



SB550
Remote Display
Installation and Technical Manual

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PRECAUTIONS

Before using this instrument, read this manual and pay special attention to all "WARNING" symbols:



IMPORTANT



**ELECTRICAL
WARNING**



**STATIC
SENSITIVE**

Static Electricity Precaution



CAUTION! This device contains static-sensitive circuit cards and components. Improper handling of these devices or printed circuit cards can result in damage to or destruction of the component or card. Such actual and/or consequential damage **IS NOT** covered under warranty and is the responsibility of the device owner. Electronic components must be handled only by qualified electronic technicians who follow the guidelines listed below.



WARNING! ALWAYS use a properly grounded wrist strap when handling, removing, or installing electronic circuit cards or components. Make certain that the wrist strap ground lead is securely attached to an adequate ground. If you are uncertain of the quality of the ground, you should consult a licensed electrician.



ALWAYS handle printed circuit card assemblies by the outermost edges.

NEVER touch components, component leads, or connectors.

ALWAYS observe warning labels on static protective bags and packaging and never remove the card or component from packaging until ready for use.

ALWAYS store and transport electronic printed circuit cards and components in anti-static protective bags or packaging.

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 designed within the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules 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 are 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. The stock number is 001-000-00315-4.

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Disclaimer

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 the 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 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 in the procedures do so entirely at their own risk.

INTRODUCTION

Thank you for your purchase of our Cardinal SB550 Remote Display. This manual will guide you through the installation, and operation of your display. Please read it thoroughly before attempting to install your display. Also, make certain that you pay attention to the warnings that appear in this manual. Failure to read and follow these instructions and warnings may result in damage to the display and/or bodily injury. Please keep this manual available for future reference.

SPECIFICATIONS

Character Height:	5 inch (12.7 cm)
Display Type:	High-Intensity dual-row LED
Number of Characters:	7-segment, 6 digits with decimal points
Annunciators:	Units (lb, kg) and Mode (G, N)
Ambient Light Levels:	Total darkness to direct sunlight
Display Capacity:	-99,999 to 999,999
Viewing Range:	Up to 250 Feet (76 Meters)
Viewing Angle:	+/- 70 degrees
Data Input:	RS-232, RS-485, 20mA Current Loop
Data Format:	8N1, 7E1, Selectable
Baud Rates:	1200 bps to 115200 bps selectable (NOTE: 20mA Current Loop is limited to 9600 bps)
Enclosure Type:	Painted Mild Steel, Weatherproof IP65-rated
Power Requirements:	115 to 230V AC (50/60 Hz)
Operating Temperature:	-5 to +160 °F (-20 to +70 °C)
Product Dimensions:	30.44 in W x 4.69 in D x 10.5 in H [14.25 in H w/mounting flanges] (77.3 cm W x 11.9 cm D x 26.7 cm H [36.2 cm H w/mounting flanges])

SITE PREPARATION

Electrical Power

The SB550 has been designed to operate from 115 to 230V AC at 50/60 Hz. On installations using 230V AC power, **it is the responsibility of the customer** to have a qualified electrician install the proper power adapter plug that conforms to national electrical codes and local codes and ordinances.

Electrical Noise Interference

To prevent electrical noise interference, make certain all other wall outlets for use with air conditioning and heating equipment, lighting, or other equipment with heavily inductive loads, such as welders, motors, and solenoids are on circuits separate from the display. Many of these disturbances originate within the building itself and can seriously affect the operation of the display. These sources of disturbances must be identified, and steps must be taken to prevent possible adverse effects on the display. Examples of available alternatives include isolation transformers, power regulators, uninterruptible power supplies, or simple line filters.

INSTALLATION

Unpacking

Before beginning the installation of your SB550 Remote Display, make certain it has been received in good condition. Carefully remove the display from the shipping carton and inspect it for any evidence of damage (such as exterior dents or scratches) that may have taken place during shipment. Keep the carton and packing material for return shipment if it should become necessary. **NOTE:** It is the responsibility of the purchaser to file all claims for any damages or loss incurred during transit.

Overview

The SB550 has an ambient light sensor located at the bottom of the enclosure. Also located on the bottom of the enclosure is the Configuration Dip Switch Access Panel, with the gland connectors for the AC Power Cord and Communication Interface Cable. Refer to Figure No. 1.

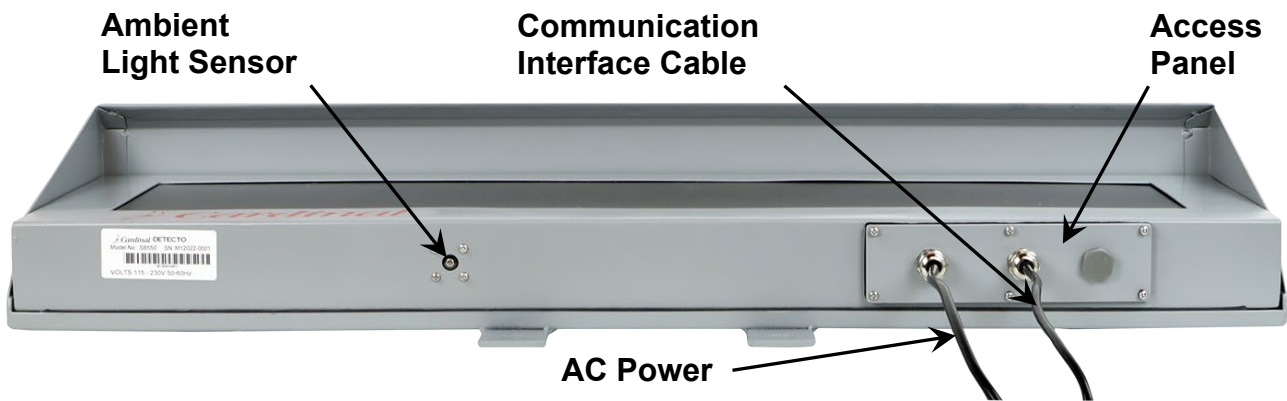


Figure No. 1

Dimensions



Figure No. 2

INSTALLATION, CONT.

Indicator Compatibility

The SB550 remote display can be driven by the following Cardinal weight indicators and by most weight indicators from other manufacturers.

Current Models:

185/185B, 190/190A, 204, 200, 212/212X, and 825
205, 210, 210FE, 212G/212GX, 225 (with USB)

Legacy Models

180, 204S, 215, 220, 777 Series, 778 Series and 788 Series
Non-USB 205, 210, 210FE, 212/212X, 212G/212GX, 225

Indicator Connections

The SB550 remote display is equipped with a 33-foot (10 m) communication interface cable terminated with a DB9 to connect to a Cardinal weight indicator or most weight indicators from other manufacturers. The SB550 remote display can be configured for either RS-232 or RS485 with the baud rate selectable from 1200 to 115.2k, or 20mA Current Loop with the baud rate limited to 9600 bps. Communications input and baud rate are selectable using switches on the SB550 remote display mainboard.

Communication Interface Cable Color Code and Terminal Block Details

RS232 Interface			
Pin	Function	Color	Terminal
2	RXD	Black	CH2
3	TXD	Yellow	CH3
5	GND	Blue	AGND

RS485 Interface			
Pin	Function	Color	Terminal
1	RS485 Receive +	Red	CH1
2	RS485 Receive -	Black	CH2
3	RS485 Transmit +	Yellow	CH3
4	RS485 Transmit -	Green	CH4
5	GND	Blue	AGND

20mA Current Loop (Labeled BT/Wifi)*			
Pin	Function	Color	Terminal
1	CL RX +	Red	CH1
2	CL RX -	Black	CH2

* **NOTE:** 20mA Current Loop is limited to 9600 bps.

INSTALLATION, CONT.

Mounting

The SB550 remote display is normally mounted on a wall or other vertical surface. The remote display is attached to the wall with four (4) bolts. Refer to Figure No. 3 for the mounting hole layout.

First, make sure the mounting surface is strong enough to support the display. Carefully layout the mounting hole locations and then drill and install the anchor bolts. Attach the display to the wall and securely tighten the retaining bolts.



Figure No. 3

Accessing the Configuration Switches

Referring to Figures No. 4 and 5, loosen the gland connector nuts on the AC power cord and communication interface cable, remove the six (6) Philips head screws securing the access panel to the display enclosure, and then lower the Access Panel to expose the configuration dip switches and communications interface type switch on the circuit board inside the display enclosure.



Figure No. 4

Loosen both gland connectors nuts, then remove the access panel screws.



Figure No. 5

Lower the Access Panel to allow access to the configuration switches.

SB550 CONFIGURATION

The SB550 remote display has been pre-configured at the factory and should not require configuration for use in most applications. If the factory settings do not meet the requirements of your application, the following describes the steps to configure the display.

The configuration switches are located on the bottom right side of the enclosure behind an access panel. You may gain access to the switches by loosening the gland connectors for the AC power cord and communication interface cable, removing the six (6) screws securing the panel, and then lowering the access panel on the enclosure. The switches are shown in Figure No. 6. Once you have access to the switches, proceed with the setup instructions.

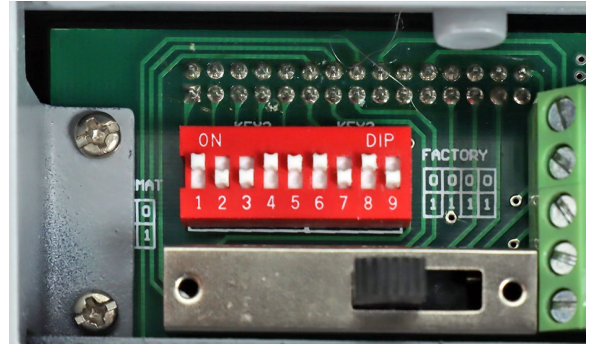


Figure No. 6



IMPORTANT! All configuration changes should be made with the power off!

NOTE: Default switch settings are in Bold.

BAUD RATE SETTING

The Baud Rate setting for the SB550 remote display is set using dip switches 1, 2, and 3. Allowable baud rates are 1200 to 115,200. **NOTE:** 20mA Current Loop is limited to 9600 bps.

SWITCH	1200	2400	4800	9600	19,200	38,400	57,600	115,200
1	ON	ON	ON	ON	OFF	OFF	OFF	OFF
2	ON	ON	OFF	OFF	ON	ON	OFF	OFF
3	ON	OFF	ON	OFF	ON	OFF	ON	OFF

DATA FORMAT SETTING

The Data Format setting for the SB550 remote display is set using dip switches 4 and 5. Allowable data format settings are (8, None, 1), (7, Odd, 1), (7, Even, 1), and (7, Even, 1).

SWITCH	8, NONE, 1	7,Odd, 1	7, Even, 1	7, Even, 1
4	ON	ON	OFF	OFF
5	ON	OFF	ON	OFF

HOST INDICATOR SERIAL FORMAT

The Host Indicator Serial Format setting for the SB550 remote display is set using dip switches 6, 7, 8, and 9.

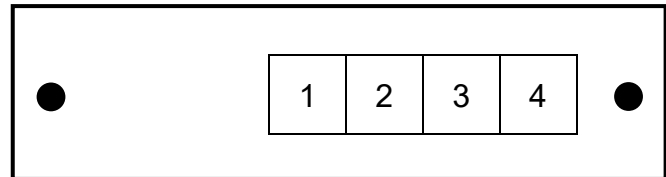
SWITCH	SMA	SB200	SB400 (with Decimal Point)	Rice Lake IQ355	Toledo (Long)	Toledo (Short)
6	ON	ON	ON	ON	OFF	OFF
7	OFF	OFF	OFF	OFF	ON	ON
8	ON	OFF	ON	OFF	OFF	OFF
9	ON	ON	OFF	OFF	OFF	OFF

SB550 CONFIGURATION, CONT.

COMMUNICATION INTERFACE TYPE SWITCH

The Communication Interface Type Switch for the SB550 remote display is a four (4) position switch. It is located near the dip switches between the communication interface cable terminal and the edge of the access opening. The four (4) positions are used to select the available communication interface types. Note that position 3 is not used at this time.

SWITCH POSITION	INTERFACE TYPE
1	RS232
2	RS485
3	not used
4	20mA Current Loop (labeled BT/Wifi)*



Communication Interface Type Switch

* **NOTE:** 20mA Current Loop is limited to 9600 bps.

CONFIGURATION COMPLETE

When the configuration has been completed:

1. Slide the access panel up the cables and remove any excess cable from the enclosure.
2. Securely tighten each of the gland connector nuts.
 - Do not over-tighten the gland connector nuts but make certain they are snug.
 - **DO NOT USE TOOLS!** Finger-tighten only!
3. Place and hold the access panel in position.
4. Secure the panel to the enclosure with the six (6) screws removed earlier.

SB550 20mA CURRENT LOOP CONNECTIONS

CURRENT Cardinal Indicators

200

PORT 1	SB550
P3, 3	Pin 1, CH1, CL RX+
P3, 4	Pin 2, CH2, CL RX-

PORT 2	SB550
P3, 6	Pin 1, CH1, CL RX+
P3, 7	Pin 2, CH2, CL RX-

205, 210, 210FE, 212/212X, 212G/212GX

PORT 0 (ACTIVE)	SB550
P13,2	Pin 1, CH1, CL RX+
P13,6	Pin 2, CH2, CL RX-
JUMPER P13,7 to P13,10	n/c

PORT 1 (ACTIVE)	SB550
P13,2	Pin 1, CH1, CL RX+
P13,8	Pin 2, CH2, CL RX-
JUMPER P13,9 to P13,13	n/c

225

PORT 0 (ACTIVE)	SB550
P20,10	Pin 1, CH1, CL RX+
P20,8	Pin 2, CH2, CL RX-

PORT 1 (ACTIVE)	SB550
P20, 3	Pin 1, CH1, CL RX+
P20, 4	Pin 2, CH2, CL RX-
JUMPER P20, 5 to P20, 8	n/c

PORT 2 (ACTIVE)	SB550
P16, 1	Pin 1, CH1, CL RX+
P16, 2	Pin 2, CH2, CL RX-
JUMPER P16, 3 to P16, 9	n/c

825

PORT 2 (ACTIVE)	SB550
P21, 2	Pin 1, CH1, CL RX+
P21, 5	Pin 2, CH2, CL RX-
J3 INSTALLED J7 SHUNT:20mA	n/c

SB550 20mA CURRENT LOOP CONNECTIONS, CONT.

LEGACY Cardinal Indicators

205, 210, 210FE, 212/212X, 212G/212GX (without USB), and 215

PORT 1	SB550
P11, 3	Pin 1, CH1, CL RX+
P11, 4	Pin 2, CH2, CL RX-

PORT 2	SB550
P11, 6	Pin 1, CH1, CL RX+
P11, 7	Pin 2, CH2, CL RX-

220

220 PORT 1 (ACTIVE)	SB550
P10, 1	Pin 1, CH1, CL RX+
P10, 2	Pin 2, CH2, CL RX-
JUMPER P10, 3 to P10, 10	n/c

220 PORT 2	SB550
P10, 11	Pin 1, CH1, CL RX+
P10, 10	Pin 2, CH2, CL RX-

225 (without USB)

PORT 1 (ACTIVE)	SB550
P14, 3	Pin 1, CH1, CL RX+
P14, 4	Pin 2, CH2, CL RX-
JUMPER P14, 5 to P14, 8	n/c

PORT 2 (ACTIVE)	SB550
P18, 1	Pin 1, CH1, CL RX+
P18, 2	Pin 2, CH2, CL RX-
JUMPER P18, 3 to P18, 9	n/c

PORT 3 (ACTIVE)	SB550
P18, 12	Pin 1, CH1, CL RX+
P18, 13	Pin 2, CH2, CL RX-

778C

778C (ACTIVE)	SB550
COMA, 10	Pin 1, CH1, CL RX+
COMA, 11	Pin 2, CH2, CL RX-
JUMPER COMA, 23 to COMA, 24	n/c

SERIAL DATA FORMAT DETAILS

SMA

If the Host Indicator Serial Format is set to SMA, the transmitted data should be in the following format:

```
<LF><sp><sp><M><sp><sp><sp><wwwwwwUU><sp><CR>
```

Where:

LF =	Line Feed	(hex 0a)
sp =	Space	(hex 20)
M =	Mode	G = Gross, N = Net
wwwwww =	Weight	Six digits ("- " and Five digits if negative weight)
UU =	Units	lb, kg
CR =	Carriage Return	(hex 0d)

SB-200

If the Host Indicator Serial Format is set to SB-200, the transmitted data should be in the following format:

```
<CR><sp><sp><wwwwww><sp><UUM><ETX>
```

Where:

CR =	Carriage Return	(hex 0d)
sp =	Space	(hex 20)
wwwwww =	Weight	Six digits
UU =	Units	lb, kg
M =	Mode	G = Gross, N = Net
ETX =	End of Text	(hex 03)

SB-400

If the Host Indicator Serial Format is set to SB-400, the transmitted data should be in the following format:

```
<sp><www.wwwUUUM><sp><sp><CR>
```

Where:

sp =	Space	(hex 20)
www.www =	Weight	Six digits with decimal point
UU =	Units	lb, kg
M =	Mode	G = Gross, N = Net
CR =	Carriage Return	(hex 0d)

SERIAL DATA FORMAT DETAILS, CONT.

Rice Lake IQ355

If the Host Indicator Serial Format is set to Rice Lake IQ355, the transmitted data should be in the following format:

```
<STX><sp><sp><wwwwwwUM><sp><CR><LF>
```

Where:

STX =	Start of TeXt	(hex 02)
wwwwwww =	Weight	Seven digits
U =	Units	L = lb, K = kg
M =	Mode	G = Gross, N = Net
CR =	Carriage Return	(hex 0d)
LF =	Line Feed	(hex 0a)

Toledo Long

If the Host Indicator Serial Format is set to Toledo Long, the transmitted data should be in the following format:

```
<stx><swa><swb><swc>xxxxxyyyyyy<cr><sum>
```

Where:

stx =	Start of TeXt (hex 02)
swa =, swb=, swc=	Status Bytes
xxxxxx=	Displayed Weight, Gross, or Net Weight (Six Digits)
yyyyyy=	Tare Weight (Six Digits)
cr =	Carriage Return (hex 0D)
sum=	Checksum Character

Toledo Short

If the Host Indicator Serial Format is set to Toledo Short, the transmitted data should be in the following format:

```
<stx><swa><swb><swc>xxxxxx<cr><sum>
```

Where:

stx =	Start of TeXt (hex 02)
swa =, swb=, swc=	Status Bytes
xxxxxx=	Displayed Weight, Gross, or Net Weight (Six Digits)
cr =	Carriage Return (hex 0D)
sum=	Checksum Character

TROUBLESHOOTING

The SB550 Remote Display is equipped with software that tests various portions of its circuitry and verifies proper operation when powered ON. Should a problem be detected, a message will be displayed. The following lists the messages displayed and their meaning:

SYMPTOM	POSSIBLE CAUSE	SOLUTIONS
Display does not light	<ul style="list-style-type: none"> • Blown fuse • Damaged AC power adapter 	<ul style="list-style-type: none"> • Replace fuse • Replace the AC power adapter
Display is dark	<ul style="list-style-type: none"> • Low voltage 	<ul style="list-style-type: none"> • Check the input voltage
<i>Err01</i> (no communication)	<ul style="list-style-type: none"> • Indicator data format differs from the host • The communication cable is not connected correctly 	<ul style="list-style-type: none"> • Check data format setup • Check cable connection
<i>Err02</i> (incorrect data format received)	<ul style="list-style-type: none"> • Format switches are not set correctly • The host is not set correctly • Unknown data format or incorrect data format selected on host indicator 	<ul style="list-style-type: none"> • Refer to the SB550 Configuration section to verify the Host Indicator Serial Format is set correctly
- - - - -	<p>Over Range (upper dashes)</p> <ul style="list-style-type: none"> • This message indicates the weight on the scale exceeds the SB550 display capacity. 	<ul style="list-style-type: none"> • Remove the weight from the scale. • Ensure the scale is at zero. • If the problem persists, contact your scale service company.
- - - - -	<p>Below Range (lower dashes)</p> <ul style="list-style-type: none"> • On some indicators, the serial output will stop when displaying an error code or if in an "input" mode. 	<ul style="list-style-type: none"> • Correct the error condition on the indicator. • Cancel or complete the input operation on the indicator.

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 WORKMANSHIP	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)	LIFE	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
PSC and LSC SCALE STRUCTURES (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
IN-MOTION 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



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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 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.



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