Newflow

P568
Multi Pulse
Input Module

User Manual

The Pulse Wizard

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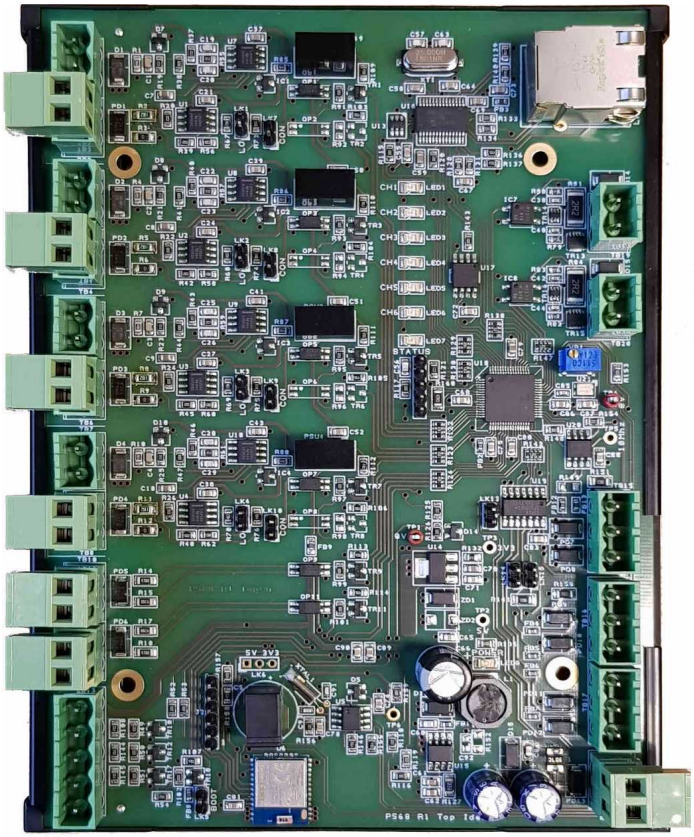

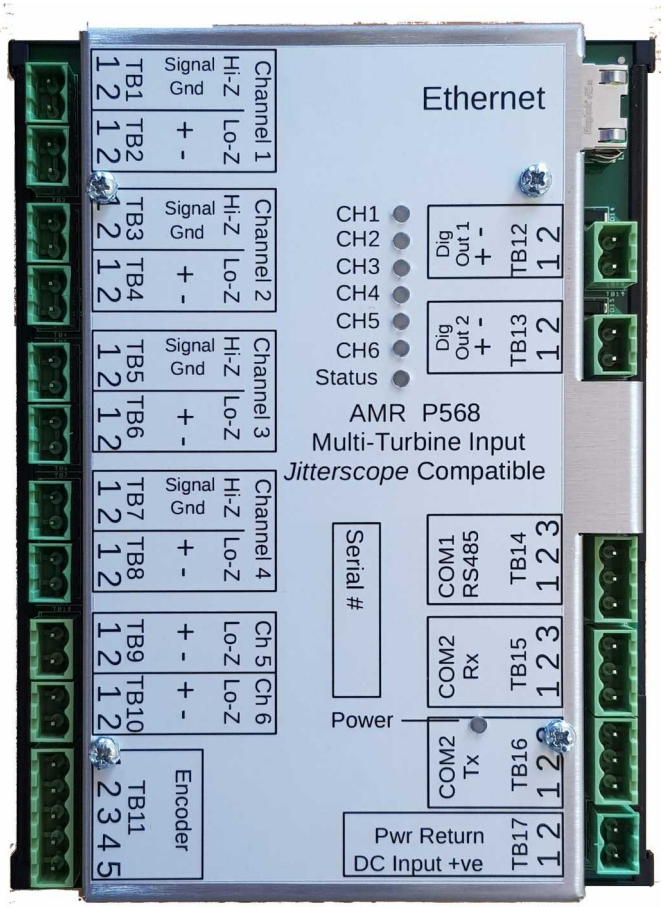
Ethernet
Channel 1
Channel 2
Channel 3
Channel 4
Ch 5
Ch 6
Signal
Gnd
Hi-Z
Lo-Z
TB1
TB2
TB3
TB4
TB5
TB6
TB7
TB8
TB9
TB10
TB11
Encoder
CH1
CH2
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CH4
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Dig Out 2
TB12
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AMR P568
Multi-Turbine Input
Jitterscope Compatible
Serial #
Power
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Table of Contents

1 Features

The P568 Multi Pulse Input Module is a highly flexible Pulse management product. It can be used as a standalone product or integrated with a MicroCube Flow Computer to provide expanded functionality.

1.1 The Standalone P568 features include:

- **Near Unity Scaler Mode with 3rd party flow computers**

  The Near Unity Scaler can be used with other flow computers for closed loop system validations. In real time the input pulse stream can be rate multiplied by a value between 0.9 and 1.1.

- **JitterScope® Data Capture Mode**

  The "*JitterScope*"™ is a highly innovative visualization tool for analyzing repetitive waveforms. It is a powerful tool for diagnosing meter proving problems and is equally useful with mechanical meters as with synthesized pulse meters. A separate JitterScope™ user manual is available from your distributor.

- **Station Flow Rate Indicator & Station Sampler Driver**

  The P568 MPIM is equipped with a Bluetooth interface allowing connection to an Android device (iOS & iPadOS to follow) for viewing the instantaneous flow rate of any input and the station total flow rate. In addition a sampler pulse can be generated using the whole station flow total.

- **Multi-stream Pulse Averager for proving and adding additional channels to an existing system**

  The P568 MPIM can produce a pulse output frequency equal to the average of 2,3,4,5 or 6 inputs channels. So for example an existing system can be readily upgraded with the addition of more meters, with different K-Factors & Meter Factors.

- **Master Meter Proving with Multiple Master Meters to extend the flow rate**

  When high flow rates are encountered that cannot be handled by a single master meter, the P568 MPIM allows multiple master meters to be used to prove a single high flow rate meter under test.

- **Multiple Communication methods available**

  The P568 has both Ethernet and Bluetooth communications links for ease of connections to other systems.

- **Built in web server for configuration and monitoring**

  A password protected web server allows browser access to the P568 MPIM for configuration, diagnostics and monitoring.

- **Zero Conf Ethernet IP address configuration**

  The P568 MPIM is fully compatible with the MicroConf IP address configuration tool.

1.2 When used with a MicroCube Flow Computer, the features include:

- **Adds up to 6 additional Pulse Input Channels**

  For applications such as Mass measurement, or where process conditions are either identical or unimportant, such as produced water, the P568 MPIM can allow a single MicroCube Flow Computer to measure multiple meter runs. This feature also allows multiple master meters to be used simultaneously to extend the maximum flow rate for proving larger meters.

- **Adds a Linear Encoder for Small Volume Provers**

  Allows a very high resolution linear encoder based SVP app to function and also provides the water draw modes for calibration.

- **Operates as a 6 channel Pulse Multiplexor for Proving**

  Each P568 can multiplex up to 6 pulse channels to a differential Raw Pulse Bus or can be put into high impedance output mode, allowing up to 32 P568 MPIMs to route 192 pulse sources to a single MicroCube prover computer.

- **Adds the patent pending Near Unity Scaler functionality for advanced prover validation**

  The Near Unity Scaler feature can be used with any MicroCube prover computer, when used with Reynolds corrections or closed loop system validations.

NOTE: The MicroCube Applications may need modifying to support all of the listed features.

2 Operating Modes

The P568 has 3 fundamental operating modes each supporting different features.

2.1 Standard 6 Channel mode

In 6 channel mode, most of the features are available, with the exception of the JitterScope and Encoder Interface Modes. This is the normal mode of operation.

2.2 JitterScope™ Mode

This mode is designed purely to drive data to the JitterScope™ visualization tool. Only Pulse Input Channels Ch1 & Ch2 are used in JitterScope mode, see the JitterScope Operating Manual.

2.3 Encoder Interface Mode

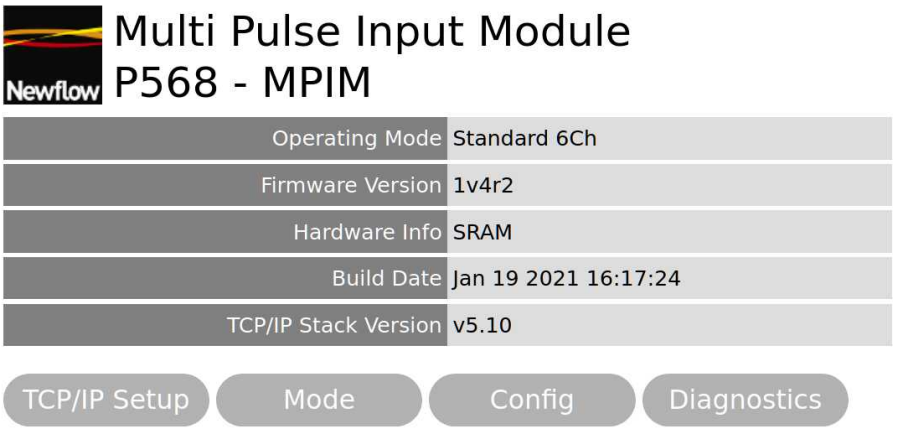
When the P568 MPIM is operating in Encoder Interface Mode, it is expecting a very high resolution linear encoder to be connected and used with the specific Encoder based Small Volume Prover application. For more information on the Encoder operation, contact the factory.

2.4 Selecting the Operating Mode

The modes are selected using the web server interface. To check which mode is selected or to change the mode in operation, point your web browser at the IP address of the P568 MPIM unit to be changed.

If the IP address of the unit is not known, then MicroConf will be required to identify or change the IP address, see Section 10 MicroConf - Network Discovery & Configuration Tool.

Once the IP address of the units has been determined, this should be typed into the browser address, or if Start Web Interface has been selected in MicroConf, this will have been filled in automatically, and the P568 MPIM home page will be displayed, as shown below.

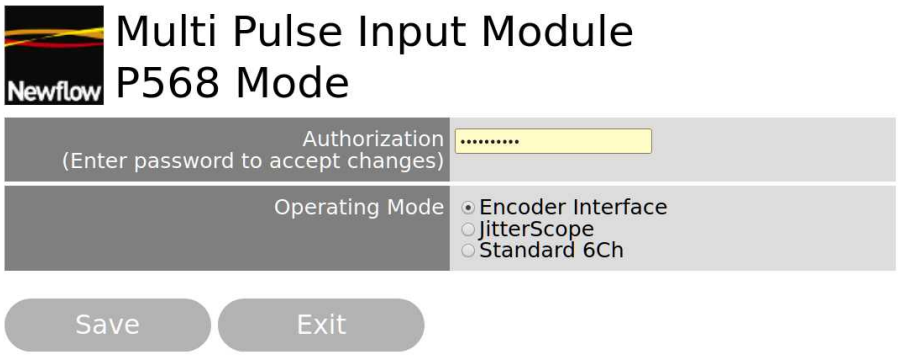


The home page has five lines of information underneath the logo, the part number & title as well as two or four clickable buttons (depending upon Operating Mode in use) to control operation.

Operating Mode	This will display the current operating mode as "Standard 6Ch" , "Encoder Interface" or "JitterScope"
Firmware Version	This line shows the installed firmware version
Hardware Info	This line shows the type of memory used for the totals. Early versions of the hardware utilized SRAM memory backed up by a capacitor, giving around five days data retention. Later versions have non-volatile FRAM storage is fitted giving more than ten years of data retention.
Build Date	This is the date the firmware was compiled
TCP/IP Stack Version	This field indicates the revision of Microchip TCP/IP stack is in use.

Underneath the five lines of information on the home page there are always two buttons to configure the TCP/IP Network settings and the Operating Mode. If the mode is set to standard 6 Channel (6Ch) or Encoder Mode, then there will also be a Config and Diagnostics buttons visible too. In JitterScope mode, there are no additional settings or diagnostics available.

If the Operating Mode, as shown on the home page is the wrong mode, click on the Mode button, and the browser will display the mode selection screen, as shown below.



Click the radio button to select the required mode. Then enter the password and click Save.

You will be returned to the home screen. If the operating mode shown on the top line has NOT changed, then the wrong password has been entered.

If the operating mode has changed, now click on the Config button to configure the P568 MPIM, unless JitterScope mode has been selected.

3 Standard Six Channel mode

In Six Channel mode, there are six independent measurement channels, a station totalizing function and an ability to either multiplex the selected channel pulses to the Raw Output directly or via the "Near Unit Scaler" (patent pending) feature.

Each measurement channel looks like the block diagram below. The exception is that channels 5 & 6 do not have the built-in High Impedance Signal Conditioner input circuit, they only have a regular isolated flow computer pulse input stage. An external P542-SCM Signal Conditioning Module can be used if more than four high impedance inputs are needed.

3.1 Single Channel Overview

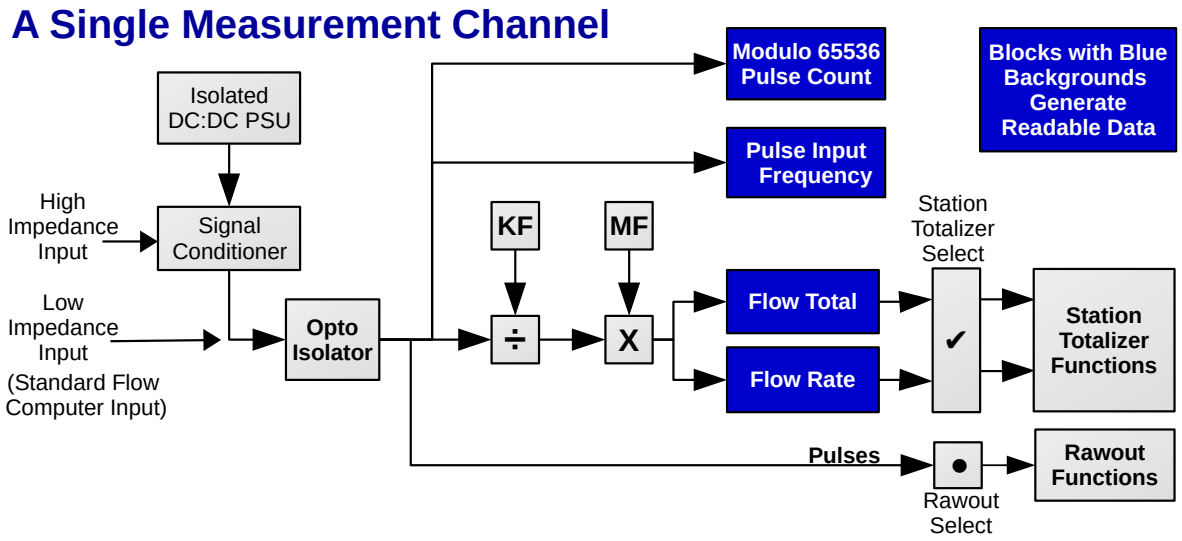


Diagram 1

Each channel calculates the pulse input frequency and a modulo 65536 pulse count. This information is made available to a MicroCube flow computer using XML communications and expands the number of pulse inputs available. When used with a MicroCube flow computer, the K-Factor (KF) and Meter Factor (MF) are applied by the MicroCube application, and the P568 MPIM does not need to be configured.

In standalone mode however, the P568 MPIM can be loaded with a separate K-Factor (KF) and Meter Factor (MF), and the unit will generate flow rates and flow totals in the units determined by the K-Factor.

The Flow Rates and Flow Totals can be summated by the Station Totalizer Function and the pulses from each channel can also be processed by the Raw Output function block, as shown in the block diagram on the next page.

The K-Factors and Meter Factors for each measurement channel are entered either using the Modbus communications interface or via the in-built web server. See section 3.3 Configuring the 6 Channel Mode

3.2 6-Channel Overview Drawing

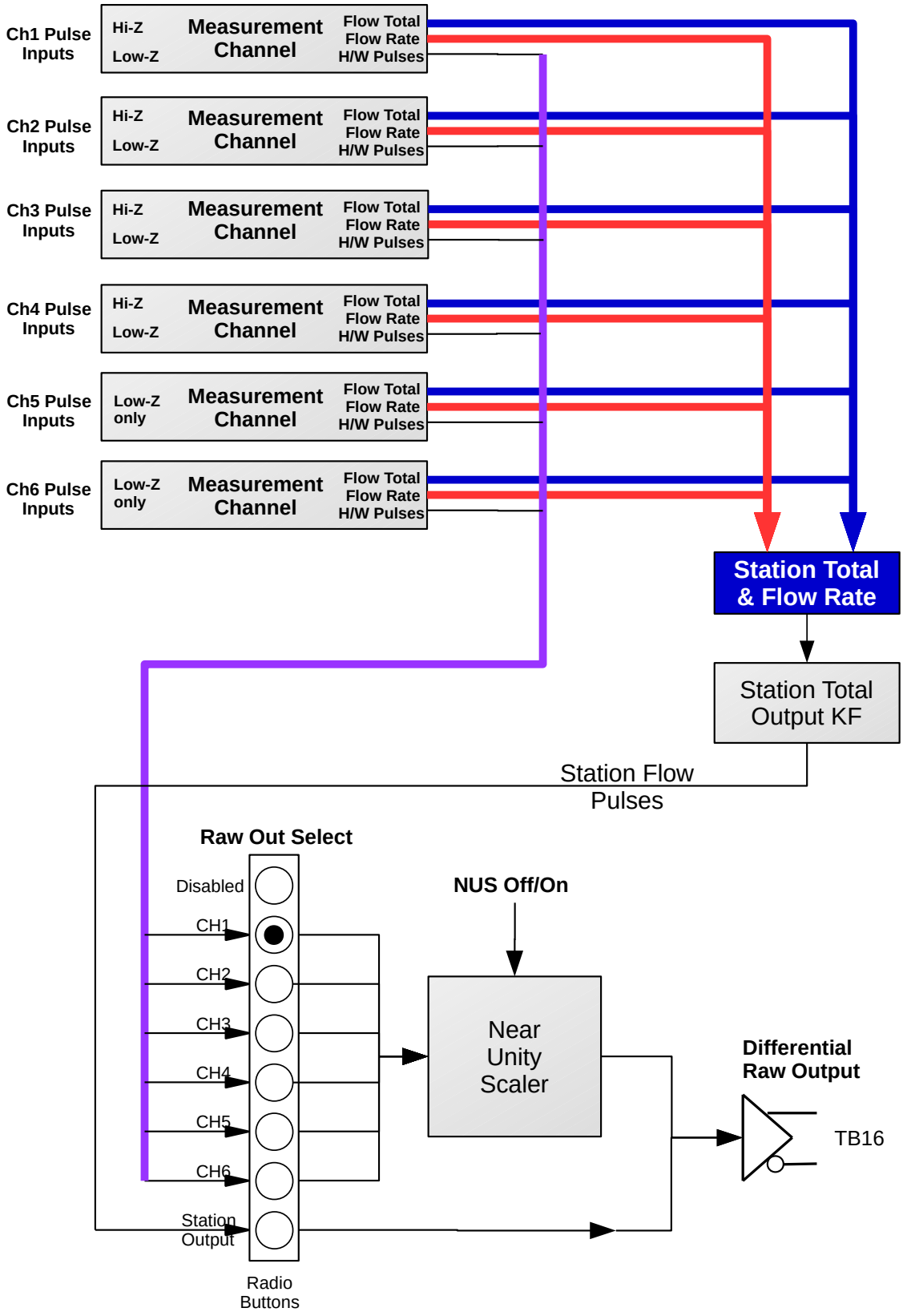


Diagram 2

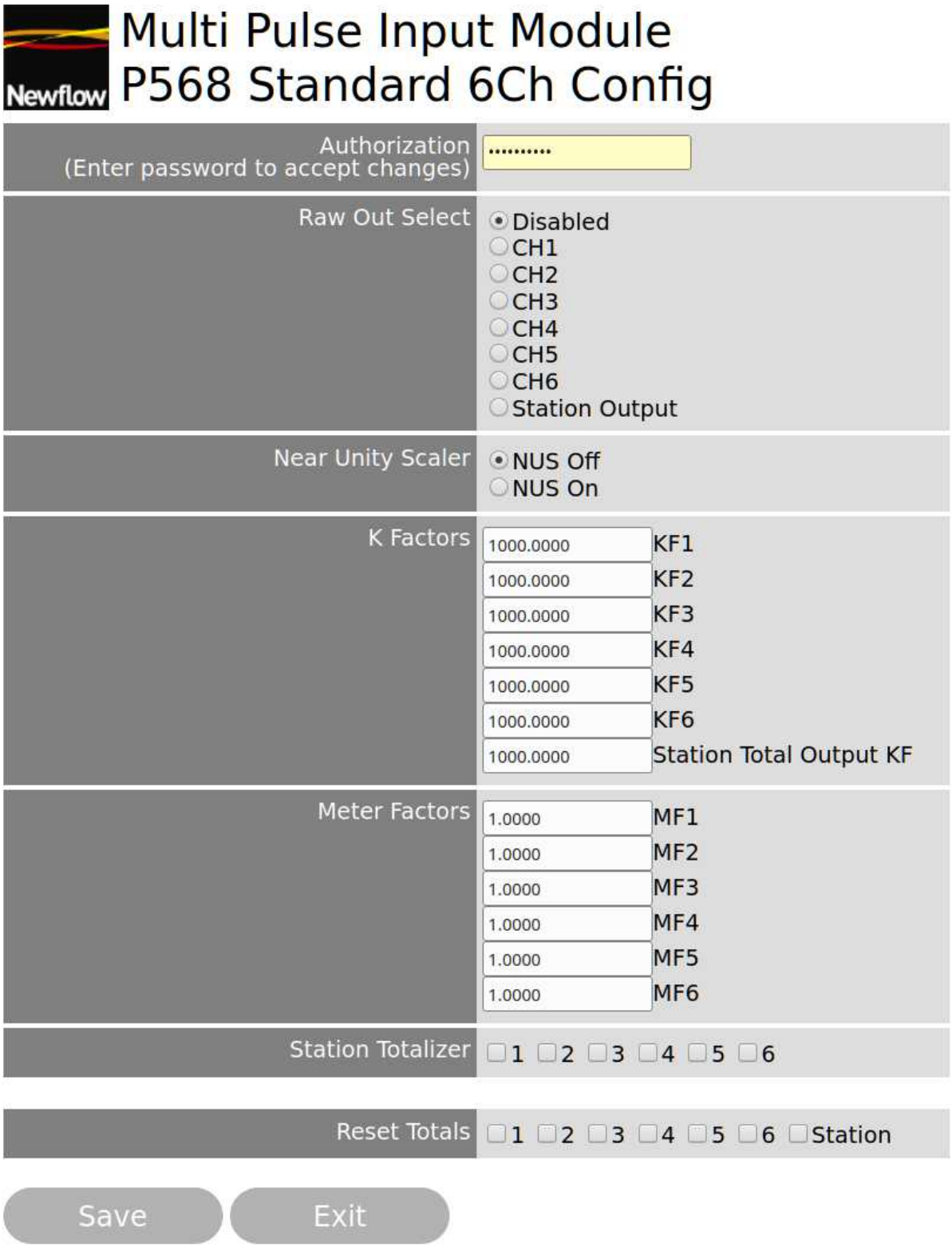
The 6 Channel Overview Drawing (Diagram 2) on the previous page shows how the data from the six measurement channels can be combined and used.

The Flow totals and Flow Rate information from each selected channel (see section 3.3 Configuring the 6 Channel Mode for information regarding channel selection) is combined and a composite flow rate and total for the station is calculated. Note each channel total and the station total can be individually reset.

The Station Flow Rate can be regenerated as a pulse stream and directed to the Raw Output.

To configure the P568 MPIM in 6 channel mode using the web server, point your web browser to the IP address of the unit and refer to section 3.3 below.

3.3 Configuring the 6 Channel Mode



The table on the following page explains each of the fields in the web page.

Authorization	The settings can be viewed and changed on the screen without requiring a password. However the changes will NOT be recorded unless the correct password is entered into the Authorization field before the Save button is clicked.
Raw Out Select	These radio buttons allow only one of the eight choices to be selected. The choices are Disabled (No pulses will be driven from the Raw Out Circuit), Channels Ch1 to Ch6, or the synthesized Station Output Pulse. See the bottom half of Diagram 2 for a schematic representation.
Near Unity Scaler	The Near Unity Scaler can apply a real time multiplication to the pulse frequencies of any of the six channels and drive the modified frequency out of the Raw Output circuit. If the NUS featured is set to off, the Raw Out frequency will be identical to the frequency of the selected measurement channel. The multiplier is the MF of the selected channel and must be in the range of 0.9000 to 1.1000.
K Factors	There are seven K-Factor fields, one for each measurement channel. KF1 is for channel 1 through to KF6 for channel 6. The seventh K-Factor is used to scale the Station Totals Output Frequency.
Meter Factors	There are six Meter Factor fields, one for each measurement channel. MF1 is for channel 1 through to MF6 for channel 6. **NOTE:** Applying a negative Meter Factor will generate negative flow rates and totals. If the stream with negative MF is selected as part of the station, then pulses into this channel will subtract from the Station Total.
Station Totalizer	There are six check boxes, one for each Measurement Channel. Clicking the box toggles the check mark. If the check mark is shown, the output from the selected channel is added into the Station Total. If the check mark isn't shown, the channel will not contribute to the Station Total.
Reset Totals	There are seven check boxes, one for each Measurement Channel and one for the station. Clicking the box will toggle the check mark. If the check mark is active, the relevant total will be cleared if the changes are saved.
Save	The selections made above only take effect when the Save button is pressed AND the correct password has been supplied in the Authorization field at the top of the menu.
Exit	Clicking exit returns the browser to the home page and any changes made are canceled.

3.4 Diagnostic Menu Page

When the P568 MPIM is used in Standard 6 Channel mode, a comprehensive diagnostic page is available, as shown below.

Standard 6Ch Diagnostics

CH	INPUT	FREQ	COUNT	KF	MF	F/RATE	TOTAL
1	ACTIVE	100.1674	309532	100.0000	1.0050	1.0067	1301.616
2	ACTIVE	1900.1180	2077128	200.0000	1.0000	9.5006	8291.610
3	ACTIVE	50.0028	154522	1000.0000	1.0200	0.0510	8299.721
4	ACTIVE	100.0056	309043	36.0000	1.0000	2.7779	1639.754
5	HI	0.0000	318	1000.0000	1.0000	0.0000	0.318
6	LO	0.0000	0	1000.0000	1.0000	0.0000	0.000

Station F/Rate	13.2852
Station Total	11232.980

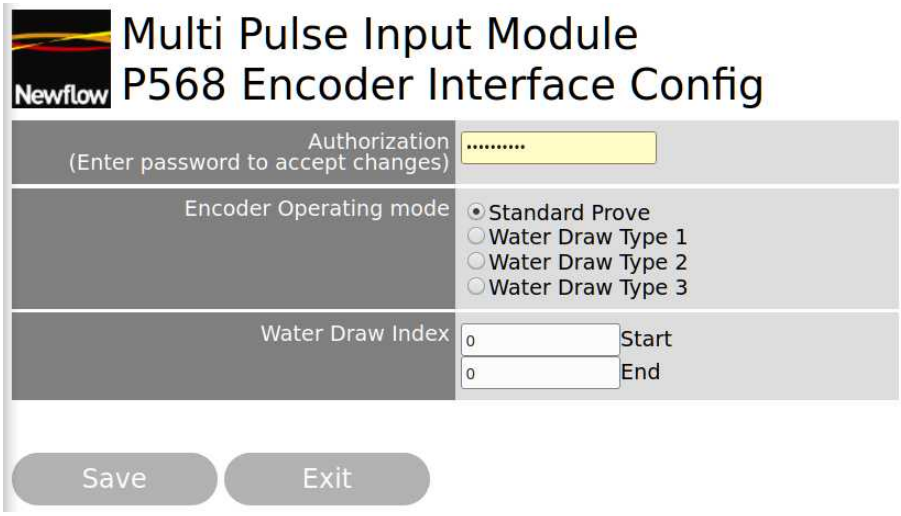
Exit

Individual Measurement Channels	
CH	This column indicates which measurement channel is being referred to.
INPUT	This indicates the pulse input state for each channel. If the input is running, the background will be green and will state ACTIVE. Note the relevant activity LED on the top of the unit will also be showing green. If the input is in a DC condition, the text will state HI or LO depending upon the DC level applied (not relevant for high impedance inputs).
FREQ	This column shows the frequency of the pulse input for each measurement channel to four decimal places. If the input is static, it will show 0.0000.
COUNT	This is the pulse count for each measurement channel. It is a 32 bit unsigned integer, and will wrap at 4,294,967,295.
KF	This column shows the K-Factor that was entered for each measurement channel via the Config page on the website or using the Modbus Interface.
MF	This column shows the Meter Factor that was entered for each measurement channel, via the Config page on the website or using the Modbus Interface.
F/RATE	This field shows the calculated F(LOW) RATE for each channel, taking into account the K-Factor (KF) and Meter Factor (MF). The Flow rate is in the units of the K-Factor per second. For example in screenshot 4 above, the K-Factor shown is in pulses per pound, and hence the Flow Rate is shown in pounds per second. If the background is shown in mustard-yellow color (as the Station F/Rate and Station Total are shown) this indicates that the channel has been selected to add its Flow Rate (F/Rate) into the Station F/Rate.
TOTAL	This is the cumulative Flow Total for each channel since the channel total was reset. The total is a 64 bit unsigned integer with 3 implicit decimal points. Thus the total has a resolution of 0.001 and will roll over at around 1.8 e16, or approximately 58,000 years at 10KHz. This is the Flow Total. The total is stored in NVRAM and will be preserved when powered down. If the background is shown in mustard-yellow color this indicates that the channel has been selected to add its Flow Total into the Station Flow Total.
Station	
Station Flow	This is the summated flow rate for all the measurement channels that the Station Totalizer check box has been set as active. Note this summation assumes that all the selected measurement channels have the same Flow Rate units. That is, they are all pulses per pound, pulses per gallon, etc.
Station Total	This is the summated flow total for all the measurement channels that the Station Totalizer check box has been set as active. Note this summation assumes that all the selected measurement channels have the same Flow Rate units. That is, they are all pulses per pound, pulses per gallon, etc. The total is a 64 bit unsigned integer with 3 implicit decimal points. Thus the total has a resolution of 0.001 and will roll over at around 1.8 e16, or approximately 9,000 years with all 6 channels selected and running at 10KHz.

4 Encoder Interface Mode

The Encoder Interface mode is designed to work with the MicroCube Encoder Small Volume Prover application, and can be operated in standalone mode when the encoder based prover is calibrated using the water draw method.

The Encoder Interface mode can be selected using XML communications by the MicroCube or from the website. From the website, click the Mode button and select the radio button for Encoder Interface and supply a valid password in the Authorization field (see Screenshot 2).



There are four operating modes available, one Prove mode and three water draw modes.

Standard Prove	In standard prove mode, the encoder is totally controlled by the MicroCube Encoder Small Volume Prover application using XML communications over Ethernet. Refer to the MicroCube application manual for further details.
Water Draw Type 1,2 & 3	The water draw modes can be used standalone, without a MicroCube Prover Application. The three different types allow different arrangements of divertor valves to be accommodated. Please contact the factory for further details.
Water Draw Index	The Start and End Indices define the actual segment of the prover which is to be calibrated. Note: for multi-segment proving (multiple passes within one stroke of the piston) the Start & End Indices would need to be updated for each segment. For convenience, these values can be set using the XML communications.

During Proving or water draw, the diagnostics page can be viewed so that process can be monitored.

From the home page, click the Diagnostics button and the screen below will be shown.

NOTE: Once an encoder based prove cycle has been started, the P568 MPIM will be unresponsive until either the last virtual detector switch (Encoder Point Of Interest) or a timeout occurs. During this interval the web server will not update the diagnostics menu.

For a long prove cycle, the unresponsive time may be such, that the web browser informs the user that the web server is no longer reachable, so ideally once the unit is setup and working, do not continue to monitor the Encoder Interface Diagnostics page.

4.1 Encoder Interface Diagnostics Menu

Encoder Interface Diagnostics

CH	INPUT	FREQ	COUNT	KF	MF	FLOW	TOTAL
1	ACTIVE	100.1495	928958	1000.0000	1.0000	0.1001	8611.077
2	ACTIVE	233.0046	2161301	1000.0000	1.0000	0.2330	19331.589
3	ACTIVE	50.0028	463815	1000.0000	1.0000	0.0500	4131.011
4	ACTIVE	100.0056	927630	1000.0000	1.0000	0.1000	8262.095

Encoder Position	4294967294

Exit

When the encoder mode is selected, only 4 measurement channels are available and the station function is not supported. Channel Ch1 is used as the prover pulse source, but the three remaining channels can be used with other pulse sources.

In addition, for diagnostic purposes, the encoder position is displayed. Note that once the launch signal has been given during a prove, the encoder position is only updated once the encoder reaches the last point of interest.

5 JitterScope Mode

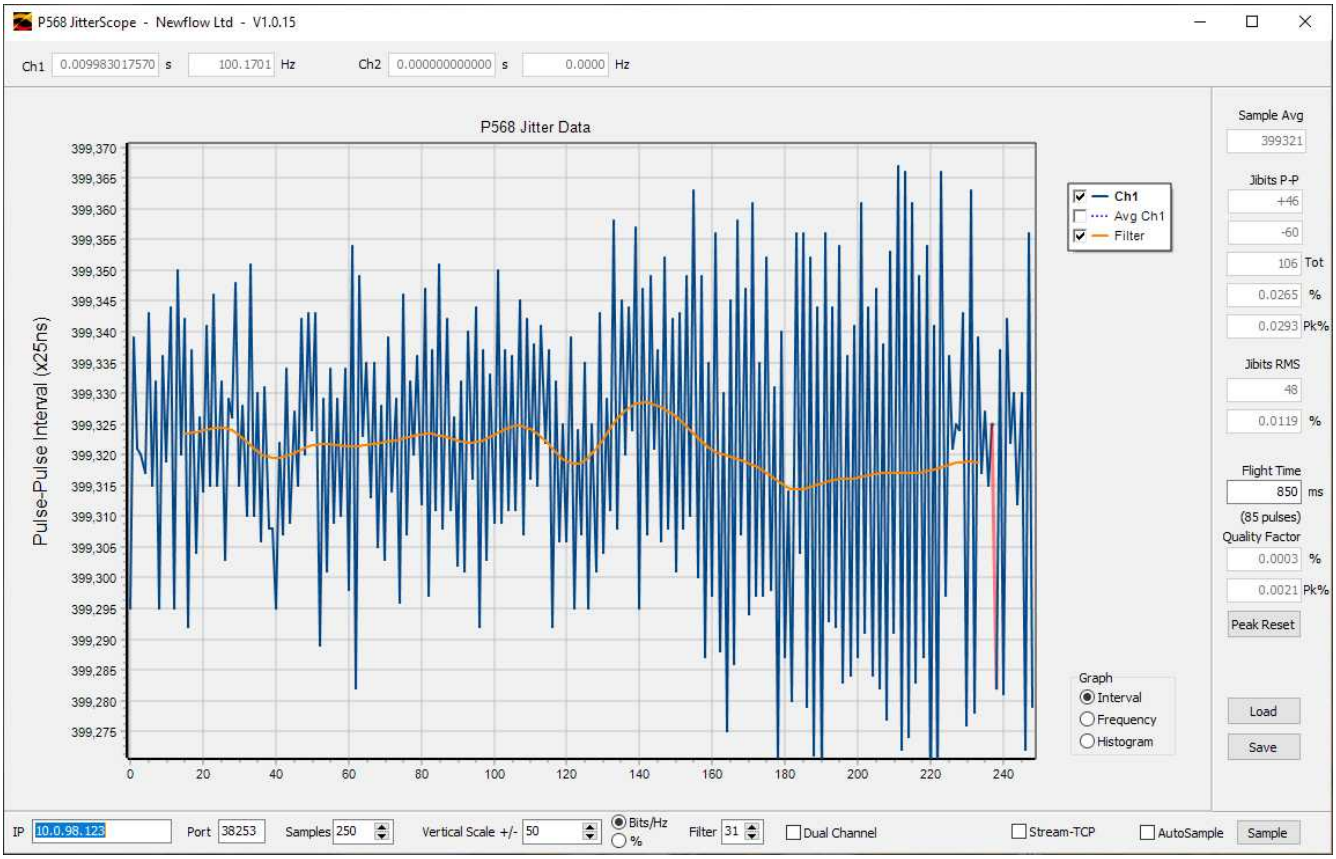
The P568 MPIM has a high stability oscillator, to give accurate pulse frequencies. In addition, it can measure the period ***between*** Input meter pulses to a very high resolution.

The JitterScope visualization program allows an operator to readily see the pulse jitter introduced by worn bearings on a mechanical meter, Pre-amplifier problems, electrical noise pickup or problems with manufactured pulses from Coriolis and Ultrasonic flow meters.

This information is invaluable for understanding field proving problems and can also be used to determine what type and/or size of prover will be needed to get a repeatable prove.

This analytical tool has also been used by a number of vendors of whose products use vibrating processes, such as density meter, Coriolis meter and viscosity meter manufacturers as well as many rotary based products.

The screenshot below is just one sample view of the JitterScope Visualization program.



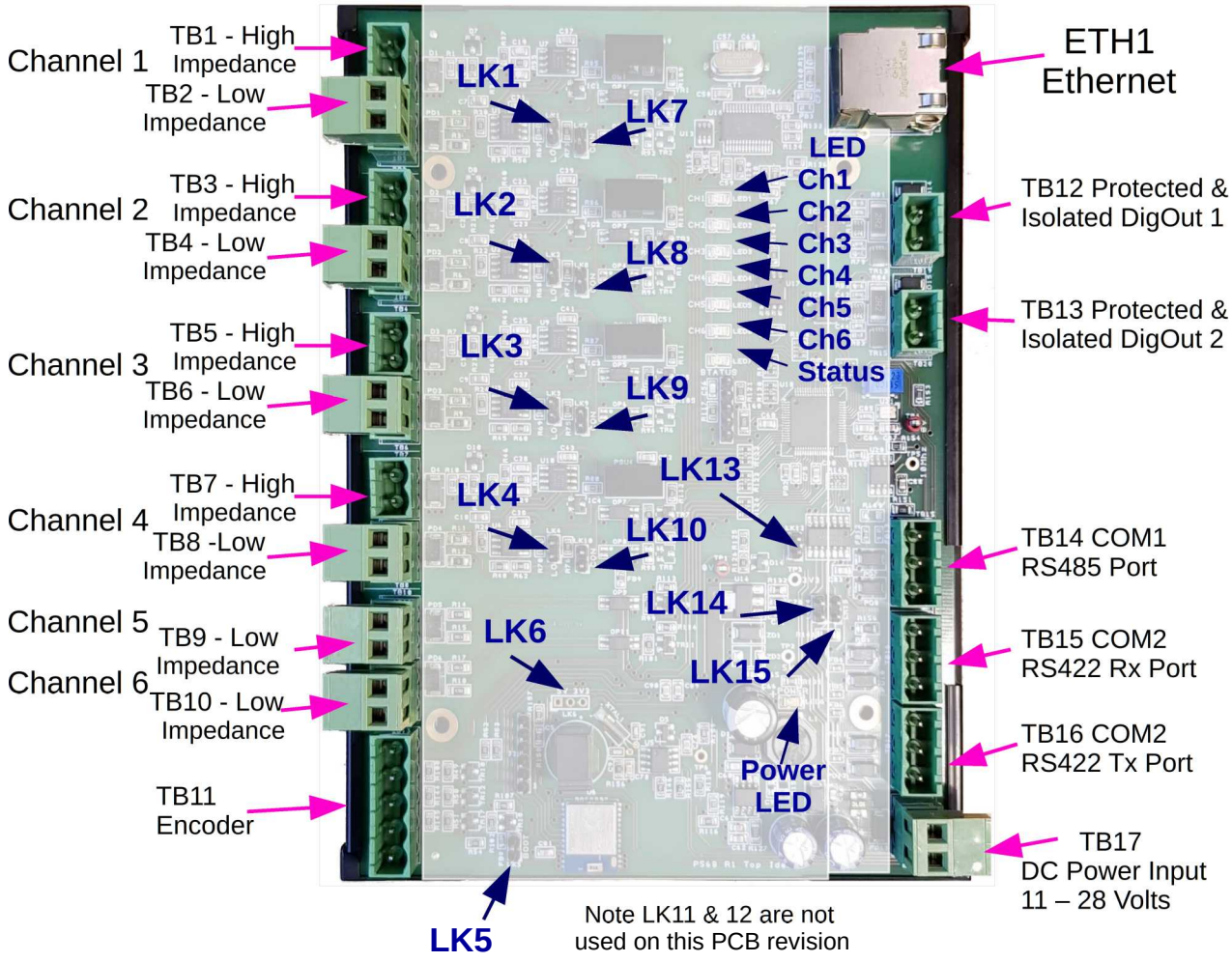
The JitterScope Visualization program is very powerful and there is a separate manual detailing the operation of the diagnostic tool.

6 P568 Hardware

The P568 MPIM is designed to operate both as an expansion board for the MicroCube and in stand-alone mode.

The P568 MPIM is designed to be attached to 35mm symmetrical Top Hat rail to TS35/7.5 DIN, EN50022 or asymmetric G-type rail to EN50035. It requires 6 5/8 Inches (168 mm) along the rail and is 5 1/4 inches (134 mm) wide.

The diagram below shows the location of the connectors & their function, as well as indicator LEDs and the internal jumper settings.



7 Inputs

7.1 DC Power Input

The P568 MPIM is designed to run from a DC supply of between 11 Volts to 30 Volts, the same as the MicroCube Flow Computer.

7.2 Pulse Inputs

All meter pulse inputs are optically isolated, both in the low impedance direct connection or when the built-in active circuitry of the signal conditioner is enabled.

Four of the six Pulse Inputs (Channels 1 to 4) have a link selectable signal conditioner input.

If the low impedance inputs are used, these are similar to the MicroCube Pulse Inputs, or other flow computers, and operate down to DC.

If the high impedance inputs are used, each channel is still optically isolated but only loads the input very lightly, as it has a minimum of 15KΩ input impedance. The AC coupling reduces the sensitivity below 10Hz, so is not intended for measuring when flow is almost static.

NOTE: Channels 5 and 6 are not available if the encoder inputs are in use.

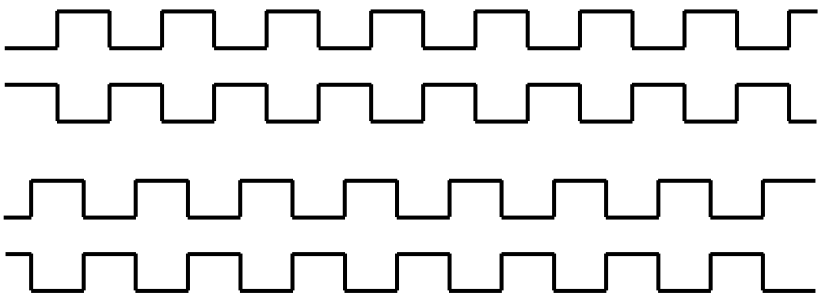
7.3 Encoder Inputs

These are designed to take in the very high speed pulses that can come from a linear encoder, when proving at high speed.

The P568 MPIM can be factory set to accept either single-ended encoder pulse inputs or differential encoder pulse inputs. The default factory setting is to use differential encoder input pulse.

If configured for single ended encoder pulses, these should be connected to Terminal Block TB11. TB11 can also supply 5 volt power to the encoder (up to 150mA is available).

As standard, the P568 MPIM is configured for differential encoder pulse inputs These should be connected to Terminal Blocks TB14 and TB15. Note but these are labeled on the enclosure as RS422/485 comms ports.



Ch A (normal) connect to TB14-1

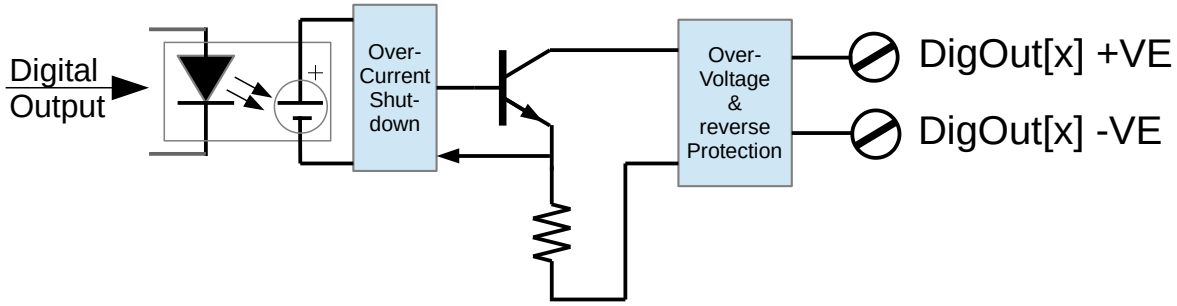
Ch B (normal) connect to TB15-1

NOTE: It is difficult to determine the direction from most encoder data sheets, so the direction should be checked by looking at the Encoder Position information on the Encoder Interface Diagnostics Menu, see section 4.1 Encoder Interface Diagnostics Menu .

If the direction is wrong, swap the plugs between TB14 and TB15 to reverse the direction seen by the P568 MPIM.

8 Outputs

The P568 MPIM has two sets of very rugged optically isolated digital outputs. The diagram below shows the equivalent circuit of one channel.



The isolated digital output circuit is fully floating. Each can be used to either source current (by connecting the +VE connection to the 24 Volt supply, with the -VE connection providing a switched voltage source) or can be used as a traditional open collector, with the -VE terminal connected to the supply ground.

This is an exceedingly rugged field output, but if overloaded it will protect itself and shutdown. Once a shutdown has been triggered, the digital input will need to go off before it will reset. When next turned on, it will respond once more.

These are intended for driving Samplers and future firmware will generate flow related pulses.

9 Communications

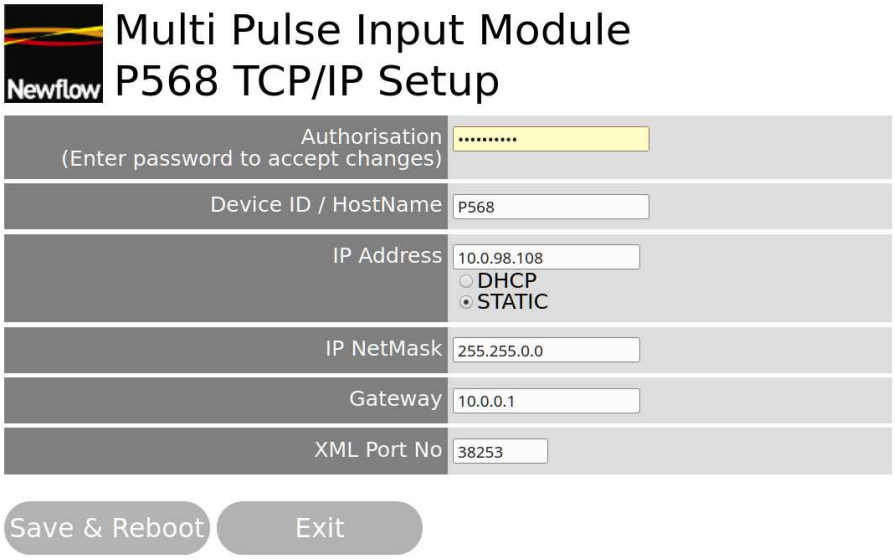
There are currently two possible communication links available. The P568 MPIM has a wired Ethernet port and a Bluetooth port. The serial ports are not currently used for serial data communications.

The wired Ethernet supports the following features:

- The ability to configure the IP address and other features provided by MicroConf "Zero-Configuration" See Section 10 MicroConf - Network Discovery & Configuration Tool
- The IP address and other communication settings can also be modified using the built in web server see Section 9.1 TCP/IP setup using a web browser immediately below.
- The Modbus TCP port, described in Section 9.2 Modbus Interface
- The Newflow XML link described in Section 9.4 XML Data Link

A subset of the features is available over the Bluetooth Link. Section 11 Driving the P568 MPIM Android App shows these features.

9.1 TCP/IP setup using a web browser



Authorisation	The password must be input before any changes are saved.
Device ID / HostName	The Device ID will default to P568, but can be changed to distinguish particular units when viewed using MicroConf. Up to 15 ASCII characters can be stored, but note that the field is padded with spaces, so these need to be deleted.
IP Address	If the DHCP radio button has been selected, this field will show the IP address that has been allocated to the unit by the DHCP server. If Static IP radio button has been selected then the IP address must be entered in commonly used IPv4 quad-dotted decimal representation, as shown by the example screen on the previous page.
IP Netmask	If the DHCP radio button has been selected, this field will show the Netmask that has been allocated to the unit by the DHCP server. If Static IP method has been selected then the Netmask can be input. The Netmask must be entered in IPv4 quad-dotted decimal representation, like an IP address.
Gateway	If the DHCP radio button has been selected, then this field will show the gateway that has been allocated to the unit by the DHCP server. If Static IP radio button, the manual Gateway address can be entered. The Gateway address must be entered in IPv4 quad-dotted decimal representation. NOTE: The P568 MPIM does not currently push data, so this setting is currently not required
XML Port No	The XML port number must match the port number used by the NÅNO Flow Computer. **NOTE:** This setting does not change the Modbus port which is fixed as port 502

9.2 Modbus Interface

The Modbus Interface is Modbus-TCP using the standard Modbus port 502.

Modbus Slave Address is 01

The P568 MPIM supports Function codes FC3 & FC16.
FC4 commands are also interpreted exactly as if they were FC3.

The addressing is register based (rather than logical addressing) and has zero offset. Therefore to write to the Write Protection Register at address 1000 (decimal), the Modbus string would show "03 E8" as the address when viewed in hexadecimal, as in the example in section 9.2.1 below.

In the Modbus Map in section 9.3 , the heading labeled ATT. means attribute and defines the read or write behavior.

- RO indicates that the data is Read Only.
- R/W indicates that the data has both Read and Write attributes
- PRW indicates a Protected Read/Write location. The data can always be read, but the write will not be accepted unless the Modbus Write Protection register had the correct pass code written to it on the previous Modbus communications cycle. The pass-code is 2B67 hex (11111 decimal).

The column labeled NV indicates if the value is stored in Non-Volatile memory, so will be remembered following a power cycle. A "YES" indicates that the value is stored.

There are five data types used.

1. INT16 is the standard 16 bit Modbus data format in 10 byte order.
2. INT32 denotes a 32 bit extended Modbus integer in 3210 byte order.
3. INT64 denotes a 64 bit super-extended Modbus integer in 76543210 byte order.
4. Float denotes an IEEE754 32 bit Binary Floating point number in 3210 byte order.

9.2.1 Example of a Protected Write

NOTE: The standard Modbus port 502 is used for all Modbus communications

In order to write to a protected Read/Write location, pass-code 2B67 must be written to the Write Protection Register, address 1000 (decimal) IMMEDIATELY before writing to the protected register to set the enable flag. Any write cycle or read cycle will clear this flag.

Below is an example showing the hexadecimal data to reset the Ch1 Flow Total.

Sent: 00 01 00 00 00 09 01 10 03 E8 00 01 02 2B 67	//Write decimal 11111 (2B67) to reg 1000 (03E8)
Response: 00 01 00 00 00 06 01 10 03 E8 00 01	//response from P568 MPIM
Sent: 00 01 00 00 00 09 01 10 03 EE 00 01 02 00 01	//Write 1 to register 1006
Response: 00 01 00 00 00 06 01 10 03 EE 00 01	//response from P568 MPIM

9.3 Modbus Map

Modbus Address (decimal)	Type	Description	ATT.	NV?	Range	Pre-Scaler Value
1000	INT16	Write Protection Register	R/W	-	Only 1 valid value	None
1001	INT16	P568 Operating Mode - Encoder, JitterScope, 6Channel mode	R/W	Yes	1, 2 or 4	Binary
1002	INT16	Encoder Mode - Standard, WD1,2,3	R/W	-	0, 1, 2 or 3	Binary
1003	INT16	Rawout Select. Bit selection from LSB is: None, 1, 2, 3, 4, 5, 6, Station	R/W	Yes	0 to 255	Binary
1004	INT16	Near Unit Scaler - Off(0) On(1)	R/W	Yes	0 or 1	Binary
1005	INT16	Station Totalizer Selection. Ch1 is bit 0,Ch6 is bit 5	PRW	Yes	0 to 63	Binary
1006	INT16	Reset Totals. Ch1 is bit 0,Ch6 is bit 5 & the station total is bit 6	PRW	-	0 to 127	Binary
1007	INT16	Firmware Major Revision	RO	-		None
1008	INT16	Firmware Minor Revision	RO	-		None
1009	INT16	Firmware Build Number	RO	-		None
1010	INT16	Product Number	RO	-	Always 568	None
1011	INT16	Device ID (lowest four hex digits of the MAC address	RO	-	0 to 65535	None
1012	INT16	Update Counter. This increments twice per second and indicates when new data is available. It rolls over at 65535.	RO	-	0 to 65535	None
1100	INT32	WaterDraw Index Start	R/W	-	0 to 2e31	Not Scaled
1102	INT32	WaterDraw Index Stop	R/W	-	0 to 2e31	Not Scaled
1104	INT32	Pulse Count Ch1	RO	-	unsigned 32 bit	None
1106	INT32	Pulse Count Ch2	RO	-	unsigned 32 bit	None
1108	INT32	Pulse Count Ch3	RO	-	unsigned 32 bit	None
1110	INT32	Pulse Count Ch4	RO	-	unsigned 32 bit	None
1112	INT32	Pulse Count Ch5	RO	-	unsigned 32 bit	None
1114	INT32	Pulse Count Ch6	RO	-	unsigned 32 bit	None
1120	INT64	Flow Total Ch1	RO	Yes	unsigned 64 bit	Count x 1000
1124	INT64	Flow Total Ch2	RO	Yes	unsigned 64 bit	Count x 1000
1128	INT64	Flow Total Ch3	RO	Yes	unsigned 64 bit	Count x 1000
1132	INT64	Flow Total Ch4	RO	Yes	unsigned 64 bit	Count x 1000
1136	INT64	Flow Total Ch5	RO	Yes	unsigned 64 bit	Count x 1000
1140	INT64	Flow Total Ch6	RO	Yes	unsigned 64 bit	Count x 1000
1144	INT64	Flow Total - Station	RO	Yes	unsigned 64 bit	Count x 1000
1200	Float	K-Factor Ch1	R/W	Yes	Not Range Checked	None

Modbus Address (decimal)	Type	Description	ATT.	NV?	Range	Pre-Scaler Value
1202	Float	K-Factor Ch2	R/W	Yes	Not Range Checked	None
1204	Float	K-Factor Ch3	R/W	Yes	Not Range Checked	None
1206	Float	K-Factor Ch4	R/W	Yes	Not Range Checked	None
1208	Float	K-Factor Ch5	R/W	Yes	Not Range Checked	None
1210	Float	K-Factor Ch6	R/W	Yes	Not Range Checked	None
1212	Float	Station Output K-Factor	R/W	Yes	Not Range Checked	None
1214	Float	Meter Factor Ch1	R/W	Yes	Not Range Checked	None
1216	Float	Meter Factor Ch2	R/W	Yes	Not Range Checked	None
1218	Float	Meter Factor Ch3	R/W	Yes	Not Range Checked	None
1220	Float	Meter Factor Ch4	R/W	Yes	Not Range Checked	None
1222	Float	Meter Factor Ch5	R/W	Yes	Not Range Checked	None
1224	Float	Meter Factor Ch6	R/W	Yes	Not Range Checked	None
1226	Float	Frequency Ch1	RO	-	1 to 12,500	None
1228	Float	Frequency Ch2	RO	-	1 to 12,500	None
1230	Float	Frequency Ch3	RO	-	1 to 12,500	None
1232	Float	Frequency Ch4	RO	-	1 to 12,500	None
1234	Float	Frequency Ch5	RO	-	1 to 12,500	None
1236	Float	Frequency Ch6	RO	-	1 to 12,500	None
1238	Float	Flow Rate Ch1	RO	-	Not Range Checked	None
1240	Float	Flow Rate Ch2	RO	-	Not Range Checked	None
1242	Float	Flow Rate Ch3	RO	-	Not Range Checked	None
1244	Float	Flow Rate Ch4	RO	-	Not Range Checked	None
1246	Float	Flow Rate Ch5	RO	-	Not Range Checked	None
1248	Float	Flow Rate Ch6	RO	-	Not Range Checked	None
1250	Float	Flow Rate Station	RO	-	Not Range Checked	None

Note the INT64 can be read as two INT32 values with the lower address being the higher order word.

As an example 1120 as an INT64 would have 1120 as the high order word as an INT32 with 1122 as the low order word as an INT32.

9.4 XML Data Link

When the P568 MPIM is used with the NÅNO Flow Computer, the NÅNO controls the operation and retrieves acquired data utilizing a sub-set of the Newflow XML Schema. Port 38253 is used as standard, but can be changed in the web server TCP/IP Setup menu page.

For more information on the XML Link, see the NANO XML Comms - Rev22.pdf document.

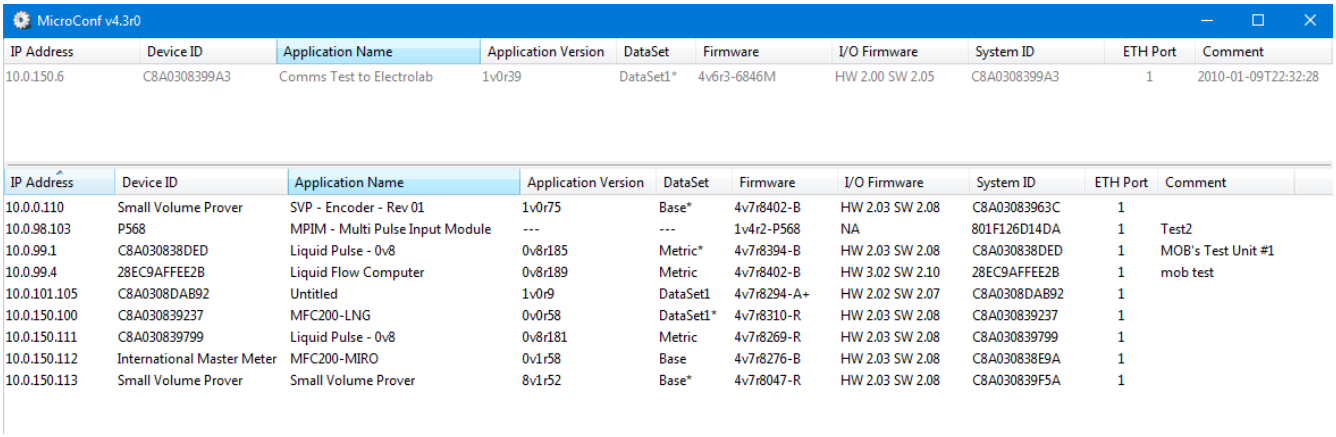
10 MicroConf - Network Discovery & Configuration Tool

When used with a MicroCube Flow Computer, MicroConf allows the operator to load applications and a host of additional tasks.

However when used with the P568 MPIM, only the following functions are available.

- Strobe Ident Light
- Start Web Interface
- Configure (network)

A screenshot of a Windows PC running MicroConf is shown below. In this example, the second item shown in the lower display pane (sorted by IP Address) is a P568 MPIM at address 10.0.98.103



IP Address	Device ID	Application Name	Application Version	DataSet	Firmware	I/O Firmware	System ID	ETH Port	Comment
10.0.150.6	C8A0308399A3	Comms Test to Electrolab	1v0r39	DataSet1*	4v6r3-6846M	HW 2.00 SW 2.05	C8A0308399A3	1	2010-01-09T22:32:28

IP Address	Device ID	Application Name	Application Version	DataSet	Firmware	I/O Firmware	System ID	ETH Port	Comment
10.0.0.110	Small Volume Prover	SVP - Encoder - Rev 01	1v0r75	Base*	4v7r8402-B	HW 2.03 SW 2.08	C8A03083963C	1	
10.0.98.103	P568	MPIM - Multi Pulse Input Module	---	---	1v4r2-P568	NA	801F126D14DA	1	Test2
10.0.99.1	C8A030838DED	Liquid Pulse - 0v8	0v8r185	Metric*	4v7r8394-B	HW 2.03 SW 2.08	C8A030838DED	1	MOB's Test Unit #1
10.0.99.4	28EC9AFFEE2B	Liquid Flow Computer	0v8r189	Metric	4v7r8402-B	HW 3.02 SW 2.10	28EC9AFFEE2B	1	mob test
10.0.101.105	C8A0308DAB92	Untitled	1v0r9	DataSet1	4v7r8294-A+	HW 2.02 SW 2.07	C8A0308DAB92	1	
10.0.150.100	C8A030839237	MFC200-LNG	0v0r58	DataSet1*	4v7r8310-R	HW 2.03 SW 2.08	C8A030839237	1	
10.0.150.111	C8A030839799	Liquid Pulse - 0v8	0v8r181	Metric	4v7r8269-R	HW 2.03 SW 2.08	C8A030839799	1	
10.0.150.112	International Master Meter	MFC200-MIRO	0v1r58	Base	4v7r8276-B	HW 2.03 SW 2.08	C8A030838E9A	1	
10.0.150.113	Small Volume Prover	Small Volume Prover	8v1r52	Base*	4v7r8047-R	HW 2.03 SW 2.08	C8A030839F5A	1	

The MicroConf program shows two panes when started. The upper pane is used to display machines that are being actively managed, with known and fixed IP address. The lower pane shows all the machines that have been discovered using the MicroConf Zero-Configuration networking.

Each machine is shown on a separate row, there are ten columns of information shown for each machine, these are explained in the table below.

NOTE

MicroConf has the concept of Local and Remote machines. A local machine is one that is available over an office LAN, which supports the full range of TCP/IP commands and allows broadcast messages to be sent. A remote machine is one with more limited connectivity, internet connected but outside the corporate firewall and hence having restricted TCP/IP connectivity and with broadcast messages filtered out.

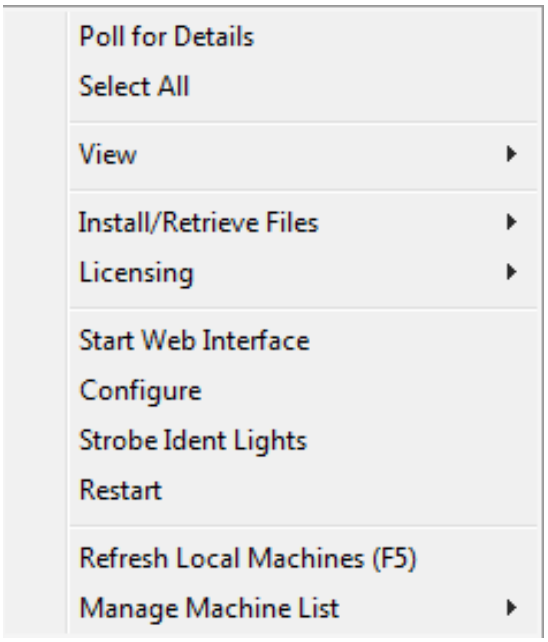
The MicroConf Zero-Configuration networking eliminates the highly frustrating and convoluted methods needed to set up some Ethernet enabled equipment. There is no requirement to change either your PC/Laptop's IP address or subnet in order to discover a compatible device and change its network settings. This is true even if it has been set to an address outside the range used on the LAN network.

IP Address	This column shows the IP addresses in IPv4 quad-dotted decimal representation.
Device ID/ Hostname	The Device ID is a user selectable field that can be used to differentiate between machines. It can be changed via the web interface.
Application Name	This field is fixed and will show MPIM - Multi Pulse Input Module
Application Version	This field is not populated for the P568 MPIM.
DataSet	This field is not populated for the P568 MPIM.
Firmware	This column shows the version number of the P568 MPIM firmware resident.
I/O Firmware	This field is not applicable to the P568 MPIM and will show NA.
System ID	This field shows the MAC address of the P568 MPIM.
ETH Port	This field will always be a 1 for the P568 MPIM (as there is only 1 Ethernet port)
Comment	This shows the comment that may be changed using the Configure (Machine) right-click option.

MicroConf is a deceptively powerful program. Although it only appears to have two similar panes, without tabs or menu items, access to the additional functions is obtained by the use of the right-click mouse button.

If you left-click on the line which shows the P568 MPIM machine you wish to interact with, the line will be highlighted.

If you now right-click whilst pointing at the highlighted line, the menu shown here on the right will be displayed. All of the menu items are shown as available. If you do not highlight a line and right click over white space on the screen, then the menu displayed will have most of the items shown "grayed-out" indicating these options are not available for use.



For example you cannot install an application if you have not selected a target device.

It is possible to select more than one unit using the shift and control keys, in line with the usual Windows conventions. When you right-click after selecting more than one unit, you will get a different selection of options in the right-click menu.

Items that are not supported or relevant will be grayed out to signify that they are not available.

Poll for Details	This is not relevant when using the P568 MPIM.
Select All	This is not relevant when using the P568 MPIM.
View	This is not relevant when using the P568 MPIM.
Install/Retrieve Files.	This is not relevant when using the P568 MPIM.
Licensing	This is not relevant when using the P568 MPIM.
Start Web Interface	This item is only available when one machine has been selected. Selecting this option will start the PC/Laptop's default browser and load the selected IP address into the browser.
Configure	This item is only available when one machine has been selected. Selecting this option opens the Configure Machine window. This shows the Network settings for each of the Ethernet Interfaces. Ethernet Interface 1 has a check box for DHCP. If selected, this network interface will be given its setting by the DHCP server. If the box is not checked, the user can enter in standard quad-dot notation the IP address, the Netmask and the Gateway address. The second port does not exist in the P568 MPIM.
Strobe Ident Lights	This item is only available when one machine has been selected, and causes the unit's hardware Ident Lights to flash. When Strobe Ident Lights command is issued to the relevant P568 unit, LED 7, the Status LED, flashes rapidly and the LEDs 1 to 6 flash in a "Knight Rider" KITT fashion for 30 seconds allowing the unit to be physically identified.
Restart	This is not supported when using the P568 MPIM.
Refresh Local Machines (F5)	This option is available with none, one or several machines selected. This action forces the auto-discovery mechanism to do an immediate check for machines that may be on the Local Area Network (LAN).
Manage Machine List	This option is used to select which machines appear in the managed (upper) pane. There are 4 sub-menus available, these are:. **Add** - This option is always available, and allows the user to type in an IP address or a range of addresses. **NOTE:** The user can highlight one or more machines in the discovered (lower) pane and drag them to the upper pane to add them to the managed list. **Remove** - This option is only available with one or more of the managed machines selected in the upper pane. **Import** - With the cursor in the managed (upper) pane, this option opens an explorer style dialog and a nanolist file (.nnl suffix) can be selected. The selected file will be parsed and the upper window will be populated accordingly. **Export** - This allows the user to export the list of managed machines in .nnl format. One or more managed machines must be selected and this option then exports the details of the selected machines to the .nnl list.

11 The P568 Android Tool

As an alternative interface, an Android application has been generated. This allows settings to be configured and the pulse input frequencies visualized.

The App is currently very simple, but can be enhanced with user feedback.

Currently it only shows the input frequency on the six pulse input channels, and allows the Meter Factors and K-Factors for each channel to be configured. In addition, the Station channel selection can be made and the Raw Out source chosen.

11.1 Enabling the Bluetooth Link

To establish the Bluetooth link, go to settings on the Android device, select Bluetooth, ensure Bluetooth is turned on and then search for devices.

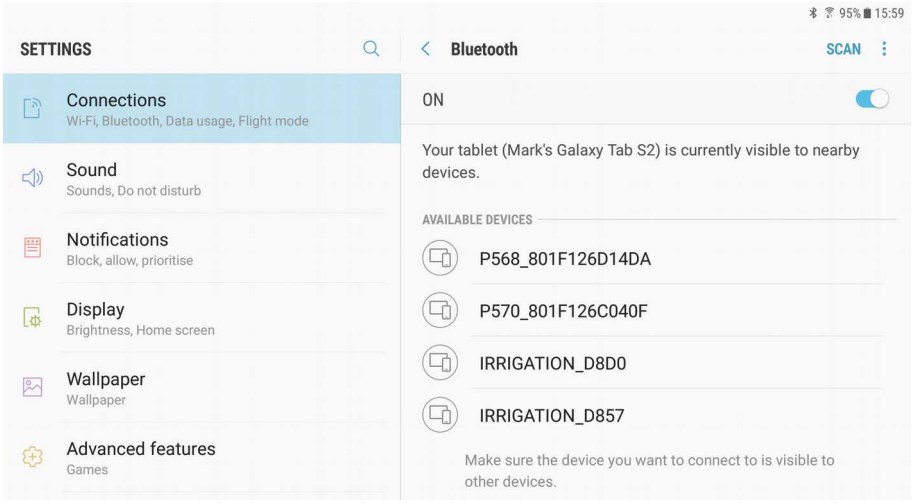
Assuming the P568 MPIM is both turned on and in range (within 10 feet), your Android device should be able to detect the P568 MPIM.

The screenshot on the following page shows that there are no devices paired, and four new devices have been discovered by the device search.

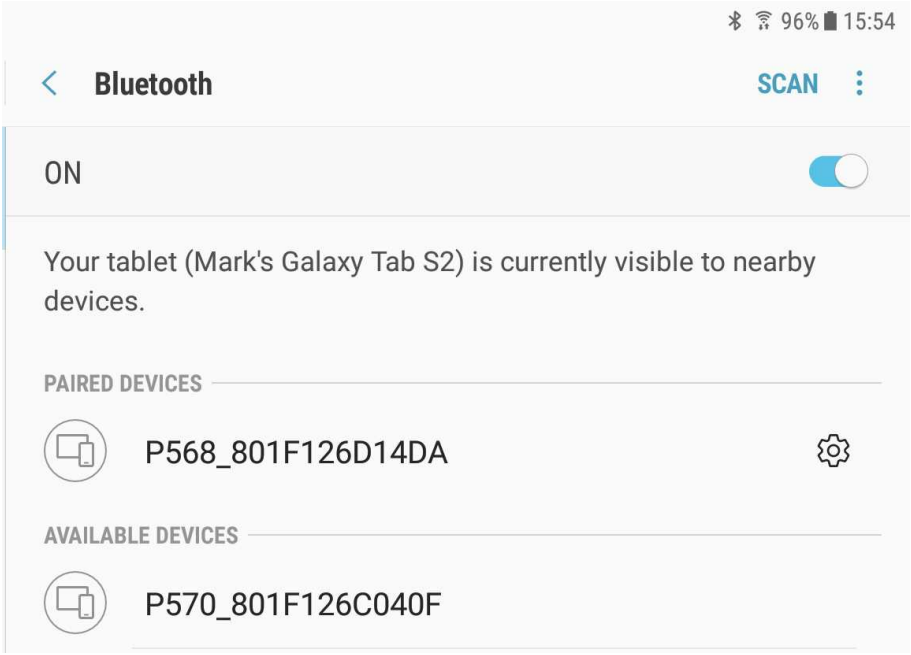
The Bluetooth name of Newflow products is a combination of the Product Number (P568 in this case) and the Ethernet MAC address

In the list of available devices shown in the screenshot on the following page, the first device in the list is a P568 MPIM. If the unit is not found, pressing the SCAN button will force the Android device to search again.

Note: If several P568 units are discovered, you can find out which is which by looking at the label on the underside the P568 MPIM, it will show the last 6 digits of the MAC address.



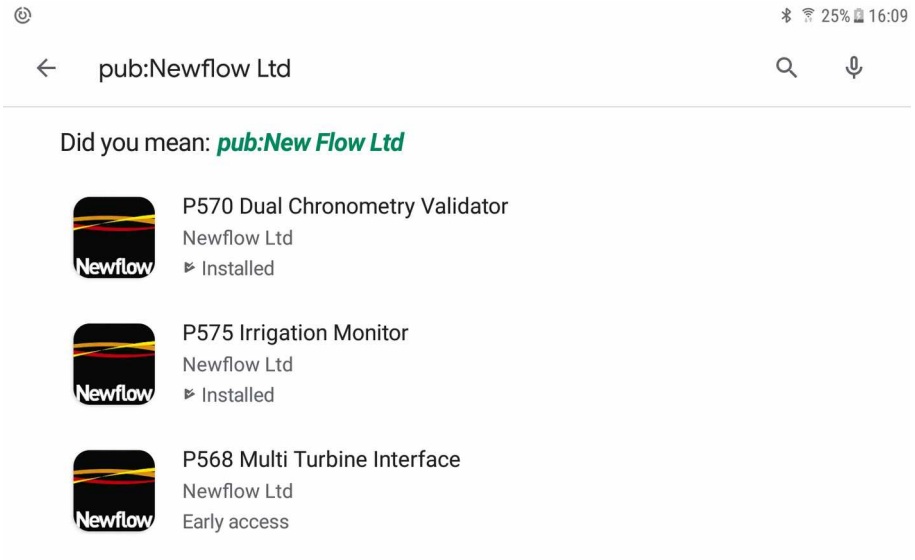
By clicking on the relevant device in the AVAILABLE DEVICES list, Android will then perform the pairing operation and will add the P568 MPIM unit into the PAIRED DEVICES list, as shown on the next page.



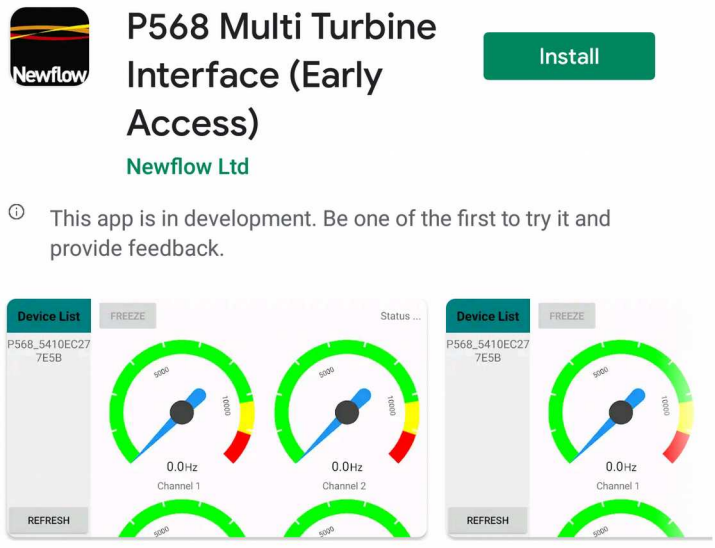
Now that your Android device is paired with the P568 MPIM, you can install and launch the P568 MPIM Android Application.

11.2 Installing the P568 MPIM Android App

The P568 MPIM App is available on the Android Play Store. Search for the publisher Newflow Ltd and all the Newflow applications will be displayed. The search string should be "**pub:Newflow Ltd**" Note the search is case sensitive.

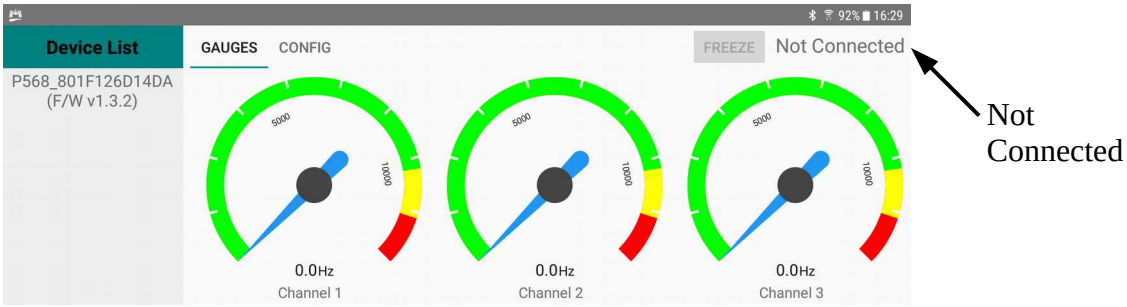


Select the P568 Application



When installing the Application, you will need to give permission for the Application to access the Bluetooth communications. The App does not look at anything else on your Android device, nor does it store any data on your Android device, it simply acts as the display and relays the settings.

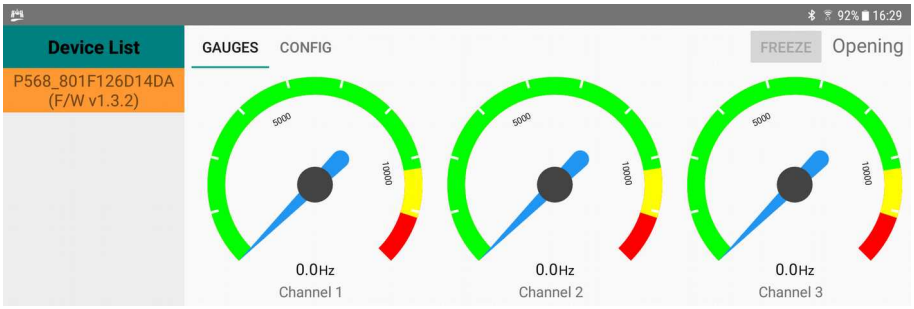
Once you have installed the P568 MPIM App, launch it, and the user will be presented with the Device List and Gauges page, as shown on the following page.



In the screenshot above, the Android P568 MPIM App has launched, but is not connected as shown at the top right hand side of the Android App. To connect to the P568 MPIM hardware, click on the device to be used in the device list on the left hand side. In this example there is only one paired P568 MPIM.

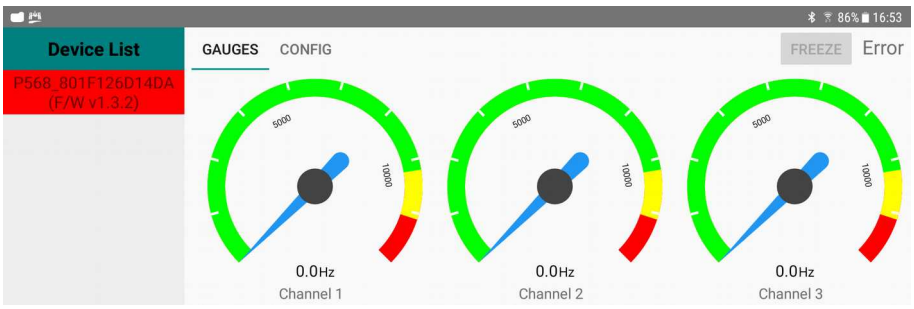
NOTE: As well as showing the Name and MAC address, the firmware version running in the P568 MPIM is also shown.

Clicking on the desired device name, starts the connection process. The background of the selected unit will become orange in color, as shown in the screenshot below.



If the connection is successful, the display will look like the screenshot on the following page.

If however, the connection cannot be made, the background of the selected unit will become red in color, as shown in the screenshot below. To retry, simply click on the device name another time.



If your device does not show up at all in the Device List then click the refresh button at the bottom of the screen. Note, you may need to scroll down, depending upon the screen size of the Android device.

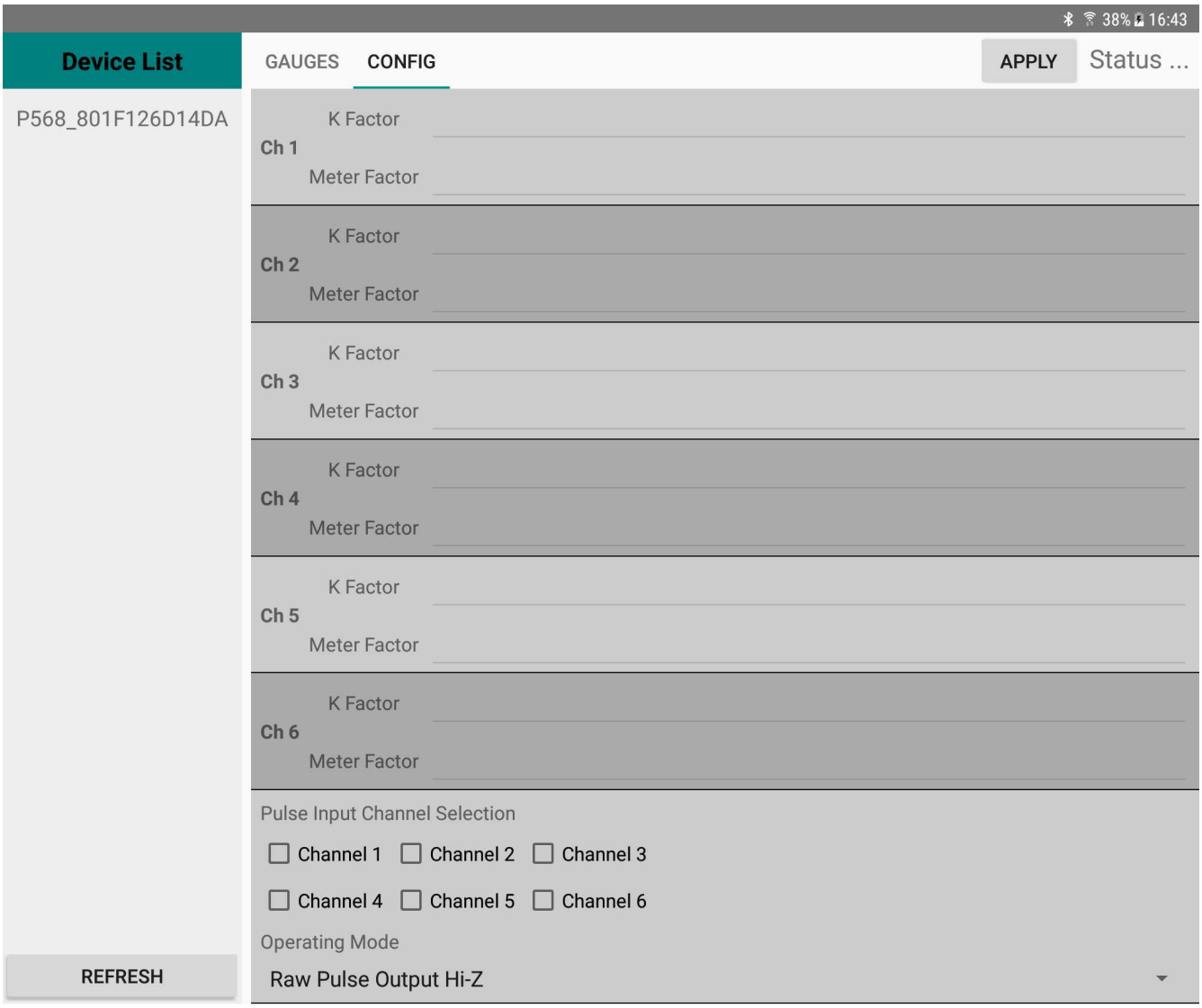
Note 1: Depending upon your device screen size, you may only see a portion of this whole screen at any one time, and will have to scroll up and down to get to all the features available.

Note 2: The P568 MPIM App is designed to run in Landscape mode. Regardless of your Android settings, the App will not rotate into Portrait mode.

12 Driving the P568 MPIM Android App

The GAUGES tab simply shows the Pulse Input Frequency for all six Pulse Input channels.

Clicking the CONFIG tab, allows the user to set the K-Factor & Meter Factors. It also allows selecting which channels are to be grouped into the station and the mode for the differential Raw Out signal.



The K-Factor and Meter Factor for channels Ch1 to Ch6 can be typed in.

The Pulse Input Channel Selection is a tick box for each channel.

The Operating mode is a pull-down offering the range of choices available.

13 LED Indicators

There are 8 LEDs on the unit used to give feedback to the installer or operator.

LED #	Color	Description
Ch1	Green	Channel 1 activity indicator. If off, no meter pulses are being received. If the pulse frequency is above 1Hz, the LED will stay on. Below 1Hz the LED will flash as the leading edge of each pulse is received.
Ch2	Green	Channel 2 activity indicator, operating as for Channel 1, above
Ch3	Green	Channel 3 activity indicator, operating as for Channel 1, above
Ch4	Green	Channel 4 activity indicator, operating as for Channel 1, above
Ch5	Green	Channel 5 activity indicator, operating as for Channel 1, above
Ch6	Green	Channel 6 activity indicator, operating as for Channel 1, above
Status	Red	Communications Status LED. When a TCP/IP connection or a Bluetooth SPP connection is opened, the LED will be on. As data packets are received and sent, the LED flashes off briefly.
Power	Blue	Power-on Indicator

13.1 Power On

The P568 starts almost immediately, and rapidly flashes the Status LED for 600mS. At the same time all the channel LEDs come on together for 1 second.

14 Field Connections

Connector	Pin	Detail	Description
TB1	1	Signal	Channel 1 High Impedance Meter Pulse Input
	2	Ground	
TB2	1	+	Channel 1 Low Impedance Meter Pulse Input
	2	-	
TB3	1	Signal	Channel 2 High Impedance Meter Pulse Input
	2	Ground	
TB4	1	+	Channel 2 Low Impedance Meter Pulse Input
	2	-	
TB5	1	Signal	Channel 3 High Impedance Meter Pulse Input
	2	Ground	
TB6	1	+	Channel 3 Low Impedance Meter Pulse Input
	2	-	
TB7	1	Signal	Channel 4 High Impedance Meter Pulse Input
	2	Ground	
TB8	1	+	Channel 4 Low Impedance Meter Pulse Input
	2	-	
TB9	1	+	Channel 5 Low Impedance Meter Pulse Input
	2	-	
TB10	1	+	Channel 6 Low Impedance Meter Pulse Input
	2	-	
TB11	1	+5 Supply	Single Ended Quadrature Encoder Connections
	2	0V Return	
	3	QA (Input)	
	4	QB (Input)	
	5	INDEX (Input)	
TB12	1	DigOut1 +ve	Protected Digital Output 1
	2	DigOut1 -ve	
TB13	1	DigOut2 +ve	Protected Digital Output 2
	2	DigOut2 -ve	
TB14	1	Non Inverting	Differential Encoder A-Train Pulse inputs (Using COM1 RS485 Port)
	2	Inverting	
	3	Ground	

Connector	Pin	Detail	Description
TB15	1	Non Inverting	Differential Encoder B-Train Pulse inputs (Using COM2 Rx Port)
	2	Inverting	
	3	Ground	
TB16	1	Non Inverting	Differential Raw Output Port (Using COM2 Tx Port)
	2	Inverting	
	3	Ground	
TB17	1	+VE	DC Power Input (11 to 28 Volts)
	2	Return	

15 Jumper settings

LK #	Description	Default
LK1	Channel 1, Signal Conditioner Gain Jumper (Low gain when fitted)	On
LK2	Channel 2, Signal Conditioner Gain Jumper (Low gain when fitted)	On
LK3	Channel 3, Signal Conditioner Gain Jumper (Low gain when fitted)	On
LK4	Channel 4, Signal Conditioner Gain Jumper (Low gain when fitted)	On
LK5	Bluetooth Boot select Jumper - Factory use only	Off
LK6	Bluetooth FTDI Jumper power select - Factory use only	not fitted
LK7	Channel 1, Signal Conditioner Enabled when Jumper fitted	On
LK8	Channel 2, Signal Conditioner Enabled when Jumper fitted	On
LK9	Channel 3, Signal Conditioner Enabled when Jumper fitted	On
LK10	Channel 4, Signal Conditioner Enabled when Jumper fitted	On
LK11	Not used on this design	
LK12	Not used on this design	
LK13	Tx-Rx Loop-back. Must match LK14. Must be OFF for Encoder usage	OFF
LK14	Tx-Rx Loop-back. Must match LK13. Must be OFF for Encoder usage	OFF
LK15	RS422 Receiver termination. Active when Jumper fitted	On

16 FAQs

16.1 FAQ 1

Q) Can I use the Low Impedance and High Impedance inputs on the same Meter Pulse Input channel at the same time?

A) No, you can only connect to one set of terminals for each channel.

16.2 FAQ 2

Q) The meter is shut in, but I see occasional green flashes on LED 1, why is that?

A) Even very slow, infrequent pulses will trigger the channel indicator LED for 1 second as each pulse edge is detected.

17 Label Showing Pin Out