Mercury

Method 30B

APEX INSTRUMENTS, INC.

Method 30B Automated Mercury Source Sampler – Model XC-30B

Operator's Manual

AUTOMATED MERCURY SOURCE SAMPLER –MODEL XC-30B

Operator's Manual

Apex Instruments, Inc.
204 Technology Park Lane
Fuquay-Varina, NC 27526
Phone 919-557-7300 • Fax 919-557-7110
Web: www.apexinst.com
E-mail: info@apexinst.com

Published 05/28/2010

Introduction

The purpose of this manual is to provide a basic understanding of the Apex Instruments automated sampling console available for EPA Method 30B Mercury Sampling. The MercSampler Model XC-30B console is applicable for Mercury Emissions Sampling Using Iodinated Charcoal Traps. For additional information on the applicable Appendix K and Method 30B, please visit http://www.epa.gov/air/mercuryrule/. Individual states may have additional requirements for Mercury emissions monitoring and reporting, please contact your state government for further information.

MercSampler Console Description

The MercSampler Console is the operator's control station that controls and captures data necessary for paired sorbent tube sampling according to EPA Method 30B. The basic principle of the console is to sample stack gas flow at a constant rate and determine the standardized volume extracted through each sorbent trap. To capture the samples, a pair of diaphragm vacuum pumps works in concert with proportional valves and mass flow sensors. Optical encoders are mounted inside the gas meters to provide digital feedback for the volume sampled. From additional temperature and pressure measurements the sample volume at standard conditions (USEPA 20°C and 760mmHg) is calculated. Figure 1-1 illustrates the Apex Instruments Model XC-30B.

Figure 1-1. Model XC-30B MercSampler Console

Shown with SC-30B sample conditioner, Heated Sample Return Line and Probe.

Table 1-2. Features and Specifications of Apex Instruments Model XC-30B MercSampler Console

Features	**XC-30BEPC MercSampler Console**
Gas Meter	Positive displacement diaphragm meter, 45 Lpm maximum and 0.17 Lpm starting flow rate, 0.7L/revolution
Sample Pump	Internal Hargraves miniature diaphragm pump. Brushless DC (BLDC) Motor rated at 12VDC. >20inHg Maximum Vacuum. ~4Lpm maximum unrestricted flow.
Proportional Valve	Pneutronics Voltage Sensitive Orifice (VSO) Series. 47ohm, 12VDC
Mass Flow Sensor	Honeywell AWM Series. 100-4000ccm.
Barometric Sensor	AllSensors 600-1000mBar, 5VDC Supply
Vacuum Sensor	SMC 0-30”Hg
Umbilical Connections	Electrical: 4-pin locking Amphenol connectors Sample Line: ¼” Stainless Steel Quick-Connect or Swagelok fittings
Dimensions	23 in x 21 in x 12 in (W x H x D)
Power Requirements	120VAC/60Hz standard 2 or more 15A circuits depending upon configuration (230VAC/50Hz optional)
Weight	35 lbs (16 kg)

The MercSampler Console is comprised of plumbing and electrical (including thermocouple and electronic circuits) subsystems that work together to give appropriate control and feedback.

Plumbing Subsystem

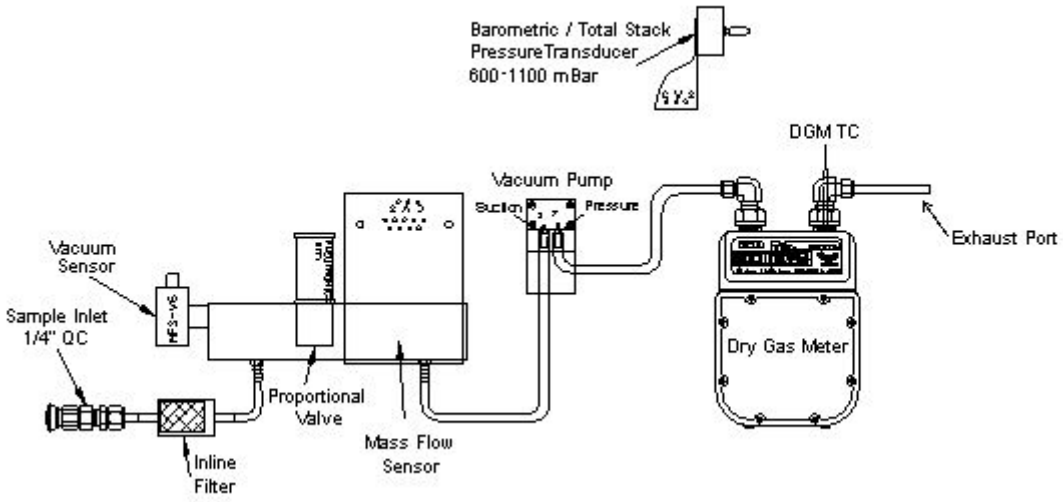


Figure 1-4. Plumbing Flow Diagram of XC-30B MercSampler Console.

Electrical Subsystem

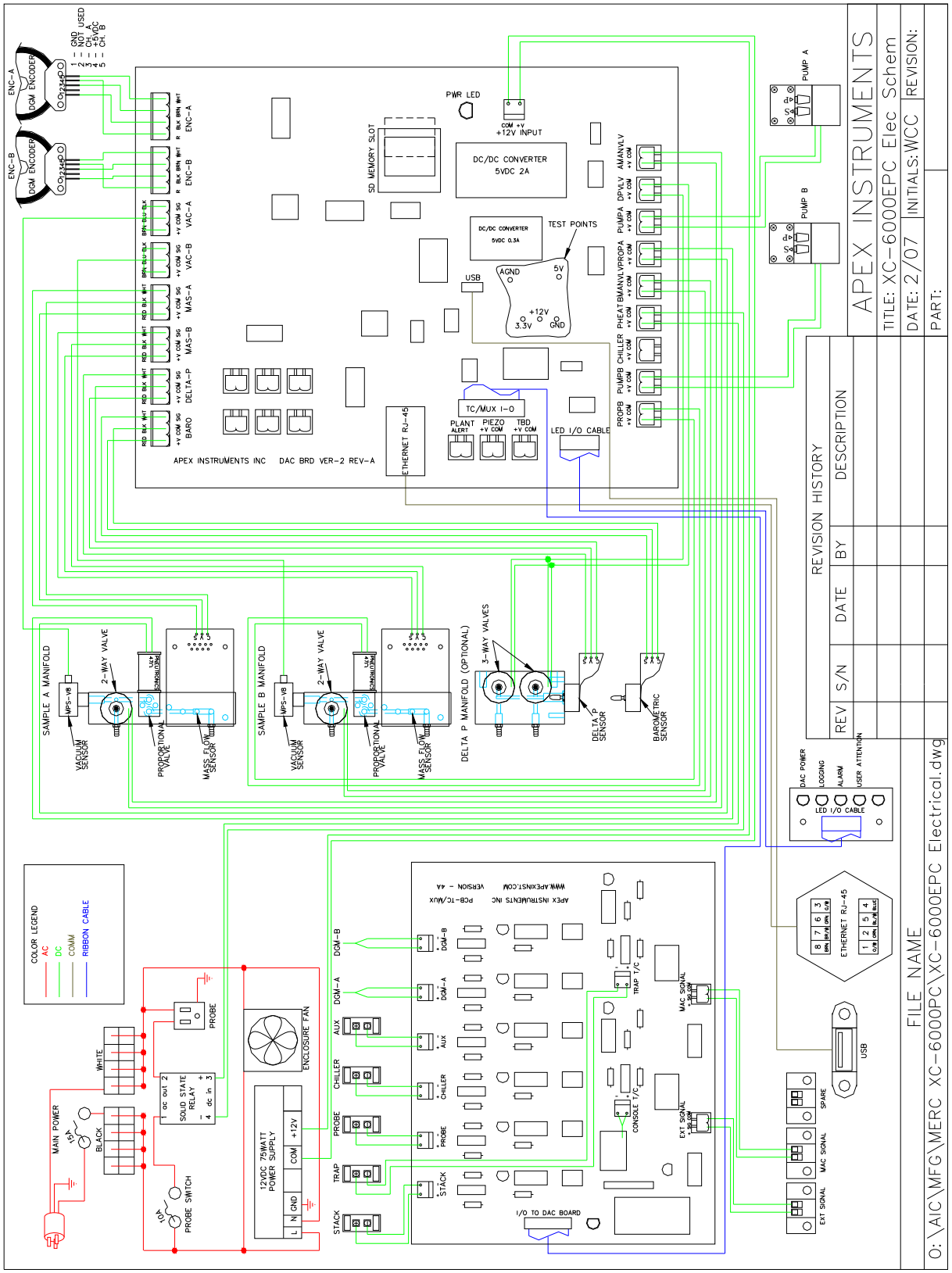


Figure 1-5. Electrical Diagram of XC-30BC MercSampler Console.

Console Connection Diagrams

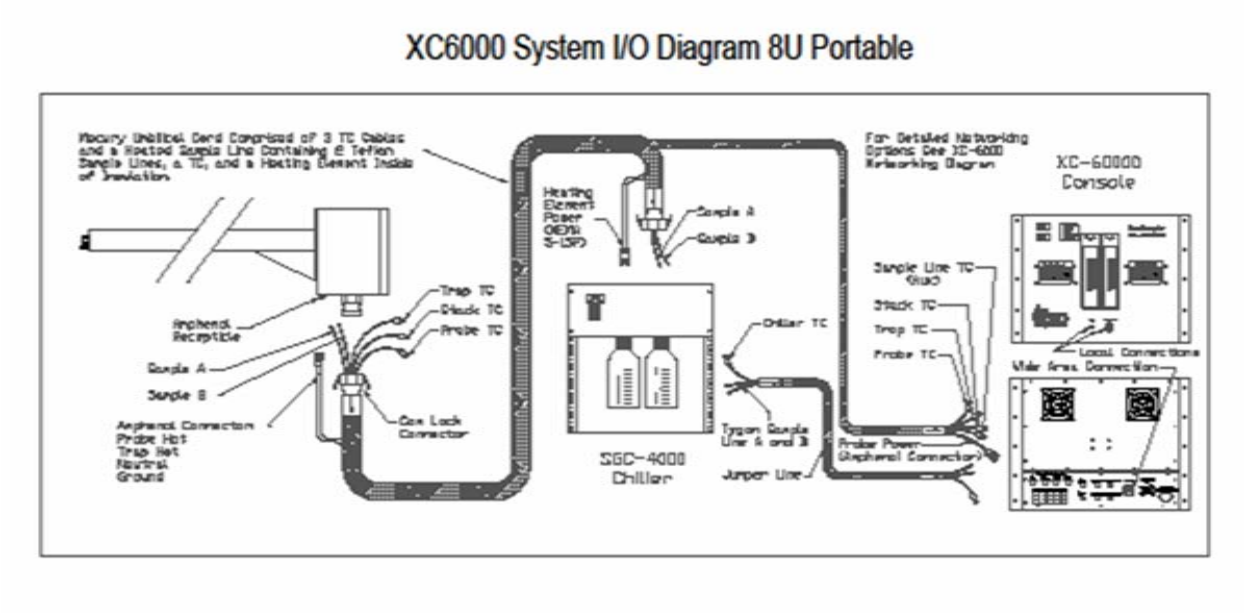


Figure 1-5a. Connection Diagram for XC-30B in Portable Enclosure

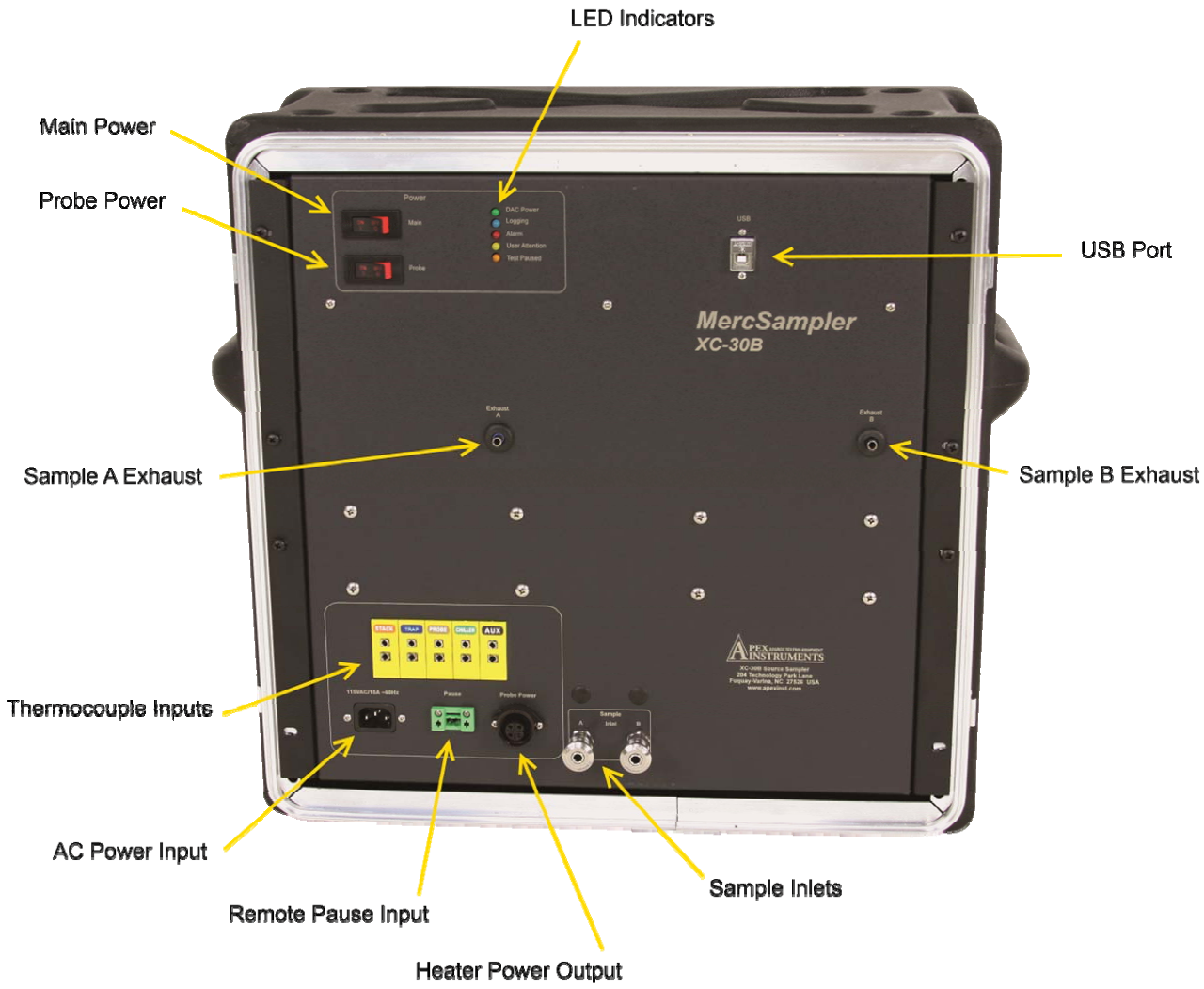
- The Source Sampler Console is factory-configured for 115 VAC / 60 Hz electrical power. Configuration for 220 VAC / 50 Hz operation is an available option.

- The AC electrical subsystem provides switch power to each circuit, controlled by two switches: MAIN and PROBE.

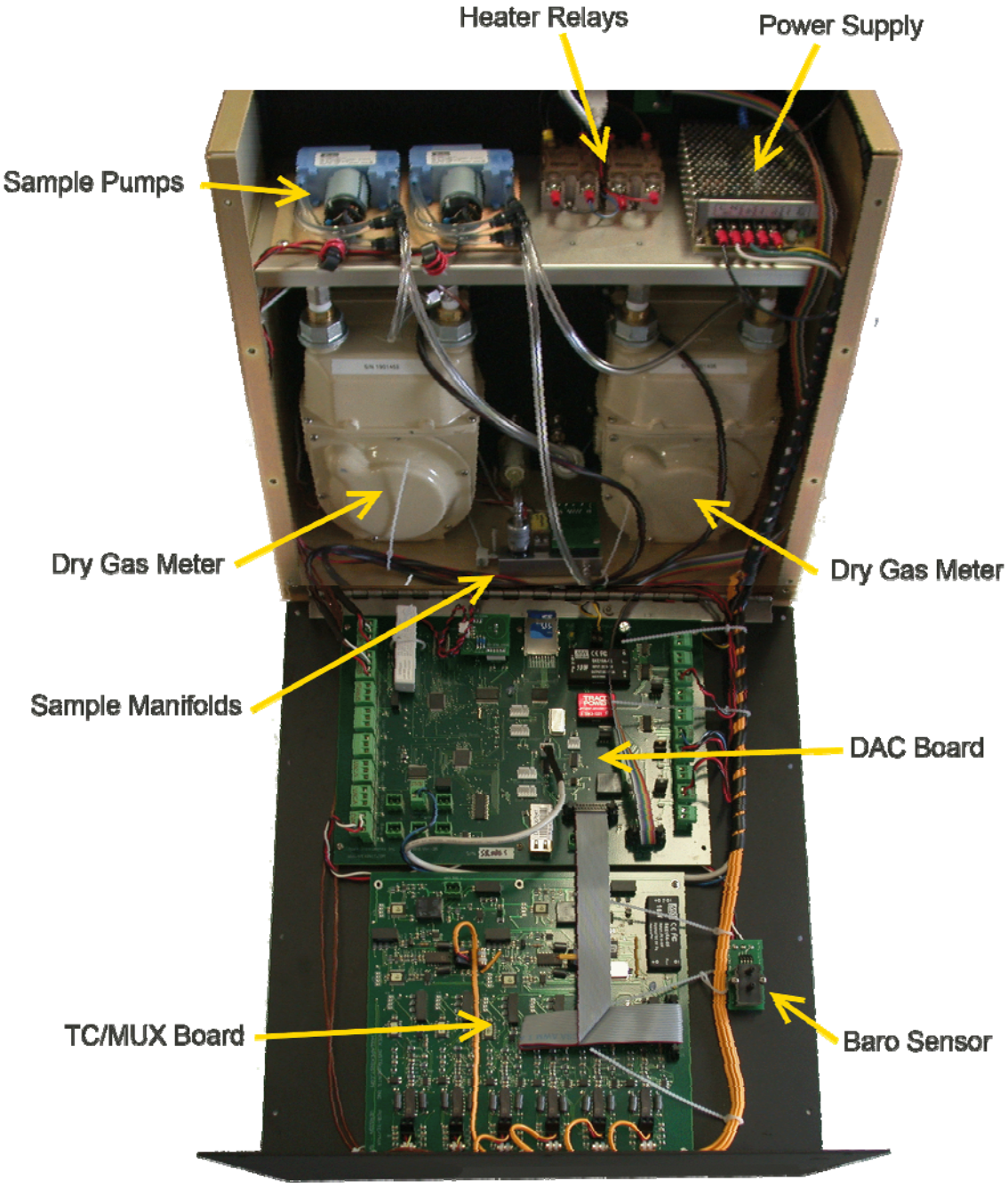
- All circuits are protected by a MAIN 15 Amp (10 Amp 220V) circuit breaker. Additionally, the probe is protected by a 10 Amp breaker. These circuit breakers detect and interrupt overload and short circuit conditions, providing an important safety factor. If the circuit breaker opens, or "trips," indicating interruption of the circuit, investigate and repair the electrical fault, and then reset the breaker by pressing the circuit breaker switch. The Electrical Schematic for the Source Sampler Console is presented in Figure 1-3.

- Two custom-designed and manufactured circuit boards, a Data Acquisition and Control (DAC) board and Thermocouple (TC-MUX) board, are utilized.

XC-30B Front Panel Connections



XC-30B Internal Components



MercSampler Software

The MercSampler includes firmware preloaded on its DAC and TC/MUX boards. Also included is Windows-based interface software. Apex Instruments recommends the purchase of a laptop or desktop computer directly through Apex to ensure computer compatibility and proper loading of software. However, if you prefer to use or purchase your own computer please ensure your computer has, as a minimum, the following specifications.

Item	**Description**	**Capacity**
CPU	Processor Speed	1GHz+
RAM	Random Access Memory	>512MB
HDD	Hard Drive Capacity	~12MB for Software. Data file storage varies.
O/S	Operating System	Windows XP SP2 or Vista

Loading Software

To load MercSampler software on your laptop or desktop computer, follow these steps:

Insert the Apex XC-30B MercSampler CD-ROM into your computer CD-ROM drive. Open the drive letter of the CD-ROM drive (sometimes D:\ or E:\) and copy the "Apex" folder to the root directory of your system drive (C:\.)

The software must be installed in the C:\Apex directory on your computer. Please delete any files currently in the C:\Apex directory, and then copy the files from the CD-ROM or .zip file to the C:\ drive.

The software is now installed correctly.

To simplify running the XC-30B application, create a shortcut on your desktop buy opening the C:\Apex\A_XC6000\bin\. Locate the file "XC-6000.exe". Right click on the file and select "Send To" then Desktop. *This will create the shortcut on the desktop named Shortcut to XC-6000.exe. Double click the shortcut to start the application.*

The same software application is used for both the XC-6000 and the XC-30B. When the application is first launched it may display XC-6000 until the first time the console is connected.

Driver Installation

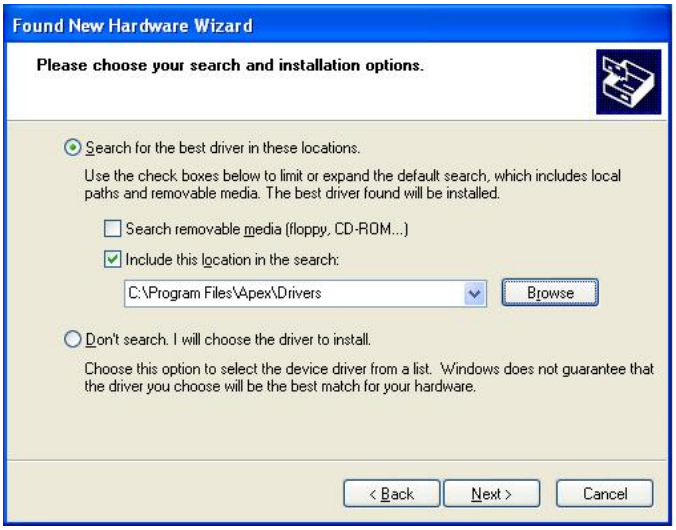
The Apex XC-30B includes a USB connection functionality, which is implemented using a virtual serial port on the connected PC. To install drivers for this serial port, please perform the following steps:

Power down the XC-30B MercSampler if it is not already powered off by switching the main Power switch to the "off" position.

Connect the XC-30B to the PC using the included USB cable.

Windows will discover the XC-30B. The Windows "Found New Hardware Wizard" will appear onscreen.

Please select "Install from a list or specific location (Advanced.)

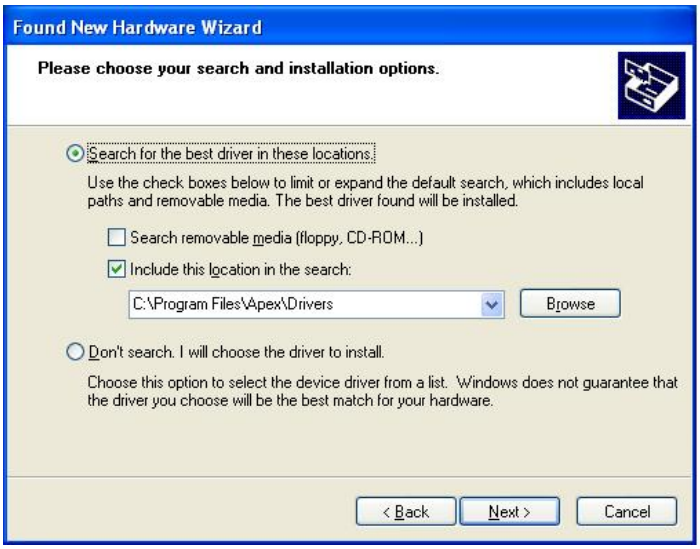


Use the "Browse" button to find the folder where the XC-30B application is installed (usually C:\ Apex) and then navigate to the "FT232_UART_Driver" subfolder. (C:\ Apex\FT232_UART_Driver) lick "Next."

The drivers for the serial converter (UART) will be installed. Press "Finish."

Windows will then discover the virtual serial port. The installation for the serial port drivers is the same as for the serial converter. The "Found New Hardware Wizard" will start:

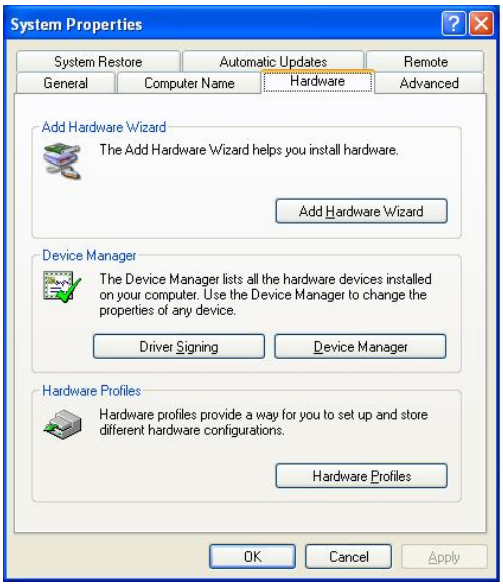
Select "Install from a list or specific location (Advanced,)" and press "Next."



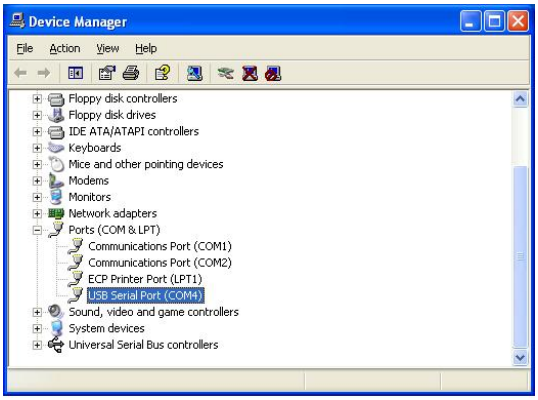
Select the driver location (same as for the serial converter installed previously) and press "Next."

The wizard will complete. Press “Finish.”

Open the System Properties control panel (either open Control Panel > System or right click on My Computer and select “Properties.”



Click the “Hardware” tab, and then click “Device Manager.”



When the Device Manager opens, open up the “Ports (COM & LPT)” item and make sure that a “USB Serial Port” is installed. Please make a note of the COM number (in this case, it is COM4, but your installation may vary.)

Driver installation should only need to be performed once the first time the PC is connected to the XC-30B

Software Operation

To start the MercSampler software on your laptop or desktop computer follow these steps: Double click the "XC-6000" icon on your desktop. The following screen should appear. Please take a moment to note the version number of the software, which is printed on-screen in the center-right of the menu, near the top of the smokestack.

Figure 1-6. Initial Main Screen

If you have already setup the communication method single click the "Connect" button and skip the following section and go to the Test Profile section, otherwise follow the instructions that follow to setup the communication between the console and the computer.

Software Communication

The MercSampler software communicates via USB. To connect single click the "Config/Utilities" button.
The following screen should appear. The application will scan for the XC-30B and list the com port it is attached to.

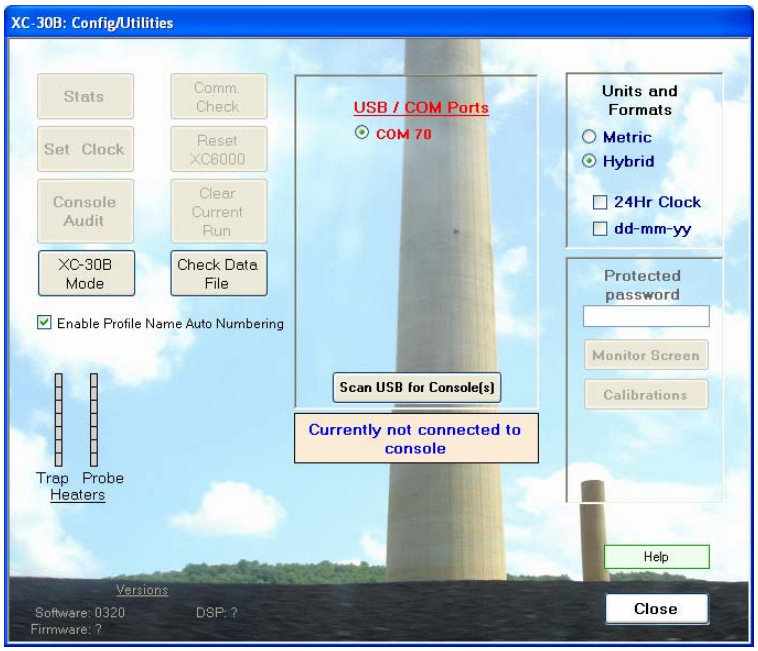


Figure 1-7. Config & Utilities Screen

To connect via USB follow these steps:

1. Single click the "Scan USB for console(s)".
2. The application should automatically fond and select the correct COM port. If multiple COM ports are located select an available COM Port – make sure that this COM number is the same as the COM number for the USB Serial Port installed previously.
3. Single Click "Return" and the Main Screen will appear.
4. Single click the "Connect" button. The screen should indicate the console ID, communication method and console date/time.

When connected the main screen identifies the console and the communication method as shown below:

Figure 1-8. Main Screen Communication Connected

The following summarizes the steps involved in configuring and running a complete test with the MercSampler console.

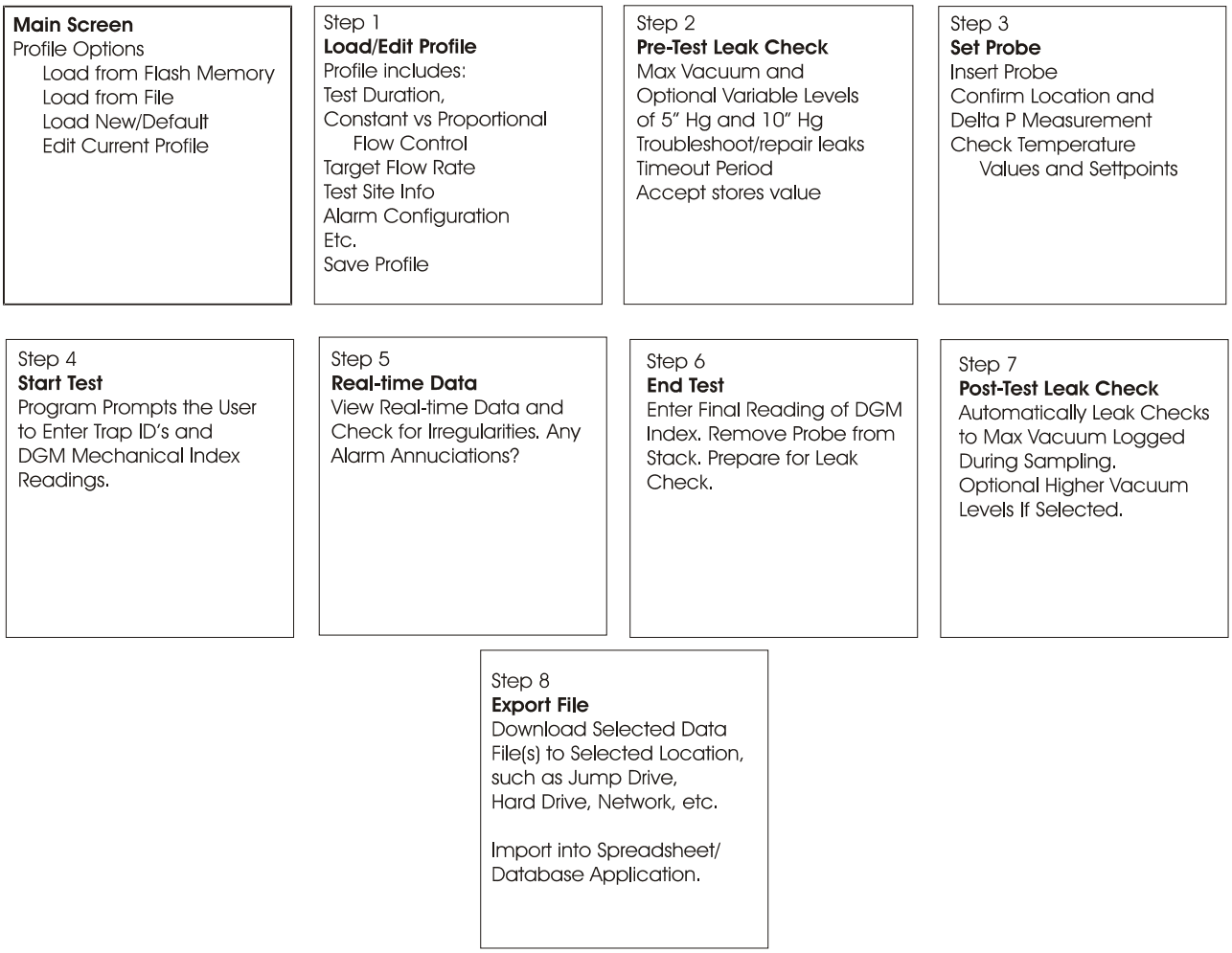


Figure 1-9. Software Flow Summary

Test Profile

The Test Profile is how we configure the console for running a test. The profile contains all information about the specific job or test being performed, including sample location, job name, flow rate, and test duration. Once a profile has been created, it is stored in the XC-30B internal memory and may be retrieved for later use. Click the "From Memory" button on the Main screen to load a previously used profile from the console memory. In most cases, a new profile should be created for each sampling location or job. This helps to prevent confusion or errors in configuration when using the same console to sample from different sites.

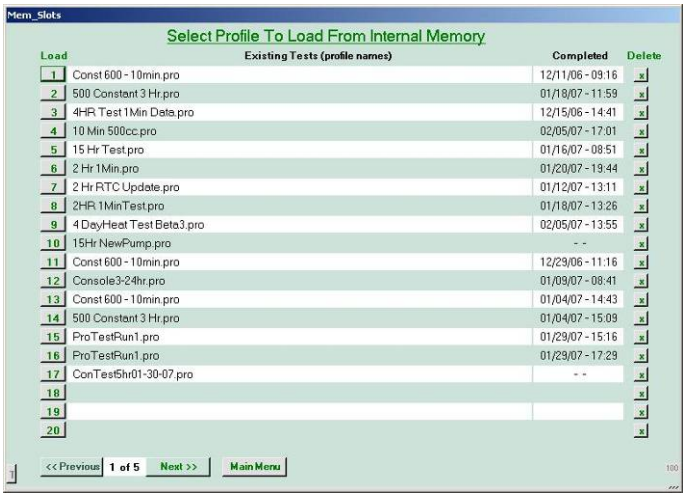


Figure 1-10. Load Profile from Internal Memory Screen

To create a new profile, click the "New Profile" button on the Main screen. The General Information screen will be shown as below. The information on this screen will be appended to the exported data at the conclusion of the test run. The General Information screen is optional but Apex Instruments recommends that all of this information be entered before sampling. Once this data has been added, press the "Next" button to continue.

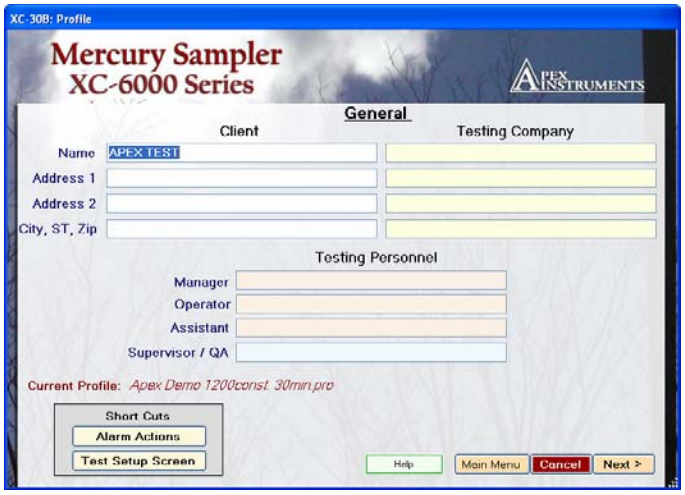


Figure 1-11. General Test Information Screen

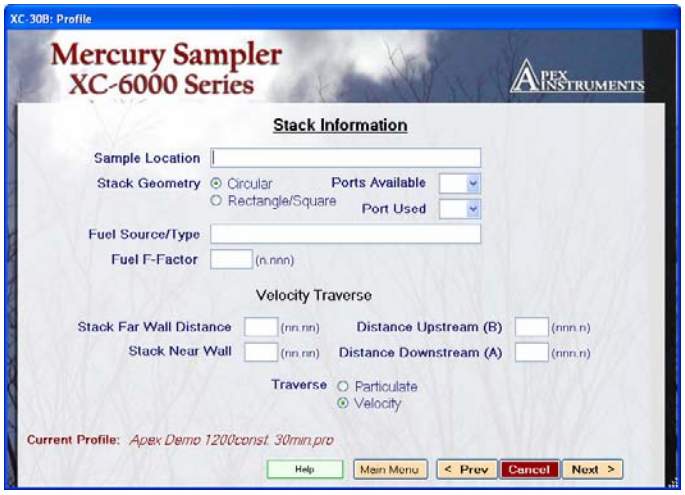


Figure 1-12. Stack Information Screen

The Stack Information screen will be shown next. The fields on this screen are also optional, but are useful for maintaining thorough job records. If a stack traverse is required while performing Method 30B, it may be helpful to enter the traverse information and stack geometry on this screen. Press "Next" to continue.

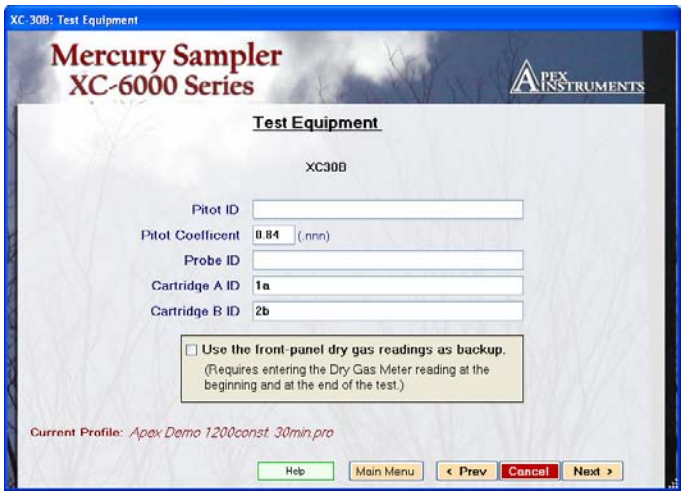


Figure 1-13. Test Equipment Information Screen

The Test Equipment information screen will be shown next. This information is also optional. The Cartridge ID's may be entered here but the user may enter them during the Pre-Test sequence.

The XC-30B does not contain a pitot transducer, so leave the Pitot ID blank and the Pitot Coefficient should always be left at 0.84. The console does not have Front Panel Dry Gas Meter displays. The option to use the front-panel dry gas readings as backup should be left unchecked.

Press the "Next" button to continue.

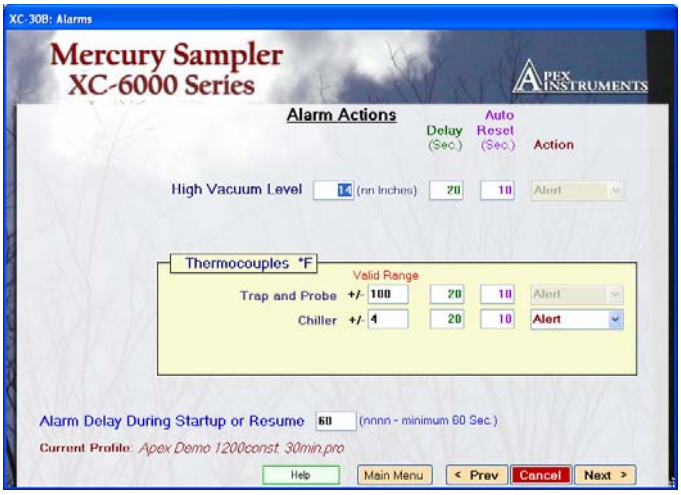


Figure 1-14. Alarm Actions Screen

Alarm Actions

The Alarm Actions screen is used to set Alarm points and actions.

Each alarm condition has several parameters that may be set. For each sensor input on the Alarm Actions screen, a valid range or upper limit may be set, depending on the sensor type. Additionally, most alarms feature an auto-reset function, which serves to return the XC-30B to a non-alarm state in the case of a non-critical alarm condition. For most testing conditions, the alarms may be left at their default values. If a Stirling Cooler (SGC-4000) is not in use, set the Chiller alarm to "Disable."

DELAY (sec.) Length of time alarm condition must continue before alarm action is performed. For an instant alert, set to zero (0.)

AUTO-RESET (sec.) Length of time elapsed before alarm condition resets. When alarm condition resets, Alarm Piezo output and dry contact will deactivate.

ALARM ACTION: Action performed by XC-30B upon reaching an alarm condition. See table below. Only the Chiller Alarm may be disabled.

ALARM DELAY (Startup / Resume)

When a test run is started or resumed from a pause condition, the alarms will be disabled for a minimum of 60 seconds, in order to prevent false alarm conditions when establishing the flow baseline. This delay may be extended at the user's discretion.

ACTION	***Description of Action***
ALERT	Displays an Alarm Condition on the Monitor Screen May be Auto-Reset or reset manually by operator
DISABLE	No action

Press "Next" to continue.

Test Setup

This is where the user selects the test target flow rates, Trap and Probe Temperature setpoints, Chiller Alarm setpoint (if using the optional SGC-4000) and the Moisture value.

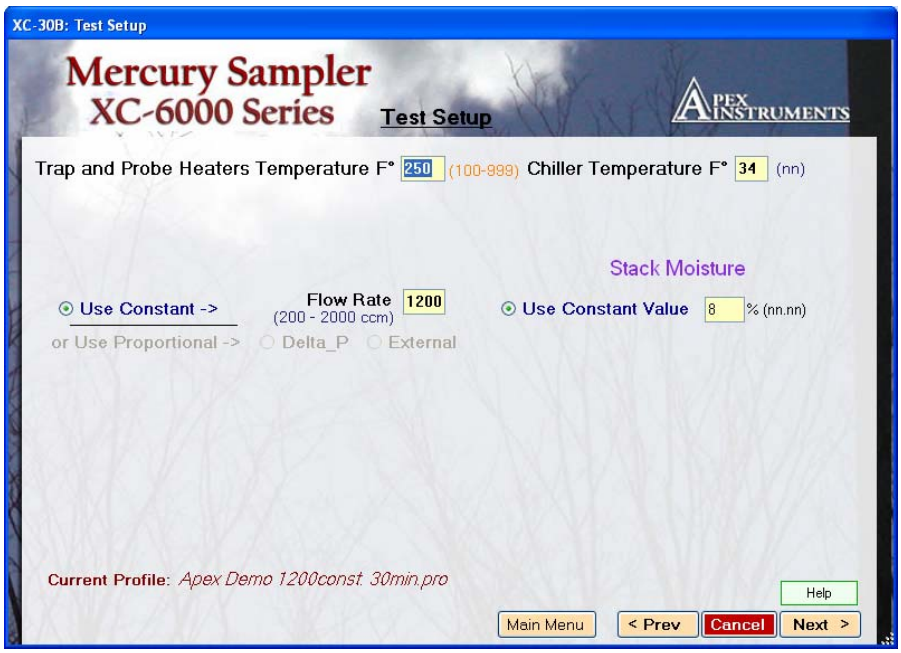


Figure 1-15. Test Setup Screen

Test Parameters:

Trap and Probe Heaters Temperature: Setpoint for the console-controlled heaters in the sample probe. This should be set high enough to keep any water vapor or other moisture entrained in the stack gas without condensing. In a "wet" stack (more than 10% moisture,) trap and probe heaters should be set to well above stack temperature.

Chiller Temperature: This parameter does not control the sample conditioner, but it does provide a reference temperature used in setting the alarm values. Typically 35° F.

Flow and Moisture:

The XC-30B is designed to operate at a constant sample flow rate. Enter the sample flow rate in cubic centimeters per minute (ccm.) The value entered into the Moisture will be recorded in the exported data. Moisture data is used during data analysis in order to determine dry basis and affects mercury output. Moisture data may be set to a constant value based on fuel type, depending on the local regulations. Please consult your regulatory body to determine requirements for moisture reporting.

Sampling Options:

The XC-30B Sampling Options allow for the setting for the duration of the sample test. Enter the amount of time for the test to run. The test can always be ended early or extended during the test run.

The Averaging period determines how often a Data Record is recorded.

The Sampling Options also allow for setting automatic pauses to allow for the relocation of a probe.

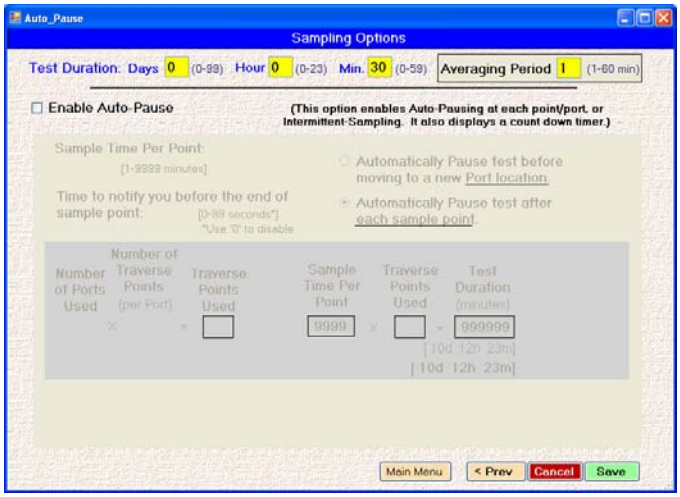


Figure 1-16. Test Setup Screen

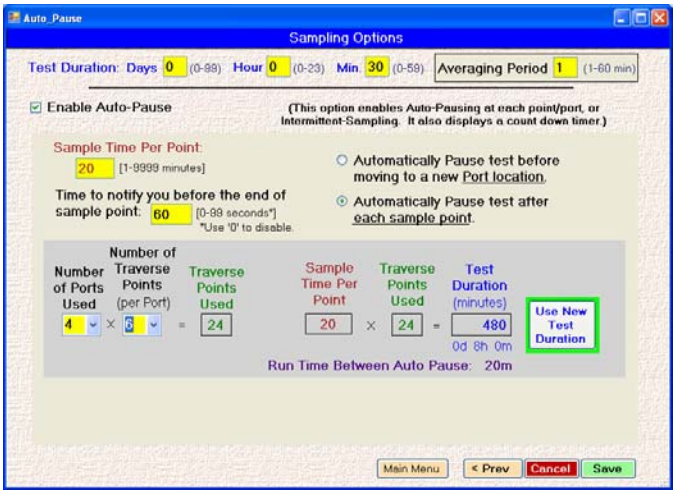


Figure 1-17. Auto Pause

Auto Pause

By selecting the Enable Auto Pause box parameters maybe entered to automatically pause the console at predetermined intervals. This may be helpful when performing a traverse, as the console may be paused at each traverse point or when performing port changes.

The information entered will also be used to calculate the total duration of the test.

If a value is entered the console will display a countdown until the next pause time.

After all parameters have been entered click “Save” to save this profile to a location on your hard drive. Please note that selecting “Save” does not write any information to the memory of the XC-30B. The XC-30B profile is not updated until all pre-test preparations are complete. Click “Main Menu” to start the testing protocol.

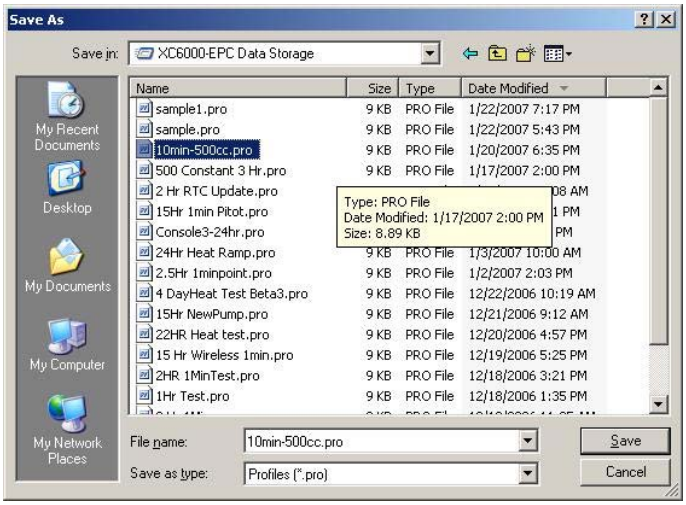


Figure 1-18. Save Profile Screen

Pre-Test Leak Check

Once back at the “Main” screen single click the “Pre-Test Leak Check” button. The following screen will appear. Ensure the sorbent test tubes are inserted in the probe trap receptacles. Plug the ends of the sorbent tubes with clean stoppers. Click the two “Start Test” buttons to individually leak check Side A and B. This is a required leak check done at maximum vacuum. The leak check vacuum level and flow rate are stored with each test run. The test can be bypassed by checking the “Bypass” button and then selecting “Next>>>”. However, this bypass will be logged and stored with the data.

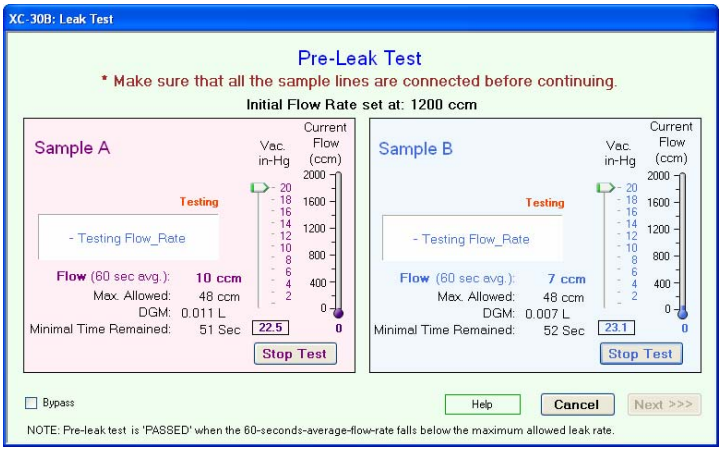


Figure 1-19. Pre-Leak Test Screen Running

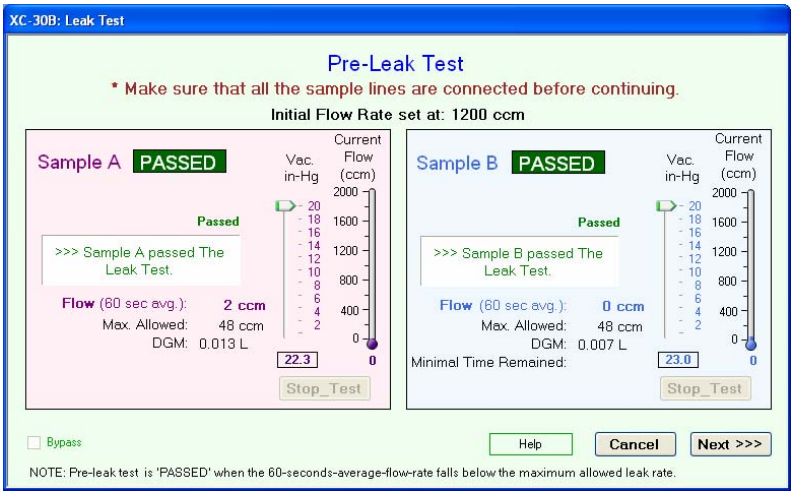


Figure 1-20. Passed Pre-Leak Test Screen

Once the test has passed click the "Next" button. The system prompts you to remove the caps. Click OK to continue. The system will automatically switch these off the pumps.

Figure 1-21. Pre-Leak Test Pump off Prompt

Set Probe

The next screen to appear prompts the user to insert the probe when the temperatures are at/near set point. If the temperatures are approaching the setpoint you can select bypass. You will have an opportunity to verify the temperatures have reached the setpoint prior to starting the test. If you are not using SGC-4000 conditioner bypass the chiller temperature.

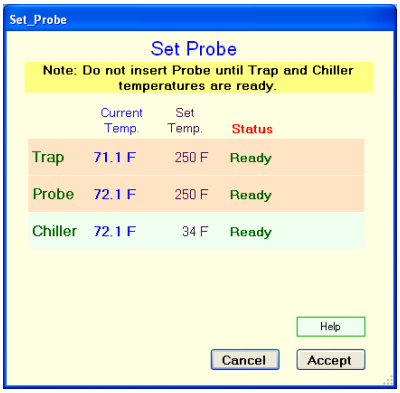


Figure 1-22. Set Probe Screen

Select Memory

The following prompts the user to select a storage location on the flash memory drive inside the box. Single click the number in the left column that corresponds to the data slot to be used. The user can select one of up to 99 slots. Click the "<<Previous" or "Next>>" buttons to scroll through the list. The system will prompt to confirm the case of overwriting data.

Figure 1-23. Memory Slot Selection for Data Storage Screen

Trap ID's

Verify the Trap ID's are correct. The Profile Name may also be changed at this time. Press the Accept and Upload button to upload the test profile to the XC-30B

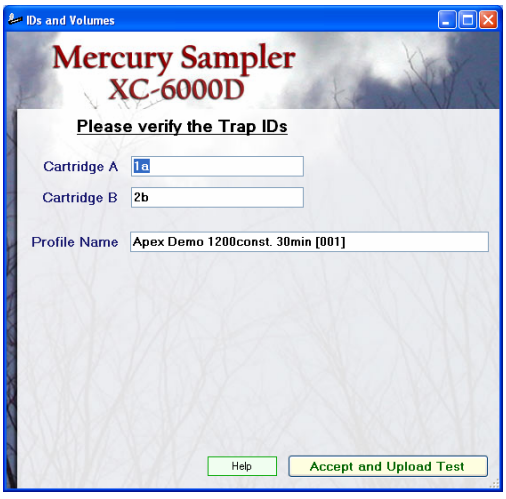


Figure 1-24. Trap ID Screen

Test Start

After clicking "Accept" the following screen appears. The system is ready to start the test. Verify temperatures are correct

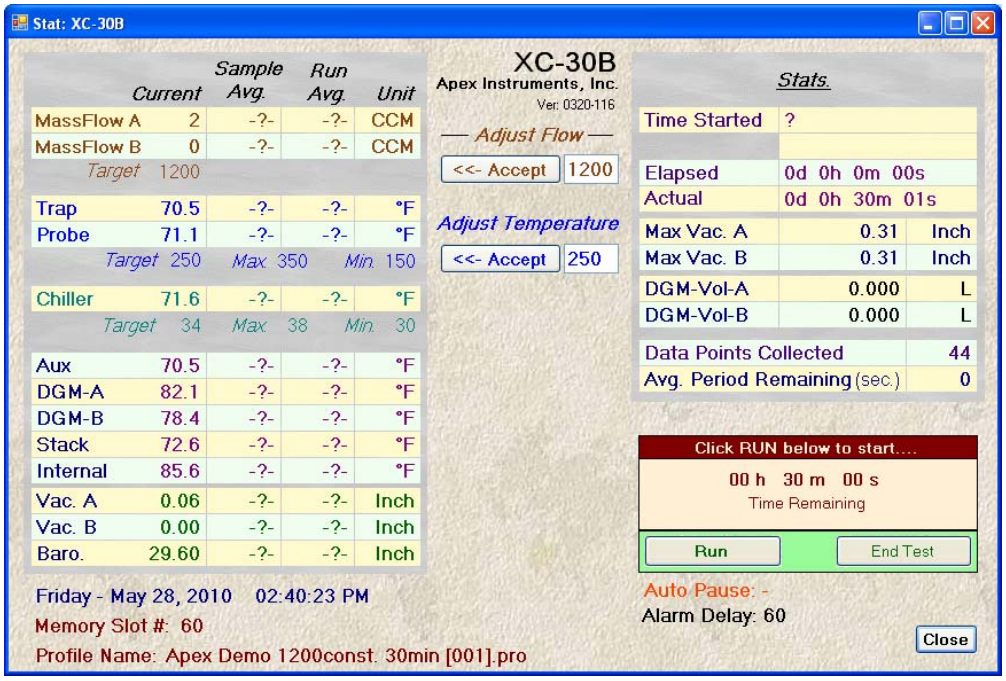


Figure 1-25. Test Ready to Run Screen

To start, click "Run" and the system should indicate Mass Flow in the top left of the screen and volume should be incrementing on the Dry Gas Meter (DGM) in the center right of the screen. The time to Auto Pause will also be displayed in the lower right corner of the screen

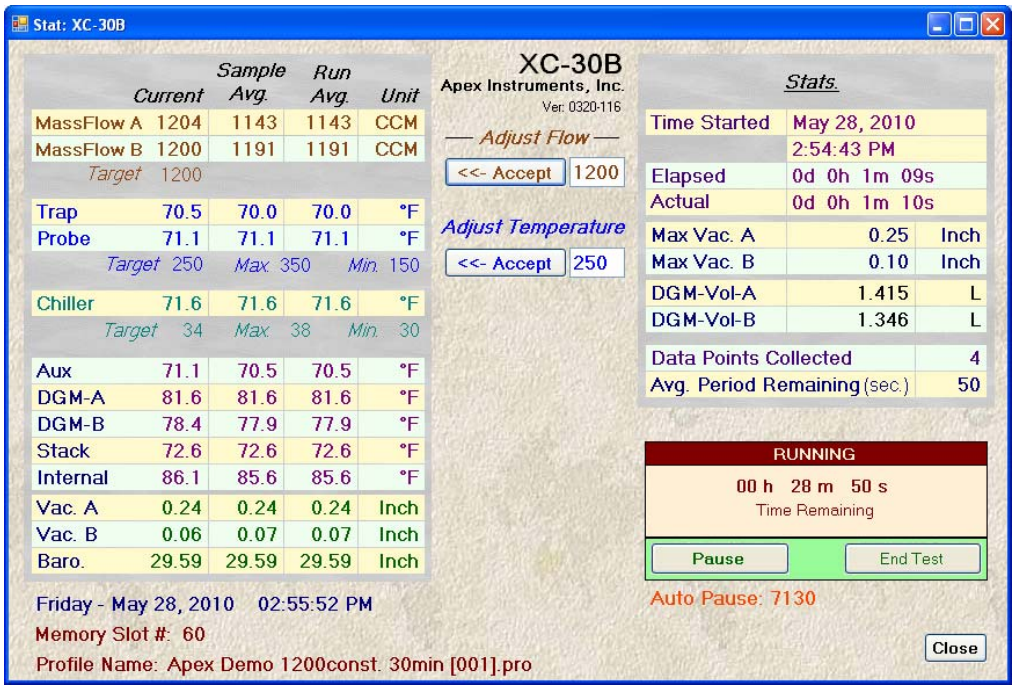


Figure 1-24. Test Running Screen

Pause Test

To pause the test, single click the “Pause” button in the lower right of the screen. The button will change to a "Resume" button once the test has been paused. Click on the "Resume" button to resume the test.

Click the **?** beside the Resume button and the reason for the pause will be displayed.

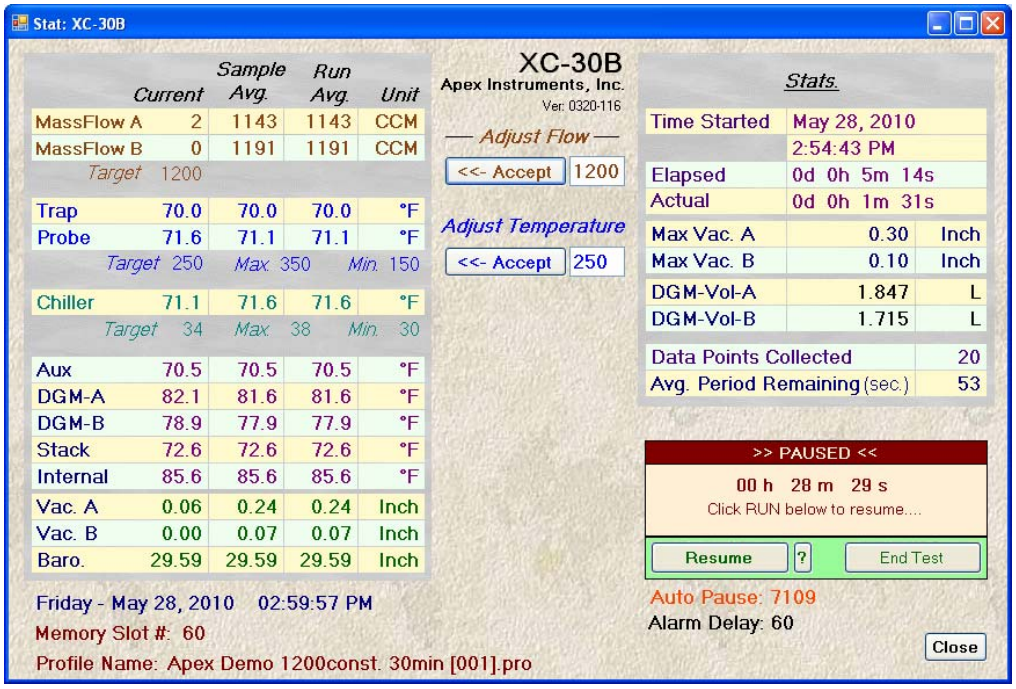


Figure 1-26. Test Paused Screen

In addition, a remote pause functionality has been integrated into the software. The user may pause and resume the test by closing and opening a dry contact connected to the front panel Pause connector. The remote pause functionality is discussed in the Test Setup menu.

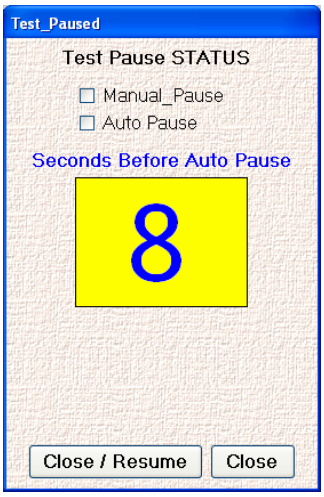
Adjust Buttons

The XC-30B is designed to offer flexibility during testing as well as when creating profiles. By entering a new value and pressing the **Accept** button the trap / probe heater set point or the target flow rate may be changed during testing,

Auto Pause

If Auto Pause was selected during test setup the following screen will be displayed indicating the amount of time until the Auto Pause is activated.

When the countdown reaches 0 the console will pause. Press the Close/Resume to close the dialog and resume the test or press the Close button to return to the Test Screen. From the Test Screen the Resume button may be pressed to resume the test.



End Test

To end the test there are two options. The user can wait until the system times out and automatically stops the test. Second, the user can end the test early by single clicking the "End Test" button in the lower right of the Test Screen. The system will prompt the user to confirm this action.

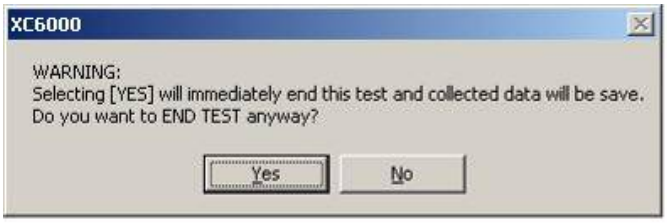


Figure 1-28. End Test Early Prompt

The following prompt informs the user the system will store the data.

Figure 1-29. End Test Confirmation Prompt

The following prompt informs the user the Post-Test Leak check is next and to remove the probe from the stack and plug the ends of the traps.

Figure 1-30. Initial Post-Test Leak Check Prompt

Post-Test Leak Check

The following screen displays the status of the leak check and allows the user to start/pause the leak check. The system has logged the highest vacuum achieved for both flow channels A and B as displayed in the center box and will control the vacuum level to just over those levels. Just like with the Pre-Test Leak Check, the user can bypass this step but no leak check data will be stored. But if no Post-Leak is performed the sample run data will be invalid.

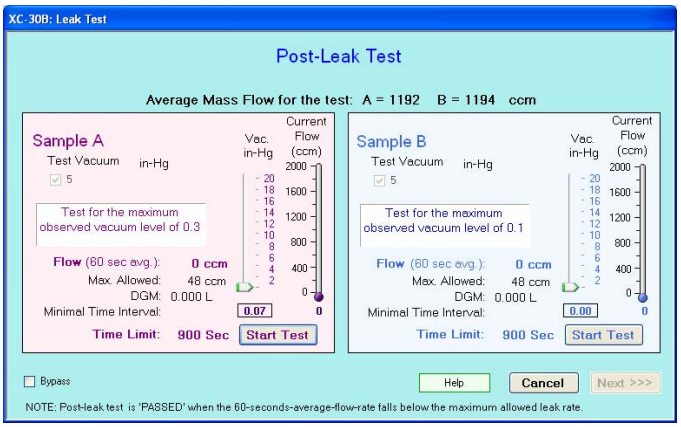


Figure 1-30. Initial Post-Test Leak Test Screen

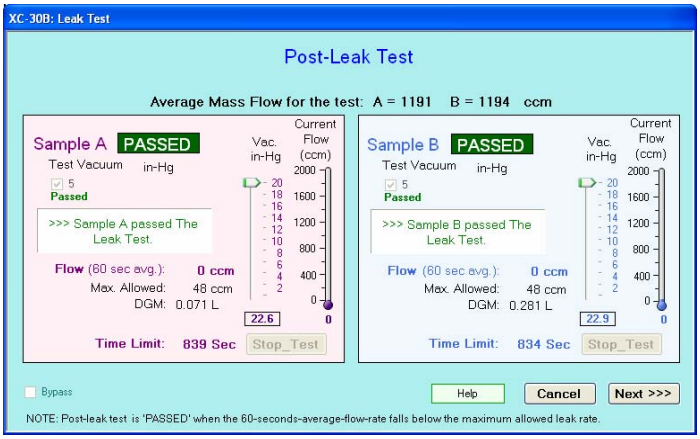
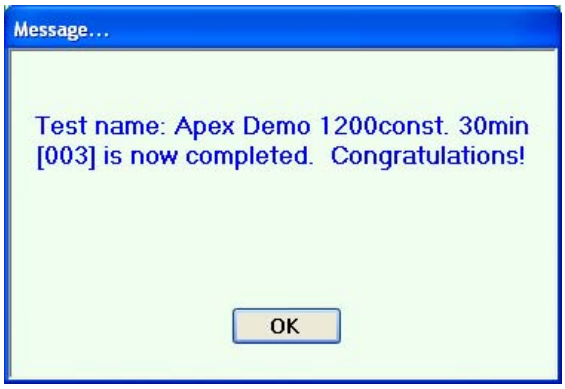


Figure 1-31. Running Post-Leak Test Screen

After both flow channels have passed. Click the "Next>>>" button and cycle off the pumps and the system will inform the user it is storing the leak check data.

Figure 1-32. Save Data to Memory Prompt



Export Data

The system will now go back to the main screen. To export and view the data file(s), Click on the Export Data box.

Figure 1-33. Export Data to File from main screen

Now select test data to export, the bottom right of screen will indicate sample run just completed.

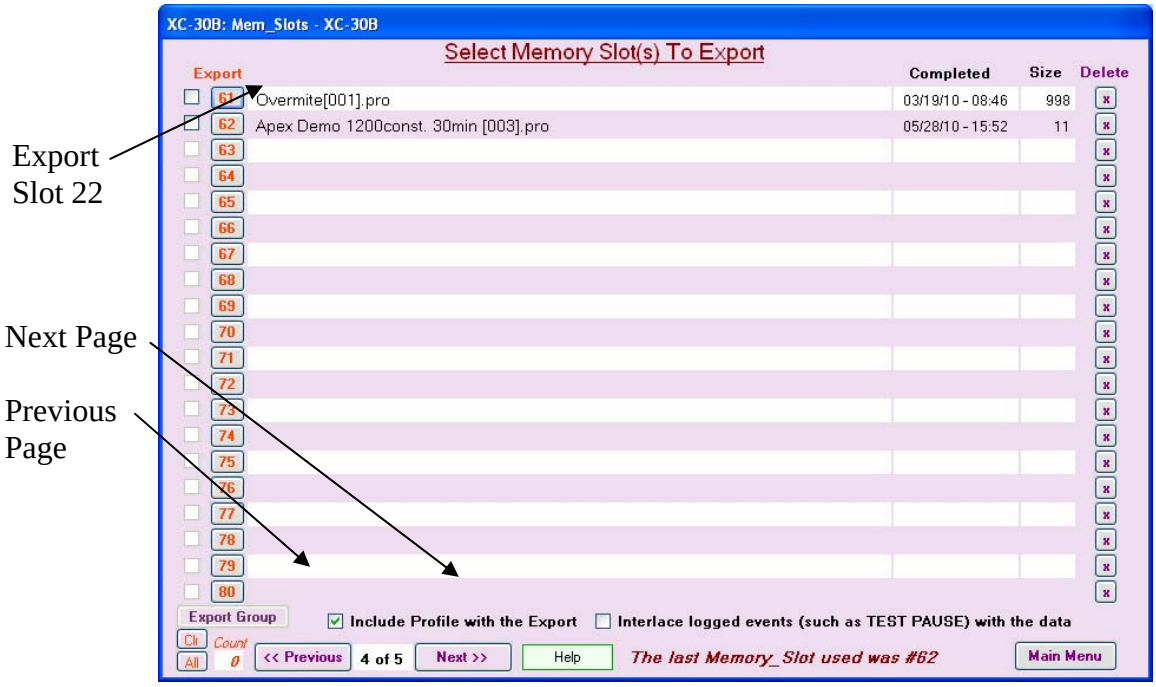


Figure 1-34. Export Data from memory slot

Click on the button corresponding to the slot number of the test to be exported. The XC-30B supports 99 memory slots, which may be accessed 20 at a time using the **Previous** and **Next** buttons.

Once the slot number button is pressed, the following dialog box will prompt the user to save the file to a local or network location. A text file (.txt) and a comma separated value (.csv) file will be generated at this user-specified location. The text file can be viewed in various applications such as Notepad, Word Pad, Word, Excel, etc. The CSV file is formatted to be opened in a spreadsheet application such as Excel.

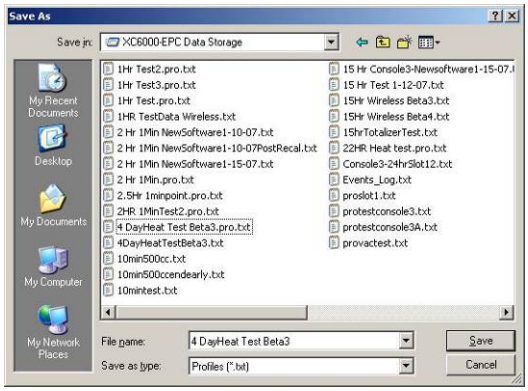
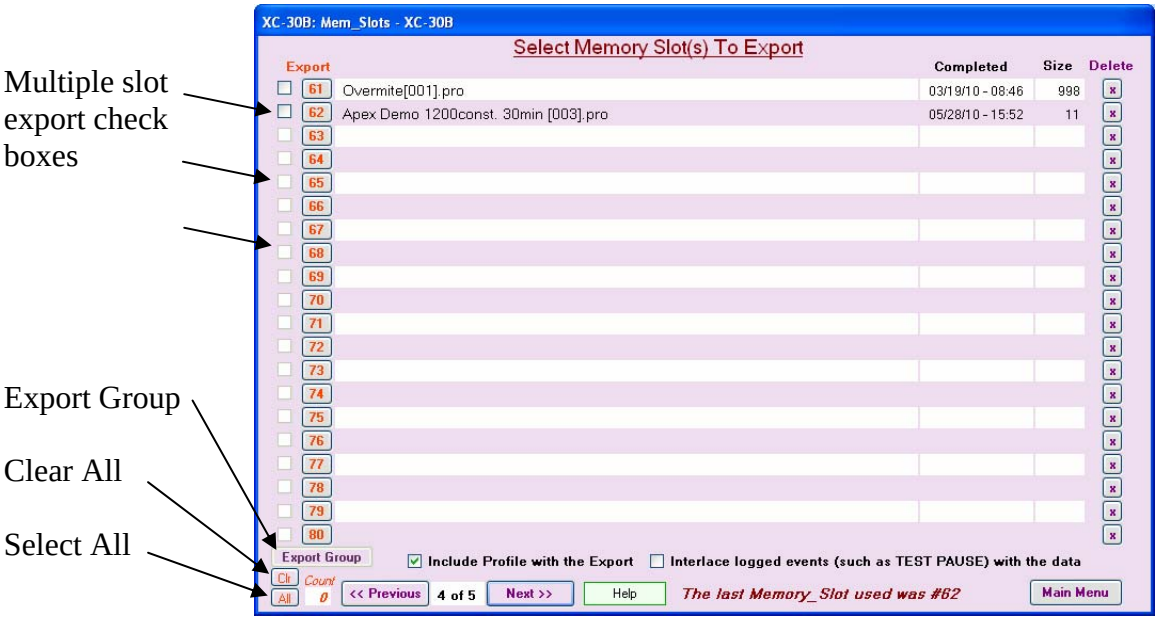


Figure 1-35. Export Data Path Screen

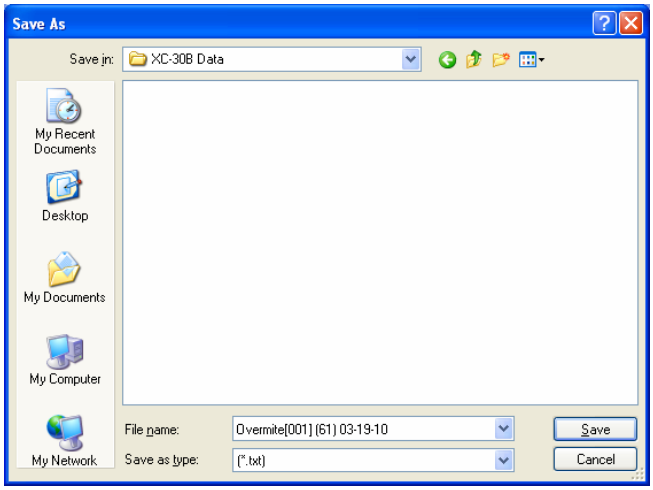
Multi-File Export

The XC-30B also supports multi-file export, which will export a group of completed test profiles to a folder on the local hard drive. To use multi-file export, select the Multiple Slot Export check boxes next to the slots desired. To select all available slots, press the **ALL** button. To clear all selected slots, press the **CLR** button.



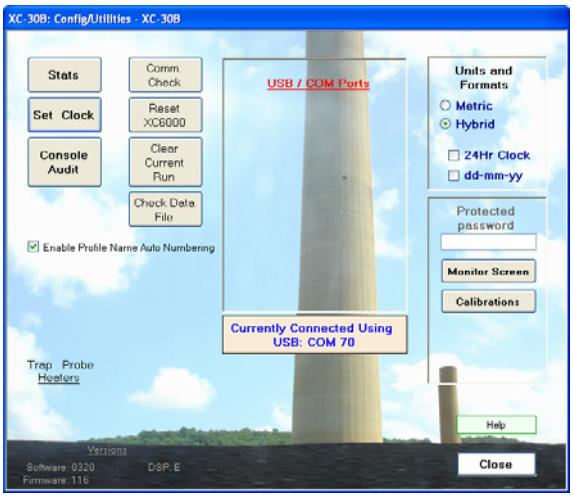
Multiple File Export (cont.)

After the slots are selected, press the **Export Group** button. The XC6000 application will prompt the user for a directory as in single file export. With a multiple file export, all slots will be exported to the directory selected for the first slot. Exported files will be named based on their profile name, and all will be given unique filenames.



Config/Utils Screen

The Config/Utils screen is used to carryout non-test activities



Stats

Stats displays current operating statistics of the console and looks the same as the Test Screen

Set Clock

The Config/Utilities screen has various other functions built-in. The “Set Clock” button automatically synchronizes the MercSampler Console time with the clock time of the computer connected.

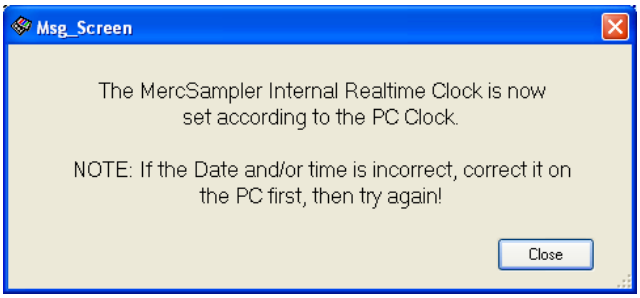


Figure 1-36. Set Console Clock Confirmation Screen

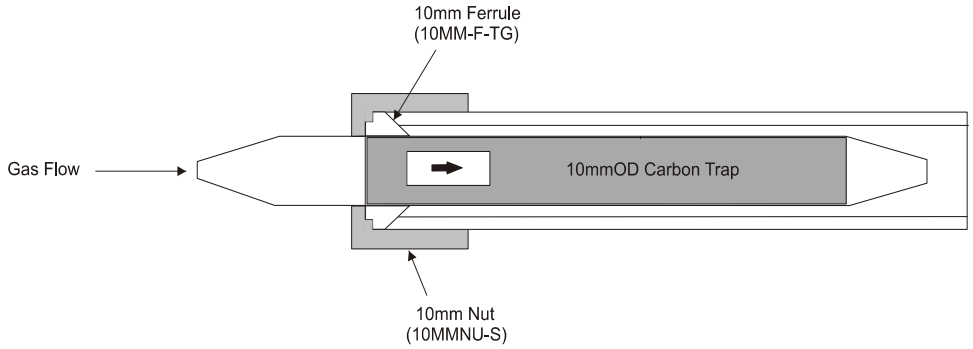
Console Audit

The Console Audit performs required QA/QC verifications per the EPA Method. Barometer sensor, Vacuum sensors, Thermocouples and DGMs are verified to be within tolerance.

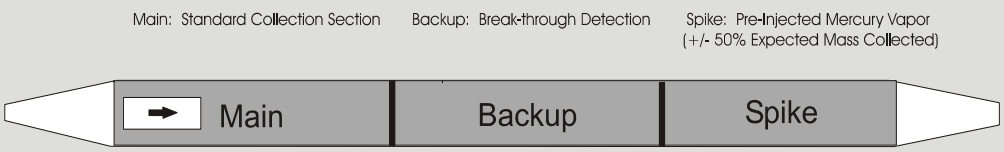
Detailed procedures for performing the Console Audit can be found in Console Audit document located in C:\Apex Documentation.

Sorbent Traps

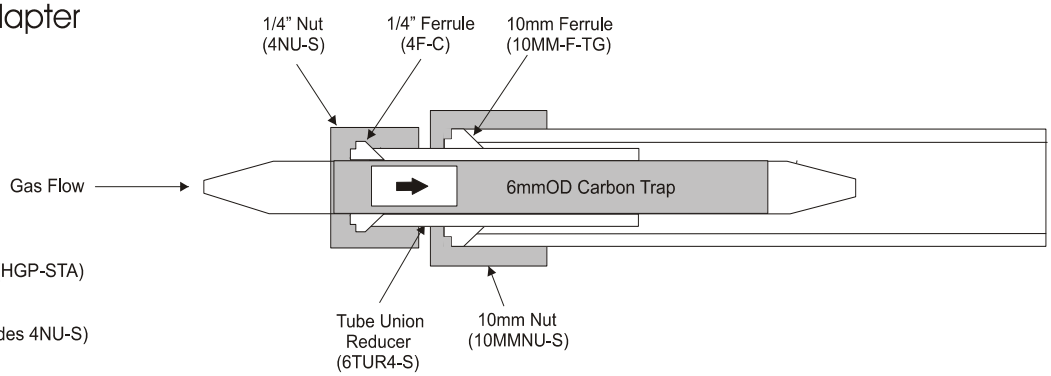
Large Trap (Standard)



Sorbent Trap Sections



Small Trap Adapter HGP-STA (Optional)



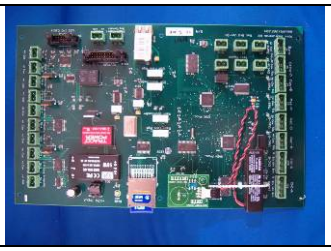
Small Trap Adapter (HGP-STA)
Includes:

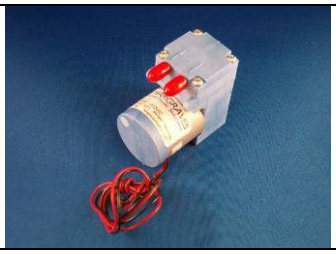
Qty	Part#
1	6TUR4-S (Includes 4NU-S)
3	4F-C

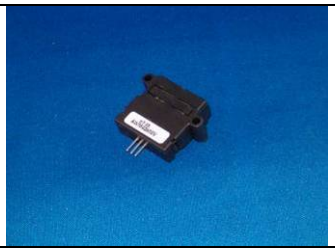
Appendix 1

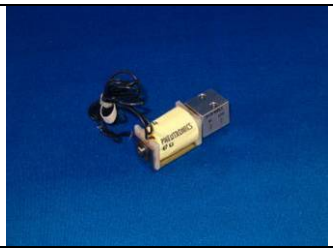
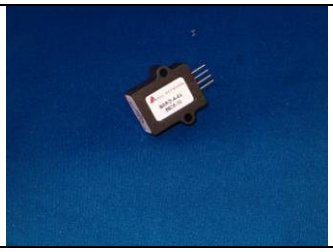
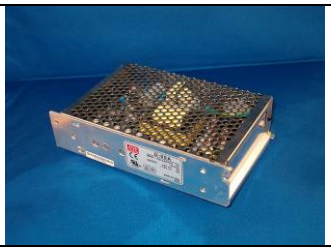
REPLACEMENT PARTS

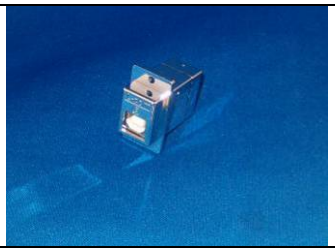
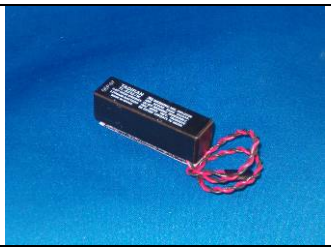
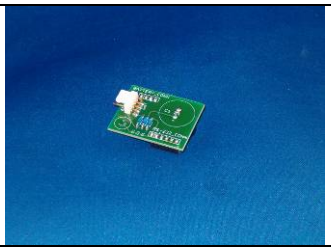
CONSOLE

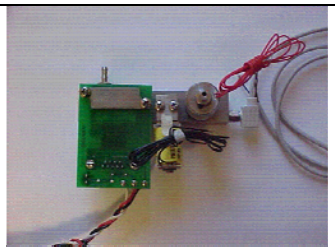
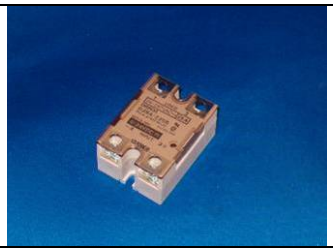
M-PCB-DAC-V3A	POPULATED Printed Circuit Board for Data Acquisition & Control (DAC) Board for XC-6000EPC Dual PC-Based Hg Console Series	
PCB-TC/MUX	POPULATED TC/Mux Board for use in XC-6000EPC Mercury Console Series. 8 Type K TC Channels with External Signal and Moisture Analyzer Inputs.	
PCB-LED-HG	BOARD, LED DISPLAY	
EL-PCB-MODBUS	BOARD, TCP/IP MODBUS INTERFACE	
EL-SDCARD	A-DATA Speedy 1GB Secure Digital (SD) Flash Card Model SDC-1G0	

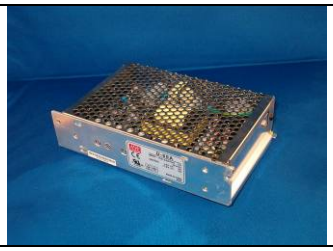
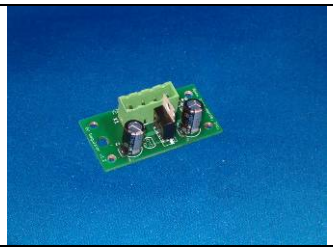
EL-EBR-2310	D-LINK ROUTER, IEEE 802.3/3u, IEEE 802.11b/g Wired-G Broadband Router	
EL-WBR-1310	D-LINK ROUTER, WBR-1310 Wireless G Router - 54Mbps, 802.11g, 4-Port, used in Meter Consoles in SKB, Environmental Enclosures	
GP-C131-11	PUMP, BTC DIAPHRAGM PUMP, BRUSHLESS MOTOR, 10,000 HR, MAX VACUUM 20"HG, 12VDC, 3900 RPM, MAX PSIG 24", 6 lpm max free flow, 900cc @15" Hg	
DGM-SK25-5701	DRY GAS METER, MODEL SK-25, METRIC, with optical encoder (no mechanical index)	
DGM-SK25EN	DRY GAS METER,MODEL SK-25, METRIC, with optical encoder (for XC-6000EPC)	

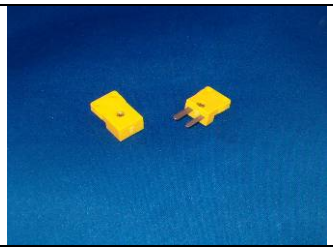
TOT4-36X72	QUADRATURE PULSE DIGITAL TOTALIZER	
AK-6000	Deluxe Mercury Audit Kit for Appendix K/Method 30B System includes:SK25 DGM with 15-pt calibration, quadrature totalizer,vaccum gauge, 4U black polyethylene molded case, Handheld type K Thermocouple Simulator with Certificate, Hand-held digital barometer, Digital Thermometer, Vacuum Bottle	
EL-670-OA938	FAN, AC Fans 92mm 115VAC 50CFM	
AWM-4360	Airflow Sensor, Signal Conditioning: Amplified; Flow/Pressure Range: + 6000 sccm (6.0 SLPM); Linear Range 1LPM; Port Style: Manifold	
XC-6K-PGMC	Programming Cable for XC-6000EPC Automated Mercury Sorbent Trap Metering Console.	
M-AM2312	VALVE, 3-WAY, .055/.048 ORIFICE, 12V	

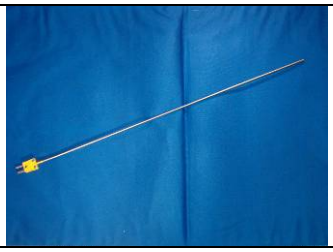
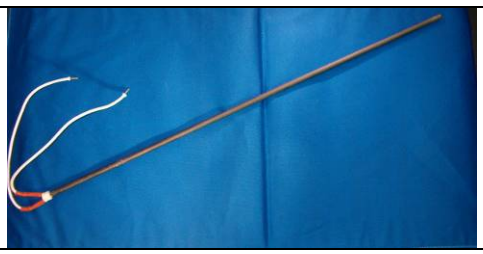
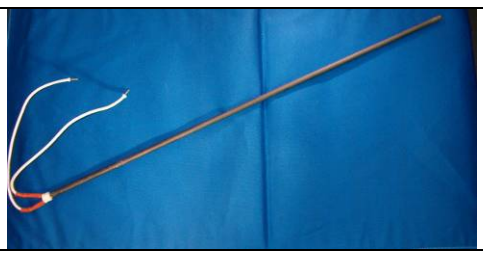
VSO-1SV	VALVE, SOLENOID, PROPORTIONAL Model VSONC-3S11-IC-FO MANIFOLD MOUNT WITH WIRE LEADS AND 11.5VDC	
SP-PSE541-M5	SENSOR, PRESSURE, 0-30" Hg, 1 NPN/PNP OPEN COLLECTOR TRANSISTOR OUTPUT, 30VDC, 125mA	
BARO-A-4V	Barometric Pressure sensor, 600 to 1100 mbar, temperature compensated, amplified output	
M-CBR10A-M	Magnetic Type Circuit Breaker Rocker Switch, 10 Amp. Horizontal Mount. Typically Used in 120V Consoles as Probe/Oven Breaker Switch.	
M-CB15A-M	Magnetic Type Circuit Breaker, 15 Amp., Typically Used in 120V Consoles as Main Breaker.	
D-60A	POWER SUPPLY, 5V@6A, 12V@ 4A, Meanwell	

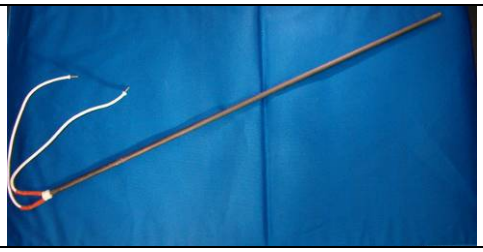
EL-P1082-031	CONNECTOR, A TO B USB, PANEL MOUNT	
EL-TL5242W	Memory Backup Lithium Batteries 3.6V 2.1Ah BATT PACK	
PCB-BATTERY	Battery interface board with short-term capacitor backup	
TC-PJK	THERMOCOUPLE JACK, TYPE K, PANEL, SNAP-IN	
AM-T3107000	AMP. CONN, 7P FEMALE, PNL, C16 C16-1 Series Amphenol Circular Connector. High Grade Plastic for Harsh Environmental Conditions. Panel-Mount Straight Female Slots, 7 Slot (6 + Ground (First Mate/Last Break)) – Hardigg Case external input connector	
AM-T3108	AMP. CONN, 4 PIN (MALE),CBL,C16 – Probe / Trap Heater power connection, console side	
AM-T3109	AMP. CONN, 4 SCKT (FEMALE),CBL – Probe / Trap Heater power connection, probe	

	side	
XC-6K-MANI	MANIFOLD SUBASSY, XC-6000EPC Includes vac sensor, mass-flow sensor, manifold valve, proportional valve, ss hose barb fittings. Assembly calibration data to be provided with this unit.	
COOLER		
SSR-330-25	RELAY, SSRT, 25A 110/240V	
SGC-TR4/7-SCR	HEAT EXCHANGE ASSEMBLY FOR STIRLING GAS CONDITIONER Heat Exchange Assembly, 4 inch inner Tube, 7 inch overall with outer tube.	
26840	CARTRIDGE, Aluma-Sorb Gas Drying Unit with 1/8" SS FNPT Fittings. 2-5/8"x11-3/8". 50g H2O Capacity. <.01psi@200lph press drop. 90psig working press. Polycarbonate	
26809	MOUNTING CLIP FOR ALUMA-SORB CARTRIDGE	

AM-SP100A	Fan, for Stirling Chiller, 115V, Sunon 95/115 Air Flow	
M-SD31	Temperature Controller, Red LED, Watlow	
M-PSRS7512	POWER SUPPLY, 75W, 12V, 6 AMP, INPUT: 100-240VAC	
D-60A	POWER SUPPLY, 5V@6A, 12V@ 4A, Meanwell	
M-PCB-REG-A	REGULATOR PCB ASSEMBLY, 5V, for use with M-PSRS7512	
M-CBR10A-M	Magnetic Type Circuit Breaker Rocker Switch, 10 Amp. Horizontal Mount. Typically Used in Cooler as AUX breaker	

M-CB15A-M	Magnetic Type Circuit Breaker, 15 Amp., Typically Used in Cooler as Main breaker	
PROBE		
TC-SP-K	Thermocouple Plug, Mini, Type K, Male	
TC-LJ-KA	TC, CONNECTOR ASSY, TYP.K, F, CORD 7.200 7.20 Includes: Female Type K Thermocouple Plug Assembly, Cord-mount, with cover, screws and bushing.	
TC-LPS-KA	TC, CONNECTOR ASSY, TYP.K, M, CORD 5.500 5.50 Includes: Male Type K Thermocouple Plug Assembly, Cord-mount, with cover, screws and bushing.	
TC-MJ-KA	TC CONN. ASSY. MINI, TYP K, CORD, F 5.500 5.50 Mini-Thermocouple Assembly, Type K, Female, Cord Mount, includes Plug, Cover, Screws and Bushing	
TC-SP-KA	TC CONN. ASSY. MINI, TYP K, CORD, M 5.500 5.50 Mini-Thermocouple Assembly, Type K, Male, Cord Mount, includes Plug, Cover, Screws and Bushing	

WK-125CI	Replacement Thermocouple with Magnesium Oxide Insulation, Type K, 1/8" Dia, per ft	
MPT-6-133H	Modular Pitot Tip, 'S' type	
HGH-4T463W	Replacement Probe Heater, 4-ft, 463 watt	
HGH-5T1650W	Replacement Probe Heater, 5-ft, 1650 watt	
HGH-STRI72	Replacement Probe Heater, 6-ft, 2000 watt	
HGH-2T144W	Replacement Probe Heater, 2-ft, 575 watt. (used on all probes, exit end of probe)	
HGH-9T838W	Replacement Probe Heater, 9-ft, 838W	

HGH-12T1000W	Replacement Probe Heater, 12-ft, 1000W	
HGP-STA	Small Trap (6mm) Adapter for Mercury Probes. Includes 10MTUR6M-S (with 10mm Nut and ferrule) and Three 1/4" Ceramic Ferrules	

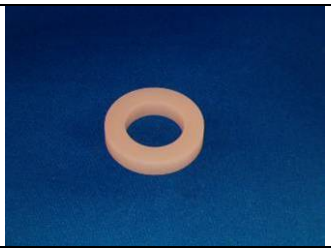
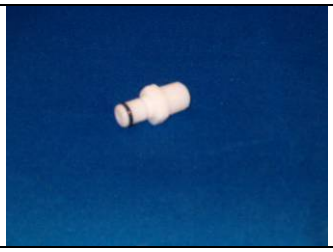
CONSUMABLES

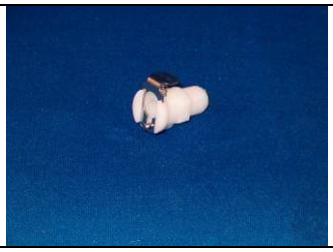
CONSOLE

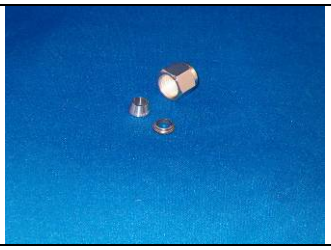
DIF-N70	FILTER , INLINE, DISPOSABLE, NYLON Disposable In-Line Filter, Nylon Housing with 1/4" tube stubs, 95%+ efficiency for 0.1 micron.	

COOLER

GSB-1000SC	SAMPLE BOTTLE, CLEAR GLASS,GL-45 THREADED, 1000mL Safety Coated, for Condensate Collection	
GSB-400SC	SAMPLE BOTTLE, CLEAR GLASS,GL-45 THREADED, 500mL Safety Coated, for Condensate Collection, used in 16U shock mount rack chiller	

GSB-250SC	BOTTLE, SAMPLE, CLEAR GLASS, GL-45 THREAD, 250mL with Safety Coat Sample Bottle, 250mL, used in SC-40 condensate collection ice bath	
GA-GL-45S	Seal for 1000 ml bottle	
GA-GL-45B	Cap for sample bottles – fits 1000mL, 500mL, 250mL bottles	
ALUMA-SORB	ACTIVATED ALUMINA DESSICANT, highly efficient adsorbent with high porosity and contact surface. 1/8" diameter beads, 2.5Kg (5.5 LB) container with 80% active alumina (>/= 92%) and 20% silica gel.	
AG-1080	DESSICANT AIR DRYER WITH INDICATOR, disposable drying canister	
QC-PMC2	QC, STIRLING GAS CONDITIONER, MALE, STRAIGHT CONNECTOR, ¼” OD PTF, 1/8"ODX.170"ID (used on Drierite Cartridge outlet/top) – Threaded Male	
QC-SGC-F4	QC, STIRLING GAS CONDITIONER, FEMALE, FERRULLESS POLYTUBE FITTING, PTF (used on jumper from Stirling Cooler to sampling console) – Tube-Mount Female	

QC-SGC-F3	QC, STIRLING GAS CONDITIONER, COUPLING BODY, 1/4"OD, FEMALE, 1.73" (on Stirling, sample-in connection) – Threaded Female	
QC-SGC-M2	QC, STIRLING GAS CONDITIONER, STRAIGHT CONNECTOR, FERRULESS POLYTUBE FITTING, PTF, 1/4"ODX.170"ID (Heated U-Cord Sample Line to Stirling, high-SO2 connector) – Tube-Mount Male	
HGU-10DJ	TUBING, PFA, 5/32ID X 1/4OD X .047 WALL (jumper from Stirling Cooler to sampling console), replace 10DJ with desired length (standard is 10ft.)	
PROBE		
9531K22	CAP, VINYL PROTECTIVE, used for capping sorbent traps during pre- and post-leak testing	
10MMNU-S-EXT	PARTICULATE SHIELD FOR 10MM SORBENT TRAP Stainless Steel Tube, 3/4" o.d. x 1.25" L with 10mm nut, welded	
10MMNU-C-EXT	PARTICULATE SHIELD FOR 10MM SORBENT TRAP,C276 Hastelloy C276 Tube, 3/4" o.d. x 1.25" L with 10mm nut, welded	

10MMNU-S	NUT, 10MM TUBE, Stainless Steel	
10MMBLP-S	PLUG, 10mm TU, SS – thread-on plug for end of probe, protects probe when not sampling	
SR-2.625	Neoprene square ring, 2" ID x 2 5/8" OD x 3/16" tk, for cam-lock connectors	
10M-F-TG	FERRULE, 10MM, Single, Glass filled Teflon	
4NU-S	NUT, 1/4 TUBE, Stainless Steel	

Appendix 2

Upgrading Firmware

From time to time, Apex Instruments may release updated device firmware for the XC-30B console. These firmware upgrades may add additional functionality or capabilities to the console, and may be required in order to use the latest version of the monitor / control client software. If the XC-30B software displays a message regarding your firmware revision number, please contact Apex Instruments to get more information.

Current software and firmware versions may be obtained from Apex Instruments.

The XC-30B firmware may be programmed using a PC and the Apex Firmware Programming Cable. PLEASE NOTE: The drivers for the programming cable and the version of the XC-30B firmware most current at the time of shipment are installed along with the Apex software. Please install the Apex XC-30B software before attempting to upgrade the firmware.

The Apex Firmware Programming Cable uses a USB Serial Converter similar to the one in the main console. When connecting the Firmware Programming Cable to the PC for the first time, the Found New Hardware Wizard may appear.

The programming cable is shipped with new consoles inside the XC-30B console.

Programming Cable

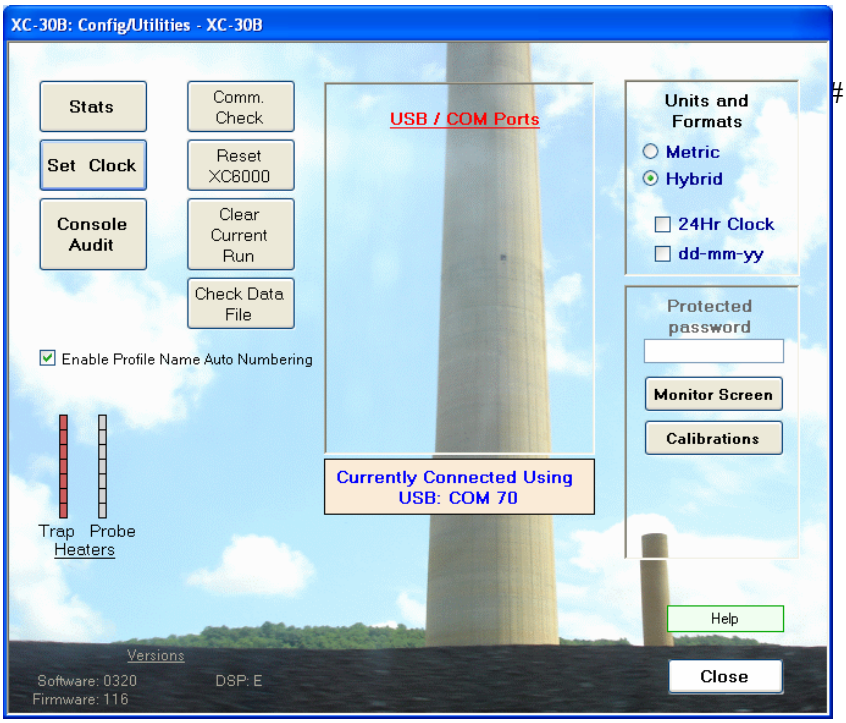
The programming cable has a 6-pin Molex connector and a 4-pin USB A connector. Please use the same steps as for connecting the XC-30B to the PC via USB. The programming cables use the same USB converter as the XC-30B so no additional drivers are necessary. The COM port installed may not be the same as the XC-30B virtual COM port, consult the Device Manager and note the COM number of the new serial port installed by the Apex Firmware Programming Cable.

Important Notes About Upgrading Firmware:

The older versions of the XC-30B firmware lack several important new features of the current consoles. These include the ability to set alarms based on test conditions, the optional ability to sample at flow rates above 1Lpm, and the provision for communication with the optional ModBus module. In addition, the calibration tables for the older versions may not be immediately compatible with the newer versions, and some conversion must be performed.

Before upgrading your XC-30B firmware, please connect the console to your current software and make a note of the application and firmware version.

This can be found on the Config/Utils screen in the lower left corner.

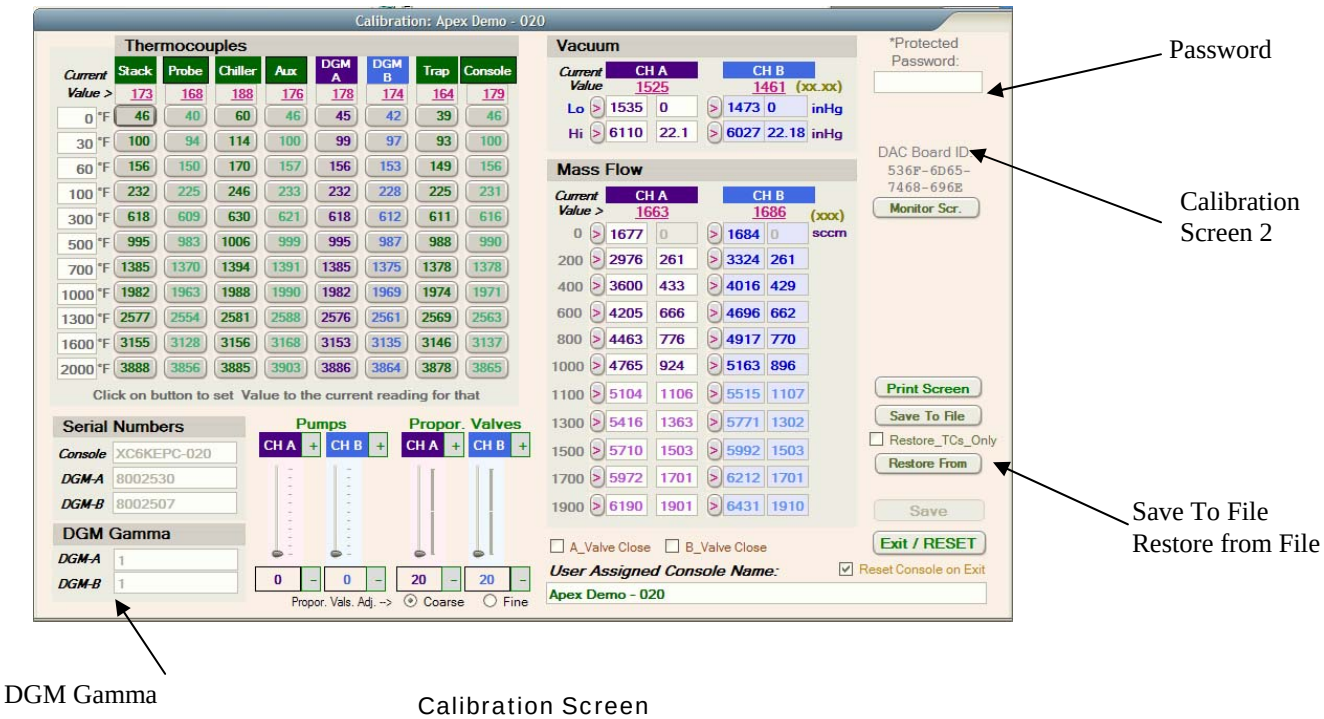


#

Make a note of these version numbers. The new software CD will list the version included.

Once connected, enter the Config / Utilities screen and then the Calibration screen. Enter the word “enable” (no quotes all lowercase) into the protected password space on the Calibration screen. Press the “Save to File” button. Choose a location for your saved table, and give it a unique name.

IMPORTANT NOTE: Always save the XC-30B calibration table to a file before upgrading the console firmware.

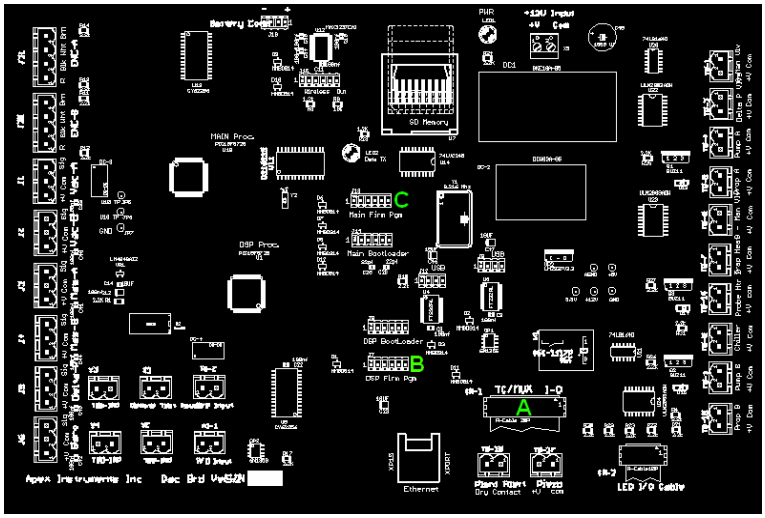


Programming the XC-30B Firmware

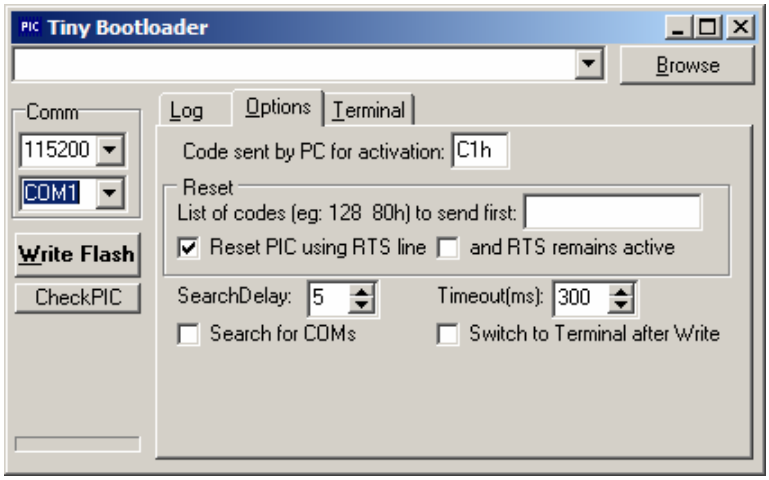
1. Ensure XC-30B console is powered off. Disconnect any connecting cables from the console, and remove the console from its rack enclosure. Remove the screws from the top of the unit and the on the outside left and right edges of the rear panel, and open the lid of the console by pulling the top/back cover towards the rear. The cover is mounted on a hinge at the back bottom of the console

Programming the DSP Processor – SKIP THIS STEP IF DSP IS ALREADY AT THE CURRENT VERSION!

2. Remove the 20-pin ribbon cable coming from the XC-30B TC/MUX board.
   Reference: Figure DAC-1 below, item A.
3. Connect the 6-pin Molex connector on the end of the programming cable to the DAC board header labeled **DSP Firm Pgm**
   Reference: Figure DAC-1 below, item B.



4. Power on XC-30B console
5. Navigate to the install location
   default: C:\Apex\Firmware
6. Execute **dl.exe**
7. The Tiny Bootloader window will launch

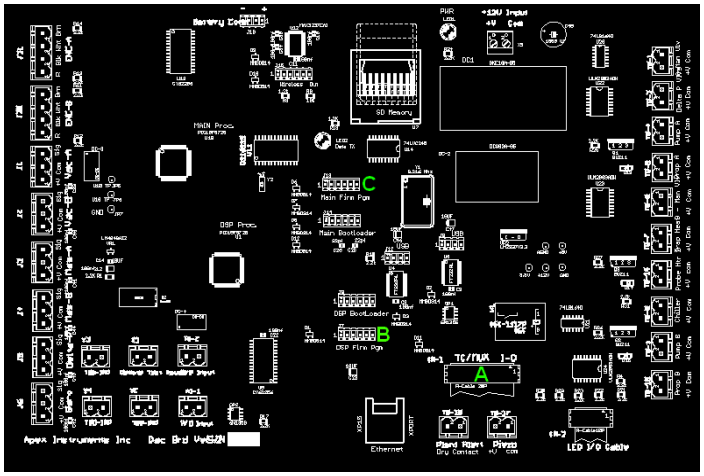


DL.EXE - Tiny Bootloader

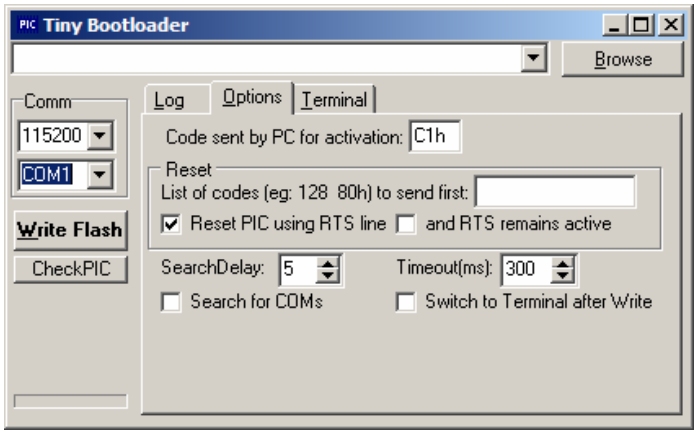
8. Click Browse and select ApexDSP_XX.hex (XX is the version) from the current directory
9. Select the following options:
   - Comm: 115200
   - Comm (use the COM number noted earlier)
   - Enable Options -> Reset PIC using RTS line
10. Click Write Flash
11. When update is complete, Log window will read **Write OK.** The writing process should take between 3 and 6 seconds. If you receive an "**Error**" power off the console then back on again then press the write button.
12. Power off XC-30B console and remove 6-pin Molex connector on the end of the programming cable from the DAC board.

Programming the Main Processor

13. Connect the 6-pin Molex connector on the end of the programming cable to DAC board header labeled **Main Firm Pgm**
    Reference: Figure DAC-1 below, item C.



14. If the Tiny Bootloader is already open skip to step 17. Navigate to the install location *default: C:\Apex\Firmware*
15. Execute **dl.exe**
16. The Tiny Bootloader window will launch



DL.EXE - Tiny Bootloader

17. Click Browse and select ApexMAIN_XX.hex (XX is the version)from the current directory
18. Select the following options: (same as for DSP Processor)
    - Comm: 115200
    - Comm (use the COM number noted earlier)
    - Enable Options -> Reset PIC using RTS line
19. Power on XC-30B console
20. Click Write Flash

21. When update is complete, Log window will read **Write OK.** The writing process should take between 45 and 60 seconds. If you receive an "**Error**" power off the console then back on again then press the write button.
22. Power off XC-30B console and remove 6-pin Molex connector on the end of the programming cable from the DAC board.
23. Replace the 20-pin ribbon cable from the TC/MUX board (item A above)
24. Power on the XC-30B console and connect using the XC-30B MercSampler application. The version number of the console should appear in the upper right of the application window once connected. Ensure that the version number that the console reports matches the version number of the supplied firmware update.

After a successful upgrade:

Once the console has been upgraded, the calibration table will need to be converted to the new format. Connect to the console and enter the Config / Utilities screen. Press the "Set Clock" button to ensure that the XC-30B has the correct time and date set. Close the Config / Utilities screen and observe the date and time on the Main screen to make sure the time and date are correct and that the time is advancing. Then re-enter the Config / Utilities screen and go to the Calibration screen.

Enter "enable" (no quotes) in the password field and press the "Save" button. Once the table is saved, press "Save to File" and save a copy of the new table with a new filename. Press the Exit / Reset button to reset the console and apply the new calibration factors.

Older test profiles may cause errors when used with newer firmware. To avoid this, create new profiles for performing sample runs. If an older profile must be used, please step through the profile one screen at a time (press the "Next" button) and save the profile with a new filename. The profile should be automatically converted to the newest version.