



FOCUS APPLIED TECHNOLOGIES DATA ACQUISITION MODULE

Manual Rev. 1-0516

16 CHANNEL DAQ WITH VARIOUS
INPUT AMPLIFIERS FOR LOGGING AND DISPLAY



FOCUS APPLIED TECHNOLOGIES SDN. BHD.

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INTRODUCTION

The Focus Applied Technologies DAQ-15 is a universal data acquisition unit designed for data display and logging to a computer. Several different types of input amplifiers are included:

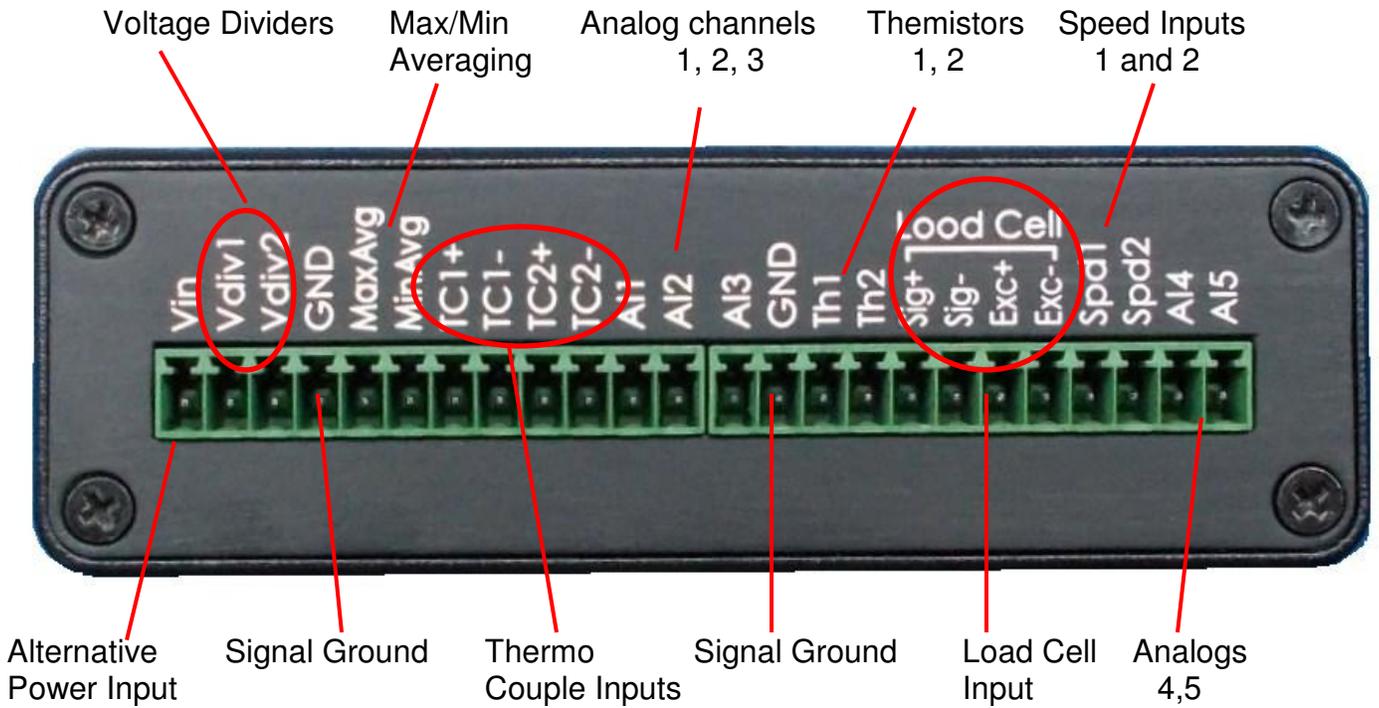
Thermistor	This includes a variable “pull up” resistor internally
Thermocouple	A precision K-Type thermocouple amplifier
Load Cell	A precision variable gain Load Cell Amplifier with Excitation Voltage
Speed	For Hall Effect, Variable Reluctance or other sensors
Voltage Dividers	For reading DC voltages up to 24.5V
Maximum Averaging	For reading “Peak” voltage events (eg. Combustion Pressure)
Minimum Averaging	For Reading “Low” voltage events (eg. Manifold Pressure)
Generic Analog Inputs	0-5V DC Inputs for most signals

The input power 12V and draws less than 1 amp.

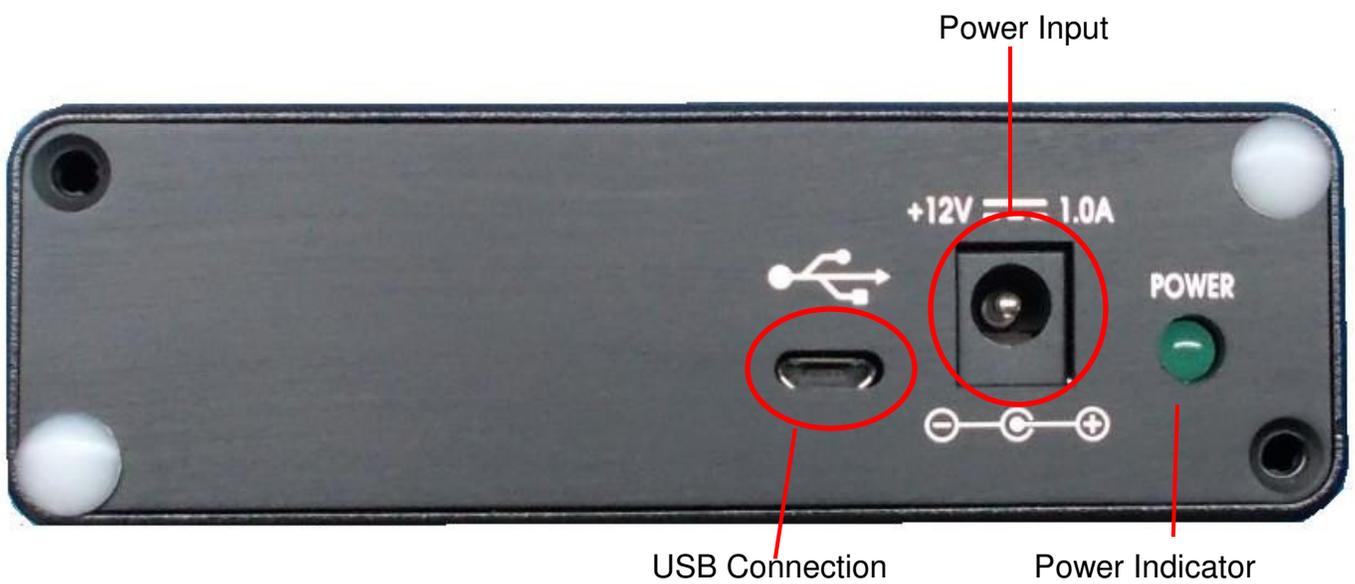
NOTE: This unit can be used for dynamometer instrumentation either as a loading dynamometer (ie. Reading the torque via the load cell, or other analog input), or as an inertial dynamometer, reading just the speed and then calculating acceleration in the computer.

Data is sent from the unit at a user selectable rate from every 100ms to once every 10sec. The data can be viewed and saved to a file with the DAQ Monitor software provided, or with any 3rd party serial communications software (eg. Hyperterminal, Kermit, etc.). Additionally users can easily make user specific interfaces from almost any programming language.

FRONT VIEW



CONTROLLER REAR VIEW



FEATURES

Computer Communications

A computer can be connected to the DAQ Unit for data logging via the Serial Port. If serial ports are unavailable on your computer then an optional USB-Serial Port converter may be used. Serial port communications are via RS232: 19200 baud, No parity, 1 Stop bit. The cable should be a "straight through" cable connecting pins 2, 3, and 5 at both ends. The DAQ Unit automatically sends data out in the format shown below at 0.1Hz to 10Hz. Data can be logged from various serial communications programs including Hyperterminal, RealTerm and similar. Alternatively Focus provides a variety of "DAQ Monitor" programs, and users can also develop their own data logging and display applications using the information provided below. Various DAQ parameters can be modified from the computer interface, and data can be logged by the computer as well.

In general the data is output in the following format:

RPM1, RPM2, TC1, TC2, Th1, Th2, D1, D2, LC, Mx, Mn, A1, A2, A3, A4, A5 [CR]

Where:

RPM1 and 2 are the speeds input channels in rotations per minute

TC1 and 2 are the thermo couple readings in °C

Th1 and 2 are the Thermistor temperatures in °C

D1 and D2 are voltage at the Voltage Divider inputs

LC is the Load Cell voltage

Mx and Mn are the Max and Min average voltages of their input terminals filtered at ~1kHz

A1 – A5 are the 05-V analog input voltages

For example the following data has the meaning explained below:

2510, 6500, 32, 27, 50, 53, 16.6, 12.3, 3.45, 3.24, 0.601, 1.686, 3.314, 5.00 [CR]

Speed 1 is 2510 RPM

Speed 2 is 6500 rpm

Temperature of TC1 is 32C

Temperature of TC2 is 27C

Temperature of Th1 is 50C

Temperature of Th2 is 53C

Voltage Divider 1 is at 16.6V

Voltage Divider 2 is at 12.3V

Load Cell is reading 3.45V

Maximum average input voltage is 3.75V

Minimum average input voltage is 3.24V

Analog Input 1 is 0.601V

Analog Input 2 is 1.686V

Analog Input 3 is 3.314V

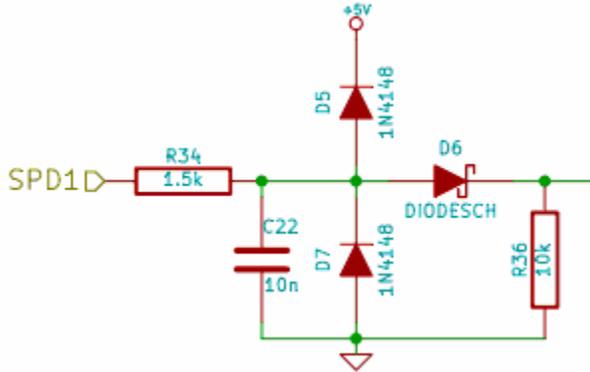
Analog Input 4 is 5.00V

This basic internal Data Acquisition System (DAQ) is a 10 bit low speed system is for reading 0 to 5V analog signals from various sensors commonly used in engine testing such as Thermocouples, Pressure Sensors, Voltages and etc. Several channels are available for this use, and can be displayed and logged to a computer. Some conversion may be required to convert the voltage back into a useful measurement An offset, scaling factor and filtering factor are provided in the Calibration screen of the DAQ Monitor software.

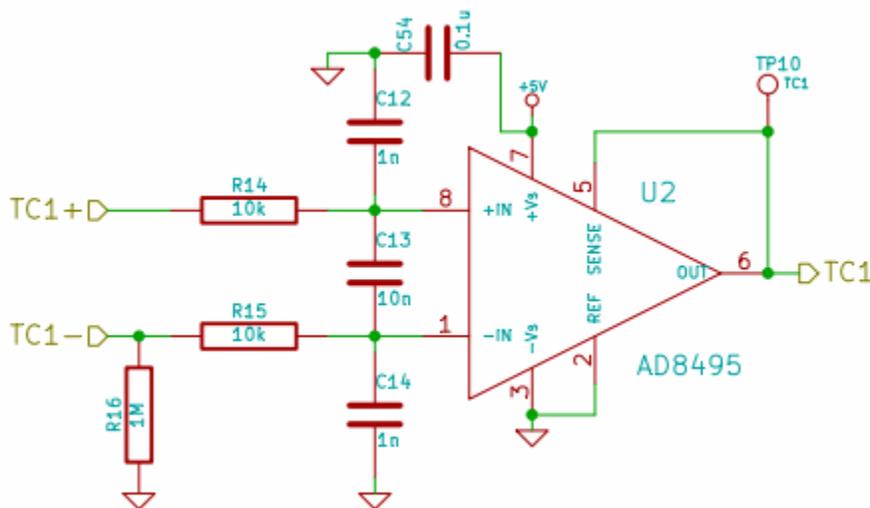
DETAILED CHANNEL EXPLANATION

Speed sensors are read via adjustable trigger level op-amps. This DAQ Unit accepts speed signals from most “pulsed” types of speed sensors. Speed is determined from the frequency of teeth passing the speed pickup. As such the only calibration required is setting the proper number of teeth on the speed target wheel. The standard speed target wheel has around 30 teeth. This can be set from the DAQ Configuration menu by hitting the “?” (question mark) and following the prompts on the screen.

The input circuitry includes voltage filtering and clipping as shown below. Additionally the upper and lower triggering thresholds are independently adjustable from the DAQ Configuration menu.

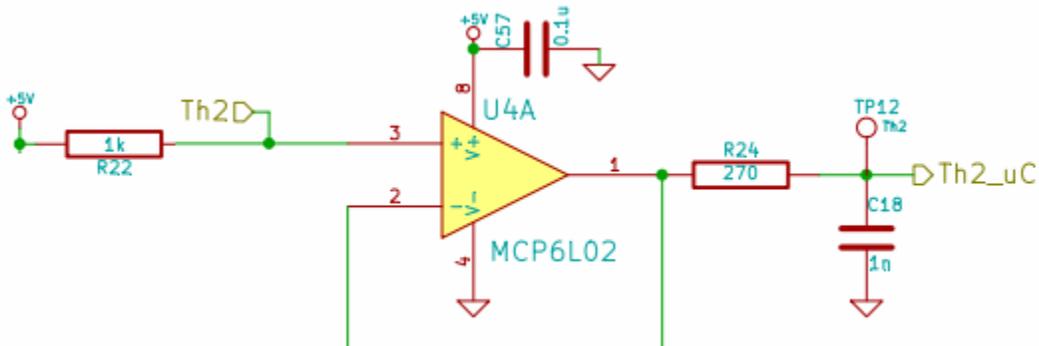


Thermocouples (K-type) are read with the following circuitry:

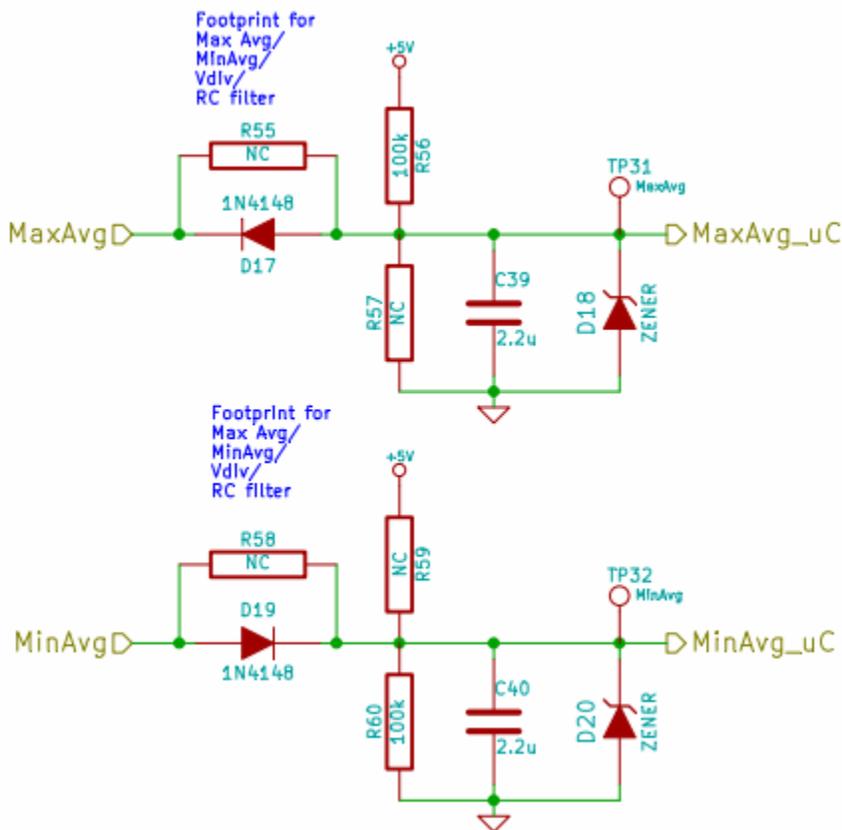


Thermistors are read with the circuit shown below. The resistor at left is digitally selectable. A resistance – temperature conversion is applied based on the popular Synerject Air Cooled Engine Temperature sensor, which has a resistance of 12k Ohm at 23C and about 700 Ohm at 100C.

NOTE: The thermistor should be connected between GND and the TH1 or TH2 input.



Maximum and Minimum Averaging input circuitry is shown below:



SPECIFICATIONS

DIMENSIONS (DAQ box only)

HxWxD: 125 x 105 x 33 mm)
Weight: 250 grams

POWER IN

Voltage: 120 VAC +/- 10%, or 220+/- 10%
Frequency: 50 to 60Hz
Current Draw: 1A max

INPUTS

Speed: Variable Reluctance or Hall type input
1 to 60 pulse per revolution
20V pk-pk maximum
24,000 rpm maximum at 60 ppr

Load Cell: 100 to 500 ohm
4-wire Wheatstone bridge
5V excitation

Voltage Dividers: 0V - 25V Maximum
Analog Inputs 1-5: 0V – 5V Maximum
Thermistor: 20k ohm to 200 ohm
Thermocouple: K-type 0 to 1000C

SERIAL COMMUNICATIONS

Baud, Bits, Parity, Stop: 19200, 8, N, 1

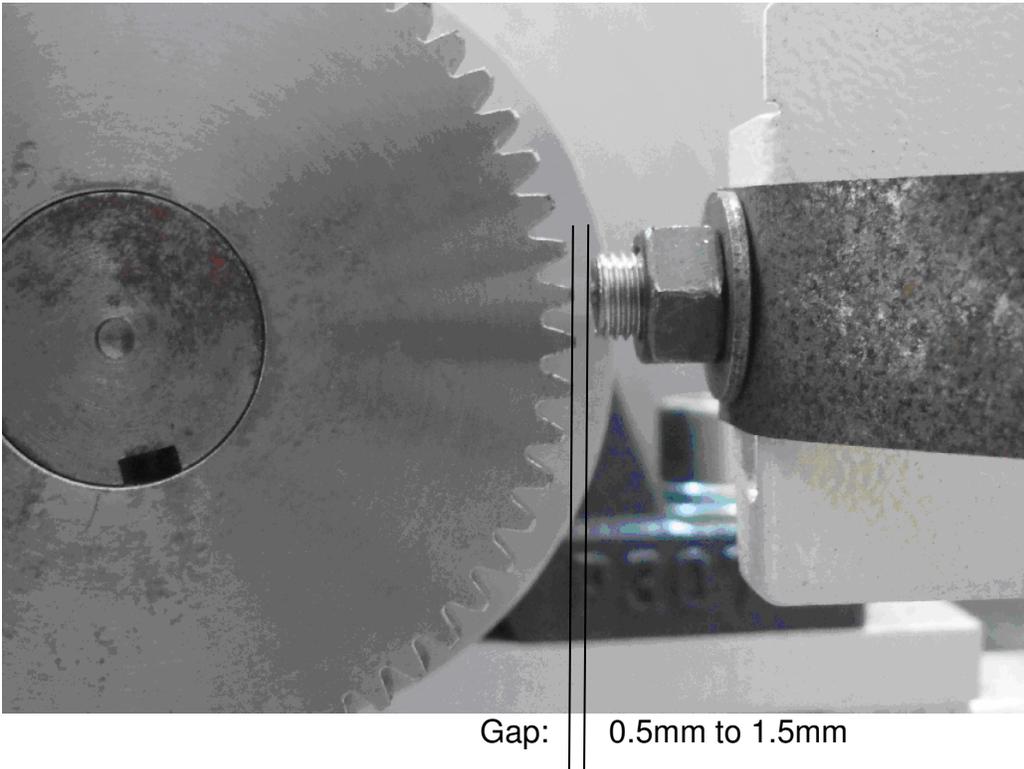
ENVIRONMENT

Temperature: 10 to 40°C Operational
0 to 50°C Non-Operational
Humidity: 5 to 90% Non-condensing
Shock/Vibe: <10g

CALIBRATION

Speed Calibration and Adjustment

To properly read the teeth it is important that the speed pickup be clean, and in close proximity to the target wheel. The gap between the speed pickup tip and the target wheel should be approximately 1mm. The acceptable range is 0.5mm to 1.5mm.

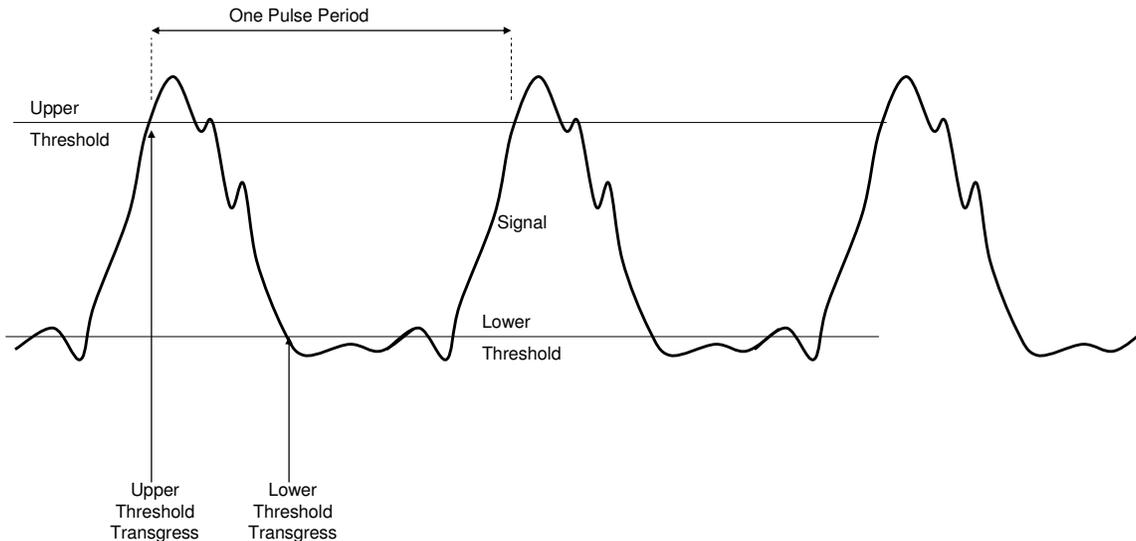


The speed sensing circuit is a 2-level signal qualification type circuit to eliminate the influence of noise. In order to qualify as a pulse, the voltage of the signal must exceed the UPPER THRESHOLD (**UT**), and then go below the LOWER THRESHOLD (**LT**) before the subsequent pulse can be read. Both upper and lower thresholds are adjustable from the DAQ configuration menu.

NOTE: The Lower Threshold voltage MUST be LESS than the Upper Threshold voltage to insure proper triggering of the circuit.

Upper Threshold and Lower Threshold Adjustment

Typically we recommend a lower threshold voltage of 0.1V to 0.4V, and an upper threshold voltage of 0.5V to 1V for most VR sensors. For Hall Effect type sensors, the Lower Threshold Voltage should be ~0.5V above the low-voltage reading of the sensor, and the Upper Threshold Voltage should be greater than the Lower Threshold Voltage, and at least 0.5V below the upper voltage reading of the sensor.



Torque Calibration

A calibration arm is provided with most dynamometers. This needs to be mounted to the dynamometer appropriately. Calibration weights can now be added to the cal-arm at the indicated location. This places the weights at a defined radius (**R**) from the centerline of the dynamometer. The torque reading is the torque resulting from a mass **M** is:

$$\text{Torque} = M \times 9.81 \times R$$

Where:

M is the weight of the mass in kg
9.81 is standard gravitational acceleration
R is the radius of the weights in meters

*NOTE: if measuring the torque on a dynamometer which has a gearing ratio, this needs to be included in the calculation. If the dyno spins at **G** times the input shaft rpm then the torque at the main shaft should be:*

$$\text{Torque} = M \times 9.81 \times R \times G$$

If the front panel torque reading is different from this amount, then the calibration factor must be adjusted. To do this put the mode selector switch in TORQUE mode and go to the front panel menu by hitting the right arrow, and adjust the torque calibration factor up or down as required to get the torque (displayed on the top line) to agree with the actual torque. Re-zero and check the torque once the factor has been adjusted.

Torque Amplifier Board

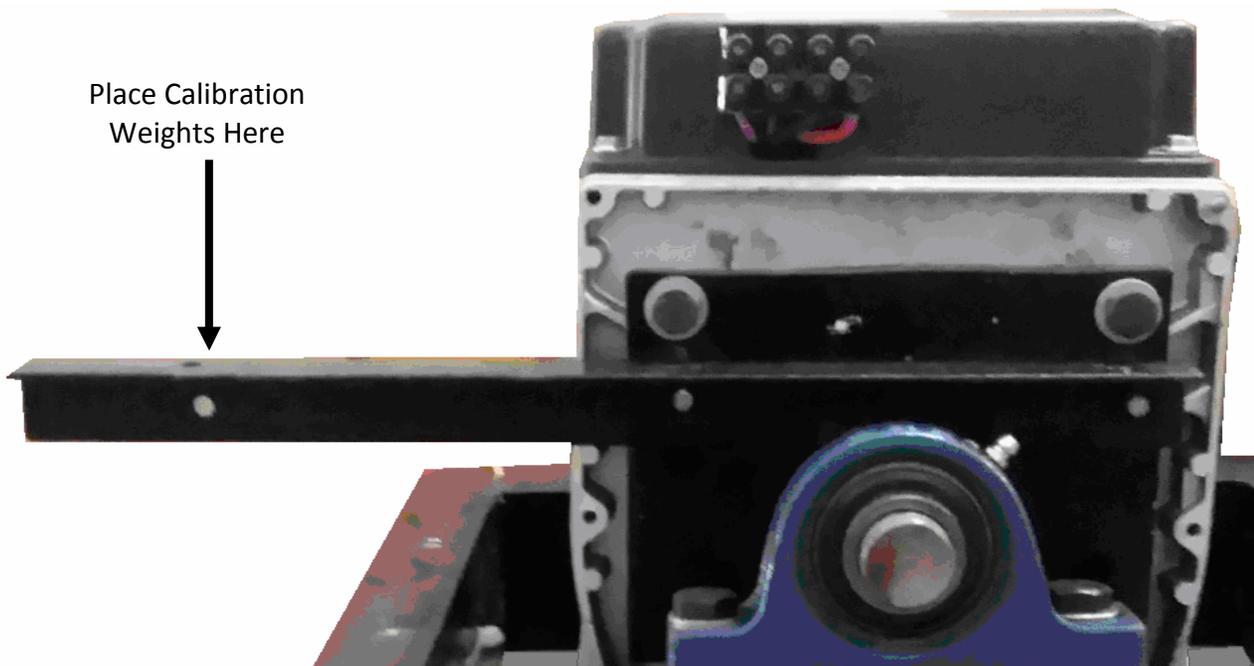
In some cases it may be necessary to adjust the Torque Amplifier Gain adjustment inside the DAQ Unit. This is generally only required when changing the load cell, or applying an unusually large or small load. The adjustment potentiometer will look similar to the image below. You can access this pot by removing the 4 screws on the front panel, and pulling the front panel off.

NOTE: The Screw Terminal Block is removable, and can be plugged back on for testing the Torque Gain value even when the front panel is off.

Torque Gain Adjustment Pot

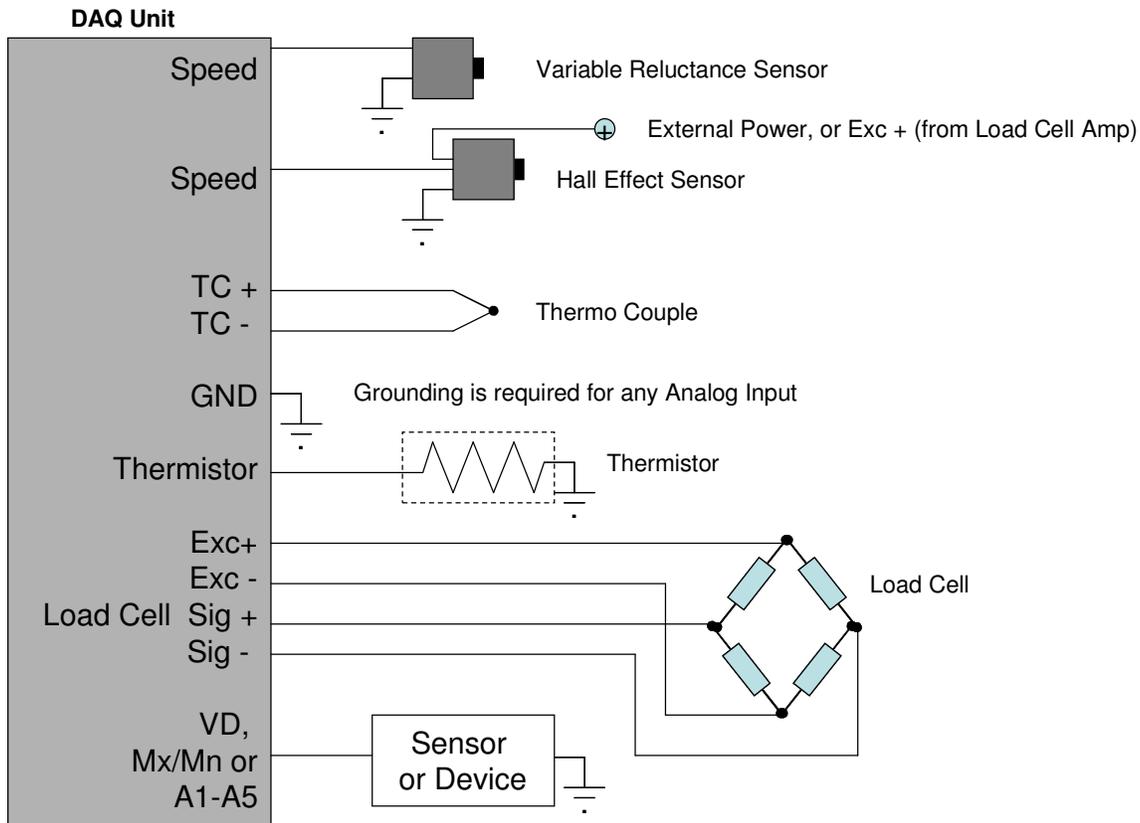


Generally the amplifier is adjusted to give a small positive voltage (like 500mV) at no load. This allows us to measure slightly negative torques without saturating the DAQ at 0V. The GAIN pot adjusts the gain of the amplifier. If the Torque Gain is adjusted, then the Torque must be re-calibrated as stated in the section above. Be sure to avoid increasing the gain so much that the output saturates, as this will cause non-linearity's, and inaccurate torque readings.



Each dynamometer should have a designated calibration weight loading point, or calibration "arm" as shown here. The radius **R** from the centerline of the dynamometer to the loading point is a critical dimension.

EXTERNAL WIRING DIAGRAM



The Controller should be is powered from a clean AC line power source.

The speed pickup is connected to the appropriate inputs via a shielded co-axial cable. The signal from Variable Reluctance sensors is non-polar and should be approximately 2 to 30V AC depending on the speed and proximity of the sensor to the speed target wheel. Hall Effect Sensors will require a power source (or they can be run from the Load Cell Excite + supply which is 5V DC). This signal is polar and should be 0-5V typically.

The load cell amplifier is connected to the appropriate connections on the dyno controller, typically the wire colors will be as follows:

RED	Excite+ (5V DC)
BLACK	Excite - (Ground)
YELLOW or WHITE	Signal +
ORNGE or GREEN	Signal -

Serial port communications are via RS232: 19200 baud, No parity, 1 Stop bit. The cable should be a "straight through" cable connecting pins 2, 3, and 5 at both ends. The data from the controller will be decimal coded ACSII number for the speed, torque and other data separated by a space and terminated by a linefeed/carriage return. The controller will send data up to 10 times a second.

TROUBLE SHOOTING GUIDE

If you encounter problems with the DAQ Unit, there are some simple tests and checks you can perform to help you track down the source of the problem. A DAQ Unit is a complex system, and very often problems are related to improper external wiring or usage of the controller. The following simple tests should help you diagnose what is wrong with the system and correct it.

POWER TEST

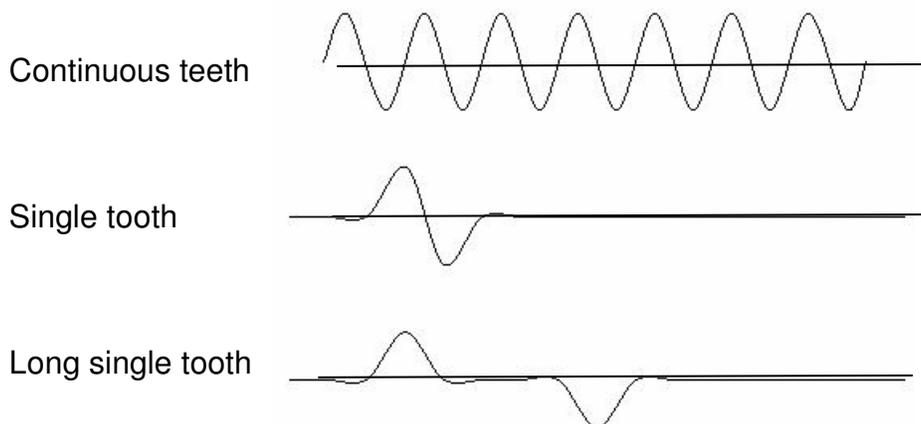
Applying power to the unit should light up the Power LED on the back panel. If this does not light, then either the unit is not receiving power, or it is non-functional. Confirm that you have 12V DC with the appropriate polarity (positive inside, negative outside) and that the connector is the right size. If this checks out, but the unit still doesn't power on, then the unit should be checked for connection breaks, or dead circuitry.

SPEED SIGNAL TEST

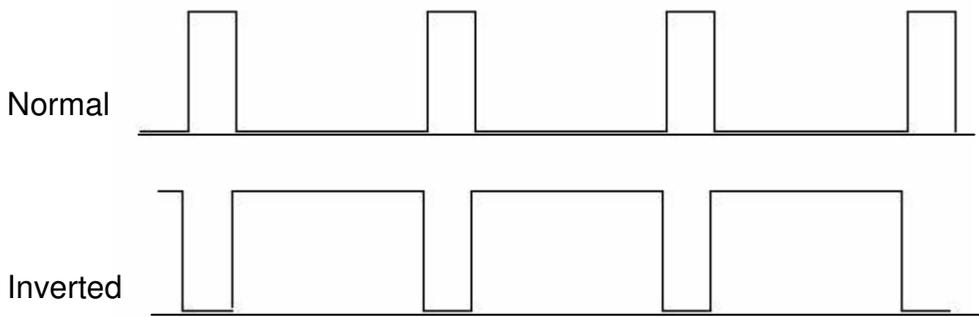
The speed signal must have sufficient amplitude to trigger the speed sensing circuitry. Typically this will require a zero-to-peak amplitude of at least 0.5V, and a lower voltage of <0.1V. For accurate speed measurements, the signal should not have any noise exceeding this threshold. With the shaft spinning the speed pickup signal can be viewed on an oscilloscope. The signal should look like one of those shown below. If you have a good speed signal, but are not reading the RPM on the DAQ Monitor, than either the sensor is not hooked up right to the controller, or the threshold levels have been set improperly.

These idealized signal waveforms are provided as a reference for trouble shooting purposes.

Variable Reluctance type Speed Signal



Hall Effect type Speed Signal



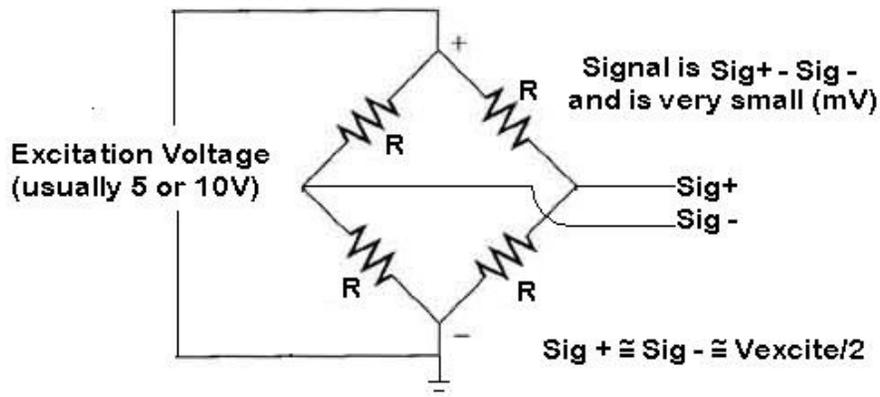
NOTE: Some Hall type sensors may not go all the way to 0 volts. This may require raising the Upper Threshold (UT) and Lower Threshold (LT) levels to properly read. Make sure that UT voltage is greater than the LT voltage.

LOAD CELL TEST

The load cell and amplifier can easily be tested together by observing the voltage while changing the load on the load cell. Unloaded the amplifier should have a small DC voltage (the “zero voltage”). As load is applied this voltage should increase linearly proportional to the applied load. If the voltage *decreases* when applying load in the nominal loading direction, reverse the **Sig +** and **Sig -** lines on the amplifier; this will cause the voltage to increase with applied load. When the load is removed the voltage should decrease back to the initial “zero voltage”. If the assembly does not behave as indicated, it is likely that there is a problem with the load cell wiring, and you should proceed to the following “Load Cell Trouble Shooting” section.

LOAD CELL TROUBLE SHOOTING

The amplifier in this unit is designed to work with standard Wheatstone bridge configuration 4-wire load cells with resistance **R** between 100 and 450 ohms.



The excitation voltage (**Excite +** relative to **Excite -**) is either 5 or 10V depending on the amplifier. When functional the **Sig +** and **Sig -** lines should both be at approximately $\frac{1}{2}$ the excitation voltage. Connecting a voltmeter (set to the DC mV scale) between **Sig +** and **Sig -** you should see a very small voltage (a few mV) which changes linearly with load. If the excitation voltage is

properly applied, and you do not get a repeatable and linear change in the **Sig +** to **Sig -** voltage, it is likely that your load cell is either improperly hooked up, one of the leads is broken, or the load cell itself is damaged.

The most common problems associated with strain gages are:

- 1) Disconnected Leads – One of the wires is not properly connected
- 2) Shorted Leads – One or more of the leads is shorted together or to a shield ground
- 3) Internal Connection Breakage – One of the wire bonds to the actual strain element is broken

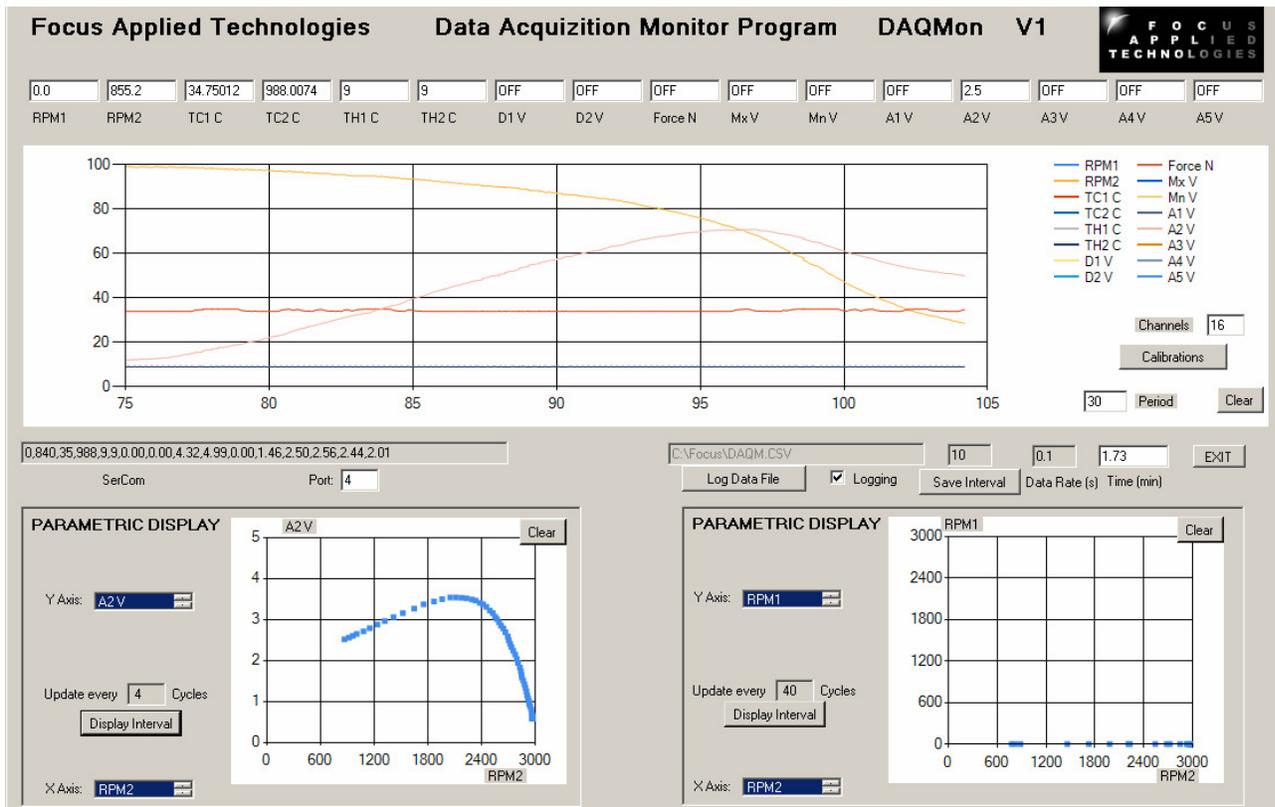
Any one of these faults may lead to signal drift, noise, no signal or signal pegged high or low. If your system is exhibiting these faults, you should check the resistance of between the leads and compare them to the table below.

LOAD CELL RESISTANCE MEASUREMENTS

<u>Leads</u>	<u>Resistance</u>
Excite + to Excite -	R
Sig + to Sig -	R
Excite (+ or -) to Sig (+ or -)	3R/4
Shield to any other lead	Infinite

If you do not get a consistent R, 3R/4 reading than the load cell may be damaged.

DAQ MONITOR PROGRAM



The DAQ Monitor software is supplied for display, data logging and configuration of the DAQ Unit. This document details the usage of the DAQ Monitor program.

To begin with the DAQ Monitor software should be “unzipped” and loaded into the **C:\Program Files\Focus** folder. If an older version exists, it should be Uninstalled first (From START menu, go to Control Panel, and then Add or Remove Programs, Click “DAQMonVx” and Uninstall).

NOTE: The DAQ Monitor software requires the Microsoft “Dot Net Framework” 4.0 or higher. This can be down loaded and installed from the Microsoft website for free:

<https://www.microsoft.com/en-us/download/details.aspx?id=17851>

Additionally a calibrations file **C:\Focus\DaqCal.CSV** should exist. If the folder does not exist, then create it. The DAQ Calibrations file contains important calibration factors relating to your DAQ Unit, and these should be recorded somewhere safe for reference (eg. in a notebook, or sticker on the DAQ Unit, or in a backup file for example DaqCal.Bak). If the DaqCal.CSV file does not exist, it will be created, and can be modified by hand, or from the Daq Monitor program. As a “CSV” (Comma Separated Variables) it can be conveniently opened in Excell or other spreadsheet, and saved (make sure to save as a CSV format). Below is a typical DaqCal file:

Focus Applied Technologies DAQ Calibration File	DAQ1						
Version	Default						
DAQ Com Port	4						
Graph Max X	1000						
Graph Scrole Time	30						
Delta T	0.1						
Save Interval	10						
RPM1	1	0	0	3000	0.5	TRUE	
RPM2	1	0	0	3000	0.5	TRUE	
TC1 C	1	0	0	100	0.5	FALSE	
TC2 C	1	0	0	100	0.5	FALSE	
TH1 C	1	0	0	100	0.5	TRUE	
TH2 C	1	0	0	100	0.5	TRUE	
D1 V	4.9	0	0	20	0	FALSE	
D2 V	4.9	0	0	20	0	FALSE	
Force N	10	-40	0.5	10	0	FALSE	
Mx V	1	0	0	5	0	FALSE	
Mn V	1	0	0	5	0	FALSE	
A1 V	1	0	0	5	0	FALSE	
A2 V	1	0	0	5	0	TRUE	
A3 V	1	0	0	5	0	FALSE	
A4 V	1	0	0	5	0	FALSE	
A5 V	1	0	0	5	0	FALSE	
Pulses per Rev RPM1	4						
Frict Offset RPM1	0						
Frict Factor RPM1	0						
Roller Diam RPM1	0						
Inertia RPM1	0						
Pulses per Rev RPM2	0						
Frict Offset RPM2	0						
Frict Factor RPM2	0						
Roller Diam RPM2	0						
Inertia RPM2	0						
Channels	16						
Dataloging File	C:\Focus\DAQM.CSV						
X Graf1	1						
Y Graf1	12						
X Graf2	0						
Y Graf2	1						
Skip1	4						
Skip2	40						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						
Spare	0						

The Com Port is the serial communications port used to talk to the DAQ Unit. This can either be a permanent port (usually a 9-pin "D" type connector on the back of a PC) or a USB cable. In either case you will need to check for the appropriate port number, and enter it in the DAQ Monitor software, or alternatively type it directly into the DaqCal.CSV file.

The main graph maximum width (ie. X dimension) is given, along with the current width in seconds. The data rate (delta T) is next, in seconds, and then the File Update Interval. Data can be saved to the logging file at this interval (ie. 10 means save data once every 10 readings) to reduce the size of data files. When reading at high data rates the logging file can quickly become unmanageably large without skipping lines.

The next section gives the label, scaling factor and offset, maximum and minimum values (for graphing) and a logical value for whether the channel is on or not (TRUE means it is active) for each of the input channels.

Speed specific channel information is given for RPM1 and RPM2 next. The Pulses Per Revolution refer to the number of teeth on the target wheel per revolution of the shaft (engine or roller). A Frictional offset and factor are given as well. The Factor is Nm of torque per rpm.

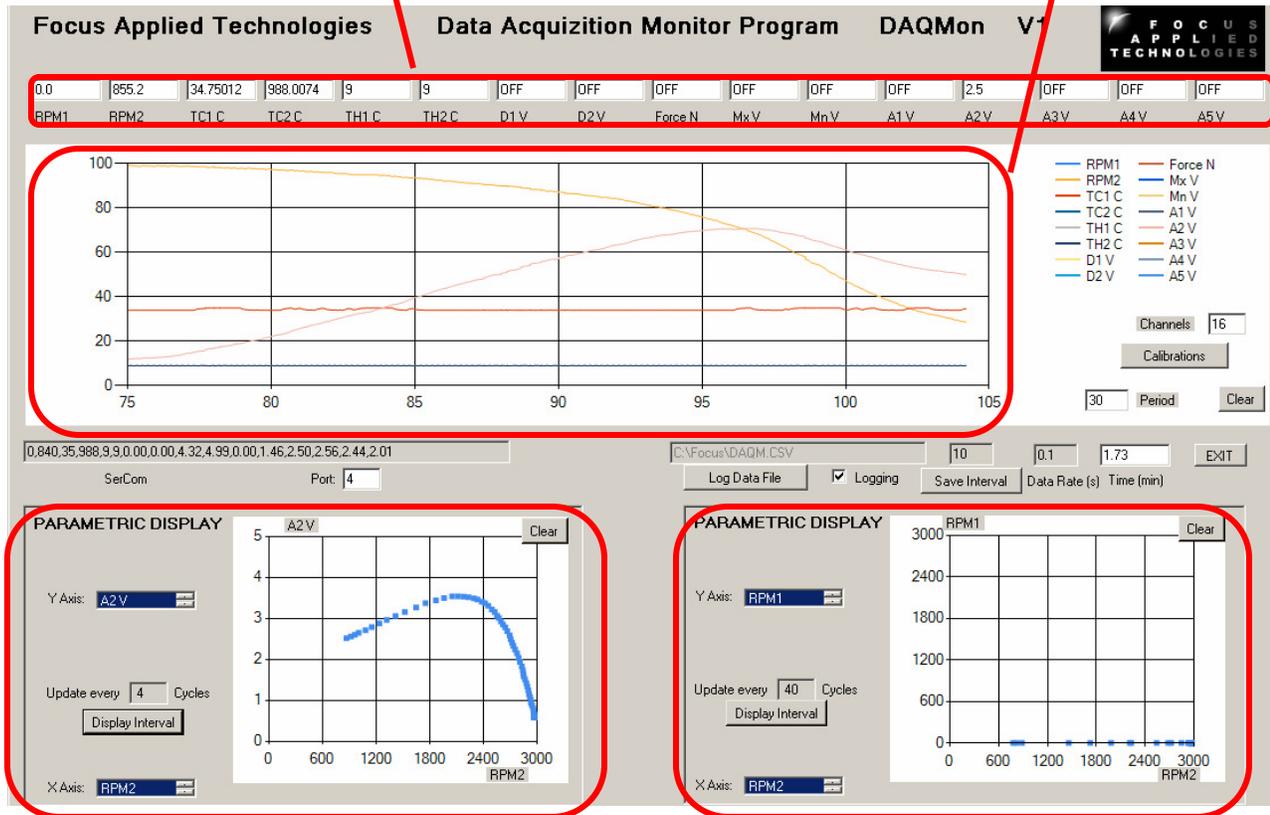
The total number of channels is then given, followed by the Data Logging Filename.

Graph input channel numbers for the X and Y axis of the Parametric Display graphs are next, along with their update (skip) rates. Lastly there are several spare values for future developments.

Major Display Areas

Input Channels Labels, and current Value

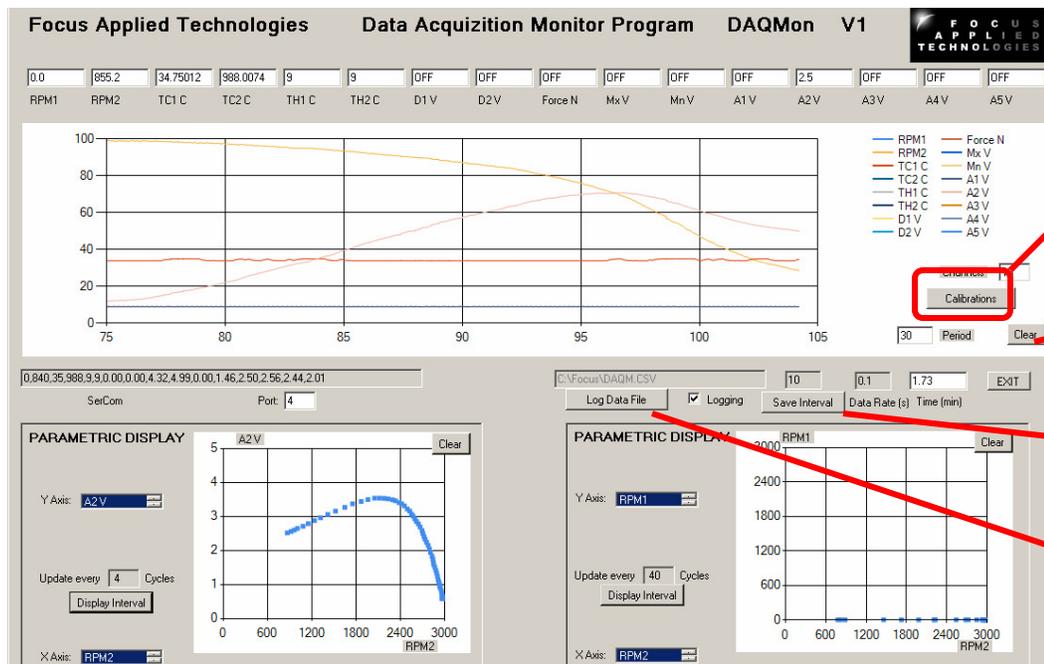
Historical trend of active channels



Parametric Display 1

Parametric Display 2

Major Controls

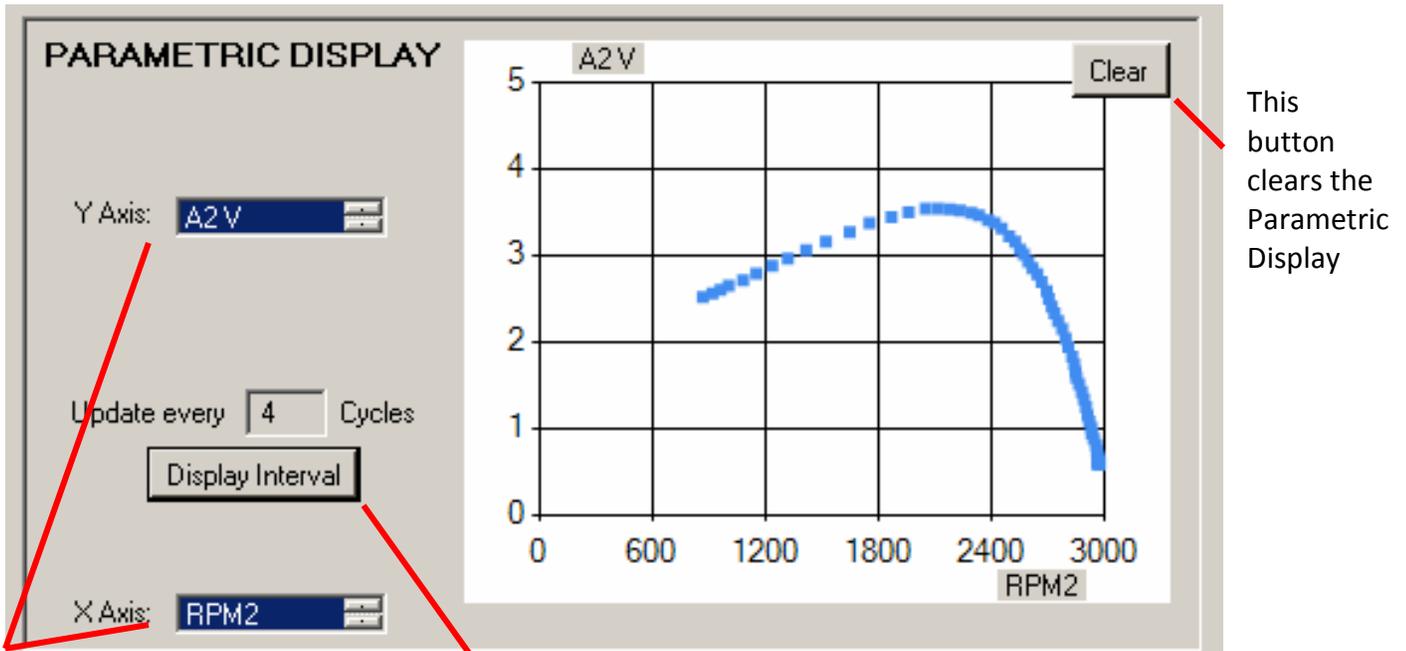


This button opens the Calibrations menu

This button clears the History graph

Logging Interval can be changed here

The Data Logging File name can be changed here

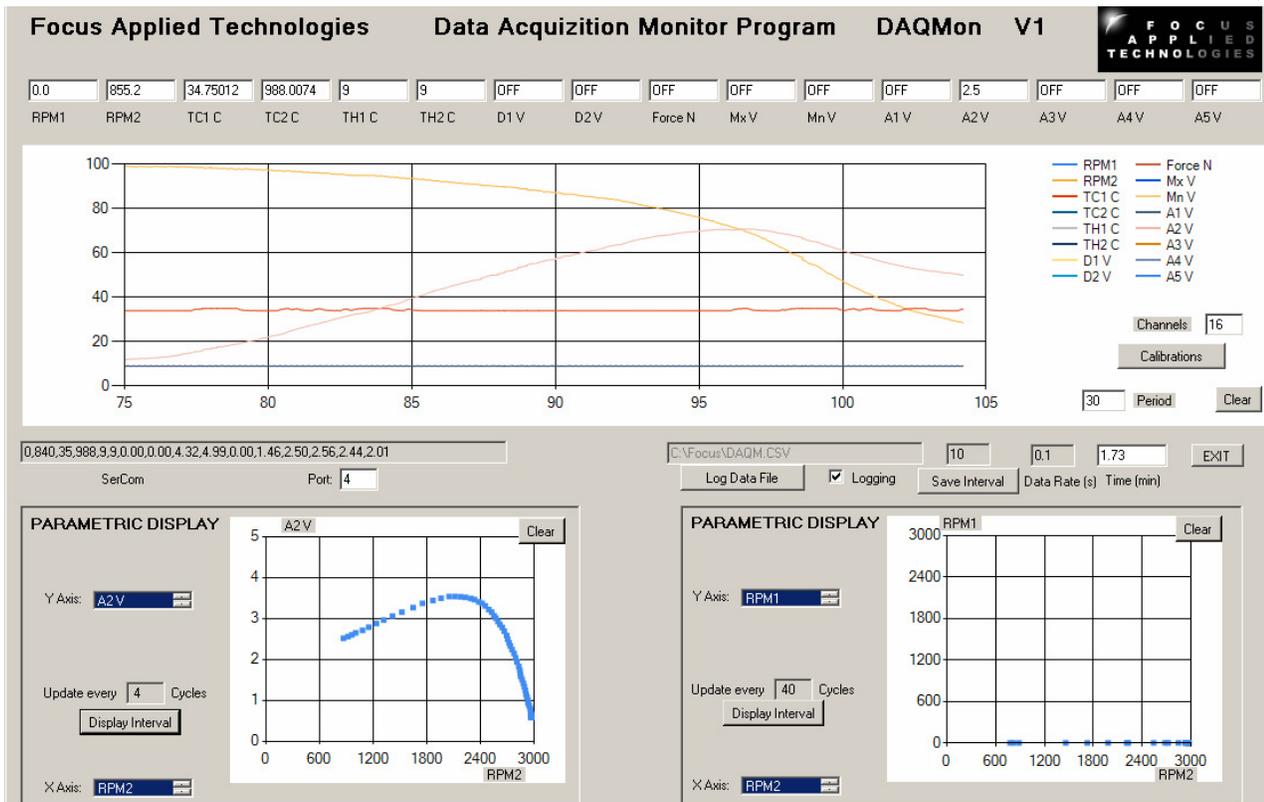


Y and X axis Channels are selected by scrolling and clicking in these boxed

The Parametric Display Update rate can be changed by clicking this button. Usually longer intervals are used for channels that change slowly, ie. The temperature of a room, as only 1000 points total are displayed (older data is erased).

The DAQ unit sends out data at a maximum rate of 10Hz (ie. One data set for every 100ms). The DAQ Unit sends data as numerical characters at 19200 baud, 8bits, 1 stop bit, no parity. The raw data is shown in the SerCom box on the left of the screen.

The History of the Analog Inputs is displayed in the central graph, on a 0-100% basis, where the 0 point is the "Min" value defined in the calibrations page, and 100% is the "Max" defined in the calibrations page.



Logging data file name is edited from the “Log Data File” button below the central graph, and logging can be turned on/off via the “check box” just below the data file name.

Calibrations

Hitting the “Calibrations” button (upper right) pulls up the Calibrations dialog box as shown below. Numbers can be entered in the appropriate boxes. Each channel can be scaled by the Factor, and Offset as follows:

Displayed Value = Raw Value (ie. Voltage) x Factor + Offset

So if a sensor gives 100mV per bar, with an offset of 1 bar (ie. 0V at 1 bar) then to read pressure in bar we could use:

Label = “P1 (Bar)”
 Factor = 10
 Offset = 1

Now a reading of 250mV would become:

$$0.250 \times 10 + 1 = 3.5 \text{ Bar}$$

Minimum and Maximum are only used for scaling the displays. Filtering can be tuned off by setting the “Filter” value to 0. A Filter value of 0.5 means there is a 50%/50% exponential average applied to the raw data:

Current Average Data = Previous Average Date x Filter + Current New Data x (1 – Filter)

A typical filter value is 0.5, a value of 0 means no filtering, and a filter value of 0.95 is very heavy filtering.

To close this hit the “Calibrations” button again.

Calibrations							
	Label	Factor	Offset	Min	Max	Filter	ON
Ch 1	RPM1	1	0	0	3000	0.5	<input checked="" type="checkbox"/>
Ch 2	RPM2	1	0	0	3000	0.5	<input checked="" type="checkbox"/>
Ch 3	TC1 C	1	0	0	100	0.5	<input checked="" type="checkbox"/>
Ch 4	TC2 C	1	0	0	100	0.5	<input checked="" type="checkbox"/>
Ch 5	TH1 C	1	0	0	100	0.5	<input checked="" type="checkbox"/>
Ch 6	TH2 C	1	0	0	100	0.5	<input checked="" type="checkbox"/>
Ch 7	D1 V	4.9	0	0	20	0	<input type="checkbox"/>
Ch 8	D2 V	4.9	0	0	20	0	<input type="checkbox"/>
Ch 9	Force N	10	-40	0.5	10	0	<input type="checkbox"/>
Ch 10	Mx V	1	0	0	5	0	<input type="checkbox"/>
Ch 11	Mn V	1	0	0	5	0	<input type="checkbox"/>
Ch 12	A1 V	1	0	0	5	0	<input type="checkbox"/>
Ch 13	A2 V	1	0	0	5	0	<input checked="" type="checkbox"/>
Ch 14	A3 V	1	0	0	5	0	<input type="checkbox"/>
Ch 15	A4 V	1	0	0	5	0	<input type="checkbox"/>
Ch 16	A5 V	1	0	0	5	0	<input type="checkbox"/>

Value = Read Value x Factor + Offset Min and Max are Graph Limits Filter: 0 to 1

Adjust the various calibration factors then hit "Calibrations" button again to close.

Logging Data File

The data is continuously saved to the designated file with Time in seconds as the first column, and any active channel (ie. Any channel that is “ON”) in the following columns. Whenever a new channel is activated, or deactivated, the new header is put in the logging file as shown below. This is done to avoid confusion between the previous header, and the new data.

	A	B	C	D	E	F	G	H	I
1	Focus Applied Technologies DAQ Log Version: Default,,,,, Opened: 6/6/2016 5:19:31 PM								
2	Time (s)	RPM1	RPM2	TC1 C	TC2 C	TH1 C	TH2 C	A2 V	
3									
4	0.9	0	0	33.9668	987.2813	8.991211	8.991211	0.6	
5	2	0	0	33.99997	988.2454	8.999991	8.999991	0.6	
6	3	0	0	34	988.5862	9	9	0.6	
7	4	0	0	34	987.9342	9	9	0.6	
8	5	0	700.6055	34	988.7304	9	9	0.6	
9	6	0	2890.909	34	988.1248	9	9	0.6	
10	7	0	2971.109	34	988.3156	9	9	0.6	
11	8	0	2980.387	34	988.5618	9	9	0.6	
12	9	0	2970.655	34	988.191	9	9	0.63	
13	10	0	2953.375	34	988.8078	9	9	0.93	
14	11	0	2917.455	34	988.994	9	9	1.47	
15	12	0	2847.473	34	987.8877	9	9	2.25	
16	13	0	2742.917	34	988.8905	9	9	2.86	
17	14	0	2662.425	34	987.8876	9	9	3.35	
18	15	0	2531.711	34	988.3749	9	9	3.8	
19	16	0	2330.094	34	987.9379	9	9	3.94	
20	17	0	2192.085	34	988.9687	9	9	3.91	
21	18	0	2123.747	34	987.4063	9	9	3.87	
22	19	0	2081.669	34	988.9916	9	9	3.85	
23	20	0	2060.109	34	988.2383	9	9	3.83	
24	21	0	2031.436	34	988.094	9	9	3.81	
25	22	0	2016.056	34	988.9855	9	9	3.79	
26	Time (s)	RPM1	RPM2	TH1 C	TH2 C	A2 V			
27	23	0	1996.104	9	9	3.78			
28	24.1	0	1984.381	9	9	3.72			
29	25	0	2118.667	9	9	3.62			
30	26.1	0	2415.399	9	9	3.34			
31	27.1	0	2620.767	9	9	2.87			
32	28.1	0	2744.556	9	9	2.23			
33	29.1	0	2833.71	9	9	1.66			
34	30.1	0	2902.719	9	9	1.19			
35	31.1	0	2942.703	9	9	0.81			
36	32.1	0	2972.844	9	9	0.63			
37	33.1	0	2978.089	9	9	0.6			
38	34.1	0	2975.193	9	9	0.6			
39	35.1	0	2981.577	9	9	0.6			
40	36.1	0	2975.431	9	9	0.62			
41	37.1	0	2972.027	9	9	0.72			
42	38.1	0	2963.879	9	9	0.94			
43	39.1	0	2931.498	9	9	1.28			
44	40.1	0	2884.621	9	9	1.73			

This data can then be graphed and analyzed further.

Alternative Data Logging and DAQ Configuration

An alternative option for data logging is via any serial communications program, such as Hyperterminal. Simply connect to the DAQ unit and save the resulting data to a text file. This text file can then be loaded into a spread sheet such as Excel and the various columns can be converted to data as mentioned above in the Computer Communications section above.

In this mode you can also change how the DAQ is configured.

WARNING: Changing some parameters may modify how the unit communicated with the computer, causing the DAQ monitor software to operate inappropriately

To get to the configuration menu simply hit the question mark “?” key. You should see a display like the following:

Focus Applied Technologies 2015

Setting Menu:

- 1. Speed 1**
- 2. Speed 2**
- 3. Voltage Divider 1**
- 4. Voltage Divider 2**
- 5. Channel Selection 1**
- 6. Channel Selection 2**
- 7. Update Interval**
- 8. Save Config**

Key in required number or ESC to exit

Hit the **ESC** button to exit the configuration menu, or **1-8** for any of the other options. From each of the sub-menus you can return to the main menu by hitting the **ESC** button.

If you enter 1 or 2 you will get the menu for the speed channels:

Speed 1 Channel:

- 1. Pulse Per Rev = 4**
- 2. Upper Threshold = 1.50**
- 3. Lower Threshold = 1.00**

From here you can change the number of pulses per revolution, or the voltage triggering levels. Make sure that you're speed signal exceeds the upper threshold, and goes below the lower threshold. To adjust the thresholds hit the number (**2** for upper, **3** for lower) appropriate, then use the **+** or **-** keys to get the desired voltage.

WARNING: Make sure that the Upper Threshold Voltage is ABOVE the Lower Threshold Voltage

Individual channels can be turned ON or OFF from the Channel Selection sub menus (items **5** and **6**), however ALL channels must be ON to use the DAQ Monitor software.

The data logging interval can be changed using the Update Interval (item **7**) from 0.1 to 10.0 seconds by using the **+** and **-** keys.

Finally once you have updated the configuration as required, you can then save these changes to the on-board flash memory, so that the unit will use these same configurations next time it is powered up. To save the configuration hit **8** from the main menu, and confirm, by hitting **Y** at the confirmation screen:

Save Config? (Y/N)

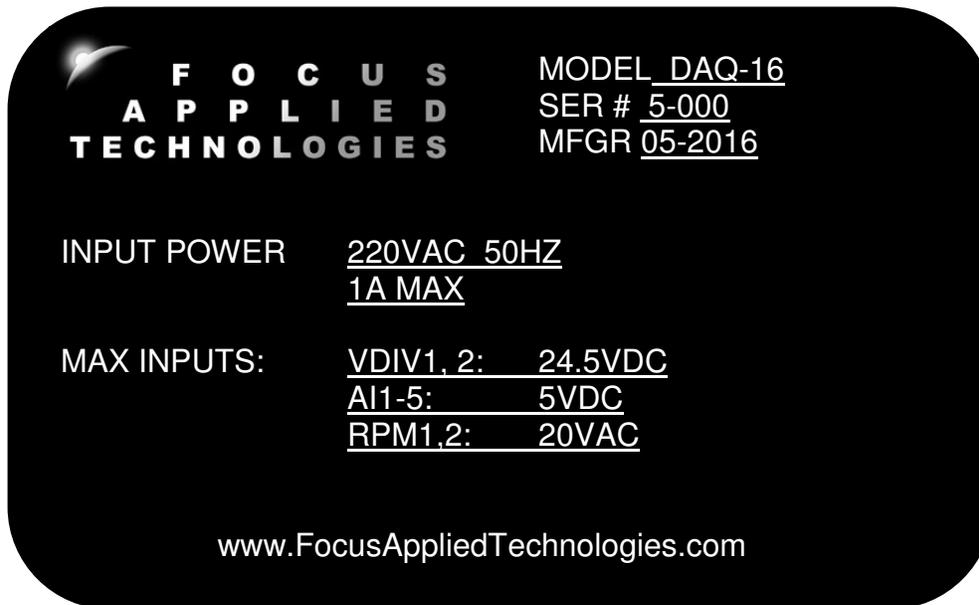
Hit **ESC** to return to normal data logging. You should see data streaming something like this:

0,0,33,988,9,9,0.00,0.00,4.32,4.99,0.00,1.45,0.60,2.50,2.44,2.02

If you wish to view the data on some terminal programs you will want to use the “Append line feeds to incoming line ends” or similar option to get the data to “scroll”.

CONTACT INFORMATION

As there are so many factors outside of our direct control, Focus Applied Technologies can not assume any liability for accidents caused by the use of this equipment. Use of this equipment is at the users own risk. If any problems or accidents occur, we wish to be informed so that we may improve our products, and fix any issues they may have. Please send us any feed back you have regarding the use of this equipment.



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