



Instruction Manual

Model 250 Multi-Function Display (analog input)

Model 251 Multi-Function Display (pulse input)

Also, Model 250E & 251E for European applications

Revision A, September 2000

**Please read instruction manual completely before
attempting to operate display unit!**

**SEE QUICK TIPS ON PAGE 2 TO GET GOING
IN JUST MINUTES!**

The Model 250 & 251 Digital Displays from McMillan Company allow you to use your flow sensor to its fullest potential. Imagine being able to program a 16-point calibration curve into a unit (9 points on the 251), and have it display the corrected values, even retransmitting the linearized signal with the optional analog output card! Imagine programming in alarm setpoints, with actual relay contacts, with hysteresis and startup options. The easy-to-use, menu driven interface makes programming a snap, and the bright LED display ensures clarity even under bright light conditions. The units even provide a 12VDC power source for connecting most McMillan Company flow sensors, saving you money on additional power supplies.

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QUICK TIPS

1. Do not skip sections! It is very important to follow the manual step-by-step to keep from getting lost.
2. Write down all your values as you program them in – this will make slight adjustments later a snap!
3. If you get lost during Programming, just press DSP – it will return you to Ready Mode.
4. Send your unit into the factory for custom programming of setpoints, calibration curves, etc.

A. Installation

1. Removing the unit from its packaging

It is very important to carefully remove all items from the packaging. Your Model 250/251 packaging should include the following:

- a. Digital display unit
- b. Power cord (USA for Model 250/251, European for Model 250E/251E)
- c. Panel gasket (for sealing unit)
- d. Panel latch to mount unit (usually already installed on display unit)
- e. Instruction manual
- f. Any option cards you may have ordered

2. Installing any option cards (250-10 or 250-11)

If you ordered the 250-10 Analog Output card or the 250-11 Alarm Output card, you must install these cards before proceeding with the installation of the meter. If not, skip to section 3.

To access the card slots on the Model 250/251, remove the main assembly from the rear of the case. Squeeze the finger holds on the rear cover, or use a small screwdriver to depress the side latches to

release it from the case. It is not necessary to separate the rear cover from the main circuit card.

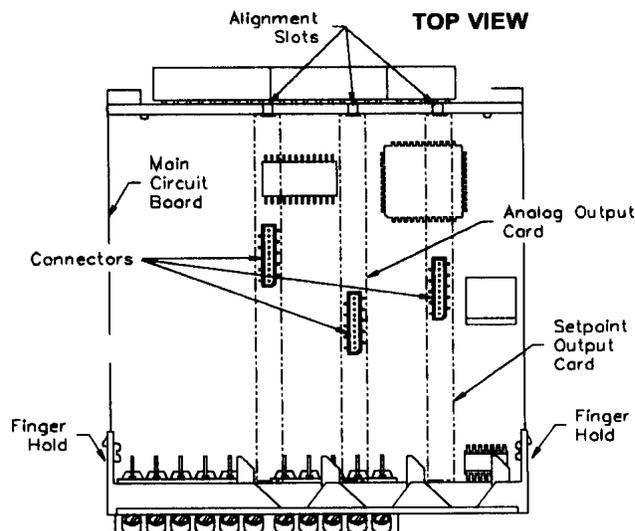


Figure A.1. Diagram of option card locations.

Inside, there are three card slots. Remove your option card from the packaging, taking care to protect the card against electrostatic damage. Install the card in the appropriate slot as shown in Figure A.1, with the terminal strip towards the rear of the display unit.

Once the card has been installed, reassemble the case by sliding the meter base back into the meter case. The case is locked when the latch locks into the case slot.

Apply the option card label (included with option card) to the bottom side of the meter. Do not cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly. Apply the label to the area designated by the large case label.

NOTE: Do not adjust or change any jumper or DIP switch settings inside the display unit unless indicated in section 3 below. Doing so may alter the function of the unit.

3. Setting the internal jumpers and switches

If you are using the Model 106 Flo-Sensor with the Model 251 Display, you must first set the DIP switch inside of the unit. *NOTE:* Unless you are using the Model 106 with the Model 251, do not change any jumper or switch settings inside the unit. Doing so may alter the function of the unit.

To access the DIP switch on the Model 251, remove the meter base from the meter case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

The DIP switch is located near the center of the printed circuit board. If using the Model 106 with the Model 251, turn switch #2 OFF. All other switches should also be OFF.

Reassemble the case by sliding the meter base back into the meter case. The case is locked when the latch locks into the case slot.

NOTE: For all McMillan products other than the 106, switch #2 should be left ON.

4. Installing the meter in a panel

The Model 250/251 meets NEMA 4X/IP65 requirements for indoor use when properly installed. The unit is intended to be mounted in an enclosed panel. Prepare the panel cutout to the dimensions shown in Figure A.2. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel.

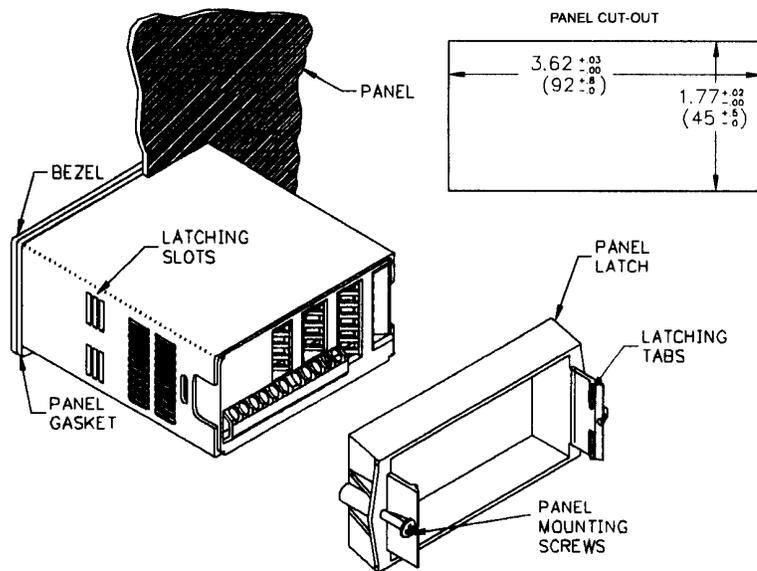


Figure A.2. Installation of the display in a panel.

The unit should be installed fully assembled. Insert the unit into the panel cutout.

While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots of the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (torque to approximately 7 in/lbs). Do not over-tighten the screws.

Notes about environment: The unit should be installed in a location that does not exceed maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

CAUTION: The bezel should be cleaned only with a soft cloth and neutral soap product. DO NOT USE SOLVENTS! Continuous exposure to direct sunlight may accelerate the aging process of the bezel. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

5. Making the Electrical Connections

After removing the unit from the packaging, you may begin wiring the unit into your application.

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes, and regulations. It is recommended that the power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in the tables below (step b) for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until wire is secure. Pull on wire to verify tightness. Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

- a. You must first connect the power to the unit. Take the provided power cord out of the packaging. Insert the two wires in the screw-clamp terminal strip, on positions 1 & 2 labeled AC. It is not important which wire goes to which position, as long as both are securely tight and properly inserted into positions 1 & 2.

CAUTION: When dealing with high voltage, take extra precaution. Insure that the power cord is not plugged in when connecting it to the display. Also, insure that no extra bare copper is left after the wires are tightened down.

- b. Now it is time to make the connections to the flow sensor. Select your McMillan product below and make the connections as indicated. Connect the colored wires as indicated to the appropriate screw-terminal:

100, 110, S-110, S-113, 101, 102, S-111, S-112, S-114, G111, G112

These products require the 100-17 cable assembly to be connected to the Model 250 Display. If you did not order this cable, please contact the factory to order one for each flow sensor you purchased.

These products are only compatible with the Model 250.

100-17 Cable

RED
WHITE
BLACK

Rear Terminal Position (Model 250/250E)

Position 6 (+EXCITATION)
Position 3 (VOLT/OHM)
Position 5 (COMM)

50K, 50S, 50D, 50SD

These products require the 50-C-X cable assembly to be connected to the Model 250 Display. If you did not order this cable, please contact the factory to order one for each flow sensor you purchased.

Also, these products are only compatible with the Model 250.

<u>50-C-X Cable</u>	<u>Rear Terminal Position (Model 250/250E)</u>
RED	Position 6 (+EXCITATION)
ORANGE	Position 3 (VOLT/OHM)
BLACK, BROWN	Position 5 (COMM)

101T, 102T, 104

These products require the 100-17T cable assembly to be connected to the Model 250/251 Displays. If you did not order this cable, please contact the factory to order one for each flow sensor you purchased.

<u>100-17T Cable</u>	<u>Rear Terminal Position (Model 250/250E)</u>
RED	Position 6 (+EXCITATION)
WHITE	Position 3 (VOLT/OHM)
BLACK	Position 5 (COMM)
GREEN	Not Used

<u>100-17T Cable</u>	<u>Rear Terminal Position (Model 251/251E)</u>
RED	Position 3 (+12V)
WHITE	Not Used
BLACK	Position 4 (COMM)
GREEN	Position 5 (INPUT A)

G101, G102

These products are compatible with either the Model 250 or 251. Select the appropriate chart for your display:

<u>Integrated Cable</u>	<u>Rear Terminal Position (Model 250/250E)</u>
RED	Position 6 (+EXCITATION)
WHITE	Position 3 (VOLT/OHM)
BLACK	Position 5 (COMM)
GREEN	Not Used

<u>Integrated Cable</u>	<u>Rear Terminal Position (Model 251/251E)</u>
RED	Position 3 (+12V)
WHITE	Not Used
BLACK	Position 4 (COMM)
GREEN	Position 5 (INPUT A)

105

This product is compatible with either the Model 250 or 251. Select the appropriate chart for your display:

<u>Integrated Cable</u>	<u>Rear Terminal Position (Model 250/250E)</u>
RED	Position 6 (+EXCITATION)
YELLOW	Position 3 (VOLT/OHM)
BLACK, BROWN	Position 5 (COMM)
GREEN, ORANGE	Not Used
<u>Integrated Cable</u>	<u>Rear Terminal Position (Model 251/251E)</u>
RED	Position 3 (+12V)
ORANGE, YELLOW	Not Used
BLACK, BROWN	Position 4 (COMM)
GREEN	Position 5 (INPUT A)

106 (with NO MSB)

This product is only compatible with the Model 251.

<u>Integrated Cable</u>	<u>Rear Terminal Position (Model 251/251E)</u>
RED	Position 3 (+12V)
WHITE	Position 5 (INPUT A)
BLACK, GREEN	Position 4 (COMM)

NOTE: If you are using the Model 106 with the Model 251, you must also change the setting of the internal DIP switch. See section 3 (on page 4) for details.

- c. Once connections to the flow sensor have been made, it is time to wire any option cards you may have ordered. If you did not install any option cards, please skip to step d on page 8.

250-10 Analog Output Card

This card allows the Model 250/251 to transmit linearized analog signals (either 4-20 mA or 0-10 VDC) to your data logger or data acquisition system. The 250-10 can only output either current or voltage at one time.

To use the 250-10 for current (0-20 mA, 4-20 mA) output: Connect your current loop to screw-terminals **18** (output) and **19** (common). Your current loop should not exceed 500 ohms in resistance.

To use the 250-10 for voltage (0-5 VDC, 1-5 VDC, 0-10 VDC) output: The signal output for voltage is on screw-terminals **16** (positive) and **17** (common). The device you connect should not have resistance less than 10 Kohms.

250-11 Alarm Output Card

This card allows the Model 250/251 to open/close relay contacts based on values the user programs. Four relay contacts are included that may be used for high/low flow alarms, etc.

Two relays are utilized, each providing two outputs sharing a common ground. Relay1 has contacts on screw-terminal **20** (output) and **21** (common). Relay2 has contacts on screw-terminal **21** (common) and **22** (output). Both share 21 as a common contact.

Relay3 has contacts on screw-terminal **23** (output) and **24** (common). Relay4 has contacts on **24** (common) and **25** (output). Both share 24 as a common contact.

Please note that these contacts should not switch more than 250V or 3 amps each.

- d. Once wiring is complete, it is time to power up the unit. Connect the power cord to AC power, and the unit should initialize, turning each LED segment on as a self-test, then displaying information about software version. After a few seconds, the unit should enter Ready Mode and display zeros (assuming it has not been used before).

Now, the unit must be programmed before use.

B. Programming the Display

1. Navigating the menus

In order to program the display, you must understand how the front panel buttons are used to navigate through the menus.

Also, the display unit can be in two different modes: Ready and Program. In Ready mode, it is monitoring, totalizing, and displaying current status. Program mode is used to calibrate, adjust setpoints, and configure options. Program mode is easily identified – while in Program mode, the display will alternate between the current menu selection and the value.

The buttons on the front of the unit perform the following functions:

DSP: In Ready mode, this button cycles between the various display modes: Flow Rate, Totalizer (and Max/Min for the Model 250) Displays. In Program mode, it ends Program mode and returns you to Ready mode.

PAR: If in Ready mode, pressing this button will enter Program mode. Once in Program mode, this button becomes a select button, entering whatever selection is currently displayed.

F1D: (function key 1) In Ready mode, this button can be programmed to perform various functions. In Program mode, it is used to browse forward through menus.

F2 \bar{N} : (function key 2) In Ready mode, this button can be programmed to perform various functions. In Program mode, it is used to browse backwards through menus.

RST: In Ready mode, this button will reset the Totalizer display. It is disabled in Program mode.

2. Programming the input parameters for the Model 250

If you get lost when programming, simply press the DSP button to return to Ready Mode. Skip to Section 3 on page 13 to program the Model 251.

MODEL 250 ONLY

PROGRAMMING INPUT VALUES (Model 250 Only)

- a. If in Ready mode, press PAR to enter Program mode. The screen will alternate.
- b. Press the F1 Δ button once. The screen should now read 1-INP (alternating).
- c. Press PAR to select "rANGE" (input range selection).
- d. Use the arrow keys (F1 Δ and F2 ∇) to browse until you find "20v" (the v looks like the letter u).
- e. Press PAR to select "20v".
- f. Now the screen should read "deCPT" (display decimal point).
- g. Using the arrow keys, select the number of decimals you wish to display. This setting only affects the Flow Rate, Max, and Min Displays. The Totalizer Display decimal place is set later. Keep in mind that the unit can only display 5 total digits, so if you have too many decimal places, your flow rate may not fully display. For example, if your maximum flow rate is 1000 (i.e., mL/minute), you can only display one decimal ("1000.0"). However, if your maximum flow rate is 2 (i.e., 2 GPM), then you could display up to 4 decimal places ("2.0000").
- h. Once you have selected the number for decimals, press PAR. The screen should now read "round" (display rounding).
- i. This function should always be set to "1". Use the arrow keys to select "1" and press PAR.
- j. The screen should now read "FILtr" (filter setting). This value (in seconds) can be used to filter the Flow Rate Display readout, making the readout appear smoother. Use higher numbers for more filtering, "0" for no filtering. For most applications, "1.0" provides a good balance for filtering and response time.
- k. Once you have selected your filter time, press PAR again. The screen should now read "bANd" (filter band). This value should be "10". Once "10" is selected, press PAR.
- l. The screen will now read "PtS" (scaling points). On this screen, you select how many scaling points you would like to program into the unit for linearization purposes. For instance, to program a linear display, select "2" – one point for zero and one other point. However, most McMillan flow sensors are slightly non-linear, and the Model 250 accepts up to 16 linearization points for correcting that linearity. All McMillan flow sensors come with a calibration certificate that can be used for programming. If the certificate has 4 points, select "5" on the PtS screen (4 points plus zero). If the certificate has 3 points, select "4" on the PtS screen (3 points plus zero). If you perform your own calibrations, specify the number of calibration points you would like to program, always adding one for zero. The calibration points should be programmed in order from lowest to highest. Press PAR once your desired number of calibration points is selected.
- m. The screen will now read "StYLE" (scaling style). The Model 250 provides two options for programming values: Apply and Key-In. Apply mode allows you to connect the flow sensor, adjust it to a known constant flow rate, and program the display value without having to enter the input value. In Key-In mode, you must already know the output of the flow sensor at various flow rates (for example, have a factory-issued calibration certificate). Select "APLY" for Apply mode or "KEY" for Key-in mode. Press PAR when you have made your selection.

- n. The screen will now show "INP 1" (input value for scaling point 1). If you are using Key-In mode, use the arrow keys to select your first input point in volts DC (usually zero). If you are using Apply mode, adjust flow to your first desired scaling point (usually zero). Once selected, press PAR.
- o. The screen will now show "dSP 1" (display value for scaling point 1). Using the arrow keys, enter your first coordinating display value in your engineering units (i.e., mL/min, GPM, etc.). This is the number you want the Flow Rate Display to show when it receives the signal you set in step n. Press PAR when complete.
- p. The screen will now show "INP 2" (input value for scaling point 2). If you are using Key-In mode, use the arrow keys to select your second input point in volts DC (i.e., 1.25 VDC). If you selected Apply mode, adjust the flow rate of your flow sensor to your second desired scaling point (i.e., 125 mL/min). Once selected, press PAR.
- q. The screen will now show "dSP 2" (display value for scaling point 2). Using the arrow keys, enter your second coordinating display value in your engineering units (i.e., mL/min, GPM, etc.) This is the value you want to display with the signal you set in step p. Press PAR when complete.
- r. Continue as above through all of your scaling points. When complete, the unit will alternate between "Pro" and "No". Press DSP to exit Program mode.

PROGRAMMING FRONT-PANEL FUNCTION KEYS (Model 250 only)

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) twice so that the screen reads "2-FNC". Press PAR to select.
- c. Press PAR three times again. The screen should now read "F1" (function key 1).
- d. Using the arrow keys, select the function you wish the F1 Δ button to perform when momentarily pressed in Ready mode. Select from the following options:
 - "No" - *None*: No function is performed if activated. This is the factory setting for all function buttons.
 - "rEL" - *Zero (Tare) Display*: Do not use.
 - "d-rEL" - *Relative/Absolute Display*: Do not use.
 - "bAt" - *Store Batch Reading in Totalizer*: Do not use.
 - "r-tot" - *Reset Totalizer*: When activated (momentary action), rESET flashes and the Totalizer Display resets to zero (same as pressing RST button). The Totalizer Display then continues to operate as it is configured. This function operates independent of the selected display (i.e., Flow Rate, Max, or Min).
 - "r-HI" - *Reset Max*: When activated (momentary action), rESET flashes and the Max resets to the present Ready display value. The Max function then continues from that value. This selection functions independent of the current selected display.
 - "r-Lo" - *Reset Min*: When activated (momentary action), rESET flashes and the Min resets to the present Ready display value. The Min function then continues from that value. This selection functions independent of the current selected display.
 - "r-HL" - *Reset Max and Min*: When activated (momentary action), rESET flashes and the Max and Min reset to the present Ready display value. The Max

and Min functions then continue from that value. This selection functions independent of the current selected display.

"Print" -	<i>Print Request:</i> Do not use.
"LIST" - *	<i>Select Main or Alternate Setpoints:</i> Do not use.
"r-1" - *	<i>Reset Setpoint 1 (Alarm 1):</i> When activated (momentary action), rESET flashes and setpoint 1 resets to normal condition. This selection functions independent of the current selected display.
"r-2" - *	<i>Reset Setpoint 2 (Alarm 2):</i> Same as "r-1" for setpoint 2.
"r-3" - *	<i>Reset Setpoint 3 (Alarm 3):</i> Same as "r-1" for setpoint 3.
"r-4" - *	<i>Reset Setpoint 4 (Alarm 4):</i> Same as "r-1" for setpoint 4.
"r-34" - *	<i>Reset Setpoint 3 & 4 (Alarm 3 & 4):</i> Same as "r-1" but for both setpoints 3 & 4.
"r-234" - *	<i>Reset Setpoints 2, 3, & 4 (Alarm 2, 3, & 4):</i> Same as "r-1" but for three setpoints 2, 3 & 4.
"r-ALL" - *	<i>Reset All Setpoints (All alarms):</i> When activated (momentary action), rESET flashes and all setpoints are reset to normal condition. This selection functions independent of the current selected display.

* *only available with optional 250-11 Alarm Output Card installed.*

- e. Once you have selected the function you desire, press PAR to select it. The screen then reads "F2".
- f. Use the arrow keys to select one of the functions as listed in step d. Press PAR when complete.
- g. The screen will now read "rSt". Using the arrow keys, select "r-tot" and press PAR.
- h. The screen will now read "Sc-F1". Using the arrow keys, select the function you wish the F1 Δ button to perform when held down for more than three seconds in Ready mode. Refer to the list show in step d for a description of functions. Press PAR when complete.
- i. The screen will now read "Sc-F2". Using the arrow keys, select the function you wish the F2 ∇ button to perform when held down for more than three seconds in Ready mode. Refer to the list show in step d for a description of functions. Press PAR when complete.
- s. The unit will alternate between "Pro" and "No". Press DSP to exit Program mode.

DISPLAY AND PROGRAM LOCKOUT CONFIGURATION (Model 250 Only)

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) three times so that the screen reads "3-LOC". Press PAR to select.
- c. The screen will now read "HI" (Max Display). It will alternate between either "rED" or "LOC". If the value is "rED", the screen will be accessible in Ready mode. By using the arrow keys, you may select "LOC", which will disable the screen in Ready mode. Press PAR when you have made your selection.
- d. The screen will now read "Lo" (Min Display). It will alternate between either "rED" or "LOC". If the value is "rED", the screen will be accessible in Ready mode. By using the arrow keys, you may select "LOC", which will disable the screen in Ready mode. Press PAR when you have made your selection.
- e. The screen will now read "tOt" (Totalizer Display). It will alternate between either "rED" or "LOC". If the value is "rED", the screen will be accessible in Ready mode. By using the arrow

- keys, you may select "LOC", which will disable the screen in Ready mode (select this mode if you are not going to use the Totalizer). Press PAR when you have made your selection.
- f. If you do not have the 250-11 Alarm output card installed, skip to step k.
 - g. The screen will now read "SP-1" (setpoint/alarm 1). It will alternate between either "rED", "LOC", or "Ent". If the value is "rED", the setpoint will be visible in Ready mode, but not changeable. By using the arrow keys, you may select "LOC", which will disable the screen in Ready mode. If "Ent" is selected, the setpoint can easily be changed from Ready Mode (must use a security code, see operating instructions for Set Points). Press PAR when you have made your selection.
 - h. The screen will now read "SP-2" (setpoint/alarm 2). Same as step g for setpoint 2.
 - i. The screen will now read "SP-3" (setpoint/alarm 3). Same as step g for setpoint 3.
 - j. The screen will now read "SP-4" (setpoint/alarm 4). Same as step g for setpoint 4.
 - k. The screen will now read "CoDE". Using the arrow keys, entering any non-zero value will result in a code lockout of Program mode. Parameters, such as setpoint values above with "Ent" access, will still be accessible. Access will only be allowed after entering a matching security code or universal code of 222. Once you have selected your security code ("0" to disable), press PAR to confirm and return to "Pro". Press DSP to exit Program mode.

PROGRAMMING TOTALIZER DISPLAY (Model 250 only)

If you do not want to use the totalizer, you may skip this section.

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) five times so that the screen reads "5-tOt". Press PAR to select.
- c. The screen now reads "dECPt". Use the arrow keys to select the number of decimal places you require for the Totalizer Display. For most applications, this matches the Flow Rate Display decimal point programmed at first. If a different location is desired, make the change here, and follow procedure below for SCFAC factor. Press PAR to select decimal place.
- d. The screen now reads "tBASE". This matches the time factor used in the flow rate display. For example, if the units that are displayed in the Flow Rate Display are mL/minute, then select "In" here. If the units display on the Flow Rate Display are GPH, then select "hour" here. Press PAR when complete.
- e. The screen now reads "SCFAC". If the Totalizer Display decimal place is the same as the Flow Rate Display decimal place (most applications), this screen should be set to "1.000". If they are different, or if you require the Totalizer Display to display flow in different engineering units than the Flow Rate Display, follow these instructions to calculate the SCFAC factor:
 1. When changing the Totalizer Display decimal point location from the Flow Rate Display decimal point, the required SCFAC factor is multiplied by a factor of 10.

Example:

Input "dECPt" = 0.0

<i>Totalizer "dECPt"</i>	<i>SCFAC Factor</i>
0.00	10
0.0	1
0	.1
X10	.01
X100	.001

Input "dECPt" = 0.00

<i>Totalizer dECPt</i>	<i>SCFAC Factor</i>
0.000	10
0.00	1
0.0	.1
0	.01
X10	.001

(x=Totalizer display is round by tens or hundreds)

2. When changing the Totalizer engineering units, the SCFAC is the known conversion multiplier from Flow Rate Display units to Totalizer Display units. Example: If Flow Rate Display is Gallons and the Totalizer Display needs to be in Liters, the conversion multiplier from Gallons to Liters is 3.785. Enter 3.785 as the SCFAC factor.
 3. When changing both the Totalizer Display engineering units and Totalizer Display decimal place then the two calculations are multiplied together. Example: Flow Rate Display = Gallons in tenths (0.0) with Totalizer Display = whole Liters (0), the SCFAC factor would be 0.3785.
- f. Once the SCFAC factor is selected, press PAR.
 - g. The screen now reads "Locut". If desired, use the arrow keys to select a low cut value. A low cut value disables the Totalizer when the Flow Rate Display value falls below the value programmed. Use "0" to disable. Press PAR when complete.
 - h. The screen now reads "P-uP". Use the arrow keys to toggle between "NO" and "rSt". NO will keep Totalizer Display values even when unit is powered off and back on. rSt will reset the Totalizer upon power down. Press PAR when you have made your selection. The screen returns to "Pro". Press DSP to exit Program mode.

If you are using the option cards, skip to sections 4 & 5 on pages 17-18 for instructions on how to program them. If not, skip to Part C on page 22, Operating Your Display.

3. Programming the input parameters for the Model 251

If you get lost when programming, simply press the DSP button to return to Ready Mode.

Follow these instructions only for the Model 251; use the previous section to program the Model 250 (see page 9).

MODEL 251 ONLY

PROGRAMMING TOTALIZER VALUES (Model 251 Only)

If you do not want to use the totalizer function, skip to the next section, "Display and Program Lockout Configuration."

- a. If in Ready mode, press PAR to enter Program mode. The screen will alternate.
- b. Press the F1Δ button once. The screen should now read 1-INP (alternating).
- c. Press PAR to select "A CNT".
- d. Using the arrow keys (F1Δ and F2∇), browse the selections until you find "cnt". Press PAR to select this option.
- e. The screen should now read "ArESET". Use the arrow keys to select "ZEro". Press PAR to make the selection.
- f. Now, the screen should say "AdECpt". This screen sets the Totalizer Display decimal position. Using the arrow keys, select the number of decimal places you want displayed on the Totalizer. Remember that more decimal places allows for less total flow displayed. Once you have made your selection, press PAR. Remember this setting – you will use it in the next step.
- g. The screen should read "ASCFAC". The ASCFAC factor is used to calculate the Totalizer Display value. Use the following equation to determine the value of ASCFAC:

$$ASCFAC = X \cdot Y$$

Where X equals:

<i>AdECPt</i> (set in step i)	<i>Value of X</i>
0	1
0.0	10
0.00	100
0.000	1000
0.0000	10000
0.00000	100000

And Y equals:

$$Y = \frac{\text{frequency (pps or Hz) at known flow rate}}{\text{Known flow rate}}$$

Example: a flow sensor outputs 353 pps (Hz) at 500 mL/minute. $Y=353/500$ or 0.706.

If ASCFAC is significantly greater than one (i.e., greater than 5), you may want to reduce the number of decimal places – the unit will have to round the display to show that many digits. To reduce the number of decimal places, press DSP to return to Ready Mode, and start over at step b.

If ASCFAC is significantly less than one (i.e., less than 0.1), you will want to use a scale divider. You may divide the ASCFAC by 1, 0.1, or 0.01, and enter that divided value into this screen. In the next step, you will tell the unit what value you divided by to gain more resolution.

Using the arrow keys, enter your final ASCFAC into the screen, and press PAR.

- h. The screen should now read "ASCALr". Using the arrow keys, select the scale divider you used in the previous step. If you did not need to use a scale divider, select "1". Press PAR when complete.
- i. Press PAR again to skip "ACNTLd".
- j. The screen should now read "A P-UP". This allows you to set whether or not the Totalizer Display automatically resets at power up. Select "YES" to reset at powerup, or "NO" to keep values from power up to power up. Press PAR to select.
- k. Press PAR again to skip "PrSEN".
- l. The screen should now read "B CNT". Using the arrow keys, select "NONE". Press PAR when selected. You are now back to the "Pro"/"No" screen. Press DSP to exit Program mode.

PROGRAMMING FRONT-PANEL FUNCTION KEYS (Model 251 only)

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) twice so that the screen reads "2-FNC". Press PAR to select.
- c. Press PAR three times again. The screen should now read "F1" (function key 1).
- d. Using the arrow keys, select the function you wish the F1Δ button to perform when momentarily pressed in Ready mode. Select from the following options:
 - "No" – *None*: No function is performed if activated. This is the factory setting for all function buttons.

"dSPSEL" -	Do not use.
"dSPrSt" -	Do not use.
"LIST" -	Do not use.
"PrINt" -	Do not use.
"PrNrSt" -	Do not use.
"CtrStL" -	Do not use.
"CtrStE" -	Do not use.
"INHlbt" -	Do not use.
"StOrE" -	Do not use.
"SPrStL" -	Do not use.
"SPrStE" -	Reset setpoints. Selecting this option sends you into a submenu, where you can select by choosing "YES" or "NO" which setpoints you would like reset.
"SPHOLd" -	Do not use.

- e. Once you have selected the function you desire, press PAR to select it. The screen then reads "F2".
- f. Use the arrow keys to select one of the functions as listed in step d. Press PAR when complete.
- g. The screen will now read "rSt". Using the arrow keys, select "dSPrSt" and press PAR.
- h. The screen will now read "Sc-F1". Using the arrow keys, select the function you wish the F1Δ button to perform when held down for more than three seconds in Ready mode. Refer to the list show in step d for a description of functions. Press PAR when complete.
- i. The screen will now read "Sc-F2". Using the arrow keys, select the function you wish the F2▽ button to perform when held down for more than three seconds in Ready mode. Refer to the list show in step d for a description of functions. Press PAR when complete.
- t. The unit will alternate between "Pro" and "No". Press DSP to exit Program mode.

DISPLAY AND PROGRAM LOCKOUT CONFIGURATION (Model 251 Only)

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) three times so that the screen reads "3-LOC". Press PAR to select.
- c. The screen will now read "A-CNT". If you are going to use the Totalizer, select "rED". If you wish to disable the Totalizer, select "LOC". Press PAR when you have made your selection.
- d. The screen will now read "B-CNT". By using the arrow keys, select "LOC". Press PAR when you have made your selection.
- e. The screen will now read "C-CNT". By using the arrow keys, select "LOC". Press PAR when you have made your selection.
- f. The screen will now read "rATE". If you are going to use the Flow Rate Display, select "rED". If you wish to disable the Flow Rate Display, select "LOC". Press PAR when complete.
- g. The screen will now read "HI". By using the arrow keys, select "LOC". Press PAR when complete.
- h. The screen will now read "LO". By using the arrow keys, select "LOC". Press PAR when complete.
- i. If you do not have the 250-11 Alarm output card installed, skip to step n.
- j. The screen will now read "SP-1" (setpoint/alarm 1). It will alternate between either "rED", "LOC", or "Ent". If the value is "rED", the setpoint will be visible in Ready mode, but not

changeable. By using the arrow keys, you may select "LOC", which will disable the screen in Ready mode. If "Ent" is selected, the setpoint can easily be changed from Ready Mode (must use a security code, see operating instructions for Set Points). Press PAR when you have made your selection.

- k. The screen will now read "SP-2" (setpoint/alarm 2). Same as step g for setpoint 2.
- l. The screen will now read "SP-3" (setpoint/alarm 3). Same as step g for setpoint 3.
- m. The screen will now read "SP-4" (setpoint/alarm 4). Same as step g for setpoint 4.
- n. The screen will now read "ACNtLd". By using the arrow keys, select "LOC". Press PAR when complete.
- o. The screen will now read "bCNtLd". By using the arrow keys, select "LOC". Press PAR when complete.
- p. The screen will now read "CCNtLd". By using the arrow keys, select "LOC". Press PAR when complete.
- q. The screen will now read "ASCFAC". By using the arrow keys, select "LOC". Press PAR when complete.
- r. The screen will now read "BSCFAC". By using the arrow keys, select "LOC". Press PAR when complete.
- s. The screen will now read "CSCFAC". By using the arrow keys, select "LOC". Press PAR when complete.
- t. The screen will now read "CoDE". Using the arrow keys, entering any non-zero value will result in a code lockout of Program mode. Adjustable settings, such as setpoint values, with "Ent" access, will still be accessible. Access will only be allowed after entering a matching security code or universal code of 222. Once you have selected your security code ("0" to disable), press PAR to confirm and return to "Pro". Press DSP to exit Program mode.

PROGRAMMING THE FLOW RATE DISPLAY (Model 251 Only)

If you do not wish to utilize the Flow Rate display, you may skip to the next section 4 on page 17.

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) four times so that the screen reads "4-rtE". Press PAR to select.
- c. The screen will now show "rAtEEn". Use the arrow keys to select "rATE-A", and press PAR.
- d. The screen will now read "LO-Udt". Use the arrow keys to select "1.0", and press PAR.
- e. The screen will now read "HI-Udt". Use the arrow keys to select "2.0", and press PAR.
- f. The screen will now read "rtE dP". This allows you to adjust the decimal position for the Flow Rate Display. Using the arrow keys, select how many decimal places you wish to display. Remember that the more decimal places, the less digits you have for whole numbers. For higher flow rates, the unit may not display properly. When you have made your selection, press PAR.
- g. The screen will now read "SEGS" (scaling points). On this screen, you select how many scaling points you would like to program into the unit for linearization purposes. For instance, to program a linear display, select "1" – the display always assumes one point is zero and allows you to enter one other point.

However, most McMillan flow sensors are slightly non-linear, and the Model 251 accepts up to 9 linearization points for correcting that linearity. All McMillan flow sensors come with a calibration certificate that can be used for programming. If the certificate has 4 points, select "4" on the SEGS screen. If the certificate has 3 points, select "3" on the SEGS screen. If you

perform your own calibrations, specify the number of calibration points you would like to program. The calibration points should be programmed in order from lowest to highest.

Press PAR once your desired number of calibration points is selected.

- h. The screen will now show "rdSP 0". Use the arrow keys to select zero, and press PAR.
- i. The screen will now show "rINP 0". Use the arrow keys to select zero, and press PAR.
- j. The screen will now show "rdSP 1". (display value for scaling point 1). Using the arrow keys, enter your first coordinating display value in your engineering units (i.e., mL/min, GPM, etc.). This is the number you want the Flow Rate Display to show when it receives the signal you set in step k. Press PAR when complete.
- k. The screen will now show "rINP 1" (input value for scaling point 1). Use the arrow keys to select your first input point in pps (Hz) (i.e., 353 pps). Once selected, press PAR.
- l. If you selected more than one scaling point, the screen will now show "rdSP 2" (display value for scaling point 2). Using the arrow keys, enter your second coordinating display value in your engineering units (i.e., mL/min, GPM, etc.) This is the value you want to display with the signal you assign for the second input value, on the next step. Press PAR when complete.
- m. Continue as above through all of your scaling points. When complete, the unit will show "rOUNd".
- n. Use the arrow keys to select "1" and press PAR.
- o. The screen should now show "LOCUt". Make sure the value is zero, and press PAR.
- p. Now, you should see "HI-t". Make sure the value is zero, and press PAR.
- q. The screen should now read "LO-t". Once again, make sure the value is zero, and press PAR.
- r. The screen will switch back to alternating "Pro" and "NO". Press DSP to exit Program mode.

4. Programming your 250-10 Analog Output Card (optional)

The card must already be installed as detailed in section A.2 (on page 3).

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) eight times so that the screen reads "8-ANA". Press PAR to select.
- c. The screen will now read "tYPE". Using the arrows, select "0-20" for 0-20 mA output, "4-20" for 4-20 mA output, or "0-10" for 0-10 VDC output (which also covers 0-5 and 1-5 VDC).
- d. Press PAR when you have made your selection.
- e. The screen will now show "ASIN". Using the arrow keys, select from the following sources for your analog output:

MODEL 250

"InP" - *Flow Rate Display*: The analog output is based off of the Flow Rate Display value.

"HI" - *Maximum Display*: The analog output is based off of the Maximum Display value.

"LO" - *Maximum Display*: The analog output is based off of the Maximum Display value.

"tot" - *Totalizer Display*: The analog output is based off of the Totalizer Display value.

MODEL 251

"A CNT" - *Totalizer Display*: The analog output is based off of the Totalizer Display value.

"B CNT" -	Do not use.
"C CNT" -	Do not use.
"rATE" -	<i>Flow Rate Display</i> : The analog output is based off of the Flow Rate Display value.
"LO" -	Do not use.
"tot" -	Do not use.

Press PAR when you have made your selection.

- f. The screen should now read "AN-LO". This allows you to set the value of the low end of the analog scale (i.e., for 4-20 mA, the display value that corresponds with 4 mA). For instance, in most cases, zero will be your low scale value. For a 1-5VDC output, you must make the low scale value negative so that you receive a 1 VDC at zero display. A reverse acting output is possible by reversing the scaling values. Press PAR when complete.
- g. The screen should now read "AN-HI". This allows you to set the value of the high end of the analog scale (i.e., for 4-20 mA, the display value that corresponds with 20 mA). For instance, in most cases, your maximum flow will be your high scale value. For a 1-5VDC or 0-5VDC output, you must make the high scale value twice that of your maximum flow so that you receive a 5 VDC at maximum flow display. A reverse acting output is possible by reversing the scaling values. Press PAR when complete.
- h. On the Model 250, the next screen will read "udt". Using the arrow keys, select "0.0". Press PAR when complete.
- i. You are now returned to the "Pro"/"NO" screen. Press DSP to exit Program mode.
- j. Check to insure the wiring is correct for your selected type of output (current or voltage) as explained in A.5.c (on page 7).

5. Programming your 250-11 Alarm Output Card (optional)

The card must already be installed as detailed in section A.2 (on page 3).

MODEL 250 ONLY

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) six times so that the screen reads "6-SPt". Press PAR to select.
- c. The screen will show "SPSEL". By using the arrow keys, you are able to select which setpoint (1-4) you wish to program. The "n" in the following steps will reflect the chosen setpoint number. After the chosen setpoint is completely programmed, the display will return to "SPSEL NO". Repeat step for each setpoint to be programmed. Once you have selected the setpoint you wish to program, press PAR.

- d. The screen will now read "ACT-n". Using the arrow keys, select the type of alarm you desire. Use figure B.1 below to determine the correct alarm for your application.

Setpoint Alarm Figures

With reverse output logic rE_u , the below alarm states are opposite.

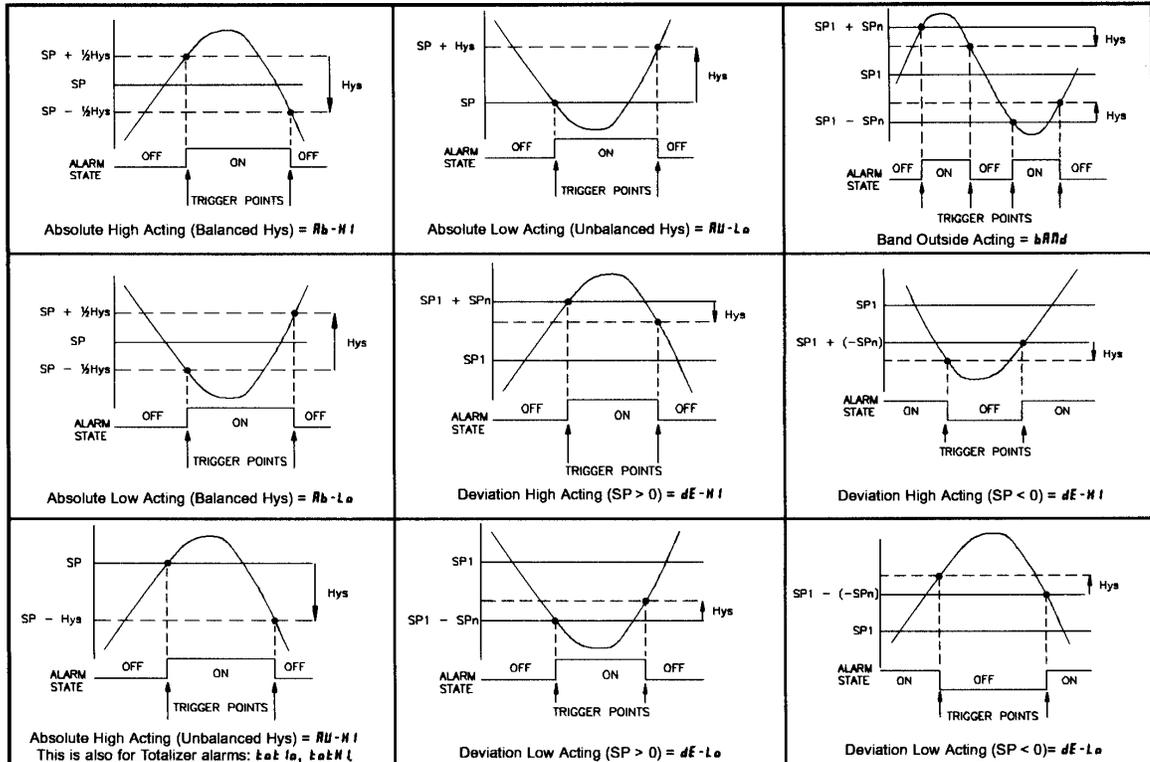


Figure B.1. Description of setpoint alarm types for the Model 250.

When you have made your selection, press PAR.

- e. The screen should now read "SP-n". Using the arrow keys, enter your desired setpoint alarm value. These setpoint values can also be entered in Ready Mode when the setpoint is programmed as "Ent" in the program/lockout configuration. Press PAR when complete.
- f. The screen should now read "HYS-n". Using the arrow keys, enter your desired hysteresis value. See Figure B.1 for a visual explanation of how setpoint alarm actions (balance and unbalance) are affected by the hysteresis. When the setpoint is a control output, usually balance hysteresis is used. For alarm applications, usually unbalanced hysteresis is used. For unbalanced hysteresis modes, the hysteresis functions on the low side for high acting setpoints and on the high side for low acting setpoints. Press PAR when set.
NOTE: Hysteresis eliminates output chatter at the switch point, while time delay can be used to prevent false triggering during process transient events.
- g. The screen should now read "tON-n". Using the arrow keys, enter the time value (in seconds) that the alarm is delayed from turning on after the trigger point is reached. A value of 0.0 allows the meter to update the alarm status per the response time listed in the specifications. If the output logic is reversed (see below), this becomes off time delay. Any time accumulated at power-off resets during power-up. Press PAR when complete.

- h. The screen should now read "tOF-n". Enter the time value in seconds that the alarm is delayed from turning off after the trigger point is reached. A value of 0.0 allows the meter to update the alarm status per the response time listed in the specifications. When the output logic is reversed (see below), this becomes on time delay. Press PAR when complete.
- i. The screen should now read "out-n". Using the arrow keys, select "nor" for normal alarm logic or "rev" for reverse alarm logic. In "rev" mode, all diagrams shown in Figure B.1 are reversed. Press PAR when complete.
- j. The screen will now read "rst-n". Select your reset action from "Auto", "LatC1", or "LatC2".
 "Auto" allows the alarm output to automatically reset off at the trigger points per the Setpoint Action shown in Figure B.1. The alarm remains reset off until the trigger point is crossed again.
 "LatC1" latches the alarm output on at the trigger point per the Setpoint Action shown in Figure B.1. Latch means that the alarm output can only be turned off by powering the unit down or using a user-programmed function key on the front panel. When the function key is activated (momentary or maintained), the corresponding "on" alarm output is reset immediately and remains off until the trigger point is crossed again. Previously latched alarms will be off if power up Display is lower than setpoint value.
 "LatC2" latches the alarm output on at the trigger point per the Setpoint Action shown in Figure B.1. Latch means that the alarm output can only be turned off by powering the unit down or using a user-programmed function key on the front panel. When the function key is activated (momentary or maintained), the meter delays the event until the corresponding "on" alarm output crosses the trigger off point. Previously latched alarms are off if power up Display value is less than setpoint value. During a power-cycle, the meter erases a previous Latch 2 reset if it is not activated at power up.
 Press PAR when you have made your reset action selection.
- k. The screen should now read "Stb-n". Select "YES" for standby operation – the alarm is disabled until (after a power up) until the trigger point is crossed. Once the alarm is activated, the alarm operates normally per the Setpoint Action and Reset Mode. Select "NO" to disable this feature. Press PAR when complete.
- l. The screen will now read "Lit-n". This controls the setpoint indicators on the front panel. The "OFF" mode disables the setpoint "n" indicator. The "nor" mode displays the indicator of an on alarm output. The "rEv" mode displays the setpoint indicator of off alarm outputs. The "FLASH" mode flashes the setpoint indicator of on alarm outputs. After you have made your selection, press PAR.
- m. You have now completed programming for this setpoint alarm. You may configure others (see step c) or press DSP to exit Program Mode.

MODEL 251 ONLY

- a. If not already in Program mode, press PAR to enter it.
- b. Press the up arrow (F1) six times so that the screen reads "6-SPt". Press PAR to select.
- c. The screen will show "SPSEL". By using the arrow keys, you are able to select which setpoint (1-4) you wish to program. The "n" in the following steps will reflect the chosen setpoint number. After the chosen setpoint is completely programmed, the display will return to "SPSEL NO". Repeat step for each setpoint to be programmed. Once you have selected the setpoint you wish to program, press PAR.
- d. The screen will now read "LIT-n". This controls the setpoint indicators on the front panel. The "OFF" mode disables the setpoint "n" indicator. The "nor" mode displays the indicator of an on

alarm output. The "rEv" mode displays the setpoint indicator of off alarm outputs. The "FLASH" mode flashes the setpoint indicator of on alarm outputs. After you have made your selection, press PAR.

- e. The screen should now read "out-n". Using the arrow keys, select "nor" for normal alarm logic or "rev" for reverse alarm logic. Press PAR when complete.
- f. The screen should now read "SUP-n". Select "SAVE" to restore the output to the same state it was at before the meter powered down. Select "ON" to activate the output at startup. Select "OFF" to deactivate the output at startup. Press PAR when you have made your selection.
- g. Now, the screen should read "Act-n". This determines the setpoint action. Select "OFF" to disable the setpoint. The active settings are:
 - "LatCH" – With latch action the output activates when the selected display value equals the setpoint. The output remains active until reset manually.
 - "bOUNd" – With boundary action, the setpoint output activates when the value is greater than or equal to (for hi boundaries, see below) or less than or equal to (for lo boundaries, see below) the setpoint. The setpoint will automatically deactivate when the value falls below (or above, respectively) the setpoint.
 - "tOUt" – With timed out action, the action depends on the type of value the setpoint is monitoring. For Totalizer monitoring, the setpoint activates when the Totalizer value equals the setpoint value and deactivates after the Time Out value (set below). For Flow Rate monitoring, the setpoint output cycles when the rate value is greater than or equal to (for hi boundaries, see below) or less than or equal to (for lo boundaries, see below). The Setpoint Time Out and Setpoint On Delay (both set below) determine the cycling times.

Make your selection and press PAR.

- h. The screen should now read "ASN-n". Select "A-CNt" to monitor the Totalizer, or "rATE" to monitor the Flow Rate. Do not select "B-CNt" or "C-CNt". Press PAR when you have made your selection.
- i. The screen will now read "SP-n". Using the arrow keys, select your desired setpoint value. Setpoint values can also be entered when the setpoint is configured as "Ent" in the Program/Lockout Configuration. Press PAR when complete.
- j. The screen will now read "trC-n". Select "NO" and press PAR.
- k. *From this point on, depending on the selections you have made, different configurations will show different options. If the option stated is not shown on your screen, move to the next step.*
- l. Your screen may show "tYP-n". This sets the boundary type. Select "HI" to activate the output when the assigned value is equal or greater to the setpoint value. Select "LO" to activate the output when the assigned value is less than or equal to the setpoint value. Press PAR to select.
- m. Your screen may show "Stb-n". Selecting "YES" will disable low-acting setpoints at a power up until the display crosses into the alarm off area. Once in the alarm off area, the setpoint will function according to the configured setpoint parameters. Select "NO" to disable this startup feature. Press PAR when complete.
- n. Your screen may show "HYS-n". Using the arrow keys, set the desired hysteresis value. This value is added to (for lo boundaries) or subtracted from (for hi boundaries) the setpoint value to determine at what value to deactivate the associated setpoint output. This function is only available for setpoints assigned to the Flow Rate Display with boundary action. Press PAR when complete.

- o. The screen may show "tOFF-n". Use the arrow keys to enter a value (in seconds) for the amount of time the Flow Rate Display must meet the setpoint deactivation requirements before the setpoint's output deactivates. Press PAR when complete.
- p. The screen may show "tON-n". Use the arrow keys to enter a value (in seconds) for the amount of time the Flow Rate Display must meet the setpoint activation requirements before the setpoint's output activates. Press PAR when complete.
- q. The screen may show "tOUT-n". Enter a value (in seconds) that the output should be on during a timed out cycle. For Totalizer applications, this is the amount of time the output is on after activation. Press PAR when complete.
- r. The screen may show "AUTO-n". This controls the auto reset feature. Select "NO" to disable this feature. Select "ZeroAS" to reset the Totalizer when the output is activated. Do not choose any of the other selections. Press PAR when complete.
- s. The screen may show "rSd-n". Select "YES" to have the setpoint reset whenever the Totalizer is reset. Choose "NO" to disable this feature. Press PAR when complete.
- t. The screen may show "rSAS-n". Selecting "YES" will make the setpoint output deactivate (reset) when SPn+1 activates (i.e., SP1 deactivates when SP2 activates and SP4 deactivates when SP1 activates – the last setpoint wraps around to the first). Select "NO" to disable. Press PAR when complete.
- u. If the screen shows "rSAE-n", select "NO" and press PAR.
- v. When you have finished programming this setpoint, the screen will display "SPSEL". Select another setpoint to program (see step c) or press DSP to exit program mode.

C. Operating the Display

1. Monitoring the Totalizer (if enabled)

Use the DSP button until you arrive at the Totalizer screen. The Model 250 indicates a small TOT in the left corner of the display; the Model 251 shows an A indicator in the left corner of the display. These indicate you are displaying the Totalizer.

When the Model 250 Totalizer Display exceeds 5 digits, the front panel indicator TOT flashes. In this case, the meter continues to totalize up to a 9 digit value. The high order 4 digits and the low order 5 digits are displayed alternately. The letter "h" in the left of the display denotes the high order display.

When the Model 251 Totalizer Display exceeds 5 digits, it switches to a two part display. This display alternates between the least 6 significant digits and the remaining most significant digits beginning with "OF" in the display. If the display exceeds 99999999 the display will roll to zero and continue counting. Outputs cannot be set to counter values above 6 digits. The indicator "A" will flash when the value is above 6 digits.

To reset the Totalizer, press the RST button.

2. Monitoring the Flow Rate Display (if enabled)

Use the DSP button until you arrive at the Flow Rate screen. The Model 250 turns off all indicators in this mode; the Model 251 shows an A indicator and displays an "r" in the left element of the LED display. These indicate you are displaying the Flow Rate Display.

The display shows Flow Rate in the engineering units programmed – see programming instructions for more details.

3. **Monitoring and Changing the Setpoints (if installed and enabled)**

Four LED indicators are provided on the front panel: SP1, SP2, SP3, and SP4. These can be programmed to be on, off, or flash during alarm modes. See programming instructions for more details.

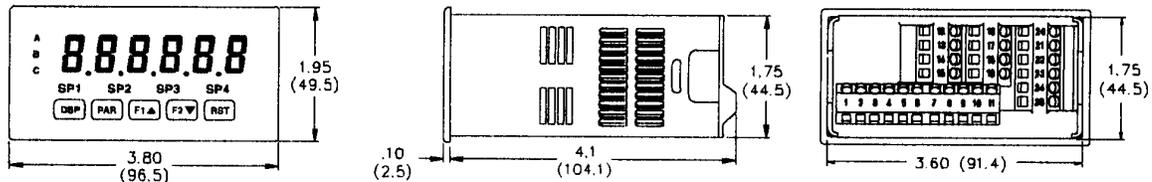
If you change setpoints often, it may be easiest to program all frequently used setpoints as “Ent” access (under programming, Program and Lockout Parameters). Then, by adding a security code, setpoints are quickly and easily changed by simply pressing the PAR button (in Ready Mode), selecting the appropriate setpoint and adjusting its value.

If setpoints are set to latch, the only way to reset them is to program one of the front-panel function buttons to reset them. Depending on your programming settings, powering off and then back on may also reset them.

D. Dimensions

DIMENSIONS “In inches (mm)”

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5.5” (140) W.



E. Specifications

MODEL 250

1. **DISPLAY:** 5 digit, 0.56" (14.2 mm) red LED, (-19999 to 99999)
2. **POWER:**
 - AC Power, 85 to 250 VAC, 50/60 Hz, 15VA.
 - Isolation: 2300 Vrms for 1 min. to all inputs and outputs
3. **KEYPAD:** 2 programmable function keys, 5 keys total
4. **A/D CONVERTER:** 16-bit resolution
5. **UPDATE RATES:** A/D Conversion Rate: 20 readings/second
6. **DISPLAY MESSAGES:**
 - “LOL” appears when measurement exceeds + signal range
 - “ULUL” appears when measurement exceeds – signal range
 - “...” Appears when display values exceed + display range

"-..." appears when display values exceed – display range

7. **TOTALIZER:**
 - Function: Time base – second, minute, hour, or day
 - Time accuracy: 0.01% typical
 - Decimal point: 0 to 0.0000
 - Scale Factor: 0.001 to 65.000
 - Low Signal Cutout: -19999 to 99999
 - Total: 9 digits, display alternates between high order and low order readouts
8. **CUSTOM LINEARIZATION:**
 - Data Point Pairs: selectable from 2 to 16
 - Display Range: -19999 to 99999
 - Decimal Point: 0.000
9. **MEMORY:** Nonvolatile EEPROM retains all programmable parameters and display values
10. **ENVIRONMENTAL CONDITIONS:**
 - Operating temperature range: 0 to 50°C (0 to 45°C with any option cards)
 - Storage temperature range: -40 to 60°C
 - Operating and storage humidity: 0 to 85% max non-condensing
 - Altitude: Up to 2000 meters
11. **CERTIFICATIONS AND COMPLIANCES:**
 - UL Recognized Component, File #E179259
 - Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
 - Electromagnetic Compatibility
 - Immunity to EN 50082-2
 - Emissions to EN 50081-2
12. **CONNECTIONS:**
 - High compression cage-clamp terminal block
 - Wire strip length: 0.3" (7.5 mm)
 - Wire gauge capacity: (1) 14 AWG (2.55 mm) solid, (2) 18 AWG (1.02 mm) or (4) 20 AWG (0.61 mm)
13. **CONSTRUCTION:**
 - This unit is rated for NEMA 4X / IP65 indoor use. IP20 touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad.
 - Panel gasket and mounting clip included.
14. **WEIGHT:** 10.4 oz. (295 g)

MODEL 251

1. **DISPLAY:** 5 digit, 0.56" (14.2 mm) red LED, (-19999 to 99999)
2. **POWER:**
 - AC Power, 85 to 250 VAC, 50/60 Hz, 15VA.
 - Isolation: 500 Vrms for 1 min. to all inputs and outputs
3. **KEYPAD:** 2 programmable function keys, 5 keys total
4. **RATE DISPLAY:**
 - Accuracy: 0.01%

Minimum Frequency: 0.01 Hz
Maximum Display: 5 digits, 99999
Over Range Display: "r OLOL"

5. **COUNTER DISPLAYS:** Maximum display: 8 digits, 99999999 (greater than 6 digits display alternates between high order and low order)

6. **INPUT A:**

LOGIC: Input trigger levels: low=1.5 V max, high=3.75 V min
Model 106: current sinking, internal 7.8 Kohm pull-up to +12VDC
All other models: current sourcing, internal 3.9 Kohm pull-down.

7. **CUSTOM LINEARIZATION:**

Data Points: selectable from 1-9
Display Range: -19999 to 99999
Decimal Point: 0.000

8. **MEMORY:** Nonvolatile EEPROM retains all programmable parameters and display values

9. **ENVIRONMENTAL CONDITIONS:**

Operating temperature range: 0 to 50°C (0 to 45°C with any option cards)
Storage temperature range: -40 to 60°C
Operating and storage humidity: 0 to 85% max non-condensing
Altitude: Up to 2000 meters

10. **CERTIFICATIONS AND COMPLIANCES:**

UL Recognized Component, File #E179259
Recognized to U.S. and Canadian requirements under the Component
Recognition Program of Underwriters Laboratories, Inc.
Electromagnetic Compatibility
Immunity to EN 50082-2
Emissions to EN 50081-2

11. **CONNECTIONS:**

High compression cage-clamp terminal block
Wire strip length: 0.3" (7.5 mm)
Wire gauge capacity: (1) 14 AWG (2.55 mm) solid, (2) 18 AWG (1.02 mm) or (4) 20 AWG
(0.61 mm)

12. **CONSTRUCTION:**

This unit is rated for NEMA 4X / IP65 indoor use. IP20 touch safe. Installation Category II,
Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad.
Panel gasket and mounting clip included.

13. **WEIGHT:** 10.4 oz. (295 g)

OPTIONAL OUTPUT CARD

1. **OPTIONAL ANALOG OUTPUT CARD (250-10):**

Types: 0 to 20 mA, 4 to 20 mA, or 0 to 10 VDC
Isolation to Sensor Common: 500 Vrms for one minute. Not isolated from all other
commons. Working Voltage 50 V.
Accuracy: 0.17% of FS (18 to 28°C); 0.4% of FS (0 to 50°C)
Resolution: 1/3500

Compliance: 10VDC: 10Kohm load min., 20 mA: 500 ohm load max
Update time: 200 msec max to within 99% of final output value

2. OPTIONAL ALARM OUTPUT CARD (250-11):

Type: Four FORM-A relays

Isolation to Sensor Common: 2300 Vrms for 1 min, working voltage: 250 Vrms

Contact rating:

One Relay Energized: 3 amps @ 250VAC or 30VDC (resistive load),
1/10 HP @ 120VAC, inductive load

Total current with all relays energized not to exceed 4 amps

Life expectancy: 100K cycles min at full load rating.

Response time: 5 msec nominal with 3 msec nominal release

F. Limited Warranty

If at any time within one year of shipment, but not thereafter, it is proved that any part of the equipment furnished by McMillan Company was defective when shipped by McMillan Company, the same will be replaced free of charge, F.O.B. McMillan Company. Notice of this claim must be made within one year after delivery. McMillan Company's liability is limited to replacement of such defective parts or equipment. There are no guarantees or warranty expressed or implied other than those herein specifically mentioned.

McMillan Company shall herein not in any event be liable for any consequential damages, secondary charges, expenses for erection or disconnecting, or losses resulting from any alleged defect in the apparatus.

Batteries are not covered by this warranty.