FreeETarget

Service Manual

Version 5 (DRAFT 3)

August 2024

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# Sumary

This document is the service manual for FreeETarget Version 5. It contains information about the operation of the target and PC client. For details about the construction of individual components, please see the component documentation.

The document is organized in chapters:

|  |  |
| --- | --- |
| Commissioning | Putting your target in service for the first time |
| LED Indicators | What to the LEDs mean |
| Multifunction Switches | Configuring the switches for your needs |
| WiFi Operation | Setting up the WiFi for your environment |
| Settings | How to configure the target to your applications |
| Uploading Firmware | How to put new software into the target |
| Trouble Shooting | Steps to take to resolve errors |

## Glossary

|  |  |
| --- | --- |
| Term | Description |
| Circuit | The signal processor to read the sensors and compute the shot location |
|  |  |
| PC Client | The program the user needs to see their score |
|  |  |
| Target | The assembly consisting of the circuit, housing, and target holder |

FreeETarget is an open source project to make a low cost electronic target that can be used for training and reginal competitions.

The features that FreeETarget provides are:

* Low cost of entry
* Precise representation of the score
* Ability to upgrade the software in the field
* Operation with WiFi or USB cables

To do this, the

The PC client is responsible for displaying the target and shot information to the shooter. The major parts of the PC client are illustrated in Figure

The target shown in Figure connects to the PC Client using USB or WiFi as needed.

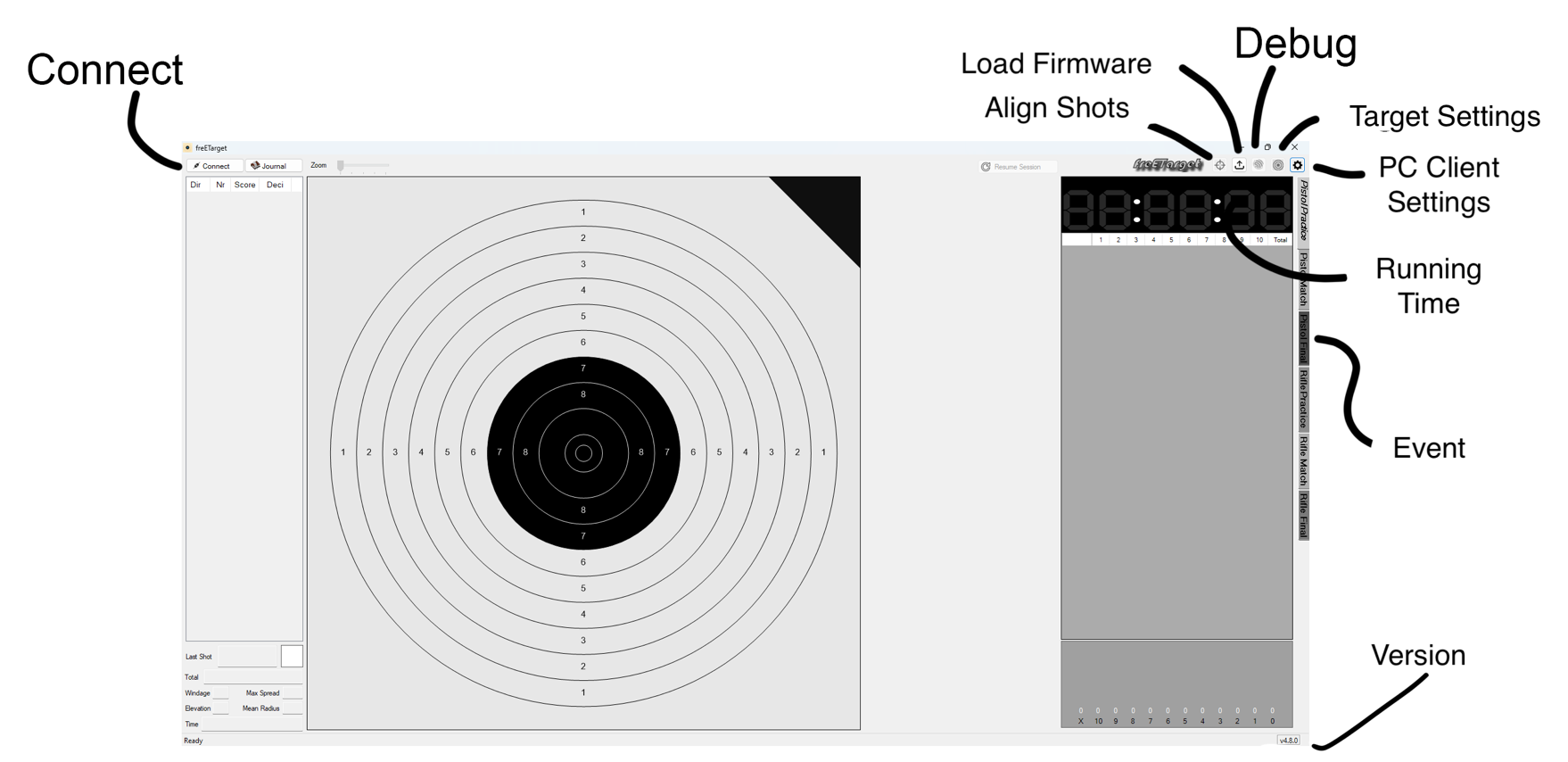


Figure 1: PC Client Menu Items

A close-up of a machine

Description automatically generated

The target is controlled by the circuit shown in Figure . The major components are shown in Figure

A close-up of a circuit board

Description automatically generated

## USB or WIFI?

All Version 5 boards support WiFi and USB operation. For all practical purposes both USB and WiFi will provide the same target information. The differences are in the details of the connection media. The USB and WiFi are summarized

|  |  |
| --- | --- |
| USB |  |
|  | Needs a purpose. Built 15 meter cable. DO NOT try to attach eight two-meter cables together |
|  | Some PCs do not supply enough current to drive the cable and the board. You may need to add a power adapter near the target |
|  | USB is needed to reflash the software |
|  | Power on diagnostics only operate on the USB connection |
| WiFI |  |
|  | Operates in both Access Point (easy) or Station Mode (allows internet access) |
|  | Software flashing cannot be done over WIFi |
|  | Supports up to four connections to each target |

|  |
| --- |
|  |

# COMMISSIONING

Commissioning is performing the first steps to load all of your software and make the target ready for operation.

Commissioning involves the following steps:

|  |  |
| --- | --- |
| Introduction | What makes up a target |
| Commissioning | Putting the target into service the first time |
| LED Indicators | What message to the LEDs display |
| Multifunction Switches | Setting the switches for individual prefereances |
| WiFI Operation | Setting up the WiFI |
| Setting up the PC client software | Performing the configurations needed to connect the target |
| Loading the tools needed to update the target firmware | Downloading files to allow for software updates |
|  |  |
|  |  |
|  |  |

## REQUIRED

* freETarget PC Client 4.5 or higher
* Firmware V5.0 or higher

Minimum

* 2 meter USB cable
* 110 or 220 VAC outlet

Preferred

* 15 meter USB cable
* 110 or 220 VAC outlet
* WiFi network

## INSPECTION

After you have assembled the freETarget into the target holder, inspect the following

* The flat cable is pressed firmly into the sensors and signal board
* There are no kinks or sharp bends in the flat cable.
* All of the sensors are correctly installed North through West
* When using the LED illumination
  + Verify the 12V supply wires are attached to the board
  + Verify that the LED wires are attached to the board
* When using the witness paper drive
  + Verify that the 12V supply wires are attached to the board
  + Verify that the motor wires are correctly attached to the board

With the USB cable plugged into the PC, turn on the PC

* + Verify that the RDY LED is blinking green (or Blue)
  + Verify that no other LEDs are blinking

## Download the PC Client Software

Visit the free-e-target.com -> Technical Support > Downloads to obtain the latest PC Client Software

Open the downloaded file from the download folder and install the software

## Setup the PC Client

Launch the PC client and select Application Configuration from the upper right icons (Settings)

A screenshot of a computer

Description automatically generated

* Enter the information needed,
* Select ESP32 for Version 5 hardware
* Choose the USB port (for the initial setup)

## Assembly

Assemble the target. PC, and cables as shown in Figure

For the first shot, we are going to connect the target to the PC using a 15 meter USB cable. This reduces the number of variables, and if needed configuration changes or software updates can be done quickly. Once we are sure that everything is working as it is supposed to we can confidently move on to more elaborate operations.

## FIRST SHOT

Set the target up ten meters from the firing point. Press the CONNECT button on the upper right of the PC client.

* Verify that after a few seconds the PC connects to the target
* The running timer increments or decrements.
* The target colour changes

If the target does not connect then review the connections and settings. Common mistakes include

* USB not configured correctly
  + Check the settings
* USB cable not plugged in correctly
  + Check the USB cables
* Defective USB cable
  + Repeat the setup but use a shorter (less than 2 meters) USB cable

Once the target connects, fire five shots into the paper. Try to separate the shots into 10, 8, 6, 4, 2 rings.

* Did the shots register in the correct place?
  + Yes, you’re done
  + No.
    - Did five shots register anywhere – Yes circuit works.
    - No shots registered – Recheck cables and connections
    - Press the DEBUG button (upper right)
      * Does it show an error?
* Do all 10 shots show up on the display?
  + No, check the cables and settings
* Are the shots correct, but the mirror image?
  + The sensors are installed correctly, but mirror image.
  + Swap North and East
  + Swap West and South
  + Go back to the beginning and test the circuit.
* Are the shots correct, but the reversed top and bottom?
  + The sensors are installed correctly, but upside down.
  + Swap North and West
  + Swap South and East
  + Go back to the beginning and test the circuit.

## ADVANCED OPERATION

Once you have the target correctly registering shots, it is time to move onto other features:

* WiFi Operation
  + Access Point – Simple operation
  + Station – Connect to your home network
  + Allow multiple people to watch your shooting
* Tabata Training
  + Select the ON and OFF time
  + Select how long between shots
* Rapid Fire shooting
  + Select the competition type

Refer to the relevant chapters here or the supplemental documentation contained on the web site

# LED INDICATORS

The LED indicators are used to shot the internal operation of the target, and fault diagnostics.

|  |  |  |  |
| --- | --- | --- | --- |
| RDY | X | Y |  |
|  |  |  | Normal Operation |
| RED | WHITE | BLUE | Power on self test (Hello World) to show that the software has booted and the circuit has some functionality |
| GREEN |  |  | The software has started but not ready for a shot |
| BLINK  GREEN |  |  | The software has completed startup and ready to receive shots |
| BLINK  BLUE |  |  | The target is connected to a PC through WiFi |
| BLUE |  |  | The target has gone to sleep |
|  | BLINK  GREEN |  | The WiFi is in station mode but not connected to a PC |
|  | GREEN |  | The WiFi is in station mode and connected to a PC |
|  | BLUE |  | The WiFi I in access mode but not connected to a PC |
|  | BLINK  BLUE |  | The WiFI is in station mode and connected to a PC |
|  |  | RED | Receiving data from the PC over WiFi or Serial |
|  |  | GREEN | Transmitting data to the PC over WiFi or Serial |
|  | GREEN |  | Shot press on MFS A (Switch 1) |
|  | WHITE |  | Long press on MFS A (Switch 1) |
|  |  | GREEN | Short press on MFS B (Switch 2) |
|  |  | WHITE | Long press on MFS B Switch 2) |
|  |  |  | Fault Codes |
| RED | RED | RED | Failure detected on NORTH sensor |
| RED | RED | GREEN | Failure detected on EASH sensor |
| RED | RED | BLUE | Failure detected on SOUTH sensor |
| RED | RED | YELLOW | Failure detected on WEST sensor |
| RED | GREEN | RED | Miss detected |

# MULTIFUNCTION SWITCHES

The Multi Function Switches are general purpose inputs and outputs that can be set to perform a user defined operation.

There are two sets of switches that are connected to the J1 connector at the top of the board. The connector is illustrated in Figure Y

A group of black circles with white letters

Description automatically generated

The 12 pins are assigned

|  |  |
| --- | --- |
| 1, 2 | 3.3 Volt , 50mA supply for interfaces |
| 4, 6, 8,10, 11, 12 | Digital Ground |
| 3 | Digital input A, also connected to push button 1 |
| 5 | Digital input B, also connected to push button 2 |
| 7 | Digital input or output C, defined in software |
|  |  |
| 9 | Digial input or output C, defined in software |

## Digital Inputs A/B (1/2)

Push button switches 1 and 2 are routed to discrete inputs A & B and have five modes of operation

* Tap switch 1
* Tap switch 2
* Hold switch 1
* Hold switch 2
* Hold switches 1 and 2 together

When pressed, the software starts a timer, if the switch is released inside of 2 seconds, it is considered a tap. If the switch is held for more than 2 seconds it is a hold. If both are held at the end of 2 seconds, then BOTH switches are held

### Digital Input Operation

The switches are configured by using the JSON command to each of the switches and modes,

* {“MFS\_HOLD\_1”:X}
* {“MFS\_HOLD\_2”:X}
* {“MFS\_HOLD\_12”:X}
* {“MFS\_TAP\_1”:X}
* {“MFS\_TAP\_2”:X}

Where the value of X is defined in Table A

Table A: Digital Input MFS Values

|  |  |  |
| --- | --- | --- |
| Value | Action | Description |
| 0 | Power Tap. | Wake the target up if it has gone to sleep |
| 1 | Paper Feed | Turn on the witness paper drive to feed paper |
| 2 | LED Adjust | Increase the brightness of the LEDs until 100% and then reset to zero |
| 3 | Paper Shot | Advance the paper a set distance as if a shot has been recognized |
| 4 | PC Test | Simulate a random shot sent to the PC client |
| 5 | On / Off | Put the target to sleep |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |

## Digital Inputs or Outputs C/D

Connections C and D differ from A and B in that C and D can be configured as inputs or outputs as needed

### Input or Output Operation

The switches / outputs are configured by using the JSON commands

* {“MFS\_HOLD\_C”:X}
* {“MFS”HOLD:D”:X}
* {“MFS\_SELECT\_CD”:X}

Where the value of X is defined in Table B

Table B: Digital I/O MFS Values

|  |  |  |
| --- | --- | --- |
| Value | Action | Description |
| 9 | No action |  |
| 10 | Target Type | Used to inform the PC of a specific target type |
| 18 | Rapid RED | Output is used to drive the RED indicator when in rapid fire |
| 20 | Rapid GREEN | Output is ued to drive the GREEN indicator when in rapid fire |
| 22 | Rapid LOW | {“MFS\_SELECT\_CD”:22} indicates that the rapid indicator LED is active low (0 turn on LED |
| 24 | Rapid HIGH | {“MFS\_SELECT\_CD”:24} indicates that the rapid indicator LED is active high (01turn on LED |
| 26 | Stepper Drive | The output is used to drive a stepper motor |

# WiFi OPERATION

The Version 5 hardware has two modes of WiFI operation

* Access Point. The target provides its’ own SSID, typically FET-TARGET. Each target is a unique SSID
* Station. The target uses the local (home) SSID. Multiple targets can be on the same SSID

The default operation of the FreeETarget is to be an access point, This allows for simple setup, but means that the Client PC cannot be on the internet at the same time as the target is connected.

While harder to setup, Station mode allows multiple targets to be on the same network as the PC and an internet connection

## ACCESS Point

Access point is the default operation. Access point sets the SSID of the target to be FET-name, where name can be changed through a command line

The controls for the access point are:

|  |  |
| --- | --- |
| Control | Description |
| {“NAME\_ID”:x} | The NAME\_ID allow the operator to select an SSID from a list of available SSIDs  0 – FET-TARGET. (Default)  1 – FET-1  2 – FET-2  3 – FET-3  4 – FET-4  5 – FET-5  6 – FET-6  7 – FET-7  8 – FET-8  9 – FET-9  10 – FET-10  11 – DOC  12 – DOPEY  13 – HAPPEY  14 – GRUPMY  15- BASHFUL  16 – SNEEZY  17 - SLEEPY  18 – RUDOLF  19 – DONNER  20 – BLITZEN  21 – DASHER  22 – PRANCER  23 – VIXEN  24 – COMET  25 – CUPID  26 - DUNDER  27 – ODIN  28 – WODEN  29 – THOR  30 - BALDAR |
| {“WIFI\_CHANNEL”:X} | Sets the WiFi channel  Use this control if there is a conflict with another network near the target  Range 1-11, Default 6. U |
| {“WIFI\_HIDDEN”:X} | Hides the SSID from the network  0 – Visible  1 - Hidden |
| {“WIFI\_PWD”:”xxxx} | Assigns a password to the target SSID |

**IMPORTANT**

When used in Access Mode, the target set itself to a fixed IP address of 192.168.10.9 and port 1090

The SSID used by the PC must match the one assigned by NAME\_ID, and is typically FET-TARGET

## Station Mode

Station mode allows the target to be on the same network as other devices in the building. For example the target can be on the home network allowing the target and teamViewer to be active at the same time on the same network

The controls for the Station Mode are:

|  |  |
| --- | --- |
| Control | Description |
| {“WIFI\_PWD”:”xxxx”} | Assigns a password to the active SSID |
| {“WIFI\_SSID”:”xxxx”} | Selectes the SSID to be used by the target |

**IMPORTANT**

When used in Station Mode, the router assigns the IP address to the target. To find the IP address that has been assigned to the target, use the {“ECHO”:0} command to list the settings and look for

WIFI\_IP\_ADDRESS: A.B.C.D, where A.B.C.D is the address that needs to be entered into PC client configuration

When using Station Mode, the PC Client will issue a warning that the SSID is not of the form FET-name. This is for information only and can be ignored.

## Quick Setup

Starting in Version 5.2, the software supports a quick WiFI setup

From the debug tab, send the command {“WC”} to the target

The target will respond with

!- Exit

1 – SSID

2 – Password

3 – Channel

4 – Hide Access point SSID

Enter the item ID and press [SEND]

Then enter the information when prompted and press [SEND]

# SETTINGS

The software has a number of settings that affect the operation of the unit

|  |  |  |  |
| --- | --- | --- | --- |
| Setting | Description | Typical Settings | Saved |
| ANGLE | Orientation of the sensors from vertical | 45 degrees | Y |
| FACE\_STRIKE | Enables face strike detection | Must be zero | Y |
| FOLLOW\_THROUGH | Time to wait before transmitting score | 0 – Immediate, 5 - Training | Y |
| KEEP\_ALIVE | WiFI beacon used to keep the WiFi connection alive | 120 | Y |
| LED\_BRIGHT | LED brightness 0-100% | 0 – Off, 100 - fully on | Y |
| MFS\_HOLD\_12 | Action to perform if both MFS switches are held down | 2 – LED adjust | Y |
| MFS\_TAP\_2 | Action to perform if switch 2 is tapped | 0 – Wake up | Y |
| MFS\_TAP\_1 | Action to perform if switch 1 is tapped | 3 – Paper shot | Y |
| MFS\_HOLD\_2 | Action to perform when switch 2 is held for 2 seconds | 5 – Turn the target off | Y |
| MFS\_HOLD\_1 | Action to perform when switch 1 is held for 1 second | 1 – Paper feed | Y |
| MFS\_HOLD\_C | Action to perform with GPIO C | 9 – No action | Y |
| MFS\_HOLD\_D | Action to perform with GPIO D | 9 – No acton | Y |
| MIN\_RING\_TIME | Time before next shot is recognized after the current shott | 500 ms | Y |
| NAME\_ID | Index to select a target name for FET- | 0-31, default 0 | Y |
| PAPER\_ECO | Distance in mm to ignore shot and not move paper | 0 – Disabled,  1-100 mm | Y |
| PAPER\_TIME | Sets the time the motor turns to advance the witness paper | 500ms | Y |
| PCNT\_LATENCY": | Uses a calibrated offset to improve the detection accuracy | 0 – Disabled, 32 Typical | Y |
| POWER\_SAVE | Idle time in minutes before going to sleep | 0 – Off, Typical 30 minutes | Y |
| RAPID\_COUNT | How many shots in a rapid fire string |  | N |
| RAPID\_ENABLE | Enable rapid fire mode | 1 - Enable | N |
| RAPID\_TIME | How long will the rapid fire event last in seconds |  | N |
| RAPID\_WAIT | How long to delay after rapid fire has been enabled |  | N |
| SEND\_MISS | Send a record to the PC whenever a shot has been missed |  | Y |
| SENSOR | Calibrated distance between sensor faces | 232mm for air pistol or air rifle | Y |
| SN | Serial number | Cannot be changed |  |
| STEP\_COUNT | How many steps to issue stepper motor witness paper | 0 – Disabled | Y |
| STEP\_TIME | Time interval in ms between steps | 0 – Disabled | Y |
| TABATA\_ENABLE | Enable the Tabata training mode | 0 – Disabled | N |
| TABATA\_ON | Time in seconds that the LEDs are on during a Tabata cycle |  | N |
| TABATA\_REST | Time in seconds that the LEDs are off between shots |  | N |
| TABATA\_WARN\_OFF | Time in seconds that the LEDs are off after the warning |  | N |
| TABATA\_WARN\_ON | Time in seconds that the LEDs are on to warn the shooter |  | N |
| TARGET\_TYPE | Target Override for alternate targets | 0 – No override  4 – 5 bull target 74mm  5 – 5 bull target 79mm  11 – 10bull + sighters (Orion)  12 – 10 bull + sighters (NRA) | Y |
| TOKEN | Enable Rapid Fire token ring | 0 – Disable,  1 Enable | Y |
| VREF\_LO | Shot detection low voltage threshold | 1.25 Volts | Y |
| VREF\_HI | Shot detection high voltage threshold (VREF\_HI > VREF\_LO) | 2.0 Volts | Y |
| WIFI\_CHANNEL | WiFi channel used with Access Point targets | 1 – First  6 – Recommended  11 - Last | Y |
| WIFI\_HIDDEN | Hide the SSID of an access point target (FET-xxx\_ | 0 Visible SSID  1 – Hode SSID | Y |
| WIFI\_PWD | WiFi password associated with SSID. Both Access point and Station Modes | Default is empty, no password | Y |
| WIFI\_SSID | SSID associated with Station Mode targets | Default is empty, Access Mode  Non empty, Station Mode | Y |
| Z\_OFFSET | Vertical distance from target plane to sensor plane | 13mm typical | Y |
| NORTH\_X/NORTH\_Y | Correction in mm from ideal location | 0 recommended | Y |
| EAST\_X/EAST\_Y | Correction in mm from ideal location | 0 recommended | Y |
| SOUTH\_X/SOUTH\_Y | Correction in mm from ideal location | 0 recommended | Y |
| WEST\_X/WEST\_Y | Correction in mm from ideal location | 0 recommended | Y |
|  | STATUS INFO |  |  |
| TRACE | Display diagnostics trace. | 1 Application  2 – Diagnostics (Hardware)  4 – Info  128 Critical (Always enabled | N |
| RUN\_STATE | Internal running state | 1 – Startup  2 – In operation (normal)  4 – Test Mode  8 - Sleep | N |
| RUNNING\_MINUTES | How long the target has been turned on |  | N |
| TIME\_TO\_SLEEP | How long before the target goes to sleep |  | N |
| TEMPERATURE | Temperature in C inside the target. Used to calculate speed of sound |  | N |
| RELATIVE\_HUMIDITY | Humidity inside the target. Used to calculate speed of sound |  | N |
| TIMER\_COUNT | Expected maximum time expected to occur after shot | 1 LSB – 100ns | N |
| V12 | LED / Witness paper drive voltage | Nominally 12V | N |
| WIFI\_MAC | MAC address of the WiFI |  | N |
| WIFI\_IP\_ADDRESS | IP address used by target |  | N |
| WIFI\_MODE | Access Point or Station mode programmed into target |  | N |
| TOKEN\_RING | Assigned token ring address |  | N |
| TOKEN\_OWNER | Which target is the master of the token ring | Should be 1 | N |
| VERSION | Current firmware version |  | N |
| PS\_VERSION | Persistent storage version. Used for automatic updates |  | Y |
| BD\_REV | Board revision |  |  |

# UPLOADING FIRMWARE

The target has the ability to be reprogrammed when new features are added or bugs fixed.

Uploading to the target performed in two steps

* Preparation – Setting up the PC Client download software, done once
* Upload – Uploading new software to the target

## Preparation

Version 5 hardware uses an ESP32 microcontroller. The download software is provided by a Python module that must be installed before the firmware can be loaded. Once the Python module have been downloaded once, there is no need to do it again

### Download Python

From your web browser, search fo PYTHON DOWNLOAD

Follow the link and select DownloadA blue background with yellow text

Description automatically generated Python (Note the version number may be higher than shown here)

Download and install Python.

If prompted, select OVERRID MAX PATH LENGTH

Restart your computer to update the PATH variable

### Install ESPTOOLS

Once the PC has finished restarting, launch a command prompt and run the command

***pip install esptool***

The PC will return something that looks like

C:\Users\allan>pip install esptool

Requirement already satisfied: esptool in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (4.7.0)

Requirement already satisfied: bitstring>=3.1.6 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (4.1.4)

Requirement already satisfied: cryptography>=2.1.4 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (42.0.2)

Requirement already satisfied: ecdsa>=0.16.0 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (0.18.0)

Requirement already satisfied: pyserial>=3.0 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (3.5)

Requirement already satisfied: reedsolo<1.8,>=1.5.3 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (1.7.0)

Requirement already satisfied: PyYAML>=5.1 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (6.0.1)

Requirement already satisfied: intelhex in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from esptool) (2.3.0)

Requirement already satisfied: bitarray<3.0.0,>=2.8.0 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from bitstring>=3.1.6->esptool) (2.9.2)

Requirement already satisfied: cffi>=1.12 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from cryptography>=2.1.4->esptool) (1.16.0)

Requirement already satisfied: six>=1.9.0 in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from ecdsa>=0.16.0->esptool) (1.16.0)

Requirement already satisfied: pycparser in c:\users\allan\appdata\local\packages\pythonsoftwarefoundation.python.3.11\_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from cffi>=1.12->cryptography>=2.1.4->esptool) (2.21)

[notice] A new release of pip is available: 24.0 -> 24.1.2

[notice] To update, run: C:\Users\allan\AppData\Local\Microsoft\WindowsApps\PythonSoftwareFoundation.Python.3.11\_qbz5n2kfra8p0\python.exe -m pip install --upgrade pip

Type

PATH

Verify that a line resembling

C:\Users\user\_name\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11\_qbz5n2kfra8p0\LocalCache\local-packages\Python311\Scripts;

Should appear in your path variable

## UPload

Once the basic download package has been installed, you can download new firmware whenever necessary

Visit the free-e-target.com -> tech support -> download for the current release software. Download and save the file (typically to your download folder)

In the PC client, from the upper right corner, select the download icon. The download menu will appear

A screenshot of a computer

Description automatically generated

Select the download file, typically freetarget\_version.bin

Press the upload firmware button. If everything is properly installed the PC will connect to the target and begin the upload.

# TROUBLE SHOOTING

The FreeETarget is a complicated system that relies on a number of components to work together. When they work it’s great, but I something is out of place it may be difficult to determine the fault and take corrective action. This section goes over the common faults and fixes for the target.

Rougly speaking, there are two phases to the failures:

* Construction failures due to assembling the target incorrectly
* Operational failures due to debris or parts coming loose.

The troubleshooting section treats this as separate sections

## Construction Trouble Shooting

You’ve put the target together and it doesn’t record shots, what to do.

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Expected Result | Yes | No |
| 1 | When power is first applied do the LEDs show RED-WHITE-BLUE | The circuit has powered up and begun operation | Check the USB cable for power |
| 2 | After RED-WHITE-BLUE does the RDY LED start blinking | The self test has completed and begun normal operation | The LEDs will stop with a pattern, Refer to the section LED Indicators to determine the fault.  Verify that all of the connections are in place |
| 3 | From the PC client, CONNECT to the target. After a few seconds doe the PC report connected, and the timer start counting | The USB is operational | Open the DEBUG tab.  Is there an error or some message on the window?  Folllow the corrective action recommended by the debugger |
| 4 | Take a shot into the target  Is a shot registered more-or-less correctly | The circuit has detected the pellet and reported the location.  Errors in assembly may introduce an error that can be calibrated out | Open the DEBUG tab.  Is there a shot registered on the display?  Is there an error message?  Common Problems  Cable not installed correctly  Sensors in the wrong location |
| 5 | The shot looks good, but is the mirror image of what it should be | Reverse the NORTH-EAST and WEST-SOUTH sensors |  |
| 6 | Is the LED illumination working? | The LEDs have been correctly installed | Verify that the LED wiring is installed correctly  Verify that the 12V supply is attached to the screw terminals  Verify that the polarity of the wires is correct |
| 7 | When the shot was fired did the witness paper move | The witness paper is correctly installed | Verify that the 12V supply is attached to the screw terminals  Verify that the polarity of the wires is correct |

### WiFi Testing

Once the basic functionality has been verified the WiFi can be turned on and verified

Preparation

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Expected Result | Yes | No |
| 1 | From the DEBUG menu  While connected to the USB, begin the WiFI configuration by typing {“WC”} [SEND]  Does the WiFI configuration menu appear on the display? | The WiFI is ready for configuration | Verify the USB connection  Retry the command  Is there ANY information on the PC client? |
| 2 | If using Station mode  Set the SSID |  |  |
| 3 | If using a password, set the password |  |  |
| 4 | If using an Access Point, set the Channel to 6 |  |  |
| 5 | Exit the configuration |  |  |
| 6 | On the PC Client, DISCONNECT and CONNECT |  |  |
| 7 | Using the DEBUG menu, look down the list of settings.  Find the WIFI\_IP setting |  |  |
| 8 | If Access Point was used  Is the IP address 192.168.10.9:1010 | The WiFi is configured correctly | Check that the value WIFI\_SSID is empty (“”) |
| 9 | If Station Mode was used  Is the IP address of the form  123.456.789.101:1090 | The WiFI is configured correctly  Record this IP address | Reenter the WIFI\_SSID and the WIFI\_PWD and try again |
| 10 | Verify that the PC is on the correct SSID for the target | The PC is configured correctly | Change the PC SSID to match the target |
| 11 | From the SETTINGs tab, set the connection type to TCPIP and enter the IP address recorded in Steps 8 or 9 as appropriate |  |  |
| 12 | Press CONNECT  After a few seconds does the client show CONNECTED | The PC is connected to the client | Repeat Steps 1 to 11 |

## Operational Trouble Shooting

Once you have successfully shot the first ten rounds into the target, you’ve proven that the target has been constructed correctly and all of the settings are correct. The target should continue to operate indefinitely.

Should the target stop working, it is most likely due to something being changed or an accumulation of dirt in the sensors. Follow the Table below for troubleshooting

### MISPLACED or no shots

When shooting a target, the shot is not recorded, or recorded in the wrong place

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Expected Result | Yes | No |
| 1 | The RDY LED is blinking green or blue | The target is receiving power and is operating correctly | The target is not receiving power or a short in the circuit  Look for debris on the board  Look for debris on the sensors, particularly West and South |
| 2 | Take a shot, Is a shot recorded in the right place | The sensors and calculations are correct | Make sure the flat cable is connected from the circuit board to all of the sensors. Press the cable in place  Make sure that there is no debris on the West or South connectors  Make sure that there is nothing blocking the sensors  When using a SUIS target mask, or a regular mask with a hole in it, ensure that the witness paper is supported. Layer the target as  Target Plate  Scrap target  Witness Paper  Front Facing Target |

### Witness Paper does not move

The witness paper should move as each shot is registered. If it does not, use the table below to identify the error

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Expected Result | Yes | No |
| 1 | Paper moves after every shot | The witness paper is operating correctly | Verify that the cables are connected and secure in the connector |
| 2 | The setting PAPER\_TIME or STEP\_COUNT are non zero | The setting appears to be correct | Program the correct value for your target |
| 3 | Press the paper advance button on the circuit  Paper advances | The witness paper hardware is installed correctly | Verify the cables  Verify the connectors  Verify that the AC adapter is plugged in |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |