



Application Note

Williams International FJ44 Series

Vibration Spectrum Survey

Part Number: 11-200-0285

AppNote Number: A-WIFJ44-4040-VI (Rev. 0.00, Aug 2010)

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Application Note

Application Note Number	A-WIFJ44-4040-VI
Revision	0.00
Function	Vibration Spectrum Survey
Airframe	Various
Engine	Williams International FJ44 Series
E-Setup Number	A-WIFJ44-4040-VI.asf
ACES Systems Analyzer	Model 4040
Boot/App Version	Boot 3.05/App 3.05 or later
Procedure	N/A

Introduction

This Application Note covers the required equipment, equipment installation, analyzer setup, and data acquisition process for using the ACES Systems Model 4040 Viper Analyzer with the Vibration Spectrum Survey Option to perform a Vibration Spectrum Survey on the Williams International FJ44 Series. General instructions for the use of the Model 4040 can be found in the Model 4040 User Manual #4040-OM-01 (P/N 75-900-4040). All procedures for performing the Vibration Spectrum Survey should be performed in accordance with the appropriate Maintenance Manual.

A. Required Equipment

The following equipment is required to perform a Vibration Spectrum Survey*:

Item	Quantity	Description	Part Number
1.	1	Analyzer, Model 4040CE	10-100-4040CE
2.	1	Sensor, Vibe, Accel, 991V	69-100-0064
3.	1	Cable, Interf, 991V-Gen Vib Cbl	10-320-0142
4.	1	Cable, Vibe, 6 Pin Generic, 50 Ft.	10-320-0127
5.	1	Mount, Sensor, FJ44 Vibration (Williams P/N TI37253)	22-430-0063

*This listing shows the latest design parts. It is acceptable to perform this task using previous designs with the appropriate accessories. For compatibility issues, contact ACES Systems.

Optional Equipment

The following equipment may be used as an alternate when accomplishing the job:

Item	Quantity	Description	Part Number
6.	1	Cable, Sensor 991V, 25'	10-320-0158
7.	1	Cable, Sensor 991V, 50'	10-320-0159

Miscellaneous Equipment

Tape or tie wraps to secure cables to airframe.

B. Equipment Installation

1. Point the nose of the aircraft into the wind.
2. Place the analyzer ([Item 1](#)) in the flight compartment.
3. Remove the engine cowling. Refer to the Aircraft Maintenance Manual.
4. Remove the lockwire and remove plug from the engine mount pad hole (upper or lower outboard side as installation allows).
5. Install the FJ44 Vibration Sensor Mount ([Item 5](#)) on the engine. ([Figure 1](#))
6. Install the 991V vibration sensor ([Item 2](#)) on the FJ44 Vibration Sensor Mount ([Figure 1](#))

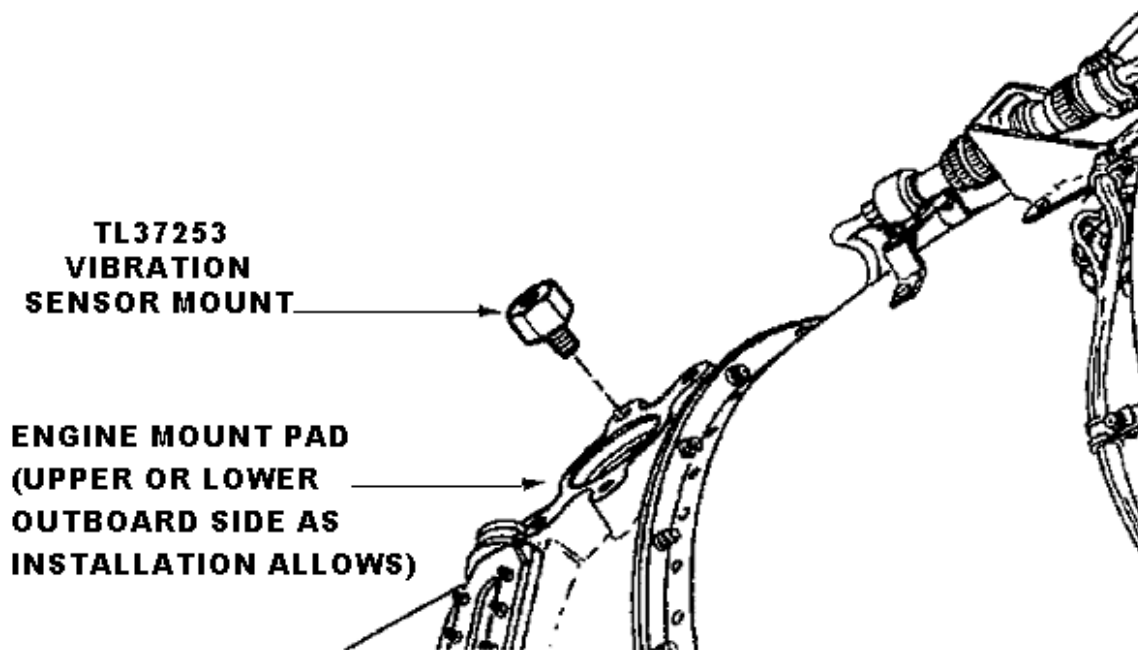
NOTE

Secure and route cables as not to interfere with hot or rotating components and aircraft controls.

7. Install Vibe Sensor Interface Cable ([Item 3](#)) by connecting the end of the cable identified as “SENSOR” to the vibration sensor. Connect the end marked “INTERFACE” to the end of the Generic Vibration Cable ([Item 4](#)) marked “VIBE INTERFACE”. Safely route the Generic Vibration Cable to the location of the analyzer. Connect the end of the Generic Vibration Cable identified as “ANALYZER” to the “CHANNEL A” connector on the analyzer.

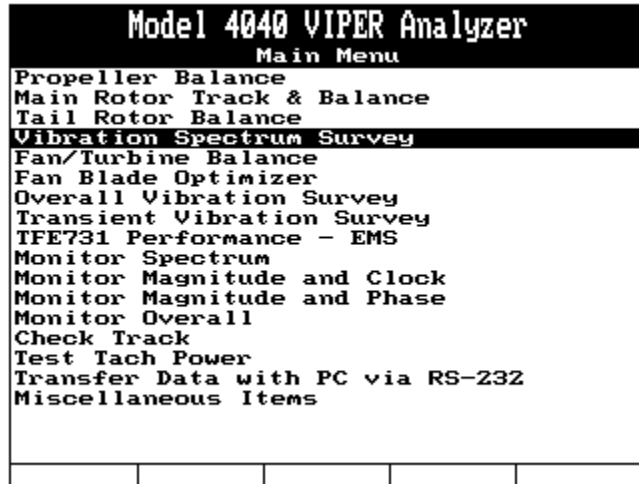
Equipment Installation Diagram

Figure 1

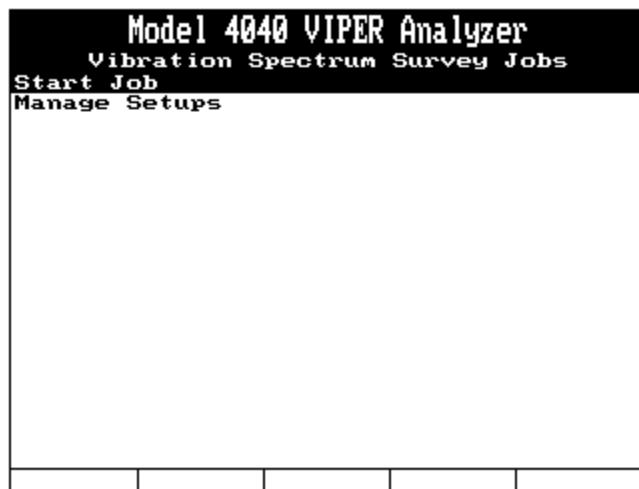


C. Analyzer Set Up

1. Insure the analyzer battery is charged prior to starting the job. See the Model 4040 User Manual #4040-OM-01 (P/N 75-900-4040) Chapter 2 for detailed instructions on battery charging.
2. Turn the analyzer ON by pressing the [ON/OFF] key.
3. From the Main Menu shown below, select “Vibration Spectrum Survey” and press the [ENTER] key.



4. From the Vibration Spectrum Survey Menu shown below, select “Start Job” and press the [ENTER] key.



5. If the Williams International FJ44 Series is listed in the Setup List, select it using the [↓] key, press [ENTER] and go to [Section D below](#). If the Williams International FJ44 Series is not in the Setup List, press the [F1], “New” key and go to [Step 6 below](#).

Select				
Setup List				
1)	e-wi-fj44-4040-vi			
2)	BRAND X	ENGINE		
3)	BRAND Y	ENGINE		
4)	BRAND Z	ENGINE		
New			Copy	

6. The “Vibration Spectrum Survey Setup” screen now appears. Enter the Vibration Spectrum Survey Setup as shown below. You can enter any name that is convenient for locating the setup in the future.

Model 4040 VIPER Analyzer				
Spectra Setup				
Name:	e-wi-fj44-4040-vi			
RPM:	1200.00	to	60000.00	
Resolution:	400	lines		
Average Type:	Peak	Blocks:	4	
Channel	Units	Mod	MaxValue	
A:	IPS	Peak	1.00	
B:	None			
C:	None			
D:	None			
Channel	Sensor		Desc	
A:	991V			
B:				
C:				
D:				
Edit Conds	Speeds	Limits		

7. Press [F3] “Limits” to display the “Limits” function keys as shown below. Press the [F1] “A-Limits” key to enter limits for the Channel A vibration sensor. Continue with [Step 8 below](#) to enter the information for the limits.

Model 4040 VIPER Analyzer
Spectra Setup

Name:

(RPM): to

Resolution: lines

Average Type: Blocks:

Channel	Units	Mod	MaxValue
A:	<input type="text" value="IPS"/>	<input type="text" value="Peak"/>	<input type="text" value="1.00"/>
B:	<input type="text" value="None"/>		
C:	<input type="text" value="None"/>		
D:	<input type="text" value="None"/>		

Channel	Sensor	Desc
A:	<input type="text" value="991V"/>	<input type="text"/>
B:		
C:		
D:		

A-Limits B-Limits C-Limits D-Limits Back

- Use the keypad to fill out the “Edit Limits for Channel A:” table as shown below. The top limit of 1.1 IPS will apply to the HP spool. The bottom limit of 0.37 IPS will apply to the LP spool. When you are finished entering the values press [ENTER] to save the changes and return to the Spectra Setup Screen.

Model 4040 VIPER Analyzer
Edit Limits for Channel A:

	F-low	F-high	Unit	Limit
1)	<input type="text" value="1200.00"/>	<input type="text" value="60000.00"/>	<input type="text" value="xRPM"/>	<input type="text" value="1.10"/>
2)	<input type="text" value="1200.00"/>	<input type="text" value="60000.00"/>	<input type="text" value="xRPM"/>	<input type="text" value="0.37"/>
3)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
4)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
5)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
6)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
7)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
8)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
9)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
10)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
11)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
12)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
13)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>
14)	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>	<input type="text" value="xCS1"/>	<input type="text" value="0.00"/>

CopyToAll CopyToB CopyToC CopyToD

- When you return to the Spectra Setup screen, press the [ENTER] key to save the setup and proceed.

Model 4040 VIPER Analyzer			
Spectra Setup			
Name:	e-wi-fj44-4040-vi		
(RPM):	1200.00	to	60000.00
Resolution:	400 lines		
Average Type:	Peak	Blocks:	4
Channel	Units	Mod	MaxValue
A:	IPS	Peak	2.00
B:	None		
C:	None		
D:	None		
Channel	Sensor	Desc	
A:	991V		
B:			
C:			
D:			
Edit Conds	Speeds	Limits	

D. Data Acquisition

- The “Job Identification” screen will be displayed, as shown below. Use the analyzer keypad to enter a customer name in the “Name:” field. The analyzer will maintain a list of customer names as new names are entered. If names have been previously entered into this analyzer, you may press the [F1] “Names” key and select a customers name from the provided list. Press the [↓] key to move to the next field and use the analyzer keypad to enter the optional aircraft registration and aircraft total time as required. When all fields are complete, press the [ENTER] key to accept and continue.

Model 4040 VIPER Analyzer			
Job Identification			
Name:	CUSTOMER NAME		
A/C Registration:	N1234		
A/C Total Time:	123.4		
Press ENTER to continue			
Names			

- The next screen to be displayed is the “Engine Information” screen, as shown below. The information entered on this screen is optional. Entering as much information as possible will help complete the final report. If prior jobs have been completed on this analyzer, pressing [F1] “Serial Nos” will display a list of Serial Numbers used in previous jobs. You may select a Serial Number from the list and this will automatically be entered in the appropriate field. When all entries are complete press [ENTER] to continue.

Model 4040 VIPER Analyzer				
Engine Information				
Position:				
{ 1 }				
Propeller:				
S/N	_____			
Type	_____			
TSO	0			
TSN	0			
Engine:				
S/N	_____			
Type	_____			
TSO	0			
TSN	0			
Serial Nos	_____	_____	_____	_____

3. The analyzer will display the “Start Engine” screen. “Perform FOD check, start the engine, and establish normal operating condition.”
4. Set generator to – OFF
5. Set bleed air to – OFF
6. Start the engine according to General Operating Procedures and allow it to stabilize for two minutes.
7. Refer to the “N1 Speeds for Ground Checks at Takeoff Thrust Settings” to determine the takeoff N1 speed setting. When the engine is stabilized, press [ENTER] to continue.

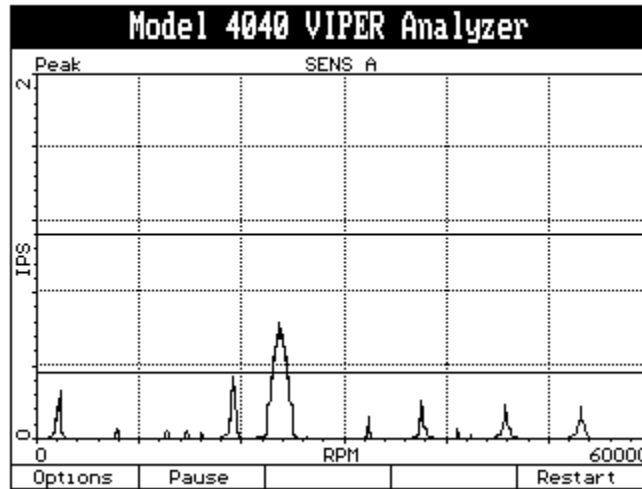
Model 4040 VIPER Analyzer				
Start Engine				
Perform FOD check, start the engine, and establish normal operating conditions				
Press ENTER to continue				
Swap Job	_____	_____	_____	_____

8. The analyzer will present the data acquisition screen as shown below. This screen allows you to monitor both the current and averaged vibration readings.
9. Advance the power lever from idle, at a uniform rate over a period of approximately 100 seconds, but not less than 90 seconds, until takeoff is achieved.
10. Hold the engine at takeoff speed for a minimum of 2 minutes.

11. Move the power lever back, at a uniform rate over a period of approximately 90 seconds, but not less than 60 seconds, to idle.
12. . Press the [ENTER] key to stop acquisition.

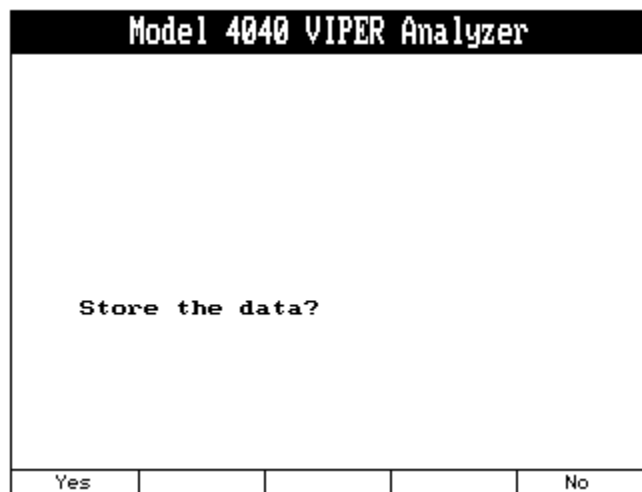
NOTE

The data shown below is a simulation only. It may not reflect actual aircraft data. The upper limit line applies to the HP spool. The lower limit line applies to the LP spool.



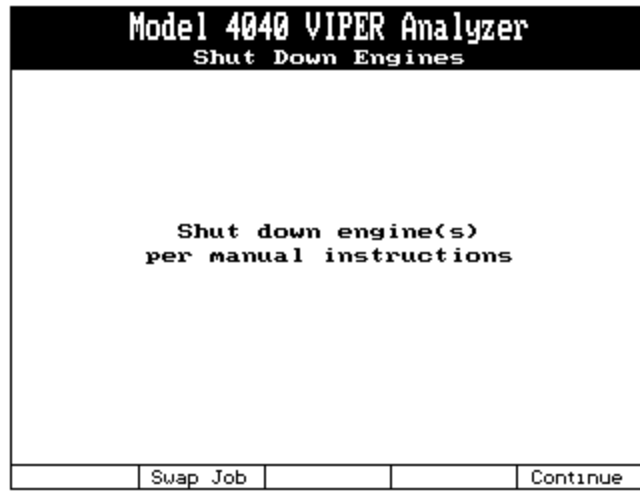
See the Model 4040 User Manual #4040-OM-01 (P/N 75-900-4040) Chapter 20 for detailed instructions on how to read the “Reading the X and Y Plotted Vibration Spectrum.”

13. The analyzer will display the screen shown below. If the data is good, press the [F1] “Yes” key to store the data. If you need to retake the data for some reason, press the [F2] “No” key.



14. After data is taken in the last condition and the data has been stored, the “Shut Down Engines” screen will appear with the message, “Shut down engine(s) per manual instructions.” When the engine shut down process is complete, press the [F3] “Continue” key. This will complete the job. Pressing the [F2] “Swap Job” key will leave the job

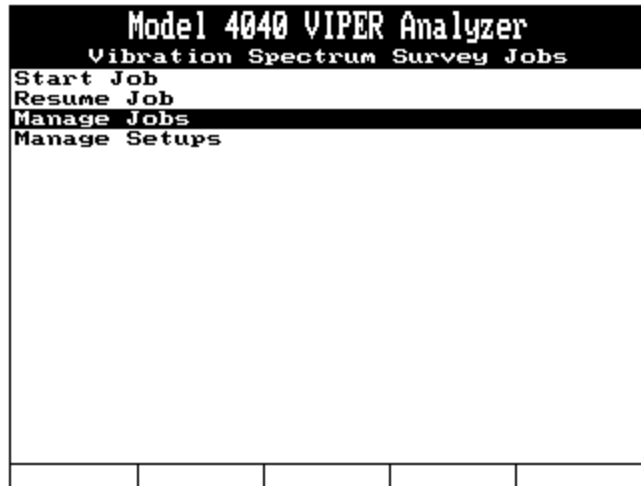
incomplete and return you directly to the Main Menu without rebooting the analyzer. This will allow you to resume the job at a later date. You may turn the analyzer OFF at this point.



15. Remove Vibe Sensor Interface Cable (Item 3) by disconnecting the end of the cable identified as "SENSOR" from the vibration sensor. Disconnect the end marked "INTERFACE" from the end of the Generic Vibration Cable (Item 4) marked "VIBE INTERFACE". Disconnect the end of the Generic Vibration Cable identified as "ANALYZER" from the "CHANNEL A" connector on the analyzer.
16. Remove the 991V vibration sensor (Item 2) from the FJ44 Vibration Sensor Mount (Figure 1)
17. Remove the FJ44 Vibration Sensor Mount (Item 5) from the engine. (Figure 1) Reinstall the plug in the engine mount pad hole and replace the lockwire.
18. Reinstall the engine cowling. Refer to the Aircraft Maintenance Manual.

E. Quit Job

1. The job can be reviewed in the analyzer by using the "Manage Jobs" function under the "Vibration Spectrum Survey Jobs" menu as shown below. The data can also be downloaded to AvTrend for review and evaluation. See the appropriate AvTrend manual for detailed instructions.



2. If vibration levels exceed limits, refer to the Troubleshooting (high vibration with or without noise) Section of the appropriate Maintenance Manual.
3. If LP vibration levels exceed limits, refer to the Trim Balance Procedure of the appropriate Maintenance Manual.