Real Time Electronic Acquisition & Monitoring

& Human Machine Interface

REAM HMI

Table of Contents

System Overview

The REAM HMI is a user-friendly data acquisition system that reads and displays data from electronic sensors. Data is recorded on solid-state Compact Flash memory and remote monitoring of the data is enabled.

The system is made of two main parts, REAM is a microprocessor based data acquisition board, which collects data from electronic sensors, digitise the readings, and supply the appropriate excitation voltage to the sensors. The HMI communicates with the REAM board to retrieve, display, and store the data.

The REAM board has 4 analogue channels, 2 counters (frequency), and 1 quadrature channel. The number of channels is doubled in the case of a double REAM (two REAM boards). The analogue channels accept output signals from sensors with 0-5 vdc, 0-10 vdc, or 0/4-20 mA. The counters accept pulse signals produced from proximity switches or magnetic pickups (with amplifier). Finally, the quadrature channel accepts quadrature signals (up/down counter such as depth).

HMI can communicate with up to 4 REAM boards simultaneously in addition to many other controllers or data acquisition modules. The outputs are available on Web Pages, which mean that they can be viewed remotely on a Local Area Network (LAN) or even a Wide Area Network (WAN), provided that proper Internet connections are available. This later feature means that the data can be viewed simultaneously from several terminals. There are many other features in the HMI and these can be tailored to client's request.

System Description

The picture below describes the various components of REAM HMI.
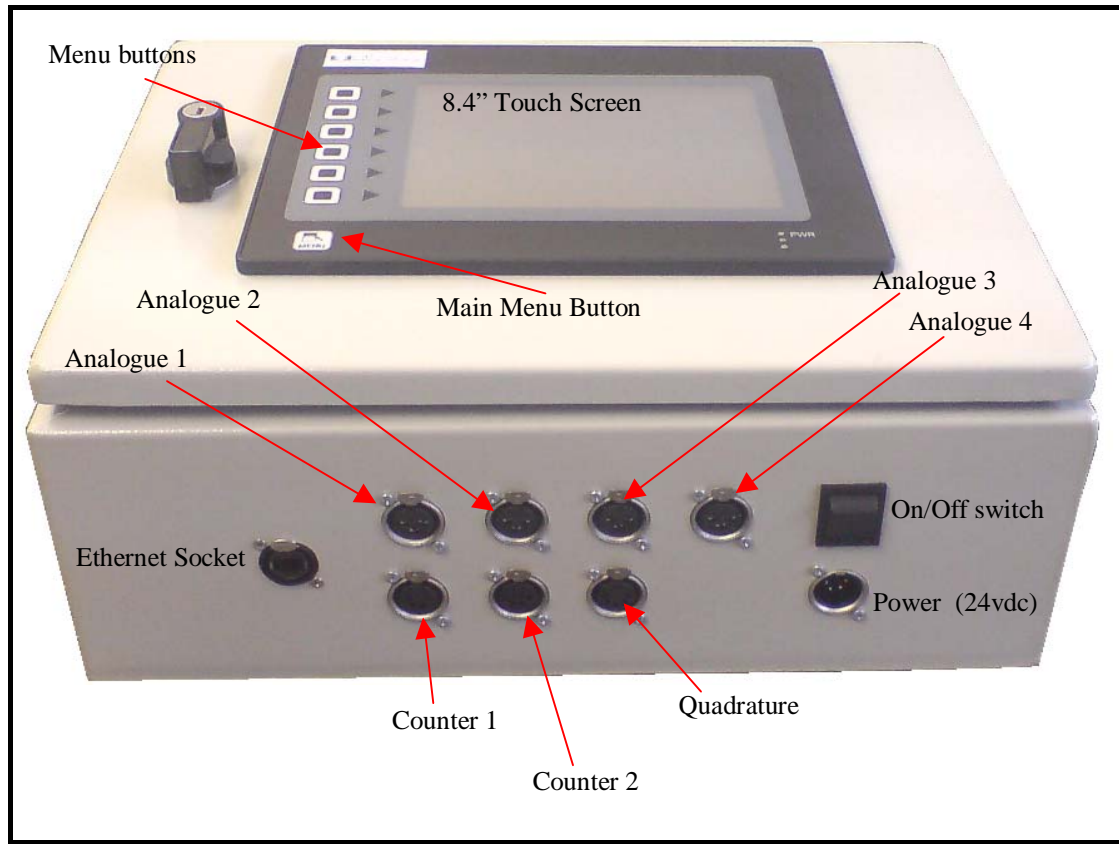
Channel Assignment

Measured Parameter	Assigned to
Weight Indicator	Analogue 1
Light Weight	Analogue 2
Wellhead Pressure	Analogue 3
Circulation Pressure	Analogue 4
Fluid Flow	Counter 1
Nitrogen Flow	Counter 2
Depth/Speed	Quadrature

Note that the rates (flow rate, N2 rate, and speed) are computed by the system automatically. There are no special channels for the rates; they use the same channels as for the Fluid Total, N2 Total, and Depth.

Default System Settings

On shipping, the default values are:
- Date and Time: As per the UK date and time.
- ADC channels (Analogue to Digital Convertors):
  - Gain: Unity.
  - Offset: Zero.
- Pulse counters (frequency channels) and quadrature: K-factor = 1.

Accessing the System

REAM HMI starts by displaying the default web page. To access the other pages in the REAM HMI use the buttons on the left hand side of the touch screen.

The default page shows MEDCO's logo and a Welcome message, including the HMI software version. In addition, the system IP Address, Subnet Mask, Gateway, date and time are shown as well as the data stream from REAM. This page can always be accessed by pressing the top button.
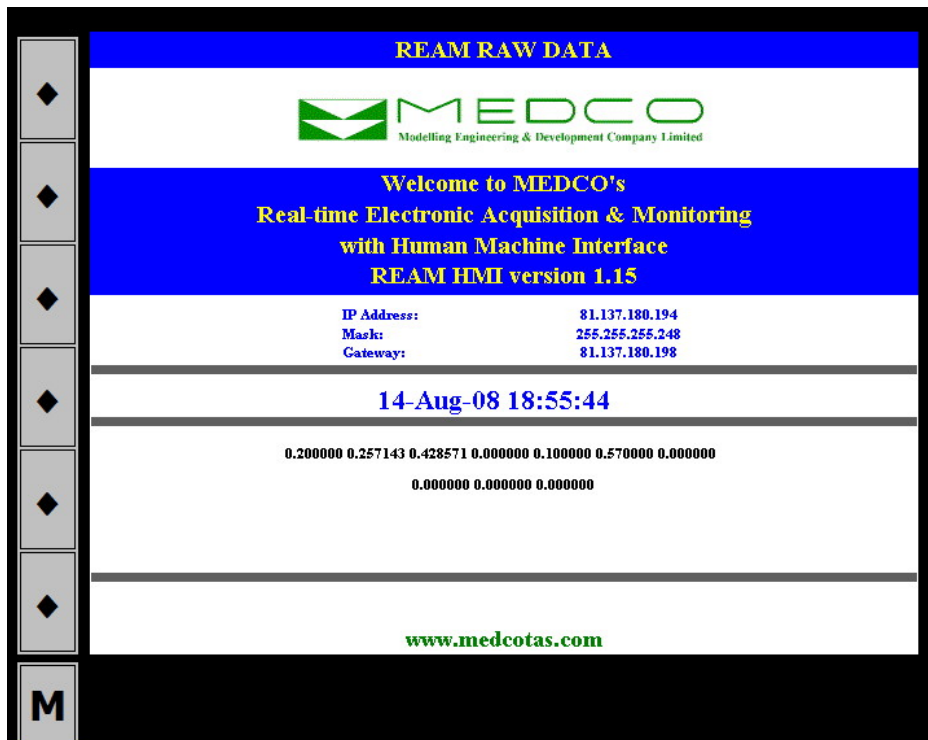
REAM Raw Data Page

This page displays some important information. The information shown is as follows:
- Software version: In the picture above, the current version is 1.15.
- Ethernet settings: These are the current Ethernet settings, including the *IP Address*, *Mask*, and *Gateway*. To change the Ethernet settings, refer to the MAIN MENU – Set Ethernet Port.
- The system current Date and Time.
- Raw Data: The raw data is that received by the HMI from the devices attached. For example, in the picture above the system is only communicating with one REAM board and the data displayed represent the 4 analogue channels, followed by the counters and quadrature totals (divided by 100) on the first line, and on the second line the rates of the counters and quadrature per second. Note that the data here is not calibrated.

   If a second REAM board is included in the system, then another two lines of raw data will be displayed here.

   Also, if an ovality monitor is included then the data from the Laser Head will be displayed too.

Displaying the Data

The second button is used to display the data page. This page will display the parameter names, current values (adjusted according to calibration data), and units.
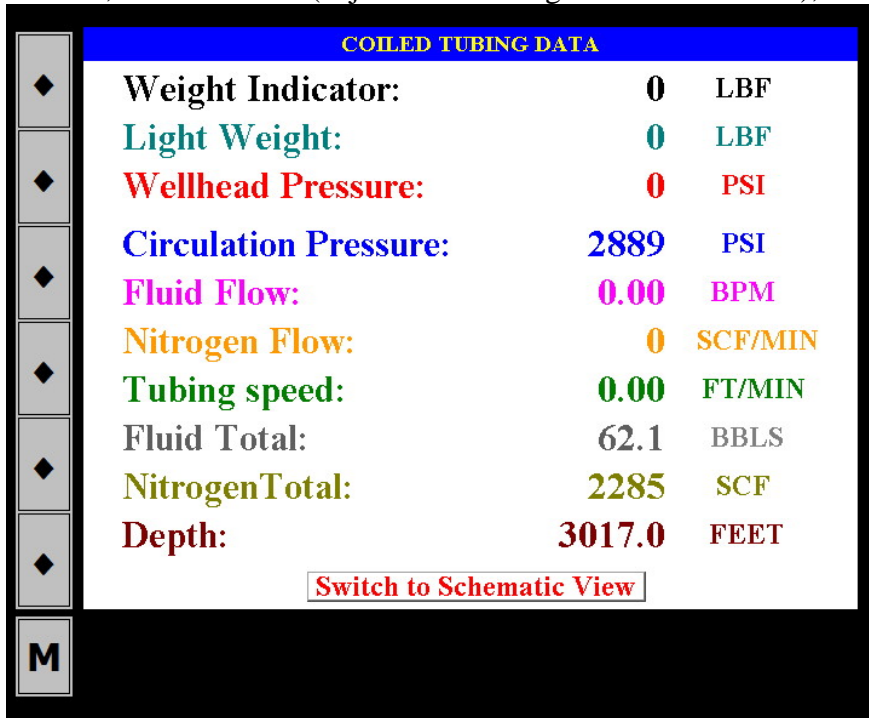
Display Schematic

A schematic can be displayed by selecting the third button, or in the case where the Ovality is turned on, this page can be accessed using the "Switch to Schematic View" button. This will show the same data as the page above but in a schematic format rather than a tabular format. The gauges scales are determined in the MAIN MENU – Change Units section.
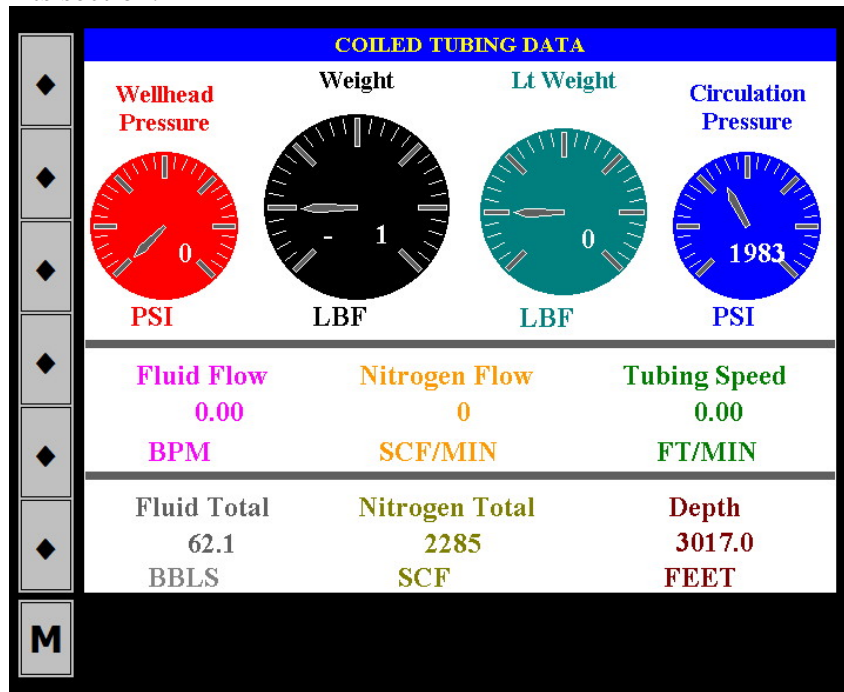
Resetting Counters/Quadrature (depth)

The fourth button will display a page dedicated to resetting counters and/or quadrature (depth). The actual value will be shown on the left-hand-side column while the user can enter the new value on the right-hand-side column. To zero the weight at the start of a coiled tubing job, click the *Zero Weight* button.

Real Time Graphs

The fifth button will display a real time graph the width of which is fixed to 4 minutes. The Y-axis scales are determined in the MAIN MENU – Change Units section.

Data Logger and Comments

The sixth button will display a page dedicated to turning on/off data loggers and adding or editing comments.

There are two data logs that can be created by the REAM HMI. A One-Hour log will have files of a maximum length of 3600 records, thus will record data every one second for one hour. The naming convention of the files is "yymmddhh.csv", where *yy* represents the year, *mm* the month, *dd* the day, and *hh* the hour. The One-Day log will have a maximum length of 86400 records, which is the number of seconds per day. Again, the naming convention is similar to that of the One-Hour log.

The data logs are stored in ASCII formatted files (text files) with comma separators; hence the file extension will be "csv" (Comma Separated Values).

Note that the data logs are stored on the CompactFlash. There is a limit of 200 files of the One-Hour log, which corresponds to more than one week, and 10 files of the One-Day log, clearly corresponding to 10 days. If the CompactFlash is full, then the older files will be automatically removed to make room for new ones. However, it is probably a good practice to copy the files to a computer for safe storage and make room on the CompactFlash. This does not need to be done too frequently, but once a week or every two weeks will be sufficient and depending on how often the system is used.

The data is captured once per second and stored in the system memory (in a buffer), then written to the CompactFlash card once every two minutes. When the system is writing to the CompactFlash, the amber LED will flicker, indicating that the writing is taking place. It is important to know this because at the end of usage it will be necessary to wait until the amber LED stops flickering indicating the end of the writing, otherwise data since the last *Write* will be lost.

Comments

If the "Add or Edit a Comment" is clicked, then a COMMENTS page will be displayed. The comments can be used to generate a "summary report" while logging data. To speed up the comment's entries, a list of up to 20 user defined comments are stored in the system, thus enabling the user to enter the comment by simply clicking a button.

Thus, this page has two uses; the first is to add comments to the logs (any log that is On will have the comments). To add a comment, for example "PUMPING WATER" the user will need to click blue button (3) until the comment appears in the "Current Comment" field, then click the BLANK button (otherwise the comment will keep repeating throughout the log).

The second purpose is to Edit the existing pre-defined comments. To edit an existing comment, click the red field that has the comment or use a blank red field to add a new comment, a pop-up window will appear for writing the comment.
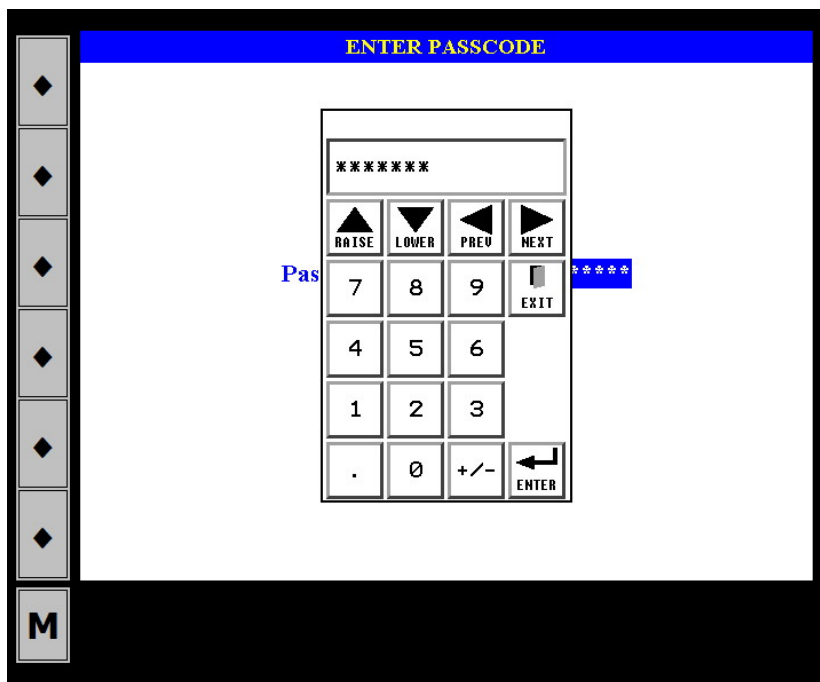
Main MENU Button

When this button is selected, the user will be prompted to enter the password. The password is "290992" which can be easily remembered as the date MEDCO was founded.

By pressing on the password a popup numeric keyboard will appear which can be used to enter the password.

Once the correct password has been entered, another screen will appear with some more options.
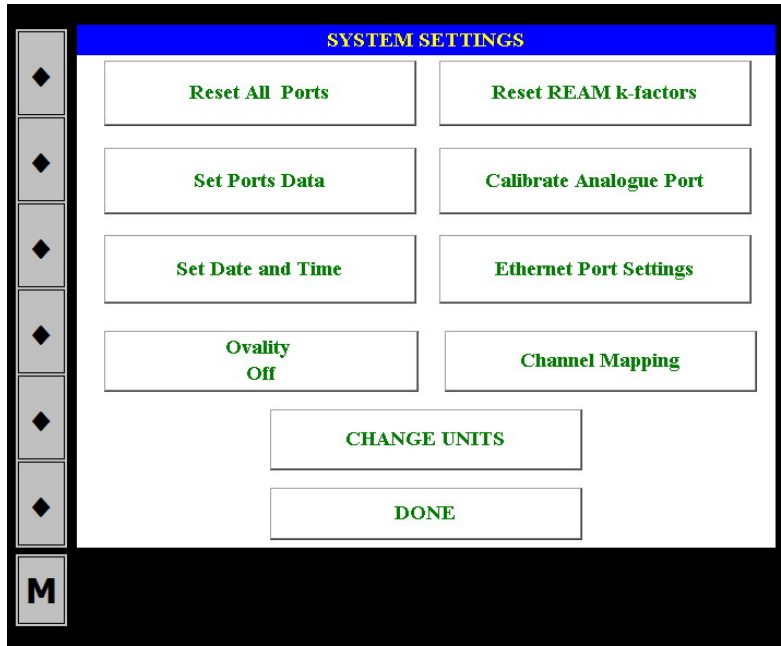
Reset All Ports

This will reset all the ports (channels) to have a gain or K-Factor of unity (1) and an offset of zero (0).

Set Ports Data

The page will display the settings of the analogue, counters, and quadrature channels. The user can make the necessary changes here. Note that if calibrations of analogue channels are done then the gain and offset of analogue channels will change to display the values obtained from the calibration process.

You can change the analogue channel type in the Port Settings Page. The available types (i.e. the output signal from your sensor) are as follows:

       0 = 0 – 5 vdc
       1 = 0 – 10 vdc
       2 = 4 – 20 mA

For the counters and the quadrature channels, you only need to change the K-factor. If you already know the K-factor, for example from the manufacturer of the sensor, then you can enter the value directly. There is no need for a K-Factor for "rates", as these are the same as the K-Factors for the total. The HMI software will compute the rates per minute, for example if depth is in "feet" then speed will be "feet/min".

For example, if your quadrate encoder (for measuring depth) produces 600 pulses per revolution and each revolution represents 2 ft of depth, then the K-factor for depth would be $600 \div 2 = 300$.

If, on the other hand, you do not know the K-factor for your sensor, then you will need to calculate the K-factor using the following procedure:
1. Ensure that the counter/depth channel has a K-factor of unity.
2. Ensure that the channel reading is zero. If necessary, reset the value to zero.

3. Physically, apply a known total. Example: If this a depth channel, then turn the sensor for a known number of revolutions (has to be exact) then calculate the equivalent depth in ft or meters. If this is a flow total channel, then pump a known quantity of the fluid/gas.

4. Take note of the channel final reading. This is the number of pulses that your sensor will produce for the physical quantity. The K-factor is thus calculated as (Number of Pulses, i.e. final reading) ÷ (Physical quantity). Example: If you pumped 2 barrels of water and your channel reading is 4600, then your K-factor is $4600 \div 2 = 2300$ (pulses per barrel).

REAM PORT SETTINGS			
Analogue Channels	**Offset**	**Gain**	**Type**
Weight Indicator	- 1.81883	12.32007	1
Light Weight	- 0.11358	0.79507	1
Wellhead Pressure	0.00000	0.79580	1
Circulation Pressure	- 0.54836	1.71872	1
			Update Type
Counter/Frequency Channels	**K-Factor**		Types 0 : 0-5V
Fluid Total	28.00000		1 : 0-10V
Nitrogen Total	0.20000		2 : 4-20mA
Depth	- 300.00000		
	DONE		

Reset REAM K-Factors

This button will re-set K-Factors of the counter channels to unity. Use this button to reset only the counters and rates without changing the settings for the analogue channels.

Calibrations

Analogue sensors produce an electrical signal proportional to the physical input. This sensor response is only valid within the range specified for the sensor. For example, a pressure sensor could have a range of up to 400 bars (5,800 psi), this implies that the sensor will have a linear response between 0 to 5,800 psi, outside this range the sensor may produce an output but there are no guarantees that this response is accurate. Further, the sensor will generally have a maximum pressure beyond which physical damage will occur.

To interpret the sensor signal, a calibration procedure is required. In essence, the procedure is required to determine a mathematical relationship between the sensor output and the physical quantity being measured. Most commonly, the response is linear, thus the mathematical relationship will be a straight line. This procedure only need to be carried out once in a while, which, generally speaking is due to change in component characteristics.

The figure below shows an example of an output response from a typical pressure sensor. The sensor has a range of 0 to 5,800 psi, and the output signal reported by the REAM board will range from 0 to 1,800. Note that the output has no units of measure, i.e. just a number. In this example, we can work out the *Gain* and *Offset* manually as follows:

$$Gain = (5,800 – 0) / (1,800 – 0) = 3.22$$
$$Offset = 0$$
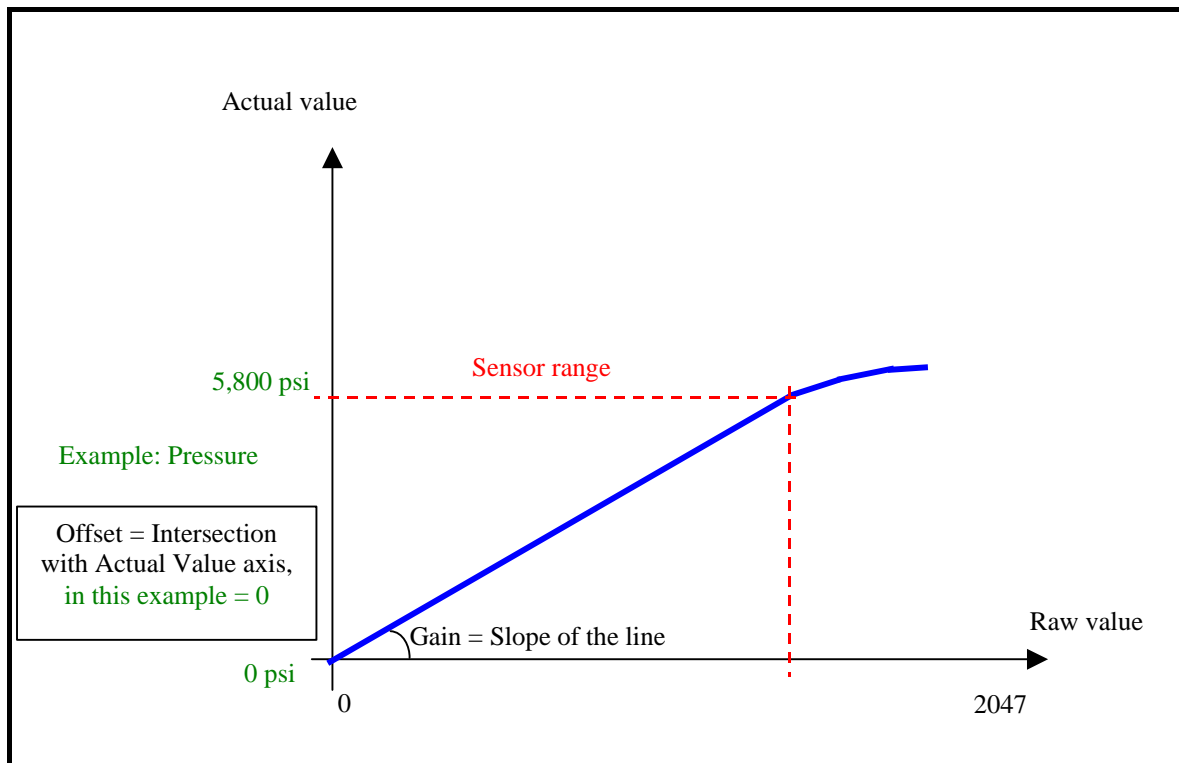
To perform a calibration in the REAM HMI, the user must supply channel number and two actual (reference) values. The system will provide the raw values then compute the gain and offset and if acceptable, then the user can SAVE these values to be stored. For counters, see Set Ports Data.

A typical calibration procedure will utilize two physical readings that are easy to apply, easily verified, and as far away as practically possible (within the specified sensor range). For example, for a pressure sensor;

1. Apply the first reading of say 0 psi, very easy to apply, wait until the "Current Raw Value" becomes steady, enter the Actual Value, then click the button "Click here to Read First Value".

2. Then, apply the second reading, say 3,000 psi. Again, wait until the "Current Raw Value" becomes steady, enter the Actual Value, then click the button "Click here to Read Second Value".
3. Note that the Raw Values will be automatically shown in the Raw Value column.
4. Click the COMPUTE button and the REAM HMI will compute the GAIN and OFFSET and will display the computed values.
5. If satisfied, click the SAVE button to save the data in the system settings. Remember not to switch off the HMI until the Amber LED has completed blinking indicating saving data to the Compact Flash.

Set Date and Time

If the HMI date and time need to changed, then use this option. A popup window will appear showing the system current date and time. To alter the date, click on the date and then enter the new date, and similarly for the time.

Another popup window will appear, to start making changes, click the ENTER button first then use the up/down arrows to increment or decrement the values, and use the left/right arrows to move to next/previous field.

Set Ethernet Port

This button will display a page with the Ethernet settings. Should only be used if it is necessary to change these setting. The reason for this is that the system will restart itself automatically. Users should avoid changing the Ethernet settings frequently.

The REAM HMI is shipped with a default IP Address of 192.168.1.10, Subnet Mask 255.255.255.0 and Default Gateway 192.168.1.1. These addresses will be valid in the case of using a router, as most routers will have a default IP address of 192.168.1.1. Note that all the numbers will range from 0 to 255.

If using the REAM HMI with a direct connection to a computer, a crossed Ethernet cable should be used. The crossed Ethernet cable is normally supplied with the REAM HMI system when shipped. The IP addresses should conform to the rules of a local area network, that is they should start with 192.168 and the following can be either 0 or 1 then a different number for the computer than that for the HMI. It is recommended that the HMI takes an IP address of 192.168.1.10 and the computer can be 192.168.1.11. The default subnet mask is 255.255.255.0, and there is no need to worry about the default gateway.

If a local area network (LAN) is used with a router, wired or wireless, then you will need to ascertain that the default gateway is properly entered. Consult your router manual to find out the appropriate gateway, most likely 192.168.1.1.

For use in a wide area network (WAN), IP Service provider will provide a range of IP addresses that are valid. WAN settings will require a competent IT/Networking technician to configure.

16
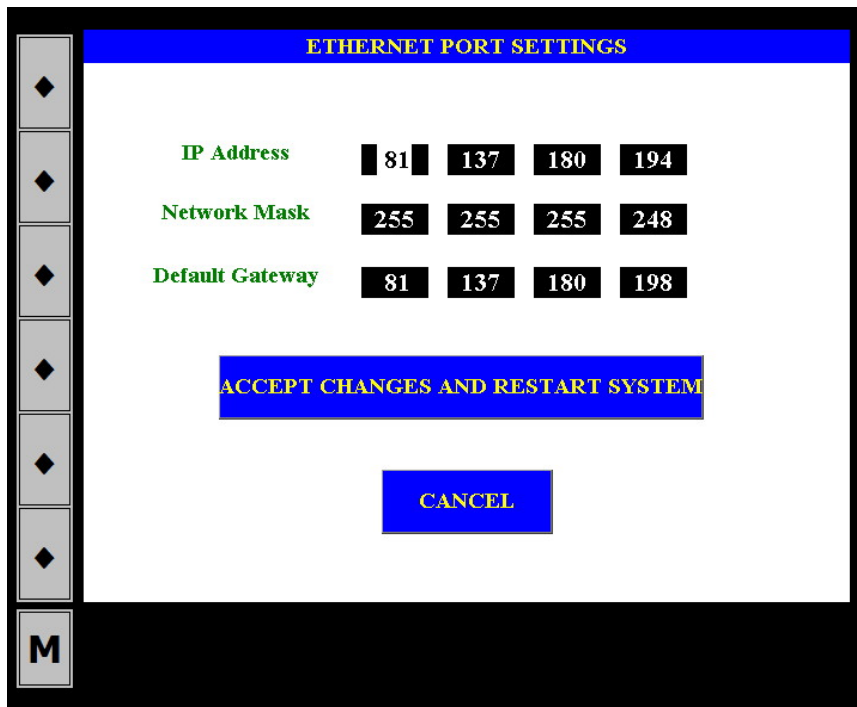
Ovality On/Off

This is a flag (Boolean), which will turn on or off the ovality. If you do not wish to have ovality included, then ensure that this button reads "Ovality Off", and vice-versa.
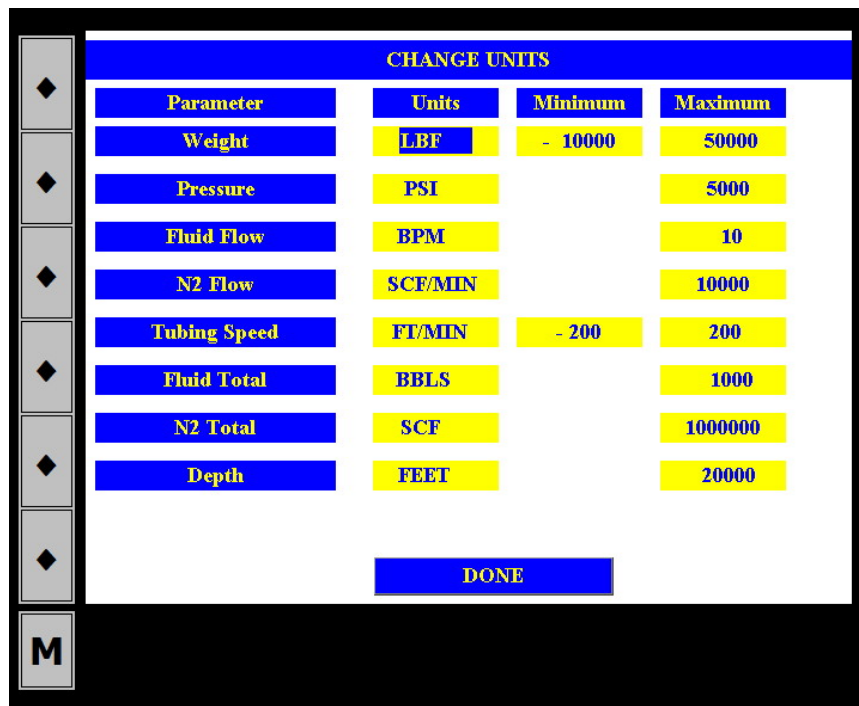
Channel Mapping

This option should only be used if it is desired to change the channel assignments. It is also possible here to turn on/off the second REAM board. Users are advised to consult with MEDCO before making changes here.

Change Units

For users in different world locations, it is possible to change the units of measure for any or all the parameters, as well as changing the scales for the real-time graph and schematic display. Note that the system will not change the calibration data to reflect any changes made here, it assumes that the calibrations and settings are appropriately set by the user using the appropriate measure units. For example, if the user calibrates the Weight Indicator while using LBF as the units of measure, then changes to KgF, then the Weight Indicator channel should be re-calibrated.

By default, the system will be set in API English units, and the scales will be those shown in the picture below.

CHANGE UNITS

Parameter	Units	Minimum	Maximum
Weight	LBF	- 10000	50000
Pressure	PSI		5000
Fluid Flow	BPM		10
N2 Flow	SCF/MIN		10000
Tubing Speed	FT/MIN	- 200	200
Fluid Total	BBLS		1000
N2 Total	SCF		1000000
Depth	FEET		20000

DONE

System Memory

REAM HMI has a 512 or 1024 Mbyte CompactFlash memory that is used for storing data. The data storage is done automatically at a once per second sampling rate. The maximum length of time for continuous recording of data is variable and depends largely on the number of logs being used.

Communication

The user can access the data in REAM HMI using the IP Address of the system. The IP Address, subnet mask, and Gateway information can be found on the *Default Page*. The user can access the pages simply by typing the IP Address in the address bar of a web browser, example in Internet Explorer. The default html page is "auto/001/", which is used to display the actual data. Other programs, such as DART software, to capture the data from the HMI, use this page "auto/001/".

A local area network has to be present to enable browsing the pages. The RJ45 cable supplied with the system is crossed, meaning it connects directly to a computer (laptop). However, if a router is used, then a straight RJ45 cable should be used (can be bought from most computer stores).
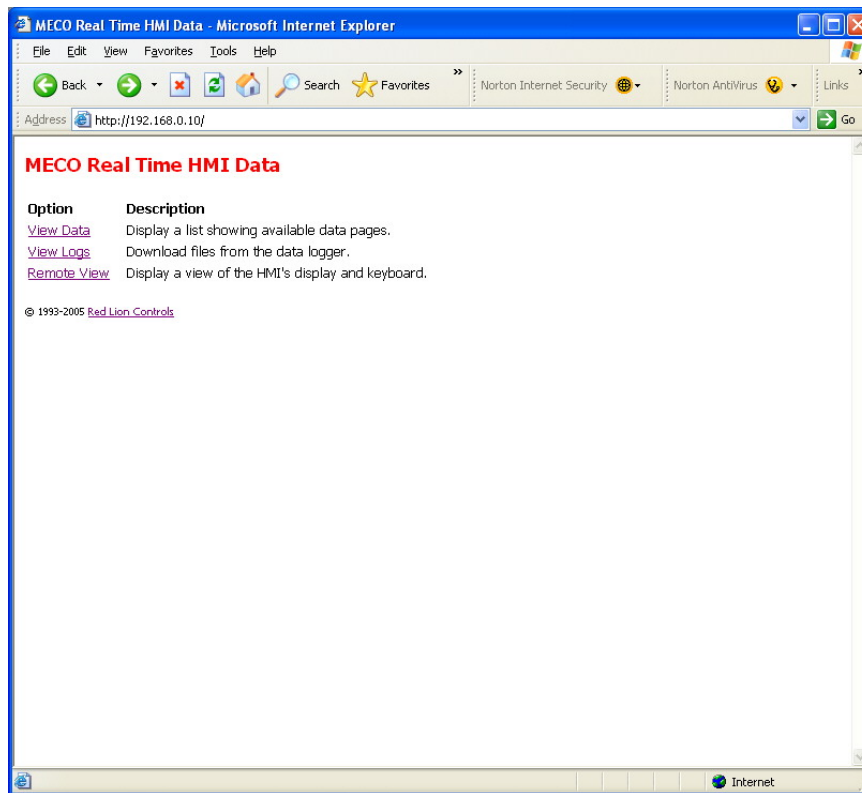
The first page that will appear will have the following hyperlinks:
- View Data: Will display raw data with raw variable names. This is not meant for end users, it is meant for transmitting data to other devices capable of logging data through TCP/IP, example DART software on a laptop.
- View Logs: Will display all the data logs available. Onehour will contain all the one-hour long files. The files format is Comma Separated Variables (extension CSV) and this can be opened directly by Microsoft Excel. The log files follow a naming convention, which is made up of the year, month, day, and hour. Each file contains 1 hour worth of data as a maximum. The CompactFlash memory can hold anything up to 200 files (more than a week worth of data recorded from all channels at 1 per second). The other logs available are the Oneday and Ovality. For the one-day logs, a maximum of 10 files are stored, while for the ovality, 100 files.
- Remote View: Gives access to all the pages described earlier in this manual. The current page being displayed on the HMI is the page that will be shown.

Updating the HMI Software

Occasionally, MEDCO will release new versions of the HMI software. One of the major advantages of the HMI hardware is that it may be easily re-programmed or updated. The following is a step-by-step procedure for updating the HMI software:
1. Ensure that you have a copy of all your system settings, such as Gains, Offsets, and K-Factors.

2. Ensure that the REAM HMI is switched off.
3. Remove the Compact Flash card. Ensure that you remember the card's orientation, this will help you when re-inserting the card back into the HMI.
4. Insert the Compact Flash card into the card reader supplied with the system.
5. Connect the card reader to your computer (USB port).
6. Download the new software version from MEDCO's web site by going to http://www.medcotas.com/reamhmi.htm. Look for the latest version, download it to your computer and remember where you saved it.
7. The new software files will be packed together in Zipped file. Extract all the files to the root folder of the Compact Flash.
8. Ensure that you stop the card reader, then disconnect the card reader from the computer.
9. Remove the Compact Flash card from the card reader and insert it back into the HMI.
10. Power up the HMI, you will see a message "Loading from CF", wait until the system starts then wait for at least two minutes to allow the system to write to the Compact Flash.
11. Note that you may need to re-configure the system, for example, your old calibration data may be lost. Here, we deliberately say that you MAY need to re-configure the system because if the changes in the software are significant from the version that you already have, then there is a good chance that some of the settings will be lost.
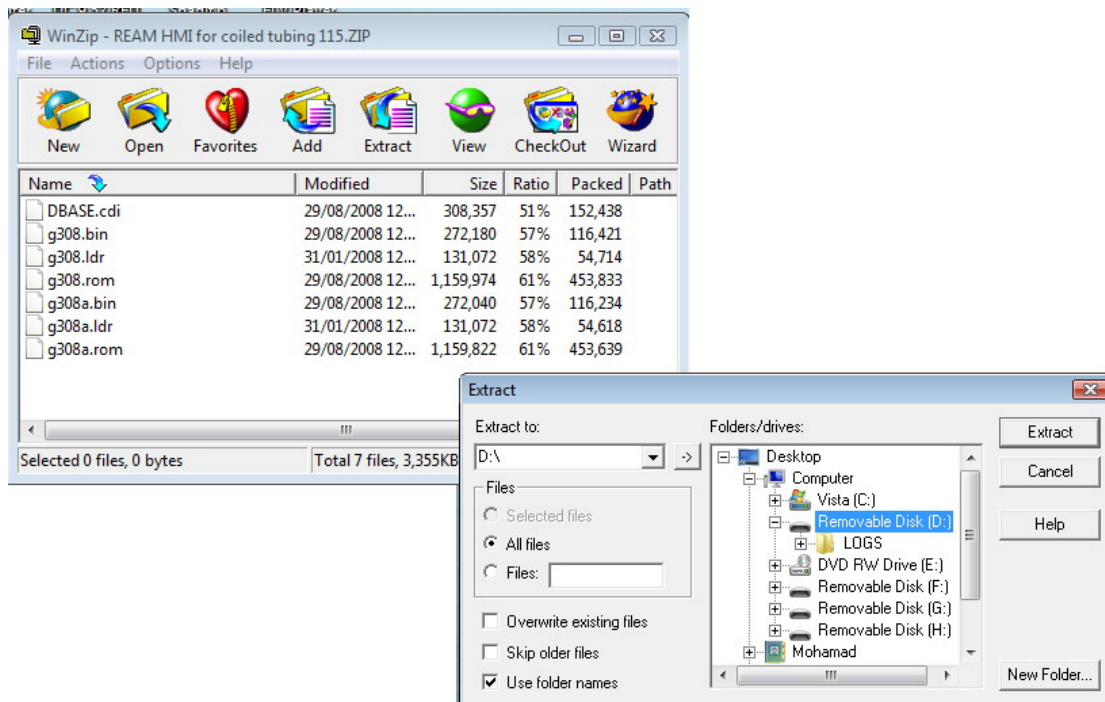
Power

REAM HMI is operated by 24 vdc power supply. The system comes with an AC to DC converter, which takes 95-250 VAC and outputs 24 vdc up to a maximum of 3.5 Amp.

To connect the system directly to a 24 vdc battery, use pin 1 for the +24vdc and pin 4 for the ground on the 4-way connector.

Power
connector
to HMI

1 2

REAM board

+24 vdc ◯ ◯ Ground

1
+24 vdc

4
Ground
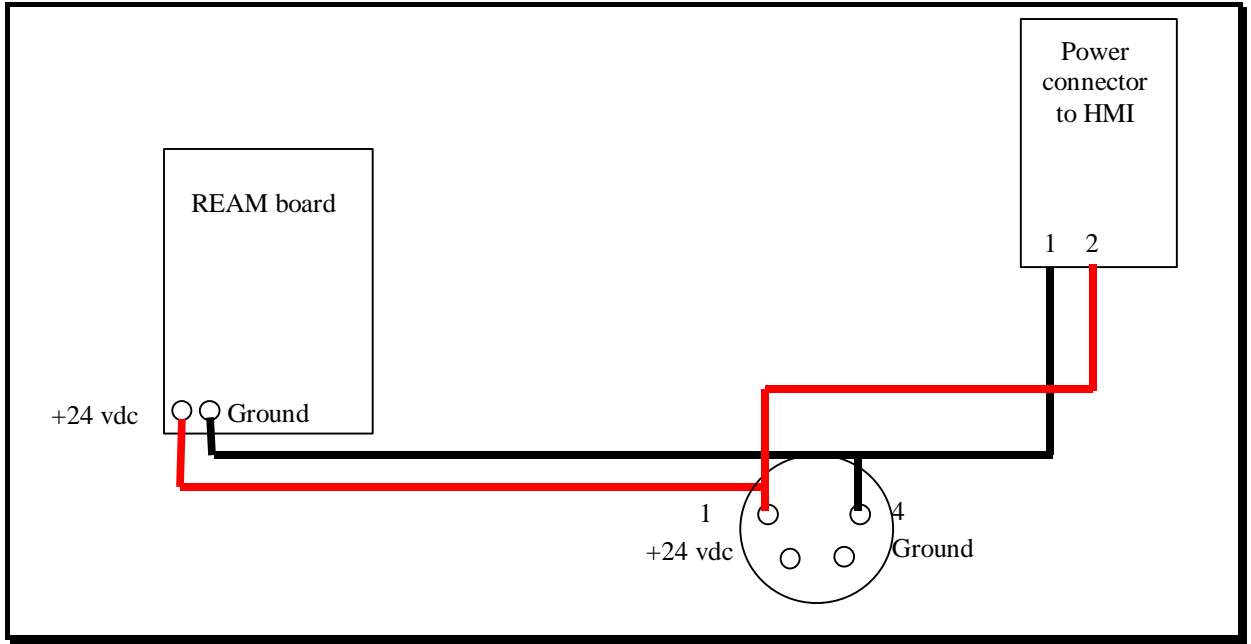
Wiring Diagram for Power

21

Sensors

Shaft Encoder

Quadrature Optical Encoder (Shaft encoder)
(Part No. 01001)

Specifications

Pulses per revolution: 600
Operating Voltage: 5 – 24 vdc
Mounting: Flange mount 1.181"
Shaft size: 3/8"

Connectors for Shaft Encoder Cable

Connector - data collection unit side
(Part No. 08154)

Connector - sensor side
(Part No. 01003)

The wiring of shaft encoder cable.

A	White wire – signal A	5
B	Black (1) – Signal B	4
C		3
D	Red wire - Power	2
E		
F	Green - Common	1

Connector to Sensor

Connector to Data Collection Unit
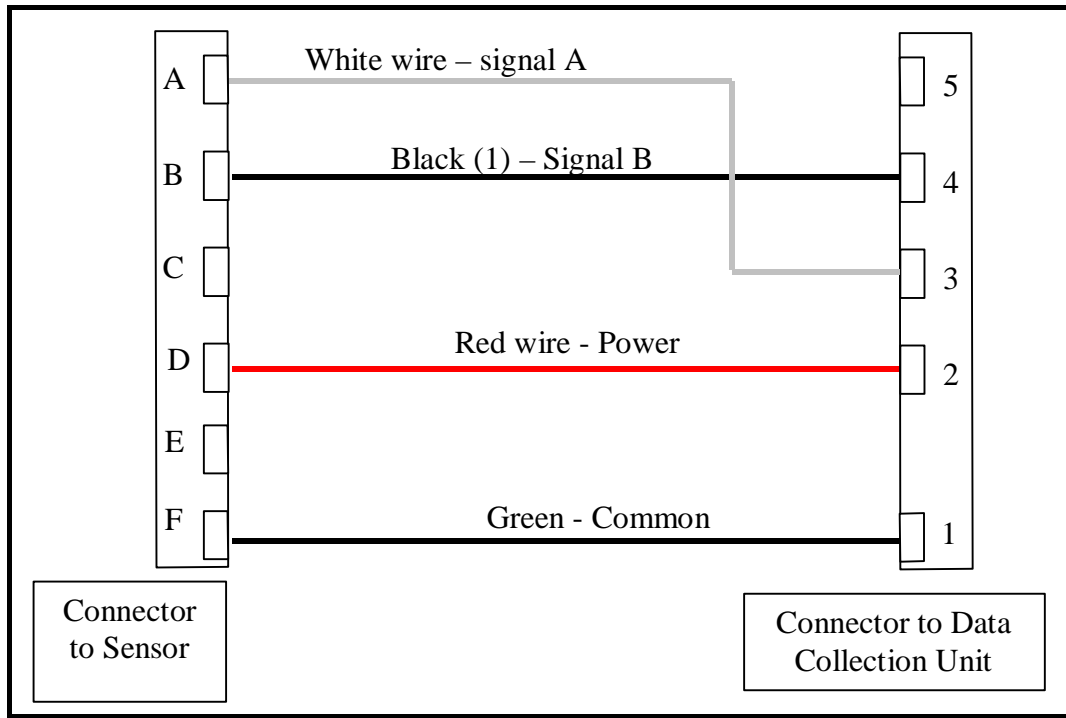
Wiring diagram of cable for shaft encoder (20m)
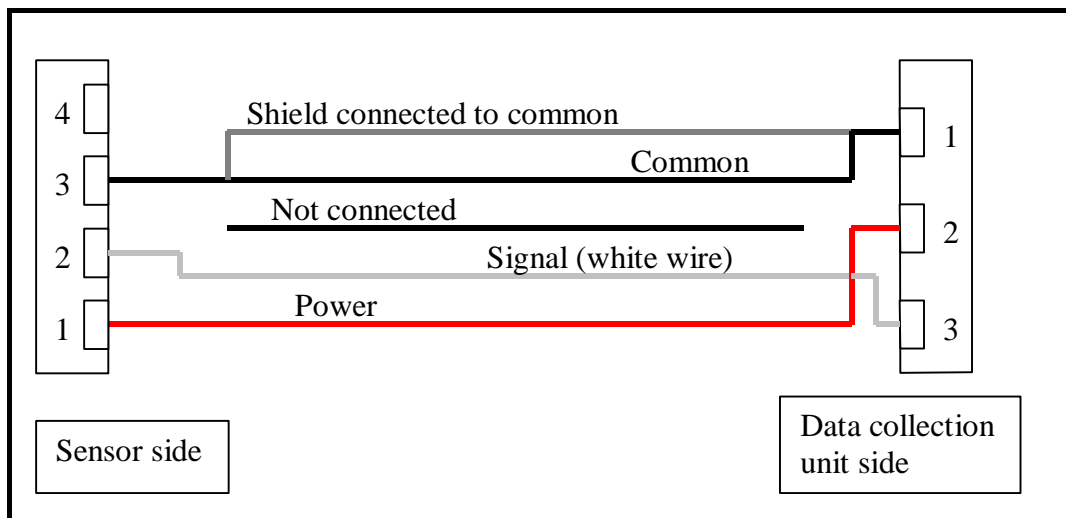(Part No. 10022)

Pressure Sensors

MEDCO supplies one of two types of pressure sensors. Both types utilize the same connection on the data collection unit side and the wiring diagram is the same.

Electrical Connection for Pressure Sensors

Connector - data collection unit side
(Part No. 08152)

A 3m cable is normally supplied with these sensors. The electrical wiring diagram is shown below.

(Part No. 10025 for Pressure sensors 04004, 04005, and 04006)
(Part No. 10026 for Pressure sensor 09001)

A.   MEDCO's part number: 04004, 04005, and 04006:

Specifications:

Part No.	Output	Measuring Range	Operating Voltage	Temp. Range	Protection	Mechanical Connection
04004	0-10 vdc	0-100 bar (0-1450 psi)	18-30 vdc	-25 to 80 °C	IP67	G ¼" Female
04005	0-10 vdc	0-250 bar (0-3625 psi)	18-30 vdc	-25 to 80 °C	IP67	G ¼" Female
04006	0-10 vdc	0-400 bar (0-5800 psi)	18-30 vdc	-25 to 80 °C	IP67	G ¼" Female

Pressure sensor type – A
(Part No. 04004, 04005, and 04006)

Connector - pressure sensor (type A) side
(Part No. 04002)

B. MEDCO's part number 09001:

Specifications:
Output:	0-5 vdc
Measuring range:	To client's requirement, up to 15,000 psi
Operating voltage:	18-30 vdc
Temperature range:	-29 to 94 ^{o}C
Protection:	
Mechanical connection:	G ¼" Female

Pressure sensor type – B
(Part No. 09001)

Connector – pressure sensor (type B) side
(Part No. 08128)

Proximity Switch

Proximity Switch Sensor
(Part No. 04007)

Specifications:
|	
Operating voltage:	10 – 36 vdc
Current rating:	250 mA
Switching frequency:	800 Hz
Temperature range:	-25 to 80 ^{o}C

Thread size: M12

Electrical Connection for Proximity Switch:
The proximity switch comes with a short cable and a 4-way in-line sensor plug connector.

Connector for Proximity Switch
(Part No. 08153)

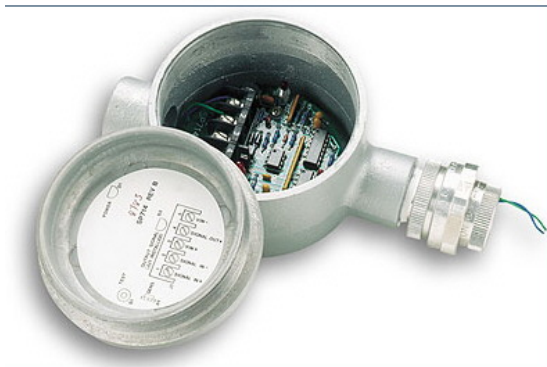The wiring inside the connector is as shown in the diagram below.
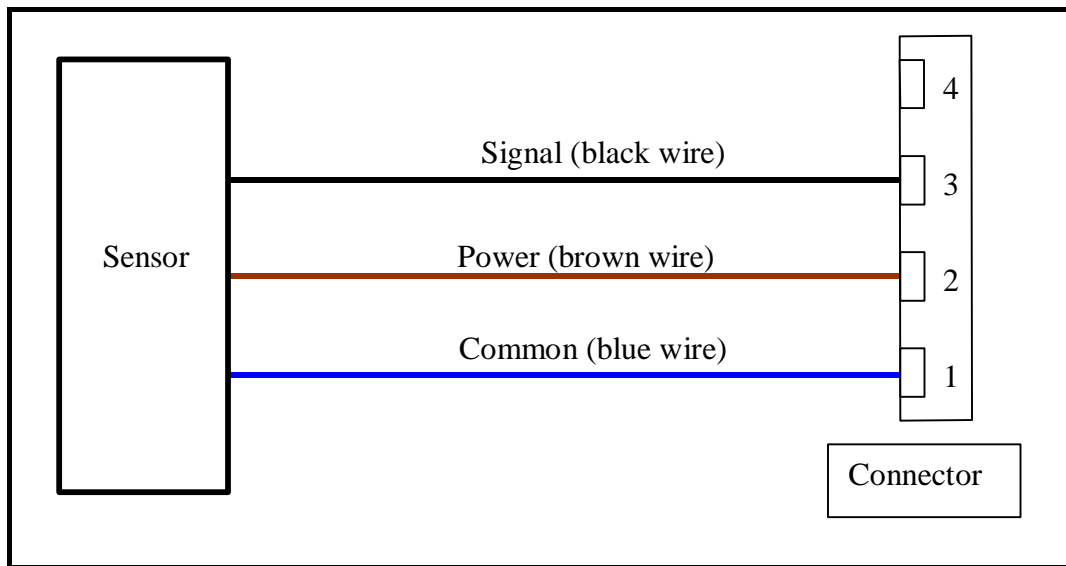
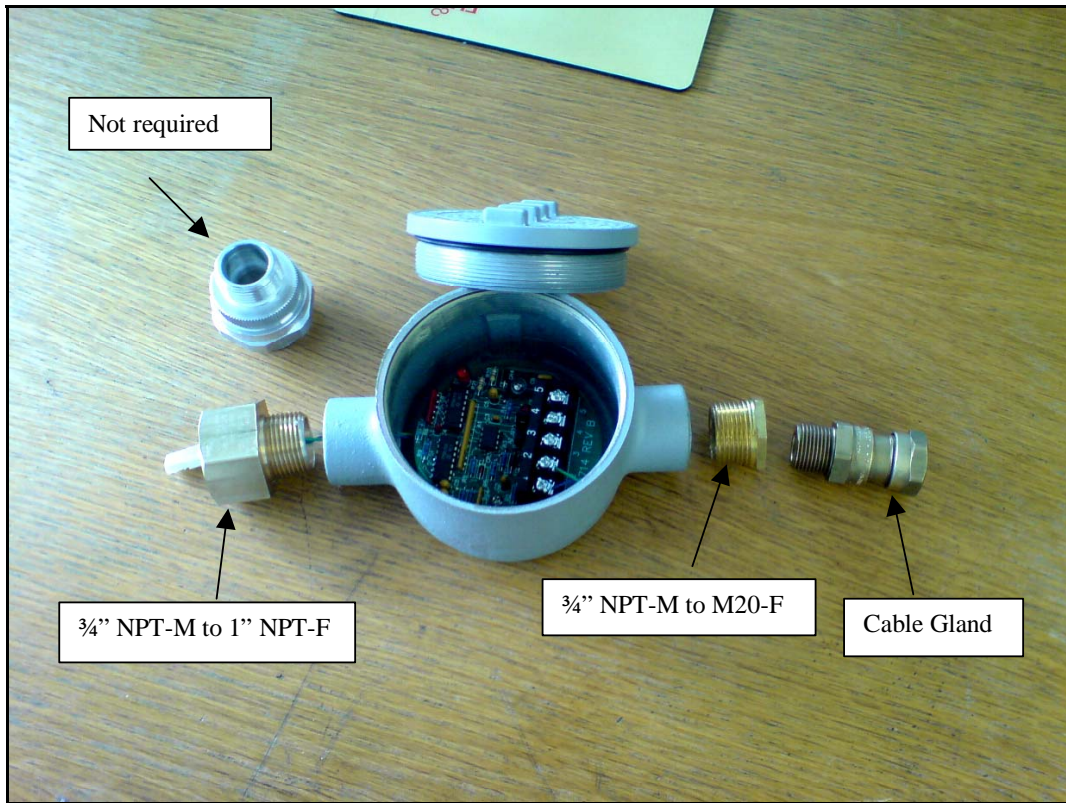Wiring diagram for proximity switch
(Part No. 10017)

Magnetic Pickup

Magnetic Pickup Sensor
(Part No. 16002)

Magnetic Pickup Amplifier

The magnetic pickup amplifier shown above is supplied with the following adaptors:

1. ¾" NPT-M to 1" NPT-F. This adaptor is to be used to connect the amplifier to the flow meter.
2. Wires connector: The wires connector connects directly to the magnetic pickup sensor. Most likely, the blue wire should connect to the left pin of the magnetic pickup when viewing the magnetic pickup pins with the alignment notch on the topside. If no signal is received, then reverse the connection.
3. ¾" NPT-M to M20-F: This connector is used to connect the amplifier to the cable gland.
4. M20 Cable Gland: Use this to hold the cable and stop it from rotating.

Magnetic Pickup Amplifier
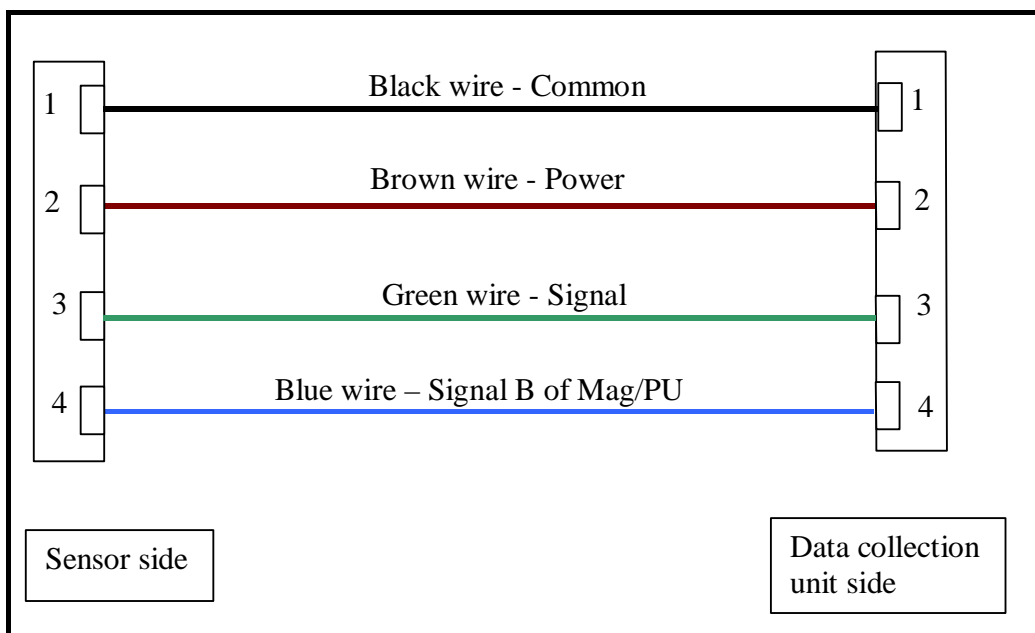(Part No. 18001)
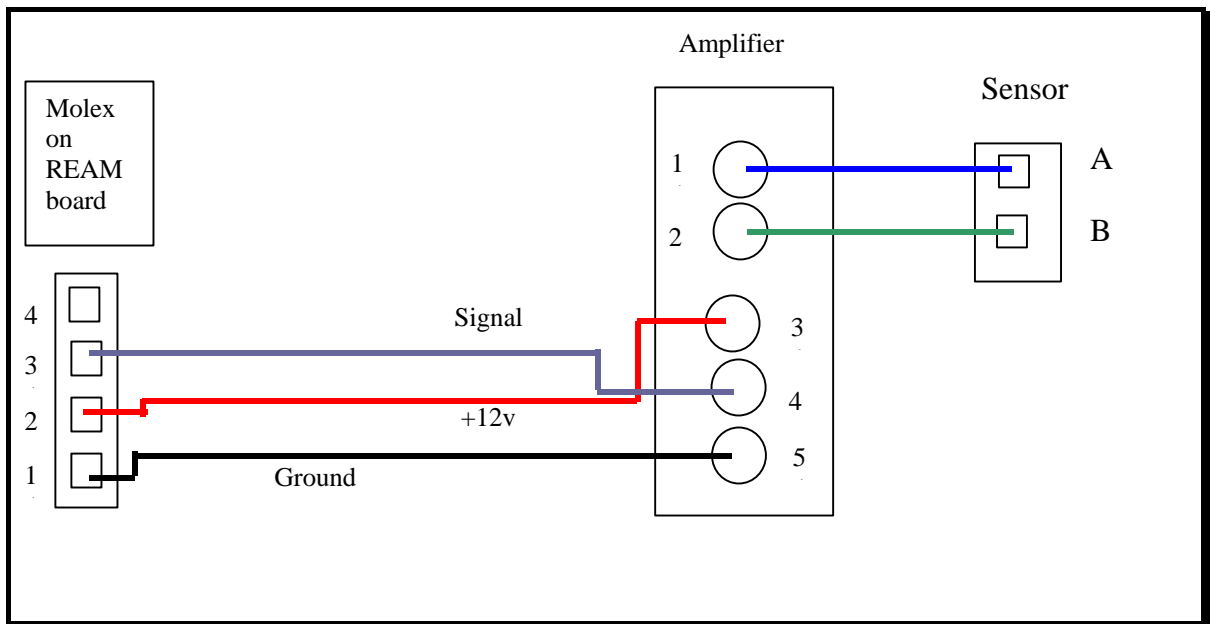
Final Assembly

Cable for Proximity Switch/Magnetic Pickup to Data Collection Unit:
The wiring of the cable (30m) to the data collection unit is as shown in the diagram below:

(Part No. 10023)

Connectors on Cable for Proximity Switch/Magnetic Pickup:

Connector - sensor side
(Part No. 08155)

Connector - data collection unit side
(Part No. 08153)

Wiring Diagram

Red, +24v supply

Black, 0 v comm

2   1

3

White, signal

Analogue channels

Blue, mag p/u low level

4   1

3   2

Black, 0v

Red, +12v supply

White, signal (pulses)

Counter channel

Power supply

5

4   1

   2

3

Black, 0v

Red, +24v supply

Blue, Ch-B

White, Ch-A

Quadrature channel

+24v supply

1   4

2   3

Ground, 0v
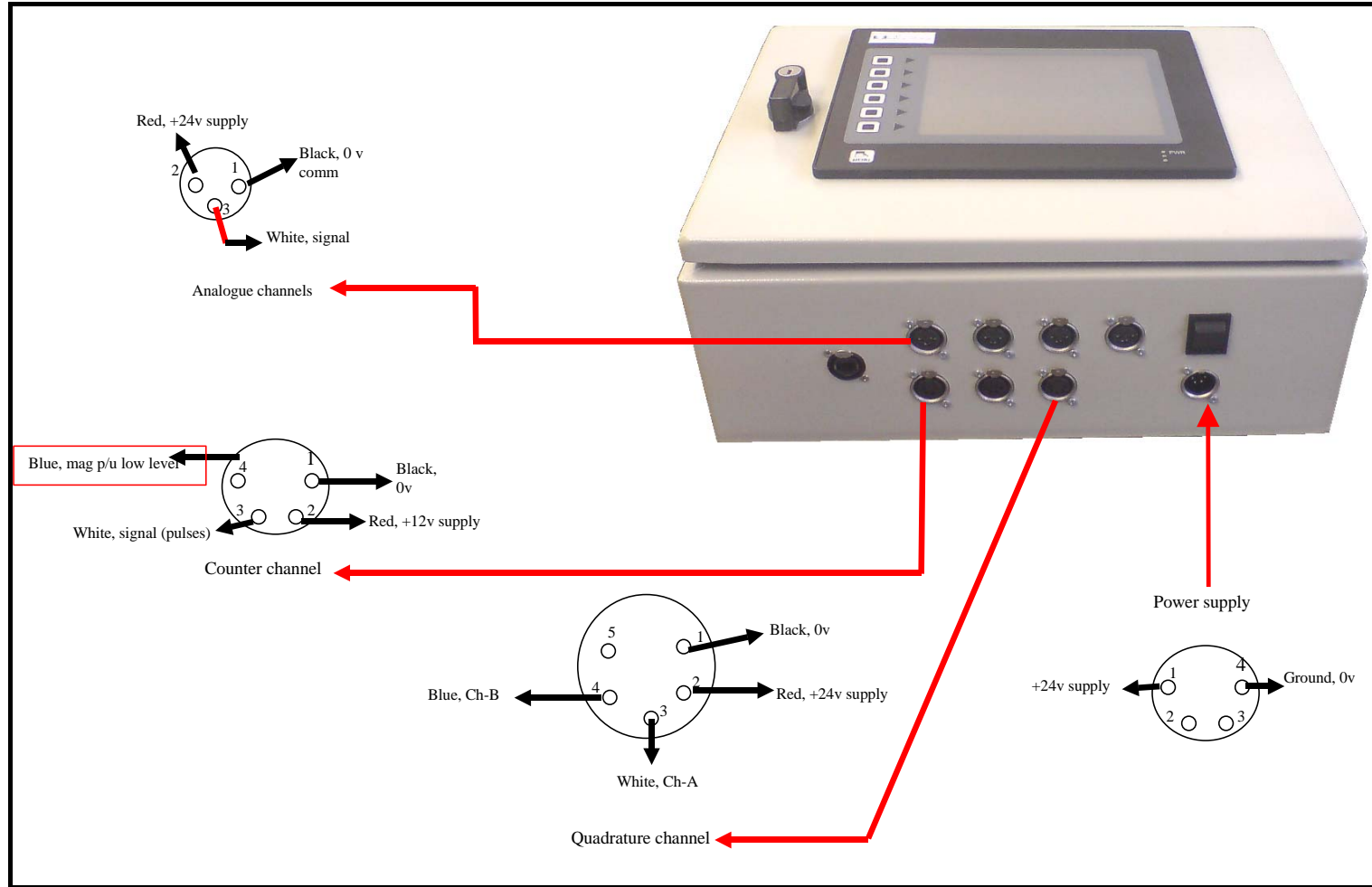
Trouble Shooting

This part of the manual is intended to help the user resolve problems. Troubleshooting is a process of elimination, thus this section will give some details of common problems and how to troubleshoot. If after checking the procedures below, you are still unable to find and resolve the fault, then contact MEDCO for further advice.

No data:

The system is not displaying data on the first page, the "Raw Data Page" accessed through the first button. This implies that there is no communication between the HMI and the REAM board. The possible causes could be one of the following:

1. Missing link on the RS232 cable between the HMI and the REAM board.
   a. First ensure that the cable is connected to the RJ11 socket on the HMI labelled "RS232 PGM PORT".
   b. Ensure that the other side of the same cable is connected to the REAM board. Three wires are used, Red goes to Pin 1 on the Molex connector, Black goes to Pin 3, and Yellow goes to Pin 4. Also ensure that these wires are securely connected in the Molex connector.
   c. If you have access to another REAM HMI, try swapping the RS232 cable. Do not remove or connect the cable while the system is on.
2. No power: Check that the REAM board is actually powered. To do this, do the following steps:
   a. On any of the analogue channels connectors, check to see if there is +24vdc power between Pin 2 (+ve) and Pin 1 (Ground).
   b. On any of the counters (not the quadrature), check to see if there is +12vdc power between Pin 2 (+ve) and Pin 1 (Ground).
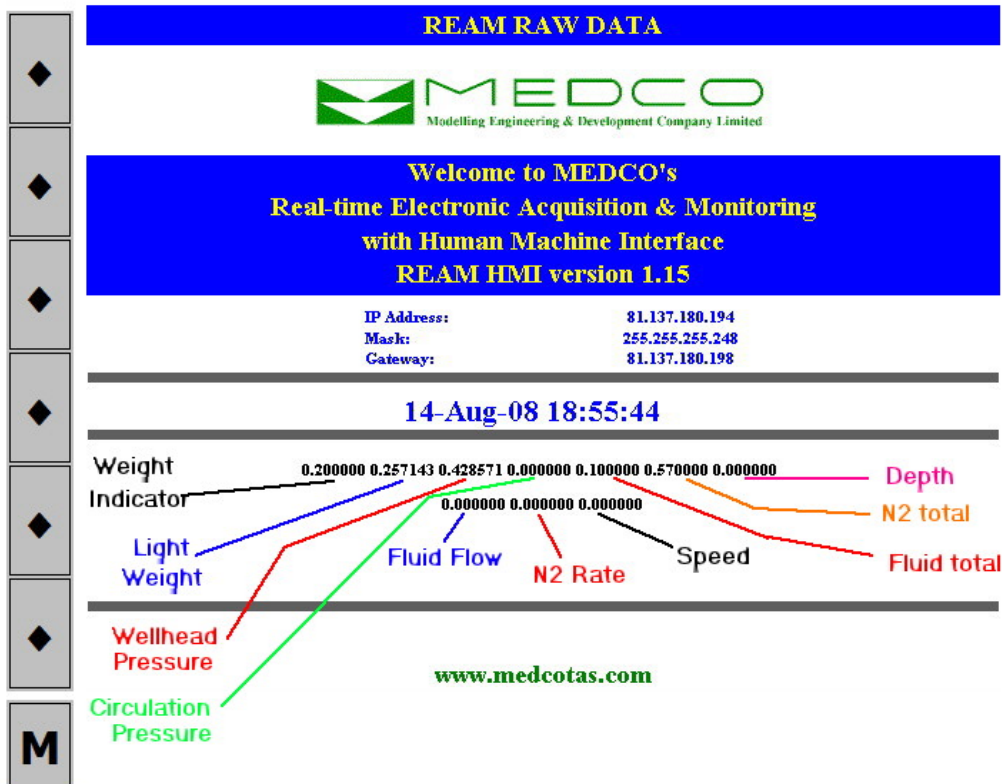
Raw Data Available:

If the data on the "Raw Data Page" is making sense, for one or more channels, but with one or more channels not making sense, then probably the REAM board needs to be re-configured. The data here should be as follows:

1. Analogue channels: As these are 11-bit ADC channels, in theory they should display values in the range of 0 to 2047, where 0 corresponds to 0 vdc and 2047 corresponds to 10 vdc or 5 vdc. If using 4 to 20 mA sensors, then the values should be 409 to 2047. Due to some variations in resistors and other electronic components, most systems will actually give approximately 1900 for a 10 vdc signal. To check that a particular channel is displaying the correct value:

    a. Apply a physical measurable quantity to the sensor. For example, if using a pressure sensor with a range of 0 to 5,800 psi and output of 0 to 10 vdc, then at 0 psi the reading should be approximately 0, and at 2,900 psi the reading should be approximately 950.

    b. It is also possible to apply voltage directly using some battery or another source for voltage. Compare the results and the ratio should be approximately the same. That is, if applying 5 vdc, then should get a reading of approximately 950. Care should be taken when applying voltage directly, ensuring that the +ve voltage is applied to Pin 3 (signal) on the connector while ground should be connected to Pin 1 (Ground).

2. Counter Channels: These should display a value of 0.01 for every pulse applied. The easiest way to check either of these channels is to connect a proximity switch to the channel and with a small metal object, such as the tip of a screw driver, generate one pulse at a time and check that the reading corresponding to the channel is incrementing by 0.01.

3. Quadrature Channel: Again, this channel should display 0.01 for every pulse applied. The depth encoder will have a Pulses Per Revolution (PPR) value written on the encoder body, for example the most common is 600 PPR. Thus for every revolution the readings should change by 6.00. Again, this figure will be approximate as it is not always possible to turn the encoder by hand exactly one revolution with an accuracy of 1 in 600.

4. If the readings of counter and/or encoder channels are not 0.01 per pulse, then it is sometimes possible to reset these from the HMI. The procedure is as follows:

    a. Go to MENU, enter the passcode.

    b. Select the RESET REAM K-FACTORS, then go back and check 2 and 3 above. If one or more of these channels is still not displaying 0.01 for every pulse, then repeat until all are responding appropriately.

Individual channels having a problem

If an individual channel is exhibiting a problem, then there are a few steps to take to determine the cause of the problem:

1. Note that Fluid Flow (Flow Rate) and Fluid Total are both obtained from the same sensor. Thus, if there is a problem with both of these then it is likely to be one problem and not two. Similarly for the N2 Rate & N2 Total, and Depth & Speed.

2. In the REAM RAW DATA page, check to see if the readings for the channel are making sense, i.e. in accordance of the description above. If they do make sense,

then you probably need to correct the calibration or the K-factor, otherwise go to step 3 below.

3. If there is no data relating to this channel in the REAM RAW DATA page, or the values are not changing when you vary the physical quantity, then it is likely that you have a hardware problem. Since, other channels are working properly then it is unlikely that the problem is inside the REAM HMI, rather it could be either the cable or the sensor itself that is causing a problem. It is very simple to determine the source of the problem by getting another sensor of the same type that you know works well and try it, if that still does not resolve the problem then try another cable.

4. When you have determined that the problem is in the sensor, then you will need to replace the sensor. If you already have one in stock, then simply replace it, otherwise contact MEDCO for replacement parts.

5. If, on the other hand, you have determined that the problem is in the cable, then most of the time you will be able to repair the cable. Use the wiring diagrams for the relevant cable and re-solder the wires. Note here that you should always check a cable by performing two tests:

   a. Continuity: If you measure the resistance between two pins that are supposed to be connected, then it should be near zero, allowing for the cable resistance.

   b. Insulation: If you measure the resistance between two pins on one side the cable that are not supposed to be connected to each other, then it should be infinite.

   c. Example: Take the depth encoder cable. This should have the wiring as follows:

      i. Pin 1 on REAM side to Pin F on sensor side – do a continuity test

      ii. Pin 2 on REAM side to Pin D on sensor side – do a continuity test

      iii. Pin 3 on REAM side to Pin A on sensor side – do a continuity test

      iv. Pin 4 on REAM side to Pin B on sensor side – do a continuity test

      v. Insulation tests on the sensor side between Pin F and D, A, & B

      vi. Insulation tests on the sensor side between Pin D and A, & B

   vii. Insulation tests on the sensor side between Pin A and B

Other Types of Problems

- No data recorded on CompactFlash:

  a. Go to DATA LOGGERS AND COMMENTS page by clicking button 6 and ensure that you have either the ONE HOUR or ONE DAY LOG turned on.

  b. Ensure that you have a CompactFlash card inserted correctly in the slot on the side of the HMI.

  c. Ensure that the CompactFlash is either 512 Mbytes or if using 1 Gbytes then only use SanDisk make.

  d. Never format the CompactFlash on the computer.

  e. Ensure that there is sufficient space on the CompactFlash. If not, then delete some of the old files to make space for recording new files (you can do this by connecting the CompactFlash to your computer).

- Unable to see REAM HMI on Computer: There are two possible ways to connect the HMI to Local Area Network:

  a. If using the crossed Ethernet cable supplied by MEDCO, then follow these steps:
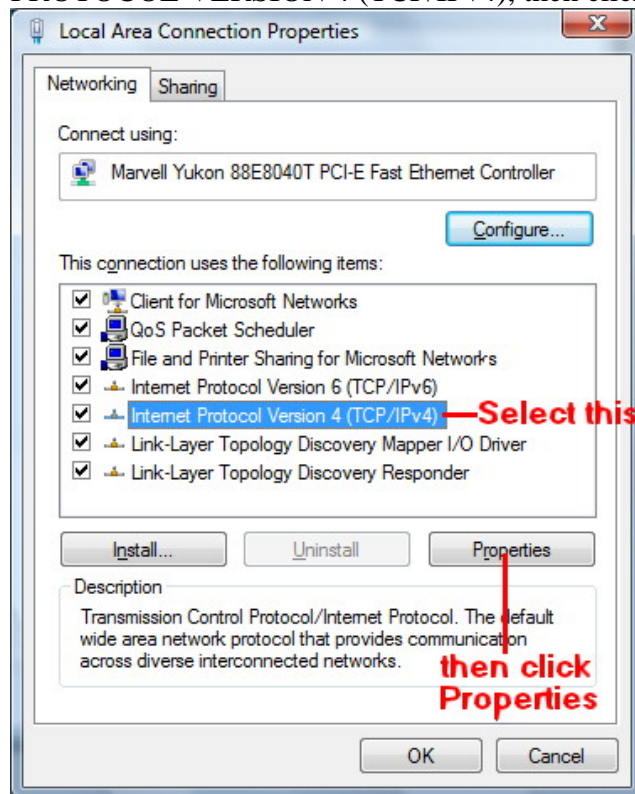
i. On your computer, click START > CONTROL PANEL > NETWORK AND SHARING CENTER
ii. On the popup window, click VIEW STATUS
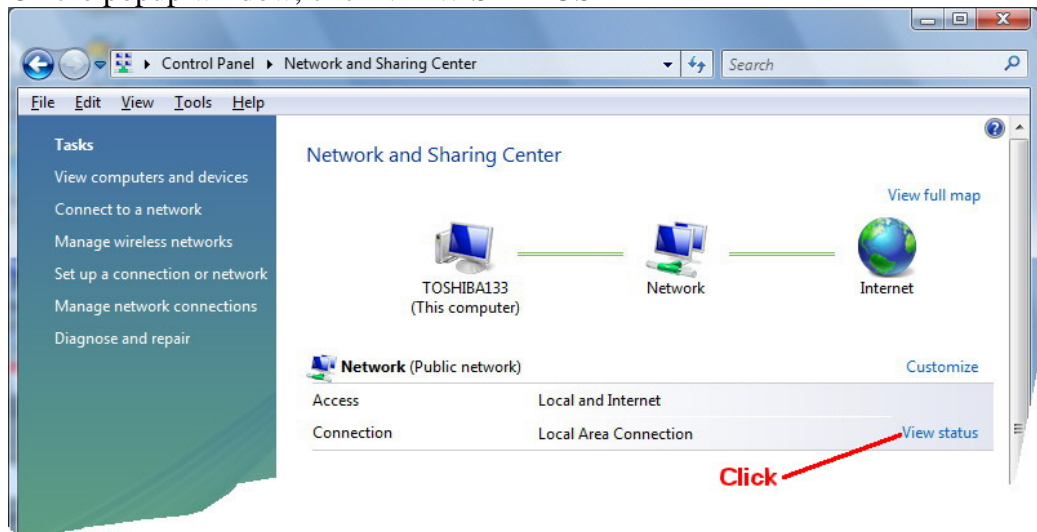
iii. On the Local Area Network Status window, click PROPERTIES
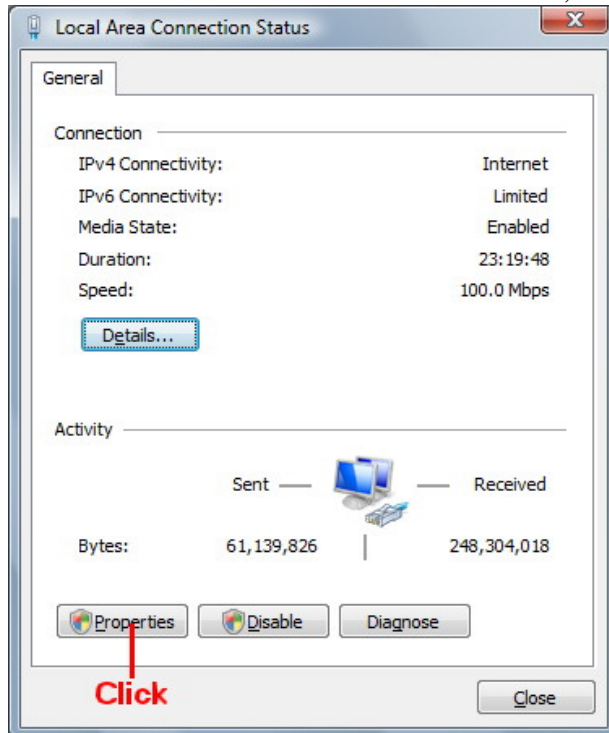
iv. On the Local Area Network Properties window, select INTERNET PROTOCOL VERSION 4 (TCP/IPv4), then click PROPERTIES

v. On the Internet Protocol Version 4 (TCP/IPv4) Properties, select USE THE FOLLOWING IP ADDRESS, then enter the IP Address as 192.168.1.1, when you move to the SUBNET MASK, the default values of 255.255.255.0 should automatically appear, accept these.
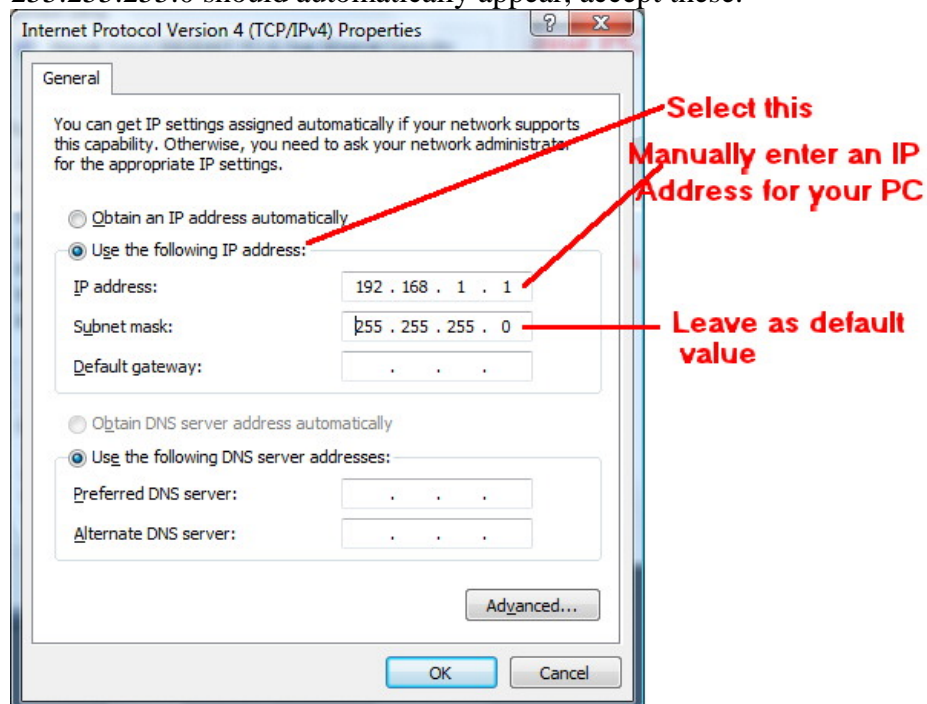
vi. Click OK on all opened windows until they are all closed. Now, start your Internet Explorer and in the address bar enter the IP Address of the REAM HMI, 192.168.1.10.

b. If using a router, then you should procure a straight Ethernet cable to connect the HMI to the router. Follow the same steps above, but in step (a.v.) select the option OBTAIN AN IP ADDRESS AUTOMATICALLY. You also need to ensure that the first three blocks of the HMI IP Address match those of the router, i.e. 192.168.1.xx or 192.168.0.xx.