

## Weather Stations

Parts 1723-XB X-11X (Firmware version 2436-4.03.00)

Parts 1723-XB X-13X (Firmware version 2917-4.03.00 Modbus units only)

Doc No: 1723-PS-0022

Issue 3



**MetPak**



**MetPak Pro**

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## 1. FOREWORD

Thank you for purchasing a MetPak unit manufactured by Gill Instruments Ltd. To achieve optimum performance we recommend that you read the whole of this manual before proceeding with use.

Gill products are in continuous development and therefore specifications may be subject to change and design improvements without prior notice.

The information contained in this manual remains the property of Gill Instruments and should not be copied or reproduced for commercial gain.

## 2. INTRODUCTION

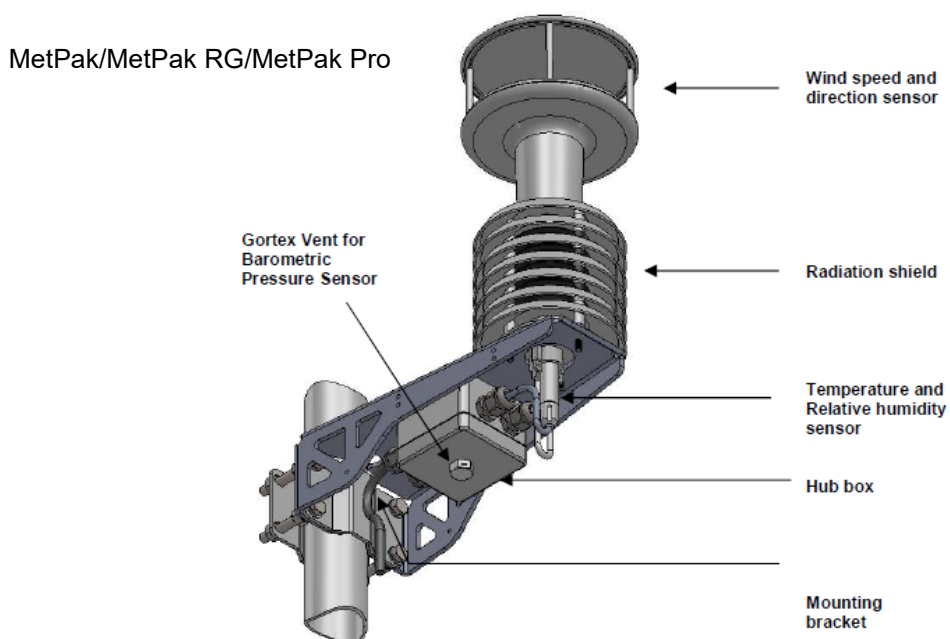
All the MetPak range equipments are Professional multi-sensor instruments that measure the most essential weather parameters. They also provide a data collection system that allows customers to add their own selection of sensors to meet local requirements. Gill ultrasonic technology, as used in the proven WindSonic instrument, measures wind speed and direction. Temperature and Humidity are measured and Dewpoint calculated using an industry standard probe housed in a naturally aspirated radiation shield. Barometric pressure is measured using an industry standard sensor.

The MetPak Pro in addition allows the customer to use a tipping bucket for rain measurements and to add up to four additional sensors. One PRT (temperature sensor), one digital (contact closure rain gauge) and two analogue inputs (4-20mA or 0-5V) e.g. water level sensor, Pyranometer, pressure sensor, soil temperature etc. Other types of sensors may be added limited by the number of inputs available.

MetPak range units combines all the instrument data into a single combined data string. This may be configured for digital ASCII RS232/RS422/RS485 (2 wire point to point), digital MODBUS RTU/ASCII and SDI-12 outputs.

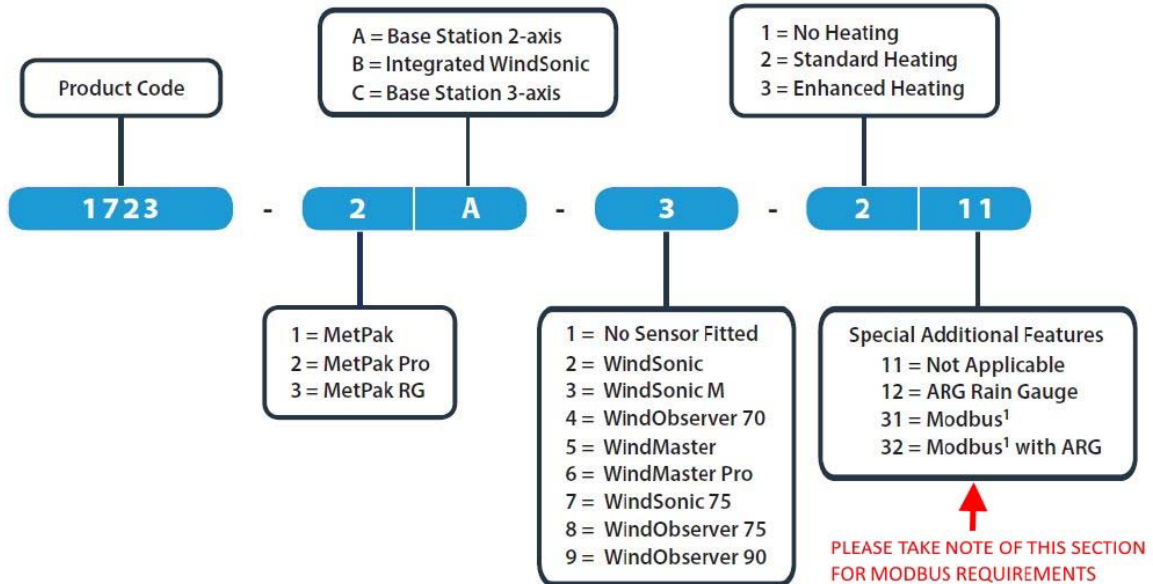
The instrument uses a rugged mounting clamp that attaches to any vertical pipe up from 30mm to 58mm diameter.

An electrical Hub box is fitted to the mounting bracket for termination of sensors limited to cable gland entry, data and power cables. A separate Junction box is optionally available for easier termination of external sensors, power and communication cables.



## 2.1. MetPak Part Numbers and Parameters

### 2.1.1. MetPak Part Number Structure.



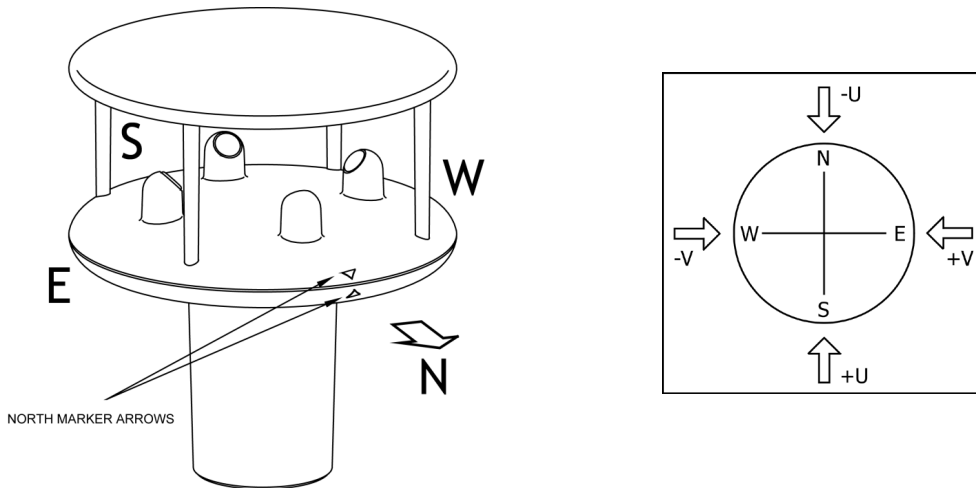
### 2.1.2. MetPak Derived Parameters and Sensors.

MetPak Sensor Parameter	MetPak	MetPak Pro
Wind Speed, Relative	Yes	Yes
Wind Direction, Relative	Yes	Yes
Temperature, Air	Yes	Yes
Humidity, Relative	Yes	Yes
Dewpoint	Yes	Yes
Barometric Pressure	Yes	Yes
Rain/Precipitation	No	Yes with user supply Rain Gauge
Temperature from a PRT	No	Yes with user supply PRT
Analogue Sensor 1	No	Yes with user supply Sensor
Analogue Sensor 2	No	Yes with user supply Sensor
MetPak Derived Parameter	MetPak	MetPak Pro
Status (Sensors)	Yes	Yes
Volts (Supply)	Yes	Yes
MetPak Outputs	MetPak	MetPak Pro
Gill ASCII	Yes	Yes
Modbus	Yes	Yes
SDI-12	Yes	Yes
NMEA	Yes	No

### 2.1.3. Wind Speed and Direction Sensor

The MetPak uses the Gill WindSonic wind speed and direction sensor. The WindSonic measures the times taken for an ultrasonic pulse of sound to travel from the North (N) transducer to the South (S) transducer, and compares it with the time for a pulse to travel from S to N transducer. Likewise times are compared between West (W) and East (E), and E and W transducer.

If, for example, a North wind is blowing, then the time taken for the pulse to travel from N to S will be faster than from S to N, whereas the W to E, and E to W times will be the same. The wind speed and direction can then be calculated from the differences in the times of flight on each axis. This calculation is independent of factors such as temperature.



Compass points

The compass point and polarity of U and V if the wind components along the U and V axis are blowing in the direction of the respective arrows.

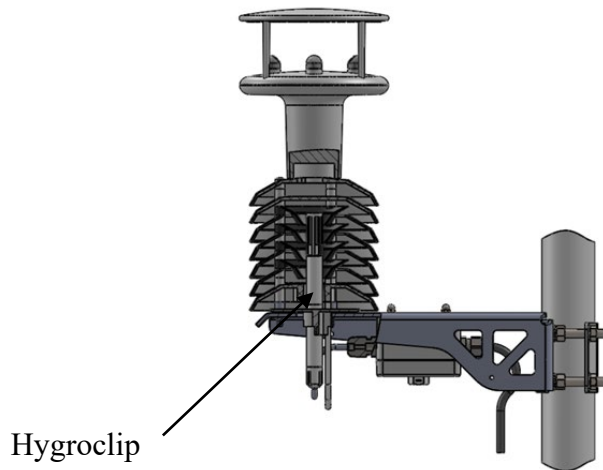
MetPak outputs Relative wind – wind speed and/or direction relative to the north marker, which may not be facing north.

### 2.1.4. Radiation Shield



A MetSpec Multi-Plate Radiation Shield provides excellent protection to the Rotronics temperature and relative humidity sensor, shielding the probe from unwanted errors, especially from secondary upward reflecting solar radiation and/or wind blown precipitation/airborne contaminants. The special shield plate geometry, with its double louvre design, provides excellent response time performance of quick ambient temperature changes while still working effectively as a baffle to stop larger contaminants such as salt or dirt from reaching the Rotronics probe. Due to the increased protection offered to the Rotronics probe by the MetSpec shield, the maintenance cycle can be extended. The shield benefits from very robust material choice and extremely high UV protection requiring no maintenance. A further benefit of the MetSpec shield design is that the measured temperature is now even closer to reference temperature measurements made using artificially aspirated motors without the drawbacks of such systems (power and the maintenance of moving parts).

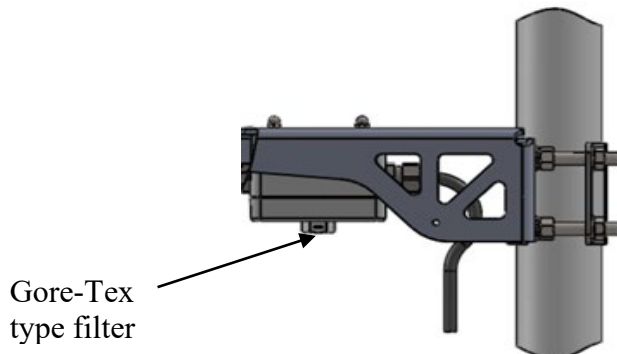
### 2.1.5. Temperature, Relative Humidity and Dewpoint



The MetPak MetSpec shield contains a Rotronic Hygroclip module. It is a complete instrument, with integrated temperature compensation. Calibration data is maintained within the integrated electronics. It provides digital output signals for Relative Humidity, Temperature and Dewpoint.

### 2.1.6. Barometric Pressure

Barometric pressure output is provided by a solid-state device fitted on to the circuit board in the MetPak Unit Hub box. Vent to atmosphere is via a Gore-Tex type filter which also protects the pressure sensor from the effects of wind and rain.



### 2.1.7. Precipitation (Digital Input 1).

MetPak Pro:-

Rainfall is measured by the well-proven tipping bucket method. Rain is collected by a funnel and is passed to one of the two buckets situated at either end of a short balance arm. The balance arm tips when the first bucket is full, emptying this bucket and positioning the second bucket under the funnel. The tipping process repeats indefinitely as long as the rain continues to fall, with each tip corresponding to a fixed quantity of rainfall; at each tip the moving arm forces a magnet past a reed switch, causing contact to be made for a few milliseconds.

Rain levels are provided by reading the number of switch closures taking place over each output rate time period (default one reading per second). Then multiplying this number by the Rain Gauge count figure set using MetSet (e.g. 0.2mm per switch closure) and outputting the result in the data string.

### **2.1.8 PRT Temperature (PRT Input)**

An external 2 or 4 wire PT100 device can be connected to a MetPak Pro to provide an additional remote temperature measurement.

### **2.1.9 Analogue Sensor 1**

An external remote analogue sensor, 0-5v/4-20mA output, can be connected to a MetPak Pro AN1 input.

### **2.1.10 Analogue Sensor 2**

An external remote analogue sensor, 0-5v/4-20mA output, can be connected to a MetPak Pro AN2 input.

### **2.1.11 Status of MetPak Sensors**

Outputs the MetPak Sensors Status Code (see para 8.3.2).

### **2.1.12 Supply Voltage**

The DC Supply voltage measured at the MetPak unit is output in the MetPak Digital Data Output string.

## **2.2. MetPak Sensors default ASCII Output Summary**

### **2.2.1. MetPak Default Data String**

Node, Relative Wind Direction, Relative Wind Speed, Pressure, Humidity, Temperature, Dewpoint, Supply Voltage, Status, Checksum.

STX>Q,170,000.08,1019.5,035.0,+024.7,+008.3,+04.9,00,<ETX>55 & (CR,LF)

### **2.2.2. MetPak Pro Default Data String**

Node, Relative Wind Direction, Relative Wind Speed, Pressure, Humidity, Temperature, Dewpoint, PRT, Analogue Input 1, Analogue Input 2, Digital Input 1, Supply Voltage, Status, Checksum.

<STX>Q,249,000.01,1017.3,049.2,+021.4,+010.3,+040.45,+000.06,+000.04,0000.000,+11.6,00,<ETX>7C & (CR,LF)

### 3. TECHNICAL SPECIFICATION

Wind Measurement	
Parameters	Polar Wind Speed & Direction or U and V Vectors
Units of Measurement	m/s, knots, mph, kph, ft/min
Wind Speed	
Range	0.01 to 60m/s
Accuracy	± 2% @12m/s
Resolution	0.01m/s
Threshold	0.01m/s
Wind Direction	
Range	0-359 Degrees – No dead band
Accuracy	± 3° @12 m/s
Resolution	1°

Air Temperature (Hygroclip)	
Type	Pt 100 1/3 Class B
Range	-35°C to +70°C
Accuracy	±0.1°C
Resolution	0.1°C
Units of Measure	°C or °F

Relative Humidity (Hygroclip)	
Range	0-100%
Accuracy	±0.8% @ 23°C
Resolution	1%
Units of Measure	% RH

Dew Point	
Resolution	0.1°C
Accuracy	±0.15°C (23°C ambient temperature @ 20°C dew point)
Units of Measure	°C or °F

Barometric Pressure	
Range	600 to 1100hPa
Accuracy	±0.5hPa
Resolution	0.1hPa
Units of Measure	hPa, mbar, mmHg, InHg
Compensated for Temperature dependency –20°C to +70°C	

<b>Inputs MetPak Pro (MetPak RG Digital Input only).</b>	
Analogue 1 (AN1)	0 to 5V or 4 to 20mA MetPak Pro powered or Analogue Sensor Powered
Analogue 2 (AN2)	0 to 5V or 4 to 20mA MetPak Pro powered or Analogue Sensor Powered
Analogue Input A-D Conversion	12 bit resolution with an accuracy of $\pm 0.1\%$ of reading, +35uV offset (voltage inputs) or $\pm 0.5\mu\text{A}$ (current inputs).
Analogue Input Impedance	Input impedance for 0-5v input is 330 k ohm. Input impedance for 4-20mA input is 47 ohms.
PRT	4 wire PRT, Pt100 conforms to IEC 60751
Digital Input (DIG1) Rain Gauge	Contact Closure input (tipping bucket rain gauge) capable of capturing events up to 10Hz
Digital Input	Capable of detecting an event with a duration of greater than 1.4mS.
Digital Input	Capable of detecting a space between events (i.e. terminals open-circuit) with a duration of greater than 11mS.
Digital Input	Capable of reading a switch contact closure providing the total Digital Switch contact resistance (contact and cabling) is less than 1k ohm.

<b>Outputs</b>	
Digital Outputs	RS232, RS422, *RS485 (*2 wire point to point) or SDI-12. (RS232 point to point and RS485 2 wire networkable – MODBUS RTU/ASCII)
Baud Rates	1200 (SDI-12), 4800-57600 (ASCII RS232, RS422, *RS485) 9600-19200 (MODBUS RTU/ASCII)
Protocols	ASCII, SDI-12 V1.3, NMEA 0183 (MetPak only) or MODBUS RTU/ASCII
Data Output	1 reading per second (1 Hz), 1 reading per 2 seconds, 1 reading per 4 seconds or Polled Mode
MetPak Status	Status codes provided within the data message string
* RS485 2 wire point to point only.	

<b>Power Supply</b>	
Input voltage (RS232, RS422, RS485)	4.5v to 30v dc
Current at 12v	MetPak - 22mA MetPak Pro - 26mA
Input Voltage SDI-12	9.6v to 16v dc (12v nominal)
Current	MetPak - 30mA MetPak Pro - 35mA

<b>Environmental MetPak Range</b>	
Protection Class	IP65
EMC	BS EN 61326
Operating Temperature	-35°C to +70°C
Storage Temperature	-40°C to +80°C
Humidity	0-100%
RoHS Compliant	Yes

<b>Mechanical MetPak Range</b>	
External Construction	UV Stabilised white thermoplastic (Wind Sensor and Hygroclip Mountings) and anodized Aluminium bracket
Fittings	
Overall Dimensions MetPak MetPak Pro	364mmx287mmx142mm (excluding bracket clamp) 364mmx287mmx142mm (excluding bracket clamp)
Weight MetPak MetPak Pro	2.2kg (including bracket) 2.2kg (including bracket)

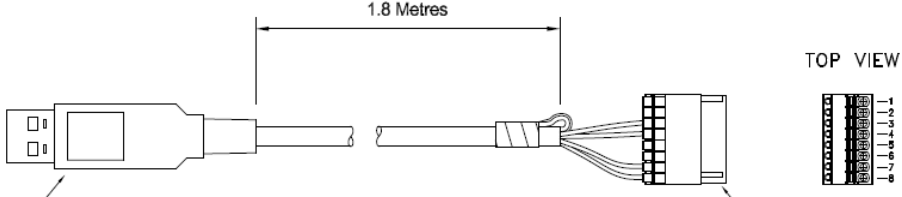
<b>Software</b>	
MetSet Configuration	Free PC Software providing the means of configuration of the MetPak Unit.
MetView	Free PC Software providing the means of Viewing data and providing a basic logging facility.

## 4. PRE-INSTALLATION

### 4.1. Equipment supplied

- 1723-xB-x-11x MetPak Variant unit
- and 8 way connector inside the hub box for power and communication.
- and Mounting bracket plate/nuts and bolts in a box.
- and Product Test Report.

#### 4.1.1. Optional Extras:

Item	Part Number
Barometric Pressure Hub Box Gore-Tex filter spares kit	1723-PK-024
Hygroclip Temperature and Humidity Filter Replacement Kit (two filters)	1723-PK-027
Hygroclip HC2A-S3-GI	037-06762
Junction Box with internal terminating pcb (for MetPak Pro).	1723-PK-201
Rain Gauge. ARG314 Tipping bucket (no cable attached)	1723-PK-077
Terminating pcb (to mount in customer box) for MetPak Pro.	1723-PK-202
Pack of 4 brackets for Pole Mounting the Junction Box for MetPak Pro	1723-PK-203
Pack of 4 feet for Panel Mounting the Junction Box for MetPak Pro.	1723-PK-204
<p>MetPak Range 1.8 Metre RS232 to USB converter including 5v dc power and communication configuration cable (8 way MetPak connector fitted one end and USB connector at the other end).</p> 	1723-10-051

## 4.2.Connector and Cable Assembly.

The MetPak is supplied with a mating 8 way connector for power and communication connections.

## 4.3.Communication Cabling

MetPak and MetPak Pro have five communication connection options:

USB (using the 1.8m MetPak RS232 to USB cable, Part No. 1957-10-065).

RS232.

RS422.

RS485 (two wire point to point) or networkable if using Modbus.

SDI-12.

MetPak Pro has in addition a contact closure input & various Sensor Input connection options:

DIG1 (Digital Switch).

AN1 and AN2, Analogue inputs (0-5v or 4-20mA).

PRT. Platinum Resistance Thermometer Input.

It is important that the cable is appropriate for the chosen communication network. The following sections describe the recommended types and maximum lengths of cable in each case.

### 4.3.1 Cable type

**Wire type:** 24 AWG

**Wire size:** 7x32 AWG.

**Cable outer diameter:** 6- 8mm (to match the connector gland).

For RS422/485 operation the cable should have twisted pairs with drain wire, screened with aluminised tape, with an overall PVC sheath. Typical wire size 7/0.2mm (24 AWG).

The following table shows an example manufacturers' reference; other manufacturers' equivalents can be used.

#### Recommended Belden cable types

Application	No. of Pairs	24 AWG Belden Ref.
SDI-12	2	9729
Digital RS232 or RS485	3	9503
Digital RS422	4	9504
Multiple External Sensors	6	9506

### 4.3.2 Cable length

The maximum cable length is dependent on the chosen communication method.

The following table shows the maximum cable lengths for the supported communication protocols at the given baud rates, using the recommended cable. If any problems of data corruption etc. are experienced, then a slower baud rate should be used. Alternatively, a higher specification cable can be tried.

#### Suggested maximum cable lengths for supported communication networks

Communication format	Baud rate	Max. cable length
RS232	19200	6.5M
RS422/485	19200	1000M
SDI-12	1200	90M
0-5v Analogue Input	Not Applicable	Refer to user Analogue Sensor data sheet
4-20mA Analogue Input	Not Applicable	Refer to user Analogue Sensor data sheet
Digital Switch Input	Not Applicable	Switch contact and cable resistance to be less than 1k ohm
PRT Input	Not Applicable	Refer to user PRT data sheet

### 4.4. Cable Connections General

Any cable wires not used should be isolated and grounded at the terminating equipment/user end.

Digital OV should be used in conjunction with RS422 TX/RX lines in order to improve noise immunity.

The Cable should be secured:-

With cable clamps or equivalent at regular intervals such that the hub box cable gland does not support the cable weight.

Away from the mounting bolts to prevent chaffing of the cable.

#### NOTES:-

Install appropriate strain relief support to the cable. If possible, pass the cable through the mounting pole.

The MetPak unit Hub Box cable glands contain spring loaded metal leaves that are designed to make a ground contact with cables that have an overall braid screen. Care is therefore required when inserting and removing cables through the glands to prevent damage to the metal leaves.

### 4.5. Earthing

To ensure correct operation and for maximum protection from lightning, a separate lightning rod system is recommended to protect the system.

You can also earth the MetPak through its mountings or by connecting a grounding cable (minimum of 6mm<sup>2</sup> copper wire) to a spare MetPak metalwork bolt hole. Clean off any paint that might prevent a good connection.

When you connect the communications cable ensure that the screen has a connection to the hub box case.

The Junction Box accessory has a plastic case, hence ensure continuity of cable screens into and out of the Junction Box using the common Earthing terminals provided in the box.

## 4.6. Power supplies

Supply Voltage: 4.5v to 30v DC.

Average Current at 12v dc:-

MetPak 22mA.

MetPak Pro 26mA.

MetPak Units have reverse voltage polarity protection.

## 4.7. Power and Communication Connections

To connect Power and Communication to the MetPak Range:

Open MetPak hub box by unfastening the four screws.

Strip the power and communication cable wires to have 8mm of exposed soldered wire.

Pass the cable through one of the gland nuts (please refer to para 4.4. Notes).

Locate the green 8 way plug in connector J5 (see below).

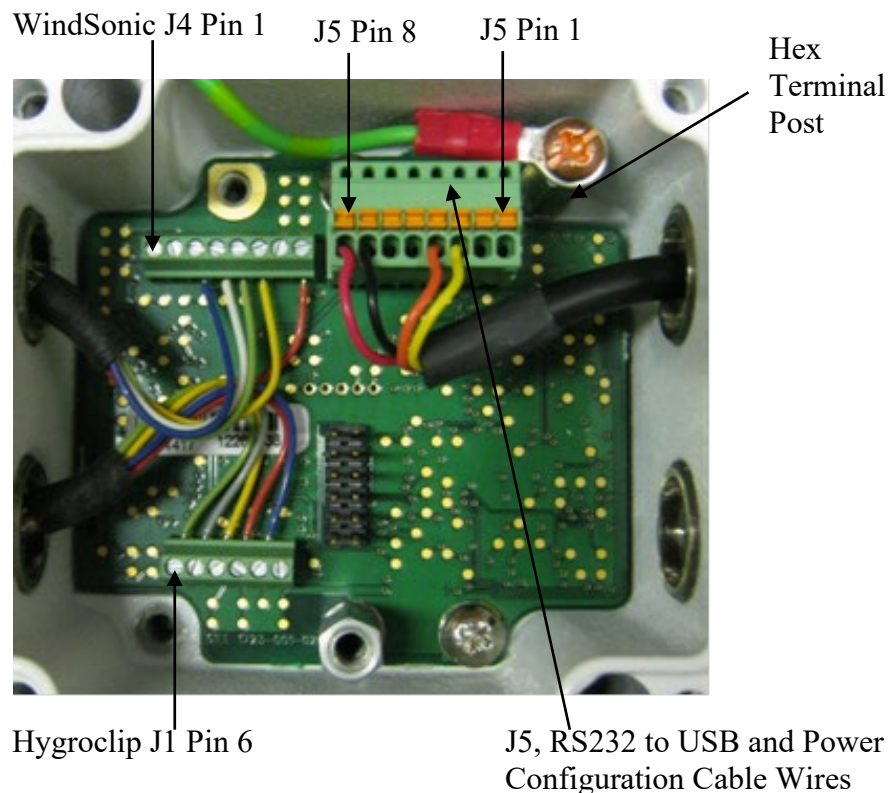
Connect the cable to J5 for the required communication type e.g. RS232, RS422 etc.

Attach the cable's screen wires to the Hex terminal post (see below).

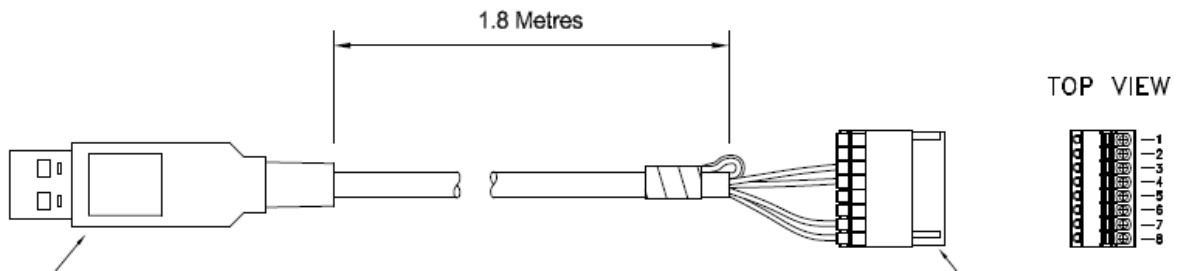
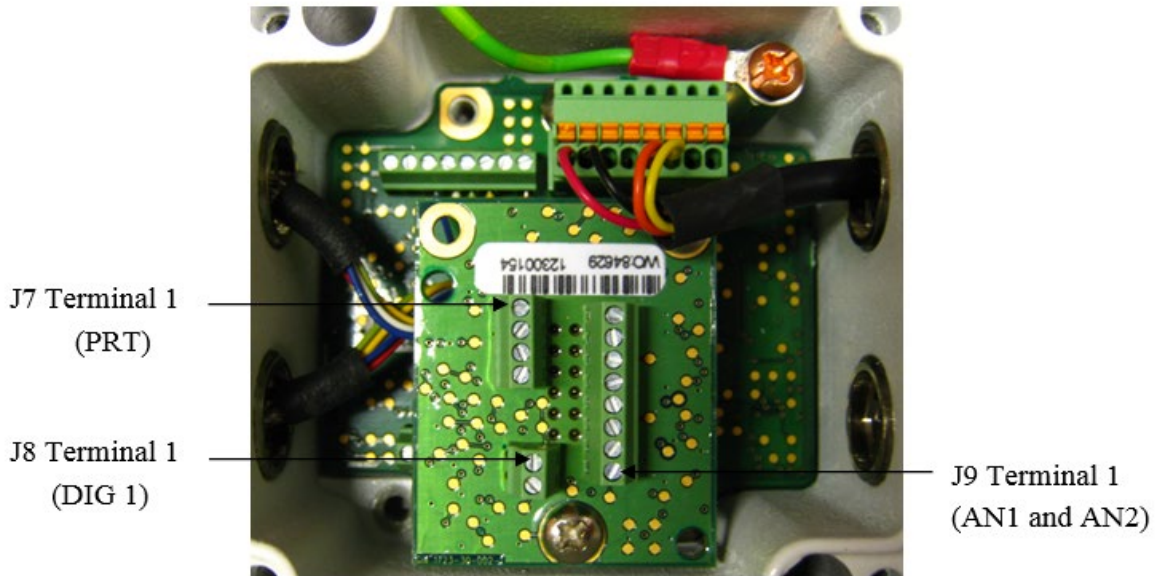
After connection, securely tighten the gland nut to prevent moisture ingress.

NOTE: The MetPak Range Hub Box cable glands contain spring loaded metal leaves that are designed to make a ground contact with cables that have an overall braid screen. Care is therefore required when inserting and removing cables through the glands to prevent damage to the metal leaves.

Re-fit the Hub box lid.



## 4.8. Connecting to a PC using Gill RS232 to USB Configuration Cable



Connect MetPak to a PC USB port using the Gill Configuration Cable 1723-10-051.

J5 Pin	1	2	3	4	5	6	7	8
Colour	None	None	Yellow	Orange	None	None	Black	Red

Connection of Gill USB Cable (Part No. 1723-10-051), the J5, 8way Phoenix connector part number is 1881383.

NOTES:- If upon connecting the USB lead to a PC the driver is not found by the PC, then the appropriate driver to match the PC Windows version may be downloaded from:-

<http://www.ftdichip.com/Drivers/VCP.htm>

### Hub Box Factory Connections

## Hygroclip connections (6-way connector J1)

Connector J1	Wire Colour	Signal Name
1	-	No Connection
2	Blue	RXD from Hygroclip UART
3	Red	TXD to Hygroclip UART
4	Yellow	Analogue 0V (Not Used)
5	Grey	Supply/Signal 0V
6	Green	Supply +ve (+3.3V DC)

## WindSonic anemometer connections (8-way connector J4)

Connector J4	Wire Colour	Signal Name
1	-	No Connection
2	-	No Connection
3	Blue	RS232 TX+ Anemometer Output to Hub
4	White	RS232 RX+ Hub Output to Anemometer
5	Green	Signal 0v
6	Yellow	Supply 0v
7	-	No Connection
8	Red	Supply +ve (4.5v to 30V dc)

[Hub Box User Connections](#)

## Power and Communications (8-way connector, J5) all units

Connector J5	Signal Name
1	SDI-12 TX/RX
2	Signal 0V
3	<b>RS232 TX-</b> , (or RS422/RS485 TX-) HUB to user
4	<b>RS232 RX-</b> , (or RS422 RX-) User to HUB
5	RS422 RX+, User to HUB
6	RS422/RS485 TX+, HUB to User
7	<b>Supply 0v</b>
8	<b>Supply +ve (4.5v to 30v dc)</b>

## MetPak Pro PRT Sensor (4-way connector, J7)

Connector J7	Signal Name
1	PWR (PRT Power Supply +ve)
2	PRT +
3	PRT -
4	GND (PRT Power Supply Ground)

## MetPak Pro Digital Switch Input, DIG1 (2-way connector, J8)

Connector J8	Signal Name
2	DIG1 (Digital Switch Contact Input)
1	GND (Ground)

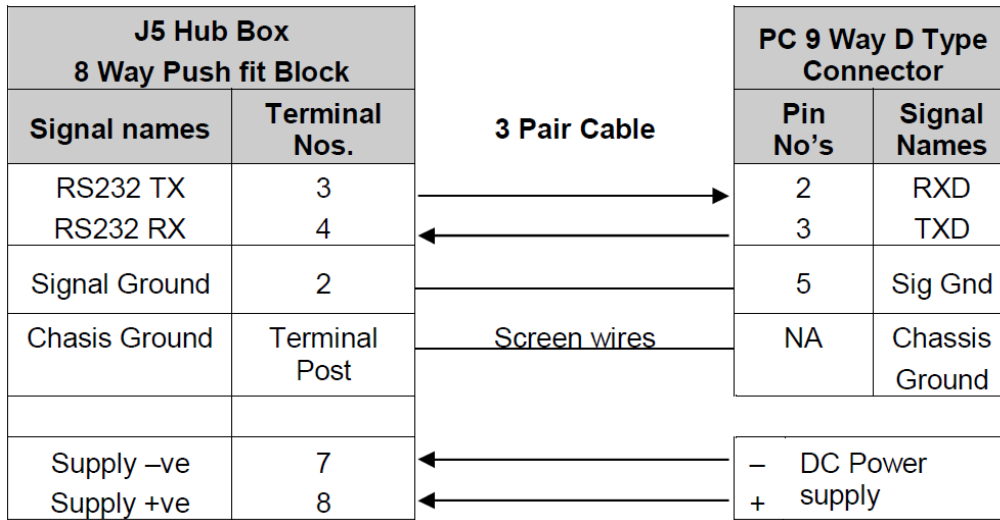
## MetPak Pro Analogue Sensors Input, AN1 and AN2 (8-way connector, J9)

Connector J9	Signal Name
1	VI 1 (Voltage Input 1)
2	GND (Voltage Input 1 Ground)
3	VI 2 (Voltage Input 2)
4	GND (Voltage Input 2 Ground)
5	II PWR (Current Supply for Analogue Input 1)
6	II 1 (Analogue Input 1)
7	II PWR (current Supply for Analogue Input 2)
8	II 2 (Analogue Input 2)

## 4.9. Connecting to a PC using RS232 (Default setting)

MetPak Range default factory comms setting is RS232.

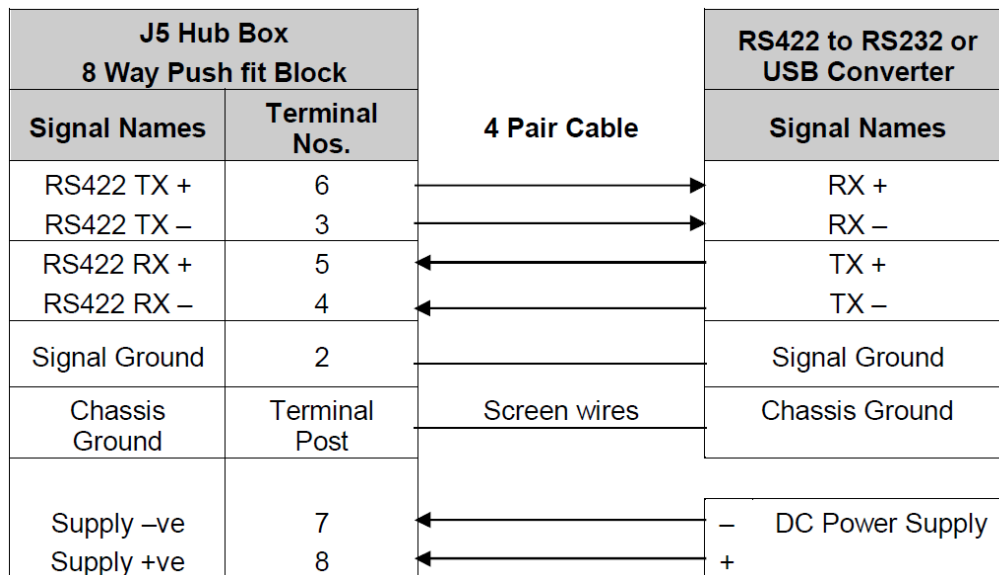
The recommended cable length for reliable operation is limited to 6.5m (20ft).  
 For longer cable runs, we recommend use of RS422 output.



#### 4.10. Connecting to a PC using RS422 (Not a Default Setting)

**MetPak Range default factory comms setting is RS232.**

To use the MetPak Range with RS422 comms use MetSet to change the COMMS Interface setting to RS422.



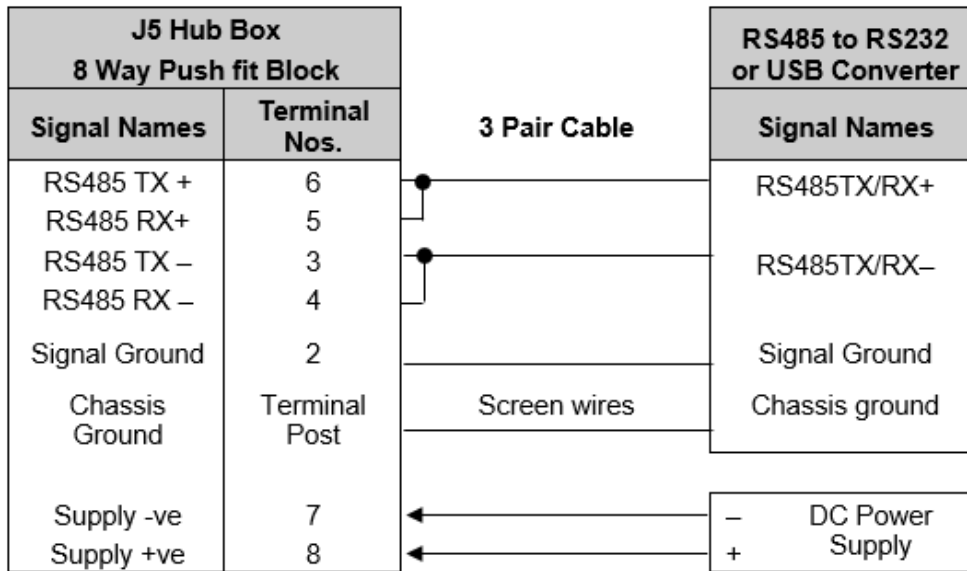
#### 4.11. Using RS485 (2 wire point to point only) not a default setting.

**MetPak Range default factory comms setting is RS232.**

To use the MetPak Range with RS485 2 wire point to point communication use MetSet to **change the COMMS Interface setting to RS485P 2W.**

Use MetSet to **change the Message setting from CONT (Continuous) to POLL**, the node address letter may be changed if required.

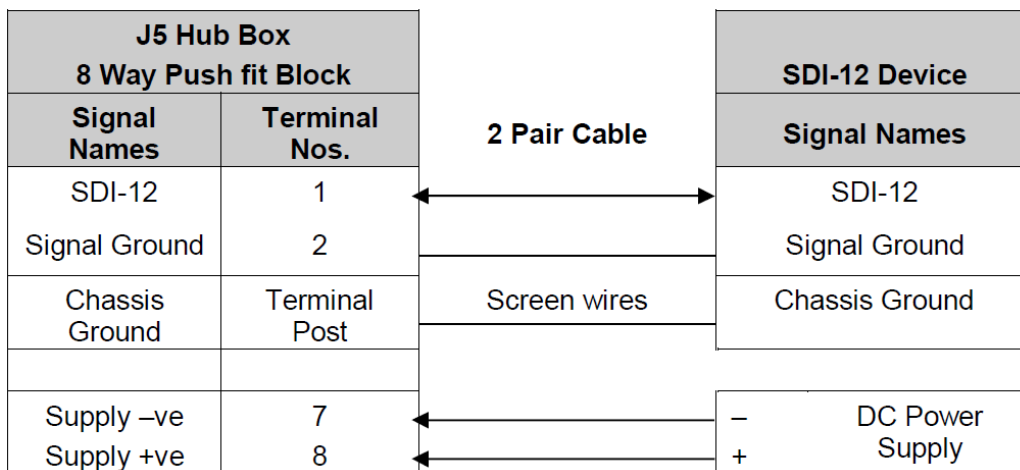
**Note that it is not possible to network other devices on this 2-wire RS485 link unless the unit has been set for Modbus operation and application.**



#### 4.12. Using SDI-12 (2 wire network) not a default setting.

**MetPak Range default factory comms setting is RS232.**

Use MetSet to change the COMMS Interface setting to SDI 12.

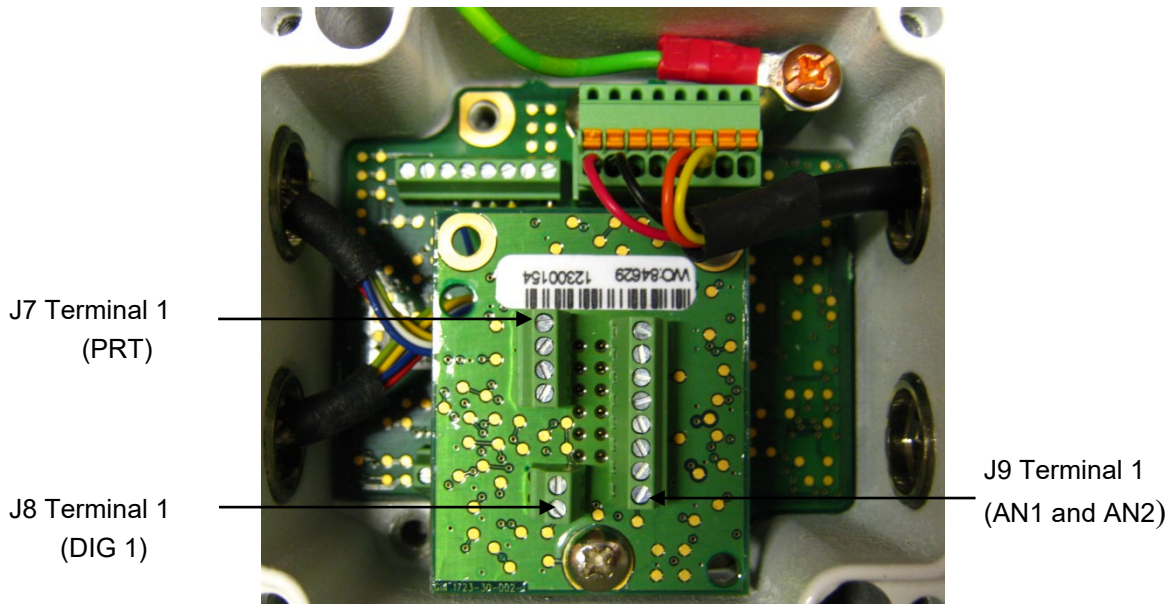


#### 4.13. Analogue, Digital and PRT Input Connections

**NOTE:**

MetPak - This section is Not Applicable.

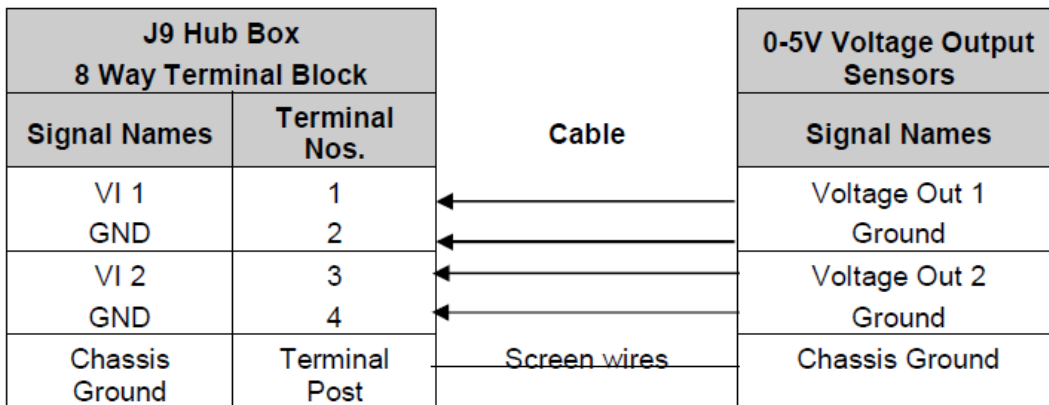
MetPak Pro - Analogue, Digital and PRT Input connections all applicable.



**Analogue 0-5 volt Input Connections AN1 and AN2**

This is not a default setting; ensure the MetPak Pro has been configured for this input requirement before wiring sensors to the MetPak Pro.

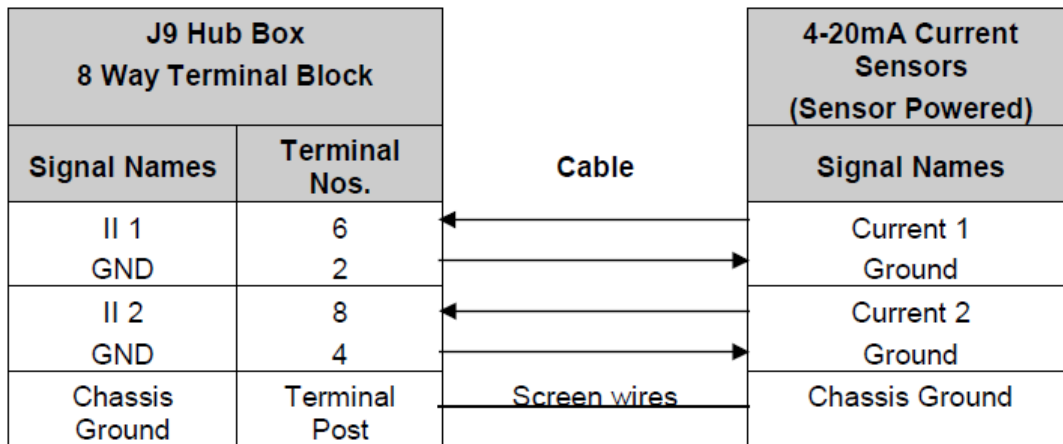
(See picture above for Power and Communication Connections).



**Analogue 4-20mA Input Connections (Sensor Powered) AN1 and AN2**

This is not a default setting; ensure the MetPak Pro has been configured for this input requirement before wiring sensors to the MetPak Pro.

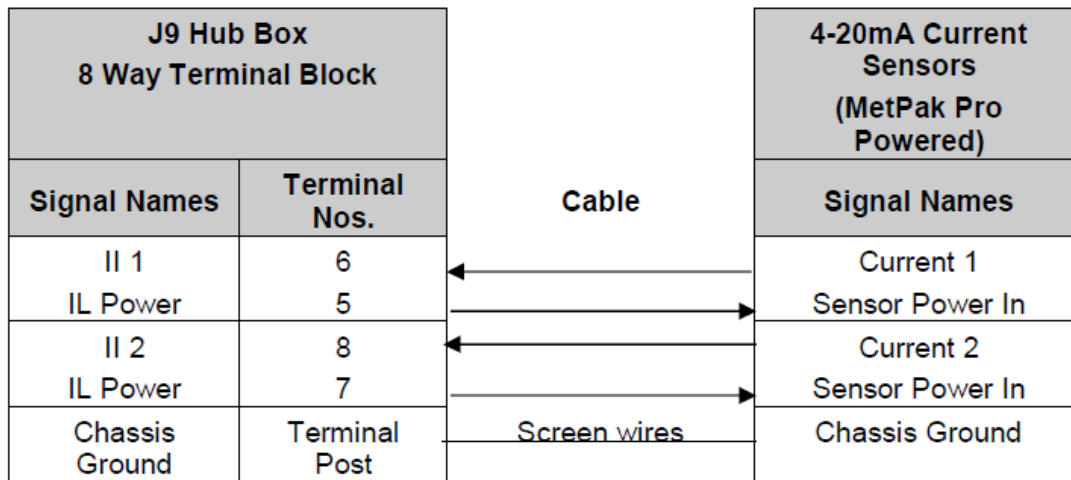
See picture above for Power and Communication Connections.



**Analogue 4-20mA Input Connections (MetPak Pro Powered) AN1 and AN2**

This is not a default setting; ensure the MetPak Pro has been configured for this input requirement before wiring sensors to the MetPak Pro.

See picture above for Power and Communication Connections.

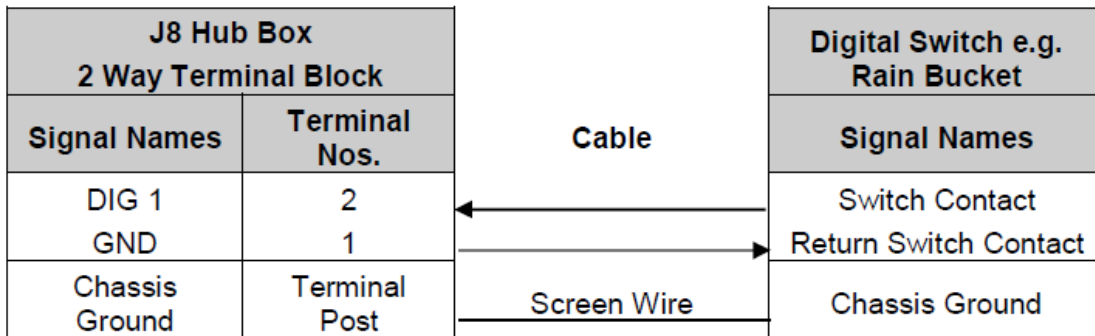
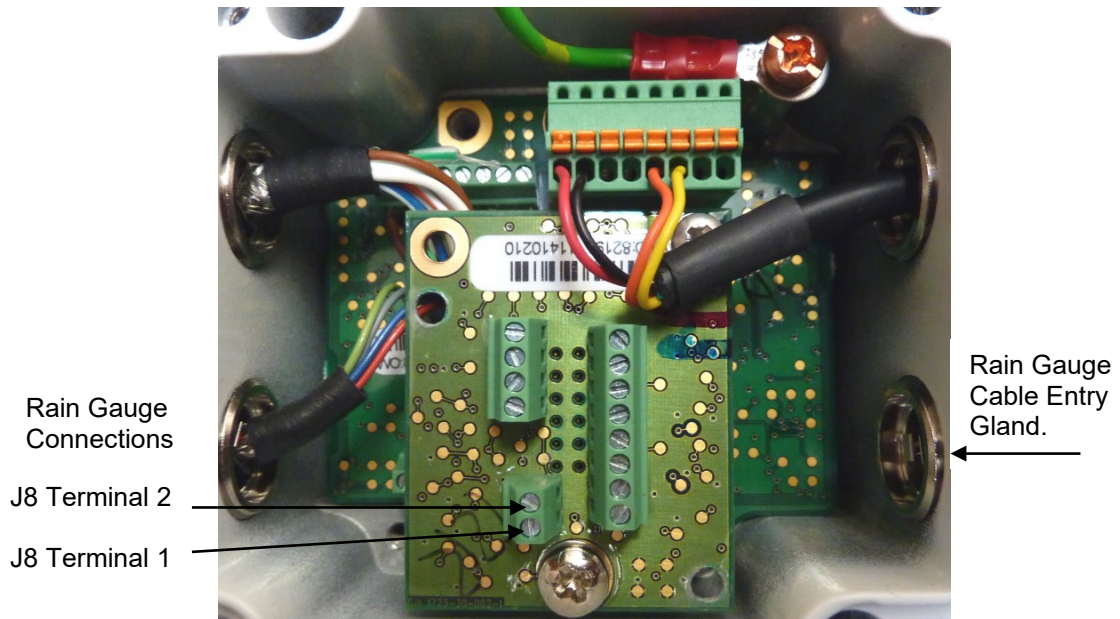


**NOTE:** If the input current drops below 4mA, an X will be shown in the data string instead of a valid reading. If the current rises above 20mA, an E will be shown in the data string instead of a valid reading.

**Digital Switch Connection (Rain Gauge) DIG1**

Ensure the MetPak Pro has been configured for this input requirement before wiring sensors to the Unit.

## Digital Rain Gauge Connections



To connect a rain gauge to the MetPak Pro hub box:

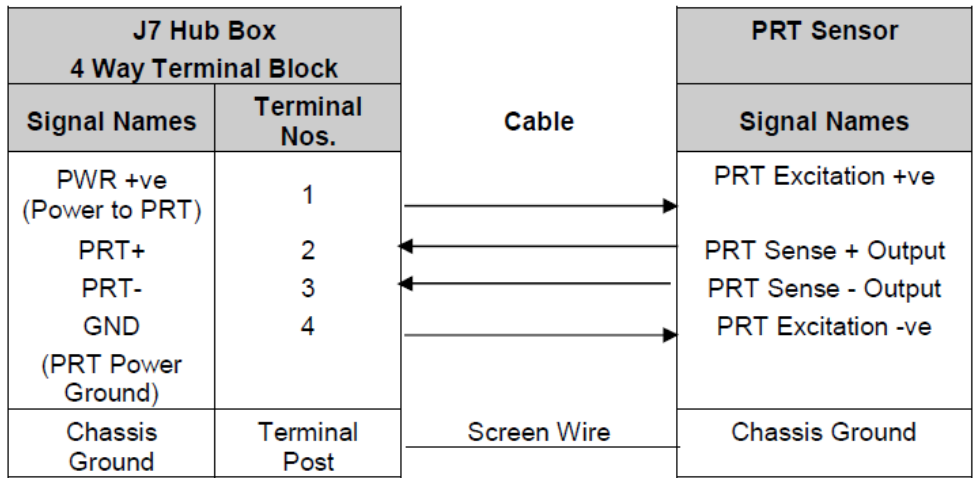
1. Open the MetPak hub box by unfastening the four screws.
2. Locate connector J8.
3. Pass the cable through one of the gland nuts (see Note below).
4. Connect the cable to connections as detailed above.
5. Attach the cable's screen wire to a terminal post.
6. After connection, securely tighten the gland nut to prevent moisture ingress.
7. Re-fit the hub box lid.

NOTE: The MetPak Range Hub Box cable glands contain spring loaded metal leaves that are designed to make a ground contact with cables that have an overall braid screen. Care is therefore required when inserting and removing cables through the glands to prevent damage to the metal leaves.

## Platinum Resistance Thermometer (PRT) Input

This is not a default setting; ensure the MetPak Pro has been configured for this input requirement before wiring sensors to the MetPak Pro.

See the previous picture for Power and Communication Connections.



## 4.14. MetPak Pro Junction Box (Part 1723-PK-021)

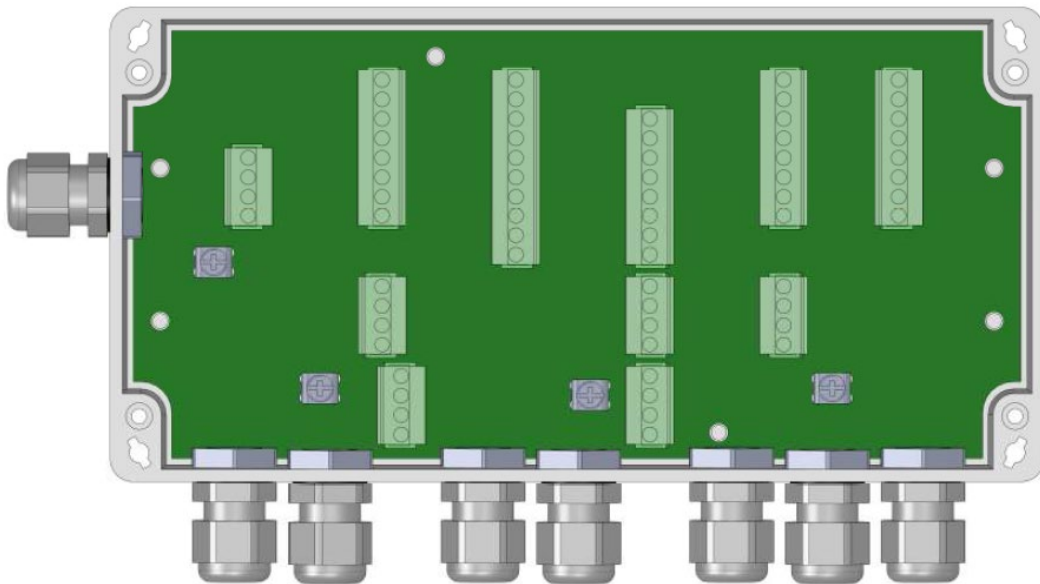
As part of a MetPak Pro system, Gill Instruments can provide a Junction Box containing a pcb with removable terminal connectors and optional mounting hardware to provide a means of connecting external sensor and MetPak Pro wiring at a convenient common point.

Alternatively the pcb with removable terminal connectors can be supplied as a standalone item for mounting in a customer supplied box.

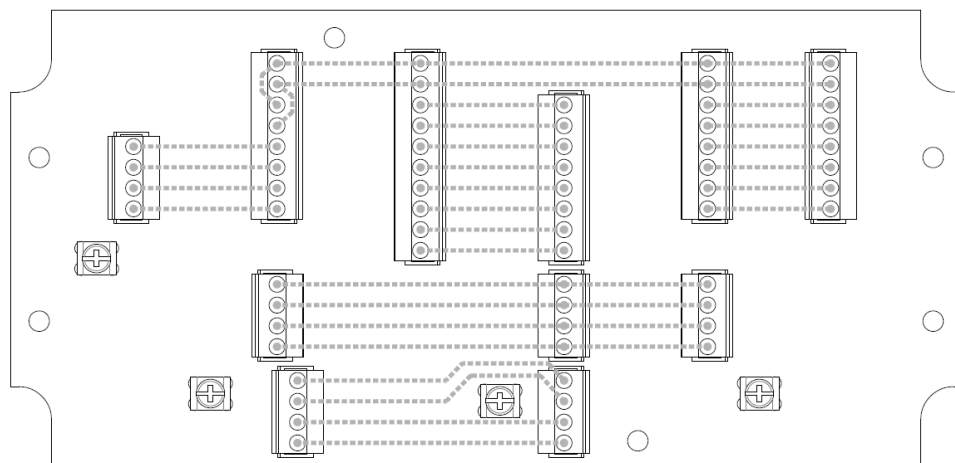
Junction Box parts if required are:

- |             |  |
|-------------|--|
| 1723-PK-201 | Junction Box with internal terminating pcb.            |
| 1723-PK-202 | Terminating pcb (to mount in customer box).            |
| 1723-PK-204 | Pack of 4 feet for Panel Mounting the Junction Box.    |
| 1723-PK-203 | Pack of 4 brackets for Pole Mounting the Junction Box. |

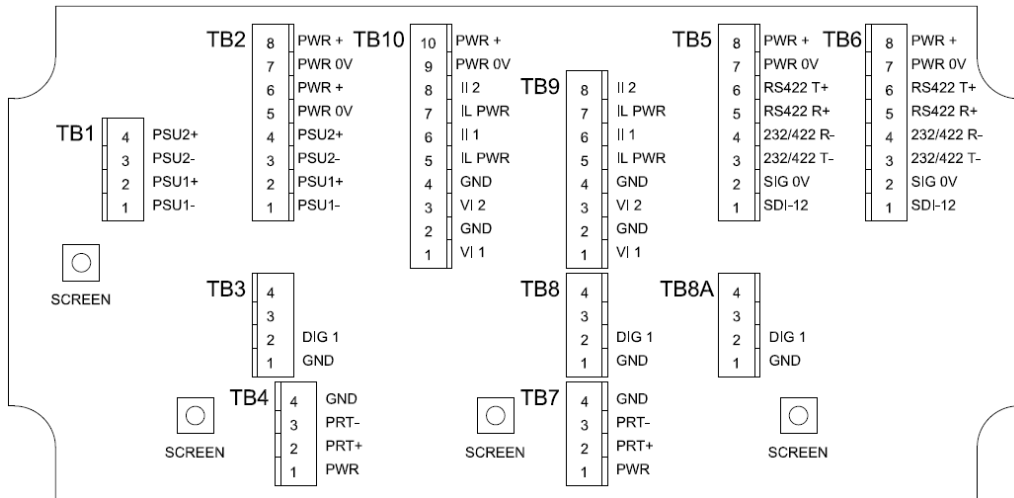
Junction Box 1723-PK-201 (containing Terminating pcb 1723-PK-202)



Junction Box terminating pcb circuit track layout



### Junction Box Terminal Block Connections



**Note** that the Junction box glands will accept cables with an outer diameter between 3-10mm. If a smaller diameter cable is to be used bulk out with heat shrink or suitable sleeve to ensure the gland can secure the cable and provide an environmental seal.

### Communication System Connections

Only connect cables that meet the required data interface requirement (e.g. RS232 etc.).

MetPak Pro Hub Box Connector J5		Hub to Junction Box Cable	MetPak Pro Junction Box TB5	MetPak Pro Junction Box TB6	Junction Box to User Cable	User PC/Logger Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
SDI-12 TX/RX	1		SDI-12	SDI-12		SDI-12
Signal 0v	2		SIG 0v	SIG 0v		SIG 0v
RS232/422/485 TX-	3		232/422 T-	232/422 T-		232/422 R-
RS232/422 RX-	4		232/422 R-	232/422 R-		232/422 T-
RS422 RX+	5		RS422 R+	RS422 R+		422 T+
RS422/485 TX+	6		RS422 T+	RS422 T+		422 R+
Supply 0v	7		PWR 0v	PWR 0v		PWR 0v
Supply +ve	8		PWR +	PWR +		PWR +
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **4-20mA Current Sensor System Connections (Sensor Powered)**

MetPak Pro Hub Box Connector J9		Hub to Junction Box Cable	MetPak Pro Junction Box TB9	MetPak Pro Junction Box TB10	Junction Box to User Cable	User Current Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
II1	6		II1	II1		II1
GND	2		GND	GND		GND
II 2	8		II 2	II 2		II2
GND	4		GND	GND		GND
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **4-20mA Current Sensor System Connections (MetPak Pro Powered)**

MetPak Pro Hub Box Connector J9		Hub to Junction Box Cable	MetPak Pro Junction Box TB9	MetPak Pro Junction Box TB10	Junction Box to User Cable	User Current Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
II1	6		II1	II1		II1
IL PWR	5		IL PWR	IL PWR		IL Power
II 2	8		II 2	II 2		II2
IL PWR	7		IL PWR	IL PWR		IL Power
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **0-5 Volt Voltage Sensor System Connections**

MetPak Pro Hub Box Connector J9		Hub to Junction Box Cable	MetPak Pro Junction Box TB9	MetPak Pro Junction Box TB10	Junction Box to User Cable	User Voltage Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
VI 1	1		VI 1	VI 1		V Out 1
GND	2		GND	GND		Ground
VI 2	3		VI 2	VI 2		V Out 2
GND	4		GND	GND		Ground
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **Digital Switch Sensor System Connections**

MetPak Pro Hub Box Connector J8		Hub to Junction Box Cable	MetPak Pro Junction Box TB8 or TB8A	MetPak Pro Junction Box TB3	Junction Box to User Cable	User Switch Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
DIG 1	2		DIG 1	DIG 1		Contact
GND	1		GND	GND		Contact
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **PRT System Connections**

MetPak Pro Hub Box Connector J7		Hub to Junction Box Cable	MetPak Pro Junction Box TB7	MetPak Pro Junction Box TB4	Junction Box to User Cable	User PRT Interface
Signal Name	Terminal Number		Signal Name	Signal Name		Signal Name
PWR+ve	1		PWR+ve	PWR+ve		PRT Excitation +ve
PRT+	2		PRT+	PRT+		PRT Sense + Output
PRT-	3		PRT-	PRT-		PRT Sense - Output
PRT GND	4		GND	GND		PRT Excitation -ve
Chassis	Terminal Tag	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

• **External Power Supply Connections**

User Power Supplies	User to Junction Box Cable	MetPak Pro Junction Box TB1	MetPak Pro Junction Box TB2	Cable to Sensors	User Sensor Supplies
Signal Name		Signal Name	Signal Name		Signal Name
PSU1 +ve		PSU1 +ve	PSU1 +ve		PSU1 +ve
PSU1 -ve		PSU1 -ve	PSU1 -ve		PSU1 -ve
PSU2 +ve		PSU2 +ve	PSU2 +ve		PSU2 +ve
PSU2 -ve		PSU2 -ve	PSU2 -ve		PSU2 -ve
Chassis	Screen	Screen Tag	Screen Tag	Screen	Screen Tag

## **4.15. Set up requirements**

### **4.15.1. Host System:**

Note: The default delivery output communication (COMMS) setting of MetPak units is RS232.

Use an RS232 to USB converter e.g. Gill part 1957-10-065, 1.8M configuration cable fitted with 8 way Hub Box connector and with integral 5v USB connector power for MetPak (see Para 4.8).

If an install driver is required for this cable it can be downloaded from:-

<http://www.ftdichip.com/FTDrivers.htm>

Or

Use an RS232 to USB adaptor or equivalent for example EasySynch part ES-U-1001-A (if not using Gill part 1957-10-065) or connect directly to an RS232 COM port.

Use a PC running Windows software up to and including Windows 10 and with an internal or external interface compatible with the output from the MetPak.

Use a Power Supply, 5V to 30Vdc at 200mA if not using the Gill Instruments Configuration cable.

Use 3 pair cable e.g. Belden 9503 (if not using Gill Part 1723-10-051), length as required if not using the Gill Instruments Configuration cable.

### **4.15.2. Software:**

Gill MetSet Software can be used as a configuration Tool, will run on PC's with up to and including Windows 10 and can be downloaded free from:-

<http://www.gillinstruments.com/main/software.html>.

### **4.15.3. Bench system test**

Prior to physically mounting the MetPak in its final location, we strongly recommend that a bench system test be carried out to confirm the system is configured correctly, is fully functional and electrically compatible with the selected host system and cabling (preferably utilising the final cable length). The required data format, units, output rate, and other options should also all be configured at this stage.

Connect the MetPak to a PC wired as per RS232 connections in Para 4.9.

Alternatively use a Gill configuration cable part 1957-10-065 with a 9 way connector fitted on one end and USB converter at the other end if required to simplify set up between MetPak and a PC.

Open Gill MetSet software provided to read, check settings or change settings as per para 6.2.

Use MetSet View Output button to check the data string and confirm that the Status field reads 00.

## **4.16. Packaging**

Whilst the MetPak is being moved to its installation site, the unit should be kept in its packaging. Retain the packaging for use if the unit has to be moved or returned to Gill Instruments.

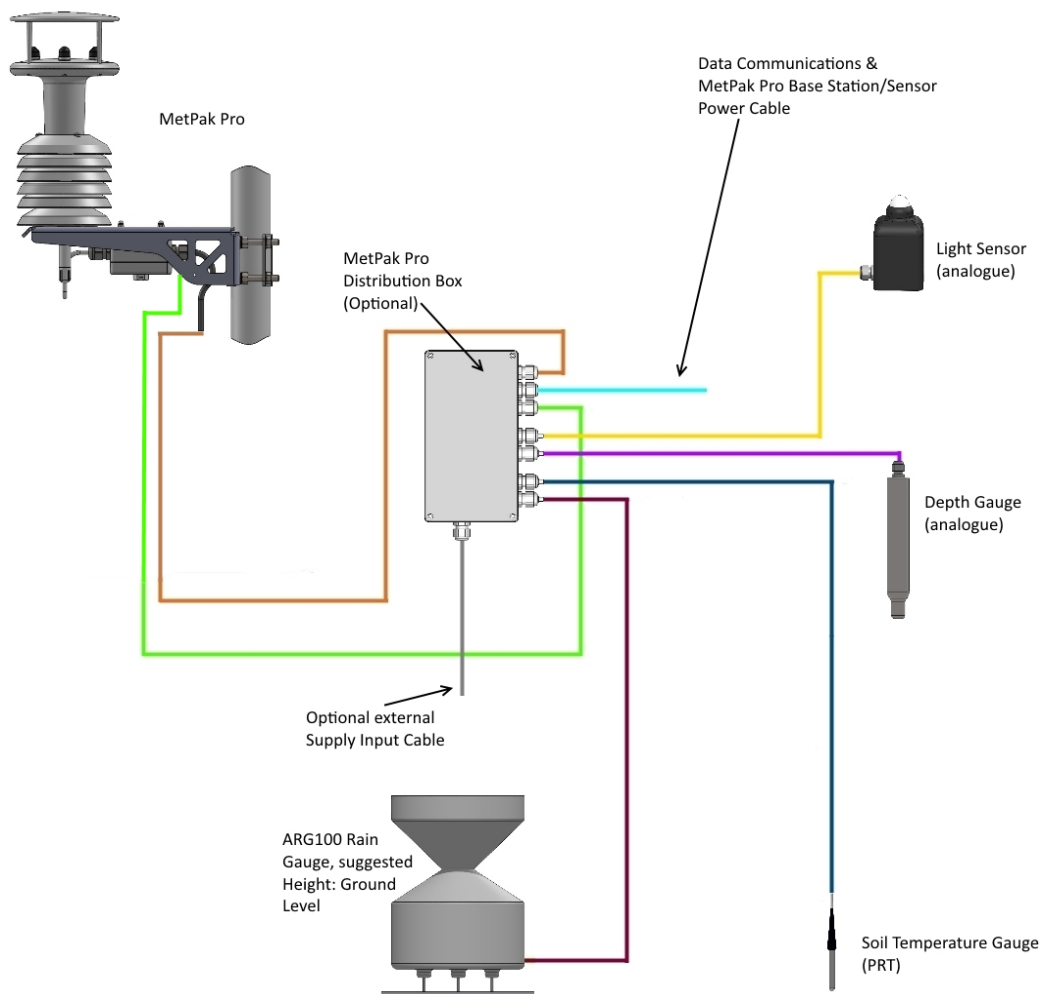
## 5. INSTALLATION

General Installation Guidelines are as follows:-

### 5.1.Example Installation Guidelines

#### 5.1.1. Non Heated Wind Sensor System

MetPak Pro System Connections - A Typical MetPak Pro system might look like the following illustration.



## 5.2. Interference

As with any sophisticated electronics, good engineering practice should be followed to ensure correct operation.

Always check the installation to ensure the MetPak is not affected by other equipment operating locally, which may not conform to current standards, e.g. radio/radar transmitters, boat engines, generators etc.

Do NOT mount the MetPak in close proximity of high-powered radar or radio transmitters. A site survey may be required if there is any doubt about the strength of external electrical noise.

Guidelines –

Avoid mounting in the plane of any radar scanner – a vertical separation of at least 2m should be achieved.

Radio transmitting antennas, the following minimum separations (all round) are suggested

VHF IMM – 1m

MF/HF – 5m

Satcom – 5m (avoid likely lines of sight)

Ensure the product is correctly earthed in accordance with this manual.

Use cables recommended by Gill, keeping the length below the maximum allowed. Where the cables are cut and re-connected (junction boxes, plugs and sockets) the cable screen integrity must be maintained, to prevent the EMC performance being compromised.

Earth loops should not be created – earth the system in accordance with the installation guidelines.

Ensure the power supply operates to the MetPak specification at all times.

## 5.3. Wind Sensor Installation

Avoid turbulence caused by surrounding structures that will affect the accuracy of the MetPak such as trees, masts and buildings.

The World Meteorological Organisation makes the following recommendation:

The standard exposure of wind instruments over level open terrain is 10m above the ground. Open terrain is defined as an area where the distance between the sensor and any obstruction is at least 10 times the height of the obstruction.

If mounting on a building then theoretically the sensor should be mounted at a height of 1.5 times the height of the building.

If the sensor is to be mounted on a mast boom, part way up a tower or mast, then the boom should be at least twice as long as the minimum diameter or diagonal of the tower. The boom should be positioned on the prevailing wind side of the tower.

It is important to ensure that the MetPak is mounted in a position clear of any structure, which may obstruct the airflow or induce turbulence.

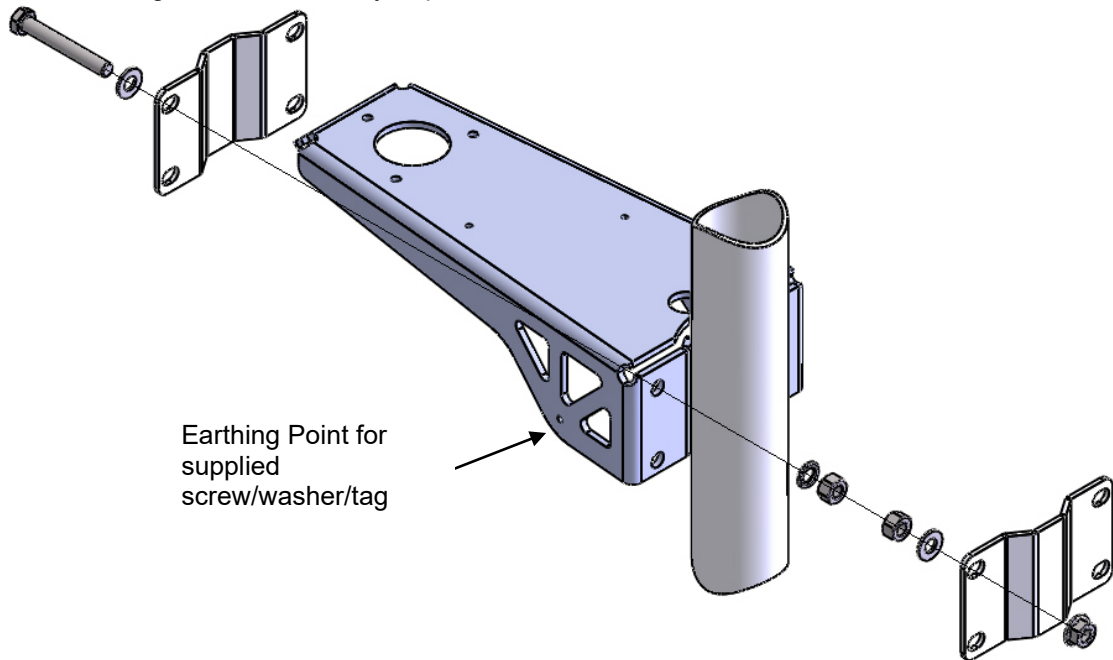
Mount MetPak so as to have a clear view of prevailing winds.

The MetPak anemometer should be set to point North (or to another known reference direction), using the North Pointers, which are identified by two arrows, a coloured rectangle, and an alignment notch to aid alignment (see the illustration in para 2.1.3).

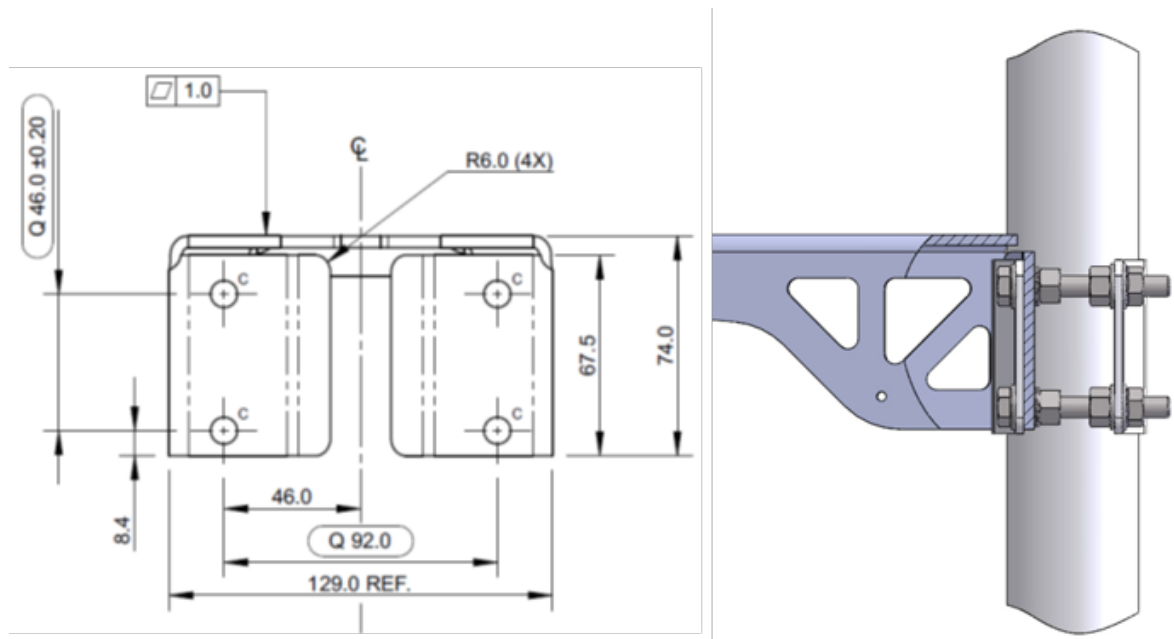
## 5.4. MetPak Range Mounting and Dimensions (in mm)

MetPak uses a mounting clamp suitable for attaching to a vertical pipe with a diameter of 30-58mm. When mounting the MetPak, consider the position, orientation and alignment of the unit. Note that the mounting pipe should first be degreased and when assembling the MetPak clamp assembly the outer clamp nuts need to be tightened evenly to a torque figure of 3 Nm. The moving plate part of the clamp needs to be reversed for poles below 38 mm diameter.

Mounting Bracket Assembly Exploded View

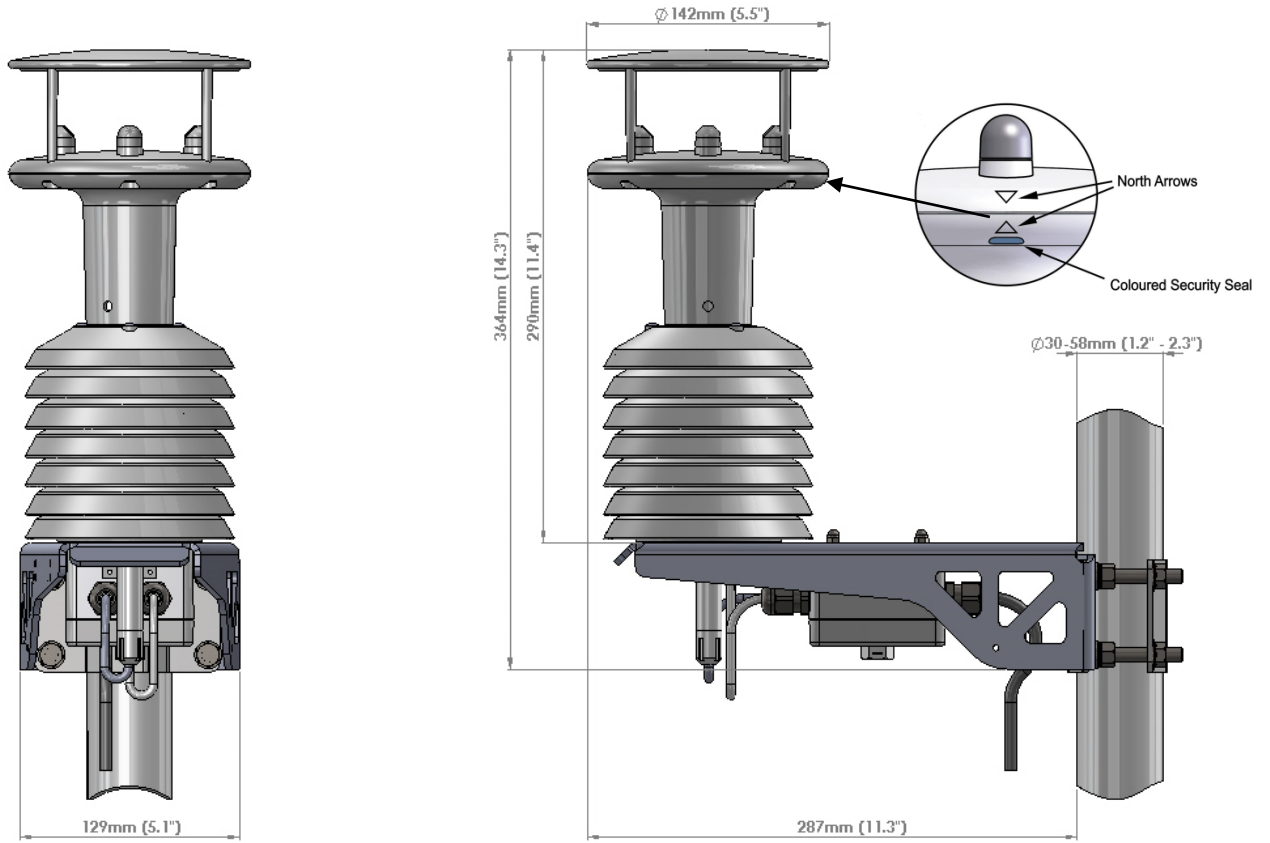


Mounting Bracket Assembled View



**C Holes are 8.5mm diameter**

### MetPak Units overall dimensions

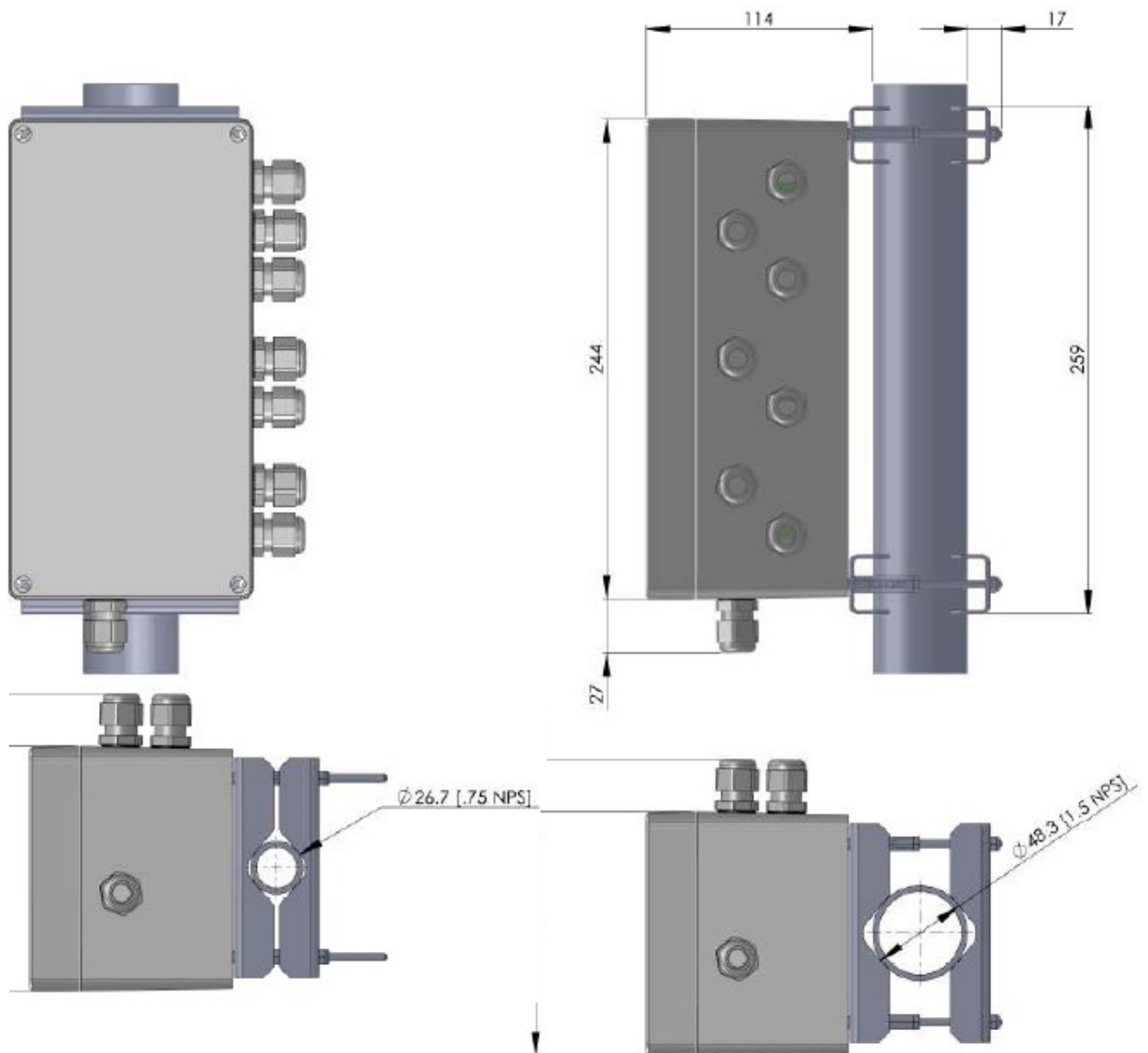


## 5.5. MetPak Pro Junction Box Mounting (1723-PK-021)

The optional MetPak Pro Junction Box comes with two mounting arrangement options: -

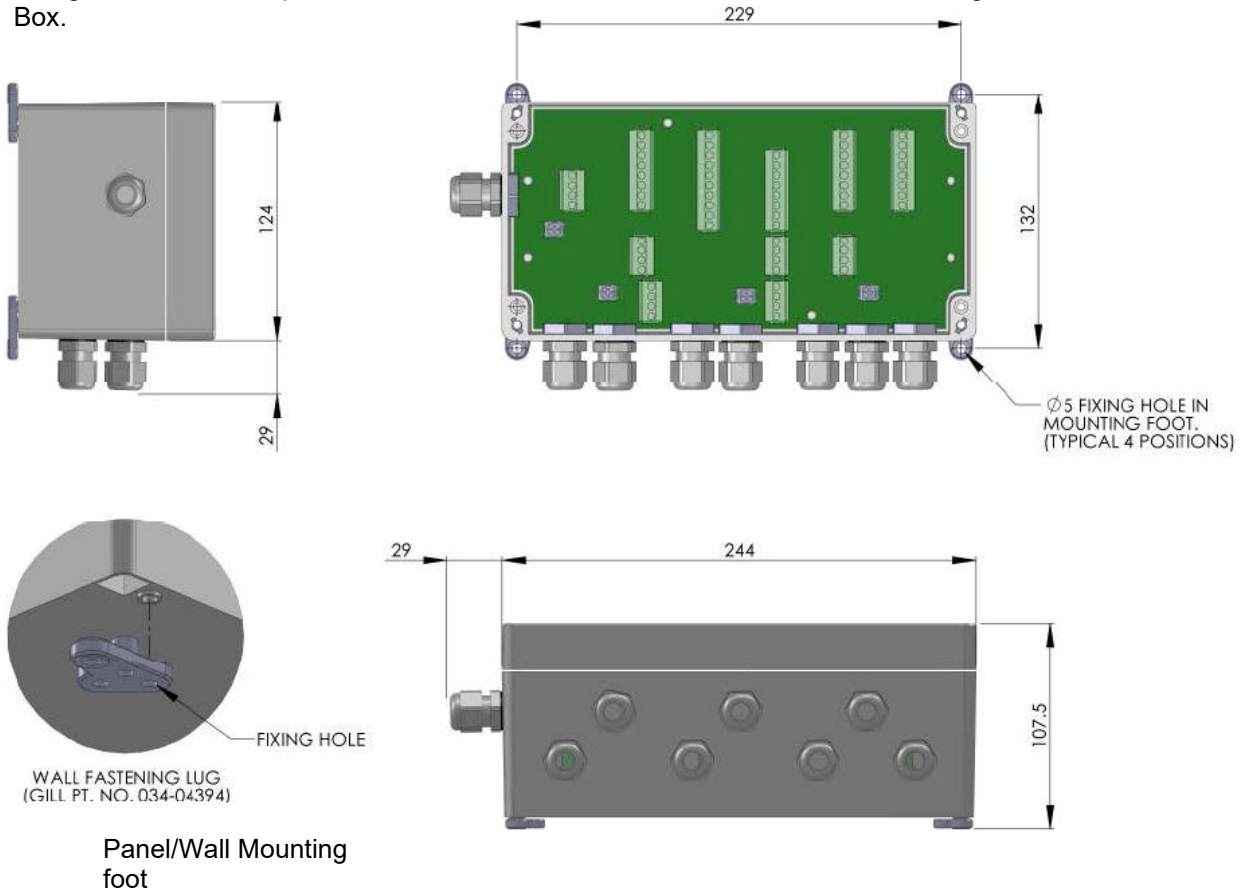
- **Junction Box Pole Mount**

Using Gill Instruments part 1723-PK-203 Pole Mount brackets set for Junction Box.



## Junction Box Panel or Wall Mount

Using Gill Instruments part 1723-PK-204 Pack of 4 feet for Wall or Panel Mounting the Junction Box.



## 5.6.Solar Installation

If a Solar Sensor is used with a MetPak Pro it should be mounted horizontally and as level as possible.

A clear view of the sky is best for an optimal solar measurements. Mounting obstructions, tree canopy, hills, mountains and tall buildings that obscure the view overhead or of the horizon can impede solar readings.

If a solar sensor is incorporated with the MetPak then mount the unit as vertical as possible during installation for optimal readings.

## 6. CONFIGURING WITH METSET

MetPaks can be configured using Gill Instruments MetSet Software which can run on PC's running up to and including Windows 10 and can also be downloaded from the Gill Website:

<http://www.gillinstruments.com/main/software.html>.

### 6.1. MetPak Default Configurations

#### MetPak Factory Default Data String

NODE DIR SPEED PRESS RH TEMP DEWPOINT VOLT STATUS.

Q,170,000.08,1019.5,035.0,+024.7,+008.3,+04.9,00, 55

Where

<input type="checkbox"/>	STX
Q	Node Letter
170	Wind Direction
000.08	Wind Speed
1019.5	Pressure
035.0	Relative Humidity
+024.7	Temperature
+008.3	Dewpoint
+04.9	Supply Voltage
00	Status
<input type="checkbox"/>	ETX
55	Checksum

#### NOTES:

<STX> is the Start of String character (ASCII value 2).

<ETX> is the End of String character (ASCII value 3).

Checksum, the 2 digit Hex Checksum sum figure is calculated from the Exclusive OR of the bytes between (and not including) the STX and ETX characters

#### MetSet Reading MetPak Default Settings

Setting	Function	Setting	Function
Comms Levels	RS232	Sensor WindSpeed	On
Baud Rate	19200	Wind Speed Units	MS (Metres/Second)
Data Connection	Data Bits 8, Parity None, Stop Bits 1, Flow Control None.	Temperature Sensor	On
Node ID	Q	Temperature Units	C (Degrees Celsius)
Output rate	1Hz	Dewpoint Sensor	On
Message Mode	Continuous	Dewpoint Units	C (Degrees Celsius)
ASCII Set Up	Carriage return and line feed, Echo on	Pressure Sensor	On
North Alignment	0	Pressure Units	Hecto Pascals
		Humidity Sensor	On
Status Message Output	On	Humidity Units	%
Report Message Output	On	Report Format	Node, Polar (Wind Direction/Wind Speed), Pressure, Humidity, Temperature, Dewpoint, Volts, Status, Checksum.
Units Message Output	On		
Inputs Message Output	On		
Output Sentence	Comma Separated Variable		

**MetPak Pro Factory Default Data String:**

NODE, DIR,SPEED,PRESS, RH, TEMP, DEWPOINT,PRT,AN1,AN2,DIG1,VOLT, STATUS

□Q,014,000.06,1011.2,042.1,+023.0,+009.4,,#,#,#,+04.9,00,□40

Where:-

□	STX
Q	Node letter
014	Wind direction
000.06	Wind speed
1011.2	Pressure
042.1	Humidity
+23.0	Temperature
+009.4	Dewpoint
,,	PRT (PRT not configured).
#	Analogue Input 1 (not configured)
#	Analogue Input 2 (not configured)
#	Digital Input 1(not configured)
+04.9	Supply voltage
00	Status code
□	ETX
40	Checksum

**NOTES:**

<STX> is the Start of String character (ASCII value 2).

,, is the default output for PRT until configured by MetSet.

# is the default output for Analogue Inputs 1 & 2 and Digital Input 1 until configured by MetSet.

<ETX> is the End of String character (ASCII value 3).

Checksum, the 2 digit Hex Checksum sum figure is calculated from the Exclusive OR of the bytes between (and not including) the STX and ETX characters.

Example configured string is:-

Q,249,000.01,1017.3,049.2,+021.4,+010.3,+040.45,+000.06,+000.04,0000.000,+11.6,00,7C

Setting	Function
Comms Levels	RS232
Baud Rate	19200
Data Connection	Data Bits 8, Parity None, Stop Bits 1, Flow Control None.
Node ID	Q
Output rate	1Hz
Message Mode	Continuous
ASCII Set Up	Carriage return and line feed, Echo on
North Alignment	0
Sensor WindSpeed	On
Wind Speed Units	MS (Metres/Second)
Temperature Sensor	On
Temperature Units	C (Degrees Celsius)
Dewpoint Sensor	On
Dewpoint Units	C (Degrees Celsius)
Pressure Sensor	On
Pressure Units	Hecto Pascals
Humidity Sensor	On
Humidity Units	%
Report Format	Node, Polar (Wind Direction and Wind Speed), Pressure, Humidity, Temperature, Dewpoint, PRT, AN1, AN2, DIG1, Volts, Status, Checksum.
Status Message Output	On
Report Message Output	On
Units Message Output	On
Inputs Message Output	On
PRT Sensor	On
PRT Units	C (Degrees Celsius)
AN1 Sensor Type	Not Configured
AN1 Units	#
AN1 Analogue Input Type	Not Configured
AN1 Substitute Name	-
AN2 Sensor Type	Not Configured
AN2 Units	#
AN2 Analogue Input Type	Not Configured
AN2 Substitute Name	-
DIG1 Sensor Type	Not Configured
DIG1 Units	#
DIG1 Digital Count	Not Configured
DIG1 Substitute Name	-
Output Sentence	Comma Separated Variable

## 6.2. Configuring MetPaks with MetSet

Before you use MetSet check that MetPak is correctly connected to a Serial COM port or USB COM port on your PC.

The optional Gill 1.8M, RS232 to USB cable (1957-10-065) can be used to power and provide a suitable communication link for configuring a MetPak unit.

### NOTES:

MetSet is compatible with RS232 and RS422 connected units only.

**The availability of certain functions and parameters illustrated will depend on the MetPak model and Options see Page 5, Para 2.1.2.**

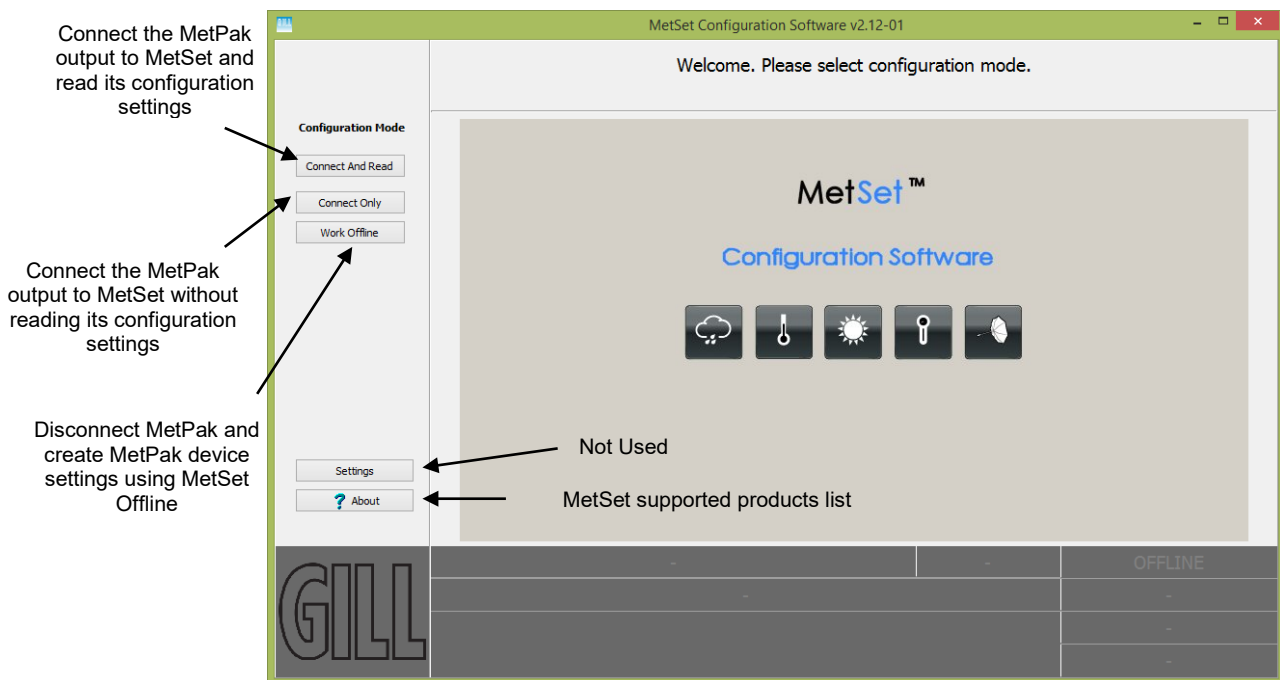
### Opening MetSet

Click on the MetSet button on your PC's desktop or choose:

**Start > All Programs > MetSet > MetSet**

The MetSet Control Centre window is displayed. If you have more than one MetPak connected to your PC, MetSet, by default, selects the first device detected.

For most applications it is recommended to click on the MetSet **Connect and Read** button.



MetSet interrogates the MetPak and returns a summary of the device settings.

Depending on the MetPak Sensor connected only settings and parameters appropriate to the connected MetPak unit will be shown.

**Note** that MetSet also saves a copy of this screen to the connected PC as a Session Report File that can be accessed from the following destination.

C:\GillAppsData\Metset\SessionReports.

Example Summary of MetPak Device Settings (MetPak Pro shown):-

SETTINGS ARE AS FOLLOWS:

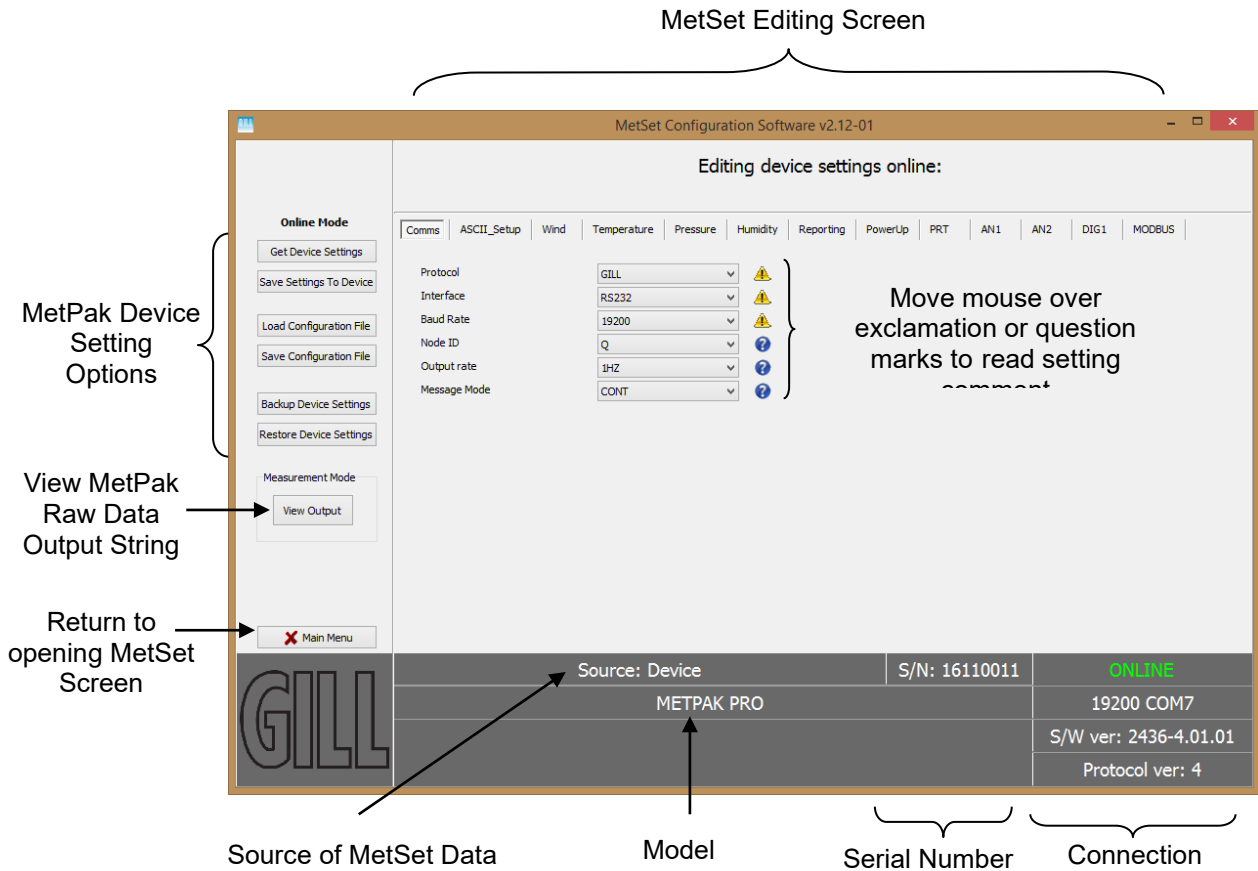
PROTOCOL : GILL  
COMMS : RS232  
(BAUD) : 19200  
NODE : Q  
OUTFREQ : 1HZ  
MSGMODE : CONT  
ASCTERM : CRLF  
ECHO : ON  
ALIGN : 0  
SENSOR WIND : ON  
UNITS WIND : MS  
NODIR : 0.00  
SENSOR TEMP : ON  
UNITS TEMP : C  
SENSOR DEWPOINT : ON  
UNITS DEWPOINT : C  
SENSOR PRESS : ON  
UNITS PRESS : HPA  
SENSOR RH : ON  
UNITS RH : %  
REPORT NODE DIR SPEED PRESS RH TEMP DEWPOINT PRT AN1 AN2 DIG1 VOLT STATUS  
PUPMSG STATUS : ON  
PUPMSG REPORT : ON  
PUPMSG UNITS : ON  
PUPMSG INPUTS : ON  
SENSOR PRT : ON  
UNITS PRT : C  
SENSOR AN1 : ON  
SENSTYPE AN1 : NOT CONFIGURED  
UNITS AN1 : #  
ANIP AN1 : VOLTAGE 99999 99998  
SUBST AN1 : NOT CONFIGURED  
SENSOR AN2 : ON  
SENSTYPE AN2 : NOT CONFIGURED  
UNITS AN2 : #  
ANIP AN2 : VOLTAGE 99999 99998  
SUBST AN2 : NOT CONFIGURED  
SENSOR DIG1 : ON  
SENSTYPE DIG1 : NOT CONFIGURED  
UNITS DIG1 : #  
DIGCOUNT DIG1 : 10.000  
SUBST DIG1 : NOT CONFIGURED  
MODBUS : RTU  
MODADDR : 1  
DATABITS : 8  
STOPBITS : 1  
PARITY : NONE  
MODTERM : 10  
MODICT : 1000

Note changes to BAUD and COMMS settings will take place after next power-up.

Click on the Close button to continue to the MetSet set up screen.

### MetSet Editing Screen

When connected correctly a MetSet editing screen is available to read configuration settings, change configuration settings, save MetPak configuration settings to a PC file location, upload MetPak configuration settings from a PC file and view the MetPak raw data string output.

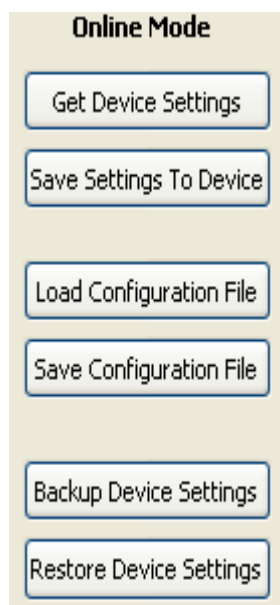


### MetSet Connection Status Information.

Reading	Function
ONLINE	ONLINE in green indicates the MetPak has been successfully connected to MetSet. OFFLINE in Grey indicates that MetSet is being used without a MetPak in communication with MetSet.
19200 COM7	19200 is a report on the MetPak Baud rate setting. COM 7 is a report on the MetPak COM Port connection number.
S/W ver 2436-4.01.01	2436 is the MetPak Firmware number. 4.01.01 is the firmware revision. PV=4 is the Protocol Version (Gill Internal Reference).
Source:Device	MetSet reads 'Device' when the source of the data that MetSet has retrieved has come from the MetPak. MetSet reads 'File' when the source of data has come from a saved file. MetSet reports on the connected MetPak device (METPAK PRO) and reads the unit Serial Number (S/N: 16110011)

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- **MetSet Online Settings.**

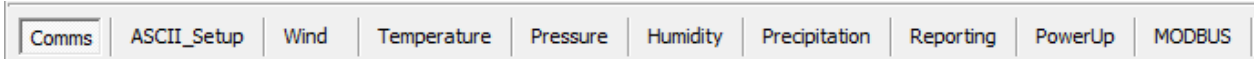


Online Mode Buttons	Function
Get Device Settings	MetSet retrieves the MetPak Configuration settings.
Save Settings to Device	MetSet configuration settings are saved to a connected MetPak.
Load Configuration File	When selected MetSet retrieves a MetSet edit PC file and updates MetSet with these settings.
Save Configuration File	When selected MetSet edit settings are saved to a PC file location.
Back Up Device Settings	When selected the MetPak configuration settings are transferred to MetSet and then to a file location selected on a PC.
Restore Device Settings	When selected MetSet retrieves a MetPak configuration setting from a PC file, loads it into the MetPak and updates the MetSet edit settings.
Measurement Mode View Output	Click on View Output to view the raw ASCII MetPak data string scrolling at the output rate. (View only feature). E.g. Q,127,000.03,000,2000-01-01T00:40:50.2,+10.5,0000, 21
Main Menu	Click here to go back to the opening MetSet screen

**MetSet Editing Pages.**

**Features and Parameters available to view and select will depend on the MetPak model connected. See page 5 for a summary of available sensor outputs and parameters.**

NOTE: Items shown in Bold are the default settings.



The Comms Page can be used to Select:-

Protocol	GILL	
Interface	RS232	
Baud Rate	19200	
Node ID	Q	
Output rate	1HZ	
Message Mode	CONT	

- Protocol:- **GILL**, or MODBUS
- Interface:- **RS232**, RS422, RS485P2W (point to point) ,SDI-12.
- Baud Rate:- 4800, 9600, **19200**, 38400 or 57600  
(1200 baud auto selected with SDI-12 setting).
- Node ID:- A to P, **Q** to Z.
- Output Rate:- **1Hz (1 per second)**, 1/2Hz and 1/4Hz.
- Message Mode:- **CONT** (Continuous output) or POLL (Polled Mode).

**NOTES:**

**When COMMS or Baud Rate settings are changed and Saved to Device a warning is issued by MetSet. These setting changes will not become active until the MetPak power is turned off and turned on again. The connecting device will then also need its Comms and Baud rate settings changed to match the MetPak.**

**When selecting Modbus then Message Mode must be set for CONT.**

The ASCII Set up Page can be used to select:-

- Termination:- **CRLF** or CR
- Echo:- **ON** or OFF.

The **Wind Page** can be used to select:-

North Alignment from **0-359** degrees. If the unit is installed on the mast and found to be off North alignment then an offset figure can be set to correct for this.

Sensor WindSpeed **ON** or OFF.

Wind Speed Units **MS**, KTS, MPH, KPH, FPM.

(Metres/Second, Knots (Nautical miles/hour), Miles/Hour, Kilometres/Hour, Feet/Minute).

No-Direction Wind Speed **0.00**m/s to 5.00m/s speed above which direction readings are output.

The **Temperature Page** can be used to select:-

Temperature Sensor **ON** or OFF

Temperature Units **C**, K or F (Centigrade, Kelvin, Fahrenheit)

Dew Point Sensor **ON** or OFF

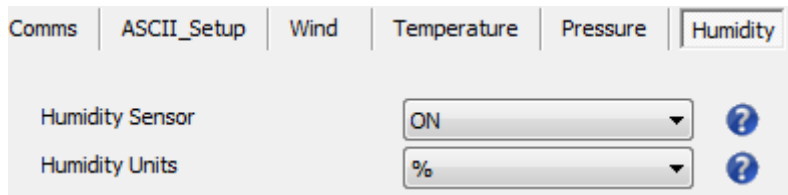
Dew Point Units **C**, K or F

The **Pressure Page** can be used to select:-

Pressure Sensor **ON** or OFF

Pressure Units **HPA**, MB, MMHG, INHG (Hecto Pascals, Milli-Bars, Millimetres Mercury, Inches Mercury).

The Humidity Page can be used to select:-



Humidity Sensor                      **ON** or OFF  
 Humidity Units                        %

The Reporting Page can be used to select:-



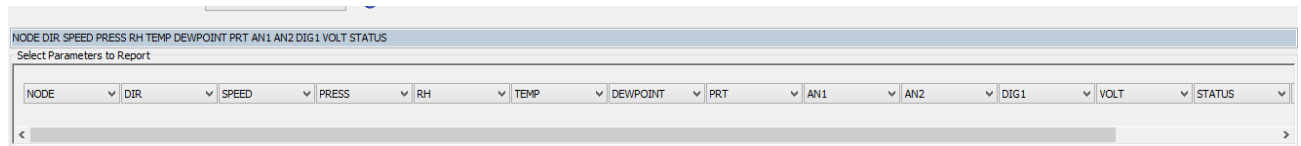
Report Format **USERDEF**, FULL or NMEA (NMEA MetPak unit only not RG or Pro versions)

**FULL**                                      Factory setting, outputs each available sensor field.

**USERDEF**  
 in USERDEF                              Report parameters can be selected in any order or on or off setting.

**NMEA**                                      Sets the unit to output an NMEA data string (MetPak only not MetPak RG or MetPak Pro units).

**Select Parameters to Report.**



**Actual reported parameters and order of output shown will depend on the MetPak Model and for more details on derived parameters refer to page 5.**

- Blank Field ,,,
- NODE                                      Outputs a Node letter (A to Z).
- DIR                                      Outputs Wind Direction readings.
- SPEED                                      Outputs Wind Speed readings.
- PRESS                                      Outputs the Barometric Pressure reading.
- RH                                      Outputs Relative Humidity reading.
- TEMP                                      Outputs the Temperature reading.
- DEWPOINT                                      Outputs the Dewpoint reading.
- VOLT                                      Outputs the MetPak Supply Voltage.
- PRT                                      MetPak Pro only, with a connected Platinum Resistance Thermometer, outputs a temperature reading.
- STATUS.                                      Outputs the MetPak Sensors Status Code (see para 8.3.2).
- AN1                                      MetPak Pro only. Outputs data from a connected analogue instrument.
- AN2                                      MetPak Pro only. Outputs data from a connected analogue instrument.
- DIG1                                      MetPak RG and MetPak Pro only, with a connected Tipping Bucket Rain Gauge it outputs precipitation in the output period.

The **PowerUp Page** can be used to select:-

The screenshot shows a navigation bar with tabs: Comms, ASCII\_Setup, Wind, Temperature, Pressure, Humidity, Reporting, and PowerUp. The PowerUp tab is active. Below the tabs, there are four rows of configuration options, each with a dropdown menu and a help icon (question mark):

Status Message Output	ON	?
Report Message Output	ON	?
Units Message Output	ON	?
Inputs Message Output	ON	?

**Status Message** Output **ON** or OFF.

E.g. METPAK PRO 2436 V4.01.01  
STARTUP: OK.

**Report Message** Output **ON** or OFF.

E.g. NODE,DIR,SPEED,PRESS,RH,TEMP,DEWPOINT,PRT,AN1,AN2,DIG1,VOLT,STATUS,CHECK.

**Units Message** Output **ON** or OFF

E.g. - DEG,MS,HPA,%C,C,C,##,##,V,-,-

**Inputs Message** Output **ON** or OFF.

E.g. PRT = CONFIGURED  
AN1 = NOT CONFIGURED  
AN2 = NOT CONFIGURED  
DIG1 = NOT CONFIGURED

The **PRT Page** (MetPak Pro) can be used to select:-

The screenshot shows a navigation bar with tabs: Comms, ASCII\_Setup, Wind, Temperature, Pressure, Humidity, Reporting, PowerUp, and PRT. The PRT tab is active. Below the tabs, there are two rows of configuration options, each with a dropdown menu and a help icon (question mark):

PRT Sensor	ON	?
PRT Units	C	?

PRT Sensor **ON** or OFF

PRT Units **C**, K or F

(Celsius, Kelvin or Fahrenheit)

The output data format for PRT data is Sign (+ or -), 3 integral digits, and 2 decimal places.

The **AN1** and **AN2** Pages (MetPak Pro) can be used to select:-

AN1 or 2 Sensor **ON** or OFF

Sensor Type – Choose a title from drop down list.

Units – Allows a choice of measurement units depending on sensor chosen.

Analogue Input Type – Select Voltage or Current.

Substitute Name field available for typing in a substitute name between 3 to 8 characters long.

Low – Match to low scale of external sensor ( $\pm 9998.0000$  possible).

High – Match to high scale of external sensor ( $\pm 9998.0000$  possible).

MetSet AN1 and AN2 Edit pages can be used to set a MetPak Pro low value and high value range figure to be input to match the output range of the connected sensor.

For instance if a 0-5v Pressure Sensor scaled over a range of 600 to 1100 Milli-bars is connected to AN1, then set MetSet AN1 Edit Screen for low value 600 and high value to 1100 and save this as device setting.

The MetPak Pro will then output the actual pressure reading value e.g. 1027.1 in the AN1 position of the digital data string.

Similarly if a 0-5v Temperature probe were used on AN2 scaled over a range  $-50$  to  $+70$  degrees, then set AN2 low value to  $-50$  and high value to  $70$ .

#### NOTE:

In the event that the input voltage exceeds 5.05v dc an overflow character E will appear in the digital data string.

In the event that the input current is less than 3.96mA an error character X will appear in the digital data string.

In the event that the input current is more than 20.2mA an overflow character E will appear in the digital data string.

The **DIG1 Page** (MetPak Pro) can be used to select:-

DIG1 Sensor **ON** or OFF

Sensor Type - Choose a title from a drop down list.

Units - Allows a choice of measurement units depending on sensor chosen. For instance MM or IN for Rain.

Count can be set from 0.001 to **10.000** in 0.001 unit steps to represent one switch closure taking place.

If using a Rain Gauge it should be set to match the Rain Gauge calibration figure for example 0.199 (mm/hr.).

Substitute Name A field available for typing in a user name between 3 to 8 characters long.

#### In Continuous Output Mode

A count will occur of the number of switch closure events taking place over 1 second (default 1Hz output rate or during 2 seconds (0.5Hz) or during 4 seconds (0.25Hz)) and will be output in each digital data output reading (when DIG 1 enabled).

#### In Polled Mode

The MetPak Pro will store and output the cumulative total number of switch closures since the last poll request. Once the cumulative total has been output the count will be reset to zero.

The maximum number of count events will be 9999, if the number counted exceeds 9999 an overflow character E will be output in the data string.

#### **NOTE:**

Once all settings have been chosen then save Edited Page Settings to MetPak Pro by clicking on 'Save Settings to Device' this will change the MetPak Pro configuration to reflect the new MetSet settings.

**The MODBUS Page** can be used to select:-

Comms	ASCII_Setup	Wind	Temperature	Pressure	Humidity	Precipitation	Reporting	System	PowerUp	<b>MODBUS</b>
Mode	RTU				?					
Address	1				?					
Data bits	8				?					
Stop bits	1				?					
Parity	NONE				?					
Termination Char ASCII code	10				?					
Inter-char timeout (ms)	1000				?					

Mode	<b>RTU</b> or ASCII.
Address	<b>1</b> to 247.
Data Bits	<b>8 for Modbus RTU</b> , 7 for Modbus ASCII.
Stop Bits	<b>2 for No Parity</b> , 1 for Even/Odd Parity.
Parity	<b>NONE</b> , ODD, or EVEN.
Termination Char ASCII code	<b>10</b> , (0-255).
Inter Char Timeout (mS)	<b>1000</b> (500 to 10000).

## 6.3. Polled Mode

### 6.3.1 To Configure a MetPak Unit for Polled Mode:

Connect a default set MetPak Unit to a PC as described in Para 4.9.

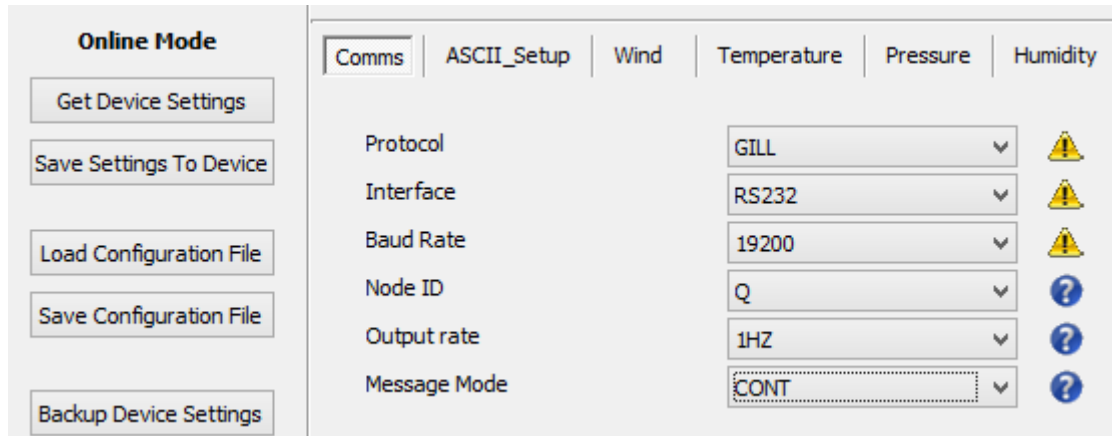
Open MetSet as described on Para 6.2.

Click on the Edit Comms page and select:-

Set Protocol for required poll mode interface e.g. RS485P2W and

Set Message Mode to Poll.

Click on Save Settings to Device on the Online Mode Menu.



Shut down the MetPak unit.

Change the hardware connections for the required Poll Mode Interface.

E.g. RS485P2W in para 4.11.

### Using Polled Mode:

When in the Polled mode, an output is only generated when the host system sends a Poll signal to the MetPak Unit consisting of a ? Character followed by the MetPak Unit Node ID – that is, the relevant letter A – Z.

The commands available in Polled mode are:

Description	Command	Base Station Response
Enable Polled mode	?	(None)
MetPak Unit ID	A ..... Z	Data output generated
Disable Polled mode	!	(None)
Request MetPak Unit Identifier	?&	A ..... Z (as configured)

It is suggested that in polled mode the following sequence is used for every poll for information.

? Ensures that the Sensor is enabled to cover the event that a power down has occurred.

A-Z Appropriate unit designator sent to retrieve a line of data (default is Q).

! Sent to disable poll mode and reduce possibility of erroneous poll generation.

When in polled mode the system will typically respond to the data command within 30mS with the last valid data sample when set for 1Hz output rate.

If a Wind Sensor is not connected to the MetPak Unit then allow at least 3 seconds for a poll request reading output.

If the unit is powered down after use or upon switch on then allow 10 seconds from switch on before sending poll commands.

## 6.4. Configuring MetPak for SDI-12

To configure a MetPak unit for SDI-12:

Connect a default set MetPak to a PC as described in Para 4.9.

Open MetSet as described on Para 6.2.

Click on the Edit Comms page and select:-

Set Interface for SDI-12.

No other settings changes are required.

Click on Save Settings to Device on the Online Mode Menu.

Shut down the MetPak unit.

Change the hardware connections for SDI-12 (see Para 4.12).

Power up the MetPak unit (**SDI-12 supply voltage 9.6v to 16v dc**).

### 6.4.1. SDI-12 Units of Measure

#### NOTE

**Not all the following outputs are available and will depend on the MetPak variant, see page 5, Para 2.1.2.**

MetPak Model SDI-12 Output Parameters.

Relative Wind Speed:	Metres/Second.
Relative Wind Direction:	Degrees
Temperature:	Degrees C
Relative Humidity:	%
Dewpoint:	Degrees C
Pressure:	Hecto Pascals
Total precipitation:	mm
AN1	As defined by MetSet
AN2	As defined by MetSet
DIG1	As defined by MetSet
PRT	As defined by MetSet
Date:	yyyymmdd
Time:	hhmmss
Status	4 Digit Sensor Status code (e.g. 00 for a no fault condition)

## 6.4.2. SDI-12 Commands

Note: Unavailable measurements shall be "padded", e.g.: +999.99.

?!	Unit Address (default is 0).
aAb!	Change unit address (a = 0).
al!	Unit identifier Firmware and Serial Number.
aM!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Humidity (%).
aM1!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Dewpoint (degrees C).
aM2!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ) and a 2 digit Wind only Status Codes.
aM3!	Temperature (degrees C), Humidity (%), Dewpoint (Degrees C) and full MetPak Status Codes.
aM4!	Pressure (Hecto Pascals/millibars).
aM5!	PRT, Analogue Input 1, Analogue input 2 and Digital Input 1.
aM6!	PRT.
aM7!	Analogue Input 1 and Analogue Input 2.
aM8!	Digital Input 1.
aM9!	Power Supply Voltage (Volts).
aD0!	Request a line of the above data.

Command	Description	Response	Example
?!	Unit Address	a<CR><LF>	0<CR><LF>
aAb!	Change the unit address a = 0, the default. b = the new address.	b<CR><LF>	1<CR><LF>
al!	Send Unit Identification	a><firmware><sn><CR><LF>	013GillInst 40116370005<CR><LF>
aM!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees-C), Pressure (Hecto Pascals/millibars), Humidity (%) and a 2 digit Status Code	atttn<CR><LF> a is unit identifier. t is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MetPak will take to complete a measurement, have data ready and the number of data values.	00055<CR><LF> 0 is unit identifier. 005 is 5 sec. measurement. 5 is the number of data readings (Direction, Speed, Temperature, Pressure and Humidity).
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><humidity><CR><LF>	0+220+000.01+021.6+1013.0+041.9<CR><LF>

<b>aM1!</b>	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees C), Pressure (Hecto Pascals/millibars) and Dewpoint (degrees C).	atttn<CR><LF>	00055<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><dewpoint><CR><LF>	0+357+000.03+021.6+1013.0+008.0<CR><LF>
<b>aM2!</b>	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ) and a 2 digit Wind only Status Code.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CR><LF>	0+029+000.01+00<CR><LF>
<b>aM3!</b>	Temperature (degrees C), Humidity (%), Dewpoint (Degrees C) and Full Sensor Status Codes.	atttn<CR><LF>	00054<CR><LF>
0D0!	Retrieve a line of the above data.	a<temp><humidity><dewpoint><status><CR><LF>	0+21.6+041.0+0007.8+00<CR><LF>
<b>aM4!</b>	Pressure (Hecto Pascals/millibars).	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<pressure><CR><LF>	0+1013.0<CR><LF>
<b>aM5!</b>	PRT, Analogue Input 1, Analogue Input 2 and Digital Input 1	atttn<><CR><LF>	00054<CR><LF>
0D0!	Retrieve a line of the above data.	a<prt><AI1><AI2><dig1><CR><LF>	0+027.65+0.0034-099903+0135.000<CR><LF>
<b>AM6!</b>	PRT.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<prt><CR><LF>	0+027.65<CR><LF>
<b>AM7!</b>	Analogue Input 1 and Analogue Input 2	atttn<><CR><LF>	00052<CR><LF>
0D0!	Retrieve a line of the above data.	a<AI1><AI2><CR><LF>	0+3.5380+017947<CR><LF>
<b>AM8!</b>	Digital Input 1.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<dig1><CR><LF>	0+0408.000<CR><LF>
<b>aM9!</b>	Power Voltage (Volts)	atttn<CR><LF>	00011<CR><LF>
0D0!	Retrieve a line of the above data.	a<voltage><CR><LF>	0+12.5<CR><LF>

### 6.4.3. SDI-12 Commands with CRC

Note: Unavailable measurements shall be "padded", e.g.: +999.99.

aMC!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Humidity (%) and CRC.
aMC1!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (degrees C) and CRC.
aMC2!	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), a 2 digit Status Code and CRC.
aMC3!	Temperature (degrees C), Humidity (%), Dewpoint (degrees C) and CRC.
aMC4!	Pressure (Hecto Pascals/millibars) and CRC.
aMC5!	PRT, Analogue Input 1, Analogue input 2, Digital Input 1 and CRC.
aMC6!	PRT and CRC.
aMC7!	Analogue Input 1, Analogue Input 2 and CRC.
aMC8!	Digital Input 1 and CRC.
aMC9!	Power Supply Voltage (Volts) and CRC.
aD0!	Request a line of the above data.

Command	Description	Response	Example
<b>aMC!</b>	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees-C), Pressure (Hecto Pascals/millibars) Humidity (%) and CRC.	atttn<CR><LF> a is unit identifier. t is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MetPak will take to complete a measurement, have data ready and the number of data values.	00055<CR><LF> 0 is unit identifier. 005 is 5 sec. measurement. 6 is the number of data readings (Direction, Speed, Temperature, Pressure, Humidity and CRC).
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><humidity><CRC><CR><LF>	0+139+000.06+022.2+1017.8+042.7BIQ<CR><LF>
<b>aMC1!</b>	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), Temperature (degrees C), Pressure (Hecto Pascals/millibars), Dewpoint (degrees C) and CRC.	atttn<CR><LF>	00055<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><temp><pressure><dewpoint><CRC><CR><LF>	0+140+000.06+022.2+1017.7+009.0D{Z<CR><LF>
<b>aMC2!</b>	Wind Direction/Speed (direction in Degrees, speed in Metres/Sec ), a 2 digit Status Code and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CRC><CR><LF>	0+098+000.04+00@sh<CR><LF>

<b>aMC3!</b>	Temperature (degrees C), Humidity (%), Dewpoint (Degrees C) and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<temp><humidity><dewpoint><status><CRC><CR><LF>	0+022.2+042.7+009.0+00LV{<CR><LF>
<b>aMC4!</b>	Pressure (Hecto Pascals/millibars) and CRC.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<pressure><CRC><CR><LF>	0+1017.8GM□<CR><LF>
<b>aMC5!</b>	PRT, Analogue Input 1, Analogue Input 2, Digital Input 1 and CRC.	atttn<><CR><LF>	00054<CR><LF>
0D0!	Retrieve a line of the above data.	a<prt><AI1><AI2><dig1><CRC><CR><LF>	0-001.19+0000.6+0000.4+0000.000 CQx <CR><LF>
<b>aMC6!</b>	PRT and CRC.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<prt><CRC><CR><LF>	0-001.19IT@<CR><LF>
<b>aMC7!</b>	Analogue Input 1, Analogue Input 2 and CRC.	atttn<><CR><LF>	00052<CR><LF>
0D0!	Retrieve a line of the above data.	a<AI1><AI2><CRC><CR><LF>	0+0000.6+0000.4FE~<CR><LF>
<b>aMC8!</b>	Digital Input 1 and CRC.	atttn<CR><LF>	00051<CR><LF>
0D0!	Retrieve a line of the above data.	a<dig1><CRC><CR><LF>	0+0000.000EgO<CR><LF>
<b>aMC9!</b>	Power Voltage (Volts) and CRC	atttn<CR><LF>	00011<CR><LF>
0D0!	Retrieve a line of the above data.	a<voltage><CRC><CR><LF>	0+12.2K@R<CR><LF>

## 6.5. Configuring MetPak for MODBUS

**NOTE:- Applies only to Parts 1723-XX-X-X31 or X32 with firmware 2436 4.02.04.**

### 6.5.1 MetPak Supported Modbus Specification

MODBUS RTU or ASCII.  
 Baud Rate 9600 or 19200 Baud.  
 COMMS RS232 point to point only, RS485 2 wire networkable.  
 Modbus Parameters ASCII or RTU.

Parameter	Modbus ASCII		Modbus RTU	
Character	ASCII 0 to 9 and A to F (Hex)		Binary 0 to 255	
Error Check	Longitudinal Redundancy Check (LRC)		Cyclic Redundancy Check (CRC)	
Frame Start	Character ':' (3A Hex)		3.5 Characters Silence	
Frame End	Characters CR/LF (0D/0A Hex)		3.5 Characters Silence	
Gaps in Message	1 Second		1.5 Times Character Length	
Start Bit	1		1	
Data Bits	7		8	
Parity	Even/Odd	None	Even/Odd	None
Stop Bits	1	2	1	2

Read Holding Registers function code is 0x03  
 Diagnostics 0x08  
 Get Comm event counter 0x0B  
 Report slave/server ID 0x11

Requires:-

**MetPak unit with version 2346-4.02.04 firmware.**

MetSet Software version 2.12-01 and onwards.

Connect a MetPak to a PC COM port (default communication is RS232).

Open Gill MetSet Software.

Click on Connect and Read to reach the Editing Pages as shown below.

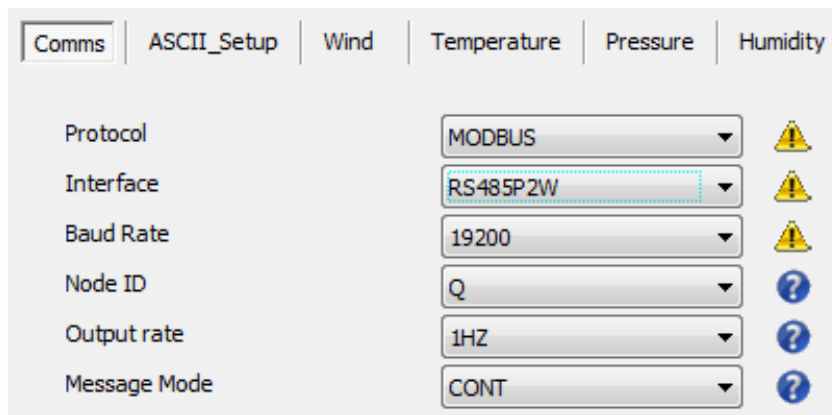
#### Configuration

Click on the MODBUS Page.

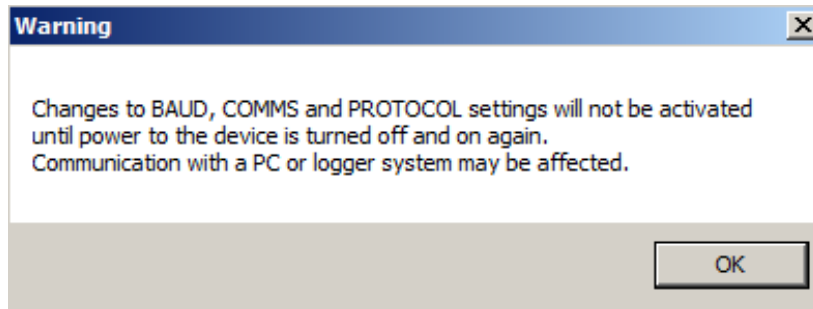
Mode: Choose between RTU and ASCII, in this case RTU.  
 Address: Choose a MetPak Address number between 1 to 247.  
 Data Bits: Choose 7 for Modbus ASCII and 8 for Modbus RTU.  
 Stop Bits: Choose 1 for Even/Odd Parity or 2 for No Parity (None).  
 Parity: Choose Even/Odd or None.  
 Termination Char ASCII code: Choose between 0-255.  
 Inter Char Timeout (ms): Choose between 500ms to 10000ms.

**Select the COMMS Page**

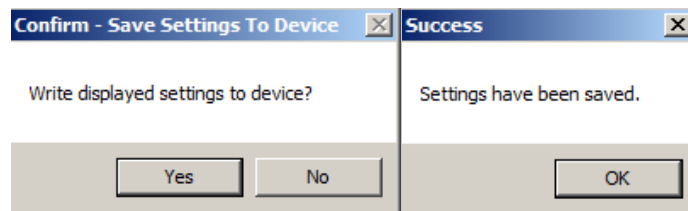
- Protocol: Default is Gill. Select MODBUS
- Interface: Default is RS232. Select RS232 or RS485P2W. RS232 will only allow a single point to point non multi drop network connection. RS485 2 wire will allow networking with up to 32 connected devices.
- Baud Rate: Default is 19200. Select required Baud rate (9600 or 19200 supported).
- Node ID: Default is Q. Not used for MODBUS.
- Output Rate: Default is 1Hz. Set update rate for MetPak Data
- Message Mode: Default is CONT. Select POLL mode and MetPak will only make and output a measurement (set by the output rate) on demand from the Modbus Master. In CONTinuous mode the MetPak continuously makes measurements set by output rate (0.25Hz to 1Hz) and only outputs a result when demanded from the Modbus Master.



When required settings have been selected click on Save Settings to Device



Click on Yes and OK.



Power down the MetPak and apply power back to the MetPak to complete setting changes.

**Note:** now that the unit is in MODBUS mode if any further changes need to be made use the SAFE MODE connection and method to re-establish communication with MetSet (See Para 6.7).

**MetPak MODBUS NOTES**

To work out Modbus register numbers applicable to a MetPak parameter, start out with setting up the MetPak in ASCII mode and determining which parameters are to be output, and the exact order that they are to be output before setting to Modbus Comms.

Refer to the Modbus output parameter table below to determine how many registers each chosen parameter will take up.

Fill up the register table, starting at 40001, with the required output parameters in the order in which they will be output.

**Note:** After powering up the MetPak, wait 10 seconds before requesting any measurements.

MetPak Output Parameters	Type	No. of Registers	Register Numbers
NODE	4 Bit Character String	2	40001-2
DIRECTION	32 Bit Floating Point Value	2	40003-4
SPEED	32 Bit Floating Point Value	2	40004-5
PRESSURE	32 Bit Floating Point Value	2	40006-7
RELATIVE HUMIDITY	32 Bit Floating Point Value	2	40008-9
TEMPERATURE	32 Bit Floating Point Value	2	40010-11
DEWPOINT	32 Bit Floating Point Value	2	40012-13
SUPPLY VOLTAGE	32 Bit Floating Point Value	2	40014-15
STATUS	32 Bit Unsigned Integer (UINT)	2	40016-17

MetPak Pro Output Parameters	Type	No. of Registers	Register Numbers
NODE	4 Bit Character String	2	40001-2
DIRECTION	32 Bit Floating Point Value	2	40003-4
SPEED	32 Bit Floating Point Value	2	40005-6
PRESSURE	32 Bit Floating Point Value	2	40007-8
RELATIVE HUMIDITY	32 Bit Floating Point Value	2	40009-10
TEMPERATURE	32 Bit Floating Point Value	2	40011-12
DEWPOINT	32 Bit Floating Point Value	2	40013-14
PRT	32 Bit Floating Point Value	2	40015-16
AN1	32 Bit Floating Point Value	2	40017-18
AN2	32 Bit Floating Point Value	2	40019-20
DIG1	32 Bit Floating Point Value	2	40021-22
SUPPLY VOLTAGE	32 Bit Floating Point Value	2	40023-24
STATUS	32 Bit Unsigned Integer (UINT)	2	40025-26

- All registers are 16bit.
- The first byte is high order and the second is low.
- Each measurement is comprised of two 16bit registers.
- For all registers, the order of the two data bytes comprising the 16-bit register's value shall be: High Byte/Low Byte.
- For each 32-bit data type (whether floating point or integer), the order of the first pair of bytes and last pair of bytes shall be: High Word/Low Word.
- Registers start at address 40001.
- Holding registers available in the order of the MetPak data string (which can be established by the REPORT command in non-Modbus Gill ASCII Mode).
- If measurements cannot be computed (i.e. a blank field in Gill mode output string), their Holding Register contents shall be set to the Maximum Positive value (0x7FFFFFFF for 32-bit format data (both floating point and integer), and as 0x7FFF for 16-bit format data).

See Simply Modbus program reading example MetPak Pro MODBUS Data as follows:-

The screenshot shows the 'Simply Modbus 7.0' application window. The interface is divided into several sections:

- Configuration:** Mode is set to RTU, COM port to 1, baud rate to 19200, data bits to 8, stop bits to 2, and parity to none. Slave ID is 1, First Register is 40001, and No. of Regs is 26. A 2-byte ID of 3 and a function code of 3 are selected. The register size is set to 16 bit registers.
- Request:** The request hex string is 01 03 00 00 00 14 45 C5.
- Response:** A progress bar shows the response is received. The response hex string is: 01 03 38 00 00 00 51 43 9D 80 00 3D B8 51 EB 44 81 A6 66 42 24 CC CD 41 B6 14 7B 41 0E E1 48 41 D0 E1 48 3A 03 12 6E 41 C8 00 00 00 00 00 41.
- Register List:** A table displays the following data:
 

copy down	register #	bytes	results	notes	clear notes
	40001	0000 0051	Q	NODE	
	40003	439D 8000	315.00000	DIR	
	40005	3DB8 51EB	0.09000000	SPEED	
	40007	4481 A666	1037.2000	PRESS	
	40009	4224 CCCD	41.20000	RH	
	40011	41B6 147B	22.760000	TEMP	
	40013	410E E148	8.930000	DEWPOINT	
	40015	41D0 E148	26.110001	PRT	
	40017	3A03 126E	5.000000E-4	AN1	
	40019	41C8 0000	25.000000	AN2	
	40021	0000 0000	0.0000000	DIG1	
	40023	4140 0000	12.000000	VOLT	
	40025	0000 0000	0	STATUS	
- Advanced Settings:** Includes options for 'High byte/Low byte', 'High word/Low word', 'send continuously', 'pause between sends' (30.0), and 'RTS delay' (0 ms).

## 6.6.CONFIGURING A METPAK FOR NMEA OUTPUT

**Applicable to MetPak units Part 1723-1B-2-111 only.**

**Not applicable to MetPak Pro.**

Connect a default set MetPak to a PC as described in Para 4.9.

Set unit for NMEA output using MetSet.

Open MetSet as described on Para 6.2 and click on the Reporting page.

Change the Report Format drop down menu from USERDEF to NMEA.

On the Comms Page select the required Interface, generally RS422.

On the Comms Page Select the required Baud rate, normally 4800 bauds (or sometimes 9600 baud).

Click on Save Settings to Device.

Alternatively set for NMEA using a Terminal Program.

Open a Terminal program (such as Tera term/Putty/HyperTerminal).

Place the MetPak into SETUP MODE by Typing the \* command.

Type **REPORT NMEA** and press Enter.

Type **BAUD 4800** and press Enter.

Type **COMMS RS422** and press Enter. Until the unit is restarted, the COMMS setting will remain unchanged.

Shut down the MetPak unit.

Change the hardware connections for RS422 communication.

Restart the MetPak unit.

Example NMEA data string produced at the output rate (default every 1Hz):-

```
$WIMWV,008,R,000.09,N,A*0C
```

```
$WIXDR,C,+023.0,C,TEMP,P,1.0199,B,PRESS,H,039.6,P,RH*33
```

**The NMEA data string comprises of: -**

```
$WIMWV,008,R,000.09,N,A*0C,<CR>,<LF>
```

Where: -

\$WIMWV	Wind Instrument Mean Wind direction and Velocity
008	Wind Direction
R	Wind Measurement <b>R</b> elative to the North Marker
000.09	Wind Speed
N	Knots (NMEA output fixed to Knots measurement only)
A	Acceptable measurement (V is a void fail measurement)
0C	Hex CheckSum

And

---

\$WIXDR,C,+023.0,C,TEMP,P,1.0199,B,PRESS,H,039.6,P,RH\*33,<CR><LF>  
Cont.

Where: -

\$WIXDR	Wind Instrument Cross track error Dead Reckoning
C	Type of Sensor (Temperature)
+023.0	Temperature Reading
C	Temperature Reading in Degrees Centigrade
TEMP	Name of Temperature Sensor
P	Type of Sensor (Pressure)
1.0199	Pressure Reading in Bars.
B	Pressure Units of Measure (Bars)
PRESS	Name of Pressure Sensor
H	Type of Sensor (Humidity)
039.6	Humidity Reading in Percent
P	Humidity Units of Measure (Percent)
RH	Name of Relative Humidity Sensor
33	Hex CheckSum

<CR> is a Carriage return character (ASCII hex value d)

<LF> is a Line Feed Character (ASCII hex value a)

Checksum, the 2 digit Hex Checksum sum figure is calculated from the Exclusive OR of the bytes between (and not including) the \$ and \* characters.

## 6.7.SAFE MODE

The MetPak Safe Mode provides a means of recovering communication with the MetPak whatever configuration setting may have been made. For instance if the unit has been set for SDI-12 or Modbus operation Safe Mode can be used to change the communication option back to RS232 , RS422 or RS485.

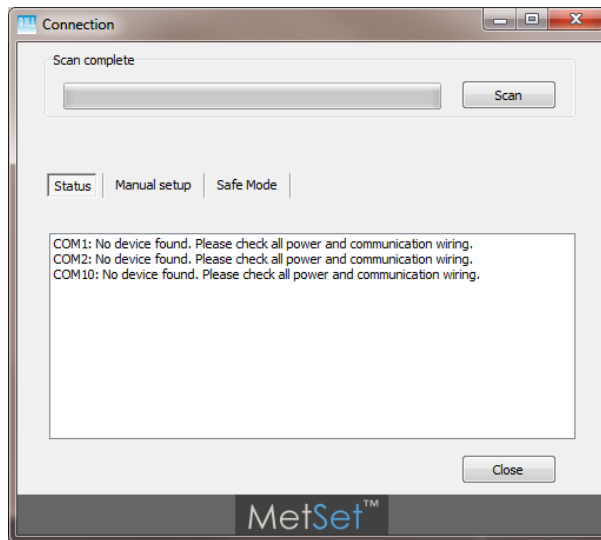
### 6.7.1. Safe Mode Method 1

Connect the MetPak for RS232 communication as detailed in Para 4.9.

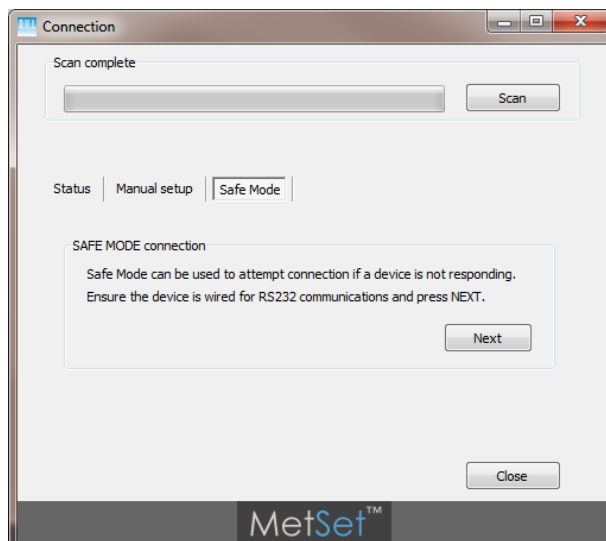
Open Gill MetSet Software (see Para 6.2).

Click on Connect and Read. MetSet will scan COM port settings for a connected MetPak but as the COMMS protocol is not matched will be unable initially to find the MetPak.

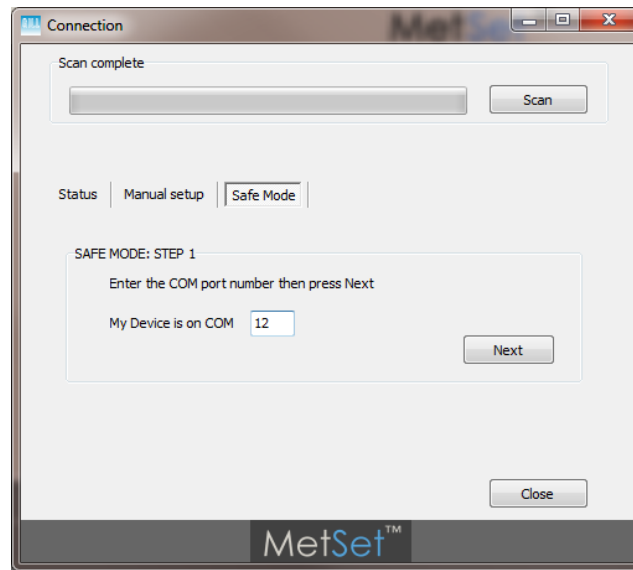
Now Click on the Safe Mode button.



Ensure the MetPak is wired for RS232 operation and power and Click on Next.

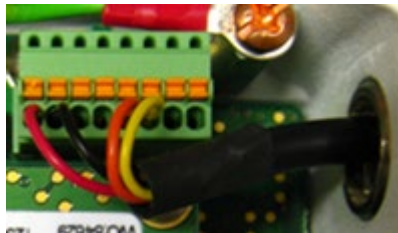


Enter the MetPak COM Port connection number.



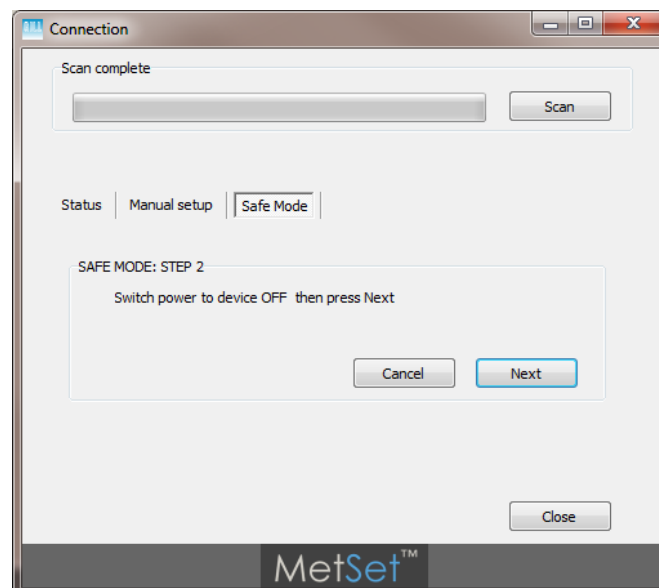
Ensure power is now disconnected from the MetPak.

**If using the Gill RS232 to USB configuration lead then unplug the 8 way connector from J5 in the MetPak hub box.**



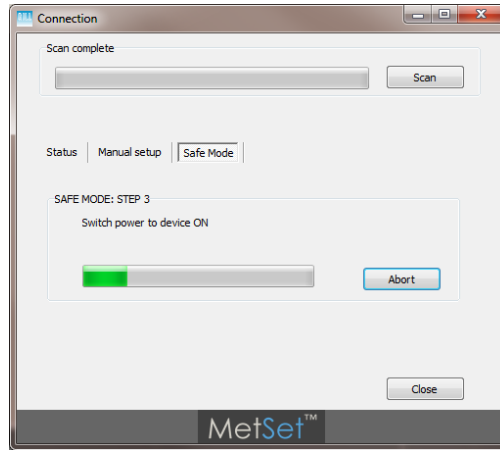
(Do not remove the Gill Configuration lead USB connector from the PC as this will stop Safe Mode being achieved).

Now click on Next.

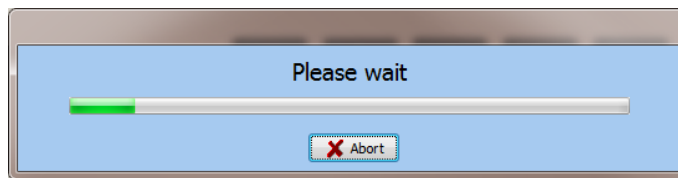


Now re-connect power to the MetPak.

If using the Gill Instrument RS232 to USB configuration cable then plug in the 8 way connector to J5 in the MetPak Hub box.

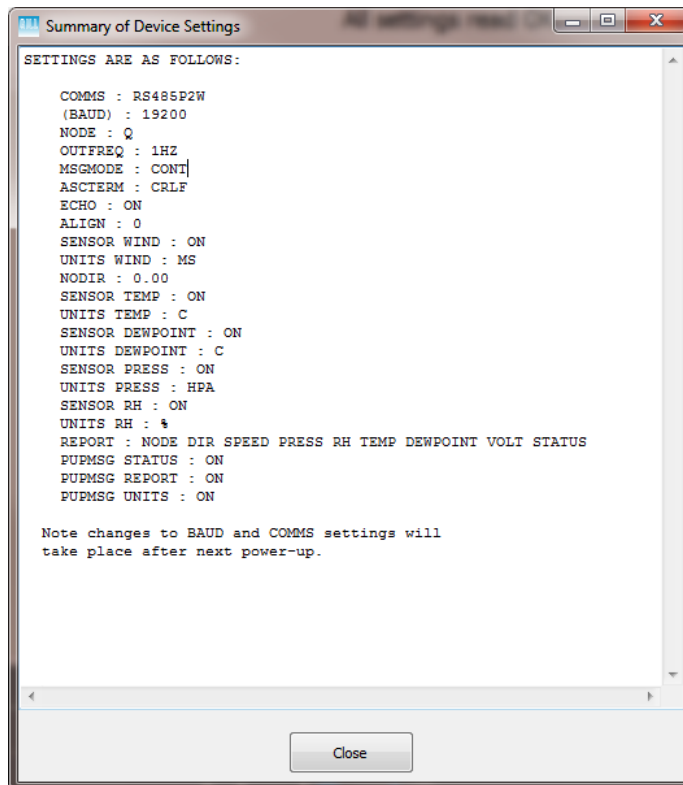


MetSet should now find the MetPak as follows to read settings.



MetPak Settings read as follows and reports Comms mode setting as RS4852W.

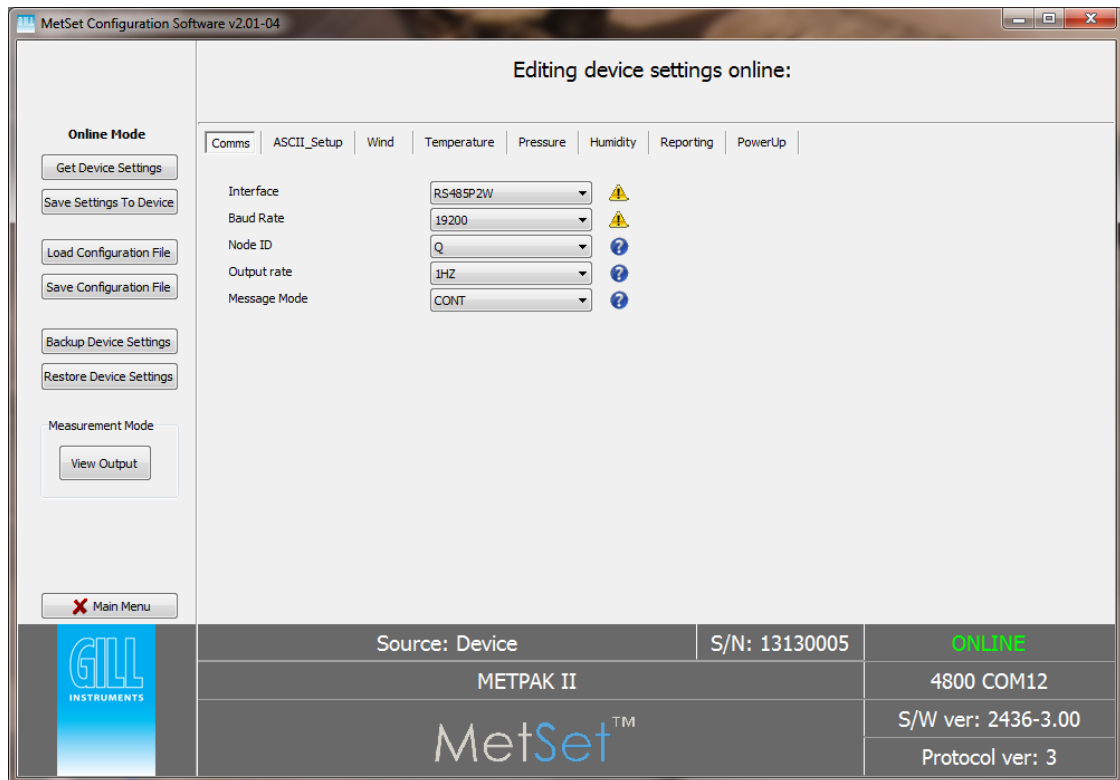
Click on Close



MetSet now opens a Safe Mode 4800 baud connection from which all settings can now be read and changed.

MetSet has detected the MetPak settings in this case Comms were set for RS485 2 Wire.

Now use the MetSet Interface Menu to make any required changes e.g. change comms back to RS232.



## 6.7.2. Safe Mode Method 2

Connect the MetPak for RS232 communication as detailed in Para 4.9.

**Note at this stage the MetPak supply to be switched off.**

**Open a Terminal program e.g. Gill WIND Software (obtainable from <http://www.gillinstruments.com/main/software.html>) or equivalent terminal program e.g. Tera-Term, Putty etc.**

If using Gill Wind Software note that the Tools features are not applicable.

Open Gill Wind Software.

**Serial Port:** Set the drop down menu to the required COM Port Connection.

Click on the **OK** button.

**Baudrate:** Set the drop down menu to **4800** Bauds.

A blank Wind Terminal screen will be opened.

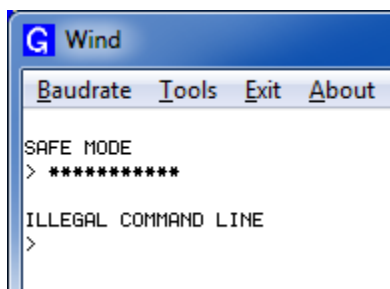
Left Click the mouse in the blank terminal screen.

Hold down the \* key on the keypad.

**With the \* key still held down, apply power to the MetPak.**

This will result in placing the unit into SAFE MODE.

Press Enter to start a new line (Ignore illegal command line).

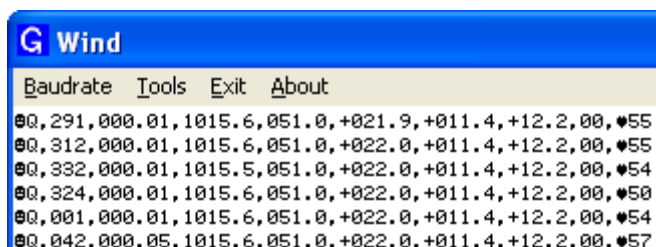


To now change communication from say SDI-12 (or MODBUS) or RS422 or RS485 to Default RS232.

Type **COMMS RS232** and press Enter.

Type **Q** and press Enter to exit SAFE MODE.

Data will now scroll on screen.



Close the 4800 baud rate Wind or Terminal Program.

**Power down the MetPak and re-apply power.**

Open a new Wind or Terminal program at **19200** baud rate.

RS232 data will now scroll on screen at the MetPak default 19200-baud rate.

## 7. VIEWING METPAK DATA

### 7.1. Use MetView to View the MetPak Data

Gill MetView Software allows you to view the MetPak range data string graphically.

MetView can be downloaded from:-

<http://gillinstruments.com/main/software.html>

Before you can use MetView, check that MetPak is correctly connected to a Serial COM port or USB COM port on your PC.

**NOTES:** MetView is compatible with RS232 and RS422 connected units only.  
MetView will not read SDI-12 or MODBUS data strings.

#### 7.1.1. Opening MetView

Click on the MetView button on your PC's desktop or choose:

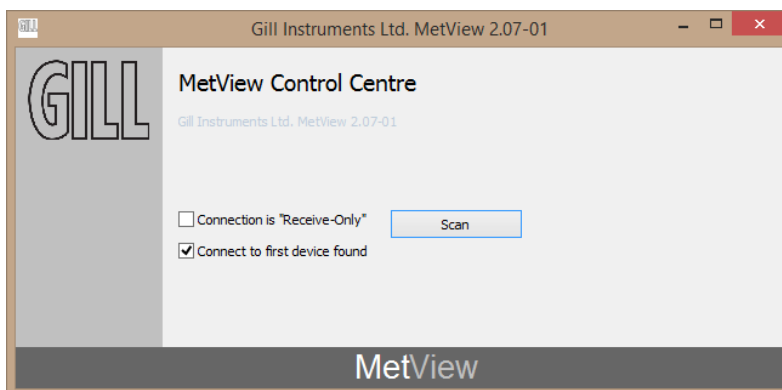
**Start > Programs > MetView > MetView**

The MetView Control Centre window is displayed.

**Connect to first device found** – Default setting and when selected and Scan operated will connect to the MetPak with the lowest COM port number if multiple MetPaks are connected to the PC COM ports.

**Scan Button**– If MetPak Unit transmit and receive wires are connected to the PC then use the Scan button to connect to MetView.

**Connection is Receive Only Tick Box** – Use if the MetPak Unit connection to the PC has only transmit wires connected and a MetSet version of its current device settings is available to upload to MetView. Select 'Connection is Receive only' tick box and click on the Scan button. Upload a MetSet generated Device file from a PC location as directed.

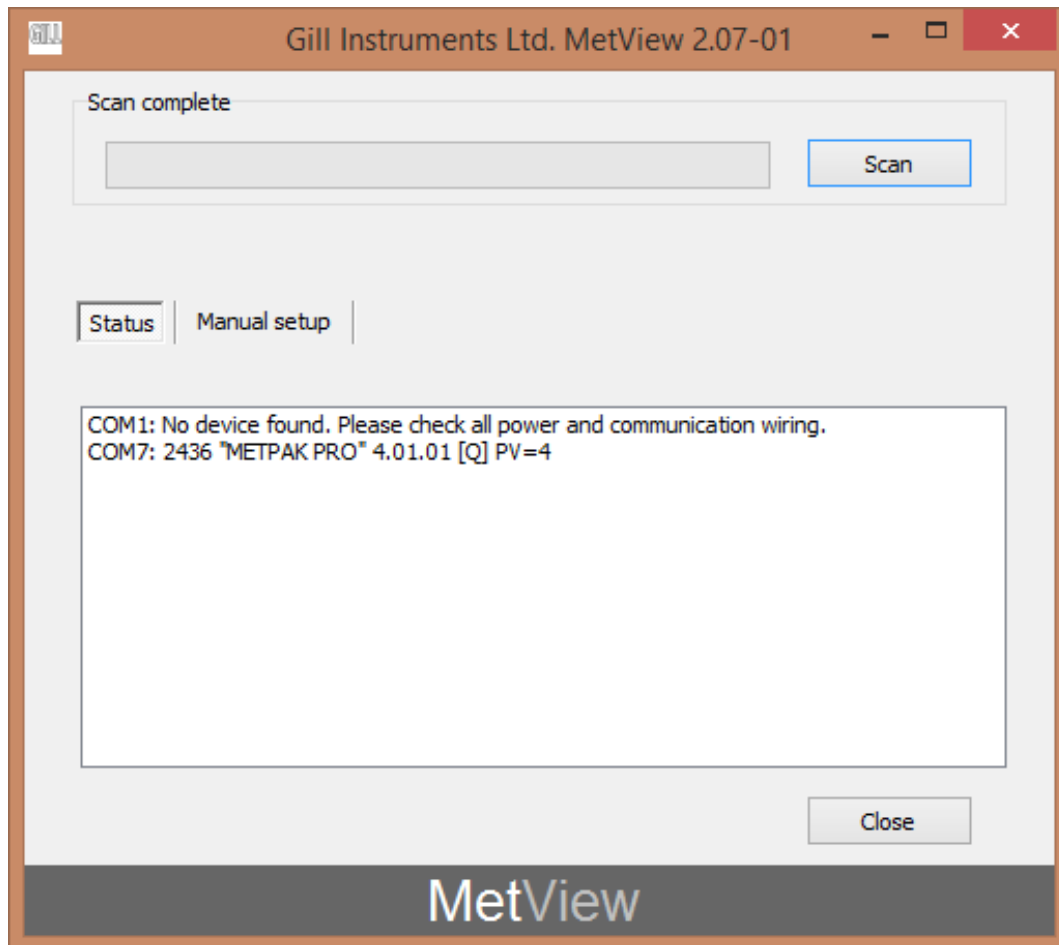


### 7.1.2. Scanning for Devices

To set up communicate between MetView and a connected MetPak Range unit:-

Click on the **Scan** button to search the available COM ports for MetPak devices.

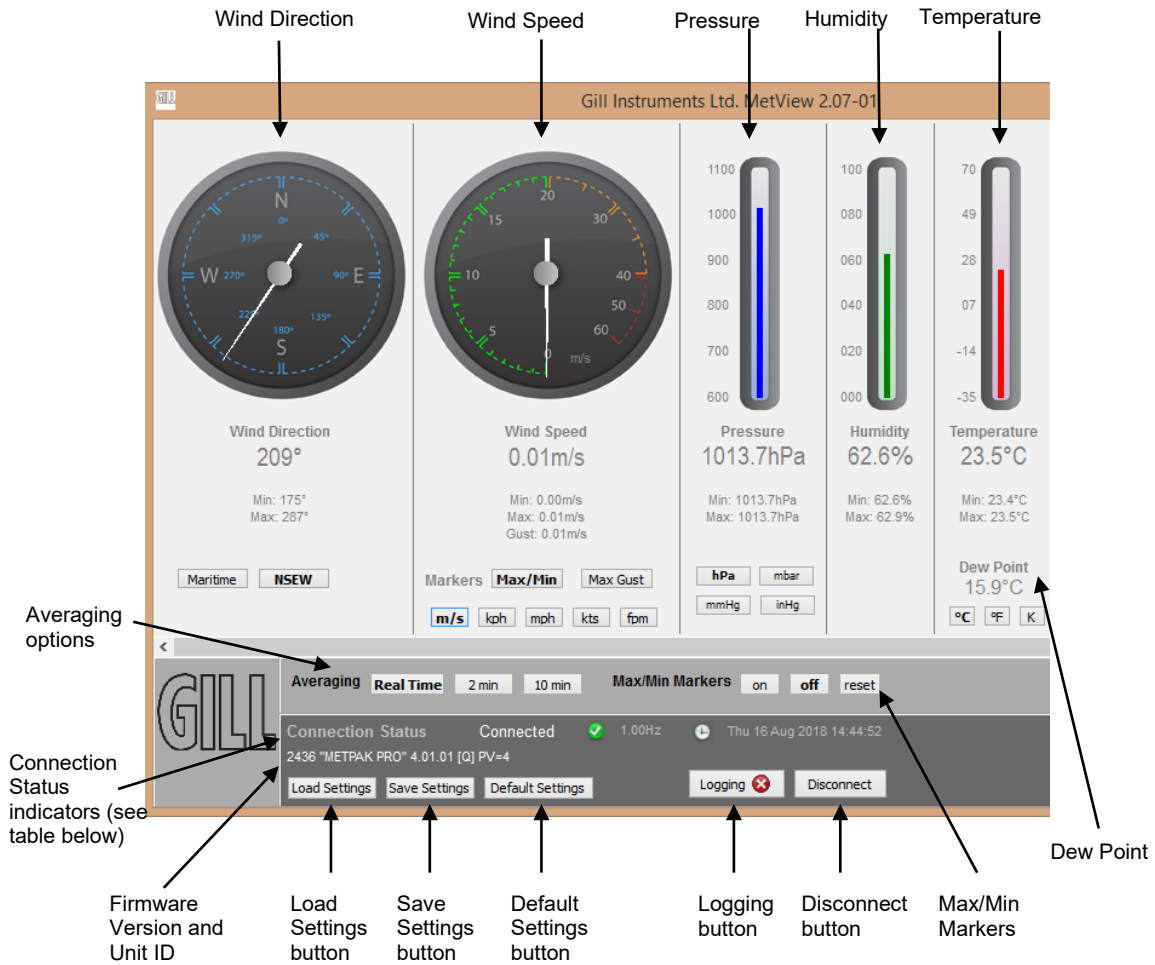
When a device is found, MetView obtains the MetPak unit configuration settings and then retrieves and displays MetPak data.



### 7.1.3. The MetView Console

When connected correctly, MetView displays its data-monitoring console. This consists of gauges showing: Wind Direction, Wind Speed, Pressure, Humidity, Temperature, PRT, Analogue Input 1 and Analogue Input 2. There are also digital readouts of Dew Point and Digital Input 1. Buttons beneath each of the gauges allow you to choose the displayed units and other options. Each gauge also shows the maximum and minimum values recorded during the current session. The wind speed gauge also shows the maximum gust speed.

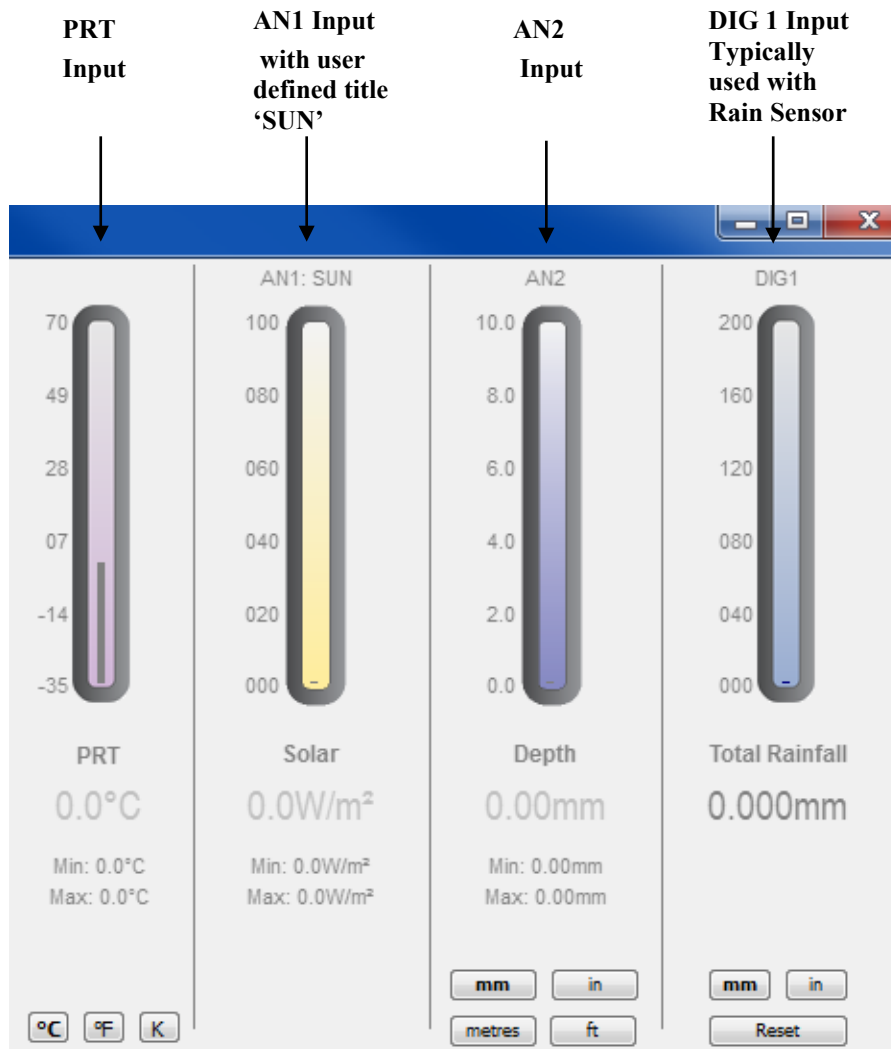
Note: MetView will not show data if the unit is set for MODBUS or SDI-12 format.



#### Connection status indicators

Reading	Function
Green Background Tick	Indicates MetPak Unit logging or communicating correctly with MetView along with reading the MetPak firmware version.
Red Background Cross	Indicates MetPak not logging or connected/communicating to MetView.
1.00Hz	Indicates the output rate of the MetPak when connected. Reads when the unit is communicating correctly with MetView.
Thu 16 Aug 2018 14:35:19	Real Time PC date and time indication.

### 7.1.4. MetPak Pro User External Sensor Display



**NOTE:** The order in which the instruments are shown in the MetView display reflects the order in which the instrument data appears in the MetPak Pro data string.

### 7.1.5. MetView Console Display Options

MetView Console buttons can convert data from the MetPak unit to read different units or scale settings. This does not alter the MetPak unit configuration.

Units shown in **bold** denote default settings.

#### MetView scale and unit options

Gauge	Function
Wind Direction	Use buttons to choose from two display styles: <b>NSEW</b> or Maritime
Wind Speed Markers	Use buttons to add markers on the gauge for <b>Max/Min</b> or Max Gust.
Wind Speed	Use buttons to choose from five wind speed units: <b>m/s</b> , kph, mph, kts, fpm
Pressure	Use buttons to choose from pressure scales: <b>hPa</b> , mbar, inHg, mmHg
Humidity	Displays Max and Min values during current session in %
Temperature & DewPoint	Use buttons to choose from three temperature scales: <b>°C</b> , °F, K
PRT	Use buttons to choose from three temperature scales: <b>°C</b> , °F, K
AN1	Buttons displayed will depend on Analogue input type selected.
AN2	Buttons displayed will depend on Analogue input type selected.
DIG1	Typically for Rain, reads total rainfall since connected, buttons available for inches or millimetres and a reset button.

#### MetView averaging options

Setting	Function
<b>Real Time</b>	Choose this button for no averaging
2 Min	Select for 2 minute rolling average of all sensor readings except DIG1
10Min	Select for 10 minute rolling average of all sensor readings except DIG1

#### Max/min markers

Setting	Function
<b>Off</b>	Maximum and Minimum Markers on all gauges turned off
On	Maximum and Minimum Markers on all gauges turned on
Reset	Reset all Gauge Maximum/Minimum Markers and all digital Maximum/Minimum reading at will

#### MetView Screen Settings Options

Setting	Function
Save Settings	Will Save all the current MetView screen settings to a file for later retrieval if required.
Load Settings	Will load and update the MetView screen with a previously saved setting.
Default Settings	Will return all MetView screen settings to factory default.

## 7.1.6. MetView Gauge Ranges and Graphs

### Gauge Range Settings.

MetView Pressure, Humidity, Temperature, PRT, AN1 and AN2 Gauge ranges may be altered to view changes in conditions more visibly.

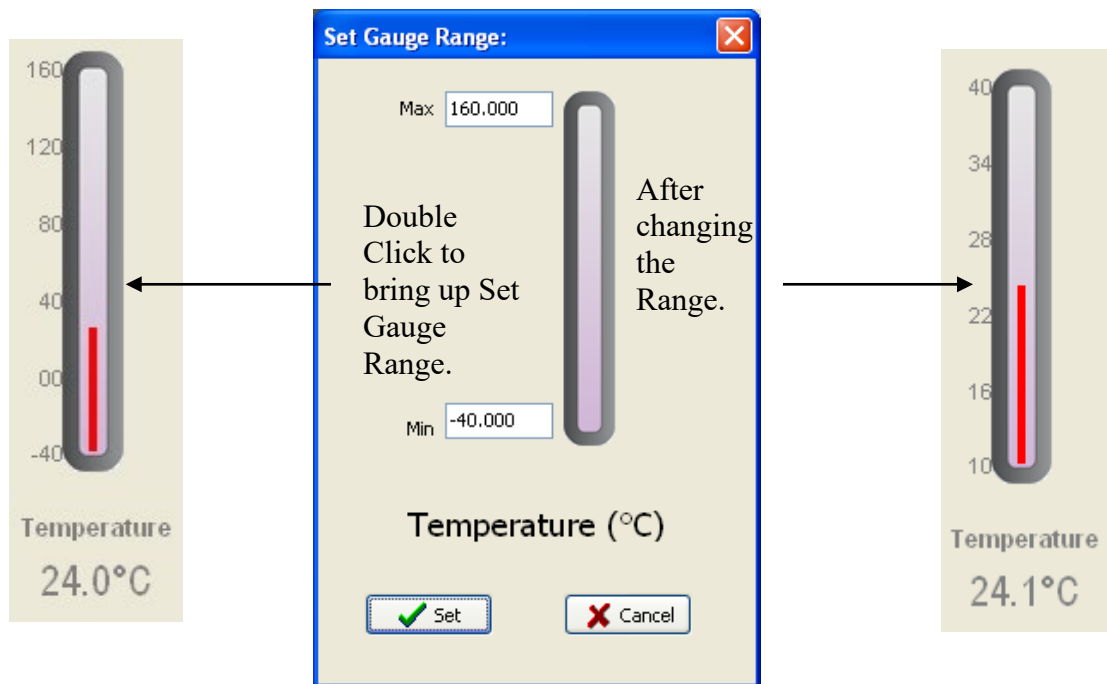
Note, these changes only affect MetView settings and do not affect the MetPak Unit output.

For instance if the typical temperature measurement range required is from +10 degrees to +40 deg C then the temperature gauge range can be adjusted to reflect this.

Place the mouse pointer over the Temperature display gauge and double click to bring up the Set Gauge Range screen. Change Max and Min readings to required values, e.g. +10 min and +40 max.

Click on Set.

The Temperature gauge range will be updated to reflect the change.



MetView Gauge Range Setting

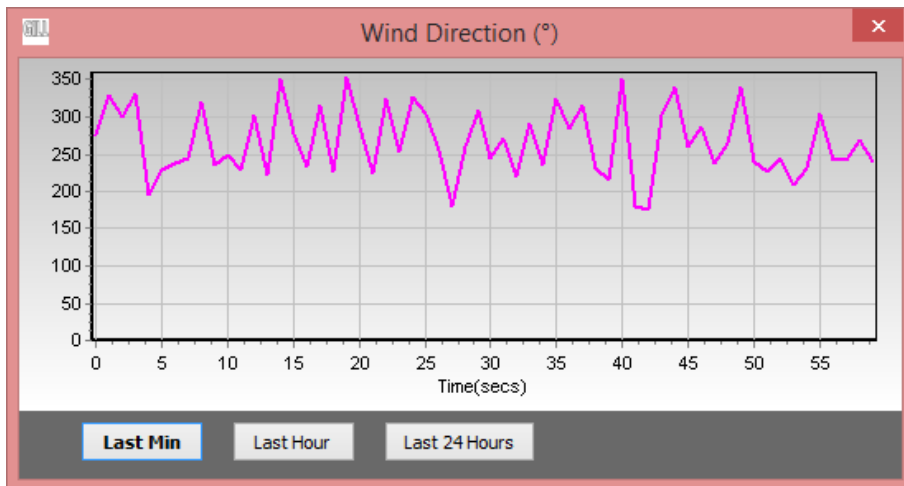
### Graphs

MetView allows data detected over the last minute, last 1 hour and last 24 hours to be accessed and shown on a graph.

Note. Data is only shown up to the time when the graph function is selected; the graph is not updated once opened. Data is collected from the time that MetView is opened and reading data from a MetPak unit.



Double Click on the reading to bring up the graph.

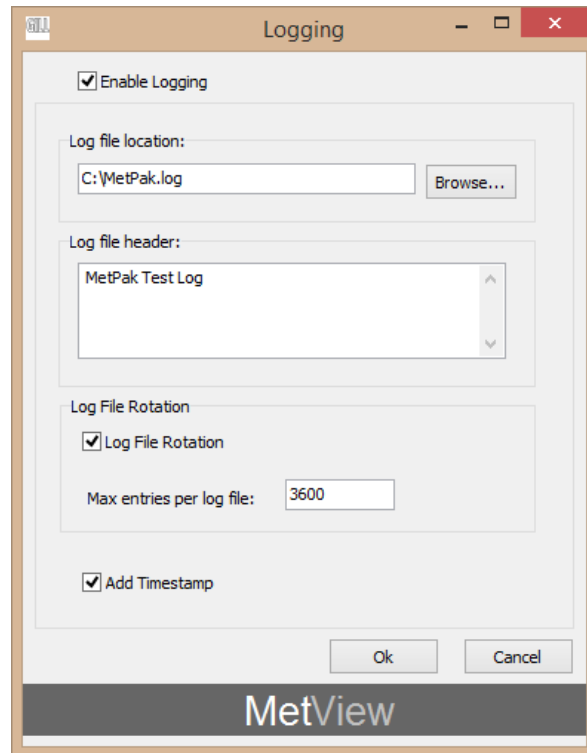


Click on the Last Min, Last Hour or Last 24 Hours buttons as required to view data.

### 7.1.7. Data logging

**NOTE.** MetView logs data based on the MetPak configuration not on the MetView console settings.

To log MetPak data, click on the **Logging** button on the MetView console. The *Logging* dialog box is displayed.



Setting up data logging

<b>Setting up a logging file -</b>	Select <b>Enable Logging</b> .
<b>Log File location</b>	Click on the <b>Browse</b> button to identify the folder where you want to store the data file. Enter the name of the file.
<b>Log file header</b>	If required type some notes on the data that is to be recorded which will appear at the top of the saved data log file.
<b>Log File Rotation</b>	If required set up segmented logging with each logged file length determined by the number entered in the text box below. The figure 3600, for example, means that each log file length will be 3600 lines of data. Maximum entries per log file is limited to 65535 and a maximum of 2048 log files can be created.
<b>Add Timestamp</b>	Adds the date and time to the logged data file taken from the PC clock.

**To start logging**

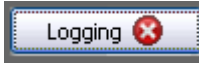


Check that the **Enable Logging** option is selected.

Click on the **OK** button to commence logging and return to the console.

To show that data is being recorded, the Logging button's icon changes to a green tick.

**To stop logging**

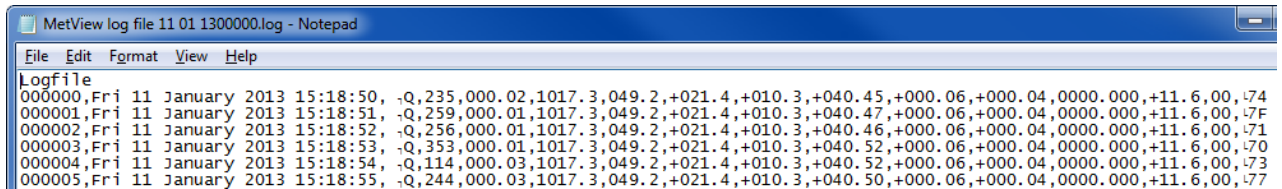


Click on the **Logging** button on the MetView console. Clear the **Enable Logging** check box.

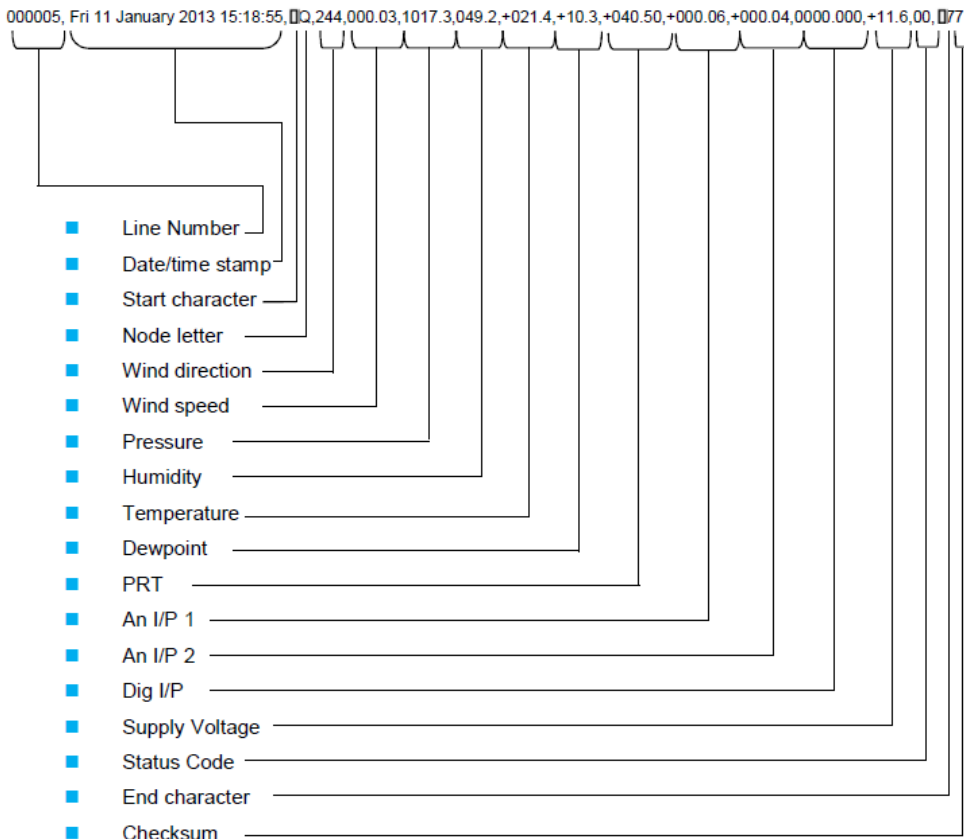
Click on the **OK** button. If logging has stopped, the Logging button shows a red background cross instead of the green background tick (see above).

**Example Logged Data**

MetView Logged data is stored to a file with a **.log** extension. This can be viewed in any text/HTML editor or spreadsheet application.



**Example MetPak Pro Data**



## 7.2. Use a Terminal Program to View the MetPak Data

There are many terminal programs that might be used to view the MetPak data string examples include: HyperTerminal, Putty, Tera Term etc.

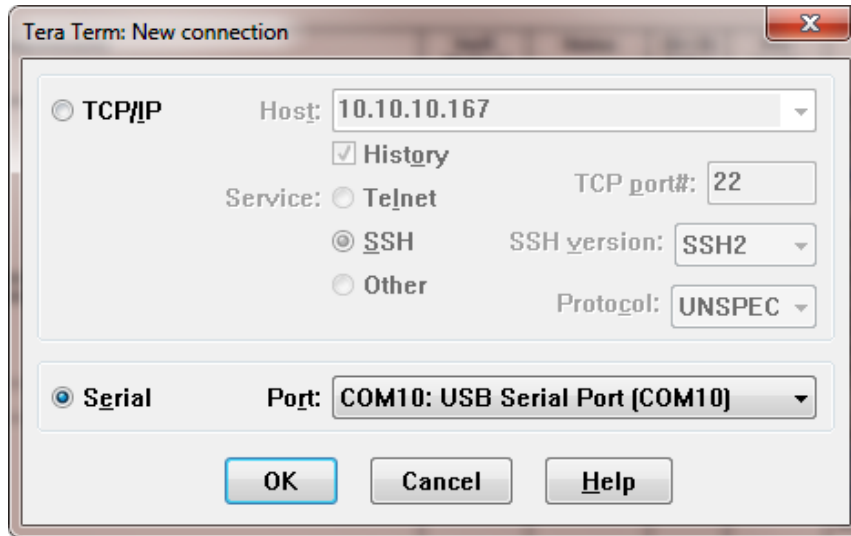
If for example Tera Term is used.

Open Tera Term.

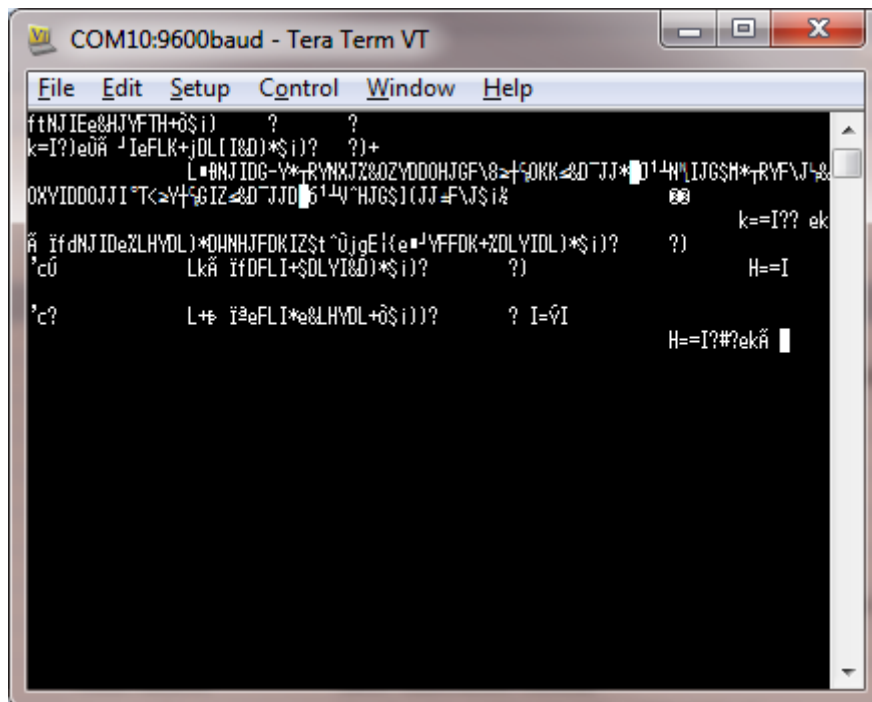
Select Serial.

Select MetPak connected Com port.

Click on Ok.



Tera Term has opened at 9600 baud and MetPak uses 19200 as a default, so change Tera Term Baud Rate setting to 19200.

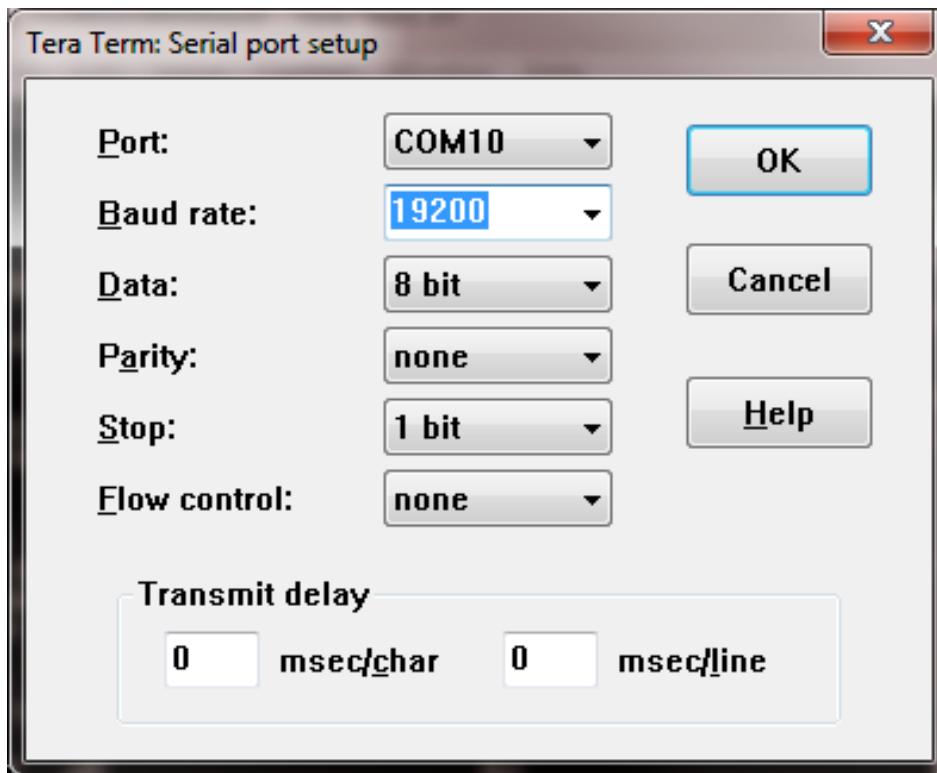


Select Setup from the top menu.

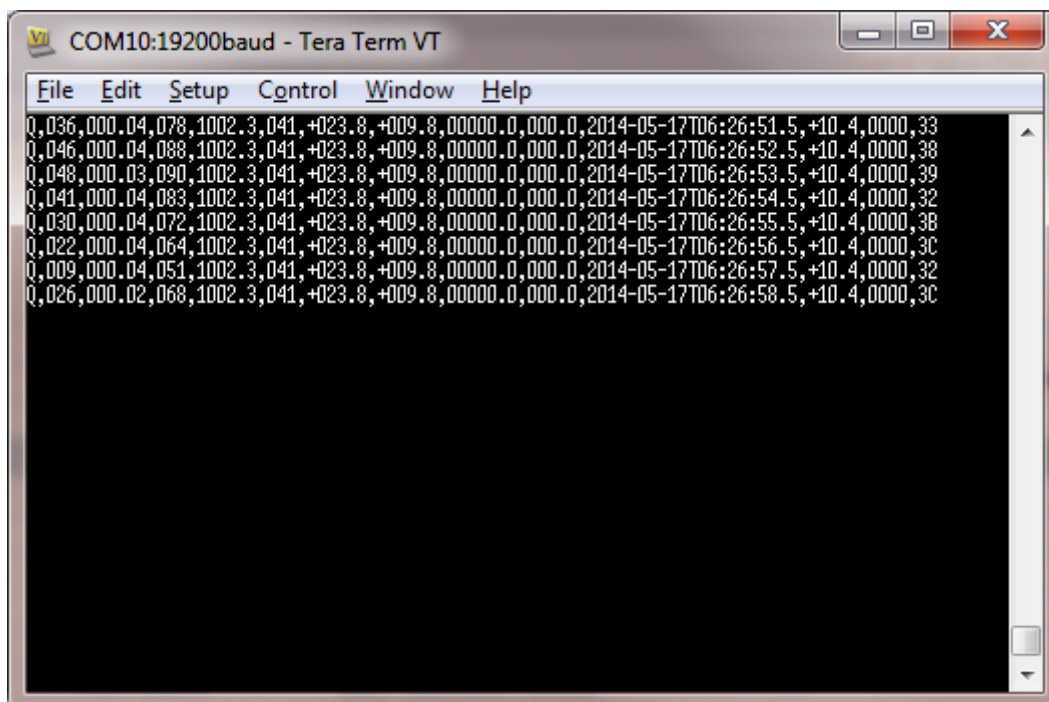
Click on Serial Port from the drop down menu.

Change Baud rate to 19200.

Click on OK.



Data will be output as follows.



### 7.2.1. Setting up a logging file

Select **File/Log**.

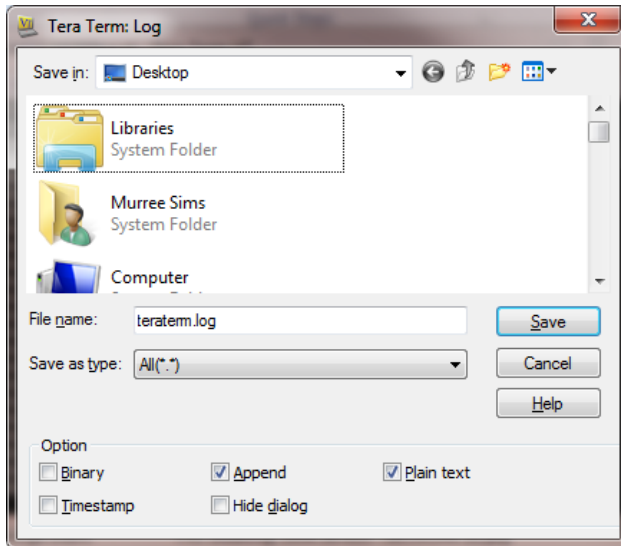
**Look in** select a log file location.

Select **Save in** destination. E.g. Desktop.

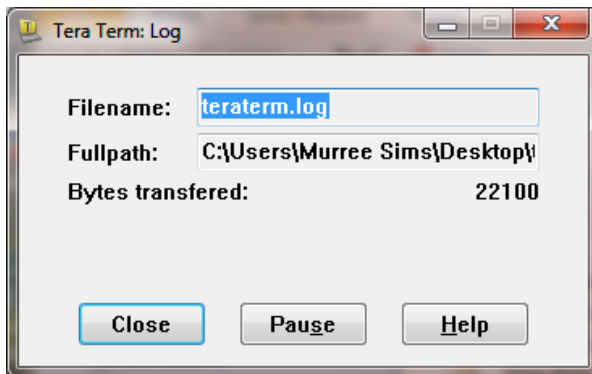
**File Name** add the name for the file e.g. teraterm.

Tick options as required e.g. Timestamp.

Click on **Save**.



The following dialog box will open on the PC desktop.

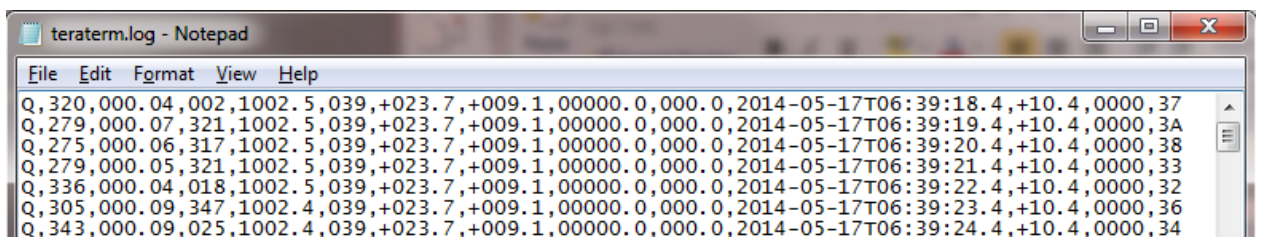


### 7.2.2. To stop logging

Click on the **Close** button to Stop Logging

#### Understanding Logged Data

Logged data is stored to a file with a **.log** extension. This can be viewed in any text/HTML editor or spreadsheet application.



## 8. MAINTENANCE & FAULT-FINDING

### 8.1. Cleaning and Handling

Ideally when installing the unit handle with lint free gloves and degrease the unit to reduce the build-up of deposits.

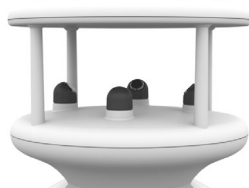
### 8.2. Servicing

There are in general no moving parts requiring routine maintenance.

In the event of failure, prior to returning the unit to your authorised Gill distributor, it is recommended that:

- All cables and connectors are checked for continuity, bad contacts, corrosion etc.
- A bench test is carried out.
- Contact your supplier for advice if failure persists.

#### 8.2.1. Wind Sensor (WindSonic)



If there is any build-up of deposits on the unit, it should be gently cleaned with a cloth, moistened with soft detergent. Solvents should not be used, and care should be taken to avoid scratching **any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to** remove ice or snow with a tool.

There are no moving parts or user-serviceable parts requiring routine maintenance.

Opening the unit or breaking the security seal will void the warranty and the calibration.

#### 8.2.2. UV Radiation Shield (MetSpec)



Ideally the user should try to keep the MetPak Temperature and Humidity housing radiation screens clean and free of biological growth but a simple wipe with some non- aggressive soft detergent cleaner will suffice. Solvents should not be used, and care should be taken to avoid scratching any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

### 8.2.3. Barometer

The Barometer device is located internally and is not maintainable or replaceable by a user. However, if required observe the following with regard to the central Hub box screw cap Gore-Tex® filter.

Consideration should be given to checking the Pressure readings against a standard every 12 months. If required contact Gill Instruments for advice on checking the Barometer calibration.

#### Pressure Sensor Filter Replacement:



There is a small venting filter for the pressure sensor of the MetPak range located on the 'Hub' box lid which ensures proper conditions are present in the 'hub' box for pressure measurements without allowing any moisture or other damaging pollutants into the box. This filter is made from Gore-Tex® material and is designed to last a long time without replacement, however, Gill do recommend that this filter is replaced every 24 months to ensure proper operation of the pressure sensor and to keep the electronics inside the 'hub' box dry.

If you do not replace the filter every 24 months you may start to see elevated or erroneous readings of the pressure sensor with time and this behaviour can be corrected by replacement of the Gore-Tex® filter unit.

The Gore-Tex® filter kit is available from:-

Gill Instruments                      Part Number    1723-PK-024.

To replace the filter, unscrew the 4 screws retaining the hub box lid. Remove the existing Gore-Tex filter and M12 Nut. Fit and secure the new filter with the nut provided. Re-fit the 4 lid screws.

Should you be uncertain as to how often you should be replacing the filters for your application or if you wish to discuss this in more detail please contact Gill support and we will be able to provide a recommendation for you.

### 8.2.4. Temperature, Humidity and Dewpoint Probe (Rotronic HC2A-S3-GI)



#### Rotronic Temperature and Humidity Filter Replacement

For extreme environments such as maritime installations, chemical plants or other areas of high pollution or contamination, Gill highly recommend replacement of the temperature and humidity probe filter every 6 months to 12 months to ensure proper performance.

Corroded, discoloured or clogged dust filters should be replaced.

If the filter is not replaced it is very likely you will see elevated humidity levels with time and if this is allowed to develop for a longer period of time it can lead to permanent damage on the electronics of the temperature probe due to the very high moisture content and corrosive effect of the pollutant or salt.

The Rotronics polycarbonate dust filter screw-on cap is available from:-

Gill Instruments	Part Number	1723-PK-027 (2 filters).
Rotronic	Part Number	SPA-PCW-PE (1 filter).

If you need to replace the dust filter cap, carefully unscrew it and withdraw carefully avoiding contact with the Temperature and Humidity circuit board. When re-fitting the filter cap, ensure the circuit board connections are not bent.

Consideration should be given to an annual calibration check of the HygroClip sensor by the manufacturer.

If you are replacing the whole cartridge, unscrew the metal ferrule and return the probe to Rotronic for calibration. Refer to the Rotronic Website for more details:

**NOTE.** If you return the sensor to a HygroClip supplier for exchange, please request that the return unit has the dewpoint feature enabled (HC2A-S3-GI).

### 8.2.5. Solar Sensor



If a Solar Sensor is used with a MetPak Pro then Users/Distributors should clean the glass dome with a soft lint free cloth and where necessary with a non-aggressive cleaning solution ideally once a week. Where this is not possible, cleaning should be done during regularly scheduled visits to the sensor and site. It is ideally recommended the solar sensor should be cleaned every month.

### 8.2.6. Calibration

A calibration check can be done by any user/distributor by comparing the values measured by MetPak with a reference value or in an environmental chamber. Users should understand that these checks are not the same as the calibration checks or calibration done at Gill but they can provide users with some degree of confidence to the validity of their measurements. If a user/distributor notices a significant difference between the MetPak and their test environment/reference they should contact Gill to discuss this and see if a calibration is required. See individual parts above for any recommended calibration periods.

### 8.2.7. Returning the MetPak

If the unit has to be returned, it should be carefully packed in the original packaging and returned to your authorised Gill distributor, with a full description of the fault condition. An RMA number should be obtained from Gill Instruments first if returning directly to Gill Instruments.

## 8.3.Fault-finding

### 8.3.1. Fault Symptoms/Solutions

Symptom	Solution
No output	<p>Check DC power to MetPak, cable and connections.            Check communications settings of the MetPak and host system match, including correct Com port.            Check that the unit is in Continuous mode.            Check that in-line communication devices are wired correctly.            NOTE: It is usual for Anemometer TX + to be connected to converter device RX +.            If appropriate use Safe Mode to attempt to obtain communication with the MetPak.</p>
Corrupted output	<p>Check that the communication settings of the MetPak and host system match.            Try a slower baud rate.            Check cable lengths and type of cable.            Check for sources of external signal interference.</p>
One way communication	Check that the wiring is in accordance with the manual.
Unexpected Temperature /Dewpoint readings	Check that the Temperature and Dewpoint units of measure (C, F, K) settings are correct on power up.
Unexpected Wind readings	Check that the Wind Sensor units of measure (m/s, knots, kph, ft/min, mph) settings are correct on power up.
Unexpected Temperature/Dewpoint and Humidity readings	Temperature and Humidity Device faulty.
Unexpected Barometer Readings	Check units of measure are set correctly and if offset HASL or PSTN readings have been applied.
Status code not 00 or A	See following Table.

### 8.3.2. MetPak Range Sensor Status Codes

Code	Status	Condition
00	OK	No fault conditions detected in measurement period.
A	Acceptable Data (NMEA Mode)	No fault conditions detected in measurement period.
01	Wind Sensor Axis 1 failed	U Axis blocked or faulty.
02	Wind Sensor Axis 2 failed	V Axis blocked or faulty.
04	Wind Sensor Axis 1 and 2 failed	U and V axis blocked or faulty.
08	Wind Sensor NVM error	Non Volatile Memory checksum failed, data could be uncalibrated.
09	Wind Sensor ROM error	Read Only Memory checksum failed, data could be uncalibrated.
0B	Wind Sensor reading failed.	Wind Sensor faulty.
10	Hygroclip error	Hygroclip faulty.
20	Dewpoint error	Hub Pec faulty.
40	Humidity error	Hygroclip faulty.
66	Wind Sensor Power	Check Wind Sensor is powered
67	Wind Sensor RS232 Communications	Check Wind Sensor RS232 wiring
80	Pressure Sensor Warning	Pressure sensor reading not available/unit faulty.
XX	More than one fault	Fault condition that can be the sum of 0B, 10, 20 or 40. e.g. 1B would mean that both the Wind Sensor (0B) and Hygroclip (10) were faulty.
V	Void Data, Wind Sensor reading failed (NMEA mode)	Wind Sensor faulty.

## **8.4.Safe Mode**

If a unit is received that will not communicate or the configuration settings are not known then Safe Mode can be used to establish communication with the MetPak and change configuration settings (see Para 6.7).

## **8.5.Bench Test**

Carry out a bench test as follows:

Connect the MetPak unit to the host PC and power supply, using a known working test cable.

Check for normal output data, and that the Status Code is OK – 00.

If the status code is other than 00, refer to above Table for a list of status (error) codes.

Use an office fan or similar to check that the unit is sensing wind, turning the unit to simulate changing wind direction and to check that both axes are functioning.

Check for output changes in temperature and relative humidity sensor (the fan will also cause small changes in these properties).

## **8.6.Returning Units**

If the unit has to be returned, it should be carefully packed in the original packaging and returned to your authorised Gill distributor, with a full description of the fault condition.

## **8.7.Guarantee**

For terms of guarantee contact your supplier or refer to the Gill Instruments Terms & Conditions here:

<https://gill.group/wp-content/uploads/Gill-Group-Company-Terms-Conditions-of-Sale-9170-0003-Issue-02-March-20...pdf>

Warranty is void if the unit is damaged or broken.

## 9. APPENDICES

### 9.1.Glossary & Abbreviations

Item	Meaning
CAL	Calibration
CR	Carriage Return
CRLF	Carriage Return Line Feed
CSV	Comma Separated Variable
ENG	Engineering
ESC	ESCAPE key on keyboard.
ETX	End of string character
fpm	Feet per minute
GND	GrouND
HEX	HEXadecimal
I/P	InPut
IP66	Protection Classification
KPH	Kilometres per Hour
LF	Line Feed
m/s	Metres per second
MAG	MAGNitude - scalar reference to wind speed
MAX	MAXimum
MIN	MINimum
MPH	Miles per Hour
NMEA 0183 (V3)	National Marine Electronics Association
No:	Number
NVM	Non-Volatile Memory
O/P	Output
PC	Personal Computer
PCB	Printed Circuit Board
ROM	Read Only Memory
RS232	Communications standard
RS422	Communications standard
RS485	Communications standard
RX	Receive
RXD	Received Data
S/W	Software
SDI-12	Serial Data Interface
SEC	SECOnd
STX	Start of string character
TERM	TERMIal
TX	Transmit
TXD	Transmitted Data
+VE	Positive
-VE	Negative
WRT	With Respect To