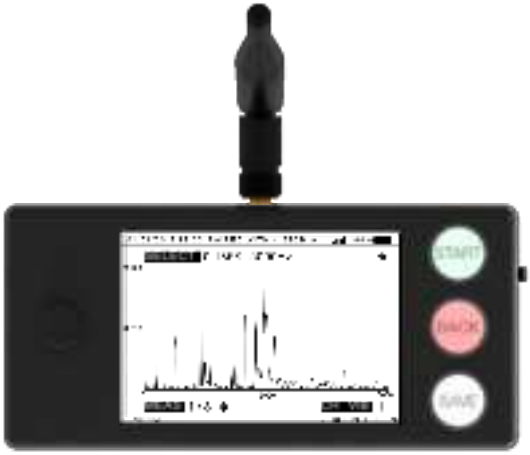
AIRVIB® Wireless System

User Guide

Revision : 1.6 - 21/04/2023



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AIRVIB® is a trademark registered by VIBRATECH SAS.

ABOUT THIS USER GUIDE

This user guide explains how to install and operate the AIRVIB® system. The manual contains an overview of the AIRVIB® system, general information on vibration analysis, explanations for the equipment installation and the use of accessories, and, finally, information about using the AIRVIB® program.
The AIRVIB® system is intended for UAV and light aircraft, but not limited to the aviation field. Any type of industrial application for vibration measurement and analysis is possible.

For any query or technical assistance, please contact DIAGNOSTIC SOLUTIONS INTERNATIONAL (DSI), LLC at the following coordinates:

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications made to this equipment not expressly approved by DSI may void the FCC authorization to operate this equipment.

AIRVIB® FEATURES

User Friendly interface and utilization with integrated joystick

Wireless communication up to 8 km (5 mi) or 50 km (31 mi)

Interface available in 4 languages (English, French, Spanish, Chinese)

User selectable units (IPS / g, Hz / RPM, degrees / hours)

LCD graphical color screen (3.5” / 8.9 cm)

SD card storage for measurement data

Spectrum analysis

Simultaneous spectrum analysis (8 channels max)

User selectable spectrum range (0 to 10 kHz / 600000 RPM max)

Acquisition in 800 bins (up to 0.125 Hz / 7.5 RPM per bin)

Graphical and peak list display

Dynamic balancer

Simultaneous dynamic balancing (4 channels max)

Real-time tachy speed measurements on all channels simultaneously

Universal program providing balance solutions

Track measurement

Simultaneous blades rotor tracking (12 blades max with lead, lag and height)

TABLE OF CONTENT

GLOSSARY OF TERMS

By convention and for a better understanding, the following terms and abbreviations used in this guide are defined below :

ACCELEROMETER : vibration sensor

AU : Acquisition Unit of the AIRVIB® system

DU : Display Unit of the AIRVIB® system

FFT (Fast Fourier Transform) : algorithm that computes the Discrete Fourier Transform (DFT) of a sequence. Fourier analysis converts a signal from its original domain to a representation in the frequency domain

g : unit of acceleration corresponding to the gravitation on earth

Hz (Hertz) : unit of frequency in the International System of Units (SI), equal to one cycle per second

IPS (Inch Per Second) : unit of vibration (by velocity) used in the aeronautical industry

MASS : quantity of matter expressed in grams

PLATFORM : structure or element to be balanced (UAV, aircraft, light aircraft, …)

POLAR CHART : circle graph representation plotting amplitude and phase of the vibratory data

RPM (Revolutions Per Minute) : unit used to indicate the rotation speed of an element

SPECTRUM ANALYSIS : graphical representation in frequency domain showing a general overview of a vibratory signal

SYSTEM : referenced to AIRVIB® equipment (AU & DU) in this user guide

TACHYMETER (*tachy*) : speed sensor for measuring rotation speed

1. AIRVIB® BASIC KIT INVENTORY

N°	Quantity	Item description
1	1	AIRVIB® suitcase
2	1	AIRVIB® Display Unit (DU)
3	1	AIRVIB® Acquisition Unit (AU)
4	1 to 8	Accelerometer (vibration sensor)
5	1 to 4	Laser photocell (tachymeter, different lengths)
6	1 to 8	Accelerometer cable (different lengths)
7	2	Whip RP-SMA antenna
8	1	Adhesive blade SMA antenna with RP-SMA adaptor
9	1	Pocket scale with calibration weight
10	1	4 GB SD card
11	2	Power supply 100-240V with USB port
12	2	USB C to USB type A cable
13	1	Polarized retroreflective adhesive roll (tachy interrupter)
14	1 to 8	3382-1 .28 HL 90° bracket for accelerometer
15	1 to 8	3383-1 .38 HL 90° bracket for accelerometer
16	1 to 8	3575 parallel bracket for accelerometers
17	1 to 8	Isolated mounting base for accelerometer
18	1 to 4	10423-1 90° bracket for photocell
19	optional	Track bracket 150° for photocell

2. ICONS LEGEND

This user guide uses icons in order to make it more understandable for the user. The icons have the following meanings:

- *Step: action performed by the user*
- ➢ *Note: useful information about the current subject*
- !⚠ *Caution: important contextual information or advice*

3. SAFETY PRECAUTIONS

Be careful when operating on UAV and aircraft. Make sure that the engine is switched off and always assume that the engine could fire at any moment. Securely chock or tie down the UAV or aircraft on the ground when performing a ground balancing process. Supplied brackets have specific vibration response and resonance frequency.
Important: homemade or modified brackets may damage the equipment or impact measurement accuracy.

Always act with caution and thought during the balancing process. If not, it could seriously hazard the flight safety, which may result in physical injuries and/or equipment damages. The operator is responsible for ensuring compliance with procedures and guidelines issued by the UAV / aircraft manufacturer, and by competent agencies.

To prevent a drop, the acquisition unit (AU) must be securely attached to the platform using clamps to be installed between the enclosure connectors. Any use of the system for a purpose not specified in the manual could compromise the built-in safety features and create a risk.

Refer to these symbols for the system installation:

Avoid placing any sensors or cables in a high temperature spot, in an excessive airflow position or close to existing cables and electrical components. An improper installation may cause damage to the equipment and/or may impact measurement accuracy

Always secure and check cables and accessories appropriately with screws, cable ties and adhesive tape before flight

Installation in some situation involves removing nuts and/or bolts from the flying platform, affecting the flight safety. Use caution and refer to your platform manual if applicable

Never stare directly into the photocell sensor lens, the laser beam may cause irreversible damage to your eyes

4. USAGE INFORMATION

Battery and charge warning

The battery should not be replaced by the user. Return the system to the authorized service center for battery replacement. Do not disassemble, drill, short-circuit, heat or throw to fire the battery. Always use the supplied sector adapters to charge the system.

Transport and storage

Carry and store the system in its original suitcase away from the sun and humidity. The device and its components are precision instruments and must not be thrown or subjected to physical shock. If the system remains unused for an extended period of time, check the battery charge level regularly and run a charge cycle, if necessary, in order to avoid deep battery discharge. Be sure to respect the storage humidity and temperatures of the system.

Maintenance

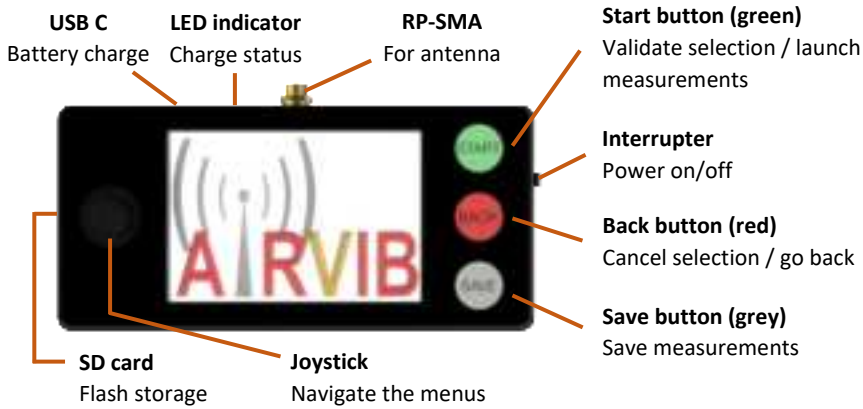
Clean the appliance and its accessories with a soft, damp cloth without detergent. It is recommended to check the calibration accuracy of the system and its accessories every year to ensure proper operation. Return the system to the authorized service center for calibration control.

Radio frequency exposure limits

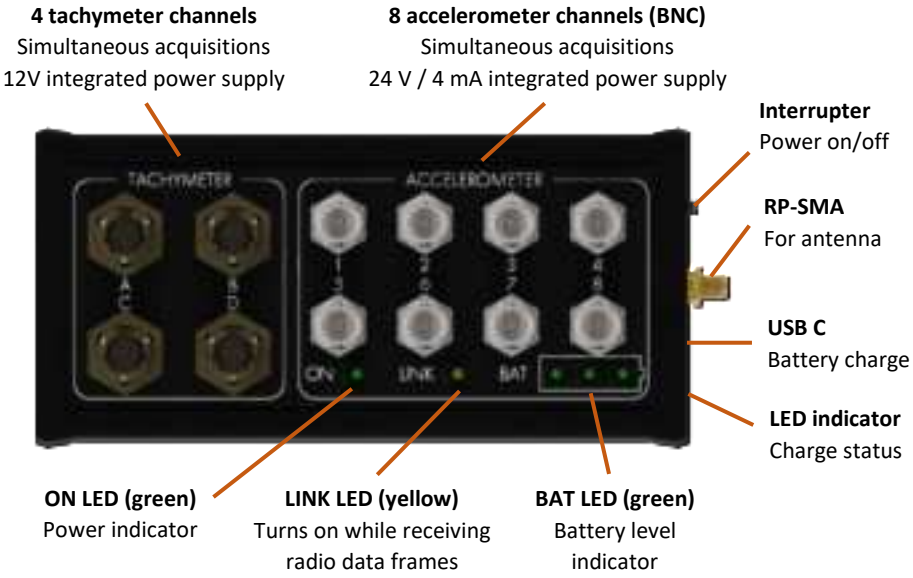
The radiated output power of the device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized.

5. AIRVIB® SYSTEM PHYSICAL DESCRIPTION

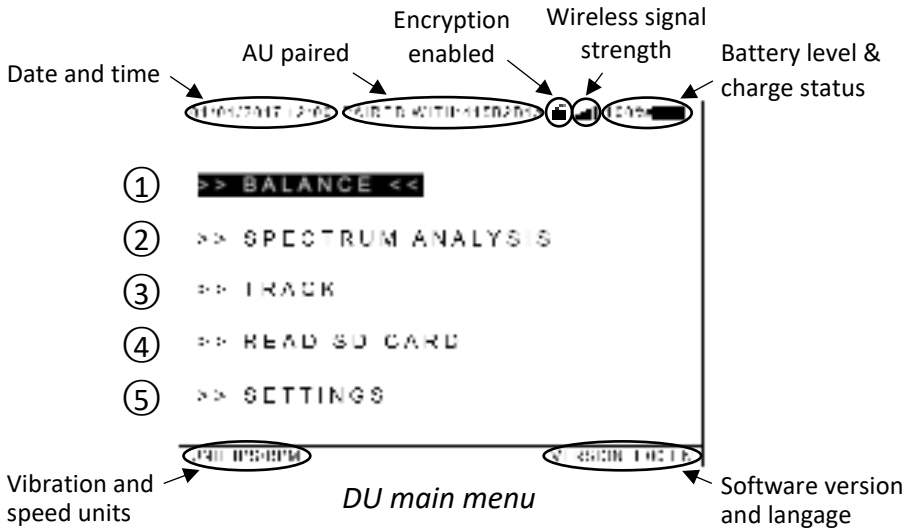
5.1. AIRVIB® Display Unit (DU) interface



5.2. AIRVIB® Acquisition Unit (AU) enclosure



6. AIRVIB® SYSTEM FEATURES OVERVIEW



DU main menu

①	Balance measurement / tuning program and tachometer speed display. Used to perform a mass adjustment in order to balance a shaft or a propeller.
②	Spectrum measurement. Used to perform a vibration diagnosis on the platform.
③	Track measurement. Used to adjust the position of the blades in order to align them in rotation.
④	Access the SD card and previously recorded measurements.
⑤	Access to the following settings: wireless pairing, set the DU language and units, adjust the date and time, enable wireless encryption and configure the AU accelerometer.

Wireless signal strength symbol meanings				
100%	75%	50%	25%	no signal

7. AIRVIB® LEADING PARTICULARS

CHARACTERISTIC	SPECIFICATION
General specifications	
Maximum autonomy (at 20°C / 68°F)	AU: ≈ 10 hours / DU: ≈ 14 hours
Full charge time (at 20°C / 68°F)	≈ 8 hours (5V DC @ 1A charge)
Battery type (AU and DU)	2 x Li-Po 3.7V 2100mAh (ref KRL704060)
Languages	English, French, Spanish, Chinese
Wireless frequency	868 or 900 MHz
Maximum wireless range at 13 and 30 dBm ERP	8 km (4 NM / 5 mi) or 50 km (27 NM / 31 mi)
Operating range	-10 à 50°C (14 à 122°F) < 85% RH
Conditions and altitude of use	Indoor use < 3000 m (9840 ft)
Degree of protection	IP 30
Wireless data link encryption	256 bits AES (user activated)
Balance measurements	
Acquisition simultaneous capability	4 vibrations and 4 tachymeters
Balance frequency range	3 to 500 Hz (180 to 30000 RPM)
Amplitude accuracy	+/- 5%
Phase accuracy	+/- 10° or 20 min
Frequency accuracy	+/- 0.1%
Spectrum analysis	
Acquisition simultaneous capability	8 vibrations (4 + 4)
Analysis range (maximum frequencies)	100, 500, 1000 and 10000 Hz (6000, 30000, 60000 and 600000 RPM)
Windows type	Flat top
FFT resolution	800 bins (lines)
Amplitude accuracy	+/- 10 %
Frequency accuracy	+/- 1 bin
Accelerometer inputs	
Constant current supply	4 mA @ 24V DC (maximum)
Input ranges	0 to 5V peak (maximum 100g pk-pk with 50mV/g accelerometer)
Tachymeter inputs	
Power supply	12V DC @ 150mA (maximum)
Input ranges	1V to 12V peak (nominal)
Frequency ranges	1.5 to 1666 Hz (90 to 100000 RPM)

8. DYNAMIC BALANCING & VIBRATORY SURVEY GENERAL OVERVIEW

8.1. Dynamic mass imbalance

An excessive mass or unequal distribution of mass moves the gravity center of a rotating element which generates a vibration. Please note that the higher the imbalance mass and rotation speed are, the higher the vibration will be.

8.2. Dynamic balancing

To perform a dynamic balancing, two parameters have to be collected: the vibration amplitude (defined as a peak acceleration or as a peak velocity), and the phase (defined by the angle from the vibration peak to the speed reference position). The vibration amplitude is the quantity of generated vibrations which gives information on the needed mass to perform a smooth balance. The azimuth phase specifies the location (angle) of an excess of mass, and therefore indicates the location where mass should be added (*at the opposite*). Please note that a static balance of the rotating system is required before performing any dynamic balancing.

8.3. Typical balancing steps

a. Perform a track / pitch link adjustment with the AIRVIB® system on ground in order to align blades
b. Perform a dynamic balancing with masses on the platform on ground until the vibration levels are acceptable
c. Perform the same track / pitch link adjustment and dynamic balancing with the AIRVIB® system in the low speed or hover flight regime until the vibration levels are acceptable
d. Perform the same track / pitch link adjustment and dynamic balancing with the AIRVIB® system, while flying in nominal conditions until the vibration levels are acceptable

8.4. Track and pitch link adjustment

To perform an optimal balancing, the first step is the blade alignment using the pitch links. If not performed, an improper blade alignment may result in important vibrations impossible to reduce.

8.5. Check other vibration sources

In order to perform a smooth balancing, other sources of vibrations need to be checked/minimized. Perform a global check of the platform to balance. General wear and tear, loose mounting, damaged gears / drive shaft and engine problems may produce vibrations.

8.6. Other considerations

It is recommended to perform the balancing steps gradually in order to reduce the risks associated with a significant imbalance.

It may be difficult to smoothly balance the platform at all regimes. In this case, it is recommended to optimize the tuning in the nominal flight regime or in the most frequently used flight regime, even if vibrations increase during transitory regimes (acceleration and deceleration).

Do not hesitate to redo a measure if the results seem to be inconsistent or faulty. If the balance is hard to perform or, even worse, if that proves impossible, use the spectrum analysis to detect a possible mechanical problem.

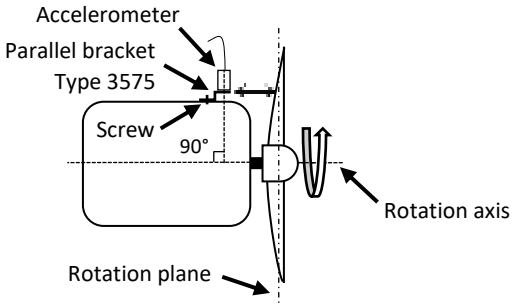
It is recommended to perform a spectrum analysis at the end of the balancing process to check the platform overall vibration level. Please note that reducing vibration during a balancing operation may increase vibration at other frequencies which are undetectable during the balancing process.

9. ACCELEROMETER INSTALLATION

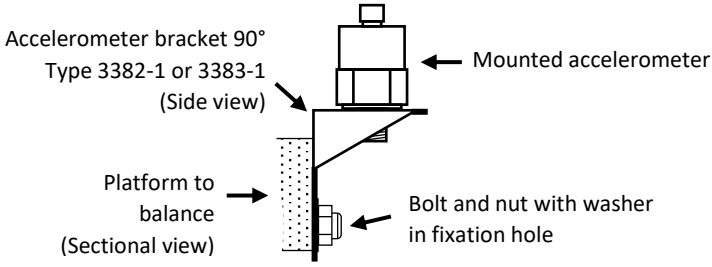
- **Find the most adequate bracket to your particular situation**

! It is recommended to use the isolating mounting base for accelerometer to electrically isolate the AIRVIB® from the platform

➢ The accelerometer must be mounted close to the rotation plane and perpendicularly to the rotation axis



- **Screw the accelerometer to the bracket and secure it with the appropriate amount of torque on the platform**



- **Connect the cable to the accelerometer by screwing it by hand and secure the cable with cable ties or with an adhesive**
- **Connect the cable to the AIRVIB® AU**

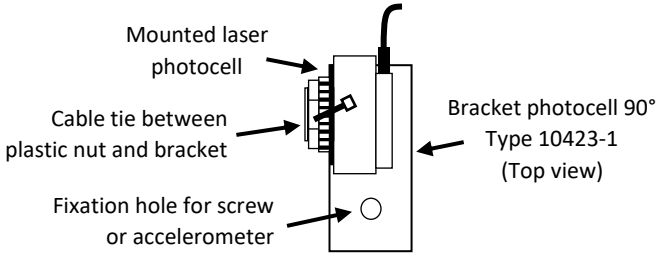
10. PHOTOCELL TACHYMETER INSTALLATION

- **Find a safe location to properly install the photocell bracket**
- **Rotate the platform part to be balanced to a position where an easily identifiable part on the rotating set crosses the laser beam (a blade for example)**

➢ The photocell has a range of 0.1m (4in) to 10m (33ft) to detect the retroreflective tape (target). Please note that the laser beam is narrow, consequently an angular alignment is required to avoid losing the tachymeter signal

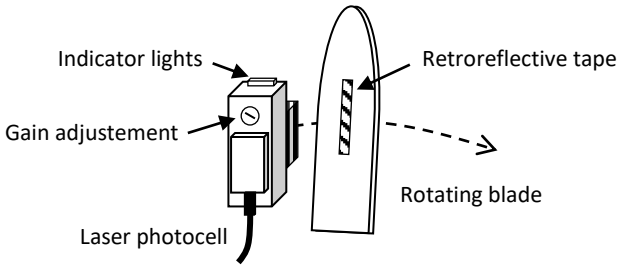
➢ The photocell laser beam should be approximately perpendicular to the retroreflective tape (target)

- **Screw the photocell to the bracket by hand and secure it with cable ties**
- **Screw the bracket to the platform and secure it with the appropriate amount of torque**



➢ The photocell bracket can be secured using an accelerometer to reduce the installation overall size. It is also possible to use screws to mount the photocell by itself

- **Place a piece of retroreflective tape (target) in front of the photocell's laser light**



- **Temporarily connect the photocell with the appropriate photocell cable to the AIRVIB® AU and turn on the AU to power on the photocell's laser. The photocell green indicator light should turn on**

- **Make sure that the red laser beam crosses the retroreflective tape. The photocell orange indicator light should turn on once the laser and the retroreflective tape is aligned**

- It may be necessary to adjust the position of the photocell and/or the position of the target to ensure they are both correctly aligned

- If the photocell and the target seem to be correctly aligned but if the orange indicator does not light or blink, try to adjust the gain of the photocell or increase the target size by doubling the width of the retroreflective tape

- **After validation, secure the cable with cable ties or adhesive**
- **Connect the photocell cable to the AIRVIB® AU**

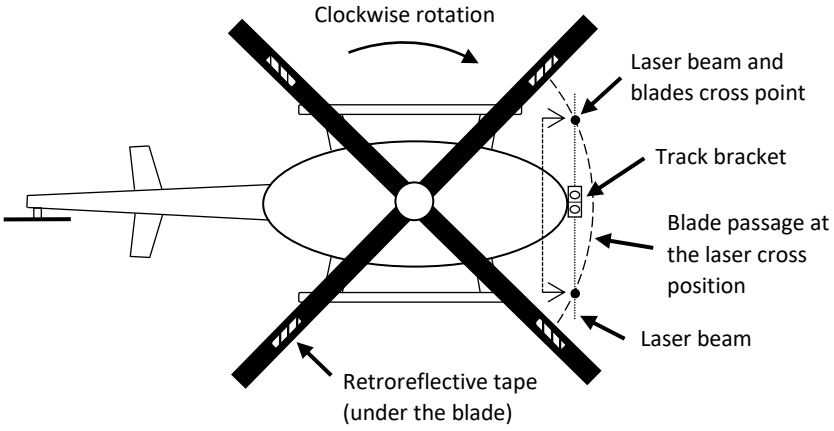
11. PHOTOCELL TRACK INSTALLATION

- **Find a location to properly install the track bracket**

➢ The track bracket can be secured on the nose of the platform (see the figure below). The position must allow the laser beam of the two photocells to cross the blades

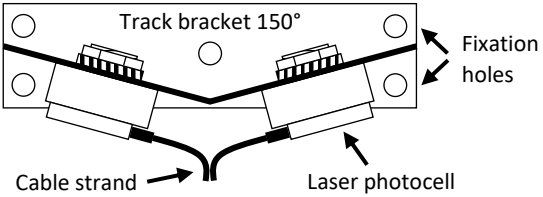
! Make sure that the laser beams are not pointing close to the blade tip, otherwise that may cause an excessive speed for the target, resulting in an inaccurate measurement or a in a deterioration, even destruction, of the retroreflective tape, due to air friction

➢ The photocell has a range of 0.1m (4in) to 10m (33ft) to detect the retroreflective tape. Please note that the laser beam is narrow, consequently the angular alignment is mandatory to avoid missing the targets



- The track bracket should be installed perpendicularly to the retroreflective tape

- **Screw the two photocells to the bracket by hand and secure them with cable ties. The photocells cables should meet at the folded part of the support**
- **Screw the bracket horizontally to your platform and secure it with the appropriate amount of torque**



- **Place a piece of retroreflective tape in front of the photocell's laser beams and on each blade at the same position**
- **Temporarily connect the two photocells with the appropriate photocell cables to the AIRVIB® AU and turn on the AU to power on the photocell's laser. The photocells green indicator lights should turn on**
- **Make sure that the red laser beam crosses the retroreflective tape. The orange indicator light on the laser photocell should turn on once the laser beam crosses the retroreflective tape**

- It may be necessary to adjust the position of the track bracket and/or the position of the retroreflective tape if they are not correctly aligned

- If the photocell and the target seem to be correctly aligned but if the orange indicator does not light or if it blinks, try to adjust the gain of the photocell or increase the target size by doubling the width of the retroreflective tape

- **After validation, secure the cables with cable ties or adhesive**
- **Connect the photocell cables to the AIRVIB® AU**

- The track measurement functionality requires a third photocell used as a tachymeter. Please refer to the corresponding section of this user guide for installation (see page 17)

11.1. Adjustment calculation for blade tracking

Calculate the lead-lag adjustment:

The result of the lead-lag is expressed as the percentage of the total rotor circumference.

$$rotor\ circumferance = blade\ length\ (any\ unit) \times 2\pi$$

or

$$rotor\ circumferance = rotor\ diameter\ (any\ unit) \times \pi$$

$$Adjustment = rotor\ circumference\ (any\ unit) \times \frac{measure\ in\ percent}{100}$$

Calculate the height adjustment:

The result of the height is expressed as the percentage of the distance between the center of the track bracket and the blade's rotation plan.

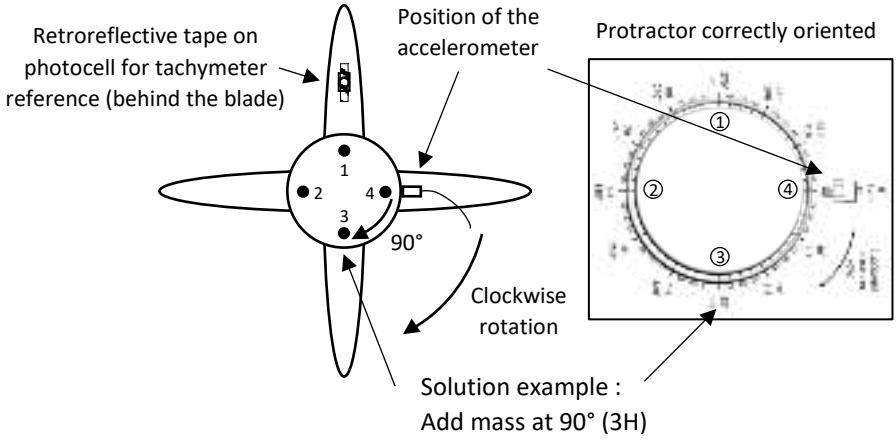
$$Adjustement = (blade\ height\ (mm) - 85) \times \frac{measure\ in\ percent}{100}$$

12. HOW TO USE THE PROTRACTOR

- **Use the protractor with the same direction of rotation as the rotating part to be balanced**
- **Align the laser of your photocell with the retroreflective tape, or any other type of tachymeter**
- **Align the accelerometer with the accelerometer drawing on the protractor so that there are parallel and pointing to the same direction**
- **Use the marks on the disk to add mass at the location specified by the balancing chart**

➢ For optimal balancing, it is recommended to precisely position the protractor throughout the entire balancing process in order to ensure a constant location of the balancing points between the different runs

➢ Annotating the balancing points can simplify their location on the platform to balance and avoid inaccuracies or position inversions during the balancing process



13. HOW TO USE THE UNIVERSAL PAPER CHART

- The universal paper chart is used as a visual support to facilitate the balancing process. The vibration should have reached an acceptable level after 4 or 5 balance runs maximum

- Balance points are plotted on the chart, and the distances between these points are considered as balance vectors. The ultimate goal is to bring the balance vector to the center of the chart

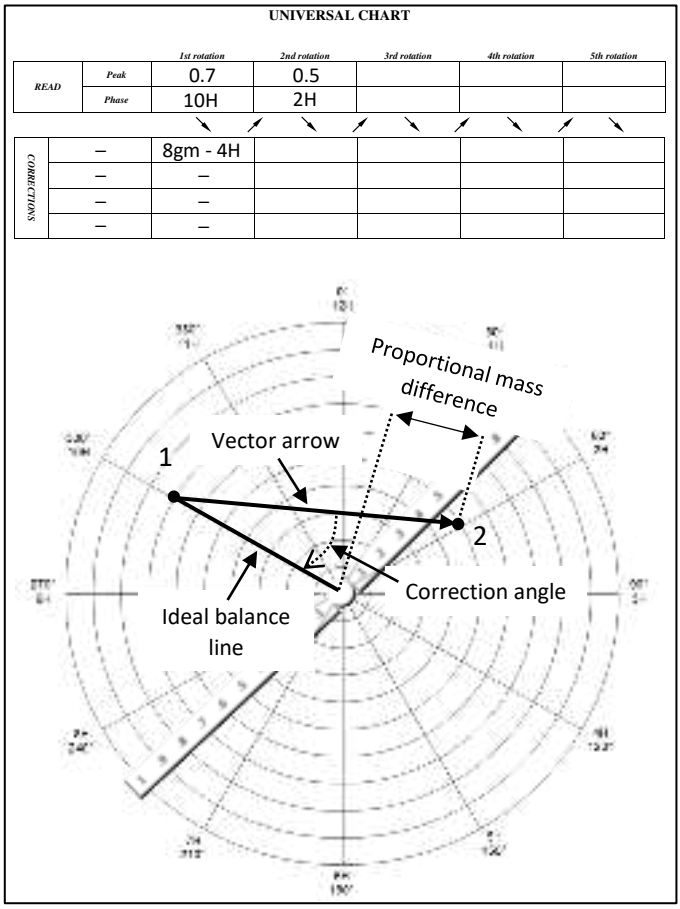
- **Remove all the non-permanent masses from your platform and acquire a balance measurement**
- **Plot the initial point (noted 1) on the paper chart (for example: 0.7 IPS at 10H)**
- **Add a trial mass on the platform at the opposite angular position of the balance phase measured (for example: 8 grams at 4H)**
- **Acquire a balance measurement**
- **Plot the mass trial point (noted 2) on the paper chart (for example: 0.5 IPS at 2H)**
- **Draw a vector arrow between the first point (noted 1) and the second point (noted 2)**
- **Draw a straight line from the first point (noted 1) to the center of the chart**

- Compare the length of the vector arrow and the length of the line : If the vector arrow is longer than the straight line, the solution to balance the platform properly is to decrease mass proportionally to the length difference. If the vector arrow is shorter than the straight line, the solution to balance the platform properly is to increase mass proportionally to the length difference

- **Measure the angle clockwise between the vector arrow and the line on the chart (in this order)**

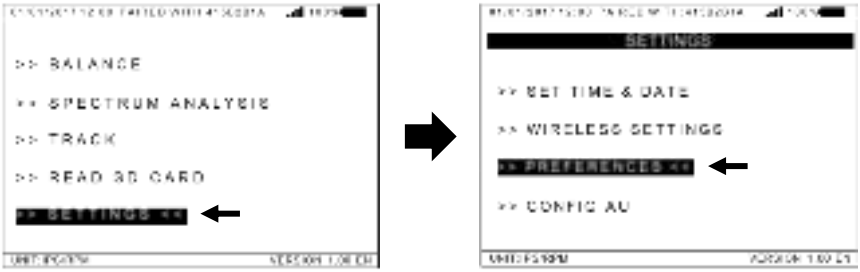
➢ Move the mass on the platform using the angular value measured on the chart. Use the protractor to facilitate the process

- **Repeat previous steps as many times as necessary in order to reach an acceptable vibration level on your platform**

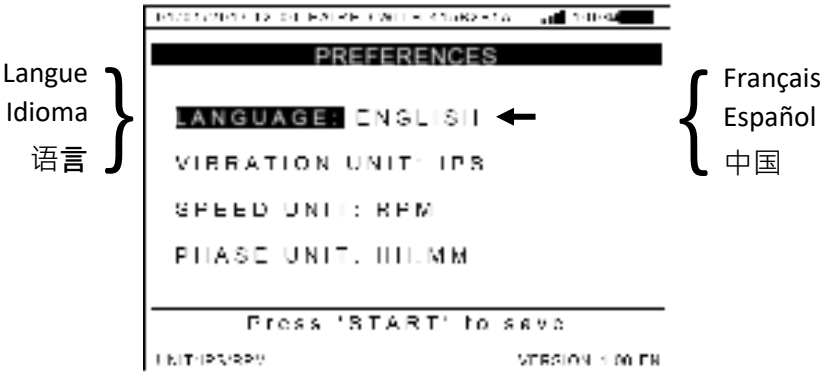


14. HOW TO CHANGE THE LANGUAGE (langue, idioma, 语言)

- **Turn on AIRVIB® DU**
- **Move the JOYSTICK DOWN ↓, select "SETTINGS" in the startup menu and press START to access the settings screen**
- **Move the JOYSTICK DOWN ↓, select "PREFERENCES" and press START to access the preferences screen**



- **Move the JOYSTICK RIGHT OR LEFT ↔ to select the desired language**



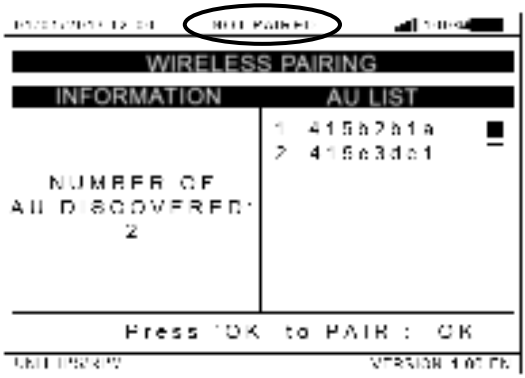
- **Press START to save the modifications or GOBACK to discard changes**
- **Press GOBACK to return to the settings menu**
- **Press GOBACK to return to the startup menu**

15. WIRELESS PAIRING

- **Turn on AIRVIB® DU**
- **Turn on the desired AIRVIB® AU(s) to be paired**
- **Move the JOYSTICK DOWN ↓, select "SETTINGS" in the startup menu and press START**
- **Move the JOYSTICK DOWN ↓, select "WIRELESS SETTINGS" and press START**
- **Press START to access the pairing settings "WIRELESS PAIRING"**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to select the desired modularity setting and press START**

➢ The modularity OFF is used to pair only one AIRVIB® AU to the AIRVIB® DU, the modularity ON allows connecting multiple AIRVIB® AU and to control them by a unique AIRVIB® DU

➢ The AIRVIB® DU automatically scans the nearby switched on AIRVIB® AU and displays their serial numbers



- **Move the JOYSTICK UP OR DOWN ↕ and press START to select the desired AIRVIB® AU(s) to pair**
- **Move the JOYSTICK DOWN ↓ to select "OK" on the bottom right of the screen**
- **Press START to launch the pairing process**

➢ If pairing is successful, the AIRVIB® DU will briefly show the message "Pairing done"

- **Press GOBACK to return to the settings screen**
- **Press GOBACK to return to the startup menu**

16. HOW TO CHANGE PREFERENCES AND CONFIGURATIONS

- **Turn on AIRVIB® DU**
- **Move the JOYSTICK DOWN ↓, select "SETTINGS" and press START to access the settings screen**

16.1. How to change DU measure units

- **Move the JOYSTICK DOWN ↓, select "PREFERENCES" and press START to access the preferences screen**

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired units**
- **Press START to save the modifications or GOBACK to discard changes**
- **Press GO BACK to return to the settings menu**

16.2. How to Change DU time and date

- **Move the JOYSTICK DOWN ↓, select "SET TIME & DATE" and press START to access the "set time & date" screen**

- **Move the JOYSTICK UP OR DOWN ↕ to select between time and date**
- **Press START to change the selected setting**
- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the correct time or date**
- **Press START to save the modifications or GOBACK to discard changes**
- **Press GO BACK to return to the settings menu**

16.3. How to Change AU accelerometer configuration

- **Turn on the AIRVIB® AU which is paired with the AIRVIB® DU**
- **Move the JOYSTICK DOWN ↓, select "CONFIG AU" and press START to download the AU configuration**

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired settings**

➢ This screen shows the AIRVIB® AU software version and battery level

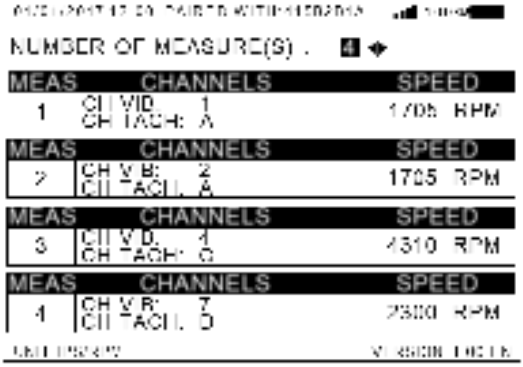
➢ The accelerometer sensitivity must match the sensitivity provided by the manufacturer

➢ The accelerometer polarity is the direction in which the acceleration produces a positive electrical signal at the output of the sensor (acceleration towards the base or the connector)

- **Press START to save the new configuration or GOBACK to discard changes**
- **Press GO BACK to return to the settings menu**
- **Press GO BACK to return to the startup menu**

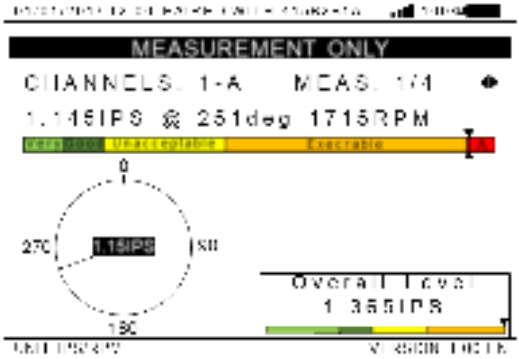
17. BALANCE MEASUREMENT AND DISPLAY

- **Install the photocell(s), accelerometer(s), and reflective tape(s) on the platform and install the antennas on the AIRVIB® systems**
- **Plug all the cables on the AIRVIB® AU**
- **Turn on both AIRVIB® AU and DU units**
- **Check on the top of the display that the AIRVIB® AU is well paired**
- **Press START to access balance mode "BALANCE" on the startup menu**
- **Press START to access "MEASUREMENT ONLY"**



- **Move the JOYSTICK RIGHT OR LEFT ↔ to select desired number of measure(s) from 1 to 4**
- **Move the JOYSTICK DOWN ↓ to change the measurement(s) channels**
- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the correct channels required for measurement(s)**
- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter(s) report speed(s) is correct**
- **When the speed is steady, press START to launch measurement(s)**

- **Wait up to the end of the acquisition**



- The measurement is displayed on top of the screen as text and as a cursor on the bargraph. The scale allows the vibration level to be quantified as follows: very good (< 0.1 IPS), good (< 0.2 IPS), unacceptable (< 0.5 IPS), execrable (< 1.0 IPS) and warning (≥ 1.0 IPS)

- The bottom left figure displays the phase position in a polar chart

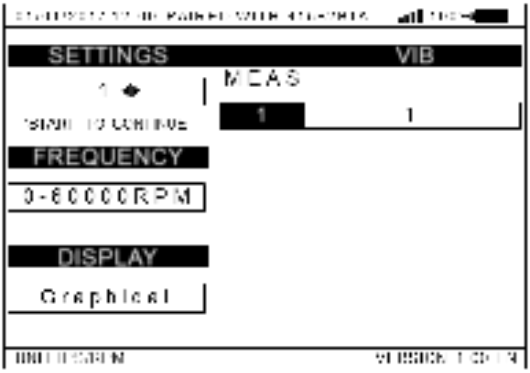
- The box at the bottom right is the overall vibration level of the platform measured in peak velocity. The colored scale allows the overall vibration level to be approximately quantified with a cursor

- Press SAVE button to save the measurement(s). For further explanations about how to save, please refer to the corresponding part of this guide (page 57)

- **Move the JOYSTICK RIGHT OR LEFT ↔ to show the desired measure number**
- **Press GOBACK to return to the balance menu**

18. SPECTRUM MEASUREMENT

- **Install the accelerometer(s) on the platform to balance and install the antennas on the AIRVIB® systems**
- **Plug all the cables on the AIRVIB® AU**
- **Turn on both AIRVIB® AU and DU units**
- **Check on the top of the display that the AIRVIB® AU is well paired**
- **Move the JOYSTICK DOWN ↓ and select the spectrum analysis mode "SPECTRUM ANALYSIS" on the startup menu**
- **Press START to access spectrum analysis mode**



- **Move the JOYSTICK RIGHT OR LEFT ↔ to select desired number of measure(s) from 1 to 8**
- **Move the JOYSTICK DOWN ↓ to select the frequency range of measure(s)**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to change the desired frequency range (4 selectable ranges)**

➢ Please note that a smaller range will increase the accuracy of the frequencies and the duration of the acquisition

- **Move the JOYSTICK DOWN ↓ to select the display mode**

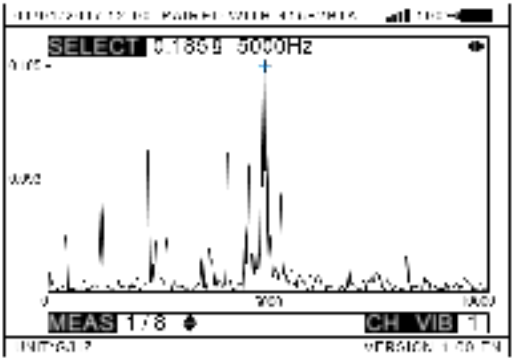
- **Move the JOYSTICK RIGHT OR LEFT ↔ to change the display mode (graphical or peak list)**
- **Press START then move the JOYSTICK DOWN ↓ to change the measurement(s) channel(s)**
- **Operate the platform to balance in the desired regime**
- **When the speed is steady, press START to launch measurement(s)**
- **Wait up to the end of the acquisition**

➢ Press SAVE button to save the measurement(s). For further explanations about how to save, please see the corresponding part of this guide (page 57)

➢ For additional information on graphical or peak list display, please refer to the corresponding section of this guide (pages 35 and 36)

19. SPECTRUM GRAPHICAL DISPLAY

- **Choose the graphical display mode in spectrum analysis and acquire at least one measurement**



- **Move the JOYSTICK UP OR DOWN ↕ to select the measurement number displayed**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to make the cursor appear and move it on the spectrum displayed**

➢ Amplitude and frequency of selected peak are displayed at the top of the graphic. The measure number and the channel currently selected are displayed at the bottom of the graphic

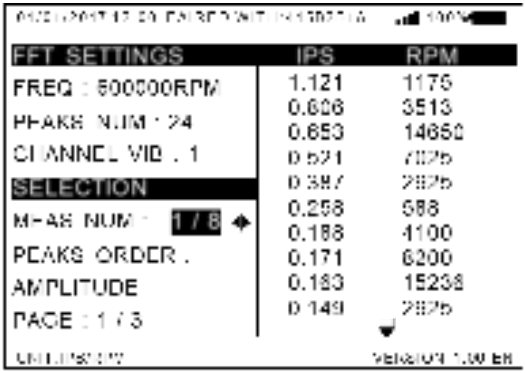
➢ Note that if the cursor is moved to one of the spectrum window extremities, it will automatically jump to the other side of the window

➢ The START button can be pressed simultaneously when moving the JOYSTICK to accelerate the movement of the graphic cursor

- **Press GOBACK to return to the spectrum menu**

20. SPECTRUM PEAK LIST DISPLAY

- **Choose the peak list mode in spectrum analysis and acquire at least one measurement**



- In the left part, the FFT SETTINGS window shows the frequency range of spectrum analysis, the number of detected peak(s), and the selected channel of current measurement

- **Move the JOYSTICK UP OR DOWN ↕ to switch between "MEAS NUM", "PEAKS ORDER" and "PAGE"**
- **To change the displayed measurement number, select "MEAS NUM" and move the JOYSTICK RIGHT OR LEFT ↔**
- **To change the displayed order of the peaks, select "PEAKS ORDER" and move the JOYSTICK RIGHT OR LEFT ↔ to change between "AMPLITUDE" (which sorts the peaks by amplitude in descending order), and "FREQUENCY" (which sorts the peaks by frequency in ascending order)**
- **To change the displayed peaks (12 displayed peaks per page max), select "PAGE" and move the JOYSTICK RIGHT OR LEFT ↔ from 1 to the highest page number**
- **Press GOBACK to return to the spectrum menu**

21. TRACK MEASUREMENT

- **Install the photocells with the track bracket 150°, align and place the reflective tape on the blades**
- **Plug all the cables on AIRVIB® AU**
- **Turn on both AIRVIB® AU and DU units**
- **Check on the top of the display that the AIRVIB® AU is well paired**
- **Move the JOYSTICK DOWN ↓ to select the track menu "TRACK" on the startup menu**
- **Press START to access track mode**

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the correct channels and parameters required for measurement**

➢ The tachymeter is a speed sensor that measures the rotation speed of the rotor

➢ The track 1 and track 2 sensors are the laser photocells mounted on the track bracket. Track 1 is the first photocell to have its laser beam cut by the blades, track 2 is the second one

- The tachymeter speed and the number of blades measured are shown on the bottom of the screen in real time

- The use of the track 2 sensor is optional: it is possible to attribute it to a disconnected channel. If the track 2 sensor is returning unexpected data, only the lead-lag measurement will be performed

- The blade radius and height are optional. If there are not filled, the track measurement will be performed in percentage instead of millimeters

- The blade radius is the distance in millimeters between the rotor axis of rotation and the end of the blade, or the rotor diameter divided by two

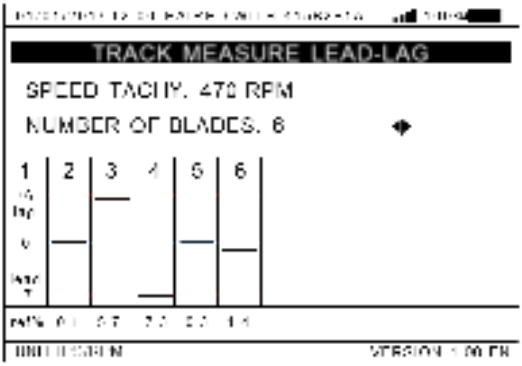
- The blade height is the distance in millimeters between the center of the track bracket and the blade's rotation plan

- **When the speed is steady, press START to launch measurement**
- **Wait up to the end of the acquisition**

- For further explanations on track measurement display, please refer to the corresponding part of this guide (page 39)

22. TRACK MEASUREMENT DISPLAY

- **Move the JOYSTICK RIGHT OR LEFT ↔ to switch between lead-lag and blade height measurement**



- The tachymeter speed and the number of blades detected during the measurement are displayed at the top of the screen

- The track measurement function uses the first detected blade as the reference blade. This reference blade is the first blade detected by the photocell track 1 after the tachymeter interrupter signal has been detected

- The lead-lag measurement screen shows percentage (or distance in millimeters) of the lead or the lag which has been measured on each blade (refer to chapter “Photocell track installation” for adjustment calculation page 21)

- The height measurement screen shows percentage (or distance in millimeters) of the height which has been measured on each blade (refer to chapter “Photocell track installation” for adjustment calculation page 21)

- The bar graph displays the percentage (or distance in millimeters) of blades shift in the vertical axis of the screen compared to the reference blade

- Press SAVE button to save the measurement. For further explanations about how to save, please refer to the corresponding part of this guide (page 57)

- **Press GOBACK to return to the track menu**

23. TUNING PROGRAM

- **Install the photocell(s), accelerometer(s), and reflective tape(s) on the platform to balance and install the antennas on the AIRVIB® systems**
- **Plug all the cables on AIRVIB® AU**
- **Turn on both AIRVIB® AU and DU units**
- **Check on the top of the display that the AIRVIB® AU is well paired**
- **Press START to access balance mode "BALANCE" on the startup menu**
- **Move the JOYSTICK DOWN ↓, select "TUNING PROGRAM" and press START to access the tuning program screen**
- **Move the JOYSTICK UP OR DOWN ↕ to select the desired option between "KNOWN ENGINE SENSITIVITY" and "UNKNOWN ENGINE SENSITIVITY"**

➢ The platform sensitivity is the quantity of mass to move the vibratory vector arrow of one vibration unit (IPS or g) (for example: X grams for 1 IPS)

➢ A rough sensitivity can be set in the menu and will be adjusted by the autocorrection factor. In this case the user has to carefully respect the mass limitation of the platform

➢ Multiple sensitivities can be set during the balancing process in order to adapt to the peculiarities of the platform to be balanced

! Please note that if more than one sensitivity is used, the sensitivities must be precisely defined to avoid adjustment discrepancies during the balancing process

- If the user does not know the platform sensitivity, the “UNKNOWN ENGINE SENSITIVITY” menu can help define the accurate sensitivity by performing an adjustment trial (see chapter “Tuning program – unknown sensitivity” page 47)

- If the sensitivities are known from a previous balancing session, the user should manually enter them to decrease the number of runs required for the balancing process

- **Press START to access “KNOWN ENGINE SENSITIVITY”**

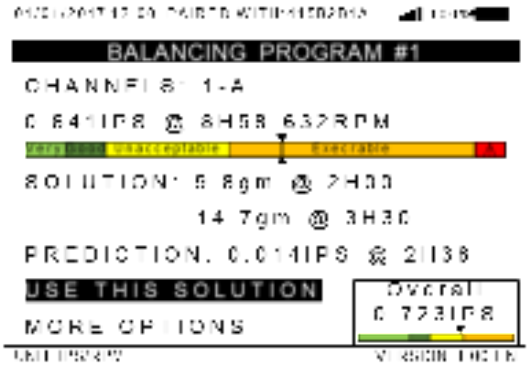
- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired channels and settings for measurement**

- A long press on the joystick scrolls faster the selection

- The angle factor compensates the propagation timing of the vibratory wave and the inaccurate position of the vibratory sensor. If the vibration sensor is located far away from the origin of the vibration, the correction angle might be important

! At this stage, it is recommended to remove all the non-permanent masses previously used in order to restart the balancing process

- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter report speed is correct**
- **When the speed is steady, press START to launch measurement**
- **Wait up to the end of the acquisition**



- The measurement is displayed as text and as a cursor on the bargraph. The scale allows the vibration level to be quantified as follows: very good (< 0.1 IPS), good (< 0.2 IPS), unacceptable (< 0.5 IPS), execrable (< 1.0 IPS) and warning (≥ 1.0 IPS)

- After the first run, a second cursor [▲] is visible on the bargraph that display the previous measurement, and a double arrow at the extremity of the bargraph shows the balancing trend (decreasing [◄◄] or increasing [►►] vibration level between run)

- The solution consists in positioning a mass at a given angular position. The prediction is the estimated measurement for the next run if the solution is implemented as is

- The box at the bottom right is the overall vibration level of the platform measured in peak velocity. The colored scale allows the overall vibration level to be approximately quantified with a cursor.

- At this screen, press SAVE button to save the measurement(s). For further explanations about how to save, please refer to the corresponding part of this guide (page 57)

- **Move the JOYSTICK UP OR DOWN ↕ to select the desired option between "USE THIS SOLUTION" and "MORE OPTIONS"**

- If the solution has been implemented on the system without modification, select "USE THIS SOLUTION" to perform the next measurement

- If the solution is unusable because of an unsuitable physical mass or position, select "MORE OPTIONS" (please refer to the corresponding part of this guide page 50)

- To display the balance history, to display various information or to exit the balancing program, select "MORE OPTIONS" (please refer to the corresponding part of this guide page 55)

- The current measurement can be erased (in order to redo the acquisition) by pressing GO BACK

- **Press START to access "USE THIS SOLUTION"**

! Before acquiring the next measurement, the solution must be installed according to the one displayed by the AIRVIB®. Failure to do so will degrade the next solution and may prevent optimal balancing process

- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter report speed is correct**
- **When the speed is steady, press START to launch measurement**

! The speed has to be within ±5% between all the measurement during the balancing process to ensure a steady speed between runs

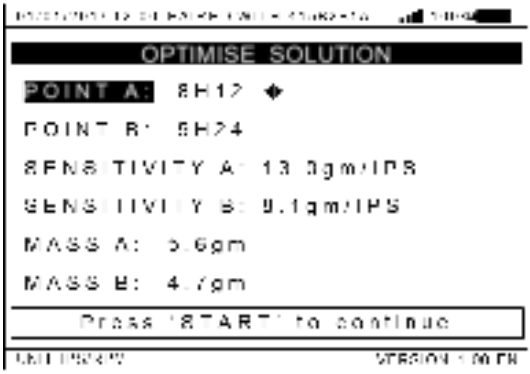
- **Wait up to the end of the acquisition**

➢ At this stage, the program should calculate a new correction factor for the amplitude and the phase unless an error occurs

➢ The rest of the tuning program is an iteration of the previous steps repeated for each run number

- **To exit the tuning program, move the JOYSTICK UP OR DOWN ↕ to select "MORE OPTIONS" and press START**
- **Move the JOYSTICK UP OR DOWN ↕ to select "END TUNING PROGRAM" and press START**

➢ The optimize solution menu can appear if a mass reduction with the same vibratory level is possible compared to the current mass installed on the platform



- The user can choose the position and the sensitivity of the two points where the masses can be added. This interface is similar to the split menu (please refer to the corresponding part of this guide page 50).

- To exit this menu, press START

- **Press START to finish the tuning program**

! All data will be deleted by pressing START. However, press GO BACK to cancel the action

24. TUNING PROGRAM – UNKNOWN SENSITIVITY

- **After the selection of "UNKNOWN ENGINE SENSITIVITY" (see chapter "Tuning program" page 41), move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired channels**

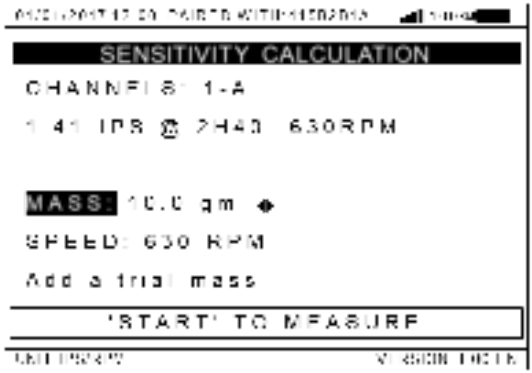
! At this stage, it is recommended to remove all the non-permanent masses previously used in order to restart the process

- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter report speed is correct**
- **When the speed is steady, press START to launch measurement**
- **Wait up to the end of the acquisition**

➢ The measurement is shown on the screen

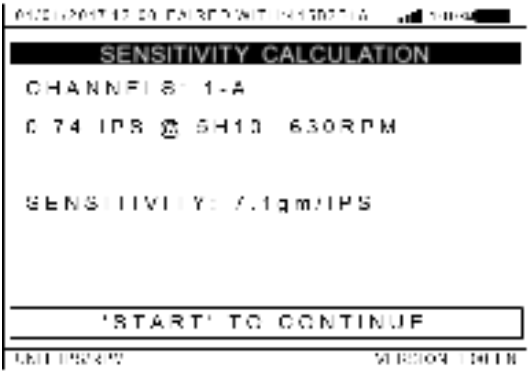
- **Add a trial mass on the platform. The mass should be added at the opposite angular position of the measured balancing phase**

- **Move the JOYSTICK RIGHT OR LEFT ↔ to select the mass added to the platform**



➢ A long press on the joystick scrolls faster the selection

- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter report speed is correct**
- **When the speed is steady, press START to launch measurement**
- **Wait up to the end of the acquisition**



- The measurement collected is shown at the top of the screen

- The calculated sensitivity is shown in the middle of the screen

- **If multiple sensitivities have to be calculated, skip to the next subchapter**

- **Press START to continue. The "KNOWN ENGINE SENSITIVITY" interface will launch with the prefilled sensitivity previously calculated. Refer to the corresponding part of this guide (page 41)**

24.1. Calculate multiple sensitivities

- This subchapter is the continuation of the steps described in the chapter above

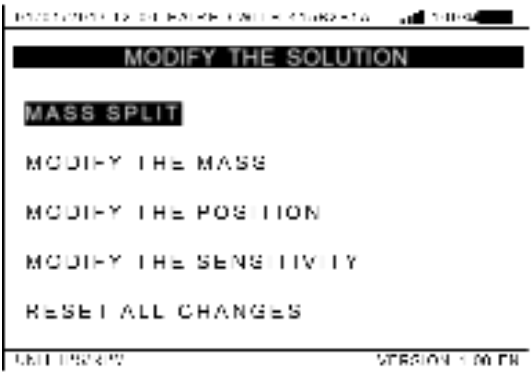
- **Note the current calculated sensitivity and press GO BACK**
- **Remove the previously used mass and add a trial mass at the desired location**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to select the mass added to the platform**
- **Operate the platform to balance in the desired regime**
- **Check that the tachymeter report speed is correct**
- **When the speed is steady, press START to launch measurement**
- **Wait up to the end of the acquisition**

- The new calculated sensitivity is shown in the middle of the screen

- **Redo this process as long as you have sensitivities to calculate**

25. TUNING PROGRAM – MODIFY THE SOLUTION

- **After the selection of "MORE OPTIONS" (see chapter "Tuning program" page 41), press START to select "MODIFY THE SOLUTION"**
- **Move the JOYSTICK UP OR DOWN ↕ to select the desired menu**



- The "MASS SPLIT" menu is used to split the solution into 2 points when the position of the calculated solution does not exist physically on the platform

- The "MODIFY THE MASS" menu is used to modify the mass added to the platform since it is impossible to add exactly the mass required by the program. If the mass modification required is significant, it is better to use the "MASS SPLIT" menu

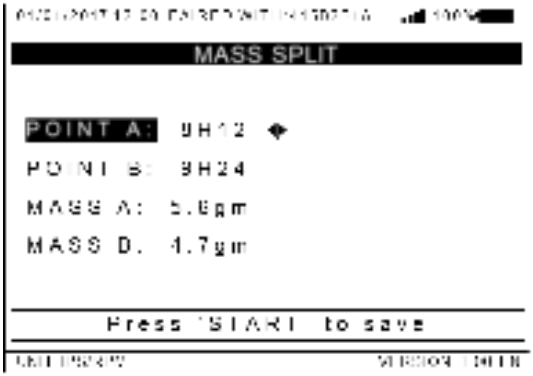
- The "MODIFY THE POSITION" menu is used when the position of the solution is slightly different from the one used on the platform to add the mass. If the position modification required is significant, it is better to use the "MASS SPLIT" menu

- The "MODIFY THE SENSITIVITY" menu is used when the sensitivity of the current solution position is different or when two sensitivities are needed
- The "RESET ALL CHANGES" menu is used to reset the solution to its initial value when the modifications made are not suitable

- **Press START to open the desired menu**

25.1. "MASS SPLIT" menu

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired position for the split**



- A long press on the joystick scrolls faster the selection

- The optimal masses are calculated and displayed in real time for the entered positions

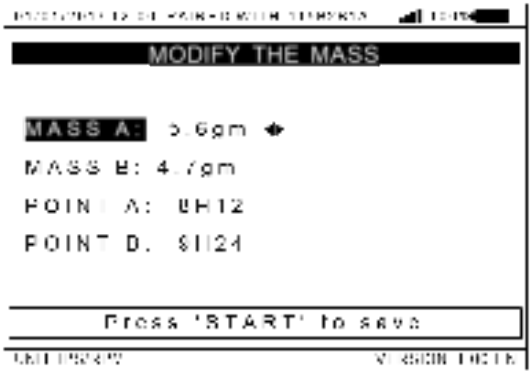
! It is recommended to choose two positions from either side of the initial solution for an optimal result

- **Press START to save the modification, or GOBACK to quit without saving**

- **Press GOBACK to return to the main tuning menu. Solution and prediction are now updated.**

25.2. <u>"MODIFY THE MASS" menu</u>

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired mass at the given position**



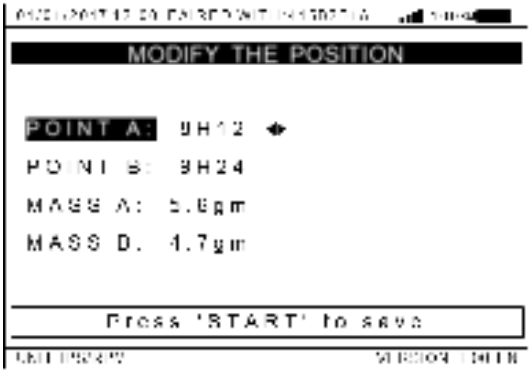
➢ A long press on the joystick scrolls faster the selection

! It is recommended to choose a mass close to the original solution for an optimal result

- **Press START to save the modification, or GOBACK to quit without saving**
- **Press GOBACK to return to the main tuning menu. Solution and prediction are now updated**

25.3. "MODIFY THE POSITION" menu

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired position for the given mass**



➢ A long press on the joystick scrolls faster the selection

! It is recommended to choose a position close to the original solution for an optimal result

- **Press START to save the modification, or GOBACK to quit without saving**
- **Press GOBACK to return to the main tuning menu. Solution and prediction are now updated**

25.4. "MODIFY THE SENSITIVITY" menu

- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired sensitivity at the given position**

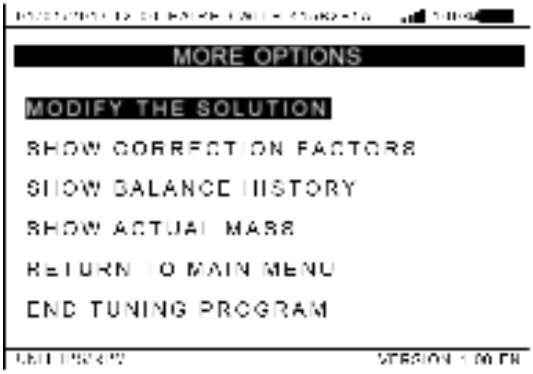
➢ A long press on the joystick scrolls faster the selection

! Sensitivity should only be changed when needed. An incorrect sensitivity modification could result in the impossibility to balance the platform

- **Press START to save the modification, or GOBACK to quit without saving**
- **Press GOBACK to return to the main tuning menu. Solution and prediction are now updated**

26. TUNING PROGRAM – MORE OPTIONS

- **After the selection of "MORE OPTIONS" (see chapter "Tuning program" page 41), move the JOYSTICK UP OR DOWN ↕ to select the desired menu**



- The "SHOW CORRECTION FACTORS" menu is used to display the correction factors calculated at the current run number and their effects on sensitivities

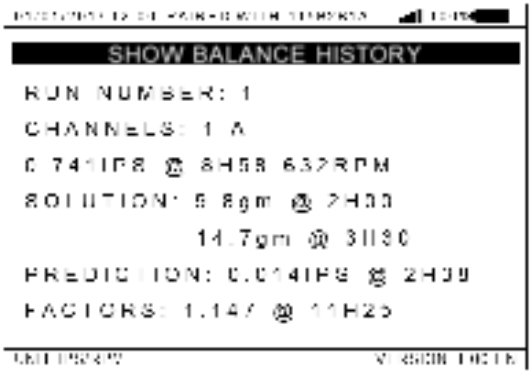
- The "SHOW BALANCE HISTORY" menu is used to display the balance history of the current tuning session

- The "SHOW ACTUAL MASS" menu is used to display the mass currently added to the platform. Removed mass from previous runs will not appear on this screen

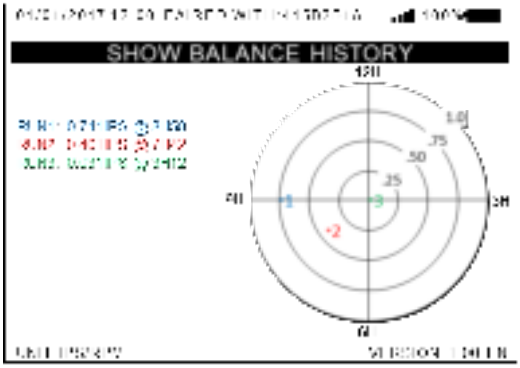
- The "RETURN TO MAIN MENU" function is used to return to the main menu without losing the current measurements and adjustments. To retrieve current work after cancellation, return to the tuning program menu

- The "END TUNING PROGRAM" function is used to terminate the tuning program and to return to the balance menu

26.1. "SHOW BALANCE HISTORY" menu



- **Move the JOYSTICK RIGHT OR LEFT ↔ to choose between the run numbers**
- **Press START to switch to the polar chart and press START again to return to the first view**



- **Press GOBACK to quit the menu**

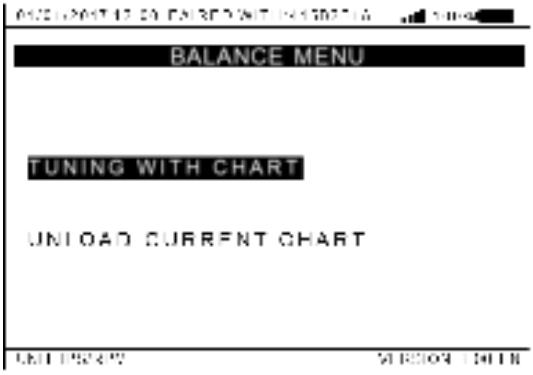
27. TUNING PROGRAM – USE A CHART

- **Open the chart file from the SD card (see chapter "How to read a file from SD card" page 60), the screen will display "CHART LOADED". Press GOBACK to return to the startup menu**

➢ The chart allows the AIRVIB® system to know the specific information needed to balance the platform (regime speed, name, position and sensitivity of balance points, correction factors, etc.)

! Opening a chart file will delete all data from the current tuning program / chart used

- **On the startup menu, press START to access balance mode "BALANCE"**
- **Move the JOYSTICK DOWN ↓, select "TUNING PROGRAM" and press START to access the tuning program screen**



- **Press START to access the tuning with chart menu**

➢ At this stage, the tuning program works identically to the program without a chart (see chapter "Tuning program" page 41)

- The program will automatically propose the best solution according to the available adjustment points on the platform and will call them by their names

- It is not possible for the user to change the corrections factors or the sensitivity when a chart is in use

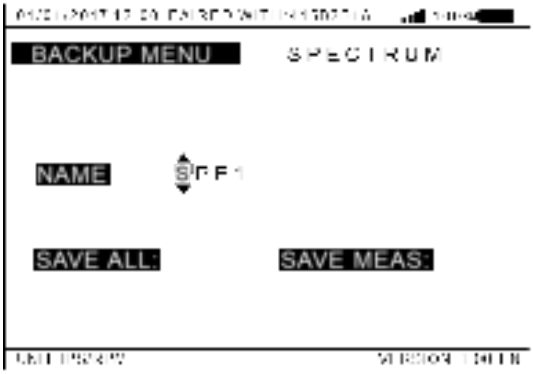
- If the AIRVIB® DU is turned off, the chart will be unloaded automatically

- **To unload the chart and use the generic tuning program, move the JOYSTICK DOWN ↓, select "UNLOAD CURRENT CHART" and press START**

! Unloading the chart will delete all data from the current tuning program / chart used

28. HOW TO SAVE MEASUREMENT ON SD CARD

- **Acquire one or more measurement(s)**
- **Insert the SD card in the left side of the AIRVIB® DU**
- **Press SAVE**



- **Name the file (with 8 alphanumeric characters maximum)**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to select the character, JOYSTICK UP OR DOWN ↕ to change the character**
- **When the filename is entered, press START or move the JOYSTICK RIGHT → to validate the entry**
- **Move the JOYSTICK RIGHT OR LEFT ↔ to select "SAVE ALL" and save all the measure(s) or "SAVE MEAS" to save the selected measure**
- **If "SAVE MEAS" is selected, move the JOYSTICK UP OR DOWN ↕ to select the desired measurement number**
- **Press START to save the measurement(s) and return to the measurement window**
- **Press GOBACK in the save menu to cancel without saving**

29. HOW TO READ A FILE FROM SD CARD

- **Insert the SD card in the left side of the AIRVIB® DU**
- **On the startup menu, move the JOYSTICK DOWN ↓ to select the read SD card menu "READ SD CARD"**
- **Press START to access the read SD card menu**

- All the files are listed in the select file menu and are sorted by date
- If the menu shows "NO SD", either the SD card slot is empty or the SD card file system is incompatible: try to format the SD card in FAT32 with your computer
- If no file is displayed, the SD card is empty
- If the filename includes a tilde (~), the filename has more than 8 characters
- If neither date nor time is displayed on the file, it is an invalid measurement file which will display an error message if opened

- **Move the JOYSTICK UP OR DOWN ↕ to select the desired file or switch between pages**
- **Press START to access the selected file**

➢ The file information is displayed in that order (from top to bottom): the filename, the file type (balance, spectrum, track or tuning), the measure date and time, the AU serial number, the DU serial number and the number of measure(s) in the file

➢ If one of the fields is filled with hashtag (#), the file is incompatible or corrupted

- **Move the JOYSTICK RIGHT OR LEFT ↔ to switch between "ERASE FILE" and "OPEN FILE"**
- **To open the file, select "OPEN FILE" and press START**

➢ For further explanations on measurement display, please refer to the corresponding parts of this guide

- **To delete the file, select "ERASE FILE" and press START**
- **Press GOBACK if you do not want to open or delete the file**
- **Press GOBACK to return to the startup menu**

30. WIRELESS ADVANCED SETTINGS

- **Turn on both AIRVIB® AU and DU units**
- **Check on the top of the display that the AIRVIB® AU is well paired**
- **Move the JOYSTICK DOWN ↓, select "SETTINGS" in the startup menu and press START**
- **Move the JOYSTICK DOWN ↓, select "WIRELESS SETTINGS" and press START**
- **Move the JOYSTICK DOWN ↓, select "ADVANCED SETTINGS" and press START**

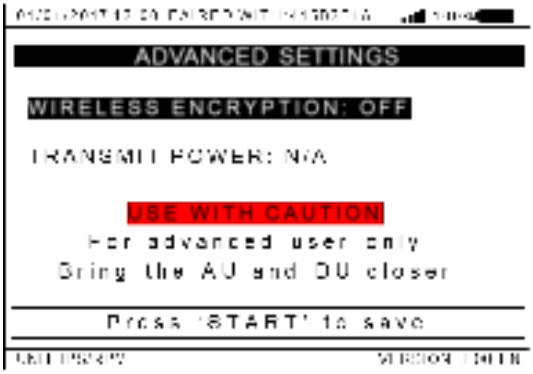
! Incorrect manipulation of this menu could permanently block the system. After encryption is enabled, only the DU encrypted with the AU can disable it. If a problem occurs, the system will have to be returned for reinitialization

! The increase of the transmit power above 20 dBm can reduce the life expectancy and reliability of the system and increase the likelihood of interferences to other appliances and systems nearby

! Before any further actions, bring the AU and DU together in order to have a strong wireless signal. A signal loss during the configuration process could lead to an unusable system

- **Press START to discard the warning message and continue**

➢ The transmit power parameter is only available on the 900MHz 1W AIRVIB® model. An increase of the transmit power will increase the wireless range but also the electrical consumption of the system, thereby reducing battery life



- **Move the JOYSTICK RIGHT OR LEFT ↔ and UP OR DOWN ↕ to select the desired parameters**

➢ The encryption parameter allows both enabling and disabling wireless encryption. If it is set to “ON”, the system will generate a random 256 bits AES key to encrypt the wireless data between the paired AU and DU

➢ For security reason, it is preferable to enable encryption in a close environment in order to prevent the encryption key from being intercepted when the key is exchanged between the AU and DU

➢ It is possible to return to this menu and press START when the encryption parameter is “ON” in order to generate a new key. This will increase security on long term if a new encryption key is generated regularly

- **Press START to save the new configuration or GOBACK to discard changes**
- **Press GOBACK to return to the wireless menu**
- **Press GOBACK to return to the settings menu**
- **Press GOBACK to return to the startup menu**

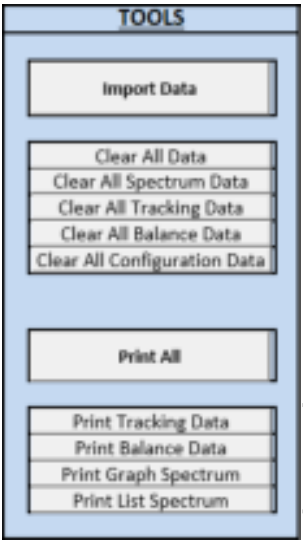
31. DATA PROCESSING ON COMPUTER

An Excel file “Airvib Data Formatting File” have been created to import AIRVIB® data and easily generate pdf reports on the computer.

This file is decomposed in three parts, from left to right:

1. **Configuration Data**
   This part has to be filled by the user. It has different fields showing on the generated report like the company name, the date, the position of the sensors, the weight configuration on the rotor/propeller, etc.
2. **Measurement information**
   This part shows a summary of the measurement(s) and is automatically filled when data are imported
3. **Tools**
   This part is used to import data, clear the file and generate pdf reports. It is also useful to rapidly convert measurement units

Here are the main functionalities of the tool box:



Used to import measurement data from the SD card (balance, spectrum and track)

Used to clear the Excel file and reset the report (all data or only specific set of data)

Used to generate a full pdf report

Used to generate a specific pdf report with only the desired measurement data

32. TROUBLESHOOTING

This chapter references the main problems encountered when using the equipment. Probable causes are ranked in descending order of probability next to the associated corrective action.

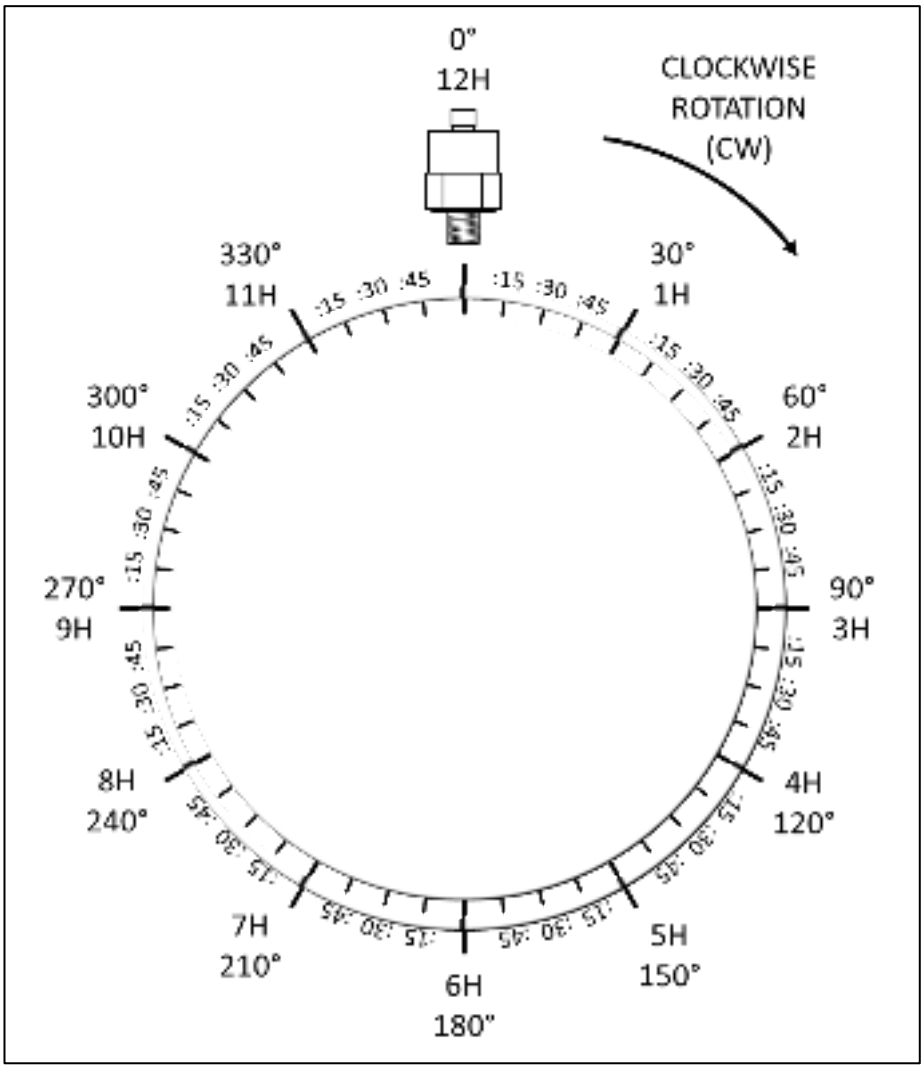
Possible cause	Corrective action
Problem: AIRVIB® AU / DU not turning on or turning off unexpectedly	
Battery power is low	Charge the battery
Unit too hot or too cold / excessive humidity	Remove the unit from harsh environment
DU display / AU indicator leds are not bright enough	Protect the unit from the sun for better visibility
Batteries installed incorrectly or defective	Check the batteries or return the unit for repair
Default on the USB bus	Disconnect the USB cable from the unit. Check USB connector and cable for damage
12V power short-circuited (AU only)	Disconnect tachy cables and try again. Check tachy cable and connectors for damage
Unit damaged	Check for visible damage or return for repair
Problem: no wireless communication or intermittent disconnection between AU & DU	
Units not properly paired	Perform the pairing of the units. It's recommended turning off nearby unused AIRVIB® units first
Loss of wireless signal / wireless signal too weak	Check the correct connection of the antennas and make sure there is no damage on antennas connectors
	Check for obstacles on the path. Use deported antenna if needed
Units too far apart	Bring units closer to each other
Wireless interferences	Try to disconnect various unused equipment nearby (including AIRVIB®) / move away from interference sources.

AIRVIB® AU not correctly initialized	In this case, the three "BAT" LEDs are off even if the battery is fully charged. Try to restart the AU by turning it off and on again
Problem: battery not charging (charge indicator staying off / battery level not increasing)	
Unit batteries too hot or too cold	Remove the unit from heat or cold and try again after approximately 15 minutes
Defective USB cable or charger	Check for visible damage on connectors, cable and charger. Try to replace the parts for testing
Default on the USB bus	Disconnect USB cable from the unit and try again. Check USB connector for damage
Batteries installed incorrectly or defective	Check the batteries or return the unit for repair
Problem: no vibration signal (balance & spectrum measurement)	
Wrong channel selected	Check the selected channel
Bad sensor configuration	Check the sensor configuration on the unit
Sensor incorrectly positioned / very low vibration level	Change the sensor location. Check the vibratory level of the platform
Damaged cable or connector	Check for visible damage or return for repair. Try another cable / vibration channel for testing
Sensor failure	Check the sensor if possible or return for inspection. Try another sensor for testing
Problem: no tachymeter signal (balance menu & measurement)	
Wrong channel selected	Check the selected channel
Retroreflective target too small, missing or misaligned	Check the photocell and target installation
Photocell gain incorrectly set	Try to change the gain of the photocell
RPM out of range	The incoming RPM is below or above the unit specifications

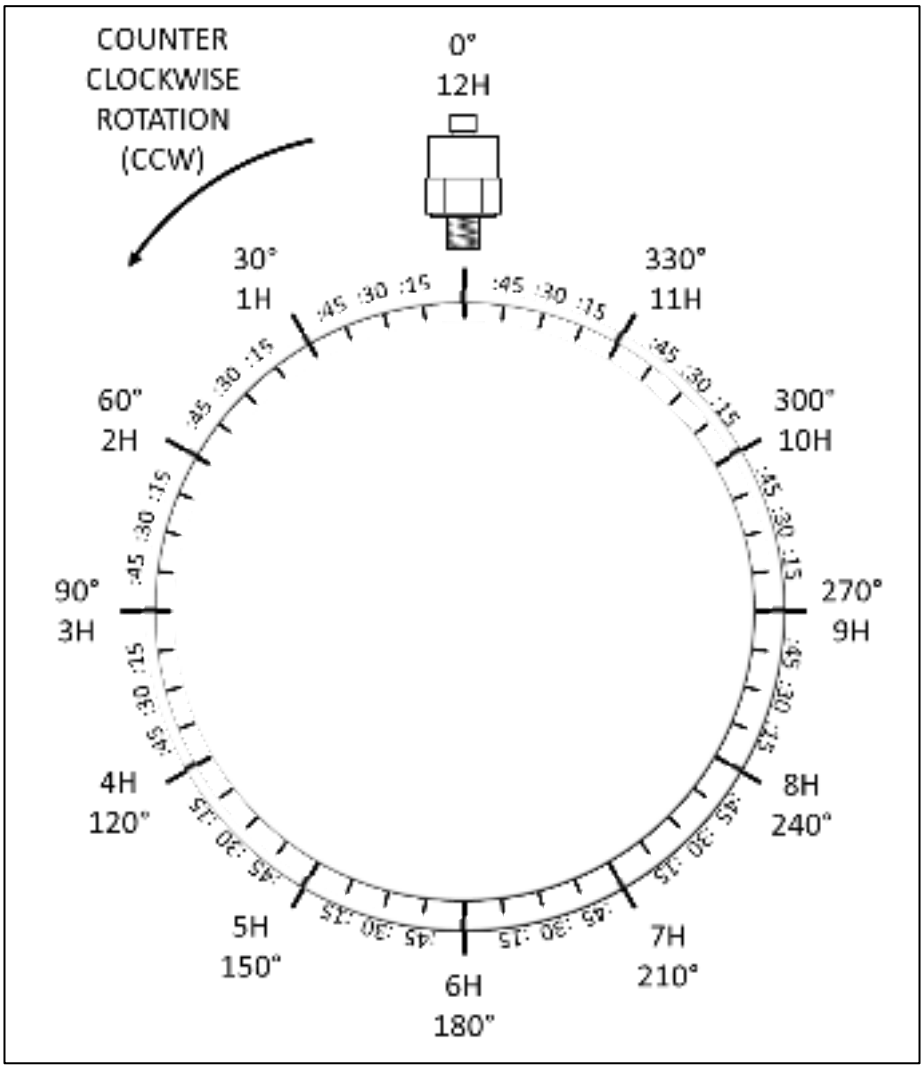
Damaged cable or connector	Check for visible damage or return for repair. Try another cable / tachy channel for testing
Sensor failure	Check the sensor if possible or return for inspection. Try another sensor for testing
Problem: tachymeter speed or number of blades reading erratic	
Retroreflective target too small, missing or misaligned	Check the photocell and target installation
Photocell gain incorrectly set	Try to change the gain of the photocell
Photocell incorrectly positioned / mounted	Make sure that the vibrations do not move the photocell and make it miss the target
Unwanted reflections of the photocell beam	Reduce the photocell gain, mask any reflective part that the photocell beam may encounter or change the target position
Excessive speed of the target	Change the target position or increase the target size
Misplaced juxtaposed targets	Always use as few targets as possible. Make sure that multiple targets are perfectly bonded together to avoid empty spaces or excess thickness
Electromagnetic disturbance from the environment	Route the AIRVIB® cables and accessories away from existing cables or electrical components on the platform. Always use the isolated mounting base for accelerometer if unsure. Try to disconnect each cable one by one from the AU to find the disturbed cable or sensor. It is possible to mask the photocell beam with adhesive tape: if the tachymeter speed measured is not equal to zero when the platform is working, then the electromagnetic disturbance is confirmed
Problem: tachymeter speed or number of blades reading consistent but not as expected	

The number of targets used is too important (tachymeter speed or number of blades reading is too high)	Use only one target for tachymeter readings (one measure per revolution) and only one target per blade for track measurement. Check undesired reflection of the photocell beam (see problem above)
One or more targets are missing or misaligned on the blade(s) (number of measured blades is too small)	Check the target installation on each blade for the track measurement. Try to increase the gain of the photocell
Problem: vibratory measurement inconsistent or unexpected	
Sensor or bracket incorrectly mounted	Check that the sensor and its bracket are well screwed and securely attached
Bad sensor configuration or direction	Check the sensor configuration on the unit and its direction on the bracket
Wing gust or platform speed regime change during acquisition	Perform several acquisitions to validate the measurement. Try to avoid wind and regime changes during acquisition as much as possible
Electromagnetic disturbance from the environment	Install the AIRVIB® cables and accessories away from existing cables or electrical components on the platform. Always use the isolated mounting base for accelerometer if unsure. Try to disconnect each cable one by one from the AU to find the disturbed cable or sensor
Vibration signal clipped (reported by the DU)	Probably caused by an electromagnetic disturbance, see above. If not, the vibration levels are too high for the sensor. Try to reduce the vibrations levels or change the sensor position
Low platform vibration level / low vibration signal	Unstable vibration readings can occur at low vibration level. Try to perform several acquisitions to validate the measurement or change the sensor position

ANNEX 1: CLOCKWISE PROTRACTOR



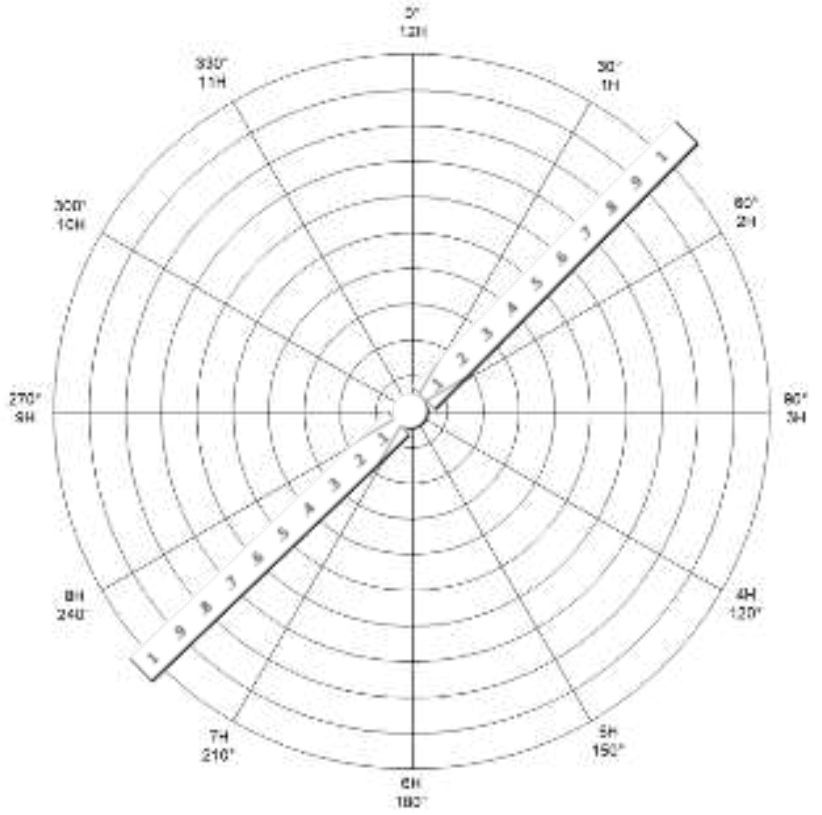
ANNEX 2: COUNTER CLOCKWISE PROTRACTOR



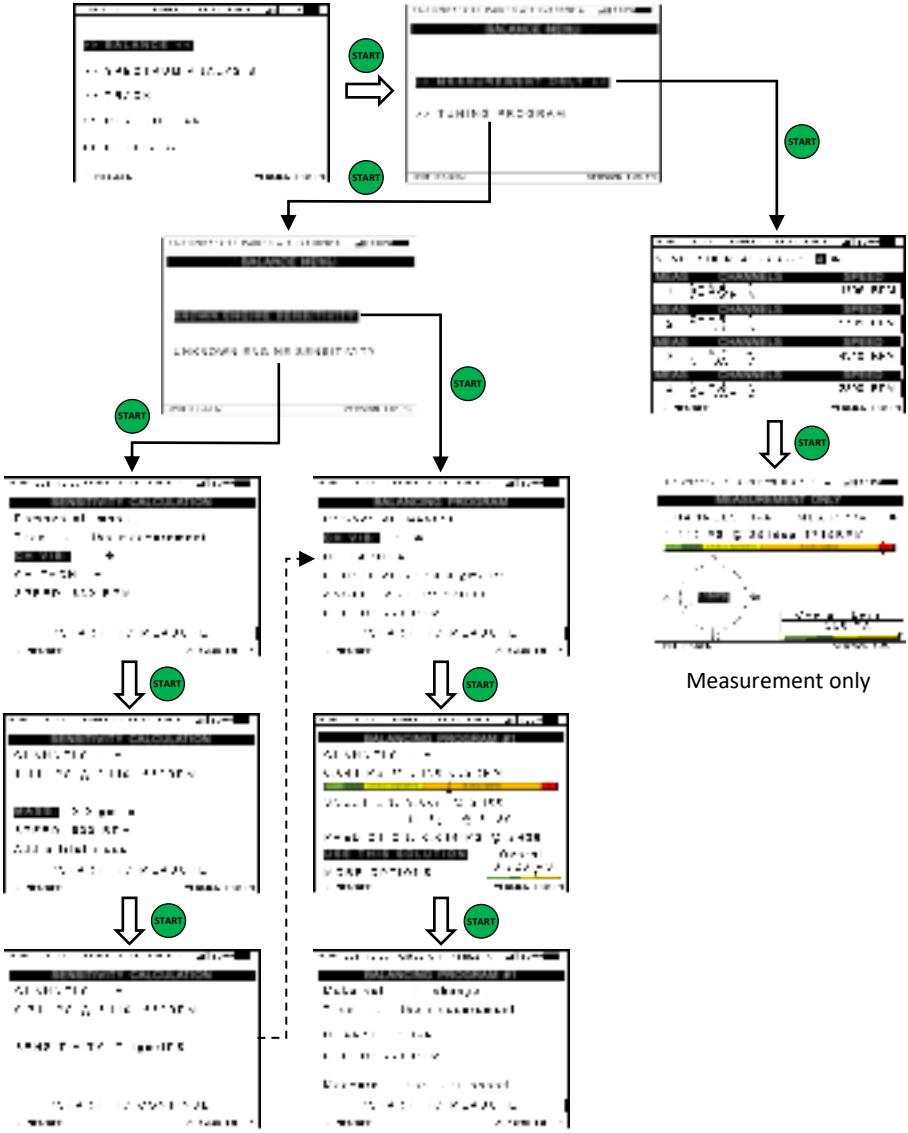
ANNEX 3: UNIVERSAL PAPER CHART

UNIVERSAL CHART

		1st rotation	*2nd rotation*	*3rd rotation*	*4th rotation*	*5th rotation*
READ	*Peak*					
	Phase					
CORRECTIONS						



ANNEX 4: BALANCE MEASUREMENT FLOWCHART



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