
Chapter 5

Main Rotor Track & Balance

(Revision 4, July 2007)

“Main Rotor Track & Balance” is a ProBalancer function that is accessed from the Main Menu banner screen as shown in the illustration below. Selecting “Main Rotor Track & Balance” from the main menu brings up the “Main Rotor Track & Balance” banner screen (also shown below). Each of the listings on the “Main Rotor Track & Balance” banner screen menu is an option within the “Main Rotor Track & Balance” 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 main rotor balance function.

Model 2015 ProBalancer Main Menu		
Propeller Balance		
Main Rotor Track & Balance		
Tail Rotor Balance		
Vibration Spectrum Surveys		
Monitor Spectrum		
Monitor IPS and Clock		
Monitor Magnitude and Phase		
Monitor Overall Vibration		
Check Track		
Transfer Data with PC		
Miscellaneous Items		
-Contrast	Default	+Contrast

Model 2015 ProBalancer Main Rotor Track & Balance		
Start Job		
Resume Job		
Manage Jobs		
Manage Setups		

5.1 – Start Job

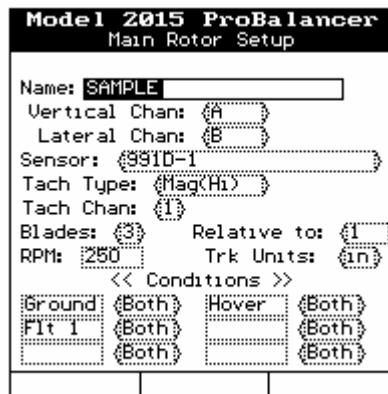
Selecting “Start Job” from the “Main Rotor Track & Balance” banner screen allows you to begin a main rotor balance job. When you select this option, one of three screens will appear next depending on whether you are using the main rotor function for the first time, have previously defined main rotor setups, or have a previously started job stored in the ProBalancer.

If you are using the analyzer for the first time, the “Main Rotor Setup” banner screen will appear allowing you to define a new main rotor setup to use. Proceed to paragraph 5.1.1 “Main Rotor Setup” for detailed instructions on defining a setup.

If you have previously saved setups stored in the ProBalancer memory, a screen displaying the list of setups will be displayed. You can then select a setup from this list to use for the job.

If another job was already in progress but not completed, the “Incomplete Job” banner screen will be displayed and the ProBalancer will present a message prompting you to verify that you wish to finish the incomplete job or begin a new job. The screen will display the message; “The last job performed is incomplete. Finish it?” If you wish to return to the unfinished job, press the [F1] “Yes” key and you will be returned to the point where the in-progress job was stopped and allowed to complete it. If you wish to continue with a new job, press the [F3] “No” key, and the screen will then display the list of previously saved setups stored in the ProBalancer memory. Select a setup to use and press [ENTER] to continue.

5.1.1 - Main Rotor Setup



The “Main Rotor Setup” banner screen allows you to define and store a main rotor balance setup. As shown in the figure above, 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 Model 2015 ProBalancer if you are unfamiliar with using the keypad.)

To complete the “Main Rotor Setup” banner screen, do the following:

1. In the “Name” field, use the keypad to enter a name to identify the setup such as the aircraft model. A name must be entered in this field or the setup will not be stored.

CAUTION

Sensors connected to Channel A and Channel B must be of the same type. Using different sensors during the same job will cause erroneous readings and problems achieving good balance results.

2. Use the [↓] key to move to the “Vertical Chan” (Channel) field. Use the [⇒] key to “toggle” between the selections in this field, either “A,” “B,” or “None.” The value you select for this field determines which ProBalancer channel you are using to measure and display the vertical vibration.

3. Use the [↓] key to move to the “Lateral Chan” field. Use the [⇒] key to “toggle” between the selections in this field, either “A,” “B,” or “None.” The value you select for this field determines which ProBalancer channel you are using to measure and display the lateral vibration.
4. Move to the “Sensor” field using the [↓] key. Use the [⇒] key to toggle between the options and select a sensor.
5. Move to the “Tach Type” field using the [↓] key. The selection in the “Tach Type” field identifies which tachometer sensor you are using as the once-per-revolution source. For main rotors, this will most often be “Mag (Hi).” Use the [⇒] key to make the selection. If you are unable to obtain a tachometer signal when the job is started, edit the setup and select “Mag (Lo)”.

NOTE

If the tachometer type is changed in a setup, you must start a new job for the changes to take affect.

6. Use the [↓] key to move to the “Tach Chan” field. Use the [⇒] key to select and identify which Tach input port on the ProBalancer you are using to acquire tachometer data.
7. Move to the “Blades” field using the [↓] key. Using the [⇒] key, select the number of blades of the main rotor system you are balancing.
8. Use the [↓] key to move to the “Relative to” field. This selection will determine the reference blade for tracking displays. Selecting “AVG” will present rotor blade positions relative to the average of all blades. Selecting a specific blade number will present all other blade positions relative to the blade number selected.
9. Move to the “RPM” field using [↓] key. In this field, enter the maximum expected RPM of the rotor system.
10. Move to the “Trk Units” field using [↓] key. Select the units of measure the ProBalancer will present on the tracking display screen. Use the [⇒] key to select either Inches or millimeters.
11. Using the [↓] key, move to the first field in the grouping of “Conditions” fields. In these fields you may define up to six flight conditions under which to measure and store data. These conditions may be a maximum of six characters long and should represent a flight regime at which you wish to record data. Directly to the right of each flight condition name box is a toggle selection for the type of measurement desired for that condition. In each of these fields, use the [⇒] key to select from “Both” (which will allow measurement and storage of both vibration and track), “Vib” (which will measure and store only vibration), or “Trk” (to measure only track).

When all fields are completed to your satisfaction, press [ENTER] to accept the setup.

If this setup has been defined as a result of selecting to start a job with no previous setups stored, a message will appear on the screen, “Store this new setup?” Press the [F1] “Yes” key to store the setup or the [F3] “No” key to skip this process (This query will only be presented

if the user assigns a name to the setup in the “Name” portion of the screen.). If using the “Manage Setups” “Edit” or “New” functions, this message will not appear.

5.1.2 – Customer Information

After you complete the “Main Rotor Setup” banner screen, the next screen that appears is the “Customer Information” banner screen. This information will appear on the job printout and will assist you in identifying this job when it is stored in the ProBalancer memory. Complete the information fields using the keypad. When finished, press [ENTER] to continue.

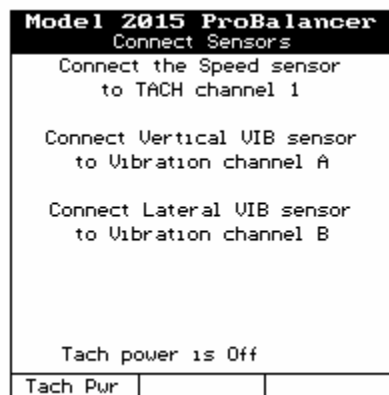
5.1.3 – Tracking Selections

The “Tracking Selections” screen is displayed allowing you to choose a tracking device for use with the job. The tracking device field is a toggle selection of either “Tracker” or “Strobe.” If you select “Tracker,” use the [↓] key to then move to the lower portion of the screen and input the number of revolutions for which you wish to acquire data and the distance, in inches, from the tracker use location (usually cockpit) to the blade tips. Use the [↓] key to move between these fields. This information is necessary for the tracker to operate correctly.

NOTE

It is highly suggested that you use no less than 50 for the number of rotations to measure track. This will result in greater accuracy from the tracker.

5.1.4 – Connect Sensors



After you complete the “Customer Information” banner screen, the “Connect Sensors” banner screen will be displayed. Messages that appear on this screen prompt you to perform the physical installation and connection of the tachometer and vibration sensors to the input ports you specified in the setup.

You must use the vibration sensor installation locations as specified by the manufacturer’s charts. The orientation of the sensor is the key to the accuracy of the polar charts, if the

sensor is installed in a direction other than specified for the chart, the clock angles will be incorrect.

If you are using a magnetic pickup for the speed sensor, install and set the gap as directed in the applicable maintenance manual or polar chart. The Model 2015 only accepts a “single” type interrupter; it will be necessary to remove any double interrupter installed and replace with a single interrupter.

It is permitted to use the phototach for the main rotor one per revolution source. If using a phototach as the tachometer, read section 5.1.4.1, Optical Tachometer Setup below. Also at this time, install any ship’s power and strobe cables as needed.

CAUTION

The Model 2015 recognizes only a single-interrupter once-per-rev. If the factory installation calls for double-interrupter logic, you must remove the double interrupter from the main rotor and use a single interrupter only. Not accomplishing this will produce inaccurate tachometer measurements or failure to obtain a tachometer signal altogether.

5.1.4.1 - Optical Tachometer Setup

To install the optical tachometer, do the following:

1. If not specifically provided by application note or manufacture, locate a position that allows the phototach to be installed no more than 18 inches away or closer than 4 inches from a rotating main rotor component. This component will be used to install the reflective tape and serve as the once-per-revolution tachometer source for the ProBalancer. Connect and route the tachometer cable from the phototach to the ProBalancer.

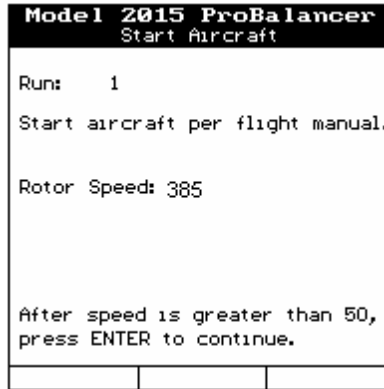
NOTE

If possible, the location of the phototach should allow for the reflective tape to trigger it when the main rotor is in the reference position as specified by the balance chart. This will provide a direct correlation of the clock angles produced by the ProBalancer and the charts. If this is not possible, the clock positions on the chart will have to be rotated based on the vibration results from the first applied correction.

2. While still in the “Main Rotor Equipment Setup” banner screen, a message is presented near the bottom that reads “Tach Power is Off.” The Block directly below this statement and corresponding to the [F1] key, is labeled “Tach Pwr.” Pressing the [F1] key will power the Tach. Turning the tachometer power on is *not* required to start the balance job; this step is only accomplished to verify the proper operation of the phototach.
3. Rotate the main rotor until the target object is aligned with the Phototach. Clean this area thoroughly to insure adhesion of the tape.
4. Cut a strip reflective tape (3M Tape, Model 7610) approximately 1.5 to 2 inches long. With the tape backing still in place, hold the tape in position on the target object, then verify the red LED gate indicator light on the back end of the phototach is illuminated. This indicates the position of the tape is correct.

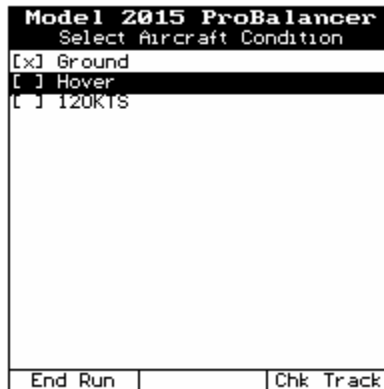
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- Remove the tape backing and attach reflective tape at that location. Be sure to smooth out any wrinkles or bubbles in the tape. Insure the edges are smoothed and attached.

5.1.5 – Start Aircraft



When you have completed the physical equipment setup tasks, press [ENTER] on the ProBalancer to continue with the main rotor balance job. The ProBalancer will then display the “Start Aircraft” banner screen (shown below). (Refer to the aircraft’s flight manual for start and operation instructions.) This screen allows you to view the current main rotor RPM. When the aircraft has been started and RPM is present, press [ENTER] to continue.

5.1.5.1 – Select Aircraft Condition



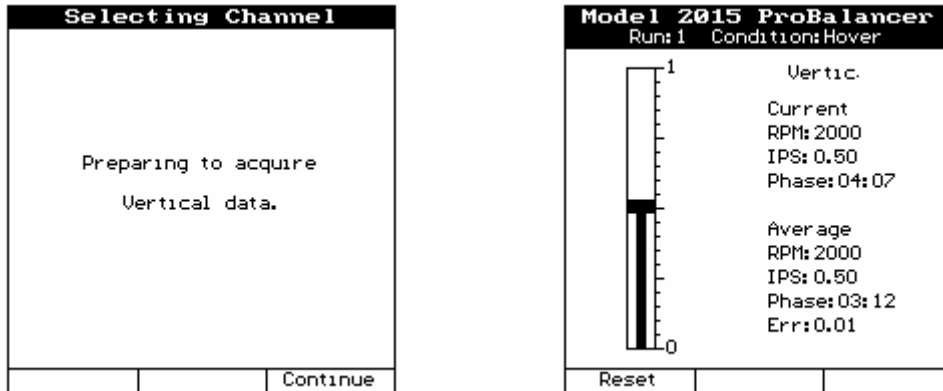
Next the ProBalancer displays the “Select Aircraft Condition” screen as shown in the illustration below. This function tracks measurements acquired at various flight conditions in the current run (The flight conditions displayed are those that were defined in the setup process.).

To start the measurement process, use the [↑] or [↓] keys to select a flight condition and press [ENTER]. As measurements are taken and stored by the ProBalancer, the status of the flight condition is marked with an “X” preceding the condition name. These conditions may be re-measured if desired, however the data previously acquired will be written over and lost.

Pressing the [F1] “End Run” key will initiate an aircraft shutdown and data save sequence.

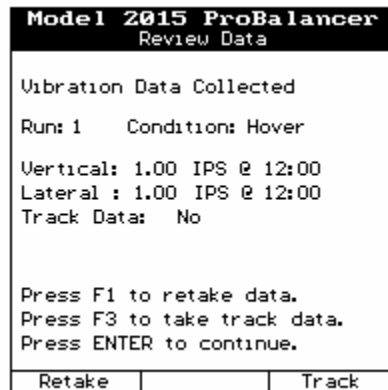
Pressing the [F3] “Chk Track” key at the lower portion of the screen will initiate a track measurement. **The “Chk Track” option from this screen is only used to make a quick check of the blade track with non-storage.** If you wish to acquire and store track measurements, you must do so from the “Review Data Screen” as shown in paragraph 5.1.5.3.

5.1.5.2 – Acquiring Vibration Data



After selecting to measure a condition, the ProBalancer displays the vibration data being acquired. (See Chapter 16, Reading Spectrum and Scales, for a detailed explanation of this screen.) The screen banner indicates the run number and flight condition for which you are acquiring measurements. During the acquisition process, you may choose to reset the vibration average by pressing the [F1] “Reset” key. When you are satisfied with the vibration levels, press [ENTER]. Data acquisition process will be the same for obtaining the lateral readings.

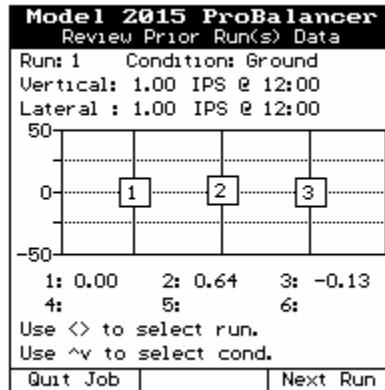
5.1.5.3 – Review Data



The ProBalancer displays the “Review Data” banner screen shown above for the run and condition just acquired. Through this screen, you may choose to retake the data just collected by pressing the [F1] key, input or measure track (depending upon the tracking option used) by pressing the [F3] key, or simply press [ENTER] to continue.

When finished acquiring measurements for the current run, select “End Run” by pressing the [F1] key from the “Select Condition” banner screen as described in paragraph 5.1.5. 1. “Select Conditions”.

5.1.5.4 – Review Prior Runs

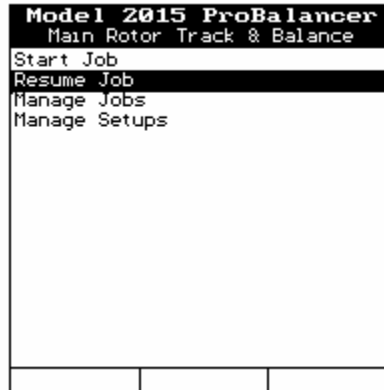


The ProBalancer displays the “Review Prior Run(s) Data” banner screen shown above. Through this screen you can review all of the measurements taken for both the current and past runs as well as conditions measured within each run. The run number is shown in the upper left-hand corner of the screen followed by the condition displayed on the right.

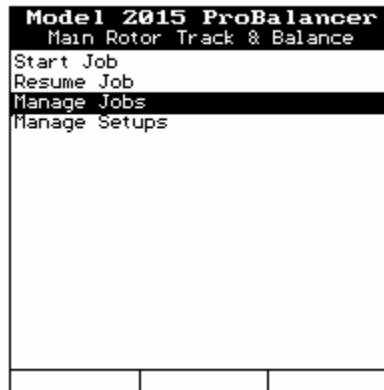
To move between runs, if there are more than one, use the [←] or [→] keys. To view the various conditions measured within a run, if there are more than one, use the [↑] or [↓] keys. Take this information and plot it on your charts for corrections. When finished making corrections, simply press the [F3] key or [ENTER] to continue with the next run, or press [F1] to quit the job. This will store the job in the ProBalancer as a completed job, and you may use the “Review Jobs” utility to view it in the future.

5.2 - Resume Job

Selecting “Resume Job” from the “Main Rotor Track & Balance” banner screen menu allows you to select a job to resume. Using the [↓] key, highlight the job you wish to complete from the list of incomplete jobs, and press [ENTER]. You will be taken to the last step completed in the process and allowed to complete it.

**NOTE**

If no customer information was entered to identify the job, it will be labeled as an “Unnamed” in the incomplete job list. If there are more than on “Unnamed” jobs, you may wish to use the review job utility to identify it prior to selecting the job to complete.

5.3 - Manage Jobs

Selecting “Manage Jobs” from the “Main Rotor Track & Balance” banner screen menu presents several sub-menu choices to choose from. These choices allow you to “manage” job data you have stored in the ProBalancer.

5.3.1 - 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. The ProBalancer will then return you to the “Manage Jobs” menu screen to select another function.

5.3.2 - 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 14, “Printing with the Model 2015 ProBalancer” for a detailed explanation of how to set up the ProBalancer to print.

5.3.3 - 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 ProBalancer “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 [F3] 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.

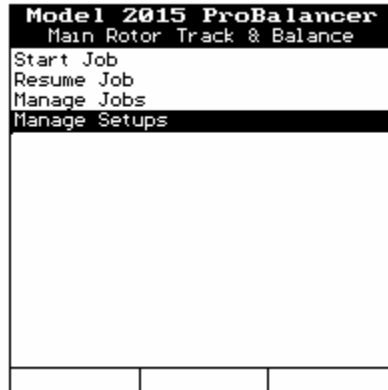
5.3.4 - Delete

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 [F3] key for “No.” You may wish to print the job for reference or permanent record prior to deleting. Once deleted, the job cannot be retrieved from the ProBalancer.

5.3.5 - Delete All

The “Delete All” option will delete all currently stored jobs. After selecting this option, the “Delete All Job” banner screen will appear, asking you to verify your intent to delete all the jobs by pressing the [F1] key for “Yes” or the [F3] key for “No.” You may wish to print the jobs for reference or permanent record prior to deleting. Once deleted, the jobs cannot be retrieved from the ProBalancer.

5.4 - Manage Setups



Selecting “Manage Setups” from the “Main Rotor Track & Balance” banner screen menu presents several sub-menu choices to choose from. These choices allow you to “manage” setups you have stored previously in the ProBalancer.

5.4.1 - Edit

Selecting the “Edit” function displays the “Setup List” screen. Select the setup you wish to edit. The screen will display the “Main Rotor Setup” screen. Edit the setup as necessary and press [ENTER] to store and exit the edited setup screen.

5.4.2 – New

Selecting “New” allows you to define and store a new main rotor job as described in paragraph 5.1.1. “Main Rotor Setup”.

5.4.3 - Print

Selecting the “Print” function displays the “Setup List” screen. Ensure your printer is turned on and connected to the with the COMM/Print cable supplied with your ProBalancer. Select the setup you wish to print and press [ENTER]. (See Chapter 14, “Printing with the Model 2015 ProBalancer” for a detailed explanation of how to set up the ProBalancer to print.)

5.4.4 - 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 [F3] 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.

5.4.5 - 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 [F3] key for “No.” We highly recommend you print the setup for reference or permanent record prior to deleting them. Once deleted, the setups cannot be retrieved from the ProBalancer.