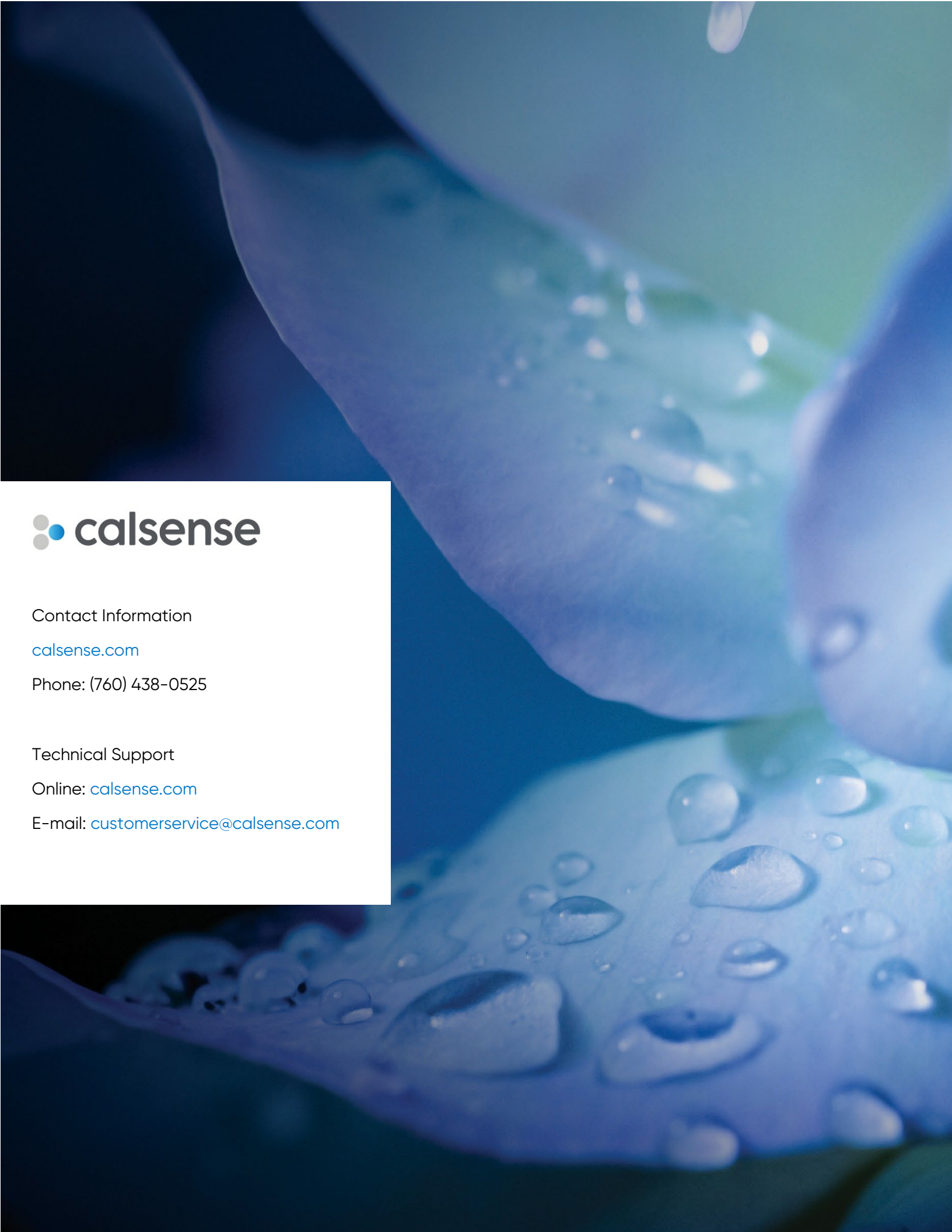

calsense
CS3000
USER'S GUIDE



calsense

Contact Information

calsense.com

Phone: (760) 438-0525

Technical Support

Online: calsense.com

E-mail: customerservice@calsense.com

TABLE OF CONTENTS

Contents

Introduction and Getting Started 6
Calsense Customer Service 7
Controller Hardware Overview 8
CS3000 Wall Mount 8
CS3000 Stainless Steel Enclosure 9
CS3000 Double Wide Stainless-Steel Enclosure 10
CS3000 Turn-Key Solar Package 11
FLOWSENSE® 12
Water Management 12
Flow Monitoring 12
Sharing Data Between Controllers 13
Device Compatibility 14
2-Wire Decoders 14
2-Station 2-Wire Decoder 14
POC Decoder 15
Soil Moisture Sensor Decoder 15
Compatible Flow Sensors 16
Calsense Flow Meters 16
Third-Party Flow Sensors 16
Compatible Calsense Weather Sensors 17
ET Gage 17
Tipping Rain Bucket 17
Wind Gage 17
WEATHERSENSE 17
Third-Party Weather Sensors 17
Central Control 18
Command Center Online 18
How to Use this User's Guide 19

Keypad Features 19
Status Screen 20
Diagnostics 21
Controller Alerts 21
Program Changes 21
Irrigation Details 22
Viewing Station Group Finish Times 22
Initial Program Setup 24
Date & Time 24
Contrast, Backlight & Volume 25
Disabling Stations 25
Stations On-at-a-Time 26
Reference ET Values 27
Assigning Points of Connection (POCs) to Mainlines 28
Viewing Mainline Status 29
Viewing POC Status 29
Additional Steps for 2-Wire 30
Discovering 2-Wire Decoders 30
Assigning Stations to 2-Wire Decoders 31
Assigning POCs to 2-Wire Decoders 32
Scheduling Irrigation 33
Setting up Station Groups 33
Adding a New Station Group 33
Adjusting Station Group Settings 33
Scheduling Irrigation Start Times and Water Days 35
Prioritizing Station Groups 36
Percent Adjust 37
Using a Pump During Irrigation 38
Stations 39
Individual Station Irrigation Schedule 39
Adjusting Stations Settings 39
Manually Testing Stations 41
Station History Report 41

Station Summary Report 42
ET and Weather Sensors 43
Specifying Use of Real-Time Weather 43
Configuring On-Site Weather Sensors 44
Configuring an ET Gage 44
Configuring a Tipping Rain Bucket 44
Configuring a Wind Gage 45
Setting up a Third-Party Rain Switch 45
Setting up a Third-Party Freeze Switch 46
Viewing and Clearing Accumulated Rain 46
ET & Rain Report 47
Real-Time Weather Status 47
Assigning Moisture Sensors to Station Groups 48
Unlinking Orphan Station Decoders 49
Unlinking Orphan POC Decoders 50
Manual Water Operations 51
Testing Stations 51
Manually Watering 52
Manual Programs 53
Manually Opening or Closing the Master Valve 54
Opening or Closing a Master Valve Immediately 54
Scheduling a Master Valve to Open 54
Performing a Station Inspection/Walk-Thru 55
Suspending or Preventing Irrigation 56
No Water Days 56
Turn Controller Off 56
Flow Monitoring 58
Installing a Flow Meter 58
Flow Meters and Master Valves 58
Configuring a Traditional POC 58
Configuring a Bypass Manifold 59
Acquire Flow Rates 60
Delay Between Valves 61

Detecting Mainline Breaks 62
Detecting Leaks 62
Defining High and Low Flow Actions 63
Maximum Time to Fill Mainline 64
Viewing Mainline Usage 65
Budgets 66
Irrigating Using a Budget 66
Defining a Budget for each Billing Period 68
Configuring Usage that Impacts the Budget 69
Irrigation Reduction within Budget 70
Comparing Actual Usage to the Budget 71
Lights 72
Scheduling Lights 72
Turning Lights On or Off 73
Viewing Lights Status 73
Viewing Lights Summary 74
Communication 75
Subscription Services and Renewal 75
Communication Options 75
Test Cloud Communications 76
Test Radio Communications 76
Configuring Hub Communications 76
Activating Software Options 77
Appendix A – Troubleshooting Alerts 78
Appendix B - Soil Types 81
Controller Behavior 81
Appendix C - Head Types 82

Introduction and Getting Started

Calsense uses the power of data intelligence and smart technologies to usher in a new era of water management solutions for our clients and the planet.

We began our journey in water management over 30-years ago by providing central control for landscape irrigation across diverse industries, including municipalities, K-12 school districts, departments of transportation, and more. We earned a reputation for cost-effective solutions that enhance the beauty and health of our customers' landscapes. Today, with the need for water sustainability universally recognized, our data-driven approach is one the entire industry is seeking to emulate.

The Calsense CS3000 Irrigation Controller is an important water conservation and management tool. Some of its major water management features include flow monitoring and weather-based irrigation which uses daily evapotranspiration (ET) to automatically calculate station run times based upon landscape details such as plant material, head type, and sun exposure.

The CS3000 provides a wide range of programming flexibility, including:

- Unlimited programs which can water individual stations or interspersed to maximize system capacity and reduce watering time
- The ability to assign landscape details as plant material, head type, sun exposure to groups of stations to simplify programming of stations with similar characteristics
- Support for managing flow on up to four mainlines and 12-points of connection simultaneously when sharing flow with multiple controllers
- Automatic cycle and soak scheduling to water each station for a fixed cycle time and allow the water to soak in between cycles, maximizing water saturation and minimizing runoff
- Ability to accommodate multiple types of irrigation schedules including irrigating even days, odd days, prescribed days of the week, and interval scheduling ranging from every other day up to every four weeks
- Unique predictive water budget feature which maximizes savings during drought conditions
- Manual programs, which allow the user to schedule stations to run for a preset time, up to 6-times per day, for hydro-seeding and new planting
- Electrical alerts, such as short circuits and no currents, to help the user troubleshoot field wiring and solenoid problems
- Permanent memory stores all controller programming and setup data, including date and time, in non-erasable memory
- Available in multiple station counts including 8, 16, 24, 32, 40, or 48 stations. If less than 48 stations are purchased initially, additional stations can be added at any time in the field.
- Supports up to 128-stations when using 2-Wire. This can either be 128 2-Wire stations or, when combined with conventional-wired stations, up to 80 2-Wire stations and up to 48 conventional-wired stations.

Calsense Customer Service

Calsense understands the need to provide hands-on field training upon product installation. The purchase price of our product includes access to trained Account Managers who will educate personnel on how to operate all the features included in the Calsense products, such as our cloud-based central control application, Command Center Online. This service is provided at no charge to the customer to ensure our customer's site is successful in achieving their water management goals.

Remote phone and video support are also available by our dedicated, in-house Customer Service team.

For service or repair, please call (800) 572-8608 or (760) 438-0525. Hours of operation are Monday through Friday, 8:00 AM to 5:00 PM Pacific Time.

Controller Hardware Overview

CS3000 Wall Mount

The Calsense wall-mounted gray box (model CS3-xx-WM) is a completely assembled unit, pre-mounted with a Calsense controller (Figure 1). The box is constructed of weather and vandal-resistant stainless steel. The unit comes complete with transient and lightning protection and factory-labeled terminals. It also features a security-tight locking mechanism, louvered vents with splash guards, and bee/wasp screens. Wall mount options 1 and 2 include pre-drilled holes for radios antennas for use with the Cellular (model CS3-GR-KIT), Wireless Ethernet (model CS3-WEN-KIT), Spread Spectrum Radio (model CS3-SR-KIT), and Local Radio (model CS3-LR-KT) options . All wall-mounted gray boxes come with 10-year warranties and are fully UL Certified.

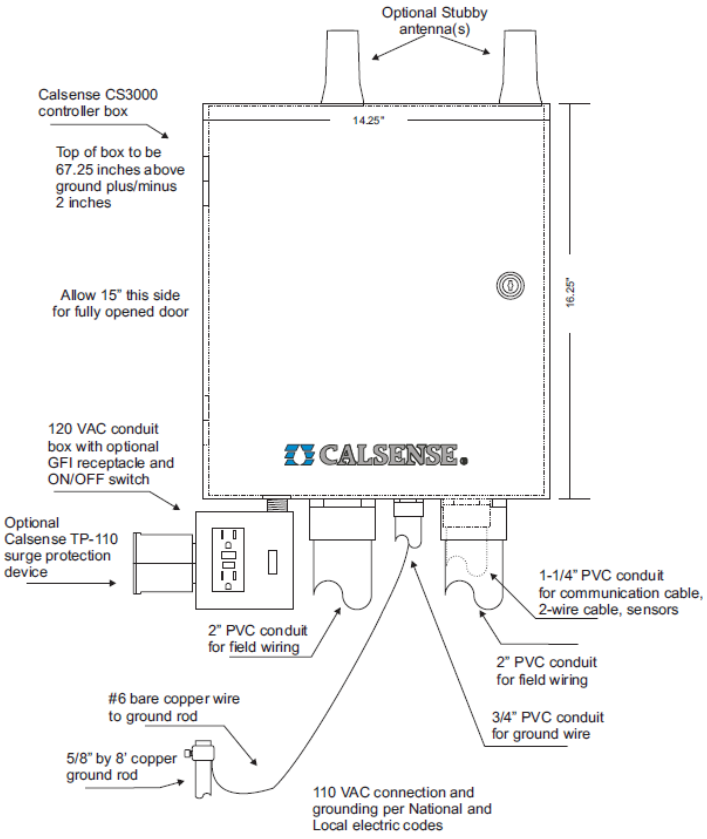


Figure 1: CS3000 Wall Mount

CS3000 Stainless Steel Enclosure

The Calsense Heavy-Duty Stainless-Steel Enclosure (model CS3-xx-S) is a complete factory-assembled unit, pre-mounted with a Calsense controller (Figure 2). The controller is mounted at a 25° angle for easy access and viewing. The enclosure is constructed of weather- and vandal-resistant stainless steel. The unit comes complete with transient and lightning protection, factory-labeled terminals, GFCI outlet, and keyed switch.

It also features a security-tight locking mechanism, louvered vents with splash guards, and bee/wasp screens. The S1 and S2 options include pre-drilled holes for radios antennas for use with the Cellular (model CS3-GR-KIT), Wireless Ethernet (model CS3-WEN-KIT), Spread Spectrum Radio (model CS3-SR-KIT), and Local Radio (model CS3-LR-KT) options . All SSE enclosures come with 10-year warranties and are fully UL Certified.

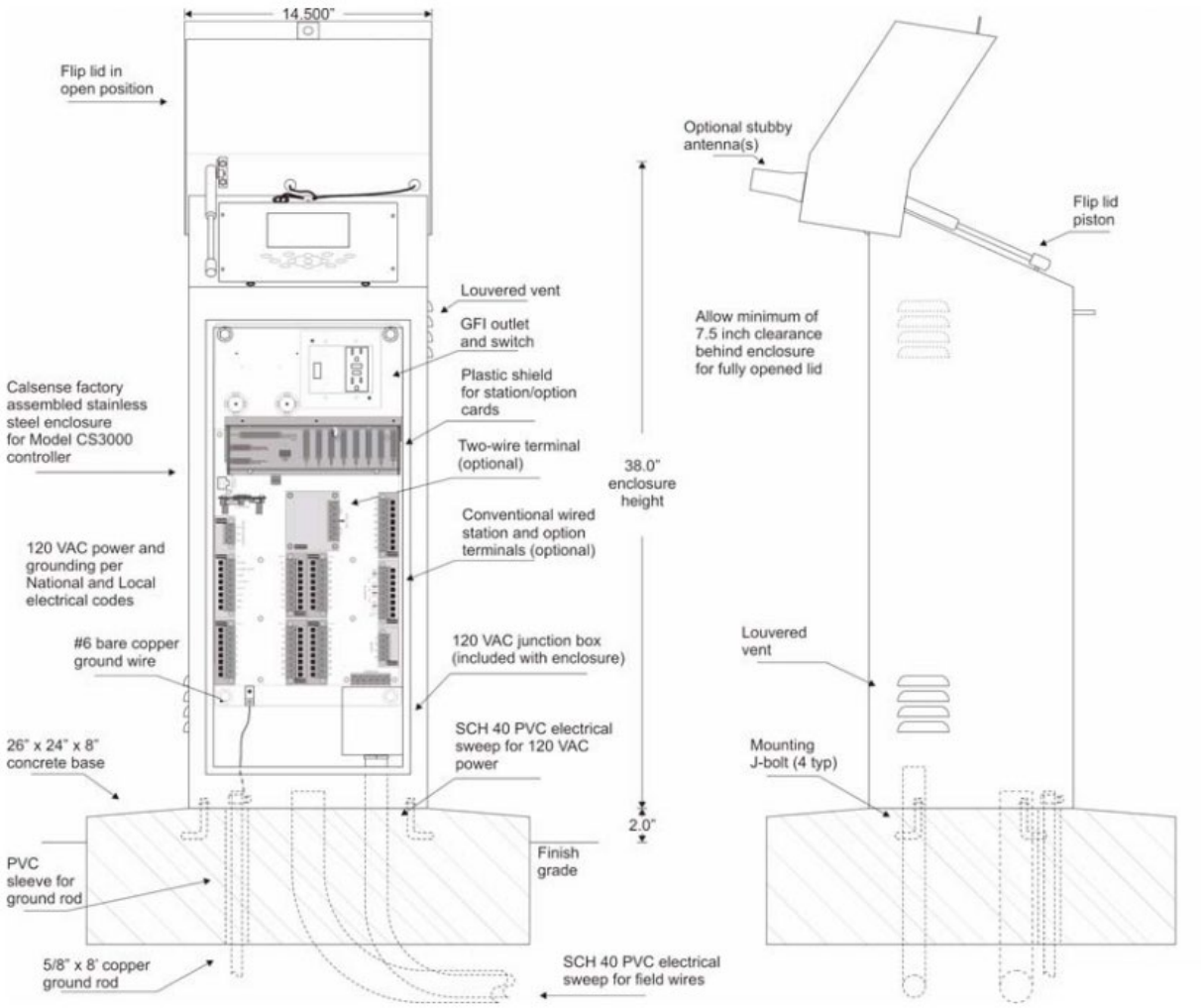


Figure 2: CS3000 Stainless Steel Enclosure

CS3000 Double Wide Stainless-Steel Enclosure

The Double-Wide Heavy-Duty Stainless-Steel Enclosure is a complete factory-assembled unit, pre-mounted with a combination of any two Calsense CS3000 Irrigation Controllers (Figure 3). When ordered, the Double-Wide enclosure includes either two CS3000 8-conventional station (model CS3-8-SD) or two CS3000 2-Wire (model CS3-2W-SD) controllers with further expansion available by purchasing station kits. There is also a third model available which includes a single 8-conventional station controller and one 2-Wire controller (model CS3-8-2W-SD).

The enclosure is constructed of weather and vandal-resistant stainless steel. The unit comes complete with transient and lightning protection, factory-labeled terminals, GFCI outlet, and keyed switch. It also features a security-tight locking mechanism, louvered vents with splash guards, and bee/wasp screens. The D1 and D2 models include pre-drilled holes for radio antennas for use with the Cellular (model CS3-GR-KIT), Wireless Ethernet (model CS3-WEN-KIT), Spread Spectrum Radio (model CS3-SR-KIT), and Local Radio (model CS3-LR-KT) options . All double-wide SSE enclosures come with 10-year warranties and are fully UL Certified.

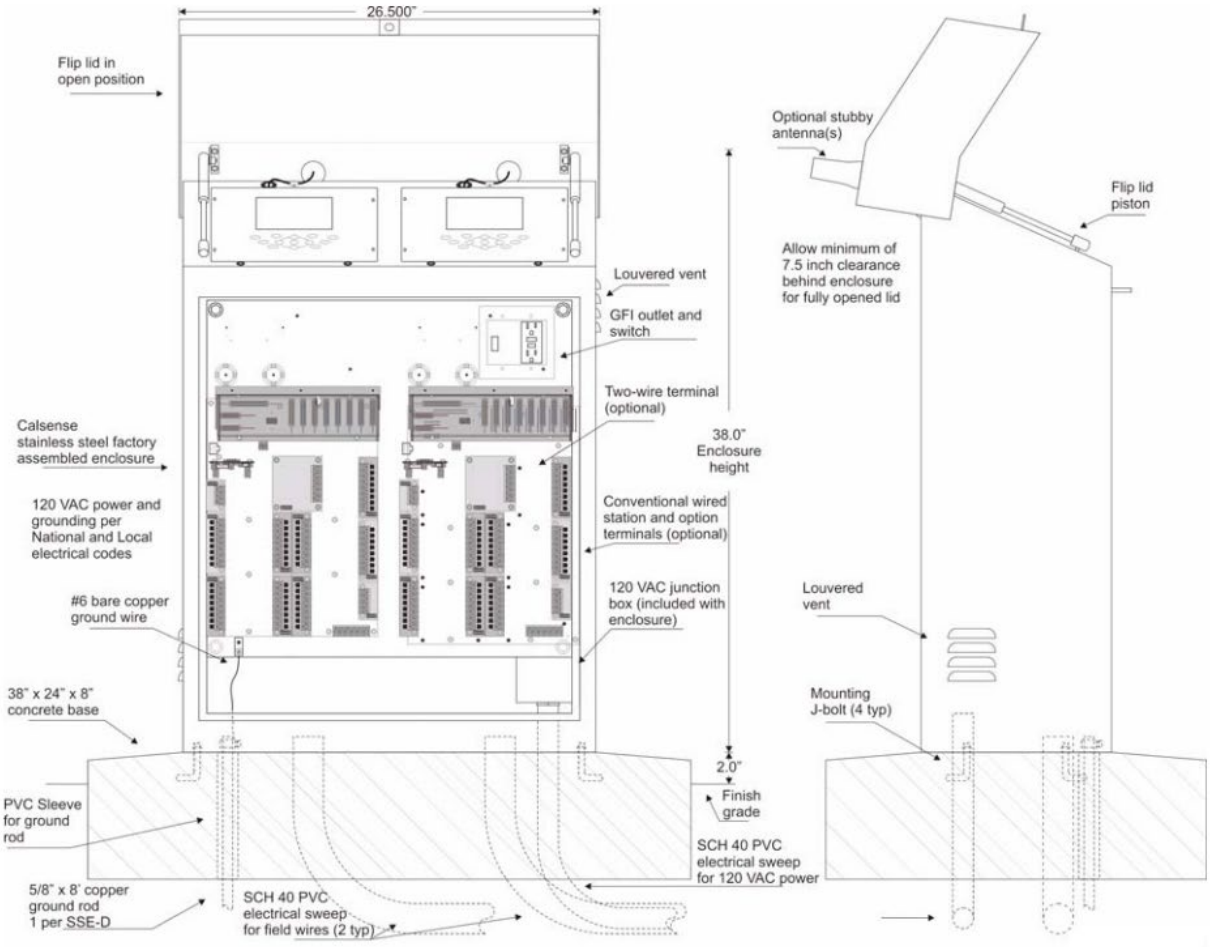


Figure 3: Double Wide Stainless Steel Enclosure

CS3000 Turn-Key Solar Package

Utilizing solar energy, the CS3-SL offers a smart sustainable solution for managing resources and labor costs in one convenient turn-key kit, accessible anywhere, anytime from any internet-connected device (Figure 4). The CS3-SL unit is housed in a flip-top enclosure that includes a Calsense CS3000 irrigation controller housed on the left. The right section of the double-wide houses the solar controller/charger equipment. This includes batteries, a power inverter, a power monitor and circuit breakers. Pre-assembled and pre-wired for convenience, the CS3-SL offers up to 48 stations, or as a 2-Wire controller, all featuring the CS3-GR-KIT communication option.

The CS3-SL provides robust irrigation management with simple installation, as well as minor lifetime maintenance by maximizing battery charge and health automatically. The controller is mounted at a 25° angle for easy access, viewing, and programming. The self-sustaining efficiency of this solar kit makes it the most environmentally friendly irrigation controller on the market, which can easily be integrated into your existing Calsense system.

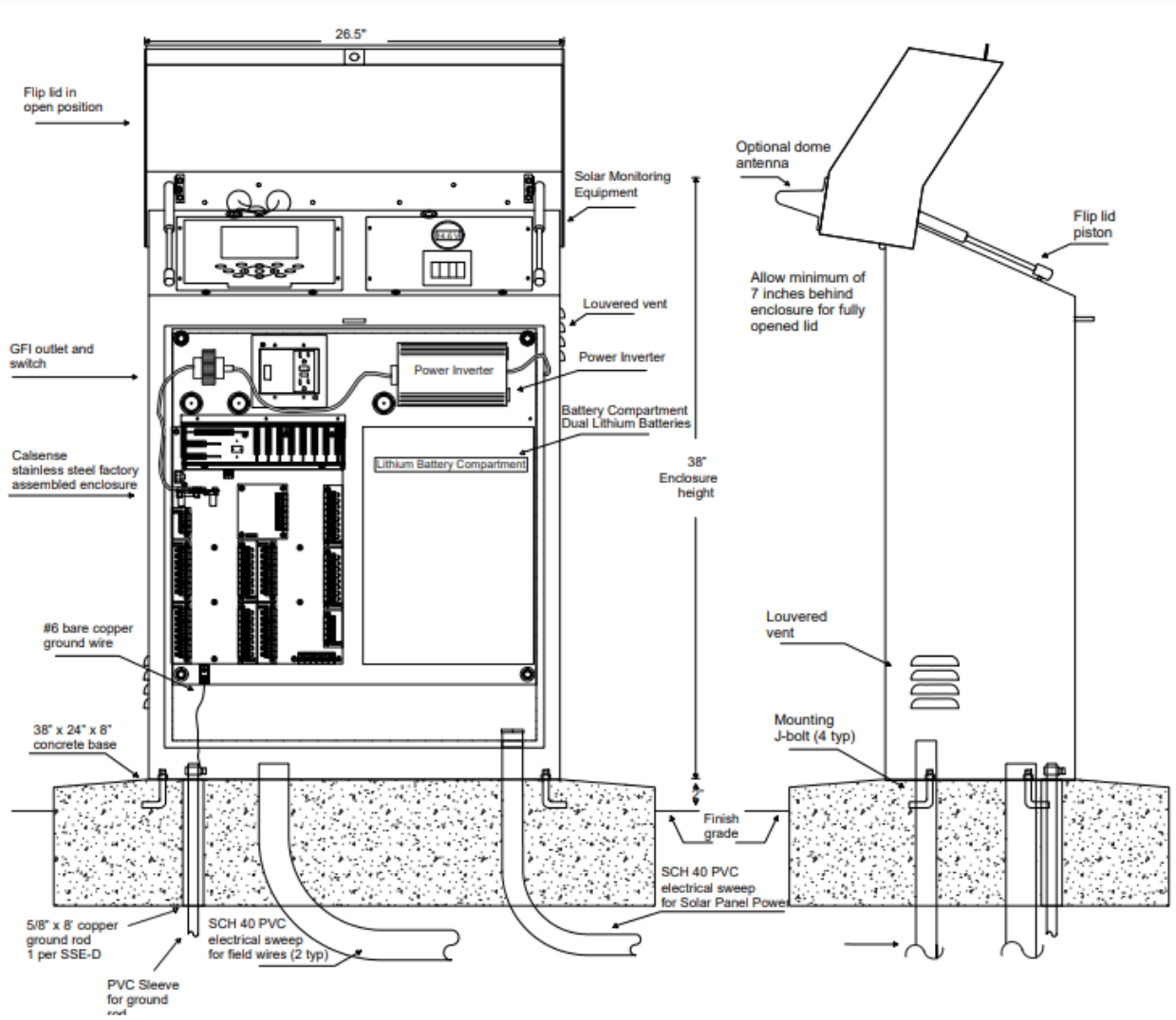


Figure 4: CS3000 Turn Key Solar Enclosure

FLOWSENSE®

The Calsense enhanced *FLOWSENSE*® option, specified as CS3-FL, allows multiple controllers to share an internet-connected communication option, master valves, flow meters, and pumps, as well as real-time weather data from devices such as an ET Gage, Tipping Rain Bucket, and/or third-party rain and freeze sensors. This sharing is accomplished through a two-way communication link between the controllers in the field, using the Hardwire (models CS3-M and CS3-MSSE) or Spread Spectrum Radio (model CS3-SR) options.

FLOWSENSE technology is designed to allow the user to setup and operate this feature directly in the field with the Calsense CS3000 controller. No other software is required. The *FLOWSENSE* option uses innovative technology to communicate between controllers and manage the proper operation of irrigation valves.

Benefits of the *FLOWSENSE* option include:

- Ability to share a single internet-connected central communication device
- Synchronizes programming across controllers so any controller on the chain can be programmed from any other controller in that chain
- Eliminates the need for additional relays when sharing pumps or master valves with several controllers
- Manages the number of valves that can be turned on at a time based on mainline flow capacities
- Eliminates scheduling conflicts with multiple controllers
- Provides water management capabilities with or without a Flow Meter

Water Management

With *FLOWSENSE*, the user can control the number of valves turned on based on the flow capacities of each mainline. This minimizes the water window; thus, the allowable mainline flow rate is never exceeded, ensuring pumps operate at their capacity and each irrigation mainline functions at maximum efficiency. The user can select the maximum mainline flow rate both with and without pumps. In addition, the user can control the number of valves coming on for areas of the main line based on mainline capacities.

The CS3000 also introduces the capability of managing flow on up to four mainlines simultaneously. The result is up to four irrigation mainlines operating at maximum efficiency, all controlled in the field solely by the CS3000 Irrigation Controllers. Additionally, turning on stations by using the manual feature or any internet-connected device including smart phones ensures that, even during programmed irrigation, the maximum capacity of each mainline is not exceeded.

Flow Monitoring

Like a single controller, *FLOWSENSE* accurately pinpoints valves with high flows caused by broken sprinklers, risers, or pipes and low flows. When such a flow event occurs, affected valves are identified, shut off, and alerts are generated to notify the user for quick and easy repair. The controllers also identify electrical problems, such as shorted solenoids and broken wires. When a faulty valve is detected

and shut off, the next available valve is turned on. Thus, *FLOWSENSE* is always working to shorten the water window and maximize pump efficiencies while not exceeding the irrigation mainline capacity.

Sharing Data Between Controllers

The *FLOWSENSE* feature provides the ability to configure the controller to share a point of connection with other controllers within a *FLOWSENSE* chain.

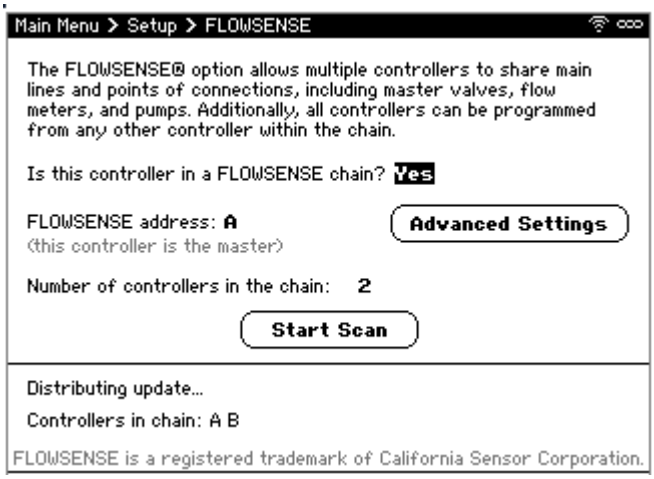


Figure 5: FLOWSENSE Screen

To configure *FLOWSENSE* (Figure 5):

1. From the Main Menu, navigate to **Setup** and select ***FLOWSENSE***. The *FLOWSENSE* screen displays.
2. Navigate to Is this controller in a *FLOWSENSE* chain? and use **+/-** to select **Yes** or **No**.
    - If **Yes**:
        i. Navigate to *FLOWSENSE* address and use **+/-** to change internal communication address of controller. The controller with the internet-connected device should be addressed "A". The other controllers in the chain can be addressed "B" through "L" in any order, but each must be unique.
        ii. Navigate to Number of controllers in the chain and use **+/-** to select number of controllers.
        Note: This setting is only available for the controller addressed "A".
        iii. Navigate to and select **Start Scan** to discover controllers in the chain.
3. When finished, press **BACK** to save changes, and return to Main menu.

Device Compatibility

2-Wire Decoders

Calsense 2-Wire technology provides easy and cost-effective installation and built-in robust lightning and surge protection, making it durable and reliable. Decoders not only receive commands from the controller but also send real-time information back. Diagnostic information is gathered automatically from each decoder on a continual, real-time basis and recorded and transmitted back to the controller as well as the Command Center Online cloud application.

2-Station 2-Wire Decoder

The Calsense 2-Station 2-Wire decoder (model CS-2W-2ST) operates up to 2-solenoids using uniquely colored wires for each station (Figure 6). A single controller can operate up to 128 2-Wire stations, spread across a maximum of 70 physical 2-Station decoders.

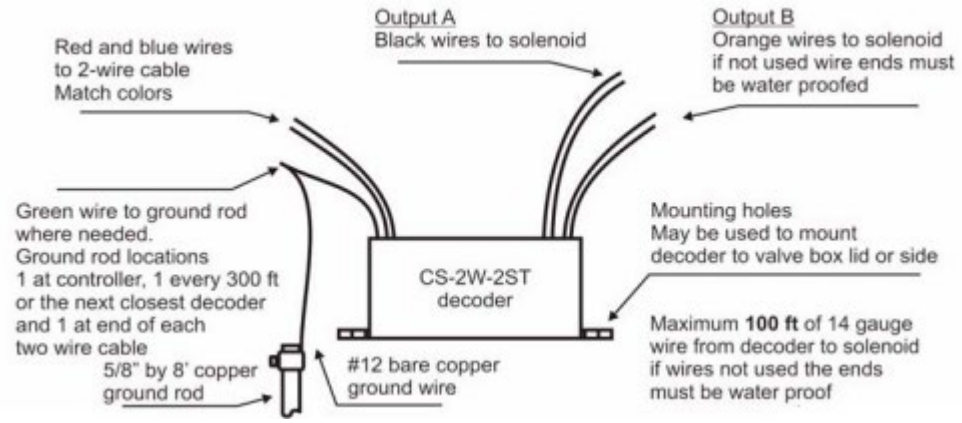


Figure 6: 2 Station 2-Wire Decoders

POC Decoder

The Calsense POC 2-Wire decoder (model CS-2W-POC) operates a single master valve and Calsense Flow Meter (model FM). A single controller can operate up to six POC decoders with a maximum of 12-POCs in a chain of controllers using *FLOWSENSE* technology (Figure 7).

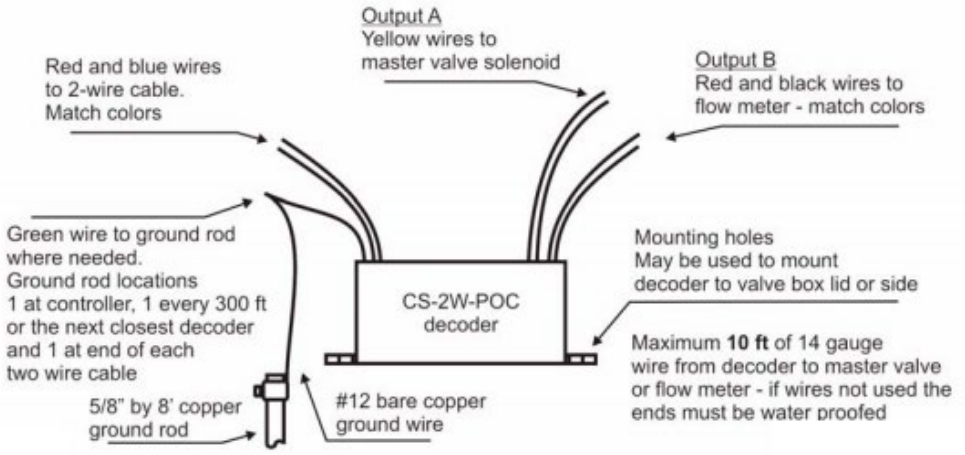


Figure 7: POC Decoder

Soil Moisture Sensor Decoder

The Calsense soil moisture sensor is used to accurately measure the volumetric water content at the depth at which the sensor is placed, by measuring the dielectric constant of the soil using capacitance/frequency domain technology. It is used to maintain soil water balance for optimum plant growth and to manage the amount of irrigation water applied.

The model CS-2W-MOIST is used in conjunction with the 2-Wire option, model CS3-2WIRE-OPT offered only with the Calsense model CS3000 irrigation controller. The dual sensor/ decoder comes with the standard 16-foot cable for proper sensor placement and the ability to wire one remote control valve to the 2-Wire cable. Moisture sensors can be installed anywhere on the 2-Wire path up to 7,000 ft. of total cable length.

Smart technology enables assigning any decoder's serial number associated with a specific moisture sensor location, to a group of like stations at the controller. The model CS3000 uses the sensor reading measured at the beginning of each irrigation cycle compared to the user defined set point to determine when to stop irrigation.

Note: Electronic signals are sent between the decoders and the controller for communication, so all connections must be waterproof. Calsense recommends using 3M Scotchcast 3570G Connector Sealing Packs (formerly 3M Scotchlok 3570 Connector Sealing Packs) for all electrical connections, including splices along the 2-wire path. If 3M Scotchcast 3570G sealing packs are not available, 3M DBR/Y-6 Direct Bury Splice Kits may be substituted.

If wire splices are unavoidable, they must be installed in a valve box using 3M Scotchcast 3570G Connector Sealing Packs (formerly 3M Scotchlok 3570 Connector Sealing Packs), Spears DS 100 Dri-Splice Connectors with DS-300 Dri-Splice Sealant, or 3M DBR/Y-6 Direct Bury Splice Kits.

Compatible Flow Sensors

Calsense Flow Meters

Calsense Flow Meters are available in a variety of models, each supporting a different size. See the Available Flow Meter Sizes and Models table below for more information. The correct Flow Meter size is not determined by the size of the irrigation mainline, but rather by the station flow rates. Selection of Flow Meter size depends on the following factors:

- Maximum flow rate, in gpm, for the system
- Minimum flow rate, in gpm, for the system
- Permissible pressure loss through the flow meter

Available Flow Meter Sizes and Models			
Flow Meter Size	Min Upstream Pipe length	Min Downstream Pipe Length	Pipe Diameter
1"	10"	5"	1"
1.25"	12.5"	6.25"	1.25"
1.5"	15"	7.5"	1.5"
2"	20"	10"	2"
3"	30"	15"	3"

To determine the correct Flow Meter size in an irrigation system, first determine the station with the highest flow rate on the system. Next determine the station with the lowest flow rate on the system. Then make sure that both flow rates are within the operating range of the selected Flow Meter size in the table below. For systems with a large mainline, consider using multiple Flow Meters configured as a bypass manifold to read both high and low flowing valves.

Recommended Flow Meter Operating Ranges					
Model	**Min Flow (0.5 fps)**	**Min Flow (1 fps)**	**Max Flow (15 fps)**	**Max Flow (15 fps)**	**PSI Loss @ gpm**
FM-1B	2 gpm	**3 gpm**	**50 gpm**	50 gpm	0.5 psi @ 36 gpm
FM-1.25B	3 gpm	**5 gpm**	**81 gpm**	81 gpm	0.5 psi @ 69 gpm
FM-1.5B	4 gpm	**7 gpm**	**105 gpm**	106 gpm	0.5 psi @ 96 gpm
Model	**Min Flow (0.5 fps)**	**Min Flow (1 fps)**	**Max Flow (15 fps)**	**Max Flow (30 fps)**	**PSI Loss @ gpm**
FM-1.5	4 gpm	**7 gpm**	**105 gpm**	212 gpm	0.5 psi @ 96 gpm
FM-2	6 gpm	**11 gpm**	**166 gpm**	333 gpm	0.5 psi @ 165 gpm
FM-2B	6 gpm	**11 gpm**	**166 gpm**	333 gpm	0.5 psi @ 165 gpm
FM-3	12 gpm	**24 gpm**	**363 gpm**	727 gpm	0.5 psi @ 390 gpm
Model	**Min Flow (0.5 fps)**	**Min Flow (1 fps)**	**Max Flow (15 fps)**	**Max Flow (15 fps)**	**PSI Loss @ gpm**
FMBX	0.5 fps	**1 fps**	**15 fps**	30 gpm	n/a

Third-Party Flow Sensors

Compatible Impeller and Ultrasonic Flow Sensors

The CS3000 irrigation controller is also compatible with several third-party flow sensors including those from Data Industrial®, Creative Sensor Technology (CST), FLOWMEC®, and Netafim™. When using one of

these flow sensors, select **FMBX** as the flow meter type in the controller and enter the manufacturer-supplied K value and offset.

Compatible Hydrometers

The Calsense CS3000 includes support for Bermad, Arad, and Netafim hydrometers. Electronic Register and Photodiode Register hydrometers require no special configuration within the controller other than selecting **FMBX** as the flow meter type. However, reed switch register hydrometers require you to select the size of the hydrometer and the pulse rate. Reed switches that are supported include 1-pulse per 1-gallon and 1-pulse per 10-gallon switches.

Caution: Calsense does not recommended using Netafim HM 4" ER, HM 6" ER, HM 8" ER, or HM 8" ER with the CS3000 due to compatibility issues between the products.

Compatible Calsense Weather Sensors

ET Gage

Using a Calsense ET Gage (model ETG), the CS3000 Irrigation Controller collects real-time daily evapotranspiration (ET) to calculate station run times automatically. To connect to an ET Gage, the controller must have a weather option (model CS3-W-KIT).

Tipping Rain Bucket

The Calsense Tipping Rain Bucket (model RB-1) allows a CS3000 controller with the weather option (model CS3-W-KIT) to keep a record of accumulated rainfall and adjust irrigation accordingly.

Wind Gage

Wind speed can be monitored by a Calsense CS3000 controller using a Calsense Wind Gage (model WG-1) to modify the irrigation schedule to ensure efficient watering. The irrigation controller must have a weather option to connect to the Wind Gage (model CS3-W-KIT).

WEATHERSENSE

WEATHERSENSE is a feature available in the cloud-based Calsense Command Center Online software which retrieves real-time evapotranspiration (ET) and rain data without the need for an on-site ET Gage or Rain Bucket. This information can be shared to controllers in the field automatically.

Third-Party Weather Sensors

The CS3000 is compatible with most third-party rain and freeze sensors. These third-party sensors typically operate by breaking the connection between the field common wire and the controller. To take full advantage of the controller's features, the weather option (model CS3-W-KIT) provides maximum flexibility including individual terminals for rain and freeze sensors. Alternately, a rain switch can be wired to the SW1 input on the POC terminal if a weather option is not available. Connecting a sensor without either of these options disables some of the controller's features when irrigation is halted due to a rain or freeze event.

Central Control

Command Center Online

Calsense Command Center Online is a cloud-based package designed to provide complete irrigation control. It is specifically designed for easy operation and requires no prior computer experience. Flow and electrical issues in the field are pinpointed in an Alerts report which enables maintenance crews to handle problems efficiently. Engineered for easy and reliable access, all that is needed is a username and password to start obtaining data from Cellular, Ethernet, or Wireless Ethernet (Wi-Fi) controllers in the field.

Programming changes can be made to the irrigation system without having to go to the field. Daily weather information can be shared automatically to adjust station run times to manager water and labor costs. Decisions made and actions taken are based on real-time conditions of the landscape through the reporting capabilities of the system. System reports include complete records of the details for every irrigation cycle, water usage versus water budget amounts, the gallons and percentages of water savings, and what events and changes have occurred at the controller. Additionally, system administrators have management reports listing sites and users for their company.

Accessible remotely from any internet-connected device, Command Center Online also features the ability to turn stations on and off. Besides the ability to turn on up to six valves simultaneously, it provides real-time flow information, details if a mainline break occurs, real-time weather data if you have an on-site weather device, and so on. The Command Center Online cloud application can also send and receive real-time weather data to and from any irrigation controller to which it is linked. It can receive daily ET data from a Calsense ET Gage (model ETG) and rainfall from a Calsense Tipping Rain Bucket (model RB-1) and send them to other field controllers. For sites without an ET Gage or Rain Bucket, Calsense's own WEATHERSENSE service may be used.

How to Use this User's Guide

This CS3000 User's Guide explains how to program many of the features included in the controller. Calsense is committed to our customer's success in achieving their site's resource management goals.

Keypad Features

The keypad is used to navigate around the screen, select a desired field and make programming changes. The keys are:

- **STOP –** stops any currently running Scheduled Irrigation, Manual Programs, Manual Watering, and Test Cycles. If multiple types of irrigation are running, you may need to press the button more than to stop it all since it only stops one type at a time.
- **ENGLISH/ESPANOL –** toggles the text on the screen from English to Spanish and back
  PREV and **NEXT –** refreshes the screen showing the next or previous group, station, or mainline.
- ← ↑ → ↓ – moves the cursor around the screen
- **SELECT –** selects the highlighted field or displays a dropdown selection of values
- **+** and **–** increase or decrease the highlighted value
- **HELP –** displays context-sensitive help based on the highlighted field
- **BACK –** returns to the previous screen. Pressing **BACK** also saves any changes made on the screen.

Status Screen

The status screen is an active screen with multiple cursor positions. It provides information on what's running, what's scheduled to run next, real-time weather data based on weather sensors attached to the controller, real-time flow in gallons per minute, and the controller's electrical current draw in amps. It also shows critical issues affecting irrigation such Mainline Break or 2-Wire Cable Overheated.

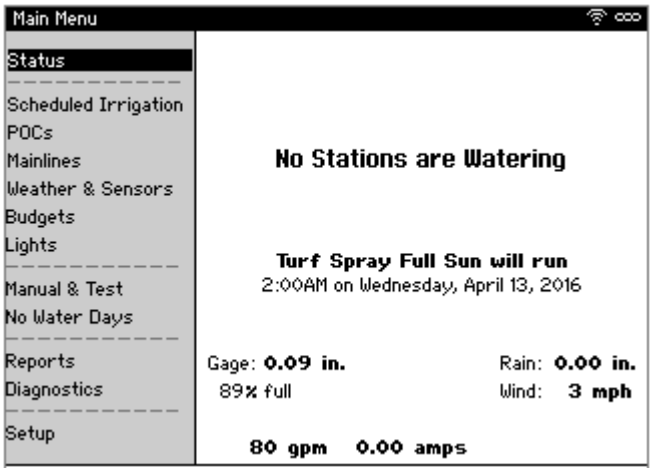


Figure 8: Status Screen

To view the Status screen (Figure 8):

1. From the Main Menu, navigate to and select **Status**. The first available cursor position is highlighted.
2. Navigate to and select the desired field to provide additional information:
    - No stations are watering: Takes the user to the Irrigation Details screen
    - Irrigation is running: Takes the user to the Irrigation Details screen
    - There will be no scheduled irrigation: Takes the user to the Station Groups screen
    - Next scheduled irrigation will run: Takes the user to the Start Times and Water Days screen
    - Gage: ET valve received from the ET Gage since 8:00 PM. Takes the user to the Weather Status screen
    - Rain: Total accumulated midnight-to-midnight rain. Takes the user to the Weather Status screen
    - Wind: Wind speed. Takes the user to the Weather Status screen
    - gpm: Total flow rate for ALL mainlines. Takes the user to the Mainline Status screen.
    - amps: Current draw at THIS controller. Takes the user to the Electrical Status screen.
3. When finished, press **BACK** to return to the Main Menu.

Diagnostics

These menu options allow the user to view controller alerts, audit program changes, see what stations are running, and view other real-time controller specifics through live screens. These menu options give the most detailed information on how the controller is operating real-time.

Controller Alerts

The Alerts report is a chronological listing of each individual event that has taken place. Alerts are automatically uploaded to Command Center Online within 15-minutes of being generated.

To view Alerts:

1. From Main Menu, navigate to **Diagnostics** and select **Alerts**. The Alerts report displays.
2. When finished, press **BACK** to return to the Main Menu.

Program Changes

The Change Lines are a chronological listing of each change that has been made to the controller's programming or *FLOWSENSE* chain.

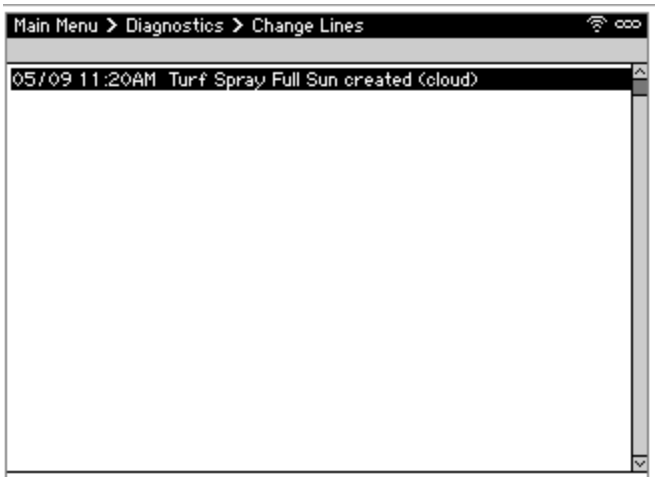


Figure 9: Program Changes

To view Change Lines (Figure 9):

1. From Main Menu, navigate to **Diagnostics** and select **Change Lines**. The Change Lines report displays.
2. When finished, press **BACK** to return to the Main Menu.

Irrigation Details

The Irrigation Details report provides details about all stations that are currently irrigating within the system.

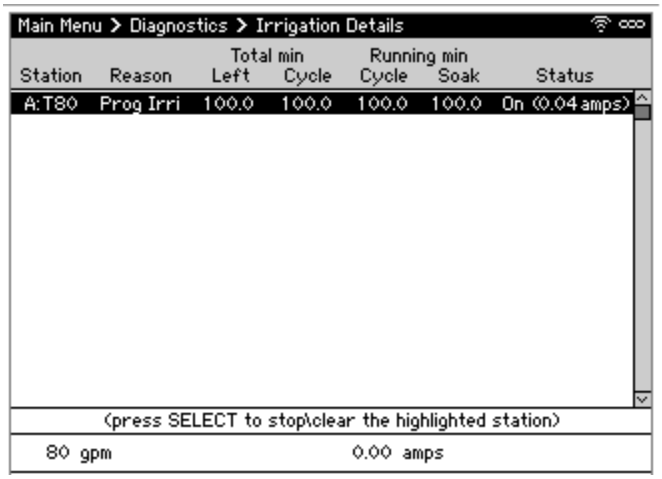


Figure 10: Irrigation Details

To view Irrigation Details (Figure 10):

1. From Main Menu, navigate to **Diagnostics** and select **Irrigation Details**. Irrigation Details menu displays.
2. To stop a particular station, highlight it and press **SELECT**. This stops the station and removes it from the list of stations to irrigate until the next time it is scheduled to run or is turned on manually.
3. When finished, press **BACK** to return to the Main Menu.

Viewing Station Group Finish Times

The Finish Times feature provides the ability to view the finish time for each Station Group within a 14-day window. This menu option is vital for ensuring that irrigation is programmed to run through its fully scheduled time within the set water windows, as defined by the group's Start and Stop times.

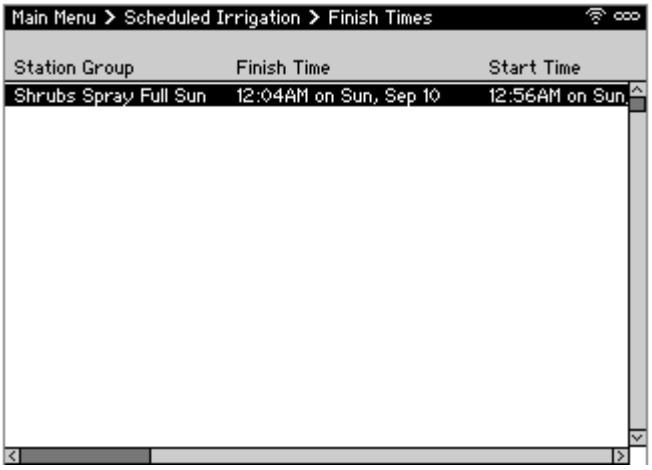


Figure 11: Viewing Station Group Finish Times

To view Finish Times (Figure 11):

1. From Main Menu, navigate to **Scheduled Irrigation** and select **Finish Times**.
2. Navigate to desired Station Group to view Finish and Start Time.
   Note: If the system has more than one mainline, press **NEXT** or **PREV** to view Station Groups assigned to the additional mainlines.
3. To edit the Start Time, navigate to and select the desired station group. The Start Times and Water Days screen displays. See Setting up Station Groups for programming instructions.
4. When finished, press **BACK** to return to Main Menu.

Initial Program Setup

Date & Time

The Date & Time feature provides the ability to set the controller's date, time, and time zone. When the time zone is set properly, Command Center Online ensures the time remains current.

Figure 12: Date and Time Screen

To set the date and time (Figure 12):

1. From the Main Menu, navigate to **Setup** and select **Date & Time**. The Date & Time screen displays.
2. Navigate to Time Zone and use **+/-** to adjust the time zone if necessary.
3. Navigate to the date and time and use **+/-** to change values to set the current date and time.
4. Navigate to and select **Set Date & Time** to save the change.

   Note: The Set Date and Time button only appears after you have made a change.
5. When finished, press **BACK** to save the time zone change, if made, and return to the Main Menu.

Contrast, Backlight & Volume

The Backlight & Volume feature provides the ability to adjust the LCD's display brightness and speaker volume.

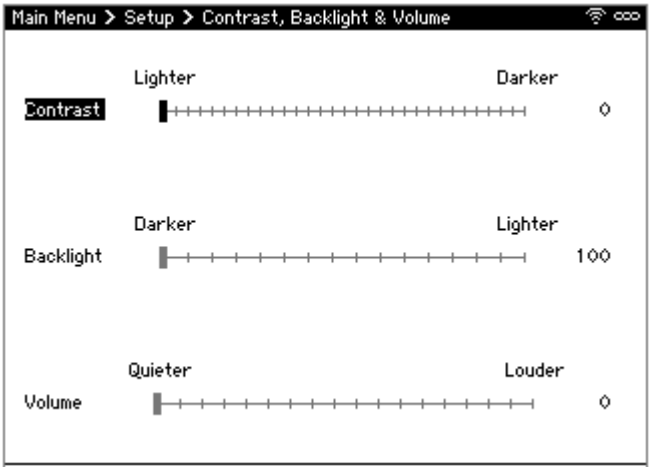


Figure 13: Contrast, Backlight, & Volume Screen

To adjust contrast, backlight, or volume (Figure 13):

1. From Main Menu, navigate to **Setup** and select **Contrast, Backlight & Volume**.
2. Navigate to and select **Contrast**, **Backlight** or **Volume** and use **+/-** to adjust to preferred setting.
   Note: Depending on when the controller was manufactured, you may or may not have the backlight feature.
3. When finished, press **BACK** to save changes, and return to the main menu.

Disabling Stations

The Stations In Use feature provides the ability to disable unused stations that are not physically connected to the controller. These stations will no longer be visible for programming in any other screen.

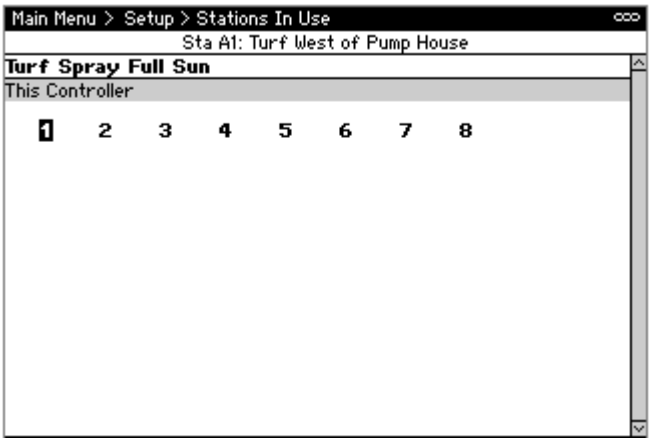


Figure 14: Stations In Use Screen

To add or remove stations (Figure 14):

1. From Main Menu, navigate to **Setup** and select **Stations in Use**.

2. Navigate to desired station and use **+/-** to turn on or off a station.
3. When finished, press **BACK** to save changes, and return to Main Menu.

Stations On-at-a-Time

The On-at-a-Time feature provides the ability to set up the number of valves that come on simultaneously within a Station Group and within a Mainline. This ensures that the water pressure within a group and mainline stays consistent. If too many valves are on at a time, the water pressure loss will result in poor coverage.

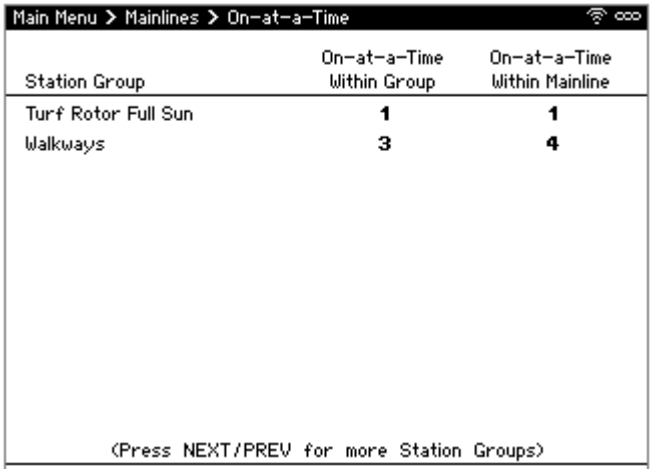


Figure 15: On-at-a-Time Screen

To set on-at-a-time (Figure 15):

1. From Main Menu, navigate to **Mainlines** and select **On-at-a-Time**.
2. Navigate to the desired Station Group.
3. Navigate to On-at-a-Time Within Group column and use **+/-** to adjust number of valves that can irrigate simultaneously within the same Station Group.
4. Navigate to On-at-a-Time Within Mainline column and use **+/-** to adjust number of valves that an irrigate simultaneously within the same Mainline.
5. When finished, press **BACK** to save changes, and return to the main menu.

Reference ET Values

The Historical ET feature provides the ability to select historical ET values, either from the built-in list or by entering manual monthly values. Historical ET values are used as reference data points in the event weather sharing fails so the controller can still irrigate as efficiently as possible.

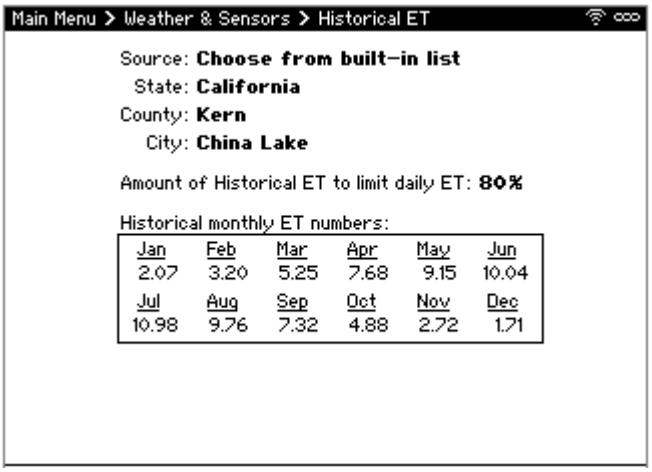


Figure 16: Historical ET Screen

To set historical ET values (Figure 16):

1. From Main Menu, navigate to **Weather & Sensors** and select **Historical ET**.
2. Navigate to and select **Source**. Two options display: **Choose from built-in list** or **Enter your own ET numbers**.
    - If using Choose from built-in list:
        i. Navigate to State and select the corresponding state in the list provided.
        ii. Navigate to County and select the corresponding county in the list provided
        iii. Navigate to City and select the corresponding city in the list provided. The pre-populated Historical monthly ET numbers for that location display.
        iv. Navigate to Amount of Historical ET to limit daily ET and use **+/-** to adjust percentage. **Note:** This setting controls the maximum allowable amount of ET that can be used to calculate station run times. This allows the user to control the maximum amount of total irrigation time for sites that have a limited water window.
    - If using Enter your own ET numbers:
        i. Navigate to and select State to use the pop-up keyboard to type your state.
        ii. Navigate to and select County to use the pop-up keyboard to type your county.
        iii. Navigate to and select City to use the pop-up keyboard to type your city.
        iv. Navigate to Amount of Historical ET to limit daily ET and use **+/-** to adjust percentage.
        v. Navigate to Historical monthly ET numbers and use **+/-** to adjust monthly ET numbers.
3. When finished, press **BACK** to save changes, and return to Main Menu.

Assigning Points of Connection (POCs) to Mainlines

The Assign POCs to Mainlines feature provides the ability to specify which Points of Connection supply water to which Mainlines.

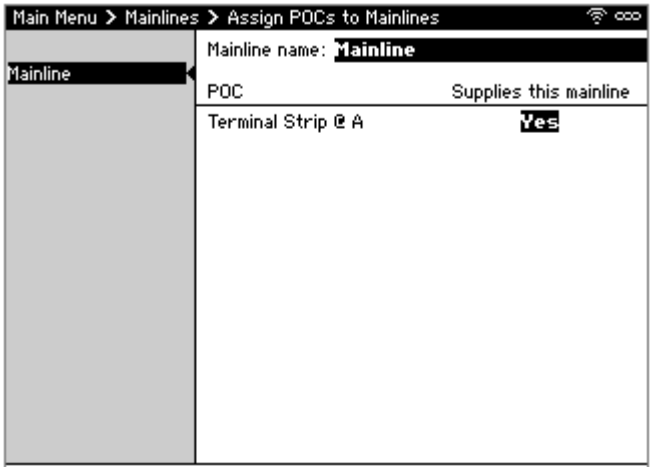


Figure 17: Assign POCs to Mainline Screen

To create mainlines and assign POCs to those mainlines (Figure 17):

1. From Main Menu, navigate to **Mainlines** and select **Assign POCs to Mainline**.
2. Navigate to and select the desired Mainline or **Add New Mainline** to add additional mainlines. The CS3000 supports up to four independent mainlines.
3. Navigate to Mainline name and press **SELECT** to edit the name with pop-up keyboard. Select **OK** when done.
4. Navigate to Supplies this Mainline and select **Yes** to add the POC to the mainline.
   Note: Each POC must be assigned to a mainline. Therefore, the only way to remove a POC from a mainline is to add it to a different mainline.
5. When finished, press **BACK** to save changes, and return to Main Menu.

Viewing Mainline Status

The Mainline Status feature provides the ability to view the state of each mainline. This includes how many valves are on at a time, actual flow rates, and expected flow rates. If a mainline break occurs, this screen provides details regarding the mainline break and gives the user the ability to clear it.

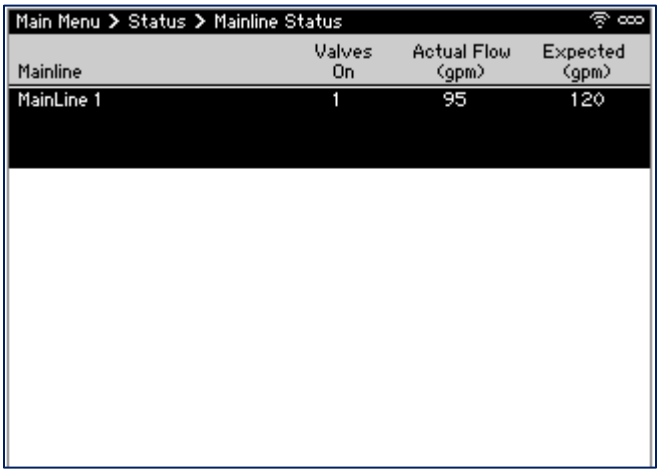


Figure 18: Mainline Status Screen

To view the real-time mainline status (Figure 18):

1. From Main Menu, navigate to **Diagnostics** and select **Live Screens**. Live Screens menu displays.
2. Navigate to and select **Mainline Status**. Mainline Status menu displays.
3. When finished, press **BACK** to return to Main Menu.

Viewing POC Status

The POC Status feature provides the ability to view the state for each points of connection including the actual flow rate and if the master valve is open or closed.

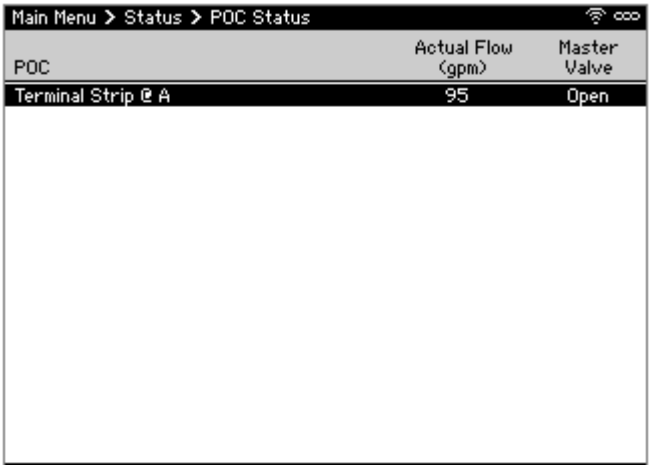


Figure 19: POC Status Screen

To view the real-time POC status (Figure 19):

1. From Main Menu, navigate to **Diagnostics** and select **Live Screens**. Live Screens menu displays.
2. Navigate to and select **POC Status**. POC Status menu displays.

3. When finished, press **BACK** to return to Main Menu.

Additional Steps for 2-Wire

Two wire systems use only two wires combined with a decoder. The following steps are additional initial setup options when using 2-Wire.

Discovering 2-Wire Decoders

The 2-Wire discovery process allows the controller to automatically detect any 2-Wire decoders attached to the 2-Wire path after they have been installed. This simplifies installation by allowing all decoders to be installed in the field without any pre-programming.

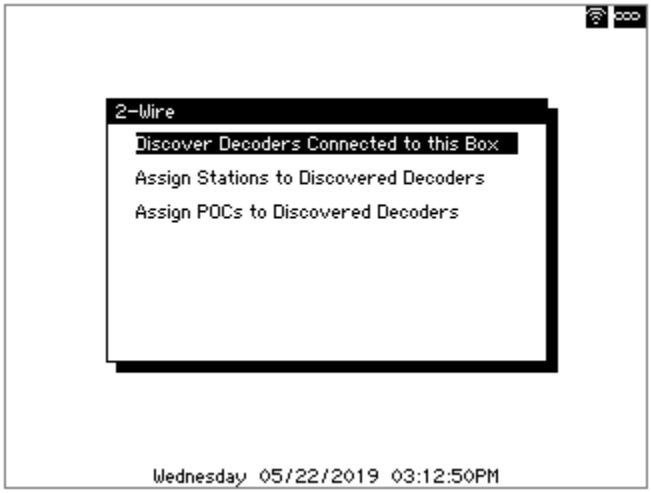


Figure 20: 2-Wire Screen

To discover all 2-Wire decoders attached to the controller (Figure 20):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to and select **Discover Decoders Connected to this Box**. The controller begins scanning for all decoders physically connected to the controller's 2-Wire terminal.
3. Once complete, select **OK** on the dialog that indicates how many decoders were discovered.

Assigning Stations to 2-Wire Decoders

Once 2-Wire decoders have been discovered, you can assign a station numbers to each output on a decoder. For a controller that has both 2-Wire and conventional wiring, the stations can be numbered from 1-80 and will be preceded with a T, such as T24. For a controller no conventional station terminals, stations can be numbered from 1-128 and do not have the T in front of them.

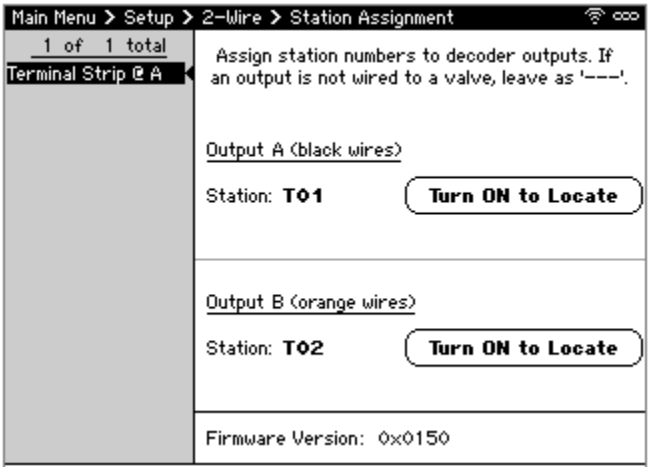


Figure 21: 2-Wire Station Assignment Screen

To edit the 2-wire Station Assignment screen (Figure 21):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to **Assign Stations to Discovered Decoders**. The Station Assignment screen displays.
3. Navigate to desired Decoder by serial number (S/N) and press **SELECT**.
4. Navigate to Station under Output A (black wires) and use **+/-** to assign a station number to selected decoder. **Note:** Soil Moisture Sensor decoders only have a single station output so will only show Output A.
5. To activate the valve, select **Turn ON to Locate** energize the solenoid attached to the decoder output. **Note:** This does not energize the pump or master valve so, the valve may not irrigate.
6. Repeat steps 4-5 for to assign a station to Output B (orange wires).
7. Press **Next** or **Prev** to move through the list of decoders and repeat steps 4-6 to assign stations to each output with a valve attached.
8. When finished, press **BACK** to save changes, and return to Main Menu.

Assigning POCs to 2-Wire Decoders

POC decoders, like station decoders, need to be assigned to a POC. On systems with a bypass manifold, this is also where the decoders are assigned to that bypass.

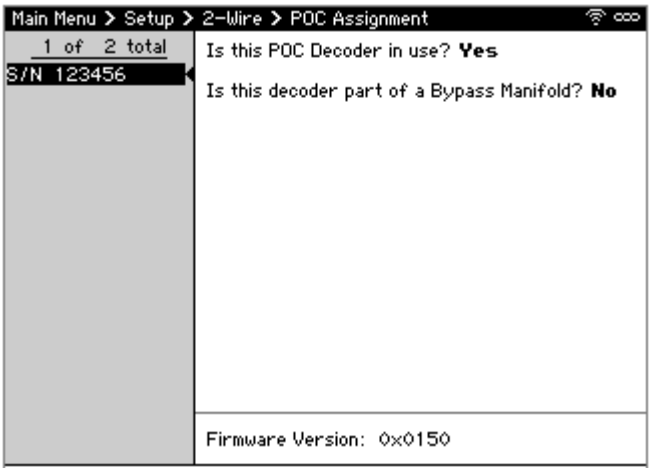


Figure 22: 2-Wire POC Assignment Screen

To edit the 2-wire POC Assignment Screen (Figure 22):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to and select **POC Assignment**. POC Assignment menu displays.
3. Navigate to the desired POC Decoder by Serial Number and press **SELECT**.
4. Navigate to Is this POC Decoder in use? and use **+/-** to select **Yes**.
5. If this decoder is part of a Bypass Manifold, navigate to the setting and use **+/-** to select **Yes**.
   Note: A minimum of two and a maximum of three decoders can be used to build a bypass manifold.
6. When finished, press **BACK** to save changes, and return to Main Menu.

Scheduling Irrigation

Station Groups provide a simple method of grouping stations together which share similar landscape details and physical characteristics. Like traditional programs, these Station Groups are used to schedule irrigation.

Setting up Station Groups

To create or edit a Station Group, from the Main Menu, navigate to **Scheduled Irrigation** and select **Station Groups**. The Station Groups menu displays (Figure 23).

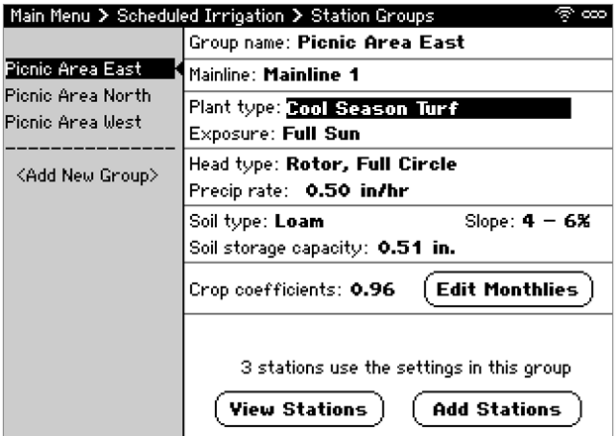


Figure 23: Station Groups Screen

Adding a New Station Group

When adding a new Station Group, a list of existing Station Groups displays. This provides the opportunity to select a group that has similar characteristics as the group being created and will copy all those settings. This is particularly useful for stations that need to be separated for a particular reason, such as slow closing valves requiring a delay before closing but retain all of the other settings.

To add a new Station Group:

1. Highlight and select **Add New group**. The Create New Group dialog displays.
2. Select an existing Station Group from the list and press **SELECT** to create a new group with those settings.

Adjusting Station Group Settings

Naming the Station Group

The first step when working with Station Groups is to provide the group with a unique name. By default, the name will be set based on the selected Plant Material, Head Type, and Exposure. For example, the name of the very first Station Group after powering up the controller for the first time is Turf Rotor Full Sun. However, this can be modified by highlighting the name and pressing **SELECT**. A pop-up keyboard displays so you can enter a more descriptive name.

Assigning a Mainline

The CS3000 supports up to four unique mainlines. To minimize water windows and make the best use of the capacity of each mainline, they operate independently of one another. Since station on-at-a-time

settings are managed at both the Station Group and Mainline level, Station Groups must be assigned to the correct mainline.

Selecting Plant Type

The Calsense CS3000 controller has 14 different plant types to choose from to best meet your Station Group's watering needs. The options include: Cool Season Turf, Warm Season Turf, Combined Turf, Annuals, Trees, Ground Cover, Shrubs-High Water Use, Shrubs-Medium Water Use, Shrubs-Low Water Use, Mixed-High Water Use, Mixed-Medium Water Use, Mixed-Low Water Use, Native Shrubs/Trees, Native Grasses. Each of these plant types have unique characteristics such as root depth, which impacts Soil Storage Capacity, and species factor, which impacts Crop Coefficients. To adjust this setting, highlight the field and either press **+/-** to change it, or press **SELECT** to see a dropdown of available options.

Selecting Exposure Type

The Calsense CS3000 controller allows the user to select the percentage of sunlight exposure the plant type experiences in a specific zone. The options include: Full Sun, 25% Shade, 50% Shade, 75% Shade, and Full Shade. Exposure affects the microclimate factor, and therefore impacts the group's Crop Coefficients. The higher the sun exposure, the greater the Crop Coefficient value will be. To adjust this setting, highlight the field and either press **+/-** to change it, or press **SELECT** to see a dropdown of available options.

Selecting Head Type

The Calsense CS3000 controller has 13 head- or sprinkler-type selections to choose from for each zone. The options are: Spray, Spray-Stream, Spray-High Efficiency, Rotor- Full Circle, Rotor- Part Circle, Rotor-Mixed, Rotor- Stream, Impact- Full Circle, Impact- Part Circle, Impact- Mixed, Bubbler, Drip Emitter, and Subsurface Drip. See Appendix C - Head Types for more information about each. Selecting a head type sets a default precipitation rate, which can be further adjusted based on the manufacturer's documentation. To adjust this setting, highlight the field and either press **+/-** to change it, or press **SELECT** to see a dropdown of available options.

Setting Precipitation Rate

The Calsense CS3000 controller automatically sets a default precipitation rate based off the selected head type. These values should be adjusted based on the manufacturer's documentation for the head type. To adjust this setting, highlight the field and press **+/-** to increase or decrease the value.

Selecting Soil Type

The Calsense CS3000 controller has seven soil types to best match your zone. The options are: Clay, Silty Clay, Clay Loam, Loam, Sandy Loam, Loamy Sand, Sand. The soil type affects the allowable surface accumulation, root zone depth, management allowable depletion, available water, and soil infiltration rate. These are all factors that affect cycle and soak-in times. Rather than requiring each of these parameters to be set, the CS3000 simplifies the process by adjusting the Soil Storage Capacity based on the soil type. There are many methods to determining soil type. See Appendix B - Soil Types for details. To adjust this setting, highlight the field and either press **+/-** to change it, or press **SELECT** to see a dropdown of available options.

Selecting Slope Percentage

The Calsense CS3000 controller has four slope percentages to use to calculate appropriate run and soak-in times. The slope percentages include: 0-3%, 4-6%, 7-12%, and 13% and plus. The slope affects the amount of water that can accumulate on the surface of the ground. Therefore, the greater the slope, the shorter the cycle time will be. To adjust this setting, highlight the field and either press **+/-** to change it, or press **SELECT** to see a dropdown of available options.

Setting up Soil Storage Capacity

Soil Storage Capacity is related to the total amount of water that is stored in the soil within the selected plant's root zone. A deeper root depth means there is a larger volume of water stored in the soil and therefore a larger reservoir of water for the crop to draw upon between irrigations. The Calsense CS3000 controller automatically adjusts Soil Storage Capacity based on Plant Material and Soil Type however, the value can be edited to account for the unique circumstances at each site. To adjust this setting, highlight the field and press **+/-** to increase or decrease the value.

Setting up Crop Coefficients

Crop Coefficients take properties of plants and use those properties to adjust the reference ET up or down based on the plant needs. The Calsense CS3000 controller automatically populates a twelve (12) month table based on Plant Type and Exposure. By default, the Crop Coefficients for a Station Group are the same for all months. To adjust the setting for all months at the same time, highlight the field and press **+/-** to increase or decrease the value. Alternately, if the plant material requires separate monthly values, select **Edit Monthlies** and use **+/-** to edit each month's value.

Scheduling Irrigation Start Times and Water Days

Start Times and Water Days provide the ability to schedule when each Station Group irrigates.

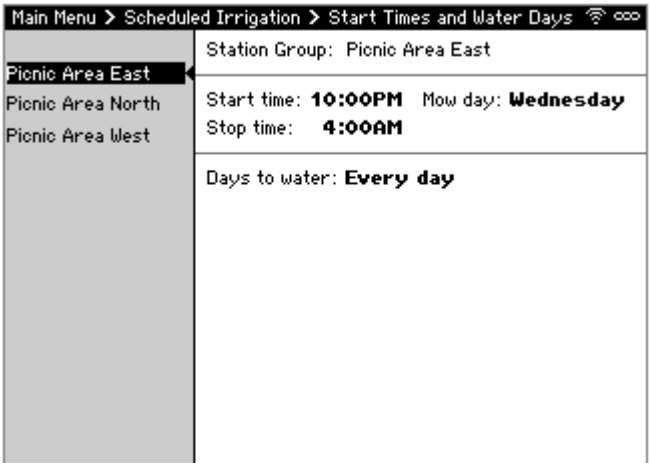


Figure 24: Start Times and Water Days Screen

To edit Start Times and Water Days screen (Figure 24):

1. From Main Menu, navigate to **Scheduled Irrigation** and select **Start Times and Water Days**.
2. Navigate to and select the desired Station Group.
3. Navigate to Start Time and use **+/-** to adjust the time.
4. Navigate to Stop Time and use **+/-** to adjust the time.

Note: The Stop Time value will stop all irrigation for that group at that time. Any group not using a stop time will continue until the irrigation is complete.

5. Navigate to Mow day use **+/-** to select a day of the week.
   Note: Mow day is a specific day of the week where irrigation will be skipped within the 24-hour period starting at 8PM the day before until 8pm the next day.
6. Navigate to and select Days to water and use **+/-** to select desired schedule. If Odd days were selected:
7. Navigate to Irrigate on the 1st after the 29th or 31st and use **+/-** to select Yes or No.
   - If Weekly schedule was selected:
     i. Navigate to desired day of the week and use **+/-** to turn On or Off.
     ii. Use ET Averaging (smooths run times) field appears. Use **+/-** to select Yes or No.
8. When finished, press BACK to save changes, and return to Main Menu.

Prioritizing Station Groups

The Priorities feature allows station groups to irrigate before other groups depending on the priority level: High, Medium, and Low. Priority levels establish the order of which station groups to water. The station group or groups with high priority will irrigate first, the station groups with medium priority will irrigate second, and the station group with low priority will irrigate last. **Note**: If scheduled irrigation exceeds the stop time, stations with low priority may not irrigate.

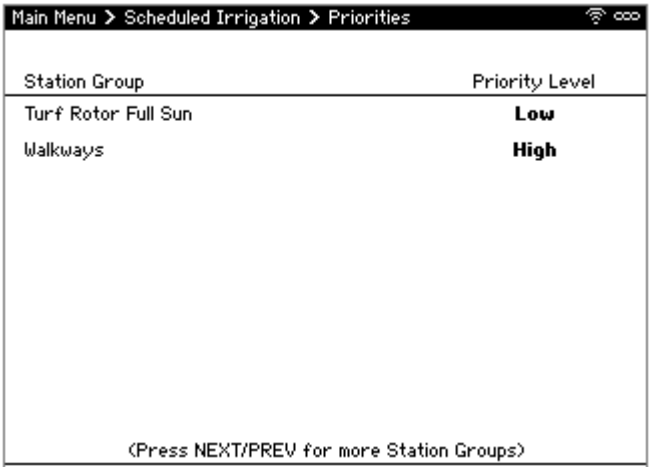


Figure 25: Priorities Screen

To edit the Priorities screen (Figure 25):

1. From the Main Menu, navigate to **Scheduled Irrigation** and select **Priorities**. The Priorities screen displays.
2. Navigate to desired Station Group and use **+/-** to change priority level:
   - High – A Station Group with a high priority will irrigate first.
   - Medium – A Station Group with a medium priority will irrigate second.
   - Low – A Station Group with a low priority will irrigate last or not at all.
3. When finished, press **BACK** to save changes, and return to Main Menu.

Percent Adjust

The Percent Adjust feature provides the ability to increase or decrease the run times of ALL stations assigned to a Station Group for a predetermined amount of time. This feature is typically used to accommodate for upcoming weather events such as heat waves or heavy expected rain. **Note:** If Days are set to zero, Percent Adjust is not in effect.

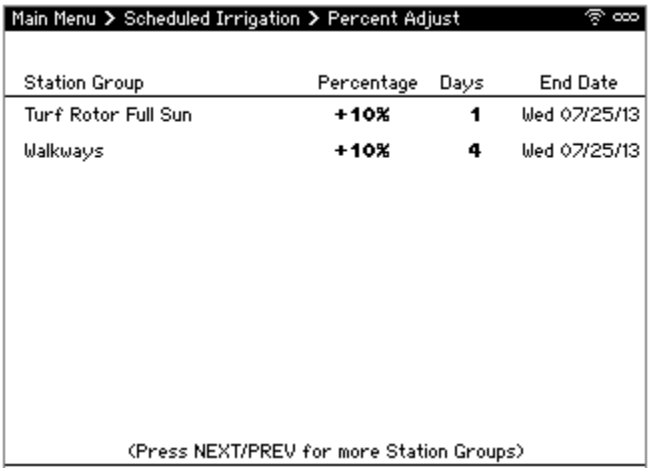


Figure 26: Percent Adjust Screen

To edit the Percent Adjust screen (Figure 26):

1. From Main Menu, navigate to **Scheduled Irrigation** and select **Percent Adjust**. The Percent Adjust screen displays.
2. Navigate to desired station group
3. Navigate to Percentage column and use the **+/-** to adjust the run time percentage.
4. Navigate to Days column and use the **+/-** to adjust the number of Days the adjustment will be in effect.
5. The End Date will correspond with the days adjusted and show the date at which the adjustment is no longer in effect.
6. When finished, press **BACK** to save changes, and return to Main Menu.

Using a Pump During Irrigation

The Pump Use feature provides the ability to select which Station Group requires the use of a pump when irrigating. This feature only activates pumps wired to the CS3000 controller. Note: Pump and non-pump stations will not irrigate at the same time.

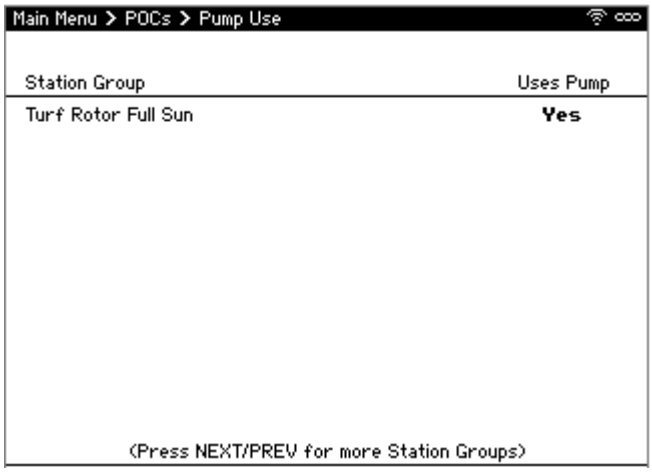


Figure 27: Pump Use Screen

To edit the Pump Use screen (Figure 27):

1. From Main Menu, navigate to **POCs** menu and select **Pump Use**.
2. Navigate to desired Station Group and use **+/-** to select Yes or No.
3. When finished, press **BACK** to save changes, and return to Main Menu.

Stations

A station is a single valve that controls multiple sprinkler heads in a zone. Station Groups allow grouping of stations based on similar physical characteristics such as head type and plant material. Proper placement of stations into station groups establishes accurate irrigation programming to ensure the health of a site.

Individual Station Irrigation Schedule

When the controller is using evapotranspiration (ET), the controller automatically calculates the station run time based on local real-time weather conditions. ET is the process of water evaporating from from the soil or transpiring from the leaves of the plant. For more information on ET, see ET and Weather Sensors.

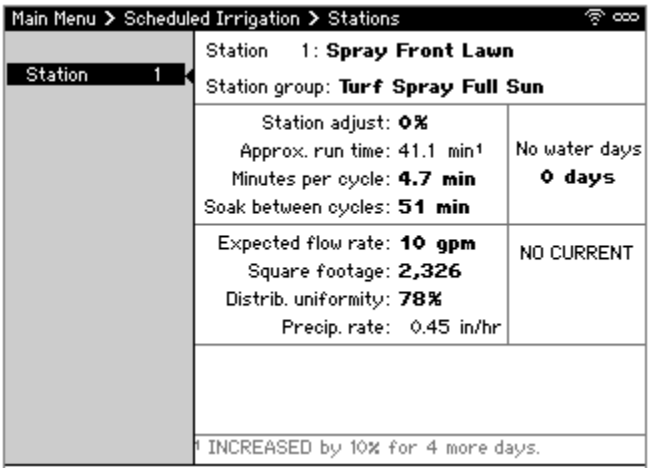


Figure 28: Stations Screen

To view or edit individual Stations (Figure 28):

1. From the Main Menu, navigate to **Scheduled Irrigation** and select **Stations**. The Stations menu displays.

Adjusting Stations Settings

Adjusting Run Time

Station Adjust is used to increase or decrease the run time of an individual station using daily ET. This feature is typically used to compensate for stations that might have slightly different exposure rates than the rest of the Station Group. To adjust this setting, highlight the field and press **+/-** to increase or decrease the value. As the percentage changes, you will see the approximate run time increase or decrease.

Approx. Run Time

The approximate run time is automatically calculated using daily ET, and several factors such as the station's irrigation schedule, station adjust factor, and distribution uniformity. The approximate run time provides an estimate on how long the station will run the next time it is scheduled but may change daily based on local weather conditions. This run time also incorporates any Station Group Percent Adjust that's in effect for this station.

Total Minutes

Note: This setting only displays if the Station Group is not operating using daily ET.

Caution: Calsense strongly encourages irrigating using real-time weather. Not doing so may result in over- or under-irrigation as weather conditions change. To re-enable use of ET, see ET and Weather Sensors.

Total Minutes allows you to specify the exact time a station will irrigation. This will not adjust based on real-time weather.

Minutes Per Cycle

The Minutes per Cycle feature breaks down the station's run time into smaller cycles. For example, if an approximate run time if 20minutes can be split into two separate cycles by setting the Minutes per Cycle to 10-minutes. The cycle time is automatically calculated based on the Station Group's soil type and precipitation rate. This default value is the maximum amount of time allowed to prevent runoff based on the EPA WaterSense guidance for weather-based irrigation control, however it can be lowered if necessary. To adjust the setting, highlight the field and press **+/-** to increase or decrease the value.

Soak Between Cycles

The Soak between Cycles feature is the time between cycles to allow the soil to soak up water to reduce runoff and overwatering. For example, if this soak-in time is set to 30minutes, the controller will pause the station for a minimum of 30-minutes before allowing it to start its next cycle. During this pause, the controller will irrigate other stations that are eligible to run. This Soak Between Cycles is automatically calculated based on the Station Group's soil type, precipitation rate, and distribution uniformity. This default value is the minimum cycle time required to prevent runoff based on the EPA WaterSense guidance for weather-based irrigation control. To adjust the setting, highlight the field and press **+/-** to increase or decrease the value.

No Water Days

The No Water Days feature is used to prevent a station from irrigating for a consecutive number of days. No Water Days are a simple way to ensure a station doesn't water during system repairs or during a scheduled event. To adjust the setting, highlight the field and press **+/-** to increase or decrease the value.

Expected Flow Rate

The Expected Flow Rate is the estimated gallons per minute at which water flows when this station irrigates. This is used when monitoring the system for high and low flow conditions as well as managing how many valves the controller turns on based on the system capacity. To learn more about flow checking and system capacity, see Flow Monitoring. This value can be manually entered or automatically detected using the Acquire Flow Rates feature. To manually adjust the expected flow rate, highlight the field and press **+/-** to increase or decrease the value.

Square Footage

The Square Footage is the area irrigated by the station. The value does not affect irrigation but is used by the controller to when irrigating using a budget. To learn more about irrigating using a budget, see Budgets. To adjust the square footage, highlight the field and press **+/-** to increase or decrease the value.

Distrib. Uniformity

Distribution uniformity indicates how evenly water is applied to the surrounding area from the sprinkler head. It can be determined using a catch-can test. The distribution uniformity affects the run time and soak-in time. For example, the lower the distribution uniformity, the less efficient the sprinkler performs, therefore increasing run time to ensure adequate coverage. To adjust this value, highlight the field and press **+/-** to increase or decrease the value.

Manually Testing Stations

The Test Stations feature provides the ability to test a station or acquire an expected flow rate for a station. When a station is being tested, it will ignore On-At-A-Time and flow checking rules.

To learn how to test a station, see

Testing Stations.

Station History Report

The Station History report provides a detailed breakdown of each programmed irrigation including:

- The time the station turned on for its first cycle
- The number of cycles run
- The total time, in minutes, the station ran
- The number of gallons irrigated
- The flow rate measured while the station was running

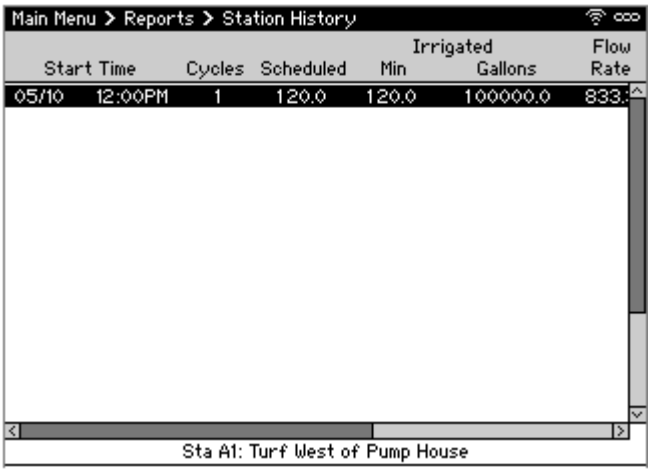


Figure 29: Station History Screen

To view the Station History Report (Figure 29):

1. From Main Menu, navigate to **Reports** and select **Station History**. Station History report displays.
2. Press the **Station Up** and **Station Down** keys to view different stations.

Station Summary Report

The Station Summary feature is a daily station-by-station summary of irrigation. For each type of irrigation, the report provides the number of minutes the station ran for and how many gallons were consumed. Types of irrigation included programmed irrigation, manual, test, walk-thru, and mobile.

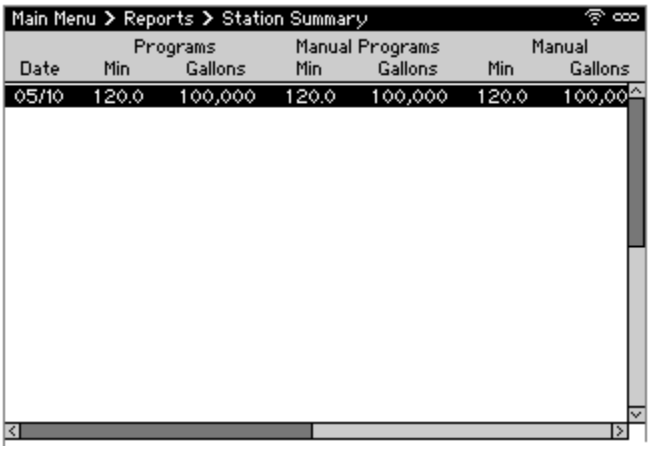


Figure 30: Station Summary Screen

To view the Station Summary Report (Figure 30):

1. From Main Menu, navigate to **Reports** and select **Station Summary**. Station Summary report displays.
2. Press the **Station Up** and **Station Down** keys to view different stations.

ET and Weather Sensors

The CS3000 irrigates based on real-time evapotranspiration (ET) allowing the controller to automatically calculate each station's run time before irrigation. Evapotranspiration is the process by which water transpires from the leaves of a plant and evaporates from the soil. This process is also known as "plant sweat" which is essential when understanding how much water is needed in each area. There are many factors that influence ET such as temperature, wind, solar radiation, and humidity. This data changes daily which is why irrigating based on ET ensures more accurate irrigation. ET data can come from an on-site ET Gage (model ETG) or Calsense's WEATHERSENSE feature on Command Center Online.

At the start of an irrigation day, 8:00 PM, the previous day's ET value is stored for historical purposes. The controller then uses the new daily ET value to calculate each station's irrigation time based on the total ET for all days since the last irrigation. Additionally, by using the site's physical conditions such as plant material, head type, and exposure, the controller automatically determines how long to run each cycle and soak between cycles to minimize run-off.

Specifying Use of Real-Time Weather

Use ET, Rain, and Wind provides the ability to select which station group will use ET to calculate run times, rain to offset irrigation, or wind to pause irrigation. **Note:** The wind column is only visible if there an on-site Wind Gage (model WG-1) enabled.

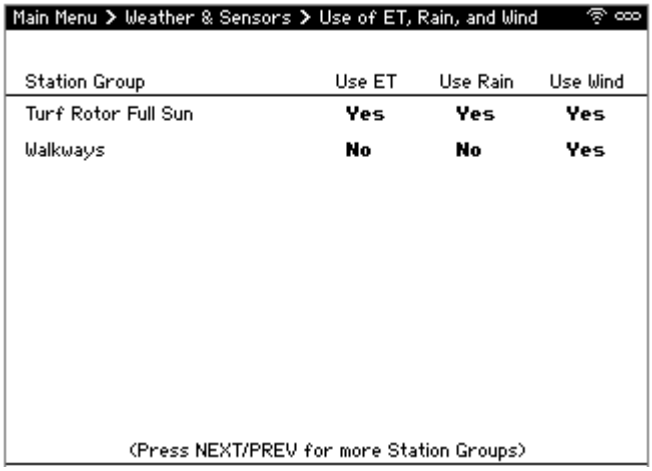


Figure 31: Use of ET, Rain, and Wind Screen

To edit the Use of ET, Rain, and Wind screen (Figure 31):

1. From the Main Menu, navigate to **Weather & Sensors** and select **Use of ET, Rain, and Wind**. The Use of ET, Rain, and Wind screen displays.
2. Navigate to desired Station Group and use **+/-** to specify which groups use real-time weather conditions.

Note: If ET or rain is disabled for a Station Group, the controller generates an alert daily at midnight to remind you that the group does not meet the EPA WaterSense standards.

Configuring On-Site Weather Sensors

The Weather Sensors feature allows a single controller or controller within the *FLOWSENSE*® chain to receive information from an ET Gage (model ETG), Tipping Rain Bucket (model RB-1), or Wind Gage (model WG-1).

To access the Weather Sensors screen (Figure 32), from the Main Menu, navigate to **Weather & Sensors** and select **Weather Sensors**. The Weather Sensors screen displays.

Note: This menu is only available if a Weather Kit (model CS3-W-KIT) is installed within the system.

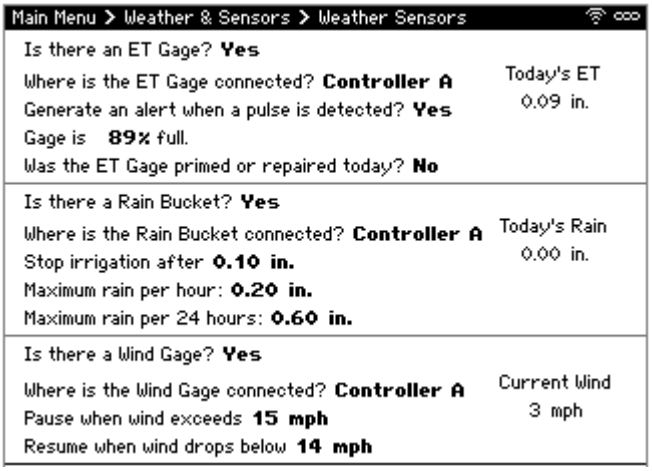


Figure 32: Weather Sensors Screen

Configuring an ET Gage

If an ET Gage is physically connected to this controller or another within the *FLOWSENSE* chain, this screen provides the ability to specify where the controller is connected. After indicating an ET Gage is in use, several settings appear:

- Generate an alert when a pulse is detected is a way to monitor the operation of the ET Gage.
- The gage percentage indicates how full the gage is. This value reduces automatically as ET is measured. After refilling and priming the gage, this should be set back to 100%.
- If the ET Gage was primed or repaired, it is important to notify the controller of the operation. Doing so causes the controller to ignore today's ET measurement since it is likely not accurate. The controller will start using the ET Gage's readings the next day without any additional user intervention.

Configuring a Tipping Rain Bucket

If a Tipping Rain Bucket is physically connected to this controller or another within the *FLOWSENSE* chain, this screen provides the ability to specify where the controller is connected. After indicating a Rain Bucket is in use, several settings appear:

- Stop irrigation after specifies how much rain, in inches, is necessary to stop irrigation. Setting this value too low will result in irrigation skipping even if the soil has not absorbed any of the rain. Similarly, setting the value too high will cause the controller to continue irrigating after measurable rain.

- Maximum rain per hour is used to ensure rain that runs off due to a high rate of rainfall is not used to offset irrigation. For example, if it rains 2" in an hour, but the site's soil can only absorb half an inch of rain before running off, set this to 0.50".
  Maximum rain per 24-hours indicates how much rain is usable within a 24-hour period. This is generally set two or three times higher than the maximum rain per hour.

Configuring a Wind Gage

If a Wind Gage is physically connected to this controller or another within the *FLOWSENSE* chain, this screen provides the ability to specify where the controller is connected. After indicating a Wind Gage is in use, several settings appear:

- The Pause setting indicates at what speed, in miles per hour (mph), irrigation should be paused. When the controller detects wind sustained at or above this speed, irrigation pauses minimum of 10-minutes or until the wind dies down.
- The Resume setting indicates at what speed, in mph, the controller should resume irrigation after pausing due to wind.

Setting up a Third-Party Rain Switch

The Rain Switch feature allows the controller to respond to a third-party rain switch which will stop irrigation if rain is detected. For controllers on a *FLOWSENSE* chain, irrigation is stopped across all controllers when the rain switch detects rain. A rain switch can be connected to either the Rain Switch inputs on the Weather Kit (model CS3-W-KIT) or the SW1 input on the POC terminal.

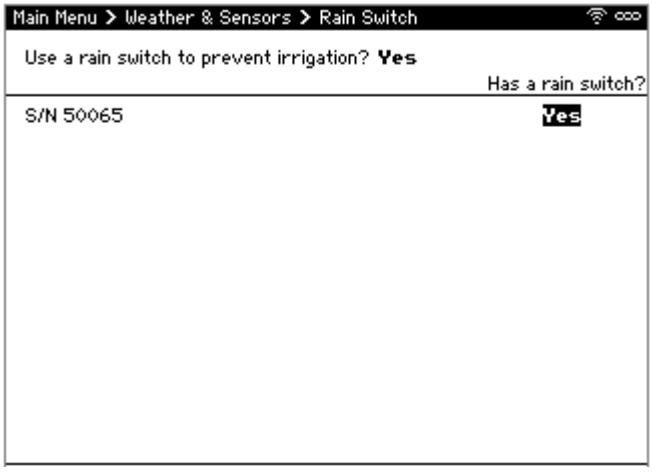


Figure 33: Rain Switch Screen

To enable use of a rain switch (Figure 33):

1. From Main Menu, navigate to **Weather & Sensors** and select **Rain Switch**. The Rain Switch screen displays.
2. Specify whether the controller uses a rain switch to prevent irrigation. When set to **Yes**, a list displays showing the controller or all the controllers in the chain.
3. Specify which controller(s) have a rain switch attached using **+/-**.

Caution: Indicating a rain switch is in use when there is not one physically connected will cause irrigation not to run.

Setting up a Third-Party Freeze Switch

A Freeze Switch allows the controller to stop irrigation when a third-party freeze switch detects a freezing temperature.

Note: This feature is only available if a Weather Kit (model CS3-W-KIT) is installed.

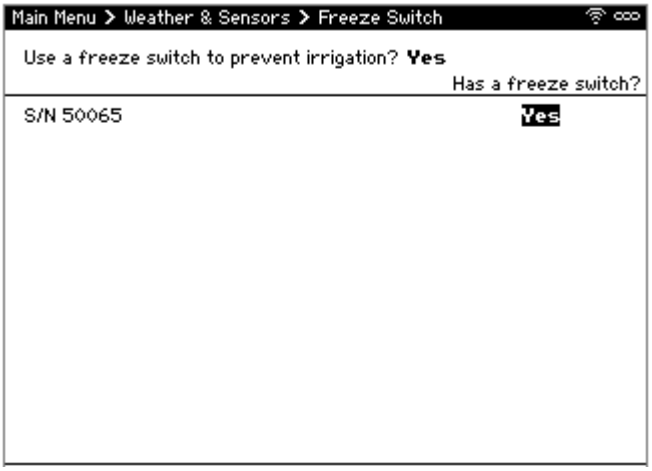


Figure 34: Freeze Switch Screen

To edit the Freeze Switch screen (Figure 34):

1. From Main Menu, navigate to **Weather & Sensors** and select **Freeze Switch**. The Freeze Switch screen displays.
2. Specify whether the controller uses a freeze switch to prevent irrigation. When set to **Yes**, a list displays showing the controller or all the controllers in the chain.
3. Specify which controller(s) have a freeze switch attached using **+/-**.

Viewing and Clearing Accumulated Rain

The Accumulated Rain report is a summary of how many minutes' each station's irrigation will be skipped due to rain.

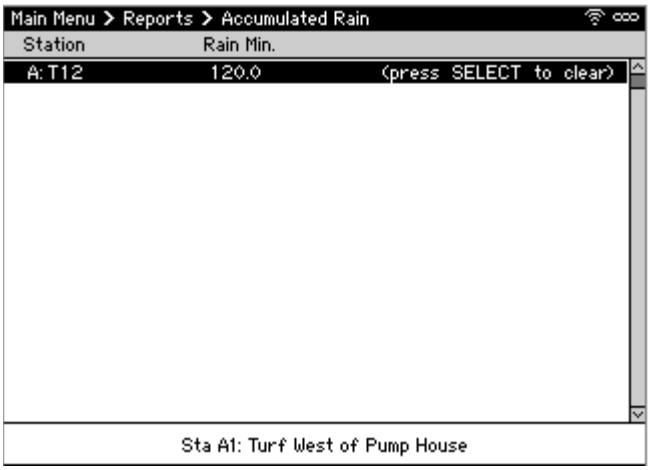


Figure 35: Accumulated Rain Screen

To view the Accumulated Rain Report (Figure 35):

1. From Main Menu, navigate to **Reports** and select **Accumulated Rain**. The Accumulated Rain report displays.
2. To clear rain from a particular station, high the station and press SELECT to set the minutes to 0.

ET & Rain Report

The ET & Rain Table provides a daily record of evapotranspiration (ET) and rain values used for irrigation. It also indicates the source of the weather:

For ET values:

- Gage means the ET measurement was received from an on-site ET Gage
- WeatherSense means the ET measurement was received from the Calsense WEATHERSENSE service
- Historical means a real-time ET value was not received and the controller reverted to a historical value. The specify historical values, see Reference ET Values.

For rain values:

- Rain indicates the controller received enough rain to cross the minimum threshold to stop irrigation
- Minimum indicates rain was received but was not enough to cross the minimum threshold
- WeatherSense indicates rain was received from the Calsense WEATHERSENSE service. By default 80% of this is used to offset irrigation.

Figure 36: ET & Rain Table Report Screen

To view the ET & Rain Table report (Figure 36):

1. From Main Menu, navigate to **Reports** and select **ET & Rain Table**. ET & Rain Table report displays.

Real-Time Weather Status

The Weather Status feature provides the ability to view the state of weather sensors attached to this controller or another controller within the *FLOWSENSE* chain including real-time information about the ET Gage, Tipping Rain Bucket, Wind Gage, Rain Switch, and Freeze Switch.

To view this real-time information:

1. From Main Menu, navigate to **Diagnostics** and select **Live Screens**. The Live Screens menu displays.
2. Navigate to and select **Weather Status**. Weather Status screen displays.

Assigning Moisture Sensors to Station Groups

The Assign Moisture Sensors to Station Groups feature provides the ability to assign discovered moisture sensors to station groups.

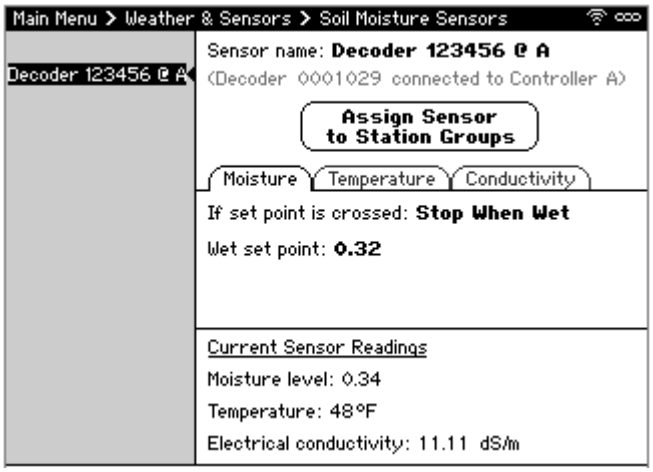


Figure 37: Soil Moisture Sensors Screen

To edit the Soil Moisture Sensors screen (Figure 37):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to and select **Assign Moisture Sensors to Station Groups**. The Moisture Sensor screen displays.
3. Navigate to the left column and select the desired moisture sensor by serial number.
4. Navigate to and select Sensor Name to edit the name with the pop-up keyboard. Select **OK** when done.
5. Navigate to and select **Assign Sensor to Station Groups**. The Station Groups screen displays.
6. Navigate to and select the desired Station Group.
7. Navigate to the Moisture sensor field and use +/- to select a moisture sensor for the Station Group.
8. Press **BACK** to save changes and return to Soil Moisture Sensors screen.
9. Navigate to the Moisture tab:
    a. Navigate to If set point is crossed and use +/- to select desired action: Do nothing or Generate an alert.
    b. Navigate to Wet set point and use +/- to change to the desired number.
    c. Navigate to Dry set point and use +/- to change to the desired number.
10. Navigate to the Temperature tab.
    a. Navigate to If high temp is crossed and use +/- to select desired action: Do nothing or Generate an alert.

   b. Navigate to High temperature and use +/- to change to desired temperature.
   c. Navigate to If low temp is crossed and use +/- to select desired action: Do nothing or Generate an alert.
   d. Navigate to Low temperature and use +/- to change to desired temperature.
11. Navigate to Conductivity tab.
   a. Navigate to If high EC point is crossed and use +/- to select desired action: Do nothing or Generate an alert.
   b. Navigate to High Conductivity and use +/- to change the desired dS/m.
   c. Navigate to If low EC point is crossed and use +/- to select desired action: Do nothing or Generate an alert.
   d. Navigate to Low Conductivity and use +/- to change the desired dS/m.
12. When finished, press BACK to save changes, and return to Main Menu.

Unlinking Orphan Station Decoders

Sometimes, 2-station decoders are removed from the system. For example, if a decoder has been damaged, it may need to be replaced with a new decoder. After removing a decoder and performing a 2-Wire discovery, the station(s) assigned to that decoder may be orphaned. This means the station can no longer run until it is assigned to a new decoder.

When an orphaned station is detected following a discovery, the Unlink Orphan 2-Wire Stations menu option appears on the 2-Wire dialog. This allows these stations to be unlinked from the missing decoder, thereby making them available to assign to a new decoder.

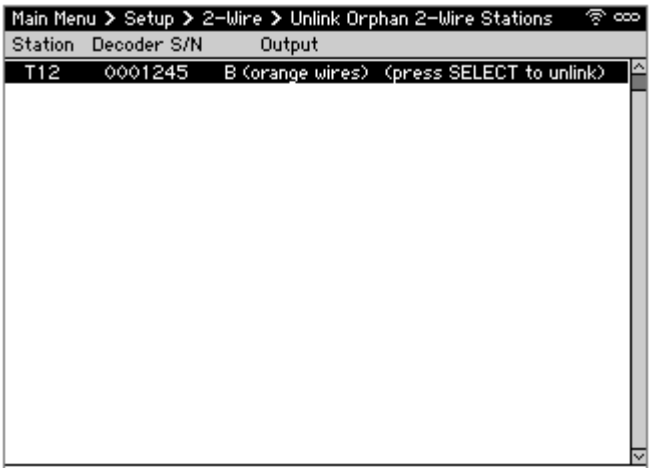


Figure 38: Unlink 2-Wire Stations Screen

To Unlink Orphan 2-Wire Stations (Figure 38):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to and select **Unlink Orphan 2-Wire Stations**. The Unlink Orphan 2-Wire Stations screen displays.
3. Navigate to the Station to unlink and and press **SELECT** to unassign the station from the removed decoder.
4. When finished, press **BACK** to save changes, and return to Main Menu.

Unlinking Orphan POC Decoders

Sometimes, POC decoders are removed from the system. For example, if a decoder has been damaged, it may need to be replaced with a new decoder. After removing a decoder and performing a 2-Wire discovery, the POCs assigned to that decoder may be orphaned. This means the POC will no longer operate until it is assigned to a new decoder.

When an orphaned POC is detected following a discovery, the Unlink Orphan 2-Wire POCs menu option appears on the 2-Wire dialog. This allows these POCs to be unlinked from the missing decoder, thereby making them available to assign to a new decoder.

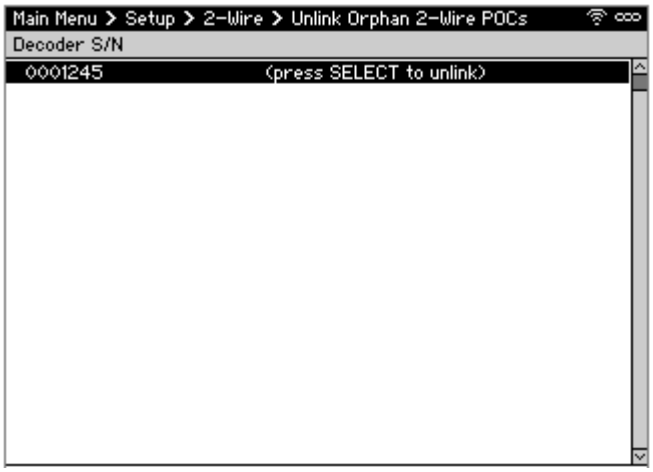


Figure 39: Unlink 2-Wire POCs Screen

To Unlink Orphan 2-Wire POCs (Figure 39):

1. From Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Navigate to and select **Unlink Orphan 2-Wire POCs**. The Unlink Orphan 2-Wire POCs screen displays.
3. Navigate to the desired Decoder S/N and press **SELECT** to unlink the POC assignment.
   Note: If the decoder is part of a bypass manifold, it is removed from the bypass manifold which will cause the bypass manifold not to function until another decoder is added to it
4. When finished, press **BACK** to save changes, and return to Main Menu.

Manual Water Operations

There are many features in the CS3000 that allow for specific water adjustments to accommodate all water management needs. These real time water adjustments are typically used to add additional watering or test repaired stations.

Testing Stations

The Test Stations feature provides the ability to test a station or acquire an expected flow rate for a station. When a station is being tested, it will ignore On-At-A-Time and flow checking rules.

Note: If testing a station while other irrigation is running, the other irrigation will be paused until the test completes.

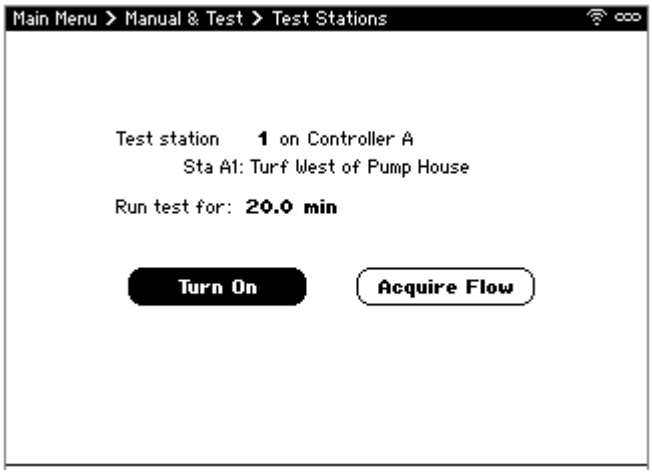


Figure 40: Test Stations Screen

To test a station (Figure 40):

1. From Main Menu, navigate to **Manual & Test** and select **Test Stations**. The Test Stations screen displays.
2. Use **+/-** to select desired station. If the controller is part of a *FLOWSENSE*® chain, make sure you select the correct controller as well.
3. To adjust the amount of time to test the station for, navigate to Run test for and use **+/-**.
4. Navigate to and select **Turn on**. The station turns on and the Irrigation details screen displays with information about all stations that are running, soaking, or waiting to run.

Note: To stop a station that is running from the Irrigation Details screen, highlight the station and press **SELECT**. The station stops and the next station turns on.

To acquire the expected flow rate for a station:

Note: To acquire the flow rates of all the station within a Station Group at the next scheduled irrigation, see Acquire Flow Rates.

1. From Main Menu, navigate to **Manual & Test** and select **Test Stations**. The Test Stations screen displays.

2. Navigate to and select **Acquire Flow** to acquire an expected flow rate. The station turns on and the Irrigation details screen displays with information about all stations that are running, soaking, or waiting to run.

Once this process starts, the station will irrigate for up to six-minutes to allow the irrigation lines to fill and for the system to gain stability before acquiring the flow rate. If the flow remains unstable for the duration of the test, the flow rate is not acquired, and an alert is generated.

Manually Watering

The Manual Watering feature provides the ability to manually water a station or a station group to supplement or make-up irrigation.

Note: If other irrigation is running when Manual Watering starts, the other irrigation will be paused until the Manual Watering completes.

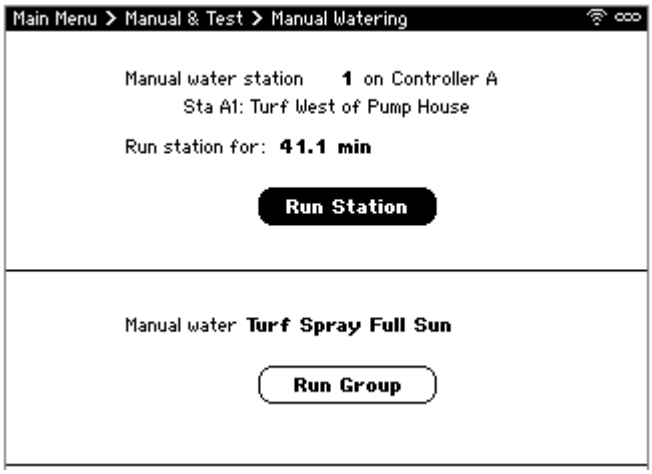


Figure 41: Manual Watering Screen

To manually water a station (Figure 41):

1. From Main Menu, navigate to **Manual & Test** and select **Manual Watering**. The Manual Watering screen displays.
2. Use **+/-** to select desired station to manually water. If the controller is part of a *FLOWSENSE*® chain, make sure you select the correct controller as well.
3. To adjust the amount of time to water the station for, navigate to Run station for and use **+/-** to adjust run time. The default is the station's scheduled approximate run time.
4. Navigate to and select **Run Station**. The station turns on and the Irrigation details screen displays with information about all stations that are running, soaking, or waiting to run.

To manually water a Station Group (Figure 41):

1. From Main Menu, navigate to **Manual & Test** and select **Manual Watering**. The Manual Watering screen displays.
2. Navigate to Manual Water and use **+/-** to select the Station Group to water.

3. Navigate to and select **Run Group**. The first station in the group turns on and the Irrigation details screen displays with information about all stations that are running, soaking, or waiting to run. Each station within the group will run for their scheduled time.

Manual Programs

The Manual Programs feature is used for supplemental scheduled watering. Commonly used for reseeding turf, watering-in fertilizer, catching up on watering after repairs, or after periods of shut down. Unlike normally scheduled irrigation, Manual Programs allow up to six unique start times.

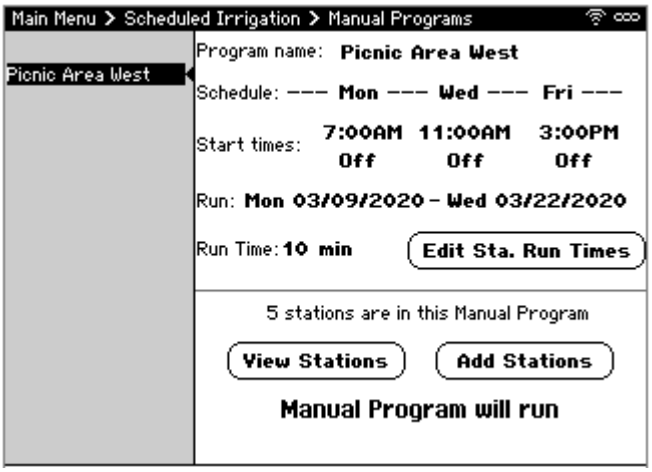


Figure 42: Manual Programs Screen

To create or edit a Manual Program (Figure 42):

1. From the Main Menu, navigate to **Manaul & Test**, and select **Manual Programs**. The Manual Programs screen displays.
2. Navigate to and select the desired Manual Program or select **Add new program** to create a new one from scratch.
3. For Program name, press **SELECT** and enter a name to uniquely identify the program using the on-screen keyboard.
4. For Schedule, use **+/-** to select which days the Manual Program will run.
5. For Start Times, use **+/-** to set up to six start times.
   Note: If only one start time is needed, ensure the remaining five fields are set to **OFF**.
6. For Run, use **+/-** to select what day to start and end the Manual Program.
7. For Run Time, use **+/-** to set the amount of irrigation time needed. To set different times for each station, select **Edit Sta. Run Times** after completing Step 8.
8. Navigate to and select **Add Stations** and use **+/-** to select which stations to include in this Manual Program.

Note: As you move through the programming, the notice at the bottom of the screen will indicate whether the Manual Program will run or not. At minimum, the Manual Program requires:

- At least one day
- At last one start time
- A current or future timeframe

- A run time for at least one station
- At least one station to be included

Manually Opening or Closing the Master Valve

The Master Valve Override feature provides the ability to open a master valve for a specified period immediately or on a recurring schedule (Figure 43). This is commonly used to open normally closed master valves for washdowns or quick coupler use. Additionally, closing a normally open master valve to exercise it occasionally is an important maintenance step. During a Master Valve Override, the controller opens or closes all master valves associated with the mainline and switches to a unique mainline break number. See **Error! Reference source not found.** for more information.

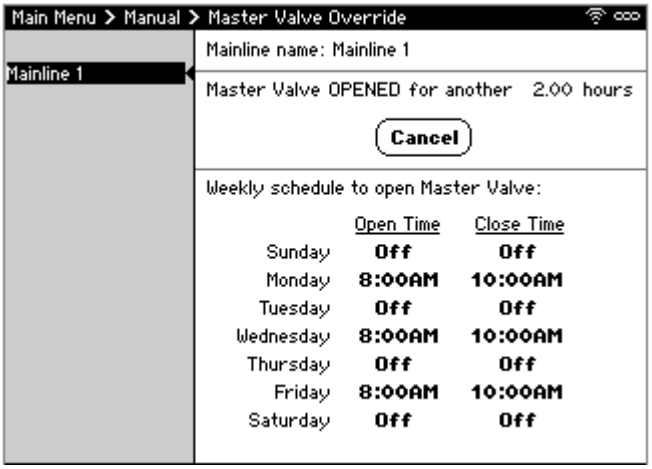


Figure 43: Master Valve Override Screen

Opening or Closing a Master Valve Immediately

To open or close a master valve now:

1. From Main Menu, navigate to **Manual & Test** and select **Master Valve Override**. The Master Valve Override screen displays.
2. If there is more than one Mainline, select which mainline to open or close.
3. For Hours, use **+/-** to set the amount of time to open or close the master valve.
4. Select **Open** or **Close** to perform the action. All the master valves associated with the mainline either open or close, respectively.
   WARNING: Using Master Valve Override to close a Master Valve when performing a repair may result in property damage or bodily injury if the override expires before the repair is complete. Physically shut the water supply off before conducting a repair on an open mainline.

Scheduling a Master Valve to Open

To schedule a master valve to open:

Note: For safety, you cannot schedule a master valve to close.

1. From Main Menu, navigate to **Manual & Test** and select **Master Valve Override**. The Master Valve Override screen displays.F

2. If there is more than one Mainline, select which mainline to schedule to open.
3. For Open Time, use **+/-** to set the time to open the master valve.
4. For Close Time, use **+/-** to set the time to override to end.

Performing a Station Inspection/Walk-Thru

The Walk-Thru feature provides the ability to perform a site inspection by turning on stations one-by-one in a specific order.

Note: A Walk-Thru cannot combine stations across multiple controllers. If performing a site inspection of multiple controllers on a *FLOWSENSE* chain, create a separate Walk-Thru for each controller and start one after the other completes.

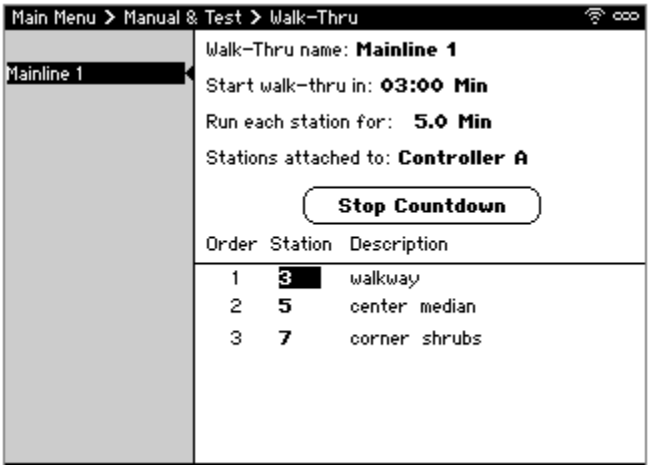


Figure 44: Walk-Thru Screen

To perform a Walk-Thru (Figure 44):

1. From Main Menu, navigate to **Manual & Test** and select **Walk-Thru**. The Walk-Thru screen displays.
2. Navigate to and select the desired Walk Thru program or select **Add Walk-Thru**.
3. For Walk-Thru name, press **SELECT** and enter a name to uniquely identify the program using the on-screen keyboard.
4. For Start walk-thru in, use **+/-** to select when to start the Walk-Thru. This should be enough time for you to walk to the first station.
5. For Run each station for, use **+/-** to set how long to run each station for.
6. For Stations attached to, use +/- to select which controller the Walk-Thru is being created for.
7. In the list of stations, use **+/-** to add/remove stations and specify what order to run in.
8. Select **Start Walk-Thru** to start the countdown. Once the countdown completes, the first valve in the sequence turns on.
9. If it is necessary to cancel the countdown, select **Stop Countdown**.

Note: If other irrigation is running when a Walk-Thru starts, the other irrigation will be paused until the Walk-Thru completes.

Suspending or Preventing Irrigation

No Water Days

The No Water Days feature allows the user to suspend scheduled irrigation for a specific Station Group on a controller for a number of days. This is typically used due to significant rainfall, special events, or to prevent irrigation during scheduled construction.

Caution: No Water Days affects stations assigned to Manual Programs as well. If attempting to suspend scheduled irrigation and run a Manual Program instead, remove the start time or water days from the Station Group.

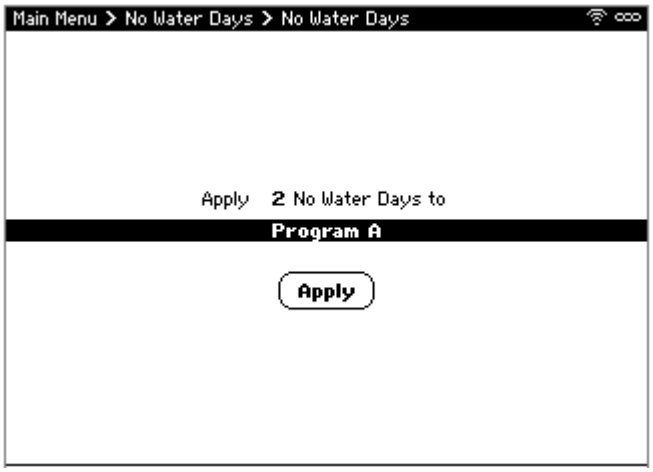


Figure 45: No Water Days Screen

To set or remove No Water Days (Figure 45):

1. From Main Menu, navigate to **No Water Days** and select **No Water Days**. The No Water Days screen displays.
2. Use **+/-** to set the number of calendar days to skip irrigation.
3. Use **+/-** to select the desired Station Group or **All Station Groups**.
4. Select **Apply** to set the no water days. A confirmation window displays.
5. Select **OK** to close the window.

Once the No Water Days are set, they can be cleared the same way. Alternately, to set or remove No Waters Days from a single station, see Individual Station Irrigation Schedule.

Turn Controller Off

Turning the controller off stops all current and prevents all future scheduled irrigation, including Station Groups and Manual Programs, on this controller and any other controllers on the same *FLOWSENSE* chain until it is turned back on. It does not physically power off the controller.

Caution: Testing stations, manually watering a station or Station Group, performing Walk-Thrus, and scheduled Master Valve Overrides are not affected. If **all** irrigation needs to be stopped, Calsense recommends physically powering off the controller.

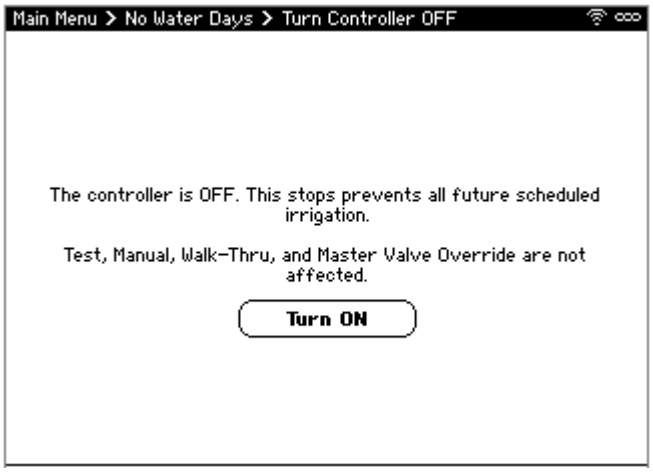


Figure 46: Turn Controller OFF Screen

To turn off the controller (Figure 46):

1. From Main Menu, navigate to **No Water Days** and select **Turn Controller OFF**. The Turn Controller OFF screen displays.
2. Select **Turn OFF** to turn the controller off, or **Turn ON** to turn it back on.

Flow Monitoring

Every Calsense CS3000 Irrigation Controller includes the ability to monitor flow real-time, detecting mainline breaks, broken risers, and closed or stuck valves. This is accomplished through the addition of a Calsense or third-party flow sensor installed in the mainline after the water meter or backflow preventer.

Installing a Flow Meter

Note: The following applies to Calsense FM series Flow Meters. If using a third-party flow sensor, refer to the manufacturer's guidelines for proper installation.

When installing a Flow Meter, the mainline pipe is typically sized down to accommodate the fitting of the sensor. The intended direction of the flow is indicated by an arrow on top of the Flow Meter. There must be free, unrestricted pipe of the same size as the Flow Meter, with a length of at least 10-times the meter's pipe diameter upstream and 5-times downstream of the Flow Meter tee. This applies to distance from any valve, pipe fitting, water meter, or backflow device. The length of #14-gauge (AWG) wire connecting the Flow Meter to the CS3000 Irrigation Controller must not exceed 2,000 feet. When using a 2-Wire POC decoder, the flow maximum length of #14 AWG wire between the Flow Meter and decoder is 20-feet accessible. Additionally, Calsense recommends housing Flow Meters in a rectangular valve box marked "FM".

Flow Meters and Master Valves

The Flow Meters and Master Valves feature establishes the points of connection typically consisting of a master valve, flow meter, and pump. To access this feature from the Main Menu, navigate to **POCs** and select **Flow Meter and Master Valves**. The Flow Meters and Master Valves screen displays.

Configuring a Traditional POC

A traditional POC consists of a single flow sensor, master valve, and or pump. If this controller utilizes a bypass manifold, see Configuring a Bypass Manifold instead.

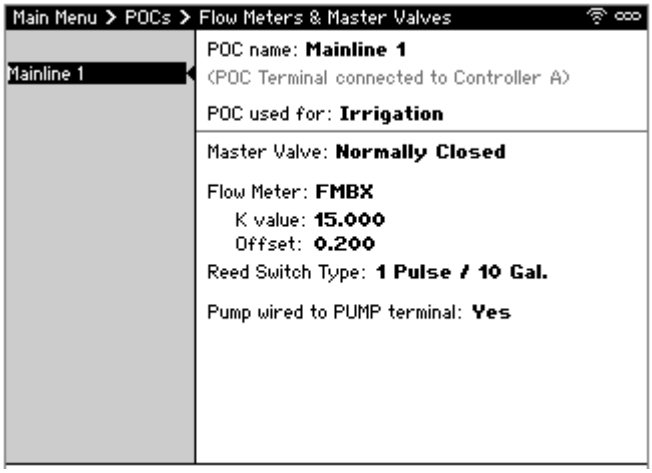


Figure 47: Flow Meters & Master Valves Screen

To edit the Flow Meters & Master Valves screen (Figure 47):

1. Navigate to the POC to edit.

2. Select the POC name to create a name to uniquely identify the POC.
3. For POC used for, indicate whether the POC is used for **Irrigation**, **Non-Irrigation**, or **Not used**.
4. For Master Valve, use **+/-** to select what type of Master Valve is installed. If there is no Master Valve connected, Calsense recommends selecting **Normally Open** to prevent the controller from activating the output and triggering a NO CURRENT alert.
5. For Flow Meter, use **+/-** to select correct type. If using a third-party hydrometer with a reed switch register, make sure you select the correct reed switch. For all other non-Calsense Flow Meters, select **FMBX**.
    - If FMBX is selected as the Flow Meter type, set the appropriate K-value and offset. Refer to the sensor manufacture's documentation for the correct settings.
    - If a Reed Switch is selected as the Flow Meter Type, use **+/-** to set the register's gallons per pulse.
6. For Pump wired to PUMP terminal, use **+/-** to select whether there is a pump attached to the PUMP terminal or not. If set to no, the controller will not activate the pump output.
   Note: This setting only displays for terminal-based POCs, not 2-Wire.

Configuring a Bypass Manifold

A bypass manifold allows low flow readings on a large mainline. It does so by utilizing one or two smaller flow meters attached to a large main.

When irrigation or a master valve override starts, the controller uses the bypass manifold to dynamically manage flow through the appropriate size flow meter using the actual flow rates. The largest level of the bypass manifold is initially opened to fill the mainline. The actual flow rate of the system is monitored, and the controller determines which level is optimally suited to read the flow. Once the appropriate level is determined, the master valves of the other levels are closed, and that level is opened. This process continues throughout irrigation, dynamically opening and closing the master valves to ensure flow is read across the widest range possible.

Note: Only one master valve can be open at any given time. This means that a normally open master valve on the smallest level will be closed when a larger level opens.

Benefits of using a bypass manifold include:

- Allows low flow readings on a large mainline
- Eliminates the need to double up low flowing valves to a single station output which is sometimes done to generate a higher flow rate for large mainlines
- Supports two and three levels

Note: A bypass manifold requires the 2-Wire option (model CS3-2WIRE-OPT) and two or more POC Decoders (model CS-2W-POC).

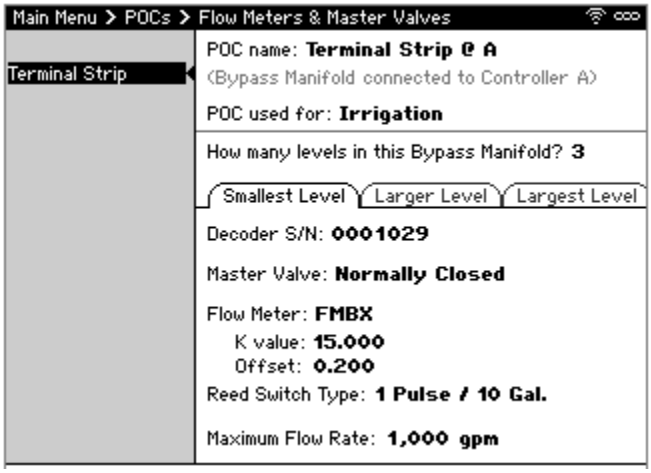


Figure 48: Flow Meters & Master Valves Screen

To configure a bypass manifold (Figure 48):

1. Navigate to the POC to edit.
2. Select the POC name to create a name to uniquely identify the POC.
3. For POC used for, indicate whether the POC is used for **Irrigation**, **Non-Irrigation**, or **Not used**.
4. For How many levels in this Bypass Manifold, select whether there are **2** or **3** levels.
5. For each tab (Smallest, Larger, Largest), perform the following steps:
   Note: The tab name refers to the size of the flow meter associated with each level. Therefore, the decoder attached to the smallest diameter flow sensor should be configured on the **Smallest** tab and so on. Failure to do so will result in the bypass manifold not operating properly.
   a. For Decoder S/N, use **+/-** to select set which decoder operates this level.
   b. For Master Valve, use **+/-** to select Master Valve type. Note that only the smallest size may have a normally open Master Valve. All other levels must be normally closed.
   c. For Flow Meter, use **+/-** to select Flow Meter type.
      - If FMBX is selected as the Flow Meter type, set the appropriate K-value and offset. Refer to the sensor manufacture's documentation for the correct settings.
      - If a Reed Switch is selected as the Flow Meter Type, use **+/-** to set the register's gallons per pulse.
   d. For Maximum Flow Rate, use **+/-** to set the maximum flow rate this Flow Meter can support before the controller should dynamically switch to a larger level within the manifold.

Acquire Flow Rates

The Acquire Flow Rate feature allows the controller to determine each station's expected flow rate the next time the Station Group irrigates. To acquire the expected flow for a single station, see

Testing Stations.

Note: This menu item only displays if there is a flow meter in use.

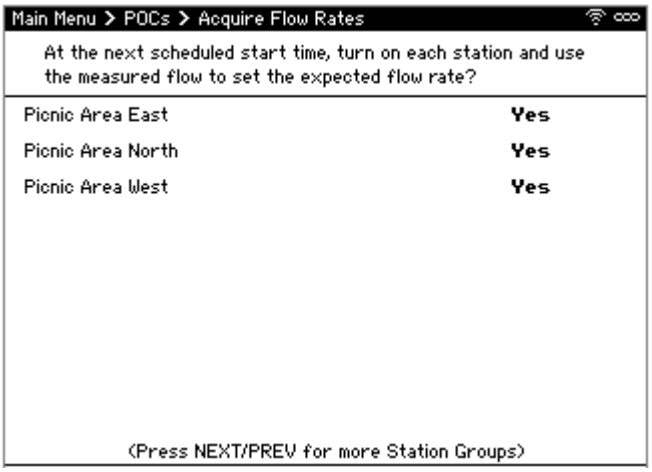


Figure 49: Acquire Flow Rates Screen

To schedule the controller to acquire expected flow rates for one or more Station Groups (Figure 49):

1. From Main Menu, navigate to **POCs** and select **Acquire Flow Rates**. The Acquire Flow Rates screen displays.
2. For each Station Group, use **+/-** to select whether to acquire the expected flow rate the next time it irrigates or not.
   Note: Setting this to yes may extend your water window for the subsequent irrigation.

Delay Between Valves

The Delay Between Valve Times feature provides the ability to delay the next valve from turning on after a particular valve closes. This is commonly used when a Station Group has slow closing valves to ensure there is enough pressure behind a valve to open it.

Caution: This setting may substantially extend the watering window. If your system has slow closing valves, Calsense recommends isolating these valves to their own Station Group and only setting this for that group.

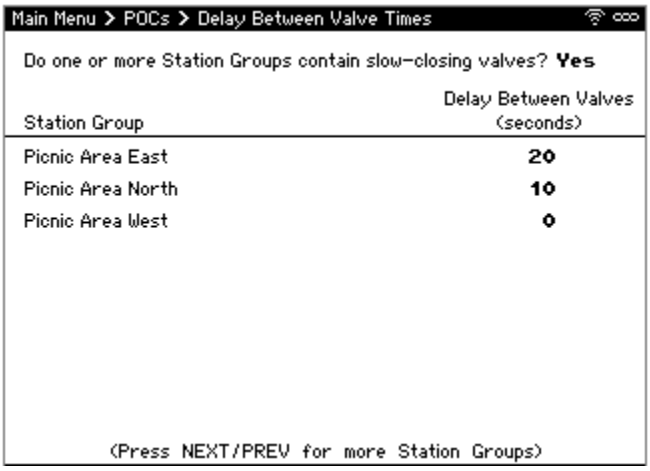


Figure 50: Delay Between Valve Times Screen

To add a delay between valves (Figure 50):

1. From Main Menu, navigate to **POCs** and select **Delay Between Valve Times**. The Delay Between Valve Times screen displays.
2. If there is at least one slow-closing valve in the system, indicate so using **+/-**.
3. Navigate to Delay Between Valves (seconds) and use **+/-** to adjust the number of seconds to wait after a valve closes before the next opens.

Detecting Mainline Breaks

The Mainline Break feature monitors the system for catastrophic mainline breaks. If the flow rate of the mainline goes beyond the specified value, irrigation will shut off and an alert will be generated. Each mainline has its own mainline break levels and there are three distinct values. The During Irrigation value is used whenever scheduled or manual irrigation is running. This is generally the highest of the values and should be set above the combined flow rate of any stations that irrigate at the same time. The Master Valve Override value monitors for breaks during a scheduled or manual Master Valve Override. Finally, the All Other Times is used when not irrigating.

Note: This menu item only displays if there is a flow meter in use.

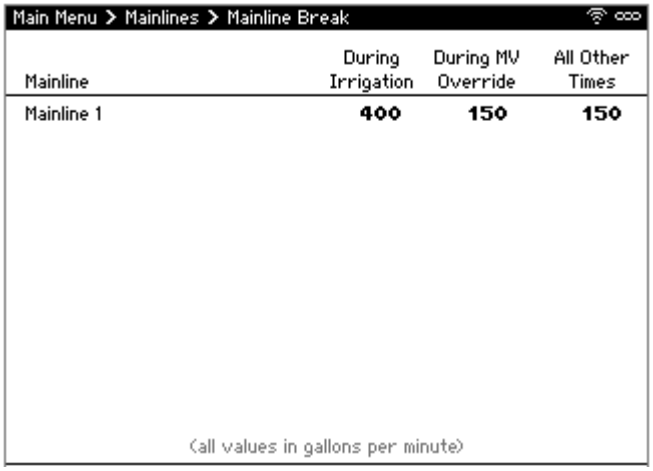


Figure 51: Mainline Break Screen

To set the mainline break values for each mainline (Figure 51):

1. From Main Menu, navigate to **Mainlines** and select **Mainline Break**. The Mainline Break screen displays.
2. Navigate to the desired Mainline.
3. For During Irrigation, use **+/-** to assign maximum flow rate during scheduled or manual irrigation.
4. For During Master Valve Override, use **+/-** to set the trip point during a scheduled or manual master valve override.
5. For All Other Times, use **+/-** to adjust the flow rate for any time irrigation is not running.

Detecting Leaks

The Flow Checking feature monitors the real-time flow rate and compares it to the expected flow rate to detect leaks or clogged heads. This is also known as head-pop protection.

Note: This menu item only displays if there is a flow meter in use.

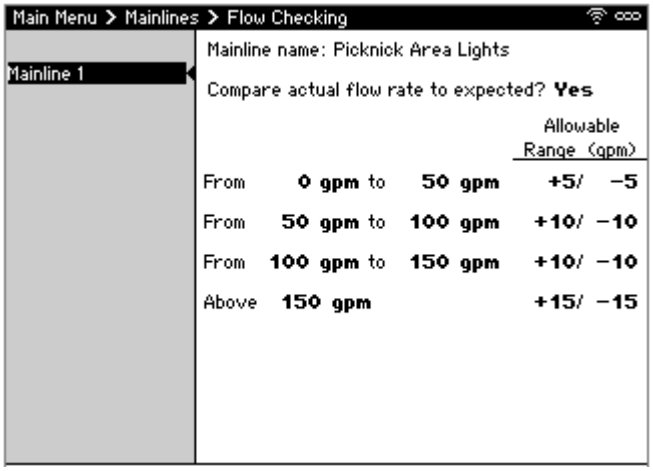


Figure 52: Flow Checking Screen

To configure leak detection (Figure 52):

1. From Main Menu, navigate to **Mainlines** and select **Flow Checking**. The Flow Checking screen displays.
2. Navigate to and select the desired Mainline.
3. Navigate to Compare actual flow rate to expected and select **Yes** to enable the feature. Several thresholds display.
4. For each threshold:
    a. Use **+/-** to set the flow boundaries for that threshold.
    b. Use **+/-** to adjust the high and low flow rate rates in the Allowable Range Column.
5. Continue to Defining High and Low Flow Actions to configure how the controller should react when one of these thresholds is crossed.

Defining High and Low Flow Actions

The Alert Actions feature specifies how the controller reacts when a high or low flow is detected. Each Station Group can have different actions.

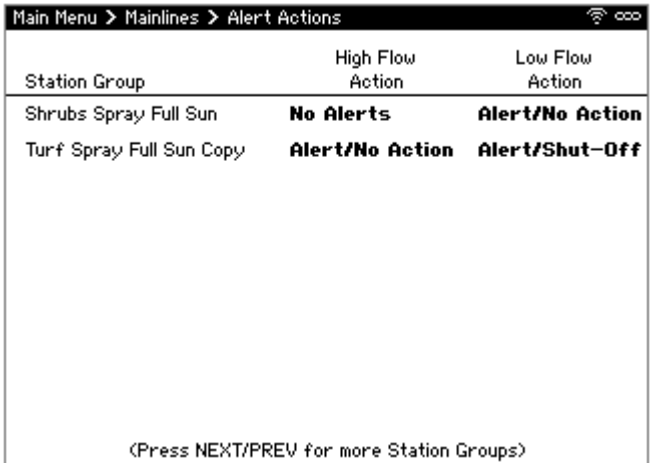


Figure 53: Alert Actions Screen

Note: This menu item only displays if there is a flow meter in use and Flow Checking is enabled for leak detection.

To select alert actions (Figure 53):

1. From Main Menu, navigate to **Mainlines** and select **Alert Actions**. The Alert Actions screen displays.
2. Navigate to the desired Station Group.
3. For both High and Low Flow Action, use **+/-** to select the desired action:
    - **No Alerts**: The controller will take no action and not notify you. This is not recommended.
    - **Alert/No Action**: An alert is generated when the high or low flow occurs, but not additional action is taken. This is commonly used when low flows are detected.
    - **Alert/Shutoff**: An alert is generated and the valve is shutoff. This is commonly used when high flows are detected.

Maximum Time to Fill Mainline

Provides the ability to set the length of time required to fill the mainline or lateral after a valve opens to stabilize the flow readings.

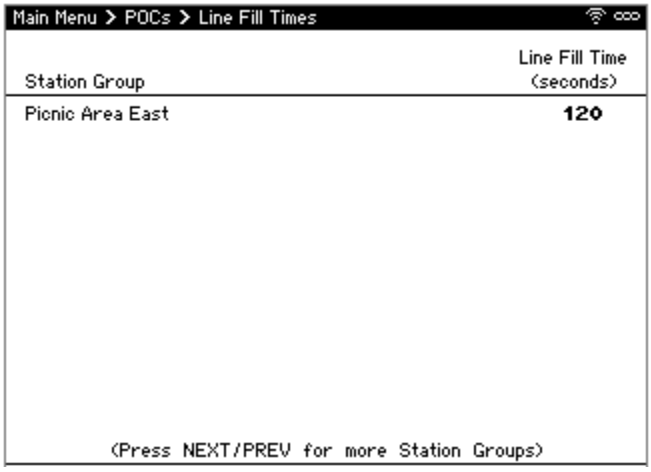


Figure 54: Line Fill Times Screen

To increase or decrease the line fill time (Figure 54):

1. From Main Menu, navigate to **POCs** menu and select **Line Fill Times**.
2. Navigate to desired Station Group and use the **+/-** to increase or decrease the line fill time.
3. When finished, press **BACK** to save changes, and return to Main Menu.

Viewing Mainline Usage

The View Mainline Summary feature is a daily summary of irrigation by mainline. It shows the number of gallons consumed for each type of irrigation including scheduled, manual, test, and so on.

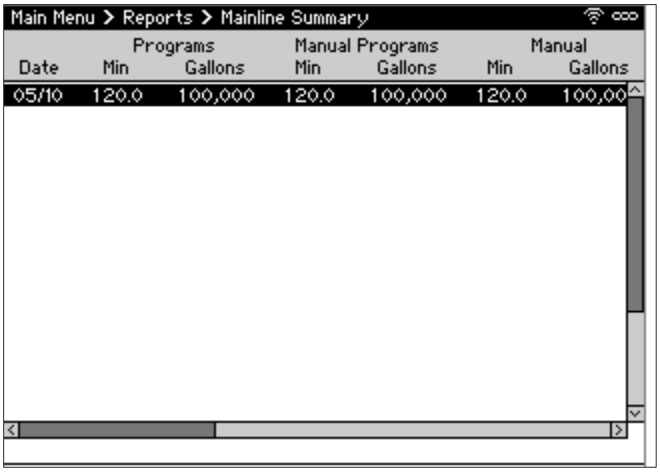


Figure 55: Mainline Summary Screen

To access the Mainline Summary report (Figure 55):

1. From Main Menu, navigate to **Reports** and select **Mainline Summary**. Mainline Summary report displays.
2. Press **Station Up** or **Station Down** to view additional mainlines if there are more than one in the system.

Budgets

Water budgets are an essential tool in planning and managing landscape water use. The Calsense smart controllers use EPA calculations to develop a water budget around each user's unique site and water restrictions. The CS3000 offers three distinct budget options: Manually Entered, Calculated using Annual, and Calculated with ET. The Budget feature gives the customer more control of the amount of water used by applying the necessary amount of water, at the right time, for sustainable long-term plant life.

Irrigating Using a Budget

Before comparing actual usage to a budget, it is important to define the budget value. Each mainline can have a unique budget.

Note: If there is no flow meter in the system, the station's expected flow rate will be used instead of actual flow for budgeting purposes.

To configure a budget for a mainline:

1. From Main Menu, navigate to **Budgets** and select **Budget Setup**. The Budget Setup screen displays.
2. Navigate to the desired Mainline.
3. For Compare use to a budget and select **Yes** to enable use of a budget. Several fields display to configure the budget.
4. For POC budget amount, select from one of the budget modes. **Manually Entered** provides the ability to enter a budget value for each period. This is commonly used when attempting to stay within a billing tier. These numbers can come from past water bills and then see what the monthly average was for each month. **Calculated using Annual** allows entry of a single annual value that is distributed among the billing periods based on monthly historical ET values. This is used when a customer is given an annual water budget, the controller will take that budget and compare what the historical ET of each month was to find what the monthly budget is. **Calculated using ET** calculates the monthly budgets based on a percent of ET instead of a fixed water budget. The initial calculation will use historical ET to calculate the budget and then adjust the budget as real time ET numbers come in.
    - If selecting **Manually Entered** (Figure 56):

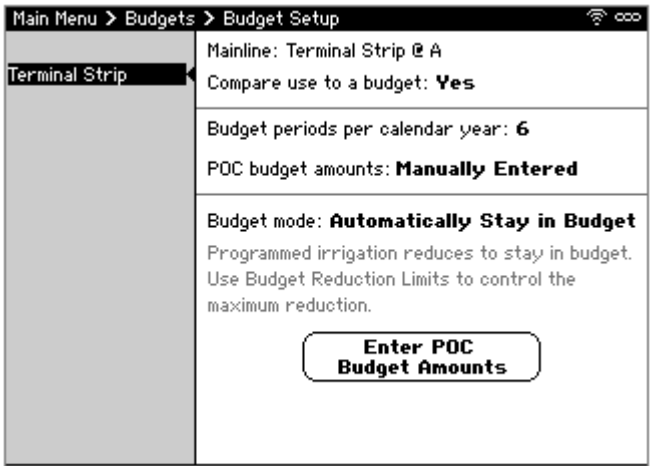


Figure 56: Manually Entered Budget Setup Screen

a. For Budget periods per calendar year, select either **12 (monthly)** or **6 (semi-monthly)**. This is based on how often you receive a bill from your water provider.
b. For Budget mode, select **Alert only** or **Automatically Stay in Budget**. When using Alert only, an alert is generated when the actual usage exceeds or is expected to exceed the budget. If using Automatically Stay in Budget, the controller will attempt to stay within budget based on parameters specified in Irrigation Reduction within Budget.
c. To enter the budget amounts now, select **Enter POC Budget Amounts** and see Defining a Budget for each Billing Period for steps to do so.

- If selecting **Calculated using Annual** (Figure 57):

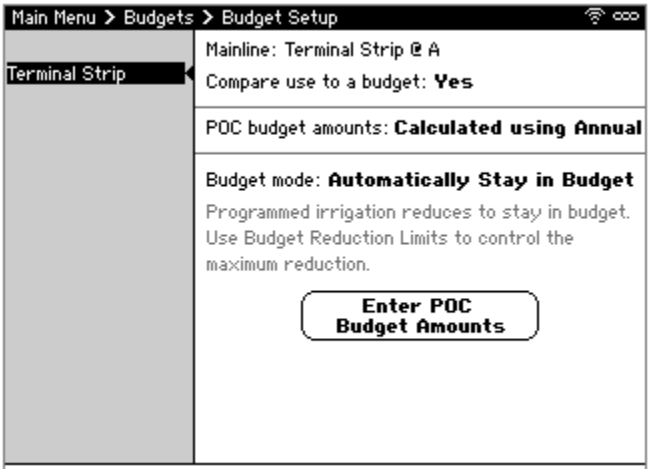


Figure 57: Calculated using Annual Budget Setup Screen

a. For Budget mode, select **Alert only** or **Automatically Stay in Budget**. When using Alert only, an alert is generated when the actual usage exceeds or is expected to exceed the budget. If using Automatically Stay in Budget, the controller will attempt to stay within budget based on parameters specified in Irrigation Reduction within Budget.
b. To enter the budget amounts now, select **Enter POC Budget Amounts** and see Defining a Budget for each Billing Period for steps to do so.

- If selecting **Calculated using ET** (Figure 58):

  Caution: This feature requires each station to have a valid area, in square feet, defined. Failure to do so will result in an incorrect budget.

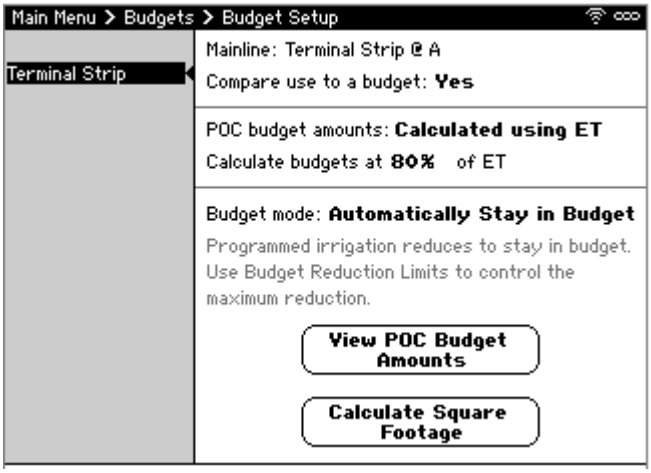


Figure 58: Calculated using ET Budget Setup Screen

  a. For Calculate budgets at, use **+/-** to set the percentage of ET to use to calculate the budget. Default is 80%.
  b. To see the calculated budgets, select **View POC Budget Amounts**.
  c. To automatically calculate the area for each station associated with the mainline, select **Calculate Square Footage**. This calculation uses the station's expected flow rate and precipitation to estimate the area the station covers.
  Note: Selecting this will not overwrite any square footages that have already been entered. It only overwrites any stations with default square footage.

Defining a Budget for each Billing Period

The Budgets Amounts by POC provides the ability to specify the budget amount and the start and end date of each billing period to compare to a water bill.

Caution: Changing the Period start and end dates affect **all** POCs associated with the selected mainline.

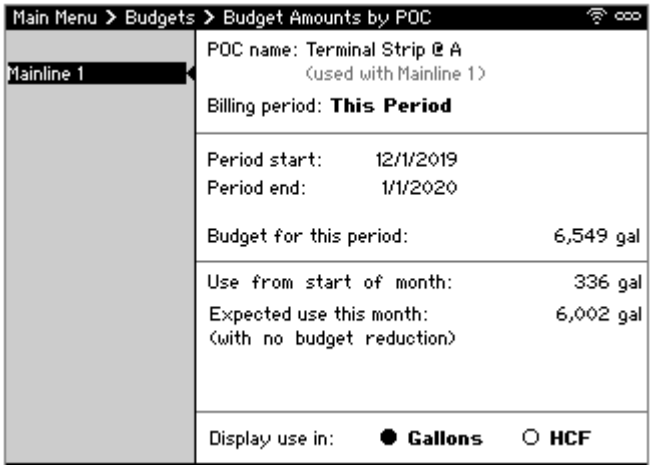


Figure 59: Budget Amounts by POC Screen

To define a budget for each billing period (Figure 59), by point of connection (POC):

1. From Main Menu, navigate to **Budgets** and select **Budget Amount by POC**. The Budget Amount by POC screen displays.
2. Select the desired POC.
    - If entering budgets manually:
        i. For Billing period, select the billing period. Select This Period or a period in the future.
        ii. For Period end, select when the billing period ends. This also defines the next period's start date.
        iii. For Budget for this period, enter the budget, in either gallons or HCF.
        Note: To change from gallons to HCF or vice versa, select the option at the bottom of the screen
    - If entering an annual budget:
        i. For Annual Budget, enter the budget, in either gallons or HCF.
        Note: To change from gallons to HCF or vice versa, select the option at the bottom of the screen.

Configuring Usage that Impacts the Budget

Defining Flow Types Included in Budget provides the ability to exclude specific usage from being included while calculating the budget. Irrigation is always included, but it is possible to exclude consumption during Master Valve Override as well as non-controller usage.

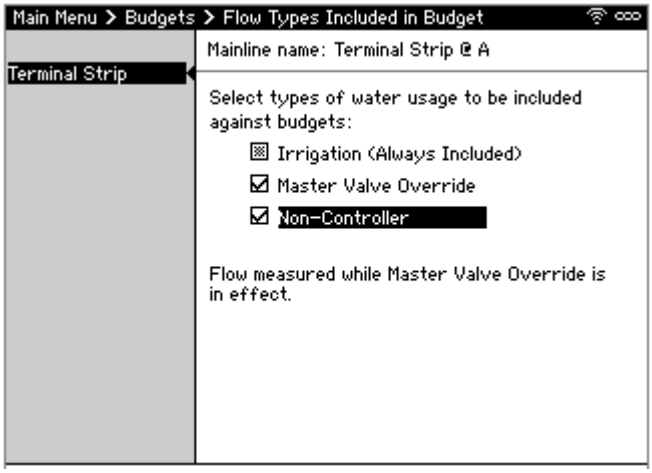


Figure 60: Flow Types Included in Budget Screen

To select which flow times to include or exclude from the budget calculation (Figure 60):

1. From Main Menu, navigate to **Budgets** and select **Flow Types Included in Budget**. The Flow Types Included in Budget screen displays.
2. Select the desired Mainline.
3. Using **+/-**, check or uncheck the types of irrigation to include in the budget calculation.

Irrigation Reduction within Budget

The Budget Reduction Limits provides the ability to indicate how much each Station Group can reduce irrigation by to stay in budget. This is a very powerful feature that can ensure the controller does not exceed its budget. However, forcing the controller to stay in budget can also negatively impact the health of plant material. Here are some examples:

- A reduction limit of 100% causes the controller to potentially not irrigate a Station Group to stay within budget.
- A reduction limit of 0% will ensure a group is not impacted by the budget at all. While this guarantees the plants are watered, it may cause the controller to go over budget.

It is important to consider plant needs while adjusting these settings. For example, there may be a cost associated with going overbudget. However, that cost is likely much less than having to replace trees that perished due to lack of deficit irrigation.

Note: This feature is only shown when budget mode is set to **Automatically stay in budget**.

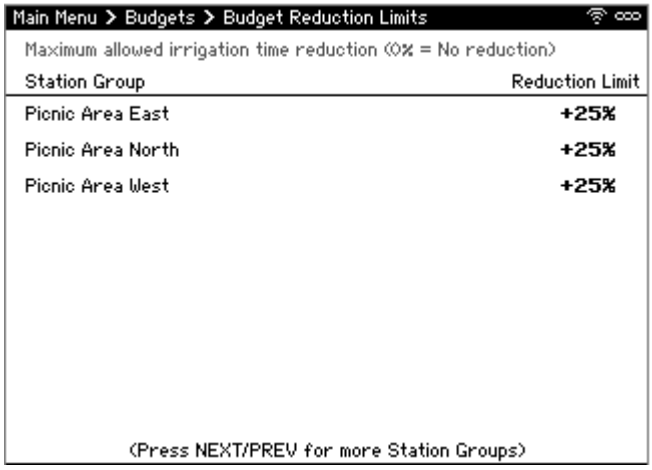


Figure 61: Budget Reduction Limits Screen

To adjust the reduction limit of each station group (Figure 61):

1. From Main Menu, navigate to **Budgets** and select **Budget Reduction Limits**. The Budget Reduction Limits screen displays.
2. For each Station Group, use **+/-** to set how much the controller can scale back irrigation to try to stay within budget.

Comparing Actual Usage to the Budget

The Use vs. Budget feature displays a comparison of actual usage compared to the budget for the current period.

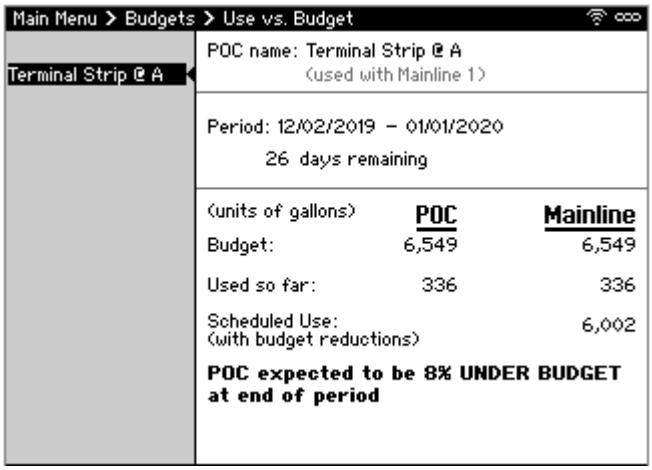


Figure 62: Use vs. Budget Screen

To access the Use vs. Budget screen (Figure 62):

1. From Main Menu, navigate to **Budgets** and select **Use vs. Budget**. The Use vs. Budget report displays.
2. Navigate to the desired mainline on the left menu to view report on the right.
3. When finished, press **BACK** to return to Main Menu.

Lights

The Calsense CS3000 Irrigation Controller provides four optional programs that can be used to control various devices such as lights, gates, or water features. The Lights schedules operate independently from the irrigation programs.

Note: The Lights menu only displays on the Main Menu if the Lights option (model CS3-L-KIT) is physically installed on the controller or within the *FLOWSENSE*® chain.

Scheduling Lights

The Lights Schedule provides the ability to program up to four (4) individual light programs per controller, each with a two-week rolling schedule and two (2) start and stop times per day. After completion of the two-week schedule, the schedule "rolls over" and begins again, continuously, until the user turns that schedule off or edits it.

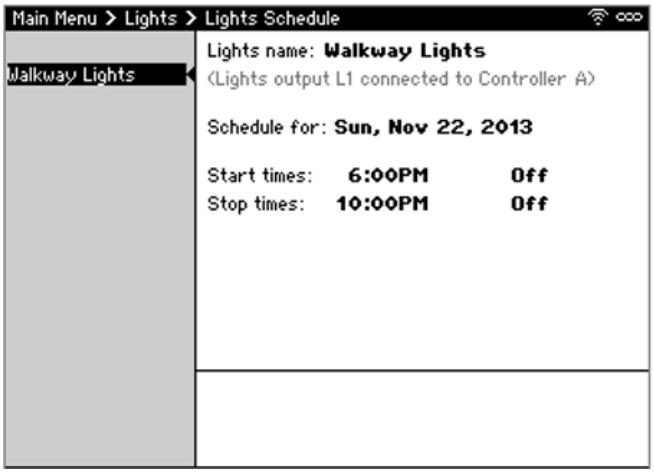


Figure 63: Lights Schedule Screen

To schedule lights to turn on (Figure 63):

1. From Main Menu, navigate to **Lights** and select **Lights Schedule**. The Lights Schedule screen displays.
2. Navigate to and select the desired Lights output to configure.
3. For Lights name, and press **SELECT** to add a descriptive name with the on-screen keyboard.
4. For Schedule, use the **+/-** keys to select the start date for the 14-day schedule.
5. For Start times, use **+/-** to set when the lights should turn on.
6. For Stop times, use **+/-** to edit when to turn off the lights.

Turning Lights On or Off

The Turn Lights On or Off feature provides the ability to turn lights ON or OFF manually.

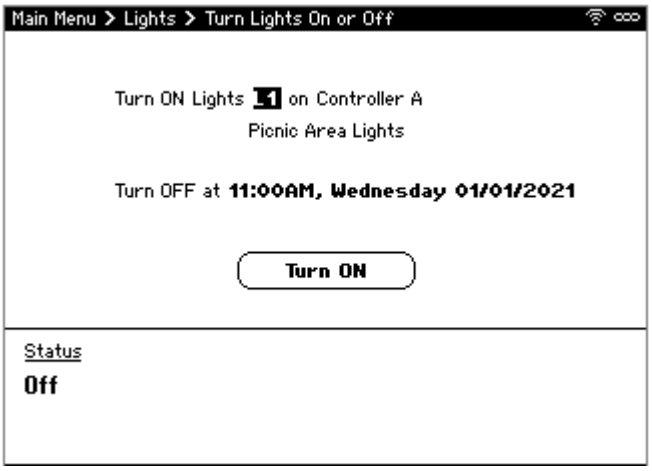


Figure 64: Turning Lights On or Off Screen

To access the Turning Lights On or Off screen (Figure 64):

1. From Main Menu, navigate to **Lights** and select **Turn Lights On or OFF**.
2. For Turn ON Lights or Turn Off Lights, use **+/-** to select the Light Schedule to turn on or off.
    - If the Lights are on:
        i. For **Turn OFF at**, select what time to turn the lights off.
        ii. Select **Turn OFF**.
    - If the Lights are off:
        i. For **Turn OFF at**, select what time to turn the lights off.
        ii. Select **Turn ON** to turn on the lights.

Viewing Lights Status

The Lights Status screen provides a real time account of what light group is on, how it was turned on, and how many minutes are left until the lights turn off.

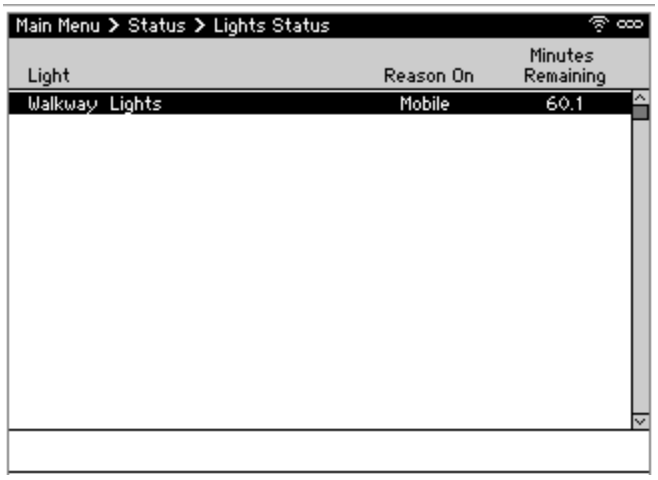


Figure 65: Lights Status Screen

To view Light Status screen (Figure 65):

1. From Main Menu, navigate to **Status** and select **Lights Status**. Lights Status screen will display.

Viewing Lights Summary

The View Lights Summary provides a daily record of lights activity.

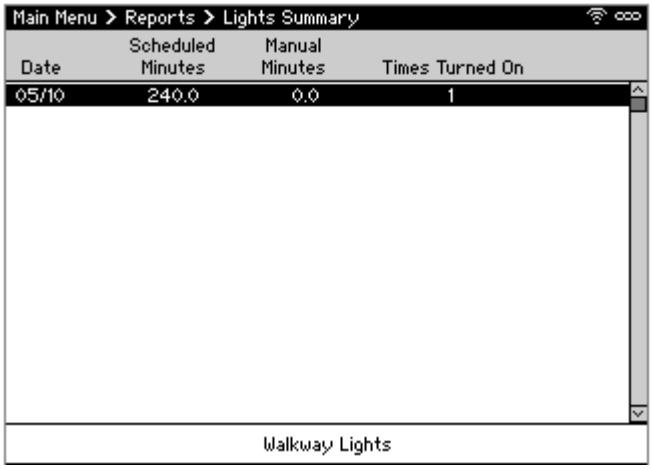


Figure 66: Lights Summary Screen

To view details of when lights turn on and off (Figure 66):

1. From Main Menu, navigate to **Reports** and select **Lights Summary**. Lights Summary screen displays for one lights output.
2. Press **Station Up** or **Station Down** to view additional lights.

Communication

Subscription Services and Renewal

Calsense offers 1-year and 5-year prepaid cellular data access service plans for use with the 4G LTE (model CS3-GR-KIT) communication option. These prepaid plans allow the use of cellular service without the need to sign a contract with a third-party service provider. Any changes to the service are handled by Calsense, as are any firmware updates and programming changes that may need to be done to the radio during the term of the plan.

The Calsense Data Access Service is offered in several varieties, based on a site's individual needs:

- COMM-1YR-2 provides one or two controllers with 12-consecutive months, or one year, of data communication service
- COMM-1YR-4 provides three or four controllers with 12-consecutive months, or one year, of data communication service. This is commonly used with small *FLOWSENSE*® chains.
- COMM-1YR-35 provides up to 35 controllers with 12-consecutive months, or one year, of data communication service. This is commonly used with larger *FLOWSENSE* chains or communication hubs.
- COMM-1YR-36+ provides an unlimited number of controllers with 12-consecutive months, or one year, of data communication service. This is intended for very large communication hubs.

Each of these plans are also available with 60-consecutive months, or five years, of data communication service. For example, the 5-year one to two controller plan is specified as COMM-5YR-2.

Communication Options

The Communication Options menu varies based on the options installed on the controller (Figure 67). Besides the ability to test communications, it also includes the ability to program communication devices physically attached to the controller. Device programming is beyond the scope of this User's Guide, but Calsense's Customer Service team is available at (800) 572-8608 to help.

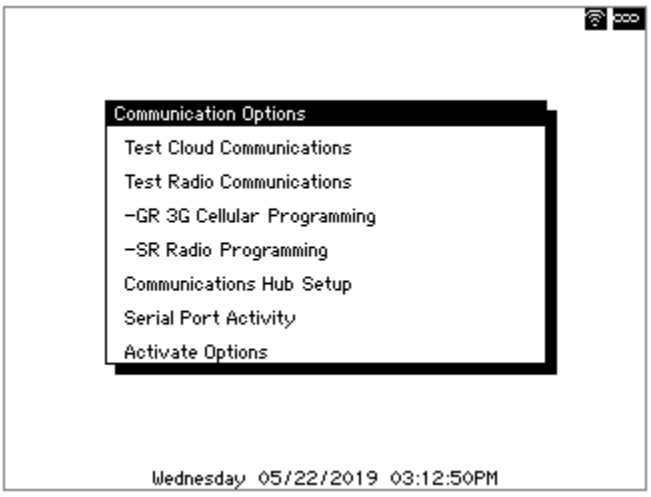


Figure 67: Communication Options Screen

Test Cloud Communications

The Test Cloud Communications provides the ability to test communications with Command Center Online and request the latest software update.

To verify connectivity to the cloud:

1. From Main Menu, navigate to **Setup** and select **Communication Options**. The Communication Options dialog displays.
2. Select **Test Cloud Communications**. The Test Cloud Communications screen displays.
3. Select one of the options on the screen to communicate with Command Center Online.

Test Radio Communications

The Test Radio Communications feature provides the ability to test Local Radio (model CS3-LR) and Spread Spectrum Radio (CS3-SR) communication between controllers.

Note: This menu is only available if a local radio or spread spectrum radio option is physically installed on the controller.

To use test radio communications:

1. From Main Menu, navigate to **Setup** and select **Communication Options**. The Communication Options dialog displays.
2. Select **Test Radio Communications**. The Test Radio Communications screen displays.
3. For Test radio communication with, select either **CS3000** or **ET2000e**.
    - If you select CS3000, use **+/-** to enter the serial number of a CS3000 to test communication with.
    - If you select ET2000e, use **+/-** to enter the three alphanumeric character address of the ET2000e to test communication with.
4. For Using, use +/- to select whether to test -LR radio or -SR radio.
   Note: This may not be editable if only one radio communication option is installed.
5. Select **Start** to begin the test.

Configuring Hub Communications

The Communications Hub feature provides the ability for multiple controllers to share a single cloud communication option using Local Radio (model CS3-LR) or Spread Spectrum Radio (model SR), or Hardwire (model CS3-M).

Note: This menu item only displays if the hub option (CS3-HUB-OPT) is installed.

To configure this controller to operate as a communication hub:

1. From Main Menu, navigate to **Setup** and select **Communication Options**. The Communication Options dialog displays.
2. Select **Communications Hub**. The Communications Hub screen displays.
3. For Does this controller act as a HUB, use +/- to select **Yes** or **No**.
4. To view the controllers assigned to this hub in Command Center Online, click **View Hub List**. The Hub List pop-up menu displays.

Note: The hub list will be blank until controllers are assigned to this hub on the Hub Assignment page of Command Center Online.

Activating Software Options

The Activate Options feature provides the ability to activate software options such as *FLOWSENSE*® (model CS3-FL) and Hub (model CS3-HUB-OPT) using an activation code.

1. From Main Menu, navigate to **Setup** and select **Communication Options**. The Communication Options dialog displays.
2. Select **Activate Options**. The Activate Options screen displays.
3. Navigate to and select Activation Code to enter the activation code using the on-screen keyboard.
4. Select **Activate Option** to activate the new option.

Appendix A – Troubleshooting Alerts

Problem	Description	Possible Causes	Solution
2-Wire Cable Excessive Electrical Current	2-wire cable exceeded the electrical threshold	Blue and red wires are improperly installed	Correct wire installation
		Nicked wire	Check wiring and replace or fix wires
		Shorted 2-wire path or decoder	Correct wire installation
		Failed solenoid	Replace solenoid
2-Wire Terminal Overheated	2-wire terminal overheated due to excessive heat	Temperature exceeded maximum threshold	Call Calsense customer service or your Account Manager
Electrical short: Pump	An electrical short was detected on pump output.	Wires are not properly installed	Correct wire installation
		Bad coil	Replace coil
		Wires are crossed	Adjust wire placement
		Wire splices are not watertight	Locate wire splices and adjust according
Electrical short: Lights Output <num>	An electrical short was detected on lights output.	Wires are not properly installed	Correct wire installation
		Wires are crossed or disconnected	Adjust wire placement
		Wire splices are not watertight	Locate wire splices and adjust according
Electrical Short: Unknown Output	An electrical short was detected from an unknown output.	Power surge	
		Wires are crossed	Adjust wire placement
		Wire splices are not watertight	Locate wire splices and adjust according
		Damaged wires	Check wiring and replace or fix wires
No Electrical Current: Master Valve	No electrical current was measured from master valve.	Broken Wire	Locate and fix the wire connection
		Burnt out solenoid	Replace solenoid
		Disconnected wires	Locate and fix the wire connection
No Electrical Current: Lights Output <num>	No electrical current was measured from lights output.	Wires are not properly installed	Locate and fix the wire connection
No Electrical Current: Station <num>	No electrical current was measured on an indicated station.	Wires are not properly installed	Locate and fix the wire connection
ET Gage- 0 Pulses	Zero pulses are being measured from ET gage.	Weather conditions	Adjust for weather conditions
		No power connected	Check power to gage
		ET gage is out of water	Check water level
***FLOWSENSE*® Communication Down- Irrigation will not run**	*FLOWSENSE* is unable to connect	Communication cable is not properly installed	Check wiring
		Incorrect control setting	Adjust control settings
		Improper radio coverage	Conduct radio survey to confirm proper radio coverage

Problem	Description	Possible Causes	Solution
Fuse Blown	The controller detected that the fuse is blown.	Bad solenoid	Replace the solenoid
		Shorted 24 VAC output	Check if incoming power is 120 VACS
High Flow: Station <num>: saw <num> gpm, expected <num> gpm	An increased amount of water flow was found.	Broken head or lateral	Repair the broken head or lateral
		Slow closing valve	Repair or replace slow closing valve, or Enable delay between valves
		Stuck valve	Repair or replace stuck valve
		Incorrect expected flow rate	Adjust station's expected flow rates
Low Flow: Station <num>: saw <num> gpm, expected <num> gpm	A decreased amount of water flow was found.	Clogged head(s)	Clear clogged head(s)
		Flow control turned down	Check flow control on valve
		Incorrect expected flow	Adjust or reacquire the expected flow rate
No Flow Detected by Flow Meter: Station <num>	No water flow found.	Valve did not open	Locate valve and check wire connections and splices
		Master valve did not open	Locate master valve and check wire connections and splices
		Problem with flow meter	Locate flow sensor and check wire connections and splices
		Clogged head(s)	Clear clogged heads
Mainline Break: <name> while irrigating	A mainline break was detected while irrigating.	Broken head	Locate the break and then fix or replace part
		To many valves are in use at one time	Adjust number of valves in use
		Broken laterals, fittings	Locate and fix laterals and fittings
		System capacity and MLB settings need to be adjusted	Adjust data accordingly
Mainline Break: <name> while not irrigating	A mainline break was detected while not irrigating.	Leak in mainline	Locate leak and fix the problem
		Broken fitting or pipe	Replace or patch fitting or pipe
		Master Valve not closing on normally closed system	Replace master valve
		Employees manually operating valves in field without telling system.	Review system protocols
Mainline Break: <name> while MV override	A mainline break was detected while master valve was in override.	Leak in mainline	Locate leak and fix the problem
		Broken fitting or pipe	Replace or patch fitting or pipe
		System capacity and MLB settings need to be adjusted	Adjust data accordingly
		To many valves are in use at one time	Adjust number of valves in use
POC Decoder Voltage Too Low: Decoder S/N <num>	The voltage measured is too low on identified decoder.	Damaged wires	Check wiring and replace or fix wires
		Bad splices	Check splices
POC Decoder Not Responding: Decoder <Serial Number>	The decoder is not responding.	Power disruption	Locate and fix the wire connection
		Damaged wires	Check wiring and replace or fix wires
		Bad splice	Check splices

Problem	Description	Possible Causes	Solution
Power Fail (Brown Out)	Voltage to the controller dropped which resulted in a restart.	Damaged wires	If the problem is persistent, check the power connections
		Low/intermitted line voltage source	
		Bad splices	
Power Fail	The controller lost power.	Power outage	If the problem is persistent, check the GFI and power connections. Replace the GFI if required.
		GFI tripped	
		Power removed from controller	
Solenoid Short: Master Valve	An electrical short was detected from master valve.	Solenoid is shorted out	Replace solenoid
		Bad splices	Repair splices
		Valve box full of water	Remove water and fix accordingly
		Wires shorted together	Replace wires and adjust positioning
Solenoid Short: Station <num>	An electrical short was detected on indicated station.	Solenoid is shorted out	Replace solenoid
		Bad splices	Repair splices
		Valve box full of water	Remove water and fix accordingly
		Wires shorted together	Replace wires and adjust positioning
STATION DECODER NOT RESPONDING: Decoder	The identified decoder is not responding.	Decoder is not connected	Check all wiring connections
		Damaged wires	Replace damaged wires
		Bad splices	Repair splices
STATION DECODER VOLTAGE TOO LOW: Decoder S/N <num> (Station <num>):	The voltage measured was too low when the indicated decoder was energized.	Solenoid not operating properly	Replace solenoid
		Solenoid burnt out	Replace solenoid
		Wrong solenoid used	Replace with suggested solenoid
		Damage to 2-wire path	Repair connections along 2-wire path
		Bad wire splices	Repair splices

Appendix B - Soil Types

Identifying the specific soil type at a site allows for better water management and healthy plants. Different soil types require different runtimes, cycles, and soak times. There are many different methods to finding out soil types. One simple test to do in the field is the "Mason Jar Test." For this test, fill a mason jar halfway with the site's soil sample and fill with water. Shake the jar for several minutes and then set aside for 2 hours. During this time, the soil particles will settle and separate. The bottom layer will be heavier particles such as sand or rocks. The middle layer will be silt. The top layer will be clay. Determine the percentage of each layer and use the table below to determine the soil type. For a more detailed and accurate soil description, collect a sample from the site to send to the nearest soil lab.

Controller Behavior

The expected controller behavior is influenced by the type of soil type selected.

Expected Controller Behavior			
Soil Texture	Water Holding Capability	Infiltration/Permeability	Expected Controller Behavior
Clay	High	Low	Short runtimes, long soak time, and multiple cycles
Silty Clay	Medium to High	Low to Medium	Short runtimes, long soak time, and multiple cycles
Clay Loam	Medium to High	Low to Medium	Longer runtimes than clay but shorter cycles and soak times
Loam	Medium	Medium	Short Runtimes with short cycles and soaks
Sandy Loam	Low to Medium	Medium to High	Short Runtimes with short cycles and soaks
Loamy Sand	Low to Medium	Medium to High	Longer runtimes, short soak times, and minimal cycles
Sand	Low	High	Longer runtimes, short soak times, and minimal cycles

Appendix C - Head Types

The Calsense CS3000 controller has 13 head type or sprinkler type selections to choose from for each zone. The head type selection will affect the precipitation rate. *Caution:* The information and measurements provided below are generalized and may vary depending on adjustments made.

Head Type	Description	Pressure/Precipitation Rate	Range
Spray	Applies a constant 360-degree fan of water over given area.	Operating pressure around 30 psi, and precipitation rate of 1.5 - 2.0 inches/hour.	360 degrees Radius of 2-20 feet 
Spray-Stream	Applies a constant 360-degree fan of water over given area.	Operating pressure around 30 psi, and precipitation rate between 1.5 - 2.0 inches/hour.	360 degrees Radius of 2-20 feet 
Spray-High Efficiency	Applies a constant 360-degree fan of water over a given area. Produces larger water droplets at a slower rate, reducing carry away from wind.	Operating pressure around 45 psi, and precipitation rates between 0.4 - 0.8 inches/hour.	360 degrees Radius of 2-20 feet 
Rotor-Full Circle	Single stream of water rotating 360 degrees.	Operating pressure between 40-110 psi, and precipitation rates between 0.25 - 1.5 inches/hour.	360 degrees Radius of 15-100 feet 
Rotor-Part Circle	Single stream of water rotating back and forth at adjustable angles less than 360 degrees.	Operating pressure between 40-110 psi, and precipitation rates of 0.25 - 1.5 inches/hour.	Adjustable angles < 360 degrees Radius of 15-100 feet 
Rotor-Mixed	Single stream of water that rotates back and forth. Adjustments between 40 and 360 degrees.	Operating pressure between 40-110 psi, and precipitation rates of 0.25 - 1.5 inches/hour.	Adjustable angles < 360 degrees Radius of 25-100 feet 
Rotor-Stream	Single stream of water that rotates back and forth within adjusted parameters.	Operating pressure between 40-110 psi, and precipitation rates of 0.25 - 1.5 inches/hour.	360 degrees Radius of 25-100 feet 
Impact-Full Circle	Ideal for large open areas. Proving even radius 360 degrees. The force of the outgoing water drives the head in a circular motion.	Operating pressure between 25-50 psi, and precipitation rates of 0.3 - 0.9 inches/hour.	360 degrees Radius up to 50 feet 
Impact-Part Circle	Ideal for large open areas. Stream of water with adjustable rotation less than 360 degrees. Force of the outgoing water drives the head in a circular motion.	Operating pressure between 25-50 psi, and precipitation rates of 0.3 - 0.9 inches/hour.	Adjustable angles < 360 degrees Radius up to 50 feet

			
Impact-Mixed	Ideal for large open areas. Even stream of water with adjustable rotation between 40 and 360 degrees.	Operating pressure between 25-50 psi, and precipitation rates of 0.3 - 0.9 inches/hour.	Adjustable angles < 360 degrees Radius up to 50 feet 
Bubbler	Umbrella pattern stream of water around emitter source. Ideal for smaller areas.	Operating pressure between 20-60 psi, and precipitation rates 0.20 - 2.0 gallons/minute.	Radius up to 1.5 feet per emitter
Drip Emitter	Applies water directly to plants root zone at a single point or multiple points along a pipe.	Operating pressure between 15-50 psi, and precipitation rates of 0.2 - 2.0 gallons/hour (depending on emitter flow rate)	Radius of 3-12 inches per emitter
Subsurface Drip	Emitters are embedded within tubing, evenly spaced apart at various distances, providing an even dispersion of water.	Operating pressure between 5-15 psi, and precipitation rates of 0.15 - 1.0 gallons/hour.	Radius of 3-12 inches per emitter