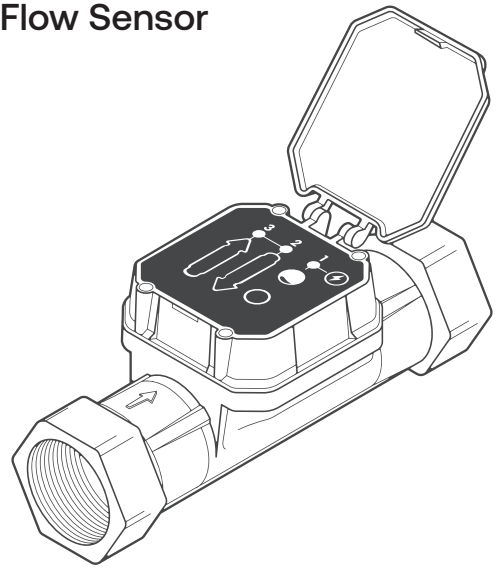
Features - Install - Setup - Troubleshooting

UFS Series User Guide

Ultrasonic Flow Sensor



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CAUTION
The ultrasonic style flow sensor described in this manual is not intended for use in safety critical applications. Use of the device in this manner is done at the sole discretion of the customer and/or end user of the device.
The ultrasonic style flow sensor described in this manual is not intended for use in systems with flammable liquids or gases. Additionally, the device is not intended for systems containing hazardous fluids or fluids other than water.
The ultrasonic style flow sensor described in this manual must be installed in accordance with all local and federal codes or end-use standards, as applicable.
If the devices described in this manual are used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ WARNING
Depressurize and vent the piping system prior to any installation or maintenance of the flow sensor.

1. Introduction

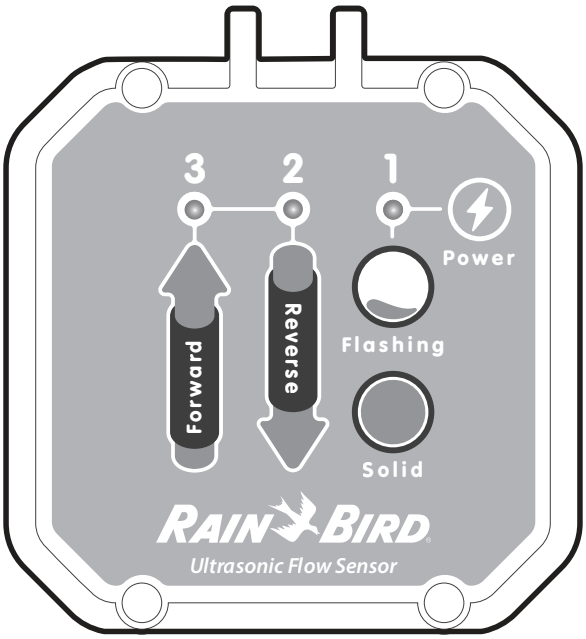
The Rain Bird UFS Series Ultrasonic Flow Sensors are high performance tools designed for commercial irrigation installations where accurate low and high flow measurement are required.

With the UFS Series, a single sensor reads both high and very low flow rates with higher precision than traditional flow sensors at +/- 2 % of reading. They have no moving parts, and due to glass filled nylon construction, they feature a 200 PSI rating – double that of traditional flow sensors.

Additionally, the UFS Series does not have straight pipe requirements, simplifying installation and allowing the UFS Series to be installed in a jumbo valve box with your master valve!

Rain Bird's UFS Series has a diagnostic display on the top of the electronics housing with three LEDs that identify the following flow states:

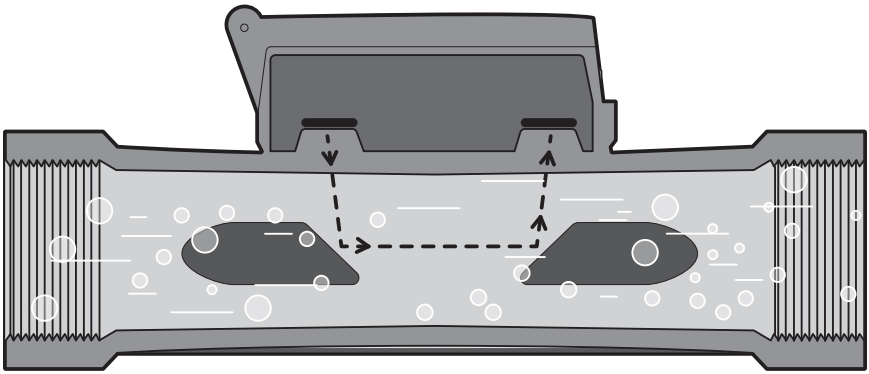
1. Flashing to Solid Green LED (right) indicates Partial Fill or Full Pipe
2. Flashing Red LED (center) – Indicates Reverse flow
3. Flashing Green LED (left) indicates Rate of Flow



1.1 Technology

The ultrasonic flow sensor uses sound waves, transmitted through the moving water in the irrigation pipe, to measure the speed of the water flow. Two transmitters generate and receive the soundwaves. The soundwave moving upstream will be slower than the soundwave moving downstream. The difference in the transit time equates to the velocity of water flowing through the pipe.

The flow sensor generates an electrical pulse with a frequency proportional to the flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 feet (610 meters) without further amplification. Power to operate the sensor is provided by the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor.



2. System Configuration

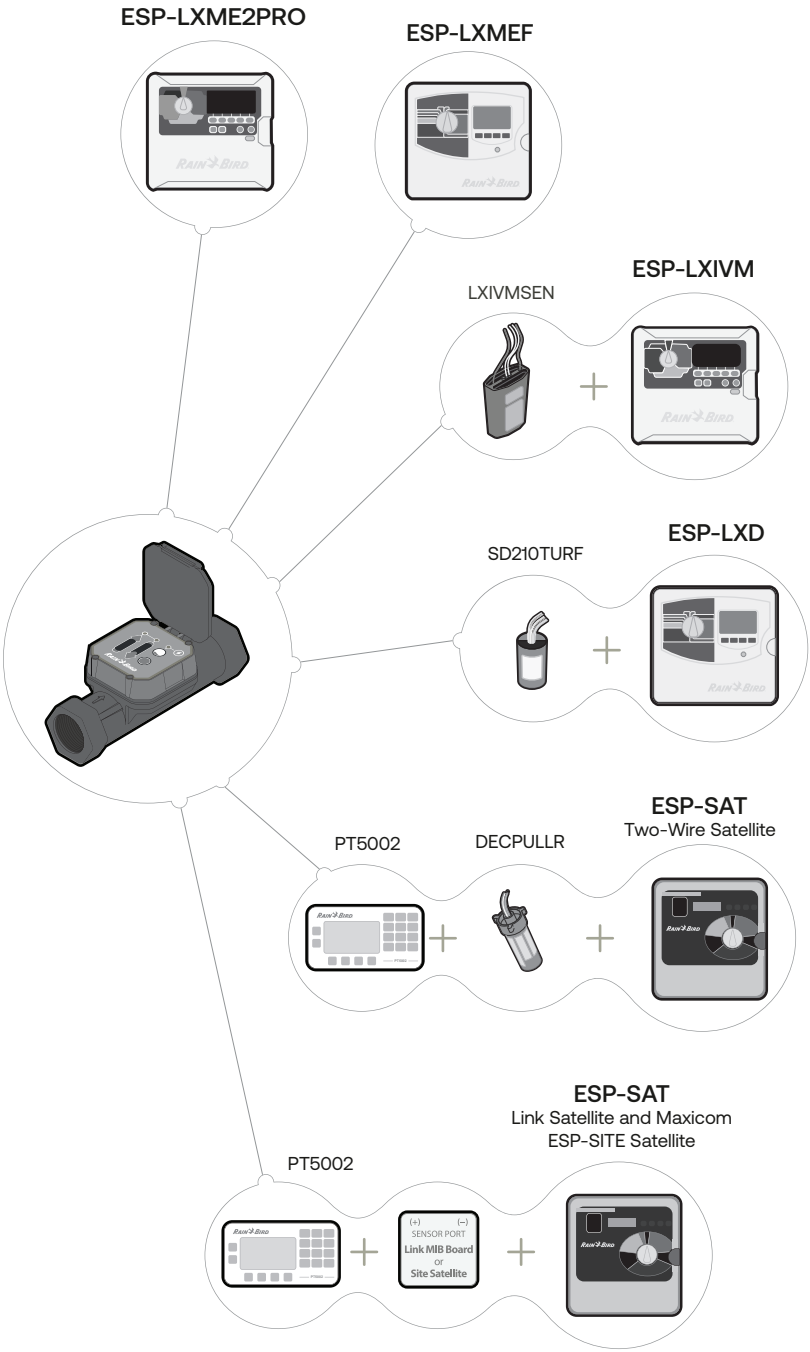
2.1 Compatibility

The UFS Series includes 2", 1.5", and 1" models with NPT and BSP threading. Their output is compatible with the following Rain Bird products:

Controllers	Central Control	Flow Monitor/Pulse Transmitters
ESP-ME3	IQ	PT322
ESP-LXMEF	Maxicom	PT5002
LXME2PRO	SiteControl	PT3002
ESP-LXD		
ESP-LXIVM		
ESP-LXIVMP		

They are also compatible with third-party irrigation controllers that can be configured with a K-factor and offset (page 10).

This manual provides instructions for installation and operation of the UFS Series.

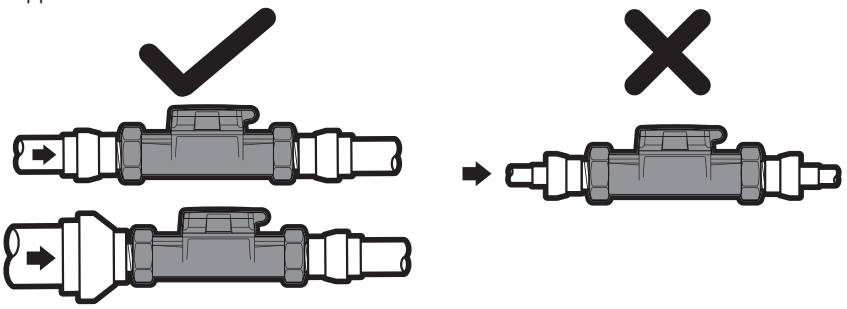

ESP-LXME2PRO
ESP-LXMEF
ESP-LXIVM
LXIVMSEN
ESP-LXD
SD210TURF
ESP-SAT
Two-Wire Satellite
PT5002
DECPULLR
ESP-SAT
Link Satellite and Maxicom
ESP-SITE Satellite
PT5002
(+) (–)
SENSOR PORT
Link MIB Board
or
Site Satellite

3. Installation

The UFS Series utilizes long body construction, providing itself with sufficient straight-pipe requirement in most situations. Ultrasonic Flow Sensor readings are less affected by flow irregularities caused by valves, fittings, pipe bends, or other obstructions than traditional flow sensors. This means it can connect directly to a Rain Bird master valve or other device.

NOTE

The UFS Series unit size (diameter) should be equal-to or smaller than the incoming piping. Using a UFS Series which is larger than the incoming pipe may lead to air being trapped in the unit.

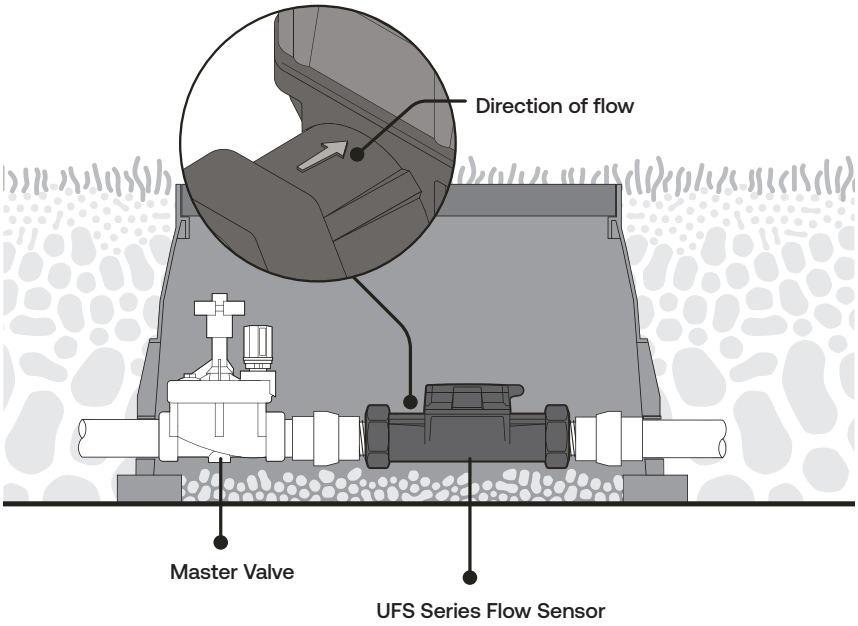


3.1 Mechanical Installation Procedure

Entrapped air in the pipe will cause inaccurate or “no-flow” readings. For best performance install the meter horizontally below or above ground, as shown in figure 3.1.1.

1. Use union fittings on both sides of the UFS Series for ease of install and maintenance.
2. Make sure the UFS Series arrow faces the direction of flow.
3. Apply Teflon tape on all threaded connections. **DO NOT OVER TIGHTEN.**

3.1.1 Typical Horizontal Installation (Recommended)



NOTE

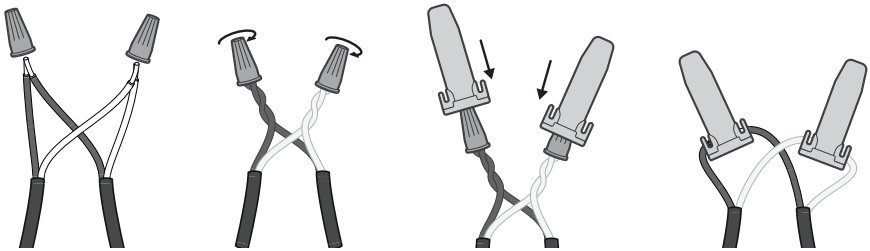
The UFS Series can be installed in a vertical application with the direction of flow arrow pointing upwards.

3.2 Electrical Installation Procedure

CAUTION

Disconnect the power from the flow sensor source and/or receiving device prior to any installation or maintenance of the system. Connecting power (24VAC, 110VAc, etc.) directly to the flow sensor wires will damage the sensor.

1. Use WC-20 Wire Splice connectors to connect the wire leads from the Rain Bird UFS Series to a 2-conductor shielded 20 AWG (or larger) flow sensor cable (Paige Electric P7162D or P7315D shielded cable or similar).



2. Route the cable from the Rain Bird UFS Series to the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor. The cable may be extended up to 2000 feet. Be sure to leave enough flexibility in the cable or conduit to allow for future service of the sensor, if necessary.

3. When connecting to an irrigation controller, 2-wire sensor decoder or pulse input type flow monitor, connect the red wire to **FLOW (+)** terminal or wire, connect the black wire to **FLOW (–)** terminal or wire.

4. When interfacing with other equipment, consult the manufacturer for input designations. The signal wave forms and power requirements are as shown in "Specifications" on page 17 of this manual.

5. After all electrical connections have been made, turn on power at the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor. It may take 15 seconds before the green power LED-1 illuminates.

3.3 Installation Test Procedure

There are three LED lights visible on the top of the Rain Bird UFS Series Ultrasonic Flow Sensor. Once connected to a powered system:

1. Run manual irrigation program from the controller
2. Once irrigation starts to run check that LED 1 is solid green
3. Check that UFS Series LED 3 (green) is flashing
4. Verify that the controller is registering flow rate. See your controller manual for detail on how to read flow from your controller.

NOTE

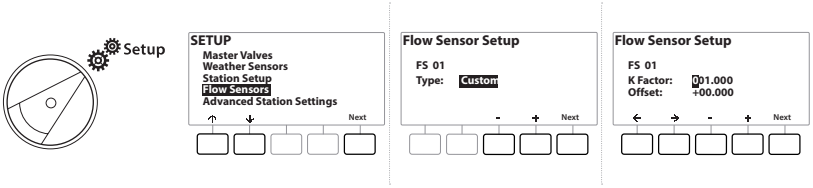
Once flow starts, readings from the controller will not be instantaneous. The lines need time to purge air, and the controller needs time to read the pulses from the UFS in order to register accurate readings.

4. Controller Programming

- Your UFS Series unit will need to be established in the irrigation controller's programming.

- This should be found in the "Flow Sensors" area of the programming. This will vary by controller, please refer to your controller manual for more specific guidance.

Controller Setup Example



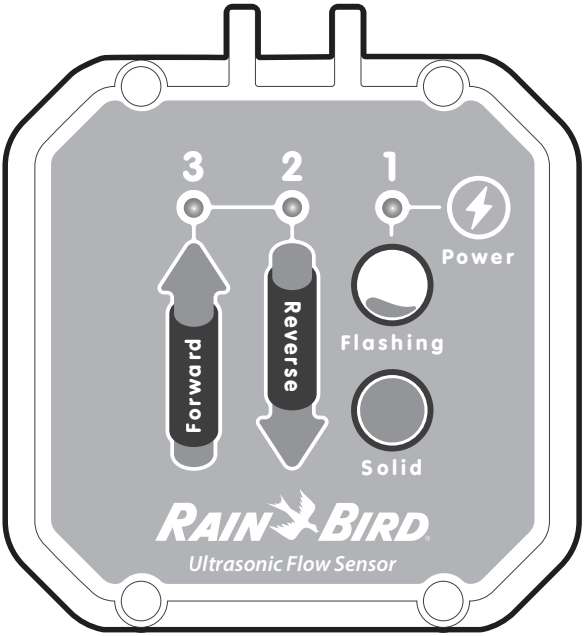
NOTE

Shown above is a common example, your controller's interface may differ, please consult the manual of your specific controller.

See below for the K-Factor and Offset values per the respective UFS Series model:

Model	Size	K	Offset	Flow Range
NPT Models				
UFS100	1 Inch	0.714	0.000	0.3 – 50 GPM
UFS150	1 ½ Inch	1.70	-0.316	0.5 – 110 GPM
UFS200	2 Inch	2.849	0.1439	1.0 – 200 GPM
BSP Models				
UFS100BSP	1 Inch	0.714	0.000	0.3 – 50 GPM
UFS150BSP	1 ½ Inch	1.70	-0.316	0.5 – 110 GPM
UFS200BSP	2 Inch	2.849	0.1439	1.0 – 200 GPM

5. UFS Series Indicator lights



Under standard operation, water flowing forwards through the system; indicator light 1 should be solid on, indicator light 2 should be off and light 3 should be flashing. Other indicator states are described on the following page.

1	Green LED		
State		Condition	Correction
Off		There is no power to the flow sensor or insufficient power for normal operation, or the Red and Black wires have been reversed at the flow sensor or on the controller.	Check the power and wiring.
Flashing		Power is connected and is sufficient for operation. Insufficient water in the pipe for proper operation.	Check to ensure the pipe is full of water.
Solid		Power is connected and is sufficient for operation. Pipe is full and there is sufficient water in the pipe for proper operation.	None (normal operation).

2	Red LED		
State		Condition	Correction
Flashing		Water is flowing in the reverse direction. LED will flash proportionally to the flow rate.	Check arrow on meter is in the same direction as expected flow. Check for reverse flow conditions.

3	Red LED		
State		Condition	Correction
Off		No forward water flow	Check controller program times or manual run condition. Check for closed valves or obstructions preventing water flow.
Flashing		Water is flowing in the forward direction. LED will flash proportionally to the flow rate.	None (normal operation).

6. Trouble Shooting

6.1 Initial Trouble Shooting

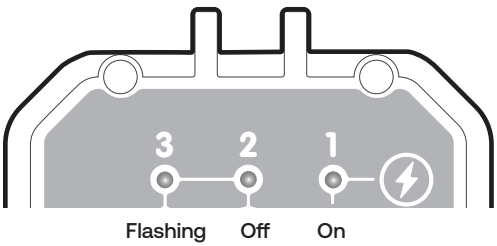
1. Confirm that the expected flow rates are above the minimum recommended flow rates for the UFS Series (see table below). This will usually purge any air out of the line.

Model	Size	Minimum Flow Rate
UFS100 / UFS100BSP	1 Inch	0.3 GPM
UFS150/ UFS150BSP	1 ½ Inch	0.5 GPM
UFS200/ UFS200BSP	2 Inch	1.0 GPM

2. Ensure that the UFS Series has been wired correctly, (see "Electrical Installation Procedure" on page 8)

3. Ensure there is flow in the system by running a manual irrigation program from the controller. Check to see if water is being emitted as expected.

4. Check the LED lights on the flow sensor upper body and ensure they indicate expected operating condition, as opposed to showing a non-full pipe or reverse flow. These light conditions would indicate problems like air in your line which would need to be solved before the remainder of trouble shooting.

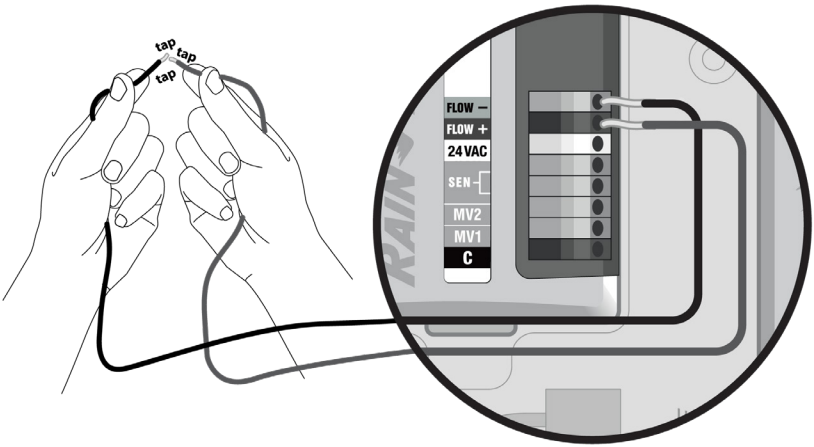


NOTE

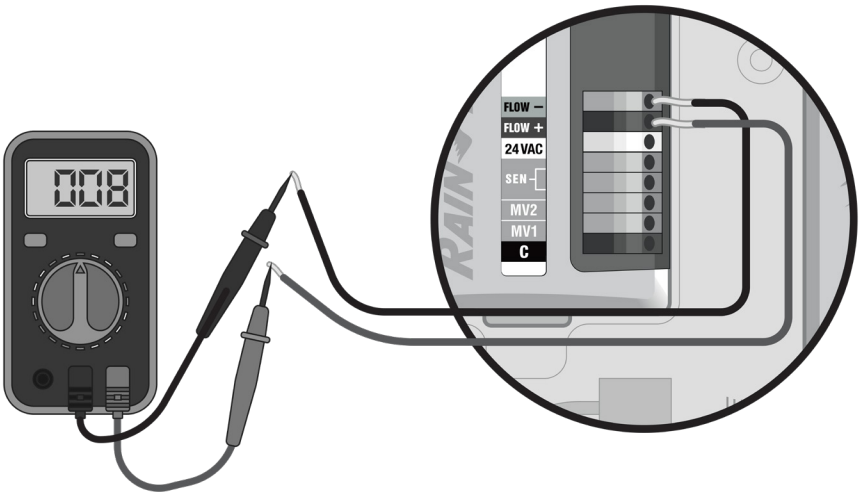
LED 3 will only be flashing if water is flowing through the system (see step 2).

6.2 Traditionally Wired Controllers

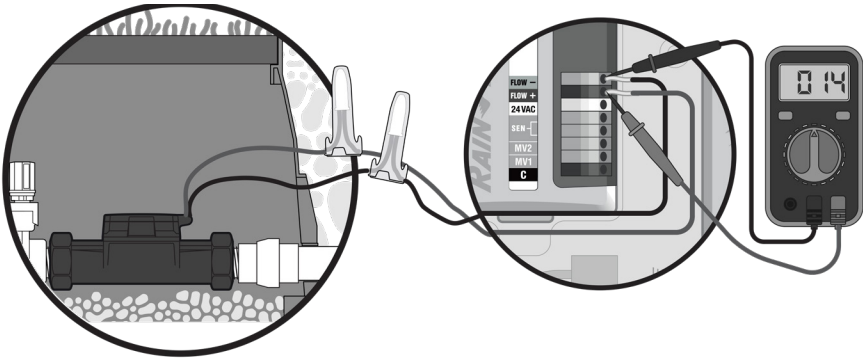
1. If the controller is not recognizing a flow input from this sensor, or if the lights are not on, test the controller itself by disconnecting the flow sensor, and very quickly and repeatedly short together the flow +/- terminals or wires that connected the flow sensor to the controller. Do this about once a second for 30 seconds. The controller should recognize this shorting as flow. If it does not, the problem is in the controller, and not the flow sensor or the wiring to it.



2. If the controller appears to be working, while the sensor is still disconnected measure the open circuit voltage on the controller's sensor input terminals. This voltage must be between 8...24V DC for the sensor to operate.

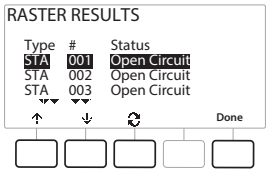


3. If the voltage is acceptable, reconnect the flow sensor to the controller and re-measure the voltage at the sensor input terminals. The voltage should drop slightly. If no drop is observed, the sensor is wired backwards, or there is a break in a wire or splice, or the sensor is open internally.



4. If the voltage drops to near zero, there is either a short in the wiring or splice, or the sensor is shorted internally.

5. If the voltage drops below 8V—but not low enough to levels indicating a short—there is most likely moisture penetration or corrosion in the wiring or in the sensor itself. See the manual for your specific controller for wiring trouble shooting and diagnostics.



6. If you are still experiencing issues with your UFS Series then contact Rain Bird Pro Support:

   +1 (800) 396-5166

   prosupport@rainbird.com

6.3 2-Wire Controllers (address based controllers)

Check the LED lights on the flow sensor upper body. The troubleshooting process will differ depending on whether LED is illuminated or not. Please refer to the appropriate section below to trouble shoot 2-wired controllers.

6.3.1 If Power is Reaching the UFS (LED 1 is illuminated)

1. If the lights are illuminating as expected, then the controller is successfully powering the UFS. If your controller is not registering expected flow readings, disconnect the UFS from the decoder.

2. Short (touch together) the wires from the decoder that connected to the UFS. Touch them together about once a second for a duration of about 30 seconds. The controller should register this as flow while you are performing this task.

3. If not recognized as flow, then double check the set-up of the UFS in the controller programming. The UFS must be established correctly and your controller's Flow Watch or equivalent must be on.

4. If the shorting is recognized as flow, then re-check your installation of the UFS. The polarity of the wiring must be correct (red to red, black to black), and the direction of the flow must be correct (see arrows on the UFS).

6.3.2 If No Power is Reaching the UFS (LED 1 is not illuminated)

1. If the UFS is not showing lights illuminated on the on board display, then it is not receiving sufficient power to operate. Disconnect the terminals (wires) from the decoder to the UFS. Measure the voltage of the decoder terminals. This voltage should be around 10 volts DC.

2. If the voltage is 10 volts DC but the UFS lights are not illuminating, then there may be a problem with the UFS unit. Double check that you have good splices and that the wires are connected at correct polarity. If this does not solve the problem, then contact Rain Bird for further assistance.

3. If the voltage is below 8 volts DC, then the UFS is not receiving sufficient power to operate. The problem may be your decoder, wire path, distance from the controller, or the controller itself. Consult the user manuals for these other components of your irrigation system for additional troubleshooting on these potential sources of the problem.

7. Specifications

Materials	• Body; GFN (Glass Filled Nylon) • Upper: PPO (Poly Phenyl Oxide)
Sizes	• 1” Female Threaded (NPT & BSP) • 1 ½” Female Threaded (NPT & BSP) • 2” Female Threaded (NPT & BSP)
LED Indicators	• Power (On/Off and Full Pipe Indication) • Flow (Flashing proportional to flow rate) • Reverse Flow
Pressure Rating	200 PSI Working Pressure
Temperature	32° - 150° F Working Temperature
Accuracy	± 2 % of Reading over recommended design flow range
Repeatability	± 2 % of Reading over recommended design flow range
Power	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 µA (typical)
	OFF State (V_{High}) = Supply voltage – (600 µA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	0.5...200 Hz
Output Pulse Width	5 msec ±25%
Environmental	• IP 68 / NEMA 4X • Suitable for pollution degree 4 environments • Suitable for outdoor use below grade • Suitable for use in submerged installations (< 3 ft. water)
Electrical Cable	4 feet of 2-conductor AWG 18 UL PTLC drain wire provided for connection to irrigation controller. Rated to 221° F. May be extended to a maximum of 2000 feet with 20 AWG (or larger) shielded flow sensing cable (Paige Electric P7162D or equal) suitable for direct burial, or appropriate for installation.

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SUPPLIER'S DECLARATION OF CONFORMITY

Responsible Party – U.S. Contact Information

Rain Bird Corporation

9491 Ridgehaven Court, Suite C,

San Diego, CA 92123, USA

www.rainbird.com

Unique Identifier: UFS100, UFS150, UFS200

FCC Compliance Statement

Note This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTICE:

Changes or modifications not expressly approved by Rain Bird Corporation could void the user's authority to operate the equipment.