

# RAIN MASTER®

## CONTROL SYSTEMS

### Rain Master Eagle Plus™ Irrigation Controller

### Product Specification

#### 1.0 BASIC RAIN MASTER EAGLE PLUS FEATURES

The Rain Master Eagle Plus controller is available in two configurations (Conventional and Two-Wire):

##### *Conventional Configuration*

- Modular station design that allows station counts from 8 stations up to 48 stations in increments of 8 stations.
- 8 independently controllable irrigation programs

##### *Two-Wire Configuration*

- Serial Two-Wire connection for up to 200 stations (100 decoders Maximum).
- 16 independently controllable irrigation programs,
- Cycle and Soak capability allows virtually unlimited start times allowing stations to start/pause/restart independently until their designated runtimes have been fulfilled.

#### 1.1 Standard Programming Capability

The key features offered by the Rain Master Eagle Plus™ controller are:

- Programmable Runtimes for each station can be set from 1 minute to 23 hrs 59 minutes.
- Programmable delay time between station execution. The programmed delay time can be from 0 to 19 minutes and 59 seconds.
- Programmable Total runtime, Maximum Cycle runtime, and Soak time on a per station basis
- Programmable pump activation independent of the master valve on a per program basis
- Programmable stacking or non-stacking operation on a per program basis.
- Provides the ability to select either ODD or EVEN day watering on a per program basis.
- Water Days for each program can be based on a 14-day cycle or a skip-by-day cycle. The Water Days can be further restricted with the selection of ODD/EVEN calendar days.
- Programmable water window setup option to ensure watering takes place only in a pre-defined watering period.
- Selectable cycle and soak irrigation programming or conventional programming on a per-program basis.
- Cycle and Soak capability allows virtually unlimited cycle times allowing stations to start, pause, and restart independently until their designated runtimes have been fulfilled.
- The Cycle and Soak feature intelligently displays the total runtime of the program.
- Displays the total runtime of a program. The controller considers all soak delays, water budget percentage, daily ET percentage adjustments, and inter-station delays.

- A copy function permitting an entire program to be copied to another program, or an individual runtime to be copied to any station or any sequential block of stations within any program.
- Each program can be individually configured as an irrigation or non-irrigation program

## **1.2 Manual Watering**

- Manual Water Off feature provides a means to quickly turn off all irrigation programs without disturbing the stored programs. Programs that are setup as non-irrigation programs will continue to operate as scheduled.
- Manually activated system check (test cycle) to sequentially run each station for a user defined time period from 1 to 59 minutes.
- Manually activated program to execute a program independently of its programmed start time and water days.
- Manually activate up to 6 stations simultaneously for a user defined time period from 1 minute to 23 hours 59 minutes.

## **1.3 Water Conservation Features - Automatic Watering**

The Rain Master Eagle Plus™ controller features the following water conservation features:

- Evapotranspiration (ET) based scheduling selectable on a per program basis
- Percentage adjustment on a per program basis to allow an increase or decrease of all station runtimes within that program. The percentage allows adjustment from 0 to 300 in 1% increments; this percent adjustment is applied to the run-time.
- Re-calculated station run times are executed to the nearest second.
- Programmable rain shut off in order to delay the start of irrigation after a rainstorm. The controller does not water during the programmed delay period (from 1 to 9 days). After the delay period has expired, the controller returns to the automatic mode of operation.
- Automatic minimization of the water window by intelligently scheduling station starts when other stations are satisfying their Soak Times.
- Automatic monitoring and display of measured station flow.
- Ability to intelligently monitor any dry contact sensor such as: rain, freeze, rain/freeze, moisture, and wind on a per program basis. When the sensor is active, irrigation stops and the display indicates that the sensor is active. This feature allows non-irrigation programs such as lighting controls to execute independent of these devices.
- A water usage reading indicates total water used by the controller on a per month basis. Up to one years worth of data shall be maintained.

## 1.4 Convenience Features

The Rain Master Eagle Plus™ controller features an intuitive keyboard layout that provides ease of use.



- 20 character x 4 line LCD backlit display and 3 embedded LEDs: Alarms, Irrigation active and Water off (Rain shutdown) modes.
- An intuitive user interface utilizing an optical encoder with integrated entry function that allows the user to select options that are presented in the LCD display.
- During program execution, the controller displays the active program number, the flow in GPM, and the station runtime countdown in hours, minutes and seconds (Flow sensor required to display flow).
- Multi-Level 4-Digit Controller Security Access code can be used to prevent unauthorized use or modifications of the controller's programs.
  - Restricted: No Program or Setup changes without entering the access code, but permits manual operation as well as Review and Water Off functions.
  - No Access: The user cannot perform any operation without entering the access code
- Review key to display current controller operations.

## 1.5 Regional Settings

- The date may be displayed in MM/DD/YY (default) or DD/MM/YY format
- The time may be displayed in 12 or 24 hour clock format

## 1.6 Diagnostic and Fault Detection

The Rain Master Eagle Plus™ controller supports extensive diagnostics and fault detection capability:

- The display reports the fault conditions. The visual Alarm LED indicator illuminates and an audible chirp (enabled/disabled in setup) is also generated until all faults are cleared.
- The controller automatically maintains a historical list of up to 220 alarms in chronological order.
- Automatic field wire fault detection enables the controller to sense a short in the field wire and instantly turn off that station. The controller will automatically advance past the faulty station to the next programmed station.

- Automatic detection of main line water breaks. In the event of a main line break, the controller shutdown all active irrigation, de-energizes a normally-closed master valve or energizes a normally-open master valve, condemns any future start times, triggers audible (if enabled) and visual alarm indicators
- Automatic detection of unscheduled water flow. In the event of an unscheduled flow exceeds the user-defined allowable flow, the controller activates the normally open master valve, condemns any future start times, triggers audible (if enabled) and visual alarm indicators.
- Automatic detection of station's upper flow limit. In the event of excessive flow detection, the controller turns off the faulty station, advances the program to the next station, condemns the station from any future watering times, and triggers audible (if enabled) and visual alarm indicators.
- Automatic Detection of station's no-flow condition. When flow is expected and the controller measures a zero flow, the controller turns off the faulty station, advances the program to the next station, condemns the station from any future watering times, and triggers audible (if enabled) and visual alarm indicators.
- Alarms that create a no-watering condition will be bypassed until the alarms are cleared. All non-irrigation programs will continue to operate as scheduled.
- Special Two-wire diagnostics:
  - The SINGLE station test function allows the user to test that a specific station has a programmed decoder and has a corresponding solenoid connected to it. The solenoid current is automatically range checked for validity. If valid, the current is displayed at the controller, if not valid the user is notified of an Open Circuit (No Solenoid Connected) or Over Current condition.
  - The ALL PROGRAMMED test function tests all stations that currently appear in one or more user programs. The test indicates the total number of programmed decoders that have a corresponding solenoid connected to it. The solenoid current is automatically range checked for validity. If valid, the current is displayed at the controller, if not valid the user is notified of an Open Circuit (No Solenoid Connected) or Over Current condition.
  - The FIND DECODERS test function allows the user to find all programmed decoders that are currently connected to the two-wire bus. The test indicates the total number of programmed decoders that have a corresponding solenoid connected to it. The solenoid current is automatically range checked for validity. If valid, the current is displayed at the controller, if not valid the user is notified of an Open Circuit (No Solenoid Connected) or Over Current condition.
  - The ALL STATIONS test function tests stations 1 thru 200, master valves and pump. The test indicates all the decoders that are currently connected to the two-wire bus irrespective, if their corresponding station appears in one or more of the controller's programs. The test indicates the total number of decoders that are addressable and that have a corresponding solenoid connected to it. The solenoid current is automatically range checked for validity. If valid, the current is displayed at the controller, if not valid the user is notified of an Open Circuit (No Solenoid Connected) or Over Current condition.

## 2.0 FLOW CONTROL AND MONITORING CAPABILITIES

The Rain Master Eagle Plus™ controller has:

- Inputs for connectivity up to two flow sensors.
- Ability to enable flow sensor 1, flow sensor 2, or a combination of flow sensors 1 and 2.
- Configurable flow sensor pipe sizes for standard Rain Master flow sensors as well as the ability to configure non-Rain Master flow sensors
  - o Brass: 1.0, 1.25, 1.5, 2.0, 2.5 inch sizes
  - o PVC: 1.5, 2.0, 3.0, 4.0 inch sizes
- Configurable main line flow limit from 0-5000 GPM defines the maximum allowable flow during scheduled irrigation.
- Configurable unscheduled flow limit from 0-999 GPM defines the maximum amount of flow that will be permitted during unscheduled irrigation periods.
- Configurable station upper flow limits from 0-999 GPM.
- Configurable flow check delay between 1 and 6 minutes (1 minute increments). This delay permits stations to stabilize before limit checks are applied.
- Automatic monitoring and display of measured station flow from 0 to 999 GPM.
- Configurable station flow limits; station flow limits can be configured based on auto learned nominal flow or can also be configured by entering limits manually.
  - o In LEARN mode, 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.
- Intelligent upper-limit processing for simultaneous station operation.
- A water usage meter indicates total water used by the controller on a per month basis (12-month period).
- The water usage totalizer function measures the total flow over a period of time. The user may elect to reset the flow total at any time.

## 3.0 EVAPOTRANSPIRATION (ET) FEATURES

- Ability to enable or disable ET adjustments on a per program basis.
- The ability to use any one of four different ET sources as the basis for its ET calculations:
  - Historical ET values
  - Manually entered ET value
  - Rain Master ET measurement device or equivalent
  - Downloaded ET data from the internet (requires iCentral option)
- The ability to input and store Historical ET values for a 12-month period. Historical ET values can be obtained from [www.rainmaster.com](http://www.rainmaster.com), under the Literature Menu – “Historic ET Data”
- The controller re-calculates station runtimes prior to the start of irrigation, utilizing the current day's ET value and up to 3 days prior if programs were not executed.
- The ability to store an ET reference value. This value is used during the adjusted station runtime ET calculations

- User may enter a manual ET value, which overrides previously entered or accumulated ET data for 7 days. At the end of the 7-day period, the controller automatically reverts to utilizing Historic, Device, or Internet provided daily ET data.
- Connectivity to an ET measuring device such as a Rain Master Weather Center.
- The ability to display the last 14 days of daily ET values.
- Ability to display the current ET percent adjustment for all ET enabled programs.

## 4.0 KEY HARDWARE FEATURES

The key features offered by the Rain Master Rain Master Eagle Plus™ controller hardware are:

- No battery is required
- Non-volatile memory to retain the programs and controller setup information during power outages or seasonal shutdowns. This information is maintained indefinitely.
- A real-time clock with non-volatile backup to maintain the current date and time during power outages without the need of batteries.
  - Clock maintains time for a minimum of 30 continuous days without power.
- Advanced circuitry to automatically monitor internal voltages and reset on-board microprocessor circuitry during electrical disturbances.
- Automatic electronic fuse, which resets intelligently based upon need – no fuses or circuit breakers to reset or replace.
- When a power outage occurs, and power is restored, the controller resumes its programmed real-time irrigation schedule.
- Output and Master Valve boards are equipped with quick connect terminals for ease of wiring.
- Automatically detects board failures and generates an alarm.

### 4.1 Output Modules, Master Valve, Pump Station, and Sensor Inputs

- Each station output module has:
  - 8 stations
  - Quick connect terminals: connectivity of up to (2) 14-gauge wires.
  - 2 quick connect common terminals capable of connecting up to (4) 14-gauge commons per output module
  - Green LED diagnostic indicator when the station is powered on
  - Station outputs (black) vs. commons (green) are differentiated via color coded terminal blocks.
- Output modules can be added in the field. The controller will re-configure itself on power up to determine the maximum station count (conventional configuration only). Note: Power must be disconnected during installation.
- Each controller has a master valve/sensor board with connectivity for each of the following:
  - Flow sensor 1
  - Flow sensor 2
  - ET device (e.g. Rain Master Weather Center)
  - Sensor input capable of connecting to either a Rain, Freeze, Rain/Freeze, Moisture, Wind or tipping bucket sensor device (e.g. Rain Master Weather Center)
  - Auxiliary 24 VAC terminal rated at 100 milliamps
  - Master Valve quick connect terminal with connectivity of up to (2) 14-gauge wires
  - Common quick connect terminal with connectivity of up to (2) 14-gauge wires

- Pump Station quick connect terminal with connectivity of up to (2) 14-gauge wires
- Master Valve type can be configured to either a Normally Open Master Valve or a normally - closed master valve.
- Master Valve control is assigned on a per program basis
- Pump Station control is assigned on a per program basis

## 5.0 AVAILABLE RAIN MASTER EAGLE PLUS™ OPTIONS

The Rain Master Eagle Plus™ controller has:

- Controller can be purchased as either a 200 station two-wire or conventional up to 48 station. Two-Wire and Conventional configurations are mutually exclusive.
- Ability to connect to a Rain Master iCentral communication card (iCard) to provide connectivity to the iCentral Internet-based central control software.
- Ability to interface to a Rain Master Weather Station for local ET data.
- Ability to connect to a Rain Master Flow sensor or other flow sensor device.
- Built-in remote control capability and compatibility with Rain Master® Pro Max remote control system.
- Connectivity for any one of the following dry contact sensors: rain, freeze, rain/freeze, moisture, or wind sensor devices. The enabling of this device can be performed on a per program basis. This feature allows non-irrigation programs to execute independent of this device.
- Availability in a variety of enclosure options: standard painted cold-rolled steel wall mount, stainless steel wall mount, stainless steel security pedestals (See dimensions below)

## 6.0 MECHANICAL SPECIFICATIONS

- Standard size enclosure: 18-gauge (jet coat®) cold-rolled steel enclosure with power coat paint or stainless steel models suitable for either indoor or outdoor environments.
  - Wall Mount: 11" W x 16" H x 5.625" D (27,9cm W x 40,6cm H x 14,29cm D)
- Pedestal Mount:
  - PSB: Heavy-Duty 14-gauge stainless steel Strongbox enclosure. 16.5" W x 38" H x 17.25" D (41,9cm W x 96,5cm H x 43,8cm D)
  - SPED: Heavy-Duty 14-gauge stainless steel security enclosure. SPED: 16" W x 34" H x 16" D (40,6cm W x 86,4cm H x 40,6cm D)
- Temperature Range:  
Operating: +14°F to +140°F (-10°C to +60°C).  
Storage: -22°F to +149°F (-30°C to +65°C).

## 7.0 ELECTRICAL SPECIFICATIONS

- Internal Transformer, Class 2, UL Listed, CSA Certified (or equivalent)
  - Input: 120 VAC ± 10%, 50/60 Hz
  - Output: 24 VAC ± 10%, 50/60 Hz, 50 VA
- Total Maximum Load: 1.5A @ 24 VAC. Output Surge Protection (excluding 2-wire decoder models): 6KV common, 1KV normal.
- Conventional Configuration:
  - Maximum Load Per Station: 0.5A @ 24 VAC @ 77° (25°C)
  - Maximum Load Per Master Valve: 0.5A @ 24 VAC @ 77°F (25°C)
  - Maximum Load Per Pump Output: 0.5A @ 24 VAC @ 77°F (25°C)

- Two-Wire Configuration
  - Drive current to a decoder is 100 to 250 milliamps (depending on the solenoid)
  - Supports up to 100 decoders on the two-wire path

## **8.0 DOCUMENTATION**

- RAIN MASTER EAGLE Plus™ User's Manual
- RAIN MASTER EAGLE Plus™ Quick Reference Guide (English and Spanish)
- RAIN MASTER EAGLE Plus™ Installation Guide
- RAIN MASTER EAGLE Plus™ Product Brochure
- RAIN MASTER EAGLE Plus™ Product Specification

## **9.0 CERTIFICATION AND WARRANTY**

- UL, C-UL, and FCC approved.
- Limited 5-year warranty.