CD Unit Changes in Version 2.5

This update primarily is for sending data to the Audio unit in training mode

- Correctly advises Audio unit of lap times and flight phase signalling
- Advises Audio unit of clip to play if flight time is below set threshold
- Updated code for restart of flight by Base A (or Camera A) for flight training mode.

This version only requires that the Teensy processor be update if upgrading from version 2.4. If upgrading from an earlier version then the Display update is also required.

If using the Audio unit then it requires an upgrade (Version 3.2) – including with this distribution.

F3X Timing System – F3F Manual

This manual covers the F3X Timing System in F3F mode using the CD unit.

The system consists of the following units interconnected via a 2.4 GHz radio network:

- CD – manages the F3F event
- Base – base turn button with information display
- Audio – remote audio for connection to a PA system
- Wind - remote anemometer sends wind speed and direction data to the CD unit
- Display – large LED display panel that shows flight information
- Coordinator – network 'router' that controls the 2.4GHz radio network (not wifi)

A minimal system comprises one CD, two Base and one Coordinator units.

CD Unit

1. Description

The CD unit provides the contest director control over an event. Contest data downloaded from f3xvault provides event selection and pilot lists. Flight results can be automatically uploaded to f3xvault for instant results.

The unit connects to other timing system units:

- Base unit – Base A and Base B units
- Audio unit – for connection to a PA system
- Wind unit – provides wind speed and direction to the system
- Display unit – large LED display for providing flight data to competitors and bystanders

The system uses a 4 inch, high intensity, colour touchscreen for operation.

A socket provides direct connectivity to an anemometer or manually connected base buttons if wireless units are not in use. An audio socket is also available to provide direct connect to a PA system. There is also an inbuilt speaker.

Power is provided by two 18650 Li Ion batteries. A CR1220 cell battery maintains the date/time clock when the power is off.

2. Controls

The CD unit primarily uses soft keys on the touch screen.

- Buttons on the bottom of the screen
- A "Back" button on the top left
- Selectable items in lists
- Selectable option items on the screen
- Scrollbars on the left or right of the screen when lists exceed the displayable limit
- Some actions will cause a verification or information panel to popup

Keyboard

Some actions require entering text, eg names and paswwords. A touchscreen keyboard will popup to allow this data entry.

Red Button

The red button on the top of the unit is for starting and progressing a flight.

Information

The top two rows of the screen display information, typically regarding screeen function and activity. Some screen show time, network status, wifi status and battery voltage.

Voice Announcements

When running a flight the system will make announcements:

- Turn signals
- Lap counts
- Countdowns (pre-launch and launch)

Network and Wifi Status

Some screens show the local network and wifi connectivity status at the top right of the screen

The status is shown as three symbols, e.g. *W5. This indicates that the local network to the Coordinator is active (the *), the wifi is connected and has signal level 5 (range of 1 to 9). A circle with a diagonal line indicates no connection.

3. Startup screen

When initially switched on the unit will go through some system checks and then show the following menu screen:

There are four touch keys:

- F3F - puts the system in F3F mode
- F3B
- F3K
- Update - applies firmware updates to the display module processor

At this time only the F3F and Update buttons operate. Support for F3B and F3K are planned for the future.

4. F3F Screen

Selecting F3F from the main menu, sets the system up for managing an F3F event.

There are four touch keys:

- Run Event – event selection and running
- Practice – F3F practice mode
- System Settings – configure the system
- Link Tests – not currently implemented

5. Event Selection Screen

This screen shows the currently loaded contests, ontest, date/time, battery voltage and network/wifi connectivity.

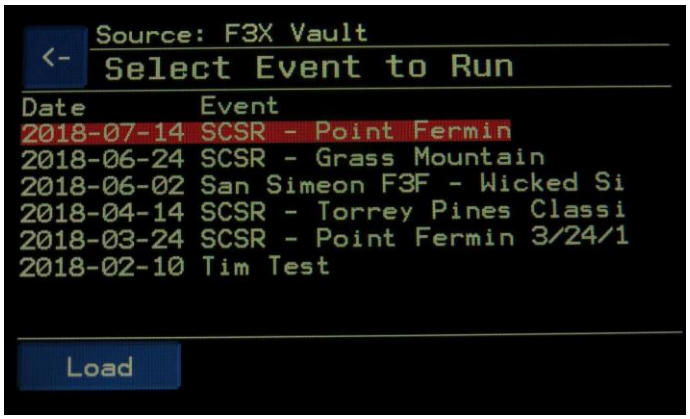
There are four touch keys:

- Run Event – Run a contest. Takes you to the event details screen
- Search Vault – select and load contests from f3xvault

- New Event – not currently implemented
- Clear Event – removes the currently selected event from the system (not from F3XVault)

6. F3xVault

Events created in f3xvault as F3F Slope Race (Plus Scoring) can be downloaded to the CD unit. Selecting Vault from the Contests screen will trigger connection to f3xvault and provide a list of available contests. A contest can be selected and then loaded into the CD unit internal storage.



The “Load” key loads the slected event into internal storage and returns to the main event selection screen.

If results for an event already exist in f3xvault, then there is an option to download the results. This may be useful for test events, or if the system fails to the point that an event must be restored.

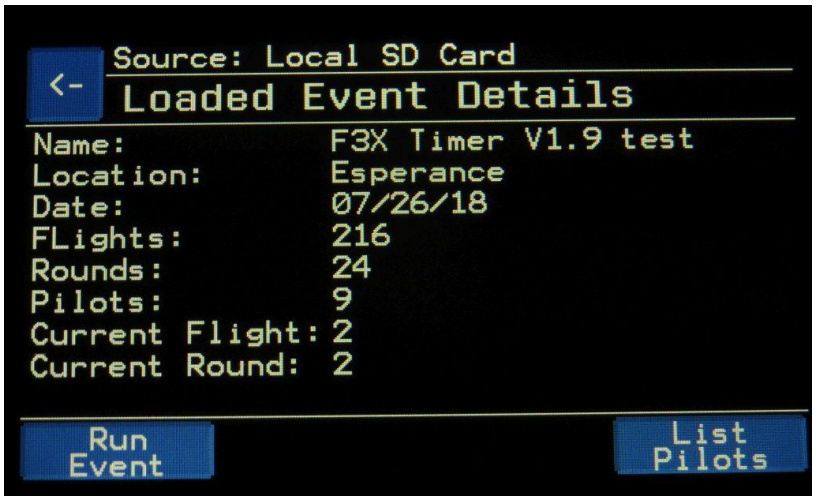
Flight data can be uploaded automatically or manually and includes:

- Time of flight
- Flight time
- Penalties
- Average wind speed and direction
- Lap times and time from launch to entering the course

Results are available from f3xvault during the contest as they are uploaded.

7. Event Details Screen

Shows details of the event and the pilot list. When first opened it will show various event data:



Selecting “List Pilots” will switch the screen to show the pilot list.

8. Rounds Screen

The Rounds screen shows the list of rounds and the flight order for the selected round

There are six touch keys:

- Run – run the selected round and flight (highlighted in red)
- New Round – generate a new round of flights
- Save Rnd – save all flights the selected round to f3xvault, that have not already been saved
- Save All – save all flights in the contest to f3xvault, that have not already been saved
- -Pen – remove a penalty from the selected flight
- +Pen – add a penalty to the selected flight

The Rounds screen shows the status of flights that have been run:

- Flight time
- Penalty (P)
- Saved to f3xvault (S) or run but not saved (R)

9. Generate Round screen

The Generate screen will create a new round. There are three keys:

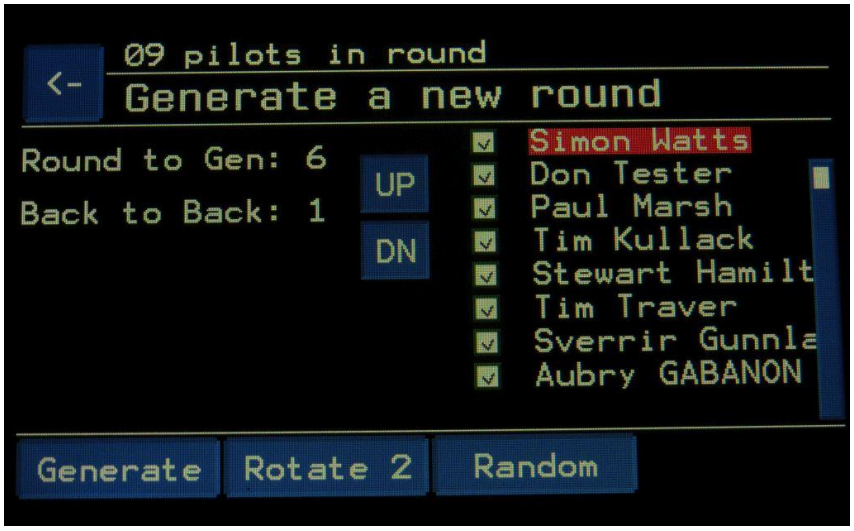
- Generate – creates a round with the selected flight order
- Rotate 2 – rotates the flight order by two. This has been used in the US to assistance in manning the bases
- Random – generates a random flight order

The flight order can also be manipulated manually. The selected pilot can be moved up or down in the flight order using the UP and DN buttons.

<Individual pilot can be removed from the round via the tick boxes.>

The number of rounds to generate can be selected from 1 to 6. Touching the “Round to Gen” text will rotate through the number of rounds to generate.

In Western Australia, we usually run back to back flights. A pilot flies two rounds without landing between the first and second. This reduces time spent launching and landing, resulting in more rounds flown. The number of back to back rounds is selectable between 1 and 6.


<-
09 pilots in round
Generate a new round
Round to Gen: 6
Back to Back: 1
UP
DN
Simon Watts
Don Tester
Paul Marsh
Tim Kullack
Stewart Hamilt
Tim Traver
Sverrir Gunnla
Aubry GABANON
Generate
Rotate 2
Random

10. Flight Screen

The flight screen shows the currently running flight. Information provided includes:

- Flight time
- Flight state: Ready, Pre-Launch, Launched, Out, Started, Finished
- Lap count
- Round and Flight numbers
- The names of the next two pilots to fly
- Lap times
- Wind state – speed and direction

The touch keys change depending on the flight state. When a flight is running the keys are:

- Reset – reset the flight. To prevent accidental reset, a confirmation popup appears.
- Penalty – apply a 100 point penalty. To prevent accidentally applying penalty, a confirmation popup appears.
- V- & V+ - volume control for the inbuilt audio
- Low & High – change the screen intensity between low, medium and high settings. Normally Low should be used. High may be useful in full sun.

Note that the "Back" button (top left of screen" will only work when a flight is in the Ready state. This prevents accidentally exiting a running flight.

In the flight Ready state the keys change. Reset and Penalty are replaced by << and >>. These keys allow the CD to move through the flight order. Useful if a flight has to be skipped.

The signal strength of connected units is also shown as a range of 1-9 (9 is high). An X indicates that the unit should be connected, but is not responding – probably turned off or out of range.


17:13 8.0V *W3
<-
Flight Ready
30.0
Don Tester
Rnd 2 Flt 2
Base A:9 Base B:8
Next Pilots:
Paul Marsh
Tim Kullack
Wind:
<<
>>
V-
V+
Low
Hi

11. System Settings

Consists of a number of screens to configure external units, wifi and f3xvault connectivity.

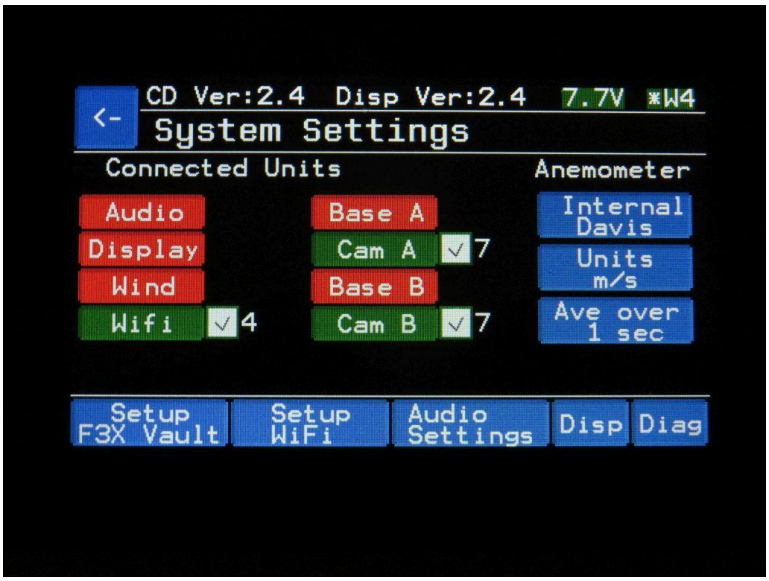
At the System Settings screen there are five touch keys at the bottom of the screen:

- Setup F3XVault – opens a second setup screen for setting up F3XVault connectivity
- Setup Wifi
- Audio Settings
- Disp – change the screen intensity
- Diag – show the diagnostics screen

There are three touch areas on the screen for anemometer setup:

- Wind Internal/External – Internal Davis or Internal Peet if an anemometer is plugged directly into the CD unit. External if a Wind Unit is used.
- Units – selectable as m/s, kph, knots, or mph
- Ave over – selectable time to average the readings shown on the display (1 to 10 seconds)

External Units. Selecting a base or other unit links the CD unit to the selected device. A tick shows that a link has been established. Wifi can also be enabled/disabled on this screen.



12. F3X Vault Setup

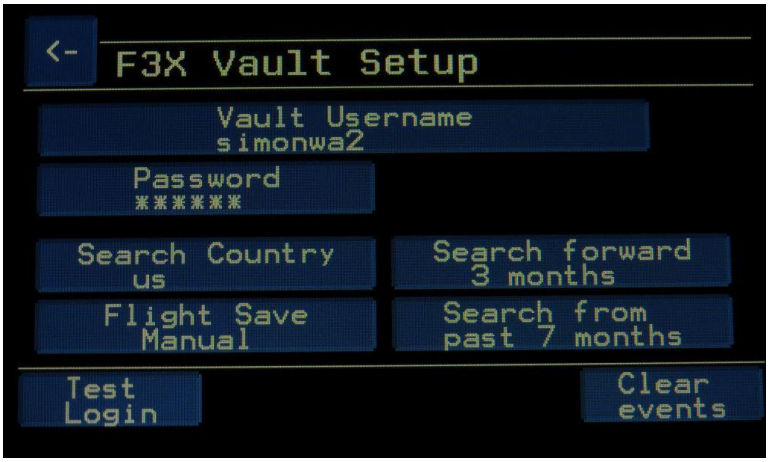
On the Vault screen there are two buttons at the bottom:

- Test Login – checks that the system can connect to F3XVault with the users credentials
- Clear Event (with double confirmation) – clears all saved contests from the system. It does not affect any events in f3xvault

There are also seven touch areas on the screen:

- Vault Username and Password. Shows the current user in F3xVault. Touching it allows the user and password to be set. Must be set for access to load and save event data to F3xVault.

- Search Country – code to be used when retrieving events from F3XVault, e.g. au for Australia, us for USA, fr for France, etc.
- Flight Save – selectable btweeen;
    - Each Flight – auto saves at the end of every flight
    - Manual – manually initiate saving from the Rounds screen for a round or the whole event
- Search forward – number of months (0 to 12) to search forward in time when looking for events in f3xvault
- Search backward – number of months (0 to 12) to search backward in time when looking for events in f3xvault



13. Wifi Setup

Sets the wifi SSID that the CD unit will connect to. This must be set manually, the CD unit will auto-connect to any available wifi routers.

There are four keys at the bottom:

- Scan – initiate a scan of available wifi routers
- Test Login – test that the router login works
- Forget SSID – removes the router ssid from the system
- Set Time – sets the system date and time

When a scan is run the system will display all currently available routers and their signal strength (RSSI). Selecting a router from the list and pressing “Select” will connect the system to that router. If it has previously been connected to, the system will apply the saved password. If it is a new router then the password will be requested.

14. Audio Setup

Set the turn beeps and time based audio clips.

Turn Beeps

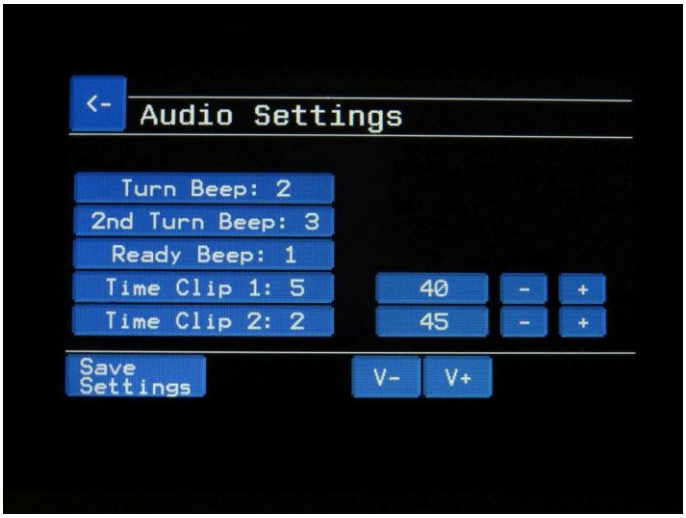
Select the beep to play for:

- Turn – played for all turns
- 2nd Turn – played only in practice mode is double beep turned on
- Ready – played when moving to the next pilot

Time Clips

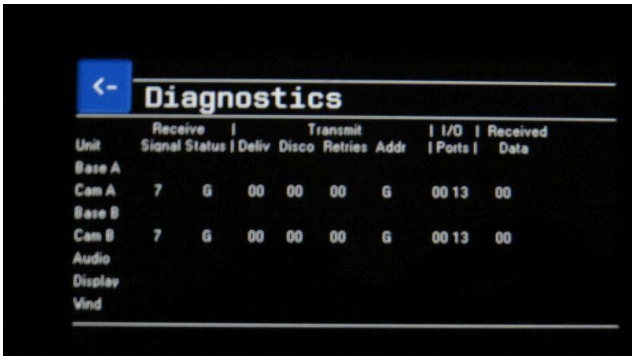
Set a clip to play and a flight time threshold to play it at.

- Two clips each with a different threshold
- Change the threshold time between 20 and 60 seconds



15. Diagnostics

The diagnostic screen provides some information regarding the connectivity to external devices, i.e. base units or camera units.

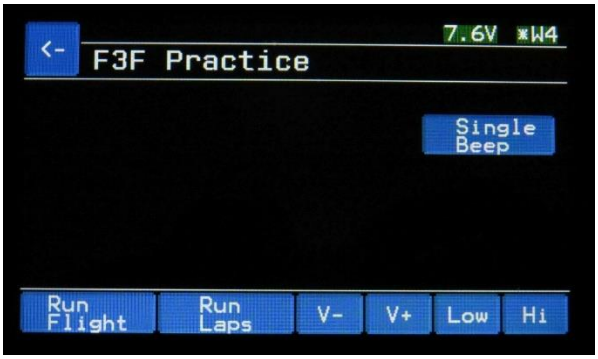


In this mode the CD unit will emit a beep if any external unit sends a turn signal.

16. F3F Practice

There are two practice modes:

- Flight – continuous full flights with flight time announcment. The flight will reset to Pre-Launch countdown after the flight completes. Flying back into the course then starts the flight.
- Laps – continuous laps with time announcements.



The practice modes can be set for:

- Single beep – only the normal turn (out) signal is given
- Double beep – the back onto course signal is also given

Setting Up the System

The following describes the initial system setup.

Wifi

- Set wifi router name and password in Wifi Setup screen
- Set system date and time
- Ensure WiFi is selected on (Green and ticked) in System Settings screen

F3XVault User

- Set the Vault User and password to match that used to create the contest in F3xVault
- Set Search Country, Flight Save and Search Forward/Backward options

Anenometer

- Set to Internal Davis, Internal Peet or External
- Select units to display
- Select time to average readings over

Bases and Other Units

For each external unit that is to be connected:

- Make sure external unit is switched on and connected to the network (Coordinator Unit must be on)
- Select the unit on the Setup screen. Colour should change to Green (unit is connected) and tick box should be ticked (unit has been linked). The signal strength is also shown.

Note that it may take up to 30 seconds for a unit to connect to the network when first switched on. Selection will not be successful until the unit is connected to the network.

Event

To set up an event:

- Create the event (with pilots) in F3xVault. It must be created with the type set to "F3F Slope Race (Plus Scoring)".
- Add the contest to the CD unit:
    - Select Vault from the main screen and then OK. Available contents will then be listed
    - Select the required contest and select Load. Contest is downloaded and stored. System returns to the main Contests screen
- Create some rounds to fly
    - Select the event to run from the main Events screen
    - Select Run from the main screen and then OK.
    - Select New Round and then OK
    - Set the flight order (defaults to order pilots were added to f3xvault):
        - Manually select a pilot and use the UP or DN buttons to move in the flight order
        - Select Random to generate a random flight order
        - Select Rotate 2 to move the pilots up the list by two positions

    - Select Generate and then OK

Run the event

From the rounds screen select the round and flight to run – usually Round 1, Flight 1.

Check correct pilot name shown on Flight screen. Press the red button on the top of the unit to start the flight. A flight goes through several states:

- Flight Ready – ready to start. Pressing the red button on the top of the unit starts the flight
- Pre-Launch – 30 second countdown for the plane to be launched
- Launched – 30 seconds countdawon to enter the ocurse
- Out of Course
- Flight Started
- Laps
    - Lap count
    - Lap times
    - Forecast
- Flight Finished
    - Time announced
    - Flt saved to SD
    - Flt saved to Vault

At the end of a flight, pressing the red button will advance to the next flight and pressing it again will start the flight.

Updating the System

The CD unit uses a Teensy 3.2 microcontroller which supports code written for the Aurduino platform. There is also a dedicated processor in the display. Both processors must be updated, however the method is different for each.

- Teensy 3.2 Processor – always updated via USB
- Display processor – updates via SD card

There are two USB ports:

- Teensy 3.2 processor. Located at the top of the unit
- Display Processor. Located at the bottom of the unit

There are two micro SD cards:

- Display SD – contains fonts and graphics. Also used for display processor updates. It is only accessible with the case open
- Teensy SD – contains sound files and event data. It is accessible from a slot in the top of the unit. All flight data is written to this card.

The unit should be left turned off whilst programming. The unit will power up from either USB port. Only use one port at a time. The two ports' power lines are tied together.

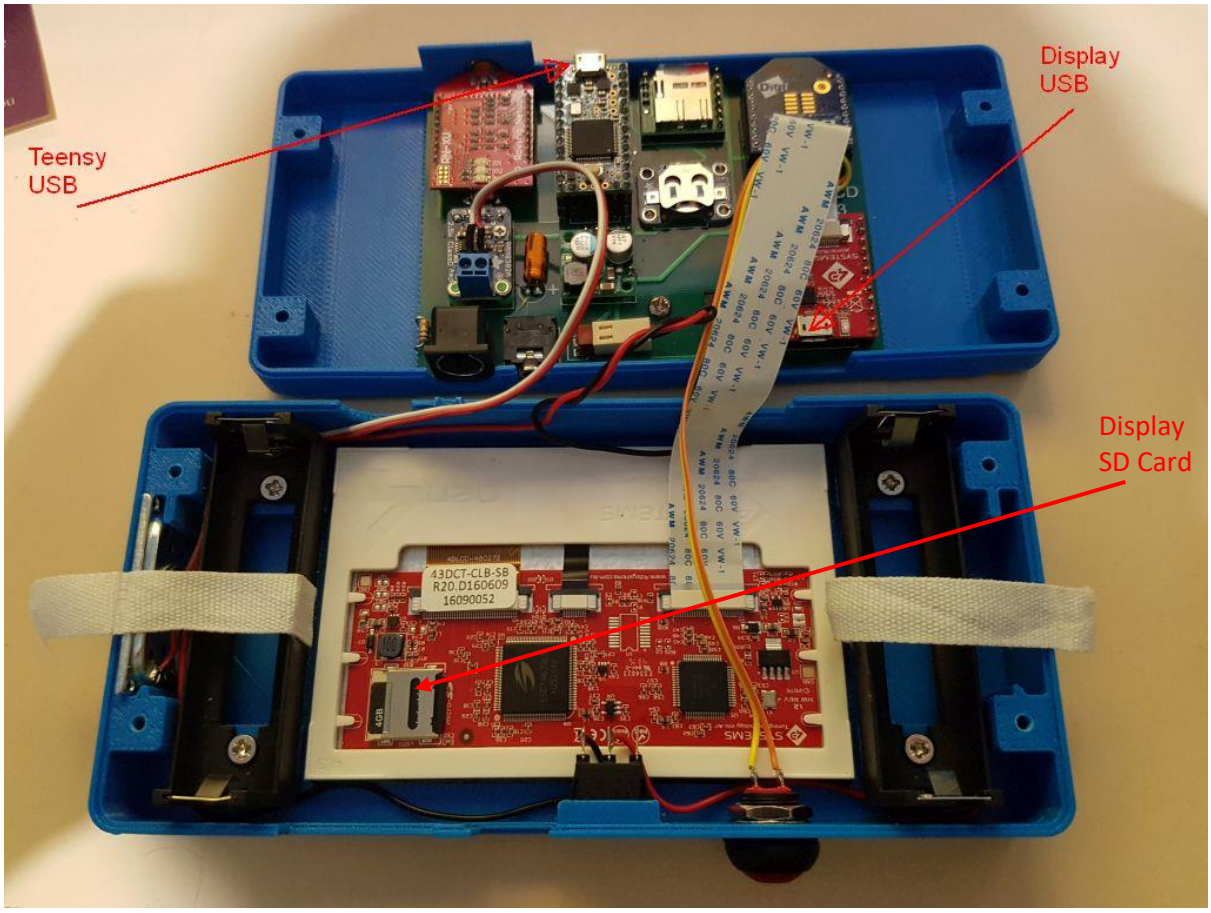
Updates are available from the following DropBox location:

https://www.dropbox.com/sh/et5j5yyjp8smrbf/AACRSWhgDqH3SgDtU287c9Kva?dl=0

1. Update Folder

The CDVxx folder contains the following folders:

- Display SD Card Update – graphics and firmware to be loaded on the display's micros sd card.
- Teensy Update – firmware to update the Teensy processor



A firmware update will usually involve updates to both the Teensy and display processors.

2. Programming the Main Processor (Teensy 3.2)

Teensy Loader

This program is used to load new software onto the Teensy. It should be downloaded from the internet from:

https://www.pjrc.com/teensy/loader.html

Updating

New software is provided as a .hex file (eg F3X_CD_v1.9.hex).

- Do not turn on the unit during this process
- Open the back of the unit
- Connect a micro usb cable to the Teensy microcontroller. The unit will be powered up from the USB connection to your computer.
- Start the Teensy Loader program
- Open the provided .hex file
- Select "Auto" on the Loader
- Press the reset button on the Teensy microcontroller (see photo)
    - After a few seconds the Loader program will show "Programming" and then "Reboot OK"
    - The Teensy processor will restart and the program update is complete.
    - You will have to restart the system for the update to be seen.

3. Programming the Display Processor (Diablo)

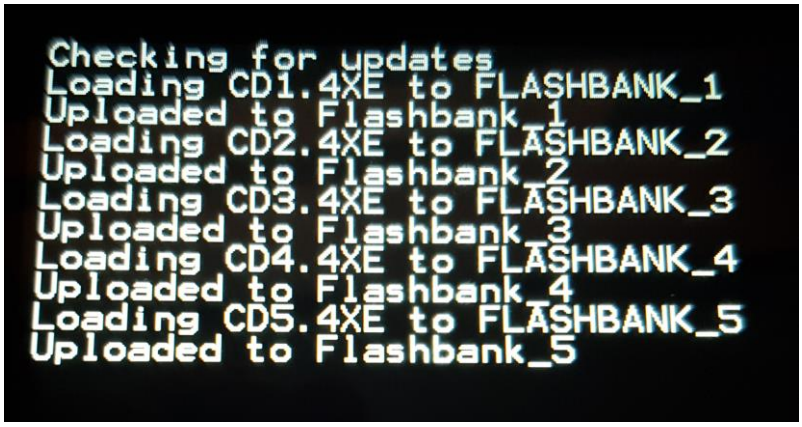
Micro SD Card Update

The display sd card contains both graphics and program code that must be updated.

To apply the update:

- remove the display sd card from the display unit. The card holder is opened by sliding the latch and opening it upwards.
- copy the contents of the “Display SD Card Update” folder to the sd card, replacing the existing files.
- replace the sd card in the display and latch it closed
- power up the CD unit and select “Update” from the main menu.
- Select OK when prompted to update the firmware:

- The following should be shown on the display as the system updates. It will then return the main start-up screen and be ready for use.



Base Unit

The base units provide turn signals to the CD unit and also display flight data to the user. Each unit must be configured and linked to the CD unit. An external antenna must be screwed on for the unit to connect to the network.

Buttons

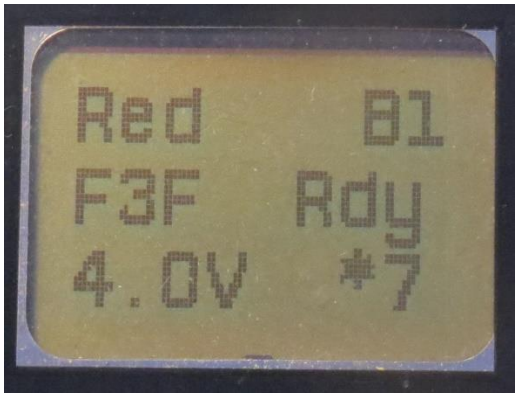
There are two buttons for using the system:

- Top button – functions as lap button and menu navigation
- Front button – functions as menu button and additional lap button

Power On

On power on the unit will briefly display version information and then go to the main screen.

Main screen (flight ready state)



This shows the following information:

Team colour – must be set to Red for F3F

Base type – should be set to either A1 or B1

Event type – F3F or F3B

Flight state – shows RDY when the flight is ready to start.

Battery voltage

Network connection indicator (flashing *) and strength (1-9)

Main Screen (flight in progress)

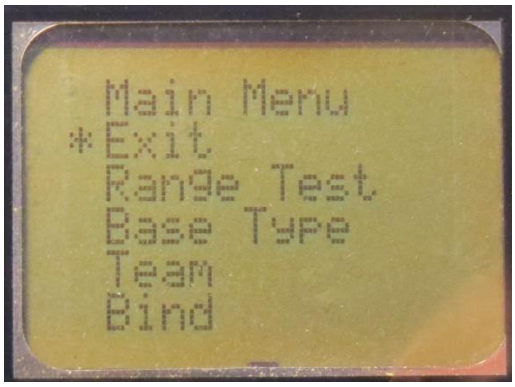
During a flight the screen changes to show

- Flight state
- Time
- Laps

Pressing the lap button only has effect when the flight is in progress and the plane is heading towards the base. Repeated pressing the lap button will have no effect. A buzzer will sound when a valid press is done. This is sent to the Base unit from the CD unit.

Menu screen

Pressing and holding down the front button for at least 2 seconds will open the menu screen.



The top button will cycle through the menu items. The front button actions the menu item:

- Exit – return to the main screen
- Range Test – put in range test mode. This does not currently function with the CD unit.
- Base Type – cycle through A1, A2, B1, B2. Only A1 and B1 are applicable to F3F.
- Team – cycle through various team colours (for F3B). Must be set to Red for F3F.
- Bind – binds the Base unit to the CD unit.

When binding the Base unit, the CD unit and Coordinator unit must be switched on.

Coordinator Unit

The Coordinator unit is essential to operation of the timing system. It acts as a network router managing the local 2.4GHz network that the system operates on.

The unit is in two parts:

- battery box – uses a single 18650 battery
- radio unit – should be placed up a mast or pole to have line of sight to all units in the system. Must have an antenna screwed on to function. A flashing LED shows that power is on.

The battery in the Coordinator unit will easily power the unit for a full day. So normally the unit would be mounted on a pole and left switched on all day. There are no settings to adjust.

<photo>