ASHRAE110 Instruction Manual

Version 1.60

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Application Description:

The ASHRAE110 software was designed to provide a computerized data collection and reporting solution to the challenges of performing fume hood containment testing, as required by standard ASHRAE110-1995.

The ASHRAE110 application is a hardware/software solution, which allows a highly integrated approach to the certification process. The application provides a series of configuration and setup screens to provide maximum flexibility for the field certifier. Every effort has been made to streamline the data entry process while providing the flexibility required to meet the diverse requirements of field certifiers, hood manufacturers and hood owners wanting to perform ASHRAE110 fume hood certification.

While the software is intended to provide complete compliance with the ASHRAE110-1995 requirements, there are a number of software features, which will allow the technician to perform additional testing and troubleshooting beyond the minimum requirements of the standard.

The ASHRAE110 software is a relational database application. The database is a run time version of FileMaker Pro. The run time version allows the user to utilize the software without the need to purchase a copy of Filemaker Pro. The functionality of the program is provided by a number of C++ custom designed software extensions to the standard Filemaker Pro database.

The ASHRAE110 software application consists of several database files, all installed in the ASHRAE110 directory.

While the software is designed to provide a simple and intuitive user interface, there are a great many features offered. The user is encouraged to read the entire manual to become familiar with all features of the software.

In addition to the software, the system also requires the Cert-Pro AS100 ASHRAE Controller, a data acquisition interface that allows the collection of data from a variety of inputs. See part 3 of the manual for a full description of the Controller.

Minimum Hardware Requirements.

PC or laptop, with RS232 port (USB/Serial adaptor is fine)
Windows version XP (Home or Pro Edition) or later.
Windows compatible printer (Color or black/white)

Staring the Application.

Double click on the ASHRAE110 icon on you computer to start the application, a copy of which is shown below:

When you first start the ASHRAE110 software, the system will open all the required database files and will attempt to establish a link with the ASHRAE controller.
During the program attempt to connect to the controller, the screen may flash on 1 second intervals indicating that it is opening each com port and querying for the controller. The system will start with COM 1 and continue through each COM port, up to COM 8, or until the controller is discovered. When the controller is discovered, the system will identify the controller version and stop the query process. Upon successful connection to the controller, the controller version and firmware version will be displayed in the upper left corner of the main menu.

If communication with the controller is successful, the main menu will be displayed and the controller version will be displayed in the upper right portion on the main menu screen.

If the communication is not successful, the dialog box in Figure 1 below will be displayed.

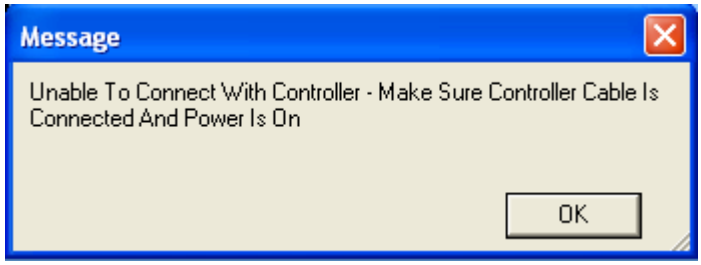


Figure 1. Communication Failure

After you click on the OK button, the ASHRAE110 program will show the test menu screen shown in figure 2. The program screens and reports will function normally without the controller link established. When you attempt to start any data collection, the software will again attempt to establish the communication link.
The most common cause of communication failure is the controller is not turned on or is not properly connected to a valid RS232 communication port (RS232 port must be in the range of COM1 thru COM8). Note that by default, the ASHRAE110 software is configured to allow auto detection of the Com port. If you do not receive the error message shown in Figure 2, the controller communication link was successful.

If your computer is not equipped with RS232 communication ports, you can use a USB to Serial adaptor. When the USB adaptor is plugged in, the computer will configure the RS232 port and assign a COM port number to the port. While in most cases, the COM port assignment will be less than 8, it is possible that the computer will assign a port number higher than 8. If this happens, you will need to manually assign a COM port number of 8 or less for the system to connect to the controller.. This setting can be changed by selecting the Windows device manager in the Windows system configuration utility and accessing the properties of the COM port.

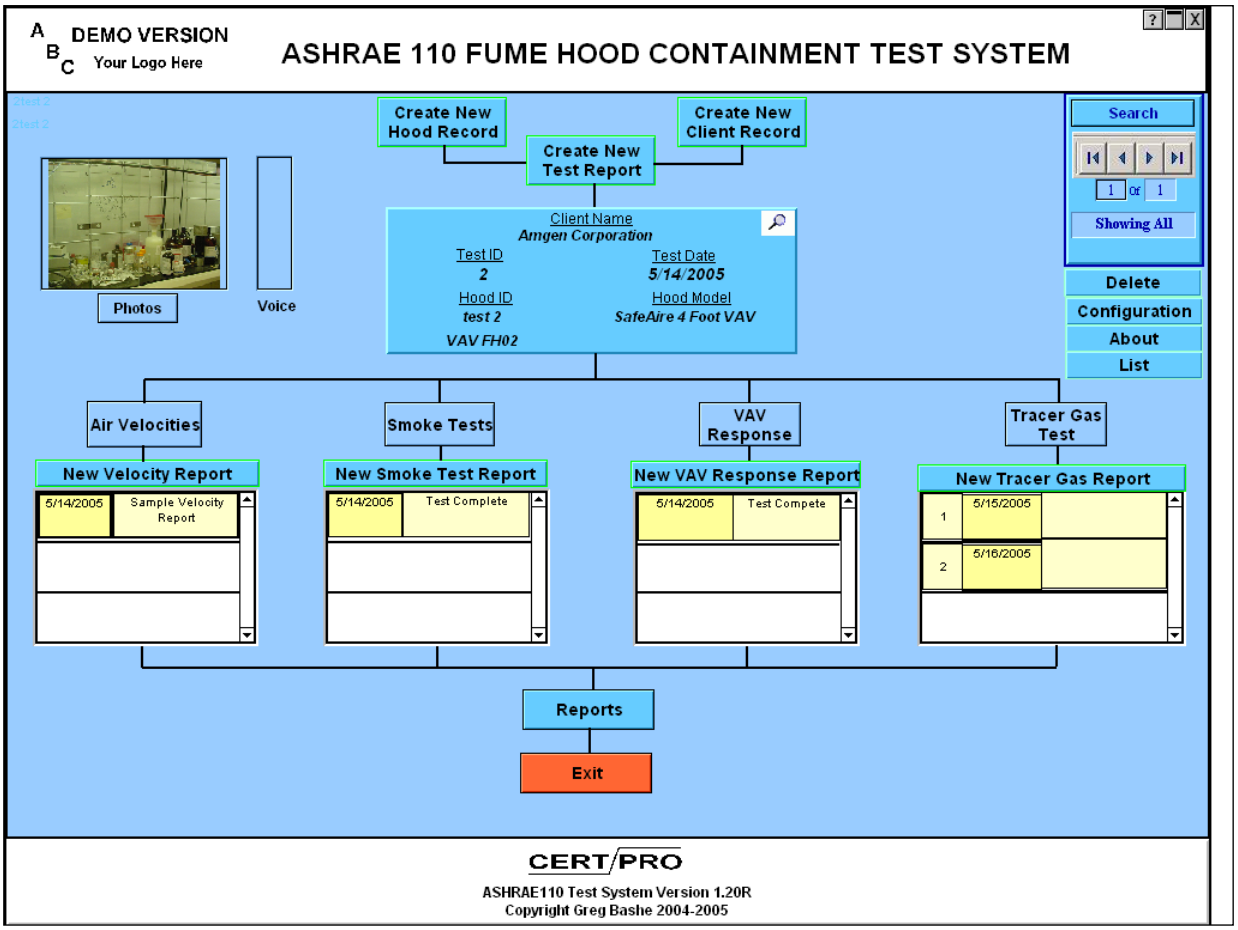


Figure 2 Main Menu Screen

The Main menu Screen (Figure 2 above) is designed as a hierarchical display of the ASHRAE 110 certification process. The certification process starts at the top of the screen with the definition of the client and hood information, defining the test report and then performing each of the test procedures, usually from left to right at the bottom of the screen.

The Main Menu Screen provides overview and progress of the testing as well as single click access to all test procedures.
The ASHRAE testing is intended to be performed in a sequential manner and the software layout is designed to guide the technician through this process. Reports can be generated at any time during the certification process, or after all testing is completed as necessary.

Description of the ASHRAE 110 Data Files

As mentioned above, the Main Menu screen depicts the process and status for each test required by the ASHRAE 110 protocol. The process of performing a certification using the software follows the main menu structure from top to bottom and left to right. The typical sequence to perform an ASHRAE test on a fume hood would follow the following steps:

Create a new Client Record. A client record contains the contact information for the owner of the hood. Once a client record is created, the same client record will be used each time a fume hood is tested for this client.

Create a Hood Template. The fume hood template contains the dimensional and performance specifications for a particular type of fume hood. The items defined in a hood template include sash opening dimensions, airflow control type (CAV or VAV), air velocity requirements, smoke test pass/fail criteria. Once a fume hood template is created for a particular type of hood, that template will be used for every hood tested of that particular hood model. For example, you would create a hood template for a 4 foot Fisher Hamilton VAV fume hood. Every fume hood test performed on this model of hood would use this fume hood template to define the test requirements. The use of a hood template promotes consistent data entry and speeds up the process of defining new ASHRAE 110 test reports. Note that the template values can always be overridden for a particular test.

Once the Client Record and an appropriate hood template exists, you can proceed to create a new test report. The test report contains all the data related to the particular fume hood test and is described below.

The Test Description

The Test Description is a page that is completed which records the actual test requirements and conditions. These requirements include what fume hood is being tested, the certification requirements for this hood, the lead technician who will be responsible for the work, and the calibrated standards (test instruments) and tools that are used for this job. One Test Description is completed for every fume hood tested.

The Test ID

Each Test Description is assigned a Test ID number. This Test ID number is used to identify the current testing performed. The Test ID may be associated with one or more ASHRAE tests. For example, if you have a contract to perform ASHRAE 110 testing of 5 hoods in a new lab project, you would typically use a single Test ID for all 5 fume hood test reports. If subsequently, you were to retest the hoods at a later date, a new Test ID would be used to identify this new test sequence. The Test ID may be associated with any number of fume hood tests but should be used as a unique identifier

The Fume Hood ID

Additionally, each Test Description includes an identification of the fume hood under test. The fume hood ID may be the clients name/number of the hood, a shop order number or a certification tracking number. The fume hood ID may be any combination of letters and numbers but should uniquely identify the hood for each client, i.e., no two hoods belonging to the same client should have the same fume hood ID.

Unique Test Identifier

The ASHRAE110 program will automatically combine the Test ID and Fume Hood ID's to create a unique test identifier. This combination of the Test ID and the fume hood ID will create a unique record number for the Test Description.
All individual tests performed on a fume hood are related back to the Test Description by the Test ID and Fume Hood ID numbers. This file hierarchy allows for multiple tests to be performed under one test ID.
The combination of the Test ID and hood numbers allows the field certifier to use one Test ID number to certify multiple hoods, as one project. This also allows for summary reports by Test ID which will include the results of all hoods tested under the same Test ID.

See Figure 1 below for a graphic description of the file hierarchy.

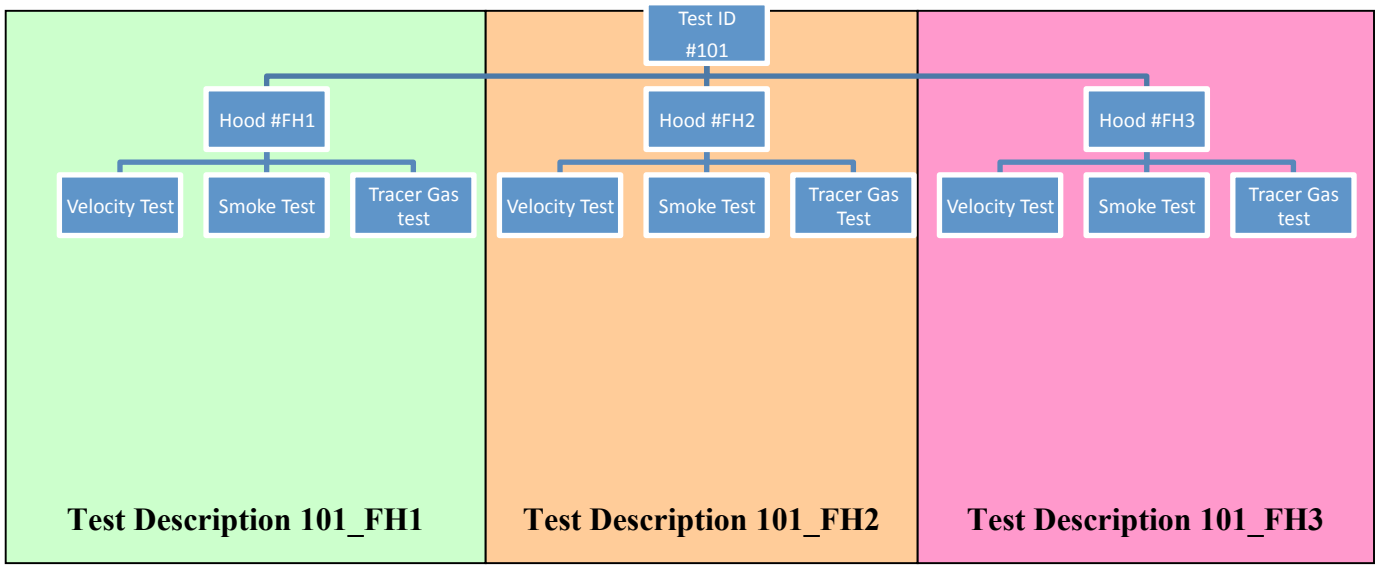


Figure 3. Test ID and Description Hierarchy

In Figure 1 above, the test activity described would be consistent with the certification of three (3) separate fume hoods under one test ID. This is a very common practice for field certifiers where several hoods will be certified under a single contract as part of a project. The use of a common Test ID number (101 in this example) allows for all certification activities to be related to the same project. This will allow the generation of summary test reports for all testing performed under the Test ID #101. The example above will also allow the tracking down to individual fume hoods for each test performed, and an individual test report generated for each fume hood which would include all testing performed for the hood.

In many situations, only one hood may be certified under each Test ID. This would be consistent with a fume hood manufacturer or a fume hood owner who performs all testing in house. The numbering scheme described above will work for this situation equally well.

A clear understanding of the test numbering hierarchy is vital to ensure that the proper numbering of tests is performed. The proper use of the Test ID will determine the ability to perform summary test reports.

Understanding the ASHRAE110 Fume Hood Definitions

The ASHRAE110 program utilizes a fume hood definition database to store all required information relating to a fume hood. The user can select either a brief or full database format when the program is configured. The brief database example is the most common and will be described here.

The use of hood templates is intended as a time saving feature that will also ensure consistent data entry on fume hood information. When creating a fume hood template, the user will enter the information on the following screen:

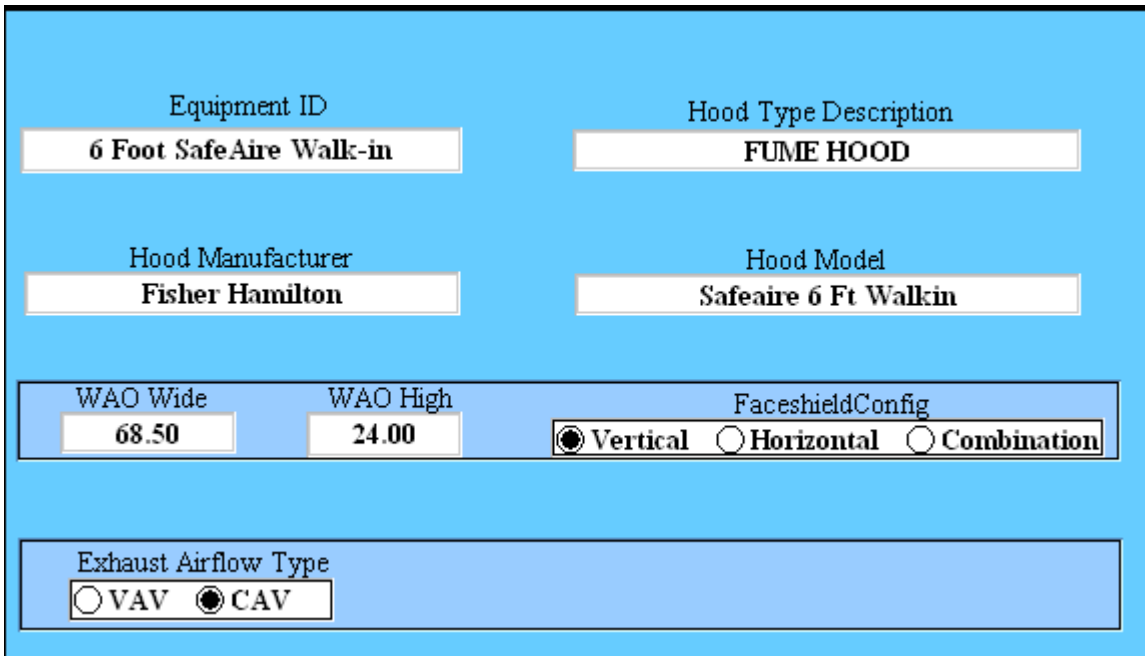


Figure 4. Typical Brief Format Hood Template

Once a template is saved, it will be used to pre-populate the appropriate fields in each Test Description that is created. When you create a new fume hood Test Description, you will enter the template ID and also the client fume hood identifier (See Figure 5). All references to the fume hood on the reports will be to the Client hood identifier. The Fume Hood temp[late is only used to populate the test decription with pertienent fume hood information.

The fume hood template is used to transfer the hood template information at the creation of the test description. When the Test Description is created, the fume hood parameters will be copied to the test description. All parameters can be changed in the Test Description screen. Any changes in the Test Description screen will not affect the fume hood template information.

The use of hood templates is optional. If you decide you do not want to use the hood definition files, you will enter the fume hood information in the Test Description screen each time you create a new test report.

The use of hood templates is strongly recommended to ensure consistent data entry.

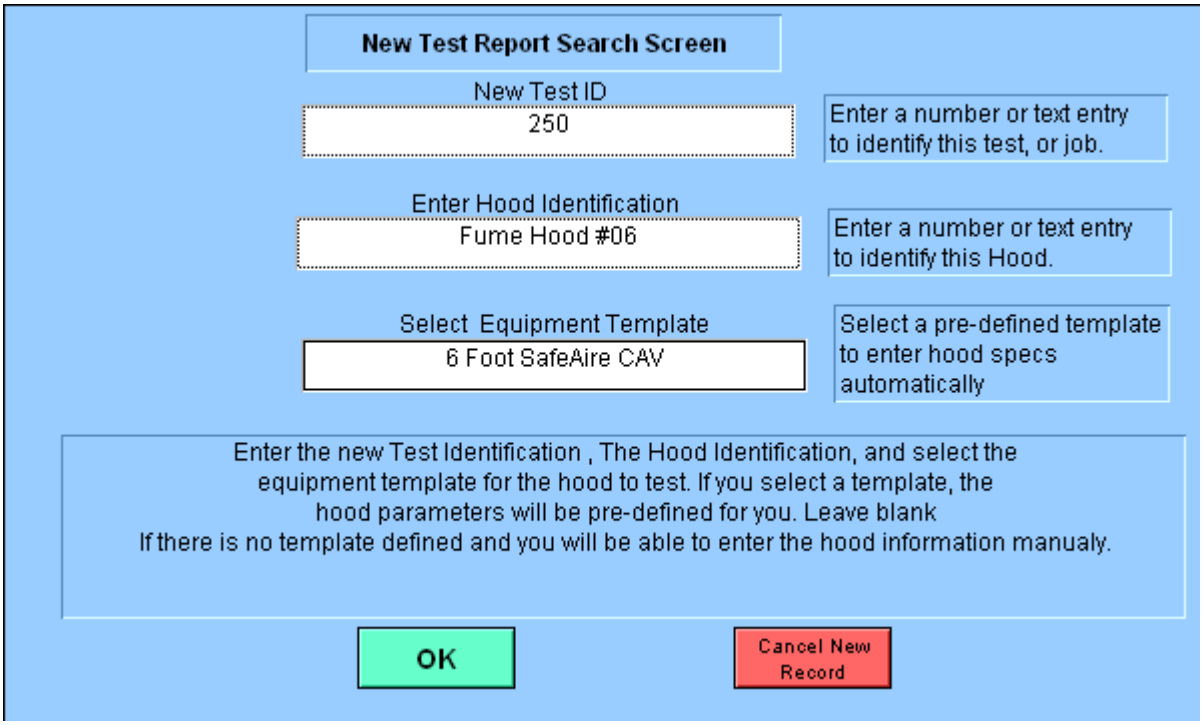
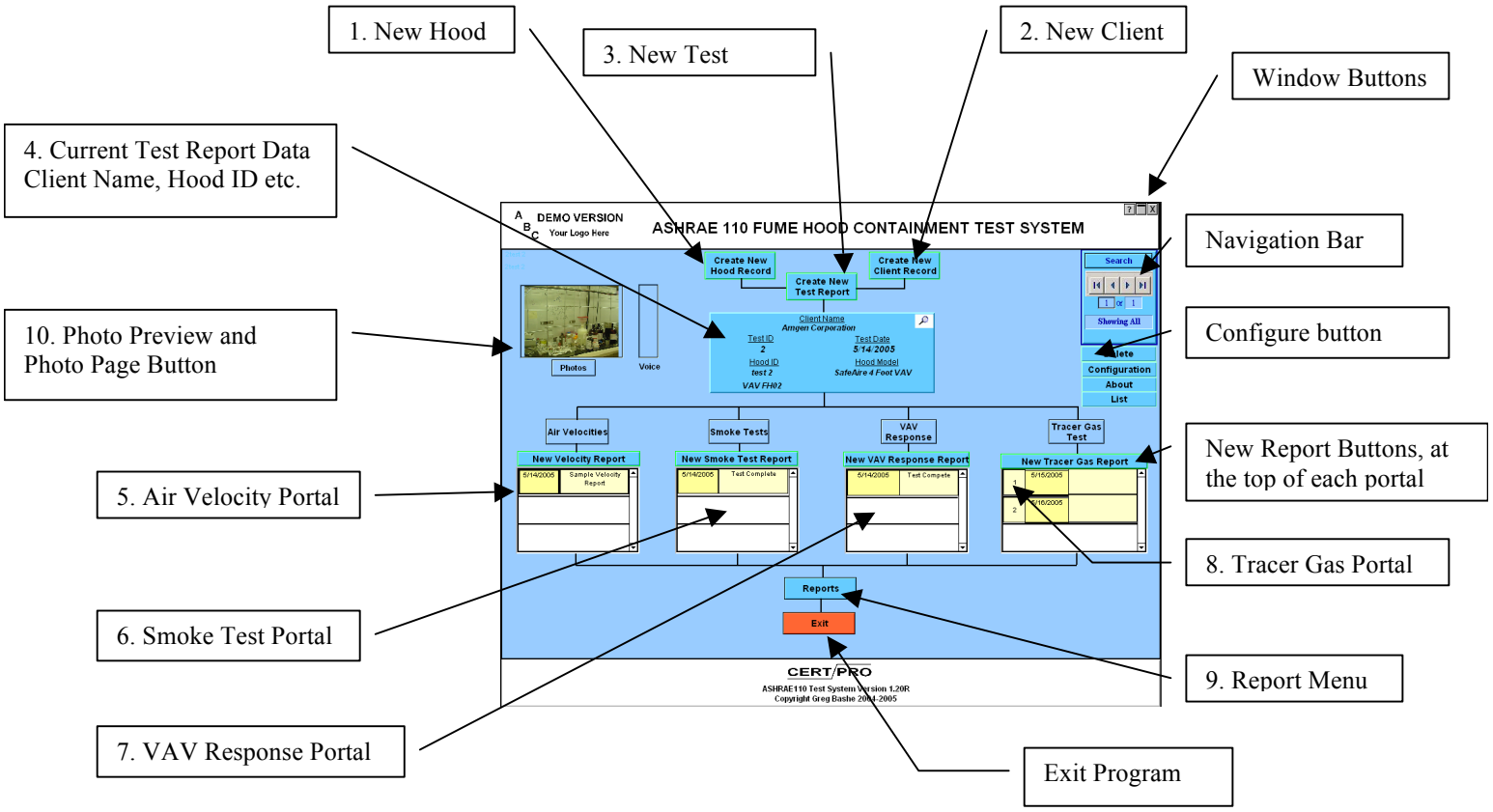


Figure 5. Create New Test Description Screen

The screen above describes the entries required to create a new Test Description. As shown in the help hints at the bottom of the screen, the use of pre-defined fume hood templates is optional. The use of hood templates will save time and ensure consistent descriptions and dimensions are used for fume hoods.

Test Screen Elements

The Test Screen includes many different program elements. Each element, which allows access to a specific part of the program, is identified in Figure 3 below:



The Test Screen elements are numbered in the order in which you would typically select them. Each element is described below:

1. **New Hood Button.** Select the new hood button to define a new fume hood template. The template allows for the storage of all required fume hood descriptors in a database record. The hood template can then be recalled for use during the testing. The hood to be tested must have a template defined before the hood can be tested. For more information on the hood template screen, see section later in this manual.
2. **New Client Button.** Select the new client button to define all client information. The client template allows for the storage of all required client information in a database record. For more information on the client template screen, see section later in this manual.
3. **New Test Button.** Select the new test button to display a screen that will allow you to define all required information about the test to be performed.. For more information on the Test Report screen, see section later in this manual. The hood and client information must be completed before you select this option.

4. **Current Test Data.** This area of the Test Screen displays the pertinent information about the current test definition. This information includes the client name, hood model and ID and test date. Click on the underlined item in this area and the details for that item will be displayed. For example, if you click on Client Name, the client template will be displayed showing all defined information for the currently selected client.

> ***About Portals***
> ***A portal is a section of the screen where multiple related records are displayed. On the Test Screen, there are four (4) portals displayed. Each portal will display all related records for the specified test. For example, the Air Velocity Portal will display a list of all air velocity test reports that were created for the current test. Any number of air velocity reports can be created and will be permanently stored in the database. Clicking on the highlighted date(s) in the portal will display the selected test report.***

5. **Air Velocity Portal.** This area of the Test Screen displays the test date and test comments for all air velocity tests that were performed for the current test report number. Click on the yellow highlighted date field to be taken directly to the selected test report screen.
6. **Smoke Test Portal.** This area of the Test Screen displays the test date and test comments for all smoke tests that were performed for the current test report number.
Click on the yellow highlighted date field to be taken directly to the selected test report screen.
7. **VAV Response Test Portal.** This area of the Test Screen displays the test date and test comments for all VAV Response tests that were performed for the current test report number. Click on the yellow highlighted date field to be taken directly to the selected test report screen.
8. **Tracer Gas Test Portal.** This area of the Test Screen displays the test date and test comments for all Tracer Gas tests that were performed for the current test report number. Note that the tracer gas test portal also has a number field on the left side. This number field is used to allow the order that the gas test report are displayed. Setting a report to number 1 will move that report to the top of the list. Click on the yellow highlighted date field to be taken directly to the selected test report screen.

> ***The top listed tracer gas test is what is reported in the Combined Test Report. Use the number field in the tracer gas test portal to select the desired tracer gas data for the combined report. Setting the***

9. **Reports Menu.** Click on the Report button to view the reports menu screen. This screen allows for the generation of various test reports.
10. **Photo Preview.** The photo Preview area shows the current photo#1. Click on the Photo button below the photo preview area to view the digital photo screen. The photo screen allows for the storage of up to four photos or bitmap images. The photos stored are related to the current work order and are intended to allow for the documentation of test conditions, attachment of floor plan sketches, etc. Any Windows compatible bitmap image may be attached to any of the four available photo fields. Additionally, you may attach up to 30 seconds of voice recording to any of the photo fields (in lieu of a photo) if your computer is equipped with a microphone for input.

Navigating the ASHRAE110 Test Screens

The test screens in the ASHRAE110 program have been designed to give the user a consistent look and feel. Most screens have the same style menu buttons to allow the user to become familiar with the use in the shortest possible time. While the menu buttons will vary in function depending on what screen you are viewing, wherever applicable, the menu selections will be in the same location.

Wherever it is possible, text data entry fields are equipped with pull down lists to allow the use of consistent values. Most of these pull down lists are either updated from the applicable fields in related databases or are supplied with pre-populated values that can be edited to fit the users' particular requirements. The use of consistent values in text fields are important to allow future search capabilities.

Take a moment now to navigate to the different test screens by clicking on the date field in the test report portals. Clicking on the dates of each test will display that particular test. To return to the Test Screen, click on the Test Menu button which will be at the top of each of the test report menu bars.

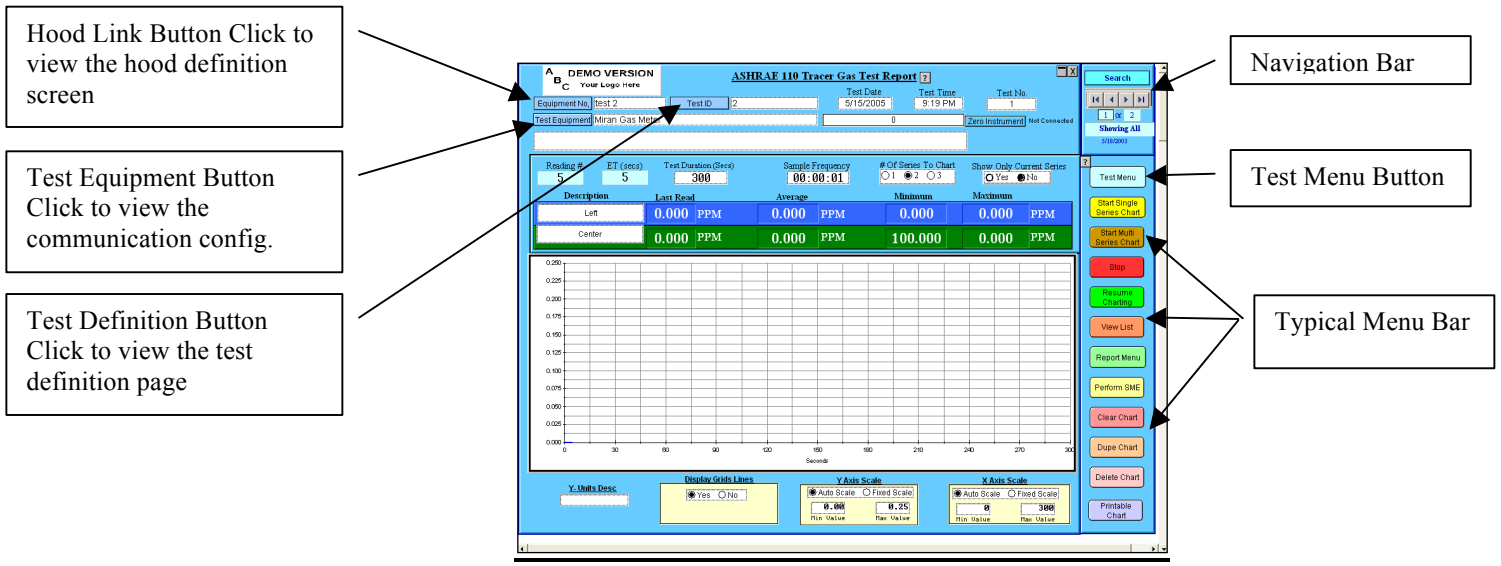


Figure 6. Typical Test Screen - Navigation Points

Configuration Screen

The configuration screen provides for customization of how the program functions, and certain default values to make creation of test setups simpler and more consistant. The configuration screen will display two separate tab based dialog boxes for access to the configuration settings. The top tabbed dialog contains the default program configurations. The lower tabbed dialog contains the air velocity configurations. Select the Configuration button from the Test Menu to access the Configuration screen, as shown below:.

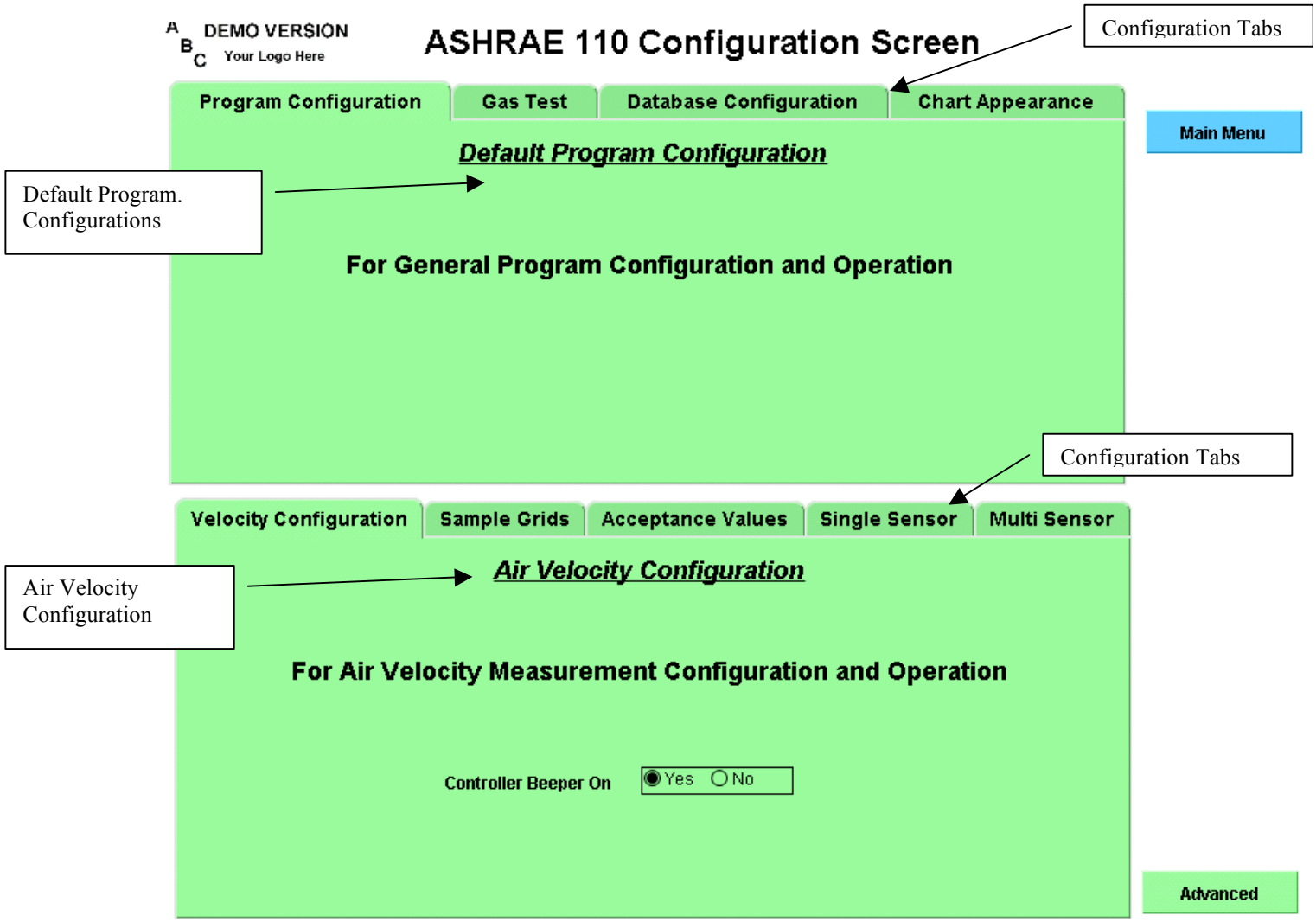


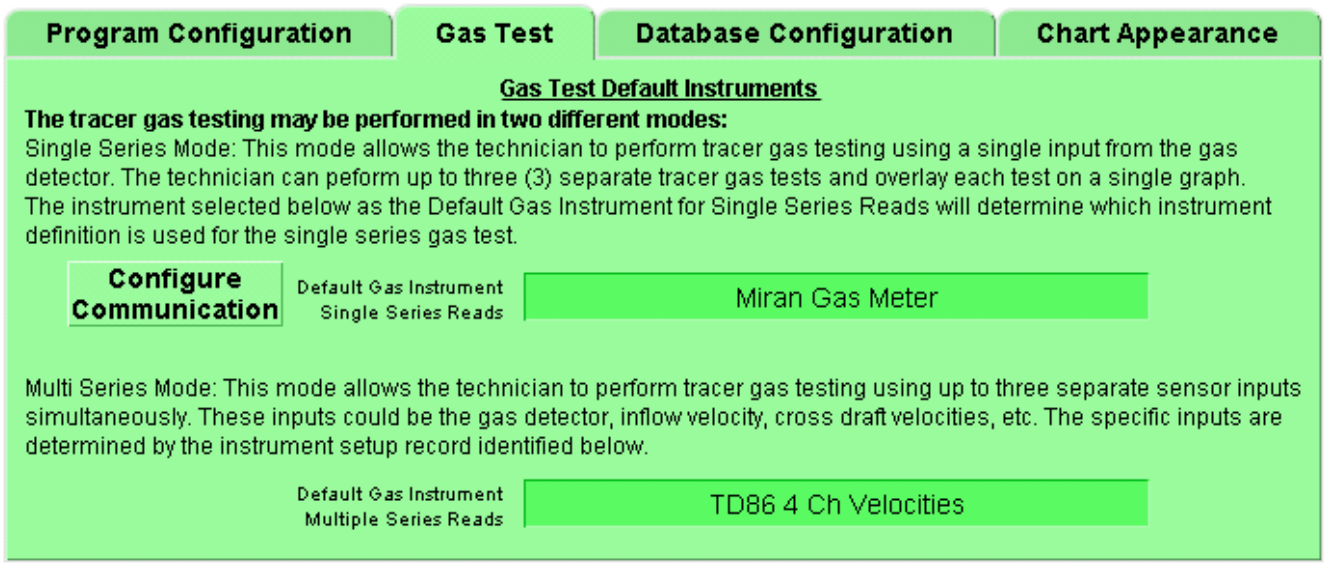
Figure 7. The Configuration Screen

Advanced Menu Button.

The Advanced menu button provides access to advanced configuration options which are not available to users with general access levels. Selecting this menu item will display a dialog box indicating that access is not allowed to this section of the program.

Gas Test Configuration

Click on the Gas Test Configuration tab to display the gas test program defaults. The Gas Test Default Instruments are displayed in this screen. The default instruments defined are the instruments that will be selected whenever a new gas test is started. As described in the configuration screen below, the type of instrument configuration that is selected upon start of a gas test is determined by the test mode selected. See the Tracer Gas section in this manual for further information on the gas test modes. The instrument configurations are presented by means of a pull down menu. Clicking on the name of the default instrument will display a pull down menu with the names of all currently defined instruments which are available for selection. Additional instruments can be defined from the communication configuration screen. See the Communication Configuration section in this manual for further information on defining additional test instruments.



Database Configuration

The database Configuration tab allows the user to select the type of database configuration to use. The selection of the database configuration will be based on the intended use of the system.

The selection of brief or expanded database definitions depends on how you plan to use the program. Selecting the Brief configuration will allow you to enter less information about customers and hoods. Using the brief database will allow you to assign all test data to a particular hood but you will not be able to track certification history by a specific hood

The brief database format allows for quick setup and testing of fume hoods. Where you wish to assign the defined hoods to specific customers, or need to have different test acceptance criteria for hoods, you should not use the brief database definitions. If you are a field certifier, or hood manufacturer and ASHRAE testing the same hood on a one time or infrequent basis then you should select the brief database option. If you are a hood owner, then you would want to take advantage of the expanded database definitions.

Repair Database
The Reapair Database button will allow a user to repair a corrupted database. A database can become corrupted in the computer is turned off at a time when the database is being accessed. Selection of the repair database will general repair this damage and recover all previously stored data. Care should be taken to always turn the computer off using the standard Windows shut down sequence.

Convert Files
The Convert Files button will convert older ASHRAE database files to the new database configuration. Clicking on the onvert Files button will display a file open dialog box allowing the user to select older ASHRAE files for conversion. This is only necessary for users who are upgrading from version 1.20 or earlier programs.

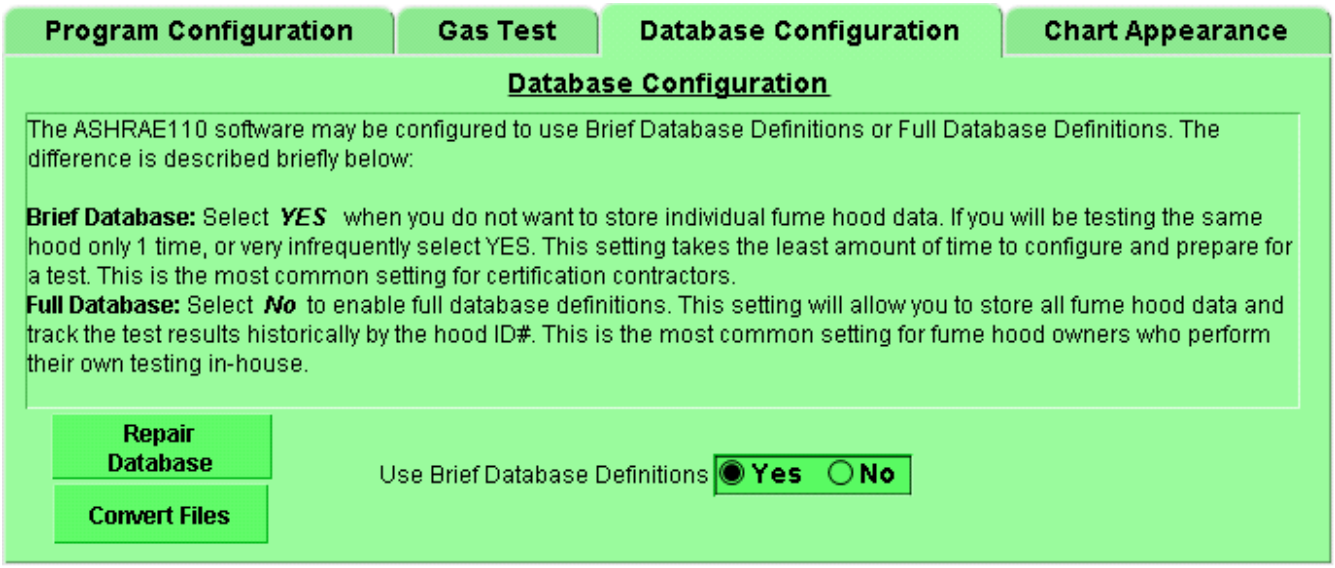


Chart Appearance Configuration

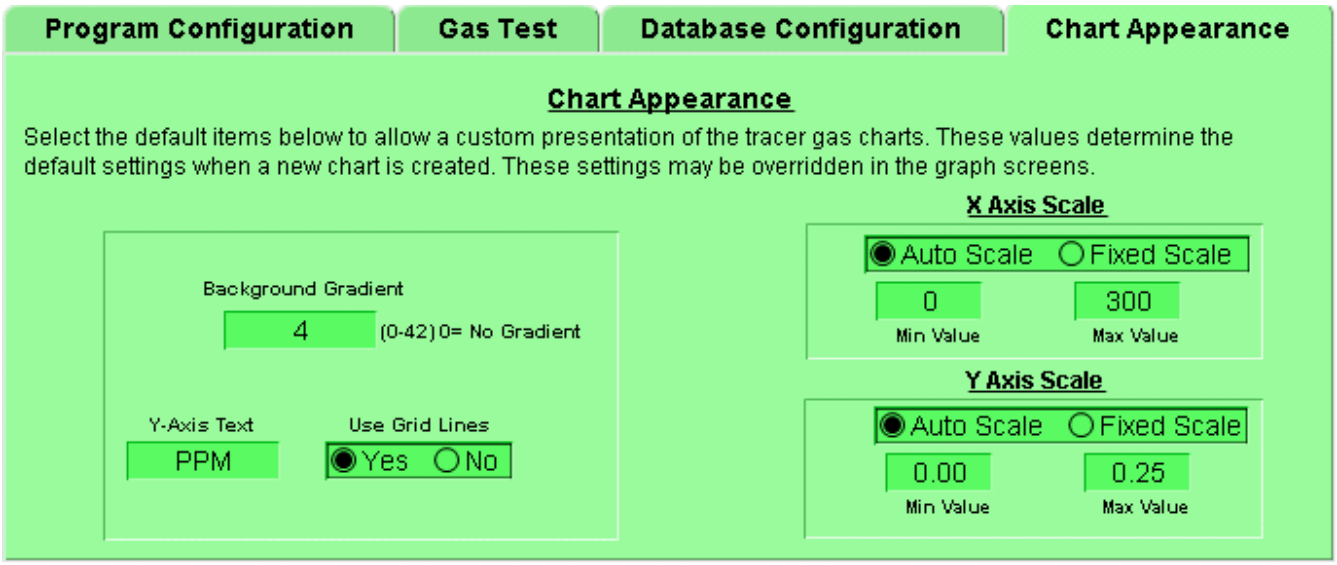
The Chart Appearance configuration tab displays the default values which control how a tracer gas chart is displayed. He following configuration items are available;

Background Gradient. The background gradient controls the color of the chart background. Selection of 0 will display no background color. This option is cosmetic only. The background gradient can be changed in the tracer gas test screen at any time to allow changing of chart appearance after the chart has been created. When changing the background gradient on a chart that has already been drawn, clicking on any button which forces a redraw will display the currently selected gradient.

Y-Axis Text. This field allows the user to define the Y axis text displayed on the tracer gas chart. Typically this value will be PPM (Parts Per Million) but can be set to any desired description. The Y-Axis text can be changed in the tracer gas test screen at any time to allow changing of chart appearance after the chart has been created. When changing the Y-Axis text on a chart that has already been drawn, clicking on any button which forces a redraw will display the currently selected gradient. The Y-Axis text will apply to all series of the current chart.

Use Grid Lines. This field allows the user to select the use of grid lines in the tracer gas chart. This is a cosmetic selection only. The grid line setting can be changed in the tracer gas test screen at any time to

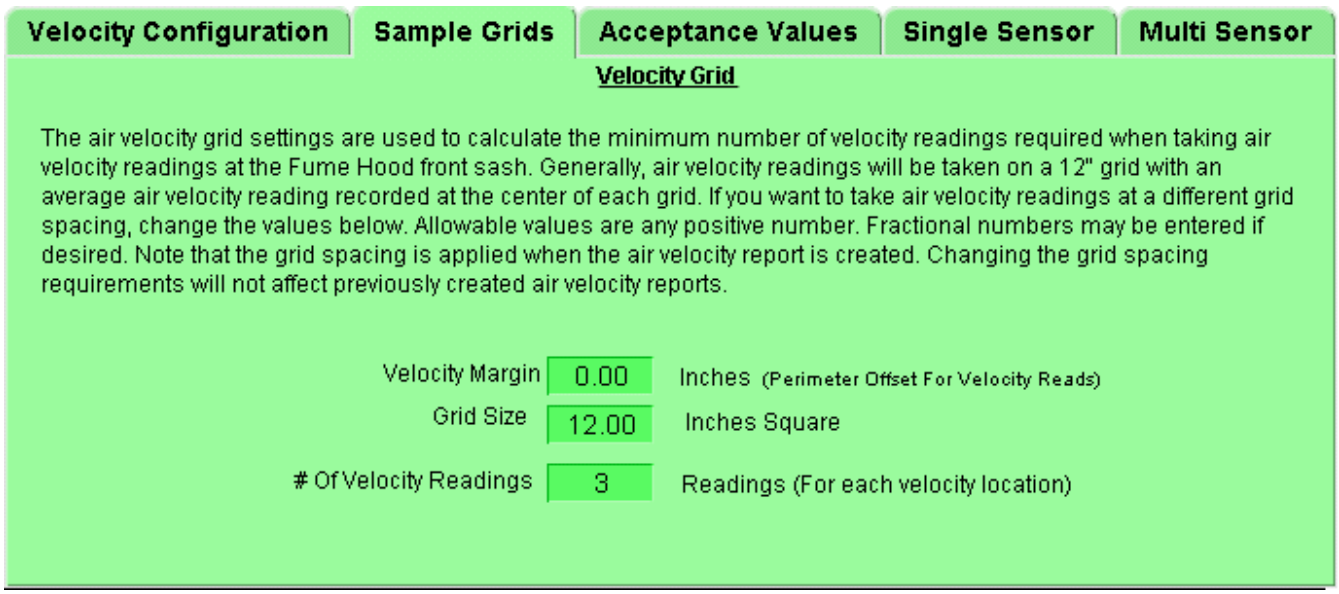
allow changing of chart appearance after the chart has been created. When changing this selection on a chart that has already been drawn, clicking on any button which forces a redraw will display the currently selected gradient. The grid line setting will apply to all charts printed or displayed.
X-Axis and Y-Axis Scales. These fields define the default values for the tracer gas chart scaling. See the gas chart section of this manual for further information on this feature. The chart scaling can be changed in the tracer gas test screen at any time to allow changing of chart appearance after the chart has been created. When changing the scaling on a chart that has already been drawn, clicking on any button which forces a redraw will display the currently selected gradient. The scaling will apply to all series of the current chart.



Air Velocity Configuration

Velocity Grids

The Velocity Grid configuration setting defines the test grid pattern to be used when performing an inflow air velocity test. These settings will determine how many inflow air velocity readings will be required and printed on the air velocity raw data report.
Velocity Margin. The margin is used to define any margin, which should be excluded from the inflow area when performing an air velocity test. This setting may be set to a value greater than zero if using a Velgrid type instrument which should be positioned 1.5" from the perimeter of the edges of the opening. A zero setting is typical when using a single point air velocity meter.
Grid Size. The Grid Size is used to define the grid spacing to be used when performing an air velocity test. This setting may be set to any numeric value. 12 inches is the typical industry standard value.
 # Of Velocity Readings. This field is used to define how many individual air velocity readings will be taken at each inflow velocity test point. The average of the readings taken at each point will be recorded and displayed on the raw data report. Typical value for this configuration is 5 based on the ASHRAE 110 standard. Any numeric value may be entered here.



Velocity Acceptance Values

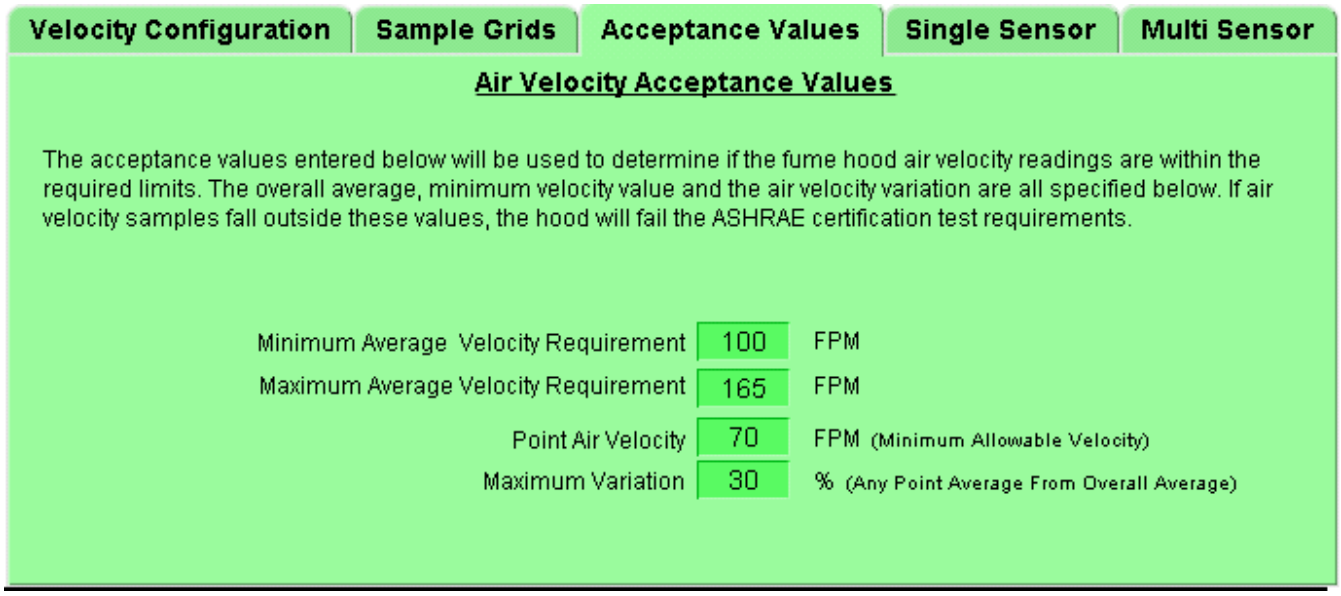
The Velocity Accetance Values are used to determine the Pass or Fail status of an inflow velocity test.

Minimum Average Velocity Requirement. This is the minimum average velocity acceptance criteria. Any air velocity test which has an overall average air velocity less than this value will be indicated as a Fail on the air velocity test report.

Maximum Average Velocity Requirement. This is the maximum average velocity acceptance criteria. Any air velocity test which has an overall average air velocity greater than this value will be indicated as a Fail on the air velocity test report.

Point Air Velocity Requirement. This is the minimum air velocity acceptance criteria for any individual average air velocity reading. Any individual air velocity location which has an average air velocity less than this value will be indicated as a Fail on the air velocity test report.

Maximum Air Velocity Variation. This is the maximum air velocity variation acceptance criteria. The air velocity variation is determined by comparing the lowest individual and highest individual air velocity averages to the overall air velocity average. Any air velocity test which has an individual average air velocity which varies by more than this valueto the overall average air velocity will be indicated as a Fail on the air velocity test report.



Single Sensor Velocity

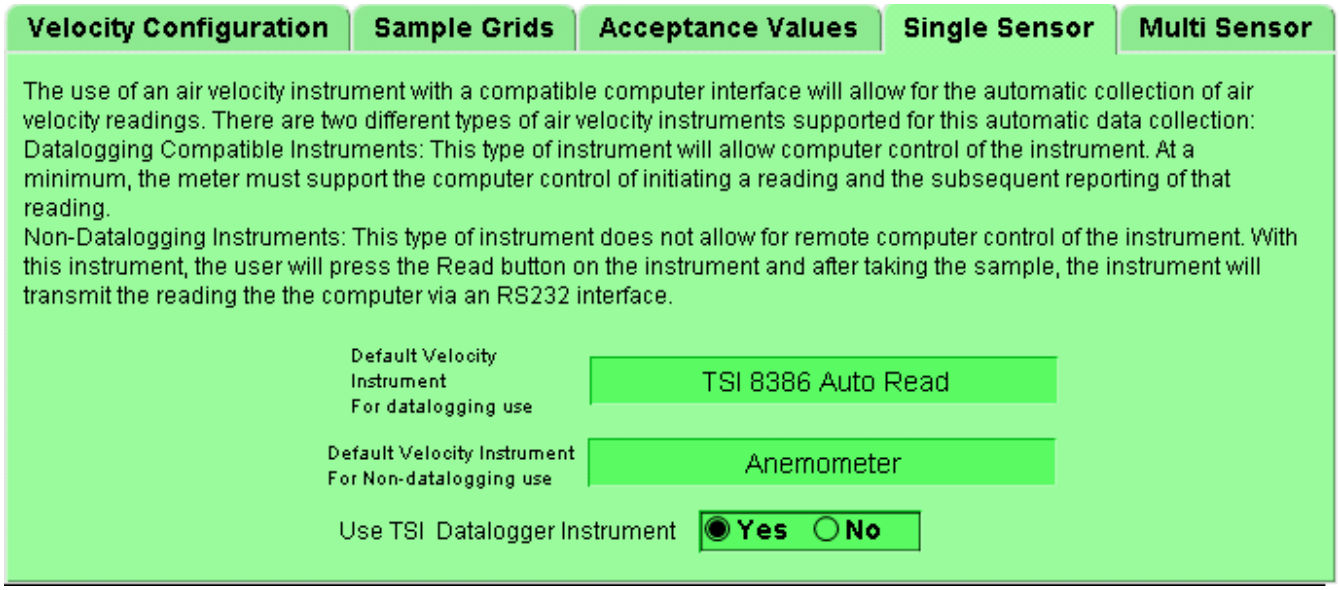
The single air velocity configuration defines the air velocity instrument which will be used to collect air velocities. The configuration defines the instrument data logging capabilities and instrument communication setup. These configuration settings only apply where air velocities will be captured directly to the program. If the user chooses to enter the air velocity values from the keyboard, these values will not apply.

Default Instrument for Datalogging. The instrument identified here will be the instrument configuration which will be used when the technician chooses to collect air velocity from an anemometer directly to the program (no keyboard entry of air velocities required) and the Use Datalogger option is set to YES in the air velocity test screen.

Datalogging instruments are those instruments which allow the computer to send read commands directly to the air velocity meter. This capability allows the ASHRAE program to initiate samples and collect the results with no user interaction.

Default Instrument for Non-Datalogging. The instrument identified here will be the instrument configuration which will be used when the technician chooses to collect air velocity from an anemometer directly to the program (no keyboard entry of air velocities required) and the Use Datalogger option is set to NO in the air velocity test screen. This selection will require the technician to press the Store button on the air velocity to initiate each air velocity reading. The ASHRAE program will collect the air velocity reading directly from the anemometer and enter the result directly into the air velocity test report.

Use TSI Datalogger. Selecting YES for this setting will set the datalogger option in the air velocity test screen to yes each time a new air velocity report is created. This setting can be overridden by the technician in the air velocity test screen.

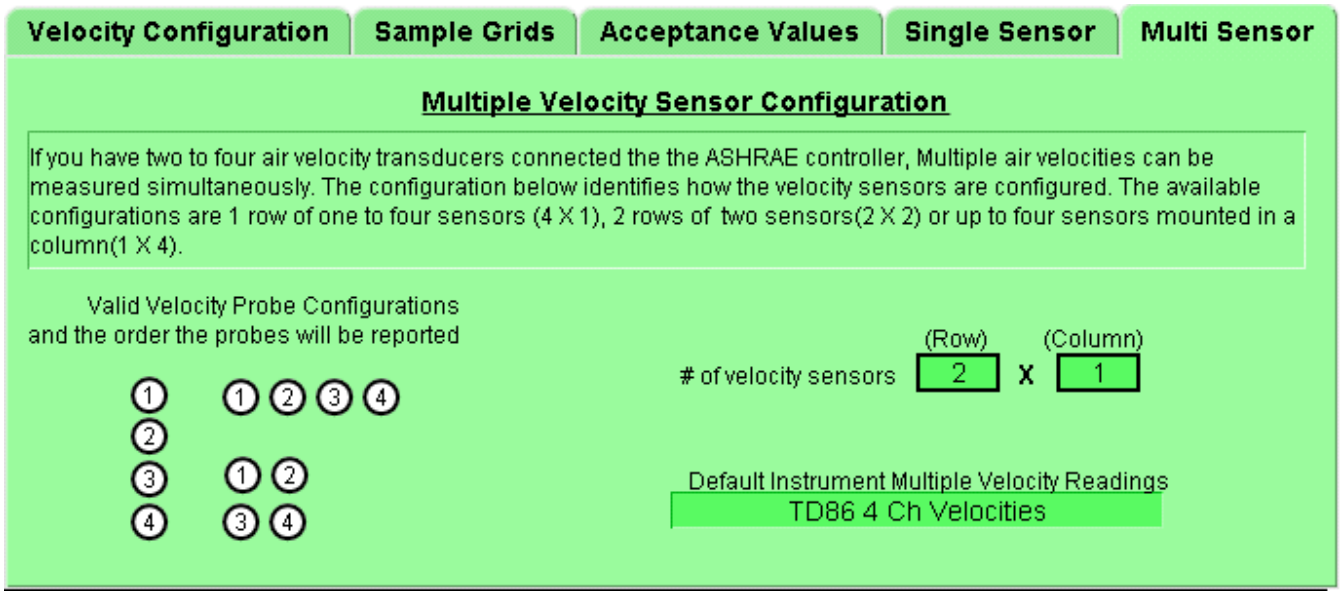


Multi Sensor Velocity

The Multi Sensor configuration screen specifies how a multi point air velocity sensor will be used. A multi point air velocity probe is a probe which contains two or more air velocity transducers simultaneously. The configuration of a multi point air velocity probe can be specified in the following configuration:

Row x Column. The Row and Column settings define how the velocity probes are oriented. The white circles indicate the available configurations. The optons are 2 to 4 probes mounted vertical, 2 to probes mounted horizontal or a grid of 4 probes mounted as shown. All orientations are relative to the sash opening. When collecting multipoint air velocities, each probe reading will be associated with one grid coordinate. For example, if a 2 x 2 probe is used, the four air velocity readings will be recorded based on 4 individual sample locations simultaneously. Therefore, if a 12" grid was defined, the example above would collect and assign four air velocity point readings on a 24" x 24" area. All readings will be automatically entered into the air velocity test report.

Default Instrument for Non-Datalogging. The instrument identified here will be the instrument configuration which will be used when the technician chooses to collect air velocity from a multi point anemometer directly to the program (no keyboard entry of air velocities required). This test is initiated by clicking on the Collect Multi Velocities menu button in the air velocity screen.



Use Brief Database Definitions:

The selection of brief or expanded database definitions depends on how you plan to use the program. Selecting the Brief configuration will allow you to enter less information about customers and hoods. Using the brief database will allow you to assign all test data to a particular hood but you will not be able to track certification history by a specific hood

The brief database format allows for quick setup and testing of fume hoods. Where you wish to assign the defined hoods to specific customers, or need to have different test acceptance criteria for hoods, you should not use the brief database definitions. If you are a field certifier, or hood manufacturer and ASHRAE testing the same hood on a one time or infrequent basis then you should select the brief database option. If you are a hood owner, then you would want to take advantage of the expanded database definitions.

Air Velocity Configuration:

The air velocity configuration allows the user to define certain aspects of how the air velocity collection functions during the automatic collection of air velocities.

Configuration Screen
(Cont'd)

# of Velocity Readings. This item allows the definition of how many air velocity readings will be taken at each velocity sample location. The ASHRAE110 standard currently requires a minimum of four (4) air velocity samples at each location. You can configure this value to any number between 1 and 99. When configured for greater than 1, the program will collect the configured number of velocity readings and each sample point. After the configured number of samples is collected, the program will calculate the average velocity and input it automatically in the current velocity position.

Velocity Margin. This item allows the definition of the margin that will be applied to the velocity sampling plan. When using a single point air velocity meter, you should set this value to 0 (providing that you sample grid is at least 4"). If you are using a Velgrid instrument, this value should be set to 2. The velocity margin is used by the program to determine how many sample sites are required for a specific fume hood work area opening. *The margin is the starting point for the outside of the sample grid.*

Velocity Grid. This item allows the definition of the air velocity grid that will be used by the program to determine how many sample sites are required for a specific fume hood work area opening. The typical value for this grid is 12 (samples for every 12 inches of fume hood work area opening). This value can be any number from 1 to 99.

Velocity Min. This item allows the definition of the minimum average air velocity value to pass the velocity test. This value is typically set to 100 but may be set to any value from 1 to 999. When an air velocity average falls below this setting, the air velocity report will automatically display a FAIL result.

Velocity Max. This item allows the definition of the maximum average air velocity value to pass the velocity test. This value is typically set to 165 but may be set to any value from 1 to 999. When an air velocity average falls above this setting, the air velocity report will automatically display a FAIL result.

Point Air Velocity. This item allows the definition of the minimum single point average air velocity value to pass the velocity test. This value is typically set to 70 but may be set to any value from 1 to 999. When a single location average air velocity falls below this setting, the air velocity report will automatically display a FAIL result.

Maximum Variation. This item allows the definition of the maximum air velocity variation value to pass the velocity test. This value is typically set to 20 but may be set to any value from 1 to 999. When a single location average air velocity varies by more than this setting, the air velocity report will automatically display a FAIL result.

Configuration Screen
(Cont'd)

Use TSI Datalogger. This item allows you to define if you are using a TSI brand air velocity meter with datalogging capabilities. If the instrument supports datalogging, the program will automatically poll the velocity meter for each air velocity reading. If you select No for this item, the program will wait for the technician to press the Store button to transmit the velocity reading to the program. The use of a datalogger compatible instrument is highly recommended. This will allow hands free collection of the velocity and will prevent any probe movements that may occur when pressing the store button. In addition, when you have a datalogger capable instrument, the ASHRAE110 program can use this instrument to collect and chart the velocity, temperature and humidity during the tracer gas testing.

Data Collection Instrument Configuration:

When the ASHRAE110 program needs to collect data from external instruments (air velocity, tracer gas readings, temperature, etc) the program will send commands to the ASHRAE controller for the values from these instruments. The command sent to the controller will determine what data is sent back to the program.

In order to simplify the configuration and selection of instrument set-ups, the configuration screen allows the user to define the default configuration to be used during certain standard tests. The settings described below are all standard configurations which will require no further configuration. If you wish to configure a different set-up refer to the Communication Configuration description later in this manual.

The default instrument configurations that are pre-configured should satisfy most users requirements.

Default Gas Instrument, Multiple Series Reads.

During a tracer gas test, the user may select to perform a multi-series chart. During a multi-series test, the program will simultaneously collect data from up to 3 separate instruments and chart all three values, in real time, on one chart. For example, the user may wish to collect inflow air velocity, room temperature and the tracer gas readings all on one chart to perform some diagnostics work. The default instrument definitions determine what data the program will collect. The default configuration for a multi-series chart is set to ***Gas Velocity and Temp using TSI 8368.*** This setup will collect the analog input from the gas meter and poll the TSI instrument for the air velocity and temperature reading. All three of these values will be charted in real time. Note that the default configuration is scaled for a Miran Sapphire instrument. If you will be using the Qualicheck Q200, you will need to change the scaling value in the communication configuration screen. The Q200 scaling should be set to 1.0 and the Non-Linear checkbox checked in the communication configuration screen Refer to the Communication Configuration section of this manual.

Default Gas Instrument, Single Series Reads.

The standard gas test for ASHRAE110 testing will collect the signal from the gas detector and plot this value on a chart. The technician will perform this single series test at three separate locations (Left, Center, Right). All three of these tests will be charted on

Configuration Screen

(Cont'd)

one report for ease of comparison. When you select the single series test, the instrument configured here will be used for the source of the data signal. The default configuration is set to ***Miran Gas Meter.*** If you are using a Miran Sapphire meter, you will not need to change this configuration. If you are using the Leak Meter Q200, there is a predefined template for that instrument. Simply click on the text box and a list of configurations will be displayed. Select the appropriate instrument (usually Miran or QualiCheck Q200).

Default Velocity Instrument for Non-Datalogging Use.

If you do not use a datalogging instrument for collection of the air velocity values. This instrument will be selected for use. This configuration will work with any TSI air velocity meter with an RS232 interface. If you are using a TSI meter, you will not need to change this setting.

Default Velocity Instrument for Datalogging Use.

If you will be using a datalogging instrument for collection of the air velocity values, this configuration will be selected for use. This default configuration setting ***TSI 8386 Auto Read*** will work with any TSI air velocity meter that has datalogging capabilities (ability to be polled by a computer). If you plan on using a different instrument, refer to the Communication Configuration section of this manual.

Configuration Screen Menu Buttons

The following menu buttons are on the bottom right part of the configuration screen:

Configure Communication

Clicking on this button will display the communication configuration screen. This screen is used to change the communication protocols, scaling and parsing functions of the program. **Use Caution** when entering this screen, changing these values could change or disable the proper operation of the program. Once a change is made in this screen, it cannot be undone, you will need to re-enter the correct values manually. Before making any changes, write down the original values that you will be changing.

The factory default communication settings are listed in the Configure Communication section of this

Import Test Defs

Clicking on this button will display the import file dialog box. This function will allow for the importation of ASHRAE110 data files from a previous version of the program.

Configuration Screen

(Cont'd)

Repair Database

Clicking on this button will display the repair file dialog box. This function will allow for recovery of damaged databases due to the improper shutdown of the computer.

Care must be taken to exit the ASHRAE110 program prior to shutting off the computer. Failure to do so may damage the structure of the database file(s). This menu item will attempt to repair the damage. See the troubleshooting section in this manual for further information on recovering databases.

Test Screen

Clicking on this button will return you to the main test screen.

Create a New Client

Client definition overview

The ASHRAE110 program allows the user to define certain information about a client. This information is used to track activities that are performed for the defined client(s). Depending on the specific use of the program, the user may want to configure the program to use Brief databases, or Full databases. (See the Configuration Screen section of this manual to learn how to select this configuration).

If you are using the brief database, an abbreviated version of the client database will be used. If you select the full database, a more comprehensive client record is stored, including assigning hoods to a specific client and the ability to store billing information and additional contact names. See the table 1 below for a feature comparison of the two databases.

Note: selection of brief databases will also require you to use the brief hood definition files. The use of full database definitions requires that all hoods be assigned to specific clients.

Feature	Available in Brief database format	Available in Full database format
Type of addresses that can be stored	Shipping address only	Billing and shipping addresses
Track all client owned hoods	NO	YES
Track all testing done for client	YES	YES
# of contacts	1	3
Fume hood test criteria	Same specs Apply to all hoods	Individually assigned
# of clients that can be defined	Unlimited	Unlimited

Table 1. Feature comparison for database models

Creating a New Client Record

When you click on the Create New Client button, a dialog box will be displayed requesting the new Client name. The program will then search the client database to ensure that a client with the same name has not previously been defined. If the client name is unique from all other names defined in the database, the client entry screen will appear.

Fill in all desired information in the client screen. After completing the client information, click on the Test Menu button to return to the test menu screen.

Once a client has been defined, test reports can be assigned to the customer and test reports will generate with the customer information.

Additionally, if you are using the Full database definitions, you will also be able to assign fume hood definitions to the specific client who owns the hood. This is useful if you plan on performing certification of these hoods on a routine basis. As you perform testing on

Create a New Client
(Cont'd)

client owned hoods, a history will be built and you will be able to search for test results based on specific hoods.

If you are using the Brief database file format, you will define fume hood templates. These templates are not assigned to a specific client. A template allows the user to define a limited number of hoods and apply the test information from the template to any number of hoods. This results in much less data entry and smaller databases. All hoods tested using the brief database format are stored and fully retrievable. The main use of the full database format is for use by clients who perform their own in house testing and wish to track the hood performance over many years. Certification agencies and fume hood manufacturers will typically use the brief database format.

Create a New Hood Record

Creating a New Hood Record

When you click on the Create New Hood Record button, a dialog box will be displayed requesting the new Hood identification. The program will then search the equipment database to ensure that a hood with the same identification has not previously been defined. If the hood ID is unique from all other hoods defined in the database, the hood entry screen will appear. As you can see from the screen shots below, the brief hood description contains much less information to enter. The Brief hood definition is a template that defines only the information required to perform the testing. All other hood identification information such as client hood ID number, room and building location and the client name are defined in the test description page described later in this manual. The concept behind the brief database files is to allow the software user to define a very small number of hood templates. These templates will be used for all hoods of the same model that are tested. For example, you would define a four foot VAV fume hood, a 4 foot CAV fume hood etc. Additionally, when using the brief databases, the velocity grid and performance specifications which are defined in the configuration menu are applied to all fume hoods tested. When using the full database definitions, you can assign specific test criteria to every hood individually. See the figures below for examples of both fume hood definitions.

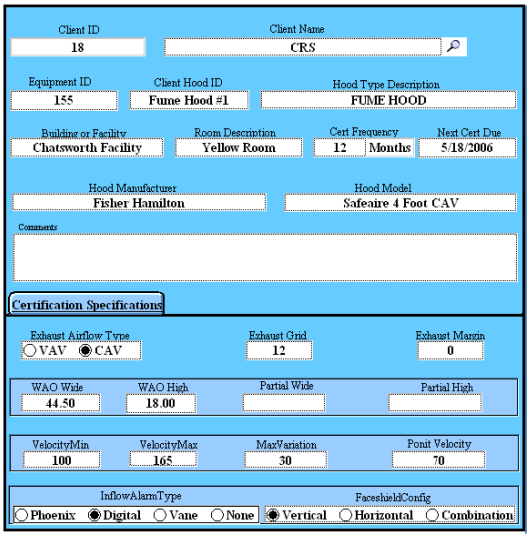


Figure 8. Full Hood Definition

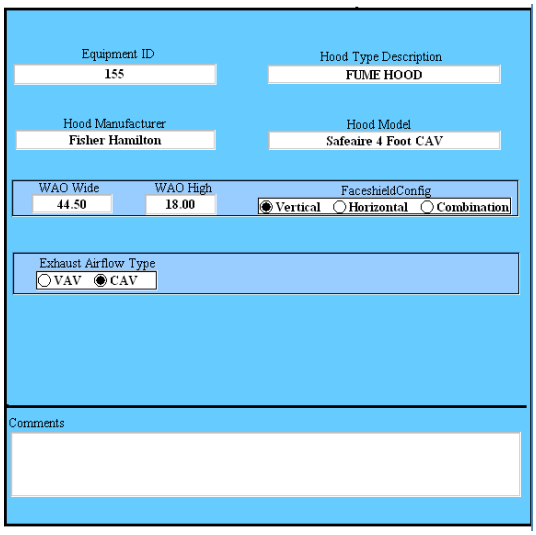


Figure 9. Brief Hood Definition

Create a New Test Description

Defining a Test Description

Test description records are used to define all the required information for a specific test. In order to reduce the time needed to fill out the test description, pre-defined fields or pull down lists are used wherever possible. See Figure 8 below for a screen shot of the test definition page.

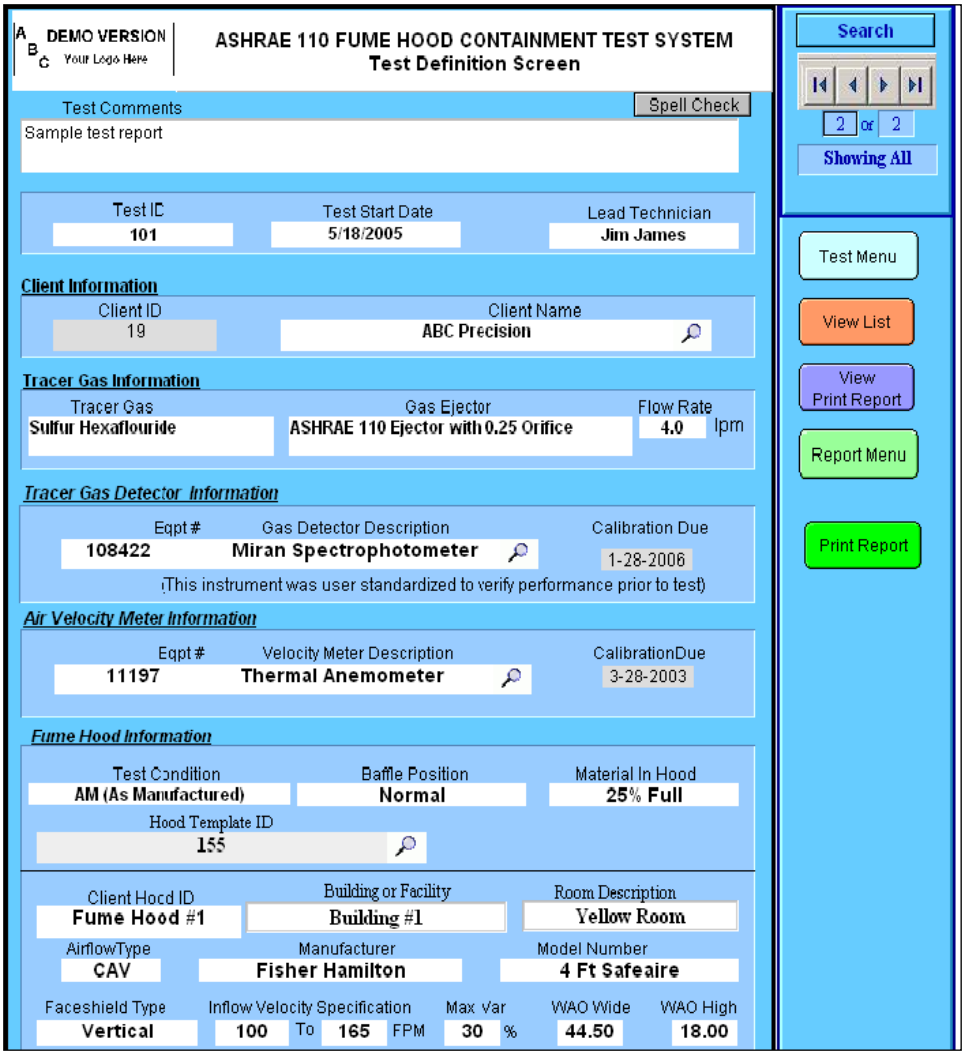


Figure 10. Test Definition Screen

As you can see from the screen shot above, all test information relating to the entire ASHRAE test is stored in the test definition page. This includes all test instruments used during the test, the lead technician, the client name and the specific information about the fume hood under test.

Clicking on the symbol will take you to the database record where the information is stored for each separate area (fume hood definition, client definition, test instrument records, etc)

ASHRAE110 Software

Section 2.0

Data Collection And Test Reports

Accessing The Test Screens

Introduction

The test screens in the ASHRAE110 program are where all testing is initiated and the test results are stored. The program as delivered to you should contain at least one sample record with test screens already populated to assist in demonstrating how the system works.

Using Portals To View/Create Reports

Each portal will display all the test reports that have been created for the currently selected test description. Each report will be displayed on one line of the portal as the test report date and the test report comments.
Access to the test screens is gained by clicking on the date of the existing report, to view a previously created report, or by clicking on the new report button which is directly above the portal. See figure 6 below for a view of the velocity test portal. All portals work identical to the air velocity portal.

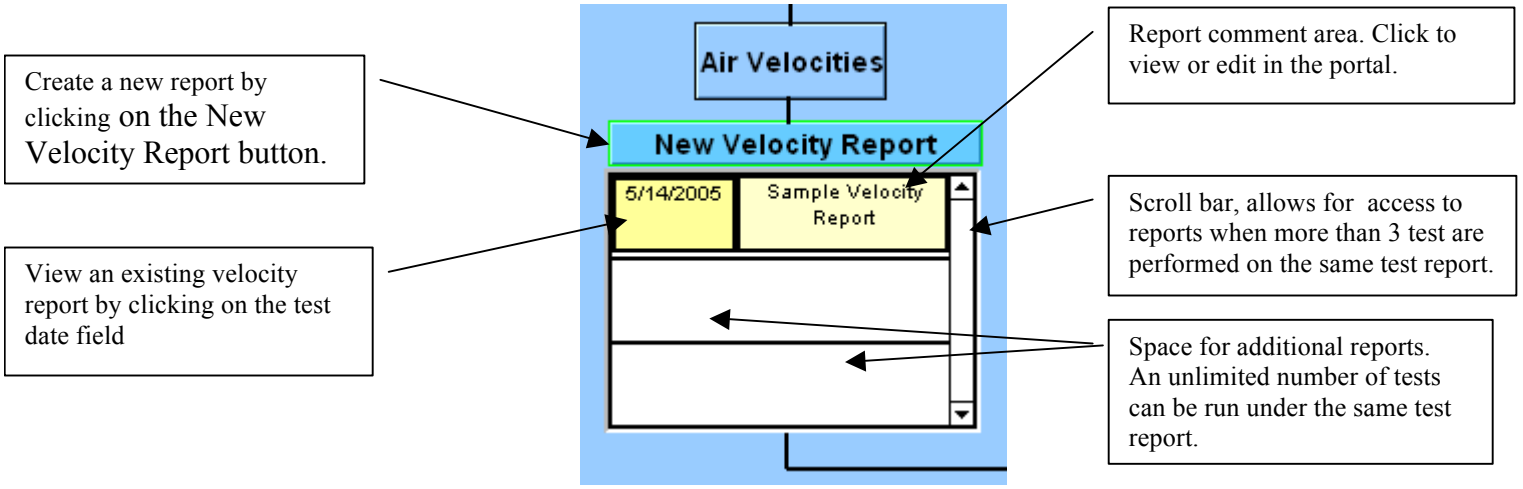


Figure 11. Typical Portal Components

View an existing report

To view an existing report, click on the date field of the report you want to view. The test report will be shown on screen and is then ready for data collection.

Create a new report

To create a new report, click on the New Report button of the report you want to create (Velocity, Smoke Test, etc.). The test report will be shown on screen and is then ready for data collection. When creating a new report, many of the report identifying fields will be pre-populated with the information that you provided in the test description screen. The test report #, test date and technician fields will all be populated at the time the report is created. While this data is provided by default, any of the fields can be modified to reflect different data.

Be aware that the method that the ASHRAE110 program uses to relate specific test reports with a test description is by the equipment ID and the test report number. If you change either of these fields, the report will no longer show up in the current test description main screen portals. If these values are changed to a different existing test report #, the tests will appear when that test description is displayed on the main screen.

The Air Velocity Test Screens

The air velocity test screen is used to collect and report the fume hood inflow velocities. The velocity data is entered into the velocity test screen either by automatic collection from the velocity meter, or you may enter the air velocity test results into the report by use of the keyboard. Either method will result in an identical looking test report.

From the main test screen, click on New Velocity Report to create a new blank velocity report or click on the date field of an existing report to display a previously created report. The ASHRAE110 program will display one of two different air velocity screens, depending on the airflow style of the fume hood that was defined in the test description. The two types of air velocity reports are either Constant Air Volume (CAV) or Variable Air Volume (VAV). Because of the different test requirements for these two fume hood styles, different screens are required.

When the air velocity screen is generated, the program will calculate the minimum number of sample locations for the test. In addition, the screen will be pre-populated with the work area opening size, the equipment ID, the test report number, test date and the technician name. All these values are pulled from the current test description that was displayed on the main screen when the velocity report was generated. If you find an error in the fume hood work area opening, you can correct the reported size in the test report itself. Any changes to the fume hood template will not be reflected in any previously created air velocity report.

As velocity data is entered into the screen (either automatically or manually) the screen will calculate the required statistics for the certification. This includes the overall average face velocity (for all openings tested), the air velocity variation and the low point air velocity value. Additionally, the report will display a Pass or Fail for each of these test criteria. The test acceptance criteria are drawn from one of two possible sources, depending on the configuration setting at the time of the screen creation.

If the program is configured to use Brief Databases, the test acceptance criteria will be drawn from the velocity settings in the configuration screen, under Velocity Configuration. If you are using Full Databases, the test acceptance criteria will be drawn from the selected fume hood record. A typical CAV and VAV air velocity test screens are shown on the following pages. Following the velocity report samples, is the air velocity menu bar.

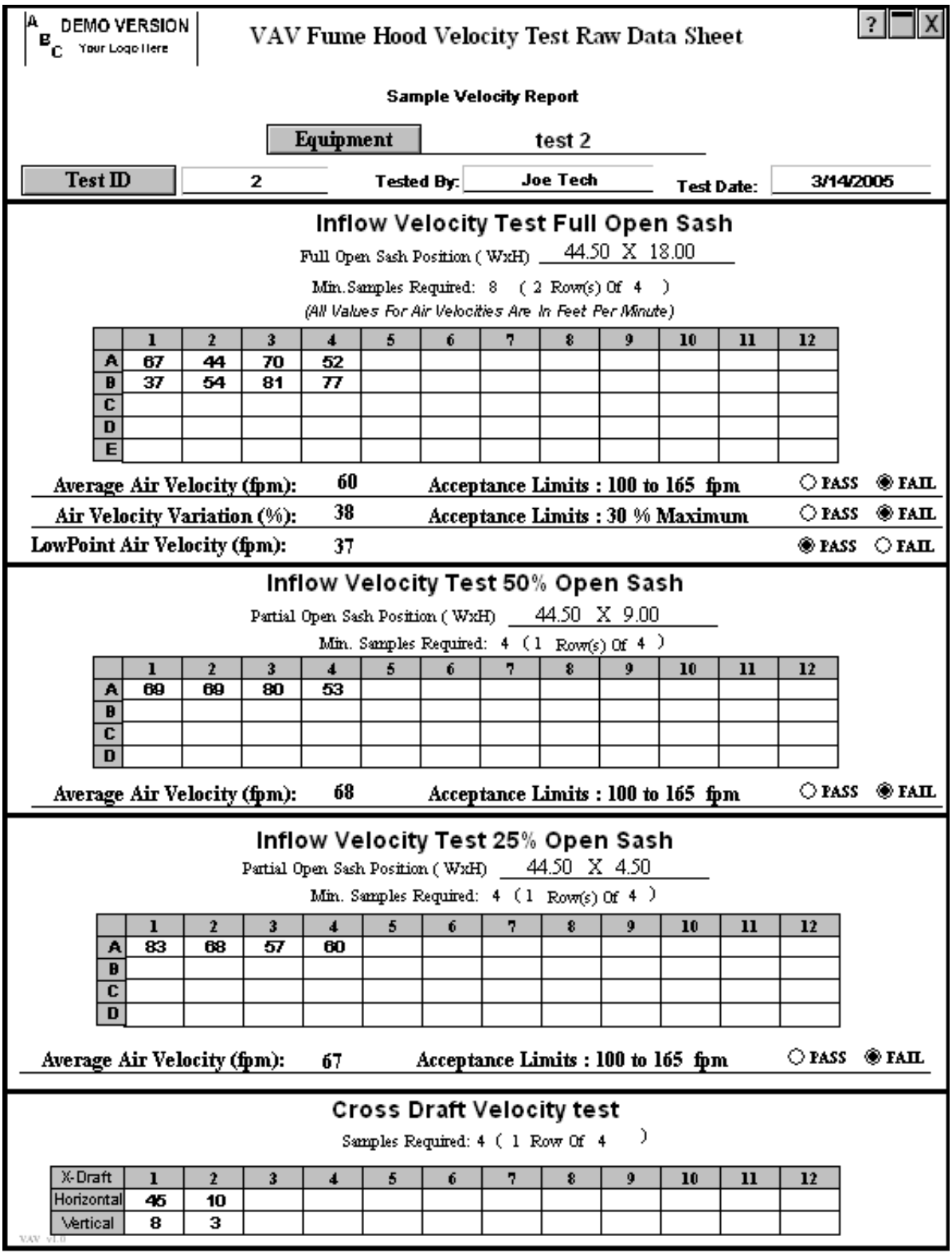


Figure 12 VAV Air Velocity Screen

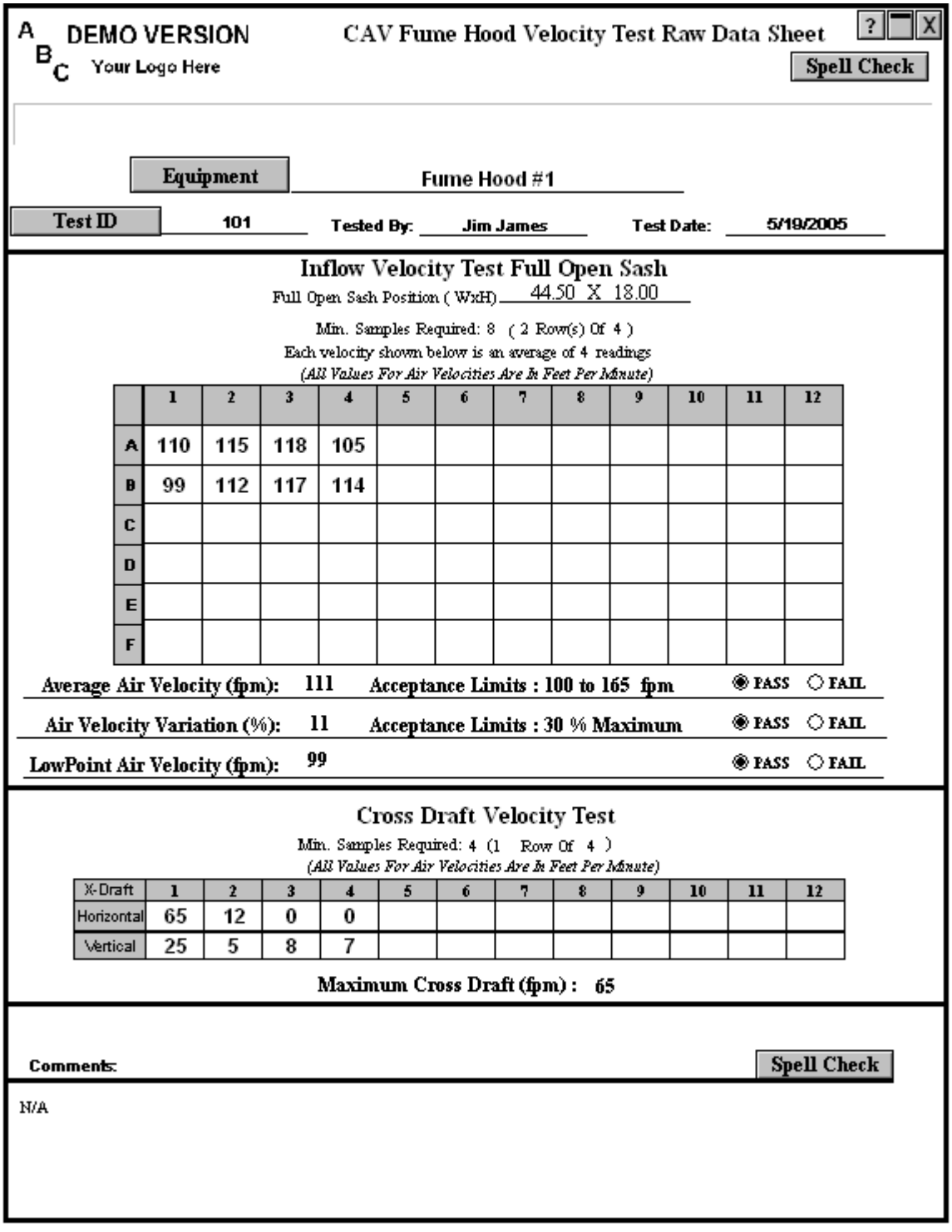


Figure 13 CAV Air Velocity Screen

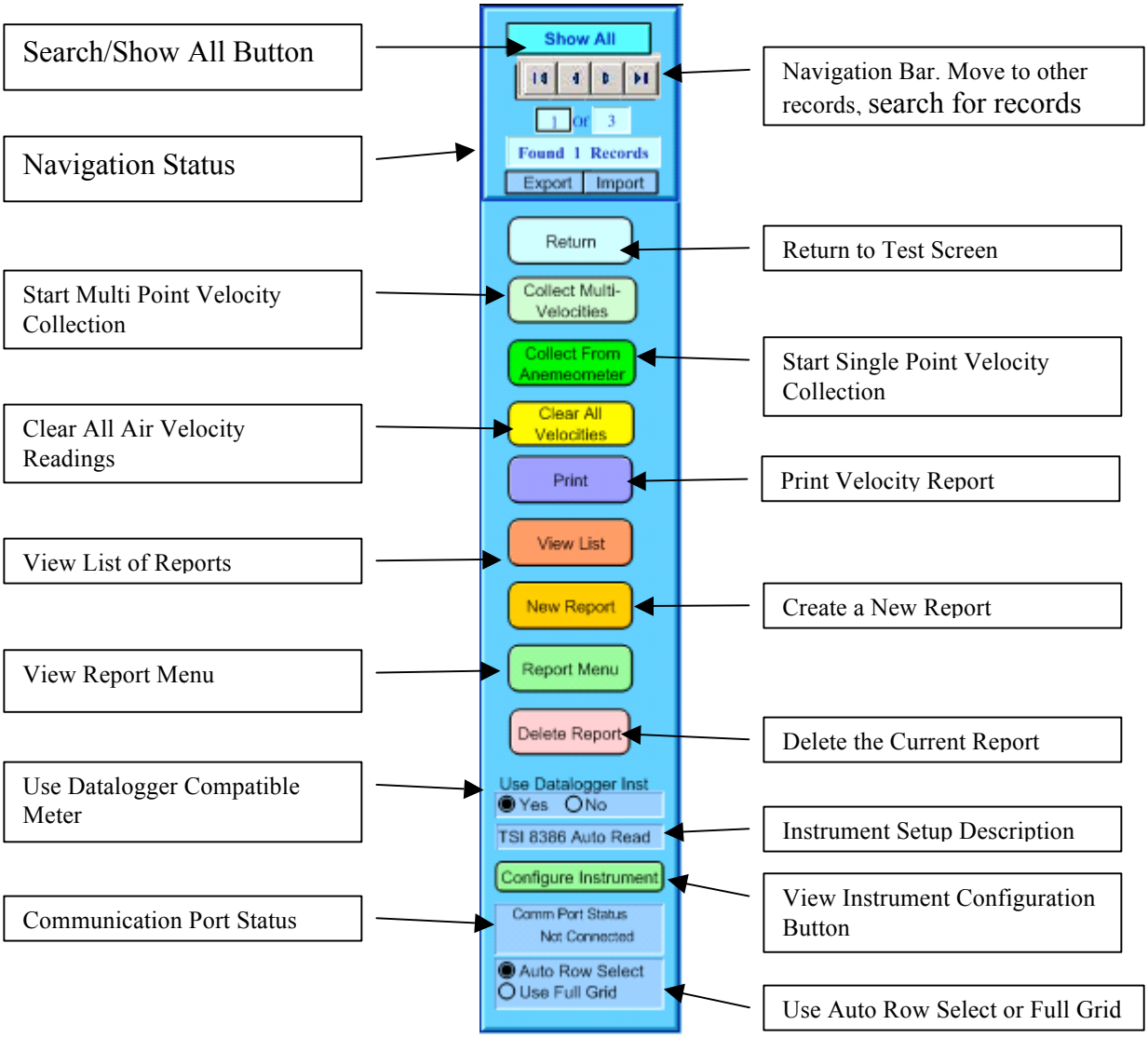


Figure 14 Air Velocity Test Menu Bar

Performing an Air Velocity Test

Refer to the page above for a picture of the menu bar and description of each menu button function. There are three different methods to complete an air velocity test.

Manual Velocity Collection

One method to collect air velocity data would be to use an air velocity measuring instrument to read air velocity readings and manually type the air velocity readings into the report. This method must be used if you have an air velocity meter that does not have an RS232 computer interface or if you wish to perform the air velocity test manually.

In order to enter the velocity data into the report, click on the grid position where the velocity sample was collected. Enter the Average air velocity for that position. You may then tab to the next position and enter the data, or click into the desired grid location and again enter the Average velocity value for that position. Continue to enter the data into the report until all required values have been recorded.

If you are testing a VAV hood, measure and enter the air velocity readings for the 50% open and 25% open sash configurations.

Next, measure and enter the cross draft air velocity data. The cross draft velocity test is intended to be performed by measuring the highest air velocity value at each point. Readings should be taken with the probe oriented to measure air flow in the vertical and horizontal directions.

Automatic Velocity Collection

If you have a TSI air velocity instrument with an RS232 communication port, air velocities readings can be collected automatically by the program.

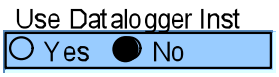
For anemometers with datalogging capabilities (VelociCalc Plus Models):

This family of anemometers has the ability to be fully controlled by the computer. The computer will initiate each air velocity read and will receive and store the result in the air velocity report. This type of instrument is ideal to place on a rolling stand and move from sample location as required. The technician will need to press the NEXT TEST button on the anemometer to signal the program that the meter is at the next sample location and ready to start sampling. When using this meter, set the Use Datalogger check box to Yes if you wish to use the fully automatic capabilities.

For anemometers without datalogging capabilities(VelociCalc Models):

This family of anemometers cannot accept commands from the computer. These anemometers do have the ability to transmit the velocity reading to the computer through the RS232 connection. The transmit is initiated by the technician pressing the STORE button one time for each velocity reading.

When using this meter, set the Use Datalogger check box to No.



The program will collect the configured number of air velocity readings for each location and enter the average air velocity at the current grid location. Once the average velocity is entered, the program will advance the cursor to the next sample position.

To Start the Automatic Test Using a NON-Datalogging Meter:

1. Click on the Collect From Anemometer button on the right side menu bar. 

2. Click in the top left position where you will begin taking the air velocity readings.
3. With the velocity probe held steady and perpendicular to the inflow, press the STORE button on the air velocity meter.

Each time the STORE button on the anemometer is pressed, the air velocity reading will be transmitted to the computer. Each time the computer receives an air velocity reading, the ASHRAE controller will sound a single beep confirming the reception. The program will continue to collect the air velocity readings for the first location until the total number of samples required has been received. This value is set in the configuration screen and is typically 4 readings for each sample location (per ASHRAE110 standard). While the program is collecting the velocity data for each location, the current reading number, location average and overall average velocity readings will be calculated and displayed in the green highlighted boxes at the left side of the report. When the number of samples required for each location has been satisfied, the ASHRAE controller will sound two short beeps and will automatically advance the cursor to the next cell to the right of the current position. Once the required number of samples on the first row has been met, the computer will automatically advance the cursor to the first column in the next row and will then be ready to start reading velocities for that position. When each row is complete, the ASHRAE controller will sound one long beep indicating row completion.
Continue with the automatic data collection until the full open position readings have been completed. If you are testing a VAV hood, you will then click into the first position on the 50% open grid and perform the air velocities at all required positions for that setting. Finally complete the air velocity readings for the 25% open grid and cross draft velocities.

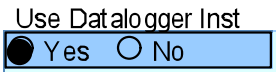
To complete the velocity testing, click on the Stop Anemometer button. 

The statistics calculations for the velocity report will disregard any blank cells during the calculations so you can leave blank spaces in the report, to more accurately represent the actual reading locations if you wish.

Fully-Automatic Air Velocity Collection

If you have a TSI air velocity instrument with an RS232 communication port, and the datalogging feature (TSI VELOCICALC PLUS) the air velocities can be requested from the air velocity meter and entered directly into the sample locations automatically.

To prepare the computer for fully automatic data collection, ensure that the Use Datalogger Inst option is set to Yes. (See the menu bar on the above page for the location of this option at the bottom of the menu bar)



To Start the Automatic Test Using a Datalogging Meter:

1. Click on the Collect From Anemometer button on the right side menu bar. 

2. Click in the top left position where you will begin taking the air velocity readings.
3. With the velocity probe held steady and perpendicular to the inflow, press the NEXT LOC button on the air velocity meter. Pressing the NEXT LOC button will signal the computer that the velocity probe is in place and ready to sample the velocity at the current sample location.

The air velocity reading will be requested from the air velocity meter and transmitted to the computer. As the computer receives each air velocity reading, the ASHRAE controller will sound a single beep confirming the reception. The program will continue to request and collect the air velocity readings for the first location until the total number of samples required has been received.

The number of velocity readings for each sample location is set in the configuration screen and is typically 4 readings for each sample location, per the ASHRAE110 standard.

While the program is collecting the velocity data for each location, the current reading number, location average and overall average velocity readings will be calculated and displayed in the green highlighted boxes at the left side of the report. When the number of samples required for each location has been satisfied, the ASHRAE controller will sound two short beeps and will automatically advance the cursor to the next cell to the right of the current position.

To start the next position samples, move the probe to the next position to the right and press the NEXT LOC button on the anemometer.

Continue this same procedure for each sample position. Once the required number of samples on the first row has been met, the computer will automatically advance the cursor to the first column in the next row and will then be ready to start reading velocities for that position. When each row is complete, the ASHRAE controller will sound one long beep indicating row completion.

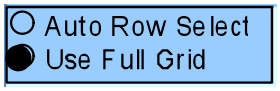
Continue with the automatic data collection until the full open position readings have been completed. If you are testing a VAV hood, you will then click into the first position on the 50% open grid and perform the air velocities at all required positions for that setting. Finally complete the air velocity readings for the 25% open grid and cross draft velocities.

The air velocities readings can be suspended at any time by clicking the Stop Velocity button. If necessary, any individual sample location can be re-sampled by clicking into that position and initiating the velocity readings by clicking the Collect Velocities button.

The Auto Row Function

The program automatically advances the cursor from left to right across the grid based on the required number of air velocity samples. When the last required sample location for the current row is complete, the program will advance the sample location to the first sample location (left side) on the next row.
You can start at any grid position you wish as long as there are an adequate number of empty cells to the left and below the starting point to satisfy the minimum sample requirements.
In some situations, you may wish to collect the air velocity data in an irregular pattern, for instance skipping a space between certain blocks of data on multiple horizontal sash hoods. This can be accomplished by setting the Auto Row function to Use Full Grid. This will disable the cursor row advance feature, thus allowing full use of the test grid.

Use Full Grid Feature



If you do not wish to use the Auto Row Select feature, click Use Full Grid in the option towards the bottom of the menu bar.

When the Auto Grid function is set to Use Full Grid, the computer will not automatically advance the cursor to the next row. This is useful for horizontal sashes or when you wish to record sets of data separated by blank spaces (for instance on multiple opening horizontal sash hoods). When the Auto Grid feature is set to Use Full Grid, the cursor will still advance to the right after completion of each sample location however, you will need to move the cursor to each test row manually by clicking in the desired row location.

	1	2	3	4	5	6	7	8	9	10	11	12
A	67	44		95	85		88	99				
B	37	54		87	103		101	105				
C	70	52		101	97		103	102				
D												
E												

Figure 15. Air Velocity Using Full Grid

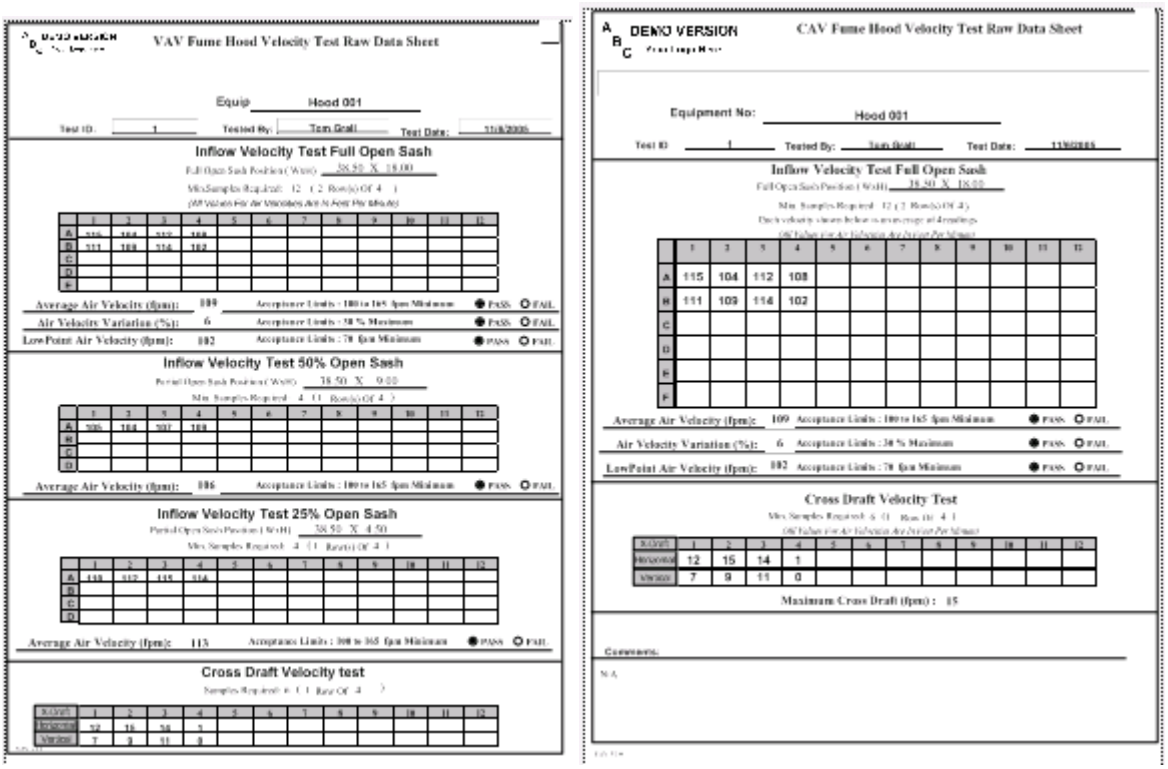
The statistics calculations for the velocity report will disregard any blank cells during the calculations so you can leave blank spaces in the report, to more accurately represent the actual reading locations if you wish.

Printing Air Velocity Test Reports

The results of the air velocity report can be printed either as separate comprehensive test reports or may be printed as summary data included in the one page summary report.

To print the air velocity comprehensive report, click on the print button on the air velocity test screen. This will print the detailed air velocity report including the test grids with all data as shown in the air velocity test screen.

Air velocity test results will automatically be printed as part of the one page summary report when that report is printed.



Air Velocity Detail Report VAV and CAV

Performing The Smoke Tests

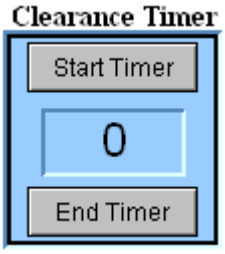
To perform a smoke test, click on the date of the pre-defined report in the smoke test portal. This will open the smoke test report. For a new report, click on the New Smoke Test button above the Smoke Test portal.

As in the velocity report, the smoke test report is populated with all the pertinent pre-defined data. You can change any of this data by clicking in the desired field and editing the information.

Smoke Test Introduction

The AHSRAE standard requires four different smoke tests and the determination of the required time to clear the fume hood of all large volume smoke.
Each of the smoke tests is fully described in the test report. Read each test description and perform the smoke test as described. After completing each test, click on the Smoke Test Results field at the right side of the description. This will display a pull down menu with several pre-defined descriptions of the results. Click on the most appropriate result for each of the four smoke tests.

Smoke Test Clearance Timer

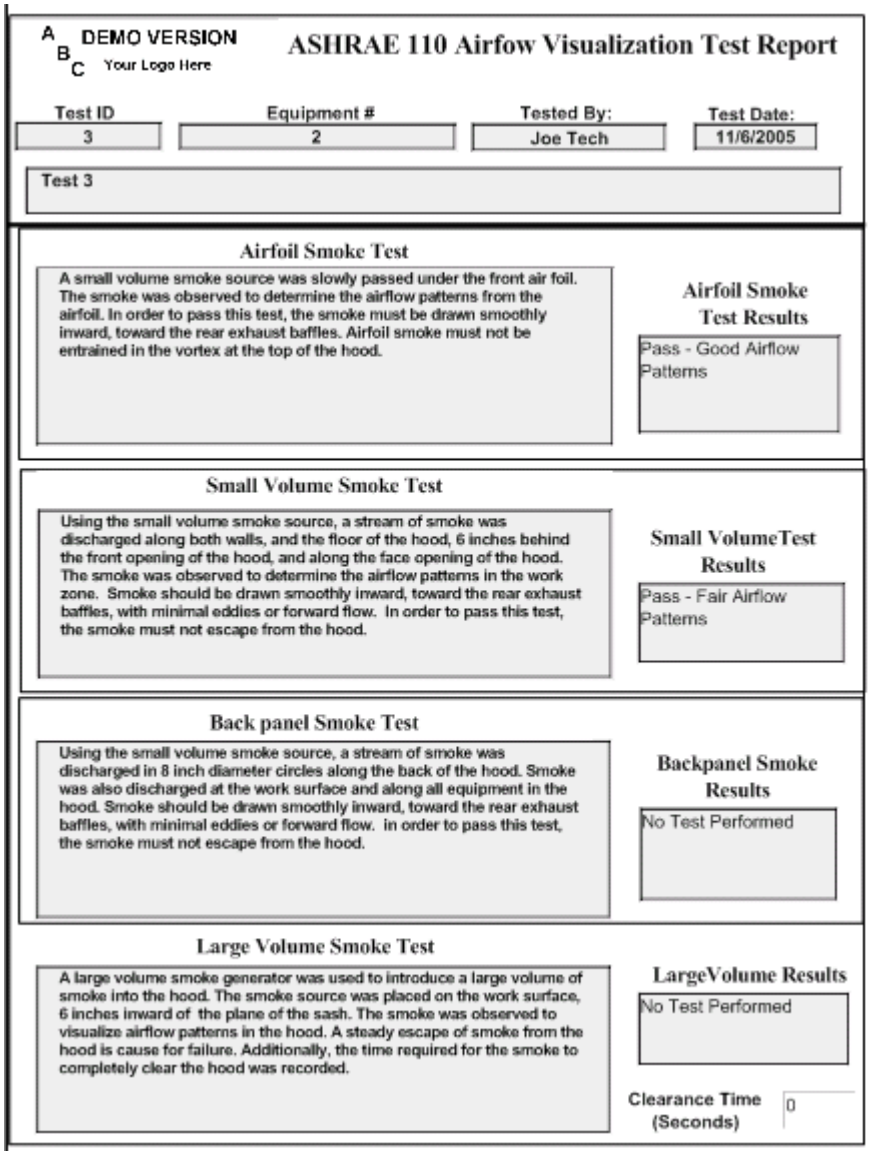


After completing the large volume smoke test, you must determine the amount of time the hood takes to fully evacuate all the smoke residue. To accommodate this test, there is a smoke clearance timer at the bottom right side of the report. When the hood is fully loaded with smoke, turn off the smoke generator and click the Timer Start button. This will initiate the count up timer displaying the number of seconds elapsed since the smoke was turned off. Once the hood is clear of smoke, click the End Timer button. This will stop the timer and transfer the elapsed time to the Clearance Time field of the report.

At this point, you have completed the smoke test report. You can either print the report now, by clicking on the PRINT button, or return to the main test screen and print the report at a later time. All test results are permanently stored in the database for later report generation.

Smoke Test Reports

The results of the smoke test may be printed as a separate detailed repot, or may be printed on the one page summary report with the results summarized. To print the smoke test detailed report, click the PRINT button on the smoke test screen. See the detailed smoke test report below or refer to the one page summary report at the end of this section of the manual.



Smoke Test Detail Report 1

Performing The VAV Response Tests

The VAV Response Test is only performed on Variable Air Volume (VAV) fume hoods. If you are testing a Constant Air Volume (CAV) hood, you will skip this test report and continue on to the Tracer Gas Test Report.

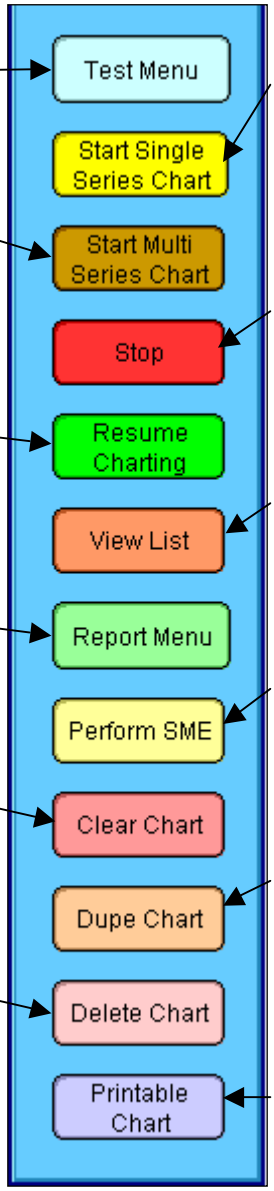
VAV Response Test Introduction

The VAV Response Test measures the amount of time the VAV controls require to stabilize after a sash movement. This test is performed with an anemometer to determine the stability of the fume hood controls. To start this test, click on the date of the pre-defined report in the VAV Response Test portal. This will open the test report. For a new report, click on the New VAV Response Test button above the VAV Response Test portal.

As in the velocity report, the VAV Response Test report is populated with all the pertinent pre-defined data. You can change any of this data by clicking in the desired field and editing the information.

The instructions for performing the VAV Response test are printed on the test screen. Follow the on screen instructions to properly set up and perform this test.

Tracer Gas Menu Bar



Return to the Test Screen

Start a multi series chart. This will chart several series simultaneously, for example gas, velocity and temperature.

Resume Charting. Will start where the last series was stopped without loosing previous data.

Display the report menu screen. Use this button to generate various test reports.

Clear the chart of all previously collected data. This **cannot be Un-done** once the data is cleared.

Delete Current Chart. This will permanently remove the current chart. **Cannot be Un-done** once the delete is confirmed

Start a single series chart. This will start a new chart or add a new series to the current chart depending on need. Up to three series can be overlaid on one chart

Stop the current chart data collection. Press ESC may work better on fast

View list of all test reports. This is based on current found set. Use Show All to see all reports on file

Go to the Sash Movement Effect (SME) and Sash Scan Test Screens

Duplicate the current chart. Useful for duplicating a chart with lots of comments. Then you can perform additional testing as needed.

Go to a printable chart report.

Performing The Tracer Gas Tests

To view the tracer gas test, click on the date of the pre-defined report in the tracer gas test portal. This will open the existing tracer gas test report.

To create a new Tracer Gas Test report, click on the New Tracer Gas Report button directly above the Tracer Gas Test portal.

As in the all reports, the tracer gas test report is populated with all the pertinent pre-defined data. You can change any of this data by clicking in the desired field and editing the information.

Tracer Gas Test Introduction

Per the ASHRAE 110 standard, the tracer gas test is performed to determine the containment performance of the fume hood at three separate test positions (Left Side, Center and Right Side of the fume hood).

The test report is designed to allow the collection of all three test positions on one chart (see figure 12). This composite report allows easy comparison of the different test positions and additionally allows for the printing of a combined test report with all test results shown on one page. When using this composite test report, each test will be plotted in a different color (Blue, Green and Red) and the test statistics Average, Min, Max and Last samples will be shown in the appropriately colored bar above the chart.

Each time you click on the 

, a new chart series will be started. You can store a maximum of three series to a single chart. After clicking on the Start Single Series Chart button, a dialog box will appear allowing you to specify which series you want to collect the data to (see figure 12).

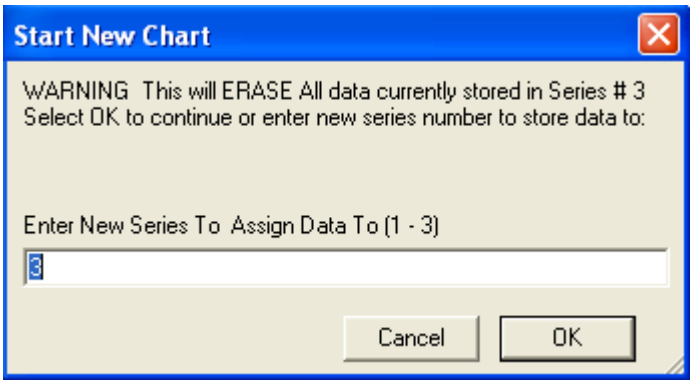


Figure 16. Start New Chart Dialog Box

As you start each new chart, the program will suggest the next series to store the data to. Click on the OK button to accept the default series, or enter a different series (1-3) to assign the data to. If you select a series which already has data stored to it, the previous data will be deleted and the new series data will be assigned. This allows you to retest any series without loosing any of the chart data that has been stored for other series.

Performing The Tracer Gas Tests
(Cont'd)

If you click on the Cancel button at this point, no data will be erased and you will be returned to the chart screen.

After specifying the desired series to collect data to, the chart screen will be displayed and the new chart data collection will begin. The chart will collect and display the data in real time on the chart screen. The sample frequency and duration can be set to any desired values. The default value for Sample Frequency is 1 second and the default value for the Test Duration 300 seconds (5 minutes). These are the ASHRAE 110 requirements.

***The Sample Frequency must be set in a valid time format as* hh:mm:ss *where hh is hours, mm is minutes and ss is seconds. For a 5 second sample frequency you would enter* 00:00:05**

While performing a tracer gas test, the test can be stopped at any time by pressing the ESC key. If you would like to restart the tracer gas test at the point where it was cancelled, click on the Resume Charting button. This will resume the test at the time the last sample was stopped without loosing any previously collected data.

If you wish to restart the test, click on the Start Single Series Chart button to erase the previous data in the current series and start new. The data previously collected for series other than the one specified will not be affected.

To completely clear all previously collected data for all series, click on the Clear Chart button. This will permanently erase all previously collected data and cannot be undone.

If desired, each test position may be recorded on a separate test report. This is done by simply creating a new test report for each test location. When performing individual test reports, each test position will be printed on a separate page resulting in a multi page report.

The duration of the tracer gas test and the interval between samples are both fully configurable from the tracer gas test screen. Additionally, the X and Y axis scaling can be manually set as well as limiting the chart view to only 1 of the series for data isolation. A sample report is shown in Figure 11 below:

Performing The Tracer Gas Tests
(Cont'd)

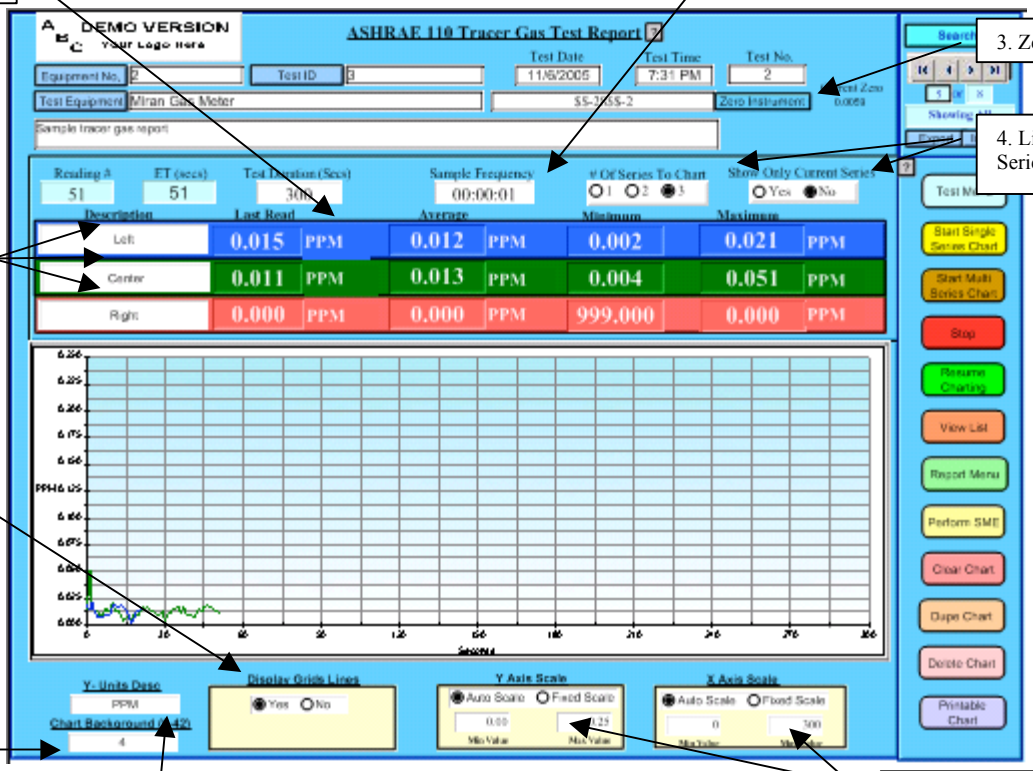


Figure 17. Three Series Tracer Gas Test Report

Performing The Tracer Gas Tests
(Cont'd)

Tracer Gas Chart Screen Elements

The Chart Screen elements called out above are used to modify how the chart is displayed. Each element is described below:

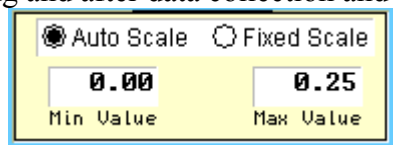
1. **Test Duration.** Enter the number of seconds that you wish to collect data for. This number can be any whole number from1 to 32,000 seconds. This will be the value for the X-Axis scale
2. **Sample Frequency.** The time entered here determines how frequently the chart will update and draw data. The default value for test duration is 300 seconds (5 minutes)The number must be entered as HH:MM:SS where HH is the number of hours, MM is the number of minutes and SS is the number of seconds. For example, if you wish the have the chart collect data every 5 seconds, you would enter 00:00:05 in the sample frequency box. The default value for the sample frequency is 1 second. (00:00:01)
3. **Zero Instrument.** Most gas detector instruments will have some positive minimum voltage when the instrument is reading zero PPM. Additionally, many times at very low voltages, there will be a drift upward or noise present on the voltage input channel. If these ***'zero'*** value voltages are not subtracted from the input, it would be impossible to show a zero reading to match the gas detector. The Zero Instrument button will take the average input value over numerous reads and set the value as the zero voltage. The Zero Instrument function should be used at the start of the first test of the day, and then as necessary if the gas detector zero voltage drifts upward significantly above the current zero setting.

> ***The Zero Instrument function should only be used when the gas detector is displaying zero PPM.***

4. **Limit Series to Display.** At times, it may be desirable to only show one or two of the current series data. The two check boxes shown below allow for complete control over how the chart is displayed after all data has been collected:

The # Of Series To Chart radio button allows you to select 1-3 series to display. This setting will allow you to only show series 1, or 1 and 2, even when series 3 data has been collected.

5. **Chart X-Y Scaling.** When you create a new chart report, the Y-axis scale will be set to 0.25 PPM and the Use Auto Scale will be selected on both the X and Y series. As the program collects data from the gas detector, if any reading is greater than 0.25, the Y-axis scaling will automatically be adjusted to 10% higher than the maximum gas reading charted. At times, the user may wish to control the full scale X or Y-axis value. To do this you click on Fixed Scale and enter the desired maximum scale. The chart will be redrawn with the desired full scale X and Y-axis values. This feature can be used during and after data collection and is useful to zoom in on an area of interest.



Performing The Tracer Gas Tests
(Cont'd)

6. **Series Data.** As data is collected, the program will update the statistics for the current series. The statistics data is displayed in a colored band directly above the chart. The color of the band matches the color that the series data is charted in. The colors are : Series 1 is blue, Series 2 is green and Series 3 is red. As data is collected, the following statistics are displayed:

Last Read – The value of the last reading.
Average - The running average of the gas level.
Minimum - The lowest reading of the series run.
Maximum - The highest reading of the series run.

All the statistics data is updated in real time for the current series. Note that the color bands are displayed only when the chart data has been collected. For example, if you start a new chart, only the series 1 band will be displayed. As you add an additional series, the appropriate band will be added to the chart.

7. **Display Chart Gridlines.** This option allows the user to turn on or off the chart gridlines. This will affect both the X and Y axis gridlines. Default setting for this is Gridlines On.

8. **Chart Background Gradient.** This text box allows the user to enter a a numeric value (from 0 to 42) to specify a background gradient. The background gradient is a color applied to the background of the chart to improve the appearance of the chart. The background gradient applies to all series of the currently displayed chart. A value of 0 will display no background gradient. The background gradient can be changed at any time to test the various colors available. After changing the value of the background gradient, click on the number of series to chart radio button to redraw the screen with the new value.

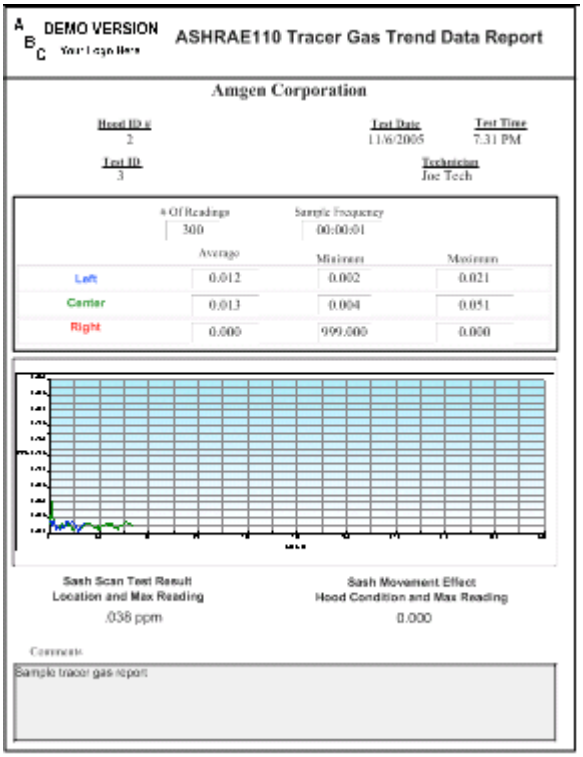
9. **Y-Axis Unit Description.** This text box allows the user to enter a descriptive label for the Y axis on the chart. Any text entered here must be enclosed in quotation marks. Failure to use quotation marks will result in a chart error and the chart will not be drawn to the screen. For example, if you want to have the text PPM displayed on the left side of the chart, you would enter "PPM" into this text box. Any quotes entered will not be displayed on the chart.

Printing Tracer Gas Test Results

The test results from the tracer gas test may be printed as comprehensive test reports or may be included as part of the one page summary test report.

To print the comprehensive tracer gas report, click on the PRINT button on the tracer gas test screen.

The summarized results will be printed on the one page summary report automatically.



Tracer Gas Comprehensive Report 1

Performing The SME and Sash Scan Tests

SME and Scan Test Introduction

Per the ASHRAE 110 standard, A Sash Movement Effect and Sash Scan test shall be performed as part of the certification process.

The Sash Movement Effect, or SME, is performed to determine the performance of the fume hood with the sash fully closed and the gas being ejected into the hood. The SME verifies that the hood does not over fill and spill into the lab when the sash is closed. This test is especially important to verify that VAV hoods have a sufficient ventilation rate with the VAV control set to minimum flow.

The Sash Scan test verifies that there are no local 'hot spots' at the sash perimeter during the gas test process.

Both these tests require the tracer gas ejector and detector and are typically performed during and/or immediately after the tracer gas containment testing.

The SME and Scan test screens are accessible from the tracer gas chart screen. Click on the Perform SME button, from the tracer gas menu bar to view the SME/Scan test screen. When you enter the SME test screen, the test information including hood ID, technician. Test ID and date and time will be populated with the values from the tracer gas test screen, these can be changed as needed.

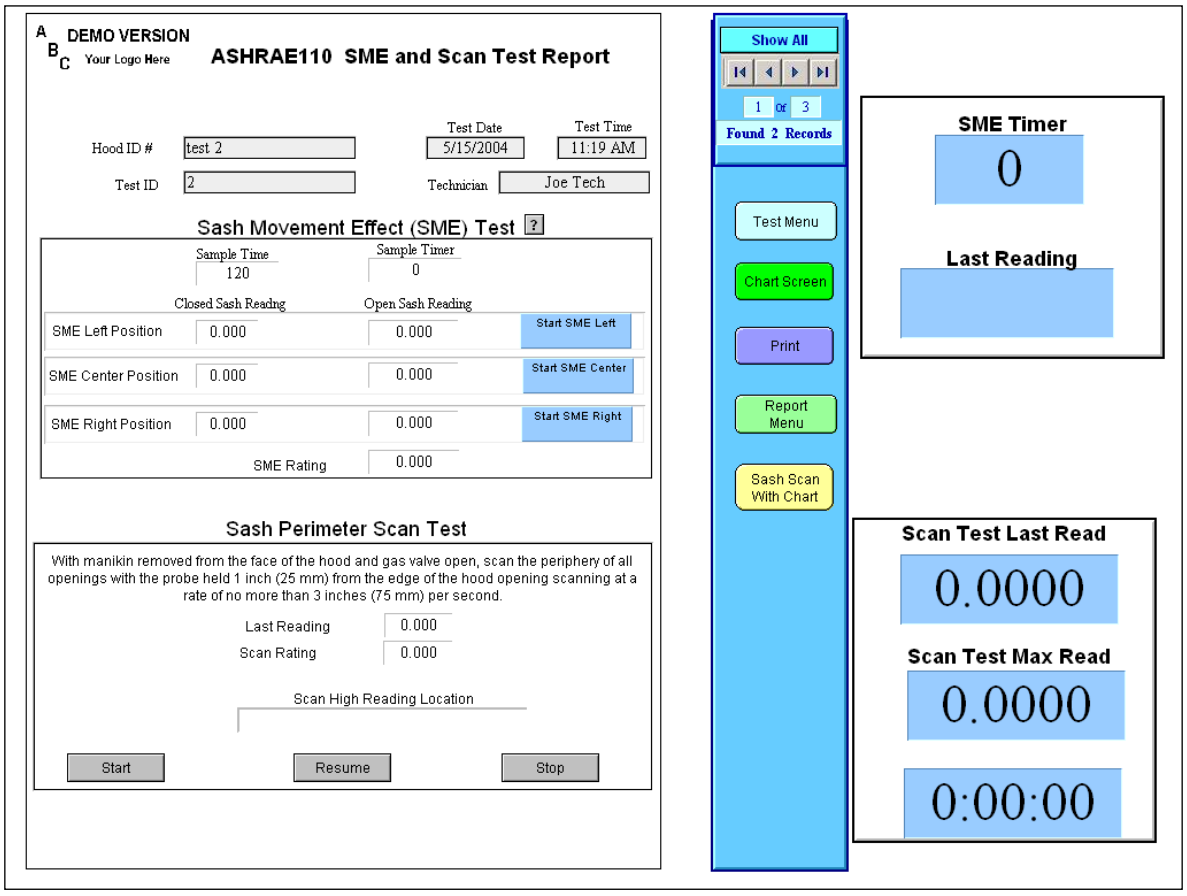
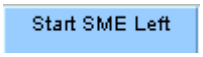


Figure 18. SME and Sash Scan Test Screen

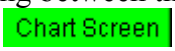
Performing an SME Test

The SME test is performed at each of the three tracer gas containment test positions (Left, center, Right) and also uses the manikin and gas ejector in the same position as the tracer gas test. It is recommended that you perform the SME test immediately after the completion of each position tracer gas test. This will eliminate the need to move the manikin and ejector back to these locations at a later time. When you enter the SME test screen, the SME test is displayed at the top half of the screen and the sash scan test is displayed at the bottom half of the screen. The SME test includes all necessary information displayed on the screen to perform this test.

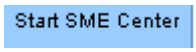
Starting The SME Test

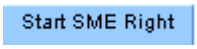
Once the gas detector and gas are ready, click on the 

button to initiate the left side SME test. After clicking the start button, the program will walk you through each step to perform the test.
During the SME test, the technician is usually required to be near the fume hood to move the sash. The SME test timer and the current gas detector values are displayed in large font to the right of the main test screen to make these values visible from a distance.

Per the ASHRAE 110 standard, the SME test shall be performed in the closed and open stages for 120 seconds. This is the default value that will be displayed in the Sample Time box. This value can be changed to another value as need, prior to performing the test. At the end of each test, the technician can switch back to the tracer gas screen to perform the next tracer gas test position without loosing any data that was collected for this test. This allows easy switching between the tracer gas and SME screens during the testing. To switch back to the tracer gas screen click on the 

button on the menu bar.

The Center and left SME test can be performed in the same manner as described above by clicking on the 

and 

buttons as appropriate.

After completion of all three SME test positions, the overall SME rating can be viewed at the bottom of the SME test screen.

> ***When you create a new Tracer gas test report, the Sash Scan information will be reset to zero. Each tracer gas test report includes a SME/Sash Scan report.***

Performing a Sash Scan Test

The Sash Scan test is performed to ensure there are no "hot spots" in the perimeter area of the sash. This test is usually performed immediately after the final SME test position is completed. The Sash Scan Test screen is displayed at the bottom half of the SME test screen (see figure 14). The sash scan test is performed with the gas ejector placed in the center position of the hood and the manikin removed. The technician will connect a hand held probe to the gas detector and will scan the perimeter of the sash opening at a scan speed of approximately 3 inches per second.

Sash Scan Timer

When the SME/Scan test report is created, the program will calculate the expected perimeter scan test time. This calculation is based on the perimeter area of the full open sash dimensions. When you start the scan test, the scan timer will be set to the expected scan time. This timer will count down from the expected time until the timer reaches zero. The timer will then start counting up, as a negative time format, to show how far over the expected scan time the test took. The scan timer is displayed in large font format at the right side of the screen for easy visibility while the technician is performing the scan test. Additionally, the high reading is also displayed along with the last reading.

Sash Scan High Position Marker

During the scan the technician needs to keep track of the position where the highest reading was detected. This position will be described in the test report. To aid the technician in determining the high reading position, the ASHRAE controller will sound a short beep each time the highest reading is exceeded. The technician only needs to remember where the last beep occurred to know where the high reading position occurred.

Starting and Pausing the Sash Scan Test

The scan test can be stopped and restarted again as needed. To stop the scan, press the ESC key. When you wish to restart the scan test click on the Resume key. This will restart the timer and maintain the high reading. To reset the scan and start over, click on the Start key. Clicking on the Start key will reset the scan timer and set the high reading value to zero.

Specifying the High Scan Location

After completion of the scan test, the technician must identify where the highest reading (last beep) occurred. There is a pull down list with pre-populated identifiers of the most common locations (see figure 15.) Click on the entry box and the list will be displayed. If the location is not included in the list, click on the Edit… field in the list to add the additional location. Any additional locations that are added will be permanently stored in the list for future use.

The list of available locations may be edited to add, delete or edit any location on the pull down list by clicking the Edit… selection at the bottom of the pull down list.

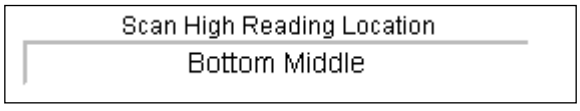


Figure 19. Scan High Reading Location

When you create a new Tracer gas test report, the Sash Scan information will be reset to zero. Each tracer gas test report includes a SME/Sash Scan report.

Performing a Sash Scan Test
(Cont'd)

Using the Sash Scan with Chart Report

For added information, the sash perimeter scan test can be plotted to a chart. To use this screen, click on the Sash Scan With Chart button. This will display the sash scan report with a line chart at the bottom. When the scan is first started, the X-axis will be scaled to reflect the expected scan time as the maximum value. If during the scan the X-axis time is exceeded, the chart will automatically rescale to allow a full view of the entire scan period.

The Y-Axis of the chart will start at 0.25 PPM scaling. If higher values are received, the scaling will be adjusted to 110% of the maximum value received. The X and Y-axis scaling cannot be controlled by the user.

Because the controller only beeps at the highest value, there will be other areas of the scan where there could be elevated readings that did not sound the beeper. Therefore, the chart adds the ability to graphically view where all hot spots are on the perimeter scan. The chart will provide a much better picture of how well the hood performed during this test.

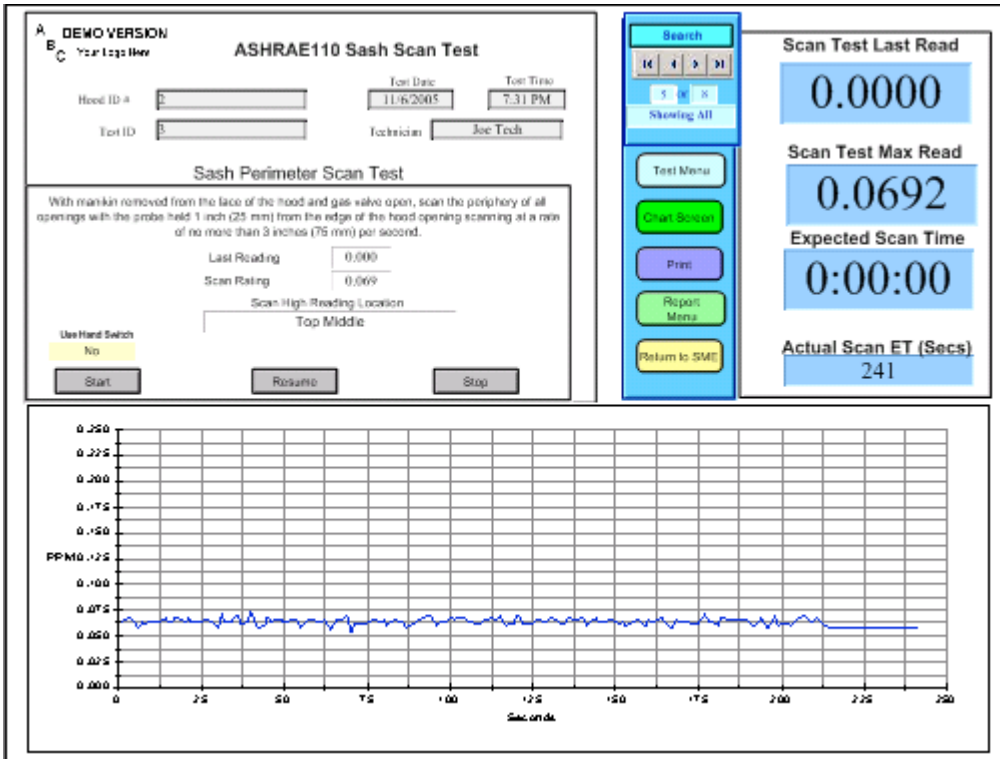


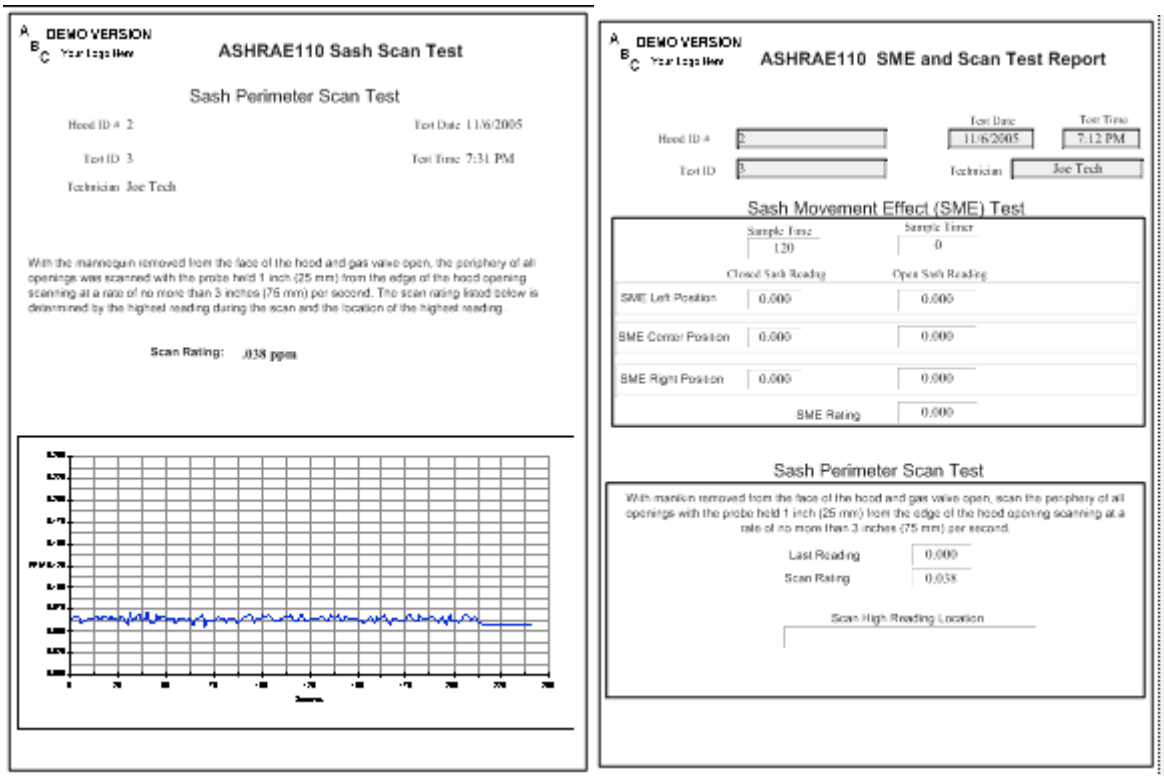
Figure 19. Sash Scan Screen with Chart

Sash Scan and SME test reports

The sash scan and SME test results may be printed as detailed reports or may be included in the single page summary report.

To print the detailed reports, click on the PRINT button in the SME or sash scan test screens.

The results of the SME and Sash Scan tests will automatically be included in the one page summary report.



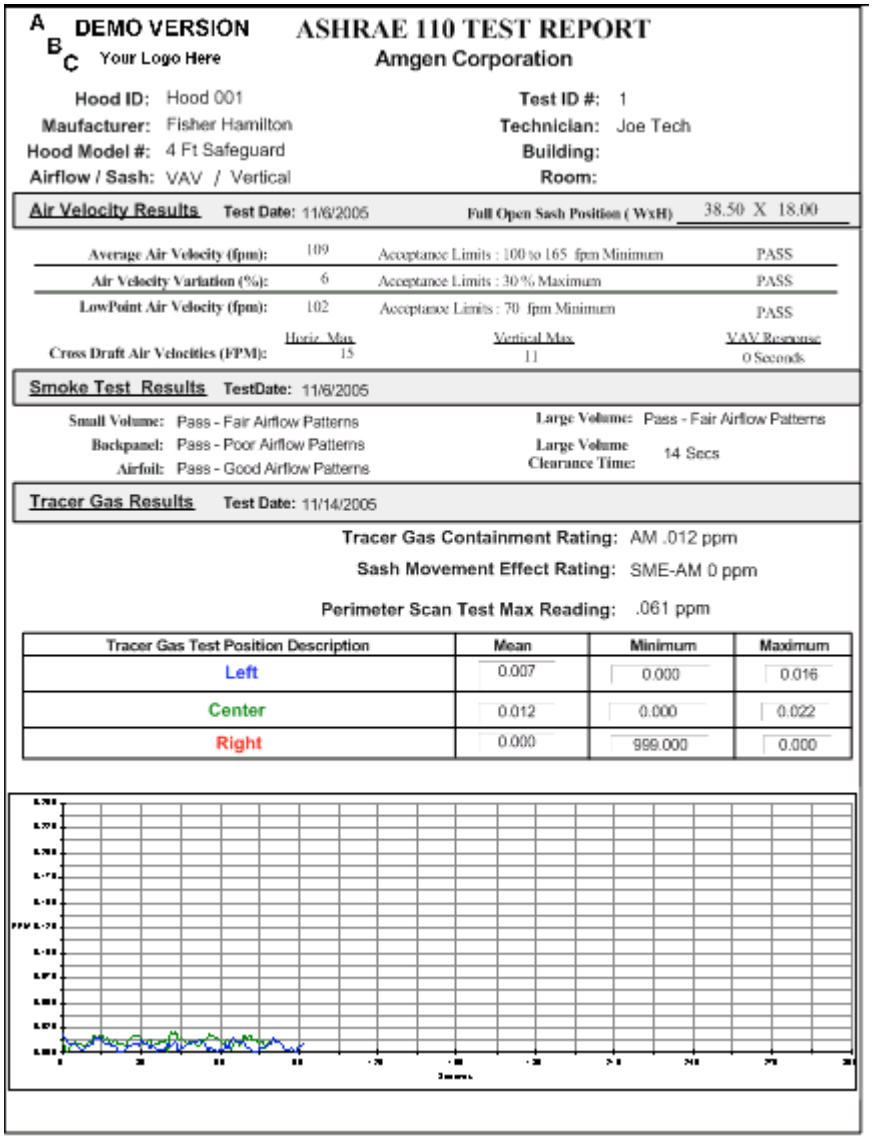
Sash Scan Test And SME Detailed Test Reports

Summary (Combo) One Page Test Report

The ASRAE test system can print a summarized test report including all test results on a single page report. This report is intended to replace the need to print multi-page test reports however, the user may choose to print both the detailed and/or summary report as described in the previous sections. To print the Summary Combo report:

- Search and display the desired report at the main test screen.
- Select REPORTS from the main test screen.
- Select Combined Report from the report menu.
- A combined report will be displayed on screen.
- Click the PRINT button to print this report

The combined report displayed will be the current report displayed in the main test screen. The test results printed when more than one test performed will be the top most report displayed in the test reports portals on the main screen. If you wish to print data from other testing performed on this test report, reorder the display of the portal and rerun the combination report.



DEMO VERSION
Your Logo Here

ASHRAE 110 TEST REPORT
Amgen Corporation

Hood ID:	Hood 001	**Test ID #:**	1
Maufacturer:	Fisher Hamilton	**Technician:**	Joe Tech
Hood Model #:	4 Ft Safeguard	**Building:**	
Airflow / Sash:	VAV / Vertical	**Room:**	

Air Velocity Results **Test Date:** 11/6/2005 **Full Open Sash Position (WxH)** 38.50 X 18.00

Average Air Velocity (fpm):	109	Acceptance Limits : 100 to 165 fpm Minimum	PASS
Air Velocity Variation (%):	6	Acceptance Limits : 30 % Maximum	PASS
LowPoint Air Velocity (fpm):	102	Acceptance Limits : 70 fpm Minimum	PASS

Cross Draft Air Velocities (FPM):	Horiz. Max	Vertical Max	VAV Response
	15	11	0 Seconds

Smoke Test Results **TestDate:** 11/6/2005

Small Volume:	Pass - Fair Airflow Patterns	**Large Volume:**	Pass - Fair Airflow Patterns
Backpanel:	Pass - Poor Airflow Patterns	**Large Volume Clearance Time:**	14 Secs
Airfoil:	Pass - Good Airflow Patterns		

Tracer Gas Results **Test Date:** 11/14/2005

Tracer Gas Containment Rating: AM .012 ppm
Sash Movement Effect Rating: SME-AM 0 ppm
Perimeter Scan Test Max Reading: .061 ppm

Tracer Gas Test Position Description	Mean	Minimum	Maximum
Left	0.007	0.000	0.016
Center	0.012	0.000	0.022
Right	0.000	999.000	0.000

Summary (Combination) Test Report 1

Section 3.0

ASHRAE110 Controller

ASHRAE110 Controller

Decsription

The ASHRAE110 system controller is a specially designed data acquisition and control system that is specifically designed to use with the ASHRAE110 fume hood certification software. The controller is a microprocessor based data acquisition system with the following features:

a) 8) Channels of analog to digital (A/D) inputs.
b) 2) Channels of TTL compatible Digital inputs.
c) 2) Channels of TTL compatible Digital outputs.
d) 1) Front panel mounted piezo audible alarm.
e) 2) RS232C serial interfaces.
f) 1) Lighted on/off front panel mounted switch.
g) 4) Multiple A/D inputs to allow connection of multiple sensors simultaneously.
h) 12 VDC instrument power sources, integrated into the input connectors for single line connections.

As mentioned above, the controller is specially designed for the ASHRAE test. This provides the advantage of optimized commands and capabilities, which result in high speed data transmission and maximum flexibility in a small durable package.

Purpose

The ASHRAE110 controller serves as the main connection point for all external instruments that need to be used during the ASHRAE110 fume hood test. This includes the gas detector analog signal, the air velocity meter and optionally, temperature, pressure or velocity transducers as needed. This single point connection means that the computer only connects to the controller itself and receives all inputs directly from the controller. This eliminates the need for special input boards, multiple communication ports or the swapping of cables that would normally be required to achieve the same results that the ASHRAE controller provides. This results in fewer cables, less hardware and hands off simplicity while performing your tests.

Basic Functionality

In it's most basic form, the ASHRAE controller will connect to the gas detectors' analog output. The controller will read the analog voltages from the gas detector and transmit these values, on command, to the ASHRAE test computer via the RS232 link. The ASHRAE computer will signal the controller to perform the A/D conversions and transmit the data only when this data is needed. Additionally, the ASHRAE test computer will signal the controller to sound its audible alarm as appropriate.

Connecting The Controller

The ASHRAE110 controller includes four (4) separate DIN style connectors on the rear panel. Additionally, there is a DB9 and RJ45 RS232 connection. The power for the controller and the instrument 12 VDC outputs are supplied from a single 12 VDC power pack that is connected to the controller via a single 2.5mm coaxially connector. The connections for using the basic functionality (gas meter and anemometer) are block diagrammed in Figure 1 below.

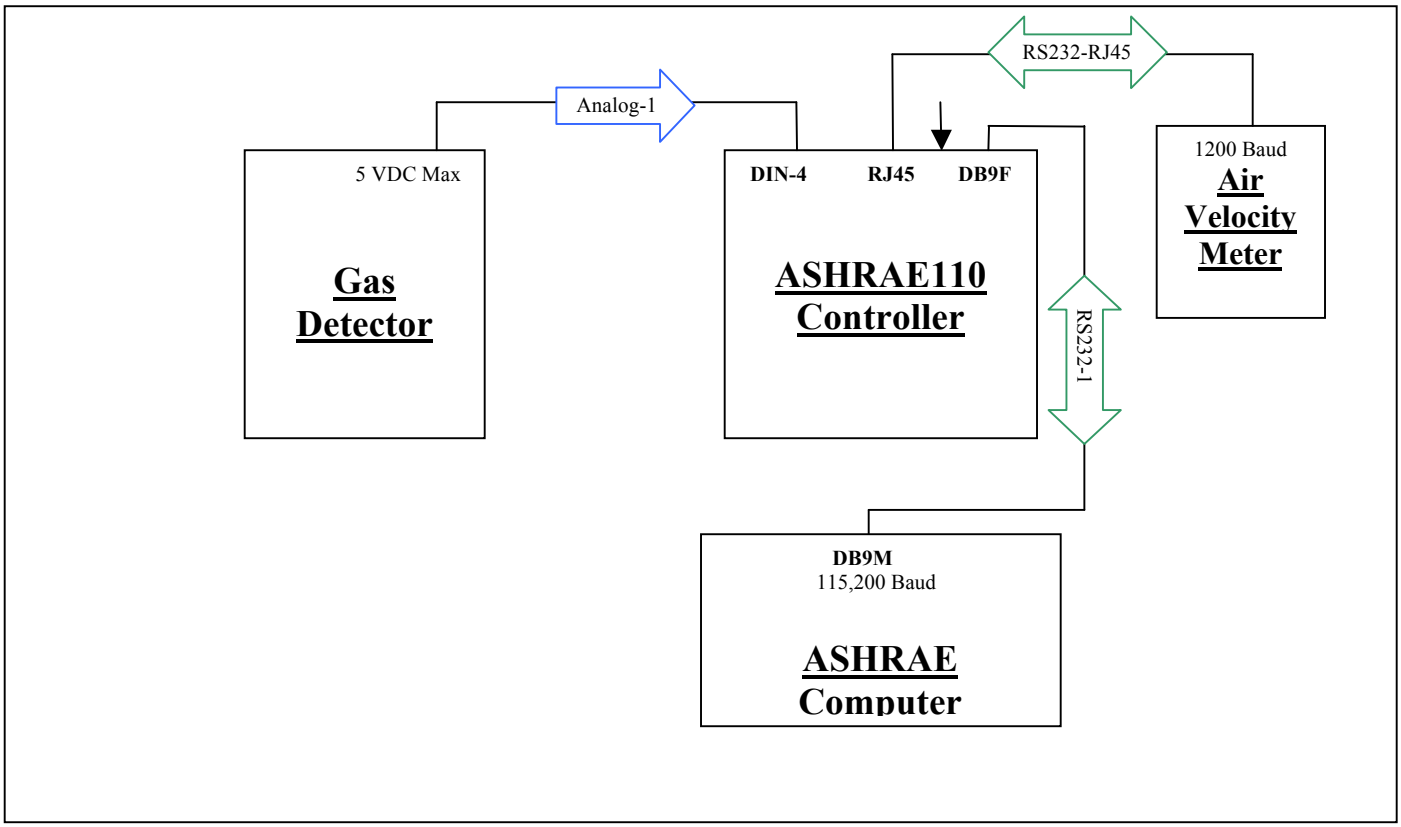


Figure 20. Basic Connections to Controller

CableDescriptions:

Analog-1. A 2 conductor cable connecting the DC analog output from the gas detector to the controller. The controller side connections are made to the circular DIN-4 conductor connector on the rear panel of the controller. The connections are Pin #1 (+) and Pin #4 (-). Maximum input voltage is 5 VDC.

RS232-1. A 9 conductor RS232 cable with Female DB9 on computer side and Male DB9 on controller side. Optionally, the computer side may use a USB to serial converter. Computer must be configured for COM1 thru COM4 only. This Com line runs at 115,200 Baud Rate

RS232-RJ45. An 8 conductor RJ45 cable CAT 5 rated or better. Connection on both the anemometer and controller side is RJ45. Any standard 8 conductor CAT5 network cable should work.

NOTE: The anemometer RS232 must be configured for 1200 baud

↓ 12 VDC power input. 12 VDC, 400 ma. (+) center 2.5mm OD coax connector. This provides controller power and instrument out power. Observe maximum output of 200 ma total instrument power.

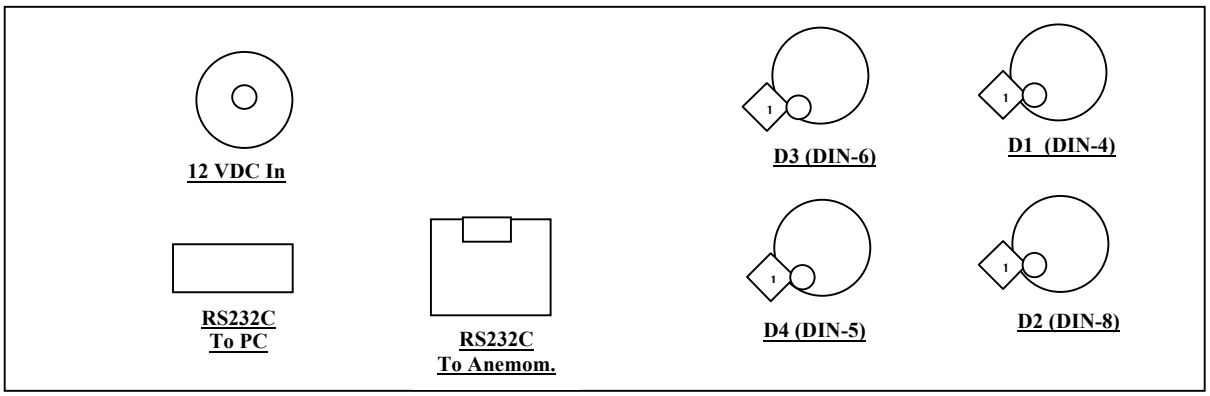


Figure 21. Exterior Rear Panel View Of Connectors

Din Connector # D1 4 Pin DIN Analog Input – Gas Detector

Pin #	DIN Pin ID	Command
1	Analog (+)	0
2	----	----
3	----	----
4	Analog (-)	----

Din Connector # D2 8 Pin DIN Analog Inputs and 12 VDC

Pin #	DIN Pin ID	Command
1	A/D 1	1
2	A/D 2	2
3	A/D 3	3
4	A/D 4	4
5	Analog Common	----
6	Not Connected	----
7	+ 12 VDC	----
8	- 12 VDC	----

Din Connector # D3 6 Pin DIN Digital I/O

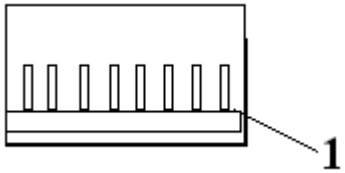
Pin #	DIN Pin ID	Command
1	HV 2 (Dig Out)	----
2	HV 3 (Dig Out)	----
3	Not Connected	----
4	IN1 (Dig In)	----
5	IN2 (Dig In)	----
	Common	----

Din Connector # D4 5 Pin DIN Analog Inputs and 12 VDC

Pin #	DIN Pin ID	Command
1	A/D 6	6
2	A/D 7	7
3	Analog Common	----
4	+ 12 VDC	----
5	- 12 VDC	----

Anemometer RS232 RJ45

Terminal On TD86	RJ45 Pin	
9	2	Ground
5	4	Rx from anemom.
3	6	Tx to anemom.



Controller Commands Version 1.01

Command	Result
?	Send 5 A/D's from A/D 0
V	Send "Velocity" A/D's 6 channels from A/D 1
Q	Show A/D's on LCD
X	Send Digital Input Status…0-3
Y	Status of velocity probe switch
!	Turn on red LED on velocity probe
@	Turn off red LED on velocity probe
$	Turn on green LED on velocity probe
%	Turn off green LED on velocity probe
S	Turn on HV1 output
T	Turn off HV2 output
A	Send 8 A/D's from AD0
B	Send 8 A/D's from AD1
R	Send AD0-0 and TSI anemometer raw data
v	Echo TSI anemometer data (1200 baud on SER1 outputted 115,200 baud on SER0)
a	Send 3 A/D's on AD0
b	Send 3 A/D's on AD1
*	Send Model and Version Info from ASH100
N	Turn on HV output 0,1 (for buzzer)
n	Turn off HV output 0,1 (for buzzer)
0…6	Send specified AD result from AD1 on J4.5…11

ASHRAE110 Software

Section 1.0

Quick Start Guide