SpectraSensors®

HCD4000™

HYDROCARBON DEWPOINT ANALYZER

OPERATOR'S MANUAL

HCD4000™

HYDROCARBON DEWPOINT ANALYZER

OPERATOR'S MANUAL

PRODUCT OF

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HCD4000™

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CONGRATULATIONS

You have purchased HCD4000™, the most advanced Hydrocarbon Dew Point Analysis system available. It is based on breakthrough CEIRS™ infrared technology to accurately and unambiguously determine the dew point of hydrocarbon gas streams at pressures up to 1500psi. HCD4000™ can distinguish between hydrocarbon dewpoints and water/glycol condensation.

HCD4000™ does not need field calibration and will retain its factory calibration under normal operating conditions. It also does not need any field adjustments as the measurements are done based on a very accurate detection of the condensation process and the nature of the condensate.

Please take the needed time to read this manual in its entirety. It will provide necessary and useful information about how you can optimize your use of this product.

TABLE OF CONTENTS

1- INTRODUCTION

HCD4000™ is an automated Hydrocarbon Dew Point Measurement System. It uses state-of-the-art infrared technology to accurately determine the dew point of hydrocarbon gas streams as well as characterizing the nature of the condensate.

In order to ensure that the analyzer performs as specified, it is important to pay close attention to the details of the installation and operation. This manual contains a comprehensive overview of the HCD4000™ analyzer and step-by-step instructions on:

- Connecting necessary power and signal cables.
- Powering the analyzer
- Operating the analyzer
- Using the serial, Digital, and 4-20 mA communication ports
- Troubleshooting

A- WHO SHOULD READ THIS MANUAL

This manual should be read and referenced by anyone installing, operating, or having contact with the analyzer. Take a moment to familiarize yourself with this Operator's Manual by reading the Table of Contents.

This manual has been written to address the most common options and accessories. Read each section in the manual carefully so you can quickly and easily install and operate the analyzer. The manual includes images, tables, and charts that provide a visual understanding of the analyzer and its functions. Special symbols are also used to make you aware of potential hazards, important information, and valuable tips. Pay close attention to this information.

B- SPECIAL SYMBOLS USED IN THIS MANUAL

This manual uses the following symbols to represent potential hazards, caution alerts, and important information associated with the analyzer. Every symbol has significant meaning that should be heeded.

This icon denotes a warning statement. It indicates a potentially hazardous situation which, if not avoided, may result in serious injury or death.

Failure to follow these directions may result in damage or malfunction of the analyzer.

This icon denotes important information concerning installation and operation of the analyzer.

This icon represents the presence of a fuse. The rating of the fuse is 1A, 250V, which can also be found in other pertinent sections of the manual, where a fuse is referenced.

C- ABOUT SPECTRASENSORS

SpectraSensors, Inc. is a leading manufacturer of state-of-the-art electro-optic gas analyzers for the industrial process, gas distribution and environmental monitoring markets. Headquartered in Houston, Texas, SpectraSensors was incorporated in 1999 as a spin-off of the NASA/Caltech Jet Propulsion Laboratory (JPL) with the purpose of commercializing space-proven measurement technologies initially developed at JPL.

2-HCD4000™ OVERVIEW

This analyzer uses advanced infrared absorption spectroscopy to accurately and unambiguously determine the dew point of Hydrocarbon gas streams at pressures up to 1500 psig. Each analyzer includes of a state-of-the-art core analyzer cell which encompasses multiple infrared sources and detectors. The analyzer core, including all electrical components, is housed in a certified explosion proof box, making the system suitable for installation in hazardous locations (Class 1, Div. 1, Groups C&D).

An appropriate sample conditioning system may also be included with the system that has been specifically designed to deliver an optimum sample stream that is representative of the process stream at the time of sampling. HCD4000™ analyzer systems are configured for use at extractive natural gas sampling stations without dropping the pressure for the analysis. Therefore, HCD4000™ reports the dew point at the actual pressure at the sampling point.

3-SPECIFICATIONS

A- PERFORMANCE

Dewpoint Measurement Range	50°C (90°F) below ambient
Dewpoint Accuracy	±0.5 °C (±0.9 °F)

B- APPLICATION CONDITION

Operating Temperature Altitude and Humidity	-10 to +40 °C, up to 2000 m Maximum 80% Relative Humidity, non-condensing
Storage Temperature	-20 to +50 °C
Flow Rate	0.1-3 SLPM (0.005-0.1 SCFM) Depends on sample conditioning configuration
Pressure	0-105 barG (1,500 PSIG)

C- ELECTRICAL & COMMUNICATIONS

Input Voltage	100-240VAC (47-63Hz), 24VDC optional
Power Usage	Less than 50 Watts average (depends on ambient temperate)
Signal outputs	Qty 4 4-20mA loop, Qty 2 RS232, 1 General Fault DO, 2 Hi/Lo Alarms; wireless optional
Modbus	Gould RTU or ASCII, Daniel RTU optional
Display	Dewpoint, Cell Temperature and Pressure, Modes & Errors
Software	SpectraSensors Analyzer Configuration Software on disc; enables system config, autopoll, history, data export, etc.

D- PHYSICAL

Size	420mm (17 in) X 575mm (22.25 in) X 300mm (12 in)
Weight	45kg (100 lb) Analyzer only; 130lbs with Sample System

E- CERTIFICATION

CSA	Field Certified, Class 1, Division 1, Groups C&D.
Enclosure NEMA Rating	NEMA 7

4- INSTALLATION

HCD4000™ is housed in an explosion proof box.

The unit weighs 100lbs (without the sample conditioning system). The weight is 130 lbs, if a sample conditioning system is included. Extreme care should be taken in handling, lifting, and installing the unit to prevent risk of injury or death. The unit should be mounted to a fixture capable of bearing the weight of the analyzer.

There is a white colored box inside the analyzer unit. This box does not contain any user serviceable items. It should not be opened by a user. Opening of this box will void the warranty on the system.

A- CONNECTING THE GAS INPUT AND OUTPUT

It is very important to close off the gas output of the system before introducing pressure. This is important because if there is a significant pressure drop upstream of the analyzer, the gas under analysis may turn into liquid due to JT effects and may damage the analyzer. After the system is pressurized the output valve can be opened to create flow within the specified guidelines.

Gas connections should be made to the input and output of the sample system. Both input and output connections are ¼" compression fitting connectors. The output of the sample system is already regulated down to 10 psi and can be vented or used for other appropriate purposes. The diagram below (Figure A) shows the analyzer and the sample system. Port (3) is the sample system input and port (5) is the output. Port (4) is the validation port.

Make sure that the output of the system is vented according to applicable industry standards and regulations.

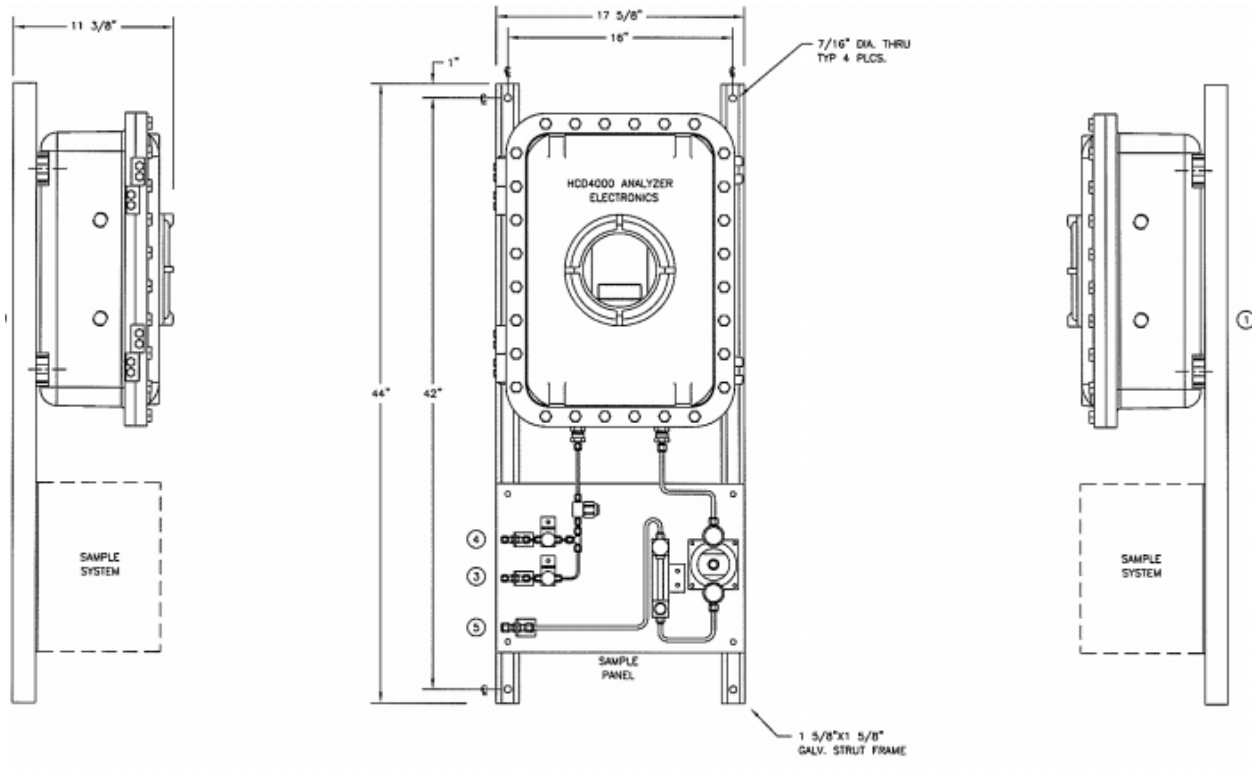


Figure A- Schematic of the analyzer and the sample system

All the gas connections should be checked for leaks before proceeding any further.

After a thorough leak check, the flow should be set to 0.1-3 SLPM.

B- CONNECTING THE ELECTRICAL AND SIGNAL CABLES

HCD4000™ is operated on AC (DC option available) power input. The power and signal cable entry points are ½" NPT. Appropriate cable sealing glands need to be used in all cases to seal the cable entry points.

The input connections need to be made at the terminal blocks (see figure B). The ground wire should be connected to the green terminal block (TB). The neutral connection needs to be connected to the white TB. The line connection should be connected to the black, fused TB. The line TB contains a fuse (1A, 250V, fast-blow) that can be accessed by unscrewing the top of the TB.

B.1- external switch or circuit-breaker over-current protection

- A switch or circuit-breaker shall be included in the building installation.

- It shall be in close proximity to the equipment and within easy reach of the OPERATOR.
- It shall be marked as the disconnecting device for the equipment.

Connect the electrical connections to the terminal blocks per figure (B).

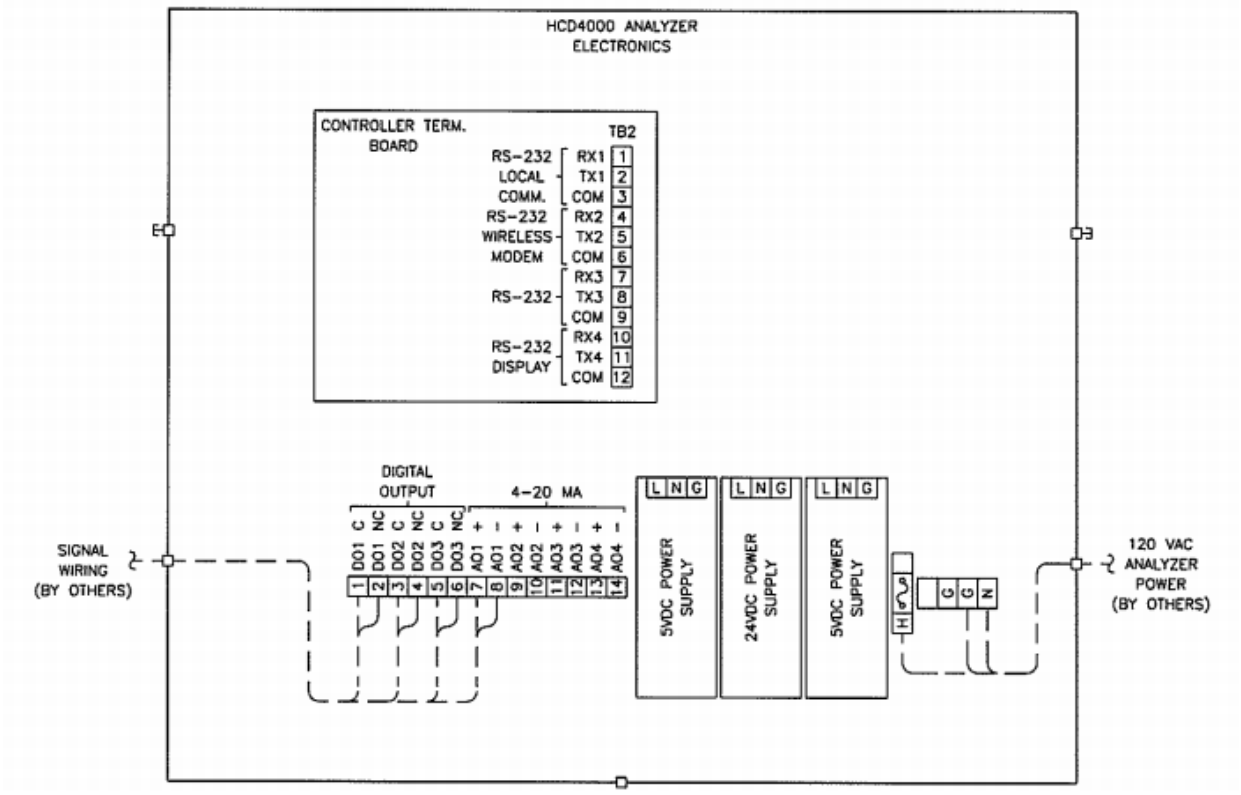


FIGURE (B)- Connecting the power input and 4-20mA outputs

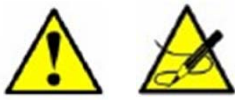
B.2- connection of 4-20ma outputs

The 4-20 mA current loops are supplied from the mating terminal block located inside the analyzer electronics enclosure as shown in Figure (B). The 4-20mA TBs are dual circuit. On all four, the upper connection on the TB is the signal and the lower connection is the common ground.

The 4-20mA terminal blocks are located to the right of the Digital Outputs (alarms). They are numbered 1-4 from left to right. Connect 4-20 mA loop number 1 to the left most AO terminal block. Follow this instruction for all four of the 4-20 mA outputs.

B.3- connection of digital outputs (alarms)

The system provides 3 Digital Outputs (DO) to be used as alarms.



The three DOs are passive (not powered) and need to be externally powered. Maximum current rating is 1A. Maximum voltage rating is 24V. Exceeding these rating will result in permanent damage to the analyzer electronics.

These DOs are programmed to signal the following conditions:

B.4- RS-232 wiring connection to the analyzer

Point-to-Point Serial Connection using SpectraSensors DB-9 Data Cable

The HCD4000™ controller has two RS232 serial ports which are labeled RX1, TX1, COM, RX2, TX2, COM, etc. COM1 and COM2 are slave Modbus ports and can be connected to a Modbus host.

The ports are configured as follows:

- COM1: Gould Modbus RTU Protocol
- COM2: Gould Modbus RTU Protocol or optionally Daniel Modbus RTU Protocol

AMS100™ uses Gould Modbus RTU Protocol. It can be used with COM1 or COM2 if not configured for Daniel protocol.

For Connection to a PC (DTE) DB9 port (see figure C):

1- Connect RX1 terminal (RCV) to black wire.

2- Connect TX1 terminal (XMT) to red wire.
3- Connect Com terminal (GND) to ground wire.

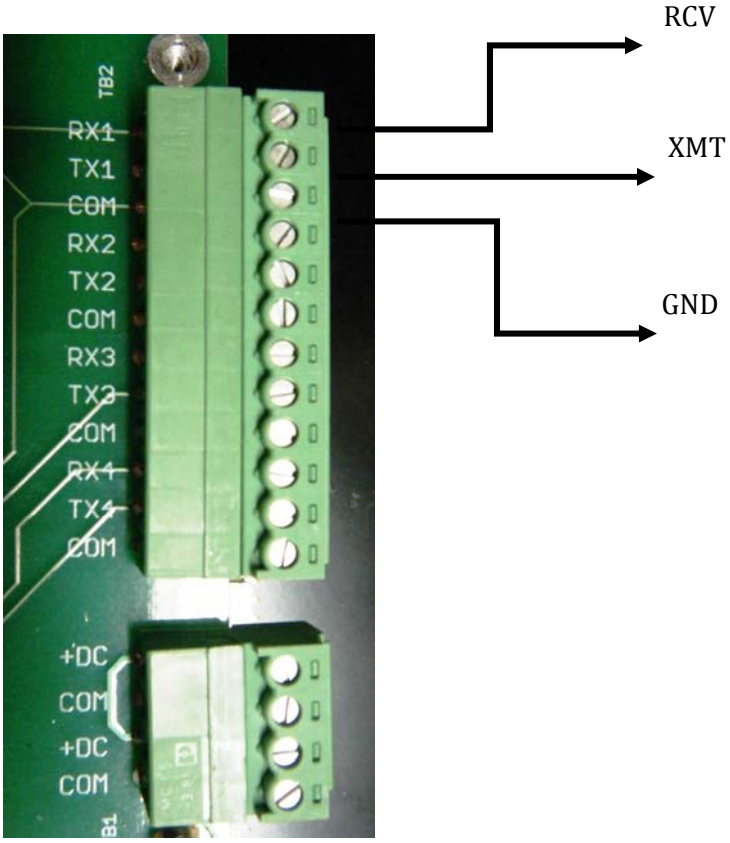


Figure (C)- Making the Serial Connections

B.5- portable wireless modem access (optional)

Rechargeable Sierra Wireless modems packaged in a portable case are available to support wireless remote interface to the analyzer from AMS100. The configuration of the serial port on the modem must match that of the analyzer RS232 port. The modem is usually pre-configured for 9600,N,8,1 to support 9600 baud communications with the analyzer.

For Connection to a DCE modem:

1- Connect RX1 terminal (RCV) to red wire.
2- Connect TX1 terminal (XMT) to black wire.
3- Connect Com terminal (GND) to ground wire;

C- SEALING THE POWER AND SIGNAL PORTS

To maintain the safety designation of the system, appropriately certified sealing glands should be used to seal the power input and signal output ports on the explosion proof box. To prevent ignition of class 1 hazardous atmospheres, the conduit seals must be within 3 inches of enclosure. Please refer to the gland manufacturer's instructions on installing sealing glands.

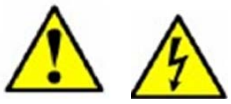
D- CLOSING THE LID

After all connections are made, the system door should be closed and bolted. Before closing the lid, check to make sure that all surfaces of the flange joint are clean and free of debris. When closing the door, make sure no wires are snagged between the door and the system.

5- POWERING THE SYSTEM

At this point, the system is ready for use. The operation of the system is completely automated.

There are no power switches on the HCD4000™ system. As soon as the external power switch or circuit breaker is turned on, the system will turn on and will go through an initialization sequence.



Only use approved power sources based on the specifications of the system. Connect the power input of the system to an approved AC source. The display should turn on and indicate the system is going through initialization. Make sure the wiring used to power the system is capable of handling the required current and the voltage. See specifications.

There are no consumable materials in the use of this system. There is an electrical fuse (2.5A, 250V, fast-blow) which may require replacement occasionally (please see spare parts list). Except the gas under analysis, there are no other gases involved in the operation of this system.

6- SENSOR SELF-DIAGNOSTICS

HCD-4000™ is equipped with state-of-the-art self-diagnostics system. Before a measurement cycle is initiated, the sensor will go through a set of self-diagnostics. A cycle will not start before the successful completion of the self-diagnostics routine.

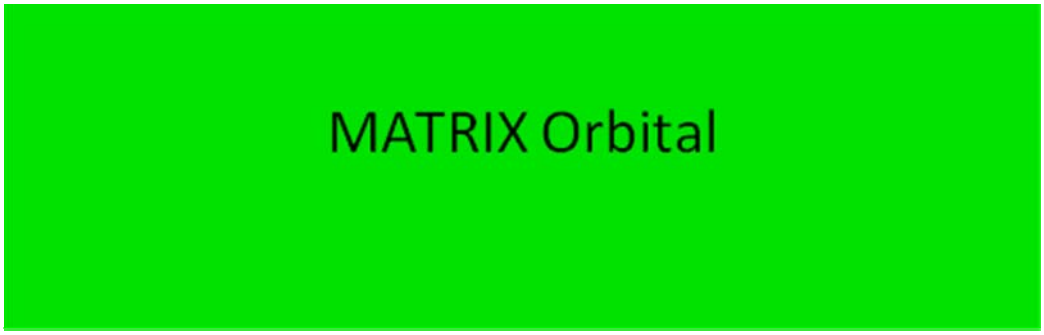
Because of the technology used in HCD-4000™, the unit can sense if the sensor element is clean will display the message "SENSOR CLEAN" before the initialization of a new measurement cycle.

7- EXPLANATION OF THE ANALYZER DISPLAY SCREENS

The LCD display has four lines which will be used to indicate the status of the system as well as recent dew point measurement results. The following is a brief description of information displayed at each stage of the analyzer's operation.

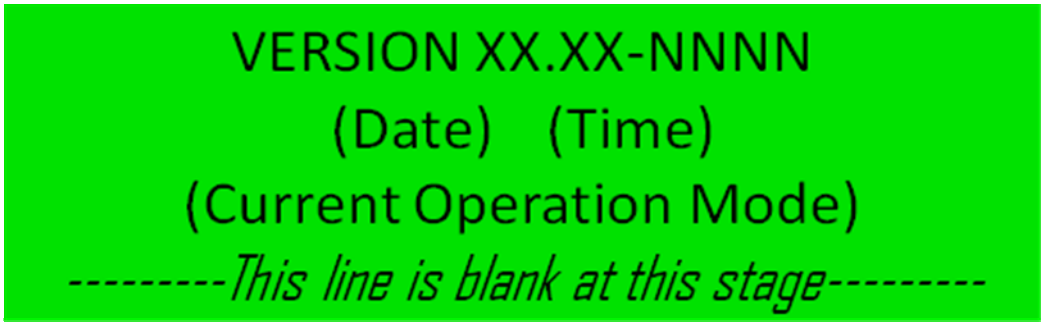
A- SYSTEM POWER UP

When the system is first turned on, the LCD display will momentarily display the following screen. (This is the logo of the display manufacturer).



B- SYSTEM INITIALIZATION AND SELF-DIAGNOSTICS

After system Power Up, the analyzer will immediately enter into an initialization phase. In this phase, the analyzer undergoes a self-diagnostic process where the integrity of each component is verified. In this phase the following screen will be displayed:

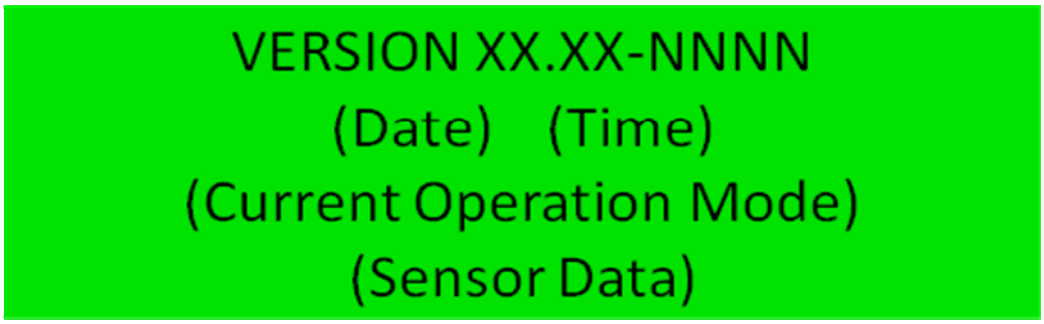


Where:

- **X.XX-NNNN** denotes the current analyzer firmware version.
- **Date Time** = Analyzer's current date and time
- **Current Operation Mode** = This line relates to the stage of the start up and will change from initialization to configure.

C- SYSTEM OPERATION

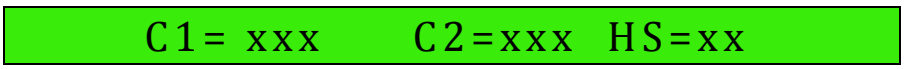
Following analyzer initialization after startup (if the Operation Mode is not OFF) begins a dew point cycle and shows the status of the cycle on lines three and four of the display as follows:



Where:

- **Date Time** - Analyzer's current date and time
- **Current Operation Mode** - START CYCLE, and COOLING as the analyzer starts and proceeds through the cycle.
- **Sensor Data** - The sensor data is displayed on this line and toggles between showing
    - a) Probe temperature (°F), pressure, internal ambient temperature as below:

    - b) sensor 1 and sensor 2 raw counts and heat sink temperature as below



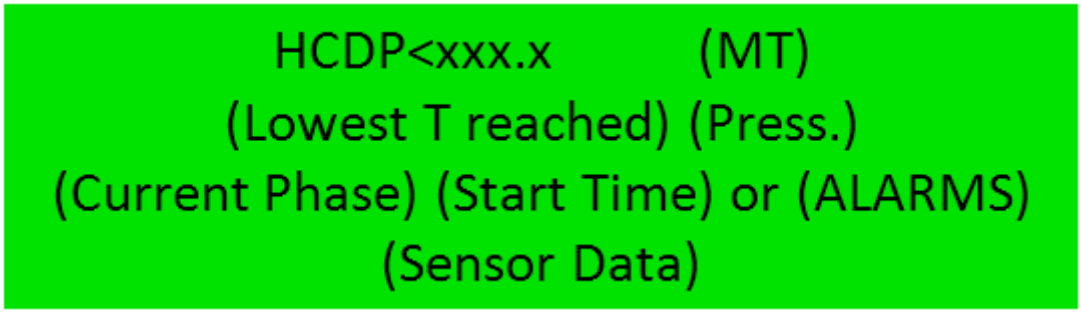
    - C) Gamma factors and heatsink temperature as below

D- END OF CYCLE DISPLAYS

At the end of the dew point cycle, the analyzer shows the result of the cycle on lines one and two. Lines 3 and 4 continue to show system status and sensor data. Either of four conditions are possible:

D.1- hydrocarbon dewpoint detected

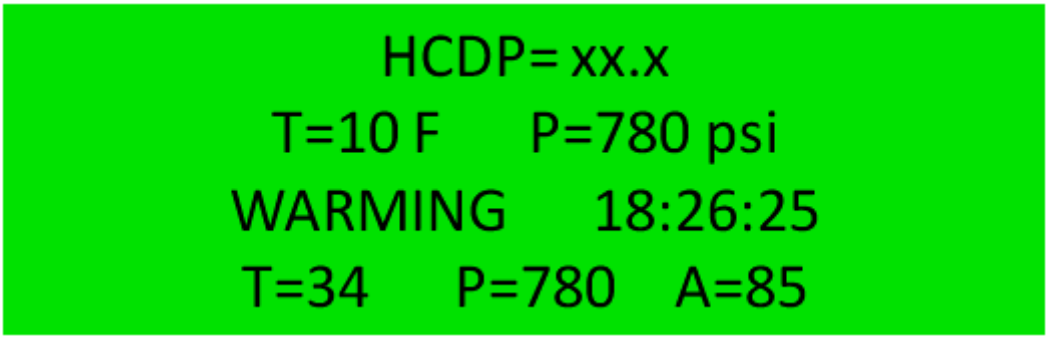
This is when the system successfully determines the dewpoint of the natural gas stream. The display will look as following:



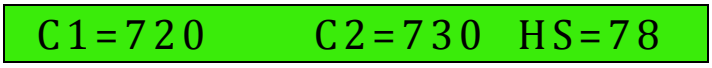
Where:

- **DP-temp** - Denotes the dewpoint temperature in degrees F.
- **DP-Pressure** - Denotes the pressure at which the dewpoint was measured.
- **Current Phase or Alarms** – This line toggles between
    - The current phase of the system. It can be WARMING, START CYCLE, or COOLING after the analyzer finishes, prepares for, and starts a new cycle respectively.
    - Alarm Status which shows any alarms if they are on. It will also indicate "SENSOR CLEAN" after the completion of the self-diagnostics on the sensor element
- **Sensor Data** - The sensor data is displayed on this line and toggles between showing
    - a) Probe temperature, pressure, and internal ambient temperature
    - b) Sensor 1 and 2 counts and heat sink temperature
    - c) Gamma factors and heat sink temperate

A typical screen would look like:



Line #4 of the display will toggle between the above or Sensor 1 and 2 counts as below:



Or sensor gamma factors as below:

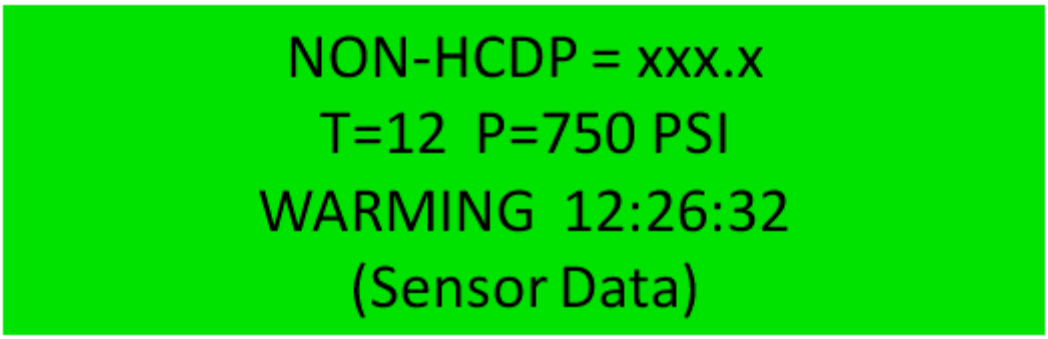
The detector counts and gamma factors are for diagnostic purposes only.

If the detected HCDP is greater than the user set limit on HCDP, thenalarm#2 will be activated and the message

Will be toggled on line 3.

D.2- Non-HC Dew Point Detected

This happens when a non-hydrocarbon (typically water) condensation is detected at a higher temperature than the hydrocarbon dewpoint. This is a unique feature of this analyzer which can distinguish between a hydrocarbon or a non-hydrocarbon condensate by spectral probing of the condensate. This condition is typically encountered when the water dewpoint is higher than the hydrocarbon dewpoint of a gas stream. The display will look as following:



Where:

- **DP-temp** - Denotes the dewpoint temperature of the contaminant.
- **DP-Pressure** - Denotes the pressure at which the contaminant dewpoint was measured.
- **Current Phase or Alarms** – This line toggles between
    - The current phase of the system. It can be WARMING, START CYCLE, or COOLING after the analyzer finishes, prepares for, and starts a new cycle respectively.
    - Alarm Status which shows any alarms if they are on. It will also indicate "SENSOR CLEAN" after the completion of the self-diagnostics on the sensor element

- **Sensor Data** - The sensor data is displayed on this line and toggles between showing

- a) Probe temperature, pressure, and internal ambient temperature
- b) Sensor 1 and 2 counts and heat sink temperature
- c) Gamma factors and heat sink temperate

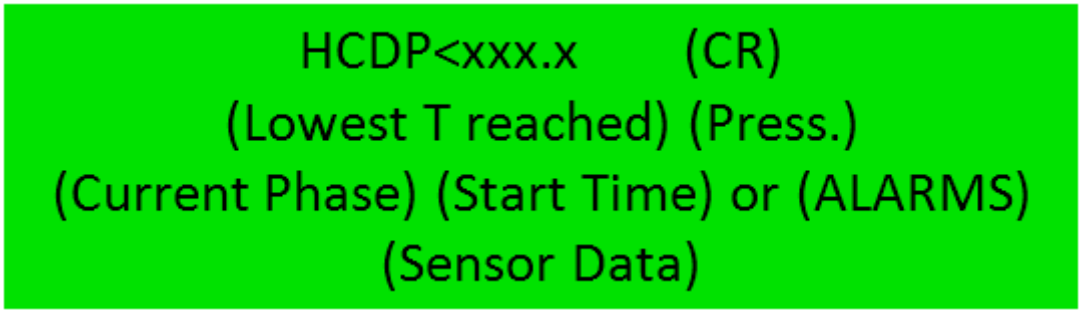
The detector counts and gamma factors are for diagnostic purposes only.

If the detected NON-HCDP is greater than the user set limit on HCDP, then alarm#2 will be activated and the message

Will be toggled on line 3.

D.3- cooling rate limit reached

This is the condition when the system cooling rate limit is reached without reaching the hydrocarbon dew point. This situation arises when the HC dewpoint is below the lowest temperature that the analyzer can reach. This situation happens when the gas is very lean.



Where:

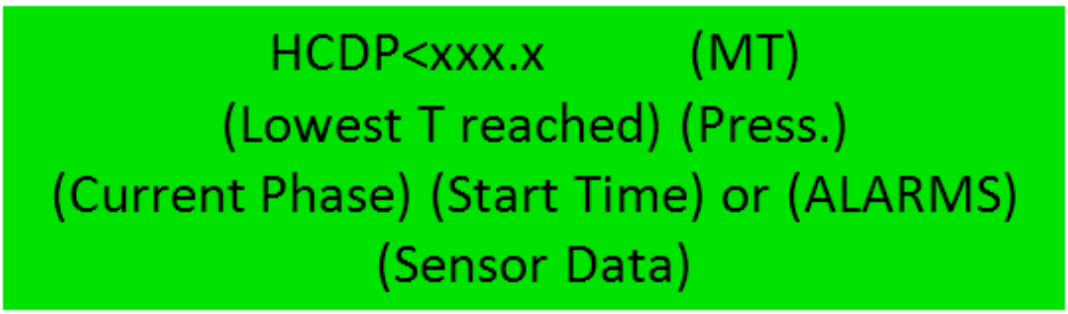
- **Lowest T Reached** - Denotes the lowest temperature reached before cycle ended due to limitation on the cooling rate.
- **Pressure** - Denotes the pressure at the time lowest Temp was reached.
- **Current Phase or Alarms** – This line toggles between
  - The current phase of the system. It can be WARMING, START CYCLE, or COOLING after the analyzer finishes, prepares for, and starts a new cycle respectively.
  - Alarm Status which shows any alarms if they are on. It will also indicate "SENSOR CLEAN" after the completion of the self-diagnostics on the sensor element
- **Sensor Data** - The sensor data is displayed on this line and toggles between showing
  - a) Probe temperature, pressure, and internal ambient temperature
  - b) Sensor 1 and 2 counts and heat sink temperature

- c) Gamma factors and heat sink temperate

When this condition is reached, Alarm # 1 is turned on.

D.4- minimum temperature reached

When the user set minimum temperature is reached without reaching the hydrocarbon dew point. This situation arises when the HC dewpoint is below the low- temperature limit set by the user.



Where:

- **Lowest T Reached** - Denotes the lowest temperature reached before the system ended the cycle to user-set limitation on the lowest temperature.
- **Pressure** - Denotes the pressure at the time lowest Temp was reached.
- **Current Phase or Alarms** – This line toggles between
  - The current phase of the system. It can be WARMING, START CYCLE, or COOLING after the analyzer finishes, prepares for, and starts a new cycle respectively.
  - Alarm Status which shows any alarms if they are on. It will also indicate "SENSOR CLEAN" after the completion of the self-diagnostics on the sensor element
- **Sensor Data** - The sensor data is displayed on this line and toggles between showing
  - a) Probe temperature, pressure, and internal ambient temperature
  - b) Sensor 1 and 2 counts and heat sink temperature
  - c) Gamma factors and heat sink temperate

When this condition is reached, Alarm # 1 is turned on.

D.4- Messages for GENERAL FAULT Conditions

There are several conditions that are considered "GENERAL FAULT" conditions. These conditions will activate Alarm#3.

"GENERAL FAULT" conditions are divided into two groups:

A- Conditions which are recoverable without service.
B- Conditions that require service.

Conditions that do not require service occur when the system is turned on but is not within its operating conditions, such as ambient temperature being too high or too low, or pressure being above 1500psi. When any of these conditions are encountered by the system, it will suspend operations and a corresponding message will appear on line 3. Alarm # 3 will also be turned on. As soon as this condition is cleared, the system will resume normal operations and the alarm is turned off.

Conditions that require service are not also announced on line 3 as well as turning on Alarm#3. These are conditions that will not self-clear and will need technical service. Some of these conditions can be fixed by the user with the help of a technical specialist s over the phone. Some other may require factory service. These conditions include:

A- Loss of internal communications.
B- Irrecoverable contamination of the measurement cell.

When any of these conditions are encountered by the system, it will suspend operations and a corresponding message will appear on line 3. Alarm # 3 will also be turned on. You should contact SpectraSensors® for further assistance.

8-ANALOG AND DIGITAL OUTPUTS SUMMARY

This section covers the various measurement results and the status of each analog output (AO) and each digital output (DO).

A- ANALOG OUTPUTS

The analog outputs (4-20mA) are designated as follows:

- #1 This signal reports the last HydroCarbon Dew Point (HCDP) dew point in (°F).
- #2 This signal reports the pressure at which the last dew point was measured at. It is reported in psig (Pounds per Square Inch).
- #3 This signal reports the temperature for detection of a non-hydrocarbon (water/glycol/alcohol) dewpoint, if it was detected at the last cycle. If the last cycle was completed with the detection of a hydrocarbon dewpoint, then this AO will revert back to 4mA.
- #4 This signal reports the pressure at which the last non-HC dew point was measured at. It is reported in psi (Pounds per Square Inch). If the last cycle was

completed with the detection of a hydrocarbon dewpoint, then this AO will revert back to 4mA.

B- DIGITAL OUTPUTS (ALARMS)

DO#1- This alarm condition signifies the system **NOT** detecting a hydrocarbon dewpoint. If this alarm is set, then the value on AO#1 should be interpreted as a less or equal to the number reported. This alarm is set under one of the following conditions:

a) Reaching the minimum temperature of -13 °F without finding a dewpoint. This signifies the HC dewpoint to be below -13°F. In this case AO#1 is populated with the lowest temperature reached, if this temperature is lower than the previous HCDP found, and this alarmed will be turned on. A message on the system display will also alert the user to this condition until the next cycle is completed. If the lowest temperature reached Is not lower than the last HCDP found, the last HCDP value will be kept on AO#1.
b) Reaching the cooling rate limit of the system without finding a dewpoint. In this case AO#1 is populated with the lowest temperature reached if this temperature is lower than the previous HCDP found, and this alarmed will be turned on. A message on the system display will also alert the user to this condition until the next cycle is completed. If the lowest temperature reached Is not lower than the last HCDP found, the last HCDP value will be kept on AO#1.
c) Detecting a dewpoint for anything other than hydrocarbon. For example, if the dewpoint of water is higher than that of HC. Under this condition, the AO#1 which shows the dewpoint of HC will keep the last value of HCDP. AO#3 will be populated with the Non-HCDP value, and AO#4 will show the pressure at which the Non-HCDP value was found. In such a condition, the statement on the first line of the display will indicate that the last dewpoint was due to a NON-HC dewpoint. .

DO#2- This is a caution alarm condition and it signifies a Hydrocarbon or contamination dewpoint above the levels set for the system by the user. This level can be changed by the user through the AMS100™ software. The system will continue operating as normal. If the dewpoints fall below the user set point, the alarm will be turned off again.

DO#3- This is a general fault alarm and signifies a condition that requires user attention. When this alarm is detected, the system display should be viewed for conditions that may have triggered the alarm. These conditions may be:

- The ambient temperatures are out of operating range. In this case, the system screen will display a message indicating this condition. The system will suspend measurement operations but will continue to monitor the temperature. If ambient temperatures go back to within the operating guidelines, the system will function again and the alarm will be turned off.

- The gas pressure supplied to the system is greater than 1500 psig. In this case, the system will display a message indicating this condition. The system will suspend measurement operations but will continue to monitor the pressure. If pressure goes back to below 1500 psig, the system will function again and the alarm will be turned off.
- There is a communication failure within the system. The system screen will display a message indicating this condition. This condition will require service.
- The detector element is fouled up and cannot recover. This condition will be indicated by the system screen. This condition will only be encountered under rare circumstances if the measurement cell is filled with liquid. Please consult the factory for service.

The following table summarizes the content of the AOs and Dos under each operational condition.

	Analog Outputs (4-20mA)				Digital Outputs (Alarms)		
CYCLE RESULT	**AO#1**	**AO#2**	**AO#3**	**AO#4**	***DO#1***	***DO#2***	***DO#3***
HC Dewpoint Found and its below the user setpoint	HC Dewpoint Value	PSIG when Dewpoint detected	4 mA	4mA	*OFF*	*OFF*	*OFF*
Low Temp limit reached without finding any dewpoint	Lowest Temp reached before cycle ended if <last HCDP found. Otherwise last HCDP value	PSIG at which Cycle ended	4mA	4mA	*ON*	*OFF*	*OFF*
Cooling Rate limit reached without finding any dewpoint	Lowest Temp reached before cycle ended if <last HCDP found. Otherwise last HCDP value	PSIG at which Cycle ended	4mA	4mA	*ON*	*OFF*	*OFF*
Non-HC Dewpoint found	Last HCDP value	PSIG when Dewpoint detected	Non-HC Dewpoint	PSIG when Dewpoint detected	*ON*	*OFF*	*OFF*
HC Dewpoint found but its over user setpoint	HC Dewpoint Value	PSIG when Dewpoint detected	4mA	PSIG when Dewpoint detected	*OFF*	*ON*	*OFF*
NON-HC Dewpoint found but its over user setpoint	Non-HC Dewpoint Value	PSIG when Dewpoint detected	4mA	PSIG when Dewpoint detected	*ON*	*ON*	*OFF*
GENERAL FAULT CONDITION	**AO#1**	**AO#2**	**AO#3**	**AO#4**	***DO#1***	***DO#2***	***DO#3***
System outside operating range*	Last Value	Last Value	Last value	Last Value	*OFF*	*OFF*	*ON*
SENSOR NOT CLEAN	Last Value	Last Value	Last value	Last Value	*OFF*	*OFF*	*ON*

9- TROUBLESHOOTING

This section covers possible problems if the system does not turn on or does not operate properly.

A- CONDITION: THE DISPLAY DOES NOT TURN ON

1- Open the system door. Make sure that the LED lights on all three power supplies are ON. This indicates that power is reaching the power supplies. If the lights are not ON:

   a. If all three lights are out, power is not reaching them. Check to make sure that the power cable is plugged into an appropriate AC power outlet.

   b. If the system is plugged into a live power connection and the LED lights are still out, then:

      i. Disconnect the power externally and check the fuse on the fuse terminal block with the line (BLACK) wire going into it. If the fuse is burnt, replace it by a factory provided fuse (1A, 250V).

      ii. If the fuse is replaced, but the light on both power supplies are still out, consult the factory.

   c. If only one of the power supply lights is out, disconnect the system from power, and check the power connections (wires) to that power supply. If the power is properly connected to the power supply and the LED light is still out, consult the factory.

2- If the LED lights on the power supplies are ON and the display is still out, then:

   a. Make sure power is reaching the circuit board stack in the upper portion of the system. This can be done by looking at the top-left corner of the stack and seeing a flashing red light.

   b. If power is reaching the PC-104 stack, then check the display cable to make sure it is properly connecting the PC-104 stack and the display.

3- If none of these steps resolve the problem, consult the factory.

B- CONDITION: 4-20MA SIGNALS ARE NOT WORKING

1- Open the system door.

a. Make sure that the 4-20mA wires are properly inserted into the terminal blocks. Check for continuity.

b. Check from continuity between the 4-20mA outputs on the lower circuit board on the system and the terminal blocks.

2- If these two steps do not resolve the problem, consult the factory.

C- CONDITION: THE PRESSURE SENSOR DOES NOT DISPLAY KNOWN PRESSURE

The pressure transducer used in this system is a durable high-quality component that should perform accurately for many years. However, under certain conditions it may cease to function. These conditions are:

1- When it is exposed to pressures above its proof pressure (2x of the maximum specified pressure). If the transducer is exposed to such pressures, it will be irreparably damaged and will need to be replaced by the factory, or a factory trained technician. Please consult the factory.

2- If the wires connecting the transducer to the circuit board gets disconnected. This should not happen during normal operation with the system door closed. When opening the system door for any reason, care should be taken so that the signal and power cables do not get damaged.

D- CONDITION: THE DATA ON THE DISPLAY DOES NOT CHANGE

The sensor data on the display changes with time and system conditions. If the quantities C1 and C2 do not change at all and always show the same value, then there is an internal communication problem. This could be to a power glitch which may have disrupted the operation of the PC-104 on-board computer. In most cases, the unit is capable of self-diagnosis of this condition and re-booting the computer. This will take 5-10 minutes.

If the system does not re-boot and the condition remains, or if it does re-boot and runs into the same condition, the problem should be reported to the factory and service requested.

E- ALL OTHER SYSTEM PROBLEMS

All other system problems should be referred to the factory.

10- SPARE PARTS

The **HCD4000™** is designed for maintenance free operation. It has very few user replaceable spare parts. If it is determined that one of the following parts has failed, they can be replaced.

Part	Name and Model	Rating
Electrical		
Fuse	LittleFuse 217 001.P	2.5A, 250V
Power supply	Meanwell MDR 15-5	100-240 VAC input, 5V Output, 15 W
Power supply	Meanwell MDR 10-24	100-240 VAC input, 24V Output, 15 W
Power supply	Meanwell MDR 60-5	100-240 VAC input, 5V Output, 60 W
Display	Matrix Orbital	NA
Mechanical		
T-Handles	Custom	100 lbs capacity

11- SERVICE CONTACT

If the troubleshooting solutions do not resolve the problem, contact your sales representative. If returning the unit is required, obtain a Return Materials Authorization (RMA) Number from your sales representative before returning the analyzer to the factory. Your sales representative can determine whether the analyzer can be serviced on-site or should be returned to the factory.

12- DISCLAIMER

SpectraSensors accepts no responsibility for consequential damages arising from the use of this equipment. Liability is limited to replacement and/or repair of defective components.

13- WARRANTY

The manufacturer warrants the items delivered shall be free from defects (latent and patent) in material and workmanship for a period of one year after delivery to the Buyer. The Buyer's sole and exclusive remedy under this warranty shall be limited to repair or replacement. Defective goods must be returned to the manufacturer and/or its distributor for valid warranty claims.

This warranty shall become inapplicable in instances where the items have been misused or otherwise subjected to negligence by the Buyer.

Notwithstanding any other provision of this contract, no other warranties, whether statutory or arising by operation of law, expressed or implied, including but not limited to those of merchantability or fitness for particular purpose, shall apply to the goods or services hereunder, other than the repair and replacement warranty above. Seller shall in no event be liable to Buyer or any third party for any damage, injury or loss, including loss of use or any direct or indirect incidental or consequential damages of any kind.

14- AMS100™ SOFTWARE

HCD4000™ can be operated using SpectraSensors™ AMS100™ software which is included in your purchase. To use the AMS100™ software follow these steps:

1- Load the AMS100™ software on a computer to be connected to the system.
2- Connect the computer to COM1 or COM 2 port on the HCD4000™. If your computer does not have a serial port, you can use a USB-Serial converter and connect to your computer's USB port.

AMS100™ comes pre-configured to connect using a serial connection to your HCD4000™ system. After the computer is connected, you should be able to use AMS100™ to control the instrument as well as change some of the default options on the system.

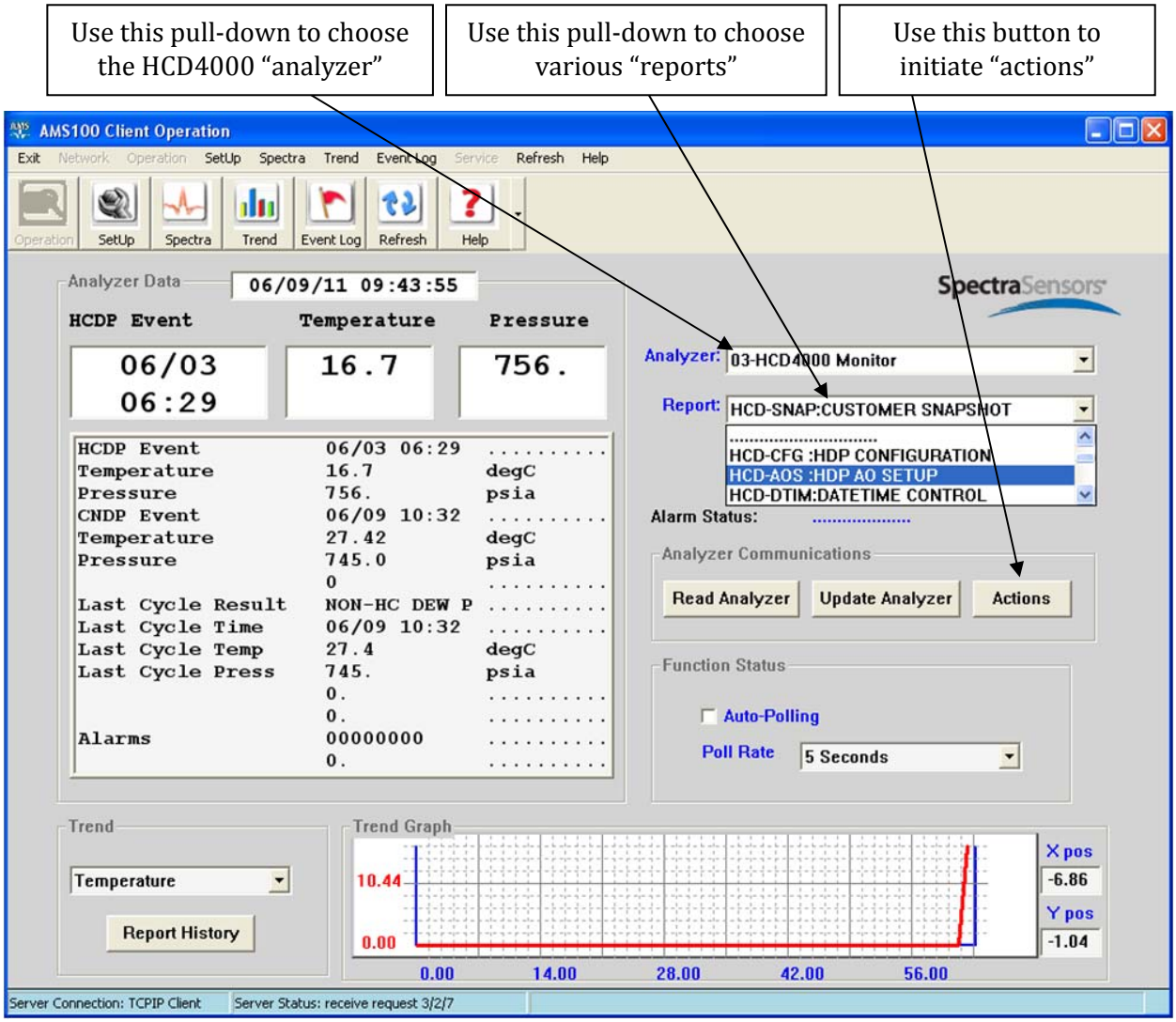
The following sections cover the basic operational modes of AMS100™.

A- AMS100™ HCD4000™ REPORTS

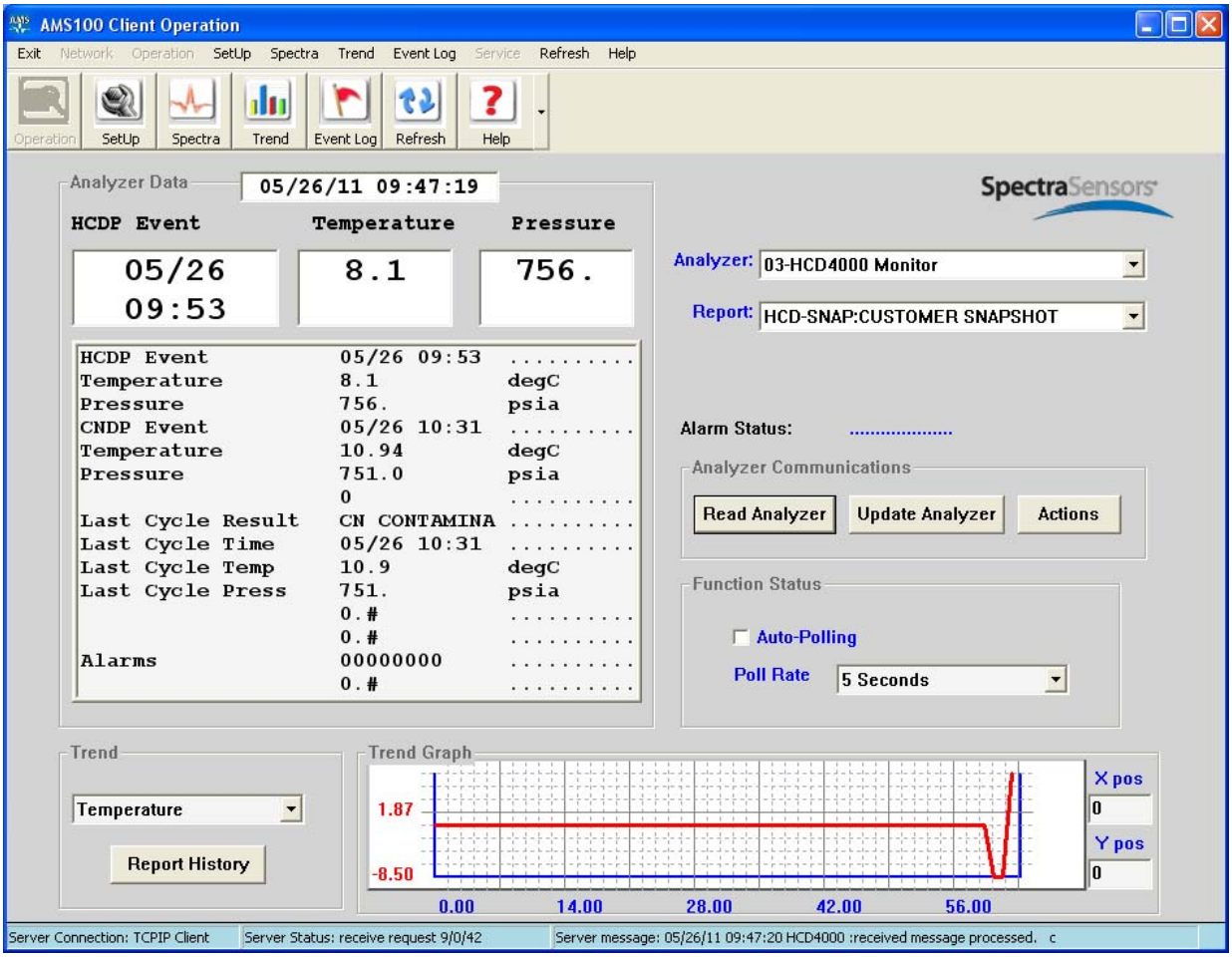
The HCD4000™ APP contains two types of reports. "read" reports contain data which can only be read from the analyzer. "Write" reports are reports containing data which can be both read from the analyzer and also written to the analyzer.

The following reports allow the user to control and configure the analyzer and to upload data locally or remotely from the analyzer for review. These reports are shown as screen shots with instructions on how to work with each report.

The diagram below shows where to find the selectors in AMS100.

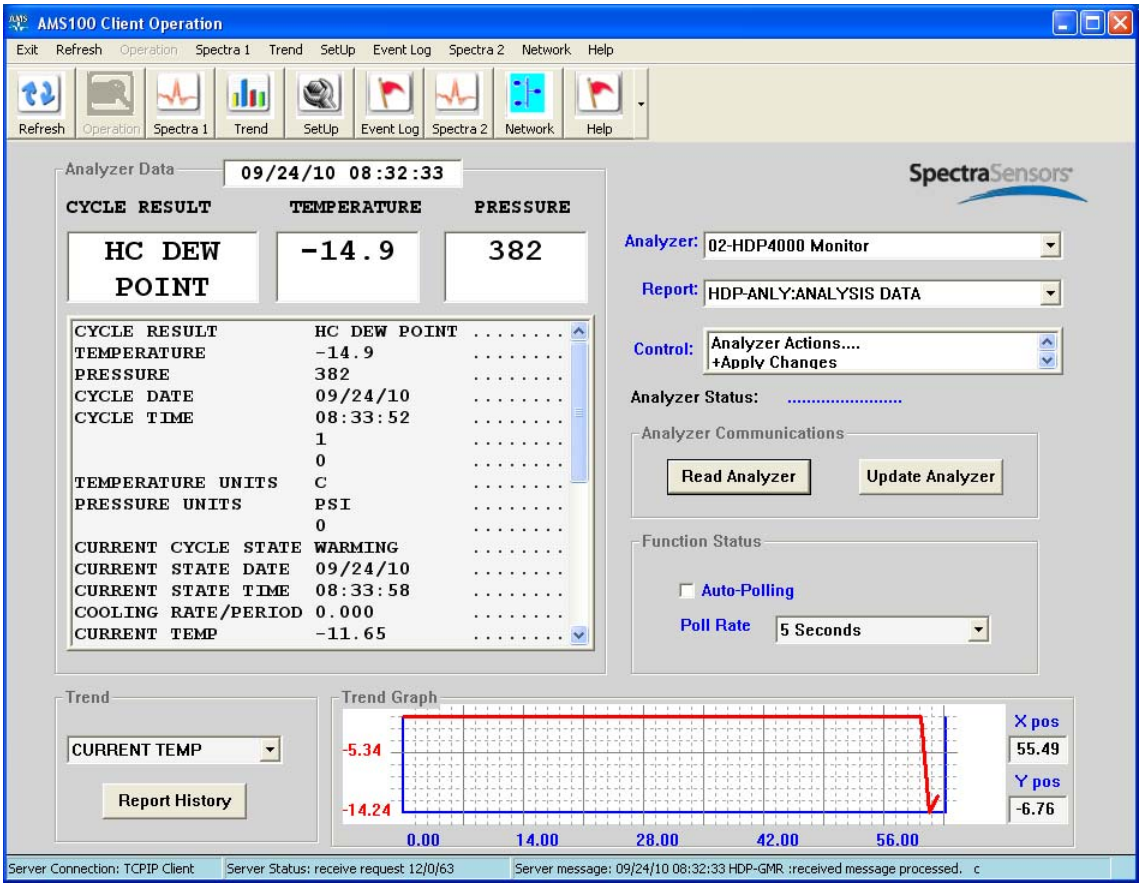


A.1- HDP -SNAPSHOT REPORT



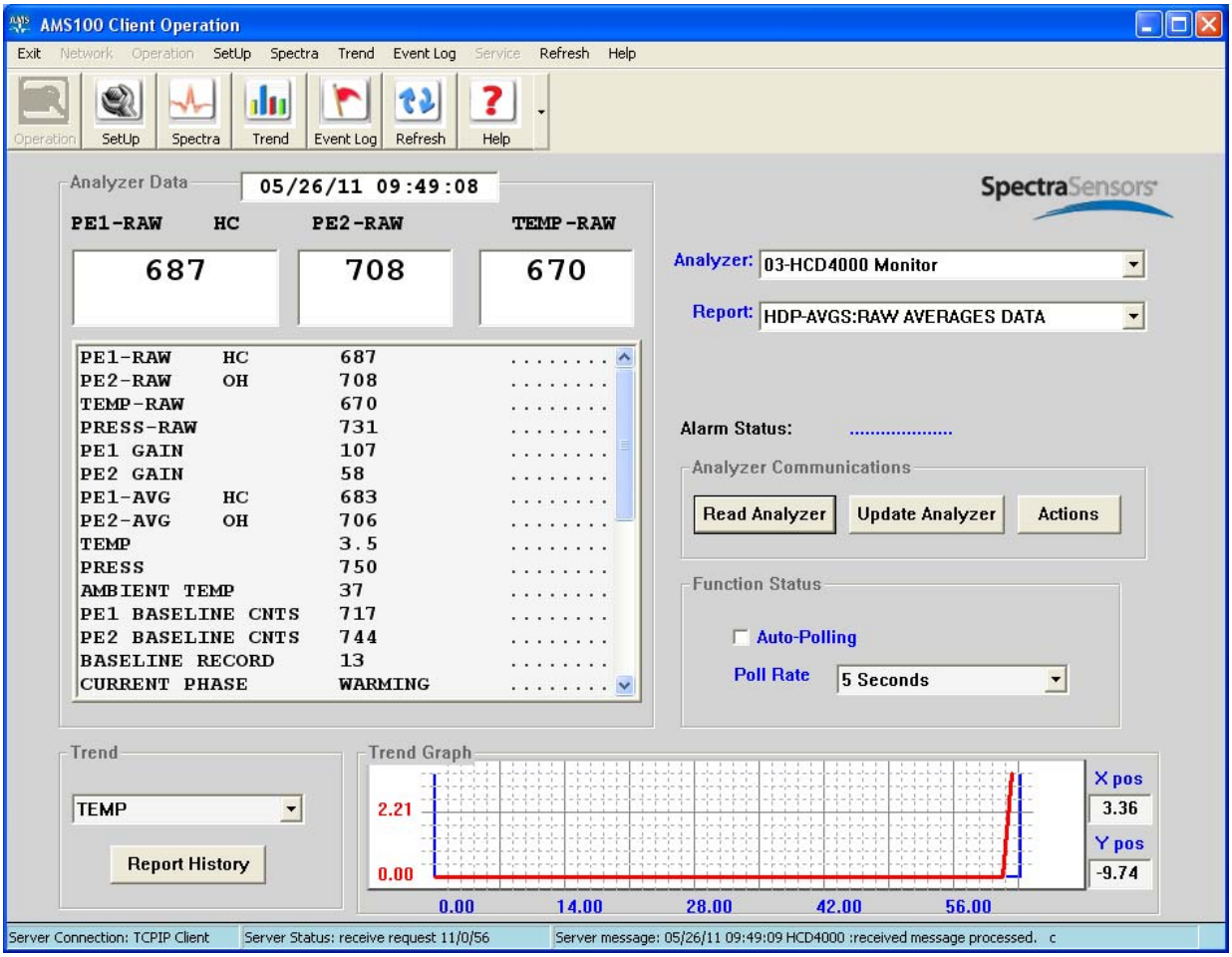
The Snapshot Report when read from the analyzer shows when the most recent dew point event was detected by the analyzer. This event may be a hydro-carbon dew point or a contaminant dew point.

A.2- HDP-ANALYSIS DATA REPORT



The Analysis Data Report when read from the analyzer shows the result of the most recent analyzer cycle and current phase conditions.

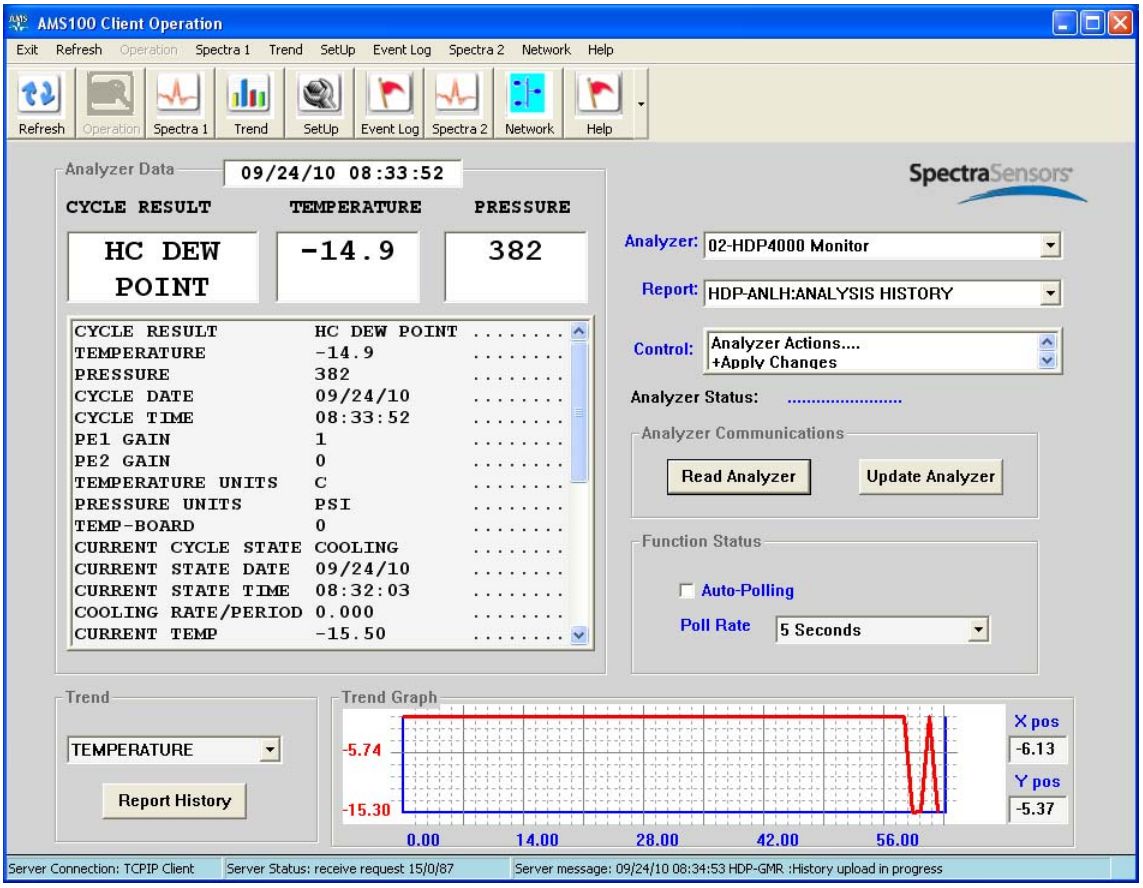
A.3- HDP-AVGS RAW AVERAGES REPORT



The Averages Data Report when read from the analyzer shows the most recent sensor data. The HCD4000™ controller is continuously (every few seconds) monitoring and processing this data as part of the dew point cycle.

The AMS100 Auto-Poll function allows the user, if desired, to continuously monitor this "raw" data.

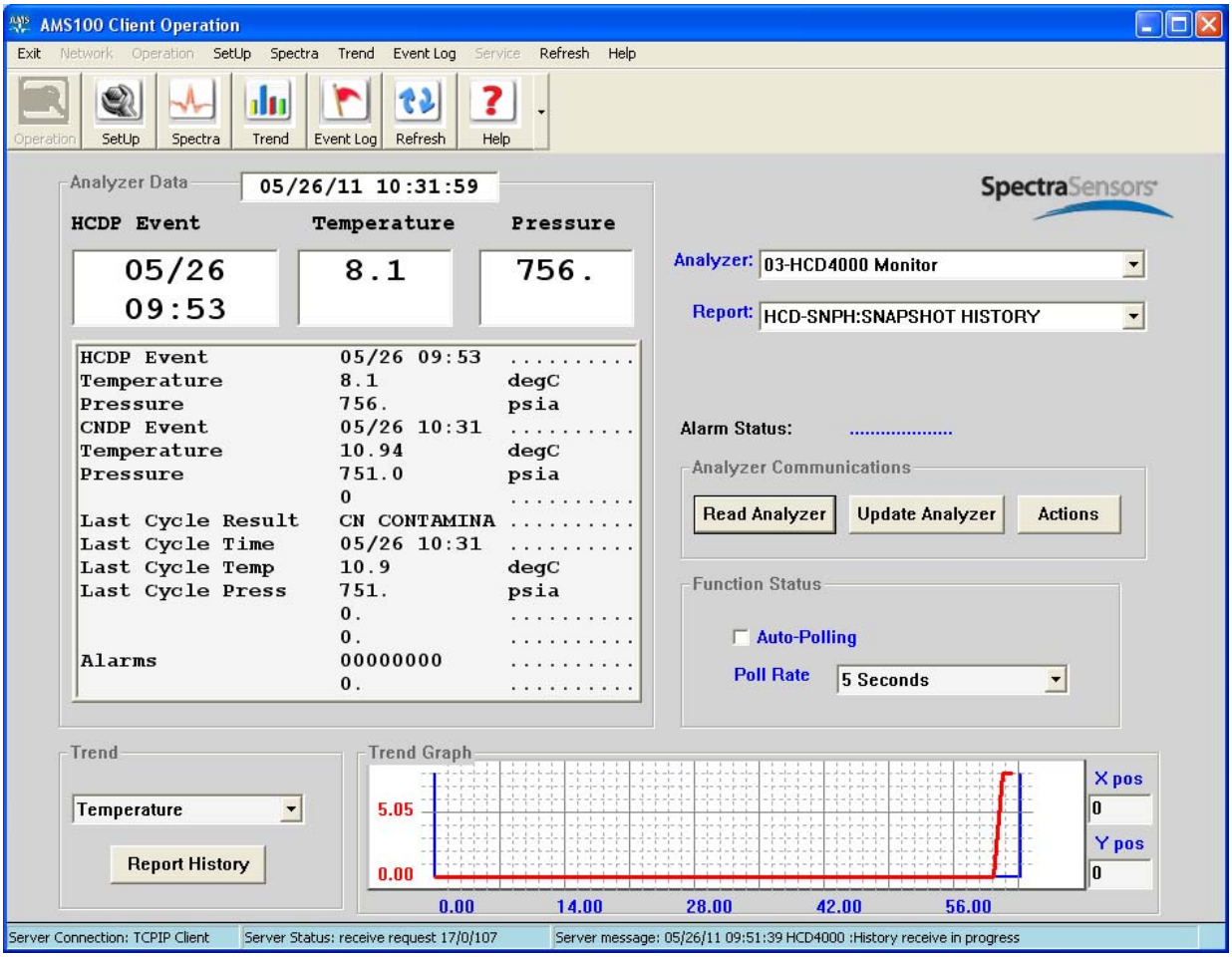
A.4- HDP-ANLH ANALYSIS HISTORY REPORT



The previous Analyzer Data report is automatically data logged by the analyzer at the end of each dew point cycle. The Analysis History Report allows the user to upload this archived history from the analyzer.

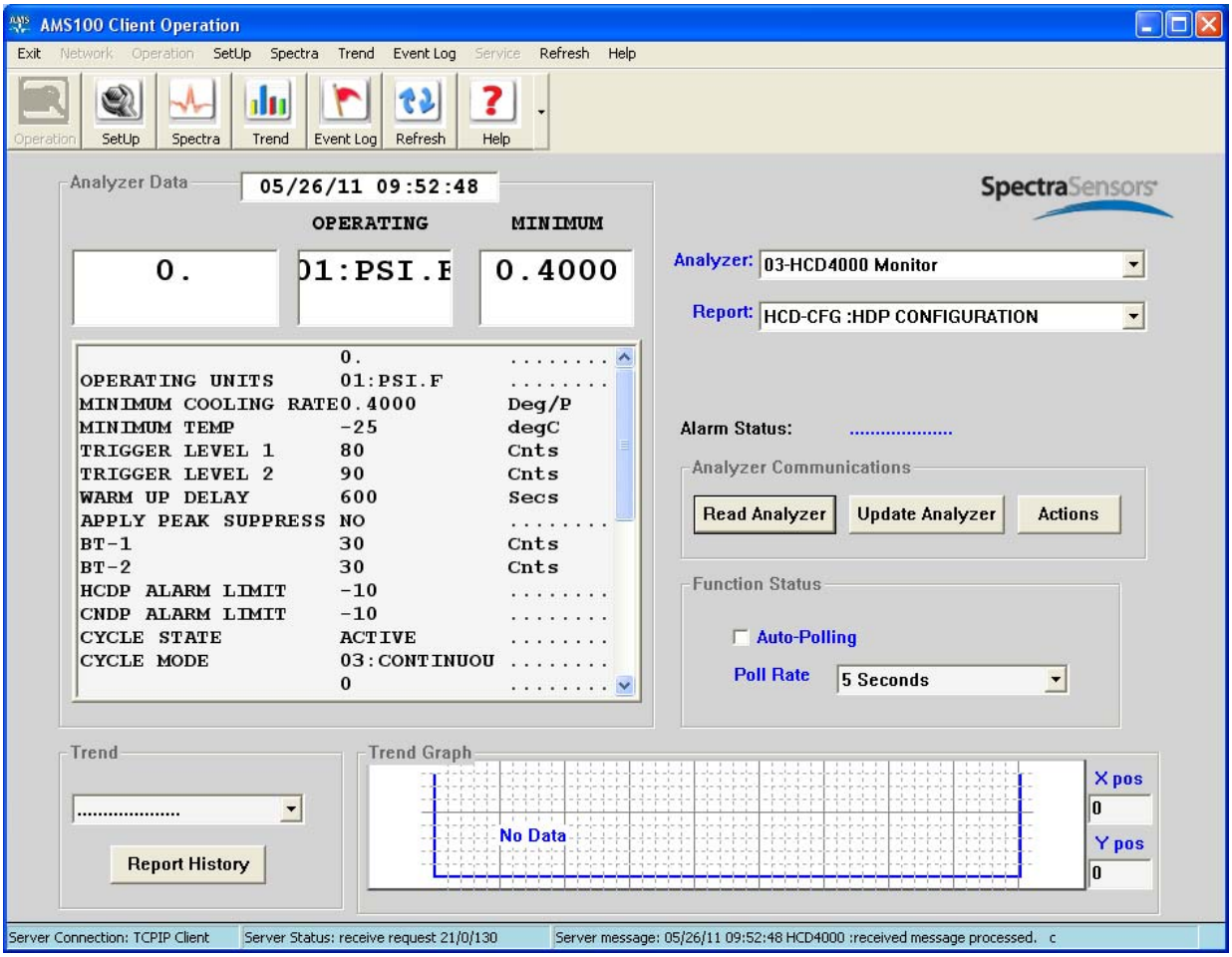
Once uploaded to AMS100, the user can print a history report or export the history data to a CSV file for import into Excel or other software.

A.5- HDP-SNPH SNAPSHOT HISTORY REPORT



The previous Snapshot Data report is automatically data logged by the analyzer at the end of each dew point cycle. The Snapshot History Report allows the user to upload this multi-event history from the analyzer.

A.6- HCD-CFG HDP CONFIGURATION REPORT

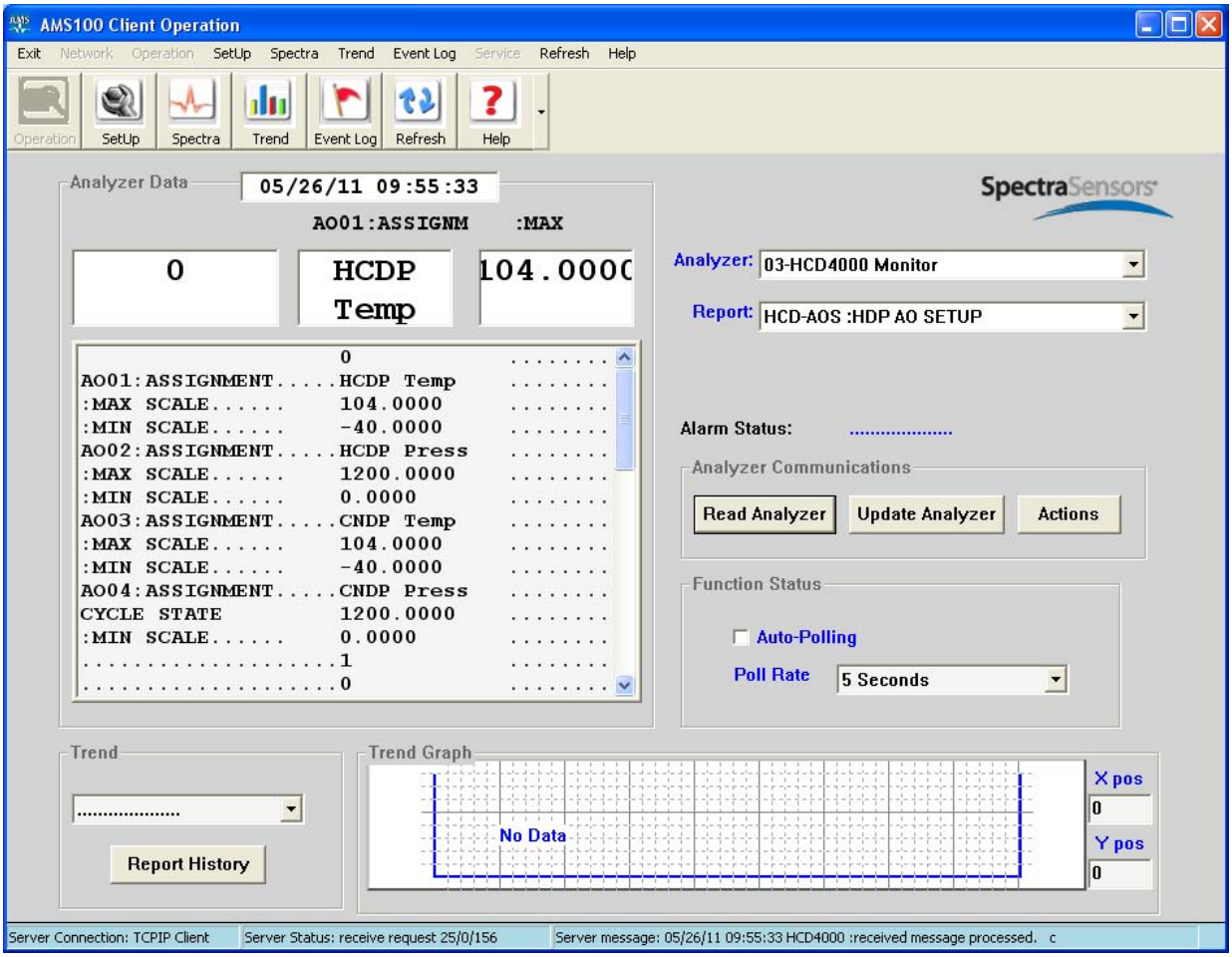


The HCD4000™ Configuration Report is used to adjust configuration parameters in the analyzer via the following steps:

1- Click on the Read Analyzer button to poll the report to review the current values in the analyzer.
2- To edit a numeric value in the report, double click on the desired numeric parameter value to access an edit box.
3- Enter the new value in the edit box.
4- After all editing is complete, click on the "Update Analyzer" button to download the report values to the analyzer.

NOTE: This is the screen where the HCDP alarm limit can be changed.

A.7- HCD-AOS HDP AO SETUP REPORT



The HCD4000™ AO Setup Report is used to assign measurements to the 4-20mA signals and to tune the signal outputs. This is a "download" report. The user can adjust the report parameters with the following procedure:

1- Click on Read Analyzer to poll for review of the current values in the analyzer.
2- To edit a value in the report, double click on the desired numeric parameter value to access an edit box.
3- Enter the desired value in the edit box.

The AO assignment values map the AOs to specific measurements in the analyzer. To change an assignment, double click on the field and enter the following numeric code into the edit box per the following table:

02 = HCDP Temp

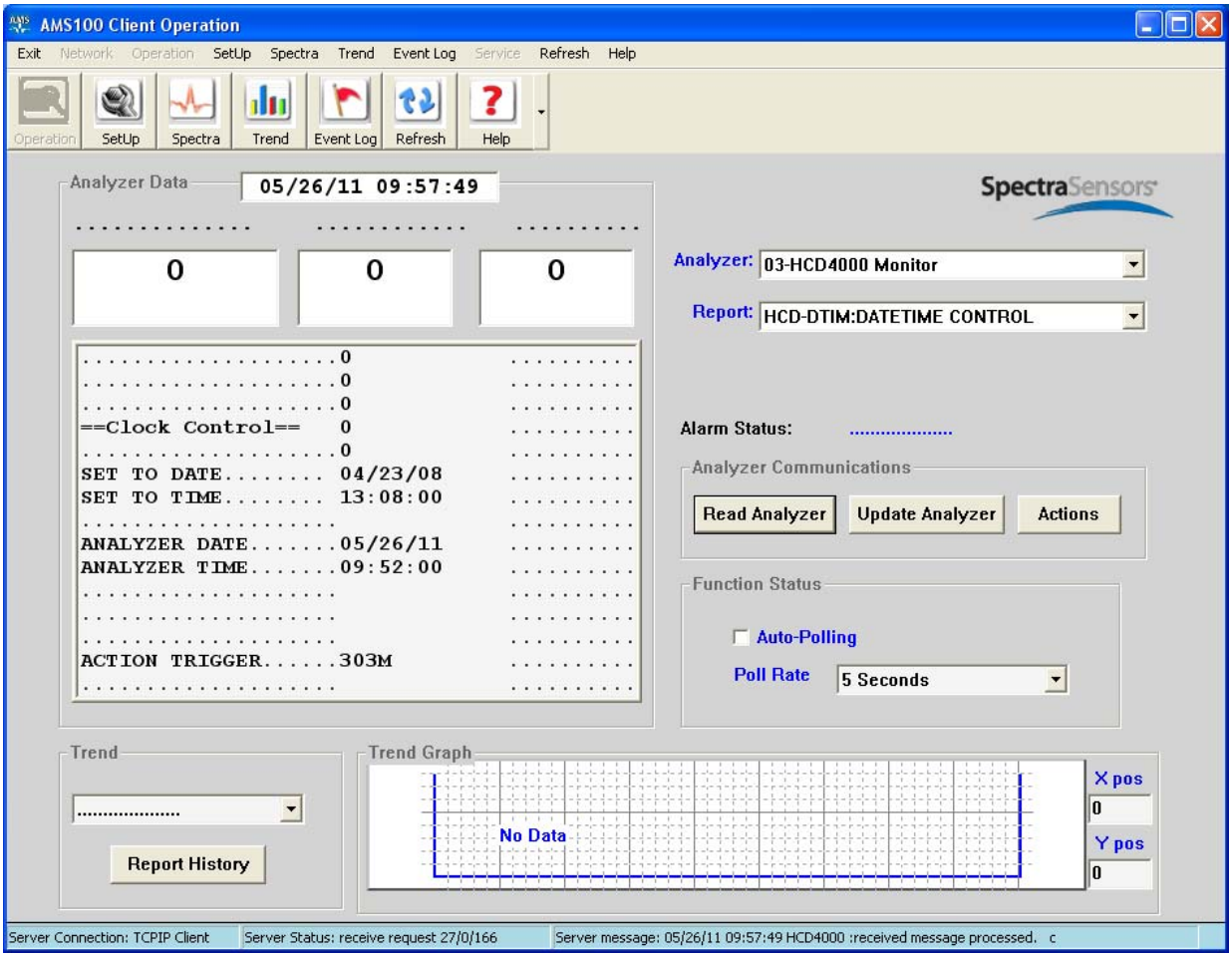
03 = HCDP Pressure

05 = CNDP Temperature from last Contaminant dew point

06 = CNDP Pressure from last Contaminant dew point

1- After all desired changes are made to the report, the user must:
2- Click on the Update Analyzer button to download the report to the analyzer.
3- Issue the Apply Changes Analyzer Action.

A.8- HDP-DTIM DATE TIME CONTROL REPORT

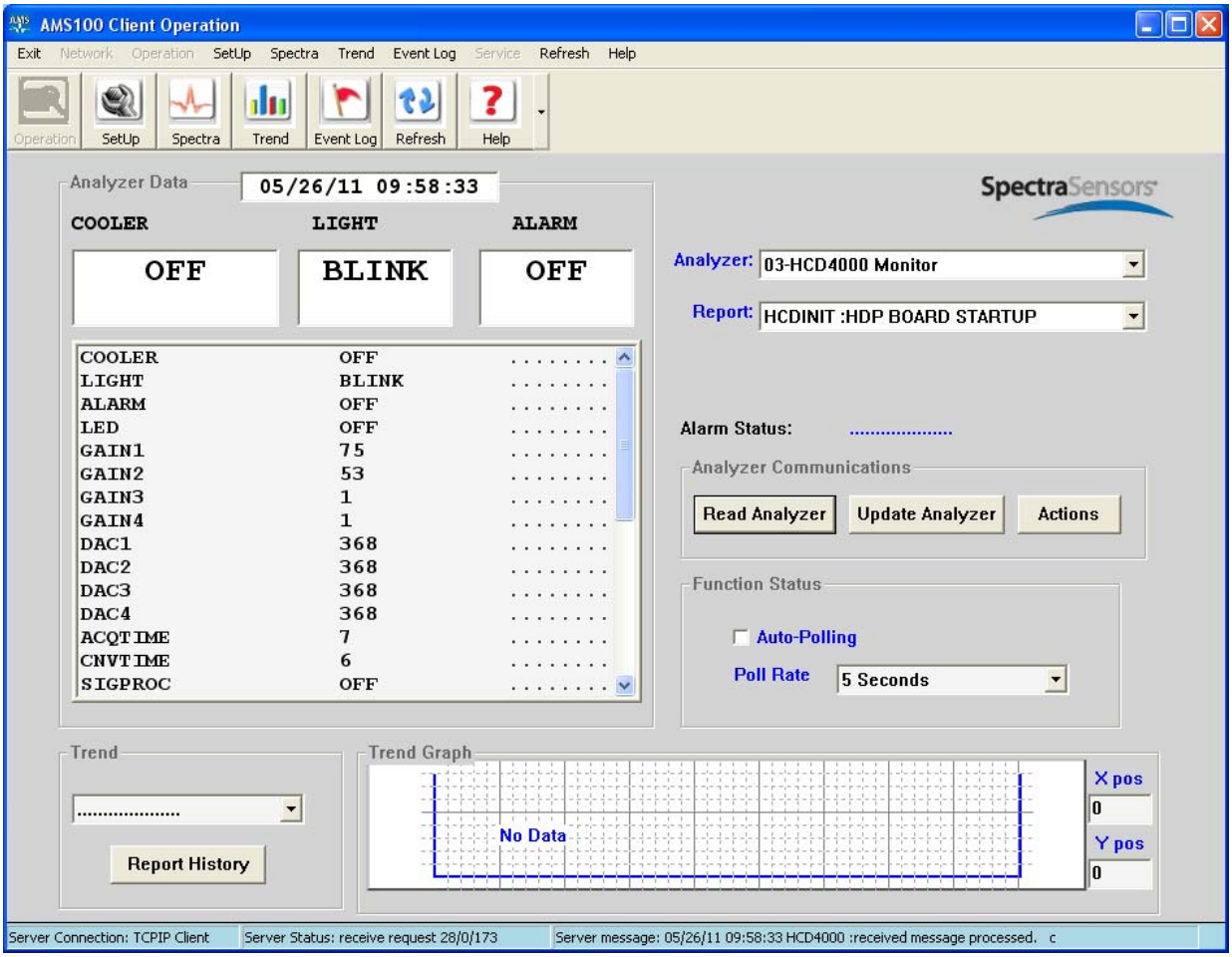


The HDP Date Time Report is used to set the clock in the analyzer controller.

This is a "download" report. The user can adjust the report parameters with the following procedure:

1- Click on the Read Analyzer button to poll for review the current values in the analyzer.
2- To edit a value in the report, double click on the desired "Set to Date" or "Set to Time" parameter value to access an edit box.
3- Overwrite the new value in the edit box retaining the displayed format.
4- After all desired changes are made to the report, the user clicks on the Update Analyzer button to download the report to the analyzer.

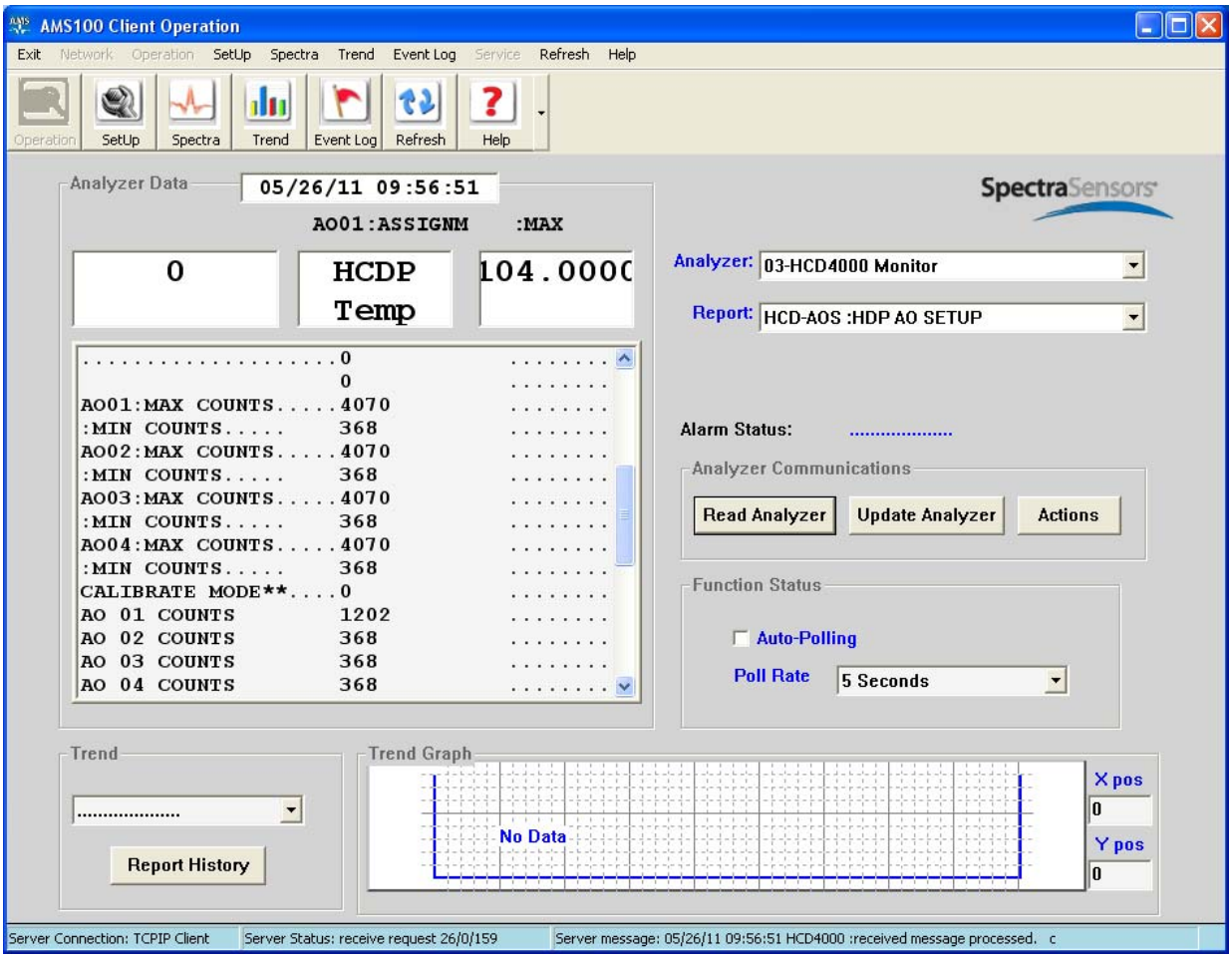
A.9- HDPINIT HDP BOARD SETUP REPORT



The HDP Board Setup Report defines initial analyzer configuration parameters used for sensor board initialization when the analyzer is powered-up. This is a "download" report. The user can adjust the report parameters with the following procedure:

1- Click on the Read Analyzer button to poll for review the current values in the analyzer.
2- To edit a value in the report, double click on the desired "Set to Date" or "Set to Time" parameter value to access an edit box.
3- Overwrite the new value in the edit box.
4- After all changes are made, click on the Update Analyzer button to download the report to the analyzer.

B- HCD4000 AO AND DO CALIBRATION AND TEST PROCEDURE



1. Access HCD AO Setup report in AMS100. Scroll down to view the AO counts data.

2. Set Calibration Mode = 1 and click on Update Analyzer to force AO1, AO2, AO3, and AO4 to the mAmp value corresponding to the min counts and to turn off DO1, DO2, and DO3.

3. Measure the mAmp output, verify DO settings.

4. Tweak the min counts for specific AOs as needed and click on Update Analyzer until output = 4 mAmp.

5. Set Calibration Mode = 2 and click on Update Analyzer to force AO1, AO2, AO3, and AO4 to max counts and to turn on DO1, DO2, and DO3.

6. Measure the mAmp output, verify the DO outputs.

7. Tweak the max counts for specific AOs as needed until output = 20 mAmp

8. Set Calibration Mode = 0 and click on Update Analyzer to terminate calibration mode.

9. Click on Read Analyzer to verify that Calibration Mode has been turned off.

C- HCD4000™ ANALYZER CONFIGURATION ACTIONS

The **Actions** field on the AMS100 Operations window is used to issue special action requests to the HCD4000™ analyzer. The analyzer responds to the action request by performing the requested action.

The following action requests can be issued to the analyzer:

Save Changes	Should be issued after changes are downloaded to the analyzer using the Update Analyzer button.
Shutdown HCD4000	Initiates shutdown sequence in the analyzer. **This procedure is highly recommended prior to cutting power to the analyzer to insure that the cooler is turned off and files are not left open.**
Load Calibrations	Updates the analyzer calibration tables from the calibration files in the CFG\CFG142 folder on the 128MB flash.
Start HCDP Cycle	Instructs the analyzer to begin dew point cycle processing. This is only required if processing has been turned off with the HCDP Cycle Off action.
Stop HCDP Cycle	Instructs the analyzer to suspend dew point cycle processing.
Compile ASL	Requests that the controller compile ASL application logic (only required if ASL logic has been updated).

D- HCD4000™ FIRST TIME STARTUP PROCEDURES

1. Starting up the HCD4000™ analyzer the first time
    a. Power up the unit.
    b. Watch the LEDs on the controller board. Controller initialization will take 2-3 minutes. The lower LED on the base Controller board after initialization is complete will begin a 5-6 second blink.
    c. Controller then begins Sensor board initialization. Monitor the progress via front LCD panel.
    d. Initialization process is indicated by "Initialize" and "Configure" phases on row 3 of the LCD panel.
    e. Controller then automatically begins a dew point cycle and indicates this with the "Start Cycle" message on row 3 of the LCD panel.

E- HCD4000™ OPERATING PROCEDURES

1. To shutdown the HCD4000™ analyzer
    a. Use AMS100™ to issue the Analyzer Action "Shutdown HCD4000" (see HCD4000™ Analyzer Actions above).
    b. Wait for the controller board LED to reach a constantly on steady state, i.e. is not flashing/blinking.
    c. Turn off analyzer power.

2. To startup the HCD4000™ analyzer
    a. Power up the unit.
    b. If the door is open you can watch the LEDs on the controller board. Controller initialization will take 2-3 minutes. The lower LED on the Controller board after initialization is complete will begin to blink every 5 to 6 seconds.
    c. Controller then begins Sensor board initialization. These phases are indicated by the "Initialize" and "Configure" phase messages on row 3 of the LCD panel.
    d. After the "Configure" phase is complete, a dew point cycle is initiated and indicated with a "Start Cycle" message on row 3 of the LCD panel.

F- REMOVING/CHANGING A COMPACT FLASH

The HCD4000™ analyzer controller uses two compact flash cards. The 2 GByte card on the left side of the controller is used for data logging of dew point cycle data. The 128 MByte card on the bottom of the back board contains the controller firmware. Use the following steps to remove or change a compact flash card:

1. Shutdown the HCD4000™ using the above Shutdown procedure.
2. After power is off, the desired compact flash can be removed and replaced as needed. Press the black button beside the card to eject it.
3. The compact flash card to be inserted must be oriented correctly with the top of the card facing away from the board surface. Do not force or exert pressure as this may damage the card slot.
4. After the card(s) have been inserted, the analyzer can be powered up.