IEFIS G4 user manual

This document details the user interface for an iEFIS panel. The generation 4 (G4) refers to the processor core hardware. Much of this document is also applicable to G1, G2 and G3 systems as the firmware is based on these generations.

Document date: 28 October 2024

Additional references (more on the MGL Avionics website):

iEFIS GPS manual
iEFIS alteration guide
iEFIS G4 installation manual
iEFIS G4 diagnositics manual
iEFIS User Screen designer
iEFIS Ground proximity and flap overspeed setup
iEFIS Navigation manual
iEFIS Autopilot manual
iEFIS Plates, iEFIS PocketFMS plates
iEFIS Mode-s/ADS-B
iEFIS I/O – Using inputs,outputs and alarms

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General

The iEFIS panels are available in two versions – a “full” version which includes one or two iBOX units that contain all interfacing or a “lite” version which has built in sensors and some interfaces. The two versions are not compatible with each other and are not used mixed in the same aircraft.

All iEFIS devices with the exception of the MX1 use a single firmware file with the name of “exp4” (no file extension). The system detects the iEFIS variant on startup and configures itself accordingly.

IEFIS consists of one or more panels, one or two iBOX units (full version only) as well as sensors and control interfaces as required.

As of writing of this document the following MGL devices are compatible with the iEFIS system:

Up to 8 panels may be connected in a single system

iEFIS MX2: 7” screen size panel
iEFIS Explorer: 8.5” screen size panel
iEFIS Challenger: 10.4” screen size panel

iBOX V1 or V2: Full feature, central interface for an iEFIS system (up to 2 units)
SP-6 CAN: Compass/Magnetometer (up to 2 units)
SP-7 CAN: AHRS (up to 4 units)
SP-9 CAN: High grade AHRS (up to 4 units) – also includes compass/magnetometer.
SP-10 CAN: Flap, trim and gear controller (up to 6 units, up to 2 functions/unit, 6 functions max)
RDAC XF: Engine monitoring interface (up to 4 units/engines)
RDAC XG: Engine monitoring interface (up to 4 units/engines)
RDAC CAN: ECU interface (typical use Rotax with ECU, ULP engines)
MGL V6: COM radio (including full remote control)
MGL V10: COM radio (including full remote control)
MGL V16: COM radio
MGL N16: NAV radio
MGL T16: Mode-s 1090-ES ADSB transponder
MGL ECB system (up to 4 units, 48 breakers)
MGL Autopilot servos (Bank, Pitch, Yaw)
MGL SP12 FAA approved ADSB GPS source (SIL/SDA of 3/2)
Trig Avionics TT21 or TT22 mode-s ADSB transponder (using MGL Trig transponder IF).

The following third party products are compatible with the iEFIS system:

Garmin SL40, GTR255, GTR200 COM radio
Garmin SL30, GNC-255 NAV/COM radio
Garmin G430W and newer GPS/NAV/COM systems
Sandia aerospace STX-165R mode-c transponder
Vertical power VPX
NexNAV FAA certified GPS receiver

Traffic systems compatible with ARINC 735 (TIS, TCAS, ADSB with TIS output)
Traffic systems: ADS-B receivers with GDL90 protocol, FLARM, XRX PCAS

Transponders requiring greycode (gillman code) altitude encoder can be connected, using the iBOX altimeter as alticoder source. These transponders are not supported by “Lite” systems.

Older navigation systems (VOR/ILS) using +/-150mV differential outputs to drive indicators can be connected as navigation source (iBox systems only)..

External autopilots can be connected to NMEA (RS232 port 6 on the iBOX) or connected to ARINC steering signals.

IEFIS capabilities

Based on a powerful platform , iEFIS introduces a modular, yet low cost approach to the aircraft avionics panel. The prinicple guidance during the iEFIS development was “complete, one stop, any function, any aircraft”. From ultralights to space craft, this system covers all.

All versions of the iEFIS with exception of the entry level “MX1” run the same firmware – only a single executable file is used for “full” and “lite” versions for all sizes and screen resolutions.

The iEFIS MX1 is a 7” EFIS implemented using a microcontroller chip with reduced functionality (no terrain, no vector maps, only raster maps supported). Other than these limitations the MX1 is a full feature EFIS with similar capabilities as a “lite” system.

Full systems including iBOX

IEFIS of varying sizes can be combined in the cockpit as required. A compact unit called the 'iBOX” contains all of the EFIS interfaces to many possible devices in the cockpit as well as pressure sensors for altimeter, airspeed and angle of attack. Airspeed can be measured to several Mach numbers at altitude with the iboxV1 high speed option or the iBOX V2 while the pressure based altimeter reaches to over 32.000 ft with a resolution of just 1 ft. The iBOX also contains one of the highest performance u-Blox GPS receivers available today, able to track GPS satellites of several countries as well as providing WAAS and RAIM capability.

Up to two iBOX units may be used in a system forming a complete master and “hot standby” system for redundancy where required.

IEFIS may be used to comprehensively monitor up to 4 engines, 8 physical fuel tank levels and 4 virtual tanks (based on fuel flow measurements).

Up to 4 AHRS units may be fitted for high redundancy systems as well as multiple magnetometers.

A multitude of interfaces allows the iEFIS system to control or monitor any conceivable aircraft system.

A comprehensive built in autopilot requires just the addition of servos to complete.

Any conceivable navigation source from GPS based to traditional navigation radios may be connected in a variety of ways. All typical interfaces are provided as standard: RS232, ARINC 429, analog +/150mV.

EFIS controlled COM radios, NAV radios and transponders, both mode-c and mode-s may be fitted for a complete, cost effective solution.

Each iEFIS panel may be connected to video sources such as taxi or night vision cameras as standard.

The modular concept of iEFIS allows not just a tailormade solution, if desired each panel can be customised by the owner using a freely available “screen design” tool. This provides similar capability to previous MGL systems but adapted to the iEFIS environment. However, despite this the iEFIS contains many built in screen layouts and options that can be simply selected during installation. This allows turn key solutions for most typical applications.

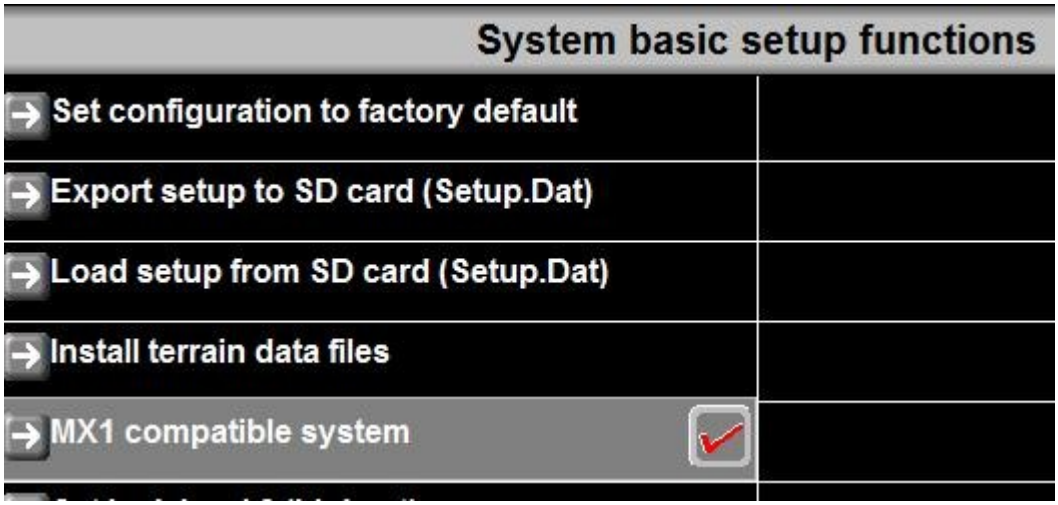
Installation of an iEFIS system poses greatly reduced effort compared to traditional systems. The iBOX(s) may be mounted in a location where they are easy accessible. This greatly simplifies and optimizes aircraft wiring. The panels themselves require only minimal installation effort – power and the iEFIS LAN connection is all that is required.

All panels and iBOX systems provide for dual redundant power supplies in a variety of different configurations as may be dictated by the aircraft systems.

“Lite” systems

In general “Lite” systems provide much the same functionality as a “full” system but with reduced number and type of physical hardware interfaces. A “Lite” system provides several RS232 serial ports and a CAN bus inteface with an optional iEFIS extender module providing additional RS232 serial ports as well as analog/digital inputs as used with the “full” ibox system.

“Lite” systems do not support video camera functions.



Note that the G4 “Lite” system caters for two different ways to communicate between panels. G2 and G3 “Lite” systems can have up to 2 panels connected to a common CAN bus. Limited communications between the panels is possible (for example setting local barometer pressure).

The G4 allows to select either the G2/G3 means of communications or a different protocol first introduced with the MX1 which allows up to 8 panels with advanced communications between panels (for example you can select a COM radio frequency on any panel and it will be set by the currently active master panel on the actual radio).

The G2/G3 and MX1 “Lite” CAN protocols must not be mixed. Usually if yo have a pure G4 “Lite” system with more than one panel you would select the MX1 compatible mode. If you would like to mix a G4 with an older G2 or G3 “Lite” panel then do not use the MX1 mode.

IEFIS documentation

Due to the nature of the iEFIS system, documentation is split into several independent documents.

Please refer to the following:

iEFIS G4 User manual (this document)
MGL EFIS files. Explains installation and function of the various database and map files.
MGL Autopilot manual.
iEFIS G4 Installation manual

iEFIS G4 Alteration guide (needed if custom screen designs are to be attempted)

In addition please refer to the manuals related to individual devices and interfaces.

Manuals are available on the MGL Avionics home website: www.MGLAvionics.co.za

The G4 system

The “G4” refers to the MGL Avionics G4 CPU board that replaces the previous G3 system. It can also be used to upgrade older G1 and G2 systems.

The G4 uses Linux as operating system (previous versions used the MGL “FlightOps” operating system.

The G4 is based on the STMicrosystems STM32MP157 chip. This contains two ARMv7 processors (dual core arrangement) plus a Cortex M4 processor and a Vivante graphics processor (GPU).

The EFIS firmware at this stage runs on one of the ARMv7 cores with the second core largely dormant (still used by linux for background tasks). The Cortex M4 is used and is in control of all hardware – linux itself is restricted to the bare minimum and effectively is only used to handle the file system which is the robust EXT4 journaling file system used as backbone for most internet file servers. However despite this the Linux implementation is very complete and most of the usual user and system administrator utilities are available. Usually interfacing to this is done using a terminal emulator connected to a PC RS232 port.

All native G4 systems use RS232 port number 2 as Linux terminal interface while classic panels and upgrades to older systems use RS232 port number 1. These ports may be used for normal systems interfacing and assigned any available function. However if the EFIS firmware is halted (via the terminal port after freeing the assigned function in the EFIS setup) the port reverts to the terminal interface.

The Linux terminal is not normally used by a user of the system – but it is available for those that need low level access to the system.

The G4 CPU card

The G4 is based on the ST Microsystems STM32MP157 processor. It provides two ARM Cortex A7 cores, one Cortex M4 core and a Vivante graphics processor (GPU) as well as a rich collection of peripherals on a single chip.

The remainder of the CPU card provides a 2MByte battery backed memory chip, a 512MByte DDR3 memory chip, SD card holder, 16Mbyte flash memory and power supply circuits.

A 16GByte (minimum) SD Micro card is used as internal disk. It holds the operating system, many Linux utilities and standard programs as well as the EFIS application program and all data required to run the EFIS. The SD Card is easily removable allowing for simple replacement should that be ever needed.

The Linux operating system

The G4 uses the Linux operating system and Buildroot is used as development platform. Linux version 5.7 is used. All unnecessary drivers and processes have been removed from the Linux kernel to promote a rapid system boot to a working EFIS.

The EFIS application itself is in full control over all hardware. Linux itself, once booted is

effectively only used to handle the file systems. The internal SD card uses the Linux EXT4 file system. This is a journaling file systems that is effectively powering most of the internet and regarded as very robust.

Main differences G4 to G3 and earlier

The major difference between the systems relates to the ability to design and modify screens on the EFIS itself – previously this was only possible by utilizing a PC based screen designer.

Further to this the screen layout has been extended by a “user” file – this allows the basic “built-in” screens to remain uncluttered as it is now very simple to add a basic or even quite advanced item to the existing “built-in” screens – for example it takes just seconds to add a COM radio status display and position it.

Similar to the way the PC based screen designer works – you can select from a range of built in options first – basic layouts, engines and fuel systems and once completed – export these to a “SCREENS” folder for editing. This allows simple modifications such as removal, resizing, addition of items as needed basing this on the built in options. It is also possible to create screen designs from scratch.

The previously available screen designer based on a PC is however still available.

While screen designs are similar to previous versions – one useful new item that has been introduced is the concept of “item groups” - here several items (such as text readouts, graphical displays like bargraphs) can be combined to form a new, single item. The EFIS provides a rich array of already made item groups built in that can be easily used from the built in screen designer and it is also possible to add such items made externally by the PC based screen designer.

Definitions for the built in weight and balance calculator can now be defined on the EFIS itself.

Weight and balance calculator can now use both MIF as well as JPEG image files as aircraft top-down view.

The screen designer “image” component now supports both MIF as well as JPEG images.

Menu pages in the G4 now use all available space for menu entries, previous versions would reserve about half the screen for a small flight/engine data display. As the number of menu items has grown over time it makes sense to use all available space for the menu for faster menu navigation.

All IEFIS models can be used in landscape or portrait modes. This is selected in the Screens setup menu. Note that older Explorer and Discovery systems may only have limited ability in portrait mode as the display polarizers limit viewing angles to the left.

For details on how the use the built-in screen design facility please refer to the document “iEFIS G4 user screen designer”. For more details on screen designs in general please view the document “iEFIS Alteration guide”.

The iEFIS panel in detail

This image shows the Explorer panel. The Challenger panel has identical controls but a slightly different screen layout.
The MX2 does not have the button array but mimics the buttons using the touch screen and has four instead of five rotary controls. Remaining functionality is similar.

Touch screen

The touch screen is a capacitive type that reacts to conductive items such as your finger. No calibration is required. Operation of such a screen with gloves is generally not possible however special gloves are available and you can also obtain conductive self adhesive pads you can place on the gloves finger tips. These are usually sold inmotorcycle accessory shops.

Note for older G1-G3 systems fitted with pressure sensitive glass/glass touch screens that have been upgraded to G4:

The touch screen of the iEFIS panels is a pressure sensitive device calibrated for use in an aircraft. The touch screen is designed to activate on a positive pressure input and will filter short or unclear inputs. This makes it possible to steady your finger on the desired location without activating the touch screen. Desired contact pressure can be selected in the touch screen calibration function. Tip: Hold the top right rotary control down while applying power to the panel to activate the touch screen calibration function.

The touch screen may be used in all ambient pressure conditions including vacuum and is tolerant to rapid decompression.

The touch screen may be operated while wearing suitable gloves that allow a defined pressure point, i.e. pressure should not be spread over a large area as this makes precise location of the touch point difficult.

Rotary controls

The 5 rotary controls have strong indents during rotation to allow positive selection of a desired value. Many rotary functions have a dual level. The second level can be obtained by pressing the rotary control towards the panel while turning. For example, this is used when selecting a COM frequency: First select the MHZ, then press and turn to select the KHZ.

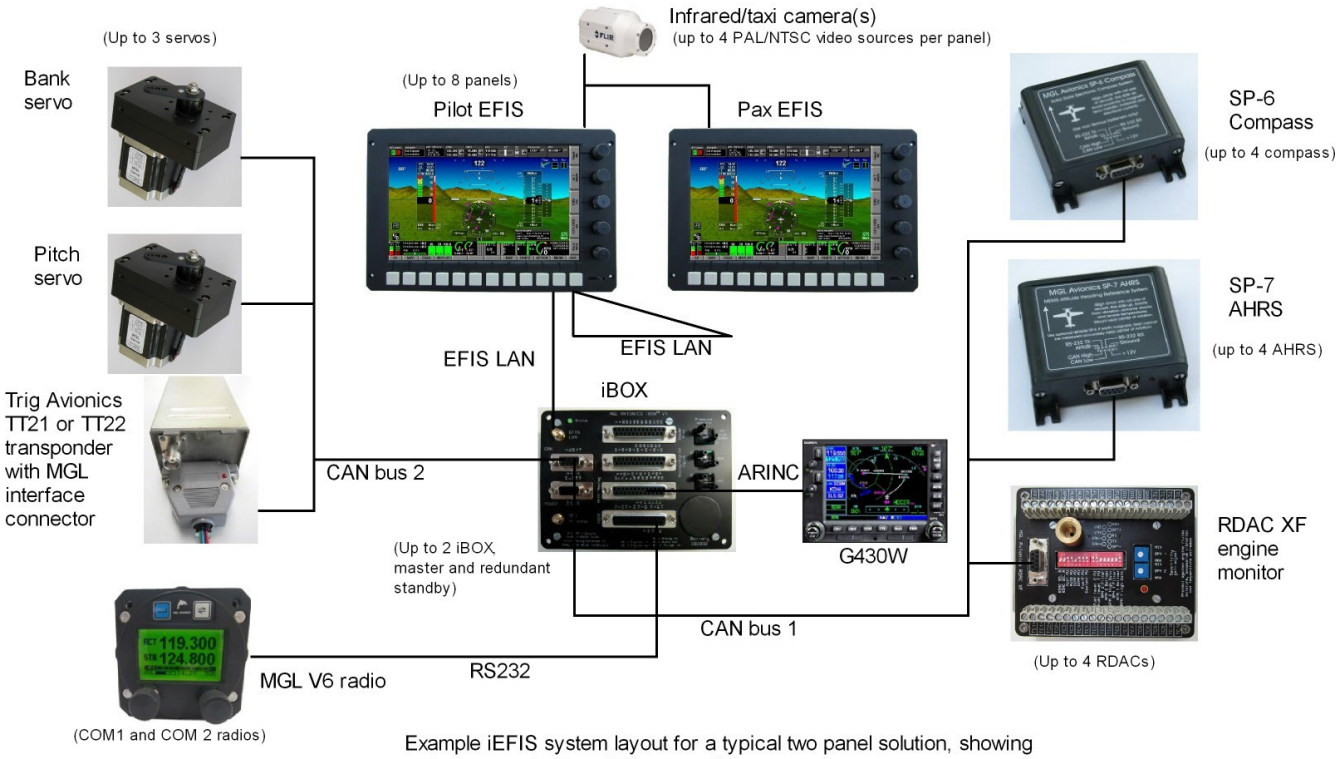
Soft keys

The soft keys below the display allow quick access to often used functions. These keys are assigned different functions depending on the currently active device context. Often they serve as a backup to the touch screen. For 7” display size systems (Discovery, MX2) the softkeys are implemented using touch buttons on the display itself.

Micro SD card slot

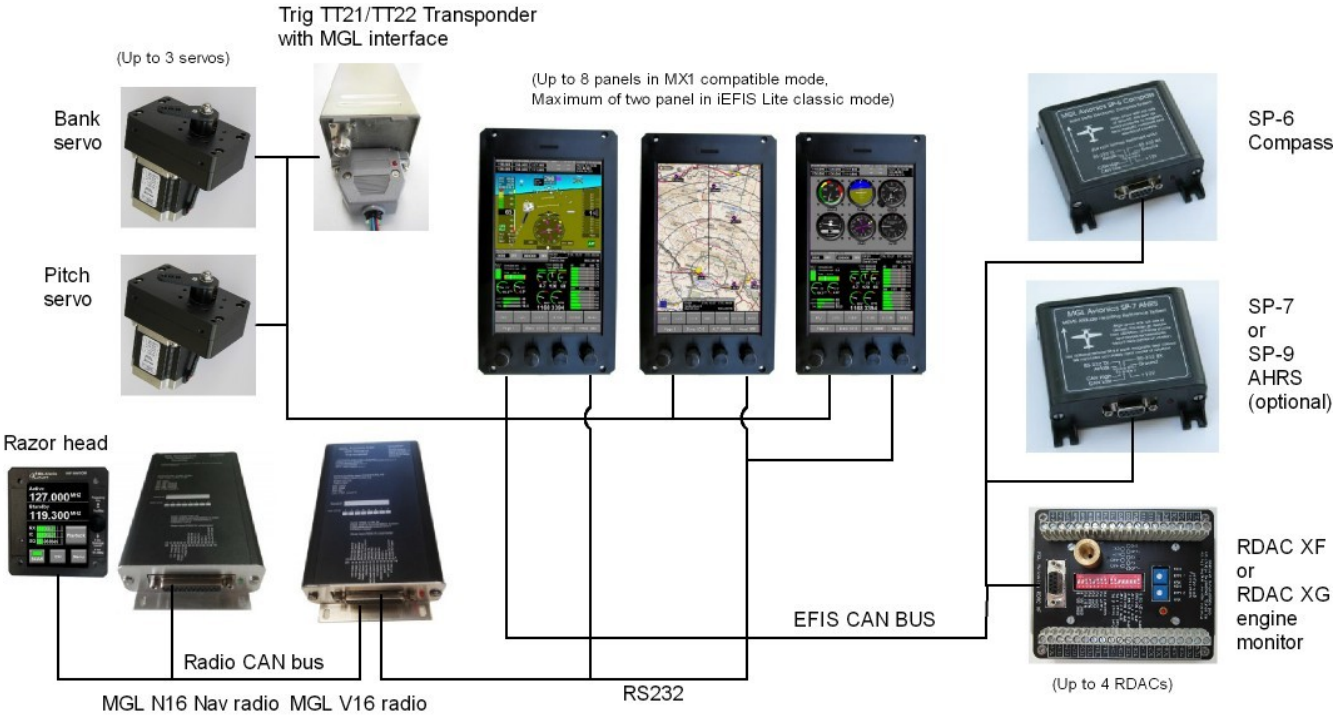
The micro SD card slot can accept SD micro cards as well as SDHC and SDXC micro cards. These cards are used mainly to transfer files to and from the panel such as maps. A permanently inserted card can also be used to record black box style flight data during flight. Note that all G4 systems contain a permanent internal black box style flight data recorder in addition that stores about the last 1 to 2 hours of flight data,

Example system designs



Example iEFIS system layout for a typical two panel solution, showing main communications bus connections.

The above image shows a typical small dual panel system with a single iBOX.



Example iEFIS G4 MX2 Lite system layout for a three panel solution, showing main communications bus connections.

The above image shows a typical “Lite” system. The “Lite” system does not have an ibox. Instead the panels themselves are fitted with pressure senders for altimeter and airspeed with some models also providing an AOA sensor. “Lite” panels provide a CAN bus for communications to most MGL peripherals as well as 2 to 4 RS232 ports.

Lite systems also support an iEFIS Extender module. This module connects to one RS232 port of the panel and provides five RS ports as well as AOA sensor and 8 analog/digital inputs.

IEFIS default screens

Default screens refer to screen layouts that are “built-in” to a panel. Various types of default screens and parts of default screens can be chosen in the system setup. Layouts refer to the general organization of a screen while details refer to parts of a screen. A detail may relate to the monitoring for a particular engine type or a fuel system setup.

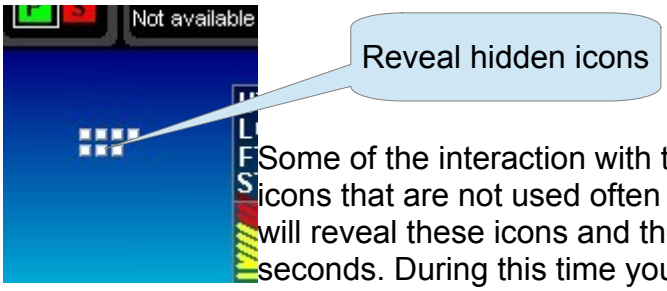
If none of the built in layouts and/or details are suitable, a custom layout may be performed using the screen designer tool. This may base a modified screen on an existing screen or it may be completely new screen that has been created from scratch.

This document refers to the built in screens. While custom screens may be similar, please refer to the company or person that designed your screens for details should this be needed.

Typical screen scene taken from the Simulator/Screen designer application. This is page 1. The screen layout is “Dedicated radio panel on top” while “2 tanks FF FP” have been selected for the fuel related section. Engine has been selected as “2-6 cyl, OT, OP, MAP” with number of EGT and CHT channels selected to six each. Basic units have here been selected as metric so you will find degrees Celsius, liters and bar used.

A “pop up” G meter is shown here – this activates automatically should you exceed or equal 1.5G positive or go below 0.5G or negative.

This screen is highly interactive and is discussed in more detail in sections:



Some of the interaction with the touch screen is via hidden icons. Some icons that are not used often are hidden. Tapping the hidden icons field will reveal these icons and they will then remain visible for a number of seconds. During this time you can activate the functions related to these icons. Typical icons that fall into this category are:

These icons lead you to the “nearest airfields” page from which you can select to view various airport information. From here you can also activate GPS based approaches (GLS) to runways if the database for your chosen airport has the relevant information available.

“GPS Goto”, is the “direct to” function for any type of waypoint in the database, including airports, navaids, fixes etc.

“GPS VOR” is your selection for GPS based VOR navigation should you not have a NAV radio fitted. GPS based VOR navigation provides an accurate emulation of VOR navigation including DME.

Your HSI will be hidden if there is currently no active navigation solution. Tap on this icon to bring up a choice of navigation sources to activate the HSI display. You also at any time tap on the HSI itself to choose a navigation source. You can also use the NAV softkey for this.

The HSI

Navigation sources available for selection in your system are selected in the HSI/GSI indicator setup menu (System setup).

Be sure to allow your chosen navigation sources to be available for selection.

You can tap on the active HSI indicator at any time to select a new navigation source or cancel the current source which will hide the HSI indicator.

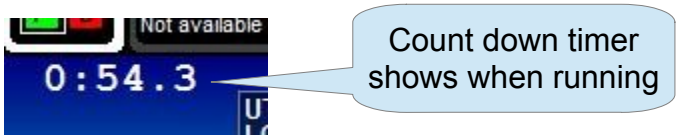
HSI = Horizontal Situation Indicator

Note: The internal autopilot follows the HSI, canceling the HSI will disengage the autopilot as it no longer has a navigation source to follow.

This field shows UTC time from GPS, your local time (kept in the iBOX), flight time if a flight is active and also a stop watch. Tap in this field to bring up:

This pop up allows you to start, stop and reset the stopwatch.

Further to this you have a count down timer. You can set this timer to a starting value and it will count down, proceeding to go negative if it goes below zero. The count down timer only shows when it is running:



Stop watch and count down timer resolutions are to 0.1 second.

These timers are located in the iBOX and apply system wide. You can start/stop timers from any panel.

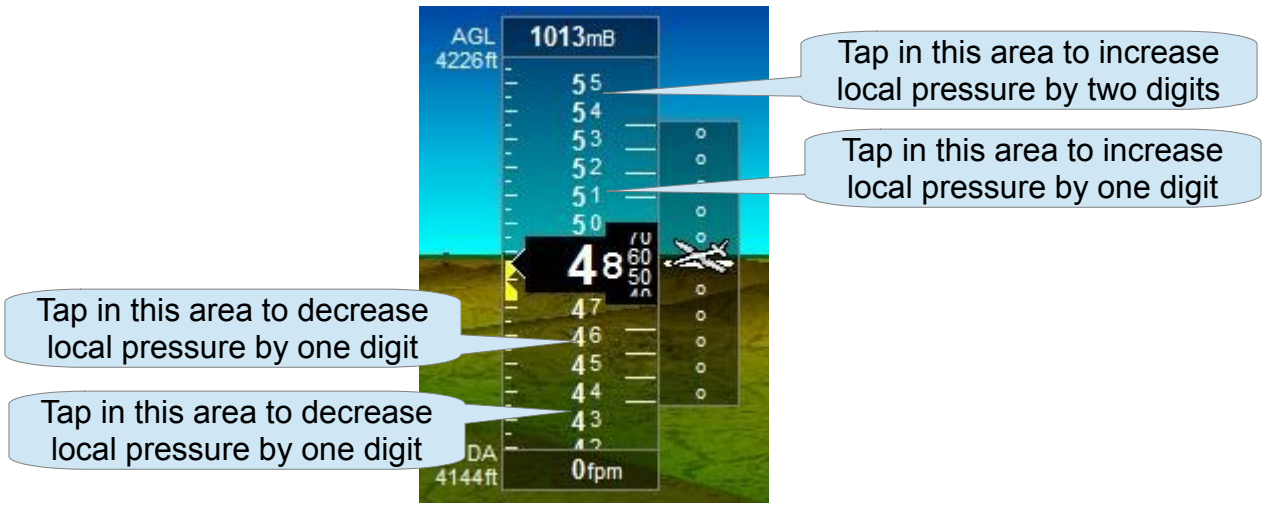
Adjusting local pressure (QNH or baro pressure)

The iEFIS panel offers two methods of adjusting local pressure:

a) adjust local pressure using the rotary control:

If you do not see the baro pressure tab next to the rotary control, press the “ROT” softkey to select a rotary control page that does have this control present.

b) Adjust the local pressure by tapping on the altimeter tape:



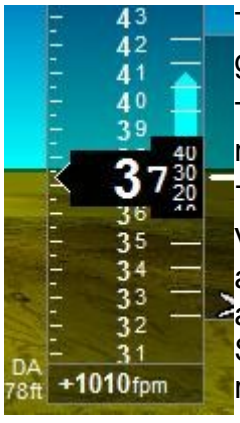
The altimeter is setup to show a tape, digital readout, local pressure (shown here in millibar), elevation above ground level (AGL) , density altitude (DA) and vertical speed (VSI).

DA requires the ambient temperature probe to be operational and correctly calibrated.

AGL requires a valid 3D GPS fix and correctly installed terrain database.

The yellow altitude bug is set either by the pilot using the altitude bug rotary control, it can be set by the autopilot on engaging “straight and level” or it can be set by a flight plan containing altitude cues.

To the right of the altimeter tape is the vertical guidance display. In this image it shows that we are very slightly above the target altitude. The vertical guidance display is also used during ILS and GLS approaches if a glide slope is present.

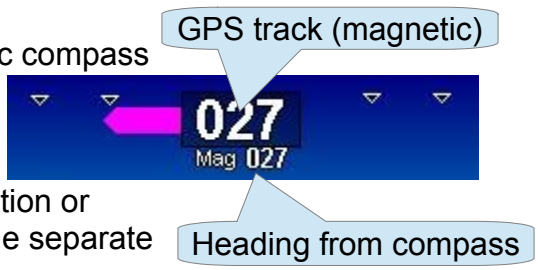


The digital VSI readout at the bottom of the altimeter tape is paired with a graphical readout.

The range of the graphical readout can be set in the Instruments setup menu to suit your aircraft. For this example, the range has been set to +/-1500 ft/min.

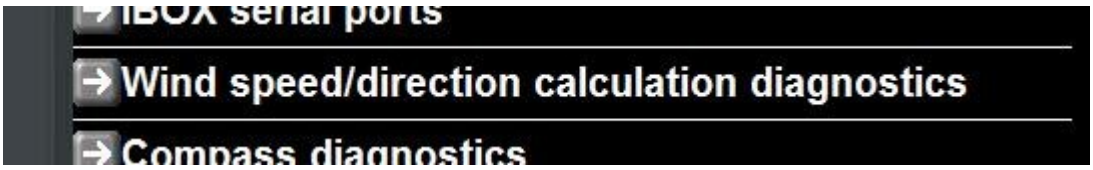
Vertical speed readout is based on changes of static pressure (static port) and is very sensitive. Please select your static port location carefully to avoid unintended pressure changes for example if pitch attitude changes. Slower aircraft can often use cabin pressure as static pressure and do not require a static port.

Two heading displays are available, the top, larger heading display is derived from GPS ground track, corrected for local magnetic variation.



The smaller readout below if derived from the magnetic compass sensor (if available in your installation). In still air (no wind) and with the aircraft not slipping, the two numbers should be very similar. Differences between the heading numbers usually indicate incorrect installation or calibration of the magnetic compass (please refer to the separate compass calibration manual if required).

Note: It is vital that the heading from the magnetic compass is as accurate as possible. This input is used for wind direction and strength calculations. If there is a difference between GPS ground track (corrected for variation) and magnetic heading the calculation will assume that the aircraft is crabbing (wind is from the side). This can result in greatly inaccurate wind speed and direction calculation results. Please also refer to the “Wind speed/calculation diagnostics” in the Diagnostics menu if there are any issues with this.

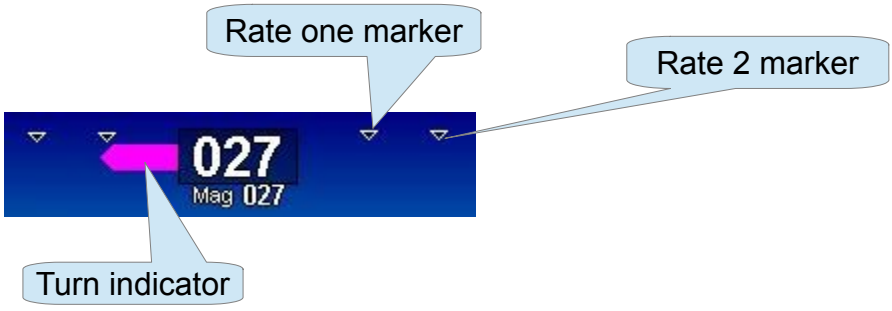


Note: Please ensure that your date/year is set correctly in the system. The magnetic variation calculations require a correct date as the magnetic field of the Earth changes slowly over time.

Wind speed and direction indication is based on GPS ground track, magnetic heading, true airspeed and GPS ground speed.

Wind direction may be shown relative to North or relative to the aircraft heading – you can choose this in the “Operations setup menu”.

Note: The calculations are based on straight line flight, wings level – aircraft is not slipping into wind. Wind calculations do not give a correct result while the aircraft is in a turn.



This image shows the rate-of-turn bargraph. It is showing that the aircraft is in a rate one turn to the left. A rate one turn completes a full 360 degree turn in two minutes. A rate two turns completes the same 360 degree turn in one minute.

Additional touch functions

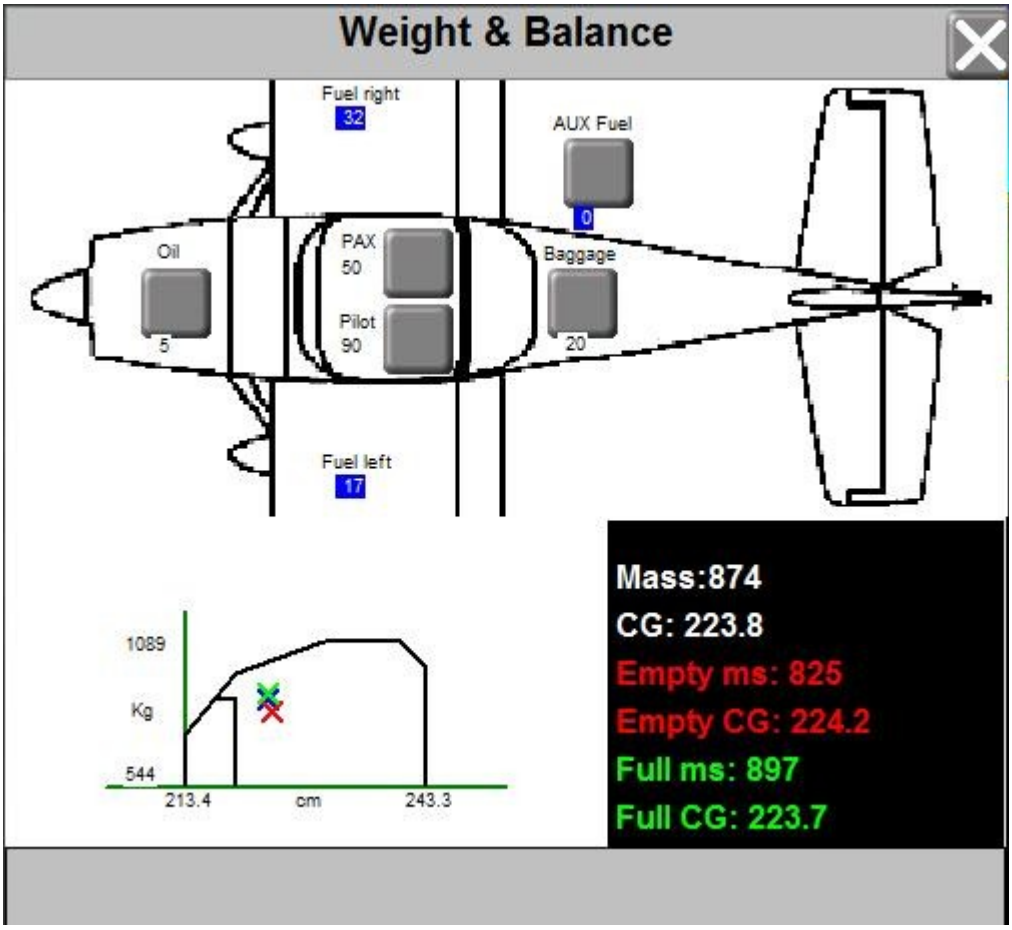
These two icons provide access to the Weight and balance calculation system as well as the electronic circuit breaker system (ECB).

The ECB icon will only show if a ECB system is available in your installation and has been configured. Two ECB systems are supported: Vertical Power VPX and MGL Avionics.

The Weight and balance icon will only show if the required configuration files are present in your panel. There are two files: WB.DAT and WB.MIF or WB.JPG. The WB.DAT file contains details about your weight stations and the WB.MIF contains an image of your aircraft (usually top down view). The WB.DAT file is created by the Weight and Balance editor in the iEFIS Simulator and Screen Designer application. The image file is typically created using a standard image editor on a PC and converted to MIF format using the MGL Avionics MIF converter application. You can also use standard JPEG image files so no conversion is needed.

Note: The aircraft image must be created in a suitable size so it fits your display. A width of about 300 to 500 pixels would be suitable depending on the display resolution your EFIS has.

The MIF converter is available as free download from the MGL Avionics website (EFIS tools page).



Typical Weight and Balance calculator image. Stations and their functions are selected in the Weight and Balance editor accessible from the weight and balance function display screen.

Stations refer to points that are a certain distance from a datum point on the aircraft. Consult your aircraft manual for the location of the datum point. For example it may be defined as the location of your propeller flange.

Each station has a name you can define and you can place the data entry point on the display as shown above at a suitable location. Weights may either be entered or calculated (as used for fuel).

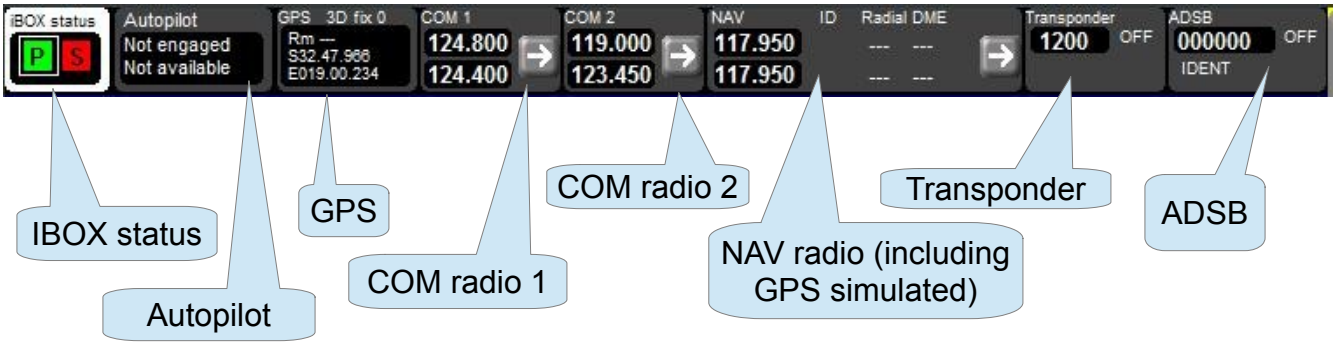
The image used for the aircraft is either a MIF file or a standard JPEG image file. You can place your own image file in your EFIS – it is located in the folder named “OTHER”. The file must be named WB.JPG or WB.MIF.

The station definitions you enter are stored in the file WB.DEF file. You can copy this file to another EFIS and reuse it.

Radio and Status panel

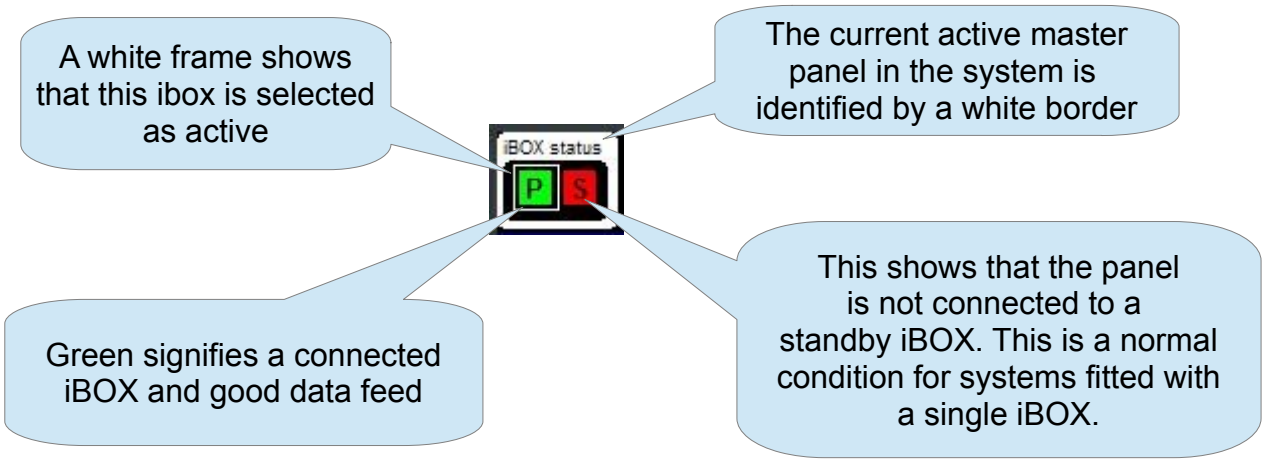
Some screen layouts may provide a partial or full Radio panel. The example screen layout provides a full panel on top of the screen.

All panel items are touch sensitive and provide localized functionality or open larger “pop up” devices as described here.



IBOX status

This display provides instant verification of your panels connection to one or two iBOX devices. It provides several indications:



The “P” and “S” fields may flash. They will flash if the following conditions are detected:

a) A “standby iBOX” has been connected to the panels primary LAN connector. This is a serious installation fault and must be rectified.

b) A “main iBOX” has been connected to the panels secondary LAN connector. This is a serious installation fault and must be rectified.

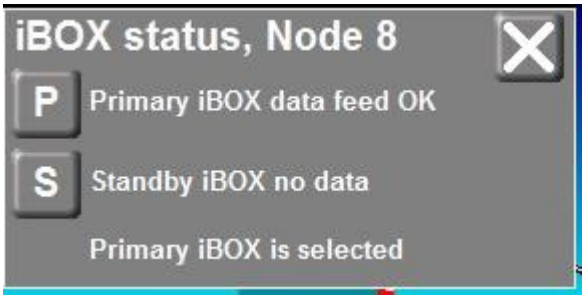
c) In a dual iBOX installation that is correctly wired, the standby iBOX has has been selected as active. In this case both fields will flash. This is a legal condition and performed either as

forced changeover due to a system fault or maintenance or setup is performed on the standby iBOX (in this case it must become the active iBOX so it becomes possible to perform certain operations.

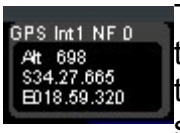
IBOX status pop up

Tapping the iBOX status will open the iBOX status dialog. This dialog gives more detailed information and allows you to select master or standby iBOX for setup or maintenance work to be performed.

This dialog also shows the node address of this panel. In this case we have node address 8 which is normally reserved for a wireless or wired connection into a PC or tablet computer.



GPS status



The GPS status shows the fix quality and number of satellites tracked. It shows the current geographic position, GPS derived altitude (if 3D fix is available) and the GPS RAIM status. (the last two indications alternate). GPS RAIM status shows if satellites have been excluded from processing due to integrity concerns.

The GPS status line:

GPS source:

INT - Internal GPS (or GPS in iBOX)

NMEA - External NMEA GPS

ARINC - External ARINC GPS (Not available for Lite systems)

GPS - External TABS (TSO-C199) GPS source.

GPS Fix quality

NF - No fix

DR - Dead recon

2D - 2D Fix

3D - 3D fix

This is followed by the number of satellites tracked

RAIM information

If RAIM is enabled, the ALT field will alternate between:

ALT GPS altitude if 3D fix

and

Rm RAIM status

RAIM status gives you the current RAIM error limit estimate as follows:

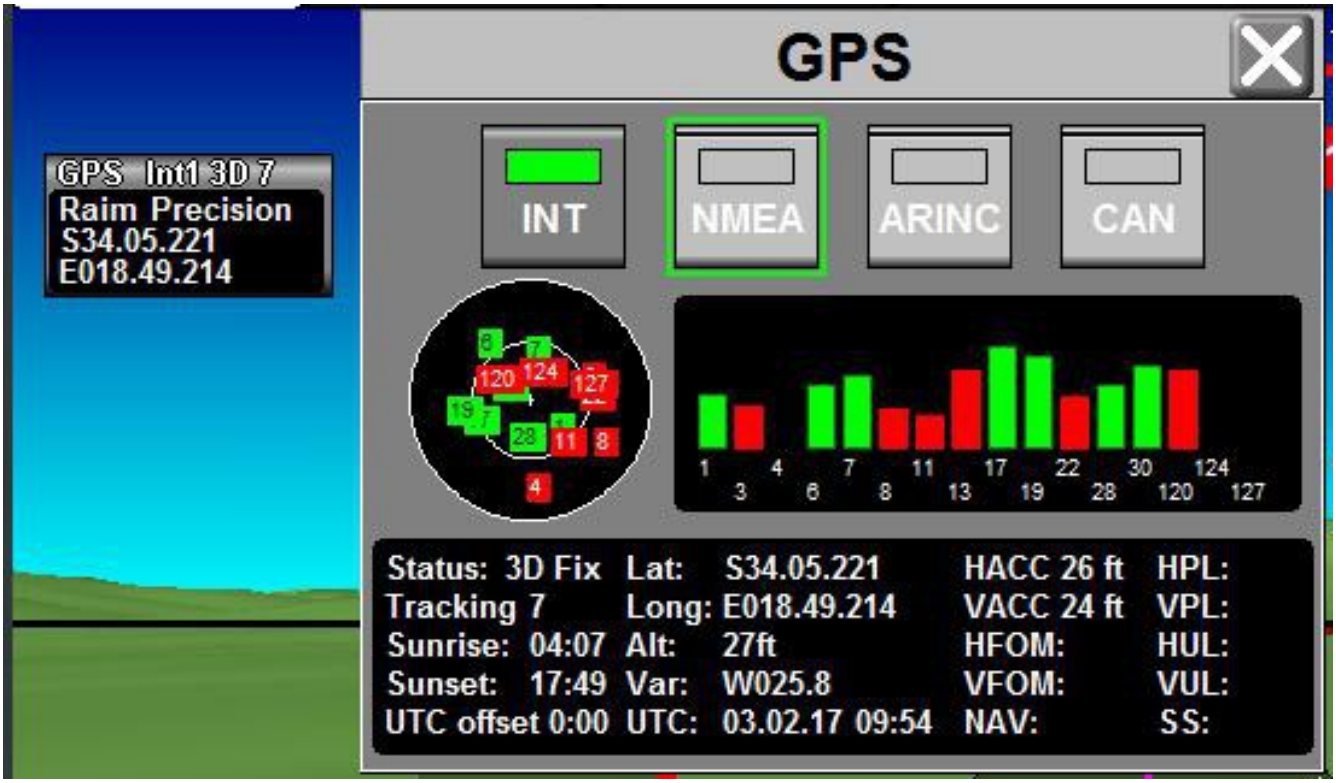
Rm OFF - The RAIM system is not operating. This is usually due to insufficient satellites in view. RAIM requires a minimum of 5btracked satellites.

Rm H12/V15 - The current RAIM error estimate. It is given in meters. In this example we have a horizontal error estimate of 12 meters and a vertical error estimate of 15 meters. RAIM error estimates tend to be very conservative, the real error is usually much less.

RAIM Alert

Should RAIM error limits be exceeded, the entire black inside rectangle of the GPS status display will flash yellow. The limits are setup in the GPS/NMEA setup menu (see installation manual) and also set from any active navigation database SID or STAR procedure.

GPS status dialog



Tapping the GPS status opens the full GPS detail screen. This screen shows a Skyview of the current satellite positions, received satellite signal strengths and several performance and status indicators.

Sunrise and Sunset times can be obtained for any region based on UTC and offset in hours. Enter the UTC offset of your area to obtain local time of sunrise and sunset. UTC offset is set in the Common Tasks menu.

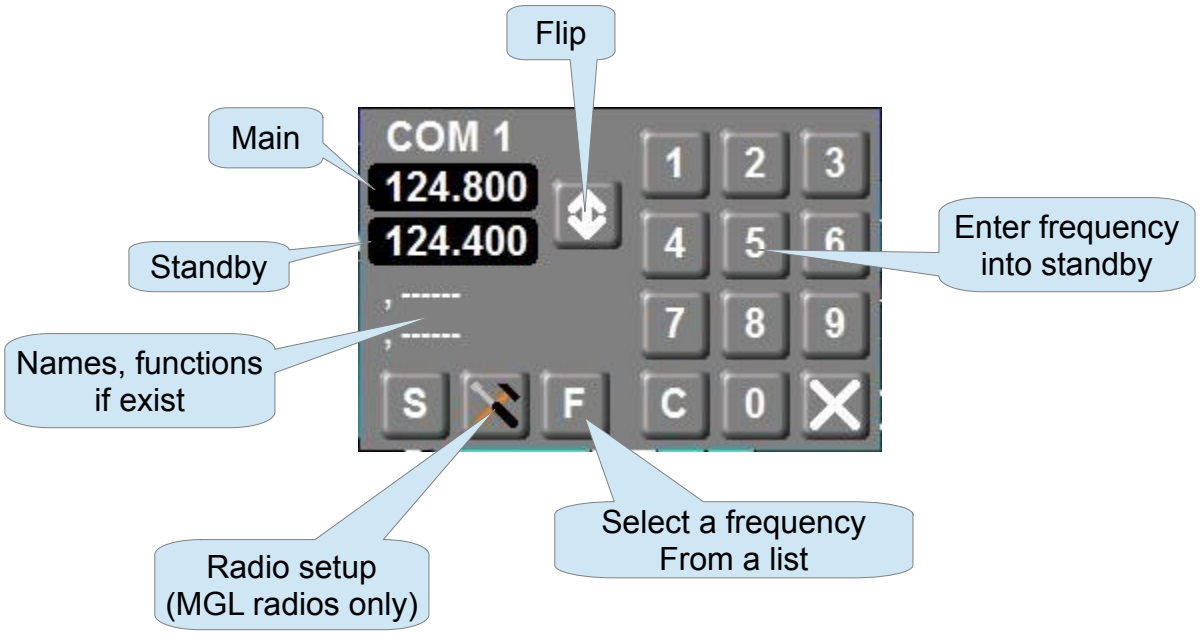
Please consult the separate manual “iEFIS GPS.pdf” available from the MGL Avionics website.

Also consult the manual “ModeS-ADSB.pdf” from the MGL Avionics website which has details on the various GPS sources and how to use them in the ADS-B context.

COM radios

The COM radio status display shows main and standby frequencies. Tapping on the frequencies exchanges them (this uses a short animation to reinforce the process visually).

COM radio dialog



Tapping the frequencies will flip main and standby frequency. Entering frequencies using the numeric keypad requires entering of 6 digits, for example, 123450 will set frequency 123.450 MHZ.

Selecting a frequency from a list: Prepare a list of frequencies in a standard text file format. For example you could use Notepad in Windows. Please create a standard ASCII text file. Native output of word processors cannot be used.

Here is a sample text file:

;Example frequency list for Radio function

;First entry is frequency in the following formats

;123

;123.0

;123.5

;123.45

;123.425

;This can be followed by a space and then text up to 30 characters for a descriptor

;Lines starting with a ";" are comments (like this line)

124.8 VFR below 1500 AGL

124.4 General flying area

123.45 Chat frequency

120.01 test 1

121.02 test 2

121.03 test 3

121.04 test 4

121.05 test 5

121.06 test 6

121.07 test 7

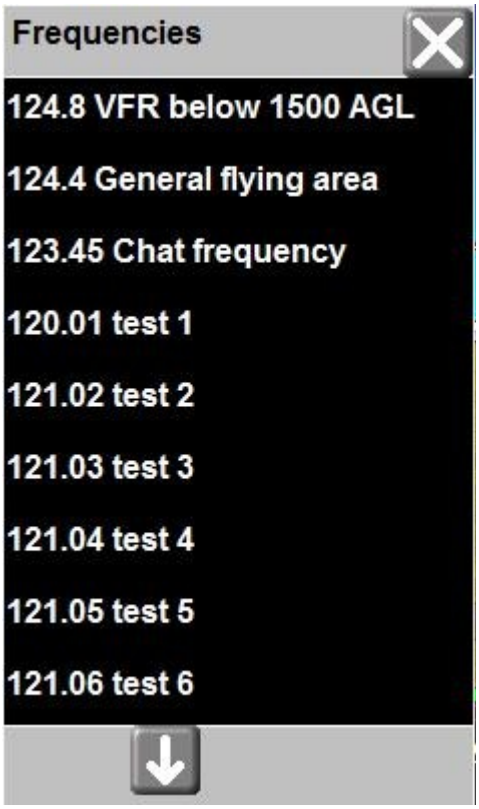
121.08 test 8

121.09 test 9

;---end of file (this text is not required to be in the file ----

Copy this text file into your panels “Other” folder using the file manager (in the menu) from your SD card..

Tapping the “F” button will then bring up the following dialog:



Select and tap the desired frequency. It will be placed in the standby field.

Note: Frequencies associated with airports or airspaces can be selected directly from the relevant view displays, for example the “nearest airports” display.

The frequency list shown here is mainly intended for often used area or unpublished frequencies. Place frequencies into your Radio.txt file that you use often. In some ways this is equivalent to the channel memory of a radio – just nicer to use.

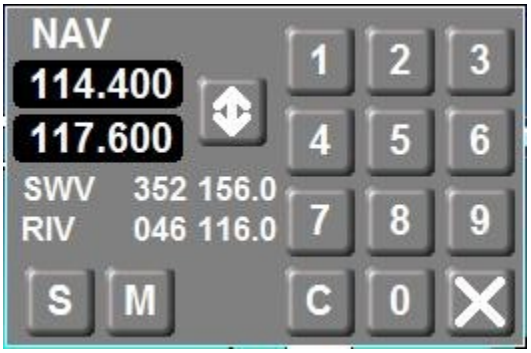
Note: Please enable COM1 and/or COM2 in the Equipment Enables setup menu to activate the interface (the gray cross through the status will be replaced with a red cross if the radio is not detected). Also ensure that you have selected the correct type and serial port for your radio in the Serial Port Routing setup menu.

NAV radio

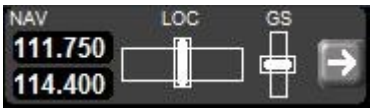
The NAV radio is based on the capabilities of the connected navigation system. For example, if you have a Garmin SL30 NAV/COM connected your will be able to use dual VOR navigation or ILS/Glideslope.

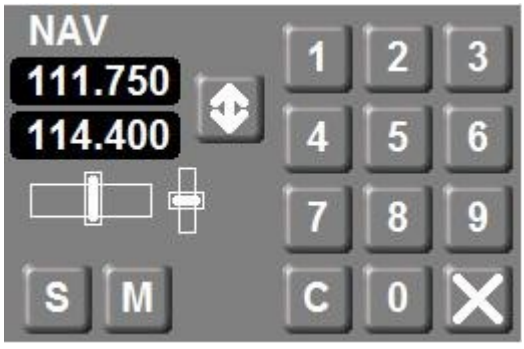
Even if you have no NAV radio connected, the NAV radio is still functional. Using the navigation database and the GPS it can emulate a real VOR navigation system. Simply choose the VOR station by tapping the 

Icon or selecting the equivalent function from the NAV menu soft key. You can select a VOR station in either the main or standby frequency slot. DME is calculated automatically.



NAV radio in ILS mode. The display switches to ILS mode either by selection of a ILS frequency or by demand from the external NAV radio. It does not switch to ILS mode if a GLS approach is activated as there is little point in that. You can continue VOR navigation even with GLS active.

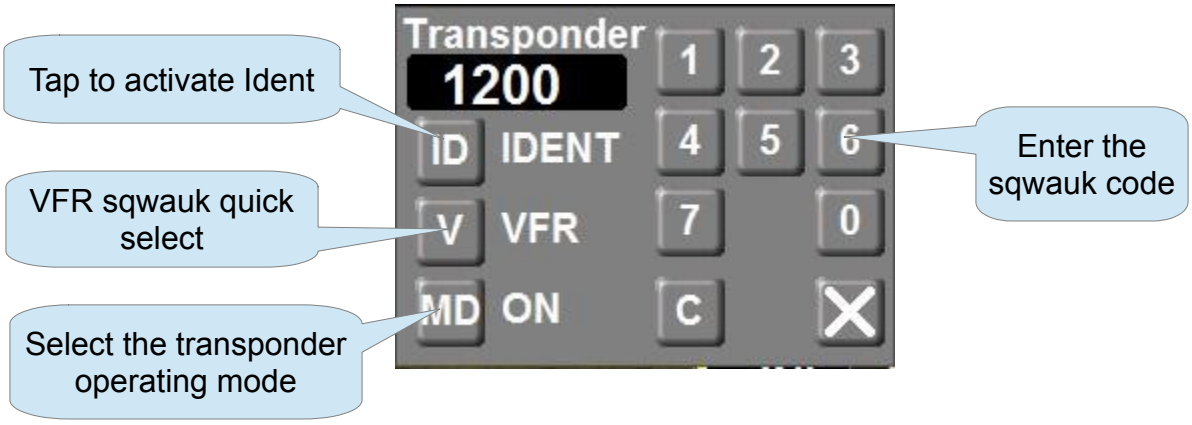




Note: If a NAV radio is connected and navigation is flagged valid, emulated GPS based VOR navigation is automatically suppressed.

Transponder

If you have a remote controlled transponder connected to the system, you can tap on the transponder display to open the transponder dialog:

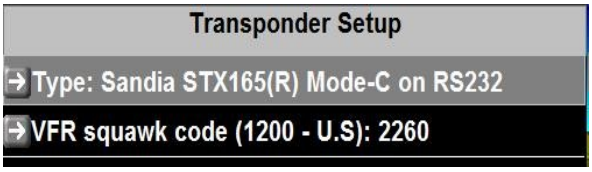


The iEFIS supports the Sandia Aerospace STX165R remote control mode-c transponder connected via a serial RS232 port (assign the port in the serial port setup and routing menu).

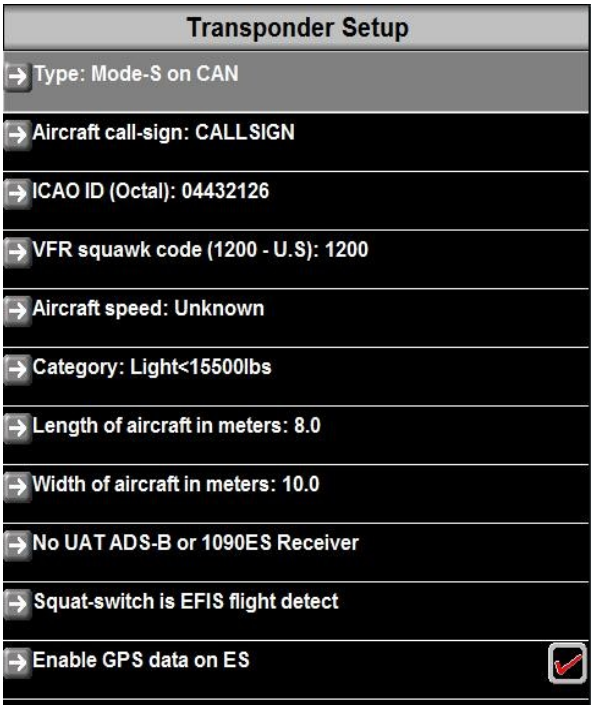
Also supported is the MGL/Garrecht and MGL/Trig Avionics remote control mode-s transponder via CAN bus interface. Further to this you can also use the uAvionics/Apollo on RS232 (Such as the popular TailBeacon).

For CAN bus no further interface setup is needed, for RS232 please select the chosen RS232 port for your transponder in the serial port routing setup menu.

Setup for mode-c transponder



Setup for mode-s transponder



Transponder setups

Please select the relevant entries depending on the transponder type.

Select the type of squat switch you would like to use. Squat switch tells your transponder if you are on the ground or airborne.

Selections: Use EFIS flight detect, Use external input on iBOX or iEFIS Extender, or “in flight” at all times. If you use an external input assign the input used and polarity in the Digital Inputs Setup menu.

In case of mode-s select if you have a UAT or 1090Mhz receiver installed. This information is sent by your transponder.

You can also disable the GPS position and velocity data from being sent on the mode-s transponder ES transmission.

Note: Please enable the Transponder in the Equipment Enables setup menu to activate the interface (the gray cross through the status will be replaced with a red cross if the radio is not detected).

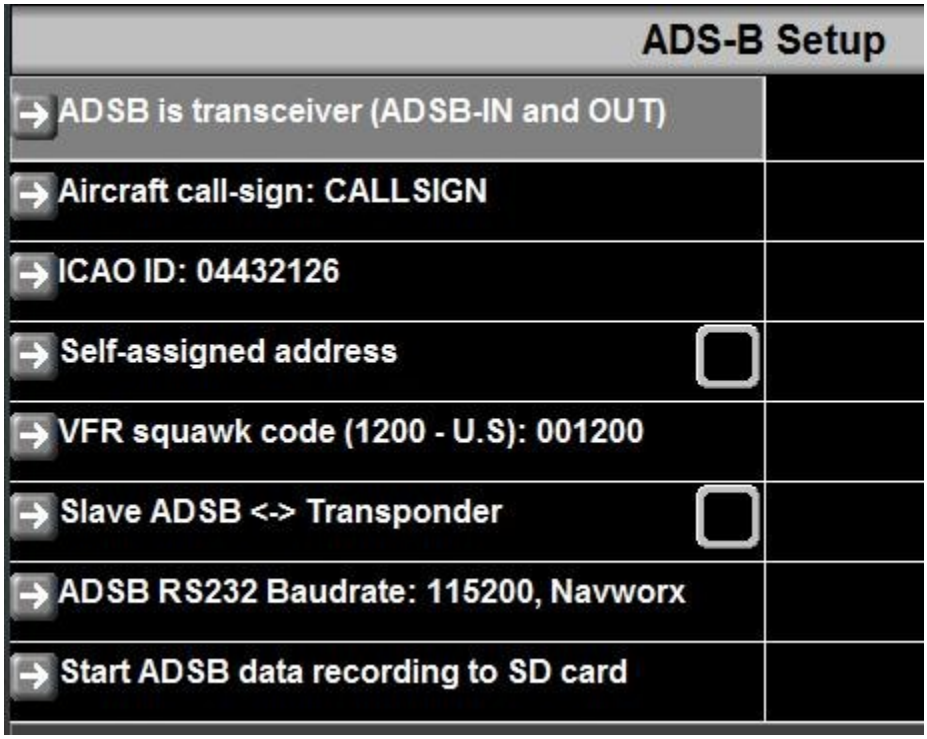
ADSB

The iEFIS system supports ADS-B receivers as well as ADS-B transceivers (978Mhz UAT). Any ADS-B receiver supporting the GDL-90 communications standard for ADS-B can be used.

The ADS-B status display and dialog is only relevant for ADS-B transceivers (“ADS-B out”).

Tap on the ADS-B status display to open the ADS-B dialog.

The ADS-B transceiver needs to be setup:



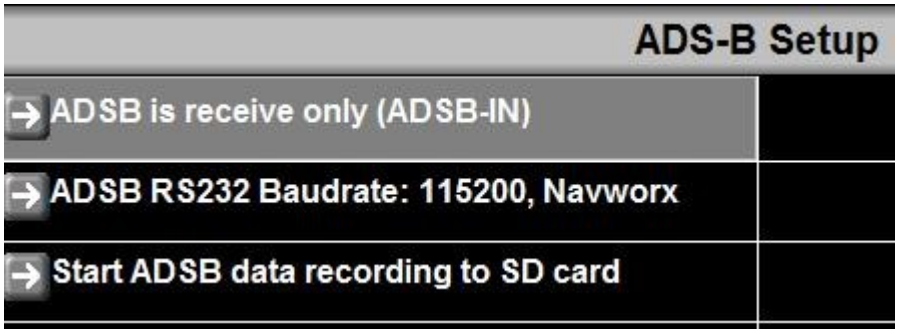
Please note the “Slave ADSB” in the ADSB setup menu. This allows you to synchronize the ADSB transceiver with your transponder if you have a remote control transponder connected to your iEFIS system.

If synchronization is activated, transponder and ADSB will transmit the same sqwauk codes. Ident is also synchronized. You can enter your sqwauk code in either transponder or ADSB and the other will follow. Note: ADSB has 6 digits. Only 4 are in common use currently.

Notes:

Control of an ADS-B transceiver is based on RS232 wired connection with a protocol compatible with the original NavWorks implementation.

Most ADS-B transceivers tend to work autonomously now so in such a case the EFIS does not control the ADS-B transceiver. In this case select “Receive only”. You can then receive ADS-B weather radar images, Notams, Traffic and other information from the UAT ground stations using any ADS-B receiver compatible with GDL-90.



Some receivers such as the popular Stratux receive transmissions from Mode-s transponders (1090ES). Aand forward these as traffic on GDL-90. This can also be used in the above configuration.

“ADS-B data recording”

This feature allows you to record the incoming ADS-B data stream to a file called “ADSB.REC” onto your external SD-Card. This file can be sent to MGL for analysis in case of issues or new features.

Note: Please enable ADSB in the Equipment Enables setup menu to activate the interface (the gray cross through the status will be replaced with a red cross if the radio is not detected). Also ensure that you have selected the Serial Port used in the Serial Port Routing setup menu.

Waypoint information

If a GPS waypoint is active, the waypoint information box is visible:

Information available in this display is:

Short and long waypoint names, Estimated time of arrival assuming a great circle line flight to the destination at current ground speed, estimated time en-route. Distance to go and magnetic bearing to destination complete the information.

Tap on the waypoint information display to gain further controls:

This is effectively a larger version of the waypoint status display. You gain a tap function allowing you to cancel the waypoint, get information on the waypoint (which also allows you to select a new one from the nearest airports function) or you can perform a retrack.

Note that you also have a waypoint cancel function available in the Action softkey menu.

Retracking a waypoint and GPS OBS

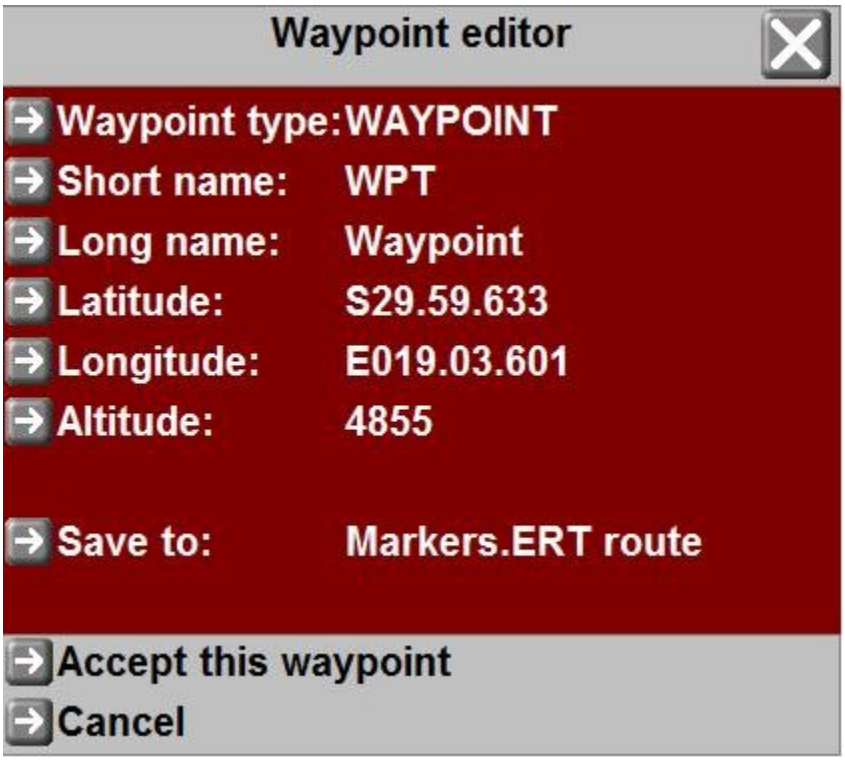
This is the procedure allowing you to create a new track from your current position to the waypoint. You would use this if you have deviated from your original track due to an obstacle or other reason but do not want to regain the original track. Effectively this function allows you to draw a new track line from current position to the original waypoint quickly.

Note that there is a related function called “GPS OBS” on one of the rotary controls (if you do not see it press the page rotary control to change the rotary control functions).

GPS OBS is effectively the track angle originating from your waypoint. Using the GPS OBS you can rotate this angle around the waypoint if you wish to approach the waypoint from another direction. The track is shown on your map – zoom the map so you can see your target waypoint and rotate the GPS OBS – note the track line following your input and the HSI is adjusting to the new track instantly.

GPS mark position

You can mark the current position at any time. Tap the GPS mark position and you will be presented with a waypoint editor:



Here you may edit the newly created waypoint. You may want to give it a name. Finally select where you would like to save the waypoint to. You may choose the “markers” route file or you can save your waypoint to the supplementary waypoint database.

Starting with an empty “markers” route file you can easily create a route “on the fly”.

Waypoints stored in routes may be reused in new routes.

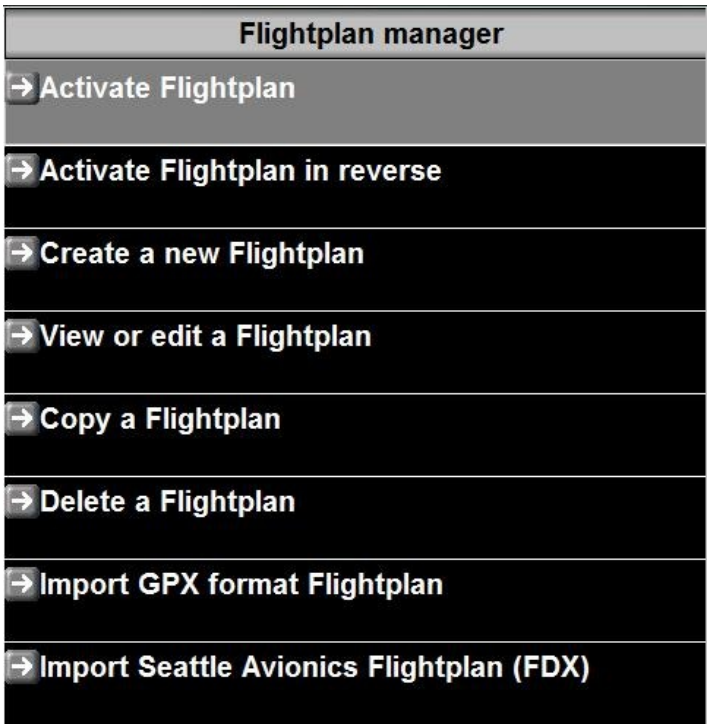
Flight plans

Flight Plans are managed via the FPLAN button.

If no flight plan is current active you will be taken to the Flight Plan manager. If a Flightplan is active you will see the active Flightplan popup. If the Flightplan popup is showing tapping the FPLAN button will hide the Flighplan (it remains active).

If the Flightplan is active, tapping the FPLAN button twice quickly will get you to the Flightplan manager.

The Flightplan manager



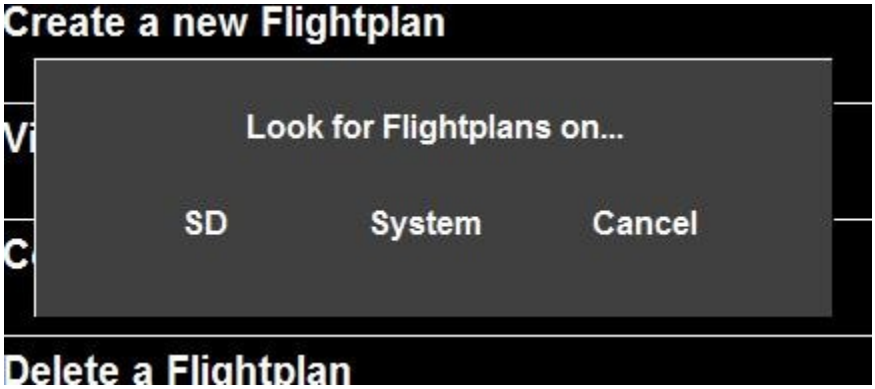
Flight plans are a collection of waypoints to be reached in order. You can create flight plans on your EFIS using the Flight planning tool or import Flight plans created by other applications. In the latter case you will copy them to the external SD Micro card and activate them from there. Note that if you activate an external Flight plan it will be copied to your internal disk and placed in the FlightPlan folder. If you import a Flight plan in GPX or FDX format it will be converted into MGL format “ERT”.

Flight plans are files with a name that usually describes the flight plan. Note that you should not use names longer than 30 characters (plus the file extention) with the G4 – it will truncate longer names for brevity.

Once you have activated an external flight plan you can reuse it from internal disk storage.

Activate Flightplan, Activate Flightplan in reverse

These two functions are very similar. You will be asked where to look for the flight plan – your choices are:



Choose “System” if your flight plan is on the internal disk (used before or created on your system). “SD” looks for the flight plan on your external disk.

One you have selected your flight plan it is activated immediately at the first (or last) waypoint depending on which direction you would like to fly the flight plan. In most cases you would select to fly it in the defined direction so choose “Actvate Flightplan”.

Create a new Flightplan

Choose this to create a new flight plan. You will be asked for the name of the new flightplan. Choose a name that contains permitted file name characters. You do not enter the file extention. That will be added by the system automatically. For example a name to enter could be:

Once you have entered your name you will be taken to the Flightplan tool.

View or Edit a Flightplan

You will be be presented with a menu allowing you to choose a flightplan from your internal disk storage (The Flightplan folder you can also access via the built in file manager).

Once you selected your flight plan it will be loaded and you will be taken to the flight plan tool where you can view and edit the flight plan.

Copy a Flightplan

Choose a flight plan – you will then be asked for a new name. A new, identical fight plan will be created. Use this function if you have a flight plan on your system that is similar to the one you need. It can be much quicker to edit a similar flight plan than to create a new one in particular if it contains many waypoints.

Delete a Flightplan

Once you know you no longer need a flight plan you should delete it from the internal disk.

Import GPX format Flightplan

Many third party flight planning tools can export flight plans in the GPX file format. You can import these files and convert them to ERT format.

Note that the success of this varies between sources of your GPX file. The MX1 will attempt to extract a short and a long name for each waypoint in the file as that is the internal for at used (the short name is usually the ICAO code and the long name something descriptive). GPX does not define this well so there is a bit of variation in the available GPX files.

Import Seattle Avionics Flightplan (FDX)

Seattle Avionics flight planning tool exports in its own format that you can use here.

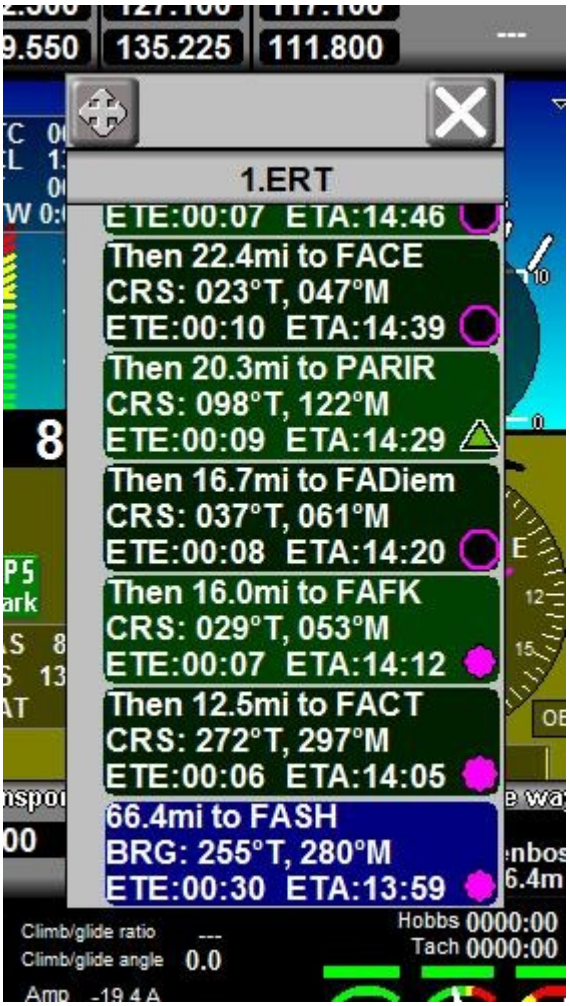
Canceling an active flight plan.

If a flight plan is active in your system there are three ways to cancel (deactivate) it:

1) A Flightplan cancel function will appear in the “ACTION” menu (tap the ACTION button).
2) A Flightplan cancel button will be available in the Waypoint status.
3) You can cancel the flight plan in the Flightplan manager. Tap the FPAN button twice (with the flight plan popup not showing) to show the Flightplan manager. The Flightplan manager will offer a cancel function in addition to the functions shown above).

The Flightplan popup

The Flightplan popup shows if you tap the FPLAN button while a flight plan is active. To hide the Flightplan simply tap the FPLAN again. If you tap the FPLAN twice rapidly (within a second) and the flight plan popup is not showing you will be taken to the Flightplan manager.



The Flightplan popup shows the next and previous waypoints of the active flight plan in bottom to top order (i.e. you fly towards the waypoint that is higher in the list).

The current waypoint is shown with a BLUE background.

You will be shown information on:

Distance to the current waypoint (this will decrease as you get closer). Distances between each of the following waypoints. You will also be shown the course to fly in both true and magnetic notation. You will be shown time to and between waypoints as well as arrival time at

each waypoint based on your current ground speed from your GPS.

If you tap on any of the waypoints in the list you will select that waypoint for further action (if any). The waypoint selected will have a PURPLE background. At the same time the context of the touch fields at the bottom of the display changes:

This will remain for a short while before reverting back to the normal display.

One of the Rotary controls now allows you to move the selected waypoint. It will also scroll the list if it is longer than space on the screen. You can also use the NextWP and PrevWP buttons if you prefer.

GOTOWP will activate the currently selected waypoint as the next waypoint.

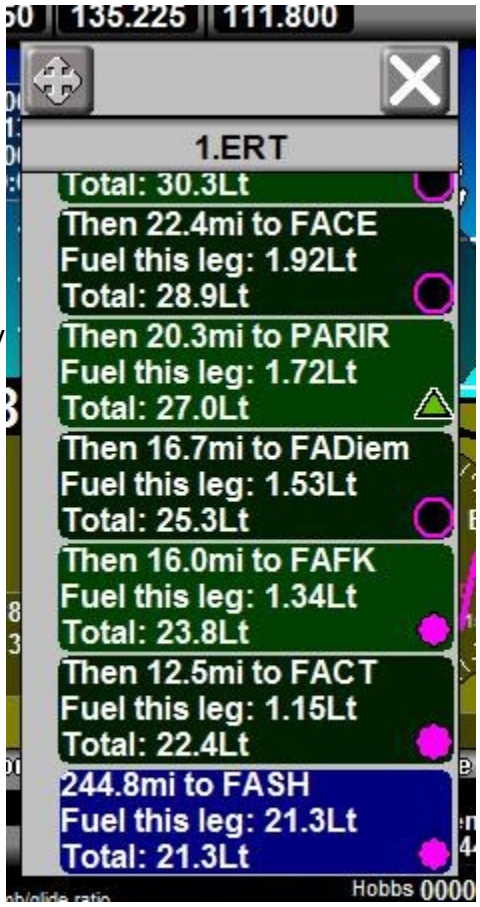
If you perform a GOTOWP the MX1 will ask you if you would like to follow the original track to the new waypoint selection or if you would like to create a new track from your current position.

ENDFP is another function available to cancel the active flight plan.

INFO will show available information for the selected waypoint such as frequencies or other information as defined in your navigation database.

Example:

FUEL changes the popup into Fuel consumption mode:

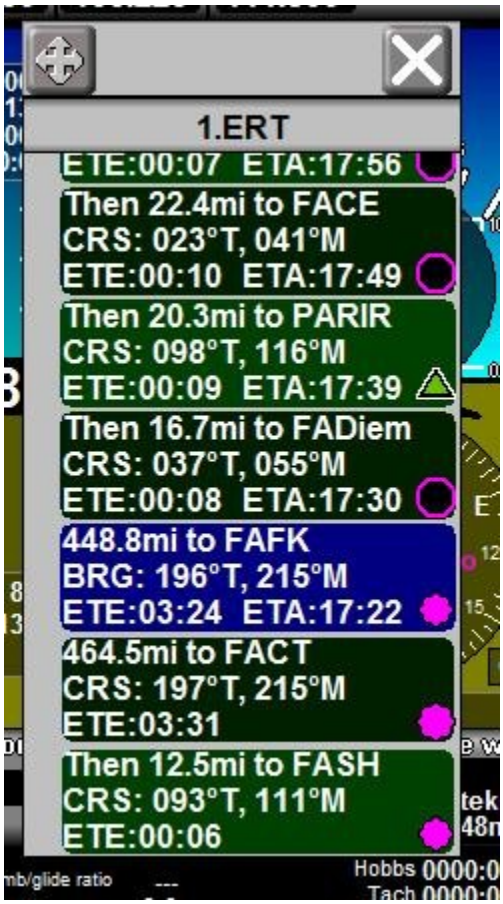


Assuming you have a fuel flow sender installed and configured the MX1 will calculate the fuel needs for every leg in your flight plan and also give you required fuel totals. This is a live display so you can easily see how power setting changes affect your fuel needs to arrive at a particular waypoint. Tapping FUEL again will revert to the normal popup display.

FLIP will mirror the active flight plan at the current position. The last waypoint will become the next waypoint. You have reversed the flight plan. This is a quick way to head back where you came from.

MANAGE will lead you to the flight plan manager.

Waypoints behind are not forgotten



Here you can see an example of waypoints that are behind you. The current waypoint here is FAFK and we still have a few minutes to go.

At the same time we can see the last waypoints we passed and also see distances and course information should we need to return.

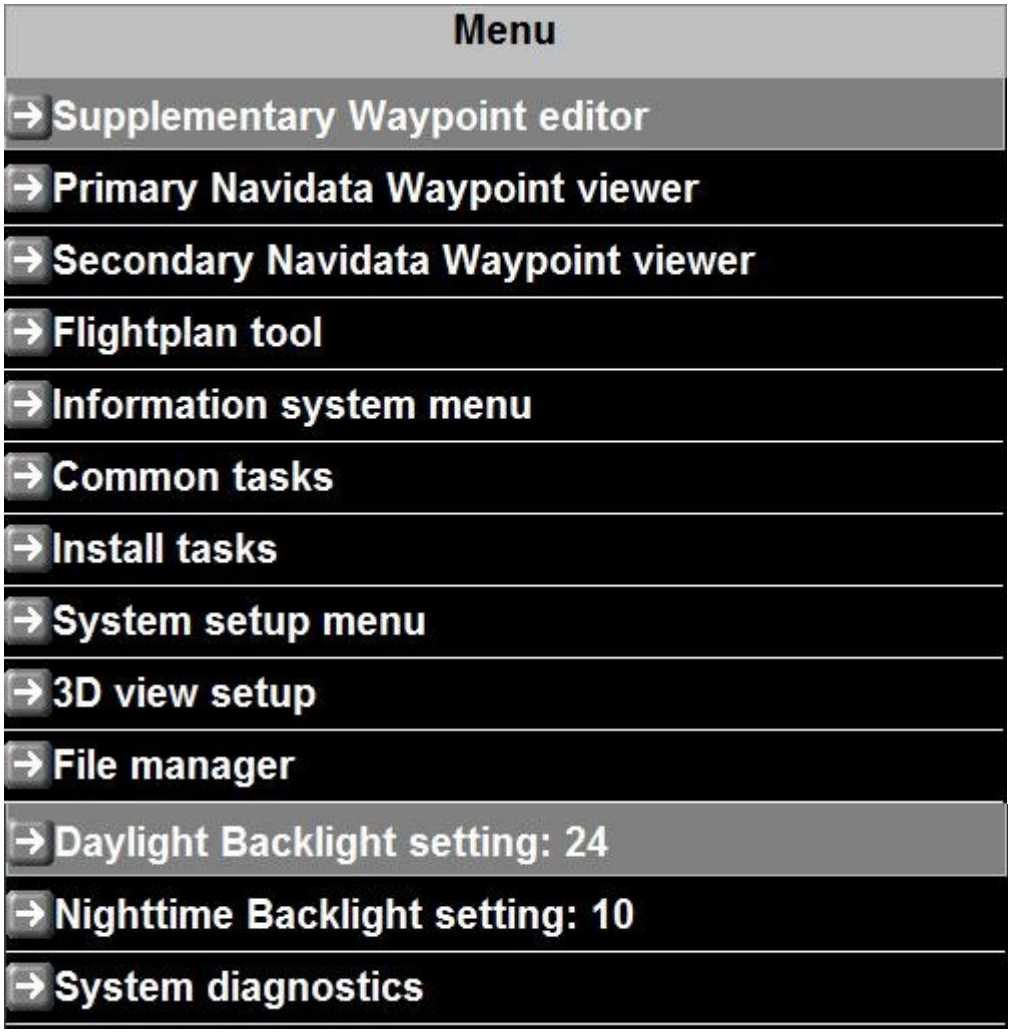
Use the FLIP button to reverse the flightplan at your current position so you will now be flying towards the last waypoint that is now the next waypoint.

The menu system

Press the “Menu” softkey button to activate the menu system.

The menu itself occupies most of the screen to allow sure use of the touch screen to select items. A smaller part of the screen is dedicated to a screen design showing essential flight instruments. This screen design can be customized similar to any other screen. Please consult the iEFIS alteration guide.

It is also possible to navigate the menu system using the soft keys. Move the highlighted bar as needed to the desired menu items and press the “Select” soft key.



Supplementary Waypoint editor

Please consult the MGL EFIS files document for detailed information on the various files and their uses in the iEFIS system.

The supplementary waypoint file is used to hold user created waypoints. Here you can create

waypoints that the system can use in addition to those provided in the navidata file(s).

Please consult the “iEFIS Navigation manual” for detailed information on this function.

Primary Navidata waypoint viewer

The primary navidata file contains navigation data provided either by a third party such as Jeppesen or you can also create and maintain your own navidata file using the MGL Central application.

The system permits up to 26 primary navidata files. One is active at any one time. You select the currently active navidata file using the NAV soft key. Navidata files are identified by the last character of the file name. This may be a character from a-z. The last navidata file would have the full filename of navidatz.ewd

Waypoints in the navidata file can be viewed but not edited.

Secondary Navidata waypoint viewer

The secondary navidata file contains navigation created using the MGL Central application.

This allows you to use a subscription product such as Jeppesen while still allowing use of a custom database that you can create yourself. One reason you may want to do this is to add airports with runway information that are not included in your subscription product.

The filenames used are Snavi.ewd or SnaviA to SnaviZ.ewd

The system permits up to 26 secondary navidata files. One is active at any one time. You select the currently active navidata file using the NAV soft key. Navidata files are identified by the last character of the file name. This may be a character from a-z. The last navidata file would have the full filename of SNaviz.ewd

Waypoints in the navidata file can be viewed but not edited.

Secondary navidata files are exactly the same format as primary navidata files. Only the filename changes.

Note: Subscription products cannot be secondary navidata files, they can only be used as primary navidata files.

Flightplan tool

The flight plan tool provides a comprehensive system for creating and editing flight plans (routes) on the EFIS. This is described in detail in a separate section of this manual.

Information system menu

Obtain information such as serial numbers or view the system log.

Common Tasks

A collection of a few tasks such as exporting the flight log

Install Tasks

This is a collection of automated installation functions you can choose to copy data files to the system such as map and terrain files.

System setup menu

This is the entry point to a comprehensive system setup menu.

This is described in detail in the iEFIS installation documentation.

3D View setup

A collection of setups affecting the synthetic vision. Here you can select texturing, colors and other options.

File manager

The file manager gives access on the file and folder level to internal files. You can copy files between internal disk and SD card or delete files.

Please ensure that you are familiar with the function and location of all files before using this function. This is powerful in the hands of the experienced user but you may also destroy your system by performing file operations that will cause a system malfunction.

Daylight backlight setting

Select the desired level of the back light for daylight operation. This is most likely the maximum setting of 31. Select a lower number if your system operates from battery and you need to conserve power. A setting of 24 reduces the systems power consumption by about 1/3.

Note: You switch between day and night light settings using the “Action” soft key.

Nighttime backlight setting

Select the desired backlight setting for night time operation. Most likely you will choose a very low number.

Note: You switch between day and night light settings using the “Action” soft key.

System Diagnostics

This provides access to low level data from iBOX devices and RDAC units. Several other useful diagnostic functions are also provided. Please consult the iEFIS diagnostics manual for a detailed description of the functions provided.

The Flightplan Tool

The Flight plan tool starts with the option of creating a new route or editing an exiting route using the FPLAN button from any page display.

Move (PAN) the map by tapping on the location you want the map to be centered at the cross hairs. Use the rotary control to zoom the map scale.

Tapping on a waypoint in the list centers the map at that waypoint and also selects that waypoint for edit, deletion or adding a new waypoint after.

The map draws the Flightplan tracks in white n and each leg is numbered.

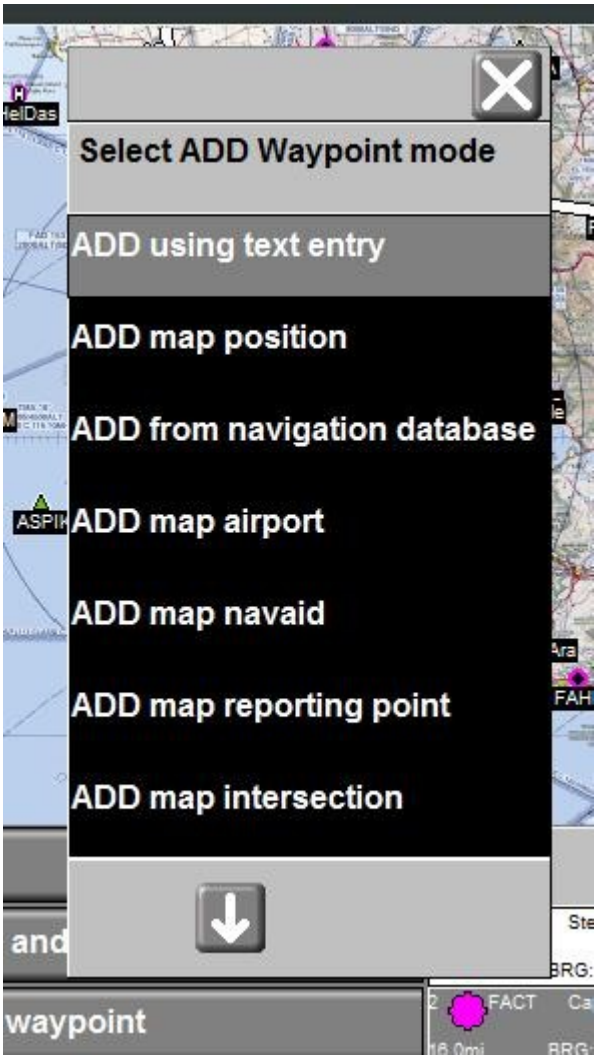
Tap EXIT to leave the flightplan tool without changing the flightplan or tap “SAVE AND EXIT” to save your changes.

Flight plans are stored in your internal drive in the folder “Fplan”. Flight plans files can be copied using the file manager. You can also use the “Flightplan manager” and seldom will need to access these files directly.

Once a route is open the right hand pane shows the route details. You can navigate the Flight plan using the touch screen.

ADD Waypoint

Adding a waypoint to a Flightplan is the function used most often. Waypoints are always added following the highlighted waypoint in the list (white background) or as first waypoint if the list is empty. You will be presented with a list of options:



Add using Text entry

Here you can add one or more waypoints using common ICAO text entry format.

"KLAX 503010N08923W" as entry would define two waypoints. KLAX (Los Angeles International) to a point at N50:30:10 W89:23:00. You can enter multiple points on one line, up to 250 characters at a time.

If you use an identifier (such as KLAX) and this cannot be found in any database (including your supplementary database) the import stops at that item with a message. In that case either correct the identifier if you had it wrong or try using coordinates or simply pick the location directly from the map.

As it is possible that identical identifiers are used for multiple items - if this is the case you will be presented with all of the ones found with additional information to help you choose the one you desire.

Add map position

This adds the center of the map at the cross hairs as waypoint. it will create a general waypoint at that location (you can always edit the waypoint details and add something descriptive).

Note that moving (panning) the map is done using single finger taps – tap the map location that you would like to center at the cross hairs. To move large distances zoom the map to a greater area.

Add from navigation database

This opens your navigation database waypoint viewer where you can select a waypoint (consider using the search function).

Add map Airport, Navaid, reporting point, etc

This operates similar to “Add Map position” except the system will search your database for the requested waypoint type that is closest to the cross hairs (locate the map so the desired waypoint is close to the cross hairs).

Edit and Delete waypoint

These two functions allow you to edit the details of the selected waypoint (waypoint with a white background in the list) or you can remove that waypoint from the list.

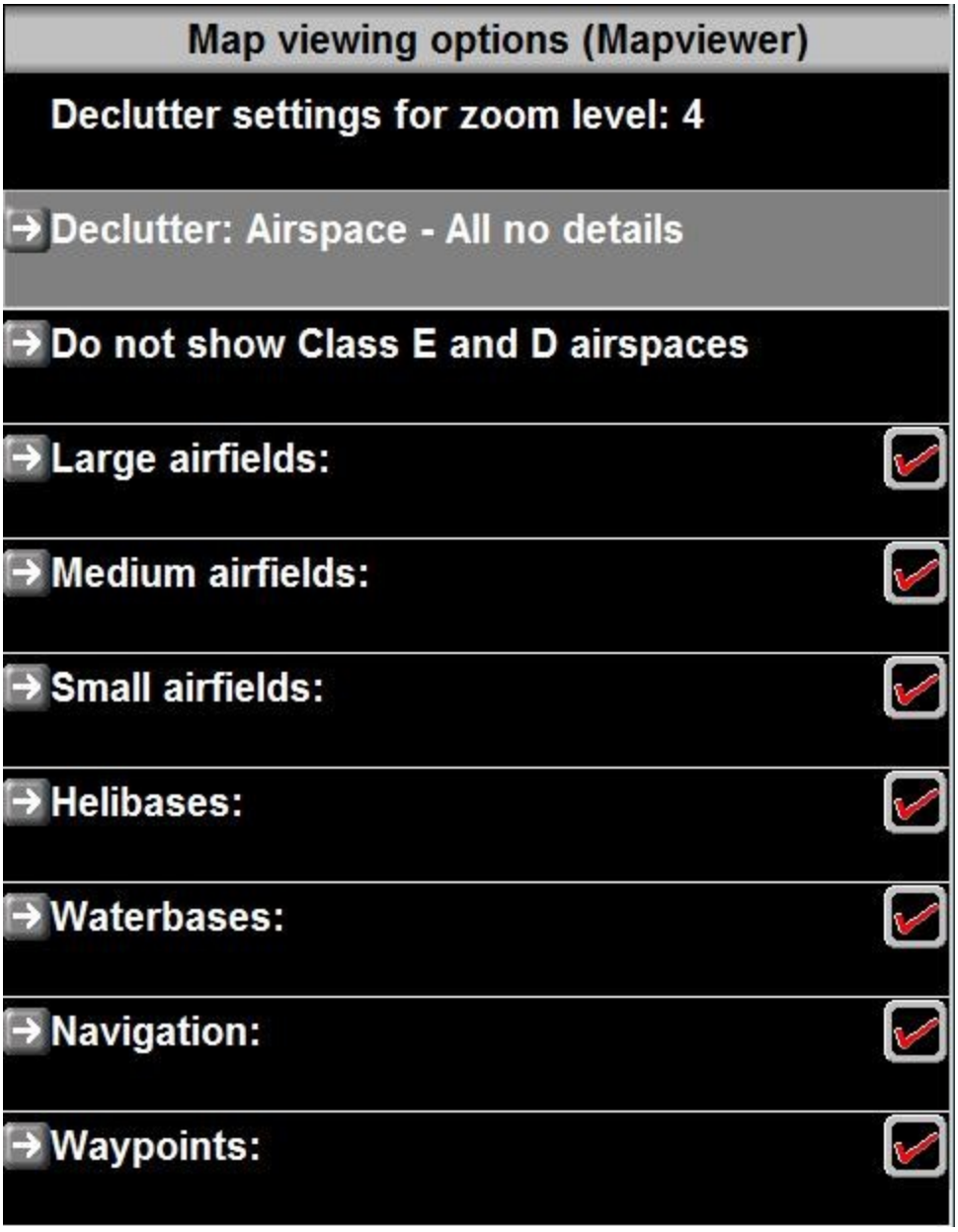
Latitude and Longitude

Here you can enter the latitude and longitude using numeric entry – this is the position you would like to place the cross hairs. You can also change latitude and longitude using the rotary controls.

Center map at GPS pos

Place the cross hairs at your current position as reported by your GPS.

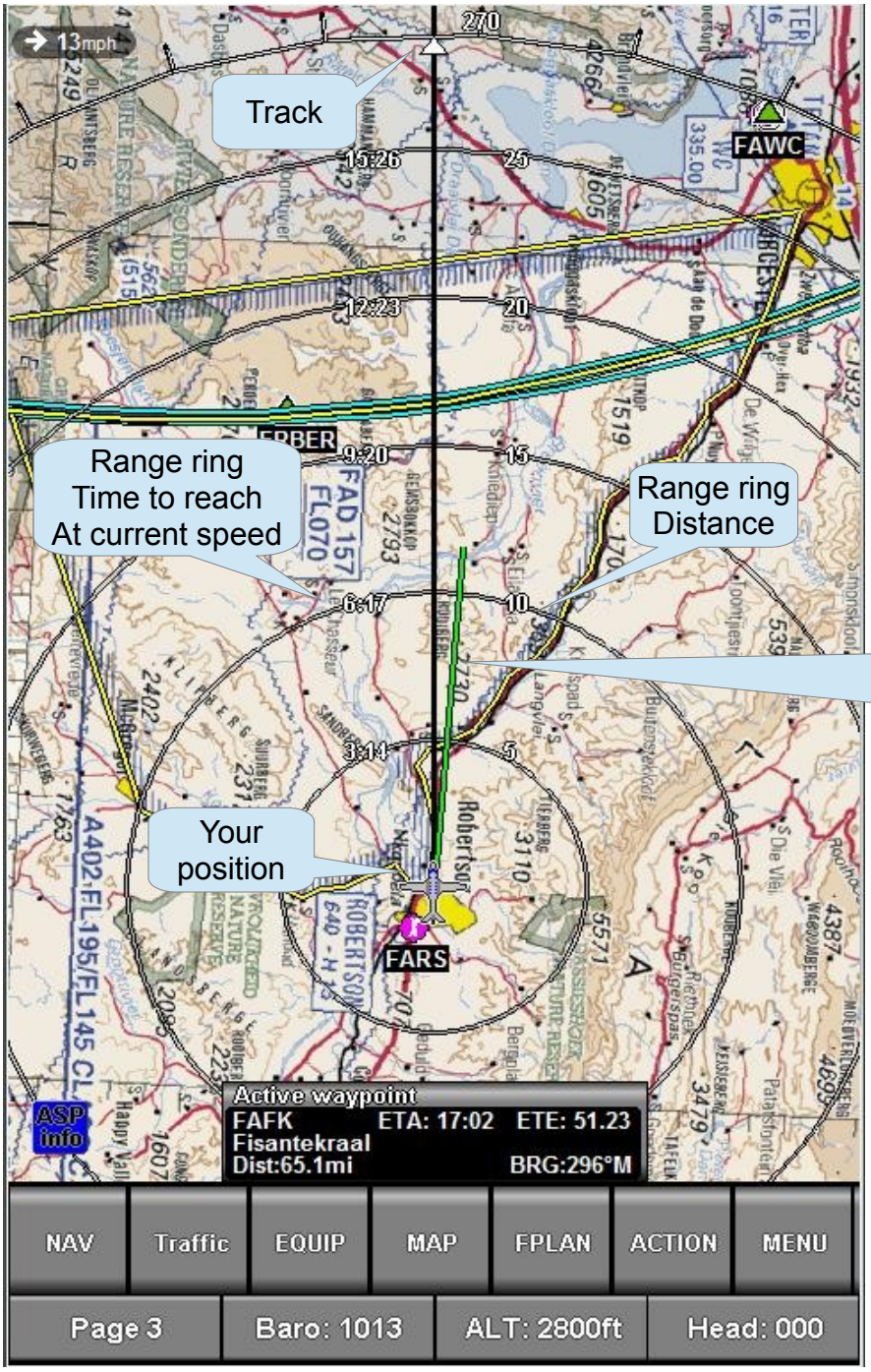
Map options



Here you select which navigation database waypoints to display as well as airspace types. Note that every zoom level has its own settings. Select the zoom level you would like to change before tapping the Map Options button.

Working with maps

Typical map view – here we have a “track up” display



Tap on the map and you get:

Mode

Allows you to select the map in either track up or north up modes.

You can also select from several different installed map styles if you have more than one style installed.

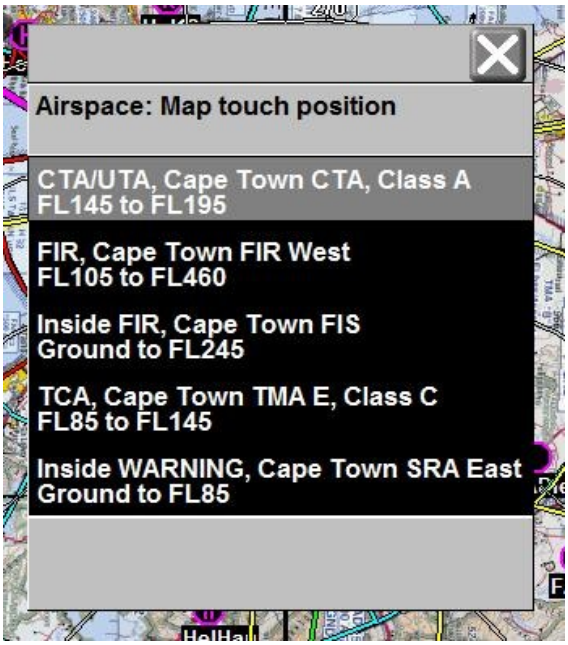
Note: Every page that has a map maintains its own settings and these are remembered if the system is switched off.

Airprt

Tap on an airport symbol on the map, then select Airprt to see information about the airport from your navigation database such as runway information or frequencies.

AirSP

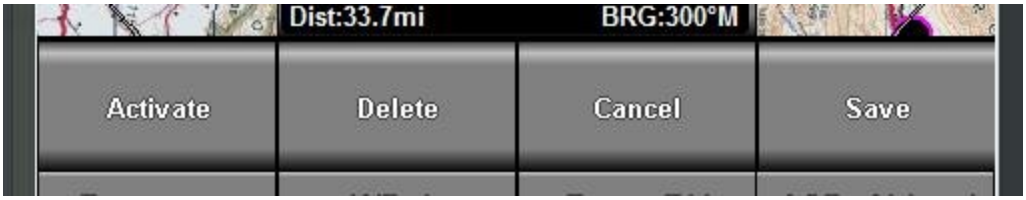
Tap on the map at any location and then select AirSP. You will get a list of all airspaces relevant for that location:

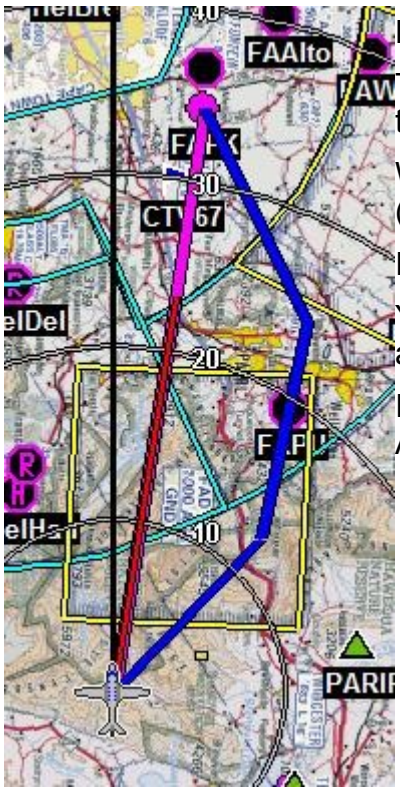


Divert

This function allows you to define a multipoint divert and even create a flight plan from your entries. You need to have an active waypoint. This has a track leading to it. You can add up to 20 points anywhere on the map and reshape the track to follow your divert. You can also save your divert as a new Flightplan.

In Divert mode the soft buttons change to this:





Here we tapped on two locations on the map to define our divert.

The original track is still shown in magnenta color and the divert track is shown in blue.

We can use the Delete function to remove the last point entered (this continues until no more points are left).

If you change your mind select Cancel.

You can now save your divert as a new flightplan. You will be asked for a name for the flightplan.

If you are happy with your divert and want to execute it – select Activate.

This is what it looks like after we activated our Divert. In effect it has created a flight plan with three waypoints – we created two along the Divert and the third one is our original waypoint.

With the Divert now active, tapping on the map gets us:

Note that a DivEnd button has been added. This allows us to end the divert at any time. The original waypoint will be restored as active waypoint.

Retrack

This function is identical to the retrack function in the waypoint status. This allows you to create a new track from your current position to the active waypoint.

PAN

This function puts the map in PAN mode. In PAN mode the map is no longer centered at your current position. In PAN mode you touch the map anywhere and it will be centered at that position. Note that during PAN mode the map is always north-up.

PAN mode allows you to locate the map anywhere.

Map information mode

Tapping on the map twice from normal soft key mode gets you:

In this mode tapping any location on the map does two things:

A yellow line shows the track between the current aircraft position and the point you touched on the map. A grey popup at the touch location shows the distance to that point and how long it would take you to get there at current ground speed.

Secondly – if your touch is within an airspace boundary – the boundary is highlighted and a further popup appears giving you details of this airspace such as name and levels.

Should more than one airspace be applicable to the location then the airspace occupying the smallest area is selected.

Note the soft key buttons are in a new mode:

Airport

Touch an airport symbol on the map (symbol from database) and then touch the Airport button. The MX1 will search the navigation database for this airport and enter the airport information display for this airport.

This allows you to view relevant airport information for this airport and also activate GLS approaches to runways (if defined).

If there is no further information available for the airport then a message will be shown. This typically happens if a waypoint has been defined as a an airport type but there is no releated airport data in the database.

Airspace

Shows all the airspace information relevant for your current position.

Goto

This useful button allows you to touch any point on the map and then select “GOTO” this creates a waypoint at the touch location and activates GPS navigation to that point.

Try this with the autopilot engaged. It's fun.

MakeWP

The last location touched on the map becomes a new waypoint and this is stored in your supplementary waypoint file (The file is called Waypoint.ewd and is located in your internal disks Navdata folder).

Before the waypoint is inserted you have the opportunity to fill in details such as waypoint types and name.

Clear

Exits out of the map information display and returns to normal mode (you can also just let it

time out – it will return to normal mode after a few seconds).

Panning the map

Sometimes it is required to view the map in locations that are not visible on the screen.

Most touch screen devices like your mobile phone allow dragging of maps with your finger. In a cockpit environment with typical mounting positions of an EFIS system this does not work well. The iEFIS touch control is thus designed to perform actions using single finger touches which are much easier to do in an aircraft in particular if there is turbulence.

In PAN mode the map is always in "North-Up" mode. The map center is shown as a cross hair and the latitude and longitude of that location is displayed.

Simply touch the location on the map in pan mode that you would like to have centered at the cross hairs.

To move a large distance first zoom the map to a larger scale.

In the preceding chapters you will have noticed many ways to use the map using single touches.

The move the map you need to select "PAN" mode.

From normal mode touch the map anywhere and then touch the "PAN" button.

This places the map in "PAN" mode and the soft buttons change to:

Airprt, AirSP, Divert and Retrack work as described earier.

P-off

Switch off PAN mode and revert to normal map mode with the map location centered at current position.

P-hold

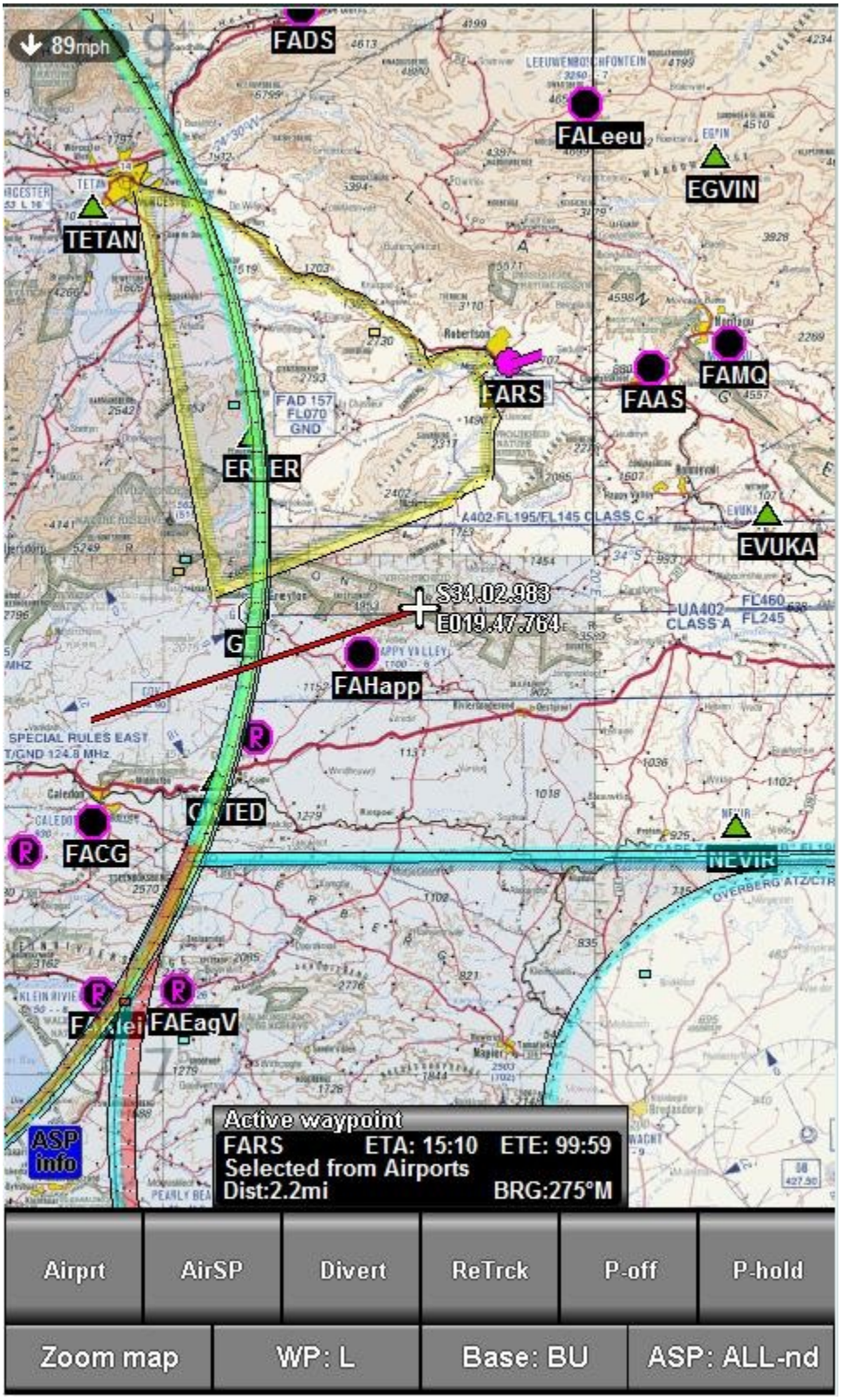
This suspends PAN node at the current PAN location allowing you to touch the map without moving it. In PAN hold mode all the normal map touch functions work such as obtaining information on airspaces, distances and time to a map point as well as activating a GOTO.

When you are in PAN hold mode, the soft key buttons are:

P-go

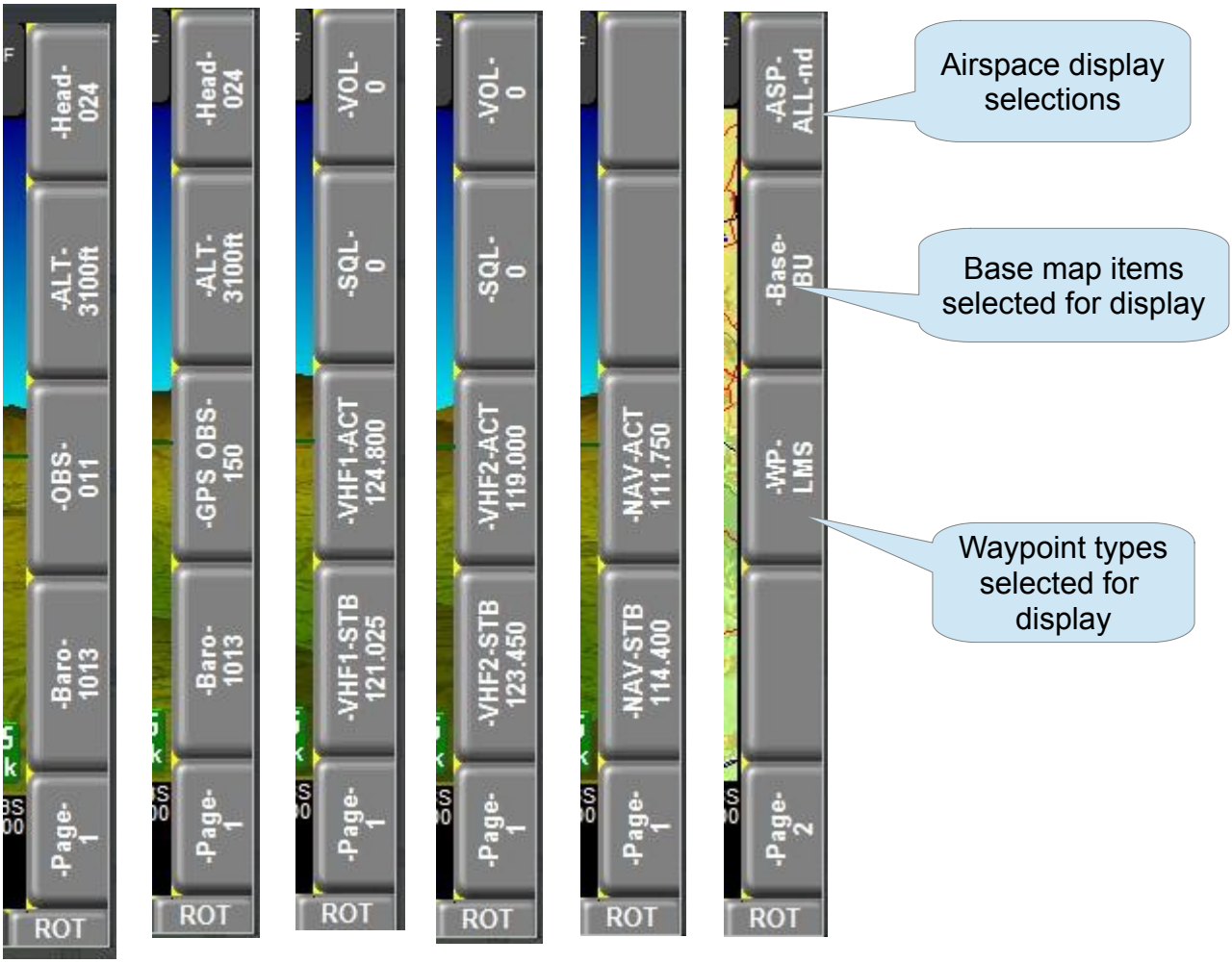
This resumes Panning mode.

Map Display in Panning mode



The rotary controls

Rotary controls work in pages. Simply flip through the available pages using the “ROT” softkey below the rotary control column.



Certain of the rotary control pages are automatically selected if you open specific devices. For example, if you open a COM radio, the corresponding radio controls are selected.

The rotary column selection shown on the right can be used to quickly select from pre-made type selections applicable for the map display. These selections are separate for every zoom level (this means you can optimize every zoom level as needed). Base map items are applicable for the vector map only.

Note that you have fine control over individual items by using the “Map” soft key. This also gives you more map related options.

If you turn a rotary control you activate a flyout which shows a large version of the current value being adjusted:

Waypoint selection system

The EFIS contains a common structure to view or select waypoints. Depending on the context, the function operates in slightly differing ways.

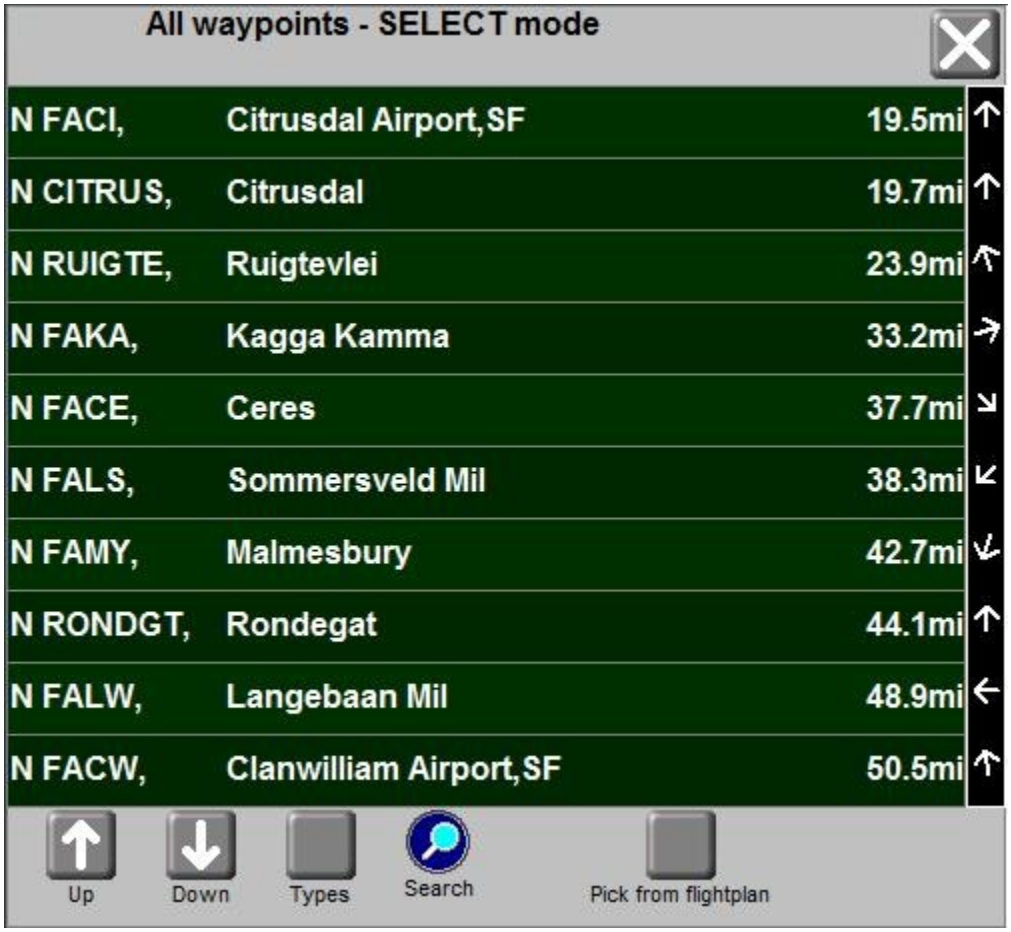
Here we start with the most common – using the “Direct goto” function to select a waypoint.

There are several ways to activate this function: 

This icon is available after tapping the reveal icon on the standard EFIS screens. 

You can also reach this icon via the GPS status display. You can also select:

from the NAV soft key menu.



Waypoints appear in order of distance from your current location.

The system maintains the nearest 20.000 waypoints from your database in memory and this is periodically refreshed as you change position. Waypoints that are very far away are not considered. Regardless if the memory list includes a waypoint or not, if it is contained in the

database you can search for this.

Note the “Types” button. Tap this to bring up a popup where you can select which types of waypoints to include in the list. Waypoint types are “Airports”, “Navaids”, “intersections”, etc.

You may select a waypoint that is included on any flight plans you have stored on your system. You will select the flight plan file name and then can pick the desired waypoint from that flight plan.

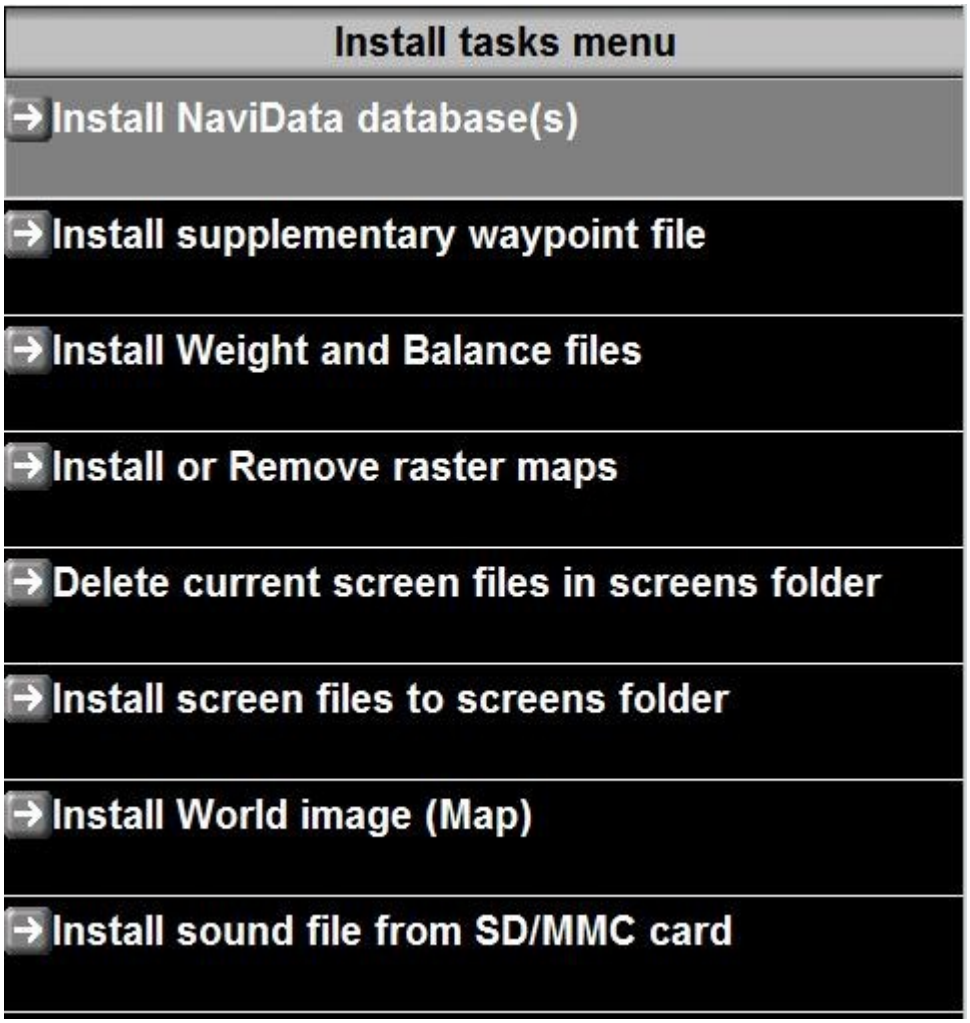
Tap the “Search” icon to activate the search function.

You can search short or long waypoint names. You can also select the search method. Either the waypoint name must start with the letters given in your search or you may choose “Contains”. In this case the name will match if any part of it contains your search criteria.

When you have finished your search you can tap the enter key on the keyboard. The search criteria will remain active until your either select a waypoint or tap the up/down icons which will allow you to resume normal selection.

The installation tasks menu

This is a menu that you will use fairly often – mostly to install updated databases.



Install NaviData database(s)

Navigation databases for your EFIS are available from various sources. You can use subscription based products from Jeppesen, PocketFMS and Easyplan.

There are also free databases available, for example the data used for North America is supplied by the MGL Avionics user forum based on the regular FAA data release.

You can also create your own data using the MGL Central application.

You can install up to 26 Databases and 26 secondary databases. In most cases however you will only install a single database.

The primary database file name is NavidatA.ewd. Further primary files are NavidatB.ewd, NavidatC.ewd.... up to NavidatZ.ewd.

Similar tho this the secondary databases are named Snavi.ewd or SnaviA.ewd to SnaviZ,ewd

Note: At any one time ONE primary and ONE secondary navigation database can be active.

You select which one in the NAV menu. Using this scheme you can create different navigation databases for different regions or use different databases for the same region.

Often you might want to use a subscription product as primary database and create your own database using the MGL Central application for your own airfields or waypoints as secondary database.

You can rename the filenames for your databases as you like to assign them to regions A to Z. However subscription products must remain primary databases.

Install supplementary waypoint file

This file refers to the file “Waypoint.ewd” in your internal disks navdata folder. This file is always there. If you delete it it will be recreated (as empty file).

You can add and edit this database in your MX1 (under the menu function “Supplementary Waypoint editor”). You can also create such a file using the MGL Central application.

Installing this file overwrites the internal file and also tells you MX1 to add the waypoints in the file to its currently active list. You can also just copy the file using the file manager but in that case the MX1 will only look at the file some other time based on circumstance).

Install weight and balance files

This installs the files WB.MIF and WB.DAT. The WB.MIF file is an image file created by the MGL BMP to MIF converter (available for download from the MGL Avionics website). The WB.DAT file defines your weight and balance stations and related information. This file is created in your MX1 Screen designer and simulator application.

Also see the separate chapter on weight and balance in this manual.

Install or remove raster maps

Raster maps are map images such as sectionals. They are converted and geo-referenced using the MGL Avionics MAPMAKER-2 application you can download from the MGL Avionics website.

Map files contain the position of the top left corner of the map as reference and use the file extention “.MAP”. However, you can rename these files and give them extentions such as:

.VFR .TAC .HIG .LOW .IFR .WAC

This allows you to install several sets of maps. You can then select the desired map type from the map “Mode” soft key button.

Note: You can also use the file manager to copy map files directly if you like. Copy them to or from the “Maps” folder of your internal disk.

Delete current screen files in screens folder

This can be used to remove all custom screens that are currently in the “Screens” folder of your internal disk.

Install screen files to screen folder

Use this function to install custom screen designs into your “Screens” folder.

The function will copy all screen files located on your external SD card and overwrite any that exist with the same name.

Screen files have names such as Flight1.sdf, Engine1.sdf, etc

The number in the name tells the MX1 which page to use these files on. You can edit the filenames to move the screen content to a new page.

Note: There is no file renaming function on the EFIS – use a laptop or PC with an SD card reader to rename the files.

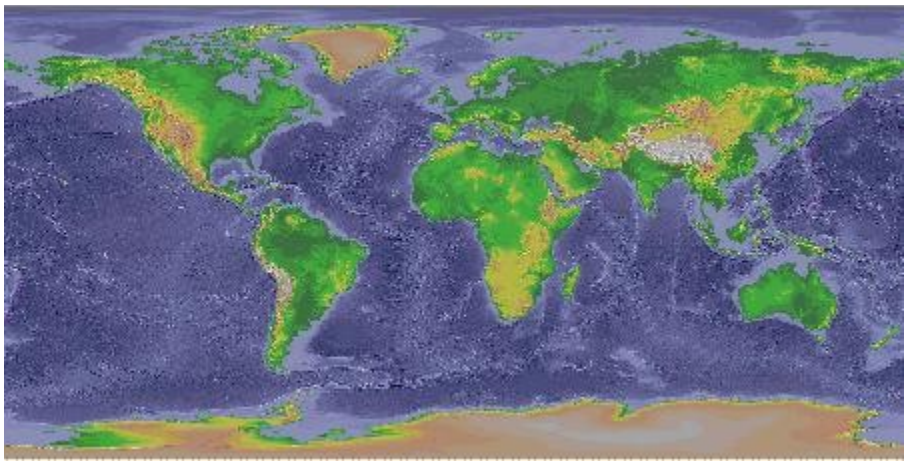
Note: The dfile.bin screen file system is a virtual file system contained in a single file. This can be created by the MX1 screen designer and replaces the built in screens. This file is NOT copied by this function. Please use the file manager to copy the dfile.bin to the Screens folder.

Install World image (Map)

This is a large image file in standard Windows BMP format. It is used as a map for large area zoom levels (continent wide). The image contains all of the Worlds land and sea mass.

The image size is 7200x3600 pixels wide and must have 32bit color depth.

The image is installed in the “Terrain” folder.



Should you wish to replace the image supplied by MGL Avionics (shown here), please ensure that you use the same map projection.

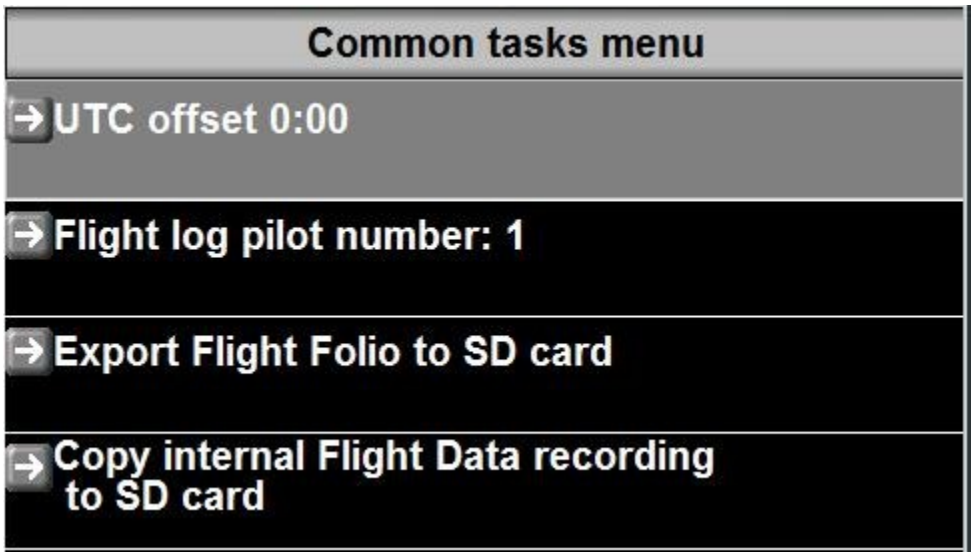
Install sound file from SD/MMC card

The sound file is named SOUNDS.ESD and is created by the Enigma Voice application available for download on the MGL Avionics website. It converts standard 8-bit, 8Khz sample rate, monaural sounds in WAV format. MGL Avionics offers two of these files for download on their website: A male and a female voice version.

The sound file is used for the various voice annunciations and also contains some other sounds such as market beacon sounds.

This file is installed on the root folder of the internal disk and loaded by the MX1 for use at system startup.

Common tasks menu



UTC offset

Enter the offset in steps of 15 minutes from UTC to your local time. This value will be used to calculate UTC from your local time or your local time from UTC GPS time if you are using the option to set your internal real time clock from the GPS (See MX1 installation manual).

Flight log pilot number

You can assign a number that will be included in any future recordings of the flight log. The flight log is a flight folio style log that is created based on your flight detection settings in the Operations setup menu. The flight folio contains information such as date and time of take-off, flight duration, speeds and altitude reached and some engine data such as hobbs.

Export Flight Folio to SD card

This function copies the internal flight log to a human readable text file onto your external SD card.

Copy internal Flight Data recording to SD card

The MX1 records all known data about your flight (primary flight, engine data, attitudes, navigation, etc) once per second to an internal non-volatile memory. It records the last hour of data even if multiple flights.

This function allows you to extract this data onto an external SD card. It can be viewed in the IEFIS flight data recording viewer. This application is a free download from the MGL Avionics

website.

3D View setup

This menu contains items that affect your horizon display.

Attitude graticule display

This allows you to switch the pitch and roll displays on or off.

View uses pressure altitude

Here you can select if your forward view should use pressure altitude (with local barometric correction) or altitude from your GPS.

The recommendation is to use pressure altitude unless you are flying in an area that has wide area GPS augmentation coverage that can significantly reduce vertical errors of the GPS position.

Show...

Here you can select from a variety of on-screen heading displays in true or magnetic heading. These displays are effectively all tapes. Choose which one suits you best.

Flight path display

You can select to compute an attitude estimate (pitch and bank) using your built in GPS. This is called “Flight path display”. It estimates your attitude based on how you move in three dimensional space. It has a slight lag but has the advantage that unlike a gyro based system it never drifts. It has several disadvantages as well. It cannot tell if you are upside down and it will show a nose down attitude if you are stalling (as your flight path is going down).

Nevertheless it can be very useful. The recommendation is to use this as additional reference if you have a multipanel system.

Flight director

The flight director is a set of purple triangles nesting over the center yellow triangles of your horizon display. If you follow these triangles as they move away from the yellow triangles you will be flying according to your turnrate, ascent and decent settings in your autopilot setup menu (even if you are not using an actual autopilot). If you engage the autopilot, the autopilot follows the flight director – the flight director in this case uses white triangles so this is a nice way of confirming that your autopilot is engaged and is following the flight director.

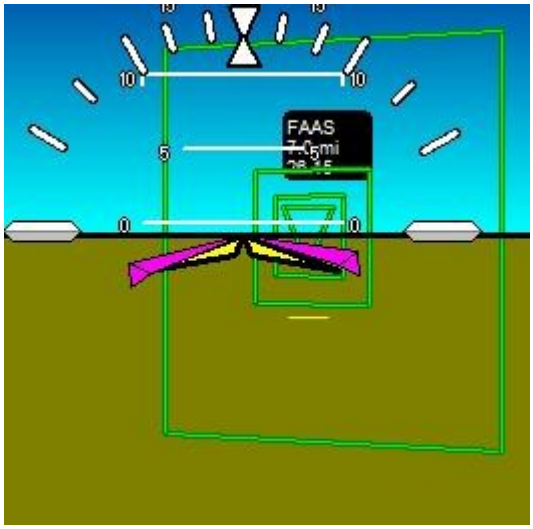
Allow helicopter pads

Select if you would like the horizon display to indicate nearby helicopter pads. Generally you

would not select this if you are flying a three axis aircraft.

Show 3D highway in the sky

Select if you would like to make use of the 3D highway in the sky. This shows you green boxes you “fly” through to stay on track and on altitude.



Here you see a highway in the sky and we are getting close to the waypoint. The waypoint “paddle” is shown with a black background indicating that it is the active waypoint.

The last highway box is a triangle with the bottom apex over the waypoint location.

If you are flying a flight plan and you are getting close to a waypoint that is not the last in your flight plan you will see a second set of highway in the sky boxes starting at the next waypoint and possibly heading in a new direction.

HITS follows altitude bug

Select if you would like the highway in the sky (HITS) to follow your current altitude or should it stay at the altitude you select using the altitude bug rotary control.

Velocity...

You can switch the velocity vector display on or off. The display looks like VV.

This vector shows you where you are going both vertical as well as horizontal. You can also select if you would like to use the GPS ground track or the magnetic heading source (compensated for local variation) as reference.

If you select the GPS the VV vector can only move up or down.

Note: If using magnetic heading a source you must ensure that your source is very accurate in order to obtain a meaningful vector.

Pitch ladder banks

Select if you would like your pitch ladder to bank or to remain vertical regardless of roll attitude.

Enable 2D traffic on SV

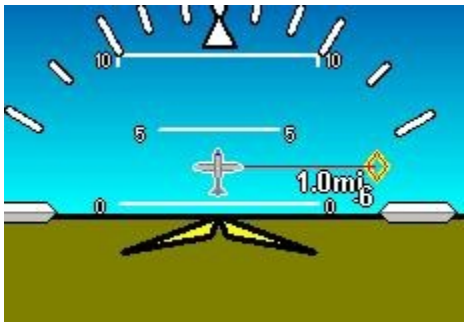
This function, if enabled will show you nearby traffic as symbols centered around the center of your horizon display. Traffic in front of you is shown above the center, behind is below and left and right as is.

A line is drawn to the closest traffic object from your horizon center.

If a traffic object is closer than the limits you have specified in your traffic monitoring setup (under your system setup menu) then the line will flash to highlight the danger.

Each traffic symbol is shown with a positive or negative number showing the relative altitude in steps of 100 ft to your altitude. Positive means the traffic is above you, negative means the traffic is below you. The line is also marked with the distance to the closest traffic object.

The same symbols are also used on maps to show traffic.



Touch screen calibration

Older iEFIS systems fitted with the original glass/glass resistive touch screen require calibration. Newer systems fitted with capacitive touch panels do not require calibration and the calibration function described here is not available. The following applies only to older systems that have been upgraded to G4.

Touch screens require calibration. The iEFIS comes with a pre-calibrated screen. You should perform the calibration so the screen behaves the way you want.

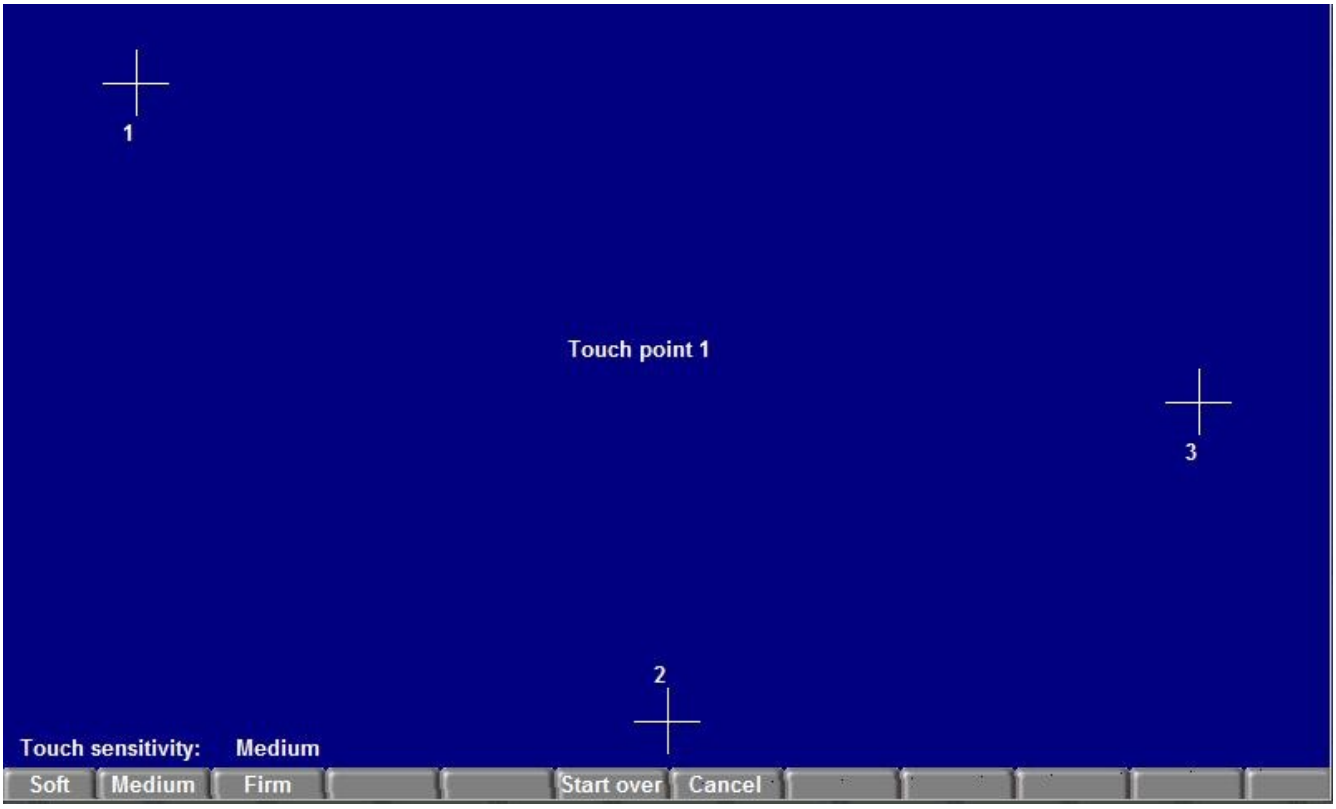
Every person is different and so are fingers. The iEFIS touch screen is pressure sensitive and locates the center of pressure when you press with your finger. The center varies a little with your anatomy and also how you press the screen, applying perhaps a bit of sideways or up/down force as you press.

Regardless of this, you may want to operate the touch screen in a way where the touch point

detected is very slightly above your finger rather than underneath. This is a personal preference but you can calibrate the screen any way you like.

You will find the touch screen calibration function towards the end of the System Setup menu.

You can also activate the touch screen calibration function by holding down the top right rotary control (press towards the panel, past the “click” point), hold it while applying power to the panel. The panel will start straight into touch screen calibration mode.



Follow the on screen instruction in the center – press all three points in sequence. After this you can test the screen. You can also select the force needed to activate the touch in three steps.

Recommendation: Smaller aircraft tend to need firmer force to assist with operation during turbulence.

The System setup menu

The System setup menu is perhaps the most important menu in your system. Here you will find all of the setups to customize your system to you aircraft and mission.

The system setup menu is described in detail in the iEFIS G4 installation manual.

The Diagnostics menu

The last item in the main menu is the System Diagnostic menu. Here you will find a useful collection of functions to fault find and diagnose problems mostly related to connected devices.

The Diagnostics menu is described in detail in the iEFIS G4 diagnostics manual.