FloPath

a MOBILTEX brand

PFM1 Loggers

Installation and Configuration Guide

Covering Model Suite PFM1 Flow & Pressure Monitors

PFM1MAN-001, REV 0.09

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1 Introduction

FloPath Cellular (GPRS) Logger Family

The PFM1 cellular logger is part of the Mobiltex Data Ltd. FloPath® - a Mobiltex Brand family of pressure monitoring and control products. Mobiltex Data Ltd. was formed in 1985 and specializes in the design and manufacture of high reliability, industrial mobile data systems for the communications, municipal and utility markets. Mobiltex has been providing solutions for the pipeline industry since 1991.

The PFM1 is a low cost, high reliability device intended for pressure & flow measurement of water networks. The field hardware is a single piece solution which is connected to the water column using an appropriate appurtenance. The PFM1 is powered by an internal, field-replaceable battery which is installed within its waterproof enclosure & rated at 5+ years of field life.

The PFM1 measures & logs pressure and/or flow data directly to its internal non-volatile memory, which is organized into independent data files. The self-powered PFM1 solution records & transmits measurements over a user defined timeframe without the need for a nearby power source or field visits. Each recorded file exists as a separate data logging entity with its own unique logging parameters. Thus, several data files operating on the same channel (ie: the pressure channel) can record different data formats simultaneously. These include Average, Instantaneous, Minimum, Maximum & Transient (form PFM1T); additionally Pulse Interval Timing (PIT)-proprietary data logging architecture is available for flow measurements. By leveraging PIT event-based logging, users can accurately measure minimum night flow and detect pressure surges within their network. Users can therefore analyze pressure and/or flow data in greater detail not previously possible with standard loggers on the market.

While users can utilize the PFM1 as a non-communicating portable logger, all PFM1 loggers come equipped with the latest in cellular technology allowing for digital transmission of all collected data to a webhosted server. Users can view this data online without having to embark on multiple site visits to manually download measurements. Users have the option to select pre-installed SIM cards for use with Mobiltex-hosted portal or to utilize their own SIM cards. Additionally, clients can select two different data portals: either Mobiltex-hosted or locally hosted on the clients internal servers. Figure 1 details the architecture for the PFM1's digital communication & storage.

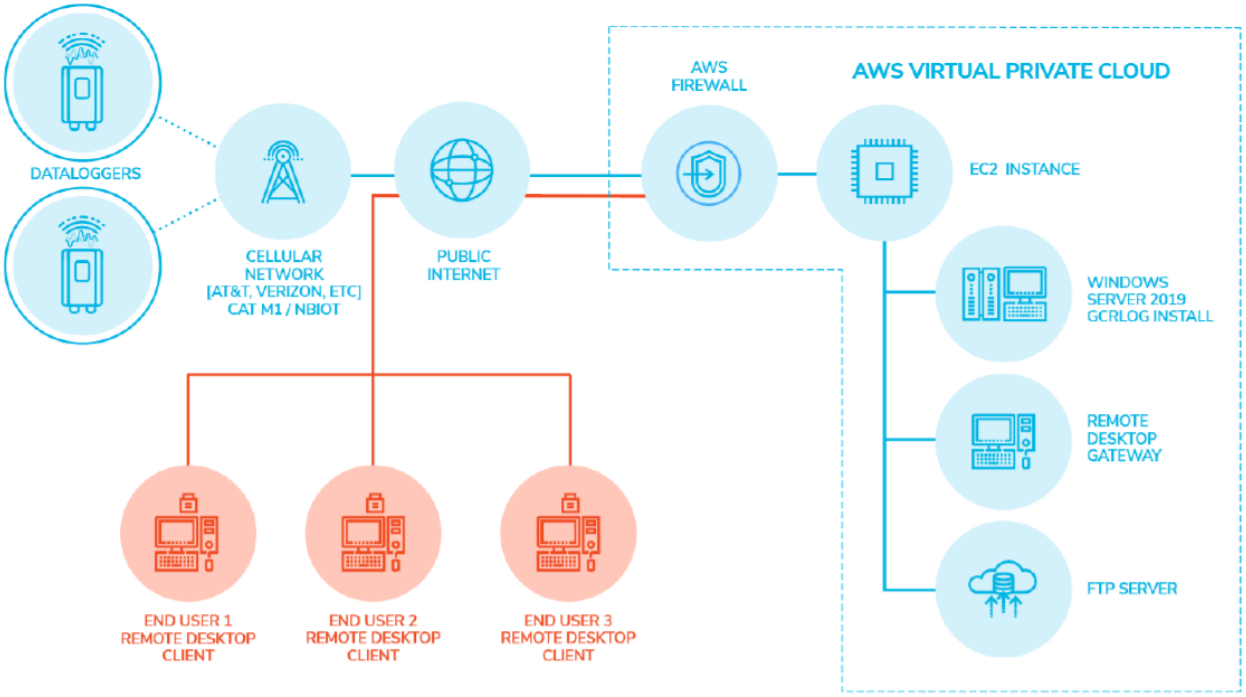


Figure 1 PFM1 Communication Block Diagram

Various versions of the PFM1 are commercially available. The stock PFM1 is available in two configurations: *Standard* and *Advanced*. The standard version, denoted as the *PFM1*, features a single pressure & single flow input; it can simultaneously log both parameters independently of one another. The advanced version, denoted as *the PFM1A*, has four inputs & can simultaneously log up to 2x pressures and 2x flow sources independently of one another. Additionally, users can connect a third pressure channel to the *PFM1A's* "Expansion" port.



Figure 2 PFM1



Figure 3 PFM1A

The PFM1T is designed to monitor & record pressure surges (transients) within a water network while simultaneously logging standard pressure and/or water flow rates, using its single pressure & single flow port. The PFM1T utilizes a user defined pressure threshold as a benchmark used to begin transient recording. The PFM1T actively checks the defined threshold against measured pressures at a rate of 10 times per second. Once the threshold is crossed, the logger can record transient pressure data at one of four configured rates: 10 Hz, 20Hz, 100 Hz or 1 KHz.



Figure 4 PFM1T

2 General Safety Information

The following safety precautions must be reviewed to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component's manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

- **Do Not Operate Without Covers.** Do not operate this product with covers or panels removed.
- **Do Not Operate With Suspected Failures.** If you suspect there is damage to this product, have it inspected by qualified service personnel.
- **Keep Internal Product Surfaces Clean and Dry.**

Symbols and Terms

These terms may appear in this **manual**:

TERM	MEANING
WARNING	Warning statements identify conditions or practices that could result in injury or loss of life.
CAUTION	Caution statements identify conditions or practices that could result in damage to this product or other property.

These terms may appear on the **product:**

TERM	MEANING
DANGER	Danger indicates an injury hazard immediately accessible as you read the marking.
WARNING	Warning indicates an injury hazard not immediately accessible as you read the marking.
CAUTION	Caution indicates a hazard to property including the product.

The following symbols may appear on the **product**:

SYMBOL	MEANING
	CAUTION Refer to Manual

3 Kit Contents

3.1 PFM1 Unit and Kits

PICTURE	DESCRIPTION
	PFM1 • Remote pressure & flow logger with 1x pressure port using male quick connect fitting & 1x flow port • Installation on fire hydrant or within a subgrade chamber using an available appurtenance

3.2 PFM1T Unit and Kits

PICTURE	DESCRIPTION
	PFM1T • Remote pressure, transient pressure & flow logger with 1x pressure port using male quick connect fitting & 1x flow port • Installation on fire hydrant or within a subgrade chamber using an available appurtenance

3.3 PFM1A Unit and Kits

PICTURE	DESCRIPTION
	PFM1A • Remote pressure & flow logger with 2x pressure ports using male quick connect fittings & 2x flow port • For use in subgrade chamber installations with access to multiple appurtenance connections

3.4 Accessories & Optional Installation Items

PICTURE	DESCRIPTION
	IrDA Programming Cable Allows for programming & data retrieval of PFM1
	Flow Input Cable Connects to flow port on PFM1. Enables logging for flow data, including direction & pulse value
	BSP Quick Connect Fitting Female quick connect fitting with ¼” BSP male thread
	NPT Quick Connect Fitting Adapter ¼” female BSP thread to ¼” maple NPT thread adapter
	Coiled Hose Malleable coiled hose extension with quick release fittings
	Rigid Hose Stiff hose extension with quick release fittings
	External Pressure Transducer Replacement external pressure transducer with 2-meter mil spec cabling & male quick connect fitting

4 Hardware Installation

Warning: Only properly qualified personnel should work on installation of this equipment. Company and industry safety procedures must be followed.

Mount the PFM1 to a horizontal or vertical surface using #10 screws in the three locations indicated in Figure 5. Do not exceed 13.5Nm (10 ft-lbs) of torque on the screws.



Figure 5 PFM1 Installation

Various PFM1 pressure & flow configurations are available based on measurement & installation needs. These configurations are dependent upon:

- The measurement connection style of the PFM1 pressure sensor (Internal or External)
    - Internal: all connection types are integrated within the PFM1 unit & bolted directly to its housing. The pressure sensor therefore exists in the body of the PFM1. The user must install the PFM1 directly to the measurement source or bridge the source to the PFM1 using a quick release hose.
    - External: the PFM1 is fabricated with M12 circular connectors but does not house the pressure sensor within its body. The pressure sensor is located at the end of an external cable which connects directly to the measurement source without having to install the PFM1 body on the source.
- The pressure/flow channel configuration based on hardware type. Table 1 depicts all pressure/flow configurations available for the various PFM1 hardware types.

MEASUREMENT TYPE	CHANNEL CONFIGURATION BY LOGGER TYPE*		
	PFM1 Standard	PFM1A Advanced	PFM1T Transient
Pressure + Flow	Pressure x1, Flow x1 (PF)	Pressure* x2, Flow x2 (PPFF)	Pressure** x1, Flow x1 (PF)

Note: All units have the option for internal *or* external pressure sensors

*Note: A 3rd pressure input is available using an optional external sensor

**Note: The pressure channel of the PFM1T is pre-configured to enable transient measurements

Table 1 Channel Configuration by Hardware Type

Installation of the PFM1 into a user's network will vary slightly based on the selected hardware configuration depicted in Table 1. All photos shown in Section 4 depict a PFM1A's PPFF configuration; however, pressure & flow

installation remains consistent across all PFM1 configuration types. Additionally, the guide will review installation for “Internal” pressure transducer connector types.

4.1 Pressure Logging Installation



Figure 6 PFM1 PPFF Connections

A PFM1A configuration is equipped with two pressure inputs and two flow inputs as noted above in Figure 6. The logger, having been purchased with “Internal” pressure components, is shipped with the pressure sensors built into its housing. A male quick-release hose port is used to connect between the pressure sensor on the logger and the quick-release fitting on the user’s waterline. Users can install the quick-release fitting at various locations or appurtenances within their network (ie: fire hydrant, blowoff valve etc) provided the installation location has direct access to the water column.

- Note: Users must ensure that there is waterflow entering the PFM1 for accurate measurements to be taken. For fire hydrant installation, the hydrant *must* be charged to enable water flow to the logger.

To qualify an appurtenance for pressure logging installation, it must be pre-fitted with two features:

1) A toggle to control the flow of water through the appurtenance. For fire hydrant installations, the operating nut/valve is sufficient for this control. For all other installations, a ball valve is recommended.

2) A pre-installed assembly reduced to a free ¼" female fitting with NPT or BSP threads. This assembly can be connected to the pumping port for fire hydrant use or on the ball valve/flow toggle for installations on other appurtenances using the appropriately sized fitting. Mobiltex supplies a ¼" male BSP threaded quick connect fitting & ¼" female-to-male NPT threaded adapter for these applications.

A sample assembly is illustrated in Figure 7. The depicted fittings illustrated from left to right are as follows:

A) Waterline appurtenance connection point using the appropriately sized fitting. In this example, a female-to-male ½" hose bib connection is used.

B) ½" T-fitting with pressure gauge.

   a. **Note:** this is an optional addition which allows for confirmation of the digital PFM1 pressure measurement.

C) ½" flow toggle (ball valve) reduced to ¼" female NPT fitting.

D) ¼" female-to-male NPT to BSP adapter & ¼" male-to-female quick connect fitting.

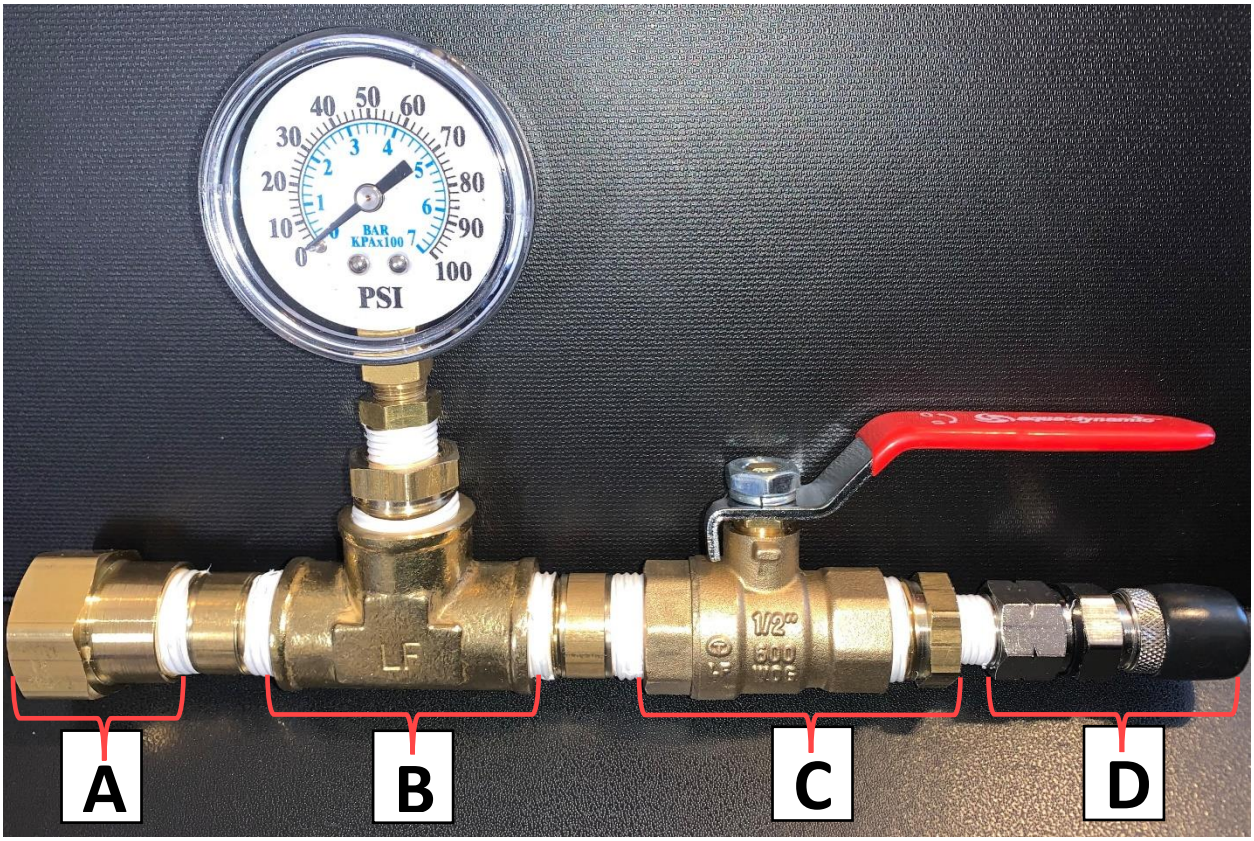


Figure 7 Sample Assembly for Pressure Measurement Installation

If 2x pressure measurements are required in tangent when installing a PFM1A with internal transducers, Mobiltex offers a hose extension to bridge the quick connect assemblies to the PFM1A. This hose extension is depicted in Figure 8.



Figure 8 Quick Release Hose for Pressure Measurements

PFM1 installation guidelines for pressure logging are as follows:

- Attach the female quick connect fitting to the reduced assembly (See segment D of Figure 7 above)
- Connect the assembly to the pipeline appurtenance/hydrant using the appropriate fitting (see segment A of Figure 7 above)
- Bleed air & confirm water flow through the assembly by slightly opening the ball valve. It is not recommended to open the valve any further than ~10%. Identify any leakage through the assembly; turn off flow & tighten assembly as required to eliminate leakage.
- Plug the quick connect fittings, plug the male end (originating from either the PFM1 or associated cabling) into the female port on the assembly. An audible "click" will be heard when the connection is successful.
    - Note: If 2x pressure measurements are required in tangent when installing a PFM1 with internal transducers & PPFF configuration, Mobiltex offers a hose extension to bridge the quick connect assembly to the PFM1. This hose extension is illustrated in Figure 8.

- Turn on the water flow through the assembly. Ensure no leakage occurs; tighten as needed eliminate any leakage.

Figure 9 below illustrates a completed installation of a PFM1 for pressure measurements.



Figure 9 Installed PFM1

4.2 Flow Logging Installation & Measurement Wiring

The PFM1 eliminates the need for a flow reader to be present in order to acquire accurate flow data. Connecting the flow rate logger is done using a flow input cable, shown in Figure 10. This cable is a male 4-pin military connector which attaches to the corresponding female “flow input connector” port on the PFM1, noted in Figure 6 as “Flow 1” and “Flow 2”. Flow measurements are acquired by connecting the PFM1 to a third-party flow meter fitted with pulse output using the flow input cable. Users can measure & log flow rate and direction (based on available inputs/connections of a flow meter’s pulse output).

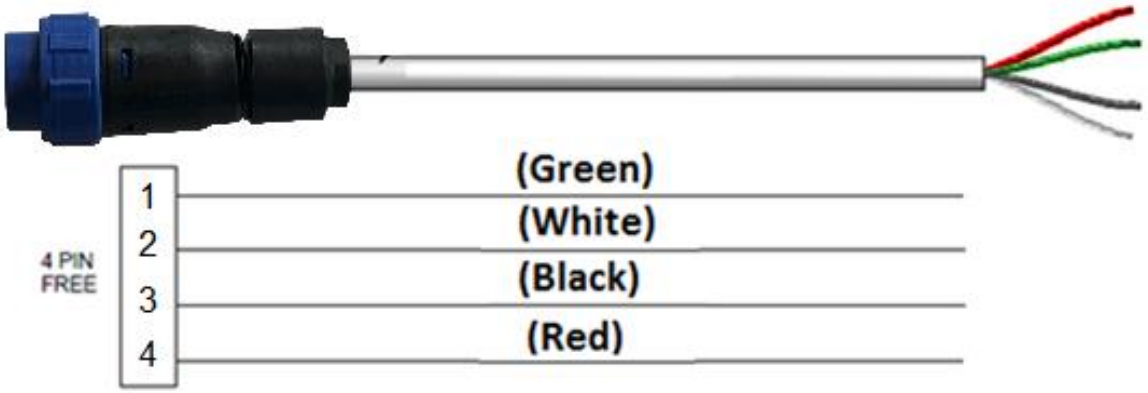


Figure 10 Flow Input Cable

Table 2 provides a list of all the wires within the flow input cable and their corresponding functions.

Table 2 Flow Input Cable Wiring Legend

4-PIN	WIRE COLOUR	DESCRIPTION	SIGNAL
1	Green	Flow Input	CH1 – Flow Pulses
2	White	Direction of Flow Input*	DIR1
3	Black	Ground/Common	0V
4	Red	Not Used – Can Be Capped	N/A
**Positive* flow direction indicates downstream flow direction. *Negative* flow indicates upstream flow direction.			

To install the flow input cable, connect the wires of corresponding function to the available inputs/connections on the pulse output of the user's flow meter.

Connections are as follows:

- To exclusively log flow rate, the **Green** (Flow Input) & **Black** (ground) wires are connected to the corresponding pulse output wires.
- To exclusively log flow direction, the **White** (Flow Direction) wire is connected to the corresponding pulse output wires.
- To log both flow rate & flow direction, the **Green**, **Black** and **White** wires are connected to the corresponding pulse output wires.
    - Note: flow direction is indicated by a positive or negative flow input value. Best instillation practice suggests a positive value correspond with *downstream* flow and negative value with *upstream* flow.
- Electrical tape or wire caps should be used to secure the connection of the flow input cable & flow meter wiring. CAUTION: ensure that all wiring is kept in a dry location away from any potential water pooling/flooding.

4.3 Antenna Installation

4.3.1 Cellular Antenna

When using the telemetric remote data transmission functionality of the PFM1, a cellular antenna must be utilized. The PFM1's cellular antenna is connected to the "Cellular" port located at the top of the unit. To do so, thread female connection port of the antenna to the male port labeled Cellular as is observed in Figure 12 & further detailed in Figure 13.

- Note: The PFM1 antenna is capable of transmitting through manhole covers when used in subgrade applications. To facilitate this communication, its final positioning within a chamber should be as close to the manhole entrance as feasible. Optimal positioning is directly underneath the manhole cover. Caution must be taken to ensure the antenna & cable are not pinched by the manhole cover.

4.3.2 GPS Antenna

The PFM1 comes pre-fitted with internal GPS functionality. This addition allows users to better track PFM1 locations within their system, particularly during long term deployments or in lift & shift operations. The GPS coordinates are relayed to FPLog & FloPath.Cloud.

The PFM1's GPS antenna is connected to the "GPS" port located at the top of the unit. To acquire a GPS signal & utilize this function, users must connect the antenna to its respective port. To do so, thread female connection port of the antenna to the male port labeled "Cellular" as is observed in Figure 12 & further detailed in Figure 13.

- Note: The PFM1's GPS antenna requires a direct line site to the sky to successfully capture a GPS signal. For subgrade PFM1 installations, users are encouraged to collect a GPS point on site prior to the final installation of the PFM1. This point should be updated any time the PFM1 is transferred between sites.



Figure 11 Cellular and GPS Antenna Ports



Figure 12 PFM1 With Connected Cellular and GPS Antennas

4.4 SIM Card Installation

By default, the PFM1 is shipped with a SIM card preconfigured & preinstalled by Mobiltex. Clients who choose to utilize their own SIM's will need to install the cards within each PFM1 manually. The following section will review this installation method.

- Note: The PFM1 is compatible with standard sized 2FF SIM cards. A user-provided adapter will be required if using micro (3FF) or nano (4FF) SIM cards.

1. Unscrew the 12 torx head screws from the back plate (see Figure 13) and put aside in a safe location.

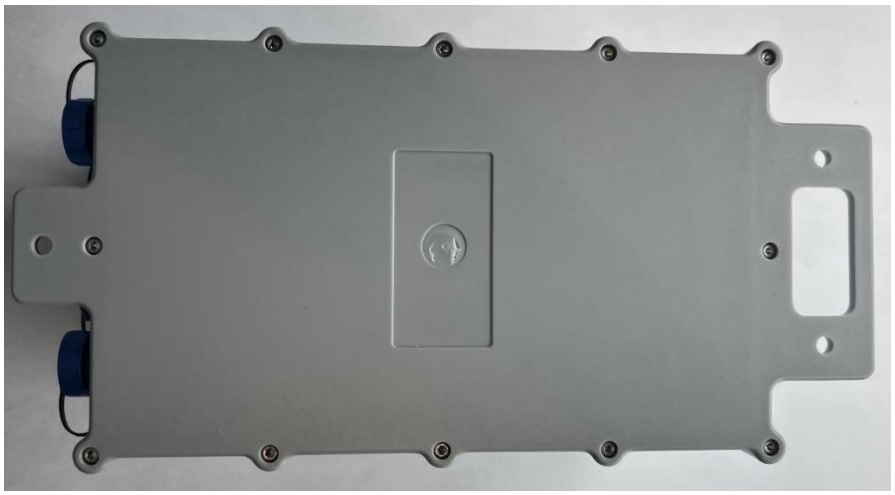


Figure 13 PFM1 Back Plate Torx Screws

2. Remove the back plate from the PFM1 logger.

    a. Note: There is a gasket seal between the back plate & PFM1 housing. Do **not** use any sharp tools to pry the back plate from the housing as this could damage the gasket seal & compromise the ingress rating. Instead, hold the PFM1 logger body with the back plate facing upwards. Grip the handle section of the back plate and carefully separate the two components by pulling the back plate away from the PFM1 body.

3. Carefully remove the foam block within the PFM1 logger body. 2 or 3 batteries will be present, depending on model.

4. The batteries will be connected to the PFM1 on the right side of the circuit board and will be titled “Cell” and “CPU” (and “SOL” for PFM1-AC models) respectively. The battery connection terminals are circled in Figure 14. Carefully disconnect each battery & remove from the enclosure. Once removed, the circuitry & SIM card holder of the PFM1 will be exposed.

    a. **Note:** When conducting a battery replacement, ensure that one battery pack always remains connected to the PFM1. I.e.: disconnect one pack & reconnect the new battery. Then disconnect the second pack & reconnect the new battery. This will ensure that user configuration is retained in the unit.



Figure 14 PFM1 Internals

5. The SIM card holder latch depicts a “Lock” and “Unlock” state, show in Figure 15. It will need to be unlocked for SIM card installations. To unlock, slide the aluminum cover to the left. The holder is hinged; when unlocked, the holder is free to swing on its hinge & open. Open the holder once unlocked.

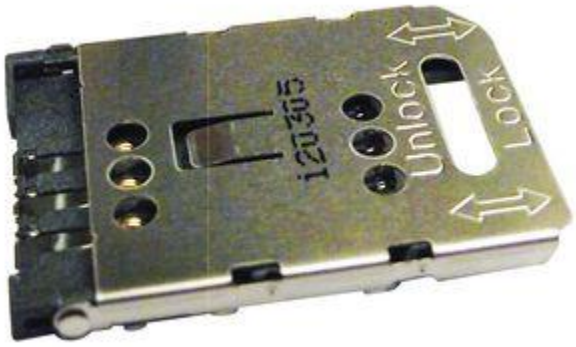


Figure 15 SIM Card Holder

6. Insert the SIM card into the holder such that the gold chip of the SIM card will come in contact with the gold terminals of the holder once closed.
7. Close the SIM card holder & reset it to the locked position by sliding the latch towards the right.
8. Reconnect the batteries to the battery connectors located on the right side of the internal circuit board of the PFM1. Note that for PFM1-AC models, the third larger battery pack must be connected to the “SOL” connector.
9. Replace the foam into the logger body.
10. Reset the rubber gasket around the PFM1 body ensuring it fits within the grooves of the PFM1 body and is not twisted at any point. Proper gasket placement is crucial for the PFM1 to maintain its IP68 rating. Improper placement will void this certification.
11. Replace the back panel using the 12 Torx screws. Mobiltex recommends using a Torx T8 screwdriver, tightening each screw to 0.56 Nm. Ensure that the back panel & PFM1 body fit together snugly with the rubber gasket set evenly between both components.

5 FPLog

5.1 Software Installation & Configuration

FPLog can be downloaded from the Mobiltex website under the Support > Software & Documents header, or by visiting the below link, and downloading the latest "FPLog" package:

Note: FPLog was formally titled "GCRLog". All UI elements of the software denote the FPLog branding. In order to maintain backwards compatibility, some file extensions may include original GCR branding.

https://www.mobiltex.com/support/software-documents/

To install FPLog, run the downloaded FPLog.msi setup wizard. Users will be prompted to select an installation location on their local machine. By default, FPLog is installed in the following directory:

C:\Program Files (x86)\Mobiltex Data Ltd\FP Log

Proceed with the installation or select a new, easy to access location for the install (ie: C:\FPlog). Once installed, a shortcut for FPLog will by automatically created on the user's desktop.

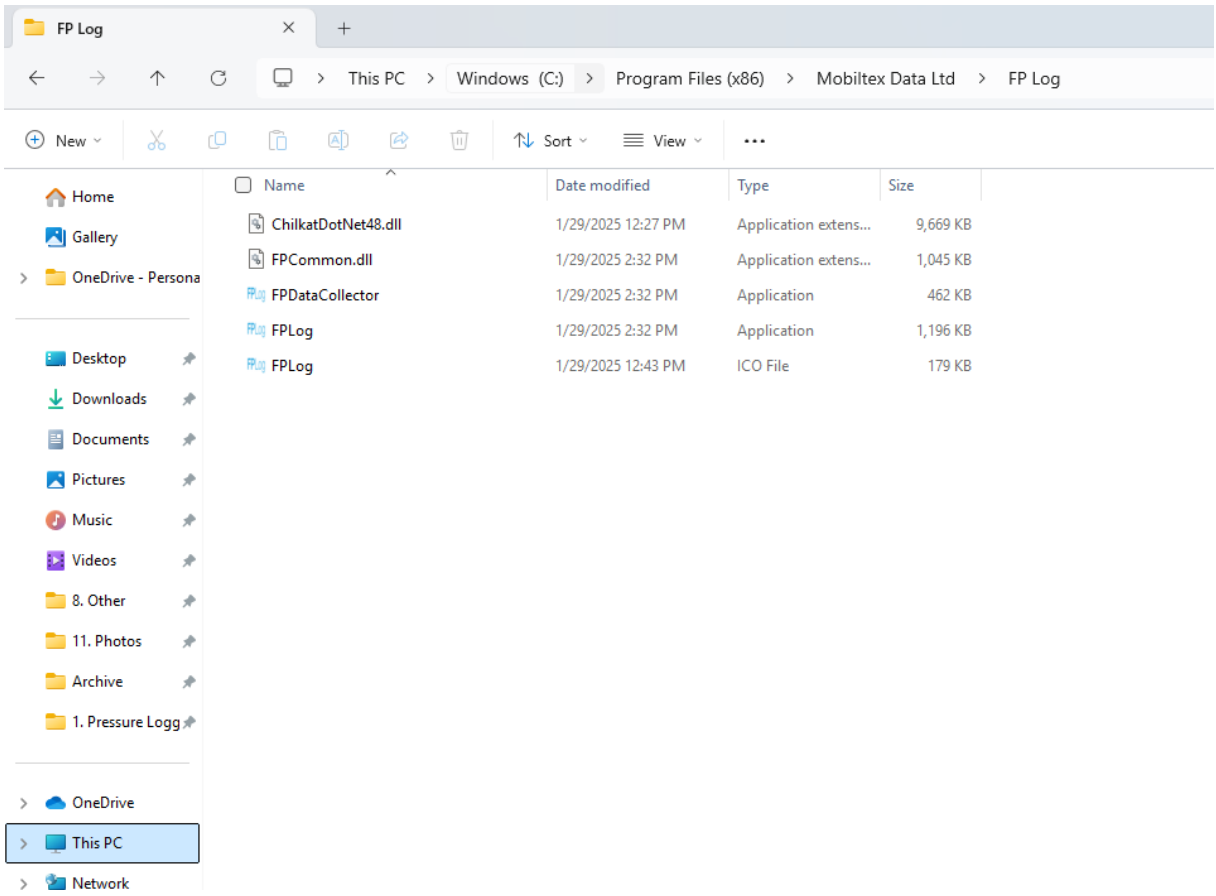


Figure 16 FPLog Local Installation

By default, FPLog operates in its "Basic" mode. When utilizing a PFM1, FPLog must be run in its "Advanced" mode. To switch operation modes, double clicking the desktop shortcut to run the software; users will be greeted with the Quick Start home page of the program. Select the gear icon in FPLog's header, highlighted in Figure 17 & select "Advanced" to change the program's operation mode. FPLog will continue to boot into whichever operation mode is selected.

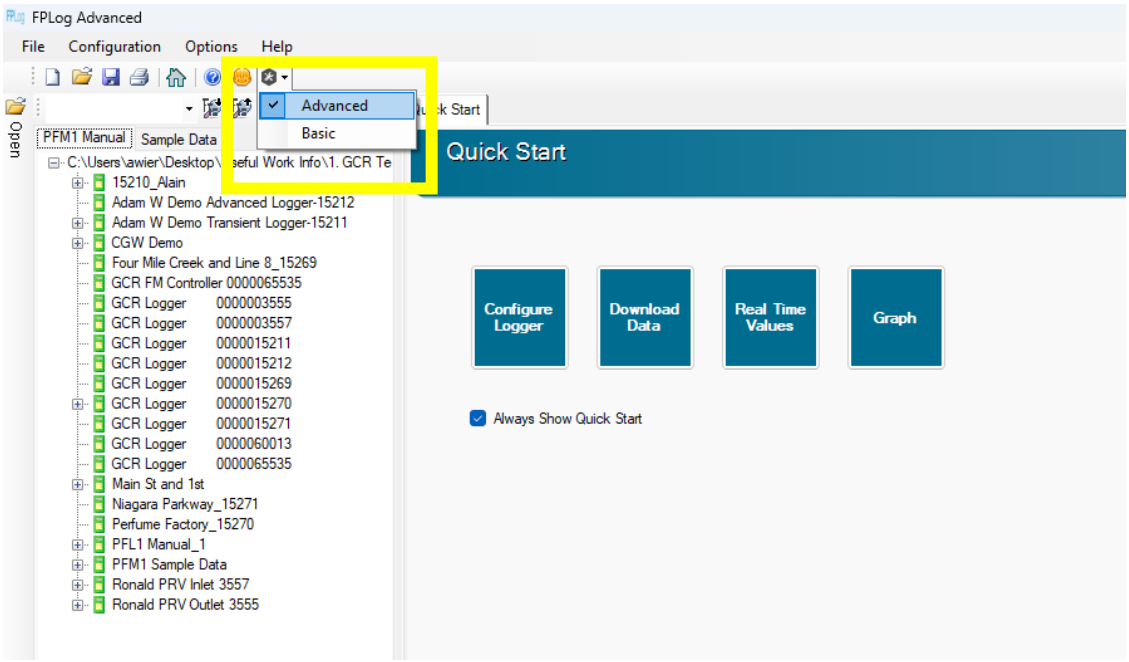


Figure 17 FPLog Home Screen & Operation Mode

FPLog is now ready to be configured. Select the "Configuration" header at the top of the program followed by "General Configuration" in the drop-down menu. FPLog will open the "General Configuration" page. This page has several different headers pertaining to configurable parameters of the FPLog software. Details of these configuration parameters are as follows:

Please Be Advised

To finalize any changes made in General Configuration detailed below, users *must* click "Apply", which is located at the bottom of the page, as highlighted in Figure 18 below. Migrating away from the Configuration page without selecting "Apply" will cause all changes to be lost.

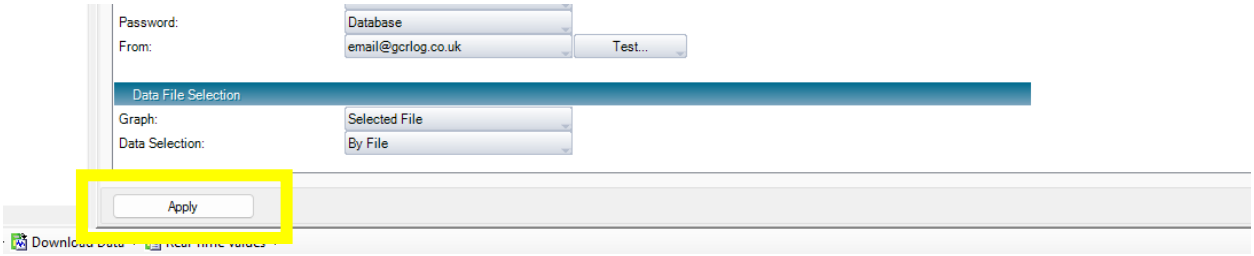


Figure 18 Apply Button Location

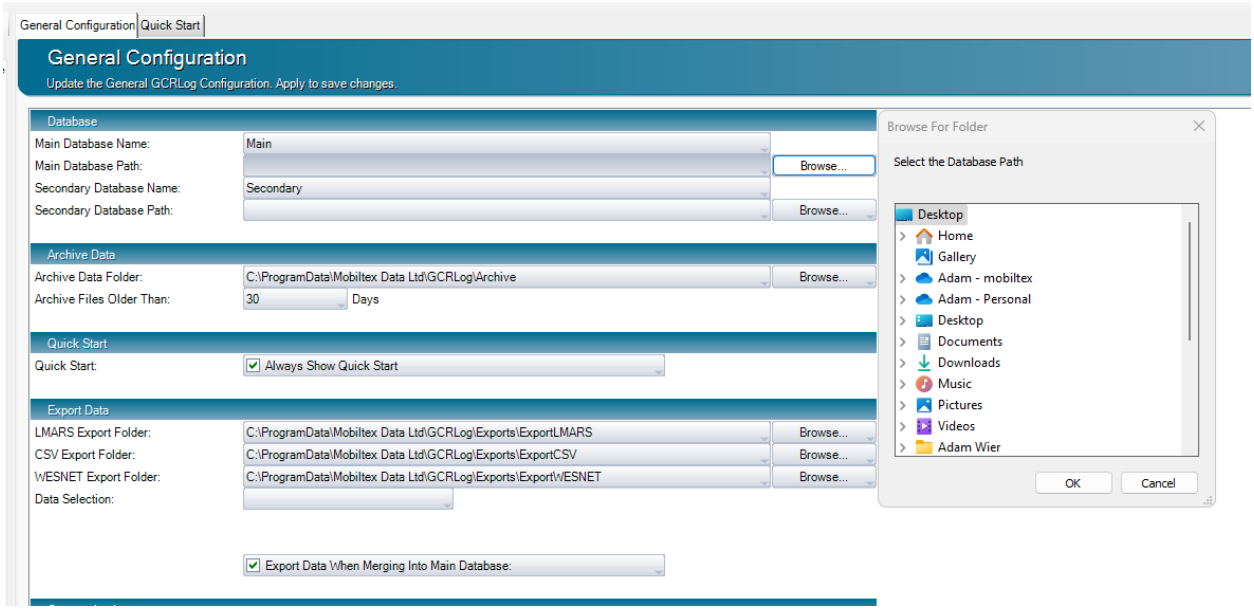


Figure 19 General Configuration & Database Path Directory

Database: Denotes the default path which FPLog will follow when saving/opening data acquired from a PFM1. Users can define two paths from which FPLog pulls data. By default, the respective database names are “Main” & “Secondary”.

Both the database name & path can be edited. To change the database name, click on the text bar with “Main” or “Secondary” listed by default. This field will become editable and a new name can be inputted. To edit either database path, select the “browse” icon next to the existing path name. A new window will open which is used to navigate & select a new directory (See Figure 19).

All data retrieved from a PFM1 will be downloaded to the directory listed in FPLog’s Main Database Path. A folder will be automatically created in the listed directory to house the downloaded data.

FPLog supports a “merge” function allowing users to transfer files between the Main & Secondary database. Users To transfer & merge files from the Main to Secondary database:

1. Set the Main Database Path to navigate to the file path hosting data which is to be transferred to the Secondary Database; Set the Secondary Database Path to navigate to the file path that will host the incoming files from the Main Database. Apply these changes.
2. From the File Tree depicted on the left side of FPLog, ensure the Main Database tab is selected, which is located at the top of the File Tree under its assigned name. By default, this will be “Main”.
3. Right click on data file within the Main Database & select “Merge Into [Secondary Database]”; the database name entered by the user will appear where [Secondary Database] is listed. By default, this will be “Secondary”. Please see Figure 20 for an example where the [Secondary Database] is titled “*Sample Data*”.
4. FPLog will automatically merge the selected data to the Secondary Database.

- **Note:** To merge data from the Secondary Database to the Main Database, users must ensure select the Secondary Database tab as opposed to Primary Database tab noted in Step 2. The same process is otherwise followed.

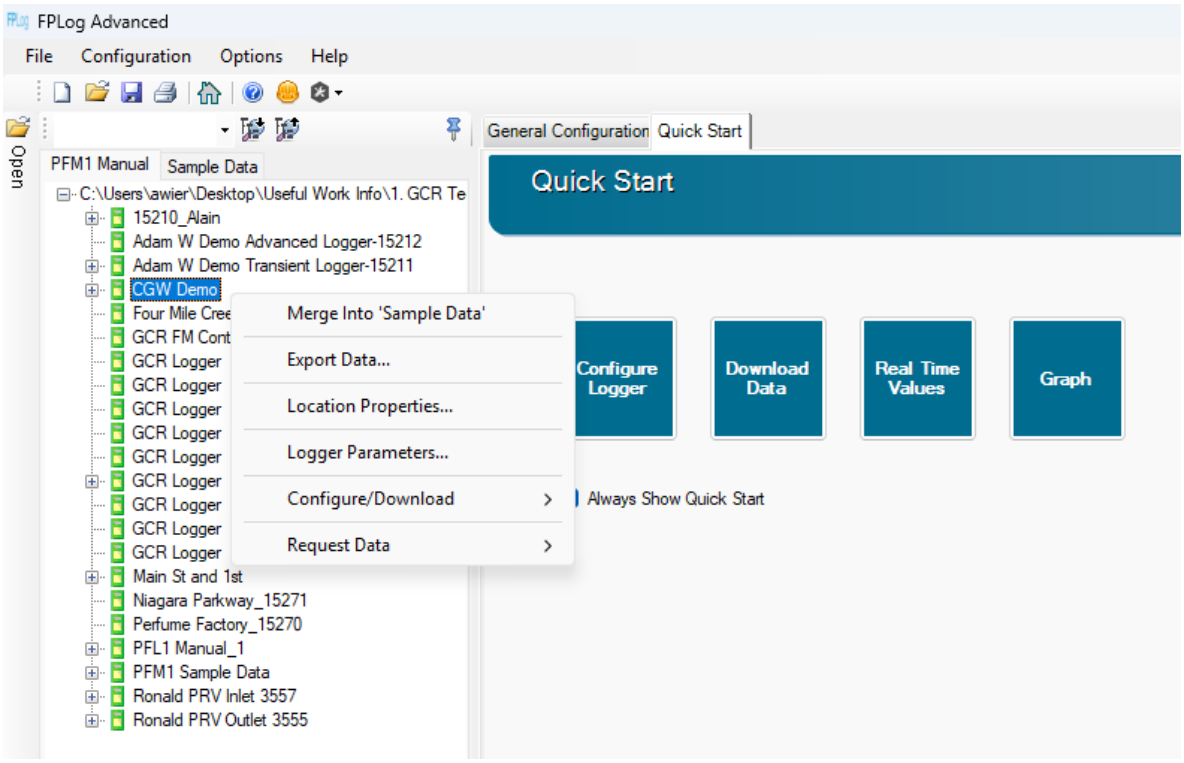


Figure 20 Merging Databases

Archive Data: This section gives users the option to configure the length of time they want logged data to remain active in a primary/secondary database before being archived. Data exceeding this age will automatically transfer to the archive database. The default file directory for the archive is **C:\ProgramData\Mobviltex Data Ltd\FPLog\Archive** and default age of files until archived is **30 Days**. This file path can be edited by selecting "Browse". The age of files to be archived can be edited by clicking on "30" and entering a new age in days, as shown in Figure 21.

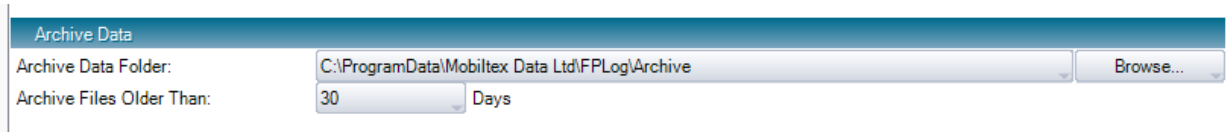


Figure 21 Archive Data

Export data: Details all available export file types & associated export paths for data transferred from FPLog. Export destinations can be edited by the user by clicking the "Browse" button to the right of each respective destination & selecting a new file destination. Additionally, users can set a default exported timeframe using the "Data Selection" drop down.

- **Note**: the "LMARS" and "WESNET" file types are unique to specific SCADA systems. Users unfamiliar with these file types can ignore the export details.

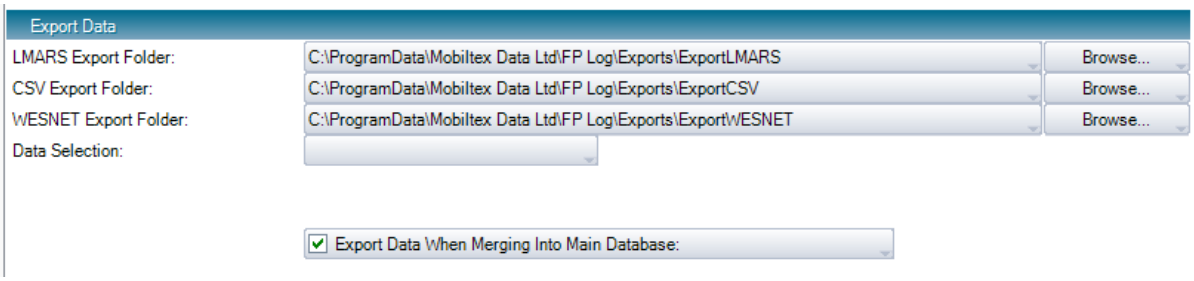


Figure 22 Export Data Configuration

Communication: Allows users to select the default method of communication with a logger. When the "Always Direct" option is enabled, FPLog will default to communication with a logger via the IrDA programming cable. When disabled, users are given the option to communicate via the IrDA programming cable or digitally via Data Collector.



Figure 23 Communication Type Configuration

Email - Sending: This is a legacy header. Email notifications are *only* available through FloPath.Cloud.

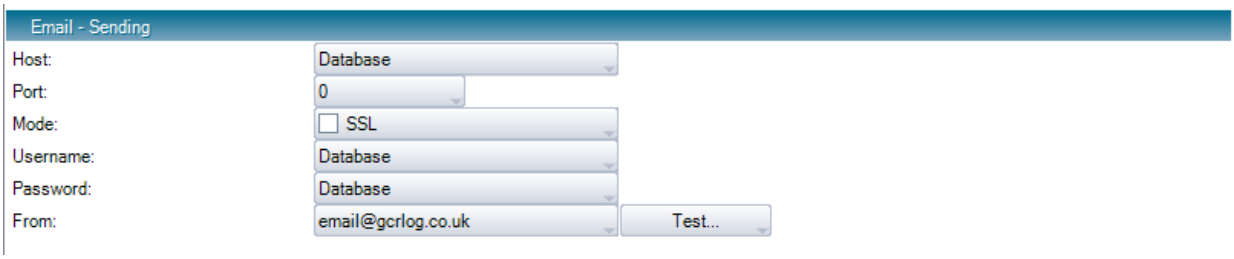


Figure 24 Email Notification Configuration

Data File Selection: Enables users to select & configure the default method by which data is displayed in FPLog. By default, FPLog will display the complete timeframe of logged recordings when a data file is opened. Should multiple files be opened in tangent, FPLog will display all files on the same graph.

Users wishing to change these default settings can do so by selecting "Data Selection" and "Downloaded Data" respectively; various options are presented which users can select to best meet their needs during data display.

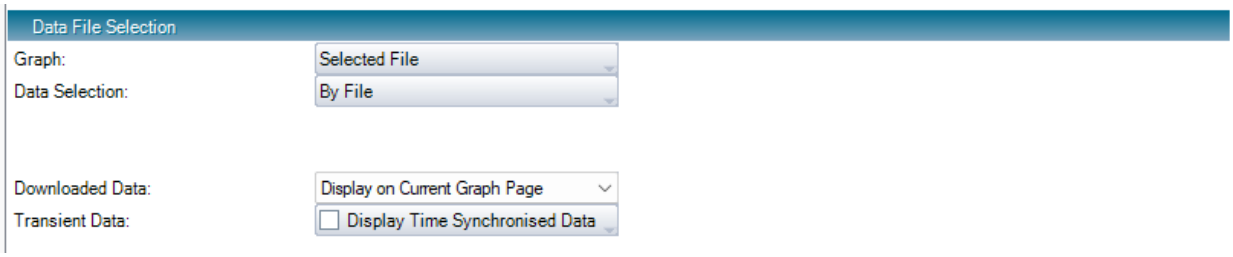


Figure 25 Data File Selection Configuration

Configure Logger: Allows for selection of the default configuration mode & time zone that is programmed into a logger. Adjusting the "Default Method" will determine which parameter configurations editor will open in FPLog by default. Additional details on the "Default Method" can be found in Section 5.2.

For "Logger Time", users are encouraged to use the "Computer Time" setting for the default time zone unless otherwise necessary.

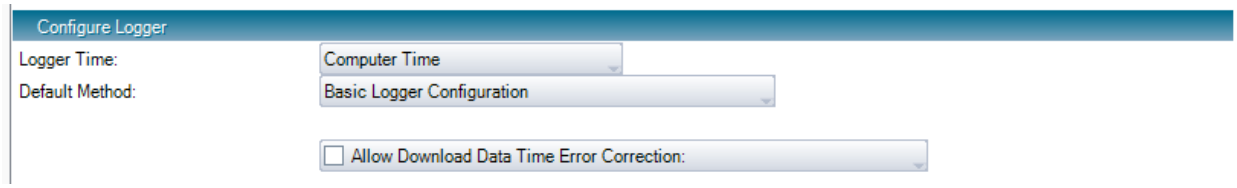


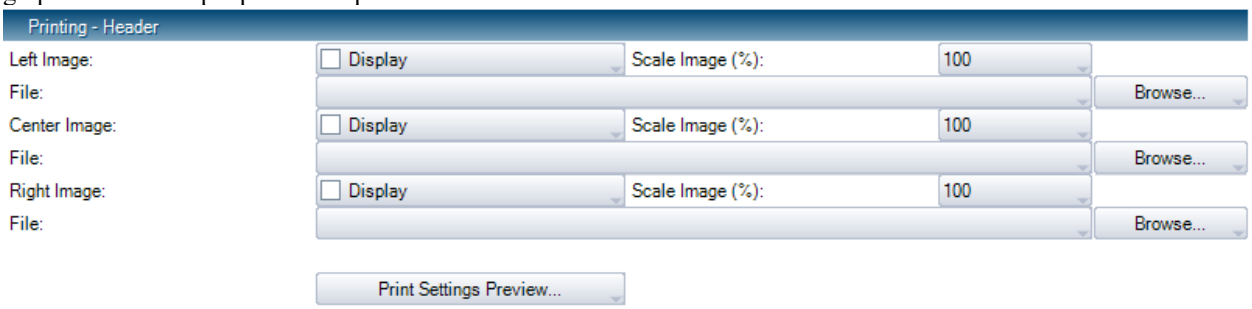
Figure 26 Time Zone & Config Type Selection

Advanced: This section allows users to enable or disable the ability to delete logger data directly from the FPLog. When enabled, users can right click on a file appearing in the data tree displayed in the left hand column of their screen and select "delete" to permanently delete the data.



Figure 27 Enable File Deletion

Printing – Header: Allows users to add graphics to data selected for printing. Users can browse & upload an image to FPLog & select where it is to be displayed on the printed data. Users can further configure the scaling of an image to their needs; the "Print Settings Preview" will allow users to confirm & fine tune the exact placement of any uploaded graphics via a sample print example.



Unit Selection: Users have the option to select their preferred units for displayed data in FPLog. To do so, select "Configuration" at the top of the program followed by "Units". This will open the Units page. Users will have see several selectable unit types for Flow, Pressure, Volume & Time. Select your preferred unit type & click "Make Default" which is highlighted below in Figure

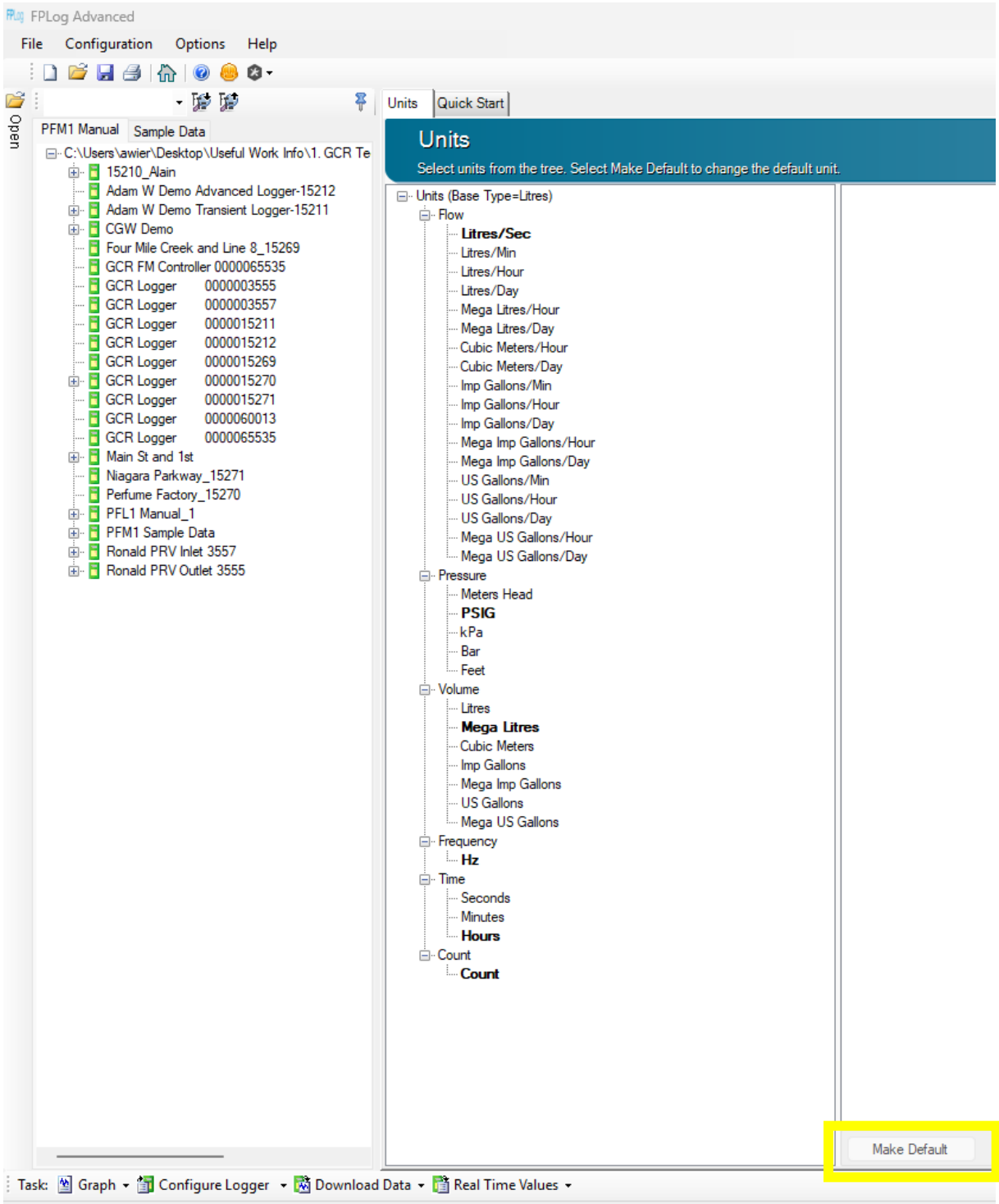


Figure 28 Default Unit Selection

5.2 PFM1 Logger Programming

5.2.1 IrDA Programmer Connection

This section will review how to configure a PFM1 logger using the FPLog software. Begin by connecting the IrDA programming cable to an available USB slot on your computer. The IrDA cable is depicted in Figure 29.



Figure 29 IrDA Programming Cable

Place the IrDA programmer head atop the PFM1 which is to be configured. Figure 30 provides an example of the correct placement of the IrDA cable atop a PFM1. The IrDA head & PFM1 are magnetic to help hold the programmer in place; tape can be used to further secure the connection if required.



Figure 30 IrDA Programmer Connection

Once the IrDA programmer is in place, open the FPLog program. To begin the configuration process from the home screen, click “Configure Logger” which is highlighted in Figure 31 in yellow.

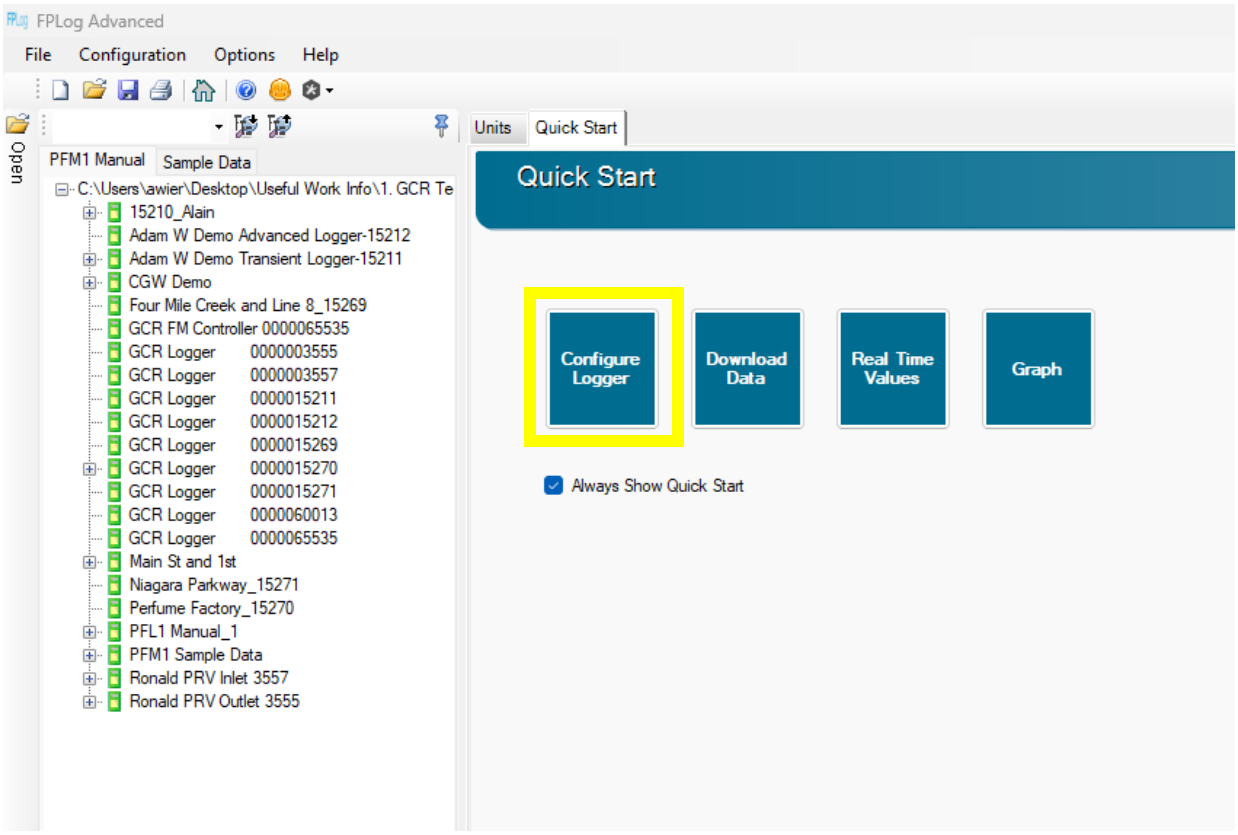


Figure 31 Logger Configuration Option

FPLog will begin downloading the existing configuration information from the PFM1 logger. A pop up will appear, shown in Figure 32, which details the information transfer. Upon a successful data transfer, the "Logger Configuration" page will open.

- **Note**: If the IrDA cable is incorrectly placed on the PFM1, a "Timeout" error will appear. Check the IrDA connection to the computer & placement on the GTRI logger. If the error persists, plug the IrDA cable into a different USB port.

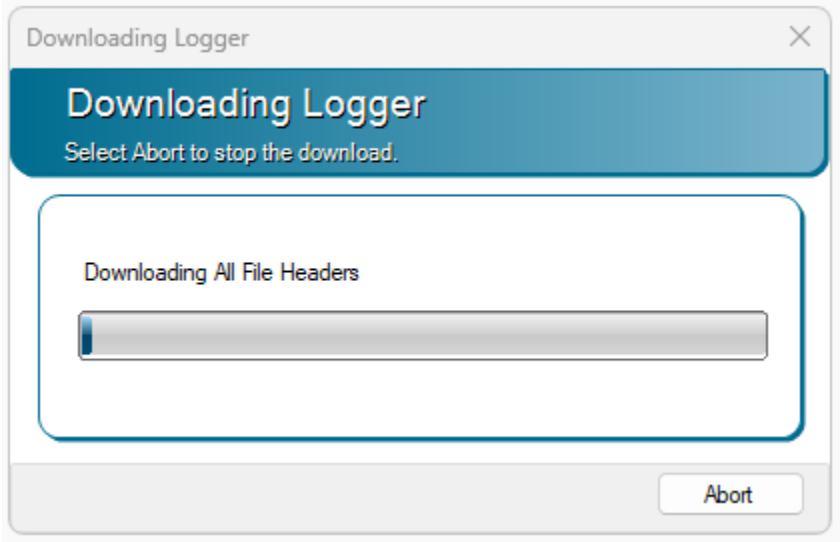


Figure 32 PFM1 Data Transfer to FPLog

5.2.2 Logger Configuration

The "Logger Configuration" page, shown in Figure 33, serves as the primary location to program & update the logger settings of a PFM1. Two unique configuration modes are available for the PFM1, which can be selected by clicking their respective tabs located at the top of the Logger Configuration page.

1) **Standard Logger Configuration:** Allows for traditional configuration of the PFM1.
2) **Advanced Logger Configuration:** Allows for higher resolution configuration of the PFM1. All parameters listed in the Standard Logger Configuration & detailed below, are present. Additionally, users can further adjust:
    - Logging rate for each individual file (See Section 5.2.3).
    - Sampling rate for each individual file (See Section 5.2.3).

Note: Advanced Logger Configuration is only available in "Technician" mode of FP Log. Standard users will only see "Standard Logger Configuration"

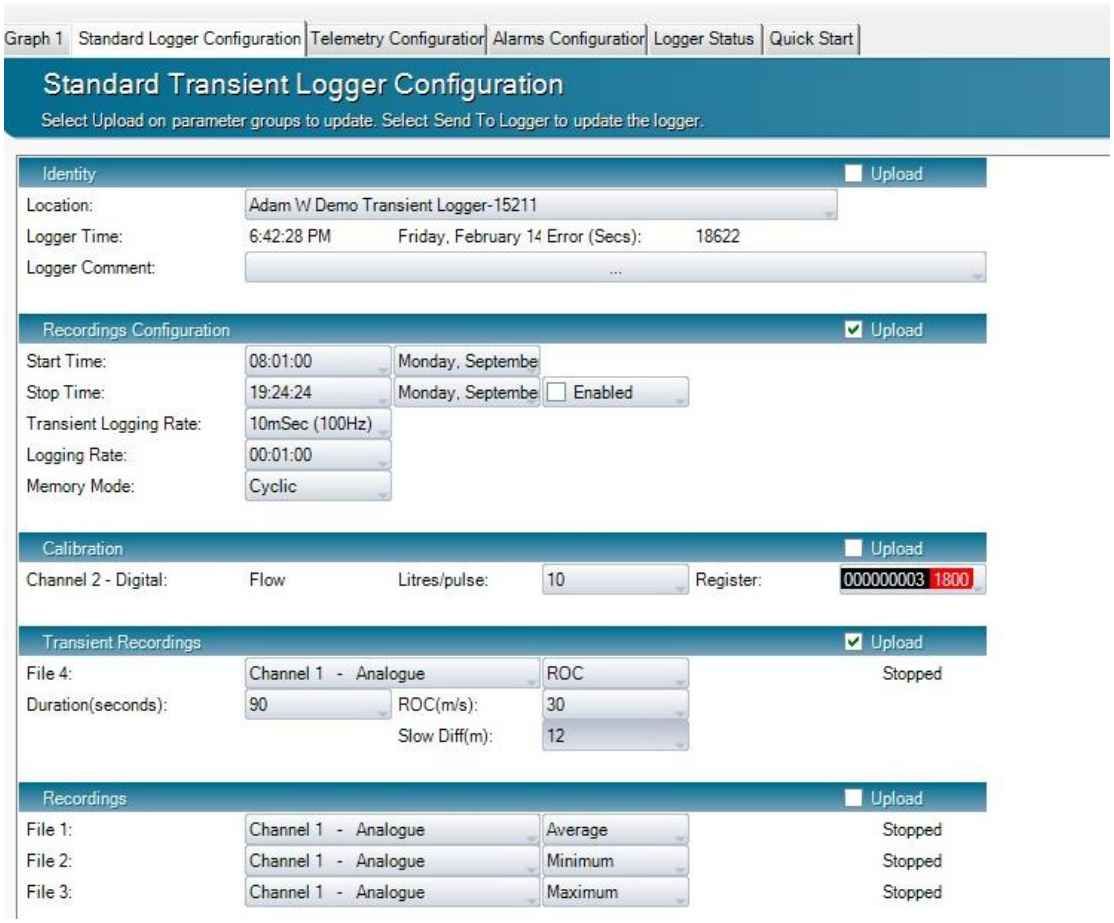


Figure 33 PFM1T Transient Logger Configuration Page

Identity: Provides general logger identification information. This section is particularly useful as it allows users to document the PFM1 site of installation in the "Location" field & associated site comments in the "Logger Comment" field. To edit either of these elements, click the text box adjacent to either "Location" or "Logger Comment" & input the respective Site information. These fields may be updated at any time (ie. between different site installations). Figure 34 highlights the various Identity fields and provides an example of user-entered information.

- **Note:** the text entered in the "Location" field will become the corresponding name of the logger used for data graphing & review purposes in FPLog (see Figure 34). Users are encouraged to enter detailed location information to avoid data confusion during the review process.

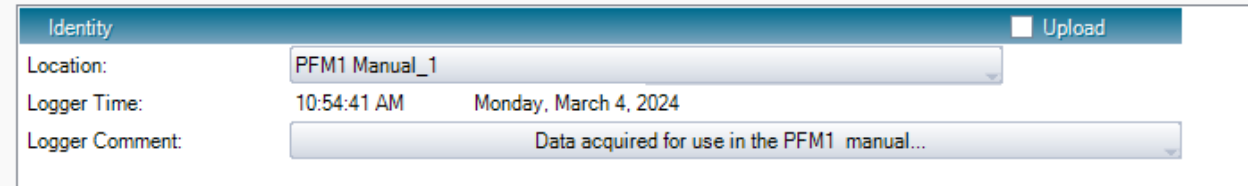


Figure 34 Identity Configuration

Be Advised: It is strongly recommended to change the "Location" name of a logger for any new/updated site install. Any adjustment made to the logger parameters of a PFM1 detailed throughout Section 5.2 *without* changing its "Location" name will cause the creation of a new data subset that is assigned to the active "Location" name on file. The result is new data erroneously being assigned to an archived site. Further information can be found in Section 5.4.1 Data Interface.

5.2.3 Start/Stop Time & Pressure Parameters

Recording Configuration: Programming/updating the logging times & pressure logging parameters of a PFM1 is completed in this section. This section is slightly different depending on whether a user is programming a PFM1/PFM1A or a PFM1T. Figure 38 illustrates the difference in the logger-specific Recording Configuration. Details on the available fields are as follows:

- Start Time: sets the time which the PFM1 will begin collecting data. A user can select a date/time in either the future or past. When selecting a future date, the PFM1 will remain dormant until the set time arrives, at which point it will begin its logging operation. By selecting a past date, the logger will immediately begin logging once the configuration is uploaded to the unit.
- Stop Time: optional setting to force the logger to stop logging data at a specific date/time. Users must ensure to check the "Enabled" option for this setting to take effect.
- Transient Rate: *Only available in the PFM1T*. The frequency at which the PFM1 acquires pressure values. Users can select one of 4 options: 10Hz, 20Hz, 100Hz or 1000Hz.
- Logging Rate: the frequency at which the PFM1 commits *standard* sampled pressure values to its memory.
    - When using the PFM1 to remotely communicate data, a logging rate between the range of 60 seconds to 24 hours can be entered.
    - When using the PFM1 as a "portable" unit (ie: not remotely communicating data), a logging rate between 5 seconds and 24 hours can be entered.
- Sampling Rate: Only available on the *PFM1 & PFM1A*. Defines the frequency at which the PFM1 collects a pressure value sample. Users must input a sampling rate value within the range of 1 second to 15 minutes. Users are encouraged to utilize a 1 second sampling rate for the possible detection of pressure surge events.
    - **Note:** For PFM1T units, the sampling rate is automatically set as **0.1 seconds** & cannot be changed.

Caution: Users must take care to always ensure that the defined logging rate exceeds the sampling rate.

- Memory Mode: allows users to select one of two data retention modes used for data storage.
    - Cyclic mode: once the memory is full, the logger will overwrite existing saved data starting with the oldest files in its memory.
    - Block mode: once the memory is full, the logger will stop logging.

- Note: This setting will stop all data acquisition regardless of whether a “Stop Time” is set. Similarly, this setting supersedes a programmed Stop Time if the memory fills prior to the unit reaching the set stop date/time.

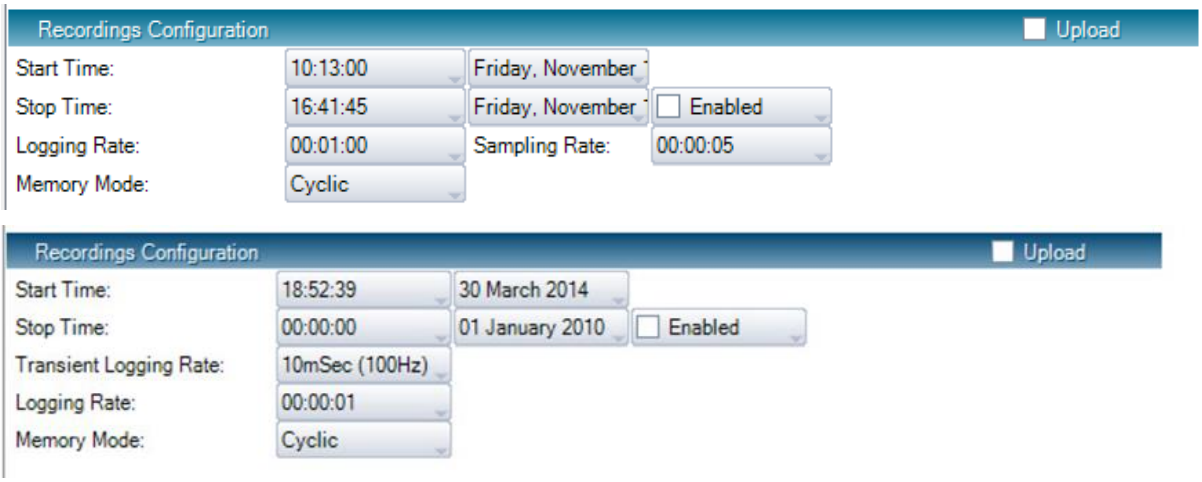


Figure 35 Pressure & Recordings Configuration
PFM1 & PFM1A (Top), PFM1T (Bottom)

5.2.3.1 Re-Zeroing Pressure Measurements

Periodically, the pressure sensor(s) of the PFM1 will need to be re-zeroed. Most notably, re-zeroing will be required during the unit’s initial setup and in the event of any large elevation changes. To re-zero the PFM1:

- Disconnect the PFM1 from any pressure source.
- Open FPLog. Connect the IrDA cable to your PC and place the programming head on the PFM1which is to be re-zeroed.
- From the home page of FPLog, select the small arrow to the right of “Configure Logger” which is listed in the bottom left-hand corner of the screen. An option menu will appear; select “Re-Zero” as highlighted in Figure 36.

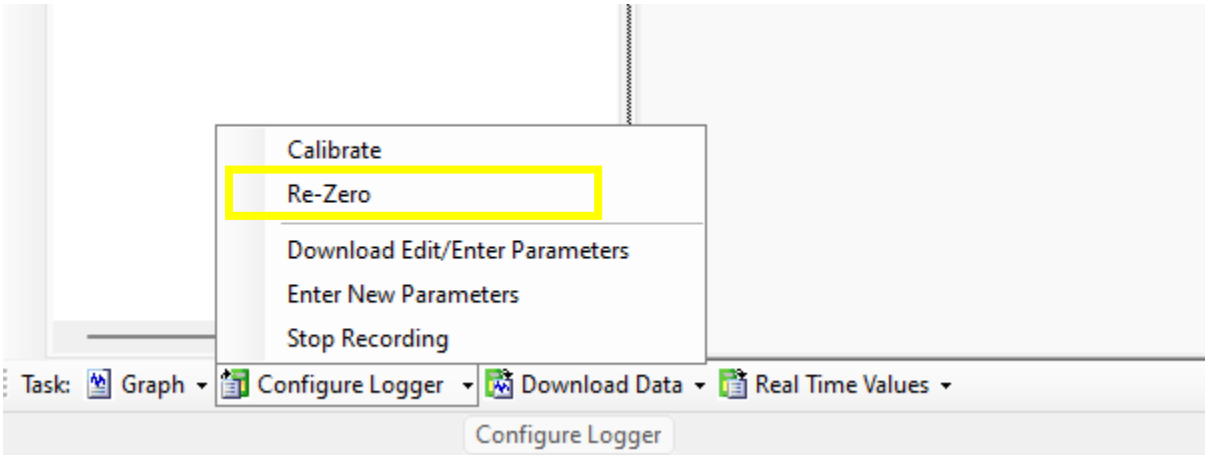


Figure 36 Re-Zero Menu Selection

- Upon selecting "Re-Zero", FPLog will download data from the PFM1. Once the data is successfully download, the “Logger Re-Zero” page will open, shown in Figure 37.
    - **Note:** FPLog will continue to download information from the PFM1 while on the Logger Re-Zero page. This is indicated by a continuously refreshing download bar at the top of the page.

- **Note**: If the IrDA cable is incorrectly placed on the PFM1 or shifted/removed during the re-zero process, a "Timeout" error will appear. Check the IrDA connection to the computer & placement on the GTRI logger. Should the error persist, connect the programmer to a different USB connection.

- Two values will be displayed on the Logger Re-Zero page: "Current Value" and "Re-Zero Values". To ensure accurate pressure measurements, **these two values must be nearly identical.** If the values differ two points, the logger will need to be re-zeroed. Figure 37 provides an example of a logger showcasing two different values and thus in need of re-zeroing.

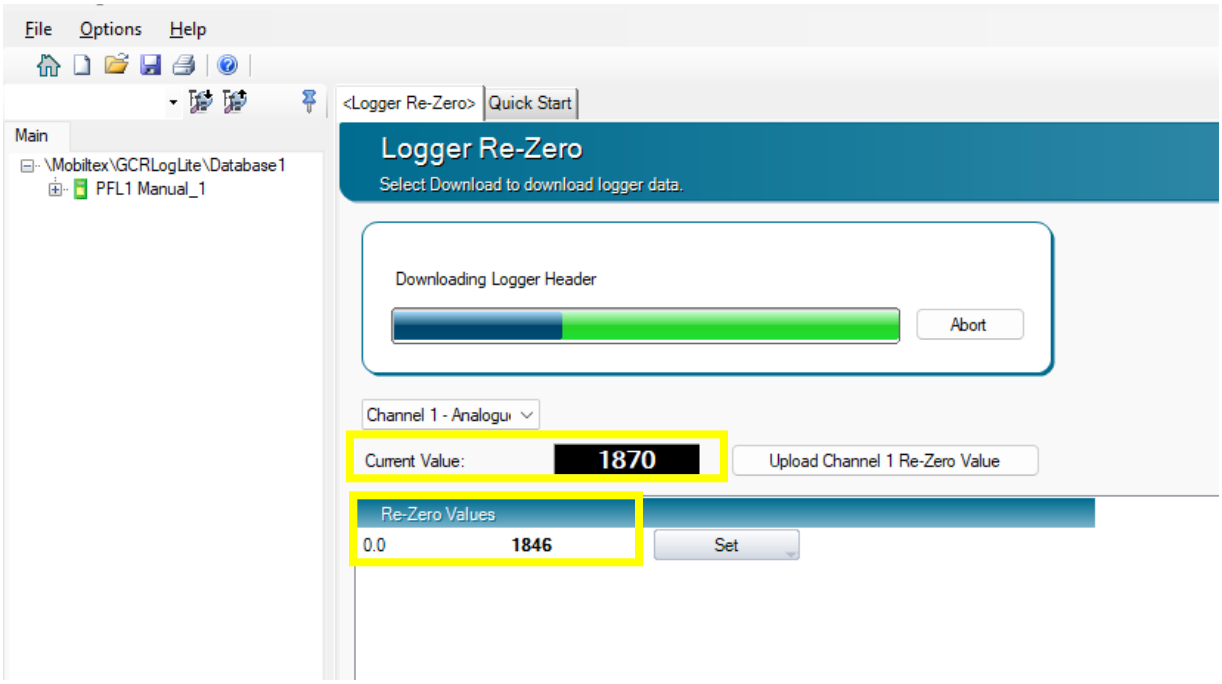


Figure 37 Logger in Need of Re-Zeroing

- Should the PFM1 require re-zeroing, conduct the following steps:

1. Click "Abort" in the "Download Logger Header" window.
2. Click "Set" under the "Re-Zero Values" header".
3. Click "Upload Channel 1 Re- Zero Value". The logger will upload the new value to the PFM1.
    a. **Note:** PFM1's with multiple pressure ports will need to complete this step for each respective pressure channel using the drop-down menu located between the download status & "Current Value" as depicted in Figure 37 above.
4. Restart FPLog by closing & reopening the program.
5. Confirm the logger has been re-zeroed by clicking "Real Time Values", which is located at the bottom left of the program to and can be seen in Figure 36. An active reading of ~0.000 pressure units (ie: PSIG) will be displayed under the "Logger Real Time Values" header, indicating that the logger has been successfully zeroed. Figure 38 illustrates logger that has been correctly zeroed.

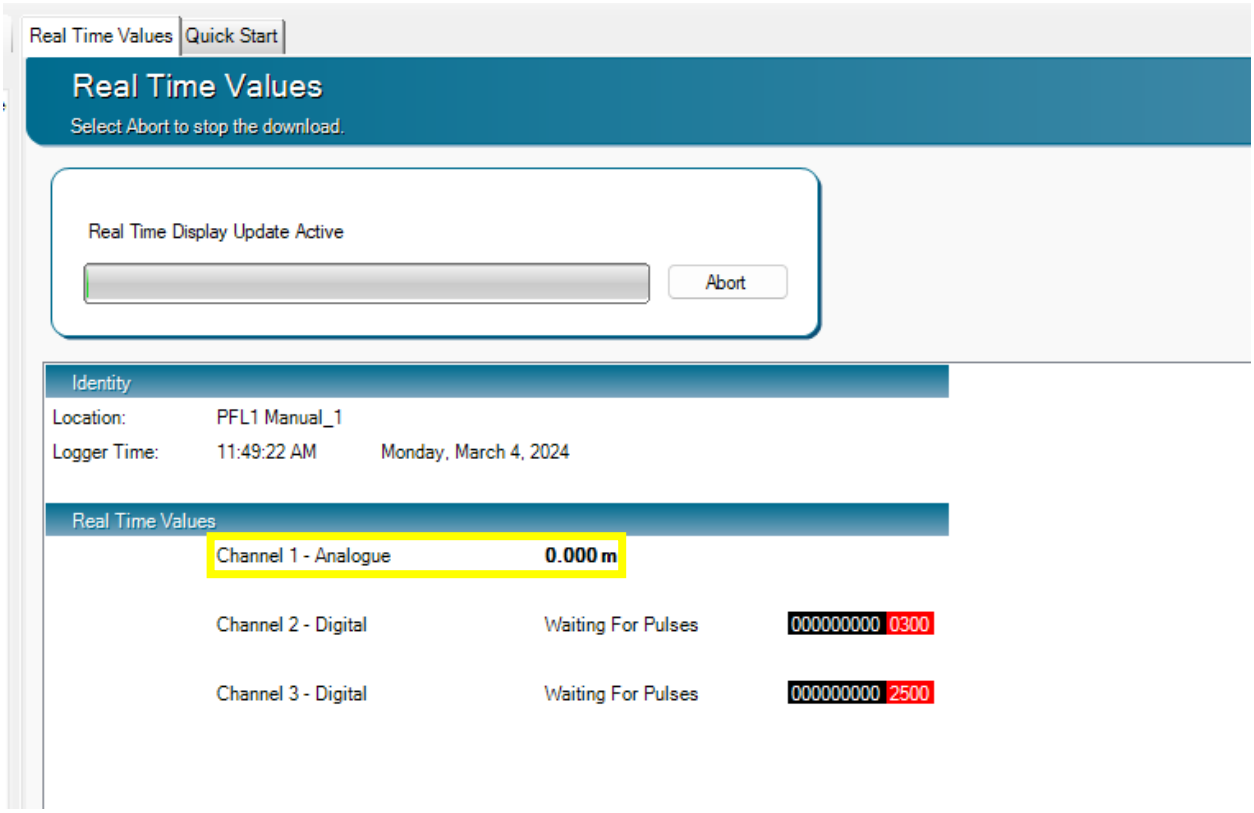


Figure 38 Zeroed PFM1

5.2.4 Transient Recording Parameters (PFM1T)

Users who purchase a PFM1T will have the ability to utilize transient pressure logging. All transient data is stored on File 4 of the PFM1. The transient parameters include Configuration & programming of transient pressure parameters are done under the "Transient Recordings" header, unique to PFM1T units. This header is located in the Standard Logger Configuration page. Definitions of each parameter are as follows:

- **Note:** Defining the Transient Logging Rate is done under "Recording Configuration" as noted in Section 5.2.3 & must be selected to the users preference to finalize the transient recording configuration.

Duration: Applicable to the Rate of Change (ROC) transient measurement type (see below). Denotes the length of time in seconds which the PFM1T will store transient data during an ROC transient event. By default, this parameter is set to 120 seconds. It can be configured by clicking on the 120 and selecting a new length of time.

Transient Type: The type of trigger used to begin transient recording. Three options are available:

- *Simple:* The PFM1T logger sets its memory mode to Block (see Section 5.2.3). At the start of its defined recording time, the PFM1T will log transient pressure readings continuously at the user selected transient sampling rate without any further defined thresholds in place. The PFM1T will stop recording once its memory is full of data.
    - **Note:** at 100 samples per second, the PFM1T logger memory will be full in less than 20-hrs
    - **Note**: This setting is traditionally used in research or test-specific settings. Users are not advised to use it for traditional transient event measurement purposes.
- *Threshold:* The PFM1T is programmed with an upper pressure threshold trigger. When this mode is selected, a PFM1T registering a pressure exceeding the user-defined threshold will automatically begin logging transient pressure. Transient logging will continue while measured pressures remain above this threshold.

This setting is useful in locations experiencing known pressure spikes (ie: near pumps or during pipe pressure tests)

- *Rate of Change (ROC):* The PFM1T logger begins recording transient data based on various user-entered thresholds. This allows for greater control & measurement of pressure surges within a system. Details on the various parameters are listed below.
    - **ROC (m/s) - Fast Surge Detection:** The user defines & enters a pressure value into the ROC. The PFM1T collects 10 pressure samples per second at a rate or 1/10th of a second per sample. As the ROC value is defined by "meters of head per second", the PFM1T inherently divides the user entered ROC value by 10 – its sampling rate. During the PFM1T's sampling process, it compares the difference between consecutively measured pressure samples against **one tenth** of the user-defined ROC (m/s) value. If the pressure difference between consecutive samples exceeds this value, the logger begins transient recording. During this process, it stores pressure data in its memory at the Transient Logging Rate for a length of time entered in the Duration (seconds) parameter. Additionally, the PFM1T also stores 60 seconds of pre-trigger readings at 10 samples per second.

      For example, a user defined duration of 120s and ROC of 30m/s would result in a PFM1T to begin transient logging when a pressure change exceeds **3m of head** between consecutive pressure samples occurring within 1/10th of a second of eachother. Logging would occur at the transient logging rate for a duration of 120 seconds.
    - **Slow Diff (m) – Slow Surge Detection**: The PFM1T actively tracks pressure over a rolling 10 second window, taking samples every 1/10th of a second. The PFM1T actively observes the MINIMUM and MAXIMUM pressure values during this rolling window. If, at any point, the absolute value between the MINIMUM and MAXIMUM pressure values exceeds the user define Slow Diff value, the PFM1T will begin recording transient data for a length of time defined in the Duration (seconds) parameter. Additionally, it will also store 60 seconds of pre-trigger readings at 10 samples per second.

      For example, a user defined duration of 120s and Slow Diff of 12m would program the PFM1T to commence transient logging when it records an absolute pressure deviation exceeding 12m at any point over a rolling 10 second period. Logging would occur at the transient logging rate for a for a duration of 120 seconds..
        - **Note:** Both Fast & Slow Surge Detection are simultaneously active when a user configures a PFM1T to ROC transient measurement.

For standard transient pressure logging, the ROC method of detection is suggested for use. Figure 39 below provides an example of a suggested configuration for transient measurements for first time users of the function. Users should still edit the Identity & Recording Configuration parameters to match their needed measurements.

Be Advised: It is important that users put ample consideration into defining the triggers for the above transient recordings. This will ensure that the measured data is meaningful and representative of a true transient event. Table 3 below details various suggested ROC below denotes suggested ROC parameters based on pipeline diameter. Users can utilize these values as a benchmark for their transient recording configuration & adjust as needed to best match their system.

TRANSIENT LOGGING RATE	DURATION (SECONDS)	PIPE DIAMETER (MILLIMETER)	PIPE DIAMETER (INCHES)
1000 readings/second	15	<25	<1
100 readings /second	150	25 to 100	1 – 4
20 readings/second	300	100 to 200	4 – 8
10 readings/second	300	>200	>8
ROC (m/s) = 30 (equals to a change of 43 psi in 1 second) Slow Diff (m) = 12 (equals to a rise in pressure of 17 psi over 10-seconds)			

Table 3 Standard ROC Parameters

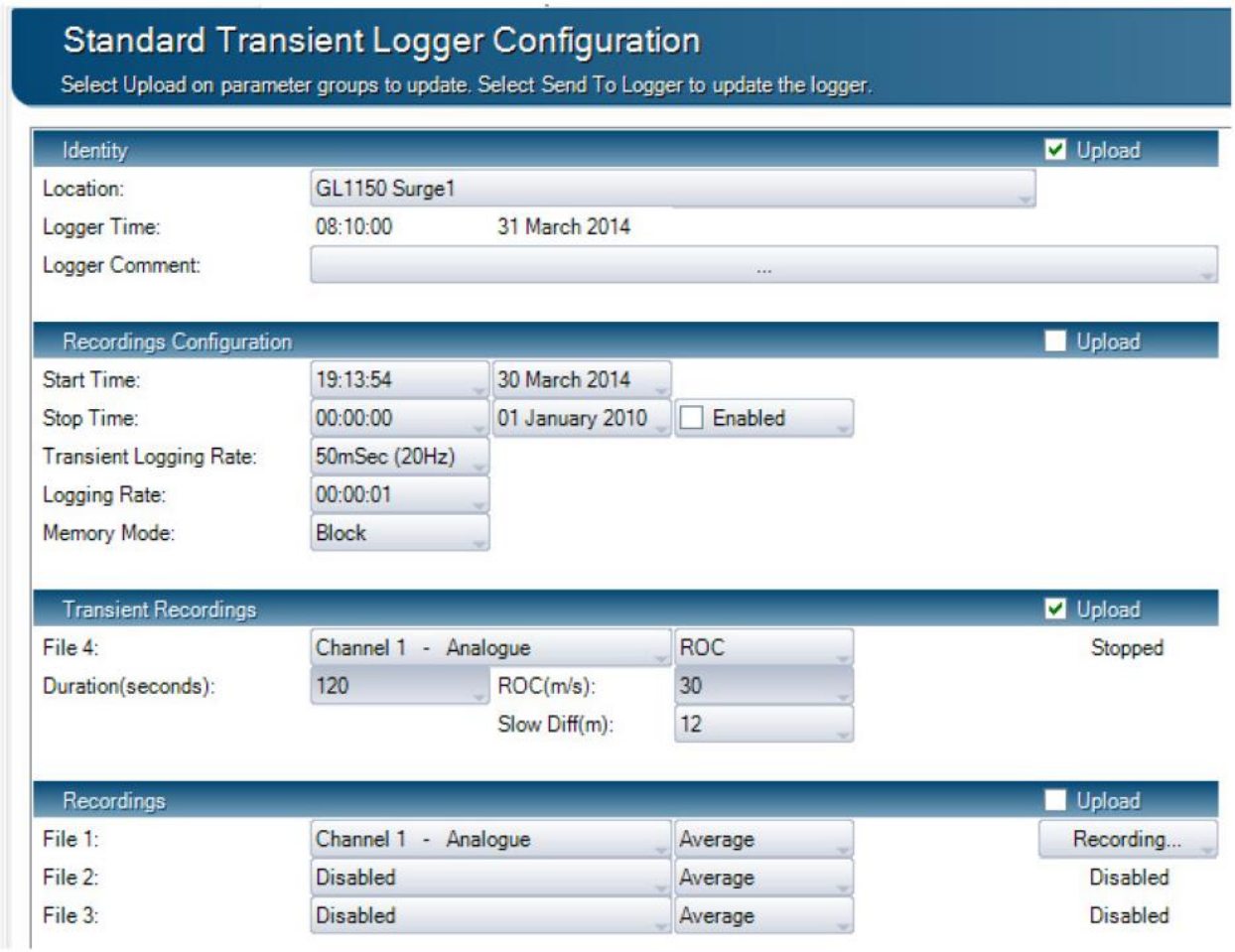


Figure 39 Suggested Transient Configuration for New Users

5.2.5 Flow Parameters

To log flow data using the PFM1, the unit's flow input cable(s) *must* be connected to existing third-party flow meter(s) which are fitted with pulse output cables. Full details on the connection process can be found in Section 4.2.

Calibration: Programming/updating flow rate parameters of a PFM1 are completed under the "Calibration" header. Users can select the flow rate to be measured & logged by entering the desired Liters/Pulse setting, as illustrated below in Figure 40, with 10 L/Pulse having been selected.

- **Note:** Figure 40 depicts a PFM1A, with 2x flow ports, denoted as Channel 2 & Channel 3 respectively. A PFM1 & PFM1T will only display Channel 2 as both units feature a singular flow port.

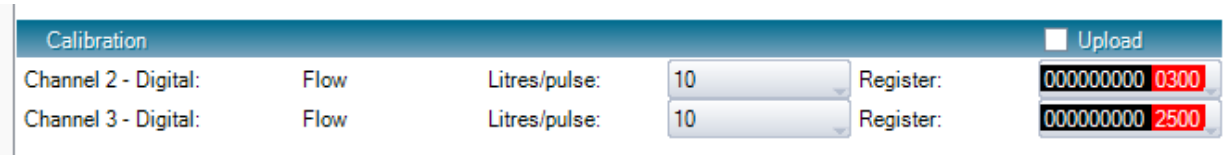


Figure 40 Flow Parameter Configuration

In addition to programming the pulse rate of a PFM1, users can further configure the "Register" setting, which is located at the far right of the Calibration subsection & observed in Figure 40 by the black & red numbering. The

Register is defined by the selected Liters/pulse setting & tracks the total *volume of flow* through the flow meter in cubic meters.

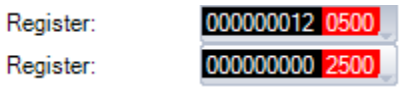


Figure 41 Register Measurement

Figure 41 provides two Register sample values:

- The first Register line denotes a value of 12.05 m^3, or 12,050 L of water having travelled through the flow meter.
- The second Register line denotes a value of 0.25 m^3, or 250 L of water having travelled through the flow meter,

Users can choose to set the Register to match the existing total volume tracker on their flow meter, or have the Register begin from 0 upon the install of the PFM1. Table 4 provides conversions for Gallons to Litres & Cubic Meters, respectively.

GALLONS	LITRES
1	3.785
10	37.85
100	378.5
1000	3785

CUBIC METERS	GALLONS
1	264.172
10	2641.72
100	26417.2
1000	264172

Table 4 Gallons to Liters (Left) Cubic Meters to Gallons (Right)

5.2.6 Selecting Active Logging Type & Parameters

Recordings: in this section, users can program/update the specific logging *types* (ie: pressure/flow) & its respective *parameters* (ie: average/minimum/maximum) to be measured during logger use. Logging types are programmed to a file of the user's choice. Each file has a finite amount of space. The PFM1 & PFM1A features 8 files total. The PFM1T features 4 files total, with File 4 being dedicated to transient recordings. All files are equivalent in memory size, with the exception of the PFM1 & PFM1A's File 7 & 8 which feature additional memory space. Table 5 below provides a brief overview of the amount of time required to fill a PFM1's memory based on assigned Logging Rates for standard pressures & flows. Transient recordings are not included given the high level of user variability in assigning detection parameters:

LOGGING RATE	MEMORY FILL TIME	
	FILE 1-6*	FILE 7 & 8
1 min	~21 days	~90 days
5 min	>90 days	~1.5 years
15 min	~1 year	~4 years
60 min	~4 years	~15 years
*Note: The PFM1T's File 4 is dedicated to Transient recordings; it does not follow the above system.		

Table 5 Memory Fill Time

To select pressure logging type & parameters

- Select a File(s) to utilize for the pressure logging. For high-resolution long-term recording using a PFM1/PFM1A, File 7 & 8 are recommended given their higher memory capacity.
- Select "Channel 1 – Analogue" in the logging type dropdown menu as highlighted in Figure 42; **Channel 1 exclusively measures pressure data**.
- Select the type of pressure data to be recorded by clicking the drop-down menu to the right of Chanel 1. The options are Average, Minimum, Maximum & Instantaneous.
- To adhere to best pressure logging practice, it is suggested that Average, Minimum & Maximum pressures are recorded. One file must be configured per measurement type. Figure 42 provides an example of a PFM1/PFM1A configured to log Average, Minimum and Maximum pressure on Files 1 to 3 respectively.
    - **Note:** A PFM1T features 4 total files. Thus, it will *only* display Files 1-4 under the "Recording" header.

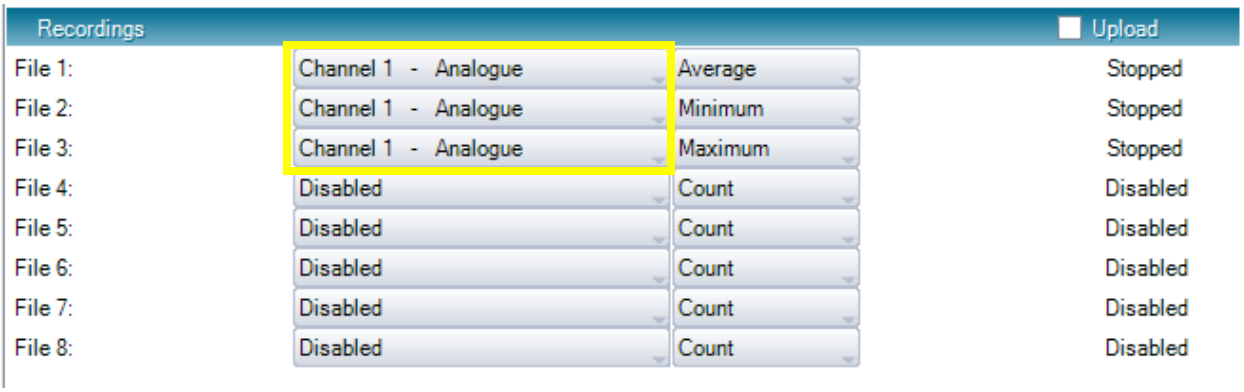


Figure 42 PFM1/PFM1A Recordings Configuration for Presure Logging

To configure flow logging type & parameters:

- Select a File(s) to utilize for the flow logging. For high-resolution long-term recording on a PFM1/PFM1A, Files 7 & 8 are recommended given their higher memory capacity.
- Select "Channel 2 – Digital" in the logging type dropdown menu as highlighted in Figure 43; **Channel 2 exclusively measures flow data**.
- Select the type of flow data to be recorded by clicking the drop-down menu to the right of "Chennel 2 – Digital". The options are Count, Minimum (Count), Maximum (Count), Minimum (PIT), Maximum (PIT) and PIT Event.
    - Users should select flow parameters which best fit their system & use case; the various "Count" settings are recommended for users unfamiliar with setting up a flow logging profile.
- Figure 43 provides an example of a PFM1/PFM1A configured to log Count, Minimum Count & Maximum Count flows on Files 1 to 3 respectively.
    - **Note:** A PFM1T features 4 total files. Thus, it will *only* display Files 1-4 under the "Recording" header.



Figure 43 Recordings Configuration for Flow Logging

5.2.7 Manually Terminating Recordings

Users can manually stop logging at any point. To do so, connect the IrDA cable to the logger needing to terminate its recording. Open FPLog; from the home page, select the small arrow next to "Configure Logger" located in the bottom left corner of the program. A drop-down menu will appear. Within this drop-down menu, select "Stop Recording", as noted in Figure 45. FPLog will force the connected logger to terminate any active recordings.

- **Note:** Users are encouraged to use this feature any time a logger is removed from field deployment to maintain battery life.

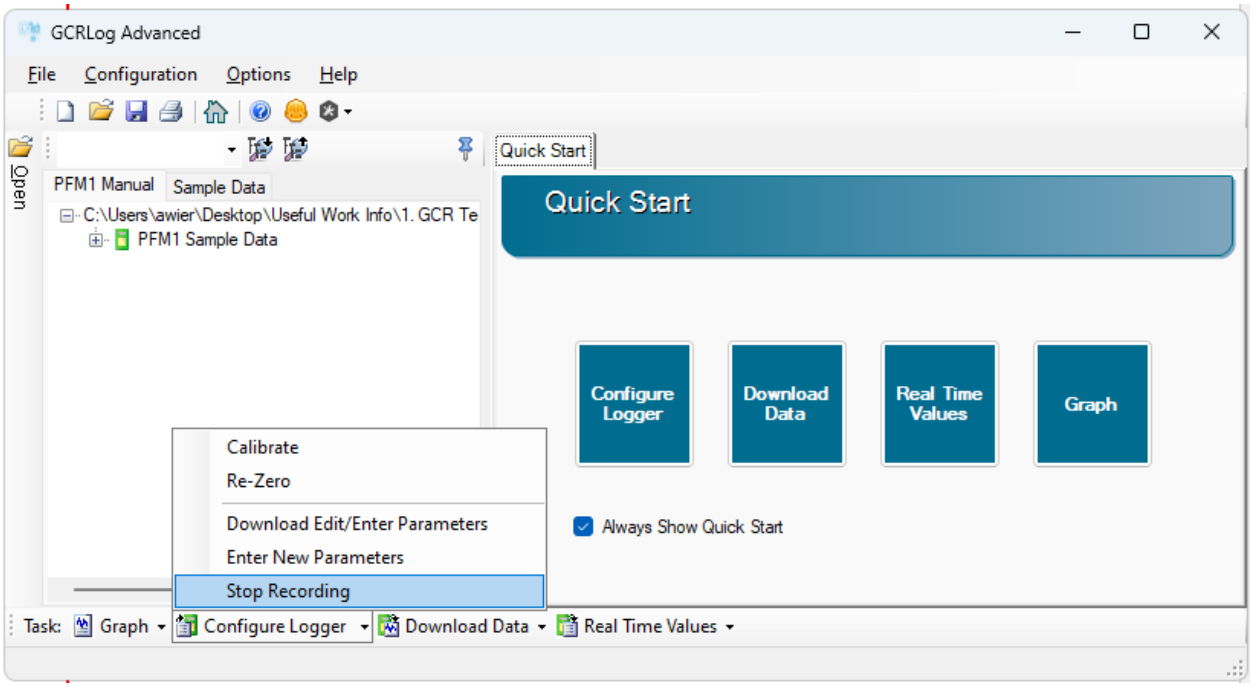


Figure 44 Stopping Recordings

5.3 Data Retrieval

PFM1's operating on a cellular network will automatically upload data to FloPath.Cloud. Users wishing to manually retrieve data from a PFM1 to be viewed on FPLog can do so at any time, including during active logging. To acquire manually retrieve data from a PFM1:

- Open FPLog.

- Connect the programming cable to an available USB slot; place the programming head on the PFM1.
    - Note: a PFM1 which is actively logging may remain connected to the pressure/flow source during the data retrieval.
- From the FPLog Quick Start menu, select “Download Data”, as highlighted in Figure 45.
    - Users can also select “Download Data” located at the bottom of FPLog.

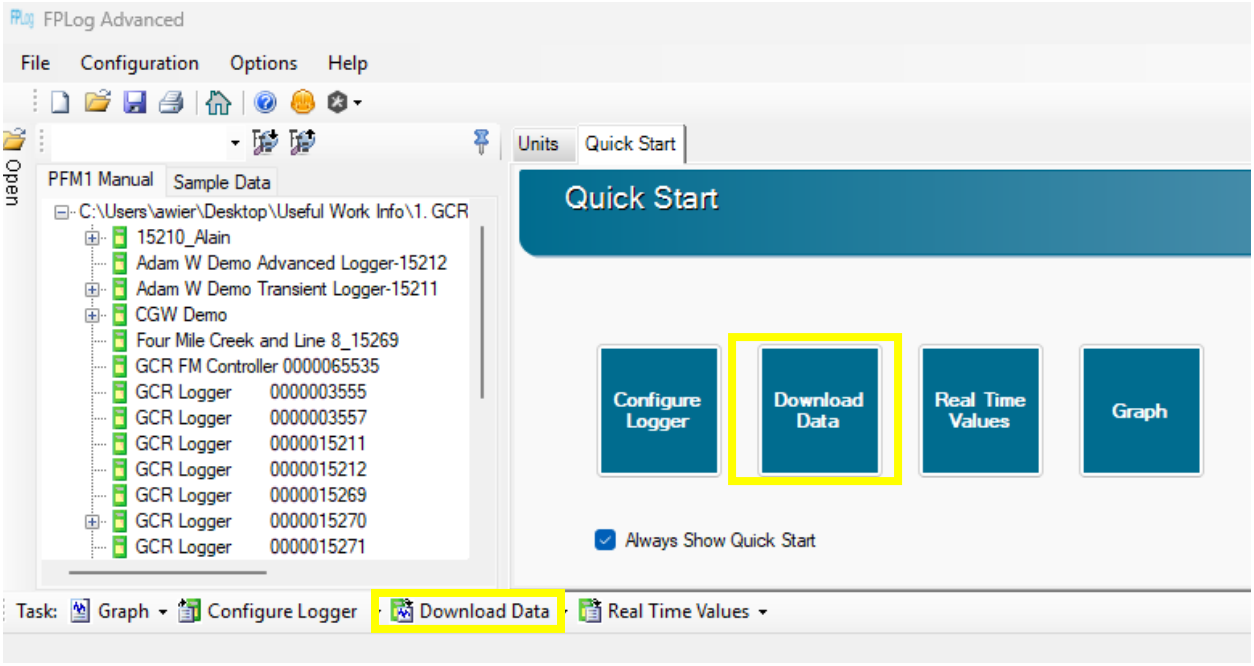


Figure 45 FPLog Data Download

Upon selection, FPLog will begin downloading data from the PFM1 which it is connected to. All logged data will be downloaded to the local computer used during the retrieval process. The downloaded data will transfer using all the user defined naming parameters, which is detailed in Section 5.2.2 of this manual. Additionally, the downloaded data will be hosted in the database folder which located at the file path detailed in Section 5.1.

5.4 Data File Review

5.4.1 Data Interface

All pressure/flow data in FPLog is presented in a graph & table format. Once a data transfer is completed, the graph presenting the newly acquired data will automatically open in FPLog. An example of graphed pressure & flow data is shown below in Figure 46.

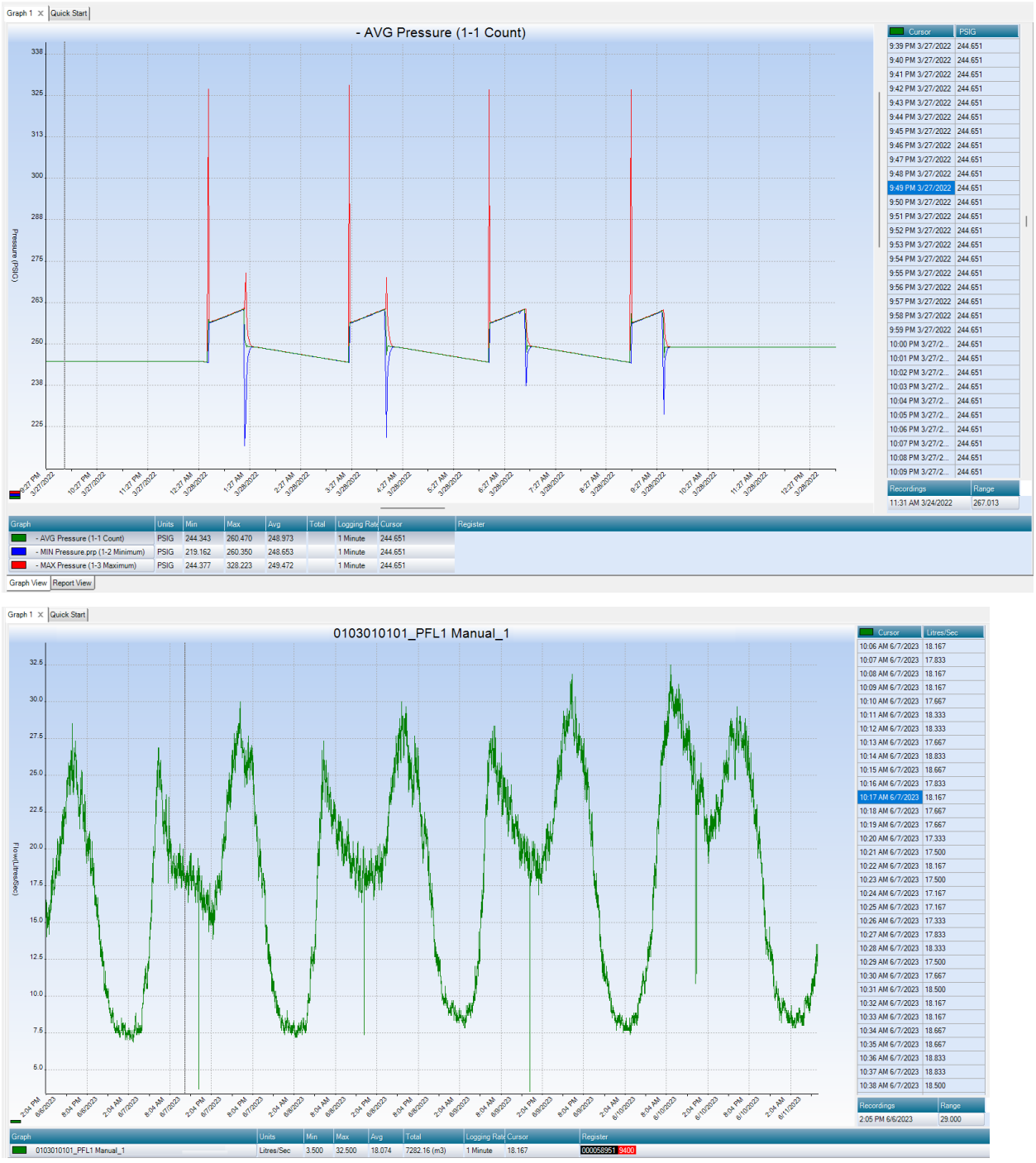


Figure 46 Pressure (Top) & Flow (Bottom) Graphs

To view previously downloaded historical data, the file tree located on the left side of FPLog is used. This tree lists all loggers by their user defined "Location" name (which is edited in the Logger Configuration tab of FPLog; See Section 5.2.2 of this manual). Downloaded logger specific data will nest beneath the assigned PFM1 name within the file tree.

To view all files associated with a logger, click the "+" next to the logger's name. To open a specific file, double click the data file name(s) of interest. Users can open multiple data files on the same graph in tangent (ie: average, maximum & minimum pressure) by double clicking each respective data file of interest. Figure 47 highlights the "+" and illustrates various files associated with a sample logger.

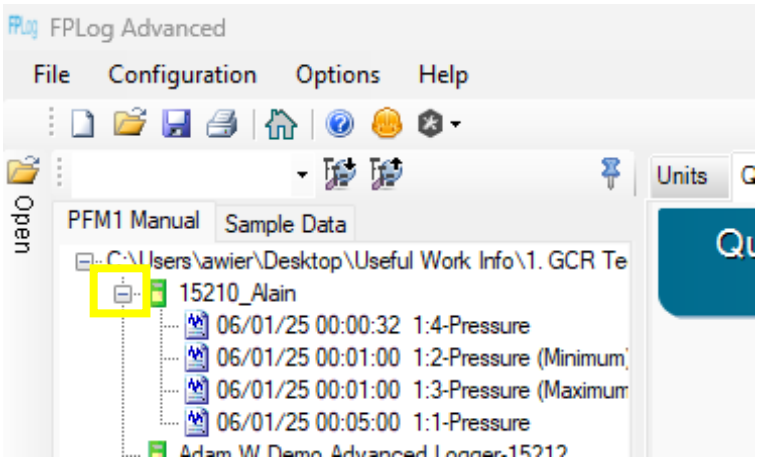


Figure 47 FPLog File Tree

When opening multiple data files simultaneously, each file is assigned & identified by a unique colour. The colour is indicated at the bottom of FPLog & by each file's respective graphed traversal path. The pressure graph in Figure 46 illustrates an example of 3 data files opened in tangent respectively assigned Red, Blue & Green colouring. These default colours can be altered by using the "Graph Options" in FPLog, detailed in Section 5.4.1.

Caution: It is strongly recommended to update the "Location" name of a logger for site updates/new field deployments, as noted in Section 5.2.2. Any changes made to the recording parameters of a logger will be linked to its corresponding "Location" name listed in both its Configuration settings & FPLog. Thus, to avoid erroneously linking new data with an archived logger, users must ensure that the "Location" name always remains updated. An example is shown below.

Figure 48 below illustrates a file tree for a FloPath logger. This file tree depicts the following:

- A single logger, named "PFL1 Manual_1" as per its "Location" setting.
- 2x pressure data subsets featuring Average, Minimum & Maximum data files.
    - Subset #1: Nov 17, 2023 at 9:37 am
    - Subset #2: Nov 17, 2023 at 10:13 am

The "PFL1 Manual_1" logger parameters were edited after Subset #1 was downloaded. Its "Location" name however was unchanged, thus causing the new 10:13 am subset. Had the logger "Location" name been changed to "PFM1 Manual_**2**", a new header would have been created and the resulting 10:13 subset would have been assigned under this header.

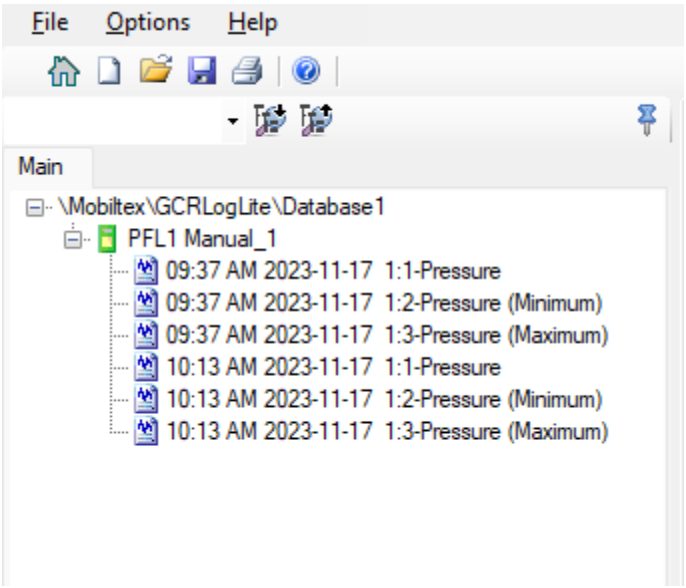


Figure 48 File Tree - Duplicate Files

5.4.2 Graph Zooming

Users can interact & customize the graphically displayed data in FPLog by using the zoom function. To access all zoom options, right click anywhere in FPLog's graphing window to open an option pane. Hovering over "Zoom" will display all zooming options, as shown in Figure 49.

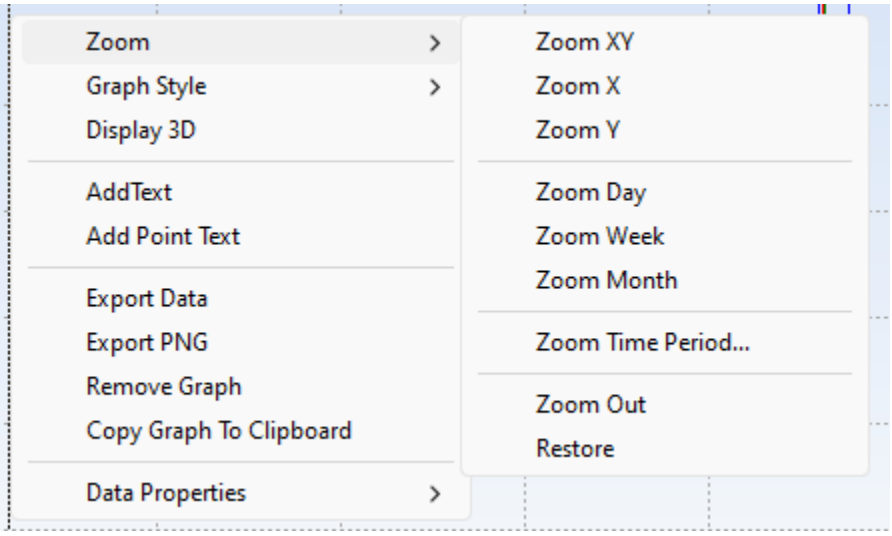


Figure 49 Zoom Options

To enhance discrete areas of a graph, the first 3 zooming options are used. Selecting "Zoom XY" will allow users to enhance data on both the X & Y axis of the graph. Likewise, "Zoom X" will enhance the graph along the X-axis, and "Zoom Y" will enhance the graph along the Y-axis.

Once the desired zoom type is selected, users can draw a box around the section of the graph which is to be enhanced. To do so, hold the left click in the graphing window & drag the cursor to create the box around the portion of data which is to be enhanced. Releasing the left mouse button will zoom in on the drawn boundary. Clicking "Zoom Out" from the option pane will return to the full data view.

Using the "Zoom Day/Week/Month" options allow users to quickly jump to a daily/weekly/monthly view of selected data. Clicking the graph after selecting any of these options will automatically enhance the graph to that date range.

- **Note:** When using "Zoom Week", FPLog will automatically display data in a Sunday-Sunday range around the date which is clicked on the graph. For example, clicking on data acquired Wednesday, January 10th, 2024 while using this function will display data from Sunday January 7th, 2024 to Sunday January 14th, 2024 to be displayed.

Users can define a specific timeframe to display in FPLog using the "Zoom Time Period" option. Once selected, a new window will open prompting the user to enter the desired start & end date and time of the data to be displayed. Figure 50 depicts this window.

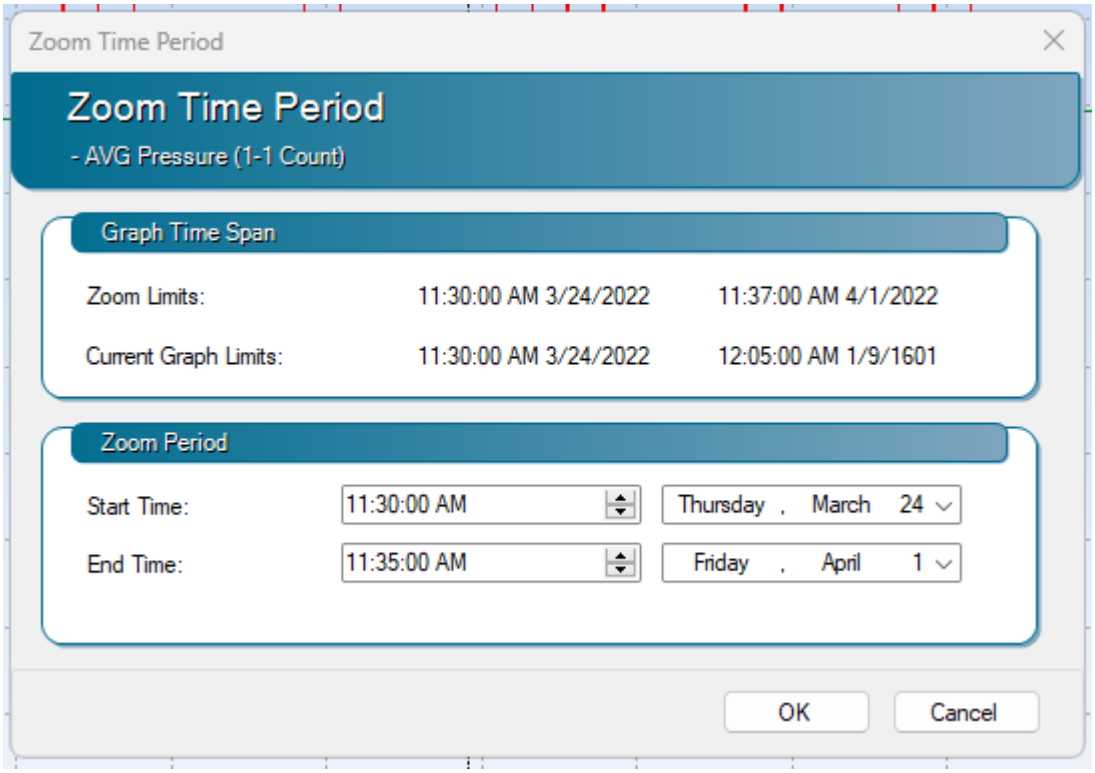


Figure 50 Zoom Time Period

5.4.3 Graph Options

Opening the "Graph Options" page of FPLog is done by clicking "Options" located at the top of the program, followed by "Graph Options". On this page, users can adjust & customize various parameters related to the appearance & display of graphed data in FPLog. Most notably, users can adjust:

- Default graphed data appearance style (ie: solid line, filled line, point, bar etc.)
- Default graphed data line colouring.
- Default zoom type, with "Zoom X" serving as the initial setting.

To implement any changes made in Graph Options, users must click "Apply" located at the bottom of the page. Figure 51 provides an illustration of the Graph Options page with the "Apply" button highlighted.

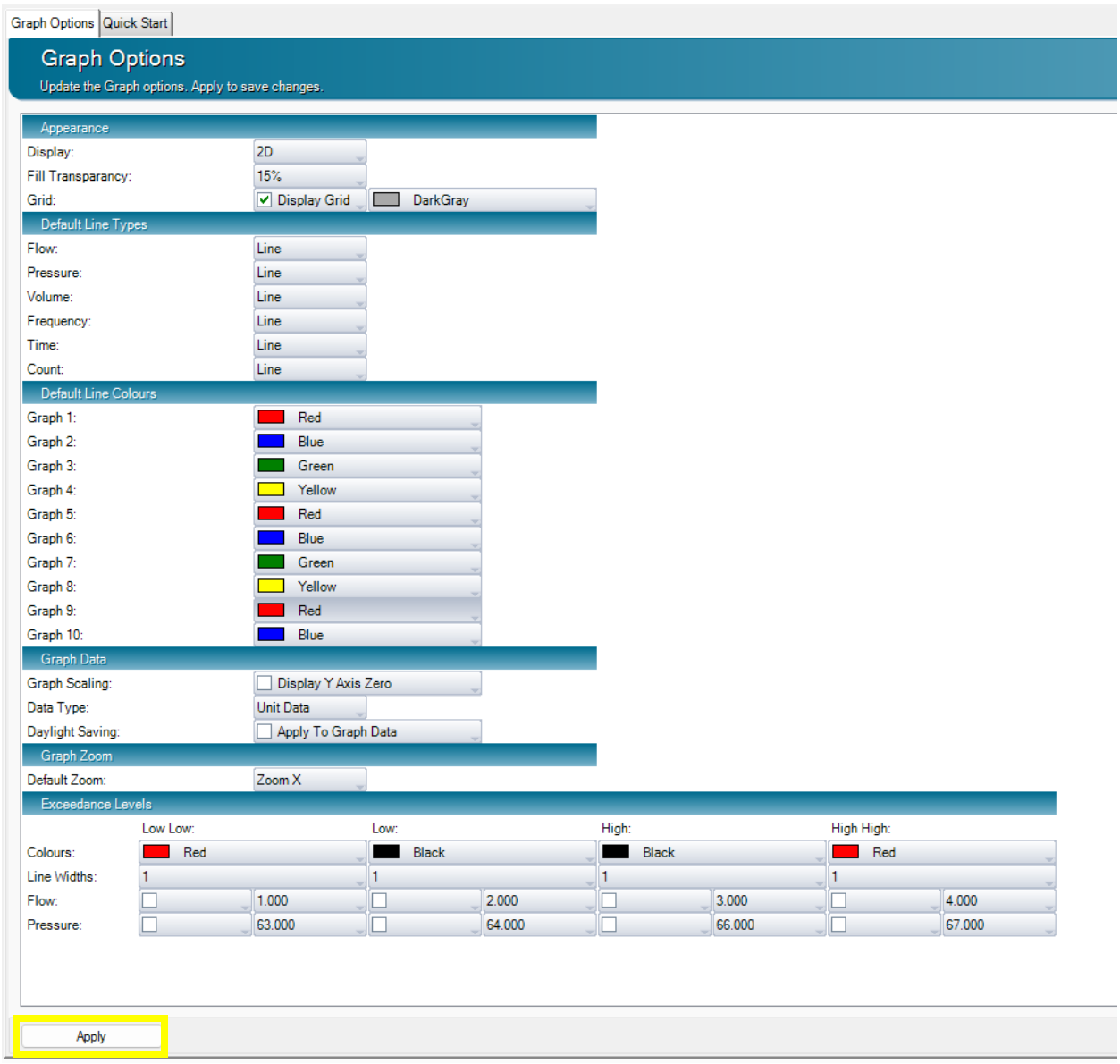


Figure 51 Graph Options

5.4.4 Exporting Data & Report Options

Data can be exported from FPLog in one of two formats:

1) A .CSV file which detailing data actively opened in FPLog.
2) ASCII/LMARS or WESNET file, which is SCADA system specific.
    a. **Note**: users should avoid this export function *except* when using a SCADA system capable of interacting with either of these file types.

To export data, open the data file(s) of interest by double clicking their respective name(s) in the file tree. Once all file(s) have been opened, select the Options tab from the top of the program, followed by “Export Data” in the corresponding drop-down window, as shown in Figure 52.

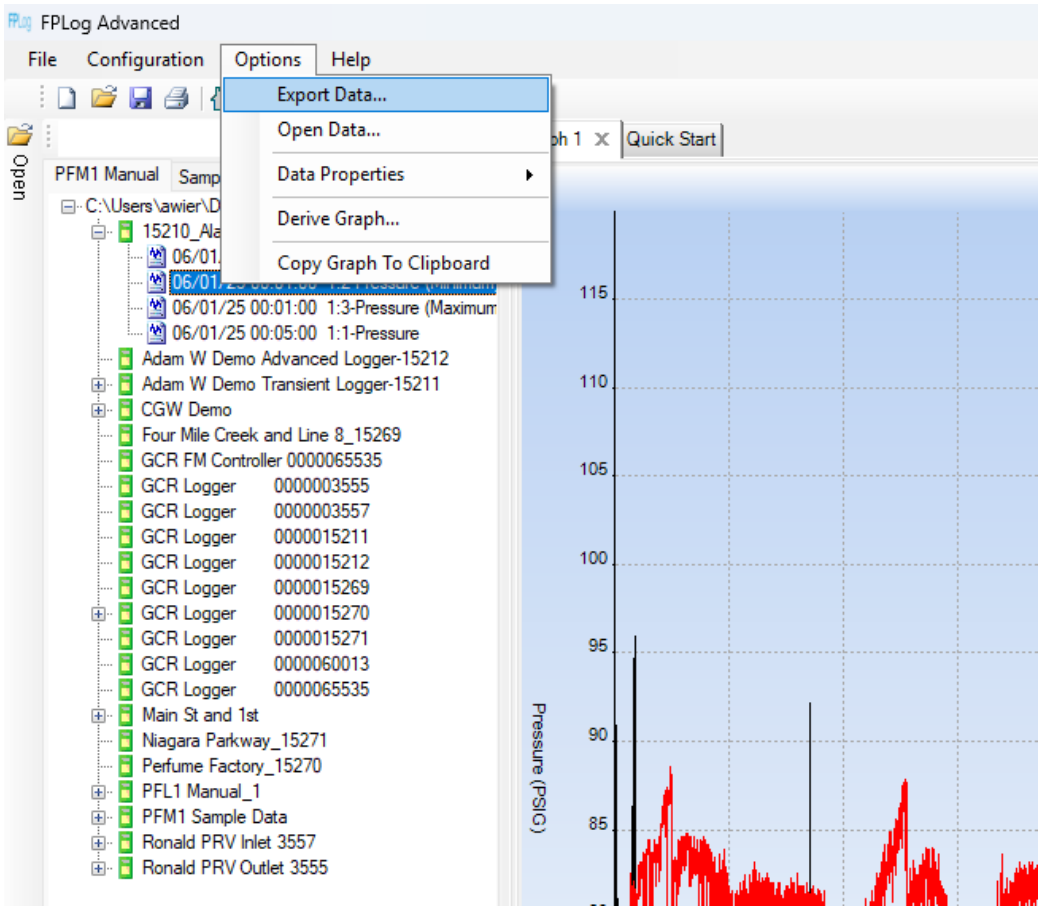


Figure 52 Data Export

A new window will appear which prompts the user to select the data type (noted above) & range to be exported. Users can select either “All Data” or “Visible Data” (ie the current view of data shown in the graph window). Select the “.CSV” option and the desired range of data to be exported & click “OK”. A final window will appear, shown in Figure 53, which prompts the user to select the destination for the file to be saved & to enter a name for the exported .CSV. Enter this information & click “Save” to finalize the export.

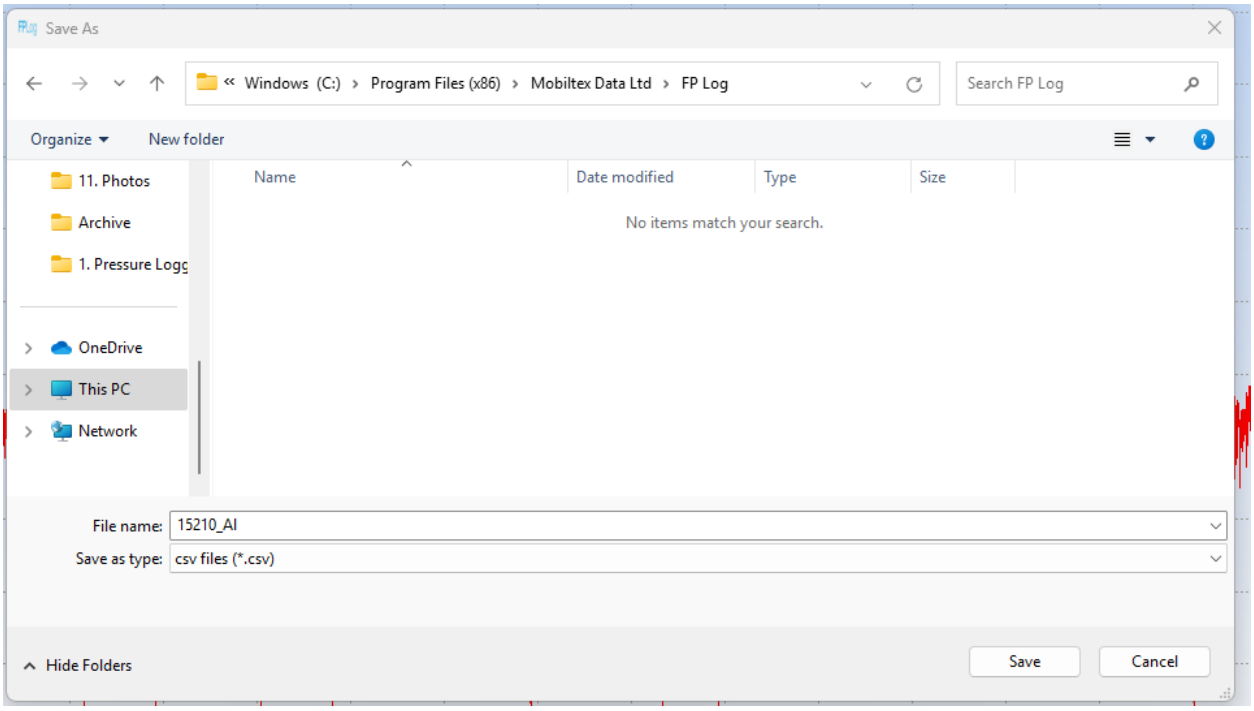


Figure 53 .CSV File Export

5.4.5 Report View

FPLog offers a "Report View" which can be used in conjunction with any opened data file(s). The "Report View" tab is located at the bottom of FPLog next to the "Graph View" tab, shown in Figure 54. When a singular data file is opened in FPLog, selecting the "Report View" tab will generate a report on that specific file. When multiple data files are opened (ie: average, maximum & minimum pressure), users must select the file which to be viewed in Report View. To do so, click the desired file name located at the bottom of the graphing interface. The selected file will be highlighted in grey. Once selected, click the "Report View" tab at the bottom of FPLog to show the specific file's report.

Figure 54 provides an example navigating to the Report View with multiple data files opened in tangent. The second blue file, denoting "MIN Pressure" has been selected for review in the Report View.

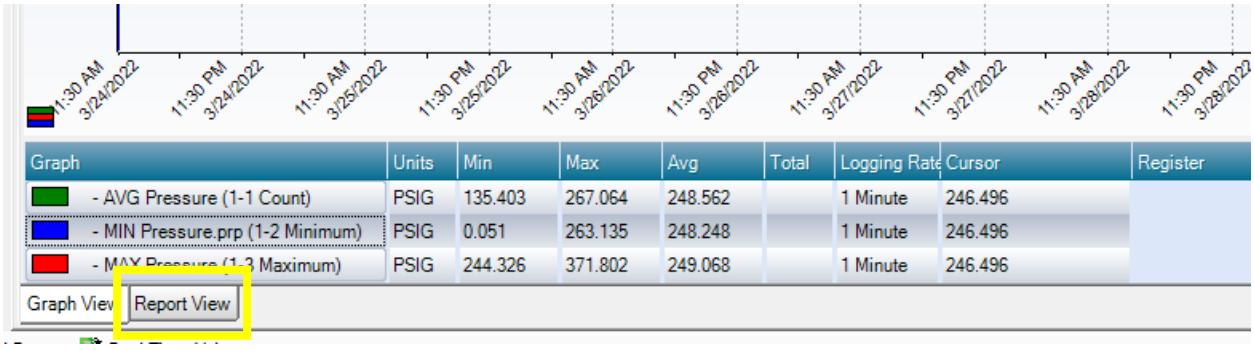


Figure 54 Report View Access & File Selection

The Report View page displays all measured data in a tabular format. The headers of the table indicate recorded measurement values (denoted by a pressure unit, ie: PSIG) & corresponding time stamps. The columns with the "+1/+2/+3 Minutes" header are the respective data measurement taken 1/2/3 minutes after the initial measurement

which is listed in the leftmost column. For example, a pressure measurement taken at 10:30 am would have a corresponding value listed in the "+2 Minute" column representing a pressure measurement taken at 10:32 am.

An interactable table titled "Report – Tabular Data" is found is the upper righthand corner of the Report View page. Clicking the various rows listed in this table will populate specific data points of interest. Specifically:

- Tabular Data: Display the default tabular view of all measured data points & their respective timestamps.
- Tabular Data Daily Min Max: Highlights the maximum & minimum pressure/flow value(s) measured over a 24-hour window. The max & min values are respectively highlighted in red & blue in the displayed tabular data.
- Tabular Data Exceedance: Allows users to apply pressure/flow exceedance thresholds to the listed data. Measurements falling within these thresholds are then highlighted in the data table. The thresholds are as follows:
    - Low Low: the lowest user-defined measurement threshold, highlighted in red.
    - Low: The second lowest user-defined measurement threshold, highlighted in yellow.
    - High: The second highest user-defined measurement threshold, highlighted in blue.
    - High High: The highest user-defined measurement threshold, highlighted in pink.

  Values are adjusted by clicking the cell beneath the respective threshold columns & entering a numerical pressure/flow value. Figure 55 illustrates an example of this exercise, with the Low to High exceedances set as 35, 40, 48 & 50 PSI respectively. All measured ranges are highlighted by their exceedance threshold in the tabular data.

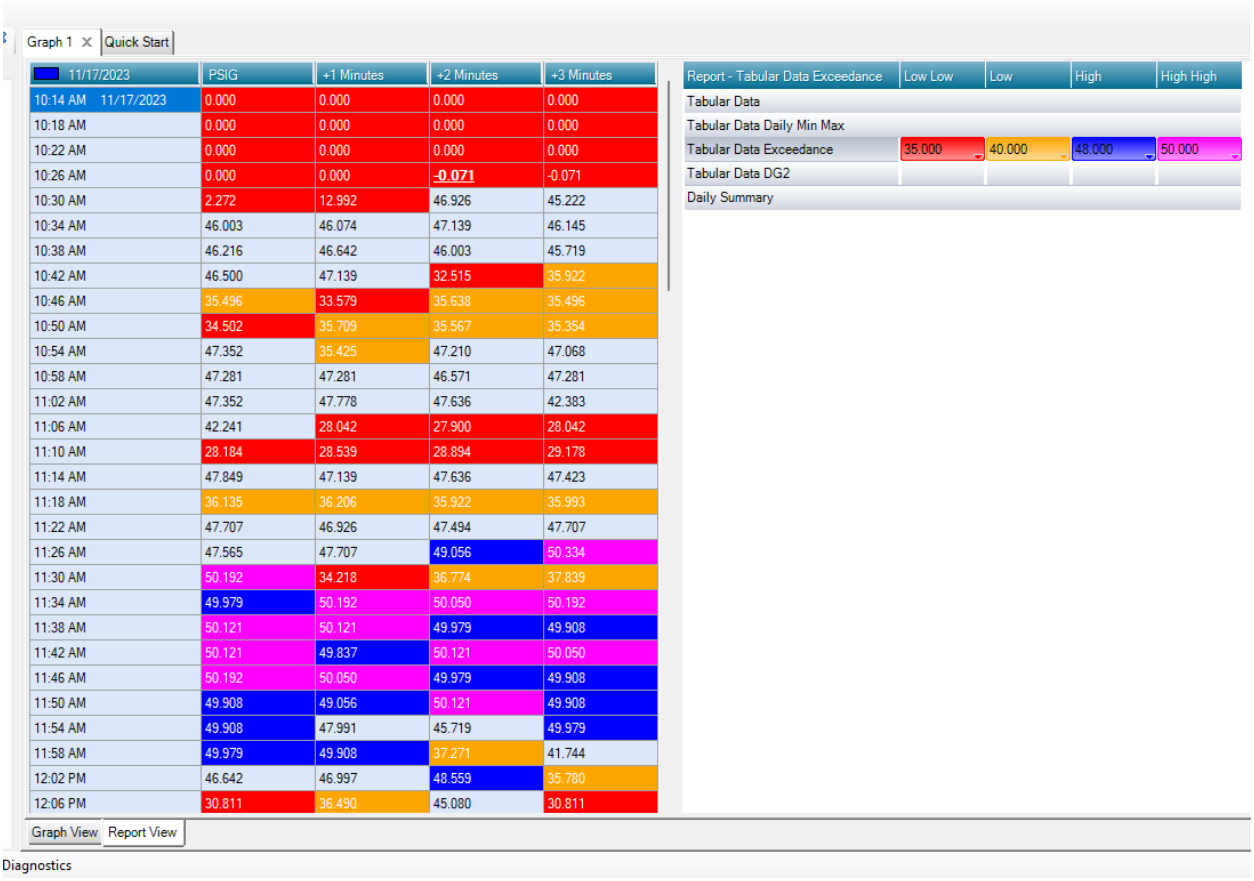


Figure 55 Tabular Data Exceedance

- Tabular Dat DG2: This row can be ignored. It will be removed in a future release of FPLog.
- Daily Summary: Provides a summary of the maximum, minimum & average pressure/flow values & corresponding time stamp which was recorded for each respective 24-hour windows within the active data set.

6 Technical Support

Technical assistance may be obtained from:

Mobiltex Data Ltd.
#36, 56 Freeport Cres. NE
Calgary, AB, Canada
T3J 0T7
Tel: (403)291-2770

Web: http://www.mobiltex.com
Service Email: service1@mobiltex.com
Service Website: http://service.mobiltex.com

A. Equipment Specifications

PFM1

ENVIRONMENTAL	
Operating Temperature	0.25° to +80° C (32.5° to +176° F) for model with internal pressure sensors -40° to +80° C (-40° to +176° F) for model with external pressure sensors 0.25° to +80° C (32.5° to +176° F) for external pressure sensor at sensor body
Storage Temperature	-40° to +85° C (-40° to +185° F)
Humidity	0 to 100% RH non-condensing
Altitude	0 – 3000m (0 – 9843 ft)
Pollution Degree	2
Mounting	Type 3 Enclosure - Suitable for outdoor use in wet locations
Ingress Protection	IP67

POWER	
Operating voltage range	7.2VDC nominal, supplied from internal batteries ($Li/SOCl_2$)
Power	9W peak, 0.72mW quiescent

PHYSICAL	
Size	229mm x 115mm x 83mm (9.0” x 4.5” x 3.3”)
Weight	1000 grams (2.2lbs)
Enclosure	Watertight, UV stable, wide temperature polycarbonate

COMMUNICATIONS	
Cellular Radio	World-band LTE Cat M1/NBIoT (LPWA variant) Telit ME910G1-WW module 2G bands: B2, B3, B5, B8 4G bands: B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B71, B85 Output power: LTE: 23 dBm (Power Class 3) GSM/GPRS: 33 dBm (Power Class 4) EMEA/APAC 2G/LTE Cat 1bis (EA variant) Telit LE910R1-EAG module Bands/Transmission Output Power

Band	Mode	Class	RF power (dBm) Nominal
B8 900	2G GSM/GPRS	4	33
	2G EGPRS	E2	27
B3 1800	2G GSM/GPRS	1	30
	2G EGPRS	E2	26
B1, B3, B5, B7, B8, B20, B28A, B28B	4G LTE FDD -CAT1bis	3	23
B38, B40, B41	4G LTE TDD -CAT1bis	3	23

PRESSURE INPUTS	
Pressure Range	0 to 20bar (0 to 290 PSI)

FLOW INPUTS	
Signal Drive	Open collector or dry contacts