 1 3`

Subsequent presses of DATA ENTRY keys 2 and 4 would add Programs 2 and 4 back into the Master Valve configuration.

> *The Master Valve will not be activated with the program if it is a Normally Open Master Valve type as selected in the next Setup option.*

6.3 TYPE OF MASTER VALVE

This feature allows you to select either a Normally Closed or Normally Open Master Valve. A Normally Closed Master Valve is the most common type of valve used in irrigation. If a Normally Open Master Valve is selected then it will not come on with any program but will come on when the controller detects a main line or unscheduled overflow condition.

> **Selection of the Master Valve Type will be skipped if you have not selected a Master Valve for at least one program (in the MASTER VALVE SETUP function). In this case the controller will act as if you had selected a Normally Closed Master Valve. If you are using a Normally Open Master Valve select the Master Valve for at least one program.**
>
> **Refer to wiring diagrams and explanations in the MOUNTING & INSTALLATION section before configuring this option.**

EXAMPLE: To select a Normally Open Master Valve,

Continue to press: [SETUP]   Until display indicates: `TYPE-NC`

Press: [**1** SUN]   **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: `TYPE-NO`

Press: [ENTER] [QUIT]

The controller will return to the Automatic Mode.

6.4 PUMP

The Pump feature allows you to program a Pump to be activated when program 1, 2, 3, or 4 is activated. The controller uses Station 1 as the pump output. Use this feature only if the Pump is to be connected to Station 1. If the pump is to be connected to the Master Valve output, then use the Master Valve configuration feature.

✏️ ***Refer to wiring diagrams and explanations in the MASTER VALVE and PUMP WIRING OPTIONS section before configuring this option.***

A typical example for using this feature occurs when using a Normally Open Master Valve and Pump combination.

✏️ ***If you select a Pump for any program, the controller will not allow you to include a Station 1 runtime in any program. If you have already programmed Station 1 into a program the controller will automatically remove it.***

EXAMPLE: Configure a Pump to turn on when Programs 2 and 4 are running,

Continue to press: | **SETUP** | Until display indicates: | PUMP |

Press: | **2** MON | | **4** WED | | **ENTER** | **Add Programs 2 and 4 to the Pump Configuration.**

Display will indicate: | PUMP 24 |

Subsequent presses of Data Entry keys 2 and 4 would remove Programs 2 and 4 from the Pump configuration.

6.5 STACK OR NO STACK

The Stack/No Stack feature allows you to run your programs one after another (Stack) or simultaneously (No Stack). If the volume of water and the pressure will allow, you have the option of running several stations from different programs at the same time.

The maximum current draw cannot exceed 1 ampere per station and 1.5 amperes for the controller.

EXAMPLE: You have a 30 station controller, and watering must be completed by 7:00 AM and cannot begin until 2:00 AM (5 hours total).

You would configure the Programs as follows:

    Stations 1 through 7 in Program Number 1
    Stations 8 through 14 in Program Number 2
    Stations 15 through 21 in Program Number 3
    Stations 22 through 30 in Program Number 4

Set the runtimes for each station, and the start time of 2:00 AM, you must be sure not to have any program run over 5 hours total (total runtime can be checked using the REVIEW feature). You must also ensure that your system can provide the volume of water required to supply 4 stations at one time.

EXAMPLE: To activate the No Stack feature,

Continue to press: | SETUP | Until display indicates: | STACK |

Press: | 1 SUN | **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: | NO STACK |

Press: | ENTER | | QUIT |

The controller will return to the Automatic Mode.

6.6 DELAY

The Delay feature allows you to program a delay time between stations. A programmable delay may be useful to allow stations to reach a steady state condition before energizing the next station (completely turned off).

EXAMPLE: Program a 68 second delay time between stations turning off and the next station turning on.

Continue to press: | SETUP | Until display indicates: `DELAY0000`

Press: **6 FRI** | **8** | | ENTER | Until display indicates: `DELAY068`

The maximum delay possible is 255 seconds.

Press: | QUIT |

The controller will return to the Automatic Mode.

6.7 SECURITY CODE

The Rain Master Eagle controller has the capability to enter a pass code which must be entered before any function(s) can be executed. This code can be up to 4 numbers long. Use a number that can be easily remembered, and have it written down should you forget.

📝 *This feature should only be used where security is limited.*

EXAMPLE: To enter a new Security Code of 1960, the year you were born,

Continue to press: | SETUP | Until display indicates: | CODE0000 |

Press: | 1 SUN | 9 | 6 FRI | 0 | ENTER |

Display will indicate: | CODE 1960 |

Press: | QUIT |

📝 *0000 is not a valid security code. 0000 means that the security code feature is disabled.*

The controller will return to the Automatic Mode.

6.7.1 Enabling Security Code

Once you have completed operating or making changes to your controller you can enable the security code.

EXAMPLE: Enable the Security Code feature,

Press: | MANUAL | ENTER | ENTER |

The controller will return to the Automatic Mode.

📝 *Should you forget to enable the security code, the code will automatically become enabled at midnight and no one will be allowed to operate the controller without first entering the security code.*

6.7.2 Disabling Security Code (LOCKED Controller)

Once the Security Code feature has been enabled, it will be necessary to enter the security code every time you wish to operate or change your controller.

EXAMPLE: To disable the security code used in the previous example,

Press: | MANUAL | ENTER | 1 SUN | 9 | 6 FRI | 0 | ENTER |

The controller will return to the Automatic Mode.

6.7.3 Eliminating Security Code

To eliminate the Security Code completely, you must first disable the security code as described above.

EXAMPLE: To remove the Security Code,

Continue to press: **SETUP**   Until display indicates: `CODE 1960`

Press: **0** **0** **0** **0** **ENTER**

Display will indicate: `CODE0000`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.8 SENSOR

✍️ *When this symbol* ✱ *appears in the left most position of the display, this indicates that the Rain Sensor is reading a "Wet" condition. If one or more running programs have the Rain Sensor enabled, no stations will be activated due to the wet condition.*

The Rain Master Eagle Controller has the ability to affect irrigation based on an external rain sensor or remote switch input. This feature can be programmed on an individual program basis, so that one or more programs will cease watering for as long as the rain sensor is active.

The external sensor or switch must be of the Normally Closed type when there is no rain detected, and opens when rain is detected or when it is desired to suspend irrigation. Most commercial rain sensors are of this type. See the wiring instructions in 3.0 MOUNTING AND INSTALLATION section.

EXAMPLE: Program 4 is set up to operate your outdoor lighting; however you also have a rain sensor connected to your Rain Master Eagle.

Continue to press: | SETUP | Until display indicates: | SNSR |

Press: | 1 SUN | | 2 MON | | 3 TUE | | ENTER |

Display will indicate: | SNSR 123 |

Press: | QUIT |

The controller will return to the Automatic Mode.

Once programmed in this manner, the designated program(s) will not turn on any stations unless the Rain Sensor cables are shorted together, either by an external switch or the appropriate Rain Sensor. See SENSOR WIRING section for details.

If any program is set up to utilize the Rain Sensor then the status of the Rain Sensor can be determined by pressing the Review key repeatedly or holding it down until the display indicates the word SNSR- followed by Wet or Dry.

| SNSR-WET | **- OR -** | SNSR-DRY |

If the sensor condition is Dry, the irrigation program(s) will operate normally. If the sensor condition is Wet, no irrigation will take place on those configured program(s).

Additionally, when a program is scheduled to operate, an asterisk will appear in the leftmost location in the display, if the external sensor has detected rain, or the external switch is Open.

| P   04:30 |

✍️ *The external sensor is independent of the Rain Switch on the front of the controller. Leave the front panel Rain Switch in the Automatic Watering position.*

EXAMPLE: To configure Program 4 for Sensor Mode,

Continue to press: **SETUP**   Until display indicates: `SNSR 123`

Press: **4 WED**   **ENTER**

Display will indicate: `SNSR 1234`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.9 ALARM

The Rain Master Eagle controller is equipped with an audible alarm feature which notifies the operator if a field wire or flow fault has been detected. The alarm is an audible "chirp" which occurs once every 6 seconds. It remains in effect until the alarm is cleared by the operator. When the alarm is enabled, the sound will be heard by anyone passing by the controller.

EXAMPLE: Turn the audible alarm off,

Continue to press: **SETUP**   Until display indicates: `ALARMON`

Press: **1 SUN**   **ENTER**   **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: `ALARMOFF`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.10 CYCLE AND SOAK

The Cycle and Soak feature allows you to select whether a program will be a Cycle and Soak program or not.

For a description of what a Cycle and Soak program is, see 5.0 FUNCTION AND EXECUTION KEY OPERATIONS chapter of this manual under the heading 5.3.12 Cycle and Soak Programming.

EXAMPLE: Programs 1, 2 and 3 are to be configured as Cycle and Soak programs.

Continue to press: **SETUP**   Until display indicates: `SOAK`

Press: **1 SUN**   **2 MON**   **3 TUE**   **ENTER**

Display will indicate: `SOAK 123`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.11 ODD/EVEN WATERING CONTROL

The ODD or EVEN Watering Control feature allows you to select whether a program will run on an ODD day or an EVEN day of the month watering schedule or the feature is off and the controller will run programs as originally scheduled.

In areas where water allotments are based on ODD day or EVEN day irrigation schedules, the Rain Master Eagle can support this through a setup configuration. Prior to running a previously stored irrigation program, the controller will evaluate the water day versus the day of the month.

If the controller is configured for ODD day watering, the day of the month is an odd day, and this is a program defined Water Day, the controller will run the stored program. If the day of the month is an EVEN day, then the controller will run the program, but no valves will be activated.

If the controller is configured for EVEN day watering, the day of the month is an even day, and this is a program defined Water Day, the controller will run the program. If the day of the month is an ODD day, then the controller will run the program, but no valves will be activated.

If a program or programs are not configured for ODD or EVEN watering control, the programs will irrigate as set by the WATER DAYS or SKIP DAYS function of the program.

If the controller is set to ODD or EVEN Watering days and the current month has 31 days (January, March, May, July, August, October, or December), the controller will not water on day 31 (the thirty-first day of the month).

EXAMPLE: Programs 2 and 3 are to be configured as ODD Water day programs.

Continue to press: **SETUP**   Until display indicates: `O/E OFF`

Press: **1 SUN**   **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: `O/E ODD`

Press: **ENTER**

Display will indicate: `ODD 1234`

Press: **1 SUN**   **4 WED**   **ENTER**

Display will indicate: `OK`   Then   `ODD  23`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.12 COMMUNICATIONS (ENABLING)

This feature allows the Rain Master Eagle Controller to be used with an optional wireless communications plug-in card. With the option installed you can program, monitor and transmit weather information to the Rain Master Eagle Controller using the Internet. By sending daily weather information to the Rain Master Eagle Controller, intelligent irrigation schedule adjustments can be automatically performed in order to facilitate water savings.

EXAMPLE: If you have the optional wireless communications product installed, the communications are enabled as follows:

Continue to press: | **SETUP** | Until display indicates: | *COMM OFF* |

Press: | **1 SUN** | **ENTER** | **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: | *COMM ON* |

Press: | **QUIT** |

The controller will return to the Automatic Mode.

6.13 FLOW SENSOR

This Flow enable/disable feature allows you to select whether you are using a flow sensor or not. For a general description of how the flow features work, see 9.2 FAULT DETECTION OVERVIEW chapter of this manual.

📝 ***The remaining SETUP features are related to the Flow Sensor features and will be skipped if the Flow Sensor features have not been enabled.***

EXAMPLE: If you have a Flow Sensor connected to the controller and you wish to activate the Flow Sensor features.

Continue to press: | **SETUP** | Until display indicates: | *FLOW* |

Press: | **1 SUN** | **ENTER** | **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: | *FLOW ON* |

Press: | **QUIT** |

The controller will return to the Automatic Mode.

6.13.1 Pipe

In order to properly measure flow, the pipe size of the Rain Master Flow Sensor must be specified. Appendix B lists flow sensor part numbers and their associated pipe size. You can select the following pipe sizes in inches: 1.00, 1.25, 1.50, 2.00, 3.00, 4.00 and OTHR

Each depression of the 1 key will toggle the display to the next pipe size (Selection of OTHR is reserved for future use). When you have reached the pipe size you want to select, press ENTER.

This SETUP function will be skipped if you have not enabled the flow features.

EXAMPLE: Select a pipe size of 3.00 inches.

Continue to press: **SETUP**   Until display indicates: `PIPE 1.50`

Press: **1 SUN** **1 SUN** **ENTER**   **The 1 key acts as a toggle when used in this setup configuration item.**

Display will indicate: `PIPE 3.00`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.13.2 Main Line Flow Limit

This feature allows you to program the Main Line Upper Flow Limit. This is the maximum water flow that the controller will allow whenever any station is on. If the controller has been setup for NO STACK operation, multiple stations may be on at the same time. The main line limit should be larger than the sum of the flow totals of all simultaneously "on" stations.

This SETUP function will be skipped if you have not enabled the flow features.

EXAMPLE: Program a Main Line Flow limit of 400 GPM.

Continue to press: **SETUP**   Until display indicates: `MAIN`

Press: **4 WED** **0** **0** **ENTER**

Display will indicate: `MAIN 400`

Press: **QUIT**

The controller will return to the Automatic Mode.

6.13.3 Unscheduled Flow Limit

This feature allows you to program the Unscheduled Upper Flow Limit. This is the maximum flow that the controller will allow whenever there are no stations on. With no irrigation, and a Normally Closed Master Valve, the typical installation should have no flow and the limit should be set to zero. For systems which have a Normally Open Master Valve and the possibility of supplemental watering due to quick coupler manual devices, you have the option of setting a non-zero value which will be allowed when the controller does not have any active stations. If this value is exceeded an unscheduled flow fault occurs.

📝 *This SETUP function will be skipped if you have not enabled the flow features.*

EXAMPLE: Select an Unscheduled Flow Limit of 25 GPM.

Continue to press: [**SETUP**]   Until display indicates: [UNSCH200]

Press: [**2** MON] [**5** THU] [**ENTER**]

Display will indicate: [UNSCH025]

Press: [**QUIT**]

The controller will return to the Automatic Mode.

6.13.4 Flow Check Delay

The Flow Check delay feature allows you to program a delay after any change of stations for which no flow limits will be checked.

Whenever there is a change in stations (a station gets turned on or off) the controller will not check for flow limit faults from the time of the change until this delay has expired; this gives the system time to stabilize before any flow limit checking takes place.

The flow check delay can be set, from 1 to 6 minutes, in 1 minute increments.

📝 *This SETUP function will be skipped if you have not enabled the flow features.*

EXAMPLE: Set a flow check delay to 4 minutes,

Continue to press: [**SETUP**]   Until display indicates: [FDELAY 2]

Press: [**4** WED] [**ENTER**]

Display will indicate: [FDELAY 4]

Press: [**QUIT**]

The controller will return to the Automatic Mode.

6.13.5 Totalizer

The Totalizer feature allows you to view and clear the total gallons of water used. (The Totalizer value is also displayed in the REVIEW mode.) The display indicates the total gallons of water used since the last time you cleared it.

> *The total gallons will automatically be cleared when you select a new pipe size (using the PIPE SETUP feature).*

> *This SETUP function will be skipped if you have not enabled the flow features.*

EXAMPLE: Determine how many gallons of water were used in a month,

At the beginning of the month:

Continue to press: Until display indicates:

| SETUP | | TOTAL | GALLONS | 0 |

Press: | CLEAR |

Display will indicate: | 0 |

Press: | QUIT |

The controller will return to the Automatic Mode.

> *If you hit SETUP while the words TOTALGALLONS are on the display you will miss this SETUP feature because the controller will go to the next SETUP feature.*

Then at the end of the month:

Continue to press: Until display indicates:

| SETUP | | TOTAL | GALLONS | 252567 |

This is the total gallons of water used for the month.

Press: | QUIT |

The controller will return to the Automatic Mode.

> *The Totalizer will reset to zero (0) after displaying 9,999,999 gallons.*

6.13.6 Flow Percentage

The Flow Percentage feature can be used to globally establish station flow upper limits. The flow percentage can be set from 5 to 80 percent. This feature can be used in two ways:

1. Assume limits need to be established for a new system and you wish to have all station flow limits to be 15 percent above their nominal value.

Then:

- Set the flow percentage to 15 percent.
- Run Automatic LIMITS (see next section) for all stations.
- The new limits will be automatically saved (nominal measured flow + 15 percent) for each station.

2. Your system has been operational for some time. Occasionally, one or more stations seemingly at random fail the flow upper limit. Upon physical inspection of the stations everything appears fine. Upon further investigation it is determined that there are large fluctuations in the static water pressure. It is desired to bump all stations from their existing 15 percent (above nominal) to 25 percent (above nominal).

Then:

- Set the flow percentage to 25 percent.
- All station limits will now be recalculated to provide another 25 percent over the initial nominal readings.

📝 *This SETUP function will be skipped if you have not enabled the flow features.*

EXAMPLE: Assume the initial measured flow (nominal value) was 40 GPM for a station. Because the flow percentage was originally 15% then the station upper limit as retained in the controller is 46 GPM (115 x 40). Now, setting the new flow percentage of 25% yields a new station limit of 50 GPM (125 x 40).

Continue to press: [**SETUP**]   Until display indicates: [PERCNT 15]

Press: [**2** MON] [**5** THU] [**ENTER**]

Display will indicate: [PERCNT25]

Press: [**QUIT**]

The controller will return to the Automatic Mode.

6.13.7 Limits

The Limits feature will allow you to set the station's upper flow limits by either using the LEARN mode or by setting them explicitly. The next 2 sections explain each of these methods.

📝 *This SETUP function will be skipped if you have not enabled the flow features.*

6.13.7.1 Station Limits Using Learn Mode

This feature allows the controller to LEARN and set the station upper flow limits.

Controller operation:

- Each station is turned on one at a time. The amount of time it is on is determined by the flow check delay time (1 to 6 minutes).
- The nominal flow reading is established by averaging the measured flow for the last minute in which the station is on.
- The station upper limit is calculated taking the nominal value and adjusting upward by the flow percentage (previously established).
- The new limit is saved in memory (non-volatile RAM).

You just press ENTER and the controller will automatically set the upper flow limits by LEARNING them.

EXAMPLE: Set the controller to LEARN and automatically set all the station upper flow limits.

You think 30% is a good amount to add to the upper limits over and above what the controller measures.

Continue to press: **SETUP**   Until display indicates: `PERCNT 20`

Press: **3** **0** **ENTER**

Press: **SETUP**   Display will indicate: `PERCNT 30`

Press: **SETUP**   Display will indicate: `L IM ITS`

Press: **ENTER**

The controller will now LEARN and set up all the upper station flow limits. It will take the Flow Delay time for each station. If you have a 36 station controller and your Flow Delay time is 2 minutes, it will take 72 minutes. (If you want the controller to skip to the next station at any time, press MANUAL and the station which was skipped will not have its limit changed.) During this time the LED will display which station is watering and the flow in GPM will be on the display.

When the controller is done, the display will indicate: `L IM ITS`

Press: **ENTER**

📝 *While each station is watering, if you have selected a Normally Closed Master Valve, the Master Valve will come on also; if the station is in a program that has a Pump assigned to it, the Pump (Station 1) will also turn on with the station.*

📝 *If you selected Pump for any program, Station 1 will be used for the Pump and the controller will not set an upper flow limit for Station 1.*

6.13.7.2 Setting Station Limits

This feature allows you to directly set a station's upper flow limit to any value. It is an alternative to using the LEARN mode described above. In this feature each station limit is set one at a time.

To use this feature:

1. Successively press SETUP until you see LIMITS in the display.
2. Press the station number followed by ENTER.
3. You now have the opportunity to set the upper flow limit in one of two ways. Pressing the MANUAL key will toggle between them.

• You can explicitly put in the limit followed by ENTER.

• You can press MANUAL and the controller will start watering the station. During this time the flow rate will be displayed on the left and the limit will be displayed on the right. By pressing ENTER you can accept the flow rate as the limit (adjusted by the flow percentage):

> *The limit can be set to from 0 to 500 GPM. The set limit will be rounded to the nearest 2, so if you set the limit to 55, when you review the setting it will be 54.*

EXAMPLE: Set the upper station flow limit of Station 15 to 44 GPM.

Continue to press: | **SETUP** | Until display indicates: | L IM ITS |

Press: | **1** SUN | | **5** THU | | **ENTER** |

Display will indicate: | IS - 200 |

Press: | **4** WED | | **4** WED | | **ENTER** |

Display will indicate: | L IM ITS |

You can now continue to enter limits for other stations, when complete,

Press: | **QUIT** |

The controller will return to the Automatic Mode.

EXAMPLE: Review the Upper Station Flow limit of station 15

Continue to press: | SETUP | Until display indicates: `L IM ITS`

Press: **1** SUN   **5** THU | ENTER |

Display will indicate: `15 - 44`

Press: | SETUP | **This will leave the limit for Station 15 set to 44 GPM.**

Press: | QUIT |

The Controller will return to Automatic Mode.

EXAMPLE: You want to watch Station 7 water and when you feel it has stabilized you want the flow (adjusted up by the flow percentage) to be used to set the upper flow limit. Your flow percentage has previously been set to 30%.

Continue to press: | SETUP | Until display indicates: `L IM ITS`

Press: **7** SAT | ENTER |

Display will indicate: `7 - 200`

Press: | MANUAL |

Station 7 will begin watering, to stop watering at any time, press the MANUAL key.

If you have selected a Normally Closed Master Valve, the Master Valve will also come on. If Station 7 is in any program which has a Pump assigned to it, then the Pump (Station 1) will also come on.

Display will indicate: `052 200`

The value on the left is the measured or (nominal) flow and the value on the right is a previously established limit (both in GPM). The flow display will update once every 10 seconds.

You can now watch the display until you see that the flow has reached a stable value and you want to use that value (adjusted up by the flow percentage) for your limit.

Suppose the stable value is 45 GPM, then your display will be   `045 200`

Press: **ENTER**   Display will indicate: `L IM ITS`

The new limit will be 45 adjusted up by 30% or 58 GPM.

EXAMPLE: Turn on Station 7 and monitor its flow without changing its upper flow limit.

Continue to press: **SETUP**   Until display indicates: `L IM ITS`

Press: **7** **SAT**   **ENTER**

Display will indicate: `7 - 200`

Press: **MANUAL**

Station 7 will begin watering and its flow will be displayed. The Master Valve and/or Pump may also be on, depending on previously established conditions.

Display will indicate: `052 200`

The value on the left is the current flow and will be update once every 10 seconds.

Station 7 will remain on and its flow will be monitored until you press the MANUAL key or the QUIT key. When monitoring is complete.

Press: **MANUAL**   Display will indicate: `7 - 200`

You can restart watering by pressing the MANUAL key again.

Press: **QUIT**

The controller will return to the Automatic Mode.

7.0 ET KEY OPERATIONS

The chapter will provide detailed instructions in the use of the ET function key. The chapter will cover the entry, modification and review of the various parameters.

> *For details on the definition, processes, and procedures for the effective use of Evapotranspiration in irrigation control systems, please refer to Chapter 8 ET Programming.*

ET

Usage: Press the ET key to enable and configure the Rain Master Eagle controller for Evapotranspiration (ET) water conservation operations. Each ET key press will cycle through the various options of this function key.

If you wish to terminate the ET entry at any point, press the QUIT key to return to the Automatic mode.

7.1 ET DATA SOURCE DISPLAY

The controller will display the Evapotranspiration (ET) stored data value, which will be used in today's station runtime calculations. The ET Data Source Display is an information only display and can not be altered by operator entry.

When the ET key is depressed any one of four ET displays will appear, depending on the source ET device which is currently in use. The four possibilities are Historical, Manually Entered, Weather Station, and Internet provided data.

Historical Data: `ET - H . 13`

Manually Entered: `ET - M . 18`

Weather Station: `ET - D . 15`

Internet Interface: `ET - 1 . 22`

7.1.1 Historical Data

The controller will display the daily Historical ET value (measured in inches) in the ET Data Source Display. The daily Historical ET data value is obtained from the monthly historical data stored in the controller. The display will indicate the daily historical value to be used in today's runtime calculations.

EXAMPLE: Display the daily Historical ET value.

Press: **ET**   Until display indicates: `ET - H . 13`

Press: **QUIT**

The controller will return to the Automatic Mode.

7.1.2 Operator Entered Data

The controller will display the manually entered ET value (measured in inches) in the ET Data Source Display. The display will indicate the manually entered value to be used in today's runtime calculations.

EXAMPLE: Display the operator entered ET value.

Press: **ET**

Until display indicates: `ET - M . 18`

Press: **QUIT**

The controller will return to the Automatic Mode.

7.1.3 Weather Sensor Data

The controller will display the ET in inches received from the Weather Station device, during the 24 hour accumulation period and display the ET value (measured in inches) in the ET Data Source Display. The display will indicate the device ET value to be used in today's runtime calculations.

EXAMPLE: Display the Weather Station device ET value.

Press: **ET**

Until display indicates: `ET - D . 15`

Press: **QUIT**

The controller will return to the Automatic Mode.

7.1.4 Internet Interface Data

The controller will display the Internet received ET value in the ET Data Source Display. The display will indicate the Internet received value to be used in today's runtime calculations.

EXAMPLE: Display the Internet provided ET value.

Press: **ET**

Until display indicates: `ET - 1 . 22`

Press: **QUIT**

The controller will return to the Automatic Mode.

7.2 ET MODE

Selecting the ET Mode feature allows your programs to be ET based, which will provide station runtime adjustments based on daily weather conditions. This feature provides practical water conservation by automatically adjusting watering times to the landscape's needs. The ET Mode can be selected on a per program basis.

EXAMPLE: Programs 2 and 4 are to be ET based irrigation programs.

| Continue to press: | ET | Until display indicates: | ET |

| Press: | 2 MON | 4 WED | ENTER | Display will indicate: | ET 2 4 |

| Press: | QUIT |

✎ *The Rain Master Eagle controller allows the four programs to be ET based programs, conventional irrigation programs, or any combination of the two program types.*

The controller will return to the Automatic Mode.

7.3 ENTERING THE ET REFERENCE VALUE

The ET Reference value is an important parameter, required by the controller, in order to realize ET water savings. Please refer to section 8.4 ESTABLISH THE ET REFERENCE VALUE to determine how this value is derived. The reference value (measured in inches) closely coincides with the reference program defined in section 8.3 GENERATE THE REFERENCE PROGRAM.

EXAMPLE: Enter an ET Reference value of 13,

| Continue to press: | ET | Until display indicates: | ETREF |

| Press: | 1 SUN | 3 TUE | ENTER | Display will indicate: | ETREF . 13 |

| Press: | QUIT |

The controller will return to Automatic Mode.

EXAMPLE: Review the ET Reference value,

| Continue to press: | ET | Until display indicates: | ETREF . 13 |

To review the monthly ET for January,

| Press: | ET |

| Press: | QUIT |

The controller will return to Automatic Mode.

7.4 ENTERING HISTORICAL ET MONTHLY VALUES

The Historical ET Monthly values are determined based on the location of your controller. The monthly values represent data that has been averaged over several years on a site specific basis.

The entered data is the average daily ET (measured in inches) for each specific month. Refer to section 8.2 OBTAINING THE HISTORICAL ET DATA.

The monthly historical values are entered once during initial configuration of the controller and as long as the controller is not relocated, the values will not need to be changed.

The Rain Master Eagle controller uses these values during runtime calculations to average the increase or decrease in the watering time based on seasonal changes.

EXAMPLE: Enter a Monthly ET value for June of 18 and for July of 19.

Continue to press: | ET | Until display indicates: `ETJUN .10`

Press: | 1 SUN | | 8 | | ENTER | Display will indicate: `ETJUN .18`

Press: | ET | Until display indicates: `ETJUL .10`

Press: | 1 SUN | | 9 | | ENTER | Display will indicate: `ETJUL .19`

Press: | QUIT |

The controller will return to Automatic Mode.

EXAMPLE: Review the Monthly ET value for July

Continue to press: | ET | Until display indicates: `ETJUL .19`

Press: | ET | To review the value for August,

Press: | QUIT |

The controller will return to Automatic Mode.

7.5 WEATHER STATION

The Rain Master Eagle controller is capable of reading, processing and storing the accumulated values received from a Rain Master Weather Station. The Weather Station provides a single count for each .01 inch change in ET. The Rain Master Eagle controller will accumulate the Weather Station counts from midnight to midnight (24 hour accumulation) and store the total for use in the next day station runtime calculations. Refer to the Weather Center II User Manual, RMIS Part No 500009, in order to properly connect the Rain Master Eagle Controller to the Rain Master Weather Center II.

The total number of counts received from the Weather Station will increase or decrease based on weather conditions and will change through-out the year (ie summer to winter, hot to cold). This change in counts will then affect the length of watering on a day to day basis.

EXAMPLE: Turn on the Weather Station Device.

Continue to press: | ET | Until display indicates: `DVICE OFF`

Press: | **1** SUN | | ENTER | The 1 key acts as a toggle key when used in this ET configuration item.

Display will indicate: `DVICE ON`

Press: | QUIT |

The controller will return to the Automatic Mode.

EXAMPLE: Review Status of the Weather Station Device

Continue to press: | ET | Until display indicates: `DVICE ON`

Press: | QUIT |

The controller will return to Automatic Mode.

7.51 Weather Station Status Display

Once the Weather Station device has been enabled (DVICE ON), the next ET parameter display will be the current day's accumulated values received from a Weather Station interface. The Weather Station status display will provide the total number of counts received since last midnight.

Current day accumulation will complete at midnight and will then be used in tomorrow's calculation of station watering time.

The accumulated Weather Station count will only be valid and used, after a complete 24 hour accumulation period (midnight to midnight). The value will then be used for all next day and future day calculations.

If controller power is lost for more then one hour, the Weather Station count will be invalidated and the controller will store and use Historical ET data for the current day accumulation.

The display indicates the total ET (measured in inches) accumulated since midnight.

EXAMPLE: Review today's Weather Station accumulated ET

Continue to press: [**ET**]   Until display indicates: `DCNT .18`

📝 *The Weather Station Device Status display will not be presented if the Weather Station Device has not been enabled.*

Press: [**QUIT**]

The controller will return to the Automatic Mode.

7.6 MANUAL ET DATA

The Rain Master Eagle controller is capable of reading, processing and storing a manually entered ET value. The operator entered daily ET value (expressed in inches) is stored and utilized for today's station runtime calculations. The manual entry will override any other ET values received or stored by the controller (i.e. Weather Station Device, Internet received value, or the Stored Historical value).

The manually entered ET value will be used by the controller for today's runtime calculations and for the next six (6) days, unless cleared or modified by you.

EXAMPLE: Manually enter an ET value of 30 inches,

Continue to press: [**ET**]   Until display indicates: `ET - H .13`

📝 *The ET Data Source display may indicate any source or value accumulated or received by the controller.*

Press: [**MANUAL**]   Display will indicate: `ET - M .`

📝 *The ET Data Source display will indicate a data source of MANUAL. However, the value may be the default value or a previously stored manual value.*

Press: [**3** TUE] [**0**] [**ENTER**]   Display will indicate: `OK`

Display will then indicate: `ET - M .30`

Press: [**QUIT**]

The controller will return to the Automatic Mode.

EXAMPLE: Review the Manual ET value

Continue to press: [**ET**]   Until display indicates: `ET - M .30`

Press: [**QUIT**]

The controller will return to the Automatic Mode.

7.6.1 Clearing Manual ET Data

You may clear the manual ET value at anytime. Clearing the manual ET value will result in the following action within the Rain Master Eagle Controller:

1. Yesterday and today's ET value will be replaced by an Internet provided value if available or by the stored historical value.
2. Any remaining Manual entry days will be cleared.
3. Any Manual days stored within the controller will be used in future program runtime calculations.

EXAMPLE: Clear the Manual ET Value

Continue to press: | ET | Until display indicates: `ET - M .30`

Press: | MANUAL | | CLEAR | Display will indicate: `ET - H . 13`

Press: | QUIT |

The controller will return to the Automatic Mode.

8.0 ET PROGRAMMING

8.1 INTRODUCTION

Evapotranspiration (ET) is defined as the water loss that takes place on irrigated zones due to evaporation and transpiration. Evaporation is the water transfer from the soil to the air and transpiration is the water transfer from the plant to the air.

The main factors that influence ET includes incoming radiation (energy from the sun), outgoing radiation (sensible energy leaving the earth), the amount of moisture in the air, air temperature and wind speed.

ET is a feature that resides in the Rain Master Eagle controller. Its purpose is to improve irrigation efficiency on a daily basis by re-computing station runtimes based on any one of the following inputs:

1. Historical weather information
2. Manual operator entered ET values
3. Weather station measured ET
4. Internet supplied ET

Any of the four irrigation programs within the Rain Master Eagle controller can be configured to utilize the ET feature or to conform to a conventional programming model. If conventional programming is desired, please disregard this chapter and do not use the front panel key labeled "ET".

In order to utilize the ET feature for a program, you must input information before your water savings may be realized. This information includes entering site specific historical ET information, generating a reference program, and selecting a source device which will supply the ET information.

Once the data is established, the RME controller will automatically compare the daily ET source value to the ET Reference value. Station runtimes are adjusted by the controller each day based upon the daily ET (weather conditions). Water savings are achieved because the controller now responds to environmental conditions. In a conventional program model, the station runtimes never change unless the operator "reprograms" the controller. The ET feature allows the controller to make intelligent decisions as if an operator were present every day.

The remainder of this chapter addresses the setup and programming steps required to utilize your Rain Master Eagle controller with ET scheduling.

8.1.1 ET Scheduling Overview

Your Rain Master Eagle controller has been designed to offer several different ET options to facilitate immediate water savings, regardless of the configuration chosen. Additionally, the Rain Master Eagle incorporates a "one-button" (ET key) approach in order to best serve your needs

In order to take advantage of the ET water savings capability built within your Rain Master Eagle controller you must perform the following steps:

Table 7 - ET Data Entry

Operation	Description	Reference Section
Step 1 - Obtain the Historical ET Data	Obtaining and entering the twelve monthly ET values.	8.2
Step 2 - Generate a Reference Program	Enter the start times, stations, and water days.	8.3
Step 3 - Establish the ET Reference Value	Enter the reference ET data value.	8.4
Step 4 - Enable ET Operation Mode	Set Programs to ET mode or conventional program mode.	8.5
Step 5 - Select the ET data source	Select historical, weather station, manually entered, or the inernet.	8.6

8.2 OBTAINING THE HISTORICAL ET DATA

Historical Evapotranspiration is accumulated ET data (typically accumulated 5 years or longer) compiled on a monthly basis for a specific location. This data is often times collected and maintained by various state and local agencies. In order to utilize the ET Scheduling features of the Rain Master Eagle, historical ET must be entered into the controller.

Rain Master Irrigation Systems has assimilated Evapotranspiration data for the entire United States

The weather parameters used to derive historic ET has been obtained from nationally recognized weather stations and observation systems. The historic ET data was averaged over a thirty (30) year period. The data is organized by United States postal zip codes and is available at the Rain Master Irrigation Systems Website www.rainmaster.com.

In order to use historical ET data as your source you must enter the historical data into the Rain Master Eagle for each month of the year based upon your climate.

Once you have obtained your local specific data, refer to section 7.4 ENTERING HISTORICAL ET MONTHLY VALUES for the procedures necessary to enter the data into your Rain Master Eagle controller.

Utilization of historical data allows water savings to be achieved in an immediate fashion. Savings are realized because your Rain Master Eagle has been designed to re-compute station runtimes based upon climactic trends as defined by monthly historical ET information. The controller performs daily station runtime computations based upon the weather conditions, in turn, water savings are realized since the controller automatically adjusts based upon need.

Although historical data is very useful, using historical data by itself means that the controller will not be able to adjust to real-time conditions such as an overcast day or an exceptionally hot day, since historical data is averaged data.

8.3 GENERATE THE REFERENCE PROGRAM

Whether you are using the Rain Master Eagle ET feature or not it is important to enter a program that is representative of the conditions that are being irrigated. The program should take into consideration several factors including the weather conditions for that time of year for your location, the precipitation rate, the rainfall, the plant material that is being irrigated, and site specific information (ie direct sunlight vs shade, etc).

It is important to have a representative program or "reference" program because the controller will make adjustments to this program over time. If for example, the initially established reference program results in over watering by 200%, then the Rain Master Eagle will make intelligent adjustments but optimal water savings will never be achieved.

There are three ways to obtain a reference program for your irrigation controller:

1. If you are familiar with the programming of your irrigated area because you have managed this operation over time, you may best know what each of your station runtimes and the frequency of irrigation (water days) that best suits your needs.

2. There are software programs that can be utilized to aid you in determining a reference program. One internet site to aid in scheduling is www.wateright.org. Select the "Scheduling" option. The Wateright site was developed by the Center for Irrigation Technology at California State University, Fresno, California, with significant support from the United States Bureau of Reclamation. This site prompts you for specific information and then generates a representative schedule for you.

3. Another option is to seek out an irrigation consultant who has knowledge of water management and irrigation scheduling. One national organization is the American Society of Irrigation Consultants. A member list can be obtained at www.asic.org.

Although you can establish a reference program based upon any month of the year, Rain Master recommends that you pick the hottest time of the season to determine your reference schedule.

Refer to RMIS Part Number 500048, Historical ET Data Tables to determine the hottest month of the season, the hottest month will have the highest ET value.

Regardless of today's date, enter your reference program into the Rain Master Eagle controller, as described in Table 8 - Program Data Entry.

Table 8 - Program Data Entry

Operation	Description	Reference Section
Step 1 - Enter the program number.	Select a program number from 1 through 4.	5.1
Step 2 - Enter the Water Days	The days the program will start irrigation.	5.2
Step 3 - Runtimes	Enter the station length of time.	5.3
Step 4 - Start Times	Time(s) of the day the program will start.	5.4

Even though you may have entered the summer reference schedule, once the Rain Master Eagle has been setup for ET operation, it will always reduce the station runtimes accordingly to save water regardless of what time of year it happens to be.

Establishing a spring, fall, or winter schedule can be accomplished in a similar fashion as depicted above.

8.4 ESTABLISH THE ET REFERENCE VALUE

The ET Reference value is utilized by the Rain Master Eagle in order to calculate the adjusted station runtime each time a station is turned on. The calculation compares the ET Reference value with the daily ET source (ie Historical, Internet, or Weather Station). When the source value is less than the reference value, the Rain Master Eagle adjusts all station runtimes downward in order to conserve water.

The ET reference value is directly tied to the ET reference program established in section 8.3 GENERATE THE REFERENCE PROGRAM. If the reference program that you entered into the Rain Master Eagle was established for the month of August, then your reference month will be August.

Using RMIS Part Number 500048, Historical ET Data Tables, obtain the ET value associated with the month of August. Refer to section 7.3 ENTERING THE ET REFERENCE VALUE to enter the reference value into the controller.

> *Once established, the reference value should not be changed arbitrarily, ie on a daily, weekly, or monthly basis. The reference ET value works hand in hand with the reference program. The Rain Master Eagle adjusts station runtimes by comparing the daily ET versus the ET reference value.*

> *If the reference program changes to establish a new program that is representative of an irrigation schedule for a different time of the year, THEN the reference value MUST also change.*

> *As an example, assume that a set of programs were established for the month of August and the reference value for this month had been previously entered. Also assume that it is now the winter and you wish to establish a winter irrigation schedule based on the month of October. A new representative schedule would be established for this month AND the new reference value (that of October) would now be entered.*

8.5 ENABLING PROGRAMS FOR ET OPERATION

The Rain Master Eagle provides the ability for irrigation programs 1 through 4 to be enabled for ET operation or conventional programming. Each program can be setup for ET operation independently. Once the program is setup for the ET mode of operation, station runtime adjustments will be made based on daily weather conditions. Please refer to section 7.2 ET MODE to enable ET operation mode on a per program basis.

> *The controller default is all programs to be in conventional mode. Make sure you enable the appropriate programs if ET operation is desired.*

> *Once a program is enabled for ET scheduling, you will no longer be able to utilize the WATER % BUDGET adjustment feature for this program.*

The Rain Master Eagle controller will budget irrigation runtimes based upon its internal ET calculations.

```
2 ET - 75
```

If you depress the WATER % BUDGET key for a program which has been ET enabled, the display will indicate the program number followed by "ET" followed by a percent value.

This number is the percentage which each station will be adjusted from the reference program station runtime, assuming that the station watering time was to occur at this time. A value of 75 indicates that each station runtime will be reduced by 25%.

EXAMPLE: Assume program 2 was enabled for ET operations mode and that station 1 has a programmed runtime of 10 minutes. Assume that when the WATER % BUDGET key is depressed the value reads 75.

The Rain Master Eagle controller would calculate the runtime Station one (1) as follows:

10 minutes x 75% = 7 minutes 30 seconds

8.6 SELECTING THE ET DATA SOURCE

In order for water savings to be maximized, daily ET data information must be provided to the Rain Master Eagle controller so that it can more accurately re-compute station runtimes. The Rain Master Eagle can utilize any one of four different ET data sources:

1. Historical ET
2. Manually Entered ET
3. Weather Station generated ET
4. ET data provided via the Internet

To view what data source the Rain Master Eagle controller is currently using, do the following:

EXAMPLE: Display the current ET value used for today's ET runtime calculation.

Press: **ET**

Display indicates: ⌐ET - H.13⌐ = This display indicates that the Data Source is Historical (H) ET Data.

Display indicates: ⌐ET - H.13⌐ = This display indicates that the Data Source is Manually (M) Entered ET Data.

Display indicates: ⌐ET - H.13⌐ = This display indicates that the Data Source is a Weather Station Device (D).

Display indicates: ⌐ET - H.13⌐ = This display indicates that the Data Source is Internet (I) provided ET Data.

Press: **QUIT**

The controller will return to the Automatic Mode.

8.6.1 Historical ET

Historical ET data is the default source for ET calculations. Refer to sections 8.2 OBTAINING THE HISTORICAL ET DATA and 7.4 ENTERING HISTORICAL ET MONTHLY VALUES to determine how to obtain and enter the Historical ET data into your controller.

Once you have enabled a program for ET operation, see section 7.2 ET MODE, the controller will use this data source until another ET data source is selected.

> *Historical information must always be entered by the user into the Rain Master Eagle regardless of which source data is selected. Whether you are using manually entered ET, weather station ET, or Internet provided ET, the historical ET information is used as a backup.*

EXAMPLE: You have setup the Rain Master Eagle to use Weather Station data and the Weather Station malfunctions. The historical data will automatically be used by the Rain Master Eagle during the outage period of the Weather Station. A similar situation would exist when using the Internet interface.

8.6.2 Manually Entered ET

The user has the ability to manually enter daily ET information at any time. When used in conjunction with Historical ET, the user can manually input an ET value to account for extreme conditions such as unusual hot or cold spells, etc. In some communities (especially Agricultural) this data may be available in local newspapers, via the radio, or even reported as part of the local weather report. By utilizing manually entered ET data in conjunction with historical ET data a more exact picture of the irrigation needs can be defined.

The controller is designed to utilize the manually entered ET value for a period of one week. The controller will automatically revert back to the use of Historical data, or any other selected ET data source, after this time period.

Manual ET data can be entered at any time; each time it is entered it will over-write the last data value that was stored and supercede all other ET data sources.

Please refer to section 7.6 MANUAL ET DATA for detailed specifics on entering manual ET data.

⚠️ *Historical ET data should always be entered into the controller when using the controller in the ET mode. In order to ensure that the controller intelligently irrigates in the event that the user is unable to enter a manual value, it is important that the historical ET be entered as a fallback.*

8.6.3 Weather Station generated ET

The most accurate mechanism for supplying ET data to your Rain Master Eagle controller is with a Rain Master Weather Station properly installed within the irrigated area. A local weather station is capable of measuring ET data based upon your specific microclimate. Because the weather station is capable of measuring ET in the nearest one hundredth of an inch and the data is measured in real time, on a continuous basis, your Rain Master Eagle can respond to changes in weather conditions immediately.

⚠️ *In order to ensure that the controller intelligently irrigates in the event that the Weather Station fails, it is important that the Historical ET data be entered as a fallback. A Weather Station failure is declared by the controller if the weather station reads a total of 0.0 ET for the 24 hour accumulation period (midnight to midnight).*

When this occurs, the Historical ET data will be automatically used for the tomorrow's ET calculations. In climates that have significant rain, it may be possible to have a legitimate ET reading of 0.0.

Usage of a rain sensor connected to the controller's sensor input terminals is recommended for these installations.

To enable the Rain Master Weather Station as the ET data source device refer to 7.5 WEATHER STATION.

8.6.4 ET Data from the Internet

Your Rain Master Eagle controller can be configured with a communications card (iCentral card) to allow it to be controlled and manipulated over the Internet using Rain Master's web site www.rainmaster.com. As part of the service you may optionally elect to have ET data sent to your controller on a daily basis. Refer to paragraph 6.12 COMMUNICATIONS (ENABLING) in order to enable Internet communications.

9.0 TROUBLESHOOTING

9.1 MONITORING STATION FLOW

If the flow features have been enabled, using SETUP, there are three ways to observe the measured flow in gallons per minute (GPM), of any station:

1. The measured flow is automatically displayed when the controller is executing one or more programs.

2. When a manual system check is performed, the flow is shown for each station. Refer to MANUAL SYSTEM CHECK for details.

3. When in SETUP mode, the measured flow can be observed on a per station basis when utilizing the LIMITS sub-function. Refer to the LIMITS SETUP feature in the ADVANCED SETUP PROGRAMMING section, of this manual, for more details.

9.2 FAULT DETECTION OVERVIEW

The Rain Master Eagle has the ability to detect and take corrective action for a number of field related failure conditions. The operator is informed of any fault condition when the display alternates with the following words:

FAULT	PRESS	REVIEW

In addition to the display indication, the controller will sound an audible alarm once every six seconds signifying a fault occurrence.

📝 *The audible alarm may be disabled using the SETUP function.*

Pressing the REVIEW key reveals the specific fault type and momentarily suspends the audible alarm.

WIRING	=	The problem is a field wiring short circuit on a station. The station lights will illuminate to indicate which station(s) have faults.
FLOWMAIN	=	The problem is a Main Line Flow limit violation. Pressing the REVIEW key again reveals the measured GPM at the time the fault occurred.
FLOW UN	=	The problem is an Unscheduled Flow limit violation. Pressing the REVIEW key reveals the measured GPM at the time the fault occurred.
FLOW STA	=	The problem is a station Upper Flow limit violation. The station lights illuminate to show which station(s) are involved. Pressing the REVIEW key again reveals the measured GPM at the time the fault occurred.

Whenever a specific fault is displayed it can be cleared by pressing the CLEAR key. If the CLEAR key is not pressed, the QUIT key will return the controller to the Automatic Mode without clearing the fault condition.

9.2.1 Wiring Fault

The Rain Master Eagle has been equipped to detect station short circuits which may occur due to improper field wiring or faulty valve solenoids. In the event a station draws excessive electrical current, the following action occurs:

- The offending station will be immediately turned off.
- The next scheduled station of the program will be started.
- FAULT…PRESS…REVIEW…will appear in the display.
- The controller will continue to execute programs; however, any faulted station(s) will not be turned on again.

If multiple stations are on simultaneously, and the controller detects an over current fault, all running stations will be diagnosed as faulty.

If a short circuit occurs at the Normally Closed Master Valve and the program has been SETUP to use a Master Valve, the controller will successively condemn all remaining stations in the program. Upon reviewing the fault, all stations of the program shall illuminate, indicating that the problem appears to be the Master Valve.

User Action:

1. Excessive station current may be due to an inadvertent direct connection between the station wire and the common wire.
2. Check for exposed wiring in a flooded valve box.
3. Check for a faulty valve solenoid.
4. When corrective action has been completed, the fault should be cleared.

9.2.2 Main Flow Limit Fault

The Main Line flow limit, for the controller, has been exceeded.

- All running programs are terminated.
- FAULT…PRESS…REVIEW…will appear in the display.
- If the Master Valve for the controller has been setup as a Normally Open (NO) Master Valve, then this terminal will be energized with 24 VAC (Master Valve will be closed).
- All scheduled start times for future programs will be ignored (no programs will start).
- The controller remains in this state until the fault is cleared by you.

User Action:

1. Inspect the main line as well as major branches for failure.
2. Examine the main line limits to ensure they have been correctly established. If the controller has been setup for NO STACK operation, multiple stations may be on at the same time. The main line limit should be larger than the sum of the flow totals of all simultaneously "on" stations.
3. When corrective action has been completed, the fault should be cleared.

9.2.3 Flow Unscheduled Fault

The Unscheduled Flow limit has been exceeded. The controller tests for unscheduled flow whenever the controller is not performing any irrigation. With no programs running and a Normally Closed Master Valve, the typical installation should have no flow and the limit should be set to zero.

For systems which have a Normally Open Master Valve and the possibility of supplemental watering due to quick coupler manual devices, you have the option of setting a non-zero value, which is allowed when the controller does not have any active stations. If this value is exceeded the unscheduled flow fault occurs.

- All running programs are terminated.
- FAULT…PRESS…REVIEW…will appear in the display.
- If the master valve for the controller has been setup as a Normally Open (NO) Master Valve, then the terminal will be energized with 24 VAC (Master Valve will be closed).
- All scheduled start times for future programs will be ignored (no programs will start).
- The controller remains in this state until the fault is cleared by you.

User Action:

1. The user should check for leaks, broken pipe(s), or physical damage.
2. Check the system for any stuck valves from a previous scheduled irrigation cycle.
3. Check that the Unscheduled Flow limit has been properly established. If quick coupling devices were on at the time the alarm occurred, ensure that there are enough margins for the unscheduled flow limit.
4. When corrective action has been completed, the fault should be cleared.

9.2.4 Flow Station Fault

The Flow Station fault occurs whenever the measured flow is more than the expected flow (upper station limit failure). Each time a station overflow condition is detected the following action occurs:

- The offending station will be immediately turned off.
- The next scheduled station of the program will be started.
- FAULT…PRESS…REVIEW…will appear in the display.
- The controller will continue to execute programs; however, any faulted station(s) will not be turned on again.

If multiple stations are on simultaneously, and the controller detects an overflow fault, all running stations will be diagnosed as faulty.

User Action:

1. Check for:

a. An improperly adjusted valve, this is a valve which does not come on even if 24 VAC is applied.

b. Check the field wiring between the Rain Master Eagle Controller and the valve. This can be accomplished by manually turning on the valve using the Rain Master Eagle Controller, see 572 MANUAL Station and measuring 24 VAC directly at the valve.

c. If all stations generate a "NO FLOW" alarm condition check the following:

• Flow sensor wiring and setup.

• Proper operation of the Master Valve and/or Pump.

• The main water supply for the system.

When corrective action has been completed, the fault should be cleared by you.

9.2.5 No Flow Station Fault

The No Flow Station fault occurs whenever a station is activated, which has an established or learned flow limit and the station measured flow is zero gallons-per-minute. Each time a station No Flow condition is detected the following action occurs:

- The offending station will be immediately turned off.
- The next scheduled station of the program will be started.
- FAULT…PRESS…REVIEW…will appear in the display.
- The controller will continue to execute programs; however, any faulted station(s) will not be turned on again.

If multiple stations are on simultaneously, and the controller detects a No Flow Station fault, all running stations will be diagnosed as faulty.

User Action:

1. Check for:

a. An improperly adjusted valve (valve does not come on even if 24 VAC is applied).

b. Check the field wiring from the controller to the valve. This can be accomplished by turning the valve on using the controller's front panel (see 572 MANUAL Station) and measuring 24 VAC directly at the valve.

c. If all stations indicate "NO FLOW" check the following:

- Flow Sensor wiring and setup.
- Proper operation of Master Valve and/or the Pump.
- Main water supply to the system.

When corrective action has been completed, the fault must be cleared by you.

Table 9 - Troubleshooting Assistant

Symptom	Action
Display is blank.	1. Ensure controller has power and all wires are properly connected. 2. Check secondary voltage of transformer for 24 VAC.

No stations turn on automatically.	1. Is the controller in Automatic Mode?
	
	   If No, press **QUIT**
	
	2. Ensure the Rain Switch is in the "Auto Watering" position.
	
	3. Does * appear in left most position of the display? If yes, the Rain Sensor is enabled and reading a WET condition. (See SETUP to resolve.)
	
	4. Does ⊠ appear in left most position of display? If yes, Odd/Even Watering is enabled and today is a non-watering day. (See SETUP to resolve.)
	
	5. Ensure that the Master Valve, Pump wiring, and setup is correct.
	
	6. Activate Manual System Check. If station turns on, review programs:
	   • Water Days
	   • Station Runtimes
	   • Percentages Valid
	   • Start Times

Display alternates with FAULT... PRESS... REVIEW	A problem with either flow or station field wiring has occurred.

A station remains on.	Place Rain Switch in "No Watering" position.
	
	If station remains on:
	   • check for dirt in valve's solenoid which will cause the solenoid to stick.
	   • check for obstructions in valve or torn diaphragm.
	If station goes off then:
	   • check station's programmed watering time.
	   • check program percentage.

Flow reading "000 GPM" when water flowing.	Check installation / connections.

The following table lists some common ET error symptoms and corrective actions:

Table 10 - ET Troubleshooting Assistant

Symptom	Action
Water Percentage Budget is always equal to PT - XXX (should be: ET - XXX)	Enable the irrigation program for ET operation. (See 7.2 ET MODE).
ET programs are always over-watering. Press the Water % Budget key, the display indicates: ET - 1XX.	1. Verify that you have obtained the correct historical ET data. (See 8.2 OBTAINING THE HISTORICAL ET DATA). 2. Verify that the reference program has been properly entered. (See 8.3 GENERATE THE REFERENCE PROGRAM). 3. Verify that you have entered the correct ET reference value. (See 8.4 ESTABLISH THE ET REFERENCE VALUE).
The station runtimes in ET programs never change. Press the Water % Budget key, the display indicates: ET - 100.	1. Verify that you have entered the correct ET reference value. (See 7.3 ENTERING THE ET REFERENCE VALUE). 2. Verify that you have entered the Historical ET Monthly values. (See7.4 ENTERING HISTORICAL ET MONTHLY VALUES).
Weather Station device is enabled, but the display indicates historical data is being used. Press the ET key, the display indicates: ET - H .XX (should be: ET - D .XX)	1. Device must have a 24 hour (midnight to midnight) accumulation before the Weather Station data is considered valid and then used in runtime calculations. 2. If power is lost for more than one (1) hour, the controller will use historical ET data.

A APPENDIX – CONTROLLER DISPLAYS

A.1 MESSAGE AND PROMPT DISPLAY

A.1.1 HELLO Mode

| HELLO | = "HELLO" will be displayed when the controller is powered up for the first time. When HELLO is displayed the controller has NO user irrigation programs stored. |

> 📝 **After 6 hours in the HELLO mode the controller will begin to water every station for 10 minutes. The 10-minute watering cycle per station will repeat every 24 hours.**
>
> **Hitting any key exits HELLO mode, and removes the default watering program.**

A.1.2 Automatic Mode Display

| 3:13 PM | = Display time-of-day for 5 seconds |

The display will then alternate to,

| 11/23/02 | = Display Date for 5 seconds and then repeat the cycle continuously. |

A.1.3 ET Prompts and Displays

| ET-H .28 | = Display yesterday's Historical ET value, this value will be used in today's irrigation programs calculations. |

| ET-I .28 | = Display yesterday's Internet ET value, this value will be used in today's irrigation programs calculations. |

| ET-D .28 | = Display yesterday's Weather Station Device ET value, this value will be used in today's irrigation programs calculations. |

| ET-M .28 | = Display yesterday's manually entered ET value; this value will be used in today's irrigation programs calculations. This display is also presented when a manual ET value is to be entered. |

| ET 1234 | = Enable/Disable the ET program mode, on a per program basis. |

| ETREF .10 | = Display and enter the Historical ET Reference value. The value is used in all subsequent irrigation calculations. |

| ETJAN .23 | = Display or enter the Historical ET month of January value. The value is used in all subsequent irrigation calculations. |

| ETFEB .13 | = Display or enter the Historical ET month of February value. The value is used in all subsequent irrigation calculations. |

| ETMAR .14 | = Display or enter the Historical ET month of March value. The value is used in all subsequent irrigation calculations. |

`ETAPR .18` = Display or enter the Historical ET month of April value. The value is used in all subsequent irrigation calculations.

`ETMAY .21` = Display or enter the Historical ET month of May value. The value is used in all subsequent irrigation calculations.

`ETJUN .17` = Display or enter the Historical ET month of June value. The value is used in all subsequent irrigation calculations.

`ETJUL .33` = Display or enter the Historical ET month of July value. The value is used in all subsequent irrigation calculations.

`ETAUG .36` = Display or enter the Historical ET month of August value. The value is used in all subsequent irrigation calculations.

`ETSEP .31` = Display or enter the Historical ET month of September value. The value is used in all subsequent irrigation calculations.

`ETOCT .33` = Display or enter the Historical ET month of October value. The value is used in all subsequent irrigation calculations.

`ETNOV .29` = Display or enter the Historical ET month of November value. The value is used in all subsequent irrigation calculations.

`ETDEC .35` = Display or enter the Historical ET month of December value. The value is used in all subsequent irrigation calculations.

`DVICE ON`   `DVICE OFF` = Enable/Disable the ET Weather Station device.

`DCNT .92` = If device is enabled, display the current accumulated value of ET data. This value will be used in tomorrow's calculations and the total accumulation will be stored at midnight.

A.1.4 PROGRAM Prompts and Displays

`PROG-1` = Select Program One (1) for programming, modification or review.

`PROG-2` = Select Program Two (2) for programming, modification or review.

`PROG-3` = Select Program Three (3) for programming, modification or review.

`PROG-4` = Select Program Four (4) for programming, modification or review.

A.1.5 WATER DAYS Prompts and Displays

2 WDAY- 2 = Based on a seven (7) day watering cycle, enable or disable water days on a per program basis. Display indicates Program 2 selected and Monday has been entered as a Water Day.

A.1.6 STATIONS Prompts and Displays

2 PT- 120 = Displays the current Water Percentage Budget value, for the selected irrigation program. The value displayed is used as a factor to increase or decrease the base watering time, 100% represents no change to the base watering time. In this example the base watering time is increased by 20%.

3 ET-200 = Displays the calculated ET Water Percentage value, for the selected irrigation program. The value displayed is used as a factor to increase or decrease the base watering time, 100% represents no change to the base watering time. In this example the base watering time is increased by 100%.

2 STA-31 = Enter the station number to be modified or reviewed, on a per irrigation program basis. In this example modify or review program number two (2), station number thirty-one (31).

2 12-LN = Controller prompts operator to enter the watering time for program number two (2), station number twelve (12).

A.1.7 START TIMES Prompts and Displays

START = When entering Start Times for a given irrigation program the controller will prompt the operator by first displaying START.

TIME 2 = Then the Start Time number to be entered or modified. The controller supports five start times per irrigation program.

2 1:30PM = Then the irrigation program number, followed by the actual start time.

A.1.8 QUICK STATIONS Prompts and Displays

| `2 PT- 100` | `3 ET- 125` | = | If the irrigation program is a conventional program the Water Percentage Budget value is briefly displayed. |

If the irrigation program is an ET based program the ET Percentage Adjust value is briefly displayed.

| `2 LO- 14` | = | Prompts you to enter the lowest or starting station number, for each irrigation program. In this example irrigation program two (2) and starting with station number fourteen (14). |

| `2 HI-23` | = | Prompts you to enter the highest or final station number, for each irrigation program. In this example irrigation program two (2) and ending with station number twenty-three (23). |

| `2 LN-0:15` | = | Prompts you to enter the watering time (runtime) of all stations selected in the previous two prompts. In this example, irrigation program two (2), will have a watering time of fifteen (15 minutes) per station. |

A.1.9 WATER % BUDGET Prompts and Displays

| `2 PT- 185` | = | If the irrigation program is a conventional program the Water Percentage Budget value is displayed. This example indicates that the base watering time will be increased by 85%. |

| `2 ET- 150` | = | If the irrigation program is an ET based program the ET Percentage Adjust value is displayed. This example indicates that the base watering time will be increased by 50%. |

A.1.10 REVIEW Prompts and Displays

| `2 PROG` | = | Indicates the irrigation program which is about to be reviewed in subsequent displays and prompts. |

| `TOTAL` | `09H 45M` | = | Total run length of the selected irrigation program. The controller will briefly display TOTAL then the run length of the irrigation program in Hours and Minutes. |

| `TOTAL` | `GALLONS` | `12345` | = |

The controller displays the total gallons of water used since last reset.

The controller will briefly display TOTAL, then briefly display GALLONS, then display the number of gallons.

In this example 12,345 gallons were used.

| `SNSR-WET` | `SNSR-DRY` | = | If the rain sensor is enabled during SETUP, the program review indicate the state of the sensor/controller. If raining, the controller will display SeNSoR WET. If conditions are clear the controller will display SeNSoR DRY. |

`START`   `TIME 2`   `2 11:59AM`   =

The controller will sequentially display the five start times associated with each irrigation program. The controller will briefly display START, then briefly display TIME 2 (1 – 4), then display the irrigation program number and the start time.

`2 WDAY-2`   =   If irrigation is based on a seven day cycle, then the controller will display this prompt and water days will be displayed on the STATIONS/DAYS display. In this example the irrigation program is program number two (2) and the water day is Monday (2).

`2 SD-01`   =   If irrigation is based on a thirty day cycle, then the controller will display the number of days between watering cycles. In this example the irrigation program is program number two (2) and the number of Skip Days is one (1).

`2 LFT-03`   =   If irrigation is based on a thirty day cycle, then the controller will display and prompt for the number of days before the cycle starts (Days LeFT). In this example the irrigation program is program number two (2) and has three (3) days left before the irrigation cycle starts.

`O/E EVEN`   `O/E EVEN`   =   If the irrigation program is configured for ODD or EVEN watering days the configuration will be displayed during review in this format. The display will indicate O/E EVEN or O/E ODD. If ODD or EVEN watering has not been selected within SETUP, this display will not be presented.

`2 PT- 124`   =   If the irrigation program is a conventional program the Water Percentage Budget value is displayed. This example indicates that the base watering time will be increased by 24%.

`2 ET-085`   =   If the irrigation program is an ET based program the ET Percentage Adjust value is displayed. This example indicates that the each station runtime will be decreased by 15%.

`STATIONS`   =   The controller displays the selected stations and their associated water run lengths, on a per program basis.

Depression of the REVIEW key will display the prompt STATIONS.

`RUN TIME`   =   The next depression of the REVIEW key will display the prompt RUNTIME.

`2 02-0:19`   =   The next depression of the REVIEW key will display the irrigation program number, the station number and the watering time in hours and minutes. The controller will repeat the display cycle for each configured station.

`MAX TIME`   =   If the irrigation program is a Cycle and Soak irrigation method, then the MAXTIME or the time the valve is on, prompt will be displayed.

`2 02-4:00`   =   The controller automatically rotates to the display of the maximum runtime. The irrigation program number, the station number involved and the watering time in hours and minutes are displayed.

`SOAKTIME`	=	If the irrigation program is a Cycle and Soak irrigation method, then the SOAKTIME or the time the valve will be off, prompt will be displayed.
`2 02-0:00`	=	The controller automatically rotates to the display of the minimum soak time or none. The irrigation program number, the station number involved and the watering time in hours and minutes are displayed.

A.1.11 SETUP Prompts and Displays

`SETTIME`	=	Set the Time-of-Day, the controller will prompt for the SET TIME when no valid time has been previous entered.
`5:30PM`	=	Set the Time-of-Day, controller uses 12 hour clock format, the keyboard contains an AM/PM toggle key.
`SET DATE`	=	Set the current Date, the controller will prompt for the SET DATE and then display the required format.
`MMDDYY`	=	The controller will display this prompt after the SETDATE is displayed to indicate the required format of the entry.
`MV 1234`	=	Enable/Disable use of the Master Valve on a per program basis.
`TYPE - NC`	=	Select the type of Master valve to be used. NC = Normally Closed Master Valve NO = Normally Open Master Valve
`PUMP 1234`	=	Enable/Disable use of a Pump on a per program basis.
`STACK`	=	Select irrigation program Stack Mode. Stack Mode will sequentially run each program one after the other.
`NO STACK`	=	Select irrigation program No Stack Mode. No Stack Mode will simultaneously run all active programs.
`DELAY255`	=	Set inter-station delay time. The delay is used to allow one valve to completely shut off before the next valve is turned on.
`CODE 1234`	=	Set and select a four (4) digit Security Code. Unauthorized users will be unable to change or modify stored parameters.
`SNSR 1234`	=	Enable/Disable a connected Rain Sensor on a per program basis.
`ALARM ON` `ALARM OFF`	=	Enable/Disable Audible Alarm feature.
`SOAK 1234`	=	Enable/Disable Cycle and Soak irrigation on a per program basis.

`O/E OFF`　　`O/E ODD`　　`O/E EVEN`　=

    Enable/Disable ODD/EVEN Watering Control.

`ODD 1234`　　`EVEN 1234`　=   Enable/Disable ODD/EVEN Watering
Control on a per program basis.

`COMM OFF`　　`COMM ON`　=   Enable/Disable Rain Master iCentral
communications.

`FLOW ON`　　`FLOW OFF`　=   Enable/Disable Flow monitoring features.

`PIPE 1.00`　　`PIPE 1.25`　　`PIPE 1.50`

`PIPE 2.00`　　`PIPE 3.00`　　`PIPE 4.00`

`PIPEOTHR`　=   Select Flow monitoring Pipe size Selection of a pipe size is required
for accurate monitoring of water flow.

`MAIN 500`　=   Set Main Line Flow limits, in gallons-per-minute (GPM).

`UNSCH200`　=   Set Unscheduled Flow Limits, in gallons-per-minute (GPM).

`FDELAY 3`　=   Set a Flow Check Delay time, before the flow reading is analyzed, in
minutes.

`TOTAL`　　`GALLONS`　　`12345`　=

    The Total Gallons of water used since the controller was cleared. The display will
indicate "TOTAL", then "GALLONS", then the actual gallons number.

`PERCNT 20`　=   Select a tolerance percentage adjustment for all stations' Upper Flow
Limits. This feature provides a tolerance for variation in water
pressure.

`LIMIT 500`　=   Select the stations Upper Flow Limits, in Gallons-Per-Minute
(GPM).

`100 GPM`　=   This display appears in three different controller instances, if flow
monitoring has been enabled.

    1. Flashes when an irrigation program is executing.
    2. In Manual System Check/Syringe Cycle.
    3. Displayed when the controller is measuring flow while
LEARNING each stations Upper Flow Limit.

`123 200`　=   Measured flow is displayed on the left side of display and the upper
flow limit for the station on the right.

A.1.12 MANUAL Prompts and Displays

MANUAL	=	The MANUAL function allows you to independently control a station or an irrigation program.
P OR S	=	The controller prompts you to select a program to run or a station to turn-on.
PROG-	=	You have selected to manually start a program and the controller is prompting for the irrigation program to run.
STA-	=	You have selected to manually turn on a station and the controller is prompting for the valve (or station).
1- LN	=	You have selected to manually turn on a station and the controller is prompting for the runtime length.

A.1.13 SKIP DAYS Prompts and Displays

3 SD-	=	The SKIP DAYS key has been pressed and the controller will prompt for the number of days between irrigation cycles (30 day cycle).
3 LFT-00	=	The number of days left before the Skip Day's cycle will start irrigation.

A.1.14 CLEAR Prompts and Displays

OFF -	=	The controller program or function has been interrupted by the operator pressing CLEAR.
RA IN 1	=	Irrigation Program one is in Rain Shut-down Mode.

A.1.15 Flow Sensor Prompts and Displays

FLOW STA	=	Shown when REVIEW is pressed during a fault condition and the problem is a station upper flow limit violation. The faulty station(s) will be shown in the LED lights. Subsequent press of the REVIEW key shows the measured flow in GPM at the time the fault was detected.
FLOW UN	=	Shown when REVIEW is pressed during a fault condition and the problem is an unscheduled flow limit violation.
		Subsequent presses of the REVIEW key shows the measured flow in GPM at the time the fault was detected.
FLOWMA IN	=	Shown when REVIEW is pressed during a fault condition and the problem is a main line flow limit violation. Subsequent presses of the REVIEW key shows the measured flow in GPM at the time the fault was detected.

A.1.16 Miscellaneous Prompts and Displays

`1 1:36:09` =	Automatic program count down display. The controller is executing irrigation program number one and there is 1 hour, 36 minutes and 09 seconds before the program is complete.
	The controller will count down to zero then return to Automatic Mode.
`LOCKED` =	A security code has been entered and enabled. To access the controller's functions will require reentry of the access code.
`NO` =	The controller is indicating that you have entered invalid data or an out of range value.
`RAIN OFF` =	The entire controller is in Rain Shut-off Mode.
`OK` =	Okay, indicates an acceptance of an option or a data value.
`⧗  01:32` =	A program is running in the automatic mode but no stations are watering because ODD/EVEN watering schedule is enabled and an ODD or EVEN day exists.
`*  04:23` =	A program is running in the automatic mode but no stations are watering because the rain sensor is enabled and a wet condition exists.
`CHECK` =	In Manual System Check/Syringe Cycle and the flow sensor features are not enabled.
`WAIT` =	Flashes at about 1 second rate during power up (only if power up takes a long time; power up usually takes several seconds but under very unusual circumstances can take several minutes).

`FAULT` `PRESS` `REVIEW` =

Either an over-current or short circuit has occurred on one or more stations, field wires or valve solenoids OR a flow limit violation has occurred. Press REVIEW for more information.

`WIRING` =	Shown when REVIEW is pressed during a fault condition and the problem is an over-current or short circuit in the station field wiring. The faulty station(s) will be shown in the LED lights.
`NO FLOW` =	Shown when REVIEW is pressed during a fault condition and the problem occurs when a station is activated but no water is flowing. The faulty station(s) will be shown in the LED lights.
`WIRELESS` =	Displayed at any time the controller is receiving commands or information from the Rain Master iCentral web site.

A.2 DAYS/STATION NUMBER DISPLAY

The controller contains a secondary display which provides status on which Water Days have been selected and which stations have been selected for each executing irrigation program. This display consists of discrete Light Emitting Diodes (LED's) and is located directly above the Prompt and Message display, as depicted in Figure 12 - Rain Master Eagle Keyboard Configuration.

When the controller is in Automatic Mode, the day of the week is displayed on the DAYS/ STATION NUMBER display.

B APPENDIX – FLOW SENSOR PART LIST

B.1 RAIN MASTER FLOW SENSOR PART NUMBERS

Use the following table to determine the part number for your pipe size:

Table 11 - Flow Sensor Part Numbers

Pipe Size (inches)	Rain Master Part Number	Material Type
1.00	FS-B100	bronze
1.25	FS-B125	bronze
1.50	FS-B150	bronze
2.00	FS-B200	bronze
2.50	FS-B250	bronze
1.50	FS-150	PVC
2.00	FS-200	PVC
3.00	FS-300	PVC
4.00	FS-400	PVC

C Appendix – Programming Examples

C.1 Basic Programming Example – Public Park

Let's get started by using the Rain Master Eagle Controller in the roll of a conventional irrigation controller. We will construct a common irrigation program to illustrate the use of the Rain Master Eagle Controller. The programming example will describe the situation and then provide step-by-step instructions for the entry of the entire program.

Our example will be a small public park. The park is used during the daylight hours and must be watered early in the morning or after sunset.

Project: Public Park

Project Description:

4. Large sections of turf grass, irrigated by eighteen (18) separate valves.
5. Various sections of hedges and shrubs, irrigated by eight (8) separate valves.
6. Bedding flowers and annuals, irrigated by six (6) separate valves.
7. Various trees, irrigated by four (4) separate valves.

Watering Requirements:

1. Turf grass must be watered two times a day, once in the early morning and once at night. Each valve will be on for 15 minutes.
2. Hedges and shrubs must be watered three times a week, Monday, Wednesday and Friday. Each valve will be on for 20 minutes.
3. Flowers and annuals must be watered once a day in the early morning. Each valve will be on for 10 minutes.
4. The trees must be watered once every two weeks. Each valve will be on for 30 minutes.

Rain Master Eagle Controller Requirements:

1. Will Require the use of the four independent programs.
2. Water pressure is not a problem, so the controller can utilize No Stack mode.
3. More then one program can be run simultaneously.
4. Controller must be capable of controlling 36 stations (valves).
5. Watering must be complete by 7:30 AM each morning. Evening watering must not start before 7:30 PM.

The following paragraphs will provide guidance in establishing your new controller and assist you in implementing the many features of your product.

Configure the Controller:

Before the controller can be fully utilized, you need to enter some basic information. This includes the date and time and the operation mode of a basic irrigation program.

EXAMPLE: Set Time-Of-Day and Date, the time is 8:30 AM, Tuesday, March 26, 2002,

Press: **SETUP**

Controller will display: **SETTIME**   **12:00AM**

Press: **8** **3** TUE **0** **ENTER**

Controller will display: **SET DATE**   **MMDDYY**

Press: **0** **3** TUE **2** MON **6** FRI **0** **2** MON **ENTER**

Controller will display: **MV 1234**

Press: **SETUP**   Until display indicates: **STACK**

Press: **1** SUN   Until display indicates: **NO STACK**

Continue to Press: **ENTER** **QUIT**

The Controller returns to the Automatic Mode.

Configuration of the Rain Master Eagle Controller is complete; we are now ready to enter the program parameters.

Configure Program One:

The Turf grass program consists of eighteen (18) valves; each valve is on for fifteen (15) minutes, once in the early morning and once at night.

EXAMPLE: Set the Controller to Program One (1)

Press: | PROGRAM | | **1** SUN | | ENTER |

The Controller returns to the Automatic Mode.

EXAMPLE: Set Program One (1) of the Controller to water everyday.

Press:

| WATER DAYS | | **1** SUN | | ENTER | | **2** MON | | ENTER |

| **3** TUE | | ENTER | | **4** WED | | ENTER |

| **5** THU | | ENTER | | **6** FRI | | ENTER |

| **7** SAT | | ENTER |

| QUIT |

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered. The display will indicate Sunday – Saturday has been selected (S – S).

The Controller returns to the Automatic Mode.

Because all stations have the same watering length of 15 minutes, we will utilize the QUICK STATIONS programming method, to set the stations and their runtimes.

EXAMPLE: Set Stations 1 – 18 for a runtime of fifteen (15) minutes

Press: **QUICK STATIONS**

Controller will display: `1PT-100`   `1L0-`

Press: **1 SUN** **ENTER**   Until display indicates: `1 H1-`

Press: **1 SUN** **8** **ENTER**

Controller will display: `1 LN-0:00`

Press: **1 SUN** **5 THU** **ENTER**

The Controller returns to the Automatic Mode.

The final setting is the start times of the program. Program One (1) is to water in the morning and in the evening.

The morning watering must be complete by 7:30 AM and evening watering must not start before 7:30 PM. The longest watering cycle will be Program One (1). Use the REVIEW key to check the total water length (WATER WINDOW) of Program One (1).

EXAMPLE: Check watering length of Program One (1)

Press: **PROGRAM** **1 SUN** **ENTER** **REVIEW** **REVIEW**

Controller will display: `TOTAL`   `04H 30M`

The controller has calculated the total watering time of Program One (1), to be 4 hours and 30 minutes. To complete watering by 7:30 AM will require a morning start time of 3:00 AM. The evening. Start Time will be 7:30 PM.

Press: **QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: Set Start Time Number One to 3:00 AM and Start Time Number Two to 7:30 PM

Press: **START TIMES**

Controller will display: START   TIME 1   10:00AM

Press: **3 TUE** **0** **0** **ENTER**

Controller will display: START   TIME 2   10:00AM

Press: **7 SAT** **3 TUE** **0** **AM / PM** **ENTER** **QUIT**

The controller returns to the Automatic Mode.

This completes the setup of irrigation Program Number One (1). We will now enter irrigation Program Number Two (2).

Configure Program Two:

The hedge and shrubs program consists of eight (8) valves; each valve is on for twenty (20) minutes and will be watered during the night.

EXAMPLE: Set the Controller to Program Two (2)

Press: **PROGRAM** **2 MON** **ENTER**

The Controller returns to the Automatic Mode.

EXAMPLE: Set Program Two (2) of the Controller to water Monday, Wednesday and Friday

Press:

WATER DAYS **2 MON** **ENTER** **4 WED** **ENTER**

6 FRI **ENTER**

QUIT

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered. The display will indicate Monday, Wednesday and Friday have been selected (M, W, and F).

The Controller returns to the Automatic Mode.

Because all stations have the same watering length of 20 minutes, we will utilize the QUICK STATIONS programming method, to set the stations and their runtimes.

EXAMPLE: Set Stations 19 – 26 for a runtime of twenty (20) minutes

Press: [QUICK STATIONS]

Controller will display: `2 PT- 100`   `2 LO-`

Press: [1 SUN] [9] [ENTER]

Controller will display: `2 H1-`

Press: [2 MON] [6 FRI] [ENTER]

Controller will display: `2 LN-`

Press: [2 MON] [0] [ENTER]

The Controller returns to the Automatic Mode.

The final setting is the start time of the program. Program Two (2) is to water in the evening. The evening watering must not start before 7:30 PM. Use the REVIEW key to check the total water length (WATER WINDOW) of Program Two (2).

EXAMPLE: Check watering length of Program Two (2)

Press: [PROGRAM] [2 MON] [ENTER] [REVIEW] [REVIEW]

Controller will display: `TOTAL`   `02H 40M`

The controller has calculated the total watering time of Program Two (2), to be 2 hours and 40 minutes. The evening Start Time will be 7:30 PM.

Press: [QUIT]

The controller will return to the Automatic Mode.

EXAMPLE: Set Start Time Number One to 7:30 PM

Press: | START TIMES |

Controller will display: | START | TIME 1 | 10:00AM |

Press: | **7** SAT | | **3** TUE | | **0** | | AM/PM | | ENTER | | QUIT |

The controller returns to the Automatic Mode.

This completes the setup of irrigation Program Number Two (2). We will now enter irrigation Program Number Three (3).

Configure Program Three:

The flowers and annuals program consists of six (6) valves; each valve is on for ten (10) minutes in the early morning.

EXAMPLE: Set the Controller to Program Three (3)

Press: | PROGRAM | | **2** MON | | ENTER |

The Controller returns to the Automatic Mode.

EXAMPLE: Set Program Three (3) of the Controller to water everyday

Press:

| WATER DAYS | | **1** SUN | | ENTER | | **2** MON | | ENTER |

| **3** TUE | | ENTER | | **4** WED | | ENTER |

| **5** THU | | ENTER | | **6** FRI | | ENTER |

| **7** SAT | | ENTER |

| QUIT |

The Watering Days will be indicated in the STATIONS/DAYS display as they are entered. The display will indicate Sunday – Saturday has been selected (S – S).

The Controller returns to the Automatic Mode.

Because all stations have the same watering length of 10 minutes, we will utilize the QUICK STATIONS programming method, to set the stations and their runtimes.

EXAMPLE: Set Stations 27 – 32 for a runtime of ten (10) minutes

Press: **QUICK STATIONS**

Controller will display: `3 PT- 100`   `3 L0-`

Press: **2** MON   **7** SAT   **ENTER**

Controller will display: `3 H1-`

Press: **3** TUE   **2** MON   **ENTER**

Controller will display: `3 LN-0:00`

Press: **1** SUN   **0**   **ENTER**   **QUIT**

The Controller returns to the Automatic Mode.

The final setting is the start time of the program. Program Three (3) is to water in the morning. The morning watering must be complete by 7:30 AM. Use the REVIEW key to check the total water length (WATER WINDOW) of Program Three (3).

EXAMPLE: Check watering length of Program Three (3)

Press: **PROGRAM**   **3** TUE   **ENTER**   **REVIEW**   **REVIEW**

Controller will display: `TOTAL`   `0 1H 00M`

The controller has calculated the total watering time of Program Three (3), to be 1 hour. To complete watering by 7:30 AM will require a morning start time of 6:30 AM.

Press: **QUIT**

The controller will return to the Automatic Mode.

EXAMPLE: Set Start Time Number One to 6:30 AM

Press: **START TIMES**

Controller will display: `START`   `TIME 1`   `3 0:00AM`

Press: **6** FRI   **3** TUE   **0**   **ENTER**   **QUIT**

The controller returns to the Automatic Mode.

This completes the setup of irrigation Program Number Three (3). We will now enter irrigation Program Number Four (4).

Configure Program Four:

The trees program consists of four (4) valves; each valve is on for ten (10) minutes once every two weeks and we will water in the evening.

EXAMPLE: Set the Controller to Program Four (4)

Press: **PROGRAM**   **4** WED   **ENTER**

The Controller returns to the Automatic Mode.

We will use the Skip Days feature of the controller to set a watering schedule of every two weeks or fourteen days (SD). The watering cycle will start tomorrow or one day left before the watering cycle starts (LFT).

EXAMPLE: Set Program Four (4) of the Controller to water every fourteen (14) days

Press: **SKIP DAYS**   Controller will display: `4 SD`

Press: **1** SUN   **4** WED   **ENTER**

Controller will display: `4 LFT`

Press: **1** SUN   **ENTER**

The Controller returns to the Automatic Mode.

In this example we will individually set each value or station and it's associated runtime. All stations have a runtime of 30 minutes. The valve or station numbers are 33 – 36.

EXAMPLE: Set Stations 33 – 36 for a runtime of thirty (30) minutes

Press: [STATIONS] Controller will display: `4 PT- 100`   `4 STA-`

Press: [3 TUE] [3 TUE] [ENTER]

Controller will display: `4 33- 0:00`

Press: [3 TUE] [0] [ENTER]

Controller will display: `4 STA-`

Press: [3 TUE] [4 WED] [ENTER]

Controller will display: `4 34- 0:00`

Press: [3 TUE] [0] [ENTER]

Controller will display: `4 STA-`

Press: [3 TUE] [5 THU] [ENTER]

Controller will display: `4 35- 0:00`

Press: [3 TUE] [0] [ENTER]

Controller will display: `4 STA-`

Press: [3 TUE] [6 FRI] [ENTER]

Controller will display: `4 36- 0:00`

Press: [3 TUE] [0] [ENTER] [QUIT]

The controller will display the selected valves or stations in the STATIONS/DAYS display as they are entered.

The Controller returns to the Automatic Mode.

The final setting is the start time of the program Program Four (4) is to water in the evening.

The evening watering must not start before 7:30 PM. Use the REVIEW key to check the total water length (WATER WINDOW) of Program Four (4).

EXAMPLE: Check watering length of Program Four (4)

Press: [**PROGRAM**]   [**4** WED]   [**ENTER**]   [**REVIEW**]   [**REVIEW**]

Controller will display: [TOTAL]   [02H 00M]

The controller has calculated the total watering time of Program Four (4), to be 2 hours

Press: [**QUIT**]

The controller will return to the Automatic Mode

EXAMPLE: Set Start Time Number Four to 7:30 PM

Press: [**START TIMES**]

Controller will display: [START]   [TIME 1]   [4 0:00AM]

Press: [**7** SAT]   [**3** TUE]   [**0**]   [**AM / PM**]   [**ENTER**]   [**QUIT**]

The controller returns to the Automatic Mode

This completes the setup of irrigation Program Number Four (4). We have now completed the entire entry of our basic irrigation programming of the Public Park Project example.

C.2 Flow Monitor Programming – Public Park

This is a continuation of our small public park example. In the BASIC PROGRAMMING section we configured the controller and created the four irrigation programs. In this section we will use some of the flow management features of the Rain Master Eagle controller to enhance the irrigation system, provide protection in case of water line breaks, and automatically shutdown the system when it rains.

Project: Public Park

Project Description:

The table indicates the type of water flow which may be expected based on the use of some common sprinkler head types.

The greatest water volume demand is the large area rotors and would require a Main Line pipe size of two (2) inches. The controller supports this as a standard pipe/flow sensor size (PIPE 200); please refer to B APPENDIX – FLOW SENSOR PART LIST.

The flow metering device and Normally Closed Master Valve will be installed on the Main Water Line.

The following new features are added to our example:

1. The installation will include the use of a Normally Closed Master Valve. The controller will open the Master Valve at the start of any irrigation program.
2. The installation will include the use of a flow monitoring sensor. The controller will monitor the flow of water during programmed irrigation cycles and display the combined flow of all stations operating. Any above limit water flow will be detected and the controller will shut down irrigation and alert you to the problem.
3. The installation will include the use of a Rain Sensor. If rain is detected the Rain Master Eagle will automatically turn-off irrigation. Once the rain storm is over, and the sensor has dried out, the controller will automatically restart the irrigation programs.

Table 12- Water Demand

Plant Type	Number of Valves	Heads per Valve	Gallons per Head (GPM)	Total GPM
Turf grass	18	4 rotors	20	80
Shrubs	8	10 shrub heads	1.5	15
Flowers	6	10 spray heads	.85	8.5
Trees	4	10 shrub heads	1.5	15
			TOTAL	118.5

Table 13 – 30-Day Water Usage

Plant Type	Watering Cycle	Length of Watering	Gallons per Watering	30-day Water Usage (gallons)
Turf grass	2 times per day	15 minutes (4 hr, 30 min)	21,600	1,296,000
Shrubs	3 times per week	20 minutes (2 hr, 40 min)	2,400	28,800
Flowers	1 time per day	10 minutes (1 hour)	510	15,300
Trees	1 time per 14 days	30 minutes (2 hours)	1800	3,600
			TOTAL	1,343,700

Rain Master Eagle Controller Requirements:

1. Use a Normally Closed Master Valve
2. Enable Flow Sensing
3. Controller will use No Stack mode
4. Controller will monitor a Rain Sensor

Configure Master Valve:

The Rain Master Eagle will use a Normally Closed Master Valve Installation of the Master is depicted in 3211 Electrical Connections for a Master Valve.

EXAMPLE: Enable the Master Valve for Programs 2, 3, and 4

Continue to Press: **SETUP**   Until display indicates: `MV   1234`

Press: **ENTER**

Display will indicate: `TYPE-NC`

Continue to Press: **ENTER**   Until display indicates: `PUMP`

The Rain Master Eagle is now configured to use a Normally Closed Master Valve for all programs. The Master Valve will open when any irrigation program runs.

Press: **QUIT**

The Controller will return to the Automatic Mode.

EXAMPLE: Enable the Rain Sensor for all programs.

Continue to Press: **SETUP**   Until display indicates: `SNSR`

Press: **1 SUN** **2 MON** **3 TUE** **4 WED** **ENTER**

Display will indicate: `SNSR 1234`

The Rain Master Eagle is now configured to use a Rain Sensor for all programs. The controller will automatically shut off irrigation if a rain storm occurs and will automatically restart irrigation after the rain storm has passed and the rain sensor has dried out.

Press: **QUIT**

The Controller will return to the Automatic Mode.

EXAMPLE: Enable the Flow Sensor,

Continue to Press: **SETUP**   Until display indicates: `FLOW`

Press: **1 SUN**   **ENTER**

Display will indicate: `FLOW ON`

Continue to Press: **SETUP**   Until display indicates: `PIPE 1.50`

Press: **1 SUN**   **ENTER**

Display will indicate: `PIPE 2.00`

The Flow Sensor has been enabled for a pipe size of 2 inches and is applicable to all irrigation programs.

Irrigation programs one (1), two (2), and three (3) use approximately 104 gallons-per-minute when running simultaneously (see Table 12- Water Demand). To provide Main Line break notification, we will set the Main Line Flow Limit to 125 GPM. This is the approximate sum of the three stations operating simultaneously, plus a 20 percentage water fluctuation allowance.

Continue to Press: **SETUP**   Until display indicates: `MAIN 500`

Press: **1 SUN**   **2 MON**   **5 THU**   **ENTER**

Display will indicate: `MAIN 125`

The Unscheduled Flow Limit is the maximum flow that the Rain Master Eagle will allow whenever **the Rain Master Eagle controller is not in use. This feature is used when a Normally Open Master Valve has been installed and you wish to have a small amount of water available for manual use.**

When Unscheduled Flow Limit is used with a Normally Closed Master Valve, as in our example, the limit should be set to zero GPM.

Continue to Press: **SETUP**   Until display indicates: `UNSCH025`

Press: **5 THU**   **ENTER**

Display will indicate: `UNSCH000`

This completes our simple setup of the Flow Monitoring features of the Rain Master Eagle controller. The Rain Master Eagle has additional flow monitoring features, including flow reading delays, a station LEARN mode, and Percentage adjustments. These features are covered in the General Programming section of the User Manual.

Press: **QUIT**

The Controller will return to the Automatic Mode.

C.3 ET Programming Example – Public Park

This will be the final modification to our small public park example. We will enable the irrigation programs to be Evapotranspiration based. This feature of the Rain Master Eagle controller will automatically adjust the base watering schedule for changes in the seasonal and daily weather patterns. Refer to Table 14 – 30-Day ET Adjusted Water Usage to review the ET water savings.

Table 14 – 30-Day ET Adjusted Water Usage

Plant Type	Watering Cycle	Length of Watering	Gallons per Watering	30-day Water Usage (gallons)
Turf grass	2 times per day	15 minutes (2 hr, 29 min)	11,920	715,200
Shrubs	3 times per week	20 minutes (1 hr, 28 min)	1,320	15,840
Flowers	1 time per day	10 minutes (33 minutes)	280.5	8,415
Trees	1 time per 14 days	30 minutes (55 minutes)	825	1,650
			TOTAL	**741,105**

The park will be located in GLENDALE, CALIFORNIA; Glendale is a suburb within the Los Angeles basin. The ET reference and the monthly ET values, for the Glendale area, will be taken and used directly from the ET Data Tables, RMIS Part Number 500048.

Rain Master Eagle Controller Requirements:

1. Enable ET watering mode for all programs
2. Enter the ET Reference value
3. Enter the ET monthly values
4. Turn the Weather Station Device off

Configure ET Mode:

EXAMPLE: Enable the ET Mode for all Programs.

Continue to Press: [**ET**]   Until display indicates: [*ET*]

Press: [**1** SUN] [**2** MON] [**3** TUE] [**4** WED] [**ENTER**]

Display will indicate: [*ET 1234*]

Press: [**QUIT**]

The Controller returns to the Automatic Mode.

Configure ET Reference Value:

EXAMPLE: Enter the ET Reference Value In your example the hottest month of the year for Glendale is July, which has an ET value of .22. This month will be used for the ET Reference value.

Continue to Press: [**ET**]   Until display indicates: [*ETREF .10*]

Press: [**2** MON] [**2** MON] [**ENTER**]

Display will indicate: [*ETREF .22*]

Press: [**QUIT**]

The Controller returns to the Automatic Mode.

Enter the Historical ET Monthly Values:

EXAMPLE: Enter Historical ET Monthly values as follows:

January = 07	July = 22
February = 09	August = 21
March = 12	September = 17
April = 16	October = 13
May = 17	November = 09
June = 20	December = 08

Continue to Press: **ET** Until display indicates: `ETJAN . 10`

Press: **0** **7** SAT **ENTER**

Display will indicate: `ETJAN .07`

Continue to Press: **ET** Until display indicates: `ETFEB . 10`

Press: **0** **9** **ENTER**

Display will indicate: `ETFEB .09`

Continue to Press: **ET** Until display indicates: `ETMAR . 10`

Press: **1** SUN **2** MON **ENTER**

Display will indicate: `ETMAR . 12`

Continue to Press: **ET** Until display indicates: `ETAPR . 10`

Press: **1** SUN **6** FRI **ENTER**

Display will indicate: `ETAPR .16`

Continue to Press: **ET** Until display indicates: `ETMAY . 10`

Press: **1** SUN **7** SAT **ENTER**

Display will indicate: `ETMAY . 17`

Continue to Press: **ET**   Until display indicates: `ETJUN.10`

Press: **2** MON   **0**   **ENTER**

Display will indicate: `ETJUN.20`

Continue to Press: **ET**   Until display indicates: `ETJUL.10`

Press: **2** MON   **2** MON   **ENTER**

Display will indicate: `ETJUL.22`

Continue to Press: **ET**   Until display indicates: `ETAUG.10`

Press: **2** MON   **1** SUN   **ENTER**

Display will indicate: `ETAUG.21`

Continue to Press: **ET**   Until display indicates: `ETSEP.10`

Press: **1** SUN   **7** SAT   **ENTER**

Display will indicate: `ETSEP.17`

Continue to Press: **ET**   Until display indicates: `ETOCT.10`

Press: **1** SUN   **3** TUE   **ENTER**

Display will indicate: `ETOCT.13`

Continue to Press: [ET]   Until display indicates: `ETNOV . 10`

Press: [0] [9] [ENTER]

Display will indicate: `ETNOV .09`

Continue to Press: [ET]   Until display indicates: `ETDEC . 10`

Press: [0] [8] [ENTER]

Display will indicate: `ETDEC .08`

Press: [QUIT]

The Controller returns to the Automatic Mode.

Review Program One SETUP:

All irrigation programs have been automatically adjusted for the time of year The irrigation reference schedule was set up for the hottest time of the year, which was July, August, and September In our example, the date of the controller is March 26, 2002 The controller will use ET historical data for the run time calculations.

Program one (1) was to water every day for 15 minutes July represents a Global Percentage Adjust of 100 percent (the reference schedule).

EXAMPLE: Review Program One,

Press: [PROGRAM]

Press: [1 SUN] [ENTER]

Continue to Press: [REVIEW]   Until display indicates: `1 PROG`

Continue to Press: [REVIEW]   Until display indicates: `02H 29M`

Total watering time has been reduced by 2 hours and 1 minute.

Continue to Press: [REVIEW]

Until display indicates: `1 ET- 055`

The ET Percentage Adjust is 55 percent of the reference schedule.

Continue to Press: REVIEW

Until display indicates: `1 01- 008`

Total Station runtime has been reduced by 7 minutes per station.

The other irrigation programs will have similar water saving reductions and can be displayed using the review key See Table 14 – 30-Day ET Adjusted Water Usage.

This completes the example of ET based programming. The automatic adjustments made by the Rain Master Eagle controller will aid in water conservation and provide cost savings throughout the year.

Press: QUIT

The Controller returns to the Automatic Mode.

Trade Warranty: RME EAGLE & EAGLE-i Series Controllers

Excluding software and products formerly produced under the Rain Master™ brand name, Rain Master® offers the following coverage to its trade customers:

As a business within the Irritrol® family of products, Rain Master offers a 5-year manufacturer's warranty on all purchased controllers.

For the first year, from the date of original sale to the trade customer, product may be exchanged "hassle- free" over-the-counter, should it have original manufacturing defects. For years two through five from the date of original sale to the trade customer, all parts which are found to have original manufacturing defects, shall be repaired or replaced (Rain Master's choice), provided the product is returned to the original place of purchase or sent to the Rain Master Controller repair facility at 5825 Jasmine St, Riverside CA 92504, postage paid.

All Rain Master parts & accessories have a 2- year warranty, unless otherwise noted.

Rain Master Oasis Software has a 90-day warranty. All computer hardware purchased from Rain Master in conjunction with its PC related software is NOT covered by any Rain Master warranty. Computer hardware and the installed operating system(s) is specifically covered by the hardware manufacturer's warranty as provided by the hardware manufacturer.

This warranty does not apply to loss or damage to the product due to improper installation, abuse, alteration, mishandling, accident, or if the product has been serviced by other than Rain Master or its authorized service centers. This warranty is not a consumer warranty and does not extend to anyone other than those trade customers who purchase Rain Master products.

NOTE: Rain Master is not liable for (i) failure of products not manufactured by Rain Master even though such products may be sold or used in conjunction with Rain Master products; (ii) indirect, incidental or consequential damages, including but not limited to vegetation loss during periods of malfunction or resulting non-use; (iii) any loss or damage (e.g., property damage) resulting from an installer's negligence; or (iv) implied warranties of merchantability or fitness for a particular purpose. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

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 an authorized Rain Master / Rain Master Service dealer or center.

This warranty supersedes all previous warranties and shall be the sole and exclusive warranty granted by Rain Master and shall be the sole and exclusive remedy available to the trade customer. 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 trade customer with respect to the product, and shall constitute full satisfaction of all claims, whether based on contract, negligence, strict liability or otherwise.

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.

RAIN MASTER CUSTOMER SERVICE: 1-800-777-1477

RAIN MASTER®
CONTROL SYSTEMS

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