

City of Chula Vista

Measure P Central Irrigation Controller Specifications

Irrigation controllers shall meet the minimum specifications in the following categories:

1. General Requirements
2. Software
3. Operation and Programming
4. Reports
5. Mounting Options and Features
6. Two-wire Path and Decoders
7. Communications
8. Flow Management
9. Alarm Notifications
10. Weather and Soil Sensors
11. Service and Training
12. Warranty

1. General Requirements

The controller shall have EPA Watersense certification.

The controller shall be a smart irrigation controller and have the ability to use local weather data to adjust the optimal sprinkler run time to promote water conservation and a healthy landscape.

The controller shall have a backlit LCD display which is readable in full sunlight. The display shall be large enough to view all site information on the same screen without having to continually scroll.

2. Software Requirements

The software must allow multiple, simultaneous web-based users including, but not limited to:

- a) In multiple controllers that are in the same communication group
- b) In multiple controllers throughout the entire central irrigation control system throughout the city

All software features must be able to be viewed, programmed, and operated at the controller and through the web-based access.

All software or firmware updates must be automatic and offered at no additional charge to the owner.

3. Operation and Programming

All controllers shall support conventionally-wired valves and two-wire valves, in the same controller. The controller shall be able to operate conventionally-wired stations and two-wire stations simultaneously, in the same controller.

The controller shall support a minimum of 48 conventionally wired stations, or 128 two-wire stations, or a minimum of 128 stations of combined conventionally wired stations and two-wire stations.

The controller shall be able to operate master valves, flow sensors, pumps, and soil moisture sensors, using conventional and two-wire wiring.

Exhibit A

The controller shall have modular station and sensor components that are easily installed or removed by the end-user, without the need of a manufacturer's representative.

The controller programming shall be able to assign the following landscape and irrigation factors to groups of stations with similar characteristics, as follows:

1. Plant material
2. Sprinkler type
3. Sprinkler precipitation rate
4. Soil type
5. Solar exposure
6. Slope percent
7. Soil storage capacity

The controller shall be able to run stations within multiple groups of stations (as described above) simultaneously or individually to maximize the irrigation system capacity and reduce the irrigation water window, especially where reclaimed water restrictions are in use.

The controller must have the ability to assign priority levels to each group of stations to affect the sequence of watering during the programmed irrigation cycle.

Each group of stations shall include a variety of other settings including:

1. Irrigation schedules (start times, active days, etc.)
2. Percent adjust factor by group and by station
3. Line-fill times for each group of stations
4. Simultaneous valves allowed to water at the same time (adjusted by group and entire system)
5. Option to use pump or not for each group of stations
6. Option to use ET data or not for each group of stations

The controller shall:

1. Be able to simultaneously manage flow on four separate mainlines within each controller system.
2. Support up to 12 points of connection shared between controllers within the same communication group.
3. Support up to 3 master valves and 3 flow sensors, or 3 hydrometers, in straight-line and/or by-pass configuration. This must be available in conventional and two-wire decoder applications.
4. Accurately measure the gallons-per-minute flow from the lowest flowing valve to the highest flowing valve, whether using a single flow sensor or multiple flow sensors in a by-pass configuration. This feature shall function in conventional and two-wire decoder applications.
(Also listed in section 8)

The controller shall be able to create an unlimited number of manual programs with user defined station run times, a minimum of six (6) start times per day, active days, and automatic start/stop dates. The manual programs shall be able to be named for their specific use, i.e. "fertilizer water- in", "syringe", "plant establishment" or any other special applications.

4. Reports

The controller and web-based software shall have water usage and water budget reports, alarm reports, irrigation operating reports, that are easily accessed by the user, including:

Exhibit A

1. Water budget reports shall be flexible with multiple ways to display the data
 - a. Reports shall be able to be displayed in gallons or HCF (user defined)
 - b. Reports shall be displayed for each month, January through December
 - c. Monthly budgets shall be able to be calculated and displayed in multiple ways:
 - i. Monthly budgets manually entered by the user
 - ii. Monthly budgets calculated using historical evapotranspiration data
 - iii. Monthly budgets using landscape area, measured in square feet, and a user selected percent of historical evapotranspiration data
 - d. The water budget shall be able to be calculated by controller and by each point-of-connection (in cases where a controller has multiple points-of-connection)
 - e. The controller and web-based software shall have a notification system that will report if the calculated water usage will exceed the budget.
 - i. The controller shall have a feature that can be activated by the user that will automatically reduce irrigation gradually as it gets closer the budget. The controller will notify the user that this feature is activated.
 - ii. The controller will not automatically turn off irrigation if the budget is exceeded. The user will make that determination.
2. Water Usage Reports for each of the following:
 - a. Each station (station-by-station)
 - b. Each mainline
 - c. Each point of connection on each mainline
3. Historical water usage for each station showing the following:
 - a. Date and time of each cycle start
 - b. Calculated minutes and actual minutes that were watered
 - c. Calculated inches of water to be irrigated and actual inches of water applied
 - d. Number of actual irrigation cycles per scheduled day
 - e. Expected flow rate and the actual flow rate
 - f. Alarms or flags of issues that occurred during the entire irrigation cycle
4. Historical water usage of non-scheduled irrigation including:
 - a. Manual watering
 - b. Quick coupler usage
 - c. Remote watering (radio remote, cell phone, other devices)
 - d. Mainline leaks
 - e. Manually opening valves (bleed screws, solenoids, ball valves, etc.)
5. Historical record of each station's operating data:
 - a. Date of irrigation cycle
 - b. Start time and end time
 - c. Projected and actual run time
 - d. Total gallons applied during the night
 - e. Flow reading in gallons per minute
 - f. Alarms or notifications that occurred during the irrigation cycle
6. Alarms/Notifications/Alerts (see section 9)
7. All reports shall be accessible at the controller and through the web-based application.

5. Mounting Options and Features

Controllers shall have multiple mounting configurations and features:

1. Wall mount
 - a. Controller cabinet (indoor), stainless-steel or powder coated steel, weather-proof (indoor and outdoor installations)

- b. Inside a large wall mounted stainless-steel enclosure, with front entry, (outdoor, indoor installations)
 - c. Inside a stainless-steel enclosure, front entry (existing enclosures, new enclosures)
 - d. Wall mount controllers shall be mounted on a stainless-steel plate with on/off switch, GFI receptacle, and surge protection.
2. Pedestal mount, stainless-steel
 - a. Flip top lid to access the controller from a normal standing position (without kneeling or bending over to access the controller).
 - b. Weather-proof
 3. Basic radio antennas and antenna cables shall be factory mounted on the controller cabinet or stainless-steel enclosure. Note: this does not apply to controllers mounted inside an existing enclosure or that need an antenna mounted on an antenna mast.
 4. Controller cabinets and stainless-steel enclosures shall have a vandal-proof locking mechanism.
 5. Each mounting option shall have an on/off switch to isolate power to the controller along with a GFI receptacle and surge protection. The on/off switch and GFI receptacle shall have protective covers.
 6. All enclosures shall be UL-approved for indoor/outdoor installations and have a 10- year limited warranty.
 7. All terminal strips shall be factory numbered and located inside the controller cabinet or inside the stainless-steel enclosure.
 8. Cabinets shall have proper ventilation without the need for interior fans.

6. Two-Wire Path & Decoders

Each controller shall support up to 128 two-wire stations, up to 6 points of connection (POC), and all associated decoders.

The controller shall support two-wire soil moisture sensors.

The controller shall be able to fully operate all valves on the 2-wire cable of at least 7000 feet in length. The controller shall be able to fully operate a minimum of six (6) valves simultaneously along the entire length of the 2-wire cable, even if the valves are at the very end of the 2-wire cable (7000 feet).

The 2-wire decoders used at the point of connection shall be able to operate one master valve and one flow sensor.

Each controller shall be able to operate six (6) POC decoders.

Each controller, when in a group of controllers which control multiple points of connection, shall be able to operate up to twelve (12) POC decoders.

7. Communications

The controller shall have the ability to use various smart technologies to communicate with the web-based application, with other controllers in the central irrigation system and other controllers linked together using the same water source(s), as follows:

1. SCADA
2. Wi-Fi
3. Ethernet

Exhibit A

4. Cellular
5. 900 MHz radio
6. 450-470 MHz radio
7. Hardwire

The controller must be able to access web-based software for all communication types at no additional charge to the user. Cell phone data plans shall be used only when other communication options will not work. (It is understood that cell phone data plans will have an associated cost.)

The controller shall have smart device access (phone, tablet, laptop, etc.) to operate all controller features, i.e. programming, manual operation of valves, etc.

8. Flow Management

The controller shall be able to interface with a hardwired flow sensor, hydrometer, or ultrasonic flow sensor.

The controller shall accurately measure the gallons-per-minute flow from the lowest flowing valve to the highest flowing valve, whether using a single flow sensor or multiple flow sensors in a by-pass configuration. This feature shall function in conventional and two-wire decoder applications.

The controller shall be able to simultaneously monitor and manage up to four (4) mainlines and all associated flow sensors.

The individual controller or group of controllers that use the same flow sensors shall be able to share real-time flow data using 900 MHz radios and/or hardwire communications.

The control system and controllers shall have the following flow managing functions:

- 1) Learns the flow, in gallons per minute (gpm), for each station during the scheduled irrigation cycle.
- 2) Manage multiple simultaneous valves not to exceed the mainline capacity (user defined).
- 3) User defined valves allowed to operate simultaneously. The quantity of simultaneous valves shall be able to be assigned for individual programs/groups of stations and prioritized by the user.
- 4) Must be able to manage flow on multiple controllers, using the same mainline, including:
 - a) Manage flow on simultaneous valves within the controller group
 - b) Identify high, low, and no flow valves on simultaneous valves
 - c) Isolate and shut down problem valves while continuing irrigating the valves that are operating properly

The controller shall have a minimum of 4 levels of flow checking including:

- a) The flow ranges shall be adjustable by the user
- b) The flow ranges shall be shown separately for high flow and low flows
- c) The flow checking ranges shall be shown in gallons (not percentages)
- d) The response options shall be separate for high and low flows, and shall be adjustable by the user

Mainline break settings: The irrigation controller shall have multiple mainline break settings available for proper flow detection. The mainline break settings shall apply during the following irrigation functions:

Exhibit A

- a) Scheduled irrigation, including manual programs
- b) Master valve scheduled operation or controller activation
- c) Non-controller activated irrigation (manual bleeding valves, quick coupler use, etc.)

The system shall allow multiple controllers to share one or multiple points of connection with multiple flow sensors and master valves, including the following:

- a) A minimum of 12 controllers within a group of controllers that are assigned to the same communication group.
- b) Ability to monitor all flow management requirements in this section.
- c) Ability to meet all report requirements listed (section 4).

9. Alarms/Notifications/Alerts

The controller shall monitor and log alarm data from all operations and communications on a daily basis.

The alarm data log shall be accessible at the controller and on the web-based application.

The controllers shall automatically populate a notification/alarm/alert report including, but not limited to, the following information:

- a) Date and time stamp of every data point
- b) Web-based user's name, access code or email address
- c) Notification report shall keep a 30-day historical record of all data that can be accessed by the user at the controller and via the web-based application
- d) Electrical issues: shorts, no current, power failures
- e) Controller status:
 - a. All changes made to the programming
 - b. Irrigation schedules, start times, active days, no watering days, station percent adjustments, etc.
 - c. Station assignments
 - d. All operations of the controller; manually or web-based
 - e. Controller off
 - f. Irrigation did not meet water window limitations
- f) Weather information: daily ET data
- g) Flow issues: High/Low/No flows, mainline breaks
- h) Communication issues: communication failures, software updates
- i) Moisture sensor: daily soil moisture level (%)

10. Weather and Soil Sensors

The controller manufacturer shall provide real-time evapotranspiration (ET) data through the internet at no charge and without a data plan. The ET data shall be accurate for multiple local micro-climates throughout the area of coverage of central irrigation control system.

The controller shall be able to interface with a hard-wired ET gage and be able to share the ET data to other controllers via the web-based software. The controllers shall log and store the ET data for a minimum of 28 days.

The controller shall have historical ET data tables that can be selected by the user to use as back-up ET in case of internet or communication failure.

Exhibit A

The controller shall provide the option to use a single daily ET value or an average of previous multiple day ET values to calculate station run times.

The controller shall be able to interface directly with a Tipping Rain Bucket and shall accurately measure rainfall in 0.01" increments. This data must be able to be shared via the Web based software with other controllers in the same micro climate.

The controller shall provide multiple user defined data entries for rain accumulations that will be used for irrigation scheduling:

- a) Amount of rain to stop irrigation (inches)
- b) Maximum amount rain (inches) allowed to be used over a one-hour period
- c) Maximum amount of rain (inches) allowed to be used over a 24-hour period

The controller shall be able to interface with a soil moisture sensor. The soil moisture sensor shall also measure salinity.

The controller shall be able to interface with a wind gage and measure wind to pause irrigation during the normal irrigation schedule. Controllers must be able to share the wind gage data with other controllers within the communication group.

11. Service & Training

The manufacturer shall provide no charge on-site support of the controller and related manufacturer's components for the life of the products. Support shall include troubleshooting of the products, training and education for customer personnel.

Support shall be provided by manufacturer's factory-direct employee for equipment and the web-based software.

12. Warranty

The controller shall have a ten-year limited warranty.