225D

SMARTCELL
DIGITAL LOAD CELLS

Weight Indicator
Installation and Technical Manual

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DISCLAIMER

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FCC COMPLIANCE STATEMENT

This equipment generates uses, 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.

PROPER DISPOSAL

When this device reaches the end of its useful life, it must be properly disposed of. It must not be disposed of as unsorted municipal waste. Within the European Union, this device should be returned to the distributor from where it was purchased for proper disposal. This is in accordance with EU Directive 2002/96/EC. Within North America, the device should be disposed of in accordance with the local laws regarding the disposal of waste electrical and electronic equipment.

It is everyone's responsibility to help maintain the environment and to reduce the effects of hazardous substances contained in electrical and electronic equipment on human health. Please do your part by making certain that this device is properly disposed of. The symbol shown to the right indicates that this device must not be disposed of in unsorted municipal waste programs.
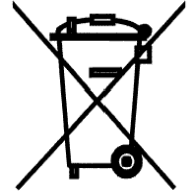
CAUTION

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

ATTENTION: RISQUE D'EXPLOSION SI LA BATTERIES EST REMPLACE'E PAR UN TYPE INCORRECT. REJETEZ LES BATTERIES UTILISE'ES SELON LES INSTRUCTIONS.

PRECAUTIONS

Before using this indicator, read this manual and pay special attention to all "NOTIFICATION" symbols:

IMPORTANT   ELECTRICAL WARNING   STATIC SENSITVE

TABLE OF CONTENTS

INTRODUCTION

The 225D SmartCell Weight Indicator has software specially written for communicating with digital scales. It provides in-depth diagnostics, easy maintenance, and a simplified calibration. The 225D consists of two main components: a 225 indicator with digital scale software, and a 225DLC controller (installed in the indicator option card slot).

The scale must contain Cardinal Scale's SCBD SmartCells or DC Digital Load Cells to communicate with the 225D.

225D Weight Indicator
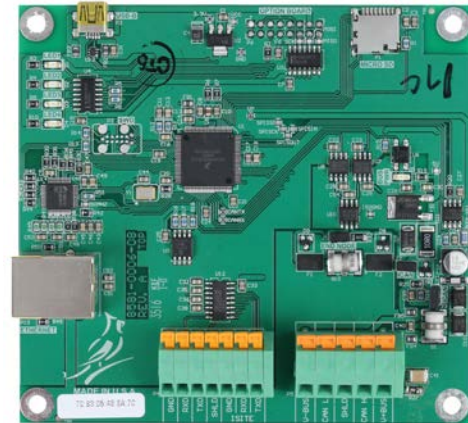
225DLC Digital Load Cell Controller

DC Digital Load Cell

SCBD Digital Load Cell

This manual is furnished as a guide to the setup and operation of the 225D SmartCell Weight Indicator. It has been supplied in addition to the standard 225 Weight Indicator Installation and Technical Manual, 8200-M698-O1. The standard 225 manual should be consulted for information concerning the installation, setup, and calibration of the indicator.

Please read both manuals thoroughly before attempting to install your indicator and keep them available for future reference.

SPECIFICATIONS

Power Requirements:	100 to 240V AC (50/60 Hz) at 0.4A Max.
Enclosure Type:	Stainless Steel wall or desk-mount
Enclosure Size:	10 7/8"W x 8 3/16"H x 3 1/8"D (276mm W x 208mm H x 79mm D)
Weight:	9.2lbs (4.2kg) *Size and Weight DOES NOT include Gimbal*
Operating Environment:	Temperature: 14 to 104 ºF (-10 to +40 ºC) Humidity: 90% non-condensing (maximum)
Display:	240 x 64 (5" x 1.33"/127 x 34mm) Graphics LCD w/ LED Backlight
Division Value:	Commercial: 1, 2, or 5 x 10, 1, 0.1, 0.01, 0.001 and 0.0001 Non-commercial: 0 to 99

Sensitivity:
    NON-COMMERCIAL
    NTEP
    CANADA
    OIML
	
	0.15 uV/e
	0.3uV/e (Class III/IIIL)
	0.3uV/e (Class III/IIIHD)
	0.7 uV/e (Class III)

Scale Divisions:
    NON-COMMERCIAL
    NTEP
    CANADA
    OIML
	
	100 to 240,000
	100 to 10,000 (Class III/IIIL)
	100 to 10,000 (Class III/IIIHD)
	100 to 10,000 (Class III)

Internal Resolution:	1 part in 16,777,216
Tare Capacity:	Six Digits (999,999)
Sample Rate:	1 to 100 samples per second, selectable
Auto Zero Range:	0.5 or 1 through 9 divisions
Weighing Units:	Tons, Pounds, Ounces, Tonnes (Metric Tons), Kilograms, Grams,
Keypad:	Membrane type with 60 color-coded keys

Standard I/O:	4 ea Serial I/O Ports configured as:
	    3 ea bi-directional RS-232 ports or 3 ea 20mA output-only ports
	    1 ea bi-directional 20mA port
	    1 ea output only RS-232/20mA port
	8 ea Remote Isolated Inputs
	16 ea Remote Isolated Outputs

225DLC Connections:	Homerun Cable - 5 position spring cage clamp (24 to 16ga wire) Ethernet Port for iSite – (1) RJ-45 USB-B port – Used for firmware updates to 225DLC card
Internal Connections:	(1) 16 pin DIL
Homerun Cable Length:	Consult Digital Load Cell cable chart. Consult the factory for other requirements.
Number of Load Cells:	20 digital load cells with 15V power from 225D 32 digital load cells with 24V power at scale

HOMERUN CABLE INSTALLATION

The Homerun Cable is installed between the 225D indicator and the first load cell in the loop (Start Node). Consult the chart below to determine the maximum Homerun Cable length. Note that the number of load cells in the scale determines the maximum length of the Homerun cable.

Maximum Homerun Cable Length
(Determined by Number of Load Cells in Scale)

Ft / M of 18ga Homerun Cable	NUMBER OF LOAD CELLS IN SCALE														
	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
100 / 30	12 V	12 V	12 V	12 V	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V
200 / 61	12 V	12 V	12 V	12 V	12 V	15 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V
300 / 91	12 V	12 V	12 V	12 V	15 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
400 / 122	12 V	12 V	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
500 / 152	12 V	12 V	12 V	15 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
600 / 183	12 V	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
700 / 213	12 V	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
800 / 244	12 V	12 V	15 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
900 / 274	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1000 / 305	12 V	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1100 / 335	12 V	12 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1200 / 366	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1300 / 396	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1400 / 427	12 V	15 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1500 / 457	12 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1600 / 488	12 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1700 / 518	12 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
1800 / 549	12 V	15 V	15 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V	24 V
Ft / M of Cable in Scale	69 / 21	123 / 37	177 / 54	231 / 70	285 / 87	339 / 103	393 / 120	447 / 136	501 / 153	555 / 169	609 / 186	663 / 202	717 / 218	771 / 235	825 / 251

OPTIONS (Power Required at the Scale):
- Media box with AC power
- Glass Fiber (1 mile)
- Plastic Fiber (300 ft)
- SnapStream wireless (1 mile unobstructed line of sight – repeaters available)
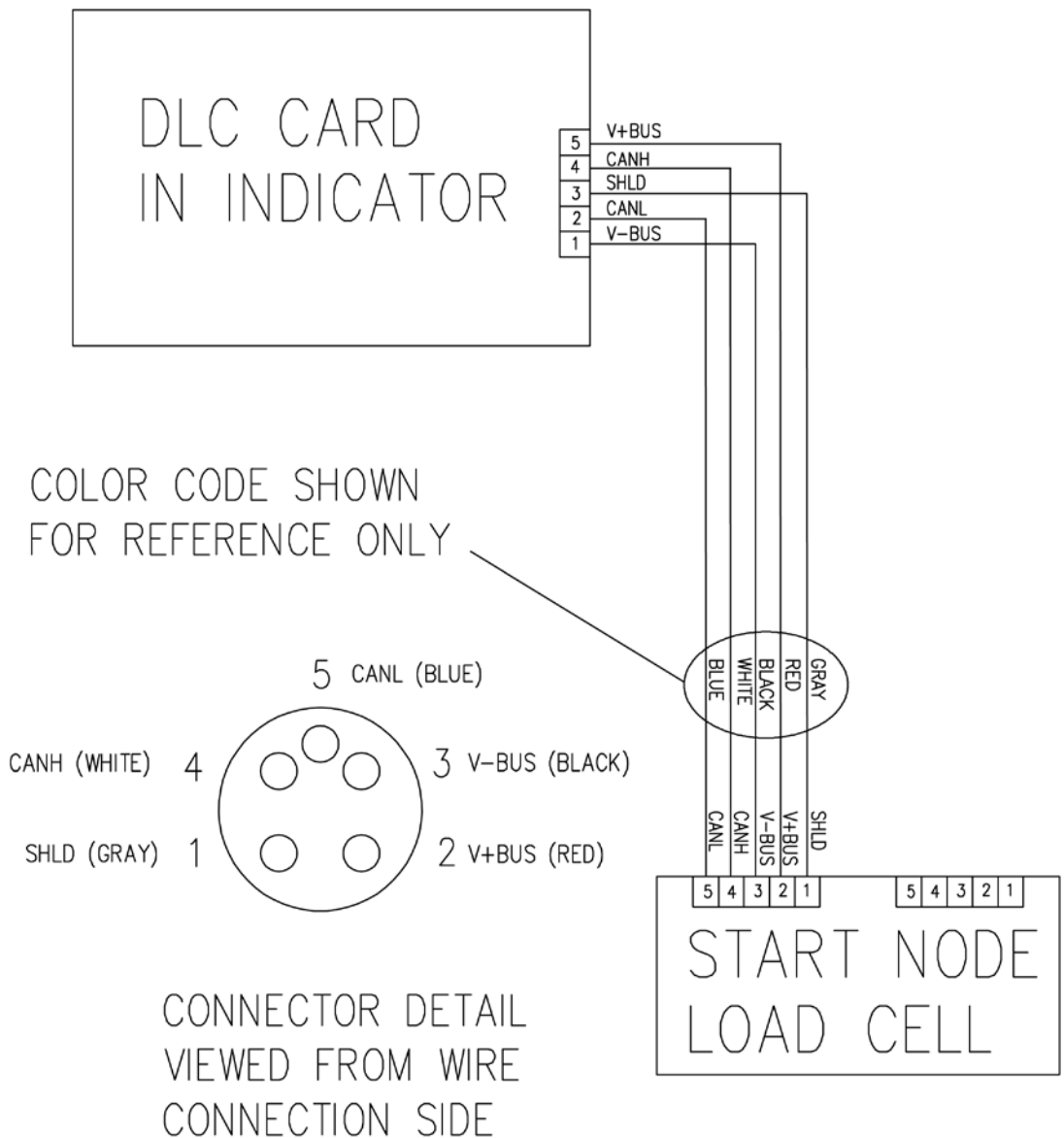
KEY

12 V — 825
15 V — 225
24 V — Power at Scale

The Homerun Cable is made from five conductors, shielded PVC cable, and is terminated in the 225D at the P5 terminal block. The load cell end is terminated with a 5-pin spring cage connector, from the Home Run Cable Connector Pack. Refer to the table below for cable and connector information.
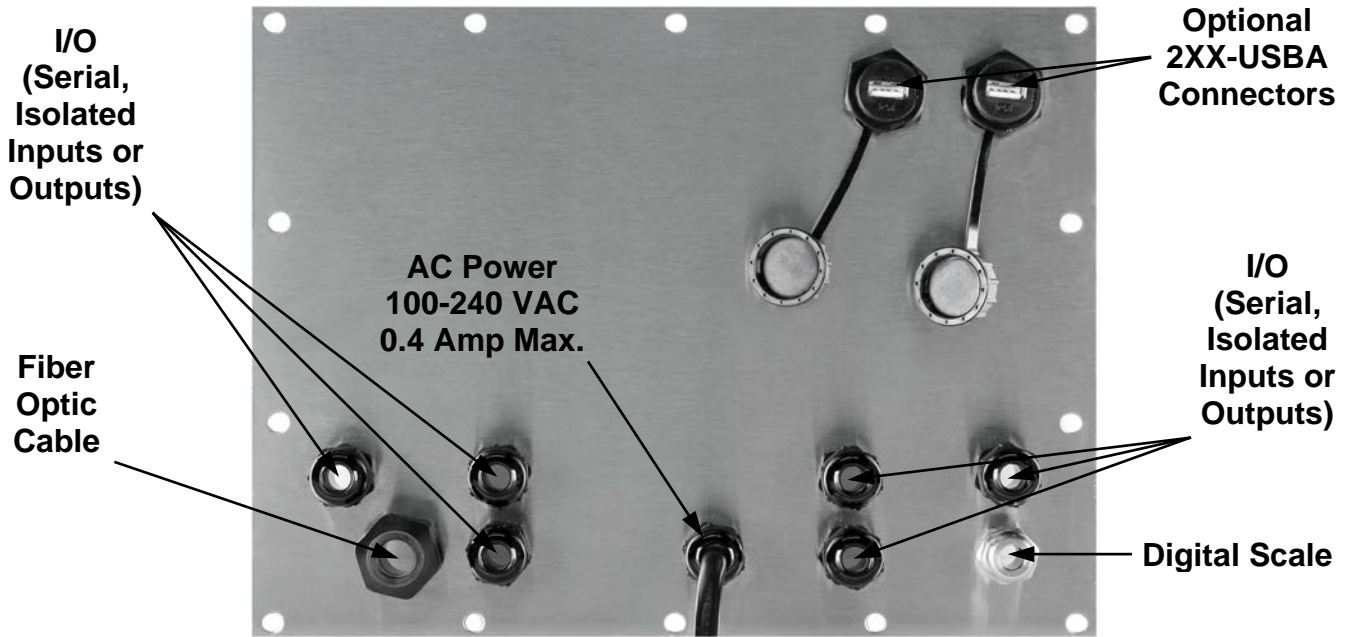
Cable and Connector Information

ITEM and DESCRIPTION	CARDINAL PART NO.
HOMERUN CABLE, 5 CONDUCTORS, SHIELDED PVC (CONTAINS 2 x 18AWG, 2 x 22AWG, AND 1 x 22AWG)	6980-1092
CONNECTOR PACK, HOME RUN CABLE (INCLUDES 5-PIN SPRING CAGE CONNECTOR, 6610-1258)	3502-0681-0A
RECOMMENDED HOMERUN CABLE BELDEN 5303FE, 18 AWG, 5 CONDUCTORS	SUPPLIED BY DEALER

Indicator Connection

The homerun cable should be routed through the metallic gland connector installed in the 225D rear panel (lower right).

I/O (Serial, Isolated Inputs or Outputs)

Fiber Optic Cable

AC Power 100-240 VAC 0.4 Amp Max.

Optional 2XX-USBA Connectors

I/O (Serial, Isolated Inputs or Outputs)

Digital Scale

ATTENTION!
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

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1. Remove the fourteen acorn nuts securing the rear panel assembly to the main housing.

2. Lift the rear panel from the main housing, taking care not to stretch the cable and wires between the panel and main housing. Lay the rear panel on the workbench next to the indicator.

IMPORTANT: You may need to loosen the gland connectors for the I/O cables to allow enough slack in the cable and wires to avoid stretching them.

3. Loosen and remove the metal gland connector nut, and then remove the plastic insert.

2.0 inches (51 mm)

1/4 inch (6 mm)
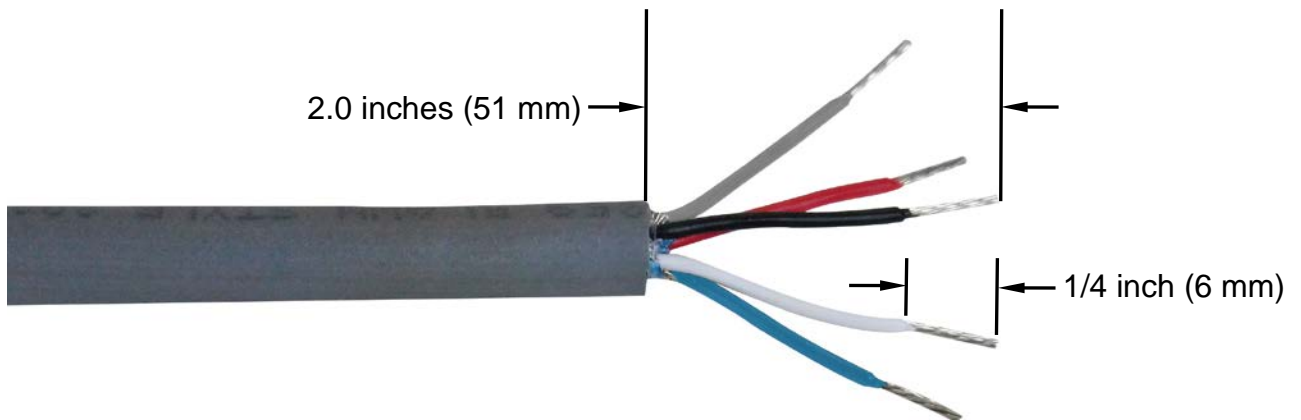
4. Route the homerun cable through the nut and plastic insert and into the enclosure.

5. With the homerun cable routed into the enclosure, remove approximately 2.0 inches (51 mm) of the cables' outer jacket, exposing the internal wires.

6. Next, remove approximately 1/4 inch (6 mm) of insulation from each of the five wires.

7. Referring to the table below (or on the circuit board) for terminal connections, connect each wire to the P5 terminal block on the 225DLC controller card.

225DLC Controller Card P5 Terminal Connections

Board Label	Homerun Cable Wire Color	Wire Color if using a Load Cell Cable
SHLD	GRAY	BROWN
V+BUS	RED	WHITE
V-BUS	BLACK	BLUE
CAN H	WHITE	BLACK
CAN L	BLUE or LIGHT BLUE	GRAY

8. Using a small flat blade screwdriver press down on the release bar for the terminal, insert the wire into the opening, and then remove the screwdriver. The release bar will return to its original position, locking the wire in place.

Press Down Here

**Insert Wire Here**
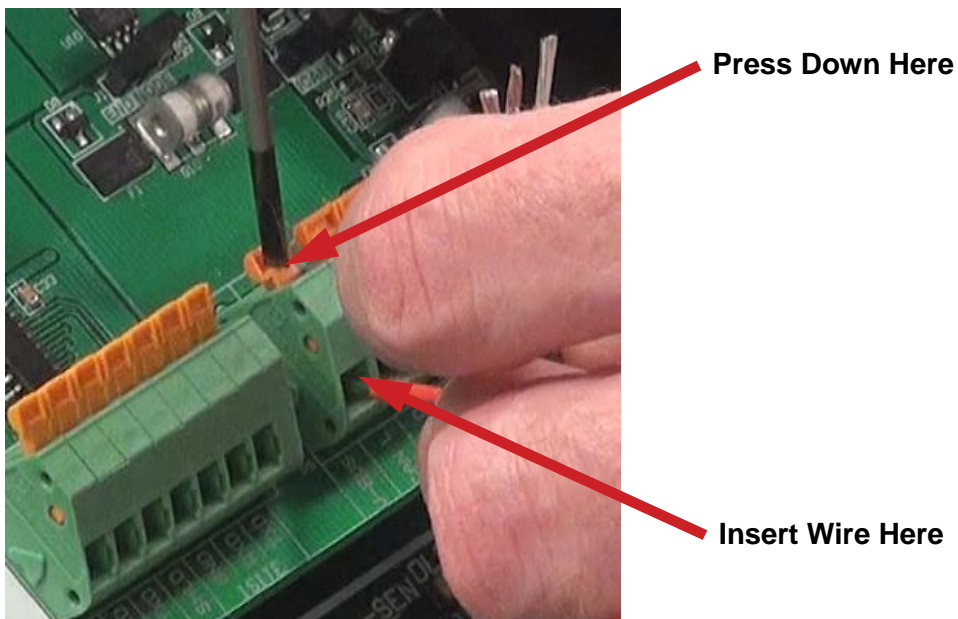
9. Repeat steps 7 and 8 until all five wires of the homerun cable are installed in the P5 terminal block on the 225DLC controller card.

10. After all terminations have been made, remove the excess cable from the indicator enclosure.

11. Insert the plastic insert into the metal gland connector, and finger-tighten the metal gland connector nut and each of the black gland connectors.

Re-Installing the 225D Indicator Rear Panel

1. After all terminations have been made, remove the excess cable from the indicator enclosure, and finger-tighten each of the cable gland connectors.

2. Ensure any unused gland connectors are plugged in and replace the rear panel.

3. Secure the rear panel with the fourteen acorn nuts removed earlier, following a diagonal pattern when tightening the acorn nuts.

4. Using a wrench, tighten the plastic gland connectors to 15 in-lb (1.7 Nm).

5. Using a wrench, tighten the metal gland connector to 33 in-lb (3.7 Nm).

225DLC Controller Card
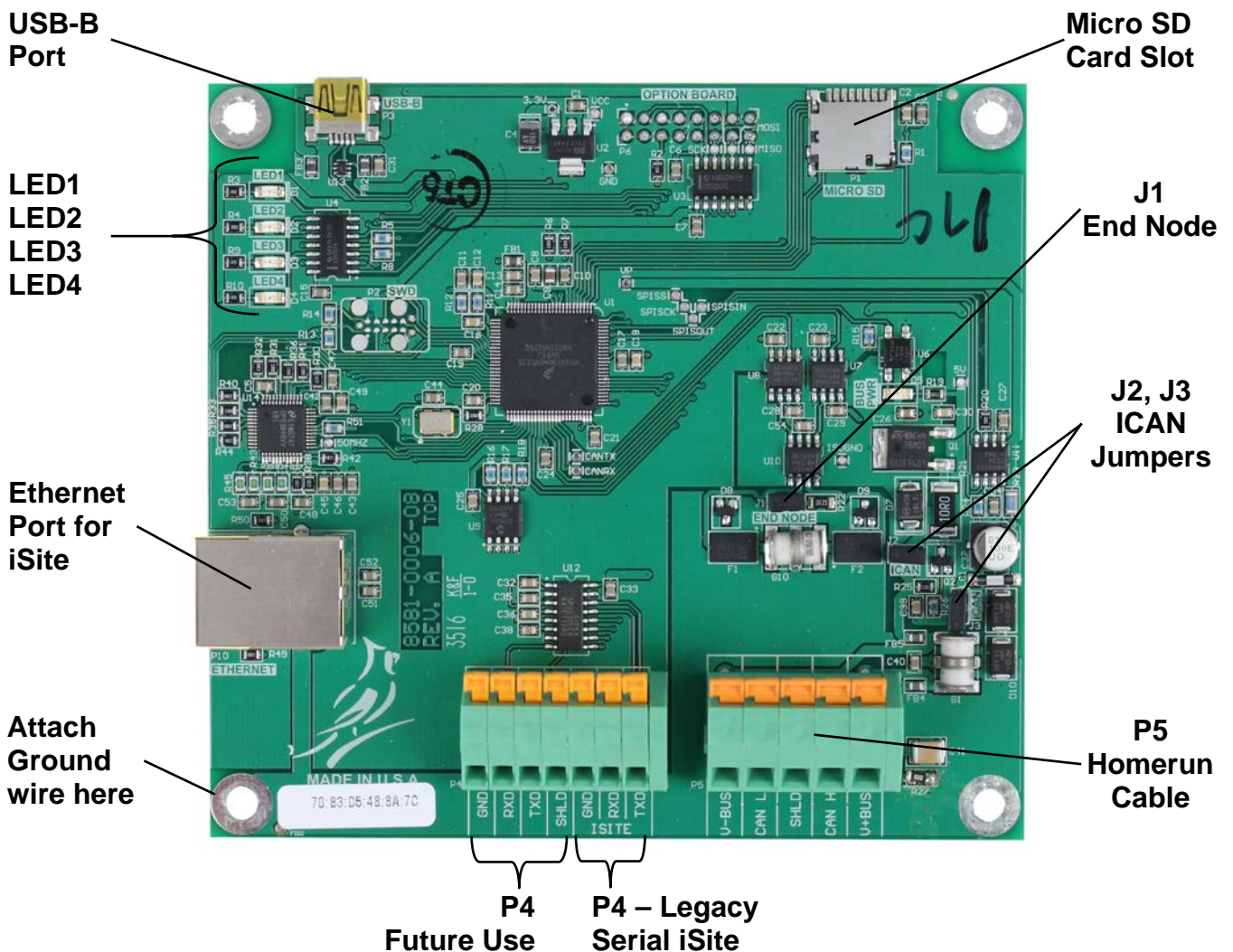
USB-B
This port is used to perform firmware updates to the 225DLC controller card.

LED 1-4
The LEDs are used for diagnostic purposes. For a complete explanation of their function, refer to the DIGITAL SCALE DIAGNOSTICS, Hardware Diagnostics section of this manual.

Ethernet Port
This port is used to connect the 225D to your network to send information to the cloud for iSite.

Micro SD Card Slot
The Micro SD card slot is not used at this time.

J1, End Node Jumper
Jumper J1 is the CAN bus END NODE jumper.

NOTE: The J1 jumper must be installed for the 225D communications to the scale to operate.

J2, J3 ICAN Jumpers
When ON (installed), these jumpers allow the 225D indicator to supply (source) 15 VDC to the digital load cells in the scale. To operate from an external power source, such as the model MB-AC media box or an external 12 to 24 VDC power supply provided by the customer, the jumpers must be OFF (on one pin only or removed).

> ⚠️ **IMPORTANT!** To operate from an external power source, the jumpers must be <u>OFF</u> (on one pin only or removed), and 12 to 24 VDC must be applied to the V+BUS terminal with a ground return to the V-BUS terminal of the P5 terminal block.

P5, Homerun Cable
The P5 terminal block is used to connect the homerun cable between the 225D indicator and the first load cell in the loop (Start Node in the scale). Refer to the table below for terminal connections.

Homerun Cable Connection to P5 Terminal Block

Board Label	Homerun Cable Wire Color	Wire Color if using a Load Cell Cable
SHLD	GRAY	BROWN
V+BUS	RED	WHITE
V-BUS	BLACK	BLUE
CAN H	WHITE	BLACK
CAN L	BLUE or LIGHT BLUE	GRAY

P4, Legacy Serial iSite
This portion of the P4 terminal block is used to connect to Legacy Serial iSite wiring when replacing or updating the indicator in an older system with a 225D.

P4, Future Use
This portion of the P4 terminal block is not used at this time. It is reserved for a future serial connection.

Load Cell Connection

The Homerun Cable is installed between the first load cell in the loop (Start Node) and the 225D indicator. It is made from five conductors, shielded PVC cable, and terminated with the *included* 5-pin spring cage connector from the Homerun Cable Connector Pack. Refer to the table below for cable and connector information.

Cable and Connector Information

ITEM and DESCRIPTION	CARDINAL PART NO.
HOMERUN CABLE, 5 CONDUCTORS, SHIELDED PVC (CONTAINS 2 x 18AWG, 2 x 22AWG, AND 1 x 22AWG)	6980-1092
CONNECTOR PACK, HOME RUN CABLE (INCLUDES 5-PIN SPRING CAGE CONNECTOR, 6610-1258)	3502-0681-0A
RECOMMENDED HOMERUN CABLE BELDEN 5303FE, 18 AWG, 5 CONDUCTORS	SUPPLIED BY DEALER

⚠️ **IMPORTANT: Clean the load cell connectors and the homerun connector plug with electrical contact cleaner, and then apply dielectric grease to the homerun connector plug before installing it into the load cell connector.**

1. Dis-assemble the connector (unscrew the black plastic part of the connector from the metal part), and then slide the black plastic part onto the homerun cable.
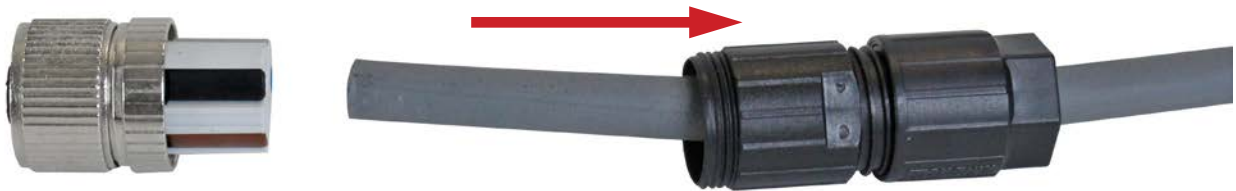
2. With the homerun cable routed through the black plastic part of the connector, remove approximately 1 inch (25 mm) of the cable's outer jacket, exposing the internal wires.

3. Next, remove approximately 5/16 inches (8 mm) of insulation from each of the five wires.

⚠️ **NOTE: The hex part of the black plastic cable clamp is approximately 5/16 inches (8 mm) and can be used as a guide for stripping the wires.**

≈ 5/16 inch (8mm)

1 inch (25 mm)

≈ 5/16 inch (8mm)
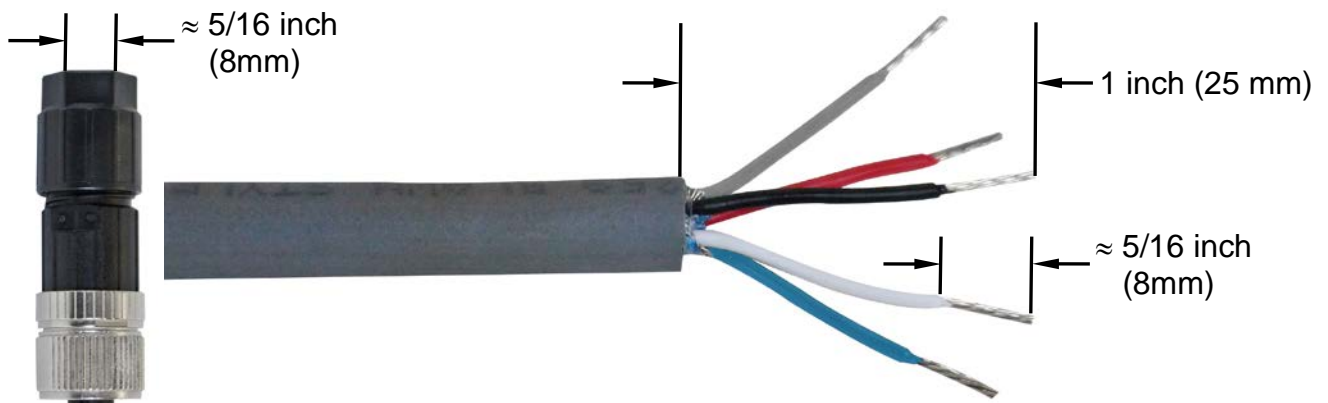
⚠️ **Refer to the Homerun Connector Wiring Color Code Table below when performing steps 4 through 7.**

Homerun Connector Wiring Color Code Table

| Connector Pin Number	Connector Lever Color	Signal	Homerun Cable Wire Color	Wire Color if using a Load Cell Cable
1	BROWN	SHLD	GRAY	BROWN
2	WHITE	V+BUS	RED	WHITE
3	BLUE	V-BUS	BLACK	BLUE
4	BLACK	CAN H	WHITE	BLACK
5	GRAY	CAN L	BLUE or LIGHT BLUE	GRAY

4. Looking at the end of the metal part of the connector where the wires are inserted, use your fingernail and gently pull a wire clamp lever down away from the body of the connector.

5. Insert the wire into the appropriate connector opening, and then close the wire clamp lever.

6. Verify that the wire is being held securely in the connector by lightly pulling on the wire.

Gently pull down to open wire clamp lever.

Insert wire, then close wire clamp lever to secure wire in connector.
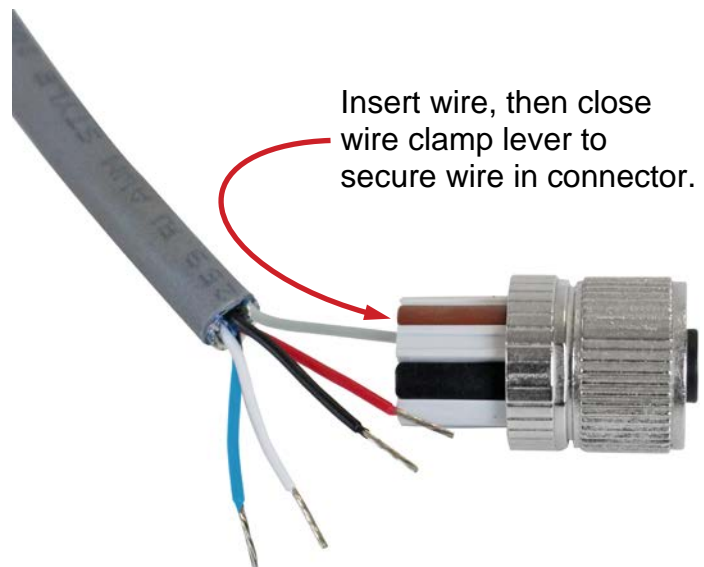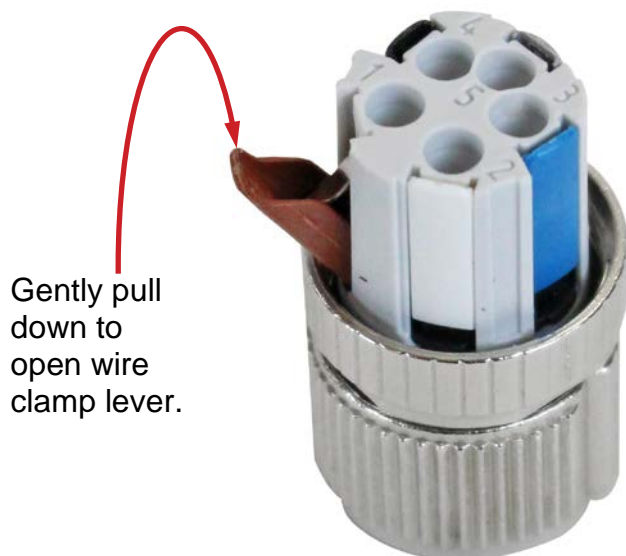
7. Repeat steps 4 through 6 until all five wires of the homerun cable are installed in the metal part of the connector.

8. After all connections have been made, slide the black plastic and metal connector parts together, and then screw them together by hand-tightening.

Slide both connector parts together and hand-tighten.

9. To complete the assembly, hold the black and metal parts of the connector housing, and then hand-tighten the cable clamp to the black plastic part of the connector housing.

Hold the black and metal parts of the connector housing.

Hand-tighten the cable clamp to the black part of connector housing.
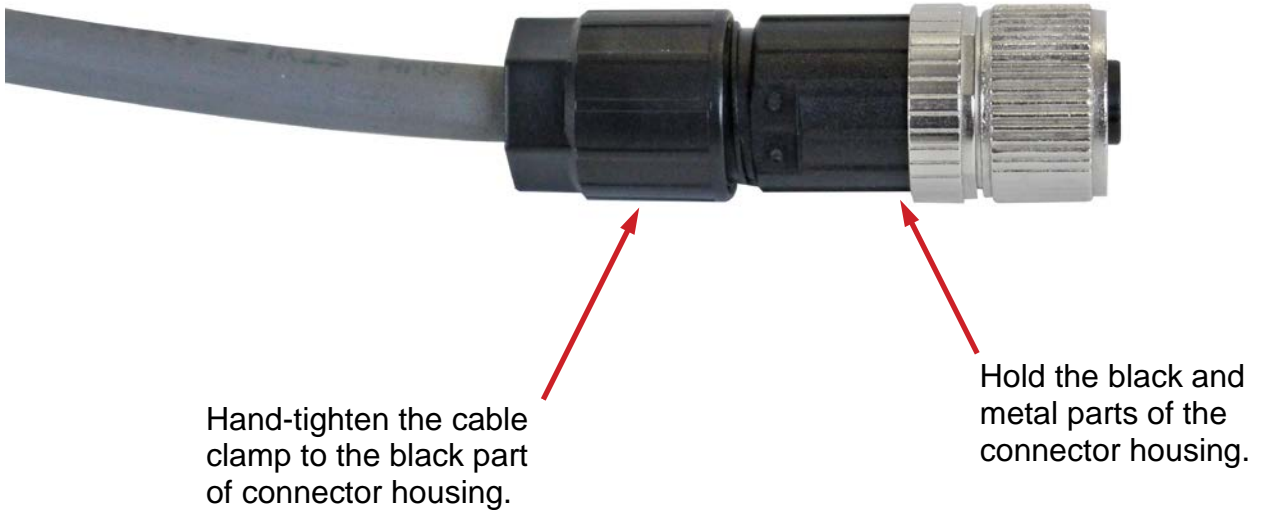
⚠ **NOTE:** For reference, the image below, shows the cable clamp separated from the connector housing in order to view the cable clamp collar.

SETUP AND CONFIGURATION

All digital scales using Cardinal Scale's SCBD SmartCell® or DC digital load cells are connected with a daisy-chained CAN (Controller Area Network) cable. The load cell connection loop can begin at any load cell and may continue clockwise as shown or counter-clockwise if preferred. Note that in the tank/hopper example below there is not a connection between cells 1 and 2 and in the truck scale example, there is not a connection between cells 4 and 6.

NOTE: Be sure to insert the end node termination plug on the load cell at end of the loop as shown in both examples.

Example: Typical Tank/Hopper Configuration

Homerun Cable

225D

End Node Terminator

1   3

2   4
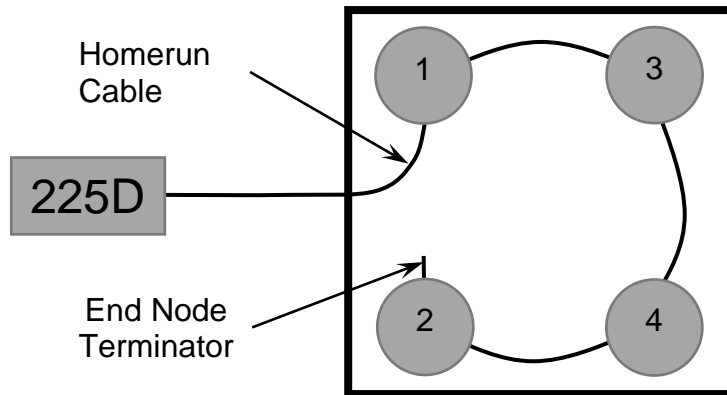
NOTE: If the loop were run in the other direction, the sequence would then be 2-4-3-1 with load cell 1 having the End Node Terminator installed on it.

Example: Typical Truck Scale Configuration

1   3   5   7

2   4   6   8

End Node Terminator

Homerun Cable

225D
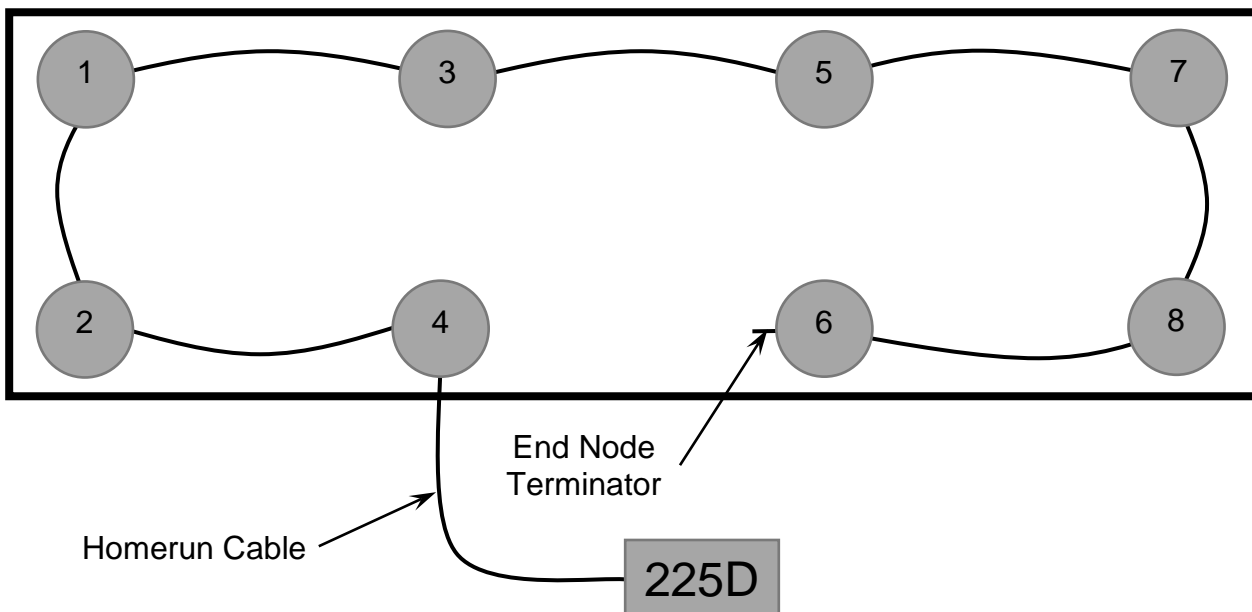
NOTE: If the loop were run in the other direction, the sequence would then be 6-8-7-5-3-1-2-4 with load cell 4 having the End Node Terminator installed on it.

Addressing Cells

Each cell has a serial number (S/N) marked on the cell. This is an eight-digit hexadecimal number. It is also known as the cell ID. Each cell ID must be matched with a cell address. In the tank/hopper example, the addresses would be 1-4. In the truck scale example, the addresses would be 1-8.

1. Enter the SETUP menu by pressing **SHIFT+RED_KEY**.
2. Press **ENTER** again to get to SETUP MENU #1.
3. Press **8** and **ENTER** to set the number of scales and cells.

```
           SETUP MENU #1
1.  USA=XXX        6.  CLR TARE=XXX
2.  NSC=XXX        7.  CLEAR ID=XXX
3.  LFT=XXX        8.  SCALES=X CELLS=X
4.  OIML=N/A       9.  TOTALIZE=XXX
5.  TIME=XX       10.  MODE OF OP=1   IDS
Enter Selection:   0  ▮NEXT  ▮EXIT
```

4. Enter the number of scales and press **ENTER**.
5. Enter the number of cells and press **ENTER**. The addressing menu will appear.

```
        CELL  TO  SCALE  ASSIGNMENTS
1.   CELL 1   SCALE=1   ID=1D7A173F   START
2.   CELL 2   SCALE=1   ID=0EB0EBFF   END
3.   CELL 3   SCALE=1   ID=18B8783F
4.   CELL 4   SCALE=1   ID=09C99FFF

Enter Selection: 0    ▮NEXT  ▮EXIT
                      END NODES    EXIT
```

6. Press a cell number, and then **ENTER** to be prompted for the associated scale number followed by the cell ID.
7. If the cell is found, the 225D will display "CELL RESPONDED". If the cell does not respond the 225D will sound an error beep and display "—FAILED—". If the cell is disconnected, then this error can be ignored.

End Nodes

The 225D indicator also needs to know where the scale starts and ends. The START NODE is the cell that connects to the 225D. The END node is the last cell in the daisy chain. In the tank/hopper example, the START node is #1 and the END node is #2. In the truck scale example, the START node is #4 and the END node is #6.

To set the nodes:

1. Press the **END NODES** soft key.
2. The 225D will display "WHICH CELL CONNECTS TO THE 225? ".
3. In the previous examples, the user would enter **1** (tank/hopper) or **4** (truck) and **ENTER**.
4. The 225D will display "WHICH CELL IS THE LAST IN THE LOOP? ".
5. In the previous examples, the user would enter **2** (tank/hopper) or **6** (truck) and **ENTER**.

Calibration

If, after test loading the scale, it is determined that adjustments are required, follow the procedure below. Note that this section describes the procedure necessary to calibrate a Digital Truck Scale.

1. Before any adjustments are made, turn on the power to the 225D indicator.
2. Drive a test truck across the scale *at least three times* in each direction before calibrating the scale.
3. Before sealing can be done, the 225D indicator must be calibrated to the scale. A division size of 10 lbs should be selected and the auto-zero function turned off. Refer to the standard 225 Weight Indicator Installation and Technical Manual, 8200-M698-O1.

All digital cells are pre-calibrated in the factory for span. That means that span calibration is not necessary to start making weights. Only a zero calibration is necessary. However, a Smart Calibration is still usually necessary to trim the corners and sections of a scale.

Navigating to the DLC Calibration Menu

1. Enter SETUP by pressing **SHIFT+RED_KEY**.
2. Press **ENTER**.
3. Press **DOWN** to get to SETUP MENU #2.
4. Select **SETUP SCALE #X** where 'X' is the scale number.
5. Press **DOWN** to get to SCALE X SETUP MENU #2.
6. Enter **10** and press **ENTER** to open the DLC calibration menu.

```
       SCALE 1 CALIBRATION MENU
  1.  SMART CALIBRATION
  2.  ZERO CALIBRATION
  3.  TRIM CELL(S)
  4.  SPAN ADJUST

Enter Selection: 0
                            EXIT
```
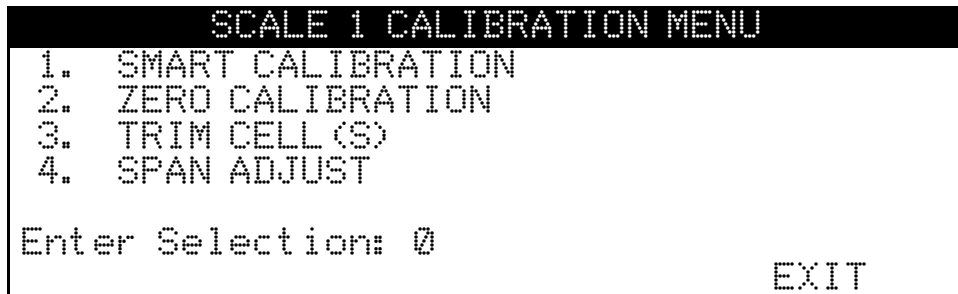
SMART CALIBRATION

Smart Calibration is not necessary to make weight, but it is helpful for trimming all load cells automatically.

1. Press **1** and **ENTER**. The 225D will prompt for "CAL WT =   0".
2. Enter the weight of the test weight.
3. The 225D will display…
     VERIFY SCALE IS EMPTY
   PRESS ENTER TO CONTINUE
4. With an empty scale, press **ENTER**. This will capture the calibrated dead load weight of the scale.
5. The 225D will display…
     PLACE WEIGHT ON CELL X
   PRESS ENTER TO CONTINUE
6. Center the weight over scale X and press **ENTER** to take a weight sample.
7. Repeat steps 5, 6 for each cell in the order that the 225D prompts for. (This is the same order as other Cardinal scales e.g., 1, 3, 5, 7, 8, 6, 4, 2).

ZERO CALIBRATION

Zero Calibration does not affect the trimming of the cells or affect span. It simply sets the dead load weight of the scale.

1. Press **2** and **ENTER**.
2. The 225D will display…
     VERIFY SCALE IS EMPTY
   PRESS ENTER TO CONTINUE
3. Ensure the scale is empty and press **ENTER**. The scale will record dead load weight.

TRIM CELLS

Individual cells or pairs of cells may be trimmed. This requires a test load weight.

1. Press **3** and **ENTER**.
2. The 225D will prompt for "Cell Number(s): ".
3. To trim a single cell, enter the cell number, and press **ENTER**. To trim a pair of cells, enter both cells in the form "X + Y", and press **ENTER**.
   E.g., to trim the pair of cells 5 and 6 enter "**5+6**" and press **ENTER**.
4. For information only, the 225D will display the cell trim "CELL   # TRIM   X.XXXXXXX". It will also display the total "SCALE WT = XXXXX".

   NOTE: High-resolution weight (interval/10) will be shown if the weight interval setting is less than 10. For example, an interval of 5 will be shown in 0.5 increments.

5. Place a test weight over the cell(s) to be adjusted.
6. Press the **SET_WT** soft key.
7. The 225D will prompt "ENTER NEW WEIGHT = ".
8. Enter the actual correct weight of the test weight and press **ENTER**.
9. The 225D will automatically trim the cell to get close to the entered test weight.
10. Press the **PREVIOUS** and **NEXT** soft keys to navigate to other cells without exiting the trim menu.

SPAN ADJUST

Span adjust allows the user to tweak the span of the entire scale at once.

1. Press **4** and **ENTER**.

2. The 225D will display the current live scale weight "SCALE WT = XXXXX.X".

   NOTE: High-resolution weight (interval/10) will be shown if the weight interval setting is less than 10. For example, an interval of 5 will be shown in 0.5 increments.

3. Note that high-resolution weight (interval/10) will be shown if the weight interval setting is less than 10. For example, an interval of 5 will be shown in 0.5 increments.

4. Place the test weight at any location on the scale.

5. Press **SET_WT** soft key. The 225D will prompt "ENTER NEW WEIGHT = ".

6. Enter the value of the test weight and press **ENTER**.

7. The 225D will adjust the span to target weight.
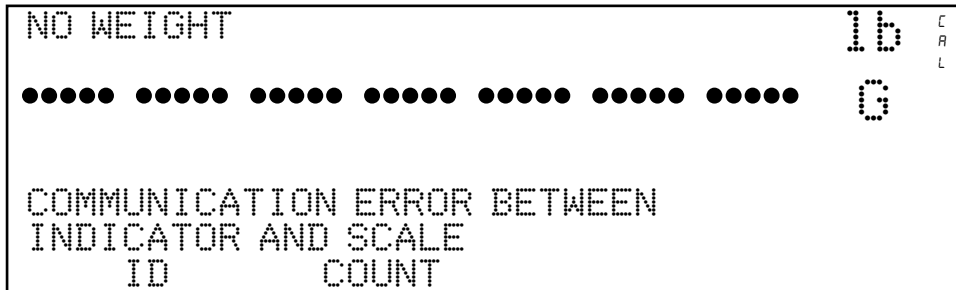
DIGITAL SCALE DIAGNOSTICS

There are four main components to 225D Digital Scale Diagnostics:

- On Screen Diagnostics – Critical errors that alert operator from the main screen of setup issues or hardware problems.

- Diagnostic Menu – A set of diagnostic tools that give a technician more information about each load cell.

- Hardware Diagnostics – LEDs on the DLC controller alert technicians of communications status.

- iSite – Web-based repository for historical load cell data that will be tracked for slow degradation of load cell integrity (for example a single load cell that is drifting away from zero). iSite will also receive all the hardware errors found by the 225D SmartCell Weight Indicator.

On Screen Diagnostics

The following messages will be shown to the operator on the main weight screen in real-time when an error happens.

COMMUNICATION ERROR BETWEEN INDICATOR AND SCALE

```
NO WEIGHT                              lb   C
                                            A
                                            L

●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●     G


COMMUNICATION ERROR BETWEEN
INDICATOR AND SCALE
      ID        COUNT
```

Probable Cause	Items to Check
The homerun cable is damaged or disconnected.	- Check that cable is connected correctly. - Check cable for damage. - Use caution on the amount of insulation stripped for the connector. Center wires could short. Must be shorter than the center connector. - Check connector for random strands of wire. - Verify that connector is clear of debris.

COMMUNICATION ERROR BETWEEN LOAD CELLS X AND Y

```
NO WEIGHT                                lb  C
                                             A
                                             L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●     G
                                             ◣◢

COMMUNICATION ERROR BETWEEN
LOAD CELLS 1 AND 3
       ID        COUNT
```
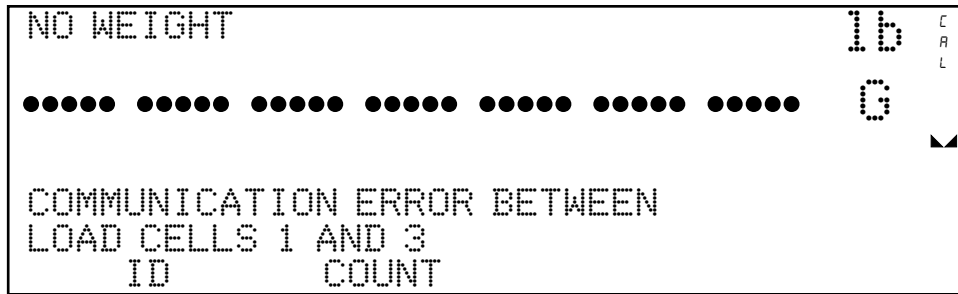
Probable Cause	Items to Check
There is a loss of communication between load cells.	• Check that cable is connected correctly. • Check cable for damage. • Verify that connector is clear of debris. • Check load cell COM ports on both load cells.

LOAD CELL X, Y, Z NOT RESPONDING

```
NO WEIGHT                                lb  C
                                             A
                                             L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●     G



LOAD CELL 2 NOT RESPONDING
       ID        COUNT
```
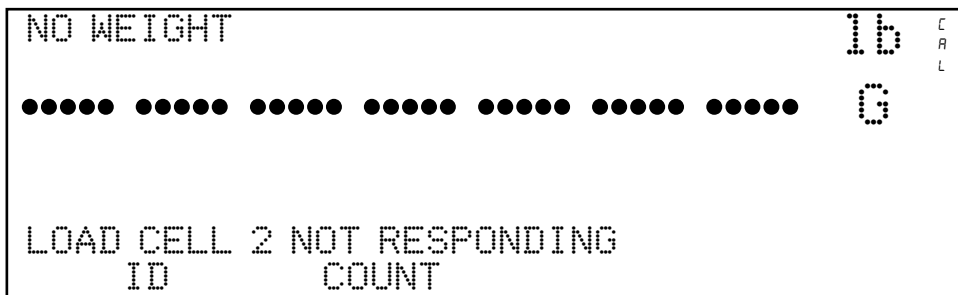
Probable Cause	Items to Check
The 225D cannot detect the exact communication problem with the unresponsive load cell.	• Check that cable is connected correctly. • Check cable for damage. • Verify that connector is clear of debris. • Potentially dead load cell.

LOAD CELL X DAMAGED

```
NO WEIGHT                                lb  C
                                             A
                                             L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●     G



REPLACE LOAD CELL 2
       ID        COUNT
```
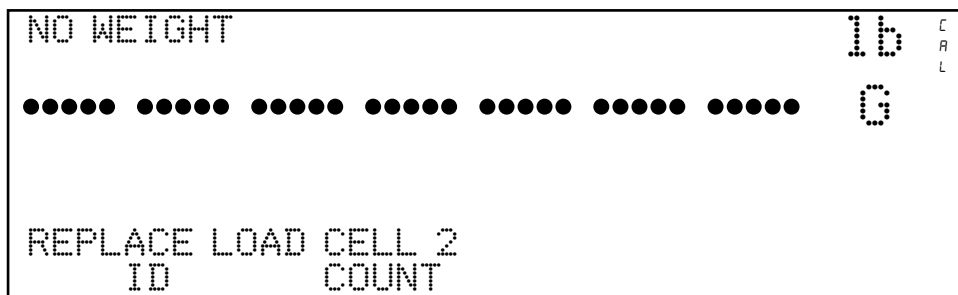
Probable Cause	Items to Check
There is irreparable internal damage to the load cell.	Replace load cell.

LOAD CELL X HAS BEEN REPLACED

```
NO WEIGHT                              lb   C
                                            A
                                            L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●   G

LOAD CELL 2 HAS BEEN REPLACED.
SCALE NOT LEGAL FOR TRADE UNTIL
CALIBRATED.
PRESS ENTER TO CONTINUE
```
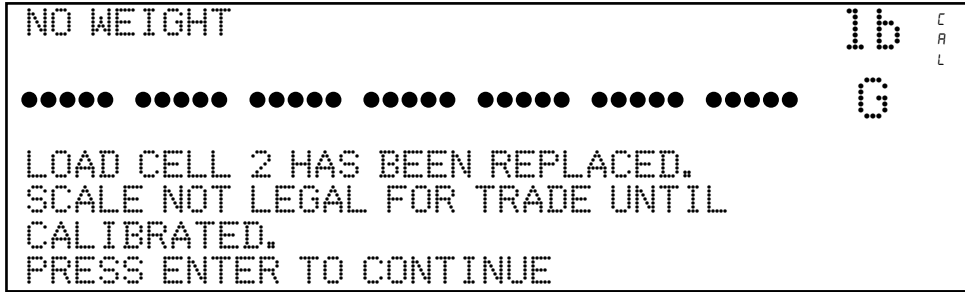
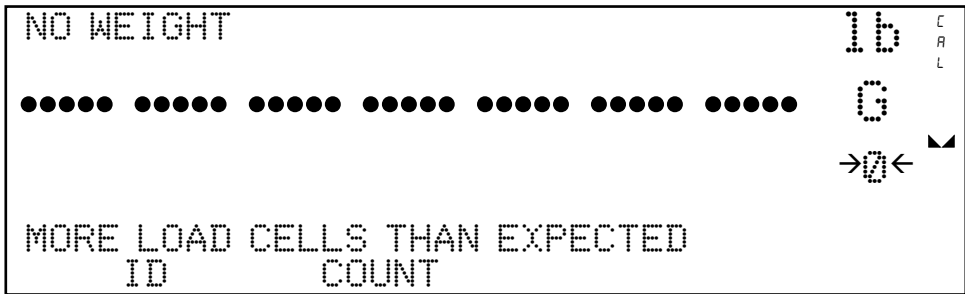| Probable Cause	Items to Check
A load cell has been replaced.	Replaced load cells are automatically detected if only one load cell was replaced. Once a load cell has been replaced, the 225D will auto-detect the new load cell, display the message that the scale is not Legal-For-Trade, and will need to be calibrated.

MORE LOAD CELLS THAN EXPECTED

```
NO WEIGHT                              lb   C
                                            A
                                            L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●   G

                                          →0←

MORE LOAD CELLS THAN EXPECTED
      ID         COUNT
```

Probable Cause	Items to Check
There are more load cells than expected connected to the 225D. For example, the indicator number of load cells is set to 8 but the controller detects there are 12 load cells.	Confirm and configure the number of load cells the scale should have.

LOAD CELL ID 8F07E8F HAS NO ADDRESS

```
NO WEIGHT                          lb   C
                                        A
                                        L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●   C
                                        ◥◣


LOAD CELL ID 8F07E8F HAS NO ADDRESS
      ID        COUNT
```
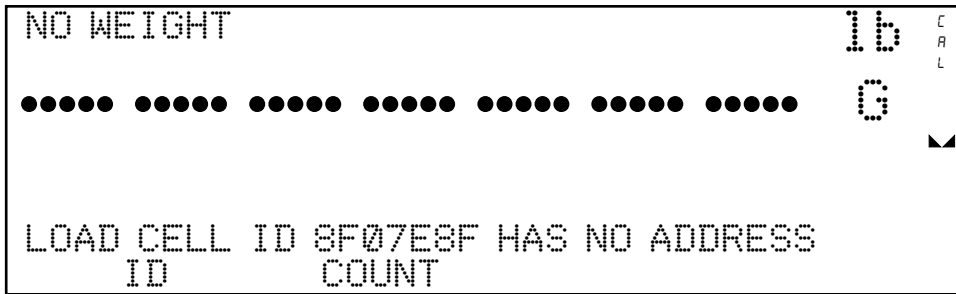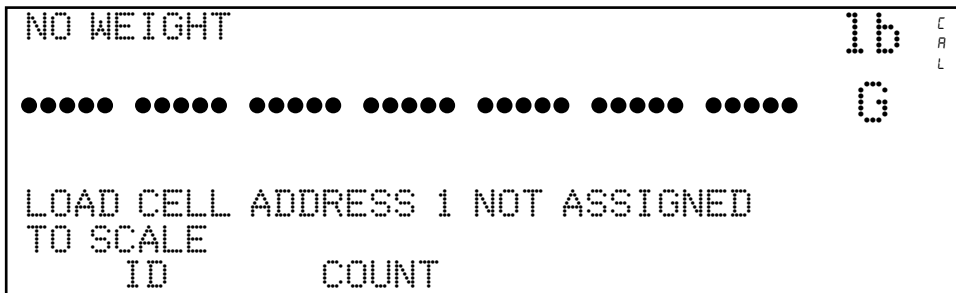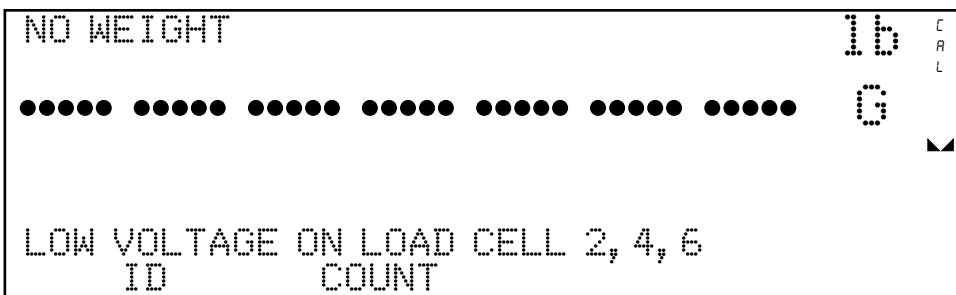
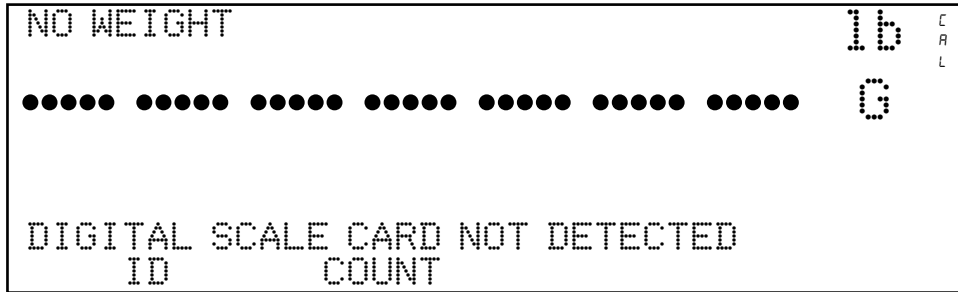| Probable Cause	Items to Check
A load cell is responding, but it is not addressed in the system.	Go to the addressing menu and assign the load cell ID to an address.

LOAD CELL ADDRESS X NOT ASSIGNED TO SCALE

```
NO WEIGHT                          lb   C
                                        A
                                        L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●   C


LOAD CELL ADDRESS 1 NOT ASSIGNED
TO SCALE
      ID        COUNT
```

Probable Cause	Items to Check
A load cell has not been assigned to a scale.	Go to the addressing menu and assign a scale to the load cell.

LOW VOLTAGE DETECTED ON LOAD CELL X, Y, Z

```
NO WEIGHT                          lb   C
                                        A
                                        L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●   C
                                        ◥◣


LOW VOLTAGE ON LOAD CELL 2, 4, 6
      ID        COUNT
```

Probable Cause	Items to Check
Low power on a load cell. Load cells at the end of the CAN daisy chain are most susceptible to low voltage errors because of voltage drop along the cable.	• Too many load cells on the chain. • Check that cable is connected correctly. • Check cable for damage. • Verify that connector is clear of debris. • Check 225D indicator power supply.

DIGITAL SCALE BOARD NOT DETECTED

```
NO WEIGHT                                    lb   C
                                                  A
                                                  L
●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●●      G


DIGITAL SCALE CARD NOT DETECTED
      ID          COUNT
```

Probable Cause	Items to Check
The 225D cannot communicate with the option card or the option card is not responding.	• Check that the card is seated properly and fastened correctly. • Check that card is seated on the correct row of pins. • Potential of a failed card if occurs after installation and in-service.

Diagnostic Menu

To enter the diagnostic menu press **SHIFT** + **CELL_DIAG** soft key. All diagnostic information except software version updates once per second.

LIVE LOAD CELL WEIGHTS (*This can be zeroed as needed.*)

```
        LOAD CELL WEIGHTS
1.      225           6.      779
2.      104           7.       36
3.     -106           8.       50
4.     -120
5.      639

PREVIOUS      NEXT              EXIT
```

MINIMUM AND MAXIMUM WEIGHTS (*This can be zeroed as needed.*)

```
      MAXIMUM / MINIMUM WEIGHTS
1.      0/      0   6.      0/      0
2.      0/      0   7.      0/      0
3.      0/      0   8.      0/      0
4.      0/      0
5.      0/      0

PREVIOUS      NEXT              EXIT
```

Zeroing the LIVE LOAD CELL WEIGHTS and MINIMUM AND MAXIMUM WEIGHTS screens is only temporary while in diagnostics. It does not affect the scale weight working zero. If you exit diagnostics and return, the weights will have returned to the previous values.

DEADLOAD SHIFT

```
DEADLOAD SHIFT       ▓ = CHECK LOAD CELL
1.       - 1         6          0
2.         2         7          2
3.         0         8         -1
4.         0
5.       - 3

PREVIOUS      NEXT              EXIT
```

This shows the live shift from the original calibrated deadload. An asterisk (✻) indicates that the deadload shift has been exceeded. The scale must empty for this to be valid.

SOFTWARE VERSION OF CELL

```
 LOADCELL SOFTWARE VERSIONS
1.  1.0.14           6.  1.0.14
2.  1.0.14           7.  1.0.14
3.  1.0.14           8.  1.0.14
4.  1.0.14
5.  1.0.14

PREVIOUS      NEXT            EXIT
```

NOTE: The controller's version number, in contrast, is displayed upon startup of the 225D indicator.

LOADCELL COMMUNICATION ERROR COUNTS

```
 LOADCELL COMMUNICATION ERROR COUNTS
1.  1                6.  0
2.  1                7.  0
3.  0                8.  0
4.  1
5.  1

PREVIOUS      NEXT            EXIT
```

DLC CARD COMMUNICATION ERROR COUNTS

```
 DLC CARD COMMUNICATION ERROR COUNTS
Overflow          0
Bus Off           0
CAN Err           0



PREVIOUS      NEXT            EXIT
```

Overflow	This is the count of any missed messages from the DLC card buffer that were not kept up with. This should not happen unless too many cells are connected with too high of a sample rate.
Bus Off	This does not happen if you completely disconnect the home run cable, but does count up if V+ or V- is disconnected.
CAN Err	This counts for any of the following errors:

WEIGHT ERROR COUNTS

```
           WEIGHT ERROR COUNTS
  1.   0                  6.   0
  2.   0                  7.   0
  3.   0                  8.   0
  4.   0
  5.   0

  PREVIOUS      NEXT              EXIT
```

CELL POWER SUPPLY VOLTAGES

```
     CELL POWER SUPPLY VOLTAGES *Approx.
  1.    14.355            6.    14.191
  2.    13.950            7.    14.530
  3.    14.334            8.    14.260
  4.    14.211
  5.    14.267 *
       0.184 Amps
  PREVIOUS      NEXT              EXIT
```

NOTES:
- The ✳ on cell number 5, indicates the cell voltage measurement was not calibrated but is an approximate value based on the raw counts.

- The 0.184 Amps in this example, shows the approximate current draw from the DLC for all of the cells. Unless an external power is being used, the more cells that are connected, the larger this number will be.
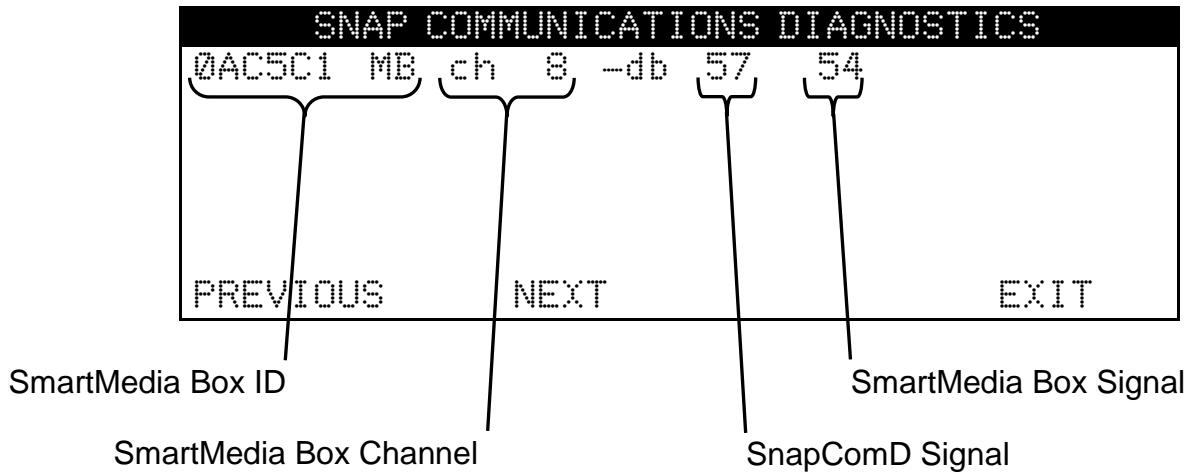
CELL SIGNAL MILLIVOLTS

```
          CELL SIGNAL MILLIVOLTS
  1.    7.984             6.    1.601
  2.    0.492             7.    0.561
  3.   -0.085             8.    0.139
  4.   -0.381
  5.    0.869

  PREVIOUS      NEXT              EXIT
```

SNAP COMMUNICATIONS DIAGNOSTICS

When the SNAP SmartMedia Box communications are enabled, an additional page of the Digital Scale Diagnostics is available.

This will scan and list the IDs of any SmartMedia boxes that it finds on the same channel that the indicator is set to.

This screen shows the ID of the SmartMedia Box, the channel that is being used, and the signal strength detected at the SnapComD and SmartMedia Box.

```
SNAP COMMUNICATIONS DIAGNOSTICS
0AC5C1 MB, ch 8, -db 57, 54




PREVIOUS        NEXT                    EXIT
```

SmartMedia Box ID   SmartMedia Box Signal

SmartMedia Box Channel   SnapComD Signal

NOTE: The –db numbers are the signal strength detected at the SnapComD and SmartMedia Box. Lower numbers indicate better signal strength.

Hardware Diagnostics

The 225DLC (Digital Load cell Controller) option card has four LEDs for diagnostic purposes.
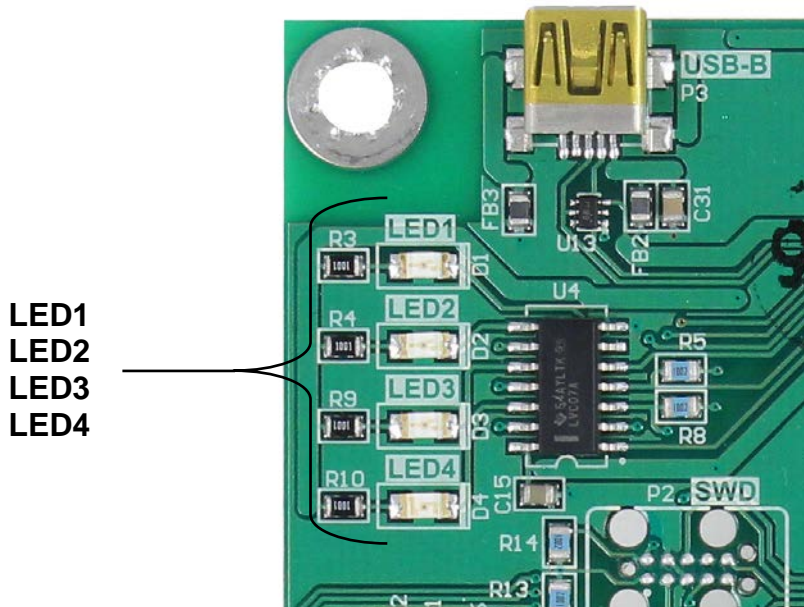
LED1 (RED) – MAIN BOARD TX/RX: Toggles each time the DLC controller and the 225D Mainboard exchange messages.

LED2 (RED) – TX TO LOAD CELL: Toggles each time a message is sent from the DLC controller to the load cells.

LED3 (RED) – RX FROM LOAD CELL: Toggles each time the controller receives a response from some or all the load cells. Blinking does not mean that it got a response from EVERY load cell. If some load cell does not respond, the 225D will drop into INIT MODE.

LED4 (GREEN) – MODE: Indicates the mode of the DLC Controller

INIT MODE – Blinks once per second. If the 225D drops into INIT MODE, it is because setup is required, or it cannot find all the load cells.

NORMAL MODE – solid ON

DIAGNOSTIC MODE – Blinks twice per second. This should happen when the operator enters the diagnostics menus.

DETECTING BOARD REPLACEMENTS

The 225D will detect when a DLC controller or 225D mainboard has been replaced using checksums and unique board identification numbers. Based on several parameters, it can detect whether the option card was replaced, or the mainboard was replaced and then reconfigure the NEW card to the existing scale.

OPTION CARD REPLACEMENT
If an option card is replaced, the 225D will boot up to this screen:

```
                      DLC
                  BY CARDINAL
               Revision 0.1.04
NEW CARD FOUND!
WAS DIGITAL SCALE CARD REPLACED?  NO
   YES                              NO
```

The 225D will check whether the option card has been replaced, to reconfigure the new option card to the existing scale.

If the operator selects YES, then the 225D mainboard will upload the scale configuration to the controller, and the 225D will immediately be able to make weight again.

MAIN PCB REPLACEMENT
If a 225D main board is replaced, the 225D will boot up to this screen:

```
                      DLC
                  BY CARDINAL
               Revision 0.1.04
NEW CARD FOUND!
WAS MAINBOARD REPLACED?  NO
   YES                              NO
```

The system will also check whether the 225D's mainboard has been replaced, so the scale configuration can be downloaded from the controller to the mainboard.

If the operator selects YES, then the scale configuration will be downloaded from the controller to the mainboard. Scale configuration includes the number of load cells, all load cell IDs, and individual load cell trim. The 225D indicator parameters will need to be entered manually (Interval, Decimal Point Position, Zero Tracking, Filtering, Print Settings, and Serial Settings).
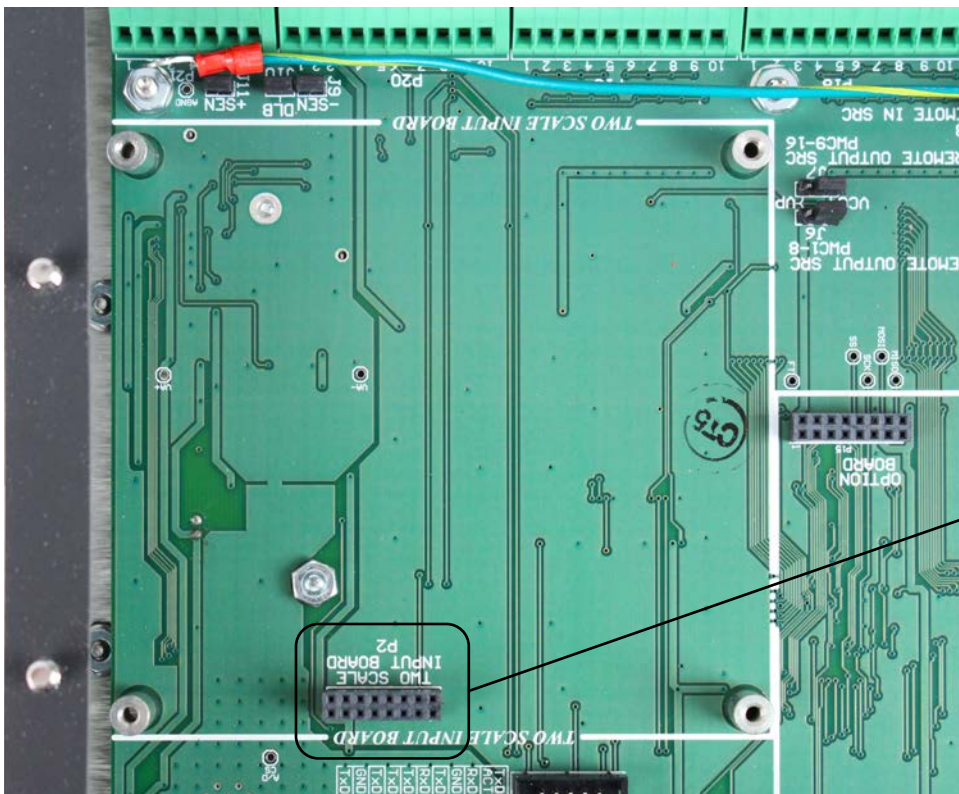
NOTE: A dead load calibration will need to be performed (does not require test weights).

225DLC CARD REPLACEMENT
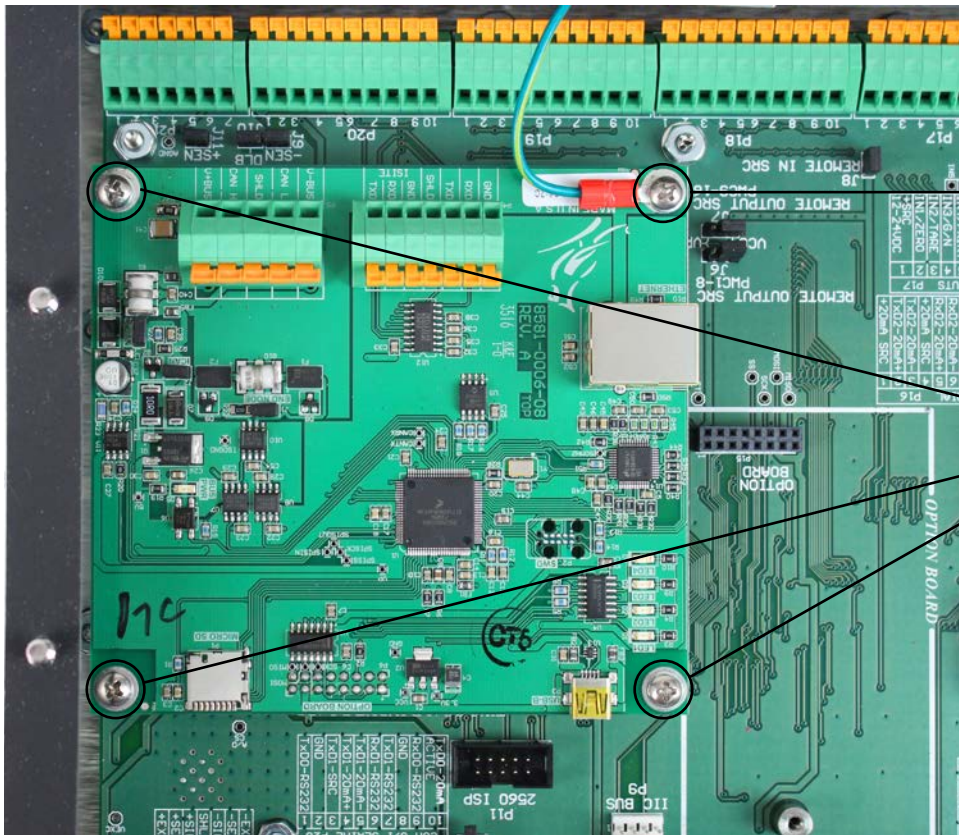
Remove this screw, washer, and the ground wire

Remove the remaining three screws and lock washers

Align pins on 225DLC card with holes in P2.

⚠ CAUTION! OBSERVE THE PRECAUTIONS FOR HANDLING STATIC-SENSITIVE DEVICES

1. Remove the 225D power cord from the wall outlet.
2. Remove the fourteen acorn nuts securing the rear panel to the main housing.
3. Lift the rear panel from the main housing, taking care not to stretch the cable and wires between the panel and main housing. Lay the rear panel on the workbench/table next to the indicator. **NOTE:** You may need to loosen the gland connectors to allow enough slack in the cable and wires to avoid stretching them.
4. Disconnect the Homerun cable wires from the 225DLC card.
5. Remove the four screws and washers securing the 225DLC card to the 225D mainboard. Note that the ground wire for the card is secured by one of these screws.
6. Gently rock the 225DLC card from side to side while pulling up to remove it from the mainboard.
7. To install the new 225DLC card, carefully align the dual row of pins on the top of the 225DLC card (on the trace side of the card) with connector P2 on the mainboard and apply even downward pressure to the edge of the 225DLC card.
8. Align the holes in the 225DLC with the threaded mounting spacers on the mainboard.
9. Secure the 225DLC card to the mainboard, using the four screws and washers removed earlier. Note that one screw and washer should be inserted through the ground wire ring terminal, before using it to secure the card to the mainboard.
10. Reconnect the Homerun cable wires.
11. Ensure that no cables or wires are exposed between the main housing and the rear panel, and then place the rear panel onto the main housing, and secure it using the fourteen acorn nuts removed in step 2.
12. Re-insert the 225D power cord into the wall outlet.
13. Press the **ON/OFF** key on the 225D keypad to turn on the indicator.
14. The 225D will boot up to this screen:

```
                    DLC
                 BY CARDINAL
              Revision 0.1.04
NEW CARD FOUND!
WAS DIGITAL SCALE CARD REPLACED?  NO
   YES                             NO
```

15. The 225D will check whether the option card has been replaced, to reconfigure the new option card to the existing scale.
16. If the operator selects YES, then the 225D mainboard will upload the scale configuration to the controller, and the 225D will immediately be able to make weight again.

iSITE CONFIGURATION

The 225D will periodically send indicator, scale, and cell data to the Cardinal iSite Webserver for diagnostic logging. This information will be used by the server to determine if there are problems with the scale(s) that need to be addressed.

To access the ISITE IP CONFIG menu:

1. Press **SHIFT + RED_KEY** to enter SETUP/REVIEW.
2. Press **ENTER** once and **DOWN** twice to navigate to SETUP MENU #3.
3. Select **#9. ISITE IP CONFIG**.

The SO# of the scale is used to match up the scale to the correct iSite dealer account. In many cases, DHCP may be used in which case setup is quite simple:

1. SO# = XXXXXX
2. DHCP = YES

If a static IP address is required (such as to address firewall issues), then set DHCP = NO, and prompting will appear to manually set addresses:

1. SO# = XXXXXX
2. DHCP = NO
3. IP = XXX.XXX.XXX.XXX
4. SUBNET = XXX.XXX.XXX.XXX
5. GATEWAY = XXX.XXX.XXX.XXX

To confirm that iSite is working or to diagnose any errors in the connection, there is an iSite status page in the diagnostics menu. Some of the information is quite technical but is present in case of a more complicated problem.

TO CHECK STATUS OF LAST ISITE CONNECTION

1. From the main weight screen, go to the diagnostics menu by pressing **SHIFT + CELL_DIAG**.
2. Navigate with **PREVIOUS/NEXT** soft keys to the page titled "ISITE STATUS OF LAST CONNECTION".

TO CHECK STATUS OF LAST ISITE CONNECTION, CONT.

```
ISITE STATUS OF LAST CONNECTION
                  IP = 10.1.3.109
ETHERNET DETECTED
WAITING FOR SOCKET INIT

HTTP RESP = 0

PREVIOUS     NEXT              EXIT
```

3. The following information is available:

A. IP address (if available).

B. Ethernet cable state – "ETHERNET DETECTED" or "ETHERNET NOT DETECTED"

C. The status of the connection. The following statuses should occur in order while making a connection after bootup:

    a. WAITING FOR SOCKET INIT

    b. IP BINDING

    c. DNS RESOLVING SERVER IP

    d. COMM ESTABLISHED – OR—PORT CONNECT FAIL

D. Once there is a connection to the webserver, the previous HTTP response will be displayed.

    a. A good response is "HTTP RESP = 200 OKAY"

    b. Any other response means there is a problem. Many issues are caused by the SO# not being entered in the indicator, "HTTP RESP = 404 CHECK SO# IN 225 SETUP".

STATEMENT OF LIMITED WARRANTY

WARRANTY TERMS

Cardinal Scale Manufacturing Company warrants the equipment we manufacture against defects in material and workmanship. The length and terms and conditions of these warranties vary with the type of product and are summarized below:

PRODUCT TYPE	TERM	MATERIAL AND WORKMAN-SHIP	LIGHTNING DAMAGE See note 9	WATER DAMAGE See note 7	CORROSION See note 4	ON-SITE LABOR	LIMITATIONS AND REQUIREMENTS
WEIGHT INDICATORS	90 DAY REPLACEMENT ---------- 1 YEAR PARTS	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D
LOAD CELLS (Excluding Hydraulic)	1 YEAR	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D
HYDRAULIC LOAD CELLS (When purchased with Guardian Vehicle Scale)	LIFETIME	YES	YES	YES	YES	90 DAYS	1, 5, 6, 8 A, B, C, D
HYDRAULIC LOAD CELLS (When purchased separately)	10 YEARS	YES	YES	YES	YES	NO	1, 5, 6, 8, 9 A, B, C, D
VEHICLE SCALE (Deck and Below Excl. PSC Series)	5 YEARS	YES	YES	YES	YES	90 DAYS	1, 2, 3, 5, 6 A, B, C, D, E
LSC SCALE (Deck and Below)	3 YEARS	YES	YES	YES	YES	90 DAYS	1, 2, 3, 5, 6, 11 A, B, C, D
GUARDIAN FLOOR SCALES	10 YEARS	YES	YES	YES	YES	NO	1, 2, 3, 5, 6, 9, 10 A, B, C, D
ALL OTHER CARDINAL PRODUCTS	1 YEAR	YES	YES	YES	YES	NO	1, 2, 5, 6 A, B, C, D, E
REPLACEMENT PARTS	90 DAYS	YES	YES	YES	YES	NO	1, 2, 4, 5, 6 A, B, C, D
SWIM AND 760 SERIES VEHICLE SCALES	1 YEAR	YES	YES	YES	YES	90 DAYS	1, 2, 5, 6 A, B, C, D
SOFTWARE	90 DAYS	YES	N/A	N/A	N/A	NO	1, 6 B, C, D
CONVEYOR BELT SCALES (including Belt-Way)	1 YEAR	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D, E, F

Ph. (800) 441-4237
E-mail: cardinal@cardet.com
102 E. Daugherty
Webb City, MO 64870

CARDINAL ®

APPLICABLE LIMITATIONS AND REQUIREMENTS

1. This warranty applies only to the original purchaser. The warranty does not apply to equipment that has been tampered with, defaced, damaged, or had repairs or modifications not authorized by Cardinal or has had the serial number altered, defaced or removed.
2. This warranty is not applicable to equipment that has not been grounded in accordance with Cardinal's recommendations.
3. This equipment must be installed and continuously maintained by an authorized Cardinal / Belt-Way dealer.
4. Applies only to components constructed from stainless steel.
5. This warranty does not apply to equipment damaged in transit. Claims for such damage must be made with the responsible freight carrier in accordance with freight carrier regulations.
6. Warranty term begins with date of shipment from Cardinal.
7. Only if device is rated NEMA 4 or better or IP equivalent.
8. Lifetime warranty applies to damages resulting from water, lightning, and voltage transients and applies only to the hydraulic load cell structure itself (does not include pressure transducers, rubber seals, o-rings, and associated wiring).
9. 10-Year prorated warranty on hydraulic load cells.
10. 1-Year warranty for scale structure.
11. PSC models' warranty coverage applies only to agricultural installations on farms up to 3,000 acres (LSC models not limited in this manner).
12. Load cell kits MUST be installed in accordance with Cardinal Scale instructions. Failure to follow these instructions will void the warranty.

EXCLUSIONS

A.) This warranty does not include replacement of consumable or expendable parts. The warranty does not apply to any item that has been damaged due to unusual wear, abuse, improper line voltage, overloading, theft, fire, water, prolonged storage or exposure while in purchaser's possession or acts of God unless otherwise stated herein.

B.) This warranty does not apply to peripheral equipment not manufactured by Cardinal. This equipment will normally be covered by the equipment manufacturer's warranty.

C.) This warranty sets forth the extent of our liability for breach of any warranty or deficiency in connection with the sale or use of our product. Cardinal will not be liable for consequential damages of any nature, including but not limited to loss of profit, delays or expenses, whether based on tort or contract. Cardinal reserves the right to incorporate improvements in material and design without notice and is not obligated to incorporate said improvements in equipment previously manufactured.

D.) This warranty is in lieu of all other warranties expressed or implied including any warranty that extends beyond the description of the product including any warranty of merchantability or fitness for a particular purpose. This warranty covers only those Cardinal products installed in the forty-eight contiguous United States and Canada.

E.) This warranty does not cover paint coatings due to the variety of environmental conditions.

F.) Do not cut load cell cables on load cells returned for credit or warranty replacement. Cutting the cable will void the warranty.

G.) Software is warranted only for performance of the functions listed in the software manual and/or the Cardinal proposal.

H.) The software warranty does not cover hardware. Warranties on hardware are provided from the hardware vendor only.

I.) The software warranty does not cover interfacing issues to non-Cardinal supplied hardware.

J.) The software warranty does not include automatic software upgrades unless purchased separately.

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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