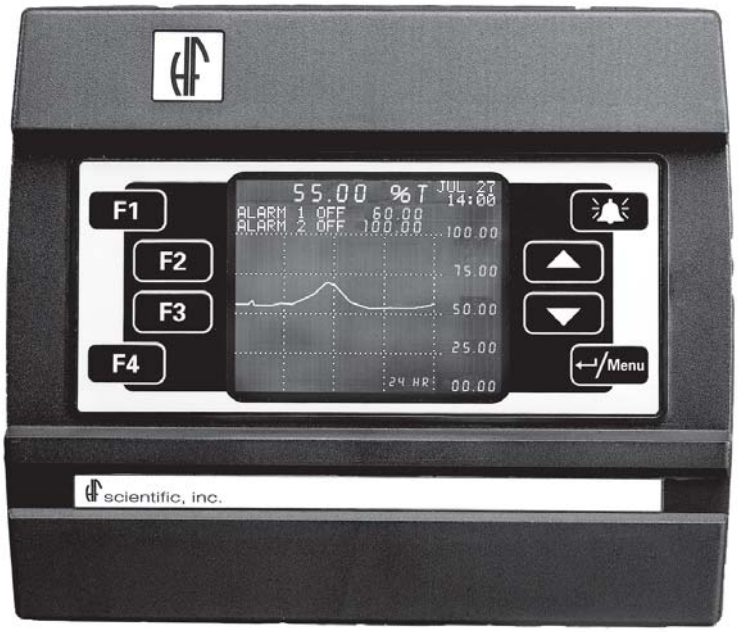
HF scientific, inc.



MicroTUV ONLINE UV TRANSMISSION ANALYZER OPERATION & MAINTENANCE MANUAL

HF scientific, inc.
3170 Metro Parkway
Fort Myers, FL 33916
Phone: (239) 337-2116
Fax: (239) 332-7643

Catalog #22814 (1/03)

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Figure No. Title

DECLARATION OF CONFORMITY

Application of Council Directive: 89/336/EEC

Standards to which Conformity is Declared:

Product Safety	Immunity	EMI
UL3111-1	EN50082-1:1997	EN55011 Group 1Class A
CSA-C22.2 No. 1010-1-92	IE801-2	Per 50081-2:1994
CE EN61010-1:1993 (73/23 EEC)	IEC801-3	FCC Part 15 Class A
	IEC901-4	

Manufacturer's Name: HF scientific, inc.

Manufacturer's Address: 3170 Metro Parkway, Fort Myers, Florida 33916-7597

Type of Equipment: UV Transmission Monitor

Model No: TUV

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standard

Place: Fort Myers, Florida USA

Robert J Maley

(Signature)

Robert J. Maley, President
(Full Name)

1.0 IMPORTANT INFORMATION

1.1 HOW TO USE THIS MANUAL

This equipment, while sophisticated, has been designed for simple and easy operation. In keeping with that philosophy, this TUV Analyzer user's manual has been written to simplify all steps in the procedures that follow.

THE MOST IMPORTANT ASPECT OF THIS MANUAL IS THAT YOU, THE USER, READ IT IN ITS ENTIRETY AND REFER TO IT OFTEN.

Figures and drawings have been used throughout the manual to show you how, and text has been used to enhance and clarify what you have been shown.

Again, please read the manual before attempting to install or operate the TUV Analyzer. Pay particular attention to the "Warning" and "Caution" messages throughout. Although the TUV Analyzer is easy to use, all electrical and safety precautions must be followed. "Notes" have also been added to give further clarification or reminders in certain instances.

1.2 SPECIFICATIONS FOR THE TUV ANALYZER

Specification	***TUV ANALYZER***
Response Time:	Reading is updated every 30 seconds
Microprocessor:	68HC11
Keyboard entry Analyzer:	8 membrane function keys
Built-in diagnostics:	Yes
Analog output:	4 - 20 mA and .1, 1 or 10 Vdc
Alarms:	1 system, 2 settable HI, LO or Off with 2.5, 5.0 or 10% settable deadband
Alarm contact rating:	Max. 250 VAC @ 5.0A resistive, isolated, Form C (SPDT)
Operating Temperature:	32° - 122°F (0° - 50°C)
Storage Temperature:	-4° - 140°F (-20° - 60°C)
Sensor/Sampler-Analyzer Separation:	Depending on site conditions, up to 1000 feet (300m)
Sensor/Sampler-Analyzer communication:	RS-485 Serial Port, 9600 Baud, Isolated 1.5kv
Analyzer Case Dimensions:	13" x 11 1/2" x 8" (330 x 290 x 200 mm)
Calibration:	Automatic, with calibration periods user selectable
Pollution Degree:	2
Over voltage category:	II

2.0 INSTALLATION

2.1 PACKING LIST

CONTENTS	QUANTITY
Mounting Bracket - installed	1
RS-485 Interface - installed	1
O & M Manual	1
Power Cord - installed	1

A complete listing of spare parts appears on page 9 of this manual.

2.2 UNPACKING AND INSPECTION

Use extreme care when unpacking your TUV Analyzer and check that all of the contents are included. Check for any damage that may have occurred during shipping. If there is any shipping damage; notify the shipping company immediately and arrange for a prompt inspec tion. If there are any omissions, report this immediately to the Service Dept. at HF scientific, inc. for assistance.

2.3 MOUNTING

NOTE: Be careful during installation not to violate the integrity of the Analyzer enclosure. The system requires approximately one hour to reach its final operating temperature. Further adjustment of the Analyzer's LCD brightness may be required after this period (see Utility Menu, Screen Brightness/History).

If it is possible, avoid mounting the Analyzer where it will be difficult to read the LCD screen because of direct sunlight. After mounting, the angle of the Analyzer may be adjusted for best visibility.

2.4 ANALYZER CONNECTIONS

All connections are reached by removing the access cover. Obey the following warnings and precautions prior to removal.

WARNING: Before removing access cover disconnect all power to the TUV Analyzer.

Step 1) Unplug the instrument or turn off the power at the circuit breaker.
Step 2) Remove power to alarm contacts if greater than 30 VAC is connected for external operations.

To remove the access cover:

Step 1) Loosen the two Analyzer clamping knobs.
Step 2) Swivel the Analyzer top forward, such that the back is now facing you.
Step 3) Retighten the two Analyzer clamping knobs.
Step 4) Remove the 6 screws that retain the black access cover.
Step 5) Remove access cover.

WARNING: Do not restore power until the access cover has been replaced and secured. When routing the cabling for the following sections, allow enough excess cable length to swivel the Analyzer upside down. Refer to figure 1 for suggested cable routing. Do not over tighten the six screws when replacing cover.

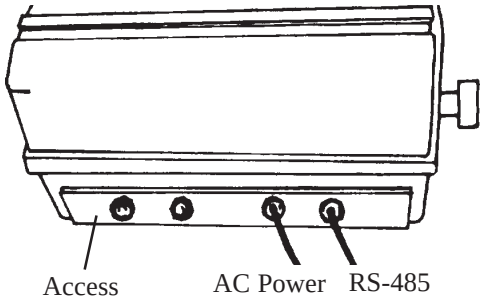

Figure 1
Analyzer Cable Routing

2.4.1 RS-485 Interconnecting Cable

The recommended interconnecting cable between the Analyzer and the Sensor/Sampler is 2 conductor, shielded Belden M8451. (Not included.) Refer to figure 4 for connection information.

Note: It is very important that a shielded cable is used.

2.4.2 Analyzer Power

The Analyzer power requirement is 40 VA at either 120 VAC or 240 VAC. The voltage setting of the Analyzer can be determined by removing the access cover and looking at the fuse cartridge just to the left of the power cord receptacle. The voltage printed next to the two triangles that point toward each other indicates the selected voltage. To change the input voltage, first remove the power cord. The fuse cartridge can be removed by prying up with a flat blade screwdriver in the slot provided. Pull the cartridge out, invert and then reinsert it. Refer to figure 2. To replace a blown fuse, remove the fuse cartridge as shown in figure 2. Replace only the fuse for your selected voltage. The triangle on the fuse cartridge points to the fuse for the voltage selected. The correct fuse ratings are 5 x 20 mm 1A fast acting for 120 VAC and 5 x 20 mm 1/2A fast acting for 240 VAC. Refer to spare parts list, Section 6.4.

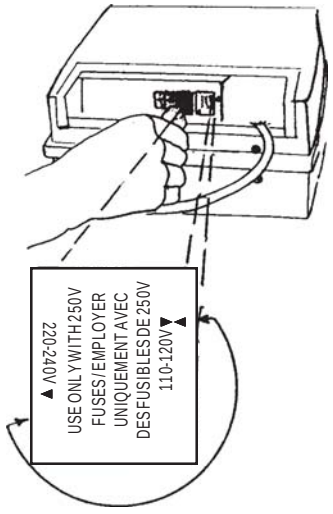

Figure 2
Changing Analyzer Voltage/Fuse

The power switch is located to the right of the power cord connection.

2.4.3 Analyzer D/A Outputs - Voltage & Current

The full-scale range of recorder outputs, both voltage and 4 - 20 mA are determined by the upper and lower limits selected by the user. Please note that either 4 - 20 mA OR voltage output may be selected in the DISPLAY PARAMETERS menu, but not both. Suggested scaling 0-100% T.

Twisted pair shielded cable, 22 AWG - 14 AWG is recommended. Tie the shield to the ground terminal at the recorder end (**Do not connect shield to TUV Analyzer**).

2.4.4 Analyzer Recorder - Voltage

Recorder output voltage is selected at the terminal block labeled ANALOG VOLTAGE (J6). Only one of these voltages is to be selected at any time.
The recorder load for each voltage is:

Terminal 1	0 - 10V	50000 ohms or greater
Terminal 2	0 - 1V	5000 ohms or greater
Terminal 3	0 - 100mV	500ohms or greater
Terminal 4	Common	

2.4.5 Analyzer Recorder - Current

A 4 - 20 mA current output is available. The connections are made at the terminal block labeled Analog 4 - 20 mA (J5). The recorder load may be rated from 0-1000 ohms maximum. Terminal #1 is positive; terminal #2 is negative.

2.4.6 Analyzer Alarm Contacts

Connections are provided to the alarm relay contacts on the terminal block labeled ALARMS.

NOTE: These are "fail safe" and will revert to an "alarm" condition should the power be disconnected, for any reason.

Refer to the Specifications to ensure that alarm contact ratings are not exceeded.

NOTE:

ALARM 1:	**Terminal Block J1**
ALARM 2:	**Terminal Block J2**
SENSOR ALARM:	**Terminal Block J3**

The following are the connections for each of the relay contacts: (Refer to Figure 4)

Terminal 1: Normally Closed (N.C.) (Open on Alarm)
Terminal 2: Normally Open (N.O.) (Closed on Alarm)
Terminal 3: Common (C)

WARNING: Ensure that all external voltages in excess of 30 volts are disconnected before attempting to make connections or disconnections from alarm terminal blocks.

NOTE:For external Analyzer connection, other than power, #14 AWG is the largest wire the connecting terminals will accept.

3.0 OPERATION THEORY

The TUV Analyzer is specifically designed to operate with the TUV Sensor/Sampler to comprise a complete "system". The TUV Analyzer performs all of the automated control functions. The Sensor/ Sampler communicates with the Analyzer through an RS 485 data port.

Once every 30 seconds, the Analyzer will ask the Sensor/Sampler for the latest reading. This reading will be processed. The processed value will be posted to the graph, to the readout display and to the 4-20mA or 0-10 V output. If the reading exceeds an alarm point, an alarm will be triggered.

Menu's are provided for the user to customize setups such as the alarm set points and time between calibrations. These menus are quite self-explanatory. To exit out of any menu press the menu button. Refer to figure 5.

3.1 START UP

NOTE: It will be necessary to verify each of the user settings, in the Analyzer, and/or change some, when starting the unit for the first time.

The Analyzer screen should respond per the Menu Guide. Refer to Figure 5. While the screen of the Analyzer will start to indicate the % Transmission until the system is calibrated, the reading may not be accurate. After at least one hour warm-up (with the Sensor/Sampler enclosure closed) go to **Main Menu**, and from there to **Utility (F3)**, and from there to **Calibrate (F3)**, and finally, **Do Both (F4)**. At this time the Analyzer will cause the sensor to calibrate by checking the 100%T adjustment and dark setting of the Sensor module. This process will take a few minutes to complete. Press **MENU** to go to **Utility** Menu. Press **Timed Cal (F4)** to observe that 000 hours **Since Last Cal**. has been posted properly. Set the calibration period XXX **Hours Between Cal**. to the desired period. From now on the **Hours Since Last Cal**. will ascend until it reaches the value of **Hours Between Cal**., at which time the Analyzer will automatically initiate a "Do Both" calibration and reset the **Hours Since Last Cal.** to zero. Obviously, the longer the interval between calibrations, the longer the 100%T solution will last.

When the 100%T solution has been exhausted, depending on the user selected setting, one of two things will happen. See section 4.2 Calibration Alarms.

Press **MENU** and the screen will return to the **Utility Menu**. At this time you may want to Set Time (F2) or adjust the **Screen Brightness** (F1). When you are satisfied with all settings, press the menu button and the **Main Menu** will be displayed. Press %T (F4), and the system will go into the on-line measurement mode.

4.0 CALIBRATION

The Sensor/Sampler requires calibrations occasionally to adjust for debris buildup on the cuvette. Calibrations are initiated by periods set in the Analyzer, usually every 24-48 hours. A calibration consists of a dark reading and a 100%T reading. Dark readings set the low end of the readable scale and 100%T calibrations set the upper end.

4.1 100%T CALIBRATION

This calibration can be performed automatically, or manually. Both operations are initiated at the analyzer.

During a 100%T calibration the solenoid/valve will switch the source of fluid supply from the effluent sample, to the 100%T water. It will pump this water for a predetermined time and then shut the pump down. During this shutdown period the Sensor/Sampler's CPU will perform several calibrations and will adjust its gain to the amount of signal available dependant on the condition of the optical path (debris or contaminant on the cuvette walls). The solenoid/valve will then return to providing the sample to the pump intake and the pump will restart. At this time the Sensor/Sampler is returned to normal on-line operation.

4.2 CALIBRATION ALARMS

The operator may select how the analyzer will respond to running out of 100% T water during a calibration. In **The Pump/Alarm Control Menu** select either:

4.2 CALIBRATION ALARMS Cont'd

A: The Analyzer will go to an alarm menu and indicate “100% T water out”, shut the Sensor/Sampler pump off and the 4-20 mA will "hold" the last valid reading.

Or

B: The Analyzer and Sensor/Sampler will continue to operate and ignore the attempted calibration. The Analyzer will show a banner displaying the problem and the time and date of the problem. Please note that while in the Graphic screen, the word MEMORY will be displayed, flashing beside the % T reading. This indicates that the displayed %T reading is from memory and is not a current measured value.

In any alarm condition the sensor alarm (SALM) will close. Press the ALARM key to cancel the alarm, and reset the analyzer.

4.2.1 100% T Water Out

If this failure occurs simply replace or refill the 100% T container at the Sensor/Sampler and perform a manual calibration. Be certain to return the Analyzer to the graphic screen (press %T from main menu) after the calibration is complete.

4.2.2 Not 100 Counts

There are instances where a calibration will fail due to fouled optics or a stuck solenoid/valve. Either of the previous conditions could cause the 100%T reading minus the Dark Setting reading to be less than 100 counts. This will not be acceptable to the analyzer and will cause an alarm.

An alarm in this instance will cause the sensor alarm (SALM) contacts to close and will display the following message: "THERE ARE NOT 100 UNITS BETWEEN THE DARK READING AND THE 100% T. READING". The 4-20 mA output will show the last valid reading until the analyzer is reset. After correcting the problem, the analyzer should be reset by pressing the alarm button. Recalibrate as described below.

The most common cause of this failure is fouling of the cuvette in the Sensor/Sampler. Refer to section 6.2. The other possibility is that the solenoid/valve is frozen and is not switching to allow 100% T solution to be pumped when calibrating.

To alleviate the problem, clean the cuvette, and perform a manual calibration. Observe the level of the fluid in the 100%T bottle to ensure that the 100%T fluid is being pumped. If the level of the 100%T fluid does not move, the solenoid/valve is probably frozen and should be replaced. After calibration, be certain to return the Analyzer to the Graphic screen.

4.3 MEMORIZED READINGS

The Analyzer stores a new “memorized” reading every 30 minutes on the hour and half hour according to it’s own internal real time clock. In case of a failure that causes an error screen to appear, the memorized reading is sent to the 4-20 mA output. Memorized readings are displayed and used after a calibration for two minutes to allow for the 100%T fluid in the sample cuvette to be replaced with a representative effluent sample. Memorized readings are displayed on the screen with the flashing word "MEMORY" after the reading.

5.0 FLOW SENSOR

The Sensor/Sampler has a flow sensor that will detect a flow failure, turn off the pump and indicate a flow failure to the analyzer. The flow switch is ignored after the CPU is reset for the first few minutes of operation to allow the system to prime with sample fluid. The flow switch is also ignored after a calibration for two minutes. The flow switch should trip after ten seconds of no flow and is indicated by the FLOW LED illuminated in the CPU Module of the Sensor/Sampler.

6.0 TROUBLESHOOTING

6.1 GENERAL NOTES

Service and Technical Support are available from HF scientific, inc. 3170 Metro Parkway, Fort Myers, Florida 33916-7597, Phone (239) 337-2116, Fax (239) 332-7643.

6.2 TROUBLESHOOTING GUIDE

The following table will supply fundamental troubleshooting information. The guide assumes that the controls and functions of the instrument are used correctly. The intention of the guide is to eliminate common faults, not to troubleshoot down to component level.

Analyzer:

SYMPTOM	SOLUTION
Display not lit	1. Make sure that the unit is plugged in and turned on. Make certain that your power source is providing the correct voltage. 2. Shut off power for about five seconds and then turn it back on. This will initiate a power-on reset. 3. Check Analyzer fuse. Refer to Section 2.5.2 for correct use size and instructions for changing. 4. If none of the above steps correct the problem, contact HF scientific, inc.'s service dept. for additional support.
Cannot Leave Menu	Invalid parameters may have been inadvertently set. Examples of this are an incorrect time or date or the lower limit set higher than the upper limit. Check the screen and change any invalid numbers.

6.3 ANALYZER ERROR CODES

The following are the error codes that may be indicated on the analyzer. The Analyzer switching to the Error Code page and placing an X beside the fault will indicate the particular problem. During this time the analyzer is not taking readings although the Sensor/Sampler may be operating properly. After correcting a fault, press the “alarm” key on the analyzer to restart the system. The system will ignore faults for the first 2- 5 minutes in order to allow the system to regain proper operation. Listed below are the error codes, a brief description of the faults and the action required in the order of most probability.

Error Code	Description of Fault/Steps to correct Problem
COMM ERROR	An error has occurred in the RS-485 serial communication between the Sensor/Sampler and the Analyzer. 1. Reset system by pressing “alarm” on analyzer. 2. Check connections and continuity of serial interconnection cable. 3. Replace RS485 port in Analyzer. 4. Replace CPU module in Sensor/Sampler. 5. Replace Analyzer. 6. Check sensor power switch.
NO FLOW	The Sensor/Sampler has detected a lack of flow of sample effluent. 1. Check that Pump Switch is ON. 2. Check T-strainer and source line strainer for blockage. 3. Check Flow Switch for blockage. 4. Check if air is present in tubing. Reset power at power supply module.
WARM-UP TIME OUT	The Sensor Module failed to warm-up. 1. If ambient temperature is cold and Sensor/Sampler was just powered up, allow 20 minutes with Sensor/Sampler enclosure closed. Press “alarm” on analyzer to restart system. 2. Check cabinet heater for proper setting (50°F) and operation. Replace if defective. 3. If CPU module indicates that heater is on continuously, replace Sensor Module.
100% WATER OUT	The Sensor/Sampler has detected a lack of flow during the last 100% T calibration. 1. Check 100%T solution. Replace if required. 2. Check that Pump Switch is ON. 3. Check for proper operation of pump. 4. Check for proper operation of valve. 5. Check that flow sensor is operating correctly by pulling it out and tipping it upside-down while observing the FLOW LED in the CPU module. It should go off when upside-down.
LAMP TEMPERATURE LOW	The Sensor Module failed to maintain adequate temperature. 1. If Sensor/Sampler was subjected to extreme cold temperatures, below -60°C, this problem may occur. Wait until temperature is above -50°C and then restart system. 2. Refer to the suggestions above under “WARM-UP TIME OUT”.
4-20mA LINE IS DEFECTIVE	The 4-20mA line is not complete. 1. Check connections at both ends of 4-20mA line. 2. Check for a break in 4-20mA line.

6.4 REPLACEMENT PARTS

Catalog No.	Description
20955	Fuse, 1/2 amp Fast Acting 5 x 20 mm (240V)
20815	Wire Shielded RS-485 (per foot)
20956	Fuse, 1amp Fast Acting 5 x 20 mm (120V)

NOTE: For any other parts not shown here, please contact HF scientific Service Department.

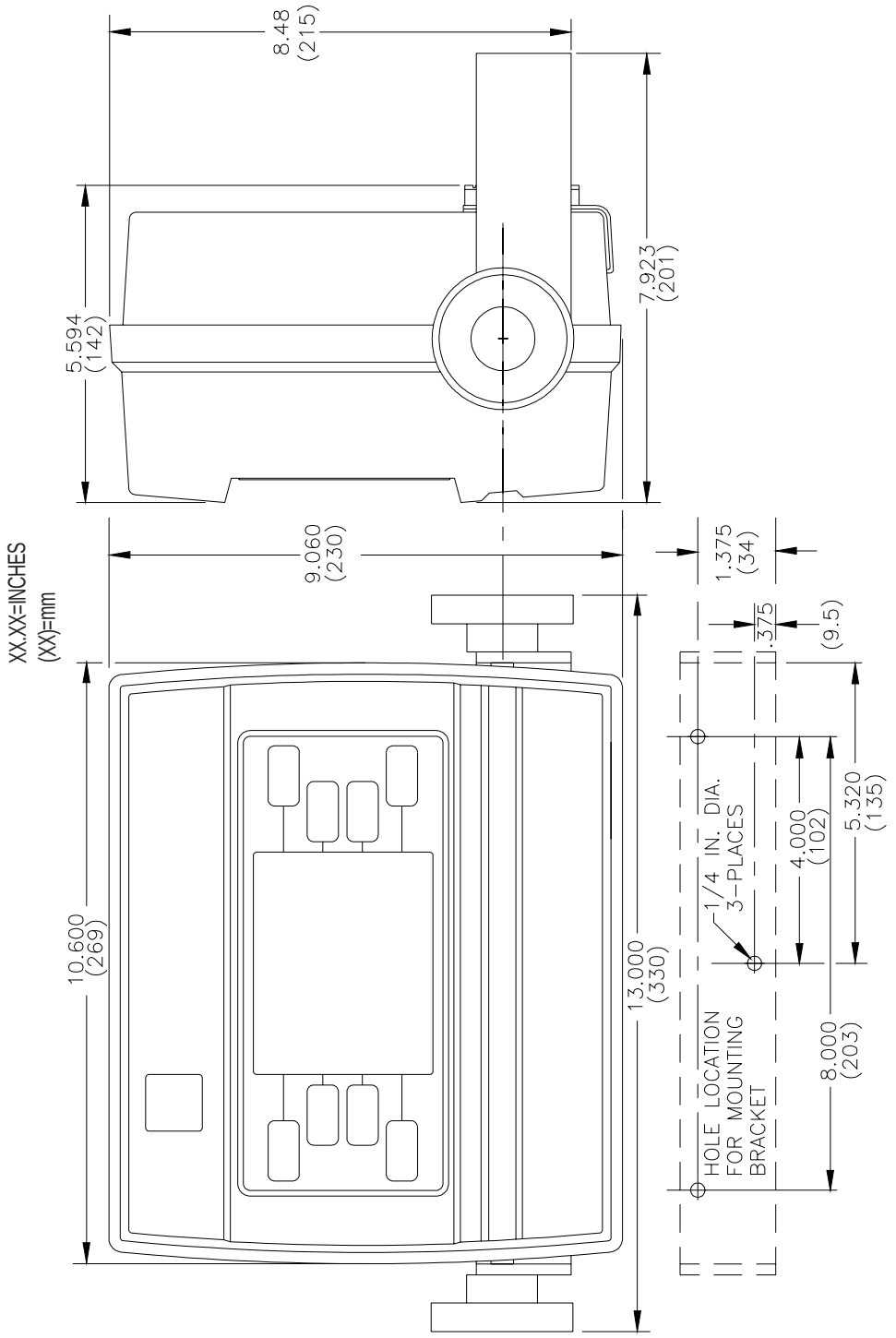

Figure 3
Analyzer Outline Dimensions

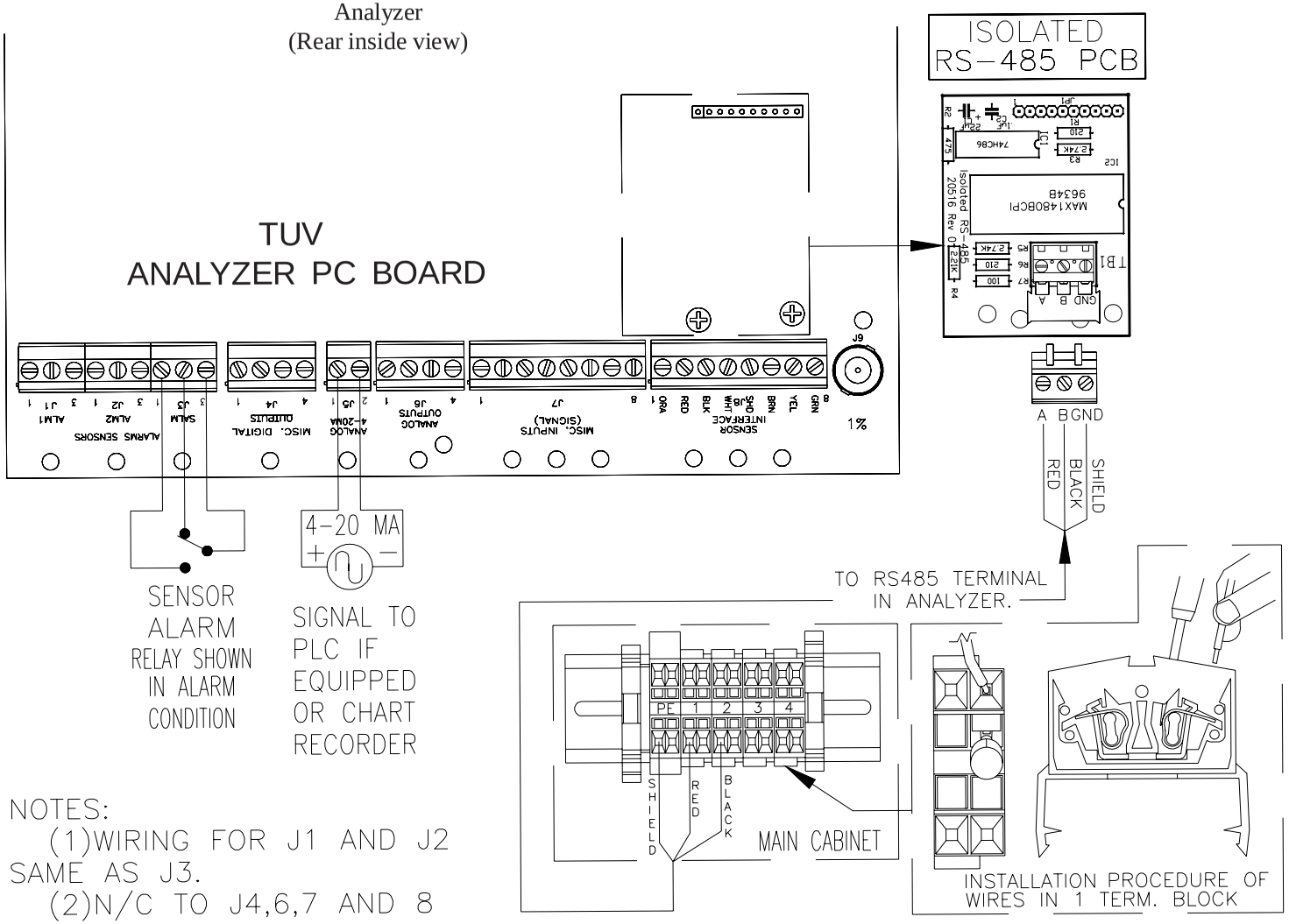

Figure 4
Alarm and Interconnect Cable Connections

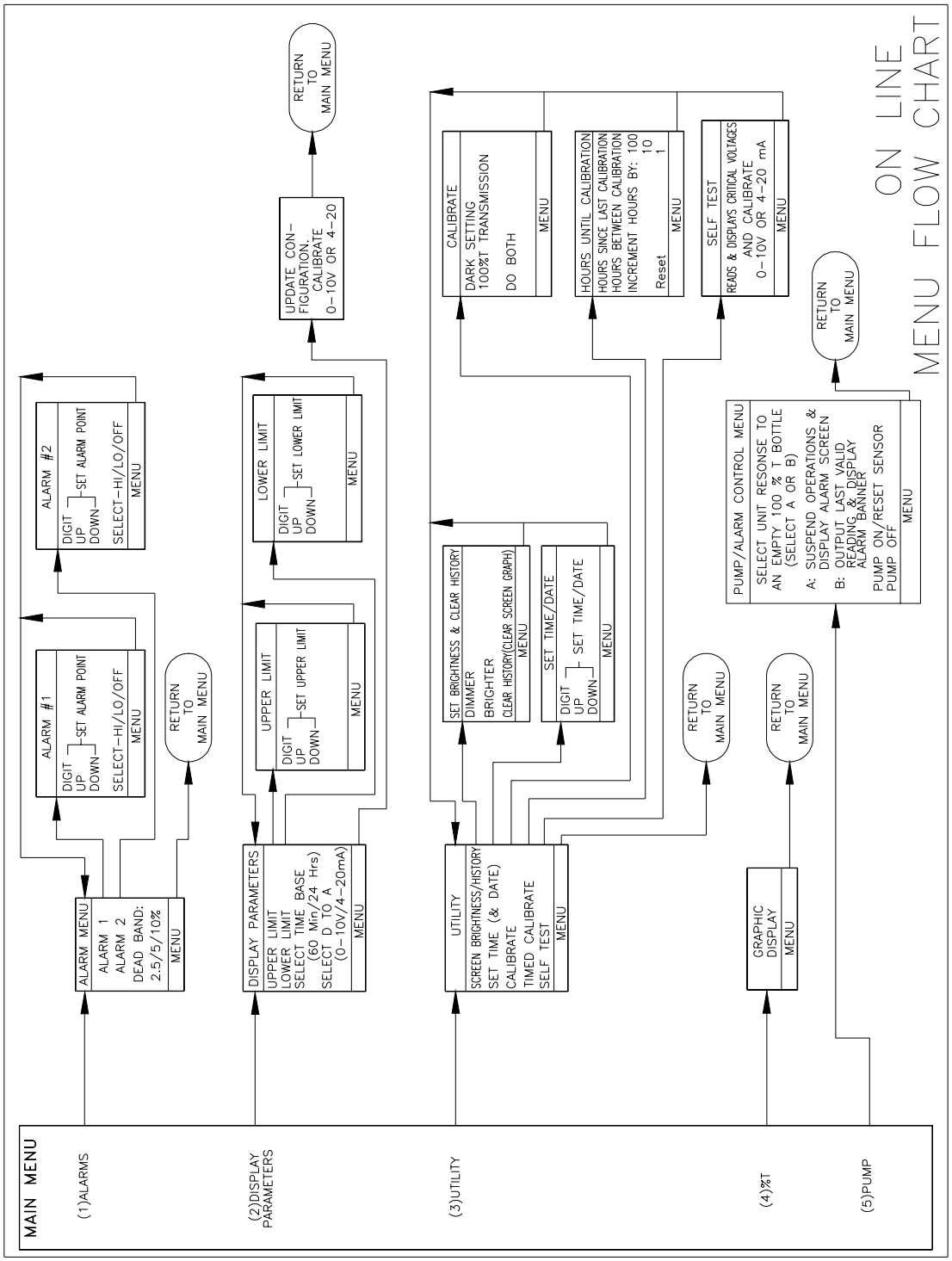

Figure 5
Analyzer Menu Flow Chart

WARRANTY

HF scientific, inc., as manufacturer, warrants to the original purchaser of the instruments to be free of defects in material and workmanship, in normal use and service, for a period of one year from date of delivery to the original purchaser. HF scientific, inc.'s, obligation under this warranty is limited to replacing, at its factory, the instrument or any part thereof. Parts which by their nature are normally required to be replaced periodically, consistent with normal maintenance, specifically lamps, reagent, desiccant, sensors, electrodes and fuses are excluded. Also excluded are accessories and supply type items.

Original purchaser is responsible for return of the instruments, or parts thereof, to HF scientific, inc.'s factory. This includes all freight charges incurred in shipping to and from HF scientific, inc.'s factory.

HF scientific, inc. is not responsible for damage to the instrument, or parts thereof, resulting from misuse, negligence or accident, or defects resulting from repairs, alterations or installation made by any person or company not authorized by HF scientific, inc..

HF scientific, inc. assumes no liability for consequential damage of any kind, and the original purchaser, by placement of any order for the instrument, or parts thereof, shall be deemed liable for any and all damages incurred by the use or misuse of the instruments, or parts thereof, by the purchaser, its employees, or others, following receipt thereof.

This warranty is given expressly and in lieu of all other warranties, expressed or implied. Purchaser agrees that there is no warranty on merchantability and that there are no other warranties, expressed or implied. No agent is authorized to assume for HF scientific, inc. any liability except as above set forth.

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