



D-2 INCORPORATED

Jet Fuel 1A Conductivity Sensor Hand Held ASTM Test Method D-2624

JF-1A-HH



OWNERS MANUAL

REVISION 4 P/N 445-003

Revision History:

Rev	Date	Description	
1	01/28/08	Written	AJF
2	07/30/09	ASTM D-2624 Listing Added	DLF
3	12/18/09	USB Version – Eliminate Blue Tooth	AJF
4	4/24/10	Updates – Immersion Depth, Menu- Structure, General Corrections	AJF

This manual covers the operational aspects of the D-2 JF-1A-HH Hand Held Conductivity Sensor. D-2 continuously strives to meet the full expectations of our customers and we welcome comments on the structure, content and the ability of this manual to answer your questions regarding our product. If you have any suggestions or comments please contact us at Mail@D-2inc.com. This document is provided with the understanding that future versions of this instrument may have additional commands, and the function of the commands shown in this document may vary from the present operation.

1.0 GENERAL DESCRIPTION

The D-2 JF-1A-HH Hand Held Conductivity Sensor is a reliable instrument for the spot sampling measurement of electrical conductivity of fuels. The JF-1A-HH Conductivity Sensor incorporates innovative electronics Digital Signal Processing (DSP) techniques to accurately determine the electrical conductivity of fuel products, identical to those used in the ASTM approved JF-1A. The instrument will measure fuel electrical conductivities between 0 and 2000 picosiemens/meter (pS/M), although it is optimized and normally used in the 0 to 500 pS/M range. The sensor offers internal LI-ION rechargeable battery and can link with any USB equipped personal computer for ease of data transfer. Up to 8 sampled data points along with temperature and time can be held in internal non volatile memory, for either readout on the display or transfer to a personal computer by the built in USB data link. Optional software is available from D-2 for data analysis plotting and archiving. The D-2 sensor uses continuously monitored references which can go an entire year without factory recalibration. Absolute calibration relies only on the sensor cell constant that is very stable by design. The conductivity sensor has a built-in platinum high stability temperature sensor.

2.0 SPECIFICATIONS

The electrical parameters are factory calibrated to 1% of reading. However, due to fuel measurement characteristics, the repeatability and reproducibility limits are as follows:

Table 1
SENSOR SPECIFICATIONS

Parameter	Conductivity	Temperature
Range	0-2000 pS/m*	0-35°C*
Accuracy	+/-2 pS/m (+/-2% of reading)	+/-0.5°C
Resolution	0.1 pS/m	0.1C
Sensor Type	316SS Coaxial Electrode	Platinum
Calibration	Internal Source Zero and Full Scale	NIST Traceable

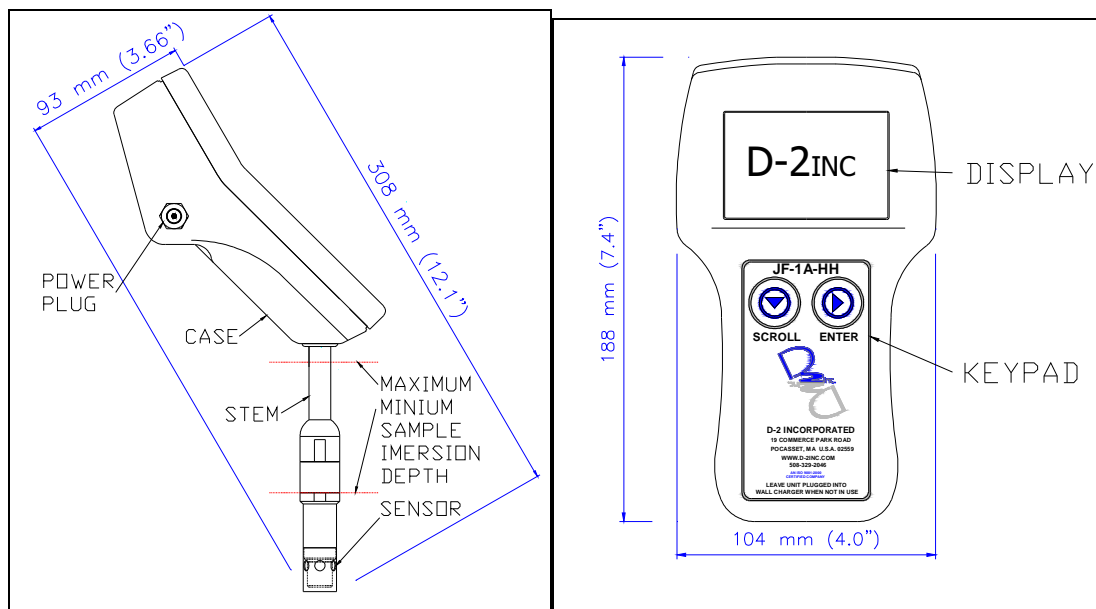
*wider ranges available – contact factory

Table 2
SYSTEM SPECIFICATIONS

Power	Built-In 2.6Ahr Lithium Ion Battery (1000 Samples) Universal Voltage Wall Mount Charger Charger Input: Typical 100- 250 VAC, 50-60 Hz, 0.5A Charger Output: Typical 9 VDC Charger Connector: 0.097”Center Pin 712 Jack w/center pin positive Battery Life: up to 48 hours without recharging (sleep mode)
Outputs	128X64 Dot Matrix Display Indicating Conductivity and Temperature, Non-Backlit Sample Trend Line Graph to Assist Data Collection USB Data Interface* LED Charging Light
Materials	Housing Polyamide – Grey Sensor 316SS and PEEK
Weight	1 – 2 Lbs
Certification	ATEX Housing – ATEX, FM, CSA, UL, CENELEC

* Virtual serial data com port

Figure 1
Major System Components
(SIDE & FRONT VIEWS)



2.1 Unpacking the Sensor

The JF-1A- HH is a delicate instrument and care should be taken during the unpacking of the box. The box should be inspected previous to unpacking and any damage should be noted and the shipping carrier should be notified.

The Contents of the box vary depending on exact purchase order. The following is a list of components for the JF-1A-HH (including D-2 Inc. part number):

1. JF-1A-HH: Hand-Held sensor
2. 4000-PW118RA0903F01: Power Supply Brick with JF-1A-HH interface cord.
3. 445-002: Safe Use Manual
4. 445-003: Owners Manual
5. JF-1A-HH-SP: Graphing Software for Windows XP® - 1 disc (optional)

If more Power Supplies are needed, please use part number JF-1A-HH-PS.

Due to the unknown length of the shipping process, a 24-hour recharge of the JF-1A-HH is necessary before use.

3.0 OPERATION

The JF-1A-HH Hand Held Conductivity Sensor runs on a rechargeable LI-ION battery. The battery powers the microcontroller of the sensor which relegates "SLEEP" mode (instrument is not actively running) and "WAKE" mode (instrument is either sampling or ready to sample). The microcontroller goes into SLEEP mode, which is the powering down of all non essential circuits, after periods of inactivity. Wake mode is activated by the pressing of either of the two keypad buttons. Battery management circuitry is always active and for best battery performance, the unit should remain plugged into the universal wall charger when not in use.

NOTE: The unit should always be left plugged into the wall charger to maintain the lithium ion battery in top condition. The universal wall charger can be connected to any suitable AC power source as is specified directly on the charger.

IMPORTANT: The instrument should be disconnected from the wall charger prior use as a measuring device.

All operations of the sensor follow the state diagrams in the section labeled Menu Structure. The menu structure is activated using the two keys: **ENTER** or **SCROLL** to move from one state to another.

3.1 Sampling Data (Please Reference to Menu Structure)

Proper techniques as described in ASTM D2624 should be used to collect a fuel sample from your test location. Please follow all suggestions outlined in the Safe Use Manual (D-2 Part Number 445-002)

<<CAUTION>> *Cross contamination of fuels can lead to erroneous conductivity values. Always clean sensor tip prior to and between sampling. Recommended cleaning includes an alcohol rinse and air dry, see section on Maintenance.*

- Prior to sampling fuel, the sensor tip should be immersed into and out of the fuel 3 times up to the "minimum" mark (top of the black sensor tip).
- Use the **ENTER** key to initialize the sensor. Using the **SCROLL** key step through to the sample storage location that you want to collect data for. When ready to sample press **ENTER** key.
- Press the **ENTER** key to commence sampling.

The display has three critical sections during the sampling...

1. Right below the words "Enter to Store", dots will increment across the

screen. Each dot represents a sample and there area a total of ten samples per acquisition.

2. In the center of the screen is the actual value of each sample.

3. Across the bottom of the screen, is a Bar Graph and Caret depicting the stability of the reading. At the center of the bar graph is a vertical line used to display the "stable" region. The Caret moves along the Bar Graph in relation to the percent difference of the previous reading.

Watching the bar graph and the number of sample dots shows the status of the current sample. There are several options for acquisition at this time

- Pressing the **ENTER** key when the Caret reaches the center vertical line (preferred method), stores the data along with temp, time and date in the current selected location. The menu screen then displays all the data just taken.
- After the ten samples have been updated during the acquisition the bar graph disappears and is replaced with "SCR TO CLEAR". At this time, pressing the **ENTER** button stores the last sample's value taken. The menu screen then displays all the data just taken. If pressing the **Scroll** button instead, the acquisition's data is cleared and the user is placed back in the choose location menu. The user then has the ability to choose another location for storing another sample.
- By choosing neither button the sensor enters its thirty second timeout mode. At this point in the menu structure, the first timeout will clear all the data and place the user back in the choose location menu; after thirty seconds more, the sensor will enter its "SLEEP" Mode.

3.2 Reviewing Data (Please refer to Menu Structure)

- The **SCROLL** key can be used to move to the location of the stored data of interest.
- Pressing the **ENTER** key will display the last data sample for that storage location along with temperature and date collected.

Note: sampling new data to any storage location overwrites previous data.

3.3 Preferred Sampling Procedure

- Sensor Probe Cleaning
- Check Calibration
- Proper Fuel Sample Collection

- Proper Insertion of Sensor Probe
- Selection of Storage Location
- Initiating Sample Measurement
- Saving at Stable Reading
- Confirming Storage of Sample in Correct Location

4.0 MENU STRUCTURE

The following pages contain the flow charts of the menu structure/keypad sequences of all the functionality of the JF-1A-HH.

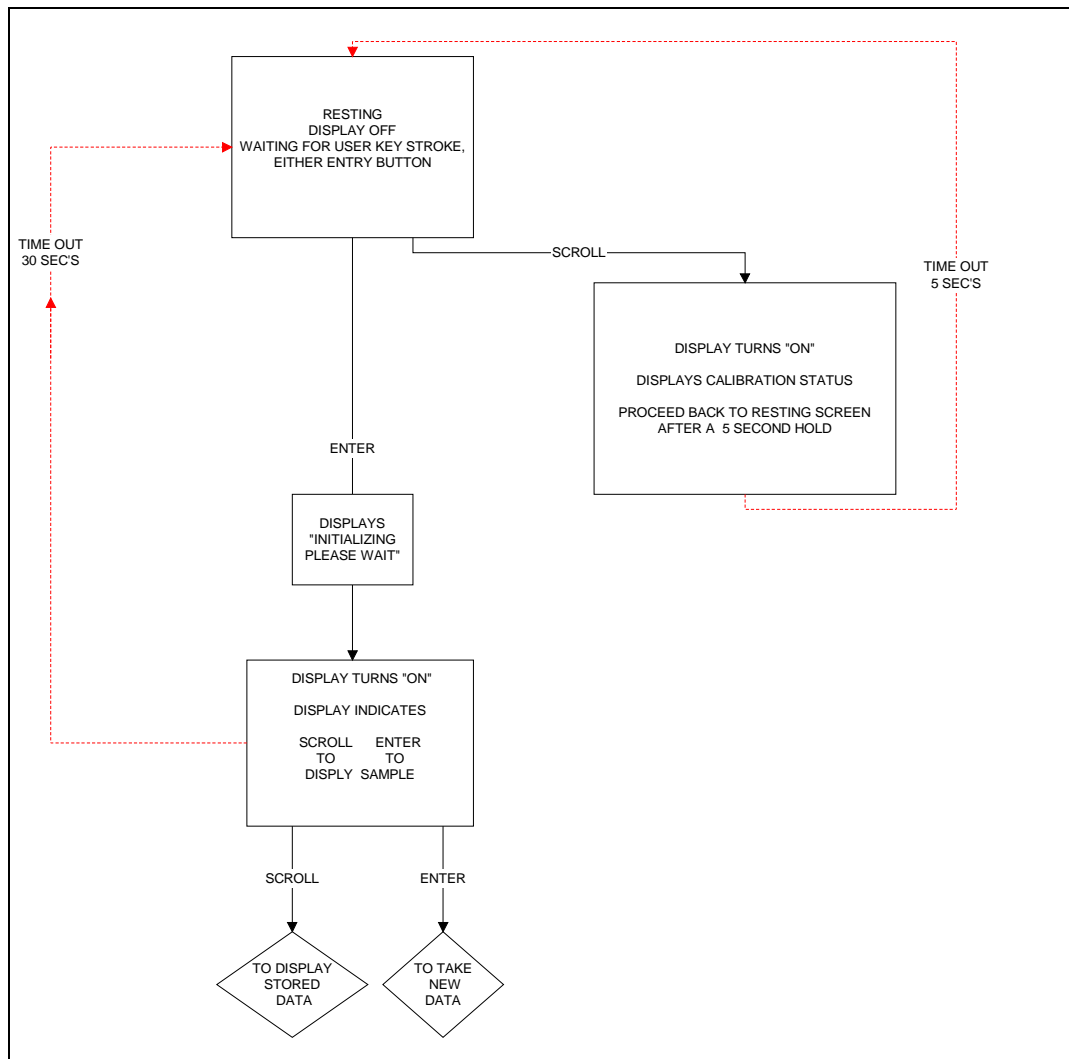
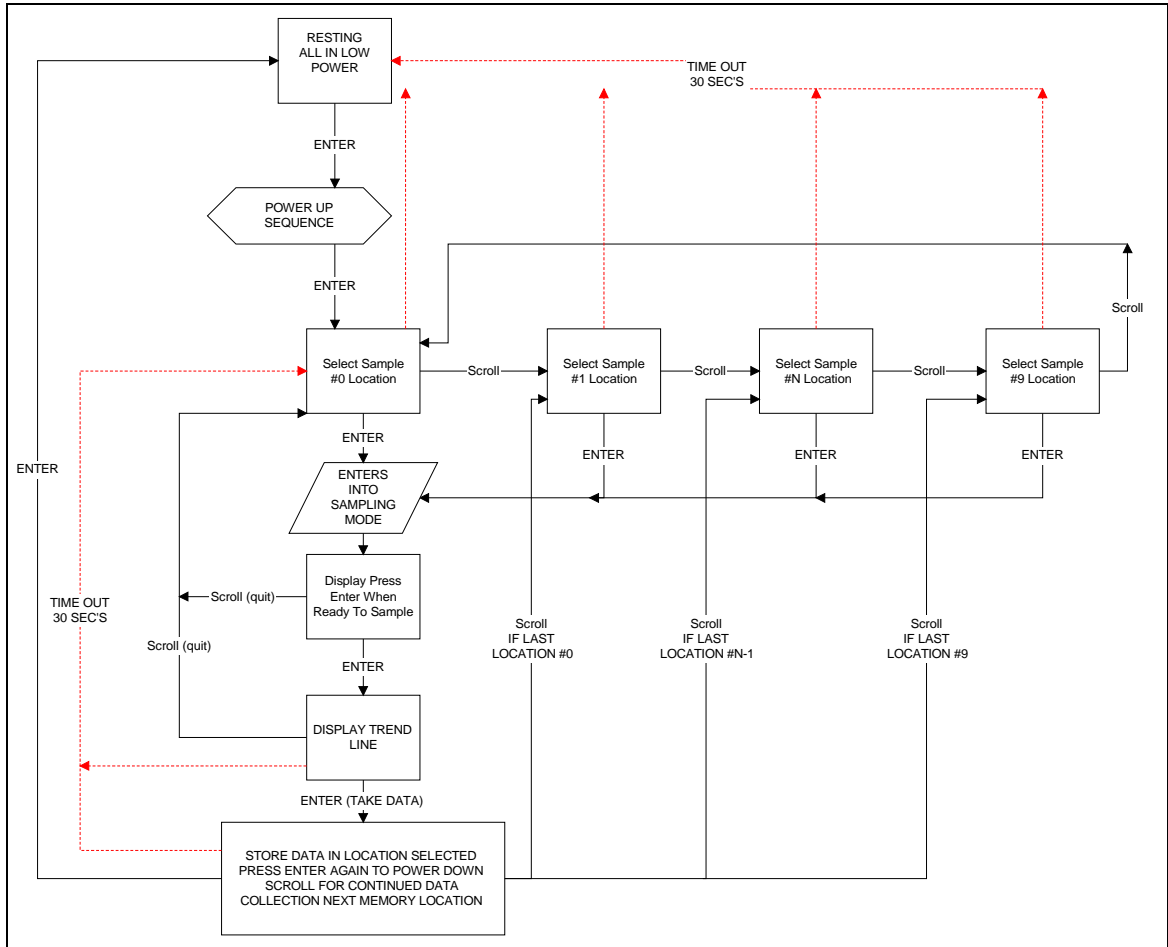
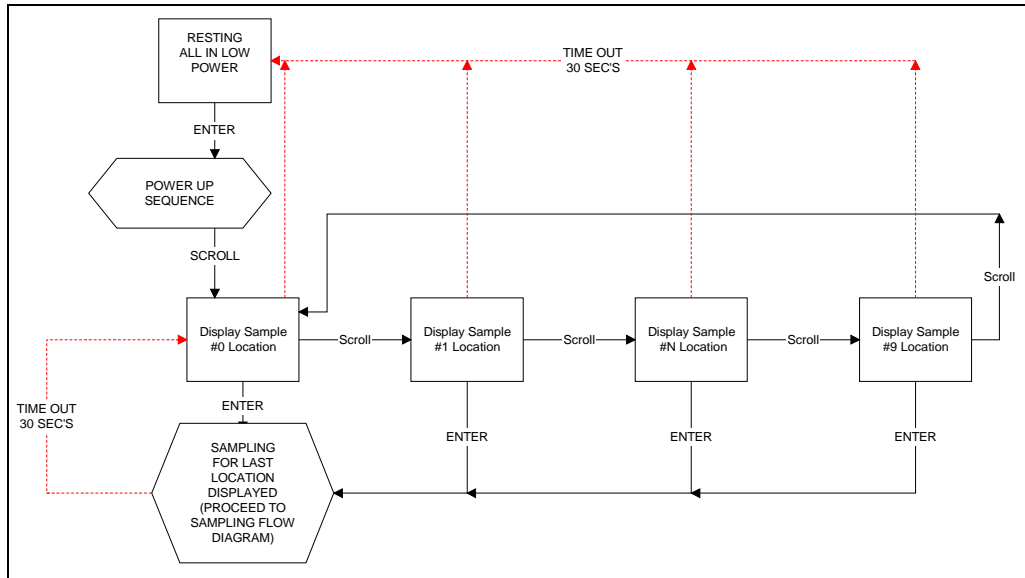


Diagram Power-Up Sequence



Flow Diagram Sampling Sequence



Flow Diagram Display Stored Data Display Sequence

5.0 USB SERIAL DATA INTERFACE

The D-2 JF-1A-HH has an industry standard USB Interface. To properly connect to the sensor certain USB drivers are needed. These drivers may or may not be already loaded on your computer. These drivers can be found accompanying the optional D-2 INC. software or online from <http://www.ftdichip.com/Drivers/VCP.htm> and looking for the FT232R product line. This USB connection will have properties of a virtual serial port and the connection shall automatically be given a comport number. This Comport number will be needed for communications with the sensor through D-2 Inc.'s Windows[®] software. The optional software allows for download of data, time synchronization, graphing, trending, change of location names, and calibration status. Follow software menus and instructions as required.

5.1 Virtual Serial Port Parameters

Once connected to the Virtual Serial Port, communication parameters must be set to 9600 N 8 1 (D-2 Inc. software shall do this automatically).

Baud Rate of 9600 BPS

No Parity

8 Data bits

1 Stop bit

5.2 Firmware Commands

A list of commands has been developed to communicate with the sensor to enhance operation. All commands end with a carriage return/line feed pair. The ability to read a parameter needs only the command, the ability to set a parameter needs the command, an equal sign, and the formatted parameter. i.e. to set the time to 1:35 PM, the command structure would be: `time=13:35:00<cr><lf>`. To find the time, the command structure would be: `time<cr><lf>`.

A list of available commands can be found in Appendix B.

6.0 CALIBRATION

6.1 Calibration Check

Before every new session of fuel sampling, a simple 30 second calibration check should be performed. Press the **SCROLL** key to power the unit into the calibration mode. Review the date displayed, if the calibration date has passed consult the factory to schedule a re-calibration of the unit.

6.2 Zero Value Reading

If either a reading at ZERO is larger than +/- 5 pS/M is observed or the user suspects that the unit is not reading correctly the sensor should be returned to the factory for certified re-calibration. **<Note: sensor tip should be clean and dry at time of zero reading>** Normal re-calibration interval for the JF-1A-HH is one year. At the expiration of the calibration interval the sensor will warn the user on power-up that calibration interval has expired.

7.0 MAINTENANCE

NOTE:

There are no user-serviceable components inside the D-2 JF-1A-HH Conductivity Sensor.

There are no electronic adjustments inside the sensor.

The total Maintenance of the instrument has been reduced to sensor probe cleaning and ensuring the battery charger is plugged in at all times when the sensor is not in use.

7.1 Cleaning

The JF-1A-HH Hand Held Conductivity Sensor should be cleaned prior to and in between sampling procedures. Fuel additives or particulate may build up on the sensor, degrading its performance. The sensor can be

cleaned using the following procedure.

With the charger removed from the sensor and the sensor removed from the sample, rinse the sensor in "Clean" Isopropyl Alcohol and blow dry using "dry" compressed air. Note that this step should be repeated until all signs of fuel residues have been removed from the sensor.

Note: Isopropyl Alcohol is highly conductive and any residual traces inside the sensor between the two electrodes will over-range the instrument. To flush the Isopropyl Alcohol a reagent grade toluene can be used as an after rinse and allowed to air dry. Note that if the Isopropyl Alcohol is well blown off with dry compressed air no residuals will be left, eliminating the need to use the more exotic Toluene. (Note: Continued long term exposure to Toluene will result in degradation of sensor components. Use Toluene as a cleaning agent only do not expose sensor to long term immersion in this solvent).

The user can be satisfied that the sensor is clean when values of less than 5 pS/M are reported for a zero reading.

APPENDIX A:

LIMITED WARRANTY

One year from date of shipment, D-2 Incorporated, guarantees its products to be free of defects in materials and workmanship. In the event a product malfunctions during this period, the company obligation is limited to repair of the defective item at our factory, or the defective item may be replaced at our option. Instruments found defective should be returned to the factory prepaid and carefully packed, as customer will be responsible for freight damage. D-2 will pay return shipping on any warranty repairs.

Repairs or replacements under warranty will be at no cost to the customer for parts, labor, or return shipment from our factory to the customer. This warranty is void if in our opinion the instrument has been damaged by accident, mishandled, altered or repaired by the customer where such treatment has affected its performance or reliability. In the event of such abuse by the customer, all costs for repairs plus freight costs will be borne by the customer. All equipment supplied by D-2 that is designed for use under hydrostatic loading has been certified by actual pressure testing prior to shipment.

The customer will be charged a diagnostic fee plus all shipping costs if an instrument is returned for warranty repair and no defect is found by the factory. Incidental or consequential damages or costs incurred as a result of product malfunction are not the responsibility of D-2 Incorporated.

Equipment not manufactured by D-2 Incorporated, is supported only to the extent of the original manufacturer's original warranties. All OEM sensors which utilize electrodes (oxygen cartridges, pH, ORP, etc.) is warranted at the time of shipment, and shall perform upon initial installation within stated specifications. If the product proves to be defective within the OEM's warranty we will replace the product or defective part with a similar model, product or part, but only to the extent that the OEM will warrant.

All returned products must be accompanied by a Returned Material Authorization (RMA) number issued by D-2 Incorporated. Shipments will not be accepted without the RMA number. An RMA number can be obtained by calling Customer Service Department at 508-564-7640 or by emailing Mail@D-2inc.com.

The following information should accompany any instrument being returned to the factory:

Return Authorization Number
Model/Serial Number
Brief Description of the Problem
Customer Contact/Telephone Number

CALIBRATION SERVICE POLICY

A calibration only service is available for JF-1A-HH Hand Held Conductivity Sensors. The service is limited to instruments requiring only calibration and minor adjustment. Instruments that are not operating properly and require repair or replacement parts will not be covered. If repair is necessary the customer will be contacted and apprised of the additional cost. The customer will be charged the standard repair cost, which includes repair and calibration. In the event that the customer does not approve repair, the unit will be returned in "as received" condition and the teardown and inspection charge will be invoked.

The customer will be required to obtain a return authorization number from Customer Service at D-2 Incorporated prior to the return of the instrument. This number should be displayed on the outside of the container, preferably on the shipping label, and included on the shipping documentation sent with the instrument.

If possible, the following information should accompany the instrument:

Return Authorization Number
Model/Serial Number
Customer Contact/Telephone Number
All Correspondence/Shipping:

Customer Service
D-2 Incorporated
19 Commerce Park Road
Pocasset, MA 02559

APPENDIX B: Serial Port Command List

Function	Command	Format
Save parameters	***E	
List variables	RCAL	
Set one Timeout of 30 min	TOFF	
Get all data for all locations	DUMP	
Get firmware version	VER	
Get list of help commands	?	
*Date	DATE =	mm/dd/yy
Time	TIME =	hh:mm:ss
Location 0 Name	LOC0 =	4 characters
Location 1 Name	LOC1 =	4 characters
Location 2 Name	LOC2 =	4 characters
Location 3 Name	LOC3 =	4 characters
Location 4 Name	LOC4 =	4 characters
Location 5 Name	LOC5 =	4 characters
Location 6 Name	LOC6 =	4 characters
Location 7 Name	LOC7 =	4 characters
Location 8 Name	LOC8 =	4 characters
Location 9 Name	LOC9 =	4 characters
Conductivity value filter number	N =	0 > whole number < 100

*all commands listed after and including this one have the ability to read or set a parameter.