Eldridge Products, Inc.

Master-Touch™

version 7.x firmware

Series 9000MP Multipoint System
Series 9600MP System Control Panel

Thermal Gas Mass Flowmeters

INSTRUCTION MANUAL

www.epiflow.com

Eldridge Products, Inc.
465 Reservation Road
Marina, CA 93933

Tel: 800/321-3569
or 831/648-7777
Fax: 831/648-7780
Email: sales@epiflow.com

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Section A Introduction

Introduction

This addendum to the Eldridge Products, Inc. Multipoint Instruction Manual only describes the functions of the enhanced v7.x firmware. When your Multipoint System is operating in the basic Run Mode, the available *system level* adjustments are described in the standard Series 9000MP Multipoint Instruction Manual (document no. 80201501) and the EPICommunicator™ Instruction Manual (document no. 80202001). These manuals are included on the CD that shipped with this system.

The enhanced firmware includes a fail-safe mode for the System Control Panel electronics, a programmable alarm for determining sensor failures, and a variety of new features for the command and control of the multipoint configuration. These features are pre-programmed as necessary by factory. Some settings must not be changed; others may be changed at the discretion of the system operators as needed for the process and control requirements.

New Features

The following new features are included the EPI Multipoint v7.x firmware:

1) Fail-Safe Operation — If the System Control Panel electronics suffer a failure that interrupts the internal communications for any reason, the averaged 4–20mA analog output signal will drop to 0mA. This will distinguish it clearly from the 4mA signal at No Flow when operating under normal conditions. If for some reason the failure is intermittent or short-lived, the output will return to normal operation when the internal communications resume.

2) Sensor Failure — The v7.x firmware supports two methods for determining the failure of one or more sensors which can be applied globally to all sensors on a probe, or individually to each sensor. None, one or both of these conditions can be operational to best meet your specific requirements. NOTE: When a sensor is considered "failed", its flow input signal is disregarded by the system firmware in the calculation of the average flow reading.

   a) The preferred method is to establish an acceptable "flow reading band" for each sensor relative to the calibrated 0 – Full Scale flow range by programming a value (X) that is above No Flow (0 + X) and below Full Scale (100 – X). For example, if the normal operation of a system typically has the flow between 30–70% of the calibrated Full Scale, then a value of "5" might be used so that any sensor with a flow reading that is less than 5% of the Full Scale (0 + 5) or greater than 95% of the Full Scale (100 – 5) is considered "failed" and Relay #2 is activated alerting the system operators to the fact. The allowable value is 0–100 (%) (0 is always Off and 100 is always On). EPI suggests "5" as the value.

Representation of Failure based on Full Scale (four sensors shown)
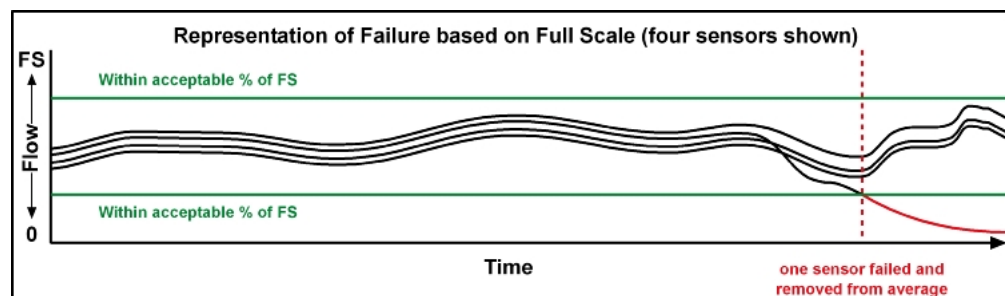
b) An alternate method is to establish a percentage difference in flow readings, *relative to the overall real-time average flow reading*, that is considered to be within an acceptable range. For example, in a well-developed flow stream a variation of ±50% might be set so that any sensor with readings 50% higher or lower than the average reading is considered "failed" and Relay #2 is activated alerting the system operators to the fact. If the flow profile typically has greater variations, then a wider range might be more appropriate. The allowed programmable value is 10–250 (%) of the real-time average flow readings. EPI recommends 50% or higher due to possible duct profile anomalies.


Representation of Failure based on % of Average (four sensors shown)
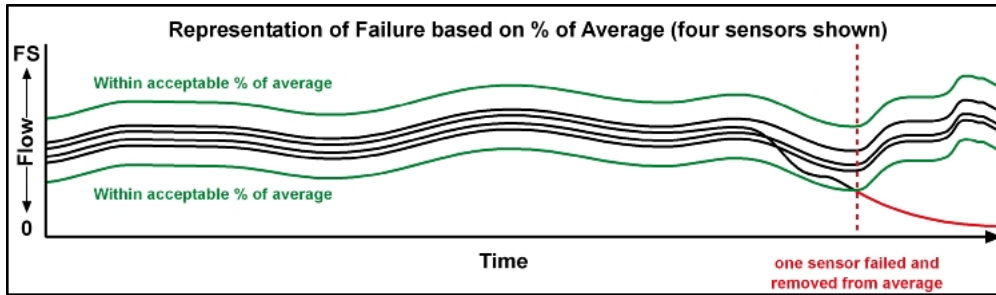
3) Sensor and Probe Flow Readings — The flow readings and failure status for each sensor are available for review in the new 300 *Status* Menu using the display and 4-button keypad (see Section B).

4) 200 *Utility* Menu (submenu 250) — Using our free EPICommunicator™ software in Terminal Mode, the 250 submenu provides new information and control for the multipoint system (see Section C). The information available includes flow and temperature readings for each sensor and each probe average, the programming for the sensor failure conditions, a view of the failure status of each sensor and the ability to clear the Relay, and the ability to disable individual sensors or enable them again after replacement.

Section B   The Master-Touch™ LCD and Key Pad

The Master-Touch™ Multipoint System includes a 2-line, 16-character LCD display and keypad to view and control the functions of the full menuing system. Most of the menus and submenu items are accessible via the key pad, though many functions are more easily used with *EPICommunicator*™ software. The software and the instruction manual are included on the CD that shipped with this System. They are also available for downloading at no charge from our website, **www.epiflow.com**.

LCD and Keypad

The illustration below shows the LCD Display when the flowmeter is in Run Mode:
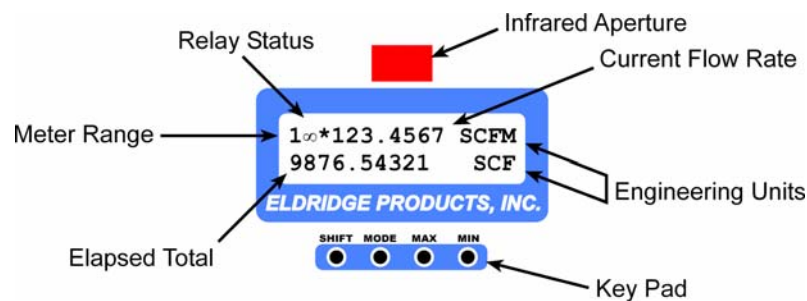
Meter Range — indicates the active meter calibration range (1–4), an exclamation point (**!**) indicates that the flowmeter is operating with menu item 212–Track Hold selected, a box (□) indicates that the flow has exceeded the range of the 0–5VDC and 0–20mA output signals;
Relay Status — indicates status of Relays 1 and 2 (∞ = de-energized, ∗ = energized); the Relay #2 symbol will be ∗ while operating in Multipoint mode.

> **The sensor failure Alarm uses Relay #2. Only Relay #1 is programmable for the other Alarm functions, such as Purge Hold, Total, Trip High, etc.**

Infrared Aperture — allows optional infrared communications with EPI's Light WIRE modules when this option has been pre-ordered and activated;
Current Flow Rate — indicates the Multipoint System's average real-time flow rate;
Engineering Units — indicates currently selected engineering units for rate and total;
Elapsed Total — indicates real-time total flow since previous reset;
Key Pad — four-button key pad for accessing microprocessor settings.

The **SHIFT** key selects menu items for numeric entry, moves the active character position to the left when in numeric entry mode, and accepts or "enters" the specific numeric entry and returns the flowmeter to the selected menu item.

The **MODE** key scrolls the flowmeter through the modes, and moves the active character position to the right when in numeric entry mode.

The **MAX** and **MIN** keys work together to move "forward and backward" through the item menus and through the numeric entry characters:

_ . / - 0 1 2 3 4 5 6 7 8 9 e + : A P M

> **The flowmeter must be unlocked to make changes to the variable settings. See the standard Multipoint Instruction Manual for this process. The factory default value for menu item 219–UnLock is "9001". If the numeric entry mode is accessed while the flowmeter settings are still locked, the top line of the LCD display will show "**METER LOCKED**" until you press the SHIFT key to exit the numeric entry mode.**

300 *Status* Menu

> **The 300 *Status* Menu in the v7.x firmware for the Multipoint System provides a different series of menu choices than the standard set of choices shown in the basic Instruction Manual. Please refer to the information below when accessing these menu items.**

The 300 *Status* Menu includes a series of submenu items which allow you to easily view the flow readings for each sensor, determine which sensor has tripped the failure alarm and clear the alarm, as necessary.

```
1∞*12.3456  SCFM
9876.54321   SCF
```
RUN MODE

```
300 *Status*
∞∞P1S1 1234.5
```
Press **MODE** three times to advance to the **300 *Meter*** menu. The display shown at left will appear. The top line will always show you that you are in the correct menu. The bottom line shows the Relay Status, the Probe & Sensor indicator, and the sensor's real-time flow rate.

> *Px = the probe number; this number is found on the multipoint probe's electronics enclosure.*
> *Sx = the sensor number; this numbering starts with the sensor that is closest to the electronics enclosure (1) and continues in sequence along each of the multipoint probes.*
> *(NOTE: this is not the same as the 8-digit EPI serial number for the sensor)*

```
300 *Status*
∞∞P1S2 1234.5
```
Use the **Max** and **Min** to cycle through all of the sensors included in the multipoint system in sequence — P1S1, P1S2, . . . P2S1, P2S2, etc.

```
300 *Status*
*∞P1S1 1234.5
```
If the Relay 1 symbol is "*" (asterisk), this indicates that a sensor is outside of the parameters used to determine a failure. The Relay 2 symbol indicates which sensor has failed. In the example at left, P1S1 has not failed because the Relay 2 symbol is "∞" (infinity).

```
300 *Status*
**P2S1 32.1
```
In the example at left, P2S1 has failed as indicated by the Relay 2 symbol "*". If more than one sensor as failed, each sensor will have this indication.

> **To reset the Sensor Failure alarm, unlock the flowmeter's settings and press Max and Min at the same time. This will clear the Relay indicators.**

To exit the 300 *Status* menu, press Mode one time. This will move you to the 400 *Alarm* menu. You may continue with System-level adjustments or return to Run Mode by following the directions in the standard instruction manual

Section C   EPICommunicator™ Menu 250

EPICommunicator™ (EPICom) is free proprietary software for use with Master-Touch™ flowmeters. For general information about EPICom, please see the full manual included on the CD that shipped with this order or download it from www.epiflow.com. The information in this manual only applies to Menu 250 and its related submenus when using Terminal Mode.
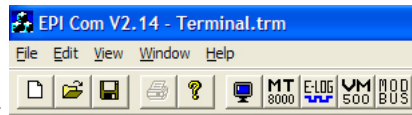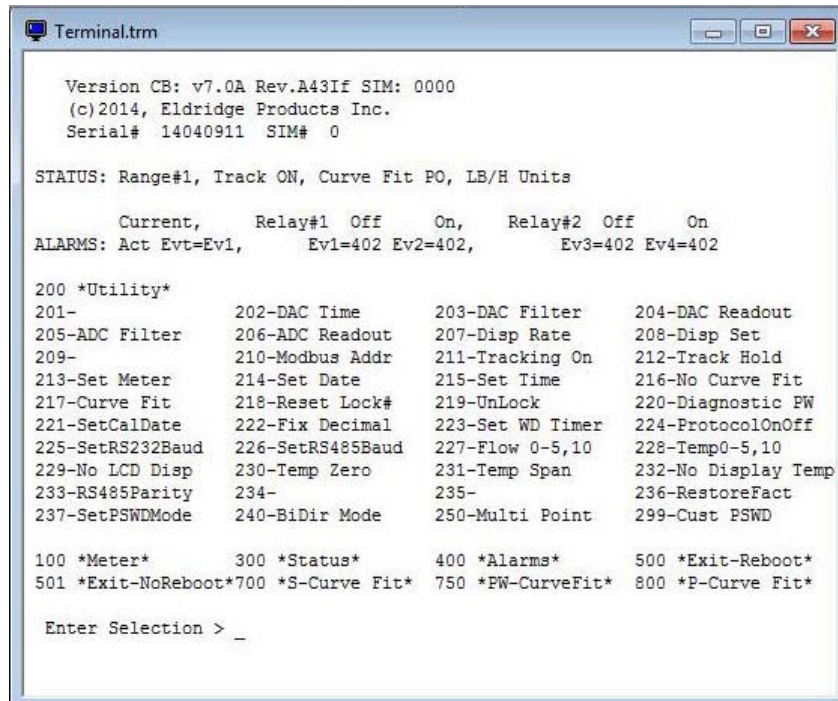
The following is the EPICom menu bar:

To open the EPITerm module, click on .

200 *Utility* Menu

The 200 *Utility* Menu of the Master-Touch™ firmware includes a series of submenu items which allow you to easily change a wide variety of microprocessor parameters at the system level. For a description of the functions, please the standard Multipoint Instruction Manual.
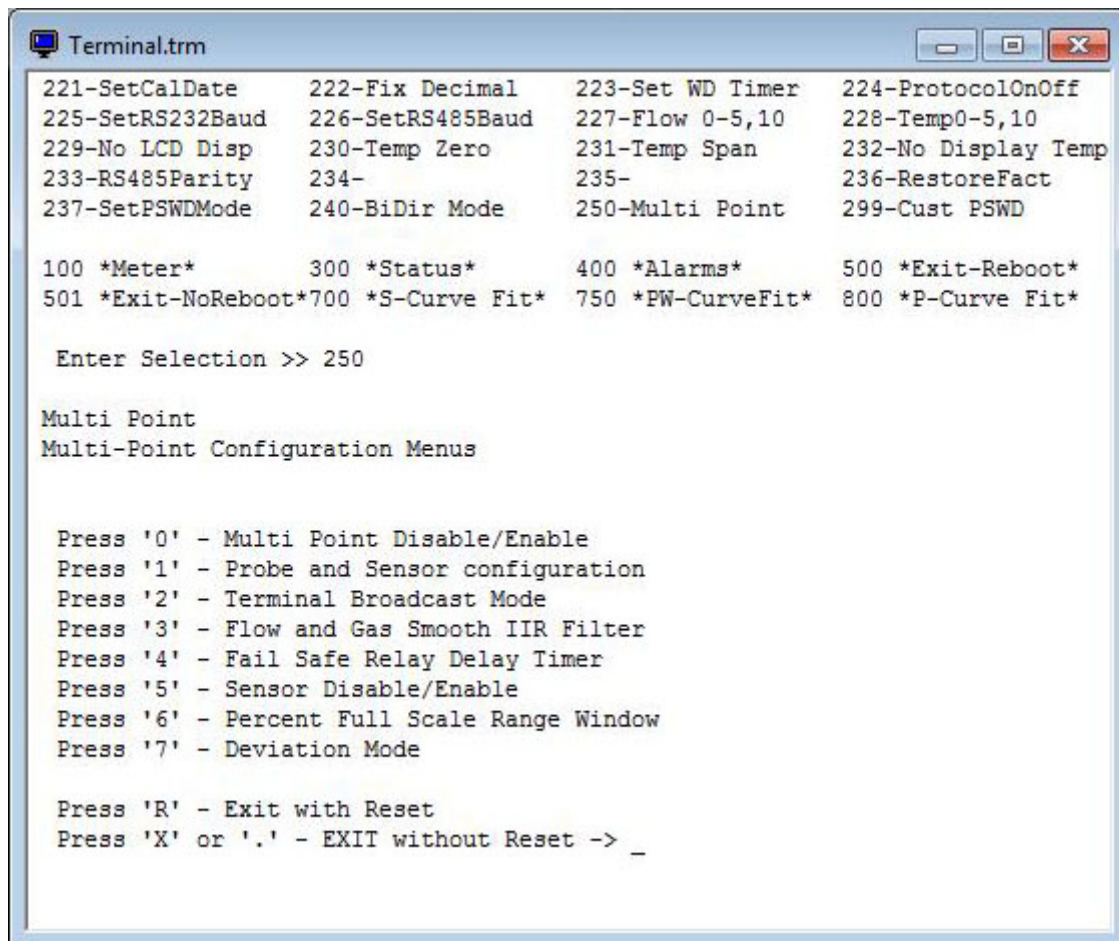
The following is the 200 *Utility* screen for the v7.x firmware as shown in EPICommunicator. The following information applies only to the 250 submenu and its functions.

```
Version CB: v7.0A Rev.A43If SIM: 0000
(c)2014, Eldridge Products Inc.
Serial# 14040911  SIM#  0

STATUS: Range#1, Track ON, Curve Fit PO, LB/H Units


       Current,    Relay#1 Off    On,    Relay#2 Off    On
ALARMS: Act Evt=Ev1,    Ev1=402 Ev2=402,       Ev3=402 Ev4=402


200 *Utility*
201-              202-DAC Time     203-DAC Filter    204-DAC Readout
205-ADC Filter    206-ADC Readout  207-Disp Rate     208-Disp Set
209-              210-Modbus Addr  211-Tracking On   212-Track Hold
213-Set Meter     214-Set Date     215-Set Time      216-No Curve Fit
217-Curve Fit     218-Reset Lock#  219-UnLock        220-Diagnostic PW
221-SetCalDate    222-Fix Decimal  223-Set WD Timer  224-ProtocolOnOff
225-SetRS232Baud  226-SetRS485Baud 227-Flow 0-5,10   228-Temp0-5,10
229-No LCD Disp   230-Temp Zero    231-Temp Span     232-No Display Temp
233-RS485Parity   234-            235-            236-RestoreFact
237-SetPSWDMode   240-BiDir Mode   250-Multi Point   299-Cust PSWD


100 *Meter*       300 *Status*     400 *Alarms*      500 *Exit-Reboot*
501 *Exit-NoReboot*700 *S-Curve Fit*  750 *PW-CurveFit*  800 *P-Curve Fit*

 Enter Selection > _
```
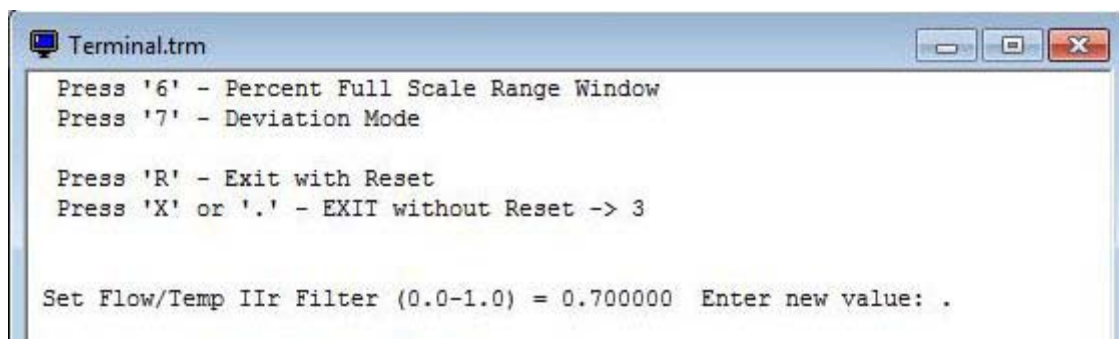
Type "250" at the prompt and press Enter to go to the 250 Multi Point submenus.

250 Multi Point submenus

The flowmeter must be unlocked to make changes to the variable settings. The factory default value for menu item 219–UnLock is "9001".

```
Terminal.trm                                         [ — ][ □ ][ ✕ ]

221-SetCalDate     222-Fix Decimal    223-Set WD Timer   224-ProtocolOnOff
225-SetRS232Baud   226-SetRS485Baud   227-Flow 0-5,10    228-Temp0-5,10
229-No LCD Disp    230-Temp Zero      231-Temp Span      232-No Display Temp
233-RS485Parity    234-               235-               236-RestoreFact
237-SetPSWDMode    240-BiDir Mode     250-Multi Point    299-Cust PSWD

100 *Meter*        300 *Status*       400 *Alarms*       500 *Exit-Reboot*
501 *Exit-NoReboot*700 *S-Curve Fit*  750 *PW-CurveFit*  800 *P-Curve Fit*

 Enter Selection >> 250

Multi Point
Multi-Point Configuration Menus


 Press '0' - Multi Point Disable/Enable
 Press '1' - Probe and Sensor configuration
 Press '2' - Terminal Broadcast Mode
 Press '3' - Flow and Gas Smooth IIR Filter
 Press '4' - Fail Safe Relay Delay Timer
 Press '5' - Sensor Disable/Enable
 Press '6' - Percent Full Scale Range Window
 Press '7' - Deviation Mode

 Press 'R' - Exit with Reset
 Press 'X' or '.' - EXIT without Reset -> _
```

The 250 submenu includes a list of seven (7) control functions for use in programming the number of probes in your multipoint system, the number of sensors per probe, the sensor failure parameters, etc. All of these parameters are set up by the factory, but most may be adjusted as necessary to meet your specific requirements.

To exit any data entry prompt, press "R" to initiate a full restart (reset), or either "X" or ". (period)" to return to Run Mode without restarting. These entries are not case sensitive.

Please note that the full restart "R" will interrupt the 4–20mA flow signal.

Submenu 250–0

```
Press '0' - Multi Point Disable/Enable
Press '1' - Probe and Sensor configuration
Press '2' - Terminal Broadcast Mode
Press '3' - Flow and Gas Smooth IIR Filter
Press '4' - Fail Safe Relay Delay Timer
Press '5' - Sensor Disable/Enable
Press '6' - Percent Full Scale Range Window
Press '7' - Deviation Mode

Press 'R' - Exit with Reset
Press 'X' or '.' - EXIT without Reset -> 0


Set Multi-Point Mode (0=Disable, 1=Enable) = 1  Enter new value: 1_
```

To go to Menu 250-0, type "0" at the prompt and press Enter.

Menu 250–0 controls the operation of the electronics in multipoint mode. It is set to a value of "1" and <u>must not be changed</u>.

Submenu 250–1

```
Press '0' - Multi Point Disable/Enable
Press '1' - Probe and Sensor configuration
Press '2' - Terminal Broadcast Mode
Press '3' - Flow and Gas Smooth IIR Filter
Press '4' - Fail Safe Relay Delay Timer
Press '5' - Sensor Disable/Enable
Press '6' - Percent Full Scale Range Window
Press '7' - Deviation Mode

Press 'R' - Exit with Reset
Press 'X' or '.' - EXIT without Reset -> 1


Current Probes Configured:  1  2
Current Sensors per Probe:  5  5

Enter  'x' to Exit  OR   '.'  to Return to Menu; Else Press Enter => _
```

To go to Menu 250-1, type "1" at the prompt and press Enter.

Menu 250-1 sets the number of probes and the number of sensors per probe. The screen will display the currently values as shown above. In this example, there are two (2) probes with five (5) sensors on each probe. <u>These values are set by the factory and should not be changed unless you are directed to do so by EPI factory support</u>.

```
Press '0' - Multi Point Disable/Enable
Press '1' - Probe and Sensor configuration
Press '2' - Terminal Broadcast Mode
Press '3' - Flow and Gas Smooth IIR Filter
Press '4' - Fail Safe Relay Delay Timer
Press '5' - Sensor Disable/Enable
Press '6' - Percent Full Scale Range Window
Press '7' - Deviation Mode

Press 'R' - Exit with Reset
Press 'X' or '.' - EXIT without Reset -> 2

Multi-Point Broadcast Data Selection Menu

Enter 41 for Probe 1 Flow Data
Enter 51 for Probe 1 Temperature Data
Enter 42 for Probe 2 Flow Data
Enter 52 for Probe 2 Temperature Data
Enter 90 Flow Averages
Enter 91 Temperature Averages
Enter 92 Error Status Data - Deivation, and Range Errors
Enter 1 Returns to Run Mode Data

Enter Broadcast Selection:  => _
```

To go to Menu 250-2, type "2" at the prompt and press Enter. The broadcast data menu choices will be displayed.

Menu 250-2 controls the display information on the EPICommunicator Run Mode screen. In this example with two (2) probes, you can display the average flow reading and individual sensor flow readings for each probe, the average temperature reading and individual temperature readings for each probe.

❚ Entry 92 is currently reserved for factory use to review the sensor failure information. ❚

When you return to Run Mode, the screen will continue to scroll with the selected data, filling the screen, until you type ". . ." to return the standard Run Mode screen.

For example, if you type "41" the screen will scroll the flow readings for the sensors on Probe 1 (P1) when you return to Run Mode.

If you type "90" the screen will scroll the system and probe flow averages.

Submenu 250–3

```
Terminal.trm                                              [_] [□] [✕]

  Press '6' - Percent Full Scale Range Window
  Press '7' - Deviation Mode

  Press 'R' - Exit with Reset
  Press 'X' or '.' - EXIT without Reset -> 3


Set Flow/Temp IIr Filter (0.0-1.0) = 0.700000  Enter new value: .
```
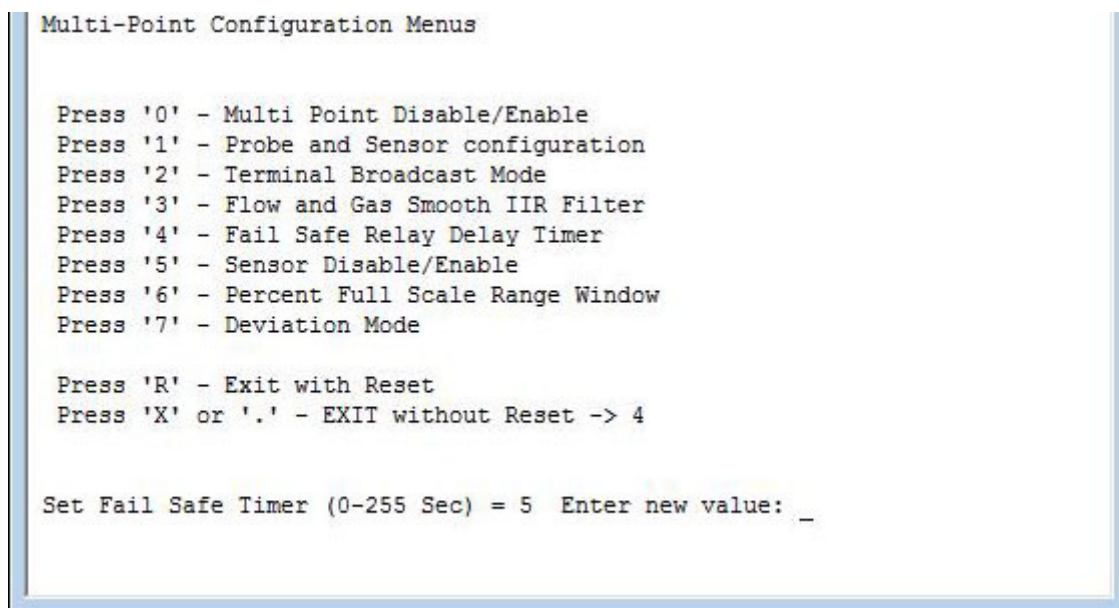
To go to Menu 250-3, type "3" at the prompt and press Enter.

Menu 250-3 controls the amount of filtering applied to the gas flow and gas temperature output signal to smooth an otherwise fluctuating signal. Although the fluctuations are most likely an accurate indication of the flow and temperature variations, a smoother signal may be preferred for operational reasons.

The acceptable value is 0.1 to 1.0. The factory default value is 0.7. To decrease the filtering, type in a lower value; to increase the filtering, type in a greater value. Press Enter accept the value and to return to the submenu screen.

Submenu 250–4

```
Multi-Point Configuration Menus


  Press '0' - Multi Point Disable/Enable
  Press '1' - Probe and Sensor configuration
  Press '2' - Terminal Broadcast Mode
  Press '3' - Flow and Gas Smooth IIR Filter
  Press '4' - Fail Safe Relay Delay Timer
  Press '5' - Sensor Disable/Enable
  Press '6' - Percent Full Scale Range Window
  Press '7' - Deviation Mode

  Press 'R' - Exit with Reset
  Press 'X' or '.' - EXIT without Reset -> 4


Set Fail Safe Timer (0-255 Sec) = 5  Enter new value: _
```

To go to Menu 250-4, type "4" at the prompt and press Enter.

Menu 250-4 controls the timer (time delay) for the Fail Safe relay. The delay helps to prevent the Multipoint System from signaling the fail safe condition if there is only a brief problem which is quickly corrected. The acceptable value is 0 to 250 (seconds). The factory default value is 5. To decrease the amount of delay, type in a lower value; to increase the amount of delay, type in a greater value. Press Enter to return to accept the value and to return to the submenu screen.

Submenu 250–5

```
Multi-Point Configuration Menus


 Press '0' - Multi Point Disable/Enable
 Press '1' - Probe and Sensor configuration
 Press '2' - Terminal Broadcast Mode
 Press '3' - Flow and Gas Smooth IIR Filter
 Press '4' - Fail Safe Relay Delay Timer
 Press '5' - Sensor Disable/Enable
 Press '6' - Percent Full Scale Range Window
 Press '7' - Deviation Mode

 Press 'R' - Exit with Reset
 Press 'X' or '.' - EXIT without Reset -> 5


Enter Probe Number 1 to 8 => 1


           Probe 1 Sensor #:  1   2   3   4   5
Currently Disabled Sensors:   0   0   0   0   0

Enter  'x' to exit   OR   '.'  to skip a sensor

Enter '0' for Enabled  or '1' for Disabled for Probe 1 Sensor 1 => _
```

To go to Menu 250-5, type "5" at the prompt and press Enter.

Menu 250-5 enables or disables individual sensors. The Multipoint System is shipped with all sensors enabled. Type in the number of the probe to display its sensors.

If a sensor has failed, its flow and temperature signals are automatically disregarded as part of the overall average. However, the sensor will continue to trip the Sensor Failure relay until it has been disabled unless the fault relay has been previously cleared via the display and keypad. If the sensor is replaced, it must be enabled to be incorporated into the overall average flow and temperature readings. A value of "0" enables the sensor; a value of "1" disables the sensor. As each sensor is enabled or disabled, a new line for the next sensor will be displayed. You may type "." to skip a sensor without changing its status. When you are finished, press enter "X" to return to the submenu selections.

Submenu 250–6

```
Multi-Point Configuration Menus


 Press '0' - Multi Point Disable/Enable
 Press '1' - Probe and Sensor configuration
 Press '2' - Terminal Broadcast Mode
 Press '3' - Flow and Gas Smooth IIR Filter
 Press '4' - Fail Safe Relay Delay Timer
 Press '5' - Sensor Disable/Enable
 Press '6' - Percent Full Scale Range Window
 Press '7' - Deviation Mode

 Press 'R' - Exit with Reset
 Press 'X' or '.' - EXIT without Reset -> 6


Percent of Full Scale Range Window (0-100 Percent) = 0
Enter new value: _
```

To go to Menu 250-6, type "6" at the prompt and press Enter.

Menu 250-6 establishes the sensor failure parameters based upon a percentage of the Full Scale value. The percentage of Full Scale value entered in 250-6 is added to "0" and subtracted from the Full Scale to establish a narrower band of acceptable flow readings. A sensor or sensors with readings outside of this band will be considered as failed. The acceptable value must be greater than "0" and less than "100" (percent). If the value is "0" or "100", the Relay will not respond until the extreme limits of the calibration range are reached. The factory default value is 5. Increase this value to create a narrower band; decrease this value to create a wider band.

Submenu 250–7

```
Multi-Point Configuration Menus


 Press '0' - Multi Point Disable/Enable
 Press '1' - Probe and Sensor configuration
 Press '2' - Terminal Broadcast Mode
 Press '3' - Flow and Gas Smooth IIR Filter
 Press '4' - Fail Safe Relay Delay Timer
 Press '5' - Sensor Disable/Enable
 Press '6' - Percent Full Scale Range Window
 Press '7' - Deviation Mode

 Press 'R' - Exit with Reset
 Press 'X' or '.' - EXIT without Reset -> 7

0 = No Deviations Applied
1 = Single Deviation Applied to all Sensors = 250
2 = Unique Deviation Applied to each Sensor

Deviation Mode = 2 Enter new value: _
```

To go to Menu 250-7, type "7" at the prompt and press Enter.

Menu 250-7 establishes the sensor failure parameters relative to the overall flow average. The value for the deviation can be inactive, applied globally to all sensors, or individually to accommodate known variations in a flow profile which might cause higher or lower flow readings across the profile under normal conditions.

Type "0" and press Enter to leave these sensor failure parameters inactive.

Type "1" and press Enter to establish a global value for the acceptable range of deviation from the overall average. The acceptable value is 0 to 250 (percent of average flow). EPI recommends a value of 50. Increase this value to create a wider band; decrease this value to create a narrower band.

Type "2" and press Enter to establish an acceptable range of deviation for each sensor. You will then be able to enter a value for each sensor. The acceptable value is 0 to 250 (percent of average flow).

> **The sensor failure parameters in submenus 250-6 and 250-7 can be used together. This allows a flexible set of criteria for determining a sensor failure. However, a sensor failure will be indicated if a sensor is outside of <u>either</u> set of parameters. Therefore, careful consideration should be given to the values used to prevent unexpected or unacceptable results.**

Section D   Engineering Drawings

The following pages include wiring diagrams related to the Master–Touch™ Multipoint System operating with the v7.x firmware.

ELDRIDGE PRODUCTS, INC.

TITLE Transmitter (Probe) Panel
Field Wiring

DRAWING NUMBER   Doc. 80201501 - 02

Transmitter Probe Enclosure
(2 – 5 microprocessor boards)

MICROPROCESSOR
(Sensor Only)

MICROPROCESSOR
(Sensor Only)

MICROPROCESSOR
(Sensor Only)

TB1

RX / RS485– TO SYSTEM CONTROL PANEL (SCP)

TX / RS485+ TO SCP

24 VDC GROUND FROM SCP

+ 24 VDC POWER FROM SCP

TB1

System Control Panel

ELDRIDGE PRODUCTS, INC.

TITLE   System Control Panel to Transmitter Field Wiring

DRAWING NUMBER   **Doc. 80201501 - 03A**

Transmitter (Probe) Panels

RX / RS485–
TX / RS485+
GROUND
+ 24 VDC

RX / RS485–
TX / RS485+
GROUND
+ 24 VDC

MICROPROCESSOR (Sensor Only)