North American Service Manual

MODEL PC SERIES

Revision B1.1 April 4, 2000

Prepared by
TRANSCELL TECHNOLOGY, INC.

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CHAPTER 1: INTRODUCTION

Service and maintenance personnel who desire more technical information than is presented in the PC Series User's Guide should use this manual. Any component level troubleshooting or board replacement should be done by factory authorized personnel only.

The PC Series has three ranges of weight capacities. The PC-30 is a 30 lb (15 kg) scale, the PC-70 is a 70 lb (30 kg) and the PC-150 is a 150 lb (70 kg) scale.

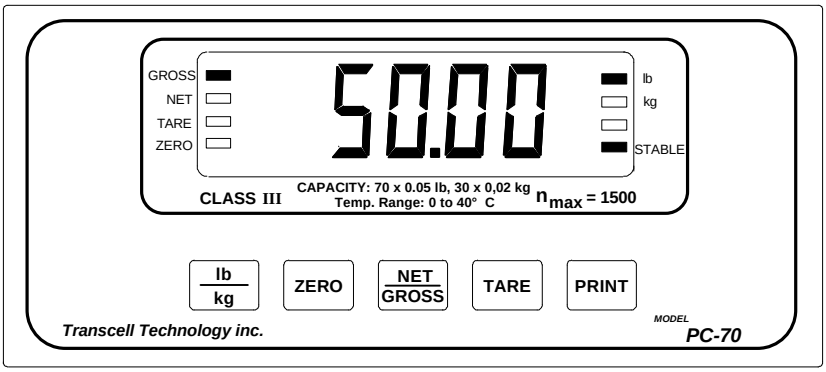


FIGURE 1-1: PC Series Front Panel

CHAPTER 2: LEGAL FOR TRADE SEALING

2.1 OVERVIEW

The scale can be prepared for commercial use by sealing access to the calibration switch, to meet the requirements for a legal-for-trade scale.

2.1.1 SEALING THE SCALE

Once calibration has been successfully completed, then the scale can be sealed as follows:

1. Referring to Figure 2-1, locate the calibration switch on the back of the scale.

2. Replace the calibration switch cover by securing with the two drilled head screws.

3. Thread a wire security seal through the openings in both drilled head screws. This prevents access to the calibration switch. Refer to Figure 2-2 for more detail.

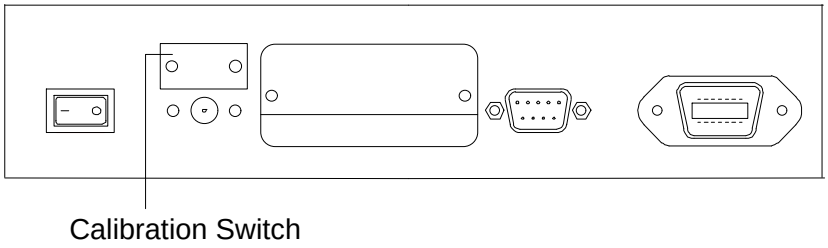


Figure 2-1: Location of Calibration Switch

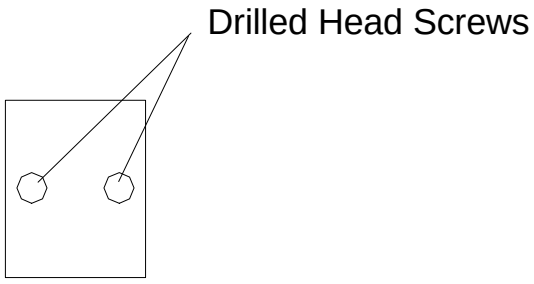
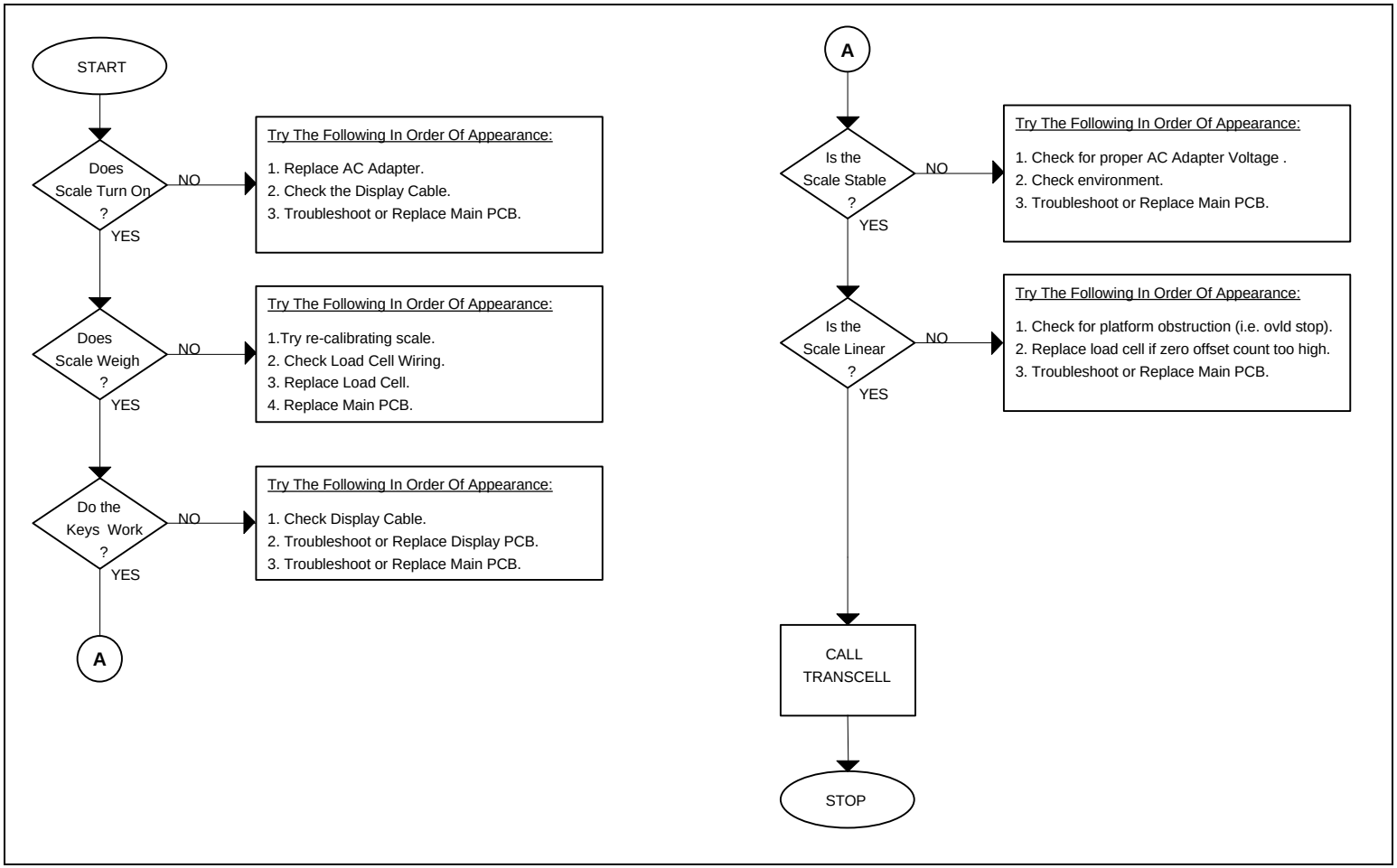


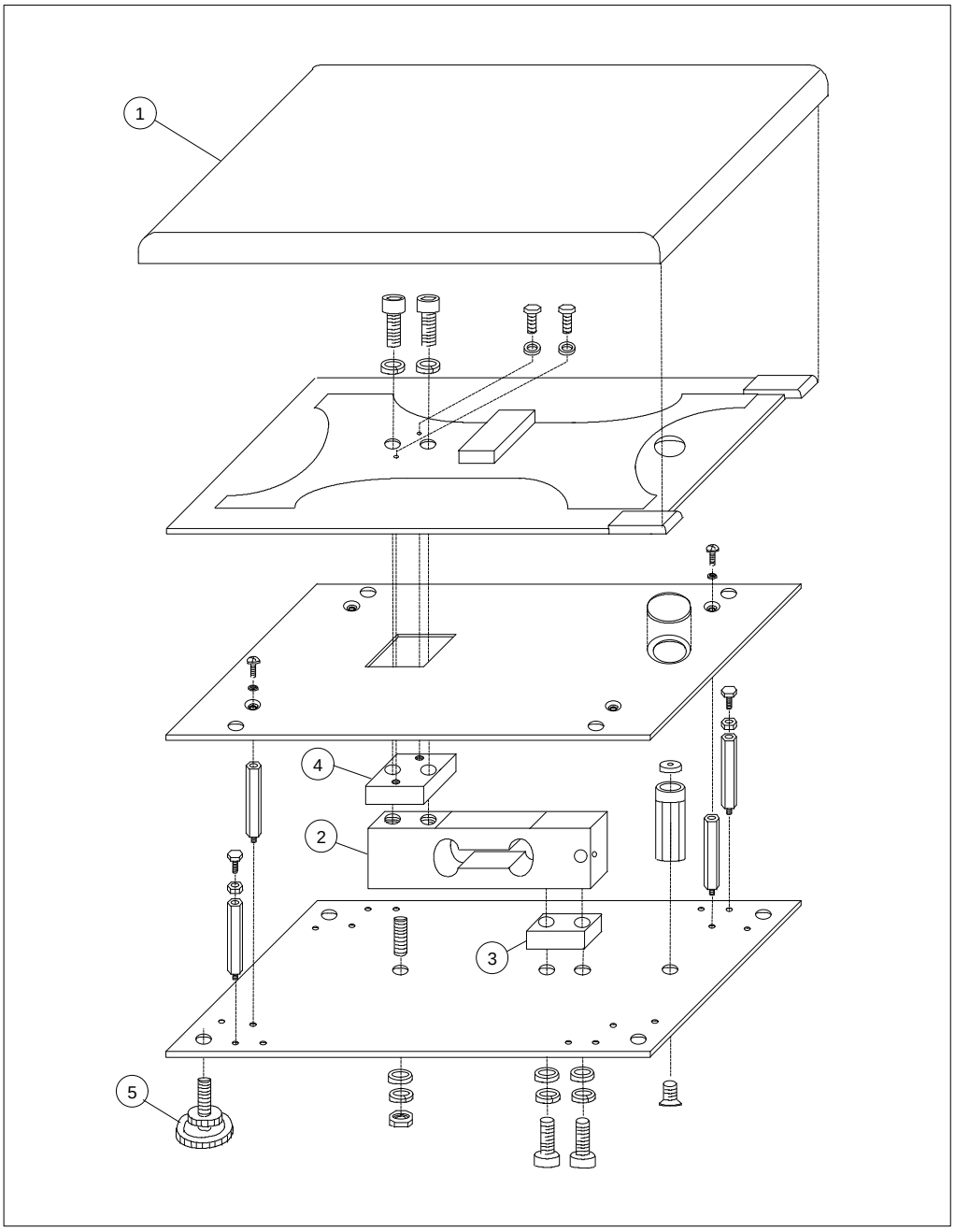
Figure 2-2: Detail of Calibration Switch Cover Plate with Drilled Head Screws

CHAPTER 3: GENERAL TROUBLSHOOTING FLOWCHART

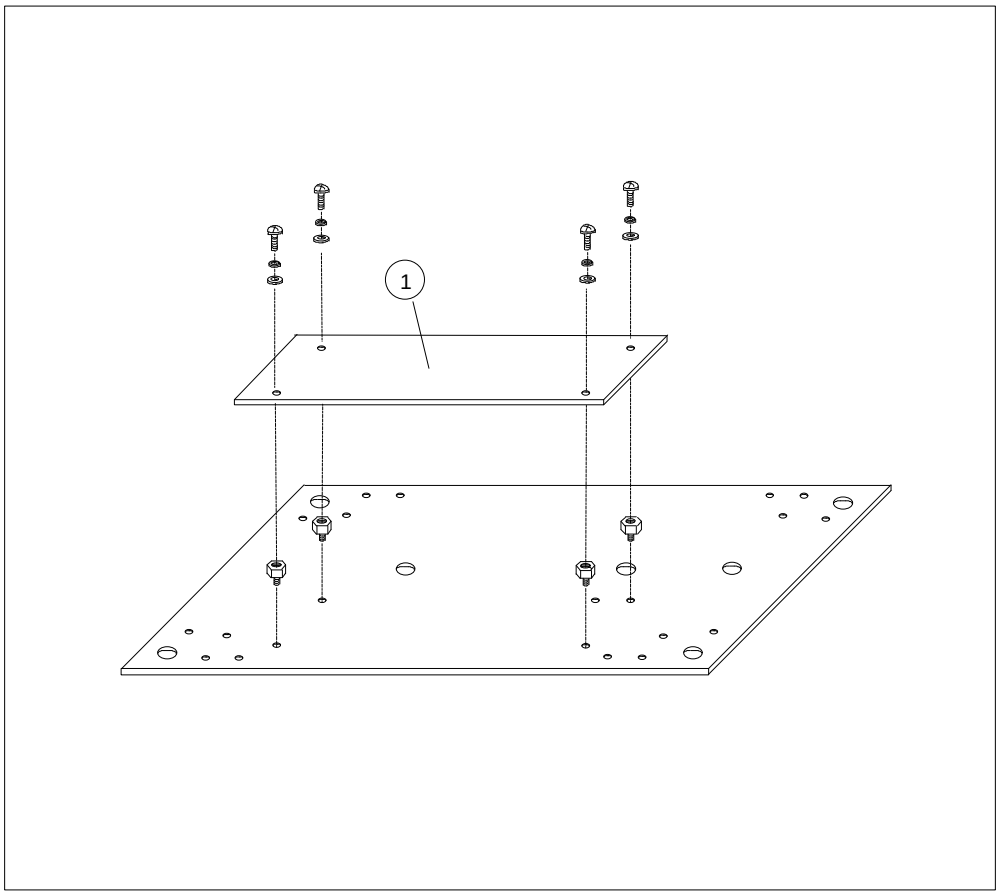


CHAPTER 4: ILLUSTRATED PARTS LIST

4.1 PC-30 AND PC-70

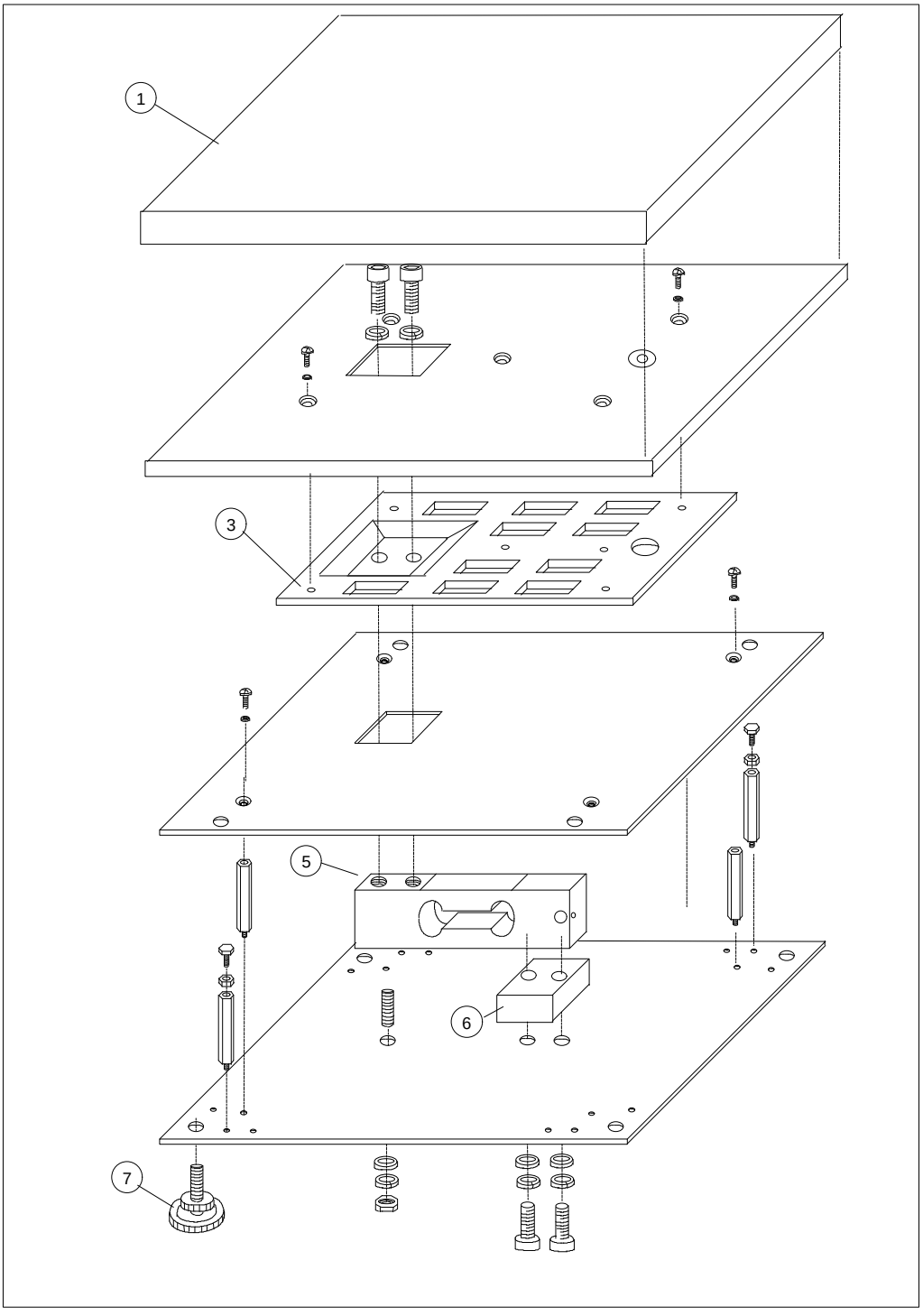


ITEM	QTY	PART NO.	DESCRIPTION
1	1	380190008	Stainless Steel Platform
2	1	211040020	Load Cell – FAD-20 (PC-30)
2	1	211040045	Load Cell – FAD-45 (PC-70)
3	1	380190036	Bottom Spacer - Aluminum
4	1	380190037	Top Spacer - Aluminum
5	4	380190013	Adjustable Foot
–	1	250116237	AC Adapter – 12 VDC, 500 mA



ITEM	QTY	PART NO.	DESCRIPTION
1	1	215193811	Main Board Assy
–	1	215366100	Display/Key Board Assy

4.2 PC-150



ITEM	QTY	PART NO.	DESCRIPTION
1	1	380190008	Stainless Steel Platform
3	1	380360001	Top Spacer - Aluminum
5	1	211040100	Load Cell – FAD-100
6	1	380360007	Bottom Spacer - Aluminum
7	4	380190013	Adjustable Foot
–	1	250116237	AC Adapter – 12 VDC, 500 mA

CHAPTER 5: ASSEMBLY / DISASSEMBLY

5.1 PC-30 and PC-70

Tools Required: 5 mm Allen Wrench
Phillips Head Screwdriver

1. Remove the scale platter (1) and set aside.
2. Using the 5 mm Allen wrench, remove the [2] load cell mounting bolts (2).
3. Lift off the sub-platform assembly (3), and set aside.
4. Remove the [4] mounting screws (5) for the splash plate (4) and set aside.
5. Lift off the splash plate and set aside.

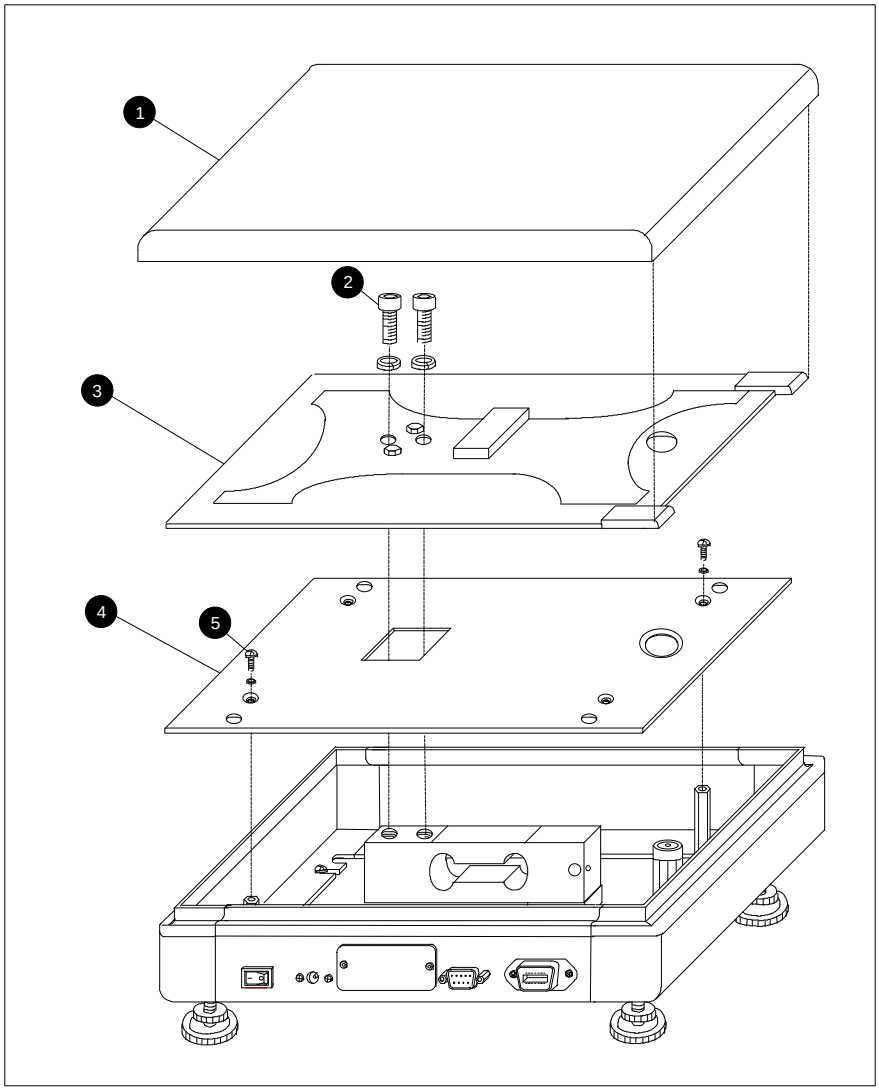


Figure 5-1: Opening up the PC-30 and PC-70 Base Unit

5.2 PC-150

Tools Required: 5 mm Allen Wrench
Phillips Head Screwdriver

1. Remove the scale platter (1) and set aside.
2. Using the 5 mm Allen wrench, remove the [2] load cell mounting bolts (2).
3. Lift off the sub-platform assembly and aluminum spacer (3), and set aside.
4. Remove the [4] mounting screws (5) for the splash plate (4) and set aside.
5. Lift off the splash plate and set aside.

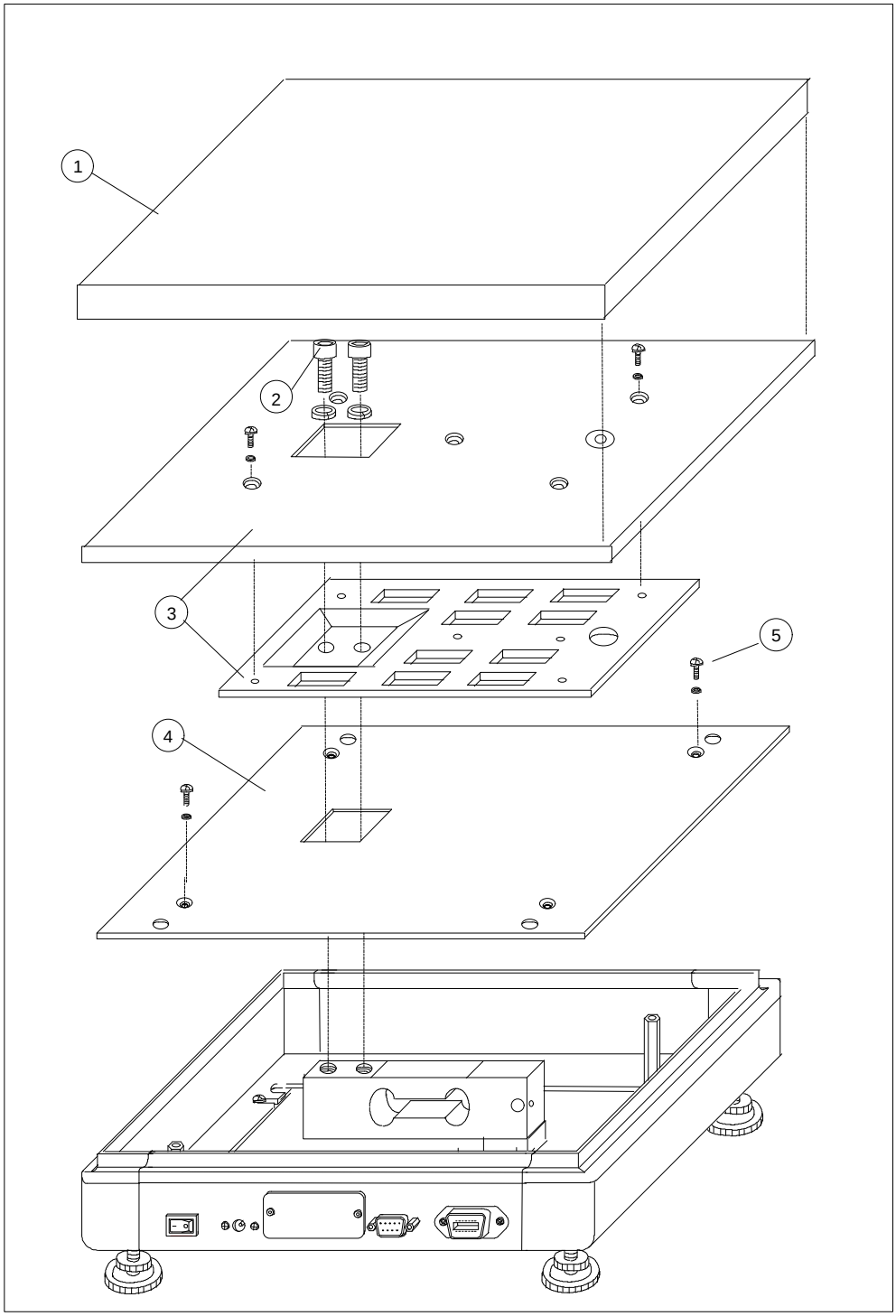


Figure 5-2: Opening up the PC-150 Base Unit

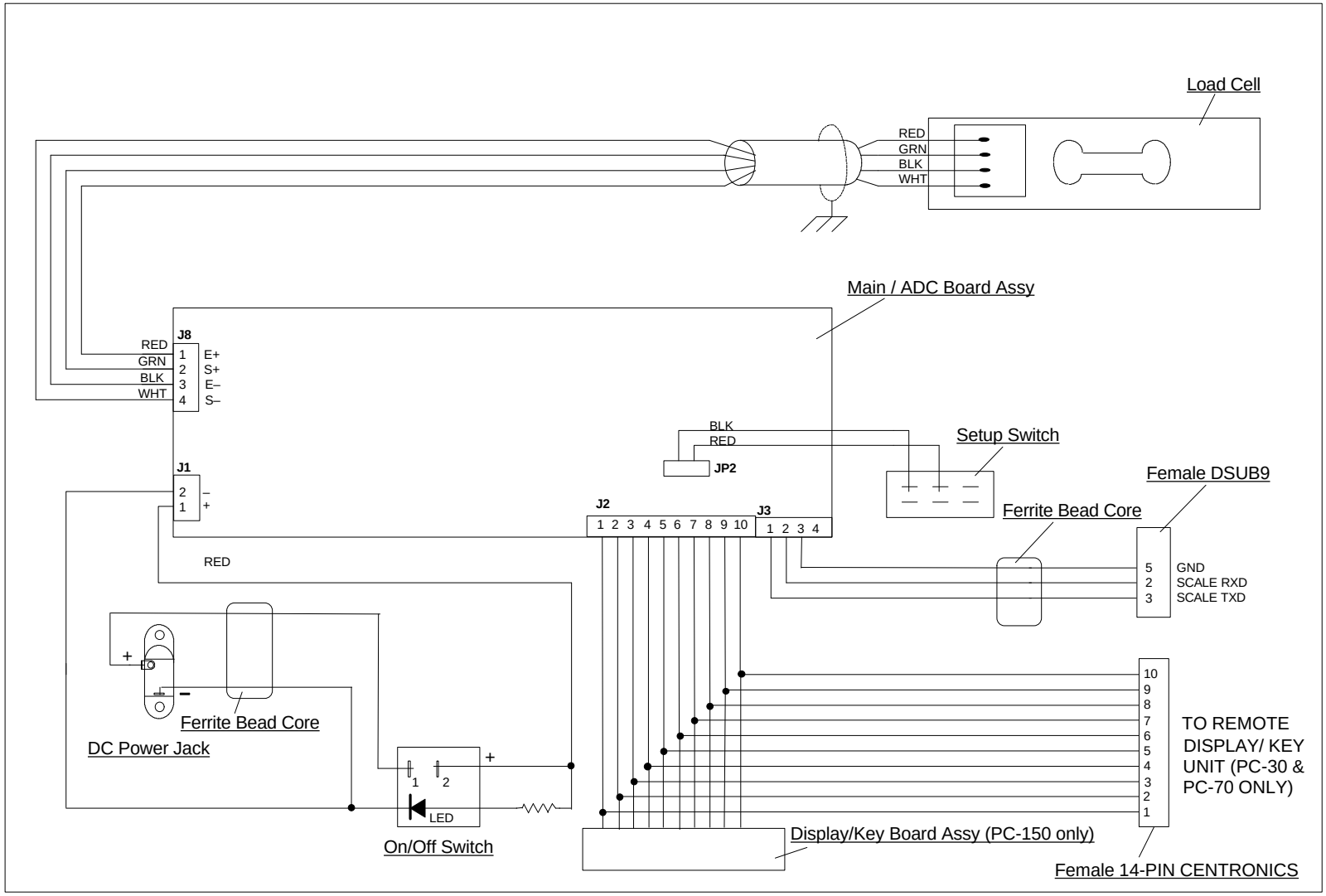


Figure 6-1: PC Series Chassis Wiring Diagram

CHAPTER 7: THEORY OF OPERATION

7.1 THEORY OF OPERATION OVERVIEW

Refer to Appendix C for reference designators.

7.1.1 MAIN / ADC BOARD ASSEMBLY

Power to the scale is supplied by a 12 VDC, 500 mA adapter. Regulator U1 supplies +5 VDC to the digital components. Regulator U8 supplies + 10 VDC to the analog components including load cell excitation. Switching regulator V5 inverts the + 10 VDC to – 10 VDC to act as the negative supply rail. Regulators V4 and V6 further regulate to ± 8 VDC for the A/D converter IC, U9.

Op-amp U11 forms a high impedance bridge amplifier for the load cell with a fixed gain of 100. Op-amp U10:B forms a low pass filter to prevent unwanted noise from entering the circuit. The other half of U10 (U10:A) provides a buffered reference voltage for op-amp U11. The A/D converter, U1, is a dual slope type converter. Timing is controlled by the microcontroller.

Microcontroller U2 executes several functions including A/D fetch, digital signal conditioning, key scan, serial communication, and display output. EEPROM U5 contains calibration data as well as the setup parameters. IC U7 is the EPROM, which contains program memory. The network around U4 boosts the MCU's UART signal to RS-232 level for serial communication with a host device.

7.1.2 DISPLAY/KEY BOARD ASSEMBLY

This circuit contains footprints for 5 keys, display driver (U4) and the LED Display (U1-U3).

APPENDIX A: TECHNICAL SPECIFICATIONS

ANALOG SPECIFICATIONS

Full Scale Input Signal	16 mV, including dead load
Internal Resolution	Approximately 150,000 counts
Displayed Resolution	Up to 3,500 graduations max
Measurement Rate	10 Meas/sec, nominal
System Linearity	Within 0.02% of FS
Calibration Method	Software Calibration, with long term storage in EEPROM
Excitation Voltage	+10 VDC
RFI Protection	Signal lines protected by LC Low Pass Filters Excitation & Power lines protected by EMI Chokes

DIGITAL SPECIFICATIONS

Microcontroller	Intel 80C32	
	Program Memory:	32K x 8, external to µC
	EEPROM:	64 x 16, external to µC

SERIAL COMMUNICATIONS

RS-232	Full Duplex, Selectable Baud, Data Bits and Parity

OPERATOR INTERFACE

Display	6-Digit, 0.56” 7-segment LED Display
Keyboard	5-key Tactile Keypad

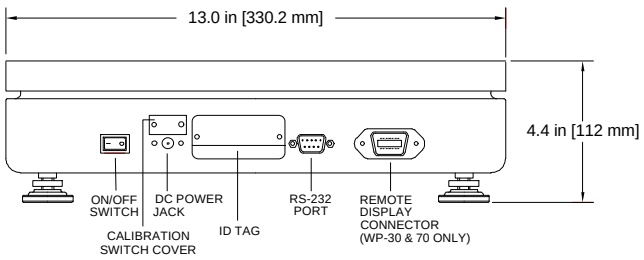
POWER

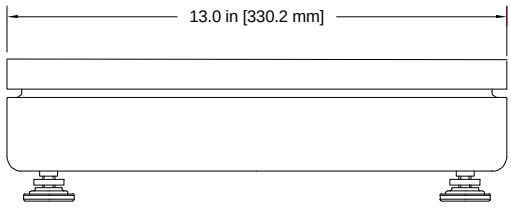
AC Adapter	12 VDC, 500mA

ENVIRONMENTAL

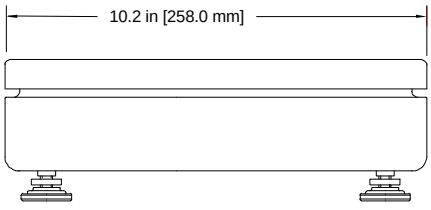
Operating Temperature	41°F (0°C) to 95°F (40° C)
Storage Temperature	-4°F (-20°C) to 167°F (+75°C)
Operating RH	20% to 95%, non-condensing
Storage RH	20% to 98%

PHYSICAL DIMENSIONS:





PC-150 Only



PC-30/70

APPENDIX B: SERIAL DATA FORMATS INFORMATION

B.1 SERIAL DATA FORMATS

B.1.1 SERIAL DATA FORMATS OVERVIEW

The COM1 serial port is a full duplex RS-232 port designed for connection to a serial printer, computer, or remote display. Consult the PC Series Operation Manual for information on pinouts and cable diagrams.

Through the User Menu, you may choose one of the available SDF's (Serial Data Formats). These serial data formats emulate certain makes of scales and make up the Application Layer. From a Data Link Layer perspective, there are two types: Demand and Continuous. Some SDF's can be used with both types but most can be used with only one type.

For Demand types, the scale acts as the client and requires a host (usually a PC). The host issues a command (typically a single ASCII character) and the scale responds with a weigh data record, a status record or no record depending on the specific SDF chosen.

NOTE: Use Demand types for interfacing to a serial printer. In this case, data output can be initiated by pressing the PRINT key on the front panel of the scale. (Host is not required).

For Continuous types, host control is not required – but not restricted either. In this type, the scale automatically transmits a weigh data / status record out of the serial port at the end of each display update. Continuous types are used to interface to computers, scoreboards, and other remote devices requiring constant data updating. Host commands, although not required, are accepted and acted upon.

B.1.2 CONSOLIDATED CONTROLS DEMAND FORMAT

Figure B-1 shows the weigh data record sent to the host when the scale receives a Print ("P") command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel. If the weigh data is invalid, the scale does not respond. See section below for more information.

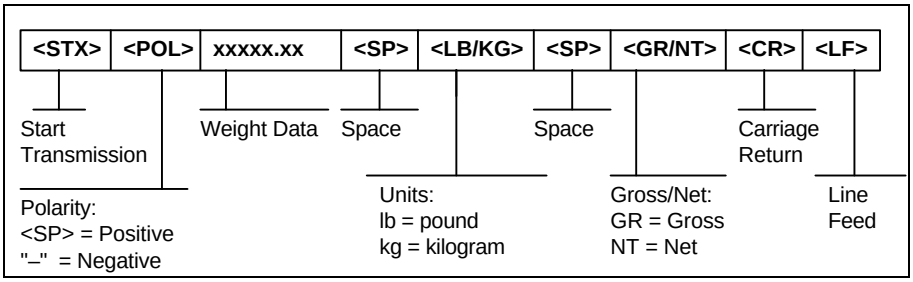


FIGURE B-1. Consolidated Controls "Demand" Weigh Data Record

B.1.2.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and are single ASCII characters.

"P" - This command is sent to the scale to print the indicated display. The scale will not respond if the scale is in motion, positive overload or negative overload.

“Z” - This command is sent to the scale to zero the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or within the zero reset range. Even if successful, the host receives no response from the scale. The host must issue a “P” command to determine if the command was processed by the scale.

“T” - This command is sent to the scale to tare the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it displaying a negative gross value. Even if successful, the host receives no response from the scale. The host must issue a “P” command to determine if the command was processed by the scale.

“G” - This command is sent to the scale to revert to gross mode. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in net mode. Even if successful, the host receives no response from the scale. The host must issue a “P” command to determine if the command was processed by the scale.

“N” - This command is sent to the scale to revert to net. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or a tare has yet to be established. Even if successful, the host receives no response from the scale. The host must issue a “P” command to determine if the command was processed by the scale.

“C” - This command is sent to the scale to toggle among the configured units. Even if successful, the host receives no response from the scale. The host must issue a “P” command to determine if the command was processed by the scale.

B.1.3 CONSOLIDATED CONTROLS CONTINUOUS FORMAT

Figure B-2 shows the weigh data / status record automatically transmitted by the scale at the end of each display update. The same host commands listed in Section B.1.2.1 are accepted and acted upon by the scale.

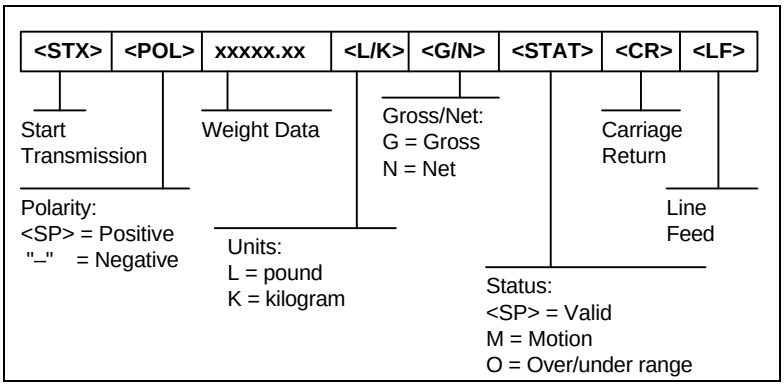


FIGURE B-2. Consolidated Controls “Continuous” Weigh Data / Status Record

B.1.4 TOLEDO 8213 DEMAND FORMAT

Figure B-3 shows the weigh data record sent to the host when the scale receives a Print ("W") command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel. If the weigh data is invalid, the scale responds with a status record instead – as shown in Figure B-4. See section below for more information.

NOTE: Since this SDF (Serial Data Format) does not support units of measure. It is recommended that lb/kg conversion be disabled.

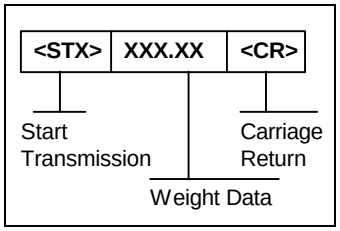


FIGURE B-3. Toledo 8213 "Demand" Weigh Data Record

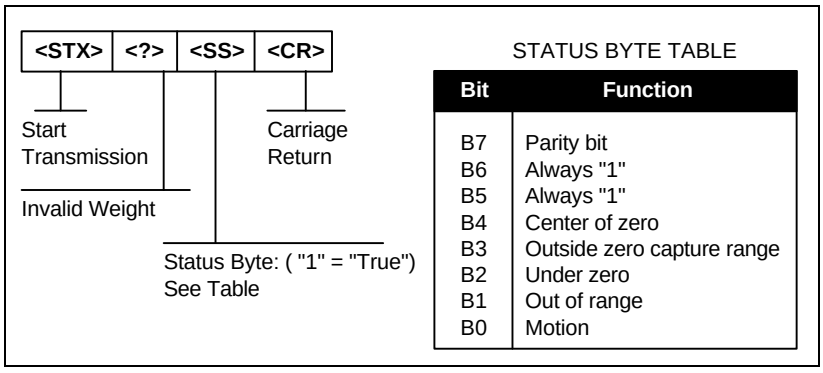


FIGURE B-4. Toledo 8213 "Demand" Status Record

B.1.4.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and are single ASCII characters.

"W" - This command is sent to the scale to print the indicated display. The scale will respond with the status record if the weight is less than zero or the scale is in motion, positive overload or negative overload. Otherwise, the scale responds with the weigh data record.

"H" – Same as the "W" command except that the scale outputs an extra character at the beginning and end of the weigh data record.

"Z" - This command is sent to the scale to zero the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or within the zero reset range. Whether the command was successful or not, the scale sends a status record to the host.

"A" - This command is sent to the scale to request an acknowledgement. This acknowledgement consists of two characters: <STX> and <CR>.

B.1.5 NCI 3800 / TRINER DEMAND FORMAT

Figure B-5 shows the weigh data record sent to the host when the scale receives a Print ("W"<CR>) command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel. The status record is shown in Figure B-6. If an invalid host command is received, the scale responds with the invalid command record shown in Figure B-7. See section below for more information.

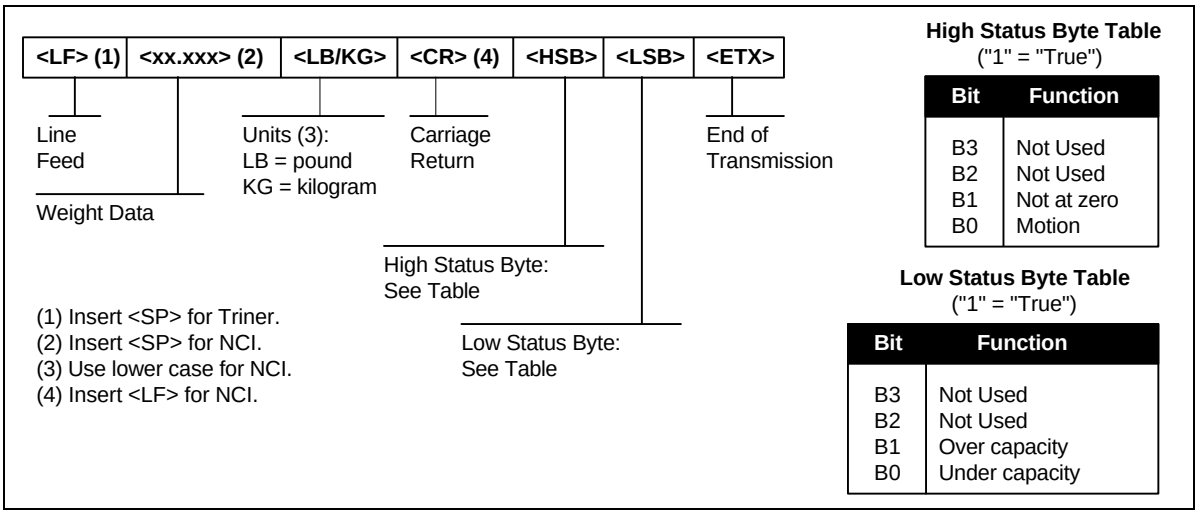


FIGURE B-5. NCI 3800 / Triner "Demand" Weigh Data Record

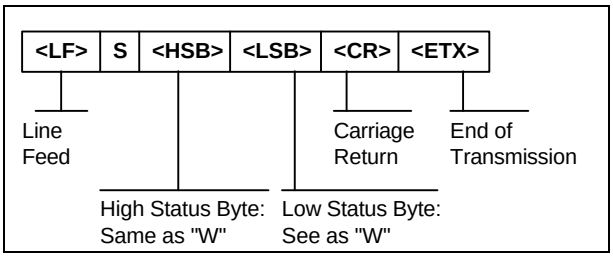


FIGURE B-6. NCI 3800 / Triner "Demand" Status Record

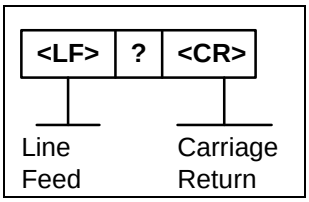


FIGURE B-7. NCI 3800 / Triner "Demand" Invalid Command Record

B.1.5.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and consist of two ASCII characters.

"W"<CR> - This command is sent to the scale to print the indicated display. The host should check the status bytes to determine if the scale is in motion, positive overload or negative overload.

"Z"<CR> - This command is sent to the scale to zero the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or within the zero reset range. Even if successful, the host receives no response from the scale. The host must issue an "S"<CR> command to determine if the command was processed by the scale.

"S"<CR> - This command is sent to the scale to request the status record.

B.1.6 TRANSCELL TECHNOLOGY DEMAND FORMAT

Figure B-8 shows the weigh data record sent to the host when the scale receives a Print ("P") command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel. If the weigh data is invalid, the scale sends the status record shown in Figure B-9. See section below for more information.

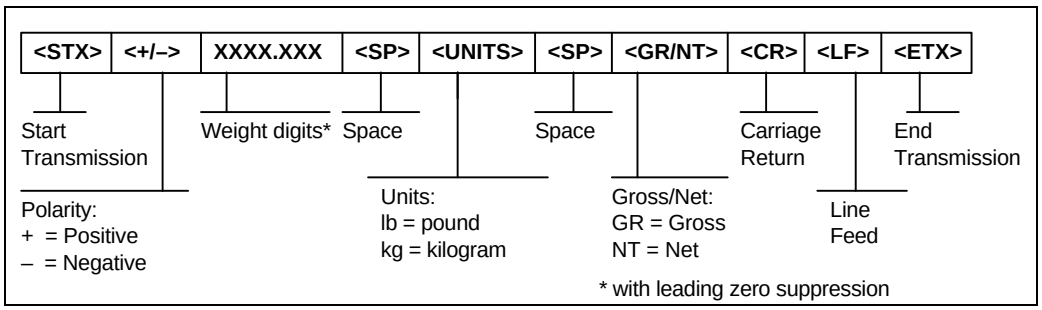


FIGURE B-8. Transcell Technology "Demand" Weigh Data Record

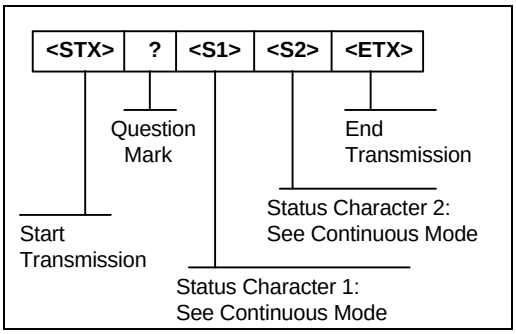


FIGURE B-9. Transcell Technology "Demand" Status Record

B.1.6.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and are single ASCII characters.

"P" - This command is sent to the scale to print the indicated display. The scale will respond with the status record instead if the scale is in motion, positive overload or negative overload.

"Z" - This command is sent to the scale to zero the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or within the zero reset range. Even if successful, the host receives no response from the scale. The host must issue a "P" command to determine if the command was processed by the scale.

"T" - This command is sent to the scale to tare the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it displaying a negative gross value. Even if successful, the host receives no response from the scale. The host must issue a "P" command to determine if the command was processed by the scale.

"G" - This command is sent to the scale to revert to gross mode. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in net mode. Even if successful, the host receives no response from the scale. The host must issue a "P" command to determine if the command was processed by the scale.

"N" - This command is sent to the scale to revert to net. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or a tare has yet to be established. Even if successful, the host receives no response from the scale. The host must issue a "P" command to determine if the command was processed by the scale.

"C" - This command is sent to the scale to toggle among the configured units. Even if successful, the host receives no response from the scale. The host must issue a "P" command to determine if the command was processed by the scale.

B.1.7 TRANSCELL TECHNOLOGY CONTINUOUS FORMAT

Figure B-10 shows the weigh data / status record automatically transmitted by the scale at the end of each display update. The same host commands listed in Section B.1.6.1 are accepted and acted upon by the scale.

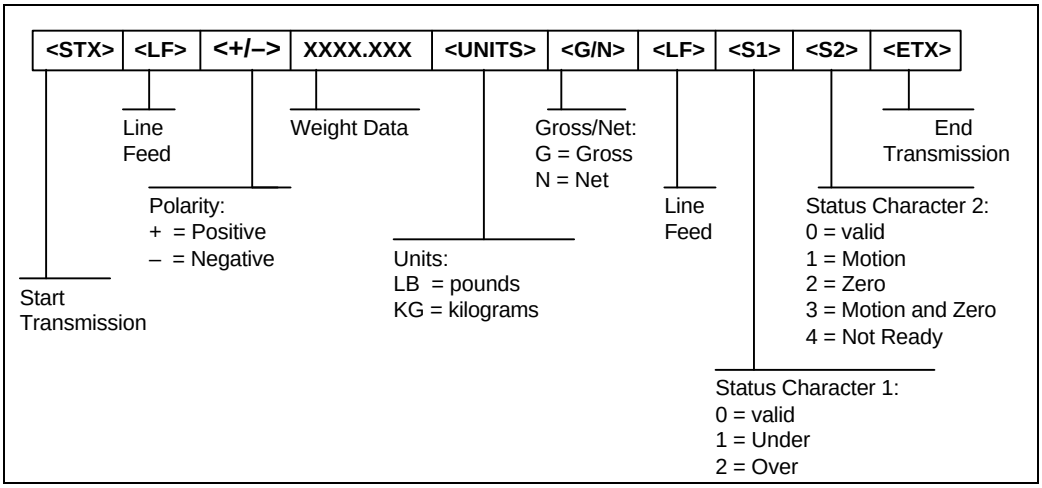


FIGURE B-10. Transcell Technology "Continuous" Weigh Data / Status Record

B.1.8 DETECTO DEMAND / CONTINUOUS FORMAT

The Detecto SDF (Serial Data Format) can work both as a Demand type and a Continuous type, depending on the commands received from the host. Upon power up, the scale defaults to Demand type. The scale disregards the type setting programmed for Mode of Serial Transmission.

Figure B-11 shows the weigh data / status record sent to the host when the scale receives a Print ("~") command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel. The output records are identical when operating as a Demand type or a Continuous type.

NOTE: Since this SDF (Serial Data Format) does not support units of measure. It is recommended that lb/kg conversion be disabled.

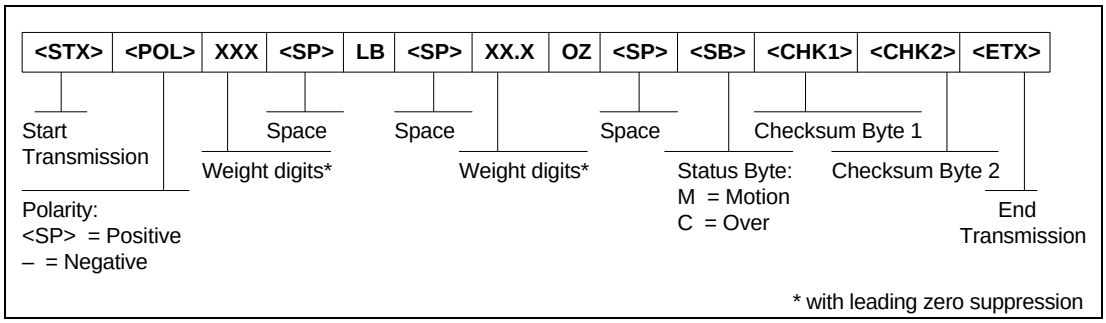


FIGURE B-11. Detecto Weigh Data / Status Record

B.1.8.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and are single ASCII characters.

"~" - This command is sent to the scale to print the indicated display. The host should check the status bytes to determine if the scale is in motion, positive overload or negative overload.

"<SO>" - This command is sent to the scale to change the scale to Continuous type. Even if successful, the host receives no response from the scale.

"<SI>" - This command is sent to the scale to change the scale to Demand type. Even if successful, the host receives no response from the scale.

NOTE: You can execute the <SO> and <SI> host commands by hitting Ctrl-N for <SO> and Ctrl-O for <SI> on your computer's keyboard.

B.1.9 FAIRBANKS 70-2453-4 DEMAND FORMAT

Figure B-12 shows the weigh data / status record sent to the host when the scale receives a Print (<CR>) command. The same weigh data record is sent out of the serial port if the PRINT key is pressed on the scale's front panel.

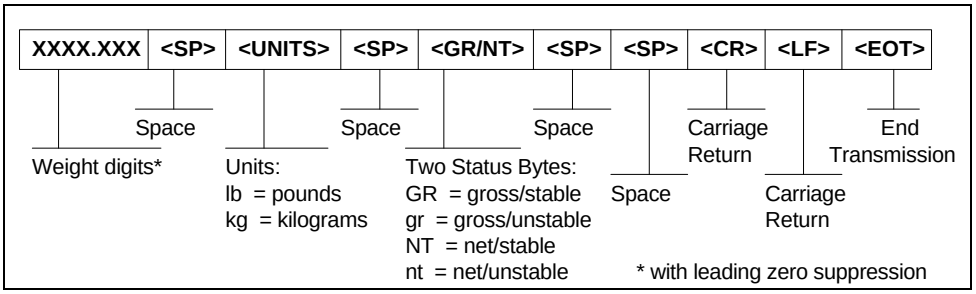


FIGURE B-12. Fairbanks "Demand" Weigh Data / Status Record

B.1.9.1 RECOGNIZED HOST COMMANDS

These commands are issued from the host to the scale and are single ASCII characters.

"<CR>" - This command is sent to the scale to print the indicated display. The scale will not respond if the scale is in positive overload. The host should check the status bytes to determine if the scale is in motion.

"Z" - This command is sent to the scale to zero the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or within the zero reset range. Even if successful, the host receives no response from the scale. The host must issue a <CR> command to determine if the command was processed by the scale.

"T" - This command is sent to the scale to tare the scale. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it displaying a negative gross value. Even if successful, the host receives no response from the scale. The host must issue a <CR> command to determine if the command was processed by the scale.

"G" - This command is sent to the scale to revert to gross mode. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in net mode. Even if successful, the host receives no response from the scale. The host must issue a <CR> command to determine if the command was processed by the scale.

"N" - This command is sent to the scale to revert to net. The scale will disregard this command if the scale is in motion, positive overload or negative overload. The scale will also disregard this command if it is not in gross mode or a tare has yet to be established. Even if successful, the host receives no response from the scale. The host must issue a <CR> command to determine if the command was processed by the scale.

“C” - This command is sent to the scale to toggle among the configured units. Even if successful, the host receives no response from the scale. The host must issue a <CR> command to determine if the command was processed by the scale.

APPENDIX C: CIRCUIT DIAGRAMS

Please see attached schematic diagram sheets.