2XX-ModbusTCP

MODBUS Ethernet/IP Card

Installation Manual

For 200 Series Indicators

INTRODUCTION

Thank you for purchasing the 2XX-MODBUSTCP Interface Card. This option card for the Cardinal 200 Series Weight Indicating Instrument was built with quality and reliability and has been designed for the industrial environment where interfacing through a MODBUS IP network is desired.

When coupled with a 200 Series indicator, it can provide the weight reading and control of multiple scale commands. The interface card resides in the main enclosure of the indicator and has a 16-pin dual in-line connector to provide an easy connection to the indicator internal hardware. A single RJ-45 connector is provided to connect to the MODBUS TCP/IP network. The 2XX-MODBUSTCP supports 10/100 Mbit, full or half duplex operation.

The purpose of this manual is to provide you with a guide through setup and installation of the 2XX-MODBUSTCP interface card. Please read it thoroughly before attempting to install it in your indicator and keep it handy for future reference.

SPECIFICATIONS

Temperature Range: ..... 14° to 104° F (-10° to +40° C)

Network Connections: ..... (1) RJ-45 connector

Diagnostics: ..... On board LED's CS (Chip Select), LK (Link) and ML (Main Line)

FCC COMPLIANCE STATEMENT

This equipment generates uses and can radiate radio frequency and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user will be responsible to take whatever measures necessary to correct the interference.

You may find the booklet "How to Identify and Resolve Radio TV Interference Problems" prepared by the Federal Communications Commission helpful. It is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 001-000-00315-4.

While every precaution has been taken in the preparation of this manual, the Seller assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from use of the information contained herein. All instructions and diagrams have been checked for accuracy and ease of application; however, success and safety in working with tools depend to a great extent upon the individual accuracy, skill and caution. For this reason the Seller is not able to guarantee the result of any procedure contained herein. Nor can they assume responsibility for any damage to property or injury to persons occasioned from the procedures. Persons engaging the procedures do so entirely at their own risk.

PRECAUTIONS

Before beginning installation of this option card, read this manual and pay special attention to all "WARNING" symbols:

IMPORTANT

ELECTRICAL WARNING

STATIC SENSITVE

INSTALLATION

Mounting the Option Card

NOTE! Should your indicator come with the option card already installed, the following section describing mounting, does not apply. Proceed to the Cable Installation on the next page.

ATTENTION! OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

1. Make sure the power to the indicator is OFF. Unplug the AC power cord.
2. Loosen the gland connector(s) where the AC power cord and any other cables enter the back panel of the indicator.
3. Remove the acorn nuts securing the back panel to the main housing.
4. Lift the back panel from the main housing, taking care not to stretch the cable and wires between the panel and main housing. Lay the back panel on the workbench next to the indicator.
5. Referring to Figure No. 1, locate the threaded stand-off and the OPTION BOARD connector on the main board.
6. To install the option card, carefully align the P4 connector (pins on trace side of option card) with OPTION BOARD connector on the indicator main board and apply even downward pressure to the end of the option card at P4.

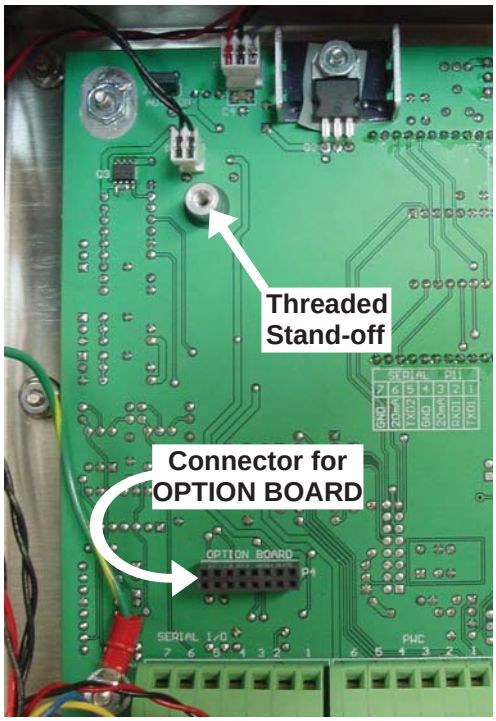


Figure No 1

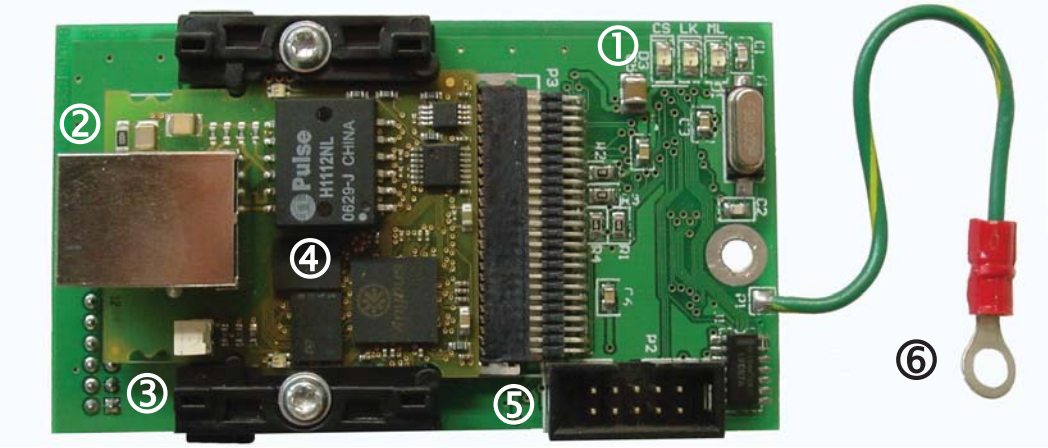
7. Align the hole in the option card with the threaded stand-off on the main board and using the lock washer and screw supplied with the option card, secure the card to the main board.
8. To attach the ground wire, remove a 6-32 nut and washer from the corner of the main board. Refer to Figure No. 2.
9. Connect the ground wire from the option card by placing the ring terminal over the 6-32 threaded stud.
10. Reinstall the washer and 6-32 nut and tighten.

Figure No 2

INSTALLATION, CONT.

Cable Installation in the Indicator

1. Loosen an unused cable gland connector for the cable.
2. Insert the Ethernet cable (CAT 5 or equivalent) through the gland connector and into the enclosure.
3. Consult your network administrator for the proper procedure to terminate the cable.
4. After the cable has been terminated, plug the cable into the RJ-45 jack on the 2XX-MODBUSTCP.

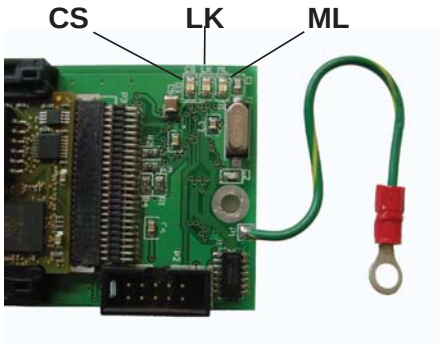


Item #	Description	Item #	Description
1	Status LED's	4	MODBUSTCP Module
2	Ethernet Connector	5	P2 Programming Connector
3	P4 Connector (pins on trace side of board)	6	Ground Wire

2XX-MODBUSTCP Status LED'S

The 2XX-MODBUSTCP Interface Card contains 3 LED's to indicate communication status with the indicator main board.

- **CS**, Chip Select
- **LK**, Link
- **ML**, Main Line



If the CS (Chip Select) LED is off, communications may have been lost between the EtherNet IP module and the indicator main board. Cycle power (press **ON/OFF** key twice) to re-establish communications.

The LK (Link) LED displays the communication status. It will be on or flashing rapidly when communications between the 2XX-MODBUSTCP and the network is established.

The ML (Main Line) LED will be on to indicate the 2XX-MODBUSTCP is powered up and running.

IMPORTANT! A load cell connection is required when testing the indicator. An ERR AL or ERR AH condition will cause the communications from the main board and the module to be very slow and will inhibit communications with the module.

RE-INSTALLING THE REAR PANEL

When the installation is complete:

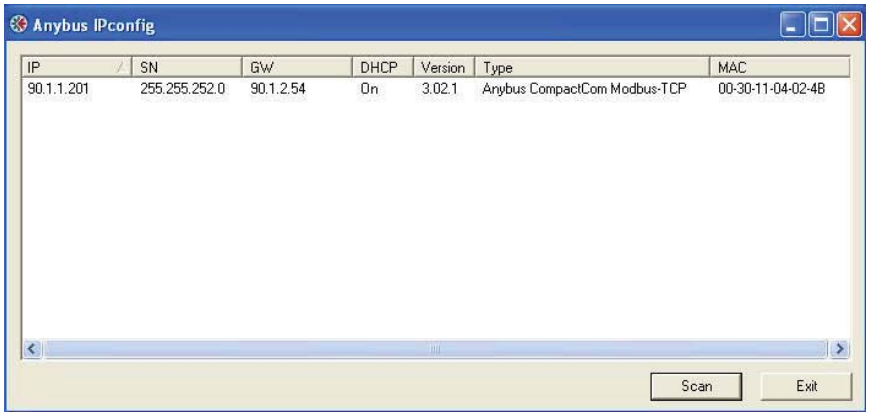
1. Remove the excess cable from the indicator enclosure.
2. Make certain no cables or wires are exposed between the main housing and rear panel and then place the rear panel onto the main housing.
3. Secure with the acorn nuts removed earlier. Follow a diagonal pattern when tightening the acorn nuts.
4. Tighten the gland connector nut to seal the cable. Do not over-tighten the connector but make certain they are snug. **DO NOT USE TOOLS!** Finger-tighten only! Insure any unused gland connectors are plugged.

INDICATOR SETUP

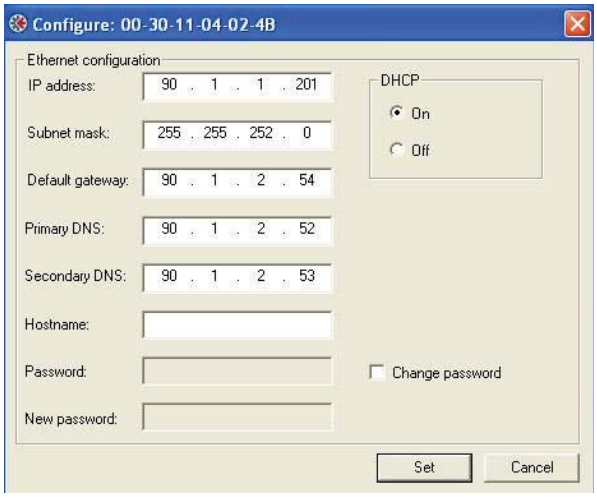
No special setup is required on the indicator.

TCP/IP ADDRESS SETUP

On an EtherNet network, each node must be assigned its own unique TCP/IP address. The 2XX-MODBUSTCP interface card IP address is set using the Anybus IPconfig Tool utility provided on the 2XX-MODBUSTCP Config File CD (8200-M533-O1).



Double click on the device listed to modify the IP address and additional parameters.

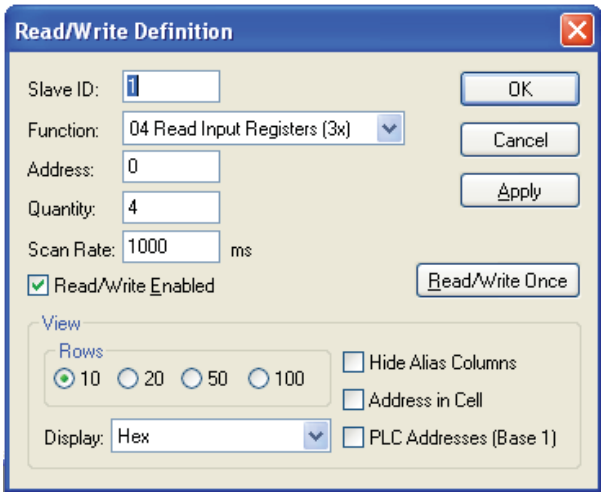


NOTE! Turn DHCP off when a fixed IP address is required.

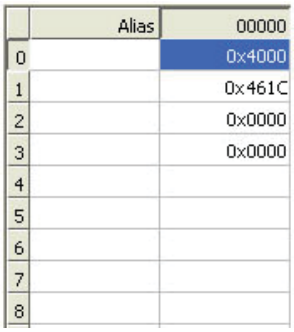
MODULE CONFIGURATION

Configure the PLC to communicate with the remote device and enter the IP address of the module; the Slave ID is set to 1, and the port is 502.

Use Modbus function code 04 (0x04) Read Input Registers to read data starting at address 0. The register data in the response message are packed as two bytes per register so a quantity of 4 is required. Here is an example of the setup to read the input registers:



Here is the data that was captured:



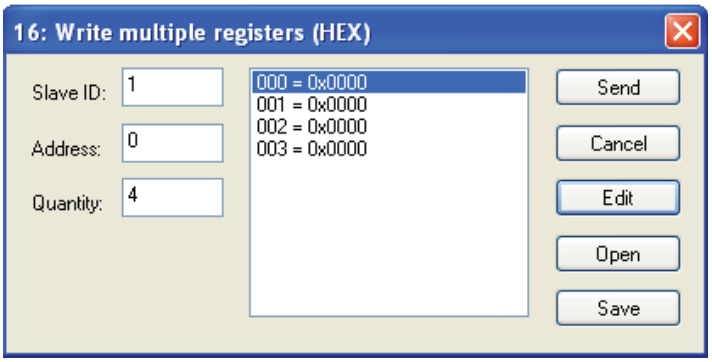
	Alias	00000
0		0x4000
1		0x461C
2		0x0000
3		0x0000
4		
5		
6		
7		
8		

Input:

The weight data begins at Data[0] and uses the next two words to produce the floating point data . The example above was with a weight reading of 10000 lbs

Float = (461C4000)

Use Modbus function code 16 (0x10) Write Multiple Registers to write a block of data starting at address 0.



COMMUNICATIONS

Data Sent From The Indicator To The PLC:

Float point weight. Byte 2	Float point weight. Byte 3	Word0
Float point weight. Byte 0	Float point weight. Byte 1	Word1
PWC status. Bit0 = PWC1... 1=on	Weight status. See bit definitions below	Word2
Cmd1. Returned by the indicator when complete	Cmd0. Returned by the indicator when complete	Word3

Data Sent From The PLC To The Indicator:

Cmd1. See definition below	Cmd0. See definition below	Word0
N/A	N/A	Word1
Float point value for Cmd. Byte 2	Float point value for Cmd. Byte 3	Word2
Float point value for Cmd. Byte 0	Float point value for Cmd. Byte 1	Word3

WEIGHT STATUS (Data[4])

Bit0 MOTION

Bit1 BELOW ZERO

Bit2 CENTER OF ZERO

Bit3 OVER CAPACITY

Bit4 WEIGH UNITS 0=unit1 (lb)/1=unit2 (kg)

Bit5 WEIGH MODE 0=Gross/1=Net

Bit6 Not defined

Bit7 Scale Error. The indicator has failed to communicate for at least 3 seconds, data is invalid.

PWC STATUS (Data[5])

NOTE! The following status section applies only if the PWC has been enabled. Refer to the Technical and Installation manual of your indicator for instructions on enabling and using the PWC feature.

Bit0 PWC1 0=off/1=on

Bit1 PWC2 0=off/1=on

Bit2 PWC3 0=off/1=on

Bit3 PWC4 0=off/1=on

Bit4 PWC5 0=off/1=on

Bit5 PWC6 0=off/1=on

Bit6 PWC7 0=off/1=on

Bit7 PWC8 0=off/1=on

COMMANDS

CMD0 and CMD1 combined make the command word. Command words are broken into command bits for PLC ease of programming. To invoke a command set the bit to one. The PLC should continue to send a command until the command is returned by the indicator. If the indicator cannot perform a command the returned command will include bit7.

Bit00 GROSS/NET

Bit01 PRINT

Bit02 ZERO

Bit03 PB TARE

Bit04 KB TARE requires float point value be sent in Bytes 4, 5, 6 & 7

Bit05 not defined

Bit06 not defined

Bit07 This bit is the error bit from the 2XX when a command fails.

Bit08 PWC1 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit09 PWC2 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit10 PWC3 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit11 PWC4 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit12 PWC5 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit13 PWC6 requires float point value be sent in Bytes 4, 5, 6 & 7

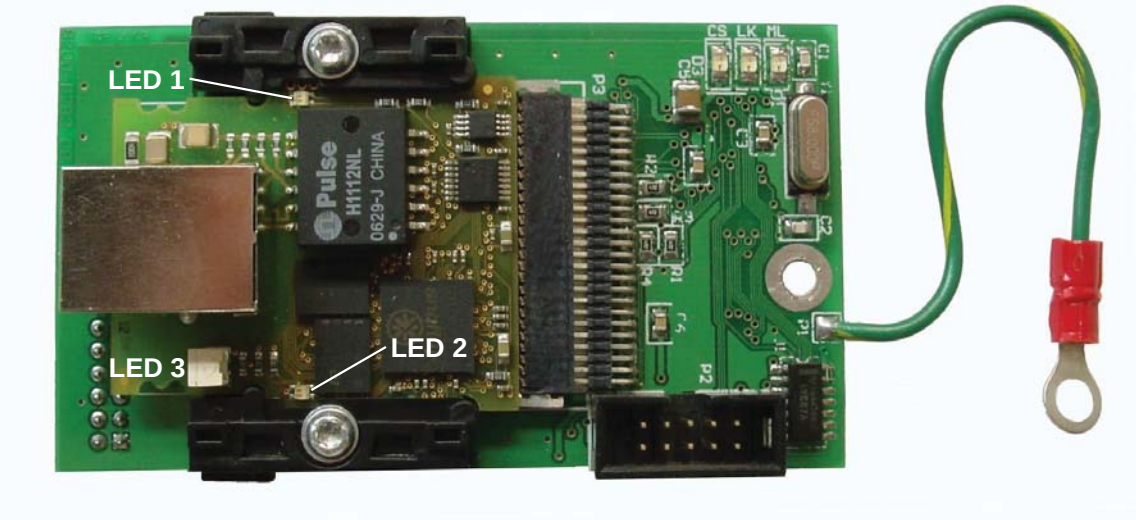
Bit14 PWC7 requires float point value be sent in Bytes 4, 5, 6 & 7

Bit15 PWC8 requires float point value be sent in Bytes 4, 5, 6 & 7

TROUBLESHOOTING

ModbusTCP Module Status LED's

The ModbusTCP Module has three LED's to indicate run time status and errors to the user.



Keep the enclosure back panel off during the configuration of the device so you can see the EtherNet IP module status LED's.

NOTE! A test sequence is performed on LED 1 and LED 2 during startup.

LED #	INDICATION	STATE	DESCRIPTION
1	Network Status	Off	No power or no IP address
		Green	Module is in process Active or Idle state
		Green, Flashing	Waiting for connections
		Red	Duplicate IP address, or FATAL error
		Red, Flashing	Process Active Timeout
2	Module Status	Off	No power
		Green	Normal operation
		Red	Major fault; module is in state EXCEPTION (or FATAL event)
		Red, Flashing	Minor fault; the present IP settings differs from the settings in the net.cfg.ob
3	Link/Activity	Off	No link, no activity
		Green	Link established
		Green, flickering	Activity

2XX-MODBUSTCP
ADDENDUM
For 225 Indicator

SETUP:

With the indicator ON, hold the **SHIFT** key down and press the Navigation **ENTER** key (red square key in center of the Navigation arrows). The display will change to show the SETUP/REVIEW MENU.

```
            SETUP/REVIEW MENU
1.ENTER CALIBRATION AND SETUP
2.VIEW AUDIT TRAIL COUNTERS
3.CALIBRATE SCALE 1


Enter Selection: 1  ^EXIT
```

Press the **ENTER** key, then press the **NEXT** Navigation arrow until SETUP MENU #3 is displayed.

```
              SETUP MENU #3
1. G/N ACCUMS=XXX   6. KEY LOCKOUT
2. BACK LITE=XX
3. PASSWORD
4. 2xx-EIP/MODBUSTCP

Enter Selection: 0  ^PREV  vEXIT
```

On rev level 1.0.P and below the 2xx-MODBUSTCP card will be reported as a 2xx-EIP card, later revs will report 2xx-EIP/MODBUSTCP.

There are no setup variables for the MODBUSTCP option card, going to this menu just assures the operator that the 225 can detect the presence of the option card.

Press the Navigation **EXIT** arrow until the indicator goes into the weight display mode.

COMMUNICATIONS

Date Sent From the XX To The PLC:

Word0	Float point weight. Byte 0	Float point weight. Byte 1
Word1	Float point weight. Byte 2	Float point weight. Byte 3
Word2	Scale Number (Bits 4-7)	Weight Status. See bit definitions below
Word3	Cmd1. Returned by 225 when complete	Cmd0. Returned by 225 when complete

Date Sent From the PLC To The 225:

Word0	Cmd1. See definitions below	Cmd0. See definitions below
Word1	N/A	N/A
Word2	Float point value for Cmd. Byte 0	Float point value for Cmd. Byte 1
Word3	Float point value for Cmd. Byte 2	Float point value for Cmd. Byte 3

COMMANDS

CMD0 and CMD1 are combined to make the command word. Command words are broken into command bits for PLC ease of programming. To invoke a command, set the bit to one. The PLC should continue to send a command until the command is returned by the indicator. If the indicator cannot perform a command, the returned command will include bit 7. The scale number is encoded as a four bit binary number, 1 through the number of scales available. NOTE: ALL COMMAND BITS SHOULD BE RELEASED AFTER THEY ARE PROCESSED BY THE INDICATOR.

Bit0 Gross/Net
Bit1 Print
Bit2 Zero
Bit3 PB Tare
Bit4 KB Tare, requires float point value be sent in words 2 and 3
Bit5-6 not defined
Bit7 This bit is the error bit from the 225 when a command fails.
Bit8-11 not defined
Bit12 Select scale number, bit 0 (least significant)
Bit13 Select scale number, bit 1
Bit14 Select scale number, bit 2
Bit15 Select scale number, bit 3 (most significant)

SCALE NUMBER

The scale number is encoded as a four bit binary number, 1 through the number of scales available. Eg. Scale #1 (00010000), Scale #2 (00100000), Scale #3 (00110000), and Total scale (01000000).

Bit0 (not used)
Bit1 (not used)
Bit2 (not used)
Bit3 (not used)
Bit4 Select scale number, bit 0 (least significant)
Bit5 Select scale number, bit 1
Bit6 Select scale number, bit 2
Bit7 Select scale number, bit 3 (most significant)

WEIGHT STATUS

Bit0 Motion
Bit1 Below Zero
Bit2 Center of Zero
Bit3 Over Capacity
Bit4 Weigh Units 0=unit 1 (PRIMARY UNITS), 1=unit 2 (ALTERNATE UNITS)
Bit5 Weigh Mode 0=Gross, 1=Net
Bit6 Not Defined
Bit7 Error. Data is invalid.

FLOATING POINT WEIGHT DATA

Example for weight data 5000 = Floating-point 459C4000h

Byte0 45h
Byte1 9Ch
Byte2 40h
Byte3 00h

Some PLCs may require Byte 1 and Byte 0 to be swapped to be compatible with the Allen-Bradley floating point data format.

Cardinal Scale Mfg. Co.
102 E. Daugherty, Webb City, MO 64870 USA
Ph: 417-673-4631 or 1-800-641-2008
Fax: 417-673-2153
www.cardinalscale.com

Technical Support: 1-866-254-8261
E-mail: tech@cardet.com

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