User Manual
ProBalancer Sport Model 1015

TEC Aviation Division
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Revision 1.01
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Web: www.AcesSystems.com/ProBalancer-Sport

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Contact Information

Technical Support

For technical support, please visit www.AcesSystems.com/ProBalancer-Sport for a list of distributors. If you require assistance with an operational problem with the balancer, please have as much detailed information as possible available before contacting your distributor. Your distributor will answer questions about the operation and care of your equipment, assist you in troubleshooting a problem, and help you overcome common application difficulties whenever possible.

Feedback

Product improvement depends on information from our customers to continue the attributes of quality, dependability, and simplicity associated with our products. We invite you to express your opinions, comments, and suggestions concerning the design and capability of your balancer by visiting www.AcesSystems.com/ProBalancer-Sport.

Warranty

The ProBalancer Sport Model 1015 is warranted to be free of defects in material and workmanship for a period of one (1) year following the purchase date. Warranty does not cover the balancer unless it is properly used, stored, and maintained in accordance with the provisions of this manual. The original manufacturer may cover individual accessories not manufactured or assembled by TEC for longer periods.

Warranty replacement and / or repair will not be honored on any unit which is overdue an annual calibration at the time of the warranty claim. If your calibration is overdue and no warranty claim is being made, you need only have your overdue calibration completed to re-validate your warranty. Warranty is limited to supplying Purchaser with replacement or repair of any unit or accessory item which, in TEC's opinion, is defective. All repaired or replacement parts will be warranted only for the unexpired period of the basic warranty. All warranty work will be on a return-to-the-factory basis. Shipping cost to the factory will be borne by the Purchaser. Warranty shall not apply to any product that, in the judgment of TEC, has been subjected to misuse or neglect, or has been repaired or altered outside the TEC factory in any way, which may have impaired its safety, operation, or efficiency, or to any product that has been subjected to accidental damage.

Warranty does not cover any cost incurred by Purchaser as the result of the purchase of TEC products. Nor does Warranty cover cost incurred by Purchaser for labor charges for replacement of parts, adjustments, or repairs or any other work performed by the Purchaser or his agents on, or connected with, TEC-supplied products. Warranty is expressly in lieu of any and all other warranties or representations, expressed or implied, and of any obligations or liabilities of TEC to the Purchaser arising from the use of said products, and no agreement or understanding varying or extending the same will be binding upon TEC unless in writing, signed by an authorized representative of TEC. TEC reserves the right to make changes in design or additions to, or improvements in, products at any time without imposing any liability on itself to install the same in any product manufactured or supplied prior thereto.

Calibration and Certification

Your equipment is calibrated and certified per NIST standards, effective the date of shipment. Annual recalibration is recommend annually unless you suspect the performance of the unit. Other intervals may be used based on standards established by your quality processes. In addition, the vibration sensors should also be calibrated on an annual basis or when dropped, damaged or suspect of improper operation. The balancer will be identified as calibrated by a sticker stating the date of calibration and next due date of calibration. A certificate of calibration will be provided to you to verify compliance to inspectors. A permanent record of your calibration is maintained by TEC. You may obtain a copy of your calibration by visiting www.AcesSystems.com/ProBalancer-Sport. For information about calibration services, visit www.AcesSystems.com/ProBalancer-Sport.

Chapter 1
Introduction

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The ProBalancer Sport Model 1015 is a simple and easy to operate tool that automates the task of propeller balance.

The balancer is capable of one-channel data acquisition and provides an automated balancing process with minimal user required input. The tachometer input is capable of acquiring speed signals from a TTL source up to a maximum 6000 RPM. The vibration input is calibrated to accept a signal from the STI CP 0907003 vibration sensor.

The ProBalancer Sport Model 1015 is designed to allow all mechanics to accomplish a propeller balance on virtually any aircraft. The automated balancing process gives step by step directions while requiring very little information or action from the user.

Overall, the ProBalancer Sport Model 1015 is designed as an inexpensive, lightweight, and portable unit with accuracy and ease of use as primary design goals.

The subsequent chapters of this manual explain the functions and features of the balancer, supporting information, and troubleshooting. The remainder of this chapter presents tips on effectively using the manual.

1.1 Notes, Cautions, and Warnings

Throughout this manual you will encounter "notes, cautions, and warnings". They will be in **BOLD** capital print centered above a short paragraph. The information in the paragraph is defined as follows for each of the three categories.

NOTE

Information considered essential to emphasize for clarity or to ensure the related procedure is correctly accomplished.

CAUTION

Information that if not heeded, may result in the damage or faulty operation of equipment.

WARNING

Information that if not heeded, may result in damage or destruction of equipment and/or injury to personnel.

1.2 Conventions

The following are writing conventions used throughout the manual to describe certain concepts.

This manual indicates keys/keystrokes through the use of small icons. For example:  ,  , or  which duplicate the key as displayed on the balancer.

The term "field" as used in this manual refers to an area that requires user input. Data is entered into the field by using the keypad to type data.

Chapter 2
Balancer Description

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This chapter gives you a brief tour of the balancer. It describes the various keys and their functions, the input ports, and the standard accessories supplied with the balancer. Optional accessories are discussed later in this chapter.

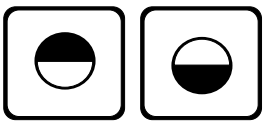
2.1 Keypad

The balancer keypad consists of 20 function keys. The keys are described in detail below.

Located at the top left of the balancer keypad is the Power button. When pressed once and released this button, turns the balancer power on. When pressed again for at least one second, the balancer is powered off. The balancer incorporates a power conservation function. If no activity (keystroke) occurs within approximately ten minutes following the on keystroke, the balancer will automatically shut off. As long as a keystroke or data acquisition is detected at least once every ten minutes thereafter, the balancer remains powered until the Power Button is pressed to turn power off, or the battery's charge expires.

Located at the top right-hand corner of the balancer keypad is the Reboot button. It is used to reboot the balancer. It will terminate the current job and return to the boot up screen initiating a new balance job.

Two contrast keys are located immediately below the display. The left or increase key is used to increase the screen contrast and the right or decrease key, which is visually opposite, is used to lower the screen contrast. These keys are fully functional for all phases of operation when the balancer is powered. Each key press will produce an incremental increase or decrease in the screen contrast. Holding the key will cause the balancer to progress through all contrast steps until the full increase or decrease limit is reached.



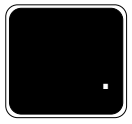
The ten numeric keys (0 through 9) are used to input numeric values into the balancer. These keys will be used when entering Engine Horsepower, RPM, Grams of Weight, or Degrees where weight is added to the propeller.

The Check Mark key is used to accept all information on a particular screen and to cause the balancer to progress forward to the next step. This key will be used when asked to “Continue” or to answer “Yes” in the case of a Yes or No question.

The X key is used when a negative answer is required to answer a question posed by the balancer. For example, if you are asked to “Retake Data” and you wish to simply use the existing data without retaking it, you would press the X key to deny the “Retake Data” request.

The three arrow keys are used to navigate around the display screen. The Left Arrow key is used to delete characters from an entry. Each press of the Left Arrow will delete one single character in the data entry field. The Up and Down Arrow keys will cycle the active cell. Each time the Down Arrow key is pressed, the active field will move to the next field in turn.

The Decimal key is used to place a decimal in number entries such as 98**.**6 g.



2.2 Screen

The full graphics Liquid Crystal Display (LCD) screen is how the balancer communicates with the user. In computer terminology, the screen is the “graphical user interface”. The screen displays messages, selection lists, and graphic illustrations. The display is 1.5 inches high by 2.8 inches wide. It is an adjustable-contrast LCD with a 128 x 64 pixel display. The screen is capable of displaying many font sizes, and displays 18 columns and 5 lines of text at one time. Screen contrast is controlled by pressing one of the two contrast keys on the right side of the main body of keys. The screen is backlit full time with an LED.

NOTE

If the balancer is exposed to extremes in temperature, either heat or cold, the LCD may darken or lighten to a point that it cannot be clearly read. If this occurs, adjust the contrast to compensate for the change. If this fails to return the LCD to a viewable state, remove the unit to an ambient room temperature of 65 – 85 degrees F. The LCD should return to its previous state in approximately 30 minutes.

2.3 Input and Output Ports

Tach Input Vibration Input

There are 2 input ports on the top end panel of the balancer, as shown in the figure above: the left-hand connector for the Tach input and the right-hand connector for the vibration sensor input.

2.3.1 Vibration Input

WARNING

Use extreme care when aligning and connecting the vibration sensor cable to the balancer. The pins act as the only locating keyway. If twisted or misaligned, damage to the connector and pins may occur.

The vibration input will only accept acceleration sensor signals. The vibration input is a 3-socket connector. The 3-socket connector enables the balancer to provide sensor power, as required, to the sensor being used.

2.3.2 Tach Input

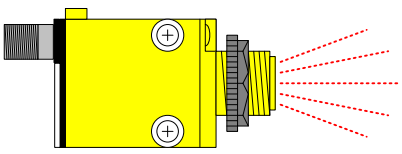
The Tach input is a 4-pin connector. It will only accept a Transistor-Transistor Logic (TTL) level speed signal. Power (+10V) is provided on one pin of the tachometer connector to power optical speed sensors such as the PhotoTach.

2.4 Standard Equipment

When you purchase a ProBalancer Sport Model 1015, several accessories come with the balancer as standard equipment. These items are described in the following paragraphs.

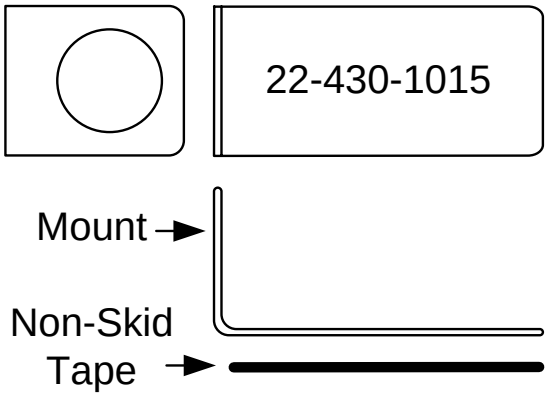
2.4.1 PhotoTach

The PhotoTach is a short-range optical sensor used in acquiring speed and phase angle data. Its optimum range is 12 to 18 inches from the target (reflective tape, 3M 7610). It is supplied with a black nylon nut for mounting purposes.



2.4.2 PhotoTach Base

The PhotoTach is supplied with a sheet metal base and a die-cut section of non-skid tape. Remove the backing on the non-skid tape and apply it to the bottom side of the mount as shown below. This will prevent the mount from damaging any cowling on which it is mounted.

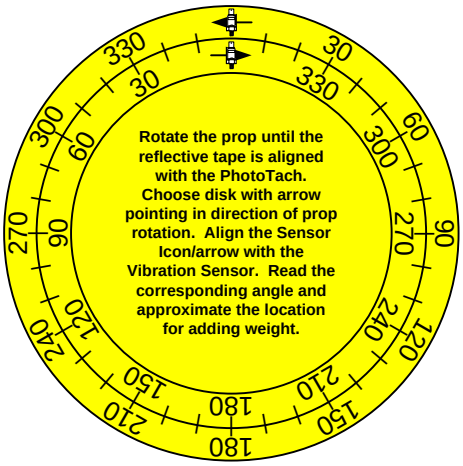


2.4.3 PhotoTach Sensor Cable

The PhotoTach sensor cable connects the balancer to a PhotoTach. The cable is a four-wire cable, insulated in a bright yellow, petroleum-resistant jacket. It is attached at one end to the PhotoTach via a 5-socket screw-on connector and on the opposite end of the cable is a mini-four-socket, screw-on connector. The 15-ft. cable was built generally for propeller balancing on light-sport aircraft applications, which normally require less distance to the sensors.

2.4.4 Propeller Protractor

The Propeller Protractor pictured below is located on the CD that contains the User's Manual for the ProBalancer Sport. You can resize and print copies of this protractor as required. The Propeller Protractor is designed to measure angles in a typical propeller/spinner assembly. As illustrated in the figure below, the protractor is divided into two circles. Each circle has a vibration sensor icon with an arrow and eleven numbers on it. The vibration sensor icon is the alignment tab, and the arrows show the direction of propeller rotation. The circle contains 35 hatch marks. Each hatch mark represents approximately 10 degrees. Numeric entries are shown every 30 degrees. To use the Propeller Protractor follow the steps below.



WARNING

Always ensure magneto switches are off prior to any movement of the propeller

1. Rotate the propeller so that the reflective tape is directly in front of the PhotoTach.

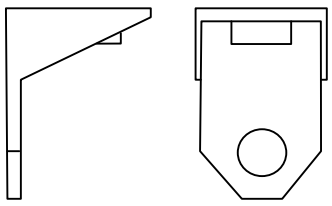
2. With the propeller in this position, and facing the propeller, raise the protractor to a centered position over the spinner. Align the vibration sensor icon with the vibration sensor as installed on the engine.

3. Choose the arrow that is pointing in the same direction as the direction of rotation of the propeller.

4. Read the values that increase opposite the direction of rotation on the corresponding circle. If necessary, interpolate values between the marked angles to locate the desired angle.

2.4.5 1/4" Right-Angle Sensor Mount

The right-angle sensor mount shown in the left portion of the illustration above is made of stainless steel and designed to be mounted directly on the engine case bolt or to the case bolt adapter, shown in the right portion of the illustration below. The mount has a 1/4 x 28-threaded hole for the vibration sensor and a ¼" unthreaded hole for mounting.



2.4.6 Reflective Tape

The reflective tape supplied with the propeller balancing kit is used as a tachometer trigger for the PhotoTach to generate a once-per-rev pulse used in speed readings and balancing calculations. The reflective tape (3M 7610) supplied with the propeller balancing kit was selected because of its excellent reflective quality and performance under varied operating conditions. Using a lower quality tape will cause inaccurate tachometer readings or unreliable phase information. The tape is manufactured by the

3M Company and is the only tape recommend for use with the system. Contact your distributor for replacement tape.

2.4.7 Accelerometer and integral cable

WARNING

Use extreme care when aligning and connecting the vibration sensor cable to the balancer. The pins act as the only locating keyway. If twisted or misaligned, damage to the connector and pins may occur.

The accelerometer (see the illustration below) was selected as the standard for use with the propeller balance kit due to its rugged construction, accuracy, cost, and range of operation. A single sensor is supplied with the propeller balancing kit. Replacement sensors may be purchased separately.

The output of the accelerometer is 10 mV per g and is pre-programmed into the balancer. The operating temperature range is -65 to + 185 degrees F. The cable is molded into the body of the accelerometer. The only way to replace a broken cable is to replace the accelerometer and cable as an assembly. The cable terminates in a three-pin screw-on connector. This connector will only fit in the vibration sensor input on the balancer. The mounting stud is 1/4 x 28. Although the sensor is rugged, it can be damaged when dropped on hard surfaces. Use care when installing the sensor, as you would with other electronic components. Since the cable and sensor is one unit take care not to kink or damage the cable during installation.

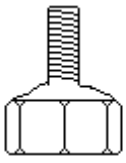
2.4.8 User Manual

This user manual is current when you receive it with the balancer. To verify that your manual is current, visit our web site at www.AcesSystems.com/ProBalancer-Sport.

2.5 Optional Equipment

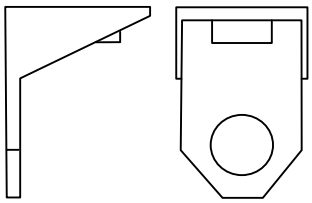
2.5.1 Case Bolt Adapter Set

An eight-piece case bolt adapter set with nut sizes 1/4 to 7/16 NF and NC threads is included in the propeller balancing kit. The stud portion is threaded with 1/4 x 28 threads. To use the bolts/nuts during a typical propeller balance, select the adapter from the set to match the case bolts of a typical opposed engine. Attach the adapter nut end to the exposed case bolt threads then slide the right angle mount over the stud end and secure with the supplied nut. You will require two sets of the adapters for dual-engine balancing.



2.5.2 5/16” Right-Angle Sensor Mount

The right-angle sensor mount shown in the left portion of the illustration above is made of stainless steel and designed to be mounted directly on the engine case bolt or to the case bolt adapter, shown in the right portion of the illustration below. The mount has a 1/4 x 28-threaded hole for the vibration sensor and a 5/16 unthreaded hole for mounting.



2.5.3 Tackle Box

A multi-compartment, high impact plastic, tackle box is available for the propeller balancing kit. The box has ample storage space for vibration sensors, vibration sensor mounts, and the case bolt adapter set. It may also serve as storage for AN washers used as balance weights.

2.5.4 Gram Scale

A 200-gram capacity scale is available for the propeller balancing kit for weighing the washers or trim weights used in balancing. Read the operating instructions enclosed with the scale carefully prior to its use.

2.5.5 Slow Discharge Rechargeable Batteries

Rechargeable batteries are available that extend the shelf life of the battery charge. These batteries reduce the need for charging the battery before every use.

2.5.6 Protective Boot

An optional protective boot is available for use with the ProBalancer Sport Model 1015. It is designed to provide additional protection to the balancer in the case of impact. This case is form fitting and relieved to allow access to the Tach and Vibration sensor connections.

2.5.7 Balance Placard

A placard is available for the propeller balancing kit. This or a similar placard should be attached to the spinner bulkhead upon completion of balancing to show that the propeller has been dynamically balanced and is indexed to the crankshaft of the engine.

Chapter 3
Using the
ProBalancer Sport Model 1015

Revision Number 1.01

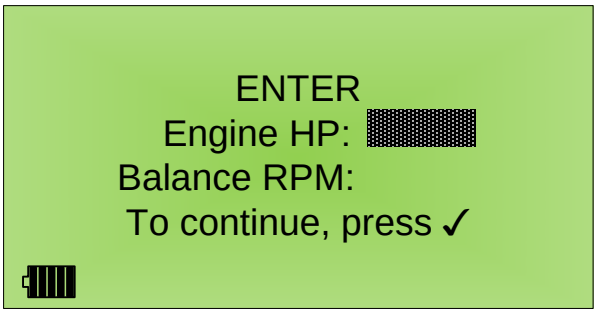
3.1 Balancer Interaction

The balancer interacts with the user through its display. The user interacts with the balancer through the use of the keypad. The balancer displays information on the display; the user replies through the keypad. This method of inputting data is described in detail in the following section.

3.1.1 Display Overview

A sample interaction screen is shown below. The top section of the screen is comprised of question and answer interactions for Engine HP and Balance RPM. The fourth line is a prompt from the balancer for the required key press to accept the entries and proceed to the next screen. The bottom left-hand icon is a representation of the battery state. In this case the batteries are fully charged.

As the batteries discharge, bars will be removed from the right-hand side of the icon. When only the outline of the battery remains, the batteries should be replaced. The information regarding the current job will be retained for approximately 2 minutes without battery power to allow battery replacement.



3.1.2 Text Fields

Data is entered into areas of the screen called fields. The active field is represented by a solid box, as shown in the figure above. The active field accepts user entered data required by the balancer to proceed with the balance job.

3.1.3 Navigating Active Fields

It is necessary to move from one active field to another to complete data entry. Use the ◄ ► ▲ ▼ keys to navigate around the screen. Use the ▲ and ▼ keys to move from field to field. Pressing the ▼ key from the bottom field on the screen will return you to the top field on the screen. If you wish to change text already in place in these fields, place the cursor in the field you wish to change then press

the ◄ key once for each character in the field you wish to remove. Use the keypad, as described below, to replace the entry with the correct one.

3.1.4 Using the Keys

The balancer keypad has 10 numeric keys. They are all single function keys and may be pressed once for each entry.

Chapter 4
Propeller Balance

Revision Number 1.01

"Propeller Balance" is an automated balancer function. The balance procedure will load automatically when the balancer is turned on.

4.1 Hardware Installation

NOTE

If it is not possible to attach all the hardware as recommended, the ProBalancer Sport Model 1015 will still balance the propeller but the first recommended weight and angle will not be as accurate as when the sensors are mounted in the ideal position. All subsequent runs will be accurate.

4.1.1 Inspect Kit

Prior to attaching any part of the ProBalancer Sport Model 1015 kit to the aircraft, conduct an inspection of the kit contents. Turn the balancer on to ensure proper function and check the battery status. Change the batteries if necessary. Inspect all cables for cuts, nicks, scrapes, and evidence of burns and heat damage. Check the cable and ProBalancer Sport Model 1015 connectors for visible damage. Check the vibration sensor for physical damage. Ensure the PhotoTach lens is clean and undamaged. Check the tachometer connector for damage. Repair or replace any damaged components as necessary to ensure proper and timely operation.

4.1.2 Install Vibration

WARNING

Use extreme care when aligning and connecting the vibration sensor cable to the balancer. The pins act as the only locating keyway. If twisted or misaligned, damage to the connector and pins may occur.

Place the Vibration Sensor Mount at the twelve o'clock position whenever possible, and on the top, forward-most area of the engine, for a typical tractor propeller. Mount the sensor on the top, aft-most area of the engine for a pusher type installation. The Vibration Sensor Mount should be positioned with the threaded hole pointing straight up. Thread the Vibration sensor into the threaded hole on the Vibration Sensor Mount. The sensor should be snug to prevent movement, but caution should be taken to prevent cross threading and stripping of the threads on the Vibration Sensor and Vibration Sensor Mount.

4.1.3 Install PhotoTach

Install the assembled PhotoTach Mount to best suit your needs. A location on top of the engine cowling along the centerline of the aircraft is preferred. Use speed tape to attach the PhotoTach assembly to the cowling at the twelve o'clock position, between twelve and eighteen inches behind the aft surface of the propeller blades.

1. Select a propeller blade to be a reference blade for the PhotoTach.

2. Center the propeller blade on the PhotoTach.

3. Cut a two inch piece of reflective tape from the roll.

4. Hold the tape with the paper backing against the aft face of the propeller blade. Do not remove the paper backing at this time.

5. When the tape is properly aligned with the PhotoTach, a red LED on the back of the PhotoTach will illuminate. This LED may appear steady or may appear to pulsate. Either indication is acceptable. Ideally, the tape should be centered horizontally and vertically with the PhotoTach and in line with the lens. It should be centered along the blade chord on the back of the propeller blade; between the leading and trailing edges of the blade.

6. Clean the area of the aft face of the blade in the aligned location and dry completely.

7. Remove the paper backing on the reflective tape.

8. Install the reflective tape in the position previously located.

See Section 5.3 below for additional tips and troubleshooting on installing the PhotoTach.

NOTE

Use only reflective tape supplied by the distributor. Other reflective tapes or targets may not perform as well and will cause delays or inaccurate signals to the ProBalancer Sport Model 1015.

NOTE

Take care not to lose alignment with the PhotoTach when attaching the tape. Squeeze any bubbles in the tape toward the edges to prevent separation after engine start.

4.1.4 Connect and Route Cables

WARNING

Use extreme care when aligning and connecting the vibration sensor cable to the balancer. The pins act as the only locating keyway. If twisted or misaligned, damage to the connector and pins may occur.

Connect the PhotoTach to the large end of the yellow cable. Safely route the cables back to the location of the balancer. Use tape or ty-wraps to secure both cables in the propeller slipstream. Use care to avoid hot or rotating components when routing the cables. Connect the other end of the fifteen foot Tach cable to the ProBalancer Sport Model 1015 Tach connector. Connect the end of the vibration sensor cable to the vibration input on the balancer.

WARNING

The ProBalancer Sport Model 1015 should be turned off while connecting cables, the sensor, and the PhotoTach.

WARNING

Do not pinch or cut the cables by closing them in doors, windows, or panels. This may cause shorting of the cables and cause damage or failure of the ProBalancer Sport Model 1015.

4.2 Balance Procedure

NOTE

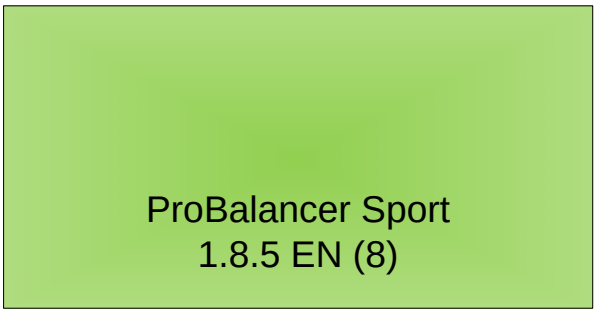
Numeric data displayed on the screens in this manual are for reference only. The numbers you see on the balancer in use may be different.

NOTE

The process described below is for normal operation. If you receive a message at any step during the balance process, which is not in the directions below, see the troubleshooting section of this manual.

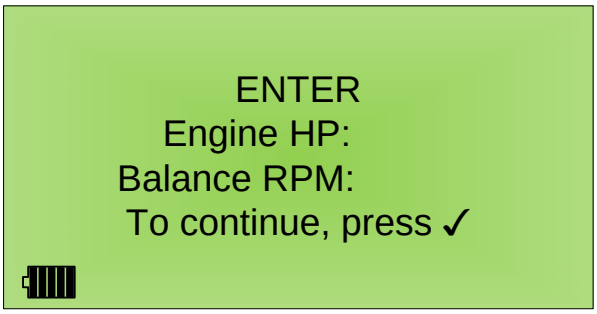
4.2.1 Boot Up Screen

After you press the key, the balancer will display a screen similar to the one shown below. The line that reads, "1.8.5 EN (8)" will tell you the installed software version and the language that will be used to display text. The two letter language abbreviation is taken from the ISO 639-1 list of approved language abbreviations.



4.2.2 Enter HP and RPM

The screen shown below will appear. In this screen, enter the engine horsepower and the RPM at which you will be performing the balance. See Chapter 5 below for errors related to this screen.



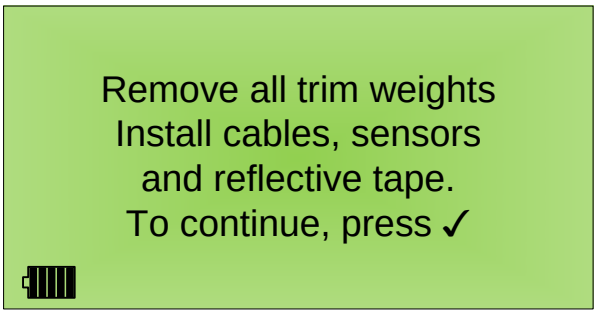
Engine HP — The engine's rated horsepower is entered here. The balancer must know this number to calculate the first weight suggestion. Use the numbers on the key pad to enter data in this field. Press the ▼ key to move to the next field.

Balancing RPM — You must enter a target balancing RPM at this point. We recommend a low cruise setting, unless another RPM is specified by another procedure. When completed, press the ✓ key to continue.

4.2.3 Remove Trim Weights

A screen displaying the "Remove all trim weights and install cables, sensors and reflective tape." message, as shown below, will appear. Remove all balance weights previously installed on the propeller. Power will be provided to the PhotoTach on this screen. Use this screen to install and align the

PhotoTach and tape. Install the vibration sensor. Route and secure the cables as necessary to allow safe operation of the aircraft. When all weights are removed, press the ✓ button.

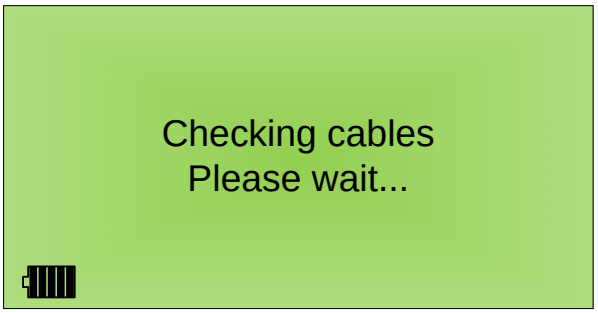


NOTE

Consult the "ACES Systems Guide to Propeller Balancing" for any questions concerning the movement or removal of static balance weights.

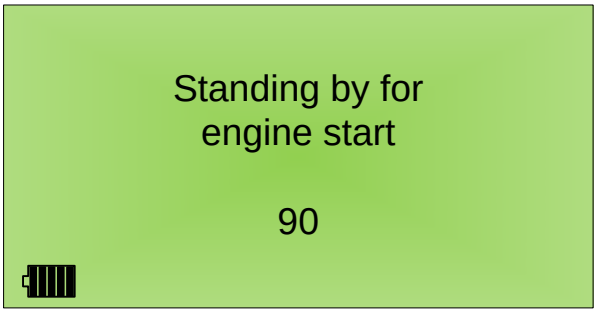
4.2.4 Checking Cables

The balancer will display the message below while it performs a test on the two cable. If the test passes, the balancer will proceed to the next step. The balancer will continue to perform this test in the background during the balance job. Whenever a problem is detected in the cable, the error messages found in Section 5.6.3 or 5.6.4 below will immediately appear.



4.2.5 Start Engine

The "Standing by for engine start" screen, shown below, will be displayed. When the balancer detects the propeller spinning at twenty-five RPM or higher the balancer will progress to the next screen. You will have approximately 90 seconds to perform the engine start. See Chapter 5 below for errors related to this screen.

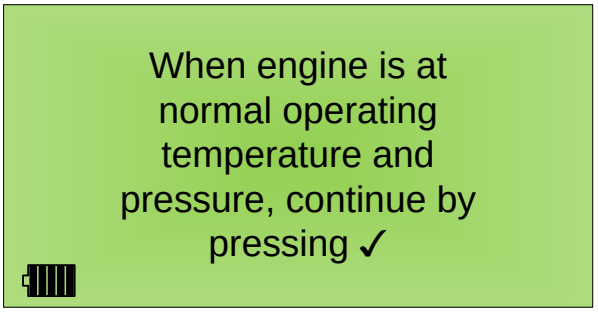


4.2.6 Warm up Engine at Idle Speed

After a Tach signal is recognized, the next screen will display the message "When engine is at normal operating temperature and pressure, continue by pressing ✓", shown below. After the engine is at normal operating temperature and pressure, press the ✓ key to continue the job.

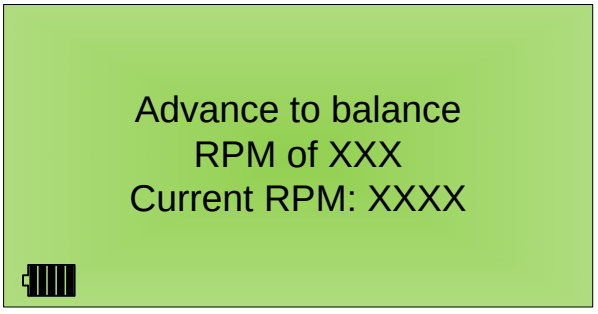
NOTE

If the engine temperatures and pressures are not within the normal operating range, continue to warm the engine. Readings taken with a cold engine may not indicate the actual vibrations within the engine and may cause excessive runs or the inability to balance.



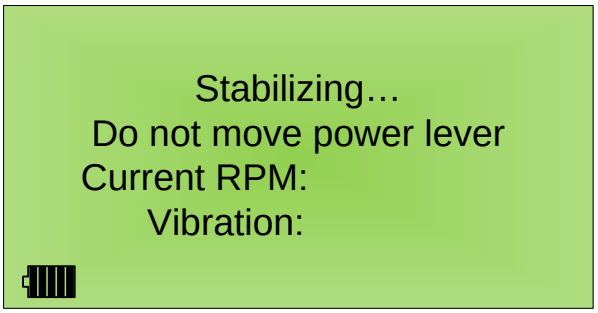
4.2.7 Advance to Balance RPM

After engine warm up, the next screen will display the message "Advance to balance RPM of XXXX", shown below. In place of the X's will be the balancing RPM you entered in Step 4.2.2 above. After the engine temperatures and pressures are within normal operating range, begin to accelerate the throttle toward the balance RPM. When the value is within 20% of the designated balancing RPM, the ProBalancer Sport Model 1015 will continue to the next screen. See Chapter 5 below for errors related to this screen.



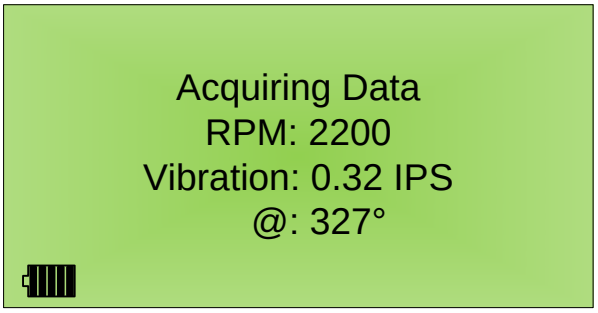
4.2.8 Stabilizing

The balancer will display, as shown below, the current RPM and the message "Stabilizing… Do not move power lever". When the RPM has stabilized and averaged within 20% of the designated balancing RPM, the ProBalancer Sport Model 1015 will continue to the next screen. See Chapter 5 below for errors related to this screen.



4.2.9 Acquiring Data

The balancer will display the screen below, stating “Acquiring Data” and displaying the current RPM, vibration, and phase readings. The balancer will average the RPM, vibration, and phase readings, until an accurate average of the imbalance is achieved. When this step is complete the balancer will automatically progress to the next step. See Chapter 5 below for errors related to this screen.



4.2.10 Vibration Summary

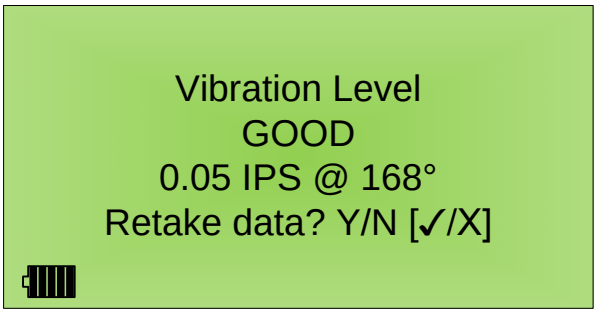
The balancer will now display the vibration condition, IPS value, and phase location for the reading just accomplished. The balancer will display a vibration level summary based on the six levels described below.

NOTE

These conditions are an interpretation of general vibration levels. They are not a reflection of OEM directed vibration levels. Consult your Maintenance Manual for acceptable vibration levels.

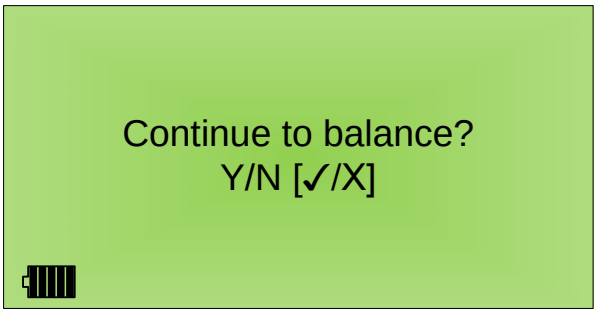
4.2.10.1 Vibration Level Good

During the balance process, if the vibration level average is below 0.07 IPS, the balancer will display a message stating “Vibration Level Good at XXX”, the vibration readings and phase location. You will be given the opportunity to “Retake data? Y/N [✓/X]”. Press the ✓ key to retake the data. This can be used to confirm the reading. Press the ✕ key to progress using the current vibration reading by following the instructions in Step 4.2.10.1.1 below.



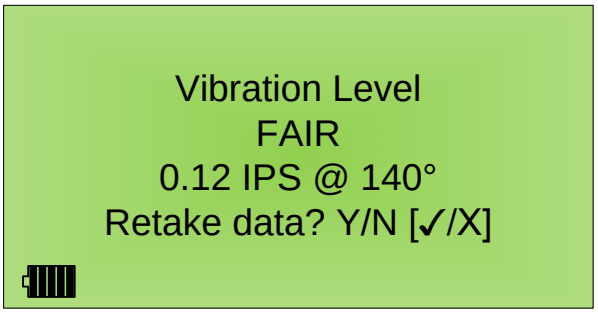
4.2.10.1.1 Continue to Balance?

Whenever the vibration level falls within the "GOOD" category, the balancer will display a message asking "Continue to balance? Y/N [✓/X]" (below). Press the ✓ key for yes to continue to attempt to improve the balance. Press the × key to accept the GOOD vibration level and follow the instructions in Section 4.2.14 below for installation of the permanent weights. Make a selection and follow the on-screen instructions to shut down the aircraft as found in Step 4.2.11 below.



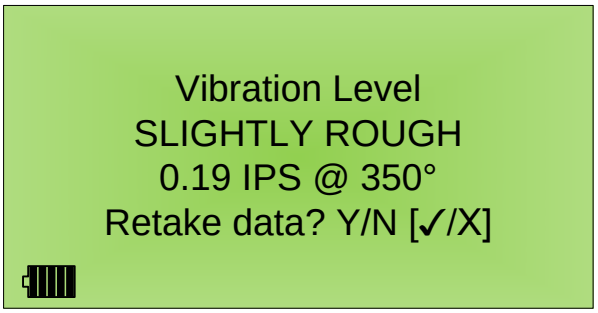
4.2.10.2 Vibration Level Fair

This condition indicates the vibration level is between 0.07 IPS and 0.15 IPS. Balancing to this level will decrease passenger and crew complaints for vibration. This level of vibration is the minimum acceptable vibration level after dynamic balancing. A message will display asking "Retake data Y/N [✓/X]". Press the ✓ key for yes and return to Step 4.2.7 above. Press the × key for no and continue with Step 4.2.11 below.



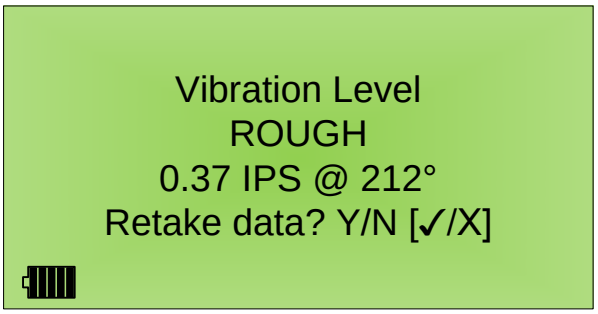
4.2.10.3 Vibration Level Slightly Rough

This condition indicates the vibration level is between 0.15 IPS and 0.25 IPS. At this level passengers and crew can feel the vibration. Dynamic balancing should be accomplished. A message will display asking “Retake data Y/N [✓/X]”. Press the ✓ key for yes and return to Step 4.2.7 above. Press the ✕ key for no and continue with Step 4.2.11 below.



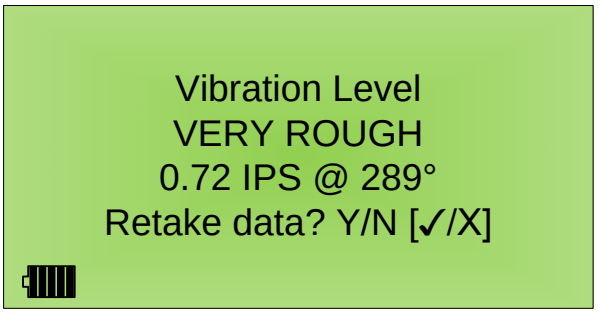
4.2.10.4 Vibration Level Rough

This condition indicates the vibration level is between 0.25 IPS and 0.5 IPS. Prolonged operation at this level could cause excessive wear of components. Passengers and crew can feel the vibration well. A message will display asking “Retake data Y/N [✓/X]”. Press the ✓ key for yes and return to Step 4.2.7 above. Press the ✕ key for no and continue with Step 4.2.11 below.



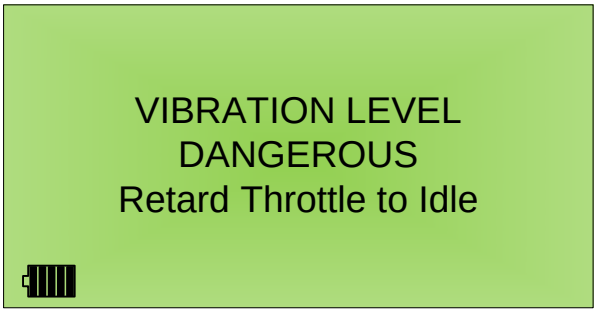
4.2.10.5 Vibration Level Very Rough

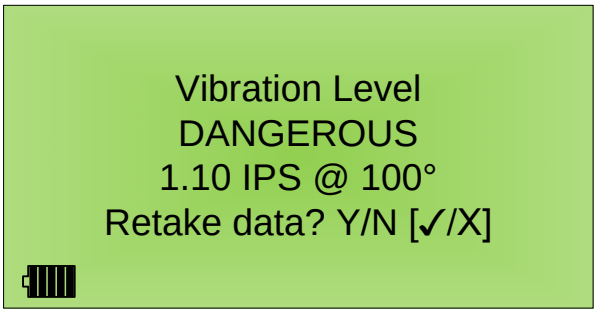
This condition indicates the vibration level is between 0.5 IPS and 1.0 IPS. At this level the propeller can still be dynamically balanced, however large amounts of weight will be required. Crew members may complain of vibrating pedals or their feet falling asleep. Performing a static balance prior to dynamic balancing should reduce the overall amount of weight required to balance from this vibration level. Operation at this level could cause damage to components and the airframe. A message will display asking “Retake data Y/N [✓/X]”. Press the ✓ key for yes and return to Step 4.2.7 above. Press the ✕ key for no and continue with Step 4.2.11 below.



4.2.10.6 Vibration Level Dangerous

This condition indicates the vibration level is above 1.0 IPS. The propeller should be removed and static balanced prior to performing a dynamic balance. The balancer will not allow balancing if the starting vibration level is above 1.0 IPS. On the first, third and all following runs, as soon as the balancer detects vibration levels above 1.0 IPS you will be prompted to "Retard Throttle to Idle" as shown directly below. The balancer will allow vibrations to reach 1.2 IPS on Run 2 as a result of an incorrect test weight. See Step 5.6.15 below for instructions on the procedure for Run 2. The balancer will then begin searching for a reduction in RPM. When the RPM begins to decline, the balancer will show the "Vibration Level DANGEROUS" summary screen as shown at the bottom. When the engine reaches idle you will be given the opportunity to retake the data to confirm the high reading. Press the ✓ key for yes and return to Step 4.2.7 above. Press the × key for no and continue with Step 4.2.11 below.



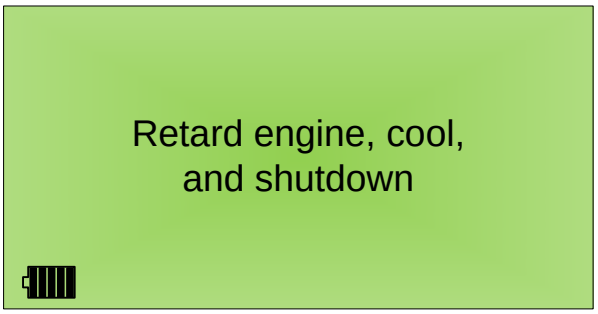


4.2.11 Shut Down

After the completion of the data acquisition phase of the run the balancer will prompt you to complete the engine shut down sequence.

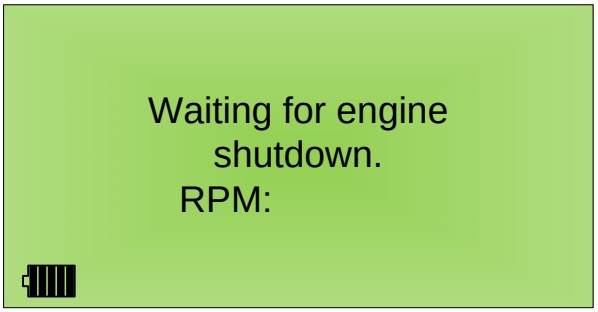
4.2.11.1 Retard Engine

The balancer will display the screen shown below. Move the throttle toward idle. Once the balancer detects a decrease in RPM, it progress to the next screen.



4.2.11.2 Waiting for engine shutdown

After the RPM has dropped below 100 the balancer will automatically display the next screen as shown in Step 4.2.12 below.

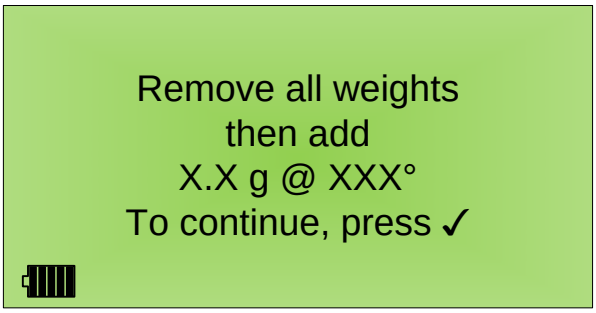


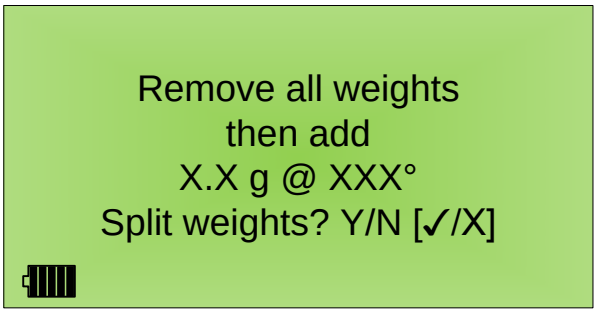
4.2.12 Suggested Solution

The balancer will suggest a solution designed to reduce the vibration level. The solution for Run 1 will be based on the engine horsepower and vibration level. In some cases this test weight may actually make the vibration level increase. This is not unusual. The balancer is only attempting to learn the response of the aircraft. As long as the vibration does not get to a dangerous level, the balancer will correct the weight suggestion prior to the next run. If the vibration level does move into the dangerous category, the balancer will attempt an alternate weight installation as shown in Section 5.6.15 below. All future runs will be refined based on the amount of weight installed, the location used for the weight installation and the resulting vibration reading. For this reason, it is extremely important to accurately enter the actual weight and angle used for each solution.

4.2.12.1 Presentation of the Solution

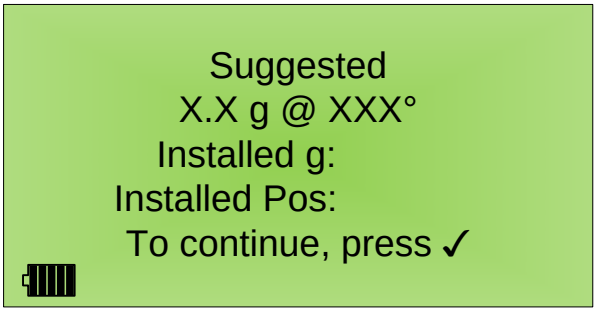
After the balancer has detected the engines have shut down, it will display a reminder to remove any previous weight. Following this line the balancer will display the suggested balance solution. Examples are shown below. The screen on the left will only appear after the first run and is limited to placement at a single location. The screen on the right will appear with each subsequent run and will allow you to split weights if needed. Press the ✓ key to continue from the Run 1 screen shown below on the left and go to Section 4.2.12.2 below. Subsequent runs will display the screen as shown on the right-hand screen. Press the ✓ key to split weights and proceed to Step 4.2.12.3 below. Press the × key to install weights at a single location and proceed at Step 4.2.12.2 below.





4.2.12.2 Single Weight Placement

Following the above screen, if you choose to install the weight at a single location, you will be presented with an interaction screen that will allow you to enter the actual amount and location of the weight. Select the location on the propeller that most closely matches the suggestion and use that location for the trial weight. Following Run 1, the balancer is only trying to measure the response of the propeller so exact duplication of the suggestion is not mandatory. Subsequent runs are using that learned response to accurately determine the correct location and amount of weight. After the test weight installation, it is important to match the suggested weight correction as closely as possible for maximum vibration reduction. Use the ▲ and ▼ keys to navigate between the "Installed g" and "Installed Pos" fields. Use the keypad to enter the actual weight installed following the "Installed g" text. Use the keypad to enter the actual angle used following the "Installed Pos" text. When all entries are complete, use the ✓ key to proceed.

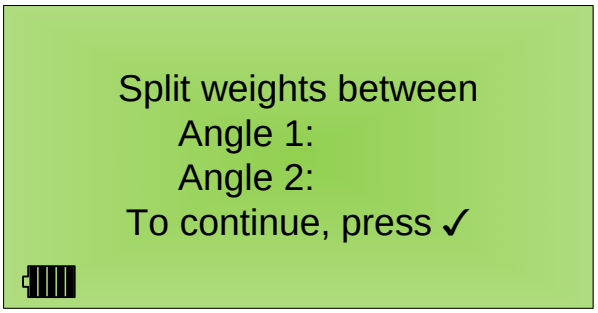


4.2.12.3 Split Suggested Weight

On Run 2 and greater, the balancer will allow for the split of the Suggested Solution. You can use this when there is not a hole close to the single suggested correction angle. You will be allowed to select one hole on either side of the suggested angle. The balancer will calculate a new weight required at a new location and present this solution.

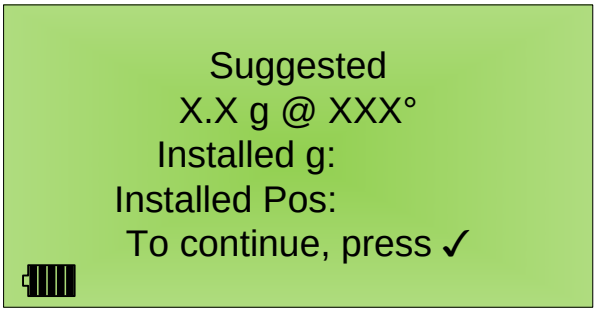
4.2.12.3.1 Select Split Angles

If you chose to split the solution weight location in the Step 4.2.12 above, you will be prompted to enter the angles of the two closest holes to the suggested angle, as shown below. Use the key pad to enter each angle navigating between the fields using the ▲ and ▼ keys. Press ✓ to continue to the next screen.



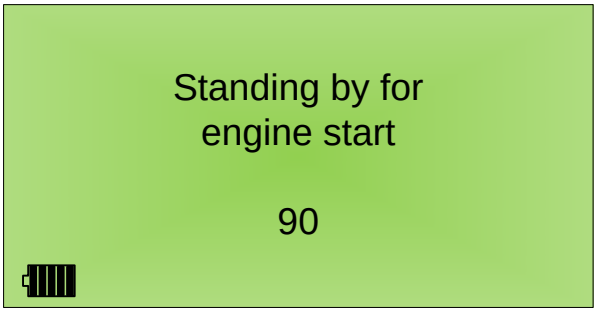
4.2.12.3.2 Split Weight Placement

You will be presented with an interaction screen that will allow you to enter the actual amount and location of the weight. This weight will be the amount of weight to place at the "Angle 1" location as chosen in Step 4.2.12.3.1 above. Select a weight as close as possible to the value on the second line. Use the keypad to enter this value on line three following "Installed g:". The "Installed Pos:" value will already show the "Angle 1" from Step 4.2.12.3.1 above. Press the ✓ key to continue. Repeat this process for "Angle 2" and press the ✓ to continue at Step 4.2.13 below.



4.2.13 Engine Start

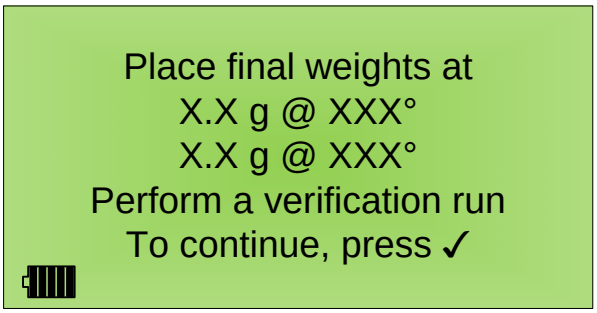
The balancer will again display the "Standing by for engine start" screen. Repeat the balance process until the vibration level is satisfactory.



4.2.14 Place Final Weights

When the final vibration level is accepted the balancer will prompt you to install the final weights. The value or values displayed will refer to weight placed in the same location as the trial weights. If the weight needs to be moved to a permanent location on the spinner, these values may need to be adjusted

for any change in radius. See the ACES Guide to Propeller Balancing or www.AcesSystems.com/ProBalancer-Sport for instructions on recalculating the weight.



4.2.15 Job Complete

After the final weights are installed and the check run is performed a screen similar to the one below will display. This screen will inform you of the final vibration level. This display will remain until power is turned off on the balancer. When power is turned back on, the balancer will start a new job.

Chapter 5
Equipment and Accessory Setup and Troubleshooting

Revision Number 1.01

This chapter discusses how to fix common pitfalls and errors associated with setting up and using the equipment required for performing routine propeller balancing with the ProBalancer Sport Model 1015.

5.1 Batteries

The balancer is powered by 4 AA size batteries. Normal alkaline batteries will provide approximately 1 - 2 hours of power for the balancer. Rechargeable Nickel Metal Hydride (NiMH) batteries are HIGHLY recommended for normal use. These batteries can provide up to 6 hours of power to the balancer depending upon the mAh capacity of the batteries selected. If the balancer will see only occasional use, slow discharge NiMH batteries are recommended. Battery life will vary between brands and also depends upon the capacity of the chosen battery.

5.1.1 Battery Status

The battery status is indicated in the lower left-hand corner of the display. A battery icon, similar to the figure below, containing eight vertical bars represents the approximate remaining charge in the batteries. As the batteries discharge, bars will be removed from the right-hand side of the icon. When only the outline of the battery remains, the batteries should be replaced. When the battery level is critically low, the outline of the battery icon will begin to blink.

Due to the variety of batteries available, the indicator has been calibrated to an average charge level. It may not indicate the exact charge state for all battery types. The important indication is that of the flashing outline. When the icon begins to flash only about 15 minutes of charge remain. It is important to turn off the balancer and replace the batteries immediately.

5.1.2 Battery Replacement

The batteries are a user changeable item. Turn the power OFF on the balancer to begin this process. The batteries may be accessed by removing the battery cover which is located on the back of the balancer case. Simply slide the cover down and off the unit. Then, remove the old batteries and install the new batteries taking care to observe the polarity markings in the back of the battery compartment. The information regarding the current job will be retained for approximately 2 minutes without battery power to allow battery replacement.

5.1.3 Tips

- Rechargeable NiMH batteries will provide the longest operating time of the Balancer. Their use is strongly recommended.

- Ensure the batteries are installed in the proper orientation.
- The balancer requires 4 standard, 1.5V, AA size batteries for use. Ensure any batteries used meet these requirements.
- If the balancer is not used for a period of more than one month, the batteries should be changed to prevent damage to the balancer and corrosion build-up on the batteries.
- If the LCD screen on the ProBalancer Sport Model 1015 lightens or is blank, use the contrast keys to darken the screen. If adjusting the contrast does not darken the screen or make it appear, change the batteries.

5.2 Cable Damage

Cables can be damaged if pinched in doors, windows, or cowlings. Always check for pinches, cuts, and abrasion prior to using the cable. Discard, replace, or repair damaged cables as necessary. Exercise care when connecting cables.

Bent or damaged pins may cause problems with normal operation. Check all connectors for evidence of damage. Contact the distributor for replacement cables.

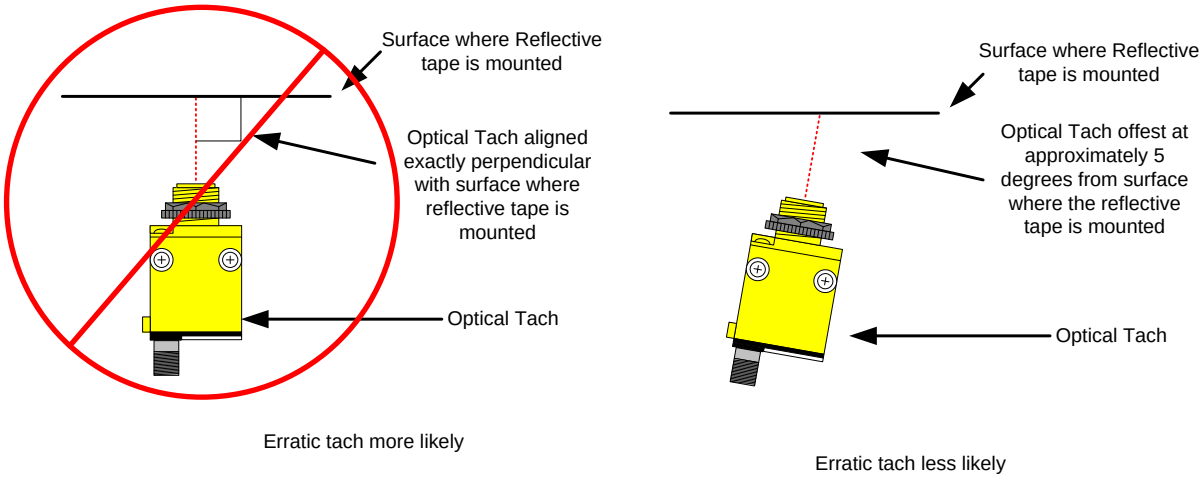
Route cables away from all hot areas, electrical equipment, and rotating components to minimize damage possibilities. If the cables are used while lying on the ground, you may experience radio interference. Secure the cables to the aircraft fuselage (off the ground) to correct this interference. Speed tape and wire ties are excellent for securing the cables.

The balancer will perform a cable test at the start of each job and continuously throughout the job. If the balancer detects a cable open or short a message will be displayed until the problem is corrected. See Sections 5.6.3 and 5.6.4 below for additional information.

5.3 PhotoTach

The PhotoTach is a very rugged piece of equipment. It is water resistant, but water on the lens may reduce the effectiveness of the PhotoTach. Always check the lens for cleanliness and to ensure it is free of damages such as cracks and scratches.

The best orientation for installation of the PhotoTach is slightly offset from perpendicular to the reflective tape. If the PhotoTach is aligned exactly perpendicular to the reflective tape false readings or erratic Tach speeds may be displayed on the balancer. See the figure below for the optimum orientation of the PhotoTach and reflective tape.



The optimum range of the PhotoTach is 12 to 18 inches. It may work at closer or more distant ranges, although it may not be as reliable. See Section 5.4.1 below for more tips.

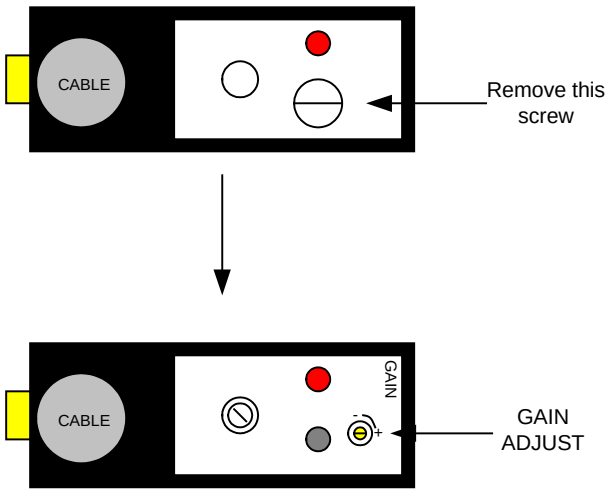
5.3.1 Setting the gain on the PhotoTach

In most cases the root cause of a Tach problem can be traced to sources other than the PhotoTach itself. Setting the gain on the PhotoTach should only be attempted as a last resort. Should you exhaust all other solutions, follow the procedure below to set the gain on the PhotoTach:

1. Remove the screw holding the clear plastic cover on the back of the PhotoTach. (See the drawing below)

Caution

You should only attempt to adjust the gain as a last resort, make sure you exhaust all other solutions before making any adjustments. Do not move the white screw to the left of the gain adjustment.



2. With the cover removed, the brass Gain Control screw can be seen in the small hole near the outside edge of the unit. Setup the balancer as follows:

    a. Connect the PhotoTach to the balancer's Tach input.

    b. Place a strip of reflective tape on a bench grinder or other rotating device from which you can measure speed.

    c. Set the PhotoTach the same distance from the tape as the distance to the tape on the aircraft you normally use this equipment on.

    d. Start the rotating machine.

    e. Press and hold the 2 key. While holding the 2 key, press the button as if you were turning the analyzer on normally. After the "Vibration Data" screen appears release the 2 key.

    f. When an RPM is indicated on the balancer screen, slowly turn the brass gain adjustment in either direction until the Tach signal as indicated on the screen is lost then stop turning the adjustment screw. The adjustment screw does not have a clear stop and will continue to turn forever. The total amount of adjustment is about 20-25 complete turns. After that, a clutch will disconnect the screw from the potentiometer and provide no further adjustment. If the RPM indication is never lost, reset the potentiometer to the center position and search elsewhere for the source of the problem.

    g. Have the screwdriver ready to make a small adjustment in the OPPOSITE direction from which you were turning when the RPM signal was lost. The signal should be regained and indicated on screen in a very short time as you **VERY SLOWLY** turn the adjustment screw in the opposite direction. Be careful not to turn the gain adjustment too fast at this time.

    h. When the RPM signal is again indicated STOP TURNING THE SCREW.

    i. From this point you will slowly continue to turn the screw in the same direction, counting the turns as you go. Continue turning the screw until the RPM indication is again lost.

    j. The goal is to put the gain screw in the center of the effective range. If, for instance, you counted 5 turns from loss of signal on one side to the loss of signal on the opposite side, you would turn the screw back 2 ½ turns to put it in the center of the effective range.

    k. When you have the screw in the center of the range, replace the clear cover and screw.

    l. Press the key to turn the balancer off. The next time you turn the balancer on, you will return to the initial screen ready to start a new job.

5.4 Reflective Tape (3M Tape, Model 7610)

Always thoroughly clean the area where the tape is to be applied. Using scissors or some other cutting tool, round off corners of the tape and be sure all edges are pressed down. Rounded corners help to

prevent tape from peeling up during use. Remove any bubbles in the tape by pressing them toward the edge of the tape to prevent "lifting" due to the airfoil effect during high speed runs.

5.4.1 Reflective Tape Width Requirements

If problems are experienced using the PhotoTach while balancing high-speed props with the reflective tape further out on the blade, refer to the following chart for tape placement adjustments.

1. First, measure the distance from the center of the propeller shaft to the location you intend to place the reflective tape.

2. In the chart below, select from the RPM column the first speed greater than the speed at which you intend to balance.

3. From this RPM number, proceed across the chart to the right until you come to the first number larger than the distance measured in Step 1 above.

4. From this point, follow the column up to the top to the minimum tape width required for your application.

5. As an example, use the following parameters: the distance from the propeller shaft to the intended tape location measures 25 inches and the balance speed is 2300 RPM. Select 2400 from the RPM column since this is the first speed greater than your intended balance speed of 2300. From this number, follow the row across to 26.5, which is the first number higher than your intended tape location of 25 inches. From 26.5 follow the column straight up to the top--2 inches. This is the width of tape required for accurate readings at the intended distance and RPM level. (If your reflective tape is only 1-inch wide, place two 1-inch strips of tape side by side to create 2 inches.)

Minimum Tape Required

RPM	1"	2"	3"	4"
1000	31.8	63.7	95.5	127.3
1200	26.5	53.1	79.6	106.1
1400	22.7	45.5	68.2	90.9
1600	19.9	39.8	59.7	79.6
1800	17.7	35.4	53.1	70.7
2000	15.9	31.8	47.7	63.7
2200	14.5	28.9	43.4	57.9
2400	13.3	26.5	39.8	53.1
2600	12.2	24.5	36.7	49
2800	11.4	22.7	34.1	42.4

5.5 Vibration Sensor

WARNING

Use extreme care when aligning and connecting the vibration sensor cable to the balancer. The pins act as the only locating keyway. If twisted or misaligned, damage to the connector and pins may occur.

Although built for rugged use, it is susceptible to internal damage when dropped, especially on hard surfaces such as concrete ramps. Do not drop the sensor.

Do not mount a sensor on a hot section of the engine until you are certain it will withstand the maximum amount of head being generated in that area. A sensor must be designed for high temperature use to be used in this type of environment. The extreme heat may permanently damage the sensor. There are no repair capabilities for most modern sensors.

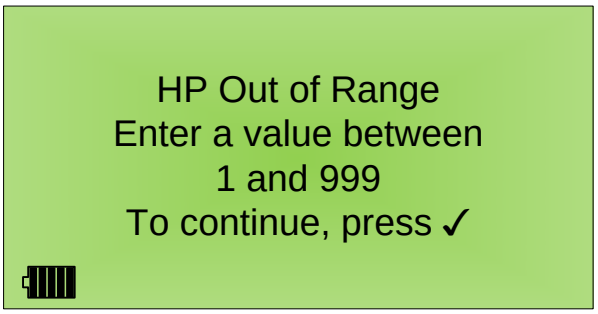
When connecting cables to the sensor, make sure the cable is not forced against the cowling at the point where it is connected to the sensor. This condition may introduce vibrations generated by the cowling, into the sensor via the cable and connector. This induced vibration will complicate or render the balance invalid.

The sensor will also be checked as part of the calibration procedure. Be sure to include your sensor with the balancer when returning it for calibration.

5.6 Information messages

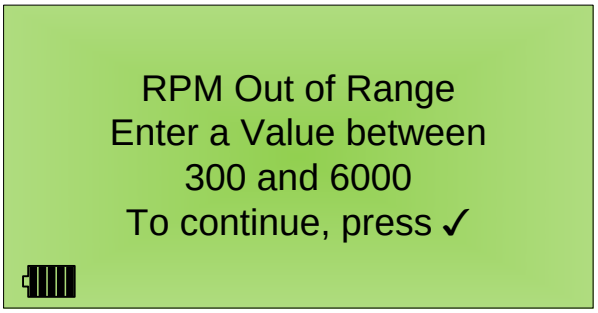
5.6.1 HP Out of Range

If the HP you entered is beyond the input range of the balancer, you will receive the message shown below. The input range is any number between 1 and 999. Press the ✓ button to return to the engine horsepower and RPM screen, then re-enter the HP with a value within the acceptable limits.



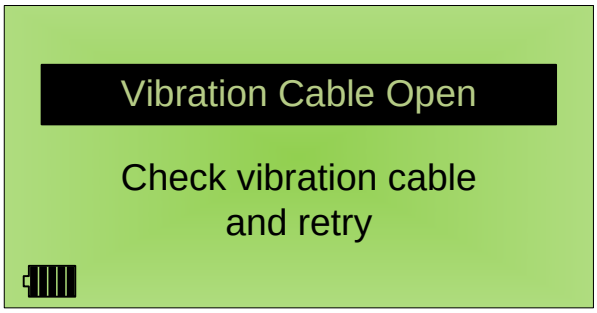
5.6.2 RPM Out of Range

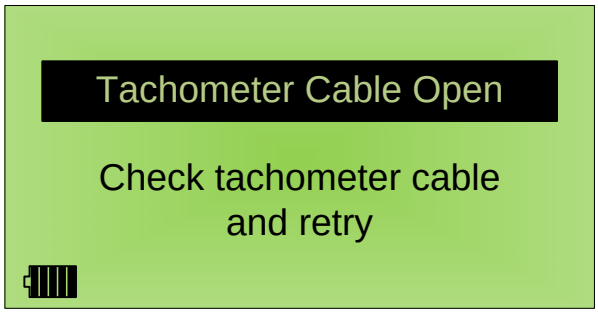
If the RPM you entered is beyond the input range of the balancer, you will receive the message shown below. The input range is any number between 300 and 6000. Press the ✓ button to return to the engine horsepower and RPM screen, then re-enter the RPM with a value within the acceptable limits.



5.6.3 Cable Open Check

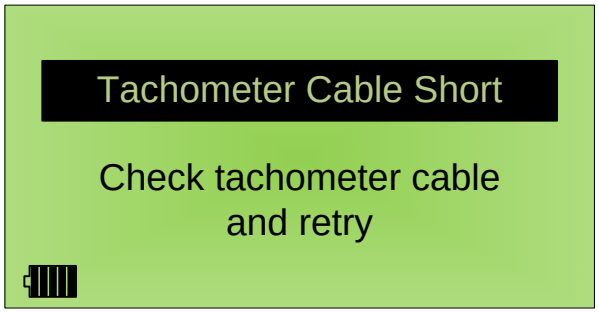
If an open circuit is detected in one of the cables, the balancer will display the message shown below. This can be as simple as the fact that the sensor cable is not connected to the balancer yet or as complex as a broken wire inside the cable itself. The problem must be corrected before the balancer can continue.





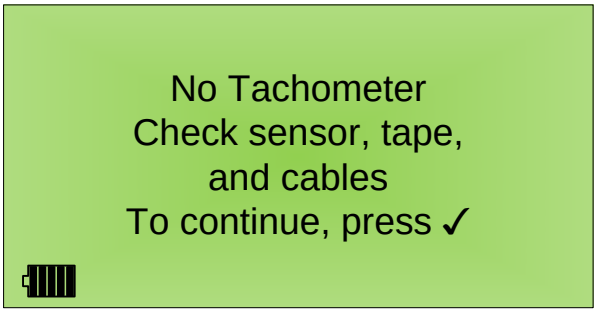
5.6.4 Cable Short Check

If a short circuit is detected in one of the cables, the balancer will display the message shown below. This is most likely caused by a broken wire inside the cable itself causing a short. The problem must be corrected before the balancer can continue.



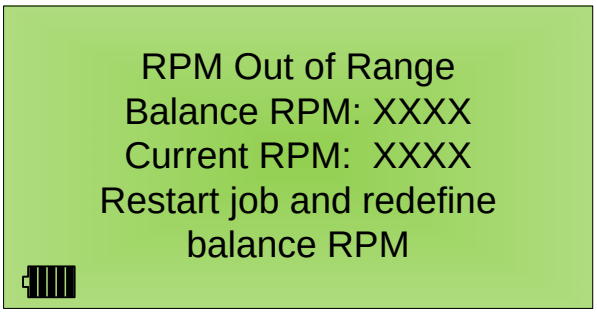
5.6.5 No Tachometer

If the balancer doesn't recognize a tachometer input within ninety seconds, the screen shown below will display. Turn all aircraft systems off then check the tachometer for proper alignment, the reflective tape for alignment and proper width, and the cables for damage and proper connections. Press the ✓ button when ready to continue. The balancer will again, display the "Standing by for engine start" screen.



5.6.6 RPM Out of Range

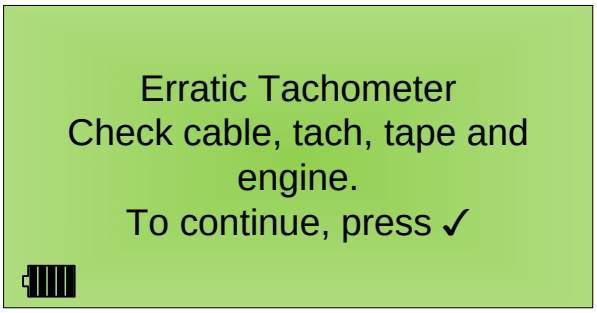
If the balancer determines that the stabilized RPM for Run 1 is more than 20% from the defined balance RPM, it will display the error message shown below. The most common situation that you will see a discrepancy is when balancing an engine equipped with gear reduction. If you enter engine speed, it may vary greatly from actual propeller speed. You must use cruise propeller speed for the balance RPM. The balancer will give you the opportunity to check the Tach, Tape and cable again then retry the reading by pressing the ✓ key. This warning screen is shown below.



If the RPM discrepancy occurs a second time, the balancer will prompt you to redefine the Balance RPM. Note the "Current RPM" displayed on the screen shown below. Press the key to restart a new job. Use the value from the "Current RPM" line as the new "Balance RPM.

5.6.7 Erratic Tachometer

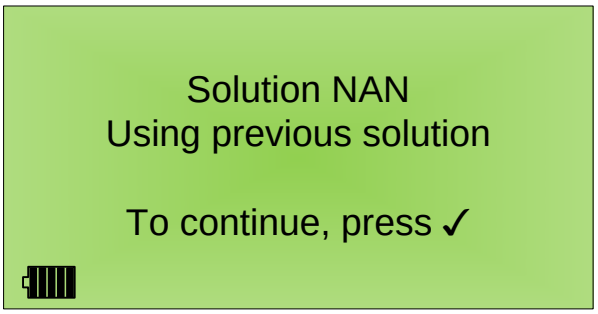
If the balancer determines the tachometer signal is erratic or weak, it will display the message shown below. Shut down the engine and add another piece of reflective tape beside the currently installed piece. See the table in Section 5.4.1 above for tape width requirements. After additional tape has been added, press the ✓ button to resume the balance job. Other causes can be fluctuations in engine speed greater than +/-25 RPM. Wind gusts can cause erratic engine speeds. In rare cases, the gain setting on the PhotoTach may be incorrect. See Section 5.3.1 above for instructions on adjusting the gain of the PhotoTach.



5.6.8 Solution NAN

This error will occur if the weight solution is Not A Number. Typically this will occur when fine tuning a very low vibration reading. If you are trying to shift 0.1 grams to fine tune a solution, eventually the balancer will determine that the changes are less than one-tenth of a gram. A change that small is

considered insignificant and the balancer will display the error below. Please contact your distributor or visit www.ProBalancerSport.com for assistance.

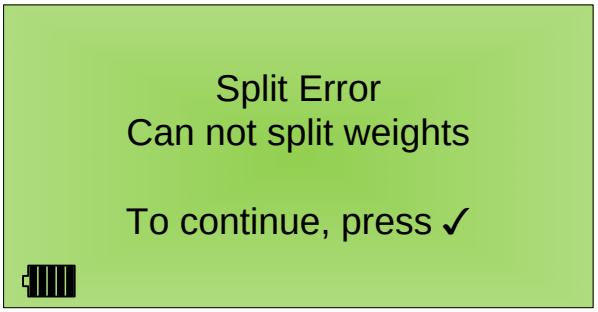


5.6.9 Split Errors

The messages displayed below will appear when errors occur in the weight split function.

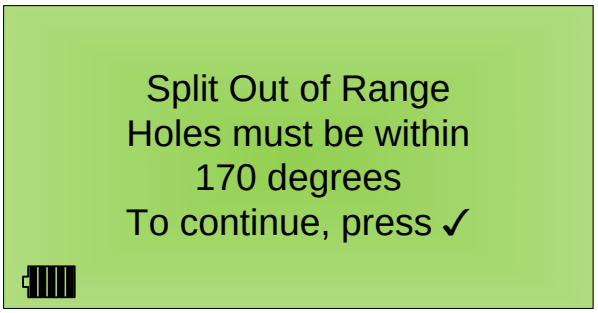
5.6.9.1 Split Error

The message shown below will appear when the balancer's weight splitter function is unable to split the weights within 10 degrees. Please contact your distributor or visit www.ProBalancerSport.com for assistance.



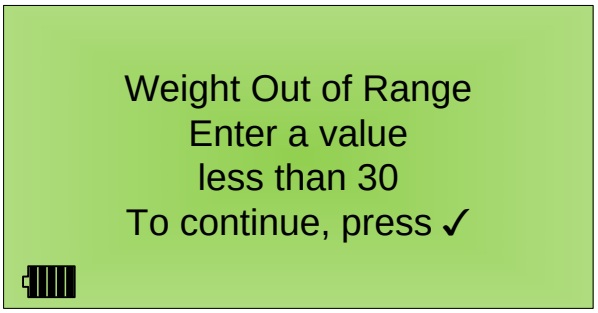
5.6.9.2 Split out of Range

The message shown below will appear when the values of Angle 1 and Angle 2 from the "Select Split Angles" screen as found in Step 4.2.12.3.1 above are greater than 170 degrees apart. Re-enter two weight angles that are on either side of the target weight location and within 170 degrees of each other. Press the ✓ key to return to Step 4.2.12.3.1 above and select new weight placement angles.



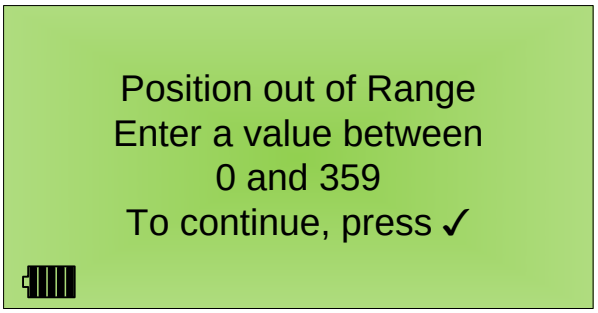
5.6.10 Weight out of Range

This message will appear if no entry is made in the “Installed g:” field of the actual weight placement screen. A number must be entered in the “Installed g:” field to continue. Any value, including zero, is a valid numeric entry. Press the ✓ to return to Section 4.2.12.2 above for a single weight installation or Section 4.2.12.3.2 above for a split weight installation.



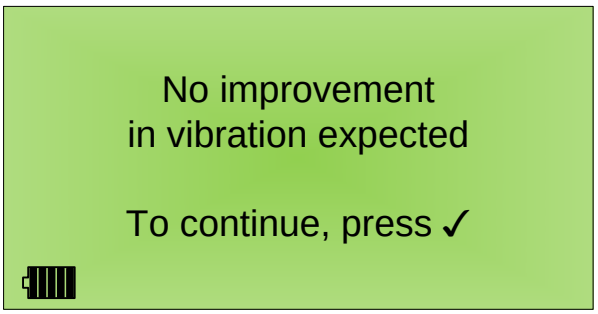
5.6.11 Position out of Range

This message will appear when a number is entered that does not fall within the 0 to 359 angle range. Angles must be entered in whole number increments between 0 and 359.



5.6.12 No Improvement

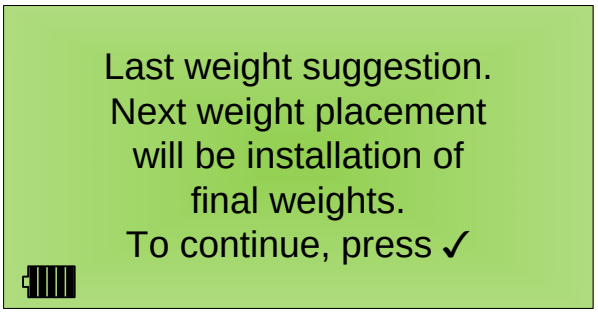
This condition indicates that no drop or an increase in the vibration level occurred between this run and the last. This condition will not display on the first or second runs. Press the ✓ key and follow the instructions as found in Section 4.2.14 above to finish the balance job.



5.6.13 Last Weight Suggestion

The balancer will only allow you a maximum of 9 runs to adjust weights plus a verification run. Prior to reaching the final run, the balancer will present the message shown below. The balancer is warning you that no more weight placements will be suggested. If you are attempting to fine tune the balance he balancer should automatically try to guide you back to the weight placement that provided the lowest vibration levels recorded during the job. If you are still seeing vibration levels above the FAIR level, you should inspect the engine and propeller combination for mechanical issues. Then, start a new job and perform a complete balance. In any event, the opportunity to place more weights is drawing to a close.

Press the ✓ key to return to Step 4.2.5 above and finish the balance job.



5.6.14 Static Balance

For dangerous vibration levels the balancer will display the screen shown below. An appropriately rated individual should perform a static balance on the propeller before continuing the balance. This screen will display until power is turned off on the balancer.

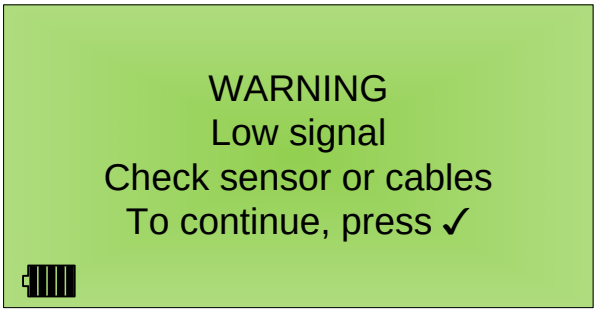
5.6.15 Trial Weight Error

If the location of the first trial weight causes the vibration level to rise above 1.2 IPS the balancer will suggest that the first trial weight be relocated on the other side of the propeller. The balancer is just trying to establish a move line to learn the response of the propeller to the trial weight. Simply follow the instructions and relocate the trial weight as directed in Section 4.2.12.1 above.

5.7 Warning Messages

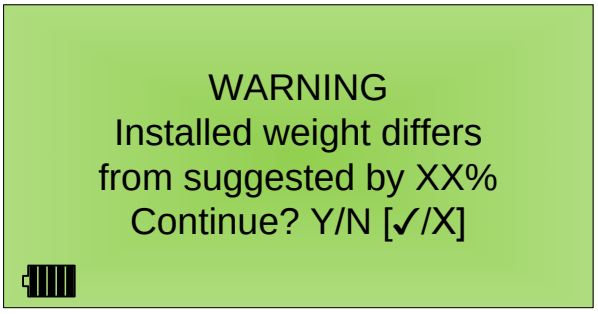
5.7.1 Low Signal

This is an indication that the vibration signal is extremely low. This can be caused by vibration sensor failure. Press the ✓ button to continue.



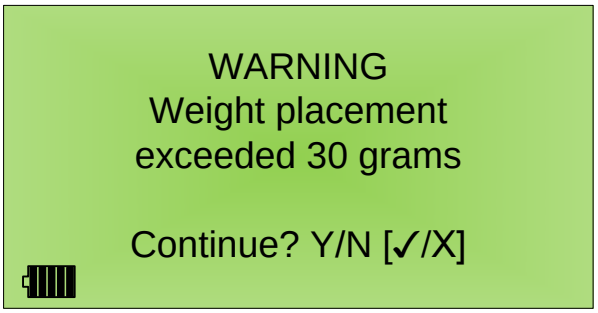
5.7.2 Installed Weight Differs from Suggestion

If you are unable to match the suggested weight installation exactly, enter the actual amount and location of the installation. The balancer will compute the difference between the actual weight installed at the actual location and the ideal weight and location. If the difference is greater than 10% you will be shown the warning screen below. If you select "Continue? Y ✓" you will proceed using the previously entered values. If you select "Continue? N ×" you will return to the suggested solution sequence as shown in Section 4.2.12 above. This will give you the chance to more closely match the suggested weight and location.



5.7.3 Weight Placement exceeded 30 Grams

The message shown below will appear whenever you attempt to install more than 30 grams of weight. Thirty grams of weight is typically the maximum amount of weight allowed in a single hole on a propeller spinner. See the ACES Guide to Propeller Balancing for limits when there are no limits in the aircraft, engine, or propeller manufacturers published manuals.

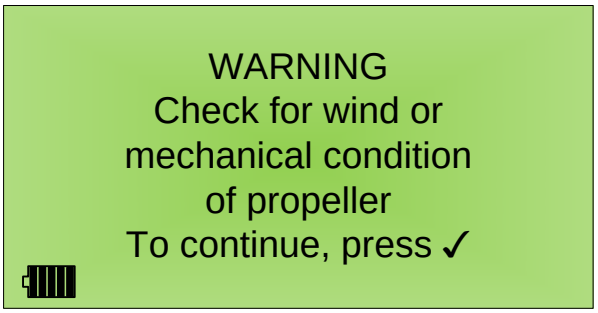


5.7.3.1 Job Aborted

The message below will appear if the ⨯ key is selected following the above message. At this point more weight than allowed is required to balance the propeller. Additional corrective action will be required. The propeller may need to be removed and statically balanced, re-indexed to the engine, or a mechanical problem may exist.

5.7.4 Check for Wind or Poor Mechanical Condition

If, during the data acquisition process, the balancer is unable to accurately determine the phase location of the vibration, the screen below will be displayed. Causes include high wind speeds, wind gusts, or poor mechanical condition of the propeller. Press the ✓ key to proceed and follow the instructions found in Step 4.2.5 above to shut down the aircraft.



NOTE

An inability to determine the vibration's location implicates high winds or mechanical problems. Ensure winds higher than 20 MPH with a gust factor limited to 5 to 7 MPH do not exist. For further guidance, see the "ACES Systems Guide to Propeller Balancing". An in-depth inspection of the mechanical components associated with and connected to the propeller should be accomplished.

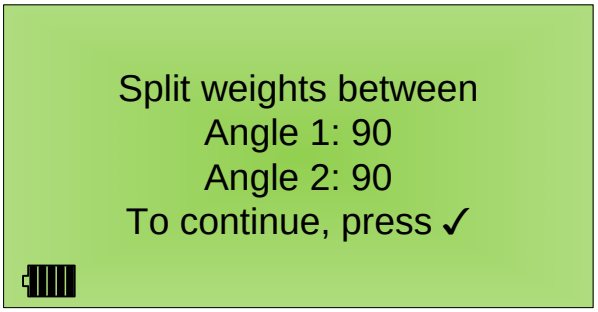
5.8 Reinitializing the balancer

To reinitialize the balancer, press the  key. This will reset the balancer to its original configuration. If this procedure fails to correct the encountered problem, visit www.AcesSystems.com/ProBalancer-Sport to search for further suggestions or obtain an RMA number.

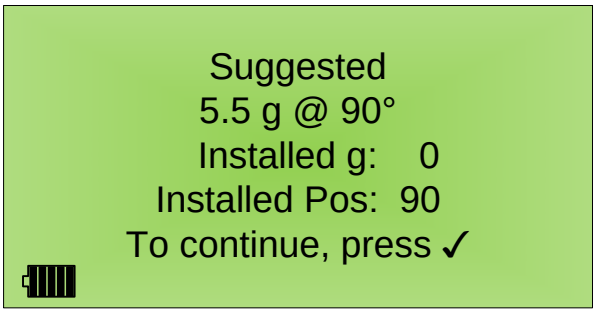
5.9 Tips

5.9.1 To clear a split

From the screen shown below, enter both Angle 1 and Angle 2 as the desired single angle value. This will clear the split.

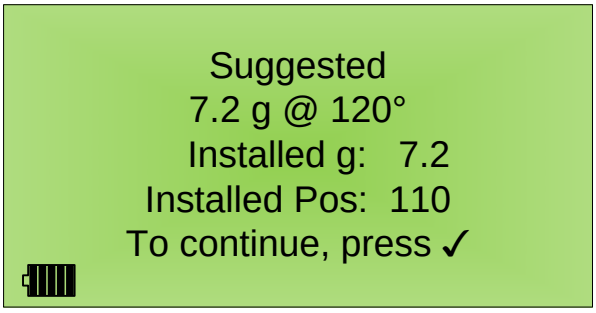


If you decide that you need to clear a split after the two angles have been selected, simply enter one of the split angles as 0.0 grams of weight at the suggested degree measurement. This will eliminate that angle as part of the split.



5.9.2 To change the split angles

Simply enter the value of the new angle on the "Suggested" screen as shown below. Acknowledge the difference in the suggestion and placement as shown in Step 5.7.2 above and continue. In the example below, the original "Installed Pos" was selected as 120 degrees. After examining the actual hole locations on the propeller it was determined that the actual location was 110 degrees. The balancer will use the actual entries from the "Suggested" screen for all calculations.



5.9.3 The Cable Open message appears when the sensor cable is connected

The Cable Open message will identify both an open in the cable wiring or excessive noise entering the sensor cable. If the cable is in a high electrical noise environment, near an ignition lead for example, the electrical signal can saturate the cable. This will provide inaccurate readings for balance purposes. To identify electrical interference as the source of the Cable Open error, shut down the aircraft engine and turn the magnetos off. The Cable Open message should disappear. The vibration sensor cable must then be rerouted to avoid the source of all electrical interference. At least route the vibration sensor cable across electrical wires at a 90 degree angle, do not run it parallel to electrical wiring.

5.9.4 The balancer will not turn off or there is a delay in powering off

The Power Off button must be pressed and held for at least one second. This feature keeps inadvertent contact with the power button from shutting down the balancer prematurely

5.9.5 Troubleshooting excessive runs or a difficult balance job

It is important to allow the engine to warm up to normal operating temperatures. If the engine is not within normal operating parameters, allow adequate time for the engine to warm up. Vibration readings taken on a cold engine may not indicate the actual vibration level in the engine. One way to determine if the vibration levels are accurate after you have been unable to balance is to start a new job and take another first-run reading with no weight installed. The vibration reading from the first job and the reading from the second job should be similar in IPS and Phase. If they are not, continue balancing in the second job.

Chapter 6
Specifications

Revision Number 1.01

ACCURACY	Vibration Amplitude +/-2% 0.00 to 20.0 IPS
	Frequency Range +/- 2% 300 -6000 RPM
PRECISION	Vibration: one one-hundredth IPS
	Frequency: one RPM
POWER SUPPLY	Voltage: 5 V DC from 4 AA batteries
	Recommended Type: Slow-discharge Rechargeable NiMH AA size batteries, 2700 mAh capacity
	Operation Time: approximately 4-6 hours – depending upon mAh rating of installed battery.
PHYSICAL	Height 9.3" Width 7.5" Depth 4.4" Weight of the unit alone: 1.0 lbs. Weight of unit including PhotoTach, sensor and cables: 2.0 lbs.
OPERATING TEMPERATURE RANGE	-20º C to 70º C

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