ADS® FlowAlert™ Installation, Operation, and Maintenance Manual

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CHAPTER 1

Introduction

The *ADS® FlowAlert™ monitor* measures and records flow depth in sanitary sewers, storm sewers, pump stations, and other environments at strategic locations to assist municipalities and other industry in detecting and monitoring backups, overflows, and surcharges. It also supports high and low depth alarming and system event notification. These capabilities are essential to providing ongoing oversight and maintenance as well as ensuring timely notification and rapid response in potentially critical situations.

The battery-powered, microprocessor-based FlowAlert monitor displays exceptional accuracy and reliability in measuring and detecting changes in flow depth, even in the most challenging monitoring environments.

This manual offers detailed instructions on installing the FlowAlert monitor and supporting devices, providing (wireless, landline, and direct, on-site) communication with the monitor, and performing routine maintenance and troubleshooting on the system.

Warnings and FCC Compliance

Manhole and sewer system work involves confined space entry and is inherently dangerous. Therefore, installers and technicians should comply with all federal, state, and municipal regulations concerning confined space entry.

In addition, personnel installing and maintaining this equipment should follow all guidelines presented in this manual concerning monitor installation and maintenance. Failure to strictly adhere to these guidelines can result in personal injury and/or damage to the monitor.

> **Note:** FlowAlert monitors are *not* intrinsically safe and, therefore, should not be used in areas containing known atmospheric hazards.

Communications Disclaimer

ADS monitoring and alarming products use publicly available landline telephone or third-party GSM/GPRS wireless communication services and, therefore, cannot control the availability of these services. For applications where ADS systems provide alarms, problems at the carrier level can delay or totally prevent the delivery of alarm messages. If the user has questions regarding the availability of services in an area or outages/interruptions that may have affected service, the user should contact the telephone company or wireless provider directly.

FCC Part 68 Compliance (*applies only to Landline Units*)

To comply with the Federal Communications Commission (FCC), ADS Environmental Services® provides the following information concerning FlowAlert flow monitor installation and operation.

This equipment complies with FCC Rules, Part 68. It bears a label displaying the FCC Registration Number. The user must provide this information to the telephone company if requested.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of this equipment. If this occurs, the telephone company will provide advance notice so the user can make necessary modifications to maintain uninterrupted service.

In the unlikely event that this equipment harms the telephone network, the telephone company will notify you that temporarily discontinuing telephone service may be required. Notification will occur in advance of discontinuation, or as soon as practically possible. They will also inform the user of the right to file a complaint with the FCC if necessary.

This equipment may not be used on public coin phone service provided by the telephone company. Connection to party line service is subject to state tariffs.

FCC Part 15 Compliance

This equipment has been tested and found to comply with the limits for a Class A 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 should try to correct the interference by one or more of the following measures:

- Reorient or relocate the radio or television antenna.
- Move and/or increase the distance between the monitor and the radio or television.

If these suggestions do not help, the user should contact the ADS Client Services Department at adssupportcenter@idexcorp.com or 877-237-9585 *or* an experienced radio/television technician.

GSM/GPRS Modem Information

The wireless version of the ADS FlowAlert contains a third party GSM/GPRS modem manufactured by Enfora, Incorporated. The modem model number is GSM0108IG001, description "Enabler II-G Quad-Band GSM/GPRS Radio Modem", FCC ID MIVGSM0108. Users of products containing the GSM0108 modem must be aware of the following:

Contains FCC ID: MIVGSM0108

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Installation and Configuration

Following is the general procedure for installing and configuring a FlowAlert monitoring system. Refer to *Chapters 3 through 6* for detailed instructions and information.

- **Investigate the Site Characteristics**
- **Install the Pressure Depth Sensor**
  - Assemble the Ring (*when applicable*)
  - Mount the Sensor to the Ring or Special Bands (*when applicable*)
  - Secure the Sensor Cable to the Ring or Special Bands (*when applicable*)
  - Install the Pressure Depth Sensor
  - Secure the Sensor Cable in the Pipe and the Manhole
- **Install the Float Switch(es) in the Manhole**
- **Connect the Sensor and Float Switch to the Monitor**
- **Attach the Dryer Tube to the Monitor**
- **Establish Wireless, Telephone, or On-Site Communication with Monitor**
- **Configure the Monitor (*using Profile® Software*)**
  - Create the Monitor Location
  - Create the Installation Table (when necessary)
  - Select and Edit the Devices
- **Set the Communication Parameters (*Profile*)**
- **Activate the Monitor (*Profile*)**
- **Run Diagnostics and Perform Confirmations (*Profile*)**
- **Install the Monitor in the Manhole**

Product Warranty

This section includes the warranty information for the ADS FlowAlert.

New Product Warranty

All new products manufactured by ADS will be free from defects in material and workmanship for up to one (1) year following the date of shipment from ADS. During this warranty period, upon satisfactory proof of a defect, the product may be returned for repair or replacement, at ADS's sole option. No returns will be accepted unless the Owner has prepaid shipping and has received a prior authorization return number from ADS. Please contact ADS to obtain an authorization return number. Warranty repairs and replacements will be performed only by ADS. Any unauthorized repair or replacement will void this product warranty. Any repair or replacement will be covered by this new product warranty for ninety (90) days from the date that such repaired or replaced product is shipped from ADS. This warranty is available only if the product has been installed and operated in accordance with the procedures outlined in the ADS Operations and Maintenance Manual. This warranty does not apply to damage by catastrophes of nature, fire, explosion, acts of God (including, but not limited to, lightning damage and power surges), accidents, improper use or service, damage during transportation, or other similar causes beyond ADS's control.

Out-of-Warranty Product Repairs

After the new product warranty expires, a product may be returned, at the owner's prepaid expense, to ADS for repair. The owner will pay for all parts and labor associated with the repair. Any repair

part will be covered by the new product warranty for 90 days from the date of shipment from ADS.

Troubleshooting Fee

ADS will charge a troubleshooting fee if the reported product defect cannot be found and/or the reported defect is not due to a defect in materials or workmanship.

Shipping

All repaired products will be returned via surface transportation prepaid by ADS. Import duties, fees, taxes, and other related charges are the responsibility of the owner.

THIS IS THE ONLY WARRANTY FOR ADS PRODUCTS. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. PRODUCT REPAIR OR REPLACEMENT IS THE ONLY REMEDY. IN NO EVENT WILL ADS BE RESPONSIBLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, OR SPECIAL DAMAGES.

CHAPTER 2

System Overview

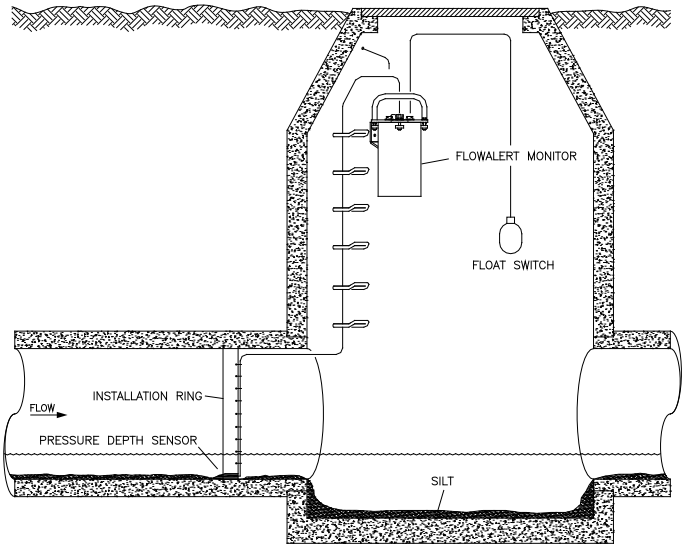
The ADS® FlowAlert™ monitor is a data logger and alarm system that uses up to two devices to measure or detect fluid levels: a pressure depth sensor and up to two float switches. The pressure depth sensor is a gauge-type sensor provided by ADS for mounting in the pipe or on the manhole or vessel wall. The float switch(es) is suspended in such a way that it becomes buoyant and trips its internal contact at a predetermined, fixed elevation.

The monitor receives the raw pressure depth data and float state from the sensor and float, respectively, based on a defined time interval. The float also can provide instantaneous notification when changes in state occur. The monitor stores this data in memory and can use the data to generate an alarm. The multiple depth devices help enhance these alarming capabilities.

The monitor memory can store a little over 2 years of data logged at a 15-minute sample rate. This data is available to the user for collection, further processing, analysis, and reporting. These reports can assist municipalities and other industry in planning improvements and additions to sewer systems and providing information for the overall management of the sewer system.

The FlowAlert monitor, pressure depth sensor, and float switch are primarily designed for use in sanitary and storm sewers and pump station wet wells. The monitor mounts to the manhole rim or wall slightly below the manhole cover. The pressure depth sensor typically attaches to a ring installed in the sewer pipe a short distance upstream from the manhole invert at a location called a

monitoring point. The float switch hangs suspended in the middle of the manhole and is secured just below the manhole rim by its cable. This equipment displays exceptional durability and accuracy, even under harsh and turbulent flow monitoring conditions.



Typical FlowAlert system installation

Communication between the monitor and the user's office or field computer can occur over GPRS (remote, wireless communication), a telephone line (remote, landline communication), or a direct connection cable (on-site communication).

Special software called **Profile**® enables the user to configure and communicate with the monitor for activation, data collection, and diagnostic purposes. Configuration involves defining the location information file (LIF) for storage in the user's local directory and building the code and variables for the site. The LIF contains information such as pipe characteristics, monitor identification, selected devices, alarm/event notification settings, data log rate, and other parameters necessary for measuring and monitoring the flow depth both accurately and efficiently.

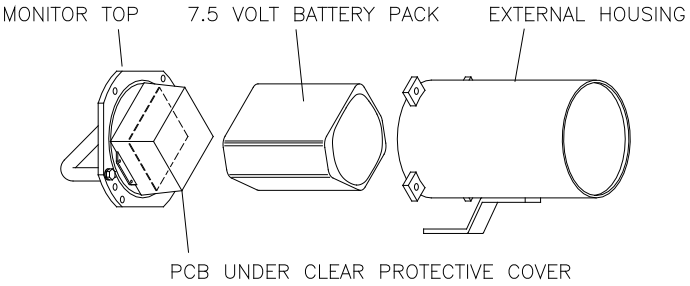
Activation involves downloading the firmware (embedded software) code and site-specific information from the LIF (stored in the user's local directory or network drive) to the monitor. It also includes initiating monitor activities such as taking sensor readings, logging flow data, and managing event notification and alarming.

Profile also enables the user to process the flow data, generate graphical and tabular reports, organize data in the user's local directory, and maintain logs of communication between the monitor and the user's PC.

> **Note:** Refer to the *Profile User's Guide* (#950015**) for more information.

ADS FlowAlert Monitor

The ADS FlowAlert monitor is a waterproof, airtight, cylindrical, marine-grade aluminum canister housing a printed circuit board and an alkaline battery pack.



Typical FlowAlert flow monitor with printed circuit board (left) and battery removed from enclosure (right)

The following table contains the available FlowAlert Monitors:

Part Number	Description
6000-FAW	Internal Battery, Wireless Modem
6000-FAL	Internal Battery, Landline Modem

Printed Circuit Board

The circuit board, attached to the inside of the monitor lid, supports the following:

- Digital Signal Processing
- Input Device (pressure depth and float switch) Processing
- Communications (modem and radio)
- Voltage Regulation

Printed circuit board (PCB)

Digital Signal Processing

The Digital Signal Processor (DSP) contains the central processing unit (CPU). As the source of all monitor activity, the processor is responsible for all of the monitor's high-level functions, including the following:

- Scanning the sensor and float switch inputs to retrieve data for processing and storage
- Maintaining the monitor time and date
- Performing power management
- Transmitting the stored and current data to the user's PC
- Initiating event and alarm notification

The DSP allocates portions of memory to firmware (permanently stored software) and data storage. A seven-segment (SS) light-emitting diode (LED) located on the board indicates the current monitor communication and operational activity. The DSP also

includes the monitor clock, random access memory (RAM), and Flash. The monitor uses RAM while taking readings and processing the flow data. The RAM then downloads the data to Flash, *or non-volatile memory*, which also stores the monitor firmware and configuration information. Flash ensures the monitor maintains the data during battery pack replacement or a power failure.

Input Device Processing

The input component of the board controls the processing of the pressure depth sensor and the float switch. It initiates pressure depth sensor readings and requests for the float switch state. The board also processes the solicited (and unsolicited) data received and stores it in the monitor memory.

Communications

The communications component of the board provides multi-tasking/handling of all communications processes. It interfaces to a landline or wireless modem (based on the model of FlowAlert), as well as manages local serial communication requests. The communications component also is responsible for gathering real-time information from the other components on the board.

Voltage Regulator

The voltage regulator regulates and distributes power supplied from the battery pack to the analog, communications, and DSP components on the board.

Communications

ADS offers two remote communication options for the FlowAlert monitor. The first option involves wireless communication over the cellular network using *GPRS* (General Packet Radio Service) through the modem in the monitor. GPRS facilitates high-speed, low-cost, efficient TCP/IP communication in areas with AT&T

wireless coverage. The second option involves telephone communication over land lines using the modem in the monitor.

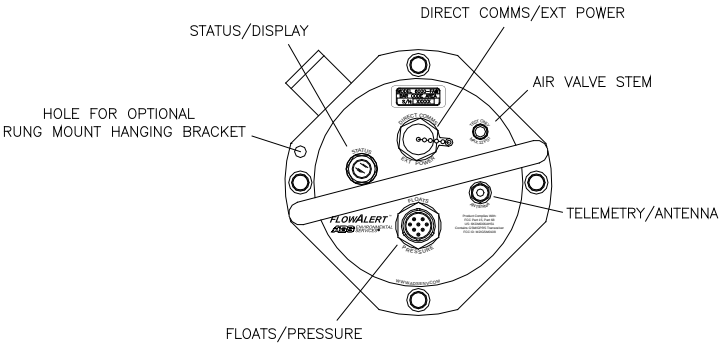
Local communication with all FlowAlert monitors is available through a direct serial cable connected to the **DIRECT COMM/EXT POWER** port.

Connectors

Connectors located on top of the monitor receive the following cabling and components:

> **Note:** Connectors available depend on the FlowAlert model. Refer to the appendices for specifics on different model types and functionality.

- Pressure depth sensor/float switch(es)
- Direct (on-site) communication/external power
- Telephone/antenna (wireless) communication
- Air pressure valve (*for testing purposes only*)



Connector ports on top of FlowAlert monitor

Power

The ADS FlowAlert Monitor is powered by an internal 7.5 volt alkaline battery pack (ADS p/n 6000-0004) mounted at the bottom of the enclosure. This battery pack provides the power for operating the monitor, handling communication, and sustaining the monitor wake-up circuitry. The monitor measures the battery voltages, and **Profile** provides a user-defined setting to ensure the monitor signals a warning when the available power is low.

Battery voltage is logged during most communication sessions and also is available on demand when performing diagnostics.

FlowAlert 7.5-volt battery pack

Flow Depth Devices

The FlowAlert monitor uses measurement devices to gather flow depth data or status. The pressure depth sensor obtains static gauge pressure data for use in determining the depth of the flow. The float switch provides status (or *state*) information regarding its position to indicate whether the depth of the flow has exceeded beyond or fallen below a certain threshold.

Pressure Depth Sensor

The pressure depth sensor (ADS p/n 3704-0010/15/16 – representing 5/15/30 psi pressure sensor ranges, respectively) mounts to a stainless steel expandable ring or stainless steel band installed in the pipe upstream from the manhole or to a small stainless steel band secured to the manhole/wet well wall.

Pressure depth sensor

A sewer system's hydraulics are much more stable and uniform in the incoming pipe than in the manhole invert or outgoing pipe. Installing it upstream minimizes hydraulic effects and erroneous data readings caused by flow waves and obstructions in the manhole. Therefore, install the sensor in the incoming pipe (at or near the bottom of the pipe) for accurate depth measurements.

If accurate depth measurements are not necessary or applicable, mount the sensor to the wall of the manhole or wet well.

The pressure depth sensor can measure depths greater than a full pipe that might extend up into the manhole (i.e., surcharges). The FlowAlert supports pressure sensors with ranges from 0-5 (11.5), 0-15 (34.5), and 0-30 PSI (69.0 ft).

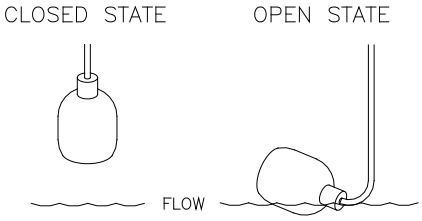
The pressure depth sensor contains a differential pressure transducer that transmits an output voltage corresponding to the difference between the water pressure and the air pressure in the sewer. It measures water pressure through a port on the underside of the sensor and air pressure using an integral vent tube running to the top of the manhole. The monitor calculates the depth of the flow by reading the difference in pressures.

Float Switch

The float switch typically is anchored just below the manhole rim and hangs suspended in the center of the manhole from its supporting cable at an elevation designated in the project requirements. It includes an integrated switch and weight system that enables the float to change position (which activates a switch) when the flow elevates to and recedes from a specific elevation in the manhole. This elevation represents the point at which the state of the switch changes. The FlowAlert receives notification from the float whenever the change in state occurs.

High and High-High float switches

When the float is suspended vertically above the fluid, the internal switch remains in a *closed* state. If the depth level rises and contacts the end of the float, the internal weight allows the float to begin to pivot into a horizontal position. If the end of the float rises slightly above this position (5 degrees above horizontal), the switch transfers to an *open* state and communicates the change in state to the FlowAlert monitor for logging and/or alarming purposes. When the depth level recedes and the end of the float falls below the switch threshold, the switch returns to a closed state once again.



Float switch changing orientation with rising flow

CHAPTER 3

Pressure Depth Sensor and Float Switch Installation

The ADS® FlowAlert™ monitor, pressure depth sensor, and float switch are primarily designed for monitoring flow in sanitary, combined, storm sewers, and pump station wet wells. The monitor mounts to the manhole rim or wall slightly below the manhole cover.

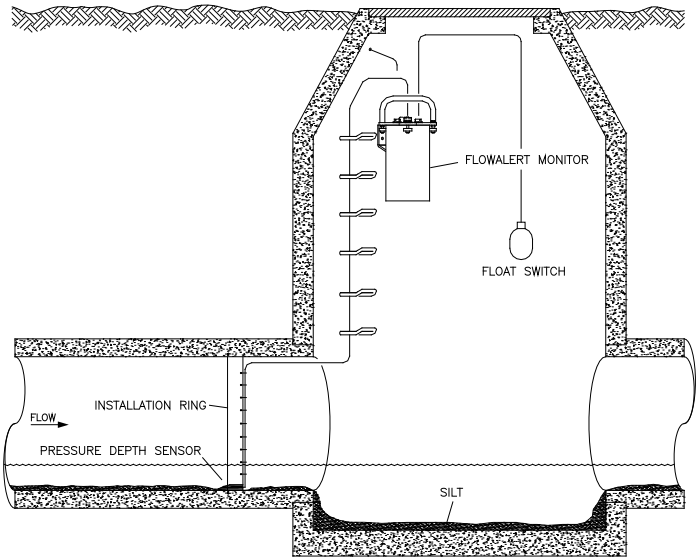
The pressure depth sensor can mount to a stainless steel, expandable ring or a stainless steel band installed in the sewer pipe a short distance upstream from the manhole invert. A sewer system's hydraulics are much more stable and uniform in the incoming pipe than in the manhole invert or outgoing pipe. Installing the sensor upstream minimizes the hydraulic effects and erroneous data readings caused by conditions in the pipe and the manhole.

The pressure depth sensor also can mount to a short, stainless steel strap secured to the wall of the manhole or wet well when flow depth measurements in the pipe are not applicable or necessary.

The float switch hangs from its cable in the center of the manhole, and the cable is secured just below the manhole rim. Hanging the float in the center prevents it from contacting or becoming tangled with other objects in the manhole that may keep it from pivoting properly when the flow rises or recedes.

Following are the basic steps for installing the FlowAlert monitor, pressure depth sensor, and float switch at a location:

- **Investigate the Site Characteristics** These characteristics include pipe size and shape, silt level, flow depth, and manhole depth, environment, and obstructions.
- **Install the Sensor** The procedure varies based on the sensor mounting location:
  - ❑ **In the Pipe** This process primarily includes assembling the ring (for standard installations) or preparing the band (for special installations) to which the pressure depth sensor attaches, securing the sensor cable to the ring or band, and installing the ring or band in the pipe.
  - ❑ **In the Manhole/Wet Well** This process primarily involves attaching the pressure depth sensor to the mounting strap and mounting the strap in the manhole/wet well.
- **Secure and Connect the Cable** This procedure involves securing the pressure depth sensor cable from the ring, band, or strap to the monitor location in the manhole.
- **Install the Float Switch in the Manhole** This process includes lowering the float switch to the proper elevation in the manhole and then securing the float switch cable to the appropriate location in the manhole.
- **Connect the Sensor and Float to the Monitor** This involves connecting the pressure depth sensor and float switch(es) to the FlowAlert monitor.



Typical FlowAlert flow monitor, sensor, and float installation

This chapter contains detailed instructions for properly installing a pressure depth sensor and a float switch(es) in sanitary, storm, and combined sewer lines; manholes; and pump station wet wells.

> **Note:** Manhole and sewer system work involves confined space entry and is inherently dangerous. Therefore, installers and technicians must comply with all federal, state, and municipal regulations concerning confined space entry. ADS is not responsible for any injuries, damages, claims, or liability resulting directly or indirectly from the use of this installation guide or the installation of any ADS equipment.

Investigating Site Characteristics

Before beginning installation activities, conduct a thorough investigation of site conditions. The physical characteristics of the pipe affect the flow and determine the procedure for installing the pressure depth sensor. The manhole environment can affect the installation and effective operation of the float switch(es). Consider the following factors and perform the following activities when installing the sensor, float switch(es), and monitor:

- **Sensor Installation Method** The mounting location determines the installation method employed for installing the pressure depth sensor. For pipe installations, pipe size and shape also influence the method used.

  - **Standard Installation** Select this option to install the sensor in a *round* pipe from *8 to 48 inches in diameter*. *Standard installations* involve attaching the sensor to an adjustable stainless steel ring that mounts inside the pipe.

  - **Special Installation** Select this option to install the sensor in a *non-round pipe* or a *round pipe larger than 48 inches in diameter*. *Special installations* involve attaching the sensor to a steel band secured to the inside of the pipe.

  - **Wall Installation** Select this option to install the sensor in a manhole or pump station wet well. *Wall installations* involve attaching the sensor to a steel strap secured to the wall.

- **Pipe Height and Width** Measure and record the horizontal and vertical pipe dimensions.

> **Note:** Specific measurements for pipe height, width, and shape are required only if the project requires using the depth data to calculate flow quantity. All relevant pipe dimensions and measurements must be available for entry in the **Profile**® software during monitor configuration and activation.

- **Pipe Shape** Taking the appropriate measurements that precisely reflect the exact pipe shape is essential to obtaining accurate flow calculations. Therefore, irregular-shaped pipes will require additional measurements if accurate flow measurements are essential. Refer to the *Profile User's Guide* (#950015**) for more information.
- **Manhole Depth** Measure the distance from the top of the manhole to the bottom of the manhole invert. This measurement may be required to determine the elevation for the float switch. Distances beyond 35 will require extension cables for the sensor. Manhole depth and expected surcharge levels also determine the PSI of the pressure depth sensor to install.
- **Manhole Obstructions** Carefully inspect the manhole for possible obstructions that may pose a hazard to the hanging float switch or prevent the float from freely changing position when the flow is rising or receding. Obstacles or obstructions, such as ledges, can create an opportunity for the float to become lodged, producing an inaccurate representation of the float switch state.

Installing the Sensor in the Pipe

This section includes the procedures for performing pressure depth sensor installation using one of the following methods:

- Standard Installations
- Special Installations

Standard Installation

Performing a standard sensor installation involves the following process:

- Gathering the parts and supplies
- Gathering the tools and equipment
- Assembling the ring
- Mounting the sensor on the ring
- Securing the cable to the ring
- Installing the ring in the pipe

Gathering Parts and Supplies

Obtain the following supplies before installing the ring and sensor to prevent any costly delays. When ordering, specify the FlowAlert flow monitor ring-mounted installation hardware.

Quantity	Description	ADS Part Number
1	FlowAlert flow monitor	6000-FAW or 6000-FAL
1	monitor mounting bracket	I40-0003
1	pressure depth sensor with two 4-40 x 5/16-inch stainless steel screws	3704-0010-40 (5 psi) 3704-0015-40 (15 psi) 3704-0016-40 (30 psi)
1	replacement dryer tube	3704-0032
1	direct connection cable	5000-0601
15	¼- × 2 ¼-inch stainless steel anchor bolts	I01-0002
1	3/8-inch x 3-inch anchor bolt and nut	I01-0003
2	3/8-inch x 1-inch stainless steel hex bolts	I01-0001
4	3/8 – 16 stainless steel hex nuts	I15-0002
5	3/8-inch stainless steel flat washers	I55-0001
1	3/8-inch x 2-inch studs	I01-0009
15	plastic push mounts	I01-0006
15	11-inch cable ties	I05-0003
25	4-inch cable ties	I05-0001
15	8-inch cable ties	I05-0002
15	anchor cable ties	I05-0004
1	stainless steel ring (*sized for pipe*)	I25-0081 – I25-0094
1	stabilizer sliding bracket	I25-0002
1	spreader assembly	I10-0003
1	18-inch stainless steel crank handle	I10-0012

Gathering Tools and Equipment

Gather the following tools for the installation:

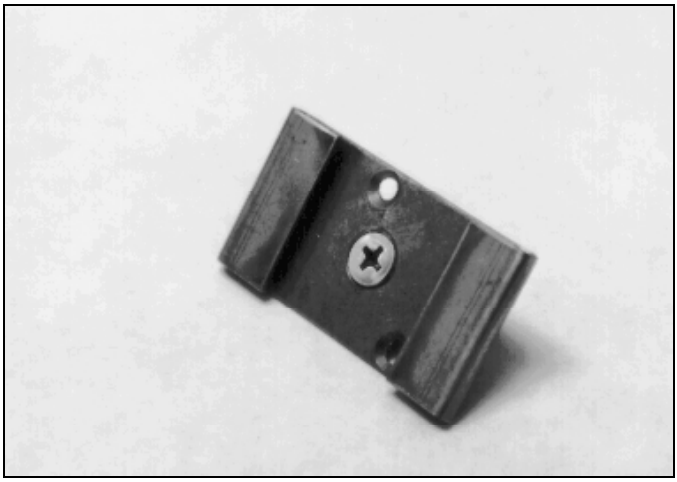
- Battery-powered hammer drill with assorted bits – including the following, at a minimum:
  - ❑ ¼-inch x 6-inch masonry bit
  - ❑ 3/8-inch x 4-inch (minimum length) masonry bit
  - ❑ 5/16-inch carbide-tipped bit (include smaller bits)
- 4-pound hammer
- Rubber mallet
- 24-inch carpenter's level
- 7/16-inch nut driver
- Wrenches
- Screwdrivers (flathead and Phillips head of assorted sizes)
- 3/8 – 16 thread tap
- Diagonal wire cutters
- Folding carpenter's rule with a brass slide
- Rubber stretch tape

Assembling the Ring

The pressure depth sensor mounts to a stainless steel ring that is installed in the pipe. Several different ring sizes exist, and each ring is adjustable within about 3 inches to fit pipes of different diameters. Assemble the ring as follows:

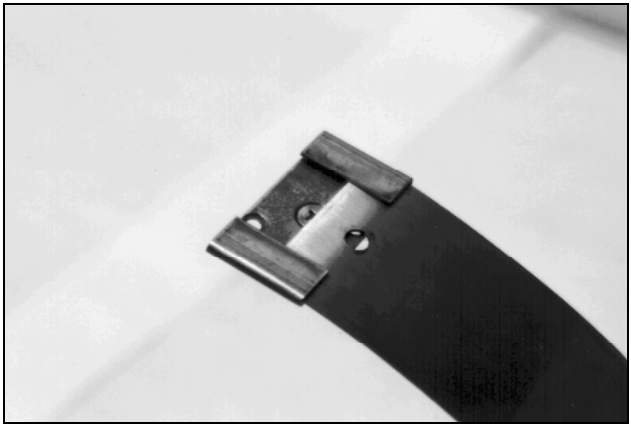
> **Note:** These instructions generally apply to overlapping rings. However, the 8-, 10-, and 12-inch rings do not have an overlapping section. Therefore, these non-overlapping rings will require small modifications to the assembly process. To assemble a non-overlapping ring, proceed directly to step 4.

1. Insert the spreader mechanism screw through the hole in the center of the ring stabilizer. Ensure that the head of the screw fits into the countersunk hole.



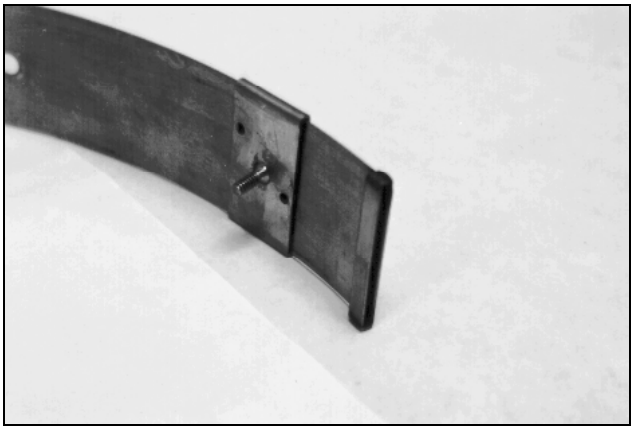
Ring stabilizer with spreader mechanism screw

2. Slide the open end of the ring (end without the welded metal band) through the flanges in the ring stabilizer, making sure the flanges face the outside of the ring and the spreader mechanism screw faces the inside of the ring.



Sliding the ring stabilizer onto the ring

3. Slide the ring stabilizer all the way around the ring until it is about 4 inches from the welded metal band at the other end of the ring.



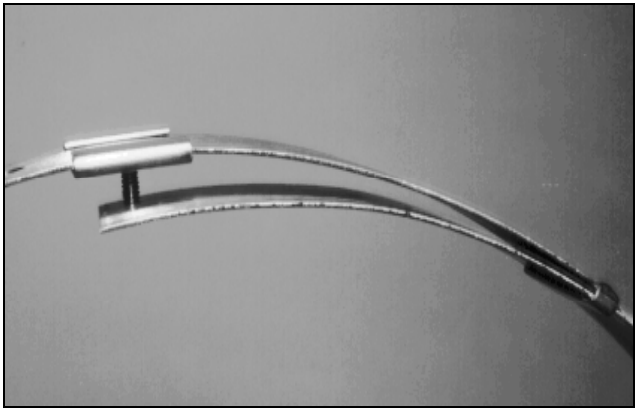
Moving the ring stabilizer into position

4. Position the ring with the downstream edge (edge with the holes) facing you.

Note: Steps 5 and 6 apply only to overlapping rings. Proceed directly to step 7 for non-overlapping rings.

5. Slide the open end of the ring through the slot in the welded band of the ring until it overlaps about 4 inches.

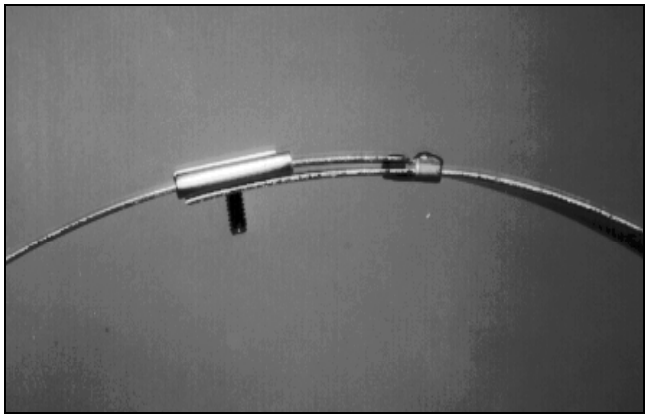
6. Spread the ring sections apart so that you can slide the ring stabilizer with the spreader mechanism screw into the gap.



Moving the ring stabilizer into position

7. Perform the following based on the ring type:

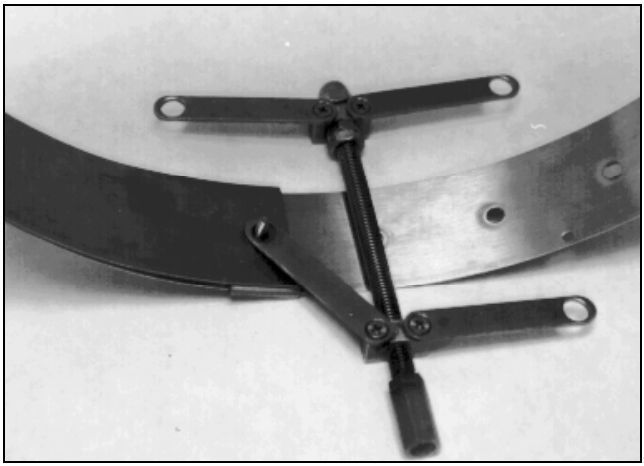
   - ❑ **Overlapping** Insert the spreader mechanism screw completely through the hole at the open end of the ring.
   - ❑ **Non-Overlapping** Insert a spreader mechanism screw through the hole at the left end of the ring so that the end of the screw extends inside the ring.



Ring stabilizer fully connected

8. Place the ring on a flat surface with the spreader mechanism screw facing up.

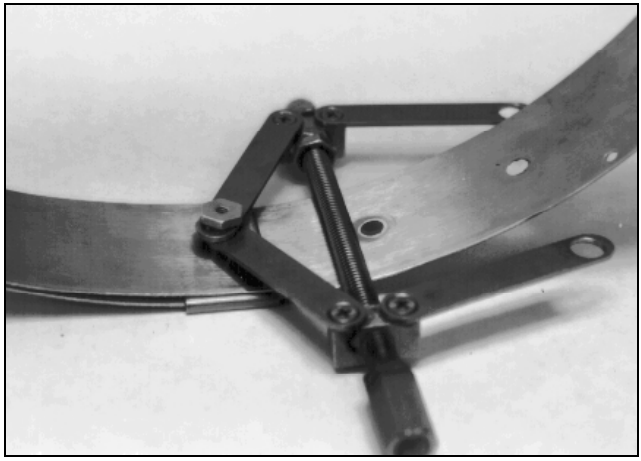
9. Orient the ring with the downstream edge (edge with small holes) facing you.
10. Lay the spreader mechanism across the inside of the ring with the downstream end of the mechanism (end with the large welded nut) facing you, the four spreader bars facing toward the inside of the ring, and the shoulder bolts pointed outside the ring.
11. Place a washer and then the downstream, left spreader bar over the spreader mechanism screw.



Orienting and attaching the spreader mechanism

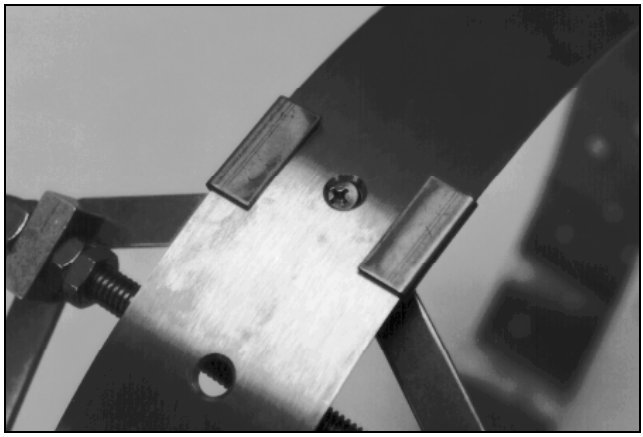
12. Place the upstream, left spreader bar onto the same screw.
13. Lightly turn the hex nut onto the screw, ensuring that it passes through the holes in the end of the spreader bar.

Note: Steps 14 through 16 apply only to overlapping rings. For a non-overlapping ring, proceed to step 17.



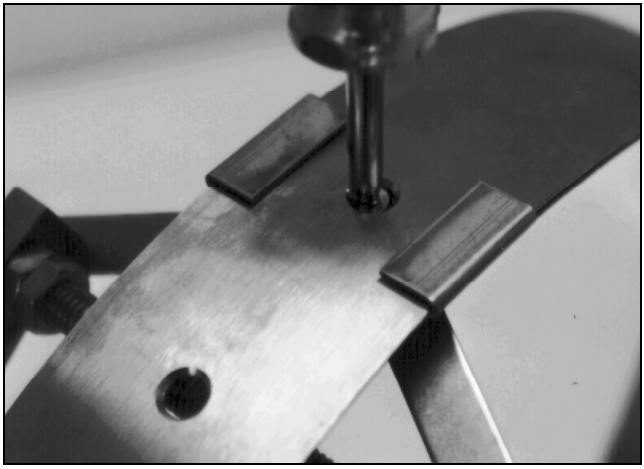
Attaching the spreader bars

14. Turn the ring until the spreader mechanism is in the 12:00 position.
15. Align the spreader mechanism screw so that the head is visible through one of the ring size adjustment holes.



Aligning the screw head and adjustment hole

16. Tighten the screw through the hole using a Phillips-head screwdriver while holding the hex nut with a ½-inch nut driver.

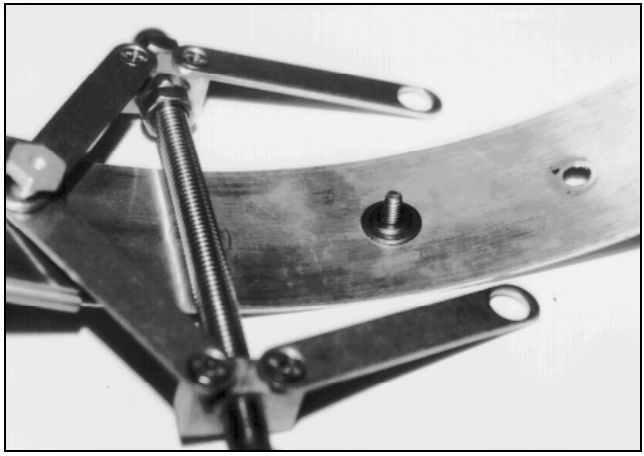


Tightening the spreader mechanism screw and hex nut

17. Insert the second spreader mechanism screw through the following hole based on the ring type:

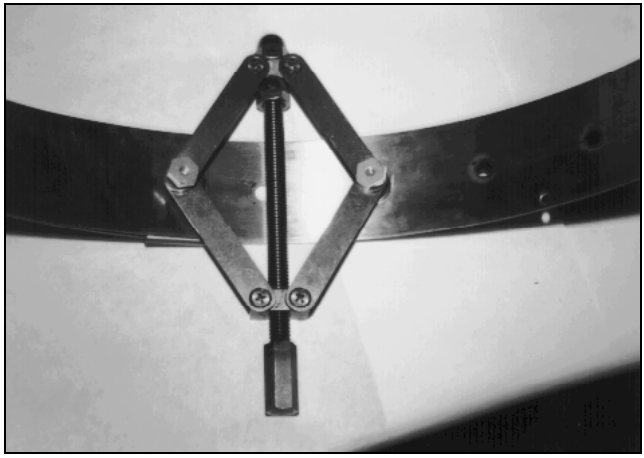
    - **Overlapping** Appropriate ring size adjustment hole on the outside of the ring
    - **Non-overlapping** Last hole on the other free end of the ring (inserting the screw from the outside of the ring)

18. Slip the large washer onto the screw on the inside of the ring.



Place the washers onto the second spreader mechanism screw

19. Place the spreader bars over the screw, and tighten a hex nut on the screw.

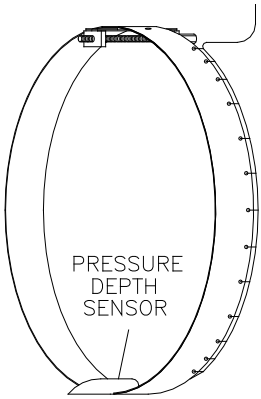


Spreader mechanism attached to the ring (view from inside the ring)

Although the spreader mechanism fits snugly against the inside of the ring, the spreader mechanism may seem loose on the hex nuts. Do not be concerned. The spreader mechanism will tighten once the ring is installed and tightened inside the pipe. The following picture displays how a properly assembled ring should look.

Mounting the Pressure Depth Sensor to the Ring

The following section provides instructions on mounting the pressure depth sensor to the ring. To ensure the most accurate flow data, standard pipe installations require proper positioning of the sensor on the ring as well as in the pipe. When facing the downstream edge of the ring, the sensor should be mounted on the bottom of the ring.



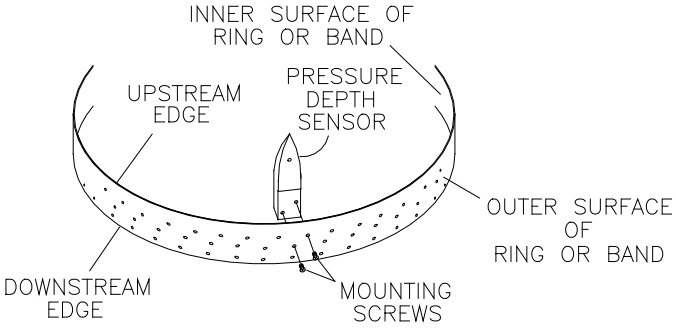
Proper positioning of sensor on the ring

> **Caution:** Handle the sensor and cable with extreme care. They contain delicate mechanisms and electronics. Keep sharp objects away from sensor cable, and avoid stepping or placing heavy objects on the cable during installation.

Mount the pressure depth sensor to the ring in the following way:

1. Orient the ring so that the ring's spreader mechanism is directly on top.

2. Use two 4-40 x 5/16-inch stainless steel screws (do not substitute any other screws) to mount the pressure depth sensor on the bottom inside of the ring with the pointed end of the sensor facing upstream. Mount the pressure depth sensor slightly to the left of bottom center when excessive silt is present.



Mounting the pressure depth sensor to the ring

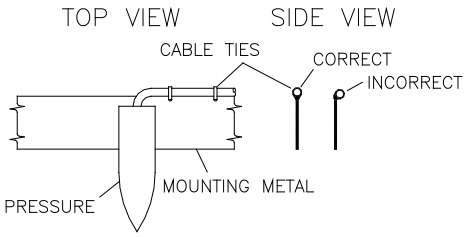
3. Secure the sensor cable to the ring. Refer to the next section, *Securing the Cable to the Ring*, for instructions on properly securing the cable.

Securing the Cable to the Ring

Securing the pressure depth sensor cable to the ring helps prevent debris from collecting between the cable and the ring or catching on the loose cable. It also prevents the loose cable from disrupting the flow.

Secure the sensor cable in the following way:

1. Starting at the sensor location, begin securing the cable with 4-inch x 0.08-inch cable ties through the pre-drilled holes along the downstream trailing edge of the ring up the side of the ring. Run the cable up the side of the ring opposite the spreader mechanism (the left side of the ring when facing the downstream edge of the ring).



Sensor cabling

2. Continue securing the cables until reaching the top of the pipe.
3. Pull the ties until they are taut.

> **Warning:** *Do not over-tighten the cable ties or kink the sensor cable!* The pressure depth sensor cable sheathes two components: the electrical cables that operate the sensor and an air tube that ventilates the sensor. Over-tightening the ties or kinking the cable can damage or restrict the air tube, causing incorrect pressure depth readings. In addition, make sure the connector-end of the sensor is not kinked, does not contain moisture, and includes an attached dryer tube filled with active *blue* desiccant.

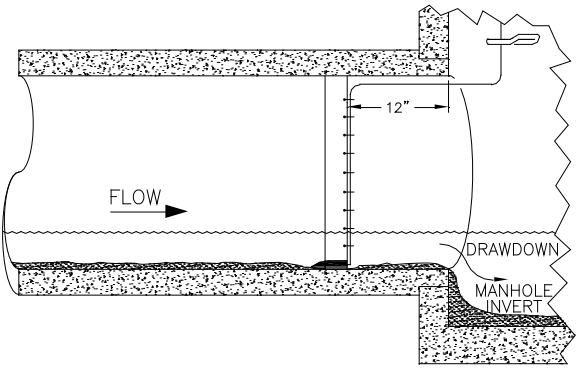
4. Use the diagonal cutters to cut off the excess portion of the cable ties.

Installing the Ring in the Pipe

The ring must fit securely in the pipe with the sensors properly positioned to ensure the most accurate monitoring results. Install the ring in the pipe in the following way:

1. Examine the pipe for possible obstructions to the flow or inhibitors to ring installation.
2. Adjust the ring size to slightly less than the pipe diameter before placing the ring in the pipe by turning the spreader mechanism adjustment nut clockwise.

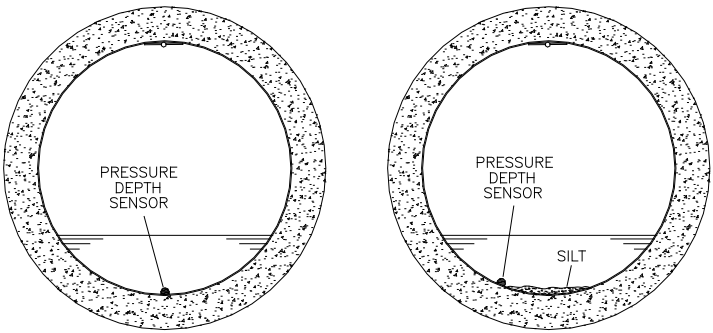
3. Place the ring in the input pipe at least 12 inches upstream from the manhole or edge of the pipe with the sensors facing upstream toward the oncoming flow. It should be located far enough upstream from the manhole to minimize the effect of the draw-down caused by a possible drop in the manhole invert.



Installing the ring at least 12 inches upstream from the manhole invert

Keep the following in mind:

- ❑ Make sure the spreader mechanism is at the top (crown) of the pipe and the pressure depth sensor is at or near the bottom of the pipe, *above* any silt present and *below* the flow surface (during minimum flows).



Proper orientation of the ring with the sensors in the pipe with and without silt present

- ❑ If necessary, temporarily clear away silt to install the ring. Restore the silt after fully securing the ring (step 7).
- ❑ Make sure the ring is flat (flush) against the inside wall of the pipe to avoid obstructing the flow or catching debris.

4. Expand the ring by turning the spreader mechanism nut counter-clockwise with the crank handle or socket. Continue tightening the ring until it fits securely and completely flush against the pipe wall.

> **Warning:** Avoid over-tightening the ring. This could bend the crank assembly.

5. Restore any silt moved to its previous level, and confirm that the pressure depth sensor is still above the silt level.
6. When the sensor is not located at the bottom of the pipe, determine the physical offset for the pressure depth sensor by measuring the vertical distance from the bottom of the sensor to the bottom, center of the pipe.

> **Note:** This value will be necessary when configuring the monitor using the **Profile** software.

7. Secure the sensor cable from the ring to the future monitor location in the manhole. Refer to page 3-36 for more information.

Special Installations

A special installation involves installing the mounting hardware for the pressure depth sensor directly to the pipe surface with anchor bolts, without the use of spreader mechanisms or rings.

Performing a special installation involves the following process:

- Gathering the parts and supplies
- Gathering the tools and equipment
- Mounting the pressure depth sensor
- Securing the cables to the band

Before beginning the installation, conduct a thorough investigation of hydraulic and other site conditions. The hydraulics of a site directly affect the monitor's ability to accurately measure flow depth. In addition, measure the horizontal and vertical pipe dimensions carefully.

> **Caution:** Handle the pressure depth sensor and cable with extreme care. The sensor and cable contain delicate mechanisms and electronics. Keep sharp objects away from sensor cable, and avoid stepping or placing heavy objects on the cable during installation.

Gathering Parts and Supplies

Be sure to obtain the following supplies before performing a special installation to prevent any costly delays. When ordering, specify the FlowAlert monitor special installation hardware.

Quantity	Description	ADS Part Number
1	FlowAlert monitor	6000-FAW or -FAL
1	monitor mounting bracket	I40-0003
1	pressure depth sensor with two 4-40 x 5/16-inch stainless steel screws	3704-0010-40 (5 psi) 3704-0015-40 (15 psi) 3704-0016-40 (30 psi)
1	replacement dryer tube	3704-0032
1	direct connection cable	5000-0601
15	11-inch cable tie	I05-0003
25	4-inch cable tie	I05-0001
15	8-inch cable tie	I05-0002

Quantity	Description	ADS Part Number
10	anchor cable tie	I05-0004
15	¼- × 2 ¼-inch anchor bolt (with 7/16-inch nut and washer)	I01-0002
1	3/8- × 2-inch stud	I01-0009
1	3/8-inch x 3-inch anchor bolt and nut	I01-0003
2	3/8-inch x 1-inch stainless steel hex bolts	I01-0001
4	3/8 – 16 stainless steel hex nuts	I15-0002
5	3/8-inch stainless steel flat washers	I55-0001
2	4-40 × 5/16-inch screw	I35-0001
8	6-32 washer	I55-0002
4	6-32 × 1-inch machine screw	I35-0004
4	6-32 × 5/16 inch nut	I15-0003
15	plastic push mounts	I01-0006
1	special predrilled 8-foot metal band	I40-0007

Gathering the Tools and Equipment

Gather the following tools for the installation:

- Battery-powered hammer drill with assorted bits – including the following, at a minimum:
  - ❑ 3/8-inch x 4-inch (minimum length) masonry bit
  - ❑ ¼-inch masonry bit (F35-0018)
  - ❑ 5/16-inch carbide-tipped drill bit (include smaller bits)
- 4-pound hammer
- Rubber mallet
- Wrenches
- Screwdrivers (flathead and Phillips head of assorted sizes)

- 3/8 – 16 thread tap
- Diagonal wire cutters
- Folding carpenter's rule with a brass slide
- Rubber stretch tape

Mounting the Pressure Depth Sensor

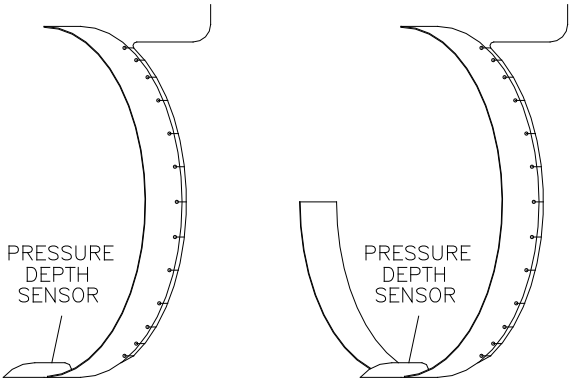
Two special installation methods are available for mounting the pressure depth sensor:

- ¾-band mount
- ½-band mount

Both mounts require almost identical installation methods. The only significant differences are that the ¾-band mount allows the installer to secure the band to both sides of the pipe wall and to position the pressure depth sensor at the bottom center of the pipe. These options are not possible using the ½-band mount. Therefore, the ¾-band mount is the preferable method for mounting the sensor.

However, a ½-band mount may be appropriate for monitoring under the following circumstances:

- Large pipes with deep minimum flows
- Large pipes with excessive silt present



½- (left) and ¾-band (right) mounts

¾-Band Mount

Perform the following procedure to mount the pressure depth sensor in a pipe using the ¾-band mount:

1. Use a hacksaw to cut the band to the appropriate length. Cut the band so that, when installed, it will run approximately ¾ of the length around the inside of the pipe.

> **Note:** The metal bands come in 8-foot lengths. Some larger pipes may require attaching two bands together. In addition, for square-shaped pipes, use an 8-foot straight metal strip.

2. Determine which end of the band will be the long end (end extending almost completely up one side of the pipe). For cable routing purposes, ADS recommends reserving the left side of the pipe (upstream from the manhole) for the long end of the band.

> **Note:** Position the edge of the band with the cable tie holes (edge with small holes) facing downstream.

3. Determine the appropriate location on the band to mount the pressure depth sensor, making sure the sensor will be both

above the silt level and *below* the flow surface during minimum flows.

- ❑ If silt is not present, locate the sensor on the band so it will be at the bottom center of the pipe once installed.
- ❑ If silt is present, locate the sensor slightly up the long end of the band so it will be above the silt level once installed.

4. Mount the sensor onto the inside of the band with two 4-40 x 5/16-inch countersink screws, making sure the pointed end of the sensor faces the upstream edge of the ring (edge opposite cable tie holes). If holes do not exist on the band at or near the desired mounting location for the sensor or the sensor does not have screw inserts, use two medium-sized cable ties to secure the sensor to the ring. Crisscross the cable ties across the top of the sensor and underneath the band.
5. Secure the sensor cable along the downstream edge of the long end of the band according to the instructions on page 3-29.
6. Position the band in the pipe so that the sensor will remain below the flow surface (even during minimum flows) and above the silt level.
7. Make sure two pre-drilled holes are visible above the flow surface on the short end of the band. Maneuver the band so that the lowest hole is almost at the flow surface.
8. Mark the pipe wall through the lowest hole with a drill, and install a ¼-inch x 2 ¼-inch anchor bolt with a pneumatic drill.
9. Secure the band to the anchor bolt with a washer and nut.
10. Conform the band to the pipe wall around to the long end of the band so that it is flush with the pipe wall.

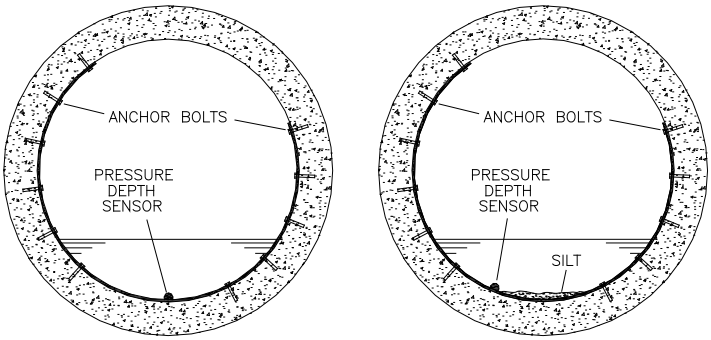
> **Note:** Temporarily remove any silt preventing the band from sitting flush against the bottom of the pipe.

11. Install a ¼-inch x 2 ¼-inch anchor bolt through the pre-drilled hole closest to the flow surface on the *long* end of the band, and secure the band with a washer and nut.

12. Make sure the band and sensor are flush against the pipe wall with no gaps, and conform the rest of the band to the pipe wall.

13. Install ¼-inch x 2 ¼-inch anchor bolts, nuts, and washers at the pre-drilled hole at the short end of the band and at the pre-drilled holes along the long end of the band (above the flow surface) approximately every 12 to 24 inches to the top end of the band.

> **Note:** Whenever possible, secure the band with an additional anchor bolt approximately 3 inches below the flow surface on each side of the pipe. This will help ensure that the band remains flush against the bottom of the pipe below the flow surface.



Sensors mounted using a ¾-band mount in the pipe with and without silt

14. Measure the physical offset for the pressure depth sensor (i.e., the vertical distance from the bottom of the pressure depth sensor to the bottom, center of the pipe).

> **Note:** This value will be necessary when configuring the monitor using the **Profile** software.

15. Run the sensor cable from the sensor location in the pipe to the monitor location in the manhole according to the instructions on page 3-36.

½-Band Mount

Perform the following procedure to mount the pressure depth sensor in a pipe using the ½-band mount:

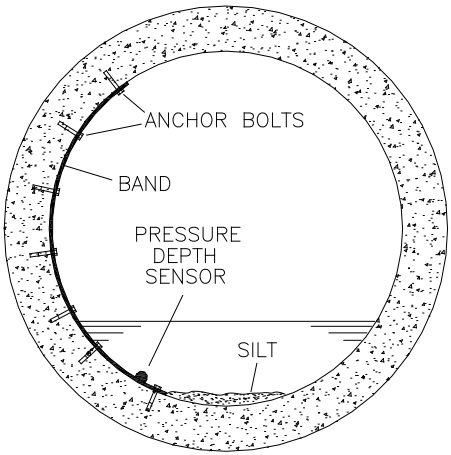
1. Use a hacksaw to cut the band to the appropriate length. Cut the band so that, when installed, it will run almost completely down the left side of the pipe.
2. Determine the best location on the band to mount the pressure depth sensor. The sensor should mount as close as possible to the bottom of the band, making sure the sensor will be both *above* the silt level and *below* the flow surface once installed.
3. Mount the sensor onto the inside of the band with two 4-40 x 5/16-inch countersink screws, making sure the pointed end of the sensor faces the upstream edge of the ring. If holes do not exist on the band at or near the desired mounting location for the sensor or the sensor does not have screw inserts, use two medium-sized cable ties to secure the sensor to the ring. Crisscross the cable ties across the top of the sensor and underneath the band.

> **Note:** The edge of the band with the cable tie holes is the downstream edge.

4. Secure the sensor cable along the downstream edge of the band according to the instructions on page 3-29.
5. Place the band in the pipe upstream at least 12 inches from the manhole invert. Position the band on the left side of the pipe so that the sensor will remain below the flow surface (during minimum flows) and above the silt level.
6. Orient the band so that one of the pre-drilled anchor bolt holes is just above the flow surface.
7. Spot drill the pipe wall through the hole, install a ¼-inch x 2 ¼-inch anchor bolt, and secure the band to the anchor bolt with a washer and nut.

Note: Make sure the submerged portion of the band is flush with the pipe wall. If it is not, remove the band and conform the band to the pipe.

8. Install a ¼-inch x 2 ¼-inch anchor bolt, washer, and nut below the flow surface 1 to 3 inches away from the pressure depth sensor on each side. This will hold the sensor securely against the pipe wall and prevent the end of the band from twisting in the flow or catching debris.
9. Conform the portion of the band above the flow surface to the pipe wall, and install an ¼-inch x 2 ¼-inch anchor bolt, nut, and washer every 12 to 24 inches up to the top of the band.



Completed ½-band mount in pipe

10. Measure the physical offset for the pressure depth sensor (i.e., the vertical distance from the bottom of the sensor to the bottom, center of the pipe).

Note: This value will be necessary when configuring the monitor using the **Profile** software.

11. Run the sensor cable from the sensor location in the pipe to the monitor location in the manhole according to the instructions on page 3-36.

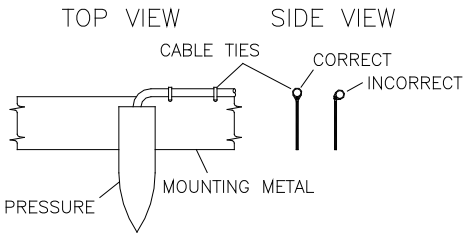
Note: If the pipe is large and the pressure depth sensor cable cannot reach the pipe crown, attach the sensor cable to ½-inch PVC tubing and anchor the tubing to the wall. This will help prevent sensor damage during heavy flow.

Securing the Cable to the Band

Securing the pressure depth sensor cable to the band helps prevent debris from collecting between the cable and the band or catching on the loose cable. It also prevents the loose cable from disrupting the flow.

Secure sensor cable as follows:

1. Starting at the appropriate sensor location, begin securing the sensor cable with 4-inch x 0.08-inch cable ties through the pre-drilled holes along the downstream trailing edge of the band up the side of the band. Run the cable up the left side of the band (when facing the downstream edge of the band).



Sensor cabling

2. Continue securing the cable until reaching the top of the pipe.

3. Pull the ties until they are taut.

Warning: *Do not over-tighten the cable ties or kink the sensor cable!* The pressure depth sensor cable sheathes two components: the electrical cables that operate the sensor and an air tube that ventilates the sensor. Over-tightening the ties or kinking the cable can damage or restrict the air tube, causing incorrect pressure depth readings. In addition, make sure the connector-end of the

sensor is not kinked, does not contain moisture, and includes an attached dryer tube filled with active *blue* desiccant.

4. Use the diagonal cutters to cut off the excess portion of the cable ties.

Installing the Sensor in the Manhole or Pump Station Wet Well

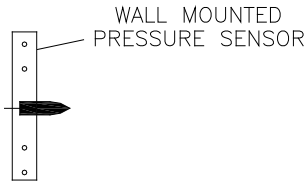
This section includes the procedure for mounting the pressure depth sensor to the wall of a manhole or pump station wet well. Install the sensor in the following way:

1. Gather the parts listed on the following table:

Quantity	Description	ADS Part Number
1	FlowAlert monitor	6000-FAW or -FAL
1	monitor mounting bracket	I40-0003
1	pressure depth sensor with two 4-40 x 5/16-inch stainless steel screws	3704-0010 (5 psi) 3704-0015 (15 psi) 3704-0016 (30 psi)
1	replacement dryer tube	3704-0032
1	direct connection cable	5000-0601
15	11-inch cable tie	I05-0003
25	4-inch cable tie	I05-0001
15	8-inch cable tie	I05-0002
10	anchor cable tie	I05-0004
2	¼- × 2 ¼-inch anchor bolt (with 7/16-inch nut and washer)	I01-0002
1	3/8- × 2-inch stud	I01-0009
1	3/8-inch x 3-inch anchor bolt and nut	I01-0003
2	3/8-inch x 1-inch stainless steel hex bolts	I01-0001
4	3/8 – 16 stainless steel hex nuts	I15-0002
5	3/8-inch stainless steel flat washers	I55-0001
2	4-40 × 5/16-inch screw	I35-0001
8	6-32 washer	I55-0002

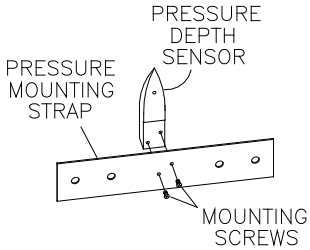
Quantity	Description	ADS Part Number
4	6-32 × 1-inch machine screw	I35-0004
4	6-32 × 5/16 inch nut	I15-0003
15	plastic push mounts	I01-0006
1	sensor mounting strap	700-100238-00

2. Gather the following tools and supplies:
   - ❑ Battery-powered hammer drill with assorted bits – including the following, at a minimum:
   - ❑ 3/8-inch x 4-inch (minimum length) masonry bit
   - ❑ ¼-inch masonry bit (F35-0018)
   - ❑ 5/16-inch carbide-tipped drill bit (include smaller bits)
   - ❑ 4-pound hammer
   - ❑ Rubber mallet
   - ❑ Wrenches
   - ❑ Screwdrivers (flathead and Phillips head of assorted sizes)
   - ❑ 3/8 – 16 thread tap
   - ❑ Diagonal wire cutters
   - ❑ Folding carpenter's rule with a brass slide
   - ❑ Rubber stretch tape
3. Determine the appropriate location on the manhole or wet well wall to mount the sensor.
4. Hold the pressure mounting strap (ADS p/n 700-100238-00) vertically against the wall at the selected location, and mark the wall through the top hole of the strap.



Desired orientation of pressure depth sensor and strap on wall

5. Remove the strap, and drill a ¼-inch hole 2 ½ inches deep at the mark.
6. Install a ¼-inch x 2 ½-inch anchor bolt in the hole.
7. Place the strap on the anchor bolt, and then mark the wall through the bottom hole of the strap.
8. Remove the strap, drill a ¼-inch hole 2 ½ inches deep at the lower mark, and install a second anchor bolt.
9. Secure the pressure depth sensor to the strap with two 4-40 x 5/16-inch countersink screws. The sensor mounts perpendicular to the strap.



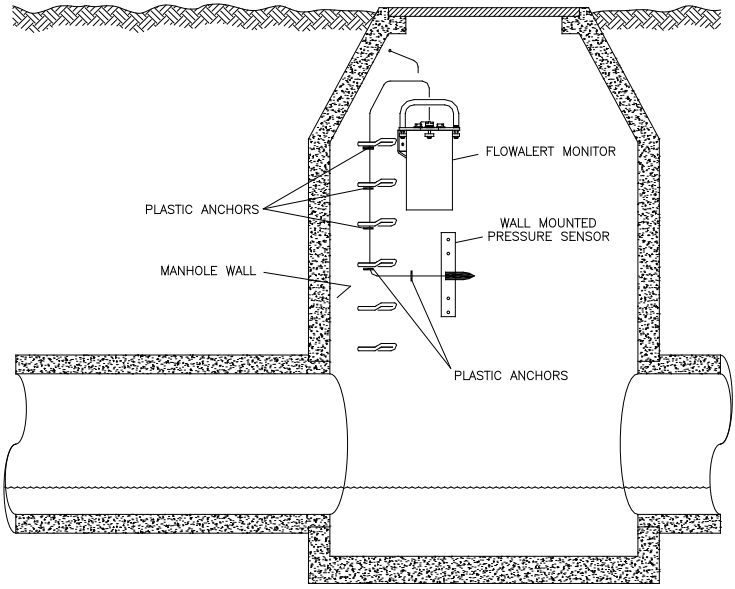
Attaching the pressure depth sensor to the pressure mounting strap

10. Place the strap onto the anchor bolts in the wall, and secure the strap to the bolts using the corresponding nuts and washers until snug.
11. Measure and record the pressure depth sensor's physical offset for entry later into the **Profile** software. The physical offset is the distance from the manhole invert (or bottom of wet well) to the nose of the sensor.

12. Secure the sensor cable to the wall with an 8-inch by 0.14-inch cable tie attached to a a plastic anchor every 18 to 24 inches from the sensor to the monitor location. A loose cable could present a manhole safety hazard or increase the potential for sensor or monitor damage. *If plastic anchors will not serve as adequate anchors based on the structure of the manhole or wet well wall, install ¼-inch x 2 ¼-inch bolts instead.*

    - ❑ Drill a 3/8-inch hole in the pipe crown.
    - ❑ Drive the plastic anchor into the pipe with a hammer until flush and secure.
    - ❑ Run the cable tie through the loop in the plastic anchor and around the cable.
    - ❑ Tighten the cable tie around the cable, and cut off the excess cable tie material.

Warning: Over-tightening the cable ties may damage the sensor cable.



Completed pressure depth sensor installation on manhole wall

Securing the Sensor Cable in the Pipe and Manhole

Securing the sensor cable from the ring (or band, when applicable), along the pipe crown, and up the manhole helps prevent debris from collecting on a sagging cable or between the cable and the pipe crown.

Do not allow the sensor cable to hang down in the pipe or sag in the manhole. Loose cables could present a safety hazard in the manhole or increase the potential for sensor or monitor damage. The cable should be secured along the pipe crown and manhole wall under *all* circumstances.

> **Note:** Do not secure a wireless communication antenna cable with the sensor cable! Refer to *Setting Up Wireless Communication* in *Chapter 4, Communication*, for information on securing the antenna cable in the manhole.

Secure the cable from the ring (or band) to the monitor location in the manhole in the following way:

1. Wrap the cable with an 8-inch by 0.14-inch cable tie attached to a plastic anchor installed at the top of the pipe.

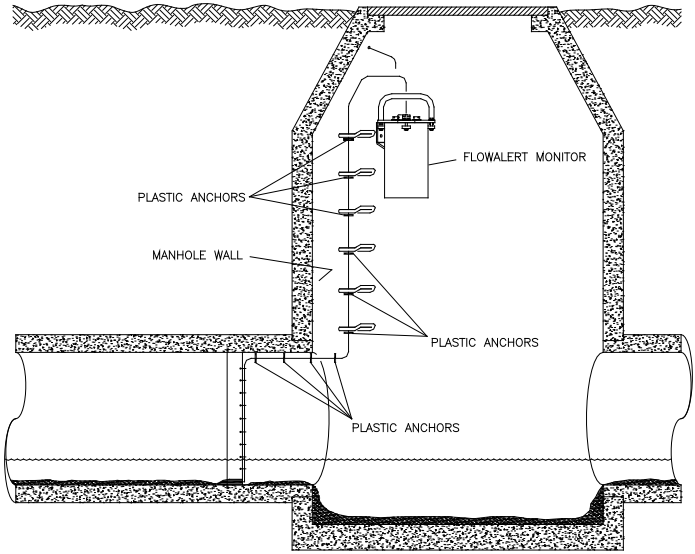
> **Note:** If a plastic anchor will not serve as an adequate anchor for securing the cable based on the structure of the pipe, install a ¼-inch x 2 ¼-inch bolt instead.

   - ❑ Drill a 3/8-inch hole in the pipe crown.
   - ❑ Drive the plastic anchor into the pipe with a hammer until flush and secure.
   - ❑ Run the cable tie through the loop in the plastic anchor and around the cable.
   - ❑ Tighten the cable tie around the cable, and cut off the excess cable tie material.

> **Warning:** Over-tightening the cable ties may damage the sensor cable.

2. Secure the cable with a cable tie and plastic anchor every 18 to 24 inches along the pipe crown (when necessary) from the ring to the manhole. *If plastic anchors will not serve as adequate anchors based on the structure of the pipe, install ¼-inch x 2 ¼-inch bolts instead.*

3. Secure the cable every 18 to 24 inches up the side of the manhole to the monitor location. A loose cable could present a manhole safety hazard or increase the potential for sensor or monitor damage. *If plastic anchors will not serve as adequate anchors based on the structure of the manhole wall, install ¼-inch x 2 ¼-inch bolts instead.*



Securing the sensor cable along the pipe and into the manhole

Installing the Float Switch in the Manhole

Installing the float switch(es) at the proper position and elevation in the manhole is essential to ensuring the status readings received are accurate and the float can pivot freely with changing flow conditions. The elevation at which to hang the float largely depends upon the project requirements and threshold of notification. However, the optimal position at which to hang the float is the center of the manhole above the top of the pipe, to avoid the flow line. Positioning the float in the center minimizes the possibility of the float encountering potential hazards or obstructions present in the manhole, particularly while swaying or pivoting.

Because the float switch is suspended in the air or flow, it must be secured by its cable. Typically, the optimal location at which to secure the cable is at the top of the manhole just below the rim. This is the best way to position the float as close as possible to the center of the manhole and to make it accessible for service or replacement.

> **Warning:** When installing floats in or adjacent to pump stations or other facilities with rotating machinery (such as mixers), ensure the customer signs off on the installation. If a float and cables were to come loose, they would cause severe damage to any downstream rotating machinery.

Gathering Parts and Supplies

Obtain the following supplies before installing the float switch(es) to prevent costly delays.

Quantity	Description	ADS Part Number
1	FlowAlert monitor	6000-FAW or -FAL
1	monitor mounting bracket	I40-0003
1	1 float switch (no pressure)	6000-0015-xx (xx represents the cable length in feet)
	2 float switches (no pressure)	6000-0025-xx (xx represents the cable length in feet)
	2 float switches and pressure pigtail	6000-0026-xx (xx represents the cable length in feet)
	1 float switch and pressure pigtail	6000-0027-xx (xx represents the cable length in feet)
1	direct connection cable	5000-0601
10	anchor cable tie	I05-0004
15	¼- × 2 ¼-inch anchor bolt (with 7/16-inch nut and washer)	I01-0002

Gathering Tools and Equipment

Gather the following tools for the installation:

- Battery-powered hammer drill with assorted bits – including the following, at a minimum:
  - ❑ 3/8-inch x 4-inch (minimum length) masonry bit
  - ❑ ¼-inch masonry bit (F35-0018)
  - ❑ 5/16-inch carbide-tipped drill bit (include smaller bits)

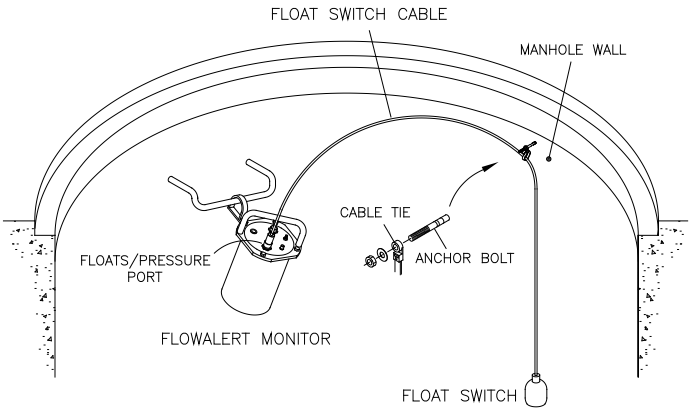
- 4-pound hammer
- Wrenches
- Screwdrivers (flathead and Phillips head of assorted sizes)
- 3/8 – 16 thread tap
- Diagonal wire cutters
- Folding carpenter's rule with a brass slide
- Rubber stretch tape

Mounting the Float Switch

Install the float switch in the following way:

> **Note:** Floats are labeled **HIGH** and **HIGH HIGH**. Therefore, always mount the **HIGH** float at the lowest monitoring elevation.

1. Install a ¼-inch x 2 ¼-inch anchor bolt in the manhole wall just below the rim. Select a location away from the monitor mounting location and on the opposite side of the manhole from the rungs. This will reduce the possibility of the float switch and its cabling striking or getting tangled in the rungs or monitor.
2. Establish the proper elevation (representing the *trip point*) at which to hang the float switch, and then determine the distance from that elevation to the anchor bolt.
3. Measure that same distance from the top of the float switch (top of the float's collar where the enclosure meets the cable) up the cable.
4. Secure the cable to the anchor bolt using an anchor cable tie at that location on the cable.
5. Slowly lower the float switch into the manhole until it is fully suspended from the mounting location.



Float switch suspended in manhole in relation to rungs and monitor

6. (*applicable only for an additional float switch*) Mount the second float switch so that is secured at least 12 inches away from the first float switch and adequately away from other potential obstructions. Projects incorporating a second float switch typically involve suspending the float switch at a different elevation than the first float switch.

Connecting the Sensor and Float to the Monitor

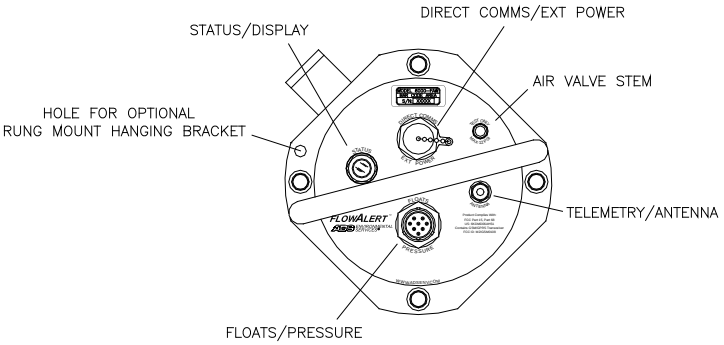
After installing the pressure depth sensor and the float switch and completely securing their cables, connect the sensor and/or float to the **FLOATS/PRESSURE** port on the top of the monitor. Applications involving pressure depth sensors and customer supplied floats/relays require connecting an intermediate adapter cable (pigtail) between the sensor/customer-supplied hardware and the monitor.

The following table indicates the part numbers for the cables and pigtails required for each application:

Description	ADS Part Number
Floats & Pressure pigtail (for customer-supplied floats or relay contacts)	6000-0013
Pressure pigtail	6000-0014
Floats pigtail (for customer-supplied floats or relay contacts)	6000-0021
1 float	6000-0015-20/40/60
2 floats	6000-0025-20/40/60
2 floats & pressure pigtail	6000-0026-20/40/60
1 float & pressure pigtail	6000-0027-20/40/60

Connect the cables to the monitor port in the following way:

1. Place the monitor in an upright position to view the monitor connector ports.



Cable connector ports

2. Visually inspect the connectors on the cable(s) and adapter (when applicable) and the FLOATS/PRESSURE connector port on the monitor for debris or moisture. Clean off any debris, and dry any surface moisture. Compressed air is useful for removing moisture from the inside of the connectors or ports (pin and socket surfaces).

3. Verify that the interfacial seal is present inside each connector with pins. The bright orange, rubber seal should sit at the bottom of the connector with the pins protruding through the seal.

> **Note:** If the user is connecting the floats pigtail (ADS p/n 6000-0021) to customer-supplied contacts, prepare this connection before connecting the cable to the monitor.

4. Connect the float switch(es) cable, pigtail, or combination cable to the **FLOATS/PRESSURE** port on the monitor. Tighten the connector in a clockwise direction until it clicks, and verify that it is seated correctly.

5. *(applies only when using pressure depth sensor)* Connect the pressure depth sensor cable to the mating connector on the pigtail. Tighten the connector in a clockwise direction until it clicks, and verify that it is seated correctly.

6. *(applies only when using customer-supplied floats or relays)* Connect the customer-supplied hardware cable to the

corresponding connector(s) on the pigtail. Tighten the connector in a clockwise direction until it clicks, and verify that it is seated correctly.

7. For locations exhibiting the presence of hydrogen sulfide and/or high moisture, provide added protection by wrapping the connection with rubber stretch tape.

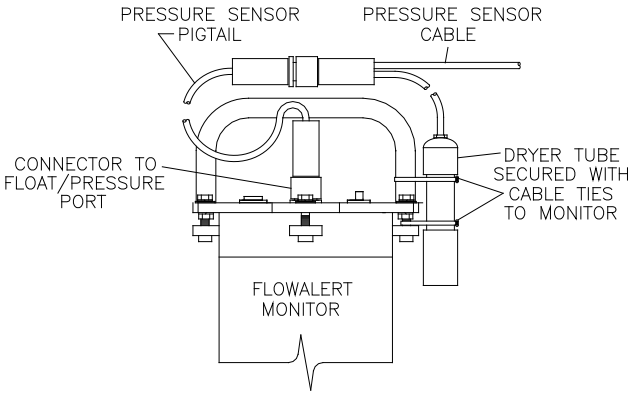
8. Seal any unused connectors with a cap. If necessary, obtain additional caps from the regional ADS representative.

Note: An air valve is present on the top of the monitor. This valve exists only for testing purposes during the manufacturing process. *Please do not attempt to fill the monitor with air or pressurize the monitor!* In addition, make sure the cap is tight on the air valve to prevent the valve components from corroding.

Securing the Dryer Tube to the Monitor

Secure the dryer tube to the monitor in the following way:

1. Attach the dryer tube from the pressure depth sensor in the vertical position to the monitor handle and chassis bolt using cable ties.



Securing the dryer tube to the monitor using cable ties

2. Make sure the black end cap on the dryer tube is removed before installing the monitor in the manhole.

CHAPTER 4

Communication

After installing the pressure depth sensor, securing the float switch(es) in the manhole, and connecting the cables to the monitor, it is necessary to establish communication with the monitor (through wireless communication, telemetry, or the direct serial connection) to activate the monitor. This chapter contains instructions on establishing a wireless connection or telephone service at the monitor location for communicating with the monitor remotely and using the direct serial cable to communicate with the monitor on-site. It also includes basic information concerning monitor activation.

> **Note:** Manhole and sewer system work involves confined space entry and is inherently dangerous. Therefore, installers and technicians must comply with all federal, state, and municipal regulations concerning confined space entry. ADS® is not responsible for any injuries, damages, claims, or liability resulting directly or indirectly from the use of this installation guide or the installation of any ADS equipment.

Setting Up Wireless Communication

Setting up wireless communication involves installing the antenna at the monitor location, connecting the antenna to the monitor, and installing the SIM card in the monitor.

> **Note:** ADS wireless communication products use static IP address network services provided by AT&T. Therefore, any installation location designated for wireless communication must have access to AT&T 850 or 1900 MHz service. Each wireless device will be fitted with a SIM (Subscriber Identity Module) card that is provisioned by AT&T with specific account and network information for use with ADS software.
>
> **Note:** Customer-supplied SIM cards cannot be used with the ADS FlowAlert™.

Installing the Antenna

ADS provides three options for installing the wireless antenna:

- **In Road** This option involves installing the antenna directly in the road, in dirt, or under other paving materials.
- **Pedestal** This option involves securing the antenna inside a telecom pedestal installed off the road. ADS recommends choosing this option when signal strength is poor using road antennas.
- **Magnetic Whip** This option involves securing the antenna to a roof or other protected structure where only a minimal opportunity exists for theft or vandalism.

> **Note:** While this manual describes the installation process for each antenna option, detailed installation instructions also accompany all wireless antennas received from ADS.

Installing a Wireless Antenna in the Road

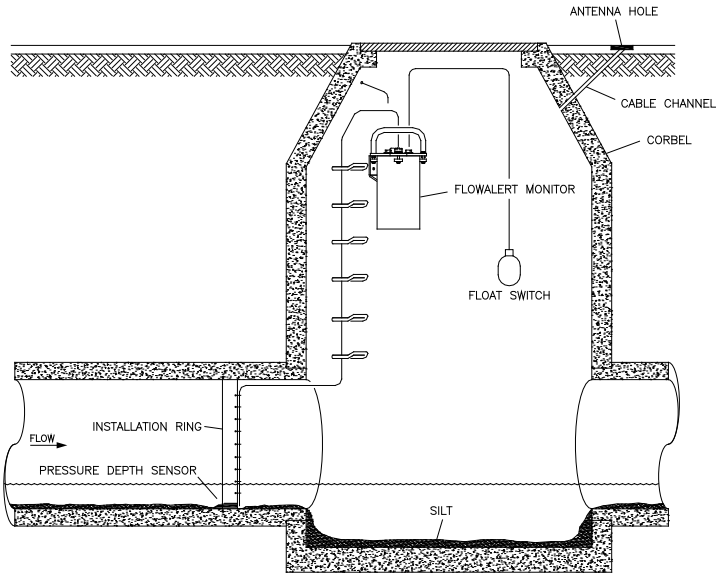
Install a wireless antenna in the road in the following way:

1. Gather the following parts and tools:
   - ❑ Wireless slim or mini-wing, quad-band antenna (ADS p/n 3800-0162/0163 with SMA connector)
   - ❑ (*for off-road installations only*) Extension cables for antennas (15-foot: ADS p/n 507165; 50-foot: 507168)
   - ❑ Medium-sized non-rotating demolition hammer with a ½-, ¾-, or 1-inch masonry chisel (sharpen the chisel before use) and bushing tool, or an abrasive saw or grinder
   - ❑ Medium to heavy duty hammer drill (*if no hammer/drill mode is available on the demolition hammer*)
   - ❑ Generator or other power source to power hammer
   - ❑ ½-inch x 36-inch (minimum length) masonry drill bit (for hammer drill)
   - ❑ 1 ¼-inch x 12-inch masonry drill bit (for hammer drill)
   - ❑ Trowel or putty knife for scooping asphalt
   - ❑ Hammer
   - ❑ Carpenter's rule
   - ❑ Pen, pencil, or chalk for marking asphalt or concrete
   - ❑ Shop vacuum
   - ❑ Wire brush
   - ❑ Alcohol wipes
   - ❑ Leather work gloves
   - ❑ Protective goggles
   - ❑ Heavy duty, high-quality caulking gun (for regular-sized tubes)
   - ❑ Masonry drill bit and screws (included with kit)

- ❑ Dry sand
- ❑ Commercial asphalt cold patch compound (1 cup)
- ❑ Scotch-kote electrical sealing compound (ADS p/n 505171)
- ❑ Scotch 130C rubber stretch tape (ADS p/n I45-0001)

2. Determine the appropriate location in the road near the manhole to install the antenna, considering the following:
   - ❑ Locate the antenna in the road no closer than 18 inches and no further than 30 inches from the manhole in which the monitor is installed.
   - ❑ Choose a location that is as flat as possible with stable base material.
   - ❑ If possible, select a location where the antenna would experience minimal direct impact from road traffic.
   - ❑ Make sure the location exists beyond the manhole's iron rim beneath the road surface. This will enable you to access the manhole corbel when drilling the channel for the antenna cable.
3. Mark the location for the antenna installation, and then mark the location to drill the corbel hole 2.5 to 3 inches back from the edge of the antenna hole.
4. Drill a hole from the marked corbel hole location in the road, through the corbel, and into the manhole using the ½-inch by 36-inch hammer drill bit. This will serve as the channel for the antenna cable running from the antenna to the monitor in the manhole. Be careful to avoid any cables in the manhole, and restart hole slightly to the right or left if mesh is encountered or resistance occurs.
5. Cut a 6-inch long by 1.25-inch wide by 0.75-inch deep hole in the road using the non-rotating demolition hammer (in the hammer only mode) with the chisel/grinder. This will serve as the installation location for the antenna. The corbel hole should travel under the center of this hole.

6. Level the bottom of the hole using the demolition hammer with the chisel and a bushing tool.



Hole running from antenna installation location to manhole

7. Thoroughly clean out the hole for the antenna of all debris using a shop vacuum with a brush.

8. If the protective cap is not present on the connector at the end of the antenna cable, clean the connector and tape it up with rubber stretch tape to protect it from damage and debris while it is traveling through the channel.

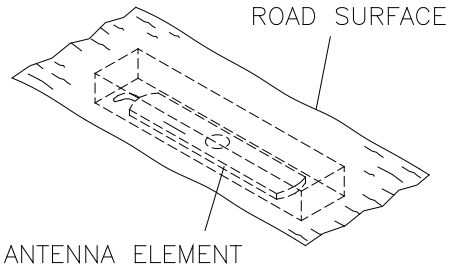
9. Feed the antenna cable into the hole, through the channel, and into the manhole. Smooth any rough edges where the cable enters the corbel hole with the chisel or rubber stretch tape. In addition, pack rubber stretch tape into cable hole to prevent asphalt or sealer from entering the cable hole.

10. Remove the white release tape from the antenna element. Be careful to avoid contacting the black rubber mastic material with anything until the antenna is ready to be seated.

11. Apply a piece of white release tape onto the top of the antenna, and then seat the antenna into the bottom of the hole. Once the antenna is firmly seated, remove the release tape.

12. Apply the asphalt on top of the antenna element. When using asphalt, scoop the warm material into the hole and then pound it in using a hammer. Place a piece of wood or metal between the asphalt and the hammer to prevent the hammer from sticking to the asphalt. Make sure the asphalt protrudes slightly above the level of the road surface.

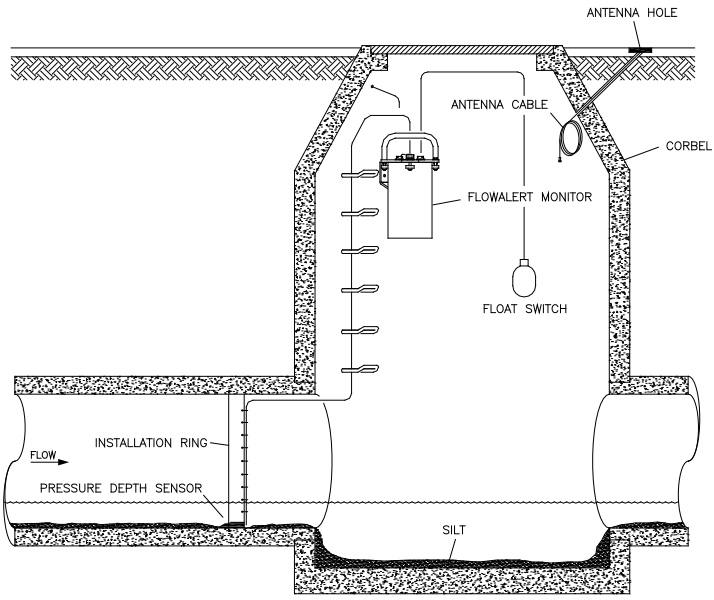
13. Sprinkle sand over the asphalt, and pound the sand lightly into the surface. The sand must be used to ensure the asphalt remains in the hole.



Antenna in cavity with patch

14. Coil the slack antenna cable and secure it away from the other cables in the manhole. Slack enables the technicians to remove the monitor from the manhole for maintenance or service activities with the antenna cable still connected. *Do not bundle the antenna and sensor cable together! This can significantly diminish antenna and sensor signal strength, disrupting communications and limiting sensor accuracy.*

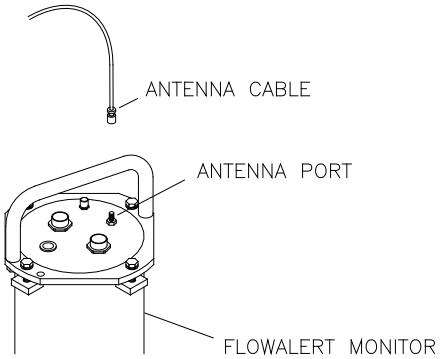
> **Note:** To prevent damage to the cable and antenna, do not kink or bend the antenna cable when coiling.



Installation with antenna cable coiled in manhole

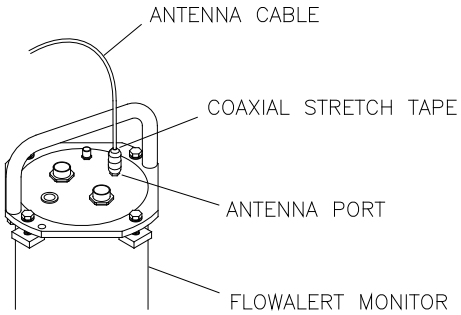
15. Seal the space between the antenna cable and the corbel hole with electrical duct seal or as required to prevent infiltration into the manhole.

16. Remove the protective tape from the antenna cable connector and attach the connector to the **TELEMETRY/ANTENNA** connector port on top of the monitor.



Top of monitor and antenna cable with connectors labeled

17. Wrap rubber stretch tape around the entire cable connection, extending onto the cable approximately 2 inches beyond the connection.



Cable connected to monitor with stretch tape properly applied

Installing a Wireless Antenna in a Telephone Pedestal Off the Road

Install a wireless antenna in a telephone pedestal located off the road in the following way:

> **Note:** Pedestal installation requires digging/trenching activities. Therefore, do not use automated digging or trenching equipment prior to identifying all underground utilities through a utility location service. Hand digging is permitted without prior identification.

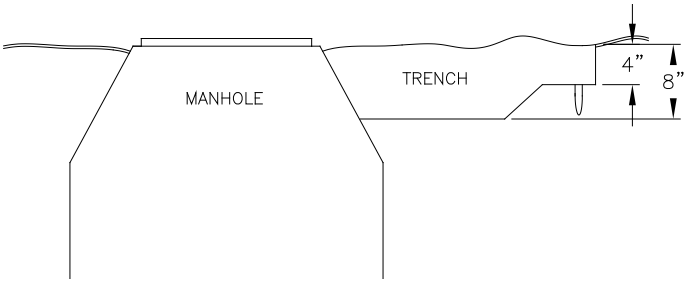
1. Gather the following parts, supplies, and tools:
   - ❑ Wireless antenna and pedestal (ADS p/n 3800-0133)
   - ❑ Portable electric drill with assorted bit sizes (include ½-inch and 3/8-inch bits)
   - ❑ 8-inch cable ties
   - ❑ Post hole digger
   - ❑ Shovel
   - ❑ Sledge hammer
   - ❑ 7/16-inch nut driver
   - ❑ Corbel drill with a ½-inch by 36-inch bit
   - ❑ Hacksaw
   - ❑ Commercial asphalt cold patch compound
   - ❑ Electrical duct seal
   - ❑ Rubber stretch tape
2. Determine the appropriate location to install the pedestal based on the following factors.
   - ❑ Locate the pedestal between 3 to 10 feet from the manhole in which the monitor is installed.
   - ❑ Evaluate the most suitable location for the service pedestal and the most appropriate route for running the cable.

Pedestal location and cable route evaluation criteria may include issues such as the manhole location in relation to the pedestal, existing landscape, utilities present, and excavation costs.

- ❑ Notify a utility location service to locate and mark underground utilities before digging or trenching with automated equipment. Hand digging does not require prior identification of utilities.

3. Using a post hole digger or shovel, dig a hole at the designated pedestal location approximately 4 inches deep and slightly larger than the diameter of the pedestal base to accommodate the base and the stake.

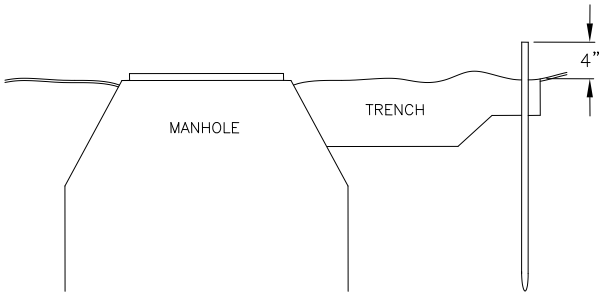
4. Dig a trench at least 8 inches deep between the hole and the manhole, tapering down from the pedestal location.



Hole, trench, and manhole

5. Drill a hole at least a ½ inch in diameter in the corbel of the manhole as close as possible to the bottom of the trench using a corbel drill.

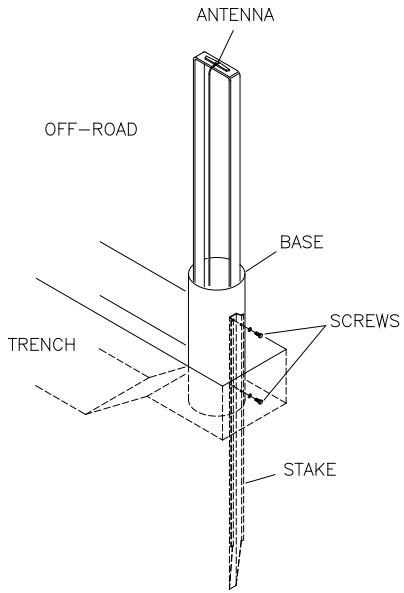
6. Drive the stake of the pedestal into the ground at the designated location until approximately 4 inches of the stake remain above ground level. Be sure to avoid driving the stake in at an angle; the pedestal should not be tilted once attached to the stake.



Stake with 4 inches remaining above ground level

7. Attach the base to the stake using the accompanying screws and washers. The pre-drilled holes in the stake and base must line up to secure them together.

Note: The stake mounts inside the pedestal base.

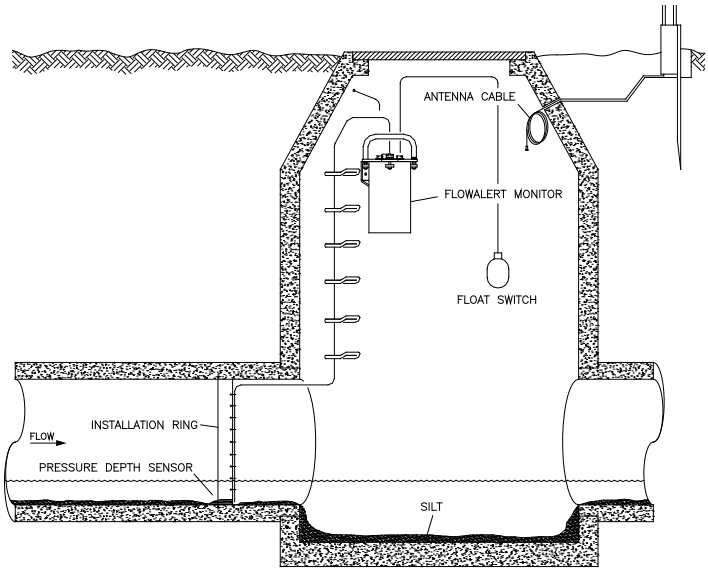


Securing the pedestal base to the stake

> **Note:** If you cannot get the stake down to the depth required to align the holes together, use a hacksaw to remove some of the length of the stake and drill new holes with a 3/8-inch bit.

8. Run the antenna cable through the bottom of the base into the trench.
9. Lay the cable in the trench, and run the cable through the pre-drilled hole in the corbel.
10. Coil the slack antenna cable and secure it away from the other cables in the manhole. Slack enables the technicians to remove the monitor from the manhole for maintenance or service activities with the antenna cable still connected. *Do not bundle the antenna and sensor cables together! This can significantly diminish antenna and sensor signal strength, disrupting communications and limiting sensor accuracy.*

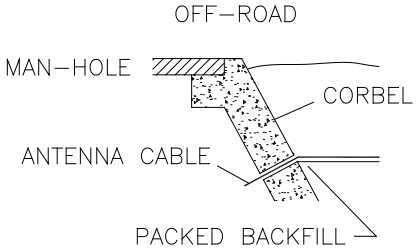
> **Note:** To prevent damage to the cable and antenna, do not kink or bend the antenna cable when coiling.



Installation with monitor and antenna cable in manhole

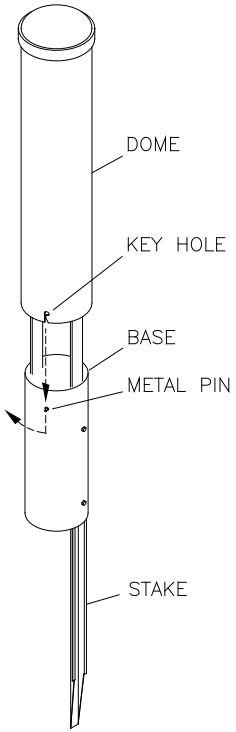
11. Seal the space between the antenna cable and the corbel hole with electrical duct seal or as required to prevent infiltration into the manhole.

12. Backfill the trench, the area surrounding the base, and the inside of the base to ground level. Make sure you firmly pack the backfill in the trench beneath the cable at the corbel hole. This provides a firm surface to protect the cable from possible crimping as the backfill accumulates and packs over the cable.



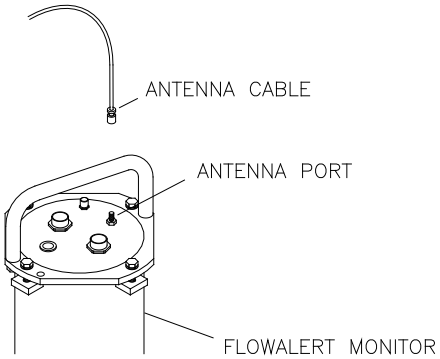
Backfill in trench protecting cable

13. Install the dome onto the base by sliding the dome over the bracket and base and then aligning the metal pins in the base with the cutouts on the bottom edge of the dome. Once the dome is seated in the cutouts, turn it to lock it into place.



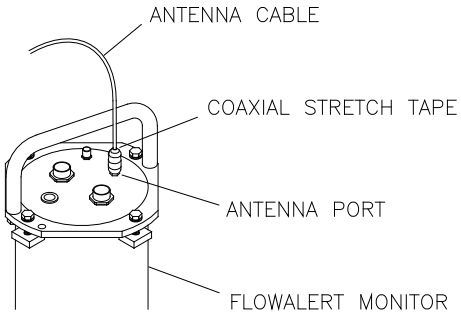
Sliding the dome over the bracket and base

14. Connect the SMA connector at the end of the antenna cable to the **TELEMETRY/ANTENNA** connector port on top of the monitor.



Top of monitor and antenna cable with connectors labeled

15. Wrap rubber stretch tape around the entire cable connection, extending onto the cable approximately 2 inches beyond the connection.



Cable connected to monitor with stretch tape properly applied

> **Warning:** Never use the pedestal as an anchor for equipment or personnel when conducting maintenance or service operations at the site.

Mounting a Wireless Antenna on a Roof or Other Protected Structure

This installation involves securing a wireless whip antenna with a magnetic base (ADS p/n 3800-0128) to a roof or other protected

magnetic structure. Roof or outdoor cabinet applications also require a lightning protection device (ADS p/n 507180).

Mount the whip antenna in the following way:

> **Warning:** Never place a magnetic mount antenna on top of or near a office or field (laptop) computer. The strong magnet in the antenna base will immediately corrupt the computer's hard drive.

1. Identify an anchored or heavy steel surface at least 4 inches by 4 inches to serve as the grounding plate. Do not consider using a manhole cover as a grounding plate to secure the antenna unless it exists in a remote or fenced location.

> **Note:** If the appropriate location for mounting the antenna is a manhole cover, do not run the antenna cable through a hole in the cover to avoid damage when removing the cover.

2. If the whip antenna is not attached to the magnetic base, screw the antenna onto the base using any sealing washers or o-rings included in the packaging.
3. Seat the antenna base to the steel grounding plate surface selected.
4. (*applies only to installations requiring lightning protection*) Install lightning protection according to the instructions included with the lightning protection device.
5. Run the antenna cable to the monitor location, and attach the connector to the **TELEMETRY/ANTENNA** port on top of the monitor.
6. Wrap rubber stretch tape around the entire cable connection, extending onto the cable approximately 2 inches beyond the connection.

Installing the SIM Card

FlowAlert monitors require a standard SIM card for wireless communication. This card must be installed in the monitor before communication can occur. The monitor uses SIM cards provisioned by AT&T (ADS p/n 507181) for public static IP address operation. Please contact ADS for specific information on procuring SIM cards for use in the specific geographic area.

Install the SIM card in the monitor in the following way:

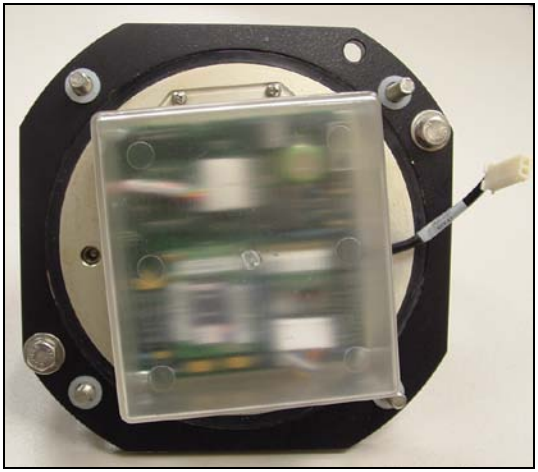
1. Record the number from the SIM card (i.e., the IP address) on the site report. This address is required for reconciling billing and setting up the LIF in the **Profile** software. This IP address is printed directly on the SIM card or on a label affixed to the card.

Sample SIM card

2. Loosen the bolts and remove the monitor lid (top) from the aluminum canister.

> **Note:** Removing the monitor lid during SIM card installation increases the risk of damaging or introducing debris or moisture to the circuit board. Make every effort to prevent water, dirt, and debris from contacting the monitor's circuit board during SIM card installation.

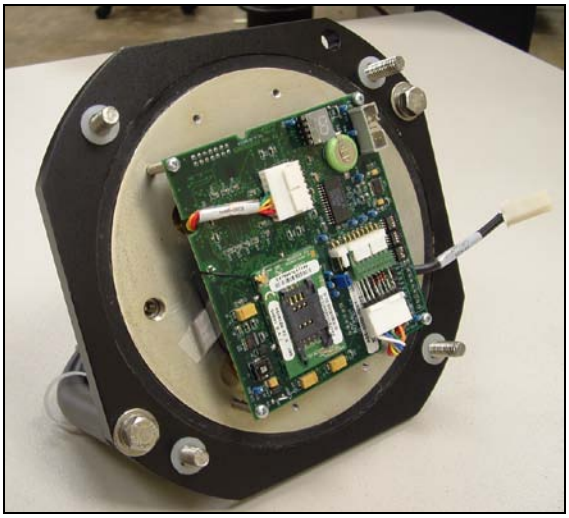
3. Lay the monitor top upside down with the plastic dust cover protecting the printed circuit board facing upward.



Dust cover over the printed circuit board on the underside of monitor top

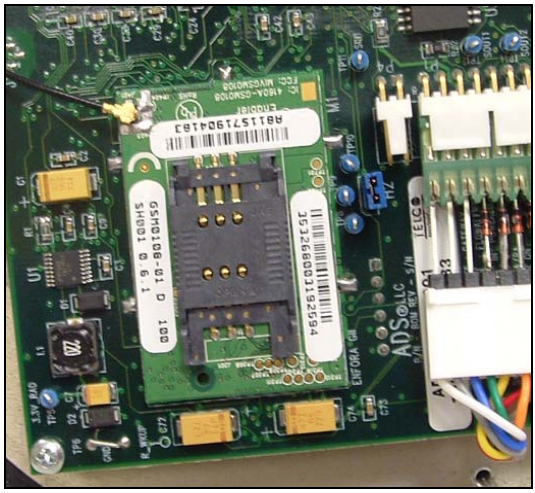
4. Disconnect the battery pack cable from the circuit board power cable.

5. Remove the four screws securing the dust cover, and remove the cover.



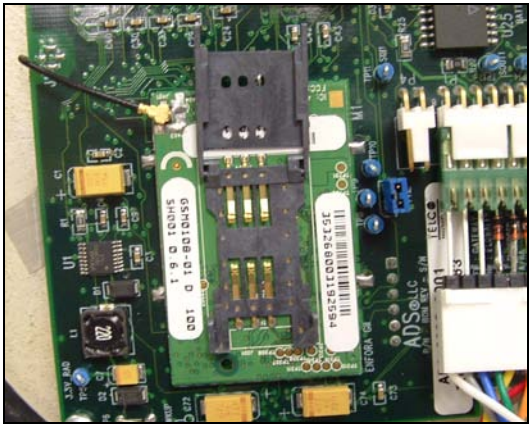
Dust cover removed revealing the board

6. Slide back the clip to the SIM card carrier on the circuit board to unlock the carrier.



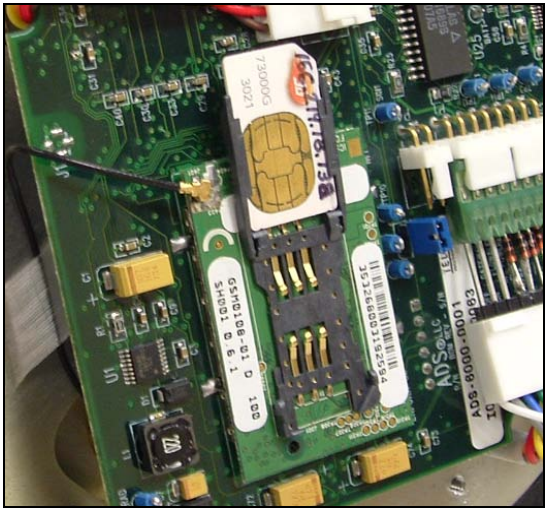
SIM card carrier (empty)

7. Swing up the hinged clip to the carrier.



Clip open on SIM card carrier

8. Gently insert the SIM card into the slot on the clip. Orient the card so that the beveled corner of the card will align with the beveled corner of the carrier when in place.



Card inserted into open carrier clip

9. Close the clip to the carrier, and slide the clip forward to lock the SIM card into place.

SIM card secured in carrier clip

10. Replace the protective dust cover over the board, and replace and tighten the screws securing the cover to the monitor top.

11. Reconnect the battery pack cable to the circuit board power cable.
12. Call the monitor through the wireless connection to verify communication. Establishing communication requires setting up the location through **Profile** and configuring the monitor with the proper serial number and IP address.
13. Carefully replace the monitor lid onto the canister (*without pinching the battery pack/power cables*), and torque down the bolts securing the top to the enclosure to 35 inch pounds (+/– 5 inch pounds).

Providing Telephone Service

Providing telephone service to the monitor involves the following steps:

- Running the telephone cable between the monitor and service locations
- Mounting the lightning protection module
- Preparing the telephone cable
- Wiring the telephone cable to the monitor
- Wiring the telephone cable to the lightning protection module
- Wiring the lightning protection module to the network interface box

> **Warning:** To avoid possible shock, make all connections to the monitor before wiring to the lightning protection module and the telephone company's network interface box.

Running the Telephone Cable Between the Monitor and Service Locations

> **Warning:** Always disconnect the telephone line at the ONI/Network Interface while performing field wiring. Dangerous voltages (100 VAC) are present when the line is ringing. Connect to the telephone company line only after all other wiring is complete.

The first step in establishing telephone service involves running the telephone cable between the monitor and service locations. However, before this can occur, the installer must evaluate the most suitable location for the service pedestal and the most appropriate route for running the cable. Pedestal location and cable route

evaluation criteria may include issues such as the monitor's location in relation to the closest service pole or pedestal, existing landscape, utilities present, and excavation costs.

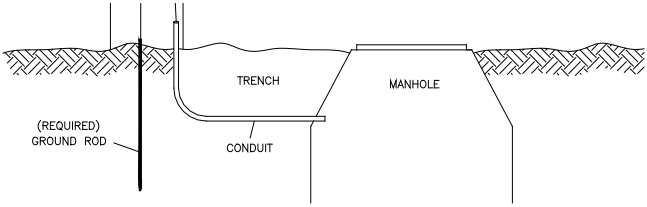
> **Note:** For more information on determining the most suitable pedestal location and cable route, consult your ADS representative.

In addition, notify the local underground utilities locating service concerning the desired pedestal location and cable route. Typically, notification must occur 2 to 3 days before excavation activities are scheduled to begin.

After finalizing the pedestal location and cable route and completing the utility location, run the telephone cable between the monitor location and the designated pedestal location in the following way:

1. Excavate a trench at least 12 inches deep from the designated telephone service pedestal location to the monitor location. Consult the local regulations to verify the required trench depth for the area.
2. Drill a hole in the corbel (structural foundation holding the manhole cover) of the manhole large enough to accommodate the diameter of ¾-inch electrical conduit plus an extra ½ inch.
3. Run the telephone cable from the monitor location in the manhole to the telephone service pedestal location through ¾-inch electrical conduit. Consider the following parameters and recommendations when running the cable:
   - ❑ Use four-conductor Belden® cable.
   - ❑ Do *not* use plumbing conduit or water fittings.
   - ❑ Run the telephone cable through the conduit one section at a time as you lay the conduit in the trench and connect the sections of conduit together. When necessary, use fish tape to feed the telephone cable through the conduit.
   - ❑ Provide enough slack in the cable at the manhole end to allow removal of the monitor from the manhole during service activities.

- ❑ Provide approximately 12 to 15 inches of excess cabling at the telephone service pedestal.
- ❑ Create a drip loop for any wires or cables that may be subject to condensation to prevent moisture from entering the electrical or telephone boxes.
- ❑ Extend the conduit through the hole in the corbel of the manhole at the monitor location.
- ❑ Extend the conduit approximately 12 inches vertically out of the trench (from the ground surface) at the designated pedestal location.



Running conduit from the telephone service location to the manhole

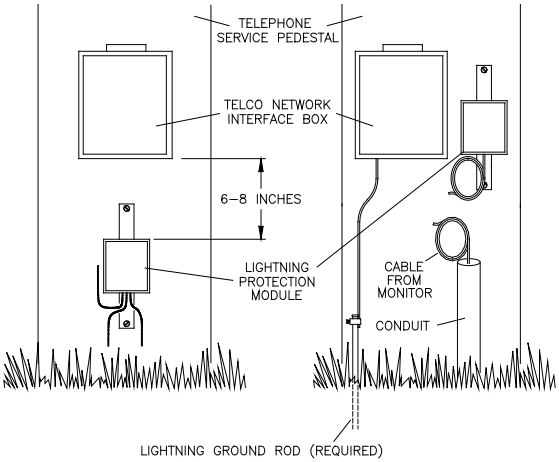
4. Use urethane foam to seal the space between the conduit and the corbel to prevent infiltration into the manhole.
5. Use urethane foam or a weatherhead to form a seal between the telephone cable and conduit at each end of the conduit. This will prevent sewer gases from entering the telephone service pedestal, moisture from entering the conduit during a surcharge, and inflow from entering the manhole.
6. Backfill the trench, and restore the landscape as necessary.
7. Install a service pedestal at the designated location based on the manufacturer's instructions.
8. Make sure the telephone company installs a network interface box inside the pedestal.
9. Make sure a ground rod (stake) is buried inside the pedestal. This rod is critical to ensuring proper lightning protection. If one does not exist, bury an 8-foot copper-coated steel rod vertically into the ground inside the pedestal until it is

completely submerged. Refer to the National Fire Protection Association (NFPA) Standard 70 National Electrical Code (NEC) Article 250 for detailed instructions on proper grounding when an 8-foot vertical depth is not available.

Mounting the Lightning Protection Module

The next step in establishing telephone service is mounting the lightning protection module to the service pedestal. Mount the module as follows:

1. Remove the front cover from the pedestal.
2. Use the screws included with the lightning protection module to mount the module on the pedestal at *least* 12 inches above the ground surface and next to or 6 to 8 inches below the network interface box.

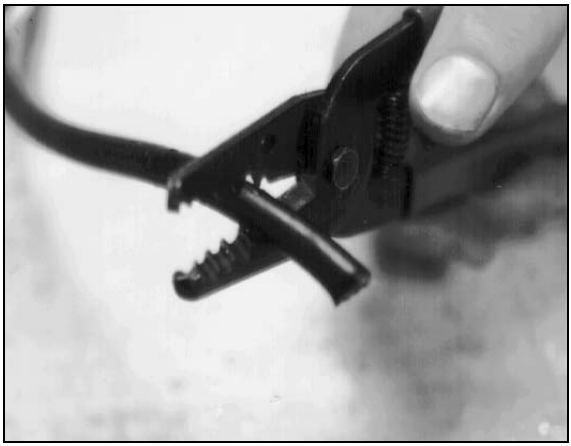


Positioning of the lightning protection module and network interface box in the pedestal

Preparing the Telephone Cable

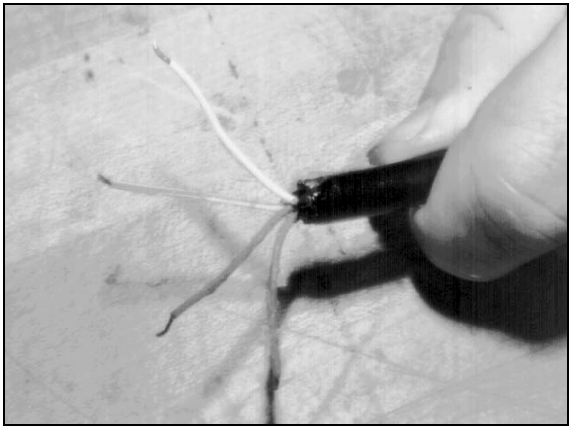
The next step in establishing telephone service is preparing the telephone cable for connection to the lightning protection module. Prepare the cable in the following way:

1. Carefully strip about 3 inches of the external insulation from each end of the telephone cable.



Stripping the external insulation from the telephone cable

2. Remove the internal braiding, and separate the four insulated wires.

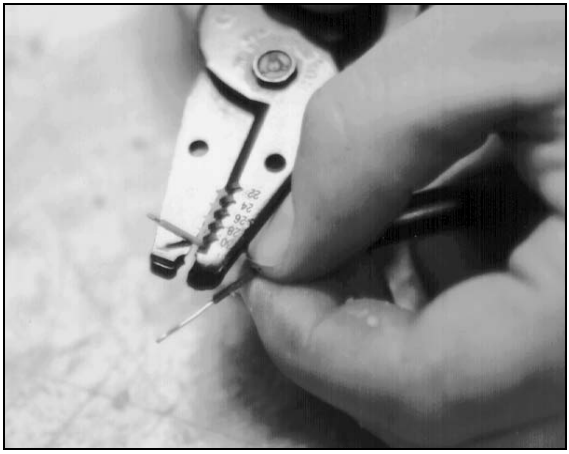


Separating the insulated wires

3. Cut off both the orange and the orange/white-striped wires down to the level of the external insulation. These wires will not be used in this application.

> **Note:** The wire colors referenced in this manual are based on the telephone cable recommended for use in these applications. However, the wires inside some telephone cables may vary in color and number. Therefore, when the actual wire colors and number differ from those designated in this manual, connect the available wiring in reference to ground, ring, and tip.

4. Strip ½ inch of insulation from the remaining blue and blue/white-striped wires.



Stripping ½ inch of insulation from each wire

5. At the *pedestal* end of the cable, fold over both exposed wires (doubling the thickness). Insert each wire into a non-insulated #10 ring terminal lug (22-18 gauge), and crimp the wires to the lugs.

Wiring the Telephone Cable to the Monitor

After preparing the telephone cable, wire the telephone cable to the monitor in the following way:

> **Note:** Wiring the telephone cable to the monitor requires an intermediate cable (External Power/Phone Cable - ADS p/n 5000-0697) supplied by ADS when ordering a FlowAlert monitor equipped for landline communication

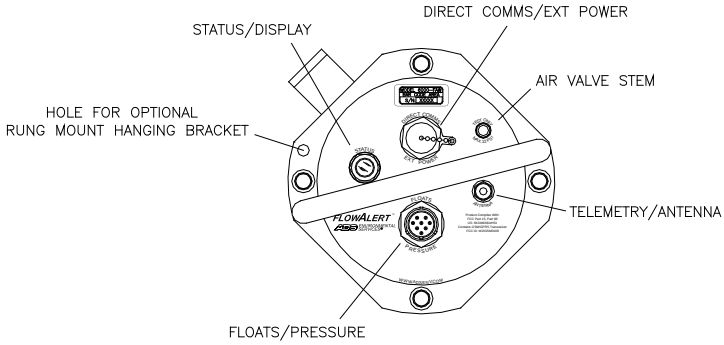
1. Unpack the FlowAlert phone cable (ADS p/n 5000-0697). *This is the same cable as the RainAlert II phone cable and the FlowShark External Power Cable.* The pigtail consists of two bundled pairs: green/white and red/black. If these soldered junctions must be modified or stripped to simplify the phone junction process, keep the pairs together. Although they do not require soldering, the green/white and red/black pairs must

remain connected together securely when splicing to the phone wire.

2. Connect the green/white and red/black pairs to the phone wires. Use crimp-type or other outdoor-rated connection methods to splice the monitor cable to the phone cable.

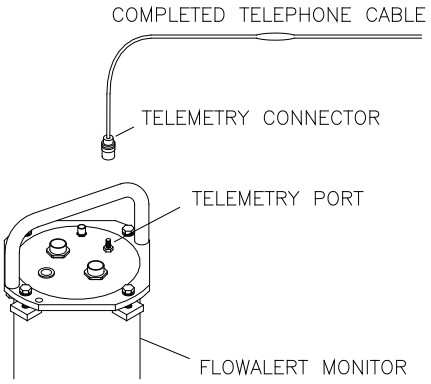
3. Thoroughly wrap the completed connection with rubber tape. Extend the tape up the cables beyond the connection to ensure a good moisture seal and to reinforce the connection.

4. Identify the communications port (**TELEMETRY/ ANTENNA**) on top of the monitor.



TELEMETRY/ANTENNA (communications) port on top of the monitor

5. Seat, fasten, and secure the completed telephone cable onto the communications port on the monitor. Tighten the connector in a clockwise direction until it clicks. Verify that it is seated correctly.



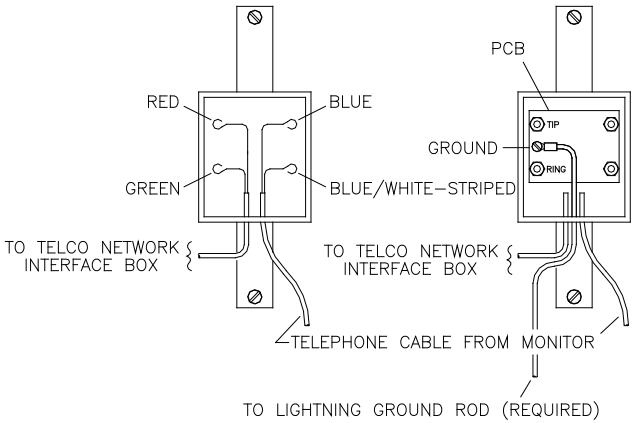
Completed telephone cable connected to **TELEMETRY/ANTENNA** port on monitor

Wiring the Telephone Cable to the Lightning Protection Module

Next, wire the telephone cable to the lightning protection module (ADS p/n 103313) in the following way:

1. Open the front cover of the lighting protection module, and remove the nuts, washers, and card from the posts inside the module. Leave only the bottom-most nut on each post.
2. Slice a hole in the grommet in the bottom of the module, and run the telephone cable up through the grommet into the module.
3. Place the lugs for the following wires onto the designated posts, and then re-place a washer and nut onto each post:
   - ❑ Red wire to Telco network interface — Top left post (tip)
   - ❑ Green wire to Telco network interface — Bottom left post (ring)
   - ❑ Blue wire from monitor — Top right post (tip)

- ❑ Blue/white-striped wire from monitor — Bottom right post (ring)



Lightning protection module wiring diagram

Note: Remember, the wire colors referenced in this manual are based on the telephone cable ADS recommends for these applications. However, the wires inside some telephone cables may vary in color and number. Therefore, when the actual wire colors and number differ from those designated in this manual, connect the available wiring in reference to ground, ring, and tip.

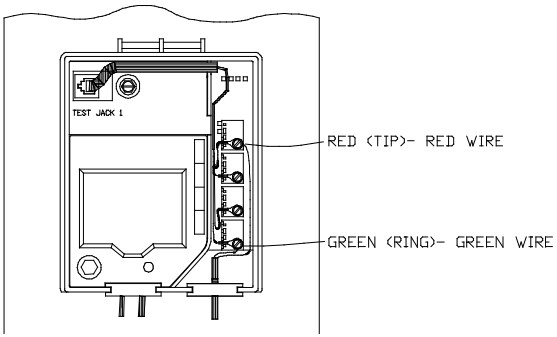
4. Run the two wires (secured to the posts on the left) down and out through the grommet in the bottom of the module.
5. Place a washer onto each post, and replace the card.
6. Securely tighten a washer and nut onto each post over the card.
7. Make sure the ground wire (included with the lightning protection module) is secured at the designated location on the front left side of the card, and run the wire down through the bottom grommet of the module.
8. Close and secure the front cover of the module.

9. Cut ½ inch of insulation from the loose end of the black ground wire running from the lightning protection module.
10. Clamp the exposed wire to the ground rod protruding from the ground inside the pedestal or to the telephone company's existing ground wire (when properly connected to the ground rod).

Wiring the Lightning Protection Module to the Network Interface Box

The final step in establishing telephone service is wiring the lightning protection module to the telephone company's network interface box. Accomplish this task in the following way:

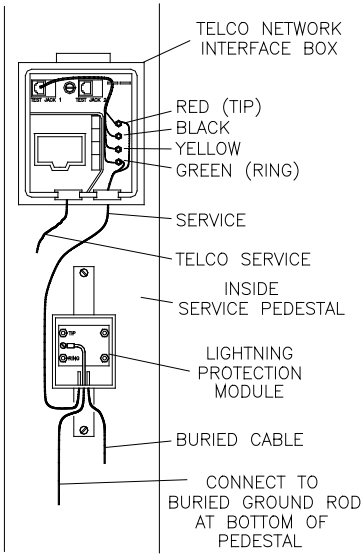
1. Open the front cover of the telephone company's network interface box, and temporarily disconnect the test plug. Opening some network interface boxes may require a special tool available only through the telephone company.
2. Remove 3 inches of insulation from the lightning protection module service cable to expose the four insulated wires.
3. Cut off the black and yellow wires (running from the lightning protection module) down to the level of the external insulation.
4. Strip ½ inch of insulation from the green and red wires.
5. Slice a hole in the rubber grommet in the bottom of the network interface box (when necessary), and run the wires up through the grommet into the box.
6. Loosen the screws for tip and ring in the network interface box. Wrap the following wires around the designated posts and then re-tighten the screws until snug:
   - ❑ Red wire — tip
   - ❑ Green wire — ring



Wiring diagram of a typical telephone company network interface box

Note: Since the colors inside some boxes vary, this manual does not reference colored posts for connection. The installer should connect the wires to the posts in reference to ring and tip.

7. Use urethane foam to seal the space between the telephone cable coming from the manhole and the conduit. This prevents sewer gases from traveling through the conduit from the manhole into the pedestal. These gases could produce a potentially explosive environment inside the service pedestal.
8. Re-connect the test plug.
9. Close and secure the cover of the network interface box.

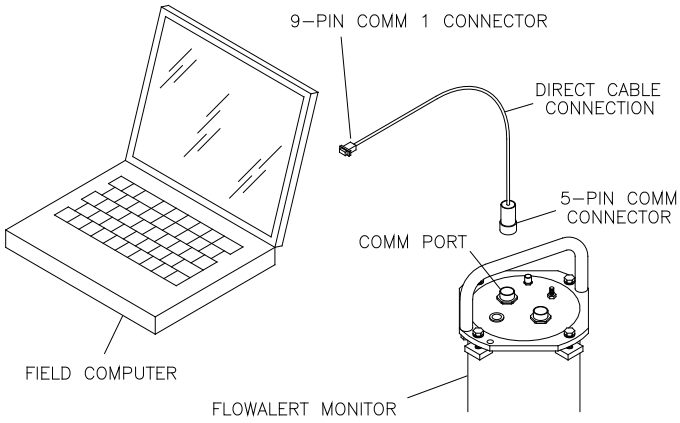


Complete wiring diagram

Connecting to the Monitor in the Field

Communicating with the monitor on-site requires a direct serial cable (ADS p/n 5000-0664) and a field computer running the **Profile®** software. The direct serial cable provides communication between the user's computer and the monitor without the need of telemetry.

To use the cable for performing on-site communication, connect the cable's 9-pin connector to the field computer's serial communication port and the 5-pin connector to the monitor's **DIRECT COMM/EXT POWER** communication port. Refer to the *Profile User's Guide* (#950015**) for using the **Profile** software to designate the appropriate local port for serial communication.



Connecting the field computer to the monitor in the field

Note: If your computer only has a USB port and no serial port, use a USB to Serial adapter cable (and driver software) to perform serial communications. Ensure that the appropriate port for the USB adapter has been designated in **Profile** (it will be different than the serial port) before attempting communications. ADS

recommends the following USB adapters: Dynex – model DX-UBDB9, and Keyspan – model USA-19S.

CHAPTER 5

Configuration and Activation

After installing the ADS® FlowAlert™ monitor, pressure depth sensor, and float switch(es) and setting up communication, it is necessary to configure and activate the monitor to begin taking flow depth measurements and recording data at the monitor location. This chapter contains general instructions on the following activities concerning monitor configuration and activation:

- Creating a monitor location
- Creating an installation (pipe) table
- Selecting and editing devices
- Setting the communication parameters
- Activating the monitor
- Configuring power savings (*optional*)

This chapter also includes the procedure for running diagnostics on the devices, collecting data from the monitor, and upgrading the firmware (embedded software) in the monitor.

Refer to the *Profile® User's Guide* (#950015**) for more detailed instructions on installing the software, collecting monitor data, and configuring, activating, and confirming the monitor.

Configuring the Monitor Location

To ensure the most accurate results for each monitor location, the user must activate the FlowAlert monitor with the proper configuration information to satisfy the specific monitoring needs of the project and to reflect actual site conditions. The configuration information includes critical details such as specific pipe characteristics, location description, device assignment and parameters, log rates, and other items relevant to the site and project requirements.

The configuration information is stored in a Location Information File (LIF) in the user's local directory or network drive. Certain elements of the LIF are saved to the monitor memory during monitor activation.

This section includes instructions on performing the following activities required for monitor configuration:

- Creating a Monitor Location in the **Profile** database
- Creating an Installation Table for the Monitor Location
- Selecting and Editing Devices

> **Note:** If remote (*landline or wireless*) communications already have been established for the location, these activities can be performed in cooperation between field and office personnel. If remote communication is not available, perform configuration and activation on-site through direct communication with the monitor.

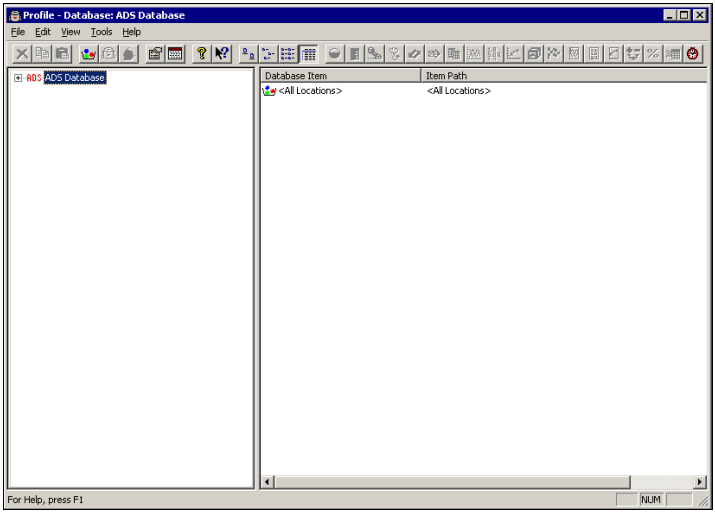
Launching the Profile Software

Before traveling to the field for installation, configuration, and activation activities, install the **Profile** software on the field computer.

Once installed, launch the **Profile** software from an office or field computer by selecting **Start** > **Programs** > **ADS Corporation** > **Profile** from the **Microsoft® Windows®** start menu or double-clicking on the **Profile** icon on the **Windows** desktop.

Profile icon on desktop

*The **Profile** main screen displays.*



Profile main screen

The left pane provides the capability to display all the levels and current details for the selected database on a tree. These levels and details are accessible by expanding and collapsing the entries on the tree. Click on the plus symbol (+) next to an entry to display the items contained under that level of the tree; click on the minus symbol (-) next to an entry to collapse the items under that entry level.

Select an entry or level name in the left pane to display the details of that entry in the right pane of **Profile**.

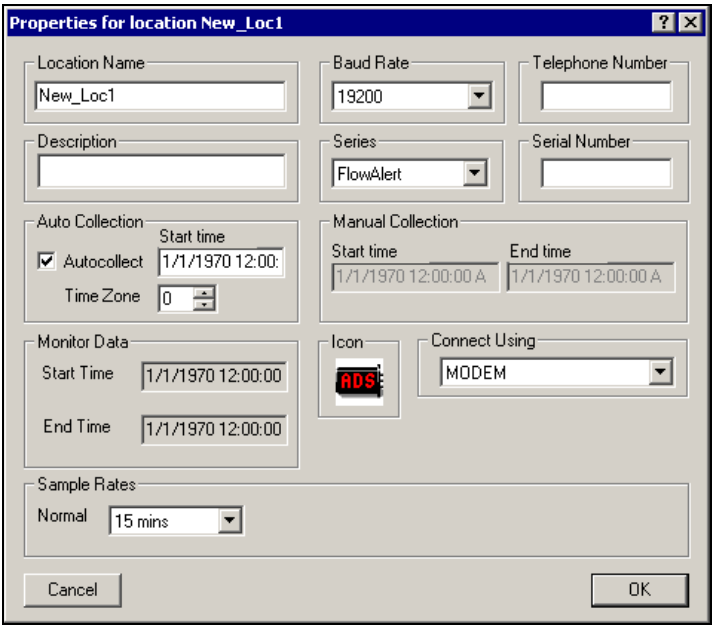
The toolbar provides access to various functions and tools in **Profile** based on the item selected in the left or right pane.

Creating a Monitor Location

Creating a new location includes entering and setting up the location information in the following way:

1. Select the **<All Locations>** group located under the database level.
2. Select the **Edit > New > Location** option or click on the **New Location** toolbar button.

A new location named **New Location #1** *is added to the* **<All Locations>** *group and displays the* ***Properties*** *dialog.*

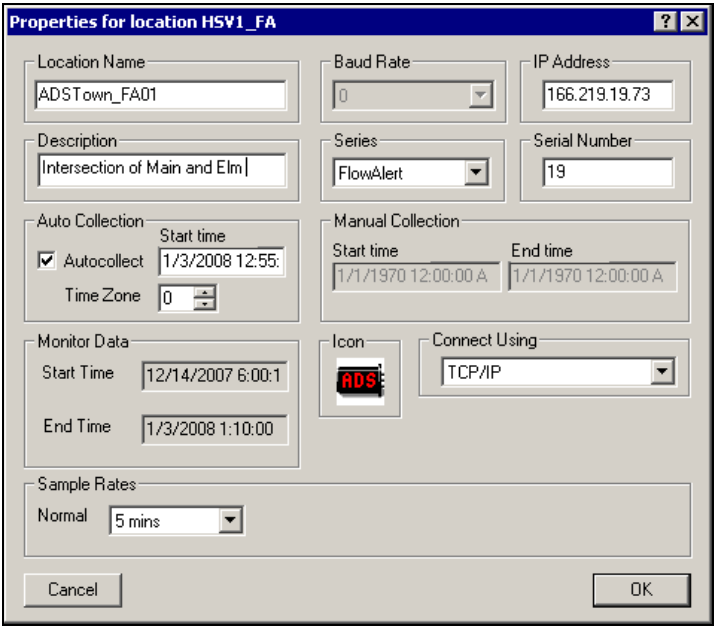


Properties dialog for the new FlowAlert location

3. Enter the new **Location Name**. *Do not duplicate more than the first 7 characters for multiple monitors names.*
4. Enter the new location **Description**.
5. Select **FlowAlert** from the **Series** drop-down list.
6. Select the appropriate method of communication from the **Connect Using** drop-down list.
7. Enter the monitor location **Telephone Number** or the **IP Address** for the wireless connection.

> **Note:** When entering an IP Address, do not include leading zeroes in the address. For example, an IP Address of 166.219.008.063 should be entered as 166.219.8.63. If leading zeroes are included in the address, monitor communications will not be successful.
>
> **Note:** To support emailing and text messaging for alarm notification, the address of the monitor's SIM card must begin with 166.219.XXX.XXX. If the address begins with other numbers, please contact ADS Client Services to arrange for a replacement SIM card for the monitor.

8. Enter the monitor **Serial Number**.
9. Enter the number of hours difference between your location (or the location of the computer on which the database resides) and the location of the monitor in the **Time Zone** field. For a monitor in a time zone earlier than the time zone in which you are located, enter a minus sign before the number of hours difference. For example, if you are in the *Central* time zone and the monitor is located in the *Mountain* time zone, select **-1** from this field.
10. Select the rate at which you want the monitor to log data from the **Normal** drop-down list.



Completed **Properties** dialog for monitor location

11. Click on the **OK button** to create a LIF for the location in the database and exit the dialog.

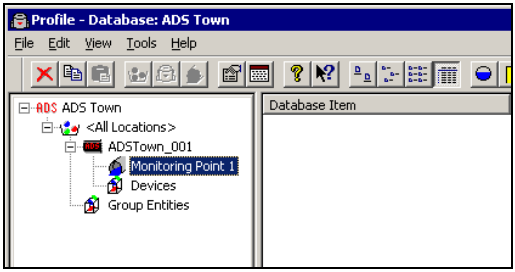
The new monitor location with a single monitoring point is now created and configured in the database.

Creating an Installation Table

Creating an installation table involves defining the size, shape, and physical characteristics of the monitoring point. This table is required for all FlowAlert installations, even those that do not include a pressure depth sensor. Base all measurements for the installation table on the incoming (upstream) pipe.

The user can create an installation table using the **Installation Generator** in the **Profile** software in the following way:

1. Select the monitoring point for which you want to create the installation.

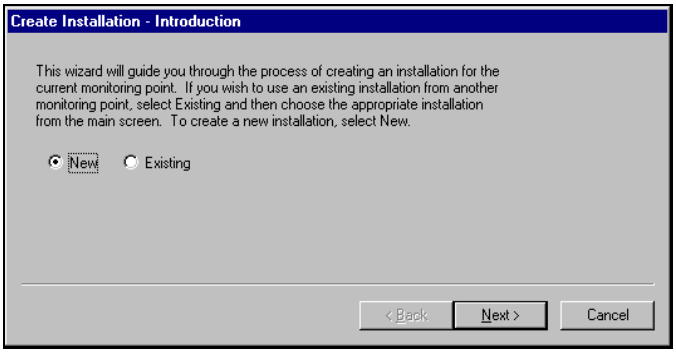


Monitoring Point 1 selected from Location ADSTown_001

2. Select **Tools > Installation Generator** from the main menu *or* click on the **Installation Generator** toolbar button on the **Profile** main screen.

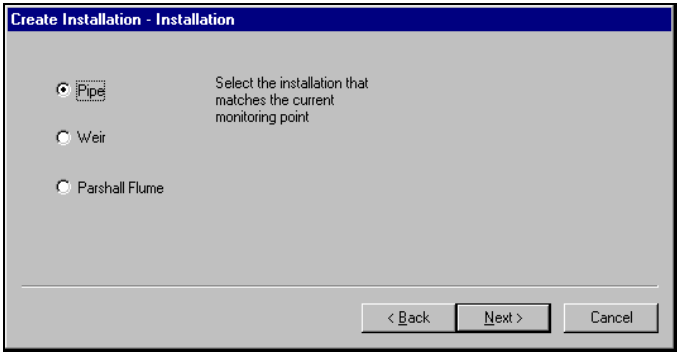
Installation Generator toolbar button

*The **Create Installation – Introduction** dialog in the wizard displays.*



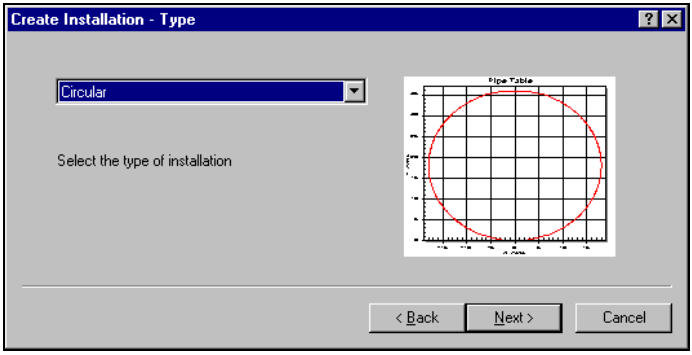
Create Installation – Introduction dialog in the wizard

3. Select the **New** radio button, and then click on the **Next** button.



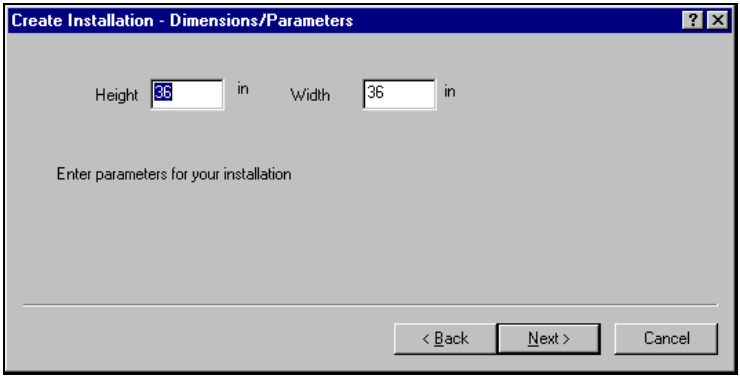
Create Installation – Installation dialog

4. Select the **Pipe** radio button, and then click on the **Next** button.



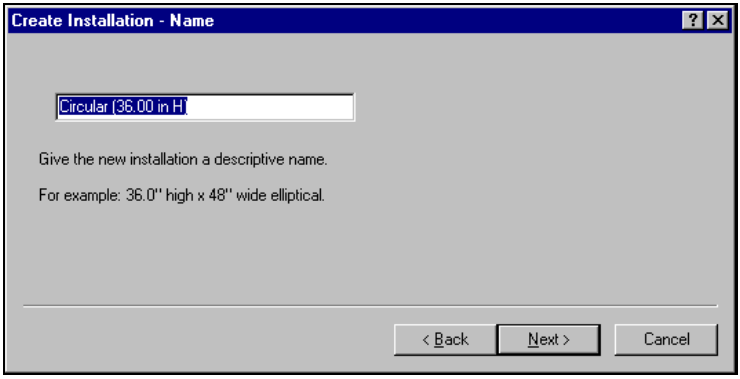
Create Installation – Type dialog

5. Select the type or shape of the pipe from the drop-down list, and then click on the **Next** button.



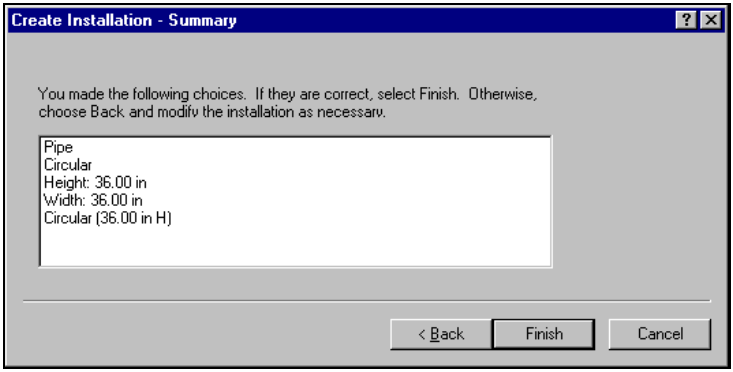
Create Installation – Dimension/Parameters dialog

6. Enter the proper pipe dimensions in the corresponding fields, and then click on the **Next** button.



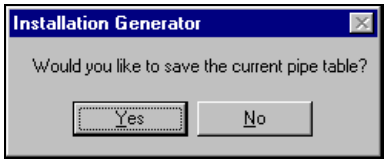
Create Installation – Name dialog

7. Enter an appropriate name for the installation in the text field, and then click on the **Next** button.



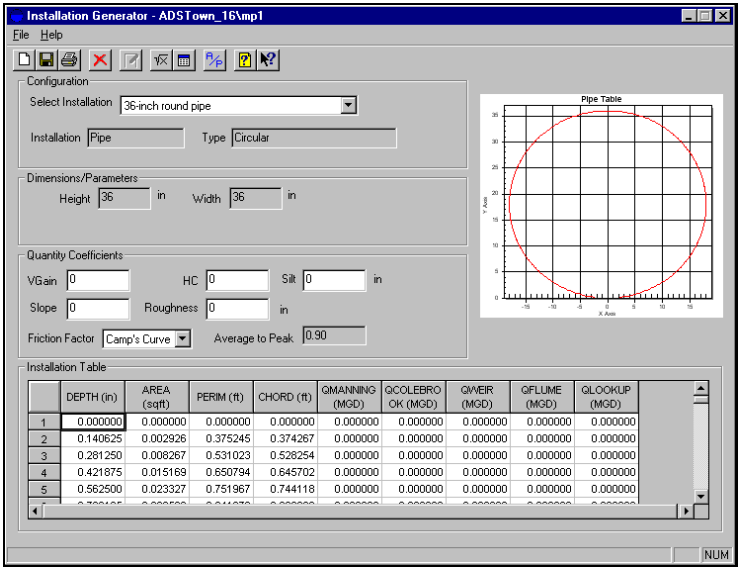
Create Installation – Summary dialog

8. Review the installation table selection summary, and then click on the **Finish** button. Click on the **Back** button to return to previous dialogs to edit any of the existing selections.



Option to save pipe table dialog

9. Click on the **Yes** button save the installation table to the **Profile** database for the selected location.



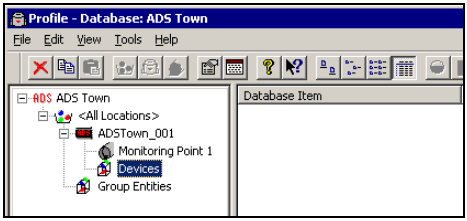
Installation Generator dialog

10. Select **File > Exit** to close the **Installation Generator**.

Selecting and Editing Devices

Select and edit the devices corresponding to the new monitor location to log the desired data. Editing the devices involves setting specific parameters to ensure the monitor and **Profile** properly obtain and process the data. Perform the following steps to properly select and edit devices:

1. Select the location for selecting/editing devices from the database.
2. Expand the location contents (monitoring point and devices) by selecting the expansion symbol corresponding to the location, and then select **Devices**.

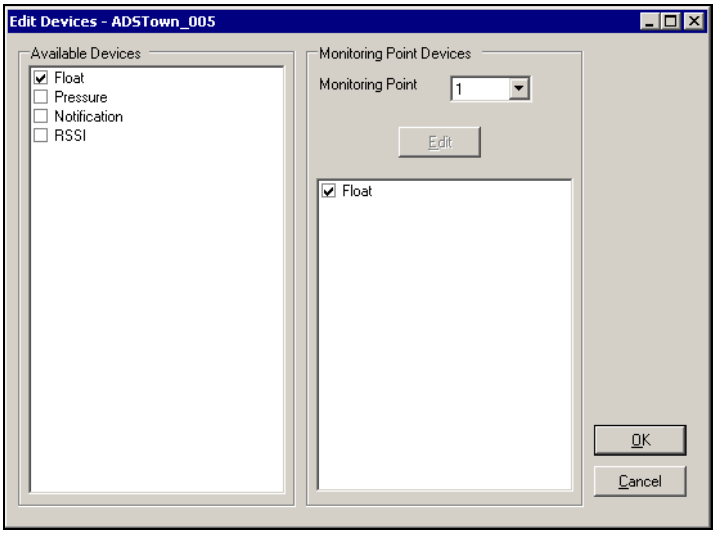


Devices selected for ADSTown_001

3. Select the **Edit > Properties** option *or* click on the **Properties** toolbar button.

Properties toolbar button

*The **Edit Devices** dialog displays the available devices and devices selected by default for Monitoring Point 1.*



Edit Devices dialog

4. Select the checkboxes corresponding to the devices you want to assign to the designated monitoring point from the **Available Devices** selection box. A checkmark *must* display beside a device in the **Monitoring Point Devices** section to ensure

Profile includes the device in the LIF. *Deselect* the checkboxes corresponding to the devices you want to remove from association with the selected monitoring point from the **Available Devices** section.

> **Note: Profile** selects the **Float** device for the FlowAlert monitor by default.

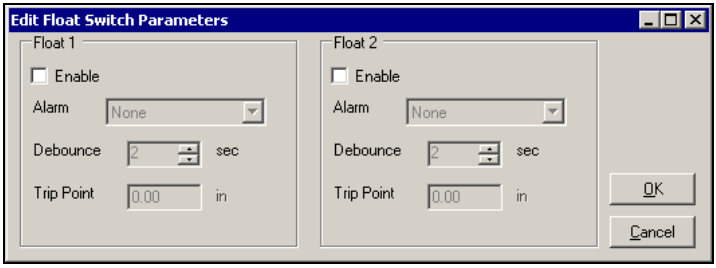
*The selected devices display in the **Monitoring Point Devices** section.*

5. Repeat steps 4 through 5 to assign devices to Monitoring Point 2, when applicable.
6. As necessary, edit the parameters specific to each device in the following way:
   - ❑ Access the device parameters by selecting (*highlighting*) the device you want to edit in the **Monitoring Point Devices** section and then clicking on the **Edit** button.
   - ❑ Refer to the following sections for details concerning the specific device parameters.
7. Once you have edited the devices as necessary, click on the **OK** button to save the devices to the LIF.

Editing the Float Device(s)

Edit the parameters for each float switch device in the following way, and then click on the **OK** button when complete:

> **Note:** If the FlowAlert is supporting two float switches, configure them both on the **Edit Float Switch Parameters** dialog. Although the floats are configured on the same dialog, each one represents an individual device.



Edit Float Switch Parameters dialog

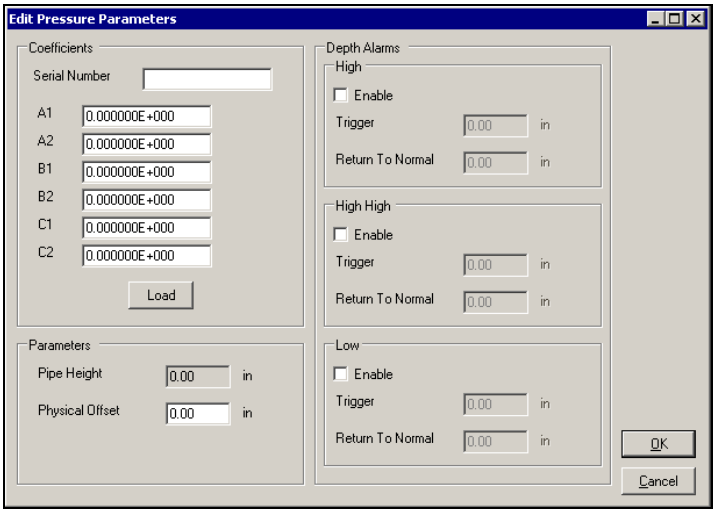
- **Enable** Select this checkbox in the **Float [*1 and/or 2*]** section to activate the options for the float you want to edit.
- **Alarm** Select the kind of alarm you want to initiate when the flow reaches the corresponding depth level.

> **Note:** You may designate only one alarm for each device when configuring the devices for a FlowAlert monitor. However, the alarms can be distributed among the float switches and the pressure depth sensor as applicable and appropriate.

- **Debounce** Use the arrows to designate the minimum amount of time, following a change in state, the float must remain in a new state to activate an alarm or indicate a return to normal.
- **Trip Point** Enter the elevation at which the float changes states.

Editing the Pressure Device

Edit the pressure device in the following way, and then click on the **OK** button when complete:



Edit Pressure Device Properties dialog

- **Serial Number** Enter the serial number listed on the pressure depth sensor.

  Note: It is essential that you enter the pressure depth sensor's serial number and download the pressure coefficients to ensure the monitor logs accurate pressure depth data.

- **Coefficients** Click on the **Load** button to browse to the folder in the local directory containing the coefficients for the pressure depth sensor (based on the sensor's serial number). These coefficients also can be entered manually. Download the file containing the pressure coefficients to the local directory from the ADS website in the following way:

  ❑ Access the ADS website at *www.adsenv.com* on the Internet.

- ❑ Select **Environmental Services** > **Support** > **Client Services**.
- ❑ Click on the **Download pressure coefficients…** link.
- ❑ Right-click on the year in which the sensor was manufactured, and select the **Save Target As** option.
- ❑ Rename the file to reflect the following format: *pressure.xx*, where xx represents the last two digits of the year in which the sensor was manufactured. You must remove the .txt extension.
- ❑ Save the file to the appropriate location in the local file system.

- **Pipe Height** This field displays the pipe height at the monitor location. *This parameter is not editable from this location.*
- **Physical Offset** Enter the physical offset for the pressure depth sensor based on the installation location. ADS recommends measuring this distance manually during the monitor installation or confirmation process. **Profile** defaults to *0 inches*.
  - ❑ **Pipe** When the sensor is installed in a pipe, enter the vertical distance from the bottom of the sensor to the bottom center of the pipe.
  - ❑ **Manhole/Wet Well Wall** When the sensor is mounted to a manhole or wet well wall, enter the vertical distance from the manhole invert (or bottom) to the nose of the sensor.
- **Depth Alarms – High** Edit the device to ensure the FlowAlert initiates a high depth alarm when a pressure depth reading reaches or a exceeds a specified depth in the following way:
  - ❑ **Enable** Select this checkbox to activate the high depth alarm options.
  - ❑ **Trigger** Enter the pressure depth reading at or above which you want the FlowAlert to initiate a high depth alarm.

- **Return to Normal** Enter the pressure depth reading at or below which you want the FlowAlert to terminate alarming conditions corresponding to a high depth alarm.

- **Depth Alarms – High High** Edit the device to ensure the FlowAlert initiates a high high depth alarm when a pressure depth reading reaches or a exceeds a specified depth in the following way:

  - **Enable** Select this checkbox to activate the high high depth alarm options.

  - **Trigger** Enter the pressure depth reading at or above which you want the FlowAlert to initiate a high high depth alarm. ADS recommends that this value be at least 2 inches greater than the value entered for the high depth trigger when it is in use.

  - **Return to Normal** Enter the pressure depth reading at or below which you want the FlowAlert to terminate alarming conditions corresponding to a high high depth alarm.

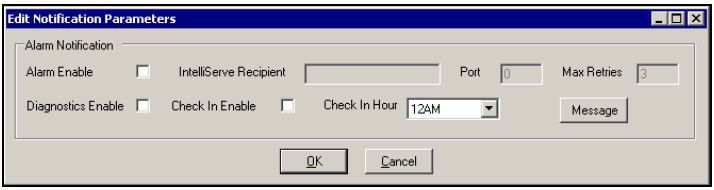
- **Depth Alarms – Low** Edit the device to ensure the FlowAlert initiates a low depth alarm when a pressure depth reading reaches or falls below a specified depth in the following way:

  - **Enable** Select this checkbox to activate the low depth alarm options.

  - **Trigger** Enter the pressure depth reading at or below which you want the FlowAlert to initiate a low depth alarm.

  - **Return to Normal** Enter the pressure depth reading at or above which you want the FlowAlert to terminate alarming conditions corresponding to a low depth alarm.

Editing the Notification Device



The FlowAlert monitor can provide alarm notification through **IntelliServe®** systems, email, and cellular phones with text messaging (SMS) capability. These alarms represent High, High High, and Low Depth alarms.

The FlowAlert also can check in daily and provide event notification to an email address and cellular phone. Events concern low battery voltage, power failure, and float and time errors.

Edit the notification device to setup alarm and/or event notification in the following way, and click on the **OK** button when complete:

- **Alarm Enable** Select this checkbox to activate the options for configuring alarm notification to an **IntelliServe** system, cellular phone, and/or email address.
- **IntelliServe Receipient** Enter the IP address for the **IntelliServe** system you want the FlowAlert monitor to notify under alarm conditions.
- **Port** This non-editable field represents the number of the port through which wireless communication will occur (when applicable). The current default and only applicable port is 2100.
- **Max Entries** Enter the number of times within a sample interval you would like the FlowAlert monitor to attempt to establish communication following an event.
- **Diagnostics Enable** Select this checkbox to enable the FlowAlert monitor to send out event notification to a cellular phone or email address.
- **Check In Enable** Select this checkbox to ensure the FlowAlert monitor checks in daily through an email or text

message. The daily check-in provides the monitor name, date and time, and battery voltage.

- **Check In Hour** Select the time at which you want the monitor to check in from the drop-down list.
- **Message** Click on this button to display the **Edit Alarm Recipients** dialog for entering alarm/event recipient email addresses and cellular phone numbers.
- **Edit Alarm Recipients** Enter the email address or cellular phone number and select the corresponding communication method for up to three recipients. To receive text messages, enter both the area code and the phone number for the cellular phone. Following is an example of the format to use for an SMS number:

  2561234567

  Note: Text messages cannot be sent to landline numbers.

  To receive email, enter the wireless provider's SMS/mail Gateway number and the recipient's email address separated by a colon. ADS only uses AT&T wireless service; therefore, all emails should read in the following format:

  +121:john.doe@adsenv.com

Editing the RSSI Device

The RSSI (Received Signal Strength Indication) device does not require editing. This device corresponds to the signal strength for wireless communication.

Setting the Communication Parameters

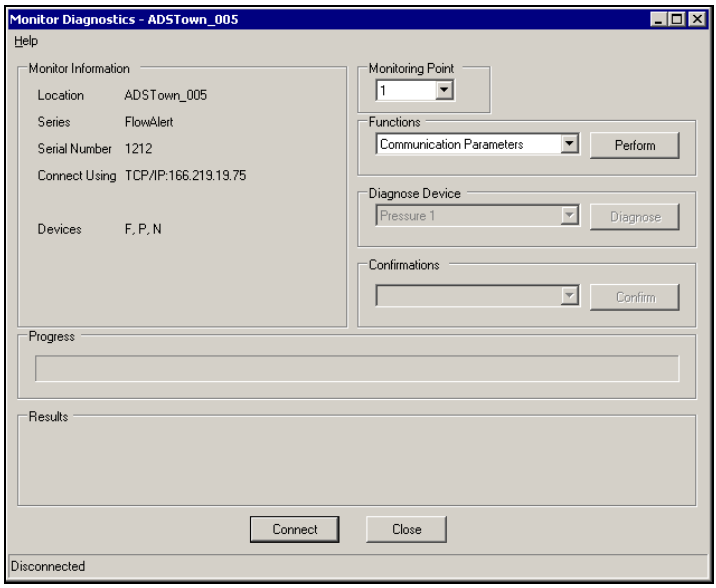
Setting the communication parameters involves designating the modem, communication ports, and temperature, battery, and signal thresholds to ensure proper communication, measurement, and maintenance of the FlowAlert monitor. Modify the communication parameters, as necessary, in the following way:

> **Note:** Typically, the default settings should not require modification.

1. Select a monitor location from the **Profile** main screen, and then select **Tools > Diagnostics** from the main menu *or* click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

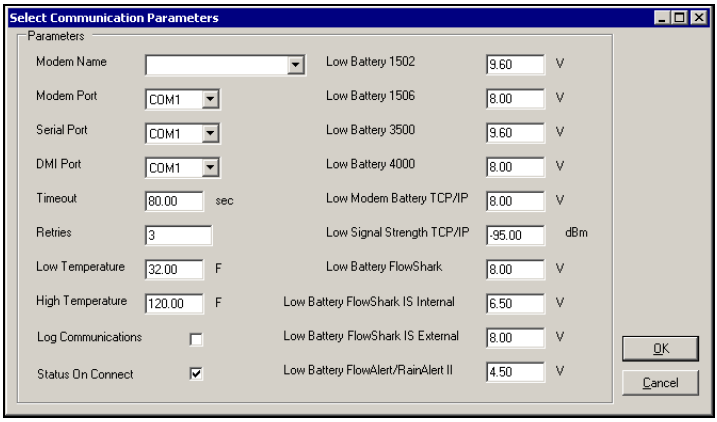
*The **Monitor Diagnostics** dialog displays.*



Monitor Diagnostics dialog

2. Select **Communication Parameters** from the **Functions** drop-down list, and then click on the **Perform** button.

*The **Select Communication Parameters** dialog displays.*



Select Communication Parameters dialog

3. Select or enter the communication parameters as necessary:

   - **Modem Name** Select the modem you want to use during modem communication from the drop-down list. This list should include all available modems on your computer.
   - **Modem Port** Select the proper port for modem communication from this drop-down list. This list should include all available ports on your computer.
   - **Serial Port** Select the proper port for serial communication from this drop-down list. This list should include all available ports on your computer.
   - **DMI Port** (*This parameter does not apply to the FlowAlert monitor*)
   - **Timeout** Enter the number of seconds you want your local computer to wait for a response from the monitor once communication has been initiated.
   - **Retries** Enter the number of times you want your local PC to request data from the monitor following failed attempts while the monitor is still on line.
   - **Low Temperature** (*This parameter does not apply to the FlowAlert monitor*)
   - **High Temperature** (*This parameter does not apply to the FlowAlert monitor*)
   - **Log Communications** Select this checkbox to record all communication activities with the monitor.
   - **Status On Connect** Select this checkbox to view details of the current state of the monitor when monitor communications are established.
   - **Low Battery 1502, 1506, 3500, 4000** (*These parameters do not apply to the FlowAlert monitor*)
   - **Low Modem Battery TCP/IP** (*This parameter does not apply to the FlowAlert monitor*)
   - **Low Signal Strength TCP/IP** Enter the signal strength (in dBm) below which you want **Profile** to provide

notification for the wireless communication unit, when applicable. *ADS recommends using -95 dBm for the low signal strength.*

- **Low Battery FlowShark, FlowShark IS, and IS External** (*These parameters do not apply to the FlowAlert monitor*)

- **Low Battery FlowAlert/RainAlert II** Enter the voltage below which you want **Profile** to provide notification for FlowAlert and RainAlert II monitors. *ADS recommends leaving the default battery voltage unchanged.*

> **Note:** Notification of low battery voltage or signal strength occurs during the data collection process, during monitor activation, and when receiving TCP/IP communication status. View the associated logs through the **Diagnostics** tool and **Log Viewer** in the **Profile** software.

4. Click on the **OK** button.

Activating the Monitor

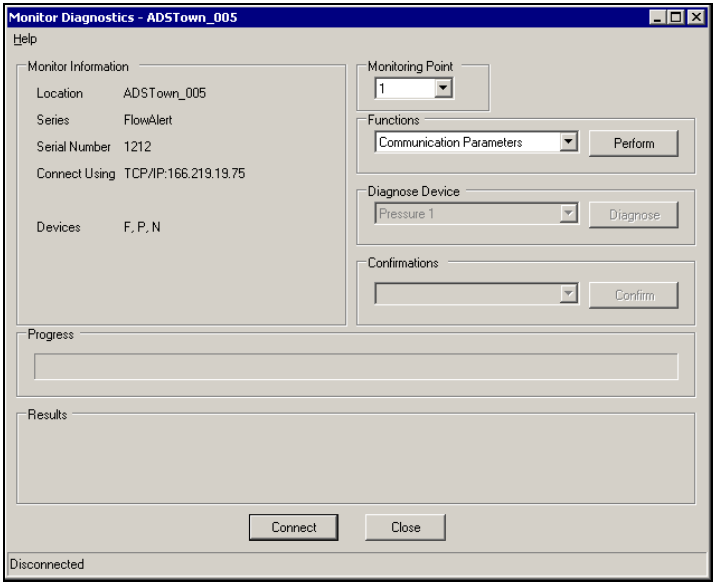
After configuring the monitor, *activate* the monitor to initiate the flow monitoring process based on the monitor configuration. Monitor activation involves generating the activation data using the **Profile** software, downloading this data to the monitor, and initiating flow data measurement and logging. The activation data includes the current monitor firmware (embedded software) and relevant portions of the LIF and other configuration parameters necessary to ensure monitoring activities reflect the specific site conditions and project requirements. The monitor requires these files and information to properly measure and record the flow.

Activating the monitor also tests communication between the user's computer and the monitor. To test communication, connect to the monitor on-site (*using the Direct Connection cable*) or have an analyst call the monitor from any telephone or computer at a remote location while a technician is on-site to verify that the monitor modem responds. This also will verify the monitor telephone number entered in **Profile**.

Monitor activation occurs through the **Diagnostics** tool in **Profile**. Activate the monitor in the following way:

1. Select the monitor location for activation from the **Profile** main screen, and then click on the **Diagnostics** toolbar button.

*The **Diagnostics** dialog displays.*



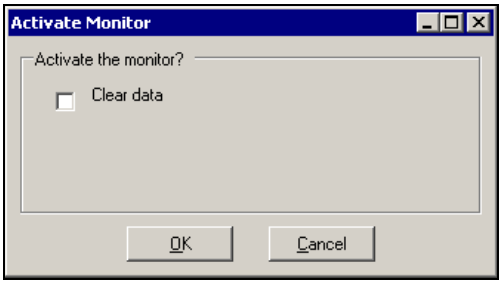
Diagnostics dialog

2. Click on the **Connect** button to establish communication with the monitor.

Profile *initiates communication with the monitor and establishes a connection.*

3. Select **Activate** from the **Functions** drop-down list, and then click on the **Perform** button.

Profile *displays the* ***Activate Monitor*** *dialog.*



Activate Monitor dialog

4. (*optional*) Select the **Clear data** checkbox to ensure that all data is removed from the monitor memory when activation occurs. If you choose to implement this option ADS recommends collecting all data from the monitor before reactivating the monitor.

5. Click on the **OK** button to activate the monitor.

Profile *downloads the configuration and installation information, activates the monitor, and begins logging data based on the selected configuration.*

6. Click on the **Disconnect** button once activation is successful (designated in the **Results** section) and complete.

The local computer disconnects from the monitor.

7. Click on the **Close** button to exit the **Monitor Diagnostics** dialog.

Configuring the Power Savings Parameters

Use the **Power Saving** function when you want to configure the monitor to conserve battery power. Battery power is conserved by powering down the wireless modem during specific hours of the day. The monitor automatically powers up the wireless modem each day between 11AM and 12PM to receive incoming calls. However, you also can configure the modem for specific on/off times for each day of the week.

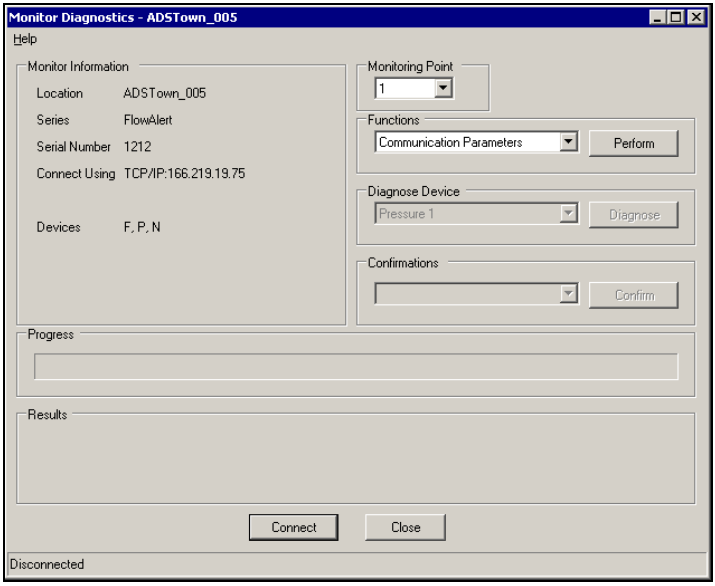
> **Note:** Alarms will be sent out even when the modem is in Power Savings mode.

Complete the parameters of the **Power Saving Configuration** window through the **Diagnostics** tool in **Profile** according to the schedule best suited to your project. Configure the power saving parameters for the monitor in the following way:

1. Select the monitor location from the **Profile** main screen, and then click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

*The **Monitor Diagnostics** dialog displays.*

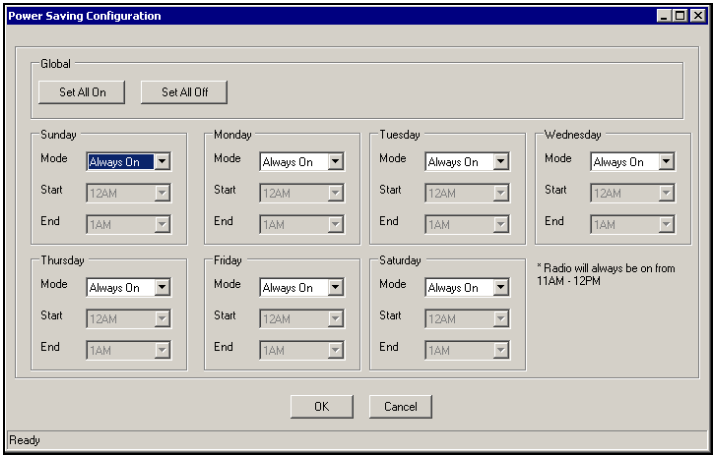


Monitor Diagnostics dialog

2. Click on the **Connect** button to establish communication with the monitor.

Profile *initiates communication with the monitor and establishes a connection. Choose the* ***Abort*** *button prior to establishing a connection to abort the communication attempt.*

3. Select **Power Saving** from the **Functions** drop-down list, and then click on the **Perform** button to display the **Power Saving Configuration** window.

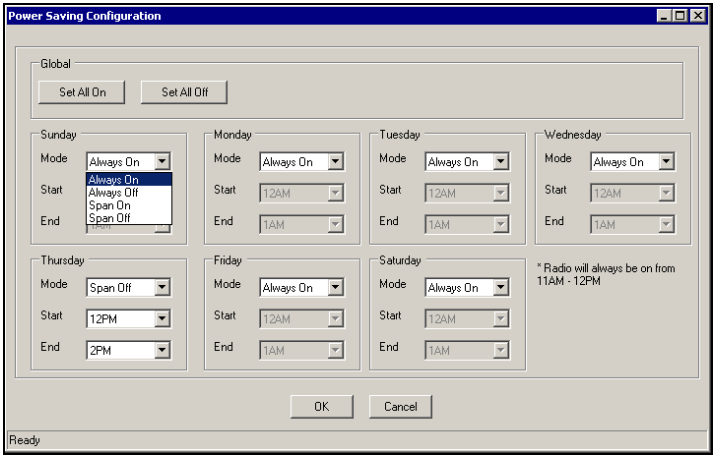


Power Saving Configuration window

4. Choose a *Global* setting when you want all 7 days of the week to be set to the same on or off mode.

   - **Set All On** Choose this *Global* settings button to configure all 7 days of the week to **Always On** or no power saving periods. The wireless modem will be set for uninterrupted power.

   - **Set All Off** Choose this *Global* setting to configure all 7 days of the week to **Always Off** to facilitate maximum battery savings. Wireless modem communications can be performed only during the hour of 11 AM to 12 PM and will be turned off all other hours of the day.



Power Saving Configuration window

5. Use the **Mode**, **Start**, and **End** fields to program each day of the week uniquely for power savings. Repeat the instructions for each day of the week you want to program and click on the **OK** button to save and exit the **Power Saving Configuration** window.

   - **Always On** Choose this setting for uninterrupted wireless modem communications and no power savings for the selected day of the week.
   - **Always Off** Choose this setting to allow wireless service only during the hour of 11AM to 12 PM. This setting is the maximum battery conservation mode for the selected day of the week.
   - **Span On** Choose this option to specify the span of time you want the wireless modem to be available (powered) during the selected day. If you choose this mode, specify values in the **Start** and **End** fields for the beginning and ending time for the span you want the wireless modem to be active.
   - **Span Off** Choose this option to specify the span of time you want the wireless modem to be unavailable (powered down) during the selected day. If you choose this mode,

specify values in the **Start** and **End** fields for the beginning and ending time for the wireless modem to be powered down.

- **Start** This field is enabled when you choose **Span On** or **Span Off** mode selections and allows you to specify the beginning time for the selected span.
- **End** This field is enabled for **Span On** or **Span Off** mode selections and allows you to specify the ending time for the selected span.

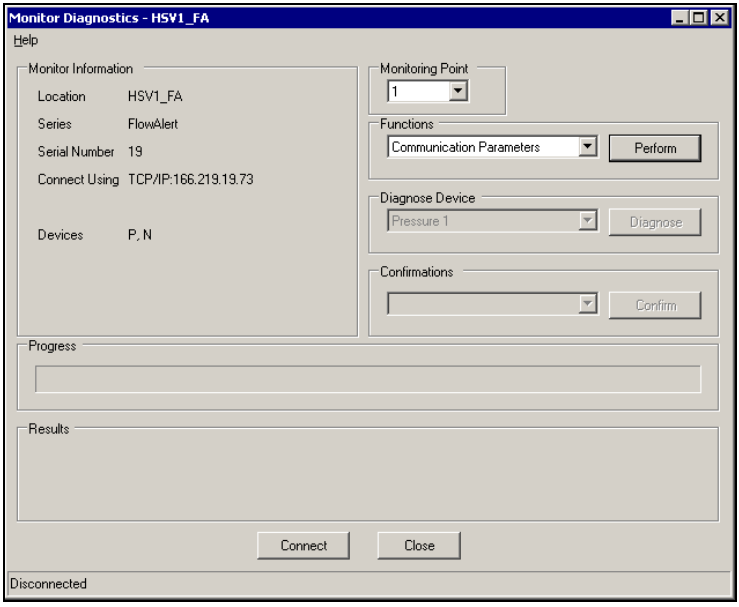
Running Device Diagnostics

Profile's diagnostics tool enables the user to verify the proper operation of the pressure depth sensor, obtain current readings and status, adjust settings, and identify, diagnose, and troubleshoot potential problems with pressure device. Run diagnostics for the system devices in the following way:

1. Select the monitor location for which you want to run diagnostics on a device from the **Profile** main screen, and then select **Tools > Diagnostics** *or* click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

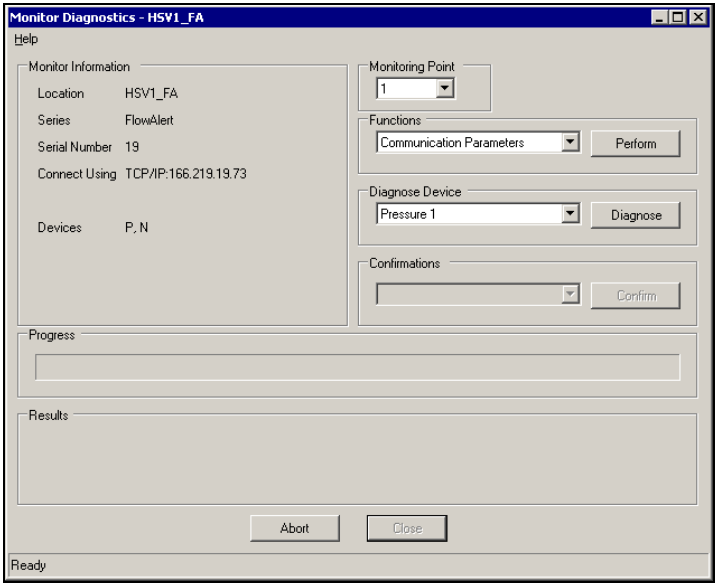
*The **Monitor Diagnostics** dialog displays.*



Monitor Diagnostics dialog

2. Click on the **Connect** button to establish communication with the monitor.

Profile *initiates communication with the monitor and establishes a connection.*

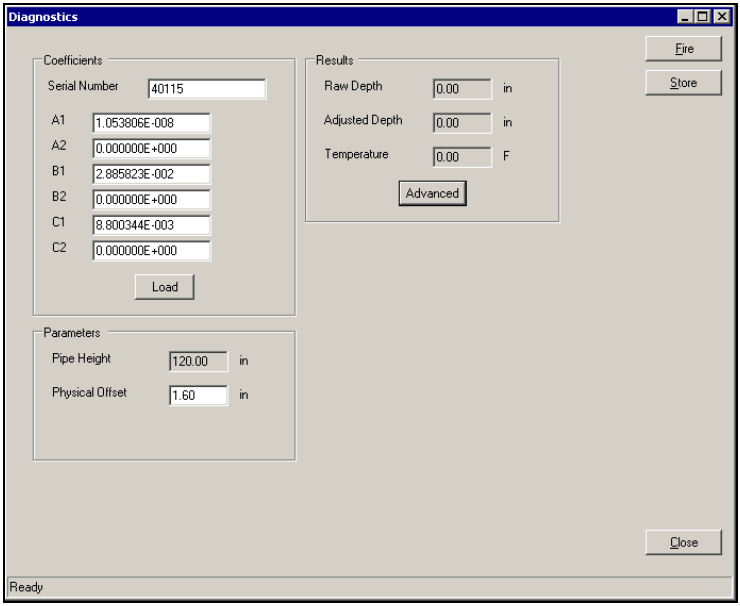


Monitor Diagnostics dialog during communication with a monitor

3. Run diagnostics on the pressure device in the following way:

   ❑ Select the **Pressure 1** device from the **Diagnose Device** drop-down list, and then click on the **Diagnose** button.

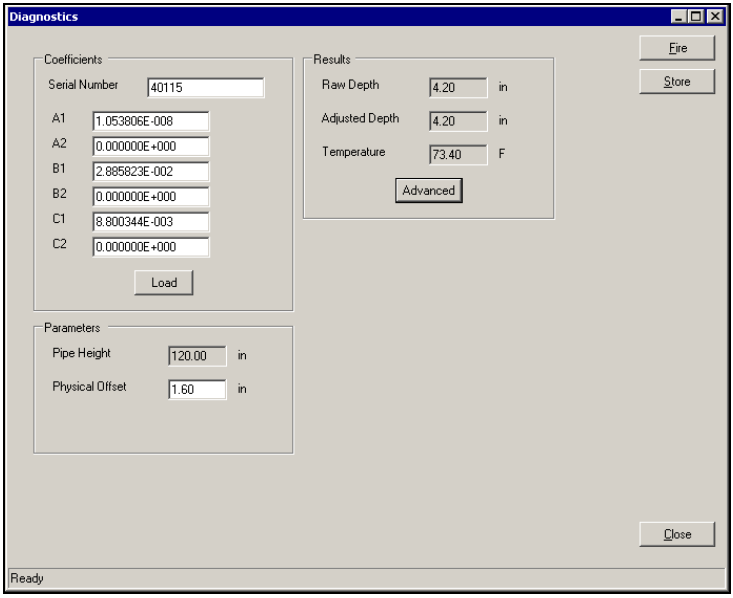
The ***Diagnostics*** *dialog displays the current configuration parameters stored in the LIF for the Pressure 1 device.*



Diagnostics dialog for the Pressure 1 device

- ❑ Click on the **Fire** button.

*The **Results** section displays the current depth readings measured by the pressure depth sensor.*



Diagnostics dialog for the Pressure 1 device following sensor firing

- ❑ Click on the **Advanced** button to view more detailed diagnostic information.
- ❑ Verify the accuracy of the pressure depth readings, and edit the configuration parameters as necessary.

Note: Refer to *Editing the Pressure Device* on page 5-13 for descriptions of the individual configuration parameters. Save these modifications to the LIF in the monitor in the following way:

- ❑ Click on the **Store** button to save any changes made in the device parameters to the LIF in the database.
- ❑ Click on the **Close** button to exit the Pressure 1 device dialog and return to the **Monitor Diagnostics** dialog.

4. Select **Activate** from the **Functions** drop-down list, and then click on the **Perform** button. For more information on activating a monitor, refer to *Activating the Monitor* on page 5-24.

5. Click on the **Disconnect** button to discontinue communication with monitor when finished running diagnostics on the system devices.

Collecting Data from the Monitor

The data collection function available through **Diagnostics** provides enhanced features for viewing and analysis. Once the collection process is complete, **Profile** displays pressure depth data in a hydrograph format (when applicable).

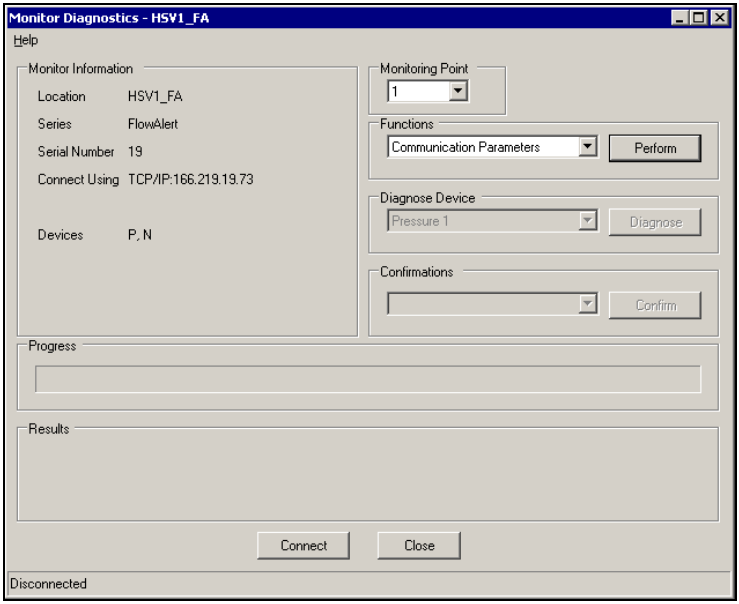
For analysis purposes, the **Diagnostics** tool automatically processes the data using **Site DR** (data review). This feature identifies issues concerning data quality or missing information and offers recommendations (when necessary) for conducting further review, investigation, or analysis. Collect data from the monitor in the following way:

> **Note:** You can perform group and scheduled collects using the **Communications** tool.

1. Select the monitor location from which you want to collect data, and then select **Tools > Diagnostics** from the main menu *or* click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

*The **Monitor Diagnostics** dialog displays.*



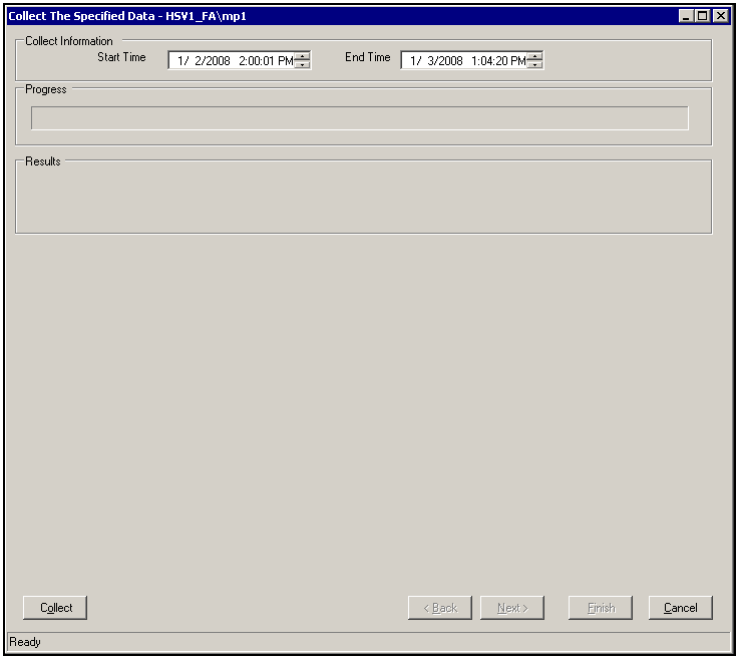
Monitor Diagnostics dialog

2. Click on the **Connect** button to establish communication with the monitor.

Profile *initiates communication with the monitor and establishes a connection.*

3. Select **Collect** from the **Functions** drop-down list, and then click on the **Perform** button.

Profile *displays the* ***Collect the Specified Data*** *dialog.*

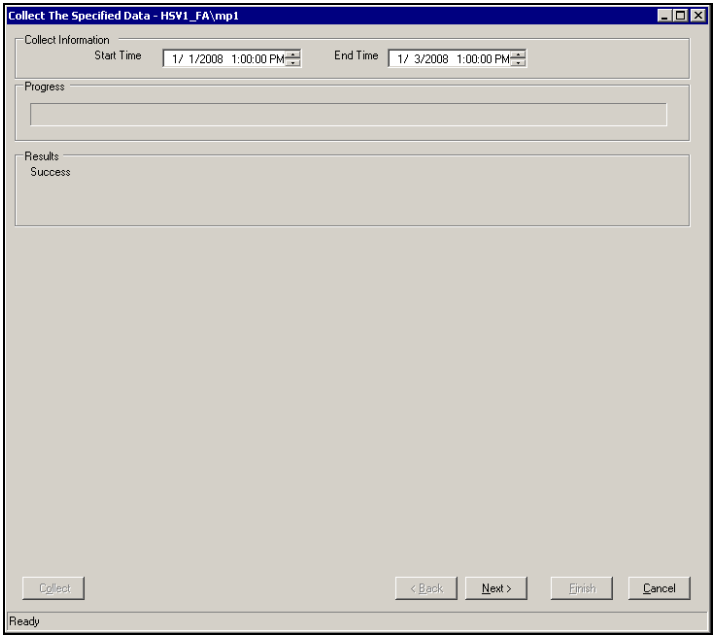


Collect the Specified Data dialog

4. Designate the range of data you want to collect from the monitor by editing the **Start** and **End Time** fields in the **Collect Information** in the section. Edit these fields directly by selecting the portion of the date or time stamp you want to change and then entering the appropriate designation or using the arrows to scroll up and down in the range. *If you do not edit the range, the start date and time automatically default to the **Auto Collect Start Date** in the LIF.*

5. Click on the **Collect** button.

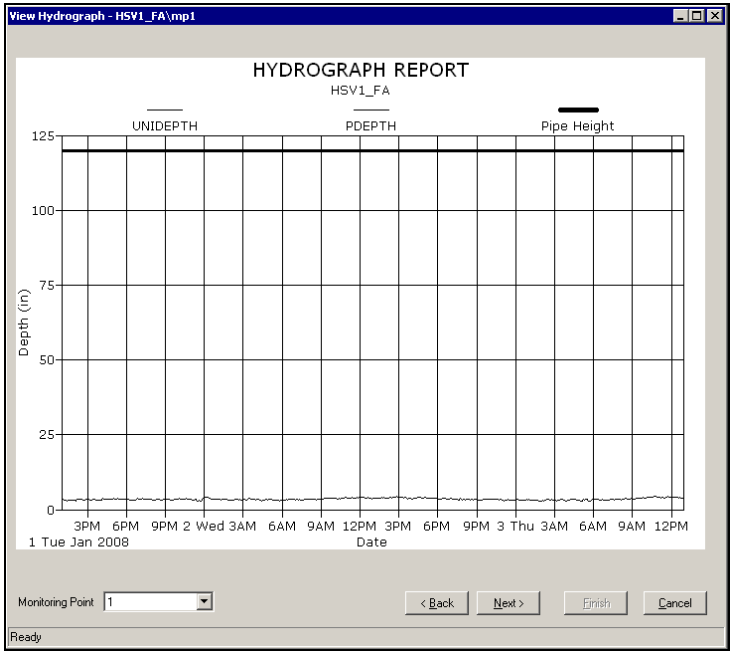
*The **Results** section displays the status of the collect. **Profile** collects all entity data from the monitor for the selected date/time range and stores it in the currently selected database.*



Collect The Specified Data dialog indicating data collection was a success

6. Click on the **Next** button.

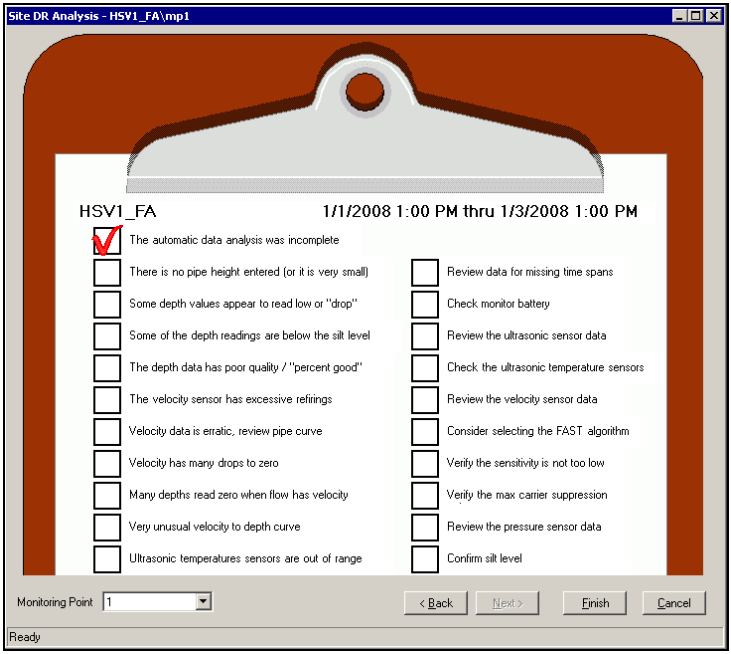
*The **View Hydrograph – [location name]** dialog displays the collected data in hydrograph format.*



View Hydrograph – [location name] dialog

7. Review the data on the hydrograph, and then click on the **Next** button. Under optimal conditions, the depth data should reflect a consistent diurnal pattern.

*The **Site DR Analysis – [location name]** dialog displays the results of the site data review analysis of the collected data and any recommendations for resolving identified issues.*

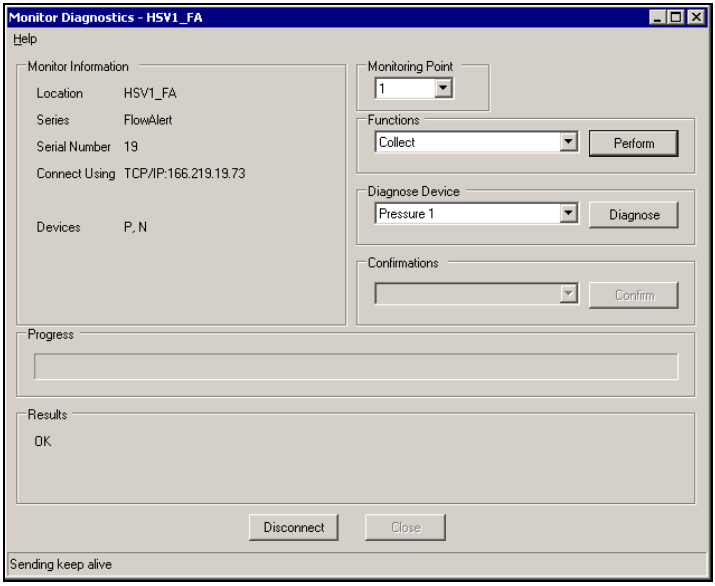


Site DR Analysis – [*location name*] dialog

8. Review any issues identified and the suggested actions, and then click on the **Finish** button.

9. Click on the **Close** button.

*The **Monitor Diagnostics** dialog displays. The **Results** section displays the recommendations from **Site DR Analysis** when applicable.*



Monitor Diagnostics dialog displaying good results without recommendations

Upgrading the Monitor Firmware

Profile enables you to download updated firmware to a FlowAlert monitor that may include new features and capabilities or performance improvements and enhancements in functions such as data processing, analysis, or communications.

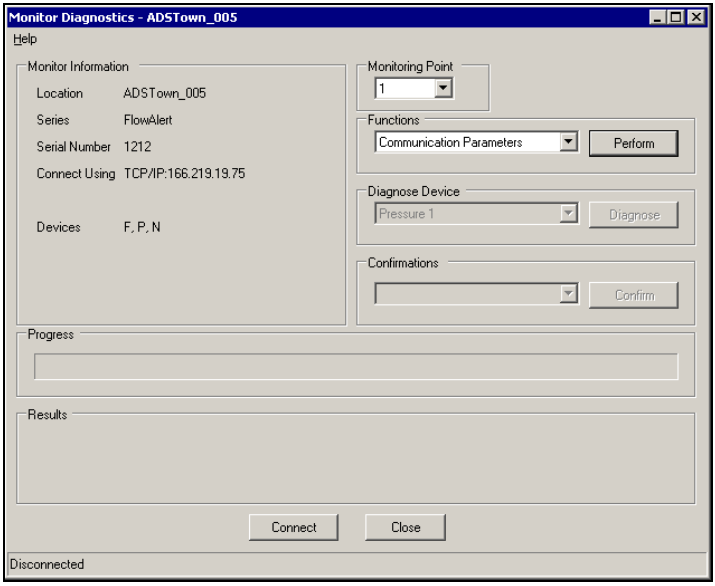
Upgrading the firmware erases the monitor memory. Therefore, you must collect the data from the monitor *before* updating the firmware in the monitor to avoid losing the flow data stored in the monitor memory. Refer to the Profile User's Guide (#950015**) for information on collecting data from the monitor. ADS also requires that you reactivate the monitor *after* updating the firmware.

Upgrade the firmware in the FlowAlert monitor memory in the following way:

1. Select the monitor location for which you want to upgrade the firmware, and select **Tools > Diagnostics** from the main menu or click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

*The **Monitor Diagnostics** dialog displays.*



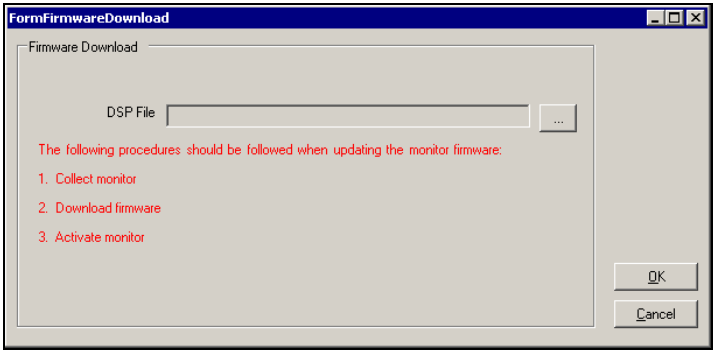
Monitor Diagnostics dialog

2. Click on the **Connect** button to establish communication with the monitor.

Profile *initiates communication with the monitor and establishes a connection.*

3. Select **Update Firmware** from the **Functions** drop-down list, and then click on the **Perform** button.

The ***Form Firmware Download*** *dialog displays.*



The **Form Firmware Download** dialog

4. Click on the **Browse** button corresponding to **DSP file** to locate and designate the DSP file applicable to the firmware download. This program file represents the firmware containing the updated code for data processing activities. An example filename for this kind of file could be FAdsp600.biw.

5. Click on the **OK** button.

Profile *downloads the new firmware to the monitor.*

6. Select **Activate** from the **Functions** drop-down list, and then click on the **Perform** button.

Profile *activates the monitor with the updated firmware.*

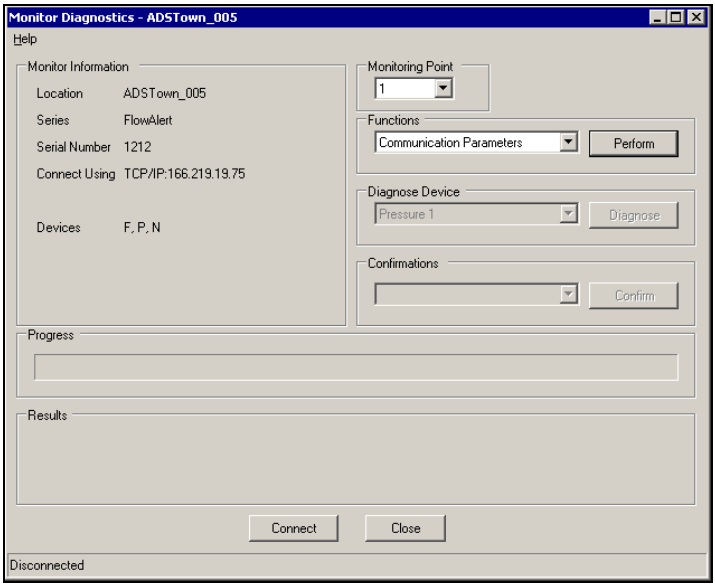
Viewing Diagnostic and Data Logs

Profile generates detailed logs for many activities performed through **Diagnostics**, such as monitor activation, data collection, and firmware downloading. These logs are available immediately following the activity and for future access to historical information.

1. Select the monitor location for which you want to run diagnostics on a device from the **Profile** main screen, and then click on the **Diagnostics** toolbar button.

Diagnostics toolbar button

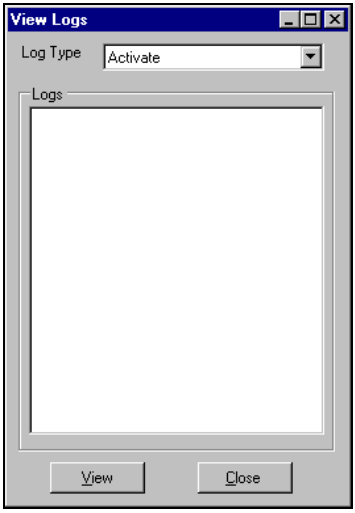
*The **Monitor Diagnostics** dialog displays.*



Monitor Diagnostics dialog

2. Select **Logs** from the **Functions** drop-down list.
3. Click on the **Perform** button.

*The **View Logs** dialog displays.*



View Logs dialog

4. Select the type of log you want to view from the **Log Type** drop-down list.

*The **Logs** section displays all logs available for the selected location and log type.*

5. Select the specific log you want to view, and click on the **View** button.

*The **View Logs** dialog displays the logs available for viewing corresponding to the selected log type.*

6. (*optional*) Click on the **Print** button to print the log file contents.

CHAPTER 6

Monitor Installation

After installing the sensors and establishing communications, install the ADS® FlowAlert™ monitor in the manhole. The monitor may mount inside the manhole by an aluminum mounting bracket attached to the monitor and bolted to the manhole wall or rim. The monitor also can mount directly to a manhole ladder rung by a rung mount hanging bracket attached to the monitor. The following procedures for monitor installation apply to most sites. However, because manholes differ in many ways, some sites may require the installer to implement slight modifications to the standard installation technique.

Before installing the monitor at the site, activate the monitor to verify that the monitor is configured correctly for the application and that the battery pack (or external power) is operating at an adequate voltage. Make any necessary changes to the configuration *before* mounting the unit. Refer to Chapter 7, *Maintenance and Troubleshooting*, for information on replacing the battery pack, if necessary.

> **Warning:** Using a battery-powered, wireless monitor without connecting an antenna will significantly decrease the life of the battery pack.
>
> **Note:** Manhole and sewer system work involves confined space entry and is inherently dangerous. Therefore, installers and technicians must comply with all federal, state, and municipal regulations concerning confined space

entry. ADS is not responsible for any injuries, damages, claims, or liability resulting directly or indirectly from the use of this installation guide or the installation of any ADS equipment.

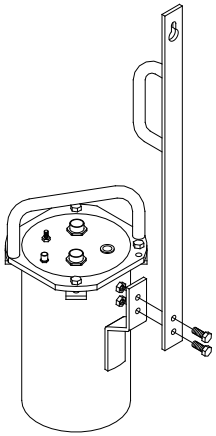
Mounting the Monitor to the Manhole Wall

Mount the monitor to the manhole wall in the following way:

1. Determine the appropriate location to mount the monitor handle (i.e., bracket) (ADS p/n I40-0003/9) to the manhole wall. This mounting bracket will connect to the welded flange on the monitor housing. Consider the following when selecting the proper location:
   - ❑ Select a location that will allow you to remove the monitor easily during service visits using the mounting bracket.
   - ❑ Select a location that provides only a minimal potential for the monitor to experience surcharge conditions.
   - ❑ Select a location that will prevent the manhole lid from potentially damaging the monitor during removal or when rotating in the opening.
   - ❑ Select a location that will allow personnel to enter/exit the manhole without removing the monitor.
2. Hold the top end of the mounting bracket against the manhole wall, and mark the location for the mounting hole through the keyhole in the bracket.
3. Drill a hole 2½ inches deep at the mark, and install a 3/8-inch x 3-inch anchor bolt in the hole.

> **Note:** Make sure all anchor bolts, studs, nuts, and washers used in mounting the monitor are stainless steel.

4. Twist a nut onto the anchor bolt, but do not tighten it down. Leave enough space between the nut and the wall for the thickness of the mounting bracket.
5. Mount the bottom of the bracket onto the monitor flange with two 3/8-inch x 1-inch hex bolts, 3/8 – 16 hex nuts, and 3/8-inch washers.

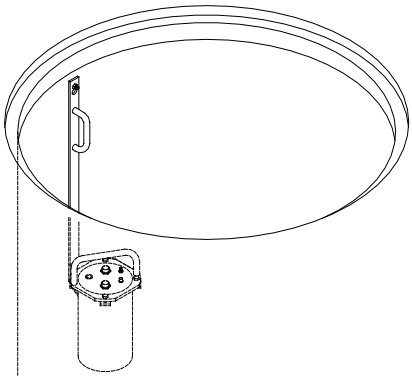


Bolting the mounting bracket to the flange welded to the monitor

6. Carefully lower the monitor into the manhole, and place the keyhole of the mounting bracket over the anchor bolt.

> **Note:** ADS strongly recommends attaching a security line to the monitor before lowering it into the manhole to prevent the monitor from accidentally dropping down the manhole during installation.

7. Tighten and secure the bolt against the mounting bracket.



Monitor installed in the manhole

8. Neatly coil and secure the excess sensor and telephone cables in the manhole to simplify future monitor service activities. Secure the cables to plastic anchors or ¼-inch x 2 ¼-inch anchor bolts using 14-inch cable ties.

> **Note:** Be careful to avoid damaging the sensor cables during installation activities. Even small pinholes in the cable can cause a sensor to malfunction or fail.

Mounting the Monitor to the Manhole Rim

Mount the monitor to the manhole rim in the following way:

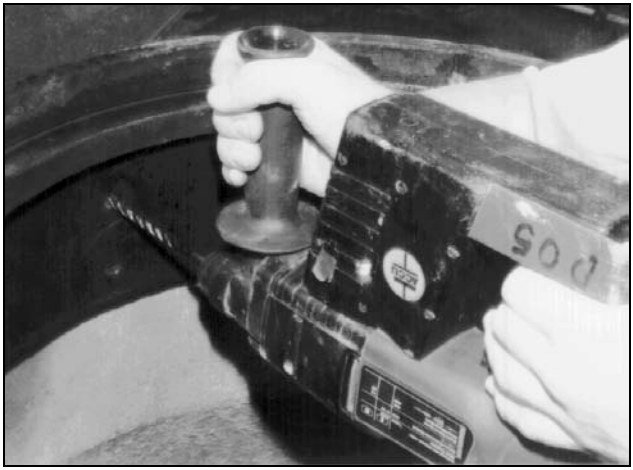
1. Determine the appropriate location to mount the monitor handle (i.e., bracket) (ADS p/n I40-0003/9) to the inside of the iron manhole rim. This mounting bracket will connect to the welded flange on the monitor housing. Consider the following when selecting the proper location:

   - ❑ Select a location that will allow you to remove the monitor easily during service visits using the mounting bracket.
   - ❑ Select a location that provides only a minimal potential for the monitor to experience surcharge conditions.
   - ❑ Select a location that will prevent the manhole lid from potentially damaging the monitor during removal or when rotating in the opening.
   - ❑ Select a location that will allow personnel to enter/exit the manhole without removing the monitor.

2. Hold the keyhole at the top end of the bracket against the lower inner rim of the manhole, and mark the location for the stainless steal stud through the keyhole in the bracket. Make sure there will be enough room to lift the bracket up and over the stud when installed.

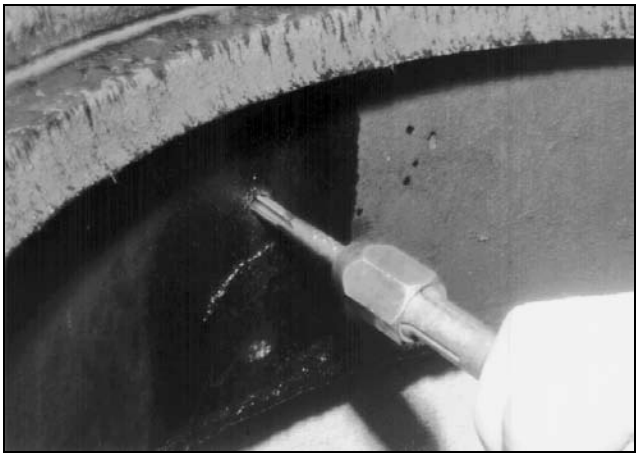
3. Drill a hole(s) into the manhole rim 1 inch deep using a 5/16-inch carbide-tipped drill bit.

> **Note:** Consider starting the hole using smaller bits to make pilot holes and increasing up to a 5/16-inch bit. In addition, spray cutting oil or another lubricant into the hole while drilling and tapping.



Drilling the hole in the manhole rim

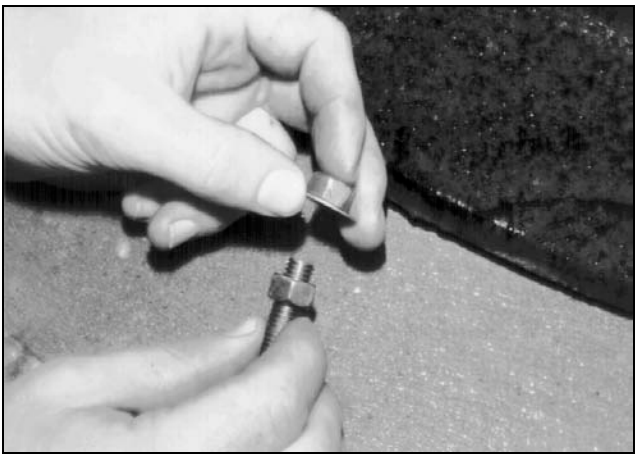
4. Use a 3/8-inch x 16 threads-per-inch tap to cut threads in the hole. Twist the tap clockwise ¾ turn, and then back out ½ turn before continuing deeper.



Using the tap to thread the hole

5. Chase the threading action at intervals to clear the metal debris by backing the tap almost completely out of the hole and then screwing it back into the hole. Lubricate the hole between threading.

6. Place two 3/8 – 16 hex nuts (with a 3/8-inch washer in between) onto one end of a 3/8- × 2-inch stud.

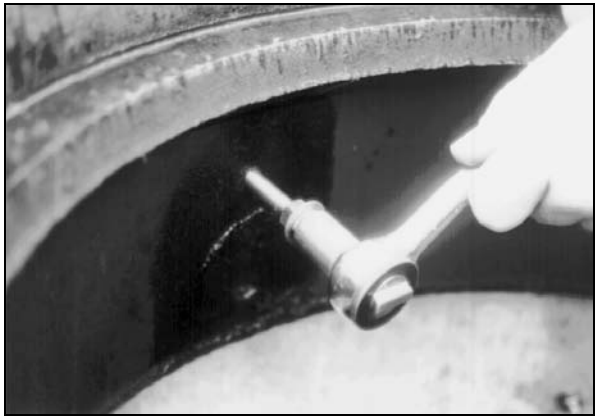


Placing two nuts and a washer onto the stud

7. Using two wrenches, turn the inner nut counter-clockwise and the outer nut clockwise simultaneously to bind the two nuts together on the stud.

Binding the nuts together with the washer in between

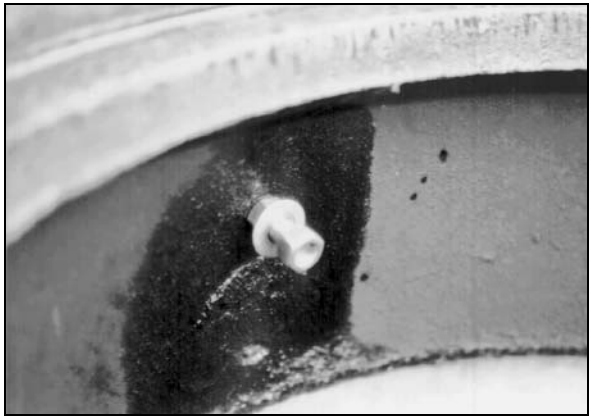
8. Install the stud into the tapped hole using the outer nut to engage the wrench. Continue turning the nut clockwise until the stud is seated at least ¾ inch deep in the hole.



Installing the stud into the hole in the manhole rim

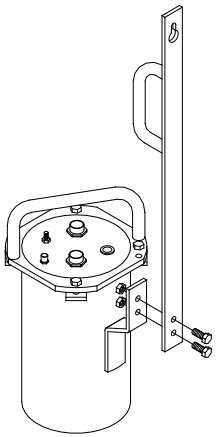
9. Separate the nuts, and turn the inner nut until it is flush against the rim.

10. Slide the washer against the inner nut, and turn the outer nut toward the edge of the stud.



Positioning the nuts on the stud to receive the mounting bracket

11. Mount the bottom of the mounting bracket onto the monitor flange with two 3/8-inch x 1-inch hex bolts, 3/8 – 16 nex nuts, and 3/8-inch washers. It may be necessary to drill new holes in the flange.



Bolting the mounting bracket to the flange welded to the monitor

12. Carefully lower the monitor into the manhole, and place the keyhole in the bracket over the outer nut on the stud.

Note: ADS strongly recommends attaching a security line to the monitor before lowering it into the manhole to prevent the monitor from accidentally dropping down the manhole during installation.

13. Slide the bracket against the inner nut and washer, and tighten and secure the outer nut against the bracket.
14. Neatly coil and secure the excess sensor and telephone cables in the manhole to simplify future monitor service activities. Secure the cables to plastic anchors or ¼-inch x 2 ¼-inch anchor bolts using 14-inch cable ties.

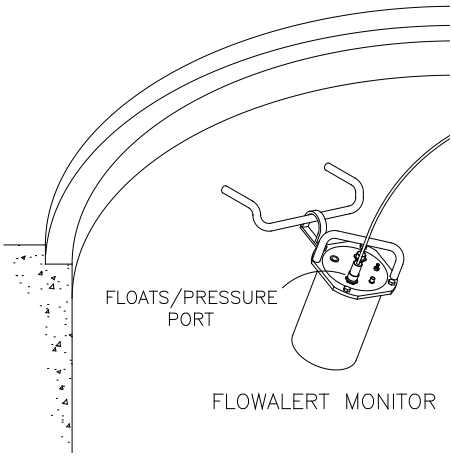
Note: Be careful to avoid damaging the sensor cables during installation activities. Even small pinholes in the cable can cause a sensor to malfunction or fail.

Mounting the Monitor to a Manhole Ladder Rung

ADS offers a rung mount hanging bracket with a hook (ADS p/n 106222A) to mount the monitor to a manhole ladder rung. Mount the monitor to a rung in the following way:

> **Note:** ADS strongly recommends attaching a security line to the monitor before lowering it into the manhole for hanging.

1. Verify that the rung to which you want to secure the monitor can support the weight of the monitor.
2. Secure the monitor to a safety line.
3. Slowly and carefully lower the monitor into the manhole, preventing it from striking the manhole wall or other structures or equipment in the manhole.
4. Open the loop end of the rung mount hanging bracket, and slip it over the top ladder rung.
5. Close the loop end of the hanging bracket and secure it.



Monitor secured to a ladder rung using a rung mount hanging bracket

6. Once the monitor is hanging securely in place, remove the safety line.

7. Neatly coil any slack in the cables into loops, and use a cable tie to secure the loops together. Lower the loops into the manhole, and secure them to a ladder rung using another cable tie.

CHAPTER 7

Maintenance and Troubleshooting

While the ADS® FlowAlert™ monitor, pressure depth sensor, and float switches are designed for dependability and durability, all electronic devices are vulnerable to wear, malfunction, or failure, particularly in a harsh sewer environment. However, many system problems can be avoided altogether by performing routine maintenance and inspections. The design of the monitor enables the user to perform general diagnostics and troubleshooting to prevent, isolate, and correct many problems easily. These serve to minimize unnecessary monitor downtime and data loss.

This chapter provides routine maintenance instructions as well as general diagnostic and troubleshooting guidelines for isolating and correcting monitoring system problems.

> **Warning:** Remove the monitor from the manhole before replacing the battery packs or performing service activities which may involve disconnecting cables from the monitor. In addition, disconnect telephone service at the network interface box before disconnecting cables from the monitor lid. These activities help prevent possible shock or injury to personnel as well as damage to the equipment during service visits at the monitor location.

Maintaining the System Components

The FlowAlert monitor, pressure depth sensor, and float switches should receive routine on-site inspections and remote confidence checks to maintain the equipment in optimal working condition, minimize monitor downtime, and prevent possible data loss.

ADS recommends performing these inspections following initial system installation, during site visits, and on a scheduled interval (i.e., quarterly or during battery pack replacement).

> **Note:** The only service or maintenance activity ADS permits within the monitor chassis is battery pack replacement. Therefore, please do not handle, alter, modify, remove, or replace any other components inside the monitor. This may void the monitor warranty agreement.

Gathering Replacement Parts and Supplies

Gather the following replacement parts and supplies for performing routine maintenance:

- Dryer tube for the pressure depth sensor
- Battery pack
- Pressure depth sensor
- Float Switch(es)
- Soft bristle brush
- Paper towels
- Compressed air
- Flat head screwdriver and assorted wrenches (including torque wrench)

Inspecting the Monitor

Perform the following inspections during site visits or from a remote location (*when applicable*):

- Inspect the monitor mounting bracket to verify that the bracket and bolts are free of heavy corrosion and the bolts are tightened and secure.
- Verify that the four bolts holding the monitor together are snug, and tighten any loose bolts.
- Verify that the monitor is mounted securely in the manhole.
- Inspect the monitor for general integrity. Verify that nothing more than surface corrosion is present and that the monitor has no obvious mechanical defects. Replace the monitor if necessary.
- Perform monitor data confirmations. These should occur from a remote location when wireless or telephone communication is available. You also can perform these locally through a serial connection.
- Review the applicable logs in **Profile®** to verify the status of the monitor clock, communications, firmware, battery pack, and temperatures.
- Clean the monitor, sensor, and float regularly with a soft bristle brush and paper towels. *However, do not use detergent!*
- Make sure all connector ports on the monitor top are dry. Use compressed air or paper towels to dry out wet or damp connectors.

Confirming the Monitor

Confirm the accuracy of the pressure depth sensor through the monitor on a regular basis. Confirmation involves comparing manually-measured depth of flow readings to the monitor's readings. This process also verifies sensor parameters. Refer to the *Profile User's Guide* (#950015**) for detailed information on performing confirmation procedures.

Obtaining Diagnostic Codes from the Monitor

The FlowAlert monitor enables you to view diagnostic information from the monitor instantly through an LED window, labeled **STATUS/DISPLAY**, located on the monitor top. This information represents specific codes corresponding to the wireless communication signal strength (when applicable) and the monitor's battery voltage and IP address (when applicable). It is particularly helpful during site investigation and system installation to ensure an adequate and consistent signal strength, to test communications, and to verify the monitor IP address.

Activate the diagnostic code sequence by disconnecting and reconnecting the connector attached to the **FLOATS/PRESSURE** port on the top of the monitor in *less than one second*. The code will begin to display immediately. Therefore, make sure the LED window is in clear view before initiating the code.

> **Note:** Always verify that the LED window is blank before attempting to activate the code.

Upon diagnostic code activation, interpret the diagnostic codes in succession in the following way. The LED window displays only one number/character at a time:

- "ads" indicates code initiation
- bbbbb is followed by the battery voltage to two decimal places
- rrrrr is followed by the wireless communication signal strength (*ranging from -51 to -112 dBs; 99 indicates no signal is available*)
- nnnnn is followed by the monitor IP address

Checking the Monitor Battery Pack Voltage

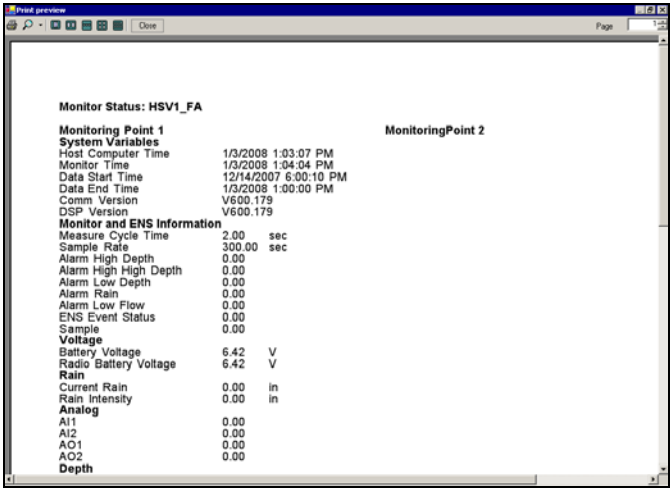
Check the battery voltage through the LED window on the monitor or using **Profile** before installing the monitor. ADS also recommends verifying the battery voltage after collecting data. Replace the battery pack as soon as possible whenever the voltage reads below 4.5 volts or **Profile** provides a **Low** battery status.

> **Warning:** Batteries reading below 4.5 volts may prevent communication with and data collection from the monitor.

Check the current battery voltage in the monitor using the **Diagnostics** tool in **Profile** in the following way:

1. From the **Profile** software main screen, select the monitor and then click on the **Diagnostics** toolbar button (or select **Tools** > **Diagnostics** from the main menu).
2. On the **Diagnostics** dialog, click on the **Connect** button to establish communication with the monitor.
3. Once communication is established, select **Monitor Status** from the **Functions** drop-down list and then click on the **Perform** button.

*The **Print Preview** dialog displays the current system information, including the monitor battery voltage, in printable format. Select the **Print** button to print the report contents.*



Print preview dialog (battery pack voltage displays under **Voltage**)

Replacing the Monitor Battery Pack

When necessary, replace the battery pack in the monitor in the following way:

> **Warning:** During rainy or snowy conditions, disconnect the cables from the monitor and move to a dry area before changing the battery pack. The circuit board is not completely sealed and must be kept dry. If the monitor is moved indoors from a cold, outdoor environment, wait for the entire chassis (inside and out) to acclimate to the inside temperature before changing the battery. Failure to do so will result in condensation damage to the boards.
>
> **Note:** Be careful to avoid damaging or pinching the battery cable between the monitor top and the enclosure when replacing the battery pack.
>
> **Note:** The only service or maintenance activity ADS permits within the monitor enclosure is battery pack replacement. Therefore, please do not handle, alter, modify, remove, or replace any other components inside the monitor. This may void the monitor warranty agreement.

1. Collect the data from the monitor.
2. Loosen bolts and remove the monitor lid from the aluminum canister.

> **Note:** Removing the monitor lid during battery pack replacement increases the risk of damaging or introducing debris or moisture to the circuit board. Make every effort to prevent water, dirt, and debris from contacting the monitor's circuit board during routine maintenance.

3. Disconnect the battery pack cable from the circuit board power cable.
4. Carefully remove the battery pack from the canister using the attached white strap.

Battery pack seated in monitor (lift out using white strap)

5. Remove the foam insert located between the strap and the battery pack, and place it in the same location on the new battery pack.

Battery pack with foam insert disconnected from monitor

6. Place the new battery pack into the enclosure without pinching the cables, and carefully push the excess cabling between the battery pack and the enclosure.
7. Connect the new battery pack to the circuit board power cable.
8. Call the monitor or connect to the monitor on site using a serial communication cable to verify communication.
9. Carefully replace the monitor lid onto the enclosure (without pinching the battery cables), and torque down the bolts securing the chassis to the enclosure to 35 inch pounds (+/- 5 inch pounds).

Checking the Sensor and Float Switch

Perform the following sensor inspections and service during regular site visits:

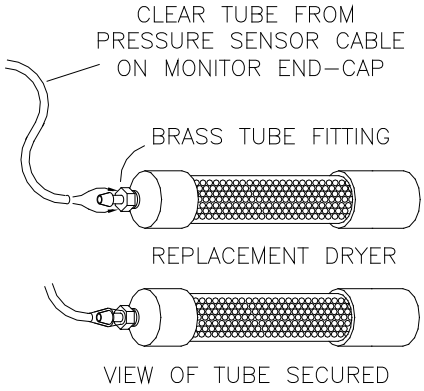
- Verify that the installation ring or band is secure and clear of debris.
- Scrub the pressure depth sensor with a soft bristle brush.
- Confirm that the pressure depth sensor cable is securely fastened and free of debris, cuts, and breaks that may affect performance. Replace a sensor that exhibits a damaged cable.
- Inspect the float switch housing for heavy grease or other debris. Remove or wipe off any debris using a paper towel. ADS recommends inspecting the float switch following an event in which the float contacts the flow to ensure no debris remains on the float.
- Inspect cable ties and other plastic fasteners for signs of degradation, such as cracks, and replace as necessary.

Inspecting and Replacing the Pressure Depth Sensor Dryer Tube

Inspect and replace the pressure depth sensor's dryer tube on a regular basis. Verify the desiccant in the pressure depth sensor's dryer tube is still blue. Pink desiccant indicates that it will no longer absorb moisture. If it appears pink upon inspection, replace the dryer tube immediately in the following way:

1. Clip the cable ties securing the dryer tube to the monitor.
2. Cut the clear flexible tubing running from the dryer tube to the pressure depth sensor connector at the location close to the brass barbed fitting on the dryer tube.
3. Place the dryer tube with the used desiccant aside, but do not discard.

4. Attach a new dryer tube to the pressure depth sensor by inserting the brass barbed fitting into the open end of the plastic tubing running from the sensor connector. Make sure the tubing seats firmly against the fitting to prevent air or moisture transfer.



Inserting the brass barbed fitting into the tube

5. Secure the new dryer tube to the monitor.
6. Remove the black end cap before reinstalling the monitor in the manhole.

> **Note:** Replacing the dryer tube quarterly may be sufficient; however, replace it more frequently when necessary.

Checking Communication Devices

Inspect the following communication devices during site visits:

- **Antenna Cable** Check the cable for damage, kinks, or breaks in the cable. Make sure the connector between the antenna cable and the monitor is dry and sealed with rubber stretch tape.

- **Lightning Protection Module** Check the lightning protection module for lightning strikes (visible arcing), damaged or poor connections, or corrosion. Replace a burned out module, and repair any bad or corroded connections in the wiring.
- **Network Interface Box** If any problems exist with the network interface box, check the connectors to ensure that the cable entries are tight and waterproof. If this does not resolve the problem, contact the telephone company.

Note: Make sure both the lightning protection module and network interface box are still waterproof.

Troubleshooting

The FlowAlert monitoring system contains several different components that perform many different functions. Since a malfunctioning component increases the risk of losing data, isolating the part containing the problem quickly is essential to performing troubleshooting activities efficiently. Minimizing monitor downtime is critical.

Consider the following when trying to isolate the component or subsystem exhibiting the problem:

- Problems affecting only one of the subsystems are usually caused by one subsystem alone. The problem may exist in the board, sensor, float switch, or cabling.
- Problems affecting more than one subsystem usually can be traced to a problem with the processor, power source, or communication lines. Problems in one subsystem can create problems in other subsystems when the power source or communication lines are faulty.
- Problems with communication lines, clock readings, time stamps, and data storage intervals usually arise from faulty processors, incorrect information entered on the user's PC, or low batteries.
- Failures occurring outside a connector (i.e., between a connector and the field input or output device) may arise from problems with the field unit or component cabling. Failures occurring on the *inside* (i.e., between a connector and the printed circuit board) may arise from problems with the board or its cabling.

> **Note:** If possible, collect all monitor data prior to swapping a sensor/float switch or troubleshooting a monitor to prevent possible data loss. Swapping a sensor, float switch, or battery pack does *not* result in stored data loss. In addition, remove the monitor from the manhole

before disconnecting cables from the monitor to avoid possible hazards.

Some problems that occur will not require a site visit, such as incorrect equipment identification numbers or other system parameters the user can re-enter on the local PC. However, some problems will require a site visit. When this is necessary, inform the analyst any time a field crew is enroute to a monitor location to troubleshoot problems so that the analyst can attempt to collect the monitor data before they arrive. If the problem is a faulty monitor and the analyst cannot collect the data remotely, replace the monitor and deliver the faulty monitor to the office so the analyst can attempt to collect the data directly. If the analyst is still unable to collect the data from the monitor, send it to ADS for repair.

This chapter provides general guidelines for troubleshooting and correcting problems with the FlowAlert monitor, the pressure depth sensor, or the float switch(s).

General Monitor Problems

The following tables contain general techniques for troubleshooting the ADS FlowAlert monitor.

Warning: Contact your regional ADS representative for further diagnosis before replacing a monitor.

Problem	Time stamp on the collected data is incorrect.
Possible Causes	PC clock may read incorrect time. Monitor clock may be faulty.
Possible Solutions	Verify the time on the PC clock and correct if necessary. Reactivate the monitor to enable the clock. Collect the data from the monitor and replace monitor if defective.

Problem	Time on the monitor clock is incorrect.
Possible Causes	Monitor clock may be faulty. PC clock may read incorrect time.
Possible Solutions	Verify the time on the PC clock and correct if necessary. Reactivate the monitor to enable the clock. Collect the data from the monitor and replace monitor if defective.

Problem	You receive a **Device Time Out** message in **Profile**.
Possible Cause	Circuit board may be faulty.
Possible Solutions	Re-attempt communication with monitor. Replace the monitor if defective. Contact your regional ADS representative.

Problem	Gap exists within the collected data.
Possible Cause	Monitor time may be incorrect. Monitor firmware or variable file may be corrupt.
Possible Solutions	Check monitor time, and reset clock if necessary. Attempt to collect data within the gap. Contact your regional ADS representative.

Problem	Data is missing at the beginning or end of the date range following data collection.
Possible Causes	Monitor activation may have failed. Monitor time may be incorrect. Monitor's firmware or variable file may be corrupt.
Possible Solutions	Verify whether the monitor has been activated, and activate if necessary. Check monitor time, and reset clock if necessary. Contact your regional ADS representative.

Problem	An I/O error message displays when communicating with the monitor.
Possible Cause	Circuit board may be faulty.
Possible Solutions	Re-attempt communication with the monitor. Replace the monitor if defective. Contact your regional ADS representative.

General Communication Problems

The following tables contain general techniques for troubleshooting communication problems.

Problem	Monitor does not answer a telephone call.
Possible Causes	Telephone connection at monitor may be damaged, loose, or leaking. Telephone cable may be noisy, damaged, or dead. Lightning protection module may be damaged. Battery pack(s) may be dead or below minimum voltage requirement (4.5 volts). Monitor may be defective. Modem in monitor may be defective. Modem in office or field computer may be defective. Telephone service may not be working.
Possible Solutions	Make sure phone cable connection at monitor base is secure and dry. Check telephone cable for damage. Use voltmeter to check voltage on telephone cable and at lightning protection module. Voltage should be approximately 48 Vdc on hook. Replace 7.5-volt battery pack if below 4.5 volts. Attempt to direct connect to monitor. Contact telephone company for repair if noise, no tone, or constant busy signal occurs at network interface box or if service does not seem to be working. Replace the monitor.

Problem	Monitor does not answer through wireless communication.
Possible Causes	Signal strength to the modem may be insufficient. Battery pack may be dead or below minimum voltage requirement (4.5 volts). Monitor may be defective. Modem in monitor may be defective. Antenna or cable may be damaged. Internet connection in office or field computer may be down. Wireless carrier may have problems. Port 2100 may be blocked by IT department.
Possible Solutions	Direct connect to monitor on site, and request the signal strength. If the signal strength falls between -51 and -95, communication should be available. If it reads below -95, relocate the antenna. If relocation is not an option, install a land line or perform all communications on-site. Replace the 7.5-volt battery pack if below 4.5 volts. Replace the monitor. Replace antenna/cable. Restore Internet connection. Check for AT&T outage. Restore/establish permission to pass TCP/IP traffic via Port 2100.

Problem	Busy signal occurs when calling the monitor using a landline.
Possible Causes	Someone else may be communicating with monitor. Monitor may be calling out an alarm. Telephone cable may be damaged. Lightning protection module may be damaged. Telephone cable may have shorted. Modem in monitor may be damaged. Telephone service may not be working.
Possible Solutions	Wait a few minutes, and attempt to communicate with monitor again. Connect at the site using the serial cable, and try to communicate with monitor. Use voltmeter to check voltage on telephone cable. Voltage should be approximately 48 Vdc on hook. If it is not, disconnect phone line at the lightning protection module and check the voltage at the network interface box. Make sure telephone cable is not damaged or severed, and repair or replace cable if necessary. Check telephone connector for moisture. Contact the telephone company to report service is not working. Replace the monitor.

Problem	Monitor establishes a connection, but does not respond to any message.
Possible Causes	Cabling may be loose. Lightning protection module may be damaged. Modem in monitor may be faulty.
Possible Solutions	Listen for noise at the site using a field phone. If noise is present, inspect the wirings and replace wiring if necessary. Replace the lightning protection module. Contact telephone company. Collect the data from the monitor on site using the serial cable, and replace monitor if defective. Contact your regional ADS representative.

Problem	Monitor does not deliver alarms through emailing or text messaging.
Possible Causes	SIM card is missing or improperly installed. Text message or email address entered for alarm delivery is incorrect. SIM card address is not valid. AT&T account has not been activated or set up correctly.
Possible Solutions	Verify the presence and proper installation of the SIM card. Verify the correct cryout address for alarm notification through emailing or text messaging. Verify the SIM card address begins with 166.219.XXX.XXX and does not include leading zeroes. Verify that AT&T activated and correctly set up account. Contact your regional ADS representative.

General Pressure Depth Problems

The following tables contain general techniques for troubleshooting pressure depth.

> **Warning:** Contact your regional ADS representative for further diagnosis before replacing a pressure depth sensor.

Problem	Pressure depth readings are consistently incorrect.
Possible Causes	Coefficients may be incorrect. Pressure dryer tube may not be functioning properly.
Possible Solutions	Retrieve or enter the correct coefficients, and reactivate the monitor. Inspect color of desiccant in dry tube and replace the dryer tube (if necessary).

Problem	Pressure depth readings are consistently off by up to 3 inches, but temperature readings are accurate.
Possible Cause	Monitor may be configured with an incorrect pressure sensor offset.
Possible Solution	Re-measure pressure sensor physical offset and enter correct value in **Profile**. Reactivate the monitor. Enable Auto-Pressure Calibration feature in **Profile** to calibrate the pressure sensor data to the ultrasonic data during non-surcharge conditions.

General Float Switch Problems

The following tables contain general techniques for troubleshooting float switches.

> **Warning:** Contact your regional ADS representative for further diagnosis before replacing a float switch.

Problem	Float switch status is not consistent with pressure depth readings.
Possible Cause	Float switch may be unable to change position due to obstruction or debris. Float switch may be malfunctioning.
Possible Solution	Inspect float switch in manhole for obstructions or debris and make necessary modifications. Replace float switch.

Problem	Float switch does not change status when flow depth reaches high or high high depth status.
Possible Cause	Float switch may be unable to change to open (horizontal) position due to obstruction or debris. Connector may not be properly engaged. Float switch may be malfunctioning.
Possible Solution	Inspect float switch in manhole for obstructions or debris and make necessary modifications. Inspect connection between float and monitor. Replace float switch.

Problem	Float switch does not change status when flow depth recedes.
Possible Cause	Float switch may be unable to return to closed (vertical) position due to obstruction or debris. Connector may not be properly engaged. Float switch may be malfunctioning.
Possible Solution	Inspect float switch in manhole for obstructions or debris and make necessary modifications. Inspect connection between float and monitor. Replace float switch.

Problem	A float error occurs.
Possible Cause	Connector may not be properly engaged (attached). *An error will not occur if two float switches are in use, but only once the connector becomes disengaged.* Float switch may be malfunctioning.
Possible Solution	Inspect connection between float and monitor. Replace float switch.

Problem	The float state changes, but no alarm occurs.
Possible Cause	Connector may not be properly engaged. Float switch may be malfunctioning.
Possible Solution	Inspect connection between float and monitor. Replace float switch.

APPENDIX A

Specifications

This appendix contains specifications for the ADS® FlowAlert™ monitor, printed circuit board/digital signal processor, pressure depth sensor, float switch, and lightning protection module.

ADS FlowAlert Monitor (ADS p/n 6000-FAL/FAW)

The following table contains the specifications for the FlowAlert monitor.

> **Note:** Currently, FlowAlert monitors are not intrinsically safe.

Enclosure	Cylindrical 0.13-inch (0.30 cm) thick seamless, marine-grade aluminum with stainless steel hardware
Dimensions	11.5 inches long by 6.38 inches diameter
Weight	22 pounds (monitor with battery)
Operating Temperature	32° to 140° F (0° to 60° C)

Internal Power	Landline: One ADS 7.5-volt 130 amp hour alkaline battery pack (not rechargeable) Wireless: One ADS 7.5-volt 130 amp hours alkaline battery pack powering both the monitor and the wireless modem; power to modem can be continuous or managed via duty cycles for power saving
Waterproof	Submersible up to 10 feet
Battery Life	5-minute sample rate: 12 months 15-minute sample rate: 24 months **Note:** Estimate based on performing weekly data collects. Actual battery life may vary depending on operating temperature and frequency of communications, particulary when using wireless communication.
Connectors	U.S. MIL-C-26482 Series 1 Type, for environmental sealing, with gold-plated contacts
Inputs	Float switch/pressure depth sensor input Serial/direct connection/external power input Communication – telemetry or antenna (GPRS wireless) Air pressure valve (*for testing purposes only*)

Printed Circuit Board (ADS p/n 6000-0001)

The following table contains the specifications for the printed circuit board.

Processor	Texas Instruments VC33 DSP (Digital Signal Processor)
Functions	Performs and processes all requests for sensor and diagnostic information, executes all math calculations, performs MLI-related functions based on user configuration, performs alarm handling, and performs multi-tasking monitor operations
Memory	1 megabyte non-volatile (program, configuration, and data storage); 512 kilobytes static RAM
Data Storage	365 days (1 pressure and 2 float readings at a 15-minute sample rate)
Sample Rates	Minutes: 1, 2, 5, 15, 30 Hours: 1, 2, 12, 24
Clock	Battery backed RTC module
Communications	Landline: Multitech Model MT5600SMI; FCC ID 6KDMD06AHS1; 19.2K baud with fallback to 9600 and 1200 as required for reliable communication; regular 2-wire voice grade POTS service line Wireless: Enfora™ Dual band 850/1900 MHZ GSM/GPRS; FCC ID MIVGSM0108; fixed address via AT&T custom APN; refreshed every 4 hours via hard-attach Serial/Direct Connect: RS-232
Comm Protocol	AccuYapp for configuration and diagnostics Yapp for data collection and cryouts
Antenna	ADS whip or direct burial

LED Diagnostic Readings	Wireless signal strength Battery voltage Monitor IP address
Voltage Regulator	13.5 VDC maximum input
Inputs/Outputs	ADS Pressure sensor/float switch input Serial RS232 communication (external) TTL serial communications (internal)
A/D Conversion	12 bit, 8 channel, 500KHz sample rate

Pressure Depth Sensor (ADS p/n 3704-0010-40)

The following table contains the specifications for the pressure depth sensor.

Enclosure	Solid machined PVC/stainless steel
Dimensions	5.25 inches long x 1.40 inches wide x 1.15 inches high
Range	0.0 to 5.0 psi: up to 11.5 feet 0.0 to 15.0 psi: up to 34.5 feet 0.0 to 30.0 psi: up to 69.0 feet
Accuracy	0.5% of full scale for these ranges: 0.1-5.0 psi: 0.25-11.5 feet 0.1-15.0 psi: 0.25-34.5 feet 0.75% of full scale for these ranges: 1.0-30.0 psi: 2.3-69.0 feet

Resolution	0.025% of full scale
Cable	Standard size: 40 feet long x 0.29 inches diameter OD polyurethane jacket Extension cables available up to 300 feet

Float Switch (ADS p/n 6000-0015/25/26/27-xx)

The following table contains the specifications for the float switch.

Type	Conery™ Control Duty 2900 Mercury Series – Narrow-Angle, Internally-Weighted Switch
Variation	Single pole, double throw
Enclosure	Durable PP outer shell with solid polyurethane foam interior
Dimensions	Float housing: 6 inches long by 4.25 inches in diameter
Weighted Swtich	Cast iron; internal at neck of floating housing
Operating Temperature	32° to 170° F (0° to 77° C)
Electrical Rating	10 AMPS at 120 VAC; 3 AMPS at 240 VAC
Actuation Point	1-inch (5 degrees) above / below horizontal
Cable	Conductor cord: Chlorinated polyethylene (CPE) Electrical: 18 AWG, 3-conductor; type SJOOW-300 Volt Diameter: 0.31 inches Available lengths: 20, 40, 60 feet **Note:** Customer can extend the cable using 18 AWG, 3-conductor SJOOW cable as needed.

Lightning Protection Module (ADS p/n 303313)

The following table contains the specifications for the lightning protection module at the service location.

Housing	Gray PVC
Dimensions	4.13 inches high x 3.25 inches wide x 1.88 inches deep
Polyswitch	600-volt 150-milliamps over-current protector
Varistor	240-volt over-voltage protector
Sidactor	280-volt over-voltage protector
Ground Wire	12 AWG black stranded
Service Wire	22 AWG 4-conductor gray unshielded

APPENDIX B

Part Numbers

This appendix includes tables for the part numbers of the most commonly ordered and used FlowAlert system parts.

Monitors	
6000-FAW	MONITOR, FLOWALERT, WIRELESS
6000-FAL	MONITOR, FLOWALERT, LANDLINE

Sensors, Float Switches, and Cables	
3704-0010-40	SENSOR, PRESSURE, 0-5PSI, 40 ft.
3704-0015-40	SENSOR, PRESSURE, 0-15PSI, 40 ft.
3704-0016-40	SENSOR, PRESSURE, 0-30PSI, 40 ft.
6000-0013	CABLE, PRESSURE & FLOAT PIGTAIL
6000-0014	CABLE, PRESSURE ONLY PIGTAIL
6000-0021	CABLE, FLOATS ONLY, PIGTAIL
6000-0015-20/40/60	FLOAT, SINGLE, NO PRESSURE, SPDT, 20/40/60 ft.
6000-0025-20/40/60	FLOATS, DUAL, NO PRESSURE, SPDT, 20/40/60 ft.
6000-0026-20/40/60	FLOATS, DUAL & PRESS CONN, SPDT, 20/40/60 ft.
6000-0027-20/40/60	FLOATS, SINGLE & PRESS CONN, SPDT, 20/40/60 ft.
5000-0601	CABLE, RS232 WITH PHONE LINE

Sensors, Floats Switches, and Cables	
5000-0664	CABLE, RS232 WITHOUT PHONE LINE
5000-0697	CABLE, PHONE

Communication and Antennas (*for wireless communication*)	
3800-0128	ANTENNA, WHIP, 850/1900 MHz, SMA
3800-0133	ANTENNA, PEDESTAL, W/15-FOOT CABLE, SMA
3800-0162	KIT, ANTENNA, SLIM, SMA/TNC
3800-0163	KIT, ANTENNA, MINI-WING, SMA/TNC
507181	SIM CARD, WIRELESS GSM
507165	CABLE, ANTENNA, EXTENSION, 15-FOOT SMA
507168	CABLE, ANTENNA, EXTENSION, 50-FOOT SMA
507180	LIGHTNING PROTECTOR, ANTENNA, MALE-FEMALE, SMA (*for use only with the wireless magnetic whip antenna*)

Monitor/Sensor Mounting Hardware (*for wall mounting*)	
I40-0009/3	FLANGE HANDLE (BRACKET), 18- or 36-INCH (*for mounting monitor to manhole wall or rim*)
106222A	HOOK, RUNG MOUNT (*for mounting monitor to ladder rung*)
700-100238-00	BRACKET, FIXED MOUNT (*strap for mounting sensor to wall*)
I25-0081 – I25-0094	STANDARD SENSOR RINGS (*sizes from 6 to 60 inches*)

Monitor Replacement PCBs	
6000-0001	PCBA, PROCESSOR, WIRELESS, FLOWALERT
6000-0001-01	PCBA, PROCESSOR, LANDLINE, FLOWALERT
3506-0078	PCBA, MODEM, LANDLINE, FLOWALERT

Monitor Replacement Battery Pack	
6000-0004	BATTERY PACK, 7.5 V

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