PWY-400-H02 Pathway
Wire Sharing System

Installation Guide

Model PWY-400-H02
For use with pulse/gallon contact closure output devices

The Pathway provides a reliable, cost effective method to add flow monitoring and control to installed systems where existing pavement, hardscape or other landscape features make conventional wiring prohibitively expensive.

The Pathway PWY-400-H02 is a communications system that allows a pulse type flow meter (reed switch, contact closure type) and master valve to be retrofit to an irrigation system utilizing existing zone wire to carry flow information back to the irrigation controller and valve control signals from the irrigation controller to the master valve.

The irrigation controller must have flow monitoring and control capabilities.

READ THROUGH THIS GUIDE BEFORE INSTALLING THE *Pathway System*

Model PWY-400-H02 may not be used with CST flow sensors or any other two wire frequency output flow sensors.

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The Controller Module is installed at the irrigation controller and the Field Module is installed in an existing zone valve box near the proposed location of the combination master valve and flow meter. The control and common wires of this "host" zone valve become the communications path between the Pathway modules.

The Controller Module requires a 24 VAC power supply of sufficient size to operate its circuitry and solenoid valves connected to it. Alternatively, some controllers offer 24VAC auxiliary power for hand-held remotes or rain switches that may also be used to power the Pathway Control Module.

New wire installation is only required to connect the Field Module to the combination master valve and flow meter.

Both modules incorporate "day-light" bright LED's providing feedback to confirm operation or assist in troubleshooting is necessary.

This product is compatible with most irrigation controllers equipped with flow monitoring functions. If you have questions specific to your controller compatibility or application, please contact CST prior to field installation.

Sensor compatibility:

The CST PWY-FM- H02 Field Module has been optimized to accept a pulse type input from a reed switch or other type of two wire contact closure device producing a scaled pulse. This model should not be used with frequency producing devices similar to Creative Sensor Technology FSI series flow sensors. Use the Pathway PMY-FM-F01 module instead.

Controller compatibility:

The CST Pathway System has been tested with many irrigation controllers. A partial list of compatible control product includes:

- ET Water
- Hunter ACC
- Irrisoft
- Rain Bird ESP LXME with flow module
- Rainmaster Eagle
- Toro Sentinel
- Tucor
- Weathermatic Smartline with Smartlink

Check with CST for other controllers.

Field Wiring / Distance:

The CST Pathway System has been demonstrated to operate reliably on a variety of common irrigation wiring systems. However, as the signal quality is dependent upon existing wiring configuration, insulation quality, splices, distances, etc., CST cannot assure operation in every situation. Please pre-qualify the existing wiring or contact CST prior to installation for recommendations and guidance.

Pre-Qualifying a Site

The Pathway system uses field wiring as a signal carrier between the two control modules. The Pathway system has been designed to operate using existing, direct burial irrigation valve control wire. In most situations it will provide a simple way to retrofit a flow sensor and/or a master valve to a site. However, if there is extreme distance between the modules, over 1500 feet, or if the wire insulation is defective or splices are poorly made, the Pathway System may not work.

The following instructions outline a simple test using the Pathway modules that can pre-qualify the wire path in thirty minutes or less.

Step 1- Identify the Host zone valve

The first priority is to find a working zone valve close to the proposed location of the flow sensor/master valve to minimize the amount of new wire installation. Identify the irrigation controller zone number that operates this valve. You will need to disconnect this zone wire at the controller for the test.

Step 2- Connect the Field Module

Disconnect the solenoid leads from the field wiring. Confirm which field wire is the power wire and which is the common. The insulation of the power wire is usually red or some color other than white. The common wire is typically white in color. Re-connect the zone valve power wire to the Purple lead of the field module. Connect the zone valve common wire(s), there may be two or more, to the Blue lead on the field module.

Do not connect any other leads and leave the valve solenoid disconnected.

Step 3- Connect the Controller Module

At the irrigation controller location, you will need a temporary 24 volt power supply for the Pathway Controller module. Use the 24 VAC auxiliary power output of the controller if available. If not, use a spare irrigation controller transformer or other plug in style 120 Volt to 24 VAC power supply for this test. Make sure the power to the irrigation controller is off before proceeding. Disconnect the power wire to the host zone valve from the irrigation controller terminal strip. Reconnect this wire to the Network "L" terminal on the Pathway controller module. Connect a wire from the controller valve common terminal of the controller to the Network "C" terminal of the controller module. Leave all common wires from the field connected to the controller common terminal. Connect 24 volt power leads to the Power terminals on the lower left side of the Pathway controller module. Power up the controller and the module.

Step 4- Observe the LEDs

When power is applied to the controller module, observe the Power and Network LEDs. They should blink three times, then the red Power LED and the green Network LED should blink continuously. Next check the field module. If its green Network LED is also blinking continuously, then the wire path will support the Pathway System and you may proceed with the permanent installation of the flow sensor and master valve. If the Network LED remains off, check your wire connections and polarity, this indicates an open circuit. There is no two-way communication between modules unless both green Network LEDs blink continuously. Take corrective action if possible.

Do not proceed with the installation of the Pathway or the flow sensor and master valve until you observe blinking Network LEDs on both devices.

Step 5– Corrective Action

A. If the two Network LEDs do not blink continuously, then there is a problem with the existing wire.
   1) Re-check the connection from the valve common terminal of the irrigation controller to the Network common terminal of the Pathway Controller Module. There must be a connection between the Network Common on the Pathway Controller module and the wire going to the field host valve location. It is not a good practice to use a wire terminal to connect multiple wires. A better way is to join a separate wire for each terminal connection to the commons coming in from the field with a large wire nut and then connecting the single wire to each terminal. Power up the Pathway and see if the green LEDs now blink continuously.
   2) If not, recheck the common wire(s) at the host valve location. If there were two common wires connected to the solenoid originally, they both need to be connected to the Blue lead of the Pathway Field Module.
   3) If the green LEDs are still not blinking, recheck the common splices at zone valves located between the irrigation controller and the host valve. Re-splice as necessary

B. Although highly unlikely, if the green network LEDs do not blink continuously, then the existing wire path will not support the Pathway.

Installation

Step 1. Make connections at the host valve and Pathway Field Module permanent.

NOTE: Always disconnect Power from the irrigation controller and Pathway Controller Module before making any wire connections. Do not reconnect power until both modules of the Pathway system are wired.

Step 2. Install the flow meter/master valve wiring

A. Verify that the flow meter/master valve is equipped with a two wire contact closure pulse type output. The Pathway F02 Field Module will only work with this type of output.

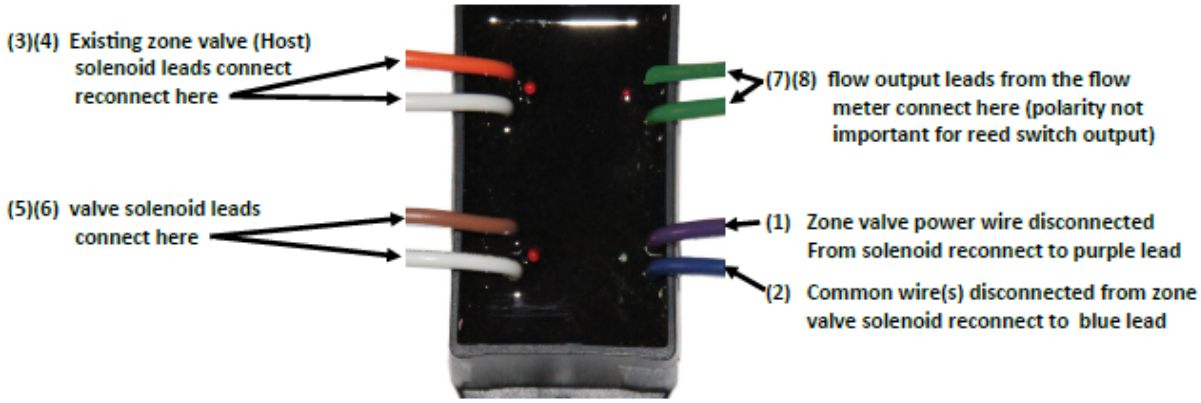
B. Install wiring from the host valve box to the location of the new flow sensor and master valve.
   1) Four conductors are required: two for the flow sensor and two for the master valve solenoid.
   2) We recommend the use of a 2 pair twisted, shielded direct burial cable.
   3) The distance between the Pathway Field Module and the flow meter/master valve may be up to 1500 feet. Size the conductors to the power requirement of the solenoid.

Step 3. Install Field Module

A. The Pathway PWY-400-F02 Field Module (FM) is intended for outdoor installation in a valve box. Make all splices to wire leads with watertight splice kits (included). The Field module may be mounted to the inside cover or wall of the valve box using enclosed fasteners through the mounting tabs on the ends of the enclosure. Locate the FM where the LEDs will be visible during start-up or troubleshooting.

B. Wire Connections

1) Disconnect the zone valve power wire from the valve solenoid of the Host and connect the wire to the PURPLE NETWORK lead of the FM.
2) Disconnect the Host zone valve common wire(s) from the valve solenoid and connect to the BLUE NETWORK lead of the FM.
3) Reconnect one solenoid lead to the ORANGE ZONE VALVE lead of the FM.
4) Reconnect the other solenoid lead to the WHITE ZONE VALVE lead of the FM.
5) Connect one lead from the valve solenoid to the BROWN MASTER VALVE lead of the FM.
6) Connect the other lead from the valve solenoid to the WHITE MASTER VALVE lead of the FM.
7) Connect one lead from the flow meter to one GREEN FLOW SENSOR lead of the FM.
8) Connect the other lead from the flow meter to the other GREEN lead of the FM.



Step 4. Install Controller Module using separate 24 VAC power supply

A. The Pathway Controller Module (CM) is intended for installation in protected locations.

1) Install the module indoors adjacent to the irrigation controller.
2) If the irrigation controller is mounted outdoors, install the Controller Module (CM) inside the controller enclosure, pedestal or use the NEMA 4 rated Pathway enclosure, CST part number PWY-400-ENC.

B. Mount the CM in a vertical orientation with the connection terminals on the sides of the enclosure to enhance airflow and minimize internal temperatures.

1) Use appropriate fasteners to attach the CM to the wall, panel or enclosure.
2) Leave space on both sides of the device to insert the connecting wires to the screw terminals.

C. Wire Connections

1) Connect the Flow sensor - terminal (or lead) of the controller to the Flow sensor - terminal of the CM.
2) Connect the Flow sensor + terminal (or lead) of the controller to the Flow sensor + terminal of the CM.
3) Connect the Master Valve output terminal of the controller to the Master valve L terminal of the CM.
4) Connect the Master Valve common terminal of the controller to the Master Valve C terminal of the CM.

NOTE: The Common Terminal(s) of the controller are often shared between the master valve, pump start circuit and zone valves. If so, connect controller common to the master valve common on the CM. The MV common and ZV common terminals of the CM are connected internally.

5) Locate the zone valve terminal on the controller that has been identified in Step 1.A. as the valve location (Host Valve) for the Pathway Field Module (FM). Disconnect the field wire lead from the terminal and connect the controller terminal to the zone valve L terminal of the CM.
6) Permanently attach the previously disconnected zone valve lead to the NETWORK L terminal of the CM. Temporary connection was made during the Pre-qualify steps.
7) Permanently attach a wire from the NETWORK C terminal of the CM to the Zone valve C terminal of the CM. Temporary connection was made during the Pre-qualify steps.
8) Connect a 24 VAC power supply to the Power terminals of the CM. The power supply must be adequate to operate the zone valve and master valve solenoids with the Pathway circuitry. Power ratings of .75 to 1 amp will cover most applications. If unsure of the solenoid current draw, check with the valve manufacturer.

Wire Connections in Table Format

		Field Module (FM) Connections
No.	**Wire Color**	**Connect To...**
1	Blue	Host Zone valve "Common" wire lead from controller
2	Purple	Host Valve "Power" wire lead from controller
3	Orange	Host valve solenoid wire lead
4	White	Host valve solenoid wire lead
5	Brown	Master valve solenoid wire lead
6	White	Master valve solenoid wire lead
7	Green	Flow Meter lead
8	Green	Flow Meter lead
		Controller Module (CM) Connections
No.	**Terminals**	**Connect To...**
1	SENSOR–	Flow Sensor (–) terminal or wire lead of irrigation controller
2	SENSOR +	Flow Sensor (+) terminal or wire lead of irrigation controller
3	MASTER VALVE **L**	Master valve terminal of irrigation controller
4	MASTER VALVE **C**	Irrigation controller's "Common" wire terminal with field common wires connected
5	ZONE VALVE **L**	"Host" zone valve terminal of irrigation controller only
6	ZONE VALVE **C**	If Common is connected to #4 then connect to #8 network C terminal of this module
7	NETWORK L	Power wire from the host valve disconnected from the corresponding controller zone valve terminal
8	NETWORK C	Connect with jumper wire to zone valve C terminal of this module
9	POWER C	24 VAC power from separate power supply C
10	POWER L	24 VAC power from separate power supply L

Alternative: Install Controller Module using 24 VAC power from the Irrigation Controller

Some irrigation controllers are equipped with auxiliary 24 VAC output terminals to power accessories. This may be used to power the Pathway system if:

- the power supply has sufficient power to operate the Pathway circuitry and the zone and master valve solenoids. Nominally .75 to 1 amp.
- The auxiliary power polarity is identified. The auxiliary "common" must be the same as the controller valve commons.

If uncertain, check with the controller manufacturer.

Disconnect power from irrigation controller before proceeding.

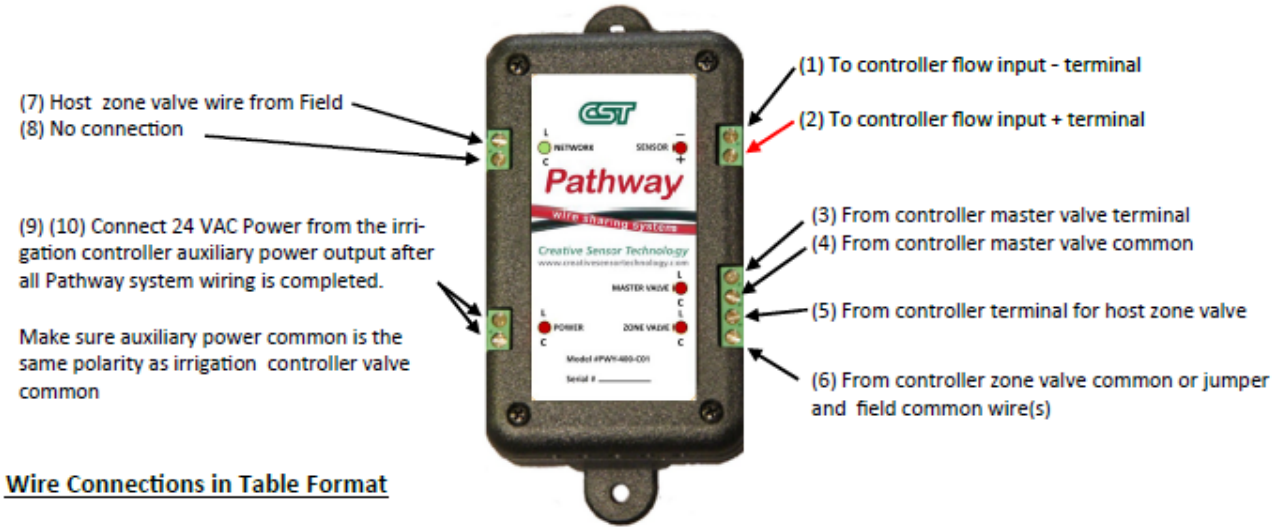
A. The Pathway Controller Module (CM) is intended for installation in protected locations.
   1) Install the module indoors adjacent to the irrigation controller.
   2) If the irrigation controller is mounted outdoors, install the Controller Module (CM) inside the controller enclosure, pedestal or use the NEMA 4 rated Pathway enclosure, CST part no. PWY-400-ENC.

B. Mount the CM in a vertical orientation with the connection terminals on the sides of the enclosure to enhance airflow and minimize internal temperatures.
   1) Use appropriate fasteners to attach the CM to the wall, panel or enclosure.
   2) Leave space on both sides of the device to insert the connecting wires to the screw terminals.

C. Wire Connections
   1) Connect the Flow Sensor - terminal (or lead) of the controller to the Flow Sensor - terminal of the CM.
   2) Connect the Flow Sensor + terminal (or lead) of the controller to the Flow Sensor + terminal of the CM.
   3) Connect the Master Valve Output terminal of the controller to the Master Valve L terminal of the CM.
   4) Connect the Master Valve Common terminal of the controller to the Master Valve C terminal of the CM.

NOTE: The Common Terminal(s) of the controller are often shared between the master valve, pump start circuit and zone valves. If so, connect controller common to the master valve common on the CM. The MV common and ZV common terminals of the CM are connected internally.

   5) Locate the Zone Valve terminal on the controller that has been identified in Step 1.A. as the valve location (Host Valve) for the Pathway Field Module (FM). Disconnect the field wire lead from the terminal and connect the controller terminal to the ZONE VALVE L terminal of the CM.
   6) Attach the previously disconnected zone valve lead to the Network L terminal of the CM.
   7) Connect nothing to the Network C terminal of the CM.
   8) Connect 24 VAC power from the irrigation controller to these terminals. Maintain polarity.



Wire Connections in Table Format

		Field Module (FM) Connections
No.	**Wire Color**	**Connect To...**
1	Blue	Host Zone valve "Common" wire lead from controller
2	Purple	Host Valve "Power" wire lead from controller
3	Orange	Host valve solenoid wire lead
4	White	Host valve solenoid wire lead
5	Brown	Master valve solenoid wire lead
6	White	Master valve solenoid wire lead
7	Green	Flow Meter lead
8	Green	Flow Meter lead
		Controller Module (CM) Connections
No.	**Terminals**	**Connect To...**
1	SENSOR—	Flow Sensor (–) terminal or wire lead of irrigation controller
2	SENSOR +	Flow Sensor (+) terminal or wire lead of irrigation controller
3	MASTER VALVE **L**	Master valve terminal of irrigation controller
4	MASTER VALVE **C**	Irrigation controller's "Common" wire terminal with field common wires connected
5	ZONE VALVE **L**	"Host" zone valve terminal of irrigation controller only
6	ZONE VALVE **C**	If Common is connected to #4 then connect to #8 network C terminal of this module
7	NETWORK **L**	Power wire for the host valve disconnected from the corresponding controller zone valve terminal
8	NETWORK **C**	No connection
9	POWER **C**	24 VAC power from irrigation controller auxiliary power "load" or "hot" terminal
10	POWER **L**	24 VAC power from Irrigation controller auxiliary power "common" terminal

Step 5. Power up the system

A. Restore power to the irrigation controller.

B. Program the flow sensor input using K= 2.5 and Offset = 0.0 for all inputs where I pulse = 1 gallon

A. Apply power to the Pathway Controller Module.
   1) Observe Controller Module – Power, Network and Sensor LEDs should blink 3 times upon start-up. Then the Red Power LED and the Green Network LED should blink continuously.
   2) Observe Field Module– Network and Sensor LEDs should blink 3 times upon start up. Then the Green Network LED should blink continuously.

C. When flow meter is operating- RED Flow LED should glow continuously on both modules.

D. When controller activates Host Zone Valve– Red ZV LED should glow on both modules and zone valve should energize.

E. When controller activates Master Valve– Red MV LED should glow on both modules and master valve should energize.

CST Pathway HO2 K Factor and Offsets for Smart Controllers

The CST Pathway HO2 allows a Smart Controller with flow inputs the ability to monitor and record totalized flow from a pulse output flow meter.

The Pathway HO2 however may not be able to replace the role of a flow ***sensor*** in 'live flow rate monitoring' for the purposes of alarms such as Rain Bird Flowatch.

For best results, use a water meter with the lowest pulse weight possible. Ie 1 L/pulse or 10L/pulse

The following K factor calculations are determined specifically with the use of the CST Pathway HO2 in between flow meter and Controller and will not work if direct wiring a flow meter to a controller.

K factor Calculation and Programming for RainBird LX Controllers

1 Establish the pulse output rate of the water meter in flow units/pulse. Meters in Australia are generally metric, ie 1L /pulse, 10L/pulse, 100L/pulse etc

2 If the pulse output is say 'xxx' litres/pulse (or in decimal points of kL), the smart controller flow rate setting must be set to record litres/minute.

3 To determine the correct K factor to be programmed into the controller in the flow sensor setup, the equation through the PCT is based on K = 2.5 x units per pulse for GPM.

Therefore, for a "Metric" flow meter that records in litres/pulse, we need to apply a conversion factor from GPM to LPM (divide by 3.785) as per the following

1 litre per pulse	K=0.661	Offset 0.0
10 litres per pulse	K= 6.61	Offset 0.0
100 litres per pulse	K =66.1	Offset 0.0
1000 litres per pulse	K= 661	Offset 0.0

Other Brand Controllers
It may also be necessary to apply a 3.785 conversion factor to the K Factor depending on the controller.