Act-Pak® Electronic Instrumentation

Models 1100D and 1100DN Quick Guide

Act-Pak® Remote Monitoring is an automatic control translator package. The Model 1100D is a standard NEMA1 free standing or panel mountable enclosure. The Model 1100DN is a NEMA4X wall mountable fiberglass enclosure. Each Act-Pak device accepts pulses or contact closures from metering devices and provides a variety of outputs.

Front Panel Display and Buttons

The display is an eight digit transmissive red LCD, 0.46" high. A green LCD is also available. For outdoor or high ambient light conditions, reflective readouts will be supplied.

- SELECT: Toggles display and advances menu selection in the programming mode.
- RESET: Resets counter to zero if enabled and changes display in programming mode.
- COUNT DISPLAY: 8-digit, display flashes "tot" over for an overflow condition.
- RATE DISPLAY: 6-digit with an enunciator "R" on the left side.

Physical Size/Weight

Model	1100D	1100DN
Length	8-3/4" (22 cm)	8-1/2" (21.6 cm)
Height	3-1/8" (8 cm)	4-1/4" (11 cm)
Width	8-9/16" (23 cm)	6-1/2" (16.5 cm)
Weight	4 lbs. (1.8 kg)	4 lbs. (1.8 kg)

Memory

Non-volatile E2PROM memory retains all programming parameters and the count value when power is removed.

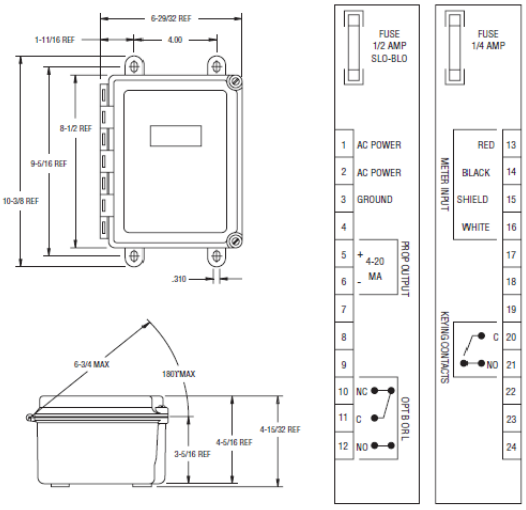
Electrical Connections

1. Complete all connections to the metering device and instrument before applying power.
2. If it becomes necessary to disconnect any of these connections, first remove the AC power to the instrument.

Meter or Signal Output

Terminal Number	Function	Wire Color Switch Inputs (Belden 8760)	Wire Color Solid State Inputs (Belden 8770)
13	+12VDC	No Connection	Red
16	Input Signal	White	White
14	Ground	Black	Black
15	Shield	Bare (Shield)	Bare (Shield)

Typical Series 1100 Act-Pak Wiring Connection Diagram



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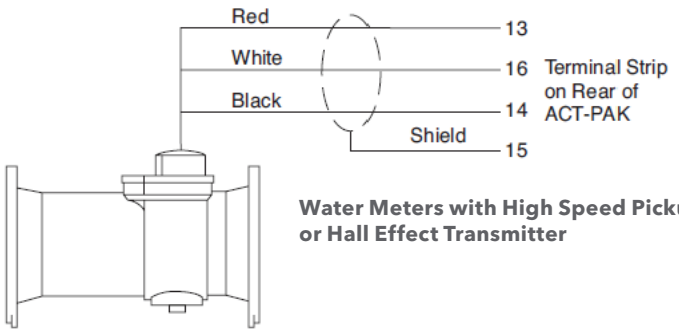
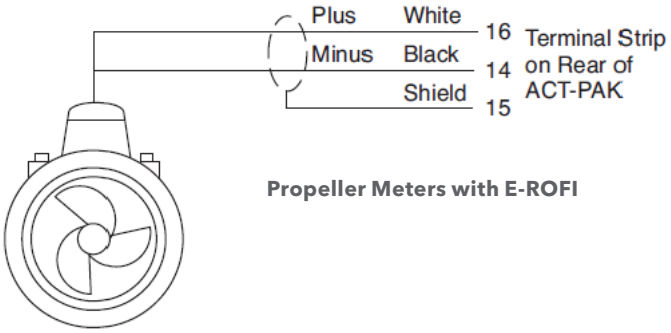
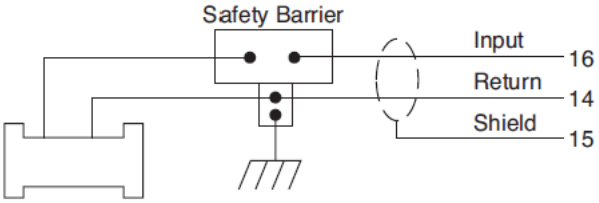
Typical Series 1100 Act-Pak Wiring Connection Diagrams



Water Meters with High Speed Pickup or Hall Effect Transmitter



Propeller Meters with E-ROFI



Gas Meters with Slot Sensors

Output Requirements

- Proportional Output: 4-20 mA, 500 ohms maximum impedance.
- Option A: Dual Analog Outputs. Specifies a dual 4-20 mA output signal in addition to the standard 4-20 mA signal supplied. The option A signals may be calibrated to different flow parameters than the standard 4-20 mA signal. These signals also operate through and impedance of 0 to 500 ohms.
- Option B, L: SPDT, rated 5 amps, resistive 24 VDC or 3 amps resistive, 117 VAC. Duration approximately 40 msec.
- Options C1, D: SPST, mercury-wetted bounce free rated 1 amp 24 VDC or 0.1 amp at 117 VAC. All resistive loads.
- Option C1 (SS): 50 mA at 24 VDC.

Proportional Output

Terminal Number	Function
5	Positive
6	Negative

Option B

Terminal Number	Function
10	Normally Closed Contact
11	Common
12	Normally Open Contact

Option C1, C1 (SS)

Terminal Number	Function Relay	Function SS
20	C1 Common	C1 Collector
21	C1 Open Contact	C1 Emmitter (common)

Option L

Terminal Number	Function
22	Normally Closed Contact
23	Common
24	Normally Open Contact

AC Power Inputs

Terminal Number	Function
3	Earth Ground
2	117 VAC
1	117 VAC

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Field Adjustments

The Flow Rate Indicator/Totalizer readout modules are programmed at the factory and will retain the program indefinitely. If it becomes necessary to reprogram the module, use the following procedure. Before starting to program the readout review the complete procedure listed below and determine all factors and parameters before starting the procedure.

⚠ WARNING!

ELECTRICAL HAZARD Use caution when working with disassembled AC electrical components.

To enter the programming mode, depress and hold the **SEL** button on the readout for 2 seconds. In the program mode the display will show **Pro** and flash to **nO**.

There are four (4) programming modules available. Press the **RST** button to step through the modules.

When the correct module is displayed press the **SEL** button to enter that module. In the module, the function being programmed is shown then the display flashes to the value presently entered for the function. Pressing the **RST** button stops the display from flashing and places the unit into the data selection mode.

In the selection mode the operator presses the **RST** button to scroll through the parameters available for that menu. When the desired selection is reached, press the **SEL** button to store the data and advance to the next menu.

When setting numerical values use the **RST** button to increment the flashing digit, and momentarily press the **SEL** button to advance to the next digit. To start the least significant digit flashing momentarily depress the **RST** button.

To exit the programming mode and save all parameters step through the module until one of the four main modules is displayed, then press the **RST** button until Pro nO displays. Pressing the **SEL** button at this point enters the data and closes the program mode.

Program Menus

Module #1 (1-inPUt)

- InP A-b – dual cnt.
- CntA dP – Numeric selection depends on the factors determined below.
- CntA SCf – This factor equals the Desired Display Units divided by the Number of Pulses for the desired display. The number varies with each meter and registration. Example for a W2000 DRE meter reading in gallons, 500.9663 pulses equals 1000 gallons. Therefore, the factor is 1/500.9883 or 0.0019961. To improve the accuracy the decimal should be moved two places and the number becomes 0.19961. Since the decimal was moved two places, the selection for Cnt dP above is .00.
- Cntb dP – (Usually the same as CntA dp.) If the units of measure are not the same, use the procedure listed above. Possible examples are gallons and cubic feet or cubic meters and imperial gallons.
- Cntb ScF – Usually the same as CntA ScF, if not use the procedure listed above.
- RSt P-Up – nO.
- USEr InP – rESEt.
- USEr Asn – both A-B.

Module #2 (2-rAte)

- RAtE Enb – yES.
- RAtE dP – The decimal location depends on the flow rate value. It typically is set to display the multiplier to use all six digits on the display. This setting is determined below.
- RAtE dSP – This number represents the maximum flow rate to be displayed. In establishing this number, all 6 of the available digits should be used if possible. This setting is determined below.
- RAtE Inp – Programs the hertz value at the

programmed flow rate. This number should be enhanced as follows. For a W2000 DRE the maximum flow rate is 2500 GPM at 20.87 hertz. The 2500 could be used for RAte dSP above, but to improve the accuracy of the hertz rate it should be set to 25000. If the decimal was moved one place to the right, hertz value must also be moved one place to keep proportions the same. Therefore, RAte dP should be 0.0, RAtE dSP should be 25000.0 and the hertz should be set to 208.7.

- LO-Udt – Set to 5.0. This step sets the time between flow rate display updates. If the flow rate is erratic due to varying meter signals, increasing this number reduces display fluctuations. May be set between 0.1 and 99.9 seconds.
- HI-Udt – Set to 10.0. Sets the number of seconds the flow rate will display for a meter pulse before going to zero. May be set between 0.1 and 99.9.

Module #3 (3-dSPLAY)

- SEL Enb – yES.
- RST Enb – b total (Enables the RST button on the front panel to reset the b totalizer.) To change set as follows:
  Total – Only counter A is resettable.
  both – both counters A and B are resettable.
  none – Neither counter is resettable.
- d-ScroLL – Typically set to nO; set to yES to have the display automatically scroll between total, b total and flow rate.
- d-COLOr – Typically set to rED, if a Green display is desired set to Grn.
- d-LEVEL – Typically set to 5, to reduce the intensity of the display reduce the number.
- Pro CodE – 024. This is the factory set cde. Although a code is not necessary, it is an electronic lock that prevents tampering.
- FACT sET – nO.

Module #4 (4-SETPT)

- SPt ASN – For a contact closure based on the flow rate set to rATE. For pulsed outputs based on total set to Count A.
- SPt ACT – If rate was selected above to bound if contacts are to close when the setpoint is exceeded and open below the setpoint. To latch or hold the contacts closed once the flow rate is exceeded set to LAtCH. A manual reset is required to release latched contacts. If SPt ASN is set to Count A set to t-OUt.
- SPt tout – (Active only if t-OUt is selected above.) Sets the number of seconds that the relay is closed each time it is activated.
- SPT VAL – For flow rate set point applications set the actual flow rate where the closure is desired. In quantity applications set in the number of counts on counter A to be accumulated before an output pulse is generated.
- SPt P-UP – SAVE.
- CntA rSt – ZERO.
- AutO rST – nO.
- SPtrST – nO.
- Ch- COLOR – nO, to change display colors when the set point is exceeded set to yES.

Arranging Mechanical Totalizer and Option B Factors

All Act-Pak instruments containing a totalizer and/or Option B have provisions for field adjusting the factor circuit.

The circuit is configured in binary code and is adjustable to any whole number from 1 to 4095. To determine the factor, the following procedure should be used.

1. Determine the quantity to be indicated by the totalizer or Option B contact closure.
2. Determine the value of a pulse from the meter in either quantity per pulse (cubic feet/pulse) or pulses per quantity (pulses/cubic foot).
3. Determine new factor as follows (assuming desired instrument output is in 1000 cubic feet increments and meter output is 0.564 cubic foot per pulse).
   - Calculate the pulses per cubic foot by determining the reciprocal of 0.564:

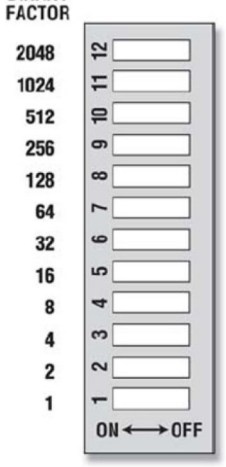
$$\frac{1}{0.564} = 1.7730496 \quad \frac{\text{Pulse}}{\text{Ft}^3}$$

Note: If meter output data is available in pulses per cubic foot, this step can be eliminated.

- Multiply the pulses per cubic feet by the quantity to be indicated.
- Since the circuitry is only capable of handling whole numbers, the factor must be rounded to the nearest whole number (1773).

Note: When the factor must be rounded off, a small error is introduced—in this example, .0028%. New meters being shipped from the factory are geared to eliminate this error or maintain it at a minimum, if possible. In applications where no error is tolerable, the ACT-PAK instrument line contains provisions for an error correction circuit and/or an input pulse scaler.

- To start, place all of the 12 switches in the OFF position. Setting the factor into the instrument is accomplished by turning the dip switch ON so that the sum of the factors equals the number desired. There is a unique combination of factors for each desired number. They are determined in the following manner: select the largest binary number from the chart that does not exceed the balance, continue selecting and subtracting until the balance equals zero. At this point, all factors subtracted must be set into the instrument by placing the associated switch in the ON position.



Example

Factor	Calculation	Check
1773	Original Number	1024
−1024	Factor	512
749	Balance	128
−512	Factor	64
237	Balance	32
−128	Factor	8
109	Balance	4
−064	Factor	1
45	Balance	1773
−32	Factor	
13	B;ance	
−8	Factor	
5	Balance	
−4	Factor	
1	Balance	
−1	Factor	
0	Balance	

Adjusting Option M Multiplier

The multiplier circuit is configured in binary coded decimal (BCD) and is adjustable to any number between 0.0001 and .9999. To set the multiplier, the following procedure is suggested:

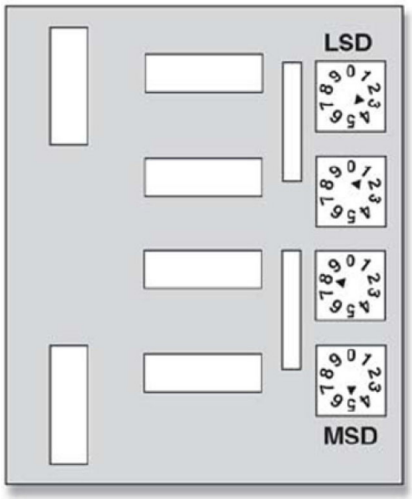
1. Determine the multiplier necessary to indicate the units required.
2. Remove the Act-Pak front panel assembly from the instrument cabinet and locate the multiplier module.

Note: Multiplier is a separate PC board in the center of the instrument assembly.

3. Rotate the assembly so the printing on the multiplier circuit board is readable from left to right, as shown in the next illustration.
4. Setting the multiplier is accomplished by rotating the pointer on the digits associated switch to the number desired using a small screwdriver.

⚠ CAUTION

The switch selector must be in the detent and not left between two digits or erratic operation will result.



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Calibrating D/A Converter

The D/A converter is factory set to the specified frequency (noted on the label affixed to main circuit board) and field recalibration is usually not required. If it becomes necessary to recalibrate the D/A converter, the following procedure must be followed and high quality test equipment used. Any component changes must be made with equivalent components.

Calculating the RANGE capacitor's value

To change the input frequency, the range capacitor may have to be replaced.

Use the formula to determine the necessary value.

$$C\ range = \frac{1.54}{f}$$

For example, to obtain full scale DC output of 20 ma DC at a full scale input pulse rate of 10 pulses/second, a capacitor of .15 MF is needed. The stability of the range capacitor affects the stability of the converter; only polycarbonate or polystyrene capacitors should be used. The zero and range potentiometers provide a minimum adjustment range of + or -10% to accommodate capacitor tolerances (for the main output).

Test Equipment Setup

Connect signal source onto Act-Pak terminals #16 and #14, positive and ground respectively. Signal sources may be solid state or switch driven. Regardless of the device being used, it must develop a square wave capable of sinking 50 mA and interrupting 50 volts. To determine the precise input frequency, it is suggested that a digital counter also be connected to terminals #16 and #14.

⚠ WARNING!

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Calibration: Proportional Output (4-20 mA) with a Voltmeter

1. Connect a load resistor across terminals #5 (+) and #6 (-).
2. This resistor may be of any value less than or equal to 500 ohms.
3. Connect a digital voltmeter across terminals #5 (+) and #6 (-)
4. Apply power to the instrument with the signal source off. The analog output signal should be 4 mA indicated by a 2.0 volt reading if a 500 ohm load resistor is used.
5. Adjust the ZERO potentiometer, if necessary.
6. Turn on signal source and adjust to full scale input frequency.
7. Adjust the SPAN potentiometer to obtain a 10.0 volt reading on the voltmeter.
8. If SPAN adjustment is required, repeat step "c" to check the zero setting; adjust and reset, if necessary. Each time the ZERO or SPAN potentiometers are moved, the opposite setting must be checked until no adjustment is required.

Calibration: Proportional Output (4-20 mA) with a Milliampere Meter

1. Remove all connections on terminals #5 (+) and #6 (–).
2. Connect a milliampere meter across terminals #5 (+) | and #6 (–).
3. Apply power to the instrument with the signal source off. The analog output should be 4.0 mA.
4. Adjust the ZERO potentiometer if necessary.
5. Turn on the signal source and adjust to full scale input frequency.
6. Adjust the SPAN potentiometer to obtain a 20 mA reading.
7. If SPAN adjustment is required, repeat step "c" to check the zero setting; adjust and reset, if necessary. Each time the ZERO or SPAN potentiometers are moved, the opposite setting must be checked until no adjustment is required.

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Connection Instructions for Models 1100D and 1104 Version E Instruments

1. Remove the four (4) screws securing the terminal cover plate to the enclosure.
2. Observe the orange connectors on the rear of the printed circuit board.
3. Note that the AC line cord is attached to terminals #1,#2 and #3.
4. Use the tables in the manual to connect the meter and control devices.
5. To attach wires, loosen the appropriate screw on the connector.
6. Run the wires through the enclosure and place in the opening on the connector at the proper location and tighten the screw.
7. Do not leave bare wires extending outside the connector.
8. Replace the terminal cover and secure with the four (4) screws.
9. Apply power to the instrument.

Connection Instructions for Models 1100DN

1. Remove the two (2) screws that secure the enclosure door.
2. Note the wiring diagram located on the inside of the door.
3. Loosen the plastic nut on the water tight grommet and run the meter connecting cable through the grommet.
4. Attach the wires to the appropriate terminals.
5. Do not leave bare wires extending beyond the terminal strip.
6. Tighten the nut on the water tight grommet to insure the NEMA-4 integrity.
7. If options are to be connected mount additional water tight grommets in the enclosure. Do not run multiple wires through a single connector.
8. Apply Power to instrument.

CAUTION

DO NOT connect the 4-20 mA output into a powered loop.

SENSUS
a xylem brand

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