

## **EAGLE Two-Wire Irrigation Controller Specifications**

### ***1.0 Basic Features***

#### **➤ Standard Programming Capability**

- Connectivity up to 36 independent stations and one master valve.
- 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 hrs 59 minutes per station, in one-minute increments.
- Quick Station(s) programming to allow rapid programming of an entire block of stations, 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 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.

## ***1.2 Water Conservation Features***

### **➤ The controller shall have:**

- Flow sensing and control (refer to section 2.0)
- Evapotranspiration (ET) based scheduling (refer to section 3.0)
- Percentage adjustment on a per program basis to allow an increase or decrease of all station runtimes within that program. The percentage shall 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 shall not water during the programmed delay period (from one to seven days). After the delay period has expired the controller shall 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 shall show "RAIN OFF"
- Connectivity for any one of the following: rain, moisture, or freeze sensor device. The enabling of this device can be performed on a per program basis. When the sensor is "active" irrigation shall stop and the display will indicate that the sensor is active. This feature allows non-irrigation programs to execute independent of this device.
- The ability to select either ODD or EVEN day watering on a per program basis. (When either of these features is selected, the controller shall not water on the 31st day of the month.)
- Selectable cycle and soak irrigation programming or conventional programming on a per-program 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. Re-calculated station run times are executed to the nearest second.

### ***1.3 Convenience Features.***

➤ **The controller shall have:**

- 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 shall 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 shall display program parameters one by one. Depression and subsequent hold of this key shall allow rapid review of program parameters.

### ***1.4 Diagnostic and Fault Detection***

➤ **The controller shall have:**

- Programmable audible alarm. When enabled this alarm will "chirp" once every six seconds whenever any flow fault condition occurs. The alarm will continue until reset by the user.
- Automatic field wire fault detection enables the TWICE Two Wire Interface module to sense a short or an open in the field wire and instantly turn off that station. The TWICE display will report the fault condition any time a field wire fault occurs.
- 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 clock 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 shall: 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 shall: 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 shall: 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.

## ***2.0 FLOW CAPABILITIES***

### **➤ The controller shall have:**

- Programmable flow to enable or disable the flow sensor features.
- Programmable flow sensor pipe sizes for standard Rain Master flow sensors (1.0, 1.25, 1.5, 2.0, 3.0, and 4.0 inch). Non-standard pipe sizes are also programmable.
- Inputs for connectivity to a flow sensor. The controller shall read the frequency of the sensor by sensing each time a contact closure appears at the input. The controller shall 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 shall: shutdown all active irrigation, energize a normally open master valve (if selected), condemn any future start times, and 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 shall: energize the normally open master valve (if selected), condemn any future start times, and trigger audible and visual alarm indicators.
- Programmable station upper flow limits from 0-500 GPM.
- Automatic detection of upper stations flow limit. Upon detection the controller shall: 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 delay 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.

### ***3.0 Evapotranspiration (ET) Features of the Eagle***

#### ***3.1 ET Operations***

➤ **The controller shall have:**

- 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 Weather Center ET measurement device
  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 previous entered or accumulated ET data. At the end of the seven day period the

controller will automatic revert to utilizing Historic, device, or Internet provided daily ET data.

- Connectivity to a Rain Master Weather Center ET measuring device. The controller shall record .01 of an inch (ET) each time a pulse is provided by the Weather Center. The controller shall source +5 VDC to the device.
- The ability to display the last ET daily value including the source (Historical, measured, manually entered, or Internet).
- Ability to display the current adjusted runtime as a percent of the base runtime for all ET enabled programs.

#### ***4.0 Twice (TWO-WIRE) Controller Capabilities***

➤ **The controller shall utilize a two-wire connection path to each station decoder.**

- The Two-Wire path shall support a variety of connectivity configurations including: single path, dual path, loop, and grid configurations, and combinations thereof.
- The communications along the two-wire path shall be bi-directional between the controller and each decoder.
- The TWICE Interface module shall confirm station ON commands by receiving an appropriate response from the corresponding station decoder.
- Station decoders shall intelligently monitor the electrical current at any solenoid and report any short or open circuit back to the TWICE interface module.
- The TWICE interface module shall display diagnostic error conditions to the operator. These diagnostic errors shall include:
  1. E1 - No station decoder found (cannot communicate from the TWICE module to the designated station decoder)
  2. E2 - Short circuit on the two wire path
  3. E3 - Open circuit of a station solenoid
  4. E4 - Over current due to shorted solenoid
  5. E5 - Station decoder communication error
  6. E6 - High temperature shutdown
  7. E7 – Decoder Programming Failure
- The TWICE Interface module shall allow the user to program the station number into any decoder.
- The TWICE Interface module shall allow the user to read and display the station number which has been programmed into any decoder.
- The TWICE Interface module shall allow the user to test the entire two wire network of decoders and report any error(s) status back to the operator. Errors shall be reported with appropriate error codes as well as with a STATUS diagnostic LED.
- THE TWICE Interface shall allow the user to test any single station for proper operation. Any error condition shall be reported in the display. When the station test is successful,

the display shall report the firmware version of the decoder followed by the electrical current drawn by the solenoid.

- The TWICE Interface module shall automatically display the STATUS of each valve via a diagnostic LED when operating in the AUTO mode. Stations that are irrigating properly (communicating with the appropriate decoder and having a nominal electrical current draw on it solenoid) will illuminate the STATUS led with a green color. Otherwise the station has an error and will illuminate the STATUS led with a red color. When no irrigation stations are on, the display will display any station(s) which may have had an error condition. The display will rotate with erred stations until the operator clears them.
- Station decoders shall be available in 1, 2, and 4 output varieties.
- The TWICE interface module shall allow for a maximum of 36 stations plus one Master Valve.
- The maximum distance from the controller to any decoder shall be limited to 5,000 feet. This distance assumes usage of Rain Master's two-wire 14 (AWG) gauge cable, Irritrol Part No. TW-CAB-14.
- The maximum distance for the two-wire loop configuration, shall not exceed 10,000 feet.
- The maximum distance between any lightning arrestors/ground rods shall be no more than 600 feet.