Application Note

Eurocopter AS 350 and AS 355 Series

Tail Rotor Balance

Part Number: 11-200-0103

AppNote Number: A-EUAS350-355-4040-TR (Rev. 1, June 2005)

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Application Note

Application Note Number	**A-EUAS350-355-4040-TR**
Revision	**1 (From Airframe Rev Dated 1996)**
Function	**Tail Rotor Balance**
Airframe	**Eurocopter AS350 and AS355 Series**
Engine	**N/A**
E-Setup Number	**a-euas350-355-4040-tr.asf**
ACES Systems Analyzer	**Model 4040**
Boot/App Version	**1.04/1.05p3 or later**
Procedure	**N/A**

Introduction

This Application Note covers the required equipment, equipment installation, analyzer setup, data acquisition and solution process for using the ACES Systems Model 4040 with the Tail Rotor Enhanced Performance Option to perform a tail rotor balance on the airframe listed above. 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) and Optical Tracker Operational Supplement #540-OM-1 (P/N 75-900-2021). All procedures for track and balance and all adjustments should be made in accordance with the Airframe Maintenance Manual.

A. Equipment Setup

Required Equipment: The following equipment is required to perform a Tail Rotor Balance:

Item	Quantity	Description	Part Number
1.	1	Analyzer, Model 4040	10-100-4040
2.	1	Option, 4040 Main and Tail Rotor	11-900-0005
3.	1	Tachometer, Optical, Phototach (New)	10-100-1773*
4.	1	Cable, Tach, Generic, 50’	10-320-0126*
5.	1	Sensor, Vibe, Accel, 991D-1	69-100-0075
6.	1	Cable, Sensor 991D-1, 50’	10-320-0163
7.	1	Mount, Sensor, AS350/355 T/R & G/B	22-430-0065
8.	1	Mount, Phototach, AS350/355 T/R	22-430-0104

9.	1	Tape, Reflective, Roll, 10’	10-400-0176

*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.

Miscellaneous Equipment

Tape or tie wraps to secure cables to airframe.

If adjustments are to be made to the tail rotor balance, use only hardware or balance weights that are specified in the applicable airframe maintenance manual.

B. Equipment Installation

1. Park the aircraft on a flat level surface with the nose into the wind. Place the Model 4040 Analyzer (Item 1) in the flight compartment.
2. Install the Phototach Mount (Item 8) to the tail boom at the 9:00 position as viewed from the right hand side of the tail boom. Secure the Mount. Install Phototach (Item 3) into Mount and secure with nut. (Figure 1)

NOTE

See Paragraph D. 2 for additional installation instructions of Phototach and Tape.

3. Remove the tail rotor gearbox cover. Install the Sensor Mount (Item 7) to the tail gearbox output and secure. Install the 991D-1 Vibration Sensor (Item 5) into the Mount and secure. (Figure 2)

NOTE

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

4. Connect the end of the 50’ Tachometer Cable (Item 4) to the Phototach. Wrap the Cable forward around the tail-boom away from rotating components to the cabin. Connect the opposite end of the Cable to the analyzer to “Tach 1”.
5. Connect the 50’ Vibration Sensor Cable (Item 6) to the Vibration Sensor. Wrap the cable forward around the tail-boom away from rotating components to the cabin. Connect the opposite end of the Cable to vibration “Channel A” on the analyzer.

Equipment Installation Diagram

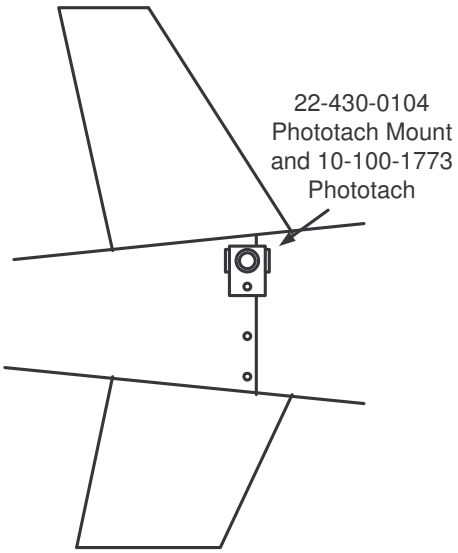


Figure 1

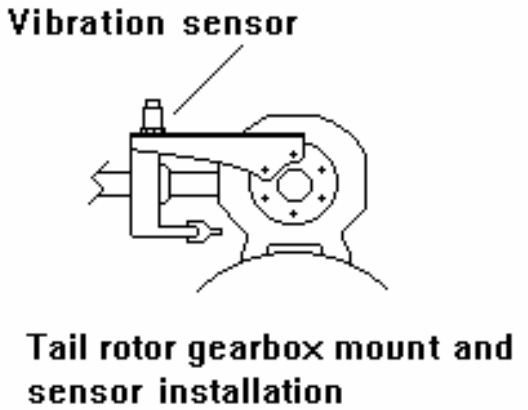


Figure 2

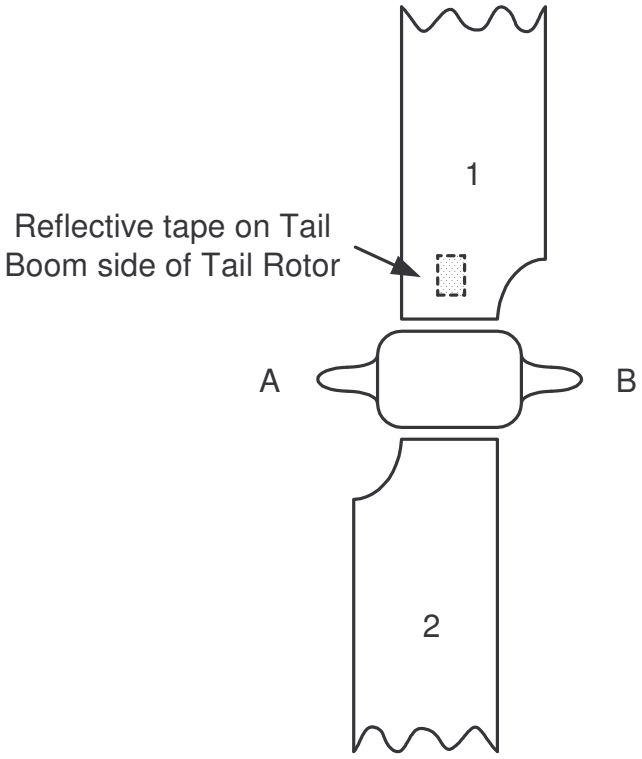
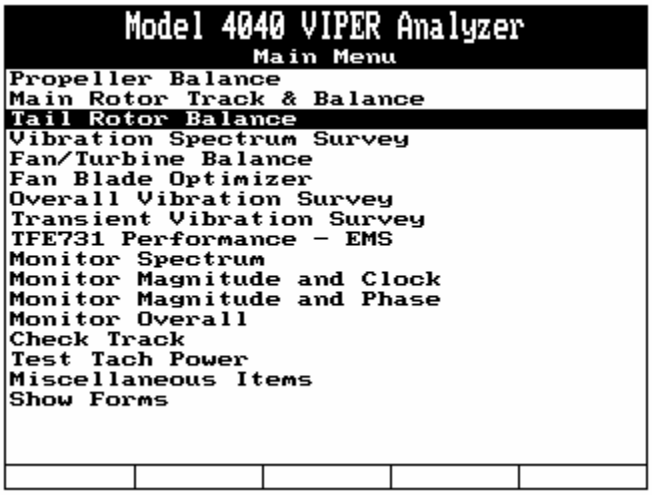


Figure 3

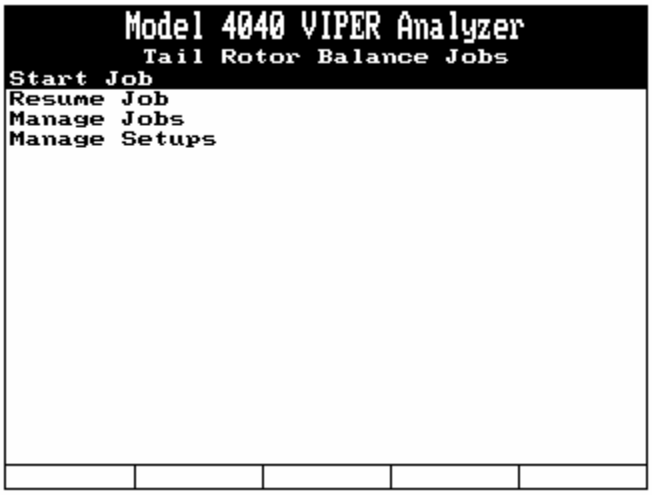
C. Analyzer Set Up

Two “Conditions” are required to perform tail rotor balance on the AS350/355 tail rotor in accordance with the maintenance manual. The initial condition is for “270NR”. It is required to check the vibration reading at this condition and if vibration levels are found to be in excess of 1.0 IPS, shutdown the aircraft and implement a solution. Failure to reduce vibration levels can result in damage to the tail rotor gearbox output shaft if aircraft speed is increased to 100%. The second condition is “NOMNL”. Balance is achieved at this RPM when 270NR readings are below 1.0 IPS.

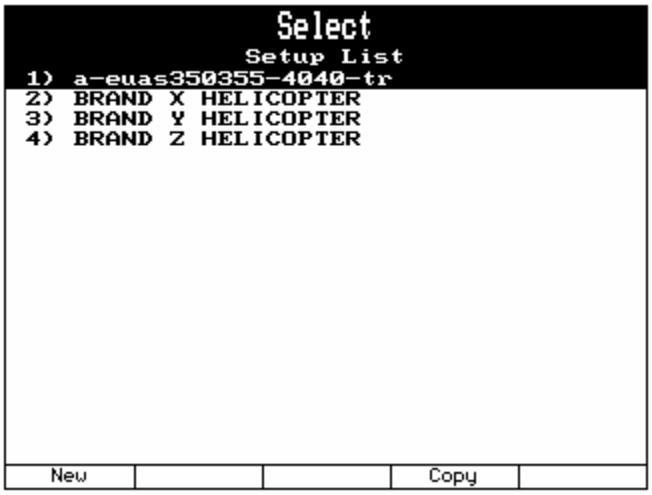
1. Insure the analyzer battery is charged prior to starting the job.
2. Turn the analyzer ON by pressing the **[ON/OFF]** key.
3. From the Main Menu shown below, select “Tail Rotor Balance” and press the **[ENTER]** key.



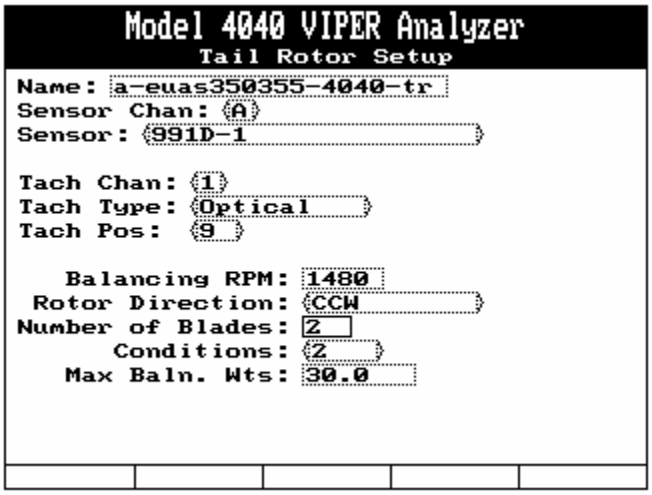
4. From the Tail Rotor Balance Menu shown below, select “Start Job” and press the **[ENTER]** key.



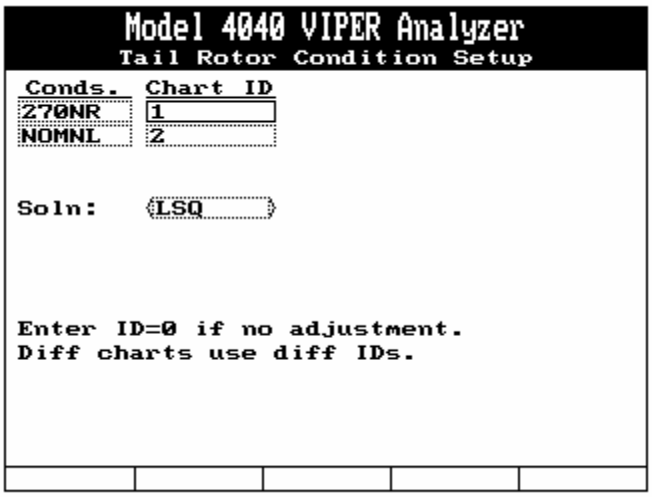
5. If the Eurocopter AS350/355 is listed in the Setup List, select it using the **[⇓]** key, press **[ENTER]** and go to Section D below. If the Eurocopter AS350/355 is not in the Setup List, press the **[F1]**, "New" key and go to step 6 below.



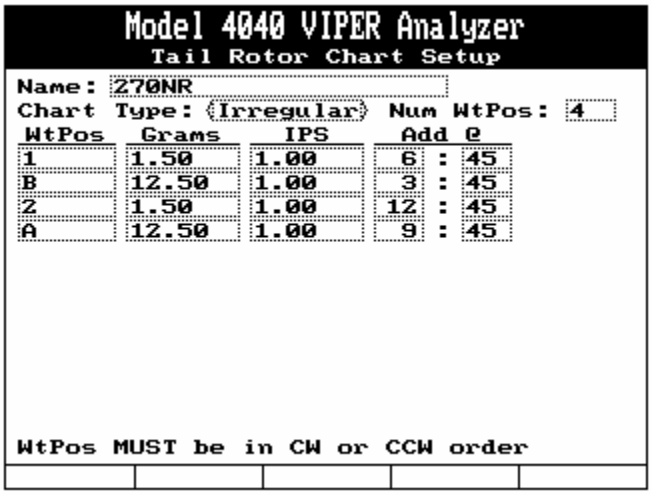
6. The "Tail Rotor Setup" screen now appears. Enter the Tail Rotor Setup as shown below. You can enter any name that is convenient for locating the setup in the future. When completed press **[ENTER]**.



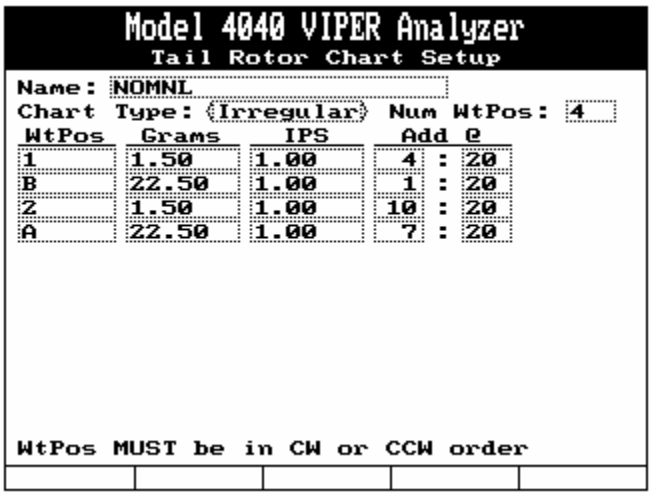
7. The "Tail Rotor Condition Setup" screen will be displayed next. The two conditions used to balance the AS350/355 Tail Rotor require separate balance charts. By using the LSQ solution, the analyzer will attempt to reduce the vibration level at both conditions concurrently. Enter the values as shown in the illustration below. Press **[ENTER]** to continue.



8. The first “Tail Rotor Chart Setup” screen will appear next. This screen will define the “270NR” condition balance chart. Enter the information as indicated in the illustration below. Press **[ENTER]** to continue.

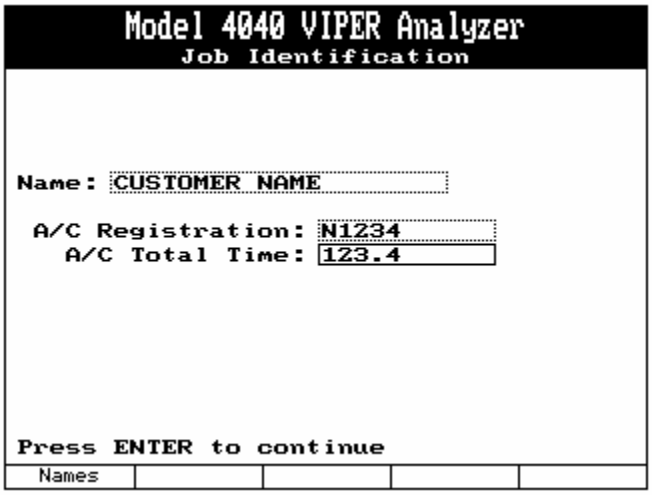


9. A second “Tail Rotor Chart Setup” screen will appear next. This screen will define the “NOMNL” condition balance chart. Enter the information as indicated in the illustration below. Press **[ENTER]** to continue.

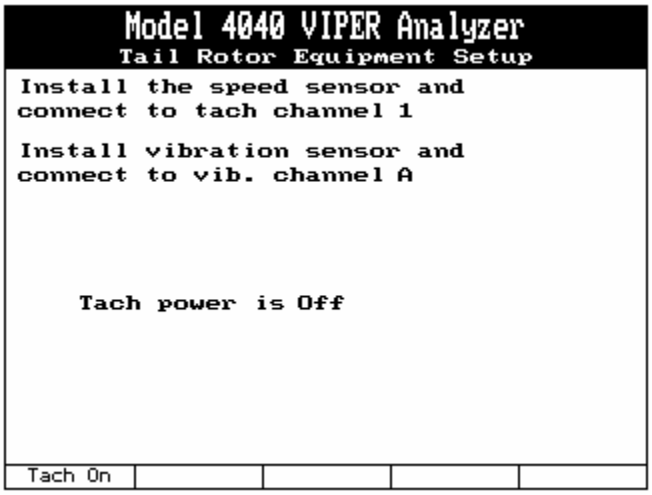


D. Data Acquisition

1. 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.



2. The next screen to be displayed will be the “Tail Rotor Equipment Setup” screen as illustrated below. This screen gives instructions on installing sensors and cables. You may also check the Phototach alignment by pressing the **[F1]** “Tach On” key which supplies power to the optical tachometer for checking alignment with the reflective tape.



   a. Press **[F1]** “Tach On”. Select a blade to be identified as the target blade. (See Section B Figure 3)

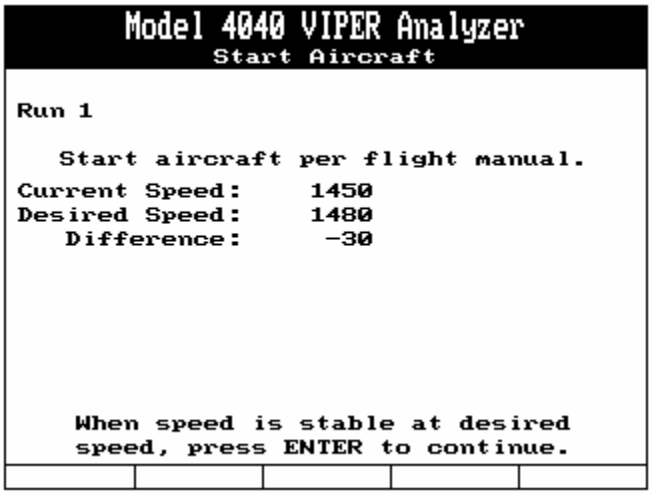
b. Hold a 2-inch piece of reflective tape (Item 9), reflective surface facing the Phototach, against the backside of the blade. Do not remove backing at this point.

c. The red "Gate" light on the back of the Phototach should illuminate as the reflective tape is properly aligned in front of the LED. Clean an area of the blade in preparation for mounting the reflective tape.

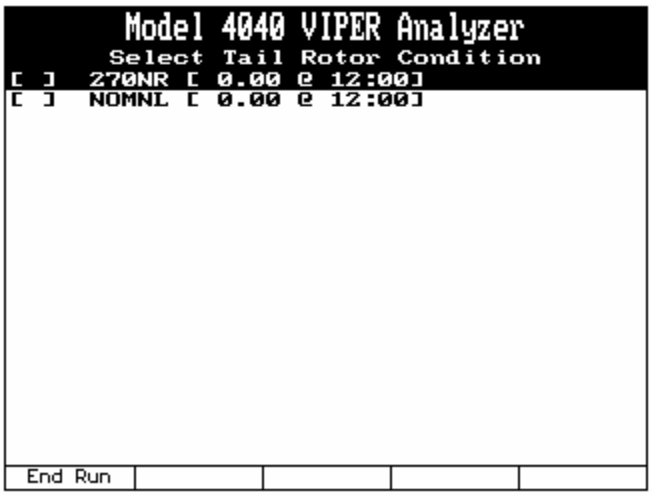
d. Remove the backing and install the reflective tape on the clean blade surface.

e. Press **[ENTER]** when finished with Tape installation.

3. The "Start Aircraft" screen will be displayed with instructions to "Start Aircraft per Flight Manual". When the aircraft is started and normal operating conditions have been established, press the **[ENTER]** key to continue.

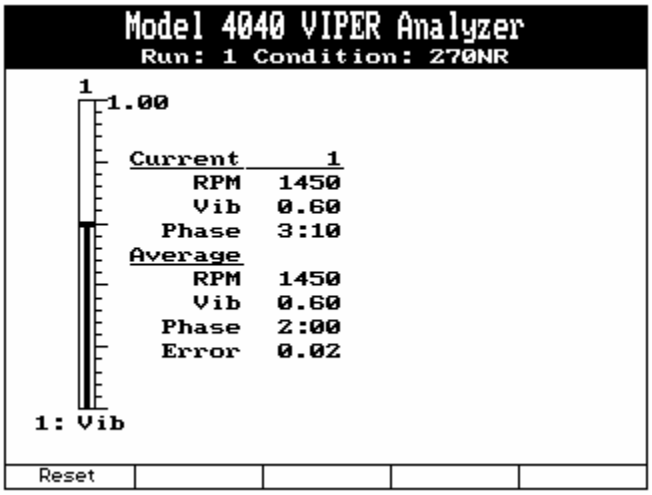


4. The "Select Tail Rotor Condition" screen will appear. Use this screen to highlight the condition where you would like to gather vibration readings. Highlight the condition name and press **[ENTER].**



5. The analyzer will present the data acquisition screen as shown. This screen allows you to monitor both the current and averaged vibration readings. While monitoring the

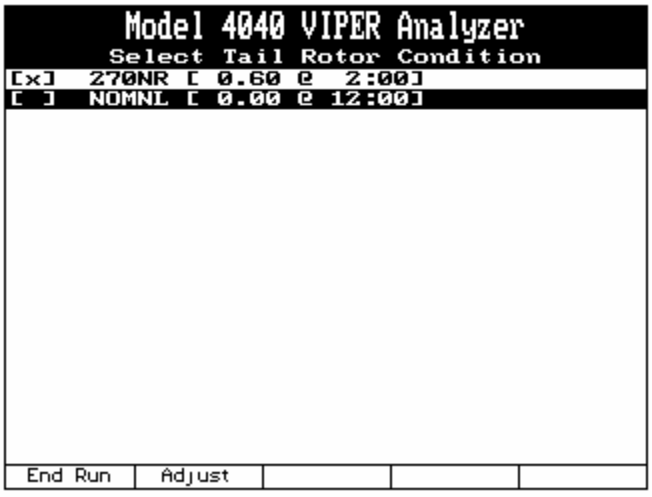
measurement, you may press the **[F1]** "Reset" key to restart the averaging process. Use this feature as a way to validate the quality of the measurement. If the averaged readings return to a value similar to that prior to being "Reset", the measurement can be considered good. If the measurement is not similar, you may choose to "Reset" the average again.



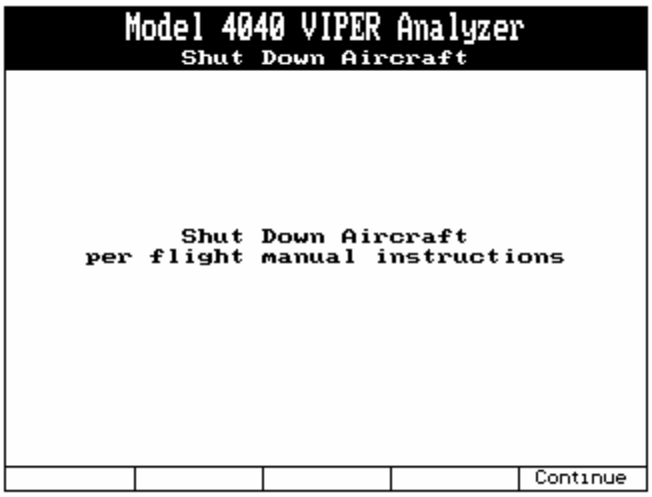
See the Model 4040 User Manual #4040-OM-01 (P/N 75-900-4040) Chapter 20 for detailed instructions on how to read the "Converging Vibration Indicator and Scale."

6. The "Select Tail Rotor Condition" screen will reappear. As shown below, conditions that already have data readings will be displayed with an **[x]** symbol. Press **[ENTER]** if you wish to "Retake" the data for the highlighted condition.

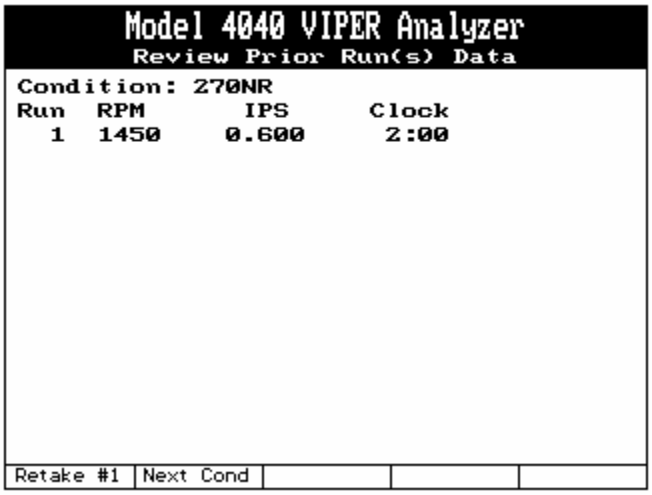
   If the 270NR reading is above 1.0 IPS, press **[F1]** to "End Run" and proceed to the recommended solution. If the 270NR reading is below 1.0 IPS, accelerate the aircraft to 100% NR, select the "NOMNL" condition and press **[ENTER]** to record the vibration reading. When you are ready to proceed, press **[F1]** "End Run" or **[F2]** "Adjust" to continue.



7. You will be prompted to "Shut Down Aircraft" as shown below. Press **[F5]** to continue.



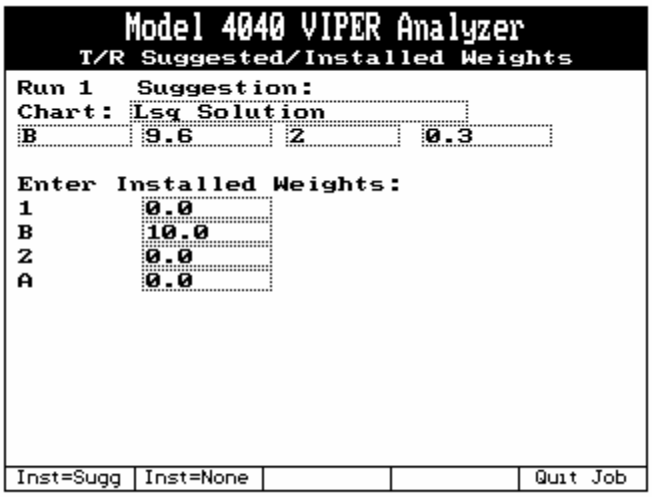
8. The “Review Prior Run(s) Data” screen will appear. This screen lets you review the cumulative readings from all first condition runs previously taken. If you wish to “Retake” the current reading, press **[F1]** “Retake (Run #)”. Pressing **[F2]** will display the readings for the next condition. Press **[ENTER]** to proceed to the recommended solution.



9. The “T/R Sugg. & Inst. Wts” screen will present a suggested solution based on the chart created in the original setup and the vibration IPS and clock reading. You have the opportunity to install the suggested weight corrections or decide on a different corrective action. It is important that the entry under the “Enter Installed Wts” reflect the actual weight amounts and locations used.

CAUTION

At no point should a correction be made that contradicts information in the maintenance manual.



Using the keypad, record the actual weight(s) installed between runs and their location. As shown in the example above, the installed solution was to add 10.0 grams to the B chord arm. This adjustment was made and entered into the analyzer. If you choose to remove weight from an opposite or alternate position, enter the negative adjustment. Do this by moving the highlight to the appropriate field, press the **[SPACE+/-]** key to produce a (-).

To remove all values in the suggested column use the **[F2]** "Inst=None" key. If you decide you would like to revert back to the suggested weights use **[F1]** "Inst=Sugg" key.

The **[F5]** "Quit Job" exits the balance job with no provisions to resume the job at a later point in time. If you wish to leave the job and be able to resume it later, press the **[MAIN MENU]** key.

10. When you have finished with the solution process, press **[ENTER]** and you will be taken to the "Start Aircraft" screen as shown in paragraph 4 of this section to continue the balance process. Continue this process until vibration readings at 270NR and NOMNL are below the manufacturer's maintenance manual limits. If these limits cannot be met, consult technical support.

E. Quit Job

1. Repeat steps D.3 through D.10 applying the solutions as necessary. When you are satisfied with the results, you can quit the job from any screen displaying the **[F5]** "Quit Job" key. This will mark the job as complete.