



Badger Meter

Batch Controller

Model CB-30



User Manual





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SCOPE OF THIS MANUAL

The sections in this manual have been arranged in such a way that you can, step by step, install, program, operate and when required, troubleshoot the instrument.

IMPORTANT

Read this manual carefully before attempting any installation or operation.
Keep the manual in an accessible location for future reference.

Safety Terminology and Symbols



Indicates a hazardous situation, which, if not avoided, is estimated to be capable of causing death or serious personal injury.



Indicates a hazardous situation, which, if not avoided, could result in severe personal injury or death.



Indicates a hazardous situation, which, if not avoided, is estimated to be capable of causing minor or moderate personal injury or damage to property.

CB-30 BATCH CONTROLLER DESCRIPTION

The CB-30 is a batch controller that accepts a signal input from the meter transmitter, scales it to the desired unit of measure and—at a preset point(s)—sends a signal to operate the flow valve.

Other features include: automatic compensation for valve overrun, batch size limit, fail-safe shutdown, and manual batching.

UNPACKING, ASSEMBLING AND INSTALLING THE CB-30

Unpacking the CB-30

NOTE: If damage to the shipping container is obvious, request that the carrier be present when the product is unpacked. All claims for equipment damage during transit are the sole responsibility of the recipient.

After carefully unpacking the unit, check for any visible sign of damage. If found, notify the carrier for insurance purposes and call the factory for possible replacement. Keep all packing material in the event that the unit must be returned to the factory.

NOTE: Operating temperature is 32...130° F (0...55° C) with a maximum humidity of 85% non condensing. Always select a mounting location with proper ventilation and environmental protection.

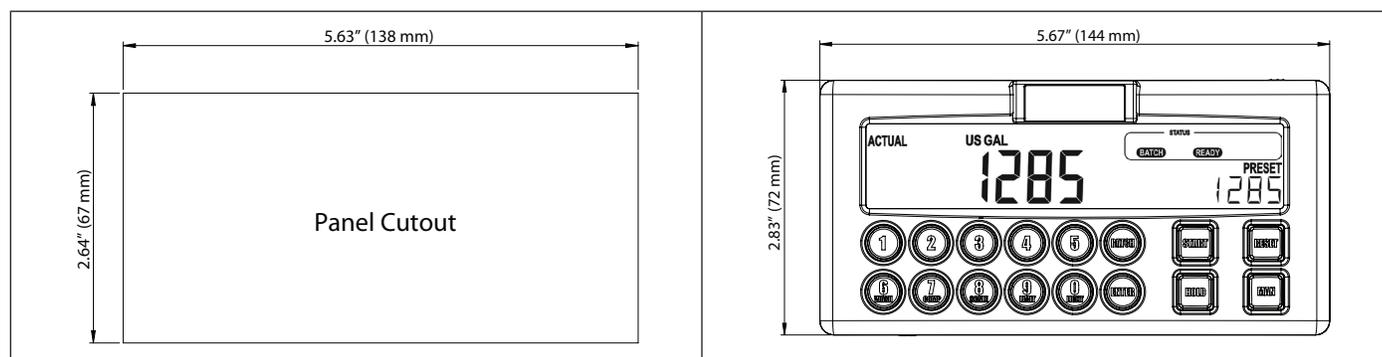


Figure 1: Panel Cutout and Mounting Dimensions

Assembling the CB-30

The CB-30 can be mounted on the flow meter, on a wall or shelf, or in an instrumentation panel. *Figure 2* shows the exploded view of a meter or wall mounted unit. In this configuration the CB-30 is shipped separately and must be installed as shown (see wiring diagrams for proper transmitter signal connections).

The basic unit is equipped for panel mount. To install:

1. Measure and cut mounting hole to the dimensions shown in *Figure 1 on page 5*.
2. Install gasket around the mounting bezel.
3. Insert the unit through the front panel cutout.
4. Secure the unit to the panel with the mounting clips.

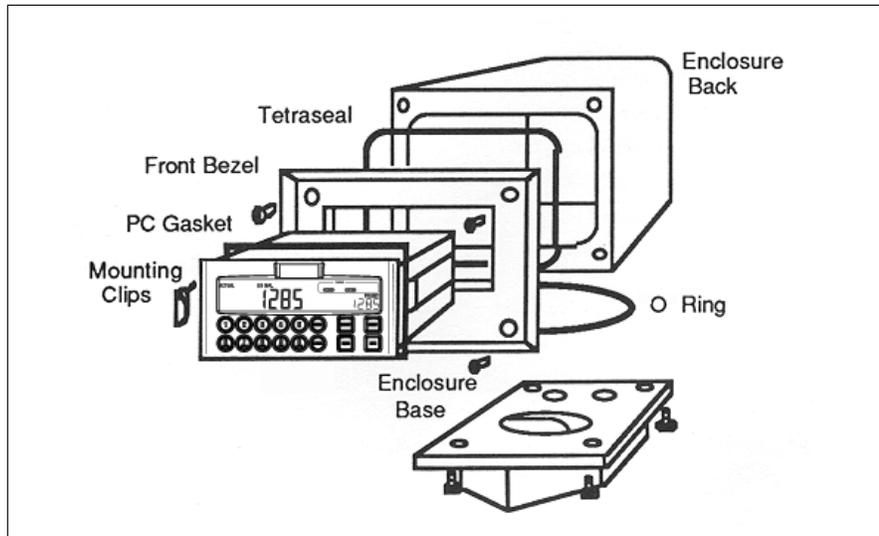


Figure 2: CB-30 Assembly

PARTS LIST

Description	Part Number
Mounting hardware kit	259170-005
Connector kit	259170-004
Replacement triac	259170-003
Replacement face plate	259170-002

Table 1: Parts list

WIRING THE CB-30

The rear panel of the CB-30 controller contains connectors with screw terminals for connecting #28 to #14 gauge insulated stranded wire (#18 gauge stranded wire is recommended).

A wire stripper and a small screwdriver are the only tools required. *Figure 3 on page 8 through Figure 6 on page 11* illustrate step-by-step the proper wiring procedures for all standard and optional functions.

At installation, be sure to comply with the following requirements:

- Disconnect power to the unit before attempting any connection or service to the unit.
- Avoid using machine power service for AC power. When possible, a dedicated or lighting circuit is recommended.
- Do not bundle or route signal lines with power lines.
- Keep all lines as short as possible.
- Use shielded wire for all input wiring.

CAUTION al electrical codes.

TO PREVENT ACCIDENTS, POWER SHOULD BE CONNECTED ONLY AFTER ALL OTHER CONNECTIONS HAVE BEEN COMPLETED.

Terminal	Function
1	Common (GND)
2	Lockout
3	Common (GND)
4	24V DC in
5	Sends out 12V (50 mA)
6	Fast in
7	Slow in
8	Common (GND)
9	RESET
10	START
11	HOLD
12	MANUAL
13	Common (GND)
14	Output
15	—
16	—
25	TRIAC
26	TRIAC
21	L1 85...265V AC
22	L2 85...265V AC
23	System Ground

Table 2: Wiring Terminal Identification

CAUTION

BECAUSE THE CB-30 IS MICROPROCESSOR CONTROLLED, IT IS VERY IMPORTANT THAT THE POWER SUPPLY BE FREE OF ELECTRICAL NOISE. AVOID USING POWER LINES THAT FEED HEAVY LOAD ELECTRICAL DEVICES SUCH AS PUMPS AND MOTORS.

THE CB-30 POWER INPUT IS INTERNALLY FUSED AND PROTECTED FROM COMMON LINE NOISE BY A FILTERING NETWORK.



Flow Valve Solenoid Connections

The CB-30 uses an electronic optically isolated TRIAC to control the valve solenoid during the Batch process.

⚠ CAUTION

ALWAYS MAKE SURE TO CONNECT THE HOT AC LINE TO TERMINAL #21 AND THE NEUTRAL TO THE SOLENOID.

At the beginning of the Batch the *normally open* contacts will close, allowing the AC supply to energize the solenoid and open the valve. At the end of the Batch the contact will open and interrupt the AC supply to the solenoid, therefore closing the valve. The TRIAC is field replaceable.

TRIAC Rating	SHARP S202T02F
Load Voltage	80...240V AC
Load Current	2 A
Transistor Output	Terminal # 14 is activated at the same time as the TRIAC, for use with external relays or transistor compatible input devices.
	One open collector NPN. 12V DC max.
	50 mA sink max. (1V DC type V CE at 50 mA)

Table 3: Flow Valve Solenoid Specifications

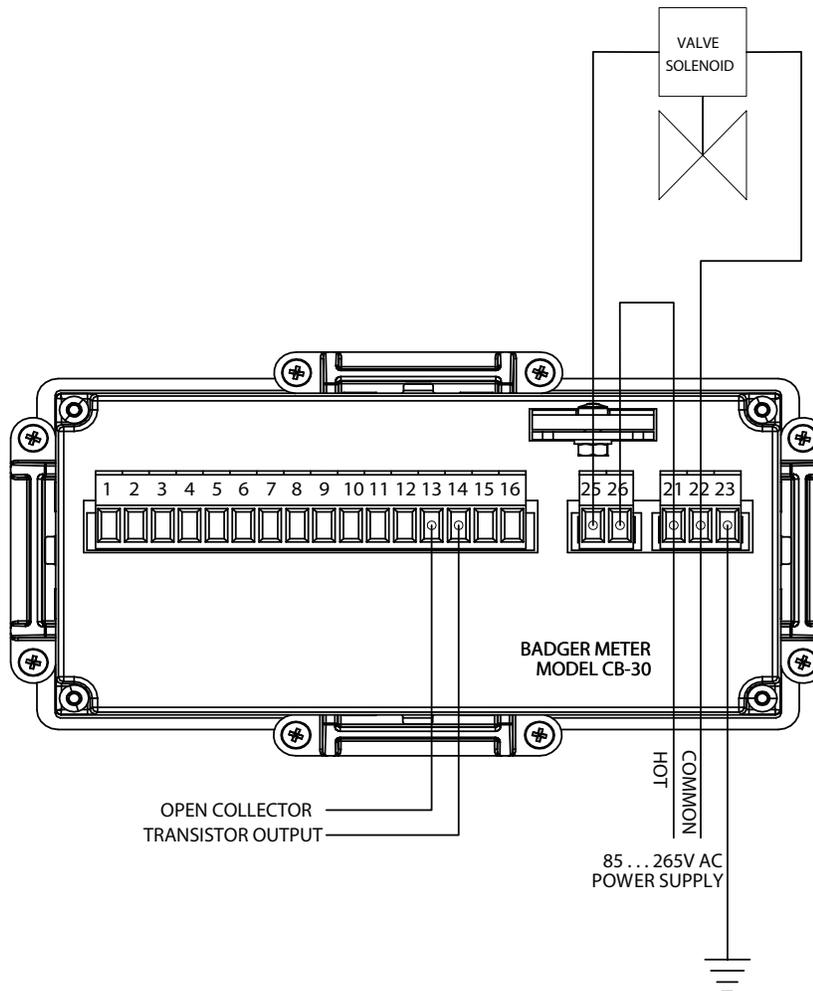


Figure 3: Flow Valve Solenoid Connections

Pulse Transmitter Connections

The CB-30 is designed to accept pulses from open collector transistors or dry contact closure transmitters.

Before making any connections please make sure to comply with the following:

1. Always use shielded wire to protect the signal line from external noise (round shield to terminal #3).
2. Make sure the signal lines are not bundled with or touching power lines.

Figure 4 shows the connection to Model PFT-3E transmitter, usually supplied with a Badger Meter Industrial Turbo meter. The Model PFT-3E provides an open collector transistor output for the CB-30.

Frequency	DC to 5 kHz (high speed) DC to 150 Hz (low speed)
Low Level	0...2V DC max.
High Level	8...20V DC max.
Impedance	4.7 K Ω pullup to +12V DC
VDC Current	2.5 mA steady state
Response	100 μ s min pulse (high speed) 3.5 ms min pulse (low speed)

Table 4: Transmitter Count Input

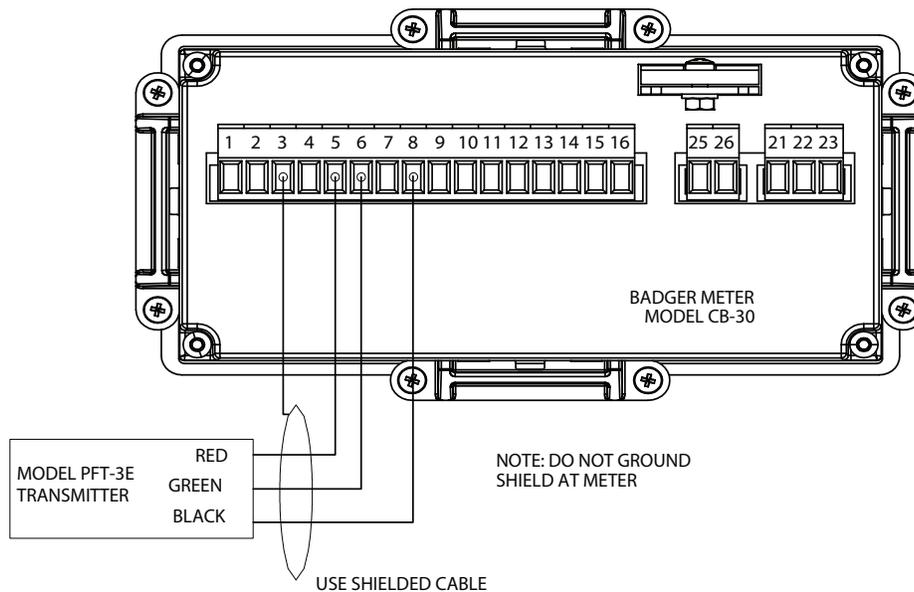


Figure 4: Pulse Transmitter Connections

Remote Control Connections

For operator convenience and process automation the functions START, HOLD, RESET and MANUAL can be wired to be used with remote mounted switches or with electronic control processors. Always use shielded wire to protect the signal from external noise interference.

Control Inputs	Remote start, reset, hold, manual, keyboard lockout
Frequency	DC to 20 Hz typical
Type	Current sinking
Logic	Level sensitive
Low Level	0...2V DC max.
High Level	8...20V DC max.
Impedance	4.7 K Ω pullup to +12V DC
Current	2.5 mA steady state
Response	32 ms make and break time

Table 5: Remote Control Specifications

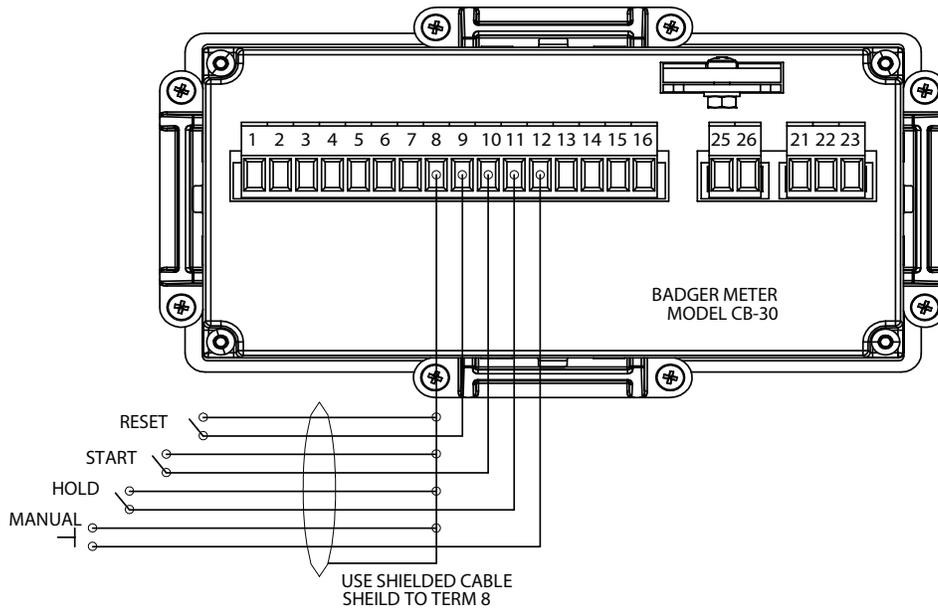


Figure 5: Remote Control Connections

AC Power Supply Connections

⚠ CAUTION

CONNECT AC POWER ONLY AFTER ALL OTHER WIRING HAS BEEN COMPLETED.

The CB-30 has an internally mounted line filter and fuse for surge protection. The unit is designed to operate with 85...265V AC power only. Always make sure to connect terminal #23 to the electrical system ground.

AC Power Input	85...265V AC
Consumption	0 VA max.

Table 6: AC Power Supply Specifications

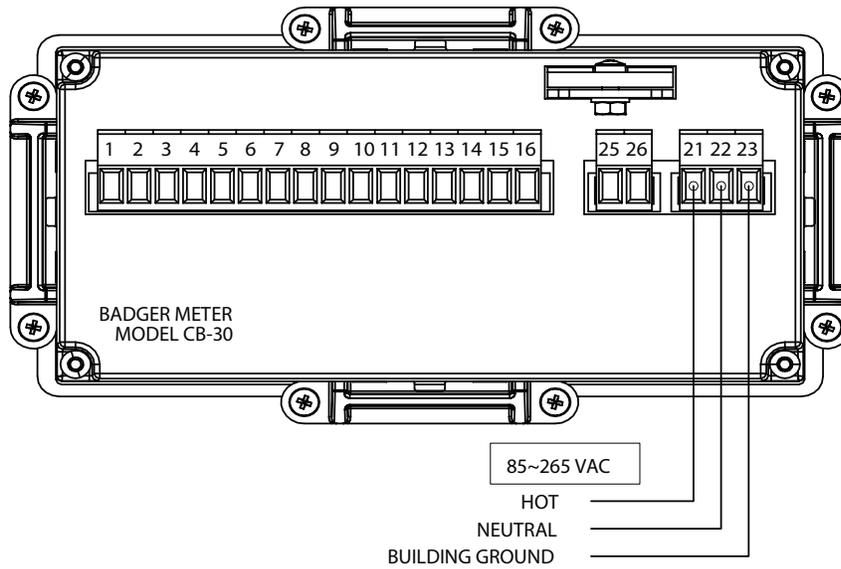


Figure 6: AC Power Supply Connections

OPERATING THE CB-30 FRONT PANEL

The CB-30 front panel consists of two displays. One is a continuous indicator of the preset batch and the other is used to show the batch progress and all other preset and programming values. The display includes four annunciators that show batch state. The 12-digit key pad includes all secondary preset functions and the four-key command pad is used to stop, start, and reset the unit in addition to presetting the batch and allowing for manual operation.

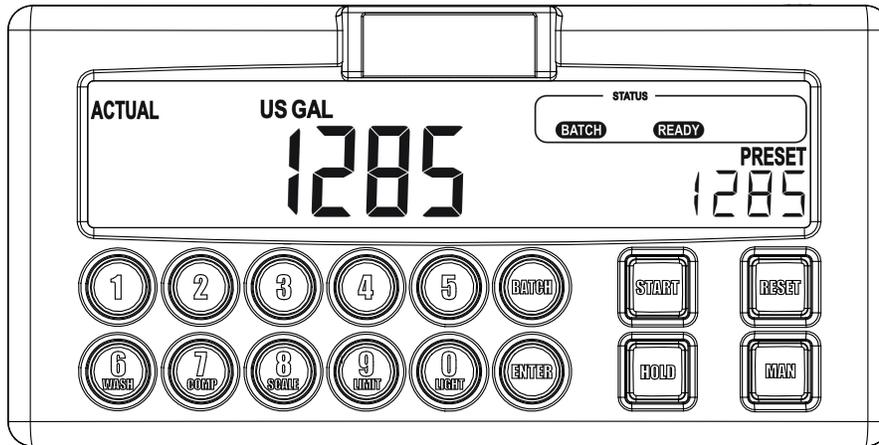


Figure 7: Front Panel

Setup Sequence

The CB-30 is equipped with a programming lockout feature for critical data protection. To use this feature, install a jumper wire between terminals 1 and 2. With the jumper in place, you cannot change the unit of measure, scale, limit, and compensation values.

IMPORTANT

The unit of measure must be selected before the unit is used. Refer to Function Key 3 description under "Function Keys" on page 13 to select a unit of measure.

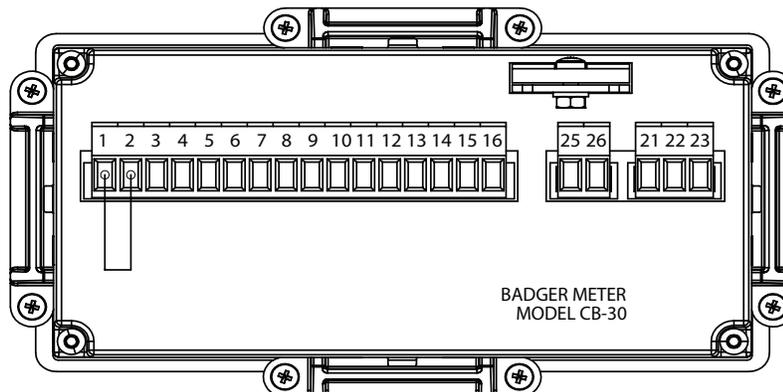


Figure 8: Lockout Jumper

Function Keys

In addition to serving as numeric keys to program the batch size or other values, these keys are used to set values for the Wash Cycle, the Valve Compensation, the Scale Factor and the Batch Limit.

*Remember: Always press **ENTER** after programming a new value or after viewing a present value.*

 <p>Press and hold until the serial number appears. Press ENTER to escape.</p>	 <p>Press and release the LIGHT (0) key to select the display brightness. The numbers correspond to the following percentages of brightness:</p> <p>1 = 20% 2 = 40% 3 = 60% 4 = 70% 5 = 80% 0 = OFF</p>
 <p>Press and hold until the software version appears. Press ENTER to escape.</p>	
 <p>Press 3 to display the current unit of measure. To change the unit of measure: Press 0 for "no unit"; Press 1 for "gallons"; Press 2 for "liters"; or press RESET to restore the unit to the last confirmed setting. Press ENTER to save your selection.</p> <p>The 3 key will be locked out when the keyboard is locked out.</p>	 <p>Press and release the ENTER key after a new value has been selected. This enters the new value in memory.</p>
 <p>Press and release the WASH (6) key to program the wash cycle amount of water (up to 999 gallons*). Program zero if no wash cycle is needed.</p>	 <p>Press and release the RESET key to reset all batch counts back to zero (after a HOLD) to start a new batch or to reprogram new preset values.</p>
 <p>Press and release the COMP (7) key to set the valve overrun compensation amount (up to 999 gallons*). Refer to "UNDERSTANDING THE BATCH CYCLE" on page 14 for information on how to determine compensation.</p>	 <p>Press and release the START key to open the valve and start the main batch, to start the wash cycle or to resume operation after a HOLD condition.</p>
 <p>Press and release the SCALE (8) key to set the scale factor (from 0.0001 to 0.9999).</p>	 <p>Press and release the HOLD key to close the valve and stop the batch or wash cycle at any point and reset to zero or complete the batch manually.</p>
 <p>Press and release the LIMIT (9) key to set the batch limit (up to 9999 gallons*). The CB-30 will not allow any batch greater than the value entered.</p>	 <p>Press and release the MANUAL key to batch manually. The valve will be open as long as the key is depressed. It will operate only after a HOLD or RESET condition.</p>

Table 8: Dual-Purpose Function Keys

*Gallons or liters based on unit of measure selected.

UNDERSTANDING THE BATCH CYCLE

This section contains a detailed explanation of the typical procedure for batching water into the concrete mix using the Badger Meter CB-30 controller.

The following parameters are used as an example for illustration purposes only:

- Total Batch to be dispensed into the mix = 250 gallons
- Amount of water for WASH Cycle = 30 gallons
- Overrun Compensation = 5 gallons

Presetting Batch Values

Initially the operator will preset all values as follows:

1. Press **BATCH**, then enter **250** and press **ENTER**.
2. Press **WASH**, then enter **30** and press **ENTER**.
3. Press **COMP**, then enter **5** and press **ENTER**.

The Initial Batch Cycle

When the operator presses **START** the unit will energize the valve solenoid and open the valve. The indicator will show "BATCH". The display to the left will start counting down from the preset value to the wash value, but begin closing the valve at 35 gallons (wash plus overrun) and coast down to 30 gallons.

The Wash Cycle

The indicator will now show "WASH READY". The operator presses **START** again, the indicator will show "WASH" and the display will count down from 30 gallons to zero but begin closing the valve at 5 gallons (overrun) and coast down to zero. The indicator will then show "BATCH READY" again.

Stopping the Batch

The operator can stop the batch at any point during the run by pressing the **HOLD** key. If done during the batch cycle the indicator will show "BATCH HOLD". If done during the wash cycle it will show "WASH HOLD". After a **HOLD** command the operator has three choices:

- Press **RESET** to start a new batch, or
- Finish the batch manually by pressing the **MANUAL** key, or
- Press **START** to continue and finish the preset cycle.

Manual Batching

If needed, the operator can stop the automatic batch cycle and finish dispensing manually. As long as the manual key is pressed and held, the valve solenoid will be energized (valve open) and the counter will count UP from zero or from that number when the **HOLD** command was received. Knowing the compensation value, it is up to the operator to release the **MANUAL** key and stop the valve in time to prevent overruns.

Setting a Batch Limit

In order to prevent anyone from entering too large a batch, you can limit the maximum batch value that can be programmed:

1. Press **LIMIT**.
2. Enter the maximum allowable batch.
3. Press **ENTER**.

If a larger quantity than the limit value is entered, the batch display will blink until a lesser value is entered.

IMPORTANT

The CB-30 is programmed at the factory with a pulse fail-safe period of three seconds. This means that if a transmitter pulse is not received within three seconds of a START command or the last pulse, (in the middle of the batch) the valve will close and the display to the left will start blinking. After correcting the problem (bad transmitter, valve or pump) press **RESET** to start over.

Determining the Compensation Value

When a slow closing valve is used, (to prevent water hammer) the CB-30 can be programmed to begin closing the valve ahead of time to compensate for the water overrun during the closing period.

To determine the amount of overrun, run one or two batches with the CB-30 without a compensation value and without a wash value.

1. Preset a typical batch (250 gallons).
2. Press **START** and let the batch run.
The counter will count down to zero, and if there is an overrun, the counter will display the amount as a negative number (for example, -5. This is the number that must be programmed to compensate for valve overrun).
3. To program, press **COMP**, enter **5**, then press **ENTER**.

The CB-30 will begin closing the valve 5 gallons prior to the Batch and Wash preset values that are programmed. On the second test batch, the counter may actually stop short of zero (for example, at 1). This indicates that the compensation value must be changed from 5 to 4 gallons.

Determining the Scale Factor

The scale factor is a number that multiplies the incoming pulses from the flow meter. It converts them to desired units of measure such as US gallons, liters, imperial gallons or pounds.

To determine the appropriate factor for the type and model of flow meter in use, apply the following formula:

$$\frac{1 \text{ gallon (liters, etc.)}}{\text{Pulse rate (liters, etc.)}} = \text{Scale Factor}$$

Example: For a 3" Turbo, the pulse input coming from the PFR-3E transmitter is 24.8 pulses per gallon.

Therefore:

$$\frac{1 \text{ gallon}}{24.8 \text{ pulses per gallon}} = \mathbf{0.0403}$$

To set the scale factor:

1. Press **SCALE**.
2. Enter **0403**.
3. Press **ENTER**.

The scale factor will appear as follows: **0** in the left display and **403** on the right display.

Turbo Size	Pulses per Gal	Scale Factors PFT-3E
2"	34.72	0.0288
3"	24.80	0.0403
4"	5.12	0.1953
6"	2.16	0.4629

Table 9: Scale Factor

TROUBLESHOOTING THE CB-30

This section deals with most of the common problems that you may encounter with the CB-30, the possible causes and the recommended remedies. Most problems are due to improper wiring and/or programming procedures. The problem may also be in the flow meter, valve, pump, or other piece of equipment.

Be sure that all other equipment is functioning properly. The CB-30 is extensively tested at the factory before shipment. However, the unit may get damaged during transit or installation. If after all possible remedies have been tried and the problem persists, contact your local representative or Badger Meter.

Problem	Possible Causes	Remedies
Unit is powered but the display does not light up.	Incorrect AC power wiring.	Re-check power wiring.
Transmitter is connected but the CB-30 does not count.	<ol style="list-style-type: none"> 1. Incorrect transmitter wiring or broken wire. 2. Transmitter is defective. 3. Wrong scale factor. 4. Low frequency input must be on terminal #7. 5. Meter is defective, rotor not turning. 	<ol style="list-style-type: none"> 1. Check wiring diagrams. 2. Replace parts or entire unit. 3. Check scale factor calculation: For example, if programmed 0.001 instead of 0.100, unit will wait for 100 pulses before decrementing one count. 4. Verify connection. 5. Disassemble meter, check rotor, replace if defective.
Valve does not close at set points.	<ol style="list-style-type: none"> 1. Triac output is not properly connected. 2. Triac is defective. 3. Valve components are defective. 	<ol style="list-style-type: none"> 1. Reconnect triac wiring. 2. Contact factory for replacement. 3. Check and replace valve components.
Counter accumulates too many counts.	<ol style="list-style-type: none"> 1. Wrong scale factor. 2. Electrical noise causing extra pulses. 3. Excessive vibration 	<ol style="list-style-type: none"> 1. Check scale factor calculation. 2. Check wiring. Make sure power lines are not touching or close to pulse signal line. Always use shielded cable. 3. Dampen vibration.
Some of the keys on the front panel are not operational.	<ol style="list-style-type: none"> 1. Broken switch behind front panel. 2. Problem with internal components. 	<ol style="list-style-type: none"> 1. Replace CB-30 or return for repair. 2. Return unit to the factory.
Unit stops counting at the beginning or in the middle of a batch and closes the valve.	Three second fail-safe has elapsed without receiving a pulse.	Transmitter signal is not received by CB-30 due to: No flow through the meter, faulty transmitter or faulty valve. Check all these components; replace as needed and press the RESET button to clear error.

Table 10: Troubleshooting

Control. Manage. Optimize.

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