CCM
INSTRUCTION
MANUAL

Phase Dynamics, Inc.

Document 0055-00000-002

Phase Dynamics CCM

August 15, 2005

The Phase Dynamics CCM is a completely self-contained stand-alone well-test system. The control electronics are configured to run a well test with user-specified parameters. The system can be configured from the front panel switches or through digital communications via the available communication port using the Modbus protocol.

The Phase Dynamics CCM controller is based on the field-proven Full Range Analyzer electronics. The system is actually an extension of the enhanced analyzer electronics with an additional analog input /output board. Most systems will also utilize Modbus communications to obtain process information from the various sub-components of the CCM. This usually includes the pressure transmitter and flow meters as well as some valve positioners.

The Phase Dynamics CCM software also contains the Full Range Analyzer software. Multiple PID Loops have been implemented to control the CCM separator. Various manual and fail-safe conditions are also included in the normal operation of the CCM software.

The following sections will describe the additional features of the CCM hardware and software. Please refer to the Full Range Water-Hydrocarbon Analyzer manual for basic operations of the Phase Dynamics Full Range Analyzer.

The Phase Dynamics CCM controller electronics adds four additional 4-20mA analog inputs and outputs to the base Full Range Analyzer system, for a total of 5 current inputs and 5 current outputs.

Most systems will not utilize the five analog inputs due to the availability of Modbus-enabled pressure transmitters and flow meters. However, some valve positioners may provide feedback to the control electronics in the form of a 4-20mA signal.

The following table lists the analog input connections on Motherboard terminal strip J12.

Terminal Number	Label	Function
7	+24VDC	N.C.
8	AI1	Stream Select
9	AI1 RET	

Each analog input channel has a +24VDC output that is used to power the CCM devices. Each 24V output and return, located on J1, is individually fused at 1A. The 24V return should be connected to the corresponding AI# RET. The following table lists the CCM Power connections on Motherboard terminal strip J1.

Terminal Number	Label	Function
9	+24VDC	Liquid Coriolis Power
11	AI2 RET	
10	AI2	N.C.
12	+24VDC	Gas Coriolis Power
14	AI3 RET	
13	AI3	N.C.
15	+24VDC	Vessel Level Transmitter Power
17	AI4 RET	
16	AI4	N.C.
18	+24VDC	N.C.
20	AI5 RET	
19	AI5	N.C.

The five analog outputs are used to control the valve positioners and provide output signals to a PLC or DCS. There can be up to two valve positioners in a CCM system. The other three outputs represent the water-cut, oil flow rate, and the gas flow rate by default.

The following table lists the analog output connections on Motherboard terminal strip J12.

Terminal Number	Label	Function
5	AO1	Water Cut
6	AO1 RET	

The following table lists the analog output connections on Motherboard terminal strip J1.

Terminal Number	Label	Function
21	AO2	Liquid Valve Control
22	AO2 RET	
23	AO3	Gas Valve Control
24	AO3 RET	
25	AO4	Oil Flow Rate
26	AO4 RET	
27	AO5	Gas Flow Rate
28	AO5 RET	

The following table lists the CCM digital communications connections on Motherboard terminal strip J1.

Terminal Number	Label	Function
1	COM3A	Liquid Coriolis
2	COM3B	
3	COM3A	Gas Coriolis
4	COM3B	
5	COM4A	Vessel Level Transmitter
6	COM4B	
7	COM4A	N.C.
8	COM4B	

Diagnostics

The CCM's main diagnostics can be read from either integer register 00003, long integer pair 08207..08208, or coils 00017-00032. This value will be non-zero when a fault is detected with any of the on-board instrumentation. Each instrument is assigned a value that will be added to the diagnostics register. The following table lists the values for the specific instrumentation.

Instrument	Bit	Coil	Value
Pressure Transmitter Diagnostics 1	0	17	1
Pressure Transmitter Diagnostics 2	1	18	2
Pressure Transmitter Diagnostics 3	2	19	4
Water-Cut Analyzer Diagnostics	3	20	8
Gas Coriolis Flow Meter Diagnostics	4	21	16
Liquid Coriolis Flow Meter Diagnostics	5	22	32

Error Messages

The following table lists the Error Messages specific to the CCM in addition to those described in the Full Range Water-Hydrocarbon Analyzer manual. The error code can be read in integer register 00004. The OIT will display the error message on the diagnostics screen.

Error	Cause	Action Needed
Modbus Exception #29	Modbus packet exception.	1) Check Comm 1 wiring. 2) Check Comm 1 settings.
Modbus Timeout #30	Modbus packet timed out.	1) Check Comm 1 wiring. 2) Check Comm 1 settings. 3) Try slower Baud Rate.
Modbus Overrun #31	Modbus packet bytes overran one another.	1) Check Comm 1 wiring. 2) Check Comm 1 settings. 3) Try slower Comm 1 Baud Rate.
Modbus Error #32	Modbus packet byte error.	1) Check Comm 1 wiring. 2) Check Comm 1 settings. 3) Try slower Comm 1 Baud Rate.
Comm Overflow #33	Master receiver buffer overflowed.	1) Check Comm 3&4 wiring. 2) Check Comm 3&4 settings.
CCM Low Level #34	CCM Separator at Low Level.	1) Raise level set point. 2) Adjust PID parameters.
CCM High Level #35	CCM Separator at High Level.	1) Empty liquid collection tank. 2) Lower level set point. 3) Adjust PID parameters.
Pressure Error #36	CCM Pressure Transmitter error.	Check Pressure Transmitter diagnostics values.
Liquid Flow Error #37	CCM Liquid Flow Meter error.	Check Liquid Flow Meter diagnostics value.
Gas Flow Error #38	CCM Gas Flow Meter error.	Check Gas Flow Meter diagnostics value.
Pressure Fail #39	CCM Pressure Transmitter not responding.	1) Check Pressure Transmitter wiring. 2) Check 24 VDC fuse.
Liquid Flow Fail #40	CCM Liquid Flow Meter not responding.	Check Liquid Flow Meter wiring.
Gas Flow Fail #41	CCM Gas Flow Meter not responding.	Check Gas Flow Meter wiring.

OPERATOR INTERFACE

MSVE BUTTON INPUT

To maintain an explosion proof rating, four function switches allow the user to operate the interface terminal without having to open the OIT enclosure to access the touch screen. The four user interface switches are labeled “MENU”, “SELECT”, “VALUE”, and “ENTER”. These control buttons allow the user to interact with the OIT to complete a variety of tasks including scaling of outputs, adjusting calibration factors, and modifying factory coefficients.

The MENU button scrolls through the list of simplified MENU items, which are a subset of the normal touch screen menus. Each time MENU is pressed, a new screen is displayed until all items have been shown and the normal display returns to the first screen. Holding MENU will force the OIT to go to the main screen.

The SELECT and VALUE buttons change the value of the selected menu item. Pressing SELECT displays a selection indicator to select a parameter to be changed. Pressing ENTER will select that parameter for entry. When changing a parameter’s value, SELECT moves a blinking cursor to each digit of the parameter. Each time the VALUE button is pressed, the digit’s value increments by one, and recycles when the end is reached. Holding SELECT at anytime will force the OIT to go to the information screen.

Pressing ENTER will store the value for the selected menu item. Once ENTER has been pressed, the new value is stored and THE OLD VALUE IS LOST. MENU will cancel the parameter-input session. The ENTER button must be pressed to store a new value for the parameter, otherwise the desired new value is ignored and the last valid value is retained. Pressing MENU will cancel the input.

TOUCH SCREEN INPUT

BASIC INFORMATION

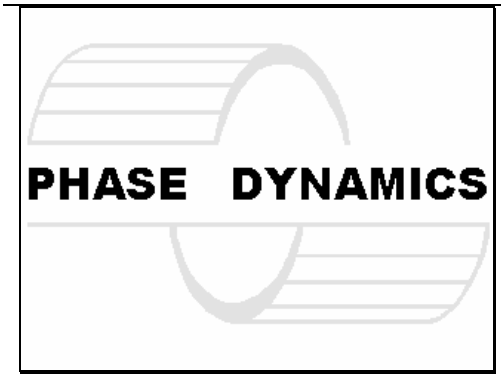
The LCD touch screen is setup with 2 different types of menus. The menus are designated by the color of their lower corner buttons.

Orange screen buttons are for menus that are common among all analyzer types. Blue screen buttons are menus that are specifically for the analyzer type currently being accessed by the OIT. Gray buttons are indicative of sub menu items or popup screens.
Note that the default analyzer screen has hidden screen buttons located in the lower corners.

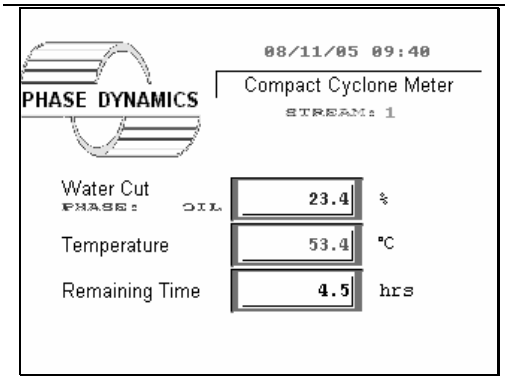
To enter the common menus, simply touch the Phase Dynamics logo on the default analyzer screen, or press the SELECT button while the default analyzer screen is displayed.

There are two types of data objects - indicators and parameter inputs. Indicators are outlined in blue and usually have proper case for their titles. Parameters and settings are outlined in yellow and their titles are usually upper case.

TYPICAL MENUS



Startup Screen
This is the first screen that is displayed upon power-up. While displaying this screen, the OIT will poll the analyzer for its mode. Once the mode has been retrieved, the OIT will automatically go to the appropriate main screen for that analyzer mode.



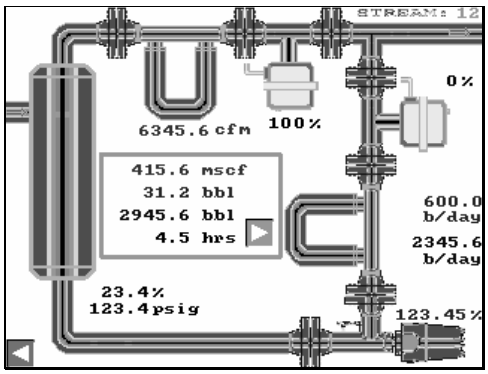
Typical Main Screen
This is the main screen for the CCM Analyzer.

To enter the common menus, simply touch the Phase Dynamics, Inc. logo or press SELECT.

The standard touch screen navigation buttons are hidden on the lower corners. Pressing MENU will display the next menu.

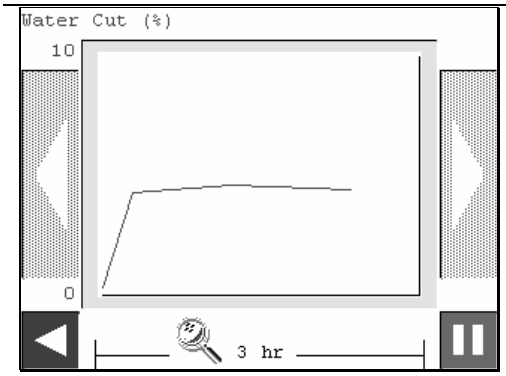
If a floppy disk icon appears, it indicates that the configuration has been changed. Simply touch the icon and it will take you to the SAVE CONFIGURATION menu.

A red exclamation point icon may appear on the bottom center of the screen when there is an error. Simply touch the icon to go directly to the DIAGNOSTICS menu. This is also a hidden button and may be pressed at any time.



P&ID Screen
This is the main Process and Instrumentation Diagram screen for the CCM Analyzer.

Touch the equipment icons to set parameters and view information. Alternately, press SELECT and ENTER to select the equipment icons.



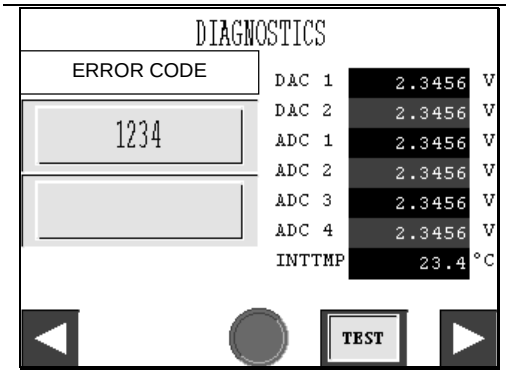
Typical Trend Display
The 1024 point logging is started upon power-up of the OIT.

Exit the trend screen by pressing the lower left button. Pressing MENU will exit the trend screen and go to the next menu.

Pause **ALL** logging of trend data by pressing the lower right corner PAUSE button. This will turn all buttons red and stop data collection. The left and right scroll buttons are

active during the pause. When finished, press the PAUSE button again, to resume data collection.

The magnifying glass icon will display a 3-minute window instead of a 3-hour window.



Diagnostics Screen
This is the main screen for DIAGNOSTICS.

Navigating right will enter the alarm status indicator screens where each alarm may be viewed and acknowledged individually.

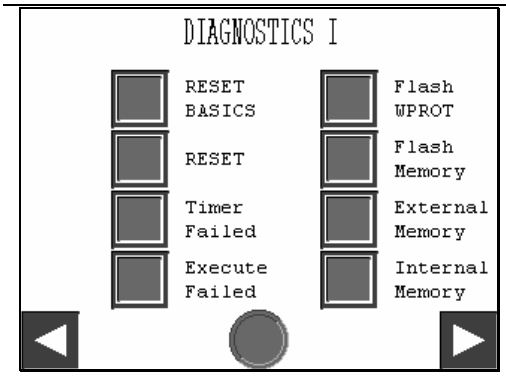
Navigating left will go back to the previous screen.

The bottom center button may be green or red in color. If it is red, touching it or pressing ENTER will clear all the diagnostic flags at once.

The value on the left is the main DIAGNOSTICS word.

The internal ambient temperature, DAC, and ADC values are displayed on this screen for technical use.

The TEST button initiates a full self-test of the hardware. Communications and other processes are halted until the self-test is completed.



Individual Alarm Indicator/Acknowledge Page 1

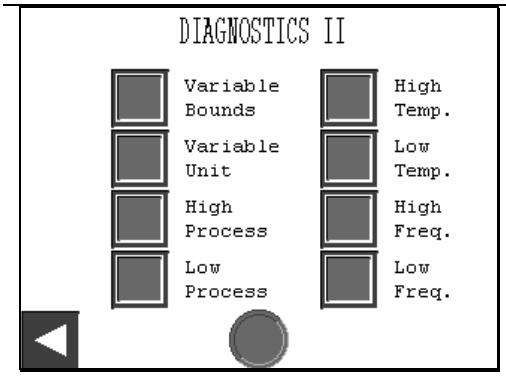
This is the first individual diagnostics screen.

Navigating right will enter the second alarm status indicator screen where each alarm may be viewed and acknowledged individually.

Navigating left will go back to the main DIAGNOSTICS screen.

The bottom center button may be green or red in color. If it is red, touching it or pressing ENTER will clear all the diagnostic flags at once.

Each status may be green or red. If it is red, touching it will acknowledge the error.



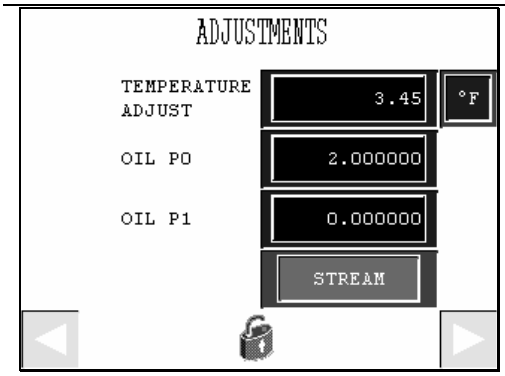
Individual Alarm Indicator/Acknowledge Page 2

This is the second individual diagnostics screen.

Navigating left will go back to the first individual diagnostics screen.

The bottom center button may be green or red in color. If it is red, touching it or pressing ENTER will clear all the diagnostic flags at once.

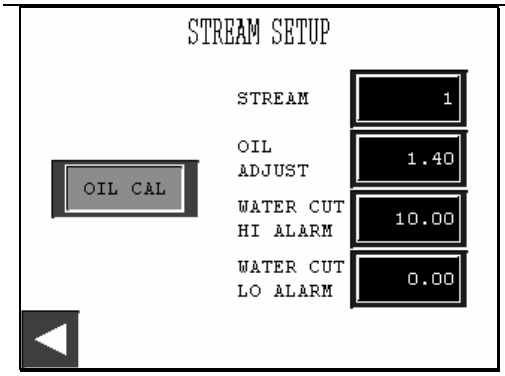
Each status indicator may be green or red. Touching a red indicator will acknowledge the error.



Typical Parameter Input
Parameter input fields are yellow. Simply touch the indicator to display a keypad. Data can then be entered. The unit will ignore the data if the input bounds are exceeded.

The button on the top right indicates the currently displayed temperature unit. This button will toggle between °F and °C.

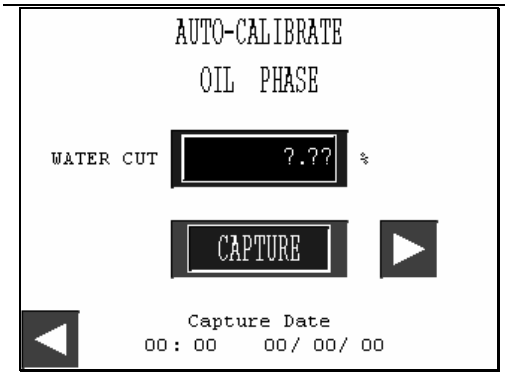
The LOCK button, shown at the bottom center of the screen, indicates the write-protection status. Touch this button to enter the SECURITY screen to lock, unlock, or to change the password of the current port.



Typical Stream Parameter Input
The parameter input fields are yellow. Simply touch the indicator and a keypad will popup. Data can then be entered or canceled. The unit will ignore the data if the input bounds are exceeded.

There are 60 streams and each stream configuration may be changed or viewed by entering the STREAM number in the top parameter field.

The CAL button enters the automatic calibration menu if the analyzer is in the appropriate phase with no range errors.



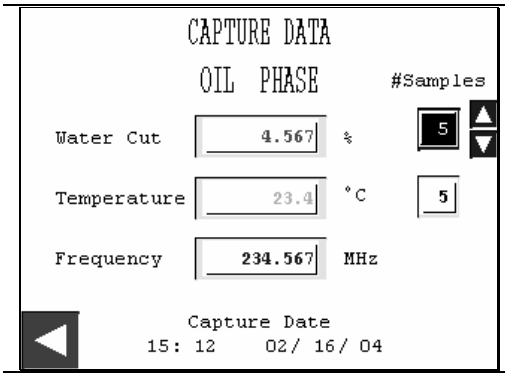
Typical Automatic Calibration

This is an automatic calibration and sample gathering screen.

The user shall press CAPTURE to capture the current analyzer readings, while he takes a sample for measurement in the laboratory. The analyzer averages the sample and date stamps it. This data can be saved for when the user completes his sample analysis.

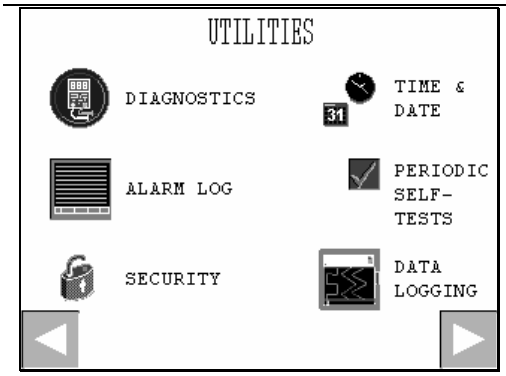
Once the sample has been analyzed, simply enter the sample's water content value into the WATER CUT field and the analyzer will compute the proper calibration factors.

NOTE: If data has not been captured, then the current analyzer readings will be used to automatically calculate the calibration parameters.



Captured Calibration Data & Setup

This is the captured data and capture setup screen. The number of samples is settable by the user. The analyzer will average the readings over the entire sample period and date stamp it.



Utilities Menu

This menu

DIAGNOSTICS – opens the main diagnostics page

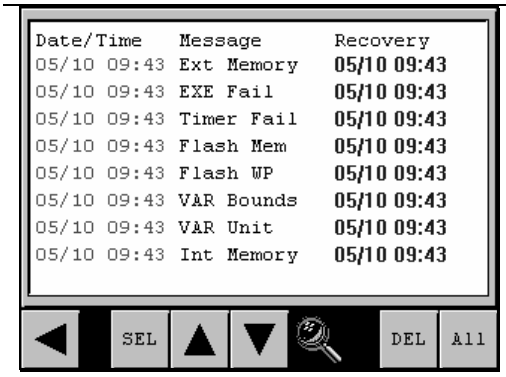
ALARM LOG – opens the alarm history page

SECURITY – opens the security page for locking, unlocking, or changing the password for the OIT port

TIME & DATE – changes the time and date in the OIT

PERIODIC SELF-TESTS – when checked, the analyzer will perform self tests automatically

DATA LOGGING – configures the internal data logging

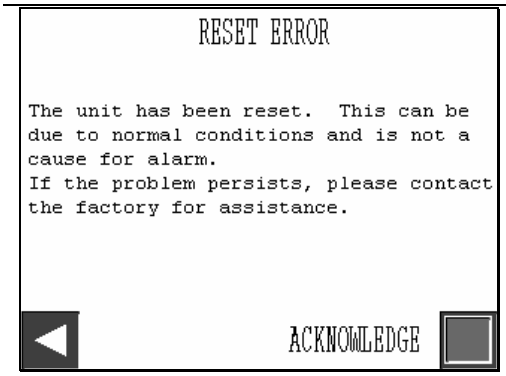


Alarm Log

The alarm log is started upon power-up of the OIT. Alarm status is indicated in red and when cleared or acknowledged it is indicated in blue.

Touch screen operation:
SEL enables the selection mode.
Press the UP and DOWN buttons to scroll through the alarm list.
The magnifying glass opens an ALARM DETAIL screen where the alarm can be acknowledged.
DEL deletes the selected acknowledged log entry.
ALL deletes all of the acknowledged log entries.

MSVE Operation:
SELECT will cycle through the active alarm detail.
MENU will exit.



Typical Alarm Detail

The alarm status is shown in the lower right corner. Press the red button to acknowledge. Press lower left button to exit this screen.

MSVE operation:
ENTER will acknowledge and alarm.
SELECT will advance to the next active alarm detail.
MENU will exit.

OIT BATTERY

If the OIT has been powered off for an extended period of time, the internal battery will discharge and the OIT will lose its settings. Once powered back on, the battery will begin charging.

OIT LCD CONTRAST ADJUSTMENT

The LCD contrast is adjustable. The OIT also temperature compensates the contrast setting.
To adjust the contrast setting, press the top right and top left corners of the touch screen simultaneously. Then select the Adjust Contrast menu item in order to change the contrast settings.
The contrast setting is stored in battery-backed memory within the OIT.

OIT LANGUAGE SELECTION

There are three languages available for the OIT. They are English, Spanish, and Chinese. The language menu is the second menu option among the common menus. Press and hold SELECT or simply touch the Phase Dynamics logo on the main display page to enter the common menus. Press MENU or touch the lower right corner of the screen to advance to the language menu. Select the language by either using the SELECT and ENTER buttons or simply touch the desired language on the screen. The language setting is stored in battery-backed memory within the OIT.

OIT MENU FLOWCHARTS

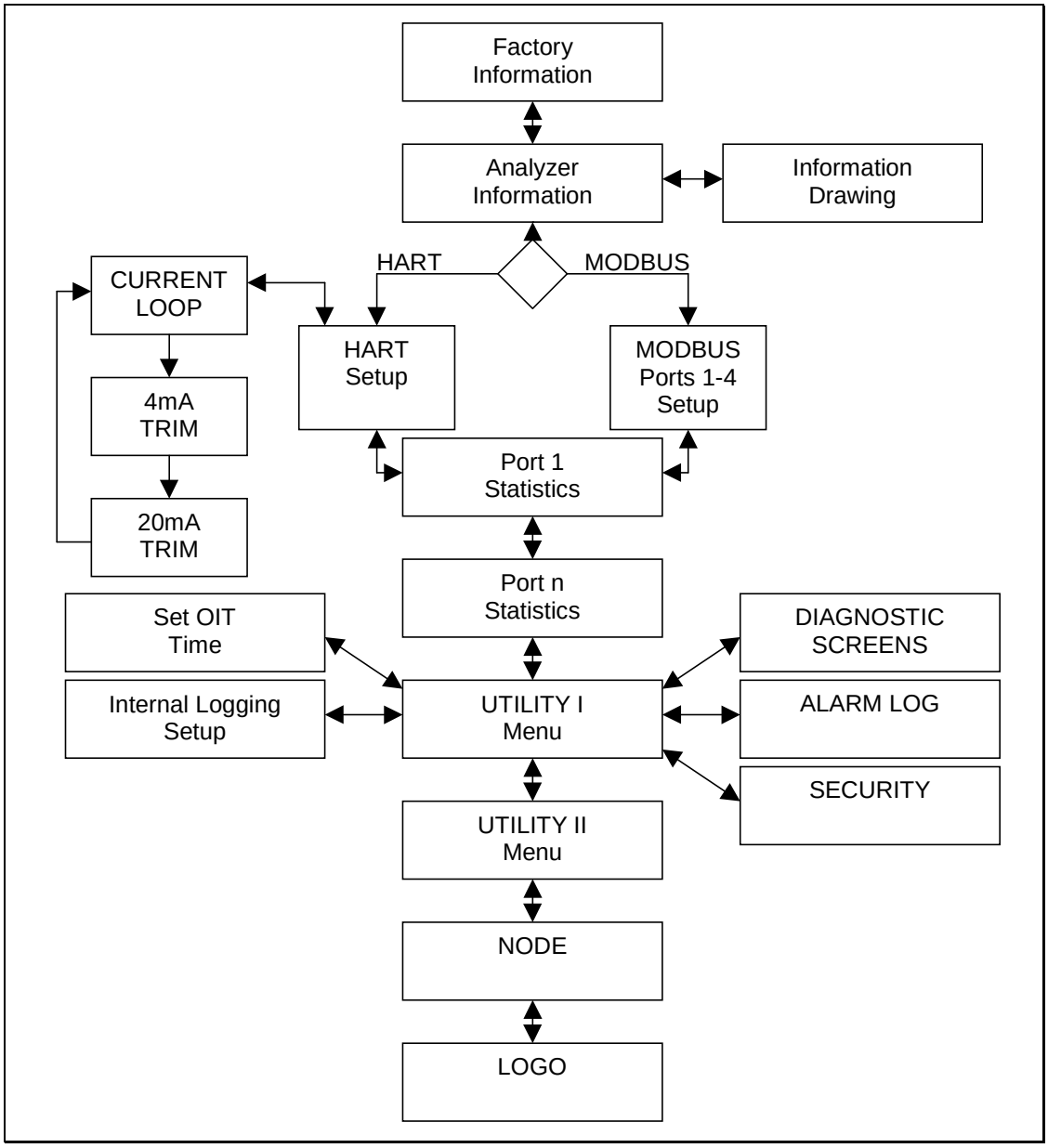


Figure 1 - Common Menus (Touch Screen Input)

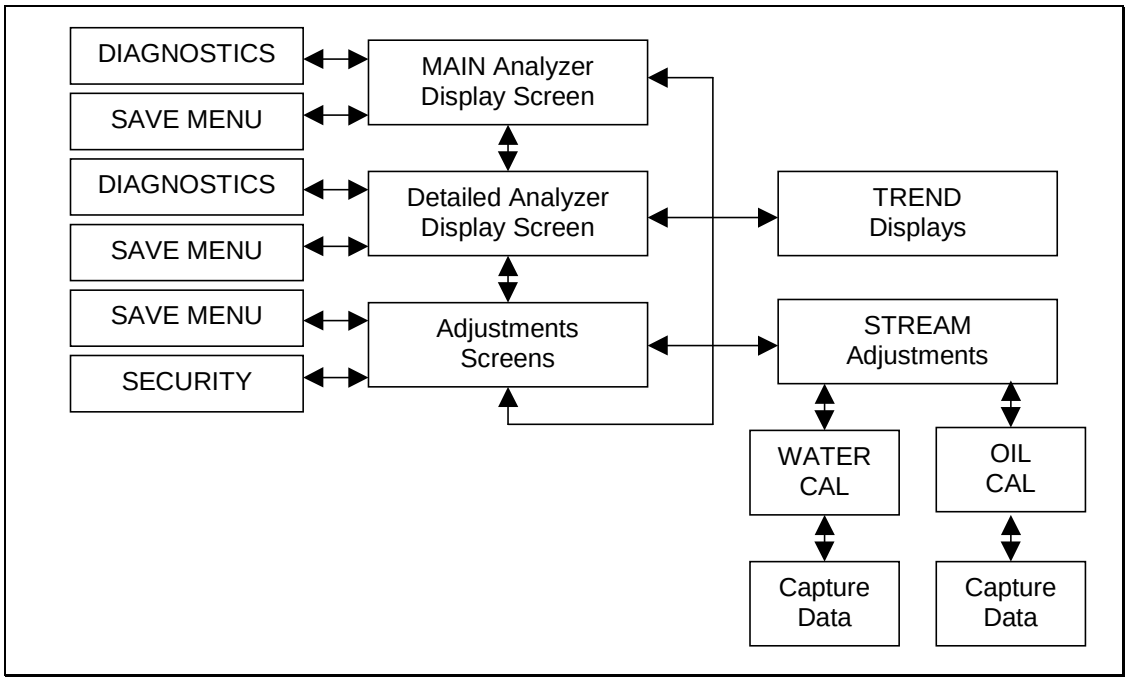


Figure 2 - Typical Analyzer Menus (Touch Screen Input)

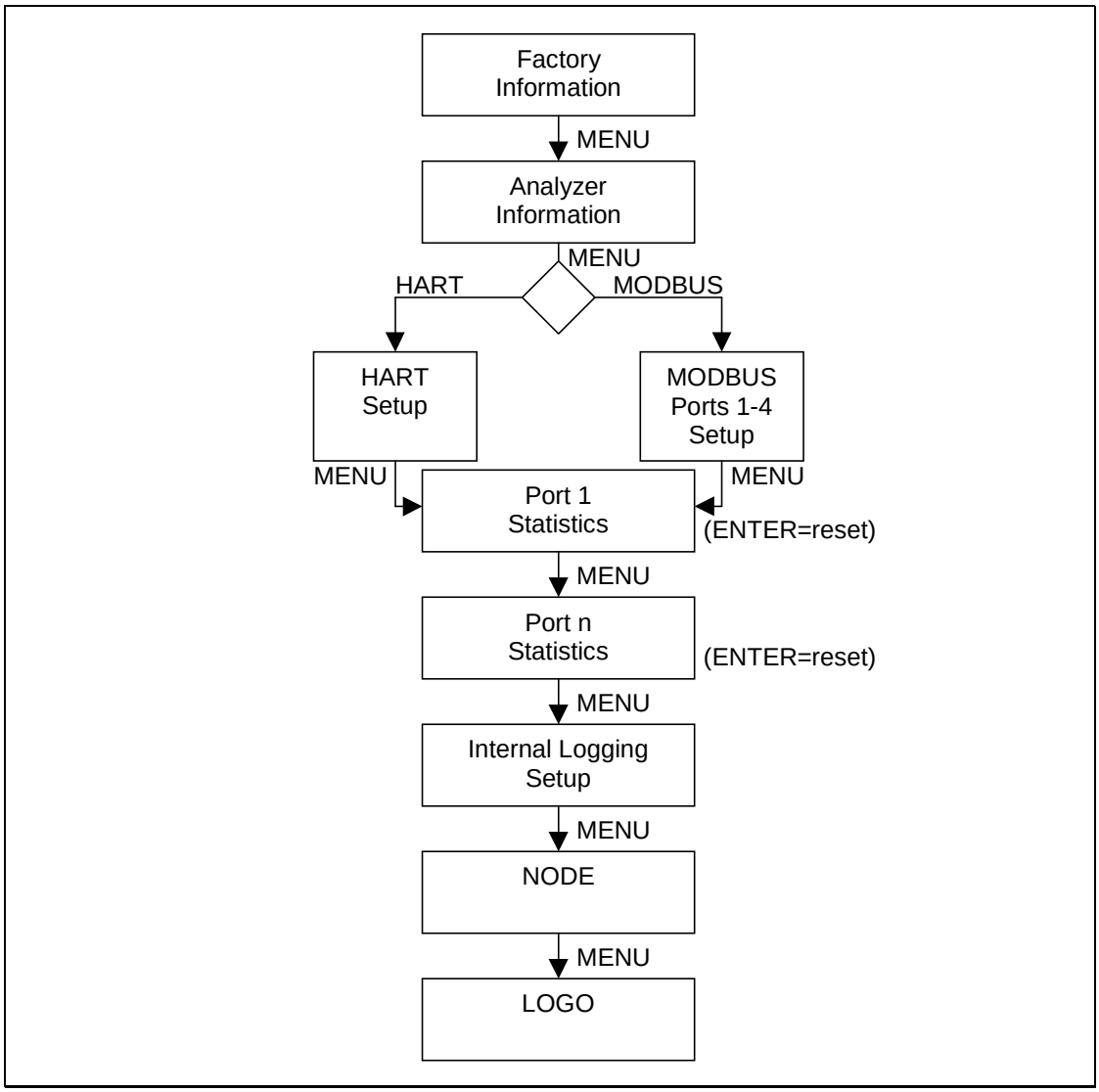


Figure 3 - Common Menus (MSVE Input)

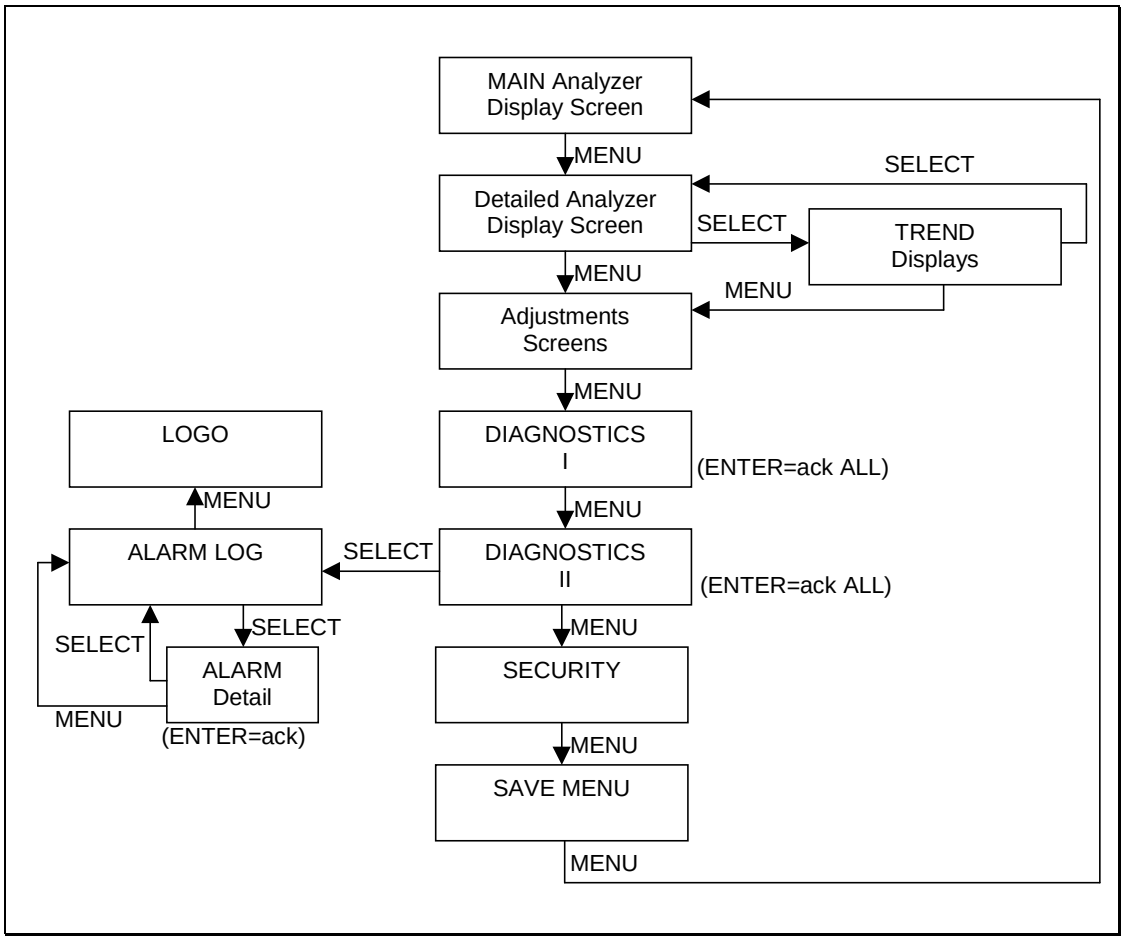


Figure 4 - Typical Analyzer Menus (MSVE Input)