



Application Note

Embraer 145/135

Fan Trim Balance

Part Number: 11-200-0017

AppNote Number: A-EMB145/135-1725-FB-3.27

This Application Note is provided for information only and does not supercede the requirements or guidelines set forth in the applicable engine or airframe maintenance manual. Technology for Energy Corporation assumes no obligation or liability, either express or implied, to the Purchaser arising out of the use of this procedure.

Copyright © 2002, TEC Aviation Division. All rights reserved. This document is to be printed and reproduced for personal use only.



Application Note

Application Note Number	A-EM145/135-1725-FB-3.27
Revision	3.27
Function	Fan Trim Balance
Airframe	Embraer ERJ135/145
Engine	Rolls-Royce AE3007
Other Application Notes Required	None
ACES Systems Analyzer	1725 Trim TEC
Firmware Version	2.08C or Higher
Procedure Cards	Rolls-Royce AE3007 Vibration

Introduction

This Application Note is number 1 of 1 Application Notes required to perform a fan trim balance on a Embraer Legacy, ERJ135, or ERJ145 with a Rolls-Royce AE3007E engines. This Application Note describes the steps necessary for set up and operation of the Model 1725 analyzer and associated equipment.

Required Equipment: The following equipment is required to accomplish a single engine fan trim balance.

Item	Quantity	Description	Part Number
1.	1EA	Analyzer, Trim TEC, 1725	Z1725-110
2.	1EA	Cable, Vibe, 6 Pin Generic, 50 Ft.	10-320-0127
3.	1EA	Tachometer, Lasetach II, 299 (Reflective tape included)	10-100-1300
4.	1EA	Mount, Lasetach Swivel	10-100-0369
5.	1EA	Procedure, AE3007	11-100-0041-2
6.	1EA	Cable, Interface, ERJ145 Vibration	10-320-0144
7.	1EA	Cable, Tachometer, Generic, 50 Ft.	10-320-0126

Optional Equipment: The following items are optional and are required only if you are conducting a dual engine balance job.

8.	2EA	Cable, Vibe, 6 Pin Generic, 50 Ft.	10-320-0127
9.	1EA	Tachometer, Lasetach II, 299 (Reflective tape included)	10-100-1300
10.	1EA	Mount, Lasetach Swivel	10-100-0369

11.	2EA	Cable, Tachometer, Generic, 50 Ft.	10-320-0126
-----	-----	------------------------------------	-------------

B. Equipment Installation

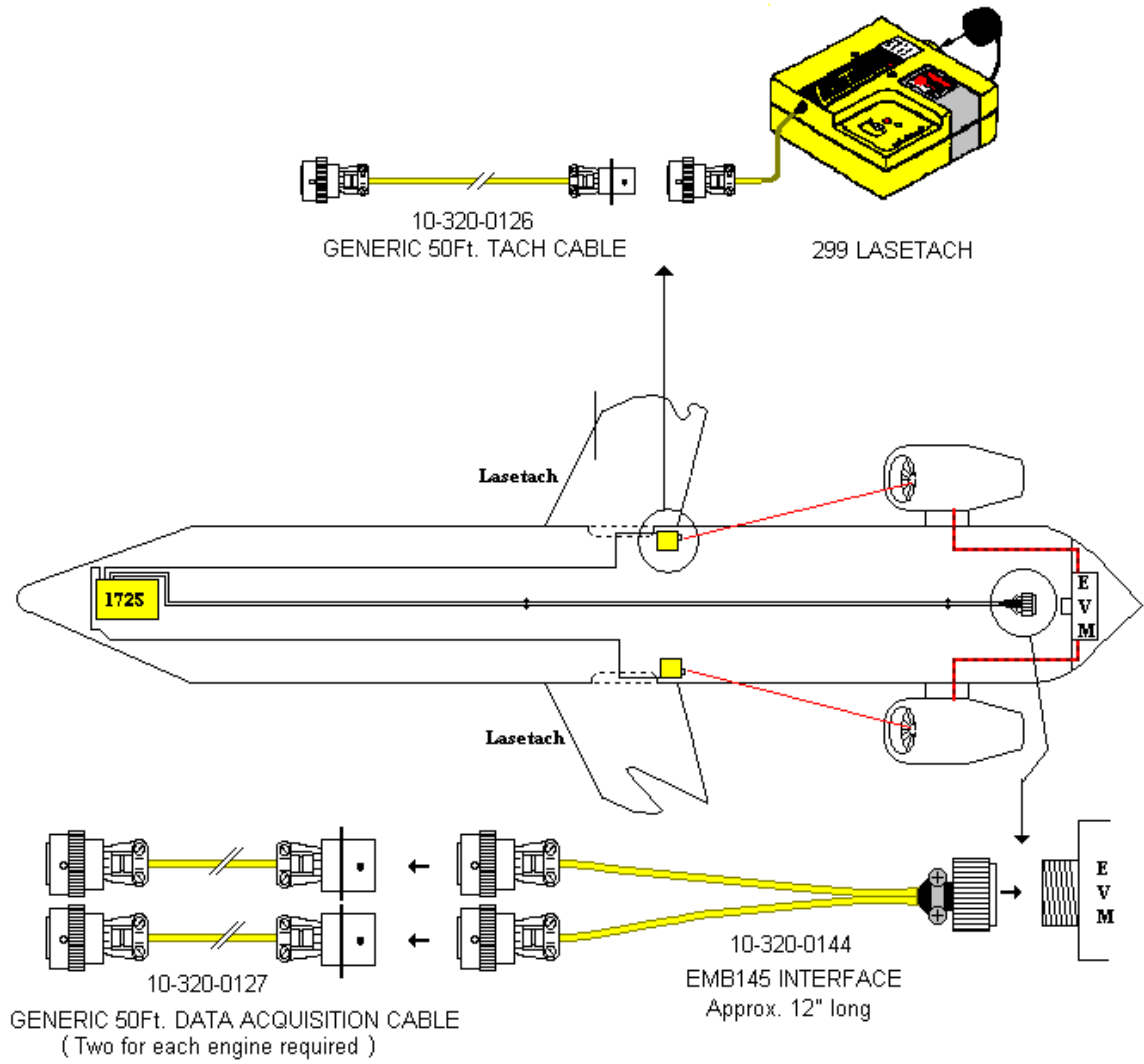
1. If connecting to the ERJ145 EVM (Engine Vibration Monitoring) system, remove the flapper valve cover from the pressure blowout door at the aft end of the baggage compartment by removing four (4) retaining nuts.
2. Route the socket end(s) one vibration cables (item 2.) for each engine you intend to balance, through the flapper valve and into the aft electronics compartment. Place approximately 4 feet of the cable through the valve. Place the excess cable near the lavatory pressure blow out door at the left forward end of the baggage compartment.
3. Open the aft electronics bay door (Access panel 272DR) on the right side of the aft fuselage. Enter the compartment and connect the ERJ145 vibration interface (item 6.) to the EVM Test Connector. The EVM signal conditioner is located on the upper equipment rack adjacent to the Flight Data Recorder.
4. Connect the small connector ends of the ERJ Vibration Interface (item 6.), labeled “Engine 1 vibe” or “Engine 2 vibe”, as required, to the 50 Ft. Generic Vibration Sensor Cable(s) (item 2.), that you routed through the flapper valves.

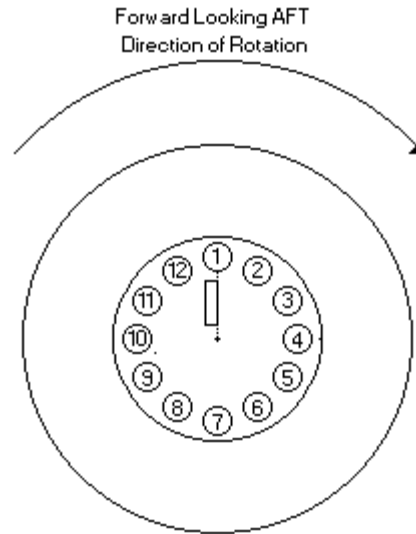
NOTE

When using two cable sets, for two engine balance or vibe survey, it is advisable to identify one of the two cables as the #1 (left engine) with a wrap of electrical tape or a wire tie at each end. As both cables are otherwise identical, this will avoid confusion when connecting to the analyzer.

5. From the lavatory side of the aft lavatory bulkhead, remove the pressure blowout door at the lower left side of the bulkhead. Route the vibration cables (item 2.) from the baggage compartment through the opening and to the cockpit. Drape the cables over passenger seat arms to avoid entanglement with feet. A second 50-foot cable (item 2.) must be connected to the first 50-foot cable in order to reach the cockpit.

Equipment Installation Diagram





6. Assemble the ACES Model 299 Lasetach (item 3.) and swivel mount (item 4.). Position this assembly on the side of the fuselage, just aft of and adjacent to the top of the over wing escape hatch. Secure the swivel mount base (item 4.) to the fuselage with four 5 inch long strips of speed tape or duct tape.
7. Attach the 50 Ft. TACH CABLE (item 7.) to the Lasetach connector. (See the Installation diagram above).

NOTE

When using two cable sets (items 2. And 7.), for two engine balance or vibe survey, it is advisable to identify one of the two sets as the #1 engine set with a wrap of electrical tape at each end. As both cables are otherwise identical, this will avoid confusion when connecting to the analyzer.

8. Route the tachometer cable (item 7.) through the access panel for the exterior emergency release of the over wing escape hatch, then forward to the cockpit, draping them over passenger seat arm rest along the way to avoid entanglement.

NOTE

Reflective quality is not the same for all reflective tape. Use only 3M brand, #7610 for best results.

9. On the engine spinner, draw an imaginary line from the center of the spinner to the center of any one of the twelve weight attachment boltholes. Clean the surface of the spinner with a degreaser and dry thoroughly. Align the leading edge of a two-inch length of reflective tape with the imaginary line. Remove the protective backing from the tape and apply at this location. (See the installation diagram above) The bolt aligned with the tape is now designated #1. The remaining numbers, 2 through 12, are in a clockwise ascending order, from forward looking aft, as shown in the drawing below. Alignment of the laser will be accomplished later in this procedure.

10. Put the analyzer in the cockpit or locate it where it will be used by the operator. Connect the various cables as follows:
 - 10.1 Left Engine Data Acquisition Cable to the six pin connector marked “ENGINE 1 A”
 - 10.2 Left Engine Tach Cable to the three pin connector marked “TACH 1”
 - 10.3 Right Engine Data Acquisition Cable to the six pin connector marked “ENGINE 2 A”
 - 10.4 Right Engine Tach Cable to the three pin connector marked “TACH 2”

B. Data Acquisition

11. Turn the analyzer on by pressing the [ON/OFF] key once. The Analyzer will display the “Operation Options” menu. Select the “Rolls-Royce Engine AE3007” by pressing the [DOWN ARROW] or [UP ARROW] key until the dark highlight bar covers that selection then press [ENTER].

```

----- Tue 02Jan1996 17:58 3809Kb
TrimTEC Analyzer
  Operation Options
1--RB211 Balancing          v3.21B
2--TFE731/ATF3 Vibration   v3.34
3--Allison Engine AE3007   v3.26
-----
Select Function Using ↑↓.
  
```

12. An information screen advising you not to exceed established limitations will appear temporarily then automatically be replaced by the “MAIN MENU” screen.

```

----- || Sat 24Feb1996 20:40 3440Kb
          WARNING ?
          DO NOT Exceed ANY
          Flight Manual or
          Maintenance Manual Limits
  
```

13. A battery check and report page may also temporarily be displayed dependent on how long the analyzer has been idle. The screen will then display the Select Model Type screen shown below. There are only two selections in the AE3007 Procedure, “AE3007C” and “AE3007-Other.” The Embraer installation is always the AE3007-Other. With this model showing in the selection box, press [ENTER] to continue.

```

-----| Sat 24Feb1996 20:41 3440Kb
+DE AE3007-Other

Select Model Type

Model: AE3007-Other

Use + - Keys To See Models

```

14. At this point, check the banner above the words “MAIN MENU” and ensure the banner does not read “+ DEMO AE3007 +”.

```

-----| Fri 11Dec1998 10:11 2878Kb
+ DEMO AE3007 +
Main Menu

1--Perform Engine Survey
2--Balance Fan
3--Enter Normal Mode
4--Change Global Settings
5--Exit

Select Operation to Perform.

```

15. This banner indicates the procedure is in the demonstration mode and therefore will not balance the engine. If the DEMO mode is active as indicated by this banner, use the DOWN ARROW key to place the highlight bar over “3--Enter Normal Mode” and press [ENTER]. If the banner reads simply “AE3007”, no action is required and you may continue.

NOTE

You may wish to review the Global Settings at this point before continuing. If so, go to item 52 to Change Global Settings. Return to this point when Global Settings are complete.

```

-----| Fri 11Dec1998 10:07 2878Kb
AE3007
Main Menu

1--Perform Engine Survey
2--Balance Fan
3--Enter Demo Mode
4--Change Global Settings
5--Exit

Select Operation to Perform.

```

16. Press the [UP ARROW] or [DOWN ARROW] keys and move the dark highlight bar to “2--Balance Fan” or press the [2] key and press [ENTER].

```

----- Fri 11Dec1998 12:31 2878Kb
          AE3007
          Main Menu

1--Perform Engine Survey
2--Balance Fan
3--Enter Demo Mode
4--Change Global Settings
5--Exit

Select Operation to Perform.

```

17. From the **BALANCE** menu which should now be displayed, press the [UP ARROW] or [DOWN ARROW] keys and move the dark highlight bar to “**1--Start Balance Procedure**” and press [ENTER].

```

----- Fri 11Dec1998 12:31 2878Kb
          AE3007
          Balance

1--Start Balance Procedure
2--Review Balance Job
3--Resume Balance Job
4--Equipment Setup
5--Exit

Select Operation to Perform.

```

18. An information message will appear “**New Balance Job Will Terminate Current Job, (Use Resume to Restart).**” At the bottom of this message screen you will see: “**O.K. to Proceed?**” followed by a “**NO**” or “**YES**”.

```

----- Fri 11Dec1998 12:35 2878Kb
          AE3007
          Balance

          New Balance Job
          Will Terminate Current Job,
          (Use Resume to Restart).

O.K. to Proceed? YES

```

This answer field is toggled to the opposite (“**YES** or **NO**”) answer by pressing the [RIGHT ARROW] key. A “**YES**” answer will start a new balance job. A “**NO**” answer will return the screen to the “**Balance**” menu screen where you may select “**3--Resume Balance Job**” if you are attempting to continue a balance job started earlier, but not yet completed. If this is a new job, toggle to “**YES**” and press [ENTER].

19. The next screen to appear will be the “**Balance Information**” screen. The first line of the text on screen will say “**Power to Tach 1 Light is ON**” . This indicates that power to the Lasetach is available for laser alignment. If you selected a 2 engine balance, this function moves to the Channel Selection screen in step 27 below.

```

----- Fri 11Dec1998 13:30 2878Kb
AE3007
Balance Information
Power to Tach 1 Light is ON
Num Of Engines : 1
Sensor Type : ERJ ON BRD
Engine S/N :
Engine Cycles :
Engine Hours : 0.0000
Enter Num of Engines to Balance

```

20. Use the [UP ARROW] or [DOWN ARROW] keys to move the dark highlight bar over the number field immediately to the right of “Num Of Engines:”. Press the [LEFT ARROW] or [RIGHT ARROW] key to toggle the number between “1” and “2”. If you are balancing one engine the field should read “1”. If you are balancing both engines it should read “2”.

```

----- Fri 11Dec1998 12:52 2878Kb
AE3007
Balance Information
Power to Tach 1 Light is ON
Num Of Engines : 2
Sensor Type : ERJ ON BRD
Engine S/N :
Engine Cycles :
Engine Hours : 0.0000
Enter Num of Engines to Balance

```

21. Press the the [UP ARROW] or [DOWN ARROW] keys to move the dark highlight bar to another field and the screen automatically defaults to the two engine Balance information screen shown below.

```

----- Fri 11Dec1998 12:46 2878Kb
AE3007
Balance Information
Adjust Tach in Next Screen
Engs: 2 Sens Type: ERJ ON BRD
Eng S/N Cycles Hours
1 0.0000
2 0.0000
Use + + Keys to Select Sensor

```

22. Press the [DOWN ARROW] key to move the dark highlight bar over the field to the right of the “Sensor Type :”. Press the [RIGHT ARROW] or [LEFT ARROW] keys until the selection in the field reads “ERJ ON BRD”. Sensitivity for the ON BOARD selection is automatically set at 50 mV/g and requires no additional user input.
23. Press the DOWN ARROW key until the dark highlight bar is in the blank field to the right of (or below if balancing two engines) “Engine S/N: “ and enter the serial number of the engine you are about to balance. Repeat these steps for the “Engine Cycles” and

“Engine Hours:” fields. When all desired information is displayed, press the [ENTER] key.

NOTE

If you have selected “CUSTOM” sensor, you must define that sensor here. If you selected “ERJ ON BRD”, proceed to item 9.

24. If you are accessing vibration signals from the EVM system, press the [RIGHT ARROW] or [LEFT ARROW] keys until the selection in the field reads “ERJ ON BRD”. Sensitivity for the ON BOARD selection is automatically set at 50 mV/g and requires no further user input. Proceed to item 27 below.
25. If you are accessing vibration signals directly from an installed vibration sensor, press the [RIGHT ARROW] or [LEFT ARROW] key until the field displays the “CUSTOM” choice. With the “CUSTOM” displayed, press the [ENTER] key.
26. The “Setup Sensor” screen will be displayed. The first field on this screen is a toggle “ON” or “OFF” according to the power requirements of the sensor being used. Press the [DOWN ARROW] key until the line directly below “Probe Type:” is highlighted. Press the [RIGHT ARROW] key until the field reads the type of probe you are using. Press the [DOWN ARROW] key again until the “Probe Sensitivity: “ field is highlighted. Set the sensitivity (mV per engineering unit of the sensor you are using). Press [ENTER] to accept the values and exit the screen.
27. The “Channels Selection” screen will appear. To the left of the screen, the engine number 1 (and 2 if two engines were selected) will be listed. Immediately to the right and below the words “Sensor” and “Tach” will be the label of the connector at the rear of the analyzer where these cables should be connected. Secure each cable to the indicated connector.

```

----- Fri 11Dec1998 13:29 2878Kb
          AE3007
          Channels Selection

          Eng      Sensor      Tach
          1      Eng 1A      Tach 1
          2      Eng 2A      Tach 2

          CURSOR HERE WHEN DONE

          Power to Tach 1 Light is ON
          Select Tach Channel, Press ENTER
  
```

```

----- Fri 11Dec1998 13:29 2878Kb
AE3007
Channels Selection

Eng      Sensor      Tach
 1       Eng 1A      Tach 1
 2       Eng 2A      Tach 2

CURSOR HERE WHEN DONE

Power to Tach 2 Light is ON
Select Tach Channel, Press ENTER

```

28. Notice that the second line of text from the bottom of the screen reads “Power to Tach (1 or 2) Light is ON. This indicates that power to the Lasetach is available for laser alignment on the indicated Lasetach. Selecting the opposite “Tach” field by using the [RIGHT ARROW] or [LEFT ARROW] keys provides power to the opposite Lasetach when two Lasetachs are being used. At this point, if you are ready to accomplish the Lasetach alignment, proceed to step 29 below. If you wish to continue with the analyzer setup and return to this point at a later time, proceed to item 30.
- 29 Follow the procedure below for LASER ALIGNMENT
- 29.1 Rotate the fan until the reflective tape on the spinner is positioned at the 9:00 position for number 1 (left engine) or 3:00 for the number 2 (right engine). Clock position is from the Front of the engine, looking aft into the intake.
- 29.2 Ensure the Lasetach is securely mounted and connected as described in Equipment Setup. Also check to make sure the Lasetach is securely mounted to the Swivel Head of the Lasetach Mount. (See figure 3 below). If it is loose, tighten by turning the Lasetach clockwise on the mounting stud while holding the Swivel head with the other hand.
- 29.3 Remove the plastic aperture cap from the Lasetach.
- 29.5 Turn the Laser **ON/OFF** switch on top of the Lasetach to the **ON** position.
- 29.6 The **BEAM ON** indicator (red) light adjacent to the Laser **ON/OFF** switch should now be illuminated.
- 29.7 Place the open palm of your hand in front of the aperture. The laser beam should be visible on your palm.

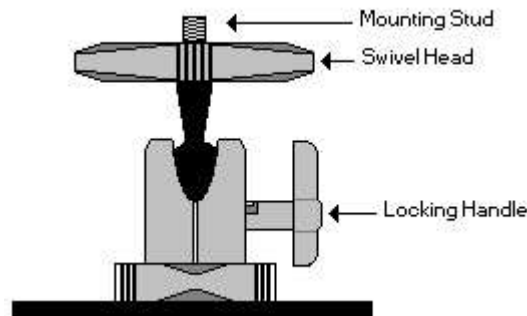
WARNING

Do not look into the aperture of the Lasetach. Avoid direct eye exposure. Eye damage may occur due to direct exposure to laser radiation.

- 29.8 Loosen the Locking Handle of the Lasetach mount (see figure below) so that the Lasetach swivels with a slight friction. Using the “gunsight” method, sight along the side or top of the Lasetach using one hand while holding the Locking Handle with the other. If you have trouble acquiring the laser beam visually, you may use a free hand or finger to sight on. No injury will occur as a result of the laser being projected on your skin. You may also choose to have someone hold a sheet of white bond paper near the target for easier acquisition. When the laser beam strikes the tape, it will be very visible. When the laser is

on target, center the beam on the length of the tape and immediately tighten the Locking handle by turning it clockwise. Release both hands and recheck the alignment.

- 29.9 The laser should now be approximately in the center of the two-inch span of the tape. If minor adjustments are necessary, loosen the Locking Handle only *SLIGHTLY*. Make adjustments as necessary and re-tighten.
- 29.10 When satisfied with the laser position, rotate the fan several times. When the tape passes through the laser position, the GATE (green) light on the Lasetach should turn on as the tape enters the beam and off as it exits. If this test is successful, return to the cockpit and select the opposite Tach. Repeat steps 29.1 through 29.30 above for the second Lasetach. When complete, return to the cockpit and continue with item 30 of this document.



NOTE

The sensor and Tach inputs are software selectable. DO NOT select the same connector for two separate inputs and always insure the indicated selection is the one to which the corresponding cable is connected.

30. When cable connection are verified, use the [DOWN ARROW] key to move the dark cursor over "CURSOR HERE WHEN DONE" and press [ENTER].
31. The next screen is the "Define Influence Coefficient" screen. If this is the first time the loaded procedure has been used to balance, use the [DOWN ARROW] key to move the dark cursor over the "1--Influence From: Default" selection. If the procedure has been used previously to balance, select "2--Influence From: Previous". If you have an influence you would like to enter, select "3--Influence From: Editing". The Influence From Editing will require a Sensor Magnitude and Lag if you intend to enter it. When Influence selection is made, press [ENTER].

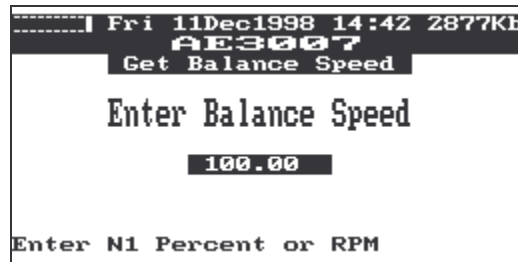
```

-----| Fri 11Dec1998 14:39 2877Kb
          AE3007
Define Influence Coefficient
1--Influence From: Default
2--Influence From: Previous
3--Influence From: Editing

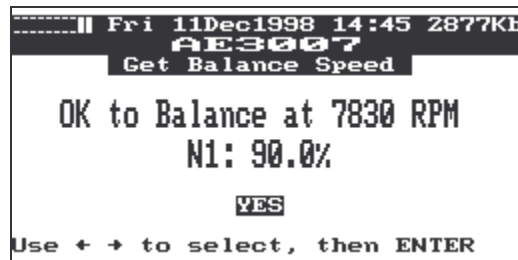
Select Operation to Perform.

```

32. The next screen will be the “Get Balance Speed” screen. Select a speed at which you wish to balance and enter it from the numeric keypad. This may be the speed obtained from a previously conducted vibration survey. You may enter either an actual RPM or an N1 %. The analyzer will accept either to be a usable balance speed. When the desired speed is displayed, press [ENTER].



33. The next “Get Balance Speed” screen will ask “OK to Balance at XXXX RPM N1: XX.X %” (where X = a numeric value). Directly under the N1 speed a highlighted answer field will be defaulted to “YES”. If the displayed speed is correct, simply press [ENTER]. If the speed is not correct, press the [RIGHT ARROW] key to toggle the answer field to NO and press [ENTER]. The screen will return to the “Get Balance Speed” screen described in item M. above.



34. The next screen is the “Balance Preparation” screen. It will direct you to “Remove All Trim Balance Weights”. REMOVE ONLY *TRIM* BALANCE WEIGHTS. Replace the Flat washers under the bolt head when reinstalling the bolts. Press [ENTER] to continue.



35. The next screen is the “**Balance Run 1**” screen. It will direct you to “**Start Engine Per Manual and Set To Idle**”.

```
.....|| Fri 11Dec1998 14:44 2877Kb
.....| AE3007
.....| Balance Run 1 Eng 1 Spd 1
.....|
.....| Start Engine(s) Per Manual
.....| Set To Idle
.....|
.....| Press ENTER to Continue.
```

36. Once the engine is started and at a stable idle RPM, press the [ENTER] key. A momentary information screen will read “**Check Idle RPM Standby....**”.

```
.....|| Fri 11Dec1998 14:44 2877Kb
.....| AE3007
.....| Balance Run 1 Eng 1 Spd 1
.....|
.....| Check Idle RPM
.....| Standby...
```

37. When acquired, the current N1% and equivalent RPM will automatically be displayed. If the speed is stable, press [ENTER].

```
.....|| Fri 11Dec1998 14:44 2877Kb
.....| AE3007
.....| Balance Run 1 Eng 1 Spd 1
.....|
.....| Check Idle RPM
.....| N1: 35% RPM: 3025
.....|
.....| Press ENTER to Continue.
```

38. The next screen will prompt you to “**Set Engine To N1: XX% RPM XXXX** (where X = a numeric value) and **Monitor Speed on Next Screen**”.

```

-----|| Fri 11Dec1998 14:44 2877Kb
                AE3007
Balance Run 1 Eng 1 Spd 1

Set Engine 1 To
N1: 90%   RPM: 7830
Monitor Speed on Next Screen

Press ENTER to Continue.

```

39. This is the target speed prompt. Press the [ENTER] key. A momentary message screen will read “Stand-by Measuring RPM for Speed 1”.

```

-----|| Fri 11Dec1998 14:44 2877Kb
                AE3007
Balance Run 1 Eng 1 Spd 1

Standby...
Measuring RPM For
Eng 1 Speed 1

```

40. When the current speed in both N1% and RPM are displayed, advance the throttle(s) to the Desired speed setting. When engine speed is set and stable, press [ENTER]. The second screen below will be displayed while the analyzer is acquiring the vibration and speed signals.

```

-----|| Fri 11Dec1998 14:44 2877Kb
                AE3007
Balance Run 1 Eng 1 Spd 1

Item           N1           RPM
Desired :     90 %     7830
Measured:     35 %     3045

Set to Desired, then Press ENTER

```

```

-----|| Fri 11Dec1998 14:44 2877Kb
                AE3007
Balance Run 1 Eng 1 Spd 1

Standby...
Acquiring Measurement

```

41. A real-time readout will be displayed on the screen showing RPM, VIBE (Vibration), and ANGLE at the left side of the screen. On the right side, a scaled thermometer type display for averaged vibration amplitude and a real time arrow (→) for real-time amplitude, will also be displayed. The arrow will move almost continuously while the thermometer (averaged) reading will begin to stabilize as more data is taken. When the averaged

reading is steady, approximately 15 to 30 seconds, press the [ENTER] key to terminate data acquisition and exit the screen. If you are performing a single speed balance, an information screen will be displayed instructing you to “Retard Engine To Idle and Shutdown Per Manual”. If conducting a

```

.....| Fri 11Dec1998 15:31 2875Kb
                AE3007
                Balance Run 1 Eng 1 Spd 1
RPM : 3032.                >| 1.312
VIB : 0.095 IPS            | 0.938
ANGLE: 338. °              | 0.562
                            | 0.188
Press CLEAR to reset average.
Press ENTER to accept average.

```

42. multi speed balance, you will be prompted to set the engine to the next speed. Each successive speed is taken in the same manner as described above. Following acquisition of the final speed data, an information screen will be displayed instructing you to “Retard Engine To Idle and Shutdown Per Manual”. Press [ENTER] to acknowledge and exit this screen.

```

.....| Fri 11Dec1998 15:31 2875Kb
                AE3007
                Balance Run 1
                Retard Engine(s)
                To Idle and Shutdown
                Per Manual
Press ENTER to Continue.

```

43. The Vib Summary: Run X screen will be displayed showing the **Starting Level** and **Current Level** vibration amplitudes. If the vibration level is acceptable per Rolls-Royce Specification, a question asking “Continue to Balance ?” followed by a YES/NO toggle field will be displayed. The default is NO. If you intend to improve the vibration even smoother than acceptance standards from the CURRENT level, you must press the [RIGHT ARROW] key to change the answer field to YES then press [ENTER].

```

.....| Fri 11Dec1998 15:31 2875Kb
                AE3007
                Vib Summary: Run 1 Eng 1
                Starting Level 0.448
                Current Level 0.448
                Continue to Balance ? YES
Use + + to select, then ENTER

```

NOTE

If you press the [ENTER] key while the NO field is displayed, the job will be terminated and may not be continued or resumed.

44. If vibration levels are in excess of 1 IPS, the following screen will appear.

```

-----|| Fri 11Dec1998 15:31 2875Kb
          AE3007
          Warning: Run 1 Eng 2

          Vibration Exceeds 1.0 IPS
          LMM Requires Fan Rotation.
          After Rotation Start New Job.

          Continue to Balance ? NO
  
```

45. You should not attempt to continue balance if this screen is displayed. Refer to the light maintenance manual for corrective action.

A WARNING screen reading “***WARNING*** DO NOT INSTALL FLAT WASHER WITH WEIGHTS” will be displayed. Acknowledge the warning by pressing the [ENTER] key.

```

-----|| Fri 11Dec1998 15:31 2875Kb
          AE3007
          Solution Run 1 Eng 1

          *** WARNING ***
          DO NOT INSTALL FLAT
          WASHER WITH WEIGHTS

          Press ENTER to Continue.
  
```

46. An information message “Standby Optimizing Weight Distribution” may be displayed temporarily followed by a Solution screen. The solution screen will advise you to “Attach Trial Weights:” followed by a weight class number, it’s actual weight in grams, and a hole number for its placement. Make note of the class weights and their respective hole numbers. At the bottom of the screen, the analyzer computed solution in grams and degrees of placement without regard for class weight or hole number is shown. Press [ENTER] to continue and exit this screen.

```

-----|| Fri 11Dec1998 15:31 2875Kb
          AE3007
          Solution Run 1 Eng 1
          Attach Trial Weights:
            -3  7.80 G In Hole #1
            -4  9.10 G In Hole #10

          To Attempt Solution of:
            12.2 G At 50 Degrees

          Press ENTER to Continue.

```

47. A warning screen will read “***WARNING*** TORQUE BOLT IAW MAINTENANCE MANUAL INSTRUCTIONS. Press [ENTER] to acknowledge and continue.

```

-----|| Fri 11Dec1998 15:31 2875Kb
          AE3007
          Fan Balance

          *** WARNING ***
          TORQUE BOLT IAW MAINTENANCE
          MANUAL INSTRUCTIONS

          Press ENTER to Continue.

```

48. An information screen will prompt you to “Record Weights Installed On The Fan Between Run x and Run x” (where X = the most recent and upcoming runs.)

```

-----|| Fri 11Dec1998 15:31 2875Kb
          AE3007
          Fan Balance Eng 1

          Record The Weights
          Installed On The Fan
          Between Run 1 and Run 2

          Press ENTER to Continue.

```

49. Press [ENTER] for the Fan Installed Weight screen. There are two columns on this screen, Weight (displayed in dash number and actual grams) and Hole numbers. If no weight placement is suggested, the word “NIL” will appear in the weight class (dash) column. If your actual weight placement differs from the suggestion, you must change the display using the [UP ARROW] and [DOWN ARROW] keys to move between the fields and the [RIGHT ARROW] and [LEFT ARROW] keys to change the field values. At the left side of the screen, the hole pattern is displayed with the letters FLA (for Forward Looking Aft) in the center. The solution hole numbers are darkened in, in this case hole number 1 (at the 12:00 position) and hole number 10. The line from the center of the circle to the arc or the holes is the single point solution angle.

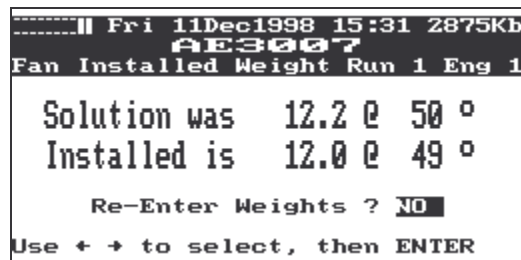


NOTE

You **MUST** record the added weights correctly on this screen in order for the balance program to provide correct balance solutions on subsequent runs.

When you are sure the screen reflects your weight placement, press the [UP ARROW] or [DOWN ARROW] keys to move the cursor over the line stating "CURSOR HERE WHEN DONE" and press [ENTER] to accept your input and exit the screen.

50. The next screen will display the Installed weight information. A line reading "**Solution was**", followed by a weight and angle, shows the solution calculated by the analyzer. The next line reading "**Installed is**", followed by a weight and angle according to your actual weight placement. These will be followed by the question "Re-Enter Weights ?" and a toggle field YES/NO.



51. If the "Installed" information does not match what you entered, press the [RIGHT ARROW] key to change the answer field to "YES" and press [ENTER]. You will be returned to the screen where you entered the actual weight placement. (See item U. above). If the displayed solution is correct, press the [RIGHT ARROW] key to change the answer field to "NO" and press [ENTER]. At this point the process repeats starting at item P. above until an acceptable balance is achieved.
52. Change Global Setting.

- 52.1 The Global Settings for the AE3007 Procedure allow the user to define values for Survey and Balance parameters. The procedure to change the Global Settings is as follows:
- 52.2 From the Main Menu Screen of the AE3007 Procedure, select “4--Change Global Settings” using the [UP ARROW] or [DOWN ARROW] keys, or by pressing the [4] key. Press [ENTER].

```

-----| Fri 11Dec1998 10:12 2878Kb
          AE3007
          Main Menu

1--Perform Engine Survey
2--Balance Fan
3--Enter Demo Mode
4--Change Global Settings
5--Exit

Select Operation to Perform.

```

- 52.3 The “Global Settings” banner screen will be displayed with four user selectable type fields, Survey Freq Units:, Survey Freq Band:, Num Balance Speeds: and Set to Default:. To the right of each of these field descriptions is the selectable field. One of the fields will have the dark highlight bar covering it. To move the highlight bar from field to field, press the [UP ARROW] or [DOWN ARROW] keys until it is positioned over the field you wish to change. Toggle between the selections for the field by pressing the [RIGHT ARROW] or [LEFT ARROW] keys.

```

-----| Mon 14Dec1998 10:28 2873Kb
          AE3007
          Global Settings

Survey Freq Units : RPM
Survey Freq Band  : .98-1.02
Num Balance Speeds : 3
Set to Default    : NO

          CURSOR HERE WHEN DONE

Press ENTER if Done

```

- 52.4 The first field is “Survey Freq Units”. The field selections are RPM (Revolutions Per Minute) or Hz (Hertz). Your choice will determine which frequency unit the vibration survey will be displayed in.
- 52.5 The second field is “Survey Freq Band”. The field selections are .90 -1.10, .95 - 1.05, .97 - 1.03 and .98 - 1.02. Each of these settings determines a total bandwidth for the vibration survey with tachometer. For instance, if you choose .98 - 1.02, and frequency units displayed in RPM, the unit will filter all frequencies outside the current turning speed X .98 as a minimum and X 1.02 as a maximum. This option allows you to record vibrations being produced by the fan only and eliminates vibrations created by other nonsynchronous components in the engine assembly.
- 52.6 The third field is Num (Number of) Balance Speeds. This field allows you to determine if the balance will be targeted to maximize the reduction of vibration produced at a

single speed or to nominally reduce vibrations created at two or three speeds. The choices are 1, 2, or 3.

NOTE

Reducing vibrations at a single speed to its lowest possible amplitude may increase vibrations at other speeds. A multiple speed balance will uniformly decrease average vibration and noise over a speed range but may not reduce them to their lowest possible amplitude at any one of the speeds within the range.

- 52.7 The Set to Default field is a toggle (Yes or No) answer field. Toggle between the answers by pressing the [RIGHT ARROW] or [LEFT ARROW] keys. If you wish to have the pre-programmed default settings for all Global fields used, select YES. If you change any of the fields and want to use them for Vibration Survey or Balance, you must choose NO in this field and define the fields of your choosing. If you change the other three fields and select YES in this field, all the fields you changed will default back to the programmed settings.
- 52.8 When all settings are set as desired, use the [UP ARROW] or [DOWN ARROW] keys to move the highlight bar over the “**CURSOR HERE WHEN DONE**” statement, then press the [ENTER] key.