BWC-1

Bulkweighing Controller

Installation Manual

RICE LAKE WEIGHING SYSTEMS
Industrial Solutions on a Global Scale®

ISO 9001 REGISTERED

42748

Contents

Version 1.0, March 1999

About this Manual

This manual is intended for use by service technicians responsible for installing and servicing BWC-1 bulkweighing controllers. It includes information needed to install, configure, and operate the BWC-1.

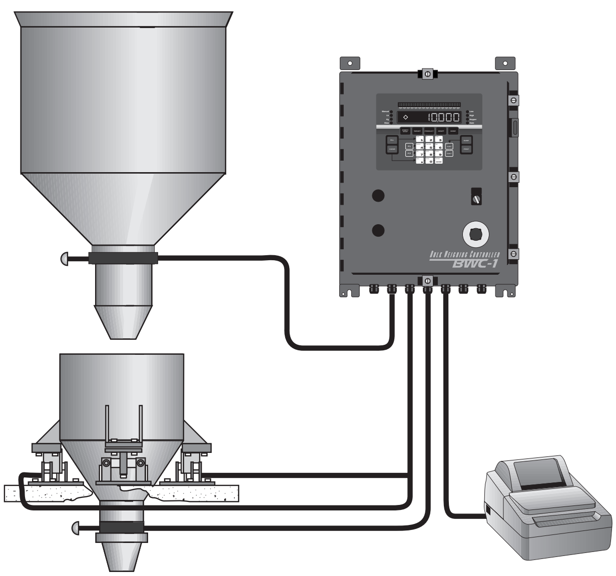
Warning *Most procedures described in this manual require work inside the controller enclosure. These procedures are to be performed by qualified service personnel only.*

Authorized distributors and their employees can view or download this manual from the Rice Lake Weighing Systems distributor site at www.rlws.com.

The *Operator Card* included with this manual provides basic operating instructions for the BWC-1. Please leave the *Operator Card* with the controller when installation and configuration are complete.

1.0 Introduction

The BWC-1 bulkweighing controller is a variant of the IQ plus® 810 digital weight indicator, with hardware and software modifications tailored to support multidraft weighing applications. The BWC-1 supports multidraft shipping and receiving processes for multiple products using a single hopper.



Multidraft weighing provides a method of shipping or receiving a large amount of material by using multiple, smaller drafts of the material. In receive mode, draft weights are accumulated until all material being received has been weighed. In shipping mode, draft weights are accumulated until the target shipping weight has been dispensed.

Features of the BWC-1 controller include:

- Single hopper operation
- Shipping and receiving modes
- Automatic and manual operating modes
- Up to 50 products with individual product names and IDs, drafting parameters, and accumulators
- Dribble fill with optional flow rate tracking for last draft
- Alarms for:
  - Low material in/high material out
  - Weigh hopper full
  - Open gates
  - Slow dump, slow fill, slow operation (gate-to-gate material flow rate)
  - Printer not ready
- Source and hopper gate closed interlocks
- Minimum final draft specification (shipping mode only)
- Material in suspension (preact) compensation, with learn mode
- Material flow rate reporting
- Subtotal sample printing
- Printer operational interlock
- Automatic buildup test mode
- NTEP approved

Standard models of the BWC-1 are available for 115 or 230 VAC operation, in either painted mild-steel or stainless steel/NEMA 4X enclosures.

Options available for the BWC-1 include:

- 48-segment bar graph for display of sequence, draft process, or progress-to-target status, PN 19363
- RS-485 communications, PN 19372
- Manual override switches
- Audible alarms
- Motorized gate control
- Simulator

For applications that require more than 20 weight measurements per second, the Jetpak™ 100 Hz high-speed A/D converter is also available.

1.1 System Components

The standard BWC-1 controller consists of the following major components:

- IQ plus 810 indicator with expansion board and digital output expander board, running BWC-1 software
- Terminal block for connection of field wiring
- 16-channel relay rack
- Batching switch with emergency stop button

1.2 Front Panel Keys and Annunciators

The following section describes the front panel keys, annunciators, and display functions of the BWC-1 controller. See Section 5.0 on page 45 for more information about front panel operations.

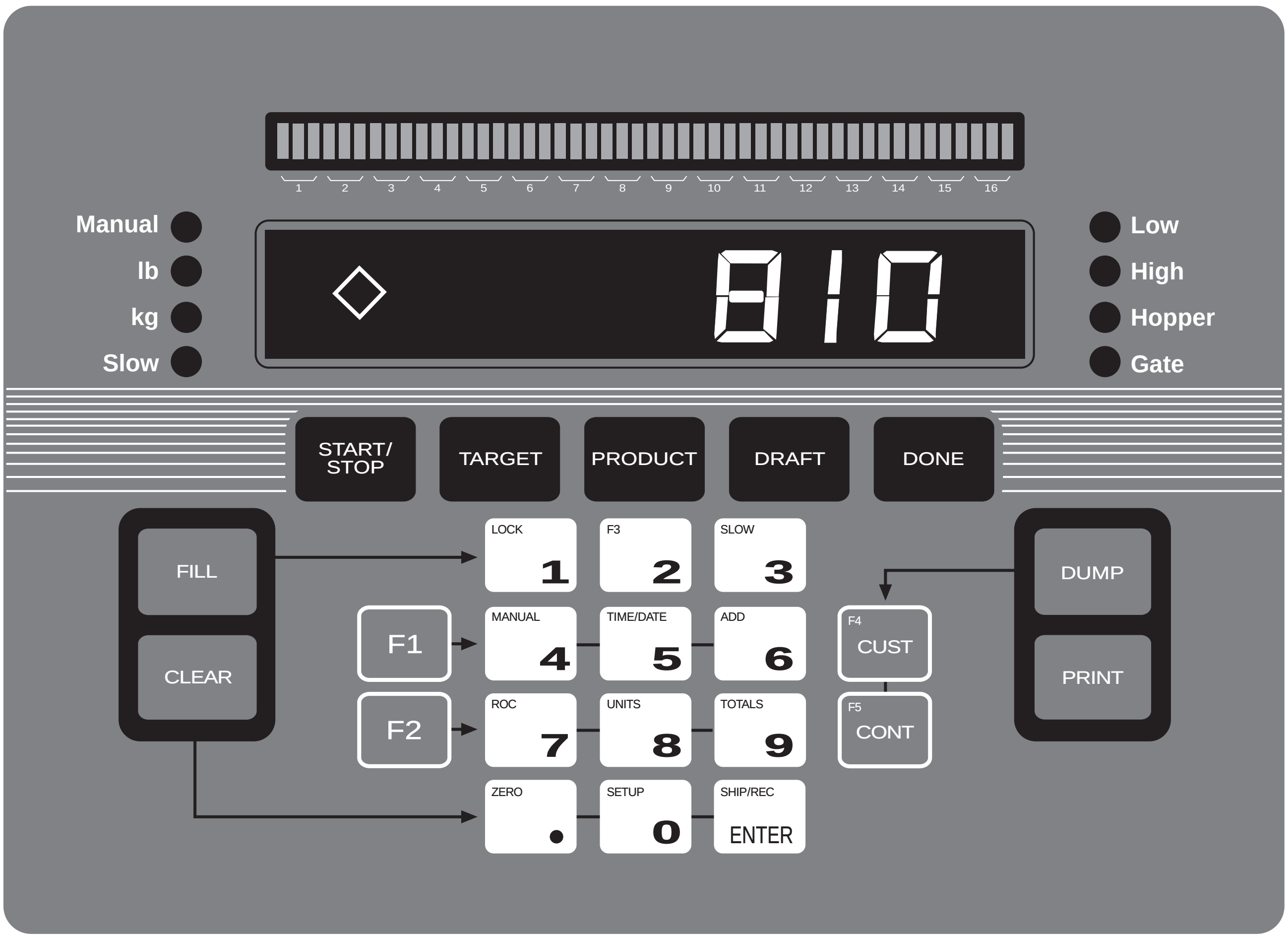


Figure 1-1. BWC-1 Front Panel

1.2.1 Display Annunciators

The BWC-1 front panel display shows a number of annunciators to indicate the status of the controller:

G Gross weight displayed.

B Transaction in progress.

T Transaction total displayed.

pT Product total displayed.

◇ Controller is in receive mode. If the rhombus symbol is not shown, the controller is in ship mode.

Scale is at standstill or within the specified motion band.

→0← Center of zero. Gross weight is within 0.25 graduations of zero. This annunciator lights when the scale is zeroed.

1.2.2 Front Panel Keys

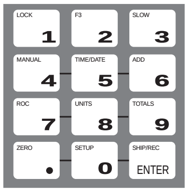
Key	Description
	Numeric keypad: The numeric keypad is used to enter numeric values, such as target weights and ID numbers. To enter a numeric value, use the keypad to enter the number, then press ENTER or the function key. Each digit appears on the display screen as entered. If you key a number and don't press ENTER and/or a function key within several seconds, the display reverts to the previous mode and the number is ignored. If you make a mistake entering a number, press CLEAR to erase the previous digit. Continue pressing CLEAR to erase as many digits as necessary. Each of the keys on the numeric keypad also provides a second function when pressed in combination with the FILL, CLEAR, F1, or F2 key. See the descriptions of these keys for more information.
START/ STOP	START/STOP: Press to start, restart, or stop an automatic multidraft transaction.
TARGET	TARGET: Press the TARGET key to view the current target value, or use the numeric keypad to enter the target weight for a shipping mode transaction, then press TARGET to set the value.
PRODUCT	PRODUCT: Press to display the current product name or to select a new product to ship or receive.
DRAFT	DRAFT: Press the DRAFT key to view the current draft weight, or use the numeric keypad to enter the draft weight, then press DRAFT to set the value.
DONE	DONE: In receive mode, press DONE to indicate that the transaction is complete. In ship mode, press DONE to finish the transaction before the target weight is reached. In operator setup mode, press DONE to exit to normal mode. In setup mode, press the DONE key to send all configuration data to the EDP port.
FILL	FILL: In manual mode, press and hold FILL to hold the fast fill supply gate open. Also used with 1, 2, and 3 keys on the numeric keypad to access additional functions.
	LOCK (FILL+1): Press 1 while holding the FILL key to lock the fast fill gate open. Press any key to close the gate.
	F3 (FILL+2): To enter a zero adjustment value, use the numeric keypad to key in the offset value, then press the FILL+2 key combination to enter the value.
	SLOW (FILL+3): In manual mode, press the FILL+3 key combination to toggle the gate signal between the fast and slow. When not in manual mode, press FILL+3 to toggle the manual mode start speed between fast and slow.
CLEAR	CLEAR: Press CLEAR to delete the last digit when entering a numeric value or to return to the gross weight display when viewing other data. CLEAR is also used with the decimal point, 0, and ENTER keys on the numeric keypad to access additional functions.
	ZERO (CLEAR+dec_pnt): To zero the scale, hold CLEAR and press the decimal point (.) key.
	SETUP (CLEAR+0): Press the CLEAR+0 key combination to enter operator setup mode.
	SHIP/REC (CLEAR+ENTER): In units configured for dual (ship/receive) mode, press SHIP/REC to toggle between ship and receive mode. The rhombus symbol (◇) on the display indicates receive mode; absence of the rhombus indicates ship mode.

Table 1-1. BWC-1 Front Panel Keys and Annunciators

Key	Description
F1	F1: Used with the 4, 5, and 6 keys on the numeric keypad to access additional functions.
	MANUAL (F1+4): Places the BWC-1 in manual mode, resets the current draft number to one, increments the transaction number, and clears the transaction accumulator.
	TIME/DATE (F1+5): Display or change the current time and date. Press once to display the date; press again to display the time. You can enter new values for the date and time while they are displayed by keying the new value and pressing ENTER. Use the 24-hour format to enter time values.
	ADD (F1+6): Used to manually add material to a transaction. Pressing the ADD key places the BWC-1 in manual mode but does not change the transaction number and does not reset the current draft number or transaction accumulator value.
F2	F2: Used with 7, 8, and 9 on the numeric keypad to access additional functions.
	ROC (F2+7): Displays the rate of change. Press the F2+7 key combination repeatedly to cycle through the calculated ROC values listed below. The character (ROC annunciator) shown at the left of the display (C, T, G, F, D, or E) indicates which ROC value is shown. • C Current ROC: Material flow rate for last x cycles • T Transaction ROC: Average flow rate from start of transaction to last time fill gate was opened • G Previous gate-to gate ROC: Average flow rate between last two times fill gate was opened • F Fill ROC: Average flow rate during current or previous fill operation • D Dump ROC: Average flow rate during current or previous dump operation • E Estimated time to completion for this transaction, in minutes and seconds (*MMM.SS*). Value displayed only if a target value is specified. Press CLEAR to return to the gross weight display.
	UNITS (F2+8): Press the F2+8 key combination repeatedly to cycle the displayed units between primary, secondary, and product units.
	TOTALS (F2+9): Press the F2+9 key combination repeatedly to cycle through the transaction accumulator, current draft number, and product accumulator value.
DUMP	DUMP: In manual mode, press DUMP to start the dump operation. Dumping continues automatically until the hopper is empty. DUMP is also used with the CUST and CONT keys to access F4 and F5 functions. F4 (DUMP+CUST) and F5 (DUMP+CONT) are reserved for special applications.
F4 CUST	CUST: Press CUST to display the current customer ID. To enter a customer ID for the current transaction, use the numeric keypad to enter the customer ID, then press CUST to set the value. The CUST key is also used to scroll up through the list of predefined product names shown when selecting a product name.
F5 CONT	CONT: Press CONT to display the current container ID. To enter a container ID for the current transaction, use the numeric keypad to enter the container ID, then press CONT to set the value. The CONT key is also used to scroll down through the list of predefined product names shown when selecting a product name.
PRINT	PRINT: Press PRINT to send product accumulator data to the serial port. See Section 5.3 on page 46 for more information.

Table 1-1. BWC-1 Front Panel Keys and Annunciators (Continued)

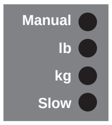
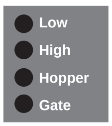
Key	Description
	LED Annunciators: The LED annunciators provide status information about the BWC-1 controller. On the left side of the front panel, the *Manual* LED lights when the unit is in manual mode; the *Slow* LED flashes when the minimum material flow specified for a dump or fill operation is not being met. The *lb* and *kg* LEDs on the left side of the display indicate the display units. These LEDs function as follows: • If the displayed weight is in pounds, the *lb* LED is lit; if kilograms, the *kg* LED is lit. • If the primary unit of weight is pounds, the *kg* LED is lit for secondary units—or, if the primary unit is kilograms, the *lb* LED is lit for secondary units, unless the secondary unit of weight is the same as the primary unit. • If neither primary nor secondary units are pounds or kilograms, the *lb* LED is used as a primary units annunciator and the *kg* LED is used as the secondary units annunciator. • When displaying product-specific units, if the units are the same as either the primary or secondary units, the LED representing primary or secondary units is lit. If the product-specific units are not the same as either primary or secondary units, both LEDs are lit.
	On the right side of the front panel, all four LEDs represent alarm conditions: • *Low* flashes when material in the supply garner is below the bindicator (LOWPROD alarm) • *High* flashes when material in the surge garner is above the bindicator (HGHSRGE alarm) • *Hopper* flashes when material in the hopper is above the bindicator (HOPPER alarm) • *Gate* flashes when the supply gate is open during a dump operation (PRDGATE alarm) or the hopper gate is open during a fill operation (HPRGATE alarm) All of the alarm conditions indicated by a flashing LED also present an alarm message on the display. See Section 5.5 on page 47 for more information about alarm conditions and display prompts.

Table 1-1. BWC-1 Front Panel Keys and Annunciators (Continued)

2.0 Installation

This section describes procedures for connecting load cells, digital I/O, and serial communications cables to the BWC-1 controller. Both external and internal wiring is discussed, along with assembly drawings and parts lists for the service technician.

Figure 2-1 shows the locations of the main BWC-1 controller components. For most applications, all wiring to external components of the system should be connected to the main terminal block inside the controller enclosure.

Caution

- *Use a wrist strap to ground yourself and protect components from electrostatic discharge (ESD) when working inside the controller enclosure.*
- *This unit uses double pole/neutral fusing which could create an electric shock hazard. Procedures requiring work inside the controller enclosure must be performed by qualified service personnel only.*

Warning *The BWC-1 controller has no on/off switch. Before opening the unit, ensure the power cord is disconnected from the power outlet.*

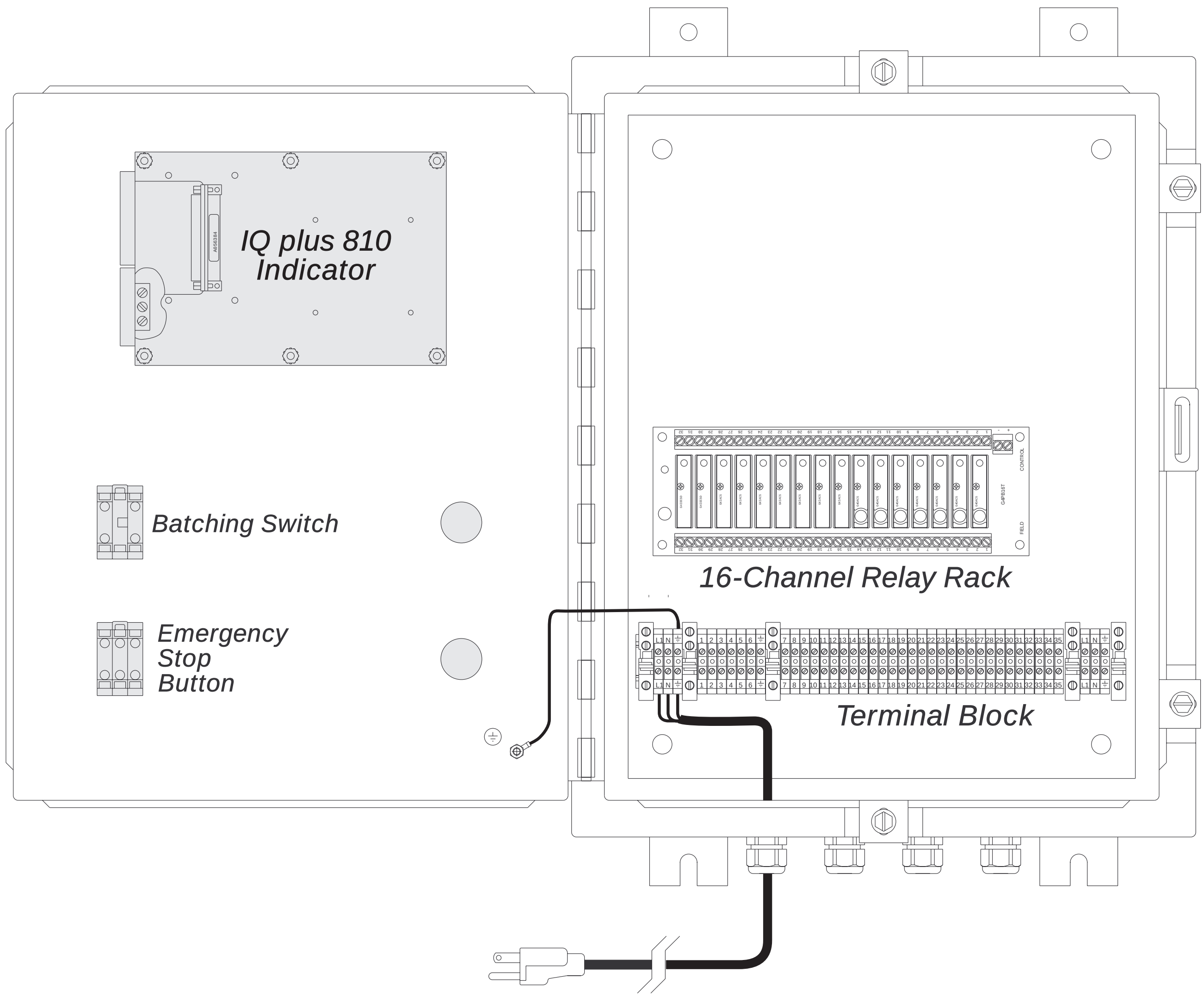


Figure 2-1. BWC-1 Controller Components

2.1 Terminal Block Wiring

The terminal block provides a common wiring interface to the BWC-1 controller, including AC power to the relays and the indicator power supply, load cell and serial communications wiring to the indicator CPU board, and digital I/O wiring to the relay rack.

Figure 2-2 shows the pin assignments used for wiring to the terminal block. Figure 2-13 on page 19 shows the complete system wiring for the BWC-1 controller.

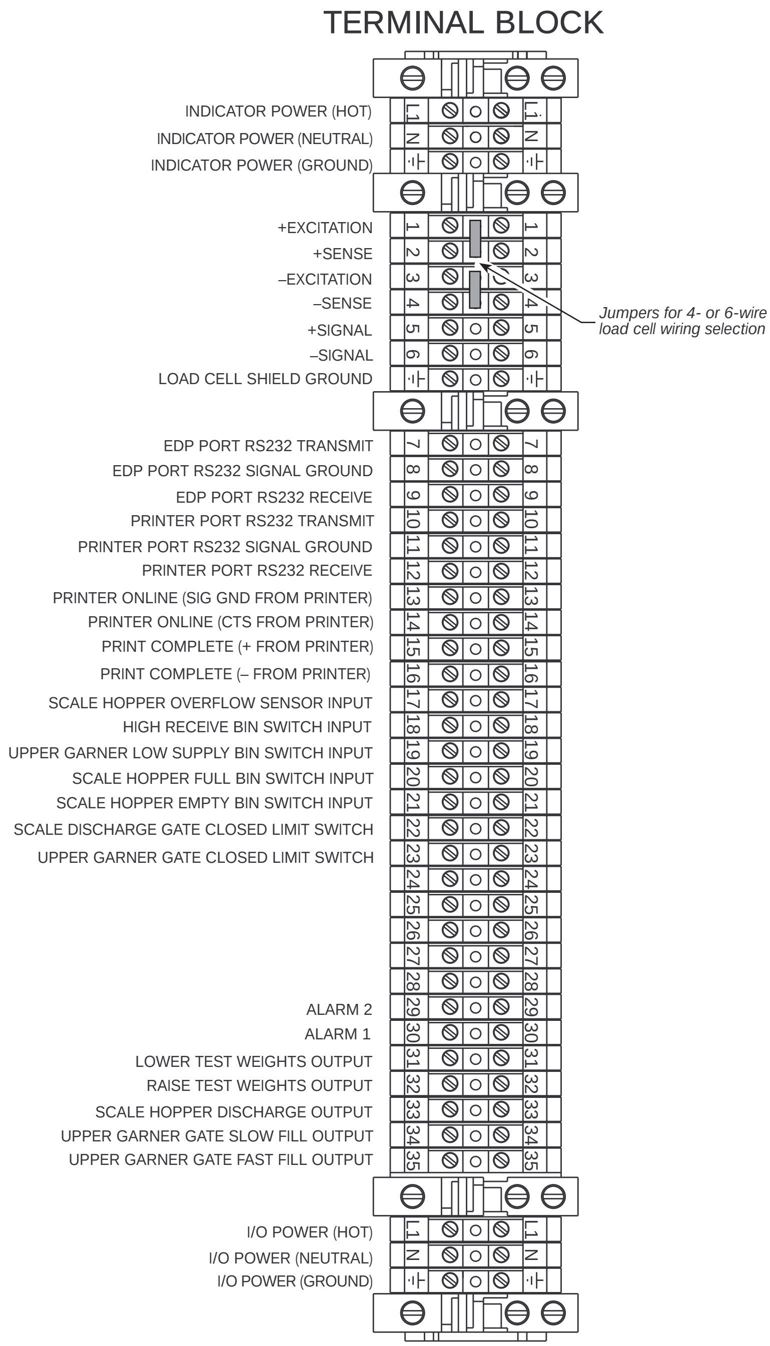


Figure 2-2. Terminal Block Pin Assignments

2.2 Power Connections

Models of the BWC-1 are available for either 115 or 230 VAC operation, using a 3-wire power supply line at 50 or 60 Hz. It is recommended that the BWC-1 be connected to an AC power supply on a separate branch or feeder from other AC equipment that could cause step-load changes and/or other AC line disturbances.

Wire the AC supply to the terminal block as shown in Figure 2-2 on page 7. AC power is distributed to both the indicator and the AC relays from the terminal block.

2.3 Load Cell Connections

Wire the analog input cable from the load cell or junction box to the terminal block as shown in Figure 2-2 on page 7. The BWC-1 is pre-wired from the terminal block to J10 connector on the indicator CPU board.

Jumpers behind pins 1–4 on the terminal block (see Figure 2-2 on page 7) are used to select whether the load cell connection uses 4- or 6-wire cable. If using 4-wire load cell cable, leave jumpers the jumpers on (these jumpers connect pins 3 and 6, 4 and 7, at terminal J10). For a 6-wire installation using sense leads, remove the jumpers.

NOTE: *The terminal block jumpers serve the same function as jumpers JP1 and JP2 on the indicator CPU board. The CPU board jumpers are not used.*

Table 2-1 shows the pin assignments used for load cell connections at the terminal block and from the terminal block to the J10 connector on the indicator CPU board.

Signal	Terminal Block Pin	CPU Board J10 Pin
+SIGNAL	5	1
–SIGNAL	6	2
+SENSE	2	3
–SENSE	4	4
SHIELD	⏚	5
+EXCITATION	1	6
–EXCITATION	3	7

Table 2-1. Load Cell Connections from Terminal Block to Indicator CPU Board

2.4 Serial Communications Wiring

Wire the serial communications cables to the terminal block as shown in Figure 2-2 on page 7. The BWC-1 is pre-wired for RS-232 communications from the terminal block to the J7 connector on the indicator CPU board.

2.4.1 RS-232 Wiring

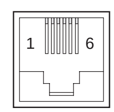
Table 2-2 shows the RS-232 pin assignments at the terminal block and the indicator serial port pins to which they are connected.

	BWC-1	
RS-232 Signal	Terminal Block Pin	IQ plus 810
EDP TxD	7	J7-11
EDP GND	8	J7-12
EDP RxD	9	J7-9
Printer TxD	10	J7-5
Printer GND	11	J7-6
Printer RxD	12	J7-3

Table 2-2. RS-232 Pin Assignments

2.4.2 Printer Wiring

The BWC-1 controller is typically used with TM-300 or TM-U200 tape printers. Table 2-3 shows the pin connections from the BWC-1 to these printers. RS-232 connections for transmit, receive, and ground are wired to the indicator serial port as shown in Table 2-2.



The print complete signal input to the BWC-1 is wired from the printer RJ-11 drawer kick-out connector to the terminal block. Pin 4 (+24VDC, green wire) and pin 5 (signal 2, yellow wire) are wired to terminal block pins 15 and 16 as shown in Table 2-3.

Terminal block connections for the printer online and print complete signals are pre-wired to input relays for DIGIN8 and DIGIN 9 (see Table 2-6 on page 12).

BWC-1		Tape Printer	
Terminal Block Pin	Signal	Printer Signal	Printer Pin
10	TxD	RxD	3
11	GND	GND	7
12	RxD	TxD	2
13	PRINTER ONLINE	GND	7
14		RTS	4
15	PRINT COMPLETE	+	RJ-11, pin 4
16		–	RJ-11, pin 5

Table 2-3. Printer Connections

2.4.3 RS-485 Wiring

The RS-485 option requires installation of a single chip (U24) on the indicator CPU board to provide 2-wire, half-duplex communications (see Figure 2-3). To wire the BWC-1 controller for RS-485 communications, do the following:

- Connect the RS-485 wires to open pins on the terminal block (see Table 2-4).
- Connect the terminal block pin for the 485-A line to the pin 7 on the indicator J7 terminal.
- Connect the terminal block pin for the 485-B line to the pin 8 on the indicator J7 terminal.

CPU Board J7 Connector	
J7 Pin	Function
7	485-A
8	485-B

Table 2-4. RS-485 Indicator Pin Assignments

RS-485 MARK and SPACE states are generated or detected when the following conditions exist:

- MARK state if 485-A (pin J7-7) is > 200 mV lower than 485-B (J7-8)
- SPACE state if 485-A (pin J7-7) is > 200 mV higher than 485-B (J7-8)

NOTE: *Biasing resistors R38 and R39 (see Table 2-5 on page 9) can be used to assure that the RS-485 loop remains in a MARK state when idle. If the indicator is installed at the end of the RS-485 cable, install a 100Ω termination resistor across the inputs.*

Equipment using the 4-wire RS-485 implementation can be incorporated into a network by tying the transmit (A) and receive (A) pins together, and tying the transmit (B) and receive (B) pins together.

2.4.4 Indicator Serial Port Connections

The indicator serial port, connector J7, provides connections for both the EDP port and the printer port:

- The EDP port supports full-duplex RS-232 or simplex 20 mA current loop communications, with half-duplex RS-485 and full-duplex 20 mA current loop as optional features.
- The printer port can support full duplex RS-232 and simplex 20 mA transmissions.

Some applications may require changes in the wiring from the indicator serial port to the terminal block. Table 2-5 on page 9 shows the J7 pin assignments for all supported serial communications connections. See Section 3.2.6 on page 36 for information about configuring the indicator serial port.

Port	J7 Pin	RS-232	20mA Current Loop	RS-485
Printer	1			*R38/GND*
	2			*R39/+5V*
	3	RxD		
	4		–20mA OUT	
	5	TxD		
	6	GND	+20mA OUT	
EDP	7		+20mA IN	485-A
	8		–20mA IN	485-B
	9	RxD		
	10		-20mA OUT	
	11	TxD		
	12	GND	+20mA OUT	

Table 2-5. Indicator Serial Port Pin Assignments

2.5 CPU Board Connections

The indicator CPU board is connected to the power supply/display board by two ribbon cables. The power ribbon cable connects the J1 connectors on the CPU and power supply/display boards; the data ribbon cable connects J2 on both boards.

Figures 2-3 through 2-5 show major component locations on the indicator CPU and power supply/display boards.

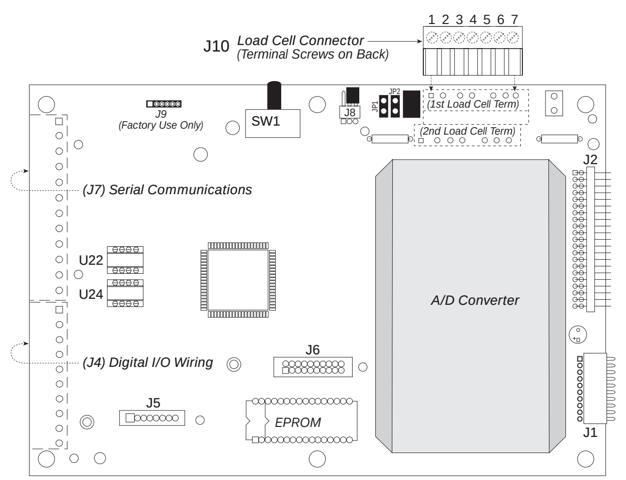


Figure 2-3. CPU Board, Component Side

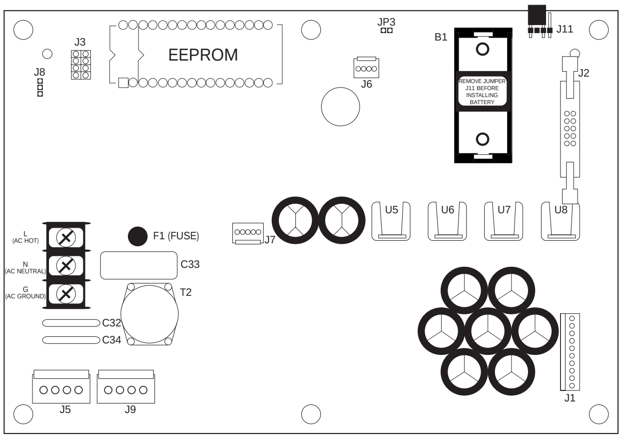


Figure 2-4. Power Supply/Display Board, Component Side

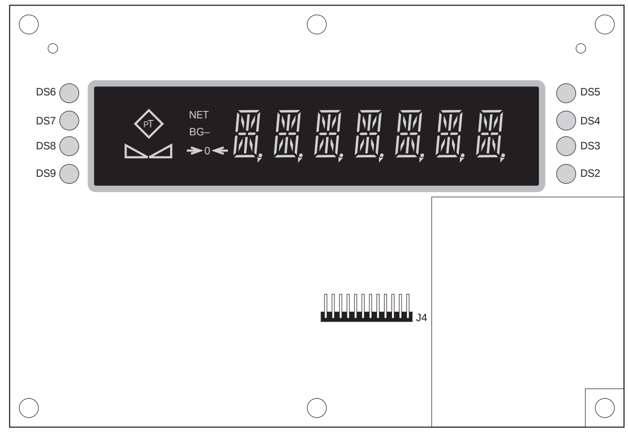


Figure 2-5. Power Supply/Display Board, Display Side

2.6 Relay Rack Wiring

The relay rack is pre-wired at the factory for the standard BWC-1 controller. Except for special applications, no additional wiring is required.

Figure 2-6 shows the wiring connections from the relay rack to the indicator CPU board (J4 connector), expansion board (J5 connector), and digital output expander board (J1 connector). A ladder logic diagram of the relays is shown in Figure 2-7 on page 11.

Digital I/O must be configured using the BWC-1 configuration menus (see Section 3.0 on page 21) or EDP commands (see Section 6.0 on page 50). The standard digital I/O assignments are described on page 12.

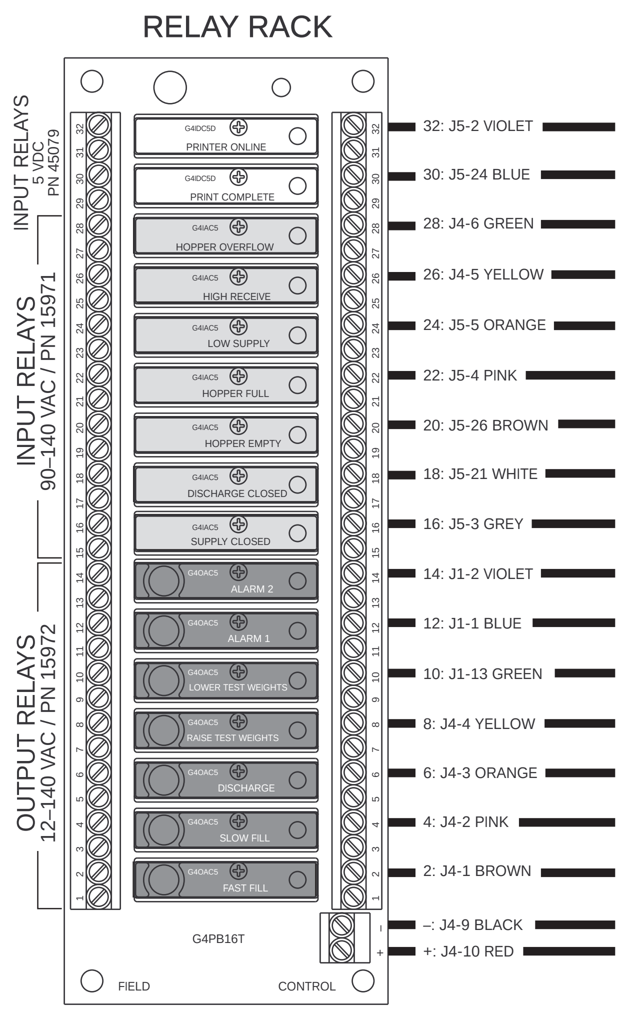


Figure 2-6. Relay Rack Wiring

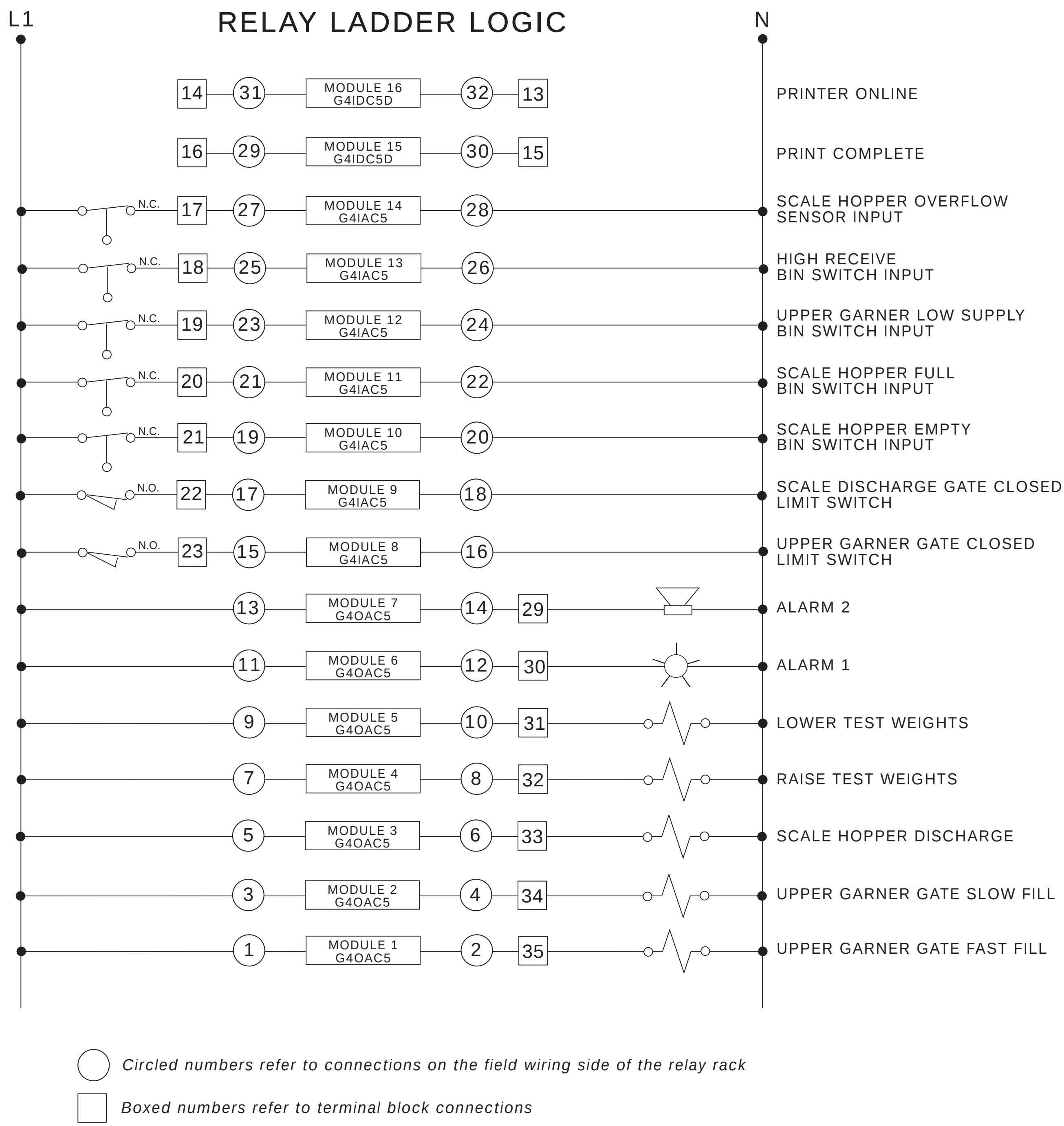


Figure 2-7. Relay Ladder Logic

2.6.1 Digital Inputs

Table 2-6 shows the default digital input assignments for the BWC-1 controller, including pin assignments on the indicator CPU board (J4 connector) and on the expansion board (J5 connector). Digital inputs are assigned using the DIGIN menu (see Section 3.2.8 on page 39).

DIGIN	Terminal	Signal
1	J4-7	Batch run (RUN)
2	J4-6	Hopper overflow (HPRLMT)
3	J4-5	High receive (HIGHREC)
4	J8-1	*not assigned (see* NOTE *below)*
5	J5-22	Start switch (START)
6	J5-03	Upper gate closed (PRDGATE)
7	J5-21	Hopper gate closed (HPRGATE)
8	J5-02	Printer operational (PRINTER)
9	J5-24	Print complete (PRNTCMP)
10	J5-05	Low supply (LOWPROD)
11	J5-23	Test mode (TEST)
12	J5-04	Hopper full (HPRFULL)
13	J5-26	Hopper empty (HPRMPTY)
14	J5-07	*not assigned*
15	J5-25	*not assigned*
16	J5-06	*not assigned*
17	J5-11	*not assigned*
18	J5-29	*not assigned*
19	J5-27	*not assigned*
20	J5-08	*not assigned*
21	J5-13	*not assigned*
22	J5-31	*not assigned*
23	J5-12	*not assigned*
24	J5-30	*not assigned*
25	J5-15	*not assigned*
26	J5-33	*not assigned*
27	J5-14	*not assigned*
28	J5-32	*not assigned*
29	J5-17	*not assigned*
30	J5-35	*not assigned*
31	J5-16	*not assigned*
32	J5-34	*not assigned*
NOTE: *Terminal J8 on the CPU board (used for supervisor switch connection on the standard IQ plus 810 indicator), can be used as a digital input if needed.*		

Table 2-6. BWC-1 Digital Inputs

2.6.2 Digital Outputs

Table 2-7 shows the digital output assignments for the BWC-1, including pin assignments on the indicator CPU board (J4 connector) and on the digital output expander board (J1 connector).

The standard BWC-1 controller has two output relays available for ALARM1 and ALARM2 conditions. Use the ALARMS menu to assign digital outputs for alarm conditions (see Section 3.2.5 on page 35).

DIGOUT	Terminal	Signal
1	J4-1	Open fast gate
2	J4-2	Open slow gate
3	J4-3	Open dump gate
4	J4-4	Add/raise test weights
5	J1-13	Remove/lower test weights
6	J1-12	*not assigned (see* NOTE *below)*
7	J1-11	
8	J1-10	
9	J1-9	
10	J1-8	
11	J1-6	
12	J1-5	
13	J1-4	
14	J1-3	
15	J1-2	Digital outputs 15 and 16 can be assigned to any of the following alarms: Low product (LOWPROD) High product (HGHPROD) High hopper (HGHHPPR) Fill gate open (PRDGATE) Hopper gate open (HPRGATE) Slow draft (SLWDRFT) Slow dump (SLWDUMP) Printer (PRINTER) Multiple conditions can be assigned to each alarm output.
16	J1-1	
NOTE: The standard BWC-1 is wired for two ALARM outputs (ALARM1 and ALARM2), assigned as DIGOUTs 15 and 16 from terminal J1 on the digital output expander board. Use of DIGOUTS 6–14 requires installation of additional relays.		

Table 2-7. BWC-1 Digital Outputs

2.7 Replacement Parts

Table 2-8 lists replacement parts for the BWC-1 controller, including all parts referenced in Figures 2-8 through 2-10.

Ref Number	PN	Description (Quantity)	Figure
1	14853	Screws, 6-32NC x 1, for mounting relay board (4)	Figure 2-9 on page 16
2	33491	16-channel relay mounting board, G4PB16T (1)	Figure 2-9 on page 16
5	29614	Terminal block clamps (5)	Figure 2-9 on page 16
6	22828	Terminal block grounding (3)	
7	22888	End cover for terminal block (1)	Figure 2-10 on page 17
8	14861	Screws, 8-32NC x 3/8, for mounting terminal block and indicator transformer (4)	Figure 2-9 on page 16 and Figure 2-10 on page 17
9	43259	Back panel (1)	Figure 2-9 on page 16
10	43260	Enclosure, mild steel (1)	
	49723	Enclosure, stainless steel (1)	
11	15628	Cable grips, 1/2 in, NPT (8)	Figure 2-8 on page 15
—	15645	Conduit hub, 1/2 in, (optional), for permanent wall mounting (1)	
12	15665	Cable grip reducing glands, 1/2 in, NPT (8)	
13	15630	Locknuts, 1/2 in, NPT (8)	
14	30376	Nylon seal rings, 1/2 in, NPT (8)	
15	43333	Screws, flush, 10-32NCX, 3.8 (5)	
16	43332	Screws, flush, 6-32UNCX, 5/16 (2)	
17	14623	Nuts, 6-32NC hex (2)	
18	15401	Standoffs, male-fem, 10-32NC, 2-5/8 x 5/16 (5)	Figure 2-10 on page 17
19	42523	Switch panel membrane (1)	Figure 2-8 on page 15
20	34036	IQ plus 810 power supply/display board (1)	Figure 2-10 on page 17
21	19644	3V lithium battery, cylindrical (1)	
22	15695	4-position connector for J5 on CPU board (1)	
23	15404	Standoffs, male-fem, 10-32NC, 1/2 x 5/16 (5)	
24	22899	Transformer mounting bracket (1)	
25	19647	Transformer (1)	
26	14626	Kep nuts, 8-32NC hex (2)	
27	14875	Screw, 10-32NF x 3/8 (1)	
28	15140	Lock washer, No 10, type A (1)	
29	15400	Standoffs, male-fem, 10-32NC, 1-3/4 x 5/16 (6)	
30	23165	7-position connector for J10 on CPU board (1)	
32	15879	10-position connector for J4 on CPU board (1)	
33	15880	12-position connector for J7 on CPU board (1)	
34	19362	Digital output expander board (1)	
35	35767	Expansion board (1)	
36	14632	Kep nuts, 10-32NF hex (6)	Figure 2-10 on page 17
37	33188	Ring terminal for ground wire (1)	Figure 2-9 on page 16
38	15472	Green/yellow 16 AWG stranded ground wire, .75 ft (1)	

Table 2-8. Replacement Parts

Ref Number	PN	Description (Quantity)	Figure
39	22827	Emergency stop mushroom switch (1)	Figure 2-8 on page 15
40	22869	Emergency stop switch label (1)	
41	22872	Contact block, 1 NC w/ latch (1)	Figure 2-9 on page 16
42	22873	Contact block, 1 NC w/o latch (1)	Figure 2-9 on page 16
43	22871	Contact block, 1 NO w/o latch (2)	
44	22866	Batching switch (1)	Figure 2-8 on page 15
46	22870	Contact block, 1 NO w/ latch (1)	Figure 2-9 on page 16
47	22883	Holder for batching switch legend plate (1)	Figure 2-8 on page 15
50	15436	Power cord plug (1)	Figure 2-8 on page 15
54	22889	Terminal block, universal (39)	Figure 2-9 on page 16
58	43363	Legend plate for batching switch (1)	Figure 2-8 on page 15
59	34711	Kep nut, 1/4-20 hex, for ground stud (1)	Figure 2-9 on page 16
61	43383	Terminal block mounting rail (1)	
62	45079	Input relay modules,5VDC, G4IDC5D (2)	
63	15971	Output relay modules, G40AC5, 115 VAC operation (7)	
	36632	Output relay modules, G40AC5A, 230 VAC operation (7)	
64	15972	Input relay modules, G4IAC5, 115 VAC operation (7)	
	36631	Input relay modules, G4IAC5A, 230 VAC operation (7)	
65	16892	Earth/ground label (1)	
66	16903	Model/serial number label (1)	—
67	15340	Nutserts, 6-32UNC, for relay board (4)	Figure 2-9 on page 16
68	33760	Nutserts, 8-32UNC, for terminal block (2)	
69	34035	IQ plus 810 CPU board assembly (1)	Figure 2-10 on page 17
70	22882	Round hole plugs (2)	Figure 2-8 on page 15
72	43362	EPROM (1)	Figure 2-10 on page 17
73	15785	37-pin connector for expansion board	Figure 2-9 on page 16
—	43380	Batching switch cable assembly (1)	—
—	32391	Power cord, 3-conductor, terminal block-to-indicator (1)	
	15643	Heat shrink tubing (2)	
	15694	Eye connector, No. 8 (3)	
—	35993	250 mA radial lead, Slo-Blo subminiature fuse, 115 VAC operation (1)	
	35994	125 mA radial lead, Slo-Blo subminiature fuse, 230 VAC operation (1)	
Caution	*For protection against risk of fire, replace fuses only with same type and rating fuse.*		

Table 2-8. Replacement Parts (Continued)

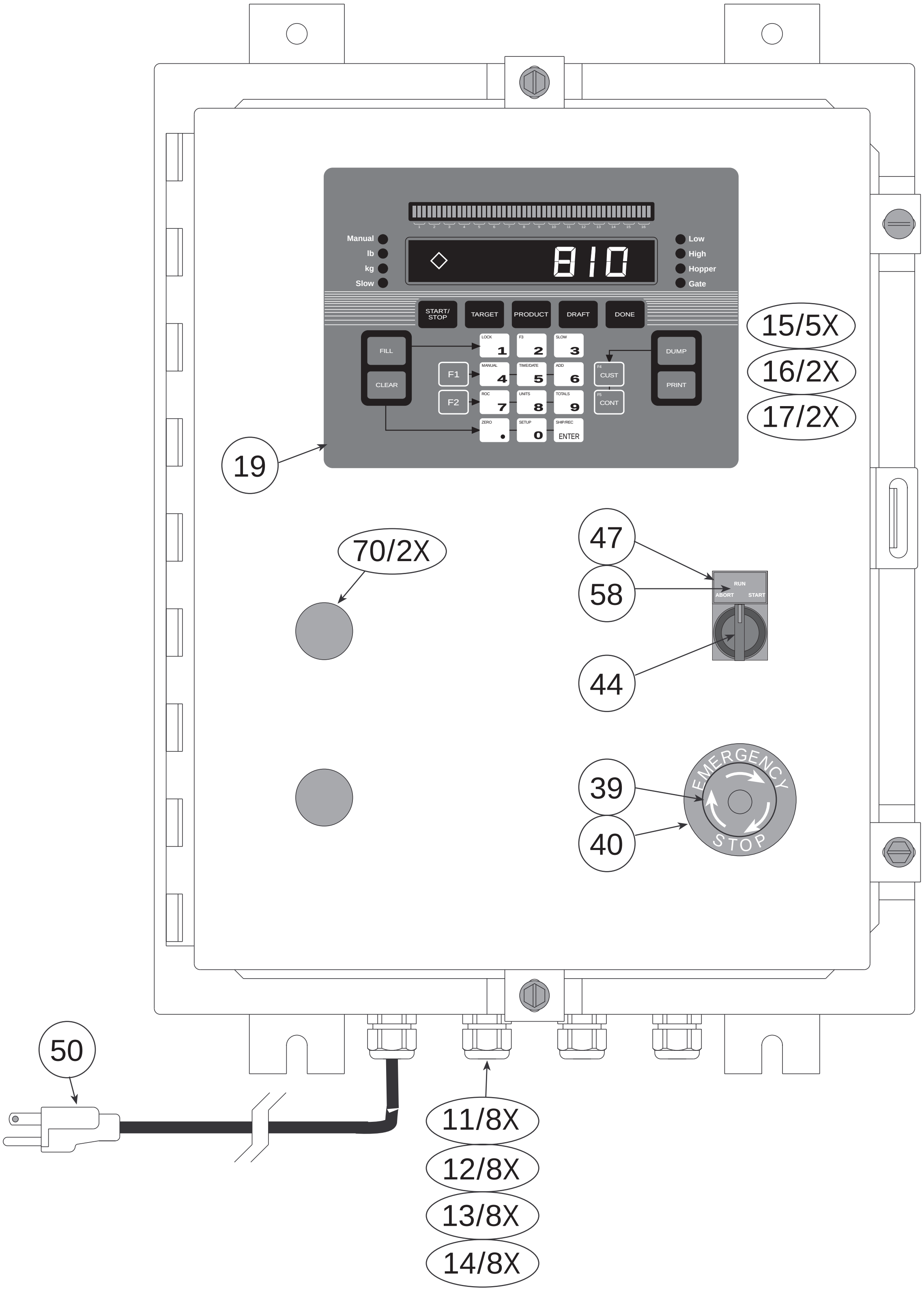


Figure 2-8. Enclosure and Switches

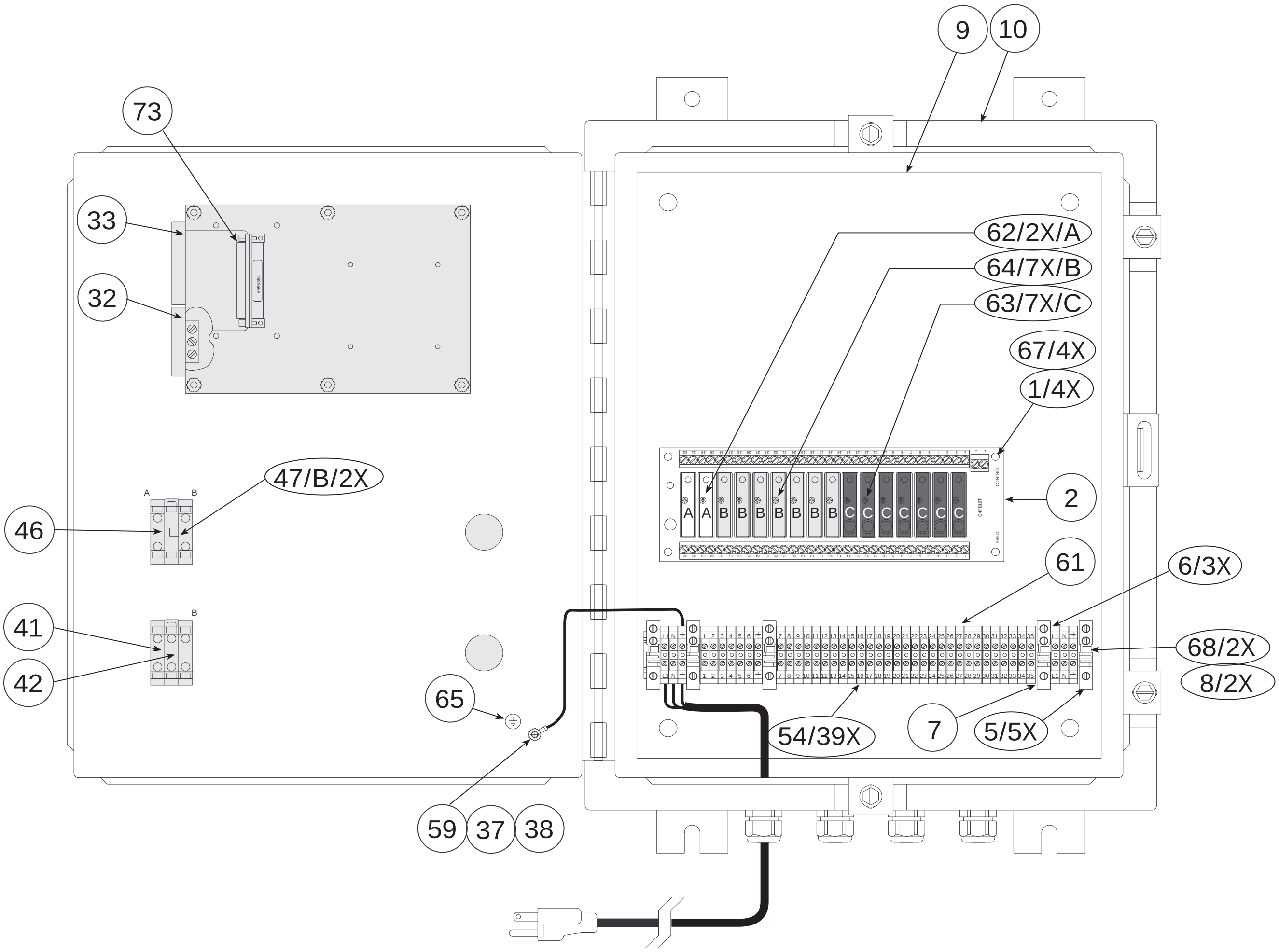


Figure 2-9. Internal Components

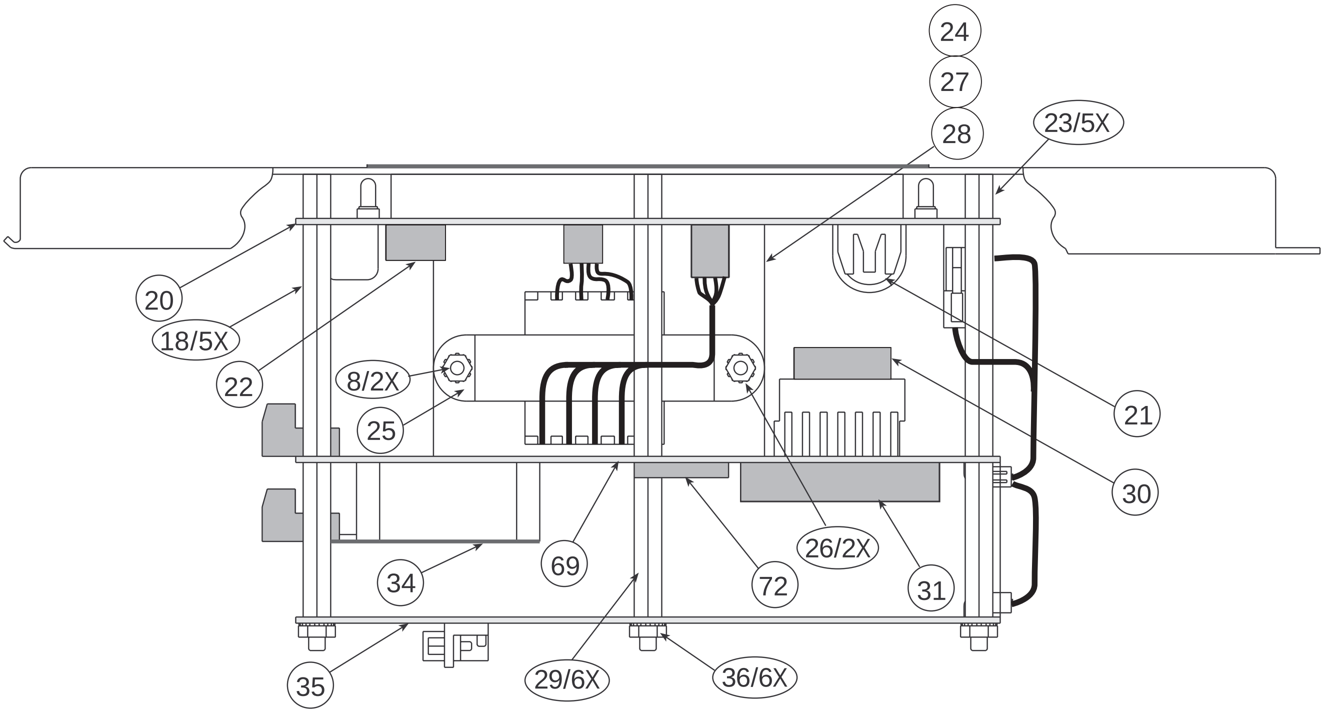


Figure 2-10. Indicator Assembly

2.8 BWC-1 Wall Mounting

To permanently mount the BWC-1 to a wall, Underwriters Laboratories (UL) requires that you run the AC power cord in conduit and connect it to the case with a 1/2-inch conduit hub (PN 15645) according to standard construction practices. For portable units, the standard power cord is sufficient.

Figure 2-11 shows a typical method for mounting the indicator which maintains its portability. Use the installation screws to secure four #10 wall anchors. Then remove the installation screws and attach the indicator with four threaded eye bolts.

Figure 2-12 on page 18 shows the BWC-1 enclosure dimensions.

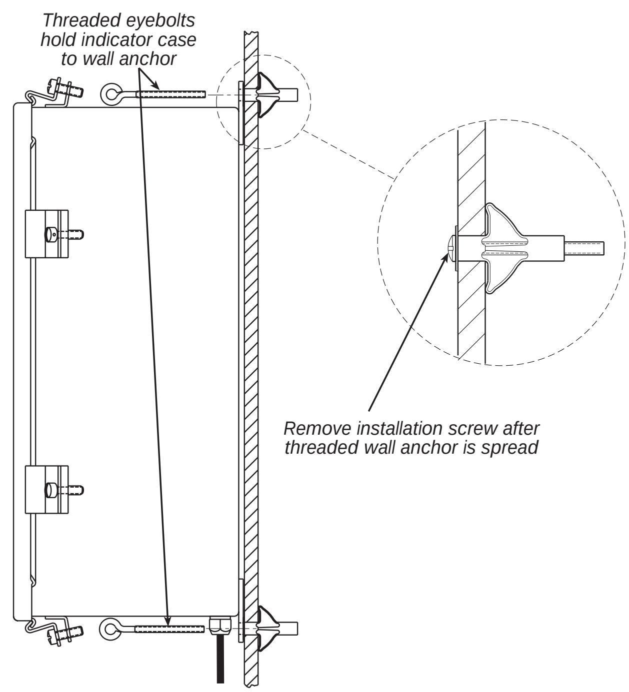


Figure 2-11. BWC-1 Wall Mounting

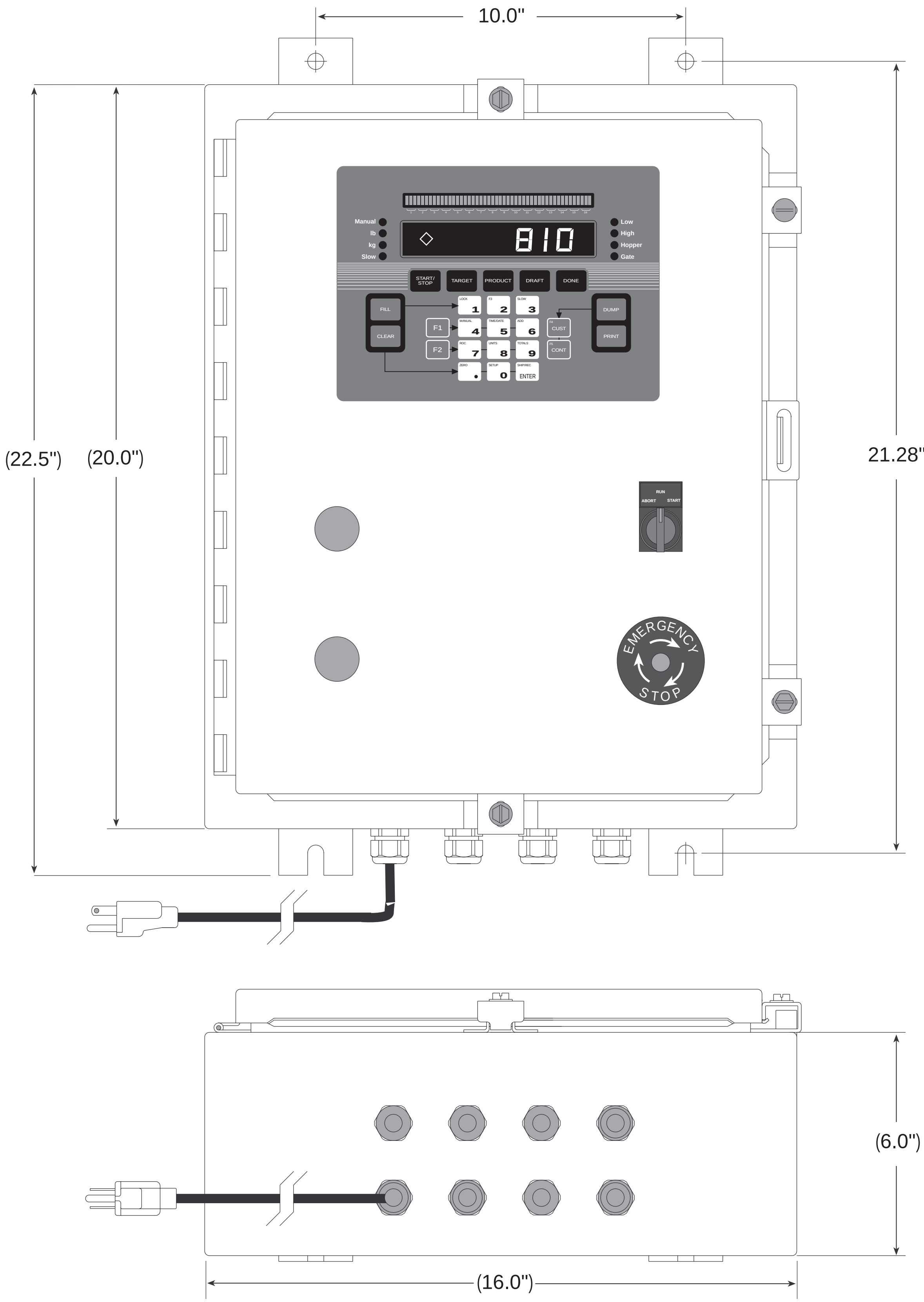
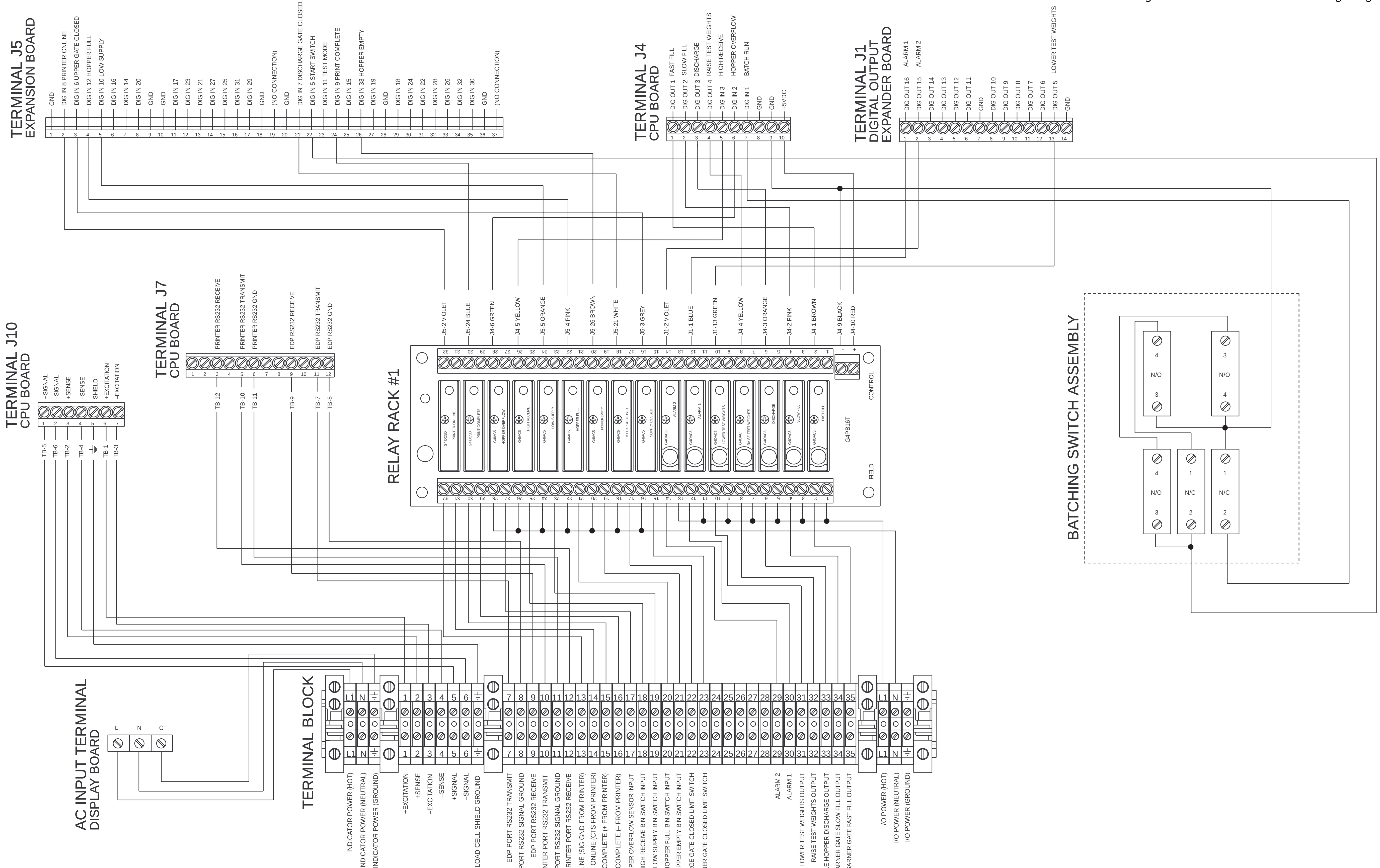


Figure 2-12. BWC-1 Mounting Dimensions

Figure 2-13. BWC-1 Controller Wiring Diagram



3.0 Configuration

The BWC-1 has two configuration modes:

- Setup mode allows full configuration of the controller. Once a legal-for-trade seal has been applied to the controller, setup mode can be accessed only by breaking the seal. Optional password protection can be used to prevent unauthorized changes to the controller configuration.
- Operator setup mode allows access to the product database only, but can be used without breaking a legal-for-trade seal. Optional password protection can be used to restrict changes to the product database.

Setup Mode

To fully configure the BWC-1, the indicator must be placed in setup mode. The setup switch is located on the top edge of the vertically-mounted CPU board, near the middle of the board. Moving the two-position setup switch toggles between setup and normal mode.

When the indicator is placed in setup mode, the word *CONFIG* is shown on the display. The CONFIG menu is the first of the main menus used to configure the controller. Detailed descriptions of these menus are given in Section 3.2. When configuration is complete, return the setup switch to the run position.

Access to setup mode can be restricted by specifying a configuration password of up to seven digits (see the description of the CFG PWD parameter on the CONFIG menu on page 24).

Operator Setup Mode

Operator setup mode provides access to all of the PRODUCT menu parameters (see Section 3.2.4 on page 30), allowing the operator to add products and customize various product transaction characteristics. To enter operator setup mode, press and hold the CLEAR key, then press 0 (SETUP) on the numeric keypad. To exit operator setup mode, press DONE.

Access to operator setup mode can be restricted by specifying a configuration password of up to seven digits (see the description of the SETUPPWD parameter on the CONFIG menu on page 24).

3.1 Configuration Methods

The BWC-1 can be configured by using the front panel keys to navigate through a series of configuration menus or by sending commands or configuration data to the EDP port. Configuration using the menus is described in Section 3.1.2.

3.1.1 EDP Command Configuration

The EDP command set can be used to configure the BWC-1 using a personal computer, terminal, or remote keyboard to send EDP commands to the indicator EDP port. EDP commands can be sent using any external device capable of sending ASCII characters over a serial connection.

EDP commands duplicate the functions available using the indicator front panel and provide some functions not otherwise available. EDP commands can be used to simulate pressing front panel keys, to configure the indicator, or to dump lists of parameter settings. See Section 6.0 on page 50 for more information about using the EDP command set.

3.1.2 Front Panel Configuration

The BWC-1 can be configured using a series of menus accessed through the front panel when the indicator is in setup mode. Table 3-1 provides a summary of the configuration functions provided by each of these menus.

Menu		Menu Function
CONFIG	Configuration	Configure scale and select general indicator functions. CONFIG menu is used to set grads, zero tracking, zero range, motion band, overload, digital filtering, empty hopper verification, restart and power-up characteristics, initial transaction and consecutive numbers, passwords, to enter or exit test mode, and to reset configuration parameters to their default values.
SET ALG	Set Analog	Select channel speed and resolution, AC frequency, and analog filtering.
FORMAT	Format	Set display format (units, decimal point position, display divisions) for primary, secondary, and rate-of-change weight displays, time and date information.
PRODUCT	Product	Define product characteristics, including product ID and name, draft sizes, preact values, product-specific units, accumulator, and slow material fill detection parameters.

Table 3-1. BWC-1 Menu Summary

Menu		Menu Function
ALARMS	Alarms	Assign digital outputs and transaction run characteristics associated with alarm conditions.
SERIAL	Serial	Configure EDP, printer, and auxiliary communications ports.
P FORMT	Print Format	Specify formats used for printed output. See Section 7.0 for more information about print formatting.
DIG IN	Digital Input	Assign digital input functions.
BAR GRF	Bar Graph	Configure bar graph function. Used only if bar graph option is installed.
CALIBRT	Calibrate	Calibrate input channel. See Section 4.0 on page 43 for calibration information.
VERSION	Version	Displays installed software version number.

Table 3-1. BWC-1 Menu Summary (Continued)

Four front panel keys are used as directional keys to navigate through the menus in setup mode (see Figure 3-1). The DUMP and PRINT keys scroll left and right (horizontally) on the same level; FILL and CLEAR move up and down (vertically) to different menu levels.

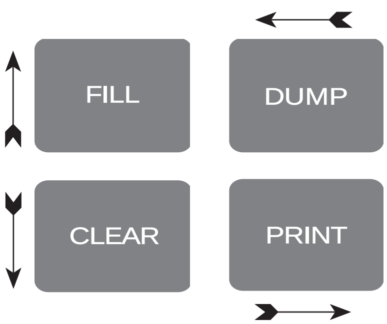


Figure 3-1. Menu Navigation Keys

To select a parameter, press DUMP or PRINT until the desired menu group appears on the display, then press CLEAR to move down to the desired level. When moving down through the menus, the default setting appears first on the display. To change a default, scroll left or right through the various options for that level. When the desired option appears on the display, press FILL to lock in your selection and move back up one level. For parameters requiring a numerical entry, key in the number, press ENTER, and scroll up to lock in the number.

3.2 Menu Structures and Parameter Descriptions

The following sections provide graphic representations of the BWC-1 menu structures (Figures 3-2 through 3-12). In the actual menu structure, the settings you choose under each parameter are arranged horizontally. To save page space, menu choices are shown in vertical columns. The factory default setting appears at the top of each column. Settings shown surrounded by a dotted-line box only appear under the special circumstances explained under each box.

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

3.2.1 Configuration Menu

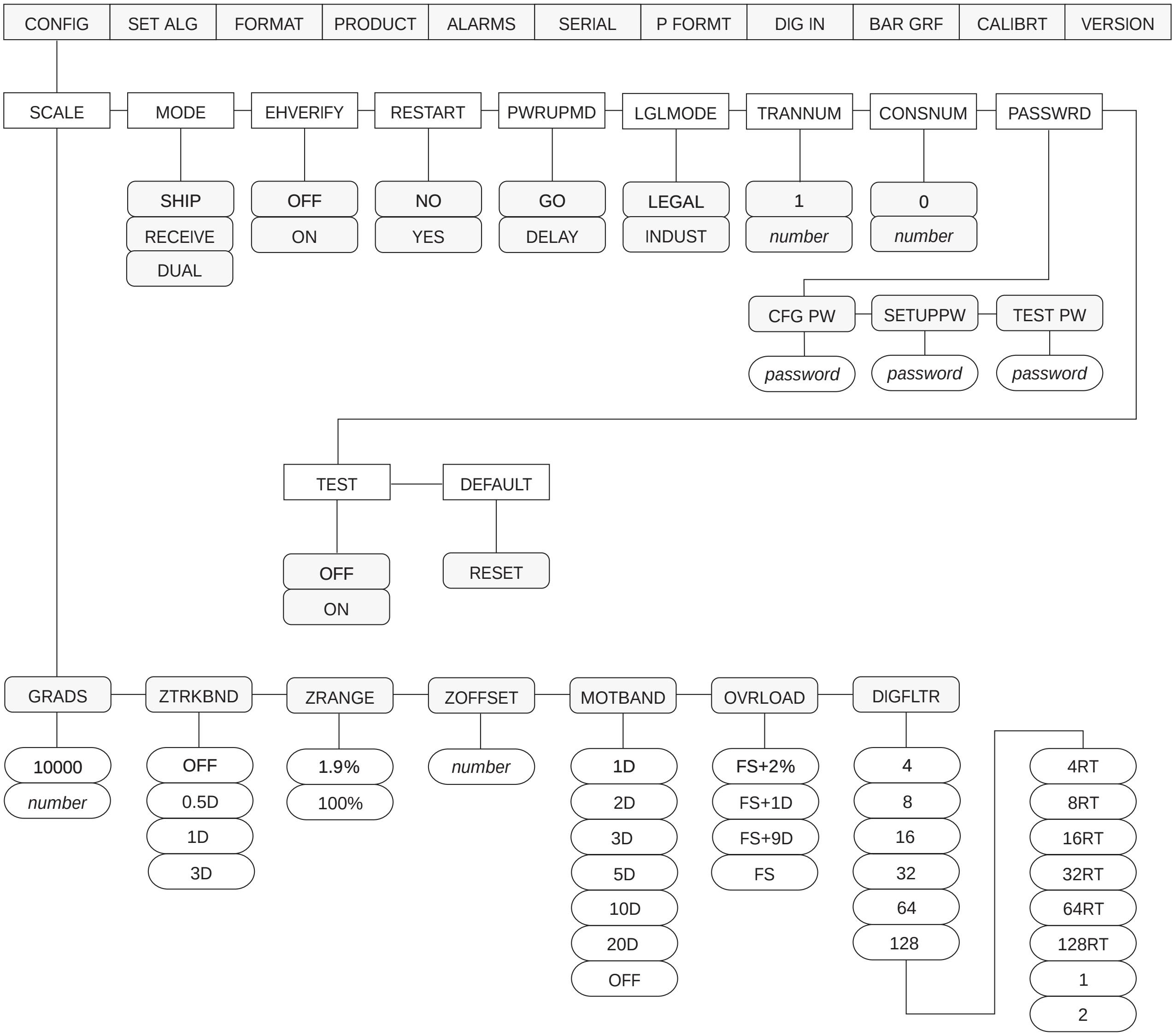


Figure 3-2. Configuration Menu

CONFIG Menu		
Parameter	Choices	Description
Level 2 submenus		
SCALE	GRADS ZTRKBND ZRANGE MOTBAND OVRLOAD DIGFLTR	Specifies scale setup parameters. See level 3 submenus for configuration choices.
MODE	SHIP RECEIVE DUAL	Operating mode. Specifies whether the default operating mode is shipping only, receiving only, or both.

Table 3-2. Configuration Menu Parameters

CONFIG Menu		
Parameter	Choices	Description
EHVERFY	OFF ON	Empty hopper verification. Specifies whether the operator must verify the hopper is empty at the end of a transaction. If verification is turned on, the indicator flashes a *CLEAN* message at the end of the transaction. To continue, the operator must verify the hopper is empty and press the DONE key.
RESTART	NO YES	Specifies whether a transaction should be restarted after a power outage.
PWRUPMD	GO DELAY	Power up mode. In GO mode, the scale goes into operation immediately after a brief power up display test. In DELAY mode, the scale performs a power up display test, then warms up (WARM UP and standstill symbol displayed). Indicator becomes operational when no motion is detected for 30 seconds. DELAY mode is used where local regulations require a warm-up period.
LGLMODE	LEGAL INDUST	Legal/industrial mode. Controls how minimum draft weights are calculated. See Section 5.6.3 on page 48 for more information.
TRANNUM	1 *number*	Transaction number. Sets the starting transaction number. This value is automatically incremented after each transaction.
CONSNUM	0 *number*	Consecutive numbering. Specifies starting value for sequential numbering used to serialize ticket numbers. The consecutive number can be printed on any print ticket; value is incremented after it is printed. If consecutive number is not printed, it is effectively disabled. The CONSECNUM EDP command allows you to view or change consecutive numbers.
PASSWRD	CFG PWD SETUPPWD TEST PWD	Passwords. Specify passwords to allow operator access to setup mode using the rear switch (CFG PWD), the front panel SETUP key (SETUPPWD), and test mode. Enter up to seven digits for each password.
TEST	OFF ON	Use to enter and exit bench test mode. Test mode ignores interlocks and learned preact values.
DEFAULT	RESET	Press the down (TIME/DATE) key to reset configuration parameters to default values. NOTE: *Indicator must be reconfigured and load cells recalibrated after performing this function.*
Level 3 submenus		
GRADS	*number*	Graduations. Specifies the number of full scale graduations. The value entered should be consistent with legal requirements and environmental limits on system resolution. Enter a value with the numeric keypad; exit upward to save the new value. To calculate GRADS, use the formula, GRADS = Capacity / Display Divisions. Display divisions for primary and secondary units are specified on the FORMAT menu.
ZTRKBND	OFF 0.5 D 1 D 3 D	Zero track band. Automatically zeroes the scale when within the range of specified, as long as the input is within the ZRANGE and scale is at standstill. Selections are ± display divisions. Maximum legal value varies depending on local regulations.
ZRANGE	1.9% 100%	Zero range. Selects the range within which the scale can be zeroed. The 1.9% selection is ± 1.9% around the calibrated zero point, for a total range of 3.8%. Indicator must be in standstill and in gross weight display mode to zero the scale. Use 1.9% for legal-for-trade applications
ZOFFSET	*number*	Zero offset. Use to prevent display or print of negative gross values. The value specified is added to the current zero value to arrive at the displayed or printed weight.

Table 3-2. Configuration Menu Parameters (Continued)

CONFIG Menu		
Parameter	Choices	Description
MOTBAND	1D 2 D 3 D 5 D 10 D 20 D OFF	Motion band. Sets the level, in display divisions, at which scale motion is detected by comparing the current display with the previous display. If motion is not detected for 1 second or more, the standstill symbol lights, enabling the scale to process a PRINT command. Maximum legal value varies depending on local regulations. If OFF is selected, ZTRKBAND must also be set to OFF.
OVRLOAD	FS + 2% FS + 1D FS + 9D FS	Overload. 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.
DIGFLT	4 8 16 32 64 128 4 RT 8 RT 16 RT 32 RT 64 RT 128 RT 1 2	Digital filtering. Selects the digital filtering rate used to reduce the effects of mechanical vibration from the immediate area of the indicator. 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. RATTLETRAP® selections (shown with “RT” after the number) are most effective at filtering repeating vibrations caused by mechanical noise from nearby machines but increase settling times over standard digital filter selections. See Section 8.5.2 on page 66 for more information on digital filtering.

Table 3-2. Configuration Menu Parameters (Continued)

3.2.2 Set Analog Menu

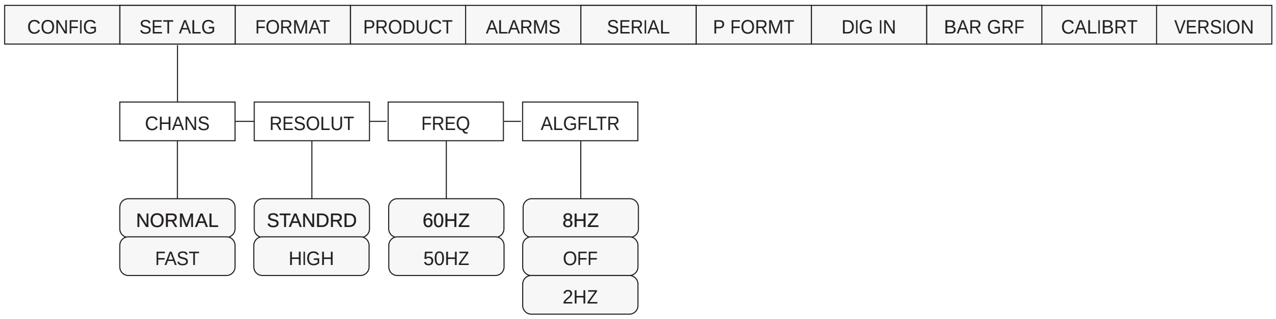


Figure 3-3. Set Analog Menu

SET ALG Menu		
Parameter	Choices	Description
Level 2 submenus		
CHANS	NORMAL FAST	Selects the channel speed. For standard units, use NORMAL (20 A/D conversions/second). If the Jetpak option is installed, specify FAST for an update rate of 100/second.
RESOLUT	STANDRD HIGH	Resolution. Selects between standard (360 000 grads a t 120V, 60 Hz, 20 updates/sec) and high resolution (740 000 grads at 120V, 60 Hz, 10 updates/sec). Internal resolution is increased by 20% with 50 Hz AC power supply.
FREQ	60 HZ 50 HZ	Frequency. Sets the A/D converter to match AC power supply.
ALGFLTR	8 HZ OFF 2 HZ	Analog filter. Selects the range used for filtering mechanical and electrical noise. 8 Hz value has a medium filtering effect; 2 Hz has the greatest effect. Normally, the minimum filter value that allows a stable display should be selected. If digital filtering is also used, select either 2 Hz or 8 Hz for this parameter. See Section 8.5.1 on page 66 for more information about analog filtering.

Table 3-3. Set Analog Menu Parameters

3.2.3 Format Menu

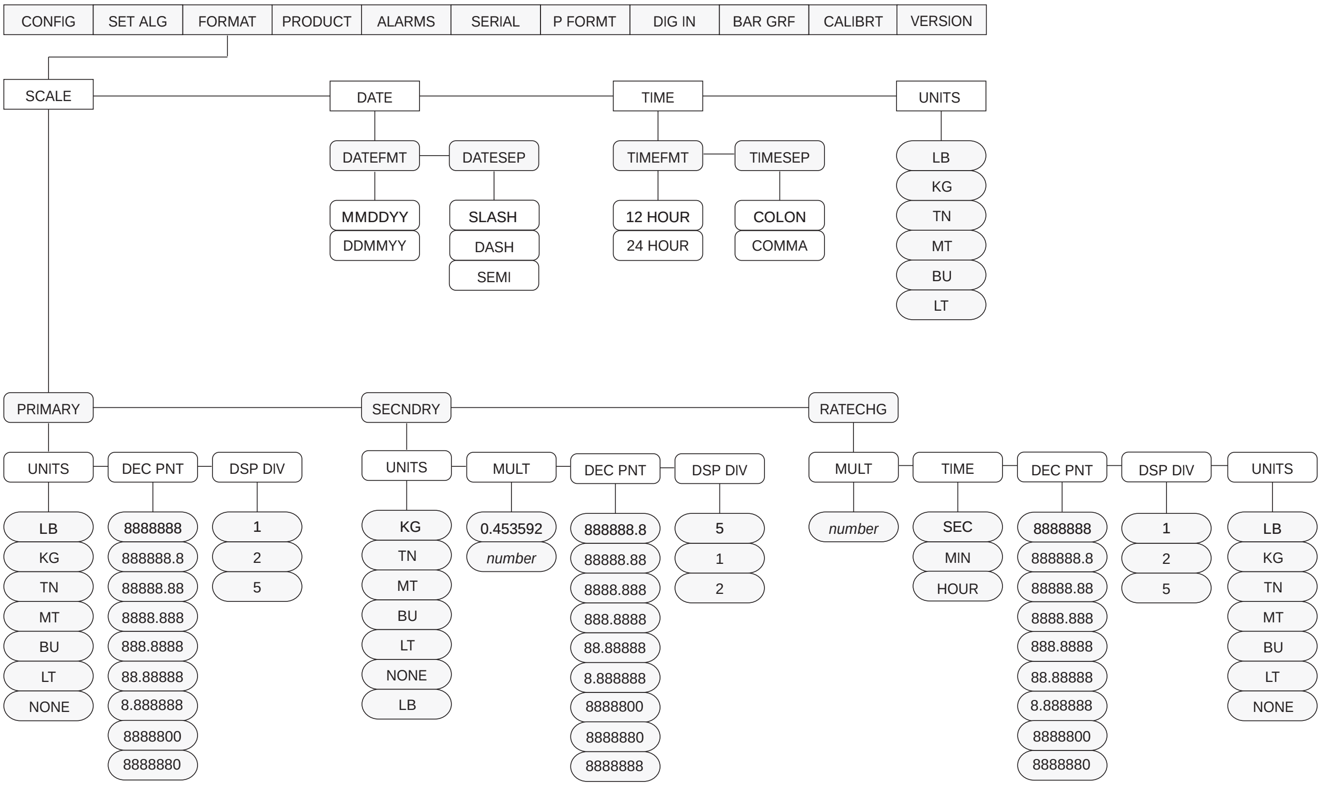


Figure 3-4. Format Menu

FORMAT Menu		
Parameter	Choices	Description
Level 2 submenus		
SCALE	PRIMARY SECNDRY RATECHG	Selects the format for an analog input channel, including primary, secondary, and rate of change units used to display weight data for each channel.
DATE	DATEFMT DATESEP	Allows selection of date format and separator character.
TIME	TIMEFMT TIMESEP	Allows selection of time format and separator character.
UNITS	LB KG TN MT BU LT	Allows customization of default units identifiers for displayed and printed weights. Default values (LB=pound; KG=kilogram; TN=ton; MT=metric ton; BU=bushel; LT=liter) can be modified using the procedure described for the P FORMT menu. Customized identifiers are listed in the UNITS subparameter values for primary, secondary, and ROC parameters.
Level 3 submenus		
PRIMARY	UNITS DEC PNT DSP DIV	Allows selection of display divisions, decimal point location, and units for the primary units.

Table 3-4. Format Menu Parameters

FORMAT Menu		
Parameter	Choices	Description
SECNDRY	UNITS MULT DEC PNT DSP DIV	Allows selection of display divisions, decimal point location, units, and multiplier for secondary units.
RATECHG	MULT TIME DEC PNT DSP DIV UNITS	Allows selection of units, display divisions, decimal point location, multiplier, and time for the rate of change (ROC) function.
DATEFMT	MMDDYY DDMMYY	Date format. Specifies the format in which the date is printed and displayed, either month/day/year, or day/month/year.
DATESEP	SLASH DASH SEMI	Date separator. Specifies the separator character between the day, month, and year when the date is printed. The display always uses a period (.) as the date separator.
TIMEFMT	12 HOUR 24 HOUR	Time format. Specifies the format in which the time is displayed and printed, either in 12-hour or 24-hour format. The actual setting of time is done through the front panel TIME/DATE key, and is always entered in 24-hour format.
TIMESEP	COLON COMMA	Time separator. Specifies the separator character between the minutes and hours when the time is printed. The display always uses a period (.) as the time separator.
Level 4 submenus		
Primary Units		
UNITS	LB KG TN MT BU LT NONE	Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; TN=ton; MT=metric ton; BU=bushel; LT=liter; NONE=none.
DEC PNT	8888888 888888.8 88888.88 8888.888 888.8888 88.88888 8.888888 8888800 8888880	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.
DSP DIV	1 2 5	Display divisions. Selects the minimum division size for the primary units displayed weight.
Secondary Units		
UNITS	KG TN MT BU LT NONE LB	Specifies secondary units for displayed and printed weight. Values are: KG=kilogram TN=ton; MT=metric ton; BU=bushel; LT=liter; NONE=none; LB=pound.

Table 3-4. Format Menu Parameters (Continued)

FORMAT Menu		
Parameter	Choices	Description
MULT	0.453592 *Enter other choices via keyboard*	Multiplier. Specifies the conversion factor by which the primary units are multiplied by to obtain the secondary units. The default is 0.453592, which is the conversion factor for changing pounds to kilograms. Section 8.4 on page 65 for a list of multipliers. To toggle between primary and secondary units, press the UNITS key.
DEC PNT	888888.8 88888.88 8888.888 888.8888 88.88888 8.888888 8888880 8888888	Decimal point location. Determines the location of the decimal point or dummy zeros in the display.
DSP DIV	5 1 2	Display divisions. Selects the value of minimum division size of the displayed weight.
Rate of Change Units		
MULT	1.0000 *Enter other choices via keyboard*	Multiplier. Specifies the conversion factor by which the primary units are multiplied by to obtain the rate of change units. The default is 1.0000. Section 8.4 on page 65 for a list of multipliers.
TIME	SEC MIN HOUR	Specifies time units for the rate of change function.
DEC PNT	8888888 888888.8 88888.88 8888.888 888.8888 88.88888 8.888888 8888800 8888880	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.
DSP DIV	1 2 5	Display divisions. Selects the minimum division size for the rate of change units displayed weight.
UNITS	LB KG TN MT BU LT NONE	Specifies primary units for displayed and printed weight. Values are: LB=pound; KG=kilogram; TN=ton; MT=metric ton; BU=bushel; LT=liter; NONE=none.

Table 3-4. Format Menu Parameters (Continued)

3.2.4 Product Menu

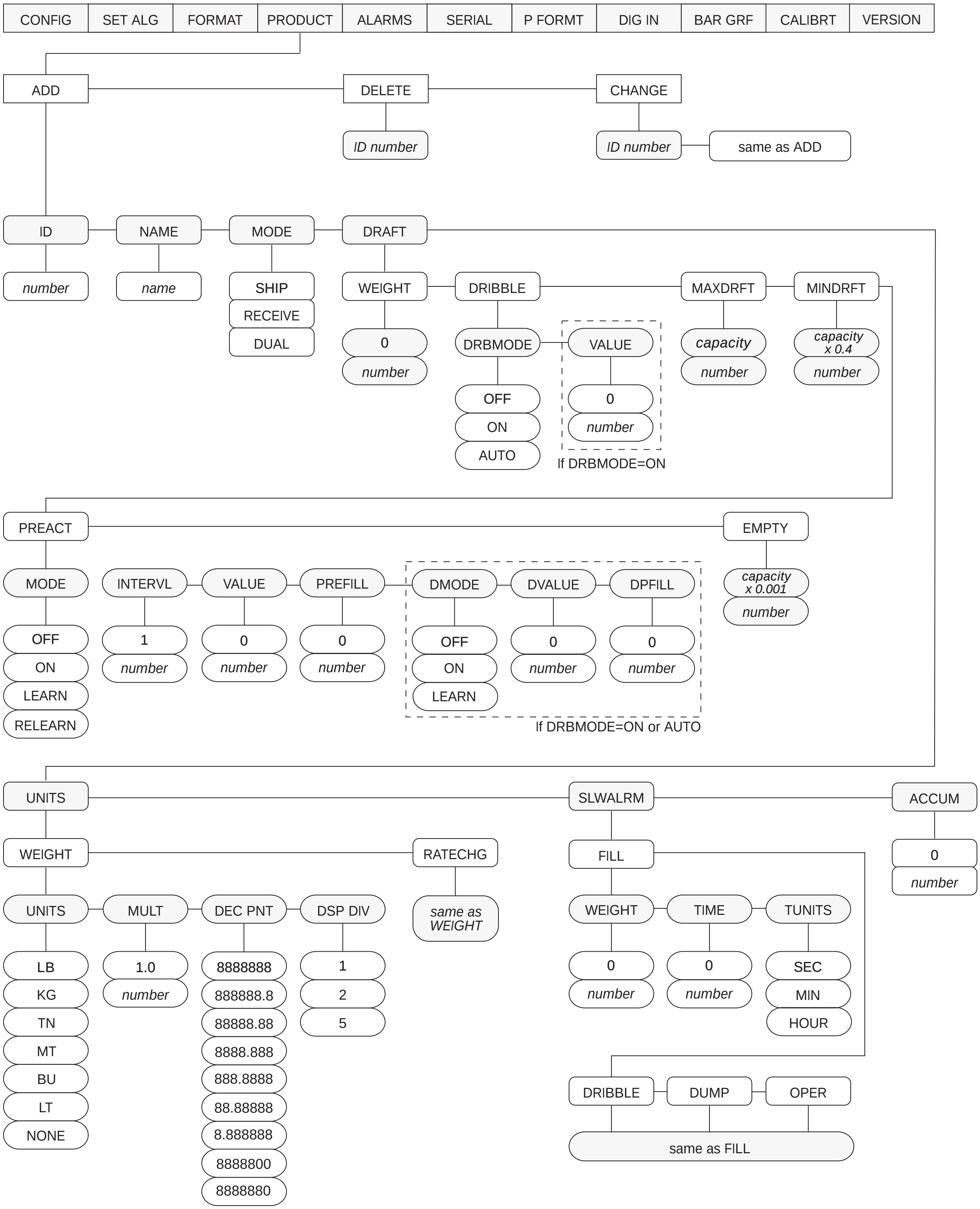


Figure 3-5. Product Menu

PRODUCT Menu		
Parameter	Choices	Description
Level 2 submenus		
ADD	ID NAME MODE DRAFT UNITS SLWALRM ACCUM	Add new product description to the product database.
DELETE	*ID number*	Delete product from database. Use the DUMP and PRINT keys to scroll through existing product IDs. Press CLEAR to delete selected product.
CHANGE	*ID number*	Change existing product description in the product database. Use the DUMP and PRINT keys to scroll through existing product IDs. Press CLEAR to select the product description to change.
Level 3 submenus		
ID	*number*	Specify the numeric product ID.
NAME	*name*	Specify the product name, using up to 16 characters. Press CLEAR to enter a new product name using the method described for defining print formats (see Figure 3-8 on page 38) or use the CUST and CONT keys to scroll through a list of predefined product names. Predefined product names include: ALFALFA, BARLEY, BEANS, BRAN, CORN, COAL, FLAX, GRAVEL, HOPS, LIME, OATS, PEANUTS, RICE, RYE, SALT, SAND, SCRAP, SORGHAM, STONE, SUNFLOWERS, and WHEAT.
MODE	SHIP RECEIVE DUAL	Specify the operating mode for this product. If DUAL is selected, the operator can switch between shipping and receiving mode using the SHIP/REC key (CLEAR+ENTER) on the front panel.
DRAFT	WEIGHT DRIBBLE MAXDRFT MINDRFT PREACT EMPTY	Allows specification of product drafting parameters.
UNITS	WEIGHT RATECHG	Allows specification of units used for product-specific weight and flow rate displays.
SLWALRM	FILL DRIBBLE DUMP OPER	Allows specification of detection parameters for slow material flow during fill, dribble fill, dump, and transaction processes for this product.
ACCUM	0 *number*	Set product accumulator value.
Level 4 submenus		
DRAFT/WEIGHT	0 *number*	Specify default draft weight. See Section 5.6.3 on page 48 for more information about how the BWC-1 determines actual draft weights.
DRAFT/DRIBBLE	DRBMODE VALUE	Allows specification of dribble (slow) fill mode and slow fill value.
DRAFT/MAXDRFT	*capacity* *number*	Maximum draft size. Default value is 100% of scale capacity.
DRAFT/MINDRFT	*capacity x 0.4* *number*	Minimum draft size. Default value is 40% of scale capacity.

Table 3-5. Product Menu Parameters

PRODUCT Menu		
Parameter	Choices	Description
DRAFT/PREACT	MODE INTERVL VALUE PREFILL DMODE DVALUE DPFILL	Allows specification of preact parameters. Dribble mode preact parameters (DMODE, DVALUE, and DPFILL) are shown only if DRBMODE= ON or AUTO.
DRAFT/EMPTY	*capacity x 0.001* *number*	Empty scale value. Specifies a value above zero gross weight at which a dump operation is assumed to be finished if the scale is at standstill. This value is used to allow for material build-up or heels. The default value is one-thousandth of scale capacity.
UNITS/WEIGHT	UNITS MULT DEC PNT DSP DIV	Allows specification of units, multiplier, decimal point location, and display divisions for product-specific units.
UNITS/RATECHG	*same as UNITS/ WEIGHT*	Allows specification of units, multiplier, decimal point location, and display divisions for product-specific rate of change function.
SLWALRM/FILL	WEIGHT TIME TUNITS	Allows specification of slow material flow limits for fill operations.
SLWALRM/DRIBBLE	*same as SLWALRM/ FILL*	Allows specification of slow material flow limits for dribble fill operations.
SLWALRM/DUMP		Allows specification of slow material flow limits for dump operations.
SLWALRM/OPER		Allows specification of slow material flow limits for transactions.
Level 5 submenus		
DRIBBLE/ DRBMODE	OFF ON AUTO	Dribble mode. Specifies whether slow fill is enabled for this product. AUTO calculates the dribble weight value based on material flow rate.
DRIBBLE/VALUE	0 *number*	Dribble mode value. Specifies weight to be filled at the slow (dribble fill) rate. This parameter is shown only if DRBMODE=ON.
PREACT/MODE	OFF ON LEARN RELEARN	Preact mode. Specifies the type of preact, if any, used to close the supply gate before reaching the target weight. Preact allows for material in suspension after the gate is closed. LEARN mode automatically adjusts the preact value to correct for overfill or underfill. RELEARN functions like LEARN mode, but resets the preact value at the start of each transaction See Section 5.6.4 on page 48 for more information about using preact.
PREACT/INTERVL	1 *number*	Preact interval. Specifies the estimated length of time, in .05-second intervals, material remains in suspension when the supply gate is closed. If a non-zero value is specified for this parameter, the VALUE parameter is not used. This parameter is valid only if MODE=ON, LEARN, or RELEARN.
PREACT/VALUE	0 *number*	Preact value. Specifies the estimated weight of material in suspension when the supply gate is closed. This value is not used if INTERVL is specified. This parameter is valid only if MODE=ON, LEARN, or RELEARN.
PREACT/PREFILL	0 *number*	Prefill value. Specifies the delay, in 0.1-second intervals, between the time the first supply gate is opened and weight checking begins.

Table 3-5. Product Menu Parameters (Continued)

PRODUCT Menu		
Parameter	Choices	Description
PREACT/DMODE	OFF ON LEARN	Dribble fill preact mode. Specifies the type of preact, if any, used to close the supply gate before reaching the target weight in dribble fill mode. Preact allows for material in suspension after the gate is closed. LEARN mode automatically adjusts the preact value to correct for overfill or underfill. This parameter is valid only if DRBMODE=ON or AUTO. See Section 5.6.4 on page 48 for more information about using preact.
PREACT/DVALUE	0 *numbe*r	Dribble fill preact value. Specifies the estimated weight of material in suspension when the supply gate is closed. This parameter is valid only if DRBMODE=ON or AUTO and DMODE=ON or LEARN.
PREACT/DPFILL	0 *numbe*r	Dribble fill prefill. Specifies the delay, in 0.1-second intervals, between the time the dribble fill supply gate is opened and weight checking begins. This parameter is valid only if DRBMODE=ON or AUTO and DMODE=ON or LEARN.
WEIGHT/UNITS	LB KG TN MT BU LT NONE	Specifies the units used to display weight data for this product. Values are: LB=pound; KG=kilogram; TN=ton; MT=metric ton; BU=bushel; LT=liter; NONE=none.
WEIGHT/MULT	1.0 *number*	Specifies the multiplier used to convert primary units (see Section 3.2.3 on page 27) to product-specific units. See Section 8.4 on page 65 for more information about conversion factors.
WEIGHT/DEC PNT	8888888 888888.8 88888.88 8888.888 888.8888 88.88888 8.888888 8888800 8888880	Specifies the location of the decimal point or dummy zeroes in the product-specific weight display.
WEIGHT/DSP DIV	1 2 5	Specifies the minimum division size for the product-specific weight display.
RATECHG/UNITS	LB KG TN MT BU LT NONE	Specifies the units used to display rate of change data for this product. Values are: LB=pound; KG=kilogram; TN=ton; MT=metric ton; BU=bushel; LT=liter; NONE=none.
RATECHG/MULT	1.0 *number*	Specifies the multiplier used to convert primary units (see Section 3.2.3 on page 27) to rate-of-change units. See Section 8.4 on page 65 for more information about conversion factors.

Table 3-5. Product Menu Parameters (Continued)

PRODUCT Menu		
Parameter	Choices	Description
RATECHG/DEC PNT	8888888 888888.8 88888.88 8888.888 888.8888 88.88888 8.888888 8888800 8888880	Specifies the location of the decimal point or dummy zeroes in the rate of change display.
RATECHG/DSP DIV	1 2 5	Specifies the minimum division size for the rate of change display.
FILL/WEIGHT	0 *number*	Specify the weight value used for detecting slow material flow conditions during fill operations for this product. If the material flow rate (WEIGHT/TIME) is not maintained during a fill operation, the action specified for the SLWDRFT alarm is performed (see Section 3.2.5 on page 35).
FILL/TIME	0 *number*	Specify the time value used for detecting slow material flow conditions during fill operations for this product.
FILL/TUNITS	SEC MIN HOUR	Specify the time units used for the fill TIME parameter value.
DRIBBLE/WEIGHT	0 *number*	Specify the weight value used for detecting slow material flow conditions during dribble fill operations for this product. If the material flow rate (WEIGHT/TIME) is not maintained during a dribble fill operation, the action specified for the SLWDRFT alarm is performed (see Section 3.2.5 on page 35).
DRIBBLE/TIME	0 *number*	Specify the time value used for detecting slow material flow conditions during dribble fill operations for this product.
DRIBBLE/TUNITS	SEC MIN HOUR	Specify the time units used for the dribble fill TIME parameter value.
DUMP/WEIGHT	0 *number*	Specify the weight value used for detecting slow material flow conditions during dump operations for this product. If the material flow rate (WEIGHT/TIME) is not maintained during a fill operation, the action specified for the SLWDUMP alarm is performed (see Section 3.2.5 on page 35).
DUMP/TIME	0 *number*	Specify the time value used for detecting slow material flow conditions during dump operations for this product.
DUMP/TUNITS	SEC MIN HOUR	Specify the time units used for the dump TIME parameter value.
OPER/WEIGHT	0 *number*	Specify the weight value used for detecting slow material flow conditions during transaction processes for this product. OPER parameters are used to monitor the total material passed through the hopper since the start of the transaction. If the material flow rate (WEIGHT/TIME) is not maintained during the transaction, the action specified for the SLWOPER alarm is performed (see Section 3.2.5 on page 35).
OPER/TIME	0 *number*	Specify the time value used for detecting slow material flow conditions during transaction processes for this product.
OPER/TUNITS	SEC MIN HOUR	Specify the time units used for the transaction TIME parameter value.

Table 3-5. Product Menu Parameters (Continued)

3.2.5 Alarms Menu

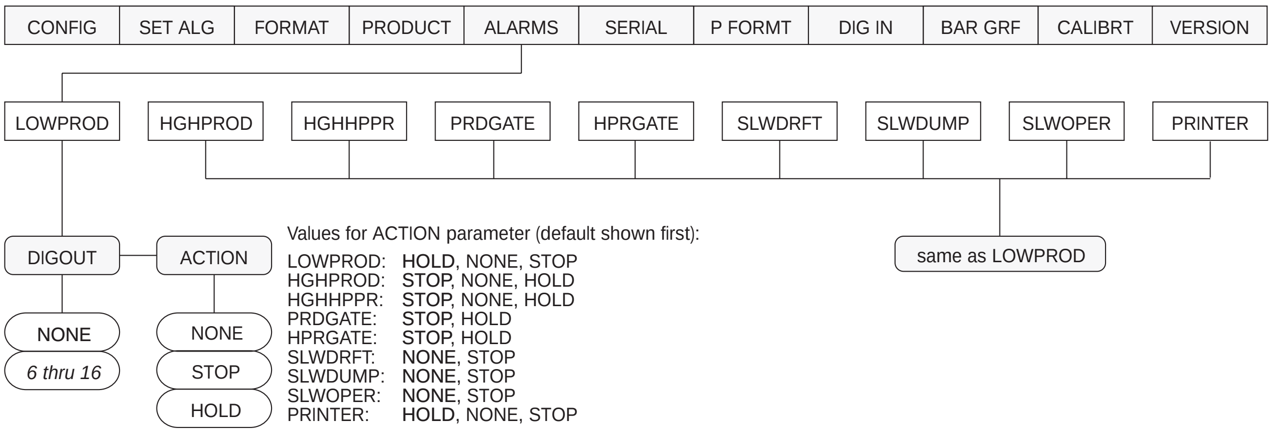


Figure 3-6. Alarms Menu

ALARMS Menu

Parameter	Choices	Description
Level 2 Submenus		
LOWPROD HIGHPROD HGHHPPR PRDGATE HPRGATE SLWDRFT SLWDUMP SLWOPER PRINTER	DIGOUT ACTION	Alarm setup. Specifies digital output and action taken for the specified alarm condition. See Section 5.5 on page 47 for more information about alarm conditions.
Level 3 Submenus		
DIGOUT	NONE *6–16*	Specifies the digital output set on when the alarm is tripped. The standard BWC-1 is wired for two ALARM outputs (ALARM1 and ALARM2), assigned as DIGOUTs 15 and 16 from terminal J1 on the digital output expander board. Use of DIGOUTS 6–14 requires installation of additional relays.
ACTION	NONE STOP HOLD	Specifies the action taken when the alarm is tripped: NONE: No action is taken. STOP: Current operation is stopped and all gates closed. A BATSTRT command must be issued to continue the operation. HOLD: Current operation is stopped and all gates closed. The operation continues automatically once the alarm condition is cleared.

Table 3-6. Alarms Menu Parameters

3.2.6 Serial Menu

See Section 8.3 on page 64 for information about serial data formats supported by the BWC-1.

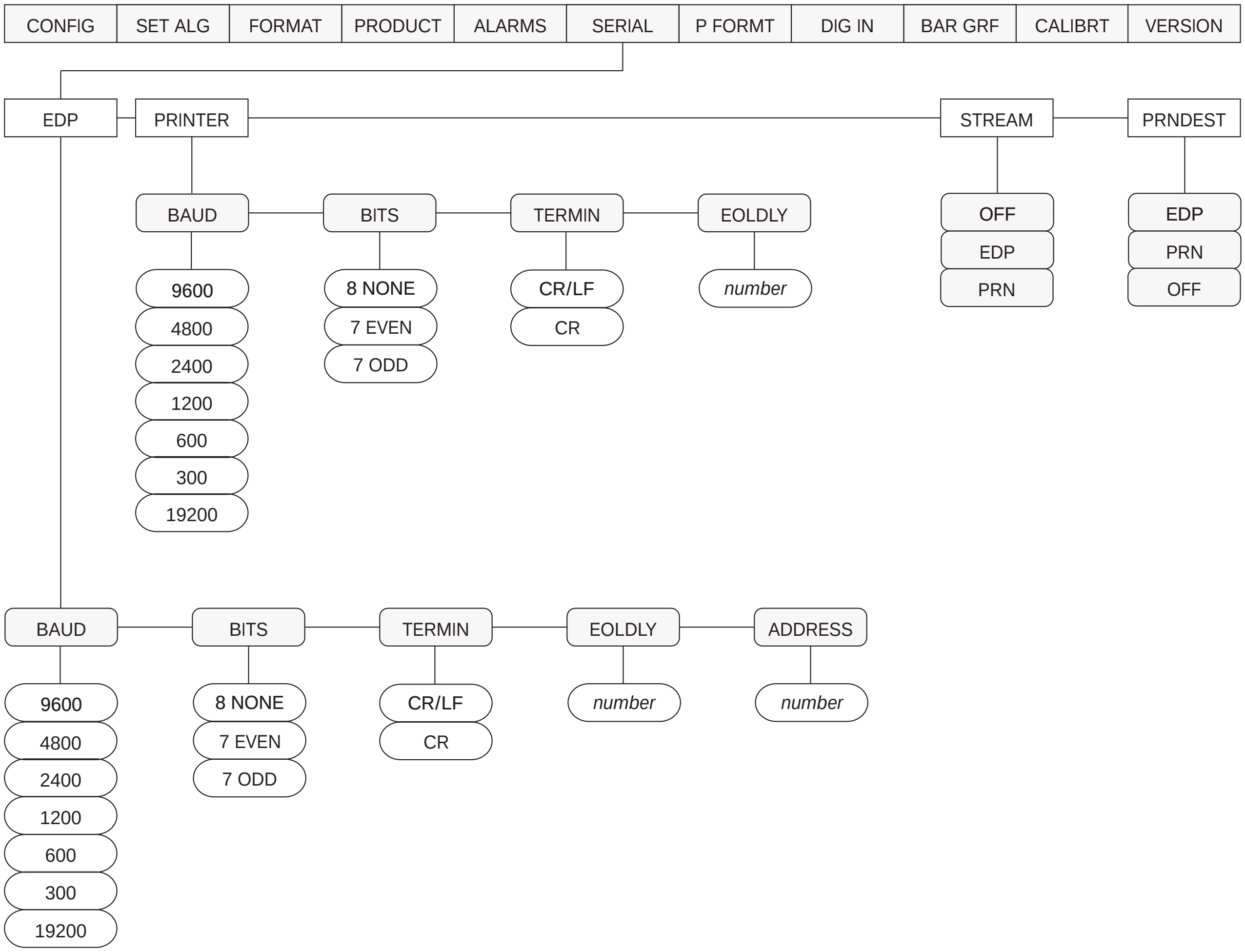


Figure 3-7. Serial Menu

SERIAL Menu		
Parameter	Choices	Description
Level 2 submenus		
EDP	BAUD BITS TERMIN EOL DLY ADDRESS	Specifies settings for baud rate, data bits, termination characters, end-of-line delay, and port address used by the EDP port.
PRINTER	BAUD BITS TERMIN EOL DLY	Specifies settings for baud rate, data bits, termination characters, and end-of-line delay used by the printer port.
STREAM	OFF EDP PRN	Selects the serial port used for continuous transmission.

Table 3-7. Serial Menu Parameters

SERIAL Menu		
Parameter	Choices	Description
PRNDEST	EDP PRN OFF	Print destination. Selects the port for data transmission when the PRINT key is pressed or the KPRINT EDP command is sent.
Level 3 Submenus		EDP Port
BAUD	9600 4800 2400 1200 600 300 19200	EDP port baud rate. Selects the transmission speed for the EDP port.
BITS	8 NONE 7 EVEN 7 ODD	Selects number of data bits and parity of data transmitted from the EDP port.
TERMIN	CR/LF CR	EDP port termination character. Selects termination character for data sent from the EDP port
EOL DLY	*number*	EDP port end-of-line delay. Sets the delay period, in 0.01-second intervals, from when a formatted line is terminated to the beginning of the next formatted serial output.
ADDRESS	*number*	EDP port address. Specifies the address used for RS-485 communications. Valid addresses are 01 through 255. An address of 0 turns off the RS-485 mode.
Level 3 Submenus		Printer Port
BAUD	9600 4800 2400 1200 600 300 19200	Printer port baud rate. Selects the transmission speed for the printer port.
BITS	8 NONE 7 EVEN 7 ODD	Selects number of data bits and parity of data transmitted from the printer port.
TERMIN	CR/LF CR	Printer port termination character. Selects termination character for data sent from the printer port
EOL DLY	*number*	Printer port end-of-line delay. Sets the delay period, in 0.01-second intervals, from when a formatted line is terminated to the beginning of the next formatted serial output.

Table 3-7. Serial Menu Parameters (Continued)

3.2.7 Print Format Menu

See Section 7.0 on page 57 for information about custom print formatting.

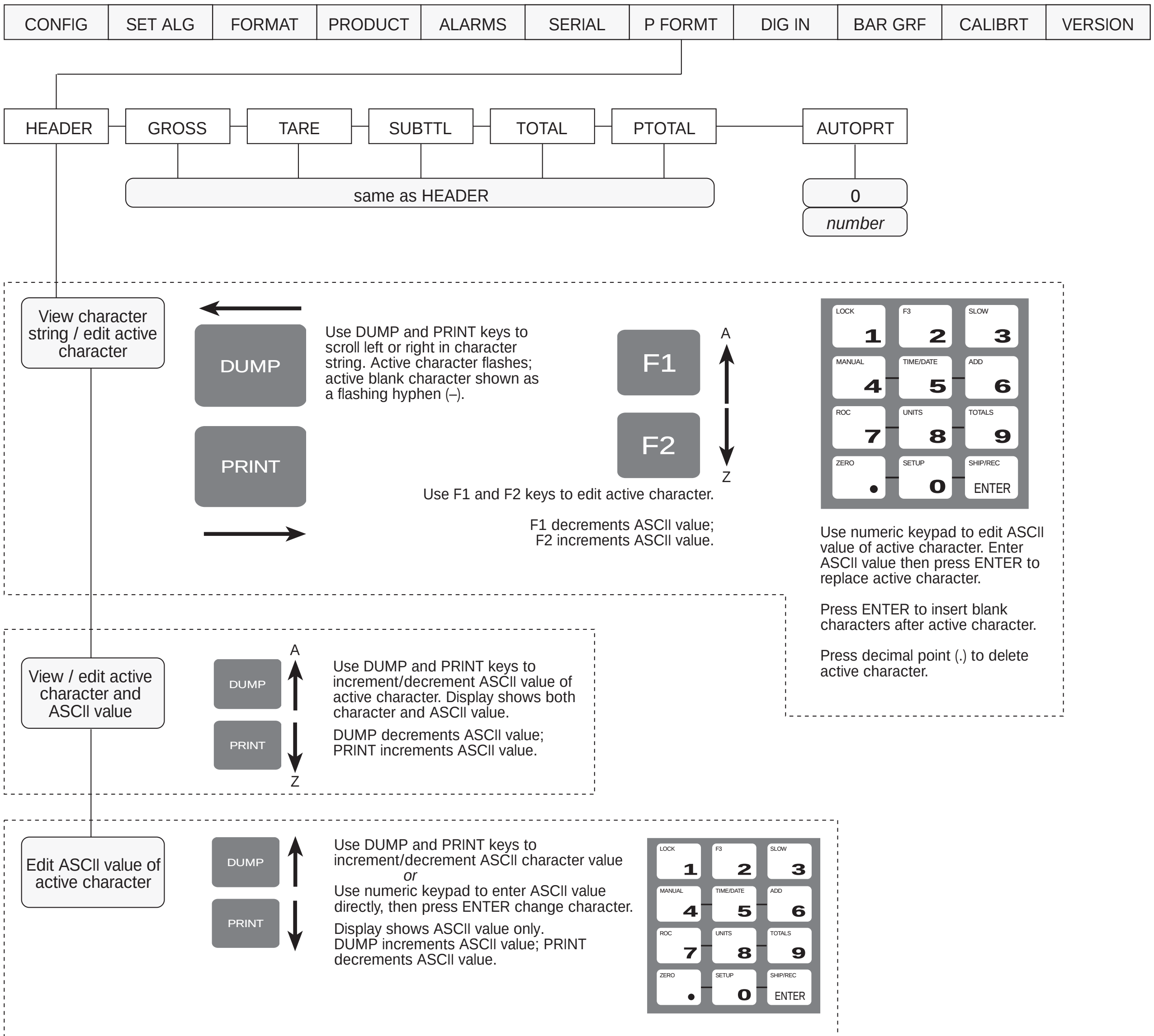


Figure 3-8. Print Format Menu

3.2.8 Digital Input Menu

Figure 3-9. Digital Input Menu

DIG IN Menu		
Parameter	Choices	Description
Level 2 submenus		
DIGIN 1– DIGIN32	OFF ZERO UNITS TEST RUN START HOLD CLR CN PRDGATE HPRGATE HIGHREC LOWPROD HPRLMT HPRFULL HPRMPTY PRINTER PRNTCMP	Specifies the function activated when the switch or TTL input device connected to the digital input becomes on (active low). See Table 3-9 on page 40 for descriptions of the digital input functions.

Table 3-8. Digital Input Menu Parameters

DIGIN Function	Description
OFF	Digital input not assigned.
ZERO	Zeroes scale. Same function as front panel ZERO key (CLEAR+*decimal*)
UNITS	Switches displayed units. Same function as front panel UNITS key (F2+8).
TEST	Places unit in test mode.
RUN	Enables START digital input for starting or stopping drafting transactions.
START	Starts drafting transaction when RUN signal is on (active low). If RUN is off (high), START terminates the transaction.
HOLD	Suspends transaction for as long as the input is held active (low).
CLR CN	Resets consecutive number to zero.
PRDGATE	Upper garner gate is closed.
HPRGATE	Lower hopper gate is closed.
HIGHREC	High product in receive or surge garner when off (high).
LOWPROD	Low product in supply garner when off (high).
HPRLMT	Hopper overflow when off (high).
HPRFULL	Hopper full / end of fill operation. Used when drafting by volume.
HPRMPTY	Hopper empty / end of dump operation. Used when drafting by volume.
PRINTER	Printer operational.
PRNTCMP	Print operation complete.

Table 3-9. Digital Input Functions

3.2.9 Bar Graph Menu

The BAR GRF menu is used only if the bar graph option (PN 19363) is installed.

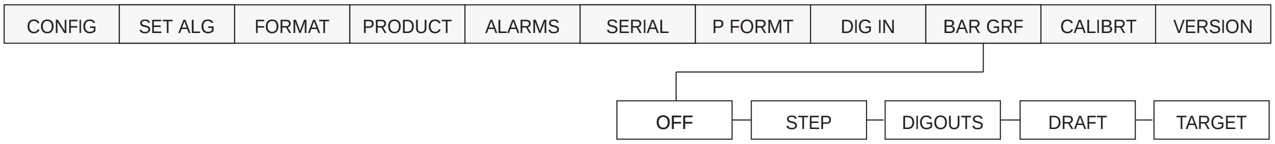


Figure 3-10. Bar Graph Menu

BAR GRF Menu		
Parameter	Choices	Description
Level 2 submenus		
OFF	—	The bar graph is turned off and disabled.
STEP	—	Step mode. Bar graph segments are turned on to show current system activity, as follows: 1: Waiting for standstill 2: Waiting for FILL key (manual mode only) 3: Waiting for supply fill 4: Manual fill in progress 5: Automatic fast fill in progress 6: Automatic slow fill in progress 7: Waiting for fill complete standstill 8: (Not used) 9: Waiting for DUMP key (manual mode only) 10: Waiting for surge clear 11: Dump in progress 12: Waiting for empty hopper verification 13: Waiting for dump complete standstill 14: Moving test weights 15: Waiting for gates to close 16: Waiting for printer
DIGINS	—	Digital input mode. Displays the logic state of the first 16 digital inputs. Corresponding bar graph segments are on for active digital inputs, off for inactive digital inputs.
DIGOUTS	—	Digital output mode. Displays the logic state of the first 16 digital outputs. Corresponding bar graph segments are on for active digital outputs, off for inactive digital outputs.
DRAFT	—	Draft mode. Bar graph segments are turned on from left to right during the fill cycle as hopper weight approaches the specified draft size (auto mode) or maximum draft size (manual mode). When the hopper weight reaches or exceeds the draft size, the bar graph flashes. Bar graph segments are turned off from right to left during the dump cycle as hopper weight approaches zero.
TARGET	—	Target mode. In automatic shipping mode, bar graph segments are turned on to show progress toward the target weight. Segments are turned on from left to right during each fill cycle as hopper weight plus accumulated weight of previous drafts approach the target weight. This bar graph mode has no function in receive mode.

Table 3-10. Bar Graph Menu Parameters

3.2.10 Calibration Menu

See Section 4.0 on page 43 for calibration procedures.

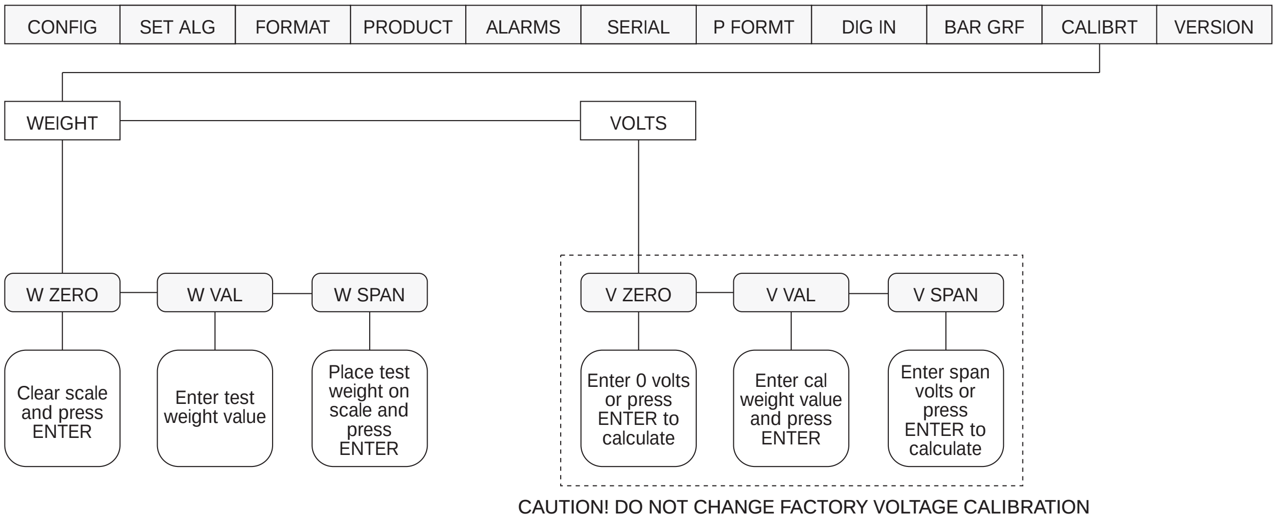


Figure 3-11. Calibration Menu

CALIBRT Menu		
Parameter	Choices	Description
Level 2 submenus		
WEIGHT	W ZERO W VAL W SPAN	See weight calibration procedure on page 43.
VOLTS	V ZERO V VAL V SPAN	DO NOT CHANGE FACTORY VOLTAGE CALIBRATION VALUES!

Table 3-11. Calibration Menu Parameters

3.2.11 Version Menu

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

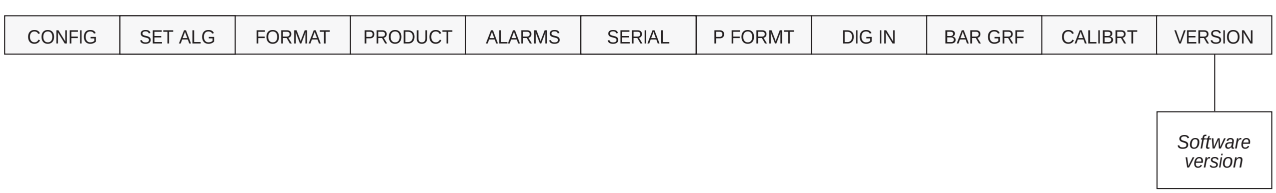


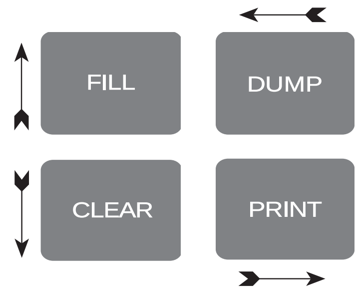
Figure 3-12. Version Menu

4.0 Calibration

Caution *Before beginning weight calibration with test weights, turn off AC power to all equipment controlled by digital outputs.*

The BWC-1 stores calibration values in nonvolatile memory on the CPU board. You access these values through the CALIBRT menu.

The procedures described in this section use the front panel keys shown below to navigate through the Calibration menu, shown in Figure 4-1.



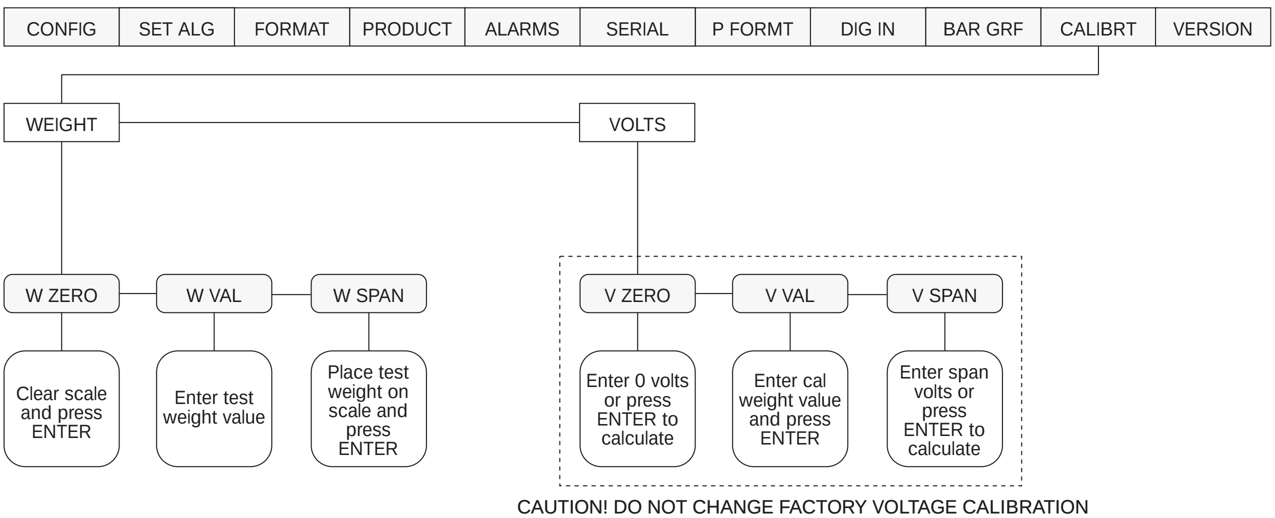


Figure 4-1. Calibration Menu

4.1 Front Panel Calibration

Use the following procedure to calibrate the BWC-1. Use Table 4-1 on page 44 to record calibration values.

1. Power up the unit for approximately 15 minutes before beginning calibration. Place the indicator in setup mode by sliding the setup switch on the CPU board so the display reads *CONFIG*. Press DUMP until the display reads *CALIBRT*.
2. Press CLEAR to show *WEIGHT*. Press again to show *W ZERO*. If *W VAL* or *W SPAN* appears, press the DUMP or PRINT key until the display reads *W ZERO*. Remove all load and allow time for the scale to settle.
3. Press CLEAR again to display current default value. Press ENTER and wait until a value reappears on the display. Record this value as the W ZERO value for channel 1 in Table 4-1 on page 44. Repeat a few times to verify that the results are similar each time. This is a numerical constant, not a weight value.
4. Press FILL to show *W ZERO*. Press PRINT to display *W VAL*. Press CLEAR to display current default value. Enter the test weight value and press the ENTER key. Record this value as the W VAL value for channel 1.
5. Press FILL to show *W VAL*, then press PRINT to show *W SPAN*. Press CLEAR to display the current default value. Place test weight on scale and allow time for the scale to settle. Press ENTER and wait until a value reappears on the display. Repeat to verify that the results are similar. Record this value as W SPAN for channel 1 in Table 4-1. This is a calibration number, not a weight value. Remove the test weight.
6. Press FILL to exit calibration and return to the first-level menus.
7. Press FILL to lock in calibration settings.
8. Slide the setup switch on the CPU board back to the previous position to exit setup mode.

WEIGHT Calibration	W ZERO	W VAL	W SPAN
CHANNEL 1			

Table 4-1. Weight Calibration Values. Use this table to record weight calibration values for your indicator. All weight calibration values should be recorded for future reference. These values allow you to swap *BWC-1* controllers in the field without using test weights to recalibrate the replacement unit.

NOTE: *BWC-1 CPU boards are built with integral, non-replaceable A/D converters. With these models, there is no need to enter the VOLTS submenu during calibration.*

Do not change any VOLTS calibration values while calibrating the indicator. Do not press ENTER while viewing values.

4.2 EDP Command Calibration

To calibrate the indicator using EDP commands, the indicator EDP port must be connected to a terminal or personal computer. See Section 2.4 on page 8 for EDP port pin assignments; see Section 6.0 on page 50 for more information about using EDP commands.

Once the indicator is connected to the sending device, use the KDOWNARROW, KLEFTARROW, and KRIGHTARROW, and KENTER EDP commands to navigate through the calibration menu shown in Figure 4-1 on page 43. When calibration is complete, use the KUPARROW command to exit the calibration menu, then slide the setup switch to the run (normal mode) position.

5.0 Operation

This section describes transaction processes, operating procedures, error messages, and special considerations for configuring the BWC-1 controller.

5.1 Transaction Setup

Some transactions may require setup to change the product used, target or draft weights, or to enter customer or container IDs:

1. If multiple products are defined for the BWC-1 and the transaction to be run uses a different product than the previous transaction, press the PRODUCT key to select the new product. Use the CUST and CONT keys to scroll up and down through the list of defined products.
2. For dual transfer mode (shipped or received) products, use the SHIP/REC key to toggle between shipping and receiving mode, if necessary.
3. If customer IDs are used, enter the customer ID using the numeric keypad, then press CUST.
4. If container IDs are used, enter the container ID using the numeric keypad, then press CONT.
5. For automatic shipping transactions only: If the target weight is different from that used for the previous transaction or different from the default target weight specified for this product, use the numeric keypad to enter the new target weight and press TARGET.
6. If the draft weight is different than the default draft weight specified for this product, use the numeric keypad to enter the new draft weight and press DRAFT.

Continue with the transaction process as described in Section 5.2.

5.2 Transaction Processes

The BWC-1 can be operated in either automatic or manual mode. Once setup is complete, follow the procedure for automatic or manual operation described below.

5.2.1 Automatic Mode Operation

To start an automatic transaction, press START/STOP. The BWC-1 controller operates the upper and lower gates to receive or dispense the number of drafts required for the transaction. During the transaction, draft and accumulated weight data are sent to the printer port using the HEADER, GROSS, TARE, SUBTTL, and TOTAL print formats, as described in Table 7-2 on page 58.

NOTES:

- To stop the transaction at any time, press START/STOP. All gates are closed and the BWC-1 display shows the message *STOPPED*. Press START/STOP again to continue the transaction.
- To restart an interrupted transaction following a power outage, press START/STOP. This function must be configured by setting the RESTART parameter (CONFIG menu) to YES.
- To end a shipping transaction before reaching the target weight, press DONE. Material in the hopper is dumped and the transaction ends.
- To cancel the transaction immediately, press and lock the emergency stop switch, then turn the batching switch to the ABORT position.
- If the BWC-1 is configured for empty hopper verification (EHVERFY parameter set to ON), the message *CLEAN* is shown following the final hopper dump. Verify that the hopper is empty, then press DONE to continue.

To add more material after the transaction is complete, use the ADD key as described in the following section.

5.2.2 Manual Mode Operation

The BWC-1 can be operated in manual mode to ship or receive a single draft, or to add material to the previously completed transaction. The system returns to automatic mode when the manual draft is complete.

Manual mode is entered by doing one of the following:

- Press MANUAL (F1+4) to ship or receive a single draft. Pressing this key starts a new transaction.
- Press ADD (F1+6) to add material to the previous transaction.

Once in manual mode, drafting is done using the FILL, SLOW (FILL+3), LOCK (FILL+1), and DUMP keys:

- To start a fill operation, press and hold the FILL key; release the FILL key to stop filling.
- To lock the FILL key on, press LOCK (FILL+1). Press any other key to unlock the FILL key.
- To switch between fast and slow fill mode on systems supporting both two-speed filling, press SLOW (FILL+3). This key combination can be used while in locked fill mode; the lock is not affected.

  NOTE: *Manual fill operations normally start in fast fill mode. To set the system to start a manual fill in slow fill mode, press* SLOW *(*FILL+3*) before entering manual mode. Repeat procedure to reset for fast fill.*

- To dump the hopper and complete the manual transaction, press DUMP.

5.3 Accumulator Operations

The BWC-1 provides a transaction accumulator for the current multidraft operation plus separate product accumulators for each of up to fifty defined products.

Product accumulators contain the total of all drafts of the product since the last time the product accumulator was zeroed.

For products that are shipped only (SHIP specified for MODE parameter on PRODUCT) or received only (MODE=RECEIVE), the weight of material shipped or received is always added to the product accumulator. For products defined as DUAL (ship or receive), draft weights are added to the product accumulator for receive transactions and subtracted for ship transactions.

5.3.1 Displaying Accumulators

To display current accumulator values, do the following:

1. Press TOTALS (F2+9) to display the transaction accumulator. The message *TTOTAL* is shown briefly, then the transaction accumulator value is displayed.
2. Press TOTALS again to display the current draft number.
3. Press TOTALS a third time to display the first product accumulator. The display briefly shows the product name or, if no product name is assigned, the product ID. (If only one product is defined, the display shows the message *PTOTAL*.) The display then shows the product accumulator value for the first product.
4. Continue pressing the TOTALS key to show product accumulators for additional defined products.

To display the product accumulator for a specific product, use the numeric keypad to enter the product ID, then press TOTALS.

To return to gross display mode while showing accumulator values or a draft number, press CLEAR.

5.3.2 Printing and Clearing Accumulators

Product accumulators can be printed or cleared at any time except during a transaction. To print a product accumulator, display the product accumulator and press PRINT. The name of the product and the accumulator value are printed using the PTOTAL print format.

To clear a single product accumulator, display the product accumulator value then press ZERO (CLEAR + dec_pnt). The display shows the message *CLR PAC* (clear product accumulator). Press ZERO again to reset the value. If more than one product is defined, the message *CLR ALL* is shown after clearing the first accumulator value. Press ZERO again to clear all product accumulators.

5.4 Material Flow/Rate of Change Displays

Six material flow statistics can be shown on the BWC-1 front panel by pressing the ROC (F2+7) key. Press once to show the current material flow rate; continue pressing the ROC key to cycle through the other rates of change listed in Table 5-1 on page 46.

The particular rate of change data shown is indicated by a character (ROC annunciator) at the left of the display. Press CLEAR to return to the gross weight display.

ROC Annunciator	Description	ROC Data Displayed
C	Current ROC	Material flow rate calculated for the last *x* weighing cycles
T	Transaction ROC	Average material flow rate from start of transaction to last time fill gate was opened.
G	Previous gate-to-gate ROC	Average material flow rate between the last two times the fill gate was opened.
F	Fill ROC	Average material flow rate during current or previous fill operation.
D	Dump ROC	Average material flow rate during current or previous dump operation.
E	Estimated time to completion	Estimated time to completion for this transaction, in minutes and seconds *(MMM.SS)*. (Displayed only if target value is specified.)

Table 5-1. Rate of Change Displays

5.5 Display Prompts and Error Messages

Table 5-2 lists the prompts and error messages that can be shown on the BWC-1 display. Several alarm conditions are indicated by both the displayed message and a flashing front panel LED, as shown in the table.

Message	Meaning	Flashing LED
CLEAN	Prompt for operator to verify that the hopper is empty. This message is shown only if empty hopper verification (EHVERFY parameter on the CONFIG menu) is turned on. Verify hopper is empty, then press DONE to continue.	—
DUMP	Manual fill operation at maximum draft size for current product. Press DUMP to empty the hopper. To add another manual draft to the transaction, press the ADD key (F1+6).	
FILL	Manual or add mode entered. Press FILL to open product gate and start hopper fill operation.	
HGHSRGE	For systems using high material surge garner bindicators, material in surge garner is above the bindicator.	*High*
HOPPER	For systems using high material hopper bindicators, material in hopper is above bindicator.	*Hopper*
HPRGATE	Hopper gate detected open during fill operation or prior to printing gross or tare weight.	*Gate*
LOWPROD	For systems using low material supply garner bindicators, material in the supply garner is below the bindicator.	*Low*
MOTION	Upper and lower gates are closed but hopper weight is not stable.	—
PRDGATE	Supply gate detected open during dump operation or prior to printing gross or tare weight.	*Gate*
PRINTER	Printer problem. Either the *printer_available* signal was lost or a print request failed to receive a *print_complete* signal.	—
SLWDUMP	Minimum material flow rate specified for dump not being met.	*Slow*
SLWFILL	Minimum material flow rate specified for fill not being met.	
SLWOPER	Minimum material flow rate specified for transaction not being met.	
STOPPED	Transaction stopped. Press START/STOP to continue operation.	—

Table 5-2. BWC-1 Prompts and Error Messages

5.6 Drafting Considerations

The following sections provide additional information about BWC-1 drafting operations and configuration.

5.6.1 Volume Drafting

BWC-1 drafting is normally done by weight. However, two bindicator inputs (HPRFULL and HPRMPTY) can be used for drafting by volume. If these inputs are enabled, draft weight specifications are ignored and drafting is done between the full and empty hopper levels.

5.6.2 Zero Offset

Negative gross values can result when the ZERO key is used to zero-off material build-up in the hopper before starting a transaction and some of that material comes loose during the operation.

A zero offset value can be specified to avoid displaying or printing negative gross values. The zero offset value is added to the current zero value to arrive at the displayed or printed weight. This value is not affected by zeroing the scale.

For example, if a zero offset value of 100 lb is entered, zeroing the scale results in a displayed gross weight of 100 lb when empty. If 3 lb of material is adhered to the hopper walls at the time the scale is zeroed, then comes loose as the hopper is filled then emptied, the gross weight displayed will now be 97 lb. If no zero offset value were entered, the displayed gross weight would be –3 lb.

To enter a zero offset value, use the numeric keypad to enter the value, then press F3 (FILL+2). The ZOFFSET EDP command can also be used to specify a zero offset value.

5.6.3 Minimum Draft Weight

Actual draft weights used by the BWC-1 are based on the transaction target weight and the draft sizes specified on the PRODUCT menu DRAFT parameter. The actual draft weights are set to use the fewest number of drafts, at or above the specified minimum draft weight whenever possible.

The following examples show how actual draft weights are determined for particular target and draft weight configurations.

Example 1

TARGET WEIGHT=90000 LB
DRAFT SIZE=60000 LB
MINIMUM DRAFT SIZE=40000 LB

In the configuration shown above, the BWC-1 disregards the default draft weight of 60000 lb because the second draft required to meet the 90000 lb target weight (60000 + 30000 lb) would be less than the specified minimum draft weight (40000 lb). Instead, the BWC-1 performs the transaction as two drafts of 45000 lb:

1ST DRAFT=45000 LB
2ND DRAFT=45000 LB
TARGET WEIGHT=90000 LB

Example 2

TARGET WEIGHT=70000 LB
DRAFT SIZE=60000 LB
MINIMUM DRAFT SIZE=40000 LB

In some circumstances, neither the default draft weight nor the minimum draft weight can be maintained. In the configuration shown above, using the default draft size (60000 lb) would result in a second draft (10000 lb) below the minimum draft weight. However, two drafts of the minimum draft weight (40000 lb) would overshoot the target weight.

Unable to maintain the minimum draft weight, the BWC-1 sets the actual draft weights based on its legal-for-trade configuration:

- In a non-legal-for-trade configuration (LGLMODE=INDUST), the BWC-1 sets the draft weights to be as close as possible to the specified minimum draft weight:

  1ST DRAFT=35000 LB
  2ND DRAFT=35000 LB
  TARGET WEIGHT=70000 LB

- In a legal-for-trade configuration (LGLMODE= LEGAL), the BWC-1 structures the draft weights to ensure that all but the final draft are at or above the defined minimum draft weight:

  1ST DRAFT=40000 LB
  2ND DRAFT=30000 LB
  TARGET WEIGHT=70000 LB

5.6.4 Preact Compensation

Two factors can degrade the accuracy of weight-based hopper fill operations:

- Material in suspension between the fill gate and the weigh hopper can cause hopper overfill.
- Momentum of falling material creates falsely high weight readings and can result in hopper underfill.

Product-specific preact values can be configured to compensate for these effects by “preactivating” the signal to close the fill gate. In systems that support both fast- and slow-fill operations, separate preact values can be configured for each.

Preact values are configured for each product on the PRODUCT menu using the PREACT subparameters. The MODE subparameter controls the type of fast fill preact used:

- MODE=OFF disables preact compensation.
- MODE=ON enables preact. The value specified for the INTERVL (time) or VALUE (weight) subparameter determines how soon, prior to reaching the draft weight, the fast fill gate is closed.
- MODE=LEARN uses the INTERVL or VALUE subparameter value as an initial value, but automatically adjusts the value up or down after each draft, depending on whether the actual draft weight was greater than or less than the specified weight.
- MODE=RELEARN provides the same function as LEARN, but resets the INTERVL or VALUE subparameter at the start of each transaction.

The INTERVL and VALUE subparameters specify the time or weight used to preactivate closing the fill gate:

- INTERVL specifies an estimate of how long (in .05-second intervals) material is in suspension after the fill gate closes. If a value is specified, the BWC-1 uses the average material flow rate for the previous second to calculate the weight value at which to close the fast fill gate.
- VALUE specifies a weight value that determines when the fast fill gate is closed. For a target draft weight of 1000 lb and a VALUE of 25 lb, the gate is closed when the scale reads 975 lb (1000 – 25 lb). If INTERVL is specified, this value is not used.

Prefill values are used to avoid early tripping due to the initial surge of material at the start of a fast fill operation or to dynamic load effects when switching from fast to slow fill mode. The PREFILL subparameter specifies a delay, in 0.1-second intervals, between the time the fast fill gate is opened and weight checking becomes active.

For systems that support two-speed fill operations, the BWC-1 allows slow (dribble) fill preact compensation for the final draft of the fill operation. The DMODE subparameter controls the type of slow fill preact used:

- DMODE=OFF disables slow fill preact compensation.
- DMODE=ON enables preact. The value specified for the DVALUE subparameter determines how soon, prior to reaching the draft weight, the fast fill gate is closed.
- DMODE=LEARN uses the DVALUE subparameter value as an initial value, but automatically adjusts the value up or down after each draft, depending on whether the actual draft weight was greater than or less than the specified weight.

The remaining slow fill preact subparameters are similar to the fast fill VALUE and PREFILL parameters:

- DVALUE specifies the weight used to preactivate closing the slow fill gate.
- DPFILL allows specification of a delay, in 0.1-second intervals, between the time the slow fill gate is opened and weight checking becomes active.

6.0 EDP Commands

The BWC-1 can be controlled by a personal computer or remote keyboard connected to the indicator EDP port. Control is provided by a set of EDP commands that can simulate front panel key press functions, display and change setup parameters, and perform reporting functions. The EDP port provides the capability to print setpoint and configuration data, to save that data to an attached personal computer, or to transfer configuration data from one indicator to another. This section describes the EDP command set and procedures for printing, saving, and transferring data using the EDP port.

6.1 The EDP Command Set

The EDP command set can be divided into five groups: key press commands, reporting commands, special function commands, parameter setting commands, and transmit weight data commands. The following sections list the commands and command syntax used for each of these groups.

6.1.1 Key Press Commands

Key press EDP commands (see Table 6-1) simulate pressing the keys on the front panel of the indicator. They can be used in both setup and operating mode. Several of the commands serve as “pseudo” keys, providing functions that are not represented by a key on the front panel.

After the indicator receives a key press command, it responds with the message *OK*. The OK response verifies that the command was received. Note that this response does not confirm that a requested action was completed. For example, the indicator will respond with *OK* even after it disallows a ZERO function.

For example, to set a draft weight of 520 lb, use the DRAFT command (see Table 6-7 on page 53): Type the command, DRAFT=520 and press ENTER (or RETURN).

Command	Function
KSTARTSTOP	Press the START/STOP key
KTARGET	Press the TARGET key
KPRODUCT	Press the PRODUCT key
KDRAFT	Press the DRAFT key
KDONE	Press the DONE key
KFILL	Press the FILL key
KCLR	Press the CLEAR key

Table 6-1. EDP Key Press Commands

Command	Function
KDUMP	Press the DUMP key
KPRINT	Press the PRINT key
KF1–KF5	Press F1–F5
KCUSTOMER	Press the CUST key
KCONTAINER	Press the CONT key
KLOCK	Press the LOCK key (FILL+1)
KSLOW	Press the SLOW key (FILL+3)
KMANUAL	Press the MANUAL key (F1+4)
KADD	Press the ADD key (F1+6)
KROC, KDISPROC	Press the ROC key (F2+7)
KUNITS	Press the UNITS key (F2+8)
KTOTALS	Press the TOTALS key (F2+9)
KZERO	Press the ZERO key (CLEAR+.)
KSETUP	Press the SETUP key (CLEAR+0)
KSHIPREC	Press the SHIP/REC key (CLEAR+ENTER)
KPRIM	Display primary units (pseudo key)
KSEC	Display secondary units (pseudo key)
KTIMEDATE	Press the TIME/DATE key (F1+5)
KDATE	Display date (pseudo key)
KTIME	Display time (pseudo key)
KACCUM	Accumulate (pseudo key)
KLEFTARROW	In setup mode, move right in the menu; in weighing mode, press the PRINT key
KRIGHTARROW	In setup mode, move left in the menu; in weighing mode, press the DUMP key
KUPARROW	In setup mode, move up in the menu; in weighing mode, press the FILL key
KDOWNARROW	In setup mode, move down in the menu; in weighing mode, press the CLEAR key
K0–K9	Press number 0 (zero)–number 9
KDOT	Press the decimal point (.) key
KMINUS	Negative value (pseudo key)
KENTER	Press the ENTER key

Table 6-1. EDP Key Press Commands (Continued)

6.1.2 Reporting Commands

Reporting commands (see Table 6-2) cause the indicator to send specific information to the EDP port. These commands are accessible in both setup mode and normal operating mode.

Command	Function
DUMPALL	List all parameter values
VERSION	Write BWC-1 software version
P	Write whatever is currently displayed
S	Write one frame of stream format

Table 6-2. EDP Reporting Commands

6.1.3 Special Function Commands

Table 6-3 lists the special function commands:

Command	Function
?	Print list of all parameter setting commands
D	Toggle debug mode
DI	Return status of digital inputs
DO	Return status of digital outputs
RESETCONFIGURATION	Reset all parameters to default values. Active software features are saved, but calibration settings are erased.
NOTES: • The DI command returns a sequence of 32 ON or OFF messages, indicating the status of digital inputs 1–32. • The D0 command returns a sequence of 16 ON or OFF messages, indicating the status of digital outputs 1–16.	

Table 6-3. EDP Special Function Commands

NOTE: *The indicator must be in setup mode to use the RESETCONFIGURATION command. This command clears all calibration values and provides no OK response.*

6.1.4 Parameter Setting Commands

Parameter setting commands allow you to display or change the current value for a particular setup parameter (Tables 6-4 through 6-14).

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

command <RETURN>

Most parameter values can be changed in setup mode only; the **NOTES** on page 55 list exceptions. Use the following command syntax when changing parameter values:

command=value <RETURN>

where value is either a number or a specific submenu parameter. Use no spaces before or after the equal (=) sign. If you type an incorrect command, the display reads *?Unknown Command*. Changes to the parameters do not take effect until you exit the setup mode.

For example, to set the motion band parameter to 5, type *MOTBAND=5* and press ENTER (or RETURN).

You can view the choices available for any command by substituting a question mark (?) in place of the value. For example, to see which choices are available for the time format parameter, type *TIMEFMT=?* and press ENTER.

Command	Description	Values
GRADS	Graduations	*number*
ZTRKBND	Zero track band	OFF, 0.5, 1, 3
ZRANGE	Zero range	1.9%, 100%
ZOFFSET	Zero offset	*number*
MOTBAND	Motion band	1, 2, 3, 5, 10, 20, OFF
OVRLOAD	Overload	FS+2%, FS+1D, FS+9D, FS
DIGFLTR	Digital filtering	1, 2, 4, 8, 16, 32, 64, 128, 4RT, 8RT, 16RT, 32RT, 64RT, 128RT
DSRMODE	Default ship/receive mode	SHIP, RECEIVE, DUAL
EHVERIFY	Empty hopper verification	OFF, ON
RESTART	Restart after power outage	OFF, ON
PWRUPMD	Power up mode	GO, DELAY
CONSECNUM	Consecutive number	0, *number*
LOCKON	Lock indicator front panel in operating mode	—
LOCKOFF	Unlock indicator front panel in operating mode	—

Table 6-4. EDP CONFIG Commands

Command	Description	Values
CHANS	Channel speed	NORMAL, FAST
RESOLUT	Resolution	STANDRD, HIGH
FREQ	Frequency of AC power source	60HZ, 50HZ
ALGFLTR	Analog filtering	OFF, 2HZ, 8HZ

Table 6-5. EDP SET ALG Commands

Command	Description	Values
PRI.DSPDIV	Primary display divisions	1, 2, 5
PRI.DECPNT	Primary decimal point location	8888888, 888888.8, 88888.88, 8888.888, 888.8888, 88.88888, 8.888888, 8888800, 8888880
PRI.UNITS	Primary units	LB, KG, TN, MT, BU, LT, NONE
SEC.DSPDIV	Secondary display divisions	5, 2, 1
SEC.DECPNT	Secondary decimal point location	8888888, 888888.8, 88888.88, 8888.888, 888.8888, 88.88888, 8.888888, 8888800, 8888880
SEC.UNITS	Secondary units	LB, KG, TN, MT, BU, LT, NONE
ROC.DSPDIV	Rate of change display divisions	1, 2, 5
ROC.DECPNT	Rate of change decimal point location	8888888, 888888.8, 88888.88, 8888.888, 888.8888, 88.88888, 8.888888, 8888800, 8888880
ROC.TIME	Rate of change time	SEC, MIN
ROC.UNITS	Rate of change units	LB, KG, TN, MT, BU, LT, NONE
ROC.MULT	Rate of change multiplier	*number*
DATEFMT	Date format	MMDDYY, DDMMYY

Table 6-6. EDP FORMAT Commands

Command	Description	Values
DATESEP	Date separator	SLASH, DASH, SEMI
TIMEFMT	Time format	12HOUR, 24HOUR
TIMESEP	Time separator	COLON, COMMA

Table 6-6. EDP FORMAT Commands (Continued)

Command	Description	Values
PRODUCT	Product definition slot	*product_slot* (identifies internal storage slot for current product)
PRODID	Product ID	*product_ID*
PRODNAME	Product name	*product_name*
PSRMODE	Product operating mode	SHIP, RECEIVE, DUAL
MAXDRAFT	Maximum draft size	*number*
MINDRAFT	Minimum draft size	*number*
DRAFT	Default draft size	*number*
DRBMODE	Dribble (slow fill) mode	OFF, ON, AUTO
DRIBBLE	Dribble value	*number*
PREACT	Preact mode	OFF, ON, LEARN, RELEARN
PRETIME	Preact interval	1, *delay_value* (0.5-second intervals)
PREVAL	Preact weight	0, *number*
PREFILL	Preact prefill	0, *delay_value* (0.1-second intervals)
DPREACT	Dribble preact mode	OFF, ON, LEARN
DPREVAL	Dribble preact weight	0, *number*
DPFILL	Dribble preact prefill	0, *delay_value* (0.1-second intervals)
EMPTY	Empty scale value	*number*
SFILL	Slow fill material flow weight	0, *number*
SFILLT	Slow fill timer interval	0, *number* (in SFILLU units)
SFILLU	Slow fill time units	SEC, MIN, HOUR
SDRIB	Slow dribble fill material flow weight	0, *number*
SDRIBT	Slow dribble fill timer interval	0, *number* (in SDRIBU units)
SDRIBU	Slow dribble fill time units	SEC, MIN, HOUR
SDUMP	Slow dump material flow weight	0, *number*
SDUMPT	Slow dump timer interval	0, *number* (in SDUMPU units)
SDUMPU	Slow dump time units	SEC, MIN, HOUR
SOPER	Slow operation material flow weight	0, *number*
SOPERT	Slow operation timer interval	0, *number* (in SOPERU units)
SOPERU	Slow operation time units	SEC, MIN, HOUR
PSUNITS	Product units	LB, KG, TN, MT, BU, LT, NONE
PSMULT	Product multiplier	1.0, *number*
PSDECP	Product units decimal point position	8888888, 888888.8, 88888.88, 8888.888, 888.8888, 88.88888, 8.888888, 8888800, 8888880
PSDSPD	Product units display divisions	1, 2, 5
PRUNITS	Rate of change units	LB, KG, TN, MT, BU, LT, NONE

Table 6-7. EDP PRODUCT Commands

Command	Description	Values
PRTIME	Rate of change time units	SEC, MIN, HOUR
PRMULT	Rate of change multiplier	1.0, *number*
PRDECP	Rate of change decimal point position	8888888, 888888.8, 88888.88, 8888.888, 888.8888, 88.88888, 8.888888, 8888800, 8888880
PRDSPD	Rate of change display divisions	1, 2, 5
PACCUM	Product accumulator	0, *number*

Table 6-7. EDP PRODUCT Commands (Continued)

Command	Description
DON#*nn*	Set digital output *nn* on
DOFF#*nn*	Set digital output *nn* off
DOFF#0	Set all digital outputs off
For commands ending with "#*nn*", *nn* is the digital output (01–16) being set on or off.	

Table 6-8. EDP DIG OUT Commands

Command	Description	Values
ADIGOUT.*alarm*	Alarm digital output	NONE, *9–16*
AACTION.*alarm*	Alarm condition action	NONE, STOP, HOLD
NOTE: For both commands, use the *alarm* parameter to specify the alarm condition being displayed or changed. Valid *alarm* values are: LOWPROD, HGHPROD, HGHPPR, PRDGATE, HPRGATE, SLWDRFT, SLWDUMP, SLWOPER, PRINTER		

Table 6-9. EDP ALARMS Commands

Command	Description	Values
EDP.BAUD	EDP port baud rate	300, 600, 1200, 2400, 4800, 9600, 19200
EDP.BITS	EDP port data and parity bits	8NONE, 7EVEN, 7ODD
EDP.TERMIN	EDP port line termination characters	CR/LF, CR
EDP.EOLDLY	EDP port end-of-line delay	*number* (in 0.01-second intervals)
EDP.ADDRESS	EDP port address	0*, 1–255*
PRN.BAUD	Printer port baud rate	300, 600, 1200, 2400, 4800, 9600, 19200
PRN.BITS	Printer port data and parity bits	8NONE, 7EVEN, 7ODD
PRN.TERMIN	Printer port line termination characters	CR/LF, CR
PRN.EOLDLY	Printer port end-of-line delay	*number* (in 0.01-second intervals)
PRNDEST	Print destination port	EDP, PRN, OFF
STREAM	Continuous stream serial port	OFF, EDP, PRN

Table 6-10. EDP SERIAL Commands

Command	Description	Values
HEADER	Transaction header print format string	See Section 7.0 on page 57 for detailed description
GROSS	Full hopper print format string	
TARE	Empty hopper print format string	
SUBTTL	Transaction subtotal print format string	
TOTAL	Transaction total print format string	
PTOTAL	Product accumulator print format string	
AUTOPRT	Transaction subtotal print frequency	0 (off), *number*

Table 6-11. EDP P FORMT Commands

Command	Description	Values
DIGIN1–DIGIN32	Digital input function	OFF, ZERO, UNITS, TEST, RUN, START, HOLD, CLR CN, PRDGATE, HPRGATE, HIGHREC, LOWPROD, HPRLMT, HPRFULL, HPRMPTY, PRINTER, PRNTCMP

Table 6-12. EDP DIG IN Commands

Command	Description	Values
BARGRF	Bar graph mode	OFF, STEP, DIGINS, DIGOUTS, DRAFT, TARGET

Table 6-13. EDP BAR GRF Commands

Command	Description	Values
WZERO#*x*	Zero weight calibration	*actual value*
WSPAN#*x*	Span weight calibration	*actual value*
WVAL#*x*	Weight value calibration	*actual value*
VZERO#*x*	Zero volts calibration (see NOTE)	*number*
VSPAN#*x*	Span volts calibration (see NOTE)	*number*
VVAL#*x*	Volts value calibration (see NOTE)	2, 3 (mV/V)
NOTE: Do not attempt voltage calibration on later indicators! See Section 4 for more information.		

Table 6-14. EDP CALIBRT Commands

NOTES:

- BAR GRF EDP commands can be run in either setup mode or operating mode.
- The STREAM command on the SERIAL submenu can be run in either setup mode or operating mode.

6.1.5 Transmit Weight Data Commands

The serial transmit weight data commands transmit data to the EDP port on demand. These commands are used to request weight data from any of the active channels. The transmit weight data commands are valid only in normal operating mode.

Command	Description
XG	Transmit gross weight
XA	Transmit accumulator
XROC	Transmit rate of change data

Table 6-15. EDP Transmit Weight Data Commands

6.2 Saving and Transferring Data

The EDP port gives you many options for saving and transferring configuration data:

- Print configuration data
- Save configuration data to a personal computer
- Download configuration data from PC to indicator
- Transfer configuration data from one indicator to another

The following sections describe the procedures for these save and transfer operations.

6.2.1 Printing Configuration Data

Configuration and setpoint data can be printed directly to a printer connected to the EDP port. See Section 2.4 on page 8 for information about serial communications wiring and EDP port pin assignments.

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

To print all configuration data, place the indicator in setup mode and press DUMP. The indicator sends all configuration parameters, including calibration values, to the printer as ASCII-formatted text. This procedure is equivalent to using the DUMPALL EDP command.

6.2.2 Saving Indicator Data to a Personal Computer

Configuration data can be saved to a personal computer connected to the EDP port. The PC must be running a communications program such as PROCOMMPLUS® or CROSSTALK® See Section 2.4 on page 8 for information about serial communications wiring and EDP port pin assignments.

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

To save all configuration data, place the indicator in setup mode and press DUMP. The indicator sends all configuration parameters, including calibration values, to the PC as ASCII-formatted text.

6.2.3 Downloading Configuration Data from PC to Indicator

Configuration data saved on a PC or floppy disk (see Section 6.2.2 on page 56) can be downloaded from the PC to an indicator. This procedure is useful when a number of indicators with similar configurations are set up.

NOTES:

- Always record the calibration values for the receiving indicator before transferring configuration data. Calibration data for the receiving indicator is overwritten during transfer and must be re-entered before using the indicator.
- When using a PC with a Pentium® processor, specify a short end-of-line delay value to avoid overflowing the indicator buffer.

To download configuration data, connect the PC to the EDP port as described in Section 6.2.2. Place the indicator in setup mode and use the PC communications software to send the saved configuration data to the indicator. When transfer is complete, re-enter the calibration values for the receiving indicator.

6.2.4 Transferring Configuration Data from One Indicator to Another

Configuration data can be transferred from one BWC-1 controller to another. Like downloading from a PC, this procedure is useful when a number of controllers with similar configurations are set up.

NOTE: Always record the calibration values for the receiving indicator before transferring configuration data. Calibration data for the receiving indicator is overwritten during transfer and must be re-entered before using the indicator.

To transfer configuration data, connect the EDP ports of the controller terminal blocks as shown below:

Sending BWC-1		Receiving BWC-1	
Terminal Block Pin	Signal		Terminal Block Pin
7	TxD	RxD	9
8	GND	GND	8
9	RxD	TxD	7

Table 6-16. Pin Connections for Transferring Data

Place both indicators in setup mode, then press DUMP on the sending indicator. When transfer is complete, re-enter calibration values for the receiving indicator.

7.0 Print Formatting

The BWC-1 has a formattable print function available as a standard feature. This feature allows the demand print serial output to be customized to meet the needs of the user.

With this feature, the BWC-1 can be configured to print special information such as company name and address, scale identification information, etc. This feature also allows the user to customize the format of the printed weight ticket.

The following is a list of user-definable print tickets and the name of the corresponding format string:

- Transaction header format (HEADER)
- Full hopper ticket format (GROSS)
- Empty hopper ticket format (TARE)
- Transaction subtotal ticket format (SUBTTL)
- Transaction total ticket format (TOTAL)
- Product accumulator ticket format (PTOTAL)

The HEADER, GROSS, TARE, SUBTTL, TOTAL, and PTOTAL format strings can include text and special commands. Commands are used to place the weight information on the ticket. Each format string can be up to 300 characters long.

7.1 Print Formatting Commands

Table 7-1 lists commands used to format print tickets for the BWC-1. All print formatting commands must be enclosed in delimiters (< >).

Command	Description	Extended Print Formatting
<G>	Gross weight	/D = Displayed units /A = Alternate (not displayed) units /P = Primary units /S = Secondary units /V = Product units Extended print formatting commands allow specification of the units used to print weight values. For example, to print a gross weight ticket using secondary units, specify *<G/S>.*
<T>	Tare weight	
<F>	Full weight	
<D>	Draft weight (*full_weight – tare_weight*)	
<A>	Draft accumulator value	
<PA>	Product accumulator value	
<R>	Rate of change	—
<PN>	Product name	
<PI>	Product ID	
<CI>	Container ID	
<VI>	Customer (vendor) ID	
<DN>	Draft number	
<TN>	Transaction number	
<TD> *or* <TD4>	Time and date (TD4 prints four-digit year)	
<TI>	Time only	
<DA> *or* <DA4>	Date only (DA4 prints four-digit year)	
<CN>	Consecutive number	
<NL*n*>	*n* = number of termination characters (<CR> or <CR/LF>)*	
<SP*n*>	*n* = number of spaces*	
<SU>	Toggle weight data format (formatted/ unformatted)**	

* If *n* is not specified, 1 is assumed.

**After receiving an SU command, the indicator will send unformatted data until the next SU command is received. Unformatted data omits decimal points, leading and trailing characters.

Table 7-1. Demand Ticket Print Format Commands

Table 7-2 shows the default print formats used by the BWC-1 controller.

Format	Default Format String	Used When
HEADER	PRODUCT: <PN><NL>CUSTOMER: <VI><NL>CAR: <CI><NL><TD><NL2>TRANSACTION <TN><NL>	At start of transaction
GROSS	FULL <DN> <F><NL>	Once per draft, when hopper is full
TARE	EMPTY <DN> <T><NL>	Once per draft, when hopper is empty
SUBTTL	SUBTOTAL <DN> <A><NL>	Every *n* drafts, as specified by the AUTOPRT parameter
TOTAL	<NL>BATCH TOTAL <A><NL>PRODUCT TOTAL <PA><NL2>	At end of transaction (printed with SUBTTL)
PTOTAL	<PA> <PN><NL>	When PRINT key is pressed while displaying an accumulator value

Table 7-2. Default Print Formats

7.2 Print Formatting Example

The following example shows the printed output that could be generated by the BWC-1 controller during a shipping operation. The example includes printed output for an automatic fill transaction, a manual mode fill transaction to add material, and a product accumulator print.

Automatic Mode Printed Output

In automatic mode, information included in the HEADER format is printed when the transaction begins. The example below uses the default HEADER format, including product name, customer ID, container ID, time and date, and the transaction number.

```
PRODUCT:  CORN
CUSTOMER: 458
CAR:      77
11:22 AM 02/12/99

TRANSACTION 9

FULL  1       4015 lb
EMPTY 1          6 lb

FULL  2       4008 lb
EMPTY 2          5 lb

FULL  3       4000 lb
EMPTY 3          7 lb

FULL  4       4001 lb
EMPTY 4          6 lb

FULL  5       4005 lb
EMPTY 5          6 lb

BATCH TOTAL     19999 lb
PRODUCT TOTAL   19999 lb
```

With a draft size of 4000 lb and a target weight of 20000 lb, five drafts are filled. At the start of each draft, the full weight of the weigh hopper is printed (GROSS format); at the end of each draft, the empty weight of the hopper (TARE format) is printed.

When the transaction is complete, the transaction accumulator (BATCH TOTAL) and product accumulator (PRODUCT TOTAL) values are printed using the TOTAL print format.

Manual Mode Printed Output

Next, the BWC-1 is placed in manual mode by pressing the ADD key. When the FILL key is pressed, the transaction header is printed (HEADER format).

```
PRODUCT:  CORN
CUSTOMER: 458
CAR:      77
11:48 PM 02/12/99

TRANSACTION 10

FULL  1       2184 lb
EMPTY 1          0 lb

BATCH TOTAL      2184 lb
PRODUCT TOTAL   22183 lb
```

An additional 2184 lb of corn is added to the weigh hopper. The GROSS format is printed at the end of the manual fill operation. The corn is added to the car by pressing the DUMP key and the TARE format is printed when the hopper is again empty. The BWC-1 returns to automatic mode and prints the PTOTAL format at the end of the transaction.

Product Accumulator Printed Output

The product accumulator value is printed by first displaying the product accumulator (TOTALS key), then pressing the PRINT key:

```
22183 lb CORN
```

7.3 Customizing Print Formats

The following sections describe procedures for customizing print formats using the EDP port or the front panel (P FORMT menu.

7.3.1 Using the EDP Port

The formattable print option can modified through the EDP port. This requires the installer to use a terminal or PC to enter the new print format into the indicator.

Print formats can include numbers, upper and lower case letters, punctuation marks, and special control characters. Commands must be enclosed between < and > delimiters. Any characters outside of the delimiters are printed as text on the ticket.

The current printout configuration can be checked or changed after establishing bidirectional communications with the BWC-1. This can be accomplished with the use of a terminal or PC running a terminal emulation program. When setting up to communicate with the BWC-1, you must match the baud rate, data bits and parity of both devices so that they can understand each other.

To view the current definition of a format string, enter the name of the string (HEADER, GROSS, TARE, SUBTTL, TOTAL, or PTOTAL) and press ENTER (or RETURN). The current string is displayed.

For example, to check the current definition of the header format, type HEADER then press ENTER (or RETURN). The BWC-1 responds by sending the current definition of the transaction header format:

```
PRODUCT: <PN><NL>CUSTOMER: <VI><NL>CAR:
 <CI><NL><TD><NL2>TRANSACTION <TN><NL>
```

An example of the actual printout is shown below:

```
PRODUCT:  SOYBEANS
CUSTOMER: 103
CAR:     14
10:43 AM 08/17/00

TRANSACTION 1
```

To change the string—for example, to print a four-digit year and change the container ID text to the word “TRUCK”—reenter the string as follows:

```
PRODUCT: <PN><NL>CUSTOMER: <VI><NL>TRUCK:
 <CI><NL><TD4><NL2>TRANSACTION <TN><NL>
```

The modified print format string includes the changed container name and the four-digit year the next time it is printed.

```
PRODUCT:  SOYBEANS
CUSTOMER: 103
TRUCK:     14
10:43 AM 08/17/2000

TRANSACTION 1
```

7.3.2 Using the Front Panel

If you have no access to equipment used to communicate through the EDP port or are working at a site where such equipment cannot be used, you can change print format strings from the front panel of the indicator.

You can access each of the ticket formats in the first level menu PFORMT. Under PFORMT are the submenu selections for each of the ticket formats: HEADER, GROSS, TARE, SUBTTL, TOTAL and PTOTAL. Figure 7-1 shows the P FORMT menu, including instructions on how to use the front panel keys to edit characters or ASCII values. See page 62 for an example of a 256-character ASCII character set.

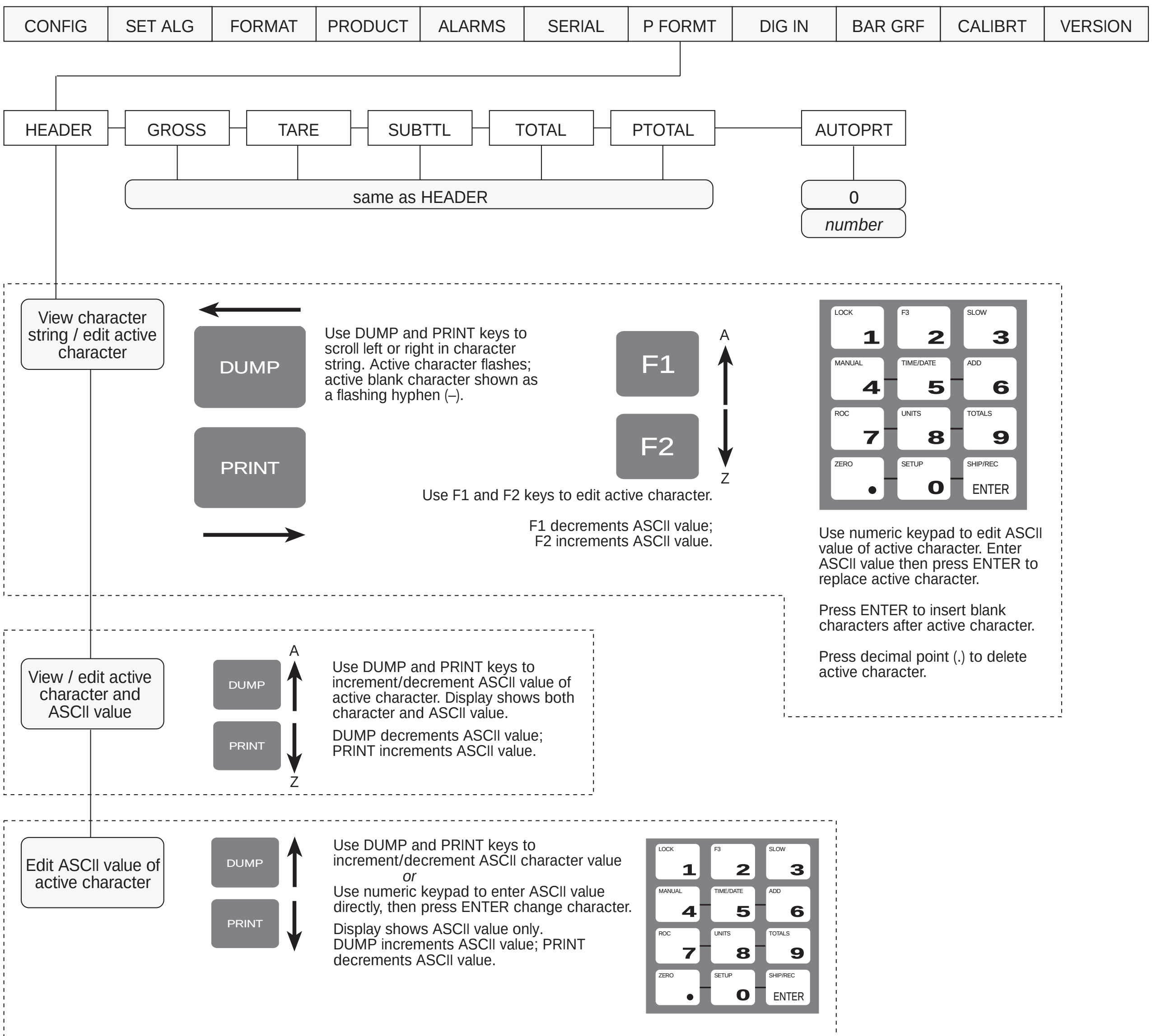


Figure 7-1. P FORMT Menu, Showing Alphanumeric Character Entry Procedure

8.0 Appendix

8.1 Test Mode

Test mode for the BWC-1 provides an automatic build-up test that can be used to verify system calibration prior to shipping or receiving a transaction. Use of the automatic build-up test requires a system with in-place test weights like that shown in Figure 8-1, with the BWC-1 wired to control raising and lowering of the test weights.

Entering and Exiting Test Mode

To enter test mode, do one of the following:

- Press and hold the DONE key, then press DUMP
- Set the TEST digital input low

Password protection can be assigned to test mode using the TEST PWD parameter on the CONFIG menu (see Section 3.2.1 on page 23). If a password is assigned, it must be entered immediately after entering test mode.

To exit test mode, press DONE.

Automatic Build-Up Test

The automatic build-up test runs until the combined weight of test weights and material in the hopper is approximately 101% of scale capacity. The BWC-1 controls the raising and lowering of test weights and the addition of material to the weigh hopper.

To run the automatic build-up test, do the following:

1. Verify that the hopper is empty.
2. Place the BWC-1 in test mode (press DONE+DUMP). Enter password, if assigned.
3. Press START to begin the automatic build-up test.

Once started, the automatic build-up test performs the following steps:

4. Record and print bottom weight value.
5. Raise (add) test weights, wait for standstill.
6. Record and print top weight value.
7. Calculate draft size (maximum of 95% of weight value).
8. Lower (remove) test weights, wait for standstill.
9. Add draft of material to weigh hopper.
10. Repeat Steps 4 through 9 until top weight (Step 6) is 101% of scale capacity.
11. Exit test mode.

Material left in the hopper by the automatic build-up test may be dumped or used as the initial draft of the next transaction. To dump the hopper, press the DUMP key; to use the material for the first draft of the next transaction, press START.

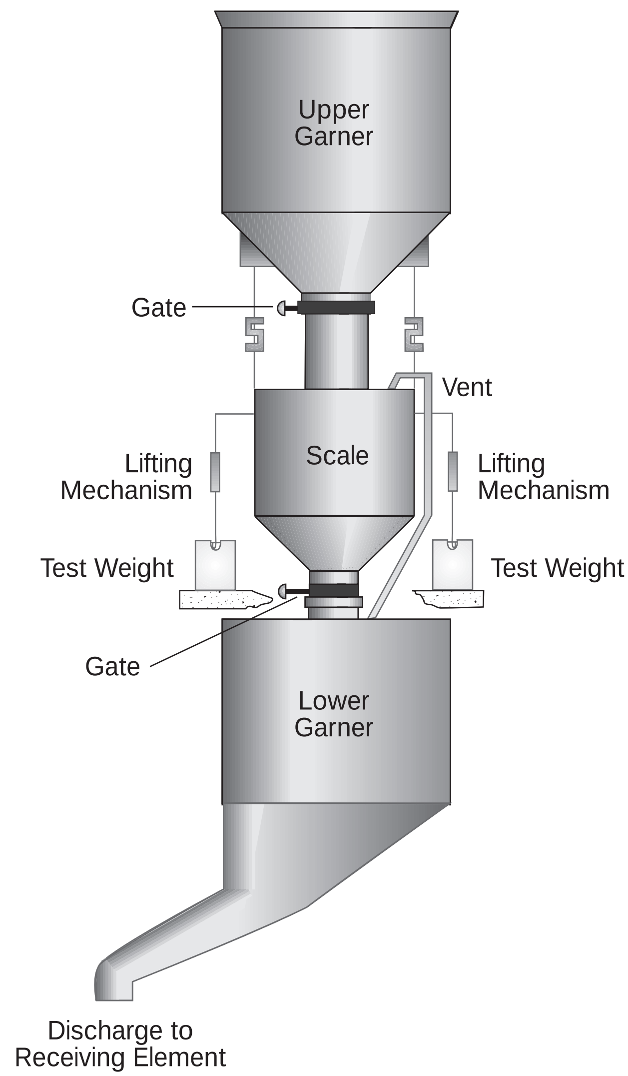


Figure 8-1. Bulk Weighing System with In-Place Test Weights

8.2 ASCII Character Chart

Use the decimal values for ASCII characters listed in Tables 8-1 and 8-2 when specifying print format strings on the P FORMT menu. The actual character printed depends on the character mapping used by the output device.

The BWC-1 can send or receive any ASCII character value (decimal 0–255), but the characters that can be shown on the indicator are limited by the 14-segment display. Text strings formatted for display on the indicator should be limited to upper-case, unaccented characters to ensure legibility.

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

Table 8-1. ASCII Character Chart (Part 1)

ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex
Ç	128	80	á	160	A0		192	C0	α	224	E0
ü	129	81	í	161	A1		193	C1	β	225	E1
é	130	82	ó	162	A2		194	C2	Γ	226	E2
â	131	83	ú	163	A3		195	C3	π	227	E3
ä	132	84	ñ	164	A4		196	C4	Σ	228	E4
à	133	85	Ñ	165	A5		197	C5	σ	229	E5
å	134	86	ª	166	A6		198	C6	μ	230	E6
ç	135	87	º	167	A7		199	C7	τ	231	E7
ê	136	88	¿	168	A8		200	C8	Φ	232	E8
ë	137	89		169	A9		201	C9	Θ	233	E9
è	138	8A	¬	170	AA		202	CA	Ω	234	EA
ï	139	8B	1/2	171	AB		203	CB	δ	235	EB
î	140	8C	1/4	172	AC		204	CC	∞	236	EC
ì	141	8D	¡	173	AD		205	CD	φ	237	ED
Ä	142	8E	«	174	AE		206	CE	∈	238	EE
Å	143	8F	»	175	AF		207	CF	∩	239	EF
É	144	90		176	B0		208	D0	≡	240	F0
æ	145	91		177	B1		209	D1	±	241	F1
Æ	146	92		178	B2		210	D2	≥	242	F2
ô	147	93		179	B3		211	D3	≤	243	F3
ö	148	94		180	B4		212	D4	⌠	244	F4
ò	149	95		181	B5		213	D5	⌡	245	F5
û	150	96		182	B6		214	D6	÷	246	F6
ù	151	97		183	B7		215	D7	≈	247	F7
ÿ	152	98		184	B8		216	D8	°	248	F8
Ö	153	99		185	B9		217	D9	•	249	F9
Ü	154	9A		186	BA		218	DA		250	FA
¢	155	9B		187	BB		219	DB		251	FB
£	156	9C		188	BC		220	DC		252	FC
¥	157	9D		189	BD		221	DD	2	253	FD
Pts	158	9E		190	BE		222	DE		254	FE
ƒ	159	9F		191	BF		223	DF		255	FF

Table 8-2. ASCII Character Chart (Part 2)

8.3 Data Formats

8.3.1 Continuous Output Serial Data Format

If continuous transmission is configured for the EDP or printer port (STREAM parameter on the SERIAL menu), the BWC-1 sends data using the Consolidated Controls serial data format shown in Figure 8-2:

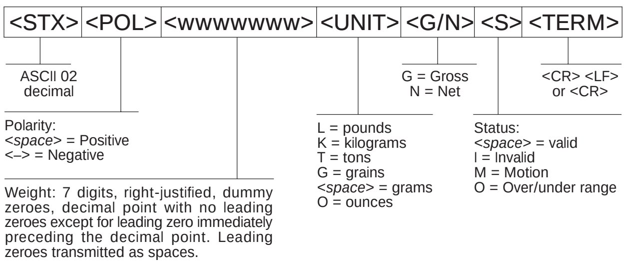


Figure 8-2. Continuous Output Serial Data Format

8.3.2 Demand Output Serial Data Format

When demand mode is configured for the EDP or printer port in the setup menus (PRNDEST on the SERIAL menu), the BWC-1 uses a data string formatted for a basic ticket printout. The particular ticket format printed depends on the indicator configuration.

You can use the EDP port or keypad to fully customize the ticket to work with a wide variety of printers, scoreboard displays, and other remote equipment. See Section 7.0 on page 57 for more information on custom print formats.

8.3.3 RS-485 Data Formats

The BWC-1 has a built-in RS-485 software protocol which is enabled when you assign an address to the indicator. The address is specified on the ADDRESS parameter on the SERIAL menu. The address is a non-zero ASCII decimal value; we recommend addresses of 65 or higher.

All remote commands are initiated using the data format shown in Figure 2-9:

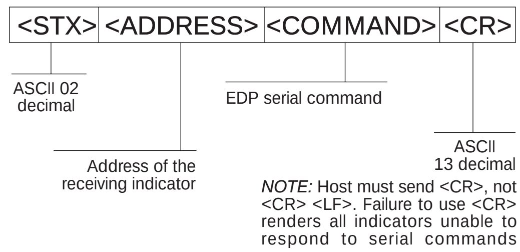


Figure 8-3. RS-485 Send Data Format

If the initiating device address matches the port address of a BWC-1 listening 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 2-10:

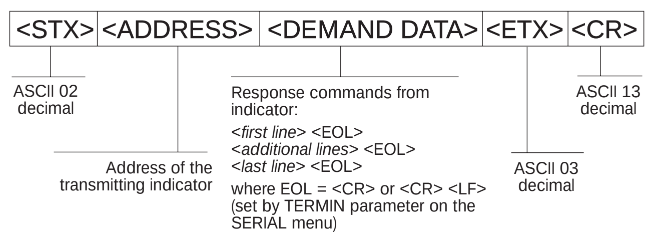


Figure 8-4. RS-485 Respond Data Format

If continuous transmission is configured for the EDP port (STREAM parameter on the SERIAL menu), the BWC-1 sends data using the data format shown in Figure 8-5:

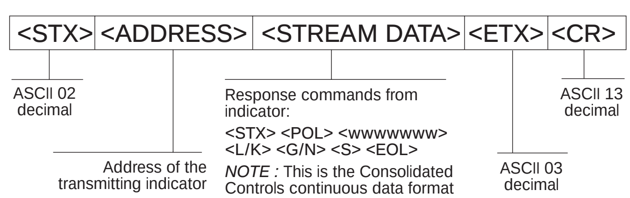


Figure 8-5. RS-485 Continuous Data Format

8.4 Conversion Factors for Secondary Units

The BWC-1 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 (F2+8) key.

Conversion factors can be specified on the FORMAT menu using the SECNDRY and RATECHG parameters; on the PROUCT menu, UNITS parameter (WEIGHT and RATECHG subparameters) for each product configured; or by using the EDP command equivalents for these parameters.

The following examples show how to configure the secondary units multiplier for the FORMAT menu:

- To configure secondary units using the front panel menus, use Table 8-3 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 units using EDP commands, use Table 8-3 to find the conversion multiplier for the SEC.MULT command. For example, if the primary unit for the current channel is pounds and the secondary unit is short tons, send the EDP command SEC.MULT=0.0005<CR> to set the multiplier for the secondary units.

NOTES:

- Ensure that the secondary decimal point position is set appropriately for the scale capacity in the secondary units. If the converted value requires more digits than are available, the indicator will display an overflow message. 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.
- For volume-based operations using bushel (BU) or liter (LT) units, the conversion factor must be calculated for the specific material used, including any adjustments for moisture content of the material.

Primary Unit	*x Multiplier*	Secondary Unit
pounds	0.453592	kilograms
	0.000500	short tons
	0.000446	long tons
	0.000453	metric tons
short tons	2000.00	pounds
	907.185	kilograms
	0.892857	long tons
	0.907185	metric tons
kilograms	2.20462	pounds
	0.001102	short tons
	0.000984	long tons
	0.001000	metric tons
metric tons	2204.62	pounds
	1000.00	kilograms
	1.10231	short tons
	0.984207	long tons
long tons	2240.00	pounds
	1016.05	kilograms
	1.12000	short tons
	1.01605	metric tons

Table 8-3. Conversion Factors

8.5 Filtering

Finding the right filter settings takes both patience and experimentation. The following subsections will help you understand how filtering works.

8.5.1 Analog Filtering

Analog filtering uses electrical components (usually special capacitors and other “voltage smoothing” elements) to make the DC voltage from the load cell to the A/D converter as free of surges and fluctuations as possible. These capacitors have a tendency toward smoothing out the major, high-frequency voltage bumps, while easily tracking the smaller, low-frequency changes. Analog filtering is generally more effective than digital filtering in preventing voltage fluctuations caused by electrical or radio frequency interference. Voltage fluctuation caused by such electrical interference usually shows as a regular rolling up and down of the display.

In Table 8-4, notice that settings for increased filtering effect that screen out more electrical noise, also tend to increase settling time, therefore slowing down the display in achieving standstill. Generally, use the lowest filtering effect which yields a quiet or stable display.

ALGFLTR Value	Filtering Effect	Approximate Settling Time
NONE	Low / > 25 Hz	64 ms
8 HZ	Medium / > 8 Hz	200 ms
2 HZ	High / > 2 Hz	800 ms

Table 8-4. Analog Filter Values

It is generally the best practice to attempt to clear interference first with just the analog filter so the signal will be clear entering the A/D converter. When testing the effect of the analog filter in this manner, set the digital filter at its lowest setting, 1. If the highest rate of analog filtering does not stabilize the display, leave the analog filter on at 8 Hz or 2 Hz, and begin increasing the digital filter settings.

8.5.2 Digital Filtering

Standard digital filtering is basically a software function. It uses mathematical averaging to try to eliminate the variant digital readings that the A/D converter sends periodically because of external vibration. Digital filtering does not effect the indicator's measurement rate, but does affect the settling time. The selections from 1 to 128 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.

Advanced RATTLETRAP® digital filtering (selections shown with RT after the number in Figure 8-6) indicate a mode that can be viewed as a hybrid combination of the best features of analog and digital filtering. RATTLETRAP® uses a vibration-dampening algorithm developed in actual industrial applications with extreme vibration present. This filtering mode 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 repeating vibration or mechanical interference from nearby machinery. RT selections eliminate much more mechanical vibration than standard digital filtering, but usually also increase settling time over standard digital filtering.

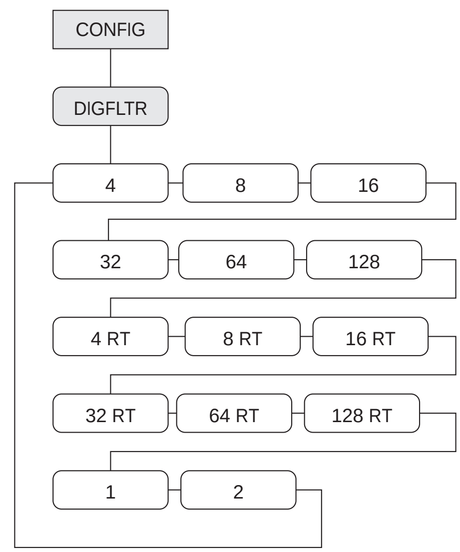


Figure 8-6. Digital Filtering Submenu

Digital filtering is most effective in eliminating effects of mechanical noise and vibrations when combined with analog filtering. Mechanical noise usually shows on the display as a random changing of the least-significant digit. The trade-off with using a high number of averages (and therefore a very accurate reading) is that the settling time increases as the number of averages increases. So even though the higher-numbered selections give a more accurate reading, if speed of display is important use the lowest selection which gives a stable display.

When using digital filtering, analog filtering is usually set to high (2 Hz). When testing the effect of the analog filter, set the digital filter to 1.

8.6 Specifications

Power

Line Voltages	115 or 230 VAC (+10%/–15%)
Frequency	50 or 60 Hz
Power Consumption	30 VA maximum
Fusing	115 VAC operation: 0.25 A Slo-Blo radial lead subminiature fuse (PN 35993)
	230 VAC operation: 0.125 A Slo-Blo radial lead subminiature fuse (PN 35994)

Analog Specifications

Full Scale Input Signal	5 – 39 mV including deadload
Analog Signal Input	0.6 mV/V – 3.9 mV/V
Analog Signal Sensitivity	0.3 μV/graduation minimum,
	1.0 μV/grad recommended
Input Impedance	> 10 MΩ
Noise (ref to input)	0.3 μV p-p with 2 Hz analog filter, digital filter 4
Internal Resolution	Selectable: 300,000 - 740,000 counts
Display Resolution	>100,000 dd, limited only by internal resolution and system noise
Measurement Rate	20 meas/sec, nominal
Input Sensitivity	Normally 130 nV per internal count, < 60 nV with expanded resolution or digital filtering
System Linearity	Within 0.01% of FS
Zero Stability	140 nV/°C maximum; 10 nV/°C typical
Span Stability	3.5 ppm/°C maximum
Calibration Method	Software through front panel, voltage and weight constants stored in EEPROM
Common Mode Voltage	± 4 V, referred to earth
Common Mode Rejection	140 dB minimum @ 50 or 60 Hz with 2 Hz or 8 Hz analog filter, digital filter 4
Normal Mode Rejection	90 dB minimum @ 50 or 60 Hz with 2 Hz analog filter
	80 dB minimum @ 50 or 60 Hz with 8 Hz analog filter
Input Overload	± 12 V continuous, static discharge protected
Excitation Voltage	10 ± 0.5 V DC, 16 x 350 Ω load cells
Analog Filter	Software selectable: Off, 2, 8 Hz
Digital Filter	Software selectable: Off, 1, 2, 4, 8, 16, 32, 64, 128
	Enhanced vibration capability available through Rattletrap® hybrid digital filtering
Sense Amplifier	Differential amplifier with 6-wire sensing
RFI Protection	Signal, excitation, and sense lines protected by capacitor bypass

Digital Specifications

Microcomputer	NEC μPD75216A display processor, Hitachi 64180 main processor
	Program memory: 128K x 8; RAM: 32K x 8; EEROM: 128 x 16, 93C66
Digital Inputs	32 inputs, TTL or switch closure, active-low
Digital Outputs	16 outputs, open collector with TTL pullup, 250 mA sink, 40 V withstand

Serial Communications

EDP Port	19200, 9600, 4800, 2400, 1200, 600, 300 bps.
	Full duplex RS-232, simplex 20 mA current loop. Optional duplex 20 mA, RS-485
Printer Port	19200, 9600, 4800, 2400, 1200, 600, 300 bps.
	Simplex RS-232, or simplex 20 mA current loop
Both Ports	RS-232 or 20 mA current loop standard; 7 or 8 data bits; even, odd, or no parity

Operator Interface

Display	14 mm (0.55 inch), 14-segment vacuum fluorescent, 7 full digit display. Decimal point available at each digit. 8 LED annunciators
Additional Symbols	Gross mode, transaction in progress, transaction total, product total, receive mode, standstill, center of zero, minus sign
Keyboard	25-key flat membrane panel
Bar Graph	Optional: 48-segment display tracks batch step, digital I/O, progress to draft or target weight.

Environmental

Operating Temperature	–10 to +40°C (legal range)
	–10 to +50°C (industrial range)
Storage Temperature	–25 to +70°C, limited by battery life

Mechanical

Overall Dimensions	16.0" W, 22.5" H, 7.25" D
Weight	40 lb
Enclosure Classification	NEMA 4X
Enclosure Materials	Stainless steel

Certifications and Approvals

NTEP
CoC Number: 98-157
Accuracy Class: III/III L
n_{max} : 10 000

BWC-1 Limited Warranty

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.

RLWS AND BUYER AGREE THAT RLWS'S SOLE AND EXCLUSIVE LIABILITY HEREUNDER IS LIMITED TO REPAIR OR REPLACEMENT OF SUCH GOODS. IN ACCEPTING THIS WARRANTY, THE BUYER WAIVES ANY AND ALL OTHER CLAIMS TO WARRANTY.

SHOULD THE SELLER BE OTHER THAN RLWS, THE BUYER AGREES TO LOOK ONLY TO THE SELLER FOR WARRANTY CLAIMS.

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.

RICE LAKE WEIGHING SYSTEMS • 230 WEST COLEMAN STREET • RICE LAKE, WISCONSIN 54868 • USA