

720<sup>TM</sup>  
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*Programmable HMI Indicator/Controller*

Version 1.04  
720i Batching Version 1.00

# Installation Manual



REVOLUTION<sup>TM</sup>  
SCREEN SOFTWARE

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# About This Manual

This manual is intended for use by service technicians responsible for installing and servicing 720i™ digital weight indicators. This manual applies to Version 1.04 of the 720i indicator software and Version 1.00 of the 720i Batching indicator software.

Configuration and calibration of the indicator can be accomplished using the *Revolution III™* configuration utility, serial commands, or the indicator front panel keys. See Section 3.1 on page 18 for information about configuration methods.

## 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.ricelake.com](http://www.ricelake.com).

The *Operator Card* included with this manual provides basic operating instructions for users of the 720i. Please leave the *Operator Card* with the indicator when installation and configuration are complete.

## 1.0 Introduction

The 720i is a single-channel, programmable digital weight indicator/controller. The configuration can be performed using the front panel, with an attached PS/2®<sup>1</sup>-type keyboard, or using the *Revolution III* utility.

The 720i can be loaded with either PCE software or 720i batching software. Refer to Section 8.0 on page 56 or Section 9.0 on page 72 for further information on each of these software choices.

### Onboard Features

Features of the basic 720i include:

- Support for a single A/D or serial scale input.
- Eight digital I/O channels on main board, each configurable as either input or output.
- Two serial ports on main board support duplex RS-232 up to 115200 bps. Port 2 supports RS-232 with hardware handshaking; Port 4 supports RS-232 and 20mA communications.
- Available in 115 VAC and 230 VAC North American and European versions.
- Configurable print formats can be defined for up to 1000 characters each using serial commands or *Revolution III*. These formats are used to print gross or net weights, truck in/out weights, accumulator weights, alert messages, and header information. Additional print formats can be created using twenty auxiliary print formats.
- Six truck modes to store and recall weights for gross, tare, and net printing. The truck register contains fields for ID number, weight,

and the transaction time and date. Weights can be stored permanently or erased at the end of the transaction.

The 720i is NTEP-certified for Classes III and III L at 10,000 divisions. See Section 11.14 on page 102 for more information about additional certifications and approvals.

### Option Cards

The CPU board provides one slot for installing other option cards. Available option cards include:

- Analog output card for 0–10 VDC or 0–20 mA tracking of gross or net weight values.
- Dual-channel serial expansion card provides one RS-485 port or two ports for either RS-232 or 20mA communications at up to 19200 bps.
- 24-channel digital I/O expansion card.
- Ethernet option card.
- Bus interface cards for EtherNet/IP™<sup>2</sup>, DeviceNet™<sup>3</sup>, Allen-Bradley Remote I/O<sup>4</sup>, Profibus® DP networks<sup>5</sup> and ControlNet™<sup>6</sup>.

Part numbers of available option cards are listed in Section 1.4 on page 4.

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## Front Panel

The 720*i* universal model front panel, shown in Figure 1-1, consists of a 22-button keypad with an LCD display. The keys are grouped as four configurable softkeys, four scale function/navigation keys, **MENU** and **PRINT/Enter** keys, and numeric entry keys. The panel mount front panel is shown in Figure 1-2.

LCD display contrast can be adjusted selecting the **Contrast Adj** function from the system menu.

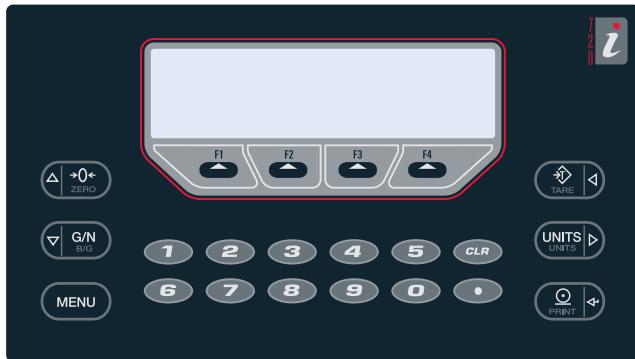


Figure 1-1. 720*i* Universal Front Panel



Figure 1-2. 720*i* Panel Mount Front Panel

## Enclosures

The 720*i* is available in universal (tilt-stand) and panel mount enclosures. Stainless steel enclosures are rated for NEMA 4X/IP66. This manual provides assembly drawings and replacement parts lists for the universal model; supplemental documentation provides information specific to the panel mount model (See Section 1.4 on page 4).

## Support Applications

In addition to *Revolution III*, the 720*i* is supported by two Windows-based applications that extend its capabilities for batch control and database management. ProAction *PCEE*, or Process Control Engine Editor, provides functions similar to setpoint configuration for 720*i*-based batch control. ProAction *DBE*, the database editor, is a tool for creating, editing, and managing databases in the 720*i*. Both applications are included on the 720*i* Toolkit CD.

## 1.1 Operating Modes

The 720*i* has two modes of operation:

### 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, press the **MENU** key on the front panel, select *Configuration*, then press **Enter**. The indicator display changes to show scale configuration menus.

**NOTE:** Jumper J9 (see Figure 2-3 on page 9) must be installed to enable access to setup mode. When configuration is complete, remove the jumper (place the jumper on a single pin of J9) to disable access to the configuration menus.

### Normal mode

Normal mode is the weighing mode of the indicator. The indicator displays gross, net, or tare weights as required, using the secondary display to indicate scale status and the type of weight value displayed. Once configuration is complete, remove jumper J9 and affix a legal seal to the fillister-head screws on the indicator enclosure.

## 1.2 Indicator Operations

Basic 720*i* operations are summarized below:

### Display Menu

Press the **MENU** key to show the system menu, then use the **Up** or **Down** navigation keys to select an item from the list. The menu provides access to audit trail information, configuration, test operations, and display contrast adjustment.

### 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 letter *G* (gross) or, in OIML mode, *B* (brutto); net mode is indicated by the letter *N*.

### Toggle Units

Press the **UNITS** key to switch between primary, secondary, and tertiary units.

### 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.

### 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 letter **N** on the display.

### Enter Tare Value

For the universal model, use the numeric keypad to key in the tare value, then press the **Tare** softkey or press and hold the front panel **TARE** key to enter the tare.

For the panel mount model, do the following:

1. Press and hold the **GROSS/NET** key for about three seconds. When released, a zero appears.
2. Use the **Up** and **Down** navigation keys to adjust the value (0-9 and a decimal point) and the **Right** and **Left** navigation keys to select the digit.
3. Press the **Tare** softkey or press and hold the front panel **TARE** key for about three seconds, then release to enter the tare.

### 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*.

### Print Ticket

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

### Select Auxiliary Print Format

Any of the auxiliary print formats (1–20) can be selected for printed output while in weighing mode.

For the universal model, use the numeric keypad to key in the tare value, then press the **Print** softkey or the front panel **PRINT** key to print using the selected auxiliary format.

For the panel mount model, do the following:

1. Press and hold the **GROSS/NET** key for about three seconds. When released, a zero appears.
2. Use the **Up** and **Down** navigation keys to adjust the value (0-9 and a decimal point) and the **Right** and **Left** navigation keys to select the digit.
3. Press the **Print** softkey or the front panel **PRINT** key to print using the selected auxiliary format.

### Accumulator Functions

The accumulator must be enabled before use. Once enabled, weight (net weight if a tare is in the system) is accumulated whenever a print operation is performed using the **PRINT** key, digital input, or serial command. The scale must return to zero (net zero if a tare is in the system) before the next accumulation.

The **Display Accum** softkey can be configured to display the current accumulator value. Printing while the accumulator is displayed uses the ACCFMT print format (see Section 6.0 on page 50).

Press the **CLEAR** key twice to clear the accumulator.

**NOTE:** With the panel mount version of the 720i, you need to use **CLR Accumulator** to clear the indicator.

## 1.3 Softkey Operations

Softkeys provide additional operator functions for specific applications. Softkey assignments are listed on the tabs shown at the bottom of the LCD display; softkey functions are activated by pressing the arrow keys below the softkey tabs (see Figures 1-1 and 1-2 on page 2).

For example, to set up a **TimeDate** softkey using serial commands, do the following:

1. Place indicator in setup mode.
2. Send the following serial command:  
`SK#s=TimeDate`  
where *s* is the softkey position.
3. Press **SaveExit** (or send the KSAVEEXIT serial command). The new softkey will appear in the position specified by *s*.
4. Press the **TimeDate** softkey. Use the **Up/Down** navigation keys to adjust the time and date value; use the **Left/Right** keys to move between fields. Time and date fields are presented in the following order:

`HOUR>MIN>[AM/PM]>MONTH>DAY>YEAR`

When done, press **Enter** to return to weighing mode.

The particular set of softkeys shown on the display can be set using serial commands or *Revolution III*.

Softkey	Description
Time/Date	Displays current time and date; allows time and date change.
Display Tare	Displays tare value for the current scale
Display Accum	Displays accumulator value, if enabled, for the current scale.
Display ROC	Displays rate-of-change value, if enabled, for the current scale.

Table 1-1. Configurable Softkeys *Continued on page 4*

Softkey	Description
Weigh In	Allows truck ID entry; generates weigh-in ticket for truck weighing applications.
Weigh Out	Allows truck ID entry; generates weigh-out ticket for truck weighing applications.
Truck Regs	Displays truck register; allows deletion of individual or all entries. Truck register can be printed by pressing the <b>PRINT</b> key while the truck register is displayed.
Alibi	Allows previous print transactions to be recalled and reprinted.
<i>F1-F10</i>	User-programmable keys; defined by <b>PCEE</b> .
**Setpoint	Displays a menu of configured setpoints; allows display and change of some setpoint parameters.
**Batch Start	Starts a configured batch.
**Batch Stop	Stops a running batch and turns off all associated digital outputs. Requires a batch start to resume processing.
**Batch Pause	Pauses a running batch. (Same as stop, but digital outputs, if on, are not turned off.)
**Batch Reset	Stops a batch and resets it to the first batch step.
More...	For applications with more than three defined softkeys, the More... key is automatically assigned to the fourth softkey position. Press <b>More...</b> to toggle between groups of softkeys.
** 720i Batching Version software only	

Table 1-1. Configurable Softkeys (Continued)

## 1.4 System Configurations and Options

Table 1-2 lists the *720i* system models and part numbers. All models include CPU board with one option card slot. The *720i* is a single scale unit and cannot be upgraded to a multi-channel A/D.

System Model	Model PNs
Universal (tilt stand) model, 115/230 VAC with PCE software	101230
Universal (tilt stand) model, 115/230 VAC, European, CEE 7/7 power cord with PCE software	103459
Panel mount model, 115/230 VAC (power cord sold separately), with PCE software	101229
Universal (tilt stand) model, 115/230 VAC with <i>720i</i> Batch software	115447
Universal (tilt stand) model, 115/230 VAC, European, CEE 7/7 power cord with <i>720i</i> Batch software	115448
Panel mount model, 115/230 VAC (power cord sold separately), with <i>720i</i> Batch software	115449

Table 1-2. Part Numbers for *720i* Models

### Option Cards

Table 1-3 lists the available *720i* option cards. Most of the listed option cards are be installed in the expansion card slot, J12. USB, Ethernet, and fiber-optic interface cards (shaded rows in Table 1-3) are installed in connector J11.

Option Card	PN
Single-channel analog output card	67602
Dual-channel analog output card	103138
Dual serial port expansion card	67604
24-channel digital I/O expansion card	67601
Ethernet communications card	71986
EtherNet/IP communications card	87803
DeviceNet interface card	68541
Allen-Bradley Remote I/O interface card	68539
Profibus DP interface card	68540
USB interface card	93245
Ethernet interface card	77142
Fiber-optic interface card	96736

Table 1-3. Part Numbers for *720i* Option Cards

### Relay Options

Relay racks are available for all *720i* systems. Relays require an external enclosure for the relays. Consult factory for details.

## DC Power Supplies

Two DC power supplies are available for mobile 720*i* applications:

PN 97474, 9–36 VDC supply

PN 99480, 10–60 VDC supply

Consult factory for more information.

## 1.5 Summary of Changes

Updates to this manual include the following:

### Version 1.03

- MINNEG and MAXNEG parameters have been added to the ALGOUT menu (see Section 3.2.6 on page 43) to support tracking of negative weight values.
- Added Section 9.0 on page 72 on ProAction PCEE information.
- Added print token for Alibi Numbering <AN>.

### Version 1.04

- Updated the analog menu.
- Added Section 8.0 on page 56 on Setpoints (Version 1.04)
- Batching (720*i* batching Version 1.00).

## 2.0 Installation

This section describes procedures for connecting load cell, digital I/O, and serial communications cables to the 720*i* indicator. Assembly drawings and replacement parts lists for the universal model are included for the service technician. See Section 11.12 on page 100 for dimension drawings.

### ! 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 720*i*. 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 720*i* to ensure all components are included and undamaged. The shipping carton should contain the indicator, this manual, and a parts kit. If any parts were damaged in shipment, notify Rice Lake Weighing Systems and the shipper immediately.

See Section 2.9 on page 11 for parts kit contents.

### 2.2 Enclosure Disassembly

The indicator enclosure must be opened to install option cards and to connect cables for installed option cards.

### ! Warning

*The 720*i* 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.

### 2.3 Cable Connections

The universal model of the 720*i* provides six cord grips for cabling into the indicator: one for the power cord, five to accommodate other cabling. Install plugs in all unused cord grips to prevent moisture from entering the enclosure.

#### 2.3.1 Cable Grounding

Except for the power cord, all cables routed through the cord grips should be grounded against the indicator enclosure. Do the following to ground shielded cables:

- Use the lockwashers, clamps, and kep nuts provided in the parts kit to install grounding clamps on the enclosure studs adjacent to cord grips. Install grounding clamps only for cord grips that will be used; do not tighten nuts.
- Route cables through cord grips and grounding clamps to determine cable lengths required to reach cable connectors. Mark cables to remove insulation and shield as described below:
- For cables with foil shielding, strip insulation and foil from the cable half an inch (13 mm) past the grounding clamp (see Figure 2-1). Fold the foil shield back on the cable where the cable passes through the clamp. Ensure silver (conductive) side of foil is turned outward for contact with the grounding clamp.
- For cables with braided shielding, strip cable insulation and braided shield from a point just past the grounding clamp. Strip another half inch (13 mm) of insulation *only* to expose the braid where the cable passes through the clamp (see Figure 2-1).

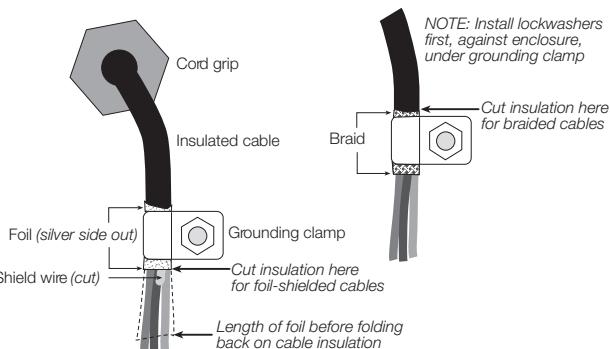


Figure 2-1. Grounding Clamp Attachment for Foil-Shielded and Braided Cabling

- For load cell cables, cut the shield wire just past the grounding clamp. Shield wire function is provided by contact between the cable shield and the grounding clamp.
- Route stripped cables through cord grips and clamps. Ensure shields contact grounding clamps as shown in Figure 2-1. Tighten grounding clamp nuts.

- Finish installation using cable ties to secure cables inside of indicator enclosure.

### 2.3.2 Load Cells

To attach cable from a load cell or junction box to the 720*i*, route the cable through the cord grip and ground the shield wire as described in Section 2.3.1 on page 6.

Next, remove load cell connector J1 from CPU board. Wire the load cell cable from the load cell or junction box to the connector as shown in Table 2-1.

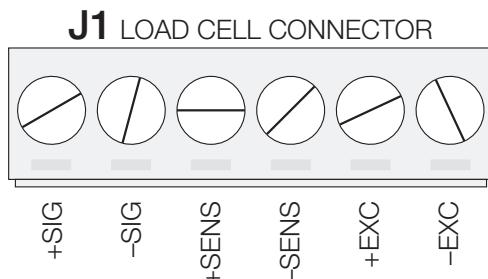


Figure 2-2. Load Cell Connector

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.

When connections are complete, reinstall load cell connector on the CPU board header and use two cable ties to secure the load cell cable to the inside of the enclosure.

J1 Connector 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. Load Cell Connector Pin Assignments

### 2.3.3 Serial Communications

Communications ports on the 720*i* CPU board support PS/2-type remote keyboard, full duplex RS-232, and 20 mA output communications at up to 115200 bps. Optional communications cards support USB, Ethernet, and fiber-optic connections to the 720*i*.

To attach serial communications cables, route the cable through the cord grip and ground the shield wire as described in Section 2.3.1 on page 6. Remove the serial connector from the CPU board and wire to the connector. Once cables are attached, plug the connector into the header on the board. Use cable ties to secure serial cables to the inside of the enclosure.

Table 2-2 shows the pin assignments for Ports 1, 2, and 4. Port 1 supports remote keyboard attachment of PS/2-type personal computer keyboards (see Section 11.9 on page 98 for information about the PS/2 keyboard interface.) Port 3 uses connector J4 to provide a dedicated display port for both universal and panel mount versions of the 720*i*.

Connector	Pin	Signal	Port
J3	1	CLK	1
	2	+5V	
	3	GND	
	4	DATA	
J2	1	GND	2
	2	RS-232 RxD	
	3	RS-232 TxD	
	4	RS-232 RTS	
	5	RS-232 CTS	
	6	GND	
J4	1	RS-422/485 Y	3
	2	RS-422/485 Z	
	3	RS-422/485 B	
	4	RS-422/485 A	
	5	+6V	
	6	GND	
J5	1	GND	4
	2	RS-232 RxD	
	3	RS-232 TxD	
	4	20mA OUT	

Table 2-2. Serial Port Pin Assignments

Serial ports are configured using the SERIAL menu. See Section 3.2.2 on page 32 for configuration information.

An optional dual-channel serial communications expansion card, PN 67604, is also available. The serial expansion card provides two additional serial

ports, assigned as port numbers 7 and 8. One port on the serial expansion card supports four-wire RS-485 communications. Both ports on the expansion card can support RS-232 or 20mA connections.

**NOTE:** Installation of option cards in connector J11 requires removal of the PORT2/OPTI port selection jumper (see Figure 2-3 on page 9). Install the jumper to enable RS-232 communications through connector J2; remove the jumper to enable an USB, fiber-optic, or Ethernet option card installed in connector J11.

See the communications interface card installation instructions for more information.

#### 2.3.4 Digital I/O

Digital inputs can be set to provide many indicator functions, including all keypad functions. Digital inputs are active low (0 VDC), inactive high (5 VDC).

Digital outputs are typically used to control relays that drive other equipment. Outputs are designed to sink, rather than source, switching current. Each output is a normally open collector circuit, capable of sinking 24 mA when active. Digital outputs are wired to switch relays when the digital output is active (low, 0 VDC) with reference to a 5 VDC supply.

Table 2-3 shows the pin assignments for connector J6.

J6 Pin	J6 Signal
1	+5 VDC
2	GND
3	DIO 1
4	DIO 2
5	DIO 3
6	DIO 4
7	DIO 5
8	DIO 6
9	DIO 7
10	DIO 8

Table 2-3. J6 Pin Assignments (Digital I/O)

Digital inputs and outputs are configured using the DIG I/O menu. See Section 3.2.5 on page 41 for configuration information.

An optional 24-channel digital I/O expansion card, PN 67601, is available for applications requiring more digital I/O channels.

**NOTE:** A digital I/O point can be configured to count active pulse inputs by setting the bit to INPUT (DIG I/O menu) and using *PCEE* to monitor the bit. However, the fastest pulse rate that can be counted using a digital input is 10Hz (10 pulses per second).

#### 2.3.5 Detached Display Module (DDM)

Table 2-4 shows the connections between connector J4 on the 720i CPU board and connector J3 (Com 1) on the detached display module (DDM) board. See board diagrams in Figures 2-3 and 2-4, on page 9.

DDM Com 1 J3 Connector		CPU Board J4 Connector	
Pin	Signal	Pin	Signal
1	A	1	Y
2	B	2	Z
3	Z	3	B
4	Y	4	A
5	+6V	5	+6V
6	GND	6	GND

Table 2-4. CPU Board—DDM Connections

#### 2.4 Installing Option Cards

Each option card is shipped with installation instructions specific to that card. The general procedure for all option cards is as follows:



*Option cards are not hot-pluggable. Disconnect power to the 720i before installing option cards.*

1. Disconnect power to the indicator. Remove backplate as described in Section 2.2 on page 6.
2. Carefully align the option card connector with connector J12 or J11 on the CPU board (see Figure 2-3 on page 9). Press down to seat the option card in the CPU board connector.
3. Use the screws provided in the option kit to secure the other end of the option card to the threaded standoffs on the CPU board (see Figure 2-3).
4. Make connections to the option card as required. Use cable ties to secure loose cables inside the enclosure. When installation is complete, reassemble the enclosure as described in Section 2.6 on page 10.

The 720i automatically recognizes all installed option cards when the unit is powered on. No hardware-specific configuration is required to identify the newly-installed card to the system.

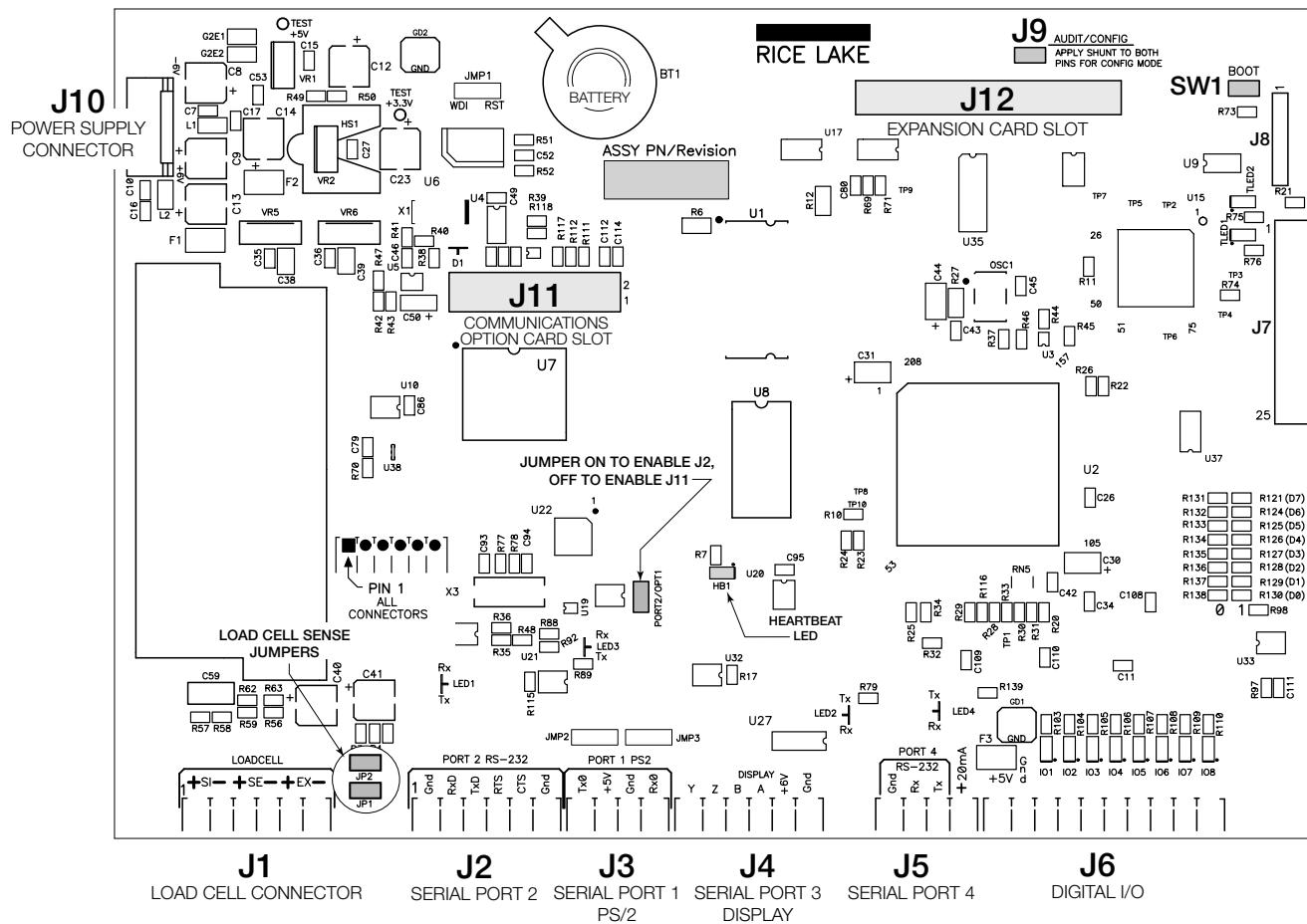


Figure 2-3. 720i CPU Board

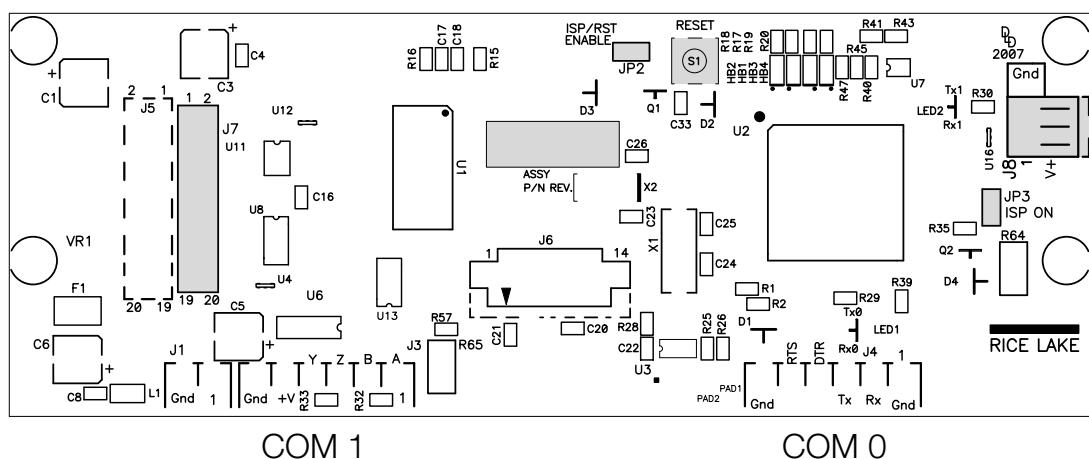


Figure 2-4. 720i Display Board

## 2.5 Slot Assignments

Table 2-5 lists the slot numbers, CPU board connectors, and configuration assignments made for both onboard and expansion card functions in the 720i. See Figure 2-3 for connector locations.

Slot Number	Connector	Function	Configured As
0	Connector J6	Onboard digital I/O	Slot 0, bits 1-8
	Connectors J3, J2, J5	Onboard serial communications	Ports 1, 2, 4
1	Connector J1	Onboard single-channel A/D	Channel 1
2	Connectors J12 (expansion card slot) and J11 (communications option card slot)	Dual-channel serial expansion card	Ports 7-8
		Digital I/O expansion card	Slot 2, bits 1-24
		Analog output card	Analog 2
		Bus communications cards	Bus Option 2

Table 2-5. 720i Slot Assignments

## 2.6 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 15 in-lb (1.7 N-m).

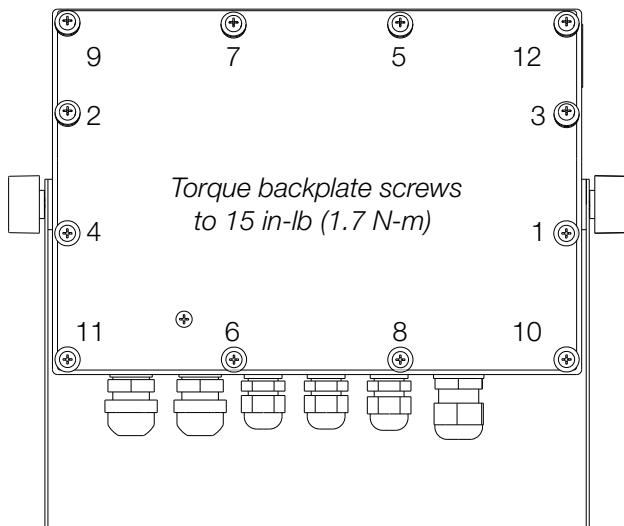


Figure 2-5. 720i Enclosure Backplate

## 2.7 CPU Board Removal

If you must remove the 720i CPU board, use the following procedure:

1. Disconnect power to the indicator. Remove backplate as described in Section 2.2 on page 6.
2. Unplug connectors for power to the board, serial communications, digital I/O, and any installed option cards.
3. Remove any installed option cards.
4. Remove the five phillips head screws and the kep nut from the CPU board.
5. Remove CPU board from the enclosure. If necessary, cut cable ties to shift cables out of the way.

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

## 2.8 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.

Data protected by the CPU board battery includes time and date, truck and tare memory, and onboard database information.

Use *Revolution III* 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.

Watch for the low battery warning on the LCD display and periodically check the battery voltage on both the CPU board and on any installed memory option cards. Batteries should be replaced when the indicator low battery warning comes on, or when battery voltage falls to 2.2 VDC. Life expectancy of the battery is ten years.

### Replacement Procedure

**For best results, replace the battery while in weigh mode and with AC power applied.** Use care not to bend the battery retaining spring.

If the battery must be replaced with power removed, do the following immediately after restoring power:

1. Place indicator in setup mode.
2. Go to the Version menu and press the RSConfig softkey. If connected using *Revolution III*, configuration can be reset by using monitor mode to enter the RESETCONFIGURATION command followed by the RS command.

See Figure 2-3 on page 9 for CPU board battery location and orientation (positive side up).



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

## 2.9 Replacement Parts and Assembly Drawings

### 2.9.1 Universal Model

Table 2-6 lists replacement parts and parts kit contents for the 720i universal enclosure model, including all parts referenced in Figures 2-6 through 2-8.

Ref Number	PN	Description (Quantity)	See Figure
1	101257	Switch panel membrane, universal (1)	2-6
2	53308	Model/serial number label (1)	
3	101263	Enclosure, universal (1)	
(4)	103988	Tilt stand washers (2), in parts kit	
(5)	103610	Tilt stand knobs (2), in parts kit	
6	67531	Tilt stand (1)	
7	15628	Cord grip, 1/2 NPT (1)	
8	15626	Cord grips, PG9 (3)	
9	15630	Lock nut for 1/2 NPT cord grip (1)	
10	68600	Cord grip, PG11 (1)	
11	15627	Lock nuts, PCN9 (3)	
12	68601	Lock nut, PG11 (1)	
13	45043	Ground wire, 4 in w/ No. 8 eye connector (1)	
14	102887	Display board assembly, universal (1)	2-7
15	85202	Power cord assembly, 115 VAC and 230 VAC North American units (1)	2-6
	85203	Power cord assembly, 230 VAC European units (1)	—
16	67885	Standoffs, M-F, 4-40NC x 3/4 (2)	2-7
17	14618	Kep nuts, 4-40NC hex (3)	
18	103443	CPU board mounting strip (1)	
19	106788	720i CPU board (PCE Version) (1)	

Table 2-6. Universal Model Replacement Parts

Ref Number	PN	Description (Quantity)	See Figure
20	102376	Backplate gasket, universal (1)	2-7
21	75062	Sealing washers (4)*	
22	14862	Machine screws, 8-32NC x 3/8 (4)*	
23	14626	Kep nuts, 8-32NC (7)*	2-8
24	53307	Label (1)	2-7
25	69291	3V Lithium coin battery	
26	103989	Standoffs, F-F, 4-40 x 1.06 (3)	
27	14825	Machine screws, 4-40NC x 1/4 (18)	
28	102888	LCD display module, 240x64, universal (1)	
29	16861	High voltage warning label (1)	
30	67796	Power supply cable assembly, to CPU board (1)	
31	67613	Power supply, $\pm 6$ VDC, 25W (1)	
32	103442	Power supply bracket (1)	
33	103936	Component plate (1)	2-6
35	16892	Ground/Earth label (1)	2-8
36	15134	Lock washers, No. 8, Type A (3)	
37	30376	Nylon seal ring for 1/2 NPT cord grip (1)	2-6
38	30375	Nylon seal rings for PG9 cord grips (3)	
39	68599	Nylon seal ring for PG11 cord grip (1)	
40	102377	Enclosure backplate, universal (1)	2-7
—	103458	Ribbon cable assembly, 7 in, 20-pin female, universal (1)	—
—	103609	Cable assembly, CPU-to-display, universal (1)	—

\* Additional parts included in parts kit.

#### Universal Model Parts Kit Contents

	104033	720 <i>i</i> Software Tool Kit CD (1)
	103988	Tilt stand washers (2)
	103610	Tilt stand knobs (2)
	42149	Rubber feet for tilt stand (4)
	30623	Machine screws, 8-32NC x 7/16 (3)
	14626	Kep nuts, 8-32NC (4)
	14862	Machine screws, 8-32NC x 3/8 (5)
	15134	Lock washers, No. 8, Type A (4)
	15631	Cable ties (5)
	15665	Reducing gland for 1/2 NPT cord grip (1)
	19538	Cord grip plugs (4)
	53075	Cable shield ground clamps (4)
	75062	Sealing washers (8)
	71344	10-position screw terminal for J6 (1)
	76513	4-position screw terminals for J3 and J5 (2)
	76514	6-position screw terminals for J1, J2 and J4 (3)
	94422	Capacity label (1)

Table 2-6. Universal Model Replacement Parts (Continued)

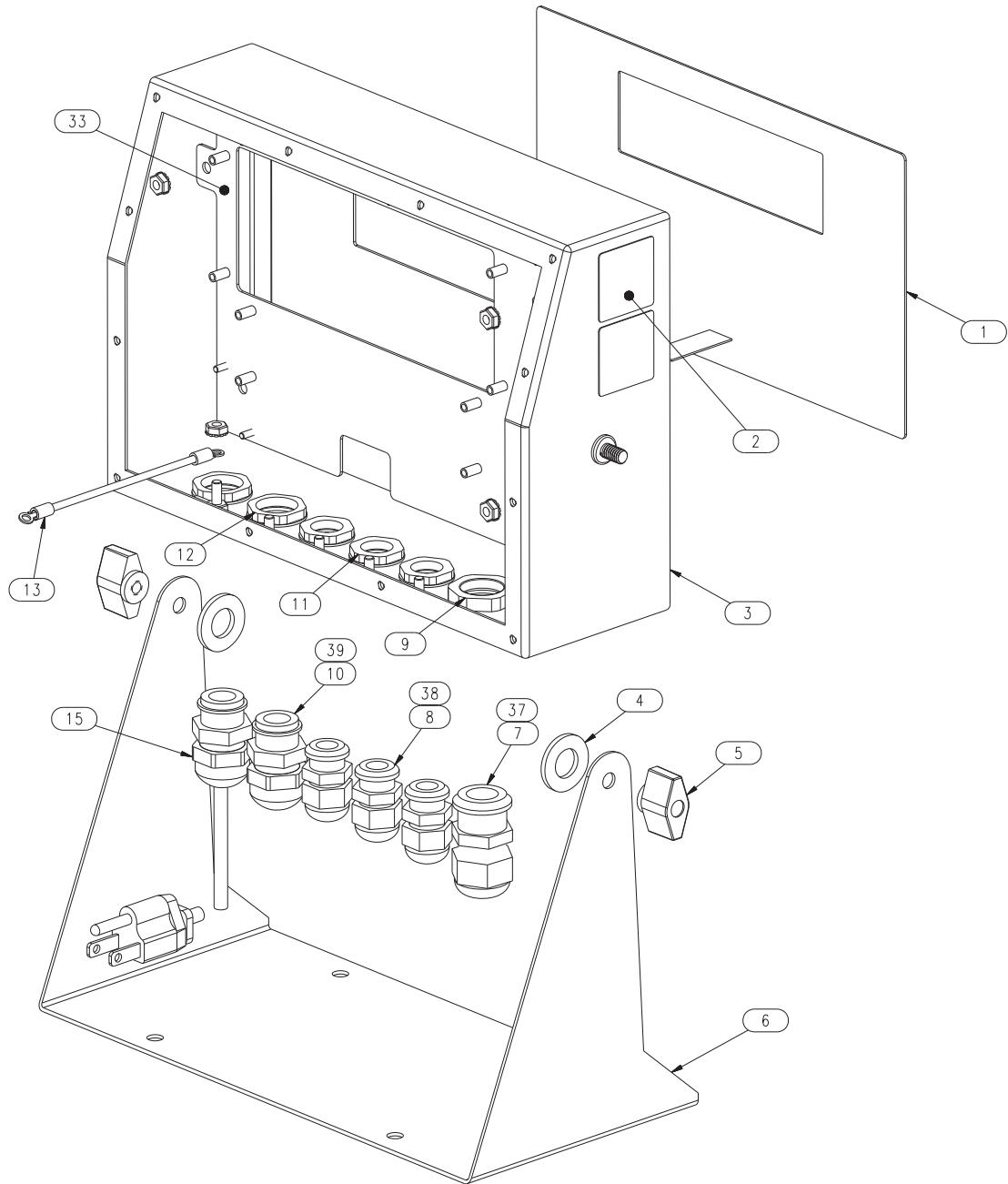


Figure 2-6. 720i Universal Model Assembly, Enclosure and Tilt Stand

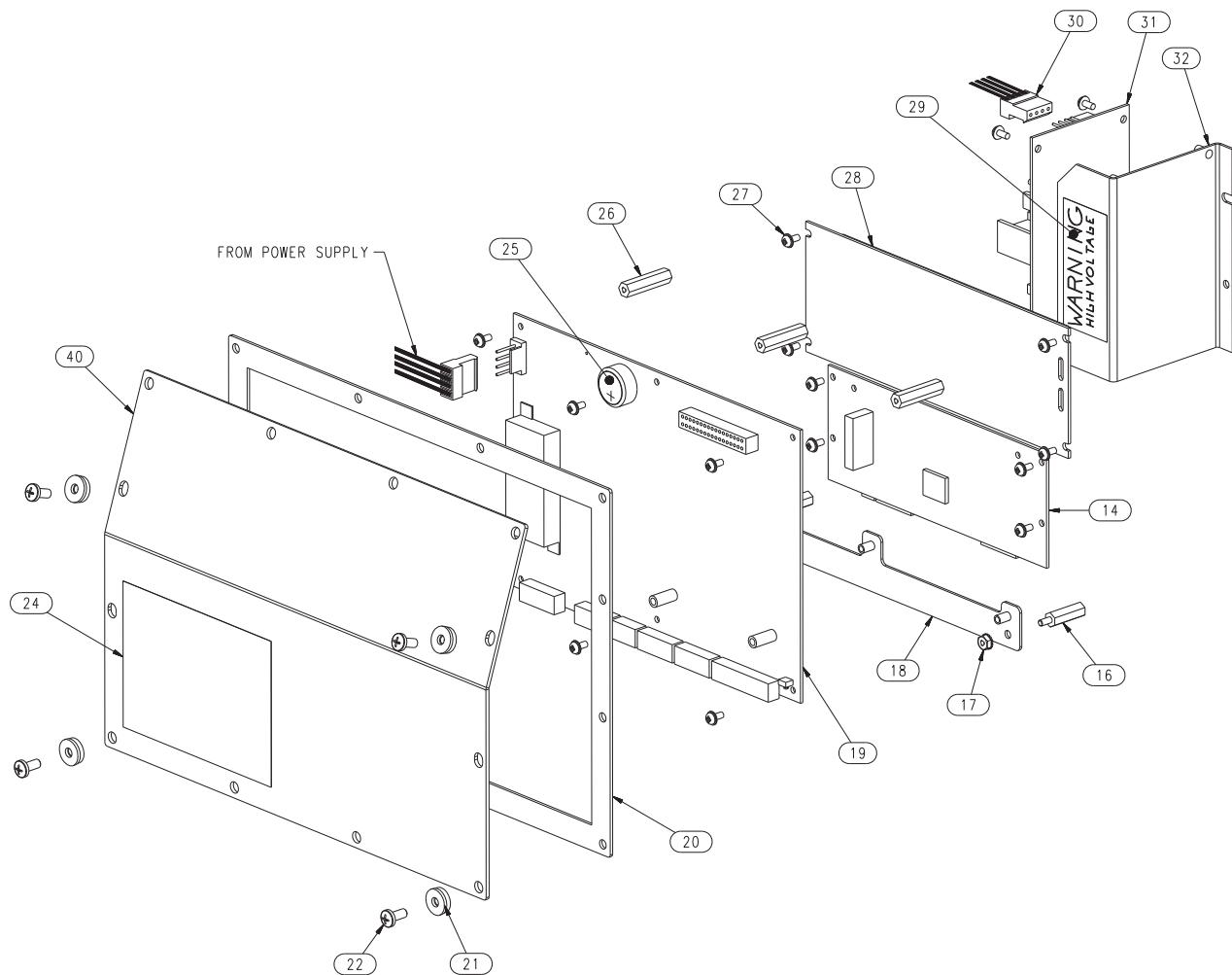


Figure 2-7. 720i Universal Model, CPU Board and Backplate

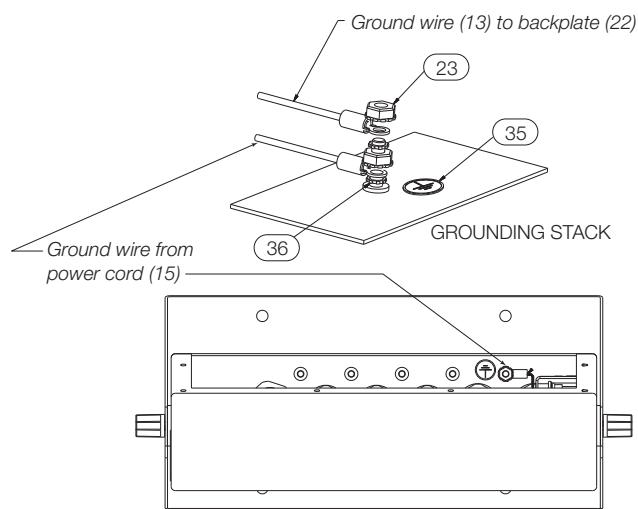


Figure 2-8. 720i Universal Model, Grounding Detail

## 2.9.2 Panel Mount Controller

Table 2-7 lists replacement parts and parts kit contents for the 720i panel mount controller, including all parts referenced in Figure 2-9 on page 16.

Ref Number	PN	Description (Quantity)
1	103314	Panel mount controller cover (1)
2	103677	Panel mount controller connector label (1)
3	101263	Enclosure, universal (1)
3	67796	Power supply cable assembly, to CPU board (1)
4	69291	3V Lithium coin battery
5	106788	720i CPU board assembly (POE Version) (1)
6	14822	Machine screws, 4-40NC x 1/4 (10)
7	101264	Panel mount controller enclosure (1)
8	53308	Labels (2)
9	14825	Machine screws, 4-40NC x 1/4 (2)
10	103681	AC feed-through header (1)
11	16892	Ground/Earth label (1)
12	15601	Ground wire, 6 in w/ No. 8 eye connector (1)
13	67885	Standoffs, M-F 4-40NC x 1.25 (2)
14	67613	Power supply, ±6VDC, 25W (1)
15	85494	Power supply cover (1)
16	16861	High voltage warning label (1)
17	54206	Machine screw, fillister head, 6-32NC x 3/8 (1)
18	14626	Kep nuts, 8-32NC hex (2)
19	14839	Machine screws, 6-32NC x 1/4 (2)
20	53307	Label (1)
21	15134	Lock washers, No. 8, Type A (2)
22	71698	Polyurethane foam strip (1)
<i>Panel Mount Controller Parts Kit Contents</i>		
	104033	720i Software Toolkit CD (1)
	15888	3-position terminal block (1)
	71344	10-position screw terminal for J6 (1)
	76513	4-position screw terminals for J3 and J5 (2)
	76514	6-position screw terminals for J1, J2 and J4 (3)
	14626	Kep nut, 8-32NC hex (1)
	14862	Machine screws, 8-32NC x 3/8 (2)
	15134	Lock washers, No. 8 Type A (7)
	15694	No. 8 crimp connector (1)
	53075	Cable shield ground clamps (4)
	30623	Machine screws, fillister head, 8-32NC x 7/16 (2)
	94422	Capacity label (1)

Table 2-7. Panel Mount Controller Replacement Parts

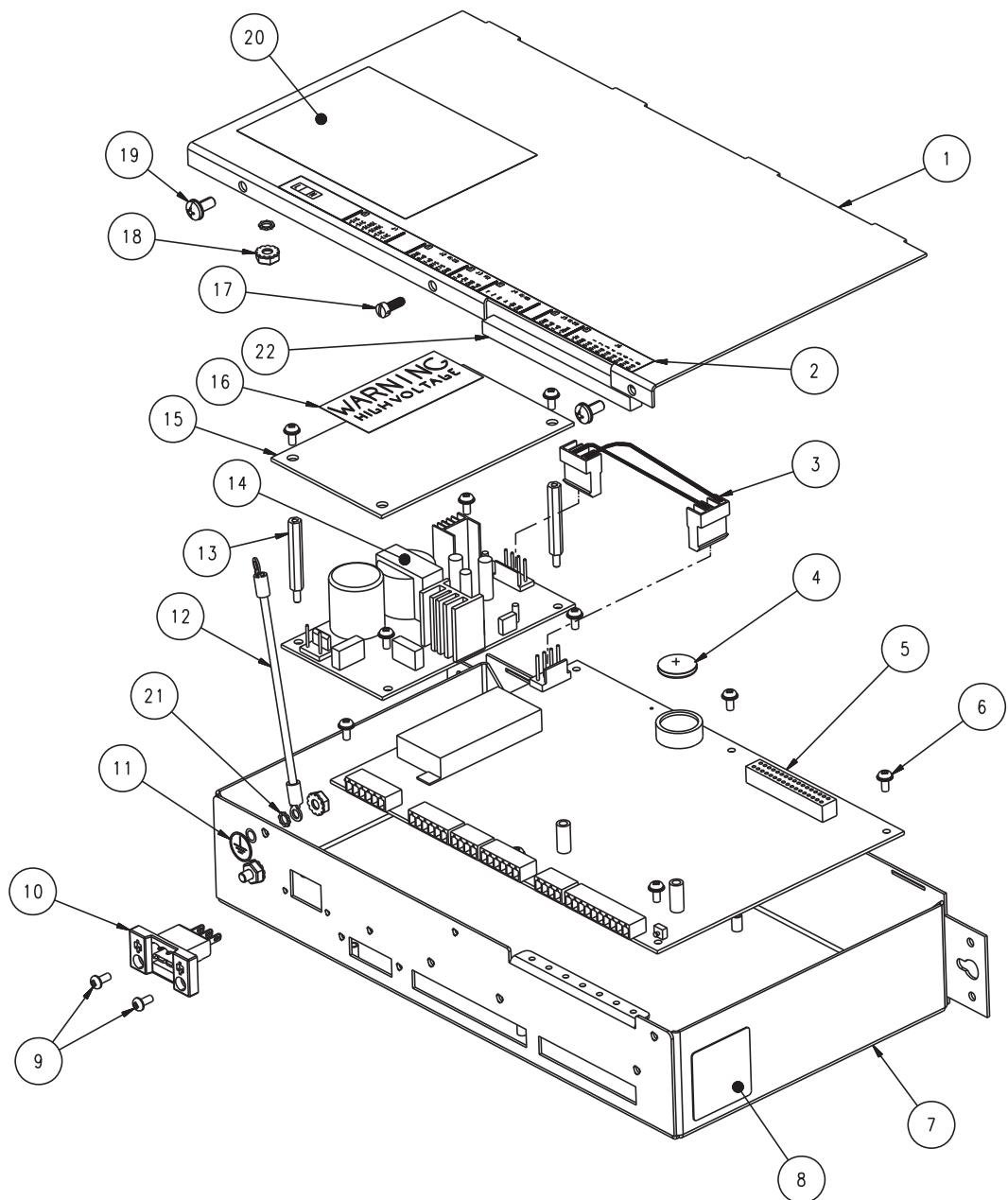


Figure 2-9. Panel Mount Controller Assembly

### 2.9.3 Panel Mount Display

Table 2-8 lists replacement parts and parts kit contents for the 720i panel mount remote display unit, including all parts referenced in Figure 2-10.

Ref Number	PN	Description (Quantity)
1	101256	Switch panel membrane, panel mount display (1)
2	101265	Faceplate, panel mount display (1)
3	68719	Faceplate gasket, panel mount display (1)
4	102605	Backplate, panel mount display (1)
5	14822	Machine screws, 4-40NC x 1/4 (6)
6	101239	Remote display board assembly (1)
7	53308	Label (1)
8	69787	Clinching bracket (1)
9	82426	Backing plate, panel mount display (1)
<i>Panel Mount Remote Display Parts Kit Contents</i>		
	76514	6-position screw terminal (1)
	94422	Capacity label (1)
	53075	Cable shield ground clamp (1)
	71522	Machine screws, 8-32NC x 1/4 (4)
	82425	Machine screws, 10-32NF x 1.50 (7)

Table 2-8. Panel Mount Display Unit Replacement Parts

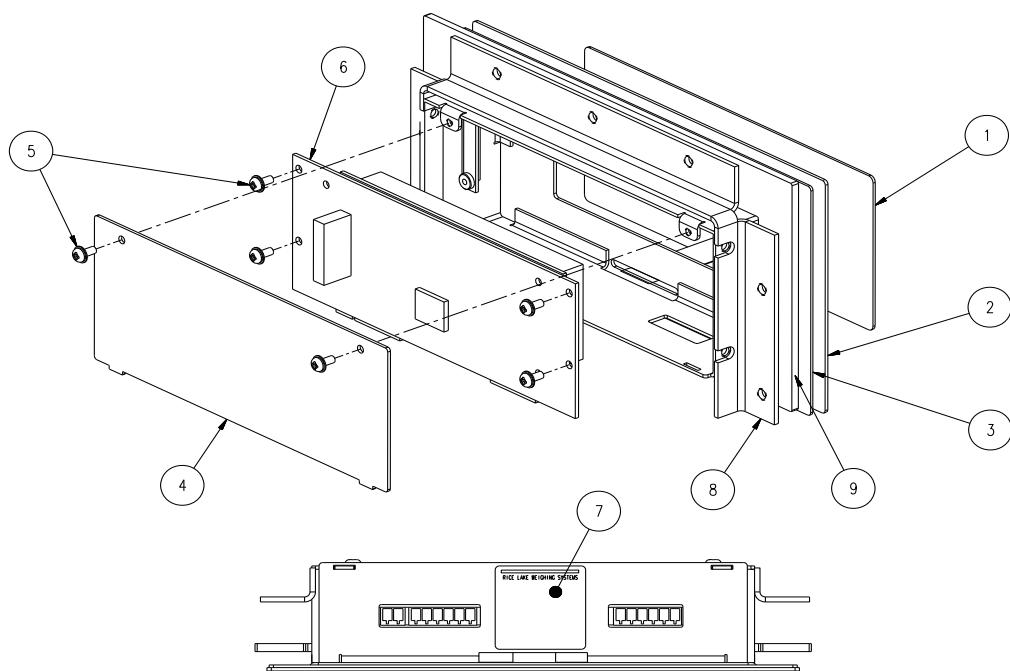


Figure 2-10. 720i Panel Mount Display Assembly

## 3.0 Configuration

To configure the 720i indicator, press the **MENU** key on the front panel (only if jumper J9 is installed), press the **Down** key to select *Configuration*, then press **Enter**. Detailed descriptions of the configuration menus are provided in Section 3.2.

When configuration is complete, press the **Save & Exit** softkey to exit setup mode. **Save & Exit** writes all parameter changes to NV RAM before returning to normal mode.



Figure 3-1. 720i Menu Display

### 3.1 Configuration Methods

The 720i 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 an indicator serial port. Configuration using the menus is described in Section 3.1.3.

Configuration using the serial port can be accomplished using either the serial command set described in Section 10.1 on page 77 or the *Revolution III* configuration utility and there are two software modules available:

- 720i PCE
- 720i Batching

**NOTE:** Some configuration parameters cannot be accessed through the configuration menus. *Revolution III* provides the most complete and efficient configuration interface for the 720i.

#### 3.1.1 Revolution III Configuration

The *Revolution III* configuration utility provides the preferred method for configuring the 720i indicator. *Revolution III* runs on a personal computer to set configuration parameters for the indicator. When *Revolution III* configuration is complete, configuration data is downloaded to the indicator.

*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 indicator with an identical hardware configuration.

To use *Revolution III*, do the following:

1. Install *Revolution III* on an IBM-compatible personal computer. See Section 5.0 on page 48 for detailed hardware and software requirements.
2. With both indicator and PC powered off, connect the PC serial port to the RS-232 pins

on the indicator serial port or to the optional USB communications card.

3. Power up the PC and the indicator. Use the setup switch to place the indicator in setup mode.
4. Start the *Revolution III* program.

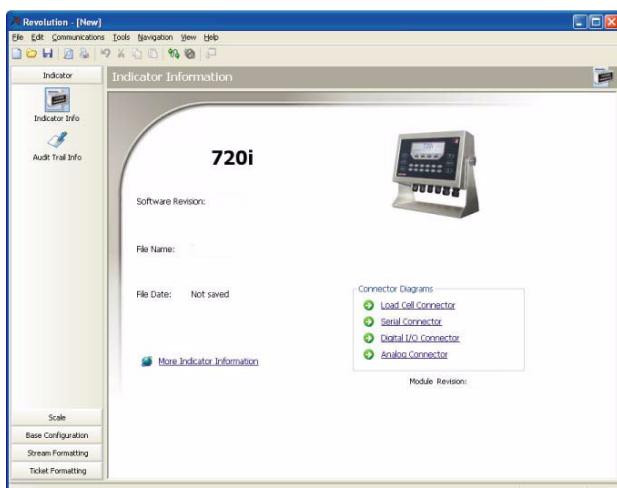


Figure 3-2. Revolution III Display for 720i PCE Version

Put second screen here illustrating the 720i Batching version screen.



Figure 3-3. Revolution III Display for 720i Batch Version

*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.

See Section 5.0 on page 48 for more information about using *Revolution III* to configure the 720*i*.

### 3.1.2 Serial Command Configuration

The serial command set can be used to configure the 720*i* indicator using either a personal computer, terminal, or remote keyboard. Like *Revolution III*, serial command configuration sends commands to the indicator serial port; unlike *Revolution III*, serial commands can be sent using any external device capable of sending ASCII characters over a serial connection.

Serial commands duplicate the functions available using the indicator front panel and provide some functions not otherwise available. Serial commands can be used to simulate pressing front panel keys, to configure the indicator, or to dump lists of parameter settings. See Section 10.1 on page 77 for more information about using the serial command set.

### 3.1.3 Front Panel Configuration

By default, the 720*i* is configured to use the installed single-channel A/D as the source for Scale 1. To configure the 720*i* for serial scale support, use the CONFIG submenu under the SCALES menu.

For example: to configure a serial scale, set the serial input function (SERIAL menu) for Port 4 (or Port 7, if using a serial expansion card) to SCALE or INDUST (see Section 3.2.2 on page 32). Return to the top-level SCALES menu, then go **Down** to Scale 1 Configuration, **Right** to CONFIG (Scale Hardware Configuration), then **Down** once more to show the scale source options. Use the **Right** or **Left** navigation key to change the default A/D value to *PORT 4* (or *PORT 7*) as shown in Figure 3-4.



Figure 3-4. Scale Hardware Configuration Display

See Section 11.3 on page 91 for more information about configuring serial scales.

### 3.1.4 Multi-Range and Multi-Interval Scales

The 720*i* supports multi-range and multi-interval scales of either two or three ranges or intervals.

*Multi-range scales* provide two or three ranges, each extending from zero to the maximum capacity specified for the range, that can specify different scale intervals (graduations). The scale interval changes as the applied weight increases but does not reset to lower range intervals until the scale returns to zero.

*Multi-interval scales* divide the scale into two or three partial weighing ranges, each with different scale intervals. The scale interval changes with both increasing and decreasing loads applied.

To configure a multi-range or multi-interval scale, use the SPLIT parameter to select 2RNG or 3RNG (for multi-range scales), or 2INTVL or 3INTVL (for multi-interval scales). Selecting a SPLIT value other than OFF allows specification of decimal point, display divisions, and maximum capacity for each range or interval.

If using streaming with multi-range or multi-interval, the stream must be set to Custom in *Revolution III* and the Tokens for Secondary and Tertiary Units must be set to L or K to match the Primary.

## 3.2 Menu Structures and Parameter Descriptions

The 720*i* 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
SCALES	Configuration	Configure and calibrate scale
SERIAL	Serial	Configure communications ports
FEATURE	Feature	Set date and time formats, truck mode, passwords, keyboard locks, regulatory mode, and initial consecutive number value, and define softkeys.
PFORMAT	Print Format	Set port used for header, gross, net, truck in/out, and auxiliary print ticket formats. See Section 6.0 on page 50 for more information.
SETPTS	Setpoints	Configure setpoints and batching mode. Only available in the 720 <i>i</i> Batching version.
DIG I/O	Digital I/O	Assign digital input/output functions
ALGOUT	Analog Output	Configure analog output module. Used only if analog output option is installed.
VERSION	Version	Display installed software version number. The <b>RSConfig</b> softkey on the Version menu can be used to restore all configuration parameters to their default values.

Table 3-1. 720*i* Menu Summary

The following sections provide graphic representations of the 720*i* menu structures and tables describing the menu parameters. Default values are shown in **bold** type; numeric ranges and string values are shown in *italic* type. Parameters shown surrounded by a dotted-line box only appear under the special circumstances explained under each box.

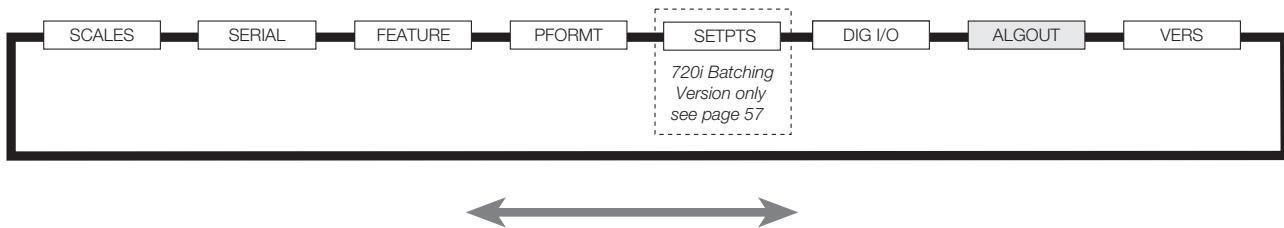


Figure 3-5. Configuration Menu Flow

### 3.2.1 SCALES Menu

The SCALES menu is shown in Figure 3-6. The FORMAT submenu is shown in Figure 3-7 on page 25; the CALIBR submenu is shown in Figure 3-9 on page 31. Parameters shown in each diagram are described in the table following that diagram.

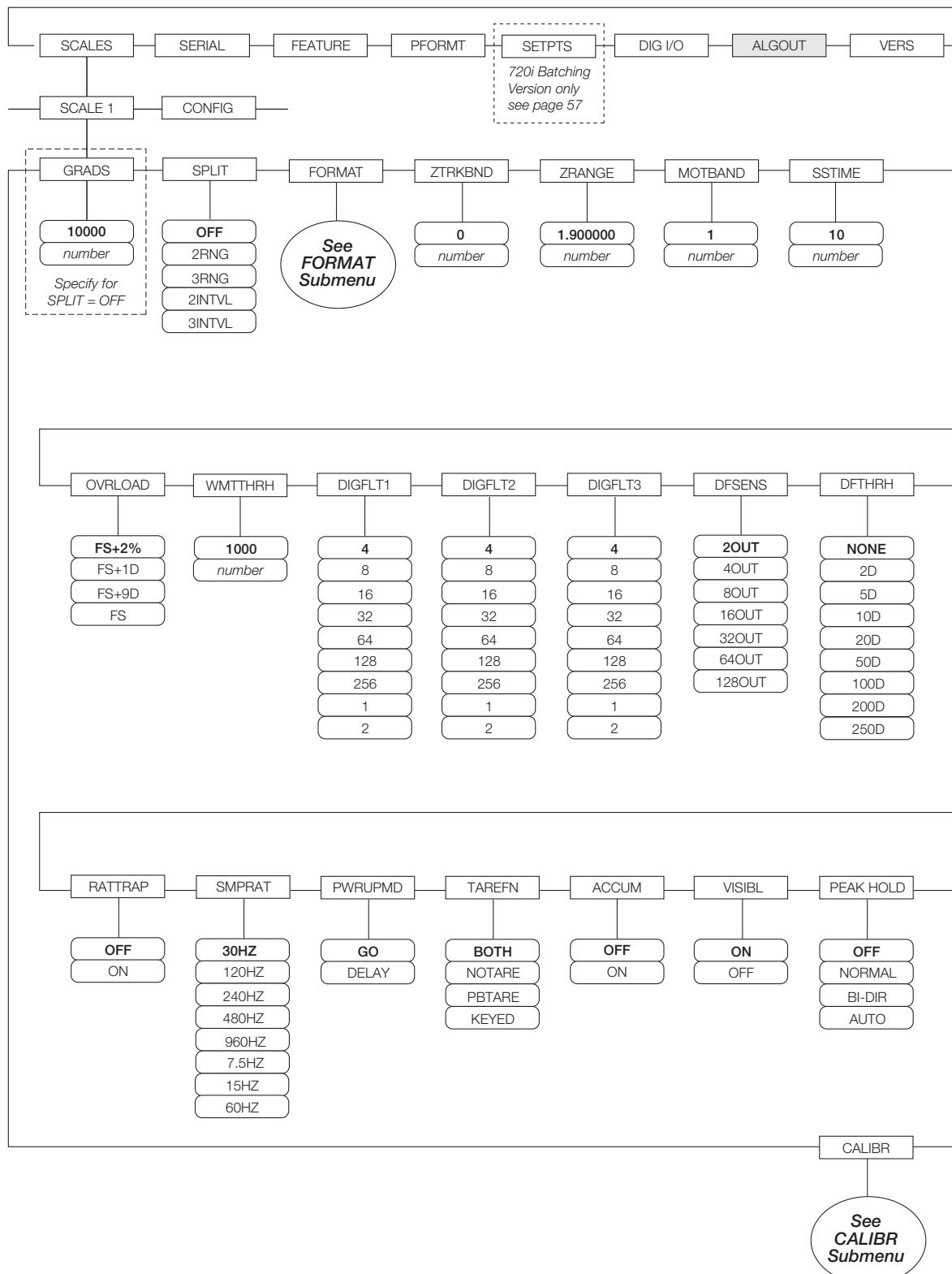


Figure 3-6. SCALES Menu

SCALES Menu		
Parameter	Choices	Description
<i>Level 2 submenus</i>		
SCALE 1		Allows configuration and calibration of each scale
CONFIG		Scale hardware configuration (A/D or serial scale)
<i>Level 3 submenus</i>		
GRADS	10000 1-9999999	<p>Specifies the number of full scale graduations if SPLIT=OFF. (For multi-range and multi-interval scales (SPLIT ≠ OFF), the GRADS value is derived from the capacity and display divisions specified for the range or interval.)</p> <p>The value entered must be in the range 1-9999999 and should be consistent with legal requirements and environmental limits on system resolution.</p> <p>To calculate GRADS, use the formula: GRADS = Capacity / Display Divisions.</p> <p>Display divisions are specified under the FORMAT submenu.</p>
SPLIT	OFF 2RNG 3RNG 2INTVL 3INTVL	Specifies whether the scale is full-range (OFF), multi-range (2RNG, 3RNG), or multi-interval (2INTVL, 3INTVL). For multi-range and multi-interval scales, see the submenu shown in Figure 3-8 on page 29 and parameter descriptions in Table 3-4 on page 30.
FORMAT	PRIMAR SECNDR TERTIA ROC	<p>For standard scales (SPLIT=OFF), see Level 4 submenu descriptions in Table 3-3 on page 26.</p> <p>For multi-range and multi-interval scales, see Table 3-4 on page 30.</p>
ZTRKBND	0 <i>number</i>	<p>Automatically zeroes the scale when within the range specified, as long as the input is within the ZRANGE and scale is at standstill. Specify the zero tracking band in ± display divisions. Maximum legal value varies depending on local regulations.</p> <p><b>NOTE:</b> For scales using linear calibration, do not set the zero tracking band to a value greater than that specified for the first linearization point.</p>
ZRANGE	1.900000 <i>number</i>	Selects the range within which the scale can be zeroed. The 1.900000 default value is ± 1.9% around the calibrated zero point, for a total range of 3.8%. Indicator must be at standstill to zero the scale. Use the default value for legal-for-trade applications.
MOTBAND	1 <i>number</i>	<p>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 varies depending on local regulations.</p> <p>If this parameter is set to 0, the standstill annunciator will be set continuously on, and operations including zero, print, and tare will be performed regardless of scale motion. If 0 is selected, ZTRKBND must also be set to 0.</p>
SSTIME	10 <i>number</i>	Specifies the length of time the scale must be out of motion, in 0.1-second intervals, before the scale is considered to be at standstill. Values greater than 10 are not recommended.
OVRLOAD	FS+2% FS+1D FS+9D 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.
WMTTHRH	1000 <i>number</i>	Specifies the minimum number of grads required for a weightment to be added to the recorded number of weightments.

Table 3-2. SCALES Menu Parameters

SCALES Menu		
Parameter	Choices	Description
DIGFLT1 DIGFLT2 DIGFLT3	4 8 16 32 64 128 256 1 2	<p>Selects the digital filtering rate used to reduce the effects of mechanical vibration from the immediate area of the scale.</p> <p>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.</p> <p>NOTE: When configuring non-A/D scales, set the DIGFLT<sub>x</sub> parameters to 1 to disable filtering.</p> <p>See Section 11.7 on page 96 for more information about digital filtering.</p>
DFSENS	2OUT 4OUT 8OUT 16OUT 32OUT 64OUT 128OUT	<p>Digital filter cutout sensitivity. Specifies the number of consecutive readings that must fall outside the filter threshold (DFTHR<sub>H</sub> parameter) before digital filtering is suspended.</p> <p>See Section 11.7 on page 96 for more information about digital filtering.</p>
DFTHR <sub>H</sub>	NONE 2D 5D 10D 20D 50D 100D 200D 250D	<p>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.</p> <p>See Section 11.7 on page 96 for more information about digital filtering.</p>
RATTRAP	OFF ON	Enables RATTLETRAP® 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.
SMPRAT	<b>30HZ</b> 120HZ 240HZ 480HZ 960HZ 7.5HZ 15HZ 60HZ	Sample rate. Selects measurement rate, in samples per second, of the analog-to-digital converter. Lower sample rate values provide greater signal noise immunity: the default 120 Hz value may be too fast to provide the desired stability in some static weighing applications.
PWRUPMD	GO DELAY	<p>Power up mode. In GO mode, the indicator goes into operation immediately after a brief power up display test.</p> <p>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.</p>
TAREFN	BOTH NOTARE PBTARE KEYED	Enables or disables push-button and keyed tares. Possible values are:  BOTH: Both push-button and keyed tares are enabled NOTARE: No tare allowed (gross mode only) PBTARE: Push-button tares enabled KEYED: Keyed tare enabled
ACCUM	OFF ON	Accumulator. Specifies whether the scale accumulator is enabled. If enabled, accumulation occurs whenever a print operation is performed.
VISIBL	ON OFF	Scale visibility. Specifies whether scale data is displayed.

Table 3-2. SCALES Menu Parameters (Continued)

SCALES Menu		
Parameter	Choices	Description
PEAK HOLD	OFF NORMAL BI-DIR AUTO	<p>Peak hold. Used to determine, display, and print the greatest net weight read during a weighing cycle. The weighing cycle ends when a print command is executed (AUTO setting) or when the peak weight is cleared by pressing <b>ZERO</b> or <b>PRINT</b>. Press <b>GROSS/NET</b> to display gross weight data when using the peak hold function.</p> <p>OFF Peak hold function is off.</p> <p>NORMAL Positive peak, manual reset. Greatest net weight is held in memory until the weight is removed from the scale and either the <b>ZERO</b> or <b>PRINT</b> key is pressed.</p> <p>BI-DIR Bi-directional peak, manual reset. Same as NORMAL, but peak value can be either positive or negative, determined by absolute value.</p> <p>AUTO Positive peak, auto print, auto reset. Automatic print occurs when scale load is 0 <math>\pm</math> 10 display divisions and at standstill. Following the print command, the peak value is cleared and reset automatically.</p>
CALIBR	WZERO WVAL WSPAN WLIN REZERO	See Level 4 submenu descriptions in Table 3-5 on page 31 and Section 4.2 on page 45.

*Table 3-2. SCALES Menu Parameters (Continued)*

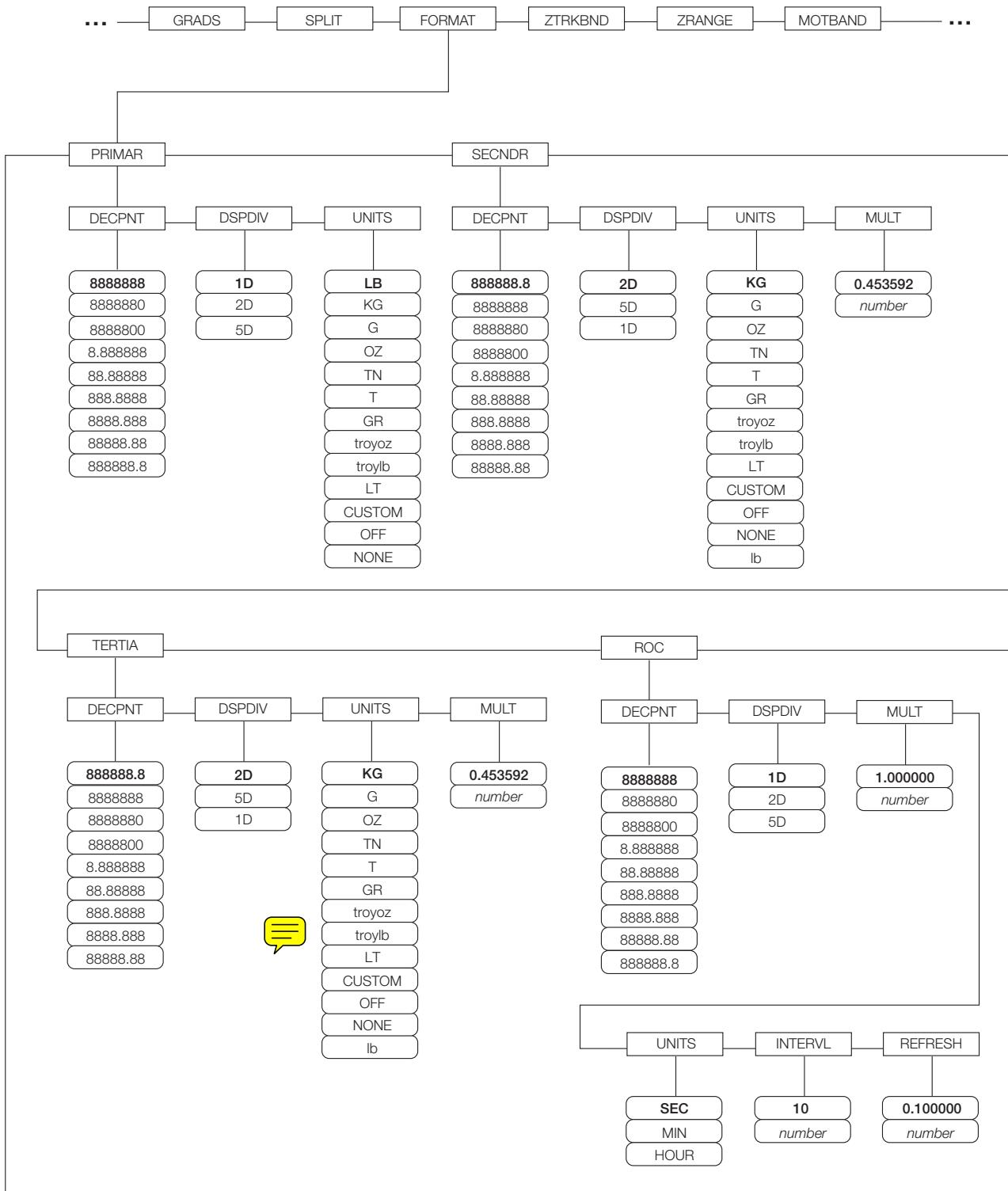


Figure 3-7. SCALES Menu, FORMAT Submenu, SPLIT = OFF

SCALES Menu, FORMAT Submenu, SPLIT = OFF		
Parameter	Choices	Description
<b>Level 4, FORMAT submenu</b>		
PRIMAR	DECPNT DSPDIV UNITS	Specifies the decimal position, display divisions, and units used for the primary units. See Level 5 submenu parameter descriptions.
SECNDR	DECPNT DSPDIV UNITS MULT	Specifies the decimal position, display divisions, units, and conversion multiplier used for the secondary units. See Level 5 submenu parameter descriptions.
TERTIA	DECPNT DSPDIV UNITS MULT	Specifies the decimal position, display divisions, units, and conversion multiplier used for the tertiary units. See Level 5 submenu parameter descriptions.
ROC	DECPNT DSPDIV MULT TIME INTERVL REFRESH	Specifies the decimal position, display divisions, conversion multiplier, time units, update interval, and refresh interval used for the rate of change units. See Level 5 submenu parameter descriptions.
<b>Level 5 submenus</b>		
<b>Primary Units (PRIMAR) Parameters</b>		
DECPNT	8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88 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	1D 2D 5D	Display divisions. Selects the minimum division size for the primary units displayed weight.
UNITS	LB KG G OZ TN T GR troyoz troylb LT CUSTOM NONE OFF	Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; G=gram; OZ=ounce; TN=short ton; T=metric ton; GR=grain; troyoz=troy ounce; troylb=troy pound; LT=long ton.

Table 3-3. SCALES Menu, FORMAT Submenu Parameters, SPLIT = OFF

SCALES Menu, FORMAT Submenu, SPLIT = OFF		
Parameter	Choices	Description
<b>Secondary Units (SECNDR) and Tertiary Units (TERTIA) Parameters</b>		
DECPNT	888888.8 8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88	Decimal point location. Determines the location of the decimal point or dummy zeros in the secondary or tertiary units display.
DSPDIV	2D 5D 1D	Display divisions. Selects the value of minimum division size of the displayed weight for secondary or tertiary units display.
UNITS	LB KG G OZ TN T GR troyoz troylb LT CUSTOM NONE OFF	Specifies secondary or tertiary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; G=gram; OZ=ounce; TN=short ton; T=metric ton; GR=grain; troyoz=troy ounce; troylb=troy pound; LT=long ton.
MULT	0.453592 0.000001– 9999999	Multiplier. Specifies the conversion factor by which the primary units are multiplied by to obtain the secondary or tertiary units. The default is 0.453592, which is the conversion factor for changing pounds to kilograms. See Section 11.8 on page 97 for a list of multipliers.  To shift between primary, secondary, and tertiary units, press the UNITS key.
<b>Rate of Change (ROC) Units Parameters</b>		
For applications using the ROC function, the primary scale should be configured with a finer resolution than the rate of change (ROC) units to prevent a stepwise appearance in the ROC display. The ROC display step size (weight increment between displayed values) can be roughly calculated as follows:  $(\text{updates\_per\_ROC\_UNIT}) * (\text{PRIMARY\_resolution} / \text{ROC\_resolution})$		
For example, with INTERVAL=30; REFRESH =0.1; UNITS=MIN; PRIMARY resolution at 0.1 LB and ROC resolution at 1.0 (LB/MIN):  <ul style="list-style-type: none"> <li>- INTERVAL * REFRESH = 30 * 0.1 = 3.0 seconds per update (ROC data is flushed every 3.0 seconds)</li> <li>- With UNITS = MIN, there are 20 ROC data updates per ROC time unit: 60 seconds / 3.0 seconds per update</li> <li>- The resolution ratio of PRIMARY to ROC units is 0.1 (0.1 / 1.0)</li> <li>- This configuration provides a step size in the ROC display of 2 LB (2 LB increments between displayed values): <math>20 * 0.1 = 2</math></li> </ul>		
Note that setting both PRIMARY and ROC display resolutions to 1 LB would have resulted in a step size of 20 LB.		

Table 3-3. SCALES Menu, FORMAT Submenu Parameters, SPLIT = OFF (Continued)

SCALES Menu, FORMAT Submenu, SPLIT = OFF		
Parameter	Choices	Description
DECPNT	8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88 888888.8	Decimal point location. Determines the location of the decimal point or dummy zeros in the display.
DSPDIV	1D 2D 5D	Display divisions. Selects the minimum division size for the ROC units displayed weight.
MULT	1.0 0.000001- 9999999	Multiplier. Specifies the conversion factor by which the primary units are multiplied by to obtain the displayed rate of change units. See Section 11.8 on page 97 for information about conversion factors.
UNITS	SEC MIN HOUR	Rate-of-change units.
INTERVL	10 1-100	Update interval. Specifies the number of refreshes over which the rate-of-change is calculated. For example, with REFRESH set to 0.1 second and INTERVL at 60, each weight value takes 6 seconds (0.1 * 60) to be flushed from the ROC data.
REFRESH	0.1 0.1-60	Refresh interval. Specifies the number of seconds between rate-of-change samples.

Table 3-3. SCALES Menu, FORMAT Submenu Parameters, SPLIT = OFF (Continued)

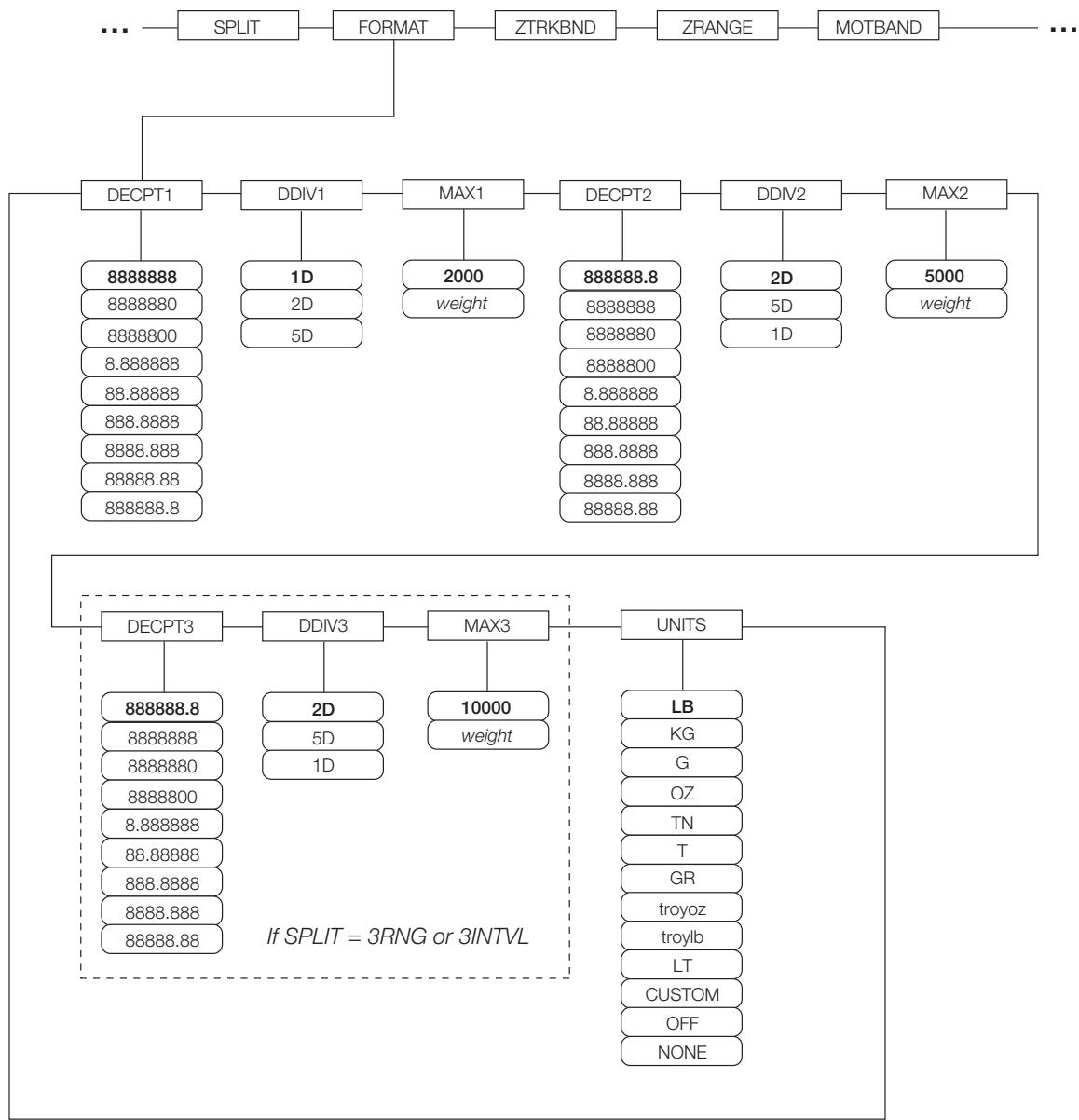


Figure 3-8. **FORMAT** Submenu, **SPLIT ≠ OFF** (Multi-range and Multi-interval Scales)

SCALES Menu, FORMAT Submenu, SPLIT ≠ OFF		
Parameter	Choices	Description
<b>Level 4, FORMAT submenu</b>		
DECPT1	8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88 888888.8	Decimal point location for first range or interval. Specifies the location of the decimal point or dummy zeroes in the primary unit display. Value should be consistent with local legal requirements.
DDIV1	1D 2D 5D	Display divisions for first range or interval. Selects the minimum division size for the primary units displayed weight.
MAX1	2000 <i>weight</i>	Maximum weight for first range or interval.
DECPT2	888888.8 8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88	Decimal point location for second range or interval. Specifies the location of the decimal point or dummy zeroes in the primary unit display. Value should be consistent with local legal requirements.
DDIV2	2D 5D 1D	Display divisions for second range or interval. Selects the minimum division size for the primary units displayed weight.
MAX2	5000 <i>weight</i>	Maximum weight for second range or interval.
DECPT3	888888.8 8888888 8888880 8888800 8.888888 88.88888 888.8888 8888.888 88888.88	Decimal point location for third range or interval (SPLIT = 3RNG or 3INTVL only). Specifies the location of the decimal point or dummy zeroes in the primary unit display. Value should be consistent with local legal requirements.
DDIV3	2D 5D 1D	Display divisions for third range or interval (SPLIT = 3RNG or 3INTVL only). Selects the minimum division size for the primary units displayed weight.
MAX3	10000 <i>weight</i>	Maximum weight for third range or interval (SPLIT = 3RNG or 3INTVL only).

Table 3-4. SCALES Menu, FORMAT Submenu Parameters, SPLIT ≠ OFF

#### SCALES Menu, FORMAT Submenu, SPLIT ≠ OFF

Parameter	Choices	Description
UNITS	LB KG G OZ TN T GR troyoz troylb LT CUSTOM NONE OFF	Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; G=gram; OZ=ounce; TN=short ton; T=metric ton; GR=grain; troyoz=troy ounce; troylb=troy pound; LT=long ton.

Table 3-4. SCALES Menu, FORMAT Submenu Parameters, SPLIT ≠ OFF (Continued)

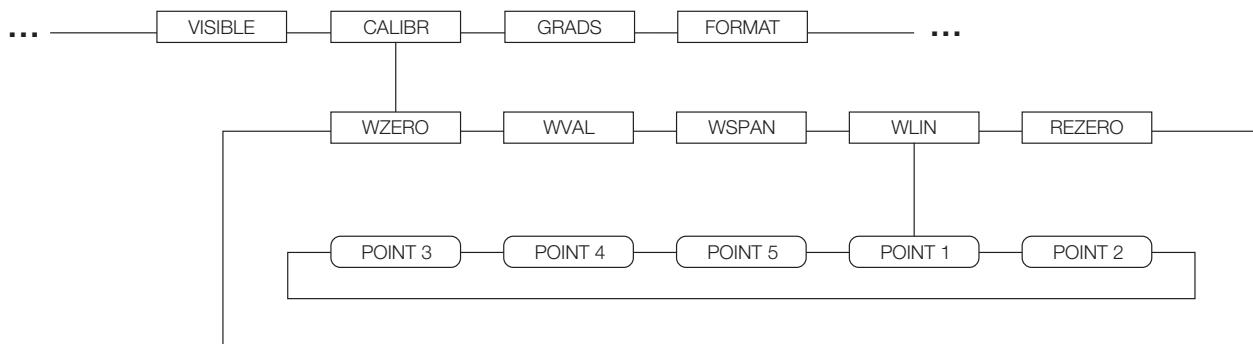


Figure 3-9. SCALES Menu, CALIBR Submenu

#### SCALES Menu, CALIBR Submenu

Parameter	Choices	Description
<b>Level 4, CALIBR submenu</b>		
WZERO	—	Press ENTER to display and edit the zero calibration A/D count or millivolts value.
WVAL	—	Press ENTER to display and edit the test weight value.
WSPAN	—	Press ENTER to display and edit the span calibration A/D count or millivolts value.
WLIN	POINT 1 – POINT 5	Press ENTER to display and edit test weight and calibration values for up to five linearization points. 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.
<b>NOTE:</b> Use this parameter only after WZERO and WSPAN have been set. See Section 4.2 on page 45 for more information about using this parameter.		

Table 3-5. SCALES Menu, CALIBR Submenu Parameters

### 3.2.2 SERIAL Menu

See Section on page 98 for information about 720i serial data formats.

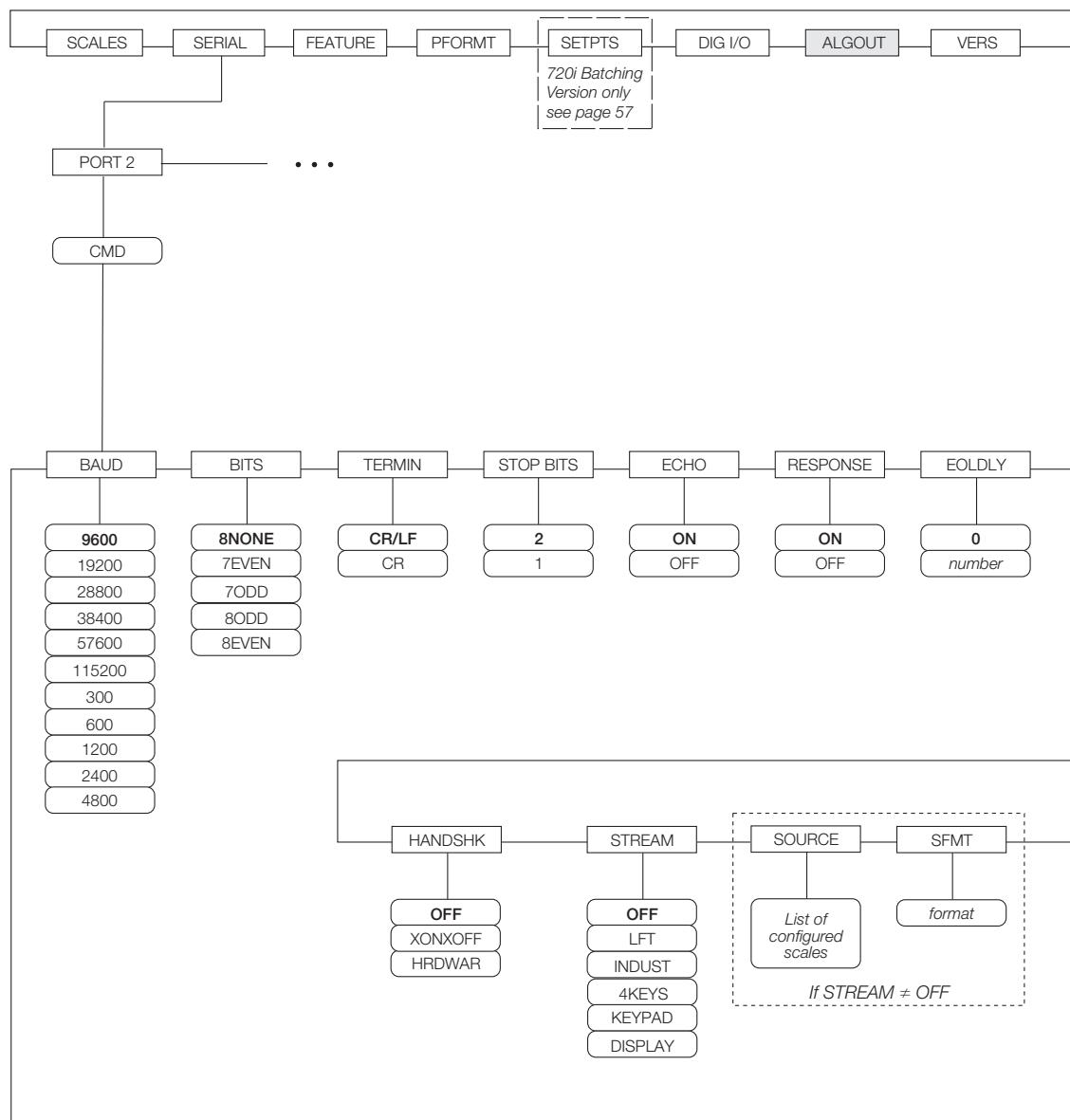


Figure 3-10. SERIAL Menu, Port 2

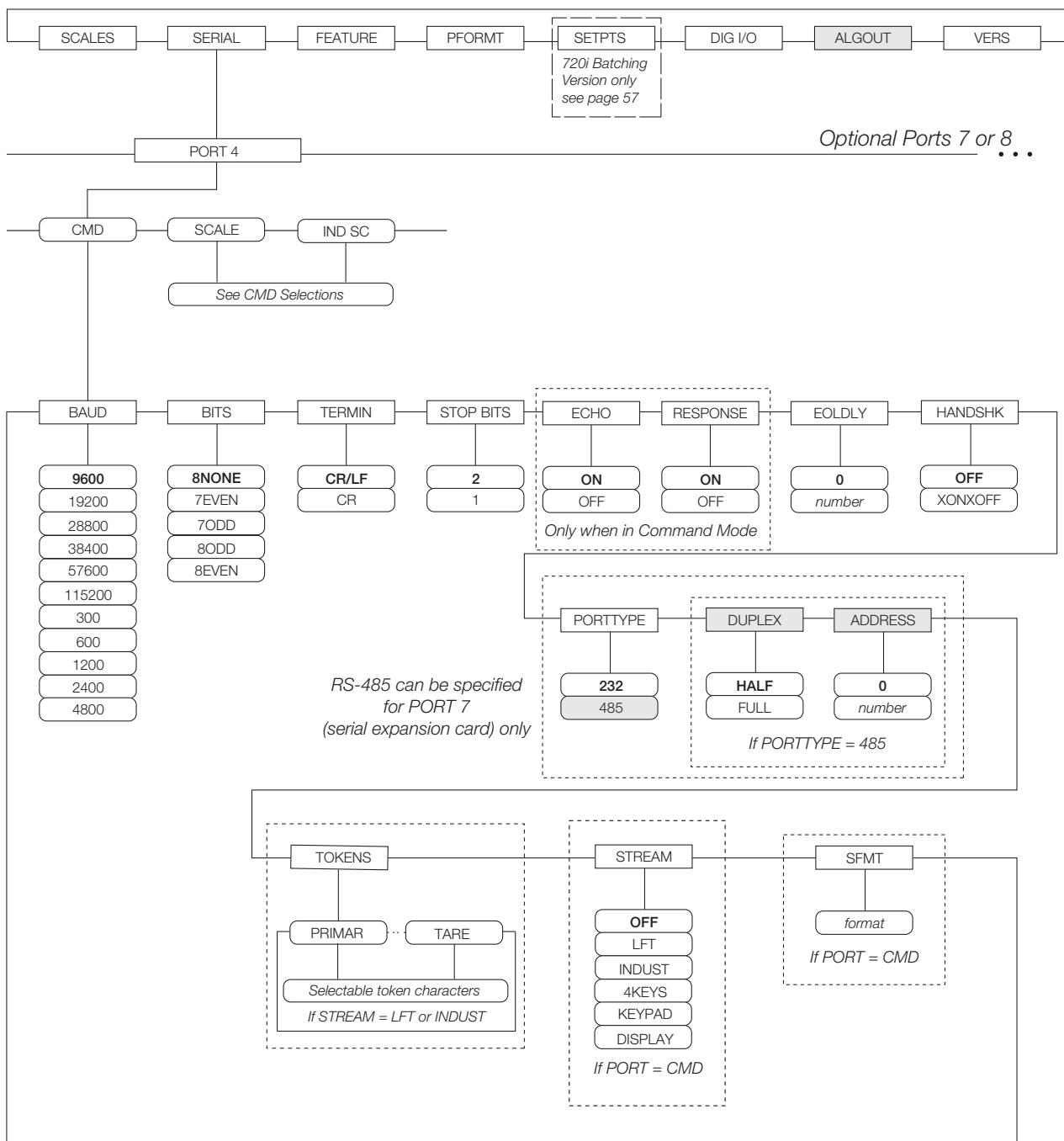


Figure 3-11. SERIAL Menu, Port 4 and Expansion Ports

SERIAL Menu		
Parameter	Choices	Description
<b>Level 2 submenus</b>		
PORT 2 PORT 4	CMD SCALE IND SC	<p>Specifies the type of data received by the port:      SCALE: Legal-for-trade serial scale input      IND SC: Industrial (non-legal-for-trade) scale input</p> <p>KEYBD is available only on Port 1; SCALE, IND and SC are available only on Port 4 and higher (expansion ports).</p> <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>• The keyboard interface is not hot-pluggable. Power-off the 720i before attaching keyboard cable to the Port 1 connector.</li> <li>• DO NOT EDIT PORT 3 PARAMETERS. Port 3 provides communications with the detached display module (DDM); changing these parameters will disable the display.</li> <li>• Print format outputs default to Port 4; if using Port 4 for other scale connections, reassign needed print formats to another port before configuring.</li> </ul>
<b>Level 3 Submenus</b>		
BAUD	9600 19200 28800 38400 57600 115200 300 600 1200 2400 4800	<p>Baud rate. Selects the transmission speed for the port.</p> <p><b>NOTE:</b> The maximum baud rate for ports on serial expansion cards (port number greater than 4) is 19200.</p>
BITS	8NONE 7EVEN 7ODD 8ODD 8EVEN	Selects number of data bits and parity of data transmitted or received by the port.
STOP BITS	2 1	Selects number of stop bits transmitted or received by the port.
ECHO	ON OFF	Specifies whether characters received by the port are echoed back to the sending unit.
RESPONSE	ON OFF	Specifies whether the port transmits replies to serial commands.
TERMIN	CR/LF CR	Termination character. Selects termination character for data sent from the port.
EOLDLY	0 0-255	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	OFF XONOFF HRDWAR	<p>Specifies whether XON/XOFF flow control characters or hardware handshaking is used.</p> <p>Hardware handshaking is available only on Port 2.</p>

Table 3-6. Serial Menu Parameters

SERIAL Menu		
Parameter	Choices	Description
PORRTYPE	232 485	Specifies whether the port is used for RS-232 or RS-485 communications. If 485 is selected (Port 7 only), additional prompts are shown to specify half- or full-duplex operation and RS-485 address. <b>NOTE:</b> RS-485 communications can be specified for Port 7 (serial expansion card) only.
DUPLEX	HALF FULL	Specifies whether the RS-485 communications is half- or full-duplex.
ADDRESS	0 0-255	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.
TOKENS	PRIMAR SECNDR TERTIA GROSS INVALID MOTION ZERO NET OK RANGE TARE	If STREAM is set to LFT or INDUST, the TOKENS parameter can be used to replace tokens used in the data stream from the indicator front panel. See Section 11.5 on page 92 for more information about custom stream formatting.
STREAM	OFF LFT INDUST 4KEYS KEYPAD	Specifies what data, if any, is streamed from the port. 4KEYS and KEYPAD stream keypad events to a receiving indicator. KEYPAD transmits all keypad events; 4KEYS transmits keypresses of the <b>ZERO</b> , <b>GROSS/NET</b> , <b>TARE</b> , and <b>UNITS</b> keys only. <b>NOTE:</b> Streaming is not supported for RS-485 connections. <b>NOTE:</b> The print key always prints locally.
SFMT	format	Specifies the stream format used for the streamed data (CMD scale type). The default format is the Rice Lake format (see Section 11.6 on page 95). See Section 11.5 on page 92 for information about custom stream formatting.

Table 3-6. Serial Menu Parameters (Continued)

### 3.2.3 FEATURE Menu

The FEATURE menu is used to set miscellaneous system attributes, including time and date, truck mode, softkey definitions, and parameters relating to the regulatory environment. See Table 3-7 on page 37 for parameter descriptions.

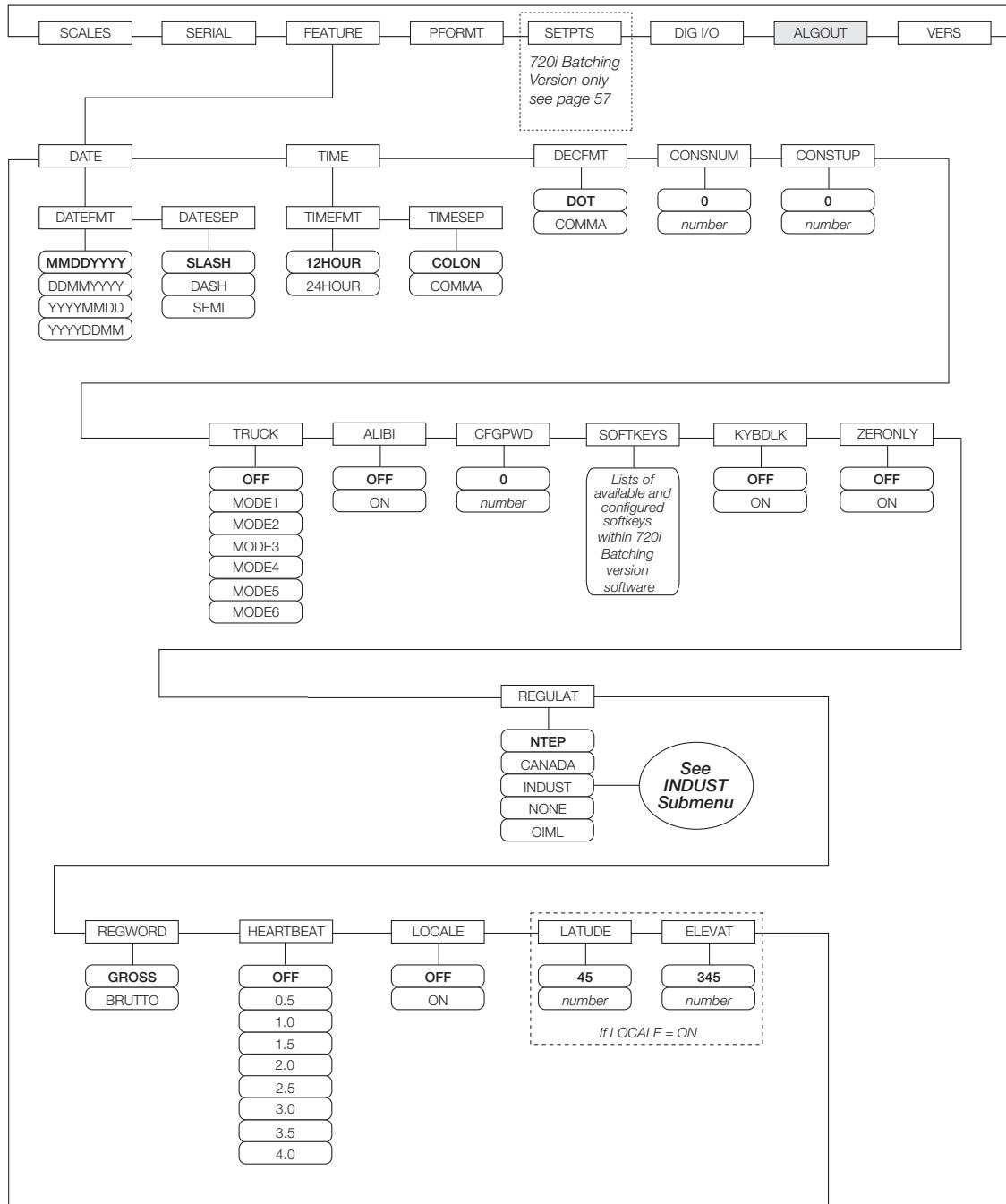


Figure 3-12. FEATURE Menu

FEATURE Menu		
Parameter	Choices	Description
<b>Level 2 submenus</b>		
DATE	DATEFMT DATESEP	<p>Allows selection of date format and date separator character. See Level 3 submenu parameter descriptions.</p> <p>Use the TIME/DATE softkey or the SD serial command to set the date. See Section 10.0 on page 77 for information about using the serial commands.</p>
TIME	TIMEFMT TIMESEP	<p>Allows selection of time format and separator character. See Level 3 submenu parameter descriptions.</p> <p>Use the TIME/DATE softkey or the ST serial command to set the time. See Section 10.1 on page 77 for information about using the serial commands.</p>
DECfmt	DOT COMMA	Specifies whether decimal numbers are displayed using a period (DOT) or comma as the decimal symbol.
CONSNUM	0 0-9999999	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 0-9999999	Specifies the consecutive number start-up value used when the consecutive number is reset by sending the KCLRCN serial command or a CLRCN digital input. Value specified must be in the range 0-9 999 999.
TRUCK	OFF MODE1 MODE2 MODE3 MODE4 MODE5 MODE6	<p>Specifies the truck mode used. If selected, the indicator switches from normal mode to the selected truck mode. See Section 7.0 on page 54 for more information about using the truck modes.</p> <p>MODE1: Auto clear ID, keyed tares, value swapping MODE2: Auto clear ID, no keyed tares, value swapping MODE3: Stored ID, keyed tares, value swapping MODE4: Stored ID, no keyed tares, value swapping MODE5: Stored ID, keyed tares, no value swapping MODE6: Stored ID, no keyed tares, no value swapping</p>
ALIBI	OFF ON	<p>Specifies whether data storage is used by the alibi feature to allow reprinting any transaction.</p> <p>Use the SOFTKEYS parameter to enable a softkey for recalling alibi print transactions.</p>
CFGPWD	0 0-9999999 reset=9999999	<p>Configuration password. Specify a non-zero value to restrict access to all configuration menus and PCE.</p> <p><i>NOTE: If a configuration password is specified, be sure to record the password and keep it in a safe place. If the configuration password is lost or unavailable, the indicator must be cleared (reset configuration and calibration parameters) to continue use.</i></p> <p><i>To clear the indicator, press the setup switch, then enter 9999999 (six nines) at the configuration password prompt. The unit performs a RESETCONFIGURATION then returns to the setup mode configuration display.</i></p>
KYBDLK	OFF ON	Keyboard lock. Specify ON to disable the keypad in normal mode.
ZERONLY	OFF ON	Zero key only. Specify ON to disable all front panel keys except ZERO in normal mode.
*SOFTKEYS	Setpoint Batch Start Batch Stop Batch Pause Batch Reset	<p>Use the <b>Add</b> and <b>Remove</b> softkeys to select softkeys to be displayed in weighing mode.</p> <p><b>*These features are only available with the 720i Batching version software</b></p> <p>Refer to Table 1-1 on page 3 for available softkeys</p>

Table 3-7. FEATURE Menu Parameters

## FEATURE Menu

Parameter	Choices	Description
REGULAT	NTEP CANADA INDUST NONE OIML	<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>• 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>• INDUST provides a set of subparameters to allow customization of tare, clear, and print functions in non-legal-for-trade scale installations. See Level 4 parameter descriptions in Table 3-8 on page 39.</li> </ul> <p>The value specified for this parameter affects the function of the front panel TARE and ZERO keys. See Section 11.2 on page 90 for a complete description of TARE and ZERO key functions for each of the regulatory modes.</p>
REGWORD	GROSS BRUTTO	Sets the term displayed when weighing in gross mode. Selecting BRUTTO replaces the Gross annunciator with <i>Brutto</i> .
HEARTBEAT	OFF, 0.5–4.0	<p>Specifies, in seconds, the rate of the heartbeat signal sent from the host to the display module. The heartbeat is used to verify active communications between the host and the display and to ensure that the displayed data is current.</p> <p>If specified, the display module input heartbeat (HB1:l parameter) must also be set, typically to a value slightly longer than the host HEARTBEAT parameter. (For example, HEARTBEAT=1.5, HB1:l=2.0.) See Section 11.11 on page 99 for more information about configuring the display module.</p>
LOCALE	OFF ON	Locale. Set this parameter ON to enable the LATUDE and ELEVAT parameters. Specifying latitude and elevation of the scale site provides compensation for gravitational effects. Attached scales must be recalibrated after changing this parameter from OFF to ON.
LATUDE	45 0–90	Latitude. Specify the latitude of the scale site in degrees. This parameter is shown only if LOCALE=ON.
ELEVAT	345 ±0–9999	Elevation. Specify the elevation of the scale site in meters. Valid values are –9999 through 9999. This parameter is shown only if LOCALE=ON.
<b>Level 3 submenus</b>		
DATEFMT	MMDDYYYY DDMMYYYY YYYYMMDD YYYYDDMM	Specifies the format used to display or print the date.
DATESEP	SLASH DASH SEMI	Specifies the date separator character.
TIMEFMT	12HOUR 24HOUR	Specifies the format used to display or print the time.
TIMESEP	COLON COMMA	Specifies the time separator character.

Table 3-7. FEATURE Menu Parameters (Continued)

## FEATURE Menu, REGULAT/INDUST Submenu

The INDUST setting of the REGULAT parameter allows customization of several tare, clear, and print functions for use in *non-legal-for-trade* scale installations. See Section 11.2 on page 90 for more information about regulatory mode functions.

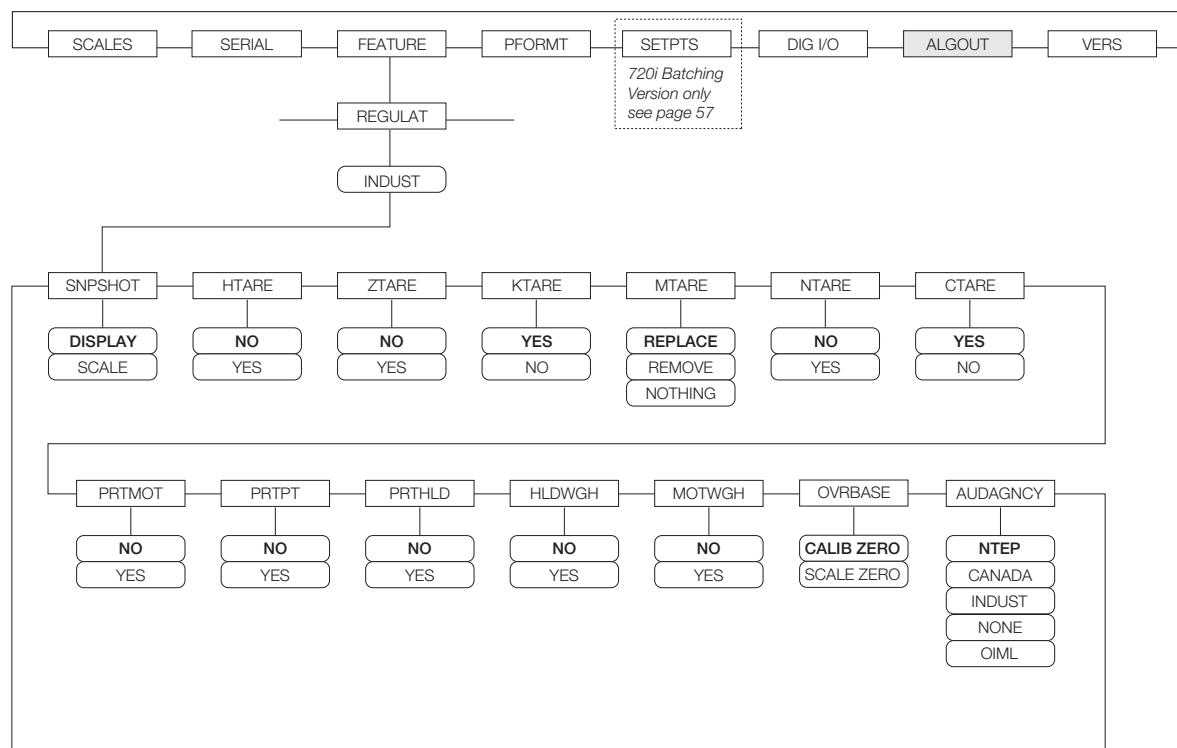


Figure 3-13. REGULAT / INDUST Submenu

FEATURE Menu, REGULAT / INDUST Submenu		
Parameter	Choices	Description
<b>Level 4, REGULAT / INDUST submenu</b>		
SNAPSHOT	DISPLAY, SCALE	Display or Scale weight source.
HTARE	NO, YES	Allow tare in display hold
ZTARE	NO, YES	Remove tare on ZERO
KTARE	YES, NO	Always allow keyed tare
MTARE	REPLACE REMOVE NOTHING	Multiple tare action
NTARE	NO, YES	Allow negative or zero tare
CTARE	YES, NO	Allow CLEAR key to clear tare/accumulator
PRTMOT	NO, YES	Allow print while in motion
PRTPT	NO, YES	Add PT to keyed tare print
PRTHLD	NO, YES	Print during display hold
HLDWGH	NO, YES	Allow truck weighment during display hold
MOTWGH	NO, YES	Allow truck weighment in motion
OVRBASE	CALIB ZERO, SCALE ZERO	Zero base for overload calculation

Table 3-8. REGULAT / INDUST Submenu Parameters

FEATURE Menu, REGULAT / INDUST Submenu

Parameter	Choices	Description
AUDAGNCY	NTEP CANADA INDUST NONE OIML	Audit trail display agency format.

Table 3-8. REGULAT / INDUST Submenu Parameters (Continued)

### 3.2.4 PFORMAT Menu

The PFORMAT menu can be used to set the port used by each print format. Print formats can be viewed or edited using *Revolution III* or serial commands. See Section 6.0 on page 50 for detailed information about print formatting.

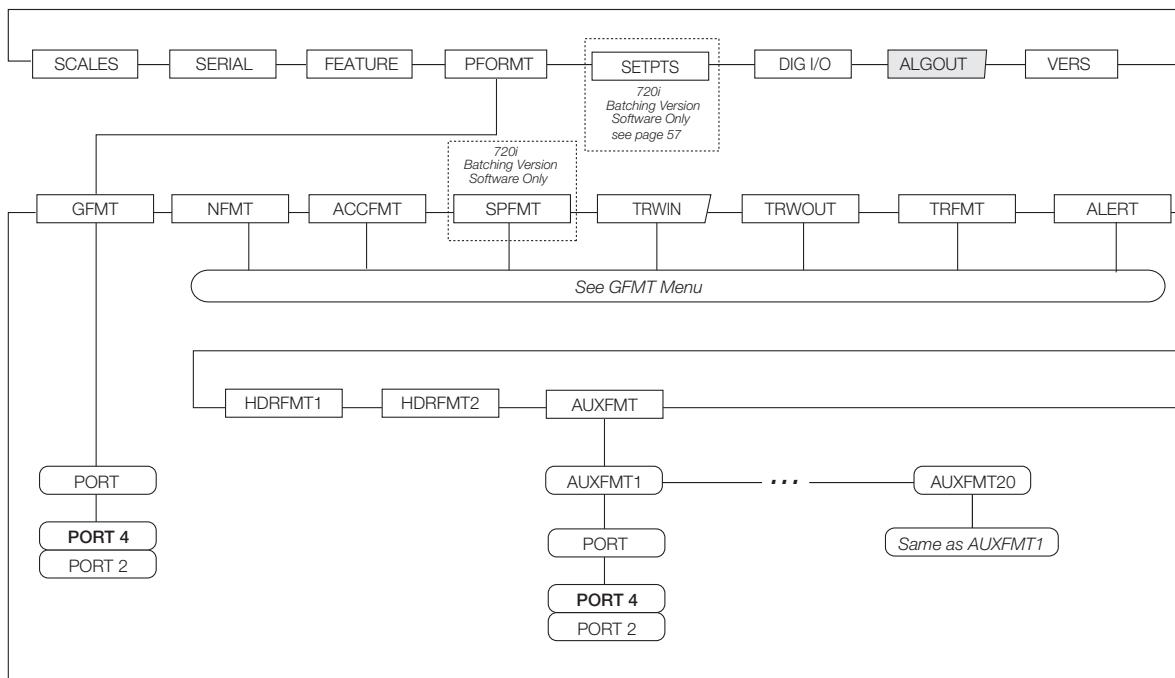


Figure 3-14. PFORMAT Menu

### 3.2.5 DIG I/O Menu

The DIG I/O menu shown in Figure 3-15 is used to assign functions to digital inputs and outputs. SLOT 0 represents the eight I/O bits available on the CPU board (connector J6). The additional slot, with 24 I/O bits, is shown only if the digital I/O expansion card is installed.

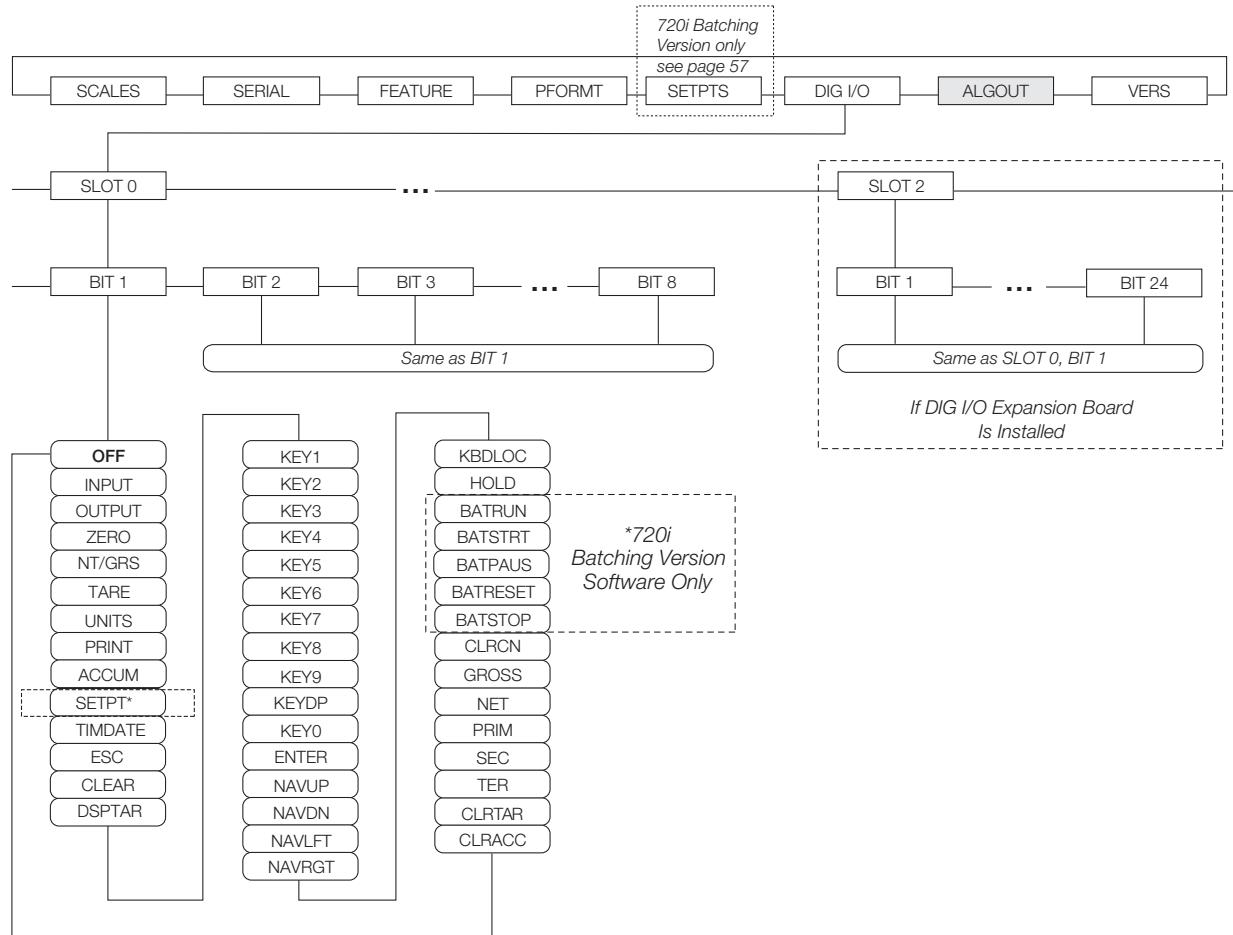


Figure 3-15. DIG I/O Menu

DIG I/O Menu		
Parameter	Choices	Description
<b>Level 2 submenus</b>		
SLOTx	BIT y	Lists available digital I/O slots.
<b>Level 3 submenus</b>		
BIT y	OFF INPUT OUTPUT ZERO NT/GRS TARE UNITS PRINT ACCUM SETPTS TIMDATE ESC CLEAR DSPTAR KEY0—KEY9 KEYDP ENTER NAVUP NAVDN NAVLF NAVRG KBDLOC HOLD *BATRUN *BATSTRT *BATPAUS *BATRESET *BATSTOP CLRCN GROSS NET PRIM SEC TER CLRTAR CLRACC	<p>Specifies the function of the digital I/O bit.</p> <ul style="list-style-type: none"> <li>OFF indicates that the bit is not configured.</li> <li>INPUT assigns the bit as a digital input.</li> <li>OUTPUT assigns the bit as a digital output.</li> <li>ZERO, NT/GRS (net/gross mode toggle), TARE, UNITS, and PRINT provide the same functions as the five major front panel keys.</li> <li>ACCUM adds the current scale weight to the accumulator, if the scale accumulator is enabled.</li> <li>SETPTS and TIMDATE provide the same function as the Setpoint and Time/Date softkeys.</li> <li>TIMDATE provides the same function as the Time/Date softkey.</li> <li>ESC provides a function equivalent to the Cancel softkey.</li> <li>CLEAR simulates pressing the front panel CLR key.</li> <li>DSPTAR displays the current tare; equivalent to pressing the Display Tare softkey.</li> <li>KEY0—KEY9 and KEYDP (decimal point) simulate pressing keys on the numeric keypad.</li> <li>ENTER simulates pressing the front panel ENTER key.</li> <li>NAVUP, NAVDN, NAVLFT, and NAVRGT simulate pressing the navigation keys.</li> <li>KBDLOC locks the keyboard (indicator front panel) when held low.</li> <li>HOLD holds the current display. Releasing this input clears the running average filter.</li> <li>BATRUN allows a batch routine to be started and run. With BATRUN active (low), the BATSTRT input starts the batch; if BATRUN is inactive (high), BATSTRT resets the batch.</li> <li>BATSTRT starts or resets a batch routine, depending on the state of the BATRUN input.</li> <li>BATPAUS pauses a batch routine when held low.</li> <li>BATRESET stops the batch sequence and resets to the first batch step.</li> <li>BATSTOP stops the batch routine.</li> <li>CLRCN resets the consecutive number to the value specified on the CONSTUP parameter (FEATURE menu).</li> <li>GROSS, NET, PRIM, SEC, and TER select gross or net weight display, and primary, secondary, or tertiary units display modes.</li> <li>CLRTAR clears the current tare for the active scale.</li> <li>CLRACC clears the active accumulator.</li> </ul>
* 720i Batching Software Version Only		

Table 3-9. DIG I/O Menu Parameters

### 3.2.6 ALGOUT Menu

If the analog output option is installed, configure all other indicator functions and calibrate the indicator itself before configuring the analog output. See the *Analog Output Card Installation Instructions*, PN 69089, for more information.

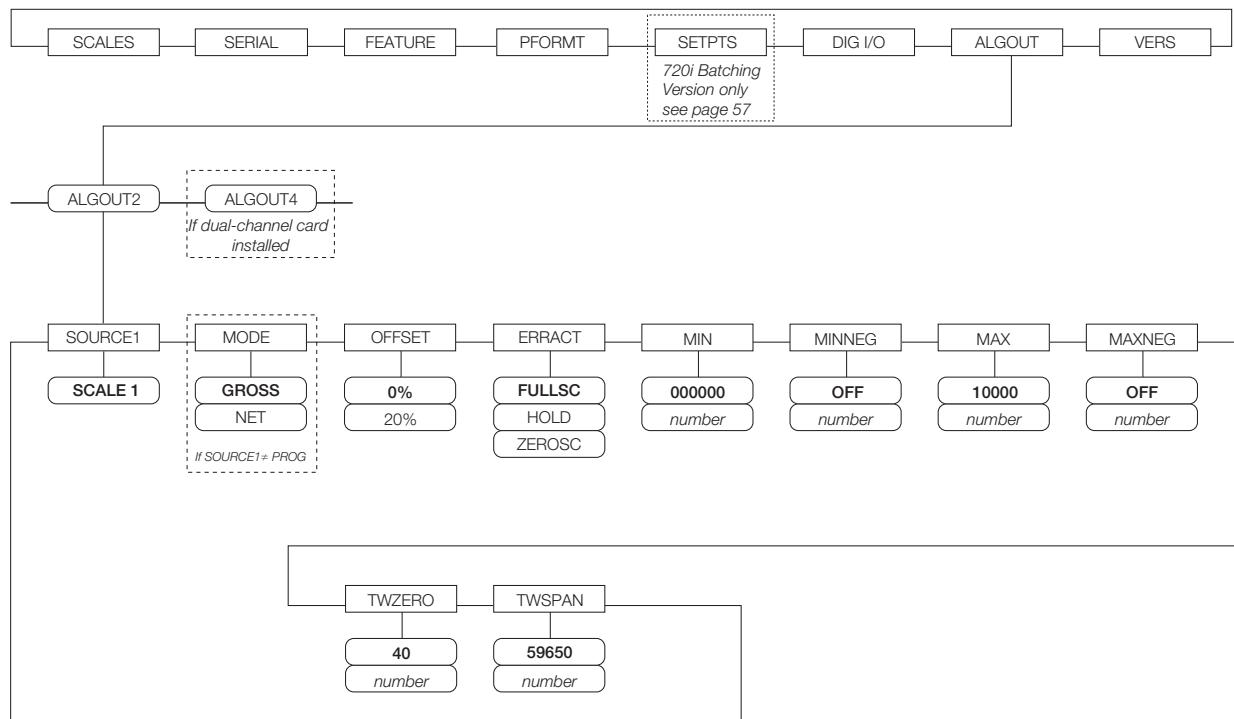


Figure 3-16. Analog Output Menu

ALGOUT Menu		
Parameter	Choices	Description
<b>Level 2 submenus</b>		
SOURCE1	SCALE	Specifies the scale tracked by the analog output.
MODE	GROSS NET	Specifies the weight data, gross or net, tracked by the analog output.
OFFSET	0% 20%	Zero offset. Select 0% for 0–10 V or 0–20 mA output; select 20% for 4–20 mA output. This parameter must be set before calibrating the analog output.
ERRACT	FULLSC HOLD ZEROSC	Error action. Specifies how the analog output responds to system error conditions. Possible values are: FULLSC: Set to full value (10 V or 20 mA) HOLD: Hold current value ZEROSC: Set to zero value (0 V or 4 mA)
MIN	000000 0–9999999	Specifies the minimum weight value tracked by the analog output. Specify a value in the range 0–9999999.
MINNEG	OFF 0–9999999	Specifies the minimum negative weight value tracked by the analog output. Specify a value in the range 0–9999999; value entered is assumed negative.
MAX	10000 0–9999999	Specifies the maximum weight value tracked by the analog output. Specify a value in the range 0–9999999.
MAXNEG	OFF 0–9999999	Specifies the maximum negative weight value tracked by the analog output. Specify a value in the range 0–9999999; value entered is assumed negative.

Table 3-10. Analog Output Menu Parameters

ALGOUT Menu		
Parameter	Choices	Description
TWZERO	40 0-65535	Tweak zero. Enter tweak value to adjust the analog output zero calibration. Use a multimeter to monitor the analog output value.
TWSPAN	59650 0-65535	Tweak span. Enter tweak value to adjust the analog output span calibration. Use a multimeter to monitor the analog output value.

Table 3-10. Analog Output Menu Parameters

### 3.2.7 VERS Menu

The VERS menu can be used to check the installed software version or, by using the RSConfig (reset configuration) softkey, to restore all configuration parameters to their factory default values. There are no parameters associated with the Version menu: when selected, the indicator displays the installed software version number.

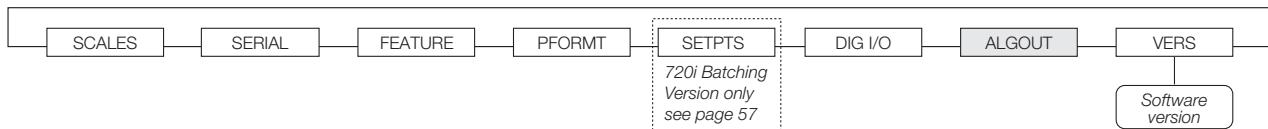


Figure 3-17. Version Menu

# 4.0 Calibration

The 720*i* can be calibrated using the front panel, serial commands, or *Revolution III*. 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.

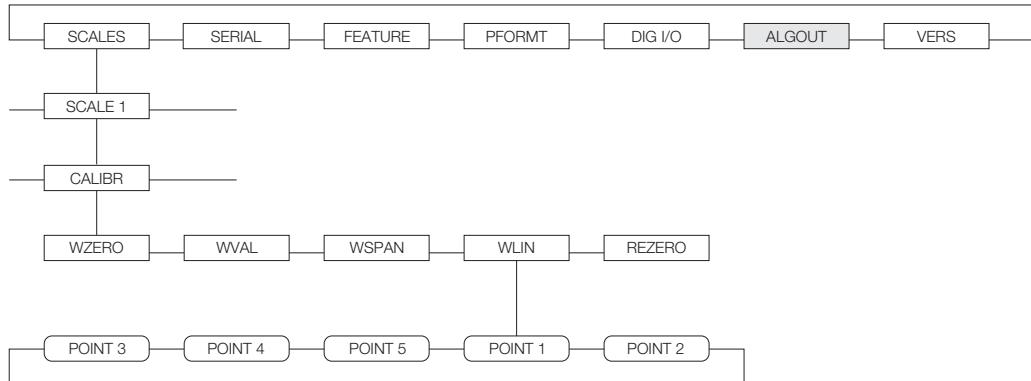


Figure 4-1. Calibration (CALIBR) Submenu

## 4.1 Gravity Compensation

Gravity compensation for latitude and elevation is available for the 720*i*. To calibrate with gravity compensation, the LOCALE parameter under the FEATURE menu must be set ON, and the LATUDE (latitude) and ELEVAT (elevation, in meters) parameters set before calibrating the indicator (see Figure 3-9 on page 31).

If the indicator is later installed at a different location, gravity compensation can be applied to a pre-calibrated indicator by adjusting the LATUDE and ELEVAT parameters.

## 4.2 Front Panel Calibration

The CALIBR submenu (under the SCALES menu, see Figure 4-2) is used to calibrate the 720*i*.



Figure 4-2. WZERO Calibration Display

The zero, span, and linear calibration point displays provide a set of softkeys used specifically for calibration procedures:

- +-** Toggles to allow entry of negative or positive values
- Last Zero** Recalls the last established zero value to allow calibration without removing test weights or product from scale.

**Calibrate** Performs calibration for the selected point

**Millivolts (or Counts)**

Toggles between display of captured A/D counts and captured millivolts values; allows entry of calibration values in mV or counts

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

1. Place the indicator in setup mode (display reads *Scale Configuration*) 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. With the **SCALES** menu highlighted, press the **Down** key, then select the scale to be calibrated. Press **Down** again (*GRADS* parameter highlighted), then press **Left** to

- highlight the **CALIBR** submenu (see Figure 4-1). Press **Down** to go to zero calibration (**WZERO**). See Figure 4-2 on page 45.
3. Ensure scale is empty, then press **Down** again to show the current **WZERO** value, then press the **Calibrate** softkey to calibrate zero. When complete, the new A/D count for the zero calibration is displayed. Press **Enter** to save the zero calibration value and go to the next prompt (**WVAL**).
  4. With **WVAL** displayed, press **Down** to show the stored calibration weight value. Use the numeric keypad to enter the actual value of the calibration test weights, then press **Enter** to save the value and go to span calibration (**WSPAN**).
  5. Place test weights on scale. Press **Down** again to show the current **WSPAN** value, then press the **Calibrate** softkey to calibrate span. When complete, the new A/D count for the span calibration is displayed. Press **Enter** 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 **Down** to go to the first linearization point (**POINT 1**). Press **Down** again to show the weight value prompt (**WGT 1**), then **Down** once more to show the weight value. Place test weights on the scale, then use the numeric keypad to enter the actual test weight value. Press **Enter** to save the value and move to the calibration (**CAL 1**) prompt. Press **Down** to show the current calibration value, then press the **Calibrate** softkey to calibrate the linearization point. 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 (**POINT 2**).
- Repeat for up to five linearization points. To exit the linearization parameters, press the **Up** key to return to **WLIN**.
7. The optional rezero function is used to remove a calibration offset when hooks or chains are used to hang the test weights.
- NOTE:** The rezero function cannot be used with five-point linear calibration.

- If no other apparatus was used to hang the test weights during calibration, remove the test weights and press **Up** to return to the **CALIBR** submenu.
- If hooks or chains were used during calibration, remove these and the test weights from the scale. With all weight removed, go to the **REZERO** parameter, then press **Down** to show the current zero value. Press the **Calibrate** softkey to adjust the zero and span calibration values. Press **Enter** or **Up** to return to the **CALIBR** submenu.
- 8. Press **Up** to return to the **SCALES** menu, or press the **Save and Exit** softkey to exit setup mode.

## 4.3 Serial Command Calibration

To calibrate the indicator using serial commands, the indicator serial port must be connected to a terminal or personal computer. See Section 2.3.3 on page 7 for serial port pin assignments; see Section 10.0 on page 77 for more information about using serial 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 **SC.WZERO#1** serial command to calibrate zero.
3. Place test weights on the scale and use the **SC.WVAL** command to enter the test weight value in the following format:  
**SC.WVAL#1=vvvv<CR>**
4. Send the **SC.WSPAN#1** serial command to calibrate span.
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:

 **SC.WLIN#1.V1=vvvv<CR>**  
**SC.WLIN#1.C1<CR>**

The **SC.WLIN#1.V1** command sets the test weight value (vvvv) for linearization point 1. The **SC.WLIN#1.C1** command calibrates the point. Repeat using the **SC.WLIN#1.Vx** and **SC.WLIN#1.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

- SC.REZERO#1 serial command.
- Send the KSAVE serial command to save the calibration changes; send KEXIT to exit setup mode.

## 4.4 Revolution Calibration

The *Revolution III* Calibration Wizard provides step-by-step scale calibration. With the 720*i* connected to the PC, select the scale and click on the scale icon in the Calibration Wizard from the Tools menu on the *Revolution III* Scales display, then follow the steps listed below to calibrate the scale. See Section 5.0 on page 48 for a general overview of the *Revolution III* utility.

- On the first Calibration Wizard display (see Figure 4-3), select whether you are performing a standard (zero and span) calibration or a multi-point linear calibration. Click the *Next* button to continue.

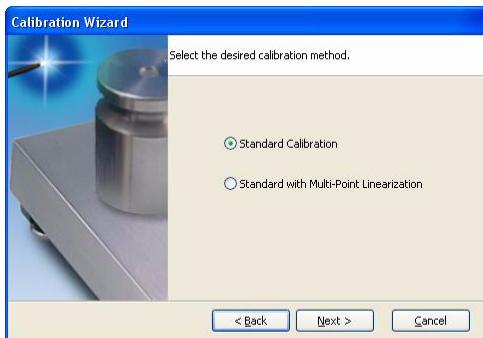


Figure 4-3. *Revolution III* Calibration Wizard Display

- Enter the test weight used to calibrate the scale. If chains or hooks are used to hold the weights, check the box below the test weight value entry. This adds a rezero step to the calibration sequence.
- Remove all weights from the scale. If chains or hooks are used, place them on the scale. Press the *Calibrate Zero* button to perform the zero calibration. A message box appears when the process is complete.
- Apply the test weights to the scale. Press the *Calibrate Span* button to perform the span calibration. A message box appears when the process is complete.
- If the option for chains or hooks was selected in step 2, the Rezero display is shown. Remove all weights from the scale, including chains or hooks. Press the *Re-Zero* button to calibrate the zero offset.
- If performing a multi-point linear calibration, up to five other calibration weight values can be entered on the display. The weights must

be in ascending order and must not include zero or the span weight. Enter the weight values and click the *Go* button to calibrate each point.

- Review the new calibration values then click *Finish* to close the Calibration Wizard. To restore the current calibration values, click *Cancel*.

## 5.0 Using Revolution

---

The *Revolution III* utility provides a suite of functions used to support configuration, calibration, customization, and backup of the *720i* software. Hardware and software configuration, stream and ticket formatting, and database management are all supported by *Revolution III*.

**NOTE:** The *720i* uses two different version software depending upon the application. They are:

*720i* Batching version software

PCE software

Calibration values, scale configuration, database tables, and user programs, can be both saved and restored to the *720i* using *Revolution III*. (See Section 4.4 on page 47 for *Revolution III* calibration procedures.)

Other supporting applications provided with *Revolution III* include:

- The Rice Lake Web Update utility uses your internet connection to check for and download updates to the *Revolution III* and *720i* software.

### Hardware and Software Requirements

Minimum system requirements: 166 MHz, x86-compatible, with 32MB RAM (64MB for NT4/2000/XP), 40MB disk space. Recommended system: 233 MHz, x86-compatible or greater, with 64MB RAM, 40 MB disk space.

*Revolution III* runs on most Windows® operating systems, including Windows 98, Windows 98 SE, Windows ME, Windows NT 4.0 (SP4 or greater), Windows 2000, Windows XP (Home or Professional), and Windows Vista™ and Windows 7.

Internet Explorer® (IE) 4.0 or greater is required to use the *Revolution III* help system. Explorer is included on the *Revolution III* installation CD or is available from Microsoft Corporation.

### 5.1 Connecting to the Indicator

Connect the PC serial port to port 2 of the *720i*, then click on the *Connect* icon in the toolbar. *Revolution III* attempts to establish communications to the indicator. If communications settings need to be adjusted, select *Options...* from the Tools menu.

#### 5.1.1 Downloading to the Indicator

The *Download Configuration* function on the *Revolution III* Communications menu allows a *Revolution III* configuration file (with or without scale calibration data) or ticket formats to be downloaded to a connected indicator in setup mode.

The *Download Section* function on the Communications menu allows you to download only the currently displayed object, such as contact information for a scale configuration.

Because less data is transferred using *Download Current Display*, it is typically faster than a full configuration download, but there is an increased possibility that the download may fail due to dependencies on other objects. If the download fails, try performing a complete download using the *Download Configuration* function.

#### 5.1.2 Uploading Configuration to Revolution

The *Upload Configuration* function on the *Revolution III* Communications menu allows the existing configuration of a connected indicator to be saved to a file on the PC. Once saved, the configuration file provides a backup that can be quickly restored to the indicator if needed. Or, the file can be edited within *Revolution III*, then downloaded back to the indicator.

## 5.2 Installing Software Upgrades

New releases of the *720i* system software can be downloaded and installed using an internet connection and the Rice Lake Web Update application. To use the Web Update application, install the program from the Tool Kit CD.

**NOTE:** Before upgrading to a new version of *720i* system software, ensure that a copy of the current indicator configuration has been saved using *Revolution III* as these are not interchangeable. Reloading the system software requires a RESETCONFIGURATION function and resets all configuration and calibration values to their factory defaults.



Figure 5-1. Rice Lake Web Update Display

Click on the **Check for Updates** button in the Rice Lake Web Update application to check if a new version of the *720i* software (either *720i* or *720i* Batching) is available. To download a new software version, select the new software version and click on **Get Selection**. Once the new software is downloaded to the PC, do the following:

1. Disconnect power to the *720i*.
2. Open the indicator enclosure and place a jumper across the SW1 boot mode pins (see Figure 2-3 on page 9).
3. Connect the PC serial port to port 2 of the *720i*.
4. Power up the *720i*. The indicator will stall at the diagnostic monitor.
5. Click on the **Update Indicator** button to download the new software. When the download is complete, the indicator resets and goes to weigh mode.
6. Disconnect power to the indicator. Remove the jumper from the SW1 boot mode pins and place it on a single pin.
7. Power up the indicator and reload as necessary.

## 6.0 Print Formatting

The 720*i* provides print formats that determine the format of the printed output when the **PRINT** key is pressed, a KPRINT serial command is received, or when truck weigh-in or weigh-out operations are performed. Supported print formats are: GFMT, NFMT, ACCFMT, SPFMT, SETPNT, TRWIN, TRWOUT, ALERT, and AUXFMT1—AUXFMT20. Additionally, two header formats, HDRFMT1 and HDRFMT2, can be inserted into any of the other ticket formats using the <H1> and <H2>formatting commands. The particular ticket format used for a given print operation depends on the indicator configuration (see Table 6-2 on page 52) and the particular operation performed.

Each print format can be customized to include up to 1000 characters of information, such as company name and address, on printed tickets. You can customize the print formats using the *Revolution III™* configuration utility or serial commands.

### 6.1 Print Formatting Commands

Table 6-1 lists commands you can use to format the 720*i* 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	Supported Ticket Formats	
<i>General Weight Data Commands</i>			
<G>	Gross weight, current scale	GFMT, NFMT, TRWIN, TRWOUT, ACCFMT, AUXFMTxx, ALERT	
<G#n>	Gross weight, scale <i>n</i>		
<N>	Net weight, current scale		
<N#n>	Net weight, scale <i>n</i>		
<T>	Tare weight, current scale		
<T#n>	Tare weight, scale <i>n</i>		
<S>	Current scale number		
NOTES:			
Gross, net, tare, accumulator, truck, and setpoint weights can be printed in any configured weight units by adding the following modifiers to the gross, net, and tare weight commands: /P (primary units), /D (displayed units), /S (secondary units), /T (tertiary units). If not specified, the current displayed units (/D) is assumed. Example: To format a ticket to show net weight for Scale #3 in secondary units, use the following command: <N#3/S>			
Formatted weight strings contain a 10-digit weight field (including sign and decimal point, with leading zeroes suppressed), followed by a space and a two-digit units identifier. Total field length with units identifier is 12 (or 13) characters.			
<i>Accumulator Commands</i>			
<A>	Accumulated weight, current scale	GFMT, NFMT, ACCFMT, AUXFMTxx	
<A#n>	Accumulated weight, scale <i>n</i>		
<AA>	Average accumulation, current scale		
<AA#n>	Average accumulation, scale <i>n</i>		
<AC>	Number of accumulations, current scale		
<AC#n>	Number of accumulations, scale <i>n</i>		
<AT>	Time of last accumulation, current scale		
<AT#n>	Time of last accumulation, scale <i>n</i>		
<AD>	Date of last accumulation, current scale		
<AD#n>	Date of last accumulation, scale <i>n</i>		
<i>Truck Mode Commands</i>			

Table 6-1. Print Format Commands

Command	Description	Supported Ticket Formats	
<TID>	Truck ID number	TRWIN, TRWOUT	
<TR1>	Gross weight for current ticket in displayed units		
<TR2>	Tare weight for current ticket in displayed units		
<TR3>	Net weight for current ticket in displayed units		
NOTE: TR1, TR2, and TR3 truck ticket weight data includes keywords INBOUND, KEYED, RECALLED, as necessary.			
<i>Setpoint Commands</i>			
<SCV>	Setpoint captured value	SPFMT	
<SN>	Setpoint number		
<SNA>	Setpoint name		
<SPM>	Setpoint mode (gross or net label)		
<SPV>	Setpoint preact value		
<STV>	Setpoint target value		
<i>Auditing Commands</i>			
<CD>	Last calibration date	All	
<NOC>	Number of calibrations		
<NOW>	Number of weighments since last calibration		
NOTES: Last calibration date (<CD>) and number of calibrations (<NOC>) are updated whenever WZERO, WVAL, WSPAN, or REZERO are changed. Number of weighments (<NOW> command) is incremented whenever the scale weight exceeds 10% of scale capacity. Scale must return to gross or net zero before the value can be incremented again.			
<i>Formatting and General-Purpose Commands</i>			
<nnn>	ASCII character (nnn = decimal value of ASCII character). Used for inserting control characters (STX, for example) in the print stream.	All	
<TI>	Time		
<DA>	Date		
<TD>	Time and date		
<UID>	Unit ID number (up to 8 alphanumeric characters)		
<CN>	Consecutive number (up to 7 digits)		
<H1>	Insert header format 1 (HDRFMT1); see Table 6-2 on page 52		
<H2>	Insert header format 2 (HDRFMT2); see Table 6-2 on page 52		
<CR>	Carriage return character		
<LF>	Line feed character		
<NLnn>	New line (nn = number of termination (<CR/LF> or <CR>) characters)*		
<SPnn>	Space (nn = number of spaces)*		
<SU>	Toggle weight data format (formatted/unformatted)		
<USnn>	Insert user print text string (from user program, SetPrintText API)		
NOTE: * If nn is not specified, 1 is assumed. Value must be in the range 1–99.			
<i>User Program-dependent Commands</i>			
<USnn>	Insert user print text string (from user program, SetPrintText API)	All	
<EV>	Invoke user program print handler x (PrintFmtx)	AUXFMTx	

Table 6-1. Print Format Commands (Continued)

## 6.2 Default Print Formats

Table 6-2 shows the default print formats for the 720i and lists the conditions under which each print format is used. The HDRFMT1 and HDRFMT2 formats are used to specify header information that can be used by the other ticket formats. The contents of the HDRFMTx format can be inserted into any other ticket format using the <H1> and <H2> formatting commands. Use *Revolution III* or serial commands to view and edit print formats (see Section 6.3 on page 53).

Format	Default Format String	Used When
GFMT	GROSS<G><NL2><TD><NL>	Normal mode, no tare in system
NFMT	GROSS<G><NL>TARE<SP><T><NL>NET<SP2><N><NL2><TD><NL>	Normal mode, tare in system
ACCFMT	ACCUM<A><NL><DA><TI><NL>	Accumulator enabled and displayed
*SPFMT	<SCV><SP><SPM><NL>	Setpoint print operation with PSHPRNT=ON
TRWIN	<NL>ID<SP><TID><NL2>GROSS<TR1><NL2><DA><SP><TI><NL>	Press the <b>Weigh In</b> softkey, enter truck ID number, and press <b>enter</b> .
TRWOUT	<NL6>ID<SP><TID><NL2>GROSS<TR1><NL>TARE<SP><TR2><NL>NET<SP2><TR3><NL2><DA><SP><TI><NL>	Press the <b>Weigh Out</b> softkey, enter truck ID number, and press <b>enter</b> .
TRFMT	REG ID: <TID>: <TR2> SCALE<S> <TD><NL>	Truck register currently displayed
ALERT	<COMP><NL><COAR1><NL><COAR2><NL><CONN1><NL><COPH1><NL><CONN2><NL><COPH2><NL><COML><NL><ERR><NL>	—
HDRFMT1	COMPANY NAME<NL>STREET ADDRESS<NL>	Must be inserted into other print format
HDRFMT2	CITY, ST ZIP<NL2>	
AUXFMTxx	GROSS<G><NL2><TD><NL>	Formats AUX1FMT—AUX20FMT
NOTE: In OIML and CANADA modes, the letters <i>PT</i> (preset tare) are automatically inserted after the printed tare weight.		
* 720i Batching Version only		

Table 6-2. Default Print Formats

## 6.3 Customizing Print Formats

The following sections describe procedures for customizing print formats using the *Revolution III* configuration utility or serial commands. See Section 11.5 on page 92 for information about custom stream formatting.

### 6.3.1 Using Revolution

The *Revolution III* configuration utility provides a ticket formatting grid with a tool bar. The grid allows you to construct the ticket format without using the formatting commands (<NL> and <SP>) required by the front panel or serial 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 6-1 shows an example of the *Revolution III* print formatting display.

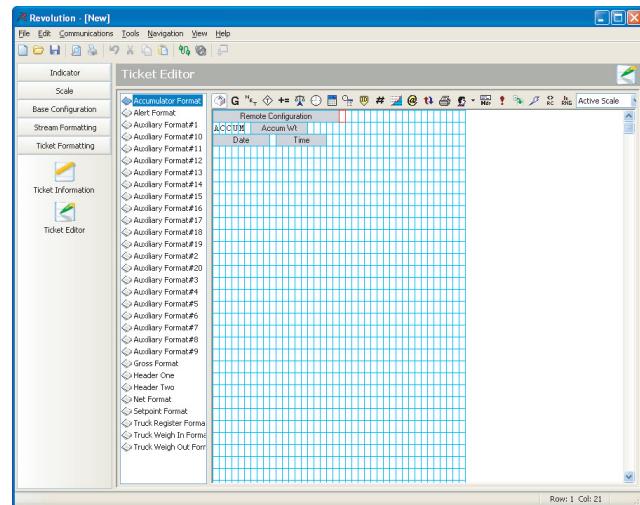


Figure 6-1. Revolution III Print Formatting Display

### 6.3.2 Using Serial Commands

With a personal computer, terminal, or remote keyboard attached to one of the 720i serial ports, you can use the serial command set described in Table 6-1 on page 50 to customize the print format strings.

To view the current setting of a format string, type the name of the print format and press the **enter** key. For example, to check the current configuration of the GFMT format, type GFMT.FMT and press **enter**. The indicator responds by sending the current configuration for the gross format:

```
GFMT.FMT=GROSS<G><NL2><TD><NL>
```

To change the format, use the GFMT.FMT or NFMT.FMT serial 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 serial command:

```
GFMT.FMT=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 HDRFMT1 ticket format, then substituting the <H1> command for the address in the GFMT ticket format:

```
HDRFMT1=MOE'S DUMP<NL>2356 EAST HIGHWAY ROAD<NL>SMALLTOWN<NL2>
```

```
GFMT.FMT=<H1><G> GROSS<NL>
```

## 7.0 Truck Modes

The truck in/out modes are used to handle multiple truck ID numbers and weights. Truck IDs can be up to 16 alphanumeric characters in length.

Six truck modes combine stored ID, keyed tare, and value swapping features in various ways:

Mode	Stored IDs	Keyed Tares	Value Swapping
MODE1	NO	YES	YES
MODE2	NO	NO	YES
MODE3	YES	YES	YES
MODE4	YES	NO	YES
MODE5	YES	YES	NO
MODE6	YES	NO	NO
OFF			

Table 7-1. Truck Mode Features

**Stored IDs** let you keep a database of truck IDs and weigh-in weights in the indicator's memory. The indicator can automatically store up to 1000 truck IDs and tares; or it can clear the information after printing a weigh-out ticket. For example, if the same truck seldom crosses the scale, it may not be practical to save its ID number and weigh-in weight. However, if that same truck crosses the scale many times each day, it's more convenient to store the information in the indicator memory and recall it when needed. Stored IDs and weights are available in modes 3, 4, 5, and 6.

**Keyed tares** allow you to manually enter the tare weight using the numeric keypad and the **TARE** key. Keyed tares are available in modes 1, 3, and 5. To use keyed tares, an incoming truck must be empty at weigh-in, full at weigh-out.

**NOTE:** Some local regulations require the tare weight to be read from the scale. If so, don't use the keyed tares feature.

**Value swapping** ensures that the lowest of two weight values associated with a particular ID number is used as the tare weight. For example, if a truck crosses the scale fully loaded at weigh-in, then unloads and crosses the scale empty at weigh-out, the indicator automatically assigns the lesser (empty truck) weight as the tare. Value swapping is available in modes 1, 2, 3, and 4.

### 7.1 Using the Truck Modes

To select a truck in/out mode, enter setup mode, use the navigation keys to go to the **FEATURE** menu, then to the **TRUCK** submenu to select the mode.

When a mode is selected, softkeys are automatically configured for truck mode operation (In PCEE version software only).

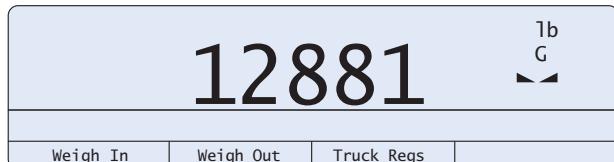


Figure 7-1. 720i Display, showing Truck Mode Softkeys

### 7.2 Using the Truck Regs Display

The Truck Regs display is shown by pressing the **Truck Regs** softkey in weighing mode. The display contains an alphabetical list of stored truck IDs, weigh-in weights (in primary units), and the time and date of the weigh-in transaction (see Figure 7-2).

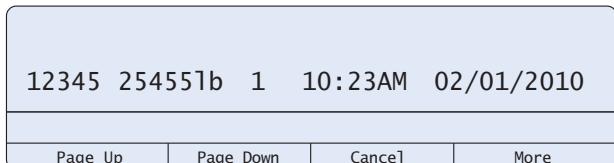


Figure 7-2. Truck Register Display

Use the **up** and **down** navigation keys to scroll through the truck register. Softkeys shown at the bottom of the Truck Regs display are described below.

- |                   |   |
|-------------------|---|
| <b>Page Up</b>    | Move up ten entries in the truck register.                  |
| <b>Page Down</b>  | Move down ten entries in the truck register.                |
| <b>Cancel</b>     | Exits to weighing mode.                                     |
| <b>More</b>       | Show the second (or first) page of truck register softkeys. |
| <b>Delete</b>     | Deletes the highlighted truck ID from the truck register.   |
| <b>Delete All</b> | Deletes all truck IDs from the truck register.              |

The truck register can be printed to an attached printer by pressing the **PRINT** key while the Truck Regs display is shown. The printed register uses the **TRFMT** print format (see Section 6.2 on page 52).

## 7.3 Weigh-In Procedure

In modes 1 and 2, the indicator erases truck ID numbers and tare weights from memory after the transaction. In modes 3–6, the truck ID and weigh-in weight values are saved after the weigh-out ticket has been processed.

The general weigh-in procedure is as follows:

1. The empty truck moves onto the scale for weigh-in.
2. Press the **Weigh In** softkey.
3. A prompt is shown to enter the truck ID (up to eight alphanumeric characters). Enter the ID, then press the **enter** key.
4. Indicator generates the weigh-in ticket:

**ID 304812**  
**GROSS 15000. LB INBOUND**  
**01/14/2010 10:24 AM**

5. Truck leaves the scale.

## 7.4 Weigh-Out Procedure

The general weigh-out procedure is as follows:

1. The loaded truck moves onto the scale for weigh-out.
2. If truck ID is known, press the **Weigh Out** softkey, enter the ID, and press the **enter** key. If ID is not known, press the **Truck Regs** softkey to view list of stored IDs (see Figure 7-2 on page 54). Scroll to the correct truck ID, note the ID number, then press the **Cancel** softkey to return to the weight display. From the weight display, press **Weigh Out**, key in the ID, then press the **enter** key.
3. Indicator generates the weigh-out ticket. In modes 1 and 2, the ID is deleted once the weigh-out ticket is processed.

## 7.5 Single-Transaction Tare Weights and IDs

One-time transactions are supported in all modes that can be configured to use stored IDs (modes 3–6). This function allows one-time weighing of trucks without adding the truck ID and weigh-in weight to the permanent truck register.

To use this function, press the **Weigh In** or **Weigh Out** softkey, then enter a truck ID containing a decimal point. IDs entered with a decimal point as part of the ID are erased from the truck register when the transaction is complete.

# 8.0 Setpoints

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**NOTE:** Directions in this chapter require the batching version of software (720i batching).

The 720i indicator provides 32 configurable setpoints for control of both indicator and external equipment functions. Setpoints can be configured to perform actions or functions based on specified parameter conditions. Parameters associated with various setpoint kinds can, for example, be configured to perform functions (print, tare, accumulate), to change the state of a digital output controlling indicator or external equipment functions, or to make conditional decisions. **NOTE:** Weight-based setpoints are tripped by values specified in primary units only.

## 8.1 Batch and Continuous Setpoints

720i setpoints can be either continuous or batch setpoints.

**Continuous setpoints** are free-running: the indicator constantly monitors the condition of free-running setpoints at each A/D update. The specified setpoint action or function is performed when the designated setpoint parameter conditions are met. A digital output or function assigned to a free-running setpoint continuously changes state, becoming active or inactive, as defined by the setpoint parameters.

**Batch setpoints** are active one at a time, in an ordered sequence. The 720i can use setpoints to control up to 32 separate batch processing steps.

A digital output associated with a batch setpoint is active until the setpoint condition is met, then latched for the remainder of the batch sequence.

To use batch setpoints, you must activate the BATCHNG parameter on the SETPTS menu. This parameter defines whether a batch sequence is automatic or manual. AUTO sequences repeat continuously, while MANUAL sequences require a BATSTRT signal. The BATSTRT signal can be initiated by a digital input, serial command, or **Batch Start** softkey.

For setpoint kinds that can be used as either continuous or batch setpoints, the BATCH parameter must also be set ON. (Setpoint kinds that can only be used as batch setpoints do not require the BATCH parameter.) If the setpoint is defined but the BATCH parameter is off, the setpoint operates as a continuous setpoint, even during batch sequences.

**NOTE:** In applications that contain both batch setpoint routines and continuous setpoints, continuous setpoints should be kept separate from the batch sequence. This is especially true when using CONCUR or TIMER setpoints to perform actions or functions based on the batch sequence. CONCUR and TIMER setpoints should not be included in the referenced START and END setpoint sequence.

Kind	Description	Batch	Continuous
OFF	Setpoint turned off/ignored.		
GROSS	Gross setpoint. Performs functions based on the gross weight. The target weight entered is considered a positive gross weight.	X	X
NET	Net setpoint. Performs functions based on the net weight. The target weight entered is considered a positive net weight value.	X	X
-GROSS	Negative gross weight. Performs functions based on the gross weight. The target weight entered is considered a negative gross weight.	X	X
-NET	Negative net weight. Performs functions based on the net weight. The target weight entered is considered a negative net weight value.	X	X
ACCUM	Accumulate setpoint. Compares the value of the setpoint to the source scale accumulator. The accumulator setpoint is satisfied when the value of the source scale accumulator meets the value and conditions of the accumulator setpoint.	X	X
ROC	Rate-of-change setpoint. Performs functions based on the rate-of-change (ROC) value.	X	X

Table 8-1. Setpoint Kinds

Kind	Description	Batch	Continuous
+REL	Positive relative setpoint. Performs functions based on a specified value above a referenced setpoint, using the same weight mode as the referenced setpoint.	X	X
-REL	Negative relative setpoint. Performs functions based on a specified value below a referenced setpoint, using the same weight mode as the referenced setpoint.	X	X
%REL	Percent relative setpoint. Performs functions based on a specified percentage of the target value of a referenced setpoint, using the same weight mode as the referenced setpoint. The actual target value of the %REL setpoint is calculated as a percentage of the target value of the referenced setpoint.	X	X
RESREL	Relative to a result setpoint. Performs functions based on a specified percentage of the captured value of a referenced setpoint, using the same weight mode as the referenced setpoint. The actual target value of the RESREL setpoint is calculated as a percentage of the captured value of the referenced setpoint, rather than the target value.	X	X
PAUSE	Pauses the batch sequence indefinitely. A BATSTRRT signal must be initiated to continue the batch process.	X	
DELAY	Delays the batch sequence for a specified time. The length of the delay (in tenths of a second) is specified on the VALUE parameter.	X	
WAITSS	Wait for standstill. Suspends the batch sequence until the scale is at standstill.	X	
COUNTER	Specifies the number of consecutive batch sequences to perform. Counter setpoints should be placed at the beginning of a batch routine.	X	
AUTOJOG	Automatically checks the previous weight-based setpoint to verify the setpoint weight value is satisfied in a standstill condition. If the previous setpoint is not satisfied when at standstill, the AUTOJOG setpoint activates the digital output of the previous weight-based setpoint for a period of time, specified on the VALUE parameter. The autojog process repeats until the previous weight-based setpoint is satisfied when the scale is at standstill.  NOTE: The AUTOJOG digital output is typically used to signify that an autojog operation is being performed. AUTOJOG should not be assigned to the same digital output as the related weight-based setpoint.	X	
COZ	Center of zero. Monitors for a gross zero condition. The digital output associated with this setpoint kind is activated when the referenced scale is a center of zero. No value is required for this setpoint.		X
INMOTON	In motion. Monitors for an in-motion condition. The digital output associated with this setpoint is activated when the scale is not at standstill. No value is required for this setpoint.		X
INRANGE	In range. Monitors for an in-range condition. The digital output associated with this setpoint is activated when the scale is within capacity range. No value is required for this setpoint.		X
BATCHPR	Batch processing signal. The digital output associated with this setpoint is activated whenever a batch sequence is in progress. No value is required for this setpoint.		X
TIMER	Tracks the progress of a batch sequence based on a timer.  The timer value, specified in tenths of a second on the VALUE parameter, determines the length of time allowed between start and end setpoints. The indicator START and END parameters are used to specify the start and end setpoints. If the END setpoint is not reached before the timer expires, the digital output associated with this setpoint is activated.		X

Table 8-1. Setpoint Kinds (Continued)

Kind	Description	Batch	Continuous
CONCUR	<p>Allows a digital output to remain active over a specified portion of the batch sequence. Two types of concur setpoints can be configured:</p> <p>Type 1 (VALUE=0): The digital output associated with this setpoint becomes active when the START setpoint becomes the current batch step and remains active until the END setpoint becomes the current batch step.</p> <p>Type 2 (VALUE &gt; 0): If a non-zero value is specified for the VALUE parameter, that value represents the timer, in tenths of a second, for this setpoint. The digital output associated with this setpoint becomes active when the START setpoint becomes the current batch step and remains active until the timer expires.</p>		X
TOD	Time of day setpoint. Performs functions when the internal clock time of the indicator matches the specified setpoint time.	X	X
DELTA	Delta weight setpoint. Satisfied when the change in weight on the scale is equal to or exceeds the absolute value specified for the setpoint.	X	
CHKWEI	Checkweigher setpoint. Allows specification of over- and under-weight values. Up to three digital outputs can be configured to represent overweight, underweight, and accept conditions.		X
ALWAYS	Always setpoint. This setpoint is always satisfied. It is typically used to provide an endpoint for true/false branching batch routines.	X	
NEVER	Never setpoint. This setpoint is never satisfied. It is used to branch to a designated setpoint in true/false branching batch routines in which the batch will not continue through the normal sequence of batch setpoints.	X	

*Table 8-1. Setpoint Kinds (Continued)*

## 8.2 Setpoint Menu Parameters

Figure 8-1 shows the general structure of the SETPTS menu. Submenus (indicated by *Go to X* in Figure 8-1) for various groups of setpoint kinds are shown on the following pages (Figures 8-3 through 8-9); parameter descriptions for the submenus are provided in Table 8-2 on page 66.

See Table 8-1 on page 56 for descriptions of each of the setpoint kinds.

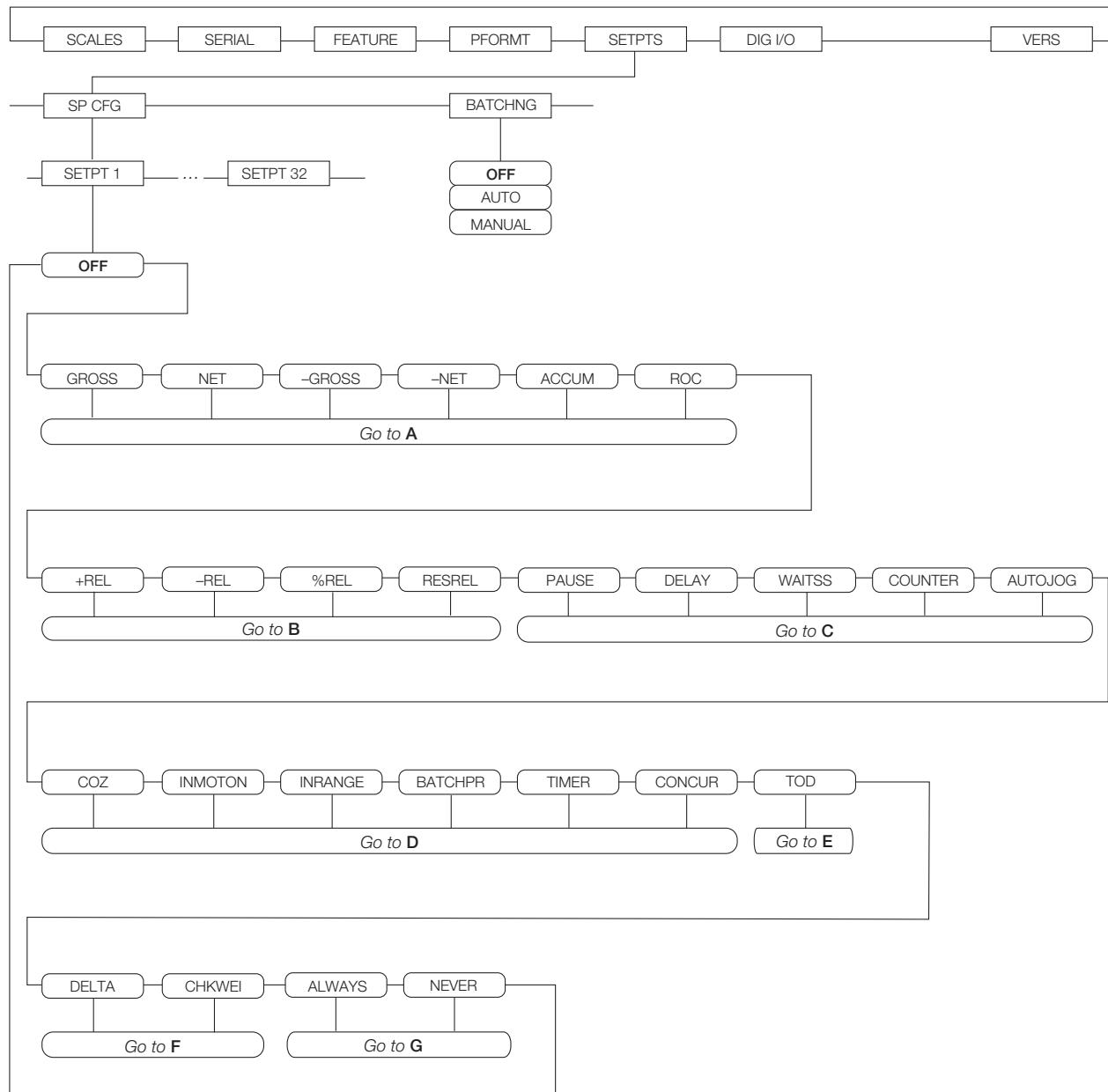


Figure 8-1. SETPTS Menu

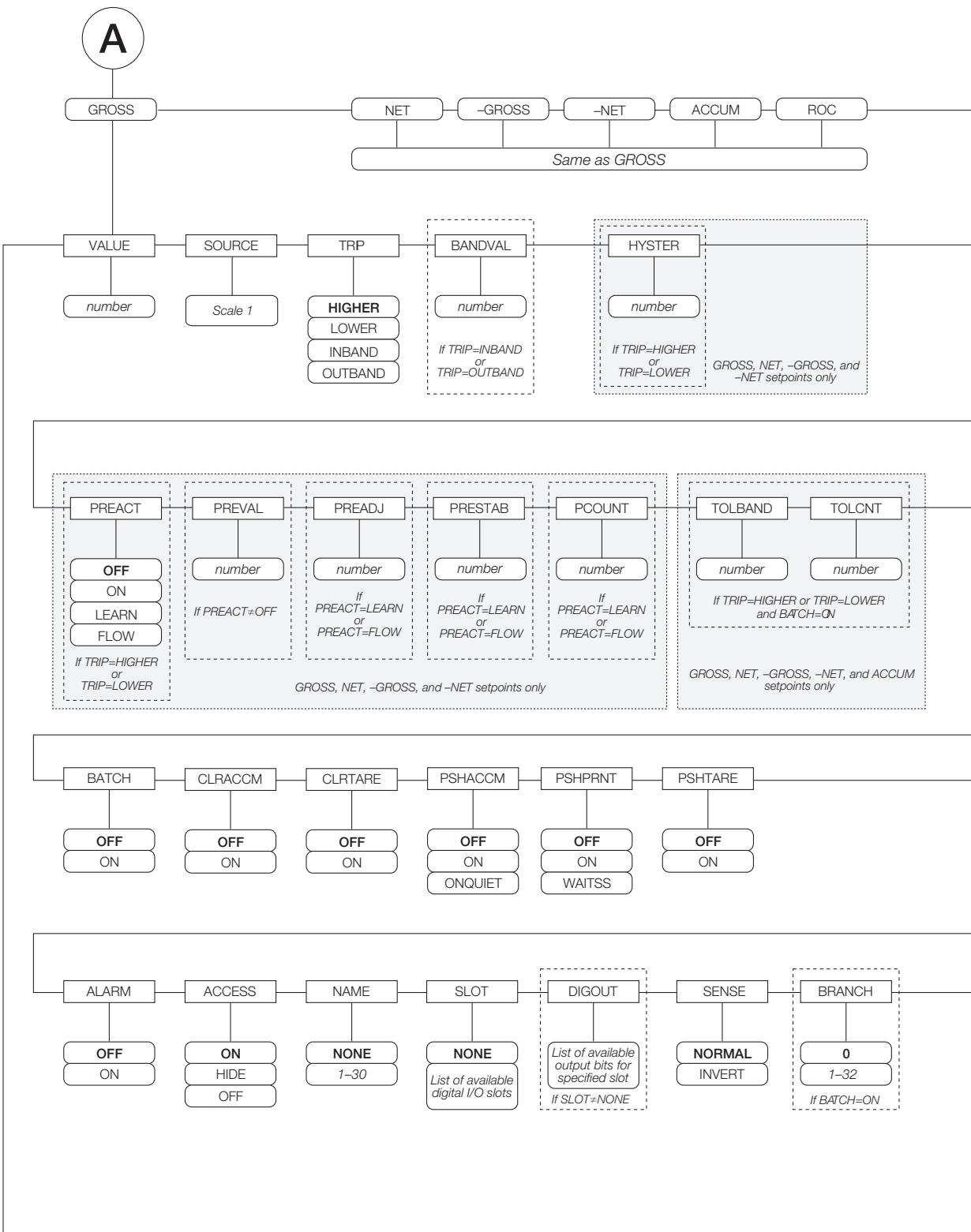


Figure 8-2. GROSS, NET, -GROSS, -NET, ACCUM, and ROC Setpoint Parameters

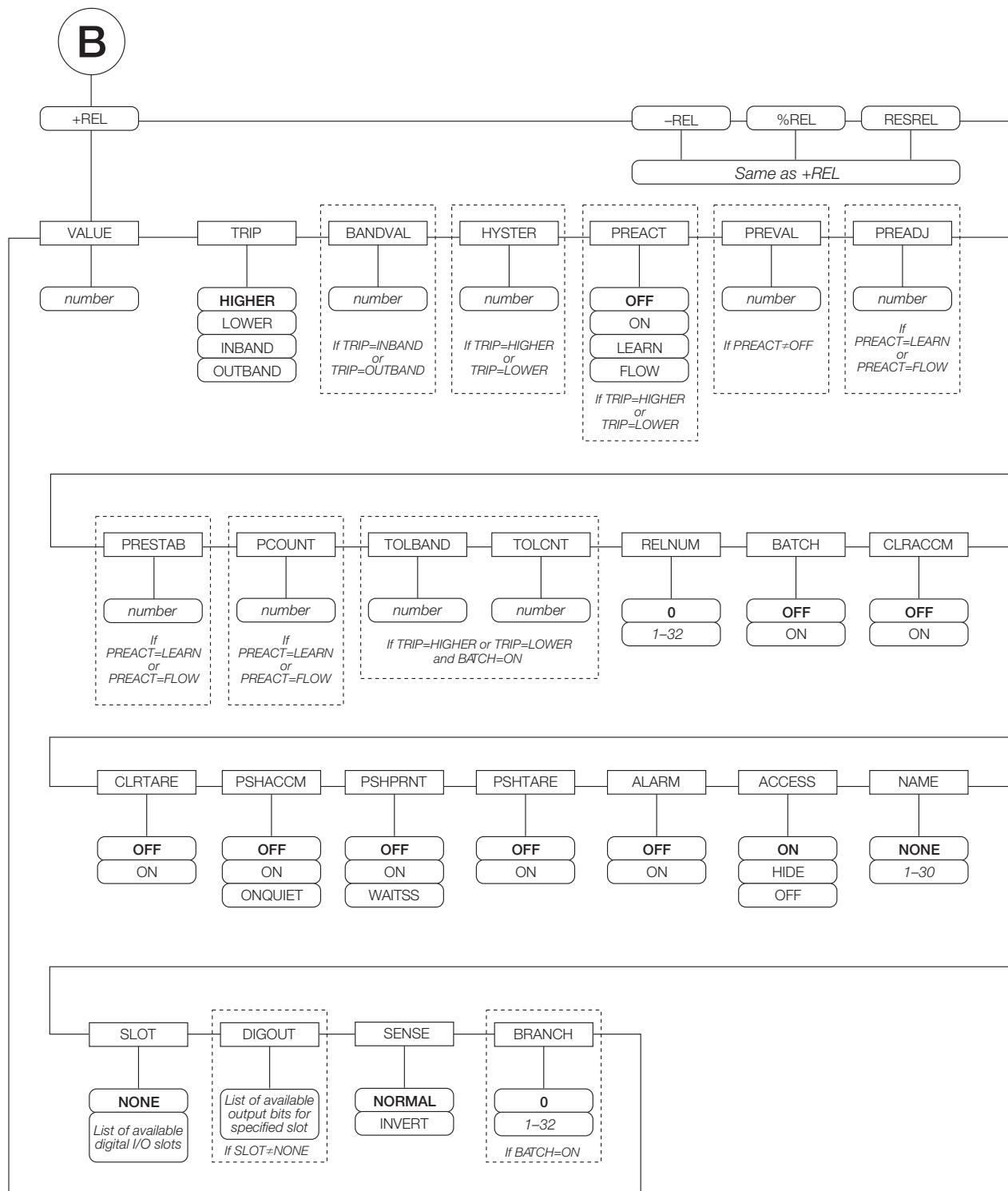


Figure 8-3. +REL, -REL, %RELS and RESREL Setpoint Parameters

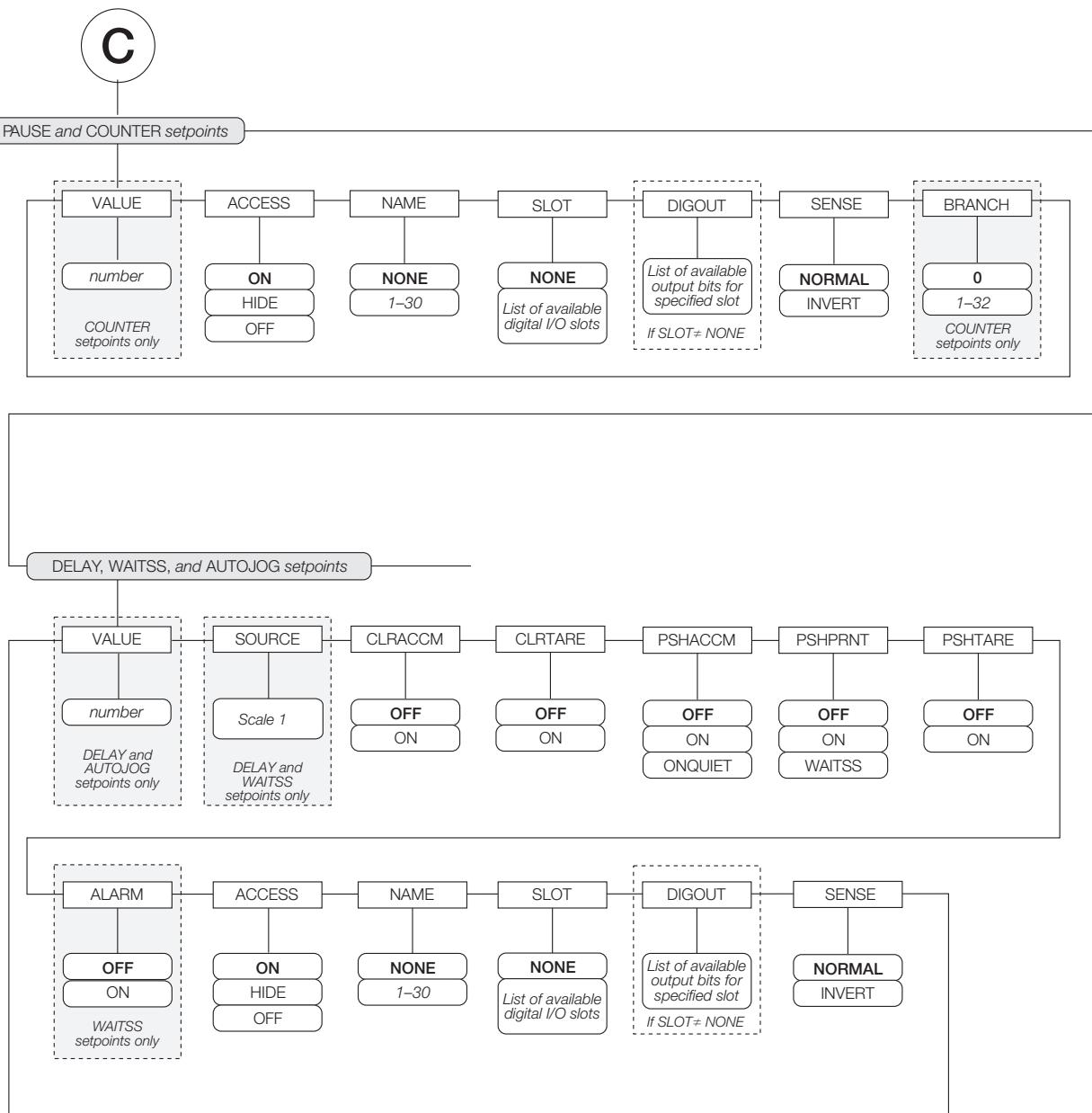


Figure 8-4. PAUSE, COUNTER, DELAY, WAITSS, and AUTOJOG Setpoint Parameters

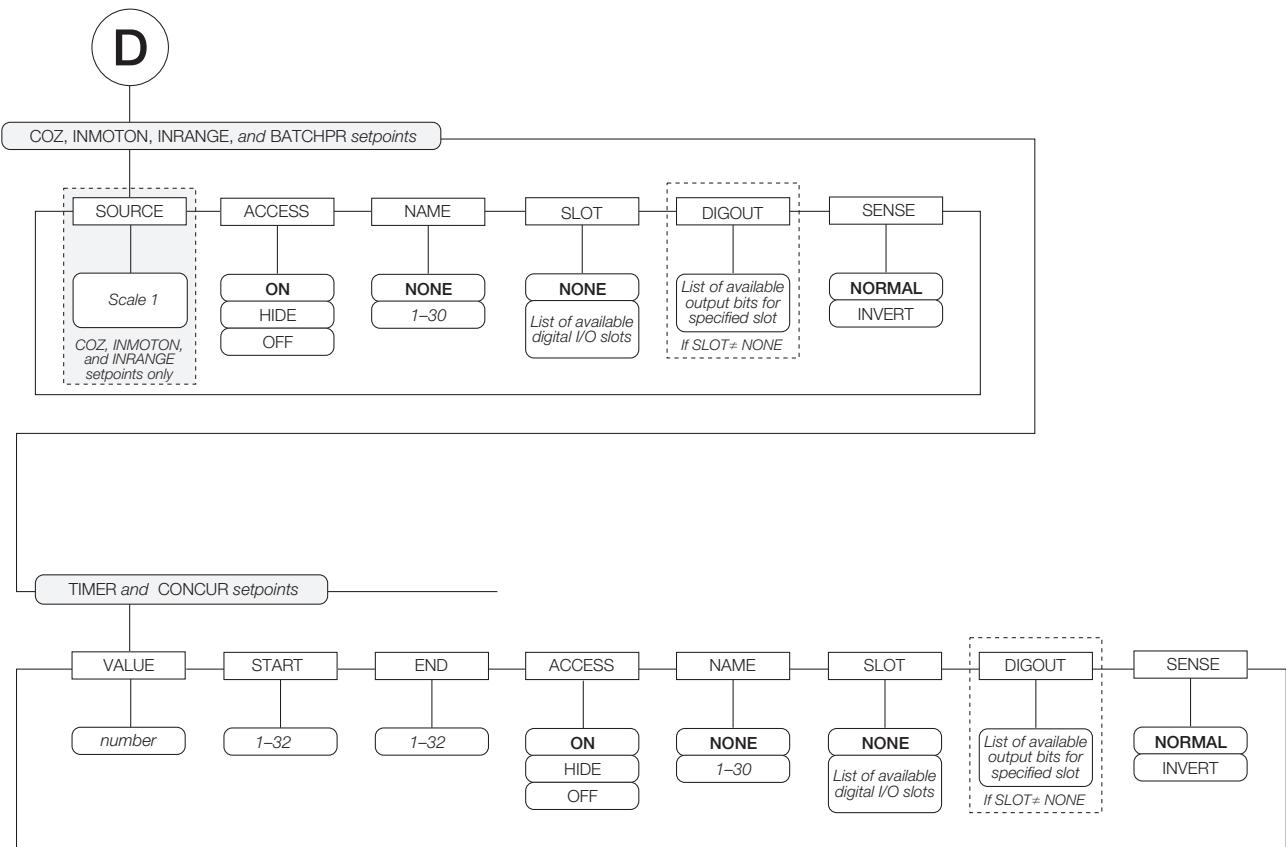


Figure 8-5. COZ, INMOTON, INRANGE, and BATCHPR Setpoint Parameters

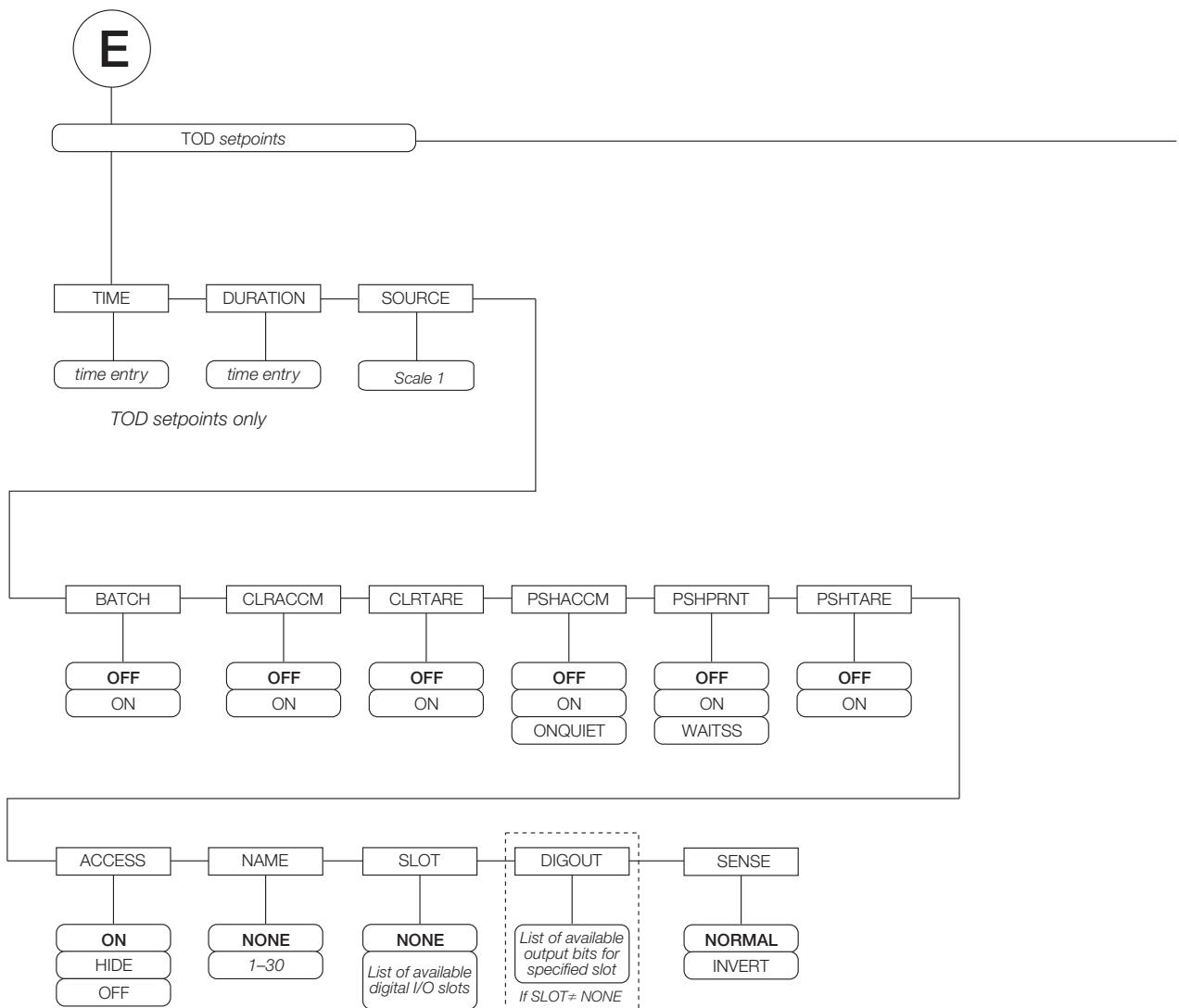


Figure 8-6. TOD Setpoint Parameters

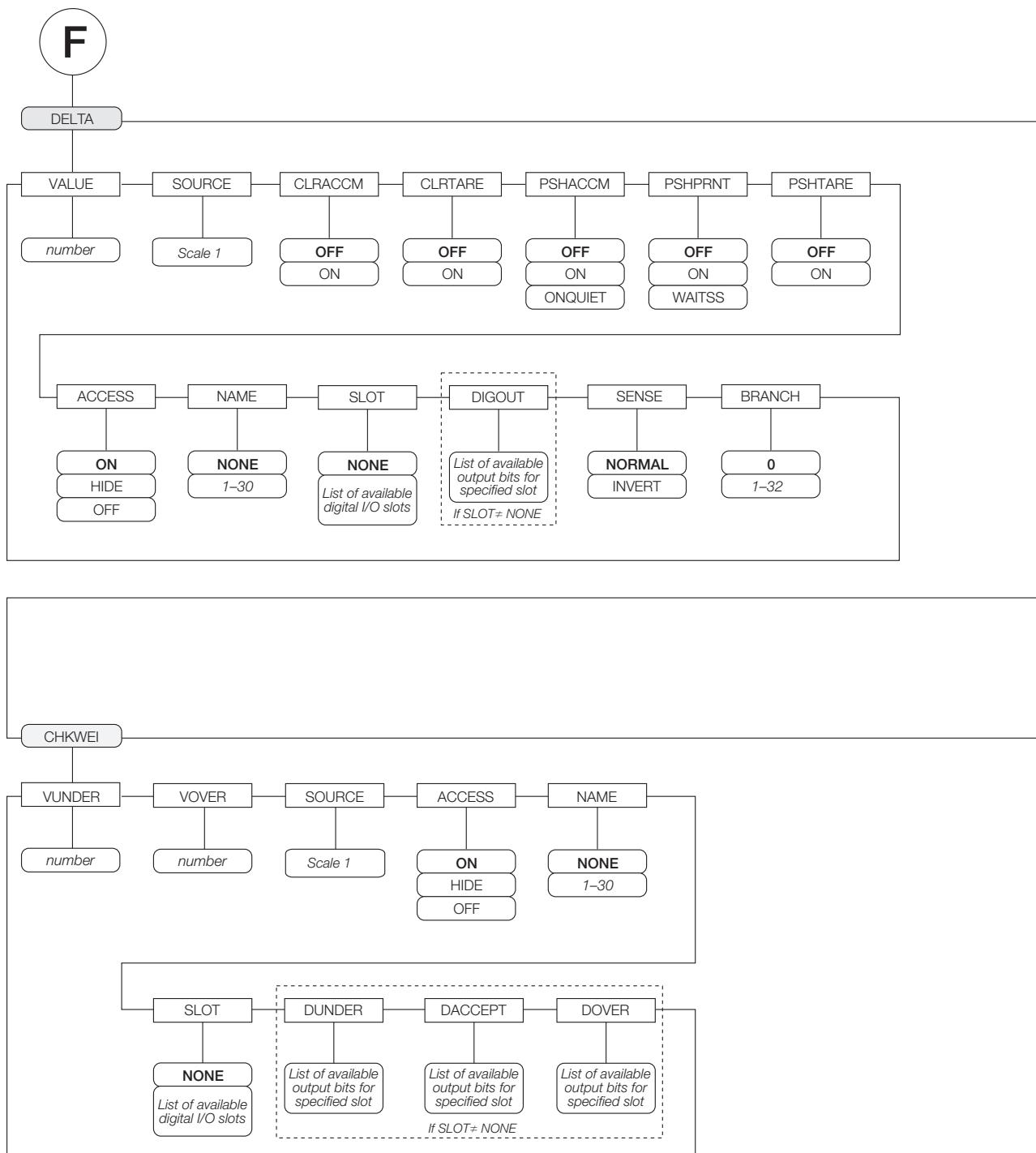


Figure 8-7. DELTA and CHKWEI Setpoint Parameters

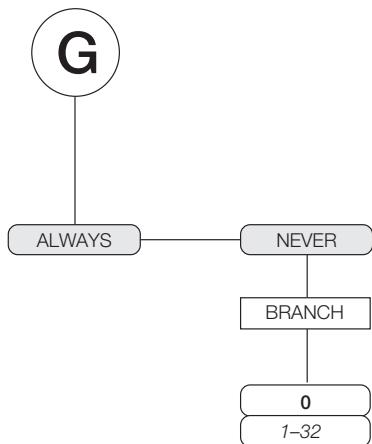


Figure 8-8. *ALWAYS* and *NEVER* Setpoint Parameters

SETPTS Menu		
Parameter	Choices	Description
<b>Level 2 submenus</b>		
SETPT 1– SETPT 32	OFF GROSS NET –GROSS –NET ACCUM ROC +REL –REL %REL RESREL PAUSE DELAY WAITSS COUNTER AUTOJOG COZ INMOTON INRANGE BATCHPR TIMER CONCUR TOD DELTA CHKWEI ALWAYS NEVER	<p>Specifies the setpoint kind.</p> <p>GROSS, NET, –GROSS, –NET, ACCUM, ROC, +REL, –REL, %REL, RESREL, and TOD setpoint kinds can be used as either batch or continuous setpoints.</p> <p>PAUSE, DELAY, WAITSS, COUNTER, AUTOJOG, DELTA, ALWAYS, and NEVER setpoint kinds can only be used in batch sequences.</p> <p>COZ, INMOTON, INRANGE, BATCHPR, TIMER, CONCUR, and CHKWEI setpoint kinds can only be used as continuous setpoints.</p> <p>See Table 8-1 on page 56 for more information about setpoint kinds.</p>
BATCHNG	OFF AUTO MANUAL	Batching enable. Set to AUTO or MANUAL to allow a batch sequence to run. MANUAL requires a BATSTRT digital input, BATSTART serial command, <b>Batch Start</b> softkey, or the StartBatch function before the batch sequence can run. AUTO allows batch sequences to repeat continuously.

Table 8-2. Setpoint Menu Parameters

SETPTS Menu		
Parameter	Choices	Description
<b>Level 4 submenus</b>		
VALUE	number	<p>Setpoint value.</p> <ul style="list-style-type: none"> <li>For weight-based setpoints: Specifies the target weight value, 0–9999999.</li> <li>For time-based setpoints: Specifies, in 0.1-second intervals, a time value in the range 0–65535.</li> <li>For COUNTER setpoints: Specifies the number of consecutive batches to be run, 0–65535.</li> </ul>
SOURCE	source_scale	Specify the scale number used as the source for the setpoint.
TRIP	HIGHER LOWER INBAND OUTBAND	<p>Specifies whether the setpoint is satisfied when the weight is higher or lower than the setpoint value, within a band established around the value, or outside of that band.</p> <p>In a batch sequence with TRIP=HIGHER, the associated digital output is active until the setpoint value is reached or exceeded; with TRIP=LOWER, the output is active until the weight goes below the setpoint value.</p>
BANDVAL	0–9999999	For setpoints with TRIP=INBAND or OUTBAND, specifies a weight equal to half the band width. The band established around the setpoint value is VALUE $\pm$ BANDVAL.
HYSTER	0–9999999	Specifies a band around the setpoint value that must be exceeded before the setpoint, once off, can trip on again.
PREACT	OFF ON LEARN FLOW	<p>Allows the digital output associated with a setpoint to shut off before the setpoint is satisfied to allow for material in suspension.</p> <p>The ON value adjusts the setpoint trip value up or down (depending on the TRIP parameter setting) from the setpoint value using a fixed value specified on the PREVAL parameter.</p> <p>The LEARN value can be used to automatically adjust the preact value after each batch. LEARN compares the actual weight at standstill to the target setpoint value, then adjusts the preact PREVAL by the PREADJ value times the difference after each batch.</p> <p>FLOW preact provides dynamic compensation for material flow rate in determining when to shut off the digital output. Rather than waiting for the specified weight to be reached, FLOW preact uses the change in weight over time to anticipate when the TRIP minus PREACT weight value will be reached.</p>
PREVAL	0–9999999	Specifies the preact value for setpoints with PREACT set to ON, LEARN, or FLOW. Depending on the TRIP setting specified for the setpoint, the setpoint trip value is adjusted up or down by the PREVAL value.
PREADJ	0.500000 0–9999999	Preact adjustment factor. For setpoints with PREACT set to LEARN, specifies a decimal representation of the percentage of error correction applied (0.5 = 50%, 1.0 = 100%) each time a PREACT adjustment is made.
PRESTAB	0 0–65535	Preact stabilization time-out. For setpoints with PREACT set to LEARN, specifies the time, in 0.1-second intervals, to wait for standstill before adjusting the PREACT value. Setting this parameter to a value greater than zero disables the learn process if standstill is not achieved in the specified interval.
PCOUNT	1 0–65535	Preact learn interval. For setpoints with PREACT set to LEARN, specifies the number of batches after which the preact value is recalculated. The default value, 1, recalculates the preact value after every batch cycle.
TOLBAND	0 0–9999999	Tolerance band. For setpoints with TRIP set to HIGHER or LOWER, specifies a tolerance band around the target weight. If the captured weight is not within the specified tolerance band, the preact learn function is not applied and the batch is paused (based on the value of the TOLCNT parameter, below) until restarted or reset.

Table 8-2. Setpoint Menu Parameters (Continued)

SETPTS Menu		
Parameter	Choices	Description
TOLCNT	1 0-65535	Tolerance count. For setpoints with TRIP set to HIGHER or LOWER, specifies the number of consecutive batch cycles in which the tolerance band (TOLBAND parameter) must be exceeded before the batch process is paused. When the specified value is met, the batch is paused and an error message is displayed. The batch must be restarted or reset to clear the error message. The special value of zero means that the batch is never paused for an out-of-tolerance condition.
RELENUM	1-32	For relative setpoints, specifies the number of the relative setpoint. The target weight for this setpoint is determined as follows: <ul style="list-style-type: none"> <li>For +REL setpoints, the value of the relative setpoint plus the value (VALUE parameter) of the +REL setpoint</li> <li>For -REL setpoints, the value of the relative setpoint minus the value of the -REL setpoint</li> <li>For %REL setpoints, the percentage (specified on the VALUE parameter of the %REL setpoint) of the target value of the relative setpoint</li> <li>For RESREL setpoints, the percentage (specified on the VALUE parameter of the RESREL setpoint) of the <i>captured</i> value of the relative setpoint</li> </ul>
BATCH	OFF ON	Specifies whether the setpoint is used as a batch (ON) or continuous (OFF) setpoint.
CLRACCM	OFF ON	Specify ON to clear the accumulator when the setpoint is satisfied
CLRTARE	OFF ON	Specify ON to clear the tare when the setpoint is satisfied
PSHACCM	OFF ON ONQUIET	Specify ON to update the accumulator and perform a print operation when the setpoint is satisfied. Specify ONQUIET to update the accumulator without printing.
PSHPRNT	OFF ON WAITSS	Specify ON to perform a print operation when the setpoint is satisfied; specify WAITSS to wait for standstill after setpoint is satisfied before printing.
PSHTARE	OFF ON	Specify ON to perform an acquire tare operation when the setpoint is satisfied. <b>NOTE:</b> PSHTARE acquires the tare regardless of the value specified for the REGULAT parameter on the FEATURE menu.
NOTE: If two or more of the CLRxxxx and PSHxxxx parameters are set on, the actions specified by those parameters are performed in the following order when the setpoint is satisfied: 1) clear accumulator; 2) clear tare; 3) accumulate; 4) print; 5) acquire tare.		
ALARM	OFF ON	Specify ON to display the word ALARM on the primary display while the setpoint is active (batch setpoints) or while the setpoint is not tripped (continuous setpoints).
START	1-32	Specifies the starting setpoint number. <i>Do not</i> specify the number of the TIMER or CONCUR setpoint itself. The TIMER or CONCUR setpoint begins when the starting setpoint begins.
END	1-32	Specifies the ending setpoint number. <i>Do not</i> specify the number of the TIMER or CONCUR setpoint itself. The TIMER or CONCUR setpoint stops when the ending setpoint begins.
ACCESS	ON HIDE OFF	Specifies the access allowed to setpoint parameters shown by pressing the <b>Setpoint</b> softkey in normal mode. <p>ON: Values can be displayed and changed HIDE: Values cannot be displayed or changed OFF: Values can be displayed but not changed</p>
NAME	NONE, 1-30	Specify the number of an assigned prompt. Up to 60 prompt names can be specified on the PROMPTS submenu of the FEATURE menu.

Table 8-2. Setpoint Menu Parameters (Continued)

SETPTS Menu		
Parameter	Choices	Description
SLOT	<i>slot_number</i>	Lists all available digital I/O slots. This parameter specifies the slot number of the digital I/O card referenced by the DIGOUT parameter.
DIGOUT	<i>bit_number</i>	<p>Lists all digital output bits available for the specified SLOT. This parameter is used to specify the digital output bit associated with this setpoint. Use the DIG I/O menu to assign bit function to OUTPUT.</p> <p>For continuous setpoints, the digital output becomes active (low) when the condition is met; for batch setpoints, the digital output is active <i>until</i> the setpoint condition is met.</p>
BRANCH	0 1-32	<p>Specifies the setpoint number to which the batch sequence is to branch if the current setpoint is not satisfied upon initial evaluation.</p> <p>The special value zero indicates that no branch is taken.</p>
TIME	<i>time</i>	For TOD setpoints, specifies the time at which the setpoint becomes active. The format used to enter the time (12-hour or 24-hour) is based on the value specified for the TIMEFMT parameter on the FEATURE menu.
DURATION	<i>hh:mm:ss</i>	For TOD setpoints, specifies the length of time that the digital output associated with this setpoint changes state. The value is entered in hours, minutes, and seconds ( <i>hh:mm:ss</i> ). All other operations associated with this setpoint (print, tare, or accumulate) are performed at the end of the specified duration.
VUNDER	0-9999999	For CHKWEL setpoints, specifies the lower weight limit.
VOVER	0-9999999	For CHKWEL setpoints, specifies the upper weight limit.
DUNDER	<i>digital_output</i>	For CHKWEL setpoints, specifies the bit number of digital output activated when the scale weight is less than the VUNDER value specified.
DACCEPT	<i>digital_output</i>	For CHKWEL setpoints, specifies the bit number of digital output activated when the scale weight between the VUNDER and VOVER values specified.
DOVER	<i>digital_output</i>	For CHKWEL setpoints, specifies the bit number of digital output activated when the scale weight is greater than the VOVER value specified.
SENSE	NORMAL INVERT	Specifies whether the value of the digital output associated with this setpoint is inverted when the setpoint is satisfied.

Table 8-2. Setpoint Menu Parameters (Continued)

## 8.3 Batch Operations

Softkeys can be configured to allow operator control of batch operations from the 720i front panel (see Figure 8-9). Softkeys can be configured using *Revolution III*, serial commands, or the FEATURE menu (see Section 3.2.3 on page 36).

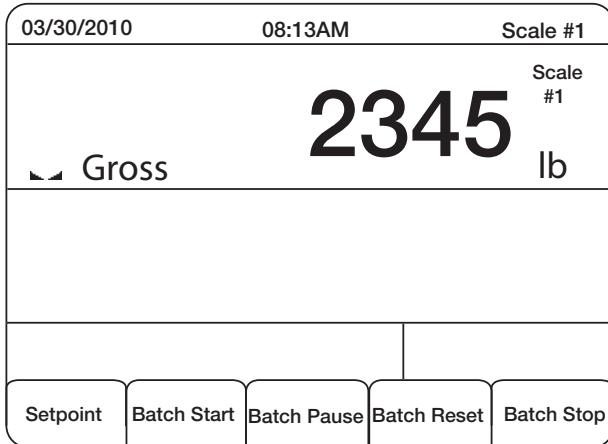


Figure 8-9. Batching Softkeys

- Setpoint** Display or change assigned setpoints.
- Batch Start** Starts batch process.
- Batch Pause** Pauses an active batch and turns off all digital outputs except those associated with concurrent and timer setpoints. Processing is suspended until **Batch Start** is pressed again. Pressing **Batch Start** resumes the batch and re-energizes all digital outputs turned off by the **Batch Pause**.
- Batch Reset** Stops and resets an active batch to the beginning of the process.
- Batch Stop** Stops an active batch and turns off all associated digital outputs.

### ! Warning

*To prevent personal injury and equipment damage, software-based interrupts must always be supplemented by emergency stop switches and other safety devices necessary for the application.*

### Batching Switch

The batching switch option, PN 19369, comes as a complete unit in an FRP enclosure, with legend plate, locking stop switch (mushroom button), and a run/start/abort 3-way switch.

Both switches are wired into the indicator's digital I/O terminal strip as shown in Figure 8-11. Each switch uses a separate digital input.

Once cables and switches have been connected to the indicator, use the setup switch to place the indicator in setup mode. Use the DIG I/O menu (see Section 3.2.5 on page 41) to configure digital input and output functions.

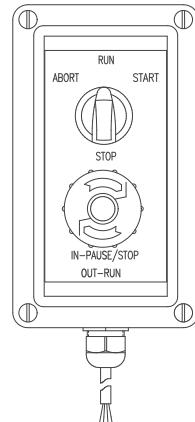


Figure 8-10. Batching Switch

When configuration is complete, exit setup mode. Initialize the batch by turning the 3-way switch to **ABORT**, then unlock the **STOP** button (the **STOP** button must be in the **OUT** position to allow the batch process to run). The batching switch is now ready to use.

### ! Warning

*If no digital input is assigned to BATRUN, batching proceeds as if BATRUN were always on: the batch will start when the 3-way switch is turned to RUN, but the STOP mushroom button will not function.*

#### ABORT/RUN/START SWITCH

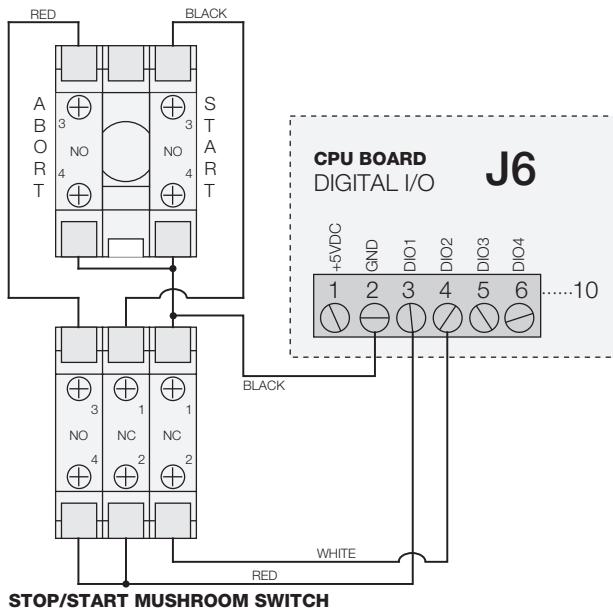


Figure 8-11. Batching Switch Wiring Diagram Example

To begin a batch process, turn the 3-way switch to *START* momentarily. If the STOP button is pushed during the batch process, the process halts and the button locks in the IN position.

The *START* switch is ignored while the STOP button is locked in the IN position. The STOP button must be turned counterclockwise to unlock it, then released into the OUT position to enable the 3-way switch.

To restart an interrupted batch from the step where it left off, do the following:

1. Unlock STOP button (OUT position)
2. Turn 3-way switch to *START*

To restart an interrupted batch from the first batch step, do the following:

1. Turn 3-way switch to *ABORT*
2. Unlock STOP button (OUT position)
3. Turn 3-way switch to *START*

**NOTE:** Use this procedure (or the BATRESET serial command) to initialize the new batch routine following any change to the setpoint configuration.

## 9.0 Using ProAction PCEE

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**NOTE:** When working with this chapter, the PCE Version software must be installed.

In addition to *Revolution III*, the *720i* is supported by two additional applications that extend its capabilities for batch control and database management. ProAction PCEE, or Process Control Engine Editor, provides functions similar to setpoint configuration for *720i*-based batch control. ProAction DBE, the database editor, is a tool for creating, editing, and managing databases in the *720i*. Both applications are included on the *720i* Toolkit CD.

PCEE is developed around a step, condition, and action philosophy.

A step contains conditions and actions (see example below). A condition is a situation that must be met to accomplish the true actions. If the conditions are not met, the false actions are executed. When a transition happens to the condition, the corresponding true or false actions will be executed. All actions will all be executed even after a pause.

*Example:*

*The condition could be a Weight Compare (Gross is trip higher than 1000).*

*The false action could be to turn on a digital output (Digital I/O 1 is On, since weight is below 1000).*

*The true action could be to turn off the digital output (Digital I/O 1 is Off, since the weight is above 1000).*

Steps are typically sequenced one after another. This is accomplished by actions that allow a step to deactivate itself and to activate other steps. The true action list for the above example is:

- Digital I/O is Off
- Deactivate Step 1
- Activate Step 2

When a step is enabled, the actions will only be executed once until a condition transitions. This transition can be from true to false, or from false to true. Deactivated steps are not evaluated until activated by another step. When a step is activated (enabled), either the true or false actions will be executed.

### Writing a PCE Process

The first step to writing a PCE Process is to decide what small routines are to be built into the total process. This could include steps for:

- The batch process
- Entering a new target weight
- Printing the weight
- Other functions relating to the process

Before the steps are created, you should write out the sequence of the process/functions on a worksheet. Then, consider the following in working through the details:

- The softkeys or inputs/outputs required
- The steps “enabled” at power-up (at least one is required to start the process)
- Determine the condition to evaluate for each step, and the actions
- What the print formats are going to be
- What database tables need to be created and the data stored in each field

As each step is built, keep in mind the True, False, and Pause lists execute the actions in the order they are listed, meaning an action such as “print” should precede an action such as “tare.”

Steps for a particular routine can be built and tested using just that routine, and when all of the smaller routines are complete, a final merge can be done to finalize the process.

Within the PCE, there are four temporary variables called user data. They are used as an interface between:

- The steps and the database (such as reading or writing data)
- The user and the database (such as searching by an ID)
- The user and the step compares (such as setting a target value)

All data goes through these temporary variables as a “Get” or “Set.” A “Get” is used to get data from a user or from a condition in a step. A “Set” is used to put data into a condition in a step.

Each variable supports a different type of data: integer (whole numbers without a decimal point); real (numbers that can contain a decimal point); string (alphanumeric printable data); and datetime (preset format for the date and time to be stored and printed). There is one location for each type of user data. The User Clear action will clear out one of the four variables based on its type.

## Performing a Merge

There are some checks to perform whenever merging is used because the editor assigns condition numbers to each step:

4. Re-Check each step’s Activate and Deactivate to ensure they are still aimed at the correct step.
5. If any Set or Get Compare actions are used, verify the condition number, as the editor will change it as it builds a merged process.
6. If a Step Compare is used, verify the correct step is being evaluated.

**NOTE:** The above checks also apply if a step is moved up or down. If you move a step, ensure condition numbers are updated accordingly.

## Pause, Reset, and Restore Process

There are three unique actions that need a bit of clarification: the Pause Process, Reset Process, and Restore Process. These actions are used to pause the process and then either restore (continue) or reset (abort) the process. These actions are typically accomplished with a softkey or a digital input.

These actions will only affect the steps that have the Pausable flag set. Setting this flag in any of the actual process steps means only those steps will be affected. When a Pause Process is initiated, only the pause actions for the current step (or other enabled, pausable steps) are run. Those steps without the pausable flag set will still operate as normal. For example, a free-running independent weight compare or any non-pausable, enabled step can continue to activate/deactivate other non-pausable steps.

A Pause will stop the pausable steps. The state of each step is then saved. If a Restore is then executed, the steps’ states are restored and the process continues where it left off. If the Reset action is executed, all pausable steps go back to the default state and the process will need to be manually restarted based on the setup of the process.

Along with the PCE Editor, there is also a Database Editor to build and download a database that can be used by PCEE. First a Schema is built. This is the framework of the database. This will include the name, number of fields, and the type of data each field will contain. This data can be used for displaying prompts, gathering data during a batch process, and as a warehouse for any data that the PCE needs to use.

Use of the database is addressed using the database commands discussed later in this document.

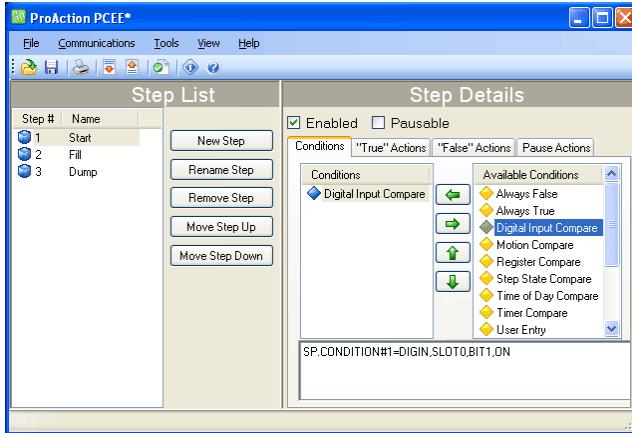
## Revolution III

Whenever a PCE process is built, be sure to build a *Revolution III* file using the 720i module so that all configuration parameters match the process. The *Revolution III* file will define any required digital i/o, softkeys, and the print formats (AuxFmt) used.

In *Revolution III*, there is a Monitor Mode in the *Tools* tab of the editor, which can be used to set individual parameters such as a DigOut to Output or Input.

## Setting Up a Simple Three-Step Fill

The following example will set up three steps to start the process with DigIn 1, turn on DigOut 2 until the target is reached (100 lbs), and wait for the scale to empty before allowing a restart.



To create this process:

1. Install both the PCEE program and the DBE program.
2. Open the PCEE program.
3. Click New Step button.  
The *Step* dialog box appears.
4. In the *Step Name* text box, type the desired name for this step.
5. Ensure Auto-Sequence is checked.
6. Click OK.  
The step will appear in the left column and the Auto Sequence will add the Deactivate for this step and an Activate for the next step.
7. Click on Enable to set the default to *Enabled* for this step.
8. Under *Available Conditions*, click on Digital Input Compare and click the Left Arrow button.  
This will use a DigIn to start this process.
9. Select bit 1 in the parameter section and ON for Target State.
10. Using Rev III, ensure that DIO bit 1 on Slot 0 is set to INPUT.
11. Click New Step to create the second step and name it.
12. Under *Available Conditions*, click on Weight Compare and click the Left Arrow button.
13. Set the parameters to Higher and a value of 100. We won't use a Preact for now. This is our fill step.
14. Select the "*True Actions*" tab.
15. Click Digital Output and click the Left Arrow button.
16. In the parameters, set to bit 2 and OFF. This will turn our relay off when the target is reached.
17. Select the "*False Actions*" tab.
18. Click Digital Output and click the Left Arrow button.
19. Set the parameters to bit 2 and select ON. This will turn our relay on until the target is reached.
20. Using Rev III, ensure that *DIO bit 2* is set to OUTPUT.
21. Click the New Step button for the final step and name it.
22. Under *Available Conditions*, click on Weight Compare and click the Left Arrow button.
23. Set the parameters to Lower and a value of 5. This is our Dump step.
24. Under Step 3's true actions, adjust the Activate to Step 1 instead of Step 4. Auto Sequence will continue to enable a next step; however, if there is no next step, we need to change the activate back to our first step.
25. From the *Tools* menu, select Validate to check the process steps for any basic errors.
26. From the *File* menu, select Save As... and select a file name and save location.
27. Open Revolution III and Connect to 720i.
28. Download the matching Rev III file.

29. Download the file you saved in Step 26.
30. Press SaveExit softkey on the 720i to open and execute these files.
31. Verify all operations of your files.

For ease in debugging your process, there is an EDP command that will dump the raw list of commands you have sent to the 720i, "SPSUMP." The first half of the list is all the conditions and actions. The second half lists the steps and associated conditions and actions by numeric reference.

*NOTE: The Enable flag will be True for the steps that are presently active. If they were set to ENABLED on download and no other step ever turns it off, it should still be ENABLED. If it was off at download and is part of a process sequence, then it may be on now to represent where the process is at this time. The EDP command can be used every step of the process to watch the progress. It is very useful.*

### **Helpful Hints**

PCE has a special feature, called auto-sequence, that when enabled, will automatically add an Activate and Deactivate action to the current step. This is used to consecutively enable and disable steps in a routine to form a process flow.

The Enable is a preset flag that you set to activate a step on a download or reset. That is its default state. A Restore will always put this flag back to a default state when processed. It can also be turned ON or OFF from any other step to form a sequence of steps. If it stays on and no other step turns it off, it can be considered free-running and is always examined by the PCE.

The Pausable flag is used for any step to be included in a pause action. Any time the process needs to be paused, this pause list in each pausable step will be executed. This flag also marks steps to be included in a Reset action to put them back to its default state, particularly to put the enable flag back to its default state.

The Reset Process with reset all pausable steps back to the downloaded default settings. If a pause was not performed prior to this action, it will be performed and then the reset will be done.

The Restore action sets all paused steps back to where they were when the pause was executed so the process can continue where it left off.

There are 32 timers that are used as a "one-shot timer." They can be started inside a step and then another step can use a Timer Compare to check if the timer is still running or stopped, and perform the appropriate actions based on the timer's state.

A simple hint for naming the steps is to insert a character or number before the step name, i.e. "A. Start." The next step would then be "A. Setup," for example. This routine is then saved as group of steps and the next routine can be built with a prefix of "B." When the merge is done, this simplified identifying which steps are grouped together in the total process.

A simple Weight Compare step would have a Weight Compare condition of Higher than a Target with the false action setting a digital output to ON, and the true action would turn the digital output OFF when the Compare is true.

*NOTE: Once a negative value is used for a Weight Compare, any new value set from a Set Compare will retain the negative sign.*

Within the Weight Compare steps we can add actions that are the same as the old setpoints used, such as Tare Scale, Clear Tare, Accumulate, Clear Accumulator, and Turn a Digital Output On or OFF.

Whenever a User Get action is used, it should be used with a User Entry condition as the next step. The User Get will prompt the user for a new value. At this time, an Activate should start a new step with the User Entry condition that will pause processing of this stream of steps until the operator presses either the ENTER key or a Cancel key. This ensures the process has the requested data before it continues.

Printing can be done by using a Print action and selecting one of 20 AuxFmts. These formats can be configured using Rev III to print anything required. The <USx> strings can be added to any or all formats and there are 99 of these to use. A Set User Print Text will fill these fields. They are strings but any type of data, (real, integer, string or DT) can be inserted and the 720i will convert it to a printable string.

Registers are a group of 256 variable registers used to hold a number that can be incremented or decremented as a counter. There is also a Clear Register (only 1) and a Clear Register All (all of them).

Math functions of Add, Subtract, Multiply and Divide are supplied and used as follows:

- There are two sources for the data to be worked with. *Immediate* is the value within the step to be used. *Database* is the field of the data to be used. This source is then added, subtracted, etc. from the user variables. The result is then left in the user variable so it can be either printed or written to the database. Also only *Integers* and *Real* variables can be used.

## Database Information

A Database consists of a group of fields that comprise a record; Record 1 = F1, F2, F3, F4, F5 etc.

Record 2 = F1, F2, F3, F4, F5 etc.

To ensure a simple search, try to make *Field 1* an integer to be used as an index number. This will allow you to search for an index and then get the other fields as you need them, or insert data to them after a successful search.

A *Sort* of the database by index will sort all records by the index and place them in order. This is not mandatory, but makes working with a database much easier.

The database index is the database number assigned from the Database Editor. DB 1 is **always** the embedded Truck Database for Weigh In / Weigh out functions. The next is DB 2 which is the first PCE database that can be used. Eight databases are allowed, but as the number increases the size of each is reduced. Slot is usually 0 as memory card expansion options are not allowed in the 720i.

There are two actions that are similar but need further definition. They are the DB Write and DB Capture. The DB Write will put a user variable into a field specified by the step. The DB Capture will put a captured value specified by the step into a database field. Captured data can be trip weight from a Weight Compare condition, Weight Compare preact value, motion status, timer state, DigIn or step state, current time and date, or a current register value.

Add Record, Delete Record, and Copy Record pertains to the complete record with all fields involved.

DB Write, DB Read, and DB Clear only affect the specified field of the current record.

A Set Compare or Get Compare is the method used to either retrieve the Compare value or set it to a new value. These values would be such as a Weight Compare (Trip) value. This is assigned to a condition number, not a step number. This is because a step could have multiple conditions of similar type so we need to aim at the exact condition.

From the *Tools* menu, there is a selection for Text View. There is also a keyboard shortcut of CTRL+T.

We can go look at the condition we want to Set or Get and then switch to *Text View* to see the exact condition number to assign. If you hover your mouse over any condition, it will show an ID number which is also the condition number.

An example of a Text View would be:

SP.CONDITION#5=WEIGHT,SCALE1,GROSS,0,HIGHER,OFF,0.

With this example, we would assign our Set Compare to condition 5. Also a Set or Get Compare can come from a user variable after a User Get or from the Database from a specified field.

# 10.0 Serial Commands

The 720*i* indicator can be controlled by a personal computer or remote keyboard connected to an indicator serial port. Control is provided by a set of serial commands that can simulate front panel key press functions, display and change setup parameters, and perform reporting functions. The serial commands provide the capability to print configuration data or to save that data to an attached personal computer. This section describes the serial command set and procedures for saving and transferring data using the serial ports.

## 10.1 The Serial Command Set

The serial 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 a serial 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.

### 10.1.1 Key Press Commands

Key press serial commands (see Table 10-1) simulate pressing the keys on the front panel of the indicator. These commands can be used in both setup and normal (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 serial 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 normal 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)

Table 10-1. Serial Key Press Commands

Command	Function
KSEC	Go to secondary units (pseudo key)
KTER	Go to tertiary units (pseudo key)
KPRINT	In normal mode, press the PRINT key
KDISPACCUM	Press the ACCUM key
KDISPTARE	Display tare (pseudo key)
KCLR	Press the CLEAR key
KCLRCN	Reset consecutive number (pseudo key)
KCLRTAR	Clear tare from system (pseudo key)
KLEFT	In setup mode, move left in the menu
KRIGHT	In setup mode, move right in the menu
KUP	In setup mode, move up in the menu; in normal mode, scroll up to previous configured scale.
KDOWN	In setup mode, move down in the menu; in normal mode, scroll down to the next configured scale.
KSAVE	In setup mode, saves the current configuration
KSAVEEXIT	In setup mode, saves the current configuration then exits to normal mode
KCLRNV	In setup mode, clears non-volatile RAM
K0-K9	Press number 0 (zero) through 9
KDOT	Press the decimal point (.)
KENTER	Press the ENTER key
KSOFTx	Press softkey number x
KLOCK	Lock specified front panel key. For example, to lock the ZERO key, enter KLOCK=KZERO.
KUNLOCK	Unlock specified front panel key. For example, to unlock the PRINT key, enter KUNLOCK=KPRINT.
KTREG	Display truck register
KWIN	Process truck weigh-in transaction Example: KWIN, K2, K3, KENTER to select ID #23)
KWOUT	Process truck weigh-out transaction
KDEL	While truck register is displayed, delete truck register
KDATE	Display date (pseudo key)
KTIME	Display time (pseudo key)
KTIMEDATE	Display time and date (pseudo key)

Table 10-1. Serial Key Press Commands (Continued)

### 10.1.2 Reporting Commands

Reporting commands send specific information to the serial port. The commands listed in Table 10-2 can be used in either setup mode and normal mode.

Command	Function
DUMPALL	List all parameter values
DUMPAUDIT	List audit trail information
SPDUMP	Print <i>PCEE</i> configuration
VERSION	Write <i>720i</i> software version
HARDWARE	Lists installed option cards. See Section 11.1.2 on page 88 for more information about using the HARDWARE command.
XE	Returns a 10-digit code representing any error conditions currently shown on the front panel. See Section 11.1.5 on page 89 for more information.

Table 10-2. Reporting Commands

### 10.1.3 Clear and Reset Commands

The following commands can be used to clear and reset the *720i*:

**RS:** Reset system. Resets the indicator without resetting the configuration.

**RESETCONFIGURATION:** Restores all configuration parameters to their default values (setup mode only). The RESETCONFIGURATION function can also be initiated by pressing the **Reset Config** softkey under the VERSION menu. Use the **up** key to select *Clear entire indicator configuration*, then press **ENTER** to reset the indicator.

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

### 10.1.4 Parameter Setting Commands

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

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 on Scale #1 to 5 divisions, type the following:

SC.MOTBAND#1=5<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.

**NOTE:** Some parameters are valid only if other parameters or parameter values are specified. See the configuration menus in Section 3.2 on page 20 for information about parameter dependencies. Restrictions for front-panel configuration also apply to serial command configuration.

Command	Description	Values
SC.GRADS#1	Graduations	1-9999999
SC.SPLIT#1	Multi-range or multi-interval scale type	OFF, 2RNG, 3RNG, 2INTVL, 3INTVL
SC.ZTRKBND#1	Zero track band	0, 0-100
SC.ZRANGE#1	Zero range	1.900000, 0-100
SC.MOTBAND#1	Motion band	1, 0-100
SC.SSTIME#1	Standstill time	1-65535
SC.OVRLOAD#1	Overload	FS+2%, FS+1D, FS+9D, FS
SC.WMTTHR#1	Weighment threshold	grads
SC.NUMWEIGH#1	Number of weighments	—
SC.MAX_WEIGHT#1	Maximum weight	—

Table 10-3. SCALES Serial Commands

Command	Description	Values
SC.DIGFLTR1#1	Digital filtering	1, 2, 4, 8, 16, 32, 64, 128, 256
SC.DIGFLTR2#1		
SC.DIGFLTR3#1		
SC.DFSENS#1	Digital filter cutout sensitivity	2OUT, 4OUT, 8OUT, 16OUT, 32OUT, 64OUT, 128OUT
SC.DFTHR#1	Digital filter cutout threshold	NONE, 2D, 5D, 10D, 20D, 50D, 100D, 200D, 250D
SC.RATLTRAP#1	Rattletrap filtering	OFF, ON
SC.SMPRAT#1	Sample rate	7.5HZ, 15HZ, 30HZ, 60HZ, 120HZ, 240HZ, 480HZ, 960HZ
SC.PWRUPMD#1	Power up mode	GO, DELAY
SC.TAREFN#1	Tare function	BOTH, NOTARE, PBTARE, KEYED
SC.PRI.DECPNT#1	Primary units decimal position	8.888888, 88.88888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800
SC.PRI.DSPDIV#1	Primary units display divisions	1D, 2D, 5D
SC.PRI.UNITS#1	Primary units	LB, KG, G, OZ, TN, T, GR, troyoz, troylb, LT, CUSTOM, NONE, OFF
SC.PRI.CUNITS#1	Primary custom units	Specify units if SC.PRI.UNITS=CUSTOM
SC.SEC.DECPNT#1	Secondary units decimal position	8.888888, 88.88888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800
SC.SEC.DSPDIV#1	Secondary units display divisions	1D, 2D, 5D
SC.SEC.UNITS#1	Secondary units	LB, KG, G, OZ, TN, T, GR, troyoz, troylb, LT, CUSTOM, NONE, OFF
SC.SEC.CUNITS#1	Secondary custom units	Specify units if SC.SEC.UNITS=CUSTOM
SC.SEC.MULT#1	Secondary units multiplier	0.00000–9999999
SC.TER.UNITS#1	Tertiary units	LB, KG, G, OZ, TN, T, GR, troyoz, troylb, LT, CUSTOM, NONE, OFF
SC.TER.CUNITS#1	Tertiary custom units	Specify units if SC.TER.UNITS=CUSTOM
SC.TER.DECPNT#1	Tertiary units decimal position	8.888888, 88.88888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800
SC.TER.DSPDIV#1	Tertiary units display divisions	1D, 2D, 5D
SC.TER.MULT#1	Tertiary units multiplier	0.000001–9999999
SC.ROC.DECPNT#1	Tertiary units decimal position	8.888888, 88.88888, 888.8888, 8888.888, 88888.88, 888888.8, 8888888, 8888880, 8888800
SC.ROC.DSPDIV#1	Rate-of-change units display divisions	1D, 2D, 5D
SC.ROC.MULT#1	Rate-of-change units multiplier	0.000001–9999999
SC.ROC.UNITS#1	Rate-of-change units	SEC, MIN, HOUR
SC.ROC.INTERVL#1	Rate-of-change interval	1–100
SC.ROC.REFRESH#1	Rate-of-change refresh interval	0.1–60
SC.RANGE1.MAX#1	Weight maximum for first range or interval	weight
SC.RANGE2.MAX#1	Weight maximum for second range or interval	weight
SC.RANGE3.MAX#1#1	Weight maximum for third range or interval	weight
SC.ACUM#1	Accumulator enable	ON, OFF
SC.VISIBLE#1	Scale visibility	ON, OFF

Table 10-3. SCALES Serial Commands (Continued)

Command	Description	Values
SC.PEAKHOLD#1	Peak hold	OFF, NORMAL, BI-DIR, AUTO
SC.WZERO#1	Zero calibration	—
SC.WVAL#1	Test weight value	<i>test_weight_value</i>
SC.WSPAN#1	Span calibration	—
SC.WLIN.F1#1–SC.WLIN.F5#1	Actual raw count value for linearization points 1–5	0–16777215
SC.WLIN.V1#1–SC.WLIN.V5#1	Test weight value for linearization points 1–5	0.000001–9999999
SC.WLIN.C1#1–SC.WLIN.C5#1	Calibrate linearization points 1–5	—
SC.LC.CD#1	Deadload coefficient	—
SC.LC.CW#1	Span coefficient	—
SC.LC.CZ#1	Temporary zero	—
SC.REZERO#1	Rezero	—

Table 10-3. SCALES Serial Commands (Continued)

Command	Description	Values
EDP.PORT	Active serial port	Returns number of port being used for serial command input
EDP.INPUT#p	Port serial input function	CMD, KEYBD, SCALE, IND SC
EDP.BAUD#p	Port baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600, 115200
EDP.BITS#p	Port data bits/parity	8NONE, 7EVEN, 7ODD, 8ODD, 8EVEN
EDP.TERMIN#p	Port termination character	CR/LF, CR
EDP.STOPBITS#p	Port stop bits	2, 1
EDP.ECHO#p	Port echo	ON, OFF
EDP.RESPONSE#p	Port response	ON, OFF
EDP.EOLDLY#p	Port end-of-line delay	0–255 (.01-second intervals)
EDP.HANDSHK#p	Port handshaking	OFF, XONXOFF, HRDWAR
EDP.PORTTYPE#p	Port type	232, 485 (Port 7 only)
EDP.DUPLEX#p	Port RS-485 duplex	HALF, FULL
EDP.ADDRESS#p	Port RS-485 address	0, 1–255
EDP.STREAM#p	Port streaming	OFF, LFT, INDUST, 4KEYS, KEYPAD
EDP.SOURCE#p	Port source scale for output	<i>scale_number</i>
EDP.SFMT#p	Port custom stream format	0-50 characters

Table 10-4. SERIAL Port Serial Commands

Command	Description	Values
STR.POS#p	Custom stream identifiers	Specify replacement text for token
STR.NEG#p		Example: STR.PRI#1=L
STR.PRI#p		
STR.SEC#p		
STR.TER#p		
STR.GROSS#p		
STR.NET#p		
STR.TARE#p		
STR.MOTION#p		
STR.RANGE#p		
STR.OK#p		
STR.INVALID#p		
For commands including "#p", p is the serial port number.		

Table 10-4. SERIAL Port Serial Commands (Continued)

Command	Description	Values
SD	Set date	MMDDYY, DDMMYY, YYMMDD, or YYDDMM. Enter six-digit date using the year-month-day order specified for the DATEFMT parameter, using only the last two digits of the year.
ST	Set time	hhmm (enter using 24-hour format)
DATEFMT	Date format	MMDDYYYY, DDMMYYYY, YYYYMMDD, YYYYDDMM
DATESEP	Date separator	SLASH, DASH, SEMI
TIMEFMT	Time format	12HOUR, 24HOUR
TIMESEP	Time separator	COLON, COMMA
DECFmt	Decimal format	DOT, COMMA
CONSNUM	Consecutive numbering	0-9999999
CONSTUP	Consecutive number start-up value	0-9999999
TRUCK	Truck in/out mode	OFF, MODE1, MODE2, MODE3, MODE4, MODE5, MODE6
ALIBI	Alibi data storage enable	OFF, ON
ALIBI.ERASE.ALL	To clear all entries	
CFGPWD	Configuration password	0, 1-9999999
SK#1-SK#10	Softkey assignment	Blank, TimeDate, DspTar, DspAcc, DspROC, WeighIn, WeighOut, TrkReg, Alibi, Setpoint*, Batch Start*, Batch Stop*, Batch Pause*, Batch Reset*
SKT#1-SKT#10	User-defined softkey text	—
KYBDLK	Keyboard lock (disable keypad)	OFF, ON
ZERONLY	Disable all keys except ZERO	OFF, ON
REGULAT	Regulatory compliance	NONE, OIML, NTEP, CANADA, INDUST
REG.SNPAPSHOT	Display or Scale weight source	DISPLAY, SCALE
REG.HTARE	Allow tare in display hold	NO, YES
REG.ZTARE	Remove tare on ZERO	NO, YES
* 720i Batch Version Software only		

Table 10-5. FEATURE Serial Commands

Command	Description	Values
REG.KTARE	Always allow keyed tare	NO, YES
REG.MTARE	Multiple tare action	REPLACE, REMOVE, NOTHING
REG.NTARE	Allow negative tare	NO, YES
REG.CTARE	Allow clear keyed tare	NO, YES
REG.PRTMOT	Allow print while in motion	NO, YES
REG.PRINTPT	Add PT to keyed tare print	NO, YES
REG.PRTHLD	Print during display hold	NO, YES
REG.HLDWGH	Allow weighment during display hold	NO, YES
REG.MOTWGH	Allow weighment in motion	NO, YES
REG.OVRBASE	Zero base for overload calculation	CALIB ZERO, SCALE ZERO
REGWORD	Regulatory word	GROSS, BRUTTO
HEARTBEAT	Display module heartbeat	0, 1–8 (0.5-second intervals; 4 = 2.0 seconds)
CONTACT.COMPANY	Contact company name	<i>company_name</i> (up to 30 characters)
CONTACT.ADDR1 CONTACT.ADDR2	Contact company address	<i>company_address</i> (up to 30 characters for each line)
CONTACT.NAME1 CONTACT.NAME2	Contact names	<i>contact_names</i> (up to 20 characters each)
CONTACT.PHONE1 CONTACT.PHONE2	Contact phone numbers	<i>contact_phone_numbers</i> (up to 20 characters each)
CONTACT.EMAIL	Contact e-mail address	<i>contact_e-mail_address</i> (up to 30 characters)
CONTACT.NEXTCAL	Next calibration date	<i>calibration_date</i>
GRAVADJ	Gravitational adjustment	OFF, ON
LAT.LOC	Latitude	0–90 (to nearest degree of latitude)
ELEV.LOC	Elevation	±0–9999 (in meters)

Table 10-5. FEATURE Serial Commands (Continued)

Command	Description	Values
GFMT.FMT GFMT.PORT	Gross demand print format string	For .PORT commands, specify the port number as PORTxx (no leading zero). For example: GFMT.PORT=PORT2.
NFMT.FMT NFMT.PORT	Net demand print format string	For AUXFMT.FMT commands, specify the auxiliary format number (1 – 20) as AUXFMTxx (no leading zero). For example: AUX8FMT=GROSS<G><NL2>...
ACC.FMT ACC.PORT	Accumulator print format string	
TRWIN.FMT TRWIN.PORT	Truck weigh-in print format string	See Section 6.0 on page 50 for information about demand print format strings.
TRWOUT.FMT TRWOUT.PORT	Truck weigh-out print format string	
TR.FMT TR.PORT	Truck register print format string	
ALERT.FMT ALERT.PORT	Alert format string	
HDRFMT1 HDRFMT2	Ticket header format strings	
AUXFMTxx.FMT AUXFMTxx.PORT	Auxiliary ticket format	

Table 10-6. PFORMAT Serial Commands

Command	Description	Values
DON.b#s	Set digital output on (active) at bit b, slot s.	—
DOFF.b#s	Set digital output off (inactive) at bit b, slot s.	—
DIO.b#s	Digital input function	OFF, INPUT, OUTPUT, PROGIN, ZERO, NT/GRS, TARE, UNITS, PRINT, ACCUM, SETPNT, TIMDATE, ESC, CLEAR, DSPTAR, KEY0–KEY9, KEYDP, ENTER, NAVUP, NAVDN, NAVLFT, NAVRGT, KBDLOC, HOLD, BATRUN*, BATSTRT*, BATPAUS*, BATRESET*, BATSTOP*, CLRCN, GROSS, NET, PRIM, SEC, CLRTAR, CLRACC,
* 720i Batch Version Software only		

Table 10-7. DIG I/O Serial Commands

Command	Description	Values
ALG.ALIAS#n	Analog output alias	name
ALG.SOURCE#n	Analog output source	SCALEn
ALG.MODE#n	Mode	GROSS, NET
ALG.OFFSET#n	Zero offset	0%, 20%
ALG.ERRACT#n	Error action	FULLSC, HOLD, ZEROSC
ALG.MIN#n	Minimum value tracked	0–9999999
ALG.MINNEG#n	Minimum negative value tracked	OFF, 0–9999999
ALG.MAX#n	Maximum value tracked	0–9999999
ALG.MAXNEG#n	Maximum negative value tracked	OFF, 0–9999999

Table 10-8. ALGOOUT Serial Commands (Valid Only If Analog Output Card Is Installed)

Command	Description	Values
ALG.ZERO#n	Zero calibration	0-65535
ALG.SPAN#n	Span calibration	0-65535
#n indicates the slot number assigned to the analog output. Single-channel cards and channel 1 of dual-channel cards are assigned ALGOUT2; channel 2 of the dual-channel card is assigned ALGOUT4.		

*Table 10-8. ALGOUT Serial Commands (Valid Only If Analog Output Card Is Installed)*

Command	Description	Values
SP.KIND#n	Setpoint kind	OFF, GROSS, NET, -GROSS, -NET, ACCUM, ROC, +REL, -REL, %REL, RESREL, PAUSE, DELAY, WAITSS, COUNTER, AUTOJOG, COZ, INMOTON, INRANGE, BATCHPR, TIMER, CONCUR, DIGIN, AVG, TOD, DELTA, CHWEI, PLSCNT, PLSRAT, ALWAYS, NEVER, DINCNT
SP.VALUE#n	Setpoint value	number
SP.SOURCE#n	Source scale	SCALE1
SP.COAST#n	Pulse counter coast	number
SP.TRIP#n	Trip	HIGHER, LOWER, INBAND, OUTBAND
SP.BANDVAL#n	Band value	number
SP.HYSTER#n	Hysteresis	number
SP.PREACT#n	Preact type	OFF, ON, LEARN, FLOW
SP.PREVAL#n	Preact value	number
SP.PREADJ#n	Preact adjustment percentage	number
SP.PRESTAB#n	Preact learn stability	number
SP.PCOUNT#n	Preact learn interval	number
SP.TOLBAND#n	Target tolerance	number
SP.TOLCNT#n	Tolerance count	number
SP.BATCH#n	Batch step enable	OFF, ON
SP.CLRACCM#n	Clear accumulator enable	OFF, ON
SP.CLRTARE#n	Clear tare enable	OFF, ON
SP.PSHACCM#n	Push accumulate	OFF, ON, ONQUIET
SP.PSHPRINT#n	Push print	OFF, ON, WAITSS
SP.PSHTARE#n	Push tare	OFF, ON
SP.ALARM#n	Alarm enable	OFF, ON
SP.NAME#n	Setpoint name number	NONE, 1-30
SP.ACCESS#n	Setpoint access	OFF, ON, HIDE
SP.DSLOT#n	Digital output slot	NONE, SLOTx
SP.DIGOUT#n	Digital output	BITx
SP.SENSE#n	Digital output sense	NORMAL, INVERT
SP.BRANCH#n	Branch destination	0, 1-32
SP.RELNUM#n	Relative setpoint number	1-32
SP.START#n	Starting setpoint	1-32
SP.END#n	Ending setpoint	1-32
SP.DISLOT#n	Digital input slot	NONE, SLOTx
SP.MASK#n	Digital input mask	number

Command	Description	Values
SP.NSAMPLE#n	Number of samples	number
SP.TIME#n	Trip time	hhmm
SP.DURATION#n	Trip duration	hhmmss
SP.VUNDER#n	Underrange value	number
SP.VOVER#n	Overrange value	number
SP.DUNDER#n	Underrange digital output	BITx
SP.DACCEPT#n	Accept digital output	BITx
SP.DOVER#n	Overrange digital output	BITx
BATCHNG	Batching mode	OFF, AUTO, MANUAL
SP.ENABLE#n	Setpoint enable	ON, OFF
For setpoint commands ending with “#n”, n is the setpoint number.		

Table 10-9. Setpoint Serial Commands

### 10.1.5 Normal Mode Commands

The normal mode print commands (see Table 10-10) transmit data to the serial port on demand in either setup or normal mode.

Command	Description	Values
CONSNUM	Set consecutive number	0-9 999 999
UID	Set unit ID	nnnnnnn
SD	Set date	MMDDYY, DDMMYY, YYMMDD, or YYDDMM. Enter six-digit date using the year-month-day order specified for the DATEFMT parameter, using only the last two digits of the year.
ST	Set time	hhmm (enter using 24-hour format)
CONTRAST	Set display contrast	0-127
SX#p	Start serial port streaming	OK or ??
EX#p	Stop serial port streaming	The port streaming parameter (EDPSTREAM#p) for the streaming port must be set to LFT or INDUST before using these commands. An EX command sent while in setup mode does not take effect until the indicator is returned to normal mode.
RS	Reset system	Soft reset. Used to reset the indicator without resetting the configuration to the factory defaults.
XA#1	Transmit accumulator value in displayed units	nnnnnn UU
XAP#1	Transmit accumulator value in primary units	
XAS#1	Transmit accumulator value in secondary units	
XAT#1	Transmit accumulator value in tertiary units	
XG#1	Transmit gross weight in displayed units	nnnnnn UU
XGP#1	Transmit gross weight in primary units	
XGS#1	Transmit gross weight in secondary units	
XGT#1	Transmit gross weight in tertiary units	

Table 10-10. Normal Mode Serial Commands

Command	Description	Values
XN#1	Transmit net weight in displayed units	<i>nnnnnn UU</i>
XNP#1	Transmit net weight in primary units	
XNS#1	Transmit net weight in secondary units	
XNT#1	Transmit net weight in tertiary units	
XT#1	Transmit tare weight in displayed units	<i>nnnnnn UU</i>
XTP#1	Transmit tare weight in primary units	
XTS#1	Transmit tare weight in secondary units	
XTT#1	Transmit tare weight in tertiary units	
XE	Query system error conditions	<i>nnnnn</i> See Section 11.1.5 on page 89 for detailed information about the XE command response format.

Table 10-10. Normal Mode Serial Commands

### 10.1.6 Batching Control Commands

The commands listed in Table 10-11 provide batching control through the serial port

**NOTE:** *The following batch control commands only apply to the 720i Batch Version Software only.*

Command	Description	Values
BATSTART	Batch start	If the BATRUN digital input is active (low) or not assigned, the BATSTART command can be used to start the batch program.
BATSTOP	Batch stop	Stops the batch program and turns off all associated digital outputs.
BATPAUSE	Batch pause	Stops the batch program at the current step. All digital outputs set on by the current step (except for those set by concur setpoints) are set off. The BATSTRT DIGIN, BATSTART serial command, or the <b>Batch Start</b> softkey.
BATRESET	Batch reset	Stops the program and resets the batch program to the first batch step. Run the BATRESET command after making changes to the batch configuration.
BATSTATUS	Batch status	<ul style="list-style-type: none"> <li>• S000 Stopped at SP0</li> <li>• R003 Running at SP3</li> <li>• P004 Paused at SP4</li> </ul>

Table 10-11. Batching Control Commands

# 11.0 Appendix

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## 11.1 Troubleshooting

Table 11-1 lists general troubleshooting tips for various hardware and software error conditions. See the following pages for additional information about specific diagnostic tools.

Symptom	Cause/Remedy
Indicator does not power up	Possible blown fuse or bad power supply. Check all voltages on CPU board. Power supply should output both +6V and -6V levels to the CPU board (see Figure 2-3 on page 9). If power supply appears bad, check the small glass fuse (2.5A, 5x20mm) on the power supply board.
Front panel power indicator blinking (i)	Power supply overloaded. Check for shorts in A/D card regulators or in the DC-to-DC converter of any installed analog output or pulse input cards.
<i>Tare and truck data pointers are corrupt, Tare storage is corrupt</i> error messages at startup	Possible dead battery. Perform configuration reset then check for low battery warning on display. If battery is low, replace battery, perform another configuration reset, then reload files.
ERROR message in weight display	Excitation voltage too low or off.
Dashes in weight display	Overrange or underrange scale condition. Check scale. For out-of-range conditions in total scale display, check all scale inputs for positive weight values.
Display reads 0.000000	Scale not updating. Check for bad option card hanging the bus.
Serial port not responding	Possible configuration error. For command input, ensure port INPUT parameter is set to CMD.
A/D scale out of range	Check source scale for proper mechanical operation. Check load cell and cable connection. Possible bad load cell: check indicator operation with load cell simulator.
Serial scale out of range	Check source scale for proper mechanical operation. Check cable connection. Possible format mismatch between serial scale and 720i: Check SFMT specification under SERIAL menu.
Option x Error	Field bus card (Profibus, DeviceNet, or Remote I/O) in slot x failed to initialize.
Option card failure	Possible defective card or slot.
Option card hardware diagnostic error	Required option card not found. See Section 11.1.1 on page 88.

Table 11-1. Basic Troubleshooting

**NOTE:** Always save copies of the indicator configuration, calibration, *Revolution III* files on a local PC so that these are available when a software reload or upgrade is required.

### 11.1.1 Option Card Diagnostic Errors

Option cards are detected by the 720i at power-up. If the current indicator configuration requires an option card but that card is not detected at power-up, an error similar to the following is displayed:

```
HARDWARE CRITICAL TO PROPER OPERATION
WITH CURRENT CONFIGURATION
CANNOT BE FOUND
```

A second screen is then shown.

```
SERIAL PORT 7 SLOT 2 CHANNEL 2
```

Then finally a third screen:

```
INSTALL HARDWARE OR RECONFIGURE
```

To recover from this error you can do the following:

- If the option is required, ensure that the card is properly seated in its slot and cycle the power. If the card is still not recognized, replace the card.
- Enter setup mode and reconfigure to eliminate the requirement for the option.
- Go to the VERSION menu and use the **Reset Config** softkey (or RESETCONFIGURATION command) to perform a configuration reset. Configuration reset returns all configuration values to their factory defaults.

See Section 11.1.2 below, for information about using the HARDWARE serial command to verify that installed cards are recognized.

### 11.1.2 Using the HARDWARE Command

The HARDWARE serial command can be issued to verify that all installed cards are recognized by the system. The HARDWARE command returns a string of card type codes. The first digit represents the single-channel A/D of the 720i; the second digit represents the card, if any, installed in the expansion slot:

```
HARDWARE=3,4
```

Table 11-2 lists the card codes returned by the HARDWARE command.

Code	Card Type
0	No card installed
1	Dual-Channel Serial Expansion Card
3	Single-Channel A/D
4	Analog Output Card
5	24-Channel Digital I/O Expansion Card
9	DeviceNet Card
10	Profibus Card
11	EtherNet/IP Card
12	Remote I/O Card
14	Custom Card

Table 11-2. HARDWARE Command Option Card Codes

Code	Card Type
16	ControlNet Card

**NOTE:** Code 11 is returned only by the EtherNet/IP card. The standard 10M/100Mbps Ethernet card does not return a card type code. The standard Ethernet card returns a value of 0 on the HARDWARE command.

Table 11-2. HARDWARE Command Option Card Codes

If an installed card is not recognized (HARDWARE command returns a code of 0 for that slot), ensure that the card is seated properly. Reinstall the card, if necessary, then cycle the indicator power to read the configuration again.

### 11.1.3 Diagnostic Boot Procedure

If a persistent error occurs that cannot be cleared with the RESETCONFIGURATION command, perform the following diagnostic boot procedure.

1. Disconnect power to the 720i.
2. Connect the serial port of a PC with *Revolution III* installed to port 2 of the 720i.
3. Open the indicator enclosure and place a jumper across the boot mode pins (see Figure 2-3 on page 9).
4. Power up the 720i. The indicator will stall at the diagnostic monitor.
5. Start *Revolution III* and enter monitor mode, then type **BOOT**.
6. Place jumper J9 across both pins to enable setup mode.
7. Press **MENU**, then select *Configuration* to enter setup mode.
8. Remove the jumper from SW1.
9. From monitor mode, enter the **RESETCONFIGURATION** command.

### 11.1.4 Onboard Diagnostic LEDs

The 720i CPU board provides a number of LEDs that may be useful for monitoring or diagnosing communications or other functions. These LEDs are listed in Table 11-3.

LED	Function
HB1	CPU heartbeat. Off in boot monitor mode; blinks when processor is running
LED 1	Port 2 communications
LED 2	Port 3 (DDM)
LED 3	Port 1(PS/2 keyboard)
LED 4	Port 4 communications
IO1-IO8	Monitor active digital I/O

Table 11-3. CPU Board LEDs

### 11.1.5 Using the XE Serial Command

The XE serial command can be used to remotely query the 720i for the error conditions shown on the front panel. The XE command returns a decimal number representing any existing error conditions. For multi-scale applications, the value returned by the XE command represents all error conditions, if any, present on all configured scales.

If more than one error condition exists, the number returned is the sum of the values representing the error conditions (see Table 11-4 on page 89). For example, if both a tare error (TAREERR, 65536) and a truck database checksum error (ETRUCKERR, 8192) have occurred, the XE command returns the value 73728, representing the sum of those two error conditions.

Error Code	Value	Description
VIRGERR	1	Virgin error
PARMCHKERR	2	Configuration checksum error
LOADCHKERR	4	Calibration checksum error
PRINTCHKERR	8	Print format checksum error
ENVRAMERR	16	General NVRAM error
ENVCRC1ERR	32	Setpoint NVRAM data error
ENVCRC2ERR	64	
ENVCRC3ERR	128	
ENVCRC4ERR	256	
ENVCRC5ERR	512	
ENVCRC6ERR	1024	
ENVCRC7ERR	2056	
ENVCRC8ERR	4096	
ETRUCKERR	8192	Truck database checksum error
GRAVERR	16384	Gravity calibration error
ADPHYSICALERR	32768	A/D physical error
TAREERR	65536	Tare checksum error
STRINGERR	262144	String program error
POWER_FAIL	524288	Power failure
RTCERR	1048576	Real time clock error

Table 11-4. Error Codes Returned on XE Command

## 11.2 Regulatory Mode Functions

The function of the front panel **TARE** and **ZERO** keys depends on the value specified for the REGULAT parameter on the FEATURE menu. Table 11-5 describes the function of these keys for the NTEP, CANADA, OIML, and NONE regulatory modes. **TARE** and **ZERO** key functions are configurable when the REGULAT mode is set to INDUST (see Table 11-6 on page 90).

REGULAT 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	ZERO and CLEAR TARE
	positive	no	TARE	ZERO
		yes	TARE	ZERO and CLEAR TARE if weight is within ZRANGE. <i>No action</i> if weight is outside of ZRANGE
NONE	zero or negative	no	TARE	ZERO
		yes	CLEAR TARE	
	positive	no	TARE	
		yes	CLEAR TARE	

Table 11-5. TARE and ZERO Key Functions for REGULAT Parameter Settings

Table 11-6 lists the subparameters available when configuring a scale using INDUST mode. The table includes the default values of the INDUST subparameters and the effective (not configurable) values used by the NTEP, CANADA, OIML, and NONE regulatory modes.

REGULAT / INDUST Parameter		REGULAT Mode				
Parameter Name	Text Prompt	INDUST	NTEP	CANADA	OIML	NONE
SNAPSHOT	Display or Scale weight source	DISPLAY	DISPLAY	DISPLAY	DISPLAY	SCALE
HTARE	Allow tare in display hold	NO	NO	NO	NO	YES
ZTARE	Remove tare on ZERO	NO	NO	NO	YES	NO
KTARE	Always allow keyed tare	YES	YES	NO	YES	YES
MTARE	Multiple tare action	REPLACE	REPLACE	NOTHING	REPLACE	REMOVE
NTARE	Allow negative tare	NO	NO	NO	NO	YES
CTARE	Allow CLEAR key to clear tare/accumulator	YES	YES	NO	NO	YES
PRTMOT	Allow print while in motion	NO	NO	NO	NO	YES
PRTPT	Add PT to keyed tare print	NO	NO	YES	YES	NO

Table 11-6. REGULAT / INDUST Mode Parameters, Comparison with Effective Values of Other Modes

REGULAT / INDUST Parameter		REGULAT Mode				
Parameter Name	Text Prompt	INDUST	NTEP	CANADA	OIML	NONE
PRTHLD	Print during display hold	NO	NO	NO	NO	YES
HLDWGH	Allow weigh during display hold	NO	NO	NO	NO	YES
MOTWGH	Allow weighment in motion	NO	NO	NO	NO	NO
OVRBASE	Zero base for overload calculation	CALIB ZERO	CALIB ZERO	CALIB ZERO	SCALE ZERO	CALIB ZERO

Table 11-6. REGULAT / INDUST Mode Parameters, Comparison with Effective Values of Other Modes (Continued)

## 11.3 Serial Scale Interface

Serial port 4 or the expansion port can be configured for serial scale input. The serial scale function allows other scale indicators to send gross, net, or tare weight data to the 720*i*. Once a serial port has been configured to accept scale data, the data format can be customized to match the data stream sent by that indicator.

To configure a serial scale, do the following:

1. Under the SERIAL menu, set the INPUT parameter for the selected port to SCALE (legal-for-trade serial scale) or IND SC (industrial serial scale).
2. Return to the SCALES menu. Under CONFIG, drop down and use the right or left navigation key to select the serial port (PORT 4 or PORT 7).
3. Use *Revolution III* to edit the SFMT parameter to match the format sent by the serial scale.

The default serial scale format is:

<2><P><W7.><U><M><S><CR><LF>

where:

<2>	STX character
<P>	Polarity
<W7.>	Seven characters of net data with decimal point
<M>	Mode
<U>	Units
<S>	Status
<CR>	Carriage return
<LF>	Line feed

**NOTE:** Industrial serial scales (INDUST) do not require the <M>, <U>, and <S> identifiers. However, the units and number of decimal places must be specified. Units can be selected from the FORMAT menu; decimal places should be indicated on the w-spec identifier. For example, a seven-digit weight requiring two decimal places should be specified as <W7.2> rather than <W7.>.

See Section 11.5 for more information about stream formatting and format identifiers.

## 11.4 Local/Remote Operation

For truck scale and similar applications, local/remote support provides function equivalent to that of a legal-for-trade remote display with keypad. Scale data from the local indicator is also displayed at the remote unit, and keypad input from the remote allows transactions to be initiated from either the local or remote unit.

To configure for local/remote operation, first set up the local unit (including truck mode and database information, as required) as an A/D scale. Once the local unit scale has been configured, use the SERIAL menu, serial commands or *Revolution III* to set the serial parameters for local/remote operation as shown in Table 11-7.

Serial Configuration Parameter	Local Unit		Remote Unit	
	Parameter Value	Function	Parameter Value	Function
EDP.INPUT#p	CMD	Enables receipt of commands from the remote unit keypad	SCALE	Configures the remote unit as a serial scale receiving weight data from the local unit
EDP.STREAM#p	LFT	Streams local unit weight data to the remote unit	KEYPAD	Streams commands from the remote unit keypad back to the local unit
EDP.BAUD#p	115200 preferred; local and remote values must match			
EDP.ECHO#p	OFF	—	OFF	—
EDP.RESPONSE#p	ON	—	ON	—
In the listed serial commands, p represents the serial port number. For units without a serial expansion card, Port 4 is recommended for local/remote configuration.				

Table 11-7. Local/Remote Configuration Parameters

**Remote unit only:** Once the serial parameters are set for the remote unit, return to the SCALES menu to finish configuring the remote unit as a serial scale. Under CONFIG, drop down and use the **right** or **left** navigation key to select the serial port (PORT 4 or PORT 7) used to receive weight data from the local unit. (See also Section 3.1.3 on page 19.)

---

## 11.5 Custom Stream Formatting

Each port can be independently configured to stream a default frame format or can be customized to stream a user-defined format. Custom formatting is very similar to the standard print formatting described in Section 6.0 on page 50.

Table 11-8 on page 92 lists the format identifiers used to configure a custom stream format.

Format Identifier	Defined By	Description
<P[G   N   T]>	STR.POS#1 STR.NEG#1	Polarity. Specifies positive or negative polarity for the current or specified (Gross/Net/Tare) weight on the source scale. Possible values are SPACE, NONE, + (for STR.POS#1), or – (for STR.NEG#1)
<U[P   S   T]>	STR.PRI#1 STR.SEC#1 STR.TER#1	Units. Specifies primary, secondary, or tertiary units for the current or specified weight on the source scale.
<M[G   N   T]>	STR.GROSS#1 STR.NET#1 STR.TARE#1	Mode. Specifies gross, net, or tare weight for the current or specified weight on the source scale.

Table 11-8. Custom Stream Format Identifiers

Format Identifier	Defined By	Description
<S>	STR.MOTION#1 STR.RANGE#1 STR.OK#1 STR.INVALID#1	Status for the source scale. Default values and meanings for each status: STR.MOTION#1 M In motion STR.RANGE#1 O Out of range STR.OK#1 <space> OK STR.ZERO#1 Z COZ
<B [-]n,...>	See descriptions below	Bit fields. Comma-separated sequence of bit field specifiers. Must be exactly 8 bits. Minus sign ([-]) inverts the bit.
B0	—	Always 0
B1	—	Always 1
B2	Configuration	=1 if even parity
B3	Dynamic	=1 if MODE=NET
B4	Dynamic	=1 if COZ
B5	Dynamic	=1 if standstill
B6	Dynamic	=1 if gross negative
B7	Dynamic	=1 if out of range
B8	Dynamic	=1 if secondary/tertiary
B9	Dynamic	=1 if tare in system
B10	Dynamic	=1 if tare is keyed
B11	Dynamic	=00 if MODE=GROSS =01 if MODE=NET =10 if MODE=TARE =11 (not used)
B12	Dynamic	=00 if UNITS=PRIMARY =01 if UNITS=SECONDARY =10 if UNITS=TERTIARY =11 (not used)
B13	Configuration	=00 (not used) =01 if current DSPDIV=1 =10 if current DSPDIV=2 =11 if current DSPDIV=5
B14	Configuration	=00 (not used) =01 if primary DSPDIV=1 =10 if primary DSPDIV=2 =11 if primary DSPDIV=5
B15	Configuration	=00 (not used) =01 if secondary DSPDIV=1 =10 if secondary DSPDIV=2 =11 if secondary DSPDIV=5
B16	Configuration	=00 (not used) =01 if tertiary DSPDIV=1 =10 if tertiary DSPDIV=2 =11 if tertiary DSPDIV=5

Table 11-8. Custom Stream Format Identifiers

Format Identifier	Defined By	Description
B17	Configuration	=000 if current DECPNT=8888800 =001 if current DECPNT=8888880 =010 if current DECPNT=8888888 =011 if current DECPNT=888888.8 =100 if current DECPNT=88888.88 =101 if current DECPNT=8888.888 =110 if current DECPNT=888.8888 =111 if current DECPNT=88.88888
B18	Configuration	=000 if primary DECPNT=8888800 =001 if primary DECPNT=8888880 =010 if primary DECPNT=8888888 =011 if primary DECPNT=888888.8 =100 if primary DECPNT=88888.88 =101 if primary DECPNT=8888.888 =110 if primary DECPNT=888.8888 =111 if primary DECPNT=88.88888
B19	Configuration	=000 if secondary DECPNT=8888800 =001 if secondary DECPNT=8888880 =010 if secondary DECPNT=8888888 =011 if secondary DECPNT=888888.8 =100 if secondary DECPNT=88888.88 =101 if secondary DECPNT=8888.888 =110 if secondary DECPNT=888.8888 =111 if secondary DECPNT=88.88888
B20	Configuration	=000 if tertiary DECPNT=8888800 =001 if tertiary DECPNT=8888880 =010 if tertiary DECPNT=8888888 =011 if tertiary DECPNT=888888.8 =100 if tertiary DECPNT=88888.88 =101 if tertiary DECPNT=8888.888 =110 if tertiary DECPNT=888.8888 =111 if tertiary DECPNT=88.88888
<wspec [-] [0] digit[.][digit]>	Scale weight	Weight for the source scale. wspec is defined as follows: wspec Indicates whether the weight is the current displayed weight (W, w), gross (G, g), net (N, n), or tare (T, t) weight. Upper-case letters specify right-justified weights; lower-case are left-justified. Optional /P, /S, or /T suffixes can be added before the ending delimiter (>) to specify weight display in primary (/P), secondary (/S), or tertiary (/T) units. [-] Enter a minus sign (-) to include sign for negative values. [0] Enter a zero (0) to display leading zeroes. digit[.][.]digit The first digit indicates the field width in characters. Decimal point only indicates floating decimal; decimal point with following digit indicates fixed decimal with <i>n</i> digits to the right of the decimal. Two consecutive decimals send the decimal point even if it falls at the end of the transmitted weight field.
<CR>	—	Carriage return
<LF>	—	Line feed

Table 11-8. Custom Stream Format Identifiers

## 11.6 Data Formats

### Continuous Output Serial Data Format

If continuous transmission is configured for a serial port (STREAM parameter set to LFT or INDUST on the SERIAL menu), the 720i sends data using the Consolidated Controls serial data format shown in Figure 11-1:

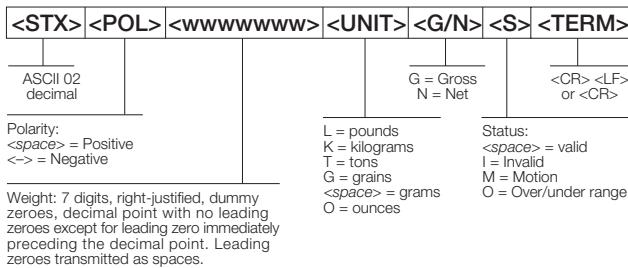


Figure 11-1. Continuous Output Serial Data Format

### Demand Output Serial Data Format

When demand mode is configured for the serial port (STREAM parameter set to OFF), the 720i uses a data string formatted for a basic ticket printout. The particular ticket format printed depends on the indicator configuration.

You can customize the ticket to work with a wide variety of printers, scoreboard displays, and other remote equipment. See Section 6.0 on page 50 for more information on custom print formats.

### RS-485 Data Formats

Four-wire RS-485 communications is supported on the “A” ports of any installed serial expansion card.

The RS-485 software protocol 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 11-2:

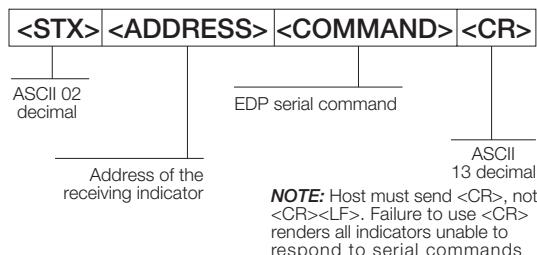


Figure 11-2. RS-485 Send Data Format

If the initiating device address matches the port address of an 720i 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 11-3:

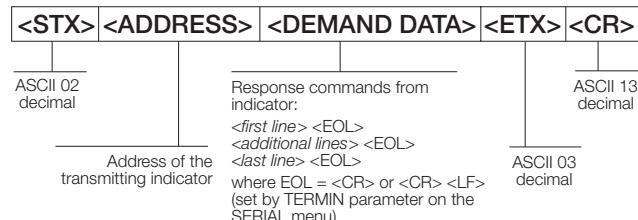


Figure 11-3. RS-485 Respond Data Format

**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 11-2:

- The keyboard equivalent for the start-of-text (STX) character is CONTROL-B.
- 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 11-3:

```
<STX> A  SCALE #1  <EOL>
          GROSS 1699 LB<EOL>
          01/14/2008 10:05 AM<EOL>
<ETX> <CR>
```

## 11.7 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.

### DIGFLT<sub>x</sub> Parameters

The first three digital filtering parameters, DIGFLT1, DIGFLT2, and DIGFLT3, 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.

A rolling average is passed to successive filters for an overall filtering effect that is effectively a weighted average of the product of the values assigned to the filter stages ( $DIGFLT1 \times DIGFLT2 \times DIGFLT3$ ) within a time frame corresponding to the sum of the values ( $DIGFLT1 + DIGFLT2 + DIGFLT3$ ).

Setting the filters to 1 effectively disables digital filtering.

### 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.

### DFSENS and DFTHR<sub>H</sub> 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<sub>H</sub> (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<sub>H</sub>) before digital filtering is suspended.
- DFTHR<sub>H</sub> 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<sub>H</sub> to NONE to turn off the filter override.

### 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–DIGFLT3) to 1. Set DFTHR<sub>H</sub> 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<sub>H</sub> parameter value in Step 4. For example, if a heavy-capacity scale (10000 x 5 lb) produces vibration-related readings of up to 50 lb, with occasional spikes to 75 lb, record 50 lb as the threshold weight value.
3. Place the indicator in setup mode and set the DIGFLT<sub>x</sub> parameters to eliminate the vibration effects on the scale. (Leave DFTHR<sub>H</sub> set to NONE.) Find the lowest effective value for the DIGFLT<sub>x</sub> parameters.
4. Calculate the DFTHR<sub>H</sub> parameter value by converting the weight value recorded in Step 2 to display divisions:

$$\text{threshold\_weight\_value} / \text{display\_divisions}$$

In the example in Step 2, with a threshold weight value of 50 lb and a display divisions value of 5 lb:  $50 / 5 = 10$ . DFTHR<sub>H</sub> should be set to 10D 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.

## 11.8 Conversion Factors for Secondary Units

The 720i 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 and tertiary units can be specified on the FORMAT menu using the SECNDR and TERTIA parameters, or by using serial commands.

- To configure secondary or tertiary units using the front panel menus, use the Table 11-9 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.
- To configure secondary or tertiary units using serial commands, use the Table 11-9 to find the conversion multiplier for the SC.SEC.MULT or SC.TER.MULT command. For example, if the primary unit is pounds and the secondary unit is short tons, send the serial command SC.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 displays 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/ Tertiary 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

Table 11-9. Conversion Factors

Primary Unit	x Multiplier	Secondary/ Tertiary Unit
grams	15.4324	grains
	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
short tons	0.001102	short tons
	0.000984	long tons
	0.001000	metric tons
	2000.00	pounds
	907.185	kilograms
	0.892857	long tons
metric tons	0.907185	metric tons
	2204.62	pounds
	1000.00	kilograms
	1.10231	short tons
long tons	0.984207	long tons

Table 11-9. Conversion Factors (Continued)

Primary Unit	<i>x Multiplier</i>	Secondary/ Tertiary Unit
long tons	2240.00	pounds
	1016.05	kilograms
	1.12000	short tons
	1.01605	metric tons
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 11-9. Conversion Factors (Continued)

## 11.9 PS/2 Keyboard Interface

Serial port 1 (connector J3) on the 720i CPU board provides a PS/2-type keyboard interface (Scan Code Set 1 only) for use with a remote keyboard. Table 11-10 shows the pin assignments for a PS/2 keyboard cable.

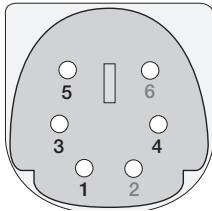
Pin	Signal	Male Connector
1	DATA	
2	(reserved)	
3	GND	
4	+5V	
5	CLOCK	
6	(reserved)	

Table 11-10. PS/2 Keyboard Connector Pin Assignments

Table 11-11 summarizes the 720i-specific functions provided by the keyboard interface; most other alphanumeric and navigational keys provide functions equivalent to those typical for PC operation. Menu parameters and serial commands that affect indicator keypad operation (including the KBDLCK, ZERONLY, and KLOCK serial commands) also affect the remote keyboard.

**NOTE:** The keyboard interface is not hot-pluggable. Disconnect power to the 720i before connecting the keyboard cable to the Port 1 connector.

Key	Function
F1	Softkey 1
F2	Softkey 2
F3	Softkey 3
F4	Softkey 4
F5	Softkey 5
F6 (Alt+Z)	ZERO key
F7 (Alt+G)	GROSS/NET key
F8 (Alt+T)	TARE key
F9 (Alt+U)	UNITS key
F10 (Alt+P)	PRINT key
F11	<i>Not used</i>
F12	
Print Screen	Same as PRINT key, in both normal and setup modes

Table 11-11. PS/2 Keyboard Functions

## 11.10 Audit Trail Support

Audit trail support provides tracking information for configuration and calibration events. To prevent potential misuse, all configuration and calibration changes are counted as change events.

Use *Revolution III* to display audit trail information. The audit trail display includes the legally relevant (LR) version number (software version for the code that provides audit trail information), a calibration count and, if REGULAT=NTEP, a configuration count. The exact format of the information shown depends on the regulatory agency specified for the REGULAT (FEATURE menu) parameter.

Audit trail information can be printed from *Revolution III* or by sending the DUMPAUDIT serial command.

## 11.11 Display Module Configuration

The detached display module (DDM) used by both the universal and panel models of the 720i communicates with the CPU board (host) using Port 3 (connector J4). To verify active communications between the host and the display, the 720i provides a HEARTBEAT parameter (FEATURE menu). This parameter, when used with the HB1:I parameter in the display module, provides notification of any communications failure between the host and the display module.

If HEARTBEAT is specified, the display module input heartbeat (HB1:I parameter) must also be set, typically to a value slightly longer than the host HEARTBEAT parameter. For example, set HEARTBEAT to 1.5 seconds, and HB1:I=2.0. With these values set, the host should send a heartbeat packet to the display module every 1.5 seconds; if the display module does not receive an incoming heartbeat with 2.0 seconds, an error message (*Host Communication Error*) is shown.

To view the DDM configuration display, press the **MENU** key to show the main 720i menu, then press and hold the **MENU** key until the following display is shown:

Com	Baud	Parity	Bits	Stop	Output	Echo	CkSum	Mode
0	<b>115200</b>	N	8	1	com0	com0	off	shell
1	115200	N	8	1	com1	off	crcA	RTL
Keydev	Keypad	DspKey			HBO:I / 0	HB1: I / 0		
com1	RTL	off			0	0	2	0
					RTL Defaults	Save & Exit		Exit

Figure 11-4. DDM Configuration Display

To change the heartbeat value for the display module, use the **right** navigation key to highlight the input (I) value for HB1, then use the **up** or **down** navigation key to adjust the value.

### DDM Communications Ports

Com1 is an RS-422 port that provides communications with the 720i CPU board host. Com0 is a limited function RS-232 port used to write the DDM firmware.

## 11.12 Dimension Drawings

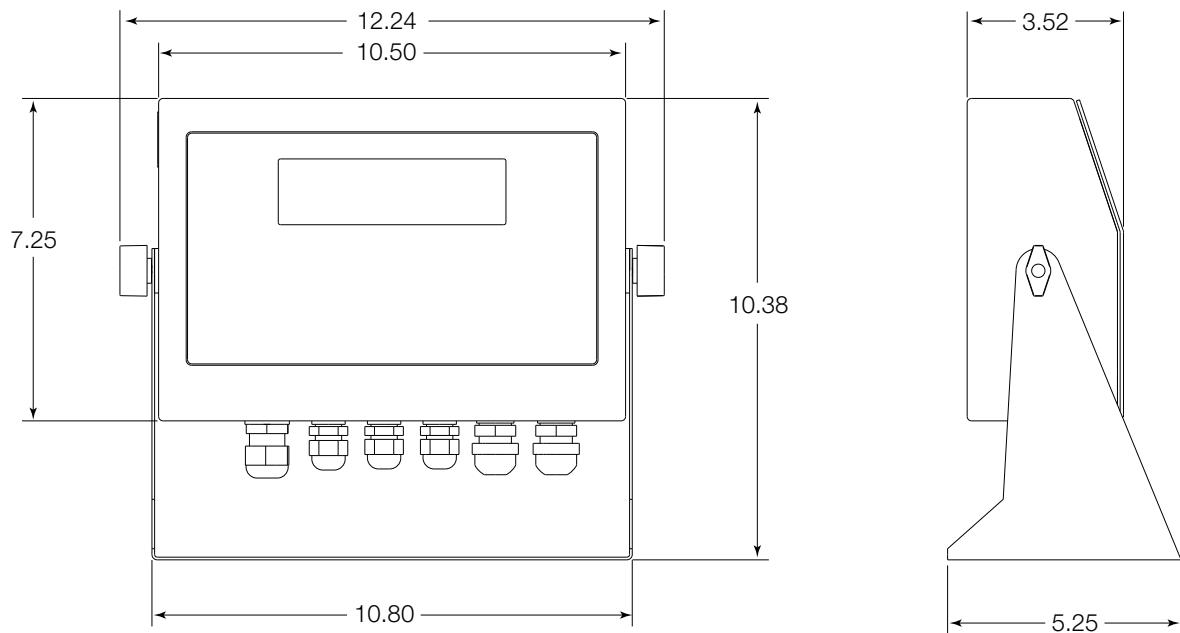


Figure 11-5. Universal Model Dimensions

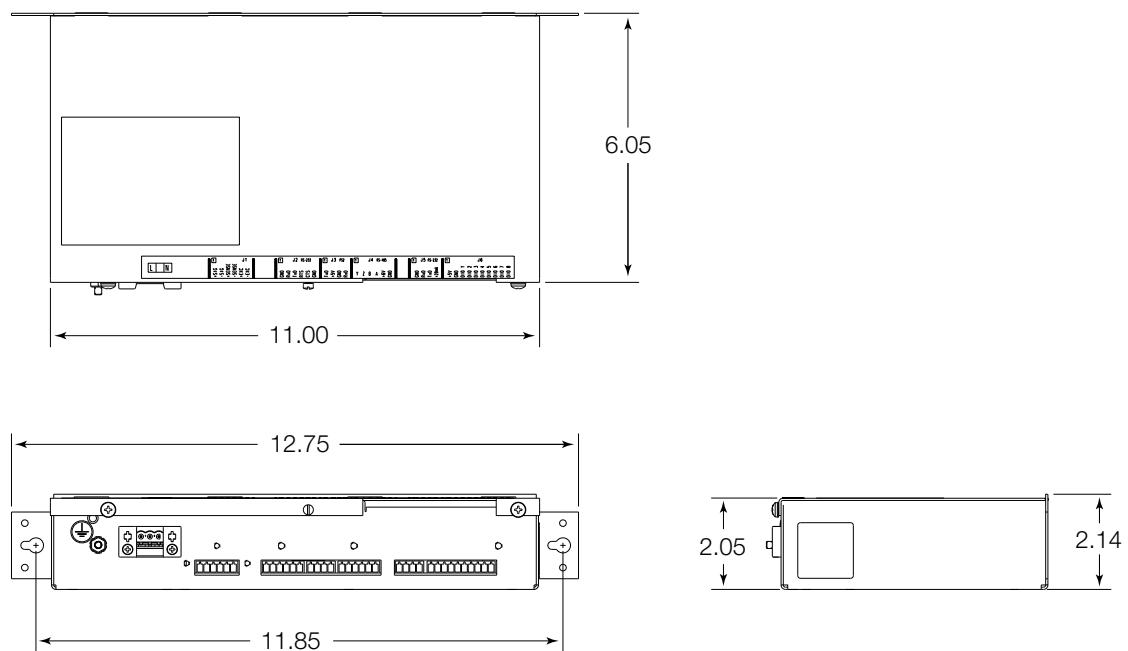


Figure 11-6. Panel Mount Controller Dimensions

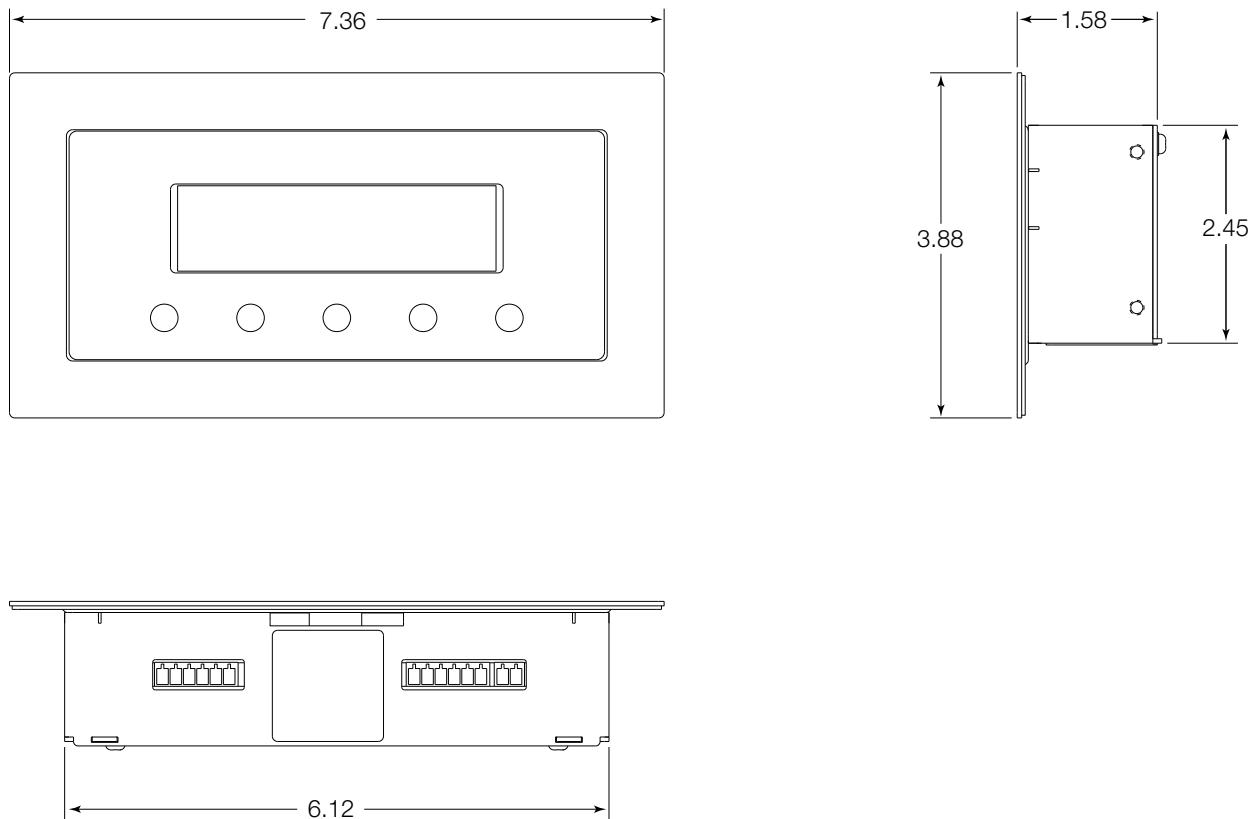


Figure 11-7. Panel Mount Display Dimensions

## 11.13 Printed Information

### System Manuals

- *720i Installation Manual*, PN 103121

### Option Cards (720i/820i/920i)

- *Analog Output Card Installation Instructions*, PN 69089
- *24-Channel Digital I/O Expansion Card Installation Instructions*, PN 69087
- *Dual Channel Serial Card Instructions*, PN 69090

### Communications Options (520/720i/820i/920i)

- *DeviceNet™ Interface Installation and Programming Manual*, PN 69949
- *Profibus® DP Interface Installation and Programming Manual*, PN 69948
- *Allen-Bradley® Remote I/O Interface Installation and Programming Manual*, PN 69950
- *Ethernet Communications Card Installation Instructions*, PN 72117
- *EtherNet/IP Communications Card Installation Instructions*, PN 88537
- *USB Interface Card Installation Instructions*, PN 95490
- *Ethernet Interface Card Installation Instructions*, PN 78907
- *Fiber-optic Interface Card Installation Instructions*, PN 78905

## 11.14 Specifications

### Power

AC Power Range	100–240 VAC
Frequency	50 or 60 Hz
Power Consumption	25 watts maximum

### A/D Specifications

Excitation Voltage	10 $\pm$ 0.5 VDC, 16 x 350 $\Omega$ or 32 x 700 $\Omega$ load cells
Sense Amplifier	Differential amplifier with 4- and 6-wire sensing
Analog Signal Input Range	-10 mV to +45 mV
Analog Signal Sensitivity	0.3 $\mu$ V/grad minimum @ 7.5 Hz 1.0 $\mu$ V/grad typical @ 120 Hz 4.0 $\mu$ V/grad typical @ 960 Hz
A/D Sample Rate	7.5–960 Hz, software selectable
Input Impedance	>35 M $\Omega$ typical
Internal Resolution	8 000 000 counts
Wt Display Resolution	9,999,999
Input Sensitivity	10 nV per internal count
System Linearity	$\pm$ 0.01% of full scale
Zero Stability	$\pm$ 150 nV/ $^{\circ}$ C, maximum
Span Stability	$\pm$ 3.5 ppm/ $^{\circ}$ C, maximum
Input Voltage Differential	$\pm$ 800 mV referenced to earth ground
Input Overload	Load cell signal lines $\pm$ 10 V continuous, ESD protected
RFI/EMI Protection	Communications, signal, excitation, and sense lines protected

### Digital Specifications

Microcomputer	Motorola ColdFire <sup>®</sup> MCF5307 main processor @ 90 MHz
Digital I/O	8 I/O channels on CPU board; optional 24-channel I/O expansion card available
Digital Filter	Software selectable: 1–256, enhanced Rattletrap <sup>®</sup> hybrid digital filtering

### Serial Communications

Serial Ports	Ports on CPU board support up to 115200 bps; optional dual-channel serial expansion card available
Port 2	Full duplex RS-232 with CTS/RTS
Port 4	Full duplex RS-232; 20mA

### Additional Communications Options

- Ethernet TCP/IP
- 4-wire RS-485
- Fiber-optic
- USB

### Operator Interface

Display	Universal viewable area: 5.3 in x 1.5 in (133 x 39 mm) Panel mount viewable area: 3.8 in x 1.2 in (96 x 30 mm) 240 x 64 pixel VGA LCD display module with adjustable contrast, 75Hz scan rate
Keyboard	Universal: 22-key membrane panel Panel mount: 10-key membrane panel PS/2 port for external keyboard connection

### Environmental

Operating Temperature	
Legal	-10 to +40 $^{\circ}$ C (14 to 104 $^{\circ}$ F)
Industrial	-10 to +50 $^{\circ}$ C (14 to 122 $^{\circ}$ F)
Storage Temperature	-10 to +70 $^{\circ}$ C (14 to 158 $^{\circ}$ F)
Humidity	0–95% relative humidity

### Enclosure

Enclosure Dimensions	
Universal enclosure	10.5 in x 7.25 in x 3.52 in
Panel mount controller	11.0 in x 2.14 in x 6.05 in
Panel mount display	7.36 in x 3.86 in x 1.58 in
Weight	
Universal enclosure	8 lb (3.6 Kg)
Panel mount controller and display	6 lb (2.7 Kg)
Rating/Material	NEMA 4X/IP66, stainless steel

### Certifications and Approvals

	NTEP	
	CoC Number	08-022
	Accuracy Class	III/IIIL $n_{max}$ : 10 000

### Measurement Canada

Approval	AM-5677
Accuracy Class	III/IIIH $n_{max}$ : 10 000

### UL

	Universal model File Number: E151461
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	Panel mount model File Number: E151461, Vol 2
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OIML - Pending

## 720i 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.

**THESE WARRANTIES EXCLUDE ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEITHER RLWS NOR DISTRIBUTOR WILL, IN ANY EVENT, BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

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**NO TERMS, CONDITIONS, UNDERSTANDING, OR AGREEMENTS PURPORTING TO MODIFY THE TERMS OF THIS WARRANTY SHALL HAVE ANY LEGAL EFFECT UNLESS MADE IN WRITING AND SIGNED BY A CORPORATE OFFICER OF RLWS AND THE BUYER.**

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