

Calsense 2-Wire Troubleshooting Guide

What is a Calsense 2-Wire System?

Unlike conventional irrigation systems, 2-Wire systems have two wires that connect the controller to various stations in the system through a series of decoders. The same two wires run underground and send power and signals to each decoder along their path(s). The signals tell each station decoder to turn on its corresponding stations through activating their solenoids. As a result, solenoids do not each need a separate power wire.

Decoders are electronic devices connected to the wire path. They activate irrigation devices based on signals received from the controller through the wire path. There are three types of decoders: POC (point of connection), station, and moisture sensing. See Appendix A – Glossary of Terms on page 14 for an explanation of each. One controller can have up to 80 total decoders (70 station decoders and 10 POC or Soil Moisture Sensor decoders) across 128 total stations. If the system has more than 80 decoders, the controller will be unable to discover decoders. Each decoder has its own serial number, used to find it in the system. Decoders are assigned using their serial numbers.

Due to reliance on signals travelling through the same two wires throughout the system, 2-Wire systems are more delicate than conventional systems – one problem along the wire can cause issues for the entire system. Therefore, 2-Wire systems must be carefully installed according to all specifications and instructions.

General System Health

Healthy Current Readings

This section applies to a healthy Calsense 2-Wire system. A malfunctioning system will not have the readings listed in this section. A healthy decoder (2-Station, POC, or Soil Moisture Sensor) will draw between 0.8 and 1 milliamps (mA). Note the healthy reading range for your system by multiplying the total number of decoders in the system by 0.8 and 1 mA as follows:

$$\# \text{ decoders} \times 0.8 \text{ mA}$$

$$\# \text{ decoders} \times 1.0 \text{ mA}$$

The healthy readings on your system will fall within the following ranges based on the number of decoders:

Decoders	Up to 10	Up to 20	Up to 30	Up to 40	Up to 50	Up to 60	Up to 70	Up to 80
Draw (mA)	8-10	16-20	24-30	32-40	40-50	48-60	56-70	64-80

Note: 80 is the maximum number of decoders allowed.

Troubleshooting Calsense 2-Wire Systems

There are typically two alerts that occur with the Calsense 2-Wire system:

- 2-Wire Cable Excessive Current/Overcurrent
- Decoder Not Responding

Complete the [Before You Begin](#) steps below. Then go to either [Troubleshooting 2-Wire Cable Overcurrent Alerts](#) or [Troubleshooting Decoder Not Responding Alerts](#) on page 9, based on the type of alert you're troubleshooting.

Reminder: Before performing these steps, review the list of key terms in the Appendix A – Glossary of Terms on Page 14.

Before You Begin

1. At the controller, navigate to **Setup** and select **FLOWSENSE**. The FLOWSENSE screen displays.

Note: If the FLOWSENSE menu item is not visible, skip to Step 3.

2. When prompted whether the controller is in a FLOWSENSE chain, select **No**.

Note: This will cause the other controllers in the chain to report that the chain is down. Once your testing is complete, return to this screen and set this back to **Yes** to ensure irrigation runs normally.

3. Record the following:

- The number of total decoders on the system.
- The approximate location of all 2-Wire cables.
- The location of all splices on the 2-Wire cable, especially 3-way and 4-way splices.
- Is the 2-Wire cable looped anywhere (does the wire go out and come back into the controller)? If so, turn off the power to the system, and disconnect the loop by cutting the red and blue wires at a decoder near the midpoint of the loop.

IMPORTANT! The 2-Wire cable attached to systems with POC and/or Soil Moisture Sensor Decoders is powered up/energized regardless of whether irrigation is running or not.

Troubleshooting 2-Wire Cable Overcurrent Alerts

Overcurrent, sometimes referred to as excessive current, occurs when more current is drawn from the 2-Wire module than it can safely supply. These alerts can be caused by a wiring short, fault on the red wire of the 2-Wire cable, a bad decoder, or deteriorating solenoids.

What You Need

- Armada Technologies Pro95i™ or Pro95™ True RMS milliamp clamp meter.
- ELK Products ELK-TRG2440 Auto-Resetting Transformer, or similar 24VAC fused transformer.
- Extension cord if no 120V power outlet is nearby.
- Wire cutter/stripper (NOT quick cutter).
- 3M™ Scotchcast™ Connector Sealing Packs 3570G-N.
- Phillips-head screwdriver.
- Zip ties and/or multi-colored electrical tape.
- Wire nuts.

Finding the Size of the Issue

The first step in troubleshooting overcurrent alerts is figuring out whether the current is constant or intermittent. To do so:

1. From CS3000 controller's Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
2. Select **Discover Decoders Connected to this Box**. The controller scans for all decoders physically connected to the controller's 2-Wire terminal.
 - If a "2-Wire Cable Shorted" warning displays showing excessive current was detected on the 2-Wire cable during discovery, the system is experiencing constant excessive current. Continue to [Troubleshooting Constant Overcurrent](#).
 - If no warning displays, skip to [Troubleshooting Intermittent Overcurrent](#) on page 8.

Troubleshooting Constant Overcurrent

Such an overcurrent condition can be the result of an issue with the 2-Wire module itself, or an issue in the field. The following steps start at the controller and then move to the field.

Evaluating the 2-Wire Module

1. Power off the controller.

IMPORTANT! Failure to power off the controller while working on it may result in damage to the product and bodily injury.

2. Open the enclosure.
3. Find the 2-Wire module. This is a red circuit board with a metal shield over it with red and blue field wires connected to the terminals on its right side.
4. Using a Phillips-head screwdriver, disconnect the red wires from the 2-Wire module.
5. Power up the controller. Be sure to leave the red wires disconnected.
6. From the Main Menu, navigate to **Setup** and select **2-Wire**. The 2-Wire dialog displays.
7. Navigate to and select **Discover Decoders Connected to this Box**. The controller scans for all decoders physically connected to the controller's 2-Wire terminal.
 - If a "2-Wire Cable Shorted" warning displays, the 2-Wire module is damaged and needs to be sent in for repair. See [Requesting an RMA](#) on page 13 for instructions.
 - If no warning displays, the issue is in the field along the 2-Wire path. Power off the controller and continue to [Finding Affected Leg of the 2-Wire Path](#).

IMPORTANT! DO NOT select **Unlink Orphan Decoders** after performing a discovery while the red wires are disconnected. Doing so will result in loss of data and the need to reassign each station or POC to the decoders.

Finding Affected Leg of the 2-Wire Path

A 2-Wire system may consist of a single leg, with one path of red and blue wires, or multiple legs. These legs may be connected to different terminals on the 2-Wire module or using wire splices in the field. The following steps narrow down which leg of the 2-Wire path is affected.

1. Power off the controller.
2. Attach one red wire to the 2-Wire module.
3. Repeat steps 5-7 of [Evaluating the 2-Wire Module](#), above.

- If a “2-Wire Cable Shorted” warning displays, there is a problem somewhere along this cable. Note the cable; this issue will be addressed in [Calculating the Known Good Reading](#).
4. Power off the controller.
 5. Repeat steps 2-4 for each red and blue cable.
 6. If any 2-Wire cables split into multiple cables in the field, repeat the above steps on each leg of cable.

Connecting the External Transformer

1. Power off the controller.
2. Disconnect the red and blue wires from the 2-Wire module.

Note: When done troubleshooting, make sure the red and blue wires are reconnected to the 2-Wire module and a 2-Wire discovery performed to bring the decoders back online.
3. Connect the set of wires that created a “2-Wire Cable Shorted” warning during discovery in the earlier section to the ELK-TRG2440 or equivalent 24VAC transformer. On the ELK transformer, land the red wire to one of the AC terminals and the blue wire to the other AC terminal; the GND terminal is not used.
4. Plug the transformer into a 120V power outlet. If there is no power outlet nearby, use an extension cord to connect the transformer to a nearby power outlet.

Calculating the Known Good Reading

Using the ELK-TRG2440 Transformer

In this step, we’ll note the healthy reading range for your system while connected to the ELK-TRG2440. Multiply the number of decoders by 1.3 and 1.5 mA. Using the ELK-TRG2440 transformer will result in a healthy reading range different from the those in [Healthy Current Readings](#). Using this transformer, healthy readings on your system will fall within the following ranges, based on the number of decoders:

Decoders	Up to 10	Up to 20	Up to 30	Up to 40	Up to 50	Up to 60	Up to 70	Up to 80
Draw (mA)	13-15	26-30	39-45	52-60	65-75	78-90	91-105	104-120

Note: 80 is the maximum number of decoders allowed.

Using a Different Transformer

Healthy readings will differ when using transformers other than the ELK-TRG2440. To find a healthy reading range with an alternative 24VAC transformer:

1. Clamp the Armada clamp meter, with LPF on (see Step 2 of [Taking a Current Measurement on the 2-Wire Path](#) for instructions) around the red wire of a single decoder and note the reading.
2. Repeat Step 1 at three to five decoders to ensure the readings are consistent. If one decoder has a significantly higher reading, it may be the root cause of the overcurrent condition.
3. Multiply the current draw for one healthy decoder by the total number of decoders in the system. The result is the current that a healthy system should draw when hooked up to the transformer. Note the value for future reference.

Taking a Current Measurement on the 2-Wire Path

1. Turn the dial on the Armada clamp meter to mA.

2. Ensure Low Pass Filter mode is enabled. This can be found by looking for “LPF” above the current reading, as shown in [Figure 1](#). If it’s not there, press the **HOLD** button to enable it.



Figure 1 - Armada clamp meter display with LPF highlighted.

3. Clamp the Armada clamp meter on the red wire of the 2-Wire cable at the controller to find the system’s current draw.

Note: Do not clamp the red and blue wires together. They will cancel each other out.

- If the reading is higher than the value you calculated in [Calculating the Known Good Reading](#), continue to the next step.
- If it is normal, that is close to the value you calculated earlier, skip to [Troubleshooting Intermittent Overcurrent](#) on page 8.

Taking a Current Measurement at a Decoder

1. Go to the first valve box along the 2-Wire path.
2. Find the decoder in the valve box.
3. Clamp the Armada clamp meter around the red wire in the following locations and note the readings: 2-Wire path upstream of the decoder, 2-Wire path downstream of the decoder, and the decoder’s red wire.

Note: Do not clamp the red and blue wires together. They will cancel each other out.

- If the readings are normal in all three locations, the issue is with the cable between the first decoder and the controller. Repair or replace the cable.
- If the readings are high both upstream and downstream of the decoder and the decoder’s reading is normal, the decoder is NOT causing the overcurrent. Proceed to [Pinpointing the Source of the Constant Overcurrent](#).
- If the readings upstream and on the decoder are high, but the reading downstream is normal, the decoder is shorted and causing the overcurrent. Proceed to [Removing the Source of the Constant Overcurrent](#).

Pinpointing the Source of the Constant Overcurrent

To pinpoint the source of the overcurrent, evaluate the 2-Wire path in sections. Start by finding whether the 2-Wire path is a single cable or splits in multiple directions.

IMPORTANT! Make sure the external transformer is disconnected from the power outlet whenever working with the wires. Failure to do so may result in damage to the product and bodily injury.

2-Wire Paths that Split Multiple Directions

1. Locate the first split in the 2-Wire path.
2. Remove the wire connectors and disconnect the red wires on all but one leg of the 2-Wire path.

3. Following the steps in Taking a Current Measurement on the 2-Wire Path, measure the current (mA) on the leg that's connected.
 - If the reading is within the healthy range, the excessive current is on a different leg of the 2-Wire path. Repeat steps 1-3 for each leg of the 2-Wire path.
 - If the reading is higher than expected, the excessive current is likely on this leg of the 2-Wire path. Continue to 2-Wire Path with a Single Cable from the Controller to the Decoders to isolate where the problem is along the path.

2-Wire Path with a Single Cable from the Controller to the Decoders

1. Move to the valve box closest to the mid-point of the 2-Wire path.
2. Repeat Step 3 of Taking a Current Measurement at a Decoder to measure the current (mA) on the 2-Wire path.

IMPORTANT! Do not reference the sub-sections of Step 3; return to this step once you've taken all three readings.

- If the readings are within or below the healthy range, you've passed the source of the excessive current, as shown in Figure 2 below. Move back up the 2-Wire path to the mid-point between your last reading and this location. Repeat steps 1-2 until you've identified the issue.
- If the reading is higher than expected at all three locations, the excessive current is occurring farther down the path, as shown in Figure 3 below. Continue down the 2-Wire path to the next mid-point between this location and the end of the 2-Wire path. Repeat steps 1-2 until you've identified the issue.
- If the readings upstream and on the decoder are high, but the reading downstream is normal, the decoder is shorted and causing the overcurrent, as shown in Figure 4 below. Proceed to Removing the Source of the Constant Overcurrent.

For a visual explanation of pinpointing decoder issues, see **Error! Reference source not found.** on the next page.

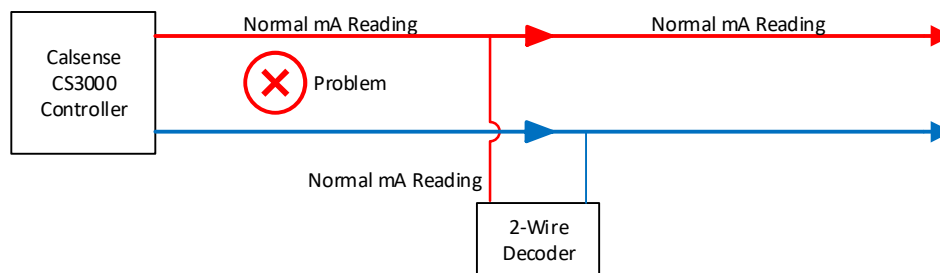


Figure 2 - Visual depiction of problem occurring upstream of measurement.

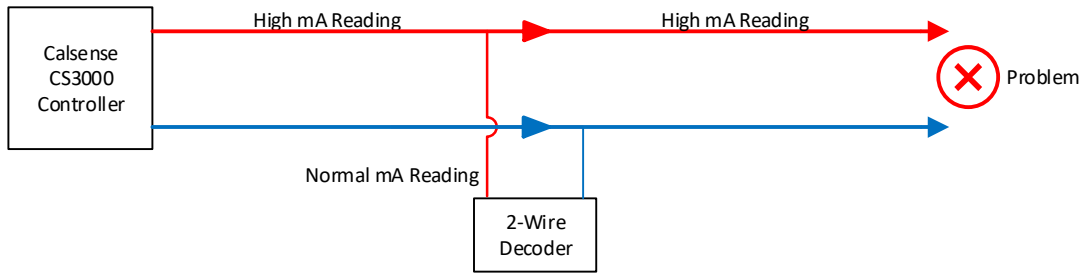


Figure 3 - Visual depiction of problem occurring downstream of measurement.

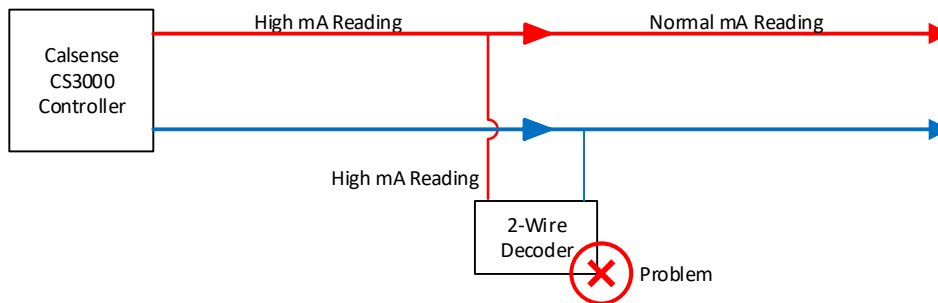


Figure 4 - Visual depiction of problem occurring at decoder.

Removing the Source of the Constant Overcurrent

Once you've pinpointed the source of the excessive current:

IMPORTANT! Make sure the external transformer is disconnected from the power outlet whenever working with the wires. Failure to do so may result in damage to the product and bodily injury.

1. Score and snap the applicable wire jackets with wire strippers and use wire cutters to disconnect the decoder or failed connection from the 2-Wire path.
2. Re-establish the 2-Wire path by using a wire nut to connect the two red and two blue wires together without the decoder.
3. Measure the current using Step 3 of [Taking a Current Measurement at a Decoder](#)
 - If the excessive current goes away, that is the reading is now within the healthy reading range, the decoder is faulty and needs to be replaced. Contact your distributor or see [Requesting an RMA](#) on page 13 for instructions to send the unit in for repair.

What if multiple decoders are shorted?

You may find that removing one decoder/connection lowers the current along the 2-Wire path, but the current reading is still high. This shows there is at least one more faulty decoder or connection on the line. There may also be problems along multiple legs of the 2-Wire cable.

Follow the same procedures outlined in the above sections to pinpoint more issues and make a note of each faulty decoder's serial number and corresponding current measurements (mA).

Troubleshooting Intermittent Overcurrent

There are two types of intermittent overcurrent. The first occurs ONLY during irrigation and usually occurs at about the same time during each cycle. The second can occur randomly, but most often occurs when it rains or during/shortly after an irrigation cycle ends due to water intrusion into the wire along the path.

Troubleshooting Overcurrent Alerts that Occur During Irrigation

Overcurrent conditions that occur only during irrigation are likely caused by multiple deteriorating solenoids running at the same time. The individual solenoids do not draw enough current to trigger the alert on their own, but together, the sum of the solenoids' draw creates overcurrent.

Finding Valves that were On During the Alert

The CS3000 controller automatically flags all stations that were running when the controller measured overcurrent as an alert. To find the stations:

1. Access the Alerts report, either on the controller under **Diagnostics > Alerts**, or online at <https://calsense.net> and selecting **Reports > Alerts**.
2. Find the first 2-Wire Cable Excessive Current/Overcurrent alert.
3. Immediately following that alert that reads: <num> stations turning OFF @ Controller <letter>: <station numbers>
4. Make note of the identified station numbers. These were the stations that were on when the overcurrent was measured.

Obtaining Healthy Solenoid Readings

1. Set the Armada clamp meter to mA and make sure LPF is turned off. If LPF is on, press **HOLD** to turn it off.
2. Using a Calsense remote, a smartphone, or the Test feature at the controller, turn on a station NOT identified in [Finding Valves that were On During the Alert](#).
3. Use the clamp meter to take a measurement around one of the solenoid wires.
4. Make note of the clamp meter reading.
5. Repeat steps 2-4 on five or six different valves.

Locating and Remove All Deteriorating Solenoids

1. Using a Calsense remote, a smartphone, or the Test feature at the controller, turn on a station that WAS identified in [Finding Valves that were On During the Alert](#).
2. Measure the draw of the solenoid using the clamp meter on one of the solenoid wires. If the draw is higher than that of a normal solenoid, replace the solenoid.
3. Repeat steps 1-2 on the remaining valves noted in [Finding Valves that were On During the Alert](#). The overcurrent should stop once all the solenoids with high current draws are replaced.

Troubleshooting Randomly Occurring Overcurrent

Randomly occurring overcurrent can be caused by failing electrical connections, a failing red wire, or contact with moisture. Common causes include flooded valve boxes, flooded conduits, or wet soil after heavy rain and irrigation cycles. Because the overcurrent is caused by a failing connection that leaks to ground when wet, the system will function properly when it's dry.

Note: If the issue consistently occurs on during or following irrigation, you may be able to pinpoint which stations irrigated prior the alert by comparing the timestamp of the alert and the stations that ran before it using the On-at-a-Time report on <https://calsense.net>.

1. Set the clamp meter to mA and make sure LPF is turned on. If LPF is off, press **HOLD** to turn it on.
2. Use the clamp meter to take a reading on the 2-Wire cable(s) at the controller.
 - If the reading is higher than normal for the number of decoders on the system, as measured during [Calculating the Known Good Reading](#), proceed to the next step.
 - If the reading is normal, wait until the overcurrent occurs again or try to force it to occur by running normal irrigation cycles.
3. Go to the decoder closest to midpoint of the 2-Wire cable. Use the clamp meter to take a measurement on the cable upstream and downstream of the decoder.
 - If the reading is still higher than normal, the problem is further downstream on the 2-Wire cable.
 - If it is normal, the problem is upstream of the decoder.
4. Repeat Step 3 until you find the problem. It will likely be a single connection on the red wire or a section of 2-Wire cable between two decoders.
5. Repair or replace the cause of the issue. The overcurrent should stop if it was the only source of the current.

Note: There may be more than one source of the overcurrent. Repeat steps 3-5 if the overcurrent persists.

Troubleshooting Decoder Not Responding Alerts

The “Decoder Not Responding” alert occurs when an issue on the output side of a 2-station, POC, or Soil Moisture Sensor Decoder interferes with operation of the decoder. This alert can be caused by poor grounding, bad wire connections, or a failing device on the output side of the decoder.

Note: If any unused wires on the decoder are left unsealed, water intrusion through that wire will cause a “Decoder Not Responding” alert.

What You Need

- Wire cutter/stripper (NOT quick cutter).
- 3M™ Scotchcast™ Connector Sealing Packs 3570G-N.
- Zip ties and/or multi-colored electrical tape.
- Wire nuts.
- A spare Calsense 2-station decoder, model CS-2W-2STA.

Note: If a single solenoid causes enough draw, it will trigger a “Solenoid Short” alert. See [Appendix B – Alert Definitions](#) on page 15 for more information.

Troubleshooting a “Station Decoder Not Responding” Alert

Checking for a Bad Station Decoder

1. Access the Alerts report, either on the controller under **Diagnostics > Alerts**, or online at <https://calsense.net> and selecting **Reports > Alerts**.
2. Find the first “Station Decoder Not Responding” alert and make note of the decoder serial number.

3. Power off the controller.

IMPORTANT! Failure to power off the controller while working on it may result in damage to the product and bodily injury.

4. Locate that decoder in the field and remove all six waterproof connections.
5. Use the wire strippers to score and snap the wire jacket and the wire cutters to cut the connections.
6. Check the copper wire for corrosion and/or discoloration. If either is present, cut the wire back until it is clean. If the wire must be cut shorter than is safe to make a secure, waterproof connection, replace the decoder.
7. Use wire nuts to reconnect the red wire of the 2-Wire cable to the red wire of the decoder. Do the same with the blue wires.
8. Power up the controller.
9. Using a Calsense remote, a smartphone, or the Test feature at the controller, turn on one of the stations assigned to the decoder.
10. Access the Alerts report to see whether the alert returned:

Note: If viewing the Alerts report from your mobile device, it may take 15-minutes for the alert to display. To have the controller send the alerts without waiting, navigate to **Quick Tasks > Update Alerts** while the controller is selected.

- If the “Station Decoder Not Responding” alert returns, remove the decoder, and connect it directly to the 2-Wire module. Repeat steps 8-10.
 - If the “Station Decoder Not Responding” alert appears, the decoder is bad and must be replaced. Request an RMA using the steps outlined in [Requesting an RMA](#) on page 13 to and ship the decoder in for repair.

11. Power off the controller.
12. Disconnect the decoder.
13. Proceed to the next step.

Checking for Issues on the Station Output Wires of the Decoder

1. Power off the controller.

IMPORTANT! Failure to power off the controller while working on it may result in damage to the product and bodily injury.

2. Connect the solenoid wires to the black output wires of the decoder using wire nuts.
3. Use wire nuts to reconnect the red wire of the 2-Wire cable to the red wire of the decoder. Do the same with the blue wires.
4. Power on the controller.
5. Check the Alerts Report:
 - If the “Station Decoder Not Responding” alert returns, the problem is the solenoid or the wires/connections between the decoder and solenoid. Repair or replace the problem part.
6. Repeat steps 1-5 for the orange wires.
7. Reinstall 3M Scotchcast Connector Sealing Packs 3570G-N on all decoder connections once troubleshooting is complete.

Troubleshooting a “POC Decoder Not Responding” Alert

Checking for a Malfunctioning POC Decoder

1. Access the Alerts report, either on the controller under **Diagnostics > Alerts**, or online at <https://calsense.net> and selecting **Reports > Alerts**.
2. Find the first “POC Decoder Not Responding” alert and make note of the decoder serial number.
3. Power off the controller.

IMPORTANT! Failure to power off the controller while working on it may result in damage to the product and bodily injury.

4. Locate the POC decoder in the field and remove all six waterproof connections.
5. Check the copper wire for corrosion and/or discoloration. If either is present, cut the wire back until it is clean. If the wire must be cut shorter than is safe to make a secure, waterproof connection, replace the decoder.
6. Use wire nuts to reconnect the red wire of the 2-Wire cable to the red wire of the decoder. Do the same with the blue wires.
7. Power on the controller.
8. Access the Alerts report to see whether the alert returned:

Note: If viewing the Alerts report from your mobile device, it may take 15-minutes for the alert to display. To have the controller send the alerts without waiting, navigate to **Quick Tasks > Update Alerts** while the controller is selected.

- If the “POC Decoder Not Responding” alert returns, remove the decoder, and connect it directly to the 2-Wire module. Repeat steps 7-8.
 - If the “POC Decoder Not Responding” alert returns, the decoder is bad and must be replaced. Request an RMA using the steps outlined in [Requesting an RMA](#) on page 13 to and ship the decoder in for repair.
9. Power off the controller.
 10. Proceed to the next step.

Checking for a Master Valve Issue

1. Connect the master valve solenoid wires to the yellow output wires of the decoder with wire nuts and power on the controller.
2. Access the Alerts report to see whether the alert returned:
 - If the “POC Decoder Not Responding” alert returns, the problem is the solenoid or the wires/connections between the decoder and solenoid. Repair or replace the problem.
3. Power off the controller.
4. Proceed to the next step.

Checking for a Flow Sensor Issue

1. Connect the flow sensor wires to the output wires of the decoder with wire nuts - red to red and black to black.
2. Power on the controller.
3. Access the Alerts report to see whether the alert returned:
 - If the “POC Decoder Not Responding Alert” returns, the problem is the flow sensor or the wires between the decoder and flow sensor. Repair or replace the problem.

- If the alert does not return, the problem was one of the waterproof connections removed in earlier steps.
4. Reinstall 3M Scotchcast Connector Sealing Packs 3570G-N on all decoder connections once troubleshooting is complete.

Check for a Malfunctioning Moisture Sensor Decoder

Checking for a Malfunctioning Moisture Sensor Decoder

1. Access the Alerts report, either on the controller under **Diagnostics > Alerts**, or online at <https://calsense.net> and selecting **Reports > Alerts**.
2. Find the first “Soil Moisture Sensor Decoder Not Responding” alert and make note of the decoder serial number.
3. Power off the controller.
4. Go to the decoder and cut all four waterproof connections.

IMPORTANT! DO NOT cut the wires to the moisture sensor.

5. Check the copper wire for corrosion and/or discoloration. If either is present, cut the wire back until it is clean. If the wire must be cut shorter than is safe to make a secure, waterproof connection, replace the decoder.
6. Use wire nuts to reconnect the red wire of the 2-Wire cable to the red wire of the decoder. Do the same with the blue wires.
7. Power on the controller.
8. Access the Alerts report to see whether the alert returned:

Note: If viewing the Alerts report from your mobile device, it may take 15-minutes for the alert to display. To have the controller send the alerts without waiting, navigate to **Quick Tasks > Update Alerts** while the controller is selected.

- If the “Moisture Sensor Decoder Not Responding” alert returns, remove the decoder, and connect it directly to the 2-Wire module. Repeat steps 7-8.
 - If the “Moisture Sensor Decoder Not Responding” alert has returned, the decoder is bad and should be replaced. Request an RMA using the steps outlined in [Requesting an RMA](#) on page 13 to and ship the decoder in for repair.
9. Power off the controller.
 10. Proceed to the next step.

Check for a Solenoid Issue

1. Connect the solenoid wires to the black output wire of the decoder using wire nuts.
2. Power on the controller.
3. Access the Alerts report to see whether the alert returned:
 - If the “Moisture Sensor Decoder Not Responding Alert” has returned, the problem is the solenoid or the wires/connections between the decoder and solenoid. Repair or replace the problem.
 - If the alert does not return, the problem was one of the waterproof connections that were removed in earlier steps.
4. Reinstall 3M Scotchcast Connector Sealing Packs 3570G-N on all decoder connections once troubleshooting is complete.

Requesting an RMA

A Return Merchandise Authorization (RMA) helps track items returned to Calsense for repair or as part of their warranties. Users must request an RMA when shipping parts to Calsense using the steps below:

1. Visit <https://calsense.com>.
2. Click **Request an RMA** at the top right corner of the page. The subject line in the form will be pre-filled.
3. Under Shipping Information, enter the address you would like to have items returned to.
4. Under Job Information:
 - a. In the Customer Name field, enter the name of the job you have on file with Calsense (e.g., ABC Park).
 - b. In the Customer Location Field, enter the identifier or location of the relevant controller.
5. Under Contact Information, enter contact information for the person Calsense should contact about this RMA if there are any questions that arise.
6. Under Product Information:
 - a. For Select Product, select the part you are sending in for repair. For example, **2-Wire Decoder** or, if sending a 2-Wire module, select **Other**.
 - b. For Select Reason for RMA Request, select **Repair**.
 - c. For Part Number, enter the part number. This is typically found on the part itself, for example `CS-2W-2STA` is the part number for a 2-station 2-Wire decoder. Similarly, `CS3-2WIRE-OPT` is the part number for the 2-Wire module on the controller.
 - d. For Controller Serial Number, enter the serial number of the controller the device was attached to. This can be found on the About screen of the controller.
 - e. If sending in a 2-Wire decoder, enter the serial number of the decoder in the Serial Number field.
7. Click **Submit**. Once the RMA request is received, a confirmation email will be sent to the email address provided in Contact Information. An RMA number will be sent to the same email address in one to two business days, along with the original RMA request details.
8. When shipping the product to Calsense, make sure you write the RMA number on the outside of the box to speed up processing.

For warranty information, please see <https://www.calsense.com/warranty/>.

Appendix A – Glossary of Terms

Term	Definition
2-Station Decoder	2-Wire station decoder with two station outputs, model CS-2W-2STA.
2-Wire Module	The device in the controller that supplies power and signal to activate the 2-Wire decoders, model CS3-2WIRE-OPT. All 2-Wire runs connect to this device.
2-Wire Path	The physical path the 2-Wire cable follows from the controller to each within the system.
Constant Overcurrent	Excessive current draw on the 2-Wire cable caused by a bad 2-Wire module, a ground fault, or a decoder short along the red wire of the 2-Wire cable.
Decoder Not Responding	A condition that occurs in which a 2-Wire decoder becomes unresponsive due to damaged wire, poor connection, or a failing solenoid or flow sensor.
Downstream	When testing, the run of wire from the decoder being evaluated to the end of the 2-Wire path.
Excessive Current	See <u>Overcurrent</u> .
Intermittent Overcurrent	Excessive current draw caused by a ground fault/short along the red wire of the 2-Wire cable or multiple deteriorating solenoids running at once.
Low Pass Filter (LPF)	A setting on an Armada clamp meter that filters out lower frequency signals to give a more exact reading in certain testing situations. Note: On the Armada Pro95i, the Low Pass Filter is on by default. On the Armada Pro95, it must be turned on manually by pressing HOLD .
Overcurrent	A high current draw along the 2-Wire path that stops irrigation and disables the 2-Wire module to prevent damage to the circuitry and decoders in the field.
POC Decoder	A 2-Wire decoder that with one flow meter input and one master valve output, model CS-2W-POC.
Soil Moisture Sensor Decoder	A 2-Wire decoder with one station output and an attached soil moisture sensor which measures soil moisture, temperature, and salinity, model CS-2W-MOIST.
Upstream	When testing, the run of wire from the decoder being evaluated back to the controller.

Appendix B – Alert Definitions

Alert	Description	Cause(s)	Solution(s)
2-Wire Cable Excessive Current/Overcurrent. Irrigation may not run.	2-Wire cable exceeded the electrical threshold.	<ul style="list-style-type: none"> • Blue and red wires are improperly installed. • Nicked wire. • Shorted 2-Wire path or decoder. • Failed solenoid. • Shorted 2-Wire module. 	<ul style="list-style-type: none"> • Correct wire installation. • Check wiring and replace or fix wires. • Replace solenoid.
2-Wire Terminal Cooled Off.	2-Wire module that had overheated cooled off.	<ul style="list-style-type: none"> • The enclosure cooled off. 	<ul style="list-style-type: none"> • No action necessary.
2-Wire Terminal Overheated. Irrigation may not run.	2-Wire module in the controller enclosure exceeded its maximum operating temperature.	<ul style="list-style-type: none"> • Excessive temperature within the enclosure. • If no module is installed, a short-circuited controller backplate (models CS3-MB and CS3-MB-SSE) caused by water or pest damage. 	<ul style="list-style-type: none"> • Find a way to cool the enclosure by adding shade. • If no module is installed, repair or replace the damaged controller backplane.
Decoder voltage too low: POC "<name>" (Decoder S/N <num>)	The voltage measured was too low when the indicated decoder was energized.	<ul style="list-style-type: none"> • Master Valve solenoid is not working properly. • Master Valve solenoid burnt out. • Bad wire splices. 	<ul style="list-style-type: none"> • Inspect and repair any poor connections between the 2-Wire decoder and the Master Valve solenoid. • Replace Master Valve solenoid. • Repair splices.
Decoder voltage too low: Station <num> on Decoder S/N <num>	The voltage measured was too low when the indicated decoder was energized.	<ul style="list-style-type: none"> • Solenoid not working properly. • Solenoid burnt out. • Wrong solenoid used. • Damaged 2-Wire path. • Bad wire splices. 	<ul style="list-style-type: none"> • Replace solenoid. • Replace solenoid. • Replace with suggested solenoid. • Repair connections along 2-Wire path. • Repair splices.

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Alert	Description	Cause(s)	Solution(s)
Error acquiring moisture sensor reading from S/N <num> - failed	A soil moisture sensor reading arrived but could not be processed.	<ul style="list-style-type: none"> • Soil moisture sensor not working properly. • Damaged 2-Wire path. • Bad wire splices. 	<ul style="list-style-type: none"> • Test soil moisture sensor. • Repair connections along 2-Wire path. • Repair splices.
Error acquiring moisture sensor reading from S/N <num> - no response	A soil moisture sensor reading did not arrive when expected.	<ul style="list-style-type: none"> • Damaged 2-Wire path. • Bad wire splices. 	<ul style="list-style-type: none"> • Repair connections along 2-Wire path. • Repair splices.
Error: Decoder-based POC @ Controller <letter> (S/N <num>) reporting in	A flow reading was sent by a POC decoder in the field that has not been assigned to a POC.	<ul style="list-style-type: none"> • The decoder was discovered but not assigned to a POC. 	<ul style="list-style-type: none"> • Navigate to Setup > 2-Wire > Assign POC decoders and ensure each decoder is set as being used as a POC.
Excessive current occurred while charging cable	Overcurrent was measured as soon as the line was powered up.	<ul style="list-style-type: none"> • Blue and red wires are improperly installed. • Nicked wire. • Shorted 2-Wire path or decoder. • Failed solenoid. • Shorted 2-Wire module. 	<ul style="list-style-type: none"> • Correct wire installation. • Check wiring and replace or fix wires. • Replace solenoid.
Invalid decoder S/N discovered (<num>). Contact Calsense for support.	The identified decoder lost its serial number.	<ul style="list-style-type: none"> • Defective decoder. 	<ul style="list-style-type: none"> • Send the decoder in for repair by Requesting an RMA.
POC DECODER NOT RESPONDING: POC "<name>" (Decoder S/N <num>)	The specified POC decoder is unable to communicate with the controller.	<ul style="list-style-type: none"> • See potential causes in this document. 	<ul style="list-style-type: none"> • Follow the steps in this document.

Alert	Description	Cause(s)	Solution(s)
POC Decoder Voltage Too Low: Decoder S/N <num>	The voltage measured is too low on decoder.	<ul style="list-style-type: none"> • Damaged wires. • Bad splices. 	<ul style="list-style-type: none"> • Replace or fix wires. • Check splices.
POCs turning OFF @ Controller <letter>	The number of POC decoders that were turned off due to an overcurrent condition. All POC decoders attached to the indicated controller are turned off, even if they are attached to a different mainline.	<ul style="list-style-type: none"> • See definition of <u>2-Wire Cable Excessive Current/Overcurrent. Irrigation may not run</u> alert for more information. 	<ul style="list-style-type: none"> • See definition of <u>2-Wire Cable Excessive Current/Overcurrent. Irrigation may not run</u> alert for more information.
SOIL MOISTURE DECODER NOT RESPONDING: Decoder S/N <num>	The specified soil moisture sensor decoder is unable to communicate with the controller.	<ul style="list-style-type: none"> • See potential causes in this document. 	<ul style="list-style-type: none"> • Follow the steps in this document.
SOIL MOISTURE DECODER NOT RESPONDING: Station <num> on Decoder S/N <num>	The specified soil moisture sensor decoder is unable to communicate with the controller.	<ul style="list-style-type: none"> • See potential causes in this document. 	<ul style="list-style-type: none"> • Follow the steps in this document.
SOLENOID SHORT: Master Valve on POC "<name>" (Decoder S/N <num>)	An electrical short was detected on the master valve.	<ul style="list-style-type: none"> • Master valve Solenoid is shorted out. • Bad splices. • Valve box full of water. • Wires shorted together. 	<ul style="list-style-type: none"> • Replace solenoid. • Repair splices. • Remove water and fix accordingly. • Replace wires and adjust positioning.

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Alert	Description	Cause(s)	Solution(s)
SOLENOID SHORT: Station <num> on Decoder S/N <num>	An electrical short was detected on shown station.	<ul style="list-style-type: none"> • Solenoid is shorted out. • Bad splices. • Valve box full of water. • Wires shorted together. 	<ul style="list-style-type: none"> • Replace solenoid. • Repair splices. • Remove water and fix accordingly. • Replace wires and adjust positioning.
STATION DECODER NOT RESPONDING: Decoder S/N <num>		<ul style="list-style-type: none"> • See potential causes in this document. 	<ul style="list-style-type: none"> • Follow the steps in this document.
STATION DECODER NOT RESPONDING: Station <num> on Decoder S/N <num>	The specified decoder is unable to communicate with the controller.	<ul style="list-style-type: none"> • See potential causes in this document. 	<ul style="list-style-type: none"> • Follow the steps in this document.
Stations turning OFF @ Controller <letter>: <station numbers>	A list of stations that were turned off by the controller due to an overcurrent condition.	<ul style="list-style-type: none"> • See definition of <u>2-Wire Cable Excessive Current/Overcurrent. Irrigation may not run</u> alert for more information. 	<ul style="list-style-type: none"> • See definition of <u>2-Wire Cable Excessive Current/Overcurrent. Irrigation may not run</u> alert for more information.