

# Underhill Decoder & 8-Station Sender Bidding Specifications

## Application

The following bidding specifications are for Underhill's single station decoder, p/n TW-TK-DEC-1 and the 8-Station Sender, p/n TW-SEN-8.

Both products are exclusive to Underhill's 2Wire products listed as follows:

- Sapien™ 2Wire Controller – TW3-115
- Novo™ 2Wire Converter – W-NOV-U2
- Universal Decoder Adapter – TW-UNI-63
- ICC 2Wire Decoder Module- TW-ICC-48

The 8-Station Senders are compatible with the Universal Decoder Adapter and Novo 2Wire Converter only. This device provides station expansion capability in 8-station increments up to a maximum of 63 stations.



Note: The allowable number of stations managed by a “host” controller is the sole determinant of maximum station capability.

## Materials

### Decoder

The single station decoder consists of a fully encapsulated or potted device with approximate dimensions of 1-7/8" l x 1-1/2" w x 1" d (47.63 l x 38.1 x 25.4mm). The decoder has 4 (qty), solid-core, 14 AWG wires extending from one end. Two of the conductors are yellow, one is black and the other is red. Approximately 1/2" (0.013mm) of each conductor core is exposed.

The decoder is encapsulated in an epoxy resin suitable for complete and prolonged water submersion up to 3 feet (0.92 meters). On one side of the decoder is a blue label denoting the following information;

- The Underhill logo and part number
- Connection of the color-coded wires to a valve solenoid or 2Wire path
- CE approved rating
- Station number with a rectangular portion of the label to physically write the corresponding station number below
- Underhill's web address

### 8-Station Sender

The 8-Station Sender consists of a fully encapsulated or potted device with approximate dimensions of 1-7/8" l x 1-1/2" w x 1" d (47.63 l x 38.1 x 25.4mm). The Sender has 2 (qty), solid-core, 14 AWG wires extending from one end. One conductor has red insulation and the remaining conductor is black insulation. Approximately 1/2" (0.013mm) of each conductor core is exposed. These conductors are the Sender's connection to the 2Wire path via a Novo or Universal Decoder Adapter.

The Sender also has a small 9-pin female header embedded in the epoxy encapsulation. This header connector mates with a 9 pin, color-coded cable assembly. The standard cable length that ships with each 8-Station Sender is approximately 8" inches in length (203.2mm). A separate cable assembly 36" (914.4mm) in length w/ shrink tubing can be ordered as a separate p/n TW-SEN-8CN-36. The color-coded wire Teflon™ coated, 24 AWG, stranded wire with tinned ends. The table below indicates the corresponding color-coding to station number when connecting to a host controller's station outputs. The table also indicates which stations each Sender manages when properly addressed.

**8-Station Sender Wire Color-Coding Chart**

	Corresponding 8-Station Sender Number								Sender Wire Color
	1	2	3	4	5	6	7	8	
Corresponding Station Numbers	1	9	17	25	33	41	49	57	Black
	2	10	18	26	34	42	50	58	Brown
	3	11	19	27	35	43	51	59	Red
	4	12	20	28	36	44	52	60	Orange
	5	13	21	29	37	45	53	61	Yellow
	6	14	22	30	38	46	54	62	Green
	7	15	23	31	39	47	55	63	Blue
	8	16	24	32	40	48	56	X	Grey
Valve Common									White

On one side of the decoder is a red label denoting the following information;

- The Underhill logo and part number,
- Connection of the color-coded wires to a valve solenoid or 2Wire path,
- CE approved rating,
- Corresponding Sender number in 8-station increments,
- Underhill's web address.

On the opposing end of the wire and cable assemblies the Sender shall have 2 (qty) LED's embedded in the epoxy encapsulation. One is red and the other is clear.

### Electrical Requirements

#### Decoders

- |  |                    |
|--|--------------------|
| • Minimum operating voltage*                       | 13 VAC             |
| • Maximum continuous solenoid current from decoder | 0.6 Amp (600 mA)   |
| • Decoder standby current                          | 2.8 mA (typical)   |
| • Station (zone) number range                      | 1 - 63 (inclusive) |

\*Most solenoids require a minimum of 19V ac to operate

### 8-Station Senders

- Input voltage to register a station (zone) active 12V-30V AC or DC
- Isolation between Sender inputs/common and L1/L2 1000V peak
- Minimum voltage on L1/L2 of Sender (no stations operating) 20 VAC
- Maximum voltage on L1/L2 of Sender 32 Volts
- Sender sense standard wires length 9" (230mm)
- Sender common standard wire length (white wire) 12" (300mm)

### Operation

#### Decoder

Each Decoder shall be capable of operating one or two 24 VAC actuated solenoids up to a maximum of 1.5 amps current draw. The determinant will be the size wire and the holding current of the solenoids in use.

#### 8-Station Sender

Senders are to be connected to the Universal Decoder Adapter and Novo with the power temporarily disconnected.

When connected to an Underhill Universal Decoder Adapter the red LED on one end of the Sender will flash every 8-10 seconds in ascending numerical sequence momentarily. If the LED's do not flash in ascending sequence than one or more Sender is not properly addressed, connected or it maybe faulty.

The color-coded cables are to be secured to the host controller's station outputs matching the table above.

When connected to a Novo, its connectivity can be confirmed under the "Diagnostics" menu under "View Sender Commands". The "." that indicate stations 33 and above will change to a "+" symbol when a station is operated from a scheduled start time or manual operation. The red LED will also flash intermittently for the duration of the station run time.

No more than 2 stations can be operated through an 8-Station sender at one time whether its used with a Novo or Universal Decoder Adapter.

### Installation

#### Decoder

Prior to installing a decoder, it should be programmed with a corresponding station number or address. The default station number if 01. Depending on the Underhill 2Wire control system used, programming can be completed using the control system or any one of three portable programming devices listed below:

- DEC-PROG-115- Portable Programmer w/ 115V power supply
- DEC-PROG-240 – Portable Programmer w/ 240V power supply
- DEC-PROG-12 – Portable Programmer w/ 12V power supply.

Upon programming a decoder, mark the corresponding station number in the appropriate location on the label or on the backside of the decoder. Failure to do so will result in a significant amount of wasted field time when troubleshooting is required. A sharpie or some other waterproof writing device is recommended.

Once programmed connect either one of the two yellow wires to the valve solenoid. These are non-polarized connections so either wire can be connected to each solenoid wire. The red and black conductors are to be connected to the 2Wire path. In most cases the 2Wire path enters and leaves a valve box to another valve in numerical sequence. Exceptions are:

- This is the last station in this portion of the 2Wire path or the highest station when the 2Wire path represents a “single-leg” configuration.
- The exiting wire path splits off into two or more directions as the wire path then represents a “fish-bone” pattern.

Expose additional wire insulation to make an adequate wire connection. The more conductors in a wire connection the more exposed conductor core may be necessary to ensure a proper connection.

All field wire connections are to be made w/ 3M DBRY wire connectors and on other approved equal. Wire connections made with “greased” wire nuts, electrical wire nuts, “blue painters” tape, duct tape, masking tape or bare wire connections are not considered acceptable connections and are prone to failure. Faulty wire connections are number 1 failure mode of any 2Wire system.

#### 8-Station Senders

Once the 8-Station Sender is properly addressed then install one or more as part of a 2Wire setup. Connect the red and black wires to a 2Wire path leading to the Universal Decoder Adapter or Novo 2Wire Converter.

Consider using a 12-position double-sided terminal block with wire loops for the red and black terminals when installing multiple 8-Station Senders. This makes troubleshooting and installing much easier. Attempting to wire nut 9 conductors together for each wire color may result in one or more Sender having poor or no connectivity. A double-sided terminal will also allow you measure AC voltage that wire-nut connection may not allow.

The 8-Station Senders should **not** be solely supported by the station wire connections. This may require some double-sided Velcro to hold them in a horizontal position allowing a user to easily view the red LED flashing indicating connectivity. It may also require using an optional longer cable assembly p/n TW-SEN-8-CN-36.

Connect each one of the color-coded cables to the host controller’s station outputs in the correct numerical order as indicated in the chart above. Confirm each wire is properly connected by gently pulling downward before moving to the next station.

It is recommended that one 8-Station Sender is connected initially and stations operated manually when used with a Universal Decoder Adapter. This is not required when connected to a Novo. It is important to verify the Sender “address” prior to an installation.



Note: An Sender installed with a Novo starts at #5 as Senders 1-4 are built-into the Novo as a standard feature.

Both the decoder and 8-station Senders are warranted for a period of 2-years from the date of purchased when installed properly. This includes the correct wire connectors for decoders **and** grounding of the corresponding 2Wire control product.

Decoders and 8-Station Senders shall be manufactured and distributed by Underhill International Corporation, Mission Viejo, CA.