

**Instruction Manual**  
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March 2008

# Micro Motion<sup>®</sup> Series 3000 MVD Transmitters

Net Oil Computer Supplement





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# Chapter 1

## Before You Begin

### 1.1 About this manual

This manual explains how to configure and use the Net Oil Computer application on the Micro Motion® Series 3000 MVD platform (a Model 3500 or Model 3700 MVD transmitter).

This manual does not provide information on basic installation, configuration, and use of the Model 3500 or Model 3700 transmitter. For basic platform information and instructions, see the manual entitled *Micro Motion® Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*.

### 1.2 Communication tools

You can communicate with a Series 3000 device using any of the following communication tools:

- The local display
- ProLink II v2.5 and higher (ProLink II v2.7 recommended)
- 375 Field Communicator with the appropriate DD: **Micro Motion 3000 Mass flo v7 DD v2**

To configure or use the NOC application, you must use either the local display or ProLink II v2.7.

This manual focuses on the use of the local display. Detailed menu flowcharts for the local display are provided throughout this manual and in Appendix A.

For general information on installing ProLink II and connecting to the Series 3000 platform, see the manual entitled *Micro Motion® Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*.

### 1.3 Manuals and manual use

Table 1-1 lists the basic steps required to install, set up, configure, and use the Series 3000 device with the NOC application. Table 1-1 also identifies the manual in which the associated information is provided. Note that for some tasks you will need to use both manuals.

## Before You Begin

**Table 1-1 Tasks and manual location**

Step		Manual	
		<i>Series 3000 MVD Transmitters: Net Oil Computer Supplement (this manual)</i>	<i>Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual</i>
1	Install the Series 3000 device		✓
2	Wire the Series 3000 device to the sensor		✓
3	Wire I/O		✓
4	Set up digital communications		✓
5	Start up the system	✓	
6	Learn to use the display and menu system	✓	
7	Configure security and language		✓
8	Configure system data		✓
9	Configure inputs		✓
10	Configure digital communications		✓
11	Configure the NOC application	✓	
12	Configure outputs	✓	✓
13	Configure NOC status alarm severity	✓	✓
14	Perform optional configuration		✓
15	Operate the NOC application	✓	
16	Perform calibrations and meter verification		✓
17	Troubleshoot	✓	✓

### 1.4 Micro Motion customer service

For customer service, phone the support center nearest you:

- In the U.S.A., phone **800-522-MASS** (800-522-6277) (toll-free)
- In Canada and Latin America, phone +1 303-527-5200
- In Asia:
  - In Japan, phone 3 5769-6803
  - In other locations, phone +65 6777-8211 (Singapore)
- In Europe:
  - In the U.K., phone 0870 240 1978 (toll-free)
  - In other locations, phone +31 (0) 318 495 555 (The Netherlands)

Customers outside the U.S.A. can also email Micro Motion customer service at *International.MMISupport@EmersonProcess.com*.

# Chapter 2

## NOC Overview

### 2.1 Overview

This chapter discusses various topics that should be reviewed and considered before beginning configuration of the Series 3000 platform with the NOC application. Topics include:

- Introduction to the NOC system – see Section 2.2
  - NOC system components – see Section 2.2.1
  - Installation architecture – see Section 2.2.2
  - Operation modes – see Section 2.2.3
  - Water cut determination and required well data – see Section 2.2.5
- NOC application features and options – see Section 2.3
  - Temperature correction – see Section 2.3.1
  - Pressure compensation – see Section 2.3.2
  - Shrinkage factors – see Section 2.3.3
  - Transient Bubble Remediation – see Section 2.3.4
  - Gas measurement – see Section 2.3.5
  - Transient Mist Remediation – see Section 2.3.6
  - Recalculation – see Section 2.3.7

This chapter also includes:

- A list of questions that should be answered before beginning configuration – see Section 2.4.
- A list of NOC measurement terms and definitions – see Section 2.5.

### 2.2 Introduction to the NOC system

“NOC” is an abbreviation of “Net Oil Computer.” In the present context, NOC is a software option that can be purchased for three members of the Series 3000 family: the Model 3500 panel-mount transmitter, the Model 3500 rack-mount transmitter, and the Model 3700 field-mount transmitter.

When paired with a Micro Motion sensor installed on the oil/water leg of a two-phase separator or the oil leg of a three-phase separator, the NOC application can provide real-time measurements of water cut. Alternatively, the NOC application can receive water cut data from an external water cut monitor (see Section 2.2.5 for information on water cut options). When the water cut value is known, net oil volume flow and net water volume flow can be calculated.

If desired, real-time gas measurement may be implemented by installing a meter on the gas leg. The Series 3000 platform then receives gas flow data via its frequency input.

## NOC Overview

### 2.2.1 NOC system components

The Series 3000 MVD NOC system requires:

- One Series 3000 MVD transmitter with the Net Oil Computer software option
- One Micro Motion sensor installed on the oil/water or oil leg

Optional components include:

- A meter on the gas leg. This meter can be used for gas measurement with or without Transient Mist Remediation:
  - If only gas measurement will be implemented, either a third-party meter or a Micro Motion meter may be used. Gas measurement must be based on mass flow.
  - If Transient Mist Remediation will be implemented, a Micro Motion meter must be used.
- A water cut monitor on the oil/water or oil leg.
- A pressure sensor on the oil/water or oil leg. Data from the pressure sensor enables pressure compensation (see Section 2.3.2).

### 2.2.2 Installation architecture

The Series 3000 MVD NOC system is designed for installation with a three-phase separator, a two-phase separator, or a variety of compact separators. See Figures 2-1 through 2-3.

*Note: These figures do not illustrate all possible combinations.*

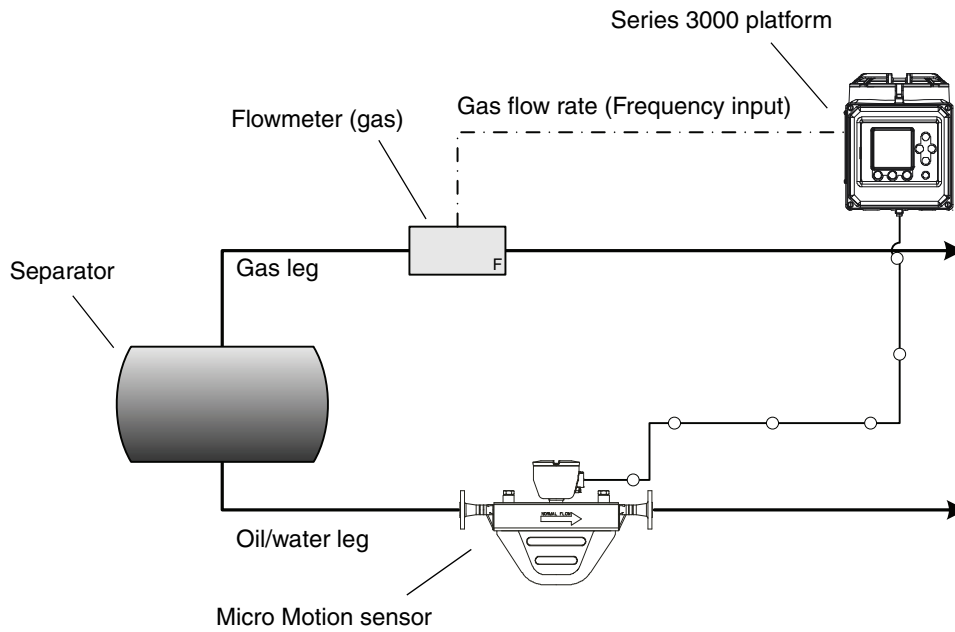


## NOC Overview

In Figure 2-1:

- The NOC system is implemented with a two-phase separator.
- An optional gas meter is installed, and gas data is sent to the Series 3000 device via the frequency input.
- Density-based water cut data is used.
- Because there is no pressure sensor, pressure compensation is not applied.

**Figure 2-1 NOC system with two-phase separator**

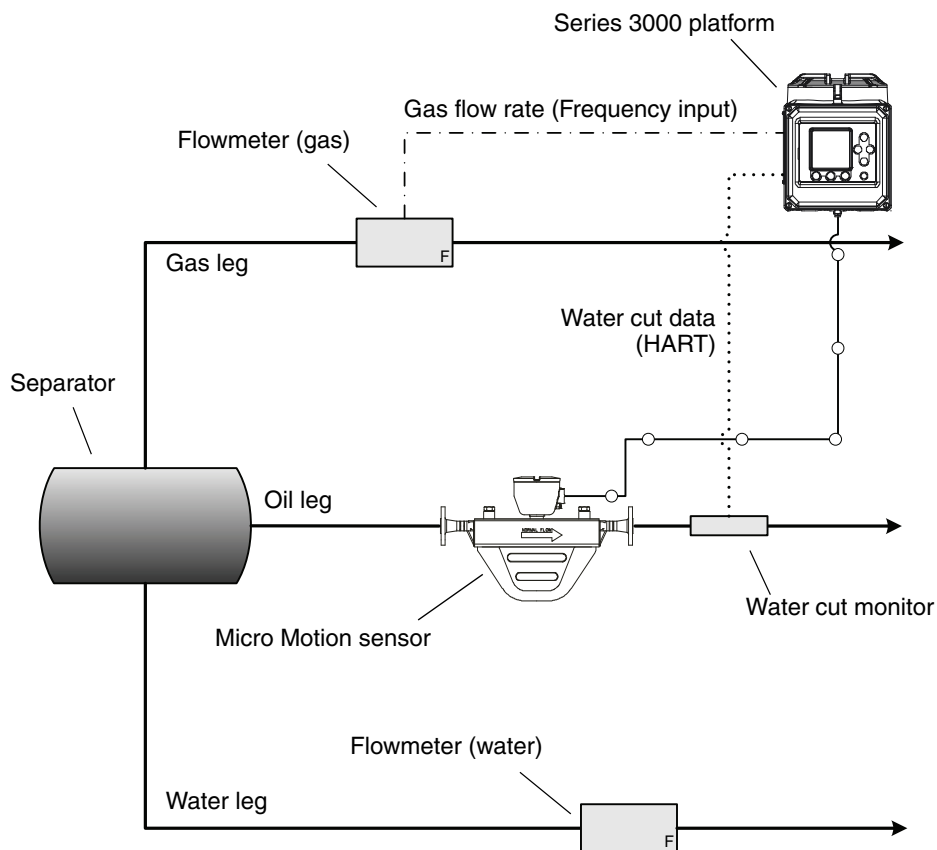


## NOC Overview

In Figure 2-2:

- The NOC system is implemented with a three-phase separator.
- An optional gas meter is installed, and gas flow rate data is sent to the Series 3000 device via the frequency input.
- A meter is installed on the water leg, but the Series 3000 device does not monitor or record flow data from this source.
- A water cut monitor is installed on the oil leg. The NOC system can be configured to use either density-based water cut data or data from the water cut monitor.
- Because there is no pressure sensor, pressure compensation is not applied.

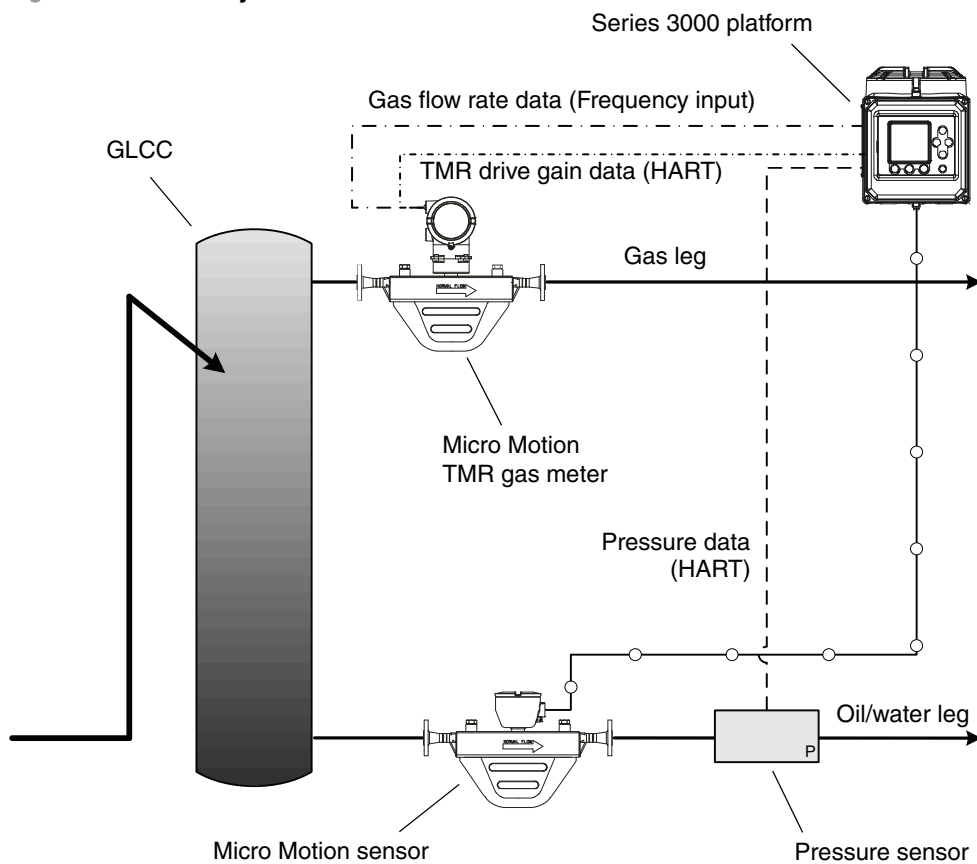
**Figure 2-2 NOC system with three-phase separator**



In Figure 2-3:

- The NOC system is implemented with a Gas-Liquid Cylindrical Cyclone™ (GLCC).
- A gas meter is installed on the gas leg. In this example, a Micro Motion meter is used, and it provides gas flow rate data for gas measurement, and drive gain data for Transient Mist Remediation via a HART connection.
- Density-based water cut data is used.
- A pressure sensor is installed on the oil/water leg. This enables pressure compensation.

Figure 2-3 NOC system with GLCC



### 2.2.3 Operation modes

The NOC system operates in either Well Test mode or Continuous mode:

- In Well Test mode, well tests can be performed on up to 48 wells. A manifold system is used to ensure that output from a single well is routed through the test separator and the NOC system. See Figure 2-4. The system can save data for three tests per well. If more than three tests are run on a specific well, older tests are overwritten as required.
- In Continuous mode, one well is measured continuously. See Figure 2-5. The NOC system supplies current flow data plus running averages and totals.

After initial configuration, you can change the operation mode. However, changing modes affects current measurement and data collection. Before changing modes, see Section 5.4.

Figure 2-4 Well Test mode

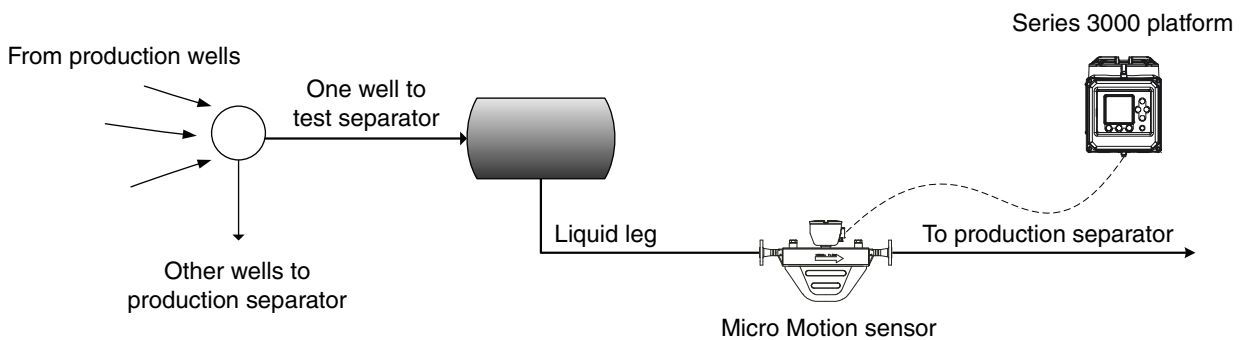
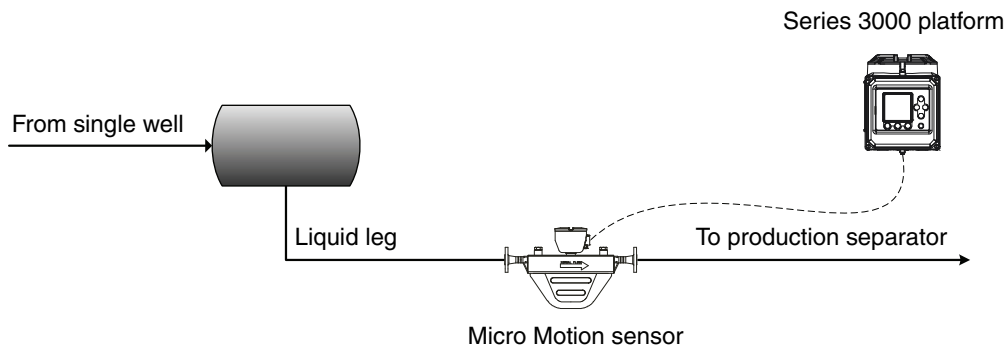


Figure 2-5 Continuous mode



### 2.2.4 Required well data

The following information is required for each well that will be tested or measured by the NOC system:

- Density of dry oil from this well, at reference temperature and reference pressure. To ensure the most accurate net oil data, the density should be based on live oil rather than dead oil. “Live oil” refers to crude oil at line pressure.
- Density of the water from this well, at reference temperature and reference pressure.

If the density values are not known:

- You can take samples of produced oil and produced water, perform laboratory analysis, and enter the results into the well configuration.
- You can perform an in-line density determination for oil, water, or both (see Section 4.9). During in-line density determination, the appropriate process fluid (water or live oil) is routed through the sensor, density values are averaged over a user-specified time period, and these values are converted to reference temperature. The water cut calculation uses these average values for  $D_o$  and  $D_w$ .
- You can enter approximate values at initial configuration, begin measurement, and recalculate NOC data at a later time when well-specific density values are known (see Section 2.3.7).

### 2.2.5 Water cut determination

There are two options for determining water cut:

- Density-based – The NOC application derives the water cut by applying the following equation:

$$\text{Water cut} = \frac{D_L - D_o}{D_w - D_o}$$

where:

- $D_L$  = Density of the liquid (oil/gas mixture), as measured by the Micro Motion sensor
- $D_o$  = Density of produced oil (user-supplied value)
- $D_w$  = Density of produced water (user-supplied value)
- Water cut monitor (external water cut) – A water cut monitor is used to measure the process stream directly, and the Series 3000 transmitter retrieves the water cut data via a HART connection. Accordingly, a HART connection between the primary mA output on the NOC platform and the water cut monitor is required.

## NOC Overview

### 2.3 NOC application features and options

This section describes several features and options of the NOC application.

#### 2.3.1 Temperature correction

Temperature correction refers to the conversion of data collected at the observed process temperature to the equivalent values at reference temperature. The NOC application automatically applies temperature correction to NOC data, using the temperature data from the RTD built into the Micro Motion sensor.

#### 2.3.2 Pressure compensation

The Series 3000 MVD NOC application can perform two types of pressure compensation:

- Pressure compensation for pressure effect
- Pressure compensation for oil density and water density

##### Pressure compensation for pressure effect

Pressure effect is defined as the change in sensor flow tube sensitivity due to the change of process pressure away from calibration pressure. The Series 3000 transmitter can adjust the sensor's raw mass or density measurements to compensate for this pressure effect.

To implement pressure compensation for pressure effect, the following information is required:

- Flow factor – the percent change in the flow rate per psi. To obtain this value, see the sensor's product data sheet and reverse the sign.
- Density factor – the change in fluid density, in g/cm<sup>3</sup>/psi. To obtain this value, see the sensor's product data sheet and reverse the sign.
- Calibration pressure – the pressure at which the flowmeter was calibrated (which therefore defines the pressure at which there will be no pressure effect). Refer to the calibration document shipped with your sensor. If the data is unavailable, use 20 psi.

*Note: For many sensors, the pressure effect is so small that pressure compensation is not required. See the sensor's product data sheet.*

##### Pressure compensation for oil density and water density

Due to the presence of gas bubbles, the density of produced oil and water can be affected by pressure. If pressure compensation for oil density and water density is enabled, the configured reference densities of oil and water are adjusted as shown in the equation below.

$$\text{RefDensity}_{\text{Applied}} = \text{RefDensity}_{\text{Configured}} \times (\text{Pressure}_{\text{Operating}} - \text{Pressure}_{\text{Reference}}) \times \text{CompensationFactor}$$

where:

- The compensation factor for oil is the value configured for Pressure Compensation for Oil Density, entered as the density change per unit of pressure change.
- The compensation factor for water is 3.0E<sup>-6</sup> g/cm<sup>3</sup>/psi.

### 2.3.3 Shrinkage factors

“Shrinkage” is a decrease in volume caused by the evaporation of solution gas, by the flashing of volatile natural gas, or by lowered temperature during the crude oil stabilization process. By estimating the shrinkage during oil storage or transport, you can estimate sellable oil based on upstream volume measurement.

The NOC application includes two shrinkage factors: one for oil and one for water. The net oil flow rate and net water flow rate measured by the NOC application are automatically multiplied by the corresponding shrinkage factor. By default, the shrinkage factors are set to 1.0, resulting in no compensation for shrinkage.

Use your standard methods to determine the appropriate shrinkage factors, taking into consideration the location of the Micro Motion sensor in your process.

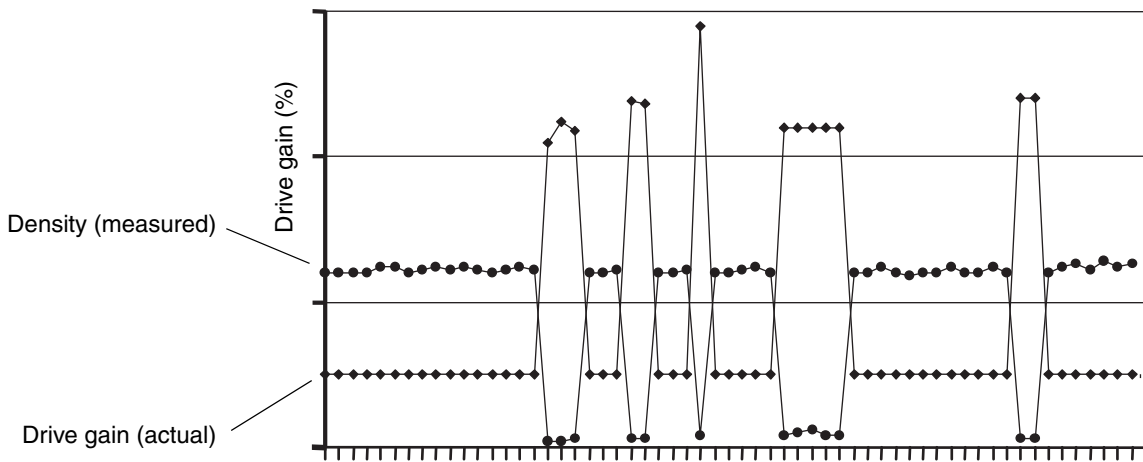
### 2.3.4 Gas carry-under – Transient Bubble Remediation (TBR)

Transient Bubble Remediation (TBR) is a standard feature of the NOC application. It is used to provide more accurate process data during intermittent gas carry-under – gas entrainment in the liquid stream. TBR is applicable only when the density-based water cut is used.

*Note: If a water cut monitor is used to measure water cut directly, see the vendor documentation for suggestions on maintaining accuracy through transient bubble conditions.*

When the density-based water cut is used to calculate net oil, transient bubbles have a negative effect on NOC measurement accuracy. Figure 2-6 shows the effect of transient bubbles on density.

Figure 2-6 Effect of transient bubbles on density



A “transient bubble condition” is defined in terms of the sensor’s drive gain: if the drive gain exceeds the configured threshold for more than three seconds, the configured TBR actions are performed. The transient bubble interval persists until drive gain is below the configured threshold for three seconds.

## NOC Overview

To determine the value to use for the drive gain threshold, observe drive gain values for this system during various flow conditions.

The NOC application can perform several different actions if transient bubbles are detected:

- Substituting a previously measured density value for the measured density value in NOC calculations (the Hold Last Value option)
- Stopping the well test (if a well test is in progress)
- Posting an alarm

Additionally, you can configure a discrete output to report TBR status (see Section 5.3).

The Hold Last Value option directs the NOC application to retrieve the measured density value from an earlier point in the process. The earlier point is identified by the configured Time Period (see Figure 2-7). The density values from a three-second period around this point are averaged, and this retrieved density average is then used in NOC calculations. Figure 2-8 shows how the Hold Last Value action affects the density measurement.

*Note: If the Time Period happens to fall into a previous transient bubble interval, the NOC application automatically extends the lookback interval as required to retrieve an averaged value from measured density values rather than substituted density values.*

**Figure 2-7 Hold Last Value option**

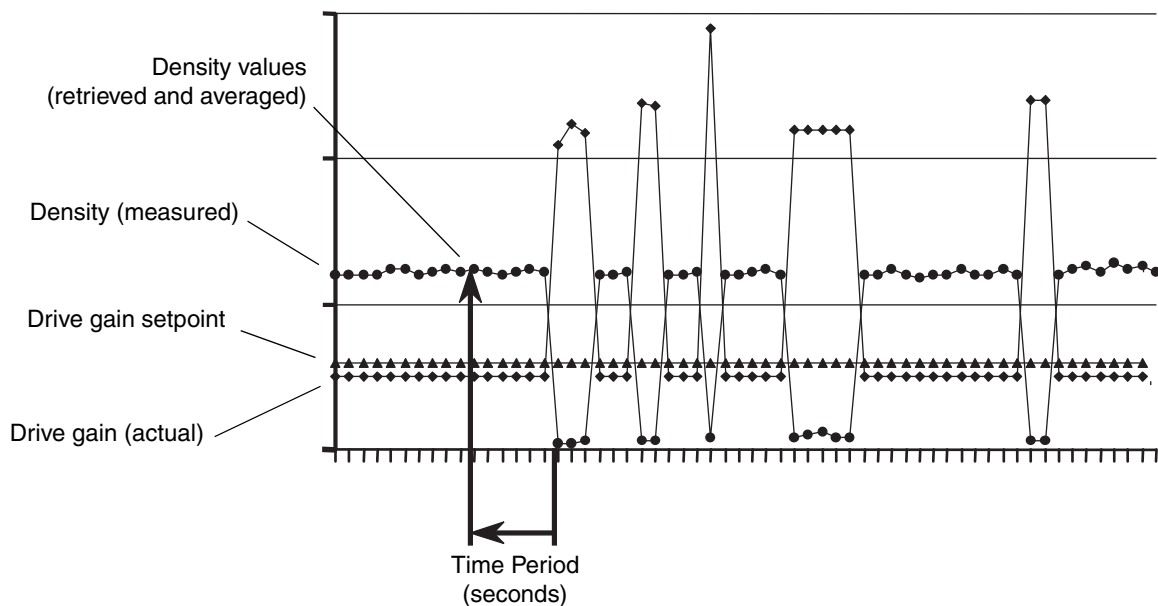
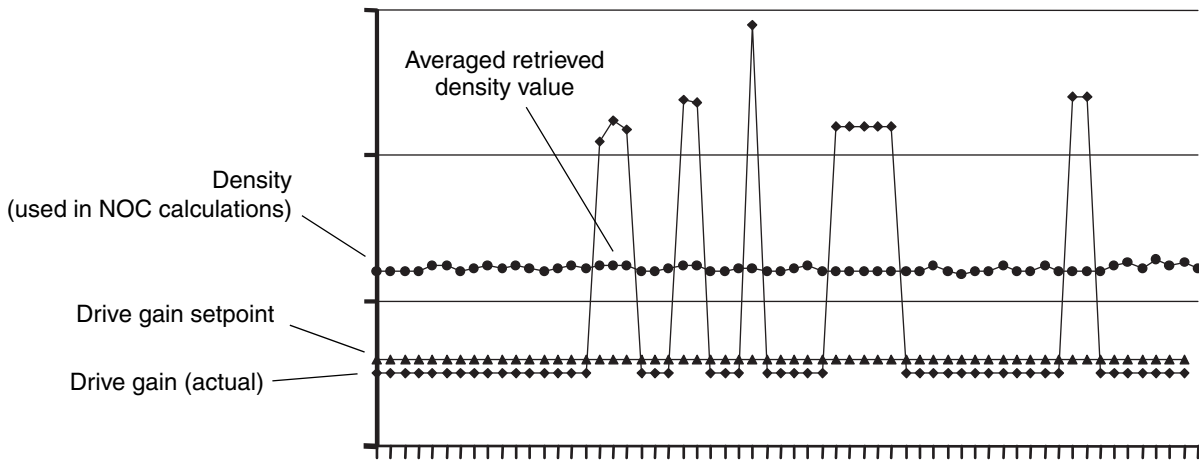




Figure 2-8 Hold Last Value effect on density measurement



### 2.3.5 Gas measurement

If you want the NOC application to report gas flow data:

- A mass flow gas meter must be installed on the gas leg
- The gas meter must be connected to the Series 3000 platform via the frequency input
- The density of produced gas at reference temperature and reference pressure must be configured in the NOC application

The Transient Mist Remediation option may be implemented to provide more accurate gas flow data during conditions of liquid carry-over. See the following section for more information on TMR.

If gas measurement without TMR will be implemented, the gas meter may or may not be a Micro Motion product. If gas measurement with TMR will be implemented, the gas meter must be a Micro Motion product.

### 2.3.6 Gas measurement with liquid carry-over – Transient Mist Remediation

Transient Mist Remediation (TMR) is an optional feature of the NOC application. It is used to provide more accurate gas flow data during intermittent liquid carry-over – liquid entrained in the gas stream. Additionally, because the liquid is assumed to be a mixture of oil and water in the same proportions as in the liquid stream, the NOC application provides the option of adding the estimated quantities back to the net oil and net water values from the liquid stream. This “addback” option provides a more accurate measurement of total oil and water production from the well.

In addition to the gas measurement requirements described in the previous section, TMR requires drive gain data from the TMR gas meter. Accordingly, a HART connection must be set up between the primary mA output on the NOC platform and the TMR gas meter.

Variations in the drive gain from the TMR gas meter are used to detect liquid carry-over. When the drive gain exceeds a user-specified threshold, liquid is assumed to be present in the gas stream. The transient mist interval persists until drive gain is below the configured threshold.

To determine the value to use for the drive gain threshold, observe drive gain values for the TMR gas meter during various flow conditions.

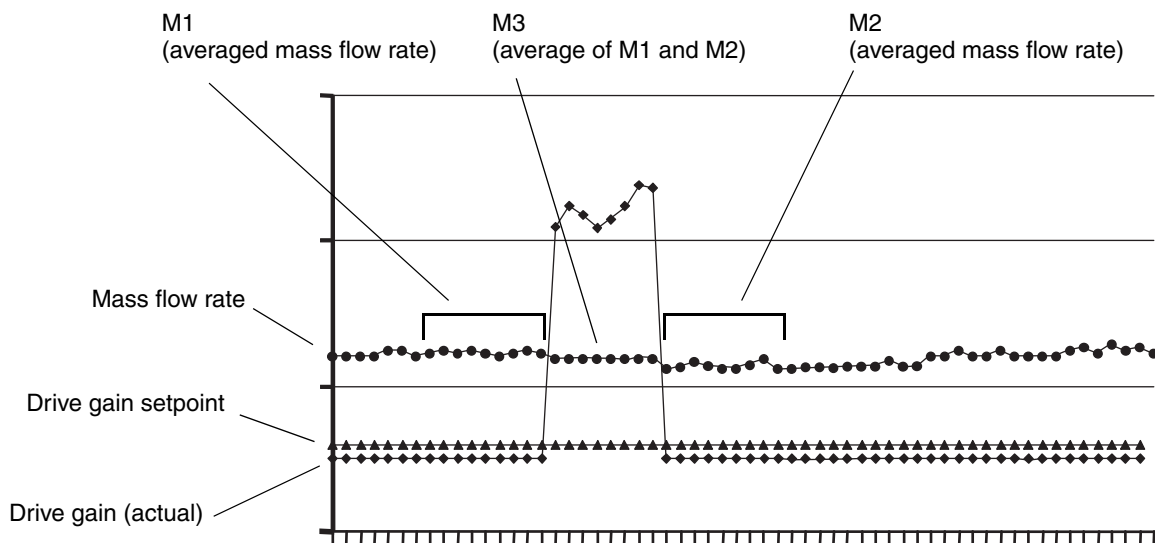
## NOC Overview

When a transient mist interval is detected:

- The mass flow rate over the previous  $n$  seconds is averaged and stored as the TMR M1 value, where  $n$  is the value configured for Time Period.
- When the drive gain drops below the configured threshold for more than three seconds, the mass flow rate over the next  $n$  seconds is averaged and stored as the TMR M2 value.

The M1 and M2 values are then averaged, and the resulting value M3 is used as the mass flow rate for the TMR interval. See Figure 2-9 for an illustration of TMR.

**Figure 2-9 TMR implementation**



### 2.3.7 Recalculation

The Recalculation feature is used to convert existing NOC data to:

- A different reference temperature
- A different oil density at reference temperature
- A different water density at reference temperature
- A different reference density of gas
- A different reference pressure
- A different pressure compensation factor for oil
- Different shrinkage factors

For example, recalculation allows you to begin NOC measurement before precise reference values are known, and then adjust the NOC data when the reference values are available.

During recalculation, you can change any or all of the values listed above. You can recalculate well test results for any of the stored well tests, and you can recalculate the Continuous mode measurement data for saved archive records.

When a well test or archive record is recalculated, the recalculated results can be saved if desired. The original data is not overwritten.

Note the following:

- Only the most recent 24 hours of data can be recalculated.
- Recalculation is based on 15-minute “snapshot” average values. As a result, recalculated data will typically be less accurate than the original data, which is based on continuous measurement.

## 2.4 Planning the configuration

This section contains a set of questions that you should answer before beginning basic configuration of the Net Oil Computer Software and the NOC system.

*Note: These questions are specific to implementation of the NOC system. They do not address basic system configuration (e.g., configuring the clock, passwords, events, communications, etc.).*

1. Will this system be used to test multiple wells or to perform continuous measurement of a single well?
2. If it will be used for well testing, what wells will be tested? in what order?
3. Will you use density-based water cut data or a water cut monitor? If you are using a water cut monitor, what is its range?
4. For all wells that will be measured:
  - a. What is the oil density at reference temperature? If not known, will you perform a density determination?
  - b. What is the water density at reference temperature? If not known, will you perform a density determination?
  - c. (Well Test mode only) What is the well’s purge time?
5. Will you use HART communications for any of the following: water cut data, pressure data, or TMR data? If yes:
  - a. What is (are) the HART tag(s) of the external device(s)?
  - b. Is the primary mA output wired to support HART communications with the external device(s)?
6. Does the system include gas measurement? If yes:
  - a. Is the frequency input wired to the gas meter?
  - b. What is the reference density of the gas (density at reference temperature and pressure)?
7. Will TBR be configured? If yes, what drive gain will be used as the TBR threshold?
8. Will TMR be configured? If yes, what drive gain will be used as the TMR threshold?
9. If you will configure pressure compensation for oil density, what is the value to use?
10. If you will configure shrinkage factors, what are the values to use?

## NOC Overview

### 2.5 NOC measurement terminology

The terms used in NOC measurement are listed and defined in Table 2-1. These terms are used in a variety of process variables and locations throughout the NOC application.

**Table 2-1 NOC measurement terms and definitions**

<b>NOC term</b>	<b>Definition</b>
Gross	The sum of the oil volume and the water volume, as measured by the NOC application. If TMR carry-over is implemented, this value includes oil and water from the gas leg.
Net oil	Oil only, measured by volume, corrected to reference temperature, with the oil shrinkage factor applied. If TMR carry-over is implemented, this value includes oil from the gas leg.
Water cut	Percentage of water in production stream, corrected to reference temperature, with the water shrinkage factor applied.
Uncorrected water cut	Percentage of water in production stream at operating conditions.
Net water	Water only, corrected to reference temperature, with the water shrinkage factor applied. If TMR carryover is implemented, this value includes water from the gas leg.
Back flow	Uncorrected volume flow moving backward through the sensor.
Uncorrected oil	Oil only, through the oil or oil/water leg, measured by volume, with no corrections applied. Any configured pressure compensations are applied. Temperature correction and shrinkage factors are not applied.
Uncorrected water	Water only, through the oil or oil/water leg, measured by volume, with no corrections applied. Any configured pressure compensations are applied. Temperature correction and shrinkage factors are not applied.
Uncorrected gross	Raw volume flow measurement from the oil or oil/water leg.
Density	Density of the mixture, with no corrections applied.
Carry-over	Oil and water entrained in the gas stream and added back to the net oil and net water measurements
Carry-under	Gas entrained in the liquid stream
Gas volume	Volume of gas in the gas stream, calculated by the NOC application from mass flow data from the gas meter
Actual	Flow rate as measured at the time of viewing
Average	Rolling average, calculated from the beginning of the applicable time period.
Total	Rolling total, calculated from the beginning of the applicable time period.

# Chapter 3

## Using the Display and Menu System

### 3.1 About this chapter

This chapter explains how to use the Series 3000 display and menu system. Using the display, you can move through the menus, configure the application, monitor and control the application, and perform maintenance and diagnostic tasks:

All NOC operations are accessed from the Well Performance Measurement screen.

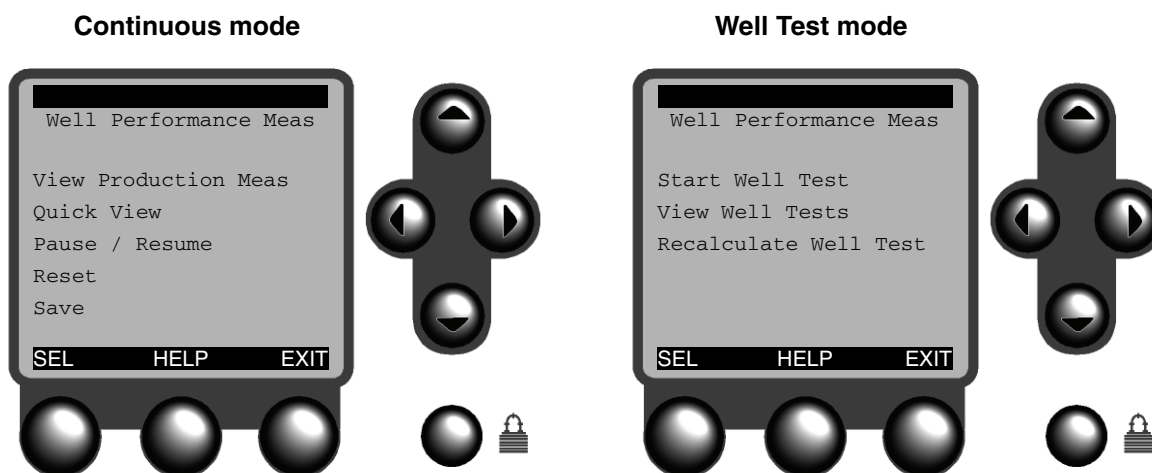
All configuration, maintenance, and other functions are accessed via the Management menu.

### 3.2 Startup and Well Performance Measurement screen

When the Series 3000 device is powered on, it automatically tests its display. During display testing, the screen darkens for approximately five seconds. After the display test is completed:

1. The Micro Motion logo is displayed for two to three seconds.
2. An application list is displayed for two to three seconds.
3. The device enters operation mode and the Well Performance Measurement screen is displayed, as shown in Figure 3-1. There are two versions of this screen, depending on whether the NOC application is in Continuous mode or Well Test mode. All NOC operations are accessed from this screen.
4. If there are any active alarms, the alarm category will be displayed in the alarm bar. To view, acknowledge, or respond to the alarms, see Chapter 6.

Figure 3-1 Well Performance Measurement screen



### 3.3 Menu systems

Most Series 3000 display functions are organized into two menu systems:

- The Management menu allows you to perform configuration and maintenance tasks.
- The View menu allows you to monitor and control the process. The Well Performance Measurement screens shown in Figure 3-1 are part of the View menu.

Figures 3-2 and 3-3 show high-level views of these menu systems. More detailed menus for the NOC application are provided in Chapters 4 and 5, and menu flowcharts for the Series 3000 device with the NOC application are provided in Appendix A.

Figure 3-2 Management menu

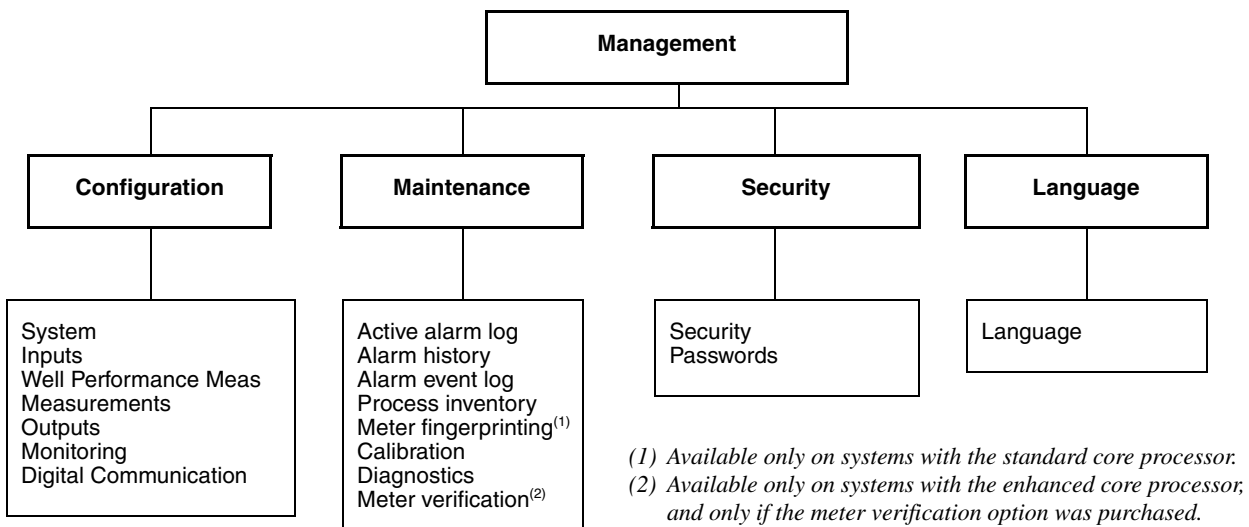
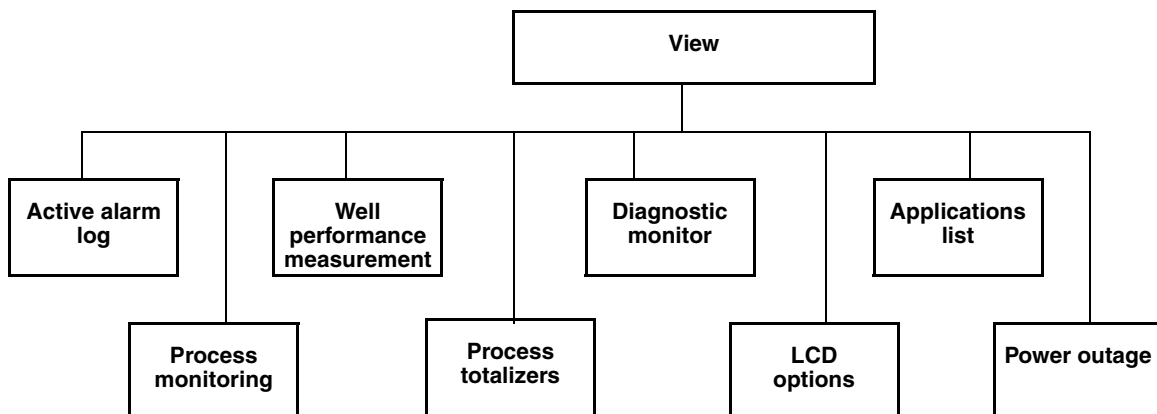


Figure 3-3 View menu



To enter the menus:

- To enter the Management menu system, press the **Security** button. The **Security** button is in the lower right corner of the display, marked with a padlock icon (see Figure 3-1). You may or may not be required to enter a password (see the following section).
- To move from the Well Performance Measurement screen to the top-level View menu, press the **EXIT** button (see Figure 3-1).

### 3.3.1 Accessing management functions

You can use the **Security** button to access management functions from any point in the Series 3000 menus. When the **Security** button is pressed:

- If security is disabled, the Management menu will be displayed immediately. By default, security is disabled.
- If security has been enabled, you will be prompted to enter a password. There are two passwords:
  - The configuration password enables access to all functions. When it is entered, the Management menu is displayed.
  - The maintenance password enables access to the maintenance functions. When it is entered, the Maintenance menu is displayed.

Both passwords consist of a sequence of four cursor control button presses. To enter a password:

1. Press the four cursor control buttons in the correct sequence.
2. Press **SEL**.

To configure and enable security, see Chapter 6.

### 3.3.2 Shortcuts

From any point in the menu system, you can:

- Return to the Management menu (if security is disabled) or the password entry screen (if security is enabled) by pressing the **Security** button, as described in the previous section.
- Return to the operating screen by pressing the **Security** button, then pressing the **EXIT** button.

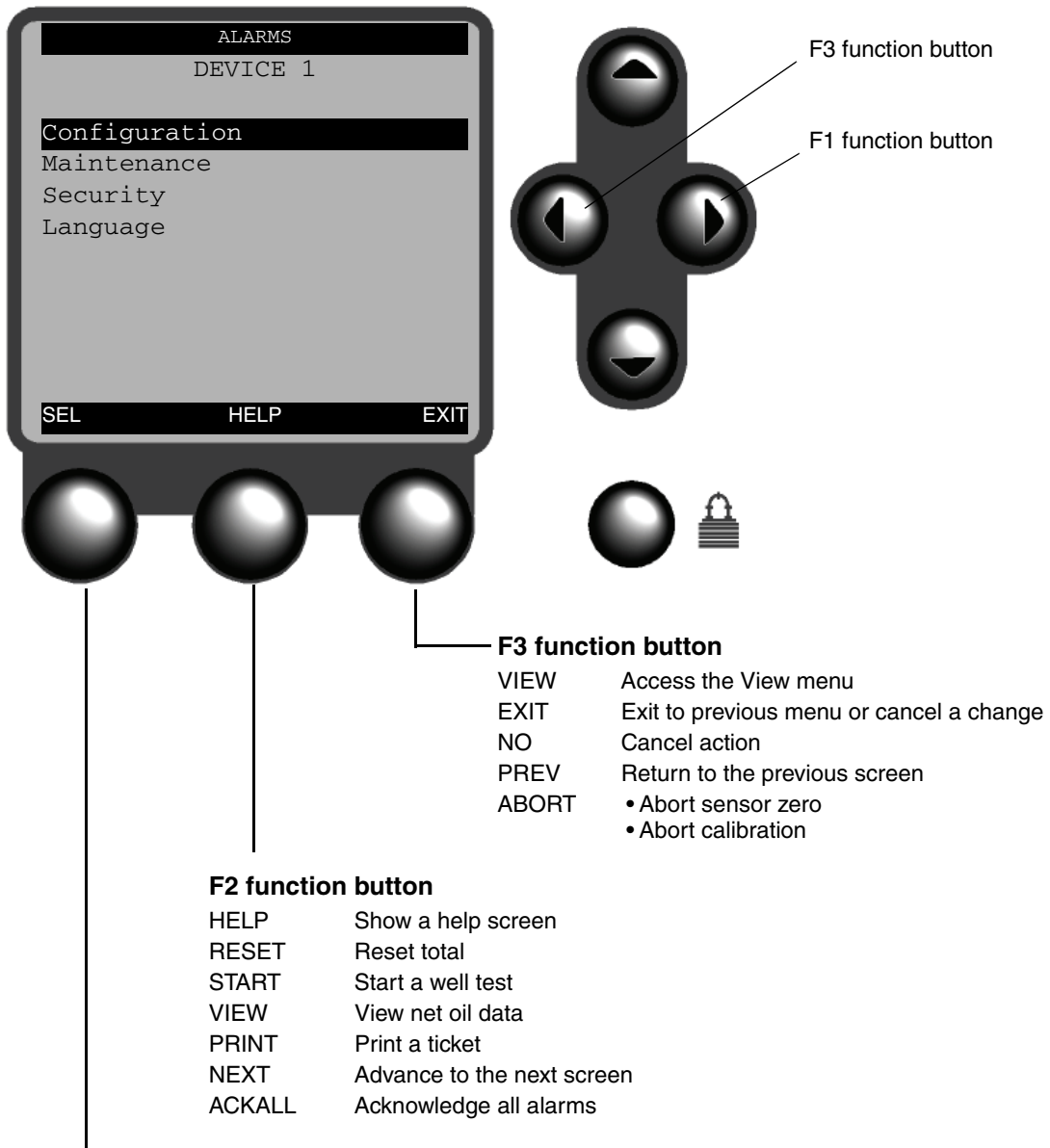
## 3.4 Using the function buttons

The buttons at the bottom of the display are the function buttons. The functions performed by the buttons vary, depending on the screen and the current state of the application. The function currently assigned to the button is always displayed on the screen, above the button. The buttons are sometimes referred to as F1, F2, and F3. Figure 3-4 lists the functions supported by the NOC application.

*Note: The left and right cursor control buttons may also be used as function buttons. See Figure 3-4.*

If a cursor is shown on the display, the action performed by the function button applies to the item where the cursor is located. Before pressing a function button, be sure the cursor is located correctly. See Section 3.5.

Figure 3-4 Function buttons



**F3 function button**

- VIEW Access the View menu
- EXIT Exit to previous menu or cancel a change
- NO Cancel action
- PREV Return to the previous screen
- ABORT
  - Abort sensor zero
  - Abort calibration

**F2 function button**

- HELP Show a help screen
- RESET Reset total
- START Start a well test
- VIEW View net oil data
- PRINT Print a ticket
- NEXT Advance to the next screen
- ACKALL Acknowledge all alarms

**F1 function button**

- SEL Select the highlighted menu item
- CHG Make a change to the highlighted menu item
- SAVE Save a change
- YES Proceed with action
- ACK Acknowledge an alarm message
- START Start well test or density determination
- STOP Stop well test or density determination
- RESET Measurement group or all measurements
- PAUSE (Continuous mode) Pause NOC measurement
- RESUME (Continuous mode) Resume NOC measurement
- NEXT Test next well
- RETURN Exit to Well Test screen
- CLEAR Clear power outage events
- OK Acknowledge



### 3.5 Using the cursor control buttons

The cursor control buttons move the cursor around the display menus. In menus, the cursor is a reverse-video highlight bar.

- Use the **Up** and **Down** buttons to locate the cursor at the menu item you want to select or change.
- After locating the cursor at the desired menu item, press **SEL** or **CHG**, or the **Right** button, to select or change the item.

#### 3.5.1 Selecting from a list

For enumerated lists, pressing **CHG** will display a separate screen from which you can choose the desired option. From that screen:

- Press **SAVE** to save the change and return to the previous screen, or
- Press **EXIT** or the **Left** button to return to the previous screen without saving.

#### 3.5.2 Changing a variable value

If you need to change the value of a variable, the cursor appears as a line under a character in the current value.

- If the variable has a value of Yes or No, all cursor control buttons toggle between the two choices.
- If the variable has a numeric or character value, press the **Up** and **Down** cursor control buttons to increase or decrease the value of the character at the cursor.
- If the variable has more than one digit or character, press the **Left** and **Right** cursor control buttons to move the cursor to the next or previous character.

When the value is correct, press **SAVE**.

Press **EXIT** to return to the previous screen without saving.

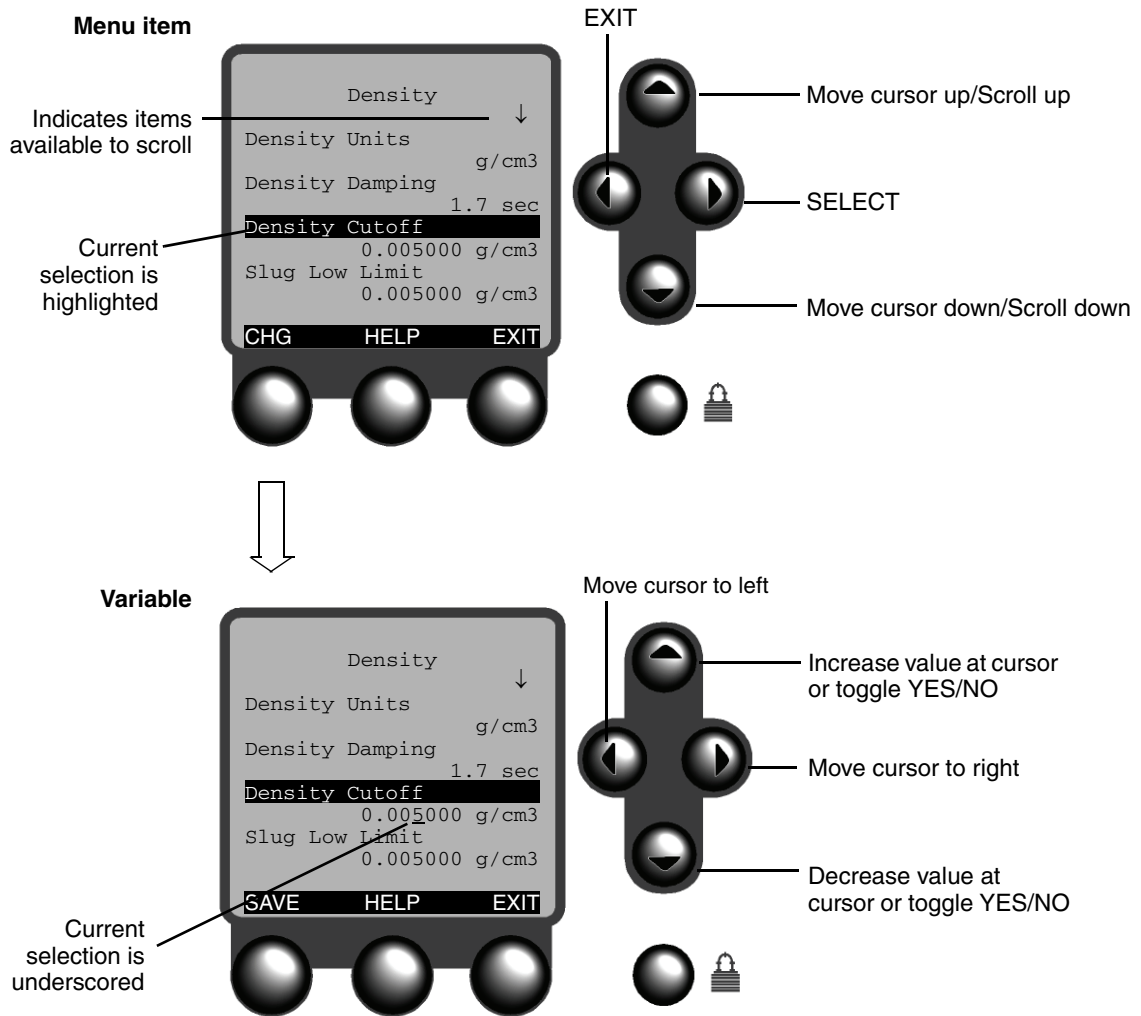
#### 3.5.3 Cursor control example

Figure 3-5 shows a typical configuration sequence involving both a menu item and a variable. Pressing **HELP** produces a screen that has help for the item at the cursor.

### 3.6 Scientific notation

Scientific notation is used on some screens for displaying values that contain more digits than the display can show, or that exceed the precision of the floating point data type. For example, the value **1234000.000** would be displayed as **1.234E6** or **1.234+6**.

Figure 3-5 Cursor control buttons



# Chapter 4

## Configuring the NOC Application

### 4.1 About this chapter

This chapter explains how to configure the NOC application and perform density determination procedures.

The following topics are discussed:

- Basic configuration procedure – see Section 4.3
- Setting up a water cut monitor – see Section 4.4
- Setting up pressure compensation – see Section 4.5
- Setting up Transient Bubble Remediation – see Section 4.6
- Setting up gas measurement – see Section 4.7
- Setting up Transient Mist Remediation – see Section 4.8
- Performing density determination procedures – see Section 4.9
  - Density determination for water – see Section 4.9.1
  - Density determination for oil – see Section 4.9.2

Failure to perform configuration tasks in the proper sequence could result in an incomplete configuration. See Section 1.3 for the recommended configuration sequence.



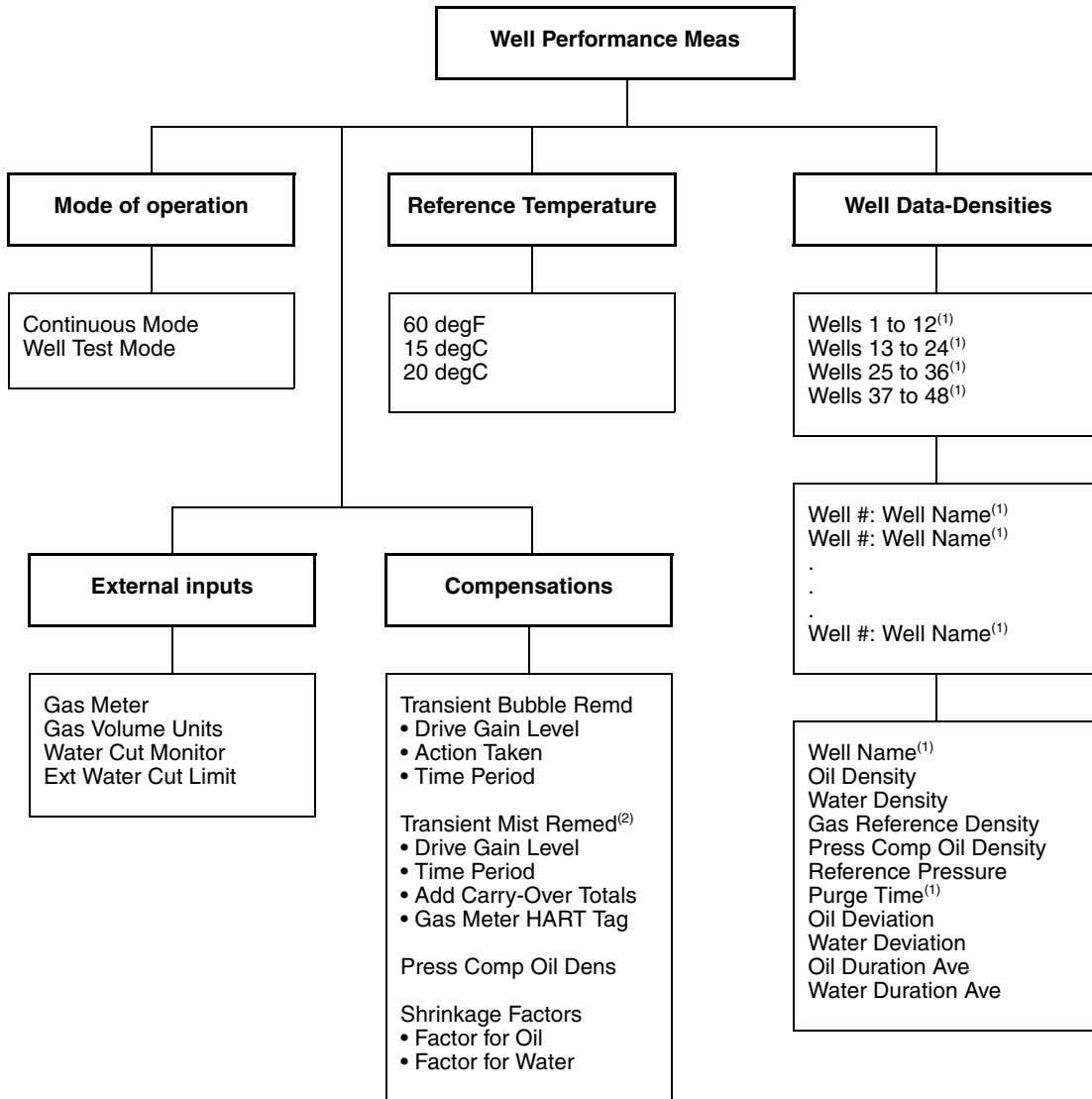
**Do not change configuration during data collection. Changes made to the NOC configuration will affect NOC measurement. Changes made to other configuration parameters may affect NOC measurement.**

**To ensure accurate NOC data, follow the instructions in Section 5.2.4 (Well Test mode) or Section 5.3.4 (Continuous mode) to change configuration.**

### 4.2 Well Performance Measurement menu

Use the Well Performance Measurement menu, shown in Figure 4-1, to access and configure NOC parameters. The Well Performance Measurement menu is accessed through the Configuration option of the Management menu. To access the Management menu, see Chapter 3.

Figure 4-1 Well Performance Measurement menu



(1) Displayed only in Well Test mode.

(2) Displayed only if the Transient Mist Remediation option was purchased.

### 4.3 Basic configuration procedure

To configure the NOC application, the following general steps are required:

1. Set **Mode of Operation** to **Continuous** or **Well Test**.
  - In Continuous mode, one well, separator, or pipeline is monitored continuously. A reset function is used to define the starting point for totals, averages, and maximum/minimum values.
  - In Well Test mode, a well test may be performed on any of the wells on a manifold, up to 48 wells. Each well is configured independently and well test data is stored separately.
2. Set **Reference Temperature** to the reference temperature to be used by the NOC application.
3. If you are using Continuous mode, use the Well Data-Densities menu to set the well parameters for the well to be measured. See Table 4-1 for definitions of these parameters.

## Configuring the NOC Application

4. If you are using Well Test mode:
  - a. Use the Well Data-Densities menu to specify the well to configure.
  - b. Assign a name to the well.
  - c. Use the Well Data-Densities menu to set the well parameters for the well to be measured. See Table 4-1 for definitions of these parameters.
  - d. Repeat for all wells in the system.

*Note: Micro Motion recommends configuring wells in the order in which they will be tested. For example, the first well to be tested should be Well 1; the second well should be Well 2, and so on. If you do this, you can use the NEXT function to move to the next well automatically.*

**Table 4-1 Well parameters**

Parameter	Default	Description
Well name	None	(Well Test mode only) Enter a name to identify this well. The name may contain a maximum of 16 characters, including spaces.
Oil density	0.8000 g/cm <sup>3</sup>	The density of oil from this well, at reference pressure and reference temperature. Required only if density-based water cut will be used. See Section 2.2.5.
Water density	1.0000 g/cm <sup>3</sup>	The density of water from this well, at reference pressure and reference temperature. Required only if density-based water cut will be used. See Section 2.2.5.
Gas reference density	0.001205 g/cm <sup>3</sup>	(Used only if gas measurement is implemented) The density of gas from this well at reference pressure and reference temperature.
Pressure compensated oil density	0.0000 g/cm <sup>3</sup> /PSI	The factor used to compensate the configured reference density of oil for the effect of pressure. See Section 2.3.2.
Reference pressure	0.0 PSI	The reference pressure value used to correct line density values to standard density values.
Purge time	0 sec	(Well Test mode only) The measurement delay period after a well test has been started. Used to allow the separator to empty any contents from the previous test.
Oil deviation	0.5000 kg/m <sup>3</sup>	The maximum acceptable difference between two consecutive density readings during a density determination for oil. If the difference is greater than the configured oil deviation, the density averaging is restarted. See Section 4.9.2.
Water deviation	0.5000 kg/m <sup>3</sup>	The maximum acceptable difference between two consecutive density readings during a density determination for water. If the difference is greater than the configured oil deviation, the density averaging is restarted. See Section 4.9.1.
Oil duration ave	30 sec	The sample time, in seconds, for an oil density determination procedure. See Section 4.9.2.
Water duration ave	30 sec	The sample time, in seconds, for an in-line water density determination procedure. See Section 4.9.1.

5. Use the External Inputs menu shown in Figure 4-1 to enable or disable use of a water cut monitor. If **Water Cut Monitor** is enabled, additional setup is required. See Section 4.4.
6. Use the External Inputs menu shown in Figure 4-1 to enable or disable gas measurement. If **Gas Meter** is enabled, additional setup is required. See Section 4.7.

## Configuring the NOC Application

7. Set the parameters in the Compensations menu as desired.
  - For **Transient Bubble Remediation**, see Section 2.3.4 for a discussion of this feature, and see Section 4.6 for additional setup instructions.
  - For **Transient Mist Remediation**, see Section 2.3.6 for a discussion of this feature, and see Section 4.8 for additional setup instructions.
  - For **Pressure Compensated Density**, see Section 2.3.2 for a discussion of this feature, and see Section 4.5 for additional setup instructions.
  - For **Shrinkage Factors**, see Section 2.3.3 for a discussion of this feature. To “disable” shrinkage factors, set them to 1.0.
8. If desired, configure discrete outputs, milliamp outputs, or the frequency output to report NOC data. To do this, refer to the manual entitled *Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual* and:
  - a. Assign the desired process variable to the output. Available NOC process variables are listed in Table 4-2.
  - b. Configure other output parameters as desired.

**Table 4-2 Assigning NOC process variables to outputs**

NOC process variable	Can be assigned to		
	Discrete outputs	Milliamp outputs	Frequency output
TBR event <sup>(1)</sup>	✓		
External water cut		✓	
Uncorrected oil volume rate		✓	✓
Uncorrected water cut		✓	
Uncorrected water volume rate		✓	✓
Back flow rate		✓	✓
Net oil flow rate		✓	✓
Net water cut		✓	
Gross volume rate		✓	✓
Net water flow rate		✓	✓
Average uncorrected oil rate		✓	
Average uncorrected water cut		✓	
Average uncorrected gross rate		✓	
Average uncorrected water rate		✓	
Average back flow rate		✓	
Average net oil flow rate		✓	
Average net water cut		✓	
Average gross volume rate		✓	
Average net water rate		✓	
Average gas volume flow rate		✓	

(1) ON = TBR active; OFF = TBR inactive.

## Configuring the NOC Application

9. If desired, configure the severity level of the NOC status alarms. The status alarms listed in Table 4-3 indicate specific states of the NOC application. Like all other status alarms on the Series 3000 platform, they can be configured for three different severity levels – Ignore, Info, and Fault. To configure the NOC status alarms, see the instructions in the manual entitled *Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*.

**Table 4-3 NOC status alarms**

Category	Alarm number	Maintenance menu listing	Description	Alarm severity		
				Default	User config?	Affected by fault timeout
Electronics	A136	Power Outage	The power was off for at least 30 seconds.	Info	Yes	No
Process	A138	TBR Active	The drive gain has exceeded the configured TBR threshold.	Info	Yes	No
	A139	Water Cut Overrange	The water cut measured by the water cut monitor is above the configured External Water Cut Limit.	Info	Yes	No
	A140	TMR Active	The drive gain has exceeded the configured TMR threshold.	Info	Yes	No
Configuration	A137	Measurements Paused	Continuous mode measurements have been paused for more than 15 minutes.	Info	Yes	No

## Configuring the NOC Application

10. If desired, configure the process monitor to display NOC process variables. Instructions for configuring the process monitor are in the manual entitled *Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*. The following NOC process variables can be assigned to the process monitor:

- External Water Cut
- Uncorrected Water Cut
- Net Water Cut
- Uncorrected Oil Volume Rate
- Uncorrected Oil Total
- Uncorrected Oil Inventory
- Uncorrected Water Volume Rate
- Uncorrected Water Total
- Uncorrected Water Inventory
- Back Flow Rate
- Back Flow Total
- Back Flow Inventory
- Net Oil Flow Rate
- Net Oil Total
- Net Oil Inventory
- Net Water Flow Rate
- Net Water Total
- Net Water Inventory
- Gross Volume Rate
- Gross Volume Total
- Gross Volume Inventory
- Gas Volume Flow Rate
- Gas Volume Total
- Gas Volume Inventory

*Note: The process monitor may also be used to display other variables such as external pressure, external temperature, etc. This may be useful to verify setup and configuration.*



### 4.4 Setting up a water cut monitor

If you will use a water cut monitor:

1. Ensure that the water cut monitor is correctly installed and tested, and configured to report water cut data in %.
2. Enable the water cut monitor as an external input, as described in Section 4.3, Step 5.
3. If desired, specify a value for **Ext Water Cut Limit**. When the measured water cut exceeds this value, an alarm will be posted. Micro Motion recommends setting this parameter to the highest value in your water cut monitor's range. To disable the alarm, set the value to 100%.
4. Set up a HART polling connection between the Series 3000 device and the water cut monitor as follows:
  - a. Ensure that the primary mA output has been wired to support HART protocol, and that it has a HART connection to the water cut monitor.
  - b. From the Configuration menu shown in Figure 3-2, select **Inputs>External Inputs**.
  - c. Select **Polling Variable 1** or **Polling Variable 2**.
  - d. Set **Polling Control** to **Poll as Primary** or **Poll as Secondary**.
  - e. Set **Polled Variable** to **External Water Cut**.
  - f. Specify the tag of the device to be polled.
5. To verify that water cut data is being received, view the current water cut value as shown in Figure 5-2 (Well Test mode) or Figure 5-3 (Continuous mode). Ensure that the displayed value matches the value sent by the water cut monitor.

### 4.5 Setting up pressure compensation

To set up pressure compensation:

1. Obtain the external pressure value, as described in Section 4.5.1
2. Enable and configure pressure compensation for oil density and water density and/or pressure compensation for pressure effect, as described in Sections 4.5.2 and 4.5.3.

The same external pressure value is used for both types of pressure compensation.

#### 4.5.1 Obtaining the external pressure value

To obtain the external pressure value, you must set up a HART polling connection between the Series 3000 device and the external pressure device, as follows;

1. Ensure that the primary mA output has been wired to support HART protocol, and that it has a HART connection to the external pressure device.
2. See Figure 3-2. Select **Configuration>Inputs>External Inputs**, and:
  - a. Select **Polling Variable 1** or **Polling Variable 2**.
  - b. Set **Polling Control** to **Poll as Primary** or **Poll as Secondary**.
  - c. Set **Polled Variable** to **Pressure**.
  - d. Specify the tag of the device to be polled.
  - e. Set **Pressure Units** to the units used by the external pressure device.
3. To verify, configure the process monitor to display the external pressure value and observe the pressure data.

## Configuring the NOC Application

### 4.5.2 Setting up pressure compensation for oil density and water density

To set up pressure compensation for oil density and water density:

1. See Figure 4-1. In the Well Data-Densities menu, set **Press Comp Oil Density** to the factor to be used to compensate for the effect of pressure on oil density.
2. In the Compensations menu, set **Press Comp Density** to **Enable**.

### 4.5.3 Setting up pressure compensation for pressure effect

To set up pressure compensation for pressure effect:

1. See Figure 3-2. Select **Configuration>Inputs>External Inputs**, and:
  - a. Select the **Polling Variable** that you have defined for pressure.
  - b. Set **Pressure Compensation** to **Enable**.
  - c. Set **Flow Factor**, **Density Factor**, and **Cal Pressure** to the appropriate values for your sensor. See Section 2.3.2.

## 4.6 Setting up Transient Bubble Remediation

To set up TBR:

1. See Figure 4-1. In the Compensations menu, select **Transient Bubble Remd**, and:
  - a. Set **Drive Gain Level** to the drive gain value (in percent) that represents a transient bubble condition in this process stream. To determine the best value, you may find it useful to observe drive gain values for this system using the **View>Well Performance Measurements>View Production Measurements** menu.
  - b. Set **Action Taken** to the desired action.
  - c. Set **Time Period** to the number of seconds that the transmitter will look back to retrieve a density value.
2. If desired, configure a discrete output to report TBR status. See Section 4.3, Step 8.

## 4.7 Setting up gas measurement

To set up and enable gas measurement:

1. Ensure that the external gas measurement device is correctly installed and tested, and configured to report gas data in the units that will be used in the NOC application.
2. Ensure that the external gas measurement device has been wired to the frequency input of the Series 3000 platform.
3. At the Series 3000 platform, configure the frequency input and perform a loop test, as described in the manual entitled *Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*.
4. See Figure 4-1. In the External Inputs menu:
  - a. Set **Gas Meter** to **Enable** (see Section 4.3, Step 6).
  - b. Set **Gas Volume Units** to the units to be used for gas measurement.

5. In the Well Data–Densities menu, set **Gas Reference Density** to the reference density of the gas from this well.
  - In Continuous mode – set for the well to be measured
  - In Well Test mode – set for each well to be measured
6. To verify that gas data is being received, view the current gas volume as shown in Figure 5-1 (Well Test mode) or Figure 5-3 (Continuous mode). Ensure that the displayed value matches the value sent by the gas measurement device.

### 4.8 Setting up Transient Mist Remediation

To set up TMR:

1. Ensure that a Micro Motion meter has been installed on the gas leg, and that it is operating correctly.
2. Follow the instructions in Section 4.7 to set up and enable gas measurement.
3. At the TMR gas meter:
  - a. Set the primary variable (the variable reported over the primary mA output) to drive gain.
  - b. Define a HART tag (software tag) for the device.
4. Ensure that the primary mA output of the Series 3000 platform has been wired to support HART protocol, and establish a HART connection to the TMR gas meter.
5. Refer to Figure 4-1. In the Compensations menu, select **Transient Mist Remed**, and:
  - a. Set **Drive Gain Level** to the drive gain value (in percent) that represents a transient mist condition in this process stream. To determine the best value, you may find it useful to observe drive gain values for the TMR gas meter.
  - b. Set **Time Period** to the number of seconds over which the transmitter will average mass flow data.
  - c. Set **Add Carry-Over Totals** as desired. If set to Yes, the estimated oil and water quantities from the gas leg will be added to the net oil and net water data from the oil/water leg.
  - d. Set **Gas Meter HART Tag** to the HART tag of the TMR gas meter.
6. To verify that drive gain data is received, view the current drive gain value as shown in Figure 5-1 (Well Test mode) or Figure 5-3 (Continuous mode).

### 4.9 Performing density determination procedures

All density determination procedures are accessed from Management>Maintenance>Calibration (see Section 3-2). When you select Density Determination from the Calibration menu:

- In Continuous mode, the Last Dates screen shown in Figure 4-2 is displayed.
- In Well Test mode, the well selection screens are shown first. After a well has been selected, the Last Dates screen shown in Figure 4-2 is displayed.

The Last Dates screen shows the date and time of the most recent oil and density determination procedures performed to completion on this device.

If you choose to continue, the Procedure Selection screen shown in Figure 4-3 is displayed.

If you are performing both a density determination for oil and a density determination for water, it is typically more convenient to perform the density determination for water first.

Figure 4-2 Density determination – Last Dates screen

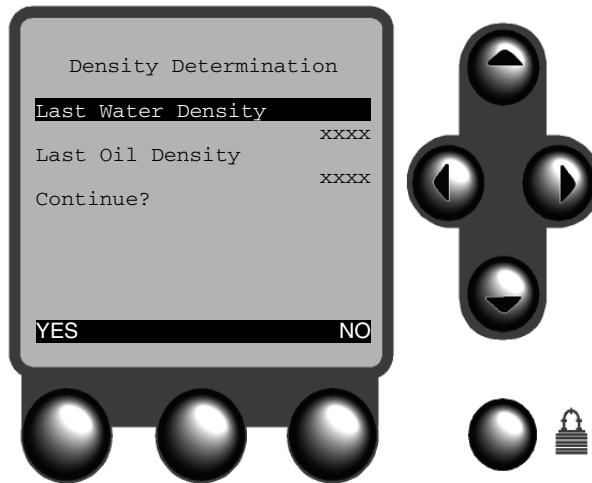
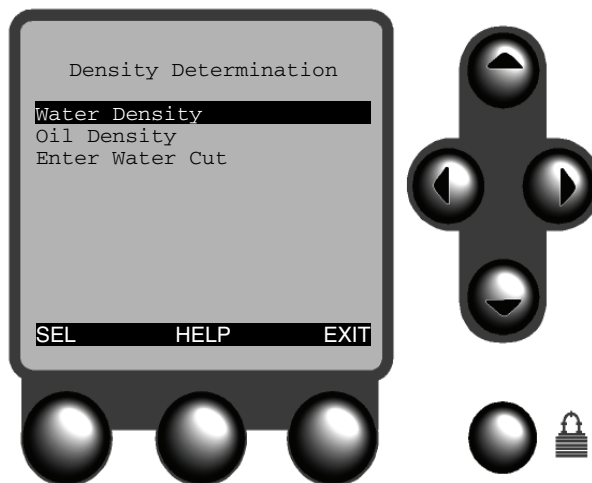


Figure 4-3 Density determination – Procedure Selection screen



#### 4.9.1 Performing a density determination for water

There are two density determination methods for water: in-line and manual. The in-line method requires enough water in the separator to supply a stable flowing density for the density determination period. If there is not enough water, you must use the manual method. This section provides instructions for both methods.

### In-line density determination for water

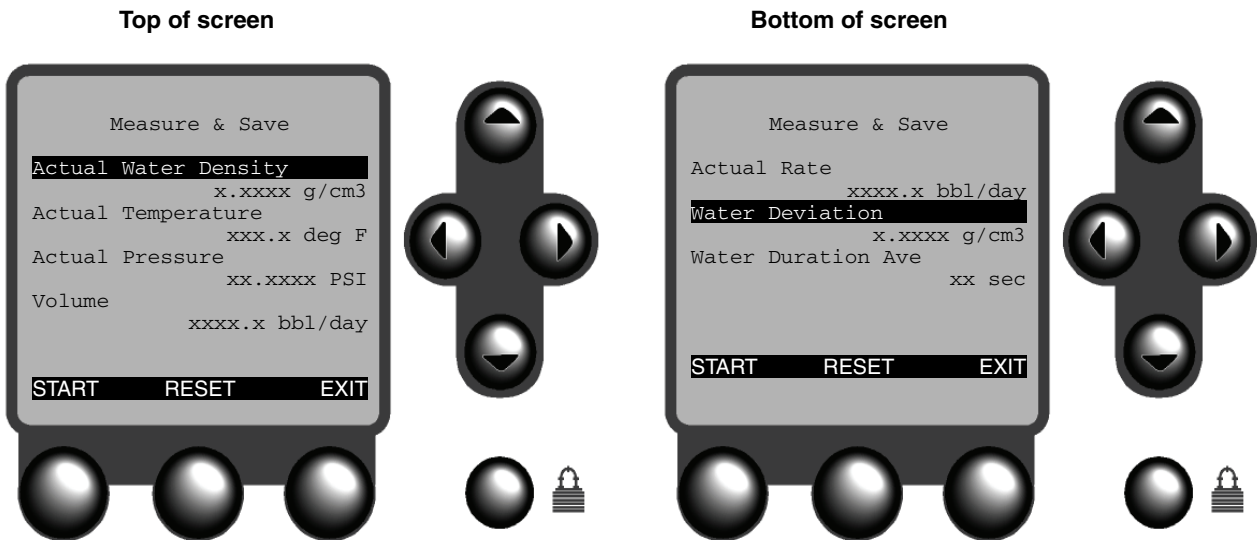
To perform a in-line density determination for water:

1. Ensure that the correct fluid (water) is flowing through the sensor. You may need to close the outlet valve from the separator and wait for the phases to settle, then open the outlet valve.
2. From the Calibration menu, select **Density Determination** and work through the screens until the Procedure Selection screen (see Figure 4-3) is displayed. In Well Test mode, you will be required to select the well for which the procedure will be performed.
3. From the Procedure Selection screen, select **Water Density**.
4. From the next screen, select **Measure and Save**.
5. The display now shows the current values for water density, water temperature, volume, flowrate, and pressure (if pressure compensation for water density is enabled), plus the configured Water Deviation and Water Duration Ave values (see Figure 4-4). Monitor the density and temperature values, watching for the density and temperature readings to stabilize.

*Note: The Water Deviation and Water Duration Ave values shown here are read-only. If you need to change them, you must reconfigure the well data. See Section 4.3.*

6. (Optional) Press **RESET** to reset the volume total to 0. This enables you to monitor the amount of fluid that remains in the separator (if the separator volume is known).

Figure 4-4 Density determination for water – Preparing to start



7. When the density and temperature readings have stabilized, press **START**. The NOC application will now average the density and temperature of the process fluid until a good sample is achieved.

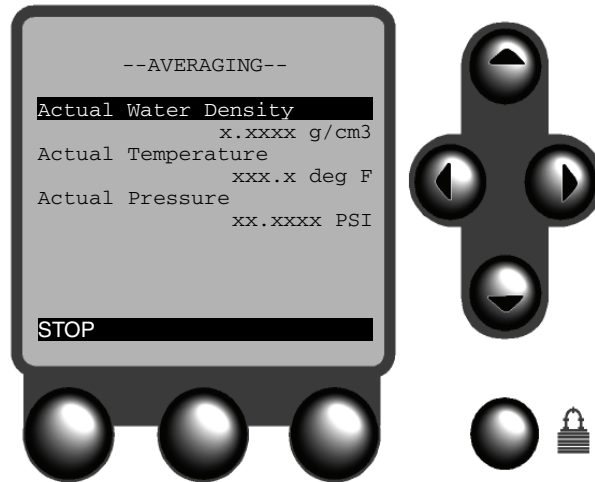
A “good sample” means that, for the configured Water Duration Ave, no two consecutive density readings differed by more than the configured Water Deviation limit. If the water deviation limit is exceeded, averaging is restarted.

*Note: If the averaging procedure does not end automatically, you may need to verify your process fluid or increase the Water Deviation value.*

## Configuring the NOC Application

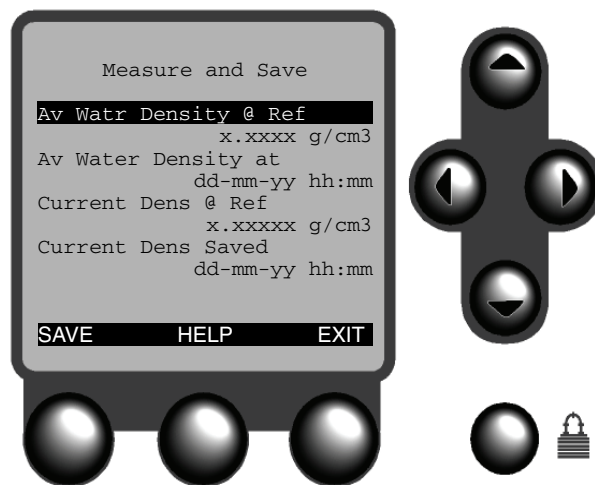
During this period, the screen shown in Figure 4-5 is displayed. (The current pressure value may or may not be displayed.) You can press **STOP** to stop the averaging. You will be returned to the previous screen.

**Figure 4-5 Density determination for water – In process**



8. When the good sample is achieved, the results are shown on a screen similar to Figure 4-6. This screen also displays the stored value for water density at reference temperature, and the date and time and which this value was stored.
  - To discard the data from this procedure, press **EXIT**. You will be returned to the Procedure Selection screen. From this point you can repeat the density determination procedure or press **EXIT** to move up the menu and return to other functions.
  - To replace the stored value with the new value, press **SAVE**.

**Figure 4-6 Density determination for water – In-line procedure results**



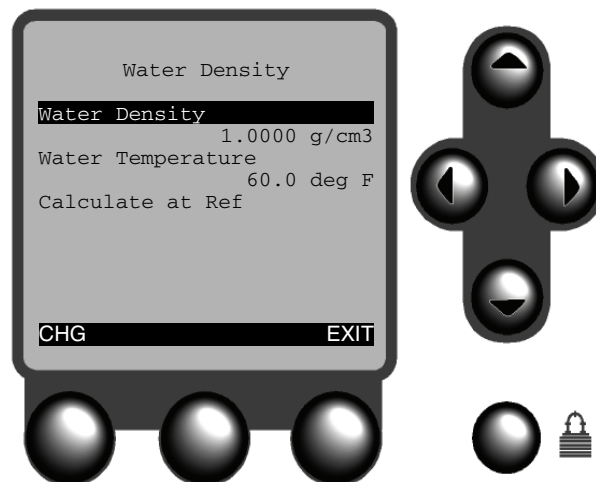
9. If pressure compensation for oil density and water density is enabled, pressure data from the beginning of the density determination procedure is displayed, along with the stored reference pressure.
  - Press **SAVE** to save the current pressure value as the new reference pressure.
  - Press **EXIT** to retain the existing reference pressure.

**Manual density determination for water**

To perform a manual density determination for water:

1. Fill the separator with production fluid from the well to be tested, and let the phases settle.
2. Take a water sample from the bottom of the water layer or from the water trap.
3. Cover the sample container and allow the sample to cool to near-ambient temperature.
4. Measure the density and temperature of the sample, using a hygrometer and a thermometer.
5. From the Calibration menu, select **Density Determination** and work through the screens until the Procedure Selection screen (see Figure 4-3) is displayed. In Well Test mode, you will be required to select the well for which the procedure will be performed.
6. From the Procedure Selection screen, select **Water Density**.
7. From the next screen, select **Manually Enter**.
8. The transmitter displays a screen similar to Figure 4-7, showing the configured reference temperature and the stored value for water density at reference temperature. In this screen:
  - a. Enter the density of the water sample, in the units shown on screen.
  - b. Enter the temperature of the water sample, in the units shown on screen.
  - c. Select **Calculate at Ref**, then press **CHG**.

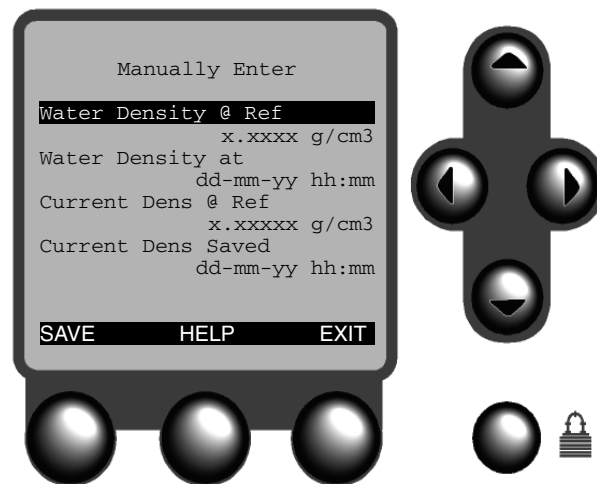
Figure 4-7 Density determination for water – Manual procedure



## Configuring the NOC Application

- The NOC application converts the observed water density to water density at reference temperature, and displays a screen similar to Figure 4-8. This screen also displays the stored value for water density at reference temperature, and the date and time at which this value was stored.
  - To replace the stored value with the new value, press **SAVE**.
  - To discard the data from this procedure, press **EXIT**. You will be returned to the Procedure Selection screen. From this point you can repeat the density determination procedure or press **EXIT** to move up the menu and return to other functions.

**Figure 4-8 Density determination for water – Manual procedure results**



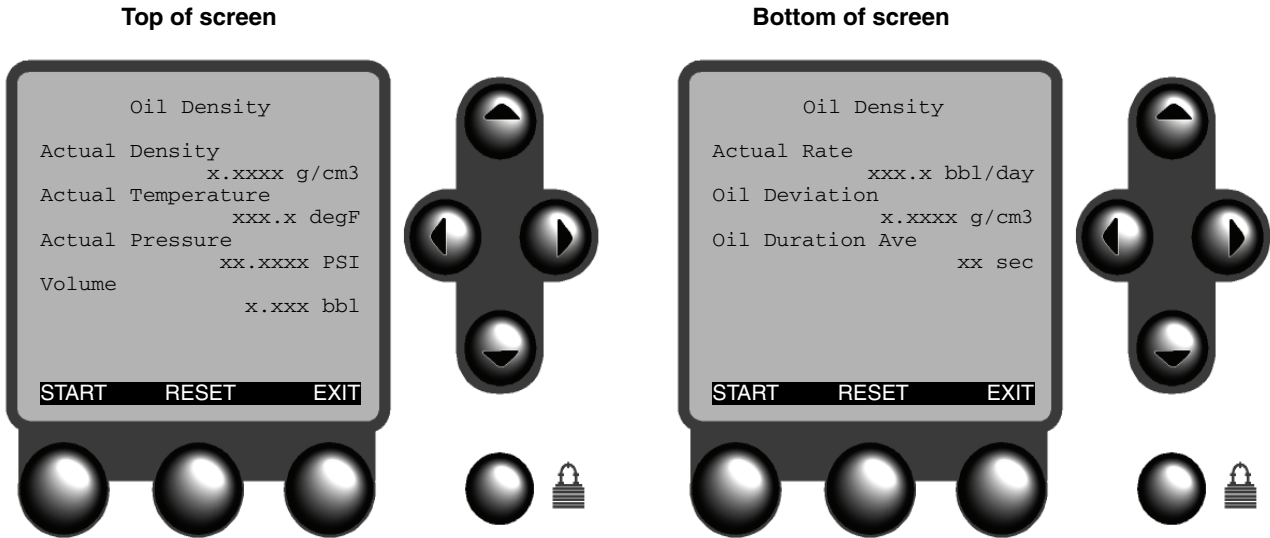
### 4.9.2 Performing a density determination for oil

To perform a density determination for oil:

- Ensure that the correct fluid (oil) is flowing through the sensor. You may need to drain water from the separator.
- From the Calibration menu, select **Density Determination** and work through the screens until the Procedure Selection screen (see Figure 4-3) is displayed. In Well Test mode, you will be required to select the well for which the procedure will be performed.
- From the Procedure Selection screen, select **Oil Density**. The screen shown in Figure 4-9 is displayed.



Figure 4-9 Density determination for oil – Preparing to start



4. The display now shows the current values for oil density, oil temperature, volume, and flowrate (see Figure 4-9), plus the configured Oil Deviation and Oil Duration Ave values. Monitor the density and temperature values, watching for the density and temperature readings to stabilize.

*Note: The Oil Deviation and Oil Duration Ave values shown here are read-only. If you need to change them, you must reconfigure the well data. See Section 4.3.*

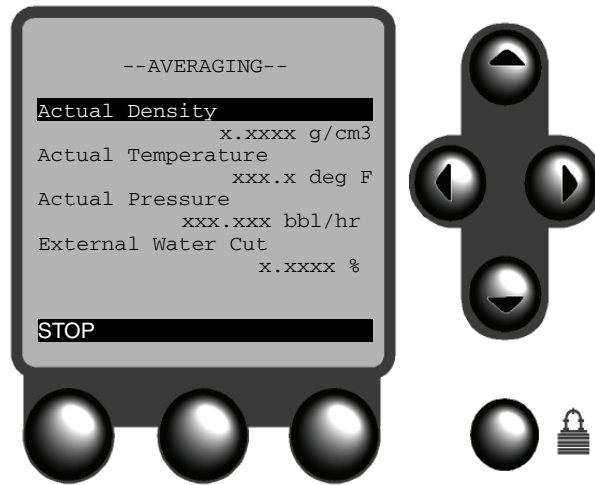
5. (Optional) Press **RESET** to reset the volume total to 0. This enables you to monitor the amount of fluid that remains in the separator (if the separator volume is known).
6. When the density reading has stabilized at a level that indicates that live oil is flowing through the sensor, press **START**. The NOC application will now average the density and temperature of the process fluid until a good sample is achieved.

A “good sample” means that, for the configured Oil Duration Ave, no two consecutive density readings differed by more than the configured Oil Deviation limit. If the oil deviation limit is exceeded, averaging is restarted.

*Note: If the averaging procedure does not end automatically, you may need to verify your process fluid or increase the Oil Deviation value.*

During this period, the screen shown in Figure 4-10 is displayed. You can press **STOP** to stop the averaging. You will be returned to the previous screen.

Figure 4-10 Density determination for oil – In process



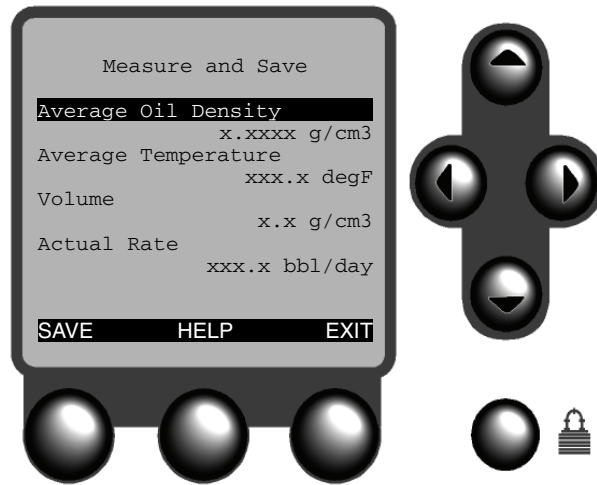
7. If you are using the density-based water cut, take a sample of the fluid in the pipe during this averaging period, then measure the water cut of the sample. You can use any standard procedure (e.g., centrifuge, distillation, Karl-Fischer, etc.) to measure the water cut. Measure in % volume.

*Note: The accuracy of this water cut value directly affects the accuracy of the NOC data. Be sure to use a representative sample and measure carefully.*

If you are using a water cut monitor, this sampling procedure is optional. You may use either the water cut data measured by the monitor or water cut data from the sample.

8. When the good sample is achieved, the results are shown on the a screen similar to Figure 4-11.
  - To discard the data from this procedure, press **EXIT**. You will be returned to the Procedure Selection screen. From this point you can repeat the density determination procedure or press EXIT to move up the menu and return to other functions.
  - To continue with this density determination procedure, press **SAVE**.

Figure 4-11 Density determination for oil – Interim results



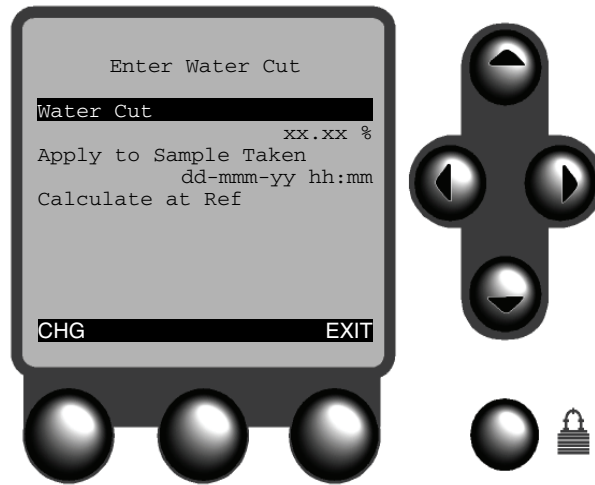
9. If a water cut monitor is enabled, water cut data from the averaging period is displayed.
  - Press **SAVE** to save this data for use in density determination. The reference density of dry oil from this density determination will then be computed and displayed, along with the current values.
    - Press **SAVE** to store the new value for reference density of oil.
    - Press **EXIT** to discard the new value.
  - Press **EXIT** to use water cut data from the manual sampling procedure.
10. If pressure compensation for oil density and water density is enabled, pressure data from the beginning of the density determination procedure is displayed, along with the stored reference pressure.
  - Press **SAVE** to save the current pressure value as the new reference pressure.

*Note: This will overwrite the value stored during density determination for water.*

- Press **EXIT** to retain the existing reference pressure.
11. If neither is enabled, press **OK**.
  12. You will be returned to the Procedure Selection screen. At this point:
    - If you are using density-based water cut, you must complete Steps 13 through 15. Continue with Step 13,
    - If you are using a water cut monitor and you saved the average water cut and the reference density of oil during Step 9, the density determination procedure is complete. However, you can still enter a manual water cut value and apply it if desired, as described in Steps 13 through 15.
  13. At the Procedure Selection screen, select **Enter Water Cut**. The screen shown in Figure 4-12 is displayed, with the date and time of the current density determination procedure.

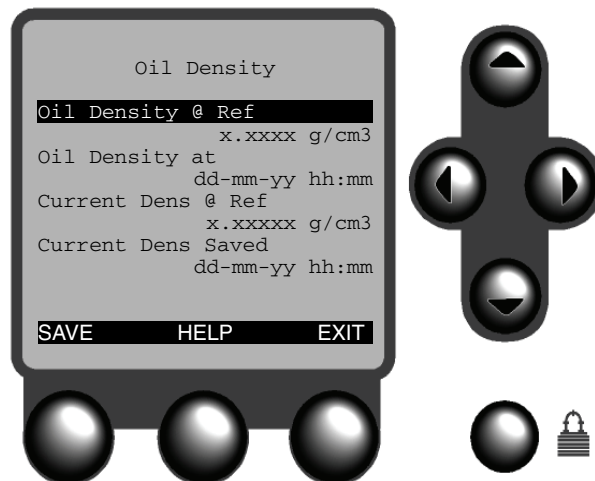
## Configuring the NOC Application

Figure 4-12 Density determination for oil – Water cut entry screen



14. Enter the water cut measured in Step 7, then press **SAVE**.
15. Select **Calculate at Ref**, then press **SEL**. The NOC application uses this water cut data to convert the observed oil density to dry oil density at reference temperature, and displays a screen similar to Figure 4-13. This screen also displays the stored value for oil density at reference temperature, and the date and time at which this value was stored.
  - To replace the stored value with the new value, press **SAVE**, then press **YES** to confirm.
  - To discard the data from this procedure, press **EXIT**. You will be returned to the Procedure Selection screen. From this point you can repeat the density determination procedure or press **EXIT** to move up the menu and return to other functions.

Figure 4-13 Density determination for oil – Procedure results



# Chapter 5

## Operation Mode – NOC

### 5.1 About this chapter

This chapter explains how to use the NOC application to run a well test or perform continuous measurement. The following topics are discussed:

- For Well Test mode:
  - Well testing overview – see Section 5.2
  - Running a well test – see Section 5.2.1
  - Viewing well test data – see Section 5.2.2
  - Time periods for average, minimum, maximum, and total values – see Section 5.2.3
  - Other activity during a well test – see Section 5.2.4
  - Recalculating well test data – see Section 5.2.5
- For Continuous mode:
  - Continuous mode overview – see Section 5.3
  - Viewing Continuous mode measurement data – see Section 5.3.1
  - Pausing and resuming Continuous mode measurement – see Section 5.3.2
  - Resetting, saving, and managing Continuous mode time periods – see Section 5.3.3
  - Other activity during Continuous mode measurement – see Section 5.3.4
  - Viewing archive records – see Section 5.3.5
  - Recalculating Continuous mode measurement data – see Section 5.3.6

Additionally, this chapter provides instructions for changing modes – see Section 5.4.

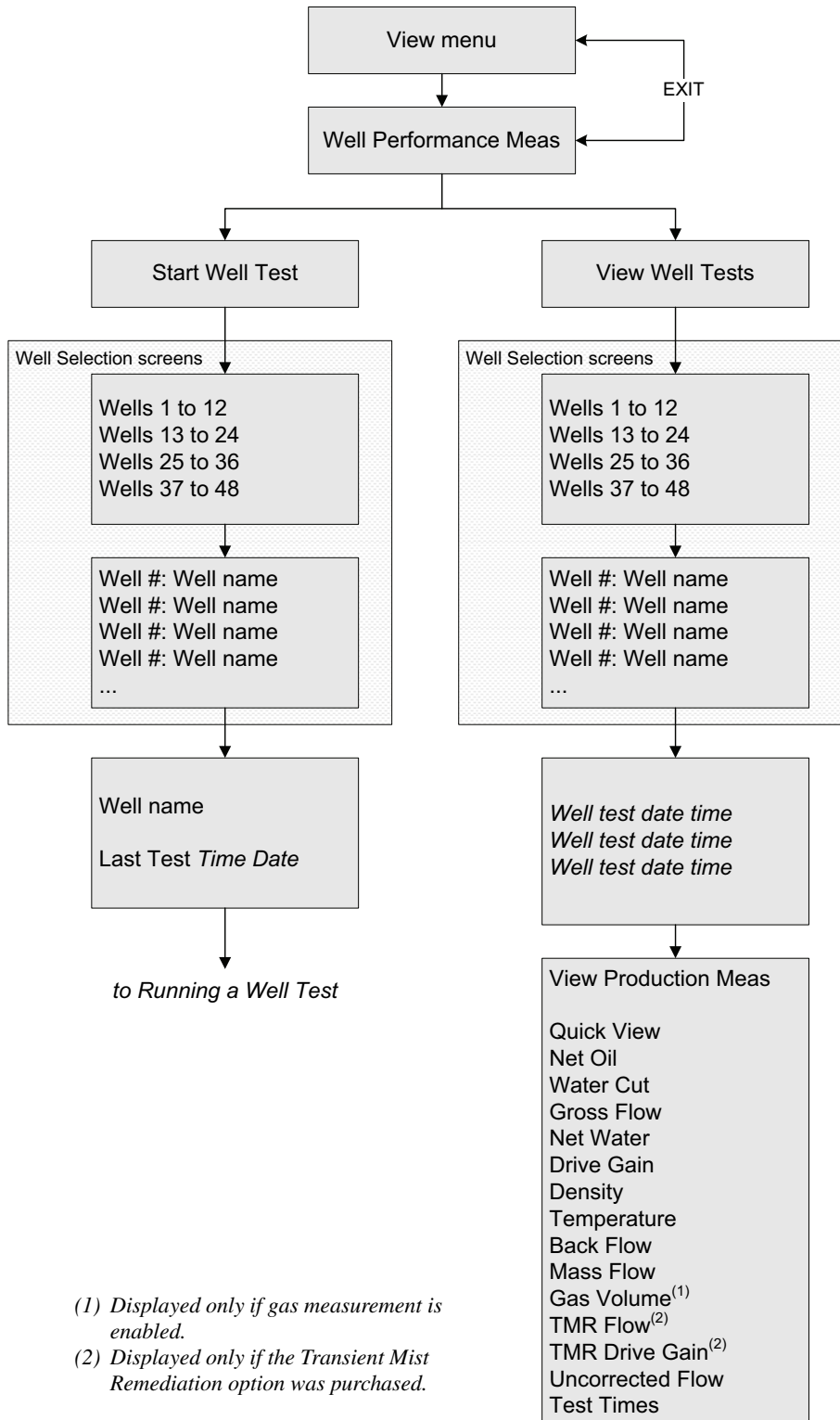
### 5.2 Well testing overview

The Well Performance Measurement menu under the View menu, shown in Figures 5-1 and 5-2, is used to run well tests.

A well test must be started and stopped manually (or via Modbus).

Well tests are identified by the well and by the start date and time. You can save up to three well tests per well. If you run additional well tests on a single well, each new well test will overwrite the oldest well test.

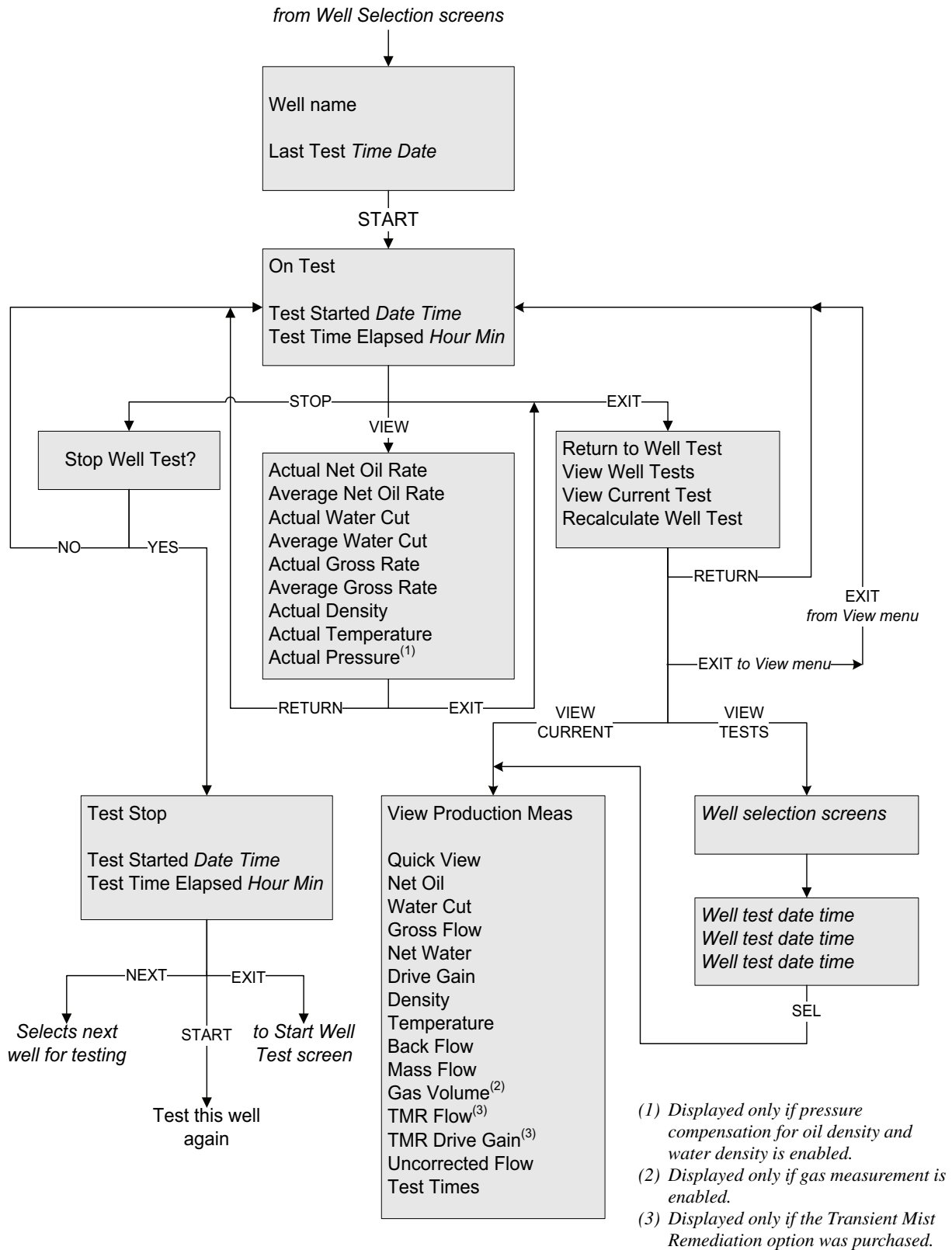
Figure 5-1 Well Performance Measurement menu – Selecting the well



(1) Displayed only if gas measurement is enabled.

(2) Displayed only if the Transient Mist Remediation option was purchased.

Figure 5-2 Well Performance Measurement menu – Running the well test



### 5.2.1 Running a well test

To run a well test:

1. Ensure that the NOC application is set for Well Test mode, and that all necessary data for the well has been configured.
2. As shown in Figure 5-1:
  - a. From the View menu, select **Well Performance Measurement**.
  - b. Select **Start Well Test**.
  - c. Navigate to the well to be tested.
3. As shown in Figure 5-2:
  - a. Press **START**. The well test screen is displayed, showing the test start time and the elapsed time.
  - b. To end the well test, press **STOP**, then press **YES** to confirm. The final well test values will be automatically written to memory.

Well test records contain snapshots of actual values. The snapshots are written to memory every 15 minutes. These snapshot values are required for recalculation, but are not available for viewing. Therefore, for meaningful recalculation, ensure that the well test is running for more than 15 minutes so that the well test record will include snapshots.

*Note: For background information on the recalculation feature, see Section 2.3.7.*

During the well test (see Figure 5-2):

- You can press **VIEW** to see current test data
- You can press **EXIT** to:
  - View more detailed data on the current test (see Section 5.2.2)
  - Exit to the View menu. From the View menu, press **EXIT** to return to the well test screen.

After the well test (see Figure 5-2):

- To run another test on the same well, press **START**, then press **YES** to confirm.
- To test the next well (as defined by the well number), press **NEXT**, then start the well test as described here.
- To exit the well test menu, press **EXIT**.

At any time, you can view and recalculate well test data for completed tests.



### 5.2.2 Viewing well test data

You can access well test data at several points in the menu.

*Note: You can also read well test data via Modbus or report actual and average process variables by assigning them to a milliamp or frequency output.*

To access basic data for the current well test, press View from the On Test screen (see Figure 5-2). The values listed in Table 5-2 are displayed.

**Table 5-1 View data – Well Test mode**

Process variable	Definition
Actual net oil rate	Current net oil flow rate. May or may not include oil carry-over, depending on TMR configuration.
Average net oil rate	Average net oil flow rate, calculated from the beginning of the well test. May or may not include oil carry-over, depending on TMR configuration.
Actual water cut	Current water cut used in net oil calculations. May be either density-based or from the water cut monitor, depending on water cut configuration.
Average water cut	Average water cut value, calculated from the beginning of the well test.
Actual gross rate	Current flow rate of the production fluid (all process fluid through the NOC sensor). May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Average gross rate	Average flow rate of production fluid, calculated from the beginning of the well test. May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Actual density	Current density of the production fluid
Actual temperature	Current temperature of the production fluid
Actual pressure	Current pressure from the external pressure device (if available)

To access more detailed data for either the current test or a stored test, use the View Production Measurement screen. You can access this screen from either:

- The Well Performance Measurement screen (see Figure 5-1)
- The On Test screen (see Figure 5-2)

The View Production Measurement screen provides:

- Quick View data, as listed in Table 5-2
- Production data for several other process variables, as listed in Table 5-3
- TMR data, as listed in Table 5-4

## Operation Mode – NOC

**Table 5-2 Quick View data – Well Test mode**

Process variable	Definition
Average net oil rate	Current net oil flow rate. May or may not include oil carry-over, depending on TMR configuration.
Net oil total	Total net oil, by volume, calculated from the beginning of the well test. May or may not include oil carry-over, depending on TMR configuration.
Average water cut	Average water cut value, calculated from the beginning of the well test.
Average gross rate	Average flow rate of production fluid, calculated from the beginning of the well test. May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Gross total	Total production fluid, by volume, calculated from the beginning of the well test. May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Test started	Date and time that the well test was started
Test time elapsed	Hours and minutes that the well test has been running
Transient bubble time	Hours and minutes that TBR has been active
Water cut overrange	(Water cut monitor only) Hours and minutes that the water cut has been above the configured External Water Cut Limit
Transient mist time	Hours and minutes that TMR has been active

**Table 5-3 Production data – Well Test mode**

Process variable	Values						
	Actual	Avg	Min	Min time / date	Max	Max time / date	Total
Net oil	Y	Y	Y	Y	Y	Y	Y
Water cut	Y	Y	Y	Y	Y	Y	
Gross flow	Y	Y	Y	Y	Y	Y	Y
Net water	Y	Y	Y	Y	Y	Y	Y
Drive gain	Y	Y			Y	Y	
Density	Y	Y	Y	Y	Y	Y	
Temperature	Y	Y	Y	Y	Y	Y	
Back flow	Y				Y	Y	Y
Mass flow	Y	Y	Y	Y	Y	Y	Y
Gas volume	Y	Y	Y	Y	Y	Y	Y
TMR drive gain	Y	Y	Y	Y	Y	Y	
Uncorrected flow							
Uncorrected oil	Y	Y	Y	Y	Y	Y	Y
Uncorrected water	Y	Y	Y	Y	Y	Y	Y
Uncorrected water cut	Y	Y	Y	Y	Y	Y	
Uncorrected gross	Y	Y	Y	Y	Y	Y	Y

Table 5-3 Production data – Well Test mode *continued*

Process variable	Values						
	Actual	Avg	Min	Min time / date	Max	Max time / date	Total
Test times							
Test started	<i>Timestamp</i>						
Test time elapsed	<i>Hours and minutes</i>						
Transient bubble time	<i>Hours and minutes</i>						
Water cut overrange	<i>Hours and minutes</i>						
Transient mist time	<i>Hours and minutes</i>						

Table 5-4 TMR data – Well Test mode

Process variable	Definition
Mass flow rate	Current mass flow rate from the gas meter
2-phase mass total	Total mass of liquid and gas in the gas stream during all TMR intervals
TMR mass total	Calculated mass of gas in the gas stream during all TMR intervals
Mass carry-over	Total mass of liquid in the gas stream during all TMR intervals (2-phase mass total minus TMR mass total)
Oil volume carry-over	Volume of oil in gas stream during all TMR intervals
Water volume carry-over	Volume of water in gas stream during all TMR intervals
Transient mist time	Hours and minutes that TMR has been active

### 5.2.3 Time periods for average, minimum, maximum, and total values

For the current test, running average, minimum, maximum, and total values for each process variable are calculated from the beginning of the test. When the well test is stopped, the final values will be stored with the test data.

### 5.2.4 Other activity during a well test

Between well tests, you can use the Exit button to move between the Well Performance Measurement menu and the View menu. While a well test is in progress, you can use the Exit button on the Return to Well Test screen to move between the well test screens and the View menu.

From the View menu, you can perform any available actions.

At any point from the well test screens, including during a well test, you can press the Security button to access the Configuration and Maintenance menus. The system does not prevent configuration changes, calibrations, or other procedures. However, many actions (e.g., reconfiguring well data) will cause discontinuities in the well test data, and many procedures will interfere with data collection. If you need to change system configuration or perform a maintenance procedure:

1. Stop the well test.
2. Make the required configuration changes or perform the required procedures.
3. Start a new well test.

### 5.2.5 Recalculating well test data

You can recalculate well test data for any stored well test. You can perform the recalculation during a well test or between well tests. To recalculate well test data:

1. Refer to Figure 5-2 and select **Recalculate Well Test**.
2. Navigate to the well test you want to recalculate.
3. Select **Recalc Parameters** and set recalculation values as desired. See Table 5-9. You can set one, several, or all of the recalculation values. If you do not assign a new value, the original value is used during recalculation. When you have finished setting recalculation values, press **EXIT**.
4. Select **Perform Recalculation**. When recalculation is complete, the following message is displayed:  
**Data Recalculation is complete.  
Press OK to view and save the  
recalculation results for this well.**  
Press **OK** to continue.
5. To view the results of the recalculation, select **View Recalc Data**. When you are finished, press **EXIT**.
6. At this point, you can save or discard the results of the recalculation.
  - To save the results of the recalculation, select **Save Recalc Data**, then press **EXIT**. A recalculation record will be written to the list of well tests for this well, and can be viewed using the View Well Test menu shown in Figure 5-2. The recalculation record is displayed with the original timestamp and the term REC.
  - To discard the results of the recalculation, press **EXIT**.

Note the following:

- Recalculation is based on the snapshot records written every 15 minutes during the well test.
- Only 96 snapshot records (24 hours of data) are stored. If the well test runs more than 24 hours, older snapshots are overwritten. Accordingly, the recalculation procedure is applied only to data from the last 24 hours of the well test.
- You may recalculate results for each well test, and you may recalculate each well test more than once.
- Only one recalculation record can be saved per well. If you perform a second recalculation and save the results, the existing recalculation record will be overwritten. Be sure to record or download (via Modbus) the existing recalculation record, if required, before performing the next recalculation for the current well.
- TMR carry-over totals are not recalculated. If carry-over totals were added to the original oil and water totals, the TMR carry-over data is not included in the recalculated totals.

**Table 5-5 Recalculation parameters – Well Test mode**

Parameter	Configurable?	Definition
Original Ref Temp <sup>(1)</sup>	No	Reference temperature for NOC calculations applied during data collection
Recalc Reference Temp	Yes	Reference temperature to used for recalculation
Orig Water Density <sup>(1)</sup>	No	Reference density of water from this well applied during data collection
Recalc Water Density	Yes	Reference density of water to be used for recalculation
Original Oil Density <sup>(1)</sup>	No	Reference density of oil from this well applied during data collection
Recalc Oil Density	Yes	Reference density of oil to be used for recalculation
Original Press Comp Oil <sup>(1)</sup>	No	Pressure compensation factor for oil applied during data collection
Recalc Press Comp Oil	Yes	Pressure compensation factor for oil to be used for recalculation
Original Ref Pressure <sup>(1)</sup>	No	Reference pressure applied during data collection
Recalc Ref Pressure	Yes	Reference pressure to be used for recalculation
Original Gas Ref Density <sup>(1)</sup>	No	Reference density of gas from this well applied during data collection
Recalc Gas Ref Dens	Yes	Reference density of gas to be used for recalculation
Original Factor for Oil <sup>(1)</sup>	No	Shrinkage factor for oil from this well applied during data collection
Recalc Factor for Oil	Yes	Shrinkage factor for oil to be used for recalculation
Original Factor for Water <sup>(1)</sup>	No	Shrinkage factor for water from this well applied during data collection
Recalc Factor for Water	Yes	Shrinkage factor for water to be used for recalculation

*(1) If the value was changed during the well test, the value displayed here is the value in use when the well test was stopped.*

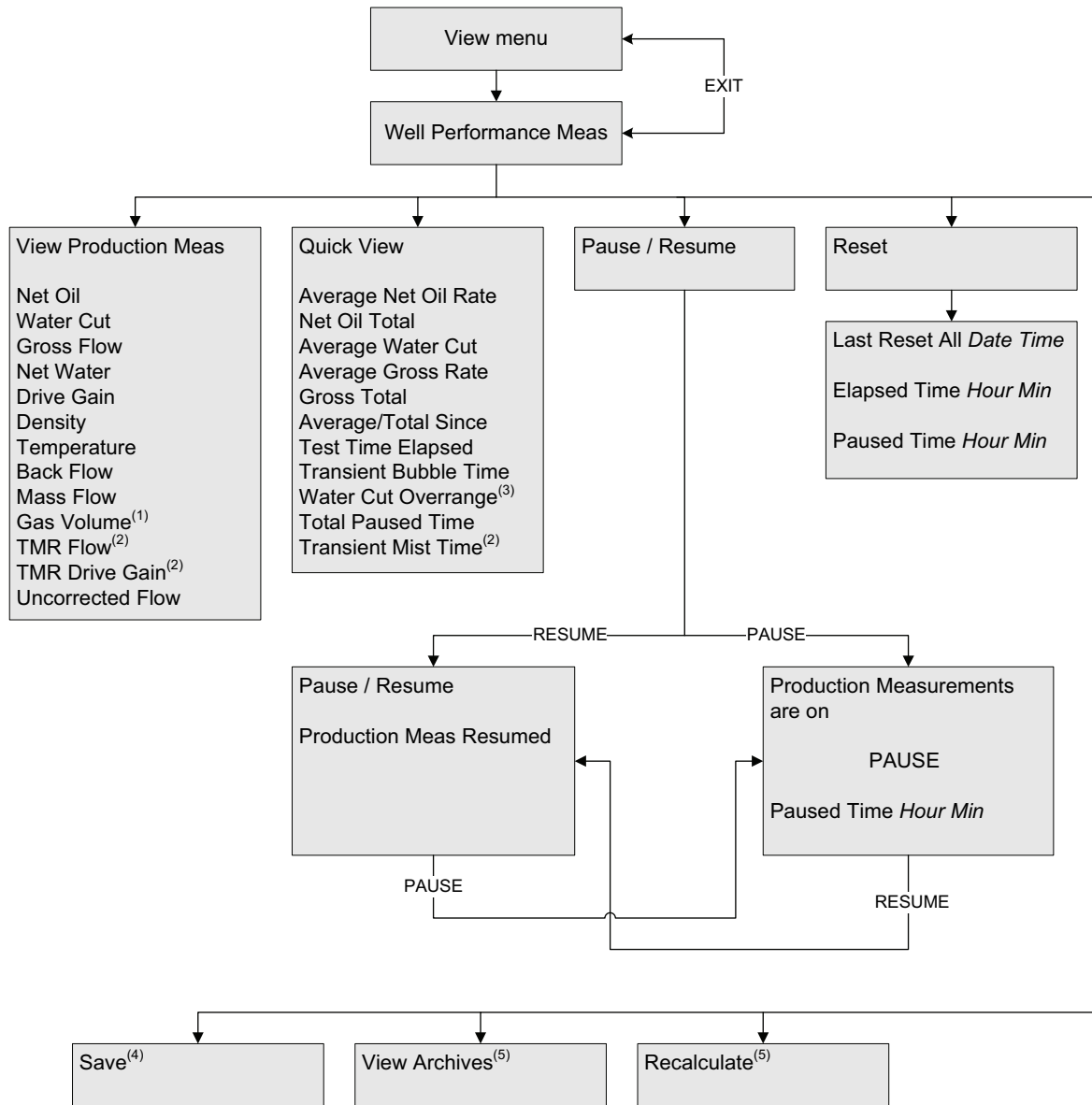
### 5.3 Continuous mode measurement overview

In Continuous mode, measurement begins as soon as the system is up and running, or as soon as the system is configured for Continuous mode measurement. You cannot start and stop Continuous mode measurement. However, you can:

- Pause and resume measurement
- View current data
- Reset the start time for summary variables
- Write archive records that summarize well production from the beginning of the Continuous mode time period up to the point the record is written.
- View archive records
- Recalculate archive records

Continuous mode measurement is managed from the Well Performance Measurement menu under the View menu, shown in Figure 5-3.

Figure 5-3 Well Performance Measurement menu – Continuous mode measurement



(1) Displayed only if gas measurement is enabled.

(2) Displayed only if the Transient Mist Remediation option was purchased.

(3) Displayed only if a water cut monitor is enabled.

(4) See Figure 5-5 and Section 5.3.5.

(5) Displayed only if the Save function has been performed. For more information, see Figure 5-5 and Section 5.3.5.

### 5.3.1 Viewing Continuous mode measurement data

To view basic data from Continuous mode measurement, use the Quick View menu shown in Figure 5-3. Process variables available from the Quick View menu are listed in Table 5-6.

*Note: You can also read Continuous mode measurement data via Modbus or report actual and average process variables by assigning them to a milliamp or frequency output.*

**Table 5-6 Quick View data – Continuous mode**

Process variable	Definition
Average net oil rate	Average net oil flow rate, calculated from the beginning of Continuous mode measurement or from the last reset. May or may not include oil carry-over, depending on TMR configuration.
Net oil total	Total net oil, by volume, calculated from the beginning of Continuous mode measurement or from the last reset. May or may not include oil carry-over, depending on TMR configuration.
Average water cut	Average water cut value, calculated from the beginning of Continuous mode measurement or from the last reset. May be either density-based or from the water cut monitor, depending on water cut configuration.
Average gross rate	Average flow rate of production fluid, calculated from the beginning of Continuous mode measurement or from the last reset. May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Gross total	Total production fluid, by volume, calculated from the beginning of Continuous mode measurement or from the last reset. May or may not include TMR carry-over data, depending on TMR configuration. Does not include gas data.
Average/total since	Timestamp of beginning of Continuous mode measurement or the last Reset All.
Test time elapsed	Hours and minutes since this Continuous mode measurement period was started
Transient bubble time	Hours and minutes that TBR has been active
Water cut overrange	(Water cut monitor only) Hours and minutes that the water cut has been above the configured External Water Cut Limit
Total paused time	Hours and minutes that measurement has been paused
Transient mist time	Hours and minutes that TMR has been active

To view more detailed data, use the View Production Measurement menu shown in Figure 5-3. This screen provides:

- Production data for several other process variables, as listed in Table 5-7
- TMR data, as listed in Table 5-8

## Operation Mode – NOC

**Table 5-7 Production data accessible via View Production Measurement screen – Continuous mode**

Process variable	Values								
	Actual	Avg	Min	Min time/ date	Max	Max time/ date	Total	Reset time/ date	Inventory
Net oil	Y	Y	Y	Y	Y	Y	Y	Y	Y
Water cut	Y	Y	Y	Y	Y	Y		Y	
Gross flow	Y	Y	Y	Y	Y	Y	Y	Y	Y
Net water	Y	Y	Y	Y	Y	Y	Y	Y	Y
Drive gain	Y	Y			Y	Y		Y	
Density	Y	Y	Y	Y	Y	Y		Y	
Temperature	Y	Y	Y	Y	Y	Y		Y	
Back flow	Y				Y	Y	Y	Y	Y
Mass flow	Y	Y	Y	Y	Y	Y	Y	Y	Y
TMR drive gain	Y	Y	Y	Y	Y	Y			
Gas volume	Y	Y	Y	Y	Y	Y	Y	Y	Y
Uncorrected flow									
Uncorrected oil	Y	Y	Y	Y	Y	Y	Y	Y	Y
Uncorrected water	Y	Y	Y	Y	Y	Y	Y	Y	Y
Uncorrected water cut	Y	Y	Y	Y	Y	Y		Y	
Uncorrected gross	Y	Y	Y	Y	Y	Y	Y	Y	Y

**Table 5-8 TMR data – Continuous mode**

Process variable	Definition
Mass flow rate	Current mass flow rate from the gas meter
2-phase mass total	Total mass of liquid and gas in the gas stream during all TMR intervals
TMR mass total	Calculated mass of gas in the gas stream during all TMR intervals
Mass carry-over	Total mass of liquid in the gas stream during all TMR intervals (2-phase mass total minus TMR mass total)
Oil volume carry-over	Volume of oil in gas stream during all TMR intervals
Water volume carry-over	Volume of water in gas stream during all TMR intervals
Transient mist time	Hours and minutes that TMR has been active

### 5.3.2 Pausing and resuming Continuous mode measurement

Use the Pause / Resume option shown in Figure 5-3 to pause and resume Continuous mode measurement. While measurement is paused, no data is collected, displayed, or stored, and average, minimum, maximum, total, or inventory values are not updated.

You can pause and resume measurement as often as you wish.



### 5.3.3 Resetting, saving, and managing Continuous mode time periods

Running average, minimum, maximum, and total values are calculated from the beginning of Continuous mode measurement.

*Note: Inventory values are calculated from the beginning of continuous mode measurement until reset by digital communications (Modbus coil 4 or HART command 242).*

You can reset the start time for these running calculations:

- To set a new start time for all process variables at once:
  - a. Select **Reset** from the Well Performance Measurement screen shown in Figure 5-3.
  - b. Press the **RESET** button on that screen, then press **YES** to confirm.
- To set a new start time for one process variable only:
  - a. Navigate to the process monitor screen where the process variable data is displayed.
  - b. Press the **RESET** button on that screen.

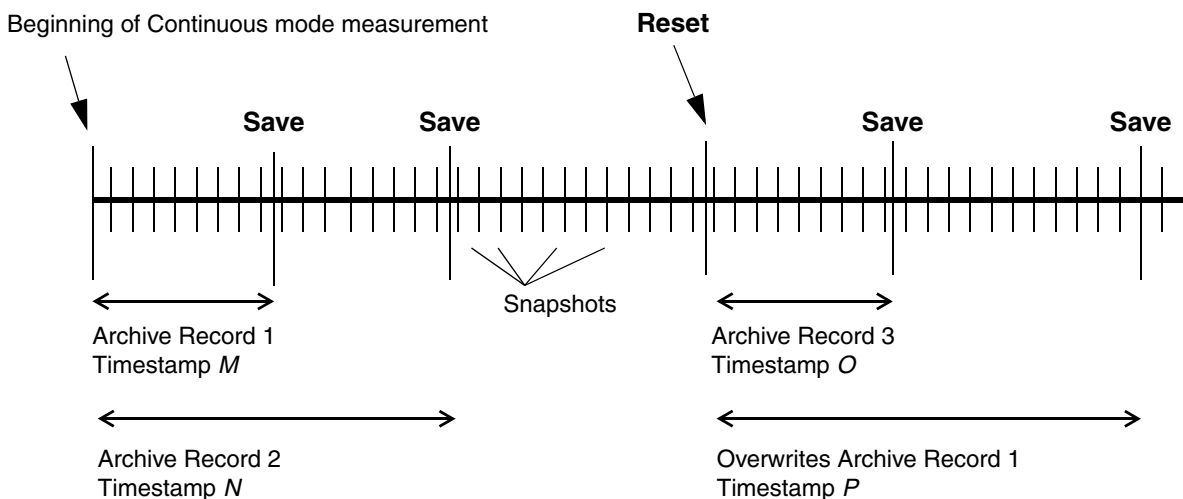
*Note: Not all process variables can be reset individually. If the Reset button is not displayed, the system does not allow individual reset for that process variable.*

At any time during Continuous mode measurement, you can save the current values of the summary variables to an archive record. To do this, select **SAVE** from the Well Performance Measurement menu as shown in Figure 5-3. The archive record is then available for viewing or recalculation.

Up to three archive records can be stored. Archive records are identified by the save time timestamp. Archive records also contain snapshots of actual values. The snapshots are written to memory every 15 minutes. These snapshot values are required for recalculation, but are not available for viewing. Therefore, for meaningful recalculation, ensure that the Continuous mode time period is longer than 15 minutes so that the archive record will include snapshots.

Figure 5-4 illustrates the relationship between Save, Reset, snapshots, and archive records.

**Figure 5-4 Continuous mode timeline and time periods**



### 5.3.4 Other activity during Continuous mode measurement

During continuous measurement, you can use the **EXIT** button on the Well Performance Measurement screen to move between the continuous measurement screens and the View menu. From the View menu, you can perform any available actions.

At any point from the continuous measurement screens, you can press the Security button to access the Configuration and Maintenance menus. The system does not prevent configuration changes, calibrations, or other procedures.

However, many actions (e.g., reconfiguring well data) will cause discontinuities in the data, and many procedures will interfere with data collection. If you need to change system configuration or perform a maintenance procedure:

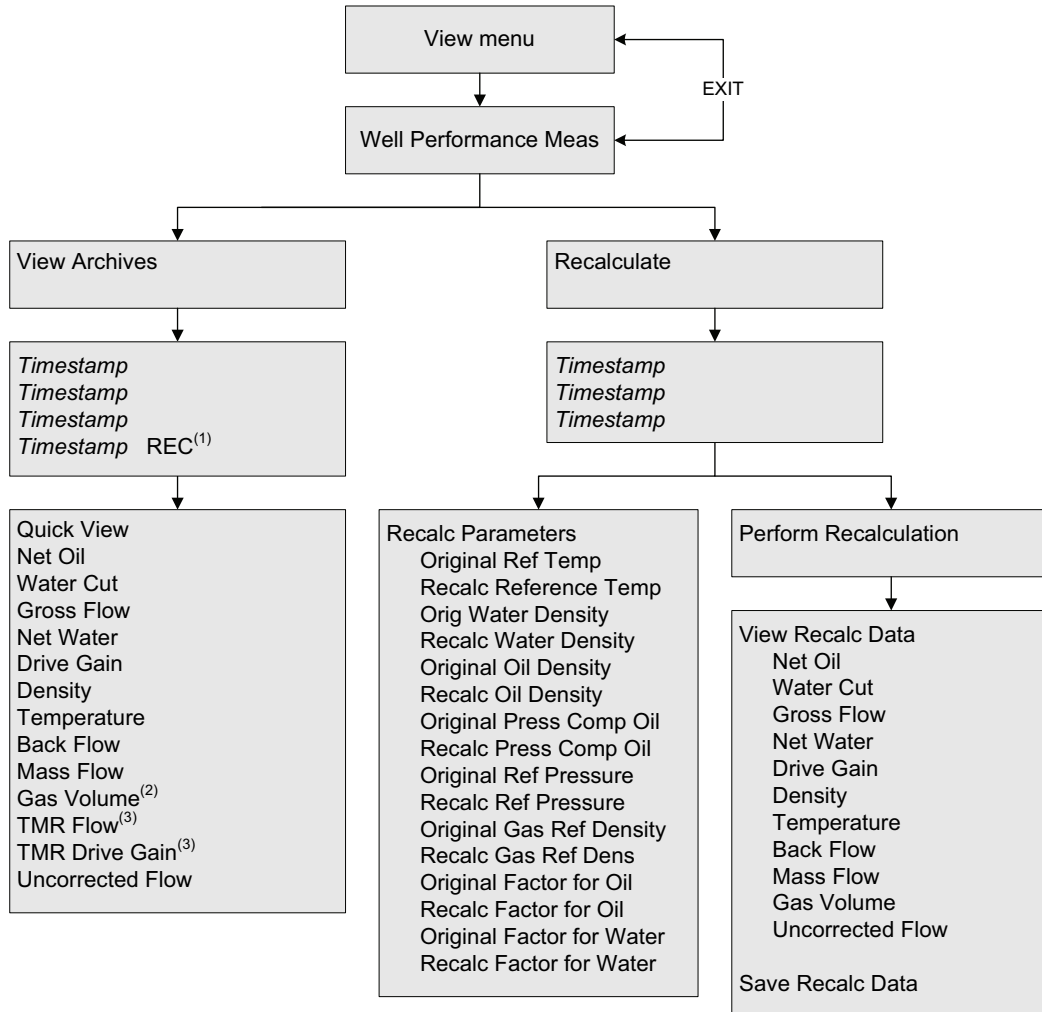
1. Pause measurement.
2. If desired, save an archive record.
3. Make the required configuration changes or perform the required procedures.
4. Reset all process variables.
5. Resume measurement.

### 5.3.5 Viewing archive records

To view archive records, refer to Figure 5-5 and:

1. Select **View Archives** from the Well Performance Measurement menu.
2. Specify the archive record you want to view.
3. Select **Quick View** or the specific process variable you want to view.

Figure 5-5 Archive records – Continuous mode measurement



- (1) Displayed only if a recalculation record has been saved.
- (2) Displayed only if gas measurement is enabled.
- (3) Displayed only if the Transient Mist Remediation option was purchased.

### 5.3.6 Recalculating Continuous mode data

To recalculate Continuous mode data, refer to Figure 5-5 and:

1. Select **Recalculate** from the Well Performance Measurement menu.
2. Specify the archive record you want to recalculate.
3. Select **Recalc Parameters** and set recalculation values as desired. See Table 5-9. You can set one, several, or all of the recalculation values. If you do not assign a new value, the original value is used during recalculation. When you have finished setting recalculation values, press **EXIT**.
4. Select **Perform Recalculation**. When recalculation is complete, the following message is displayed:  
**Data Recalculation is complete.  
Press OK to view and save the  
recalculation results for this well.**  
Press **OK** to continue.
5. To view the results of the recalculation, select **View Recalc Data**. When you are finished, press **EXIT**.
6. At this point, you can save or discard the results of the recalculation.
  - To save the results of the recalculation, select **Save Recalc Data**, then press **EXIT**. A recalculation record will be written to archives, and can be viewed using the View Archives option described in Section 5.3.5. The recalculation record is displayed with the original timestamp and the term REC, as shown in Figure 5-5.
  - To discard the results of the recalculation, press **EXIT**.

Note the following:

- Recalculation is based on the snapshot records written every 15 minutes during the Continuous mode measurement period.
- Only 96 snapshot records (24 hours of data) are stored. If the measurement period runs more than 24 hours, older snapshots are overwritten. Accordingly, the recalculation procedure is applied only to data from the last 24 hours of the measurement period.
- You may recalculate results for each archive record, and you may recalculate each archive record more than once.
- Only one recalculation record can be saved. If you perform a second recalculation and save the results, the existing recalculation record will be overwritten. Be sure to record or download (via Modbus) the existing recalculation record, if required, before performing another recalculation.
- TMR carry-over totals are not recalculated. If carry-over totals were added to the original oil and water totals, the TMR carry-over data is not included in the recalculated totals.

**Table 5-9 Recalculation parameters – Continuous mode measurement**

Parameter	Configurable?	Definition
Original Ref Temp <sup>(1)</sup>	No	Reference temperature for NOC calculations applied during data collection
Recalc Reference Temp	Yes	Reference temperature to used for recalculation
Orig Water Density <sup>(1)</sup>	No	Reference density of water applied during data collection
Recalc Water Density	Yes	Reference density of water to be used for recalculation
Original Oil Density <sup>(1)</sup>	No	Reference density of oil applied during data collection
Recalc Oil Density	Yes	Reference density of oil to be used for recalculation
Original Press Comp Oil <sup>(1)</sup>	No	Pressure compensation factor for oil applied during data collection
Recalc Press Comp Oil	Yes	Pressure compensation factor for oil to be used for recalculation
Original Ref Pressure <sup>(1)</sup>	No	Reference pressure applied during data collection
Recalc Ref Pressure	Yes	Reference pressure applied to be used for recalculation
Original Gas Ref Density <sup>(1)</sup>	No	Reference density of gas from this well applied during data collection
Recalc Gas Ref Dens	Yes	Reference density of gas to be used for recalculation
Original Factor for Oil <sup>(1)</sup>	No	Shrinkage factor for oil applied during data collection
Recalc Factor for Oil	Yes	Shrinkage factor for oil to be used for recalculation
Original Factor for Water <sup>(1)</sup>	No	Shrinkage factor for water applied during data collection
Recalc Factor for Water	Yes	Shrinkage factor for water to be used for recalculation

(1) If the value was changed during the measurement period, the value displayed here is the value in use when the archive record was saved.

### 5.4 Changing modes

Changing from Well Test mode to Continuous mode, or from Continuous mode to Well Test mode, affects current measurement and data collection. To change modes, follow the instructions in this section.

To change from Well Test mode to Continuous mode:

1. If a well test is running, it will be stopped automatically when the mode is changed.
2. Perform all required or desired recalculations.
3. Well test data will be unavailable from the display while the system is in Continuous mode. Record all required or desired well test data to an external system.
4. Change **Mode of Operation** to **Continuous Mode**.

To change from Continuous mode to Well Test mode:

1. If desired, save an archive record.
2. Perform all required or desired recalculations.
3. Continuous mode data will be unavailable from the display while the system is in Well Test mode. Record all required or desired data to an external system.
4. Change **Mode of Operation** to **Well Test Mode**.



# Chapter 6

## Diagnostics and Troubleshooting

### 6.1 About this chapter

This chapter provides information on the status alarms associated with the NOC application.

*Note: For information on diagnostics or troubleshooting for the Series 3000 platform, see the manual entitled Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual.*

### 6.2 NOC status alarms

Table 6-1 lists all status alarms associated with the NOC application, with descriptions and suggested user actions.

For information on other Series 3000 status alarms, see the manual entitled *Series 3000 MVD Transmitters and Controllers: Configuration and Use Manual*.

**Table 6-1 Process alarms**

Alarm number	Maintenance menu listing	Description	User actions
A136	Power Outage	The power was off for at least 30 seconds.	No action required.
A137	Measurements Paused	Continuous mode measurements are paused.	No action required. If desired, resume measurement.
A138	TBR Active	The drive gain has exceeded the configured TBR threshold and the configured TBR action has been implemented.	No action required.
A139	Water Cut Overrange	The water cut measured by the water cut monitor is above the configured External Water Cut Limit.	No action required.
A140	TMR active	The drive gain from the TMR gas meter has exceeded the configured TMR threshold.	No action required.





# Appendix A

## Series 3000 Menu Flowcharts

### A.1 Overview

This appendix provides menu flowcharts for the Series 3000 display when the NOC application is installed:

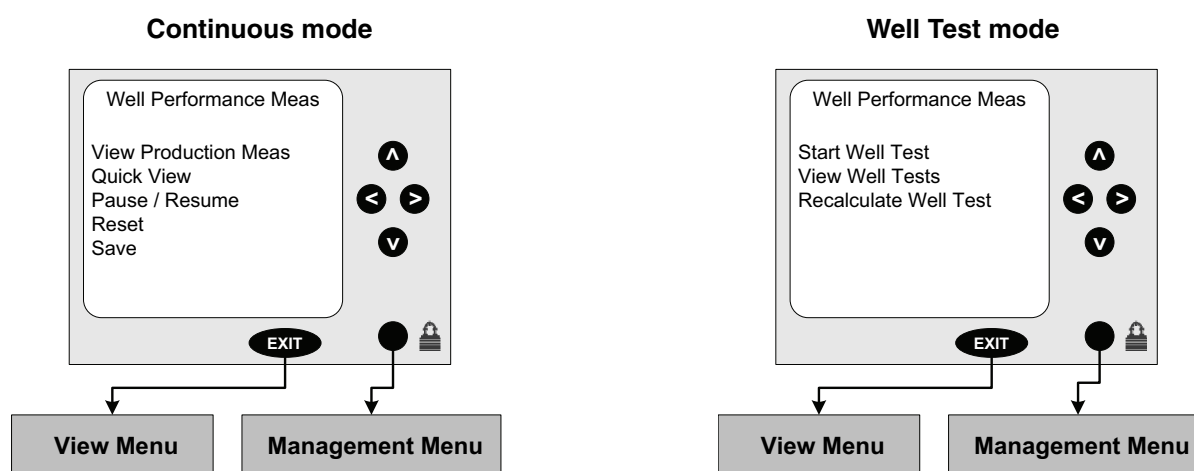
- Startup display – see Figure A-1
- View menu – see Figure A-2
- Management menu, top level – see Figure A-3
- Configuration menu – see Figures A-4 through A-7
- Maintenance menu – see Figure A-8

### A.2 Startup display and menu access

The startup display depends on whether the NOC application is in Continuous mode or Well Test mode, as shown in Figure A-1.

- For detailed information on using these NOC operation menus, see Chapter 5.
- From either version of this display:
  - To access the View menu system, press the **EXIT** function button. View menu flowcharts are provided in Section A.3.
  - To access the Management menu system, press the Security button. Management menu flowcharts are provided in Section A.4.

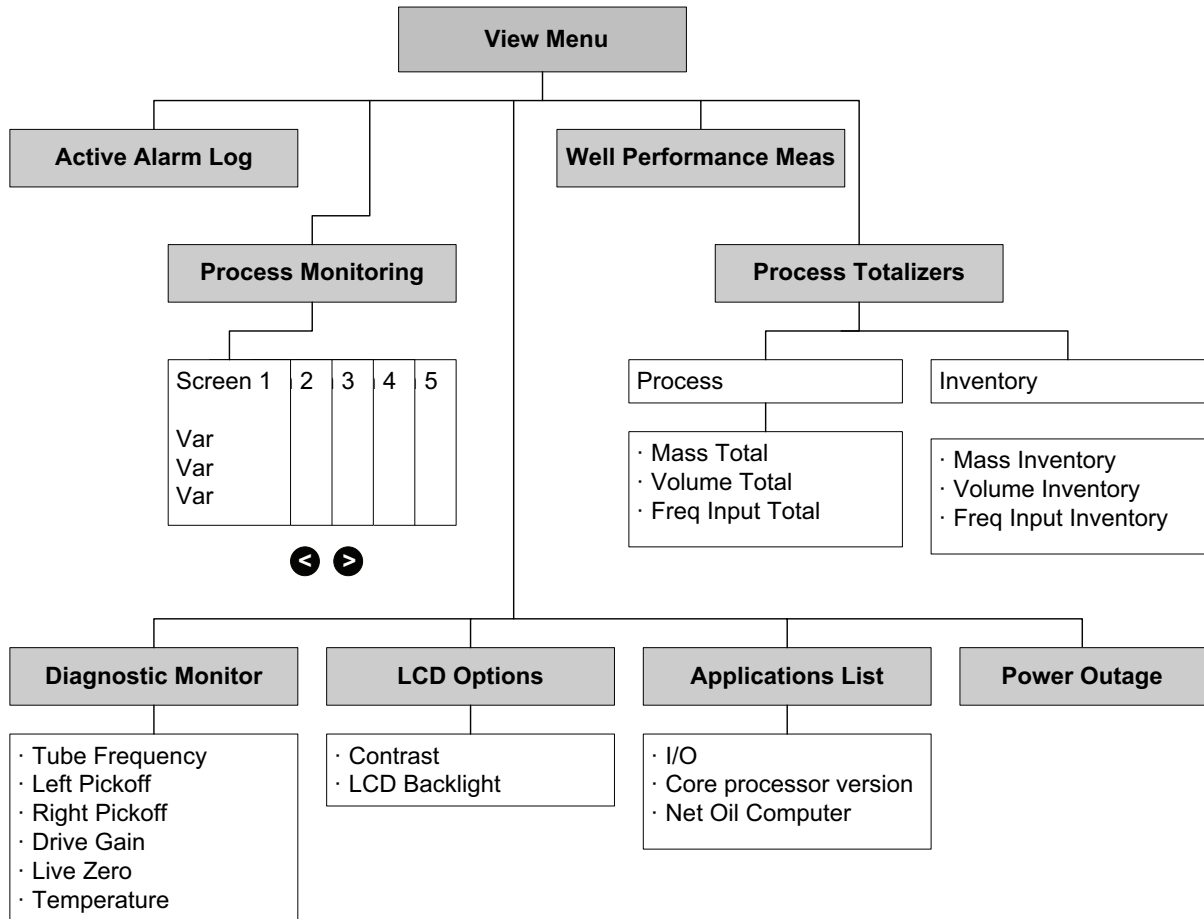
Figure A-1 Startup display



**A.3 View menu**

Figure A-2 shows the View menu.

**Figure A-2 View menu: Special applications – Net Oil Computer**



### A.4 Management menus

The Management menu system is illustrated in Figures A-3 through A-8:

- Figure A-3 shows the top level of the Management menu, plus the Security and Language menus.
- Figures A-4 through A-7 show the Configuration menu. Note that the Digital Communication menu structure changes according to the setting of the Protocol parameter.
- Figure A-8 shows the Maintenance menu.

**Figure A-3 Management menu – Top level, Security menu, and Language menu**

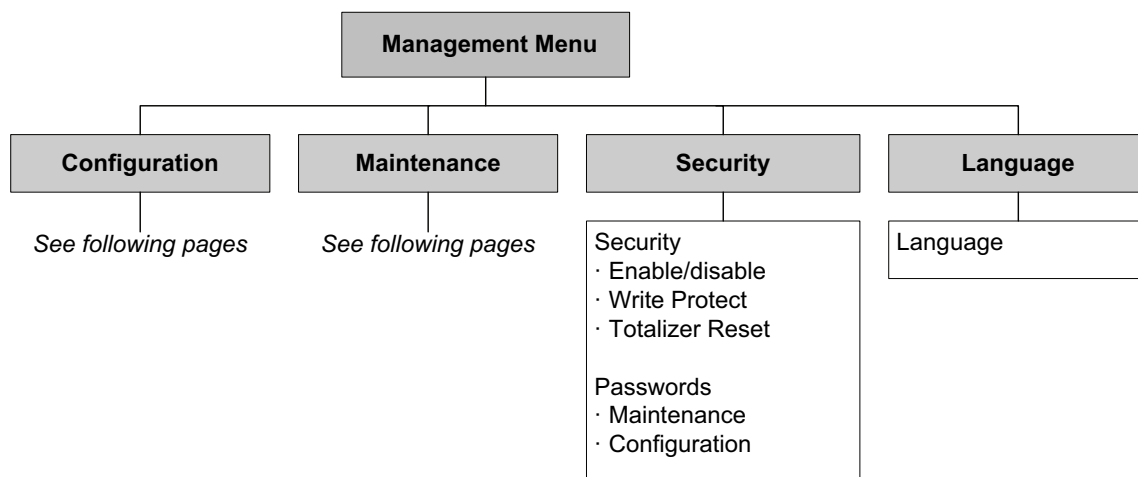
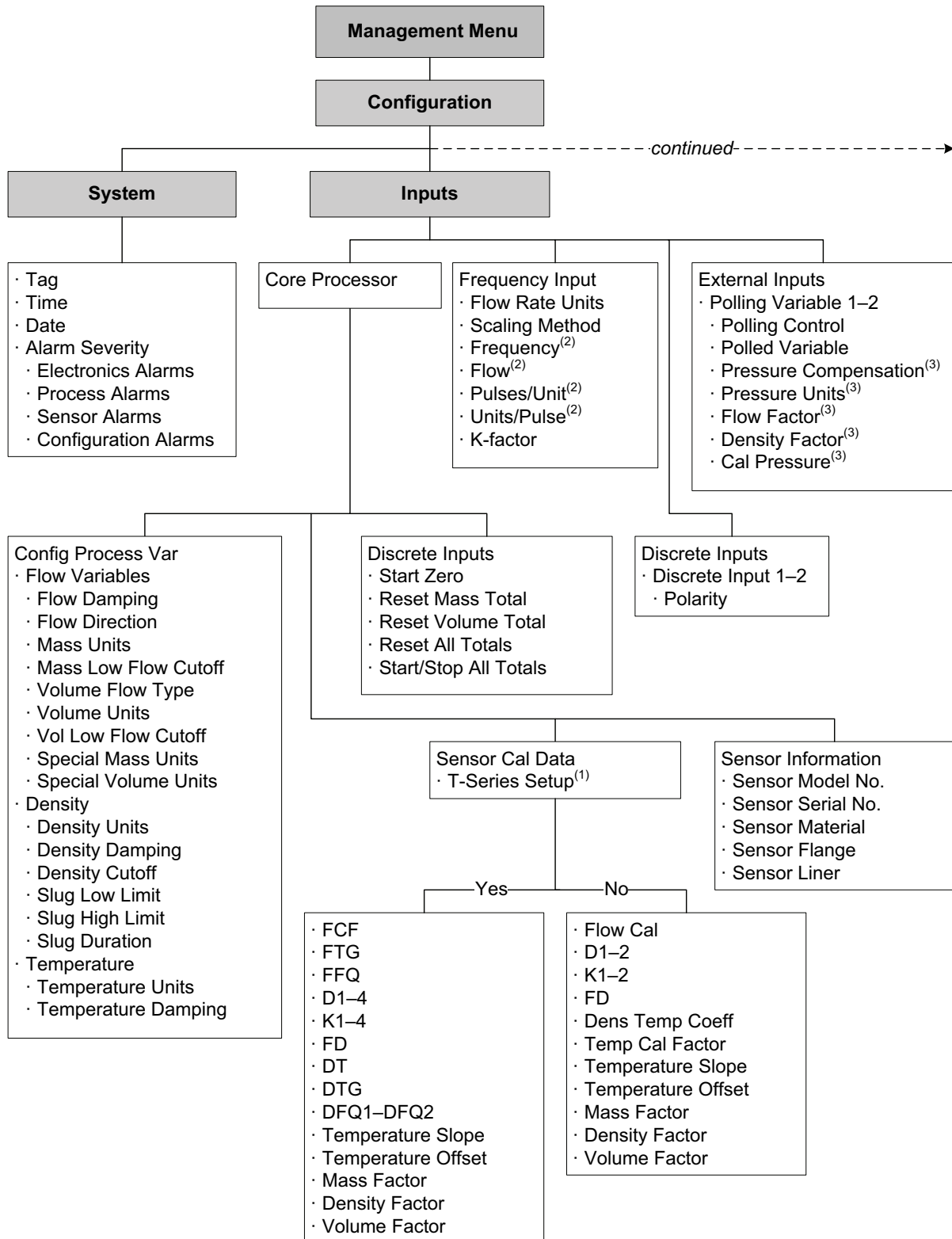


Figure A-4 Configuration menu

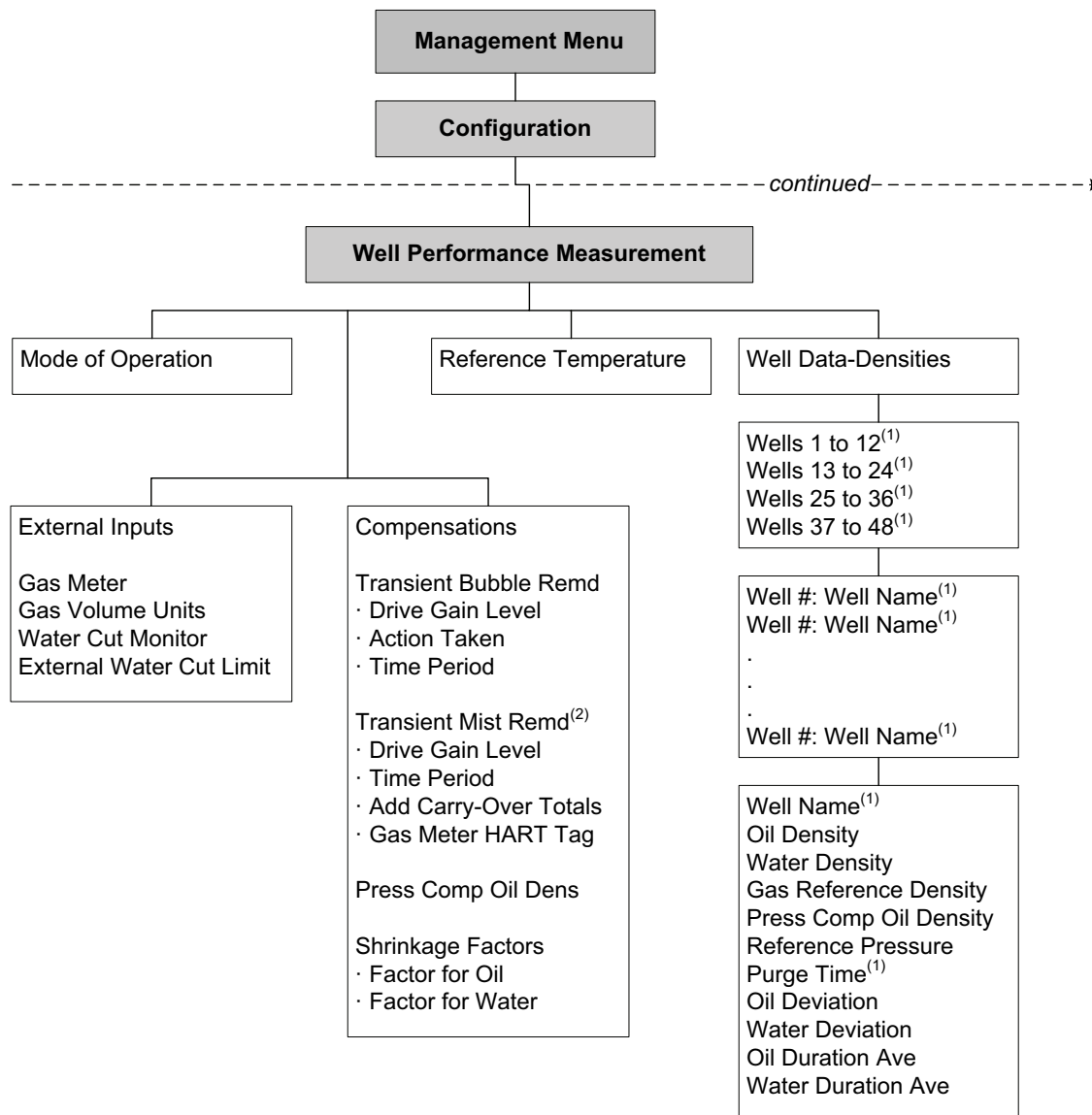


(1) T-Series option displayed only if transmitter is not connected to sensor. The parameter list displayed depends on the sensor type.

(2) Options displayed depend on Scaling Method.

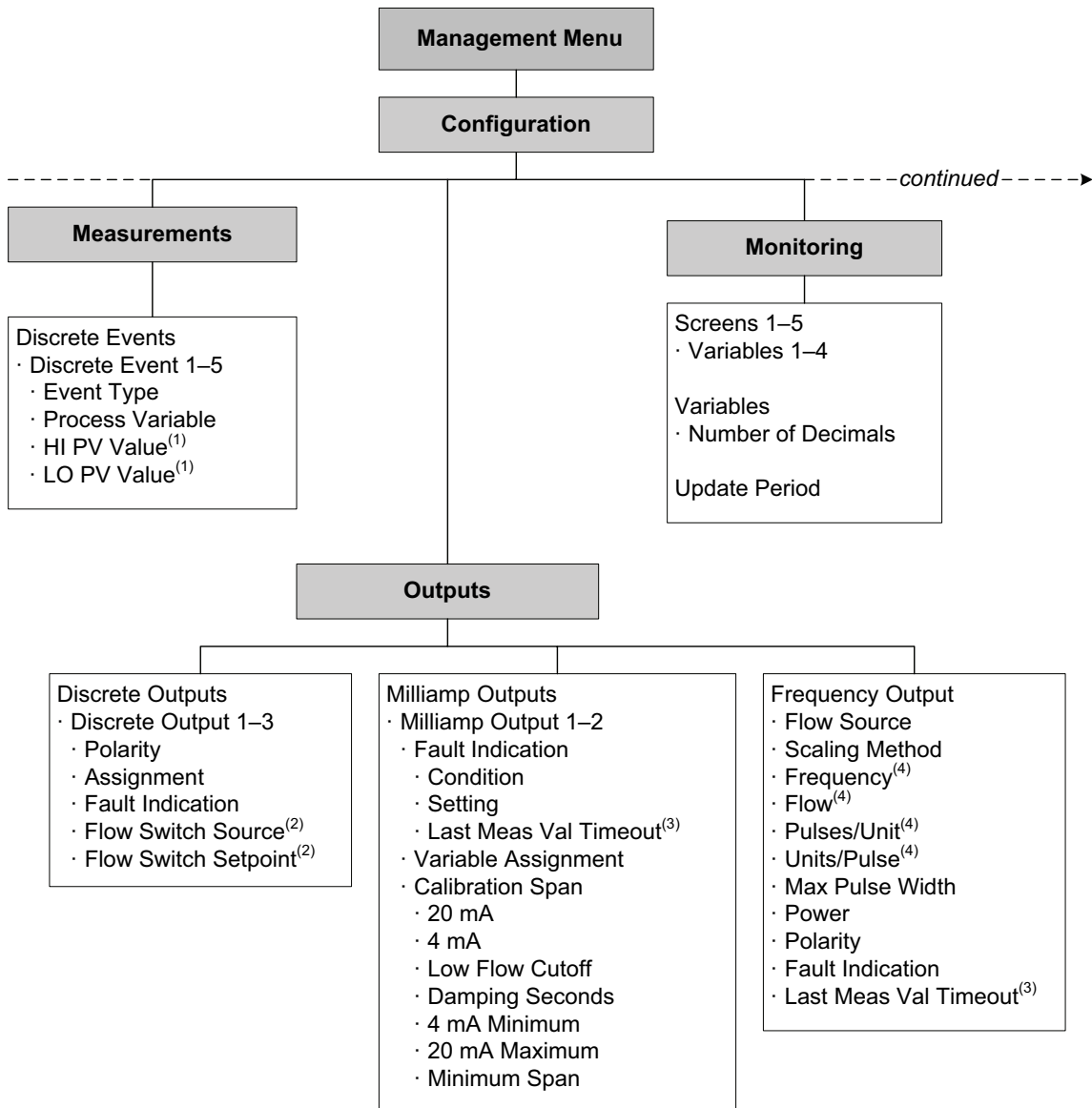
(3) Displayed only if Polled Variable = Pressure.

Figure A-5 Configuration menu *continued*



(1) Displayed only if Mode of Operation = Well Test Mode.  
 (2) Displayed only if the Transient Mist Remediation option was purchased.

Figure A-6 Configuration menu *continued*



- (1) Either or both are displayed, depending on Event Type.
- (2) Displayed only if Assignment = Flow Switch.
- (3) One setting applies to both milliamp and frequency outputs.
- (4) Options displayed depend on Scaling Method.

Figure A-7 Configuration menu *continued*

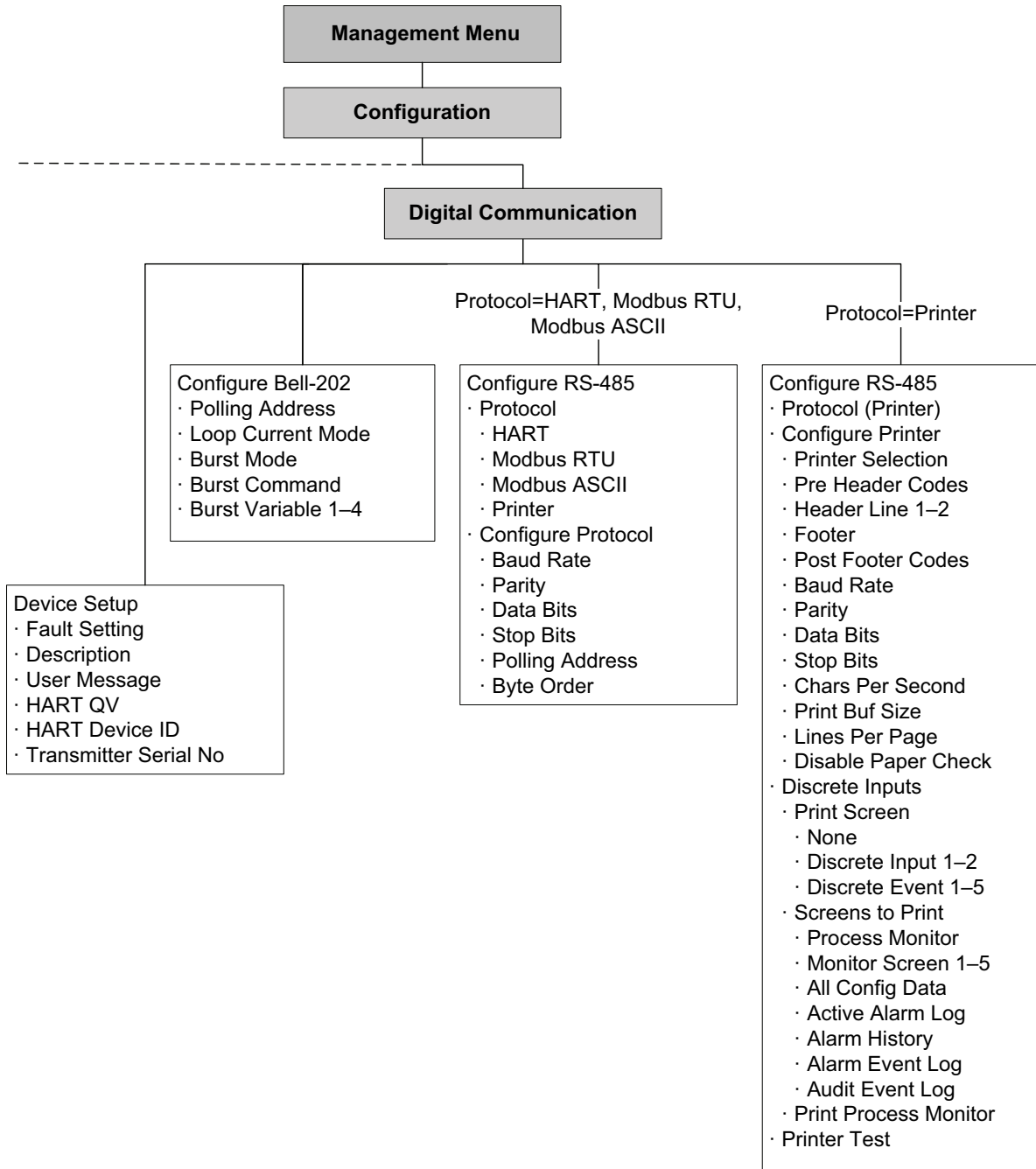
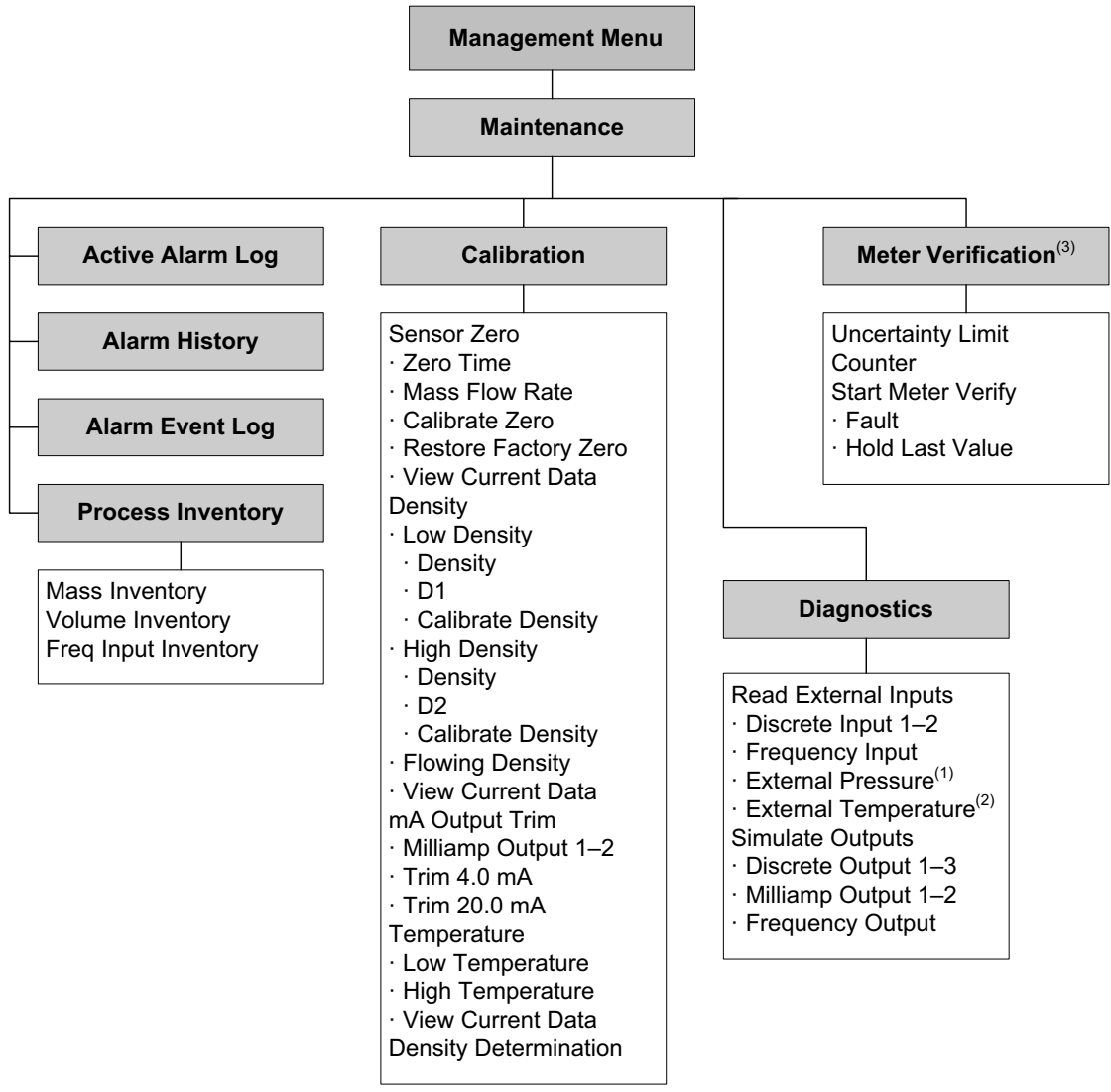


Figure A-8 Maintenance menu



(1) Displayed only if polling for pressure is configured.  
 (2) Displayed only if polling for temperature is configured.  
 (3) Displayed only if the meter verification option is available.



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