Instruction Manual

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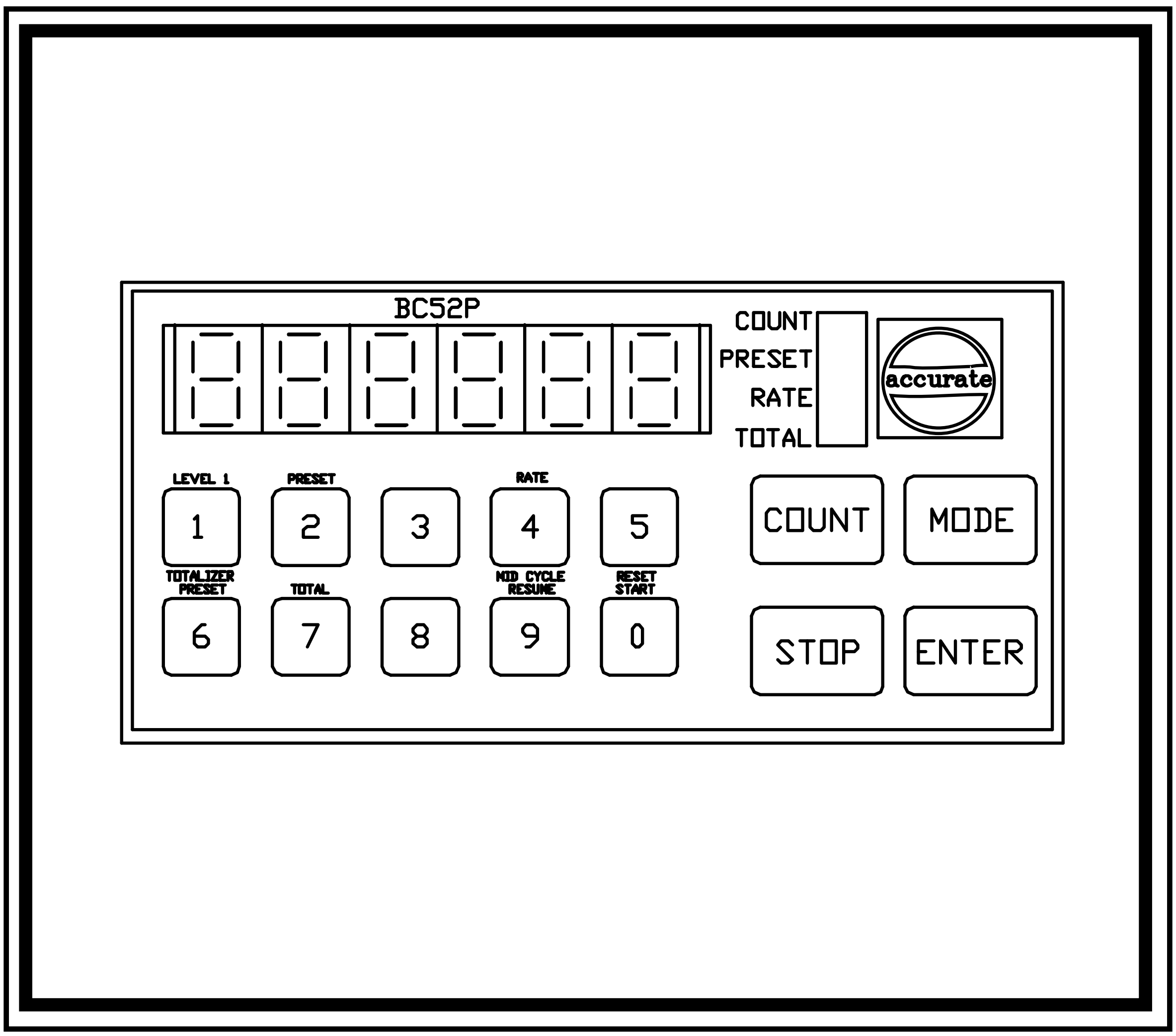
Instrument Model Number ______________________________

Instrument Serial Number ______________________________



BC-52P

Form Number AIC2042
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GENERAL DESCRIPTION

BC-52P DUAL PRESET BATCHING CONTROLLER

The BC-52P Dual Preset Batching Controller has a 6-digit preset counter with a running totalizer and flow rate indicator. Five (5) transistor outputs and two (2) Form C Relay Outputs provide two-stage shutdown. Other features include incoming count scaling, programmable decimal points, program lock-out, and independent reset/start, stop, and mid-cycle resume keys. The sealed touch keyboard allows limited user programming for optimum flexibility.

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SPECIFICATIONS

POWER REQUIREMENTS

AC Power:	120/240 VAC (+10%, -20%), 47 to 63 Hz
DC Power:	11-28 VDC
Power Consumption:	18 Watts Maximum

ENVIRONMENT

Operating Temperature:	32° to 130°F (0° to 55°C)
Storage Temperature:	-40° to 160°F (-40° to 70°C)
Operating Humidity:	85% Non-Condensing Relative

PHYSICAL:

Case Dimensions:	5.38" W x 2.62" H x 5.91" D (136.7mm W x 66.5mm H x 150.1mm D)
Bezel Dimensions:	5.80" W x 3.04" H x 0.17" D (147.3mm W x 77.2mm H x 4.3mm D)
Lip:	0.2" (5mm)
Panel Cut-Out Dimensions:	5.43" W x 2.68" H (138mm W x 68mm H, DIN)
Mounting Panel Thickness:	0.58" (14.7mm) maximum (without optional spacer provided) 0.077" (1.96mm) maximum (with optional spacer provided) Front Panel will provide watertight seal with gasket provided
Weight:	2.2 Pounds (1.0 Kg)
Display Size:	6 digits, 0.56" (14.2mm H) with programmable decimal point location
Memory Types:	PROM, RAM, Non-Volatile NVRAM
Power Output:	15 VDC (+1, -2), 100 milliamps

COUNTER:

Count Range:	6 digits (0 to 999,999) with Rollover
Preset Range:	6 digits (0 to 999,999)
Count Modes:	Count with Add and Subtract Inputs Count with Up/Down Direction Input (Hardware doubling for above modes is provided)

MAXIMUM COUNT SPEED (ADD/SUBTRACT:)

SCALE FACTOR	UP	DOWN	QUAD
0.99999	4K	2.25K	2K
1.00000	5K	3.5K	3.5K
1.99999	3.5K	2K	1.25K
2.00000	4K	3K	2.75K
9.00000	1.5K	1.5K	1.5K
9.99999	1.25K	1K	1K

COUNT INPUT RATINGS:

The count inputs are designed to work with current sinking sensors (open-collector NPN transistor output) with or without passive pull-up resistor or contact closures to DC Common.

Input Voltage: High State (Logical "1", Sensor Off or Contact Open): 10.5 to 24.5 VDC

Low State (Logical "0", Sensor On or Contact Closed): 0 to 4.5 VDC when Control is Powered by AC Line

Input Impedance: 6800 ohms to 15 VDC when Control is Powered by AC Lines

Input Current: 20 mA Peak, 3 mA Steady State

Input Response: High State (Logical "1", Sensor Off or Contact Open)
High Speed (Low Speed Jumpers Not Connected)
110 µsec Minimum
High State (Logical "1", Sensor Off or Contact Open)
Low Speed (Low Speed Jumpers Connected): 5.5 sec Minimum
Low State (Logical "0", Sensor On or Contact Closed)
High Speed (Low Speed Jumpers Not Connected)
20 µsec Minimum at 0.1 VDC (0 ohms to DC Common)
45 µsec Minimum at 1.5 VDC (500 ohms to DC Common)
Low State (Logical "0", Sensor On or Contact Closed)

	Low Speed (Low Speed Jumpers Connected: 1.0 msec Minimum at 0.1 VDC (0 ohms to DC Common) 2.0 msec Minimum at 1.5 VDC (500 ohms to DC Common)

<u>CONTROL INPUTS:</u>

Input Voltage:	High State (Logical "1", Contact Open): 3.5 - 22 VDC	
	Low State (Logical "0", Contact Closed): 0 - 1.0 VDC	
Input Impedance:	4750 ohms to 5 VDC	
Current:	10 mA Peak, 3 mA Steady State	
Response Time:	Reset:	1 msec Minimum to DC Common
	Unlatch:	5 msec Minimum to DC Common (Unlatch 1 and 2)
	Print Request:	5 msec Minimum to DC Common

<u>OUTPUT RATINGS:</u>

Relay Contacts:	Type:	Two Relays Each with Single Set of Form C Contacts
	Load Voltage:	120/240 VAC
	Load Current:	10amps resistive @ 24 VDC or 240 VAC 1/3 HP @ 120 VAC or 240 VAC
Transistor Outputs (5)	Type:	Open Collector NPN Transistor with Zener Diode Transient Surge Protection
	Load Voltage:	30 VDC Maximum
	Load Current:	300 Milliamps Maximum 480 Milliamps total for all transistors
Timing - On Delay and Off Delay:	Duration:	0.01 to 99.99 Seconds
	Accuracy:	$\pm$0.01 Second for Timeout Values Below 1 Second $\pm$1% for Time Values Above 1 Second

OPTIONAL COMMUNICATIONS:

Interface Type:	Dual Port 20 Milliamp Current Loop Active Transmit, Passive Receive
Speed:	110, 300 and 1200 BAUD, User Selectable
Date Type:	Standard ASCII Code
Format:	Start Bit, 7 ASCII Data Bits, Parity Bit, One or Two Stop Bits (Even Parity for Serial Data Output, No Parity for Serial Data Input)

COUNT SCALE FACTOR:

Range:	6 Digits (0.00001 to 9.99999)

MODE CODES

The Control has many different programmable operating modes and selectable options. Many of these modes have factory preset values for standard batching applications. Most of these factory values, or default values*, are normally left unchanged. However, it will be necessary to modify some of these values for your specific application.

*Denotes Mode Code Default Values when Mode 43 (Default Set-Up) is performed.

MODE CODE TABLE

Mode Code Number		
1	Level 1 - Preset LED Bar On	#0 to #999999, Default = 0
2	Preset - Preset LED Bar On Flashing	#0 to #999999, Default = 0
4	Rate Display - Rate LED On	
5	Scale Factor	#.00001 to 9.99999, Default = 1.00000
6	Totalizer Preset - Total and Preset LED	#0 to #999999, Default = 0
7	Totalizer Count - Totalizer LED On	
10	Main Counter - Count LED On	
20	Totalizer Multiplier	0 = X1* 1 = X10 2 = X100
21	Reset Totalizer from Keyboard	0 = Off* 1 = Momentary Reset
22	Unlatch Totalizer Output	0 = Off* 1 = One Shot Unlatch
23	Totalizer Reset at Coincidence - PS3	0 = Off* 1 = On
24	Totalizer Reset at Start/Reset	0 = Off* 1 = On
27	Totalizer Scaler Reset at Preset 3 (Function Code 23 = 1)	0 = No Reset, 1 = Reset Total Scaler*
30	Level 1 Timeout	.01 to 99.99 Seconds, 0 = No Timeout, Default = 0.00

<table>
<tr><td colspan="2">Mode Code Number</td><td colspan="2"></td></tr>
<tr><td>31</td><td>Level 2 Timeout</td><td colspan="2">.01 to 99.99 Seconds, 0 = No Timeout,
Default = 0.00</td></tr>
<tr><td>32</td><td>Totalizer Timeout</td><td colspan="2">.01 to 99.99 Seconds, 0 = No Timeout,
Default = 0.00</td></tr>
<tr><td>34</td><td>Totalizer Output</td><td colspan="2">0 = Coincidence out; 1 = Count Pulse Out*</td></tr>
<tr><td>38</td><td>Output 1 Unlatch</td><td colspan="2">*0 = Output 1 Times Out (F.C. 30)
1 = Output 1 Unlatch at End of
Output 2
Timeout or F.C. 30, Whichever Occurs First</td></tr>
<tr><td>40</td><td>Diagnostics</td><td colspan="2">*0</td></tr>
<tr><td>41</td><td>Preset Lock</td><td><u>Digit 2</u>

0 = 21 and
22 Enabled
1 = 21 and
22 Locked</td><td><u>Digit 1</u>

0 = PS1, PS2, PS3, Enabled
1 = PS1, Locked
2 = PS2, Locked
3 = PS1, PS2, Locked
4 = PS3, Locked
5 = PS1, PS3, Locked
6 = PS2, PS3, Locked
7 = PS1, PS2, PS3, Locked</td></tr>
<tr><td>43</td><td>Default Setup</td><td colspan="2">*0</td></tr>
<tr><td>60</td><td>Count Mode Select</td><td colspan="2">0 - Add/Subtract*, 1 = Common Count</td></tr>
<tr><td>62</td><td>Main Counter Decimal Point</td><td colspan="2">0 = XXXXXX*
1 = XXXXX.X
2 = XXXX.XX
3 = XXX.XXX
4 = XX.XXXX
5 = X.XXXXX</td></tr>
<tr><td>63</td><td>Rate Indicator Decimal Point</td><td colspan="2">0 = XXXXXX*
1 = XXXXX.X
2 = XXXX.XX
3 = XXX.XXX
4 = XX.XXXX
5 = X.XXXXX
9 = Floating Decimal Point</td></tr>
<tr><td>64</td><td>Rate Indicator Flow Factor</td><td colspan="2">4 Digits Plus Exponent, Default = 1000.1</td></tr>
</table>

<table>
<tr><td colspan="3">Mode Code Number</td><td colspan="3"></td></tr>
<tr><td>65</td><td colspan="2">Minimum Average Pulse</td><td colspan="3">0 = No Minimum*
1 = 3
2 = 10
3 = 30
4 = 100
5 = 300
6 = 1000
7 = 3000</td></tr>
<tr><td>66</td><td colspan="2">Rate Indicator Timeout</td><td colspan="3">1 to 90 Seconds after Last Count Before 0;
Default = 1</td></tr>
<tr><td>67</td><td colspan="2">Rate State Power Up</td><td colspan="3">0 = Power Up to Count*
1 = Power Up to Rate</td></tr>
<tr><td>68</td><td colspan="2">Rate Meter Tracking</td><td colspan="3">0 = Rate Follows Input and Multiplier Constant
1 = Rate Follows Constant and Scale Factor*</td></tr>
<tr><td>69</td><td colspan="2">Count/Rate Display</td><td colspan="3">0 = Count or Rate Display Continuous*
1-9 = Alternate Display Rate</td></tr>
<tr><td>80</td><td colspan="2">Main Counter
Reset/Preset Mode</td><td colspan="3">0 = Reset Mode, Output 2 at Preset 2
1 = Preset Mode, Output 2 at Zero*</td></tr>
<tr><td>81</td><td colspan="2">Recycle Main Counter at
Preset 2</td><td colspan="3">0 = No Recycle*
1 = Recycle at PS2</td></tr>
<tr><td>83</td><td colspan="2">Main Counter Scaler Re-
set at Preset 2</td><td colspan="3">0 = No Reset*
1 = Reset at Preset 2 (Function Code 81 = 1)</td></tr>
<tr><td>90</td><td colspan="2">Baud Rate Select</td><td colspan="2">Digit
0
1*
2</td><td>Baud Rate
110
300
1200</td></tr>
<tr><td>91</td><td>Print
Date
Select</td><td>Digit
0
1
2
3
4
5
6
7</td><td>Preset 1
On
--
On
--
On
--
On
--</td><td>Preset 2
On
On
--
--
On
On
--
--</td><td>Preset 3
On*
On
On
On
--
--
--
--</td></tr>
</table>

Mode Code Number					
93	Print Data Select	Digit	Count	Rate	Scale
		0	On	On	On*
		1	--	On	On
		2	On	--	On
		3	--	--	On
		4	On	On	--
		5	--	On	--
		6	On	--	--
		7	--	--	--
94	Print On Reset		0 = Off*, 1 = On		

NOTE: To avoid accidental change to the Mode Code values, it is recommended that the ability to change them be removed by installing a jumper between the "Program Inhibit" Terminal (15) and DC Common Terminal (12) on the rear of the Control. When installed, all of the Mode Codes (except Mode 2 “Preset”) may be interrogated but not modified.

DISPLAY

The 6-digit Numeric Display normally shows the Counter value. When Presets or Modes are being programmed, the Display shows either the Mode Code or the data being programmed. When power is applied to the unit, the Display flashes at 1/2 second intervals for 4 seconds. The unit will accept count pulses during this period.

Since different items of information are displayed, it is necessary to observe the Light Bars on the right side of the Display to determine what item of information is being displayed. When the Count Bar is on Steady, the Display shows the Current Count in the Main Counter. When the Rate Display is on Steady, the Display shows product flow rate. When the Totalizer Bar is on Steady, the Display shows the accumulated total. The Preset Bar has three (3) combinations to show which Mode is being selected. They are as follows:

a.	Level 1	Preset Bar on Steady
b.	Preset	Preset Bar on Flashing
c.	Totalizer Preset	Preset and Totalizer Bars Flashing

NOTE: To view Mode values, always press the Count key first.

During a Batch-In-Process, the Rate, Total and Count Modes are directly accessible for display. If any other keys are pushed, inadvertently or purposely, during viewing of a Batch-In-Process, you must press the Count key to return to normal viewing.

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KEY FUNCTIONS

DATA ENTRY KEYS

The Data Entry Keys (0 through 9) are used to enter the Level 1 Value, Preset Value, Totalizer Preset Value, Mode Codes and Parameters.

Key	Function
Level 1 1	The "1" Key also serves as the "Level 1" Key. The "Level 1" Key is used to select the Level 1 Value for interrogation or modification. "Level 1" controls "K1 RELAY," K1 RELAY is normally wired to the product pump circuit.
Preset 2	The "2" Key also serves as the "PRESET" Key. The PRESET Key is used to select the preset value for interrogation or modification. "PRESET" controls "K2 RELAY," K2 RELAY is normally wired to the Shut-Off Valve Circuit.
Rate 4	The "4" Key also serves as the "RATE" key. The RATE Key is used to view product flow rate.
Scale Factor 5	The "5" Key also serves as the "SCALE FACTOR" key. The "5" Key is used to interrogate or modify the Scale Factor Value.
Totalizer Preset 6	The "6" Key also serves as the "TOTALIZER PRESET" Key. The "TOTALIZER PRESET" Key is used to select the Totalizer Preset Value for interrogation or modification. ***NOTE:** When the "TOTALIZER PRESET" is reached, the Main Counter is inhibited from counting, Relays K1 and K2 de-energize. The Totalizer continues to accept counts. The Main Counter and Relays are enabled when the Totalizer is reset. *Totalizer Reset Sequence: <MODE>-2-1-<ENTER>-1-<ENTER>
Total 7	The "7" Key also serves as the "TOTAL" Key. The "TOTAL" Key is used to view the accumulative total of the process. *Reset Total Sequence: <MODE>-2-1-<ENTER>-1-<ENTER>

Key	Function
Mid-Cycle Resume 9	The "9" Key also serves as the "MID-CYCLE RESUME" Key. The MID-CYCLE RESUME Key is used to continue a batch stopped in progress. Upon pressing this key, the Controller will pick up where it left off in the batch and complete its cycle.
Reset Start 0	The "0" Key also serves as the "RESET/START" Key. The "RESET/START" Key is used to reset the Main Counter to its preset value and simultaneously start the batch cycle (energizes K1 and K2 Relays). **NOTE:** DO NOT use the "RESET/START" Key to <u>resume</u> a batch cycle "stopped" in progress.
Count	The use of this key after an interrogation or modification of an Operating Mode will cause the count to display.
Mode	The "MODE" Key is used to change the programmable modes. When this key is pressed and followed by the desired Mode Code number, the Mode to be interrogated or modified is selected.
Enter	When the Mode Key is pressed and a code is entered, the "ENTER" Key is used to terminate and enter the code. The "ENTER" Key is also used to terminate and enter a programmed value or a preset value.
Stop	The "STOP" Key is used to stop a batching cycle in progress.

MODE PROGRAMMING

THE MODES ARE MONITORED AND CHANGED AS FOLLOWS:

KEYSTROKE	**RESULT**
1) Press Mode key	Numeric Display Blanks
2) Press Desired Mode Code or Mode Key	Mode Number Displayed
3) Press Enter	Mode Value Displayed

PRESS COUNT KEY IF MODE VALUE IS TO BE LEFT UNCHANGED.

4) Enter Desired Value	New Value Displayed
5) Press Enter	New Value Blinks Once

CHANGE IS COMPLETE -- PRESS COUNT OR MODE KEY.
START BATCH CYCLE.

6) Press Count Key	Displays Current Value in Main Counter
7) Press Reset/Start Key	Displays Preset Value, Starts Batch Cycle

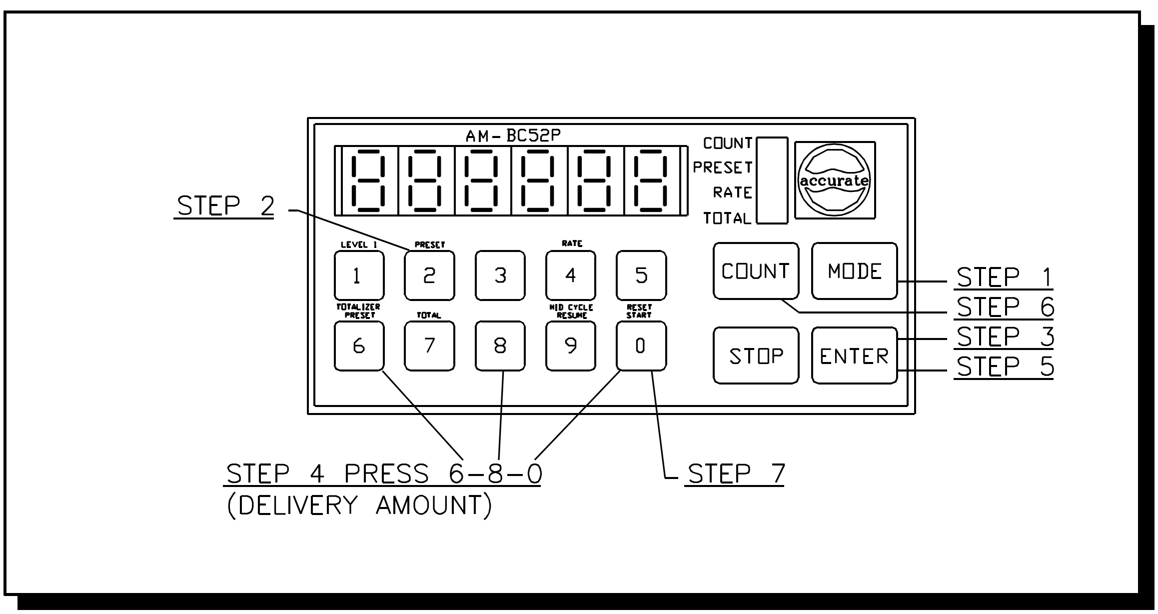

Figure 1 -- Keystroke example
OBJECTIVE: PROGRAM “680" IN PRESET MODE (STEPS 1-5 ABOVE)
START BATCH CYCLE: (STEPS 6-7 ABOVE)

SCALE FACTORS

Typically, flowmeters generate different numbers of pulses for each unit of measurement. This number is usually expressed in pulses per gallon, which we call the "K-Factor." Additionally, the number of pulses per unit normally does not correspond to common engineering units. Therefore, the Scale Factor is a number that converts the unscaled pulses of a flowmeter into the desired engineering unit of your choice, such as gallons, tenths of gallons, liters, etc.

CALCULATIONS

The Scale Factor to be entered into the Counter is easily calculated by using this formula:

$$\text{Scale Factor} = \frac{1 \text{ (Unit of Measure)}}{\text{K Factor}}$$

SCALE FACTOR CALCULATION EXAMPLES

EXAMPLE 1:

A flowmeter might produce 788.5 pulses per gallon. If the Counter is to display in "full gallons," calculate as follows:

$$\text{Scale Factor} = \frac{1(1)}{788.5} = 0.00127$$

The Scale Factor number 0.00127 would then be entered in "Mode 5" of the Controller using this sequence:

<MODE>-5-<ENTER>-0-0-0-1-2-7-<ENTER>

EXAMPLE 2:

If you desire "Tenths of Gallons" display, using 788.5 as the K-Factor, the Scale Factor would be calculated as follows:

$$\text{Scale Factor} = \frac{1(10)}{788.5} = 0.01268$$

Note that in this case, the decimal point on the Controller should be placed one place to the left (see Mode Code 62 for proper location of decimal point).

EXAMPLE 3:

Using the K-Factor of 788.5, calculate for "Full Liter" display.

$$\text{Scale Factor} = \frac{1(1)}{788.5} = 0.00126 \times 3.785 = 0.00480$$

EXAMPLE 4:

Using 788.5 as the K-Factor, calculate a Scale Factor for "Full Pound" display using milk at 8.6 Pounds Per Gallon.

$$\text{Scale Factor} = \frac{1(1)}{788.5} = 0.00126 \times 8.6 = 0.01090$$

FIELD ADJUSTMENT OF THE SCALE FACTOR

Occasionally, it is necessary to field adjust Scaling Factors to account for differing product viscosities or for wear in the meter. The procedure is displayed in the examples below.

EXAMPLE: "METER OVER-READS"

Meter reads 452 gallons. It should have been 450 gallons.
The old Scale Factor = 0.01260.

$$\text{New Scale Factor} = \text{Old Scale Factor} \times \frac{\text{Known Amount}}{\text{Amount Read}}$$

$$= 0.01260 \times 450/452$$

$$= 0.01254$$

EXAMPLE: "METER UNDER-READS"

Meter reads 98.7 gallons. It should have been 100 gallons.
The old Scale Factor = 0.01260

$$\text{New Scale Factor} = \text{Old Scale Factor} \times \frac{\text{Known Amount}}{\text{Amount Read}}$$

$$= 0.01260 \times 100/98.7$$

$$= 0.01276$$

FIELD CALIBRATIONS USING PERCENTAGE OF ERROR

EXAMPLE:

If meter over-registers by 0.4%, reduce the Scale Factor by 0.4%.
Old Scale Factor = 0.01260.

$$0.01260 \times 0.996 = 0.01254$$

If meter under-registers by 1.3%, increase the Scale Factor by 1.3%.
Old Scale Factor = 0.01260.

$$0.01260 \times 1.013 = 0.01276$$

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FLOW RATE INDICATOR

The Accurate Metering Count Controller has a Flow Rate Indicator feature that operates simultaneously with the Counter at all times.

The Rate Indicator has a "Rate" LED that is lit whenever the Rate Value is being displayed. Additionally, the "4" Key is used to display the Rate Value and is so labelled.

POWER-UP DISPLAY VALUE

In some applications, the normal operating display desired is the Rate Display rather than the Count Value. The Accurate Metering Counter normally powers up with the Count Value on the Display. To monitor the rate, an operator has to press the "Rate" Key each time the system is turned on.

The Accurate Metering Rate Indicator can allow the Power-Up Display to be either the Count Value or the Rate Value. This is done by changing the value of Mode Code 67. If Mode Code 67 has a value of "0", the Counter will power up showing the Count Value. If Mode Code 67 has a value of "1", the Rate will be displayed on power-up.

No matter which value is showing after power-up, the Count Value can be viewed by pressing the "Count" Key and the Rate Value can be viewed by pressing the "Rate" Key. Once one of these keys is pressed, that value will remain on the Display until a different selection is made or until power is removed from the Counter.

ALTERNATING DISPLAY

It is possible to program the Accurate Metering Rate Indicator to automatically alternate the Display between Count and Rate. This allows both Count and Rate to be monitored without the need to select them from the keyboard. The length of time each item is displayed before switching to the other is selectable from one to nine seconds. Program Mode 69 with a number from one to nine to select the Alternating Display Mode and the length of time each item is displayed. For example, when Mode 69 = 3, Count and Rate will each be displayed in alternating three second intervals.

COMMUNICATIONS TYPE

The Accurate Metering Rate Indicator can transmit the Rate Value through the Serial Communications Output. This is besides all of the other values that can otherwise be transmitted. If the Serial Communications Output is used, refer to the section of the Mode Code Table dealing with Mode Code 91. In this counter, you have to select the desired combination of values to be communicated. Note that when the Rate Value is printed, it is preceded by the characters "RTE", which identifies Rate.

FLOW FACTORS

The Flow Factor is a number that is used to set up the Engineering Unit for display.

In applications where the Scale Factor is being used to convert pulses to engineering units, it is desirable to use the [SCALED COUNT MODE 68 = 1]. Any changes that are made to the Scale Factor are automatically considered by the Rate Indicator. In other words, it is not necessary to recalculate the Flow Factor each time the Scale Factor is changed.

FLOW FACTOR CALCULATION

The Flow Factor must be expressed in scientific notation. This means that it must be expressed as a number less than "1" raised to a power of 10. For example, a Flow Factor of 10.34 would be expressed as 0.1034 times ten to the second power (since the decimal point was shifted two positions to the left). The resultant value entered into the Flow Factor (Mode 64) would be 10342. Note that the last digit is always the power of ten and the display would show this value as "1034.2" with the decimal point flashing once per second.

FORMULA:

$$\text{Flow Factor} = \frac{\text{Number of Seconds Per Time Unit x Decimal Point Number}}{\text{Scaled Counts Per Unit}}$$

DESCRIPTIONS:

Seconds Per Time Unit: Units Per Second = 1
Units Per Minute = 60
Units Per Hour = 3600

Decimal Point Number: Number determined by decimal point location. Refer to Mode 63 Table shown on page 23.

DECIMAL POINT:

Decide at which location on the Display the decimal point should be located when the Rate Value is displayed. Then refer to the following table and enter the value for the desired location in Mode Code 63.

Mode 63	Decimal Point Loca-tion	Decimal Point Number
0	XXXXX. (NONE)	1
1	XXXX.X	10
2	XXX.XX	100
3	XX.XXX	1000
4	X.XXXX	10000

FLOW FACTOR CALCULATION EXAMPLES

FORMULA:

$$\frac{\text{Number of Seconds Per Time Unit x Decimal Point Number}}{\text{Scaled Counts Per Unit}}$$

Remember, Mode 68 must be programmed to (1).

EXAMPLE 1:

Calculate a Flow Factor to display in "tenths of gallons per minute." The Scaled Count per unit is "10 pulses per gallon."

Time Unit: Minute = 60 Seconds
Decimal Point Number: 10 (Mode 63 = 1); See Mode Table, Page 8
Scaled Counts Per Unit: 10

$$\text{Flow Factor} = \frac{60 \times 10}{10} = 60.00 = .6000 \times 10^2$$

Mode 64 should be programmed as 6000.2. Remember, the last digit is the power of ten. Entry sequence is as follows:

<MODE>-6-4-<ENTER>-6-0-0-0-2-<ENTER>

EXAMPLE 2:

Calculate a Flow Factor to display in "Whole Gallons per Minute." The Scaled Count per unit is "10 Pulses per Gallon."

Time Unit:	Minute = 60 Seconds
Decimal Point Number:	#XXXXX = 1 (None), Mode 63 = 0
Scaled Counts Per Unit:	10

$$\text{Flow Factor} = \frac{60 \times 1}{10} = 6. = .6000 \times 10^{1}$$

Mode 64 should be programmed as 6000.1.

EXAMPLE 3:

Calculate a Flow Factor to display in "Whole Pounds Per Hour." The Scaled Count per unit is "1 Pulse Per Pound."

Time Unit:	Hour = 3600 Seconds
Decimal Point Number:	#XXXXX = 1 (None), Mode 63 = 0
Scaled Counts Per Unit:	1

$$\text{Flow Factor} = \frac{3600 \times 1}{1} = 3600 = .3600 \times 10^{4}$$

Mode 64 should be programmed as 3600.4.

FORCED AVERAGING RANGE

Normally, the Rate Indicator should be allowed automatically to select the averaging rate to provide a consistent update time for the display value. However, some flowmeters generate an irregular pulse output at different flow ranges, causing display fluctuations. If this situation occurs, it is advisable to establish the minimum number of pulses to average in order to maintain a stable display.

Often where minimum averaging is required, the range will be selected by trial and error while the process being monitored is in operation. The correct value should be selected by starting at a low average range and gradually increased until the Display stabilizes. Mode 65 has a default setting of (0).

To select an average range, refer to the table on page 25 and enter the appropriate value into Mode Code 65.

Minimum Pulse Average Quantity	Mode 65 Value
No Minimum (Automatic)	0
3	1
10	2
30	3
100	4
300	5
1000	6
3000	7

IMPORTANT: Selecting a forced averaging range defeats the ability of the Rate Indicator to maintain an update time between 0.5 and 3 seconds at lower pulse rates. The Display will be updated only after the selected number of pulses have been received, unless the pulse frequency is adequately fast to cause the Rate Indicator to select a higher averaging range automatically.

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OPERATING INSTRUCTIONS

1. Calculate and enter the Scale Factor (Mode 5) and Flow Factor (Mode 64). Program decimal point location if necessary. This unit defaults to no decimal point displayed (see Mode Codes).

2. Select the "PRESET" quantity for delivery.

3. Select "Level 1" value. Level 1 is normally used to slow the product flow rate toward the end of the Batch Cycle (shut-off pump). This procedure will help achieve repeatable batching and reduce hydraulic shock.

4. Clear Totalizer if desired:

   <MODE>-2-1-<ENTER>-1-<ENTER>

5. Press the "COUNT" Key.

6. Press the "RESET/START" Key. Upon pressing this key, the Preset Amount will be displayed and both relays, K1 and K2, will energize, initiating the Batch Cycle.

   On the Main Counter, "COUNT" will display a count-down from the Preset Amount down to zero (0). If the Main Counter decrements beyond zero, it will roll-over to all nines.

   The "TOTAL" will display a count-up, or accumulative total, of the metered units.

7. Examine the ascending Totalizer to compare the delivered quantity with the selected preset amount. If the values are not identical, adjust Level 1 value for the displayed error. An over-fill will require an increase of the Level 1 value by the amount displayed. An under-fill will require a decrease of the Level 1 value by the amount displayed.

8. The delivery may be interrupted by pressing the "STOP" key. To continue, press the "MID-CYCLE RESUME" Key.

   IMPORTANT NOTE: The "MID-CYCLE RESUME" Key completes an interrupted batch cycle. **DO NOT** use the "RESET/START" key if you want to continue an interrupted batch cycle. The "RESET/START" Key resets the Main Counter back to the preset amount and begins a new batch cycle.

9. If the next batch requires the same preset amount as previously delivered, simply press the "RESET/START" Key.

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TYPICAL BATCH PROGRAMMING PROCEDURE

NECESSARY INFORMATION FOR PROGRAM SET-UP

A. Meter K-Factor (normally expressed in pulses per gallon). The K-Factor is necessary for the Scale Factor calculation.

B. Counter and Totalizer Display, decide on Engineering Unit (gallons, liters, pounds, etc.) and how it is to be incremented (whole units, tenths of units, etc.).

C. Flow Rate Display, increments per unit.

D. Level 1 value (pump shut-down, product slow-down).

E. Preset amount, amount to be delivered (shut-off value).

EXAMPLE:

A. Meter K-Factor = 30.3 Pulses Per Gallon
B. Counter and Totalizer to display tenths of gallons
C. Flow Rate to display whole gallons per minute
D. Level 1 value: 1.0 Gallon
E. Preset Amount: 100.0 Gallons

PROGRAMMING STEPS USING EXAMPLE ABOVE:

1. Calculate the Scale Factor for tenths of gallons.

   Scale Factor = (1 x 10)/(30.3) = 0.33003

   See “Scale Factors” in this manual.

2. Scale Factor entry sequence:

   <MODE>-5-<ENTER>-0-3-3-0-0-3-<ENTER>

3. Program Counter and Totalizer decimal point one place to the left (tenth gallon display). See Mode Code 62.

4. Decimal Point entry sequence:

   <MODE>-6-2-<ENTER>-1-<ENTER>

5. Calculate the Flow Factor for whole gallons:

Flow Factor = (60 x 1)/(10) = 6. = .6000 x 10^1 or 6000.1.

See “Flow Factors” in this manual.

6. Flow Factor entry sequence:

<MODE>-6-4-<ENTER>-6-0-0-0-1-<ENTER>

7. Program 1.0 in Level l. Entry sequence:

<MODE>-< 1>-<ENTER>-1-0-<ENTER>

8. Program 100.0 in Preset, entry sequence:

<MODE>-<2>-<ENTER>-1-0-0-0-<ENTER>

9. Install program inhibit jumper (Terminal 15 to DC Common Terminal 12).

This completes the programming procedure. A batch cycle can now be run. Press the "COUNT" Key. Press "RESET/START" Key. (This will initiate a batch cycle for 100 gallons using the example above.)

INSTALLATION INSTRUCTIONS

GENERAL

When mounting, the location selected must provide for adequate air circulation space around the unit. Avoid locating the unit near instruments and/or equipment that generates excessive heat. Do not locate the unit near high voltage lines, transformers, or motor starters.

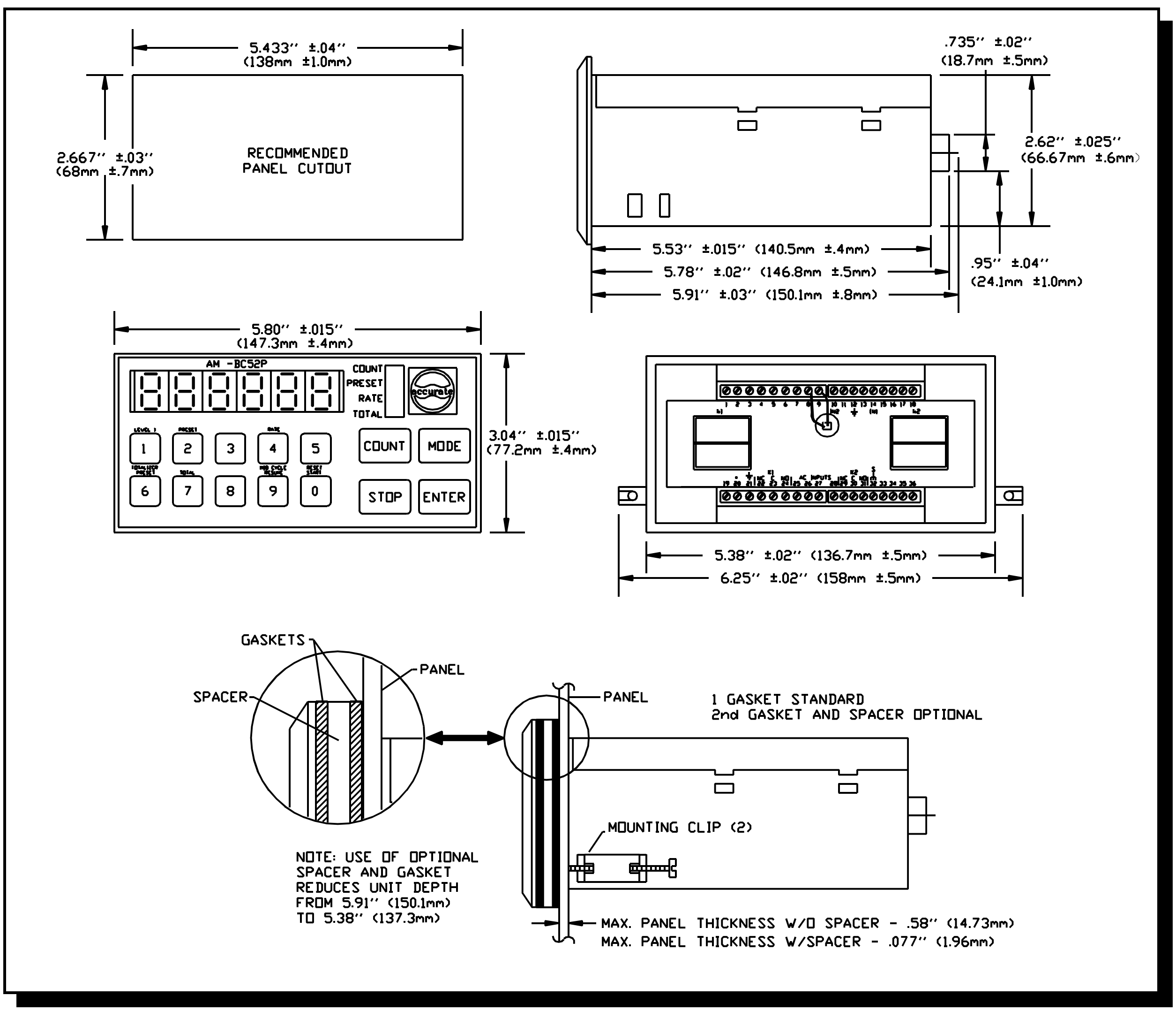
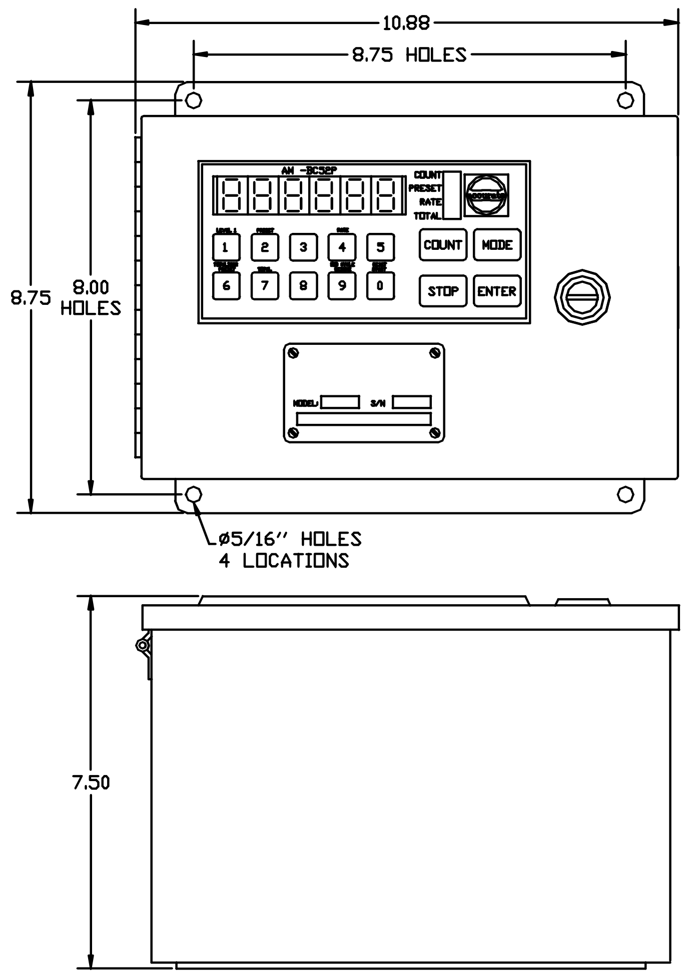


Figure 2 -- Panel Mounting Dimensions



NOTES:
1. NOMINAL ENCLOSURE SIZE:
10.5"L x 7"H x 7"D
NEMA 4X ENCLOSURE
2. 14GA. TYPE 304 STAINLESS STEEL
POLISH EXTERIOR TO NO. 4.
3. CONTINUOUS HINGE, 1/4 TURN CLAMP COVER.
4. MILD STEEL SUBPANEL PAINTED WHITE.

Figure 3 – Wall Mount Enclosure for BC-52P

WIRING

1. Disconnect all power before wiring terminals.

2. Do not use machine power service for 120/240 VAC input power to the Control. A dedicated or lighting circuit is recommended. Unit is not fused, user must provide slow blow fuse as per drawings on page 34.

3. Keep all signal cables as short as possible. This cable is to be shielded and is <u>not</u> to be bundled or routed with power carrying lines.

4. Before applying power to the equipment, recheck all wiring to insure proper connections.

5. When all wiring connections are completed, seal off all holes, conduit connections, and any other passages that could allow entry of moisture or contaminants to the Controller or flowmeter.

TERMINAL IDENTIFICATION

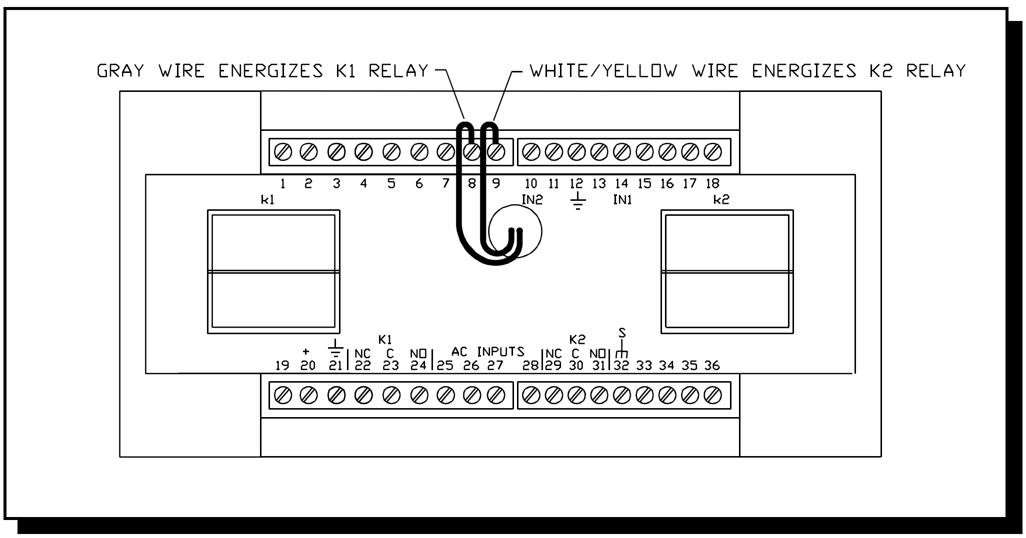


Figure 4 -- Visual Terminal Identifications

1. Reset Totalizer
2. Resume Input
3. Start/Reset Input
4. Count Reset Input
5. Transistor Output - 1 Prewarn
6. Transistor Output - 2 Final
7. Transistor Output - Totalizer
8. Transistor Output - 1 Prewarn
9. Transistor Output - 2 Final
10. Input 2
11. Low Freq 2
12. DC Common
13. Low Freq 1
14. Input 1
15. Program Inhibit Input
16. Print Req/Display Latch
17. Stop Input
18. Double Input
19. DC Input, 11-16 VDC
20. +15 VDC Output
21. DC Common
22. Relay K1 N.C.
23. Relay K1 Common
24. Relay K1 N.O.
25. 120/240 VAC
26. 120/240 VAC
27. 120/240 VAC
28. 120/240 VAC
29. Relay K2 N.C.
30. Relay K2 Common
31. Relay K2 N.O.
32. Safety Ground
33. SD1-
34. SD1+
35. SD0+
36. SD0-

All inputs are energized when connected to DC Common. A wire jumper, mechanical contact, or NPN transistor can be used to energize inputs.

POWER CONNECTION DIAGRAMS

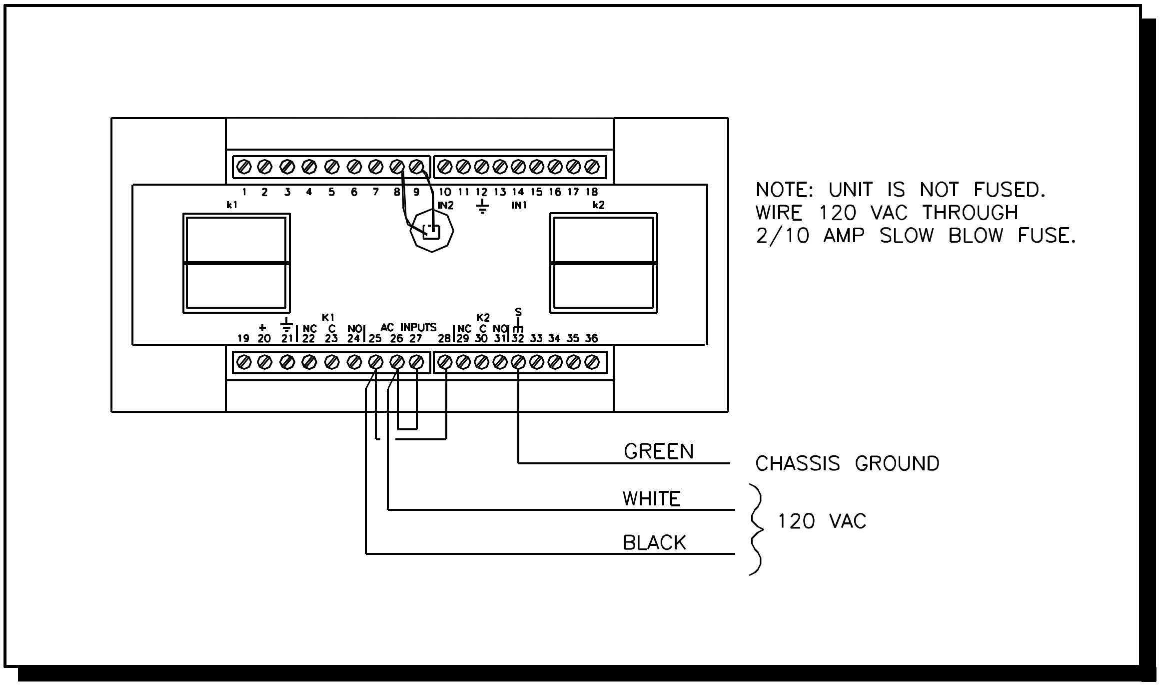


Figure 5 -- 120VAC 47/63Hz power connection

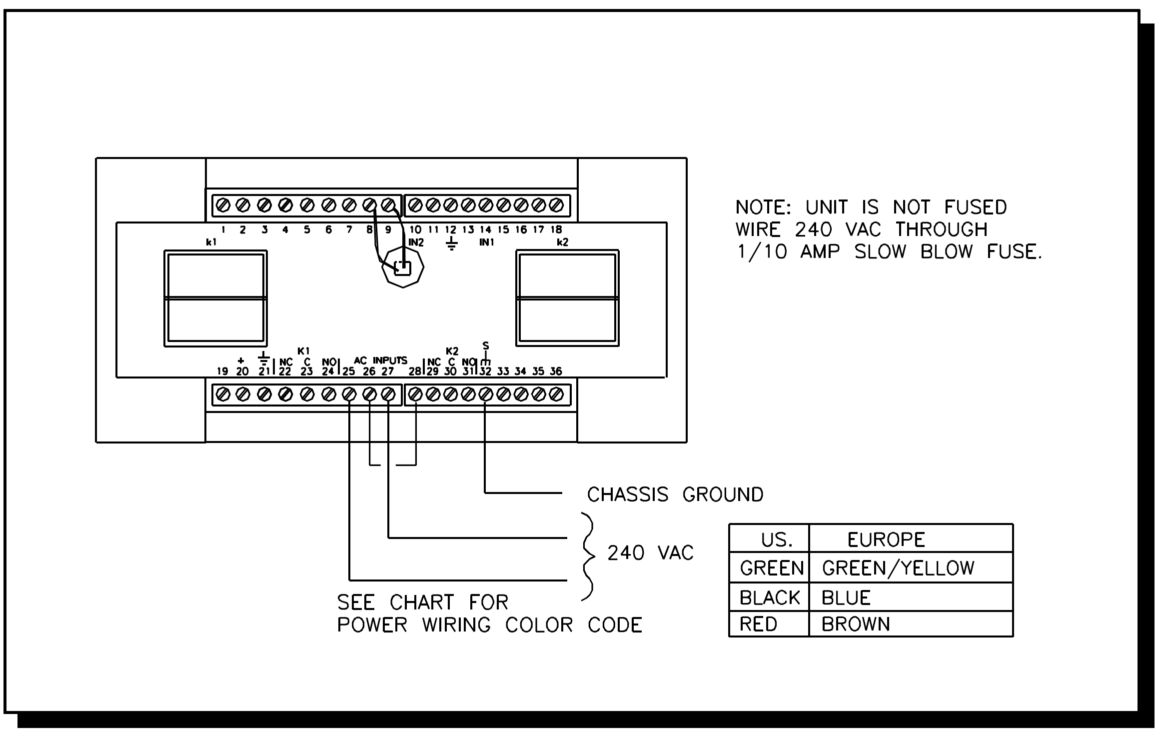


Figure 6 -- 240VAC 47/63Hz power connection

SIGNAL CONNECTION DIAGRAMS

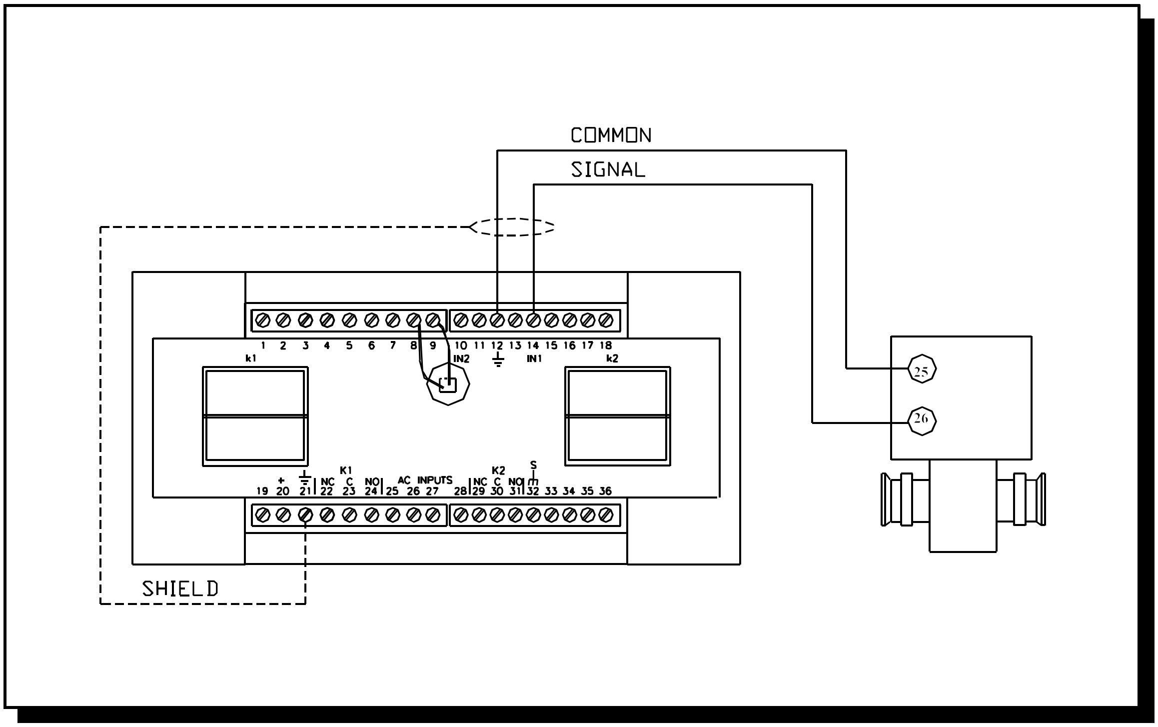


Figure 7 -- IZL Electromagnetic Flowmeter

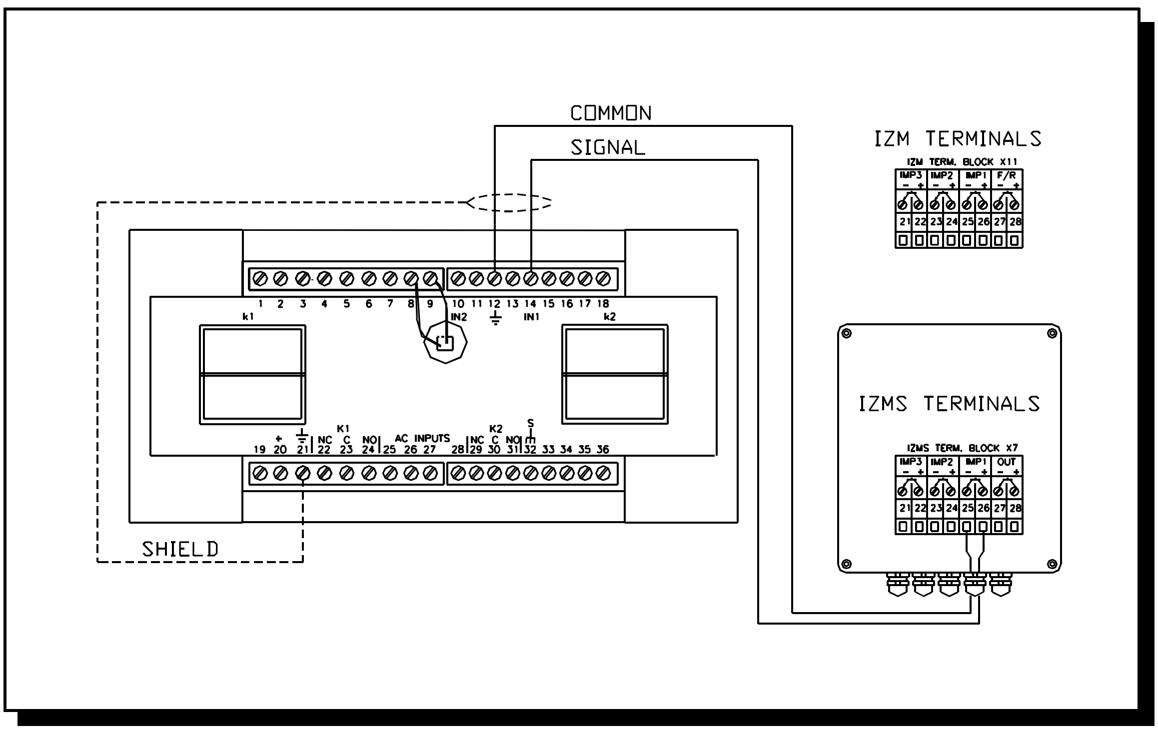


Figure 8 -- IZM / IZMS Electromagnetic Flowmeters

SIGNAL CONNECTION DIAGRAMS

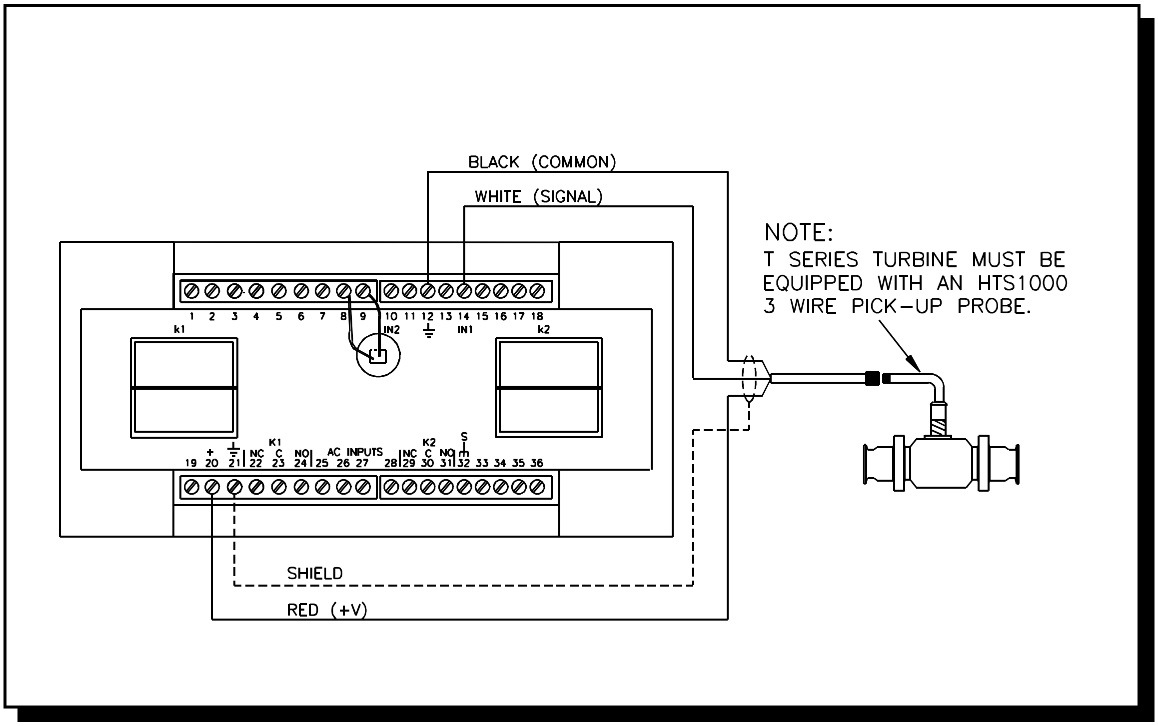


Figure 9 -- Turbine Flowmeter

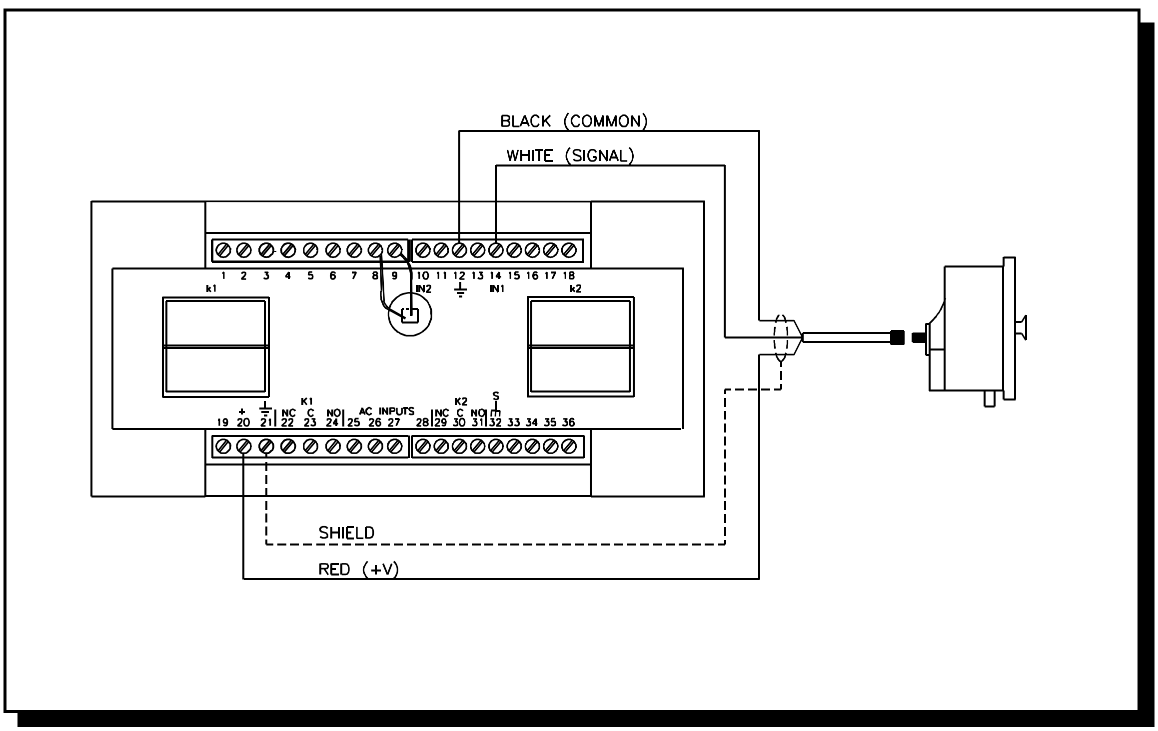


Figure 10 -- RZ Series Rotary Piston Flowmeter

SIGNAL CONNECTION DIAGRAMS

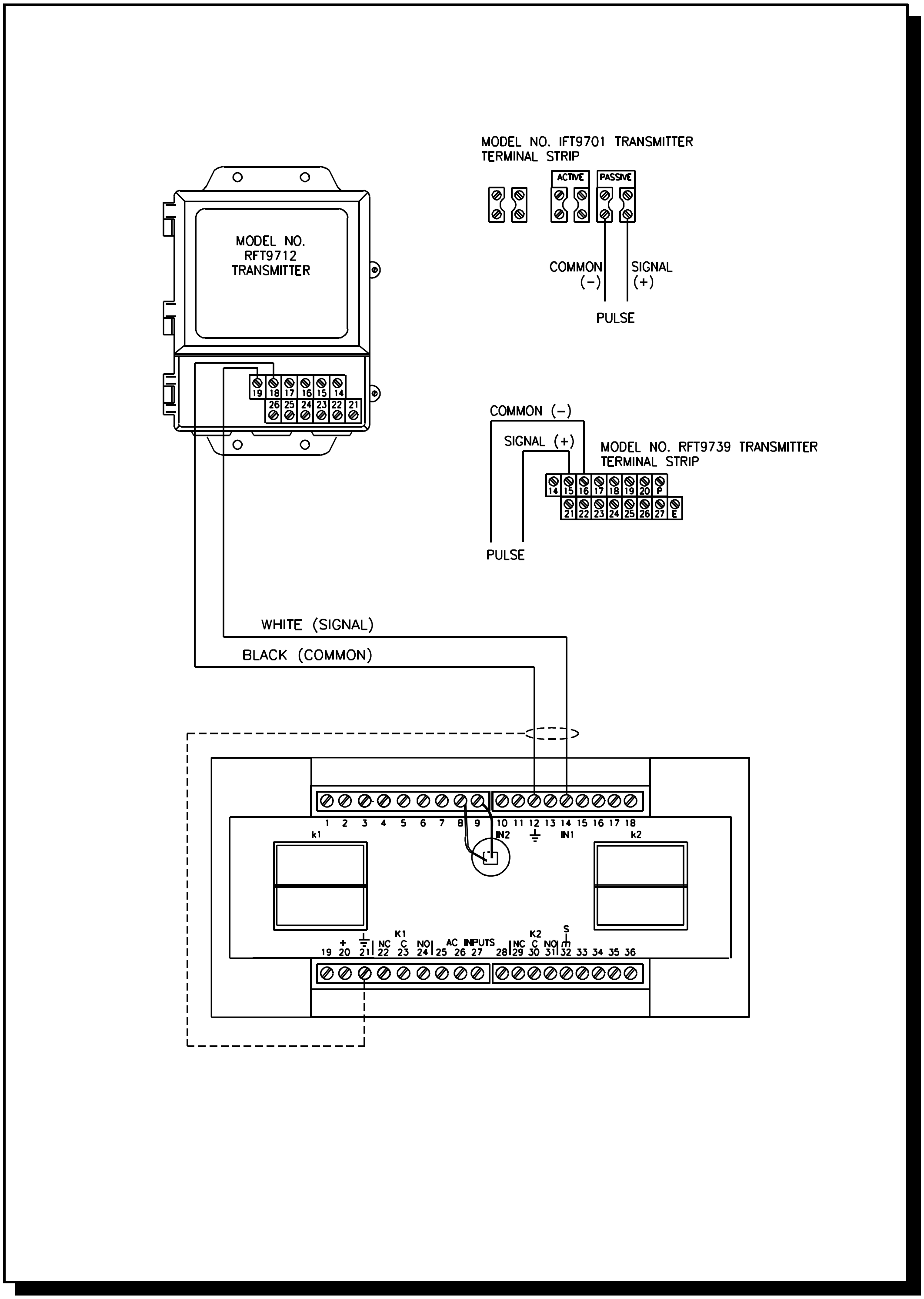


Figure 11 -- Mass Flowmeter (transmitter shown)

SIGNAL CONNECTION DIAGRAMS

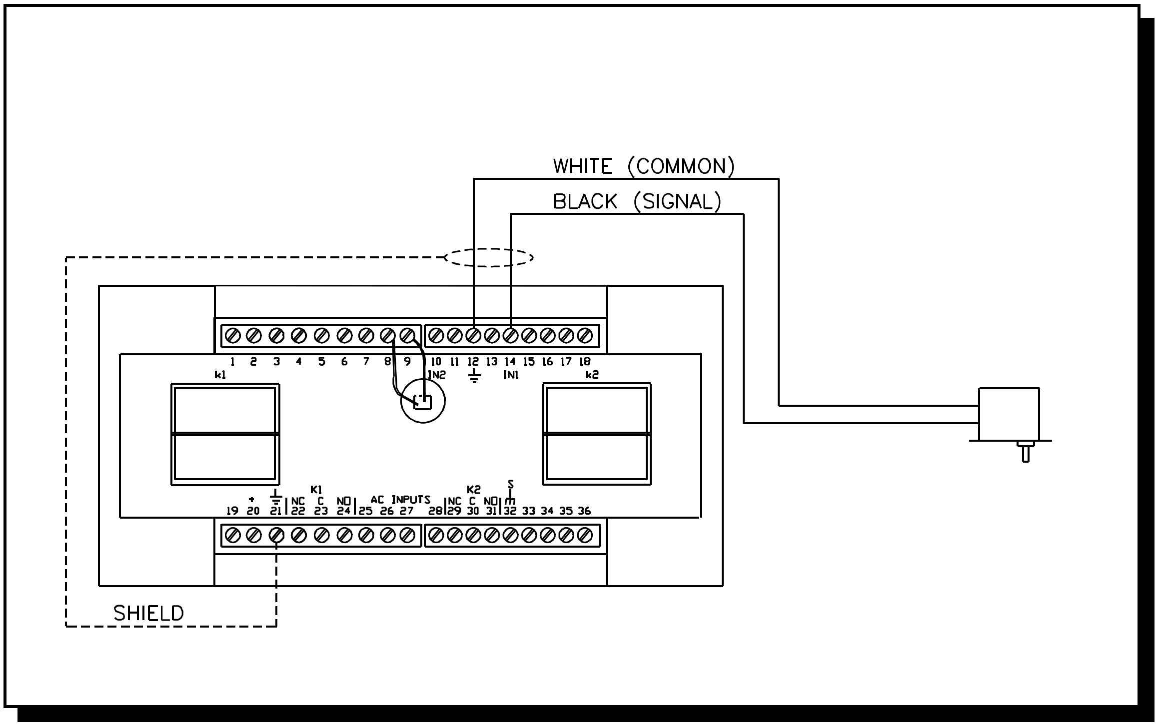


Figure 12 -- Wetted Reed Switch Pulser

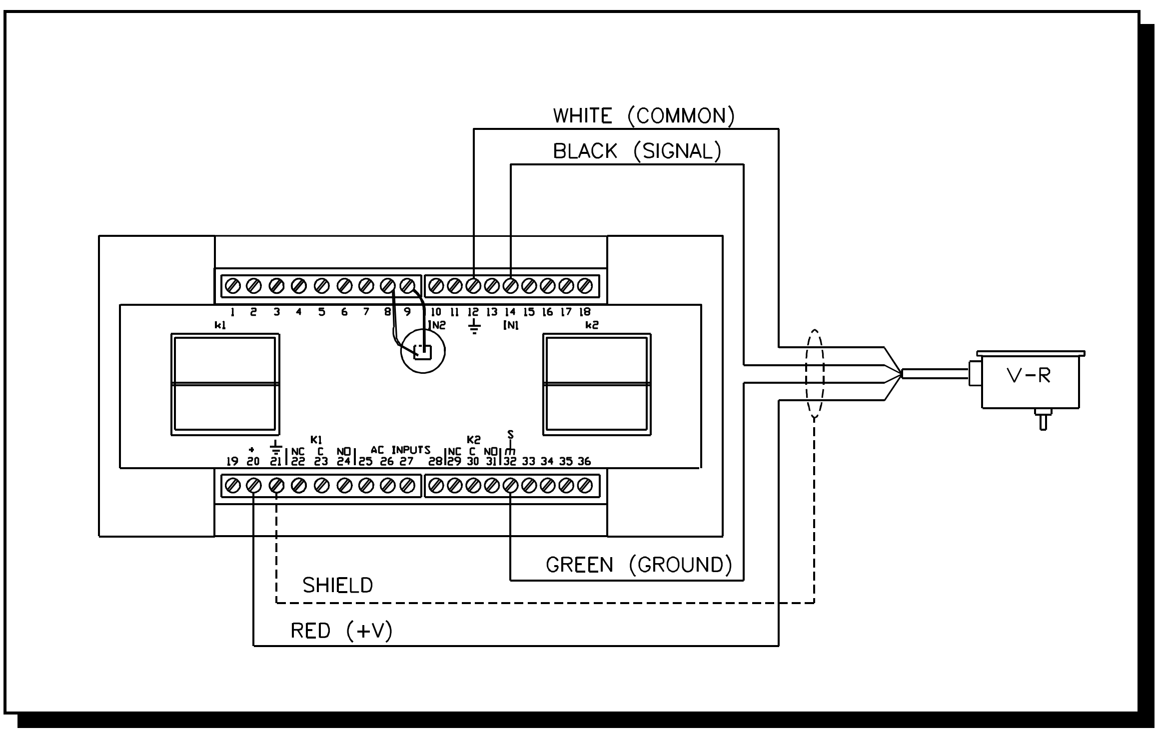


Figure 13 -- Four-wire Pulser

SIGNAL CONNECTION DIAGRAMS

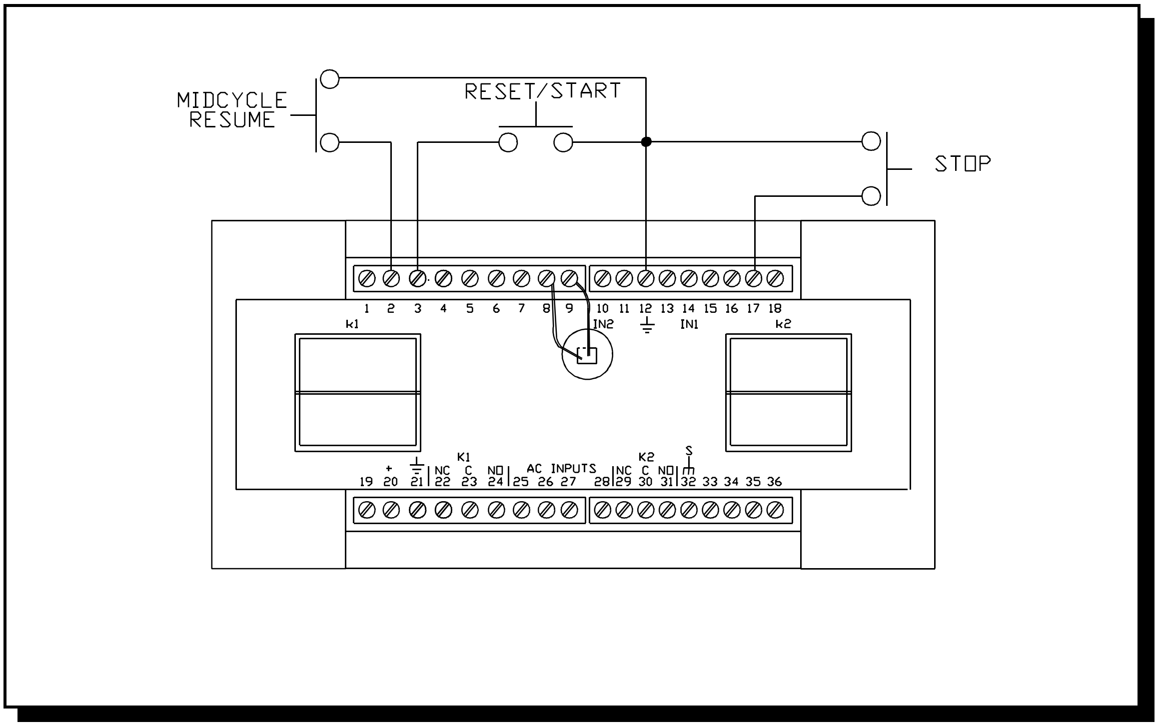


Figure 14 -- Remote Command wiring

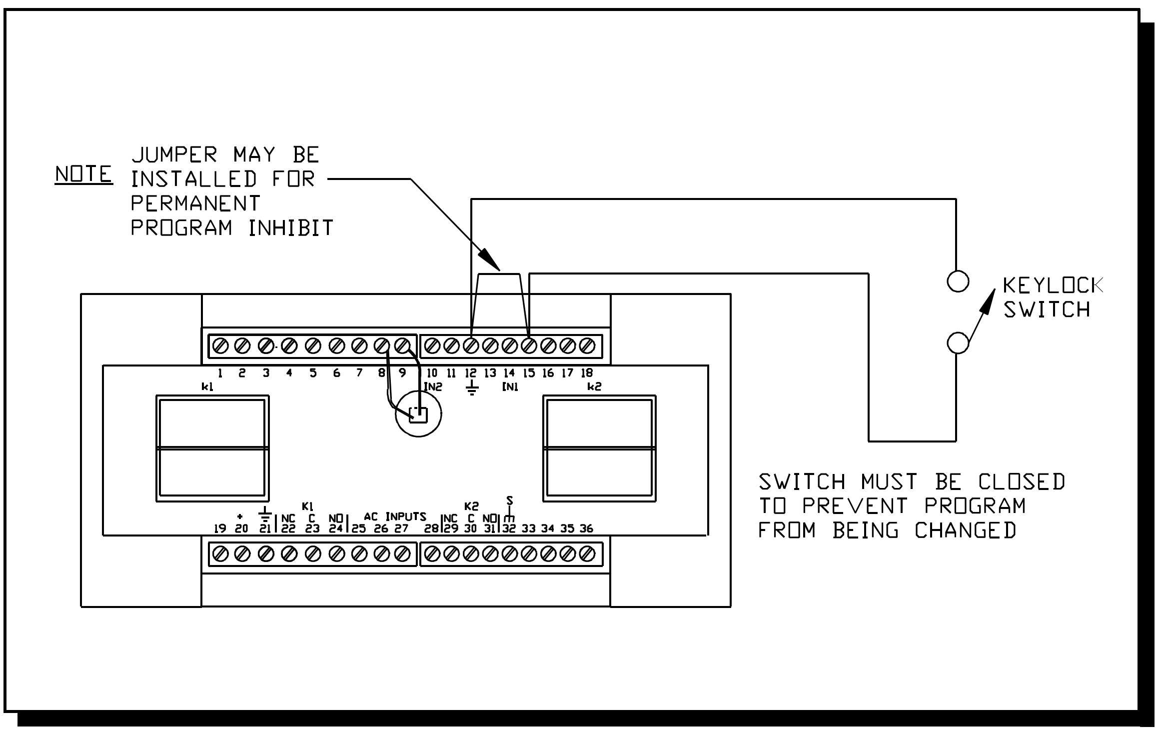


Figure 15 -- Program Inhibit wiring

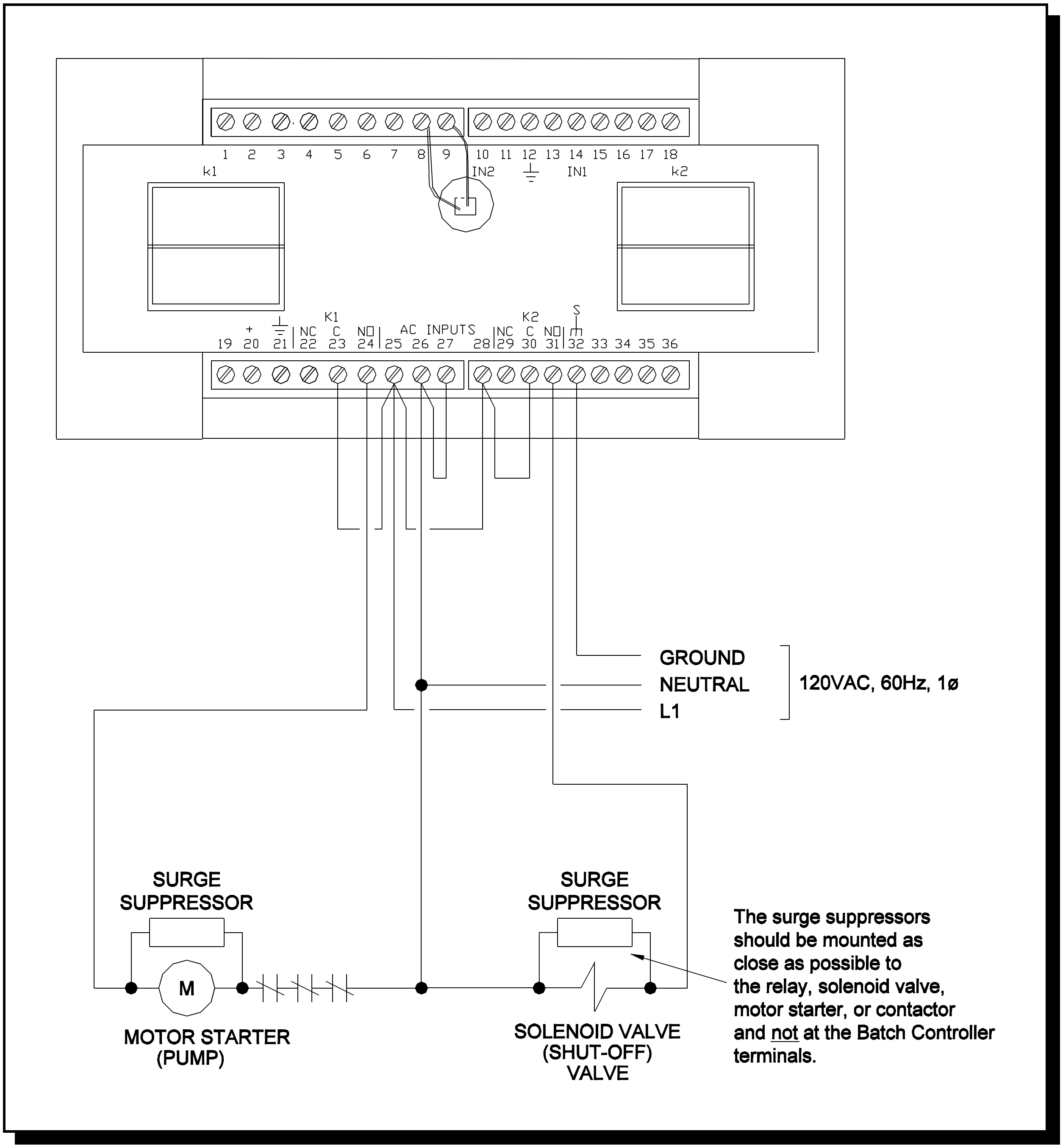


Figure 16 -- Typical AC wiring schematic for standard batching applications Voltage: 120VAC

INTERNAL DIAGNOSTICS

The Control has several internal diagnostic routines that allow it to self-test various operational characteristics. When power is applied, the Control tests its memory to determine if it has retained all of the values and Mode Code parameters previously entered. It also tests to insure that all of the internal memory is functional. Since the tests are performed very quickly, the user usually does not notice the short delay on power-up.

To select the self-diagnostic mode, specify Mode Code 40 and enter a value of "1". The Control immediately turns on all display segments and LED indicators for two (2) seconds. Then the Display blanks and the Control steps through all six (6) tests. If all six (6) test pass, the Control begins a display and LED test routine. This routine sequences through flashing the numbers "0" through "9" on the Display, alternates the Level 1, Preset, and Count LED indicators and moving the decimal point from digit to digit. When the display sequence is finished, the Control shows the count value and the Count Indicator is lit.

If the Control fails any of the diagnostic routines, either on power-up or upon manual command, the Display will flash a number indicating which of the six self-tests failed.

When the number displayed is "4", "5", or "6", the Control can be allowed to operate by pressing the "Mode" Key to clear the Display.

If no failures are found, the Control returns automatically to normal operation.

NOTE: The program inhibit jumper must be removed between Terminal 15 and DC Common when performing Mode 40.

DESCRIPTION OF THE DIAGNOSTICS

The diagnostics that are included and their related test numbers are as follows:

- #1: ROM (Read Only Memory) 16-Bit Checksum
- #2: Internal RAM (Random Access Memory) Bit Test
- #3: Non-Volatile RAM Store Test
- #4: Non-Volatile RAM Store Test
- #5: Non-Volatile RAM 8-Bit Checksum
- #6: Watchdog Timer (1.3 Seconds) Timeout

ROM (READ ONLY MEMORY) 16-BIT CHECKSUM - TEST #1

This test determines if the permanent memory, which controls how the control operates, is good.

INTERNAL RAM (RAM (RANDOM ACCESS MEMORY) BIT TEST - TEST #2

This routine tests the temporary workspace memory used for normal operation and communication. If a failure occurs, the Counter may change or lose values or operating characteristics unexpectedly.

NON-VOLATILE RAM READ/WRITE BIT TEST - TEST #3

This test checks the memory, which permanently stores the operating characteristics and values, when a power outage occurs.

NON-VOLATILE RAM STORE TEST - TEST #4

This test insures that the non-volatile memory accurately stores and retrieves the programmed operating characteristics and values upon a power outage. If a failure of this type occurs, the Counter will operate correctly but could change its values or operating characteristics upon a power failure or power drop-out.

NON-VOLATILE RAM 8-BIT CHECKSUM TEST - TEST #5

A checksum test is performed on the non-volatile memory to insure that none of the information stored was changed while the Control was unpowered. If this test fails, check all Mode Code values and the values of the Counter and preset to insure they are correct. Then disconnect and reconnect power to perform this test again. If the test fails the second time, return the Counter for repair.

WATCHDOG TIMER (1.3 SECONDS) - TEST #6

While the Control is operating, an internal watchdog timer is incremented every millisecond. Under normal operation, the Control automatically resets the watchdog timer at least once per second. If the Control should malfunction during operation, the watchdog timer may time-out (depending on the type of malfunction) and an Error Code of "6" will flash on the Display. If this type of failure occurs, run the diagnostics using Mode Code 40. Excessive electrical interference may cause this type of failure without damage to the Control or the operating characteristics. If the diagnostics find no other fault, it is reasonable to assume that the Control is fully operational, unless this failure is recurring.

NOTE: The self-diagnostics should not be performed while the process being controlled is running. The Control responds to count pulses but ignores any incoming control signals that the diagnostics are operating.

Performing the diagnostic routines does not affect the Mode Code parameters. Thus, when the diagnostics are finished, the Control retains all of the operational characteristics previously programmed.

DEFAULT MODE

If a failure occurs, as a minimum safety precaution, the Default Mode (Mode 43) should be selected (enter a value of "1"). This will reset the Control to the factory set parameters and insure that the failure has not altered any of the operating characteristics. Mode Code 43 also performs the power-up self-test, which could give another failure indication (for Tests #1, #2, or #3). If this occurs, return the Control for repair.

NOTE: When Mode Code 43 is activated, all Mode Codes return to their default values. Therefore, it will be necessary to reenter the Scale Factor, Flow Factor, decimal point locations, Level 1 value, Preset value, and any other Mode Code that deviates from the default values for your specific application (see Mode Code Table).

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TROUBLE-SHOOTING

GENERAL

Most problems encountered when applying the Controller are due to improperly set Mode Codes, errors in the AC power wiring, and/or the flowmeter signal wiring connections.

PROBLEM	POSSIBLE CAUSE
Display does not light when AC power is turned on	Check wiring, fuses and primary AC power source. Check jumper installations on Terminals 25, 26, 27 and 28. Short between Terminals 19 or 20 and DC Common. Disconnect power immediately.
Counter does not increment or decrement	Check signal wiring Check flowmeter and/or pick-up probe
Counter does not display correct units	Check Scale Factor (Mode Code 5)
Counter counts in wrong direction	Check Mode Code 60. Mode Code 60 should have a value of (0).
Counter accumulates too many counts	"Electrical Noise." Check signal wiring installation to insure they are not bundled with AC power wiring. Make sure all signal cables are shielded. Check for extreme vibration at the pick-up probe or sensor. Check Scale Factor (Mode Code 5) Check for loose signal wires.
Relays do not energize	Check relay coil leads on rear of Counter: Gray wire goes to Terminal 8 (K1), Yellow wire goes to Terminal 9 (K2).

PROBLEM	POSSIBLE CAUSE
K1 and K2 Relays de-energize, stopping the batch cycle. Control will not respond to Reset/Start or Midcycle/Resume Keys. "Control Lock-Up."	Check Totalizer Preset (Key #6). Clear Totalizer using sequence: <MODE>-2-1-<ENTER>-1-<ENTER> This sequence <u>does not</u> clear the Totalizer Preset value. The Totalizer Preset defaults to a value of (0) (see Key Functions, Page 10).
Rate Indicator displays incorrect units	Check Flow Factor (Mode Code 64). Make sure Mode Code 68 has a value of (1).
Rate Indicator Display is fluctuating	Check Mode Code 65 for proper averaging range (see Page 18).
No print-out or incorrect print-out is generated when the Control is connected to a printer	Check AC power connections and fuse in printer. Check for proper printer set-up. Check Serial Communications wiring. Check Baud Rates.

If the problem persists, remove the program inhibit jumper between Terminal 15 and DC Common (Terminal 12). Activate the factory default, Mode Code 43. If this resolves the problem, <u>do not</u> forget to reprogram your Mode Code values (see Default Mode Codes, Page 33).

Install the program inhibit jumper before resuming operations.

Warranty and Return Statement

These products are sold by The Anderson Instrument Company (Anderson) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevent Anderson instruction manual or manuals, sheet or sheets, for such products for a period of one year.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses excepting only the cost or expense of repairs ore replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating condition beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies or if the purchaser attempts to repair the product themselves or through a third party without Anderson authorization.

Returns

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours and such returns are to include a statement of the observed deficiency. The buyer shall pre-pay shipping charges for products returned and Anderson or its representative shall pay for the return of the products to the buyer.

An RMA (Return Merchandise Authorization) must be obtained from Anderson Customer Service before returning merchandise.

Approved returns should be sent to: Anderson Instrument Co., Inc.
156 Auriesville Rd.
Fultonville, NY 12072
ATTN: Repairs
Write RMA number on outside of package