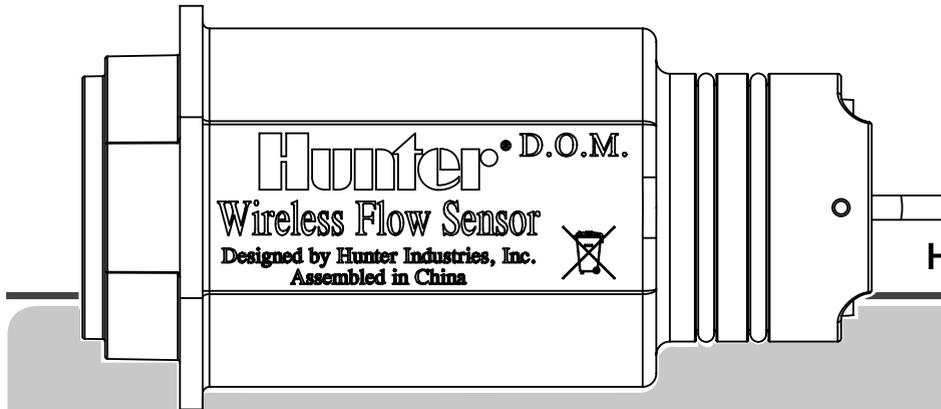


WIRELESS FLOW SENSOR



WFS
Hunter Wireless Flow Sensor

Owner's Manual and Installation Guide

Wireless Flow Sensor for Use with Compatible Hunter Controllers

Hunter®

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INTRODUCTION

The Hunter WFS allows flow-capable controllers, such as the Hunter ACC and I-Core, to monitor actual flow in irrigation systems wirelessly.

With proper setup at the controller, this allows the controller to record and report actual flow in liters or gallons. Flow-learning controllers can also use WFS to learn typical flow for each zone of irrigation, and monitor during watering for high and low flow conditions.

WFS equips controllers to respond on their own to incorrect system performance, preventing damage to landscape and wasted water resources.

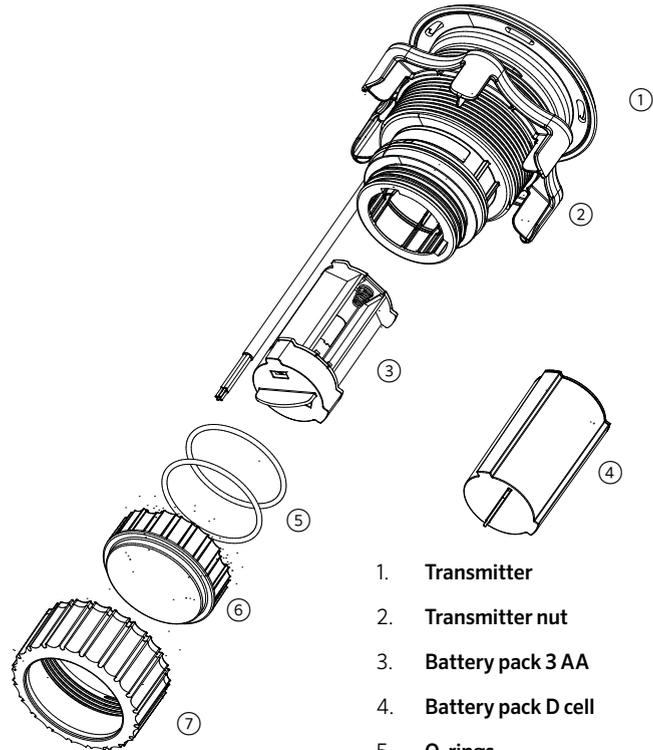
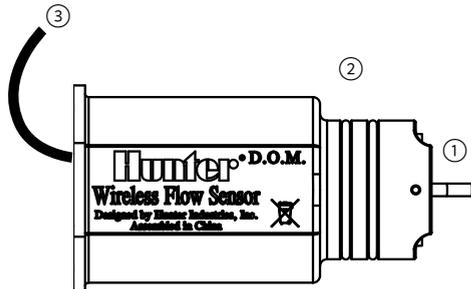
Need more helpful information on your product? Find tips on installation, controller programming and more.

 1-800-733-2823

WFS COMPONENTS

This section will give you a brief overview of some of the components of the WFS.

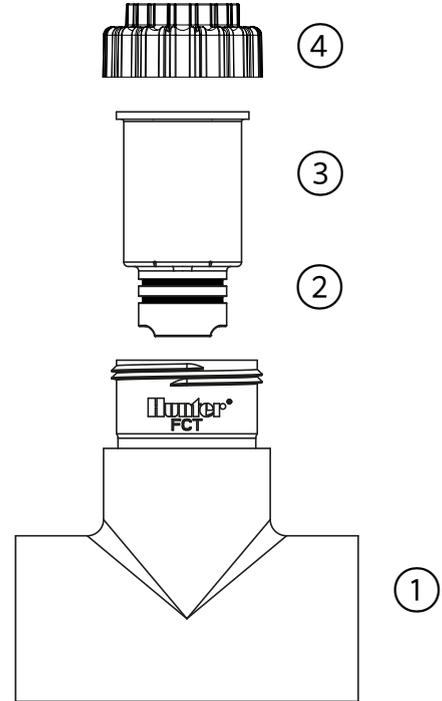
1. **Impeller:** Rotates when flow is occurring
2. **O-rings:** Provides sealing of sensor in sensor body
3. **Wire:** Black wire connects to the sensor transmitter



1. Transmitter
2. Transmitter nut
3. Battery pack 3 AA
4. Battery pack D cell
5. O-rings
6. Battery compartment cover
7. Battery compartment cap

WFS TEE ASSEMBLY

1. **Flow-Sync Tee:** The tee is installed into the irrigation system and houses the WFS
2. **O-Rings:** Provides sealing of plug in sensor body
3. **Plug:** (replace with WFS at installation, retain for winterization)
4. **Cap:** To seal plug to Flow-Sync tee



SYSTEM OVERVIEW AND WFS OPERATION

The WFS is typically installed near the point of connection, in an appropriately-sized FCT tee.

The WFS transmitter can connect to a host controller up to 500 ft/150 m away.

WFS sensors operate with an impeller positioned in the flow through the pipes.

As the impeller turns, pulses are generated to the controller, which converts them to gallons or liters, depending on the units of measurement selection in the controller.

WFS is a reporting device, and does not respond to flow situations on its own. WFS should be installed in conjunction with a master valve, which can stop flow in a damaged pipe when high flow conditions are detected and with an isolation valve for service and winterization.

Hunter controllers equipped with flow terminals will have approximately 20 VDC present on the flow sensor terminals, with no flow input.

When flow begins, the voltage will pulse. On a standard voltmeter, the voltage will appear to drop, or pulsate. On voltmeters equipped with a frequency counter, the pulse frequency can be measured in Hz.

Proper System Maintenance and Operation

It is important to ensure that your irrigation system is maintained and functioning properly for optimum performance. Check your irrigation system for any broken components or leaks, making sure that all sprinklers are operating within the pressure ranges recommended by the manufacturer.

INSTALLING THE WFS SENSOR AND FCT TEE

The WFS sensor is designed to install within an FCT tee fitting. See chart below for tee sizes and corresponding pipe diameters.

For international applications, optional slip-BSP adapters are available separately for sizes up to 75 mm.

HFS FCT Tee Fitting Models (All tees are glue/slip type fittings)			
Model	Material	Diameter (US)	Diameter (mm)
FCT 100	Schedule 40 (white)	1"	25 mm
FCT 150	Schedule 40 (white)	1.5"	37 mm
FCT 158	Schedule 80 (gray)	1.5"	37 mm
FCT 200	Schedule 40 (white)	2"	50 mm
FCT 208	Schedule 80 (gray)	2"	50 mm
FCT 300	Schedule 40 (white)	3"	75 mm
FCT 308	Schedule 80 (gray)	3"	75 mm
FCT 400	Schedule 40 (white)	4"	100 mm

BSP Adapters	
Diameter (mm)	Model
25 mm	795700
37 mm	795800
50 mm	241400
75 mm	477800

INSTALLATION

Install the FCT tee fitting first, then install the WFS sensor into the fitting.

Observe the following general rules when choosing the sensor location and preparing to install:

- Conduct a site survey to verify RF coverage. Install the wireless receiver at the controller. Install batteries in sensor/transmitter, and take to desired installation location.
- Spin impeller by hand, and have assistant verify that green light is flashing at the receiver when the impeller is rotated.
- Flush the irrigation system with the plug in place before installing the WFS sensor, to prevent damage to the impeller.
- Always install WFS together with a master valve to provide over-flow protection.
- Install the WFS and master valve as close to the water supply point of connection as possible.
- WFS requires a section of straight pipe on either side of the tee fitting to provide accurate measurement of flow. Tees, ells, and other fittings cause turbulence, which affects accuracy.
- There must be a length of straight pipe at least 10 times the diameter of the pipe upstream from the WFS (toward the water supply).
- There must be a length of straight pipe at least 5 times the diameter of the pipe in the downstream direction (toward the sprinklers).
- Example: FCT-200 is installed in a 2"/50 mm diameter pipe. The tee should have 20"/50 cm of straight pipe upstream, and

10"/25 cm straight pipe downstream.

- Install the WFS and FCT assembly in a sturdy irrigation valve box.
- WFS has an impeller, which will turn with the flow of water. If the water source is not a public water supply, add a filter upstream from the master valve and WFS to protect the impeller from rocks or stones, which may damage the impeller.

The FCT tee fitting is designed for glue ("slip") connection. Use approved PVC solvent-welding glue to install either slip x threaded fittings, or directly into the irrigation pipe if desired.

Metric thread adapters are available and are listed in this manual on page 7.

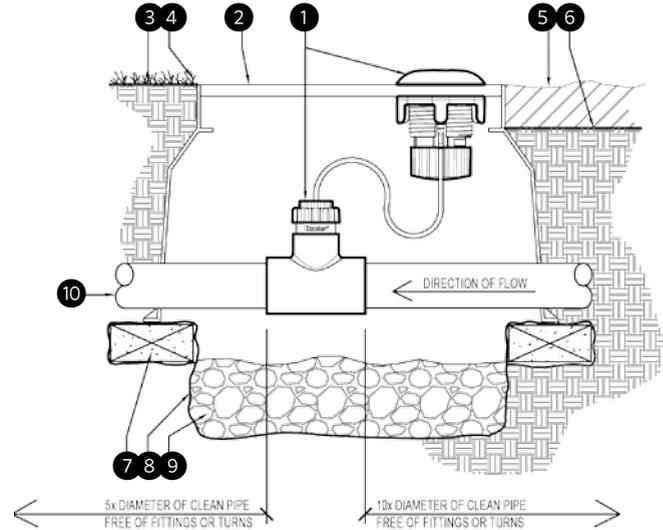


NOTE: Avoid excess glue when attaching fittings. Uncured blobs of excess glue on the fitting's interior can interfere with paddlewheel operation.

EXAMPLE OF INSTALL

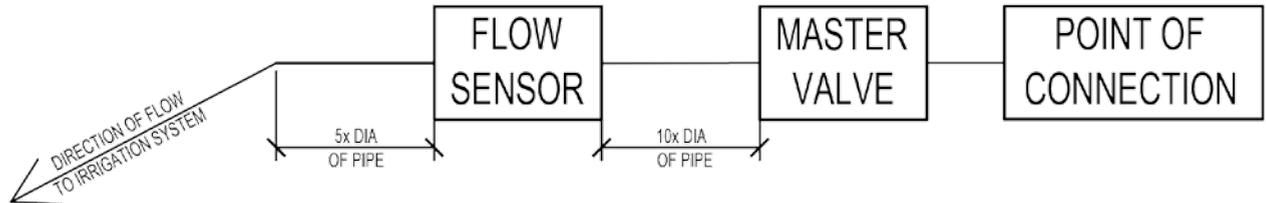
Legend:

1. Hunter Wireless Flow Sensor and transmitter (WFS)
2. Irrigation valve box per plan heat stamp lid with "FS" in Letters
3. Finished grade in turf
4. Adjacent turf (per plan)
5. Adjacent mulch (per plan)
6. Finished grade in planter bed
7. Brick supports (4)
8. Filter fabric-wrap twice around brick supports
9. ¾" washed gravel-4" min. depth
10. Irrigation lateral



NOTE: Contractor to cut 3-¼" dia. hole through valve box lid.

INSTALLATION DIAGRAM:



*NOTE: Not to scale.

INSTALLING THE WFS SENSOR INTO THE FCT FITTING

The FCT tee fitting comes with a plug that allows for installation of the FCT into the irrigation system prior to installing the sensor. This allows the FCT tee to be installed separately from the sensor and prevents damage during installation of the body.

3. Use pliers or a screwdriver and carefully pry the plug from the FCT tee. Save plug for winterization use.
4. Insert the sensor into the FCT. The sensor has a flat side that engages on the inside of the sensor body (figure 2).
5. Hand-tighten the WFS sensor cap. (figure 3).



NOTE: Do not attempt to remove the sensor plug or sensor while the system is under pressure.

To install the sensor into the body:

1. Turn the system pressure off.
2. Unscrew the cap from the top of the FCT (figure 1).



NOTE: Never glue the WFS sensor into the fitting! The threaded cap is designed to seal under pressure.

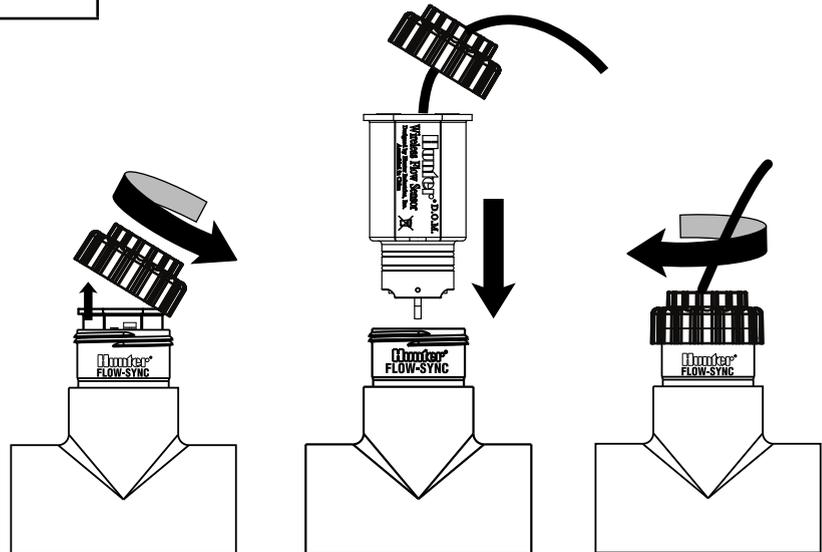


Figure 1

Figure 2

Figure 3

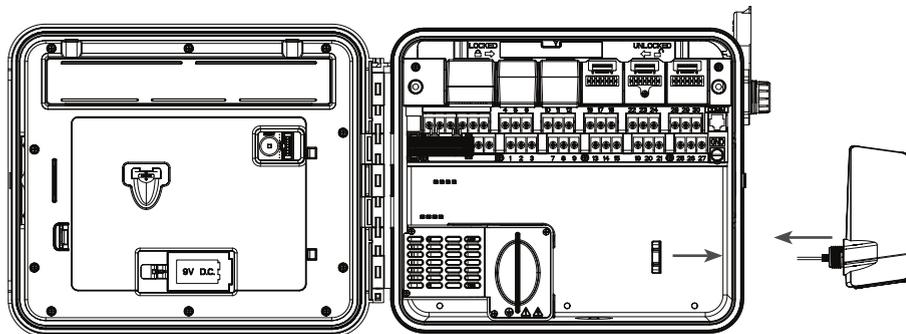
CONNECTING THE WFS TO THE IRRIGATION SYSTEM

WARNING! WFS is only designed for low-voltage connection to approved irrigation controller flow terminals. Do not install in high-voltage 120 V or 230 V circuits.

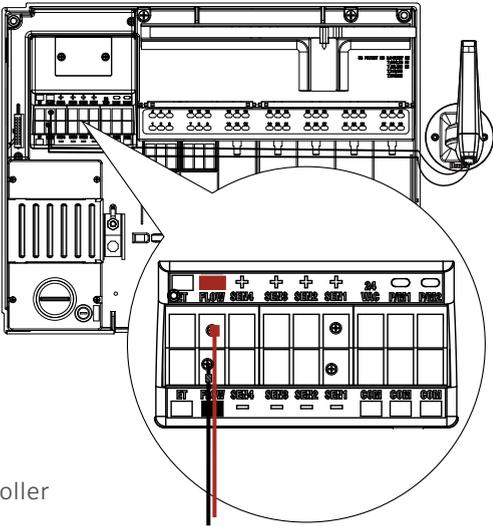
The transmitter may be placed up to 500 ft/150 m from the controller.

Connecting the receiver to the I-Core controller

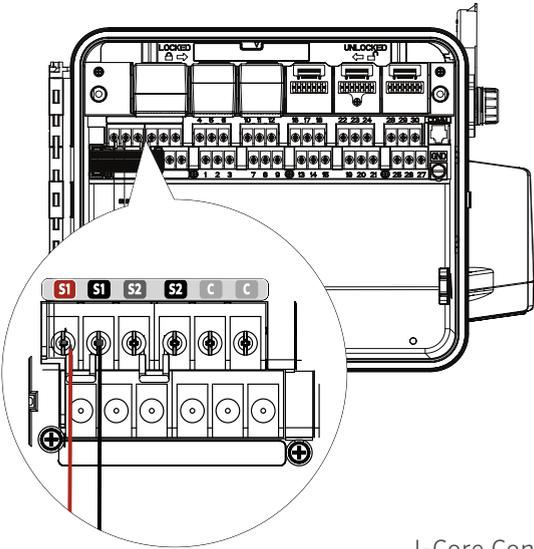
 **NOTE:** Remove nut from WFS receiver and insert threaded portion and wires through the knock out in the controller. Hand tighten nut until receiver is held firmly in place.



ACC & I-CORE® INSTALLATION



ACC Controller



I-Core Controller

PAIRING THE SENSOR AND RECEIVER

After applying power to either the sensor/transmitter or receiver, wait a minimum of 10 seconds for the power up sequence to complete. During this time there will be one or more LED blinks before the unit is ready for operation.

Low Battery Indication (Sensor/Transmitter):

The receiver LED will flash red twice every 3 seconds to indicate a low or discharged battery. This battery status update will occur only during flow conditions. The sensor/transmitter will operate for a minimum of 2 years on a D cell lithium battery and 6 months on the AA alkaline battery pack.

WFS OPERATING PERFORMANCE

When flow is occurring the sensor/transmitter will transmit sensor information at a maximum rate (depending on flow) of once every 5 seconds. The receiver LED will flash green at the same rate to indicate that flow is occurring.

Proper irrigation system design and operation assures optimum performance of the WFS in monitoring for potential high flow conditions. WFS is primarily designed to shut off the irrigation system in the event of a catastrophic system failure such as a main line or lateral line break. However, depending upon the design

of the irrigation system, the WFS can offer increased protection when components such as sprays or rotors are damaged or removed due to vandalism. The following may be helpful in making your WFS operate at its optimum level.

SYSTEM CONSIDERATIONS

Working with WFS

Hunter flow-capable controllers are designed to measure and record actual flow, shut off irrigation when a high flow condition occurs, and identify which stations caused the condition.

The controller's learn mode samples each station individually, and learns a typical flow for each station in the system. During actual irrigation, the flow can be observed at the controller. Actual flows are recorded and stored in the controller facepack. The ACC or I-Core controller will also compare actual flows to the estimated total of all active stations to see if there is an unacceptable difference, indicating a leak or break.

Consult the controller documentation closely for setup and operation of flow monitoring. It is vital to set the correct pipe size, so that the controller interprets the flow data correctly. It is also important to set adequate overage amounts (minimum is 15% over normal) and delays (default is one minute) to prevent false alarms.

Mainline Pressure Fluctuation

Some water sources may have varying pressure depending upon the demand for water upstream of the point of connection. During times of heavy demand, system pressure through the mainline may drop.

This is why the flow limit percentage and delay periods (set in the controller) are important, as false alarms lead to a lack of confidence in the system.

Additionally, excess air in irrigation piping causes the WFS impeller to spin freely during station startup, which may cause temporarily high readings. This problem may be reduced by installing check valves in the system, and by setting the alarm delay values to prevent premature alarms.

WINTERIZING THE SYSTEM

Winterization Process For Hunter WFS

Flow sensors can potentially be damaged by winterization blow-out techniques, and should be removed prior to injecting compressed air into the pipes.

WFS sensors are installed in FCT tee fittings. The flow sensor itself includes an impeller, which rotates in the flow on a metal spindle. When compressed air is used to blow standing water out of pipes, the impeller spins much more rapidly than usual, and can be damaged.

The FCT fittings are supplied with a blank plug (P/N 536100) installed inside the adaptor. This is removed when the actual flow sensor is installed.

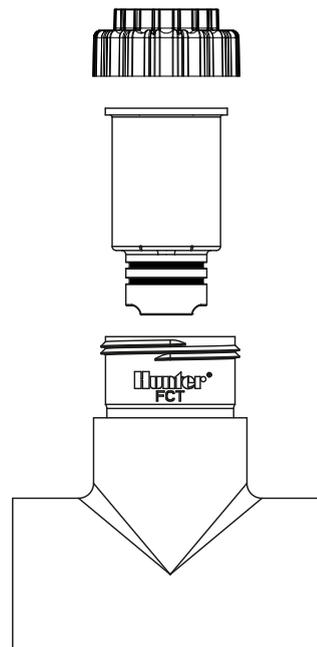
Save this blank plug and use it to temporarily replace the flow sensor during winterization blow out, to prevent damage to the sensor from high velocity air.

STEP-BY-STEP

1. Shut off the water supply
2. Unscrew the threaded cap
3. Remove the flow sensor assembly
4. Insert the blank plug, and replace the threaded cap

5. Proceed with the compressed air blow out
6. Reinstall the flow sensor and tighten threaded cap

The flow sensor will then be ready for the next irrigation season. Replacement plugs are available from Hunter Industries as P/N 536100.



TROUBLESHOOTING GUIDE

Problem	Cause	Solution
WFS not reading	Water shut off	Verify that no isolation valves are closed, and that the water source is on.
	Controller not configured	Check controller flow sensor setup. Enter sensor size (and location for sensor decoders) and other sensor information as required.
	Damaged sensor, Impeller damage (debris in water) or WFS electronics damage (lightning)	Turn off water supply, remove and inspect impeller. Verify that it spins freely and has no visible damage.
	Mismatching radio channels	Verify that the channel setting through the dials for the RX and TX units are identical.
	Obstructed line of sight	Verify that the TX and RX units are not placed more than 500 feet away from each other and there is clear line of sight.
	Radio interference	Verify that any electrical or RF interference sources are away from the controller. Change channels if required.
	Dead battery	Replace battery.

TROUBLESHOOTING

Problem	Cause	Solution
Receiver LED flashing green	Receiver is receiving flow data (green LED every 5 seconds)	Not a problem; normal operation during flow
Receiver LED flashing red	Low battery (2 rapid red blinks every 3 seconds)	Replace battery.
WFS not reading correctly	Controller configured incorrectly	Set correct flow sensor size and type at controller.
	Turbulent flow at sensor	Ensure that straight pipe is on either side of flow meter.
Frequent false alarms	Station settings too sensitive	Increase overflow percentage (and underflow, if available).
	Wide range of flows for a single station	Increase overflow percentages, and delay interval.

SPECIFICATIONS

Operating Specifications		
Temperature	Pressures	Humidity
0 to 140°F/60°C	up to 200 psi/13.7 bar	up to 100%

Flow Range		
Flow Sensor Tee Diameter	Operating Range (Gpm)	
	Minimum*	Suggested Maximum**
1"	2	17
1½"	5	35
2"	10	55
3"	28	120
4"	34	195

* Minimum recommended flow for the highest flow zone for your system.

** Good design practice dictates the maximum flow not to exceed 5 ft/sec. Suggested maximum flow is based upon Class 200 IPS plastic pipe.

FCT TEE FITTING SPECIFICATIONS

Maximum Distance Between WFS Transmitter and Receiver 500 ft/150 m

Dimensions					
FCT Tee Fitting	Height	Width	Length	Straight Pipe upstream (Ø x 10)	Straight Pipe downstream (Ø x 5)
FCT 100	4.8"/12 cm	2.3"/6 cm	4.5"/11 cm	10"/25 cm	5"/13 cm
FCT 150	5.4"/14 cm	2.3"/6 cm	4.6"/12 cm	15"/38 cm	8"/20 cm
FCT 158	5.4"/14 cm	2.3"/6 cm	5.1"/13 cm		
FCT 200	6"/15 cm	2.7"/7 cm	4.7"/14 cm	20"/50 cm	10"/25 cm
FCT 208	6"/15 cm	2.7"/7 cm	5.4"/14 cm		
FCT 300	7"/18 cm	4"/10 cm	6.2"/16 cm	30"/76 cm	15"/38 cm
FCT 308	7"/18 cm	4.2"/11 cm	6.4"/16 cm		
FCT 400	8"/20 cm	5"/13 cm	6.2"/16 cm	40"/1 m	20"/50 cm

WFS Calibration Factors

Hunter controllers allow selection of the correct pipe size by FCT model number. No further calibration is needed.

If "Other" is selected, K-factor and offset information may be entered directly. Following are K-factor and offset values for best results with each available FCT model.

Flow Sensor Values

Hunter Flow Sensor	K-Factor	Offset
HFSFCT100	0.44	0.39
HFSFCT150	1.13	0.00
HFSFCT158	0.92	1.22
HFSFCT200	2.13	0.23
HFSFCT208	1.72	1.70
HFSFCT300	4.61	0.18
HFSFCT308	5.87	1.07
HFSFCT400	8.77	0.48

RATINGS

WFS-R

For connection to Hunter controllers only
24 V~ 50/60 Hz 10 mA 0.02W
IP 43
Maximum Operating Temperature : 50 C

WFS-T

Batteries: 3 x 1.5 V AA or
Hunter Lithium pack WFLITHBATT
IP 67
Maximum Operating Temperature : 50 C

FCC NOTICE

This device complies with part 15 of the FCC Rules. (1) This device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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 receiver.
- 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.

The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

INDUSTRY CANADA NOTICE

This device complies with Industry Canada License-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTES

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