



**MEDCO**

Modelling Engineering & Development Company Limited

**Real Time Electronic Acquisition & Monitoring  
& Human Machine Interface**

**REAM HMI**



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## **System Overview**

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

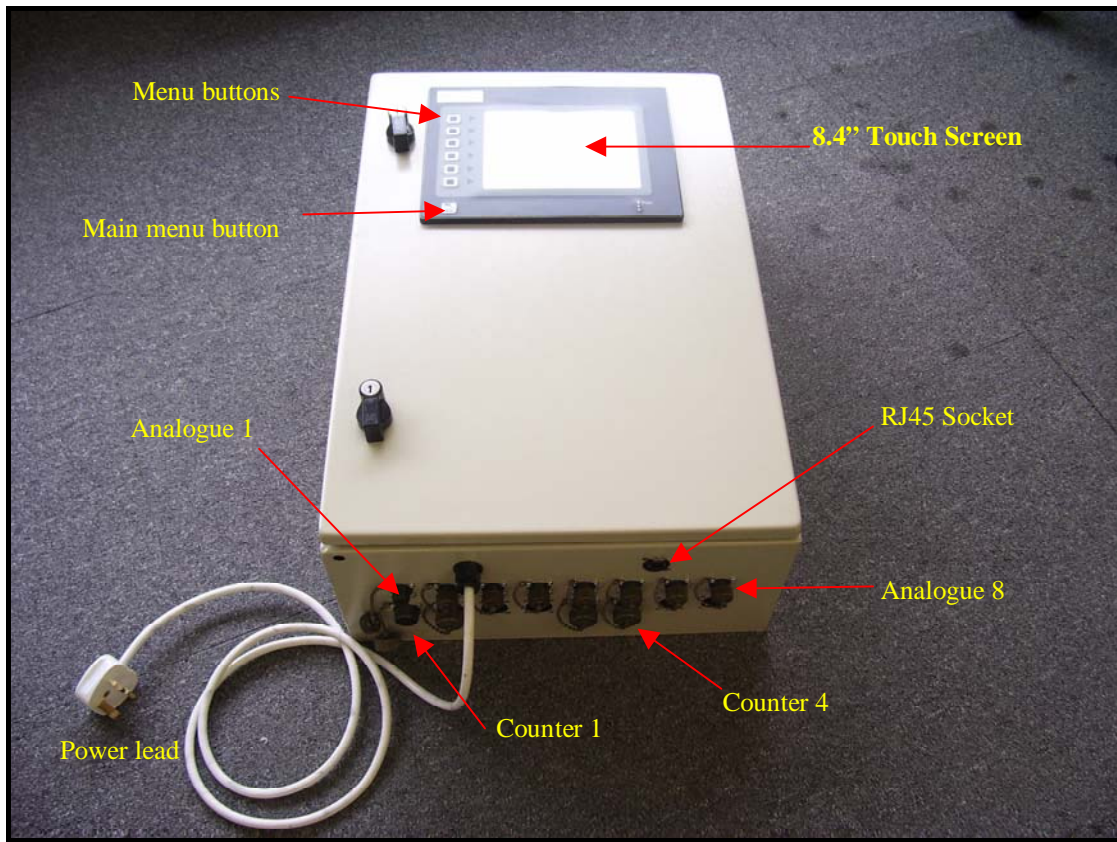
The system is made of two main parts, REAM is a microprocessor based data acquisition board, which collects data from electronic sensors, digitise the readings, and supply the appropriate excitation voltage to the sensors. The HMI communicate with the REAM board to retrieve, display, and store the data.

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

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 means 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.



### **Default System Settings**

The default values are:

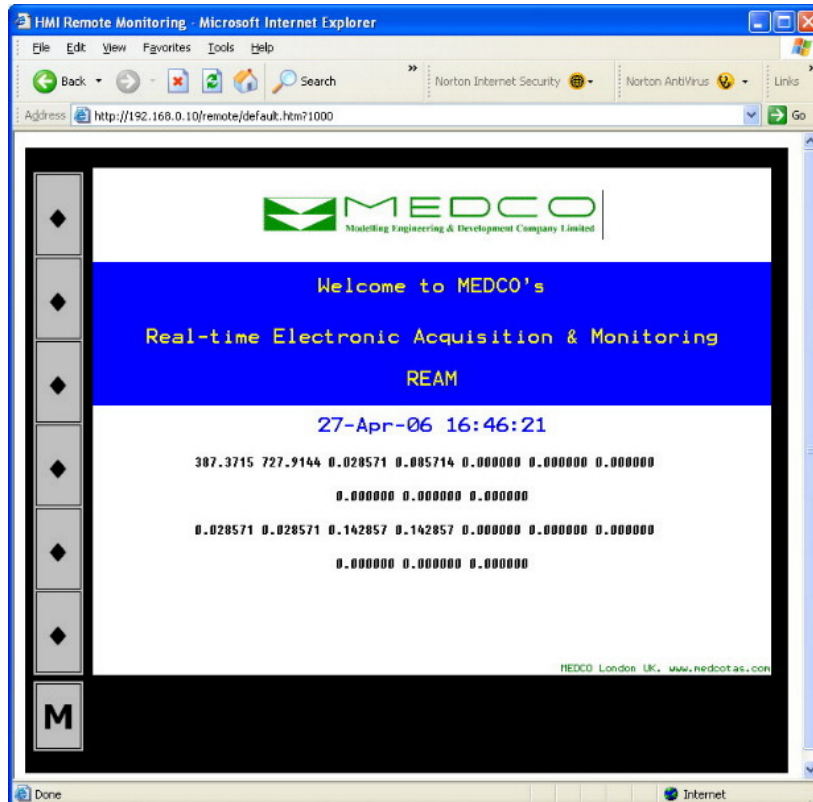
- Date and Time: As per the UK date and time.
- ADC channels (Analogue to Digital Convertors):
  - Gain: Unity.
  - Offset: Zero.
- Pulse counters (frequency channels) and quadrature: K-factor = 1.
- Rates of counters and quadrature: K-factor = 1.

### **Accessing the System**

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

The default web page shows MEDCO's logo and a Welcome message. In addition, the system date and time are shown as well as the data stream from REAM. This page can always be accessed by pressing the top button.

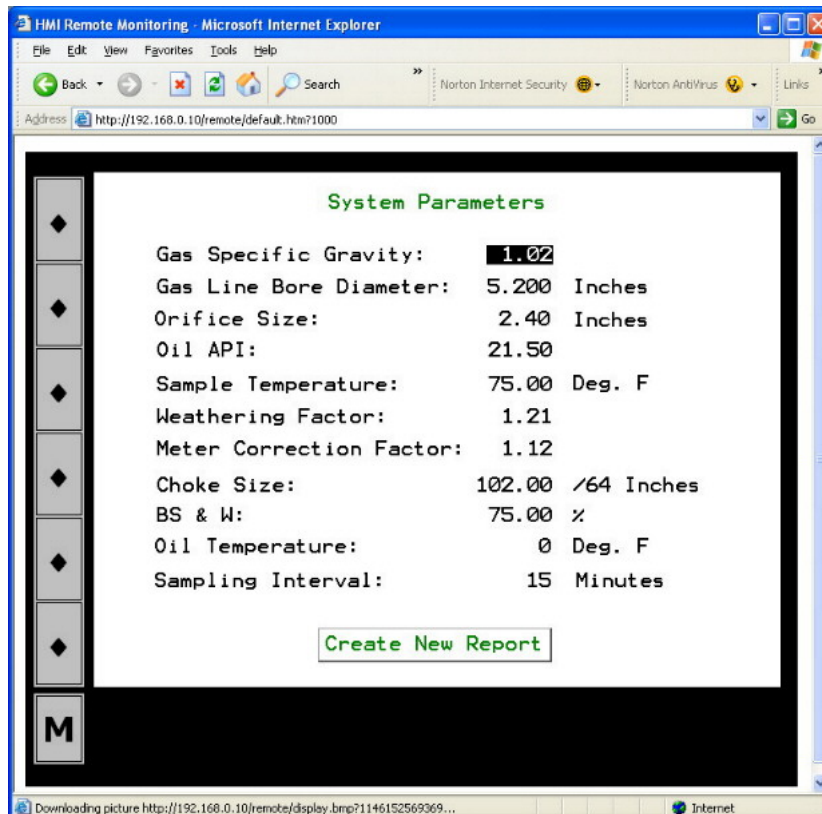
The main MENU button is used to reset the system settings and calibrating analogue channels.



Default Page

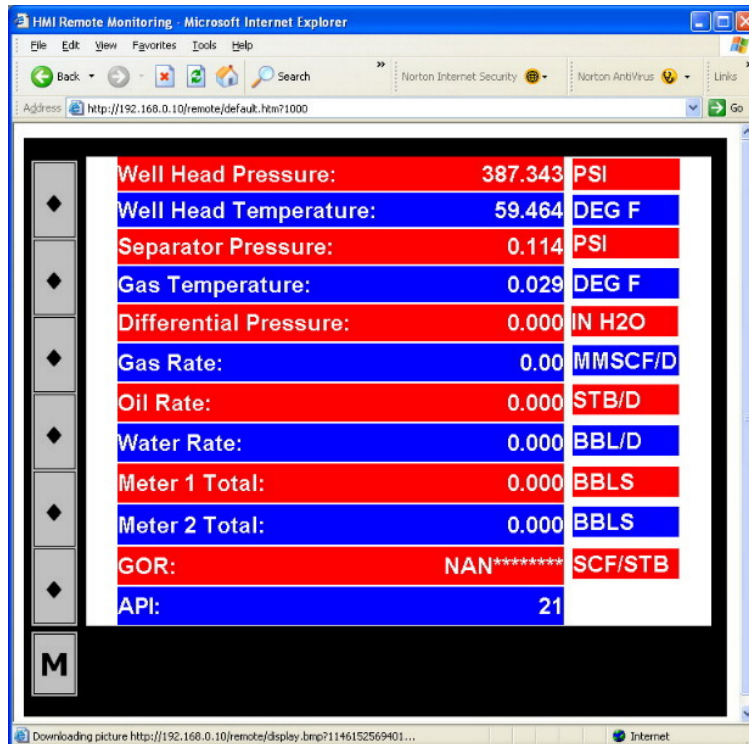
### ***Input Data (System Parameters)***

The second button is used to display the input data screen. By default, the value will be retained from the previous use.



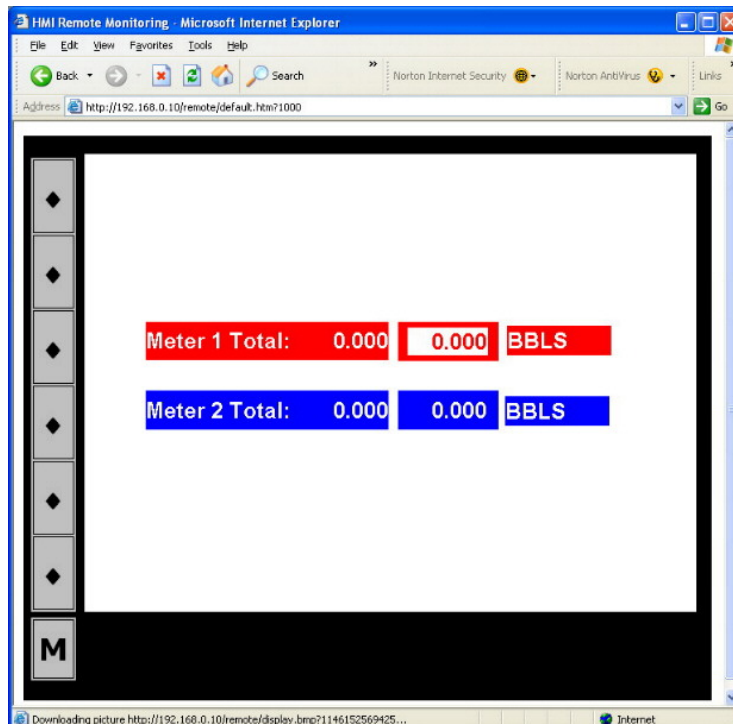
### Displaying the Data

The third button is used to display the data page. This page will display the parameter names and units.



### Resetting Counters/Quadrature (depth)

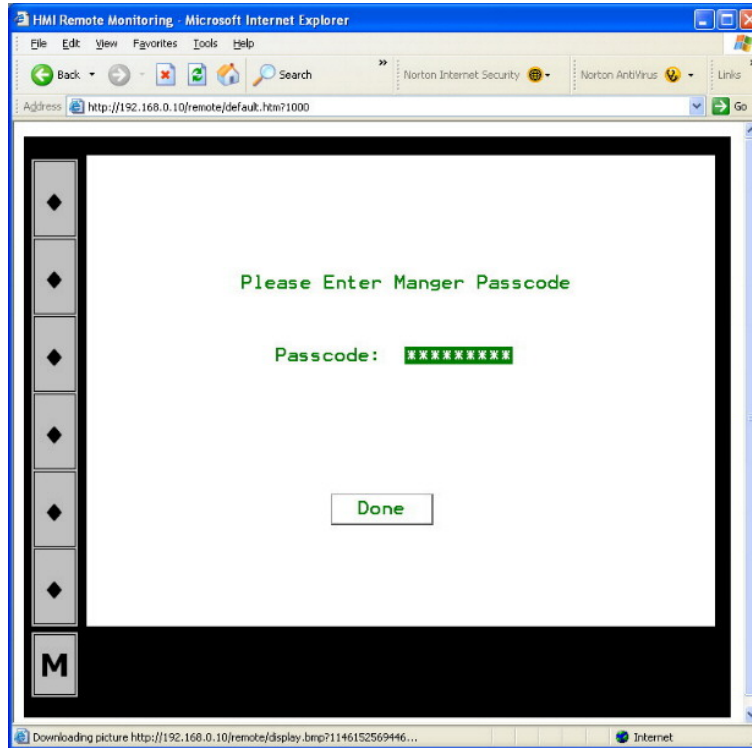
The fourth button will display a page dedicated to resetting counters. The actual value will be shown on the left-hand-side column while the new value can be entered by the user on the right-hand-side column.



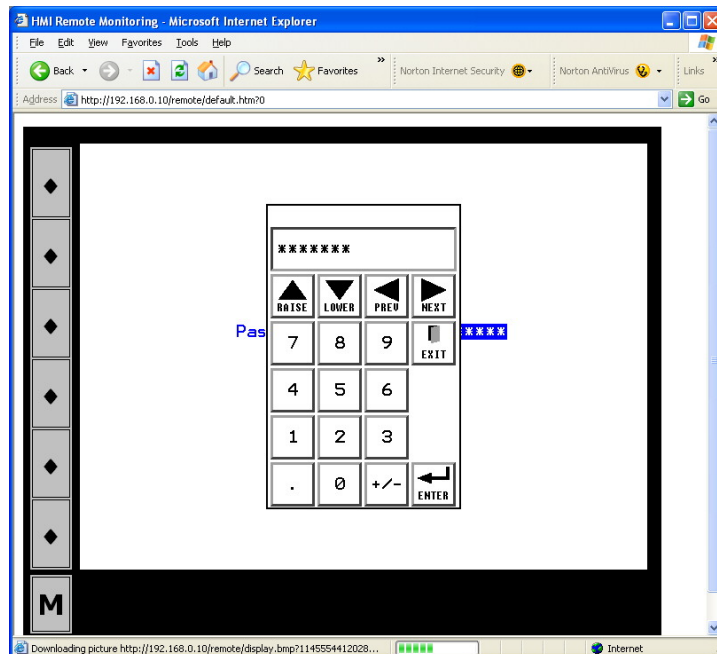


### Main MENU Button

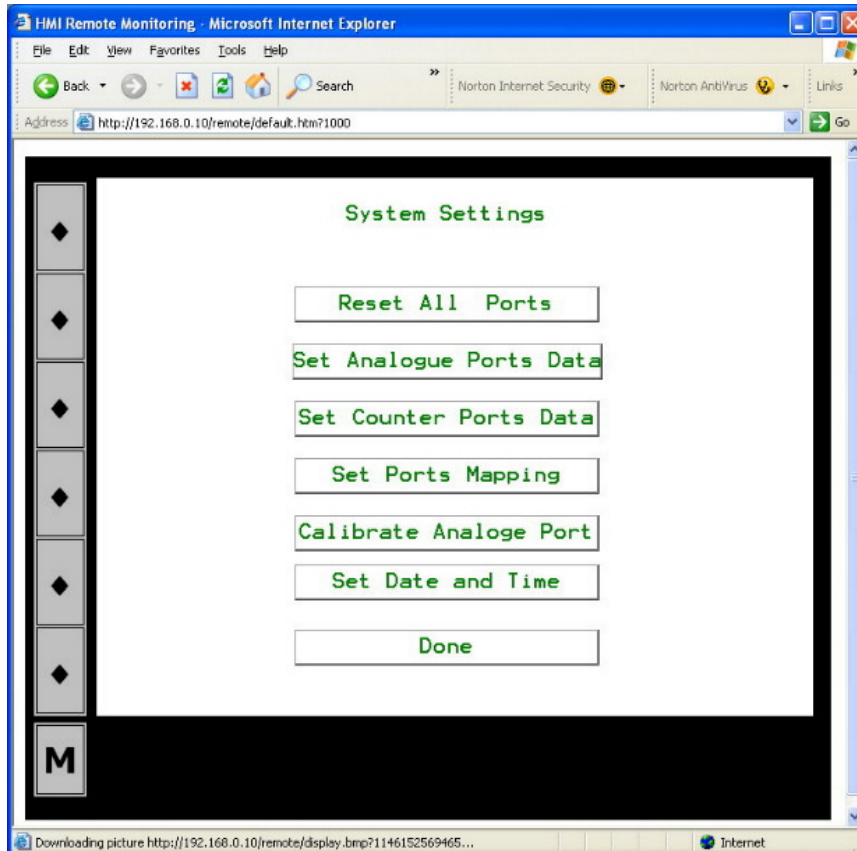
When this button is selected, the user will be prompted to enter the password. The password is “290992” which can be easily remembered as the date MEDCO was founded.



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 Analogue Ports Data***

The page will display the settings of the analogue 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.

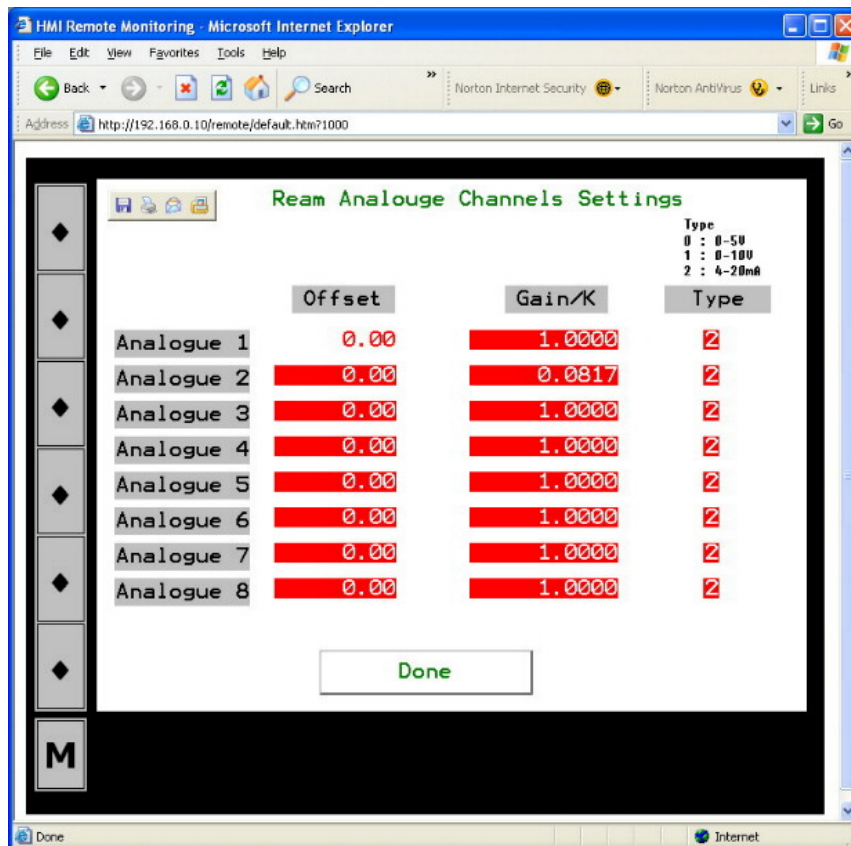
Note that you can change the analogue channel type in the System Settings Page. The channel types are as follows:

0 = 0 – 5 vdc

1 = 0 – 10 vdc

2 = 4 – 20 mA





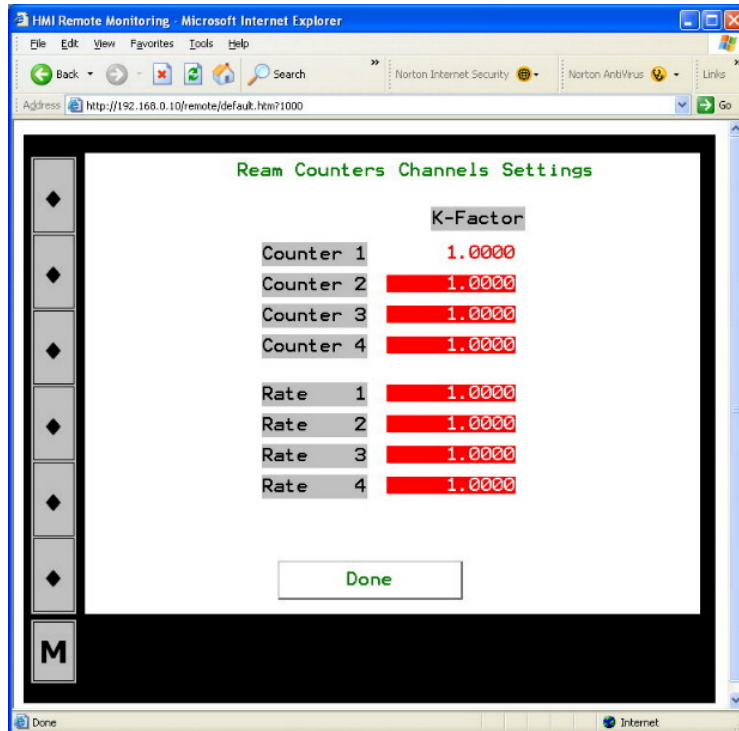
### Set Counter Ports Data

For the counter 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. To get the rate, you use the same K-factor for rate per second or divide the K-factor by 60 to get the rate per minute.

For example, if your flow meter produces 2300 pulses per barrel, then the K-factor for depth would be 2300, and if you wish to have the rate in bpm then the K-factor for speed would be  $2300 \div 60 = 38.3$ .

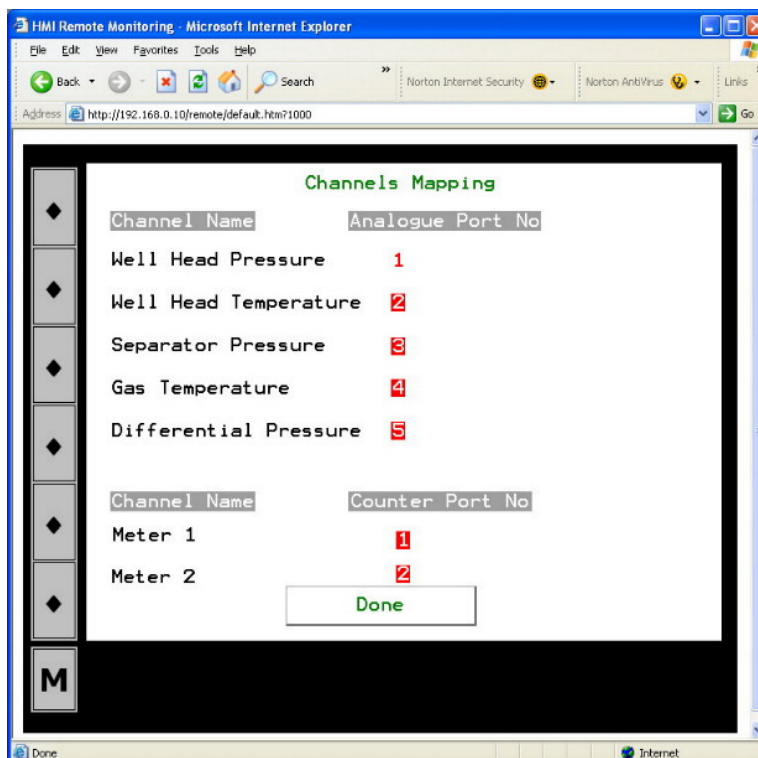
If, on the other hand, you do not know the K-factor for your sensor, then you will need to calculate the K-factor using the following procedure:

1. Ensure that the counter 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 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)  $\div$  (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).
5. Remember, you only need to calculate the K-factor for the counter. For rates, you use the same K-factor to get “per second” or divide the K-factor by 60 to get “per minute”.



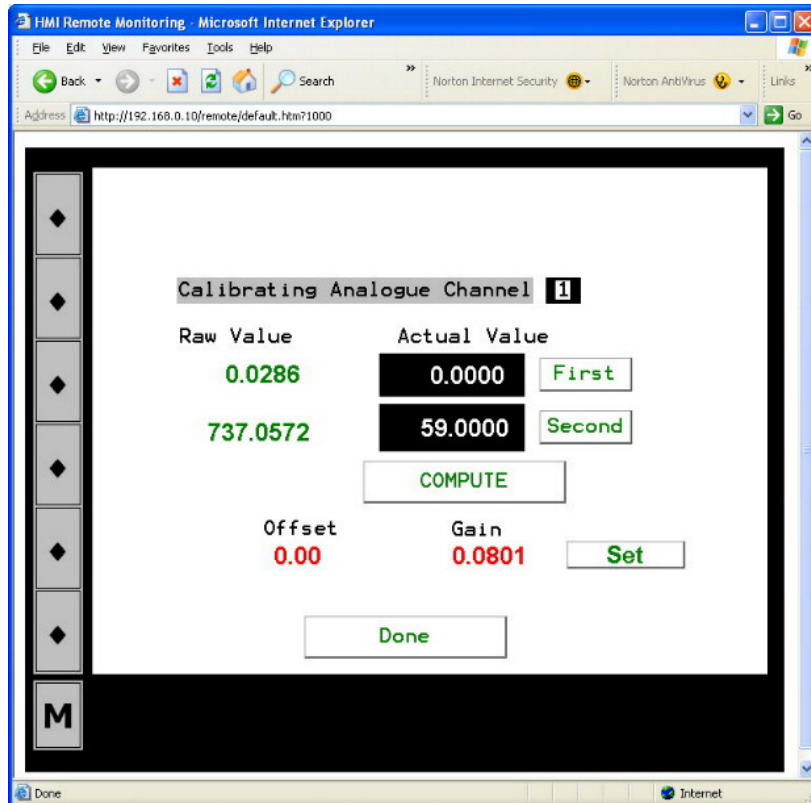
### Set Ports Mapping

The user is free to connect the sensors to any of the channels available. Note that the counting convention is starting with Channel 1 on the top left hand corner and counting upwards while moving to the right. Make note of the connections then use this function to map the channels data. Once this has been done, it is recommended that you use the same configuration in future to avoid having to recalibrate.



### Calibrations

The user must supply channel number and two actual (reference) values. The system will provide the raw values when the FIRST and SECOND buttons are pressed, then compute the gain and offset and if acceptable, then the user can SET these values to be stored. For counters, see *Set Counter Ports Data*.



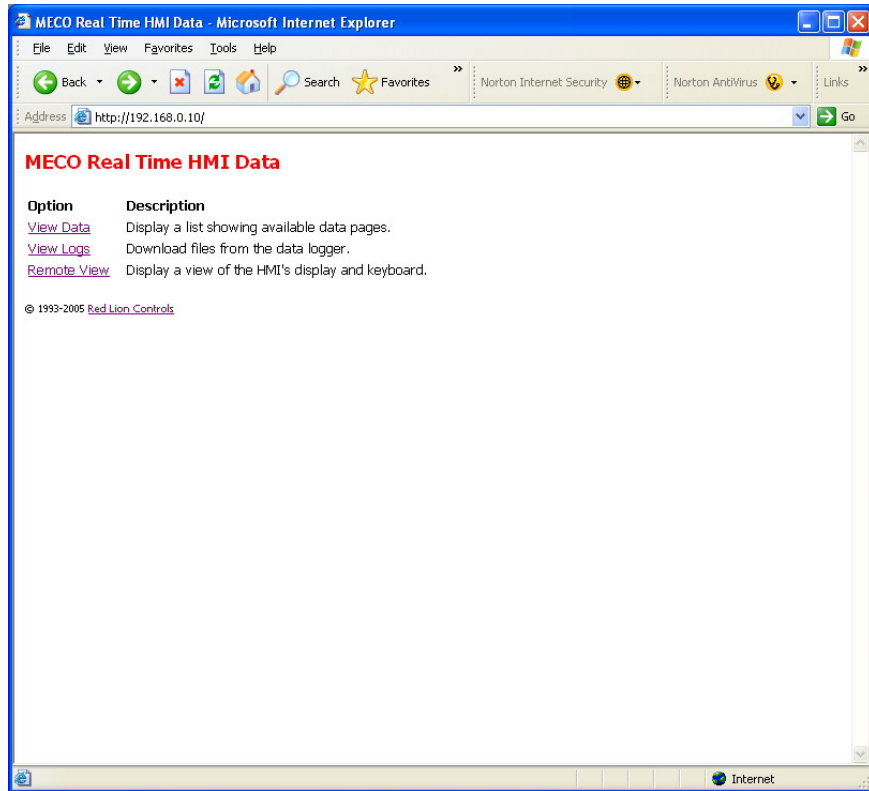
### System Memory

REAM HMI has a 512 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 channels being used.

### Communication

The user can access the data in REAM HMI using the IP Address of the system. By default, the IP Address is "192.168.0.10". 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/".

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 multi-hub port is used, then the RJ45 has to be re-crossed (use the adaptor supplied or change to the RJ45 cable to a straight through cable).



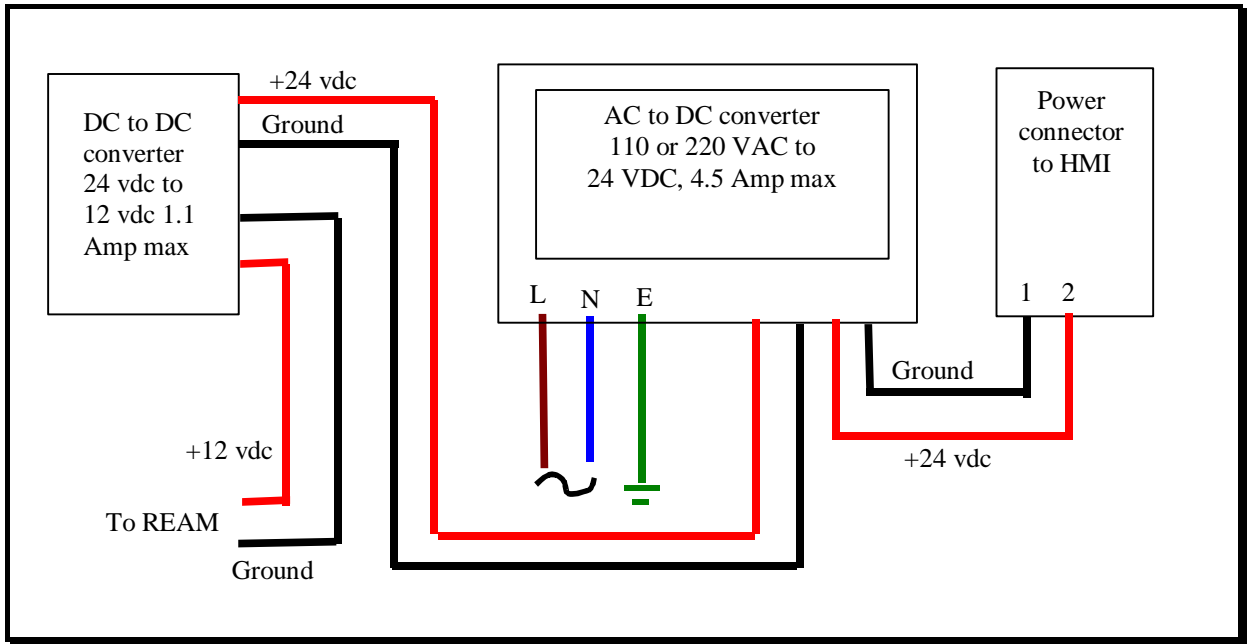
The first page that will appear will have the following hyperlinks:

- **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. By default, RealTime will contain all the files. The files format is Comma Delimited Text (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 120 files (more than a week worth of data recorded from all channels at 1 per second).
- **Remote View:** Gives access to the pages described above. The current page being displayed on the HMI is the page that will be shown.

### **Power**

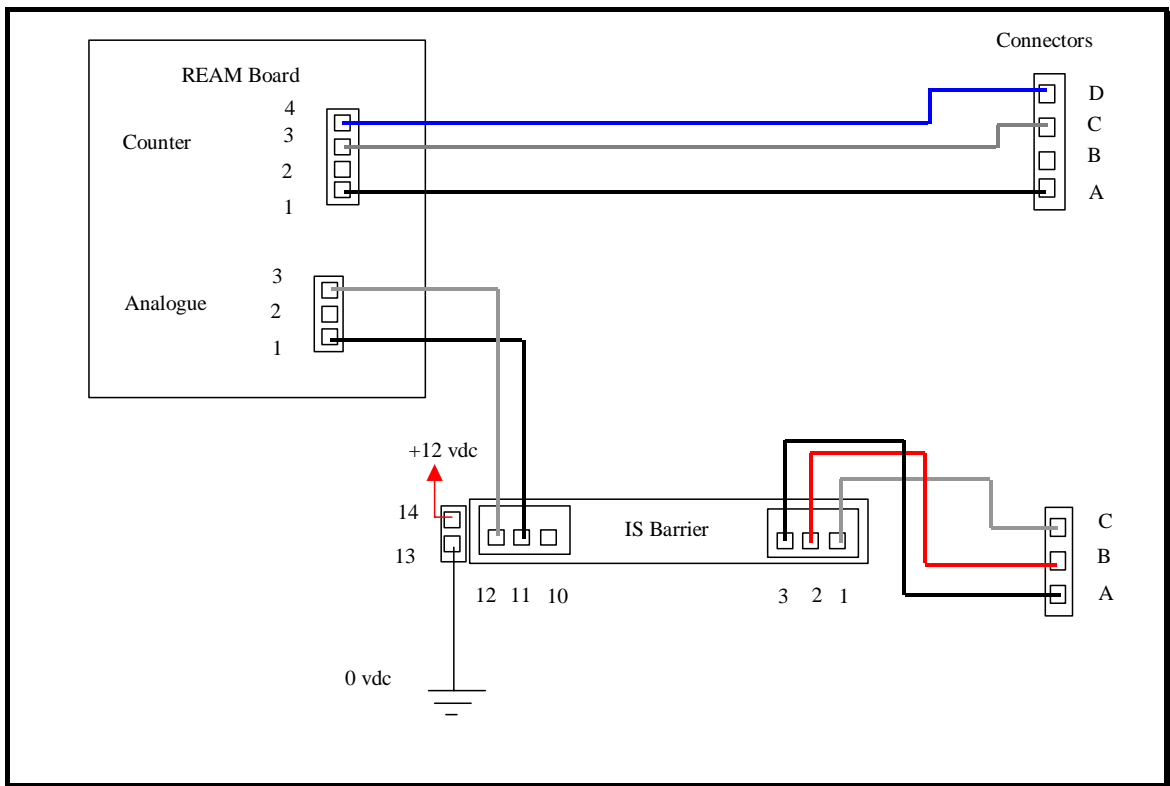
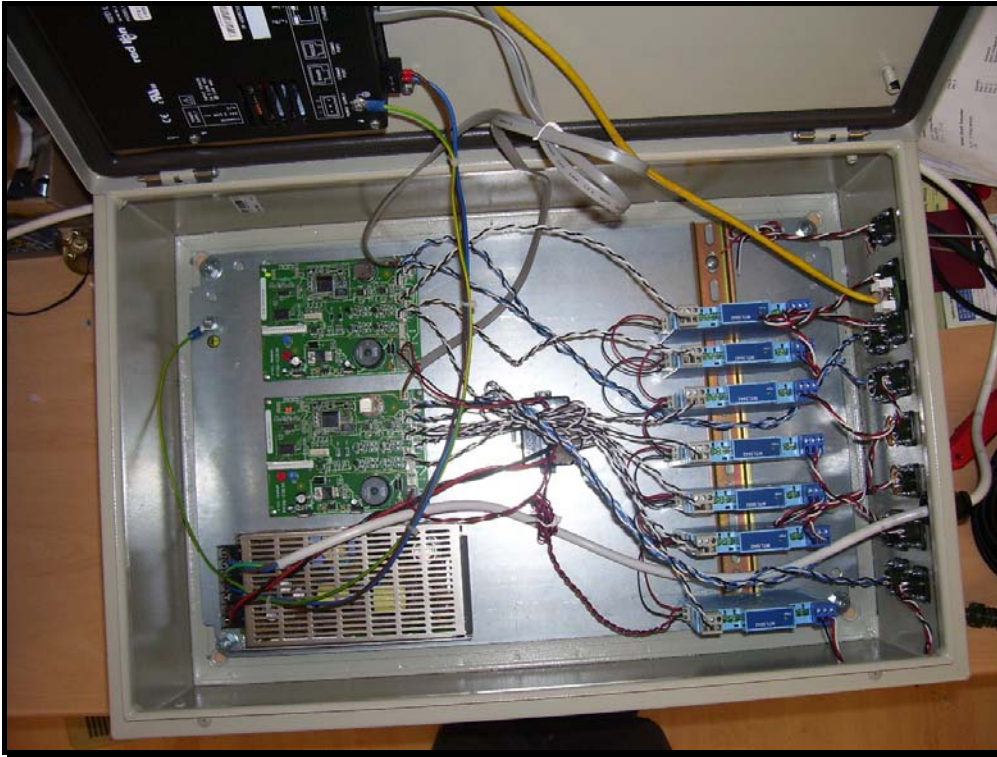
HMI is operated by 24 vdc power supply while REAM is operated by 12 vdc. The system comes with an AC to DC converter, which takes 95-250 VAC and outputs 24 vdc up to a maximum of 4.5 Amp. 12 vdc is then supplied to REAM through a DC/DC converter.

To connect the system directly to a 24 vdc battery, remove the connection to the AC inputs of the AC/DC converter and connect the +24 vdc to pin 1 and the ground to pin 2. The wiring is explained in the diagram below.



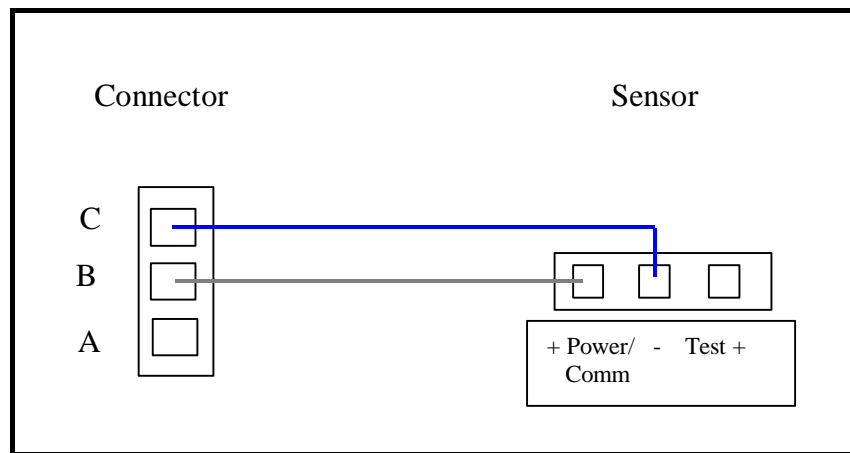
Wiring Diagram for Power

# Wiring Diagrams

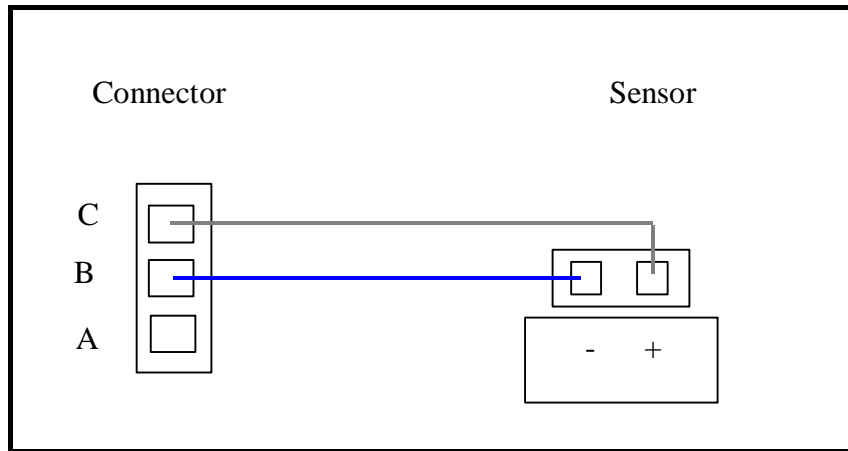




## Pressure Transmitters



*Temperature Transmitter*



**Counters/Magnetic Pickup**

