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FlightDaq3

Pressure Scanner

INSTALLATION
AND
OPERATING MANUAL

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Visit the Chell website at:
http://www.chell.co.uk

900238-1.1

Please read this manual carefully before using the instrument.

⚠ **Use of this equipment in a manner not specified in this manual may impair the user's protection.**

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Chell's policy of continuously updating and improving products means that this manual may contain minor differences in specification, components and software design from the actual instrument supplied.

CONTENTS

1 Description

1.1 Introduction

The Chell FlightDaq3 is an evolution of the FlightDaq32 product and provides additional interfaces such as DDS and Power over Ethernet (PoE).

The FlightDaq3 is a pressure scanning module capable of acquiring 32 or 64 high accuracy pressures. The pressures are acquired with a differential pressure scanner but can be combined with the on-board barometric sensors to give absolute pressures.

The FlightDaq3 has within it all the valving necessary to purge the measurement lines by forcing pressurised gas through them and isolating the pressure transducers at the same time. Due to the environments that it operates in, the FlightDaq3 has in-built heaters that will heat the scanner and valves to a temperature that can be user configured. The power available for the heater will be dependent on the power supply available – DC power or PoE. It can use a variety of PoE standards and the heater power is varied accordingly.

The FlightDaq3 runs on a Linux operating system which allows the integration of complex interfaces. These interfaces can be the Chell protocol (TCP/IP or UDP), IENA or iDDS. To maintain the deterministic acquisition of the pressure values, a separate acquisition microcontroller is utilised to cover data acquisition and the output from this is passed to the operating system processor using a dedicated bus.

Configuration of the FlightDaq3 and the output stream is carried out via an embedded web server, using commands over the selected protocol or via an iDDS configuration server or by XML file download.

The measurement connection to the FlightDaq3 are made via the SQDC / AQDC interface. This allows the user to connect flexible or solid tubing to the FlightDaq3 with an integrated quick disconnect.

2 Specification

2.1 Power Supply:

DC Supply	18 to 48VDC
Maximum current consumption:	18 VDC supply and heaters off : 250mA 18 VDC supply and heaters on : 4400mA 48 VDC supply and heaters off : 95mA 48 VDC supply and heaters on : 1550mA
Minimum cold start temp	-40°C
PoE :	See section 3.1.1

2.2 Package:

Dimensions	241.2 x 89 x 103.7mm
Weight	2.5 Kg

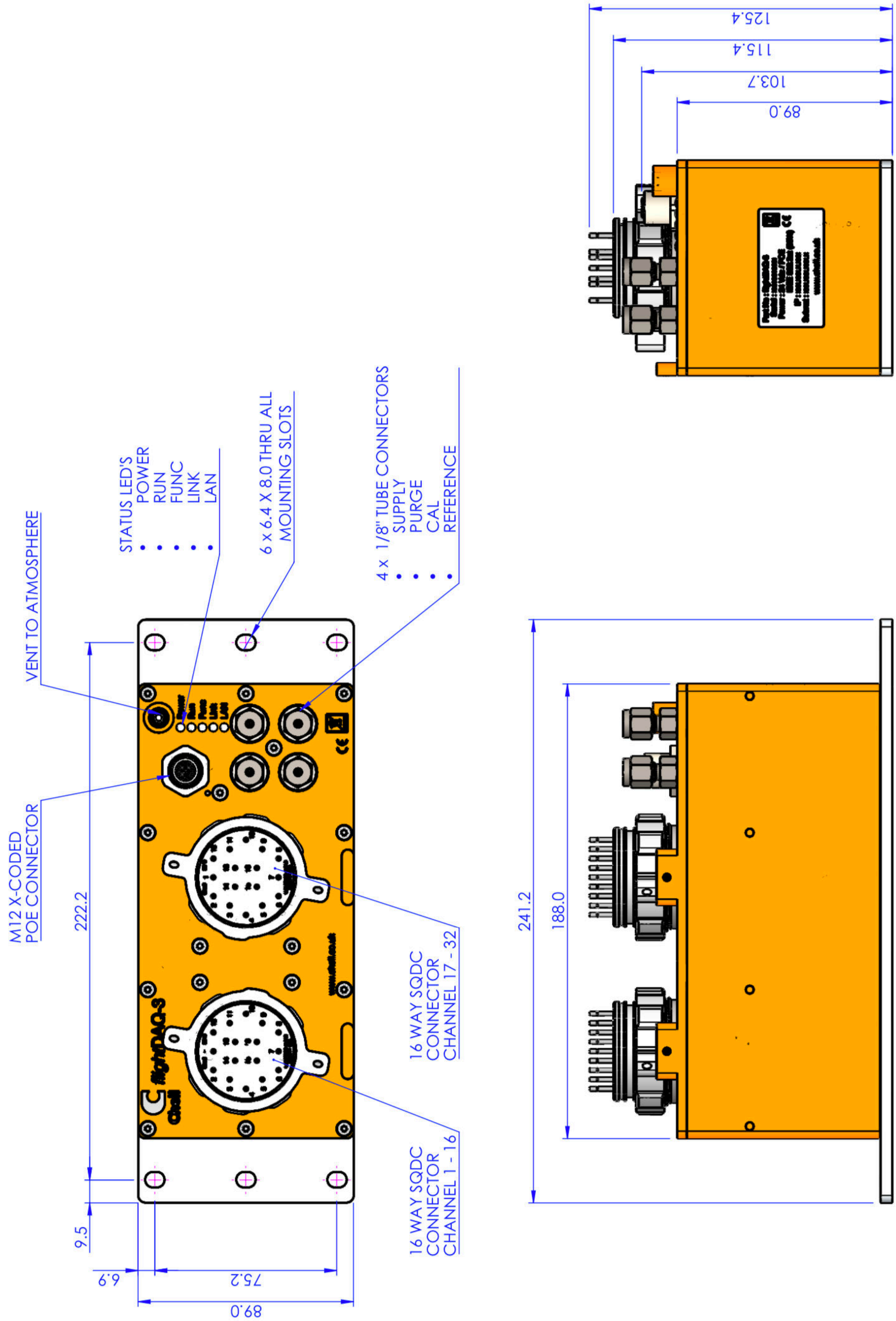
2.3 Ethernet Specifications:

TCP/IP	10Mb/s & 100Mb/s via Auto Negotiation TCP and UDP protocols supported

2.4 Operating conditions:

Operating temperature range:	-55°C to +90°C
Storage temperature range:	-55°C to +90°C
Maximum Relative humidity:	95% at 50°C (non condensing)

2.5 Dimensions



3 Installation and Interconnections

3.1 Wiring – Power & comms

3.1.1 FlightDaq3 Power Supply

The FlightDaq3 is equipped with a DC power supply and a Power-over-Ethernet supply. The DC supply will take priority so a FlightDaq3 powered up over DC will not negotiate with a PoE switch. If the DC supply is removed, then the Flightdaq3 will establish a power supply from a PoE switch if it is present.

If however the FlightDaq3 is powered via PoE and a DC supply them becomes available, the FlightDaq3 will switch all its power consunmption over to the DC supply.

The heater power of the FlightDaq3 can be configured to suit the power supply available and the environment. Please see section 5.7.6 for more information

The following PoE types are supported:

PoE type	Power	Maximum Heater Power	Minimum Operating Temperature
Type 1, Class 0	13W	0	0°C
Type 1, Class 3	13W	0	0°C
Type 2, Class 4	25W	17W	-40°C
Type 3, Class 4	25W	17W	-40°C
Type 3, Class 5	25W	17W	-40°C
Type 3, Class 6	50W	42W	-55°C
Type 4, Class 7	50W	42W	-55°C
Type 4, Class 8	70W	63W	-55°C
LTPoE++	90W	74W	-55°C
DC Power	90W	74W	-55°C

3.1.2 TV06 Mating Connector (TV06ZN-11-35PN-UWBSB2)

Recommend use : DC supply and PoE Type 1, 2 and 3.

Pin Number	Designation
1	28V DC Supply
2	Power Supply Return (0V)
3	Ethernet RX+
4	Ethernet RX-
5	Ethernet TX+
6	Ethernet TX-
7	TRIGGER IN (TTL)
8	CAN Hi
9	CAN Lo

3.1.3 M12 Mating Connector (recommended cable of type 'Harting 09478411002 or equivalent)

Recommend use : PoE Type 1, 2, 3 and 4.

Pin Number	Colour Code
1	1 DA+ (TX+)
2	2 DA- (TX-)
3	3 DB+ (RX+)
4	4 DB- (RX-)
5	5 DD+(Non POE PSU supply +)*
6	6 DD- (short to pin5)*
7	7 DC- (Non POE PSU supply -)*
8	8 DC+ (short to pin7)*

*Can be used for DC supply option in reduced heater power modes (up to 42Watt heater power) but not recommended.

3.2 Measurement Connection

Type : 2 x 16 way SQDC (SQDC-R-16-X0)

SQDC 1 : Channels 1 -16
SQDC 2 : Channels 17-32

3.2.1 Mating connectors

The Chell SQDC range provides a wide range of possible mating connectors. Please refer to the SQDC data sheet for more information.

Part Number	Description
SQDC-R-16-02	Mating connector for 1/16" o/d solid tubing
SQDC-R-16-03	Mating connector for 0.040" (1.0mm) i/d flexible tubing.
SQDC-R-16-04	Mating connector for 0.063" (1.6mm) i/d flexible tubing.
SQDC-R-16-07	Mating connector for 1mm o/d solid tubing
SQDC-R-16-02	Mating connector for 1/16" solid tubing
SQDC-R-16-08	Plastic cap for the FlightDaq3 SQDC connector
SQDC-R-16-05	Stainless steel blank (all ports sealed) for the FlightDaq3 SQDC connector
SQDC-R-16-06	Aluminium blank (overall seal) for the FlightDaq3 SQDC connector

3.3 Service Connections

The service connections on the top of the FlightDaq3 cover the supply gas, purge gas, calibrate and reference ports. These connections can be made either by 1/8" Swagelok compression fittings or Chell AS205 quick disconnects. These fittings can be interchanged as they both mate with the M5 feature in the top plate.

Port	Description	
Supply	Supply pressure for the internal shuttle valve	Clean, dry gas with a pressure 7 to 8 bar gauge.
Purge	Purge supply pressure	Clean, dry gas with a pressure 7 bar gauge. ***Care must be taken if the purge pressure exceeds the pressure range of the scanner.***
Calibration	Calibration source for calibrating the FlightDaq3	Clean, dry gas with a maximum differential pressure (relative to the reference pressure) equal to the differential range of the scanner.
Reference	Reference for pressure measurement	Reference pressure (usually left open to atmosphere). ***Maximum positive or negative gauge pressure applied to the reference must not exceed the full-scale pressure of the internal scanner.***

3.4 Mounting Holes.

The FlightDaq3 has 6 mounting holes suitable for a M6 bolt or stub. It is advisable that at least the four outer most holes are used in service.

3.5 Earthing

Any of the 6 mounting holes can be used to provide a suitable ground connection (the coating used on the base plate is conductive). It is always recommended that the FlightDaq3 is connected to a good ground.

4 Internal Valving

The FlightDaq3 contains the necessary valving to purge the measurement lines of the FlightDaq3 and to perform a re-zero – even when the measurement lines are subject to pressures.

The schematics below illustrates the function of the internal valves. There are two states of the scanner shuttle valve – run mode and calibrate mode. The shuttle valve is shifted by applying pneumatic pressure (from the supply gas port) which is switched by additional internal valves.

In run mode, the measurement ports on the integral SQDC are connected to each measurement port on the scanner. The reference port is connected to the barometric sensor and the reference cavity of the differential pressure scanner. In this mode normal differential or absolute pressure measurements can be performed.

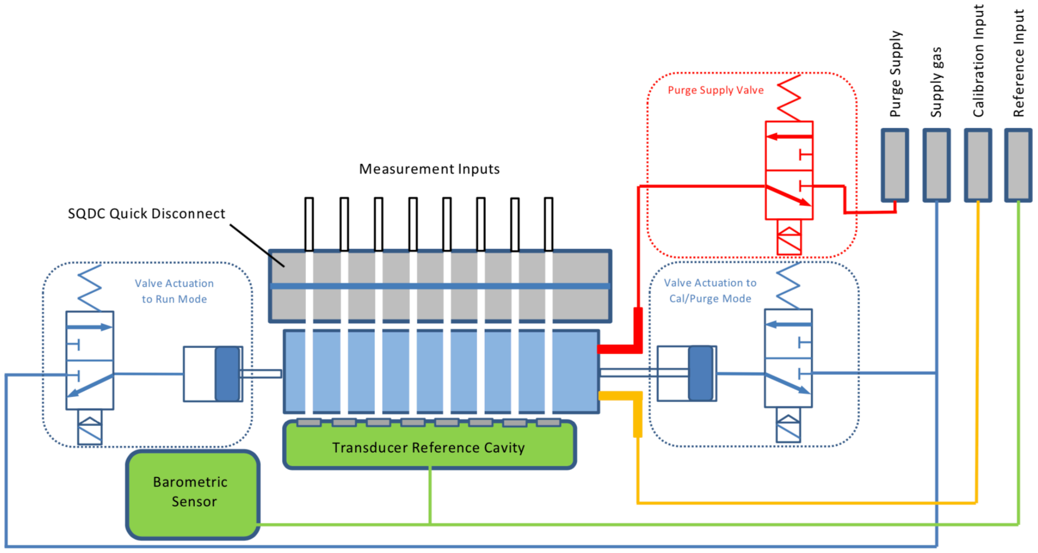
In calibrate or purge mode, the differential pressure transducers are all connected to the calibrate port and the measurement lines are connected to the purge supply valve. Purge gas supplied to the purge port on the top of the FlightDaq3 can then be switched (by using the internal valve) to purge the measurement lines of contaminants and moisture.

⚠ Please see note in section 5.5 on purge methods for on-ground and in-flight situations.

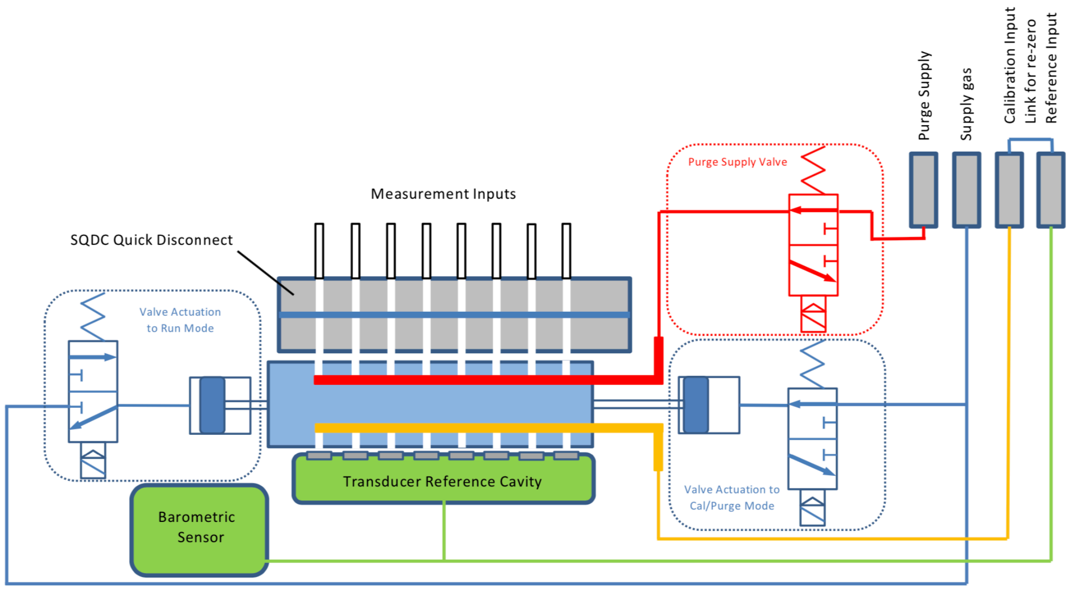
As all the differential transducers are connected to the calibration port in this mode, it is possible to re-zero the scanner and remove any zero offset – even when the system is subjected to pressures. This is simply achieved by externally connecting the calibrate and reference port together (as shown in the cal / purge mode schematic) which will ensure that the differential transducers have no pressure differential across them.

All of the internal valves are controlled via the embedded web server or over the communications protocol used. In addition to manually actuating each valve, we offer a re-zero and purge routine that will actuate all the necessary valves in the appropriate sequence.

4.1 Scanner in run mode.



4.2 Scanner in calibrate or purge mode.



5 flightDaq3 Configuration Webserver

5.1 Introduction.

The flightDaq3 web Configuration provides the means of setting up, calibrating and demonstrating the flightDaq3 unit from a standard PC with an ethernet port and browser.

The software is divided by tabs into seven areas of functionality, namely 'Setup', 'Live data', 'Calibration', 'DTC Information', 'Advanced', 'Timestamp', 'Abs Cal' and 'Factory Tools'

'Setup' provides the means to set flightDaq3's operating parameters and its identification information. The unit's function may be checked and demonstrated using 'Live Data' to show attached pressure scanner raw readings and flightDaq3's calibrated output. 'DTC Information' provides a means for interrogating a DTC variant of the flightDaq3, the user having access to identification information, the current status of the calibration shuttle valve and both excitation and temperature voltages. 'Advanced' has extra functions that some users might not need but might be necessary for other users. 'Abs Calibration' allows the user to calibrate the three absolute pressure chips on the flightDaq3. 'Factory Tools' provides some functionality to read DTC coefficients and current scanner values and change the MAC address of the Ethernet hardware.

The 'Abs Calibration' and 'factory Tools' tabs are not readily available to everyone and further detail is beyond the scope of this document.

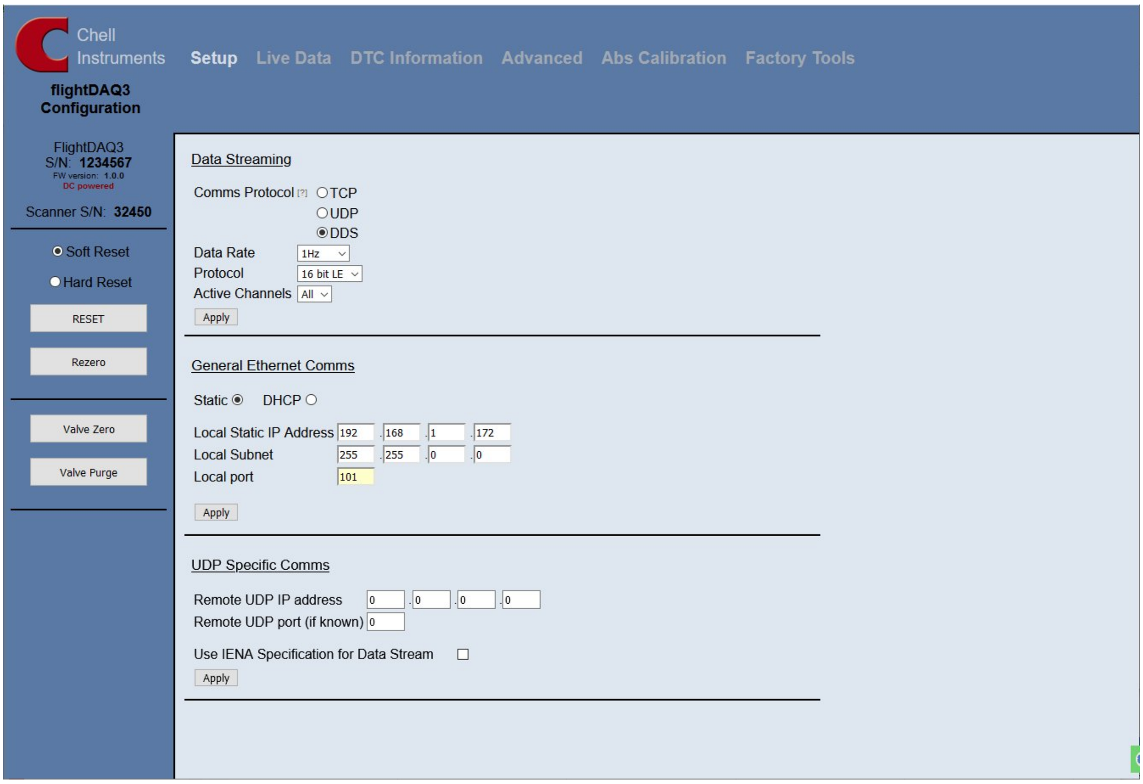


Figure 5.1, Main Setup page

5.3 Common Controls Sidebar

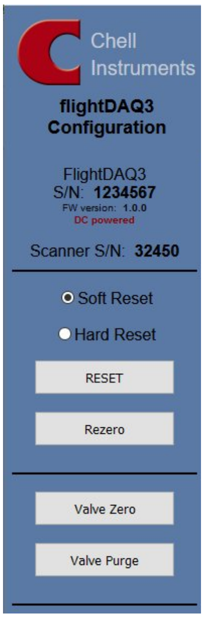


Figure 5.1 above shows the first page viewed when navigating to the webserver. The menu at the top allows the user to choose what is visible in the central window, and the sidebar (shown left) shows information and has a select few commands that are useful regardless of the central page the user is on.The function of the controls on the sidebar is detailed in the subsequent table (Table 5.1)

Control	Function
'RESET' button	Resets the FlightDaq3-TL , similar to power cycling the device. Use to activate new settings and/or rebuild calibration tables. The option exists for a hard reset and a soft reset. A hard reset will re-start the operating system within the FlightDaq3-TL and is required when low-level changes are made such as the i/p address. A soft reset will restart with modified settings and is suitable for changed to channel configuration etc. A soft reset will take around 20 seconds but a hard reset will take around 90 seconds.
'Rezero' button	Starts a flightDaq3 rezero operation.
‘Valve zero’ button	Runs the Valve Rezero routine.
‘Valve Purge’ button	Runs the Valve Purge routine

Table 5.1, Common sidebar control functions.

5.4 Valve Rezero Routine

When a rezero routine is called either by clicking the ‘Rezero’ button or calling the routine via an interface, the following procedure is followed:

Step	Function
1	Actuate C1 valve to move the scanner to cal / purge.
2	Wait 1 second.
3	Vent C1 valve.
4	Wait 0.5 second.
5	Acquire 128 pressure values, average them together and calculate the zero offsets .
6	Actuate C2 valve to move the scanner to run mode.
7	Wait 1 second.
8	Vent C2 valve.

5.5 Valve Purge Routine

When a purge routine is called either by clicking the ‘Purge’ button or calling the routine via an interface, the following procedure is followed:

Step	Function
1	Actuate C1 valve to move the scanner to cal / purge.
2	Wait 1 second.
3	Vent C1 valve.
4	Wait 0.5 second.
5	Set the internal purge valve to on
6	Wait the time value set ‘valve Control’ (5.9.3). The default is 10 seconds
7	Vent the purge valve
8	Wait 1 second.
9	Actuate C2 valve to move the scanner to run mode.
10	Wait 1 second.
11	Vent C2 valve.

NOTE : Step [8] in the above routine is there to allow any purge pressure to dissipate before the scanner is returned to RUN mode. It is there for the instance that a high purge pressure is used where there is a possibility to charge a blocked measurement line to this pressure. When the scanner is returned to RUN mode, the differential transducer would be exposed to this pressure and could be damaged.

If purging is to be carried out with pressures present on the measurement lines (for example in flight) then this routine could lead to a situation where this pressure is fed back through the measurement lines, scanner and venting purge valve for this time period (1 second). This is reverse purging and should be avoided as it can bring contaminants into the FlightDaq3. If purging is to be carried out with pressures on the measurement lines then this routine should NOT be used and the valve sequencing carried out manually without a purge vent before the scanner is returned to RUN mode. In this instance, the purge pressure should be limited to the full scale of the differential scanner.

5.6 The 'Setup' Page

5.6.1 Introduction

The 'Setup Parameters' page shows all of the FlightDaq3's main operating parameters. Setup Parameters is divided into different categories by function, and each category is detailed separately in the following.

5.6.2 Data Streaming

The ‘Data Streaming’ section allows the user to change settings that affect both communication protocols, and allows the user to choose the protocol that is to be used, along with the data transfer rate.

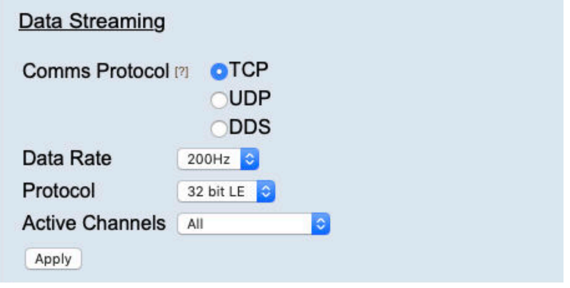


Figure 5.41, Data Steaming Setup

Control	Function
‘Comms Protocol’ radio button	Chooses the communication protocol that is to be used. This button changes what options are available below it.
‘Data Rate’ option list	Selects the rate at which the FlightDaq3 will automatically transmit data after reset.
‘Protocol’ option list	Selects the format that the data will be transmitted as, options are 32 bit LE & 32-bit BE.
‘Apply’ button	Applies the changes made to the local settings memory.
Active channels	Displays the number of active channels that will be transmitted.

Table 5.41, Data Streaming settings.

5.6.3 General Ethernet Comms

The General Ethernet Comms parameters for static i/p addresses are shown in Figure 5.42. The options in this section control the FlightDaq3's IP address, subnet mask and Local port.

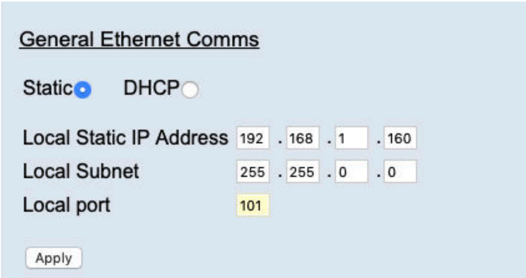


Figure 5.42, TCP Comms group

'IP Address'	IP address allocated to FlightDaq3 on the user's network.
'Subnet'	Subnet mask as set on the user's network.
'Local port'	Local port of the device (fixed to 101).
'Apply TCP'	Applies the settings to the local memory

Table 5.42, TCP Comms group settings

DHCP can be selected by clicking the radio button. In this configuration, the i/p address and subnet address cannot be edited as below.

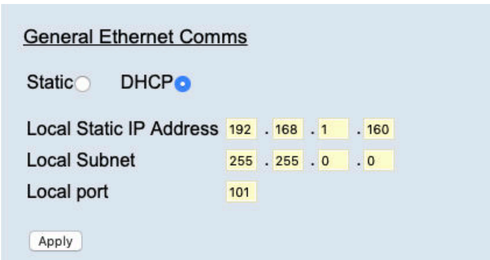


Figure 5.43, DHCP Comms

5.7 'Live Data' Page

Figure 5.6 shows the 'Live Data' page of the webserver, selected for a 32-channel pressure scanner.

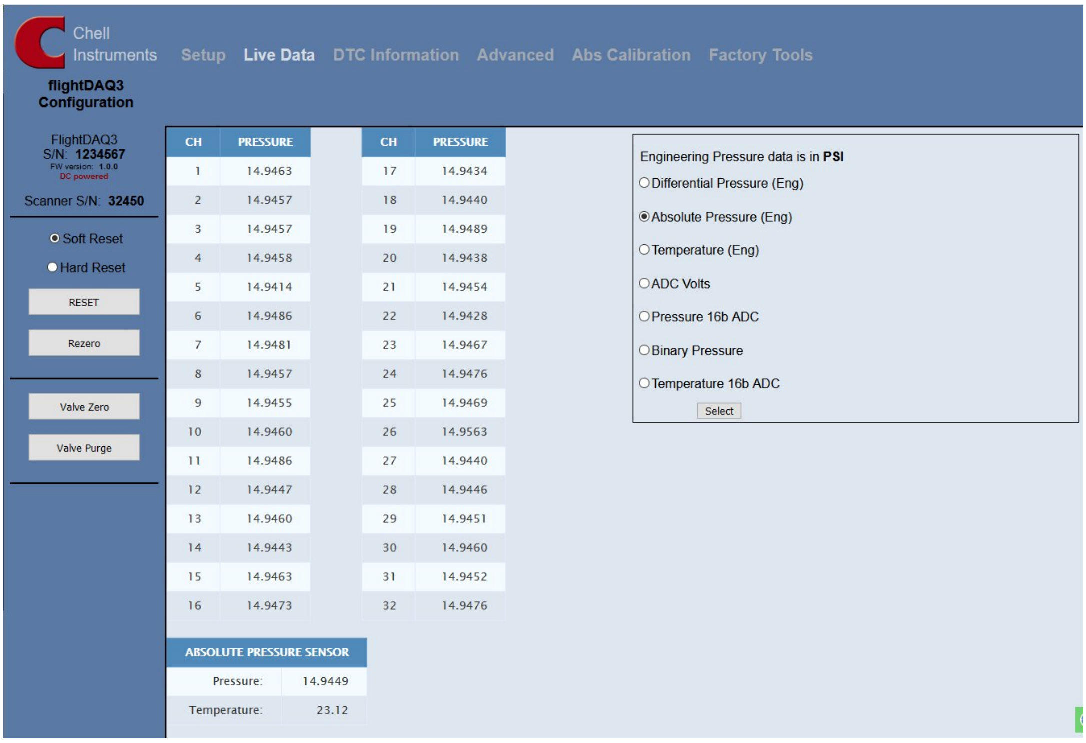
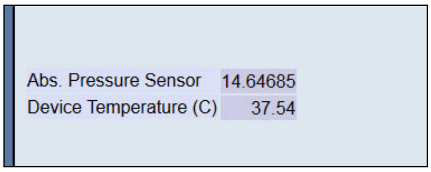


Figure 5.6, Live Data Page

The live data page is a means to demonstrating the correct operation of flightDaq3 and testing the unit's calibration. The user can select between a number of different parameters to display. To do so, highlight the radio button next to the desired output and click in 'select'.

Selected Data	Description
Differential pressure (Eng)	This is the compensated engineering unit output of the FlightDaq3 in differential mode – relative to the reference port. It is displayed in PSI by default although the units can be changed in the 'Advanced' tab.
Absolute pressure (Eng)	This is the compensated engineering unit output of the FlightDaq3 in absolute mode – the sum of the differential scanner and the absolute scanner. It is displayed in PSI by default although the units can be changed in the 'Advanced' tab.
Temperature (Eng)	This is the compensated temperature measurement for each channel of the internal DTC scanner.
ADC Volts	This is the output from the scanner as read by the ADC in volts.
Binary 16-bit ADC	This is the output from the scanner as read by the ADC in bits. It is a 16-bit output so at zero, a reading of around 32,768 would be expected.
Binary Pressure	This is the compensated engineering unit output of the differential pressure in bits (16 bit).
Binary Temperature	This is the compensated engineering unit temperature output of each channel of the DTC scanner in bits (16 bit).

5.7.1 Barometric Pressure Sensor.



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The 'Abs. pressure sensor' number shows the median of the pressure values read from the 3 absolute pressure transducers, this number is either displayed in PSI or BAR depending on the option selected on the advanced page. The device temperature is the temperature read from the transducer with the median pressure. It is this temperature that is used for the heater control.

5.8 'DTC Information' Page

The 'DTC Functions' page gives the user access to some information regarding the attached DTC scanner. The scanner voltages for temperature and excitation may be read and the position of the calibration shuttle valve determined as either being in 'RUN' or 'CAL.' mode. Also, the information contained in the scanner header may be displayed. Note that the value of the parameter read from the scanner (i.e. temperature, excitation voltage and particularly valve position) is valid only for the time that it is read.

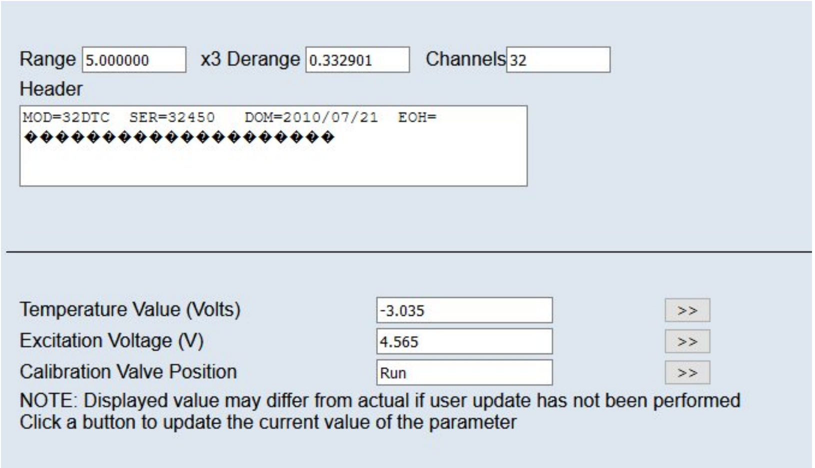


Figure 5.8, 'DTC Information' Page

Control	Function
'Range'	Shows the floating-point value for the range contained within the scanner.
'x3 derange'	Shows the floating-point value for the sensitivity derange constant contained within the scanner (if this option has been ordered).
'Channels'	Shows the floating-point value for number of scanner channels.
'Header'	Displays the data header from the DTC scanner, splits out the information and displays scanner full scale, the number of channels and the deranging factor. Also shown are the scanner model, serial number and date of manufacture.
'Temperature (V)'	Click '>>' to read the current temperature voltage from the scanner.
'Excitation (V)'	Click '>>' to read the current excitation voltage from the scanner.
Calibration Valve Position	Click '>>' to read the valve position as 'RUN' or 'CAL'.

Table 5.7, 'DTC Information' Page controls

5.9 'Advanced' Page

The advanced page contains functions that will change the how the flightDaq3 acts and how it applies various calculations to its data, this page should only be used by users who fully understand what they are changing.

5.9.1 Filtering

The flightDaq3 has settings to allow the user flexible control over the data throughput of the device. The averaging algorithm is a simple running average so increasing this value will reduce the apparent noise but reduce the response of the measurement.

Table 5.9 details the function of the signal parameter option controls.

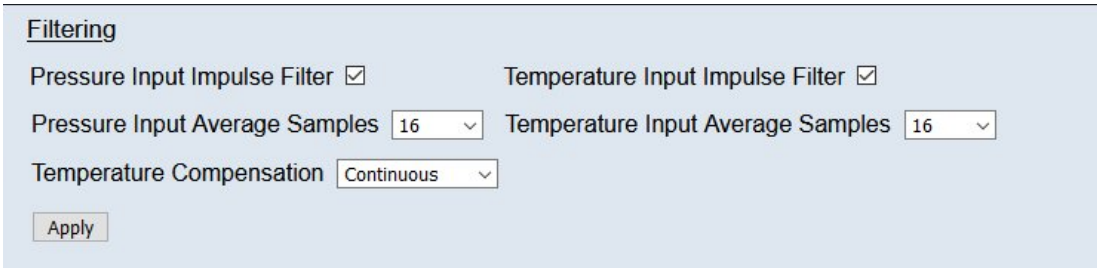


Figure 5.9, Filtering group

Control	Function
'Pressure Input Impulse Filter'	Check box to apply impulse filter to pre-calibration data - will remove single impulse noise events in the pressure data.
'Temperature Input Impulse Filter'	As above but with temperature data.
'Pressure input average samples'	Selects the number of samples for a moving average of pre-calibration pressure data.
'Temperature input average samples'	As above but with temperature data.
'Temperature Compensation'	Selects the temperature compensation scheme for the calibration. 'Continuous' repeatedly rebuilds the calibration data on a channel by channel basis without interrupting the flow of data. 'With zero only' rebuilds the table when a user rezero is issued, after the rezero has been actioned. By default, this should be set to continuous.
'Apply'	Applies the settings to the local settings memory

Table 5.8, Filtering group settings

5.9.2 IENA Configuration

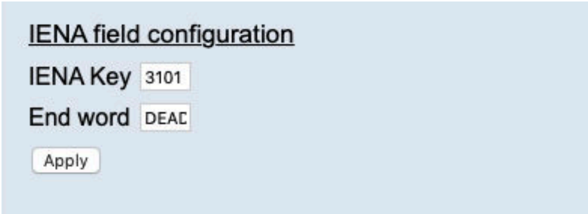


Figure 5.94, IENA Configuration group.

'IENA Key'	The key at the start of an IENA packet, the most significant byte is entered first.
'End word'	The value to signify the end of an IENA packet, the most significant byte is entered first.

5.9.3 Valve Control

The flightDaq3 has several valves which can be controlled through the webserver. From this page it is possible to switch the flightDaq3 between run and cal mode and it is also possible to change the delay in the zero & purge routines.

Figure 5.10, Valve control settings

'Function timer'	Changes the wait time of the zero or purge functions before the shuttle is returned to the run position.
'Shuttle to cal' button	Puts the shuttle in the cal / purge position
'Shuttle to run' button	Puts the shuttle in the run position

Table 5.10, Valve control settings

5.9.4 Time Stamping

This page allows the user to edit the timestamp settings of the FlightDaq3-TL. This timestamp will allow the user to get millisecond level accuracy timestamps on the data packets. If the timestamp is enabled it will have an effect on the maximum transmission rate.

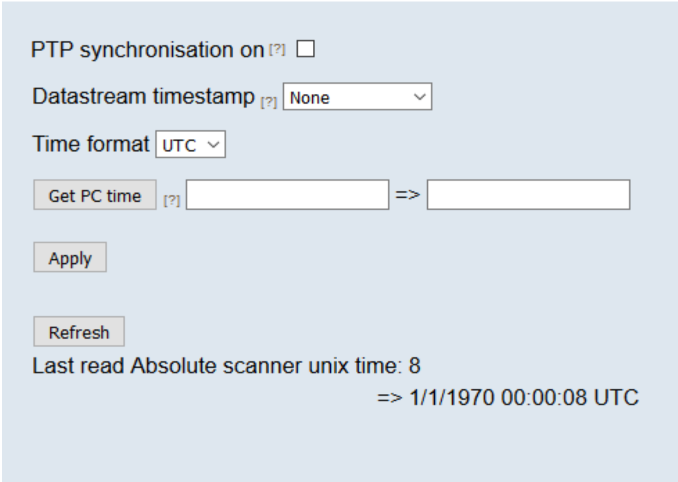


Figure 5.95, Timestamp

'PTP synchronisation on' checkbox	This allows the user to select whether any timestamps that may be added to the data stream are PTP synchronised or not. Please note this will only work if there is a PTP grandmaster on the same network as the FlightDaq3-TL.
'Data stream timestamp' drop box	The user can use this to select where the timestamp is positioned in the data stream, either none which will turn the timestamp off, start of cycle which will place a timestamp at the beginning of all the channels and every channel which will read the timestamp for every channel. It should be noted that the latter 2 options will reduce the maximum transmission speed data stream.
'get PC time'	This button allows the user to get the timestamp from the PC time of the PC they are using. This can be used as a base time for the timestamps if the user is not using PTP. In the first box it will show the timestamp and in the second box it displays the timestamp converted date/time to make it easier to understand. NOTE the user has to click apply to send the timestamp to the FlightDaq3-TL
'Apply'	This button will apply the settings chosen on this page.
'Refresh'	This allows the user to refresh the displayed value of the last read timestamp from the FlightDaq3-TL.
'last read Absolute scanner UNIX time'	The top line shows the current time in the FlightDaq3-TL

5.9.5 Miscellaneous

The remaining parameters are edited via the Miscellaneous group shown in Figure 5.11.

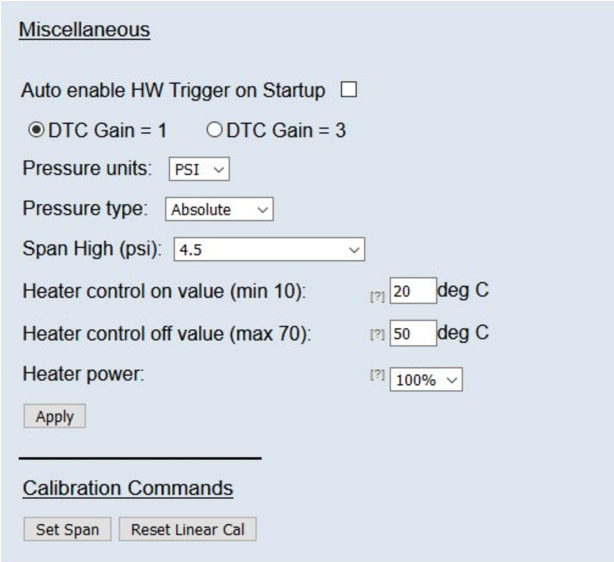


Figure 5.11, Miscellaneous group.

'Auto enable HW trigger on startup' dropdown	If set to anything other than Off, the flightDaq3 will immediately switch to hardware trigger mode, waiting for the first trigger pulse, after initialisation. The dropdown indicates the comms protocol used to send acquired data during triggering.
'DTC gain = 1/3'	Selects the deranging function of the DTC scanner if the '3' option is selected, otherwise defaults to the standard range of the scanner.
'Pressure unit'	Chooses whether the output data will be in BAR of PSI.
'Pressure type'	Chooses whether the data stream values are represented as absolute pressure (approx. 2psi to (scanner full-scale + 15psi)) or differential pressure.
'Span High'	Sets the value of pressure for the 'high' point in the linear span and zero calibration. Valid values range from 0.144PSI (3"WC) to 90PSI. Typically, this value should be set to 90% of the scanners full scale value, if possible.
'Heater control on value'	If the measured temperature of the flightDaq3 drops below this value then the heaters will turn on. The minimum value for this is 10, and must always be less than the maximum temperature.
'Heater control off value'	If the measured temperature of the flightDaq3 goes above this value then the heaters will turn off. The maximum value for this is 70, and must always be greater than the minimum temperature.
'Heater Power'	See Below
<u>Calibration commands</u>	
Set span	Set the span of the linear calibration – confirms the value of pressure that has been set up as the span value is being applied to the sensor. ***Do not use this function unless the scanner is in Cal mode and a calibration pressure that matches the 'Span High' value exactly has been applied to the cal port.***

Reset Linear cal	Resets the linear calibration to (+ 0) x1 i.e. no offset, unity gain. Applies ONLY to the current linear calibration, i.e. the DTC calibration if using a DTC scanner.

Table 5.11, Miscellaneous group settings

5.9.6 Heater Power

The power used by the FlightDaq3 heaters can be varied to suit the environment and the power available. The Flightdaq3 will negotiate with a PoE switch and enable a 25W, 50W or 70W supply depending on what is available. If PoE is not available, the FlightDaq3 will use the DC power input.

The heater power should be set to reflect the power available (see section 3.1.1 for more information)

The heater power options are as follows:

<table>
<tr><th>Power Selected</th><th>Heater Power (W)</th><th>Minimum Operating Temperature</th><th></th><th></th><th></th><th></th></tr>
<tr><td>Off</td><td>0</td><td>0°C</td><td rowspan="6">DC Supply</td><td rowspan="3">25W PoE</td><td rowspan="4">50W PoE</td><td rowspan="5">70W PoE</td></tr>
<tr><td>15%</td><td>17W</td><td>0°C</td></tr>
<tr><td>25%</td><td>25W</td><td>-40°C[1]</td></tr>
<tr><td>50%</td><td>42W</td><td>-55°C</td><td></td></tr>
<tr><td>80%</td><td>63W</td><td>-55°C</td><td></td><td></td></tr>
<tr><td>100%</td><td>74W</td><td>-55°C[2]</td><td></td><td></td><td></td></tr>
</table>

Notes:

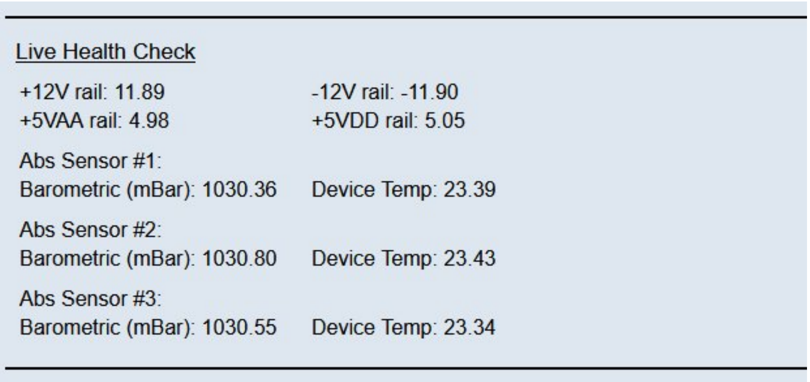
[1] With a heater power of 25W (25%), the FlightDaq3 can maintain an internal temperature of 0°C when the ambient is -40°C.

[2] With a heater power of 74W (100%), the FlightDaq3 can maintain an internal temperature of +42°C when the ambient is -40°C and +27°C when the ambient is -55°C

The greater the power available at lower temperatures, the greater the control over the internal scanner temperature. This will in turn reduce the need to re-zero due to zero drift with temperature. It is therefore better to select the highest heater power with the power supply available.

5.9.7 Live Health Check

The FlightDaq3 provides a live update of its internal supplies, internal temperature and barometric pressure as read by three individual barometric pressure transducers. The median value of these three transducers is used to calculate the absolute pressure output thereby affording some redundancy. These are updated continuously at around 2Hz.



6 Service and Calibration

6.1 Service

There are no user serviceable parts inside the instruments. Should any difficulties be encountered in the use of the FlightDaq3, it is recommended that you contact Chell Instruments Ltd for advice and instructions.

6.2 Calibration

Calibration is recommended on an annual basis and Chell Instruments Ltd. provides a fully traceable facility for this purpose.

6.3 Adjustment

There are no user adjustments in the instrument. The user is strictly forbidden from removing the covers without invalidating Chell’s obligations under warranty.

6.4 Cleaning

A dirty instrument may be wiped clean with a soft cloth that has been sprayed with a proprietary ‘foaming cleaner’, then wiped dry immediately.

Under no circumstances should the instrument be wetted directly or left damp.