

Universal Decoder Adapter Troubleshooting Guide

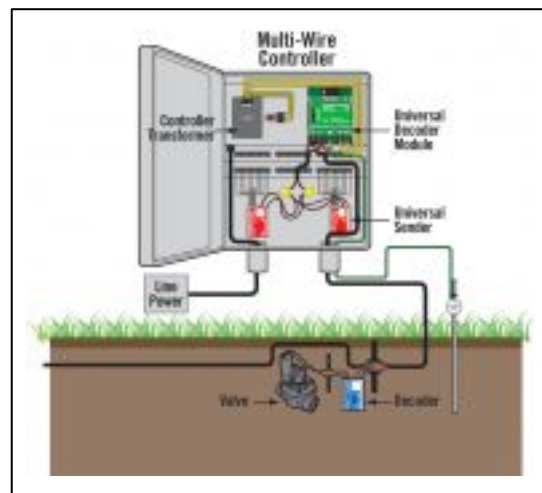
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Introduction

The following information can be used to troubleshoot an Underhill 2Wire system using a Universal Decoder Adapter.

How does it Work?

The Universal Decoder Adapter is a 2Wire Converter. 8-Station senders transfer the “host” controller’s signal output from each valve station to the Universal Decoder Adapter that sends a decoded message down the 2Wire path to the to a corresponding station valve. See Figure 1



Typical Universal Decoder Adapter Installation

Figure 1-2

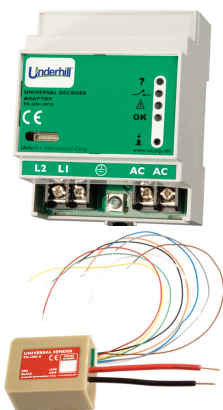
All of the “host” controller’s programming functions inclusive of a hand-held remote, rain sensor, scheduled start times, cycle/soak times, % Adjust are all preserved. The Universal Decoder Adapter is simply a pass-through of this information.

The Universal Decoder Adapter sends a 24 VAC pulse down the 2Wire path every 8-10 seconds to validate 2Wire path integrity. This is to confirm there are no direct shorts, paths to ground or broken wire along the 2Wire path. If any one of these conditions exists the Universal Decoder Adapter will signal a “fault” via the LED’s on the faceplate. See pages 7-8 for an explanation of the symbols and what various LED’s represent.

The signal sent down the 2Wire path can be verified by viewing a red LED located of the end of each of the 8-Station Sender’s that will illuminate for a few moments each time the signal is received. The Universal Decoder Adapter sends a pulse to Sender #1, then Sender #2 in this sequence. If there are additional 8-Station Senders they will follow in ascending numerical order, 1-8. If one or more 8-Station Sender flashes out of order, then the 8-Station Sender may require either re-programming but more than likely will need to be replaced.

Typical Components of an Underhill 2Wire System

The following photos represent the typical components found in an Underhill 2Wire system using a Universal Decoder Adapter with descriptions of their individual functions.



The Universal Decoder Adapter, TW-UNI-63 converts the “host” controller’s station output signal down the 2Wire path. This should be ordered with a separate external transformer as some “host” controller’s 24 VAC auxiliary outputs can corrupt the AC power input. The external transformer p/n is TW-75VA-115

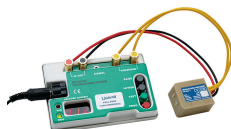
8-Station Sender, TW-SEN-8 is installed between the “host” controller and the Universal Decoder Adapter. The red and black wires represent the 2Wire path and the smaller color-coded wires are terminated in each of the “host” controller’s station outputs. One, 8-station sender must be installed for every 8 stations. For example if there is a requirement for 27 stations, then 4 (qty) 8-station senders are required. An 8-station sender must be programmed 1-8 as part of a proper the product setup. See table below.

Stations	Sender No.
1-8	Sender #1
9-16	Sender #2
17-24	Sender #3
25-32	Sender #4
33-40	Sender #5
41-48	Sender #6
49-56	Sender #7
57-63	Sender #8



Decoder, TW-TK-DEC-01 is generally installed one per valve. The Universal Decoder Adapter can manage

- 2 decoders operating at the same time, or
- one decoder that is wired to 2 separate solenoids or
- 2 decoders with the same address.

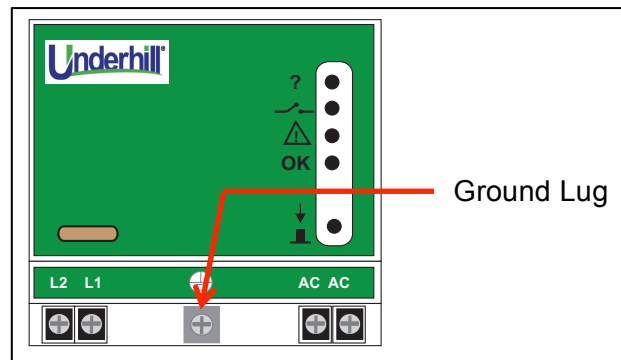


Portable Programmer, DEC-PROG-115, is used to test and/or program a decoders or 8-station senders.

Grounding

All 2Wire products require some form of grounding, some more than others. The Universal Decoder Adapter requires grounding at this device only and no other location along the 2Wire path.

The ground lug can be found between the L1 and AC terminal blocks, see Figure 3-1. A #14 solid (not stranded) copper wire should be terminated at this Philips-head fastener and attached to a ground rod, ground plate or cold-water pipe if located inside of a mechanical room.



Universal Decoder Adapter Ground Lug
Figure 3-1

Failure to provide proper grounding is the #1 failure mode of this product. This is commonly exhibited by all LED's on the Universal Decoder Adapter flashing from top to bottom and the inability to operate any station.

If an audible “clicking” noise can be heard when operating stations in “manual” mode from the “host” controller, than the Universal Decoder Adapter more than likely requires replacement. The p/n is TW-UNI-63.

Recommended Troubleshooting Tools

To reduce troubleshooting time in the field, the following products are recommended to include in your “toolbox”.



A known working AC solenoid – This is to provide a “load” or resistance when confirming a decoder is properly working.



A decoder – A new decoder will have a factory default of station #1. You can always disconnect an existing decoder from the field in lieu of using a new decoder.



Some DBRY wire connectors - Inevitably an existing wire connection may have failed or has to be disconnected to replace a solenoid or decoder. It's always a good practice to have some of these to ensure on-going consistent performance of the system. The 2nd highest failure mode of a 2Wire system is improper wire connections.



Digital Clamp Meter – These have the ability to measure volts AC, DC, conduct an ohms resistance test and to measure milliamps (mA) along the 2Wire path when a station is operating. The “lobster-claw” is meant to clamp over one of the 2Wire conductors so current can be measured without having to un-do wire splices. This is a worthwhile tool to invest in, p/n TW-DCM.

A “Sharpie” marker, a clipboard and pencil are also recommended. The “Sharpie” can be used to clearly write down the station number on a decoder or sender number. The clipboard and pencil are to write down some the field measurements collected from the Digital Clamp Meter.

Some contractors may also invest in wire trackers, but those used for conventional or multi-wire systems often do not function properly for 2Wire applications.

Common Field Observations

The following paragraphs reflect common support calls specific to this product. Each reported field observation lists possible root causes and methods of how to troubleshoot.

1) *None of the stations will operate and all LED’s on the Universal Decoder Adapter are flashing from top to bottom.*

Possible Root Causes:

- The Universal Decoder Adapter is not grounded or improperly grounded and is damaged.
- There is a direct short along the 2Wire path that could be:
 - From a broken wire (path to ground)
 - A valve solenoid that has reached end-of-life
 - A field splice that has failed

How to Troubleshoot and Isolate the Observed Condition

- The Universal Decoder Adapter makes a “clicking” noise when you attempt to operate any station “manually” from a “host” controller. The Universal Decoder Adapter has failed and requires replacement. Installing a new Universal Decoder Adapter does not require existing decoders or senders to be re-programmed.
- Disconnect all 8-Station Senders except for Sender #1. Attempt to operate each station manually (stations 01-08) until a fault LED appears. See “Common Observation” #3 to isolate a single station and repair. Repeat the process for all remaining 8-station senders until you have isolated the field issue.
- Field splices made using improper wire connections such as unprotected wire nuts, or “grease-caps” are common sources of failure. Replace and re-try operating the system. In all cases, start with Sender #1 and slowly work you way up through the total number of Senders or “open” stations on the “host” controller.
- Using the Digital Clamp Meter, measure AC volts as it leaves the Universal Decoder Adapter. It should read somewhere around 28 VAC. Measure VAC current at station number 01 – it should be the same. Measure at the last station in the system. The value should be slightly less than 28 volts but higher than 24 VAC. Some voltage drop is expected due to the length of the 2Wire path. If a measurement of less than 24 VAC is observed then there is a too much resistance and there may be a wire connection with a path to ground. If no current is measured than there is a break in the 2Wire path. Collect additional measurements along the 2Wire path to isolate there the fault is located.

2) *Some of the stations work and others don't. For example stations 1-16 work but 17 & beyond will not operate at all and the LED's on the Universal Decoder Adapter are flashing.*

Possible Root Causes

- 8-Station Sender #3 is defective or isn't programmed properly,
- There is a break in the 2Wire path between stations 16 & 17.
- There is a direct short somewhere between station 17 and the last station in the system

How to Troubleshoot

- Temporarily disconnect the 2Wire path leading out of the Universal Decoder Adapter to all of the valves in the field. Disconnect any 8-Station Senders above #3. Tie all of the red and black 8-Station Sender wires with a jumper for each color separately then connect to the L2 / L1 terminal on the Universal Decoder Adapter. Confirm the red LED's on the end of each 8-Station Senders flashes in ascending numerical order, first Sender #1, then Sender #2 followed by Sender #3. If #3 flashes first, verify it's programmed properly using the Portable Programmer or replace it.
- If the 8-Station Senders are operating ok, then attempt to operate station #17 "manually" from the host controller and see if a "fault" LED is shown on the Universal Decoder Adapter. If no fault light then proceed to station #18 and continue the process until all stations up #24 have been operated. Then connect 8-Station Sender #4 and repeat the process until you isolate the station with the fault.
- Locate valve box #16 and look at the 2Wire path exiting the valve box. This assumes the 2Wire path to #17 is the "next" station. Then conduct the same observation in valve box #17 for the incoming 2Wire path. Are the wire connections faulty or in water? Remake the wire connections with DBRY's wire connectors. Using the Digital Clamp Meter measure the current in mA when operating the station.
- If station 16 & 17 are in close proximity to one another, consider stringing 2 wires on grade between the two valves and see if station 17 and beyond will operate. If other stations operate than there is a break in the wire between the two valves. If no stations operate, the check the decoder per "Common Observations" #3 in this section.

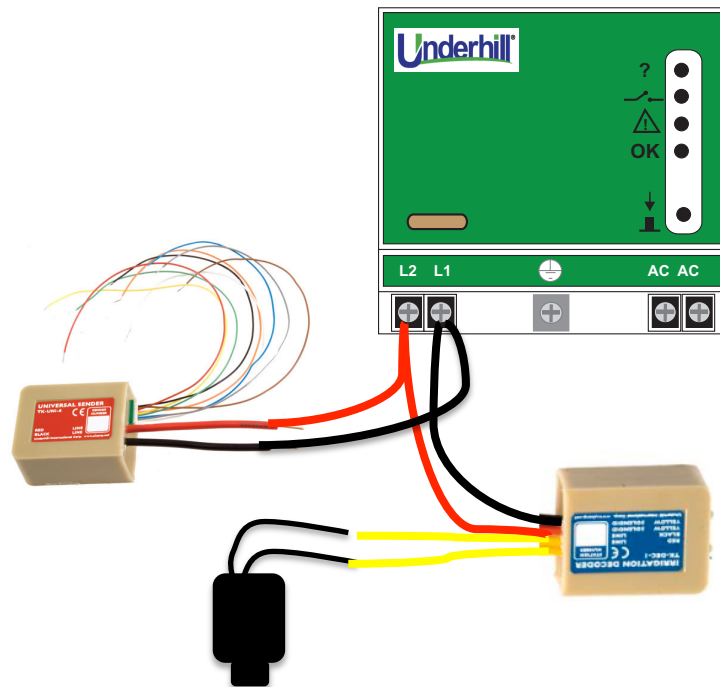
3) *Station #7 won't operate but all other stations will. The Universal Decoder Adapter flashes a LED when attempting to operate station #7*

Possible Root Causes

- The decoder for station #7 is defective or is not programmed to the corresponding address code
- The valve solenoid for station #7 has reached end of life
- The color-coded wire between Sender #1 and the Host Controller is not terminated properly.
- The station output on the host controller is defective or faulty and has stopped operating.

How to Troubleshoot

- Locate the color-coded wire for valve station #7. Its color should be “Blue”. Confirm that is connected to station output #7 on the Host controller. Expose some of the conductor if an insufficient length is preventing good connectivity.
- Disconnect the solenoid from the decoder in the field. Using a multi-meter conduct an “Ohms” resistance test. If the ohms resistance is above 65 ohms, than the solenoid is more than likely faulty and requires replacement. As a solenoid fails it will draw more current.
- While the solenoid is disconnected, remove the decoder from the 2Wire path and take it back to the Universal Decoder Adapter. Connect the red and black leads of the decoder to terminals L2 / L1 and temporarily disconnect the 2Wire path to the rest of the valves in the field. Using a spare and known working solenoid, operate this station “manually” from the “host” controller. Make sure the corresponding 8-station sender is also connected to the “host” controller and the Universal Decoder Adapter as shown below. For example, if testing station #17 verify Sender #3 is being used. The solenoid should “click” or “buzz” indicating its working. If it does neither, then using the Portable Programmer, test the decoder and reprogram the address code as #7, then re-try. If this fails, replace the decoder, p/n TW-TK-DEC-01. The pictorial below shows how this setup can be accomplished.



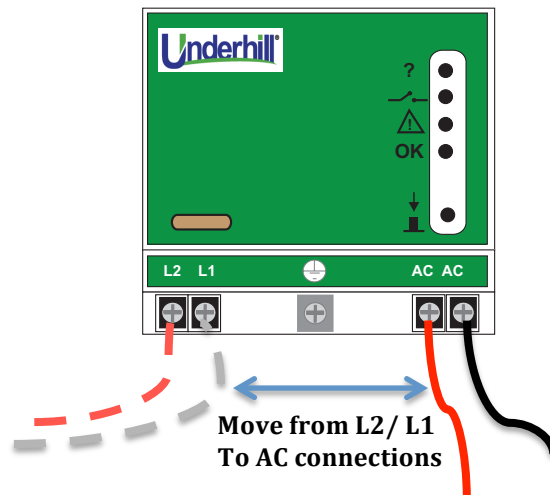
- Connect the known working solenoid to the corresponding station output of the “host” controller and verify that it can be operated from a Manual operation. If the solenoid does not actuate, try another adjacent station. It may require replacing the station module.

4) *How can a direct short be isolated on a 2Wire system?*

How to Troubleshoot

Most 2Wire control products have hardware and software protection against direct shorts. The same protection can also prevent diagnosing an issue when needed. To isolate were a field wiring issue or direct short exists use the follow the steps.

- Unplug the external transformer and power to the Universal Decoder Adapter
- Disconnect the existing 2Wire path from the L2 / L1 and reconnect to the AC connections on the Universal Decoder Adapter
- Re-connect the external transformer to the Universal Decoder Adapter
- Using a Digital Clamp Meter measure and record volts AC along the 2Wire path. This will not turn on any station as the Universal Decoder Adapter is not sending any decoded messages down the 2Wire path. For example, if the measured current at station 01 is 28 volts and is 22 volts at station 05, then somewhere between these two valves is some form of high resistance. Take another measurement at station 02, then 03 until you see where the voltage drop occurs. Then check the solenoid of the corresponding station (ohms resistance test) and the decoder at the Universal Decoder Adapter per #3 in the “Common Field Observations” section.



Universal Decoder Adapter User Interface

Definition of Symbols



- This LED confirms a Sender is receiving a message. 8-Station Senders are sent a message every 8-10 seconds in numerical order. For example, a message is sent to Sender #1, the Sender #2 etc. **This sequence is very important.**



- This LED confirms a Decoder is being turned “On” or “Off” by blinking only once. If there is a fault condition with a Sender, the 2Wire path, Decoder or Solenoid associated with the Sender this LED will flash each time the Sender receives a message once every 8-10 seconds.



- This LED will flash when a decoder or solenoid fails to turn “On” or “Off”. It will remain flashing red until the runtime from the host controller has expired. Pressing and holding the “Reset” button down for a 5-second count can clear the flashing LED.



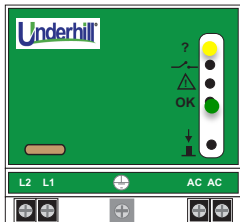
- This LED confirms the internal processor is working correctly and typically remains “On”. The LED will extinguish when a Sender receives a message successfully. It will blink twice in rapid succession if the Sender’s message is to turn on a decoder.



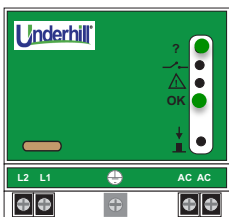
- This is a reset button used to clear a fault messages noted above.

What Do the LED’s Mean?

Normal Operation

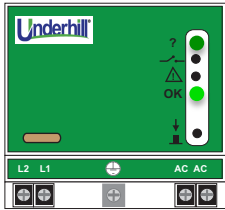


When there are no 8-Station Senders connected to the Universal Decoder Adapter, the “?” will flash yellow every second. The “OK” LED should be solid green.



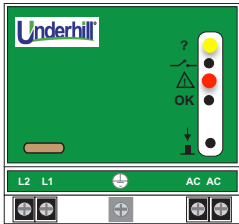
When an 8-Station Sender(s) is connected to the Universal Decoder Adapter the “?” LED will flash green. The “OK” LED should be solid green. The message to each Sender can be verified by looking at the red LED on the end of each Sender. They should blink one after another in numerical sequence, Sender #1, than Sender #2 etc. If Senders blink out of order, verify the Sender address by connecting the black and red wires to a 24-VAC power source. The LED should blink representing its corresponding Sender address. The LED will blink once for Sender #1, two times for Sender #2 etc. You should be able to measure 26-30 VAC on the L2/L1 terminals.

When a Message is sent to a Sender Successfully



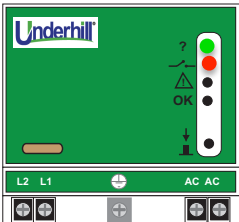
The “?” LED will flash green and the “OK” LED will extinguish when the Sender receives a message. The “OK” LED will extinguish twice in quick succession when the decoder message is received. The Red LED on the corresponding Sender will also flash.

When a Message is sent to a Sender Unsuccessfully



The “?” LED will flash yellow and the “!” LED will flash red when a message cannot reach a Sender. Verify the Sender has the correct address, by disconnecting and touching the black and red wires to a 24 VAC source and counting the number of red LED flashes. For example, Sender 5 should flash 5 times. Once reconnected, verify the interrogation message from the Universal Decoder is being received in the correct numerical order 1, 2, 3... by all senders. You may need to replace a Sender. Press the “Reset” button once the fault is resolved.

A “Fault” condition exists beyond a Sender



The “?” LED flashes green and the “!” LED flashes red indicating:

- A break in the 2Wire path

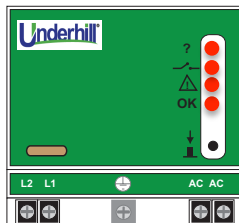
- A decoder not addressed properly or has stopped functioning

- A solenoid that has failed

- Two or more decoders with the same address

Remove the 2Wire path from L1/L2 terminals, then press the “Reset” button. Connect Sender 1 and operate stations 1-8 to isolate the issue. Continue to add Senders until the fault condition is located and corrected. Press the “Reset” once all faults have been resolved.

All LED’s are flashing!



All LED’s are flashing. The Universal Decoder Adapter is in a software protection mode attempting to reset itself.

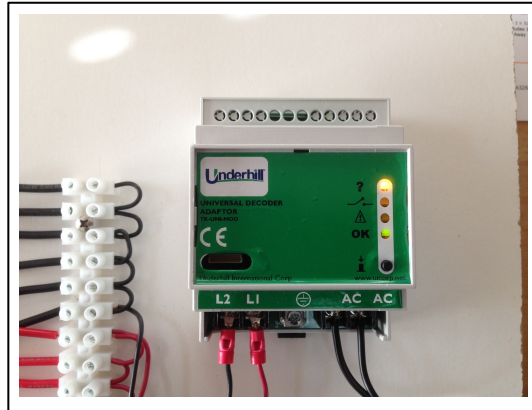
- Remove the 2Wire path,

- Remove 24 VAC power from the Universal Decoder and repower –

- All LED’s should extinguish

Installation Tip

Consider purchasing a 12-position, double-sided terminal block as shown the Figure 10-1. These are readily available at a local electronics store such as a Radio Shack for less than \$5.00. This type of terminal block will allow you to quickly test current between an 8-station sender and the Universal Decoder Adapter with a multi-meter rather than having to untwist a wire bundle each time testing or troubleshooting is needed.



Double-Sided Terminal Block
Figure 10-1

Wiring Sizing Chart

The attached wire-sizing chart identifies the maximum length of allowable 2Wire path length based on wire gauge and the number of stations being operated at one time.

