MaxiMet

User Manual

Compact Weather Stations

(Parts 1957-0X00-60-000)

Doc No: 1957-PS-001

Issue 1

GMX200

GMX600

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1. FOREWORD

Thank you for purchasing the MaxiMet 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.

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2. INTRODUCTION

The Gill MaxiMet sensor units are very robust with no moving parts. The sensor units, output rate and formats are all user selectable.

The MaxiMet can be used in conjunction with a PC, data logger or other device.

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

2.1. MaxiMet Parameters and Part Numbers

2.1.1 MaxiMet Sensors.

SENSOR PARAMETER	GMX200	GMX600
Wind Speed, Relative	■	■
Wind Direction, Relative	■	■
Compass	■	■
Temperature, Air	NA	■
Humidity, Relative	NA	■
Barometric Pressure	NA	■
Rain (built in)	NA	■
■ = Standard Fitted	NA = Not Available	

2.1.2 MaxiMet Derived Parameters.

DERIVED PARAMETER	GMX200	GMX600
Average Speed	■	■
Average Direction	■	■
Average Corrected Direction	■	■
Corrected Direction	■	■
Gust Direction	■	■
Gust Speed	■	■
Status	■	■
Wind Status	■	■
Dewpoint	NA	■
Absolute Humidity	NA	■
Pressure at Station Level	NA	■
Pressure at Station	NA	■
Precipitation Intensity	NA	■
Precipitation Total	NA	■
Precipitation Status	NA	■
■ = Standard	NA = Not Available	

2.1.3 MaxiMet Order Part Numbers.

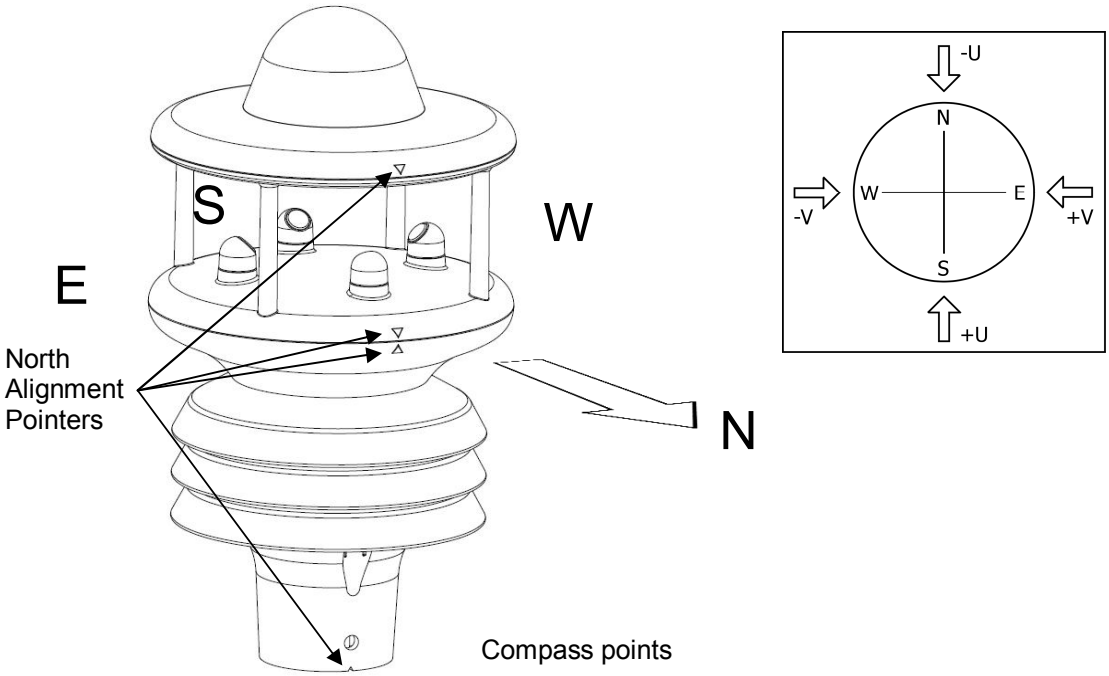
1957-0X00-60-000

Where:
1957 = family number for MaxiMet.
0X00 = model number in family (so 0200 for GMX200, 0600 for GMX600.
60 = wind speed range 60 for 60 m/s wind range.
000 = Base model (further options as available):

Wind Speed and Direction Sensor (GMX200 and GMX600)

The MaxiMet 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.



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.

MaxiMet can output the following wind readings depending on use of the Compass.

Relative wind – wind speed and/or direction, uncorrected, but relative to the north marker, which may not be facing North).

Corrected wind – with the aid of the Compass Magnetic North corrected wind direction can be output.

Radiation Shield (GMX200 and GMX600)

A MetSpec Multi-Plate Radiation Shield is used. 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 temperature and humidity. The shield benefits from very robust material choice and extremely high UV protection requiring no maintenance.

Temperature and Relative Humidity Sensor with Dewpoint Calculation (GMX600)

There is an internal solid state instrument contained within the Radiation shield that provides digital output signals for Relative Humidity, Temperature and calculated Dewpoint.

Barometric Pressure (GMX600)

Barometric pressure output is provided by a solid-state device fitted on to a circuit board inside a MaxiMet moulding.

Rain (GMX600)

A reading of Rain levels is provided by using an optical infra-red beam sensor. Infra-Red beams that bounce off the inner optical surface between transmitters and receivers. Depending on rain drop levels the intensity of the beams change and internal digital signal processing allows a measurement of Rain levels to be made.

Compass (GMX200 and GMX600)

MaxiMet contains a 2-axis compass and magnetic field sensing module using Magneto-Inductive (MI) sensors. The sensor changes inductance by 100% over its field measurement range. It incorporates a temperature and noise stabilized oscillator/counter circuit. The compass has a high degree of azimuth accuracy.

MaxiMet uses the internal; compass to electronically sense the difference in the earth's field from the system's magnetic field, then an on-board microprocessor electronically subtracts out the system's magnetic fields, reporting highly accurate compass readings. Wind direction data is corrected for the orientation of the sensor. The output of the wind direction is relative to magnetic North.

Derived Parameters selectable using MetSet Software (see page 5 for applicability).

AH Absolute Humidity.

The humidity of the atmosphere, usually expressed as the number of grams of water contained in 1 cubic metre of air.

(Note Relative Humidity also output, expressed as a percent, measures the current absolute humidity relative to the maximum for that temperature).

Absolute humidity shall be computed as:- $H = C \cdot P_w/T$.
Where:-
H = absolute humidity
C = Constant 2.16679 gK/J
Pw = Vapour pressure in Pa
T = Temperature in K

Result e.g. 08.14 g/m^3.

AVGSPEED Average Speed.

Outputs the World Meteorological Organisation (WMO) Average Wind Speed reading based on AVG short and AVG long settings (see page 36).

Result e.g. 001.45 (Metres/second default).

AVGDIR Average Direction.

Outputs WMO Average Direction Wind reading based on AVG short and AVG long settings (see page 36).

Result e.g. 145 (degrees).

AVGCDIR Average Corrected Direction

Outputs WMO average Compass Corrected Direction wind reading based on AVG short and AVG long settings (see page 36).

Result e.g. 131 (degrees).

CDIR Corrected Direction

Corrected Wind Direction shall be computed as the Apparent Wind Direction using the compass heading reading.

Result e.g. 116 (degrees).

DEWPOINT Dewpoint.

Output calculated Dewpoint from Temperature and Humidity readings.

$T_d = T_n / (Y-1)$
where
T_d = Dewpoint temperature
$Y = m/\log_{10}(Pw/A)$
T_n=Triple point temperature (in K)
Pw = Pws . RH / 100 (hPa)
Pws = water vapour saturation pressure (hPa)

Result e.g. 45.1 (%).

GDIR **Gust Direction.**

Outputs WMO Gust Direction.

Maximum Gust Direction shall be computed over a block of m vector averages as follows:

$$rwa_\max_gust_dir = \arctan\left(\frac{u_avg_k}{v_avg_k}\right)$$

where

$$k = index\ of\ gust_mag\ selected\ for\ rwa_\max_gust_mag\ defined\ above$$

$$u_avg_k = k^{th}\ u - vector\ average\ defined\ above$$

$$v_avg_k = k^{th}\ v - vector\ average\ defined\ above$$

Result e.g. 123 (degrees).

GSPEED **Gust Speed.**

Outputs WMO Gust Speed.

Maximum Gust Magnitude shall be computed over a block of m gust magnitudes as follows:

$$rwa_\max_gust_mag = \max\{gust_mag_1, gust_mag_2 \ldots gust_mag_m\}$$

where

$$m = rwa_short_len$$

$$gust_mag = \sqrt{(u_avg^2 + v_avg^2)}$$

$$u_avg = \frac{\sum_{n=1}^{3} u_vector_n}{3}$$

$$v_avg = \frac{\sum_{n=1}^{3} v_vector_n}{3}$$

Result e.g. 015.15 (Metres/second default).

PASL **Pressure at Station Level.**

Outputs Barometric Pressure at Sea Level if HASL figure set (see Page 38).

$p_0 = p_1.\exp(\ (g.h)\ /\ (R.T)\ )$

where

p_0 = air pressure at sea level (Pa)

p_1 = air pressure at sensor (Pa)

h = sensor altitude above sea level (m)

R = specific gas constant

T = air temperature as measured

g = acceleration due to gravity

Result e.g. 1015.7 (hecto-pascals default).

PRECIPI **Precipitation Intensity.**

Outputs Precipitation (Rain) Intensity. It is the sum of the last sixty lots of 1 minute accumulated Rain data. A new sum measurement is generated every minute.

Result e.g. 000.2 (millimetres default).

PRECIPS **Precipitation Status.**

Outputs Precipitation (Rain) Status as N or Y (No or Yes).

Changes N to Y when total precipitation is incremented.

Changes Y to N when total precipitation has not incremented in the last 60 seconds.

Result e.g. N (or Y).

PRECIPT **Precipitation Total**

Outputs Precipitation (Rain) Total reading, this is an accumulated rain reading updated at the output rate.

Is set to zero on MaxiMet power up.

Is set to zero when the clock reads 23:59:59 to 00 (midnight) and is the default setting.

For continuous measurement turn off Auto-reset of Total Precipitation using MetSet.

Result e.g. 00000.4 (millimetres default).

PSTN **Pressure at Station**

Outputs Barometric Pressure at Station if HASL figure set (see page 38).

Pressure at station shall be computed as:

$$P = Pb \cdot \left[\frac{Tb}{Tb + Lb \cdot (h - hb)}\right]^{\frac{g0 \cdot M}{R \cdot Lb}}$$

where:
Pb = static pressure (pascals)
Tb = standard temperature (K)
Lb = standard temperature lapse rate (K/m) in ISA
h = height above sea level (meters)
hb = height at bottom of layer b (meters; e.g., h1 = 11,000 meters)
R = universal gas constant for air: 8.31432 N·m /(mol·K)
g0 = gravitational acceleration (9.80665 m/s2)
M = molar mass of Earth's air (0.0289644 kg/mol)

Result e.g. 1001.2 (hecto pascals default).

STATUS **Status of MaxiMet Sensors**

Outputs the MaxiMet Sensors Status Code

Result e.g. 0000 (see page 64).

WINDSTAT **Status of Wind Sensor in detail.**

Outputs Status codes relating to Wind Sensor Data

Result e.g. 0000 (see page 65).

GMX Sensor Default Output Summary

Default Data String GMX200

Node,
Relative Wind Direction,
Relative Wind Speed,
Corrected Wind Direction,
Date and Time,
Supply Voltage,
Status,
Checksum.

┐ Q,127,000.03,000,2000-01-01T00:40:50.2,+10.5,0000,└ 21

Default Data String GMX600

Node,
Relative Wind Direction,
Relative Wind Speed,
Corrected Wind Direction,
Pressure,
RH,
Temp,
Dewpoint,
Total Precipitation,
Precipitation Intensity,
Date and Time,
Supply Voltage,
Status,
Checksum.

┐ Q,344,000.05,096,1018.5,037,+023.0,+007.8,00000.0,000.0,2014-05-24T06:21:01.0,+10.3,0002,└ 3C

3. TECHNICAL SPECIFICATION

Wind Measurement	
Parameters	Polar Wind Speed & Direction
Units of Measurement	m/s, knots, mph, kph, ft/min

Wind Speed	
Range	0.01 to 60m/s
Accuracy	± 3% 0.01m/s to 40m/s ± 5% above 40 and up to 60m/s
Resolution	0.01m/s
Threshold	0.01m/s

Wind Direction	
Range	0-359 Degrees – No dead band
Accuracy	± 3° 0.01m/s to 40m/s ± 5° above 40 and up to 60m/s
Resolution	1°

Compass	
Range	0-359 degrees
Resolution Compass Heading	1°
Units of Measure	Degrees

Air Temperature	
Range	-40°C to +70°C
Accuracy	±0.3°C @ 20°C
Resolution	0.1°C
Units of Measure	°C or °F or °K

Relative Humidity	
Range	0-100%
Accuracy	±2% @ 20°C (10% to 90% Relative humidity)
Resolution	1%
Units of Measure	% RH

Dew Point	
Range	-40°C to +70°C
Resolution	0.1°C
Accuracy	±0.3°C @ 25°C
Units of Measure	°C or °F or K

Barometric Pressure	
Range	300 to 1100hPa
Accuracy	±0.5hPa @ 25°C.
Resolution	0.1hPa
Units of Measure	hPa, mbar, mmHg, InHg

Rain	
Precipitation Intensity	0 to 150mm per hour.
Resolution	0.2mm/tip
Accuracy	±2%
Units of Measure	milli-metres, inches

Real Time Clock	
Format Date and Time	YYYY-MM-DDThh:mm:ss.s, e.g. : 2014-12-25-T22:34:56.1,
Updating	Manual Setting
Power Loss Accuracy	±10 seconds for at least 24 hours after power removed from MaxiMet.
Clock back up Period	24 hours.

Outputs	
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 or MODBUS RTU/ASCII
Data Output	1 reading per second (1 Hz), 1 reading per minute, 1 reading per hour or Polled Mode
MaxiMet Status	Status codes provided within the data message string

Power Supply	
Input voltage (RS232, RS422, RS485)	5v to 30v dc
Current	GMX200 – 25mA at 12v dc. GMX600 - 80mA at 12v dc.

Environmental	
Protection Class	IP66
EMC	BS EN 61326 FCC CFR47 Parts 15.109
Operating Temperature	-40°C to +70°C
Storage Temperature	-40°C to +80°C
Humidity	0-100%
RoHS Compliant	Yes

Mechanical	
External Construction	Polycarbonate.
Fittings	Bolt fittings supplied for securing the unit to a vertical pipe of diameter 44.45mm.
Overall Dimensions GMX200 Series GMA0600 Series	 169.5 mm x 142mm x 142mm 261mm x 142mm x 142mm
Weight GMX200 Series GMX600 series	 0.5Kg 0.8Kg

Software	
MetSet Configuration	Free Software providing the means of configuration of the MaxiMet

4. PRE-INSTALLATION

4.1. Equipment supplied

MaxiMet

and Installation kit comprising of a 9 way connector kit and 3 off M5 bolts and washers to bolt the unit to a mounting pole.

and MaxiMet User Manual and MetSet Software on a CD (this manual).

and Product Test Report.

Optional Extras:

Item	Part Number
Cable 3 Pair twisted and Shielded wires, 24awg, per metre.	026-02660
Cable 4 Pair twisted and Shielded wires, 24awg, per metre.	026-03156
Cable 15 metres (4 pair twisted and shielded 24 awg – connector pins attached to one end and stripped wires the other).	1405-10-080
9 way connector and 3 mounting bolts (1 supplied with the unit)	1405-PK-069
0.5 Metre x 50mm Aluminium Support Tube tapped for MaxiMet Mounting bolts	1405-30-056
50cm Lanyard	026-05335
MaxiMet 1.8 Metre RS232 to USB power and communication configuration cable (9 way MaxiMet connector fitted one end and USB connector at the other end).	1957-10-065

4.2. Connector and Cable Assembly.

The MaxiMet is supplied with a mating 9 way connector.

Open the pack of connector parts supplied (Gill Part 1405-PK-069).

Part Name	Souriau Clipper Part Number.
Connector 9 way	CLF1201
Backshell	CL101021
Solder bucket contacts (9 required)	CM10SS10MQ

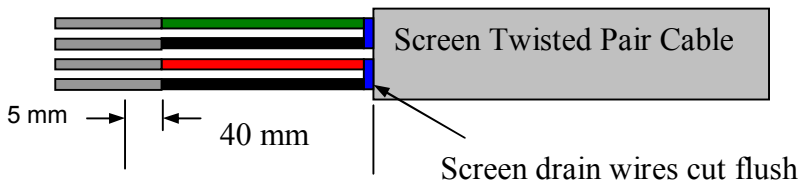
Arrange Backshell Parts.

Trim back the screened cable outer and screen sleeves 40mm.

Trim back the screen drain wires flush with the outer sleeve.

Strip back the connection wires by 5mm and tin solder.

Solder the contact pins to the wires (please note that the connector supplies the correct strain relief for cables with an outside diameter of 6-12mm).



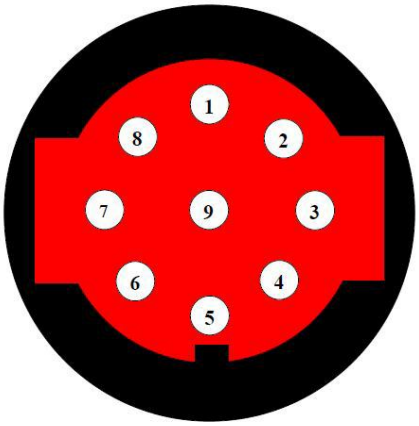
Put the parts on the cable in the order as shown below.

Whilst squeezing the red retainer in the direction of ARROWS A, pull in the direction of ARROW B.

Your connector should now resemble the connector in the picture below.

Insert each contact pin until you feel a slight click. If you have inserted the contact into the incorrect hole it can be removed at this point by simply pulling it out. Please note there will be some resistance.

Rear View of Connector



Continue to insert all of the contacts you require. Once all of the contacts are inserted push the red retainer into place. NB. The retainer can only be pushed back into place if the contacts are fully engaged.

Fit the connector to the MaxiMet so that you can finish assembling the connector.

Screw the back shell onto the connector until it is fully in place. Please note that the final rotations can be slightly stiff.

Now screw the next part of the connector into place.

Now screw the cable-clamping nut into place.

The connector can now be removed from the MaxiMet.

NOTE: To disassemble the connector, reverse this procedure.

4.3. Cabling

MaxiMet has five communication connection options:

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

RS232

RS422

RS485 (two wire point to point)

SDI-12

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: 24AWG

Wire size: 7x32 AWG.

Cable outer diameter: 6-12mm (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 Gill Ref.	24 AWG Belden Ref.	24 awg Batt Electronics Ref.
SDI-12	2	-	9729	-
Digital RS232 or RS485 2 wire	3	026-02660	9730	91030
Digital RS422/RS485 4 wire	4	026-03156	9728	91199

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.

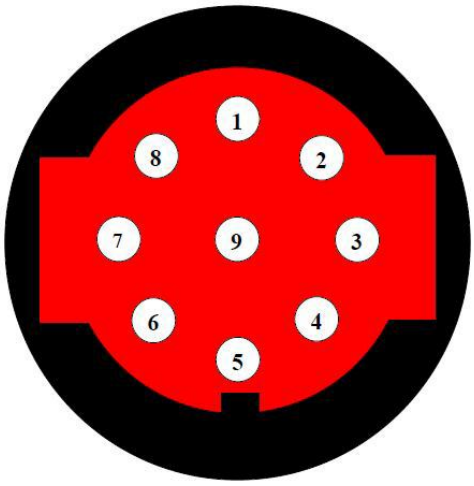
Suggested maximum cable lengths for supported communication networks

Communication format	Baud rate	Max. cable length
RS232	19200	6.5M
RS422/RS485	19200	1000M
SDI-12	1200	90M

4.4. Connections

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.

View of the MaxiMet connector



9 way connector and cable connections

9 Way Connector Number	Signal Designation
1	Signal Ground
2	Supply +ve
3	Supply –ve
4	RS422/485 TXD+
5	RS232 TXD, RS422/RS485 TXD-
6	RS422/RS485 RXD+
7	RS232 RXD, RS422/RS485 RXD-
8	**Comms Select – Only.** **Applicable if MaxiMet COMMS Interface Setting set for EXT** using MetSet. If MaxiMet is set for EXT Comms then:- For RS232 connect Pin 8 to Pin 2 +ve. For RS422 leave Pin 8 open circuit or connect to Pin 3 –ve**.**
9	SDI-12 Data

4.5. Power supplies

MaxiMet units

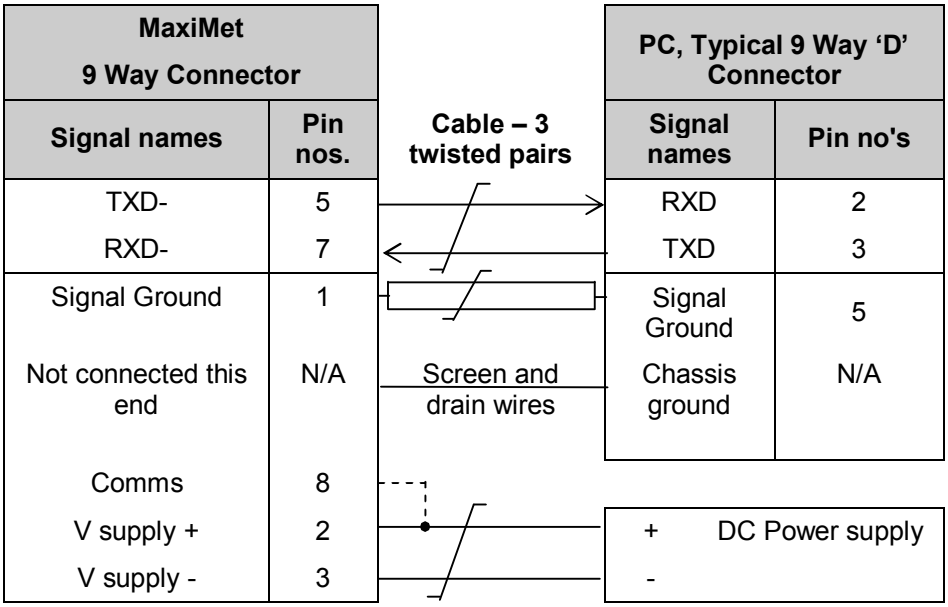
Supply Voltage: 9v to 30v DC.

Normal Mode Current:- 25mA Average @12v dc GMX200.
80mA Average, @ 12v dc GMX600.

- The MaxiMet has reverse polarity protection.

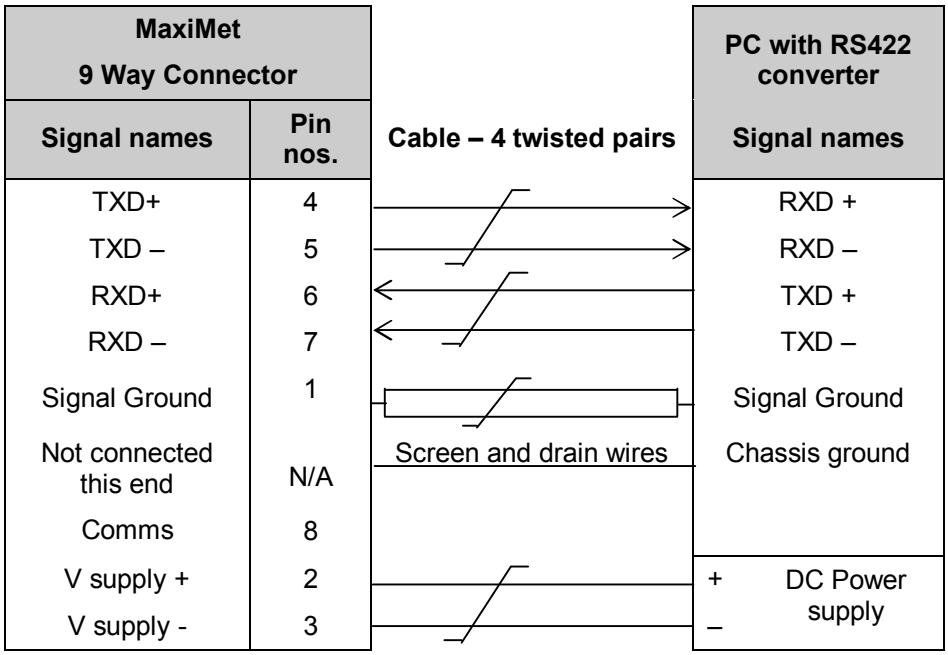
4.6. Connecting to a PC using RS232 (Default setting)

1. **MaxiMet default factory comms setting is RS232.**
2. The recommended cable length for reliable operation is limited to 6.5m (20ft).
3. For longer cable runs, we recommend use of RS422 output.
4. As an alternative method of using MaxiMet with RS232 comms change the COMMS setting from RS232 to EXT and connect Pin 8 to the +ve supply connection (dotted line connection).
5. If EXT is selected and Pin 8 is left open circuit then note that RS422 comms will be set.



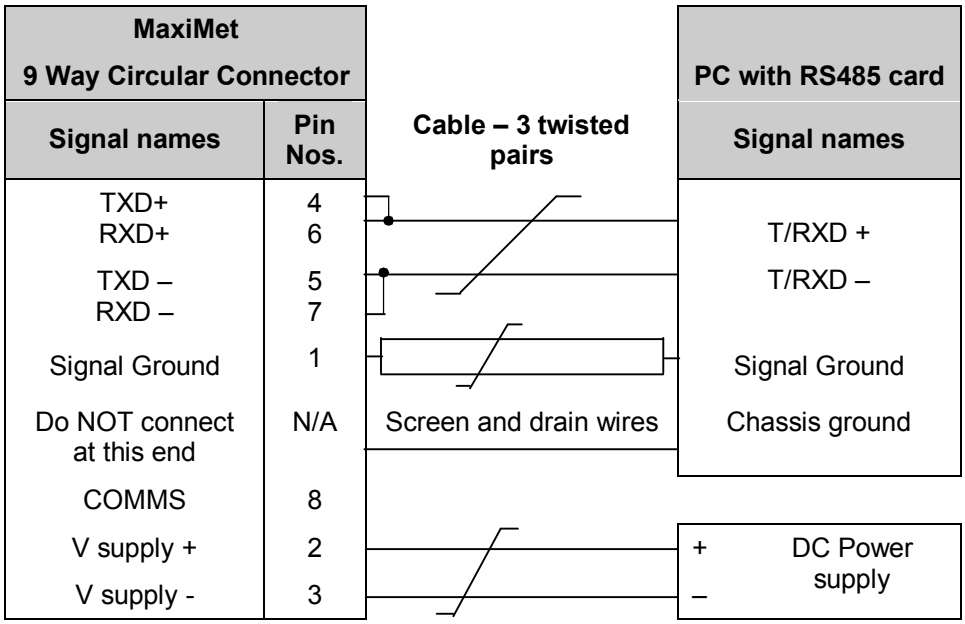
4.7. Connecting to a PC using RS422 (Not a Default Setting)

1. **MaxiMet default factory comms setting is RS232.**
2. To use the MaxiMet with RS422 comms use MetSet to change the COMMS Interface setting to RS422.
3. Alternatively use MetSet to change the COMMS Interface setting to EXT and leave connector Pin 8 open circuit.
4. If EXT is selected and Pin 8 connected to Pin 2 supply positive then COMMS will change to RS232.



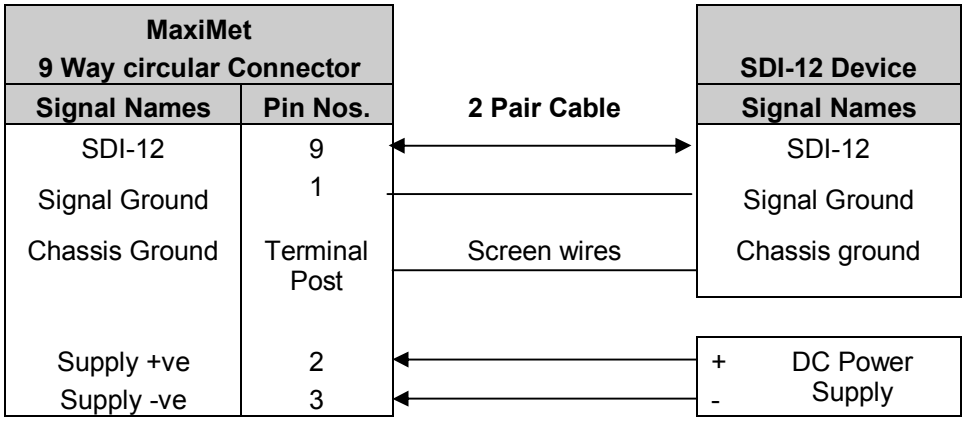
4.8. Using RS485 (2 wire point to point only), not a default setting.

1. **MaxiMet default factory comms setting is RS232.**
2. To use the MaxiMet with RS485 2 wire point to point communication use MetSet to **change the COMMS Interface setting to RS485P 2W**.
3. Use MetSet to **change the Message setting from CONT (Continuous) to POLL**, the node address letter may be changed if required.
4. Leave connector Pin 8 open circuit.



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

1. **MaxiMet default factory comms setting is RS232.**
2. Use MetSet to **change the COMMS Interface setting to SDI 12.**



4.10. Set up requirements

Host System:

Note: The default delivery output communication setting of MaxiMet output is RS232 with the COMMS Interface setting set for RS232.

Use PC running Windows software including Windows 8 and with an internal or external interface compatible with the output from the MaxiMet.

Use an RS232 to USB converter e.g. Gill part 1957-10-065, 1.8M configuration cable fitted with 9 way MaxiMet connector and with integral 5v USB connector power for MaxiMet.

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 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.

Software:

Gill MetSet Software used as a configuration Tool (supplied on MaxiMet CD), will run on PC's with up to and including Windows 8 and can be downloaded free from:-
http://www.gillinstruments.com/main/software.html

Bench system test

Prior to physically mounting the MaxiMet 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 MaxiMet to a PC wired as per RS232 connections in Para 4.6.

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

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

Use MetSet to View the data string and confirm that the Status field reads 0000.

4.11. Packaging

Whilst the MaxiMet 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

5.1. General Installation Guidelines

Interference

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

Always check the installation to ensure the MaxiMet 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 MaxiMet 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 MaxiMet specification at all times.

Wind

Avoid turbulence caused by surrounding structures that will affect the accuracy of the MaxiMet 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 MaxiMet is mounted in a position clear of any structure, which may obstruct the airflow or induce turbulence.

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

Compass

Mounting Orientation

MaxiMet should be mounted horizontally and as level as possible.

It is not possible to calibrate for changing magnetic anomalies. Thus, for greatest accuracy, keep the MaxiMet away from sources of local magnetic distortion that will change with time; such as electrical equipment that will be turned on and off, or ferrous bodies that will move. Make sure that MaxiMet is not mounted close to areas that may be see large sources of local magnetic fields.

Electric motors usually generate magnetic fields that are much stronger than the earth's field. It is recommended that MaxiMet be moved as far away from the motors as possible.

As a guide ensure that MaxiMet is mounted at least 1 metre away from Ferrous objects to prevent them influencing the compass reading.

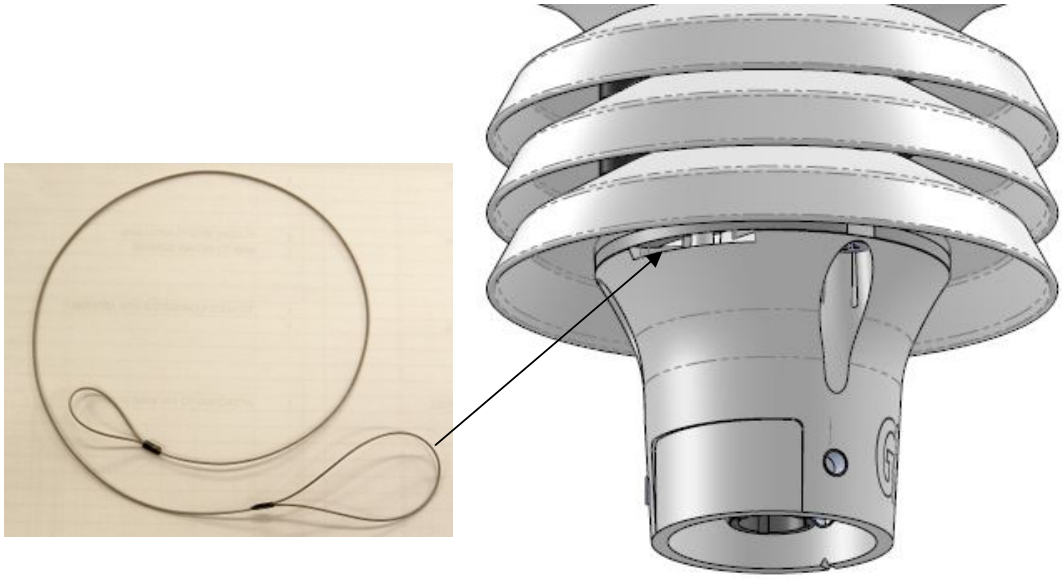
Lanyard Safety Line Attachment (Gill Part 026-05335).

A 50cm stainless steel Lanyard wire (Nylon Coated) is supplied connected to MaxiMet through a slot in the lower moulding should this feature be required to prevent it falling from height when installed.

The Lanyard should be removed if it is not to be used.

If it is required to fit a replacement lanyard:-
Push the larger loop through the Lanyard slot and then feed through the larger loop, pull to secure.
The smaller loop end of the lanyard should be secured to the installation pole/mount etc.

The picture shows where the lanyard safety wire/line attaches to recessed post in MaxiMet.



Mounting Tube/Pole

A tube 1.75 inches (44.45mm) Outside Diameter x 3mm wall thickness is recommended (see figure on the next page). **Note it is important that the correct diameter tube is used to prevent damage to the MaxiMet lower moulding when tightening the screws.**

The support tube requires three 3 equally spaced holes, tapped M5, 7.5mm from the top of the tube. Pass the cable (fitted with the 9 way Clipper plug) through the tube.

Note: the customer must fit appropriate strain relief to the cable.

Connect the plug by twisting it whilst pushing it gently into the socket on the MaxiMet. When it locates, twist the outer sleeve clockwise to connect and lock the plug.

Fix the MaxiMet to the tube using the 3 stainless steel screws provided. (Maximum mounting screw torque 4 Nm.)

For hostile environments, you should select a material suitable for the intended environment. For example, stainless steel 316 for marine use.

For non-hostile environments an Aluminium tube can be used.

NOTE: An optional 0.5 Metre Aluminium mounting tube is available from Gill Instruments (Part 1405-30-056). This tube is predrilled and tapped with 3 holes to match with those on the base of the MaxiMet unit (3 mating screws and washers supplied with the MaxiMet mounting kit).

Alignment

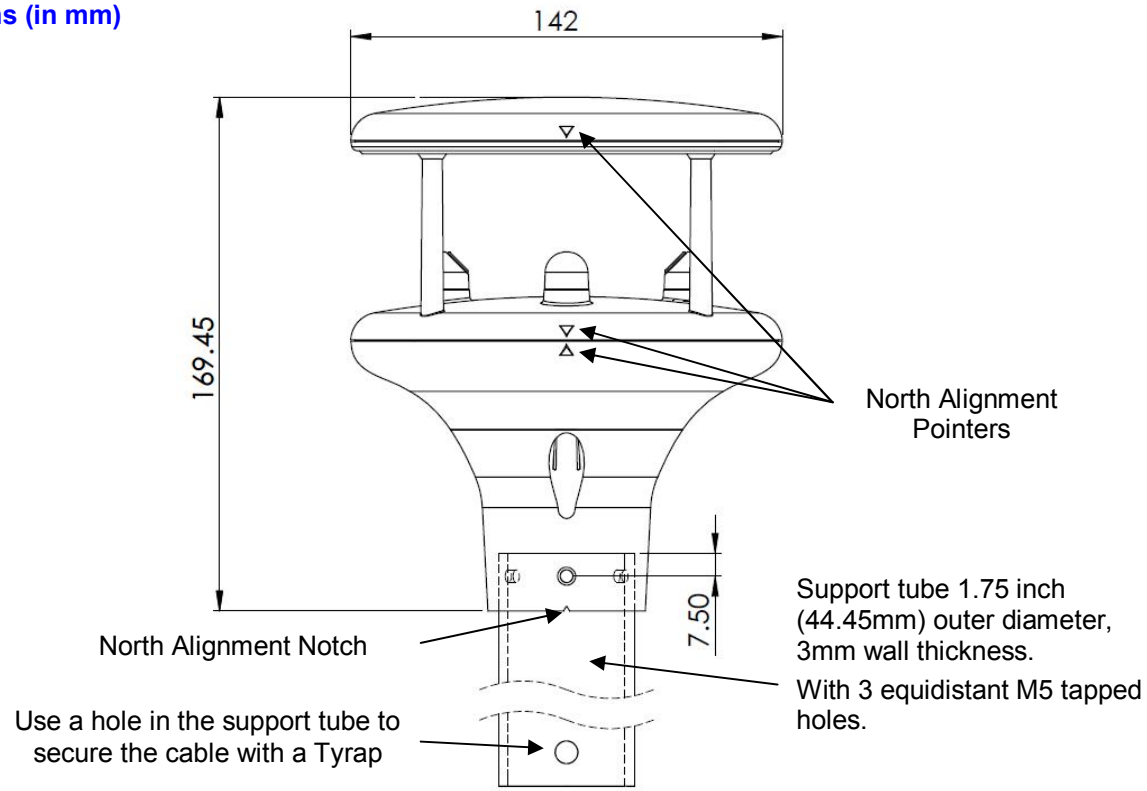
The MaxiMet anemometer should be set to point North (or to another known reference direction), using the North Pointers, which are identified on the instrument figure on the next page.

If the MaxiMet Compass output is enabled by using MetSet then a direct magnetic north compass reading can be used to set MaxiMet north markers to north.

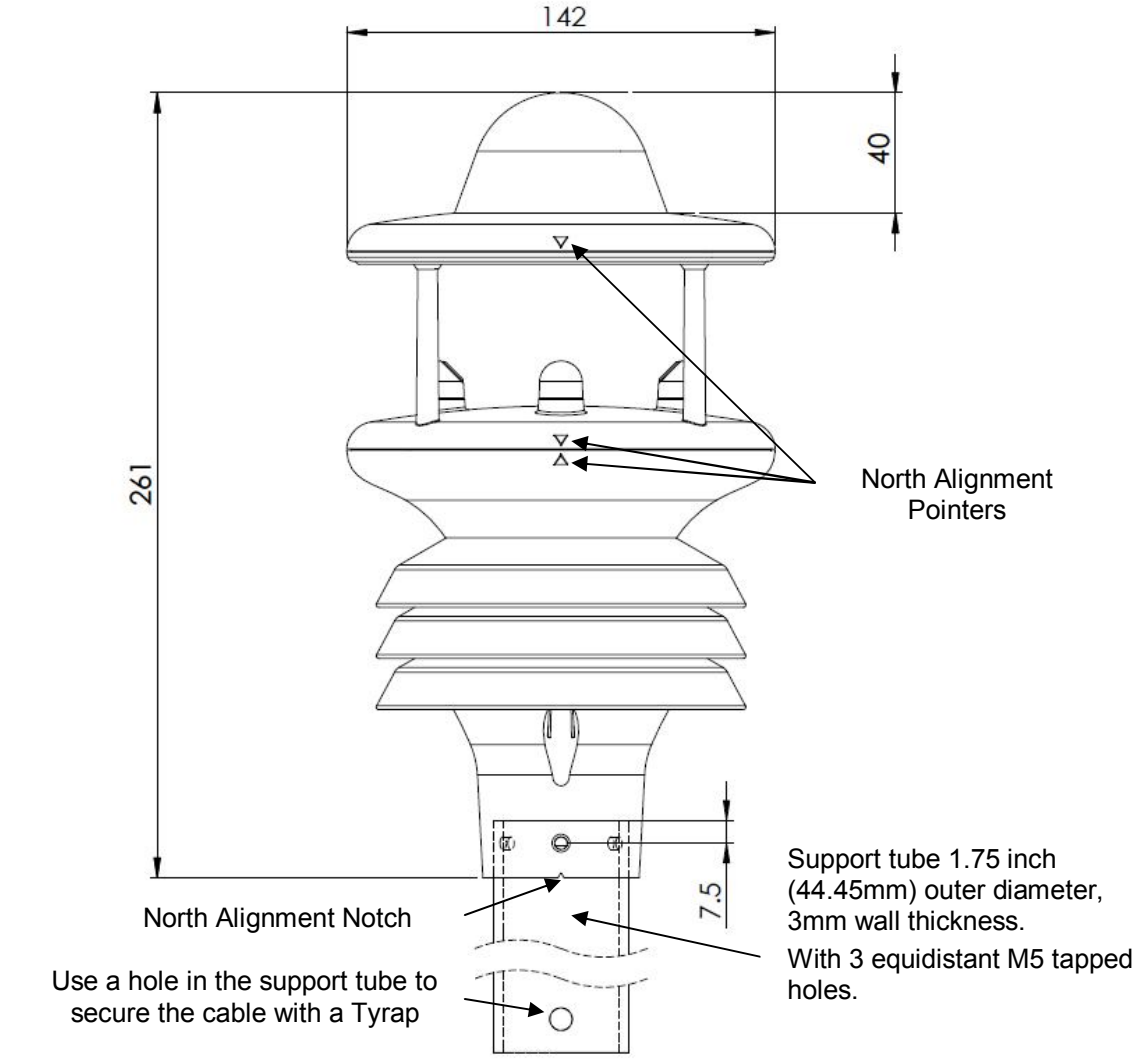
Otherwise MaxiMet need not be aligned precisely if the compass Corrected Direction (CDIR) readings are to be used.

Dimensions (in mm)

GMX200



GMX600



6. CONFIGURING WITH METSET

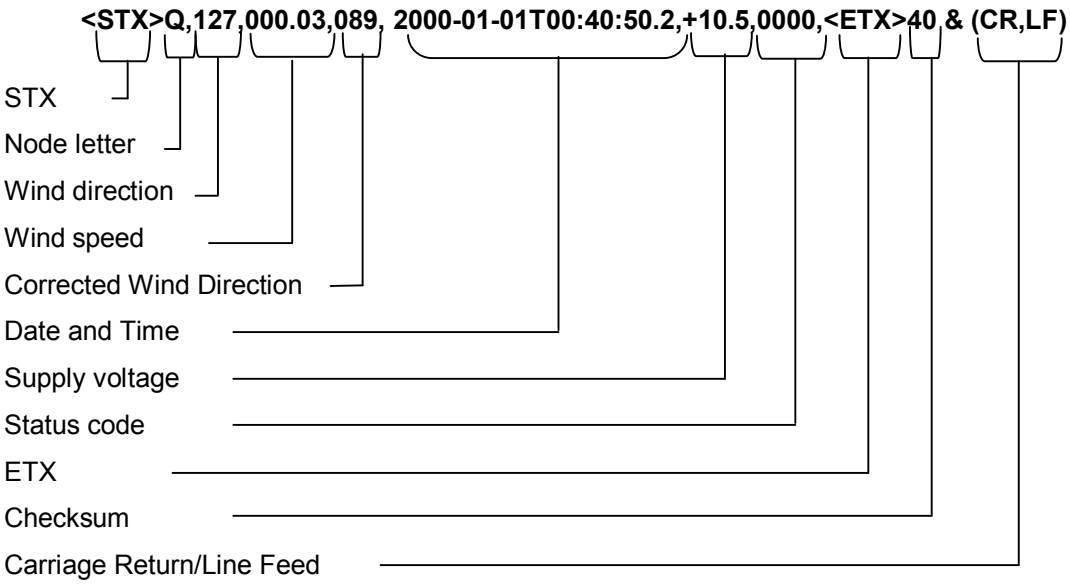
MaxiMet can be configured using Gill Instruments MetSet Software which is loaded on the CD supplied with MaxiMet.

MetSet software can run on PC's running up to and including Windows 8 and can also be downloaded from the Gill Website:-

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

6.1. MaxiMet Default Configurations

GMX200 Factory Default Data String:



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.

Q,127,000.03,000,2000-01-01T00:40:50.2,+10.5,0000, 21

NOTE. Switch on Time.

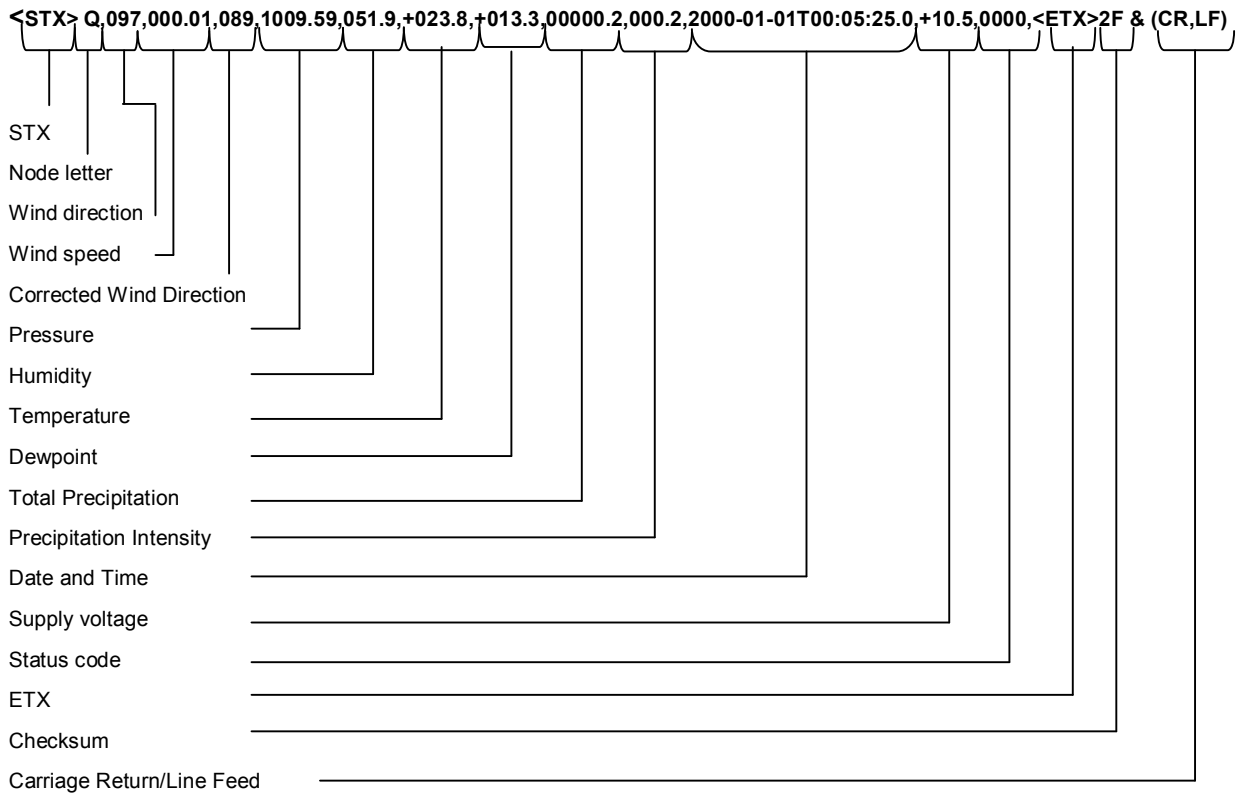
Upon switching on the MaxiMet, allow 9.5 seconds to elapse before data is output.

GMX200 ASCII factory default configuration settings

Default configuration settings

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)
Report Format	Node, Polar (Relative Wind Direction and relative Wind Speed), Corrected Wind Direction, Date and Time, Supply Voltage, Status, Checksum.
Status Message Output	On
Report Message Output	On
Units Message Output	On
Inputs Message Output	On
Output Sentence	Comma Separated Variable

GMX600 Factory Default Data String



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.

Q,097,000.01,000,1009.59,051.9,+023.8,+013.3,00000.2,000.2,2000-01-01T00:05:25.0,+10.5,0000, 2F

NOTE. Switch on Time.

Upon switching on the MaxiMet, allow 9.5 seconds to elapse before data is output.

GMX600 factory default configuration settings

Default configuration settings

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)
Pressure Sensor	On
Pressure Units	Hecto Pascals
Humidity Sensor	On
Humidity Units	%
Temperature Sensor	On
Temperature Units	C (Degrees Celsius)
Dewpoint Sensor	On
Dewpoint Units	C (Degrees Celsius)
Precipitation Sensor	On
Precipitation Units	mm
Report Format	Node, Polar (Relative Wind Direction and Relative Wind Speed), Corrected Wind Direction, Pressure, Humidity, Temperature, Dewpoint, Total Precipitation, Precipitation Intensity, Date and Time, Volts, Status, Checksum.
Status Message Output	On
Report Message Output	On
Output Sentence	Comma Separated Variable

6.2. Configuring MaxiMet with MetSet

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

NOTE: MetSet is compatible with RS232 and RS422 connected units only.

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 MaxiMet 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.

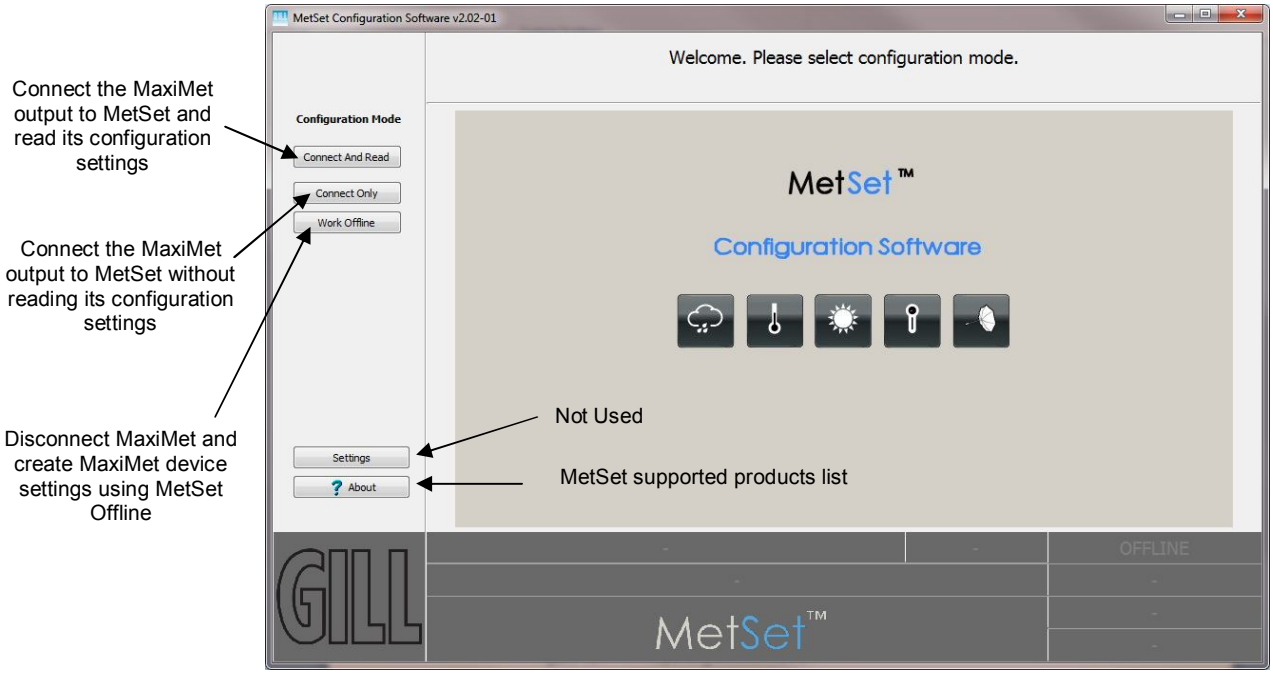


Figure 1 Opening MetSet Screen

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

Depending on the MaxiMet Sensor connected only settings and parameters appropriate to the connected MaxiMet 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:\Program Files(X86)\Gill Instruments\MetSet\SessionReports.

Example Summary of MaxiMet Device Settings (GMX600 shown):-

SETTINGS ARE AS FOLLOWS:

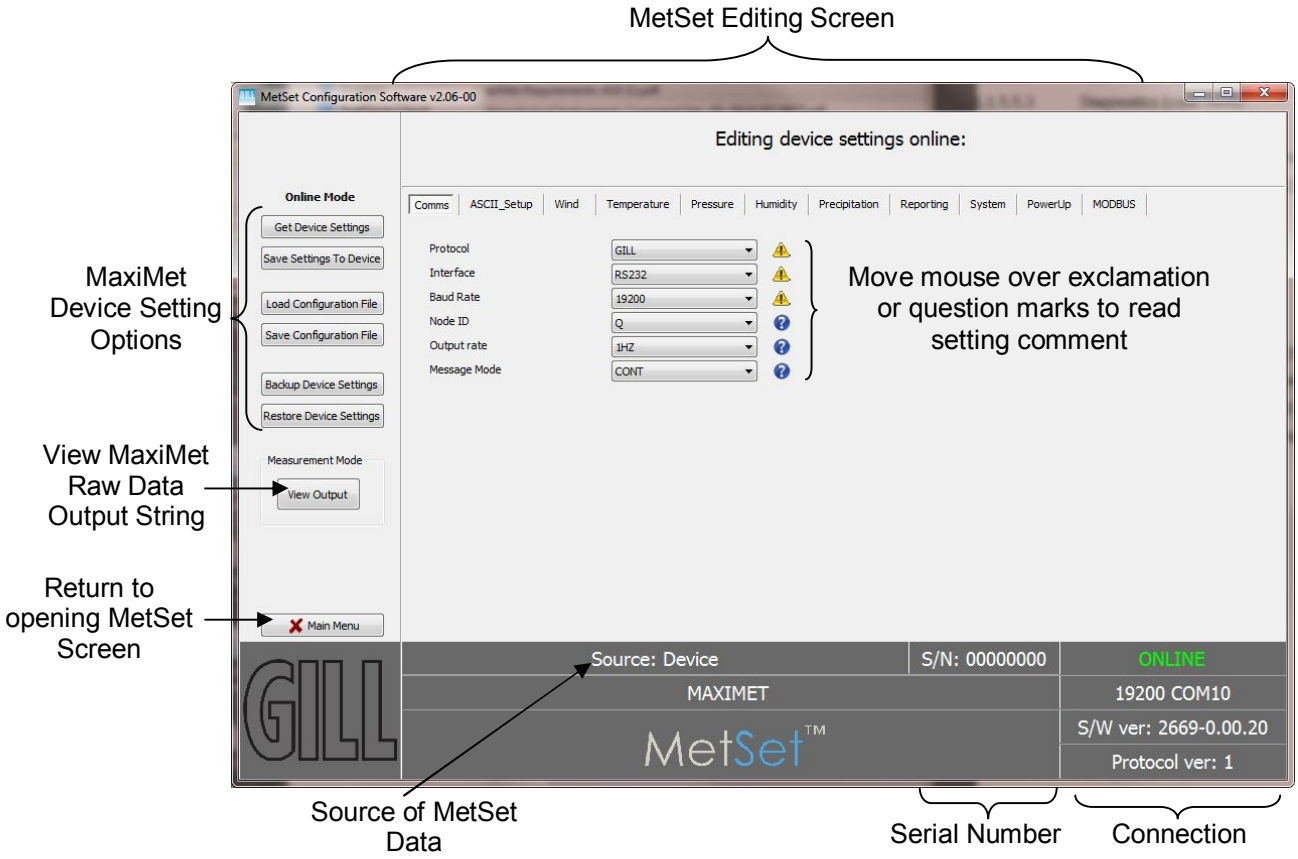
PROTOCOL : GILL
COMMS : RS232
(BAUD) : 19200
NODE : Q
OUTFREQ : 1HZ
MSGMODE : CONT
ASCTERM : CRLF
ECHO : ON
ALIGN : 0
SENSOR WIND : ON
UNITS WIND : MS
NODIR : 0.00
AVGSHORT : 60
AVGLONG : 10
SENSOR COMPASS : ON
SENSOR TEMP : ON
UNITS TEMP : C
SENSOR DEWPOINT : ON
UNITS DEWPOINT : C
SENSOR PRESS : ON
UNITS PRESS : HPA
HASL : +00000.00
HASTN : +00000.00
SENSOR RH : ON
UNITS RH : %
SENSOR PRECIP : ON
UNITS PRECIP : MM
ARPRECIP : ON
REPORT : NODE DIR SPEED CDIR PRESS RH TEMP DEWPOINT PRECIPT PRECIPI TIME VOLT STATUS
POWER : 0
TIME :2015-03-23T13:36:09
PUPMSG STATUS : ON
PUPMSG REPORT : ON
PUPMSG UNITS : ON
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

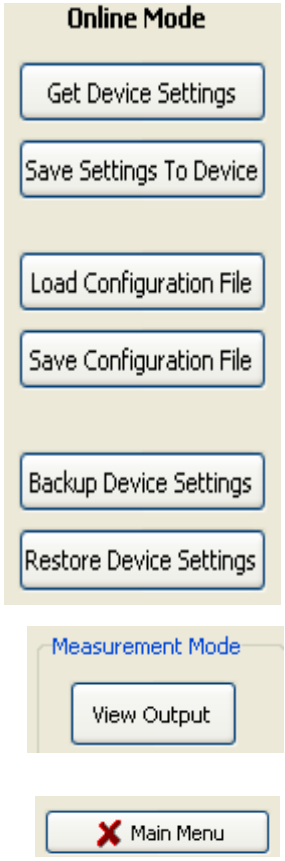
When connected correctly a MetSet editing screen is available to read configuration settings, change configuration settings, save MaxiMet configuration settings to a PC file location, upload MaxiMet configuration settings from a PC file and view the MaxiMet raw data string output.



- **MetSet Connection Status Information.**

Reading	Function
ONLINE	ONLINE in green indicates the MaxiMet has been successfully connected to MetSet. OFFLINE in Grey indicates that MetSet is being used without a MaxiMet in communication with MetSet.
19200 COM10	19200 is a report on the MaxiMet Baud rate setting. COM 10 is a report on the MaxiMet COM Port connection number.
S/W ver 2669-0.00.20	2669 is the MaxiMet Firmware number. 0.00.20 is the firmware revision. PV=1 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 MaxiMet and the MaxiMet Model. MetSet reads 'File' when the source of data has come from a saved file. MetSet reports on the connected MaxiMet device (MAXIMET) and reads the unit Serial Number (S/N: XXXXXXXX)

- **MetSet Online Settings.**

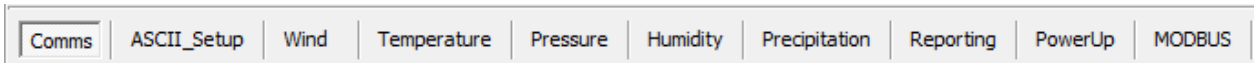


Online Mode Buttons	Function
Get Device Settings	MetSet retrieves the MaxiMet Configuration settings.
Save Settings to Device	MetSet configuration settings are saved to a connected MaxiMet.
Load Configuration File	When selected MetSet retrieves a MetSet edit PC file and updates MetSet with these settings.
Save Configuration File	When selected MetSet edit settings are saved to a PC file location.
Back Up Device Settings	When selected the MaxiMet configuration settings are transferred to MetSet and then to a file location selected on a PC.
Restore Device Settings	When selected MetSet retrieves a MaxiMet configuration setting from a PC file, loads it into the MaxiMet and updates the MetSet edit settings.
Measurement Mode View Output	Click on View Output to view the raw ASCII MaxiMet 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

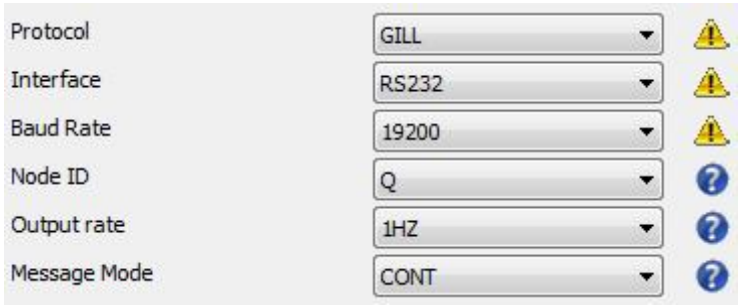
MetSet Editing Pages.

Feature and parameter available to view and select will depend on the MaxiMet model connected. The following example pages refer to the GMX600 device. See page 5 for a summary of available sensor outputs and parameters.

NOTE: Items shown in Bold are the default settings.



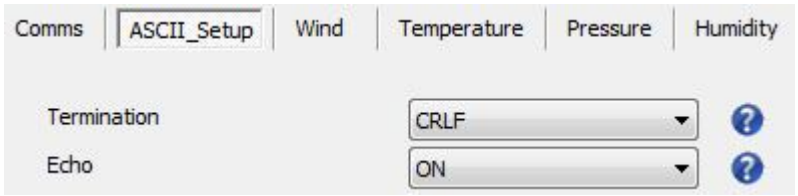
The Comms Page can be used to Select:-



Protocol:-	**GILL**, MODBUS or SDI-12 (for SDI-12 also set MetSet Comms/Interface to SDI-12).
Interface:-	**RS232**, RS422, RS485P2W (point to point) ,SDI-12 and EXT. EXT setting means RS422 or RS232 selected by a wire link on connector pin 8 (see Page 19 table).
Baud Rate:-	4800, 9600, **19200**, 38400 or 57600 (1200 auto selected with SDI-12 setting).
Node ID:-	A to P, **Q** to Z.
Output Rate:-	0.25Hz to **1Hz**.
Message Mode:-	**CONT** (Continuous output**)** or POLL (Polled Mode).

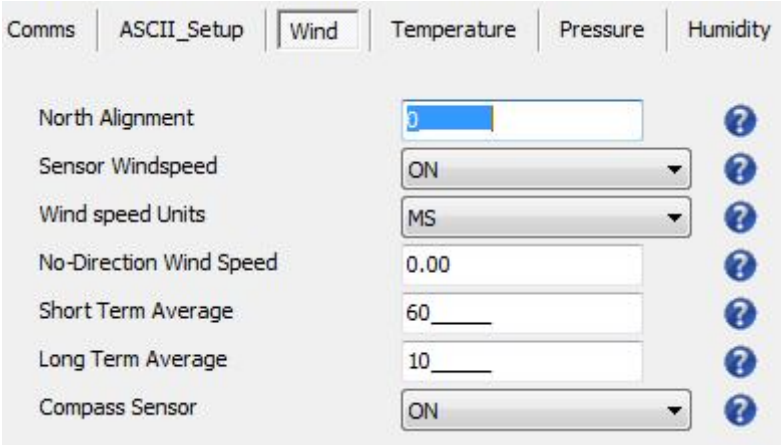
NOTE: When COMMS or Baud Rate settings are changed and Saved to Device a warning is issued by MetSet. These setting changes will not become active until the MaxiMet power is turned off and turned on again. The connecting device will then also need its Comms and Baud rate settings changed to match the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

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.

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.

Short Term Average **60** (10 -60).

Configures WMO Short Term Average as the defined multiple of the Output rate .i.e. AVGSHORT 10 is a rolling average of the last ten outputs.

Long Term Average **10** (1-10).

Configures WMO Long Term Average as the defined multiple of the short Term Average.

.i.e. if AVGSHORT is 10 then short term average is a rolling average of the last ten outputs.

Then if AVGLONG is set to 10, long term average is a rolling average of the last 100 outputs.

Compass Sensor **ON** or OFF

With Compass Sensor ON Wind Direction readings corrected to magnetic north are output in the data string (CDIR). If set to OFF then the field with Compass corrected direction reading is left blank.

WMO Average Wind Reading Notes:

The default output rate from MaxiMet is one new reading every second.

There in this case the WMO averaged Wind reading result will be based on:-

Long Term Average (1-10) x Short Term Average (10-60).

For instance if a **2 minute averaged data** output was required set:-

RWA Long to 2

RWA Short to 60

For these settings then every minute you would get an averaged output reading based on the previous 2 minutes of wind data.

For instance if a **10 minute averaged data** output was required set:-

RWA Long to 10

RWA Short to 60

For these settings then every minute you would get an averaged output reading based on the previous 10 minutes of wind data.

To enable WMO averaged Wind readings in the MaxiMet data string select the Reporting Tab/USERDEF and add new reporting field from the drop down menu called:-

AVGSPEED	Outputs Average Speed readings.
AVGDIR	Outputs Average Direction Readings.
AVGCDIR	Outputs Average Corrected Direction Readings.

The maximum Gust Speed is the magnitude of the maximum gust measured over the short term output period. Gust is generated from a rolling 3s average of the short term output period, and reset at the end of short term output period.

GSPEED	Outputs Average Wind Gust Speed.

The Maximum Gust Direction is the direction of the maximum gust measured over the short term output period. Gust is generated from a rolling 3s average of the short term output period, and reset at the end of short term output period.

GDIR	Outputs Average Wind Gust Direction.

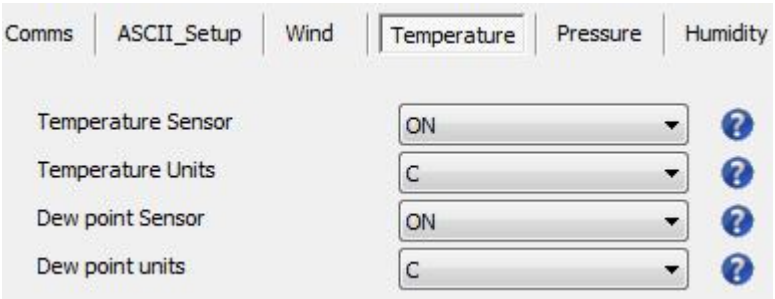
Whenever the unit is powered up then until the unit has reached its minimum long term averaging interval the Wind Status code will read 0100 (Measurement Average Building).

If MaxiMet is in Polled mode then when polled (default 1Hz output) MaxiMet will output the last valid 10 minute wind speed and direction average, updated every minute along with last valid 1 minute Gust magnitude.

In polled mode, the last set of computed WMO measurements shall be output on receipt of a poll request.

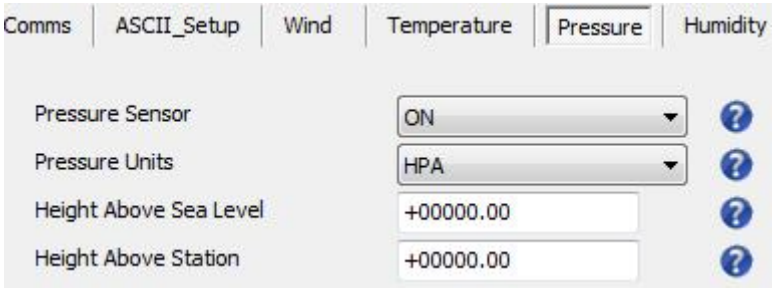
In polled mode whilst a new WMO average is building, the last computed WMO average shall be output.

The Temperature Page can be used to select:-



Temperature Sensor	**ON** or OFF
Temperature Units	**C,** K or F
Dew Point Sensor	**ON** or OFF
Dew Point Units	**C**, K or F
	(Centigrade, Kelvin, Fahrenheit)

The Pressure Page can be used to select:-



Pressure Sensor **ON** or OFF

Pressure Units **HPA**, MB, MMHG, INHG

Height Above Sea Level **+00000.00** (0 to 10000 Metres)

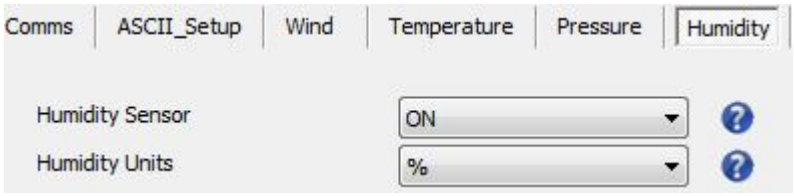
Is the elevation (on the ground) of the unit, relative to the average sea level point.

Atmospheric pressure varies with height above sea level as well as with atmospheric conditions. As the altitude at which the pressure sensor operates is usually constant (the station height), a correction is made to make the reading of the pressure sensor seem as if it were made at sea level. This means that the pressure reading has to be slightly increased from the value read by the MaxiMet sensor situated above sea level (often known as the station pressure).

Height Above Station **+00000.00** (-100 to +100 Metres)

(Hecto Pascals, Milli-Bars, Millimetres Mercury, Inches Mercury).

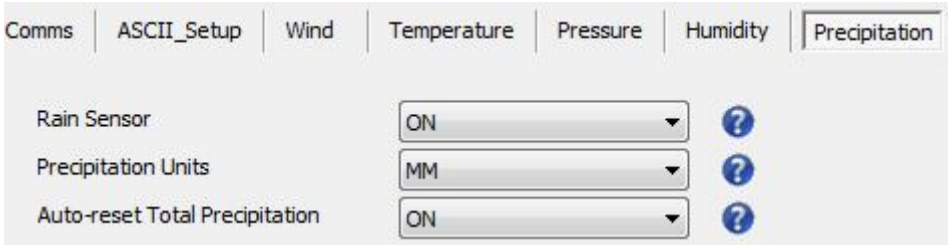
The Humidity Page can be used to select:-



Humidity Sensor **ON** or OFF

Humidity Units **%**

The Precipitation (Rain) Page can be used to select:-



Rain Sensor **ON** or OFF

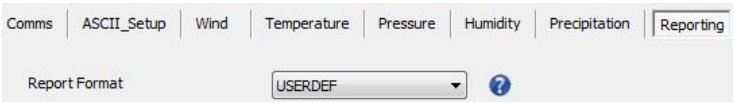
Precipitation Units **MM** or IN

Auto-reset Total Precipitation **ON** or OFF

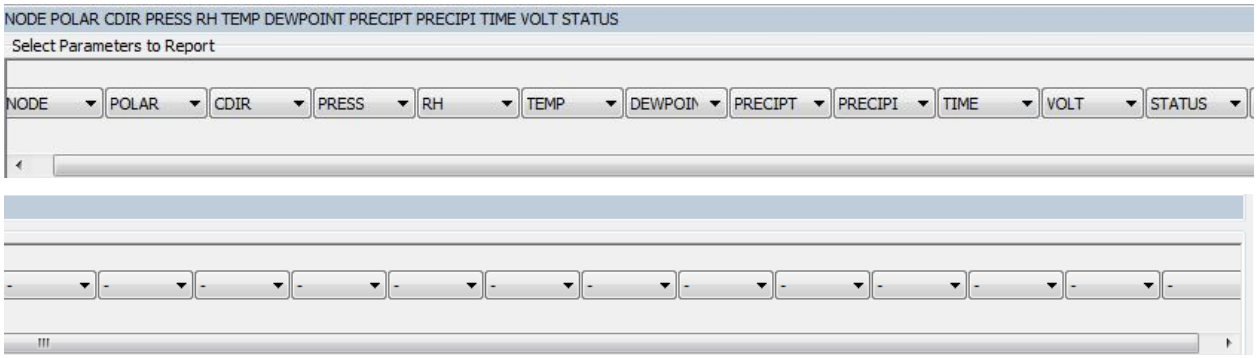
ON resets the total precipitation reading to zero when the clock time reads 23:55:59 to 00 (midnight)

OFF results in continuous total precipitation measurement.

The Reporting Page can be used to select:-



Report Format **USERDEF**, FULL or NMEA



Select Parameters to Report

Report FULL will set the MaxiMet to report default parameters (example show GMX600 report):-

NODE,DIR,SPEED,CDIR,PRESS,RH,TEMP,DEWPOINT,PRECIPT,PRECIPI,TIME,VOLT,STATUS.

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

NODE	Output Node letter.
DIR	Outputs wind direction readings.
SPEED	Outputs wind speed readings.
CDIR	Outputs Compass corrected wind direction readings.
PRESS	Outputs the Barometric Pressure reading.
RH	Outputs Relative Humidity reading.
TEMP	Outputs the Temperature reading.
DEWPOINT	Outputs the Dewpoint reading.
PRECIPT	Outputs Precipitation (Rain) Total reading, this is an accumulated rain reading updated at the output rate. Is set to zero on MaxiMet power up. Is set to zero when the clock reads 23:59:59 to 00 (midnight) if Automatic Reset of Total Precipitation is set to ON (default setting).
PRECIPI	Outputs Precipitation (Rain) Intensity. It is the sum of the last sixty lots of 1 minute accumulated Rain data. A new sum measurement is generated every minute.
TIME	Outputs Date and Time.
VOLT	Outputs the MaxiMet Supply Voltage.
STATUS.	Outputs the MaxiMet Sensors Status Code (see page 64).

There are drop down menu selectable parameters available depending on the MaxiMet model (see pages 5 and 8 to10).

These are:-

WINDSTAT	Outputs Status codes relating to Wind Sensor Data (see Page 65).
PRECIPS	Outputs Precipitation (Rain) Status as No (N) or Yes (Y).
	Changes N to Y when total precipitation is incremented.
	Changes Y to N when total precipitation has not incremented in the last 60 seconds.
CSPEED	Outputs Corrected Speed if a GPS unit is fitted.

PASL Outputs Barometric Pressure at Sea Level if HASL figure set (see page 38).

$p_0 = p_1.\exp((g.h) / (R.T))$
where
p_0 = air pressure at sea level (Pa)
p_1 = air pressure at sensor (Pa)
h = sensor altitude above sea level (m)
R = specific gas constant
T = air temperature as measured
g = acceleration due to gravity

PSTN Outputs Barometric Pressure at Station if HAS figure set (see page 38).

Pressure at station shall be computed as:

$$P = Pb \cdot \left[\frac{Tb}{Tb + Lb \cdot (h - hb)}\right]^{\frac{g0 \cdot M}{R \cdot Lb}}$$

where:
Pb = static pressure (pascals)
Tb = standard temperature (K)
Lb = standard temperature lapse rate (K/m) in ISA
h = height above sea level (meters)
hb = height at bottom of layer b (meters; e.g., h1 = 11,000 meters)
R = universal gas constant for air: 8.31432 N·m /(mol·K)
g0 = gravitational acceleration (9.80665 m/s2)
M = molar mass of Earth's air (0.0289644 kg/mol)

AH Outputs Absolute Humidity.

Absolute humidity shall be computed as
$H = C \cdot P_w/T$
where
H = absolute humidity
C = Constant 2.16679 gK/J
Pw = Vapour pressure in Pa
T = Temperature in K

AVGSPEED	Outputs WMO average speed reading based on AVG short and AVG long settings.
AVGDIR	Outputs WMO average direction reading based on AVG short and AVG long settings.
GSPEED	Outputs WMO Gust Speed.
GDIR	Outputs WMO Gust Direction.
AVGCDIR	Outputs WMO average corrected compass direction reading based on AVG short and AVG long settings.
COMPASSH	Compass Heading reading.

The System Page can be used to select:-

Power Mode	**0** or 1, 0 is the default normal operation mode. (1 is a future operating condition).
Date Time	Set/Read system Date/time. (YYYY-MM-DDTHH:MM:SS).

The PowerUp Page can be used to select:-

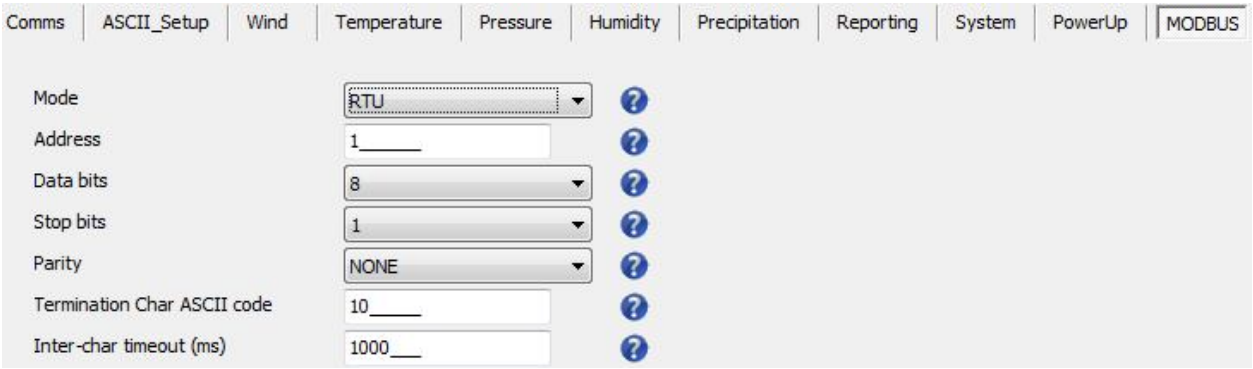
Status Message Output	**ON** or OFF.
E.g.	MAXIMET - GMX 600 1B 2669 V0.00.17 STARTUP: OK RCON: 0120 WDT enabled Voltage reg. active during Sleep CRC: 6BB8

Report Message Output	**ON** or OFF.

E.g.
NODE,DIR,SPEED,CDIR,PRESS,RH,TEMP,DEWPOINT,PRECIPT,PRECIPI,TIME,VOLT,STATUS,CHECK

Units Message Output	**ON** or OFF
E.g. -	DEG,MS,DEG,HPA,%,C,C,MM,MM/H,-,V,-,- <END OF STARTUP MESSAGE>

The MODBUS Page can be used to select:-



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

6.3. Polled Mode

The measurement rate shall always be 1Hz (i.e.: regardless of the selected output rate).

The configured measurement string shall be output in response to a measurement request ("?<network node address>") from the user.

When the user issues a poll measurement request, the last computed set of 1 Hz measurement shall be output.

6.4. Configuring MaxiMet Compass

The MaxiMet compass is calibrated at Gill Instruments before the unit is delivered.

Prior to installing MaxiMet it is suggested that for best accuracy a declination figure should be entered.

Compass Declination

Declination is the magnetic declination (the angle between Magnetic North and True North) in degrees.
This is a correction factor that is added to the magnetic north heading from the compass.

Map and declination figures in decimal figures can be obtained from:-

http://www.geosats.com/magdecli.html

http://www.magnetic-declination.com/

http://www.ngdc.noaa.gov/geomag/declination.shtml

To find the MaxiMet current declination figure (default is 0.0) then using a terminal program.

Open a Terminal Program at MaxiMet baud rate e.g. 19200 bauds.

Type * to place the unit in SETUP MODE

Type COMPASSDECL and press the Enter key.

MaxiMet will report the current declination figure (range +- 180.0 degrees)
COMPASSDECL = 0.0

To enter a Compass declination figure of -1.0
Type COMPASSDECL -1.0 and press the Enter key.
MaxiMet reports back with New value saved (Advise to verify Compass Heading).

Type Q and press Enter key to return to measurement mode.

6.5. Configuring MaxiMet for SDI-12

To configure a MaxiMet unit for SDI-12:

Connect a default set MaxiMet to a PC as described in Para 4.6.

Open MetSet as described on Para 6.2.

Click on the Edit Comms page and select:-

Set Protocol for SDI-12. and

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 MaxiMet unit.

Change the hardware connections for SDI-12 (see Para 4.9).

Power up the MaxiMet unit.

SDI-12 Units of Measure

Relative Wind Speed:	Metres/Second.
Relative Wind Direction:	Degrees
Corrected Wind Direction:	Degrees
Temperature:	Degrees C
Relative Humidity:	%
Dewpoint:	Degrees C
Pressure:	Hecto Pascals
Precipitation Intensity:	Millimetres/hour
Total Precipitation:	Millimetres
Status	4 Digit Sensor Status code (e.g. 0000 for a no fault condition).

SDI-12 Commands

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

?! Returns Unit Address (default is 0).

a Current unit address letter (factory default is 0, range is 0 to 9).

b New address letter, range 0 to 9.

aAb! Change unit address from a to b see above.

aM! Address, Relative Wind Direction, Relative Wind Speed, Corrected Wind Direction, Corrected Wind Speed (GPS option units only), Status.

aM1! Address, Temperature, Relative Humidity, Dewpoint, Pressure and Status (GMX600).

aM2! Address, Relative Wind Direction, Relative Wind Speed and Status.

aM3! Address, Precipitation Intensity (Rain), Total precipitation (Rain), Status (GMX600).

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>
aI!	Unit Identification	013GillInst Serial Number<CR><LF>	013GillInst 00014490002<CR><LF>
aM!	Address, Relative Wind Direction, Relative Wind Speed, Corrected Wind Direction, Corrected Wind Speed (GPS option unit only), Status.	atttn<CR><LF> a is unit identifier. ttt is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MaxiMet 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, Corrected Direction and Corrected Speed).
0D0!	Retrieve a line of the above data.	<address><relative wind direction><relative wind speed><corrected wind direction><corrected wind speed><status>CR><LF>	0+220+000.01+218+999.99 +0000<CR><LF>
aM1!	Address, Temperature, Relative Humidity, Dewpoint, Pressure and Status	atttn<CR><LF>	00014<CR><LF>
0D0!	Retrieve a line of the above data.	<address><temperature> <relative humidity><dewpoint> <pressure><status> CR><LF	0+024.3+036+008.4 +1024.9+0000<CR><LF>
aM2!	Address, Relative Wind Direction, Relative Wind Speed and Status.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CR><LF>	0+029+000.01+0000<CR><LF>
aM3!	Address, Precipitation Intensity, Total precipitation, Status	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	<address><precipitation intensity><total precipitation><status> CR><LF	0+0002.1+123.1+0000<CR><LF>

SDI-12 Commands with CRC

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

?! Returns Unit Address (default is 0).

a Current unit address letter (factory default is 0, range is 0 to 9).

b New address letter, range 0 to 9.

aAb! Change unit address from a to b see above.

aMC! Address, Relative Wind Direction, Relative Wind Speed, Corrected Wind Direction, Corrected Wind Speed (If GPS fitted), Status and CRC.

aMC1! Address, Temperature, Relative Humidity, Dewpoint, Pressure, Status and CRC (GMX600).

aM2C! Address, Relative Wind Direction, Relative Wind Speed Status and CRC.

aM3C Address, Precipitation Intensity, Total Precipitation, Status and CRC (GMX600).

aD0 Request a line of the above data.

Command	Description	Response	Example
aMC!	Address, Relative Wind Direction, Relative Wind Speed, Corrected Wind Direction, Corrected Wind Speed (GPS option unit only), Status and CRC.	atttn<CR><LF> a is unit identifier. ttt is time in seconds. n is number of data values. Measurement command to retrieve a reading of the maximum time the MaxiMet 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, Corrected Direction, Corrected Speed and Status).
0D0!	Retrieve a line of the above data.	<address><relative wind direction><relative wind speed><corrected wind direction><corrected wind speed><status> <CRC><CR><LF>	0+192+000.07+267+999.9+0000DQ^ <CR><LF>
aMC1!	Address, Temperature, Relative Humidity, Dewpoint, Pressure, Status and CRC.	atttn<CR><LF>	00015<CRC><CR><LF>
0D0!	Retrieve a line of the above data.	<address><temperature> <relative humidity><dewpoint> <pressure><status><CRC><CR><LF	0+023.3+035+007.2+1015.1+0000AiL <CR><LF>
aMC2!	Address, Relative Wind Direction, Relative Wind Speed, Status and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	a<dir><mag><status><CRC><CR><LF>	0+168+000.02+0000GbT><CR><LF>
aMC3!	Address, Precipitation Intensity, Total Precipitation, Status and CRC.	atttn<CR><LF>	00053<CR><LF>
0D0!	Retrieve a line of the above data.	<address><precipitation intensity><total precipitation><status><CRC> <CR><LF	0+000.0+00000.0+0000HB@ <CR><LF>

6.6. Configuring MaxiMet for MODBUS

MaxiMet 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

Requires:-

MaxiMet.

MetSet Software.

Connect a MaxiMet 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 MaxiMet Address number between 1 to 247.

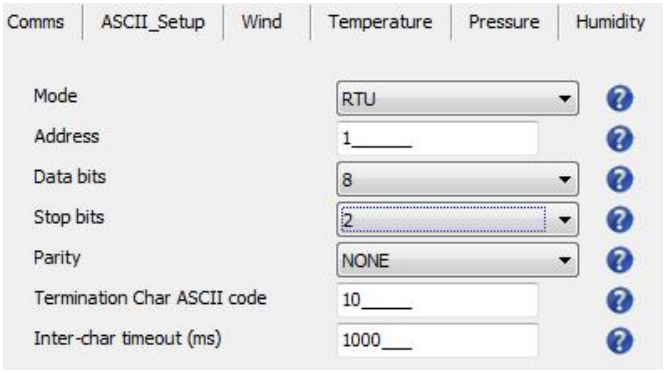
Data Bits: Choose 7 for Modbus ASCII and 8 for Modbus RTU.

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

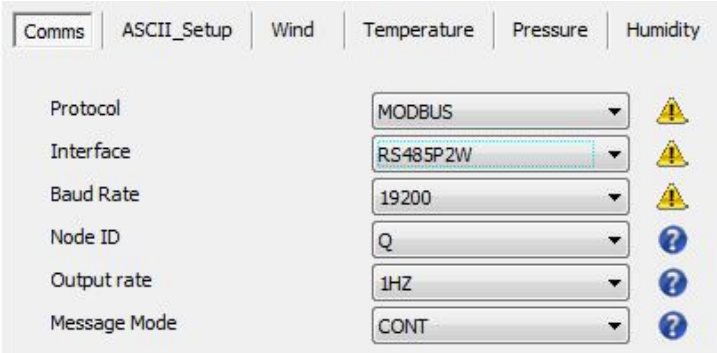
Interface: Default is RS232. Select RS232 or RS4852W. RS232 will only allow a single point to point non multi drop network connection. RS485 2 wire will allow networking with up to 32 connected devices.

Baud Rate: Default is 19200. Select required Baud rate (9600 or 19200 supported).

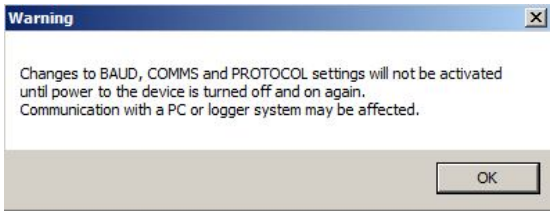
Node ID: Default is Q. Not used for MODBUS.

Output Rate: Default is 1Hz. Set update rate for MaxiMet Data (0.25Hz to 1Hz).

Message Mode: Default is CONT. Select POLL mode and MaxiMet will only make and output a measurement (set by the output rate) on demand from the Modbus Master. In CONTinuous mode the MaxiMet 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 MaxiMet and apply power back to the MaxiMet 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.

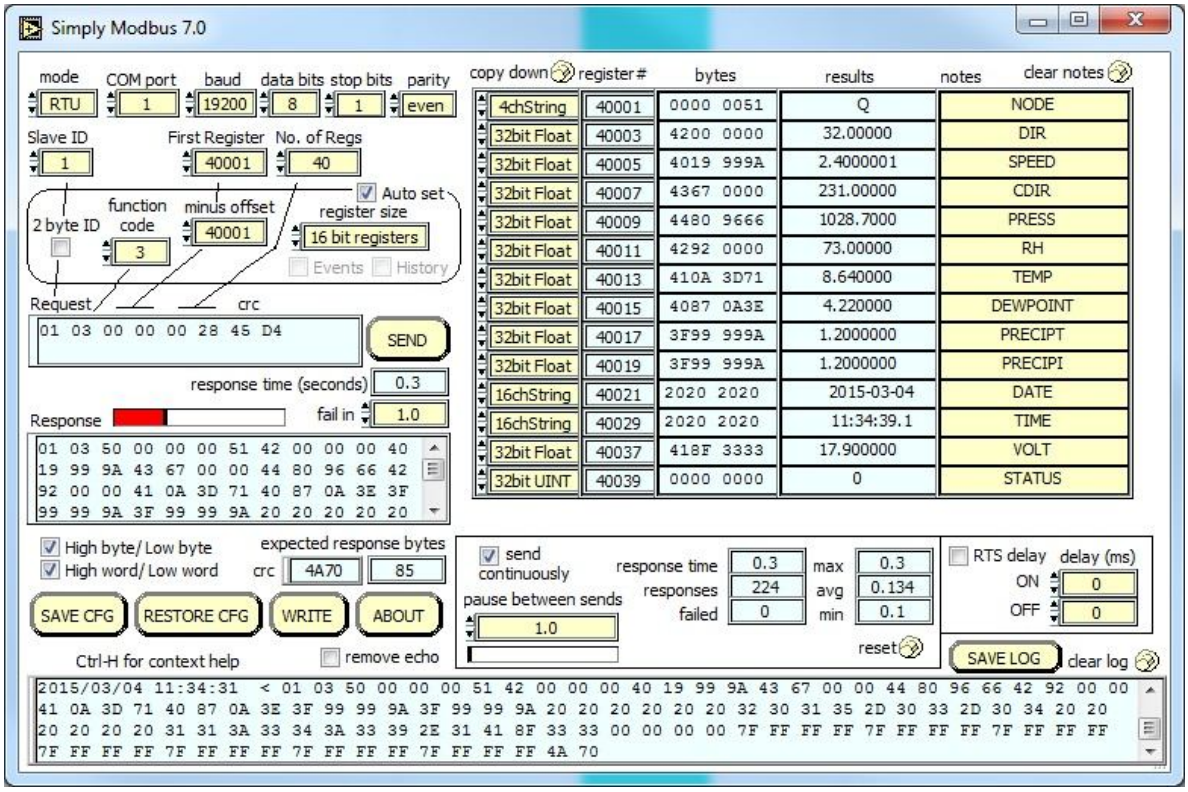
MaxiMet MODBUS NOTES

1. All registers are 16bit.
2. The first byte is high order and the second is low.
3. Each measurement is comprised of two 16bit registers.
4. For all registers, the order of the two data bytes comprising the 16-bit register's value shall be: High Byte/Low Byte.
5. 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.
6. Registers start at address 40001.
7. Holding registers available in the order of the MaxiMet data string (which can be established by the REPORT command in non-Modbus Gill ASCII Mode).
8. 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).

MaxiMet MODBUS Default Data String Field Encoding (example shows GMX600):

Node	4-byte character string	Registers 40001-2.
Direction:	32 Bit Floating point value	Registers 40003-4.
Speed:	32 Bit Floating point value	Registers 40005-6.
CDIR	32 Bit Floating point value	Registers 40007-8.
Pressure:	32 Bit Floating point value	Registers 40009-10.
Relative Humidity	32 Bit Floating point value	Registers 400011-12.
Temperature:	32 Bit Floating point value	Registers 400013-14.
Dewpoint:	32 Bit Floating point value	Registers 400015-16.
Total Precipitation:	32 Bit Floating point value	Registers 400017-18.
Precipitation Intensity:	32 Bit Floating point value	Registers 400019-20.
Date:	16 Byte Character String	Registers 400021-28.
Time:	16 Byte Character String	Registers 400029-36.
Supply Voltage:	32 Bit Floating point value	Registers 400037-38.
Status:	32 bit Unsigned Integer (UINT)	Registers 400039-40.

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



6.7. Configuring MaxiMet for NMEA Output

Connect a default set MaxiMet to a PC as described in Para 4.6.
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.

GMX200

GMX200 NMEA data strings comprise of: -

$WIMWV,049,R,000.03,N,A*03<CR><LF>. Where:-

$WIMWV	Wind Instrument Mean Wind direction and Velocity.
049	Wind Direction.
R	Relative Wind measurement, wind speed and/or direction information, reported with respect to the MaxiMet North marker.
000.03	Wind Speed.
N	Knots (NMEA output fixed to Knots measurement only).
A	Acceptable measurement (V is a void fail measurement).
O3	Hex Check Sum.

Immediately followed by:-

$WIMWV,049,T,,N,A*18<CR><LF>.

$WIMWV	Wind Instrument Mean Wind direction and Velocity.
049	Wind Direction.
T	**T**rue Wind measurement, wind speed and/or direction information, corrected by a compass and GPS (option) to give accurate data regardless of where north marker is aligned.
,,	Wind Speed only available if a GPS option is fitted.
N	Knots (NMEA output fixed to Knots measurement only).
A	Acceptable measurement (V is a void fail measurement).
OC	Hex Check Sum.

Example GMX200 Data.

$WIMWV,069,R,004.06,N,A*00
$WIMWV,122,T,,N,A*14

GMX600

GMX600 NMEA data strings comprise of: -

$WIMWV,049,R,000.03,N,A*03<CR><LF>. Where:-

$WIMWV	Wind Instrument Mean Wind direction and Velocity.
049	Wind Direction.
R	Relative Wind measurement, wind speed and/or direction information, reported with respect to the MaxiMet North marker.
000.03	Wind Speed.
N	Knots (NMEA output fixed to Knots measurement only).
A	Acceptable measurement (V is a void fail measurement).
O3	Hex Check Sum.

Immediately followed by:-

$WIMWV,049,T,,N,A*18<CR><LF>.

$WIMWV	Wind Instrument Mean Wind direction and Velocity.
049	Wind Direction.
T	**T**rue Wind measurement, wind speed and/or direction information, corrected by a compass and GPS (option) to give accurate data regardless of where north marker is aligned.
,,	Wind Speed only available if a GPS option is fitted.
N	Knots (NMEA output fixed to Knots measurement only).
A	Acceptable measurement (V is a void fail measurement).
OC	Hex Check Sum.

Immediately followed by:-

$WIXDR,C,+023.9,C,TEMP,P,1.0243,B,PRESS,H,039,P,RH,Y,000.0,M,PRECIP*01<CR><LF>.
Where: -

$WIXDR	Wind Instrument Cross track error Dead Reckoning
C	Type of Sensor (Temperature)
+023.9	Temperature Reading
C	Temperature Reading in Degrees Centigrade
TEMP	Name of Temperature Sensor
P	Type of Sensor (Pressure)
1.0243	Pressure Reading in Bars.
B	Pressure Units of Measure (Bars)
PRESS	Name of Pressure Sensor
H	Type of Sensor (Humidity)
039	Humidity Reading in Percent
P	Humidity Units of Measure (Percent)
RH	Name of Relative Humidity Sensor
Y	Type of Sensor (Precipitation)
000.0	Millimetres per hour of Precipitation
M	Precipitation Units of Measure (Millimetres)
PRECIP	Name of Precipitation Sensor
*01	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.

Example GMX 600 Data.

$WIMWV,069,R,004.06,N,A*00
$WIMWV,122,T,,N,A*14
$WIXDR,C,+023.2,C,TEMP,P,1.0281,B,PRESS,H,037,P,RH,Y,000.0,M,PRECIP*0A

Followed 1 second later by

$WIMWV,238,R,000.46,N,A*06
$WIMWV,303,T,,N,A*15
$WIXDR,C,+023.2,C,TEMP,P,1.0281,B,PRESS,H,037,P,RH,Y,000.0,M,PRECIP*0A

Followed 1 second later by

$WIMWV,130,R,000.21,N,A*0C
$WIMWV,205,T,,N,A*12
$WIXDR,C,+023.2,C,TEMP,P,1.0281,B,PRESS,H,038,P,RH,Y,000.0,M,PRECIP*05

Etc.

6.8. Safe Mode

Summary

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

Safe Mode Method 1

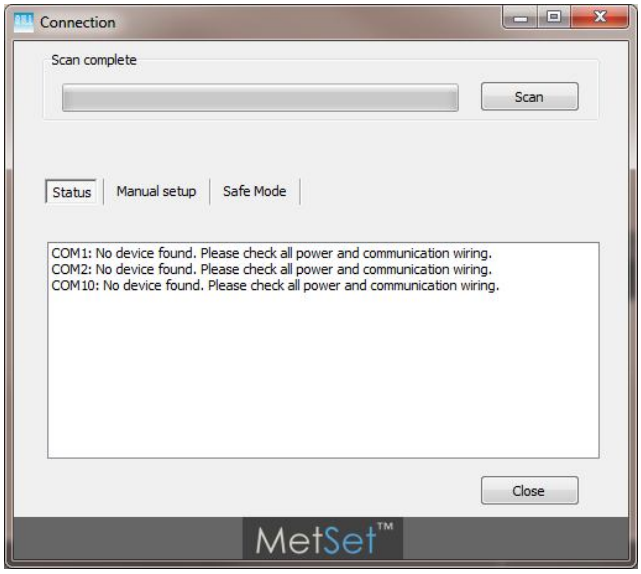
Connection

Connect the MaxiMet for RS232 communication as detailed in Para 4.6.

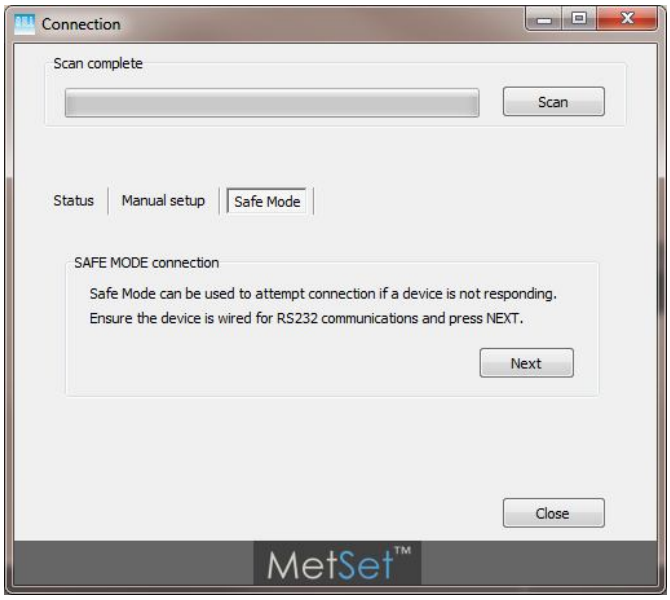
Open Gill MetSet Software (see Para 6.2).

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

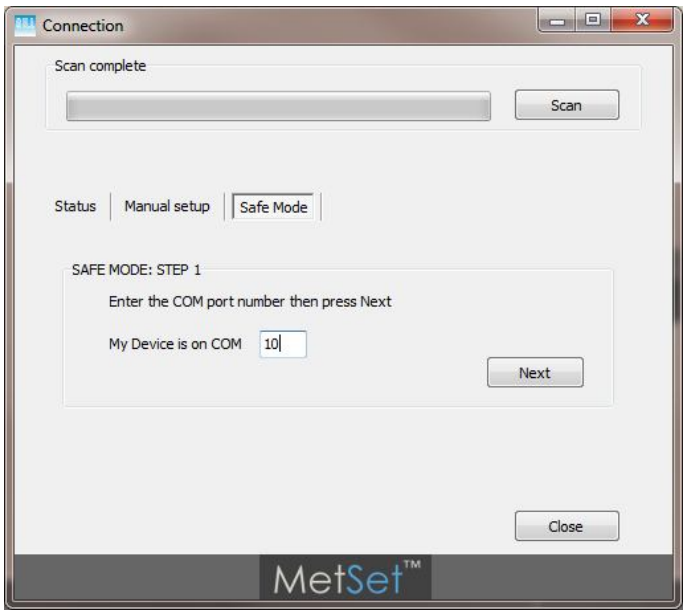
Now Click on the Safe Mode button.



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



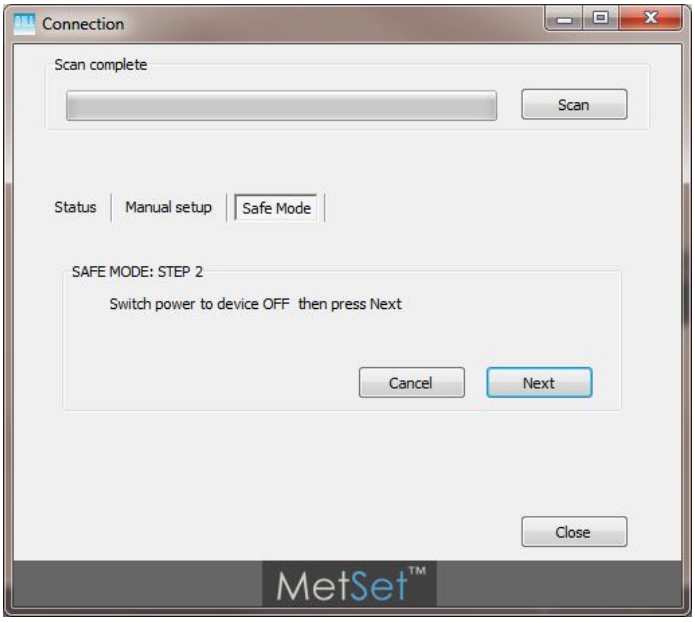
Enter the MaxiMet COM Port connection number.



Ensure power is now disconnected from the MaxiMet.

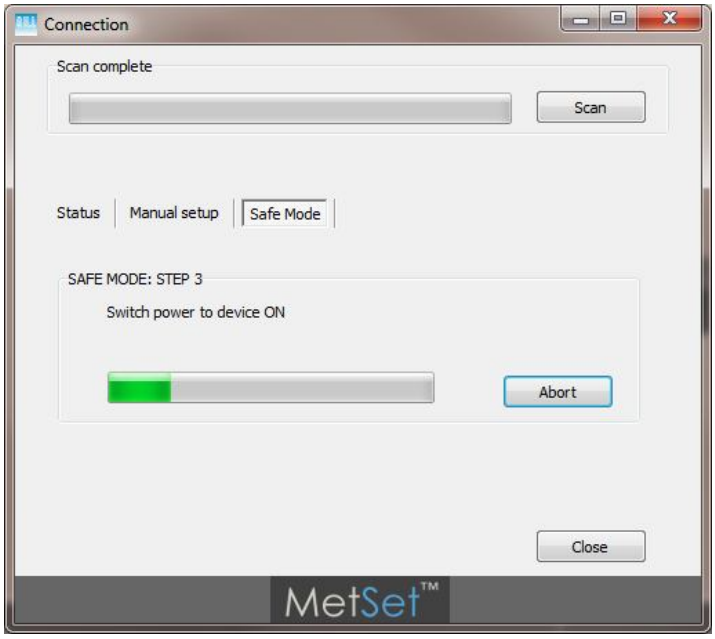
If using the Gill Instrument RS232 to USB configuration cable then unplug the 9 way connector from the base of the MaxiMet.

Now click on Next.

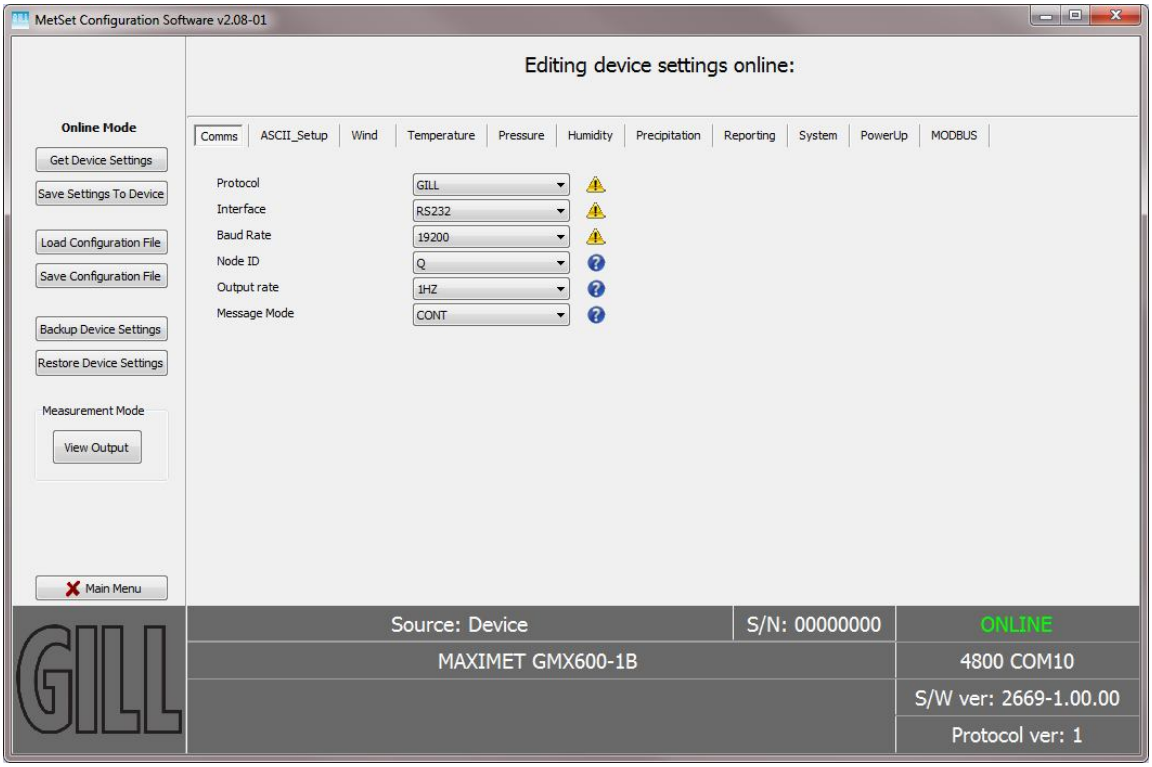


Now re-connect power to the MaxiMet.

If using the Gill Instrument RS232 to USB configuration cable then plug in the 9 way connector to the base of the MaxiMet.



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



Safe Mode Method 2

Connection

Connect the MaxiMet for RS232 communication as detailed in Para 4.6.

Note at this stage the MaxiMet 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.

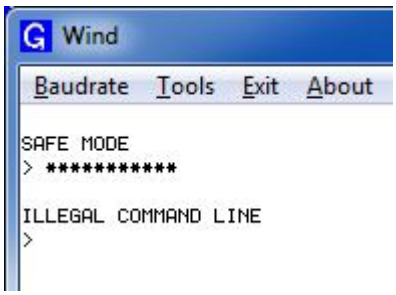
Left Click the mouse in the blank terminal screen.

Hold down the * key on the keypad.

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

This will result in placing the unit into SAFE MODE.

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

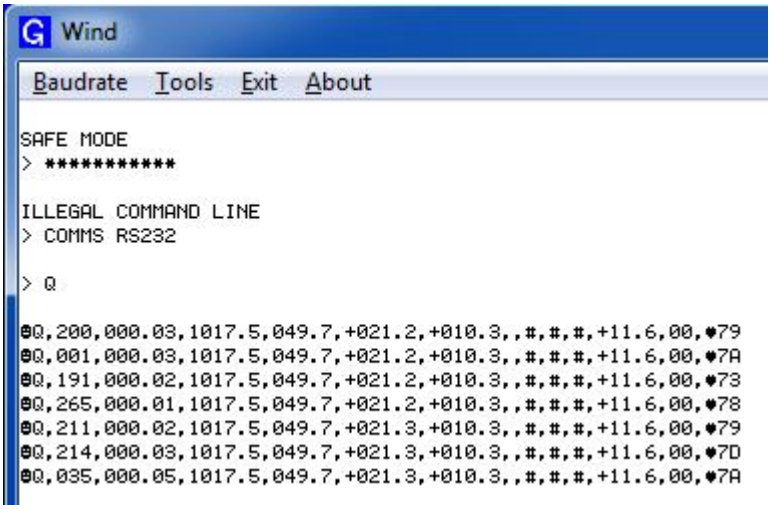


To now change communication from say SDI-12 (or MODBUS) or RS422 or RS485 to Default RS232.

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 MaxiMet and re-apply power.

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

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

7. VIEWING MAXIMET DATA STRING

7.1. Use MetSet to View the MaxiMet Data String

MetSet Software allows you to view the MaxiMet data string graphically.

Before you can use MetSet, check that MaxiMet 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.

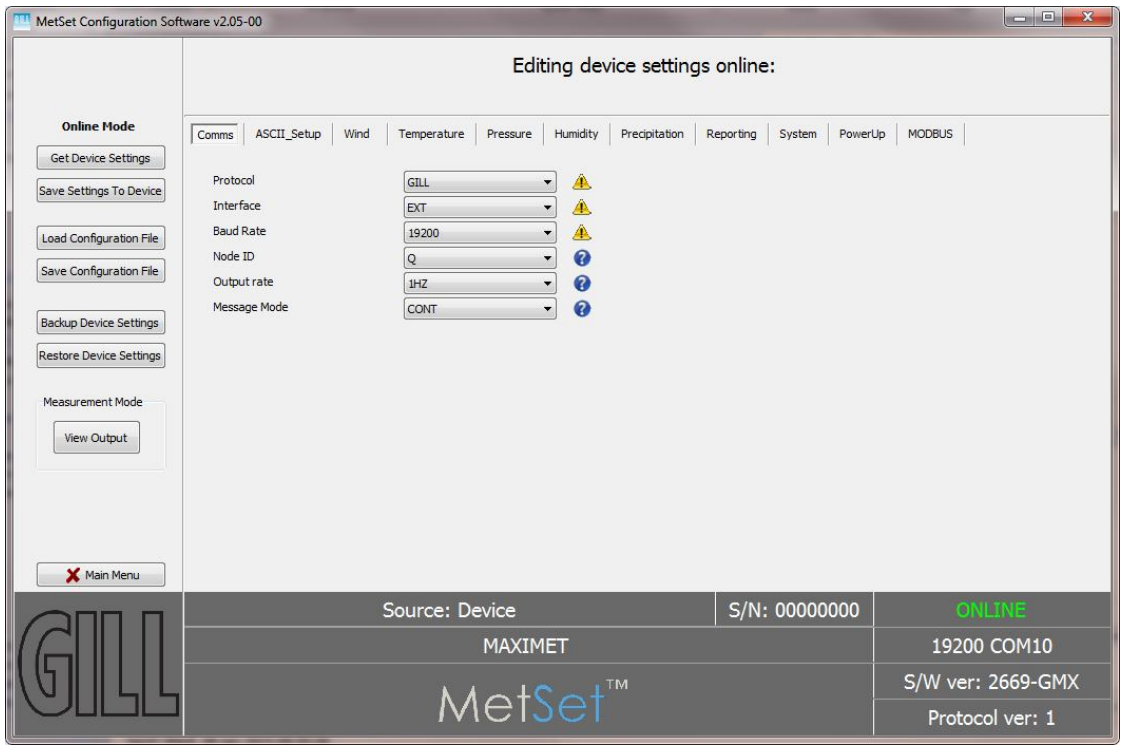
MetView will not read SDI-12 or MODBUS data strings.

Opening MetSet

Click on the MetSet **Connect and Read** button:

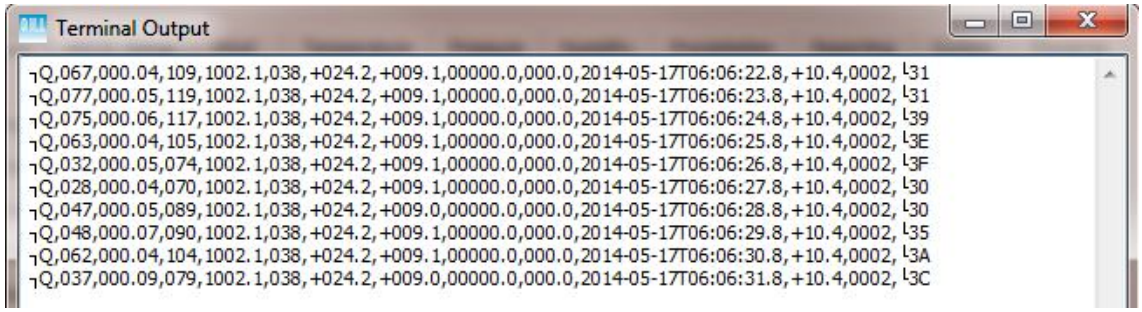
MetSet will display the Editing Screen.

Now Click on **View Output** button.



The MaxiMet data string will be shown.

Note that this terminal program can only read MaxiMet data it cannot be used to send commands to the MaxiMet.



7.2. Use a Terminal Program to View the MaxiMet Data String

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

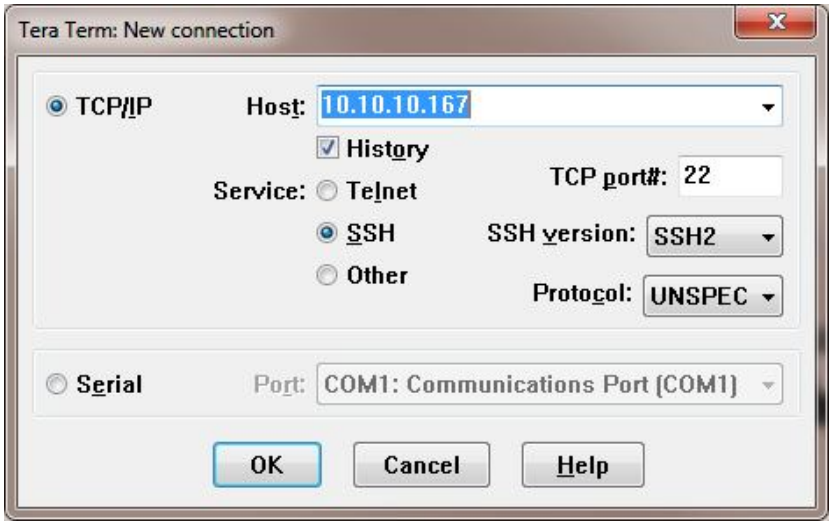
If for example Tera Term is used.

Open Tera Term

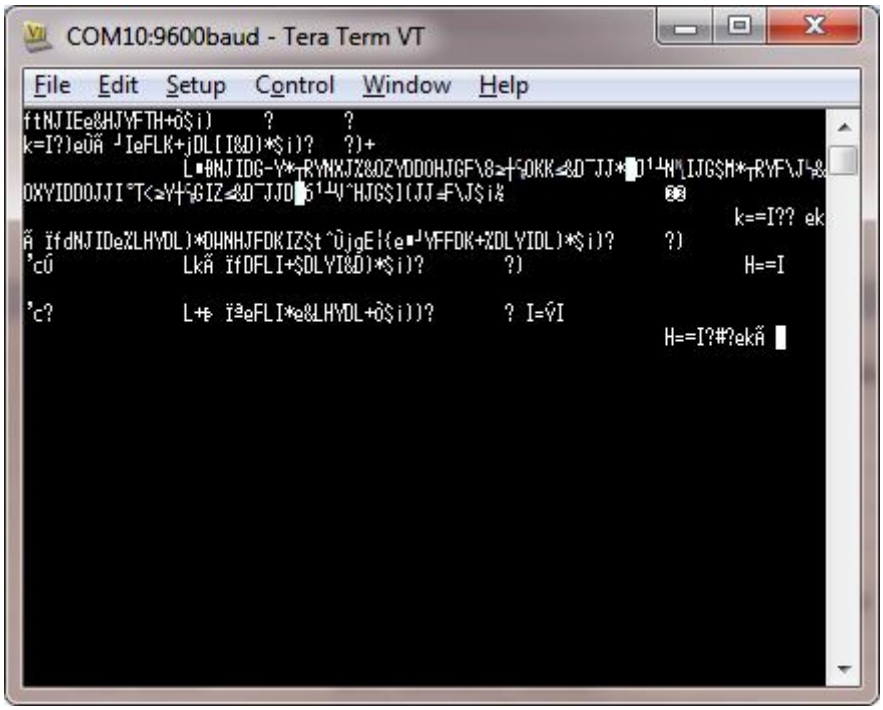
Select Serial.

Select MaxiMet connected Com port.

Click on Ok.



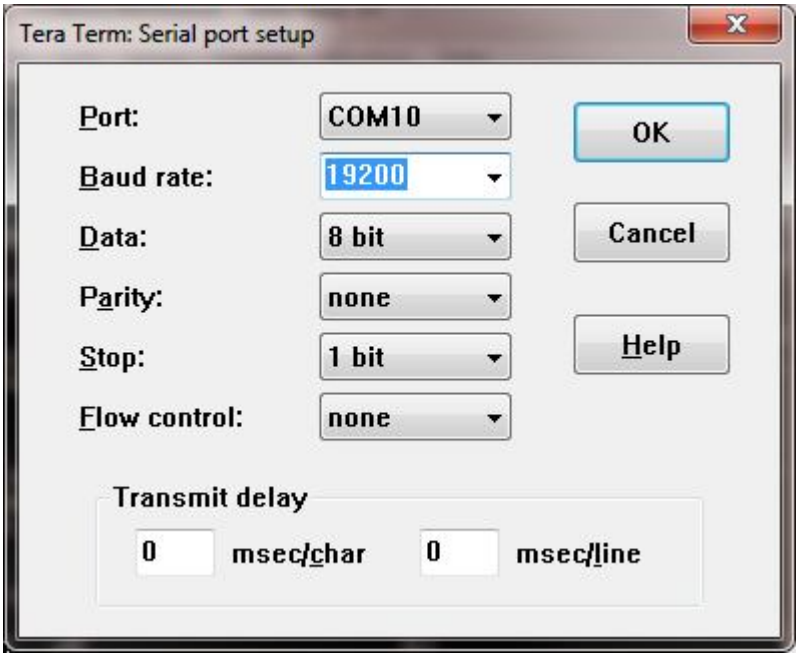
Tera Term has opened at 9600 baud and MaxiMet uses 19200 as a default, so change Tera Term Baud Rate setting to 19200.



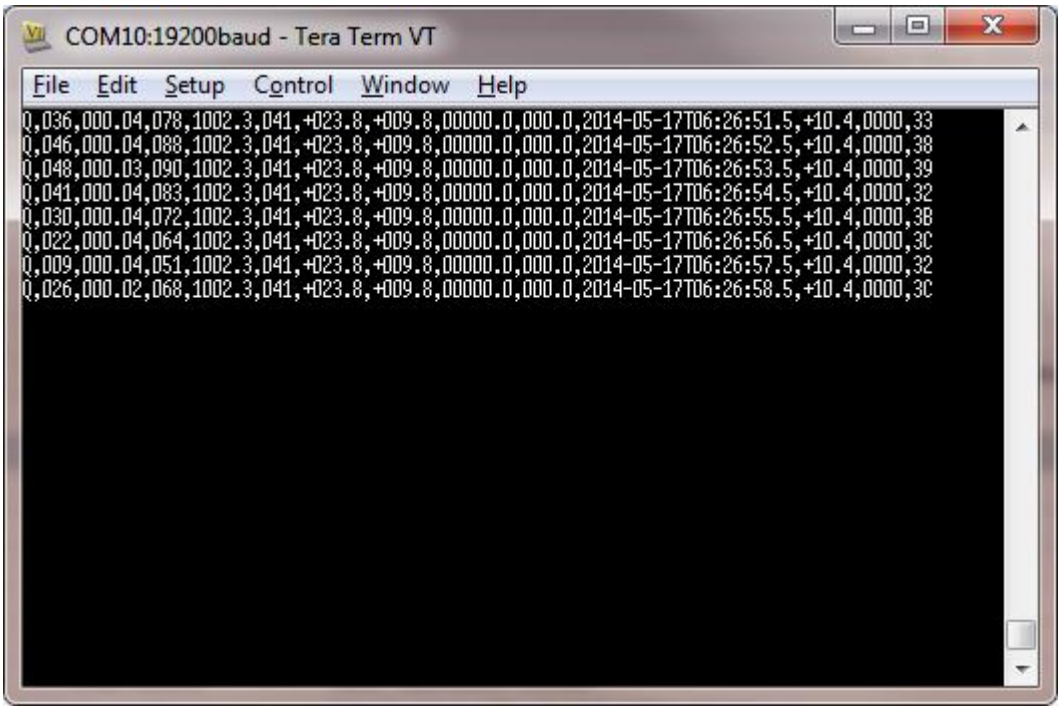
Click on Serial

Change Baud rate to 19200

Click on OK.



Data will be output as follows.



Setting up a logging file

Select **File/Log**.

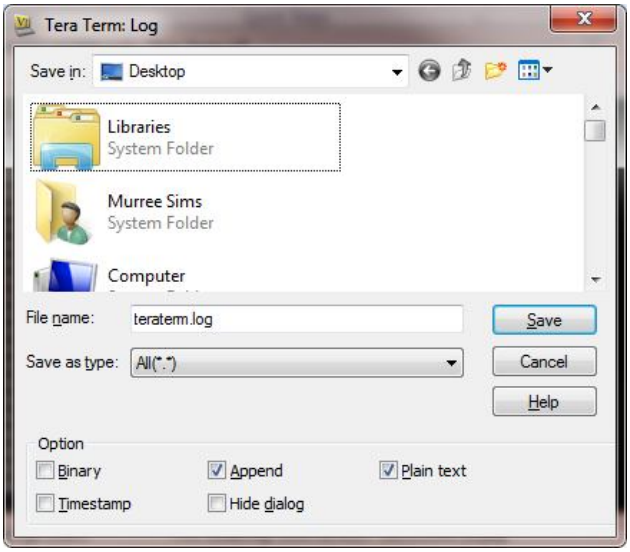
Look in select a log file location.

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

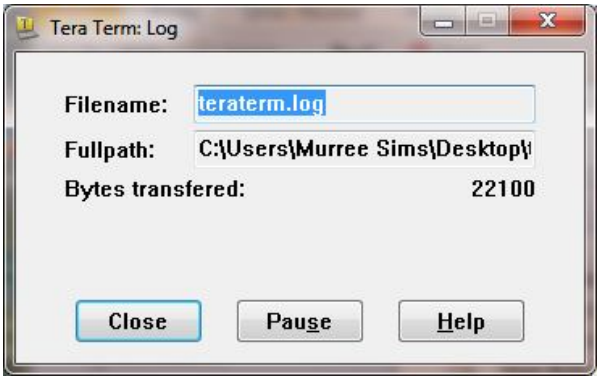
File Name add the name for the file e.g. teraterm.

Tick options as required e.g. Timestamp.

Click on **Save**.



The following dialog box will open on the PC desk top.

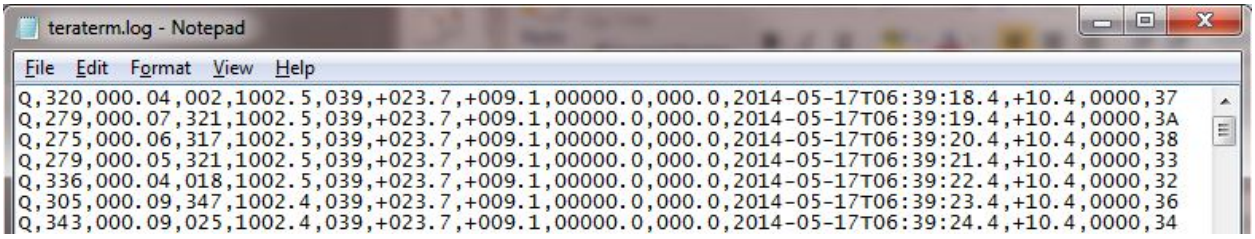


To stop logging

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

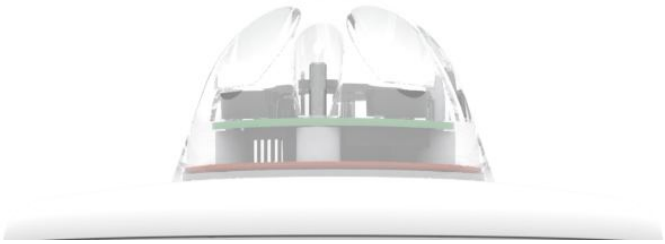
There are no moving parts or user-serviceable parts requiring routine maintenance.

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

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.

Precipitation sensor.



Users/Distributors should clean the plastic 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 recommended the rain gauge sensor should be cleaned every 3 months as a minimum.

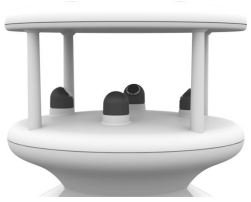
Users can check operation of the rain gauge by performing a simple test of functionality by spraying some water using a mist nozzle similar to that used in many households for watering plants. The MaxiMet rain gauge should register incremental rain fall when sprayed with water.

Compass module.

The Compass device is maintenance free.

If required return the MaxiMet to Gill Instruments to check the Compass operation.

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.

UV Shield (MetSpec)

Ideally the user should try to keep MaxiMet 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.

Temperature, Humidity and Dewpoint

The internal temperature and humidity sensor is not user maintainable or replaceable.
If used in areas of high pollution or marine environments then consideration should be considered to return the unit for maintenance at Gill instruments every 12 to 24 months to ensure proper performance.

Barometer

The Barometer device is located internally and is not maintainable or replaceable by a user.

If required return the MaxiMet to Gill Instruments to check the Barometer calibration.

Calibration

A calibration check can be done by any user/distributor by comparing the values measured by MaxiMet 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 MaxiMet and their test environment/reference they should contact Gill to discuss this and see if a calibration is required.

Returning the MaxiMet

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

Common problems and their solution

Symptom	Solution
No output	Check DC power to MaxiMet, cable and connections. Check communications settings of the MaxiMet 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 MaxiMet.
Corrupted output	Check that the communication settings of the MaxiMet and host system match. Try a slower baud rate. Check cable lengths and type of cable. Check for sources of external signal interference.
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 0000 or A	See Table below.

Sensor Status Codes

Code	Status	Condition
0000	OK	No fault conditions detected in measurement period.
0001	Wind Measurement Fault	Wind Sensor faulty
0010	Temperature Measurement Fault.	Temperature sensor faulty
0020	Dewpoint fault	If Temperature and Humidity are reporting correctly then this code indicates a main pcb fault.
0040	Humidity fault	Humidity Sensor faulty.
0080	Pressure Sensor Warning	Pressure sensor reading not available/unit faulty.
0100	Compass fault	Compass fault

WindStat Codes

Code	Status	Condition
Code	**Status**	**Condition**
0000	OK	No fault conditions detected in measurement period.
0001	Wind Sensor Axis failed	Wind U Axis blocked or faulty
0002	Wind Sensor Axis failed	Wind V Axis blocked or faulty
0004	Wind Sensor both Axis failed	Wind U and V Axis blocked or faulty
000B	Wind Sensor readings failed	Wind Sensor data output fault.
0100	Wind Average Building	WMO wind average building.
0200	Corrected Wind Measurement not available.	Compass corrected wind measurement failure.
A	NMEA Acceptable Data	No fault conditions detected in measurement period.
V	NMEA Void Data	Fault condition detected in measurement period.

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 MaxiMet and change configuration settings (see Para 6.8).

8.5. Bench Test

See Para 4.2.

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.

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	IBM compatible Personal Computer
PCB	Printed Circuit Board
ROM	Read Only Memory
RS232	Communications standard
RS422	Communications standard
RS485	Communications standard
RWA	Road Weather Averaging
RX	Receive
RXD	Received Data
S/W	SoftWare
SDI-12	Serial Data Interface
SEC	SECond
STX	Start of string character
TERM	TERMinal
TX	Transmit
TXD	Transmitted Data
+VE	Positive
-VE	Negative
WRT	With Respect To

9.2. Electrical Conformity

EC DECLARATION OF CONFORMITY ACCORDING TO COUNCIL DIRECTIVE 2004/108/EC

We, Gill Instruments Ltd., declare under our sole responsibility that the products:

MaxiMet Weather Station (GMX200 Variants)
MaxiMet Weather Station (GMX600 Variants)

Manufactured by: Gill Instruments Ltd
Saltmarsh Park
67 Gosport Street
Lymington, SO41 9EG

to which this declaration relates, are in conformity with the protection requirements of Council Directive 2004/108/EC on the approximation of the laws relating to electromagnetic compatibility.

This Declaration of Conformity is based upon compliance of the product with the following harmonized standards:

Emissions: EN61326:2013
Immunity: EN61326:2013

Signed by

A.C.R. Stickland – Director

Date of issue: 27/03/2015

Place of issue: Gill Instruments Limited
Saltmarsh Park
67 Gosport Street
Lymington, SO41 9EG