2XX-DN

DeviceNet Interface Card
For 200 SERIES INDICATORS
INSTALLATION MANUAL

INTRODUCTION

Thank you for purchasing the Cardinal 2XX-DN DeviceNet Interface Card. This option card for your 200 Series (Models 200, 205, 210, 215, 220 and 225) Weight Indicator was built with quality and reliability.

The 2XX-DN interface card has been designed for the industrial environment to interface to a DeviceNet network. The 2XX-DN when coupled with a Cardinal 200 Series indicator can provide the PLC with the weight reading and control of multiple scale commands.

The interface card resides in the indicator main enclosure and has a 16-pin dual in-line connector to provide an easy connection to the indicator internal hardware. The card has an external five (5) terminal connector for connection to a DeviceNet network.

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

FCC COMPLIANCE STATEMENT

WARNING! 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

SPECIFICATIONS

Temperature Range: 14° to 104° F (-10° to +40° C)
Internal Connections: (1) 16 pin DIL
External Connections: (1) five terminal connector block
Selectable Baud Rate: 125k, 250k or 500k
MAC Address: 0-63
Diagnostics: On board LED's LINK and MASTER

⚠️ **NOTE!** 200 Series indicator software revision 2.3 or above is required.

Network Size	Up to 64 nodes

Network Length	Selectable end-to-end network distance varies with speed
	     125 Kbps 500 m (1,640 ft)
	     250 Kbps 250 m (820 ft)
	     500 Kbps 100 m (328 ft)

Data Packets	0 to 8 bytes
Bus Topology	Linear (trunkline/dropline); power and signal on the same network cable
Bus Addressing	Peer-to-Peer wilt Multi-Cast (one-to-many); Multi-Master and Master/Slave special case; polled or change-of-state (exception-based)
System Features	Removal and replacement of devices from the network under power

Table 1: Summary of DeviceNet Features and Functionality

DATA RATES	125 KBPS	250 KBPS	500 KBPS
Thick Trunk Length	500 m (1,640 ft)	250 m (820 ft)	100 m (328 ft)
Thin Trunk Length	100 m (328 ft)	100 m (328 ft)	100 m (328 ft)
Flat Trunk Cable	380 m (1,250 ft)	200 m (656 ft)	75 m (246 ft)
Maximum Drop Length	6 m (20 ft)	6 m (20 ft)	6 m (20 ft)
Cumulative Drop Length	156 m (512 ft)	78 m (256 ft)	39 m (128 ft)

Table 2: The end-to-end network distance varies with data rate and cable thickness.

INSTALLATION

Mounting the 2XX-DN Board

NOTE! Should your indicator come with the 2XX-DN board already installed, the following information describing the mounting of the board does not apply. Proceed to the DeviceNet Cable Installation section.

ATTENTION! OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

1. Make sure the power to the indicator is OFF. Unplug the AC power cord and/or remove the battery.

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 P4 OPTION BOARD connector (above P11, SERIAL I/O) on the indicator main board.

6. To install the 2XX-DN board, carefully align the pins of P1 (on the component side of the 2XX-DN with connector P4 on the indicator main board and apply even downward pressure to the 2XX-DN board.

7. Align the hole in the 2XX-DN board with the threaded stand-off and using the lock washer and screw supplied with the 2XX-DN board, secure the board to the indicator main board.

8. To attach the ground wire, remove a 6-32 nut and washer from the corner of the indicator main board. Refer to Figure No. 2.

9. Connect the ground wire from the 2XX-DN board by placing the ring terminal over the 6-32 threaded stud.

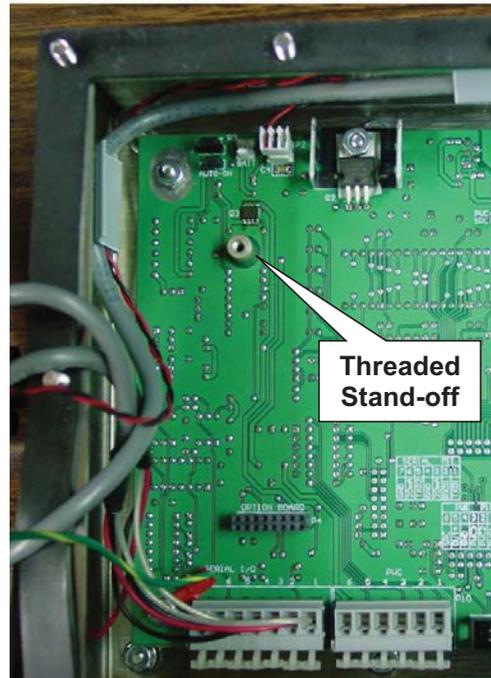10. Reinstall the washer and 6-32 nut and tighten.

Threaded Stand-off

Figure No 1

Attach Ground Here

Figure No 2

INSTALLATION, Cont.

DeviceNet Cable Installation

Refer to the connector shown in Figure No. 3.

1. Begin by removing the five (5) connector terminal block connector from the 2XX-DN option card. To remove the terminal block, grasp the terminal block connector and pull straight back away from the card.

2. Next, pull the cable from the DeviceNet scanner through a gland connector on the indicator.

3. Remove 2" of the outer insulation jacket then remove 1/4" of insulation from each of the 4 wires and shield.

4. Connect each of the wires to terminal block according to the labels on the 2XX-DN option card.

5. Loosen the screws in the terminal block, then slip the wire into the terminal opening and tighten the screw to lock the wire in place. Repeat the procedure until all wires are in place.

6. Install the terminal block connector by aligning the grooves on the connector and the socket in the 2XX-DN option card. Push in until the connector snaps in place.

Wire Color	Connection
Red	V+
White	CAN_H
Drain	Cable Shield
Blue	CAN_L
Black	V-

NOTE! The 2XX-DN option card is isolated from the indicator power supply and protected against miswiring in accordance with the ODVA specification.
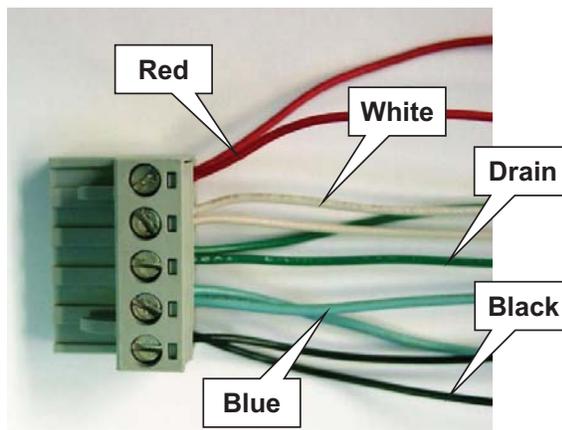

Figure No 3

Re-Installing the Rear Panel

After all terminations and connections have been made, remove the excess cable from the instrument enclosure and securely tighten each of the cable gland connectors. Do not over-tighten these connectors but make certain they are snug. **DO NOT USE TOOLS!** Finger-tighten only! Insure any unused gland connectors are plugged.

Make certain no cables or wires are exposed between the main housing and rear panel then place the rear panel onto the main housing. Secure with the acorn nuts removed earlier.

NOTE! Follow a diagonal pattern when tightening the acorn nuts.

INDICATOR SETUP

A new section has been added to the SETUP menu for the 2XX-DN card. The new sub menu *OPt iOn* (OPTION) has been placed after *LOCOUt* (LOCOUT). The *OPt iOn* sub menu contains the setup required to establish communications with the PLC.

bAUd: **(2XX-DN Card Baud Rate)**

  Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter a new baud rate, then press the **ENTER** key to save it. Allowable values are:

  0 = 125k   *1* = 250k   *2* = 500k

Addr: **(MAC Address)**

  Press the **ENTER** key to show the current value. If the setting displayed is acceptable, press the **ENTER** key again to save it. Otherwise, use the numeric keys to enter a new MAC Address, then press the **ENTER** key to save it.

  Allowable values are: 0 to 63

⚠ **NOTE! Setup may be interrupted at any time. ALL data previously entered and finalized with the ENTER key will be retained in the non-volatile memory.**

Pressing the calibration switch *at any prompt* will return you to the SEtUP menu. To exit setup, press the **ASTERISK** key with any of the menu selections displayed or cycle power at any time (press the **ON/OFF** key twice).

STATUS LED's

The 2XX-DN DeviceNet Interface Card contains three LED's to indicate the communication status:

- LINK, D1 (Green LED)

- BUS POWER, D2 (Green LED)

- MASTER, D3 (Red LED)
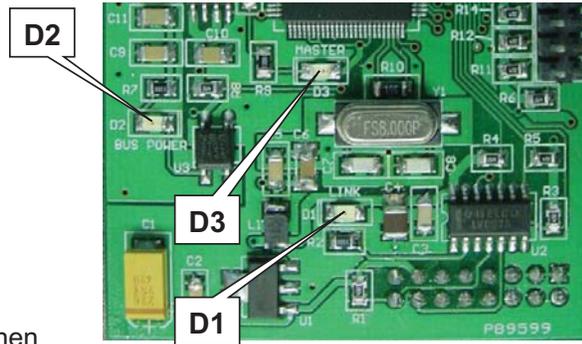
The LINK (D1) and BUS POWER (D2) LED's display the communication status.

The LINK (D1) LED will be continuously on when communications with the PLC is established.

The BUS POWER (D2) LED will be continuously on when the bus is powered.

The MASTER (D3) LED will flash with every weight sample.

If the MASTER (D3) LED is not lit, then communications with the indicator has been lost.

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

COMMUNICATIONS

Data Sent From The 2XX To The PLC:

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

Data Sent From The PLC To The 2XX:

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

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 word 2 & 3

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 word 2 & 3 (models 210 & 215 only)

Bit09 PWC2 requires float point value be sent in word 2 & 3 (models 210 & 215 only)

Bit10 PWC3 requires float point value be sent in word 2 & 3 (models 210 & 215 only)

Bit11 PWC4 (not used)

Bit12 PWC5 (not used)

Bit13 PWC6 (not used)

Bit14 PWC7 (not used)

Bit15 PWC8 (not used)

WEIGHT STATUS

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. 2XX has failed to communicate for at least 3 seconds, data is invalid.

PWC STATUS

Bit0 PWC1 0=off/1=on (models 210 & 215 only)

Bit1 PWC2 0=off/1=on (models 210 & 215 only)

Bit2 PWC3 0=off/1=on (models 210 & 215 only)

Bit3 PWC4 (not used)

Bit4 PWC5 (not used)

Bit5 PWC6 (not used)

Bit6 PWC7 (not used)

Bit7 PWC8 (not used)

2XX-DN 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-DN

Enter Selection: 0  ^PREV  vEXIT
```

Press the **4** key and then the **ENTER** key, the 2xx-DN SETUP MENU will be displayed.

```
              2xx-DN SETUP MENU
1.  BAUD=X
2.  ADDR=XX




Enter Selection: 0   ^EXIT
```

1. BAUD=X
The current baud rate setting will be shown (0, 1 or 2), to change the setting press the **1** key and then the **ENTER** key.

```
           2xx-DN BAUD RATE SELECTIONS


0=125k          1=250k            2=500k




BAUD=X
```

If the displayed baud rate value is acceptable press the **ENTER** key, otherwise, press the **0**, **1** or **2** key and then the **ENTER** key for the desired baud rate.

2. ADDR=XX
The current address is shown, to change the address, press the **2** key and then the **ENTER** key.

```
           2xx-DN ADDRESS SELECTION

VALID ADDRESS:  0-63




ADDR=XX
```

If the address is correct press the **ENTER** key, otherwise, enter the desired address and press the **ENTER** key.

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.