

Application Note 018  
Version 004  
03 October 2014

## **EtherMeter Firmware For Iridium Satellite Systems**

This document describes the unique EtherMeter features inherent in the 'IRIDIUM'-version firmware, which is targeted for use within satellite-based SCADA Systems integrated by Preferred Controls Inc. (Albany, MN). The Satellite Modem supported and referenced in this document is the Model 9602W by JouBeh Technologies (Dartmouth, Nova Scotia, CA).

### **Communication Protocols:**

1. The IRIDIUM-version firmware offers the following industrial protocols:
  - IRIDIUM (RS-232) – Denoted By SCADAmetrics as Protocol 'SAT1' (DEFAULT)
  - MODBUS/TCP (Ethernet)
  - MODBUS/UDP (Ethernet)
  - MODBUS/RTU (RS-232)
  - MODBUS/RTU (RS-485)
  - MODBUS/ASCII (RS-232)
  - MODBUS/ASCII (RS-485)
  
2. The IRIDIUM-version firmware does **NOT** offer the following industrial protocols:
  - EtherNet/IP (Ethernet)
  - DF1 Full Duplex (RS-232)
  - DF1 Full Duplex (RS-485)
  - DF1 RadioModem (RS-232)
  - DF1 RadioModem (RS-485)

## **Summary of Special Features:**

1. The Iridium Modem Protocol is a Push-Based, ASCII Protocol.
2. Colon (':')-Separated ASCII metering data is uploaded to the Iridium Satellite System by the EtherMeter, and then the ASCII data is included within an email (as an attachment) from the Iridium System to pre-determined customer email addresses.
3. The first ASCII data field within each attachment file is the 'Unit Identifier', which is the final 6 hexadecimal digits of the EtherMeter's MAC ID.
4. The EtherMeter transmits its data immediately upon power-up, and then at regular, customer-defined intervals. This Push Interval is controlled by the EtherMeter's 'PERIOD\_S' setting. The default value for PERIOD\_S is 21600 (6 hours), although this setting may be changed via the Setup Menu.
5. The EtherMeter can be forced to transmit its data on demand, as the EtherMeter will begin a transmit sequence upon transition from "Setup Mode" to "Run Mode" (controlled via EtherMeter DIP switch 1).
6. The default meter sampling period for the Iridium-version firmware is 300s (5 minutes). However, the sampling period may be adjusted by the customer using the Setup Menu (parameters SAMP1 and SAMP2).
7. The Iridium power supply must be switched ON/OFF via the AUX1 output on the EtherMeter: Terminal 10 (+) and Terminal 11 (-). AUX1 can be wired directly to a switching SSR, or EtherMeter Terminal 10(+) can be wired directly to Modem Pin #4. AUX1 is set by default to control this output as 'PWRSVHI'. The normal PWRSVHI timing parameters are ignored in the Iridium version firmware, and are replaced by internal timing parameters based upon the 'PERIOD\_S' setting.
8. The Raw Modem Communications (as well as Raw Flow Meter Communications) may be observed on Setup Screen Page 8, which can be viewed via Telnet/Ethernet.
9. The Iridium Satellite Signal Strength is displayed on the 2x16 LCD display, as well as on Setup Screen, Page 2.
10. Data Fields that are to be transmitted are customer-selectable on Setup Screen Page 5. The default fields are:
  - MAC ID Last 6 Digits (Always Sent, Cannot Be Disabled)
  - Meter 1 Total LCD01=ON
  - Meter 1 OK/NOT-OK LCD01=ON
  - Power Supply Voltage x 10 LCD05=ON
  - Satellite Signal Strength (0-5, 0=No Signal, 5=Strongest Signal) LCD14=ON

11. When ALL Data Fields are active (customer-selectable on Setup Screen Page 5), the fields transmitted are as follows:

- MAC ID Last 6 Digits (Always Sent, Cannot Be Disabled)
- Meter 1 Total LCD01=ON
- Meter 1 OK/NOT-OK LCD01=ON
- Meter 2 Total LCD02=ON
- Meter 2 OK/NOT-OK LCD02=ON
- Meter 1 Flow Rate (Floating Point Format) LCD03=ON
- Meter 2 Flow Rate (Floating Point Format) LCD04=ON
- Power Supply Voltage x 10 LCD05=ON
- Analog Input 1 (0-10000) LCD06=ON
- Analog Input 2 (0-10000) LCD07=ON
- Digital I/O 1 (0 or 1) LCD08=ON
- Digital I/O 2 (0 or 1) LCD09=ON
- Digital I/O 3 (0 or 1) LCD10=ON
- Up-Time (Minutes Since Last Reboot) LCD11=ON
- Satellite Signal Strength (0-5, 0=No Signal, 5=Strongest Signal) LCD14=ON

## **JouBeh 9602W Modem Pre-Configuration:**

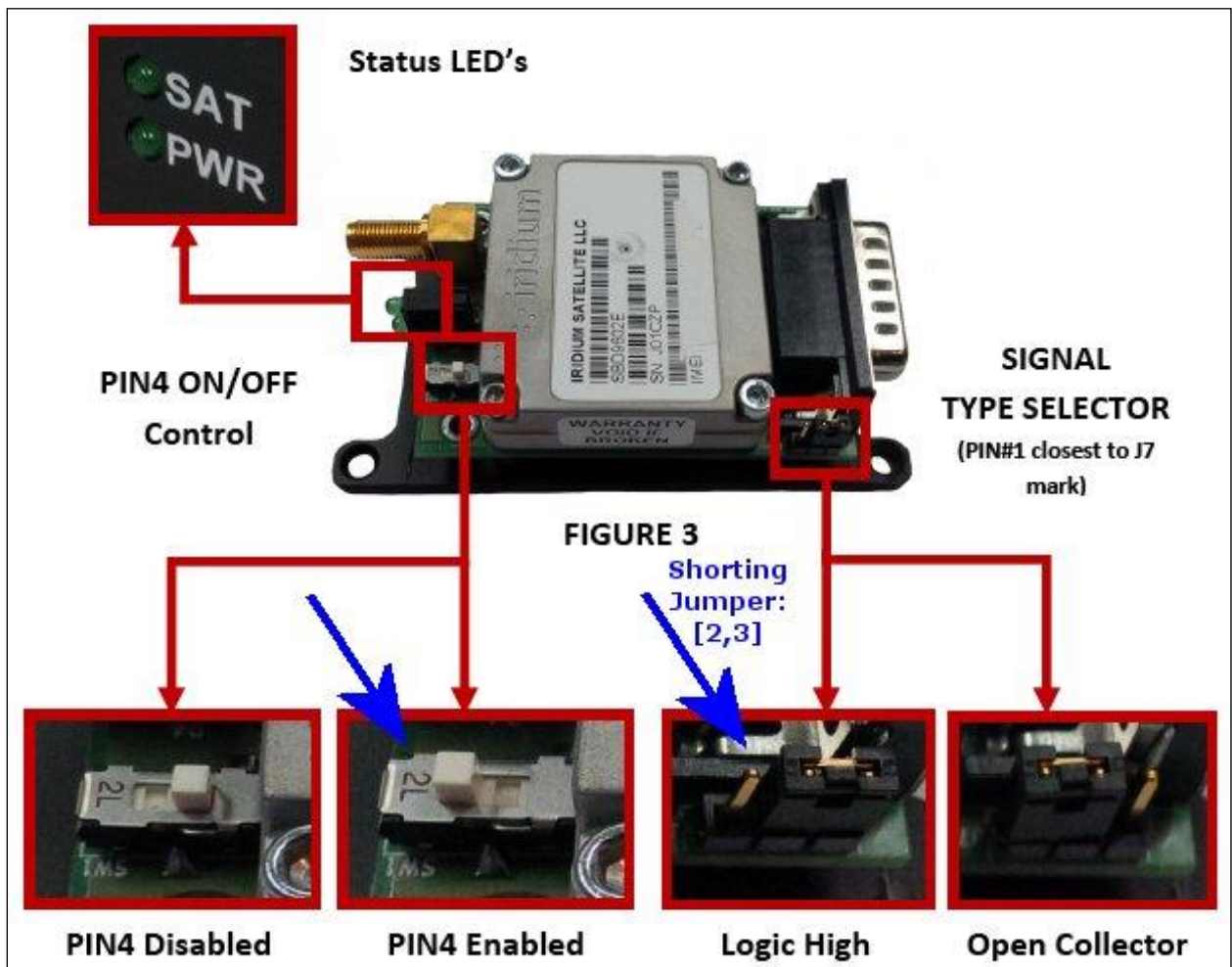
The 9602W Satellite Modem requires setup of its internal switches/jumpers; and the switch/jumper configuration depends upon how the Modem is to be switched ON/OFF between Push Transmissions.

**Method1: EtherMeter Controls Power to Satellite Modem by Wiring EtherMeter Terminal 10 Directly to Modem Pin 4 –**

J7: Short Terminals 2,3  
Switch: PIN4 Enabled

**Method 2: EtherMeter Controls Power to Satellite Modem by Wiring EtherMeter Terminals [10,11] to an SSR; and the SSR switches the Power to Modem Pin 1 –**

J7: <N/C>  
Switch: PIN4 Disabled



9602 Modem Internal Configuration Diagram As Shown In JouBeh 9602W User Manual Page 9.

## **EtherMeter / Modem Signal Wiring:**

### **Method1: EtherMeter Controls Power to Satellite Modem by Wiring EtherMeter Terminal 10 Directly to Modem Pin 4 –**

The Iridium Satellite Modem features a 15-pin, Male D-Subminiature Port. Therefore, the connecting cable should have a 15-pin, Female D-Subminiature Connector. The wiring pinout is as follows:

1	Power +
2	
3	Power –
4	ON/OFF Control (EtherMeter AUX1 (EtherMeter Terminal 10))
5	
6	RxD (from EtherMeter TxD, Serial Port Pin 6)
7	TxD (from EtherMeter RxD, Serial Port Pin 5)
8	Signal Common (from EtherMeter Signal Common, Serial Port Pin 4)
9	
10	
11	
12	
13	
14	DSR (from EtherMeter DTR, Serial Port Pin 3)
15	

### **Method 2: EtherMeter Controls Power to Satellite Modem by Wiring EtherMeter Terminals [10,11] to an SSR; and the SSR switches the Power to Modem Pin 1 –**

The Iridium Satellite Modem features a 15-pin, Male D-Subminiature Port. Therefore, the connecting cable should have a 15-pin, Female D-Subminiature Connector. The wiring pinout is as follows:

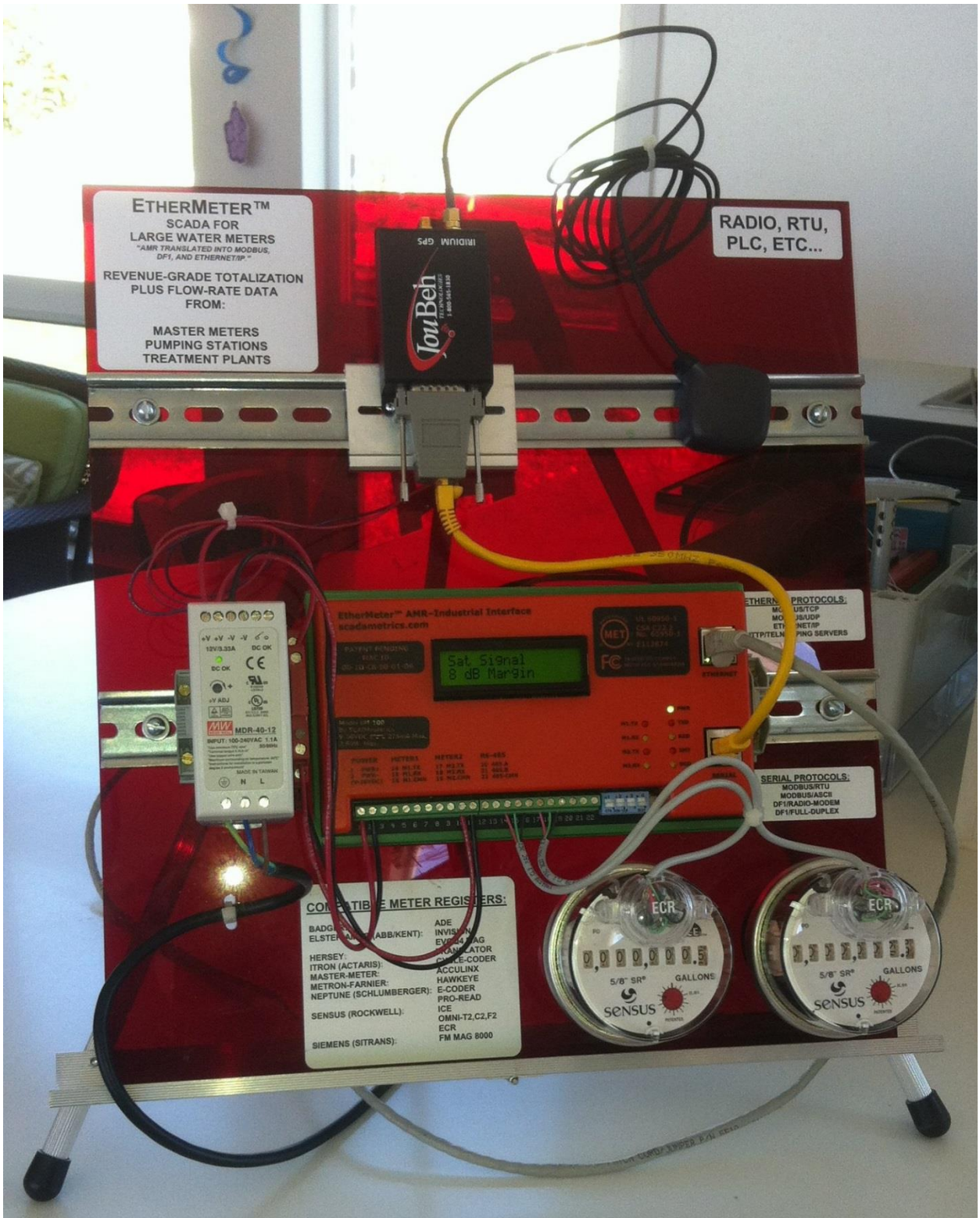
1	Power + (Gated thru an SSR controlled by the EtherMeter AUX1 Output, Terminals [10,11].)
2	
3	Power –
4	
5	
6	RxD (from EtherMeter TxD, Serial Port Pin 6)
7	TxD (from EtherMeter RxD, Serial Port Pin 5)
8	Signal Common (from EtherMeter Signal Common, Serial Port Pin 4)
9	
10	
11	
12	
13	
14	DSR (from EtherMeter DTR, Serial Port Pin 3)
15	

## **Example of an Iridium Email Attachment:**

ABCDEF:12345678:1:122:5:

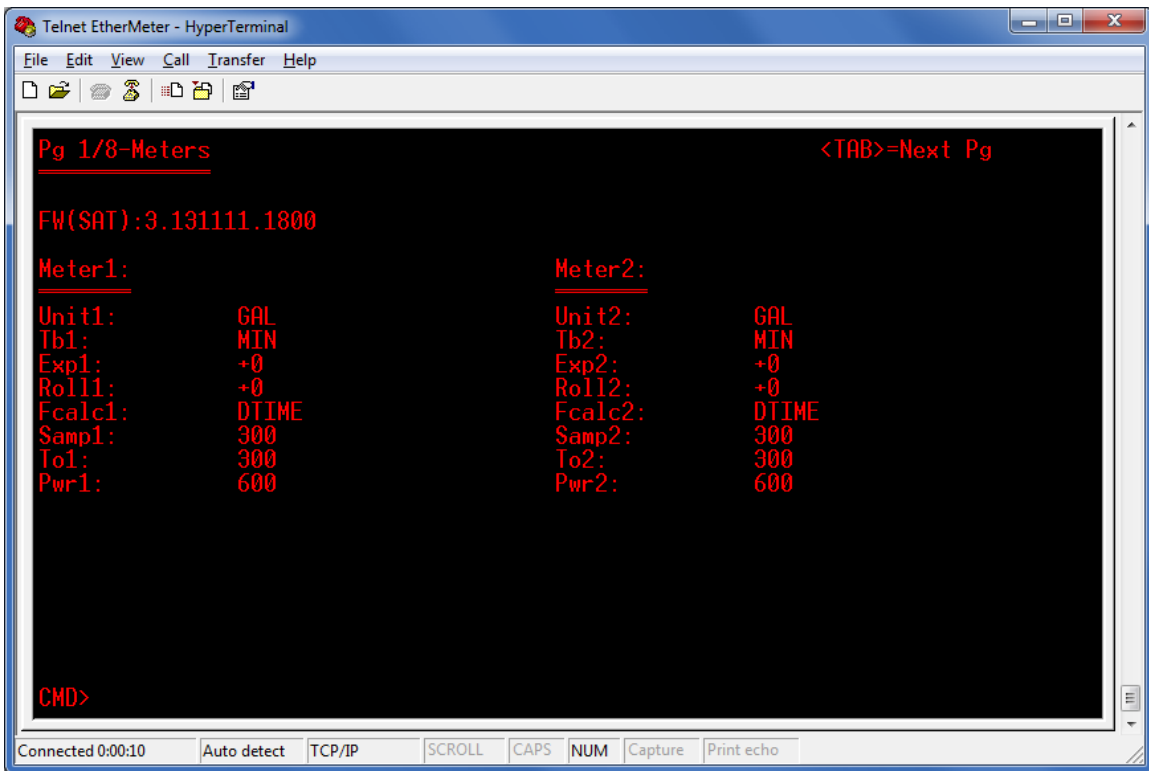
### Decoding:

Unit ID:	ABCDEF
Meter Reading:	12345678
Meter Working/Not-Working:	1 (Working)
Supply Voltage:	12.2 Volts
Satellite Signal Strength:	5 (Strongest)

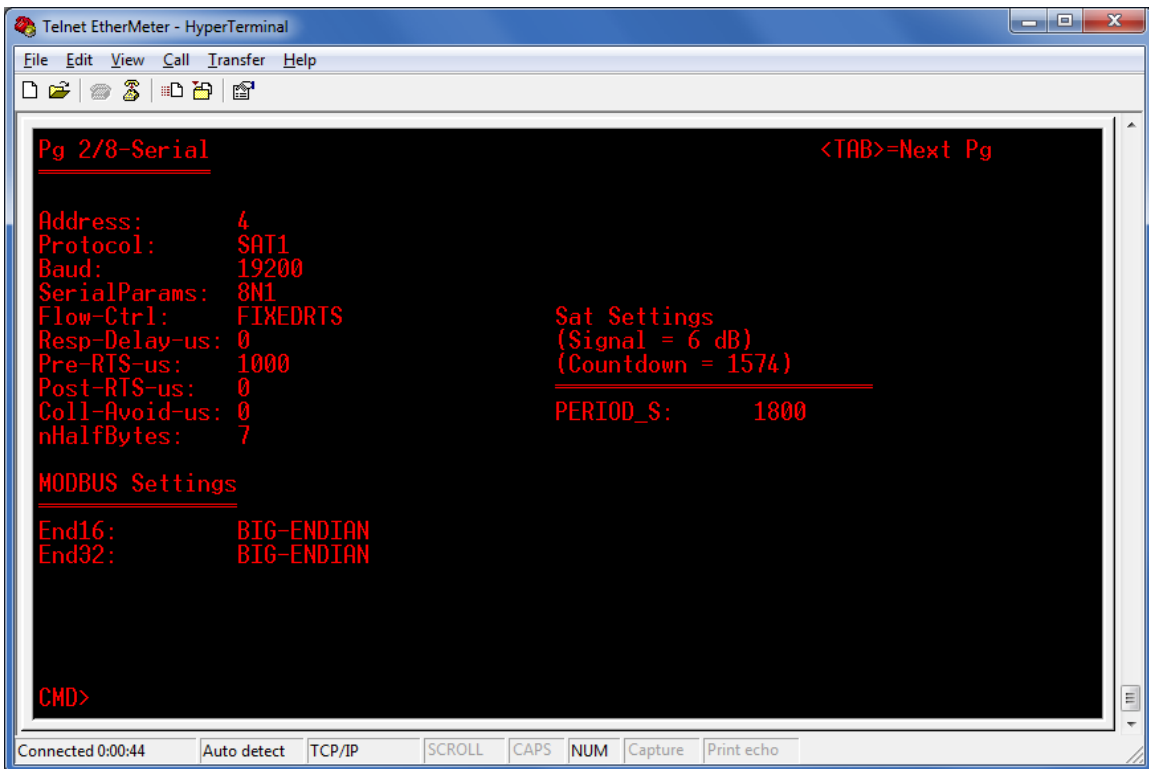


**Figure 1. EtherMeter / Iridium Demonstration Panel**

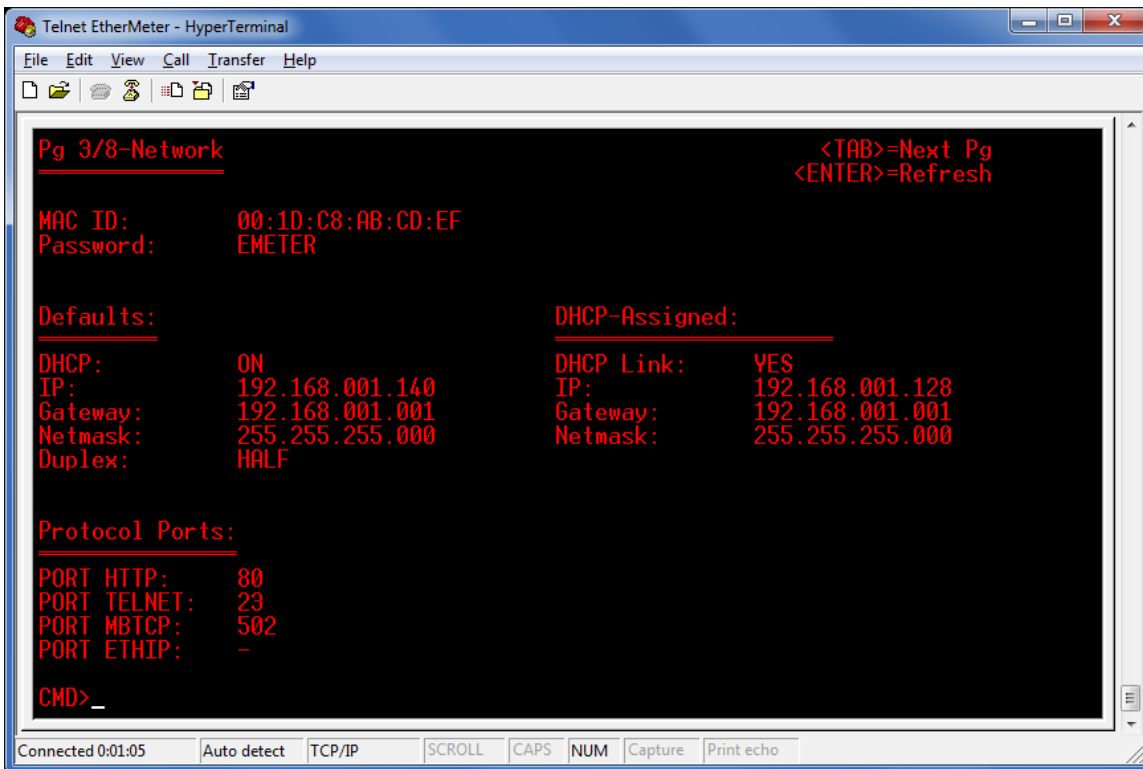
Note that the satellite modem is powered via a SSR controlled by EtherMeter Terminals [10,11].



**Figure 2a. Setup Screen Page 1/8**  
 Note that SAMP1 and SAMP2 are defaulted to 300s.

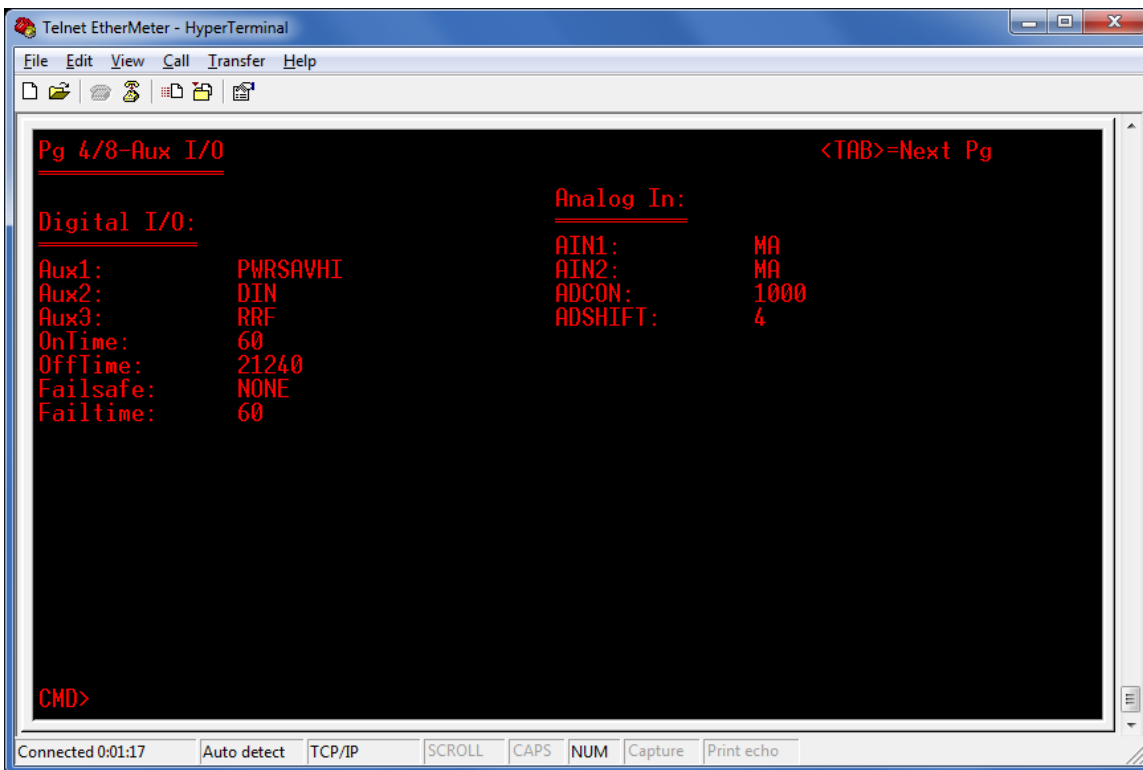


**Figure 2b. Setup Screen Page 2/8**  
 Note PERIOD\_S is defined/adjusted on this screen.



**Figure 2c. Setup Screen Page 3/8**

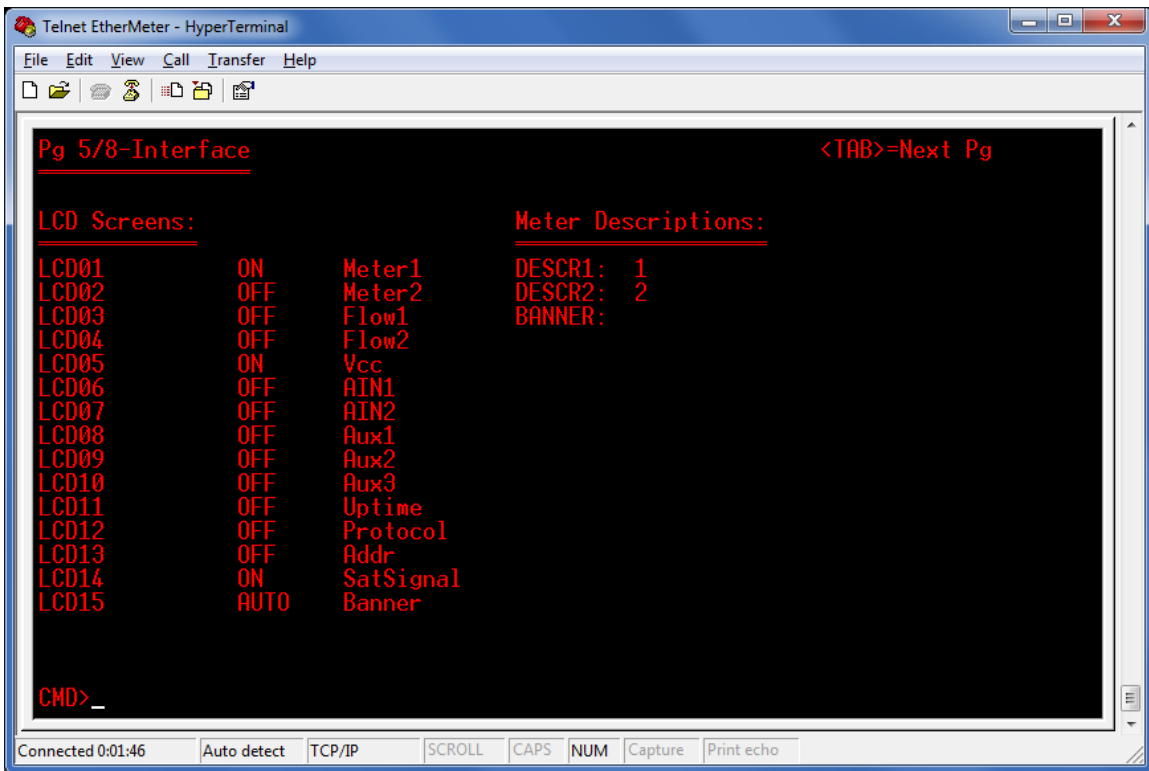
Note that the full MAC ID is visible on this screen, as well as on a tag on the front cover of the unit.



**Figure 2d. Setup Screen Page 4/8**

Note that AUX1 is set to PWRSAVHI. The ‘OnTime’ and ‘OffTime’ parameters are ignored in this version.





**Figure 2e. Setup Screen Page 5/8**

Note that the items in which LCDnn is set to ON will be transmitted via satellite modem (except Protocol, Addr, and Banner).

## Table 1. Sample EtherMeter/Modem Communication Session

Transmit (5) : ATZ  
Receive: (5) ATZ<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (7) : AT&F0  
Receive: (7) AT&F0<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (7) : AT&K0  
Receive: (7) AT&K0<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (7) : AT&D0  
Receive: (7) AT&D0<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (8) : AT+CSQ  
Receive: (8) AT+CSQ<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (8) +CSQ: 4<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (35) : AT+SBDWT=ABCDEF:00000005:1:121:4:  
Receive: (17) 000005:1:121:4:<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>

Transmit (9) : AT+SBDI  
Receive: (9) AT+SBDI<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (26) +SBDI: 1, 39, 0, 0, 0, 0<CR><LF>  
Receive: (2) <CR><LF>

Transmit (6) : AT\*F  
Receive: (4) OK<CR><LF>  
Receive: (6) AT\*F<CR><LF>  
Receive: (2) <CR><LF>  
Receive: (4) OK<CR><LF>