Hybrid 3D

Basic Installation Overview

Hybrid 3D-6

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About your Hybrid 3D-6

How does this work?

Your Hybrid 3D system uses your existing conventional system's common wire and one existing valve wire to add up to 5 valves, a flow meter, and master valve to your existing system using 2-Wire and Tucor's series of 3D decoders. With our Hybrid 3D, your controller becomes a true hybrid controller by using one existing valve wire and sharing the system common to create a 2-Wire path. Preserve the wire you have in the ground, and eliminate running new wire back to the controller by harnessing the technology of 2-Wire!

What is 2-Wire?

We won't get into the details, but 2-Wire uses a technology called a "decoder" that is placed anywhere along the 2-Wire path where you'd like to add a valve or sensor.

What do I have and do I need anything else?

The Hybrid 3D-6 works off of a system of two main components – the Hybrid 3D-6 and a series of decoders. The "6" in the Hybrid 3D-6 refers to the total number of valves you can add to your existing system (1 transition valve + 5 additional irrigation valves), this unit is installed at the terminal strip of the existing control system.

The Hybrid 3D can utilize 2-Wire by using a series of decoders it can communicate with. Different models of decoders have different functions based on what they are intended to add to the 2-Wire.

Valve Decoders – Tucor's 3DLD-050

To add a valve and to start any 3D system, you will need a 3DLD-050 decoder. To make sure you have the correct amount of 3DLD-050s, count the number of valves you are looking to add, then add one additional decoder as the transition decoder for the "transition valve" (i.e. If you are looking to add four valves, need 5 3DLD-050s (1 transition + 4 valves)). These units can come pre-programmed or unprogrammed and require you to program at the 3D unit or with our handheld programmer (HCP-100).

Flow Meter/Master Valve Decoders – Tucor's 3D-FMV-M

To add a flow meter and/or a master valve, you need our combination flow meter/master valve decoder. This unit is always pre-programmed.

What is a Transition Valve?

All 3D systems use a "transition valve" decoder that acts as the end of the existing conventional system and the beginning of the 2-Wire system in the field and at the controller. In the field, a Tucor 3DLD-050 decoder will be added to the "Common" and "Hot" wire of the valve and spliced together with new 2-Wire. At the controller, the Brown 3D wire will be the transition wire, and will signify the start of adding additional valves of the 2-Wire system at the controller. If you've selected Station 7 at the controller to be where you begin the 3D system, the Brown wire will match to the Station 7 terminal at your controller, and your transition decoder will be located at station 7.

Hybrid 3D

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Installing a Hybrid 3D

Overview Steps

In seven simple steps, you can install your Hybrid 3D unit to any existing controller.

1. **Verify** the existing field wire passes our wire quality test.
2. **Determine** which terminal is the "Hot" & "Neutral" for the specific controller transformer.
3. **Connect** the 3D wires at the controller terminal EXCEPT the long Red and Black wires labeled "POS" and "NEG".
4. **Program*** the Hybrid 3D decoders at either the 3D device or using Tucor's handheld decoder programmer. The decoder types will vary based on their intended usage:
   a. Decoder(s) for the transition valve or adding valves - **Tucor Part: 3DLD-050.**
   b. Decoder for adding a flow sensor and/or a master valve - **Tucor Part: 3D-FVM-M.**
5. **Install** the appropriate decoders.
6. **Connect** the long Red and Black wires labeled "POS" and "NEG" at the controller terminal.
7. **Perform** the "Test Run".

*Note the 3D-FMV-M combination flow meter/master valve decoders are always pre-programmed and do not require programming. If you ordered pre-programmed 3DLD-050 decoders, then you will not need to program them.

Step 1) Verify the Quality of an Existing Wire Path
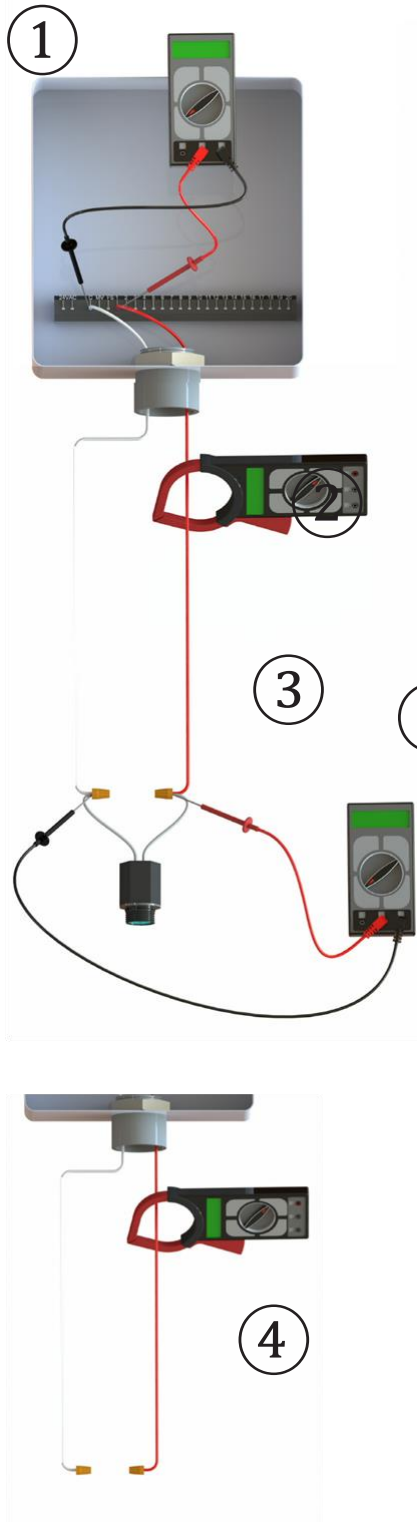
1.   Measure the current in the active station wire close to the controller. The expected range is 150-350 mA.

2.   Measure the voltage at the active station valve with its solenoid connected. The expected range is 16-28 VAC.

3.   Turn on the station that will be used as the transition valve. Make sure its solenoid is connected. Measure the voltage at the controller. The expected range is 22-28 VAC.

4.   Disconnect the active solenoid. Make sure that you cap the wires feeding the solenoid. Measure the milliamps again like in step 2. The range must be within 0-5 mA for a "good" existing wire*.

5.   Calculate* the wire resistance using the formula shown in *Figure 1*. The range must be within 0-15 Ohms for a "good" existing wire**.

Figure 1. - Wire resistance calculation

$$\frac{(Step\ 1\ (V) - step\ 3(V)) * 1000}{Step\ 2\ (mA)} = Resistance\ (Ohm)$$

Calculation example:

$$\frac{(25\ V - 23\ V) * 1000}{200\ mA} = 10\ Ohm$$

*We provide a wire quality test calculator on our Helpdesk site for your convenience. Visit www.tucor.com for more information.

**If the values in step 4 and/or step 5 are outside the specified range, you must perform a fault tracing test on your wires.

Figure 2

Hybrid 3D

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Step 2) Determing the Hot vs Neutral Wire at Your Existing Controller

With certain control systems, the "Hot" and "Neutral" 24VAC terminals are not identified or easily known. Identifying which terminal is the "Hot" and "Neutral" terminal will allow you to properly install the 3D.

1. Measure the voltage between the Common and first 24VAC terminal
   a. Record the voltage reading

Figure 3

2. Measure the voltage between the Common and second 24VAC terminal.
   a. Record the voltage reading

Figure 4

3. Analyze your results. The Hot Wire terminal will read ~24-28VAC and the Neutral terminal will read 0V.

Step 3) Wiring the Hybrid 3D-6

Wiring the most of the 3D is necessary before programming decoders at the 3D. Note this step does not include wiring the Hybrid 3D-6 2-Wire lines, which will come after decoder programming and installation to prevent system short circuits and incorrect programming.
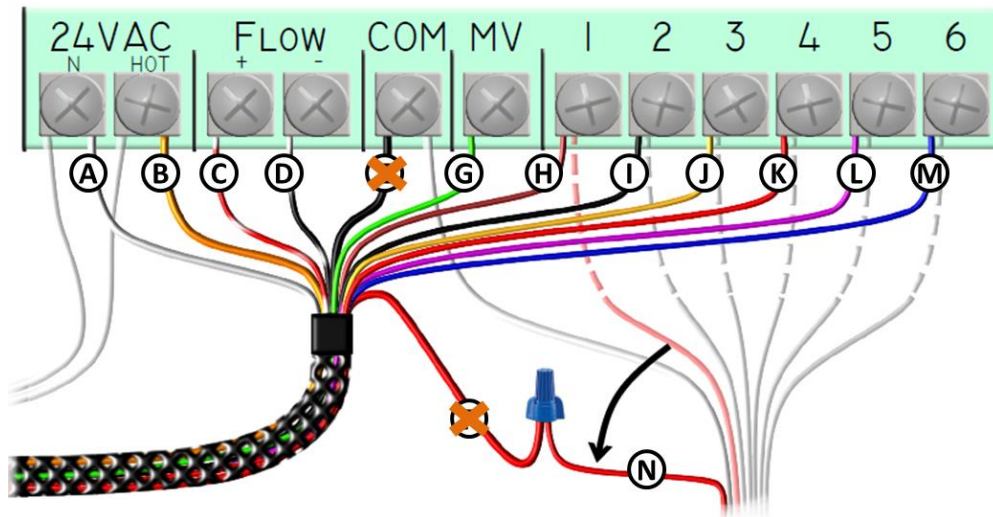

Figure 5

1. Disconnect the valve wire that will be used for the transition, wire **(N)**, from the transition terminal.

   > **Stop!** Have you tested the existing valve wire "N" for quality? If not, revert back to *How to Check the Quality of an Existing Wire Path* **before proceeding**!

2. Connect the white 3D, wire **(A)**, to the "Neutral" 24VAC terminal.

3. Connect the orange, wire **(B)**, to the "Hot" 24VAC terminal.

   > **Stop!** Do you know which 24VAC terminal is your "Hot" terminal? If not, refer to the section *Determining the Field vs Hot Wire. . .* for more information.

4. **If using flow**: connect the 3D red/white striped wire, wire **(C)**, to the "Flow +" terminal. Connect the 3D black/white striped wire, wire **(D)**, to the "Flow –" terminal.

Hybrid 3D-6 Wire Key		
24VAC Neutral	**A**	White
24VAC HOT	**B**	Orange
Flow +	**C**	Red/White Striped
Flow -	**D**	Black/White Striped
2-Wire Line Neg.	**E**	Long Black
2-Wire Line Pos.	**F**	Long Red
Master Valve	**G**	Green
3D Station Wiring		
3D Station 1 (Transition Valve)	**H**	Brown
3D Station 2	**I**	Black
3D Station 3	**J**	Orange
3D Station 4	**K**	Red
3D Station 5	**L**	Violet
3D Station 6	**M**	Blue

Figure 6

5. **IMPORTANT**: **<u>Do not</u>** connect the 3D 2-Wire Line(s), wire **(E)** and wire **(F)** yet. Connecting these wires before the decoders are properly programmed and installed could short the Hybrid 3D. (In essence, you are connecting the live 2-Wire directly to a solenoid, causing the short circuit).

6. Connect the green 3D wire, wire **(G),** to the master valve terminal.

7. Select which Controller Station you'd like to be your 3D transition valve (see *About Your Hybrid 3D* for more information). This will be where your 3D station wiring will start. Your 3D station wiring will always start with the Brown wire, wire **(H).** In Figure 1, the Controller's Station 1 is the selected station to start the 3D station wiring.

8. Repeat adding 3D Station Wires using Figures 1 - 2. For reference, Figure 1 shows the Hybrid 3D being utilized to add 5 additional valves beginning at the Controller's Station 1.

Step 4) Programming your Decoders

You have two options for ease of programming 3D-LD050 decoders if you have not already ordered them pre-programmed. Note that sensor decoders (3D-FMV-M, 3DSD-100 and 3DSD-100M) are pre-programmed and do not require programming.

At the Controller

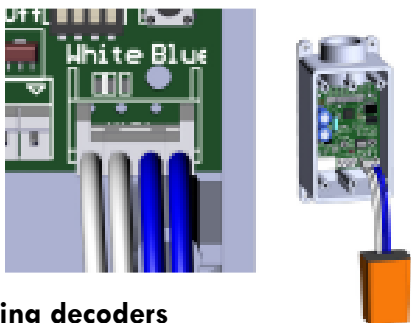1. Connect the decoder or master valve to the 3D programming connectors (see Figure 7).

Figure 7

For programming decoders

1. Push the "Prog." button **once**. The "ST" LED light will be lit (see Figure 8).
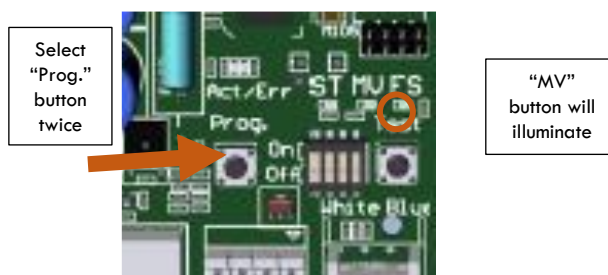

Figure 8

2. Manually activate the desired station on the controller for at least one second, i.e. activate station 1 to assign an id of 1 to the decoder. Repeat with remaining decoders.
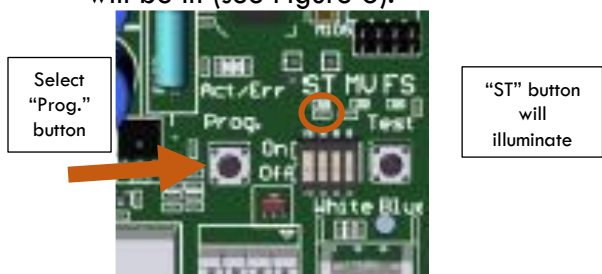
For a programming a master valve

1. Push the "Prog." Button **twice**. The "MV" LED light will be lit (see Figure 9).

Figure 9

2. Activate any station that is connected to the 3D on the controller for at least one second to assign the decoder as a master valve.

3. For either decoders or a master valve, determine the programming status through the "Act/Err" labeled LED light (Figure 10). Below is a summary of the light codes, see the "Act/Err LED Code Guide" in the Troubleshooting section for more detail.

Figure 10

Status	Color	Code
Ready	Green	30
Active	Green	31
Done	Green	32
Error	Red	Error Code

Programming Decoders with a Handheld Programmer (HCP-100)

The HCP-100 is a battery powered device that can be used to program and test new decoders as well as for reprogramming and testing existing decoders. The HCP-100 can be used on every version of Tucor branded decoders, however this document is focused on the 3DLD-050 decoder.
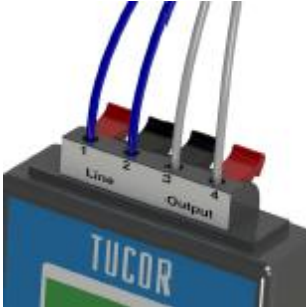
1. Turn the HCP-100 on by pressing the **ON/OFF** button. The backlight will be active for 10 seconds after a key pressed. (When battery is charged.) The unit will automatically turn off after one minute without use.

2. Connect the decoder (see Figure 11 & 12) by attaching the blue wires to terminals 1 and 2 and white wires to terminals 3 and 4. Press OK after screen in Figure 14 is displayed.

Figure 11

```
Applying dec pow-
er. Please wait
```

Figure 13 - The HCP-100 is communicating with the decoder.

```
RKLD050-3
Address: ST1
```

Figure 14 - The decoder's address is shown. Press Ok.
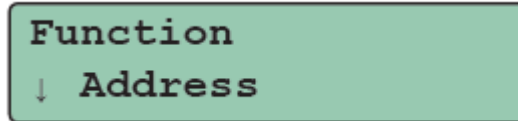
Figure 12

Function
↓ Address

Figure 15 - Select the "Address" function.
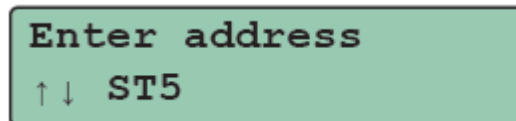
Enter address
↑↓ ST5

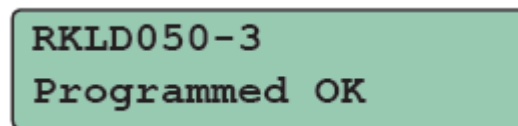*Figure 16 - Select desired decoder address.*

RKLD050-3
Programmed OK

Figure 17 - Decoder has been programmed

3. Select the "Address" under the "Function" field using the programmer's up and down arrow buttons and press OK (see Figure 15).

4. Select a new address using the Up and Down arrow buttons (Figure 16).
Press OK. The HCP-100 is now communicating.

5. The decoder is accurately programed when the "Programmed OK" message is displayed (see Figure 17).

Step 5) Installing your Decoders in the Field

Installing a 3DLD-050
  As transition valve (Figure 18)
1. Connect the "Common Wire" of the valve and "Hot Wire" of the valve to the 2-Wire path.
2. Connect the blue wires to the Common and Hot Wire.
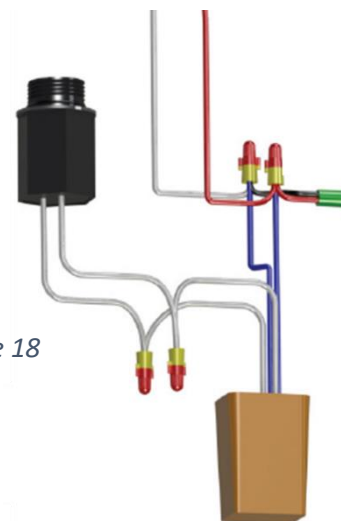3. Connect the White wires to the solenoid.

Figure 18

As valve decoder (Figure 19)
1. Connect each blue wire to the 2-Wire path.
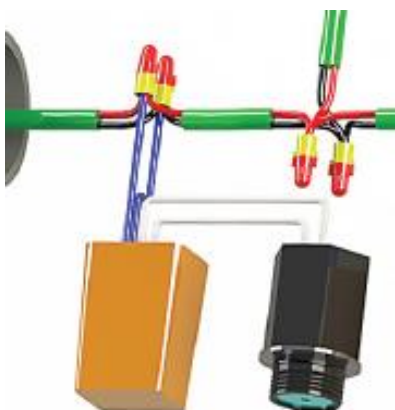2. Connect the white wires to the solenoid wires.

Figure 19

3D-LD-050 Wire Key		
2-Wire Connection	A	Blue
Solenoid Wire	B	White

Figure 20

Installing a 3D-FMV-M
1. Connect each blue wire to the 2-Wire path.
2. Connect the white wires (for solenoids) to the solenoid wires (if applicable).
3. Connect flow sensor wire to (red and black) to wire of decoder to flow sensor.

3D-FMV-M Wire Key		
2-Wire Connection	A	Blue
Solenoid Wire	B	White
Flow Sensor	C	Red/Black

Figure 21

Step 6) Connect the Red and Black Wires

Note: Adding power to the Hybrid 3D unit after installing the decoders prevents a short circuit/ making the 3D go into "short circuit" mode.
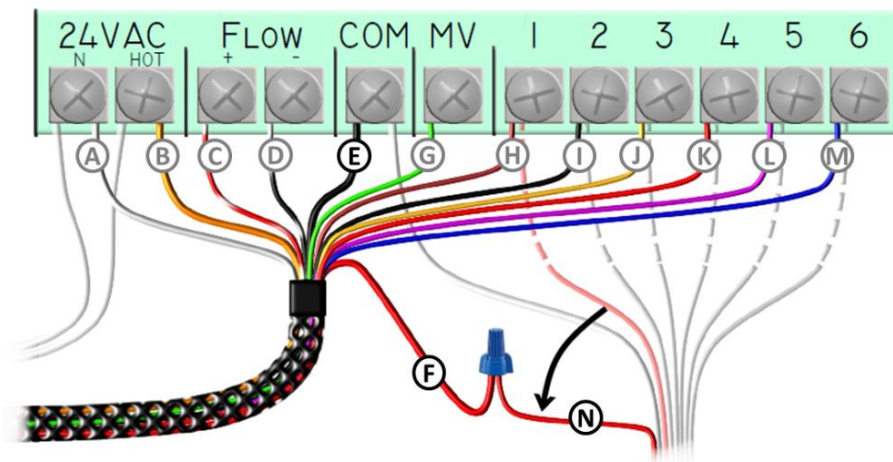

Figure 22

1. Connect the long black wire, wire **(E)**, to the controller's Common terminal.

2. Connect the long red wire, wire **(F)**, to the valve wire selected for the transition, **wire (N).**

Step 7) Perform "Test Run"

Performing a test run verifies a correct installation and that the sensor decoder, master valve, and/or transition valve ("TrV") are connected and communicating with the Hybrid 3D.

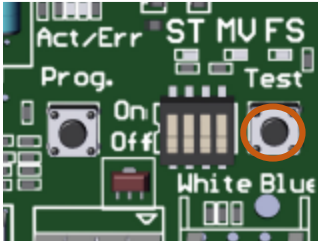1. Push the "Test" button on the Hybrid 3D interface.

Figure 23

3. The Test function will run until complete or until it has discovered an error and will test in the following order: Flow Sensor, Master Valve, and Transition Valve. The green LED will blink if a station is active, a red LED will blink in case of an error. Follow the "Act/Error LED Code Guide" for corresponding error messages.

4. If you found an error, press the "Test" button again once the error has been cleared to resume the test. Repeat if necessary until all three components (FS-MV-TrV) have been tested.

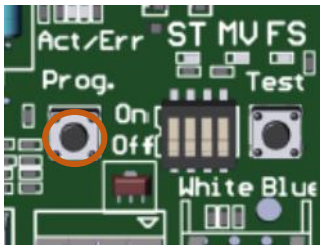5. Press the "Prog." Button to exit the Test program and resume normal operation

Figure 24

Note: The Flow Sensor is only checked for presence and not accuracy. If there is no FMV (flow Sensor Master Valve) decoder connected, then the Flow Sensor ("FS") LED will blink red, whether or not the device is in Test mode.

Note: If you encounter a valve that won't turn on, it may require higher power. See "Adjusting DIP switch for High Power Valves" for more information.