PIPEMINDER T

TECHNICAL MANUAL

Syrinix

Intelligent Pipeline Monitoring

Content

1. Safe Usage of PIPEMINDER-T

1. Please read these instructions before using PIPEMINDER-T.
2. Retain the instructions and make them available to others who may use PIPEMINDER-T.
3. Follow the instructions when deploying PIPEMINDER-T.
4. Take care when handling PIPEMINDER-T and its battery pack. If it is dropped or damaged please contact Syrinix for instruction.
5. There are no user serviceable components inside PIPEMINDER-T. In the event of failure, do not attempt to use the instrument and contact Syrinix for guidance.
6. Use only electrical attachments and accessories supplied by Syrinix. Syrinix cannot be responsible for the performance of the instrument when used with non-approved parts. A USB cable is provided in the box.
7. Do not place PIPEMINDER-T, accessories or battery pack on or near a heat source.
8. Do not incinerate.

CE

Syrinix hereby declare that this product is in compliance with the essential requirements and other relevant provisions of Electromagnetic Compatibility Directive 2004/108/EC, R&TTE directive 1999/5/EC and further conforms with the following EU Harmonized Standards:

EN55022:2010
EN55024:2010
EN301 489-7 V1.3.1

2. Revision History

Document Number	Date	Revision
PT-EN26-001_	02/01/2018	A
PT-EN26-001_	01/03/2018	B
PT-EN26-001_	03/03/2018	C

3. Primary Functions

Syrinix's PIPEMINDER-T provides automated monitoring of pressurised water supply pipelines, including pressure and flow reporting, early stage leak detection/location and real time burst detection.

A fusion of sensors that include a hydrophone in direct contact with the water and a geophone in contact with the pipe wall enables PIPEMINDER T to precisely identify small leaks in advance of becoming catastrophic failures. High resolution pressure monitoring and analysis allows the user to manage pipeline assets and identify associated risks within their networks. Burst detection alerts (optional) are also available when utilised with a flow meter (customer supplied).

3.1 Leak Detection

Syrinix PIPEMINDER-T works by acquiring the signal created when the water escapes through the leak point. The water is moving rapidly, over a small distance (typically the thickness of the pipe wall) from the high-pressure zone inside the pipe to atmospheric pressure outside the pipe. It is this rapid transition that creates a signal of sufficient power that, after propagation along the pipeline to the sensors, can be successfully acquired, processed and analysed. The potential leak is monitored for seven days by the system. A confidence level is then established to determine the leak likelihood and the user is issued a warning via Syrinix's RADAR platform.

3.2 Burst Detection (Optional)

PIPEMINDER-T requires an external flow meter (provided by the customer) for burst detection. When both flow and pressure signals are available it continuously monitors them for changes characteristic of a burst. Upon detection of a burst:

- An alert is sent to Syrinix's RADAR platform;
- A section of flow and pressure data containing the event is sent to Syrinix's servers.
- Users may also receive Email and SMS alerts if configured.

3.3 Syrinix Severity Score S3

The S3 score is a non-dimensional measure of pressure transient activity calculated within PIPEMINDER-T itself. Large changes which happen quickly result in a high score, small changes over a longer period result in a lower score and a continuously stable pressure results in a score of zero. S3 is a broad measure of transient severity and is related to the energy of the transient event. Oscillatory pressure waves, therefore, also give higher S3 scores even though their amplitude may not be as high as an impulsive event.

Tracking and profiling S3 for a particular site over time is a good measure of the pipeline's transient activity and readily indicates if the activity level has increased or if mitigation work has been successful in reducing it.

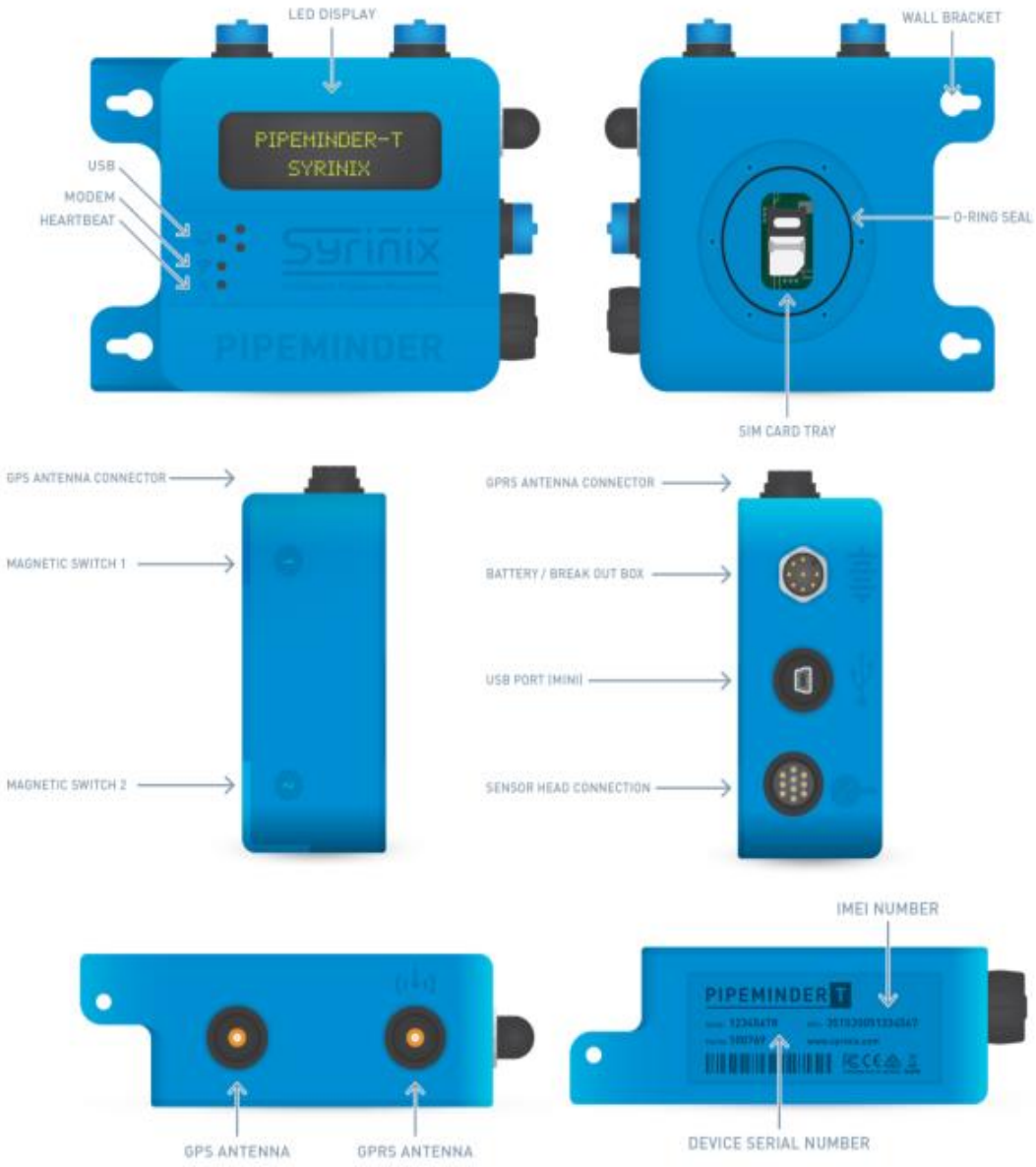
4. Specification

GENERAL	
Functions	• Automatic leak detection • Pressure & flow delivery (when used with customer supplied flow meter) • Burst detection with real time notification (when used with customer supplied flow meter) • Real time pressure transient monitoring (optional)
Support pipe materials	• Cast iron/ductile iron • Steel • MDPE & PVC • Concrete
Interface	• Remote managed alerts (SMS, Email)
Leak detection accuracy	• 1 metre (dependant on accuracy of measured sensor distance)
Operating range	• Typically, 500m up to 750m (subject to site survey and pipe material)
Sample rates	• Pressure 128S/s (for events, 15-minute summary) • Flow 1 S/s
Power source	• Rechargeable lithium battery
Operating environment	• -20°C to + 65°C (-4°F to 149°F)
Cable length (processing unit to sensor)	• 10m (longer distances available subject to testing)
Sensor Head: Part no. 100755	
Enclosure	• LG2 M/C Casting
Fitting	• 2.5” BSP Gate Valve (other fittings by arrangement)
Dimensions	• 155mm (H) x 185mm (Dia) (6.10” x 7.28”) (relative to centre of gate-valve for clearance)
Weight	• 12 Kg (24.46 lbs)
Environmental rating	• IP68
Control Unit: Part no. 101660	
Enclosure	• Housing: Acetal
Dimensions	• 108mm x 108mm x 49mm (4.2” x 4.2” x 1.9”)
Weight	• 0.95Kg (2lb 1 0z)
Environmental rating	• IP68
Antenna	• External (various options available)
***12V 100AHr Rechargeable Battery: Part no. 101601**	
Type	• Rechargeable lithium iron phosphate
Voltage	• 12V
Enclosure	• Valox
Environmental rating	• IP68
Dimensions	• 411 mm x 322 mm x 168 mm (16.2” x 12.7” x 6.6”)
Weight	• 13.19 Kg (29lb 1oz)
Charge Time	• 10 – 12 hrs

Table 1: PIPEMINDER-T Specification

***Note:** More detailed specifications regarding the battery can be found in the Syrinix rechargeable battery operation and maintenance manual

5. System components



Part no. 100769 Control Unit

Part no. 100755
Sensor Head

Part No. 100183
Sensor Head O Ring

Part no. 101602
12V 10A Battery charger

Part no. 101601
12V 100Ah Rechargeable battery

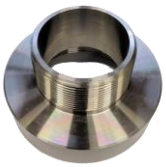
Part no. 101610
Battery to control unit 2 meter lead

Part no. 100819
GPS/GPRS Antenna 3 metre lead

Part no. 100964
Dual antenna bracket

Part no. 100170
USB lead

Part no. 100024
Magnetic wand



Part no. 100444
21/2” BSP to 2” NPT adaptor
(North America only)

Part no. 100781
Battery/Flow combo unit

6. SIM Installation and Configuration

- PIPEMINDER-T Units provided with a SIM card data plan will not require SIM installation and configuration upon initial receipt and will be ready to deploy immediately.
- All users who have a requirement to install a new or replacement SIM card please refer to Chapter 6.1 before deployment.

6.1 To install the SIM card:

If you are fitting your own SIM card, then the SIM installation and configuration procedure must be followed before your PM-T can be deployed.

Before starting you will need:

- Small cross-head screwdriver;
- Standard size SIM card;
- APN, Username and Password information for SIM card;
- Mini USB lead (supplied).

Steps (refer to Figure 3.)

1. Remove the SIM cover on the rear of PIPEMINDER-T;
2. Slide the metal cover to unlock the hinge-type SIM holder;
3. Pull SIM holder upwards
4. Insert the SIM card into the hinged part of the SIM holder following orientation shown in Figure 3.
5. Close and lock the SIM card holder by folding down and sliding the clip back, replace SIM cover.

IMPORTANT:
- Failure to fit the SIM cover and O-Ring correctly can result in water ingress and damage to PIPEMINDER-T;
- The screws retaining the SIM cover are into plastic threads, do not over tighten.

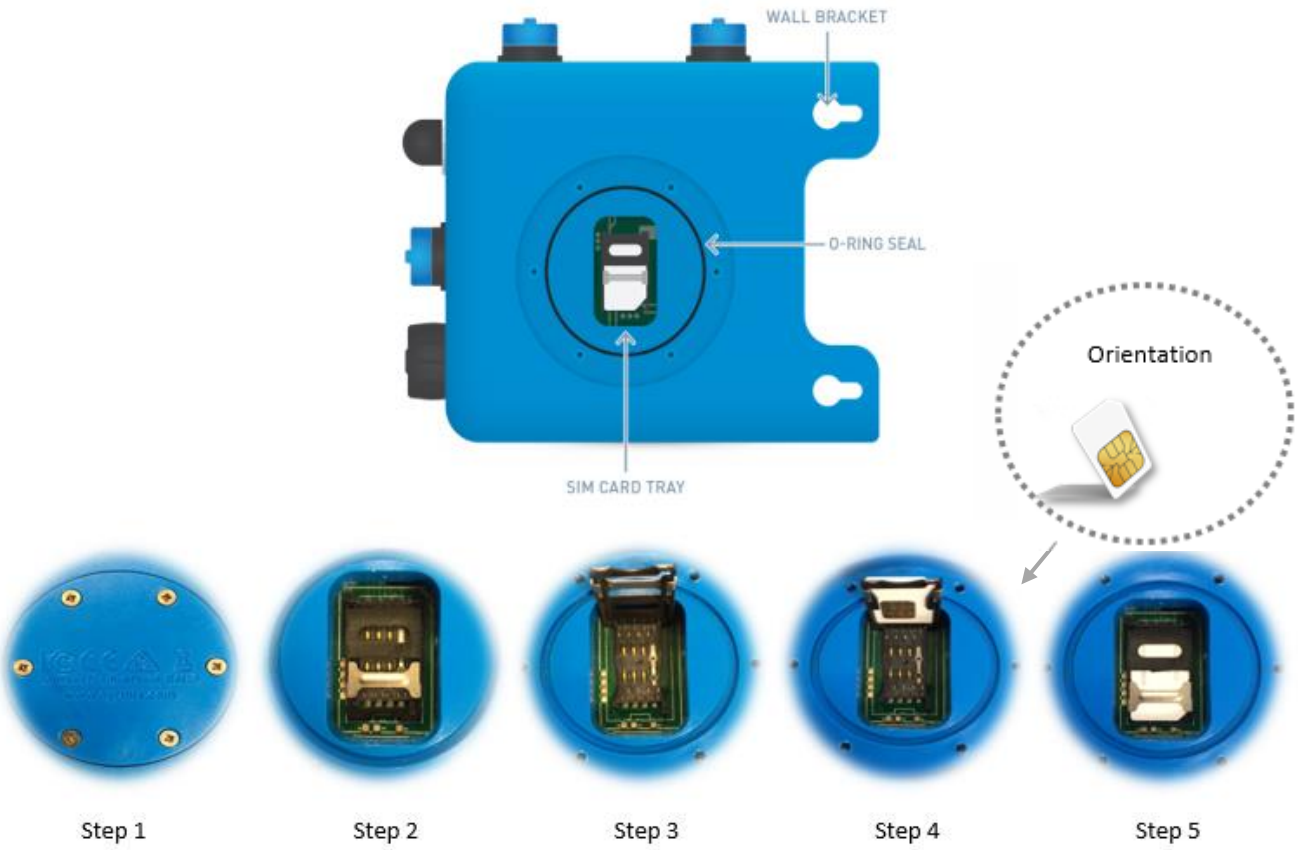


Figure 3. SIM Installation

7. To configure PIPEMINDER-T to use the SIM card:

1. Log on to the RADAR at https://radar.syrinix.com using your username and password.
2. Ensure that the side bar is visible by clicking the ☰ symbol
3. Download and install Syrinix Device Manager from the Help and Resources section
4. Select the device that you wish to configure from the Select a Device drop down box
5. Click on the Manage tab from the menu across the top of the page
6. Enter the APN settings (APN Address, Username and Password) and click Save Configuration
7. Click Download Config File at the top of the page and save the file to your desktop
8. Start Syrinix Device Manager
9. Connect the USB lead to the PIPEMINDER-T and PC
10. In Syrinix Device Manager select the Manage Device tab
11. Select the device from the Select Device… dropdown
12. Expand the Update Configuration section and click Update Configuration
13. Select the file that was downloaded in step 7
14. “Mission file updated successfully” should be display
15. Disconnect battery and USB lead

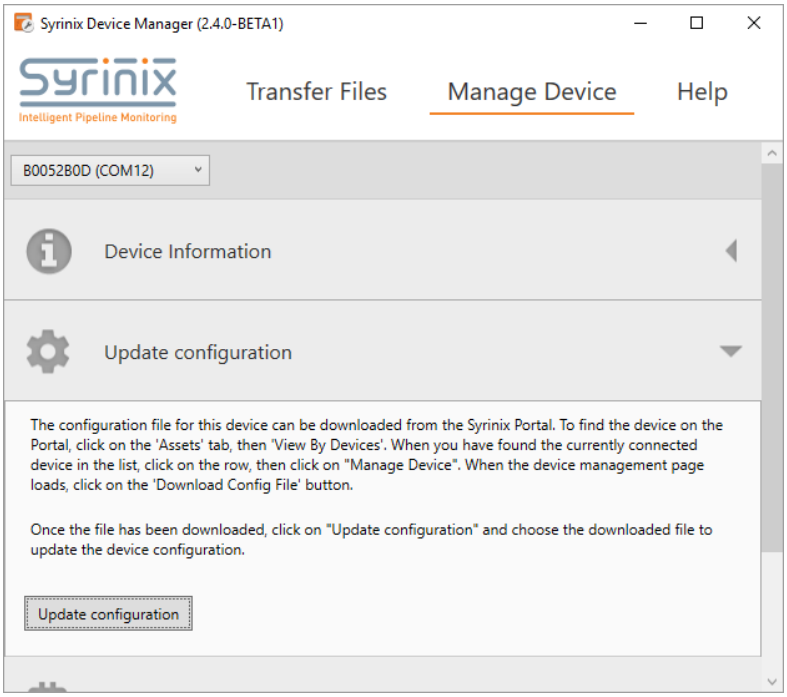


Figure 4: TRM Config Application

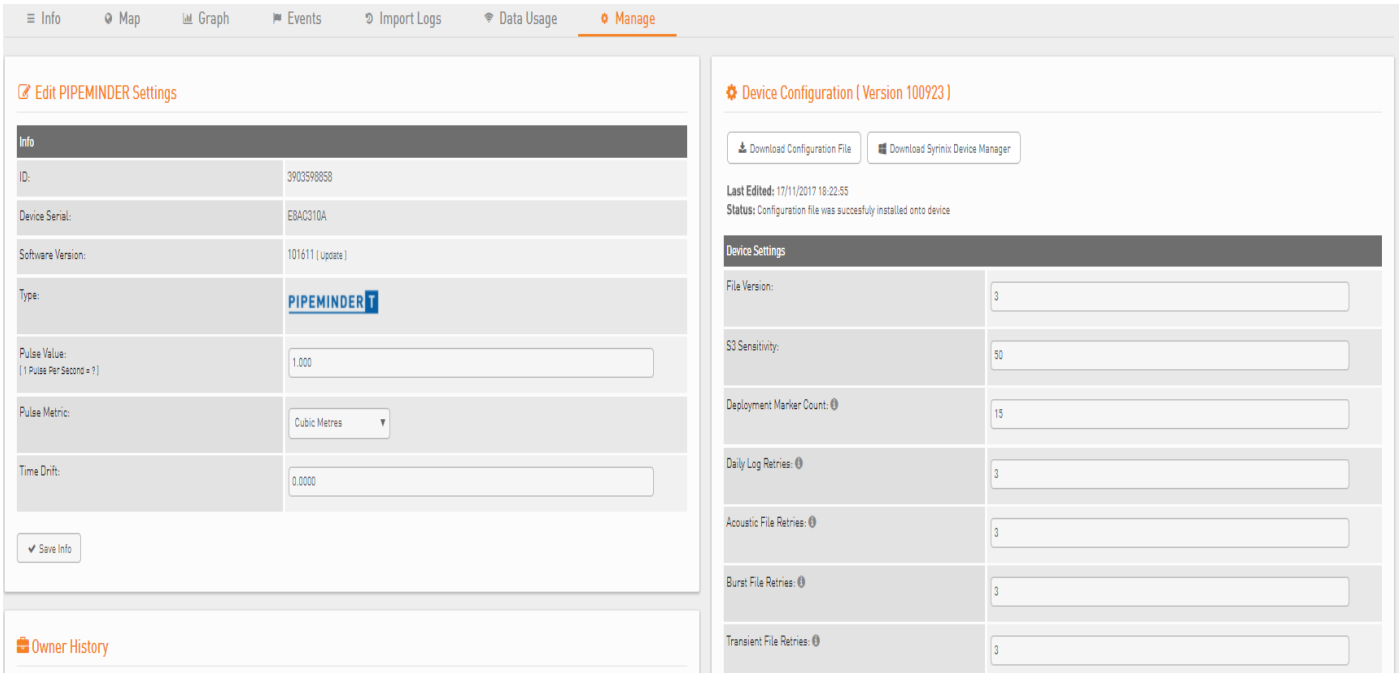


Figure 5: Configuration editor on RADAR

8. Site selection

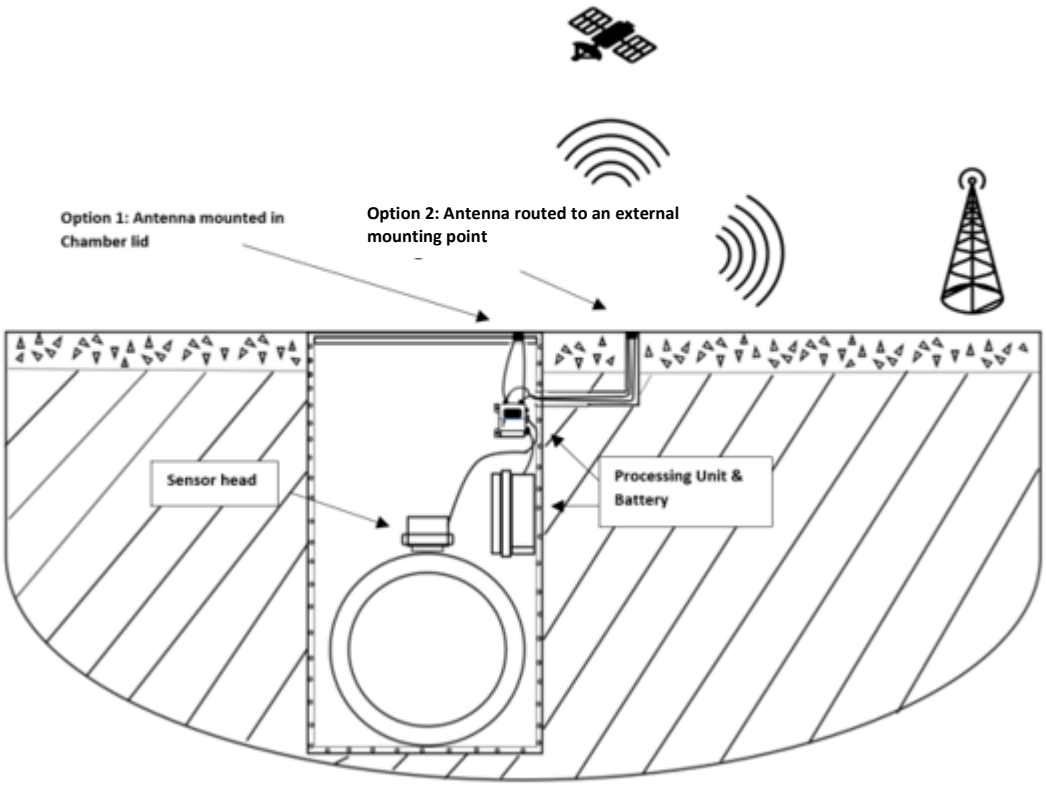


Figure 6: Typical Installation

8.1 Pipe side requirements

PIPEMINDER-T requires a physical tapping on to the main. The simplest installation uses a 2 1/2" BSP gate-valve directly installed on the crown of the main. Other fittings are possible using adaptors but should be cleared by Syrinix prior to installation.
Clearance around the gate-valve: A (horizontal, plan) diameter of 220mm from the centre of the valve is the absolute minimum but 280mm is recommended for easier handling.
Clearance above the mating surface of the gate valve: minimum 190mm.
Position of the gate-valve: The gate-valve must be on the crown of the main, the thread and mating surface of the valve must be level, tolerance +/-6 degrees. A horizontal (at the 3-oclock position configuration is also available, but require changes to the standard configuration and must be notified to Syrinix at time of Order.
The lead from the sensor head is approximately 10m long.
Once the sensor head installation is complete the unit is submersible (1.5m for 2 weeks continuous). The installation should be carried out in dry conditions. If the installation site is known to exceed these submersible parameters, then Syrinix should be notified at date of order.

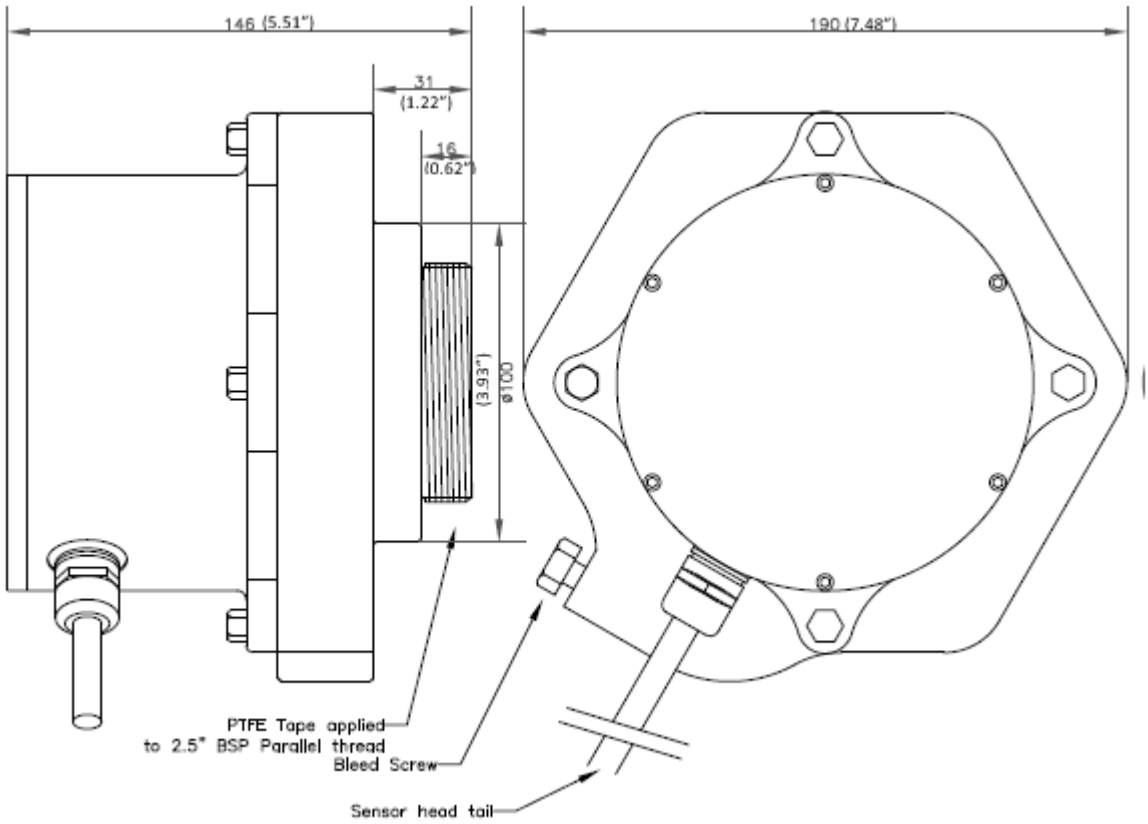


Figure 7: PIPEMINDER-T Sensor Head

8.2 Kiosk Bollard and utility chamber requirements

Each PIPEMINDER-T sensor head has an accompanying enclosure to house the System components and rechargeable battery unit.
The requirements below are quite general with only the following specific requirements.

In the case of **bollard installations**, the equipment is installed off site onto the steel mounting plate and delivered to site as a complete unit to be mounted on the pre-constructed base.
In the case of a **kiosk installation**, **or utility chamber**, then these should be made of a material transparent to radio for the GPS receiver, 3G-system. If a metal kiosk/chamber is essential, then arrangements must be made to house the antennas outside the metal enclosure.
By default, the PIPEMINDER-T system battery is provided in a ruggedized Peli Case solution, with the control unit and sensor head as separate components. The waterproof kiosk or utility chamber should be of sufficient size to accommodate both the rechargeable battery case, control unit and if located in the same chamber the sensor head also.

9. Installation

9.1 Pre-Requisites

A survey of the water main has been completed and the distances between PIPEMINDER-T installation sites has been verified by the owner of the trunk main or his designated contractor.

- Chamber of sufficient depth to accommodate the installation and equipped with a valve fitted to the pipe suitable for the PIPEMINDER-T sensor head.
- Main chamber, roadside utility chamber, cabinet or bollard for the control system
- Cable Conduit between Sensor Head Chamber and utility chamber
- Good 3G Signal
- Good GPS Signal

9.2 Site Arrival

Before starting the installation please make note of the following information:

- Chamber Reference
- Site Address
- Main Size
- Main Material
- Enter your name
- Record the Date
- Pairing Information

9.3 Site Checks

Perform the following checks prior to installing the equipment and make note of the results:

- Check Cellular signal
- Check GPS signal

If any of the above checks fail, then the system should not be deployed. This should be reported to the designated prime contractor or Syrinix technical support for further advice.

9.4 Sensor head cable installation (Kiosk/Bollard/Chamber)

1. Using the rope pull the Cable through the cable conduit between the Chamber and the Kiosk/bollard or chamber.

2. The cable should protrude 0.5m above ground level to enable connections to be made.

3. Any excess cable that cannot be lost in the conduit must be coiled and securely tied to the side of the chamber. (Cable provided in 10 M lengths as standard)

9.5 Sensor head installation onto pipe

1. Before starting the Sensor Head installation, record the Sensor Head serial number and store details in safe location

2. Fit 'O' Ring seal (located in plastic bag taped to box) into the groove on the base of the Sensor Head. You will need a wipe of silicone grease to seat it securely.

3. PTFE tape the thread on the Sensor Head.

4. Crack the gate valve and use the water flow to clean the valve area and particularly the mating surface. There must be no grit or loose particles. Close the valve.

5. Chlorine spray the mating areas of the sensor head and the gate valve in accordance with local practice. Pay particular attention to the inside cavity of the PIPEMINDER-T head but take care not to physically bump the hydrophone sensor element.

6. Screw the Sensor Head into the gate valve. Wearing rigger gloves, the Head only needs to be hand tightened.

7. Open the valve allowing water into the Sensor Head cavity.

8. Using a 17mm spanner open the Bleed Screw ONE TURN ONLY: DO NOT REMOVE THE SCREW COMPLETELY allowing trapped air to be bled from the Pressure Chamber until only water escapes from the bleed hole. Re-tighten Bleed Screw. NOTE nip-tighten sufficiently to stop all water flow and drips from the bleed screw. Over-tightening will damage the unit.

9. Check all seals for any leaks and rectify if required.

10. Connect the earth lead, which forms part of the TT-Earth system of the chamber, to the Sensor Head, see section 8.

9.6 Sensor head removal

1. Close the gate valve

2. Open the air bleed screw – do not remove it

3. Remove the head from the valve. If the head is very tight, a large stilson may be used – alternatively, Syrinix can supply a special purpose spanner for removal.

4. Take care that the gate valve is not unscrewed from the pipe with the sensor head.

5. Take special care when handling the sensor head as it is heavy and may be slippery due to being wet.

9.7 Earth cable installation

1. The earth cable used should be of sufficient cross-section to provide a low impedance path to the earthing point.

2. Once the sensor head is correctly fitted remove the earth cable securing bolt as shown. Figure 8.

3. The earth cable should be terminated in an M6 eye tag; this is fitted to the securing bolt as shown. Figure 9.

4. Replace the bolt and tighten using an appropriate socket. Do not over tighten as the screw thread in the sensor head could be damaged. Figure 10.

9.8 Control Unit connection

1. Place the rechargeable battery case horizontally at the bottom of the chamber/kiosk with the lid uppermost.

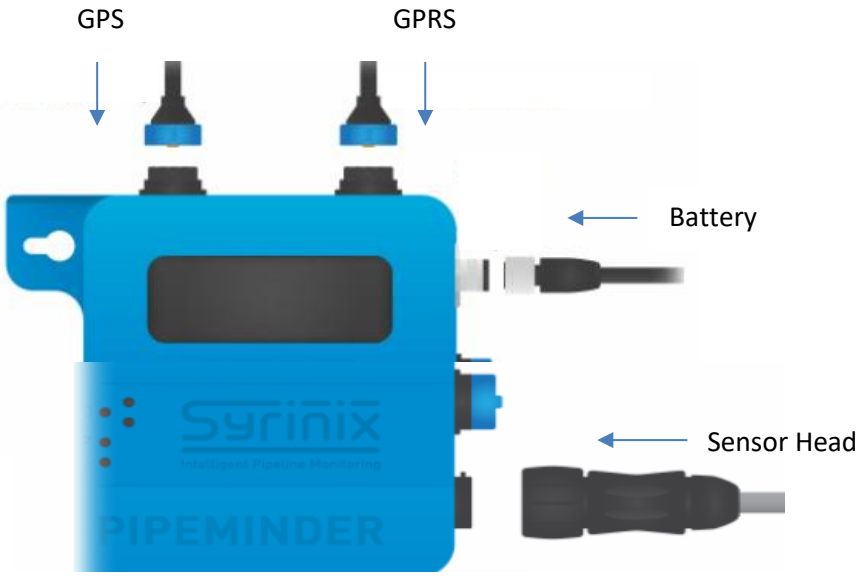
2. Remove dust cover, then connect battery lead to rechargeable battery case.

3. Connect GPS/Cellular antenna directly to the control unit via two connectors as marked on case. Dependant on the installation environment the antenna should ideally be installed externally to chamber/kiosk*.

4. Connect the sensor head to the control unit as marked on the case.

5. Connect the battery lead to the control unit to power on the control unit.

6. Wait for start-up sequence to complete, refer to Chapter 9.9 Start-up sequence.



***Note:** It is essential that PIPEMINDER-T are installed such that a daily GPS signal can be acquired as this is used to precisely time-synchronise the data acquisition. Without a successful GPS lock prior to data acquisition, any data acquired cannot be used for further processing and analysis. It is recommended that a survey for GPS signal is performed before installation.

PIPEMINDER-T requires reliable 3G signal strength to allow for the transmission of data to and from Syrinix's cloud-based RADAR platform. It is recommended that a survey is performed to establish cellular strength prior to installation and where possible the antenna should be located above ground in clear site of the sky.

When locating in a chamber consider the use of radio transparent covers or similar solutions as metal covers can have an adverse effect on cellular and GPS signals.

9.8 Start-up sequence

1. During start up the screen will display the following messages

2. Once start up sequence is complete the screen will go blank please validate deployment on the RADAR cloud based platform.

10. Flow meter connection

PIPEMINDER-T requires an external flow meter (provided by the customer) for burst detection. When both flow and pressure signals are available it continuously monitors them for changes characteristic of a burst. Upon detection of a burst:

- An SMS alert is sent to the configured mobile number;
- A section of flow and pressure data containing the event is sent to Syrinix's servers.

PIPEMINDER-T can indicate whether the burst is upstream or downstream of the installed location.

The flow meter inputs share an 8 way connector with the power input, a breakout box (Figure 8) is used to make the connections.

Cable Colour	Function
Green	Signal Ground and Battery Negative
Red	Battery Positive
Blue	Pulse Input 2: Direction or Reverse Pulses (internal pull up)
White	RS232 Tx
Yellow	Do not connect.
Grey	Alarm Input: Alarm Signal (internal pull up)
Pink	Pulse Input 1: Pulses or Forward Pulses (internal pull up)
Brown	RS232 Rx

Table 2: Flow meter connections

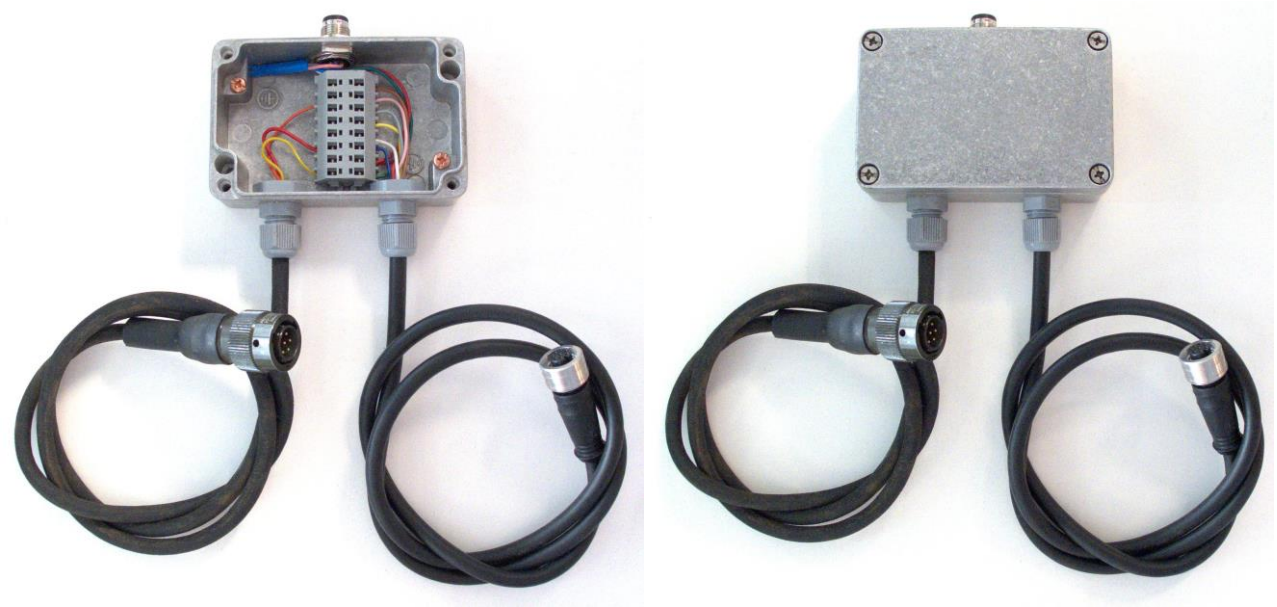


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Figure 8: Flow Meter Breakout Box

Figure 8 shows the flow meter breakout box with example connections made for an ABB Aquamaster cable. Cable colours and functions are given in Table 3.

The flow meter inputs can be configured to work with a range of open collector pulse outputs. The mode is set in the “Flow Mode” field of the configuration editor on RADAR (see

Table 6: Configuration Parameters).

Setting	Input 1	Input 2	Counting Method	Edge
0	Disabled	Disabled	Disabled	Disabled
1	Flow	Direction	Pulse Period	Rising
2	Flow	Direction	Pulse Period	Falling
3	Flow	Direction	Pulses per 5 seconds	Rising
4	Forward Flow	Reverse Flow	Pulse Period	Rising
5	Forward Flow	Reverse Flow	Pulse Period	Falling
6	Forward Flow	Reverse Flow	Pulses per 5 seconds	Rising

Table 3: Flow Meter Modes

11. Signal Strength

The signal strength reported during start-up comes straight from the GPRS modem within PIPEMINDER-T. It is of the form "CSQ: 13,99" where the first number, "13", represents the reported signal strength.

Reported Signal Strength	What does it mean?
0	Very weak signal
1	Weak signal
2..30	Medium Signal
31	Strong Signal
99	No Signal

Table 4: Signal Strength

12. USB Data Removal and Upload

When the device is connected via USB the Device Manager application may be used to copy files from the device.

1. Connect the PIPEMINDER-T to the PC using the supplied USB lead;
2. Start Syrinix Device Manager;
3. Select device on Transfer Files tab;
4. Select files to download either directly or by using the bulk selection tool in the bottom left;
5. Click Download Files or Delete File (if you want to delete them);
6. Some files (FILExx.DAT where xx = 00 to 29) are read only and cannot be deleted.

IMPORTANT:

- Once complete, disconnect battery and USB connection – PIPEMINDER-T must be power cycled before redeployment.
- The USB port in PIPEMINDER-T is disabled after 30 minutes of inactivity.
- PIPEMINDER-T will have to be restarted before a USB connection can be made.
- To avoid duplicate filenames, separate folders should be used in step 5 above.

Data files copied from PIPEMINDER-T may be uploaded to the RADAR via "Upload Device Data" on the Manage menu of RADAR. The files themselves contain all the device information for import by the RADAR. Multiple files can be zipped together before upload.

Table 5 gives a description of the files which, depending upon configuration, may be found on a PIPEMINDER-T device.

Example Name	Approximate Size	Description
10212019.TNS	50 KB	Transient or burst file, 128 S/s, 21st Oct at 20:19
DL141020.DAT	2 KB	Daily Log file, 1 S/15mins, 20th Oct 2014
FILExx.DAT	21.92MB	30 days of 128 S/s data stored in 30 files, loop.
10212114.DFT	256 B	Drift Test Results, 21st October at 21:14.

Table 5: File Formats

Despite the cryptic names, internally the files follow a common structure where data is interleaved with markers containing device information, drift information, GPS location, fault information etc. When the data is imported into RADAR the file name is irrelevant as all the required information is in the file itself.

The files stored on the device are identical to those sent over the modem, providing it was configured to send them and a cellular signal was available. The data upload functions on RADAR ignore repeated data blocks so it is safe to upload all the files using the “Upload Device Data” feature on the Manage menu in RADAR.

13. Battery Life

Battery life is designed to last 1 years with standard operating use for leak detection and transmitting 7 transients a week (2-minute events). This is based on 3 dial up per day for summary data uploading and two dial ups per day for leak detection.

A Resend communication slot is also scheduled in case of any communication problems. The unit can be configured to set a number of “event” and “daily log” retries should communication fail on the first attempt. Whilst pressure is continuously monitored, the S3 score can also be adjusted to refine the sensitivity with which transient alerts are issued.

Please note that, setting a high level of resends, or requesting a very sensitive level of transient alert communications will negatively impact battery life. Battery performance can also be reduced in areas of poor signal strength or if the unit is left powered on with a damaged or disconnected antenna as the device will by default use more power in order to achieve successful communication. In case of any doubt as to the impact of specific actions on battery life please contact Syrinix for further information.

14. RADAR

14.1 RADAR Address

The RADAR (RADAR) can be found at:

https://radar.syrinix.com

The username and password issued to you by Syrinix will be required for access to RADAR.

Training on the full use of RADAR is provided by Syrinix upon purchase of PIPEMINDER-T.

More advanced guidance can be found in RADAR on the RADAR help and resources guide.

14.2 Devices, Sites and Groups

RADAR has a hierarchical structure of devices, sites and groups.

A device is an individual PIPEMINDER-T.

A site is a fixed location containing a PIPEMINDER-T device. The intention is that sites remain static and that devices are registered to them for periods of time. Plotting is done by site, so several devices installed, one after the other, may be used to generate a continuous stream of data for that site. Conversely, several sites may be visited by one PIPEMINDER-T; in this case the data would be split across sites.

Each site must be a member of a group which makes plotting and other functions much quicker.

The “Manage” menu on RADAR can be used to manage devices, sites and groups.

14.3 Remote Device Configurations

Once the SIM card is correctly configured, all device configuration changes can be made via RADAR and downloaded to the PIPEMINDER-T over the cellular network. The PIPEMINDER-T will check daily at midnight for configuration changes or can be forced to check at any time by activating magnetic switch (see system components) using the supplied magnet.

Parameters which may be edited on the “Manage Device” page are listed in

Table 6: Configuration Parameters.

Device Settings	
File Version:	3
S3 Sensitivity:	130
Deployment Marker Count:	15
Daily Log Retries:	3
Acoustic File Retries:	3
Burst File Retries:	3
Transient File Retries:	3
Reporting Hour:	8
Resend Hour:	17
Pressure Settings	
Burst Pressure Change:	0.5
Minimum Pressure Drop:	1
Flow Settings	
Gain:	0.0015259200008586
Offset:	0
Burst Flow Change:	0.2000000298023
Flow Mode:	0

APN Settings	
APN Address:	em
Username:	
Password:	
Collection 1 Settings	
Enabled:	☐
Hour:	17
Minute:	0
Second:	0
Duration (Seconds):	480
Hyrdrophone: Enable Analogue Gain:	☐
Hyrdrophone: Digital Gain Level:	0
Geophone: Enable Analogue Gain:	☐
Geophone: Digital Gain Level:	0

Collection 2 Settings	
Enabled:	☐
Hour:	19
Minute:	0
Second:	0
Duration (Seconds):	480
Hyrdrophone: Enable Analogue Gain:	☐
Hyrdrophone: Digital Gain Level:	0
Geophone: Enable Analogue Gain:	☐
Geophone: Digital Gain Level:	0

Table 6: Configuration Parameters

15. Transient Sensitivity Adjustment (S3)

When initially manufactured, the devices are configured with an S3 Sensitivity of 130. This setting is deliberately conservative to avoid the situation where the devices continually detect transient events on active pipes.

Once PIPEMINDER-T has been installed for a few days the background S3 score may be evaluated using the "S3 Value" plot in the graph on RADAR. In most cases a clear background S3 value can be identified with occasional event spikes; the S3 sensitivity should be set midway between these two.

The resulting number of transient events identified per day can vary significantly between pipelines but the situation where transients are continuously detected should be avoided.

When relocating the devices, it is important to re-set the S3 Sensitivity back to 130 until the background knowledge of the pipe is developed.

16. Data Download

High sample rate data and the 15-minute mean / minimum / maximum / S3 data can all be downloaded from the RADAR as CSV files. The instructions on the Download menu should be followed.

The time and date information in the CSV files is in a Unix epoch format which is the number of seconds since midnight January 1, 1970. There is a little more information here:

http://spreadsheetpage.com/index.php/tip/converting_unix_timestamps

The CSV files can be loaded into excel and the epoch time converted into an excel format. From the above link, and assuming that the epoch time is in cell A2:

In a different cell, perhaps F2, enter the following formula:

1. =(((A2/60)/60)/24)+DATE(1970,1,1)
2. Change the format of cell F2 to a date:
3. Right click on cell F2;
4. Select “Format Cells…”;
5. Select the “Number” tab;
6. Select you preferred time / date format either from Date, Time or Custom;
7. If choosing Custom, entering “did/mm/ivy hh:mm:ss.000” in the type results in a format which includes decimal seconds.
8. Drag the formula down the sheet.

17. Common Problems

CSQ Reported as 99,99 at Start-Up.

- Check that GPRS antenna is connected.
- Check that SIM card is installed.
- Check that SIM card is correctly orientated (not upside down)

CSQ Reported OK but Communications Fail (above ground).

- Check that APN settings, including username and password, have been correctly entered into RADAR and that the mission file has been downloaded and sent to the PIPEMINDER-T via USB.

CSQ Reported OK Above Ground but no Communications from Chamber.

- Metal lids/enclosures can affect cellular signals, re-position antenna externally to chamber.

USB Download doesn't work.

- Power cycle the PIPEMINDER-T as the USB port is disabled 30 minutes after deployment to save power.
- Check that the USB driver is installed correctly.
- Check that the correct COM port is selected

Device cannot establish GPS or leap seconds

- Ensure antenna has clear line of sight of sky with no obstructions.
- Leap seconds may take up to 12 minutes to establish.

18. Further Help and Advice

Syrinix can provide assistance in the following areas:

- Initial system set up
- Troubleshooting
- System failure

If extra help and guidance is required please contact Syrinix technical support in your region.

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