



**SIXNET's Ethernet Modbus Gateway allows communications over Ethernet to an Action Instruments' AIOS 2500 PID Controller**

**Abstract:** This document explains the procedure for using a SIXNET Ethernet Modbus Gateway (ET-GT-485-1) to communicate over Ethernet to an AIOS 2500 PID Controller. The ET-GT-485-1 converts Ethernet Modbus/TCP messages to Serial Modbus RTU messages. This allows the AIOS 2500, which has only serial ports, to be communicated to over Ethernet.

There are many installations and products that continue to use RS485 networking and Modbus protocol. This was and is a reliable method for interfacing to industrial equipment. However, Ethernet is becoming the standard for industrial networking due to its combination of reliability and speed. Those users who want to gain the advantages of Ethernet are faced with two options: replace all their existing (and paid for) serial devices with new Ethernet-enabled devices OR interface their existing devices to Ethernet. In most cases the latter choice is far less costly due to Ethernet to Modbus converters such as SIXNET's EtherTRAK modules and gateways. These devices can save users substantial time and money by allowing them to maintain their existing devices and wiring.

In this document we outline how to setup communications from Action Instruments' iTools software to an AIOS 2500 Controller using a SIXNET ET-GT-485-1 as the interface between Ethernet and RS485.

**Software Used:**

- ITools v2.51 from Action Instruments
- SIXNET's Remote I/O Tool Kit v3.24
- Windows NT 4.0 OS with Service Pack 5

**Hardware Used:**

- (1) PC with an Ethernet card and TCP/IP protocol installed
- (1) ST-CABLE-ETH-X (cross wired Ethernet cable)
- (1) Custom RS485 cable (see pinouts below)
- (1) ET-GT-485-1 (Note: Any EtherTRAK module could have been used. They have the same Modbus passthru capability of the ET-GT-###-1. The only difference is that the ET-GT-485-1 doesn't have any physical I/O points. Also, an ET-GT-232-1 can be used if your serial Modbus device has an RS232 port.)
- (1) AIOS 2500 PID Controller
- (1) RS232 configuration cable (2500A/CABLE/CONFIG/RJ11/9PINDF)
- (1) ST-PS-024-02N AC/DC power supply (24 VDC used to power ET-GT-485-1 and 2500)

**Custom RS485 Cable:**

ET-GT-485-1 Screw Terminals	2500 RJ45 Connector
4 (GND)	Pin 3 and 6 (GND)
5 (RS485 +)	Pin 1 (D-)
6 (RS485 -)	Pin 2 (D+)

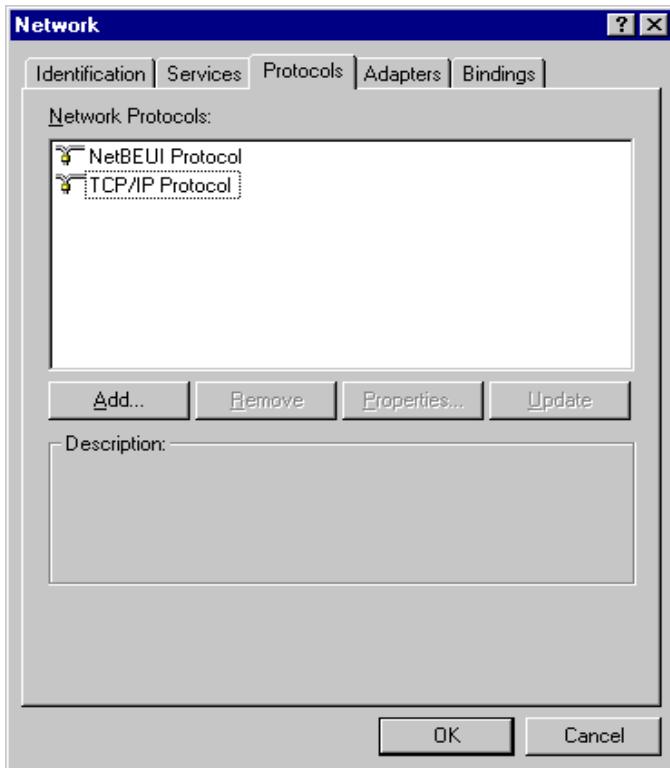
## Hardware Setup:

24 VDC power was applied to both the ET-GT-485-1 and AIOS 2500. Refer to the appropriate user manual for details on doing this. The ET-GT-485-1's Ethernet port was connected directly to the Ethernet card in the PC via the ST-CABLE-ETH-X. Alternatively, you can connect the ET-GT-485-1 to an Ethernet hub or switch. In this case you should use straight-thru Ethernet cables. Make sure the LNK (LINK) LED on the ET-GT-485-1 (and on the Ethernet card or hub) goes ON solid. The ET-GT-485-1's RS485 port was then connected to the RS485 port of the AIOS 2500 using the custom made cable (see pinouts above). The 2500's RS232 configuration port was also connected to a serial port on the PC using the prescribed serial cable.

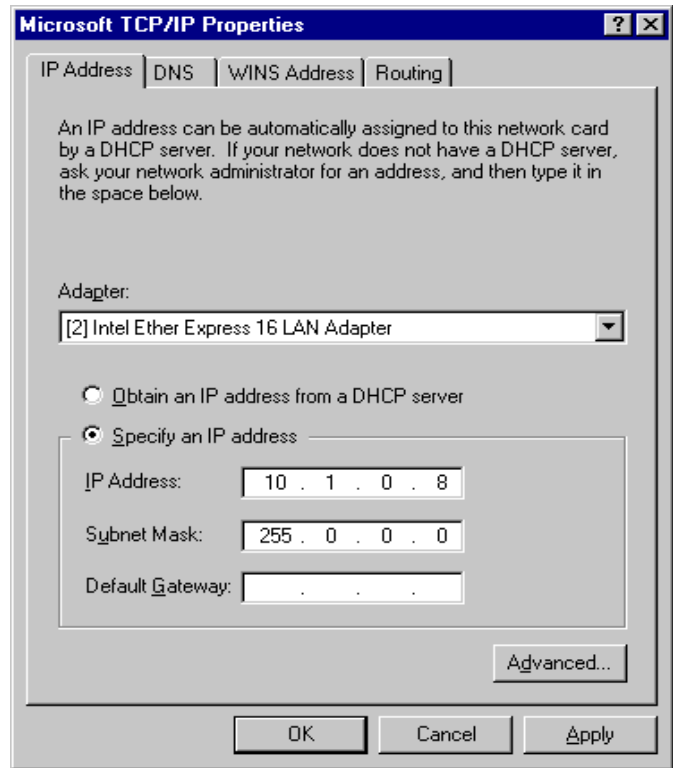
- Notes:**
1. The AIOS 2500 had only dip switches 1 & 4 in the up position. This configures it for no parity and station number 5.
  2. The AIOS 2500 was jumpered for 2-wire RS485 communications.
  3. No RS485 termination was used on either the ET-GT-232-1 or AIOS 2500. For longer cable lengths termination is recommended. Refer to the user manuals.

## Configuring the PC:

To successfully communicate over Ethernet you must first make sure that your PC has the TCP/IP network protocol installed. Go to the Window's Control Panel and double click on the Network icon. Look for the TCP/IP protocol and view its properties. Make a note of what the IP address and Subnet Mask are. These will be important later on when you assign the IP address for your EtherTRAK module/gateway. If you don't have TCP/IP installed then click on the Add button and follow the directions. See screen shots 1 and 2 from Windows NT. Note: These windows may look a little different in other Windows operating systems.



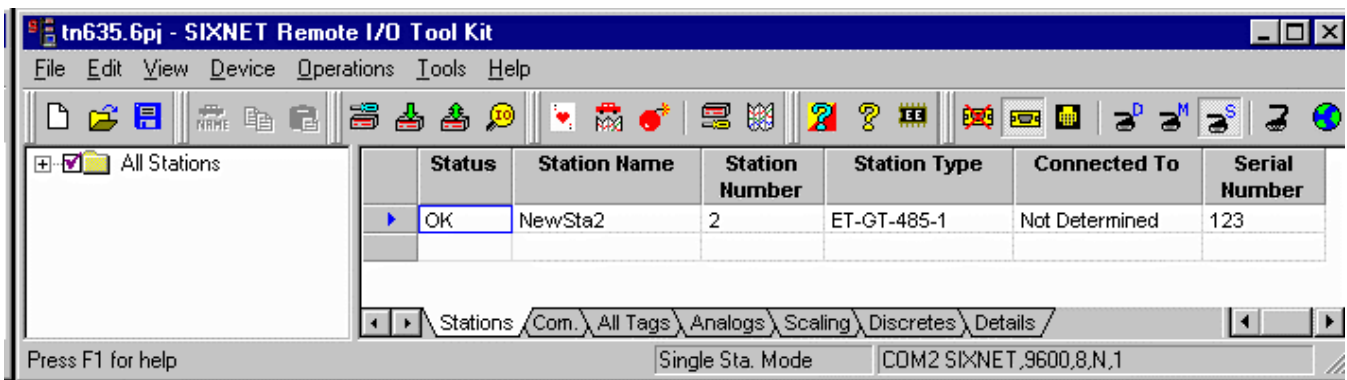
Screen Shot 1



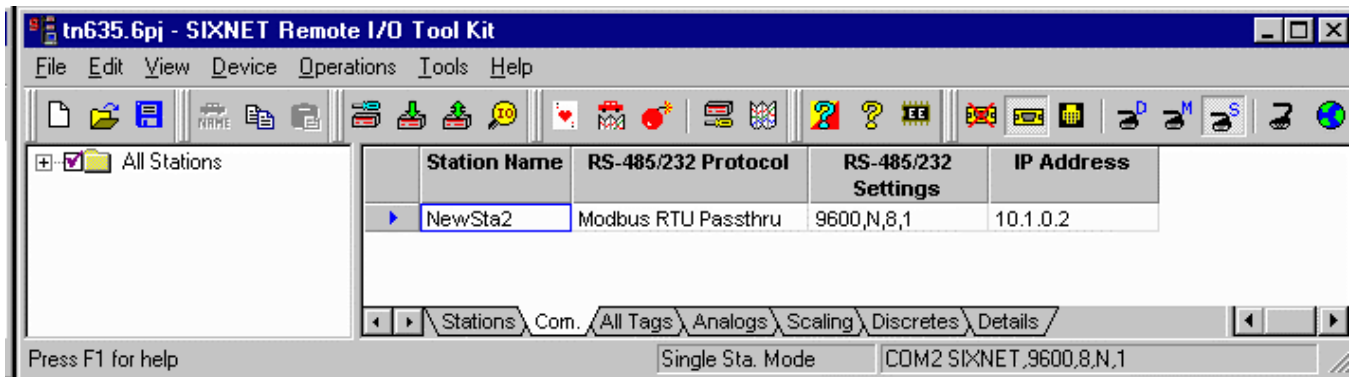
Screen Shot 2

### Configuring the EtherTRAK Module or Gateway:

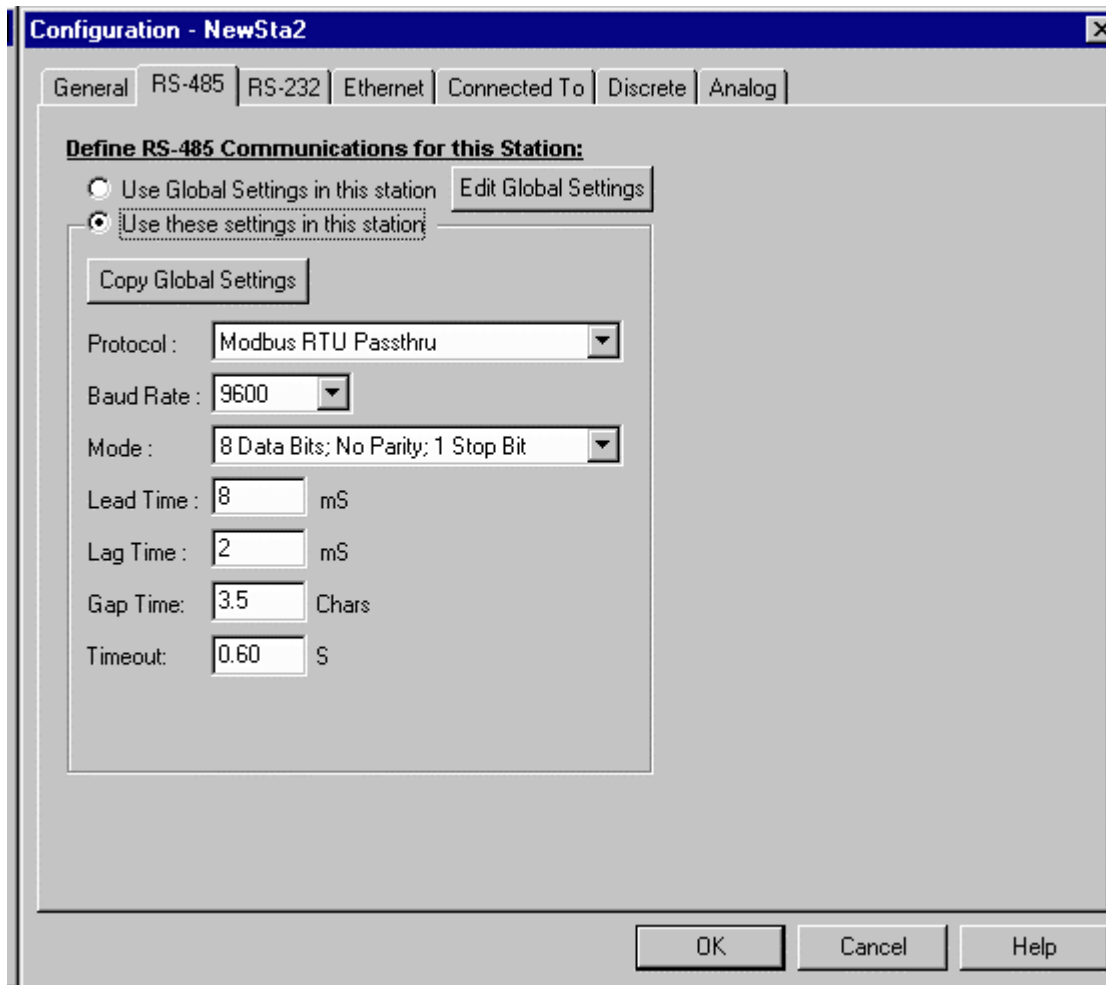
Install the Remote I/O Tool Kit from the SIXNET CD if you haven't done so already. Now run the Tool Kit and select the EtherTRAK module or gateway that you are using. In this case we used an ET-GT-485-1. Then step through the configuration windows to configure the module or gateway. Make sure to assign the correct serial number from the sticker on the base of the unit. Assign a unique station number. Make sure this number is different from the device that is connected off of the EtherTRAK. Next, assign an IP address that is appropriate for your network. For example, if the IP address of the Ethernet card in your computer is 192.68.98.4 then you would want to assign to the EtherTRAK a similar (but unique) IP address such as 192.68.98.5. Refer to the Remote I/O Tool Kit help for more details on assigning the IP address or check with your MIS department or network administrator. Finally, configure the RS485 port settings appropriately for the device you will be connecting to. In this case we are interfacing to an AIOS 2500 with RS485 settings of 9600 baud, 8 data bits, no parity, and 1 stop bit. See screen shots 3, 4, and 5. Now in the Device menu select Ethernet. Then go to the Operations menu and perform a Load.



Screen Shot 3



Screen Shot 4



Screen Shot 5

**Important Note 1:**

Make sure you select Modbus RTU Passthru to interface the AIOS 2500. This “Passthru” mode tells the EtherTRAK module to forward any incoming Ethernet messages, not addressed to itself, out the RS485 port. The RS485 responses will then get forwarded back out the Ethernet port.

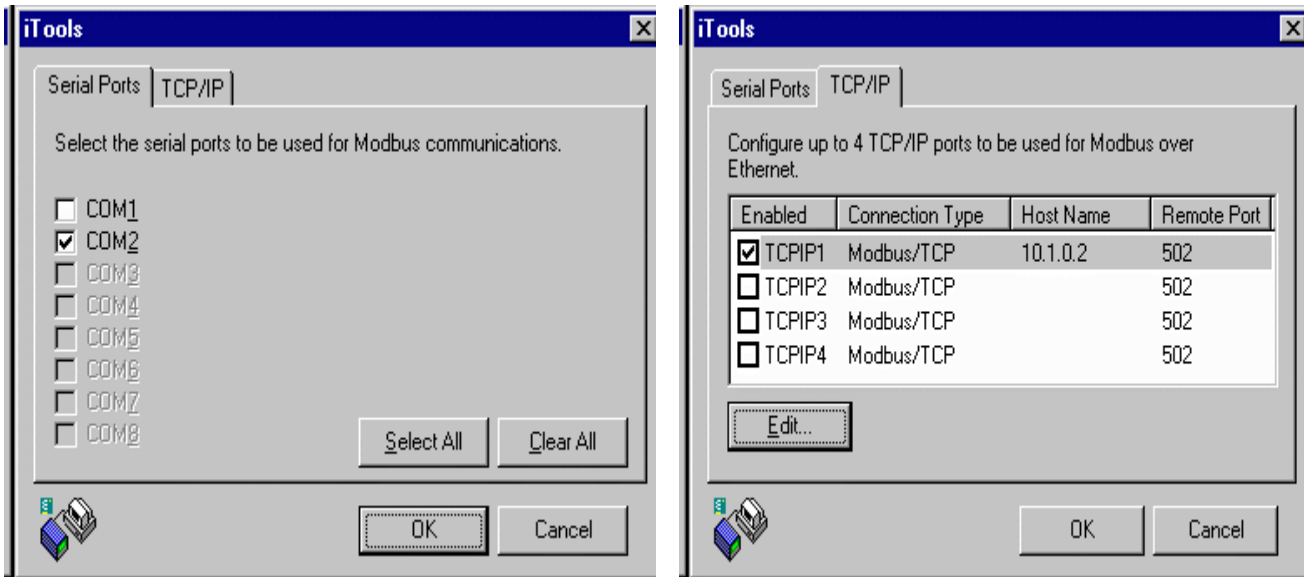
**Important Note 2:**

The default Timeout in the RS485 window (screen shot 5) is 0.15 seconds. This timeout is defaulted for 38,400 bps communications. If you are using a slower baud rate then you should increase this timeout (0.60 seconds used for this test).

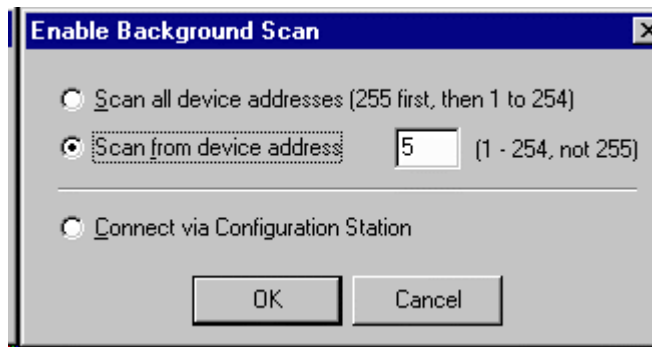
### Configuring the AIOS 2500:

Install the iTools software if you haven't already. This software allows you to configure the AIOS 2500. Refer to the user manual and iTools Help for details. The following steps were performed in order to configure the AIOS 2500 for proper communications with the ET-GT-485-1.

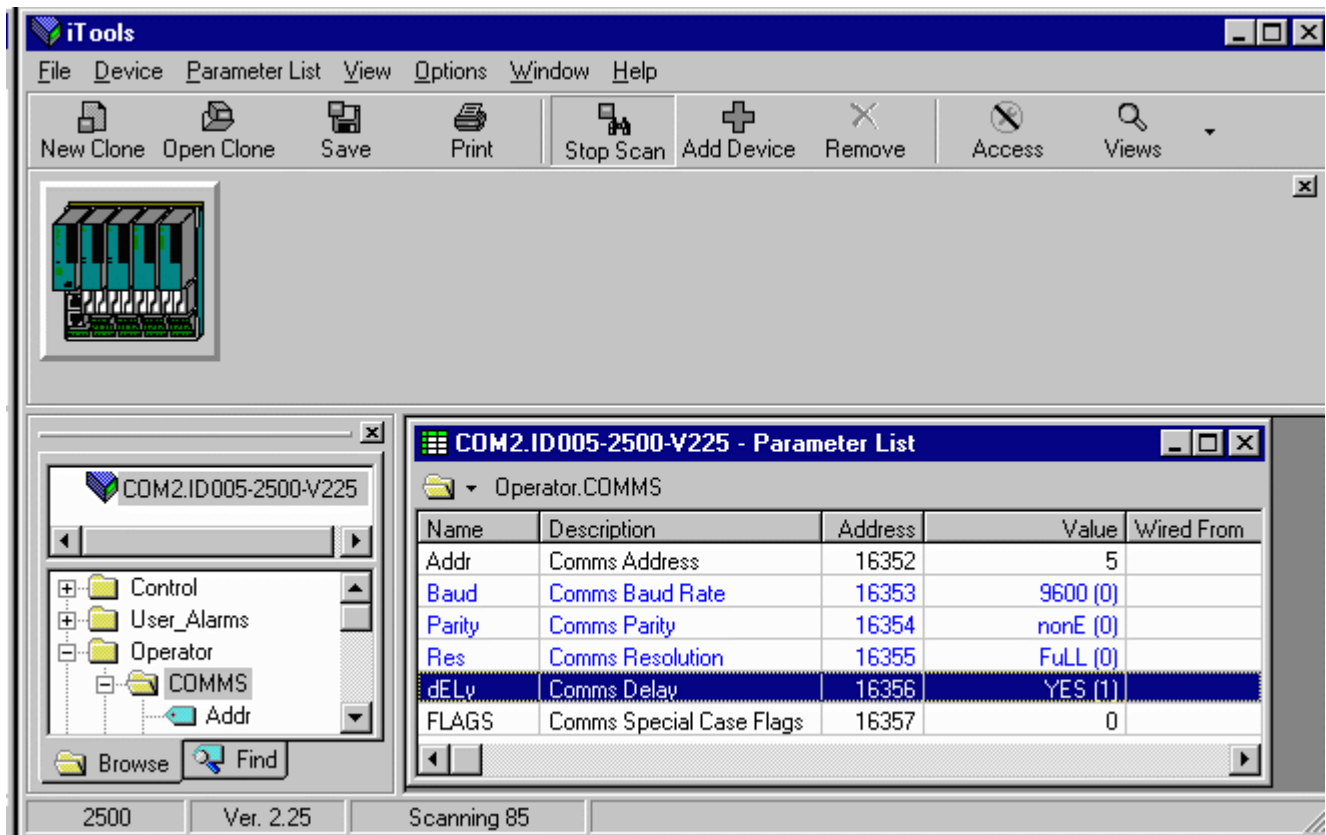
1. Run the iTools icon found in Microsoft's Control Panel. Under the Serial Ports tab, enable the Com port that the RS232 configuration cable is connected to. Under the TCP/IP tab, select TCPIP1 and edit its properties. Enter the IP address of the ET-GT-485-1. See screen shot 6. Click OK to close this utility.
2. Run iTools from Start - Programs – Eurotherm iTools.
3. Select Start Scan, enter device # 5, and click OK. Now iTools should start scanning the 2500 through the RS232 connection. (See screen shot 7)
4. Go to the View menu and select Parameters List.
5. In the tree go to Operator – Comms. See screen shot 8.
6. **Double click on the Comms Delay and change it to Yes. Then hit Apply and OK. This setting is absolutely required for successful communications thru a ET-GT-485-1.**
7. Now shutdown iTools and disconnect the RS232 cable.
8. Cycle power (turn power off and back on) to the AIOS 2500 so the Comms Delay change takes affect. Wait until the green status LED (top most LED) comes on solid before proceeding.



Screen Shot 6



Screen Shot 7



Screen Shot 8

## Communicating to AIOS 2500 over Ethernet:

Now you are ready to communicate over Ethernet from iTools to the AIOS 2500 with the ET-GT-485-1 acting as the interface. Just follow these steps:

1. Run iTools from Start - Programs – Eurotherm iTools.
2. Select Start Scan, enter device # 5, and click OK. Now iTools should start scanning the 2500 through the Ethernet connection. See screen shot 9.

The screenshot displays the iTools software interface. The main window is titled "TCPIP1.ID005-2500-V225 - Parameter List". The interface includes a menu bar (File, Device, Parameter List, View, Options, Window, Help) and a toolbar with icons for New Clone, Open Clone, Save, Print, Stop Scan, Add Device, Remove, Access, and Views. A device tree on the left shows a hierarchy of folders: Control, User\_Alarms, Operator, IO, Module01, Module02, Module03, MOD03, and M03\_C1. The right pane displays a table of parameters for the selected device.

Name	Description	Address	Value	Wired From
TYPE	Channel Type	4944	Pot (9)	
LinTyp	Linearisation Type	4955	Linear (11)	
Val	Process Value (Eng Units)	5207	84.18	(not wired)
VALH	Engineering Value High	4948	100.00	
VALL	Engineering Value Low	4949	0.00	
IOH	Electrical High	4950	100.00	
IOL	Electrical Low	4951	0.00	
MeasV	Electrical Value (V/A/R)	5216	84.18	
FiltTm	Filter Time	4962	OFF (0)	
ChStat	Status	5208	0	
Offset	Simple Cal Offset (Eng)	4956	0.00	
Inhibt	Status Alarm Inhibit	14881	no (0)	(not wired)
Ack	Status Alarm Acknowledge	14884	no (0)	
OP	Status Alarm Output	14885	OFF (0)	

The status bar at the bottom of the window shows "2500", "Ver. 2.25", and "Scanning 19".

Screen Shot 9

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**Conclusion:**

**The ET-GT-485-1 successfully converted Ethernet Open Modbus/TCP messages to serial Modbus RTU and vice versa. This allowed the iTools software to communicate over Ethernet to the AIOS 2500 PID Controller**

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