SCADAMETRICS
APPLICATION NOTE

Application Note 005
Version 005
17 Nov 2015

Configuring EtherMeter™–CompactLogix Communications Using EtherNet/IP™.

(Note: This document also applies to EtherMeter-ControlLogix Communications.)

The purpose of this document is to provide assistance to the Allen Bradley CompactLogix PLC user who wishes to connect to an EtherMeter using the EtherNet/IP™ protocol. This document assumes that the user is well-versed in CompactLogix PLC's and the RsLogix 5000 Programming Environment.

When creating an EtherNet/IP™ client/server connection between an Allen Bradley CompactLogix PLC (client) and an EtherMeter™ (server), no special setup is generally required within the EtherMeter's Setup Menu. The EtherMeter features an "always-on" EtherNet/IP™ server on TCP logical port 44818; and it is configured to auto-detect and service incoming client requests from CompactLogix PLC's. To simplify integration into an EtherNet/IP network, the EtherMeter emulates a SLC/500 series PLC.

In this sample application, the CompactLogix PLC's used included a Model 1769-L32E with integrated Ethernet and a Model 1768-L43 with an attached 1768-ENBT/A EtherNet/IP Bridge Module. Both CompactLogix processors were flashed with firmware version 17.2.5. The programming software was RsLogix5000 Version 17.

The 1769-L32E processor was provided courtesy of Missouri American Water Company; and the 1768-L43 processor and RsLogix5000 programming software were provided courtesy of French Gerleman Corp. (St. Louis, MO).

1. Wiring Configuration.

   In this example, the Ethernet ports of the CompactLogix and EtherMeter are wired directly to each other, without an Ethernet switch, using a single Ethernet crossover cable. Alternatively, the Ethernet ports of both the CompactLogix and EtherMeter could be connected to a common Ethernet switch if expanded network connectivity is desired. For reference, the wiring and hardware configuration is illustrated in Figure 1.

   The alternate configuration was created with a CompactLogix Model 1768-L43 plus a 1768-ENBT/A EtherNet/IP bridge module. See Figure 2. However, the setup and programming procedures were identical. For the sake of brevity, this Application Note documents connection to the 1769-L32E.

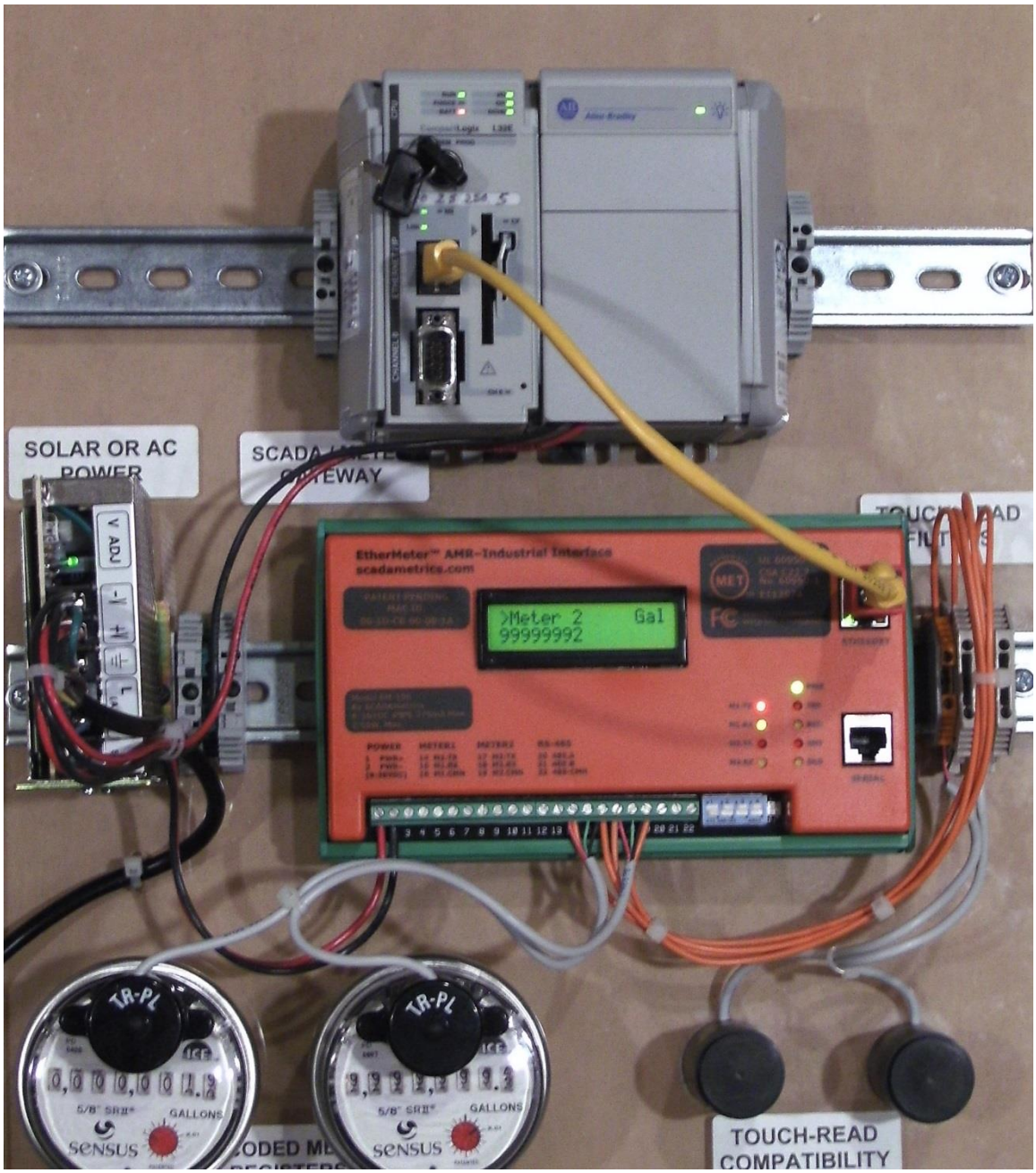

Figure 1. EtherNet/IP™ Communication Demonstration Panel I. CompactLogix (1769-L32E) / EtherMeter Hardware and Wiring Configuration. CompactLogix processor courtesy of Missouri American Water Company.

* EtherNet/IP™ is a trademark of ControlNet International.

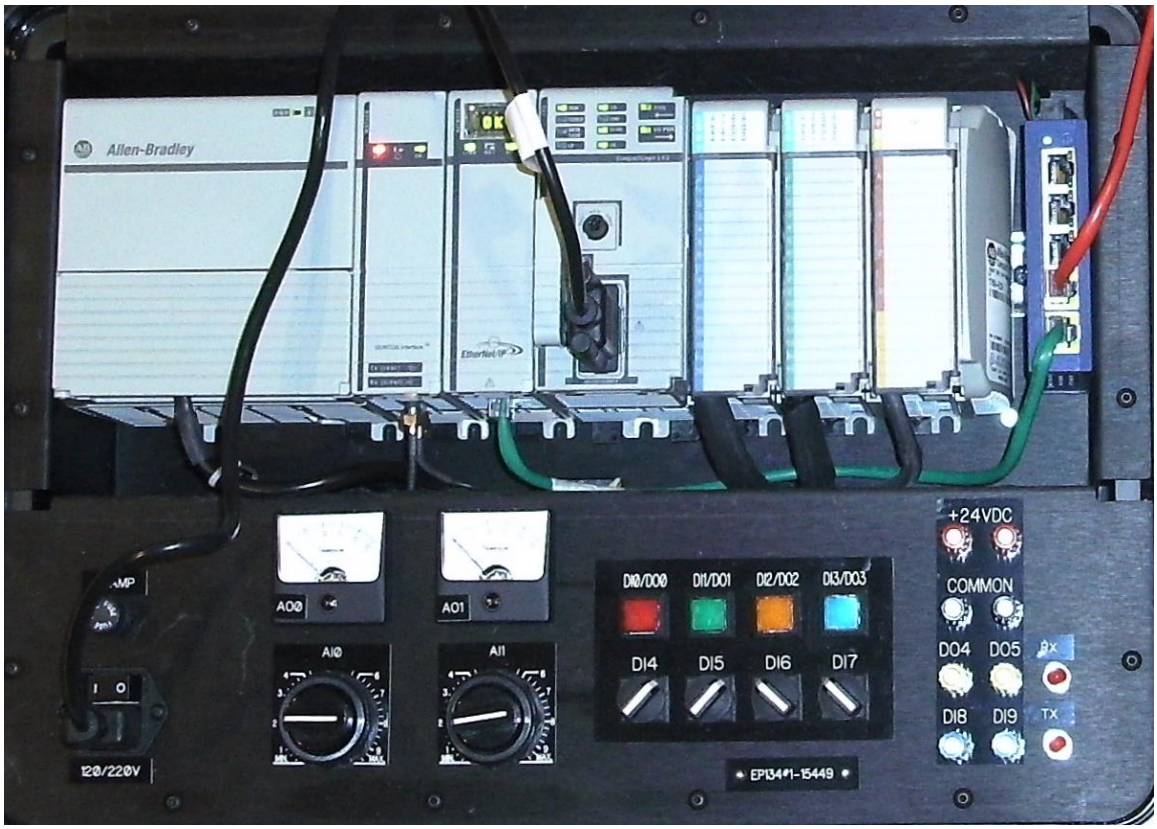

Figure 2. EtherNet/IP™ Communication Demonstration Panel II.
CompactLogix (1768-L43+1768-ENBT/A EtherNet/IP Bridge Module)
CompactLogix Demonstrator Kit Courtesy of French Gerleman Corp. (St. Louis, MO).

2. New Project Creation.

Within the RsLogix 5000 programming environment, a new project should be created and the appropriate CompactLogix processor should be selected. In this example, 1769-L32E is selected, and a unique project name is given. See the dialog box in Figure 3.

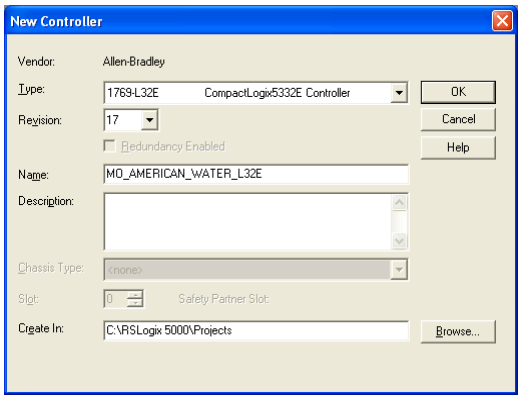

Figure 3. Project Creation Dialog Box

3. CompactLogix Ethernet Port Configuration.

Also within RsLogix 5000, the configuration of the Ethernet port shall be performed. In this example, the CompactLogix is given an IP address 192.168.001.192. Note that the factory default IP address of the EtherMeter is 192.168.001.140. However, both IP addresses may be changed to values appropriate to the user's network configuration. Also within this dialog, the appropriate subnet mask should be entered (255.255.255.000 in this case). A gateway address may also be added. The port speed must be set to either "Auto-Negotiate" (recommended), "10Mbps Half-Duplex", or "10Mbps Full-Duplex". See Figure 4.

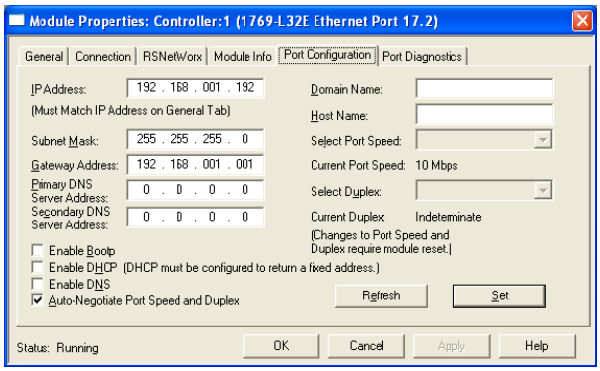

Figure 4. Ethernet Port Configuration Dialog Box

4. Ladder Logic.

In this example, a short ladder logic program is created that will poll the EtherMeter for data with a message instruction at one-second (1000 msec) intervals. In practice, a shorter or longer polling interval could be selected, depending upon the application.

Before the ladder logic is created, three (3) controller tags are created:

POLL_TIMER	1000 msec Timer
METER_DATA	Data Array: DINT x 4 (Meter 1 Total, Meter 2 Total, Meter 1 Flow, Meter 2 Flow)
ETHERMETER_REQUEST	Message Instruction

The data array for holding the EtherMeter's data within the CompactLogix is configured through a dialog box. See Figure 5. Note that the data type is selected as a four-element array of type DINT (a four- element array of signed 32 bit integers).

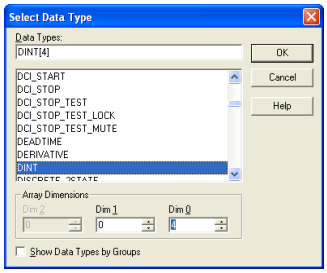

Figure 5. "METER_DATA" Array Configuration Dialog Box

The message instruction (ETHERMETER_REQUEST) is also configured through a dialog box. Figures 6-8 detail the data that should be entered into the three (3) tabbed dialog boxes.

In Figure 6, the "Message Type" is entered as "SLC Typed Read", and the "Source Element" is N7:0. The "Number Of Elements" is selected as "4", because the CompactLogix reads 32 bits per element, and this instruction is designed to read four (4) 32-bit elements (Meter 1 Total, Meter 2 Total, Meter 1 Flow, Meter 2 Flow). For the "Destination Element", the "METER_DATA" array is selected.

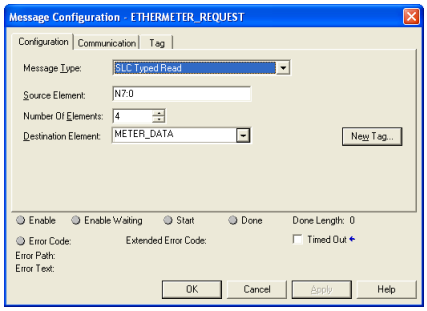

Figure 6. Message Instruction Dialog Box: Configuration

In Figure 7a, the "Path" is entered as "LocalENB, 2, 192.168.1.140". Note that in this example, the EtherMeter's IP address is 192.168.1.140, although a different IP address could be specified depending upon the network configuration. The "Communication Method" is selected as "CIP".

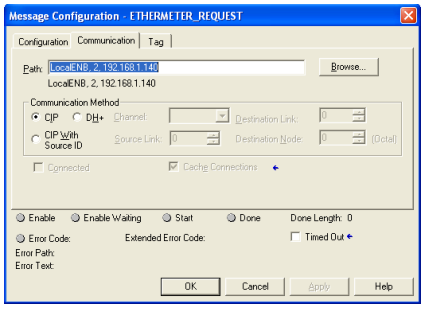

Figure 7a. Message Instruction Dialog Box: Configuration

05 Nov 2015 Note: If the C*Logix Processor does not have a built-in Ethernet card (e.g. if the Ethernet card is a plug-in card), then the path would be entered differently. For example, the path might be entered as:

"1, 2 (Ethernet Card Slot Number, Could Be Different), 2, 192.168.1.140"

In cases such as these, the Logix5000 software may re-write configuration using the client-specified Ethernet path naming convention. (See Figure 7b.)

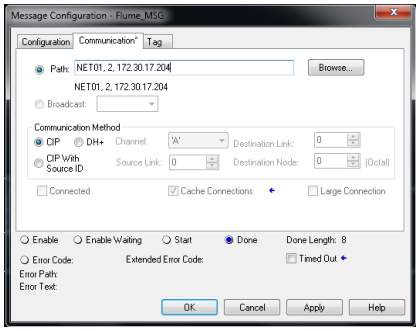

Figure 7b. Message Instruction Dialog Box: Configuration (non-built-in Ethernet)

In Figure 8, the name of the message instruction is entered. In this example, "ETHERMETER_REQUEST" was the name selected.

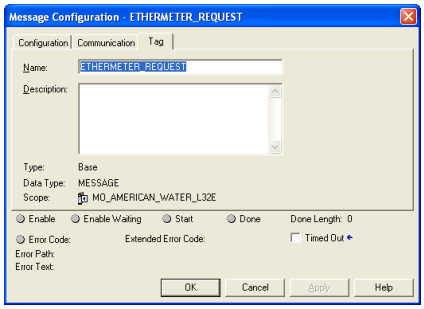

Figure 8. Message Instruction Dialog Box: Tab

After the Controller Tags and Ladder Logic are created, the project should be downloaded to the CompactLogix PLC. A screen snapshot of the complete project is shown in Figure 9.

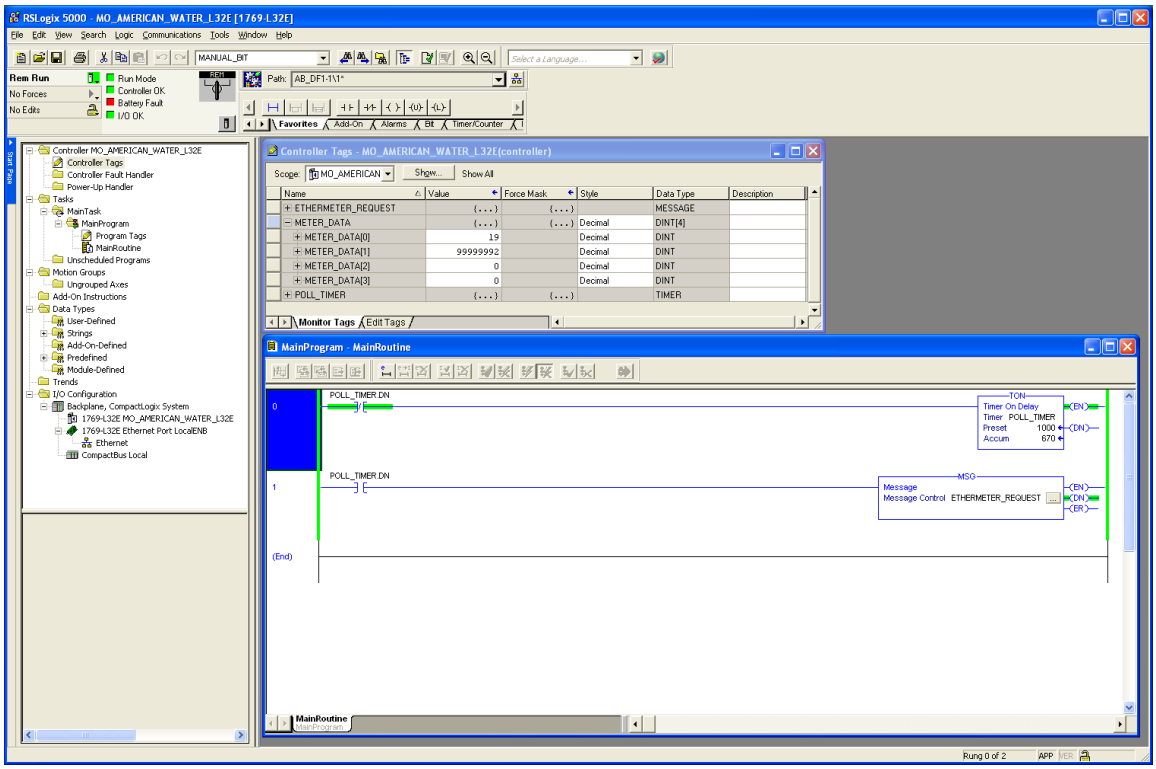

Figure 9. Screen Snapshot of Complete RsLogix 5000 Project.

5. Results.

After project download, the CompactLogix should be placed into “Run Mode”.

In this example, the EtherMeter is reading two encoded 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:	1.9 GAL	(Register Contents: 19)
Meter 2 Total:	9999999.2 GAL	(Register Contents: 99999992)
Meter 1 Flow Rate:	0 GPM	(Register Contents: 0)
Meter 2 Flow Rate:	0 GPM	(Register Contents: 0)

Figure 10 displays a screen snapshot of the Controller Tags display window, in which the requested EtherMeter data is contained in the METER_DATA array.

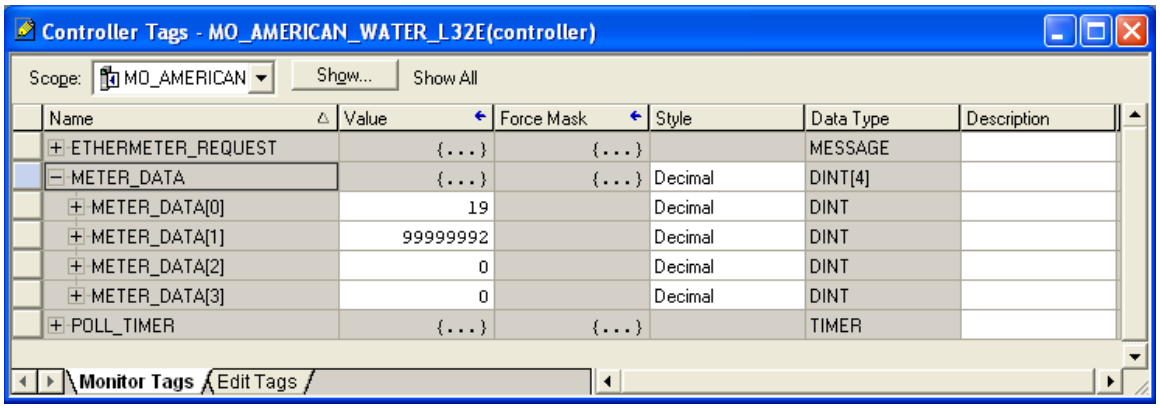

Figure 10. Screen Snapshot of the Controller Tags Displayed During Execution.

6. Notes.

When setting up EtherNet/IP communications between the C*Logix PLC and EtherMeter, it is important that only one message instruction to the EtherMeter be programmed per ladder rung. Use of more than one message instruction per ladder rung to the EtherMeter may result in inconsistent communications.