

Application Note 023
Version 003
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Configuring EtherMeter™-to- MicroLogix/ControlLogix/CompactLogix/SLC5xx Communications Using the DF1 Radio Modem Protocol and the SCADAmetrics Bell-202 Modem For Radio-Telemetry Applications.

The purpose of this document is to provide assistance to the Allen Bradley MicroLogix PLC user who wishes to connect to an EtherMeter using the DF1 Radio Modem protocol in conjunction with the SCADAmetrics Bell-202 Modem. This document assumes that the user is well-versed in Allen Bradley PLC's, DF1, and the RsLogix Programming Environment.

This document is written mainly for the MicroLogix family of PLC processors, although the Addendum provides special instructions pertaining to the ControlLogix and CompactLogix families.



**SCADAmetrics Bell-202 Modem For Radio Telemetry
Model No. B202**

1. Wiring Configuration.

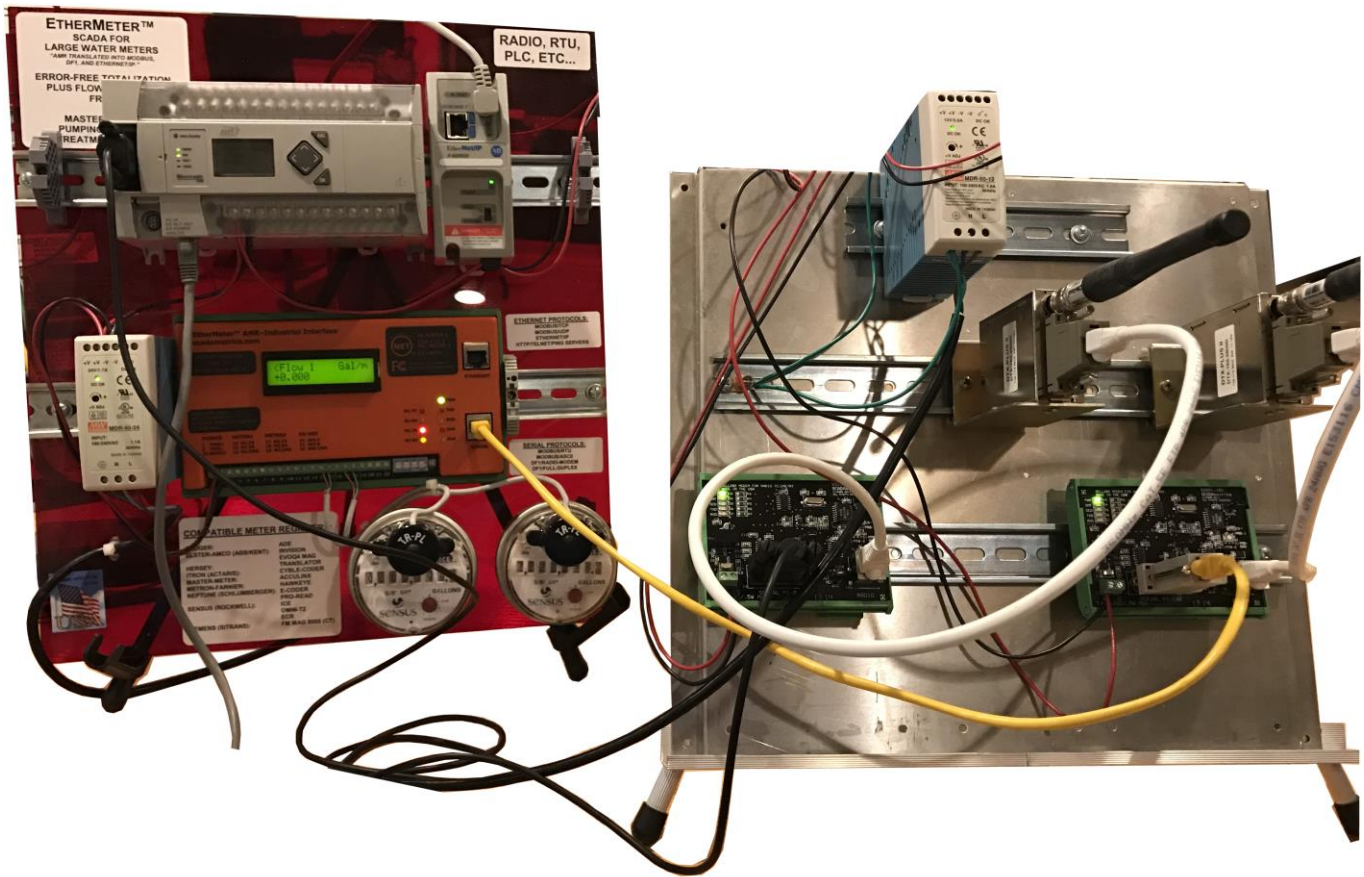
In this example, the serial ports of the MicroLogix and EtherMeter are wired directly to each other using a serial cable. For reference, the wiring and hardware configuration is illustrated in Figure 1.

Important Notes! –

The **MicroLogix** requires that CTS be tied to RTS – either within a customized serial cable, or via a modification to the modem. Update! (2018 April 2018) – the B202.v108 (and later) modem features RTS-CTS and DTR-DSR pins internally tied together. No customized serial cable required!

The **ControlLogix/CompactLogix** Family requires that CTS be tied to RTS and DSR be tied to DTR – either within a customized serial cable, or via a modification to the modem. Update! (2018 April 2018) – the B202.v108 (and later) modem features RTS-CTS and DTR-DSR pins internally tied together. No customized serial cable required!

For the B202.v103 modem, SCADAmetrics can provide **factory modification** to the modem by internally shorting RS-232/DCE pins 7 (CTS) and 8 (RTS), and by internally shorting pins 4 (DSR) and 6 (DTR).



**Figure 1. DF1 Radio Modem Communication Demonstration Panels.
MicroLogix 1400 / EtherMeter / Bell 202 Modems / Analog Narrowband Radios.**

2. EtherMeter Configuration.

When creating a DF1 master/slave serial connection between a MicroLogix PLC (master) and an EtherMeter® (slave), a few setup commands are required within the EtherMeter's Setup Menu. See Figure 2.

- a. SET PROTOCOL DF1-RM
- b. SET BAUD 1200
- c. SET RESP-DELAY-US 100000
- d. SET PRE-RTS-US 500000
- e. SET POST-RTS-US 50000

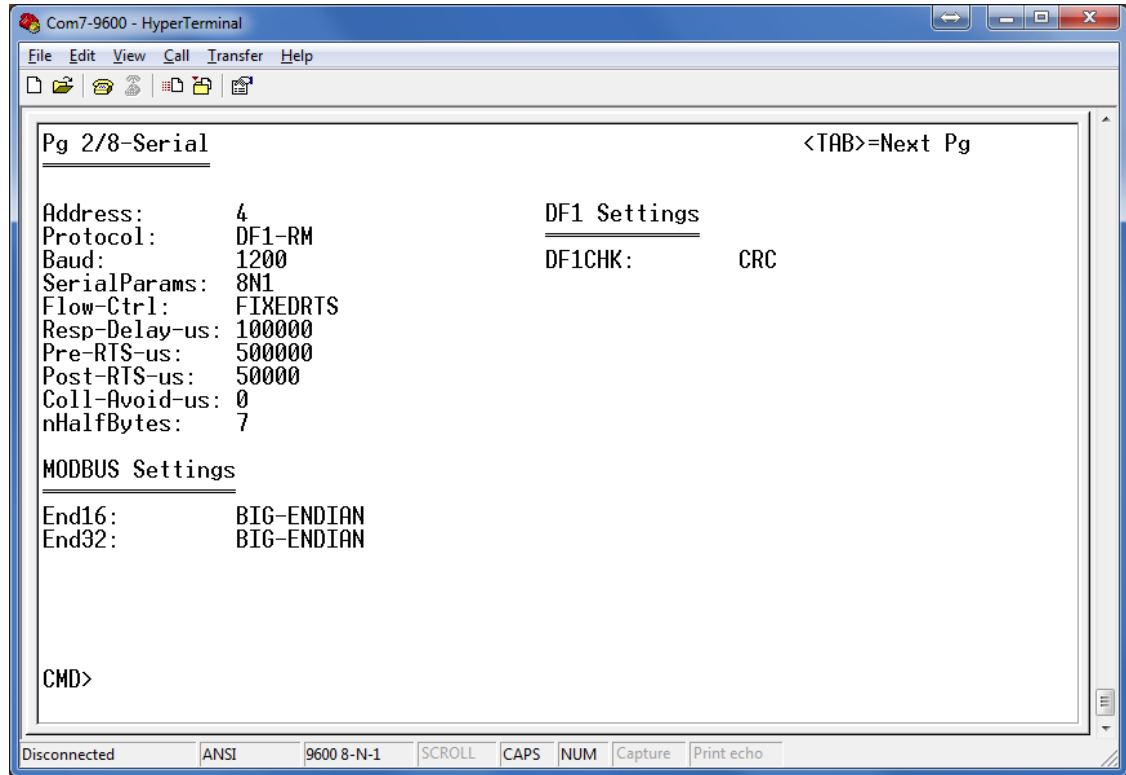


Figure 2. EtherMeter Setup Menu: Page 2 of 8.

3. MicroLogix Ladder Logic Programming.

To begin the setup, a new programming project should be initialized In RsLogix using the appropriate selections for processor type, version, serial port setup, etc.. For brevity, the details of these steps have been omitted.

Within a MicroLogix (or other Allen Bradley) PLC, communication setup is performed within the RsLogix Programming Environment. Figure 3 displays a screen snapshot of a simple ladder logic program that is designed to poll the two (2) totalization and two (2) flow-rate registers of an EtherMeter and deposit the data into the L12:xx long integer (32-bit) registers:

In Rung 0, a self-resetting, five-second timer is created to set up the polling interval, although a shorter or longer polling interval could be selected, depending upon the application.

In Rung 1, the five-second timer is used to trigger the message instruction to the EtherMeter. A double-left-click on the “Setup Screen” button of the MSG Block causes a popup window to appear, as shown in Figure 5. The setup parameters should be entered as shown in the figure. Within the popup window, first the “General” tab should be selected, and the parameters on its page should be entered as instructed below. The General tab is shown in Figure 5.

Under the “This Controller” heading, note that the selected Channel is “Channel 2 (Integral)”, which corresponds to the DB-9M serial port of the MicroLogix 1400. The selected “Communication Command” is “500CPU Read”, as the EtherMeter emulates a SLC/500. The selected target data table address within the MicroLogix is L12:0, although a different memory location could be chosen. The “Size in Elements” is entered as “4” (4 x 32-bit words), because in this example four 32-bit words are requested from the EtherMeter (Total1, Total2, Flow1, Flow2).

Under the “Target Device” heading, note that the “Data Table Address” is entered as N7:0, as this is the desired beginning memory location within the EtherMeter. For the complete memory map of the EtherMeter, please refer to the User Manual or Setup Menu. For “Local/Remote”, “Local” should be selected.

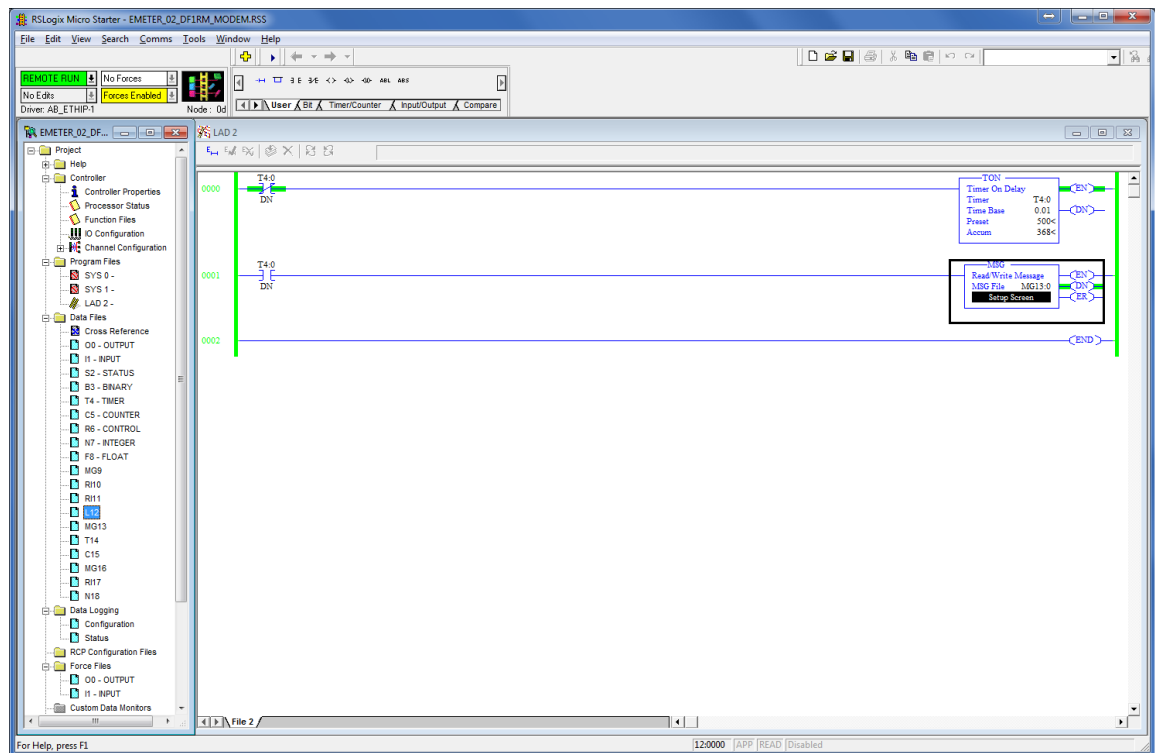


Figure 3. RsLogix Programming Environment.

4. Serial Port (Port 2) Configuration.

In order to configure the MicroLogix's Ethernet port, double-left-click the "Channel Configuration" icon in the Project (leftmost) Frame. The "Channel Configuration" window will appear. Select the "Channel 2" tab, and enter the setup parameters as shown in Figure 4.

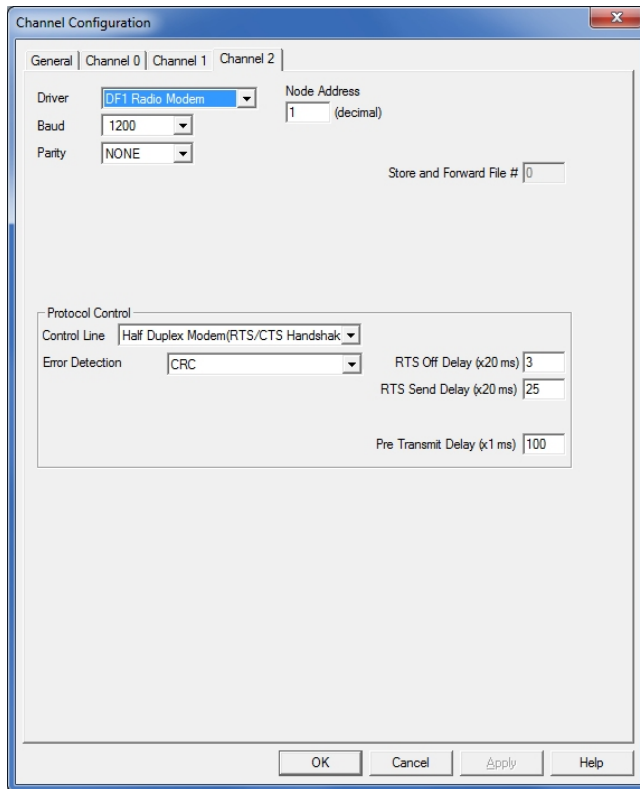


Figure 4. Channel 2 (Serial Port) Configuration Window.

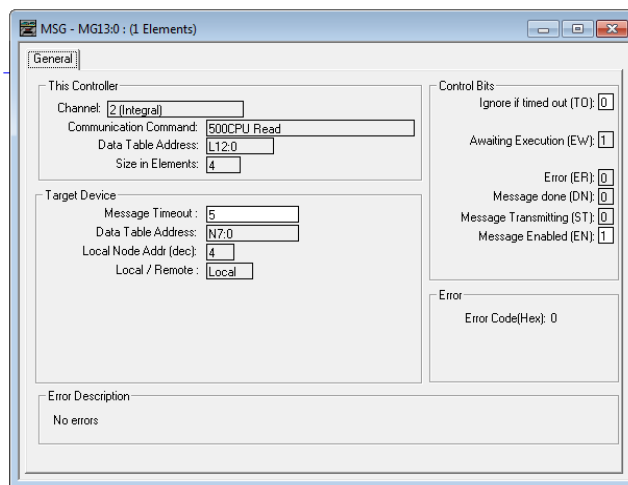


Figure 5. Message Configuration Window (General Tab).

5. Results.

After the Ethernet port is configured and the ladder logic is written, the program should be downloaded into the MicroLogix; and the PLC should be placed into “Run Mode”.

In this example, the EtherMeter is reading two encoder meter registers. As documented in the EtherMeter User Manual, the totalization register contents are never scaled by the EXPn multiplier, so as to eliminate the possibility of 32-bit overflow conditions. The following meter data is applicable to this example:

Meter 1 Total:	21 GAL	(Register Contents: 21)
Meter 2 Total:	99999986 GAL	(Register Contents: 99999986)
Meter 1 Flow Rate:	0 GPM	(Register Contents: 0)
Meter 2 Flow Rate:	0 GPM	(Register Contents: 0)

Figure 6 displays a screen snapshot of the L12 register contents.

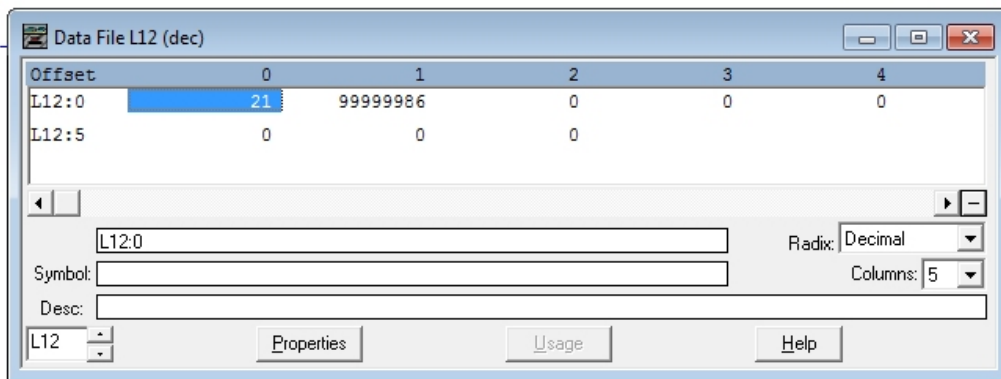
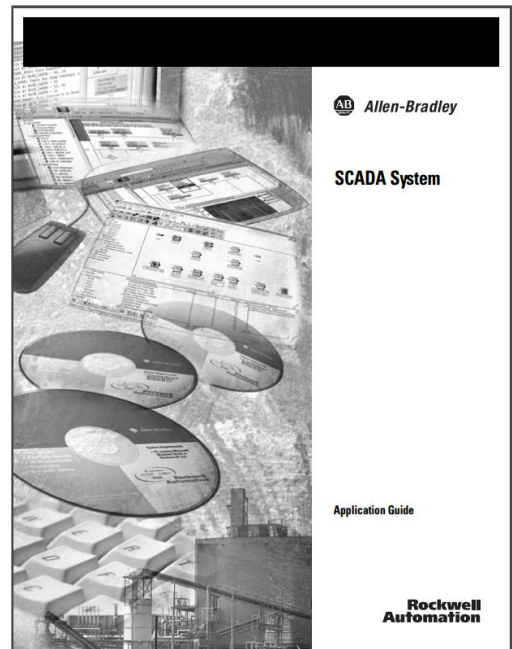


Figure 6. Register Display Window (Realtime).

6. Further Reading.

An excellent resource on SCADA System design using Rockwell PLC's is available on the web. The document contains further detailed information on the DF1 Radio Modem protocol usage and settings.

http://literature.rockwellautomation.com/idc/groups/literature/documents/um/ag-um008_-en-p.pdf



ControlLogix / CompactLogix Addendum:

Modem Control Line Operation

MicroLogix

Half-Duplex Modem (RTS/CTS Handshaking)

If using B202.v103 Modem, the following changes are required:

Must Jumper RTS/CTS (7,8).

OK to Jumper DTR/DSR (4,6), but not required.

If using B202.v108 Modem (or later), no pin jumpering is required.

C*Logix

Half-Duplex with Continuous Carrier Unchecked

C*Logix will not receive data unless DCD is active during receptions.

DCD is generated either by the Radio or by the B202's integral Modem IC (Jumper-Selectable, See JP2)

If using B202.v103 Modem, the following changes are required:

Must Jumper Serial Pins RTS/CTS (7,8) and DTR/DSR (4,6)

If using B202.v108 Modem (or later), no pin jumpering is required.

For both MicroLogix and C*Logix, the RTS delay timing should be identical:

RTS Send Delay	500ms (25 x 20ms)
RTS Off Delay	60ms (3 x 20ms)
Pre Transmit Delay	100ms

It is important that the **Pre Transmit Delay** be greater than the **RTS Off Delay** to ensure that radio transmitter collisions are avoided.