Tonewinder V 1.1

The Ultimate CNC Winder

Operating Manual

Revision 1.0 • June 2023

Original Operating Manual

The hardware descriptions in this manual revision refer to devices **Tonewinder V 1.1** .

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Contacting Us

There are several ways to contact us:

Ordering Information

For ordering information or sales support for **Tonewinder OE** products, contact your local **Tonewinder OE** sales organization. For contact information, go to Contact Us on http://www.Tonewinder.es.

Technical Assistance

For technical support for **Tonewinder OE** products, contact your local **Tonewinder OE** support organization. For contact information, go to Contact Us on http://www.Tonewinder.es.

Contents

1 Using this Manual

This chapter provides information about this manual, the conventions used throughout the manual, and the reference documentation that is available in addition to this manual.

1.1 About this Manual

This manual describes the functional features and operating principle of your **Tonewinder®** ***V 1.1 "The ultimate CNC winder"*** and provides instructions for installation, set up, start up, shut down, operation, maintenance and troubleshooting.

The layout of this manual is designed to provide quick reference to the sections of interest to the user. To obtain a full understanding of your device, read this manual thoroughly.

This manual also contains safety messages, precautionary statements, and special notices that can prevent personal injury, damage to the device, or loss of data when followed properly.

Note the following:

- The **Tonewinder®** configuration may vary; therefore, not all descriptions necessarily apply to your particular device.
- If some detail applies to only one model or variant, the model or variant is identified by name.
- Illustrations in this manual are provided for basic understanding. They can vary from the actual model of the device or component. However, this does not influence the descriptions. No claims can be derived from the illustrations in this manual.

1.2 Conventions

This section describes the conventions that are used throughout this manual.

1.2.1 Safety Messages

The safety messages and precautionary statements in this manual appear as follows:

- Safety messages or precautionary statements that apply to the entire manual and all procedures in this manual are grouped in the Safety chapter.

- Safety messages or precautionary statements that apply to an entire section or to multiple procedures in a section appear at the beginning of the section to which they apply.
- Safety messages that apply to only a particular section or procedure appear in the section or procedure to which they apply. They appear different from the main flow of text.

Safety messages are often preceded by an alert symbol and/or alert word. The alert word appears in uppercase letters and in bold type.

Make sure that you understand and follow all safety messages presented in this manual.

1.2.2 Special Notices and Informational Notes

Special notices and informational notes in this manual appear different from the main flow of text. They appear in boxes and a note label identifies them. The label text appears in uppercase letters and in bold type.

NOTICE Highlights information necessary to prevent damage to the device or invalid test results.

TIP Highlights information of general interest or helpful information that can make a task easier or optimize the performance of the device.

1.2.3 Typographical Conventions

These typographical conventions apply to the descriptions in this manual:

Data Input and Output

- The following appears in **bold** type:
  - Input that you enter by the keyboard or that you select with the mouse
  - Buttons that you click on the screen
  - Commands that you enter by the keyboard
  - Names of, for example, dialog boxes, properties, and parameters
- For brevity, long expressions and paths appear in the condensed form, for example: Click **START > MAIN MENU > NEW BOBBIN**

References and Messages

- References to additional documentation appear *italicized*.
- Messages that appear on the screen are identified by quotation marks.

Viewpoint

If not otherwise stated, the expressions *left* and *right* in this manual always refer to the viewpoint of a person that is facing the device from the front.

Particularly Important Words

Particularly important words in the main flow of text appear I **bold** or *italicized*.

Electronic Manual Version (PDF)

The electronic version (PDF) of the manual contains numerous links that you can click to go to other locations within the manual. These include:

- Table of contents entries
- Index entries
- Cross-references (in orange text), for example, to sections and figures

2 Safety

This chapter provides general and specific safety information and informs about the intended use of the device.

2.1 Safety Symbols and Signal Words

2.1.1 Safety Symbols and Signal Words in This Manual

This manual contains safety messages to prevent injury of the persons using the device. The safety symbols and signal words in this manual include the following:

Always be aware of the safety information. Do not proceed until you have fully understood the information and consider the consequences of what you are doing.

CAUTION Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

WARNING Indicates a hazardous situation that, if not avoided, could result in serious injury.

2.1.2 Observing this Manual

Observe the following:

- Before installing or operating the device, read this manual carefully to be familiar with the winder and this manual. The manual contains important information with regard to user safety as well as use and care of the device.
- Always keep the manual near the device for quick reference.
- Save this manual and pass it on to any subsequent user.

Read, understand, and comply with all safety messages and precautionary statements presented in this manual.

2.1.3 Safety Symbols on the Device

The table lists the safety symbols that can appear on the device or on labels affixed to the device. Follow the safety notices in this manual to prevent the risk of operator injury or damage to the device.

Symbol	Description
	Indicates a potential hazard. Refer to this manual to avoid the risk of personal injury and/or to prevent damage to the device.
O —	Power supply is off Power supply is on
~	Indicates alternating current.
	Indicates a terminal for protective grounding.
	Indicates a terminal for functional grounding

2.2 Intended Use

The device is designed for use in the manufacture of musical instrument pickup coils.

The device is for use by qualified personnel only.

2.3 Safety Precautions

2.3.1 General Safety Information

All users must observe the general safety information presented in this section and all specific safety messages and precautionary statements elsewhere in this manual during all phases of installation, operation, troubleshooting, maintenance, shutdown, and transport of the device.

If the device is used in a manner not specified by **Tonewinder OE**, the protection provided by the device could be impaired. Observe the following:

- Operate the device only within its technical specifications.
- Use only the replacement parts and additional components, options, and peripherals specifically authorized and qualified for the device by **Tonewinder OE**.
- Perform only the procedures that are described in this operating manual and in supporting documents for the device. Follow all instructions step by step and use the tools recommended for the procedure.
- Open the enclosure of the device and other components only if specifically instructed to do so in this manual.
- **Tonewinder OE** cannot be held liable for any damage, material or otherwise, resulting from inappropriate or improper use of the device. If there is any question regarding appropriate usage, contact **Tonewinder OE** before proceeding.

Safety Standard

This device is a Safety Class I instrument (provided with terminal for protective grounding). The device has been manufactured and tested according to international safety standards.

2.3.2 Qualification of the Personnel

Observe the information below on the proper qualification of the personnel repairing the device.

Repairs

Only skilled personnel are permitted to repair the device and to establish the electrical connections according to the appropriate regulations**. Tonewinder OE** recommends always having service personnel certified by **Tonewinder OE** perform the repairs.

2.3.4 Electrical Safety Precautions

WARNING— Electric Shock or Damage to the Device

High voltages are present inside the device that could cause a electric shock or damage to the device.

- Do not make any changes to the electrical or grounding connections.
- If you suspect any kind of electrical damage, disconnect the power cord and contact **Tonewinder OE** Technical Support for assistance.
- Do not open the housing or remove protective panels unless specifically instructed to do so in this manual.
- Do not place liquid reservoirs directly upon the device. Liquid might leak into the device and get into contact with electronic components causing a short circuit.

2.4 Compliance Information

Tonewinder OE performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the device is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in this manual.

Changes that you make to the device may void compliance with one or more of these EMC and safety standards. Changes to the device include replacing a part or adding components, options, or peripherals not specifically authorized and qualified for the product by **Tonewinder OE**. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from **Tonewinder OE** or one of its authorized representatives.

The device has been shipped from the manufacturing site in a safe condition.

3 Device Overview

This chapter introduces you to the device and the main components.

3.1 Device Features

The device comprises the following main features:

- User friendly Pickup winder for musical instruments, totally autonomous, works without the need for a computer connection.
- Winding speed may reach 1500 r.p.m.. Nevertheless, we do recommend not to exceed 1,000 r.p.m.
- Automatic winding available in four different winding strategies.
- There is also a manual winding mode with additional manual speed control.
- The wire tension sensor monitors the tension wire across the whole winding and automatically hold the process in case of wire breaks. Wire tension may be adjusted during winding.
- There is a tachometric sensor that hold the winding in case of motor blocking.
- All settings and controls made with the 2,8 inches touchscreen so there is no need for a PC connection.
- Software upgrades can be made via Wi-Fi.

3.2 Operating Principle

Tonewinder® is designed for winding up instrument pickups, generally guitars and basses. Its main function is to be able to wind up musical instrument pickups, doing it with the accuracy that a CNC offers you, the advantage of which is to control at all times:

- Position of the wire that you are winding
- Speed of rotation of the bobbin
- Real tension of the wire

In this way, you can program the automatic winding in the way you like the most in order to achieve certain nuances in the sound of the pickup. It can also work semi-automatically, manually guiding the wire.

The following picture shows the interior components of **Tonewinder®**, and illustrates how the device operates:

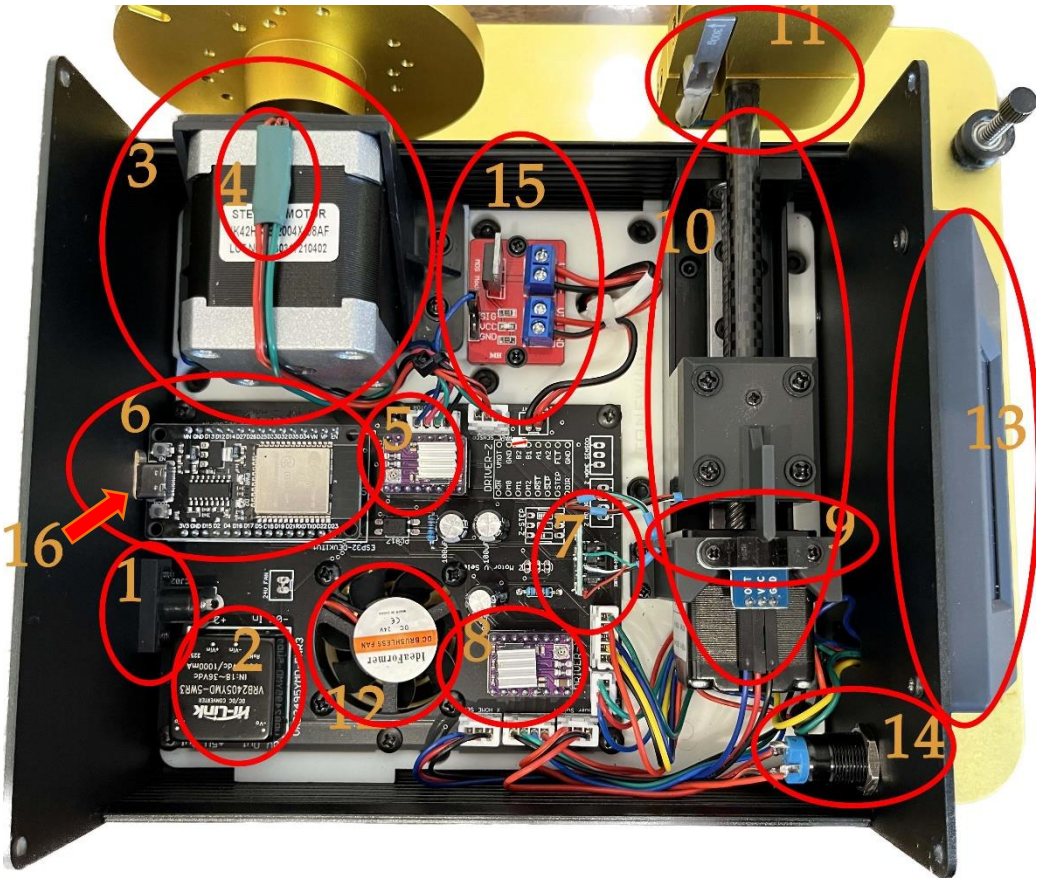


*Figure 1: Inside view of **ToneWinder® V1.1***

No.	Description	No.	Description
1	Main power 24V entrance	9	Home sensor
2	Power supply 5v	10	Step motor X – Nema 11
3	Step Motor Y – Nema 17	11	Tension sensor
4	Tachometer sensor	12	Cooling fan
5	Driver DRV8825 motor Y	13	Touch screen
6	Microcontroller ESP32	14	Main power switch
7	Tension sensor electronics	15	Cosmetic Ligth power control
8	Driver DRV8825 motor X	16	USB connector

3.3 External Components

On the front-right, the device provides easy access to the user-accessible components:

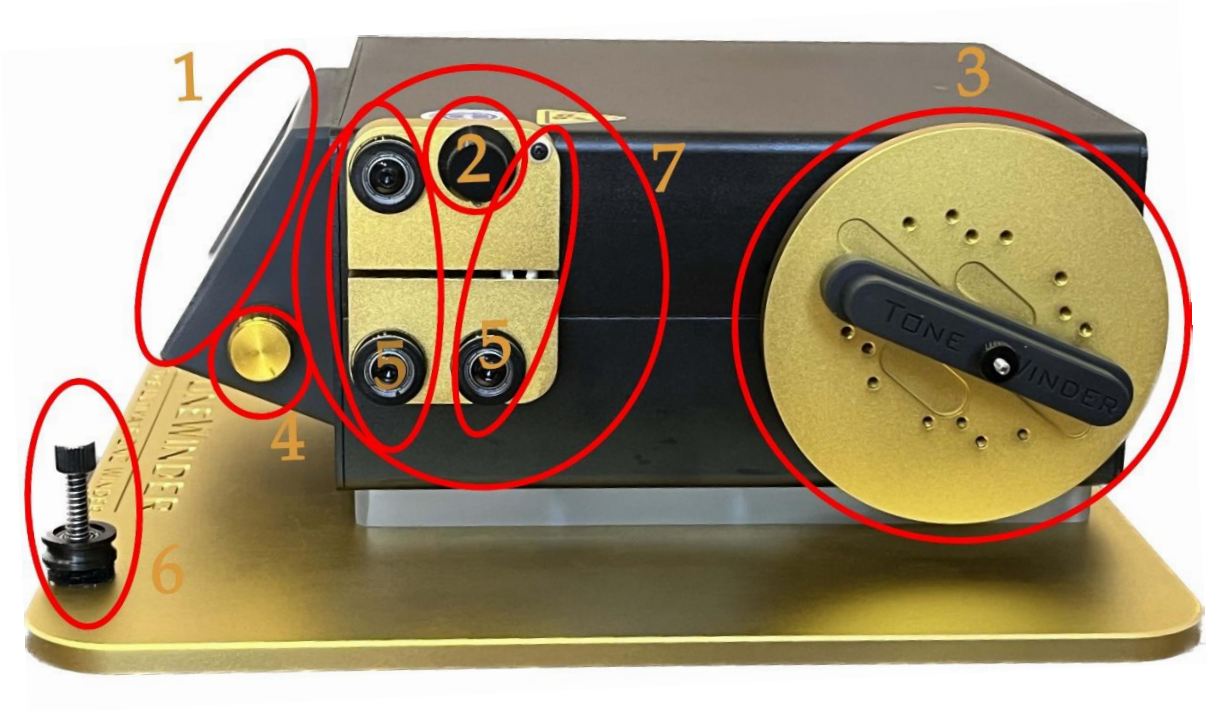


*Figure 2: Right side view of the device (here: **Tonewinder® V1.1**)*

No.	Description
1	2.8” Liquid-crystal color display with integrated touch screen
2	Wire tension screw
3	Plate to install the coils
4	Control/Emulate potentiometer
5	Wire guider pulleys
6	Wire stabilizer, first fix point of the wire
7	Wire guider arm, include tension sensor

3.4 Touch Screen Display (HMI)

ToneWinder® has a 2,8 inches Nextion Enhanced touchscreen with high sensitivity and precision. A touchscreen stick is attached in a convenient holder.

3.5 Coils Plate

The cylindrical plate to fix the coils is machined in aluminum, with an anodized finish. It has 2.5 metric threads to house any available coil in the market. It also has a central thread to be able to fix the simple coils, using a fixing piece.

Figure 3: Special part to fix single coils

Grooves are made in the holding plate to house the pickups eyelets, so they can be perfectly seated on the plate.

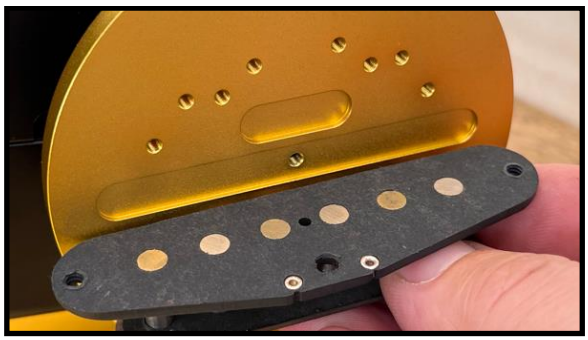


Figure 4: Coil plate insertions

3.6 Wire guide arm + Tension sensor

The wire guide arm consists of two pieces of anodized aluminum, joined together by a 300gr load cell, this mount is capable of measuring variations of 1 gr in the tension of the wire. In the lower part it has housed two polyethylene pulleys for the correct guidance of the thread. The upper part houses the thread pressure screw, with which you can regulate the tension applied to the thread.

Figure 5: Wire-Guide Assembly

The wire guidance block is fixed to the transmission of the X-axis motor (Nema 11 stepper motor), by means of an 8 mm carbon tube.

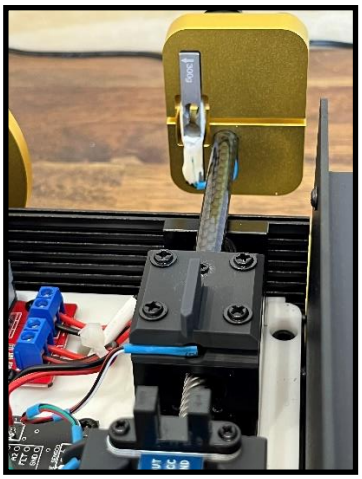


Figure 6: Axis X view

3.7 Software Operation

Tonewinder® is designed to be operated from the integrated touchscreen display, without using a computer. Software provides complete instrument control.

There are two software packs running inside **Tonewinder®**. The software running in the ESP32 microcontroller that can be upgraded via Wi-Fi or USB cable. The touchscreen software that can be upgraded via a Micro-SD card.

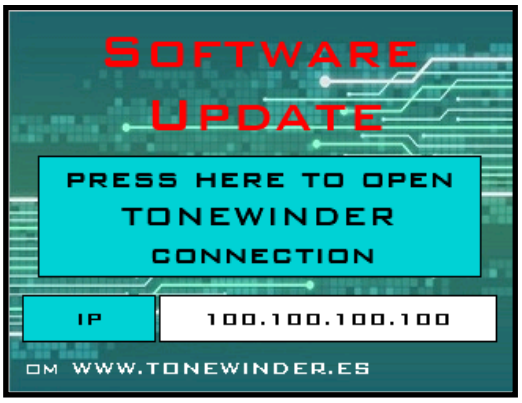


Figure 7: Software update screen

The very last version of both software packages are available for download in **Tonewinder®** web site http://www.Tonewinder.es.

4 Unpacking

This chapter provides information for unpacking the device and informs you about the scope of delivery.

4.1 Unpacking

Damaged Packaging, Defective on Arrival

Inspect the shipping container for signs of external damage and, after unpacking, inspect the device for any signs of mechanical damage that might have occurred during shipment.

If you suspect that the device may have been damaged during shipment, immediately notify the incoming carrier and **Tonewinder OE** about the damage. Shipping insurance will compensate for the damage only if reported immediately.

4.2 Scope of Delivery

In addition to **Tonewinder®**, the following items are also included in the delivery:

- M2.5 Screws for coils with two holes.
- M2.5 Screw and nut for Single coils.
- Two special pieces to fix single coils.
- 24V 60W-75W Power Supply
- Power cord.
- Protection case with foam.

5 Installation

This chapter specifies the requirements for the installation site and describes how to set up, install, and configure the device.

5.1 Installing the device

The device is installed and set up by the buyer and must follow the steps below.

1. Pay attention to the safety guidelines and observe all site requirements. For the safety guidelines when installing the device.
2. Set up the device hardware.
3. Turn on the device.

5.2 Site Requirements

The operating environment is important to ensure optimal performance of the device. This section provides important requirements for the installation site. Note the following:

5.3.1 Workbench

For dimensions and weight of the device, see chapter 9 Specifications.

Provide a sturdy workbench of a height that ensures convenient access to the interior of each device in the system. The workbench must stand in a secure and level position that is free of vibrations. The bench top must be dry and clean.

Allow sufficient free space on the sides and on the rear of the system for electrical connections and for proper air circulation. Allow at least 15 cm of clearance on the rear, at least 20 cm of clearance on each side, and at least 30 cm of clearance above the top.

Make sure that the power switch and power cord can be easily reached at any time.

5.3.2 Power Considerations

The power supply of the device has wide-ranging capability, accepting any line voltage in the range specified for the device.

CAUTION—Electric Shock or Damage to the Device

- Connecting the device to a line voltage higher or lower than specified could result in personal injury or damage to the device. Therefore, connect the device to the specified line voltage only.
- Do not use defective multiple socket or extension cords, as they could result in personal injury or damage to the device.
- After the power to the device is turned off, the device is still energized as long as the power cord is connected. Repair work on the device while the device is connected to power could lead to personal injury. Therefore, always unplug the power cord before starting repair work inside the device. If you were instructed to remove any covers or panels, do not connect the power cord to the device while the cover or panels are removed.

5.3.3 Power Cord

The power cords are designed to match the wall socket requirements of the country in which they are used. The end of the power cords that plugs into the power socket on the device is identical for all power cords. The end of the power cords that plugs into the wall socket is different.

WARNING—Electric Shock or Damage to the Device

- Never use a power cord other than the power cords provided by **Tonewinder OE** for the device.
- Only use a power cord that is designed for the country in which you use the device.
- Do not use defective multiple socket or extension cords, as they could result in personal injury or damage to the device.
- In case of emergency, it must be possible to reach the power cord easily at any time to disconnect the device from the power line.

5.3.4 Condensation

NOTICE Condensation in the device can damage the electronics. Therefore, when using, shipping, or storing the device, avoid or minimize conditions that can lead to a build-up of condensation in the device. For example, avoid significant or fast changes in environmental conditions. If you suspect that condensation is present, allow the device to warm up to room temperature. This may take several hours. Wait until the condensation is gone completely before connecting the device to the power line.

5.3.5 Operating Conditions

When operating the device, make sure that the installation site meets these general environmental and operating conditions:

Temperature

Temperature fluctuations can affect the performance of the device. Avoid locations with significant changes in temperature and strong air drafts. For example, do not place the device in the direct sunlight, near heating or cooling sources, or under an air duct.

Humidity

The relative humidity of the operating environment is important for the performance of the device. Operate the device in the specified humidity range, with no condensation.

When the humidity is too high, condensation may occur, causing damage to the electronic components in the device. When the humidity is too low, static electricity may accumulate and discharge, shortening the life of the electronic components.

Vibration

Vibrations may affect the performance of the device. Therefore, the installation site should be free of vibrations. Avoid placing the device in locations where vibrations are caused by other instruments.

5.4 Setting Up the Hardware

Tonewinder® is calibrated and ready to be used. You just need to connect the mains cable and switch it ON. Eventually you will need to make a fine adjustment of the wire guider position.

5.5 Turning On Tonewinder®

1. Turn on the device with its main power switch.

2. Wait until the device completes the following sequence of events after power-up:

   ♦*Self-test diagnostics*

   The device runs a series of internal tests. During these self-diagnostics, all of the main components are checked. When testing is complete and has been successful, **Tonewinder®** continues moving the axis X, in order to find the home position.

Figure 8: Start-up screens

   If an error is detected during the self-test, the device is not ready for work. For further information, see chapter 8 Troubleshooting.

♦*Homing motor X*

In the **homing** state, the device moves the axis X in order to find the home position.

6 Operation

This chapter describes the elements for device control, provides information for routine operation and for shutdown.

6.1 Introduction to this Chapter

The information in this chapter assumes that the initial setup of the device has been completed. If this is not the case, refer to the instructions in chapter 5 Installation before proceeding.

6.2 Touch Screen Display

The role of the keys depends on the screen presented. These keys are called *general* keys.

General Soft Key Functions

Depending on the screen, general soft key functions are available:

Soft key	Description
Back	To come back to the previous screen
Main	To go directly to the Main Menu
Reset	To reset the device, and come back to initial screen

6.3 Terminology

Please find below a concise description of the parameters utilized in the **Tonewinder®** software, along with their recommended values. A warning message will be displayed if any parameter exceeds these predefined limits. For further assistance, you can access the contextual help screen by simply tapping on the corresponding parameter icon.

Figure 9: Contextual help access

Parameter	Description	Range
Max Speed	Max speed that Tonewinder can operate	Up to 1500 RPM
Offset	Distance between “Home position” and “Zero position”	<10,000 um
Home position	Home reference to axis X	n.a.
Zero position	Position that aligns the Wire Guide Arm with the plate	n.a.
Delta	Distance, measured from the limits of the height of the bobbin, where the wire won’t be winded, to avoid overload of wire.	<1,000 um
Initial turns	Number of turns that device run at extra low speed.	<20 turns
Filling factor	This Is the ratio of total conductor cross section to the area of the core window (see appendix 1)	[10, 100] %
Constant mode	Mode where filling factor is constant during all the coil	n.a.
Table mode	Mode where you can fix up to 6 segments with different filling factor	n.a.
Scatter mode	Mode where the winding of the bobbin is done under “semi-random” conditions.	n.a.
Emulate mode	Mode where you can modify the filling factor during the bobbin, using the external potentiometer.	n.a.
Manual mode	Mode where you need to distribute the wire manually, during the winding.	n.a.
CW	Direction of rotation of the plate clockwise	n.a.
CCW	Direction of rotation of the plate counterclockwise	n.a.
Wire Gauge	Gauge of the wire that you are using	[20,200] µm
Height Coil	Free height of the bobbin	[1,000, 30,000] µm
Base Thickness	Thickness of the base of the bobbin, which leans on the plate	[700, 5,000] µm
Turns per layer	(TPL) is the number of turns that **Tonewinder** will wind in each direction. It is proportional to Filling Factor, Height and wire gauge	n.a.
Winding speed	Speed used to winder the bobbin	[50, 1500] rpm

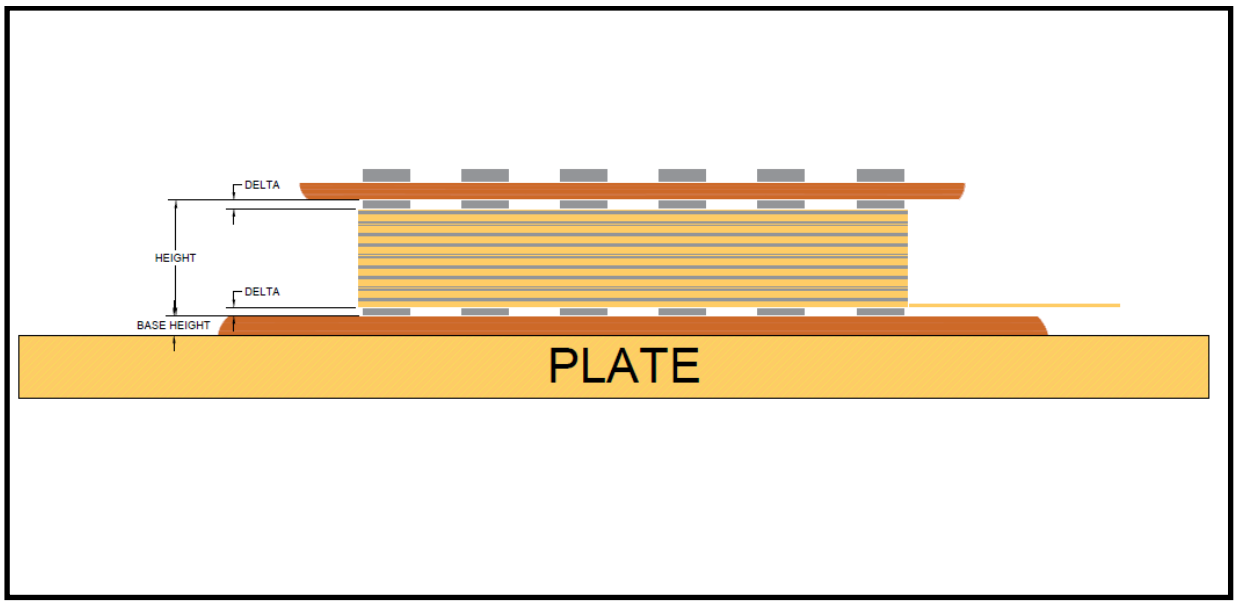


Figure 10: Basic Parameters screen

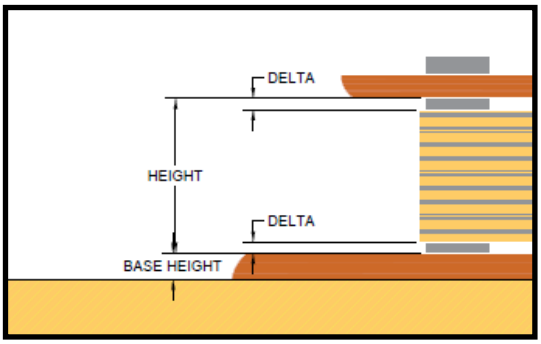


Figure 11: Basic Parameters screen

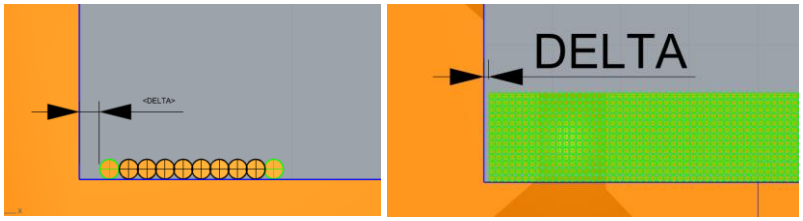


Figure 12: Basic Parameters screen

6.3.1 Interactive help

Clicking with the screen pen on the parameter name you will see a comprehensive description of the selected parameter/variable.

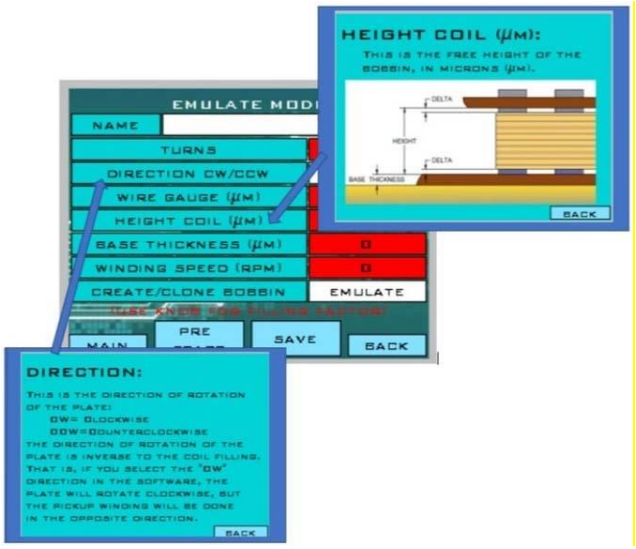


Figure 13: Interactive Help Screens

6.4 Preparing ToneWinder for Operation

This section gives information on any additional steps that are required to prepare the device for operation and wind up a bobbin.

6.4.1 Verify “Zero Position”

Before Operating the Device for the First Time, verify “**Zero Position**”

Prepare the device for the first-time operation, follow the next steps to verify that the “**Zero position**” is set properly:

1. Switch ON **Tonewinder®** and navigate to the “**BASIC PARAMETERS**” screen (**Main Menu>Settings>Basic Parameters**). Set **Delta** to zero (**0 µm)**, then save basic parameters.

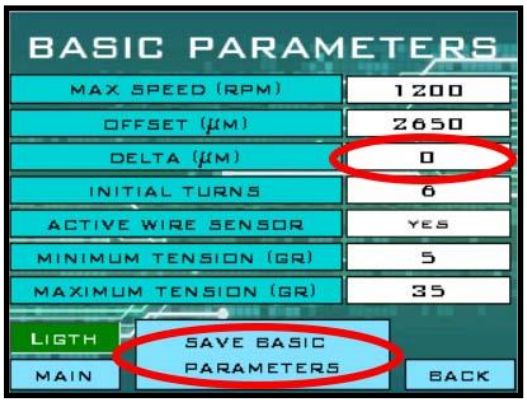


Figure 14: Basic Parameters screen

2. Load a coil from memory (from the "**LOAD BOBBIN**" menu, for example "**P.A.F."),** and set the "**Base Thickness**" parameter to zero (**0 µm)**, push **"PRESTART"**, value is stored in memory. Once the winding has started, it can be stopped. This step is only to set the thickness of the coil wing to zero in the software.

3. Go back to "**BASIC PARAMETERS**" and adjust the "**Offset**" value until the wire guider matches the guide pulley groove (white pulley) from the coil winding base. See next image.

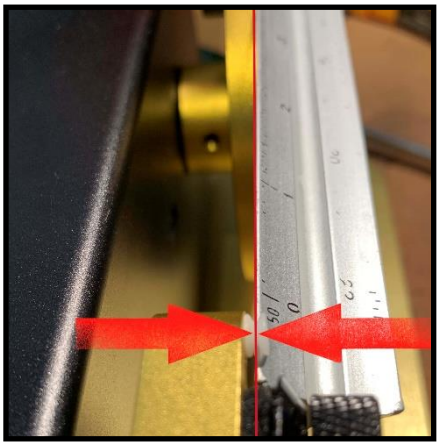


Figure 15: Adjusting offset to align turning plate with wire guide

NOTE: This is a suitable enough setting to start working with **Tonewinder®**, but during the first windings you will be able to adjust this parameter to its final value (See Constant Mode).

4. Once you have properly adjusted the "**Offset**" value, you may set back "**Delta**" to your preferred value (normally **100 µm**). Remember to save parameters again. Please have in mind that "**Offset"** value adjustment can be optimized while winding.

6.4.2 Setting up the wire

Before Operating **Tonewinder®** *for each bobbin, setting up the wire*

Prepare **Tonewinder®** for winding a bobbin, follow the next steps to set up the wire properly (You may find your own way to do this):

1. Fix the pickup to the plate firmly and make sure it rests completely flat against the aluminum plate, then fix the wire with adhesive tape to the winding plate having in mind to let distance enough to later make the soldering or necessary connections (If it is not already soldered to the pickup), but avoiding to intercept the wire trajectory from the white pulley to the pickup.
2. Pass the cooper wire through the white polyethylene pulley, the wire tension adjustment screw and the black pulleys as shown in picture 16. Turn clockwise the tension adjustment screw lightly.

Figure 16: Wire Guider Arm

3. Guide the copper wire through the stabilizer on the ToneWinder® base lifting it with your fingers to be able to introduce the wire between lower and upper plates. Do not tight too munch the screw, the tension should be enough to avoid the wire to go off the black pulleys while winding, but as light as possible, unless you wish to have an additional wire tension.

Figure 17: Wire stabilizer

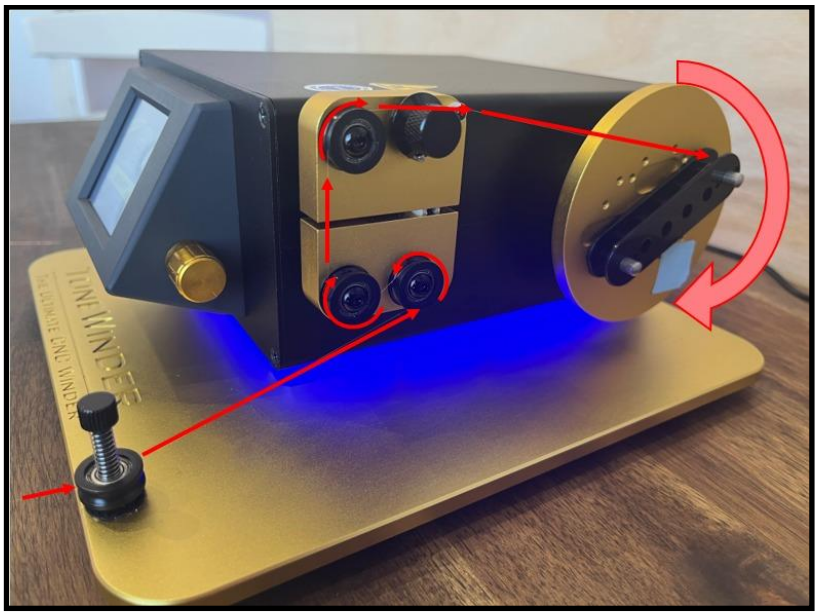


Figure 18: Wire scheme. Right side view.

Note: Please have in mind that the direction of rotation of the plate is inverse to the coil filling. That is, if you select the "**CW"** direction in the software, the plate will rotate clockwise, but the pickup winding will be done in the opposite direction.

6.5 Operating with Tonewinder

Operating **Tonewinder®** is very simple. Everything is managed through the program loaded on the ESP32 microcontroller and the Nextion touch screen, without the need to be connected to a PC.

Figure 19: Initial screen

After switching ON the winder, pushing **"START"**, the "**MAIN MENU"** is shown. The options you may select are:

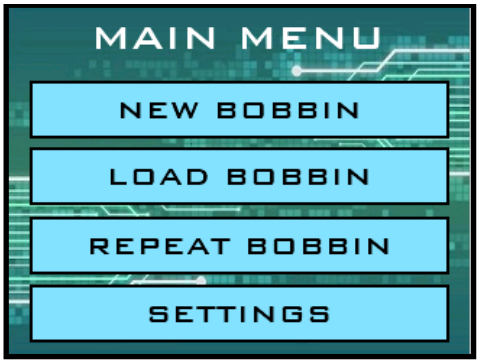


*Figure 20: "**MAIN MENU**" screen*

Next we will review "**MAIN MENU**" options.

6.5.1 Create a "NEW BOBBIN"

You can create a new bobbin from scratch. There are four automatic winding modes :

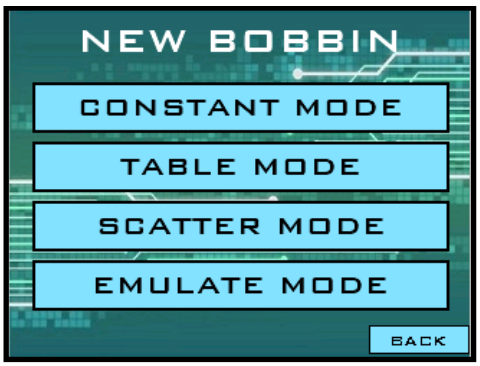


*Figure 21: "**NEW BOBBIN**" screen*

Automatic winding modes description.

6.5.1.1 Constant mode:

This is the simplest winding mode. The entire winding is done using a single filling factor (the filling factor is the percentage of wire filling at the coil height. A 100% means that, at each turn, the wire is placed next to the previous one in such a way that the entire height of the coil is covered by wire, and 50% means that only wire is placed in 50% of the height of the coil).

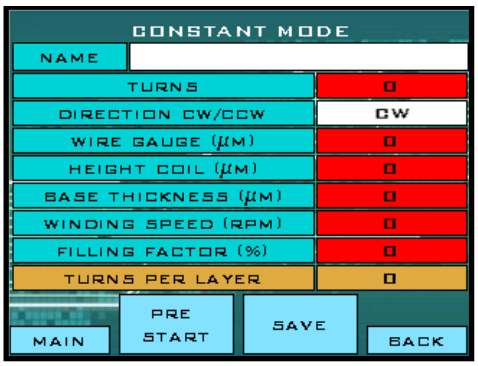


*Figure 22: "**CONSTANT MODE**" screen (empty)*

Select , eventually a name (only needed if you want to save it), the total number of turns, the winding direction (plate turning Clockwise or counterclockwise) , wire diameter (values are in microns, µm), the coil heigth (**µm)** and base thikness (**µm)** , winding speed (**Tonewinder®** may reach 1500 rpm but normal winding speed is about 800 rpm) , and Filling Factor. If a parameter is set out of “normal” range, the winder could still be started but the parameter field will be turned red. (In this case, not all required specifications may be met)

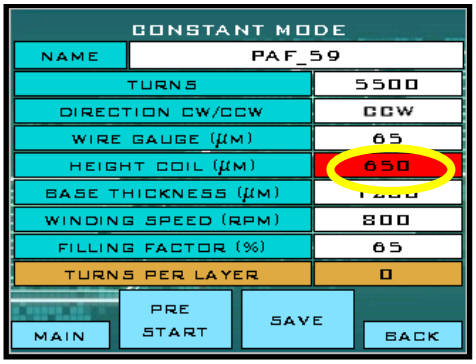


Figure 23: cell warning

The "**Turns per Layer**" field is only calculated if you click the field. This parameter is depending of Filling Factor, wire diameter and coil heigth.

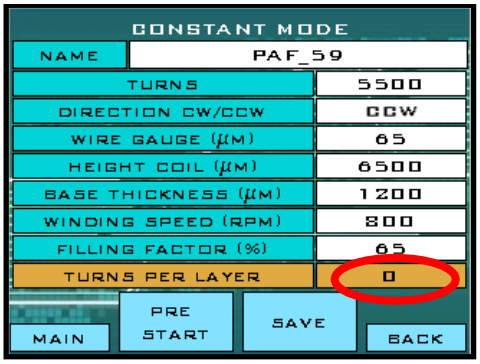


*Figure 24: "**Turns per Layer"** update*

Any time you may store the coil parameters by clicking "**SAVE**", "**SAVE BOBBIN**" screen will then be shown, there you may choose in wich one of the seven available memory position you wish to save the parameters by clicking on it. In case there were already saved parameters there, they would be erased and overwriten.

*Figure 25: "**SAVE BOBBIN"** screen*

Once the coil parameters are saved, pressing "**BACK**" will return you to the previous "**CONSTANT MODE**" screen. When you select the "**PRE-START**" button, the process of winding the pickup starts with the execution of the initial turns at a very low speed (the number of initial turns is an adjustable parameter in the **"BASIC PARAMETERS"** page), allowing to accommodate the wire in the coil and prepare the system for winding.

"**Pre-Start**" should be pushed smothly and keep pushed until screen changes. CIlcking over **Pre-Start** too fast does not give enougth time to the communication procedures to interchange information correctly and may produce unexpected motor movements.

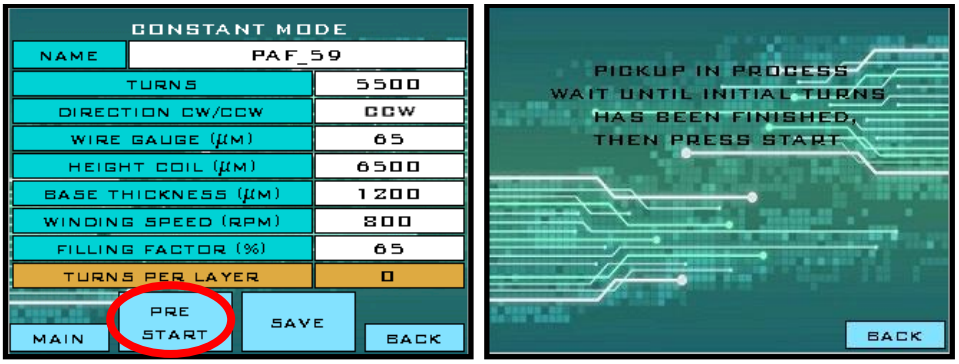


*Figure 26: Press "**Pre-start**" to start winding*

Once the initial turns are finished , **Tonewinder®** will be ready to start winding and the "**START**" button will be shown.

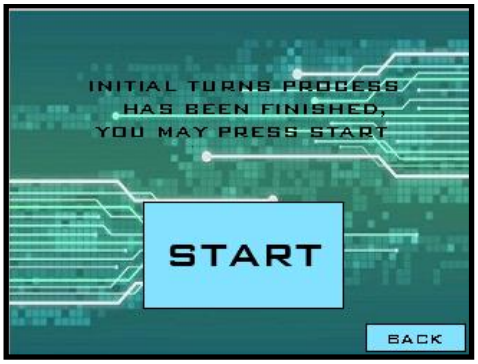


*Figure 27: "**PRE-START**" screen*

Pushing the "**START**" button, the instrument will start winding under controlled acceleration until the selected winding speed is reached, if ligth is activated it will ramp up and down during winding. While winding, the follow real time winding information is shown in the screen:

*Figure 28: "**RUNNING**" screen*

All those parameters are being updated real time while winding. The tension at wich the wire is working is all time monitorized and shown. If the "**WIRE TENSION SENSOR**" is activated (can be deactivated in "**BASIC PARAMETERS**" screen), and the wire tension falls below the setting lower limit (**default 5gr)** or max. limit (**default 35 gr**), the winder "understands" there is an issue with the wire (i.e wire broken) and automatically holds the winding process, showing the follow screen (**and blue ligh will blink if enabled**):

*Figure 29: Screen "**AUTO HOLD**" (tension sensor)*

Under this holding state you may check if there is any issue. If you wish, you may disable the wire sensor (this will deactivate the automatic hold when one of the limits are reached, but the tension value will continue to be shown). If you disable here the "**WIRE SENSOR"**, this selection will be stored also in "**BASIC PARAMETERS**", so you will have to activate it again in case you want it active for sucesive windings.

The winder will auto hold as well in case the Y motor stops or gets blocked for any reason, or the tachometric sensor stops measuring the plate turning pulses (**and blue ligh will blink if enabled**), then showing the following screen:

*Figure 30: Screen "**AUTO HOLD**" (tachometer sensor)*

If the reason for the hold can be solved, you may continue winding by cliking "**CONTINUE**", otherwise you may abort the winding by clicking "**STOP**". In this case this screen will be shown:

*Figure 31: "**RUN ABORTED**"* screen

At any time during the winding process you may hold the winding by clicking "**HOLD/STOP"** , the winder will quikly decelerates and hold, winded turns and layers are shown in the screen.

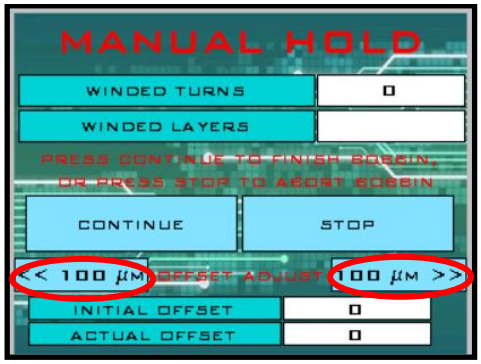


*Figure 32: "**MANUAL HOLD**"* screen

Also, if you think the winded coils have an unwished bias to left or rigth, you may correct it by increasing or decreasing the "**OFFSET**" value at 100 um intervals. Once "**CONTINUE**" is pushed this will be also save the new "**OFFSET**" value permanently in "**BASIC PARAMETERS**". This is the fine "**OFFSET**" value adjustemet.

Clicking "**STOP**" at this stage will abort the winding process. By clicking "**CONTINUE**" the winding will continue at same stage it was holded.

Once the winding is completed, the "**RUN COMPLETED SUCCESSFULLY"** screen is shown, then you can return to "**MAIN MENU"** screen.

NOTE: In this mode, **Tonewinder®** will finish the coil by making the last laps next to the base of the coil.

*Figure 33: "**RUN COMPLETED**" screen*

6.5.1.2 Table mode:

In table mode you can make a coil in a similar way to the constant mode, but being able to select up to 6 different sections, where you can vary the filling factor:

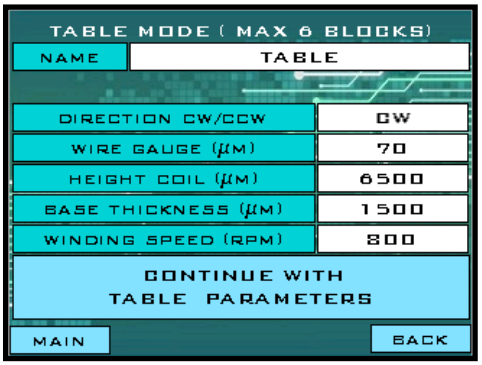


*Figure 34: "**TABLE MODE**" screen*

In each one of the blocks you must select the number of turns you want to make and the desired filling factor, selecting it from the slider. To update the TPL of the block click on the value field:

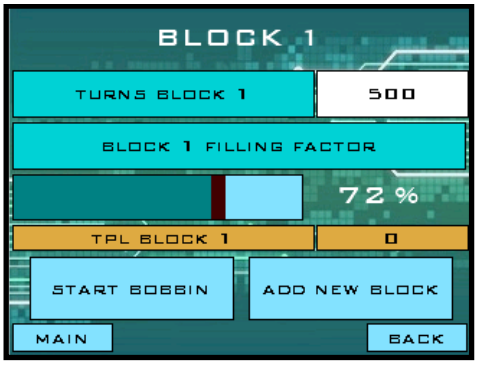


*Figure 35: "**BLOCK PARAMETERS**" screen*

At this point, we can add a new block (up to a maximum of six) or start with the winding. Once we have completed the desired sections, and before starting the winding process, the system shows a screen with the total number of selected blocks and the total number of blocks to be made:

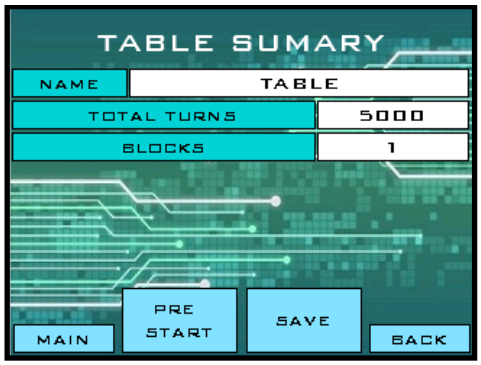


*Figure 36: "**TABLE SUMMARY**"* screen

From this moment on, the winding process is identical to the **"CONSTANT MODE".**

NOTE: In this mode, **Tonewinder®** will finish the coil by making the last laps next the base of the coil.

6.5.1.3 Scatter mode:

In this mode you may wind the pickup randomly or disorderly, randomly modifying the filling factor every certain number of turns. This mode is configured on two screens. In the first of them the general parameters of the coil and winding are fixed:

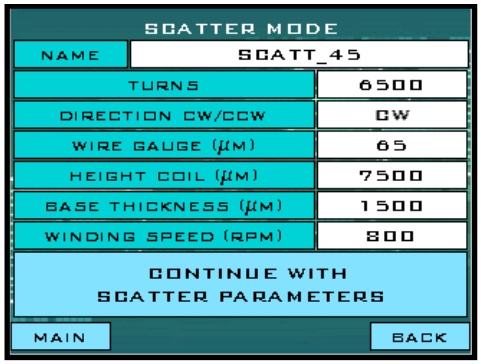


*Figure 37: "**SCATTER MODE**"* screen

In the second screen ("**SCATTER PARAMETERS**") you will set the particular Scatter parameters. You have to choose the max and min Filling Factor and also the turns interval between changes (i.e each 50 turns the FF will be set ramdomly inside the limits previously selected). You may also set a pre and post scatter number of turns at wich the **Filling Factor** will be kept constant. You may see the **TPL** of every stage by clicking the **TPL** field.

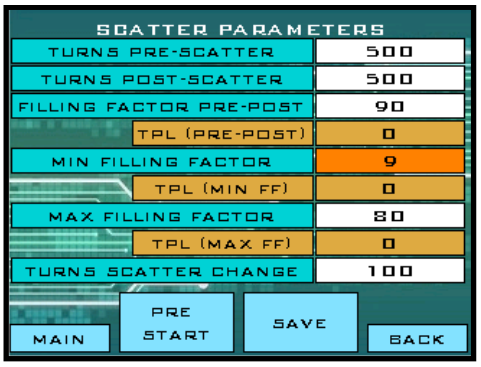


*Figure 38: "**SCATTER PARAMETERS**"* screen

Saving and winding processes are the same as for " **CONSTANT MODE**" from this point. **NOTE:** In this mode, **Tonewinder®** will finish the coil by making the last laps next to the base of the coil.

6.5.1.4 Emulate mode:

In this mode you can manually vary the filling factor at any time, by activating a potentiometer. It also allows you to save these parameters during winding so that you can clone the winding pickup later as many times as you want:

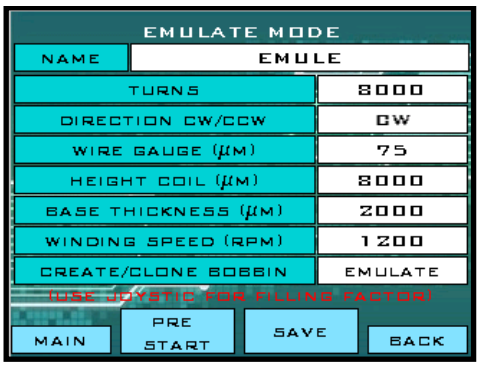


*Figure 39: "**EMULATE MODE**"* screen

In this mode we have to turn the potentiometer to vary the **Filling Factor** while winding.

Clicking "**SAVE"** here will store only the coil parameters, but if your intention is to later **clone** the bobbin once made, then you need to go step by step the following process:

1. Make a reset to initialize the winder and make sure there is no spurious data in the ram memory, then select **"NEW BOBBIN"** in **"MAIN MENU"**, and **"EMULATE MODE"** in **"NEW BOBBIN".**
2. Wind the pickup, acting on the potentiometer to modify the filling factor as appropriate.
3. Once the coil is finished, press "**REPEAT BOBBIN**" in the **"MAIN MENU"**.
4. Modify the "**CREATE/CLONE BOBBIN**" field to display "**CLONE**".
5. Set a name for the bobbin.
6. Press "**SAVE**" to save the coil made. At this time the system will save both the general parameters and the data for the reproduction of the coil.
7. Once the saving is done, we can Load and replicate this coil as many times as desired.

6.5.2 Load Bobbin

In this menu you can load the parameters of both a coil stored in memory by "**DEFAULT**", and a previously saved coil:

*Figure 40: "**LOAD BOBBIN"** screen*

There is 1 coil saved by default and space to store up to 11 new coils. Once the data is saved, it remains stored in the SPIFFS memory of the ESP32. Via Wi-Fi you can download these memories to a PC, to later reload them in **Tonewinder®**. This applies to both simple files and also clone mode files previously stored using the **Emulate** mode.

6.5.3 Repeat Bobbin

By choosing this option you may repit the last winded coil (This option can not be used if last winding was made in **Manual Mode or Clone after a swith Off**)

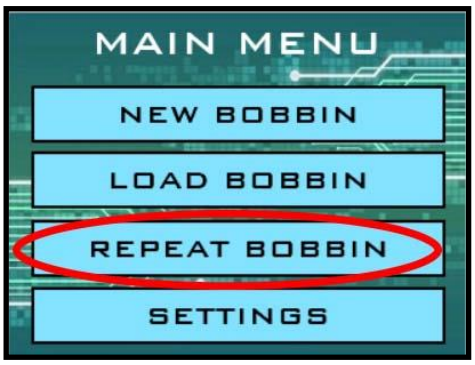


*Figure 41: "**REPEAT BOBBIN**" screen*

You may also use **SAVE** from this screen.

6.5.4 Settings

In this section you can adjust the main parameters of the winder, it also allows you to wind a coil manually, update, through a Wi-Fi network, the ESP32 microcontroller software or reset the device.

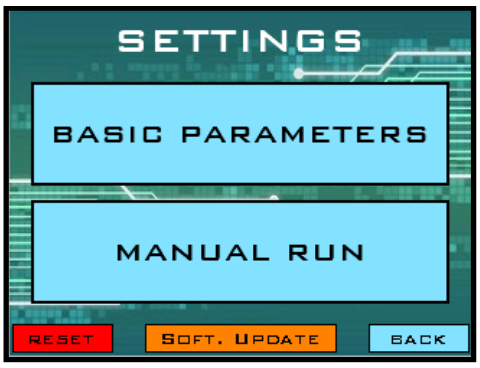


*Figure 42: "**SETTINGS**" screen*

6.5.4.1 Basic Parameters

Basic parameters:

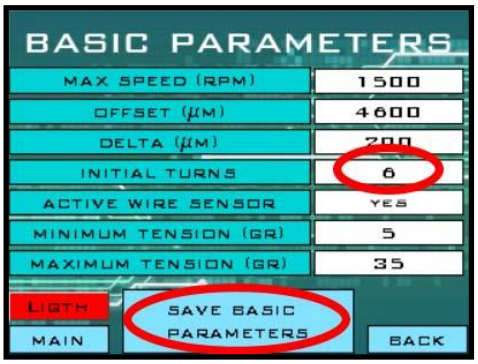


*Figure 43: "**BASIC PARAMETERS**" screen*

- **Max Speed**: allows you to limit the maximum winding speed, this to avoid that we can mistakenly select a very high coil speed, the system limits the speed to this value.
- **Offset**: is the distance, in microns, from the home position (initial set point of the X motor position) to the plane of support of the coil on the plate.
- **Delta**: it is the distance, in microns, where you do not want to have wire, stuck to the limits of the height of the coil, to avoid piling up the wire in the changes of direction of the winding and the overload in the wings of the coil, avoiding pickup deformations.
- **Initial Tuns**: Number of initial turns that the system will perform, to accommodate the thread in the coil, before starting the winding.
- **Active Wire Sensor**: From here you can activate/deactivate the wire tension sensor.(Only auto hold system. Wire tension monitoring will be still performed)
- **Minimum tension**: Treshold for the auto stop low level.
- **Maximum tension**: Treshold for the auto stop high level.
- **Ligth**: Switch On/Off for the cosmetic ligth.

Once you have set or modified any parameter you must click on "**SAVE BASIC PARAMETERS"** to permanently store it.

6.5.4.2 Manual Run

Within this menu you can also make a manual winding of a pickup, selecting the total number of turns, the maximum winding speed and direction of rotation:

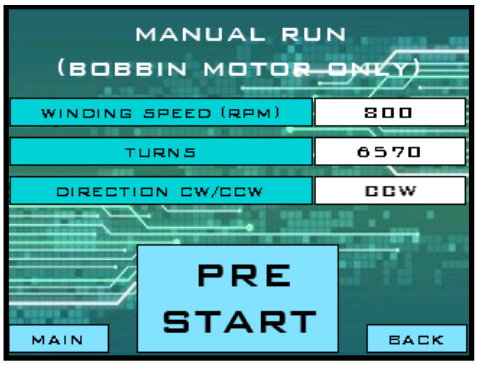


*Figure 44: "**MANUAL RUN**" screen*

In Manual winding mode the X motor moves to a fully out position (Fully at the rigth end) to facilitate the manual guidance of the wire in the pickup. The wire guide arm can be used to stand the wire during winding. Winding speed can be continuosly varied, by activating the potentiometer, bettween 50 r.p.m. and the selected speed chosen in previous screen.

6.5.4.3 Software Update and Upload/Download files

From the settings screen you can also update the microcontroller software via Wi-Fi 2.5G network (No 5G compatibility). To do this, press on the button "**Soft. Update**"and the following screen will shown up :

*Figure 45: "**WI-FI CONNECTION**" screen*

Pressing on each of the fields will open the keyboard to be able to enter both, the name of the ***Wi-Fi*** to which you want to connect and the access password. Be aware of case discrimination.

*Figure 46: **QWERTY** keyboard screen*

Once the fields have been properly filled in, by pressing the "**CONNECT**" button the device will show the next screen where you can open the communication to connect with the **Wi-Fi** network, showing you up the IP address that you have to write in your browser to connect with **Tonewinder®**.

If the winder cannot connect with the router in 25 seconds, it will return to "**SETTINGS"** screen . If this happens, please check **SSID** name, **password** and also distance to the router.

When next screen shows up, **Tonewinder®** has managed to establish a connection with the router and show up on the screen the **IP** address that we have to use in the browser of our PC to establish connection with the **Tonewinder®** web server.

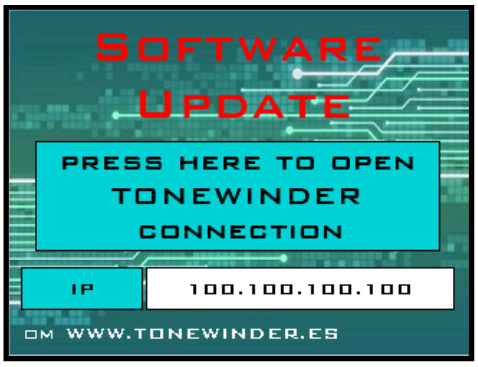


*Figure 47: "**SOFTWARE UPDATE**"* screen

Note: It is possible that under certain circumstances (especially distance from **Tonewinder®** to the transmitter of the **Wi-fi** network) **Tonewinder®** does not connect to the network. If the problem persists, it is recommended to move the device closer to the **Wi-Fi** transmitter, and if this is not possible,

WARNING— Electric Shock or Damage to the Device

High voltages are present inside the device that could cause an electric shock or damage to the device.

you can temporarily remove the top cover of the equipment, removing the four screws from the corners, during the update process.

Once we have typed in the IP address in our browser, and "**enter**" is pressed,

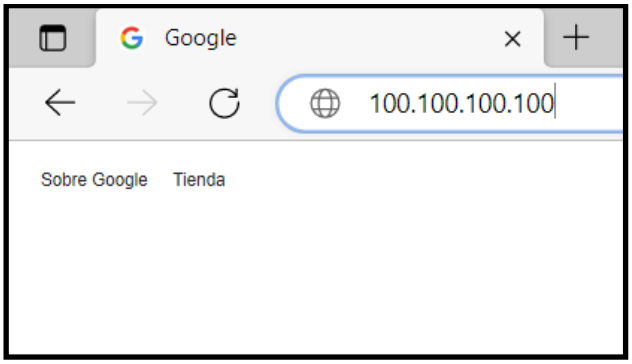


Figure 48: IP address in your navigator

Then we have to push the connection blue button in the **Tonewinder®** screen.

Figure 49: Press Connection button

Next screen will be shown.

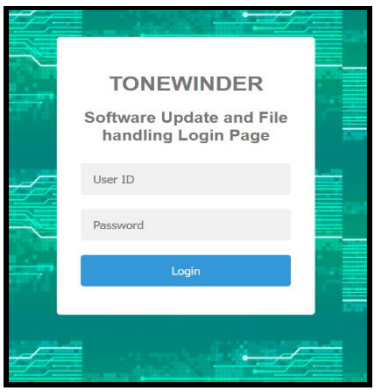


Figure 50: **Tonewinder®** *Access screen*

This is the access screen to the **Tonewinder®** web server menu. In the "**User ID**" field we must type: **admin** (all lowercase), in the "**password**" field we should type: **tonewinder** (all lowercase). This "*password*" does not provide security on the internet, so it must be used exclusively in a private environment. Once you enter "U**ser ID**" and "**Password**" we will access the screen **Tonewinder® Server**

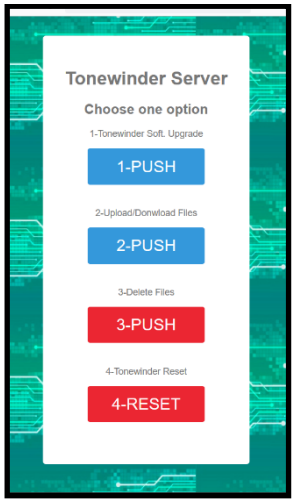


Figure 51: **Tonewinder®** *server*

Tonewinder Server Options Menu:

1. Update **Tonewinder® software.**
2. Upload/Download files from/to a PC.
3. Erase files from **Tonewinder® memory.**
4. Reset **Tonewinder®.**

By selecting "1. **Tonewinder® Soft. Upgrade"**, we must make sure to choose one of the files with **.bin** extension. This step is crucial because in case of uploading a wrong file **Tonewinder®** would be inoperative. You can download the latest version compatible with your **Tonewinder®** on http://www.Tonewinder.es the correct files are:

Tonewinder_Inicializer.ino.bin, this program prepares the winder to allocate the working program. This file is only necessary if you are configuring **Tonewinder®** from Scratch. If you just want to upgrade a working **Tonewinder®**, the only needed file is the **Tonewinder_xx.bin**, this is the working program. You can download the latest version compatible with your **Tonewinder®** on http://www.Tonewinder.es

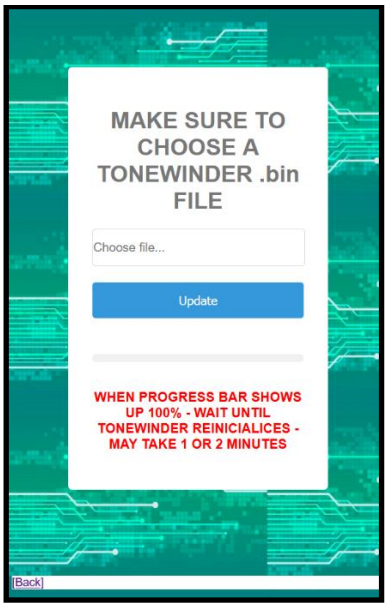


Figure 52: Select a software update

Once the file is selected, press the "**UPDATE"** button. The blue Progress bar will advance. Once 100% is complete, we wait for **Tonewinder®** to reboot (it may take a few minutes).

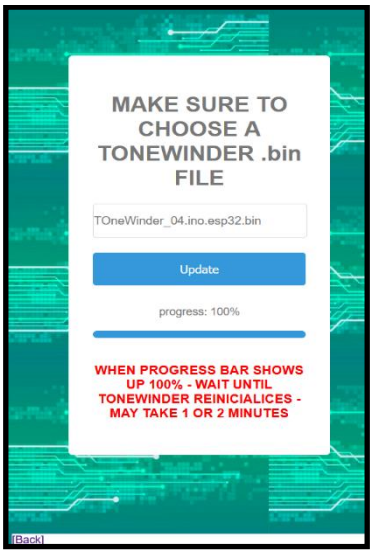


Figure 53: New software updated

When **Tonewinder®** restarts, it will be disconnected from the router untill we follow the connecting steps.

NOTE: If the updated file is **ToneWinder_Inicializer.ino.esp32.bin** we have to wait for the screen "FORMATING" is gone to…

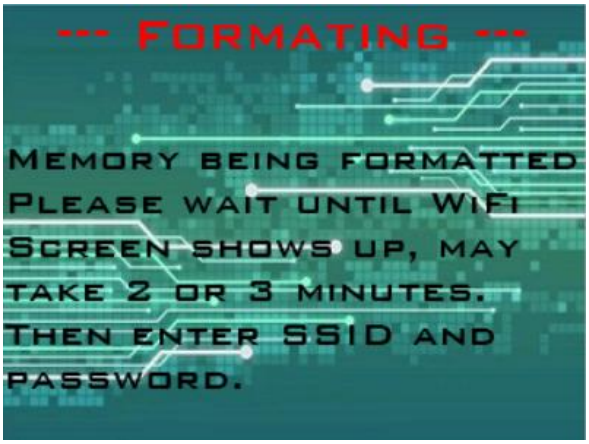


Figure 54: Formating Screen

…write again **SSID** and **Password** in the ***"WI-FI CONNECTION"*** screen to connect to our **Wi-Fi** router.

If we select "**2- Upload / Download Files"** the screen will appear that will allow us to download the files from **Tonewinder®** to the download folder on our PC by selecting the file and pressing "**enter**", the download will start.

Figure 55: File list overview

After files **1-11.txt** and **CloneArrayxx.txt** are downloaded, it is recommended to move them from the downloads folder to a folder identified with the file name, such as "**PAF 2022-11-21**".

Through "**Upload file**" we can upload files previously downloaded to the PC back to **Tonewinder®**. When selecting the files we will see the progress monitor advance and through the "**Refresh**" button we will see the list of files updated.

It is important to decide in advance where we want to locate the files uploaded to **Tonewinder®**. If we want to store the file in a free memory position or in one already occupied, in this case the old file will be deleted.

If our file "**1.txt"** that we have named "**Tele 2022-22-17"** we rename it as "**3.txt"**, once uploaded to **Tonewinder®** will be shown as : "**Tele 2022-22-17"** , in the memory position 3.

*Figure 56: "**LOAD BOBBIN"** screen*

If the file we are uploading is a **CLONE file (i.e. 1.txt)**, then we need to upload also the corresponding **CloneArra1.txt** to same memory position (as we have renamed "**1.txt"** to "**3.txt"** we have to rename "**CloneArray1.txt"** to "**CloneArray3.txt**" and then upload it to **Tonewinder®**.

The option "**3- Delete Files"** give us the posibility to delete files from the **Tonewinder®** memory.

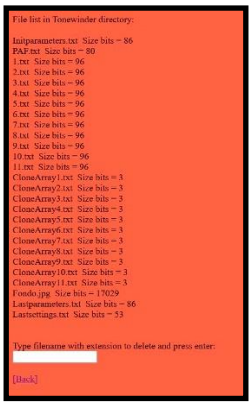


Figure 57: Delete File Overview

To delete a file we have to write the full name including the extension and the press "**enter**". If the file has been properly erased, a confirmation screen will be shown.

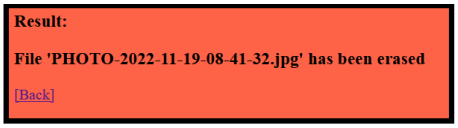


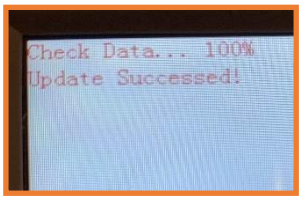
Figure 58: Message after deleting a file

We can only delete user files, or files that we have previously uploaded to memory. System files cannot be erased with this tool.

Option **4- RESET**. Reinitialices **Tonewinder®** and disconect it from the router.

NOTE: IT IS IMPORTANT TO CLOSE ALL BROWSER SCREENS UPON COMPLETION.

6.5.4.4 Touch Screen Software Update



The touchscreen software update is performed using a **microSD**, **max 32Gb**, card through the slit located under the screen.

Download the updated version of the **Nextion software** program in the download section of http://tonewinder.es, copy the program to an empty **microSD** card. With **Tonewinder®** turned off, insert the **microSD** card into the ready-made socket under the display (**Contacts facing to you**). Make sure the card has been adjusted correctly (you will feel a soft resistance when the card is seated, making a final click). Then operate the **Tonewinder®** power switch.

The guide arm will be moved first to the starting position and then to the zero position. This movement is normal.

The update screen should show the progress of the program load and, after a few seconds, the screen will show the successfully updated status.

Remove the **microSD** card by pushing it lightly and then remove it completely.

6.6 File System Operation

Tonewinder® uses different files for its operation, some of these files are for the exclusive use of the winder itself such as system files, and others are configurable by the user to define the winding parameters or the name of the files, among others.

All of these files are used in the volatile memory of the **Tonewinder®** and in the permanent memory **SPIFFS. (S) erial (P) eripheral (I) nterface (F) lash (F) ile (S) ystem.**

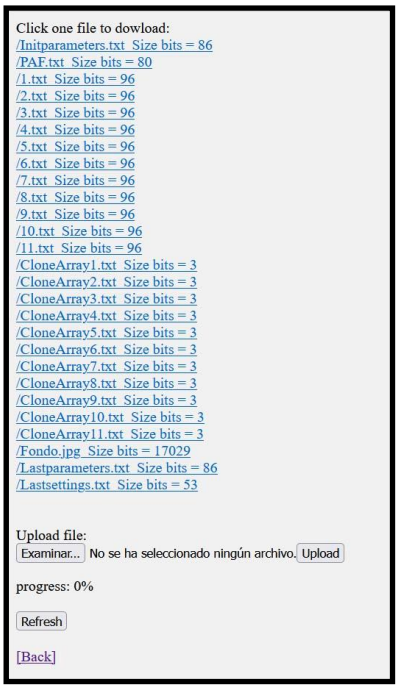


Figure 59: Tonewinder File list

We can work with **Tonewinder®** without worrying about the structure of the file system, but it is important to understand it if we want to export files to an external PC, and / or manipulate them thus making the file storage capacity practically unlimited and also increase the possibilities of customization of the windings.

6.6.1 System files

Those are files for the exclusive use of **Tonewinder®** that should not be modified or deleted, since any of these actions could cause the unforeseen operation of **Tonewinder®** or even a breakdown. Winding files, system parameters, winding data, and image parameter files.

Winding parameter files:

The structure of the winding parameter files is as follows. These are data files separated by commas and ending with a "/0". These files meet the parameters of csv files, but ***Tonewinder®*** uses the txt extension for these files. They have 30 positions + "/0" and their content corresponds to the following parameters:

1. Coil rotation direction

2. Number of coil turns
3. Winding coil width
4. Filling factor %
5. Wire gauge
6. Support thickness
7. Winding speed RPM
8. Winding mode (Continuous, Random, Table, Manual, Emulation, or Cloning)
9. Random mode fill factor change interval
10. Minimum fill factor in random mode
11. Maximum fill factor in random mode
12. First stage laps in Table mode and pre and post-random turns in random mode.
13. First stage filling factor
14. First stage winding mode

15 - 17idem (12. to 14.) second stage
18 - 20 idem (12. to 14.) third stage
21 – 23 idem (12. to 14.) fourth stage
24 – 26 idem (12. to 14.) fifth stage
27 - 29. idem (12. to 14.) sixth stage

30. File Name

Winding parameter file types:

1. Winding files with preset parameters (**DEFAULT**):
    - PAF.txt

Shown in **Tonewinder®** screen with its name followed by the (**DEFAULT**) tag.

2. The **Initparameters.txt** and **Lastparameters.txt** files, with the same structure as the previous ones, but where initialization parameters for the winding and last winded coil parameters are stored respectively. (The **Lastparameters.txt** file cannot be used for manual winding mode. The parameters of the manual winding mode speed and number of turns are stored in **Lastparameters.txt** but the rest of the parameters are not stored) (**NOTE**: Repeat coil cannot be used when the manual winding mode has been used in the last coil).

System parameters files:

Tonewinder® use the file Lastsettings.txt to store parameters as:

- Maximum winding speed
- Number of initial turns
- DELTA
- OFFSET
- Wire tension sensor auto-hold enable/disable
- SSID WIFI
- PASSWORD WIFI
- Min. Wire Tension set value
- Max. WirebTension set value
- Ligth enable/disable switch

NOTE: SSID and **PASSWORD** are relative to the **Tonewinder®** connection to **Wi-Fi** router.

System parameter files structure is the same as the winding parameter files, but it has only the 10 fields, already mentioned +"/0":

Winding data files:

The **EmulateArraySPIFFS.txt** file contains the winding data of the last winded coil using **EMULATE** winding mode, it is only stored in SPIFFS memory when such data has not been yet stored in a **CLONE** file type. It is a temporary system file and the data it contains could be corrupted, so if you intend to use such data, you should do it with caution. This file does not contain information except in the case of winding in **CLONE** mode.

Image files:

This is just a picture, Fondo.jpg, contains information for the web server background and is an optional file that can be removed to save SPIFFS memory space.

6.6.2 User Files

There are two types of user files, the first one is exactly the same as the System winding parameters files, but all parameters are user configurable, those are the files **1.txt** to **11.txt**.

```
0,1000,10200,100,75,1500,800.00,2,0,10,100,500,90,2,6000,50,2,500,90,2,0,50,0,0,50,0,0,50,0,2022-11-10
```

*In this example we have a Table Winding file and its 30 parameters fields with the given name **2022-11-10**.*

The second file type is an attached file to the winding parameters file (Separate file but must be copied next to), which contains winding data generated during EMULATE winding mode and used exclusively in **CLONE** COIL winding mode. These are the files **CloneArray1.txt** to **CloneArray11.txt**. They only contain winding information in two fields, time from winding start in milliseconds, and wire positioning motor speed. The file stores a maximum of 4000 information points with a frequency of approximately 3.8 times per second. So the maximum storage time could be set between 16 and 17 minutes. If we exceed the winding time beyond 17 minutes, and the 4000 memory positions are filled, the subsequent data will not be stored. These files are empty for any winding mode other than **CLONE MODE**.

```
0,0
```

*This is the data contained in a **CloneArrayXXX.txt** for any file other tan **CLONE** MODE. Empty file with only 0, 0.*

Below an example of the partial contend of a **CloneArrayXXX.txt** file with winding data. Time and X motor speed coma separated data. The number of data depends of the winding time (Max 4000 points).

```
380,91
632,96
888,99
1147,101
1401,102
1666,101
1923,100
2183,105
2439,97
2706,103
2962,101
3222,95
3478,97
3746,207
3996,365
4264,425
4520,435
4788,514
5042,611
5303,722
5558,880
5826,1103
6083,1284
6342,1555
6599,1992
6866,2000
7122,2000
7382,1973
```

6.6.3 Storage memory

Tonewinder® has 11 memory positions available to store user files. The memory position gives the name to the corresponding file. When we create a new file, or modify an existing one, when saving it, the file acquires the name of the memory position where we save it and then this deletes the file that was previously in that memory position, if there was any.

That is, if we create a new file with the name "**Tele 2022-11-17**" (Maximum 20 characters for the name) and we save it in memory position number 3, the file will be stored with the name "**3.txt"** and will contain in its data, as a parameter no. 30, the name "**Tele 2022-11-17**" (which we will see on the **Tonewinder®** screen in memory position no. 3)

*Figure 60: "**LOAD BOBBIN"** screen*

The amount of SPIFFS available memory for user files is about 1.3 Mb. Enough to store 11 user files (**1.txt** to **11.txt**.), with their corresponding data files (**CloneArray1.txt** to **CloneArray11.txt**).

7 Maintenance and Service

This chapter describes the routine maintenance and the service procedures that the user may perform.

7.1 Routine and Preventive Maintenance

Tonewinder® is designed to be trouble-free if properly maintained.

7.1.1 Weekly maintenance

Lubricate felt discs in wire guide arm and wire stabilizer with oil.

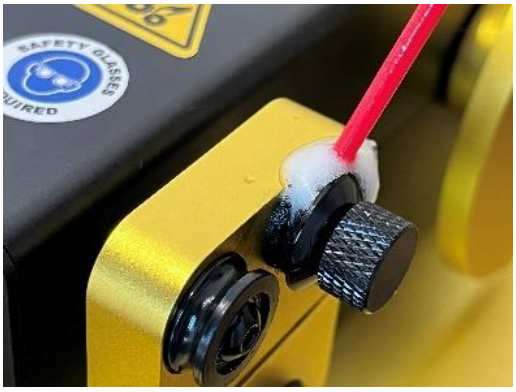


Figure 61: Lubricating wire tension felts

7.1.2 Monthly maintenance

Clean and lubricate pulleys with oil.

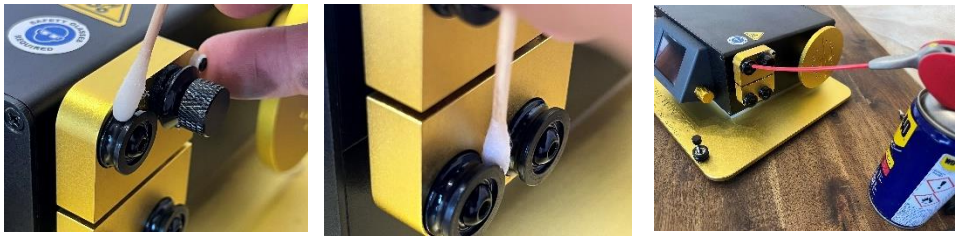


Figure 62: Lubricating pulleys

7.1.3 Yearly maintenance

Clean and grease the guide arm screw, then move it back and forth several times. Lubricate motor bearings with oil.

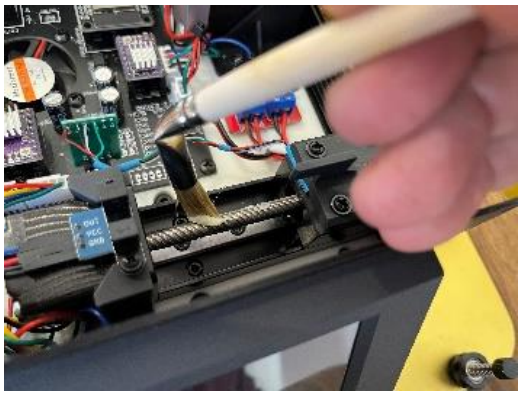


Figure 63: Lubricating wire arm guider screw with grease

7.2 Reload Software procedure (from scratch)

If connection between **Tonewinder®** and Wifi router is posible, reload software according to section 6.5.4.3 Software Update and Upload/Download files.

Only if connection between **Tonewinder®** and Wifi router **is not possible**, you can still upload the software by means of a USB/USB cable.

Plug the USB cable in the ESP32 board connector in the back cover (2).

Figure 64: Back panel with USB-C and 24V power inlet connectors

1. On a PC with Windows download and install the program **flash_download_tool_xxx.exe** (download). There will also be the drivers you eventually need if your PC does not find a new Serial Port Connection when connecting the USB. (Retain the COM number for posterior use)

2. Start the program **flash_download_tool_xxx.exe** and select:
    a. ChipType : **ESP32**
    b. Workmode : **Developer Mode**
3. Find the bin file to upload and select it, then write the memory address as indicated below. Type in or select the COM port (previously noted) and the port speed (speed **921.600** baud).
(ToneWinder_Inicializer.ino.esp32.bin): **0x10000**
Select the check box on the left of the file name.
4. If not already selected, click on the SPI SPEED and SPI MODE as shown in the image below.
5. Push **START**

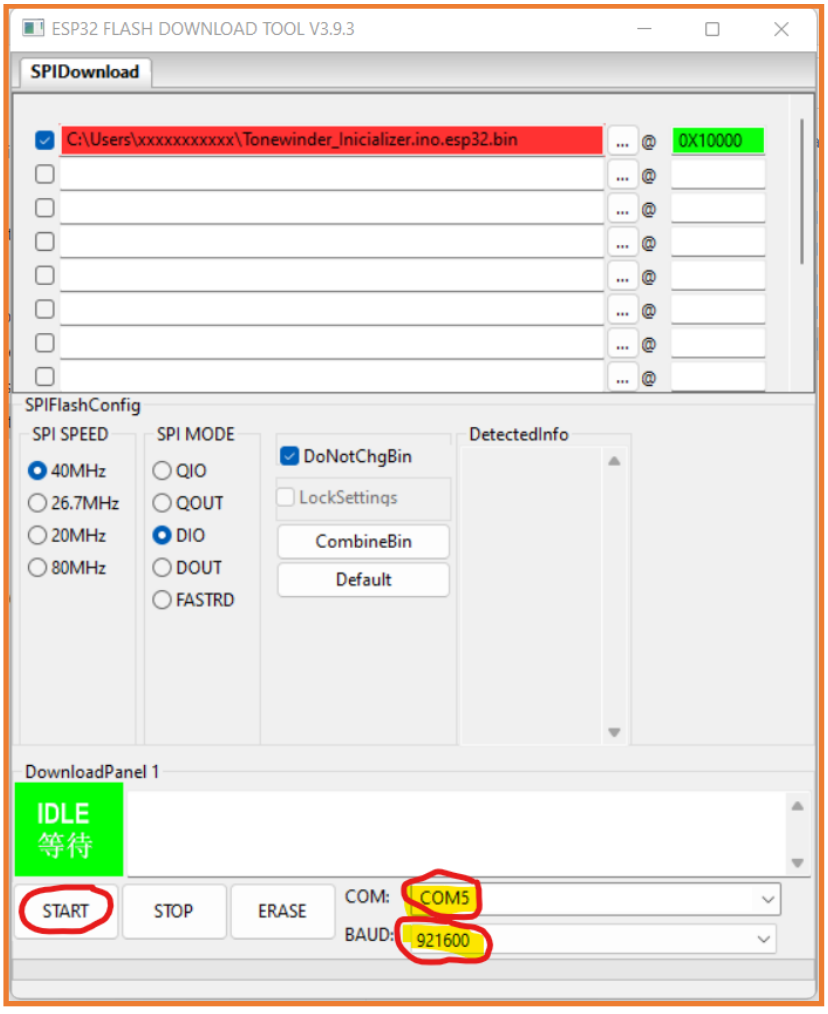


Figure 65: ESP32 Flash program

In case the last uploaded program was Initializer, once successfully uploaded, Tonewinder® will reinitiate , will format the system and will automatically show the Wi-Fi connection screen (may take a couple of minutes).

From this point, we can continue uploading .bin files by means of the USB or we can introduce the Wi-Fi router SSID and Password, and then we can continue the upload via the web server (recommended procedure).

8 Troubleshooting

This chapter is a guide to troubleshooting issues that may arise during operation of the device.

8.1 General Information about Troubleshooting

Tonewinder® has been designed with robustness in mind, to provide fully satisfactory and reliable operation. Both its mechanical components and the control program have been exhaustively tested for reliability, however, it is possible that some component deteriorates or suffers wear and it needs to be replaced, or that the control program is corrupted due to unexpected electric phenomena. In both cases we have solutions. We have spare parts for any of the components, we have a repair service in our facilities and the control programs can be reloaded by yourself.

In the event of unexpected or anomalous operation, we must always first ensure that **Tonewinder®** is connected to an appropriate electrical source (between 100V and 240V 50/60Hr)

The following features help you to identify and eliminate the source for problems that may arise during operation of the device.

If you are unable to resolve a problem following the instructions given here or if you experience problems that are not covered in this section, contact **Tonewinder OE** Technical Support for assistance. See the contact information at the beginning of this manual.

To facilitate device identification, have the serial number and technical name available when communicating with **Tonewinder OE.**

8.2 Troubleshooting Check

If a problem occurs with the device, the following troubleshooting check helps identifying and isolating the cause of the problem. Subsequent troubleshooting sections cover the problems in greater detail.

Symptom	Description
Dark screen	Check Power supply cable and switch. 1. Switch On 2. Chech there is power in the wall socket 3. Check there is power in power supply
Screen is On but winder does not inicialices.	X or Y motors bloqued 1. Move manually de winding plate to verify it rotates freely. 2. Move manually to rigth and left untill you feel resistance, the wire positioning arm to verify it is not blocked 3. Switch OFF the winder for 10 seconds and test again
Screen is On but winder does not inicialices and one or both motors vibrate and canot be freely moved by hand	Main program corrupted 1. Reload programs
The winder suddenly stops, ligth is blinking winding and screen shows up the message : PLEASE CHECK WIRE. WIRETENSION WAS TOO LOW OR TOO HIGH	Winding wire broken or too loose or to tigth 1. Increase or reduce wire tension 2. If wire is broken decide if it can be ironed or have to abbort the winding 3. Disable the auto-hold **Wire Sensor** clicking on the black button (This change will be stored in Basic Parameters)
The winder suddenly stops, ligth is blinking winding and screen shows up the message :	Winding motor stalled or blocked by a foreign object (Traces of hair or winding wire coils obstructing the winding shaft or wire tension too high) 1. Remove bloking object 2. Release wire tension 3. Clean winding shaft

PLEASE CHECK BOBBIN MOTOR. IT CAN BE BLOCKED OR STALLED	4. Continue winding 5. If problem persists, driver curent needs to be adjusted (Contact with us for instructions)
Winder makes strange noise, motors vibrating or moving too fast	Corrupted files 1. Switch OFF the winder for 10 seconds and test again 2. Reload the software
Upon **Pre-Start** push, X axis moves too fast or erratic, some parameter field showing extrange numbers or too large numbers or zero.	Parameters not correctly sent from touchscreen to microcontroller. 1. Push "**Back**" to go back to parameters screen 2. Edit parameters to set them correctly 3. Push again "**Pre-Start**" and keep it pushed until screen changes. CIlcking over **Pre-Start** too fast does not give enougth time to the communication procedures to interchange information correctly and may produce unexpected motor movements.

9 Specifications

This chapter provides the physical and performance specifications, including information about the materials used in **Tonewinder®**.

9.1 Physical Specifications

The physical specifications of the device are specified as follows:

Type	Specification
Device type	Tonewinder V 1.1
Microcontroller	ESP 32 Wroom Wi-Fi 240Ghz 512 Kb de SRAM
Motor X Driver	DRV8825
StepMotor X	Nema 11 with transmission (Resolution 0,0075mm)
Motor Y Driver	DRV8825
StepMotor Y	Nema 17 (Resolution 0,045 degrees)
Work Voltages	5vdc and 24vdc
Tension Sensor	Max 300 gr
Tension gauge accuracy	1 gr
Touch Screen	*Nextion 2.8“ Enhanced*
Max Speed	*1,500 r.p.m.*
Max power	*100w*
Range of use	Indoor use only
Ambient temperature	15 – 35 °C
Ambient humidity	12 - 80% relative humidity (non-condensing)
Power requirements	100 – 240 V AC; 50/60 Hz, 100 VA
Overvoltage category	II
Emission sound pressure level	<70 dB(A), typically 54 dB(A)
Dimensions (Height x width x depth)	110x225x238 mm
Weight	Approx. 2.8 kg

9.2 Appendix 1

About **Filling Factor**

In addition to other factors such as wire quality, wire insulation coating, magnets, and many others, also the filling factor (**Filling Factor**) is a parameter of great importance when characterizing the sound of our pickups. One of the determining factors of the sound that an inductive type transducer can generate is its distributed capacitance. This intrinsic characteristic of any coil is due, to some extent, to the way in which the wire loops of the coil are distributed along the width of the coil, which can be, among others, a winding of loops located contiguously with each other, without leaving any space between them (FF of 100%) or, a winding spacing the turns to each other (an FF of 20% means putting only two turns of wire in the place where ten of them would fit contiguously, without space in between)

We must keep in mind that lowering the filling factor increases the space between turns in the same layer, and therefore reduces the distributed capacitance in this precise layer, but a standard guitar pickup has several tens or hundreds of layers that overlap and also produce distributed capacity. By increasing the space between loops, we leave space available for subsequent layers loops to settle in that place. This means that an increase of the spacing between loops does not necessarily have the effect of a directly proportional reduction of distributed capacitance.

The increase in distributed capacity decreases the ability of our transducer to generate high frequencies, and therefore also reduces the number of harmonics (their intensity) of our transducer and causes the dominant tone of the transducer to be lower. That is why playing with the value of the filling factor allows us to vary the tone of our sound, allowing us to print that unique personal stamp we are looking for.

Figure 66: Filling Factor 20%

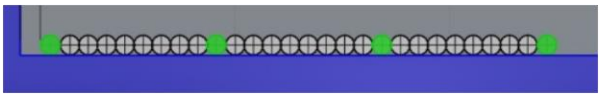


Figure 67: Filling Factor 100%