FOXBORO®

**Instruction**

MI 021-388
September 1996

# I/A Series® Magnetic Flow Transmitter Model IMT25

## with Integral Keypad and Display

## Local Operation, Configuration, and Calibration

SIEBE®
A Siebe Group Company

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# 1. Introduction

## Description

An I/A Series Magnetic Flowmeter System consists of two major components:

- IMT25 Magnetic Flow Transmitter
- Magnetic Flowtube (8000 or 8000A wafer body, or 2800, 8300, or 9300A flanged body)

A system may be specified with the transmitter integrally mounted with the flowtube or with a remote mounted transmitter, which can be mounted either on a pipe or a flat surface.

An IMT25 Transmitter can be operated, configured, and calibrated locally from the transmitter optional keypad/display or remotely from a Model HHT Hand-Held Terminal, an I/A Series Workstation, or the PC10 Configurator.

This document describes local operation and configuration of an IMT25 Transmitter supplied with local keypad and display. For information on remote operation, configuration, and calibration, refer to the documents listed in “Reference Documents” on page 2.

## Intended Audience

This document is intended for use by process operators, engineers, and instrument technicians. If you are interested only in operation, read the general information in the *Introduction* and the chapter titled *Operation*. If you are interested in calibration, read the *Introduction* and chapters titled *Operation* and *Calibration*. If you are concerned with configuration, read the entire manual, with special emphasis on the chapter titles *Configuration* and the structure diagrams in Appendix A and the configuration worksheets in Appendix B.

## Functions

Using the IMT25 front panel keypad/display, the functions you can perform are:

### Operating Functions

- Display measurement information
  (The current value of: Flow Rate in engineering units (EGU), Flow Rate in % of upper range value (URV), Forward Total, Reverse Total, Net Total, and Grand Total)
- Display current status or values of transmitter parameters
  (Operating mode, outputs, contact inputs, relay outputs, empty pipe data, noise reduction, and write protection)
- Display identity information
  (Tag number, location, tag name, device name, and transmitter, flowtube, and software identification data)

- Acknowledge Alarms
- Reset Totals (if authorized by passcode assignment)
- Reset Empty Pipe Counter

### Calibration Functions

*NOTE: These functions can be passcode protected.*

- Adjust the 4 and 20 mA output signal (requires additional equipment)
- Preset outputs to calibrate control loop

### Configuration Functions

*NOTE: These functions can be passcode protected.*

- Read, enter, and modify all configuration parameters
- Assign passcodes and set levels of privilege

## Reference Documents

This document addresses operation, configuration, and calibration using the local keypad/display panel. For remote communication with your transmitter and other details of the flowmeter, refer to the applicable documents listed in Table 1.

*Table 1. Reference Documents*

| Document | Description |
|---|---|
| Refer to I/A Series System Integrated Control Software Documentation | Remote Configuration and Operation from an I/A Series System |
| MI 021-380 | 8000A Series Flowtubes, Ceramic Lined, Installation |
| MI 021-381 | 8300 Series Flowtubes, Installation |
| MI 021-386 | 9300A Series Flowtubes, Flanged, Installation |
| MI 021-387 | IMT25 Transmitter, Installation and Wiring |
| MI 021-389 | IMT25 Transmitter, Operation/Configuration/Calibration using Hand-Held Terminals with FOXCOM Communications Software |
| MI 021-391 | IMT25 Transmitter, 8000A/9300A Flowtube, System Maintenance |
| MI 020-479 | PC10 Configurator |
| TI 27-71f | Magnetic Flowtubes, Material Selection Guide |
| TI 027-072 | Electrical Conductivity of Process Liquids |

# 2. Quick Start

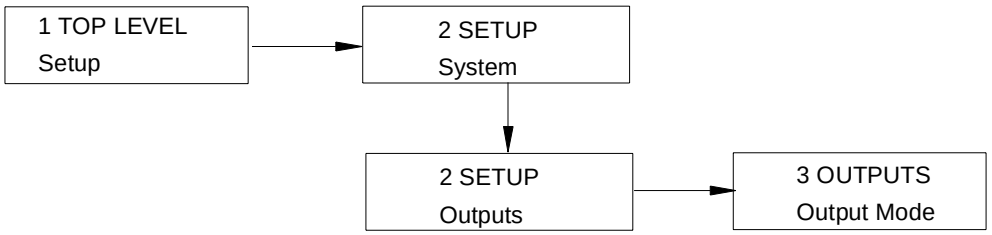
Your IMT25 Transmitter has been preconfigured at the factory to the settings shown in Appendix B. Compare your needs to the factory configuration and note the changes to the configuration you will have to make.

When you power up your transmitter, the display will read:

| 1 TOP LEVEL<br>Measurements |
|---|

To make changes to the configuration, go to 1 TOP LEVEL Setup by pressing the Down arrow key three times. The procedure to change your configuration will be demonstrated with the example of a process requiring an EGU rate display in GPM, an analog output, a forward unidirectional range of 0 to 150.0 GPM, and a meter factor of 18.22. To make the required configuration changes:

1. In the Default Screen section of Appendix B, note that the factory Rate Display is already configured as GPM, so no change is required.
2. In the 3 OUTPUTS section of Appendix B, note that you may have to change the Output Mode from digital to analog. To do this:
   a. Go to Setup Level 2 by pressing the Right arrow key. Next move to 2 SETUP Outputs with the down arrow key. Then move to 3 OUTPUTS Output Mode with the Right arrow key.




   b. Use the Right arrow key to move to OUTPUT MODE? {Digital}. The curly brackets indicate that the Digital status is editable. See Figure A-8 for a pictorial representation of this and other output changes.
   c. Press the Shift + Change key to enter Edit mode. You will be asked “Go Off-Line?” Reply yes by pressing the right arrow key. The display will show OUTPUT MODE? [Digital]. The plain brackets show that you are in edit mode.
   d. Press the Down arrow key to display Analog and press the Right arrow key to enter this selection. The display will read OUTPUT MODE? {Analog}. Press the key again to return to 3 OUTPUTS Output Mode.

3. Also in the 3 OUTPUTS section of Appendix B, note that the factory Output Mode is also already configured as UniDir, so no change in the direction is required.
4. You will have to enter your flow upper range value however. To do this:
   a. Use the Down arrow key to go to 3 OUTPUTS Range Info and the right arrow key to go to FORWARD URV? {#####.# GPM}.
   b. Press the Shift + Change key to enter Edit mode. The display will show FORWARD URV? [#####.# GPM].
   c. Use the Right arrow key to move the cursor under the first digit. Use the Down arrow key to scroll the character list until the 0 appears. Use the Right arrow to move the cursor under the second digit. Scroll the list to find the 0. Select the 1, 5, 0, and 0 in a like manner. The display now reads the required URV of 00150.0 GPM.
   d. Using the Right arrow key, move the cursor under the right bracket and press the key to enter the URV. The display will read FORWARD URV? {150.0 GPM}.
   e. Press the key again to move back to 3 OUTPUTS Range Info.
5. Lastly, you have to enter your flowmeter factor. To do this:
   a. Use the Left arrow key to move to the Level 2 menu, 2 SETUP Outputs.
   b. Press the Down arrow key six times to move to 2 SETUP Calibration and the right arrow key to move to the Level 3 menu, 3 CALIBRATION Meter Factor. See Figure A-5.
   c. Use the Right arrow key to move to METER FACTOR? {#.#####e+##}.
   d. Use the Right arrow key to move the cursor under the first digit. Use the Down arrow key to scroll the character list until the 1 appears. Use the Right arrow to move the cursor under the second digit. Scroll the list to find the 8. Select the 2, 2, 0 and 0 and 1in a like manner. The display now reads the required meter factor of 1.8220.e+01.
   e. Using the right arrow key, move the cursor under the right bracket and press the key to enter the meter factor. The display will read METER FACTOR? {1.8220E+01}.
   f. Press the Right arrow key again. The display will read 3 CALIBRATION Meter Factor.
6. Now that all changes have been made, press the Left arrow key until you are asked “Go On-Line?” Reply yes by pressing the Right arrow key.

# Determination of Meter Factor for IMT25

First find the “CAL FACTOR” or “IMT25 CAL FACT” on the flowtube data label.

If the tube data label has a “IMT25 CAL FACT.” listing, use that value as “METER FACTOR.”

If only a “CAL FACTOR” value is found on the flowtube data label, that value must be multiplied by the appropriate factor from the following table to calculate “METER FACTOR.”

| 8300 Tubes | | | 8000A and 9300A Tubes | | | |
|---|---|---|---|---|---|---|
| Line Size (in) | M.S. Code | Multiply by Factor | Line Size (in) | M.S. Code | M.S. Code | Multiply by Factor |
| | | | 0.062 | 801SA | 931SA | 1.0034 |
| | | | 0.125 | 801QA | 931QA | 1.0033 |
| | | | 0.25 | 801EA | 931EA | 1.0011 |
| 0.5 | 830H | 0.9938 | 0.5 | 800HA | 930HA | 1.0032 |
| 1 | 8301 | 0.9967 | 1 | 8001A | 9301A | 1.0011 |
| 1.5 | 831H | 0.9960 | 1.5 | 801HA | 931HA | 0.9976 |
| 2 | 8302 | 0.9964 | 2 | 8002A | 9302A | 0.9985 |
| 3 | 8303 | 0.9974 | 3 | 8003A | 9303A | 0.9996 |
| 4 | 8304 | 0.9961 | 4 | 8004A | 9304A | 0.9981 |
| 6 | 8306 | 0.9947 | 6 | 8006A | 9306A | 1.0001 |
| 8 | 8308 | 0.9946 | | | | |
| 10 | 8310 | 0.9941 | | | | |
| 12 | 8312 | 0.9948 | | | | |
| 14 | 8314 | 0.9945 | | | | |
| 16 | 8316 | 0.9943 | | | | |
| 18 | 8318 | 0.9950 | | | | |
| 20 | 8320 | 0.9954 | | | | |
| 24 | 8324 | 0.9962 | | | | |

Example:

A (3-inch) 8303-... tube with only “CAL FACTOR” listed:

i.e., CAL FACTOR = 7.2911
8303 “MULTIPLY BY FACTOR” = 0.9974
METER FACTOR = 7.2911 * 0.9974 = 7.2722

# 3. Operation

## Keypad/Display Panel

For local operation, configuration, and calibration, all operator entries are made through a 5-button keypad and all data is presented on a 2-line x 16 character LCD display. The keypad/display of the IMT25 Transmitter is shown in Figure 1. Information on various types of display is shown in Figure 2.

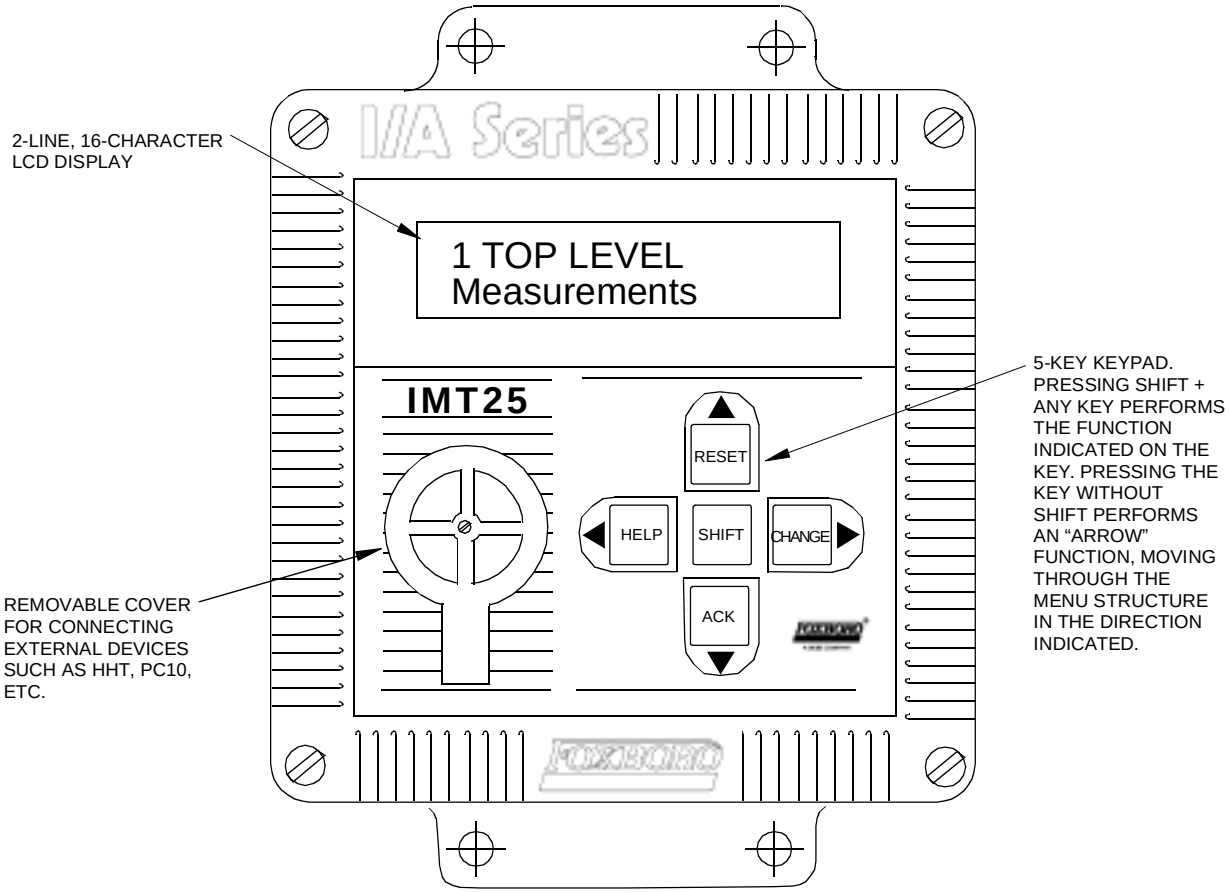



*Figure 1. IMT25 Magnetic Flow Transmitter — Keypad/Display*

All required functions are accomplished by using the four arrow keys alone and in combination with the Shift key. Table 2 explains the function of each key.

*Table 2. Functions of Keys*

| Key | Function |
|---|---|
| Δ | Move up in the product structure.<br>Scroll up in menu, list of characters, or on-line Help message. |
| Shift + Δ | Reset totals and empty pipe count. |
| ∇ | Move down in the product structure.<br>Scroll down in menu, list of characters, or on-line Help message. |
| Shift + ∇ | Acknowledge alarm or diagnostic messages. |
| ◁ | Move to the left in the product structure.<br>Cancel parameter selection or data entry. |
| Shift + ◁ | Access on-line Help. |
| ▷ | Move to the right in the product structure .<br>Enter parameter selection or data entry. |
| Shift + ▷ | Access Edit mode. |

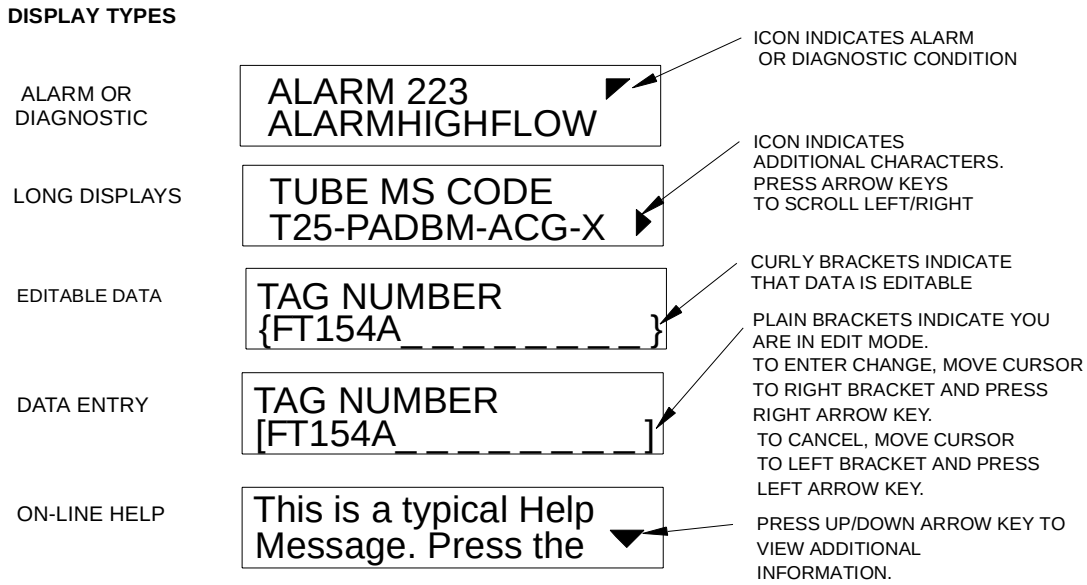



*Figure 2. IMT25 Magnetic Flow Transmitter — Displays*

# Alarm and Diagnostic Messages

The IMT25 will display the Alarm/Diagnostic icon in the upper right of the display if a problem occurs. Identification of the problem is given in one of several alarm or diagnostic messages in Status mode. These are summarized in Table 3 and Table 4:

*Table 3. Alarm and Diagnostic Messages*

| Code | Message | Explanation |
|---|---|---|
| 0100 | Invalid Multirange | Reconfigure with a valid multirange. |
| 0116 | CoilLow | Transmitter unable to generate a reliable measurement of either the electrode voltage or the coil current. See maintenance instruction (MI 021-391) for additional information. |
| 0117 | CoilHigh | |
| 0118 | CoilUnstable | |
| 0119 | ElecHigh | |
| 0120 | ElecUnstable | |
| 0121 | ElecLow | |
| 0122 | EmptyUnstable | |
| 0128 | EmptyUnableToCal | |
| 0131 | PulsesLagTotal | Totalizer putting out pulses at the maximum rate but falling behind the actual total. Reconfigure totalizer display format so that each pulse represents a larger volume. |
| 0223 | AlarmHighFlow | Flow above configured high flow rate. |
| 0224 | AlarmLowFlow | Flow below configured low flow rate. |
| 0225 | AlarmHighFwdTotalOne | Total above configured High Fwd Tot 1. |
| 0226 | AlarmHighFwdTotalTwo | Total above configured High Fwd Tot 2. |
| 0227 | AlarmEmptyPipe | Pipe is empty. |

In addition, other problems could be identified on your display in Status mode in the form of a four digit code on line 1 and a five digit code on line 2 of your display. Interpretation of the five digit Reason codes are found in Table 4.

*Table 4. Reason Codes*

| Code | Interpretation |
|---|---|
| 00000 | No error; transmitter is functioning normally. |
| 00256 - 02559 | Memory or computational error; contact Field Service. |
| 02560 | An error has occurred in the program storage area, or a code download did not succeed. If you are performing a code upgrade, repeat the procedure. If error persists, contact Field Service. |
| 03072 - 03327 except: 03159, 03169, 03170, 03175, 03176, 03183, 03191, 03193 | There is an error in the transmitter configuration. Either a value is out of range, or it is incompatible with other parameters. Make not of the exact number being displayed and contact Field Service. |
| 03159 | Illegal analog output URV(s). |
| 03169 | Output mode flow direction and transmitter flow direction do not agree. |

*Table 4. Reason Codes (Continued)*

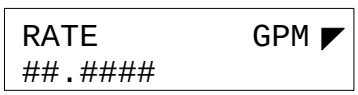
| Code | Interpretation |
|---|---|
| 03170 | Illegal meter factor configured. |
| 03175 | Illegal analog output URV(s). |
| 03176 | Illegal analog output URV(s). |
| 03183 | Pulse URV equals zero. |
| 03191 | Output mode configured multi-range, but Contact Input 1 is not configured multi-range. |
| 03193 | Output mode configured multi-range, but Contact Input 2 is not configured multi-range. |
| 03328 - 03583 except: 03330, 03332 | An error occurred during the configuration process and the transmitter does not trust the configuration information. Step through the menu and edit any selections which might be incorrect. If they are all correct, change one anyway, following the standard edit procedure and then change it back to the desired value. |
| 03330 | Configuration error during mode change or 4-20 mA. Change Output Mode from analog to digital (or vice versa), then change it back to the desired state. It is not necessary to go online between changes, but it is necessary to go into and out of the edit mode, as follows:<br>1. Brackets around the mode change from { } to [ ] when you press Shift+Right Arrow and go from display to edit mode.<br>2. Change the mode with the up or down arrow key. At this point, the mode may not be what you want, but press the right arrow key to accept the new value anyway. The brackets change back to { }.<br>3. Repeat the cycle if the mode is not the desired one.<br>At this point, the change flag in the transmitter is set and the CRC will be recalculated when the transmitter is put back online. |
| 03332 | Configuration error (such as that caused by a power failure during configuration). To correct the error, you must change a parameter (such as default display) in the main block, using the method described above in 03330. |
| 03584 - 03840 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 04096 - 04607 | The fundamental flow tube measurements are incorrect. Contact Field Service. |
| 04608 - 05119 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 05120 - 05887 | Hardware error; contact Field Service. |
| 05888 - 07423 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 07424 - 07936 | Hardware error; contact Field Service. |

*Table 4. Reason Codes (Continued)*

| Code | Interpretation |
|---|---|
| 07937 - 08191 | An unexpected processor reset has occurred. This might result from an external condition such as a voltage transient. Verify correct operation. If this error persists, contact Field Service. |
| 08192 - 08959 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 08960 - 09471 | Hardware error; contact Field Service. |
| 09472 - 09727 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 09728 - 10230 | An error has occurred in the digital communications. This may have resulted from a noisy electronic environment or improper installation. Refer to MI 020-350, Wiring Guidelines for Foxboro Intelligent Transmitters, and correct any deficiencies in the field wiring. Contact Field Service if the condition persists. |
| 10240 - 10495 | An error has occurred in writing the total to nonvolatile storage. The transmitter may otherwise be operating normally and the displayed and reported totals are correct, but the total will not be saved correctly if the processor is reset. Contact Field Service. |
| 10496 | Hardware error; contact Field Service. |
| 10752 | Transmitter is performing a reset prior to accepting the download of a new code image. |
| 11776 - 12031 | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |
| 12032 - 12288 | Transmitter is in the process of performing a requested reset. This reason may be seen if the configuration is being changed. It is not abnormal. |
| 12289 - 13823 | Communications error; see above explanation of reasons 09728 - 10239. |
| 13824 and up | If reasons in this range are displayed, follow the “acknowledge alarm” procedure to see if any other codes exist. Correct the faults indicated by any other codes. If this doesn’t clear all codes, contact Field Service. |

# Acknowledging Alarms

Whenever an alarm or diagnostic error condition occurs, the Alarm/Diagnostic icon will appear in the upper right of your display.




If you have configured Display Respon as Blink, the display will blink.

To acknowledge the alarm or diagnostic, press the Shift + Ack (▽) key. This action acknowledges the error condition and clears the error history buffer. You may first wish to view an explanation of the problem in Status mode. If you acknowledge the error in Status Alarm or Status Diagnostic, each of the errors in the history buffer will appear on the display for one second before being cleared from the buffer. A contact input may also be configured to acknowledge an alarm. If so, the buffer is also cleared by the contact input.

## Write Protect Switch

The unit is shipped with the Write Protect Switch in the disable position, which disables write protection and permits you to make configuration changes. Refer to MI 021-387 for a more detailed description of this switch.

If you have difficulty making changes, check to see if the switch is in the disable position.

## Resetting Totals and Empty Pipe Count

To reset Fwd Tot (forward total), Rev Tot (reverse total), and Net Tot (net total) to zero, go to Net Tot in Measurements mode and press Shift + Reset (△). If Reset Totals is passcode protected, the message ENTER PASSCODE appears. Enter the passcode to proceed.

To reset Gr Tot (grand total) to zero, go to Gr Tot in Measurements mode and press Shift + Reset (△). If Reset Totals is passcode protected, the message ENTER PASSCODE appears. Enter the passcode to proceed.

If write protection is enabled, you cannot reset any totals. You must move the Write Protect switch to the disable position and then turn power off and on to disable write protection.

To reset Empty Pipe Count, go to Empty Pipe Cnt in Status mode and press Shift + Reset (△).

## Viewing and Changing Data

In Setup (configuration) mode, you will need to move through a structure of parameters (using the arrow keys) to view and/or change the value or status of a particular parameter. Structure diagrams, located in Appendix A, will aid you in doing this.

The Up- and Down-arrow keys will also enable you to scroll through a menu in either direction. You may do this one position at a time or continuously through a menu or string of values by holding the key in the depressed position.

The following example will show you how to use the keys in moving through the structure and in editing several parameters. For the example, we will configure the transmitter for a pulse rate URV of 150.7 GPM at a rate maximum frequency of 5000 Hz. In following this procedure, refer to Figure 3. We will begin at the Level 3 Output menu.

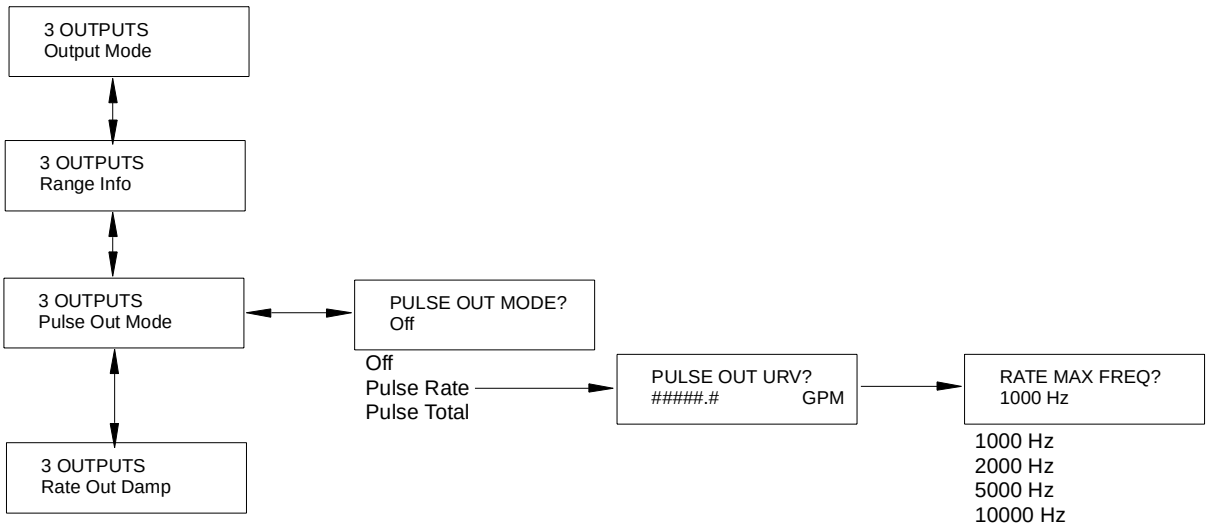



*Figure 3. Example of Structure Diagram*

1. Use the Down arrow key to move from Output Mode to Range Info to Pulse Out Mode.
2. Use the Right arrow key to move to PULSE OUT MODE? {Off}. The curly brackets indicate that the Off status is editable.
3. Press the Shift + Change key to enter Edit mode. If you are not already Off-Line, the display will ask “Go Off-Line?” Reply yes by pressing the Right arrow key. The display will show PULSE OUT MODE? [Off]. The plain brackets indicate that you are in Edit mode.
4. Use the Down arrow key to scroll through the menu. Stop at Pulse Rate. Press the Right arrow key to enter this selection. The display will show PULSE OUT URV? {#####.# GPM}.
5. Press the Shift + Change key to enter Edit mode. The display will show PULSE OUT URV? [#####.# GPM]. The cursor will be under the left bracket.
6. Use the Right arrow key to move the cursor under the first digit. Use the Down arrow key to scroll the character list until the 0 appears. Use the Right arrow to move the cursor under the second digit. Scroll the list to find the 0. Select the 1, 5, 0, and 7 in a like manner. The display now reads the pulse rate required in our example.
7. Using the Right arrow key, move the cursor under the right bracket and press the key twice to enter our pulse rate and move to the next parameter. The display will change to {00150.7 GPM} and then to RATE MAX FREQ? {1000 Hz}.
8. Press the Shift + Change key to enter Edit mode. The display will show RATE MAX FREQ? [1000 Hz].

9. Use the Down arrow key to scroll the menu until 5000 Hz appears. Press the Right arrow key once to enter our selection and a second time to return to Pulse Out Mode. Use the arrow keys to go to the next parameter to be changed.

# On-Line Help

Context-sensitive on-line help messages can be displayed by pressing Shift+Help key. The message displayed pertains directly to the parameter currently displayed on the screen. A typical Help screen is shown below.

```
This is a typical
HELP message    ▼
```

The down arrow icon indicates that more information is available. Press the Down arrow key to display the additional information. Similarly, an up arrow icon indicates more information can be displayed by pressing the Up arrow key. To exit from the On-Line Help mode, press either the Left or Right arrow keys. Press the Shift + Help key while in On-Line Help to get help on the On-Line Help function.

# Top Level Menu

The Top Level menu displays four modes – Measurements, Status, Identity, and Setup. You can switch from one to another in sequence by using the Up/Down arrow keys. To enter the second level menu from a particular top level screen, press the Right arrow key. To return to the top level from a second level menu item, press the Left arrow key. The level of the first, second, third, and fourth level menus is indicated by the digit appearing as the first character in Line 1 of the display; a 1 indicates Level 1 (Top Level), a 2 indicates Level 2, and a 3 indicates Level 3, etc.

The top level menu is shown in Figure 4. For a complete presentation of all menu structures, refer to Appendix A.

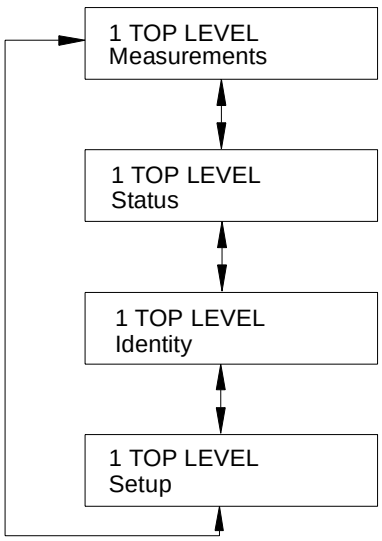



*Figure 4. Top Level Menu Summary*

## Measurements Mode

The Measurements mode is your main operating mode and it is displayed upon startup. It has six parameters:

- RATE (EGU): Shows current flow rate (forward or reverse) in the selected engineering units.
- RATE (% Range): Shows current flow rate (forward or reverse) as a percentage of full scale URV.
- FWD TOT: Shows current value of the forward totalized flow in engineering units. Use the Net Tot display to reset.

*NOTE: If the Totalizer function is configured OFF, the display will read FWD TOT OFF.*

- REV TOT: Shows current value of the reverse totalized flow in engineering units. Use the Net Tot display to reset.

*NOTE: If the Totalizer function is configured OFF, the display will read REV TOT OFF.*

- NET TOT: Shows current value of the net totalized flow (Fwd Tot - Rev Tot) in selected engineering units. If the Reset Totals function is *not* passcode protected, press Shift + Reset (Δ) to reset the displayed total to zero. Resetting Net Tot also resets Fwd Tot and Rev Tot. It does not reset Gr Tot. If Reset Totals is passcode protected, the message ENTER PASSCODE appears.

*NOTE: If the Totalizer function is configured OFF, the display will read NET TOT OFF.*

- GRAND TOT: Shows current value of the grand total flow in engineering units. If the Reset Totals function is not passcode protected, press Shift + Reset (Δ) to reset the displayed total to zero. Resetting Gr Tot does not reset Fwd Tot, Rev Tot, and Net Tot. If Reset Totals is passcode protected, the message ENTER PASSCODE appears.

*NOTE: If the Totalizer function is configured OFF, the display will read GRAND TOT OFF.*

If the Dual Display feature is configured ON, a combination of two of these parameters can be displayed at once. A typical dual display, in which Line 1 shows flow rate and Line 2 shows the present forward total, is shown below. Note that the units are not displayed.

You may step through the displays of each of these parameters with the Up- and Down arrow keys. However, unless you specifically do so, the display defaults to that configured in Setup

mode. The engineering units and formats used in the displays are also configured in Setup mode.

The structural diagram of the Measurements menu is located on Figure A-2 of Appendix A on page 34.

## Status Mode

The Status mode enables you to view fourteen system parameters and thus assess the performance of the loop. You may not edit them in this mode. To step through the displays of the following parameters, use the up/down arrow keys:

- MODE: Shows the present operating mode: On-Line, Off-Line, Override, or Calibrate. This will normally display On-Line. The other modes will only be displayed if someone else has changed the mode with an HHT Hand-Held Terminal, PC10 Configurator, or I/A Series Workstation. Off-Line means that it has been taken off-line; Override, that the measurements cannot be relied upon because one or more of the outputs is at a preset value; and Calibrate, that the transmitter is in Calibration mode.
- ALARM: Shows the most current active alarm. If there are no active alarms but something is in the history buffer, the display reads ALARMS IN BUFFER. If there are no active alarms and nothing in the buffer, display reads NO ALARMS.
- DIAGNOSTICS: Shows the most current active diagnostic. If there are no active diagnostics but something is in the history buffer, the display reads DIAGS IN BUFFER. If there are no active diagnostics and nothing in the buffer, display reads NO DIAG.
- DIGITAL OUTPUT: If the transmitter output is set to Digital output mode, the display shows whether the transmitter is configured for Unidirectional or BiDirectional flow. If Digital output mode is not selected, the screen is not displayed.

---

*NOTE: Digital and Analog Output are mutually exclusive. Only one of the two will be displayed at any one time.*

---

- ANALOG OUTPUT: If the transmitter output is set to Analog output mode, the display shows whether the transmitter is configured for U (unidirectional), U/M1 (unidirectional multirange-range 1, U/M2 (unidirectional multirange-range 2, U/M3 (unidirectional multirange-range 3, B/D (bidirectional dual range), or B/S (bidirectional split range). If Analog output mode is not selected, the screen is not displayed.

---

*NOTES:*
*1. Digital and Analog Output are mutually exclusive. Only one of the two will be displayed at any one time.*
*2. For definition of direction and range, see “Output Mode” on page 25.*

---

- PULSE OUTPUT: Shows Off, Pulse Rate or Pulse Total depending on configuration.
- CONTACT IN 1: Shows the current state of Contact Input 1. The possible states are as shown in Table 5.

*Table 5. Contact Input Status*

| Display | Interpretation |
|---|---|
| Off | Contact Input configured Off. |
| Inactive | There are no Ack Alarm, Reset Totals, or Signal Lock actions taking place. |
| Invalid | Multi-Range is configured for one contact input and not the other, or both contacts are off. |
| Ack Alarm | Contact is acknowledging an alarm. |
| Reset Net Tot | Contact is resetting Fwd Tot, Rev Tot, and Net Tot. |
| Reset Gr Tot | Contact is resetting Gr Tot. |
| Reset All Tot | Contact is resetting All Totals |
| Signal Lock | Contact has “locked” the outputs (fully downscale) |
| Multi-Range | Contact is configured to switch ranges. |

- CONTACT IN 2: Similar to CONTACT IN 1.
- RELAY OUT 1: Shows the current function of Relay Output 1. The possible functions are shown in Table 6.

*Table 6. Relay Output Status*

| Display | Interpretation |
|---|---|
| Off | Relay Output configured Off. |
| Inactive | No alarm or diagnostic conditions are activating the Relay Output. |
| Forward Dir | Flow in forward direction. |
| Reverse Dir | Flow in reverse direction. |
| High Rate Alm | High Rate Alm has activated the Relay Output. |
| Low Rate Alm | Low Rate Alm has activated the Relay Output. |
| High Tot 1 Alm | High Tot 1 Alm has activated the Relay Output. |
| High Tot 2 Alm | High Tot 2 Alm has activated the Relay Output. |
| Empty Pipe Alm | Empty Pipe Alm has activated the Relay Output. |
| Diagnostics | One of the diagnostics has activated the Relay Output. |

- RELAY OUT 2: Similar to RELAY OUT 1.
- EMPTY PIPE DET: The intent of the Empty Pipe Detection feature is explained in “Empty Pipe Detection” on page 31.
  If the empty pipe detector is configured On, the display shows FULL or EMPTY.
  If this feature is configured Off, the display reads OFF.

*WARNING: Do not take any action that can cause danger to personnel or damage to equipment based on the assumption that a pipe is empty or full because of an Empty Pipe Detection indication.*

- EMPTY PIPE CNT: Shows the cumulative count (maximum of 255) of empty pipe conditions that have occurred since the last reset. To reset the count to zero, press Shift + Reset (Δ).
- NOISE REDUCTION: Shows whether the noise reduction function is configured ON or OFF.
- WRITE PROTECTION: Shows whether the Write Protection dip switch is in the ON position so that *no* Setup (configuration) changes may be made. This feature is usually only used in custody transfer applications or for another reason that the user wants to assure that the configuration will not be changed. For procedure to change the setting of this switch, see MI 021-387.

The structural diagram of the Status menu is located on Figure A-3 of Appendix A on page 35.

## Identity Mode

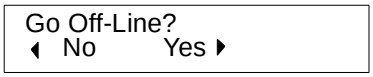
The Identity mode enables you to view the identity parameters. You may not edit them in this mode. To step through the list of the following parameters, use the Up and Down arrow keys.

TAG NUMBER
LOCATION
TAG NAME (displayed only if in Digital Output mode)
DEVICE NAME (displayed only if in Digital Output mode)
XMTR MS CODE (transmitter model code)
XMTR SERIAL NUM (transmitter serial number)
TUBE MS CODE (flowtube model code)
TUBE SERIAL NUM (flowtube serial number)
SOFTWARE VER (software version)
On strings over 16 characters, left and right arrow icons indicate that there are off screen characters. Use the Left and Right arrow keys to view these characters.

The structural diagram of the Identity menu is located on Figure A-4 of Appendix A on page 36.

## Setup Mode

The Setup mode enables you to configure your system, output, alarm, diagnostic, identity, passcode, transmitter, and calibration parameters. This is an off-line mode. Outputs will be driven fully upscale or downscale as configured. Upon attempts to enter this mode, you will be warned that you are going off-line and will be asked if you want to do so. Indicate your reply with the left or right arrow keys.



This can also be a passcode protected mode. So after the initial configuration, you may need a password to enter this mode.

*NOTE: If you lose your passcode, call Foxboro for assistance.*

For detailed instructions on how to configure your transmitter, see “Configuration” on page 21. The structural diagram of the Setup menu begins with Figure A-5 of Appendix A on page 37.

# 4. Configuration

## Configuration Procedure

Several tools have been provided to assist you in configuring the IMT25 transmitter. The structure diagrams in Appendix A provide a road map for moving around within the various menus. Using the structure diagrams, you can determine what you want to do and how to get there to do it.

The second major tool you can use is the configuration worksheets contained in Appendix B. The worksheets provide, in tabular form, a description of each menu item, the available options and, where applicable, the limits for parameter value entries, the normal factory default setting, a space for you to record your own entries, and space for remarks and notes.

Before configuring your transmitter, you should assemble a list of data entry items. Some of the information can be obtained from instrument data plates and/or documents shipped with the instrument. Other data should be calculated based on process information and application requirements. With this list, you can quickly fill in the configuration worksheets and then, using the structure diagrams, operate the keypad/display to make the actual entries.

The items you will have to obtain, decide, and/or calculate are:

- Analog or Digital mode
- Flow direction and engineering units
- Desired resolution of flow rate and totalizer display
- Unidirectional or BiDirectional and type of range (if analog output)
- Upper Range Values (URVs) for each range
- Pulse rate acceptable to external receiver equipment (if so configured)
- Calculated value of flow volume per pulse (if so configured)
- Damping factor
- Relay Output Functions – what you want each output to do and whether the relay will be normally open (NO) or normally closed (NC).
- The maximum value expected for each totalizer. (Calculate by multiplying the maximum flow rate times the maximum period of totalization.)
- Alarm functions, setpoints, deadbands
- Diagnostic functions, response to be taken on a diagnostic, action of the display on a diagnostic function
- Instrument data (tag number, name, location, tube MS code and serial number, Transmitter MS code and serial number, software version)
- Passcodes, persons authorized, level of authorization
- Transmitter initial operating mode, line frequency
- Contact input functions, status, and operation (NO/NC)
- Noise reduction setting (on/off)
- Empty pipe detection (on/off)
- Flowtube meter factor

# System Setup

The structural diagram of the System menu is located on Figure A-6 and Figure A-7 of Appendix A beginning on page 38.

## Default Screen

The first item to be considered in setting up your system is to decide what display you want your system to default to in Measurements mode. Your choices are:

Rate in engineering units
Rate in percent of range
Forward Total
Reverse Total
Net Total
Grand Total

or a Dual Display of any two of the above if Dual Display is configured ON (see next section).

## Dual Display

In configuring this parameter, first you need to decide whether you want to use the dual display mentioned immediately above. If you selected the Dual Display as your Default Screen, you *must* configure this parameter On. If you want to scroll to a Dual Display sometimes in Measurement mode, you should also configure it On. If you never intend to use it, configure it Off.

If you configure the Dual Display On, you must select the display for Line 1 and for Line 2. You may pick these from the first six choices that were available for the Default Screen.

## Rate Display

### *Rate EGU*

In the Rate EGU parameter specify the engineering units in which you want your flowrate to be displayed. You may pick from a menu of:

GPM (gallons per minute)
GPH (gallons per hour)
GPD (gallons per day)
LPM (litres per minute)
LPH (litres per hour)
LPD (litres per day)
Custom Units

If you select Custom Units you must enter the Custom Units you desire in up to six alphanumeric characters. The characters that may be used are listed in Table 7.

*Table 7. Alphanumeric Characters*

| Characters |
|---|
| 0 through 9 |
| A through Z |
| a through z |
| . (period) |
| + |
| – |
| * |
| / |
| (space) |

You must also enter the conversion factor from gallons per minute to the custom units under Custom Slope. The slope for some frequently used units are given in Table 8. The slope may be from $1.0e^{-30}$ to $1.0e^{+30}$. Enter it in the form +#.####e+##.

*Table 8. Custom Slope*

| Unit | Slope |
|---|---|
| $ft^3$/min | 1.3368e-1 |
| $m^3$/min | 3.7900e-3 |
| bbl/min* | 2.3810e-2 |
| ImpGal/min | 8.3267e-1 |

* 42 gallon barrel

Slope is the quantity of the custom unit that equals one gallon per minute; i.e., 0.00379 $m^3$/min = 1 GPM. Therefore, 0.00379 is the slope.

*NOTE: To convert to units/hour, multiply the factor in the table by 60. To convert to units/day, multiply the factor in the table by 1440.*

## Rate Format

In Rate Format, from the eight choices in the menu, select the format of your rate from rounding to the nearest thousand to the nearest ten thousandth of a unit.

*NOTE: Changing this parameter can affect other parameters such as Range URV and Alarm Setpt. For example, if Rate Format was configured as xxxx.xx and the Hi Alm Setpt as 1234.56 but then the Rate Format was changed to xxx.xxx. When you access Alm Setpt again, you will find the display reading 999.999, meaning that the Hi Alm Setpt exceeded the maximum legal limit. The displayed value is the maximum allowable value, not the currently configured value.*

## Rate Damping

In Rate Damping, specify the damping response time for the local display only. It is used to minimize flickering of the less significant digits. Choices are from 00.0 to 99.9 seconds. 00.0 is no damping.

# Totalizer

If you are going to use the Totalizer feature, configure the Totalizer On; if not configure it Off. If you configure it On, specify the engineering units of the totals (Tots EGU), the format of Forward, Reverse, and Net Total (Tot/Net Format), and the format of Grand Total (Gr Tot Format).

## *Tots EGU*

Specify the engineering units as Gallons, Litres, or Custom Units. If you selected Custom Units in Tots EGU, specify the Custom Units and Custom Slope as you did in Rate EGU. The slope for some frequently used units are given in Table 8. The slope may be from $1.0e^{-10}$ to $1.0e^{+10}$. Enter it in the form +#.####e+##.

*NOTE: Changing the totalizer EGU rescales all totals to the new engineering units. Changing this parameter can change the total to zero if the total exceeds the limit of the new format. For example, if Tot Net Format is xxxxx.xx and the present total is 50000.00, changing Tots EGU from Gal to Lit will cause the rescaled total to exceed the maximum displayable value and it will be reset to zero.*

*Table 9. Custom Slope*

| Unit | Slope |
|---|---|
| $ft^3$ | 1.3368e-1 |
| $m^3$ | 3.7900e-3 |
| barrel | 2.3810e-2 |
| Imp Gal | 8.3267e-1 |

* 42 gallon barrel

Slope is the quantity of the custom unit that equals one gallon; i.e., 0.00379 $m^3$ = 1 Gallon. Therefore, 0.00379 is the slope.

## *Tot/Net Format*

In Tot/Net Format, from the eight choices in the menu, select the format of your forward, reverse, and net total from ####.### to #######.e4.

*NOTES:*
*1. Changing this parameter can change the total to zero if the total exceeds the limit of the new format. For example, if Tot/Net Format was configured as xxxxxx.x and present total was 123456.7 but then the Rate Format was changed to xxxxx.xx, the totalizer would reset to zero.*
*2. If you plan to use the output pulse in Totalizer mode, the size of each pulse will be the equivalent of 1 digit in the rightmost decimal position of the displayed total.*

## *Gr Tot Format*

In Gr Tot Format, from the eight choices in the menu, select the format of your grand total from ######.### to #########.e4.

*NOTE: Changing this parameter can change the total to zero if the total exceeds the limit of the new format. For example, if Gr Tot Format was configured as xxxxxx.x and present total was 123456.7 but then the Gr Tot Format was changed to xxxxx.xx, the totalizer would reset to zero.*

### *Reset Totals*

This Setup parameter offers the opportunity to reset the totalizers to zero. To reset the totalizers, answer yes to the question “Reset All Tots?”

# Setup of Outputs

The structural diagram of the Outputs menu is located on Figure A-8 through Figure A-10 of Appendix A beginning on page 40.

## Output Mode

In this parameter, specify your output as Digital or Analog. Specify Analog if you want an analog 4 to 20 mA signal. In this mode, a 600 baud digital signal is superimposed over the 4-20 mA signal for communication with an HHT and/or PC10. Specify Digital if you want to have a 4800 baud digital signal for I/A Series system communication.

If you selected Digital, further specify Unidirectional or BiDirectional flow. If you selected Analog, further specify Unidirectional, Unidirectional Multi-Range, BiDirectional Dual Range, or Bidirectional Split Range.

For Unidirectional Multi-Range, both contact inputs must be set to “Multi-Range” to select from one of three ranges. In Bidirectional Dual Range the transmitter outputs a 4-20 mA current based on the URV for either forward or reverse flow, as appropriate, and uses a contact output to indicate flow direction. In either case (Unidirectional Multi-Range or BiDirectional Dual Range), the output is 4 mA at zero flow and 20 mA at the URV. BiDirectional Split Range causes forward flow to output 12 to 20 mA and reverse flow to output 12 to 4 mA. Zero flow is 12 mA.

## Range Info

If you selected Digital Output and Unidirectional mode, specify the Forward URV.

If you selected Digital Output and BiDirectional mode, specify the Forward URV and the Reverse URV.

If you selected Analog Output and Unidirectional mode, specify the Forward URV.

If you selected Analog Output and Unidirectional Multi-Range mode, specify the URV for each of three ranges.

If you selected Analog Output and BiDirectional Dual Range mode, specify the Forward URV and the Reverse URV.

If you selected Analog Output and BiDirectional Split Range mode, specify the Forward URV and the Reverse URV.

*NOTE: In each case, the URV must be within the minimum and maximum URV limits of the flowtube (see appropriate flowtube Master Instruction in "Reference Documents" on page 2). The largest number that can be entered is limited by the "Rate Format" selection. The units for the URVs are defined by the "Rate Display/Rate GU" selection.*

## Pulse Out

In this parameter, specify the Pulse Output as Off, Pulse Rate, or Pulse Total.

*NOTE: The Pulse Output is only unidirectional. Therefore it should be configured OFF if you have specified BiDirectional flow.*

If you selected Pulse Rate, specify the Pulse Out URV within the minimum and maximum URV limits of the flowtube (see note above) in the Rate EGU units previously configured and Rate Max Freq at that rate from the menu as 1000, 2000, 5000, or 10000 Hz.

*NOTE: Changing Rate Max Freq can affect the Pulse Preset in the Calibration Menu. For example, if Rate Max Freq was configured as 5000 and Pulse Preset as 4000 but then the Rate Max Freq was changed to 1000. When you accessedPulse Preset again, you would be warned that the preset value exceeded the maximum. The display would show a value of 1000.0, the maximum allowable value.*

If you specified Pulse Total, specify the Tot Max Freq from the menu as 10 or 100 Hz. This limits the frequency of the pulses to protect your counting device.

## Rate Out Damp

In this parameter, specify the damping rate for the analog output and the pulse rate output. It is the time required to go from zero to 90% of a change. It can be set from 0.0 to 99.9 seconds. If the Noise Reduction parameter is enabled, it also affects the digital output indirectly since the rate output damping determines the timing of the noise reduction algorithm.

## Relay Out 1 and Relay Out 2

In RO n FUNCTION, specify the function of each of the output relays from the menu. Choices are shown in Table 10.

*Table 10. Function of Output Relays*

| Function | Description |
|---|---|
| Off | Relay not used. |
| Alarm | Relay activates upon alarm as configured. |
| Alarm & Diagnostics | Relay activates upon configured alarms or any diagnostic condition. |
| Diagnostics | Relay activates upon any diagnostic condition. |
| Flow Direction | Relay activates upon change in flow direction. |

If you specified Alarm or Alarm & Diagnostics, further specify the alarm from the menu as High Rate, Low Rate, High Fwd Tot 1, High Fwd Tot 2, Empty Pipe, or Any Alarm.

In RO n OPERATION, specify each relay as normally open or closed.

In RO n SUPPRESSION, specify the suppression feature for each relay as Yes or No. The suppression feature applies only to alarms. When present, it suppresses reactivation of an alarm once it is acknowledged until the alarm condition is cleared and reoccurs.

# Setup of Alarms

The structural diagram of the Alarms menu is located on Figure A-11 of Appendix A on page 43.

First, specify the alarms feature as On or Off.

*NOTE: Shutting alarms Off does not acknowledge existing alarms.*

If On, proceed to configure the following alarm parameters:

## High Rate and Low Rate

Set each of these alarms as On or Off. If On, specify the set point and the amount of dead-band between 0 and 999999 in the Rate EGU units previously configured. Alarm rates are absolute values so use care in applying them to bidirectional flow.

## High Fwd Tot 1 and High Fwd Tot 2

Set each of these alarms as On or Off. If On, specify the set point between 0 and 999999 in the TOTS EGU units previously configured.

## Empty Pipe

The intent of the Empty Pipe Detection feature is explained in “Empty Pipe Detection” on page 31.

*WARNING: Do not take any action that can cause danger to personnel or damage to equipment based on the assumption that a pipe is empty or full because of an Empty Pipe Detection indication.*

Set this alarm as On or Off.

## Rate Response

Specify if an alarm will cause the analog output and pulse rate output to Go (fully) Down-scale, Go (fully) Upscale, or have No Effect. Analog output limits are 3.8 mA and 22.0 mA (12.0 mA and 22.0 mA. in Split Range). Pulse rate limits are 3 Hz and 110% of the configured maximum pulse rate.

*NOTE: There is a hierarchy of precedence in driving the output up or down scale. The Signal Lock takes precedence over Diagnostics which takes precedence over Alarms. Therefore, if an alarm condition has caused the output to be driven upscale, a diagnostic condition could override the first action and drive the output downscale.*

### Display Respon

Specify if the display icon, upon an alarm condition, is to Blink or Don't Blink.

### Alarm Clear

Set this parameter to Manual if acknowledging an alarm is mandatory. Set it to Auto if acknowledging an alarm is not required if the alarm condition self corrects.

## Setup of Diagnostics

The structural diagram of the Diagnostics menu is located on Figure A-12 of Appendix A on page 44.

### Rate Response

Specify if a diagnostic error will cause the analog output or pulse rate output to Go (fully) Downscale or Go (fully) Upscale.

*NOTE: There is a hierarchy of precedence in driving the output up or down scale. The Signal Lock takes precedence over Diagnostics which takes precedence over Alarms. Therefore, if an alarm condition has caused the output to be driven upscale, a diagnostic condition could override the first action and drive the output downscale.*

### Display Respon

Specify if the display, upon an alarm condition, is to Blink or Don't Blink.

## Setup of Identity

The structural diagram of the Identity menu is located on Figure A-13 of Appendix A on page 44.

Identify the following with the maximum number of alphanumeric characters listed. Use the characters listed in Table 7.

| | |
|---|---|
| Tag Number | 12 Characters |
| Location | 14 Characters |
| Tag Name* | 14 Characters |
| Device name* | 6 Characters |
| Tube MS Code | 32 Characters |
| Tube Serial Num | 16 Characters |

**NOTE: Setup of Passcodes Tag Name and Device Name only apply if Output Mode was configured as Digital.*

# Setup of Passcodes

The structural diagram of the Passcodes menu is located on Figure A-14 on page 45.

Passcodes may be configured On or Off. If you specify Off, there is no passcode protection. If you specify On, you may configure each of two passcodes to protect:

- Setup (setup functions protected, ability to reset totals not protected)
- Totals Reset (ability to reset totals protected, ability to change setup functions not protected)
- Setup and Totals (both functions protected).

An example of how this can be used is that one passcode could be given to some operators to enable them to reset totals but not change the configuration of the transmitter. Other operators could be given another passcode to enable them to reset totals and change the configuration.

The sequence of this setup procedure is to specify the function of Passcode 1 and then its passcode. The passcode can be any four digit number between 0000 and 9998. When you have entered it, the display will ask you, “Are You Sure?”. Use the right arrow key to accept the new passcode and the left arrow key to cancel it. After you have completed the procedure for Passcode 1, repeat it for Passcode 2.

# Setup of Transmitter

The structural diagram of the Transmitter menu is located on Figure A-15 and Figure A-16 in Appendix A beginning on page 46.

## Xmtr Mode

Specify if you want the transmitter to be on-line or off-line. This parameter could read calibrate or override if someone has changed the mode with an HHT Hand-Held Terminal, PC10 Configurator, or I/A Series Workstation. However, there is no need to set this parameter to anything other than on-line or off-line.

## Line Frequency

Specify the line frequency as 50 or 60 Hz. If you are using a dc powered transmitter, select the local ac power frequency to ensure optimal performance.

## Flow Direction

Specify the flow direction as shown in Table 11.
You must select BiDir if, and only if, you selected a BiDir flow mode in the Output section of Setup.
Select “positive” if the forward flow direction agrees with the flow direction arrow on the tube.
Select “reverse” if the forward flow direction is opposite from the flow arrow.

*Table 11. Flow Direction*

| Direction | Description |
|---|---|
| Positive | Forward flow is in direction of arrow on flowtube and unidirection flow mode was selected in the output section of setup. |
| Reverse | Forward flow is in direction of arrow on flowtube and unidirection flow mode was selected in the output section of setup. |
| BiDir Positive | Forward flow is in direction of arrow on flowtube and bidirection flow mode was selected in the output section of setup. |
| BiDir Reverse | Forward flow is in direction of arrow on flowtube and bidirection flow mode was selected in the output section of setup. |

## Contact Input 1 and Contact Input 2

For each of the two contact inputs, specify On or Off. If On, specify the Function as one of the choices shown in Table 12 and then the Operation as Normally Closed or Normally Open.

If you have specified Analog Unidirectional Multi-Range output, you *must* select Multi-Range for both CI1 and CI2. The external connections to these contacts must be so arranged that at least one of them is always in the active state; it is considered an error condition for both inputs to be in the off state. If you have *not* specified Analog Unidirectional Multi-Range output, you should *not* select Multi-Range as the function of either of the contact inputs.

*Table 12. Contact Input Functions*

| Function | Description |
|---|---|
| Ack Alarm | Acknowledges an alarm, eliminates the need to do this manually. |
| Reset Net Tot | Resets the Forward, Reverse, and Net Totals. |
| Reset Grand Tot | Resets the Grand Total. |
| Reset All Tot | Resets all totals. |
| Multi-Range | Switches the range in a Multi-Range configuration. |
| Signal Lock | Drives the outputs to zero. |

## Noise Reduction

The noise reduction feature slows the initial output response to a change. See Figure 5. Specify the noise reduction feature as On or Off, and use the Rate Out Damp selection to control the amount of Noise Reduction action.

*NOTE: Noise reduction is applied to the Display, 4-20 mA, and Digital outputs.*

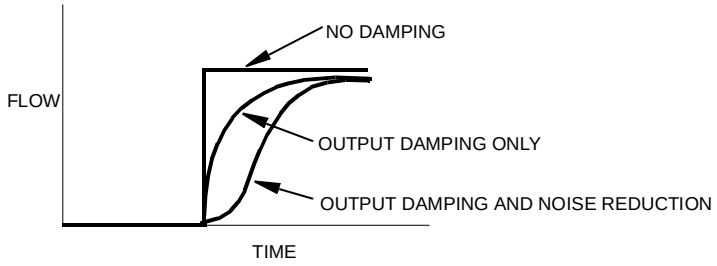



*Figure 5. Noise Reduction*

## Empty Pipe Detection

The intent of the Empty Pipe Detection feature is to prevent false flow readings that can occur with empty pipe conditions. Without this feature, the input to the transmitter could become an open circuit and the output could drift. With this feature, the empty pipe detection circuit prevents output drift by monitoring the conductivity between electrodes and forcing the output to zero if the conductivity falls below a predetermined level. The feature does not reveal a partially full condition if the electrodes remain covered with fluid and does not indicate how empty a pipe is if the electrodes are exposed. Also, fouling of the electrodes could cause a false empty pipe condition and coating of the electrodes with a viscous fluid could cause a significant lag before an empty pipe condition is recognized.

*WARNING: Do not take any action that can cause danger to personnel or damage to equipment based on the assumption that a pipe is empty or full because of an Empty Pipe Detection indication.*

Specify the Empty Pipe detector as On or Off. Then, with the pipe full, perform the calibration procedure which determines the set point by following the structure diagram on Figure A-16 located on page 47.

# Setup of Calibration

The structure diagram of the Calibration menu is located on Figure A-17 in Appendix A beginning on page 48.

## Meter Factor

Enter the meter factor of the flowtube. Use the form #.####e+##. For example, a meter factor of 18.22 should be entered as 1.8220e+01. For determination of IMT25 Meter Factor, see page 5.

## Analog Out Cal

This parameter allows you to tune the 4 mA and 20 mA output values. The procedure is as follows:

1. Connect a precision milliammeter in the output loop.
2. With 4 mA ADJUST on the first line of the display, use the ∆ and ∇ keys to select an adjustment step size of 0.5, 0.05, or 0.005 mA. Then, use the left or right arrow keys to execute the adjustment in the lower or higher direction respectively.
3. Repeat Step 2 until your milliammeter reads 4 mA. Then using the ∆ and ∇ keys, go to Done and press either the left or right arrow key.
4. Repeat Steps 2 and three for 20 mA.

*NOTE: This parameter only appears if transmitter is in Analog Output mode.*

## Preset Outputs

This parameter allows you to override the normal output with a particular output. If the transmitter is in Analog mode, you may preset the output between 3.80 and 22.0 mA; If in Digital mode, between 0 and 999999 in the configured Rate EGU units; If in Pulse Rate mode, between 0 and the maximum pulse rate as configured; and if in Pulse Total mode, between 0 and the maximum pulse rate as configured. You can preset this value and configure it Off until you are ready to use it. You may change the configuration to On at the appropriate time.

*NOTE: Presets have a lower priority than Signal Lock, Diagnostics, and Alarms. If the transmitter is in Signal Lock or an alarm or diagnostic is active and the output action for the active condition is anything other than No Effect, the preset will not actually control the output until the overriding condition goes away.*

# Appendix A. Structure Diagrams

This appendix contains structure diagrams that illustrate the menu structure of the IMT25 Transmitter and show how you can use the local display and keypad to get from one point to another in the structure. These diagrams and the configuration worksheets included in Appendix B can be invaluable tools in configuring and troubleshooting your transmitter.

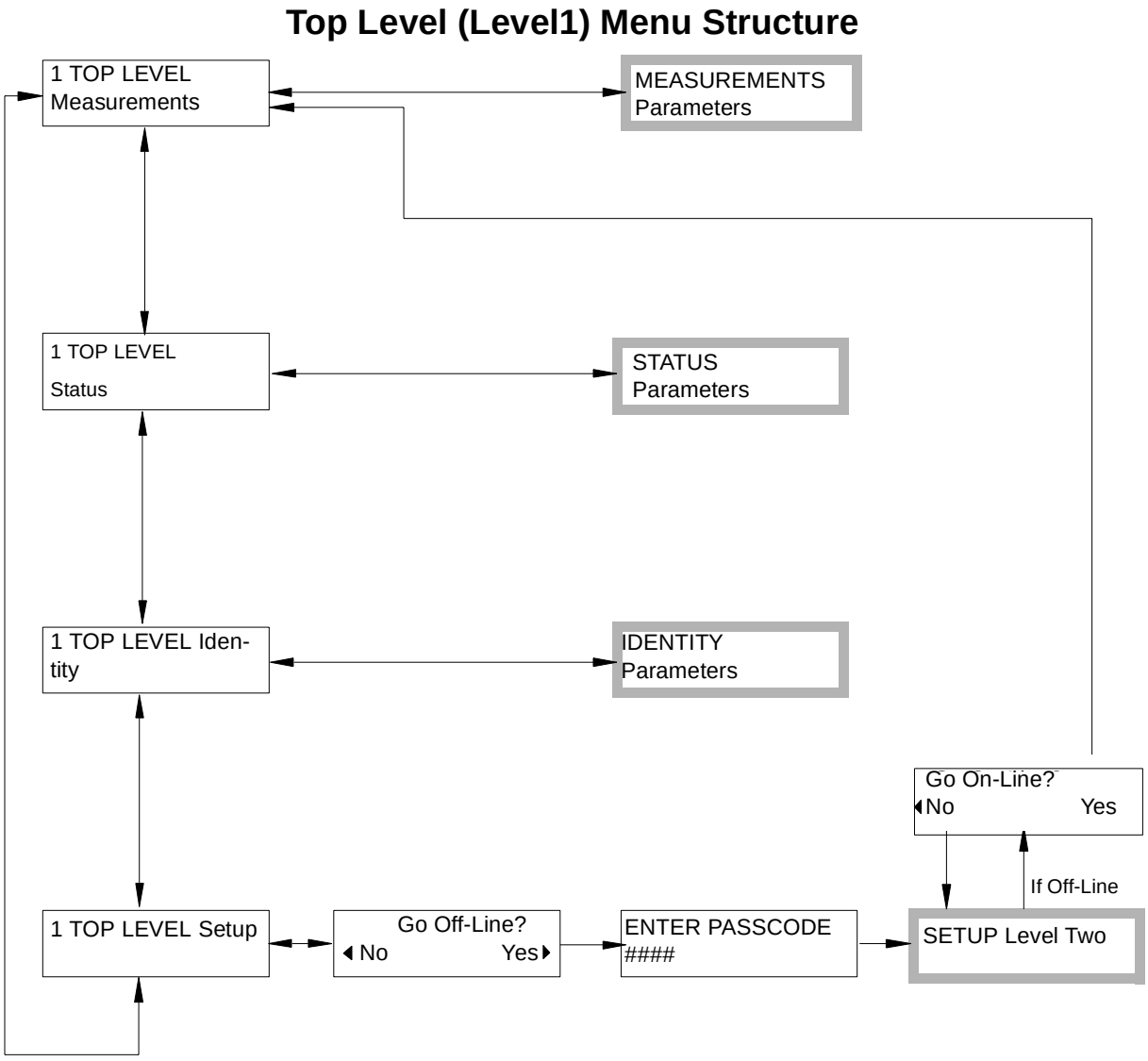
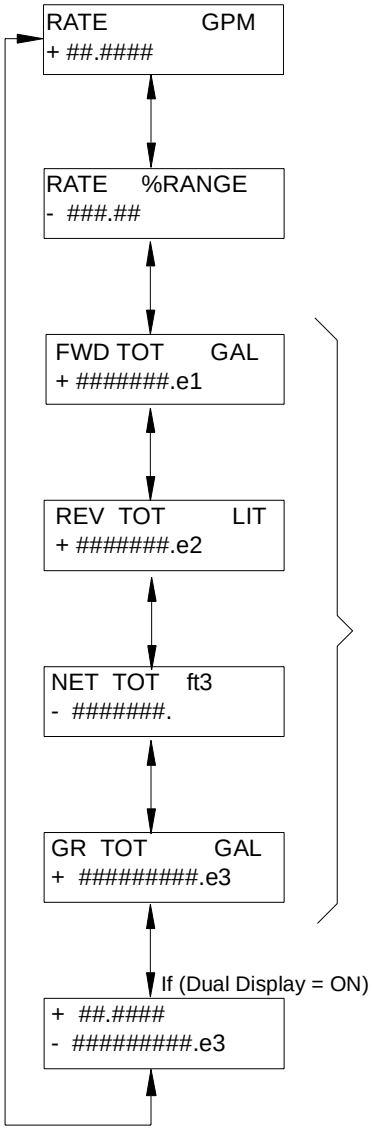



*Figure A-1. Structure Diagram – Top Level Menu*

## Measurements Menu Structure




If the totalizer function is OFF, the second line of the display reads OFF.

Shift + Reset (Δ) resets the displayed total. Resetting Net resets Net, Fwd, and Rev Totals. Resetting Grand resets Grand Total only. Attempting to reset Fwd or Rev Total displays results in a message to reset the Net display.

If the Reset Total function is password protected, the ENTER PASSCODE screen is displayed. Correct passcode displays total zero. Incorrect passcode displays error message.

Dual display is a combination of two selected measurement parameters.

*Figure A-2. Structure Diagram – Measurements Menu*

# Status Menu Structure

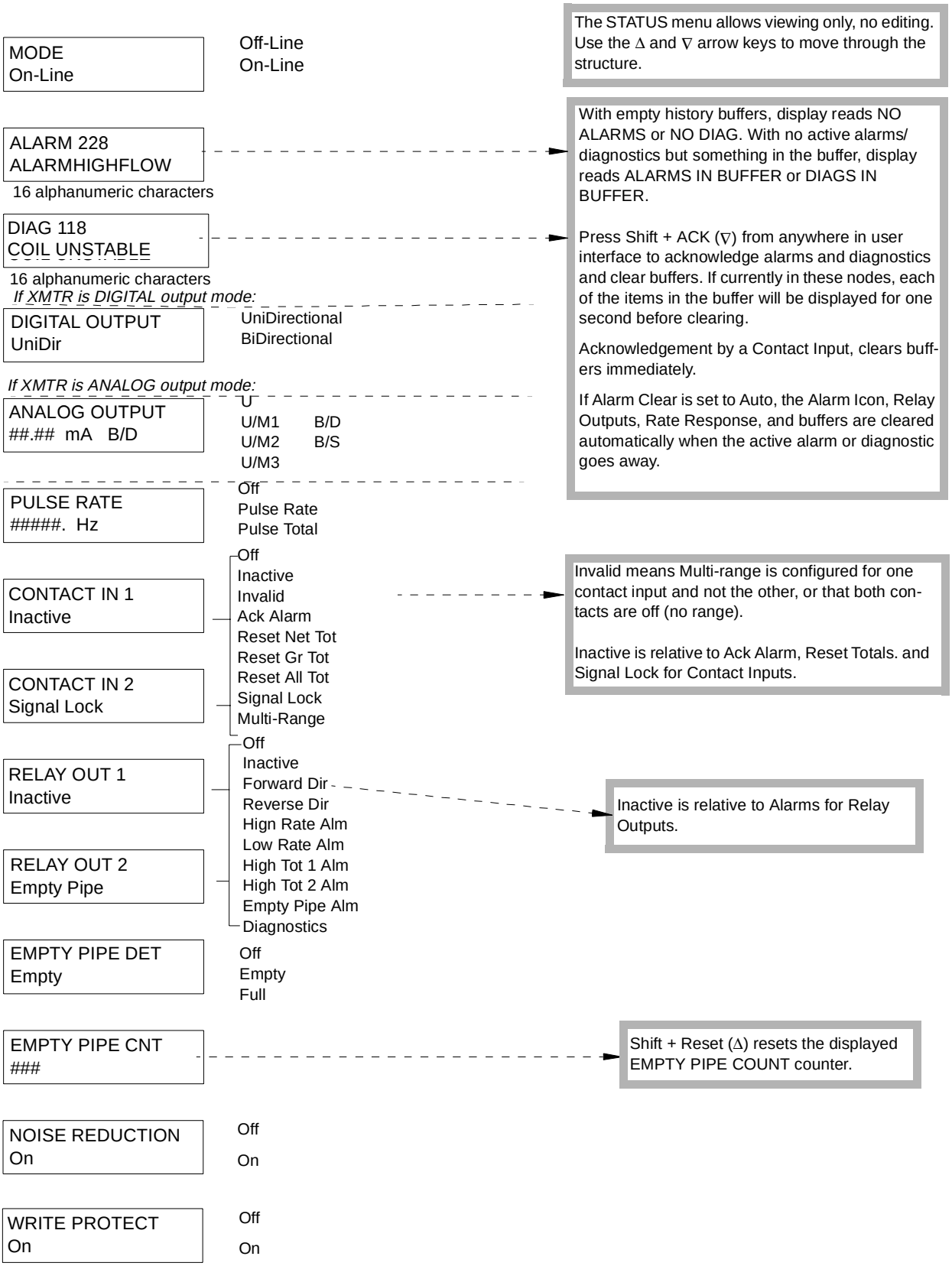



*Figure A-3. Structure Diagram – Status Menu*

## Identity Menu Structure

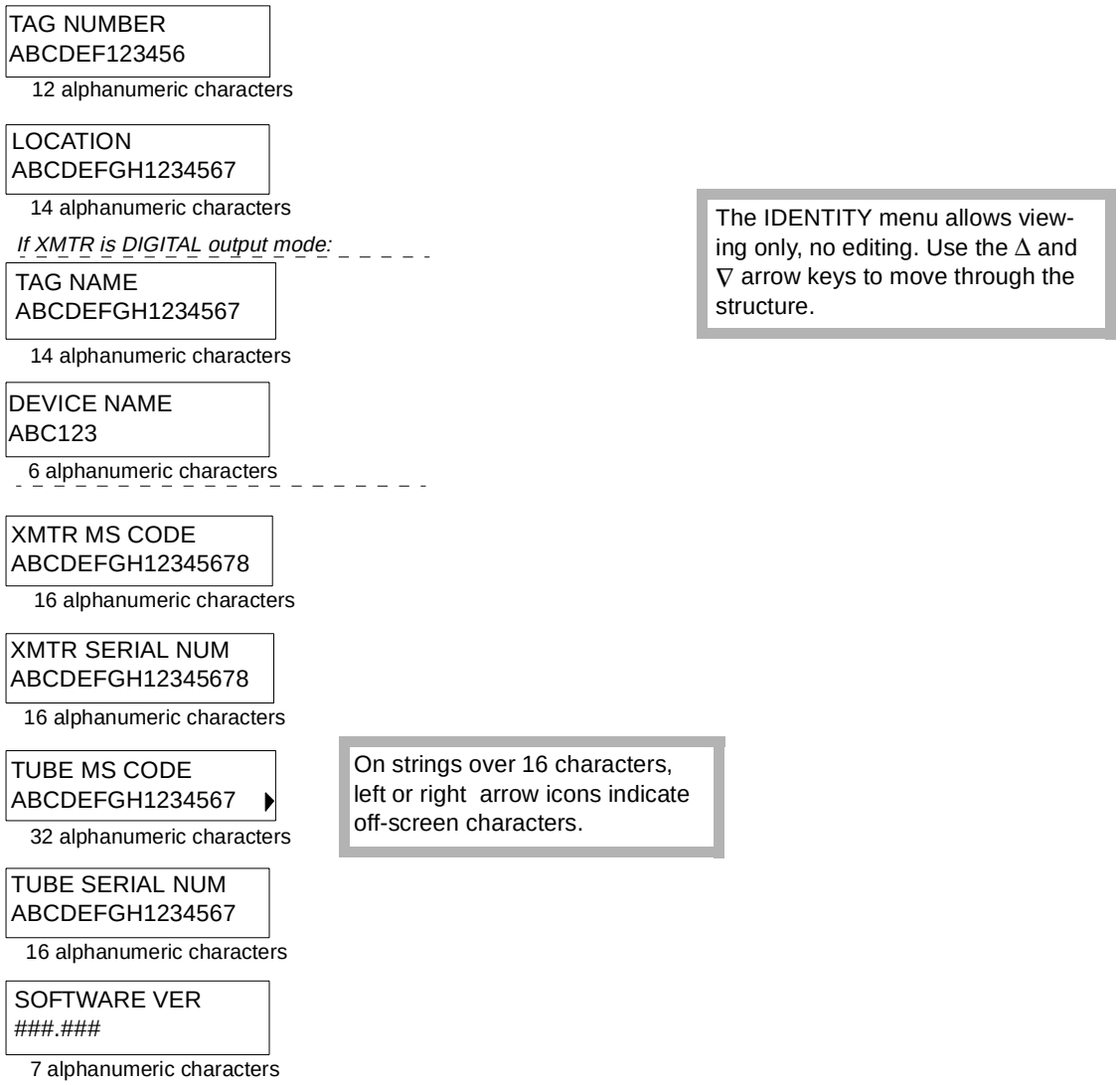



*Figure A-4. Structure Diagram – Identity Menu*

## Level 2 Setup Menu Structure

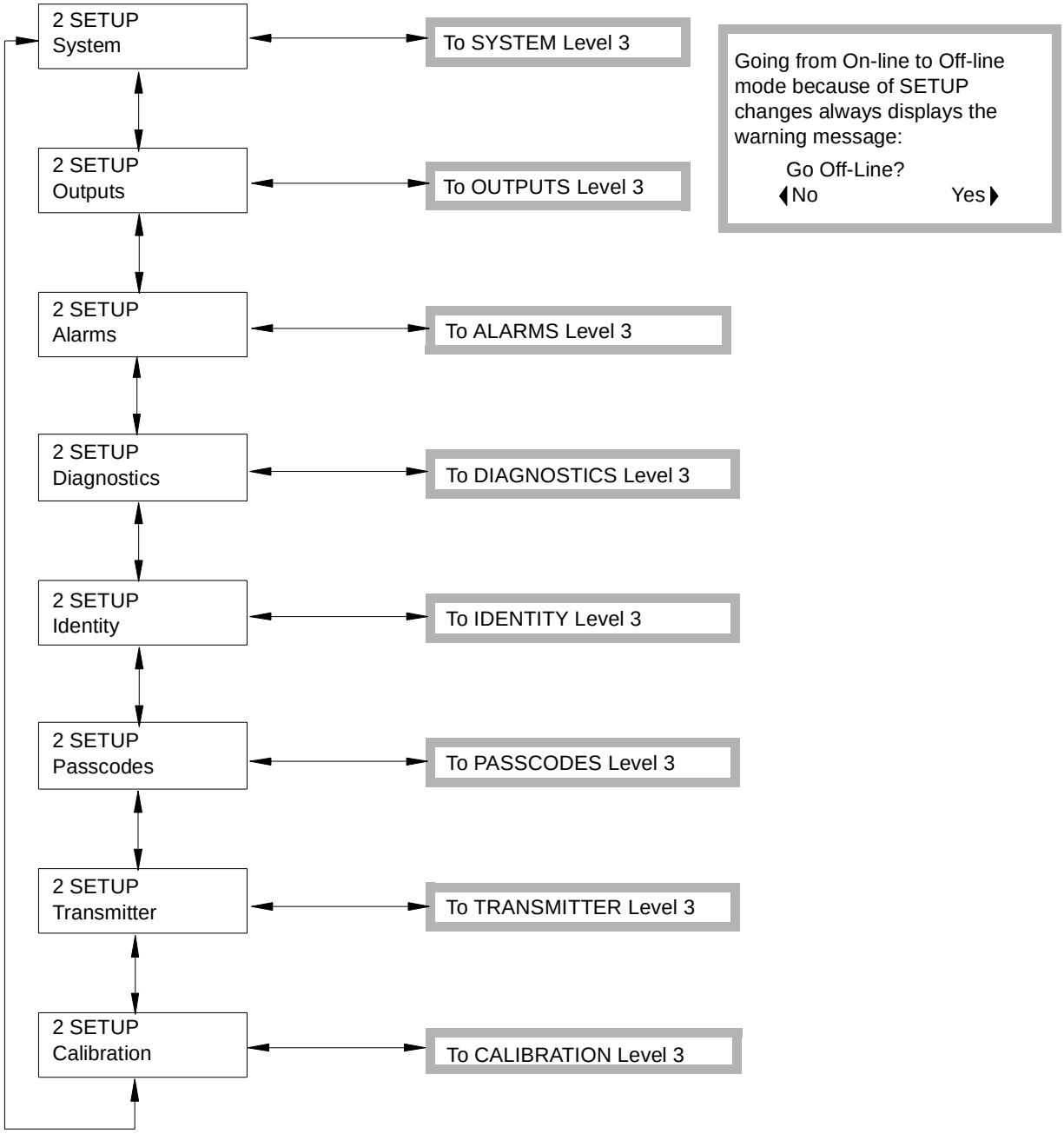



*Figure A-5. Structure Diagram – Setup Menu*

## Level 3 System Menu Structure

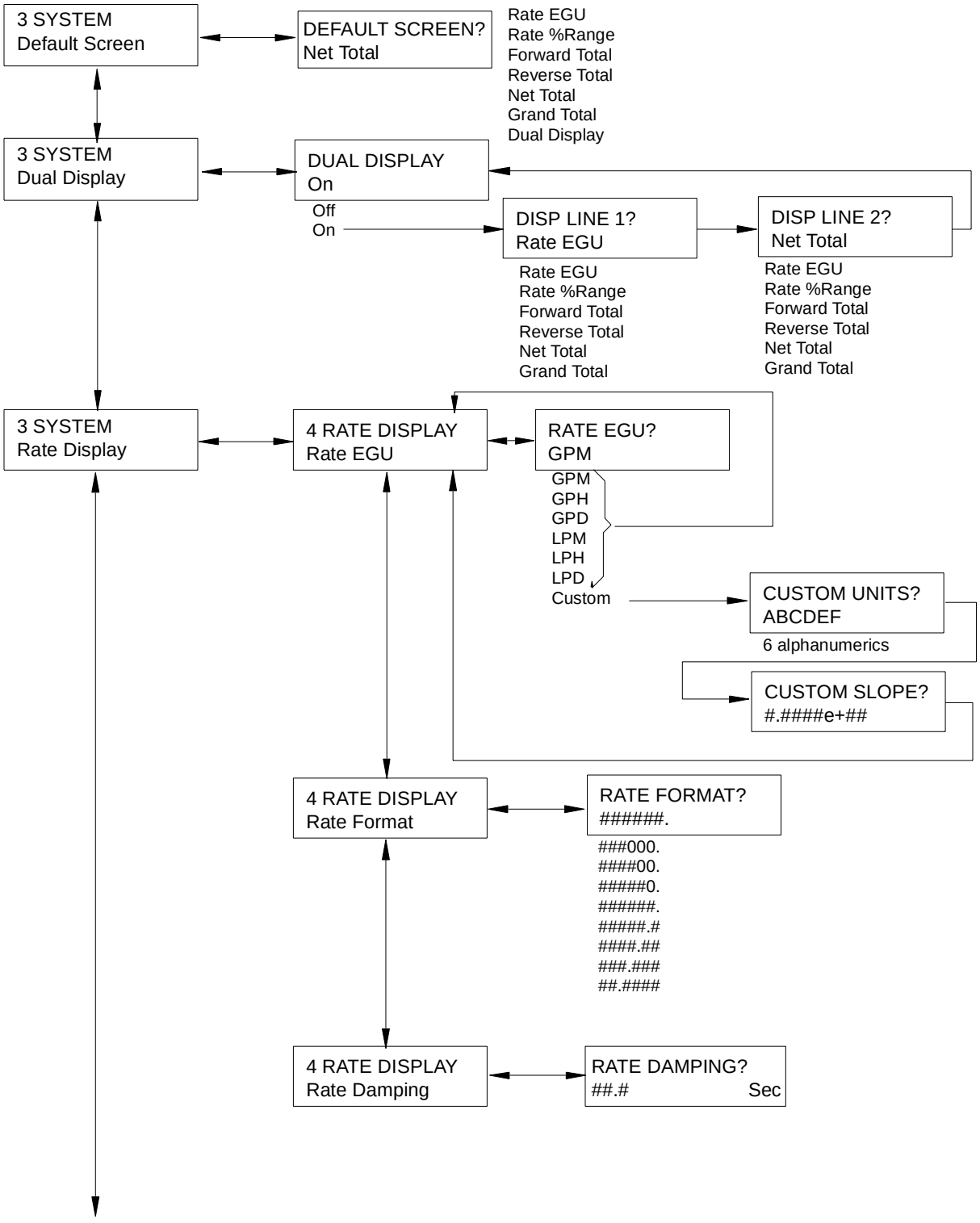



*Figure A-6. Structure Diagram – System Menu*

## Level 3 System Menu Structure (Cont.)

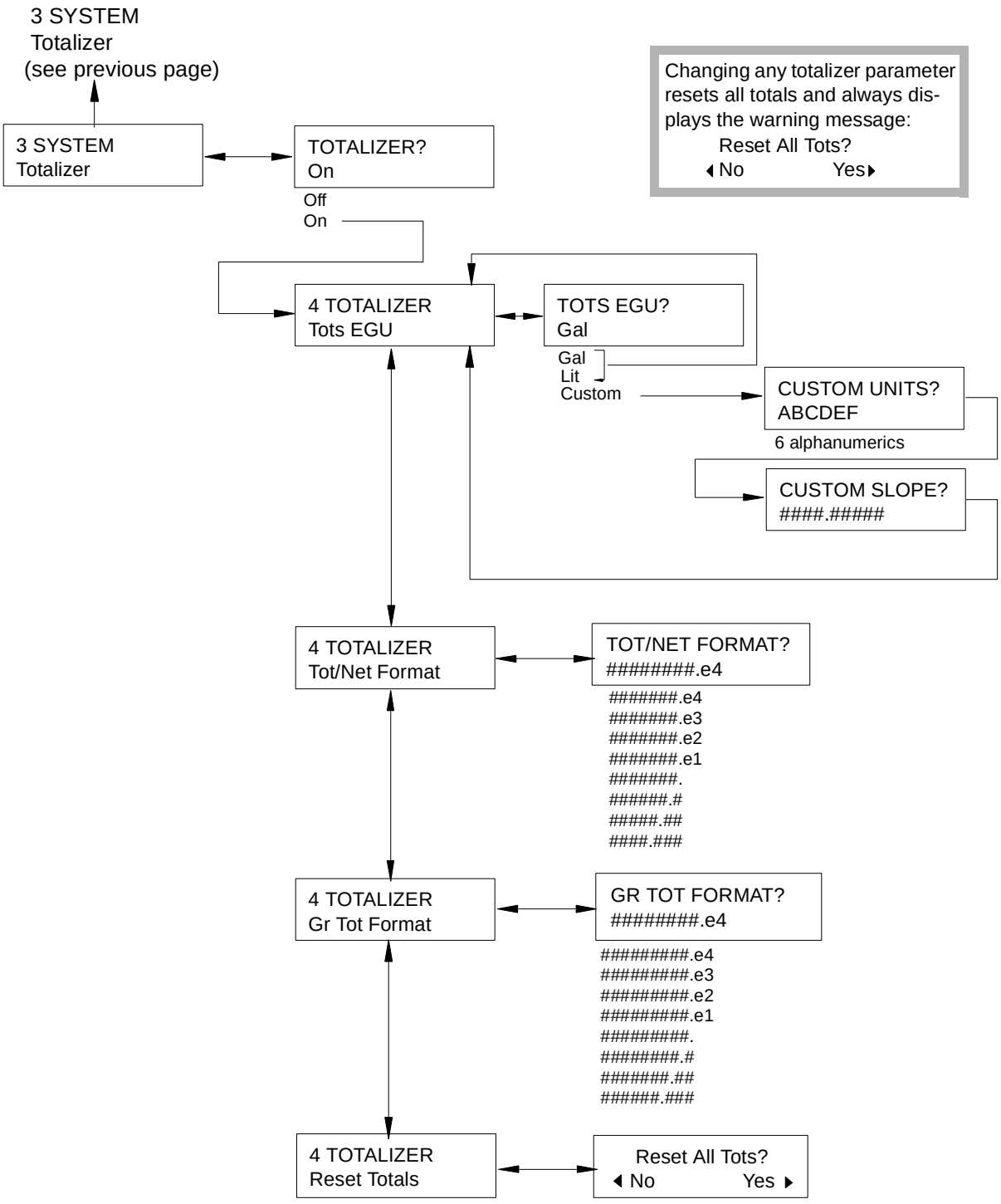



*Figure A-7. Structure Diagram – System Menu (Cont.)*

## Level 3 OUTPUTS Menu Structure

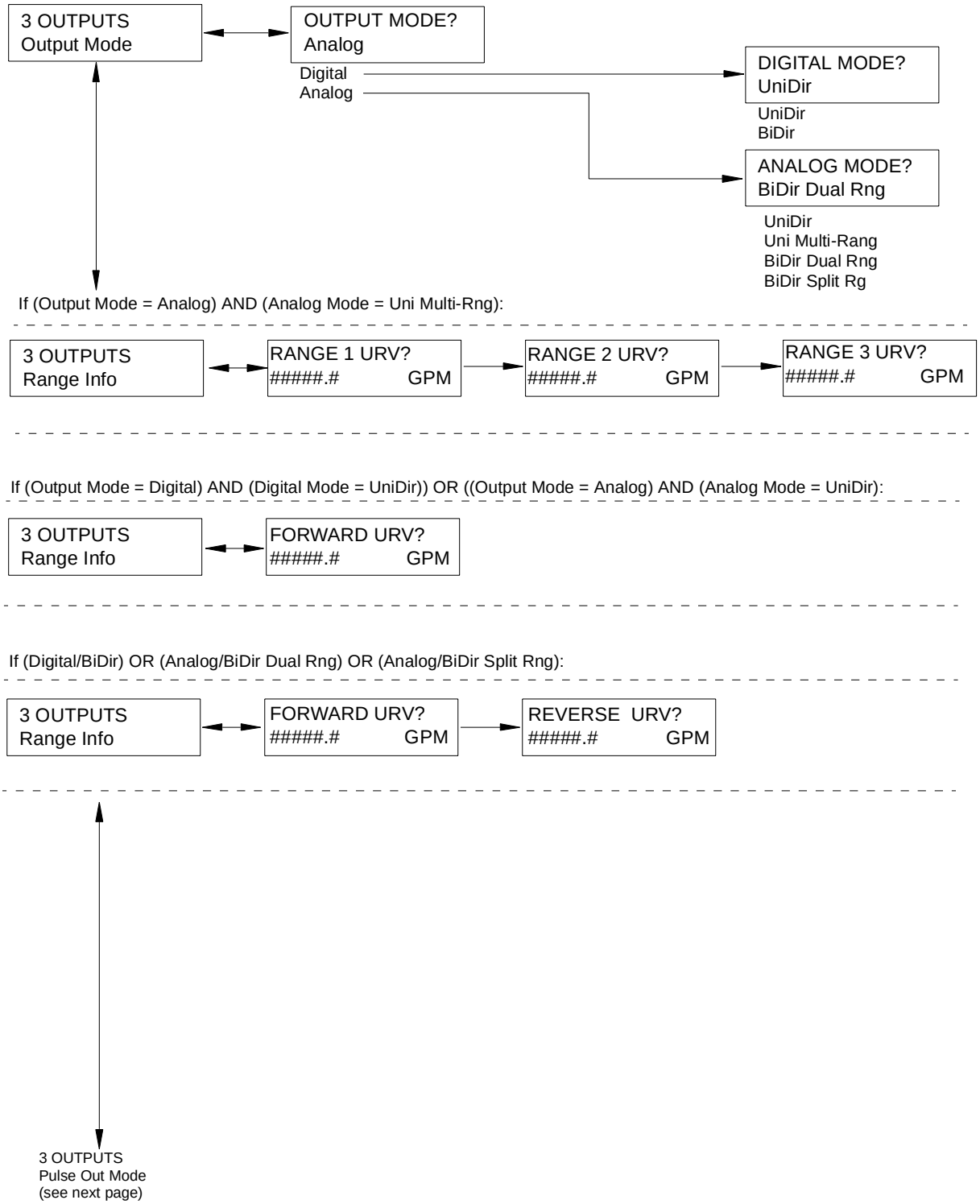



*Figure A-8. Structure Diagram – Outputs Menu*

# Level 3 OUTPUTS Menu Structure (Cont.)

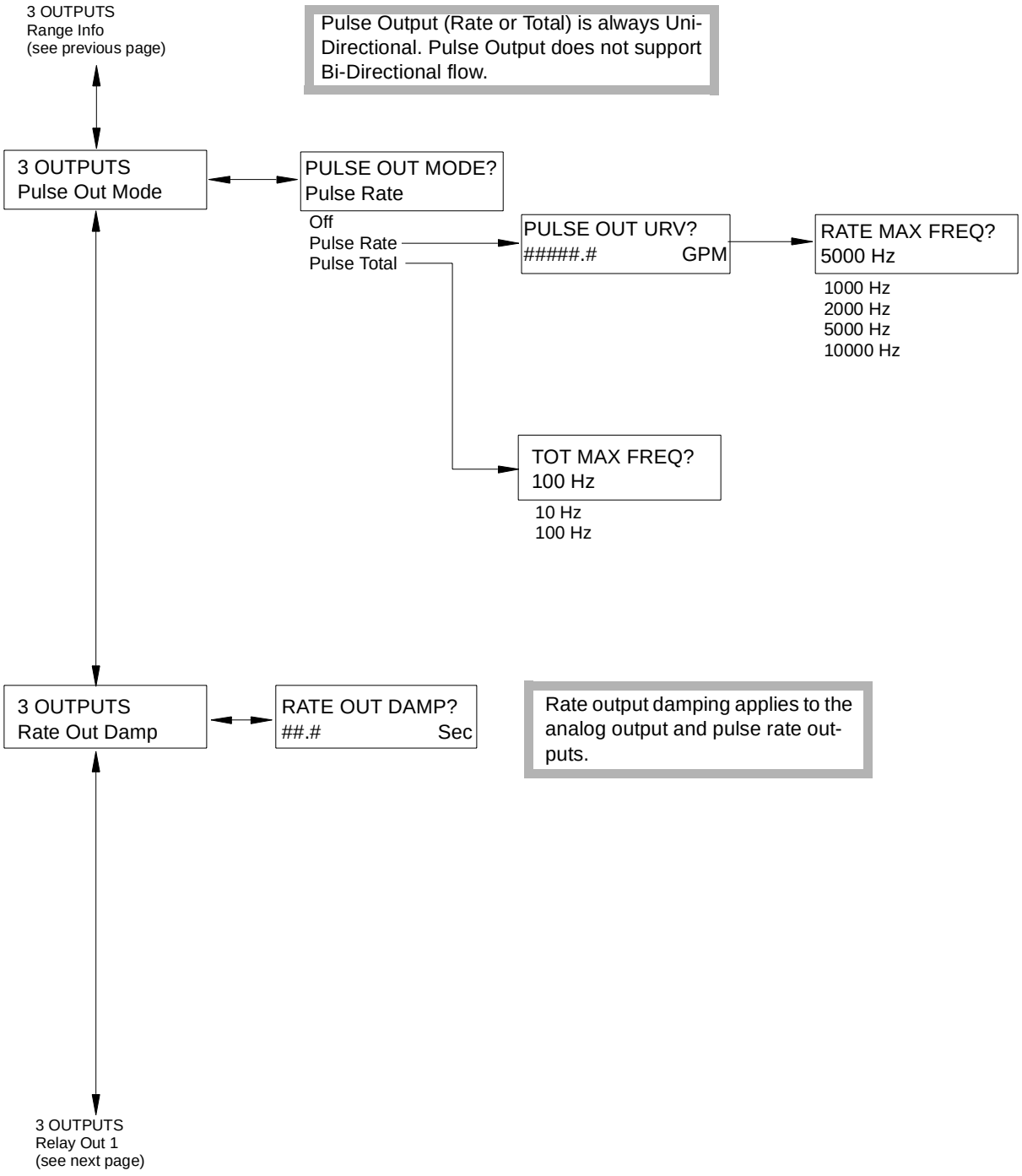



*Figure A-9. Structure Diagram – Outputs Menu (Cont.)*

# Level 3 OUTPUTS Menu Structure (Cont.)

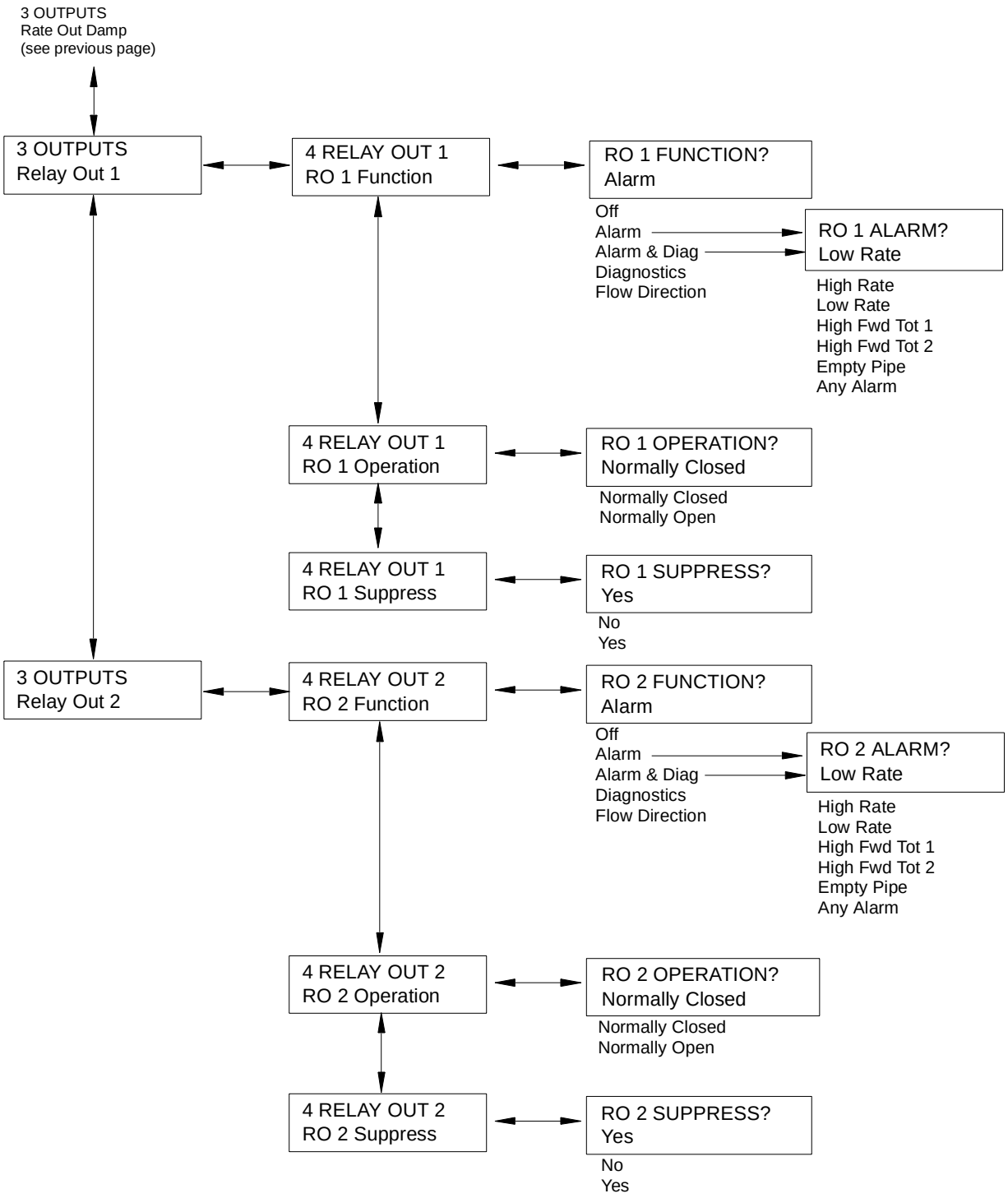



*Figure A-10. Structure Diagram – Outputs Menu (Cont.)*

## Level 3 ALARMS Menu Structure

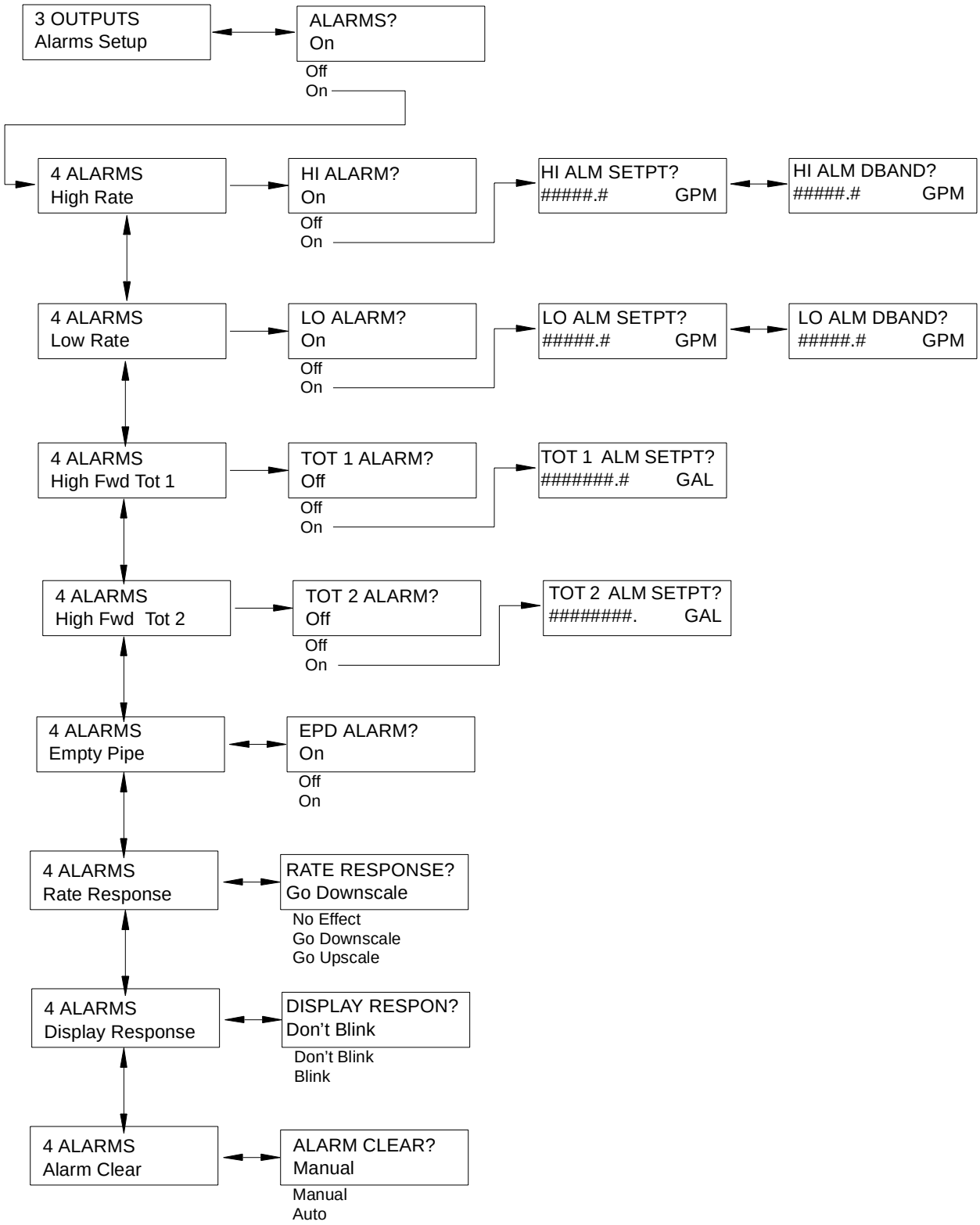



*Figure A-11. Structure Diagram – Alarms Menu*

## Level 3 DIAGNOSTICS Menu Structure

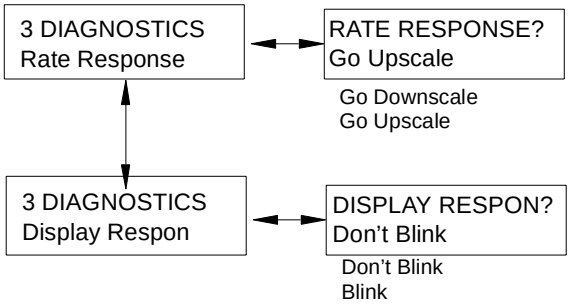



*Figure A-12. Structure Diagram – Diagnostics Menu*

## Level 3 IDENTITY Menu Structure

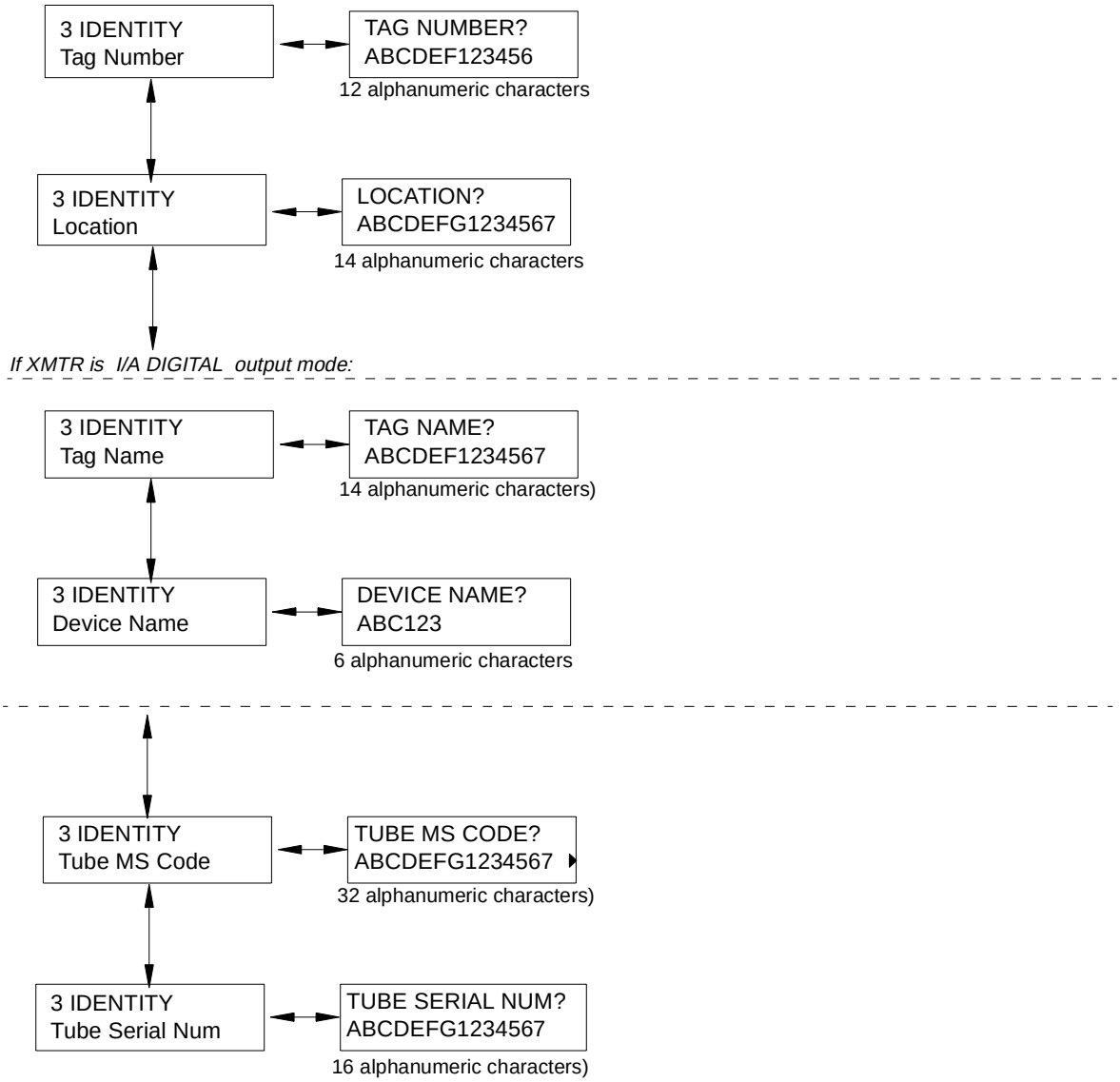



*Figure A-13. Structure Diagram – Identity Menu*

# Level 3 PASSCODES Menu Structure

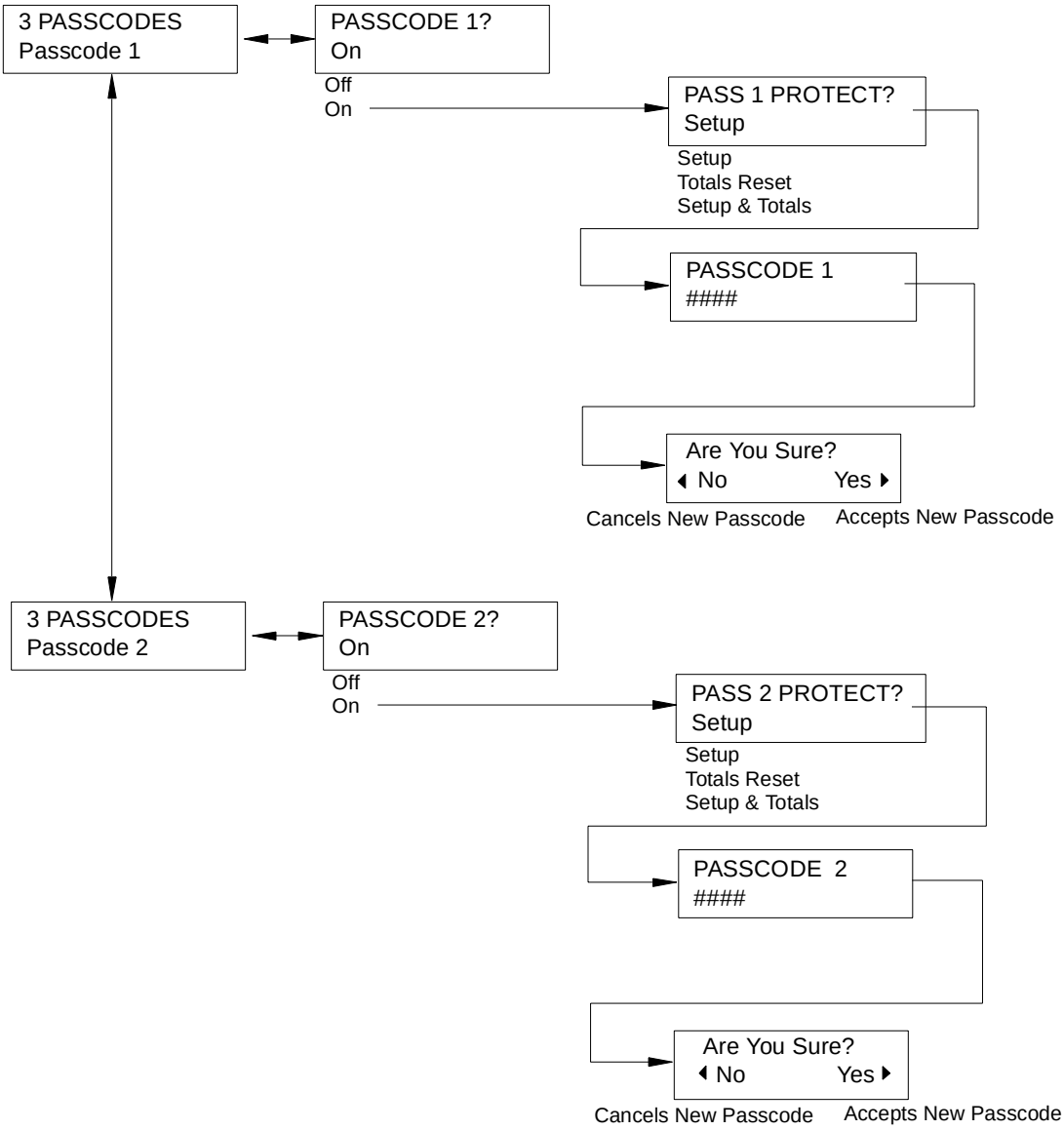



*Figure A-14. Structure Diagram – Passcodes Menu*

## Level 3 TRANSMITTER Menu Structure

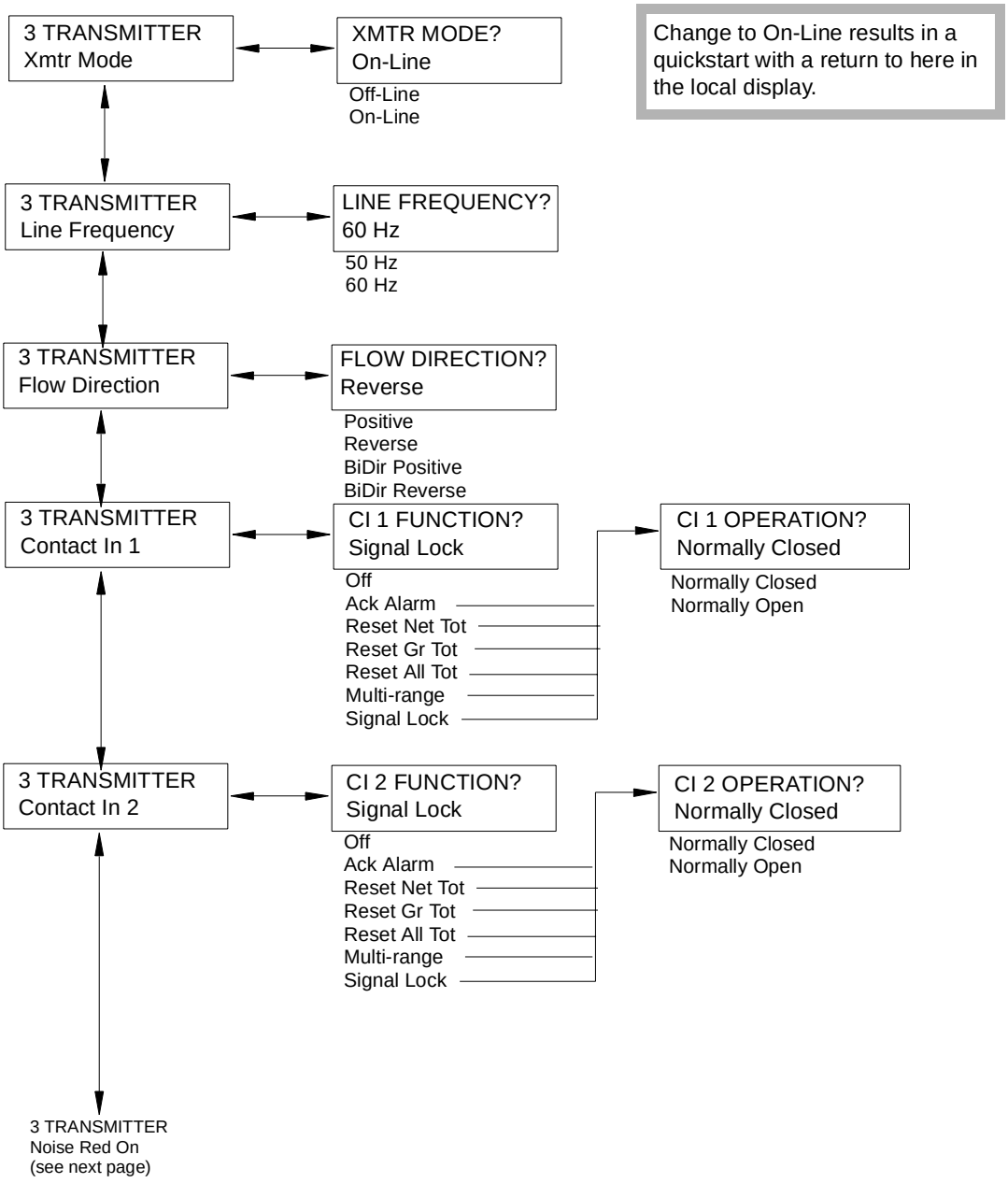



*Figure A-15. Structure Diagram – Transmitter Menu*

# Level 3 TRANSMITTER Menu Structure (Cont.)

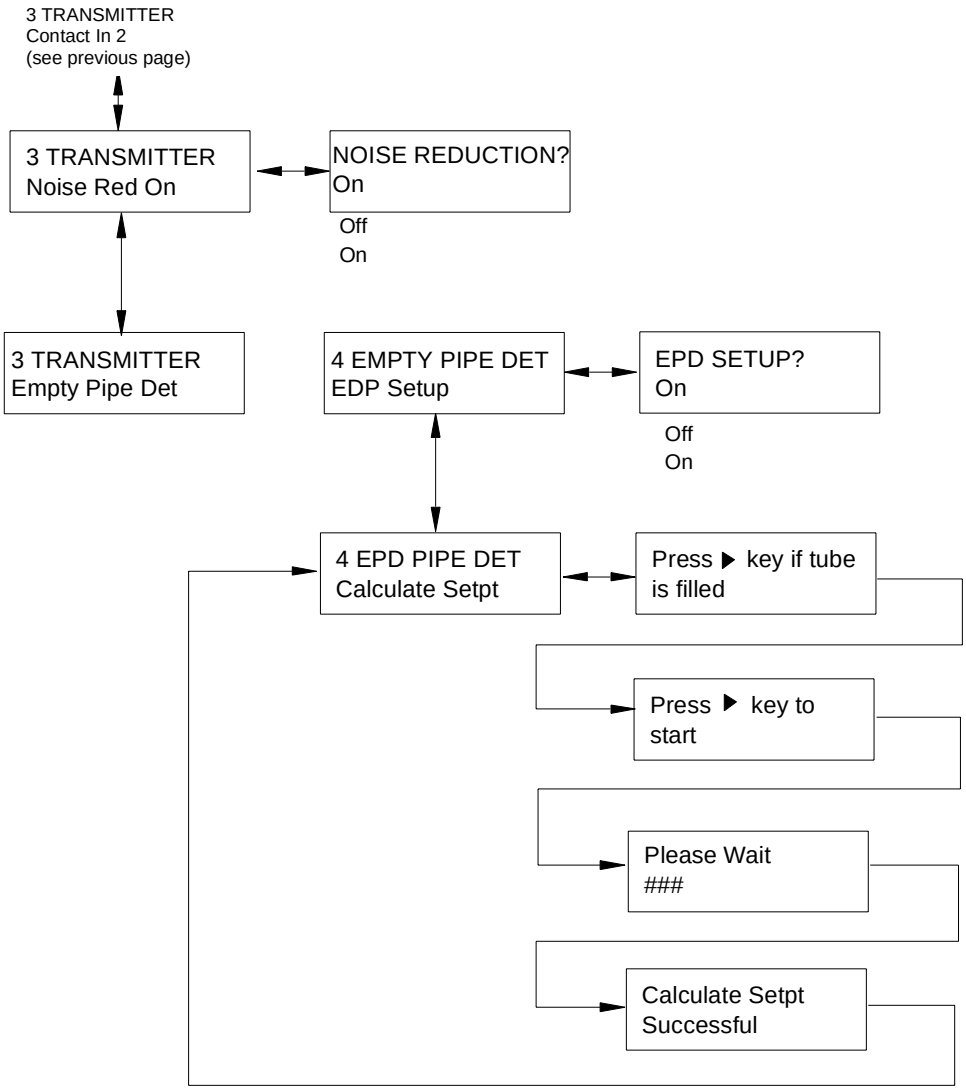



*Figure A-16. Structure Diagram – Transmitter Menu (Cont.)*

## Level 3 CALIBRATION Menu Structure

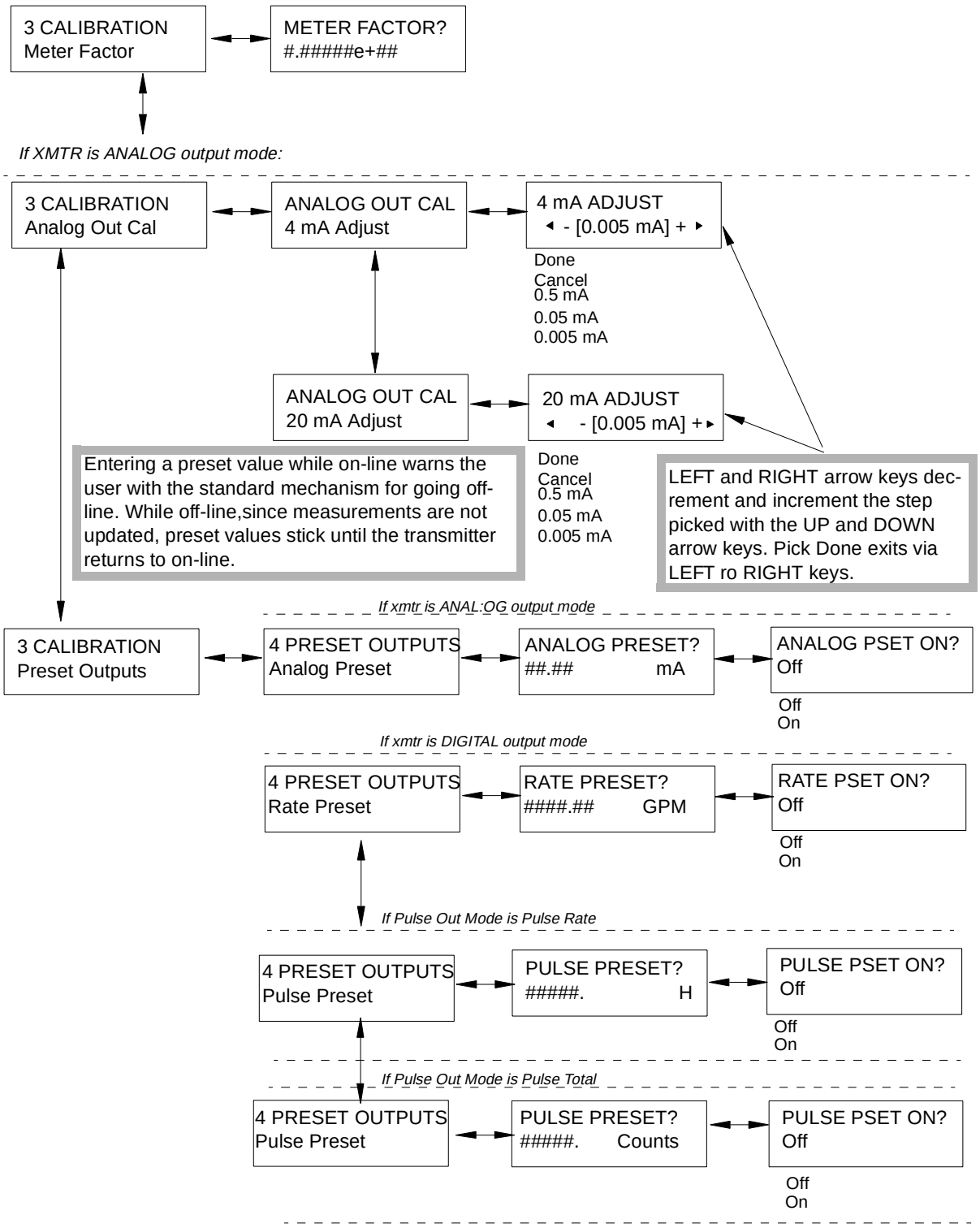
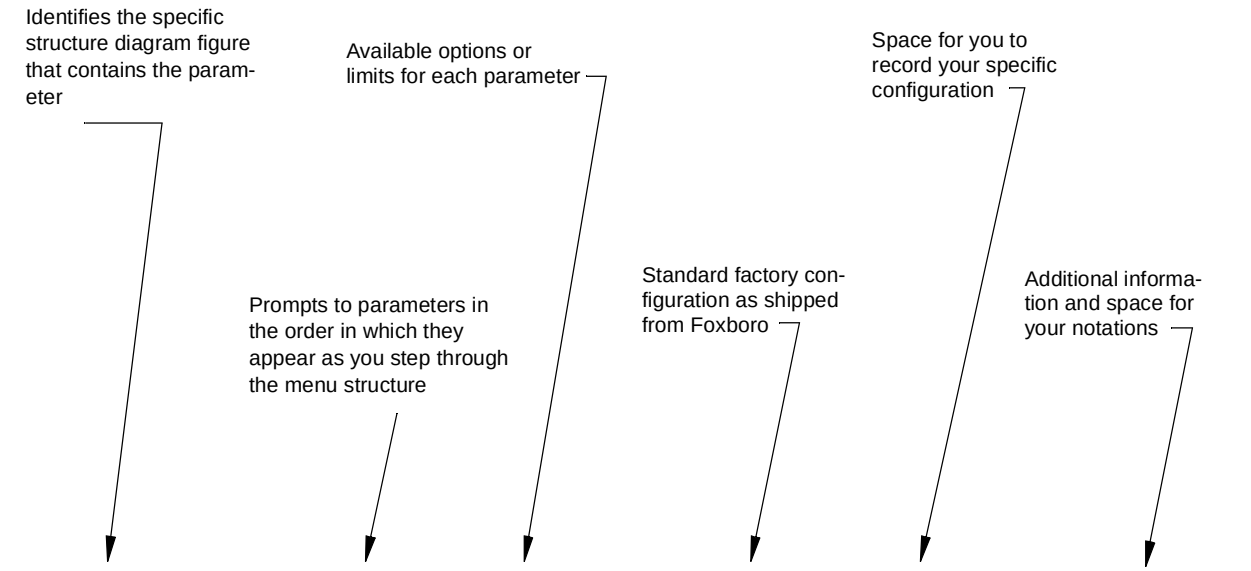



*Figure A-17. Structure Diagram – Calibration Menu*

# Appendix B. Configuration Worksheets

This appendix contains information that will help you configure your IMT25 Transmitter. This page defines the content of the worksheets. Subsequent pages contain the actual configuration worksheets.




| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Default Factory Configuration | User Configuration | Remarks and Notes |
|---|---|---|---|---|---|
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*NOTE: Shaded areas in configuration worksheets indicate options that are available only if the preceding option has been selected.*

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| 3 SYSTEM | | | | | |
| A-6 | DEFAULT SCREEN | | | | |
| | Default Screen | Rate EGU, Rate %Range, Forward Total, Reverse Total, Net Total, Grand Total, Dual Display | Rate EGU | | |
| | Dual Display? | On, Off | Off | | |
| | If On: | | | | |
| | Disp Line 1? | Rate EGU, Rate %Range, Forward Total, Reverse Total, Net Total, Grand Total | Rate EGU | | |
| | Disp Line 2? | Rate EGU, Rate %Range, Forward Total, Reverse Total, Net Total, Grand Total | Rate EGU | | |
| | Rate Display | GPM, GPH, GPD, LPM, LPH, LPD, Custom | GPM | | |
| | If Custom: | | | | |
| | Custom Units | Enter up to 6 alphanumerics | - - - | | |
| | Custom Slope | Enter up to 9 digits | 1 | | |
| | Rate Format | ###000.<br>####00.<br>#####0.<br>#####.#<br>####.##<br>###.###<br>##.#### | ######.# | | |
| | Rate Damping | 0.0 to 99.9 seconds | 3.0 | | |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-7 | TOTALIZER | | | | |
| | Totalizer On? | Off, On | Off | | Changing any totalizer parameter resets all totals and causes warning message to appear. |
| | If On: | - - - | - - - | | |
| | Tots EGU: | Gal, Lit, Custom | Gal | | |
| | If Custom: | - - - | - - - | | |
| | Tots Cust Units | Enter up to 6 alphanumerics: | - - - | | |
| | Tots Cust Slope | Enter up to 9 digits from 1.0e-10 to 1.0e+10 | 1 | | |
| | Tot/net Format | Select 1 of 8 formats | #######. | | |
| | Gr Tot Format | Select 1 of 8 formats | #########. | | |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-8 | 3 OUTPUTS | | | | |
| | Output Mode? | Digital, Analog | Per Model Code | | |
| | If Digital: | - - - | - - - | | |
| | Output Mode? | UniDir, BiDir | UniDir | | |
| | If Analog: | - - - | - - - | | |
| | Output Mode? | UniDir, Uni Multi-Rng, BiDir Dual Rng, BiDir Split Rg | UniDir | | |
| | If Analog AND Uni Multi Rng: | - - - | - - - | | |
| | Range Info: | - - - | - - - | | |
| | Multi-Rang URV1 | 0 to 999999 | 100 | | |
| | Multi-Rang URV2 | 0 to 999999 | 200 | | Must match value below marked ** |
| | Multi-Rang URV3 | 0 to 999999 | 300 | | |
| | If digital AND UniDir OR Analog AND UniDir: | - - - | - - - | | |
| | Range Info: | - - - | - - - | | |
| | Forward URV | 0 to 999999 | 100 | | |
| | If Digital AND BiDir OR Analog AND BiDir Dual Rng OR Analog AND BiDir Split Rg | - - - | - - - | | |
| | Range Info: | - - - | - - - | | |
| | Forward URV | 0 to 999999 | 100 | | |
| | Reverse URV | 0 to 999999 | 200 | | ** Must match value of Multi-Range URV2 above |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-9 | 3 OUTPUTS (cont.) | | | | |
| | Pulse Out Mode | Off, Pulse Rate, Pulse Total | Off | | Pulse output (rate or total) is always unidirectional. |
| | If Pulse Rate: | - - - | - - - | | |
| | Pulse Out URV | 0 to 999999 | 100 | | |
| | Rate Max Freq | 1000, 2000, 5000, or 10000 Hz | 2000 Hz | | |
| | If Pulse Total | - - - | - - - | | |
| | Tot Max Freq | 10 Hz, 100 Hz | 10 Hz | | |
| | Rate Out Damp | 0 to 99.9 seconds | 3.0 seconds | | Rate output damping applies to analog and pulse rate outputs. It also controls the noise reduction action. |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-10 | Relay Out 1 | - - - | - - - | | |
| | RO1 Function: | Off, Alarm, Alarm & Diag, Diagnostics, Flow Direction | Off | | |
| | If Alarm or Alarm & Diag | - - - | - - - | | |
| | RO1 Alarm? | High Rate, Low Rate, High Fwd Tot 1<br>High Fwd Tot 2<br>Empty Pipe<br>Any Alarm | High Rate | | |
| | RO1 Operation: | Normally Closed, Normally Open | Normally Open | | |
| | RO1 Suppress: | No, Yes | No | | |
| | Relay Out 2 | - - - | - - - | | |
| | RO2 Function: | Off, Alarm, Alarm & Diag, Diagnostics, Flow Direction | Off | | |
| | If Alarm or Alarm & Diag | - - - | - - - | | |
| | RO2 Alarm? | High Rate, Low Rate, High Fwd Tot 1<br>High Fwd Tot 2<br>Empty Pipe<br>Any Alarm | Low Rate | | |
| | RO2 Operation: | Normally Closed, Normally Open | Normally Open | | |
| | RO2 Suppress: | No, Yes | No | | |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-11 | 3 ALARMS | | | | |
| | Alarms On? | Off, On | Off | | |
| | If On: | | - - - | | |
| | High Rate: | - - - | - - - | | |
| | Hi Alarm On? | Off, On | Off | | |
| | If On: | - - - | - - - | | |
| | Hi Alm Setpt | 0 to 999999 | 100 | | |
| | Hi Alm Dband | 0 to 999999 | 1.00 | | |
| | Low Rate: | - - - | - - - | | |
| | Low Alarm On? | Off, On | Off | | |
| | If On: | - - - | - - - | | |
| | Low Alm Setpt | 0 to 999999 | 1.0 | | |
| | Low Alm Dband | 0 to 999999 | 0.5 | | |
| | High Fwd Tot 1: | - - - | - - - | | |
| | Tot 1 Alarm On: | Off, On | Off | | |
| | Tot 1 Alm Setpt | 0 to 9999999 | 100000 | | |
| | High Fwd Tot 2: | - - - | - - - | | |
| | Tot 2 Alarm On: | Off, On | Off | | |
| | Tot 2 Alm Setpt | 0 to 9999999 | 100000 | | |
| | Empty Pipe | - - - | - - - | | |
| | EPD Alarm On? | Off, On | Off | | |
| | Rate Response? | Go Downscale<br>Go Upscale | Go Down-scale | | |
| | Display Response? | Don't Blink, Blink | Don't Blink | | |
| | Alarm Clear? | Manual<br>Auto | Auto | | |
| A-12 | 3 DIAGNOSTICS | | | | |
| | Rate Response? | Go Downscale<br>Go Upscale | Go Down-scale | | |
| | Display Respon? | Don't Blink, Blink | Blink | | |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-13 | 3 IDENTITY | | | | |
| | Tag Number | Enter up to 12 alphanumeric characters | Tagnumber | | |
| | Location | Enter up to 14 alphanumeric characters | Location | | |
| | If XMTR is Digital Output Mode: | | | | |
| | Tag Name | Enter up tp 14 alphanumeric characters | Tagname | | |
| | Device Name | Enter up to 6 alphanumeric characters | Devicename | | |
| | Tube MS Code | Enter up to 32 alphanumeric characters | Tube MS | | |
| | Tube Serial Num | Enter up to16 alphanumeric characters | Tube S/N | | |
| A-14 | 3 PASSCODES | | | | |
| | Passcode 1 | Off, On | Off | | |
| | If On: | - - - | - - - | | |
| | Pass 1 Protect? | Setup, Totals Reset, Setup & Totals | Setup | | |
| | Passcode 1 | 0000 to 9998 | - - - | | Following entry, confirmation screen appears. Press “Left” to cancel, “Right” to accept. |
| | Passcode 2 | Off, On | Off | | |
| | If On: | - - - | - - - | | |
| | Pass 2 Protect? | Setup, Totals Reset, Setup & Totals | Setup | | |
| | Passcode 2 | 0000 to 9998 | - - - | | Following entry, confirmation screen appears. Press “Left” to cancel, “Right” to accept. |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-15 | 3 TRANSMITTER | | | | |
| | Xmtr Mode? | Off-Line, On-Line | - - - | | A change to On-Line causes a quickstart with return to here in the local display. |
| | Line Frequency? | 50 Hz, 60 Hz | 60 Hz | | |
| | Flow Direction? | Positive, Reverse, BiDir Positive BiDir Reverse | Positive | | |
| | CI 1 Function? | Off, Ack Alarm, Reset Net Tot, Reset Gr Tot, Reset All Tot, Multi-Range, Signal Lock | Off | | |
| | If NOT Off: | - - - | - - - | | |
| | CI 1 Operation? | Normally Closed, Normally Open | Normally Open | | |
| | CI 2 Function? | Off, Ack Alarm, Reset Net Tot, Reset Gr Tot, Reset All Tot, Multi-Range, Signal Lock | Off | | |
| | If NOT Off: | - - - | - - - | | |
| | CI 2 Operation? | Normally Closed, Normally Open | Normally Open | | |
| A-16 | Noise Red On? | Off, On | On | | |
| | Empty Pipe Det | | | | |
| | EPD Setup | Off, On | Off | | |
| | Calculate Setpt | Press→ if tube is filled. Press→ to start. | - - - | | Completion indicated by Successful or Fail message. |

| Structure Diagram | Prompt/ Parameter | Options or Parameter Limits | Factory Default Configuration | User Entry or Selection | Remarks/Notes |
|---|---|---|---|---|---|
| A-17 | 3 CALIBRATION | | | | |
| | Meter Factor | In form #.#####e+## | 1.20000e+01 | | |
| | If Xmtr is Analog Output Mode: | | | | |
| | Analog Out Cal | - - - | - - - | | |
| | 4 mA Adjust | Done, 0.5 mA, 0.05 mA, 0.005 mA | Done | | Left and right arrow keys decrement and increment the step size picked with the Up and Down arrow keys. |
| | 20 mA Adjust | Done, 0.5 mA, 0.05 mA, 0.005 mA | Done | | Left and right arrow keys decrement and increment the step size picked with the Up and Down arrow keys. |
| | Preset Outputs | - - - | - - - | | |
| | Analog Preset | 3.80 to 22.00 mA in form ##.## | - - - | | |
| | Analog Preset On | Off, On | Off | | |
| | If Xmtr is Digital Output Mode: | - - - | - - - | | |
| | Rate Preset | 0 to 999999 | - - - | | |
| | Rate Preset On | Off, On | Off | | |
| | If Pulse Out Mode is Pulse Rate | - - - | - - - | | |
| | Pulse Preset: | 0 to 10000 Hz | - - - | | |
| | Pulse Preset On | Off, On | Off | | |
| | If Pulse Out Mode is Pulse Total | - - - | - - - | | |
| | Pulse Preset: | 0 to 10000 Hz | - - - | | |
| | Pulse Preset On | Off, On | Off | | |

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