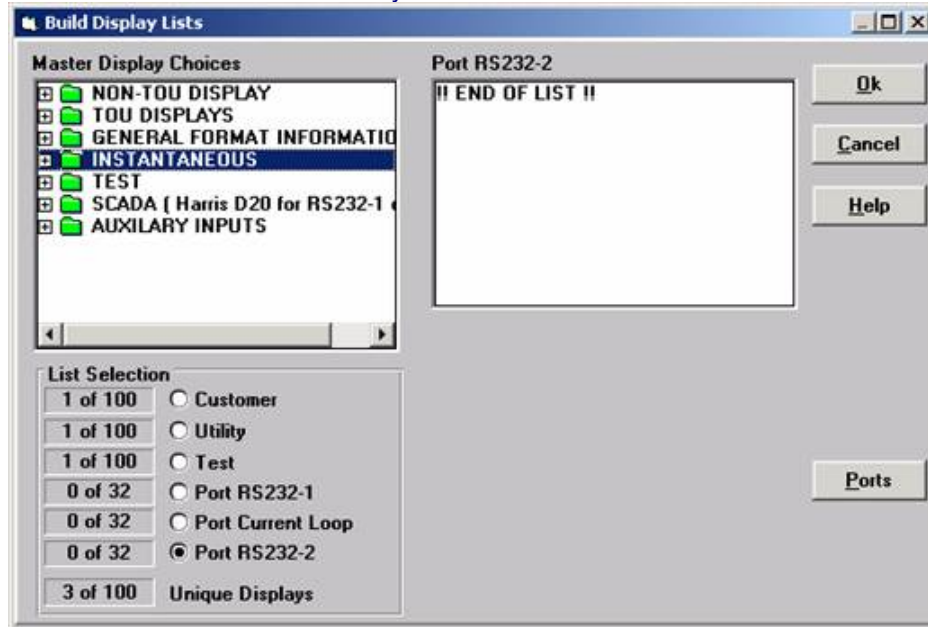# Set-up and Troubleshooting Guide
# MODBUS Protocol

How to set-up and read MOBBUS

Before anything can be read from the RTU, the meter must be programmed. During programming up to 16 of the thousands of displays in the meter can be assigned to the RTU. The first item in the list will be at (point) zero (0).

EXAMPLE 1: Default from factory

Please Note: In example 1, the list on the right is empty. The meter will send the items in the list on the right to the RTU starting with point 0. Because there has been no items selected all 16 registers are loaded with zeros.

EXAMPLE 2: After Programming
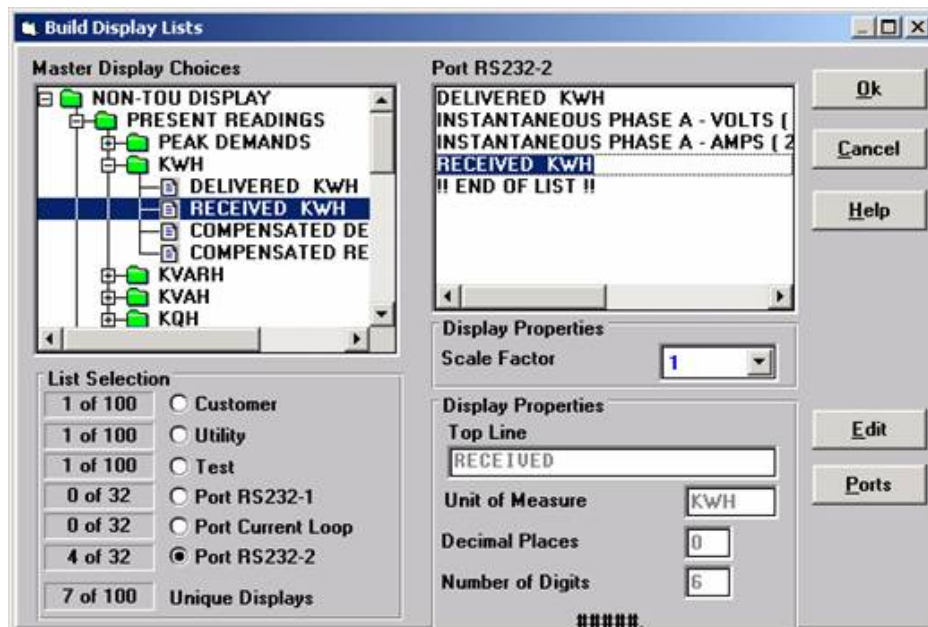
Please note: Four (4) items have been added to list on the right from the master list on the left. The first items Delivered KWH will be assigned to RTU point 0 and the numbering will continue down the list ending with Received KWH at point 3. The maximum number of selection is limited at 16.

The scaling factor allows you to scale the value being sent back by the RTU. If the value was 120.1 volts and you left the scaling factor set at one (1), the results would be a value of 120 would be returned. If the scale factor was changed from 1 to 10 the results would be a value of 1201 would be returned by the RTU.

The following is the port configuration for ModBus. The only change that you should make is the slave address.

EXAMPLES of reading registers:

Example 1

If you wanted to read register 0 from the RTU card, you would us the following:

Slave Address	01	In this example the slave address is 1
Function Code	03	Read input Registers
Starting Address MSB	00	
Starting Address LSB	00	Start at address 0
# of points MSB	00	
# of points LSB	01	Read one point (value)
Check	CRC	

The above example reads register 0 from remote 1

Example 2

If you wanted to read register 9 from the RTU card, you would us the following:

Slave Address	01	In this example the slave address is 1
Function Code	03	Read input Registers
Starting Address MSB	00	
Starting Address LSB	09	Start at address 0
# of points MSB	00	
# of points LSB	01	Read one point (value)
Check	CRC	

The above example reads register 9 from remote 1

Example 3

If you wanted to read all of the registers from the RTU card, you would us the following:

Slave Address	01	In this example the slave address is 1
Function Code	03	Read input Registers
Starting Address MSB	00	
Starting Address LSB	00	Start at address 0
# of points MSB	00	
# of points LSB	10	Read 16 points (values)
Check	CRC	

The above example reads all 16 registers from remote 1

Troubleshooting:

If you are unable to communicate with the RTU card, please review the following check list:
1. **Check the jumpers on the RTU card and the E9 jumper on the display card.**.

Jumper Installations Protocol Board

Host Serial Ports (connection from Protocol Board to host computer):

Port	Jumper	Position	Function
	E1	Not Used	On Standard Board
****	E1	A	Common Ground
****	E1	B	Isolated Ground
RS-232 (J2)	E2	A	RX data
RS-485 (J2)	E2	B	RX data
****	E2	B	Isolated RS232
	E3	*Not Used	Ring indicate
	E4	A	RS232 CTS used, signal from external source
	E4	B	RS232 CTS not used & RS485
	E5	Don't Care	RS232
RS485	E5	A	RX data Recommended
****	E5	B	RX data Isolated RS232
	E6	In	RS485 Terminated Not Recommended
	E6	Out	RS485 Un-terminated Recommended
	E7	N/A	Not customer configurable
	E8	N/A	Not customer configurable

Meter Serial Port (connection from Protocol Board to CPU of meter):

	Jumper	Position	Function
2	E9	In	TXD connected to backplane (standard)RS232-
	E9	Out	RXD connected to RS-232 external RS232-1
2	E10	A	RXD connected to backplane (standard)RS232-
	E10	B	RXD connected to RS-232 external RS232-1

Example of jumper settings:
Application:
      Configured to talk to the meter processor on the SuperBoard (Display Card) over the backplane (i.e., bus) on the Mother Board. The host interface is RS-232 with CTS not used.

Jumpers on Protocol Converter Board:
      For meter serial port: E9 In; E10 on A.
      For host connection: E2 on A, , E4 on B, E5 on A.
      NOTE: You can convert from RS232 to RS485 by moving E2 from the jumper from "A" to "B".
            **** Indicates position NOT USED on standard board.
Jumpers on SuperBoard (Display Card):
      E9 in position 2-3 for operation with Protocol Converter
      Note: If E9 is in position 1-2, RS-232 port #2 is active for other purposes.

2. **Check the firmware**
3. **Check the internal wiring.**
4. **Check the external wiring.**
5. **We will be using the LED's on the RTU card for checking the communications.**

The Protocol Converter Card has six LED's labeled LED1 through LED6. These LED's indicate the status of the host and meter communications, and the error status.

LED 1: On when data is being received from the RTU host. Green LED on the left side.

LED 2: On when data is being transmitted to the RTU host. Green LED on the right side.

LED 3: On when data is being received from the meter. Red LED left side

LED 4: On when data is being transmitted to the meter. Red LED right side.

LED 5: On when RTU communications to the host are not possible, due to an error or due to the protocol converter card booting up. This LED turns off when the protocol converter card finishes its boot-up process, and is ready to communicate to the RTU host. Yellow LED on the left side.

LED 6: Displays error codes by blinking on and off. The tens digit of the error code is a "long" on, while the units digit is a "short" on. A solid on, scintillating, condition indicates a "line break" has been detected and a recovery effort is underway. A very short on condition upon power up, reset by command or table reload is normal. Yellow LED on the right side

6. **Power-up the meter and wait for one minute, then check the LED's on the RTU card.**

The two yellow LED's should be off.

The two read LED's should be toggling

> If LED's the red LED's are not toggling check E9 jumper on the display and make sure the program in the meter are set-up for modbus.

7. **Connect a Modbus test set to the meter.**

Send a request to the RTU and observe the green LED on the left. The LED should blink.

> If the green LED on the left does not blink, check the wiring. The RTU is not seeing the request.
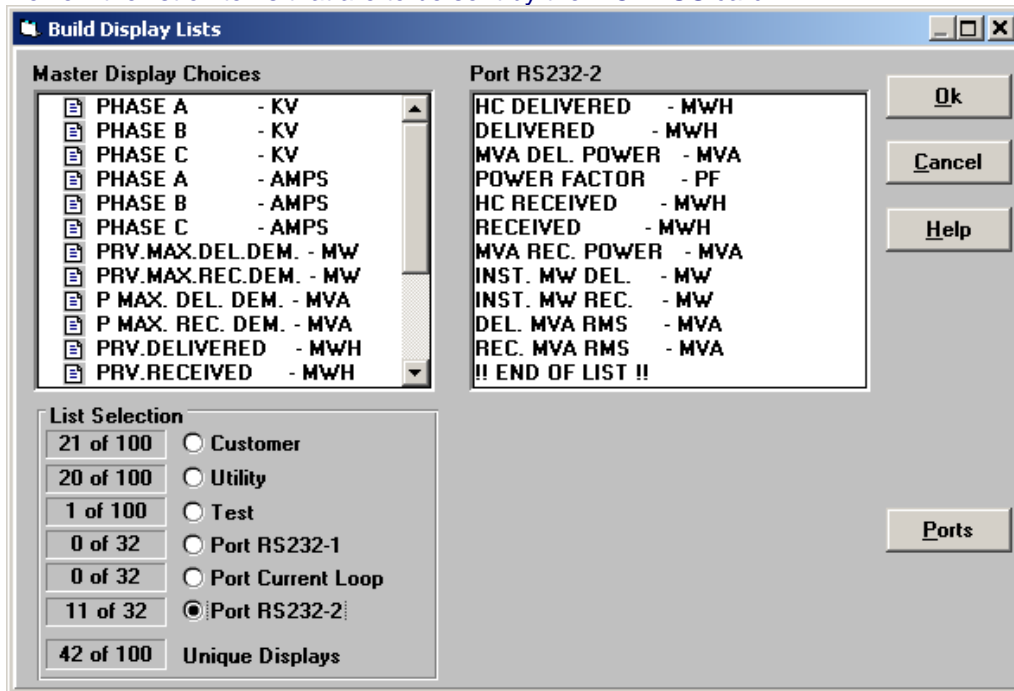
If the green request LED on the left blinked, the green LED on the right should blink and you should get (received) a response.

> If the green response LED on the right did not blink and you did not get a response, check the RTU ID. The unit will not respond without the correct ID, also check the baud rate.

Note: The yellow should not come on if they do check the communications set up. If the yellow LED"s are off, the read LED"s are toggling and the green LED on the left blinks when you send a request and the ID's and baud rates are correct and you do not get a response and the green LED on the right does not blink. The problem is more than likely with the format of the request or the MODBUS card is bad.
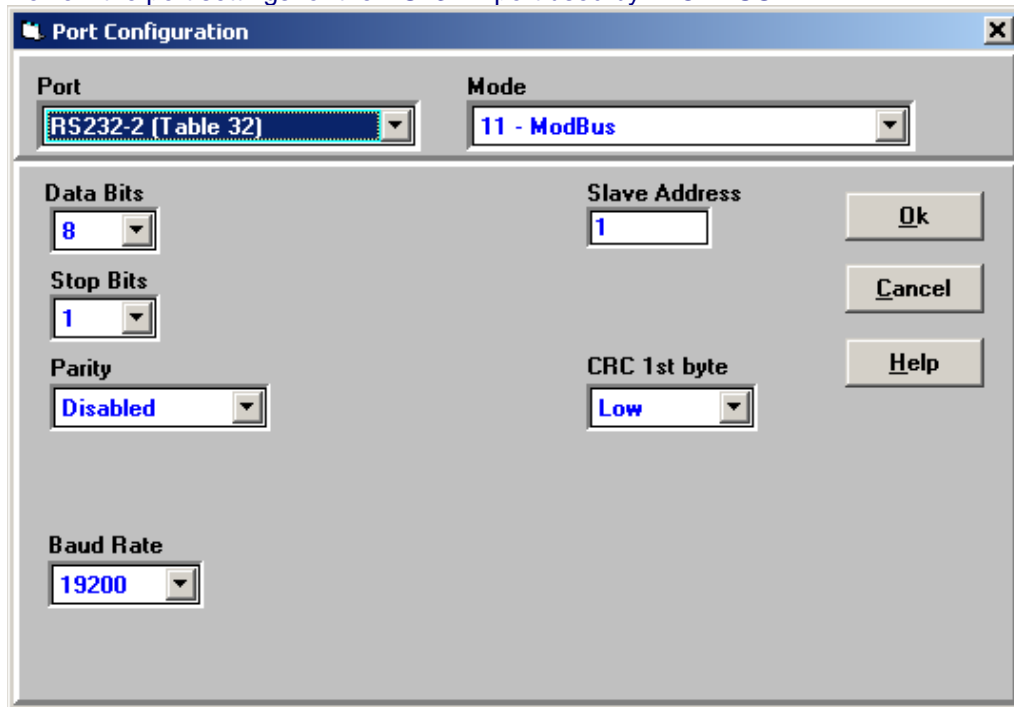
8. Review set-up and format of request.

a. Review the list of items that are to be sent by the MODBUS card.

Build Display Lists

Master Display Choices

📄 PHASE A	- KV
📄 PHASE B	- KV
📄 PHASE C	- KV
📄 PHASE A	- AMPS
📄 PHASE B	- AMPS
📄 PHASE C	- AMPS
📄 PRV.MAX.DEL.DEM.	- MW
📄 PRV.MAX.REC.DEM.	- MW
📄 P MAX. DEL. DEM.	- MVA
📄 P MAX. REC. DEM.	- MVA
📄 PRV.DELIVERED	- MWH
📄 PRV.RECEIVED	- MWH

Port RS232-2

HC DELIVERED	- MWH
DELIVERED	- MWH
MVA DEL. POWER	- MVA
POWER FACTOR	- PF
HC RECEIVED	- MWH
RECEIVED	- MWH
MVA REC. POWER	- MVA
INST. MW DEL.	- MW
INST. MW REC.	- MW
DEL. MVA RMS	- MVA
REC. MVA RMS	- MVA
!! END OF LIST !!	

Ok   **Cancel**   **Help**   **Ports**

List Selection

21 of 100	○ Customer
20 of 100	○ Utility
1 of 100	○ Test
0 of 32	○ Port RS232-1
0 of 32	○ Port Current Loop
11 of 32	◉ Port RS232-2
42 of 100	Unique Displays

As you can see there are eleven (11) items that are being sent back. They start with point 0 and go through point 10.

b. Review the port settings for the RS232-2 port used by MODBUS.

Port Configuration

Port
RS232-2 (Table 32)

Mode
11 - ModBus

Data Bits
8

Stop Bits
1

Parity
Disabled

Slave Address
1

CRC 1st byte
Low

Ok   **Cancel**   **Help**

Baud Rate
19200

c. Review the se-up for an ASE 2000 test set..

Note: The test set is going to request Slave 1 send data starting with point 0 and then send back one (1) point. Therefore the unit will respond by sending back the value in point 0.

d.   The test set sends request.

Note: you can see the format of the request and the response in the line monitor box. The value is also displayed in the point box. If you do not get a response check the format of the request that is being sent. If your format is the same as above, the problem is more than likely the MODBUS card. If you do not have a test set you can use a line monitor to capture the request. You can also download a demo copy of the ASE 2000 test set from the Applied Systems Engineering's web site.

Breakdown of Request: 01 Slave Address, 03 Function Code (Read Registers), 00 00 Starting Point (Point 0), 00 01 Read one point (Point 0), 84 0A Check Sum.

Breakdown of Response: 01 Slave address, 03 Function Code, 02 Byte Count, 00 37 Register Point 0 (answer 55), F9 92 Check sum.

e. This is a request to bring back all 11 points.

Note: The test set is requesting Slave 1 send data starting with point 0 and then send back one (11) point. Therefore the unit will respond by sending back the values in point 0 through 10. You can also see the format of the request and of the response in the example above. If you can not get a response from the MODBUS card you will need to make a capture file of the communications before you move to step 9.

Breakdown of Request: 01 Slave Address, 03 Function Code (Read Registers), 00 00 Starting Point (Point 0), 00 0B Read eleven points (Point 0), 04 0D Check Sum.
Breakdown of Response: 01 Slave address, 03 Function Code, 16 Byte Count, 00 37 Register Point 0 (answer 55), 15 91 Register Point 1 (answer 5521), 02 B3 Register Point 2 (answer 691), 03 E2 Register Point 3 (answer 994), 00 42 Register Point 4 (answer 66), 1A 0A Register Point 5 (answer 6666), 00 00 Register Point 6 (answer 0), 02 3E Register Point 7 (answer 574), 00 00 Register Point 8 (answer 0), 02 68 Register Point 9 (answer 614), 00 00 Register 10 (answer 0), 85 17 Check sum.

9. **If you continue having issues connect Landis+Gyr Inc. at 800.777.2774, please have a capture file you can send to Landis+Gyr help desk.**
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