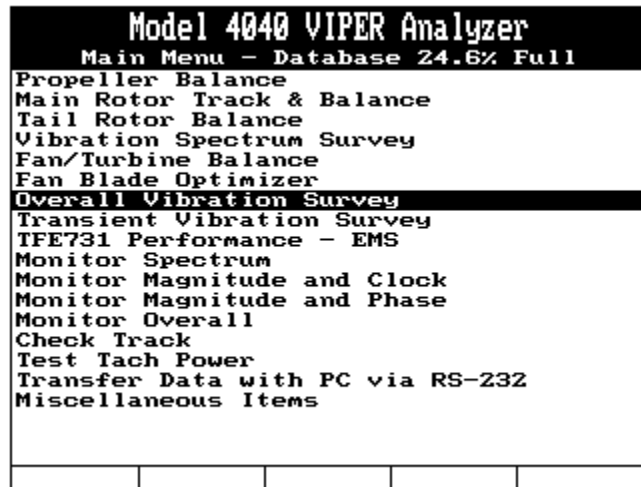

Chapter 10

Overall Vibration Surveys

(Revision 3, Aug 2007)

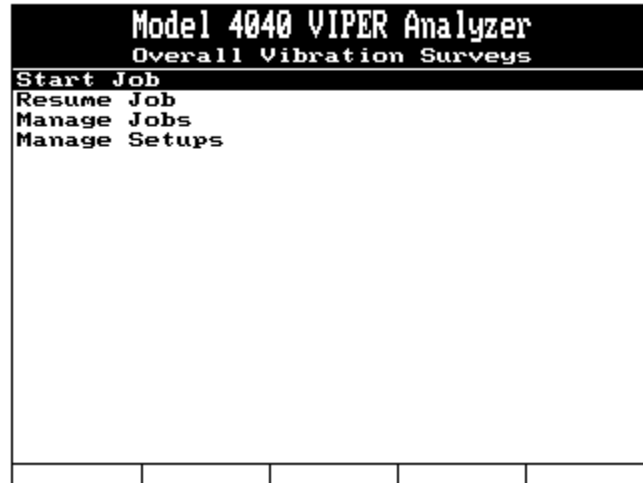
“Overall Vibration Surveys” is an analyzer function that is accessed from the analyzer’s Main Menu banner screen as shown in the illustration below. Selecting this function from the main menu brings up the “Overall Vibration Surveys” banner screen menu. Each of the listings on this banner screen menu is an option within the “Overall Vibration Surveys” function. Descriptions of each of these options follow, along with the information required to complete the menu screens within the options, and the steps necessary to perform the overall vibration surveys function.



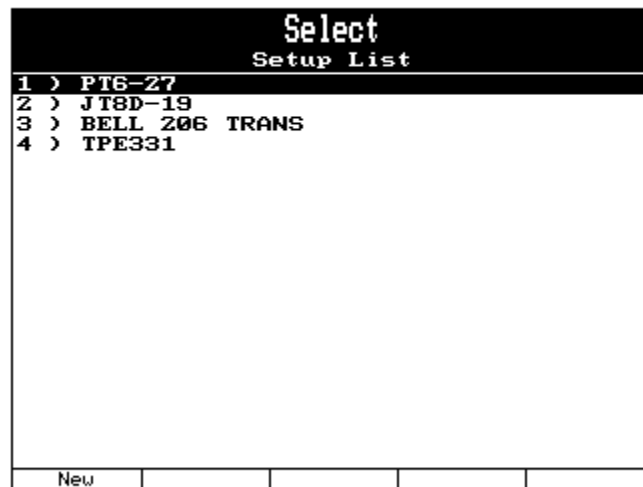
The Overall Vibration Survey option allows the user to rapidly complete and store overall vibration surveys using the “Overall Vibration Setup” feature (described in section 10.1.1 below). With the setup feature you may complete surveys on several different components without manually entering the setup data between surveys. Each job is unique and very quick.

10.1. - Start Job

Selecting “Start Job” from the “Overall Vibration Surveys” banner screen allows you to begin an overall vibration survey. When you select this option, one of two screens will appear next depending on whether you are starting a job from scratch or an incomplete job still exists in the analyzer’s memory.



If you have previously saved setups in the analyzer’s memory, a screen displaying the list of setups, as shown below, will be displayed. If no setups are stored, or if you choose “New” by pressing the [F1] key from the Setup List screen, the analyzer will display the “Overall Vibration Setup” banner screen. If you select from the list, you proceed to the “Job Identification” banner screen described in section 10.1.2. Instructions for completing the “Overall Vibration Setup” banner screen appear in the following Section, 10.1.1.



Model 4040 VIPER Analyzer			
Overall Vibration Setup			
Name :	<input type="text"/>		
RPM :	<input type="text" value="0.00"/>	to	<input type="text" value="10000.00"/>
Channel	Units	Mod	MaxValue
A:	<input type="text" value="g's"/>	<input type="text" value="Peak"/>	<input type="text" value="1.00"/>
B:	<input type="text" value="g's"/>	<input type="text" value="Peak"/>	<input type="text" value="1.00"/>
C:	<input type="text" value="g's"/>	<input type="text" value="Peak"/>	<input type="text" value="1.00"/>
D:	<input type="text" value="g's"/>	<input type="text" value="Peak"/>	<input type="text" value="1.00"/>
Channel	Sensor	Desc	
A:	<input type="text" value="None"/>		
B:	<input type="text" value="None"/>		
C:	<input type="text" value="None"/>		
D:	<input type="text" value="None"/>		
Conds	Speeds		

If another job was in progress but was not completed, the “Incomplete Job” banner screen will be displayed to inform you of this. The analyzer will then display a message prompting you to verify that you want to complete the in-progress job or that you want to ignore it and begin a completely new job. This verification prevents you from accidentally erasing data from an in-progress job. The screen will display the message “The last job performed is incomplete. Do you want to RESUME work on it?”

Model 4040 VIPER Analyzer			
Incomplete Job			
<p>The last job performed is incomplete.</p> <p>Do you want to RESUME work on it?</p>			
Yes			No

You must then choose a “Yes” or “No” answer by pressing the corresponding [F1] key, for “Yes”, or the [F5] key, for “No.” The “Yes” answer will return you to the point where the in-progress job was stopped and allow you to complete it. If you choose the “No” answer, the screen will then display the “Overall Vibration Setup” banner screen so you can program a new job setup *or* if you have previously-saved setups stored in the analyzer’s memory, a screen displaying the list of setups will be displayed. You can then select a setup from this list. If you select from the list, you proceed to the “Job Identification” banner screen described in section 10.1.2. Instructions for completing the “Overall Vibration Setup” banner screen appear in the following Section, 10.1.1.

NOTE

The analyzer will store Setups as long as available memory remains. If you are attempting to store a survey that will exceed the analyzer's memory capacity, the analyzer will display a message saying "You must delete an item before adding a new one." Press the [BACKUP] key and select "Manage Setups" to delete the Setup of your choosing. It is advisable to transfer setups to AvTrend for storage and, when necessary, retrieval.

10.1.1. – Overall Vibration Setup

The "Overall Vibration Setup" banner screen allows you to define and store an overall vibration survey job. As shown in the figure below, some fields in this screen have default values that appear automatically. You can use this information if appropriate or input your own specific setup information using the keypad. (Refer to Chapter 3, "Using the Viper 4040 Analyzer" if you are unfamiliar with using the keypad.) The analyzer will display the "Overall Vibration Setup" banner with default values or values entered from the previous job such as those shown in the figure below.

Model 4040 VIPER Analyzer
Overall Vibration Setup

Name :

(RPM) : 0.00 to 10000.00

Channel	Units	Mod	MaxValue
A:	g's	Peak	1.00
B:	g's	Peak	1.00
C:	g's	Peak	1.00
D:	g's	Peak	1.00

Channel	Sensor	Desc
A:	None	
B:	None	
C:	None	
D:	None	

Conds Speeds

- 10.1.1.1. To complete the "Overall Vibration Setup" banner screen, do the following
 - 10.1.1.1.1. In the "Name:" field, use the analyzer keypad to enter a name for the overall vibration survey setup. (Refer to Chapter 3, "Using the Viper 4040 Analyzer" if you are unfamiliar with using the keypad.) The name should be one of your choosing which you will easily recognize and associate with this setup. The airframe or engine name such as "AS350 or TFE731-2" is best to use when naming a Setup.
 - 10.1.1.1.2. Use the [↓] key to move to the frequency units field. Determine if the required frequency units are revolutions per minute (RPM) or cycles per second (Hz), then use the [⇒] key to "toggle" between the two selections in this field.
 - 10.1.1.1.3. Using the [↓] key, move to the Minimum Frequency and Maximum Frequency field. (These are the two unmarked fields immediately to the right of the

frequency units filed and separated by the word “to”.) Using the keypad, enter the minimum and maximum frequency values according to the requirements for the job.

For instance, if the frequency of interest is 300 Hz, choose a minimum and maximum frequency that will place the 300 Hz in the center of the range. The minimum could be 250 Hz and the maximum 350 Hz for example. You should also consider other factors such as Harmonics. If you want multiples of the fundamental frequency included in the frequency range, determine to what extent that need is (1X, 2X, 3X, and so on) then extend the frequency range to include it. For example, 300Hz is the frequency of interest, the fundamental frequency. If you want 3X harmonics included in the frequency range you must multiply the fundamental frequency (300 Hz) X the harmonic range (3X) and arrive at an upper range of 900 Hz. After you have entered the appropriate minimum and maximum frequency values, use the [↓] to move to the next field.

- 10.1.1.1.4. The “Units” field determines the engineering units in which the amplitude or “Y” axis (amplitude) of the spectra will be displayed. Consult your equipment maintenance manual for specific requirements of a vibration survey or for analysis guidelines. Use the [⇒] key to select g’s (equivalent gravities of acceleration), IPS (Inches Per Second), mm/sec (millimeters per second), cm/sec (centimeters per second), Mils (1/1000th of an inch), Microns (1/1000000th of a meter), or m/s/s (meters per second per second) or cm/s/s (centimeters per second per second). Use the [↓] key to move to the next field.
- 10.1.1.1.5. The “Mod” field is an abbreviation for the unit Modifiers relevant to the engineering units specified in step 10.1.1.1.4 above. Use the [⇒] key to select either Peak, Pk - Pk (Peak to Peak, also called Double Amplitude), Avg. (Average) or RMS (Root Mean Square). Consult the appropriate equipment maintenance manual for specific requirements of an overall vibration survey or for analysis guidelines. Use the [↓] key to move to the next field.
- 10.1.1.1.6. In the “MaxValue” field, toggle between the possible selections by using the [⇒] key. This value indicates the maximum amplitude you expect to acquire or the maximum amplitude of interest. You should choose an amplitude that will adequately display the full amplitude of any specified limit. If you do not expect amplitudes in excess of what would normally be experienced for the equipment application, set this field as low as possible while still allowing sufficient space to display the maximum limitations as stated above. Repeat steps 10.1.1.1.4 through 10.1.1.1.6 for all the channels you are planning to use during the survey. Then press the [↓] key to move to the “Sensor” field.
- 10.1.1.1.7. Select a “Sensor” from the available sensor list by using [⇒] key. A “None” selection indicates that you do not intend to use the channel and the “Desc” (description) field will be skipped. If the Sensor field contains a sensor selection, use the [↓] key to move to the “Desc” fields.
- 10.1.1.1.8. The “Desc” fields are optional fields that are not required to be filled in to use the Overall Vibration Survey function; however, this information will aid you

in differentiating the reading on one channel from another. The Channel A, B, C, and D descriptions likewise should be a description of your choosing which you and your co-workers easily understand, such as “Lateral,” “Vertical,” or “No. 1 Gen” and “No. 2 Gen”. All other fields are not optional and must be selected or filled in.

NOTE

Encountered amplitudes above this setting may cause the analyzer to overload. An overload will result in spurious harmonics and may cause unusual termination of the job. It is best to set the “Full Scale Vibration” higher than needed as opposed to lower than needed for this reason. The overload does not cause a fatal error. You can recover from the overload by pressing the [MAIN MENU] key and starting the process again from the beginning. However, avoiding an overload will save you time in the process.

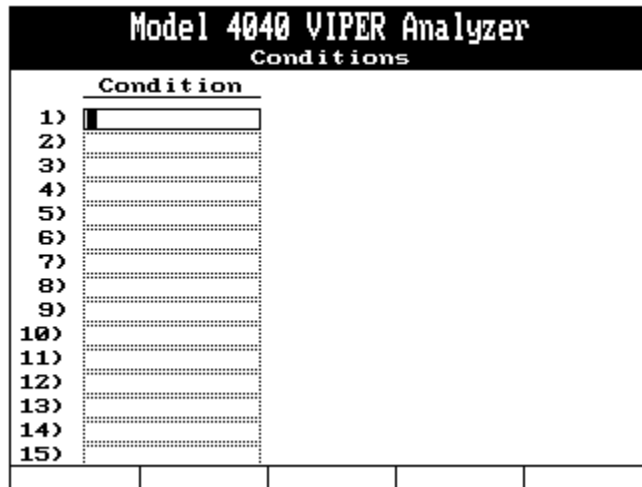
The available selections are: 0.01, 0.02, 0.05, .10, .20, .50, 1.00, 2.00, 5.00, 10.00, 20.00, 50. and 100. This scale refers to the number of engineering units of vibration amplitude specified in step 10.1.1.1.4 above.

NOTE

See the Chapter 15, Equipment and Accessory Setup and Troubleshooting, for additional information on installing accessory equipment such as vibration sensors and tachometers.

10.1.1.2. – Conditions

The “Conds” (which corresponds to the [F1] key) selection appears at the bottom left of the “Overall Vibration Setup” banner screen. Press the [F1] key if you wish to define conditions for the survey. If you choose this option, the following “Conditions” banner screen is displayed.



To input conditions, do the following:

- 10.1.1.2.1. Use the [↑] and [↓] to move from field to field on this screen and the [⇒] and [⇐] keys to navigate within the field or toggle between selections. Make field entries in the fields using the keypad.
- 10.1.1.2.2. In the “Condition” column, use the analyzer keypad to enter a descriptive name for up to fifteen conditions. You may define up to fifteen individual points at which you collect and optionally store data. When defined, these conditions are stored with the setup and are accessed when the setup is selected.
- 10.1.1.2.3. When the conditions are completed per your requirements, press [ENTER] to accept and exit back to the “Overall Vibration Setup” screen.

10.1.1.3. – Speeds

The “Speeds” (which corresponds to the [F2] key) selection appears at the bottom, second from the left, of the “Overall Vibration Setup” screen. Press the [F2] key if you wish to define speeds for the survey. If you choose this option, the following “Speed Inputs Setup” banner screen is displayed. There are four rows, 1, 2, 3, and 4 indicating the tachometer input channel. There are four columns, Measure, DESC, OFF/100%, and Factor. These inputs are described below.

Model 4040 VIPER Analyzer				
Speed Inputs Setup				
	Measure	DESC	OFF/100%	Factor
1)	None		0.00000	0.00000
2)	None		0.00000	0.00000
3)	None		0.00000	0.00000
4)	None		0.00000	0.00000

To define the Speed Inputs Setup, do the following:

- 10.1.1.3.1. Use the [↑] and [↓] to move from field to field on this screen and the [⇒] and [⇐] keys to navigate within the field or toggle between selections. Make field entries in the fields using the keypad.
- 10.1.1.3.2. In the “Measure” column, use the [⇒], and [⇐] keys to select from Pulse S-H, Volts S, Pulse D-H, Volts D, Pulse S-L, Pulse D-L, or None indicating the tachometer input type for the corresponding tachometer input channel 1 through 4. “None” is selected when the corresponding tach channel is not being used.

- 10.1.1.3.3. In the “DESC” (description) column, enter a description for the corresponding tachometer input channel. The description should be a name commonly understood by all users of this setup. Use the analyzer keypad to input the description. For instance, if the input is in Hertz (cycles per second), the description might be Hz1. If the input is in a raw voltage, the input description might be DC2 indicating a Direct Current input on Channel 2. You might also choose common terminology such as N1, N2, Fan, etc.
- 10.1.1.3.4. In the “OFF/100%” column you should enter the DC OFFSET when measuring a DC voltage, if known. If you are measuring a Hertz input enter the expected Hz @ 100% speed.
- 10.1.1.3.5. In the “FACTOR” column, enter the multiplier for the voltage or frequency to result in a 100% speed reading for the component being measured. The resultant speed indication is based on either OFFSET + VOLTS x FACTOR, or Hz x FACTOR.
- 10.1.1.3.6. When all fields are completed per your requirements, press ENTER. The screen will return to the “Overall Vibration Setup” banner screen. Press ENTER again.

10.1.2. - Job Identification

The next screen displayed is the “Job Identification” banner screen shown in the following illustration. All information on this screen is optional; however we highly recommend you fill in as much information as possible to ease the task of storage and retrieval of surveys. If you have entered names into the analyzer previously, you may press the [F1] key to select from a list of stored customer names, which will then be entered into the “Name” field. When all fields are completed as desired, press [ENTER] to continue.

Model 4040 VIPER Analyzer
Job Identification

Name:

A/C Registration:

A/C Total Time:

Press ENTER to continue

Names			
-------	--	--	--

10.1.3. – Engine Information

The “Engine Information” banner screen is displayed as shown below. A serial number (“S/N”) and “Type” field are available for both an engine and a propeller so that stored surveys can be traced by either component of the powertrain system. All fields are optional but we highly recommend you fill in as much information as possible for ease of use in trending, recall, and storage.

Navigate (move) between the fields using the [↓] and [↑] keys. All fields are entered from the keypad with the exception of the “Pos” (Position) field, which is a selection field. The position indicates the position on the airplane of the engine, propeller or subcomponent. Using the [⇒] key, select positions from 1 through 4. The “TSO” and “TSN” fields for “Time Since New” and “Time Since Overhaul” are optional fields. When all fields are filled as required, press [ENTER] to continue.

Model 4040 VIPER Analyzer				
Engine Information				
Position:	1			
Propeller:				
S/N	MC8799			
Type	BLK MAX			
TSO	700			
TSN	1478			
Engine:				
S/N	34889			
Type	10540			
TSO	0			
TSN	1478			
Serial Nos				

10.1.4. – Select Aircraft Condition

The “Select Aircraft Condition” banner screen is displayed. The conditions are those defined in the “Edit Conditions” screen (see section 10.1.1.2).

Use the [↑] or [↓] keys to select the condition you wish to collect. When your choice is highlighted, press [ENTER] to begin collecting data.

10.1.5. – Start Component

Start the component you are checking (engine, generator, gearbox, etc.). When the component reaches the desired operating condition (speed, temp, etc.), press the [ENTER] key to begin acquiring data.

NOTE

When the spectra is displayed on screen, you may press the [↑] or [↓] keys to produce

a **NORMAL CURSOR** immediately at the highest displayed amplitude frequency. The [**←**] and [**⇒**] keys may also be used immediately to **EXPAND** or **SHRINK** the Y scale.

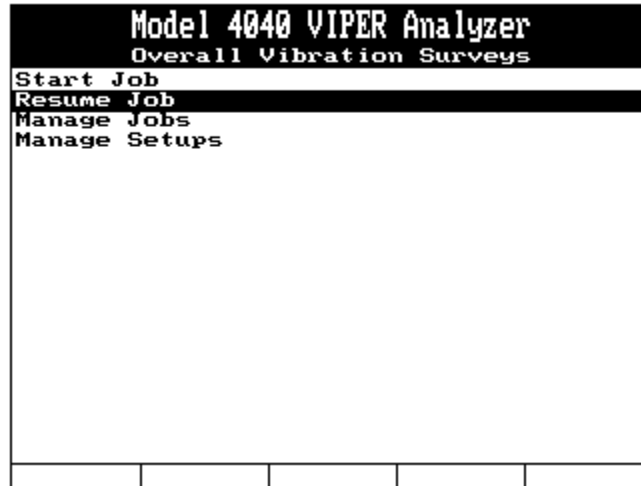
10.1.6. - Collecting Data

When the data screen is displayed, you will also see one function box at the bottom of the screen (see following figure) corresponding to the position of the [F5] key. The box reads “Reset.”

Model 4040 VIPER Analyzer				
Overall Vibration				
Samples :				
Units : IPS Peak				
Current		Maximum		
				Reset

Pressing the “[F5]” key will delete the collected data, zero out the affected fields and begin anew. As shown in the screen above, the analyzer will report the total number of Samples taken and the engineering Units of vibration plus the modifier for those samples. Lower on the screen, there are two columns corresponding to the “Current” input measurements and the “Maximum” which is the highest amplitude reading from the number of Samples taken. There will be a number of rows corresponding to the number of input channels specified in the Setup for this job.

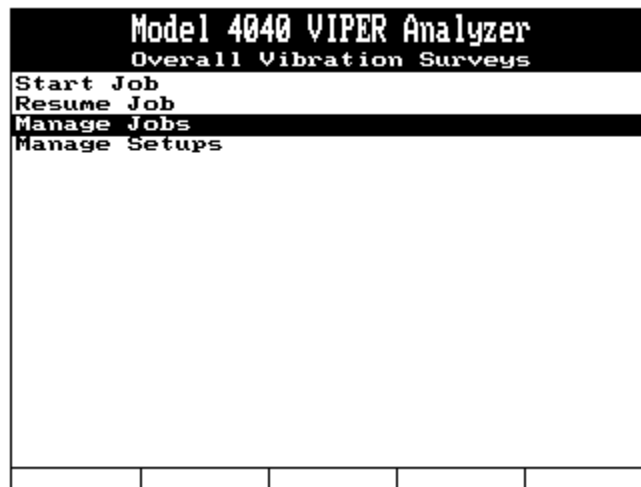
10.2. - Resume Job

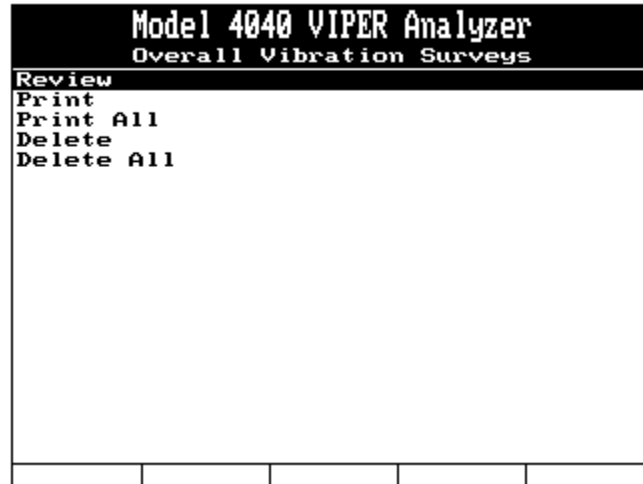


When you select “Resume Job” from the “Overall Vibration Surveys” banner screen menu, the “Incomplete Jobs” banner screen will be displayed. Incomplete jobs are listed by name, preceded by an asterisk. Select the job you wish to complete and the analyzer will return you to the point where the in-progress job was stopped, allowing you to complete it.

10.3 - Manage Jobs

Selecting “Manage Jobs” from the “Overall Vibration Surveys” banner screen menu presents several sub-menu choices to choose from. These choices allow you to “manage” previously completed job data you have stored in the analyzer.





10.3.1. - Review

Selecting the “Review” option presents a list of stored jobs on the “Job List” banner screen. You can select one job for on-screen viewing. When viewing is complete, press the [BACKUP] or [ENTER] key to exit the screen.

10.3.2. - Print

The “Print” option presents a list of stored jobs on the “Job List” banner screen. From the list, you may select one job for printing. See Chapter 21, “Printing” for a detailed explanation of how to set up the analyzer to print.

10.3.3. - Print All

The “Print All” option sends all currently stored jobs to the printer. When you select “Print All,” a message will appear on the analyzer’s “Print All Jobs” banner screen asking you to verify that you want to print all jobs. Answer the prompt, “Are you sure?” by pressing the [F1] key for “Yes” or the [F5] key for “No.” If you choose the “Yes” answer, ensure your printer is prepared (paper, print cartridge, etc.) to complete the number of jobs stored. The “Yes” answer will send *all* currently stored jobs to the printer. The “No” answer will return you to the previous menu.

10.3.4. - Delete

The “Delete” option presents a list of stored jobs on the “Job List” banner screen. From the list, you may select one job for deletion. After making your selection, the “Delete Job” banner screen will appear, asking you to verify your intent to delete the selected job by pressing the [F1] key for “Yes” or the [F5] key for “No.” You may wish to print the job for

10.4.3. - Print

Selecting the “Print” function displays the “Setup List” screen. Ensure your printer is turned on and connected to the analyzer with the COMM/Print cable supplied with your analyzer. Select the setup you wish to print. (See Chapter 21, “Printing” for a detailed explanation of how to set up the analyzer to print.)

10.4.4. - Print All

Selecting “Print All” sends all currently stored setups to the printer. When making this selection, you will be asked to verify “Are you sure?” by pressing the [F1] key for “Yes,” or the [F5] key for “No.” If choosing the “Yes” answer, ensure your printer is prepared (paper, print cartridge, etc.) to complete the number of jobs stored. The “Yes” answer will send *all* currently stored setups to the printer. The “No” answer will return you to the previous menu.

10.4.5. - Delete

The “Delete” option presents you with a list of stored setups. From the list, you may select one setup for deletion. If you wish to delete all stored setups, you must delete them individually. After making your selection, you will be asked to verify your intent to delete the selected job by pressing the [F1] key for “Yes,” or the [F5] key for “No.” We highly recommend you print or download the setup to your PC for reference or permanent record prior to deleting them. Once deleted, the setups cannot be retrieved from the analyzer.