

# IQ plus® 510

*Digital Weight Indicator*  
Version 2.1

## Installation Manual





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# About This Manual

This manual is intended for use by service technicians responsible for installing and servicing IQ plus® 510 digital weight indicators.

This manual applies to indicators using Version 2.1 of the IQ plus 510 software. See Section 7.10 on page 53 for a summary of software changes included in this release.

Configuration and calibration of the indicator can be accomplished using the indicator front panel keys, the EDP command set, or the Version 2.5 or later Revolution™ configuration utility. See Section 3.1 on page 13 for information about configuration methods.

## 1.0 Introduction

The IQ plus 510 is a single-channel digital weight indicator housed in a NEMA 4X/IP66-rated stainless steel enclosure. The indicator front panel consists of a five-button keypad with a large, seven-digit, 14-segment, vacuum fluorescent display, two-character dot-matrix annunciator field, and a sixteen-character dot-matrix prompt field. Features include:

- Drives up to eight 350Ω or sixteen 700Ω load cells
- Supports 4- and 6-wire load cell connections
- Eight configurable digital inputs
- Electronic data processing (EDP) port for full duplex RS-232 or RS-485 communications at up to 19200 bps
- Printer port for full duplex RS-232 and output-only 20 mA current loop communications at up to 19200 bps
- Optional analog output module provides 0–10 VDC or 4–20 mA tracking of gross or net weight values
- Optional Remote I/O Interface for communication with PLC™ and SLC™ controllers using the Allen-Bradley® Remote I/O networks<sup>1</sup>
- Optional interface for Profibus® DP network communications<sup>2</sup>
- Available in 115 VAC and 230 VAC versions

1. Allen-Bradley®, PLC®, and SLC™ are trademarks of Allen-Bradley Company, Inc., a Rockwell International company.

2. Profibus® is a registered trademark of Profibus International.



### Warning

Some procedures described in this manual require work inside the indicator enclosure. These procedures are to be performed by qualified service personnel only.



Authorized distributors and their employees can view or download this manual from the Rice Lake Weighing Systems distributor site at [www.rlws.com](http://www.rlws.com).

The *Operator Card* included with this manual provides basic operating instructions for users of the IQ plus 510. Please leave the *Operator Card* with the indicator when installation and configuration are complete.

The IQ plus 510 is NTEP-certified for Classes III and III L at 10,000 divisions. See Section 7.11 on page 54 for more information about NTEP and OIML certifications and Measurement Canada approval.

## 1.1 Operating Modes

The IQ plus 510 has three modes of operation:

### Normal mode

Normal mode is the weighing mode of the indicator. The indicator shows gross and net weights as required, using the secondary display to indicate scale status and the type of weight value displayed. Once configuration is complete and a legal seal is affixed to the back of the indicator, this is the only mode in which the IQ plus 510 can operate.

### Setup mode

Most of the procedures described in this manual require the indicator to be in setup mode, including configuration and calibration.

To enter setup mode, remove the large fillister head screw from the enclosure backplate. Insert a screwdriver or a similar tool into the access hole and press the setup switch once. The indicator display changes to show the word *CONFIG*.

### Test mode

Test mode provides a number of diagnostic functions for the IQ plus 510 indicator. Like setup mode, test mode is entered using the setup switch. See Section 7.9 on page 51 for more information about entering and using test mode.

## 1.2 Front Panel Keypad

The IQ plus 510 display is divided into three areas:

- The primary display consists of seven large,

14-segment digits used to display weight data.

- A two-digit units annunciator shows the units associated with the displayed value: lb=pounds, kg=kilograms, oz=ounces, T=short tons, t=metric tons, LT=long tons, g=grams, GN=grains. When the units configured are troy pounds or troy ounces, the word **troy** is shown in the secondary display area in addition to the **lb** or **oz** annunciator. The units can also be set to NONE (no units information displayed).
- The 16-digit secondary display is used to display the weighing mode (Gross/Brutto or Net) and status indicators, including standstill ( **▲▲** ) and center of zero ( **►◄◄** ).

The IQ plus 510 keypad and normal mode key functions are shown in Figure 1-2.

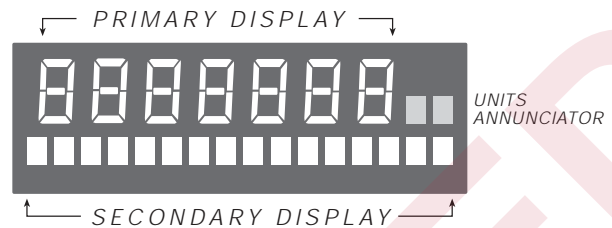


Figure 1-1. IQ plus 510 Front Panel Display Areas

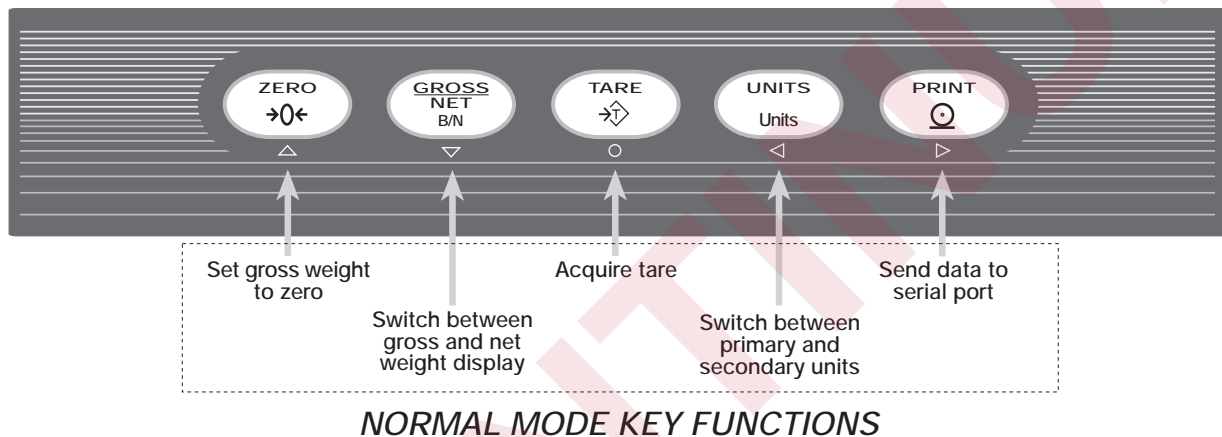


Figure 1-2. Front Panel Key Functions in Normal Mode

### 1.3 Indicator Operations

Basic IQ plus 510 operations are summarized below:

#### 1.3.1 Toggle Gross/Net Mode

Press the GROSS/NET key to switch the display mode from gross to net, or from net to gross. If a tare value has been entered or acquired, the net value is the gross weight minus the tare. If no tare has been entered or acquired, the display remains in gross mode.

Gross mode is indicated by the word **Gross** (or **Brutto** in OIML mode) on the secondary display; net mode is indicated by the word **Net**.

#### 1.3.2 Toggle Units

Press the UNITS key to switch between primary and secondary units. The units identifier is shown to the right of the primary display. Troy ounces and troy pounds are indicated by the word **troy** on the secondary display.

#### 1.3.3 Zero Scale

1. In gross mode, remove all weight from the scale and wait for the standstill annunciator ( **▲▲** ).

2. Press the ZERO key. The center of zero ( **►◄◄** ) annunciator lights to indicate the scale is zeroed.

#### 1.3.4 Acquire Tare

1. Place container on scale and wait for the standstill annunciator ( **▲▲** ).
2. Press the TARE key to acquire the tare weight of the container.
3. Display shifts to net weight and shows the word **Net** on the secondary display.

#### 1.3.5 Remove Stored Tare Value

1. Remove all weight from the scale and wait for the standstill annunciator ( **▲▲** ).
2. Press the TARE key (or, in OIML mode, the ZERO key). Display shifts to gross weight and shows the word **Gross** on the secondary display.

#### 1.3.6 Print Ticket

1. Wait for the standstill annunciator ( **▲▲** ).
2. Press the PRINT key to send data to the serial port.

## 2.0 Installation

This section describes procedures for connecting load cells, digital inputs, and serial communications cables to the IQ plus 510 indicator. Instructions for field installation of the analog output option and replacement of the CPU board are included, along with assembly drawings and parts lists for the service technician.

### Caution

- Use a wrist strap to ground yourself and protect components from electrostatic discharge (ESD) when working inside the indicator enclosure.
- This unit uses double pole/neutral fusing which could create an electric shock hazard. Procedures requiring work inside the indicator must be performed by qualified service personnel only.
- The supply cord serves as the power disconnect for the IQ plus 510. The power outlet supplying the indicator must be installed near the unit and be easily accessible

### 2.1 Unpacking and Assembly

Immediately after unpacking, visually inspect the IQ plus 510 to ensure all components are included and undamaged. The shipping carton should contain the indicator with attached tilt stand, this manual, and a parts kit. If any parts were damaged in shipment, notify Rice Lake Weighing Systems and the shipper immediately.

The parts kit contains the items listed below:

- Capacity and identification labels.
- Two 8-32NC x 7/16 fillister head screws (PN 30623). These screws occupy the holes above and on either side of the setup screw on the indicator backplate (see Figure 2-5 on page 7).
- Ten 8-32NC x 3/8 machine screws (PN 14862) for the indicator backplate (see #29 in Figure 2-9 on page 12).
- Twelve bonded sealing washers (PN 45042) for backplate screws included in the parts kit.
- Four cord grip reducing glands (PN 15664).
- Four rubber bumpers (“feet”) for the tilt stand, PN 42149.
- 6-position screw terminal (PN 70599) for connector J1; two 7-position screw terminals (PN 70600) for connectors J4 and J12; one 10-position screw terminal (PN 70601) for connector J7.
- One kep nut (PN 14676) for grounding cable shield wires against the backplate.

### 2.2 Enclosure Disassembly

The indicator enclosure must be opened to connect cables for load cells, communications, digital inputs, and analog output.



#### Warning

*The IQ plus 510 has no on/off switch. Before opening the unit, ensure the power cord is disconnected from the power outlet.*

Ensure power to the indicator is disconnected, then place the indicator face-down on an antistatic work mat. Remove the screws that hold the backplate to the enclosure body, then lift the backplate away from the enclosure and set it aside.

**NOTE:** With the backplate removed, check the battery to ensure it has not been jarred loose from the battery holder (B1) in shipping.

### 2.3 Cable Connections

The IQ plus 510 provides five cord grips for cabling into the indicator: one for the power cord, three to accommodate communications, digital I/O, and analog output cables, and one metal cord grip for the load cell cable. The three nylon cord grips come with a plug installed to prevent moisture from entering the enclosure. Depending on your application, remove the plug from any cord grip that will be used and install cables as required.

Except for the power cord and load cell cables, all cables routed through the cord grips should be grounded to the ground stud on the indicator backplate.

#### 2.3.1 Load Cells

To attach cable from a load cell or junction box, use the following procedure to cable through the metal cord grip:

1. Disconnect indicator from power source.
2. Place indicator face-down on an antistatic work mat. Remove screws that hold the backplate to the enclosure body.
3. Loosen cord grips, then route cables through cord grips. Determine cable length required to reach connector J1. Mark the cable at the inside edge of the cord grip (see Figure 2-1 on page 4).

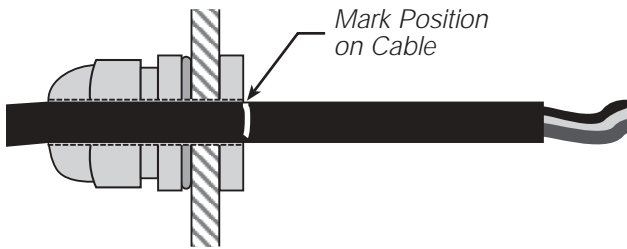


Figure 2-1. Mark Length of Cable at Inside of Cord Grip

4. Remove cable from cord grip. Strip insulation from the marked position to the end of the cable.
5. For cables with braided shielding, cut the shield at the same location as the insulation, then strip an additional 15 mm of insulation from the cable to allow the shield to contact the inside of the metal cord grip (see Figure 2-2).

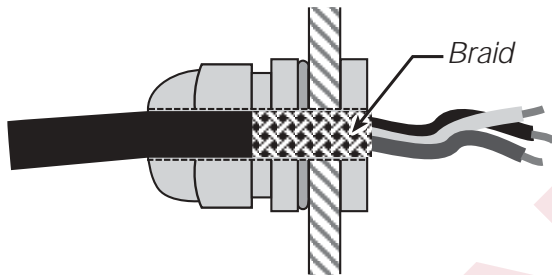


Figure 2-2. Braided Shield Cabling

For cables with foil-type shielding, strip an additional 15 mm of insulation from the cable. Cut the foil shield at a location about 15 mm *inside* the enclosure, then fold the foil shield back on the cable (see Figure 2-3). Ensure silver (conductive) side of foil is turned outward for contact with the metal cord grip.

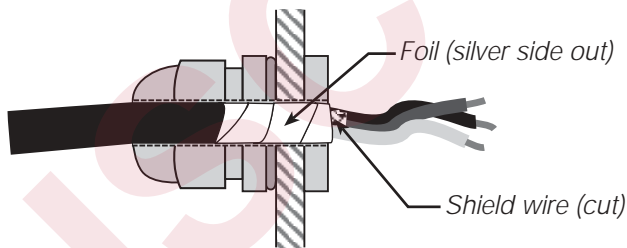


Figure 2-3. Foil Shielded Cabling

6. Cut the shield wire just inside the enclosure (see Figure 2-3). Shield wire function is provided by contact with the metal cord grip.
7. Route cables through cord grips so cable shield contacts cord grip fitting as shown in Figures 2-2 and 2-3. Tighten cord grips.

8. Next, remove connector J1 from the board. The connector plugs into a header on the board (see Figure 2-4 on page 5). Wire the load cell cable from the load cell or junction box to connector J1 as shown in Table 2-1.

| J1 Pin  | Function |
|---|----------|
| 1   | +SIG     |
| 2   | -SIG     |
| 3   | +SENSE   |
| 4   | -SENSE   |
| 5   | +EXC     |
| 6   | -EXC     |
| For 6-wire load cell connections, remove jumpers JP1 and JP2. |          |

Table 2-1. J1 Pin Assignments

9. If using 6-wire load cell cable (with sense wires), remove jumpers JP1 and JP2 before reinstalling connector J1. For 4-wire installation, leave jumpers JP1 and JP2 on.
10. Finish installation using cable mounts and ties to secure cables inside of indicator enclosure.

When connections are complete, reinstall connector J1 onto the header so that it snaps securely into place. Use two cable ties to secure the load cell cable to the inside of the enclosure.

#### Setting the Load Cell Compensation Jumper

The load cell compensation jumper JP5 (near the transformer on the CPU board; see Figure 2-4) must be set ON for load cells with unbalanced bridges. The compensation jumper has the effect of lowering the positive excitation voltage. Uncompensated unbalanced load cells can cause instability or calibration errors.

For RL1040 and RL1042 load cells, set the compensation jumper as follows:

- RL1040 load cells: jumper OFF
- RL1042 load cells: jumper ON

For other load cell types, use the following procedure to determine the correct jumper position;

1. Disconnect load cell from indicator and use an ohmmeter to measure the following:
  - +EXC to +SIG, +EXC to -SIG
  - -EXC to +SIG, -EXC to -SIG

Measured values between the excitation line and each of the signal lines should be within 2–3Ω.

2. If the +EXC measurements are ≥ 5% larger than the -EXC measurements, set the compensation jumper in the ON position. If the +EXC measurements are < 5% greater (or are less) than the -EXC measurements, set the jumper in the OFF position.





### 2.3.2 Serial Communications

To attach serial communications cables, remove connector J4 or J12 from the board. Connector J4 provides connections for the EDP (Electronic Data Processing) port, printer port, and 20 mA current loop transmit signals; connector J12 provides RS-485 signals. Table 2-2 shows the pin assignments for connectors J12 and J4.

Once cables are attached, reconnect J12 or J4 to the header on the board. Use cable ties to secure serial cables to the inside of the enclosure.

The EDP port supports RS-232 or RS-485 communications; the printer port provides active 20 mA output and full-duplex RS-232 communications. Both ports are configured using the SERIAL menu. See Section 3.0 on page 13 for configuration information.

| Connector | Pin | Signal      |
|-----------|-----|-------------|
| J4        | 1   | EDP TxD     |
|           | 2   | GND         |
|           | 3   | EDP RxD     |
|           | 4   | Printer TxD |
|           | 5   | Printer RxD |
|           | 6   | -20 mA TxD  |
|           | 7   | +20 mA TxD  |
| J12       | 1   | Reserved    |
|           | 2   | Reserved    |
|           | 3   | +5V         |
|           | 4   | GND         |
|           | 5   | RS485-A     |
|           | 6   | RS485-B     |
|           | 7   | GND         |

Table 2-2. J4 and J12 Pin Assignments

### 2.3.3 Digital Inputs

Digital inputs can be set to provide many indicator functions, including all keypad functions. Digital inputs are active (on) with low voltage (0 VDC), inactive (off) at 5 VDC. Use the DIG IN menu to configure the digital inputs.

Table 2-3 shows the pin assignments for connector J7.

| J7 Pin | Signal |
|--------|--------|
| 1      | GND    |
| 2      | DI1    |
| 3      | DI2    |
| 4      | DI3    |
| 5      | DI4    |
| 6      | DI5    |
| 7      | DI6    |
| 8      | DI7    |
| 9      | DI8    |
| 10     | GND    |

Table 2-3. J7 Pin Assignments (Digital Inputs)

### 2.3.4 Analog Output

If the optional analog output module is installed, attach the output cable to connector J1 on the analog output board. Table 2-4 lists the analog output pin assignments.

Use the ALGOUT menu to configure and calibrate the analog output module when cabling is complete. See Section 2.4 for information about installing the analog output module.

| Pin | Signal        |
|-----|---------------|
| 1   | + Current Out |
| 2   | - Current Out |
| 3   | + Voltage Out |
| 4   | - Voltage Out |

Table 2-4. Analog Output Module Pin Assignments

## 2.4 Analog Output Module Installation

To install or replace the analog output module, follow the steps listed in Section 2.2 on page 3 for opening the IQ plus 510 enclosure.

Mount the analog output module on its standoffs in the location shown in Figure 2-4 on page 5 and plug the module input into connector J5 on the IQ plus 510 board. Connect output cable to the analog output module as shown in Table 2-4, then reassemble the enclosure (Section 2.5).

See Section 7.8 on page 50 for analog output calibration procedures.

## 2.5 Enclosure Reassembly

Once cabling is complete, position the backplate over the enclosure and reinstall the backplate screws. Use the torque pattern shown in Figure 2-5 to prevent distorting the backplate gasket. Torque screws to 10 in-lb (1.13 N-m).

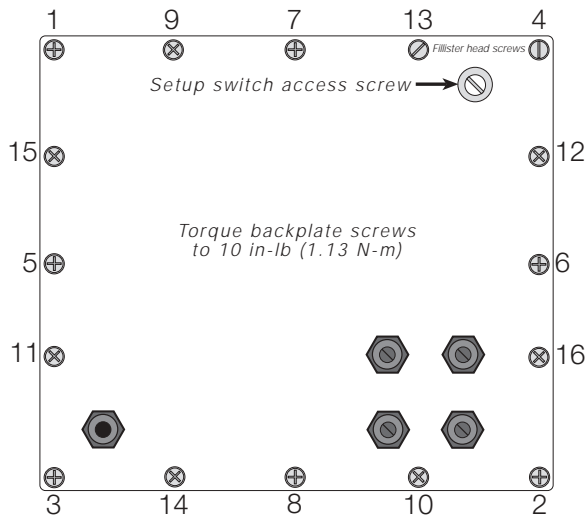


Figure 2-5. IQ plus 510 Enclosure Backplate

## 2.6 Board Removal

If you must remove the IQ plus 510 CPU board, use the following procedure:

1. Disconnect power to the indicator. Loosen cord grips and remove backplate as described in Section 2.2 on page 3.
2. Unplug connectors J1 (load cell cable), J4 and J12 (serial communications), J7 (digital inputs), J6 (keypad ribbon cable), and JP4 (setup switch). If an analog output board is installed, disconnect the analog output cable. See Figure 2-4 on page 5 for connector locations.
3. Remove the standoff and three nuts from the corners of the CPU board.
4. Cut the cable tie that holds the line filter load wires to the enclosure.
5. Lift the board off of its spacers just far enough to access the setscrews that secure the line filter load wires at connector P2. Use a small screwdriver to loosen the setscrews and disconnect power to the board.
6. Remove the CPU board from the enclosure.

To replace the CPU board, reverse the above procedure. Be sure to reinstall cable ties to secure all cables inside the indicator enclosure.

## 2.7 Battery Replacement

The lithium battery on the CPU board maintains the real-time clock and protects data stored in the system RAM when the indicator is not connected to AC power.

System RAM data includes all keyboard locks. This information is lost if the battery loses power and the indicator is disconnected from AC power. To prevent loss of data, do the following:

- Periodically check the battery voltage and replace when the voltage drops below 3.1 VDC. The battery should last a minimum of one year. Therefore, in critical applications, replace the battery every twelve months.
- Use the Revolution™ configuration utility or EDP commands (see Section 5.2 on page 38) to store a copy of the indicator configuration on a PC before attempting battery replacement. If any data is lost, the indicator configuration can be restored from the PC.

*Risk of explosion if battery is replaced with incorrect type. Dispose of batteries per manufacturer instruction.*



## 2.8 Replacement Parts

Table 2-5 lists replacement parts for the IQ plus 510, including all parts referenced in Figures 2-6 through 2-9.

| Ref Number | PN     | Description (Quantity)                            | Figure                 |
|------------|--------|---|------------------------|
| 1          | 41397  | Enclosure, sloped front (1)                       | Figure 2-9 on page 12  |
|            | 41401  | Enclosure, flat front (1)                         |                        |
| 2          | 41398  | Enclosure backplate (1)                           | Figure 2-6 on page 9   |
| 3          | 14626  | Kep nuts, 8-32NC hex (13)                         | Figure 2-9 on page 12  |
| 4          | 30375  | Nylon seal rings for cable grips (3)              | Figure 2-6 on page 9   |
| 5          | 14621  | Kep nuts, 6-32NC hex (4-flat enclosure; 6-sloped) | Figure 2-8 on page 11  |
| 6          | 15626  | Cable grips, PG9 (3)                              | Figure 2-6 on page 9   |
| 7          | 15627  | Locknuts, PCN9 (3)                                |                        |
| 8          | 15650* | Cable tie mounts (8)                              | Figure 2-7 on page 10  |
| 10         | 19538  | Cable grip plugs (3)                              | Figure 2-6 on page 9   |
| 11         | 44676  | Sealing washer for setup switch access screw (1)  |                        |
| 12         | 42640  | Setup switch access screw, 1/4 x 28NF x 1/4 (1)   |                        |
| 13         | 41965  | Power cord assembly, 115VAC (1)                   |                        |
|            | 45254  | Power cord assembly, 230VAC (1)                   |                        |
| 15         | 16892  | Ground/Earth Label (1)                            | Figure 2-7 on page 10  |
| 16         | 45402  | Bezel, sloped front (1)                           | Figure 2-9 on page 12  |
|            | 41399  | Bezel, flat front (1)                             |                        |
| 17         | 41385  | Switch panel membrane (1)                         | Figure 2-9 on page 12  |
| 18         | 41400  | Backplate gasket (1)                              | Figure 2-6 on page 9   |
| 19         | 45043  | Ground wire, 4 in w/ No. 8 eye connector (1)      | Figure 2-7 on page 10  |
| 21         | 46027  | Setup switch mounting bracket (1)                 | Figure 2-8 on page 11  |
| 24         | 44844  | Setup switch assembly (1)                         |                        |
| 25         | 68403  | Wing knobs for tilt stand (2)                     | Figure 2-10 on page 12 |
| 26         | 29635  | Tilt stand (1)                                    |                        |
| 27         | 15144  | Nylon washers for tilt stand, 1/4 x 1 x 1/16 (2)  |                        |
| 28         | 45891  | Line filter assembly (1)                          | Figure 2-7 on page 10  |
| 29         | 14862* | Screws, 8-32NC x 3/8 (4)                          | Figure 2-9 on page 12  |
| 30         | 16903  | Model/serial number label (1)                     | —                      |
| 31         | 46252  | Bezel gasket, sloped front (1)                    | Figure 2-9 on page 12  |
|            | 45076  | Bezel gasket, flat front (1)                      |                        |
| 36         | 45401  | CPU board mounting tab, sloped front models (1)   | Figure 2-8 on page 11  |
| 37         | 15134  | Lock washers, No. 8 (4)                           | Figure 2-7 on page 10  |
| 38         | 48027  | Nylon spacers for board mounting (3)              | Figure 2-8 on page 11  |
| 39         | 45042* | Sealing washers (4)                               | Figure 2-9 on page 12  |
| 40         | 15369  | Standoffs, fem 6-32NC x 3/4 (3)                   | Figure 2-7 on page 10  |
| 41         | 64948  | Display and CPU board assembly, 115 VAC (1)       | Figure 2-8 on page 11  |
|            | 64949  | Display and CPU board assembly, 230 VAC (1)       |                        |
| —          | 40698  | VFD display (1)                                   |                        |
| 42         | 19644  | 3V cylindrical lithium battery                    |                        |

Table 2-5. Replacement Parts

| Ref Number | PN    | Description (Quantity)                     | Figure                            |
|------------|-------|--|-----------------------------------|
| 45         | 65981 | Brass spacer (1)                           | Figure 2-9 on page 12             |
| 46         | 15130 | Internal lock washers (2)                  |                                   |
| 49         | 50959 | Metal cable grip, PG9 (1)                  | Figure 2-6 on page 9              |
| 50         | 50962 | Metal cord grip nut, PG9 (1)               |                                   |
| 51         | 73769 | Grounding clips                            |                                   |
| —          | 70600 | 7-position connectors for J4, and J12 (2)  |                                   |
| —          | 70599 | 6-position connectors for J1 (1)           | Figure 2-4 on page 5              |
| —          | 70601 | 10-position connector for J7 (1)           |                                   |
| —          | 45484 | 160 mA TR5 subminiature fuses (2), 115 VAC |                                   |
| —          | 45107 | 80 mA TR5 subminiature fuses (2), 230 VAC  | F1 and F2 in Figure 2-4 on page 5 |

\* Additional parts included in parts kit.

**Caution** For protection against risk of fire, replace fuses only with same type and rating fuse. See Section 7.11 on page 54 for complete fuse specifications.

Table 2-5. Replacement Parts (Continued)

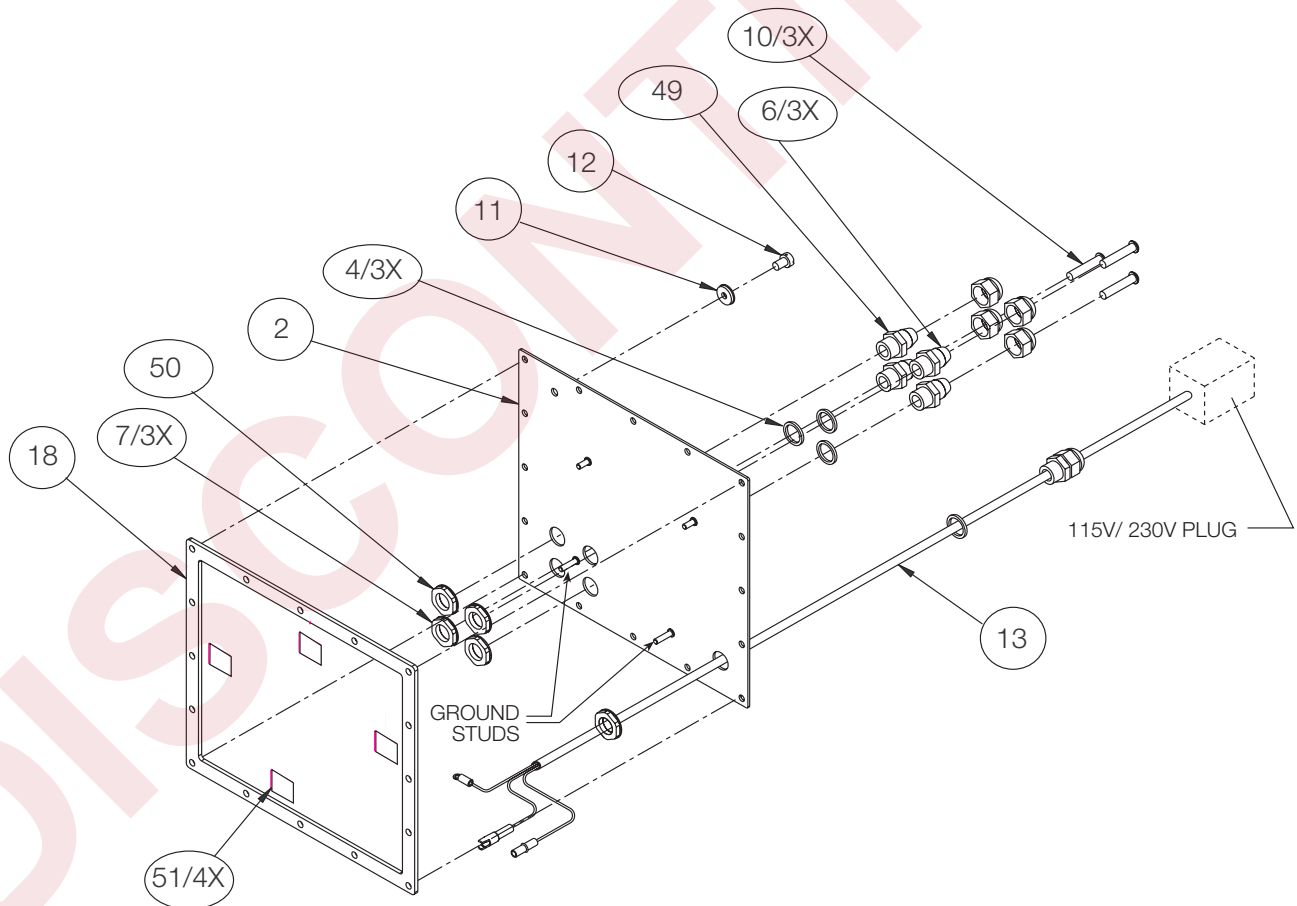


Figure 2-6. Backplate Assembly

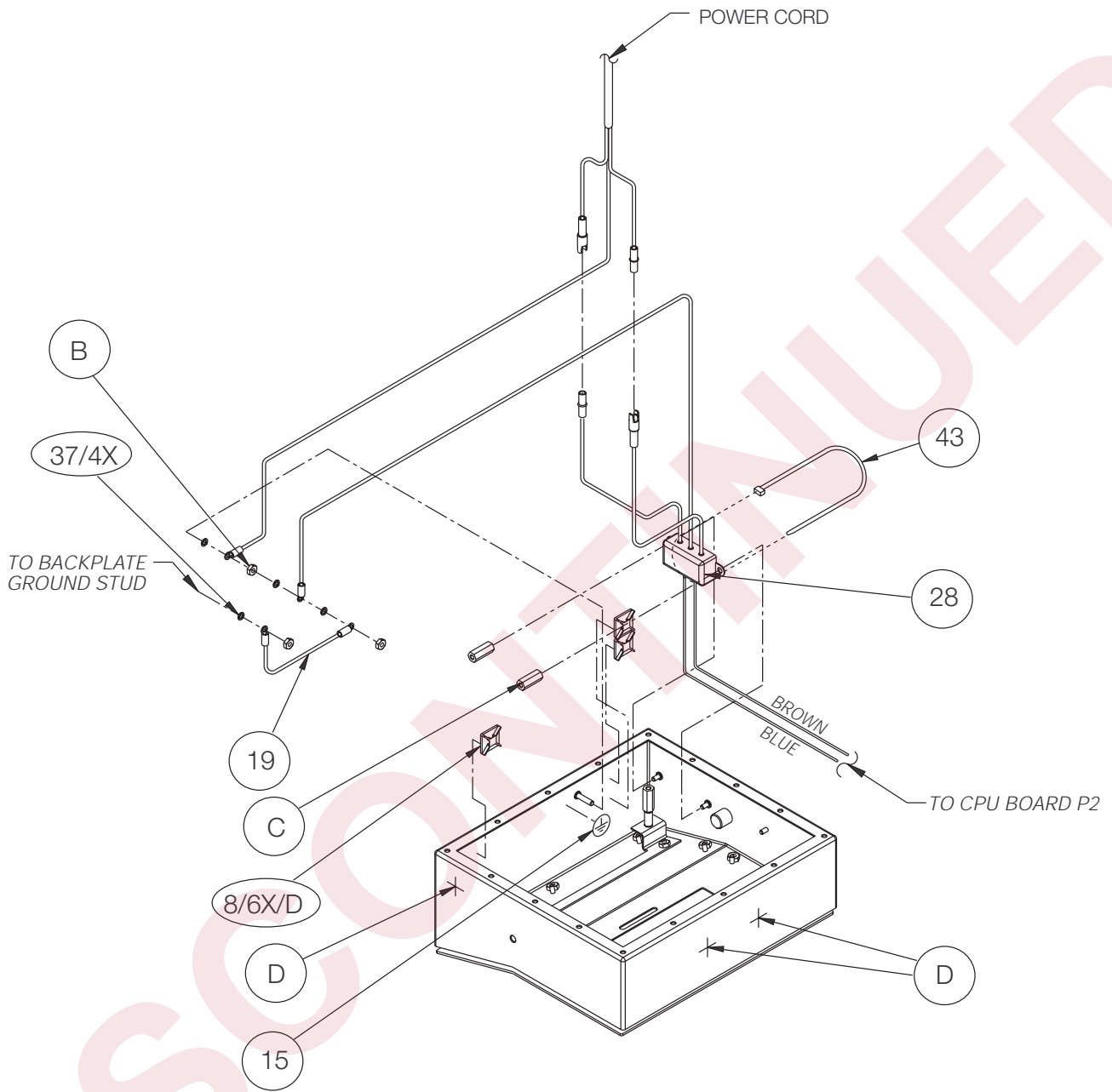


Figure 2-7. Enclosure and Line Filter Assembly

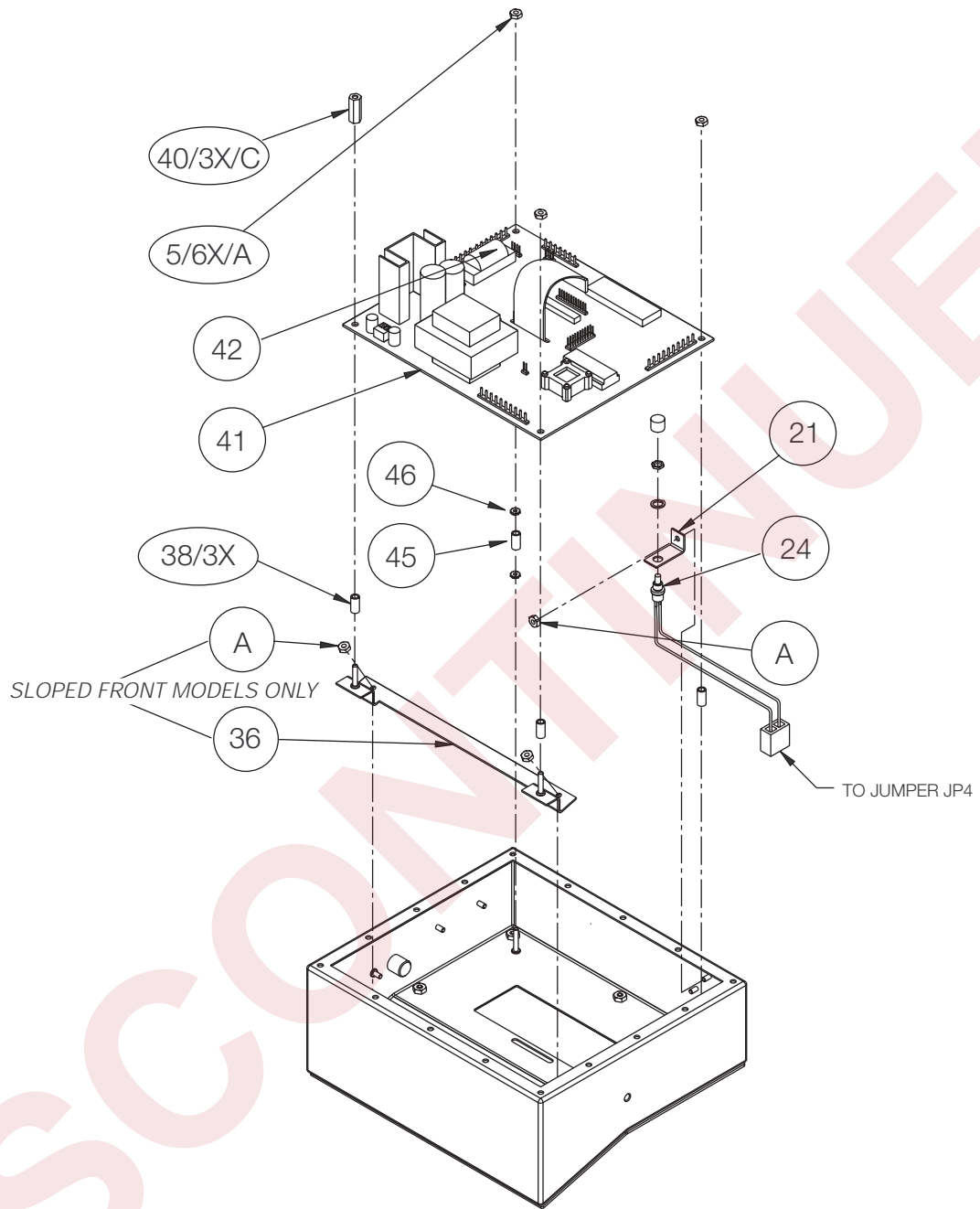


Figure 2-8. Enclosure and CPU Board Assembly

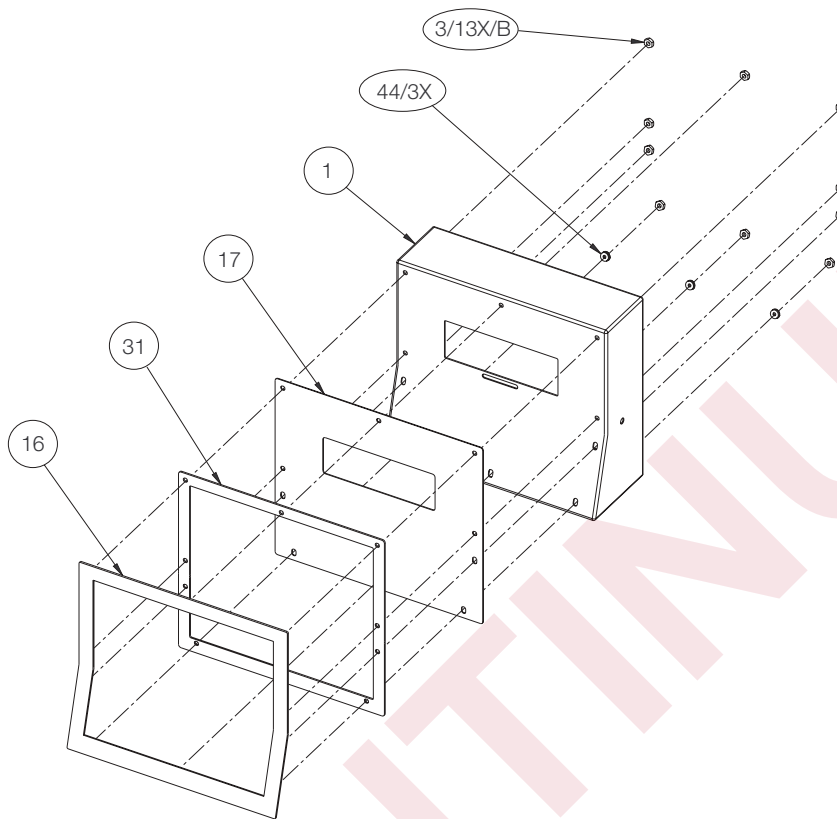


Figure 2-9. Bezel Assembly

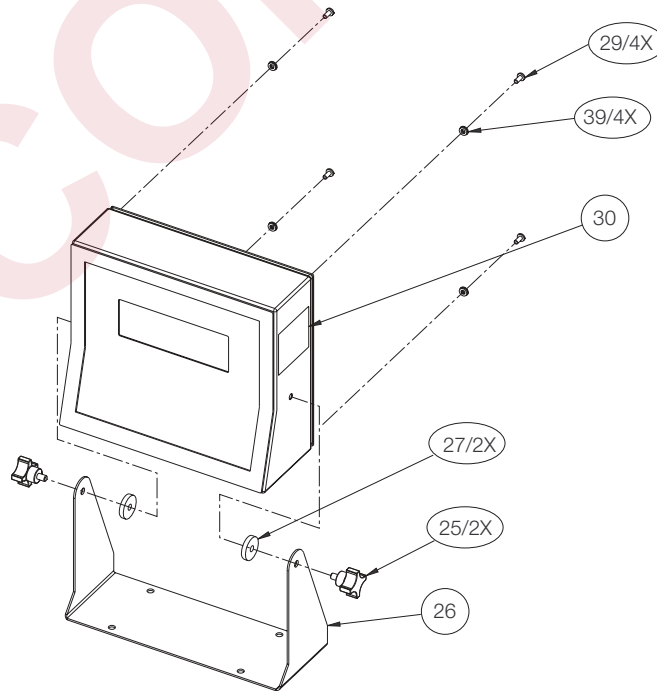


Figure 2-10. Tilt Stand Assembly



## 3.0 Configuration

To configure the IQ plus 510 indicator, the indicator must be placed in setup mode. The setup switch is accessed by removing the large fillister head screw on the enclosure backplate. Switch position is changed by inserting a screwdriver into the access hole and pressing the switch.

When the indicator is placed in setup mode, the word *CONFIG* is shown on the display. The CONFIG menu is the first of nine main menus used to configure the indicator. Detailed descriptions of these menus are given in Section 3.2. When configuration is complete, return to the CONFIG menu and press the  $\Delta$  (ZERO) key to exit setup mode, then replace the setup switch access screw.

### 3.1 Configuration Methods

The IQ plus 510 indicator can be configured by using the front panel keys to navigate through a series of configuration menus or by sending commands or configuration data to the EDP port. Configuration using the menus is described in Section 3.1.3.

Configuration using the EDP port can be accomplished using either the EDP command set described in Section 5.0 or the Revolution™ configuration utility.

#### 3.1.1 Revolution™ III Configuration

The Revolution III configuration utility provides the preferred method for configuring the IQ plus 510 indicator. Revolution III runs on a personal computer to set configuration parameters for the indicator. Plug-in modules are downloadable from the Internet or off the Revolution III CD, allowing the user to choose the specific indicators that Revolution III will configure with. When Revolution III configuration is complete, configuration data is downloaded to the indicator.



Figure 3-1. Sample Revolution III Configuration Display

Revolution III supports both uploading and downloading of indicator configuration data. This capability allows configuration data to be retrieved from one indicator, edited, then downloaded to another.

To use Revolution III, do the following:

1. Install Revolution III on an IBM-compatible personal computer running Windows® 98 or later. Minimum system requirements include a processor speed of at least 233MHz, 64MB of memory, and at least 40MB of available hard disk space for installation.
2. Follow on-screen instructions to select the indicator module to be used with Revolution III.
3. With both indicator and PC powered off, connect the PC serial port to the RS-232 pins on the indicator EDP port.
4. Power up the PC and the indicator. Use the setup switch to place the indicator in setup mode.
5. Start the Revolution III program.

Figure 3-1 shows an example of one of the Revolution III configuration displays.

Revolution III provides online help for each of its configuration displays. Parameter descriptions provided in this manual for front panel configuration can also be used when configuring the indicator using Revolution III: the interface is different, but the parameters set are the same.

#### 3.1.2 EDP Command Configuration

The EDP command set can be used to configure the IQ plus 510 indicator using either a personal computer, terminal, or remote keyboard. Like Revolution, EDP command configuration sends commands to the indicator EDP port; unlike Revolution, EDP commands can be sent using any external device capable of sending ASCII characters over a serial connection.

EDP commands duplicate the functions available using the indicator front panel and provide some functions not otherwise available. EDP commands can be used to simulate pressing front panel keys, to configure the indicator, or to dump lists of parameter settings. See Section 5.0 on page 33 for more information about using the EDP command set.

### 3.1.3 Front Panel Configuration

The IQ plus 510 indicator can be configured using a series of menus accessed through the indicator front panel when the indicator is in setup mode. Table 3-1 summarizes the functions of each of the main menus.

| Menu    |               | Menu Function  |
|---------|---------------|--|
| CONFIG  | Configuration | Configure grads, zero tracking, zero range, motion band, overload, A/D sample rate, tare function, power-up mode, analog and digital filtering parameters. |
| FORMAT  | Format        | Set format of primary and secondary units, decimal format, and display rate.   |
| CALIBR  | Calibration   | Calibrate indicator. See Section 4.0 on page 29 for calibration procedures.  |
| SERIAL  | Serial        | Configure EDP and printer serial ports.  |
| PROGRM  | Program       | Set date and time formats, keyboard locks, regulatory mode, and consecutive number values.   |
| PFORMAT | Print Format  | Set print format used for header, gross, net, and EDP format tickets. See Section 6.0 for more information.  |
| DIG IN  | Digital Input | Assign digital input functions.  |
| ALGOUT  | Analog Output | Configure analog output module. Used only if analog output option is installed.  |
| VERSION | Version       | Display installed software version number.   |

Table 3-1. IQ plus 510 Menu Summary

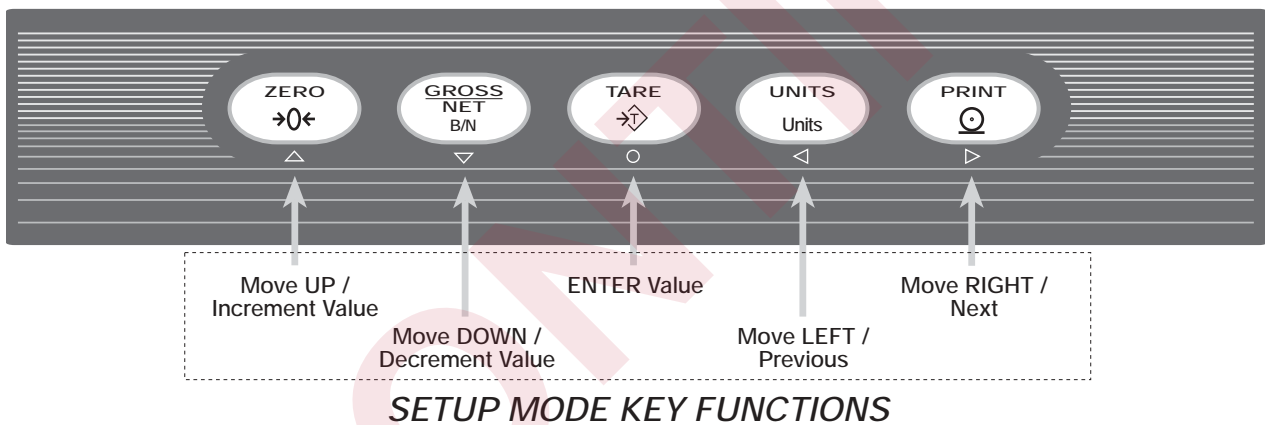
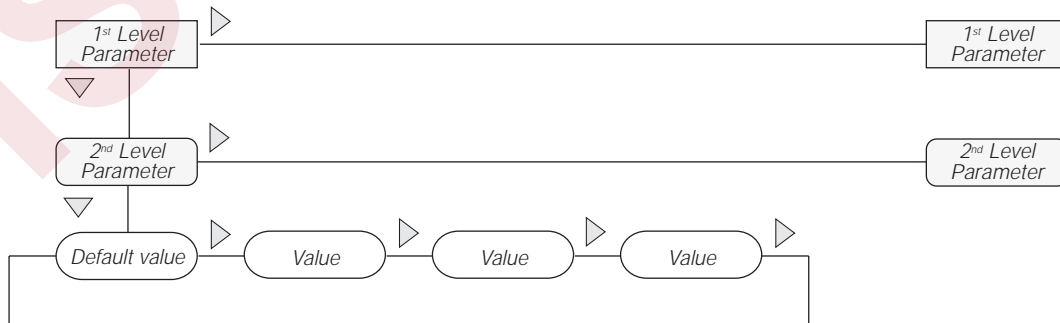


Figure 3-2. Front Panel Key Functions in Setup Mode

Four front panel keys are used as directional keys to navigate through the menus in setup mode (see Figure 3-2). The UNITS (◀) and PRINT (▶) keys scroll left and right (horizontally) on the same menu level; ZERO (▲) and GROSS/NET (▼) move up and down (vertically) to different menu levels. The TARE key (○) serves as an Enter key for selecting parameter values within the menus. A label under each of these keys identifies the direction provided by the key when navigating through the setup menus.

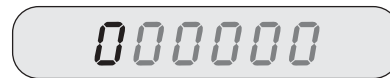


When moving through values below the first menu level, press ▲ to return to the level above. Press ○ or ▼ to move to the next parameter on the level above.

Figure 3-3. Setup Mode Menu Navigation

To select a parameter, press ◀ or ▶ to scroll left or right until the desired menu group appears on the display, then press ▼ to move down to the submenu or parameter you want. When moving through the menu parameters, the default or previously selected value appears first on the display.

To change a parameter value, scroll left or right to view the values for that parameter. When the desired value appears on the display, press ○ to select the value and move back up one level. To edit numerical values, use the navigation keys to select the digit and to increment or decrement the value (see Figure 3-4).



When editing numeric values, press ◀ or ▶ to change the digit selected. Press ▲ or ▼ to increment or decrement the value of the selected digit.

Press ○ to save the value entered and return to the level above.

*Figure 3-4. Editing Procedure for Numeric Values*

---

## 3.2 Menu Structures and Parameter Descriptions

The following sections provide graphic representations of the IQ plus 510 menu structures. In the actual menu structure, the values you choose under each parameter are arranged horizontally. To save page space, menu choices are shown in vertical columns. Default values are shown in bold type at the top of each column.

Most menu diagrams are accompanied by one or more tables that describe all parameters and parameter values associated with that menu option. Default parameter values are shown in bold type.

### 3.2.1 Configuration Menu

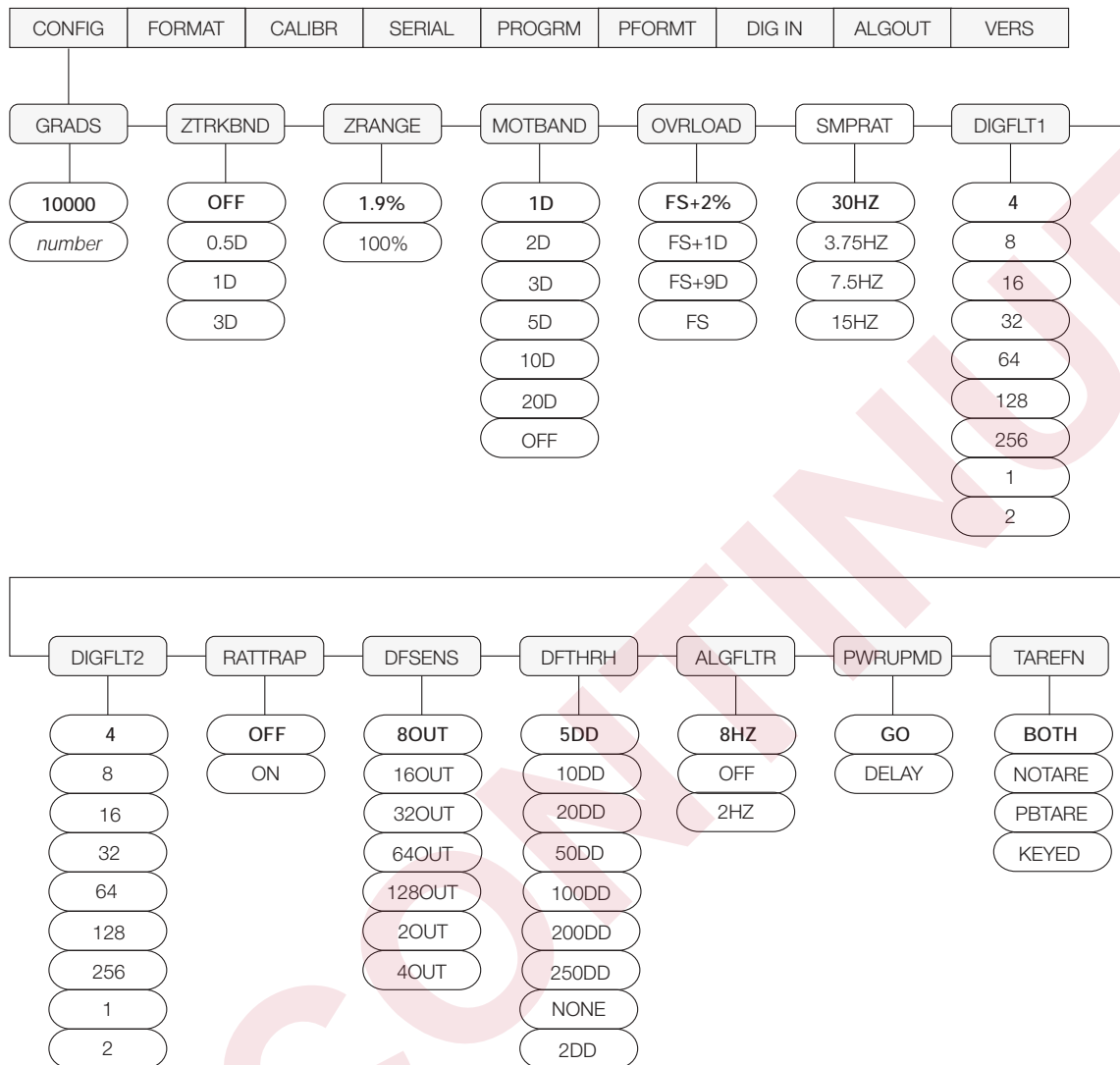


Figure 3-5. Configuration Menu

| CONFIG Menu             |                        |   |
|-------------------------|------------------------|---|
| Parameter               | Choices                | Description   |
| <i>Level 2 submenus</i> |                        |   |
| GRADS                   | 10000<br><i>number</i> | Specifies the number of full scale graduations.<br>The value entered must be in the range 1–9 999 999 and should be consistent with legal requirements and environmental limits on system resolution.<br>To calculate GRADS, use the formula, $GRADS = Capacity / Display Divisions$ .<br>Display divisions for primary and secondary units are specified on the FORMAT menu. |

Table 3-2. Configuration Menu Parameters

| <b>CONFIG Menu</b> |   |  |
|--------------------|---|--|
| <b>Parameter</b>   | <b>Choices</b>  | <b>Description</b>   |
| ZTRKBND            | OFF<br>0.5D<br>1D<br>3D   | Automatically zeroes the scale when within the range specified, as long as the input is within the ZRANGE and scale is at standstill. Selections are $\pm$ display divisions. Maximum legal value varies depending on local regulations.   |
| ZRANGE             | 1.9%<br>100%  | Selects the range within which the scale can be zeroed. The 1.9% selection is $\pm$ 1.9% around the calibrated zero point, for a total range of 3.8%. Indicator must be at standstill to zero the scale. Use 1.9% for legal-for-trade applications.  |
| MOTBAND            | 1D<br>2D<br>3D<br>5D<br>10D<br>20D<br>OFF                             | Sets the level, in display divisions, at which scale motion is detected. If motion is not detected for 1 second or more, the standstill symbol lights. Some operations, including print, tare, and zero, require the scale to be at standstill. Maximum legal value for this parameter varies depending on local regulations.<br><br>If this parameter is set to OFF, the standstill annunciator will not light; operations normally requiring standstill (zero, tare, print) are performed regardless of scale motion. If OFF is selected, ZTRKBND must also be set to OFF. |
| OVRLOAD            | FS+2%<br>FS+1D<br>FS+9D<br>FS   | Determines the point at which the display blanks and an out-of-range error message is displayed. Maximum legal value varies depending on local regulations.  |
| SMPRAT             | 30HZ<br>3.75HZ<br>7.5HZ<br>15HZ                                       | Sample rate. Selects measurement rate, in samples per second, of the analog-to-digital converter. Lower sample rate values provide greater signal noise immunity.  |
| DIGFLT1<br>DIGFLT2 | 4<br>8<br>16<br>32<br>64<br>128<br>256<br>1<br>2                      | Selects the digital filtering rate used to reduce the effects of mechanical vibration from the immediate area of the scale.<br><br>Choices indicate the number of A/D conversions per update that are averaged to obtain the displayed reading. A higher number gives a more accurate display by minimizing the effect of a few noisy readings, but slows down the settling rate of the indicator.   |
| RATTRAP            | OFF<br>ON   | Enables RATTLETRAP <sup>®</sup> digital filtering. RATTLETRAP is most effective at filtering repeating vibrations caused by mechanical noise from nearby machines but may increase settling times over standard digital filter selections.   |
| DFSENS             | 8OUT<br>16OUT<br>32OUT<br>64OUT<br>128OUT<br>2OUT<br>4OUT             | Digital filter cutout sensitivity. Specifies the number of consecutive readings that must fall outside the filter threshold (DFTHRH parameter) before digital filtering is suspended.  |
| DFTHRH             | 5DD<br>10DD<br>20DD<br>50DD<br>100DD<br>200DD<br>250DD<br>NONE<br>2DD | Digital filter cutout threshold. Specifies the filter threshold, in display divisions. When a specified number of consecutive scale readings (DFSENS parameter) fall outside of this threshold, digital filtering is suspended. If NONE is selected, the filter is always enabled.   |

Table 3-2. Configuration Menu Parameters (Continued)

| CONFIG Menu |                                   |  |
|-------------|-----------------------------------|--|
| Parameter   | Choices                           | Description  |
| ALGFLTR     | 8HZ<br>OFF<br>2HZ                 | Analog filter. Selects the range used for filtering mechanical and electrical noise. 8 Hz value has a medium filtering effect; 2 Hz has the greatest effect. Normally, the minimum filter value that allows a stable display should be selected. If digital filtering is also used, select either 2 Hz or 8 Hz for this parameter.   |
| PWRUPMD     | GO<br>DELAY                       | Power up mode. In GO mode, the indicator goes into operation immediately after a brief power up display test.<br><br>In DELAY mode, the indicator performs a power up display test, then enters a 30-second warm up period. If no motion is detected during the warm up period, the indicator becomes operational when the warm up period ends; if motion is detected, the delay timer is reset and the warm up period repeated. |
| TAREFN      | BOTH<br>NOTARE<br>PBTARE<br>KEYED | Enables or disables push-button and keyed tares. Possible values are:<br><br>BOTH: Both push-button and keyed tares are enabled<br>NOTARE: No tare allowed (gross mode only)<br>PBTARE: Push-button tares enabled<br>KEYED: Keyed tare enabled   |

Table 3-2. Configuration Menu Parameters (Continued)

### 3.2.2 Format Menu

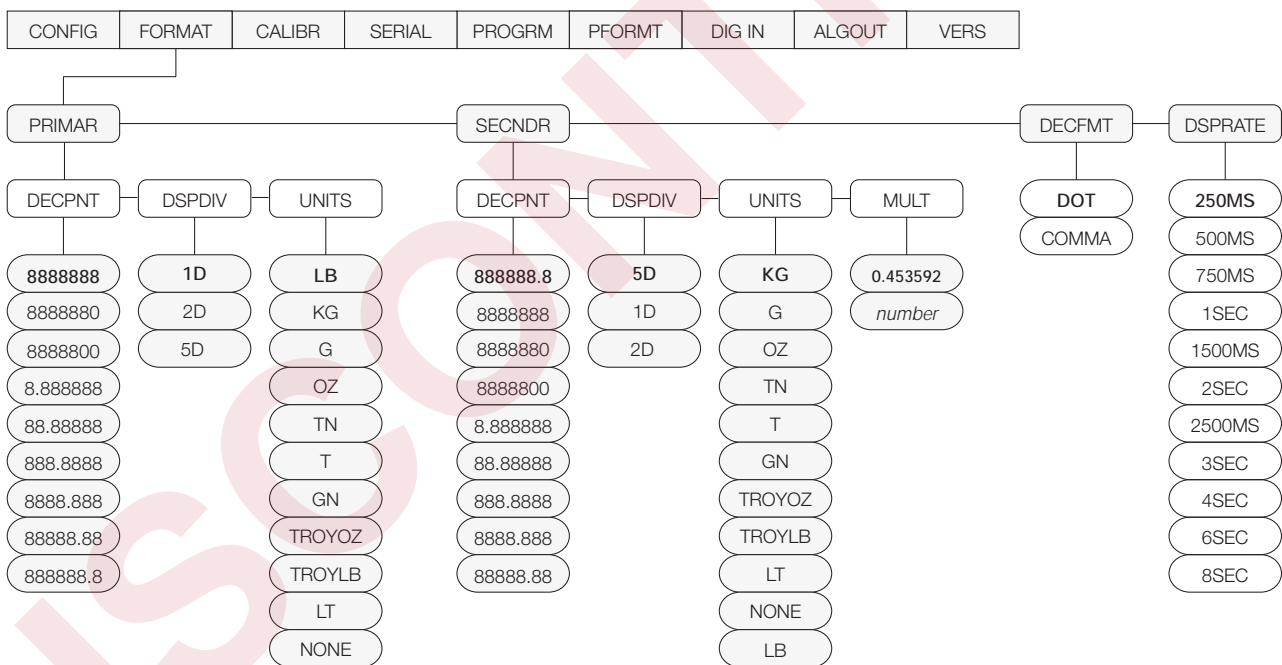


Figure 3-6. Format Menu

| <b>FORMAT Menu</b>                      |  |  |
|---|--|--|
| <b>Parameter</b>                        | <b>Choices</b>   | <b>Description</b>   |
| <i>Level 2 submenus</i>                 |  |  |
| PRIMAR                                  | DECPNT<br>DSPDIV<br>UNITS  | Specifies the decimal position, display divisions, and units used for the primary units. See Level 3 submenu parameter descriptions.   |
| SECNDR                                  | DECPNT<br>DSPDIV<br>UNITS<br>MULT  | Specifies the decimal position, display divisions, units, and conversion multiplier used for the secondary units. See Level 3 submenu parameter descriptions.  |
| DECfmt                                  | <b>DOT</b><br>COMMA  | Specifies whether decimal numbers are displayed using a period (DOT) or comma as the decimal symbol.   |
| DSPRATE                                 | <b>250MS</b><br>500MS<br>750MS<br>1SEC<br>1500MS<br>2SEC<br>2500MS<br>3SEC<br>4SEC<br>6SEC<br>8SEC           | Display rate. Sets the update rate for displayed values. Values are in milliseconds (MS) or seconds (SEC).   |
| <i>Level 3 submenus</i>                 |  |  |
| <b>Primary Units (PRIMAR Parameter)</b> |  |  |
| DECPNT                                  | <b>8888888</b><br>8888880<br>8888800<br>8.888888<br>88.88888<br>888.8888<br>8888.888<br>88888.88<br>888888.8 | Decimal point location. Specifies the location of the decimal point or dummy zeroes in the primary unit display. Value should be consistent with local legal requirements.   |
| DSPDIV                                  | <b>1D</b><br>2D<br>5D  | Display divisions. Selects the minimum division size for the primary units displayed weight.   |
| UNITS                                   | <b>LB</b><br>KG<br>G<br>OZ<br>TN<br>T<br>GN<br>TROYOZ<br>TROYLB<br>LT<br>NONE                                | Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; G=gram; OZ=ounce; TN=short ton; T=metric ton; GN=grain; TROYOZ=troy ounce; TROYLB=troy pound; LT=long ton.<br><br><b>NOTE:</b> 230 VAC indicators are configured with <b>KG</b> for both primary and secondary units. |

*Table 3-3. Format Menu Parameters*

| FORMAT Menu                               |  |   |
|---|--|---|
| Parameter                                 | Choices  | Description   |
| <b>Secondary Units (SECNDR Parameter)</b> |  |   |
| DECPNT                                    | <b>888888.8</b><br>8888888<br>8888880<br>8888800<br>8.888888<br>88.88888<br>888.8888<br>8888.888<br>88888.88 | Decimal point location. Determines the location of the decimal point or dummy zeros in the display.   |
| DSPDIV                                    | <b>5D</b><br>1D<br>2D  | Display divisions. Selects the value of minimum division size of the displayed weight.  |
| UNITS                                     | <b>KG</b><br>G<br>OZ<br>TN<br>T<br>GN<br>TROYOZ<br>TROYLB<br>LT<br>NONE<br>LB                                | Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; G=gram; OZ=ounce; TN=short ton; T=metric ton; GN=grain; TROYOZ=troy ounce; TROYLB=troy pound; LT=long ton.   |
| MULT                                      | <b>0.453592</b><br><i>Enter other choices via keyboard</i>   | Multiplier. Specifies the conversion factor by which the primary units are multiplied to obtain the secondary units. The default is 0.453592, which is the conversion factor for changing pounds to kilograms. See Section 7.7 on page 49 for a list of multipliers.<br><br>To toggle between primary and secondary units, press the UNITS key. |

Table 3-3. Format Menu Parameters (Continued)



### 3.2.3 Calibration Menu

See Section 4.0 on page 29 for calibration procedures.

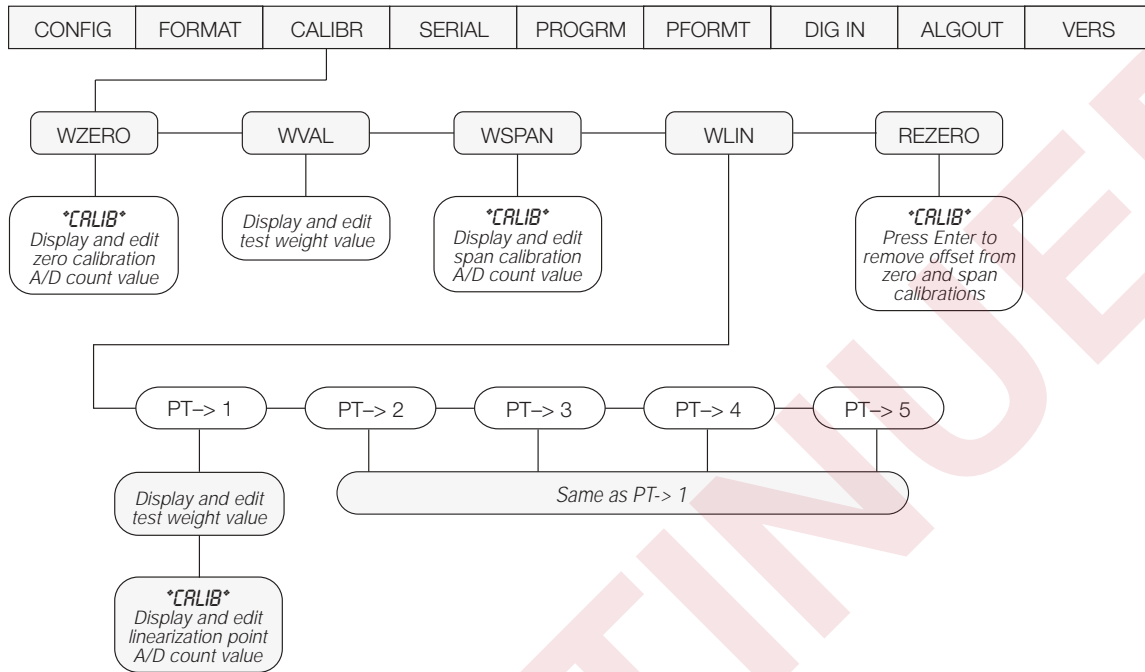


Figure 3-7. Calibration Menu

| CALIBR Menu             |               |  |
|-------------------------|---------------|--|
| Parameter               | Choices       | Description  |
| <i>Level 2 submenus</i> |               |  |
| WZERO                   | —             | Press ENTER to display and edit the zero calibration A/D count value.  |
| WWAL                    | —             | Press ENTER to display and edit the test weight value.   |
| WSPAN                   | —             | Press ENTER to display and edit the span calibration A/D count value.  |
| WLIN                    | PT->1 – PT->5 | Press ENTER to display and edit test weight and calibration values for up to five linearization points.<br>Perform linear calibration only after WZERO and WSPAN have been set.  |
| REZERO                  | —             | Press Enter to remove an offset value from the zero and span calibrations.<br>Use this parameter only after WZERO and WSPAN have been set. See Section 4.1 on page 29 for more information about using this parameter. |

Table 3-4. Calibration Menu Parameters

### 3.2.4 Serial Menu

See Section 7.4 on page 45 for information about IQ plus 510 serial data formats.

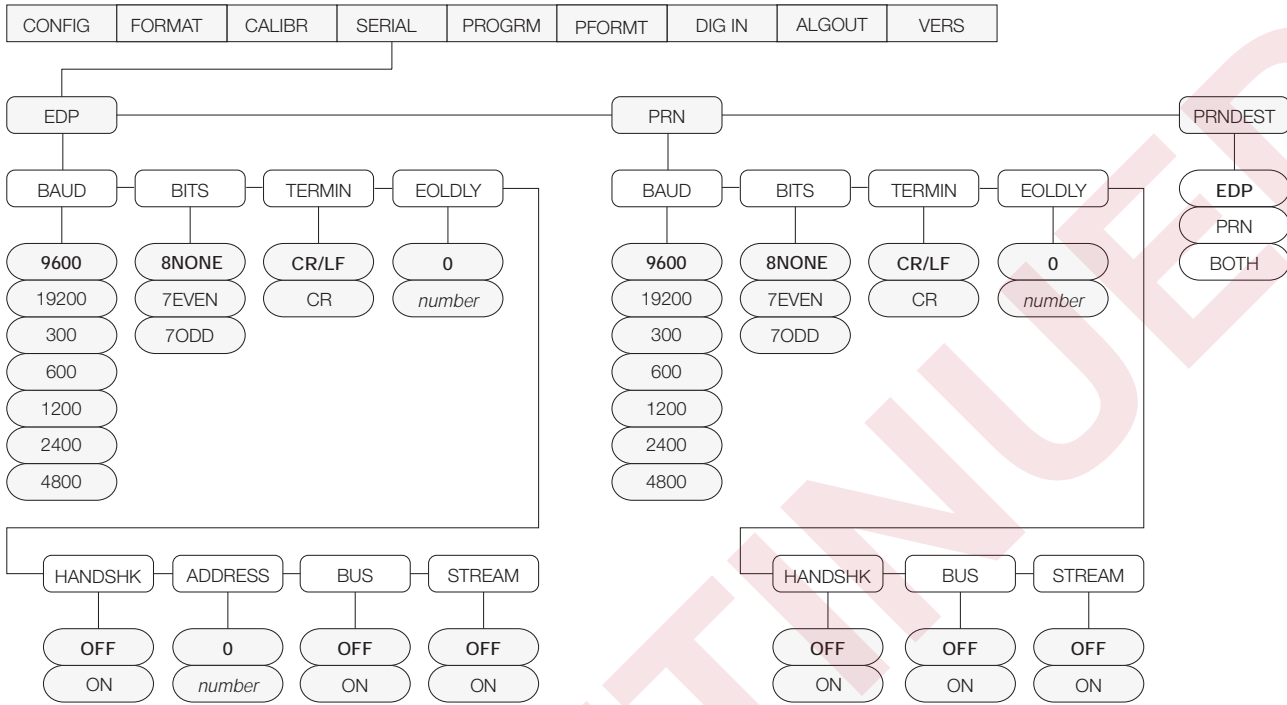


Figure 3-8. Serial Menu

| SERIAL Menu             |   |  |
|-------------------------|---|--|
| Parameter               | Choices   | Description  |
| <i>Level 2 submenus</i> |   |  |
| EDP                     | BAUD<br>BITS<br>TERMIN<br>EOLDLY<br>HANDSHK<br>ADDRESS<br>BUS<br>STREAM | Configure the EDP port. See Level 3 submenu parameter descriptions.  |
| PRINT                   | BAUD<br>BITS<br>TERMIN<br>EOLDLY<br>HANDSHK<br>BUS<br>STREAM            | Configure the printer port. See Level 3 submenu parameter descriptions.  |
| PRNDEST                 | EDP<br>PRN<br>BOTH  | Print destination. Selects the port for data transmission when the PRINT key is pressed or the KPRINT EDP command is sent. |

Table 3-5. Serial Menu Parameters

| <b>SERIAL Menu</b>      |  |  |
|-------------------------|--|--|
| Parameter               | Choices  | Description  |
| <b>Level 3 Submenus</b> |  | <b>EDP Port</b>  |
| BAUD                    | <b>9600</b><br>19200<br>300<br>600<br>1200<br>2400<br>4800 | Baud rate. Selects the transmission speed for the EDP port.  |
| BITS                    | <b>8NONE</b><br>7EVEN<br>7ODD                              | Selects number of data bits and parity of data transmitted from the EDP port.  |
| TERMIN                  | <b>CR/LF</b><br>CR   | Termination character. Selects termination character for data sent from the EDP port.  |
| EOLDLY                  | <b>0</b><br><i>number</i>                                  | End-of-line delay. Sets the delay period, in 0.1-second intervals, from when a formatted line is terminated to the beginning of the next formatted serial output. Value specified must be in the range 0-255, in tenths of a second (10 = 1 second). |
| HANDSHK                 | <b>OFF</b><br>ON   | Specifies whether XON/XOFF flow control characters are used.   |
| ADDRESS                 | <b>0</b><br><i>address</i>                                 | Specifies the decimal indicator address for RS-485 connections. RS-232 communications is disabled if an address other than zero is specified for this parameter. RS-485 addresses must be in the range 01–255.                                       |
| BUS                     | <b>OFF</b><br>ON   | Specifies whether the EDP port sends the data stream to a network bus. Specify ON only if the Remote I/O or Profibus option is installed.  |
| STREAM                  | <b>OFF</b><br>ON   | Specifies whether data is streamed from the EDP port.  |
| <b>Level 3 Submenus</b> |  | <b>Printer Port</b>  |
| BAUD                    | <b>9600</b><br>19200<br>300<br>600<br>1200<br>2400<br>4800 | Baud rate. Selects the transmission speed for the printer port.  |
| BITS                    | <b>8NONE</b><br>7EVEN<br>7ODD                              | Selects number of data bits and parity of data transmitted from the printer port.  |
| TERMIN                  | <b>CR/LF</b><br>CR   | Termination character. Selects termination character for data sent from the printer port.  |
| EOLDLY                  | <b>0</b><br><i>number</i>                                  | End-of-line delay. Sets the delay period, in 0.1-second intervals, from when a formatted line is terminated to the beginning of the next formatted serial output. Value specified must be in the range 0-255, in tenths of a second (10 = 1 second). |
| HANDSHK                 | <b>OFF</b><br>ON   | Specifies whether XON/XOFF flow control characters are used.   |
| BUS                     | <b>OFF</b><br>ON   | Specifies whether the printer port sends the data stream to a network bus. Specify ON only if the Remote I/O or Profibus option is installed.  |
| STREAM                  | <b>OFF</b><br>ON   | Specifies whether data is streamed from the printer port.  |

Table 3-5. Serial Menu Parameters (Continued)

### 3.2.5 Program Menu

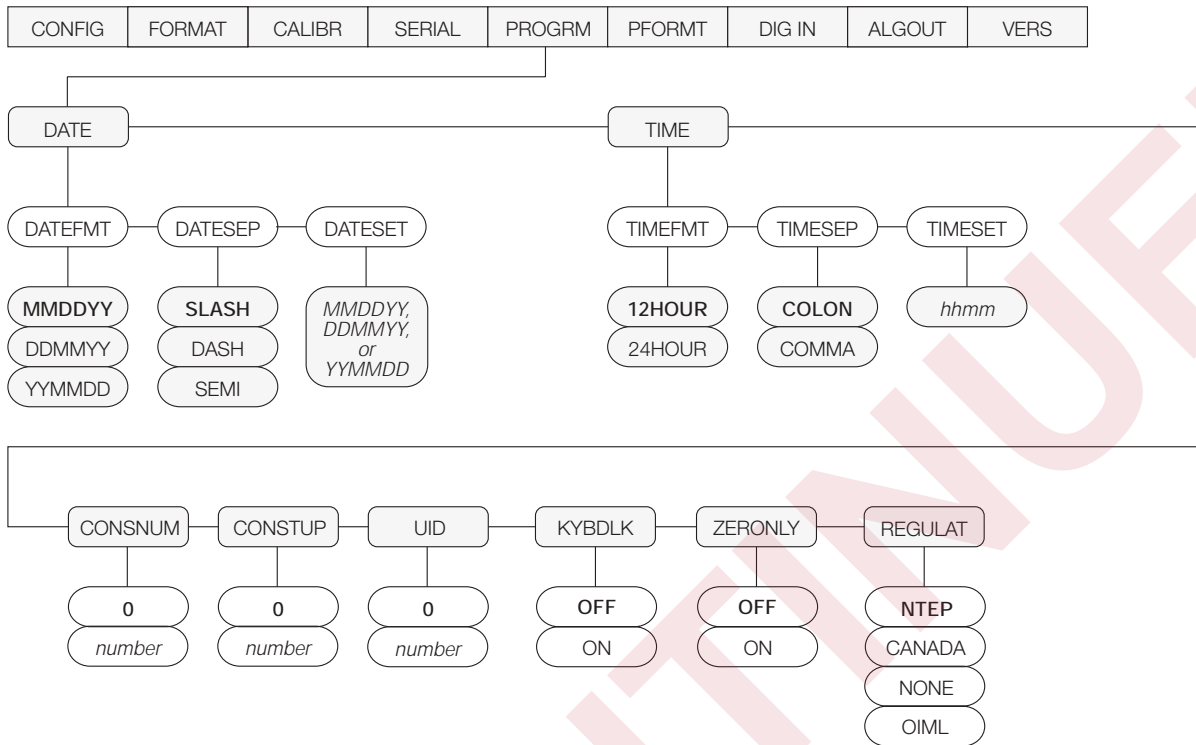


Figure 3-9. Program Menu

| PROGRM Menu             |                               |   |
|-------------------------|-------------------------------|---|
| Parameter               | Choices                       | Description   |
| <i>Level 2 submenus</i> |                               |   |
| DATE                    | DATEFMT<br>DATESEP<br>DATESET | Allows selection of date format and date separator character. See Level 3 submenu parameter descriptions.<br><br>Use the DATESET parameter or the SD EDP command to set the date. See Section 5.0 on page 33 for information about using the EDP commands.                                      |
| TIME                    | TIMEFMT<br>TIMESEP<br>TIMESET | Allows selection of time format and separator character. See Level 3 submenu parameter descriptions.<br><br>Use the TIMESET parameter or the ST EDP command to set the time. See Section 5.0 on page 33 for information about using the EDP commands.   |
| CONSNUM                 | 0<br><i>number</i>            | Consecutive numbering. Allows sequential numbering for print operations. The consecutive number value is incremented following each print operation that includes <CN> in the ticket format. When the consecutive number is reset, it is reset to the value specified on the CONSTUP parameter. |
| CONSTUP                 | 0<br><i>number</i>            | Specifies the consecutive number start-up value used when the consecutive number is reset by sending the KCLRNCN EDP command or a CLRNCN digital input. Value specified must be in the range 0–9 999 999.   |
| UID                     | 0<br><i>number</i>            | Specifies the unit identification number. Value specified must be in the range 0–9 999 999.   |

Table 3-6. Program Menu Parameters

| PROGRM Menu             |                                |  |
|-------------------------|--------------------------------|--|
| Parameter               | Choices                        | Description  |
| KYBDLK                  | OFF<br>ON                      | Keyboard lock. Specify ON to disable the keypad in normal mode.  |
| ZERONLY                 | OFF<br>ON                      | Zero key only. Specify ON to disable all front panel keys except ZERO in normal mode.  |
| REGULAT                 | NTEP<br>OIML<br>NONE<br>CANADA | <p>Regulatory mode. Specifies the regulatory agency having jurisdiction over the scale site.</p> <ul style="list-style-type: none"> <li>• OIML, NTEP, and CANADA modes allow a tare to be acquired at any weight greater than zero. NONE allows tares to be acquired at any weight value.</li> <li>• OIML, NTEP, and CANADA modes allow a tare to be cleared only if the gross weight is at no load. NONE allows tares to be cleared at any weight value.</li> <li>• Streamed output in OIML, NTEP, and CANADA modes follows the display update rate. In NONE mode, streamed output follows the A/D update rate.</li> <li>• NTEP and OIML modes allow a new tare to be acquired even if a tare is already present. In CANADA mode, the previous tare must be cleared before a new tare can be acquired.</li> <li>• NONE, NTEP and CANADA modes allow the scale to be zeroed in either gross or net mode as long as the current weight is within the specified ZRANGE. In OIML mode, the scale must be in gross mode before it can be zeroed; pressing the ZERO key in net mode clears the tare.</li> <li>• OIML mode replaces the <i>Gross</i> annunciator with <i>Brutto</i>.</li> </ul> <p>The value specified for this parameter affects the function of the front panel TARE and ZERO keys. See Section 7.3 on page 44 for a complete description of TARE and ZERO key functions for each of the regulatory modes.</p> |
| <i>Level 3 submenus</i> |                                |  |
| DATEFMT                 | MMDDYY<br>DDMMYY<br>YYMMDD     | Specifies the format used to display or print the date.  |
| DATESEP                 | SLASH<br>DASH<br>SEMI          | Specifies the date separator character.  |
| DATESET                 | MMDDYY<br>DDMMYY<br>YYMMDD     | Specifies the current date. Use the numeric editing procedure shown in Figure 3-4 on page 15 to enter the date in the format specified on the DATEFMT parameter (MMDDYY, DDMMYY, or YYMMDD).   |
| TIMEFMT                 | 12HOUR<br>24HOUR               | Specifies the format used to display or print the time.  |
| TIMESEP                 | COLON<br>COMMA                 | Specifies the time separator character.  |
| TIMESET                 | hhmm                           | Specifies the current time. Use the numeric editing procedure shown in Figure 3-4 on page 15 to enter the time in the format specified on the TIMEFMT parameter (12- or 24-hour).  |

Table 3-6. Program Menu Parameters (Continued)

### 3.2.6 Print Format Menu

See Section 6.0 on page 39 for information about custom print formatting.

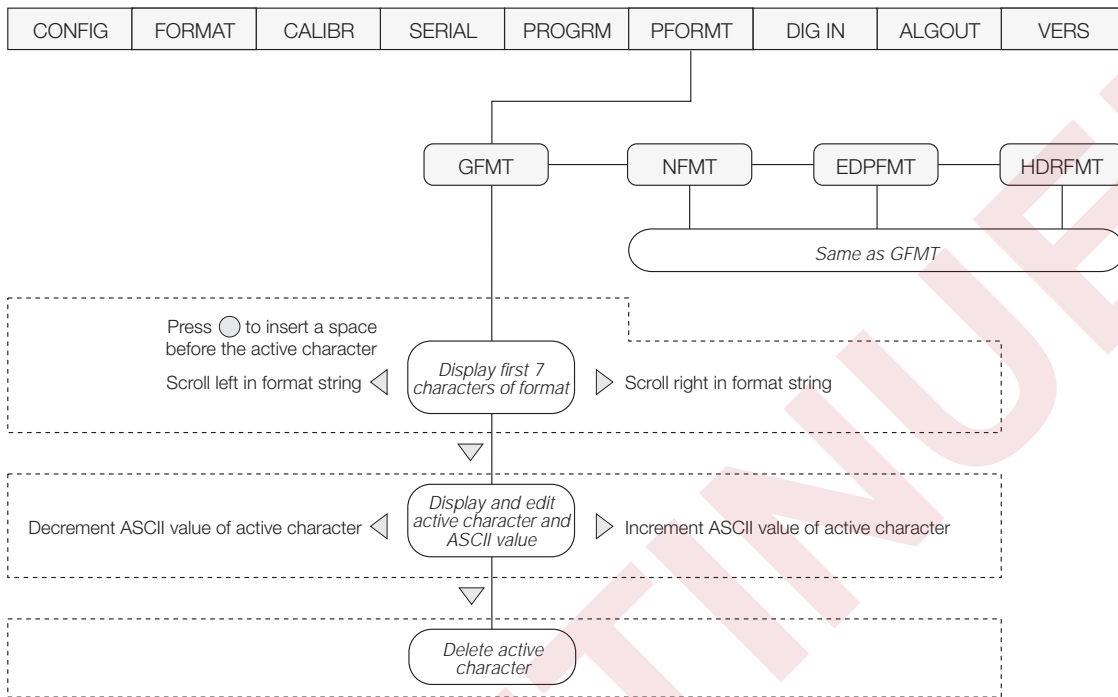


Figure 3-10. Print Format Menu

### 3.2.7 Digital Input Menu

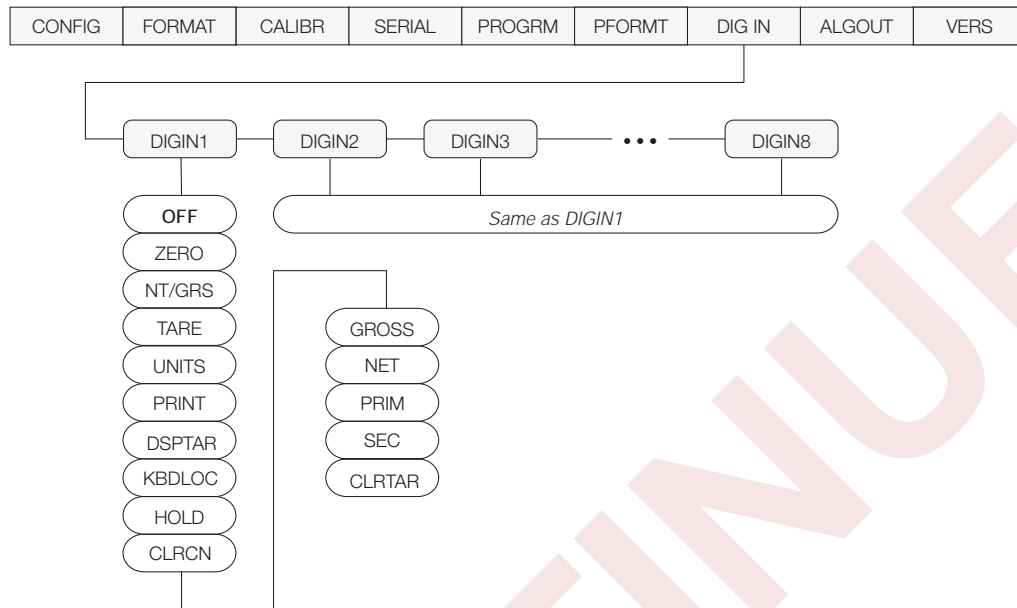


Figure 3-11. Digital Input Menu

| DIG IN Menu  |   |  |
|--|---|--|
| Parameter  | Choices   | Description  |
| <i>Level 2 submenus</i>  |   |  |
| DIGIN1<br>DIGIN2<br>DIGIN3<br>DIGIN4<br>DIGIN5<br>DIGIN6<br>DIGIN7<br>DIGIN8 | OFF<br>ZERO<br>NT/GRS<br>TARE<br>UNITS<br>PRINT<br>DSPTAR<br>KBDLOC<br>HOLD<br>CLRCN<br>GROSS<br>NET<br>PRIM<br>SEC<br>CLRTAR | Specifies the function activated by digital inputs 1–8. <ul style="list-style-type: none"> <li>• ZERO, NT/GRS (net/gross mode toggle), TARE, UNITS, and PRINT provide the same functions as the front panel keys. DSPTAR displays the current tare value.</li> <li>• KBDLOC locks the keyboard (indicator front panel) while the digital input is held low.</li> <li>• HOLD holds the current display. Releasing this input clears the running average filter.</li> <li>• CLRCN resets the consecutive number to the value specified on the CONSTUP parameter (PROGRAM menu).</li> <li>• GROSS, NET, PRIM, and SEC select gross, net, primary units, or secondary units display modes.</li> <li>• CLRTAR clears the current tare.</li> </ul> |

Table 3-7. Digital Input Menu Parameters

### 3.2.8 Analog Output Menu

The ALGOUT menu is used only if the analog output option is installed. If the analog output option is installed, configure all other indicator functions and calibrate the indicator before configuring the analog output. See Section 7.8 on page 50 for analog output calibration procedures.

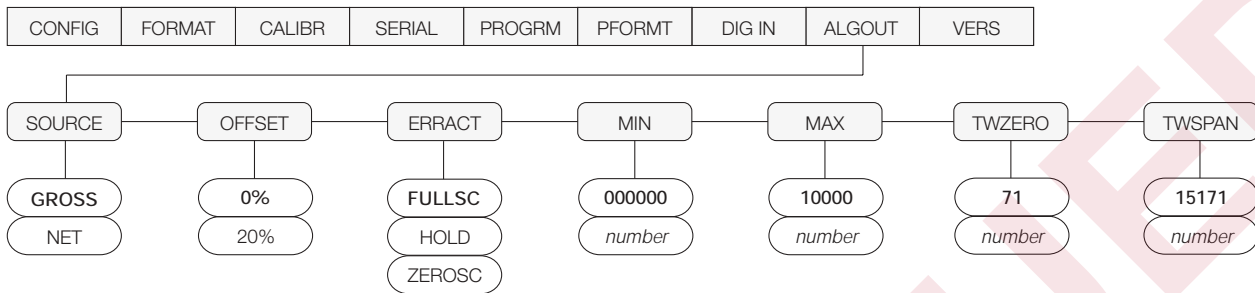


Figure 3-12. Analog Output Menu

| ALG OUT Menu            |                                 |   |
|-------------------------|---------------------------------|---|
| Parameter               | Choices                         | Description   |
| <i>Level 2 submenus</i> |                                 |   |
| SOURCE1                 | <b>GROSS</b><br>NET             | Specifies the source tracked by the analog output.  |
| OFFSET                  | <b>0%</b><br>20%                | Zero offset. Selects whether the analog output supplies voltage (0–10 V) or current (4–20 mA) output. Select 0% for 0–10 V output; select 20% for 4–20 mA output.   |
| ERRACT                  | <b>FULLSC</b><br>HOLD<br>ZEROSC | Error action. Specifies how the analog output responds to system error conditions. Possible values are:<br><br>FULLSC: Set to full value (10 V or 20 mA)<br>HOLD: Hold current value<br>ZEROSC: Set to zero value (0 V or 4 mA) |
| MIN                     | <b>000000</b><br><i>number</i>  | Specifies the minimum weight value tracked by the analog output. Specify a value in the range 0–9999999.  |
| MAX                     | <b>010000</b><br><i>number</i>  | Specifies the maximum weight value tracked by the analog output. Specify a value in the range 0–9999999.  |
| TWZERO                  | <b>71</b><br><i>number</i>      | Tweak zero. Adjust the analog output zero calibration. Use a multimeter to monitor the analog output value. Press and hold $\Delta$ or $\nabla$ to adjust the output.   |
| TWSPAN                  | <b>15171</b><br><i>number</i>   | Tweak span. Adjust the analog output span calibration. Use a multimeter to monitor the analog output value. Press and hold $\Delta$ or $\nabla$ to adjust the output.   |

Table 3-8. Analog Output Menu Parameters

### 3.2.9 Version Menu

The VERS menu is used to check the software version installed in the indicator. There are no parameters associated with the Version menu: when selected, the indicator displays the installed software version number.

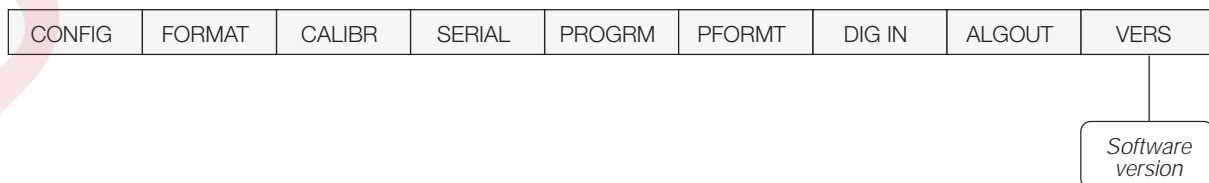


Figure 3-13. Version Menu



## 4.0 Calibration

The IQ plus 510 can be calibrated using the front panel, EDP commands, or the Revolution™ configuration utility. Each method consists of the following steps:

- Zero calibration
- Entering the test weight value
- Span calibration
- Optional five-point linearization
- Optional rezero calibration for test weights using hooks or chains.

The following sections describe the calibration procedure for each of the calibration methods.

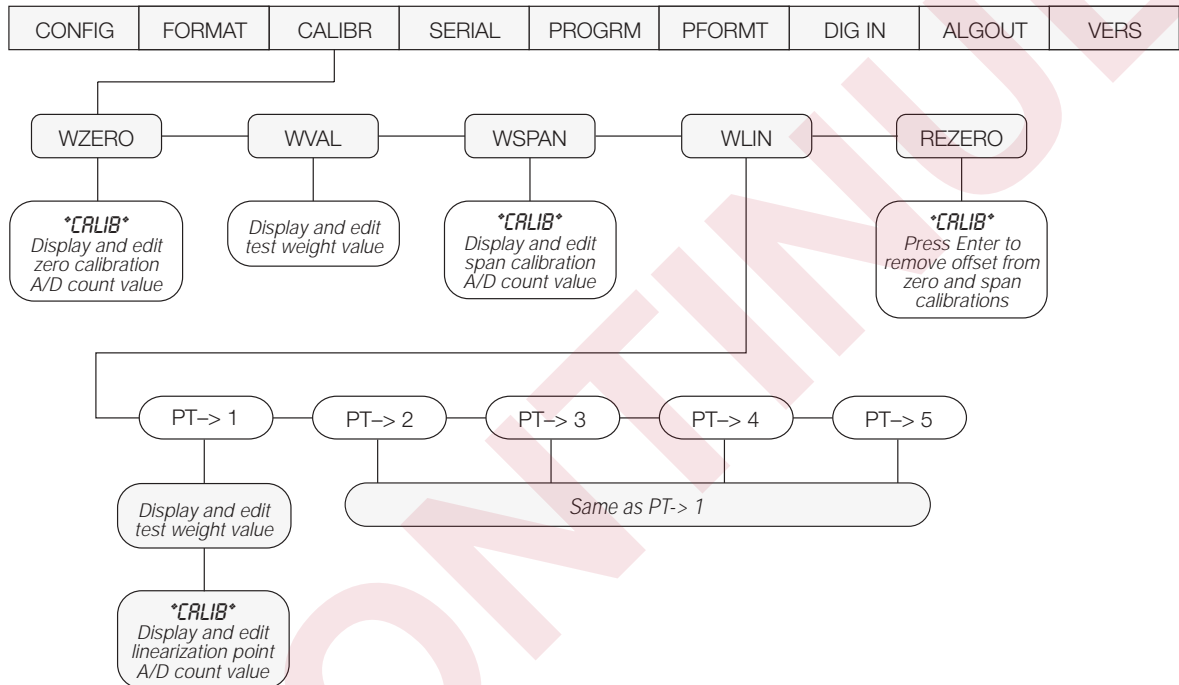


Figure 4-1. Calibration (CALIBR) Menu

### 4.1 Front Panel Calibration

To calibrate the indicator using the front panel, do the following:

1. Place the indicator in setup mode (display reads *CONFIG*) and remove all weight from the scale platform. If your test weights require hooks or chains, place the hooks or chains on the scale for zero calibration.
2. Press  $\triangleright$  until the display reads *CALIBR* (see Figure 4-1). Press  $\nabla$  to go to zero calibration (*WZERO*).
3. With *WZERO* displayed, press  $\bigcirc$  to calibrate zero. The indicator displays *\*CAL\** while calibration is in progress. When complete, the A/D count for the zero calibration is displayed. Press  $\bigcirc$  again to save the zero calibration value and go to the next prompt (*WVAL*).
4. With *WVAL* displayed, place test weights on the scale and press  $\bigcirc$  to show the test weight value. Use the procedure shown in Figure 4-2 to enter the actual test weight, then press  $\bigcirc$  to save the value and go to span calibration (*WSPAN*).
5. With *WSPAN* displayed, press  $\bigcirc$  to calibrate span. The indicator displays *\*CAL\** while calibration is in progress. When complete, the A/D count for the span calibration is displayed. Press  $\bigcirc$  again to save the span calibration value and go to the next prompt (*WLIN*).
6. Five-point linearization (using the *WLIN* parameter) provides increased scale accuracy by calibrating the indicator at up to five additional points between the zero and span calibrations.

Linearization is optional: if you choose not to perform linearization, skip the WLIN parameter; if linearization values have previously been entered, these values are reset to zero during calibration. To perform linearization, follow the procedure below:

With *WLIN* displayed, Press  $\nabla$  to go to the first linearization point (*PT-> 1*). Place test weights on the scale and press  $\circ$  or **ENTER**.

Use the procedure shown in Figure 4-2 to enter the actual test weight value, then press **ENTER** to calibrate. The indicator displays \**CAL*\* while calibration is in progress. When complete, the A/D count for the linear calibration is displayed. Press **ENTER** again to save the calibration value and go to the next prompt (*PT-> 2*).



When editing numeric values, press  $\triangleleft$  or  $\triangleright$  to change the digit selected. Press  $\triangle$  or  $\nabla$  to increment or decrement the value of the selected digit.

Press  $\circ$  to save the value entered and return to the level above.

Figure 4-2. Editing Procedure for Numeric Values

## 4.2 EDP Command Calibration

To calibrate the indicator using EDP commands, the indicator EDP port must be connected to a terminal or personal computer. See Section 2.3.2 on page 6 for EDP port pin assignments; see Section 5.0 on page 33 for more information about using EDP commands.

Once the indicator is connected to the sending device, do the following:

1. Place the indicator in setup mode (display reads *CONFIG*) and remove all weight from the scale platform. If your test weights require hooks or chains, place the hooks or chains on the scale for zero calibration.
2. Send the *WZERO* EDP command to calibrate zero. The indicator displays \**CAL*\* while calibration is in progress.
3. Place test weights on the scale and use the *WVAL* command to enter the test weight value in the following format:  
`WVAL=nnnnnn<CR>`
4. Send the *WSPAN* EDP command to calibrate span. The indicator displays \**CAL*\* while calibration is in progress.

Repeat for up to five linearization points. To exit the linearization parameters, press  $\triangle$  to return to *WLIN*.

7. The rezero function is used to remove a calibration offset when hooks or chains are used to hang the test weights.
  - If no other apparatus was used to hang the test weights during calibration, remove the test weights and press  $\triangle$  to return to the *CALIBR* menu.
  - If hooks or chains were used during calibration, remove these and the test weights from the scale. With all weight removed, press  $\circ$  to rezero the scale. This function adjusts the zero and span calibration values. The indicator displays \**CAL*\* while the zero and span calibrations are adjusted. When complete, the adjusted A/D count for the zero calibration is displayed. Press  $\circ$  to save the value, then press  $\triangle$  to return to the *CALIBR* menu.
8. Press  $\triangleleft$  until the display reads *CONFIG*, then press  $\triangle$  to exit setup mode.

5. Up to five linearization points can be calibrated between the zero and span calibration values. Use the following commands to set and calibrate a single linearization point:  
`WLIN.V1=nnnnn<CR>`  
`WLIN.C1<CR>`

The *WLIN.V1* command sets the test weight value (*nnnnn*) for linearization point 1. The *WLIN.C1* command calibrates the point. Repeat using the *WLIN.Vx* and *WLIN.Cx* commands as required for additional linearization points.

6. To remove an offset value, clear all weight from the scale, including hooks or chains used to hang test weights, then send the *REZERO* EDP command. The indicator displays \**CAL*\* while the zero and span calibrations are adjusted.
7. Send the *KUPARROW* or *KEXIT* EDP command to exit setup mode.

### 4.3 Revolution™ III Calibration

To calibrate the indicator using Revolution III, the indicator EDP port must be connected to a PC running the Revolution configuration utility.

Use the following procedure to calibrate the indicator:

1. Place the indicator in setup mode (display reads *CONFIG*) and remove all weight from the scale platform.
2. Select *Calibrate Indicator* from the Revolution III main menu.
3. On the Indicator Calibration display, select the indicator model (*IQ+510*) and communications port then click *OK*.
4. Revolution uploads calibration data from the indicator then presents the information in a display like that shown in Figure 4-3.



Figure 4-3. Revolution III Calibration Display

5. Enter the *Value of Test Weight* to be used for span calibration then click *START*.
6. A dialog box asks whether hooks or chains are used to hang calibration test weights. Click *Yes* or *No* to continue.
7. The Zero Calibration dialog box prompts you to remove all weight from the scale. Clear the scale and click *OK* to begin zero calibration. If your test weights require hooks or chains, place the hooks or chains on the scale for zero calibration.
8. When zero calibration is complete, the Span Calibration dialog box prompts you to place test weights on the scale for span calibration. Place test weights on the scale then click *OK*.
9. When span calibration is complete, a dialog box asks whether you wish to perform linear calibration. Click *Yes* to perform linear calibration for up to five linearization points, or click *No* to continue calibration with step 11.
10. On the Linear Calibration display, select the point (1–5) to calibrate, then click *Calibrate*. Place test weights on scale then click *OK*. When prompted, enter the test weight value then press *Enter*. Repeat for additional linearization points, then click *Exit* to return to the Indicator Calibration display.
11. If hooks or chains were used to hang test weights, the Rezero dialog box prompts you to remove weights from the scale. Remove the weights then click *OK*.  
If hooks or chains were not used in the calibration procedure, Revolution goes directly to step 12. Calibration is complete.
12. When calibration is complete, the *New Settings* fields of the Indicator Calibration display are filled in. Click *Exit* to save the new values and return to the Revolution main menu; to restore the previous calibration values (including linear calibration values), click *Restore Settings*.

## 4.4 More About Calibration

The following topics provide additional information about compensating for environmental factors (Section 4.4.1) and diagnostic information for determining expected zero and span coefficients.

### 4.4.1 Adjusting Final Calibration

Calibration may be affected by environmental factors including wind, vibration, and angular loading. For example, if the scale is calibrated with 1000 lb, a strain test may determine that at 2000 lb the calibration is 3 lb high. In this case, final calibration can be adjusted by tweaking WVAL to 998.5 lb. This adjustment provides a linear correction of 1.5 lb per 1000 lb.

To adjust the final calibration, return to the *WVAL* prompt and press  $\odot$  to show the test weight value. Press  $\triangle$  or  $\nabla$  to adjust calibration up or down. Press  $\odot$  to save the value, then press  $\triangle$  to return to the CALIBR menu.

### 4.4.2 Zero Deadload A/D Counts

Table 4-1 lists the ideal A/D counts that result from input signals of 0–45 mV with zero deadload. Actual values will typically be higher than the values shown in Table 4-1.

| Input Signal (mV) | Raw A/D Count |
|-------------------|---------------|
| 0                 | 105 000       |
| 1                 | 126 000       |
| 2                 | 147 000       |
| 3                 | 168 000       |
| 4                 | 189 000       |
| 5                 | 210 000       |
| 6                 | 231 000       |
| 7                 | 252 000       |
| 8                 | 273 000       |
| 9                 | 294 000       |
| 10                | 315 000       |
| 15                | 420 000       |
| 20                | 525 000       |
| 30                | 735 000       |
| 45                | 1 050 000     |

Table 4-1. Ideal A/D Raw Counts

### 4.4.3 Calculating the Span Coefficient

The span coefficient value displayed by the WSPAN parameter can be calculated using the following formula:

$$(21000 * \text{mV\_signal\_input}) + \text{zero\_coefficient}$$

where *mV\_signal\_input* is the change in the signal input when the test weight is applied and the *zero\_coefficient* is the WZERO value. Actual values typically vary from the calculated value.

## 5.0 EDP Commands

The IQ plus 510 indicator can be controlled by a personal computer or remote keyboard connected to the indicator EDP port. Control is provided by a set of EDP commands that can simulate front panel key press functions, display and change setup parameters, and perform reporting functions. The EDP port provides the capability to print configuration data or to save that data to an attached personal computer. This section describes the EDP command set and procedures for saving and transferring data using the EDP port.

**NOTE:** The full duplex RS-232 printer port provided with Version 2.0 and later hardware can also be used to process EDP commands.

### 5.1 The EDP Command Set

The EDP command set can be divided into five groups: key press commands, reporting commands, the RESETCONFIGURATION special function command, parameter setting commands, and transmit weight data commands.

When the indicator processes an EDP command, it responds with the message *OK*. The *OK* response verifies that the command was received and has been executed. If the command is unrecognized or cannot be executed, the indicator responds with *??*.

The following sections list the commands and command syntax used for each of these groups.

#### 5.1.1 Key Press Commands

Key press EDP commands (see Table 5-1) simulate pressing the keys on the front panel of the indicator. These commands can be used in both setup and weighing mode. Several of the commands serve as “pseudo” keys, providing functions that are not represented by a key on the front panel.

For example, to enter a 15-pound tare weight using EDP commands:

1. Type K1 and press ENTER (or RETURN).
2. Type K5 and press ENTER.
3. Type KTARE and press ENTER.

| Command     | Function  |
|-------------|---|
| KZERO       | In normal mode, press the ZERO key  |
| KGROSSNET   | In weighing mode, press the GROSS/NET key   |
| KGROSS      | Go to gross mode (pseudo key)   |
| KNET        | Go to net mode (pseudo key)   |
| KTARE       | Press the TARE key  |
| KUNITS      | In weighing mode, press the UNITS key   |
| KPRIM       | Go to primary units (pseudo key)  |
| KSEC        | Go to secondary units (pseudo key)  |
| KPRINT      | In weighing mode, press the PRINT key   |
| KLEFTARROW  | In setup mode, move left in the menu  |
| KRIGHTARROW | In setup mode, move right in the menu   |
| KUPARROW    | In setup mode, move up in the menu  |
| KDOWNARROW  | In setup mode, move down in the menu  |
| K0          | Press number 0 (zero)   |
| K1          | Press number 1  |
| K2          | Press number 2  |
| K3          | Press number 3  |
| K4          | Press number 4  |
| K5          | Press number 5  |
| K6          | Press number 6  |
| K7          | Press number 7  |
| K8          | Press number 8  |
| K9          | Press number 9  |
| KDOT        | Press the decimal point (.)   |
| KENTER      | Press the ENTER key   |
| KEXIT       | Exit setup mode   |
| KCLRTAR     | Clear tare from system (pseudo key)   |
| KCLRCN      | Reset consecutive number (pseudo key)   |
| KCLRNV      | Clear non-volatile RAM  |
| KLOCK       | Lock specified front panel key. For example, to lock the UNITS key, enter KLOCK=KUNITS.       |
| KUNLOCK     | Unlock specified front panel key. For example, to unlock the PRINT key, enter KUNLOCK=KPRINT. |

Table 5-1. EDP Key Press Commands

### 5.1.2 Reporting Commands

Reporting commands (see Table 5-2) send specific information to the EDP port. These commands can be used in both setup mode and normal mode.

| Command | Function   |
|---------|--|
| DUMPALL | List all parameter values  |
| VERSION | Write IQ plus 510 software version   |
| P       | Write current displayed weight with units identifier. See Section 7.2 on page 43 for more information. |
| ZZ      | Write current weight and annunciator status. See Section 7.2 on page 43 for more information.          |
| S       | Write one frame of stream format   |

Table 5-2. EDP Reporting Commands

### 5.1.3 The RESETCONFIGURATION Command

The RESETCONFIGURATION command can be used in setup mode to restore all configuration parameters to their default values.

This command is equivalent to using the DEFLT function on the TEST menu. See Section 7.9 on page 51 for more information about test mode and using the TEST menu.

**NOTE:** All load cell calibration settings are lost when the RESETCONFIGURATION command is run.

### 5.1.4 Parameter Setting Commands

Parameter setting commands allow you to display or change the current value for a particular configuration parameter (Tables 5-3 through 5-10).

Current configuration parameter settings can be displayed in either setup mode or normal mode using the following syntax:

*command*<ENTER>

Most parameter values can be changed in setup mode only. Use the following command syntax when changing parameter values:

*command=value*<ENTER>

where *value* is either a number or a parameter value. Use no spaces before or after the equal (=) sign. If you type an incorrect command, the display reads ??.

For example, to set the motion band parameter to 5, type the following:

*MOTBAND=5D*<ENTER>

For parameters with selectable values, enter the command and equal sign followed by a question mark:

*command=?*<ENTER>

to see a list of those values. The indicator must be in setup mode to use this function.

| Command              | Description                       | Values  |
|----------------------|-----------------------------------|---|
| GRADS                | Graduations                       | 1-9999999   |
| ZTRKBND              | Zero track band                   | OFF, 0.5D, 1D, 3D                                     |
| ZRANGE               | Zero range                        | 1.9%, 100%  |
| MOTBAND              | Motion band                       | 1D, 2D, 3D, 5D, 10D, 20D, OFF                         |
| OVRLOAD              | Overload                          | FS+2%, FS+1D, FS+9D, FS                               |
| SMPRAT               | Sample rate                       | 30HZ, 3.75HZ, 7.5HZ, 15HZ                             |
| DIGFLTR1<br>DIGFLTR2 | Digital filtering                 | 1, 2, 4, 8, 16, 32, 64, 128, 256                      |
| RATLTRAP             | Rattletrap filtering              | OFF, ON   |
| DFSENS               | Digital filter cutout sensitivity | 2OUT, 4OUT, 8OT, 16OUT, 32OUT, 64OUT, 128OUT          |
| DFTHRH               | Digital filter cutout threshold   | NONE, 2DD, 5DD, 10DD, 20DD, 50DD, 100DD, 200DD, 250DD |
| ALGFLTR              | Analog filter                     | OFF, 2HZ, 8HZ   |
| PWRUPMD              | Power up mode                     | GO, DELAY   |
| TAREFN               | Tare function                     | BOTH, NOTARE, PBTARE, KEYED                           |

Table 5-3. CONFIG EDP Commands

| Command    | Description                       | Values   |
|------------|-----------------------------------|--|
| PRI.DECPNT | Primary units decimal position    | 8.888888, 88.888888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800 |
| PRI.DSPDIV | Primary units display divisions   | 1D, 2D, 5D   |
| PRI.UNITS  | Primary units                     | LB, KG, G, OZ, TN, T, GN, TROYOZ, TROYLB, LT, NONE                                     |
| SEC.DECPNT | Secondary units decimal position  | 8.888888, 88.888888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800 |
| SEC.DSPDIV | Secondary units display divisions | 1D, 2D, 5D   |
| SEC.UNITS  | Secondary units                   | LB, KG, G, OZ, TN, T, GN, TROYOZ, TROYLB, LT, NONE                                     |
| SEC.MULT   | Secondary units multiplier        | 0.00000-99999.99   |
| DECfmt     | Decimal format                    | DOT, COMMA   |
| DSPRATE    | Display rate                      | 250MS, 500MS, 750MS, 1SEC, 1500MS, 2SEC, 2500MS, 3SEC, 4SEC, 6SEC, 8SEC                |

Table 5-4. FORMAT EDP Commands

| Command         | Description   | Values                   |
|-----------------|---|--------------------------|
| WZERO           | Zero calibration                                    | —                        |
| WWAL            | Test weight value                                   | <i>test_weight_value</i> |
| WSPAN           | Span calibration                                    | —                        |
| WLIN.F1-WLIN.F5 | Actual raw count value for linearization points 1-5 | —                        |
| WLIN.V1-WLIN.V5 | Test weight value for linearization points 1-5      | <i>test_weight_value</i> |
| REZERO          | Rezero  | —                        |
| LC.CD           | Set deadload coefficient                            | <i>value</i>             |
| LC.CW           | Set span coefficient                                | <i>value</i>             |

Table 5-5. CALIBR EDP Commands

| Command     | Description                        | Values                                  |
|-------------|------------------------------------|---|
| EDP.BAUD    | EDP port baud rate                 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| EDP.BITS    | EDP port data bits/parity          | 8NONE, 7EVEN, 7ODD                      |
| EDP.TERMIN  | EDP port termination character     | CR/LF, CR                               |
| EDP.EOLDLY  | EDP port end-of-line delay         | 0-255 (0.1-second intervals)            |
| EDP.HANDSHK | EDP port handshaking               | OFF, ON                                 |
| EDP.ADDRESS | EDP port RS-485 address            | 0, 01-255                               |
| EDP.BUS     | EDP port bus network enable        | OFF, ON                                 |
| EDP.STREAM  | EDP port streaming                 | OFF, ON                                 |
| PRN.BAUD    | Printer port baud rate             | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| PRN.BITS    | Printer port data bits/parity      | 8NONE, 7EVEN, 7ODD                      |
| PRN.TERMIN  | Printer port termination character | CR/LF, CR                               |
| PRN.EOLDLY  | Printer port end-of-line delay     | 0-255 (0.1-second intervals)            |
| PRN.HANDSHK | Printer port handshaking           | OFF, ON                                 |
| PRN.BUS     | Printer port bus network enable    | OFF, ON                                 |
| PRN.STREAM  | Printer port streaming             | OFF, ON                                 |
| PRNDEST     | Print destination                  | EDP, PRN, BOTH                          |

Table 5-6. SERIAL EDP Commands

| Command | Description                       | Values   |
|---------|-----------------------------------|--|
| SD      | Set date                          | MMDDYY, DDMMYY, YYMMDD (enter using DATEFMT specified) |
| ST      | Set time                          | hhmm (enter using 24-hour format)                      |
| DATEFMT | Date format                       | MMDDYY, DDMMYY, YYMMDD                                 |
| DATESEP | Date separator                    | SLASH, DASH, SEMI                                      |
| TIMEFMT | Time format                       | 12HOUR, 24HOUR   |
| TIMESEP | Time separator                    | COLON, COMMA   |
| CONSNUM | Consecutive numbering             | 0-9 999 999  |
| CONSTUP | Consecutive number start-up value | 0-9 999 999  |
| UID     | Unit identifier                   | 0-9 999 999  |
| KYBDLK  | Keyboard lock (disable keypad)    | OFF, ON  |
| ZERONLY | Disable all keys except ZERO      | OFF, ON  |
| REGULAT | Regulatory compliance             | NONE, OIML, NTEP, CANADA                               |

Table 5-7. PROGRM EDP Commands

| Command | Description                      | Values  |
|---------|----------------------------------|---|
| GFMT    | Gross demand print format string | See Section 6.0 on page 39 for detailed information |
| NFMT    | Net demand print format string   |   |
| EDPFMT  | EDP demand print format string   |   |
| HDRFMT  | Header format string             |   |

Table 5-8. PFORMT EDP Commands



| Command  | Description            | Values  |
|--|------------------------|---|
| DIGIN1<br>DIGIN2<br>DIGIN3<br>DIGIN4<br>DIGIN5<br>DIGIN6<br>DIGIN7<br>DIGIN8 | Digital input function | OFF, ZERO, NT/GRS, TARE, UNITS, PRINT, DSPTAR, KBDLOC, HOLD, CLRCN, GROSS, NET, PRIM, SEC, CLRTAR |

Table 5-9. DIG IN EDP Commands

| Command | Description           | Values               |
|---------|-----------------------|----------------------|
| SOURCE1 | Analog output source  | GROSS, NET           |
| OFFSET  | Zero offset           | 0%, 20%              |
| ERRACT  | Error action          | FULLSC, HOLD, ZEROSC |
| MIN     | Minimum value tracked | 0-9 999 999          |
| MAX     | Maximum value tracked | 0-9 999 999          |
| ZERO1   | Zero calibration      | 0-16 383             |
| SPAN1   | Span calibration      | 0-16 383             |

Table 5-10. ALGOUT EDP Commands

### 5.1.5 Normal Mode Commands

The normal mode commands (see Table 5-11) transmit data to the EDP port on demand. The SX command is valid only in normal operating mode; all other commands are valid in either setup or normal mode.

| Command | Description                                  | Response Format  |
|---------|--|--|
| CONSNUM | Set consecutive number                       | 0-9 999 999  |
| SD      | Set date                                     | MMDDYY, DDMMYY, YYMMDD (enter using DATEFMT specified)   |
| ST      | Set time                                     | hhmm (enter using 24-hour format)  |
| SX      | Start EDP streaming                          | OK or ??   |
| EX      | Stop EDP streaming                           | OK or ??   |
| DX      | Start streaming raw A/D counts               | OK or ??   |
| RS      | Reset system                                 | —  |
| XG      | Transmit gross weight in displayed units     | nnnnn UU<br>where nnnnn is the weight value, UU is the units.  |
| XN      | Transmit net weight in displayed units       |  |
| XT      | Transmit tare weight in displayed units      |  |
| XG2     | Transmit gross weight in non-displayed units |  |
| XN2     | Transmit net weight in non-displayed units   |  |
| XT2     | Transmit tare weight in non-displayed units  |  |
| XE      | Query system error conditions                | nnnnn<br>See Section 7.1.2 on page 43 for detailed information about the XE command response format. |

Table 5-11. Normal Mode EDP Commands

## 5.2 Saving and Transferring Data

Connecting a personal computer to the IQ plus 510 EDP port allows you to save indicator configuration data to the PC or to download configuration data from the PC to an indicator. The following sections describe the procedures for these save and transfer operations.

### 5.2.1 Saving Indicator Data to a Personal Computer

Configuration data can be saved to a personal computer connected to the EDP port. The PC must be running a communications program such as PROCOMMPLUS®. See Section 2.3.2 on page 6 for information about serial communications wiring and EDP port pin assignments.

When configuring the indicator, ensure that the values set for the BAUD and BITS parameters on the SERIAL menu match the baud rate, bits, and parity settings configured for the serial port on the PC.

To save all configuration data, send the DUMPALL EDP command to the indicator. The IQ plus 510 responds by sending all configuration parameters to the PC as ASCII-formatted text.

### 5.2.2 Downloading Configuration Data from PC to Indicator

Configuration data saved on a PC or floppy disk can be downloaded from the PC to an indicator. This procedure is useful when a number of indicators with similar configurations are set up or when an indicator is replaced.

To download configuration data, connect the PC to the EDP port as described in Section 5.2.1. Place the indicator in setup mode and use the PC communications software to send the saved configuration data to the indicator. When transfer is complete, calibrate the indicator as described in Section 4.0 on page 29.

**NOTE:** Calibration settings are included in the configuration data downloaded to the indicator. For non-legal-for-trade applications, if the receiving indicator is a direct replacement for another IQ plus 510 and the attached scale is not changed, recalibration is not required.

## 6.0 Print Formatting

The IQ plus 510 provides three print formats, GFMT, NFMT, and EDPFMT, that determine the format of the printed output when the PRINT key is pressed or when a KPRINT EDP command is received. Each print format can be customized to include up to 300 characters of information.

A fourth format, HDRFMT, allows specification of up to 300 characters of ticket header information for use on the GFMT, NFMT, and EDPFMT tickets. The contents of the HDRFMT format can be inserted into any other ticket format using the <AE> formatting command.

If there is no tare in the system, the GFMT print format is used; if there is a tare in the system, NFMT is used. If PRNDEST is set to BOTH (SERIAL menu), the GFMT or NFMT print format is sent to the printer port, the EDPFMT print format to the EDP port.

You can use the indicator front panel (PFORMT menu), EDP commands, or the Revolution™ configuration utility to customize the print formats.

### 6.1 Print Formatting Commands

Table 6-1 lists commands you can use to format the gross and net print formats. Commands included in the format strings must be enclosed between < and > delimiters. Any characters outside of the delimiters are printed as text on the ticket. Text characters can include any ASCII character that can be printed by the output device.

| Command  | Description  |
|--|--|
| <G>  | Gross weight in displayed units  |
| <G2>   | Gross weight in non-displayed units                                    |
| <N>  | Net weight in displayed units  |
| <N2>   | Net weight in non-displayed units                                      |
| <T>  | Tare weight in displayed units   |
| <T2>   | Tare weight in non-displayed units                                     |
| <AE>   | Ticket header (HDRFMT)   |
| <TI>   | Time   |
| <DA>   | Date   |
| <TD>   | Time and date  |
| <ID>   | ID number  |
| <CN>   | Consecutive number   |
| <NL $nn$ >   | New line ( $nn$ = number of termination (<CR/LF> or <CR>) characters)* |
| <SP $nn$ >   | Space ( $nn$ = number of spaces)*                                      |
| <SU>   | Toggle weight data format (formatted/unformatted)**                    |
| Gross, net, and tare weights are 9 digits in length, including sign (10 digits with decimal point), followed by a space and a two-digit units identifier. Total field length with units identifier is 12 (or 13) characters. |  |
| ID and consecutive number (CN) fields are 1–7 characters in length, as required.   |  |

Table 6-1. Print Format Commands

| Command | Description   |
|---------|---|
|         | Ticket header (AE) inserts information specified for the HDRFMT header format.  |
|         | * If $nn$ is not specified, 1 is assumed. Value must be in the range 1–99.  |
|         | ** After receiving an SU command, the indicator sends unformatted data until the next SU command is received. Unformatted data omits decimal points, leading and trailing characters. |

Table 6-1. Print Format Commands (Continued)

The default print formats use only the new line (<NL>, <NL2>) and gross, net, and tare weight commands in displayed units (<G>, <N>, and <T>). The default IQ plus 510 print formats are shown in Table 6-2.

| Format   | Default Format String                               |
|--|---|
| GFMT   | GROSS<G><NL>  |
| NFMT   | GROSS<G><NL>TARE<SP><T><NL>NET<SP2><N><NL>          |
| EDPFMT   | GROSS<G><NL>  |
| HDRFMT   | COMPANY NAME<NL>STREET ADDRESS<NL>CITY, ST ZIP<NL2> |
| NOTE: In OIML and CANADA modes, the letters PT (preset tare) are automatically inserted after the printed tare weight. |   |

Table 6-2. Default Print Formats

#### NOTES:

- The <G2>, <N2>, and <T2> commands listed in Table 6-1 print the gross, net, and tare weights in non-displayed units—that is, in the units *not* currently displayed on the indicator.
- ID numbers included in the print format string (<ID> command) must be set using the either the UID parameter on the PROGRAM menu or the UID EDP command.

## 6.2 Customizing Print Formats

The following sections describe procedures for customizing the IQ plus 510 print formats using the EDP port, the front panel (PFORMT menu), and the Revolution configuration utility.

### 6.2.1 Using the EDP Port

With a personal computer, terminal, or remote keyboard attached to the IQ plus 510 EDP port, you can use the EDP command set to customize the print format strings.

To view the current setting of a format string, type the name of the string (HDRFMT, GFMT, NFMT, or EDPFMT) and press ENTER. For example, to check the current configuration of the GFMT format, type GFMT and press ENTER. The indicator responds by sending the current configuration for the gross format:

```
GFMT=<G> GROSS<NL>
```

To change the format, use the HDRFMT, GFMT, NFMT, or EDPFMT EDP command followed by an equals sign (=) and the modified print format string. For example, to add the name and address of a company to the gross format, you could send the following EDP command:

```
GFMT=MOE'S DUMP<NL>2356 EAST HIGHWAY  
ROAD<NL>SMALLTOWN<NL2><G> GROSS<NL>
```

A ticket printed using this format might look like the following:

```
MOE'S DUMP  
2356 EAST HIGHWAY ROAD  
SMALLTOWN
```

```
1345 LB GROSS
```

The ticket above could also be formatted by specifying the company address information in the HDRFMT ticket format, then substituting the <AE> command for the address in the GFMT ticket format:

```
HDRFMT=MOE'S DUMP<NL>2356 EAST HIGHWAY  
ROAD<NL>SMALLTOWN<NL2>
```

```
GFMT=<AE><G> GROSS<NL>
```

### 6.2.2 Using the Front Panel

If you have no access to equipment for communication through the EDP port or are working at a site where such equipment cannot be used, you can use the PFORMT menu (see Figure 6-1) to customize the print formats.

Using the PFORMT menu, you can edit the print format strings by changing the decimal values of the ASCII characters in the format string.

#### NOTES:

- Lower-case letters and some special characters cannot be displayed on the IQ plus 510 front panel (see the ASCII character chart on page 46) and are shown as blanks. The IQ plus 510 can send or receive any ASCII character; the character printed depends on the particular ASCII character set implemented for the receiving device.
- Because commas and periods are shown as part of the digit on the front panel, display and displayed position of commas entered into a print format may not reflect the actual printed output.

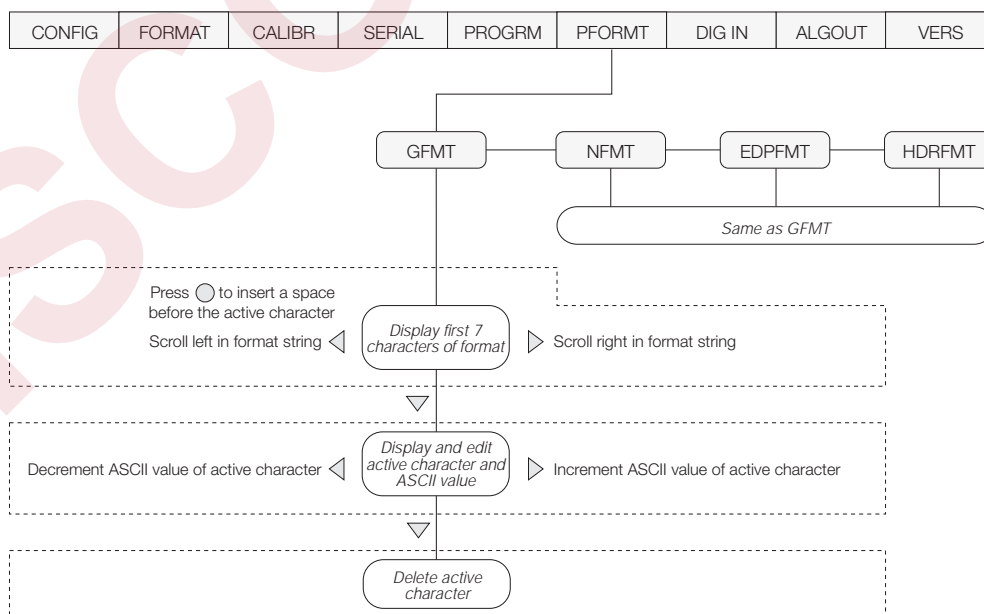


Figure 6-1. PFORMT Menu, Showing Alphanumeric Character Entry Procedure

### 6.2.3 Using Revolution III

The Revolution III configuration utility provides a print formatting grid with a tool bar. The grid allows you to construct the print format without the formatting commands (<NL> and <SP>) required by the front panel or EDP command methods. Using Revolution III, you can type text directly into the grid, then select weight value fields from the tool bar and place them where you want them to appear on the printed ticket.

Figure 6-2 shows an example of the Revolution III print formatting grid.

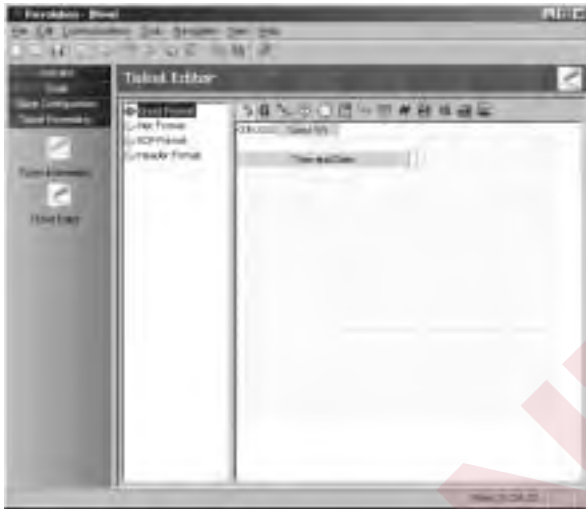


Figure 6-2. Revolution III Print Format Grid

## 7.0 Appendix

### 7.1 Error Messages

The IQ plus 510 indicator provides a number of error messages. When an error occurs, the message is shown on the indicator display. Error conditions can also be checked remotely by using the XE EDP command as described in Section 7.1.2.

#### 7.1.1 Displayed Error Messages

The IQ plus 510 provides a number of front panel error messages to assist in problem diagnosis. Table 7-1 lists these messages and their meanings.

| Error Message | Description                             | Solution  |
|---------------|---|---|
| E EEROM       | EEPROM physical error                   | Call RLWS Service.  |
| E VIREE       | Virgin EEPROM                           | Use TEST menu to perform DEFLT (restore defaults) procedure, then recalibrate load cells.                                   |
| E PCKSM       | Parameter checksum error                |   |
| E LCKSM       | Load cell calibration checksum error    | Recalibrate load cells.   |
| E ACKSM       | A/D calibration checksum error          | A/D converter requires recalibration. Call RLWS Service.  |
| E FCKSM       | Print format checksum error             | Use TEST menu to perform DEFLT (restore defaults) procedure.  |
| E IDATA       | Internal RAM data error                 | Call RLWS Service.  |
| E XDATA       | External RAM data error                 |   |
| E A/D         | A/D physical error                      |   |
| E REF         | A/D reference error                     | A/D converter requires recalibration. Call RLWS Service.  |
| REG ERR       | Non-volatile RAM (NVRAM) register error | Battery weak or not installed. Replace battery then use TEST menu to perform CLR NV (clear non-volatile storage) procedure. |
| TAR ERR       | Tare register checksum error            | Acquire tare, acquire zero, or reset configuration.   |
| PWRFAIL       | Power failure                           | Input voltage too low.  |
| OVERFL        | Overflow error                          | Weight value too large to be displayed.   |
| -----         | Gross > overload limit                  | Gross value exceeds overload limit. Check configuration.  |
| _____         | A/D underrange                          | A/D reading < -4 mV. Check scale for binding or damage.   |

Table 7-1. IQ plus 510 Error Messages

### 7.1.2 Using the XE EDP Command

The XE EDP command can be used to remotely query the IQ plus 510 for the error conditions shown on the front panel. The XE command returns a decimal number representing any existing error conditions.

If more than one error condition exists, the number returned is the sum of the values representing the error conditions (see Table 7-2). For example, if the XE command returns the number 1040, this value represents the sum of an A/D reference error (1024) and an A/D calibration checksum error (16).

| Error Code | Description                          | Binary Value        |
|------------|--------------------------------------|---------------------|
| 0          | No error                             | 0000 0000 0000 0000 |
| 1          | EEPROM physical error                | 0000 0000 0000 0001 |
| 2          | Virgin EEPROM                        | 0000 0000 0000 0010 |
| 4          | Parameter checksum error             | 0000 0000 0000 0100 |
| 8          | Load cell calibration checksum error | 0000 0000 0000 1000 |
| 16         | A/D calibration checksum error       | 0000 0000 0001 0000 |
| 32         | Print format checksum error          | 0000 0000 0010 0000 |
| 64         | Internal RAM data error              | 0000 0000 0100 0000 |
| 128        | External RAM data error              | 0000 0000 1000 0000 |
| 256        | NV register checksum error           | 0000 0001 0000 0000 |
| 512        | A/D physical error                   | 0000 0010 0000 0000 |
| 1024       | A/D reference error                  | 0000 0100 0000 0000 |
| 2048       | Tare register error                  | 0000 1000 0000 0000 |
| 4096       | <i>not assigned</i>                  | 0001 0000 0000 0000 |
| 8192       | A/D underrange                       | 0010 0000 0000 0000 |
| 16384      | Power failure                        | 0100 0000 0000 0000 |
| 32768      | Gross > overload limit               | 1000 0000 0000 0000 |

Table 7-2. Error Codes Returned on XE Command

## 7.2 Status Messages

Two EDP commands, P and ZZ, can be used to provide status about the indicator.

- The P EDP command returns whatever is currently shown in the indicator's primary display area.
- The ZZ EDP command returns whatever is currently shown in both the primary and secondary displays. Depending on the type of device used to receive data from the indicator, the standstill and center of zero symbols may be shown as spaces or as special characters. The ZZ command returns information in the following format:

*PPPPPPP uu sssssssssssssss*

where:

- *PPPPPPP* is the information shown on the primary display
- *uu* is the 2-digit units annunciator
- *ssssssssssssss* is the contents of the secondary display

If the indicator is in an underrange or overload condition, the weight value is replaced with &&&&&& (overload) or :::: (underrange).

### 7.3 TARE and ZERO Key Functions

The function of the front panel TARE and ZERO keys depends on the value specified for the REGULAT parameter on the PROGRM menu. Table 7-3 describes the function of these keys for each of the regulatory modes.

| REGULAT<br>Parameter Value | Weight on Scale  | Tare in System | Front Panel Key Function |                  |
|----------------------------|------------------|----------------|--------------------------|------------------|
|                            |                  |                | TARE                     | ZERO             |
| NTEP                       | zero or negative | no             | <i>no action</i>         | ZERO             |
|                            |                  | yes            | CLEAR TARE               |                  |
|                            | positive         | no             | TARE                     |                  |
|                            |                  | yes            | TARE                     |                  |
| CANADA                     | zero or negative | no             | <i>no action</i>         | ZERO             |
|                            |                  | yes            | CLEAR TARE               |                  |
|                            | positive         | no             | TARE                     |                  |
|                            |                  | yes            | <i>no action</i>         |                  |
| OIML                       | zero or negative | no             | <i>no action</i>         | ZERO             |
|                            |                  | yes            | CLEAR TARE               |                  |
|                            | positive         | no             | TARE                     | ZERO             |
|                            |                  | yes            | TARE                     | <i>no action</i> |
| NONE                       | zero or negative | no             | TARE                     | ZERO             |
|                            |                  | yes            | CLEAR TARE               |                  |
|                            | positive         | no             | TARE                     |                  |
|                            |                  | yes            | CLEAR TARE               |                  |

Table 7-3. TARE and ZERO Key Functions for REGULAT Parameter Settings



## 7.4 Data Formats

### 7.4.1 Continuous Output Serial Data Format

If continuous transmission is configured for the EDP or printer port (STREAM parameter on the SERIAL menu), the IQ plus 510 sends data using the Consolidated Controls serial data format shown in Figure 7-1:

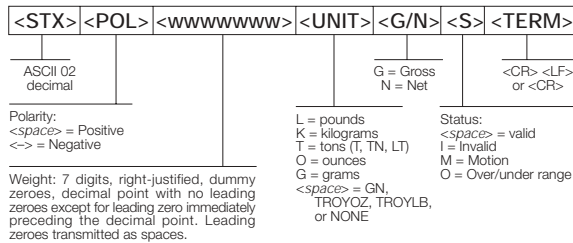


Figure 7-1. Continuous Output Serial Data Format

### 7.4.2 Demand Output Serial Data Format

When demand mode is configured for the EDP or printer port in the setup menus (PRNDEST on the SERIAL menu), the IQ plus 510 uses a data string formatted for a basic ticket printout. The particular ticket format printed depends on the indicator configuration.

You can use the EDP port or keypad to fully customize the ticket to work with a wide variety of printers, scoreboard displays, and other remote equipment. See Section 6.0 on page 39 for more information on custom print formats.

### 7.4.3 RS-485 Data Formats

The IQ plus 510 has a built-in RS-485 software protocol which is enabled when you assign a non-zero address to the indicator. Valid RS-485 addresses must be in the range 1–255; the address is specified on the ADDRESS parameter on the SERIAL menu.

All remote commands are initiated using the data format shown in Figure 7-2:

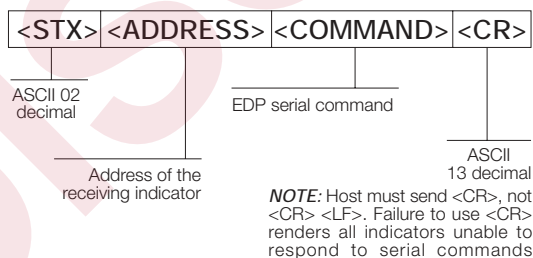


Figure 7-2. RS-485 Send Data Format

If the initiating device address matches the port address of an IQ plus 510 on the RS-485 network, that indicator responds. For example, with demand outputs, or in response to a KPRINT command, the responding indicator uses the format shown in Figure 7-3:

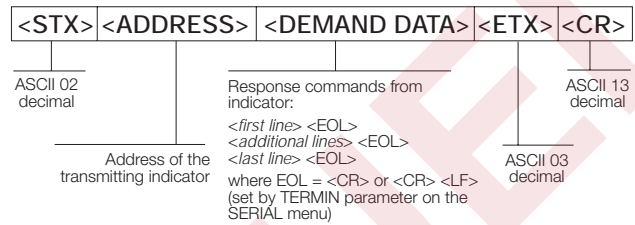


Figure 7-3. RS-485 Respond Data Format

**Example:** To send the KPRINT command from an ASCII terminal to an indicator at address 65 (decimal) on the RS-485 network, use the format shown in Figure 7-2.

- The keyboard equivalent for the start-of-text (STX) character is CONTROL-B (see Table 7-4 on page 46).
- The indicator address (65) is represented by an upper case “A”.
- The carriage return (CR) character is generated by pressing the ENTER key.

Therefore, to send the KPRINT command to the indicator at address 65, enter the following at the terminal: CONTROL-B, A, K, P, R, I, N, T, ENTER.

The indicator responds with the format shown in Figure 7-3:

```
<STX> A SCALE #1 <EOL>
      GROSS 1699 LB<EOL>
      08/20/1998 10:05 AM<EOL>
<ETX> <CR>
```

If continuous transmission is configured for the EDP port (STREAM parameter on the SERIAL menu), the IQ plus 510 sends data using the data format shown in Figure 7-4:

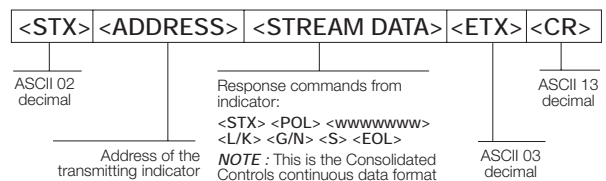


Figure 7-4. RS-485 Continuous Data Format

## 7.5 ASCII Character Chart

Use the decimal values for ASCII characters listed in Tables 7-4 and 7-5 when specifying print format strings on the IQ plus 510 PFORMAT menu. The actual character printed depends on the character mapping used by the output device.

The IQ plus 510 can send or receive any ASCII character value (decimal 0–255). Due to limitations of the indicator display, some characters cannot be shown.

| Control          | ASCII | Dec | Hex | ASCII | Dec | Hex | ASCII | Dec | Hex | ASCII | Dec | Hex |
|------------------|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|
| Ctrl-@           | NUL   | 00  | 00  | space | 32  | 20  | @     | 64  | 40  | `     | 96  | 60  |
| Ctrl-A           | SOH   | 01  | 01  | !     | 33  | 21  | A     | 65  | 41  | a     | 97  | 61  |
| Ctrl-B           | STX   | 02  | 02  | “     | 34  | 22  | B     | 66  | 42  | b     | 98  | 62  |
| Ctrl-C           | ETX   | 03  | 03  | #     | 35  | 23  | C     | 67  | 43  | c     | 99  | 63  |
| Ctrl-D           | EOT   | 04  | 04  | \$    | 36  | 24  | D     | 68  | 44  | d     | 100 | 64  |
| Ctrl-E           | ENQ   | 05  | 05  | %     | 37  | 25  | E     | 69  | 45  | e     | 101 | 65  |
| Ctrl-F           | ACK   | 06  | 06  | &     | 38  | 26  | F     | 70  | 46  | f     | 102 | 66  |
| Ctrl-G           | BEL   | 07  | 07  | '     | 39  | 27  | G     | 71  | 47  | g     | 103 | 67  |
| Ctrl-H           | BS    | 08  | 08  | (     | 40  | 28  | H     | 72  | 48  | h     | 104 | 68  |
| Ctrl-I           | HT    | 09  | 09  | )     | 41  | 29  | I     | 73  | 49  | i     | 105 | 69  |
| Ctrl-J           | LF    | 10  | 0A  | *     | 42  | 2A  | J     | 74  | 4A  | j     | 106 | 6A  |
| Ctrl-K           | VT    | 11  | 0B  | +     | 43  | 2B  | K     | 75  | 4B  | k     | 107 | 6B  |
| Ctrl-L           | FF    | 12  | 0C  | ,     | 44  | 2C  | L     | 76  | 4C  | l     | 108 | 6C  |
| Ctrl-M           | CR    | 13  | 0D  | -     | 45  | 2D  | M     | 77  | 4D  | m     | 109 | 6D  |
| Ctrl-N           | SO    | 14  | 0E  | .     | 46  | 2E  | N     | 78  | 4E  | n     | 110 | 6E  |
| Ctrl-O           | SI    | 15  | 0F  | /     | 47  | 2F  | O     | 79  | 4F  | o     | 111 | 6F  |
| Ctrl-P           | DLE   | 16  | 10  | 0     | 48  | 30  | P     | 80  | 50  | p     | 112 | 70  |
| Ctrl-Q           | DC1   | 17  | 11  | 1     | 49  | 31  | Q     | 81  | 51  | q     | 113 | 71  |
| Ctrl-R           | DC2   | 18  | 12  | 2     | 50  | 32  | R     | 82  | 52  | r     | 114 | 72  |
| Ctrl-S           | DC3   | 19  | 13  | 3     | 51  | 33  | S     | 83  | 53  | s     | 115 | 73  |
| Ctrl-T           | DC4   | 20  | 14  | 4     | 52  | 34  | T     | 84  | 54  | t     | 116 | 74  |
| Ctrl-U           | NAK   | 21  | 15  | 5     | 53  | 35  | U     | 85  | 55  | u     | 117 | 75  |
| Ctrl-V           | SYN   | 22  | 16  | 6     | 54  | 36  | V     | 86  | 56  | v     | 118 | 76  |
| Ctrl-W           | ETB   | 23  | 17  | 7     | 55  | 37  | W     | 87  | 57  | w     | 119 | 77  |
| Ctrl-X           | CAN   | 24  | 18  | 8     | 56  | 38  | X     | 88  | 58  | x     | 120 | 78  |
| Ctrl-Y           | EM    | 25  | 19  | 9     | 57  | 39  | Y     | 89  | 59  | y     | 121 | 79  |
| Ctrl-Z           | SUB   | 26  | 1A  | :     | 58  | 3A  | Z     | 90  | 5A  | z     | 122 | 7A  |
| Ctrl-[           | ESC   | 27  | 1B  | ;     | 59  | 3B  | [     | 91  | 5B  | {     | 123 | 7B  |
| Ctrl-\           | FS    | 28  | 1C  | <     | 60  | 3C  | \     | 92  | 5C  |       | 124 | 7C  |
| Ctrl-]           | GS    | 29  | 1D  | =     | 61  | 3D  | ]     | 93  | 5D  | }     | 125 | 7D  |
| Ctrl-^           | RS    | 30  | 1E  | >     | 62  | 3E  | ^     | 94  | 5E  | ~     | 126 | 7E  |
| Ctrl-_<br>Ctrl-` | US    | 31  | 1F  | ?     | 63  | 3F  | _     | 95  | 5F  | DEL   | 127 | 7F  |

Table 7-4. ASCII Character Chart (Part 1)

| ASCII | Dec | Hex | ASCII | Dec | Hex | ASCII | Dec | Hex | ASCII | Dec | Hex |
|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|
| Ç     | 128 | 80  | á     | 160 | A0  |       | 192 | C0  | α     | 224 | E0  |
| ü     | 129 | 81  | í     | 161 | A1  |       | 193 | C1  | β     | 225 | E1  |
| é     | 130 | 82  | ó     | 162 | A2  |       | 194 | C2  | Γ     | 226 | E2  |
| â     | 131 | 83  | ú     | 163 | A3  |       | 195 | C3  | π     | 227 | E3  |
| ä     | 132 | 84  | ñ     | 164 | A4  |       | 196 | C4  | Σ     | 228 | E4  |
| à     | 133 | 85  | Ñ     | 165 | A5  |       | 197 | C5  | σ     | 229 | E5  |
| â     | 134 | 86  | ª     | 166 | A6  |       | 198 | C6  | μ     | 230 | E6  |
| ç     | 135 | 87  | º     | 167 | A7  |       | 199 | C7  | τ     | 231 | E7  |
| ê     | 136 | 88  | ¿     | 168 | A8  |       | 200 | C8  | Φ     | 232 | E8  |
| ë     | 137 | 89  |       | 169 | A9  |       | 201 | C9  | Θ     | 233 | E9  |
| è     | 138 | 8A  | ¬     | 170 | AA  |       | 202 | CA  | Ω     | 234 | EA  |
| ï     | 139 | 8B  | ½     | 171 | AB  |       | 203 | CB  | δ     | 235 | EB  |
| î     | 140 | 8C  | ¼     | 172 | AC  |       | 204 | CC  | ∞     | 236 | EC  |
| ì     | 141 | 8D  | ¡     | 173 | AD  |       | 205 | CD  | φ     | 237 | ED  |
| Ä     | 142 | 8E  | «     | 174 | AE  |       | 206 | CE  | €     | 238 | EE  |
| Å     | 143 | 8F  | »     | 175 | AF  |       | 207 | CF  | ∩     | 239 | EF  |
| É     | 144 | 90  |       | 176 | B0  |       | 208 | D0  | =     | 240 | F0  |
| æ     | 145 | 91  |       | 177 | B1  |       | 209 | D1  | ±     | 241 | F1  |
| Æ     | 146 | 92  |       | 178 | B2  |       | 210 | D2  | ≥     | 242 | F2  |
| ô     | 147 | 93  |       | 179 | B3  |       | 211 | D3  | ≤     | 243 | F3  |
| ö     | 148 | 94  |       | 180 | B4  |       | 212 | D4  | ∫     | 244 | F4  |
| ò     | 149 | 95  |       | 181 | B5  |       | 213 | D5  | ∫     | 245 | F5  |
| û     | 150 | 96  |       | 182 | B6  |       | 214 | D6  | ÷     | 246 | F6  |
| ù     | 151 | 97  |       | 183 | B7  |       | 215 | D7  | ≈     | 247 | F7  |
| ÿ     | 152 | 98  |       | 184 | B8  |       | 216 | D8  | °     | 248 | F8  |
| Ö     | 153 | 99  |       | 185 | B9  |       | 217 | D9  | •     | 249 | F9  |
| Ü     | 154 | 9A  |       | 186 | BA  |       | 218 | DA  |       | 250 | FA  |
| ç     | 155 | 9B  |       | 187 | BB  |       | 219 | DB  |       | 251 | FB  |
| £     | 156 | 9C  |       | 188 | BC  |       | 220 | DC  |       | 252 | FC  |
| ¥     | 157 | 9D  |       | 189 | BD  |       | 221 | DD  | ²     | 253 | FD  |
| Pts   | 158 | 9E  |       | 190 | BE  |       | 222 | DE  |       | 254 | FE  |
| f     | 159 | 9F  |       | 191 | BF  |       | 223 | DF  |       | 255 | FF  |

Table 7-5. ASCII Character Chart (Part 2)

## 7.6 Digital Filtering

Standard digital filtering uses mathematical averaging to eliminate the variant digital readings that the A/D converter sends periodically because of external vibration. Digital filtering does not affect the indicator measurement rate, but does affect the settling time. The selections from 1 to 256 reflect the number of readings averaged per update period. When a reading is encountered that is outside a predetermined band, the averaging is overridden, and the display jumps directly to the new value.

### 7.6.1 DIGFLx Parameters

The first two digital filtering parameters, DIGFLT1, and DIGFLT2, are configurable filter stages that control the effect of a single A/D reading on the displayed weight. The value assigned to each parameter sets the number of readings received from the preceding filter stage before averaging.

The overall filtering effect can be expressed by multiplying the values assigned to the two filter stages:

$$DIGFLT1 \times DIGFLT2$$

For example, if the filters are configured as DIGFLT1=16, DIGFLT2=8, the overall filtering effect is 128 (16 x 8). With this configuration, each A/D reading has a 1-in-128 effect on the displayed weight value. Setting the filters to 1 effectively disables digital filtering (1 x 1 = 1).

### 7.6.2 RATTLETRAP® Filtering

RATTLETRAP digital filtering (RATTRAP parameter set ON) uses a vibration-dampening algorithm to provide a combination of the best features of analog and digital filtering. The RATTLETRAP algorithm evaluates the frequency of a repeating vibration then derives a composite displayed weight equal to the actual weight on the scale less the vibration-induced flaws. It is particularly effective for eliminating vibration effects or mechanical interference from nearby machinery. Using RATTLETRAP filtering can eliminate much more mechanical vibration than standard digital filtering, but will usually increase settling time over standard digital filtering.

### 7.6.3 DFSENS and DFTHR Parameters

The digital filter can be used by itself to eliminate vibration effects, but heavy filtering also increases settling time. The DFSENS (digital filter sensitivity) and DFTHR (digital filter threshold) parameters can be used to temporarily override filter averaging and improve settling time:

- DFSENS specifies the number of consecutive scale readings that must fall outside the filter threshold (DFTHR) before digital filtering is suspended.
- DFTHR sets a threshold value, in display divisions. When a specified number of consecutive scale readings (DFSENS) fall outside of this threshold, digital filtering is suspended. Set DFTHR to NONE to turn off the filter override.

### 7.6.4 Setting the Digital Filter Parameters

Fine-tuning the digital filter parameters greatly improves indicator performance in heavy-vibration environments. Use the following procedure to determine vibration effects on the scale and optimize the digital filtering configuration.

1. In setup mode, set the digital filter parameters (DIGFLT1 and DIGFLT2) to 1. Set DFTHR to NONE. Return indicator to normal mode.
2. Remove all weight from the scale, then watch the indicator display to determine the magnitude of vibration effects on the scale. Record the weight below which all but a few readings fall. This value is used to calculate the DFTHR parameter value in Step 4.
3. Place the indicator in setup mode and set the DIGFLTx parameters to eliminate the vibration effects on the scale. (Leave DFTHR set to NONE.) Find the lowest effective value for the DIGFLTx parameters.
4. Calculate the DFTHR parameter value by converting the weight value recorded in Step 2 to display divisions:

$$\text{threshold\_weight\_value} / \text{DSPDIV}$$

In the example in Step 2, with a threshold weight value of 50 lb and a display division value of 5D:  $50 / 5D = 10$ . DFTHR should be set to 10DD for this example.

5. Finally, set the DFSENS parameter high enough to ignore transient peaks. Longer transients (typically caused by lower vibration frequencies) will cause more consecutive out-of-band readings, so DFSENS should be set higher to counter low frequency transients. Reconfigure as necessary to find the lowest effective value for the DFSENS parameter.

## 7.7 Conversion Factors for Secondary Units

The IQ plus 510 has the capability to mathematically convert a weight into many different types of units and instantly display those results with a press of the UNITS key.

Secondary units can be specified on the FORMAT menu using the SECNDR parameter, or by using EDP commands.

- To configure secondary units using the front panel menus, use the Table 7-6 to find the conversion multiplier for the MULT parameter. For example, if the primary unit is pounds and the secondary unit is short tons, set the MULT parameter to 0.000500.

Enter the numeric value for the multiplier using the navigation keys to select each digit and to increment or decrement the value of the digit. Press  $\odot$  (ENTER) to save the numeric value, then use the  $\triangleleft$  or  $\triangleright$  buttons to move the decimal point as required. Press  $\odot$  again to save the multiplier value.

- To configure secondary units using EDP commands, use the Table 7-6 to find the conversion multiplier for the SEC.MULT command. For example, if the primary unit is pounds and the secondary unit is short tons, send the EDP command SEC.MULT=0.0005<CR> to set the multiplier for the secondary units.

**NOTE:** Ensure that the secondary decimal point position is set appropriately for the scale capacity in the secondary units. If the converted value requires more digits than are available, the indicator will display an overflow message (*OVERFL*).

For example, if the primary units are short tons, secondary units are pounds, and the secondary decimal point is set to 8888.888, the indicator will overflow if 5 tons or more are applied to the scale. With 5 tons applied, and a conversion factor of 2000, the secondary units display needs five digits to the left of the decimal point to display the 10000 lb secondary units value.

| Primary Unit | x Multiplier | Secondary Unit |
|--------------|--------------|----------------|
| grains       | 0.064799     | grams          |
|              | 0.002286     | ounces         |
|              | 0.000143     | pounds         |
|              | 0.000065     | kilograms      |
|              | 0.002083     | troy ounces    |
|              | 0.000174     | troy pounds    |
| ounces       | 437.500      | grains         |
|              | 28.3495      | grams          |
|              | 0.06250      | pounds         |
|              | 0.02835      | kilograms      |
|              | 0.911458     | troy ounces    |
|              | 0.075955     | troy pounds    |
| pounds       | 7000.00      | grains         |
|              | 453.592      | grams          |
|              | 16.0000      | ounces         |
|              | 0.453592     | kilograms      |
|              | 14.58333     | troy ounces    |
|              | 1.215278     | troy pounds    |
|              | 0.000500     | short tons     |
|              | 0.000446     | long tons      |
|              | 0.000453     | metric tons    |
|              | grams        | 15.4324        |
| 0.035274     |              | ounces         |
| 0.002205     |              | pounds         |
| 0.001000     |              | kilograms      |
| 0.032151     |              | troy ounces    |
| 0.002679     |              | troy pounds    |
| kilograms    | 15432.4      | grains         |
|              | 35.2740      | ounces         |
|              | 1000.00      | grams          |
|              | 2.20462      | pounds         |
|              | 32.15075     | troy ounces    |
|              | 2.679229     | troy pounds    |
|              | 0.001102     | short tons     |
|              | 0.000984     | long tons      |
|              | 0.001000     | metric tons    |
| short tons   | 2000.00      | pounds         |
|              | 907.185      | kilograms      |
|              | 0.892857     | long tons      |
|              | 0.907185     | metric tons    |

Table 7-6. Conversion Factors

| Primary Unit | <i>x Multiplier</i> | Secondary Unit |
|--------------|---------------------|----------------|
| metric tons  | 2204.62             | pounds         |
|              | 1000.00             | kilograms      |
|              | 1.10231             | short tons     |
|              | 0.984207            | long tons      |
| long tons    | 2240.00             | pounds         |
|              | 1016.05             | kilograms      |
|              | 1.12000             | short tons     |
|              | 1.01605             | metric tons    |

Table 7-6. Conversion Factors (Continued)

| Primary Unit | <i>x Multiplier</i> | Secondary Unit |
|--------------|---------------------|----------------|
| troy ounces  | 480                 | grains         |
|              | 31.10348            | grams          |
|              | 0.031103            | kilograms      |
|              | 1.09714             | ounces         |
|              | 0.068571            | pounds         |
|              | 0.083333            | troy pounds    |
| troy pounds  | 5760                | grains         |
|              | 373.2417            | grams          |
|              | 0.373242            | kilograms      |
|              | 13.16571            | ounces         |
|              | 0.822857            | pounds         |
|              | 12                  | troy ounces    |

Table 7-6. Conversion Factors (Continued)

## 7.8 Analog Output Calibration

The following calibration procedure requires a multimeter to measure voltage or current output from the analog output module. If the option is not already installed, see Section 2.4 on page 6.

**NOTE:** The analog output must be calibrated *after* the indicator itself has been configured (Section 3.0) and calibrated (Section 4.0).

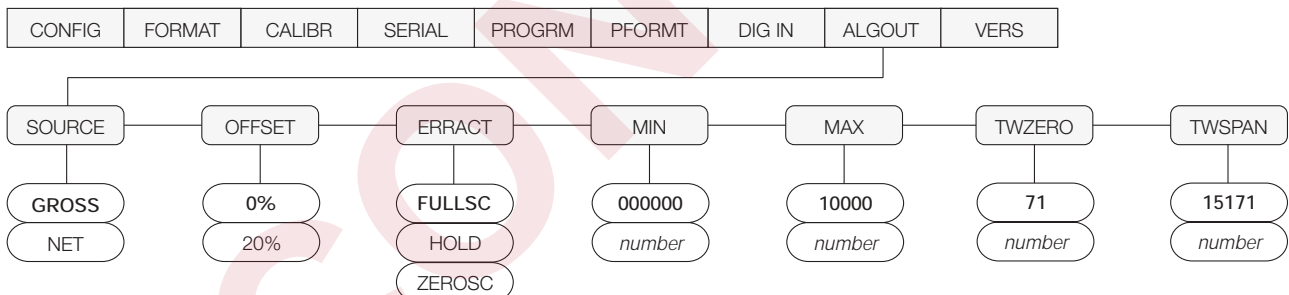


Figure 7-5. Analog Output Menu

- Enter setup mode and go to the ALGOUT menu (see Figure 7-5):
  - Set OFFSET to 0% for 0–10 V output, 20% for 4–20 mA output
  - Set MIN to lowest weight value to be tracked by the analog output
  - Set MAX to highest weight value to be tracked by the analog output
- Connect multimeter to connector J1 on the analog output board:
  - For voltage output, connect voltmeter leads to pins 3 and 4
  - For current output, connect ammeter leads to pins 1 and 2
- Adjust zero calibration: Scroll to the TWZERO parameter. Press  $\nabla$  to view zero value, then check voltage or current reading on multimeter. Press and hold  $\Delta$  or  $\nabla$  to adjust the zero value up or down.
- Adjust span calibration: Scroll to the TWSPAN parameter. Press  $\nabla$  to view span value, then check voltage or current reading on multimeter. Press  $\Delta$  or  $\nabla$  to adjust the span value up or down.
- Final zero calibration: Return to the TWZERO parameter and verify that the zero calibration has not drifted. Press  $\Delta$  or  $\nabla$  to re-adjust the zero value as required.
- Return to normal mode. Analog output function can be verified using test weights.

## 7.9 Test Mode

In addition to normal and setup modes, test mode provides a number of diagnostic functions for the IQ plus 510, including:

- Display raw A/D count
- Display digital input states
- Reset configuration parameters to default values
- Clear non-volatile (battery backed) storage
- Set analog output state to zero or full scale
- Print configuration

To enter test mode, press and hold the setup switch until the front panel display shows the word *TEST*. After about three seconds, the test mode display automatically shifts to the first test menu function, A/DTST.

Figure 7-6 shows the Test Menu structure; Figure 7-7 shows the front panel key functions in test mode. Note that, because the Test Menu functions are all on a single menu level, the GROSS/NET (▽) key has no function. Press the ZERO (△) key to exit test mode.

Table 7-7 on page 52 summarizes the test menu functions.

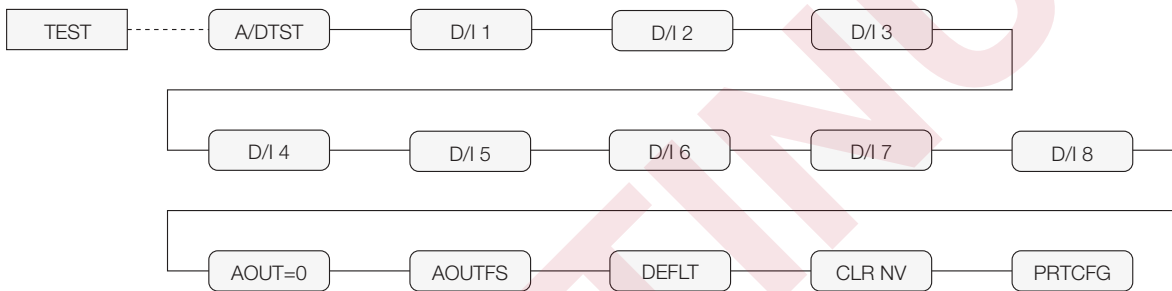


Figure 7-6. Test Menu

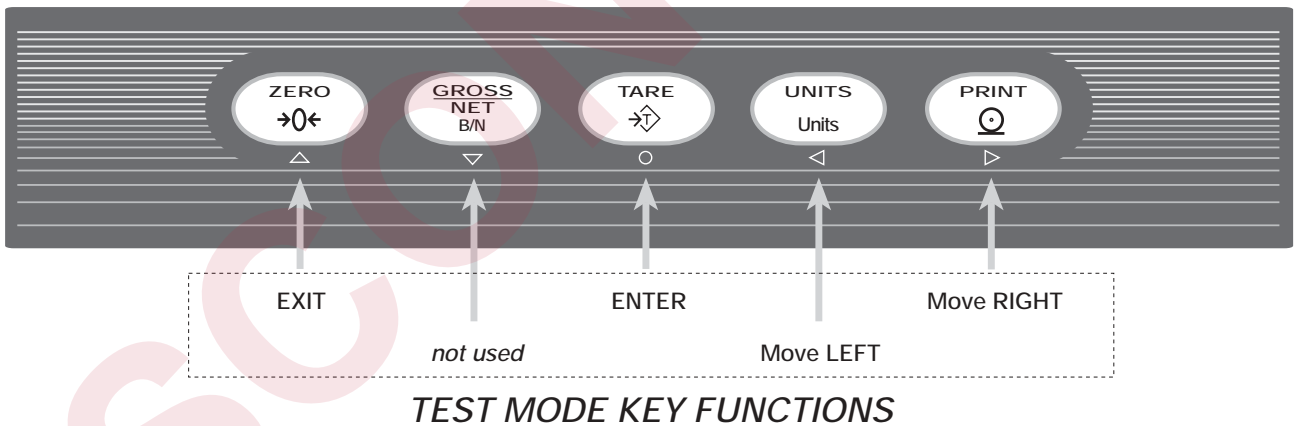


Figure 7-7. Front Panel Key Functions in Test Mode

| TEST Menu     |   |
|---------------|---|
| Function      | Description   |
| A/DTST        | Display A/D test<br>Press and hold Enter key to display raw count from A/D converter.   |
| D/I 1 — D/I 8 | Display digital inputs 1–8<br>Press and hold Enter key to show status of DIGIN <sub>x</sub> (DI <sub>x</sub> =HI or DI <sub>x</sub> =LO).   |
| AOUT=0        | Set analog output to zero<br>Press and hold Enter key to set analog output to its zero value.   |
| AOUTFS        | Set analog output to full scale<br>Press and hold Enter key to set analog output to its full scale value.   |
| DEFLT         | Default parameters<br>Press and hold the setup switch, then press the Enter key to reset configuration and calibration parameters to factory default values. Load cells must be recalibrated before using the indicator (see Section 4.0 on page 29); |
| CLR NV        | Clear non-volatile storage<br>Press and hold the setup switch, then press the Enter key to clear values stored in battery-backed SRAM.  |
| PRTCFG        | Print configuration<br>Press and hold Enter key to send configuration data to the serial port. This function is equivalent to using the DUMPALL EDP command.  |

*Table 7-7. Test Menu Functions*



## 7.10 Software Revision History

The following list summarizes the principal software changes made for Version 2.1:

- New SMPRAT parameter on the CONFIG menu provides selectable A/D conversion rate ranging from 3.75–30 Hz.
- New YYMMDD value on the DATEFMT parameter (PROGRM menu).
- A/D gain (ADGAIN) and A/D offset (ADOFs) functions removed from TEST menu.

The following list summarizes the principal software changes made for Version 2.0:

### Analog and Digital Filtering

- Configurable analog filter added with available settings of OFF, 2HZ, 8HZ.
- Digital filtering changed from one to two filters (DIGFLT1 and DIGFLT2). New RATTRAP parameter enables RATTLETRAP® algorithm for both digital filters.

### Serial Communications and Printing

- PORT parameters removed from the SERIAL menu.
- EDP port AB-RIO parameter name changed to BUS; BUS parameter added to printer port.
- Printer port now supports duplex RS-232 communications; can be used to send and receive EDP commands.
- Streamed weight information now uses the following units designators: lb=L; Kg=K; oz=O; gram=G; ton, metric ton, and long ton=T; grain, troy ounce, troy pound, and none=space.
- Print command latches for three seconds: A print command issued while the scale is in motion is now completed if the scale comes out of motion before the three seconds elapses.
- CONSNUM (consecutive numbering) and UID (unit ID) parameters added to PROGRM menu.

### Zero and Tare Operations

- Except in OIML mode, a tare is cleared by pressing the TARE (rather than ZERO) key. NTEP, CANADA, and OIML modes all require the scale to be at no load before clearing a tare.
- Scale can now be zeroed (gross zero) with a tare remaining in the system. Exception: In OIML mode, the tare is cleared when the ZERO key is pressed.
- Tare values restricted to six digits to avoid display overflow when tare weight is removed.

### Digital Inputs

- Digital input selections now include CLRTAR (clear tare), GROSS, NET, PRIM (primary units), and SEC (secondary units) pseudo key functions.

### EDP Commands

- Except for those commands requiring numeric or text entry, entering any valid EDP command (while in setup mode) followed by an equal sign and question mark (<cmd>=? ) now lists possible values for the command.
- KCLRNV EDP command added for clearing nonvolatile RAM.
- KCLRTAR EDP command added for clearing tare values.
- KLOCK and KUNLOCK EDP commands added for locking and unlocking individual front panel keys.
- Configuration changes made using the EDP commands now take effect only when the indicator leaves setup mode.

### Error Messages and Test Menu

- The numeric value returned by the XE command now represents only the error conditions present, if any.
- ECHO R (echo received characters) and XMT U (transmit “u” characters) functions have been removed from the TEST menu.

## 7.11 Specifications

### Power

|                   |   |
|-------------------|---|
| Line Voltages     | 115 or 230 VAC  |
| Frequency         | 50 or 60 Hz   |
| Power Consumption | 100 mA @ 115 VAC (11.5 W)<br>50 mA @ 230 VAC (11.5 W) |

### Fusing

|         |  |
|---------|--|
| 115 VAC | 2 x 160 mA TR5 subminiature fuses<br>Wickmann Time-Lag 19374 Series<br>UL Listed, CSA Certified and Approved |
| 230 VAC | 2 x 80 mA TR5 subminiature fuses<br>Wickmann Time-Lag 19372 Series<br>UL Recognized, Semko and VDE Approved  |

### Analog Specifications

|                           |  |
|---------------------------|--|
| Full Scale Input Signal   | Up to 45 mV  |
| Excitation Voltage        | 10 ± 0.5 VDC,<br>8 x 350Ω or 16 x 700Ω load cells  |
| Sense Amplifier           | Differential amplifier with<br>4- and 6-wire sensing   |
| Analog Signal Input Range | 0.6 mV/V – 4.5 mV/V  |
| Analog Signal Sensitivity | 0.3 μV/graduation minimum,<br>1.5 μV/grad recommended  |
| A/D Sample Rate:          | 3.75–30Hz, software configurable   |
| Input Impedance           | 200 MΩ, typical  |
| Noise (ref to input)      | 0.3 μV p-p with digital filter at 4  |
| Internal Resolution       | 1 000 000 counts, approximate  |
| Display Resolution        | 100 000 dd   |
| Input Sensitivity         | 50 nV per internal count   |
| System Linearity          | Within 0.01% of full scale   |
| Zero Stability            | 150 nV/°C, maximum   |
| Span Stability            | 3.5 ppm/°C, maximum  |
| Calibration Method        | Software, constants stored in<br>EEPROM  |
| Common Mode<br>Voltage    | –0.15 to +0.95 V, referred to earth  |
| Common Mode<br>Rejection  | 130 dB minimum @ 50 or 60 Hz   |
| Input Overload            | ± 12 V continuous, static discharge<br>protected   |
| RFI Protection            | Signal, excitation, and sense lines<br>protected by capacitor bypass   |
| Analog Output             | Optional: fully isolated, voltage or current<br>output, 14-bit resolution.<br>Voltage output: 0 –10 VDC<br>Load resistance: 1kΩ minimum<br>Current output: 4–20 mA<br>External loop resistance: 500Ω maximum |

### Digital Specifications

|                |  |
|----------------|--|
| Microcomputer  | Hitachi H8/3002 main processor @<br>9.8304 MHz   |
| Digital Inputs | 8 inputs, TTL or switch closure,<br>active-low   |
| Digital Filter | Software selectable: 1–256, enhanced<br>Rattletrap <sup>®</sup> hybrid digital filtering |

### Serial Communications

|              |  |
|--------------|--|
| EDP Port     | Full duplex RS-232 or RS-485   |
| Printer Port | Full duplex RS-232 or active 20 mA current<br>loop output  |
| Both Ports   | 19 200, 9600, 4800, 2400, 1200, 600, 300<br>bps; 7 or 8 data bits; even, odd, or no<br>parity; two stop bits on transmit, one stop<br>bit on receive |

### Operator Interface

|          |   |
|----------|---|
| Display  | Vacuum fluorescent display:<br>7-digit, 14-segment primary weight display;<br>Two 5x7 dot matrix digits for units,<br>alpha/numeric entry mode designators;<br>16-digit dot matrix display for additional<br>symbols, user prompts. |
| Keyboard | 5-key membrane panel  |

### Environmental

|                       |  |
|-----------------------|--|
| Operating Temperature | –10 to +40°C (legal);<br>–10 to +50°C (industrial) |
| Storage Temperature   | –25 to +70°C                                       |
| Humidity              | 0–95% relative humidity                            |

### Enclosure

|   |  |
|---|--|
| Enclosure Dimensions (without tilt stand) |  |
| Sloped Enclosure:                         | 9.5 in x 8.38 in x 4.95 in<br>241 mm x 213 mm x 126 mm |
| Flat Enclosure:                           | 9.5 in x 8.38 in x 5.25 in<br>241 mm x 213 mm x 133 mm |
| Weight                                    |  |
| Sloped Enclosure:                         | 7.4 lb (3.3 Kg)  |
| Flat Enclosure:                           | 7.8 lb (3.5 Kg)  |
| Rating/Material                           | NEMA 4X/IP66, stainless steel                          |

### Certifications and Approvals



#### NTEP

|                |                                 |
|----------------|---------------------------------|
| CoC Number     | 98-081                          |
| Accuracy Class | III/III L<br>$n_{max}$ : 10 000 |

#### Measurement Canada

|                |   |
|----------------|---|
| Approval       | AM-5253   |
| Accuracy Class | III $n_{max}$ : 10 000<br>III HD $n_{max}$ : 20 000 |



#### OIML

|                        |                        |
|------------------------|------------------------|
| R76-2 Test Certificate | TC5678                 |
| Accuracy Class         | III $n_{max}$ : 10 000 |



## **IQ plus 510 Limited Warranty**

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Rice Lake Weighing Systems (RLWS) warrants that all RLWS equipment and systems properly installed by a Distributor or Original Equipment Manufacturer (OEM) will operate per written specifications as confirmed by the Distributor/OEM and accepted by RLWS. All systems and components are warranted against defects in materials and workmanship for two years.

RLWS warrants that the equipment sold hereunder will conform to the current written specifications authorized by RLWS. RLWS warrants the equipment against faulty workmanship and defective materials. If any equipment fails to conform to these warranties, RLWS will, at its option, repair or replace such goods returned within the warranty period subject to the following conditions:

- Upon discovery by Buyer of such nonconformity, RLWS will be given prompt written notice with a detailed explanation of the alleged deficiencies.
- Individual electronic components returned to RLWS for warranty purposes must be packaged to prevent electrostatic discharge (ESD) damage in shipment. Packaging requirements are listed in a publication, *Protecting Your Components From Static Damage in Shipment*, available from RLWS Equipment Return Department.
- Examination of such equipment by RLWS confirms that the nonconformity actually exists, and was not caused by accident, misuse, neglect, alteration, improper installation, improper repair or improper testing; RLWS shall be the sole judge of all alleged non-conformities.
- Such equipment has not been modified, altered, or changed by any person other than RLWS or its duly authorized repair agents.
- RLWS will have a reasonable time to repair or replace the defective equipment. Buyer is responsible for shipping charges both ways.
- In no event will RLWS be responsible for travel time or on-location repairs, including assembly or disassembly of equipment, nor will RLWS be liable for the cost of any repairs made by others.

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