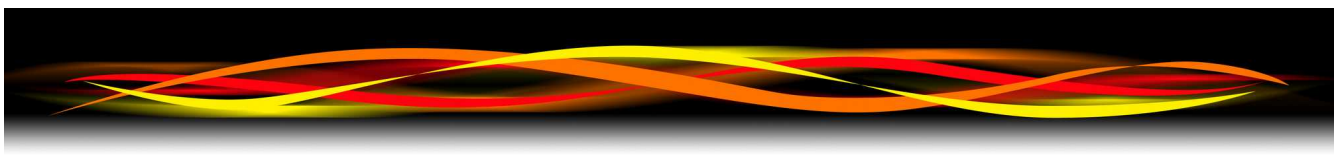
# Newflow

# *“JitterScope”*™

# Operating Manual



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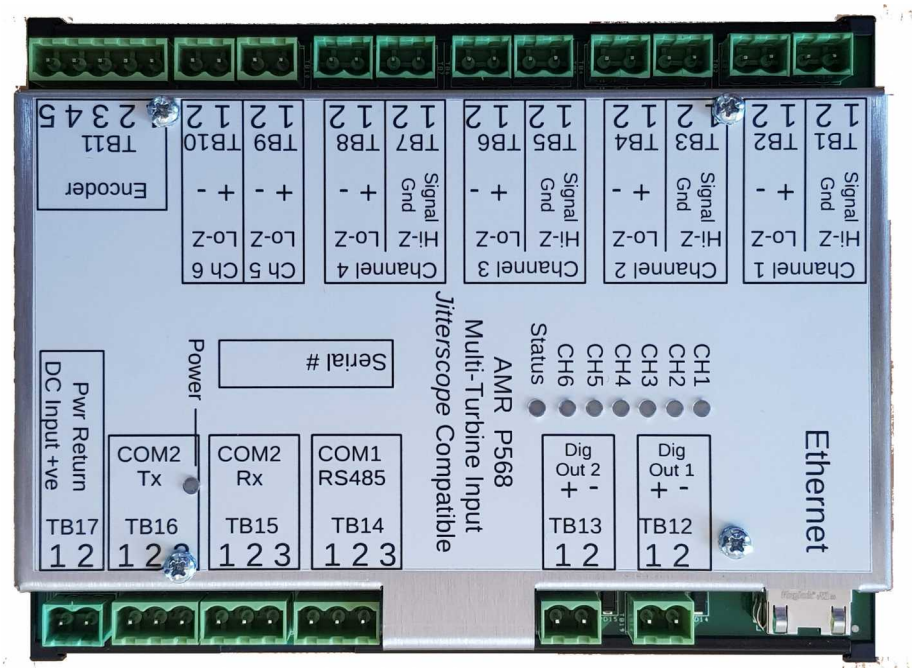
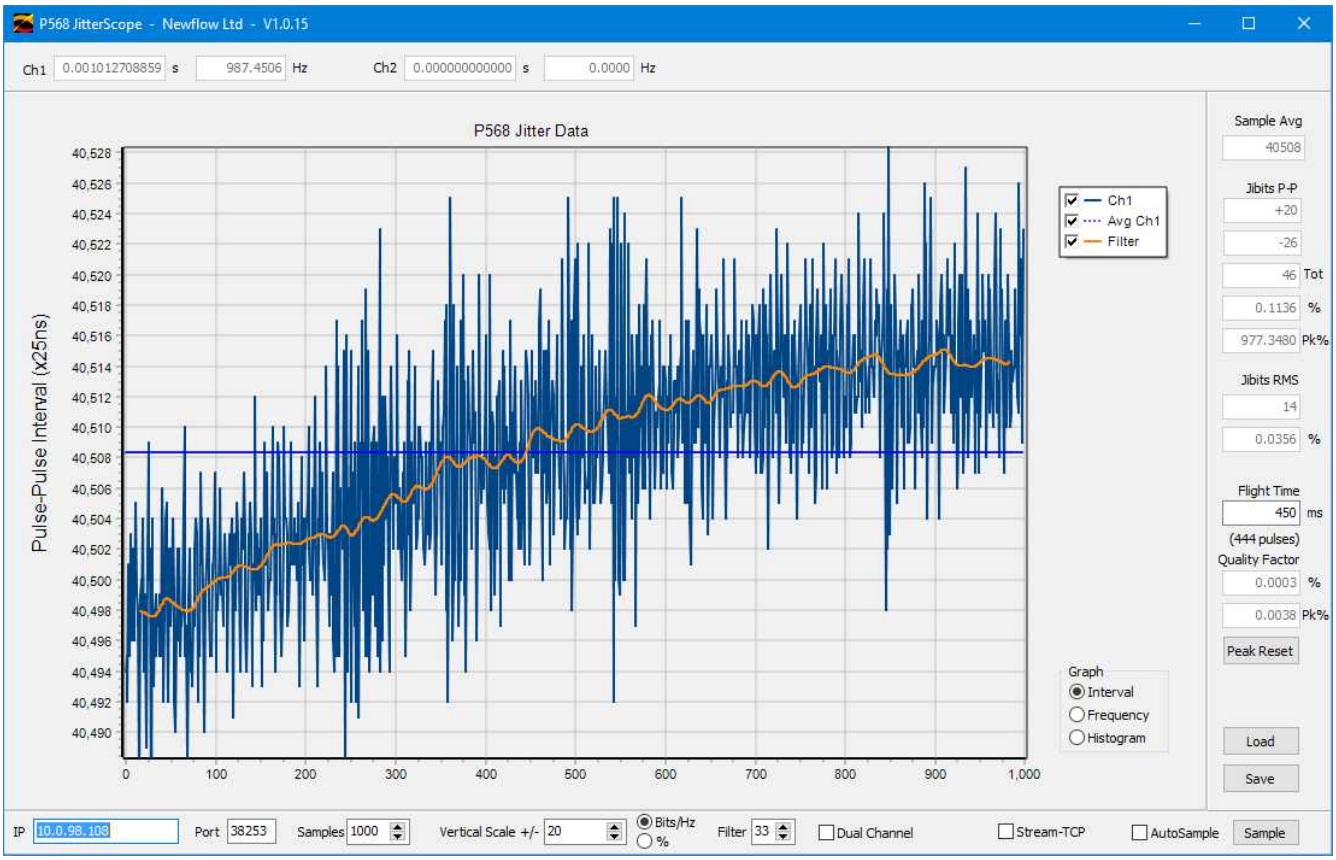
# P568 Multi-Pulse Input Module




# JitterScope™ Display



# Table of Contents

# 1 Introduction

The JitterScope is an add-on feature to the P568 MPIM. The P568 hardware accurately times the rising edge of every single pulse on input channels 1 and 2. This information can be either streamed continuously (assuming the PC and Network speeds allow) or it can be sampled in sections of up to 3000 data points per sample. This will work perfectly on slower PCs and networks, including WAN and Internet connections.

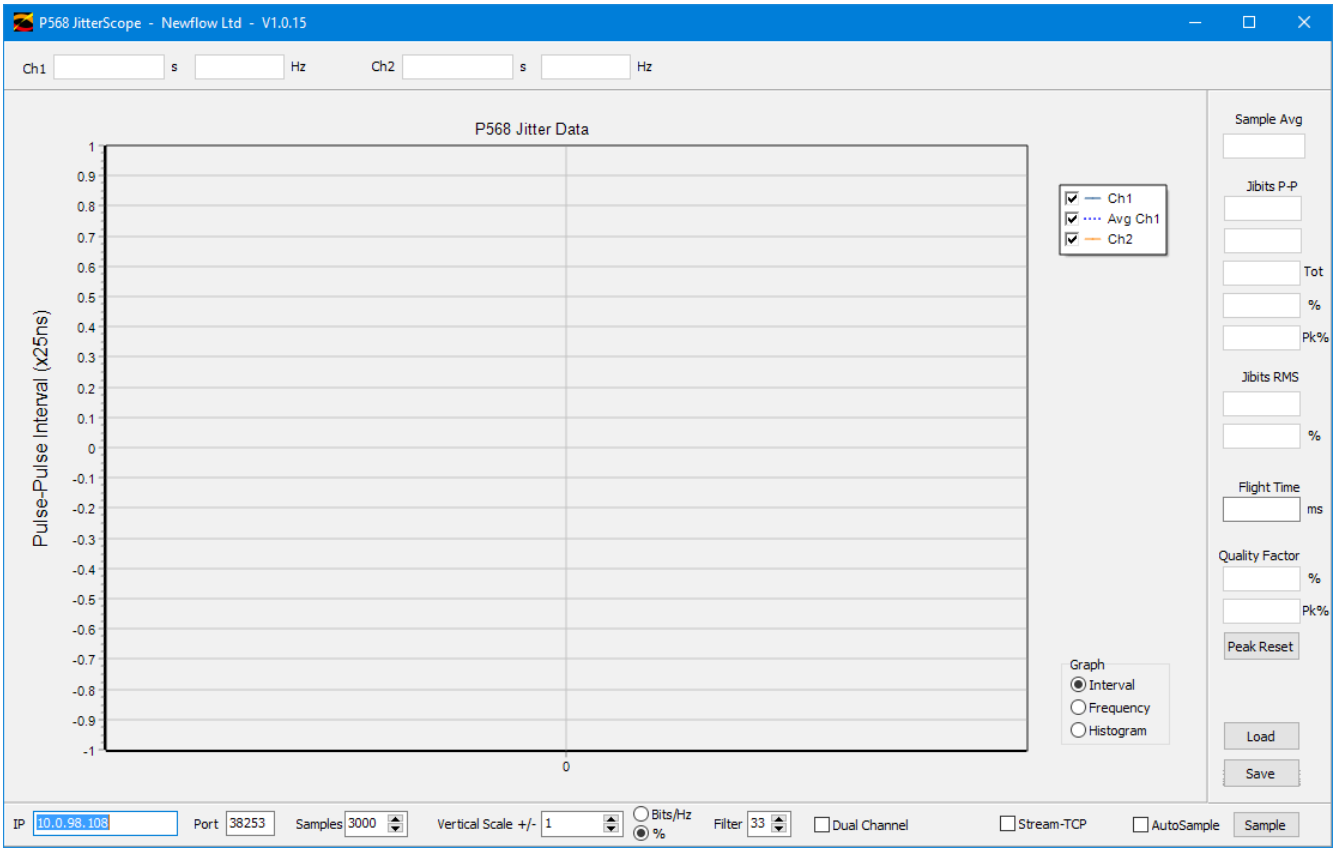
The JitterScope is a visualization tool to view the inter-pulse timing on repetitive pulses in the range of 1Hz to 10KHz, with exceptionally high resolution.

## 1.1 Install the JitterScope program

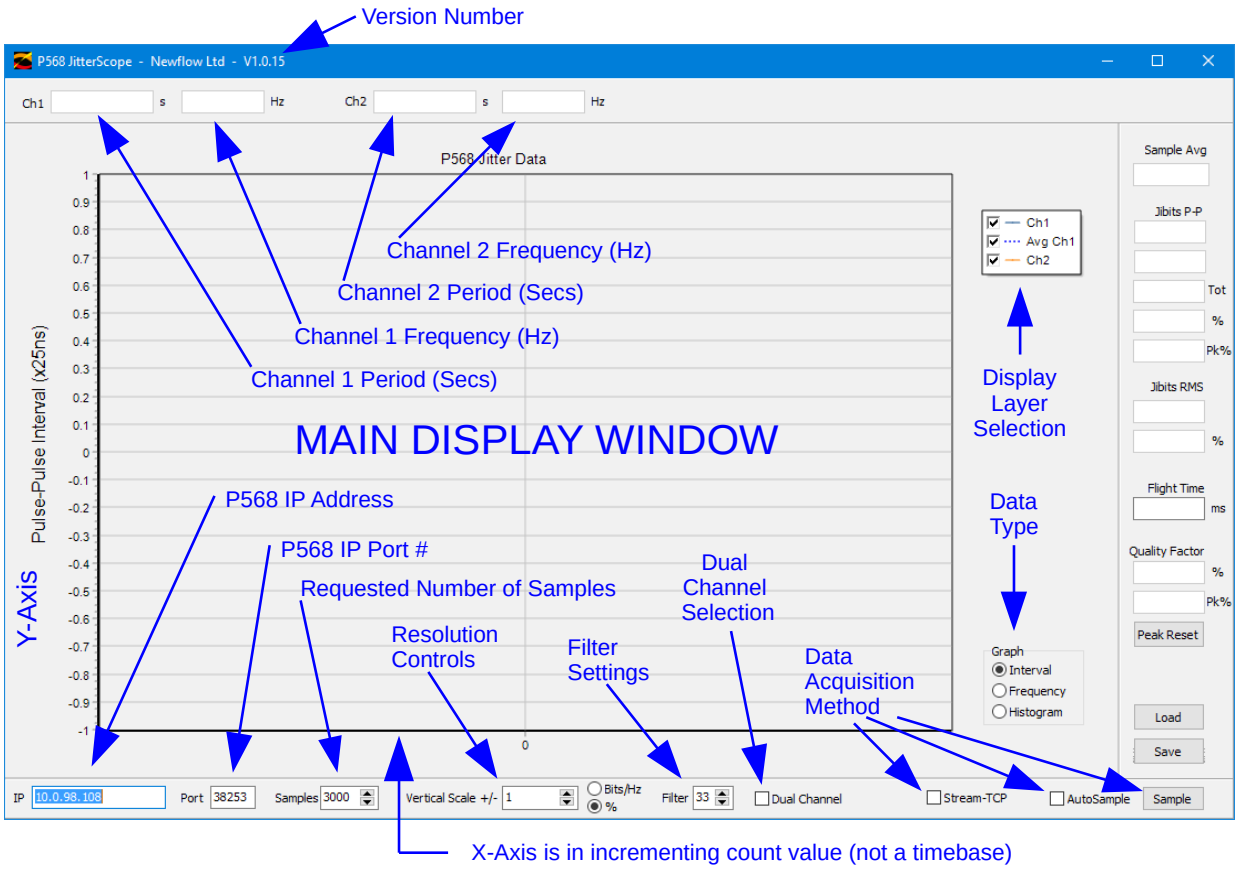
The JitterScope program, P568capx_y_z.exe is a standalone executable that does not need any supporting files (such as DLLs), and so does not need to be installed, it just runs in place like a portable application. If no INI file has been supplied, when the P568capx_y_z.exe file is launched, a default P568cap.ini file will be created in the same folder/directory. If however an INI file has been supplied, it will be called P568cap.ini and should be placed in the same folder/directory as the .exe file.

## 1.2 Launching the JitterScope program

To launch the JitterScope program, simply double click on the executable or make a link to the executable, pin it to the task bar or start menu and select it. Shown below is the initial screen.



## 1.3 JitterScope Screen Elements, Main Window



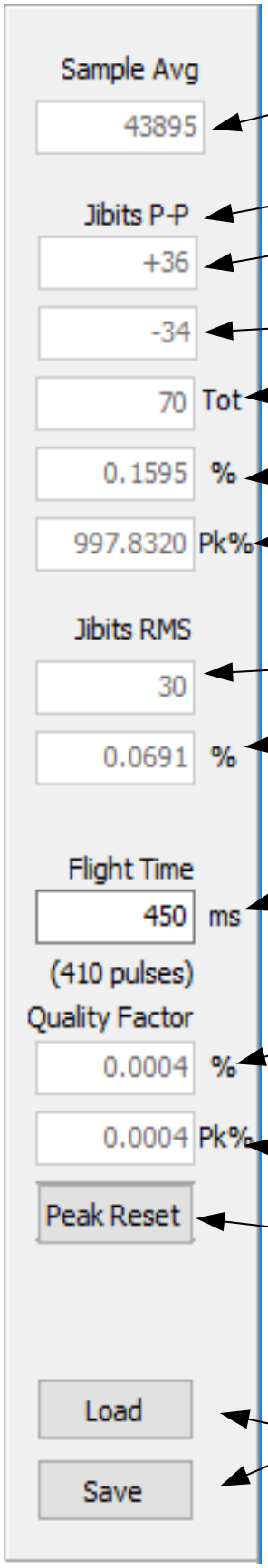

The various screen elements are explained in detail below.

| | |
|---|---|
| ***Version Number*** | The Vx.y.z field following the program name shows the version number of JitterScope. |
| ***Channel 1 Period (Secs)*** | This field shows the average period between consecutive pulses on Channel 1, averaged across all the displayed sample points. |
| ***Channel 1 Frequency (Hz)*** | This field shows the average frequency of all the displayed pulses on Channel 1. |
| ***Channel 2 Period (Secs)*** | This field shows the average period between consecutive pulses on Channel 2, averaged across all the displayed sample points. |
| ***Channel 2 Frequency (Hz)*** | This field shows the average frequency of all the displayed pulses on Channel 2 . |
| **P568 IP Address** | This must be set to match the IP address of the P568 MPIM in use. |
| **P568 IP Port #** | This should be set to 38253 unless otherwise directed by the factory. |

| | |
|---|---|
| **Requested No. of samples** | This number of requested samples can be from 10 up to 3000. At high frequencies, you will always get the requested number of samples, but note, there is a 3 second maximum acquisition time in Sample (and Autosample) mode, so below 1KHz, the JitterScope may not be able to display the requested number. At 200Hz, the JitterScope can display a maximum of 600 samples along the horizontal (X) axis. |
| **Resolution Controls** | The resolution control determines the vertical (Y) axis scaling.<br>There are two radio buttons which allow the scaling to be set as either a percentage of the average or as Bits or Hz depending upon Data Type (Interval or Frequency). Once the radio button selection has been made, the vertical scale can be set.<br>In percentage mode, the spin buttons allow a percentage between 1% and 100% to be selected although a larger value can be typed in.<br>In Interval mode, the Bits setting can be any value above 10. In Frequency mode, the Hz setting can be any value above 10. |
| **Filter Settings** | This selects the number of bits used in the rolling average, displayed in the Display Layer Selection dialog. Note in single channel mode the Display Layer Selection box will substitute Ch2 for the Filter display. |
| **Dual Channel Selection** | Dual Channel mode is intended for studying two channels that are basically operating at the same frequency, but may have a different phase and different jitter, such as the dual pulse outputs from a turbine meter. Interpreting the data from two unrelated pulse streams is very complex, and is not recommended. |
| **Display Layer Selection** | In single channel mode, the Display Layer Selection shows a tick box associated with 3 layers that can be shown in the Main Display Window area. These are Ch1, Avg Ch1 and Filter. Ch1 displays the data from Channel 1 on the P568. Avg Ch1 will show a horizontal straight line indicating the average over all of the samples currently displayed, and the Filter shows a weighted average. |
| **Data Type** | The Main Display Window can display the data in three different ways, according the radio button selection made. The three choices are Interval, Frequency and Histogram.<br>In Interval mode, the vertical (Y) axis shows the number of 25nS intervals between one pulse and the next pulse. With a stable 10KHz signal fed into Channel 1 of the P568, there will be around 4000 counts.<br>If Frequency mode is selected, the vertical (Y) axis will be in terms of Hz.<br>If Histogram mode is displayed, the vertical (Y) axis shows the number of samples that fit into any one frequency. |

| | |
|---|---|
| **Data Acquisition Method** | There are 3 methods of acquiring data for the JitterScope™ to display. There is a Sample button, that acquires a single set of data in the P568, and transmits it to the JitterScope program, each time the button is clicked. The second method is to tick the Autosample box. This mode is the equivalent of continuously pressing the Sample button, and the display will update as rapidly as the data is made available.<br><br>The two sample modes of operation are reliable even with slow data links and slow computers, with slow graphic capabilities and slow disk access.<br><br>The third method is Stream-TCP. This mode is very powerful, as there are no gaps in the data acquisition, but when the input frequency is high, the Program redraws the screen at very high rates and logs the streamed data to a disk file. Unless all elements of the PC are fairly rapid, especially the graphics interface, data can be lost resulting in apparent spikes of 0Hz in Frequency mode or huge counts in Interval mode. |
| **Right Hand Toolbar** | The right hand toolbar complements the Main Display Window by providing some numerical data, see the explanations below. |

## 1.4 JitterScope Screen Elements, Right Hand Toolbar




This box shows the average pulse to pulse interval for all the samples displayed as the number of 25ns intervals

The boxes below show the peak Jitter Bits (Jibits) values

This box shows the peak positive Jibits from the sample average

This box shows the peak negative Jibits from the sample average

This box shows the peak to peak total Jibits from the sample

This box shows the peak to peak total Jibits as a percentage of the sample average. So 70/43895 as a % in this example

This box shows the maximum percentage of Jibits since the Peak Reset button (below) was clicked. A huge number indicates either a massive change in frequency or a PC overrun

This box shows the jitter as an RMS average of Jibits

This box shows the RMS averaged Jibits as a percentage of the sample average.

In order to calculate the JitterScope proving Quality Factor, the proving Flight Time must be entered into this box. The line below then shows the number of pulse between the detector switches

This box shows prover Quality Factor, which can be used to determine if the pulse stream being fed to the prover has a low enough jitter to prove successfully

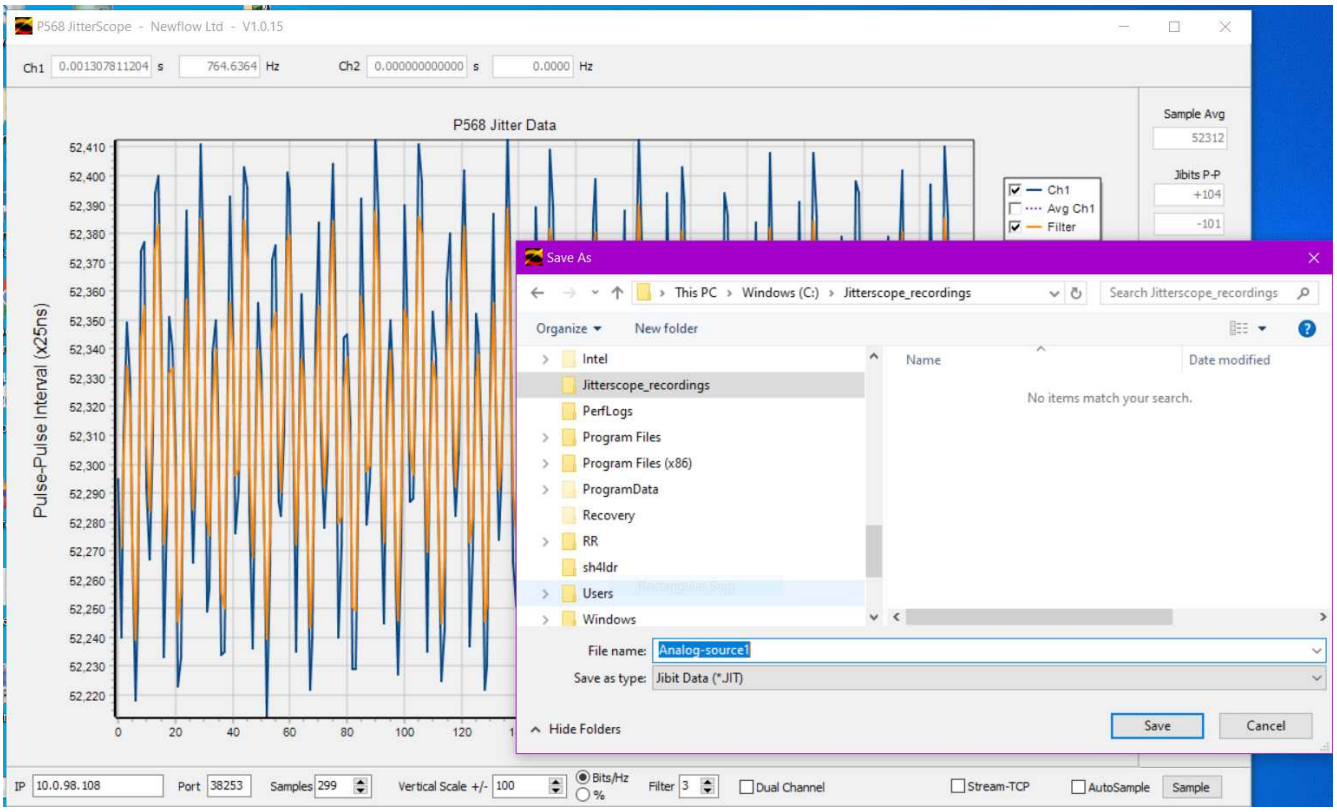
This box shows the maximum Quality Factor since the Peak Reset button (below) was clicked.

The Peak Reset button clears both the maximum peak to peak percentage value and the maximum Quality Factor value

The Save button allows the sampled data to be stored on the PC and the Load button re-imports the saved data for viewing at a later time. This is explained further below

## 1.5 Saving and Loading Sampled Data

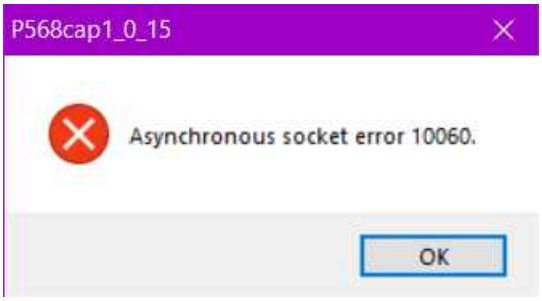
The Load and Save buttons allows the sampled data to be stored for later analysis. Clicking the Save button opens the standard Windows Explorer dialogue box, as shown below.




The file will be given a .JIT extension but the contents are in plain data, and can be viewed in a simple text editor, such as Notepad.

The Load dialog is similar, it allows the user to navigate to where .JIT files are stored, re-import the pulse data and recalculate all of the displayed values.

# 2 Running the JitterScope




For the first run, click the Sample button.

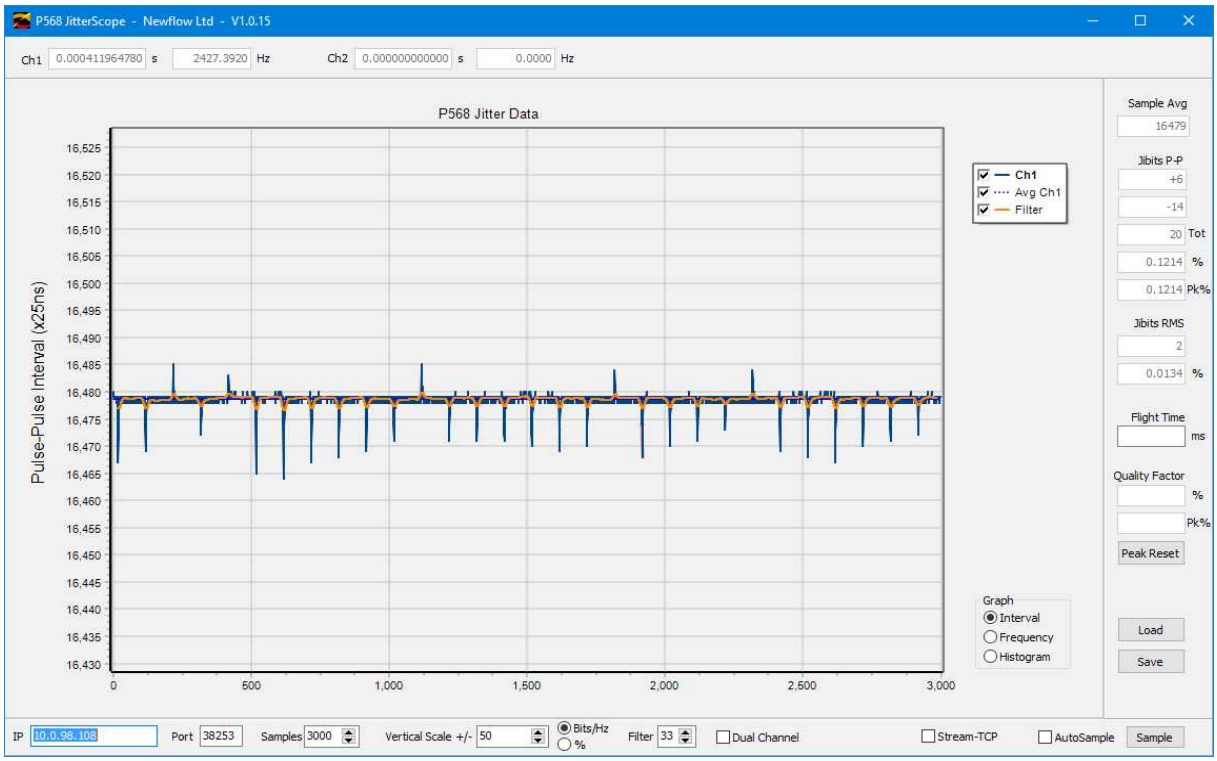
If you see the socket error dialog box, check the IP Address (and Port Number) are correct.

**NOTE:** The P568 has a built-in website. As a double check that the address is correct, put the address into a web browser and ensure you can view the built in pages. If not, use NÅNOconf, see:
section 5. MicroConf - Network Discovery & Configuration Tool

If three seconds after pressing the Sample button, the display has NOT changed, the P568 is not receiving any pulses on the Channel 1 input. This can be verified by looking for the LED indicator light on the P568 Lid.

If however, a display is observed, the system is configured correctly. The AutoSample tick box will grab the next samples as soon as the previous one has been displayed. The Stream-TCP tick box works in a different manner and attempts to update the display window as each new input pulse is measured.

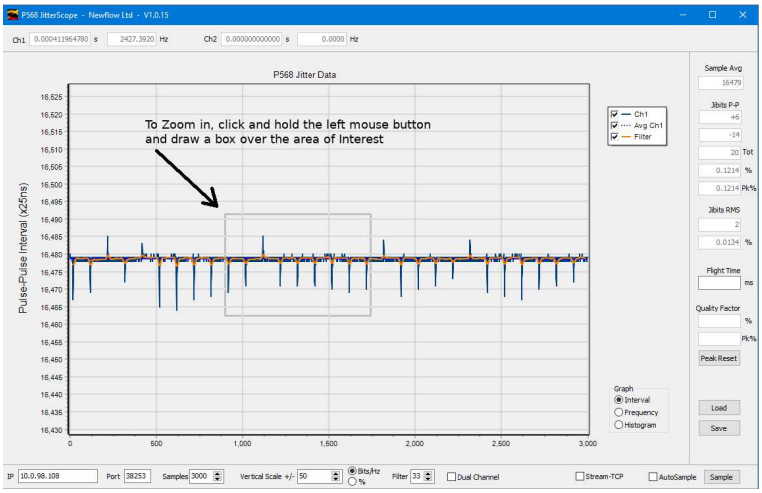
The example screenshot below is from a digitally synthesized frequency generator, showing the typical jitter associated with digital synthesizers.



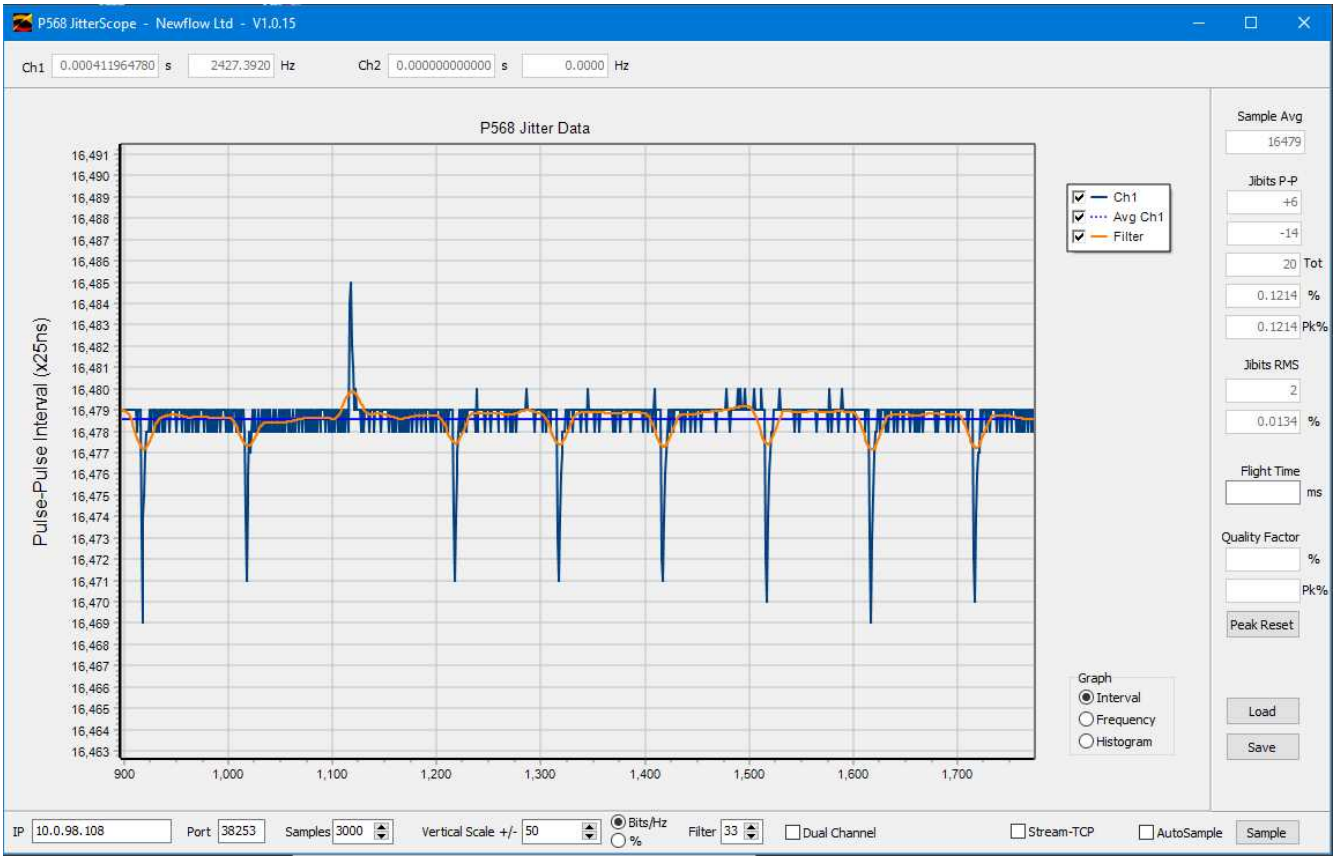
# 3 Main Display Window Features

## 3.1 Zooming in to the Display Window

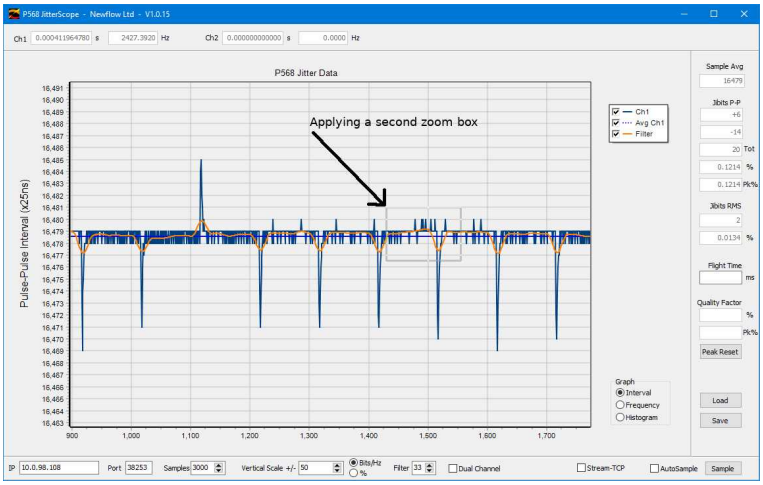
Zooming is performed by drawing a box over the area of interest by holding down the left mouse button and moving left to right. Then release when the box is the required size. The screenshot below shows how we would zoom into the image on the previous page.



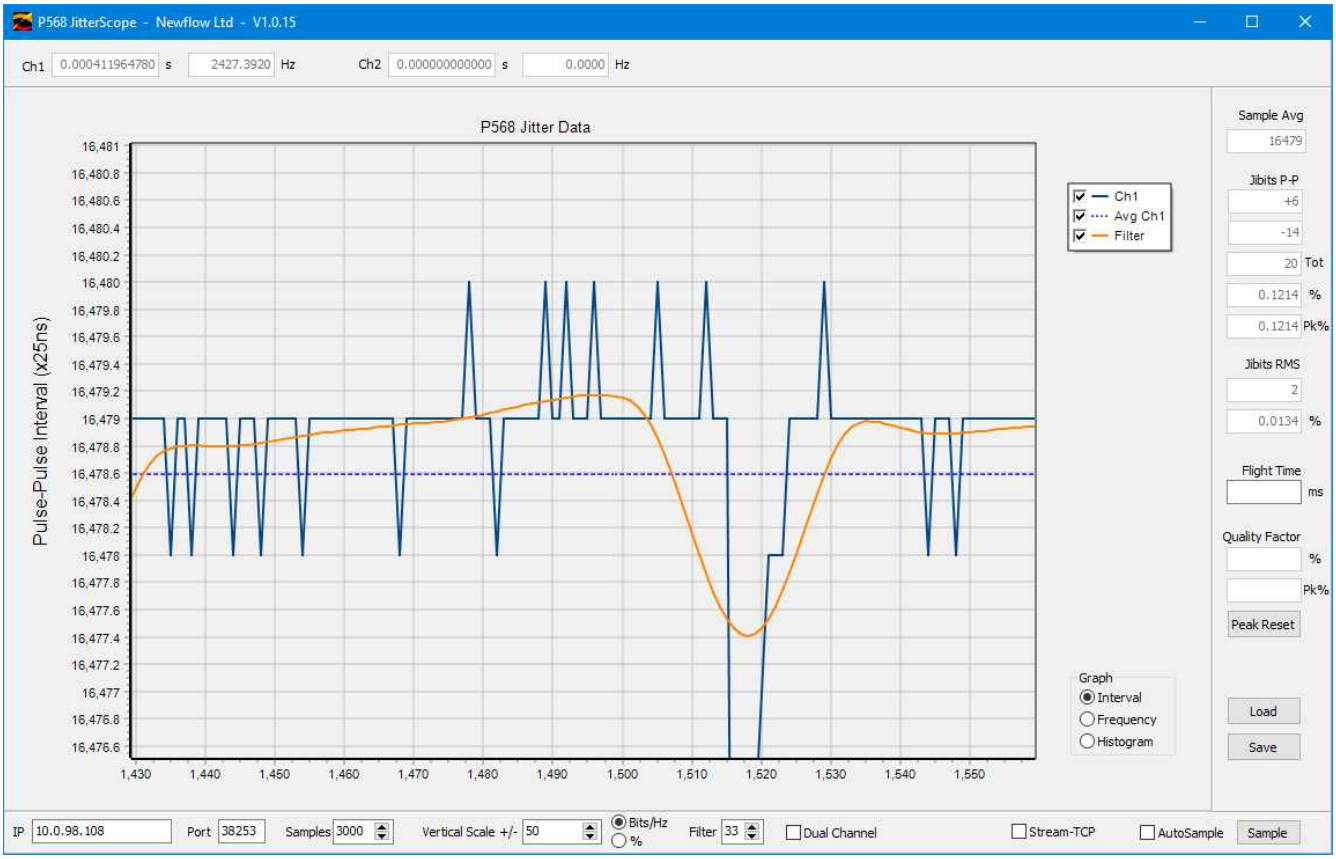

This is the resulting image:-



The zoom is virtually unlimited, so you can zoom in further by repeating the process.




Again the resultant zoomed view:-

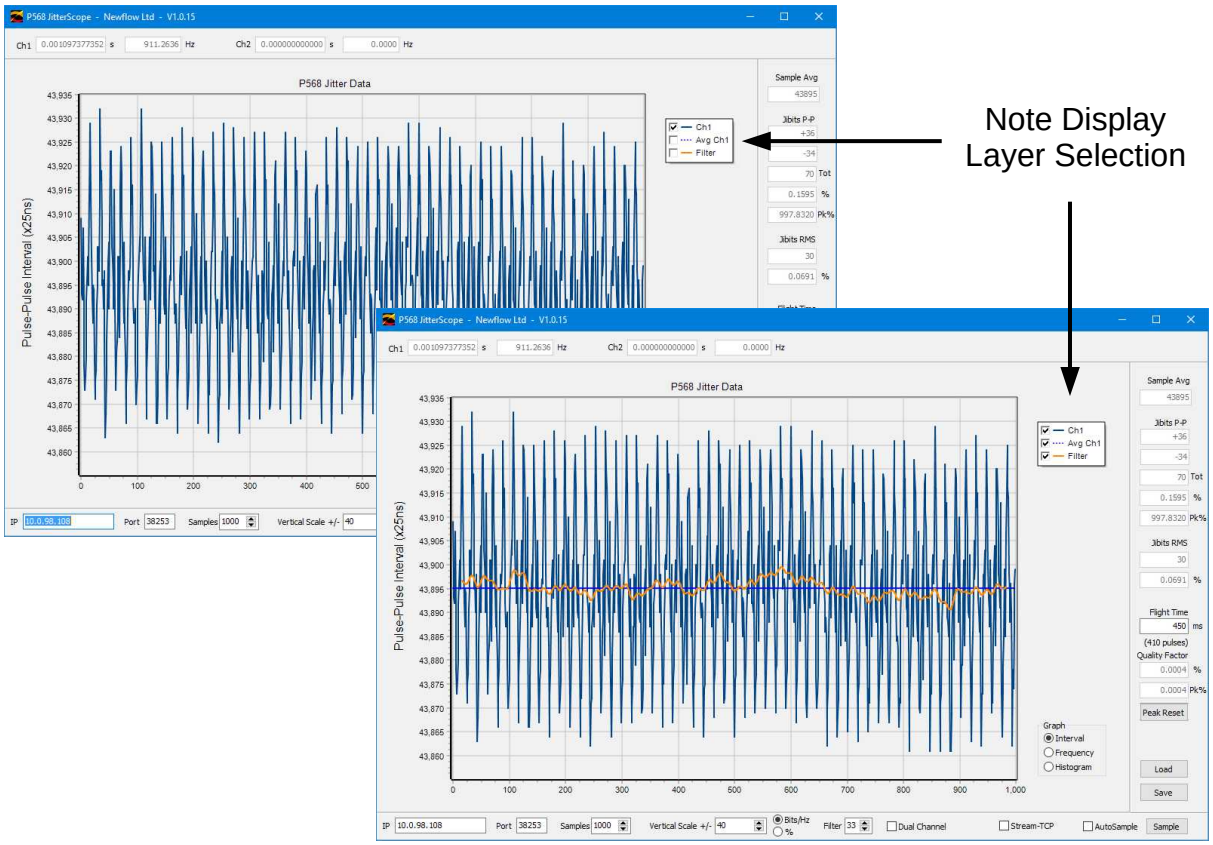



## 3.2 Zooming out

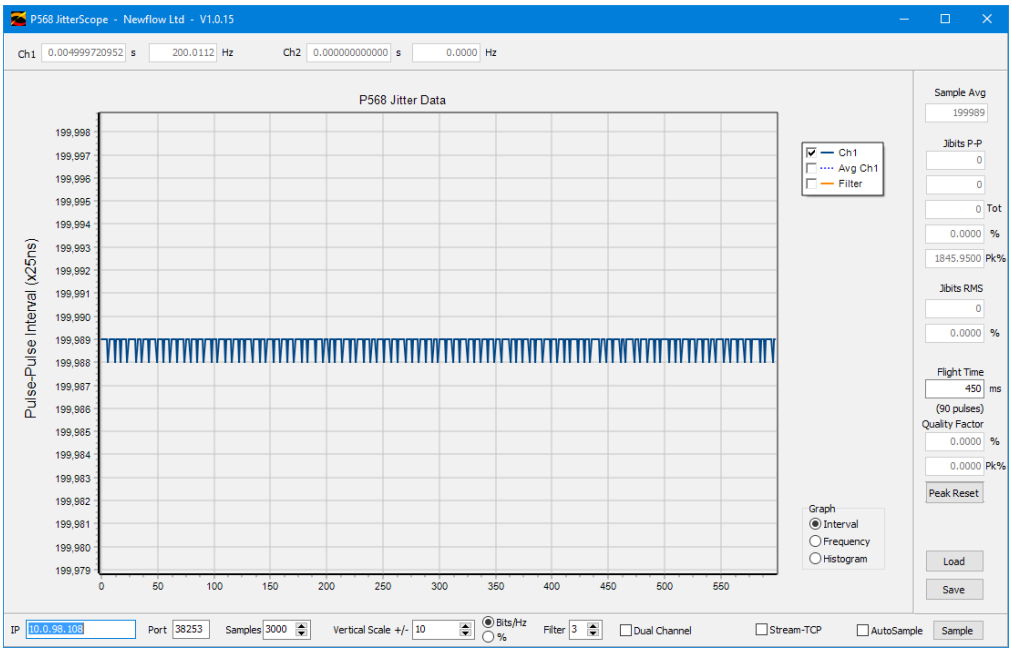
To zoom out, draw a box of any size but move the mouse in a right to left direction, and the initial view will be restored.

**NOTE:** The vertical scale is recalculated after each sample is acquired, but the horizontal is not. It is therefore important to zoom out before acquiring new data.

## 3.3 Example Display with and without Avg and Filter



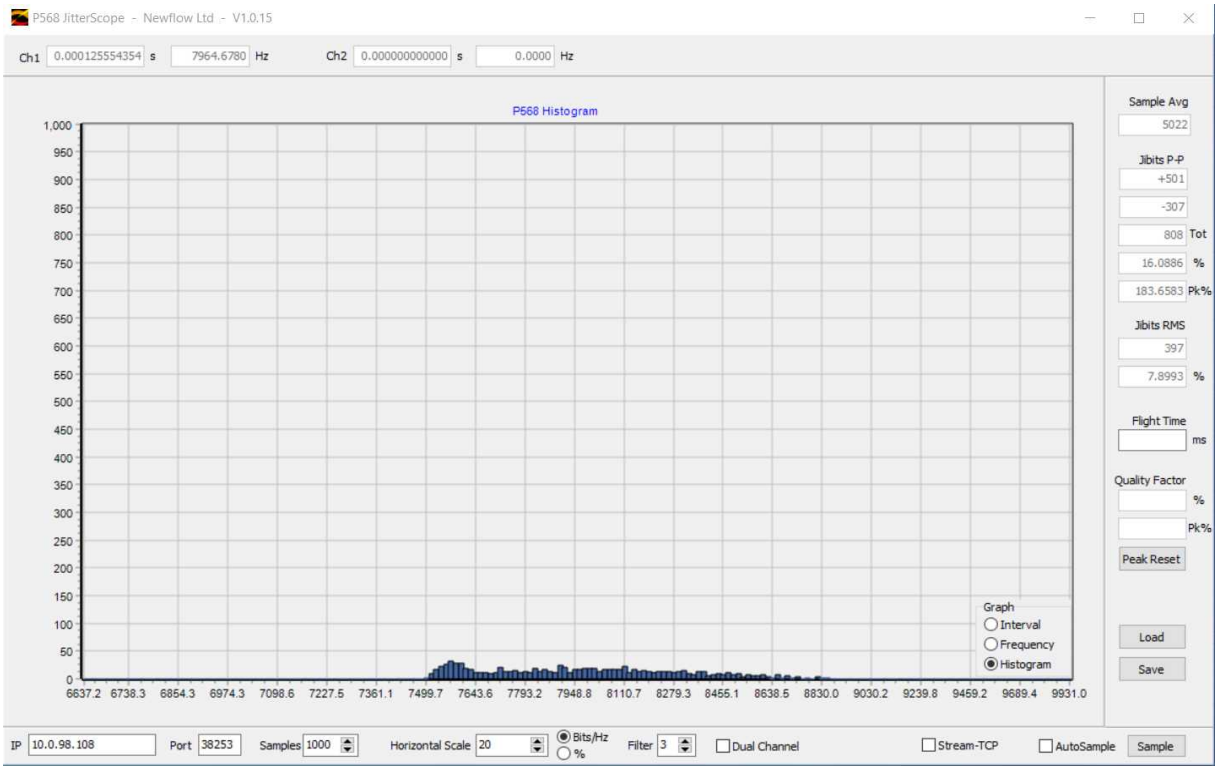

## 3.4 Low frequency Input Frequency



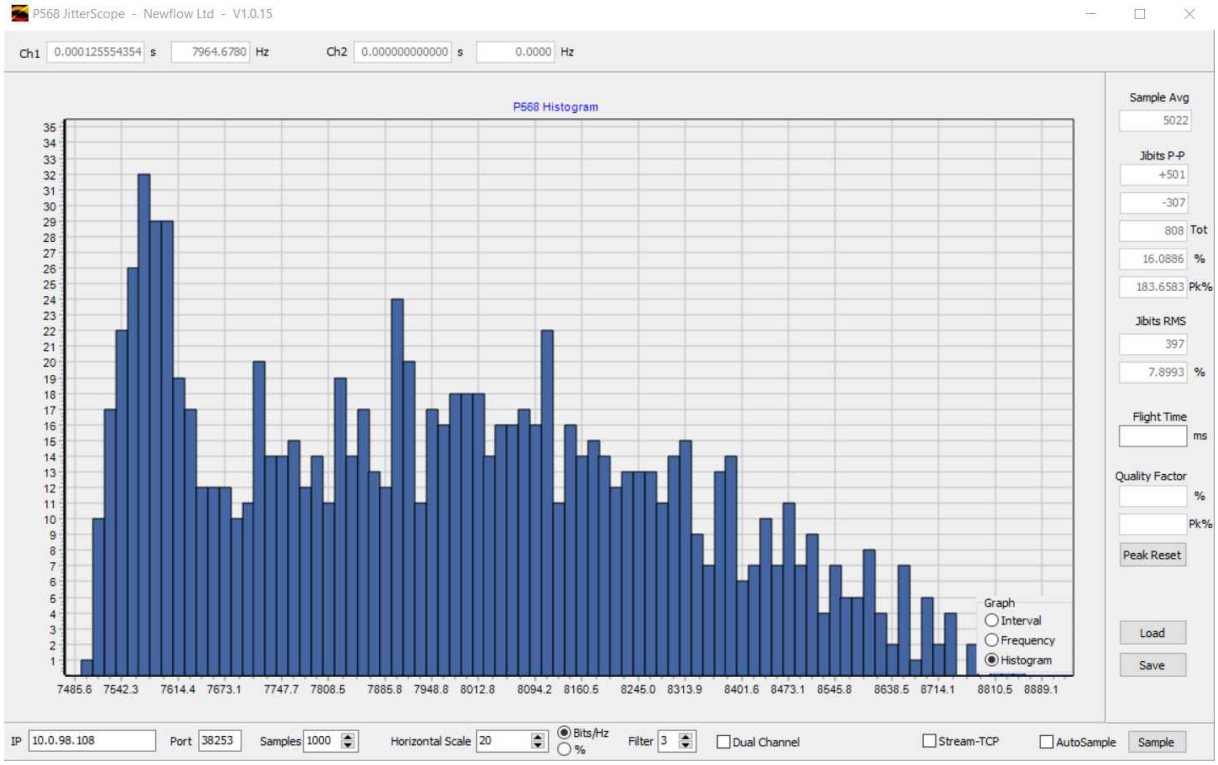

In the screenshot above, the input frequency is about 200 Hz so although 3000 samples are requested, the P568 will stop data acquisition after 3 seconds, hence only collecting around 600 samples.

## 3.5 Histogram Displays

If the Data Type is set to Histogram and the Sample button clicked, a display similar to the screenshot below will be presented. It shows the frequency distribution of all the incoming pulses.




For a more detailed view, the Histogram can be zoomed in exactly the same way as the other displays. The screenshot below is a zoomed in view of the screenshot above.



# 4 Streaming Mode

In Sample and AutoSample modes, the P568 collects up to 3000 samples (or a maximum of three seconds worth of data) and saves it into internal memory. This data is then requested by the JitterScope as a file and the data is then displayed. This is a robust transfer mechanism and works with slow PCs and older laptops.

If the Data Acquisition Method is selected as Stream-TCP, the method of operation is completely different. The data is not stored in the P568 but is pushed out via the Ethernet in almost real time.

This mode is very powerful as there are no gaps in the data acquisition. When the input frequency is high, the Program is redrawing the screen at very high rates and logging the streamed data to a disk file. Unless all elements of the PC are fairly rapid, especially the graphics interface, data can be lost, resulting in apparent spikes of 0Hz in Frequency mode or huge counts in Interval mode.

In addition, at low frequencies, the JitterScope is able to build up the display over a period of time. A rolling display is presented, which is not possible in sampled acquisition mode.

In streaming mode, only the data from Channel 1 of the P568 is recorded and the Dual Channel Selection tick box ignored.

In all other regards, the JitterScope operates in a similar manner as in Sample mode, except the streamed data is logged by the PC continuously.

## 4.1 Data Logging

When running in Stream-TCP mode, as well as displaying the streamed data, the data is also saved to the PC storage. This is saved in the same directory/folder as the JitterScope was launched from. The file is called stream.dat and is re-written each time streaming is started, so copy or rename any data that needs to be retained, before re-starting streaming.

**NOTE:** The stream.dat file can get very large if the JitterScope is left running for long periods with a high input frequency.

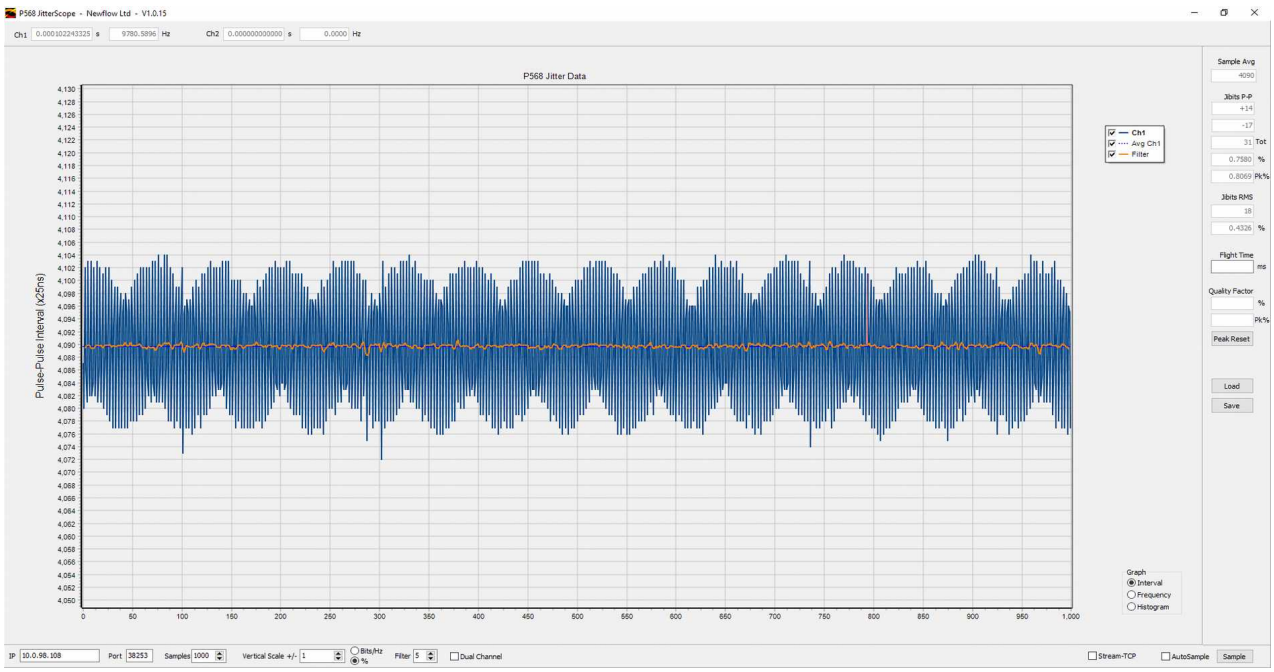
## 4.2 Importing into a Spreadsheet

The streamed data can be imported in a spreadsheet, such as LibreOffice, OpenOffice or Excel for further analysis and can be then manipulated or charted.

One method of importing the file is to rename the stream.dat file as "somename.csv" and open the file as a spreadsheet. As the data is stored a single column, the choice of column deliminator is irrelevant. The first row should be deleted as this is information is not from consecutive pulses.

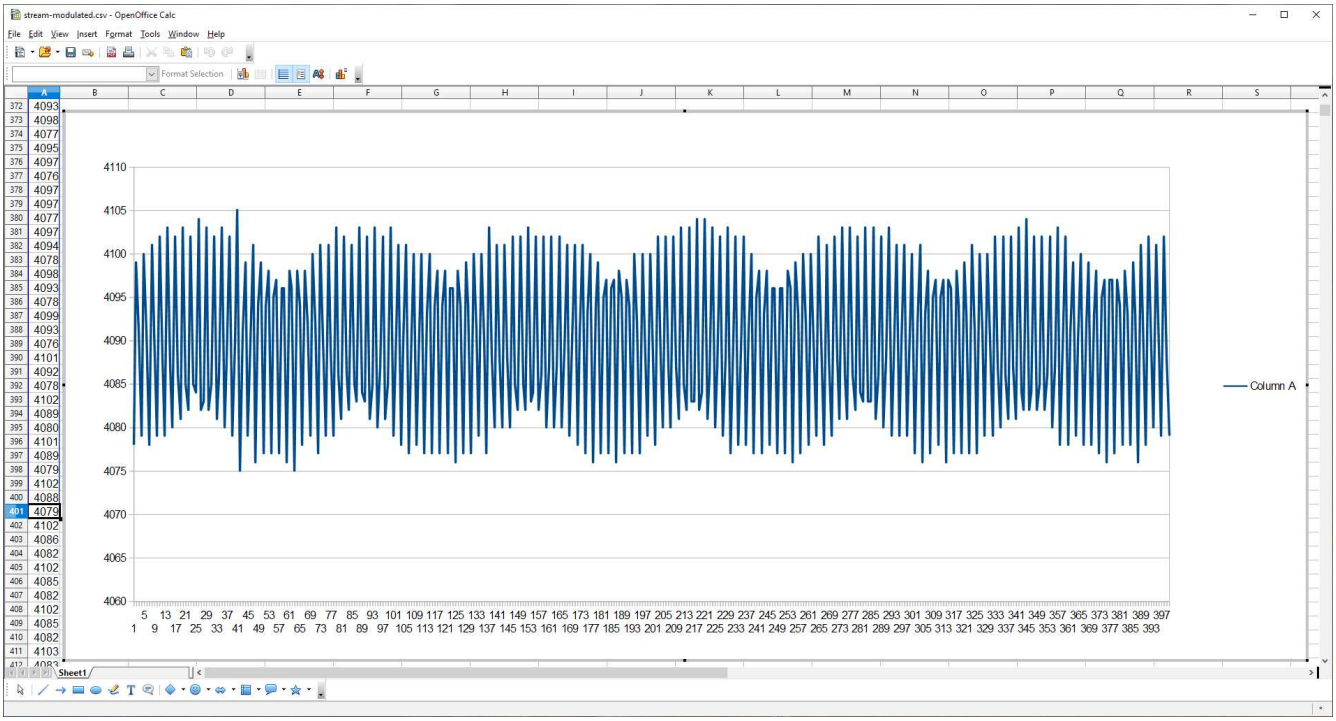
As an example, the JitterScope screenshot on the next page shows the display for a pulse stream which is modulated. Below that is a screenshot of the saved data imported into OpenOffice.

### 4.2.1 JitterScope View




### 4.2.2 Spreadsheet Chart

The data that was recorded when the JitterScope display above was made has been imported into OpenOffice and a portion of the data charted.

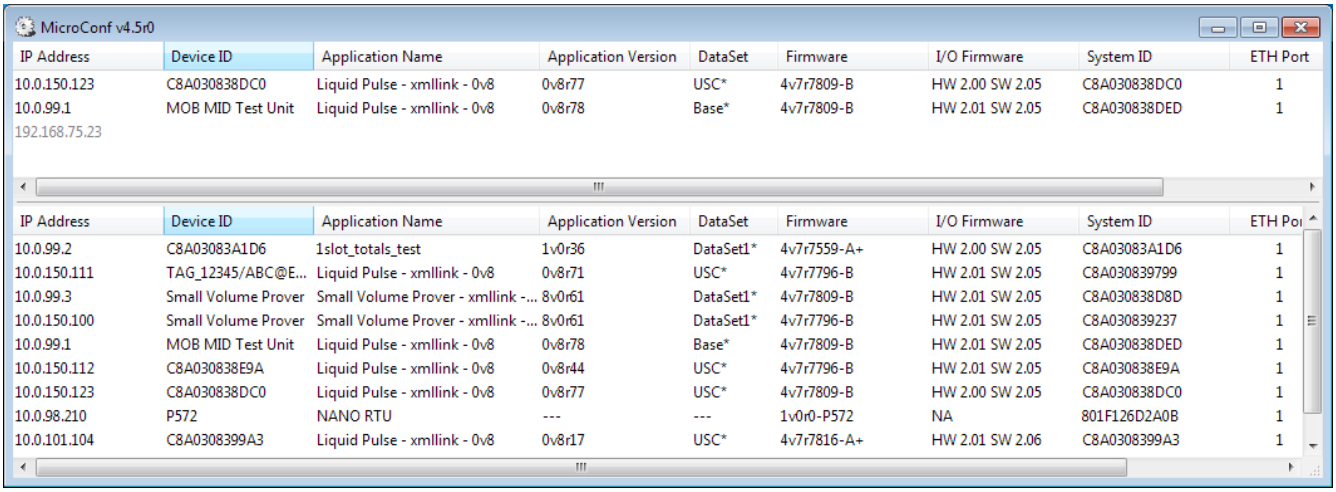


# 5 MicroConf - Network Discovery & Configuration Tool

When used with a Newflow NÅNO Flow Computer, MicroConf allows the operator to load applications and a host of additional tasks. When used with the P568 MPIM, only the following functions are available.

- Strobe Ident Lights
- Start Web Interface
- Configure (the network)

A screenshot of a Windows PC running MicroConf is shown below.




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 NÅNO Zero-Configuration networking.

Each machine is shown on a separate row and there are 10 columns of information shown for each, which 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 NÅNO 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 NÅNO and change its network settings, even if it has been set to address outside the range used on the LAN network.

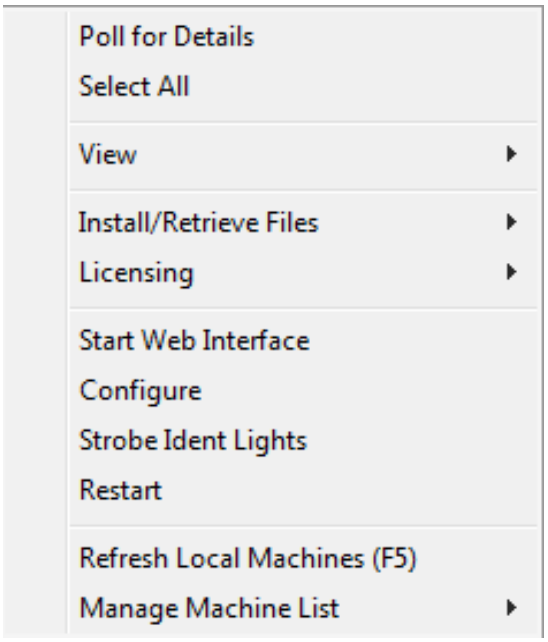
| | |
|---|---|
| ***IP Address*** | This column shows the IP addresses in IPv4 quad-dotted decimal representation. |
| ***Device ID (Hostname)*** | The Device ID for the P568 MPIM is fixed as P568.<br>Use the comment field to differentiate between different P568 MPIM units. |
| ***Application Name*** | This field is fixed and will show "6Ch Flow Rate Interface". |
| ***Application Version*** | This field is not populated for the P568. |
| ***DataSet*** | This field is not populated for the P568. |
| ***Firmware*** | This column shows the version number of the P568 firmware resident. |
| ***I/O Firmware*** | This column is not applicable to the P568 MPIM and will show "NA". |
| ***System ID*** | This field shows the MAC address of the P568. |
| ***ETH Port*** | This field will always be a 1 for the P568 (as there is only 1 Ethernet port). |
| ***Comment*** | This shows the comment that can be altered 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 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.

| | |
|---|---|
| ***Poll for Details*** | This will indicate if the P568 MPIM is running. |
| ***Select All*** | This is not relevant when using the P568. |
| ***View*** | This is not relevant when using the P568. |
| ***Install/Retrieve Files.*** | This is not relevant when using the P568. |

| | |
|---|---|
| ***Licensing*** | This is not relevant when using the P568. |
| ***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 the two Ethernet interfaces available in the NÅNO Flow Computer. The P568 however only has one Ethernet port, and Ethernet Interface 2 dialog is ignored.<br><br>The P568 MPIM can be given a fixed IP address, or configured to use a DHCP server, by ticking the DHCP server selection box.<br><br>If the box is not checked, the user can enter in standard quad-dot notation the IP address, the Netmask and the Gateway address. |
| ***Strobe Ident Lights*** | This item is only available when one machine has been selected, and causes the P568 MPIM Channel Selection lights to light in a repeating sequence. |
| ***Restart*** | This is not supported when using the P568. |
| ***Refresh Local Machines (F5)*** | This option is always available. 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:.<br><br>**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.<br><br>**Remove** - This option is only available with one or more of the managed machines selected in the upper pane.<br><br>**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.<br><br>**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. |

# 6 Program and P568 Firmware Version History

The JitterScope consists of a Windows program and a Newflow P568 Multi-Pulse Input Module (MPIM)

## 6.1 Windows JitterScope Program

The JitterScope Windows program is called P568capx-y-z, where the x, y & z is the program version number.

This manual was written using version 1_0_15.

## 6.2 P568 MPIM board

1v3r1 Released firmware to support the JitterScope

# 7 P568 MPIM Field I/O Connection Information