F3X Uni-Timer Version 1.1.0

Contents

1. Introduction

UniTimer operates as either a central timing unit (CD Unit), a base switch (Base Unit) or a remote audio unit (Audio Unit).   It will work with MotCam and piCAMTracker camera systems. It can also be used (as a Base Unit) with the larger touch screen CD Unit. UniTimer also has wifi capability for managing small events and for connectivity to F3XVault for scoring.

2. Switches and ports
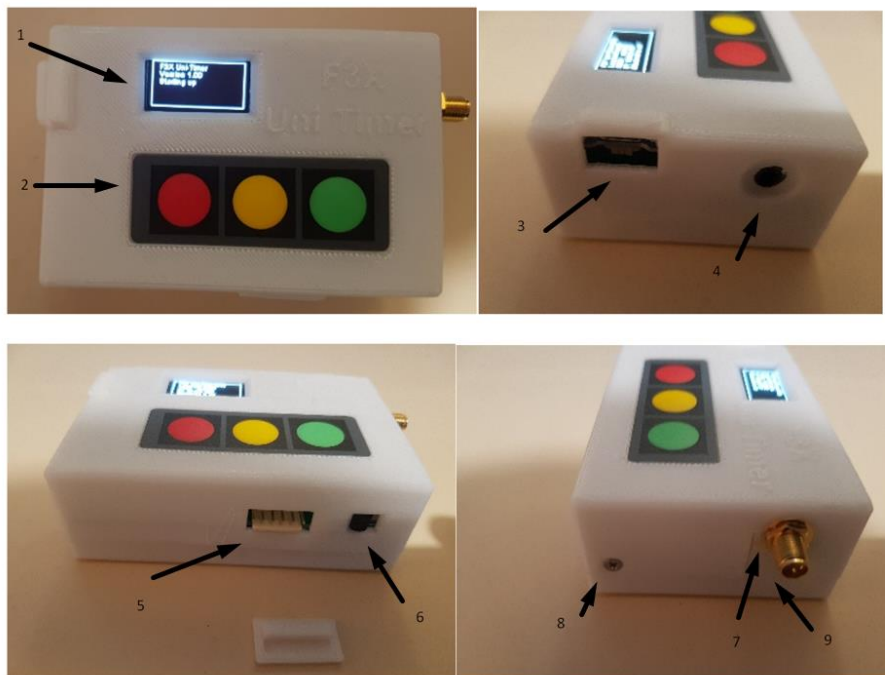
1. Display
2. Menu and operation switches
3. USB port – connect to phone charger to charge the battery
4. Audio out – connect headphones or a powered speaker
5. Expansion port
6. On/off switch
7. Antenna
8. Case screw
9. Charging port

3. Battery

The system is designed to be powered by a single cell 18650 LiIon battery. The unit has been fitted with a 3-pin connector to connect the battery using a JR style plug. The centre pin is positive and the two outer pins are negative.

Installation

The case must be opened to install the battery. Remove the case screw and antenna nut. The case can then be hinged open from the antenna end. The battery can then be pushed into the recess and held in place with double sided tape if necessary.
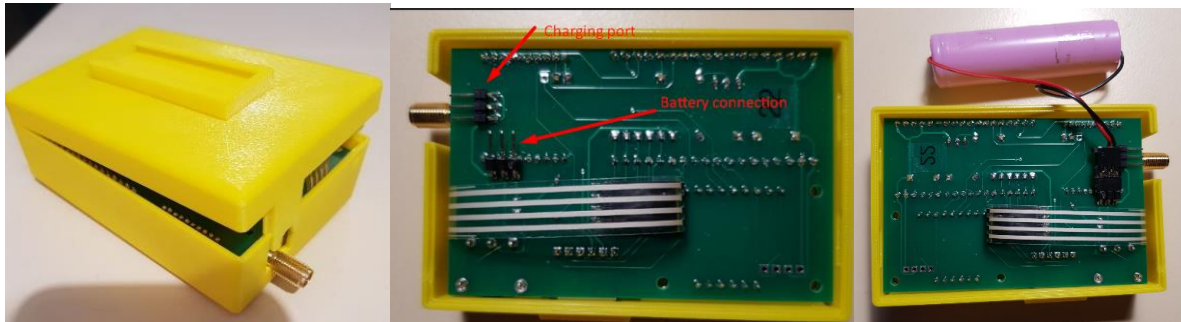
Charging

The unit has a USB charger built in. Connecting a USB power source and turning the unit on will initiate charging. Charge time is approximately 8 hours for a 1,200 mAh battery. Charging is indicated by a red LED visible through the case to the left of the display (not for dark blue cases). The LED has three modes when the USB is connected:

1. Flashing – USB power has been applied, but power switch is off – unit is not charging
2. Solid red – unit is charging
3. Off – battery is fully charged

Note that the unit can be used whilst charging. It will turn on as soon as USB power is connected.

There is also a charge socket next to the antenna connector. This is a three-pin header that a standard JR connector will plug into. The centre pin is positive and the two outer pins are negative. The header is directly connected to the battery so a standard LiPo charger can be used.

Battery voltage indicator

The battery voltage is visible on the main menu and the flight screens.

4. Starting

When powered on, either by battery or USB, the unit will go through start-up stages dependent on its settings:

1. Power on screen
   a. Startup
   b. Wifi initialisation (if wifi enabled)
2. Information screen – shows web server URL, wifi mode
3. Pressing the yellow button then shows the main menu

5. Navigation

There are three buttons used to navigate the system:

1. Red – menu exit and flight reset. Factory Reset when pressed on startup screen.
2. Yellow – menu item select
3. Green – menu item navigation and flight start

6. Factory Reset

If necessary, e.g. after a major firmware upgrade, a factory reset can be run. This simply resets critical configuration data back to preset values. To run the factory reset, press and hold the Red button once the startup screen appears after turning on power. The screen will then show *Factory Reset* and restart the system.

4. System Menus

Main Menu

The main menu has the following (in Base Unit configuration the Setup Bases item is not present):

1. F3F Flights – flight menus
2. Setup Bases – base and camera unit selection
3. Options – setup options
4. Sleep – puts the unit into low power sleep mode. Use when charging.
5. Network Info – displays network connection information

F3F Flights Menu
1. Practice Flights
2. Practice Laps
3. Prac Flight Restart setting

Options Menu

1. Volume – Cycles through 10 steps by pressing Yellow button
2. Unit Type – CD, Base A, Base B, Audio, or Wind (changing requires a restart)
3. Wifi – Client, AP, or Off (selecting goes to the wifi menu)

Bases Menu

Allows binding of base or camera units to use with the system.

Binding process

1. Ensure that the relevant base or camera unit is turned on
2. Select the unit in the Base menu. It will show 'On' and should also show 'Linked' to confirm that binding has been successful and then the signal strength (1-10).
3. This process only needs to be done once. The configuration is saved and subsequent use of the system uses the saved configuration.
4. Units should be deselected if they are not being used ('-' shown next to unit name)

Wifi Menu

1. Wifi Mode
2. SSID to use
3. Save Setting and Restart

The WiFi type can be selected to be one of:

- Client (UniTimer connects to an access point, e.g. a mobile phone hotspot)
- AP (UniTimer sets up its own access point)
- Off (Wifi is turned off)

For Client mode, the SSID of the wifi router/hotspot to be used must be specified. This can be selected here, but the values to use are setup using the System Settings web page.

A restart is necessary when switching Wifi modes

Signal indicator

A small Y or N will show in the bottom right of the display on the flights pages and setup menu. When using the unit as a base unit, this indicates connection to the central timing unit. Y=connected. N=not connected.

5. Wifi

Wifi Modes

The unit has three wifi modes:

1. Client Mode – connects to a wifi access point, e.g. a router or phone set to be a mobile hotspot
2. AP Mode – runs its own access point that other devices can connect to
3. Off – wifi disabled

When in Client or AP mode, devices such as smart phones can connect to the unit's web pages for information and configuration.

AP Mode

If AP mode is selected then the unit will start up its own access point called 'F3X Timer'. To use this:

1. Use a wifi device, e.g. mobile phone to connect to the unit
2. On the phone wifi setup select 'F3X Timer' from the available wifi sources
3. In a web browser, enter 192.168.1.4 as the address to use

AP mode must be used for setting up the client mode access point details.

Client Mode

If Client mode is selected, then the unit will attempt to connect to a local wifi access point using saved credentials. These credentials are stored in a file on the system called ssids.csv. The details (SSID name and password) of up to five access points can be stored in the system. The access point to use is selected in the Options menu.

If the access point is not turned on, not in range, or the credentials have not been set, then a warning will show saying that it is unable to connect. Press the green button to continue. Wifi will not be active.

Further details on setting up Wifi are available here:

https://github.com/simonwa2/F3X-Timing-System/wiki/F3X-Uni-Timer---wifi-modes

and:

https://github.com/simonwa2/F3X-Timing-System/wiki/F3X-Uni-Timer---configuring-for-multiple-wifi-access-points

7. Web Pages

The unit has a web server that provides web pages for controlling and viewing flights, and for configuring the system. The address to use is shown on the startup screen.

Main (Home) page

The home page provides access to events, practice flights and system settings. It is also used to initiate firmware upgrades. The URL address for this page is as shown on the UniTimer Startup and Network Info screens.

F3X Uni-Timer

Events

Practice Flights

System Settings

Software Updates:

Upload new support file	Upload new firmware file
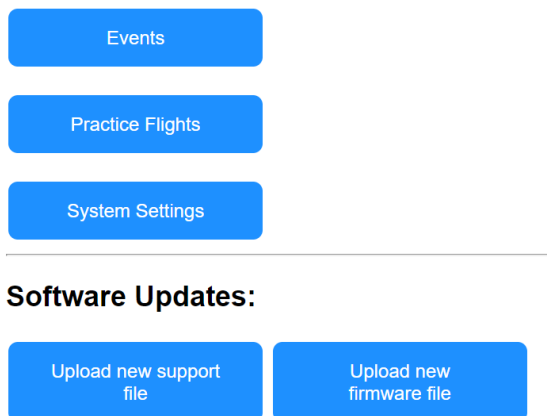
System Settings

Allows the configuration of various settings.

- Base Configuration – shows the current base/camera setup
- Volume – shows and adjusts the volume for the audio out socket
- Battery – shows the current battery charge
- Wifi HotSpot – use this to set up credentials for up to to five different wifi hotspots/routers. The hotspot to then use is set in the Wifi Options page on UniTimer. This is applicable only to Client mode. Enter the SSID name and password and select *Submit.*
- F3XVault User – use this to set your credentials for logging into F3XVault. Required for downloading events and uploading flight data from/to F3XVault. Enter the username and password and select *Submit*
- Software Updates. Select *Upload new support file* or *Upload new firmware file* as directed in the upgrade instructions included with new versions.

System Settings

Base Configuration:

Base A: On	Base B: On
Cam A: Off	Cam B: Off

Volume: 10 [slider]

Battery: 4 V

Wifi Hotspot (UniTimer as client):

ID	SSID:	Password:	
1	msts02	xxxxxx	Submit
2	SWA	xxxxxx	Submit
3	ssid3	xxxxxx	Submit
4	ssid4	xxxxxx	Submit
5	F3Xsw	xxxxxx	Submit

F3xVault User:

Username:	Password:	
simonwa2	xxxxxxxx	Submit

Software Updates:

Upload new support file	Upload new firmware file

7. F3F Flights

There are three types of flight management:

- Practice Flights – individual F3F flights saved for later analysis
- Practice Laps – continuous laps practice with lap times called out
- Contest Flights – full F3F contests suitable for small events or groups practice

Practice Flights

Practice flights can be run from the unit interface (LCD display and buttons) or the web interface.

Unit Interface:

- From the Flights Menu:
  - Set the desired auto-restart time: manual, 10, 15, 20, or 30 secs
  - Select Practice Flights
  - Use:
    - Green button to start the flight – Pre-Launch, Launched
    - Red button to reset the flight
    - Yellow button to go back to the Flights Menu
  - Flight data: status, time and lap count are shown on the screen
  - At the end of a flight, the flight data is saved to internal storage for later retrieval

Web interface

- From the Practice Flights web page:
  - Set the desired auto-restart time: manual, 10, 15, 20, or 30 secs
  - To run the flight use:
    - Start Flight to start the flight – Pre-Launch, Launched
    - Reset Flight to reset the flight
  - Flight data is dynamically displayed as the flight progresses. Note that updating the web page is a lower priority than flight signalling and timing and may be delayed slightly.
  - To access flight data use:
    - Download Results to download a .csv file to your computer. The .csv file can be viewed in a text editor or a spreadsheet (Excel). Note that the download does not work with Android phones (iPhone not tested). There is only one file and flights are appended to it after each flight.
    - Delete Results to clear the results file.

Manual or automatic start of the next flight can be set on the F3F Flights menu. The options are 10s, 15s, 20s, 30s or manual start. If an auto start time is selected then, at the end of a flight, a pre-launch countdown will commence. This gives the pilot time to fly back to the centre of the course n time to get the Launched signal and commence the 30s climb-out to start the flight,

Practice Flights

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Reset Flight   Start Flight

Flight:	# 1
Flight Phase:	Ready
Working Time:	30 remaining
Climb Out Time:	30 remaining
Flight Time:	0

Lap 1	0.0	Lap 6	0.0
Lap 2	0.0	Lap 7	0.0
Lap 3	0.0	Lap 8	0.0
Lap 4	0.0	Lap 9	0.0
Lap 5	0.0	Lap 10	0.0

Restart Auto 0s

Download Results

Delete Results

Volume:	10	

Battery:	3.9 V

Practice Laps

Practice laps can only be run from the unit interface (LCD display and buttons). It provides for continuous lap timing with each lap time being called.

- From the Flights Menu:
    - Select Practice Laps
    - Use:
        - Green button to start the flight
        - Red button to reset the flight
        - Yellow button to go back to the Flights Menu

Events Flights

Contest flights can only be run from the web interface. Two types of events can be created:

- Downloaded from F3XVault. Event created in F3XVault and pilots assigned. Rounds created in UniTimer. Flight times can be uploaded to F3XVault for scoring. Flight data is also available to be downloaded to a computer for analysis.

- Manually created on UniTimer. Flights cannot be uploaded to F3XVault, but flight data is available to be downloaded to a computer for analysis.

To run events, select Events from the home page. This open the Events page where you can add or run events and download event flight data.

Events

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Search F3xVault | Create New Event | Delete All Events

Stored Event List:

Name	Date	Pilots	Rounds	In Vault?		
Simon CD test 2	11/24/19	3	0	Yes	Run	
Simon F3F test A1	04/16/20	6	0	Yes	Run	

F3XVault Event

Note that to search F3XVault you must have set your F3XVault username and password on the System Settings page.

To add an F3XVault event:

- select *Search F3XVault* - a search page will open
- set the country code and range of months to search
- select *Search Vault* – a list of available events will load
- select *Load* for the required event – the event will be loaded to memory and the Events page will open.

F3XVault Search

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Search Country Code	AU
Number of months in the past to search	12
Number of months in the future to search	4

Search Vault

Event List:

ID	Name	Location	Date	
1837	Simon F3F test A1	Albany T10 Windfarm	2020-04-16	Load
1767	Bay of Isles Cup 2020 & F3F Team Trial	Albany T10 Windfarm	2020-02-01	Load
1735	Simon CD test 2	Albany T10 Windfarm	2019-11-24	Load
1674	WA F3F State Open (Trial Event)	Albany	2019-10-12	Load

Manual Events

To manually create an event:

- Select *Create New Event* on the Events page – the New Event page will open
- Complete the event name, location, date and number of pilot fields.
- Update the pilot names for the number of pilots that will compete (or leave as is)
- Select *Create* – The event will be created and the Events page will open

Running an Event

- Select *Run* for the event from the list of stored events on the Events page.
- The Rounds page opens. For a new event, no rounds will be available and at least one must be created to start flying:
    - Select *New Round* – the New Round page opens
        - Set the number of rounds to create
        - Set the number of back to back rounds. This is useful for small events where a pilot flies two or more consecutive flights without landing
        - Adjust the flight order, if necessary, using the *Up* and *Down* buttons for each pilot. Note that flight order will be retained for future rounds.
        - Select *Create New Round* to create the new round(s). The rounds will be created and the Rounds page will open with the first round selected

Simon F3F test A1

Rounds

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[New Round] [Save Round to Vault]

[⇐] [1 of 4] [⇒]

Flight	Pilot	Time	Status	
1	Paul Marshall	0.00	Not run	[Run]
2	Tim Traver	0.00	Not run	[Run]
3	Tim Kullack	0.00	Not run	[Run]
4	Aubry GABANON	0.00	Not run	[Run]
5	Jaejin Lee	0.00	Not run	[Run]
6	Sverrir Gunnlaugsson	0.00	Not run	[Run]

- The round to fly can be selected using the left and right arrow buttons.
- Select *Run* for the first pilot to fly, e.g. Round 1, Flight 1. The Flights page will open and the UniTimer LCD display will show the flight data screen. The flight is now ready to start.
- Select *Start Flight* on the web page or press the green button on UniTimer to start the 30 second pre-launch countdown.
- When the aircraft is launched, select *Start Flight* on the web page or press the Green button on UniTimer to start the 30 second launch countdown.
- UniTimer now responds to Base A and Base B button presses for the Out and base turn signals.
- During the flight the web page and the UniTimer display will show the flight status, countdowns and flight time. The web page will also show the individual lap times and the next two pilots to fly.
- At any point in the flight up until it is finished, *Reset Flight* or the Red button can be pressed. The flight will be reset back to the start point.
- After the flight has finished, selecting *Start Flight* or the Green button will advance to the next flight.
- If a pilot has to fly out of order then the *<= Prev* or *Next =>* buttons can be pressed to move through the flight order. Or return to the Rounds screen to directly select the round and flight to fly.

Flights

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Reset Flight   ⇦ Prev   Next ⇨

Start Flight

Event:	Simon F3F test A1
Pilot:	Paul Marshall
Round:	# 1
Flight:	# 1
Flight Phase:	Ready
Working Time:	30 remaining
Climb Out Time:	30 remaining
Flight Time:	0.00

Lap 1	0.0	Lap 6	0.0
Lap 2	0.0	Lap 7	0.0
Lap 3	0.0	Lap 8	0.0
Lap 4	0.0	Lap 9	0.0
Lap 5	0.0	Lap 10	0.0

Next Pilots
Tim Traver
Tim Kullack

Volume:	10	⸺⸺⸺⸺

Saving Rounds to F3XVault

Once one or more flights have been run the flight data can be uploaded to F3XVault from the Rounds page. Select *Save Round to Vault*. The flight data will then be scored by F3XVault. This is only available for events that have been downloaded from F3XVault.

Downloading Flight Data to Computer

Any event (from F3XVault or manually created) can be downloaded to a computer once rounds have been created. The file provided is in .csv format which can be opened with a text editor or with Excel spreadsheet. The file name will be eventx.csv where x is the event number. The data columns are:

Round, Flight, Pilot, Time, Climb Out, Lap 1, Lap 2 …. Lap 10

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Round	Flight	Pilot	Time	Climb Out	Lap 1	Lap 2	Lap 3	Lap 4	Lap 5	Lap 6	Lap 7	Lap 8	Lap 9	Lap 10
2	1	1	Pilot 1	24.86	6.6	3.3	3	2.7	2.8	3	2.5	2	1.8	1.6	1.7
3	1	2	Pilot 2	0	0	0	0	0	0	0	0	0	0	0	0
4	1	3	Pilot 3	0	0	0	0	0	0	0	0	0	0	0	0
5	1	4	Pilot 4	0	0	0	0	0	0	0	0	0	0	0	0
6	1	5	Pilot 5	0	0	0	0	0	0	0	0	0	0	0	0
7	2	1	Pilot 1	0	0	0	0	0	0	0	0	0	0	0	0
8	2	2	Pilot 2	0	0	0	0	0	0	0	0	0	0	0	0

Select *Download* on the Events page for the required event.

Events

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| Search F3xVault | Create New Event | Delete All Events |

Stored Event List:

Name	Date	Pilots	Rounds	In Vault?		
Simon CD test 2	11/24/19	3	0	Yes	Run	
Simon F3F test A1	04/16/20	6	4	Yes	Run	Download
Event 1	28/02/2020	5	4	No	Run	Download

Clearing the events list

A maximum of five events can be stored on UniTimer. Once that limit is reached all events must be deleted before any new events can be created. There is no single event delete. Select *Delete All Events* to remove all events from UniTimer. Note that this has no impact on F3XVault.

8. Firmware Updates

Updating the firmware is done via a browser. There are two type of files that may need to be updated:

1. Firmware files. The actual code the unit runs. These all have a file extension of .bin, e.g. "F3X UniTimer vx.xx.bin"
2. Support files. The code for the web pages. These typically have a file extension of .mp3, .csv or .html.

Update files will be available from GitHub here:

https://github.com/simonwa2/F3X-Timing-System

Instructions for applying the updates are contained within each version's page.

9. Base Unit Operation

If configured as a base unit, the menus are only slightly different, e.g. no Base Setup option. The unit will automatically go into the correct flight mode once the CD unit goes to an F3F flight start screen.

Signalling a turn can be done in two ways:

1. Pressing the Red button
2. Connecting an external switch to the expansion port (D1)

11.　　Expansion Port

The expansion port provides for the following:

1. Two external switches – e.g. a base turn switch on D1
2. Anemometer (not yet implement in software)
   a. Davis 6410, or
   b. Peet Bros Ultimeter Pro
3. External alarm/buzzer (not yet implemented in software)

Connector pins (left to right):

1. Ground
2. 3.3V (for Davis anemometer only)
3. Relay – open collector output for driving a relay for an external buzzer
4. D2 – digital input for anemometer or external switch
5. D1 - digital input for anemometer or external switch
6. A1 – analog input for Davis wind direction

When used as external switches, D1 and D2 have the following functions:

	D1	D2	Green button
Event Flights	Pre-launch, Launch then reset	Pre-launch though to Started, then turns	Pre-launch though to Started, then turns
Practice Flights	Pre-launch, Launch then reset	Pre-launch though to Started, then turns	Pre-launch though to Started, then turns
Practice Laps	Start then turns	Start then turns	Start then turns
Base Unit	Sends turn signal to CD	Sends turn signal to CD	Sends turn signal to CD

10.　　Audio Unit Operation

If configured as an audio unit, the menus are only slightly different, e.g. no Base Setup option. The unit will automatically go into the correct flight mode once the CD unit goes to an F3F flight start screen.