Technical Information

FLXA202/FLXA21 2-Wire Analyzer
HART Communication

FLEXA

TI 12A01A02-60E

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This document describes HART communication by the FLXA202/FLXA21 2-wire liquid analyzer.
Before communicating using the HART protocol, refer to the User's Manual for the FLXA202/FLXA21 2-wire analyzer (IM 12A01A02-01E) for details of the parameters.

HART is a registered trademark of the HART Communication Foundation.

What Is HART Communication?

HART Communication superimposes specific waveforms called HART Communication waveforms on the 4–20 mA analog signal from a FLXA202/FLXA21 to enable remote intercommunication between the online FLXA202/FLXA21 and a setup tool (*).

*: FieldMate, Plant Resource Manager (PRM), or a handheld HART communicator such as the 375 Field Communicator may be used as the setup tool.

Note: When using FieldMate or a 375 Field Communicator, make sure you use the following versions or later:
FieldMate:
FieldMate R2.02.00 + Device Files R3.01.01
375 Field Communicator
System Software Version : 3.2
CDC Firmware Version : 1.17
Opereting System : 4.48
BIOS : 7.17
Koala Version : 3.9
CPU Board Version : 1.3
Baseboard Version : 2.0

Downloading and installing DD files

To enable HART communication between a FLXA202/FLXA21 and setup tool, the device description (DD) file of the FLXA202/FLXA21 needs to be installed in the setup tool. The DD file contains the HART communication details and menu configurations specific to the FLXA202/FLXA21.

FieldMate contains the latest versions of DD files at the time when sold. When using FieldMate, the latest DD files updated since you purchased the product can be downloaded from the following sites (*):

- Yokogawa homepage: http://www.yokogawa.com/an/download/an-dl-fieldbus-001en.htm

*: This address is subject to change without prior notice. If the above address cannot be accessed, consult your nearest sales office or the agency from which you purchased the product.

Before using FieldMate

Before using FieldMate, check the revision of Device Files.

• Compatibility among revisions of FLXA202/FLXA21, FieldMate and DD file

Device		HOUSING ASSY		FieldMate		DD of Field Communicator	
		Software revision	Device revision	Revision of Device Files	DD file revision in Device Files	Corresponding device revision	DD file revision
FLXA21		1.20 or earlier	1	R3.01 or later	1	1	1, 2
FLXA21		1.21 or later	2	R3.05 or later *	1	2	2
FLXA202/ FLXA21	PH	2.11 or later	2		5	2	5
	SC, ISC, DO				3		3

*: This revision of Device Files can be used with the FLXA202, but the device name will be displayed as FLXA21. Device Files for the FLXA202 are planned to be released in December 2015.

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• History of DD file

Corresponding device revision	DD file revision		Description
1	1		1st edition. Download from the website of Yokogawa.
	2		Limited-function edition. Download from the website of the HART Communication Foundation.
2	1		1st edition for Device revision 2. Device Files R3.05 supports this edition.
	2		Added-function edition for Device revision 2. Download from the website of Yokogawa.
	PH	3	SENCOM-adaptive edition. Download from the website of Yokogawa.
		4	SENCOM-adaptive edition. Download from the website of the HART Communication Foundation.
		5	FLXA202/FLXA21-adaptive edition. Download from the website of Yokogawa.
		6	FLXA202/FLXA21-adaptive edition. Download from the website of the HART Communication Foundation.
	SC, ISC, DO	3	FLXA202/FLXA21-adaptive edition. Download from the website of Yokogawa.
		4	FLXA202/FLXA21-adaptive edition. Download from the website of the HART Communication Foundation.

The software revision and the device revision are shown on the display of HOUSING ASSY (Figure 1) of the ZOOM display which is introduced by pressing the on the main display of FLXA202/FLXA21.

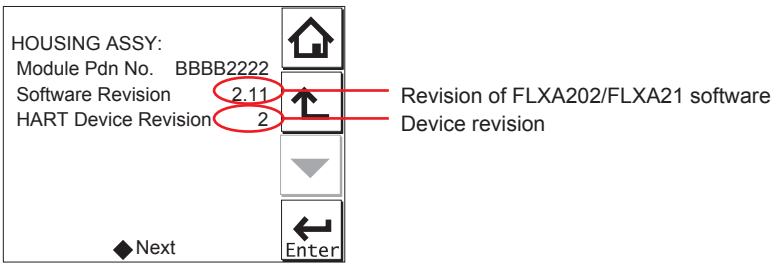


Figure 1 Software Revision

Installing the DD File

For how to install the DD file, see the respective documentation for the setup tool you use. The following shows how to install the latest DD file in the Yokogawa setup tool, FieldMate, for example.

Note that the following descriptions assume installation in FieldMate R2.02.00. If the version is upgraded later, the following descriptions may not match. In this case, please see the latest documentation for FieldMate.

Obtaining and decompressing the DD file

Download the DD file from the Internet homepage of Yokogawa. DD files are downloadable as ZIP files (when downloading from the homepage of HART Communication Foundation, a compressed DD file will be downloaded with the name of dd.zip).

The ZIP file contains a folder named 000037, which in turn contains the folders named 0058 for pH, ORP, and SENCOM, 0059 for SC, 005a for ISC, and 005b for DO.

Installing the Device Descriptions (DDs) file of FieldMate

Install the latest DD files you obtained by following the instruction described in the manual of FieldMate.

Precaution on DD file revision and device revision

When using HART communication of a FLXA202/FLXA21, it is necessary to use the DD file that matches the revision of the FLXA202/FLXA21 device used. Make sure to check they match before use, as follows.

(1) Checking the FLXA202/FLXA21 device revision

Call up the detailed settings screen on the front display panel or access the Zoom display on the setup tool.

Select “HOUSING ASSY”.

The device revision number will be displayed as Hart Device Revision.

(2) Checking the DD file revision

DD files are stored with filenames beginning with a four-digit number such as 0102.xxxdd.

The first two digits, 01 in the example above, indicate the device revision. The following two digits, 02 in the example above, indicate the DD revision.

Use the latest revision of the DD file that matches the device revision.

● Connecting Setup Tool

You can connect the setup tool to any interconnection terminals such as those in the central control room, a converter’s junction box, or somewhere within the transmission loop as long as the load resistance between the power supply and the terminals to which you want to connect the setup tool is 250 ohms or larger. Connect the setup tool in parallel with the load resistance. It is polarity-insensitive.

■ Functions Available via HART Communication

Almost all FLXA202/FLXA21 functions accessible via the front panel display of the FLXA202/FLXA21 are available via HART communication. For details of the functions, see the descriptions for panel display contents. Some functions, however, are not available via HART communication, and some are available only via HART communication.

Correspondences between menu structure and FLXA202/FLXA21 front panel display

Online

+– sensor 1	.....	Shows the information of the Slot 1 sensor in FLXA202/FLXA21.
+– zoom	.....	Shows the details of the FLXA202/FLXA21.
+– Execute	.....	Executes functions such as calibration.
+– Setup	.....	Shows setups of the FLXA202/FLXA21.
+– Alarm	.....	Displays alarms.
+– Forward Cal. Data	.....	Sets the backup calibration data in the sensor.
+– sensor 2	.....	Shows the information of the Slot 2 sensor in FLXA202/FLXA21 (the menu structure is the same as under Sensor1).
+–Process Value	.....	Shows the measured process values (PV, SV, TV, and FT).
+– Basic Setup	.....	Shows the basic HART device information.
+– Device Information	.....	Shows the device information.
+– Loop Test	.....	Carries out analog output tests.
+– Review	.....	Shows the basic HART device parameters.

Unique Features of HART Communication

(1) Multi-drop mode

Up to 15 field devices put in multi-drop mode can be connected in parallel on a single twisted-pair cable. To enable the multi-drop mode, set the device address to a unique number from 1 to 15.

Enabling the multi-drop mode fixes the outputs of the corresponding field devices to 4 mA DC and thus disables the 4–20 mA analog output signals as well as burn-out outputs.

NOTE

When the FLXA202/FLXA21 is used in the multi-drop mode, the output signal is changed from 12.5 mA DC to 4 mA DC just after the power is turned on. Enough power supply for the instruments is to be provided.

NOTE

Multi-drop mode communication requires the devices on the link to be given unique device addresses for polling (polling addresses). If the same address is set in two or more devices, correct communication is disabled.

Communication actions in multi-drop mode:

a. To use multi-drop mode communication, an address needs to be set for each device for polling. To enable searching for the devices working in the multi-drop mode, setup tools usually require search address settings, too.
b. When the HART setup tool starts or carries out a device search, it searches through device addresses that should be set uniquely. The tool then shows a list of devices thus searched by polling address, allowing for communication with selected devices.
c. To add a device and enable communication with it, restart the setup tool or carry out a device search to make the tool recognize the added device.

Canceling multi-drop mode:

To release a device from the multi-drop mode, set the polling address to zero.

(2) Burst mode

Burst mode allows a field device to be configured to transmit digital process values (selected from the PV, output percent, and 4–20 mA output) continuously three times every second. Burst mode can be initiated from a HART setup tool. In order to use burst mode, however, the setup tool and receiver equipment such as a distributed control system must support burst mode.

Burst made is set in the following menu.

Online
+– Sensor 1
+– Setup
+– Commissioning
+– Advanced Setup
+– Communication

(3) Physical write-protect

The FLXA202/FLXA21 has two switches for physical write-protection on the back side of the display. Setting two switches to ON position prevents the settings from being changed via HART communication.

Write-protect switch

The FLXA202/FLXA21 has a write-protect switch for HART communication.

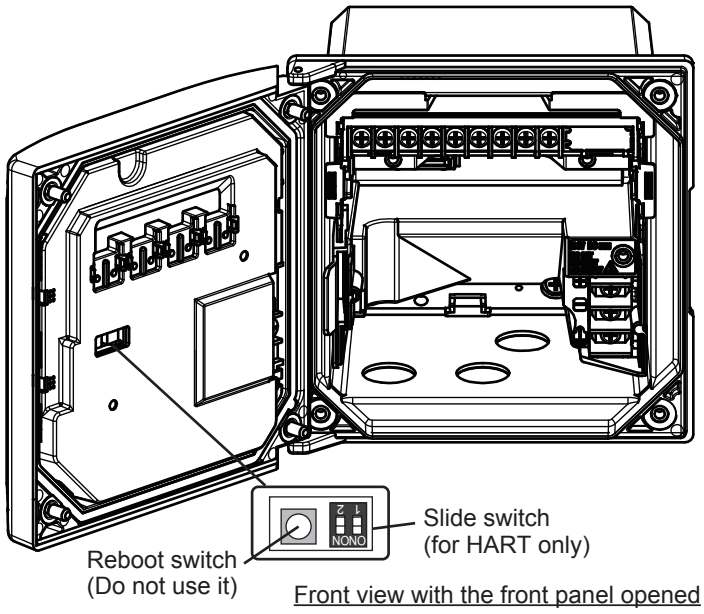


Figure 2 FLXA202 Parts names and descriptions

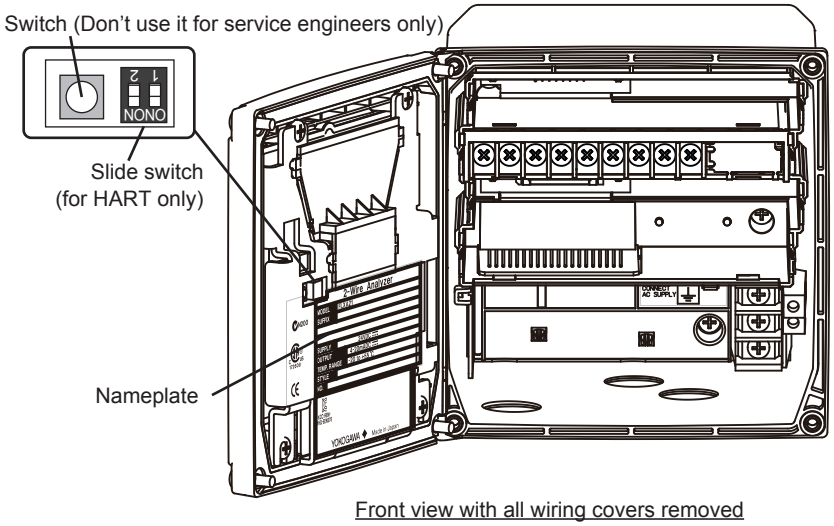


Figure 3 FLXA21 Parts names and descriptions

Turning those slide switches ON disable the setting via HART communication (default: OFF).

NOTE

Don't push the button switch next to the two slide switches, when these switches are set to ON or set to OFF.

Setting Non-Available via HART Communication

The following FLXA202/FLXA21 settings cannot be done via HART communication:

- Changes to matrix information
- pH Manual 3Pt
- pH Automatic 3Pt
- pH Automatic ITP
- ORP Manual 2Pt
- rH Manual 2Pt
- Manual wash (PH, DO)
- Changes to settings for communication with PH201G
- Changes to settings for temperature coefficient (TC) factor. (Note)
- Changes to settings for heat cycle temperature. (Note)

Note: This cannot be set with "-J" (use in Japan) in Country Suffix Code.
However, Device revision 2 or later and DD revision 2 or later allow this setting even with "-J".

Operational Precaution

Setting on the FLXA202/FLXA21 and a setup tool (communication tool):

When settings are done on a setup tool (ex. FieldMate), don't perform settings on the FLXA202/FLXA21 at the same time.

Operation with handling all the parameters of the FLXA202/FLXA21:

For the operation with handling all the parameters, like print-out of parameters, uploading, downloading etc, it takes a few minutes, because the FLXA202/FLXA21 has a lot of parameters.

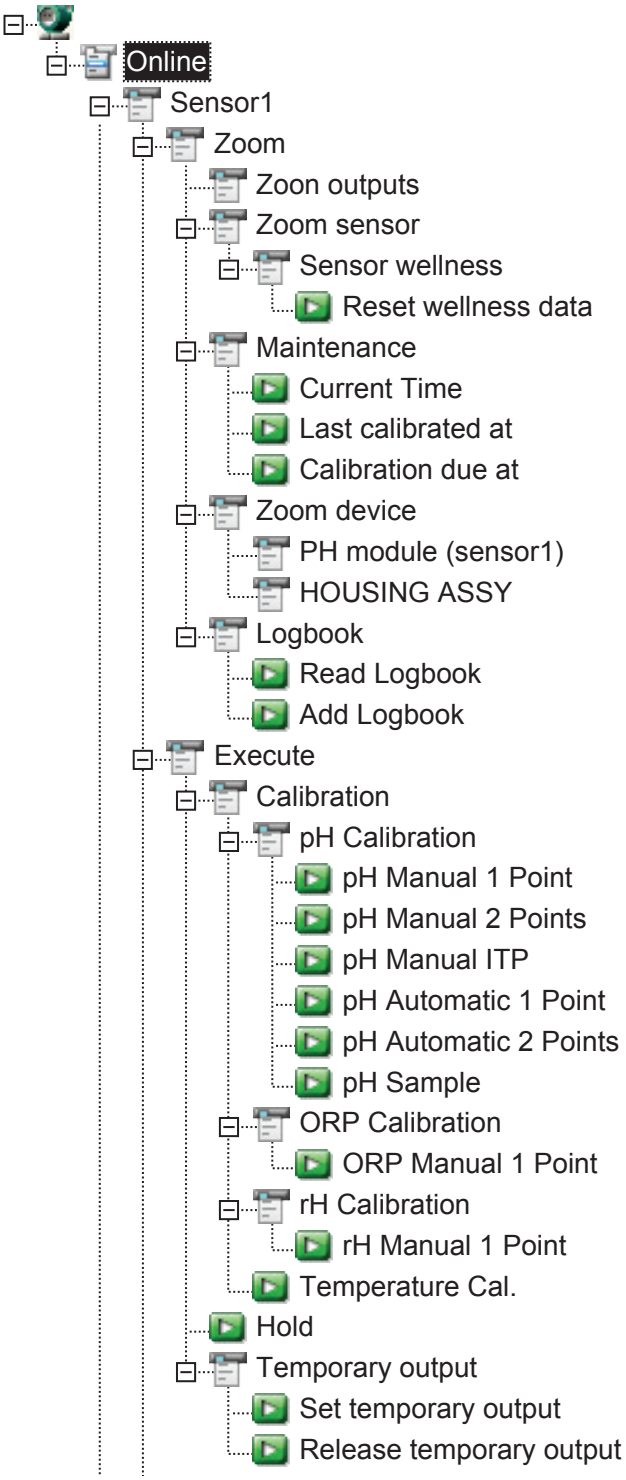
Note for Functions

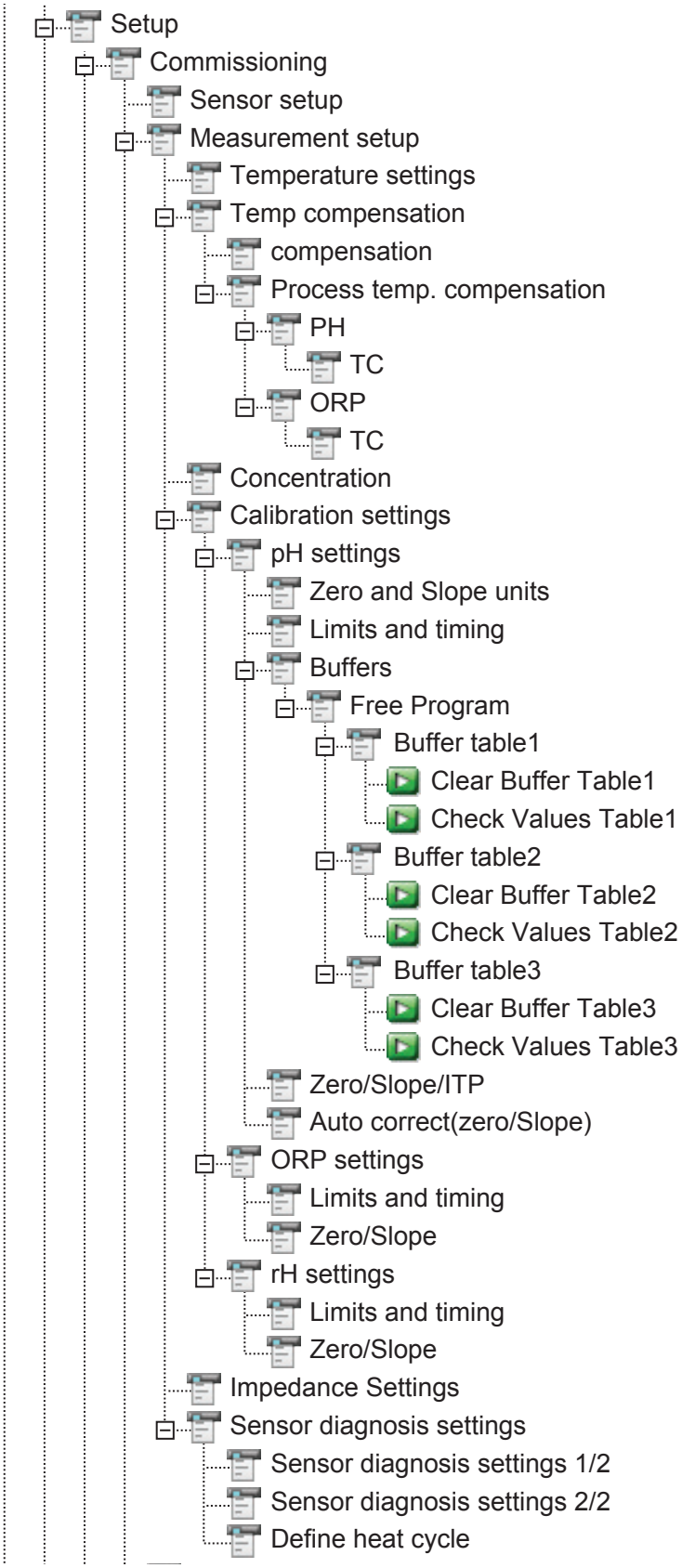
Hold status signal:

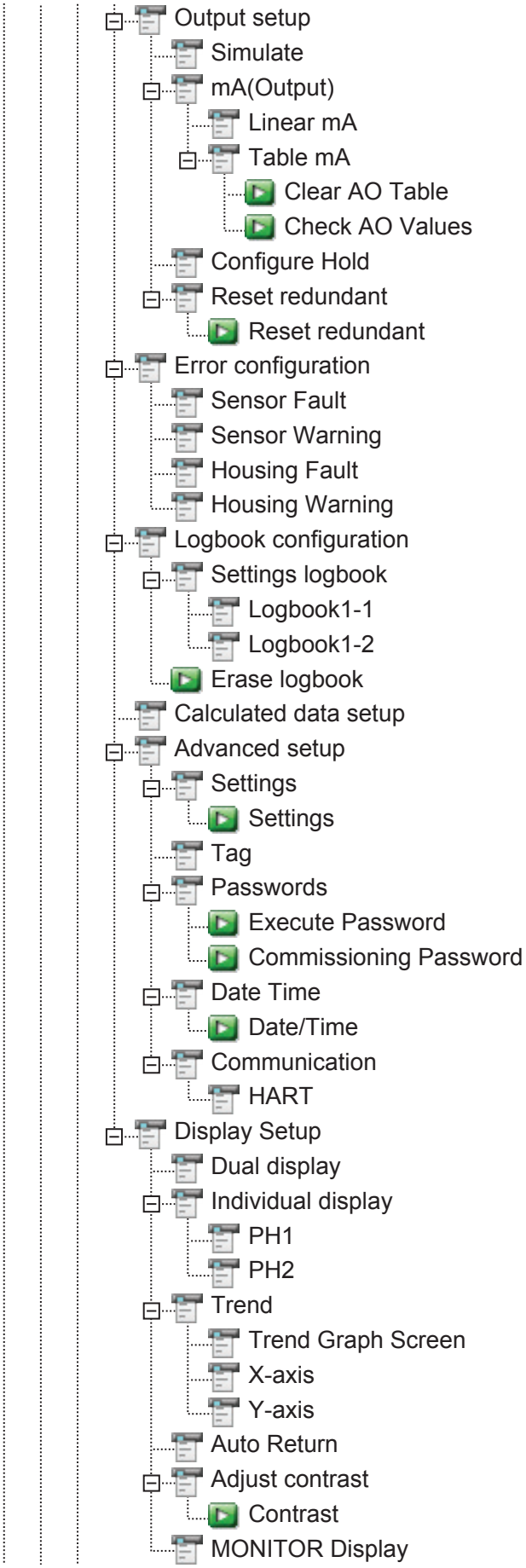
The FLXA21 has the status button of Hold on the display (Main display or Home display). (Refer to the section 1.3) This Hold status is available as a parameter on the HART communication. This parameter is in the following menu of the each measurement DD menu structure;

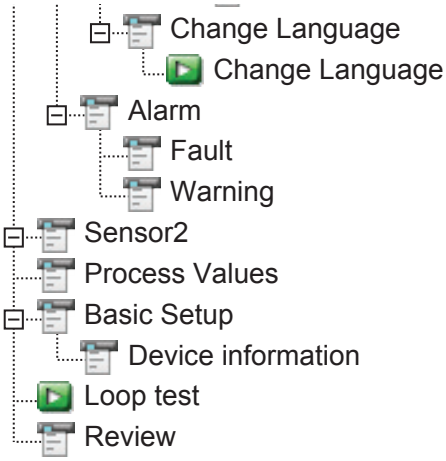
Sensor1(or 2) – Zoom – Zoom outputs – mA value
└ HOLD

DD Menu Structure for pH Meter Functions (Device revision 2, DD file revision 1)




Setup
Commissioning
Sensor setup
Measurement setup
Temperature settings
Temp compensation
compensation
Process temp. compensation
PH
TC
ORP
TC
Concentration
Calibration settings
pH settings
Zero and Slope units
Limits and timing
Buffers
Free Program
Buffer table1
Clear Buffer Table1
Check Values Table1
Buffer table2
Clear Buffer Table2
Check Values Table2
Buffer table3
Clear Buffer Table3
Check Values Table3
Zero/Slope/ITP
Auto correct(zero/Slope)
ORP settings
Limits and timing
Zero/Slope
rH settings
Limits and timing
Zero/Slope
Impedance Settings
Sensor diagnosis settings
Sensor diagnosis settings 1/2
Sensor diagnosis settings 2/2
Define heat cycle

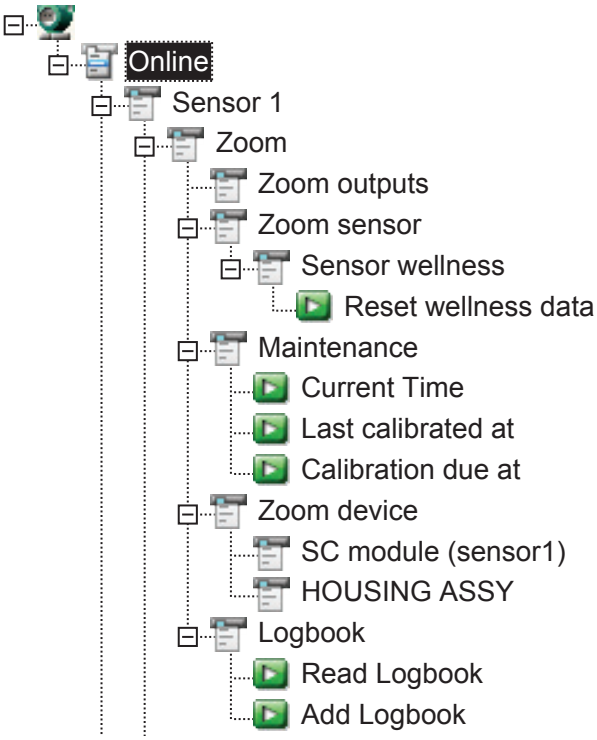

Output setup
Simulate
mA(Output)
Linear mA
Table mA
Clear AO Table
Check AO Values
Configure Hold
Reset redundant
Reset redundant
Error configuration
Sensor Fault
Sensor Warning
Housing Fault
Housing Warning
Logbook configuration
Settings logbook
Logbook1-1
Logbook1-2
Erase logbook
Calculated data setup
Advanced setup
Settings
Settings
Tag
Passwords
Execute Password
Commissioning Password
Date Time
Date/Time
Communication
HART
Display Setup
Dual display
Individual display
PH1
PH2
Trend
Trend Graph Screen
X-axis
Y-axis
Auto Return
Adjust contrast
Contrast
MONITOR Display

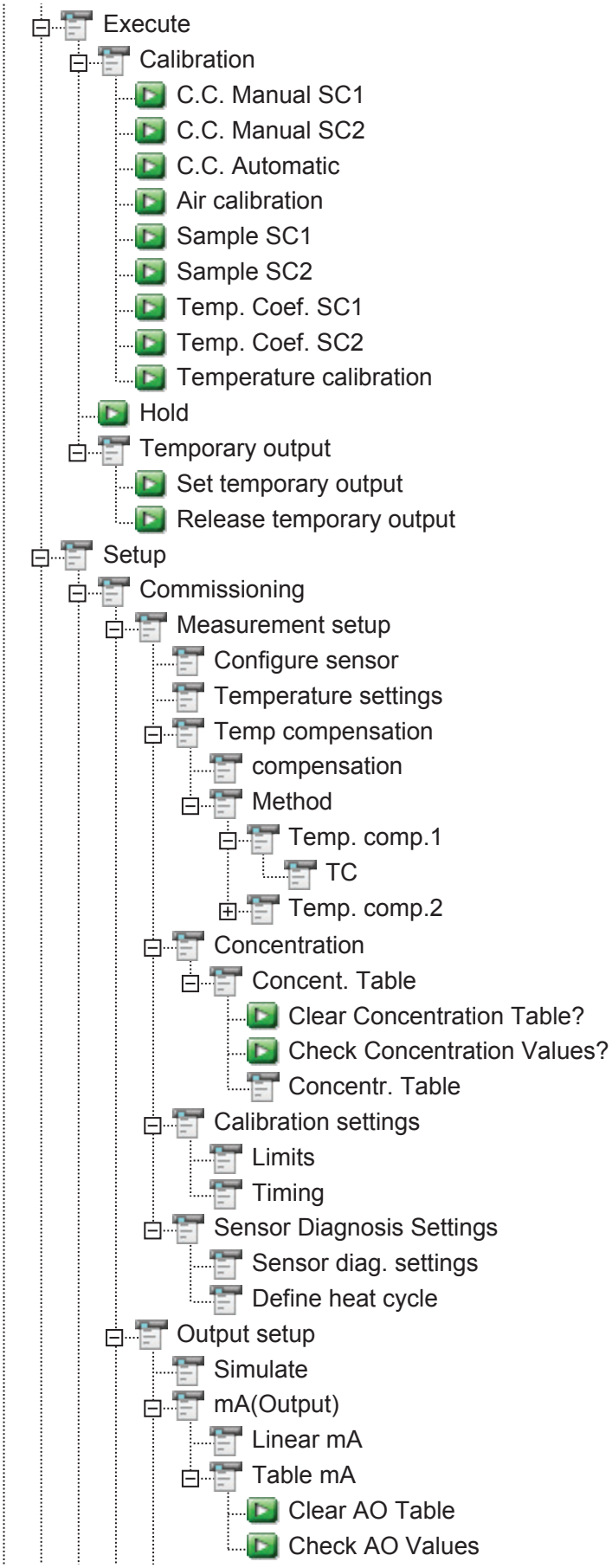


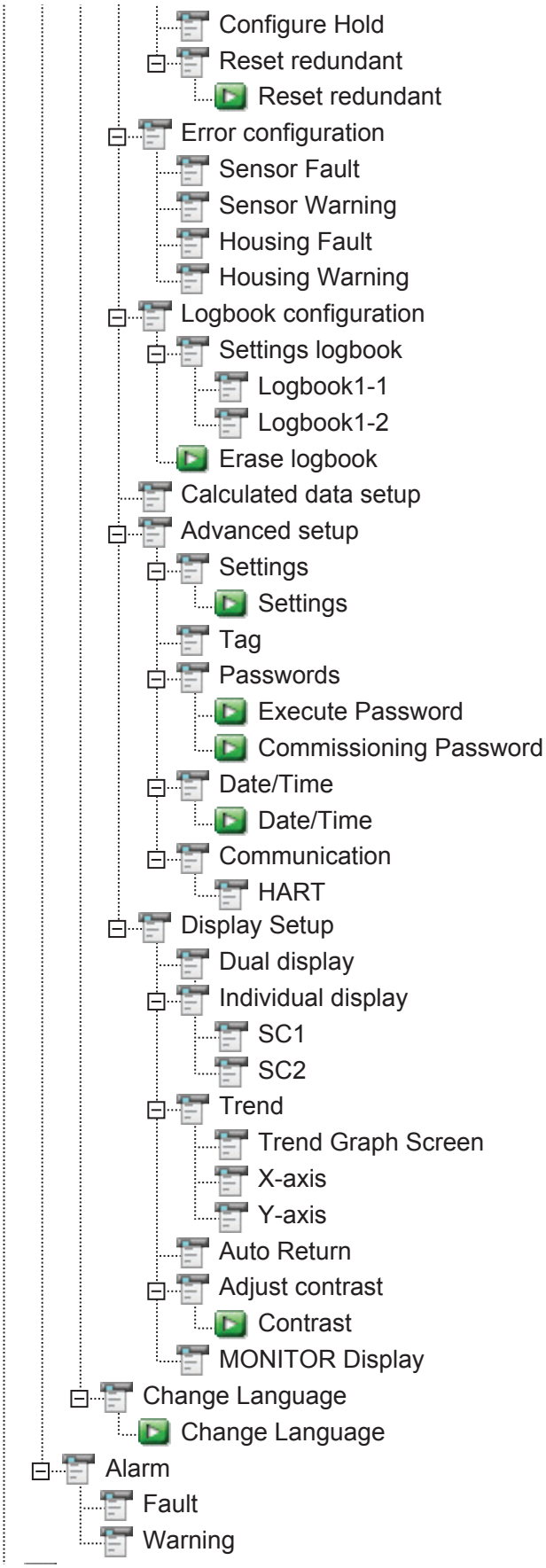
NOTE

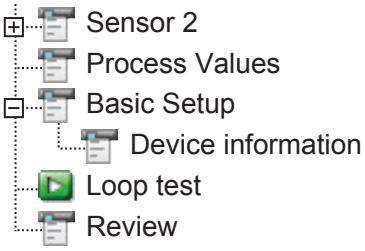
In the Device Type Manager (DTM) of FieldMate, the Sensor Wellness menu and Alarm menu are below the Diagnosis menu.

DD Menu Structure for SC Meter Functions (Device revision 2, DD file revision 1)




Execute
Calibration
C.C. Manual SC1
C.C. Manual SC2
C.C. Automatic
Air calibration
Sample SC1
Sample SC2
Temp. Coef. SC1
Temp. Coef. SC2
Temperature calibration
Hold
Temporary output
Set temporary output
Release temporary output
Setup
Commissioning
Measurement setup
Configure sensor
Temperature settings
Temp compensation
compensation
Method
Temp. comp.1
TC
Temp. comp.2
Concentration
Concent. Table
Clear Concentration Table?
Check Concentration Values?
Concentr. Table
Calibration settings
Limits
Timing
Sensor Diagnosis Settings
Sensor diag. settings
Define heat cycle
Output setup
Simulate
mA(Output)
Linear mA
Table mA
Clear AO Table
Check AO Values

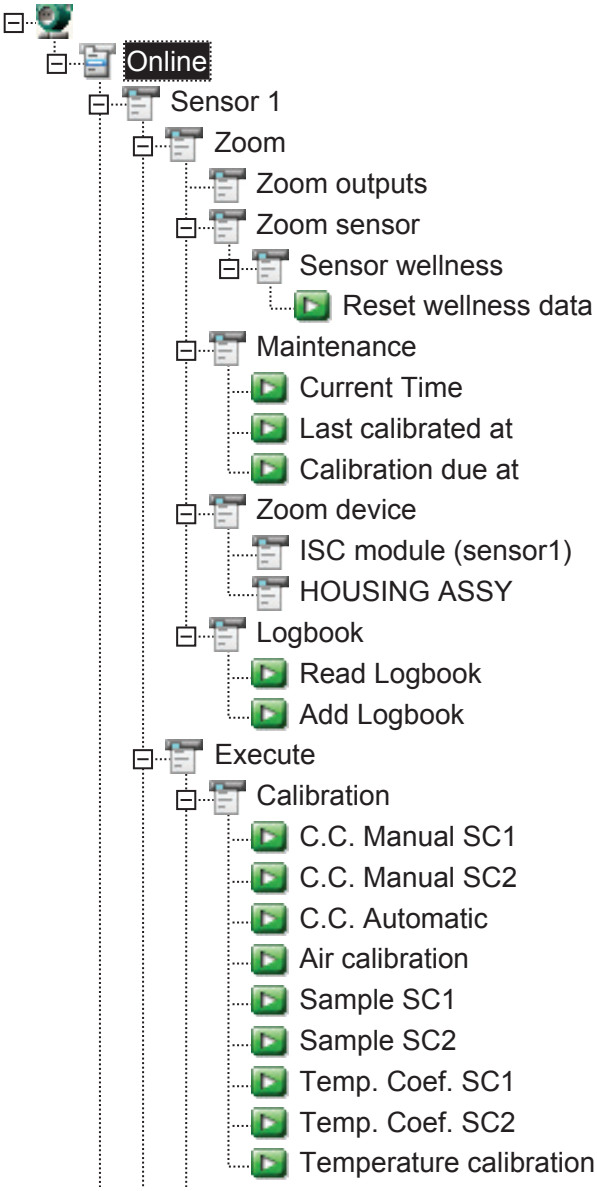

Configure Hold
Reset redundant
Reset redundant
Error configuration
Sensor Fault
Sensor Warning
Housing Fault
Housing Warning
Logbook configuration
Settings logbook
Logbook1-1
Logbook1-2
Erase logbook
Calculated data setup
Advanced setup
Settings
Settings
Tag
Passwords
Execute Password
Commissioning Password
Date/Time
Date/Time
Communication
HART
Display Setup
Dual display
Individual display
SC1
SC2
Trend
Trend Graph Screen
X-axis
Y-axis
Auto Return
Adjust contrast
Contrast
MONITOR Display
Change Language
Change Language
Alarm
Fault
Warning

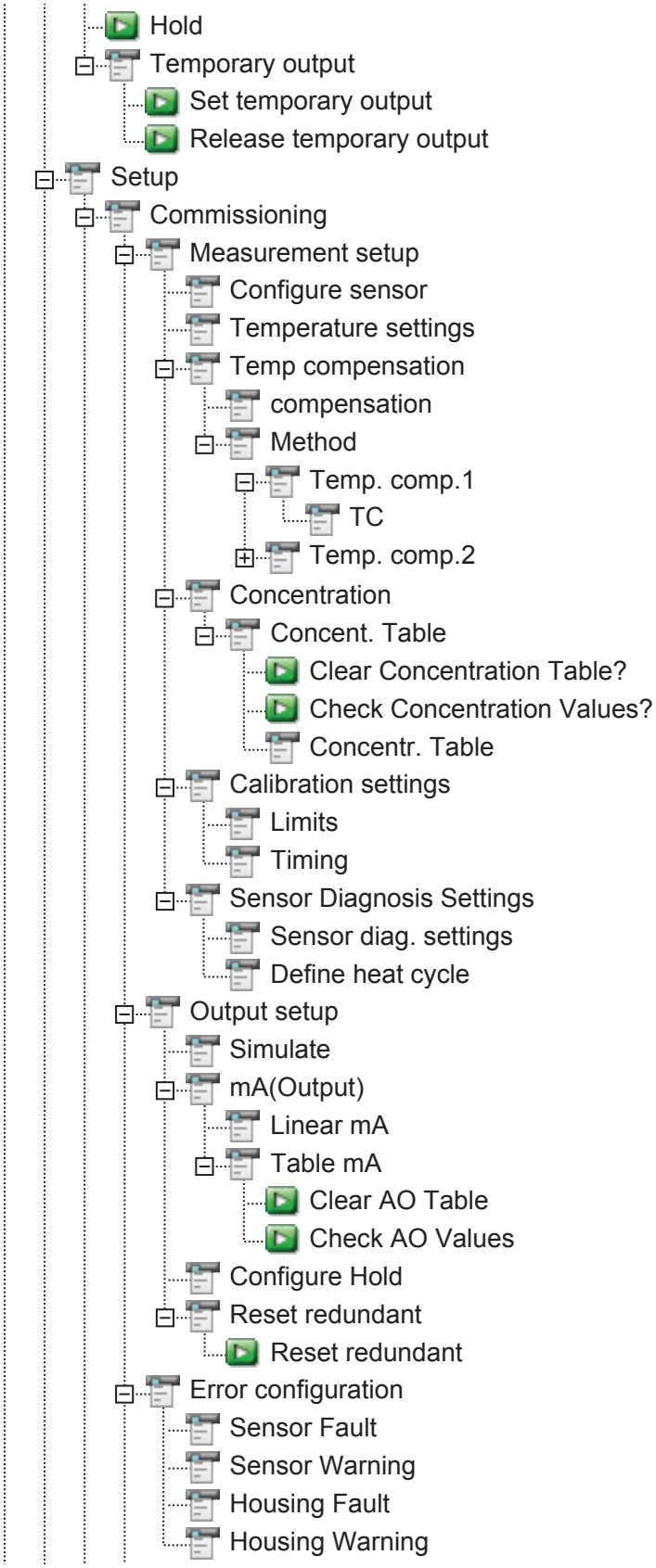


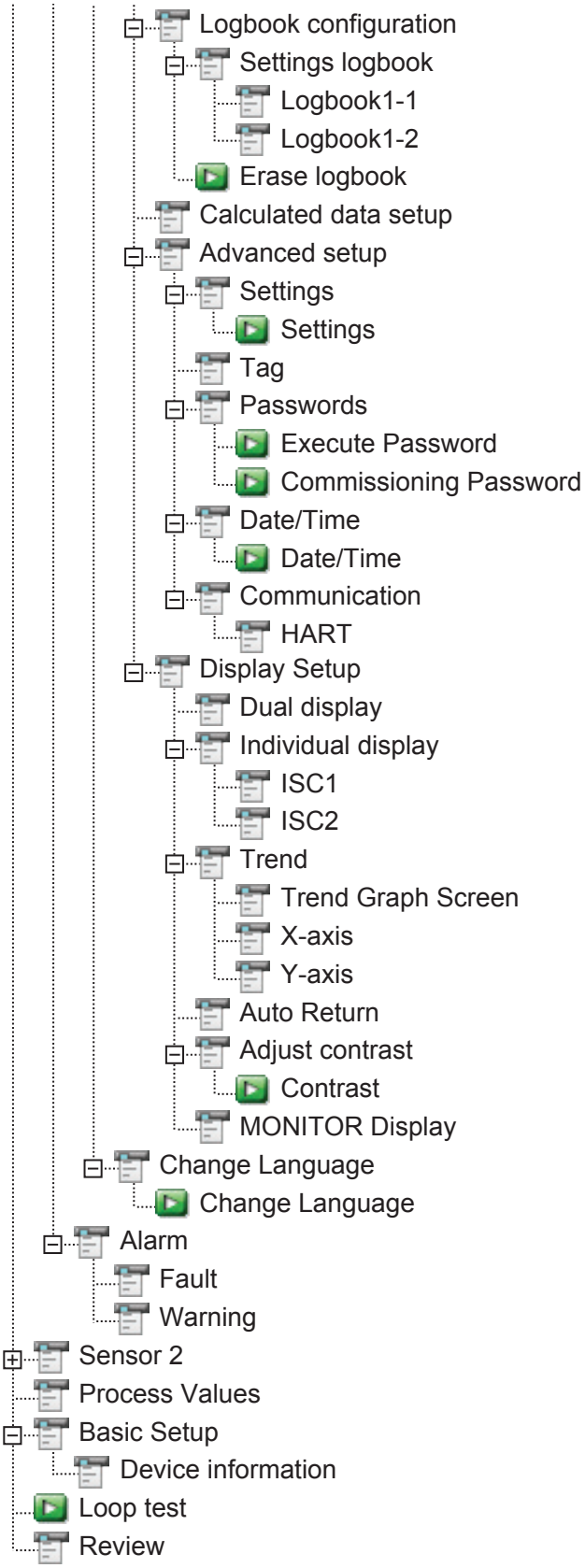
NOTE

In the Device Type Manager (DTM) of FieldMate, the Sensor Wellness menu and Alarm menu are below the Diagnosis menu.

DD Menu Structure for ISC Meter Functions (Device revision 2, DD file revision 1)



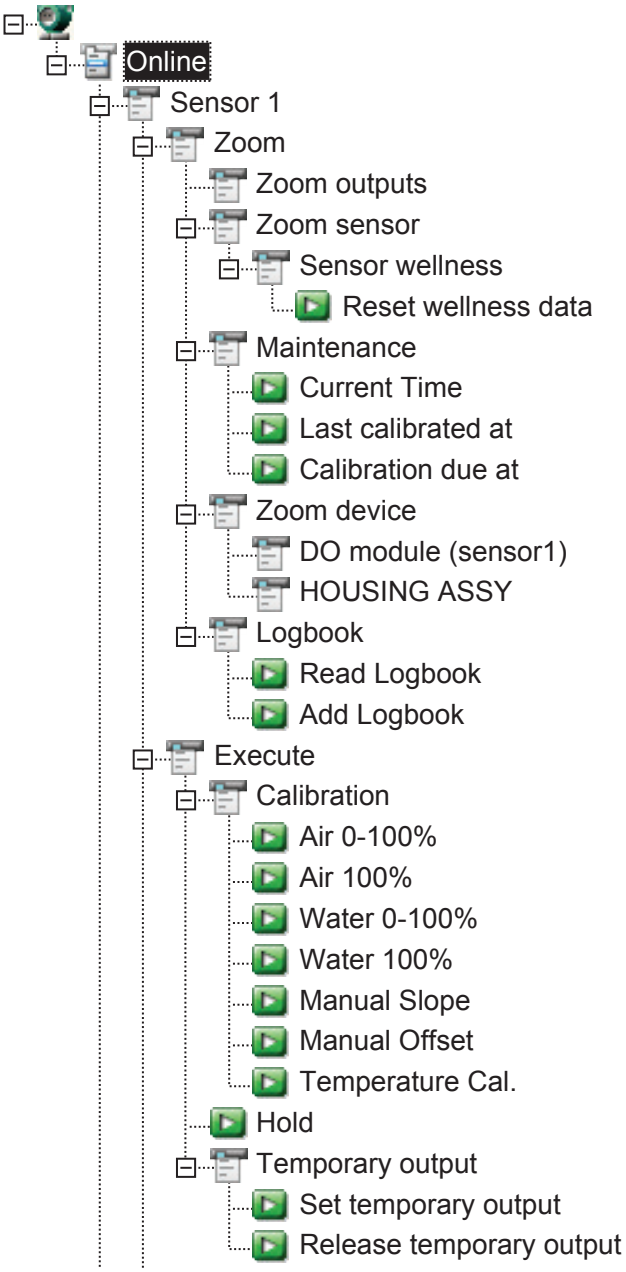

Hold
Temporary output
Set temporary output
Release temporary output
Setup
Commissioning
Measurement setup
Configure sensor
Temperature settings
Temp compensation
compensation
Method
Temp. comp.1
TC
Temp. comp.2
Concentration
Concent. Table
Clear Concentration Table?
Check Concentration Values?
Concentr. Table
Calibration settings
Limits
Timing
Sensor Diagnosis Settings
Sensor diag. settings
Define heat cycle
Output setup
Simulate
mA(Output)
Linear mA
Table mA
Clear AO Table
Check AO Values
Configure Hold
Reset redundant
Reset redundant
Error configuration
Sensor Fault
Sensor Warning
Housing Fault
Housing Warning

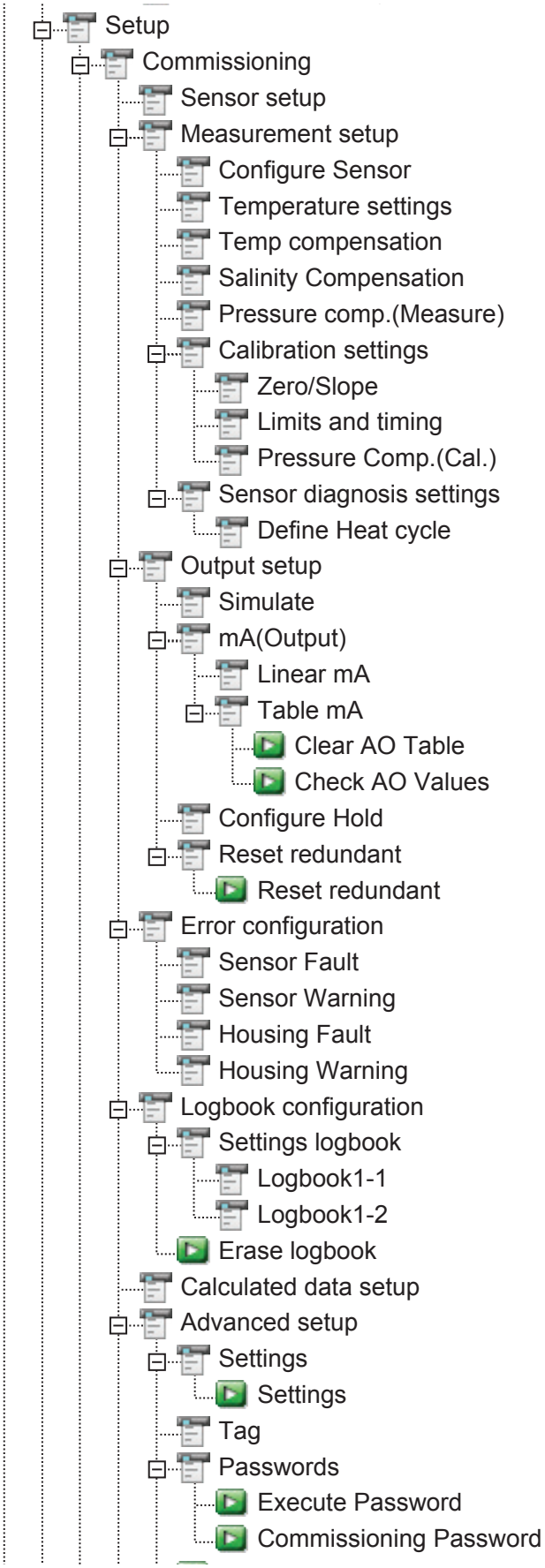

Logbook configuration
Settings logbook
Logbook1-1
Logbook1-2
Erase logbook
Calculated data setup
Advanced setup
Settings
Settings
Tag
Passwords
Execute Password
Commissioning Password
Date/Time
Date/Time
Communication
HART
Display Setup
Dual display
Individual display
ISC1
ISC2
Trend
Trend Graph Screen
X-axis
Y-axis
Auto Return
Adjust contrast
Contrast
MONITOR Display
Change Language
Change Language
Alarm
Fault
Warning
Sensor 2
Process Values
Basic Setup
Device information
Loop test
Review

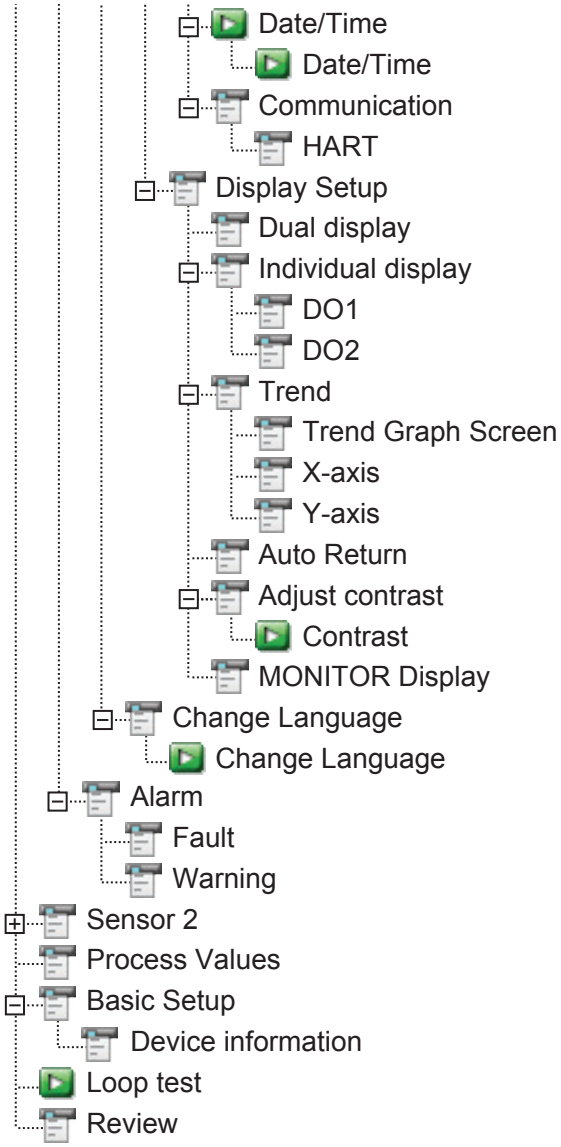
NOTE

In the Device Type Manager (DTM) of FieldMate, the Sensor Wellness menu and Alarm menu are below the Diagnosis menu.

DD Menu Structure for DO Meter Functions (Device revision 2, DD file revision 1)



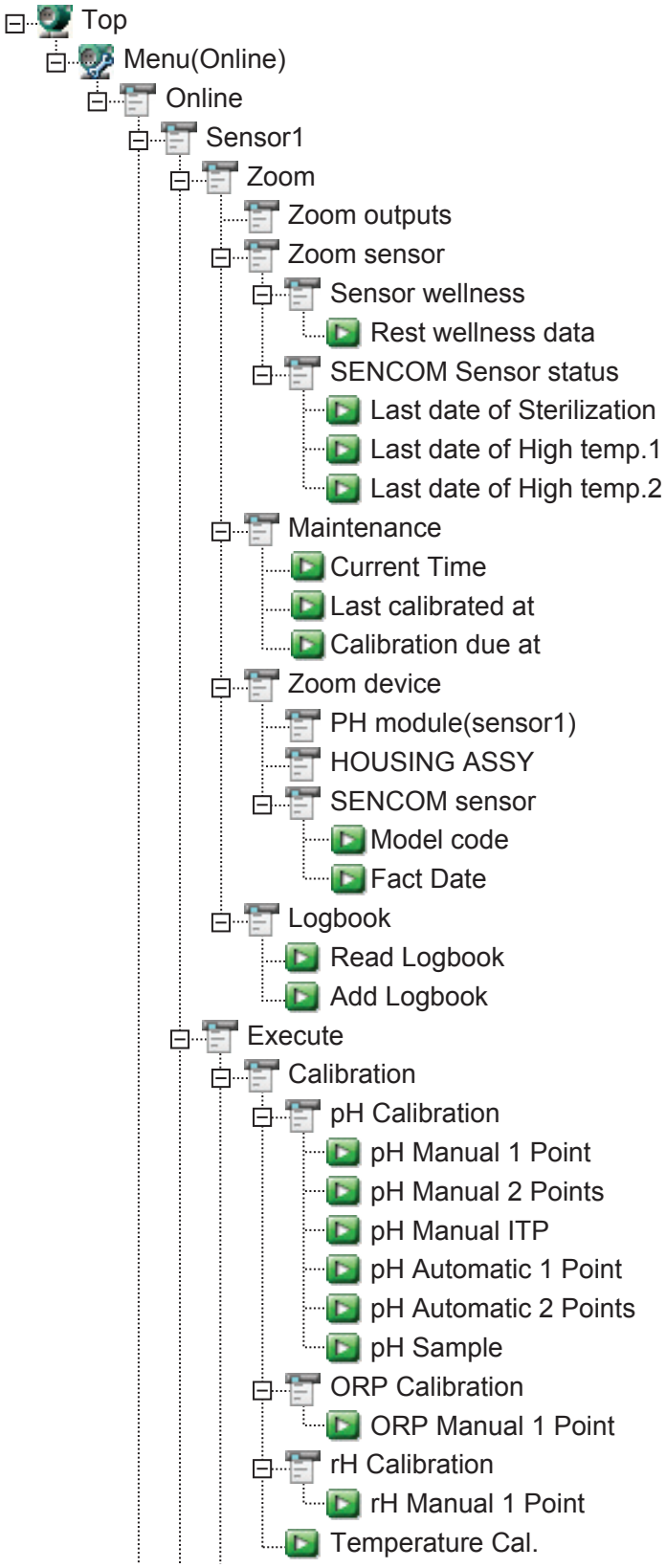

Setup
Commissioning
Sensor setup
Measurement setup
Configure Sensor
Temperature settings
Temp compensation
Salinity Compensation
Pressure comp.(Measure)
Calibration settings
Zero/Slope
Limits and timing
Pressure Comp.(Cal.)
Sensor diagnosis settings
Define Heat cycle
Output setup
Simulate
mA(Output)
Linear mA
Table mA
Clear AO Table
Check AO Values
Configure Hold
Reset redundant
Reset redundant
Error configuration
Sensor Fault
Sensor Warning
Housing Fault
Housing Warning
Logbook configuration
Settings logbook
Logbook1-1
Logbook1-2
Erase logbook
Calculated data setup
Advanced setup
Settings
Settings
Tag
Passwords
Execute Password
Commissioning Password

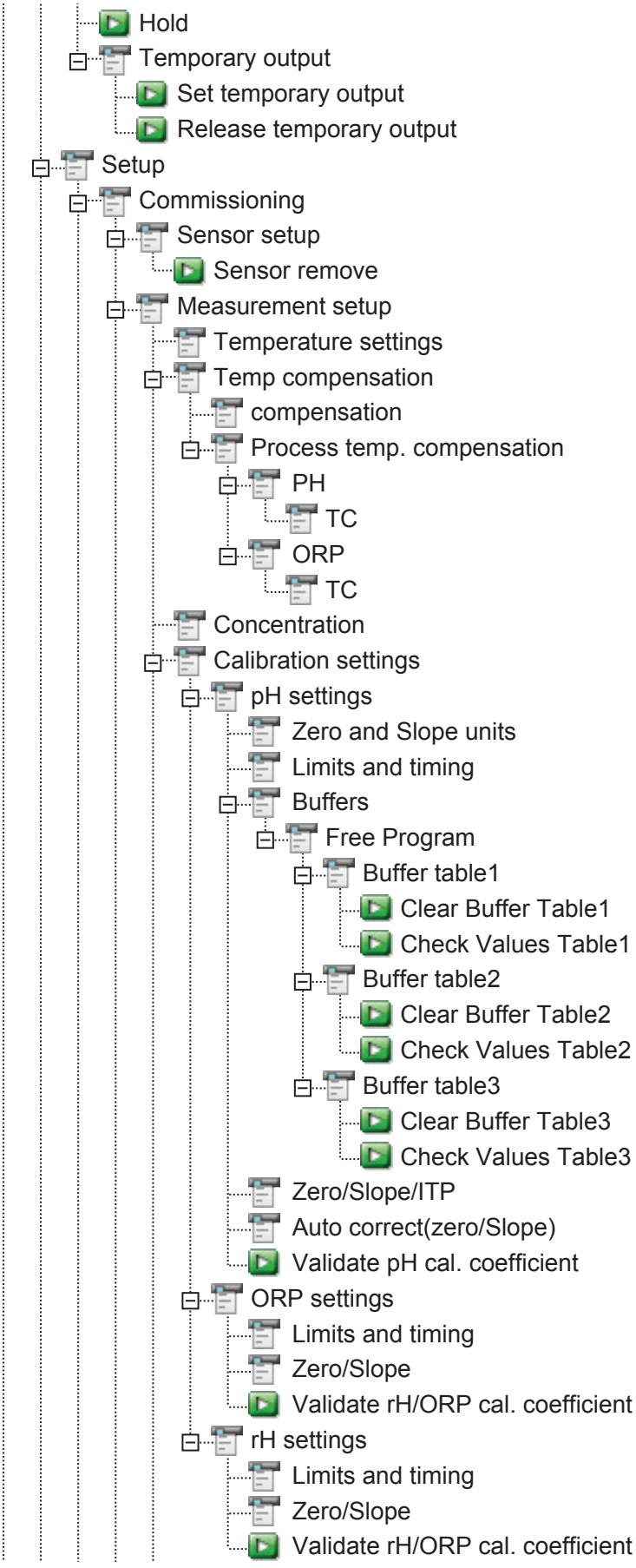


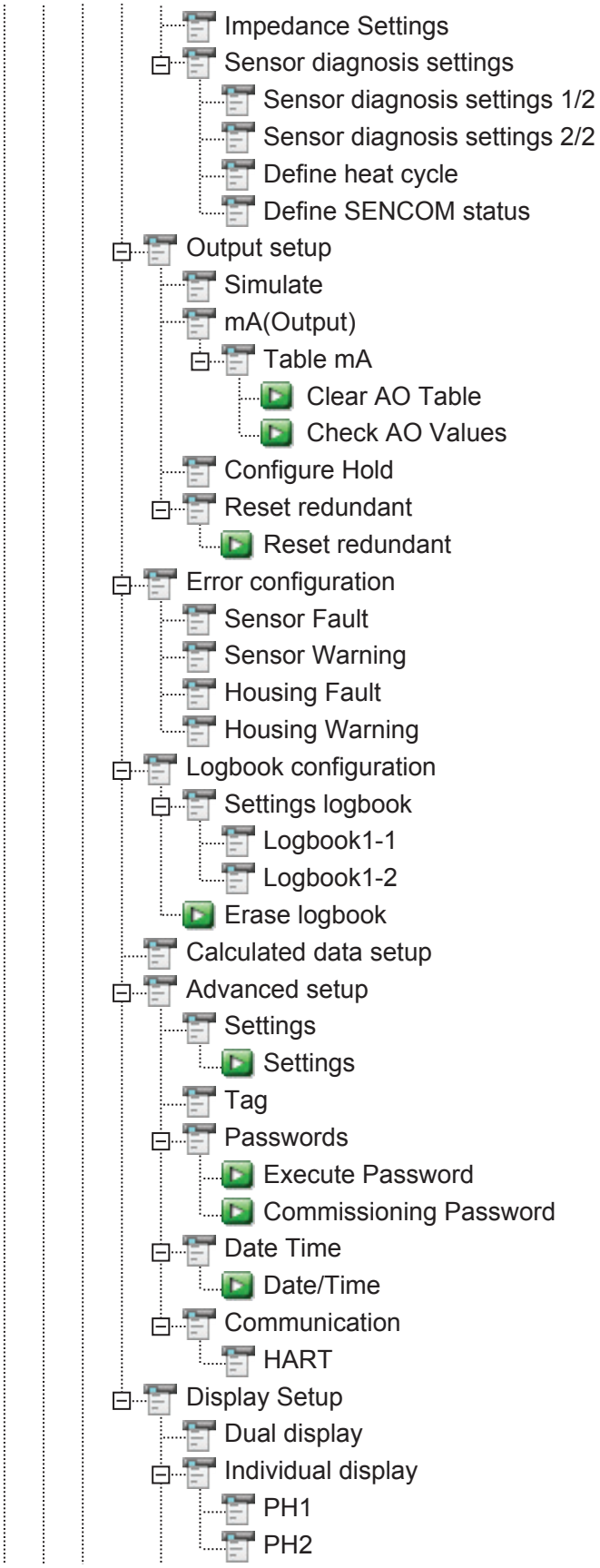
NOTE

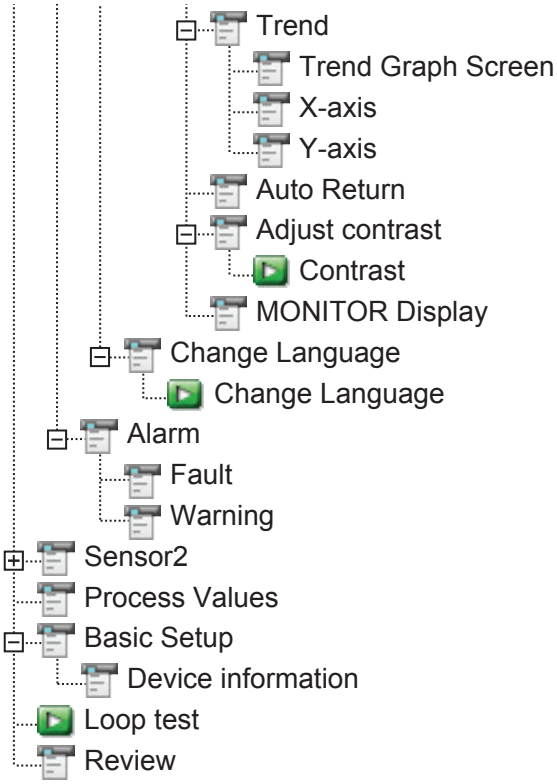
In the Device Type Manager (DTM) of FieldMate, the Sensor Wellness menu and Alarm menu are below the Diagnosis menu.

DD Menu Structure for SENCOM Meter Functions (Device revision 2, DD file revision 1)




Hold
Temporary output
Set temporary output
Release temporary output
Setup
Commissioning
Sensor setup
Sensor remove
Measurement setup
Temperature settings
Temp compensation
compensation
Process temp. compensation
PH
TC
ORP
TC
Concentration
Calibration settings
pH settings
Zero and Slope units
Limits and timing
Buffers
Free Program
Buffer table1
Clear Buffer Table1
Check Values Table1
Buffer table2
Clear Buffer Table2
Check Values Table2
Buffer table3
Clear Buffer Table3
Check Values Table3
Zero/Slope/ITP
Auto correct(zero/Slope)
Validate pH cal. coefficient
ORP settings
Limits and timing
Zero/Slope
Validate rH/ORP cal. coefficient
rH settings
Limits and timing
Zero/Slope
Validate rH/ORP cal. coefficient


Impedance Settings
Sensor diagnosis settings
Sensor diagnosis settings 1/2
Sensor diagnosis settings 2/2
Define heat cycle
Define SENCOM status
Output setup
Simulate
mA(Output)
Table mA
Clear AO Table
Check AO Values
Configure Hold
Reset redundant
Reset redundant
Error configuration
Sensor Fault
Sensor Warning
Housing Fault
Housing Warning
Logbook configuration
Settings logbook
Logbook1-1
Logbook1-2
Erase logbook
Calculated data setup
Advanced setup
Settings
Settings
Tag
Passwords
Execute Password
Commissioning Password
Date Time
Date/Time
Communication
HART
Display Setup
Dual display
Individual display
PH1
PH2



NOTE

In the Device Type Manager (DTM) of FieldMate, the Sensor Wellness menu and Alarm menu are below the Diagnosis menu.

Revision Information

Title : FLXA202/FLXA21 2-Wire Analyzer HART Communication
Manual number : TI 12A01A02-60E

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Correction (Page 3, Installing the Device Descriptions (DDs) file of FieldMate)

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Addition of FLXA202

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Addition of SENCOM

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