

Model CB 20

Concrete Batch Controller

Installation & Operation Manual



IMPORTANT !!!! Read this manual before attempting any installation, wiring or operation.

Service Information (File manual for future reference and service)

Serial Number _____ Date Installed _____

Service Line _____ Operator _____



BadgerMeter, Inc. _____

IOM-076-01
Part No. 53400-076

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.

It is very Important that you read this manual carefully before attempting any installation or operation.

Keep the manual in an accessible location for future reference.

OPERATION

The CB 20 is a batch controller. It will accept a signal input from the meter transmitter, scale it to the desired unit of measure and at a preset point(s) send a signal to operate the flow valve.

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

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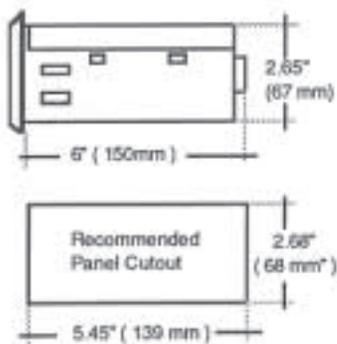
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HOW TO UNPACK, ASSEMBLE AND INSTALL THE CB-20



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.



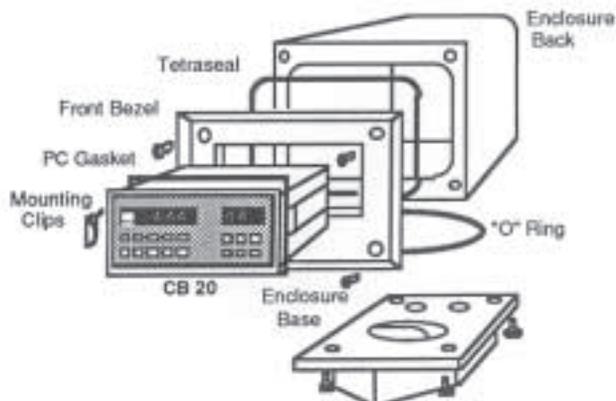
Note: Operating temperature is 32° F to 130° F (0° to 55° C) with a maximum humidity of 85% non-condensing. Always select a mounting location with proper ventilation and environmental protection.



The CB 20 can be mounted on the flow-meter, on a wall or shelf, or in an instrumentation panel. The picture below shows the exploded view of a meter or wall mounted unit. In this configuration the CB 20 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.
2. Install gasket around the mounting bezel.
3. Pass the unit through the front panel cutout.
4. Secure the unit to the panel with the mounting clips.



HOW TO WIRE THE CB 20



The rear panel of the CB 20 controller contains 15 active screw terminals for connecting #28 to #14 guage insulated stranded wire (#18 guage stranded wire is recommended).

A wire stripper and a small screwdriver are the only tools required. The diagrams on page 3 and 4 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.
- Observe all local electrical codes.

CAUTION: To prevent accidents, power connection should be done only after all other connections have been completed.

STEP 1 - CONNECT THE FLOW VALVE SOLENOID

The CB 20 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 26 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 replaceable (use nose pliers to gently remove it from its' socket.)

TRIAC rating:

MAC 3040-4 Motorola or equivalent
Load Voltage: 25 to 140 VAC
Load current: 1.5 amps

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. 12VDC max. 50 ma sink max. (1 VDC typ V ce at 50 ma)

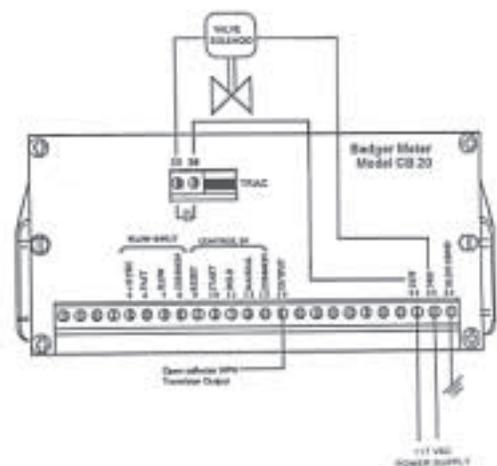
WIRING TERMINAL IDENTIFICATION

Term No.	Function
5	12VDC supply
6	Fast pulse input
7	Slow pulse input
8	Common
9	Remote RESET input
10	Remote START input
11	Remote HOLD input
12	Remote MANUAL input
13	Remote input Common
22	117 VAC input (hot)
23	117 VAC neutral
24	AC System ground
25	Triac output
26	Triac power input

CAUTION

Because the CB 20 is microprocessor controlled, it is very important that the power supply be as "clean" as possible. Avoid using power lines that feed heavy load electrical devices such as pumps, motors, etc.

THE CB 20 POWER INPUT IS INTERNALLY FUSED AND PROTECTED FROM COMMON LINE NOISE BY A FILTERING NETWORK.



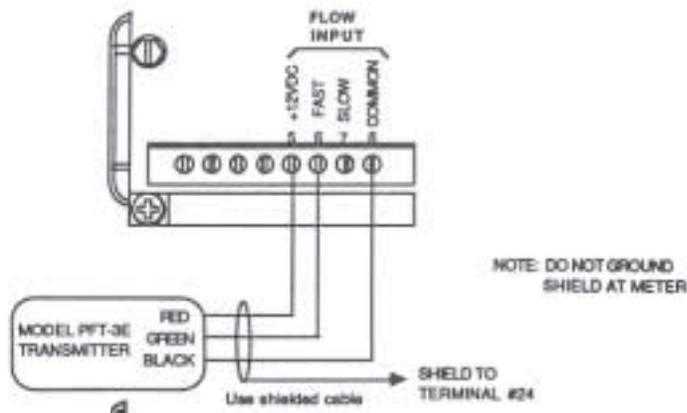
STEP 2 - CONNECT THE PULSE TRANSMITTER

The CB 20 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 (Ground shield to terminal #24).
2. Make sure the signal lines are not bundled with or touching power lines.

The diagram to the right shows the connection to Model PFT-3E transmitter, usually supplied with Badger's Turbo meter. The Model provides an open collector transistor output for the CB 20.



TRANSMITTER COUNT INPUT

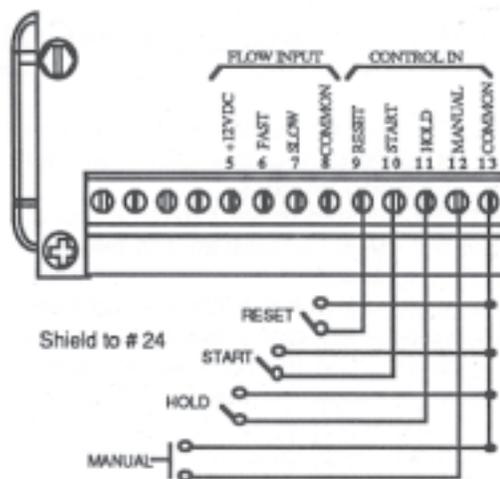
- Frequency:** DC to 5 kHz (fast)
DC to 80 Hz (slow)
- Low Level:** 0 to 2 VDC min.
- High level:** 10 to 20VDC max.
- Impedance:** 4.7 KΩ at +1 2VDC
- Current:** 2.5 ma steady state.
- Response:** 10μs fast pulse
6ms slow pulse

STEP 3 (OPTIONAL) - CONNECT REMOTE CONTROLS

For operator convenience and or 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.

Remote Control

- Inputs:** Switch Contacts or Open collector transistors.
- Frequency:** DC to 20HZ, Current sinking
- Low Level:** 0 to 2 VDC min.
- High Level:** 10 to 20 VDC max.
- Impedance:** 4.7 KΩ at + 12DC
- Current:** 2.5 ma steady state.
- Response:** 25ms make and break time.

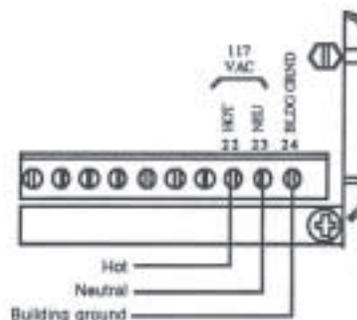


STEP 4 - CONNECT THE AC POWER SUPPLY

CAUTION Connect AC power only after all other wiring is completed.

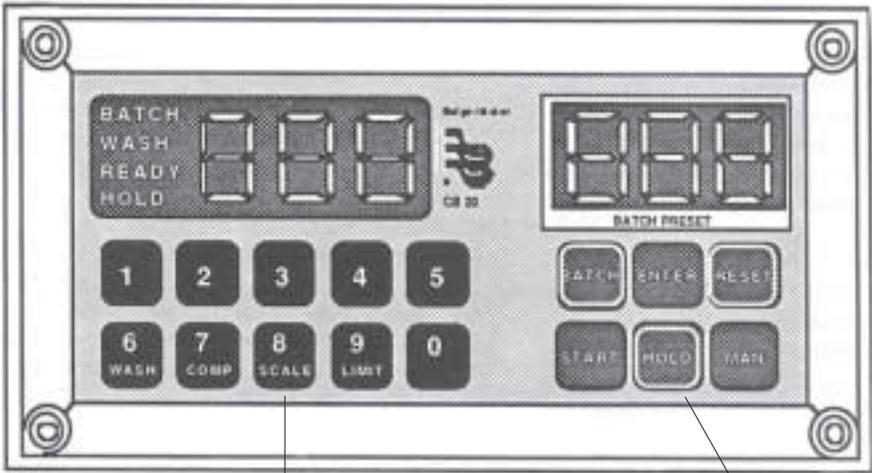
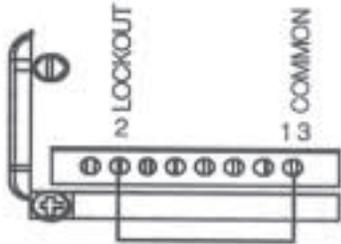
The CB 20 has an internally mounted line filter and fuse for surge protection. The unit is designed to operate with 117 VAC power only. Always make sure to ground terminal #24 to the electrical system ground.

- AC Power Input:** 117 VAC ±10% 47- to 63 Hz
- Consumption:** 10 VA max.



HOW TO OPERATE THE CB-20 FRONT PANEL

The CB-20 front panel consist 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 to the left includes four LED english annunciators that show batch state. The 10 digit key pad includes all secondary preset functions and the six key command pad is used to stop, start, and reset the unit in addition to presetting the batch and allowing for manual operation.



DUAL PURPOSE 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 just viewing the present one.

6 WASH Press the **WASH (6)** key to program the wash cycle amount of water (up to 99 gallons). Program zero if no wash cycle is needed.

7 COMP Press the **COMP (7)** key to set the valve overrun compensation amount (up to 99 gallons). See page 6 on how to determine compensation.

8 SCALE Press the **SCALE (8)** key to set the scale factor (from .0001 to .9999) The scale factor will appear split between both displays, for example:

.6 435

9 LIMIT Press the **LIMIT (9)** key to set the batch limit (up to 999 gallons). The CB 20 will not allow any batch greater than the value entered.

PROGRAMMING SEQUENCE

The CB-20 is equipped with a programming lockout feature. This feature consists of a jumper wire between terminals 2 and 13. With the jumper in place programming of the scale, limit, and compensation can not be done. The lockout jumper must be removed before these functions can be programmed. This jumper is installed at the factory.

TO PRESET VALUES

Lockout jumper must be removed to preset scale, limit, and compensation

1. Press the key for the function to be programmed.
2. Enter the desired value.
3. Press the **ENTER** key, to store the new value in memory.

FACTORY PRESETS:	
LIMIT	_____
SCALE	_____
COMP.	_____
WASH	_____

BATCH Press the **BATCH** key to set the batch size. (up to 999 gallons) Batch size includes wash amount.

ENTER Press the **ENTER** key after a new value has been selected. This enters the new value in memory.

RESET Press the **RESET** key to reset all counts back to zero (after a HOLD) to start a new batch or to reprogram new preset values.

START Press 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.

HOLD Press 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.

MAN Press 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.

UNDERSTANDING THE BATCH CYCLE

This section contains a detailed explanation of the typical procedure for batching water into the concrete mix using Badger's CB 20 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 enter 250 and press ENTER.
2. Press WASH enter 30 and press ENTER.
3. Press COMP* 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: either press RESET to start a new batch; 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 depressed, 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.

Selecting 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: Press LIMIT; enter the maximum allowable batch; 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 20 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 20 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 20 (without a compensation value and without a wash value).

- Preset a typical batch (250 gallons)
- 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, e.g. - 5. This is the number that must be programmed to compensate for valve overrun. To program:

- Press COMP; enter 5; press ENTER.

The CB 20 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 (e.g.1). This indicates that the compensation value must be changed from 5 to 4 gallons.

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, pounds, etc.

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 a PFT-3E transmitter is 24.8 pulses per gallon.
Therefore:

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

To set the scale factor: Press SCALE enter 0403 and press ENTER. The scale factor will appear as follows:
0 in the left display and 403 on the right display.

TURBO SIZE	PULSES/ GAL.	SCALE FACTORS PFT-3E
2"	34.72	.0288
3"	24.80	.0403
4"	5.12	.1953
6"	2.16	.4629

TROUBLESHOOTING THE CB 20



This section deals with most of the common problems that you may encounter with the CB 20, 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 flowmeter, valve, pump, or other piece of equipment.

Be sure that all other equipment is functioning properly. CB 20s are 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 call Badger Meter at (918) 628-7400.

PROBLEM	POSSIBLE CAUSES	REMEDIES
Unit is powered but the display does not light up	<ol style="list-style-type: none"> 1. Incorrect AC power wiring 2. Excessive line noise affecting the processor. 	<ol style="list-style-type: none"> 1. Re-check power wiring. 2. Recycle power.
Unit works fine but occasionally the display freezes up.	<ol style="list-style-type: none"> 1. Line noise is affecting processor due to a current spike or surge 	<ol style="list-style-type: none"> 1. Use dedicated power or install surge suppression in network.
Transmitter is connected but the CB 20 does not count.	<ol style="list-style-type: none"> 1. Incorrect transmitter wiring or broken wire. 2. Transmitter is defective. 3. CB 20 is defective. 4. Wrong scale factor. 5. Low frequency input on terminal #7 instead of terminal #8. 6. Meter is defective, rotor not turning. 	<ol style="list-style-type: none"> 1. Check wiring diagrams. 2. Replace parts or entire unit. 3. To confirm, connect wire to terminal #8 and short to terminal #7. Each contact should produce one visible count on the display (with a scale factor of .9999) 4. Check scale factor calculation: i.e. if programmed .001 instead of .100, unit will wait for 100 pulses before decrementing one count. 5. Reconnect to terminal #8. 6. 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 at transmitter site. 	<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 CB20 or return for repair. 2. Return unit to the factory.
Unit is operational but front panel has excessive wear	<ol style="list-style-type: none"> 1. Operator using blunt objects to program unit or certain keys are worn out. 	<ol style="list-style-type: none"> 1. Connect external remote switches to control frequently used functions and/or return the unit for replacement.
Unit stops counting at the beginning or in the middle of a batch and closes the valve.	<ol style="list-style-type: none"> 1. Three second fail-safe has elapsed without receiving a pulse. 	<ol style="list-style-type: none"> 1. Transmitter signal is not received by CB 20 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.



Please see our website at
www.badgermeter.com
for specific contacts.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding bid obligation exists.



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