QualityWings SIMULATIONS

Ultimate 787

Users Manual

Rev: V1.4.0

Legal Stuff

This manual was developed for use only with the QualityWings Simulations Ultimate 787 Collection simulation for Microsoft Flight Simulator ™ X and Prepar3D. This manual is not to be used for training or familiarity with any aircraft and is solely written for entertainment purposes.

It is a violation of the owner's copyright to redistribute this manual or any portion of this manual without the permission of QualityWings Simulations.

Please visit our website at:
http://www.qwingssim.com
http://www.qualitywingssim.com

All images contained in this manual are either taken directly from the simulator or used with permission.

Table of Contents

Introduction

Thanks for purchasing The Ultimate 787 Collection from QualityWings Simulations. We hope you enjoy this add-on as much as we've enjoyed developing it for you.

This add-on product package represents Boeing's newest twin-engine widebody aircraft, the exciting Boeing 787 series. All 787 variants are included with the Base package.

All models have been skillfully built by our dedicated team, both on the inside and outside, using real aircraft plans and the expert opinion of active 787 pilots.

In the systems department we strive for an accurate representation of the real plane.

A detailed Virtual Cockpit with supplemental 2D panels allow for accurate and efficient operation of the controls inside the State of the Art flightdeck. An airplane simulation package is not complete without realistic sounds and we pulled out all the stops to ensure this 787 sounds just like the real deal. More importantly, the expertly crafted flight dynamics ensure that the plane handles like the real deal.

Product Package Overview

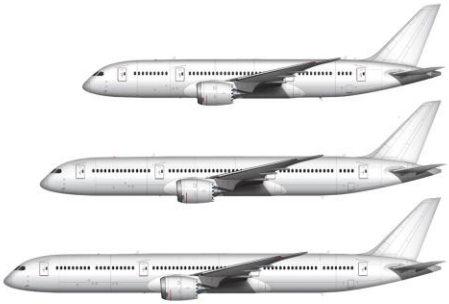
The most important facts about this package:

Exterior Models

Choose between three highly accurate and detailed models.

- Boeing 787-8
- Boeing 787-9
- Boeing 787-10

Based on hundreds of drawings, photos and videos, the exterior models replicate every small detail of the real airplane. Differences between each variant – such as for the main landing gear – are modeled in great detail. In addition we made sure that material reflectivity, aircraft lights and animations closely resemble the real aircraft.



There are over 100 Custom animations on the exterior models including, but not limited to:

- Realistic Wing Flex
- 787-9 HLFC System
- Environmental Control System inlets & outlets
- 787-specific "Autodrag" function
- 787-specific Maneuver Load Alleviation
- All Flight Controls
- APU Inlet Door
- Landing gear incl. Shock Strut Compression
- Passenger & Cargo Doors with correct animation
- And much, much more…

Liveries

Choose from over 65 High quality real-world liveries, available for download free of charge from the QualityWings website

Repaint Kit

We've provided a detailed repaint kit for those who would like to paint their own liveries. There are many effects included to ensure that ANYONE can make great looking paints! It also includes MANY option layer sets allowing you to match several different airline configurations.

Flight Dynamics

Each variant comes with its own flight dynamic to ensure that you can actually feel the different handling characteristics. The Fly-by-Wire Flight Controls System has been simulated to great precision and accurately reflects the Boeing C*U, P-Beta and spiral stability logic you find on the real aircraft. Additionally, protective features such as Bank Angle Protection and Tail-Strike Protection help you to operate the aircraft safely. Flight Characteristics have been tested by real-world 787 drivers.

Flightdeck & Systems

The Advanced flightdeck of the 787 has been painstakingly rendered

- Detailed 3D Virtual Cockpit with 787-8 and 787-9 Flightdeck differences modeled
- Undockable Multifunction Displays
- Comprehensive Aircraft Systems Simulation incl. Fuel Balancing function
- Comprehensive Flight Management System incl. SID / STARS
- Comprehensive EICAS System
- Realistic RR and GE engine models and matching EICAS indications
- Accurately Simulated Fly-by-Wire Flight Control System
- Accurately Simulated Autoflight System with Autoland Capability
- Accurately Simulated Tuning Control Panel
- Electronic Flightbag with dynamic Chart System and Onboard Performance Tool
- COMM Page with Online ATC Integration
- Heads-Up Display with normal and decluttered modes
- Airport Display System

- Weather Radar System Integration (Requires Active Sky product, sold separately. REX Integration is coming soon)
- Electronic Normal Checklists
- Traffic Collision Avoidance System with aural warning sounds
- *All New*QualityWings JumpAhead feature (allows jumping ahead to waypoints on your flightplan)
- *All New*QualityWings Approach Config feature (positions your aircraft on a selected approach – perfect to practice landings!)
- Configuration Options available to be set on the fly (in the Flightdeck)

Sounds

We created two incredibly realistic sound packages for the GE and RR engine variants. Each variant comes with a separate sound to truly make you feel and hear that you're flying with different engines. May it be the humming sound of the electrical system, individual switch sounds, the hydraulic pumps back in the cabin or the loud recirculation fan noise in the flightdeck…our 787's environment sounds will immerse you right away. All sounds were recorded on the real airplane.

- Realistic sound package featuring GE & RR engines
- EICAS Aural Warnings, GPWS and Flightdeck Environment Sounds
- QualityWings Passenger Alerting System (QWPAS) returns offering an authentic
- Passenger Announcement experience
- Introducing the QualityWings Crew Alerting System (QWCAS) – your virtual Captain and First Officer

Installation

Flight One Purchase Agent (new system)

The QualityWings 787 can be bought and installed conveniently using the Flight1 Purchase Agent, which is the successor of the Flight1 Wrapper.

There are several advantages with the new Purchase Agent:

- You can manage all Flight1 purchases within a single application including viewing all your past Flight1 orders
- The application contains different "Stores" within the Purchase Agent "Mall" which allow for customized presentations of different product lines by different vendors.
- Product downloads are handled within the system with all files stored to a configurable download location.
- Product updates can be distributed via the Purchase Agent.
- You can purchase more than one item at the same time

Download the Flight1 Purchase Agent from www.flight1.com and create a Flight1 Account.

Once logged in, you can browse products from many different vendors who partnered up with Flight1.

In the upper right corner, click the "Change Store" button and select QualityWings Simulations from the list.

Under the "Products" tab, you will find all available products from us here at QualityWings.

Select your desired product and click "Add to Cart". Once done, simply select the cart symbol and proceed to checkout.

After the purchase, the Ultimate 787 Collection will show up in your library, from where you can download and install it.

Flight One Wrapper (old system)

The QualityWings 787 installer utilizes the Flight1 Wrapper. Once the installation file has been unwrapped, installation is pretty self-explanatory.

Flight1.com's e-commerce software "wrapper" system is designed to allow product to be delivered to you through a secure, convenient, and easy to use system of distribution that allows you immediate access to the software. The system was specifically designed to give you self-manageable access to your software, and since the system has "prepackaged" the software on your system, you do not need to worry about downloading your software after your purchase.

Once you download and initially run a Flight1.com E-Commerce enabled product you will be presented with a simple to use screen that will allow you to purchase software through our secure and encrypted e-commerce engine. Depending on the version of our E-Commerce Wrapper that is in use with the EXE you have, you will be presented with either of the following screens...

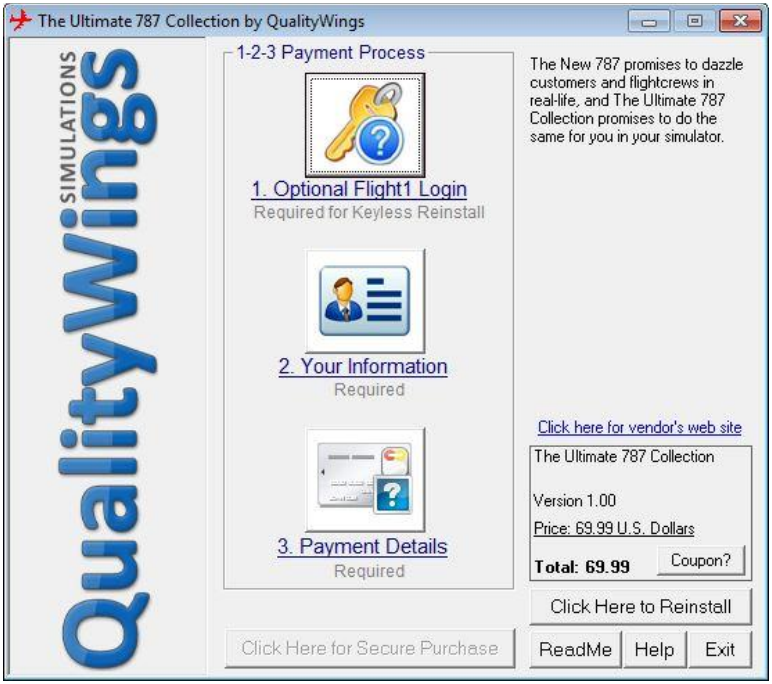
If using the newer type wrapper (with the 3 big buttons):

Button 1. You can enter your Flight1 account information behind button one. This would be an account you opened separately at our new account creation page. Accounts are totally optional and are NOT required. But if you have an account, you can reinstall without needing software keys. See this page for more info on Flight1 accounts.

Button 2. This is required, and it is your name, address, and contact info.

Button 3. This is required also, and it contains the method of purchase you will be using. In this case, you can use either of the 4 major credit cards, or PayPal.

Once data is correctly entered behind at least Buttons 2 and 3, the purchase button will activate.



The Purchase Process

Once the credit card transaction has been validated and approved by our secure servers (we never save complete credit card information on our servers), the ESD system will "unwrap" the core program and create a unique and exclusive ".key" file for you to use for reinstalls (do not forget that if you associated your order with an account, you do not have to use keys for reinstalls). The ESD system also prompts you to backup a copy of the key file for safe storage in case you need to re-extract your software again later.

You will also be notified via e-mail of the successful transaction.

To summarize the entire process (after you enter your information for a purchase):

- Once your purchase is approved, a Key file is saved to a folder on your main hard drive in the company's name. Since "Flight One Software" uses the wrapper, you will get a C:\Flight One Software folder (replace

C:\ with your current boot drive if Windows is on another drive). Other companies will of course get a folder different than Flight One Software. Keys are used for reinstall, and are not required if your order is assigned to a Flight1 account.

- •You will also get a Proof of Purchase Certificate in HTML format. This has special information that may be required by some vendors for you to access additional services. Never post your certificate information in public.
- •Usually a Setup file is unpacked to the same location just listed above.
- •In some cases, a license file will be created. This .lic file contains additional information that may be required by the software you are purchasing, and it ties your purchase to your current machine. Do note that this does not permanently tie your order to your machine, just this installation. If you go through the reinstallation process, a new license file will be generated for that machine.
- •If you need to service your order (new keys, replacement certificates, lost orders, etc.) you can use our automatic service system at http://www.flight1.com/view.asp?page=wrapperservice.

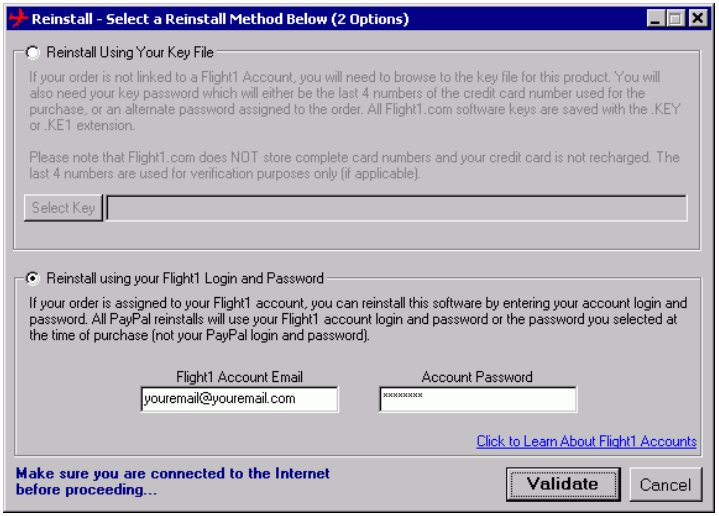
Reinstallation

The ability to reinstall is fully implemented, and in many cases just takes a few moments. If you have your product key, or if your order is assigned to a Flight1 account, all you will need is the correct password (along with an Internet connection), to reinstall. In cases where you lost all information pertaining to an order, as long as you have access to your purchase email address, you can retrieve from our automated system all necessary information required for your reinstall. The goal is to allow you to feel confident with your purchase, even if you did not back up your original purchase information or files. Even if you do not have access to your original email address, you can contact FlightOne and we can try to help you get up and running again.

How to Reinstall using your Flight1 Account

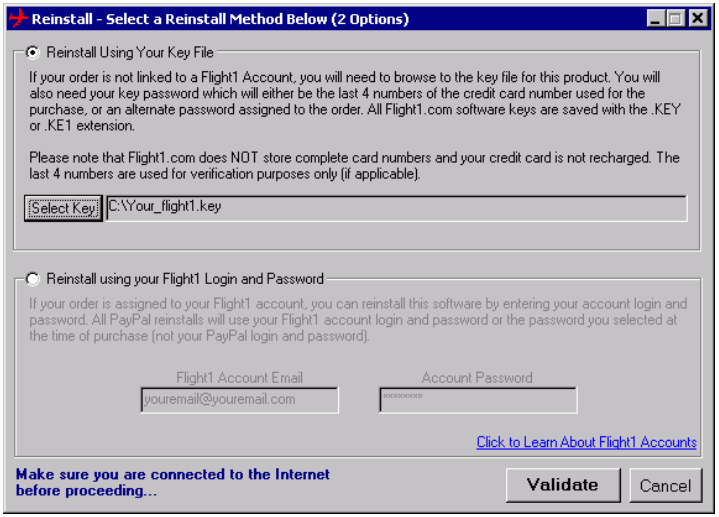
In the main screen (as noted above in the interface pictures), press the button that says "Click Here to Reinstall". You will be led to a screen that gives you 2 options... to "Reinstall Using Your Key File", or to "Reinstall using your Flight1 Login and Password".

If you have saved your login and password in the wrapper from a previous purchase, your data will have been automatically entered. All you need to do next is click Validate. If your login name and password are not entered, you may enter it, then select the Validate button.

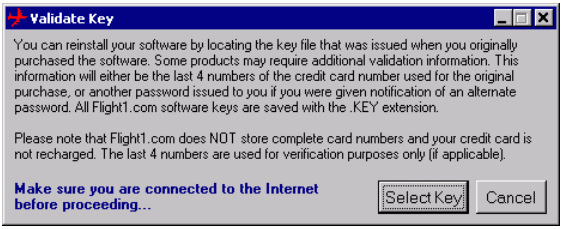


Reinstall Using Your Key File

If you need to reinstall using your key file, simply make sure the key option is selected. Then press the Select Key button. You can then browse to your product key file. After the key is selected, hit the Validate button. You will need to have the last 4 digits of your credit card handy (this is use for verification purposes only), or alternately, you may have a customer selected password. Once everything is ready and the Validate button is selected, the server will login and confirm your information, and then unpack the software.



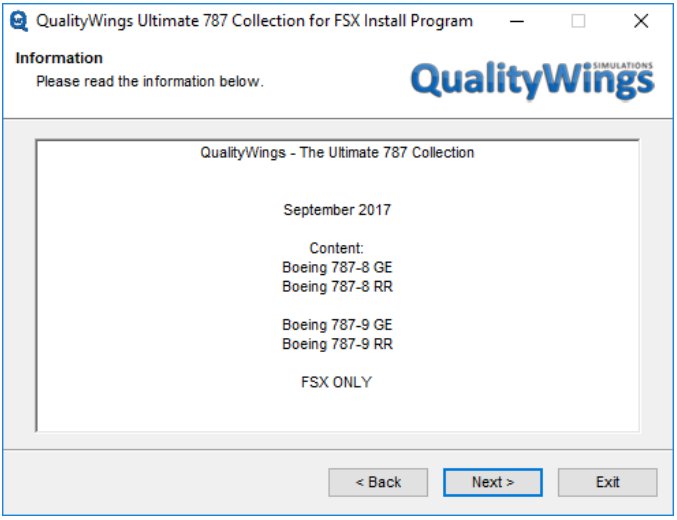
If your wrapper version has the data-entry boxes in the main screen, instead of the 3 big buttons, then you will need to use your key file for reinstallation. Your password for this version will be the last 4 digits of the card used for the original purchase. After the Select Key button is pressed, you will browse to your key file, enter your password, and then the server will login and confirm your information.



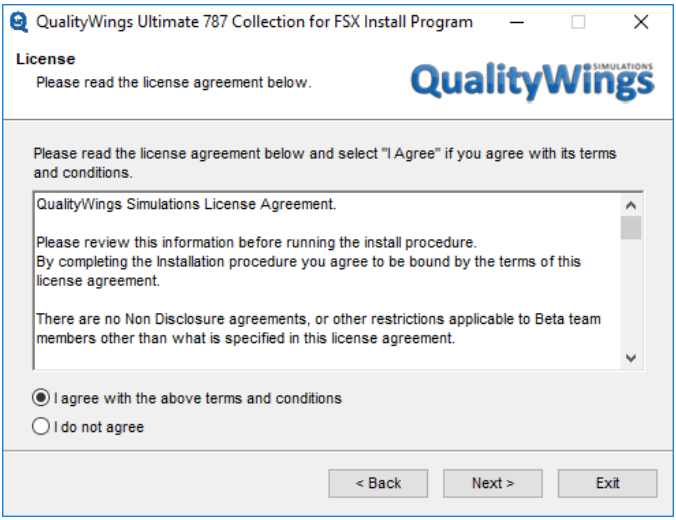
QualityWings Installer

Installation is fairly straight forward. Once you execute the installer file, just follow the on screen instruction. The graphics in this manual show FSX installation. P3D installation is similar.

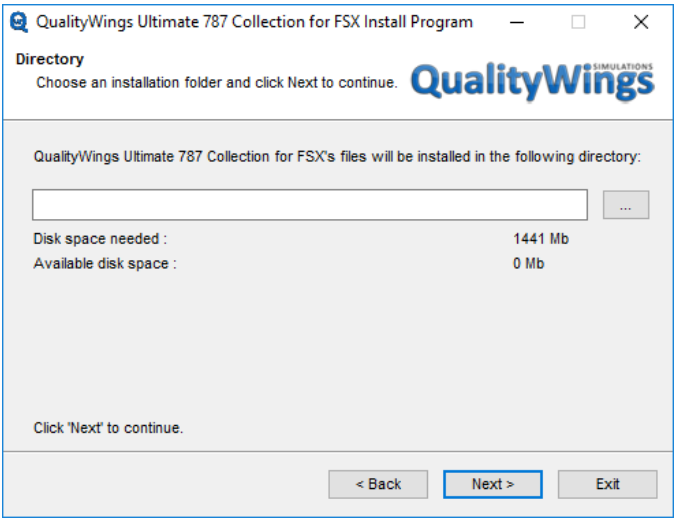
Initial page of the Installer. Click NEXT



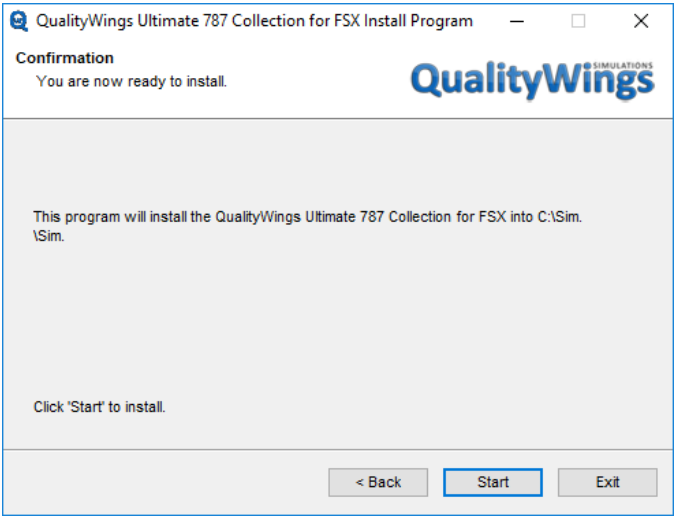
Any pertinent information will be shown on this page. Click NEXT



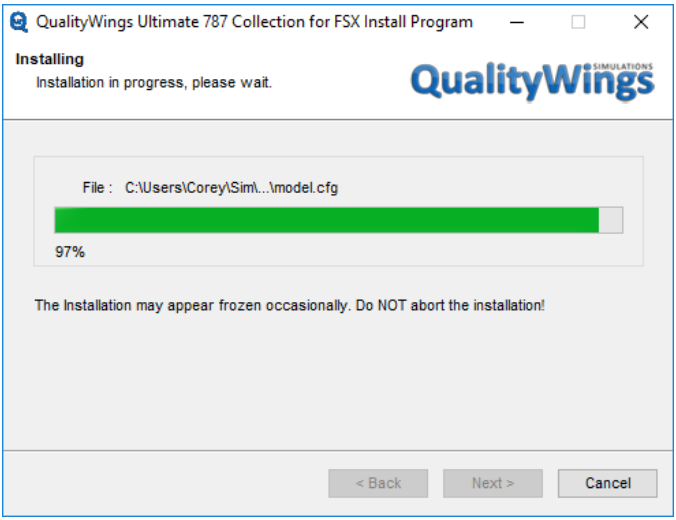
Please read the License information. If you agree, select "I agree..." and then click NEXT.. If you don't agree, click "I do not agree"...though that will make it extremely difficult to install the product ;-)



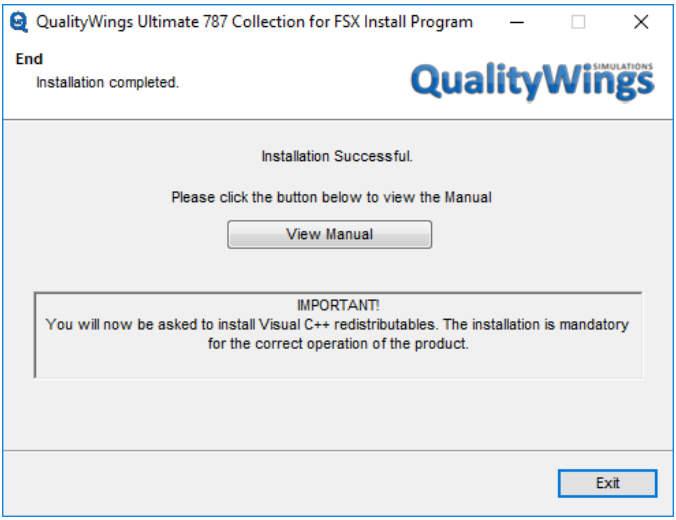
By default, your Simulator will show in the directory box. You can change as necessary. When you've chosen your installation directory, click NEXT



This screen shows is confirmation before the installation begins. If you're ok with your choices, click NEXT



Please be patient while the installation process runs



Installation Successful, BUT you're not done. It is IMPORTANT that you pay attention to the message in the box. An additional installer will open when you click EXIT. Visual C++ Redistributables software MUST install in order for the Ultimate 787 to work.

FSX Launch

After launching FSX, go to the Select Aircraft screen.
Scroll down to find the QualityWings aircraft. Alternatively, you can use Select screen filters such as:
Aircraft Manufacturer

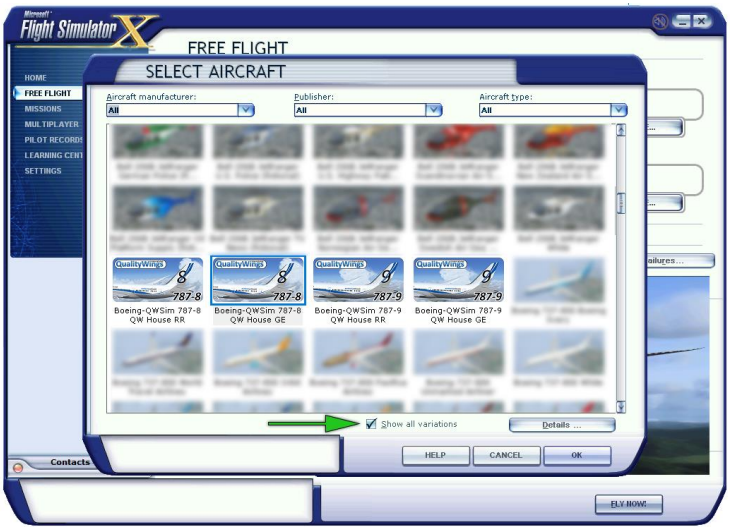
- Boeing-QWSim

Publisher

- QualityWings Simulations

Aircraft Type

- 787-8
- 787-9
- 787-10



Note: Once you start installing other liveries, you will need to ensure that 'Show All Variations' is checked on the Select Aircraft screen. Otherwise, the livery may not show.

P3D Launch

After launching P3D, go to the Select Vehicle screen.
Scroll down to find the QualityWings "vehicle". Alternatively, you can use Select screen filters such as:
Aircraft Manufacturer

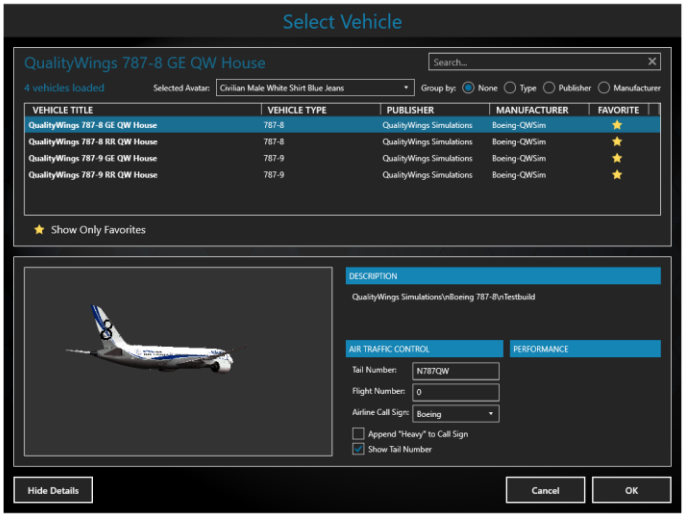
- Boeing-QWSim

Publisher

- QualityWings Simulations

Aircraft Type

- 787-8
- 787-9
- 787-10



Note: You can choose to make an aircraft a favorite by clicking on the yellow star adjacent to the livery in the vehicle select window. Then you can filter the entire list to show only favorites to minimize scrolling. This is especially helpful for users with a large list of aircraft.

QualityWings On-Screen Tips

We've included information in the Flight Simulator Banner.
During loading of the 787, a 30 second initialization process occurs when it first loads into the sim. This will be noted by a banner at the top of your display.
We suggest not touch anything during this 30 second period to ensure

everything is set up correctly.
Once the process is complete, a message will show letting you know that it's ok to start interacting with the switches.

Background

Speed or Efficiency? That was the question facing Boeing in the Late 1990s, as plans for a new airplane took shape. As Boeing toyed between of a Sub-Sonic jet dubbed the "Sonic Cruiser" (Shown above), the tragic events of September 11th changed Boeing's focus. While some airlines were intrigued by the idea of faster flight, the steady rise of fuel cost forced the airlines to push for Fuel Efficiency.

The Boeing 787 began with the initial designation of the Boeing "7E7", where the "E" stood for Efficiency. The aircraft makes several advances in technology which help reduce weight and the amount of air extracted from the engine. The results are an aircraft that is approximately 20% more efficient than the 767 it is designed to replace. Composite materials make up approximately 80 percent of the aircraft by volume and the resulting weight savings are a major factor in fuel savings. The composites also help to improve the ability of the aircraft to pressurize to a lower cabin altitude, aiding in less passenger fatigue. The weight savings from the lack of Pneumatic ducting due to the "Bleedless" engines are also a major contributor to fuel savings.

The "E" in the "7E7 may as well also stand for Electric. Some of the responsibilities normally taking care of by an aircraft's pneumatic system are now handled by electrical power. Starting engines and operating the Air Conditioning/Pressurization systems now work off of Electrical Power.

Not all of the advances in technology are transparent to the flying public. While the original design of the 787 has evolved from its original artist rendition which featured a "Shark tail", the sleek design of the nose and wings is very appealing to the eye. The Passenger cabin shines with its dimmable windows and interior lighting builds off technology introduced on the Boeing 737 Next Generation

program called the "Boeing Sky Interior". The Sky interior has an adaptive lighting system which provides an inviting passenger cabin experience, further adding to passenger comfort.

The first 787 was rolled was unveiled on July 8, 2007, by which time order totals had reached 677—more than any launch to roll out than any previous Widebody aircraft. The Maiden flight took place on December 15, 2009 and flight testing completed midway through 2011. While the program suffered many delays and setbacks, the 787 entered commercial service on October 26, 2011.

Variants

787-8

The 787-8 is considered the base model of the 787 family. It has a length of 186 feet and a wingspan of 195 feet (yes, the wingspan is greater than fuselage length!). Range capability is 7,650 to 8,200 nautical miles and depends on seating configuration, with the higher seating configurations offering less range.

787-9

The 787-9 is the first derivative of the 787 family. It has a length of 206 feet making it exactly 20 feet longer than the 787-8. Wingspan is the same as the –8. A higher fuel capacity allows the range capability to be higher than the 787-8 at 8,000 to 8,500 nautical miles and depends on seating configuration.

787-10

|R| The 787-10 sacrifices some range (Up to 7,000 nautical miles) to accommodate additional seating capacity. The aircraft has a length of 224 feet and is designed as a 777-200 replacement.

Design & Flight Systems

External features include a smooth nose contour, raked wingtips and engine nacelles with noise-reducing serrated edges (chevrons). The longest-range 787 variant can fly 8,000 to 8,500 nautical miles (14,800 to 15,700 km), enough to cover the Los Angeles to Bangkok or New York City to Hong Kong routes. Its cruising airspeed is Mach 0.85, equivalent to 561 mph (903 km/h; 487 kn) at typical cruise altitudes.

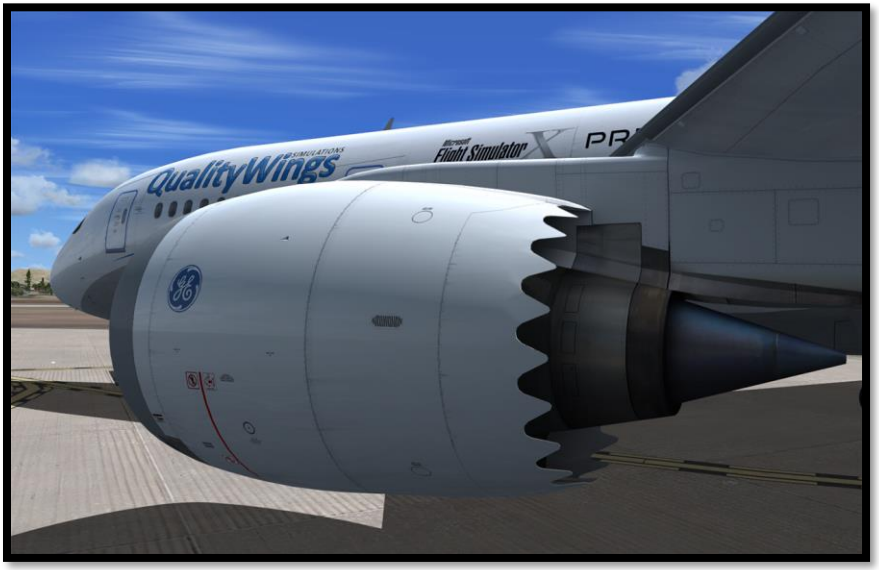
Among 787 flight systems, a key change from traditional airliners is the electrical architecture. The architecture is bleedless and replaces bleed air and hydraulic power sources with electrically powered compressors and pumps, while completely eliminating pneumatics and hydraulics from some subsystems (e.g., engine starters or brakes). It has been said that this system extracts 35% less power from the engines, allowing increased thrust and improved fuel economy. The total available on-board electrical power is 1.45 megawatts, which is five times the power available on conventional pneumatic airliners. Some of the most notable electrically powered systems include:

- Engine Start
- Air Conditioning & Pressurization
- Horizontal Stabilizer Trim
- Wheel Brake System
- Wing Ice Protection

The 787 has a "fly-by-wire" control system similar in architecture to that of the Boeing 777. The flight deck features LCD multi-function displays as well as two head-up displays (HUDs) as a standard feature. The 787 shares a common type rating with the larger 777, allowing qualified pilots to operate both models. Like other Boeing airliners, the 787 uses a yoke instead of a side-stick.

Engines

The 787 is powered by two engines; fitted with either Rolls-Royce Trent 1000 or General Electric GEnx engines. These engines use all-electrical bleedless systems, eliminating the superheated air conduits normally used for aircraft power, de-icing, and other functions. Noise reducing technologies make the 787 significantly quieter both inside and out. The noise-reducing measures prevent sounds above 85 decibels from leaving airport boundaries.

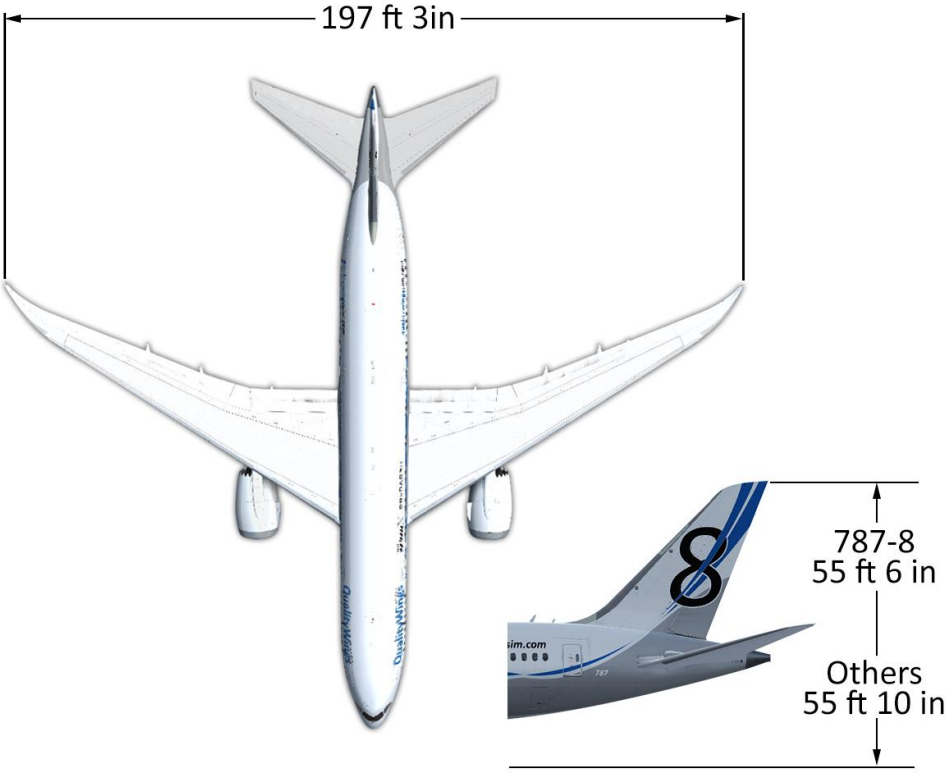


General Data

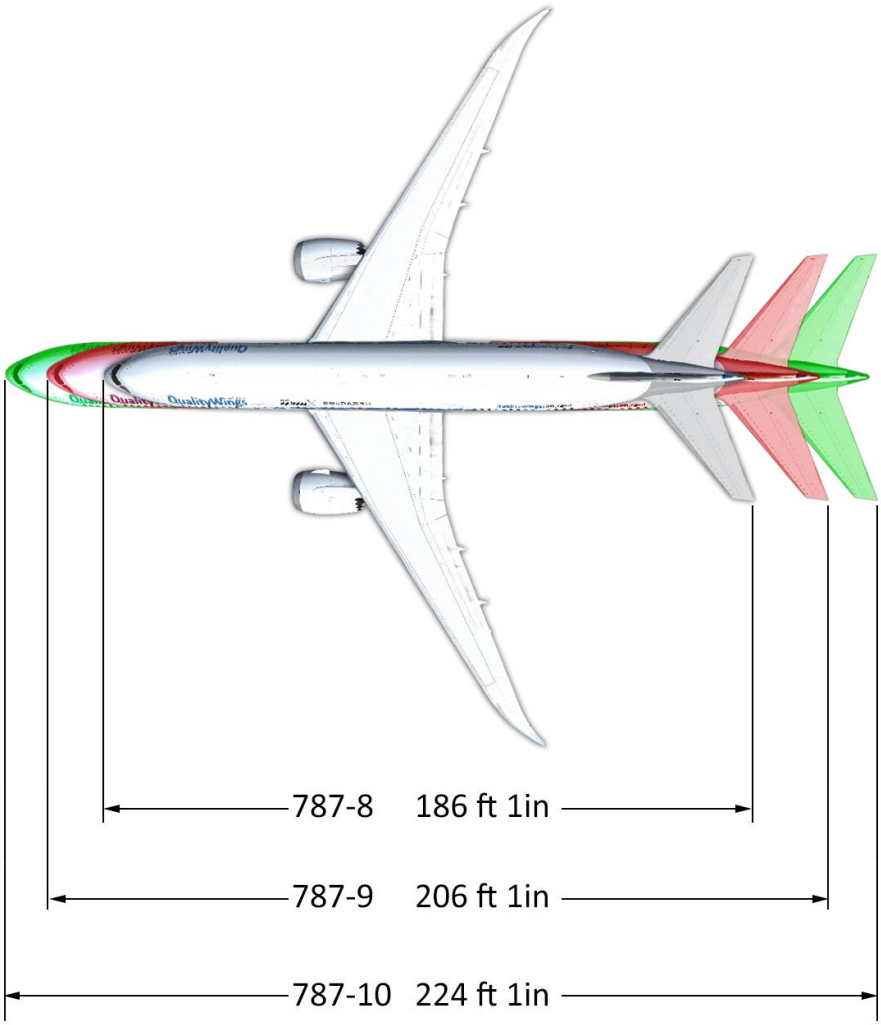
Aircraft General Data & Dimensions

Variant	**787-8**		**787-9**		**787-10**	
Unit	English	Metric	English	Metric	English	Metric
Length	186.1 ft	57.6 m	206.1 ft	62.8 m	224 ft	68.3 m
Height	55.6 ft	8.59 m	55.10 ft	17 m	55.10 ft	17 m
Wingspan	197.3 ft	60.1 m	197.3 ft	60.1 m	197.3 ft	60.1 m
Wing Area	3,501 ft²	325 m²	3,501 ft²	325 m²	3,501 ft²	325 m²
Empty Weight	259,500 lbs	118,000 kg	277,000 lbs	126,000 kg	277,000 lbs	126,000 kg
MTO Weight	502,500 lbs	228,000 kg	557,000 lbs	253,000 kg	553,000 lbs	251,000 kg
Cruise Speed	490 kts	913 km/h	490 kts	913 km/h	490 kts	913 km/h
Cruise Altitude	43,000 ft	13,100 m	43,000 ft	13,100 m	43,000 ft	13,100 m
Range	7,355 Nm	13,600 km	7,635Nm	14,100 km	6,430 Nm	11,900 km

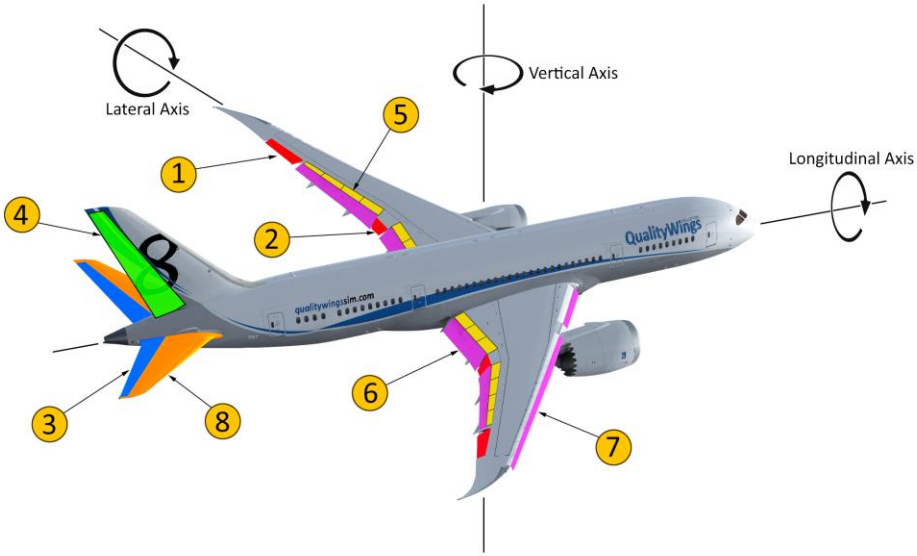
Plan & Height Information



Length Information



Aircraft Flight Control Surfaces



1—**Ailerons**

- The ailerons are located outboard of the outboard flaps on each wing. The ailerons and spoilers droop with the trailing edge flaps to improve slow speed performance.
- The ailerons are locked out during high speed flight where the flaperons and spoilers provide sufficient roll control. During low speed flight, the ailerons operate to augment roll control.
- Ailerons are controlled manually by the control wheel. Automatic control of the ailerons is handled by the Autopilot.

2—Flaperons

- The flaperons are located between the inboard and outboard flaps on both wings. In the normal mode, they are used for roll control with the flaps either retracted or extended. The flaperons also droop with the trailing edge flaps to improve slow speed performance. Flaperons are controlled manually by the control wheel. Automatic control is handled by the Autopilot.

3—Elevators

- There is one Elevator on each Horizontal Stabilizer. The elevators move together UP or DOWN to make the aircraft climb or descend. Elevators are controlled manually by the control column. Automatic control is handled by the Autopilot.

4—Rudder

- Yaw control is provided by a single rudder. During takeoff, the rudder becomes aerodynamically effective at approximately 60 knots groundspeed.

5—Spoilers

- Fourteen spoilers augment the Ailerons and Flaperons for roll control. Symmetric spoilers are used as speed brakes.

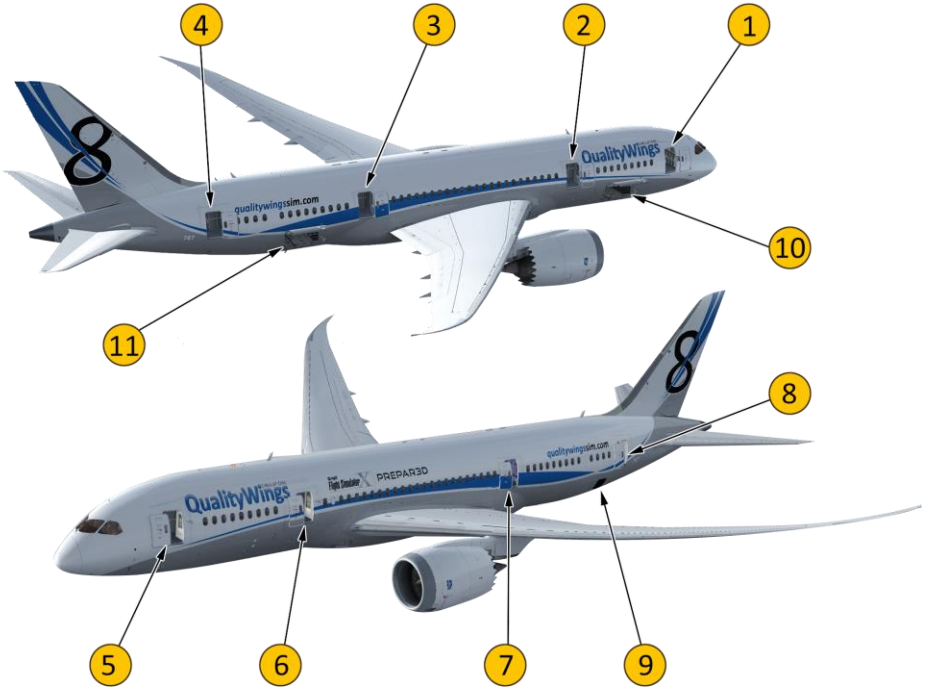
6 & 7—High Lift Control System

- Flaps and slats provide high lift for takeoff, approach, and landing.

8—Horizontal Stabilizer Trim

- Long term pitch trim is available via the movable Horizontal Stabilizer

Aircraft Doors



1—Door 1 Right
2—Door 2 Right
3—Door 3 Right
4—Door 4 Right
5—Door 1 Left
6—Door 2 Left
7—Door 3 Left
8—Door 4 Left
9—Bulk Cargo Door
10—Forward Cargo Door
11—Aft Cargo Door

QWTip: *All doors can be easily controlled via the QualityWings Control panel.*

Aircraft Lighting

1—Beacon Lights

- Red Body Anti-Collision Lights are located on the top and bottom of the fuselage.

2—Strobe Lights

- White Wing Anti-Collision (Strobe) Lights are located on the forward side of each wingtip leading edge.

3—Tail Strobe Lights

- One White Tail Anti-Collision (Strobe) Lights is located on each side of the tailcone.

4—Tail Navigation Light

- One white Navigation Light is located on each side of the tailcone. .

5—Wing Navigation Light

- One white Navigation Light is located on the aft tip of each wing.

6—Position Lights

- Position lights are located on each wingtip leading edge. The Left Wing position light is Red and the right wing is Green.

7—Logo Lights

- One logo light is located on the top of each Horizontal Stabilizer to provide illumination of the Vertical Stabilizer

8—Wing Inspection Lights

- One Wing Inspection Light is located on each side of the fuselage just forward of the wing-to-body fairing and illuminates the leading edge of the wing.

9—Runway Turnoff Lights

- One Runway Turnoff Light is located on each side of the wing root. These lights cast an angled lights splash on the ground, improving visibility to the sides of the aircraft. Wing Landing and Turnoff Lights share the same housing and can be used together.

10—Wing Landing Lights

- One Landing light is fitted to each wing. Wing Landing and Turnoff Lights share the same housing and can be used together.

11—Nose Landing Lights

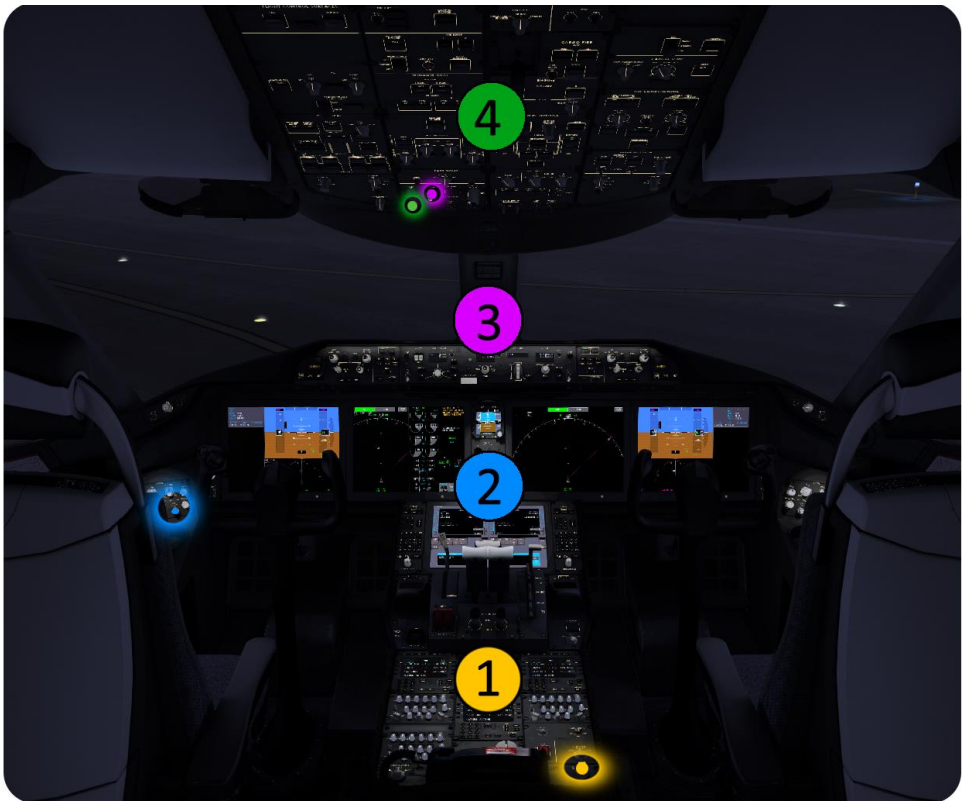
- Two Landing Lights are fitted to the Nose Landing Gear. They provide much greater illumination than the Taxi Lights which are also located on the Nose Landing Gear.

12—Taxi Lights

- Two Taxi Lights are fitted to the Nose Landing Gear.

QWTip: *All exterior lights can be controlled via the Lighting Control Panels on the Overhead panel in the flightdeck.*

Flightdeck Lighting



There are four distinctive areas of Night Lighting in the Cockpit:

1. Aft Console
2. Main Instrument Panels & Lower MFD
3. Glareshield
4. Overhead Panel

You can see the respective switches for each area highlighted on the figure above. These switches are covered in more detail in the Flight Manual Section.

QWTip: *The use of default lighting is still possible utilizing the Flight Sim default "Panel Lights (on/off)" command. The default command assigned is "Shift + L). Check your Simulator Settings/Controls/Buttons Keys assignment.*

Cabin Lighting

The distinctive Sky Interior of the 787 can be controlled via the QualityWings Control Panel. The cabin can be programmed to 7 different hues:

- Flourescent
- Light Blue
- Blue
- Magenta
- Yellow
- Red
- Green

Flightdeck Tour

Welcome to the Flightdeck

You find yourself sitting in the left seat, which is where you'll spend most, if not all of your time. Looking straight ahead, you see the main instrument panel.

This is what you will be seeing most of the time, and what a view it is. Most of the real-estate on the main instrument panel is taken up by the huge LCD Screens called Multifunction Displays. The 787 Dreamliner features the largest forward display screens of any certified airliner, with five MFDs that measure 15 inches diagonally. The displays provide more than twice the area as those used on the 777, giving you more information and significant flexibility to tailor the display layout to their needs for each phase of flight.
The Primary Flight Display (PFD) is easily discovered in the left and right Outboard Displays while the Navigation Displays (ND) can be found on the Inboard Displays by default. EICAS is displayed on the Inner half of the Left Inboard display default but can be switched to the right. In fact, just about anything on the Inboard displays can be configured in any way you want. In the center panel we see the Integrated Standby Flight Display as well as Landing Gear Controls. Above the center portion of the main instrument panel we find the glareshield. Here, the left and right portions include Display &Crew Alerting controls, while the center portion contains the Mode Control Panel, or MCP.

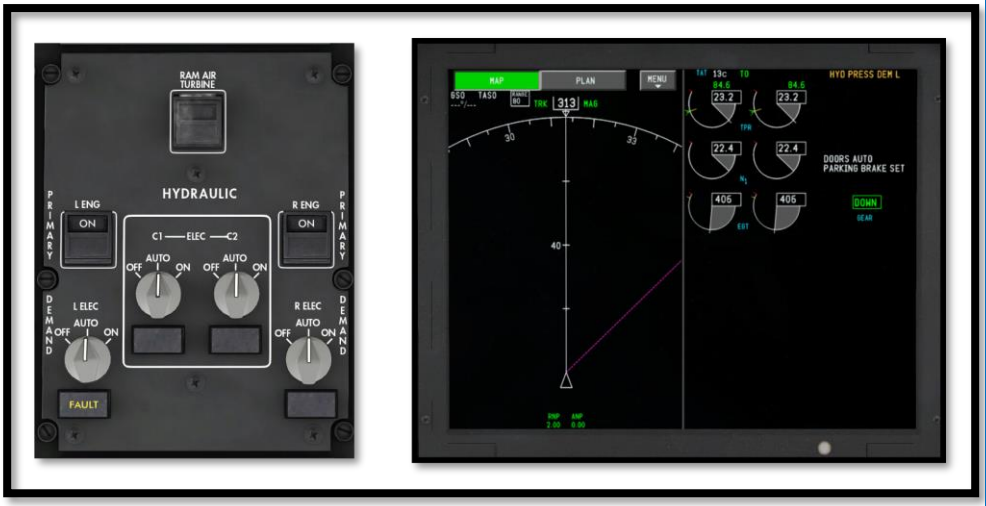
This is what houses the Autoflight control system, or autopilot. This should be familiar in layout and function for those already having flown jetliners in Flight Simulator before.

It is obvious that the main instrument panel is your main source of information, what with all the vital instrumentation placed here. However, as important as it is, it is not the place from where most systems are controlled. For this we tilt our view upwards, and look at the overhead panel

The overhead panel is the place where you will click switches, rotate knobs and press buttons. It is the place from which all systems are controlled that are not necessary for flying the plane. Thus they are given a place which is easily accessible yet not in the way when flying the plane. The Overhead Panel is used to setup, initialize and turn on many systems (such as Fuel, Hydraulics, and Earth Reference systems to name a few) during preflight mainly. Once systems are setup, interface with the overhead panel is minimal. But what if a system fails? You won't be looking at the overhead, so chances are you'll miss any failures. For this Boeing Aircraft incorporates a Crew Alerting System called EICAS

EICAS & the Dark Cockpit Concept

The Dark Cockpit concept emphasizes the principle that if everything works okay and is configured properly, then there are no annunciator lights turned on. As an example, when a hydraulic pump is switched off, there is an Amber annunciator light that says FAULT. When you switch on the pump, the FAULT light should extinguish. During preflight, systems on the airplane are setup so that there are no illuminated annunciator lights...hence the term "Dark Cockpit. If a system has a malfunction (in this case the Hydraulic pump stops working), the FAULT light will turn on. The ultimate goal is to make sure that if something goes wrong, the pilot's attention will be drawn to it. You can imagine that one light turning on in an otherwise dark overhead will be easier to spot than a light turning on in a sea of other lights signifying correct system operation. But what if that light is way up on that Overhead Panel.? Here is where EICAS comes into play.



Developed for the 757 and 767 back in the Late 1970s, EICAS has found its way onto all subsequent Boeing models sans the 737 Next Generation. Besides provided the graphics for the engine indications, EICAS also takes the place of the old Flight Engineers that were monitoring Aircraft Systems status on older generation aircraft such as the 727s and Old Generation 747s. When there is a system malfunction, EICAS will provide the Flightcrew with a Message on the Multifunction Display. And not only does this message tell them what's not working, it also provides an indication of the severity of the situation. It also

prioritizes all messages. In other words, an Engine Fire would be a more severe and require a higher priority than a Hydraulic Pump that's not working.
In addition to messages, higher priority non-normals are also accompanied by Aural Warnings for even more crew awareness. Warning/Caution lights directly in the Flightcrews sightline also provide awareness and serve to break the "Dark Cockpit" when things require attention.

Continuing the Tour

Turning our attention back to the overhead panel, let's see what we can find here. There are light switches and passenger controls at the very front. Above it (from left to right) we find the electrical panel, the hydraulic panel, the Fuel Panel and Air Conditioning/Pressurization Panels. Further aft, we find Inertial Reference, Ice & Rain Protection System controls, Fire Protection Systems and other miscellaneous system controls. As such, just about every system's state on the plane can be modified from this "nerve center".
The overhead panel is mostly passive in operation, however. Unlike the main instrument panel, where indicators are constantly changing and require your constant attention, the overhead panel follows the philosophy of "set it and leave it". That is, until you have to reset something of course. There are two other panels in this cockpit that fall in between the activity of the main instrument panel and the overhead panel and are located on the aisle stand. On the aft part of the aisle stand, you will find Communications & Navigation Controls as well as some Flight Control, Fire Protection & other miscellaneous controls. The throttle quadrant is in its traditional location but just forward of the throttle quadrant we find a familiar friend with a new look: The Flight Management Computer Control Display Unit (CDU). This CDU is the interface with which you, the pilot, talk to the "brain" of the plane: the Control Display Unit, or CDU for short. The CDU used to be a physical component, but is now a "Virtual" component that is projected on the Multifunction Displays. There is however still a physical keyboard that you sue to interact with the CDU.

The design of the aisle stand is not surprising and closely resembles other aircraft on the market, and for good reason: this works. The throttle quadrant is positioned in such a way that access is easy, yet isn't in the way when tuning radio frequencies on the aft pedestal. The Radios which are tuned via the New Tuning Control Panels on the aft pedestal are your interface to the world outside the aircraft and thus is probably a very important panel.
The CDU, however, is the brain of the plane. It is what makes the auto pilot a true autopilot by regulating everything for you without any real pilot intervention being necessary. It's your entry into the plane's Flight Management System (FMS), and thus lets you enter various data, including the route to follow, performance data, like fuel load, gross weight and zero fuel weight.

Virtual Cockpit Camera Views

The QualityWings Ultimate 787 is best experienced inside of the Virtual Cockpit where a true sense of operating in a 3d dimensional space can be achieved. We've provided 3 Virtual Cockpit default Camera Views of the following areas of the flightdeck:

Figure A Overhead Panel

Figure B Control Quadrant

Figure C First Officers View

Introducing the 2D Panels

The QualityWings Ultimate 787 Collection sports a limited set of the 2D panels, alongside the high quality VC. Via the 2D panels, you'll be able to easily access all relevant systems. There is no difference in simulation between the VC and 2D panel.

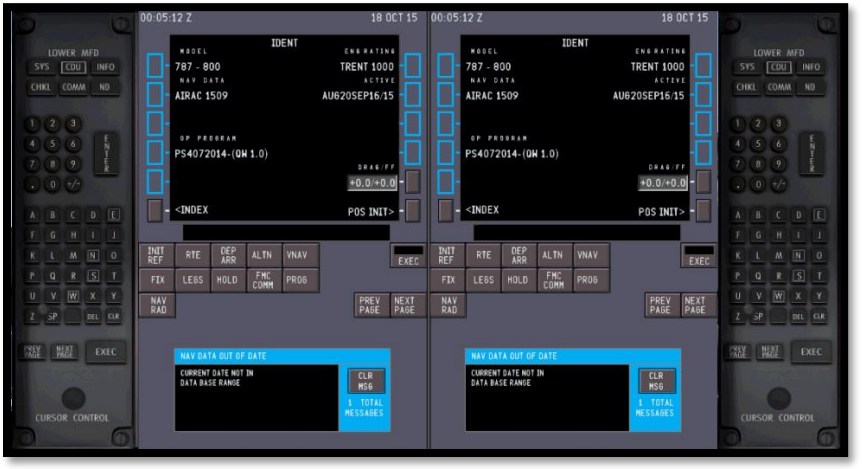


Figure D Lower MFD with Multifunction Keyboard (MFK). All MFDs are available as 2D Panels, but only the Lower has the MKF attached.

Figure F EFIS Control Panel

Figure G Electronic Flight Bag

Figure E Tuning Control Panel

Flight Manual

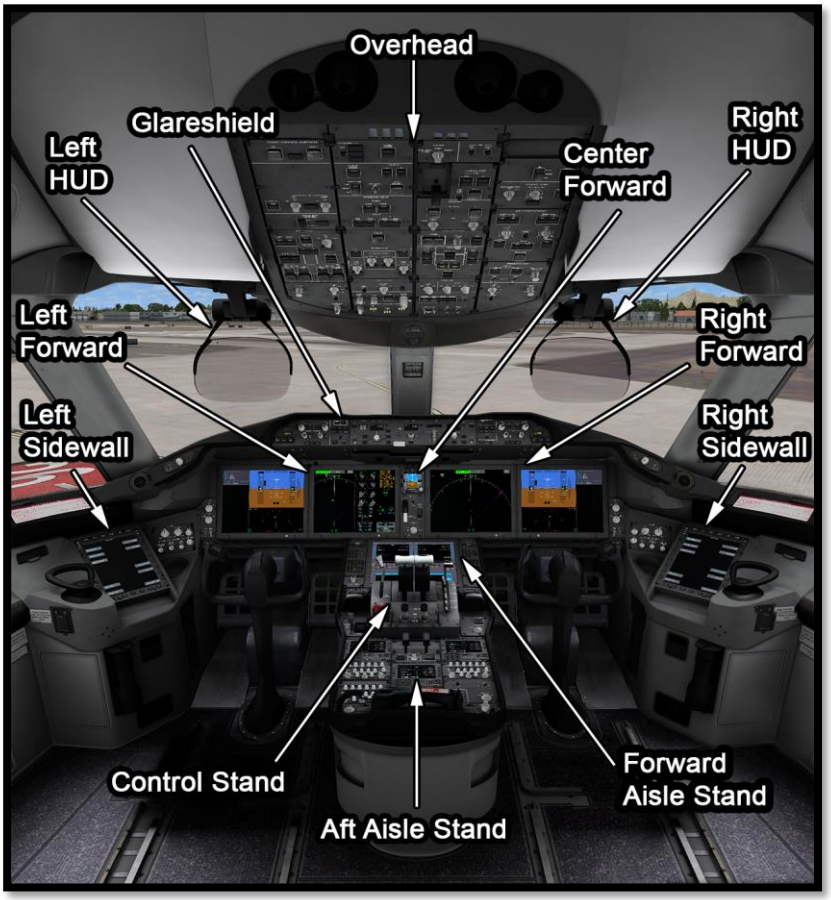
Introduction

In this section, you'll find general descriptions for each of the simulated systems; their location in the cockpit, the way to read them and their function.

Flightdeck Panels

The panels shown in this graphic are representative of panels that have an interface in the QualityWings 787.

Click the relevant panel label for information about a particular panel.

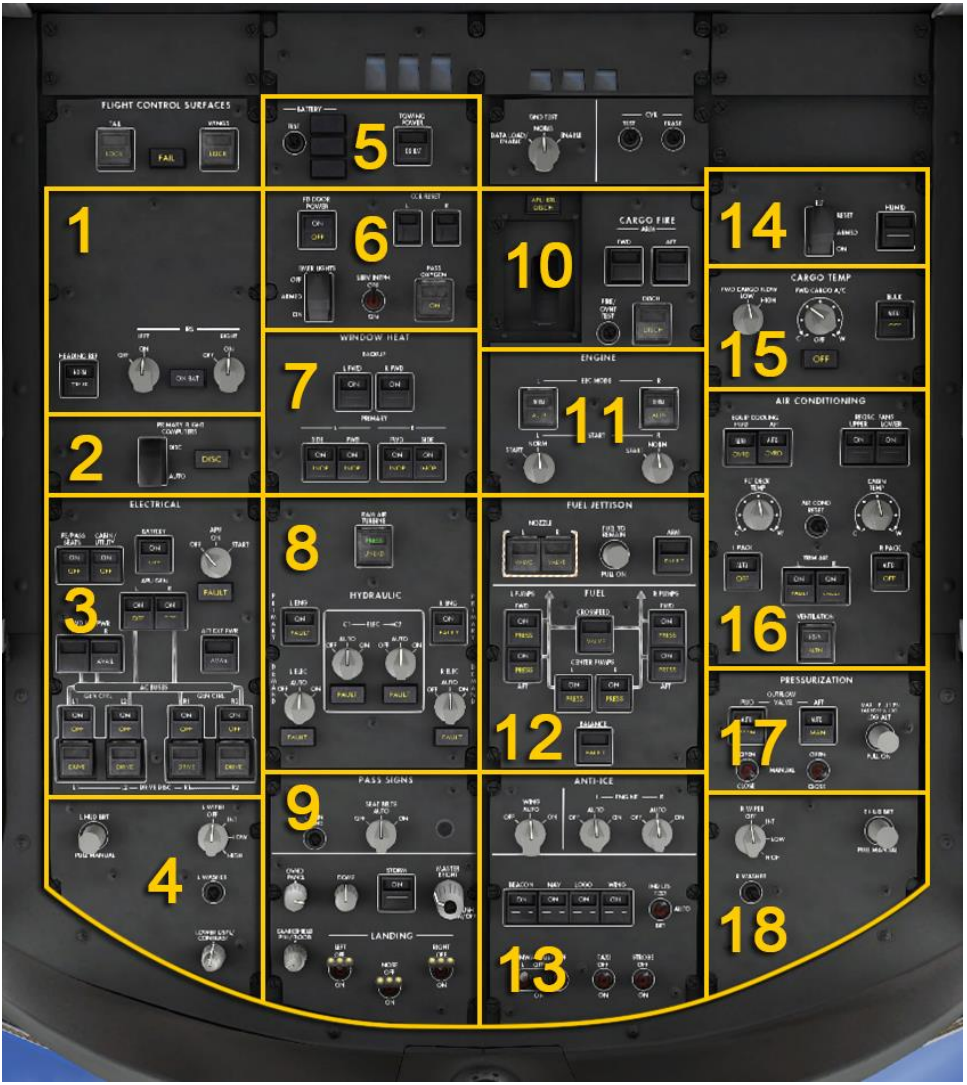


All Panels

Click an area for more information

Overhead Panel

Click an area for more information

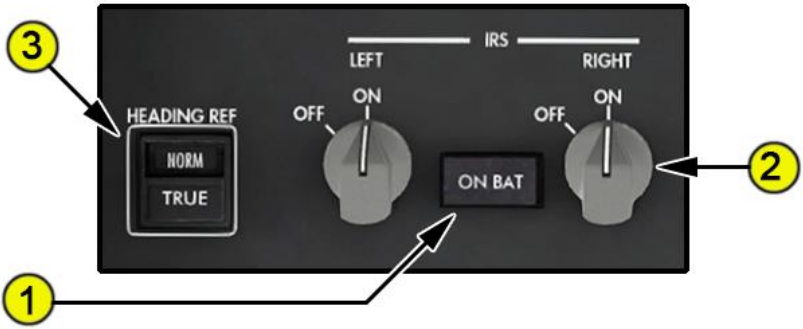


The overhead is sectioned into four columns, within each column are a different number of subpanels, grouping together the buttons, switches, knobs, and lights that represent the status and control of a particular system.
What system they represent is written at the top of each subpanel in big, white lettering. The various systems on the overhead panel are the following (compare to figure on the previous page).

1. IRS subpanel
2. Primary Flight Computers subpanel
3. Electrical subpanel
4. Left Miscellaneous Controls subpanel
5. Towing subpanel
6. FD door, Emergency Lights, Passenger Oxygen & CCR Reset subpanel
7. Window Heat subpanel
8. Hydraulics subpanel
9. Passenger Signs & Flightdeck Lighting subpanel
10. APU & Cargo Fire Protection subpanel
11. Engine Control subpanel
12. Fuel Management subpanel
13. Anti-Ice & Exterior Lighting subpanel
14. ELT & Humidity Control subpanel
15. Cargo Temp Control subpanel
16. Air Conditioning subpanel
17. Pressurization subpanel
18. Right Miscellaneous Controls subpanel

So as you can see, there is definitely a system to be found in all this mess. All you have to do to find a system is find the correct label and you'll know you've found all relevant controls for that system.

Inertial Reference System (IRS) Subpanel



1—On Battery (ON BAT) Light

Illuminated (white) Aircraft battery powers IRS.

2—IRS Selectors

ON Applies power to the associated IRS.

OFF Removes power from the associated IRS.

3—Heading Reference (HDG REF) Switch

- Pushing alternately selects the heading reference for the PFDs, NDs, AFDS, and FMCs.

NORM

- Normally references magnetic north.
- Automatically references true north when north of 82°N or south of 82°S latitude or within the vicinity of the magnetic poles (PFDs, NDs, and FMCs).
- Provides no reference for AFDS roll modes other than LNAV when north of 82°N or south of 82°S latitude or in the vicinity of the magnetic poles.

TRUE

- References true north regardless of latitude.
- When the AFDS roll mode is HDG SEL, switching the heading reference switch from NORM to TRUE or TRUE to NORM engages the HDG HOLD mode.
- When the AFDS roll mode is TRK SEL, switching the heading reference switch from NORM to TRUE or TRUE to NORM engages the TRK HOLD mode.

Inertial Reference System Information

The IRS calculates aircraft airspeed, attitude, heading, and position data for the displays, flight management system, flight controls, engine controls, and other systems.

How to Use

By default, your IRS is powered and ready to go when you load the aircraft. If however you choose to power up the Aircraft from a Cold State, the IRS will need to complete a process called "Alignment." It is a process that will require approximately 7-17 minutes depending on the latitude of the aircraft. During this alignment, the aircraft should not move until alignment is complete.

IRU Alignment

If you choose to perform a power up of the aircraft of yourself, once electrical power is established, you may notice an EICAS message that says:

NAV INERTIAL SYS

This message tells you that the IRS system is not turned on. This condition will cause other systems to be degraded until the IRS system is aligned, so you may see other messages such as **FLIGHT CONTROL MODE** & **NO AUTOLAND**.

To align the system

- Turn both the Left and Right IRS switches to the ON position
- On initial power–up, the IRUs enter the ALIGN mode. The EICAS memo message **IRU ALIGN MODE L+R** displays.
- It is not necessary to ENTER PRESENT POSITION as it is for the IRS systems of previous Boeings. This is because the aircraft will automatically use a GPS supplied position. On the real 787, it's possible that GPS might not be available and the pilot would need to tell the system what the present position of the aircraft is in order to complete alignment. Luckily, GPS ALWAYS works in your Flight Simulator.
- As previously mentioned, alignment time is approximately 7 to 10 minutes at mid latitudes and up to 17 minutes at high latitudes. You can always configure the product to perform an Instant Alignment or shorter alignment time via QW Options.
- When the alignment is complete, the IRS changes to the navigate mode and the aircraft can be moved.

Primary Flight Computers (IRS) Subpanel

1—PRIMARY FLIGHT COMPUTERS Disconnect Switch DISC

DISC

- Disconnects the Primary Flight Computers (PFCs) from the flight control system.
- Puts the flight control system in the direct mode.
- AUTO can be reselected to attempt restoration of secondary or normal mode operation.

AUTO

- The flight control system operates in the normal mode.
- System faults automatically cause the system to switch to the secondary or direct modes.

2—PRIMARY FLIGHT COMPUTERS Disconnect (DISC) Light

Illuminated (amber) The primary flight computers are disconnected automatically or manually and the system is in the direct mode.
Related EICAS Message: **PRI FLIGHT COMPUTERS**

Primary Flight Control System Information

The primary flight control system uses conventional control wheel, column, and pedal inputs from the pilot to electronically command the flight control surfaces (Fly-by-Wire). The system provides conventional control feel and pitch responses to speed and trim changes. At the heart of the system are 3 Primary Flight Computers (PFCs). The system's electronic components provide enhanced handling qualities and reduce pilot workload.

How to Use

As ensure that the PFC Disconnect Switch is in AUTO and ensure that you have aligned your IRS System—you will be protected with the 787s Advanced Primary Flight Control Features. You will be able to use your Autopilot and all other systems that rely on a functional PFCS.

Primary Flight Control System Modes

The primary flight control system is highly redundant, with three operating modes:

- Normal mode
- Secondary mode
- Direct mode

Flight Control System Normal Mode

This is the highest mode of operation in the PFCS. In the normal mode during manual flight, when you operate the control inputs in the flight deck (turning the control wheel as an example), electrical signals are routed through computers to the three PFCs. The PFCs verify these signals and information from other aircraft systems to compute control surface commands. These commands are processed and then sent to the flight control actuators which move the surface (Ailerons, Flaperons and Spoilers continuing with the control wheel example. The other control surfaces operate in a similar manner).

When the autopilot is engaged, the autopilot system sends control surface commands to the PFCs. The PFCs generate control surface commands which are routed through other computers and then to the control surface actuators. The Normal Mode is the only one of the 3 modes where the Autopilot is available.

As long as your IRS System is aligned AND your PFC Switch is in Normal, Normal Mode will be available in the QualityWings 787.

While operating in Normal Mode, the PFCs provide Flight Envelope Protections which try to protect the aircraft from being put into a dangerous situation. Flight envelope protection reduces the possibility of inadvertently exceeding the flight envelope by providing crew awareness of envelope margins through tactile, aural, and visual cues. The airplane will try to deter you by adding force against what you are trying to do. But as with all Boeing airplanes with Flight Envelope protections, you the pilot have the ultimate say.

Envelope protection does not reduce pilot control authority. The protection functions include:

- Stall protection
- Overspeed protection
- Bank angle protection
- Tail Strike protection

Stall and Overspeed Protection logic is also built into the Autopilot System
Additional features of the PFCS in the Normal mode are

- Pitch Compensation
- Roll/Yaw Asymmetry Compensation

On the real 787 an additional feature is "Gust Suppression" but this is not modeled on the QW787.

Flight Control System Secondary Mode

Secondary mode is not a manually selectable mode. The PFCs automatically revert to secondary mode when inertial or air data is insufficient to support normal mode. The only way the PFCS can enter this mode on the QW787 is if you fail to align your IRS.

In the secondary mode, the following functions are not available:

- Autopilot
- Auto speed brakes
- Pitch compensation
- Gust suppression
- Roll/yaw asymmetry compensation
- Tail strike protection
- Envelope protection

The EICAS caution message FLIGHT CONTROL MODE is displayed when the primary flight control system is in the secondary mode.

Flight Control System Direct Mode

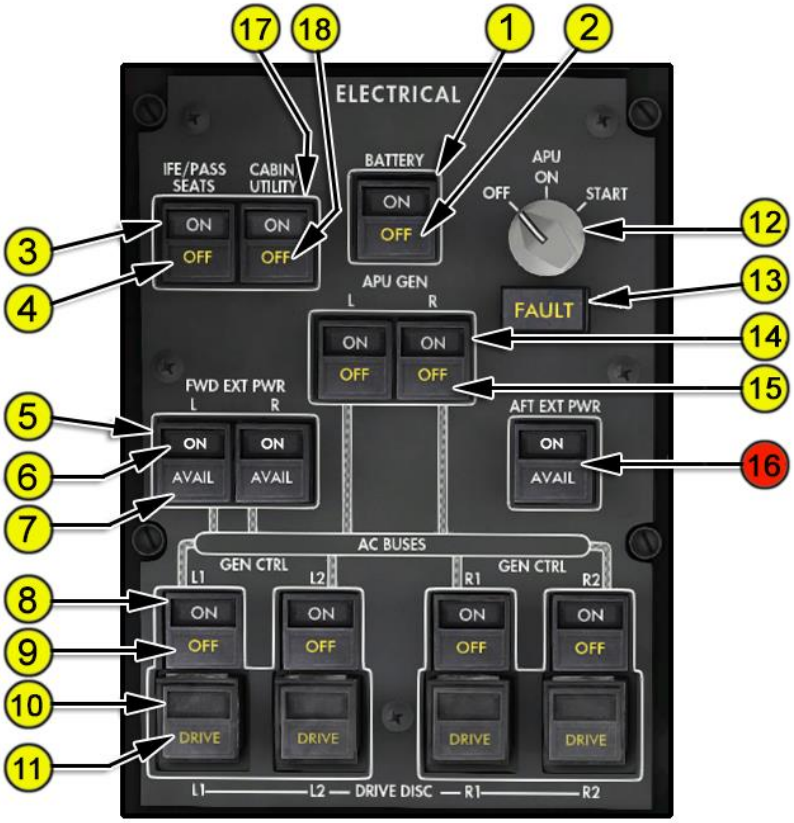
On the QualityWings 787, Direct Mode is entered only when the PFC Disconnect Switch is placed to DISC. In the Direct mode, the PFCs are taken out of the equation. The system is still considered FBW as other computers still provide electrical signals to the flight control actuators. But all protections and extra features are no longer available which is similar to Secondary Mode.

The direct mode provides full aircraft control for continued safe flight and landing. The aircraft handling qualities are almost the same as the secondary mode. All flight control surfaces remain operable and yaw damping is degraded. The EICAS caution message **PRI FLIGHT COMPUTERS** is displayed when the system is in the direct mode.

In the direct mode, the following functions are not available:

- Autopilot
- Auto speed brakes
- Pitch compensation
- Roll/yaw asymmetry compensation
- Gust suppression
- Tail strike protection
- Envelope protection

Electrical Power Subpanel



1—BATTERY Switch

ON Initiates Aircraft Start-up sequence into On-Ground Battery Only mode

OFF (After delay of up to 2 minutes) de-activates the On-Ground Battery Only mode.

2—Battery OFF Light

Illuminated (amber) The BATTERY switch is OFF.

Related EICAS Message: **ELEC BATTERY OFF**

3—IFE/PASS SEATS Power Switch

ON Energizes several Passenger Service Systems including QWPAS.

OFF De-energizes several Passenger Service Systems including QWPAS.

4—IFE/PASS SEATS OFF Light

Illuminated (amber) The IFE/PASS SEATS power switch is OFF.

Related EICAS Message: **ELEC IFE/SEATS OFF**

5—Forward External Power (FWD EXT PWR) Switches

These Switches cannot be controlled individually on the QW787

Push (If AVAIL light illuminated) supplies forward external power

Push (If ON light illuminated) removes forward external power.

QWTip: *Use the QualityWings Control panel to Connect External Power to the aircraft. Once it's connected, the AVAIL light will illuminate.*

6—Forward External Power ON Lights

Illuminated (white) Forward external power is selected ON.

7—Forward External Power AVAIL Lights

Illuminated (white)

- Forward external power is plugged in and ready for use.
- Extinguishes when the ON light illuminates.

8—Generator Control (GEN CTRL) Switches

ON Arms respective generator, allowing it to supply power automatically when power is available.

OFF Removes respective generator Power.

QWTip: *The Respective Engine must be running in order for the (2) generators on each to supply power to the electrical system.*

Related EICAS Message: **ELEC GEN OFF L1 (L2)**
ELEC GEN OFF R1 (R2)

9—Generator OFF Lights

Illuminated (amber) The respective Engine generator power is OFF or unavailable

10—Generator **Drive Disconnect (DRIVE DISC) Switches**

Push *(Switch is Guarded. Right click to lift guard and then left click to push switch)*

- Disconnects generator drive from engine.
- Requires reset on the ground to reconnect generator drive.

11—Generator DRIVE Lights

- Illuminated (with the engine running) (amber) A generator drive malfunction has occurred.

12—APU Selector

OFF

- Initiates normal shutdown.

ON (APU operating position)

- During operation of the selector from ON to START, prepares APU components for a normal start.

START (momentary position, spring-loaded to ON)

- Initiates automatic start sequence

QWTip: *You can monitor the status of the APU Start on the SYS STATUS Page.*

13—APU FAULT Light

Illuminated (amber)

- APU shutdown due to fault and/or fire.
- Momentarily during APU Start.

14—APU Generator (APU GEN) Switches

These Switches cannot be controlled individually on the QW787

ON

- Arms APU generator, allowing it to supply power automatically when power is available.
- Closes generator field to supply APU generator power to the electrical system.

OFF

- Removes APU generator Power.

QWTip: *The APU must be running in order for the APU generator to supply power to the electrical system. You can start the APU using the APU Start Switch on this same panel.*

15—APU Generator OFF Lights

Illuminated (amber)

- The APU generator control breaker is open.
- The APU GEN switch is selected OFF.

Related EICAS Message: **ELEC GEN OFF APU L (R)**

16—AFT External Power (AFT EXT PWR) Switch (Not Simulated)

17—CABIN/UTILITY Power Switch

ON Energizes galleys, most cabin lights, and other non-essential cabin utility loads.

OFF De-energizes galleys, most cabin lights, and other non-essential cabin utility loads.

18—CABIN/UTILITY Power OFF Light

Illuminated (amber) CABIN/UTILITY power switch is selected OFF.

Related EICAS Message: **ELEC CABIN/UTIL OFF**

Electrical Power System Information

The 787 aircraft electrical system generates, distributes, and manages aircraft electrical power. System operation is automatic. In addition to traditional electrically powered systems, the 787 electrical system powers engine start, pressurization, wing ice protection, stabilizer trim, and wheel brake systems. The system primarily uses 115 VAC and 28 VDC power, with a limited number of systems optimized with 235 Vac.

How to Use

The 787 is an electrical power hungry aircraft. Most airplanes have a single generator on each engine and a single generator on the APU. The 787 doubles that on each engine and the APU (6 Starter/Generators total).

Engine start will require the use of the APU in order to achieve the start with minimal load shedding. Engine start using Forward External Power will result in a large amount of load shedding. Ensure the APU is running and that the APU Generator switches are on prior to Engine Start.

The Engine Generator Switches on the Electrical Panel are on by default, and each generator will automatically provide power to its busses, but only after those same generators are done starting the engine (Remember they are Starter/Generators).

The aircraft has a lot of automation and will always try to ensure that it has electrical power. If inflight and all engine generator power is lost, the Ram Air Turbine will deploy automatically to supply power to essential systems. Also occurring in this situation is that the APU will automatically start itself (once it senses the loss of more than 3 generators). Once the APU is running in this situation, the electrical power system will have a high level of capability.

Electrical System Power Sources

The main electrical power sources are:

- Four variable frequency engine starter/generators
- Two variable frequency APU starter/generators
- Three external ac power receptacles (Only 2 useable on the QW787)
- One Ram Air Turbine (RAT)
- One main battery
- One APU battery

Engine Starter/Generators

The engine starter/generators function as electrically powered starter motors for engine start, and as engine driven generators once the engines are running.

Each engine has two 235 VAC variable frequency starter/generators. L1 and L2 are mounted on the left engine. R1 and R2 are mounted on the right engine. They are directly connected to the engine gearboxes, producing variable frequency power proportional to engine rotor speed.

Electrical power for engine start can be provided by external power, APU generated power, or the opposite engine's generated power. The electrical system automatically selects both starter/generators to engage in order to provide optimal torque for engine start.

After start, the starter/generators function as generators to energize their respective main AC buses, also designated L1, L2, R1, and R2. Generator status is shown by generator switch indications, MFD electrical synoptic, and the EICAS message system.

Each generator has a drive disconnect mechanism that allows the generator to be mechanically disengaged from the engine. Depending on the fault condition, the generator drive is either automatically disconnected, or requires pilot action to be disconnected. The generator DRIVE light, generator DRIVE synoptic indication, and EICAS advisory message **ELEC GEN DRIVE** shows when a condition is detected that requires the pilot to disconnect the generator drive. The generator can then be disconnected from the engine by pushing the respective generator drive disconnect (DRIVE DISC) switch. **The drive cannot be reconnected by the pilot.**

APU Starter/Generators

APU starter/generators function as electrically-powered starter motors for APU start, and as generators once the APU is running. The APU generators can provide electrical power for ground operations and supplemental power during flight. Additionally, normal engine start is accomplished using electrical power supplied by the APU.

The APU has two 235 VAC variable frequency starter/generators, designated left (L) and right (R). The generators are directly connected to the APU gearbox, producing variable frequency power proportional to APU speed.

Electrical power for APU start can be provided by forward external power, APU battery, or engine generated power.

On the ground, both APU generators are available to energize the aircraft's 235 VAC electrical buses; L1, L2, R1, and R2. Inflight, one or both APU generators provide power depending on the electrical load requirements of the aircraft. Generator status is shown by generator switch indications, MFD electrical synoptic, and the EICAS message system.

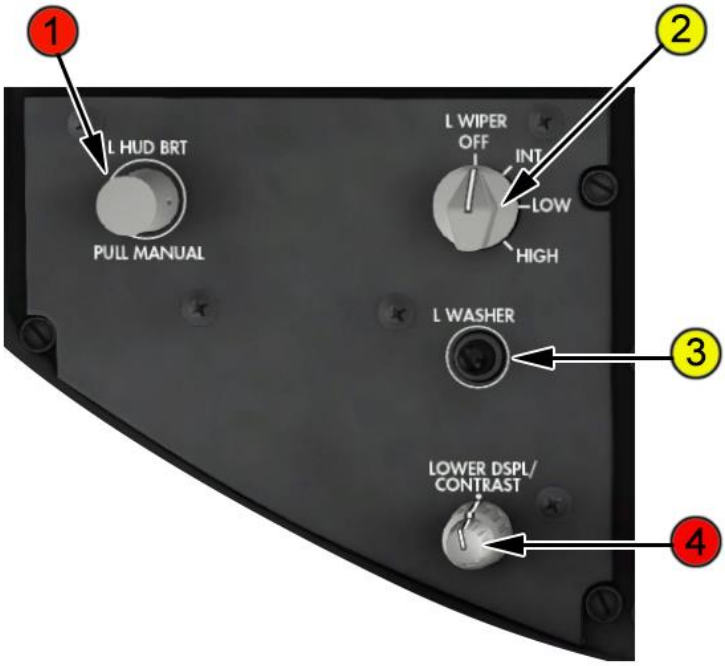
External Power

The 115 VAC external power system consists of both a forward and aft system, with their corresponding receptacles, controls, and indications. The Aft System is not simulated on the QW787.

The forward system provides the power for general ground operations. It has two (L, R) power receptacles located on the left forward fuselage of the aircraft. Connecting forward power sources via the QualityWings Control panel illuminates the AVAIL light(s) in the power switch(es), and energizes Ground Handling mode. Selecting the external power switch(es) to ON energizes the External Power On mode and extinguishes the AVAIL light(s). Two connections are recommended in this mode to power the maximum number of electrical loads and minimize load shedding. This is why we deliberately ensured that you cannot operate the switches individually.

If the APU is not available, engine start may be accomplished using external power. At a minimum, two 90 kVA-rated forward external power sources are required. In this configuration, either engine may be started first, however, significant load shedding occurs.

Left Miscellaneous Controls Subpanel



1—L HUD BRT Switch (Not Simulated)

2—L Wiper Switch

- **OFF** The wiper is stowed vertically.
- **INT (intermittent)** The wiper operates intermittently.
- **LOW** The wiper operates at low speed.
- **HIGH** The wiper operates at high speed.

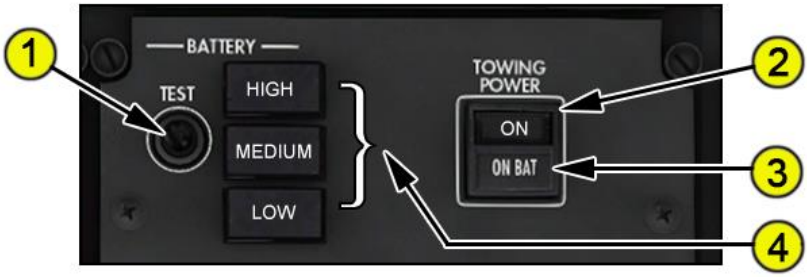
3—WASHER Switch

- **Push** Simulates Washer Fluid being applied.

  Note: No visual effects only Audible

4—Lower Display Brightness Switch (Not Simulated)

Towing Subpanel



1—Towing Battery Test Switch

Push Applicable towing battery charge light illuminates, indicating the current state of charge of the batteries (HIGH, MEDIUM, LOW).

2—TOWING POWER Switch

ON Selects the main and APU batteries for energizing the Towing Power mode. Applicable towing battery charge light illuminates.

OFF De-energizes the Towing Power mode.

3—ON BAT Light

Illuminated (white) The battery TOWING POWER switch is ON.

4—Towing Battery Charge Light

Illuminated (white) Pushing the towing battery TEST switch illuminates one of the following battery state of charge indicators:

HIGH A minimum of 60 minutes remains before battery charge is depleted.

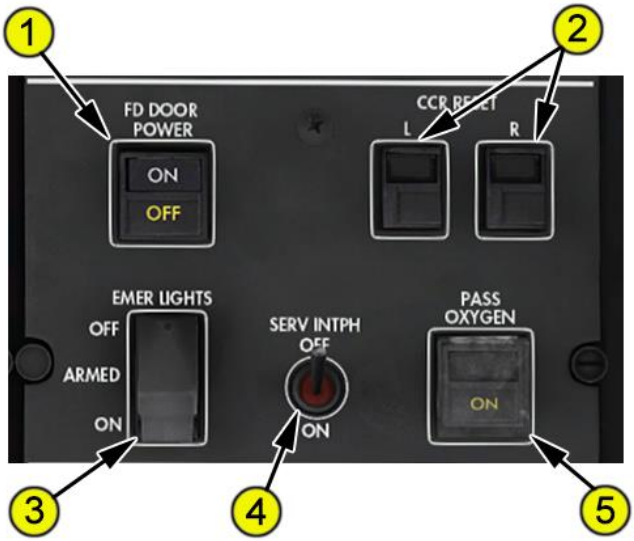
MEDIUM A minimum of 30 minutes remains before battery charge is depleted.

LOW A minimum of 15 minutes remains before battery charge is depleted.

How to Use

This panel does not interact with any part of the towing (pushback) function within MS Flight Simulator. The Battery test lights will however indicate the charge level of the aircraft battery.

FD Power, Emergency Lights, Pax Oxygen & Service Interphone Subpanel



1—Flight Deck (FD) DOOR POWER Switch

ON Door lock is powered. Door is locked when closed.

OFF Removes electrical power from door lock. Door is unlocked

Related EICAS Message: **FD DOOR LOCK FAIL**

2—CCR RESET Switch

L—Push Performs 787 Systems Reset

R—Push No Functionality.

QWTip: *The Left CCR switch can be used to restow the RAT, reset a disconnected generator, restow deployed passenger Oxygen masks*

3—Emergency (EMER) LIGHTS Switch

OFF Prevents automatic emergency lights system operation

ARMED All emergency lights illuminate automatically if required

ON All emergency lights illuminate.

Related EICAS Message: **EMER LIGHTS**

4—Service Interphone Switch

OFF Allows independent operation of the service and flight interphone systems.

ON Connects the service and flight interphone systems.

NOTE: *No real functionality for Flight Simulator*

5—PASS OXYGEN Switch

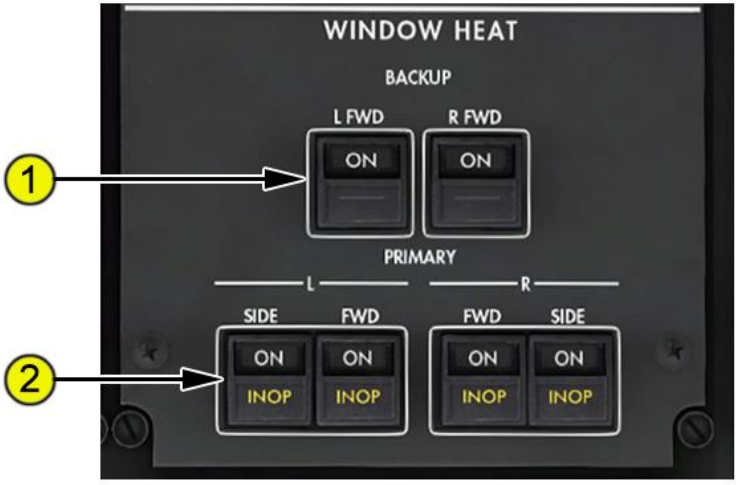
Push The passenger cabin oxygen masks drop.

Passenger Oxygen ON Light The passenger oxygen system is operating and the masks have dropped.

Related EICAS Message: **PASS OXYGEN ON**

QWTip: *If the aircraft is not pressurized correctly, the passenger oxygen masks can activate automatically*

Window Heat Subpanel



1—BACKUP WINDOW HEAT Switches

OFF (ON not visible) Backup window heat anti-fogging system is off.

ON Backup window heat anti-fogging is commanded on for the selected windows if primary window heat system fails.

2—WINDOW HEAT Switches

ON Window heat is applied to the selected windows.

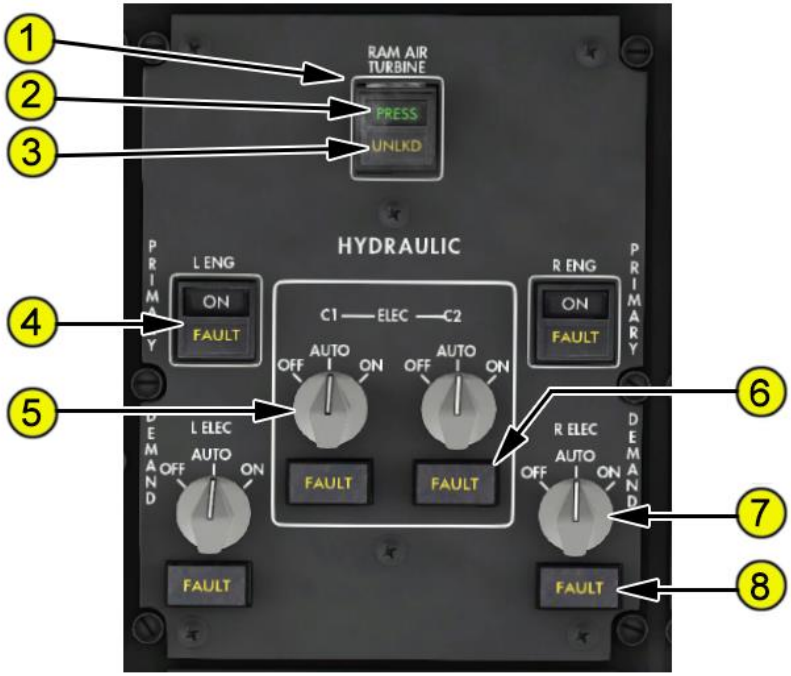
INOP (inoperative) illuminated (amber)

- The switch is OFF, ***or***
- An overheat is detected, ***or***
- A system fault has occurred.

Related EICAS Messages:

WINDOW HEAT L SIDE
WINDOW HEAT R SIDE
WINDOW HEAT L FWD
WINDOW HEAT R FWD
WINDOW HEAT

Hydraulics Subpanel



1—RAM AIR TURBINE Switch

Push Deploys the RAT.

QWTip: *The RAT can also deploy automatically*

2—Ram Air Turbine Pressure (PRESS) Light

Illuminated (white)

- The RAT is deployed.
- Center system primary flight control hydraulic pressure is greater than 3000 psi.

3—Ram Air Turbine Unlocked (UNLKD) Light

- **Illuminated (amber)** The RAT is not in the stowed position.

Related EICAS Messages: **RAT UNLOCKED**

QWTip: *You can see the RAT when it's deployed on the right side of the aircraft just aft of the R MLG along the wingroot*

4**—Left/Right Engine (L/R ENG) PRIMARY Pump Switches**

ON The engine-driven hydraulic pump pressurizes the related left or right

hydraulic system when engine starts.

Off (ON not visible) The engine-driven hydraulic pump is turned off and depressurized.

FAULT illuminated (amber)

- Low primary pump pressure,
- Excessive primary pump fluid temperature, ***or***
- Pump selected OFF

Related EICAS Messages: **HYD PRESS PRI L (R)**
HYD OVERHEAT PRI L (R)

5—C1/C2 Electrical (C1/C2 ELEC) Pump Selectors

ON The pump runs continuously.

AUTO Pumps alternate as a primary pump and a demand pump. The primary pump operates continuously and the demand pump operates during high system demand.

OFF The pump is off.

6—C1 and C2 Pump FAULT Lights

Illuminated (amber)

- Low primary pump pressure, ***or***
- Excessive primary pump fluid temperature, ***or***
- Pump selected OFF.

Related EICAS Messages: **HYD PRESS C1 (C2)**
HYD OVERHEAT C1 (C2)

7—DEMAND (L/R ELEC DEMAND) Pump Selectors

ON The pump runs continuously.

AUTO The pump operates when system and/or primary pump(s) pressure is low, or when control logic anticipates a large system demand.

OFF The pump is off.

8—Demand Pump FAULT Lights

Illuminated (amber)

- Low demand pump pressure, ***or***
- Excessive demand pump fluid temperature, ***or***
- Demand pump is selected OFF.

Related EICAS Messages: **HYD PRESS DEM L (R)**
HYD OVERHEAT DEM L (R)

Hydraulic Power System Information

The aircraft has three independent 5000 psi hydraulic systems: left, right, and center. The hydraulic systems power the:

- Flight controls
- Landing gear
- Leading edge slats
- Nose gear steering
- Thrust reversers
- Trailing edge flaps

How to Use

The Left & Right Primary Engine Driven Hydraulic Pumps switches are normally left in the ON position at all times. All other pumps are configured for Automatic operation. Once setup, the pumps are left alone for the remainder of the flight.

In the AUTO position, the L and R demand pumps operate under the following conditions:

- System low pressure, ***or***
- On the ground for the first three minutes after the second engine is started, ***or***
- From takeoff thrust set to flaps retracted, ***or***
- During descent from when the gear handle is down or radio altitude is less than 1000 feet until groundspeed is less than 40 knots, ***or***
- Thrust reverser operation.

The C1 and C2 ELEC center pumps alternate as a primary pump and demand pump. The primary pump operates continuously while the other operates under the following conditions:

- System low pressure
- On the ground for the first three minutes after the second engine is started
- From takeoff thrust set until radio altitude exceeds 2000 feet
- Flaps or slats are in motion
- During descent from when the gear handle is down and radio altitude is less than 2000 feet until groundspeed is less than 60 knots

Other Related EICAS Messages: HYD PRESS SYS C
HYD PRESS SYS L
HYD PRESS SYS L+C
HYD PRESS SYS L+C+R
HYD PRESS SYS L+R
HYD PRESS SYS R
HYD PRESS SYS R+C

The RAT provides hydraulic power to the primary flight controls connected to the center hydraulic system and electrical power throughout the flight envelope. Inflight, the RAT deploys automatically if any of the following occur:

- Both engines have failed
- All three hydraulic system pressures are low
- Loss of all electrical power to Captain's and First Officer's flight instruments
- Loss of all four EMPs and faults in the flight control system occur on approach
- Loss of all four EMPs and an engine fail on takeoff or landing

QWTip: *Once deployed, the RAT cannot be stowed in flight. The Left CCR switch can be used to restow the RAT.*

Additional System Information

3000 psi used to be the hydraulic pressure standard on previous Boeings, but with a mandate to save fuel by any means necessary—changes were made to the hydraulic system. The 3 hydraulic systems now pumps out an astonishing 5000 psi which enables the use of smaller actuating components thereby saving weight.

Flight control system components are distributed so that any one hydraulic system can provide adequate aircraft controllability.

The left and right hydraulic systems are identical. They differ only in the components they power:

The left hydraulic system powers:

- Flight controls
- The left engine thrust reverser
- Right and left wing spoilers

The right hydraulic system powers:

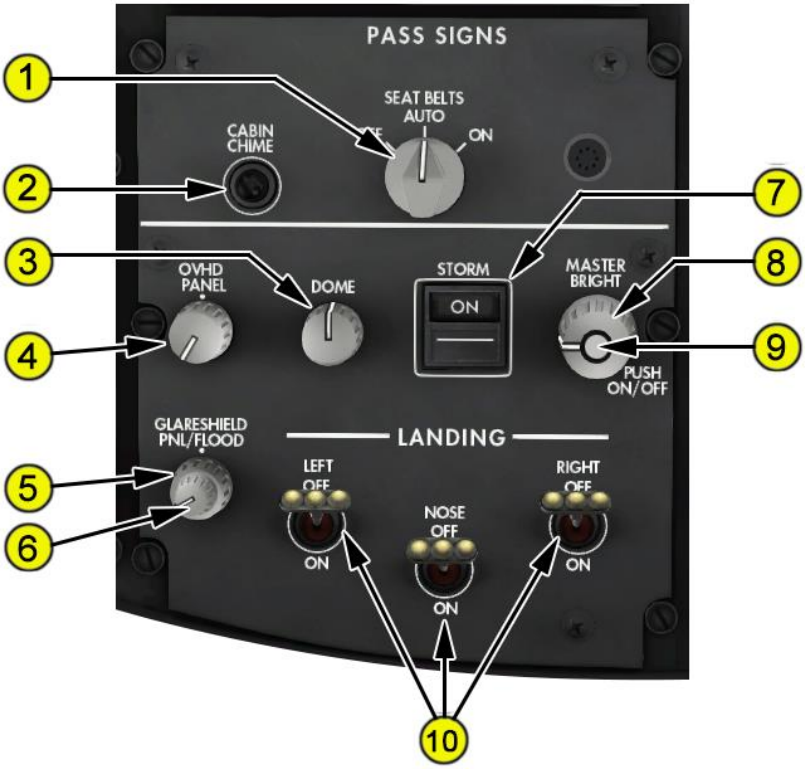
- Flight controls
- The right engine thrust reverser
- Right and left wing spoilers

The center hydraulic system powers:

- Flight controls
- Landing gear actuation
- Leading edge slats
- Nose gear steering
- Right and left wing spoilers
- Trailing edge flaps

The Ram Air Turbine (RAT) only provides hydraulic power to the center hydraulic system primary flight controls. The RAT can also provide Electrical Power as described in the Electrical Power section

Passenger Signs & Flightdeck Lighting Subpanel



1—SEAT BELT SIGNS Selector

OFF The fasten seat belt and return to seat signs are not illuminated.

AUTO The fasten seat belt and return to seat signs are illuminated or extinguished automatically with reference to aircraft altitude and system configuration.

ON The fasten seat belt and return to seat signs are illuminated.

2- CABIN CHIME Switch

Push Rings chime in cabin.

3—DOME Light Control

Right/Left Click Turns overhead dome lights On/Off

QWTip:

These lights are also controlled by the STORM Switch

4—Overhead (OVHD) PANEL Light Control

Right/Left Click Turns overhead panel light text backlights On/Off

QWTip:

These lights are also controlled by the Master Bright Switch

5—GLARESHIELD Panel (PNL) Light Control (outer)

Right/Left Click Adjusts glareshield panel light brightness.

6—GLARESHIELD FLOOD Light Control (inner)

Right/Left Click Adjusts glareshield flood light brightness.

7—STORM Light Switch

ON Overrides normal controls and illuminates the following lights:

- All illuminated indicator lights
- Glareshield flood lights
- Instrument panel flood lights
- Aisle stand flood lights
- Forward dome lights

8—MASTER BRIGHTNESS Control (outer)

Right/Left Click (when the MASTER BRIGHTNESS switch is pushed on)

- Turns on all panel instrument panel lights (does not control: Displays brightness, dome lights, flood lights, area lights, HUD, standby compass, handset and annunciators).

9—MASTER BRIGHTNESS Control (inner) A black ring on the side of the inner switch is visible when the switch is out (OFF).

Push ON (in) The MASTER BRIGHTNESS control is on.

QWTip:

Turns on all PANEL lighting even if their respective switch is off

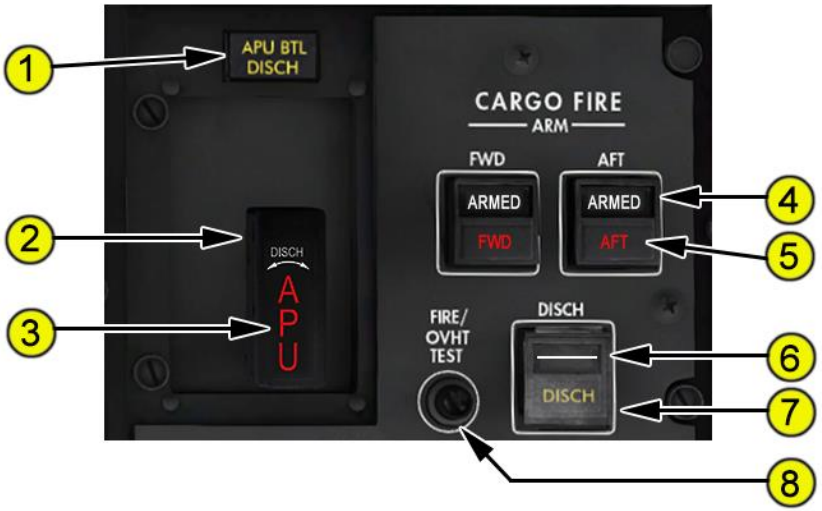
Push OFF (out) The MASTER BRIGHTNESS control is off.

10—LANDING Light Switches

OFF The landing light is not illuminated.

ON The landing light is illuminated.

APU & Cargo Fire Protection Subpanel



1—APU Bottle Discharge (APU BTL DISCH) Light

Illuminated (amber) The extinguisher bottle is discharged or has low pressure.

Related EICAS Messages: **BOTTLE DISCH APU**

2—APU Fire Switch

In Normal position, mechanically locked, unlocks automatically for a fire warning.

Out Shuts down the APU (if automatic shutdown does not occur)

Click to Rotate Discharges the APU fire extinguisher into the APU compartment.

3—APU Fire Warning Light

Illuminated (red)

- An APU fire is detected, ***or***
- The FIRE/OVERHEAT TEST switch is pushed

Note: The APU automatically shuts down for a detected fire.

Related EICAS Messages: **FIRE APU**

4—CARGO FIRE ARM Switches

ARMED

- Arms all cargo fire extinguisher bottles.
- Shuts down several other non-essential airplane systems as a result of arming the extinguishing system

Off (blank) Normal position.

5—CARGO FIRE Warning Lights

Illuminated (red)

- Associated cargo compartment smoke is detected, ***or***
- The FIRE/OVERHEAT TEST switch is pushed

Related EICAS Messages: **FIRE CARGO FWD**
FIRE CARGO AFT

6—CARGO FIRE Discharge (DISCH) Switch

Push Discharges the fire extinguisher bottles into the ARMED cargo compartment.

7—CARGO FIRE Discharge (DISCH) Light

Illuminated (amber) The first two extinguishers discharged.

8—FIRE/OVERHEAT TEST Switch

Push and hold

- Sends fire/overheat test signals to the engine, APU, wheel well, and cargo compartment fire detector systems.
- Tests flight deck fire and overheat indications.

Related EICAS Messages: **FIRE TEST IN PROGRESS**
FIRE TEST PASS

APU Fire Protection System Information

APU Fire Warning

The indications of an APU fire warning are:

- Fire bell sounds
- Master WARNING lights illuminate
- EICAS warning message **FIRE APU** is displayed
- APU fire switch fire warning light illuminates
- APU fire switch unlocks

How to Use

APU Fire Extinguishing

There is one APU fire extinguisher bottle. When the APU fire switch is pulled out, rotating the switch discharges the extinguisher bottle into the APU compartment. Once the bottle is discharged:

- APU BTL DISCH light illuminates
- EICAS advisory message **BOTTLE DISCH APU** is displayed

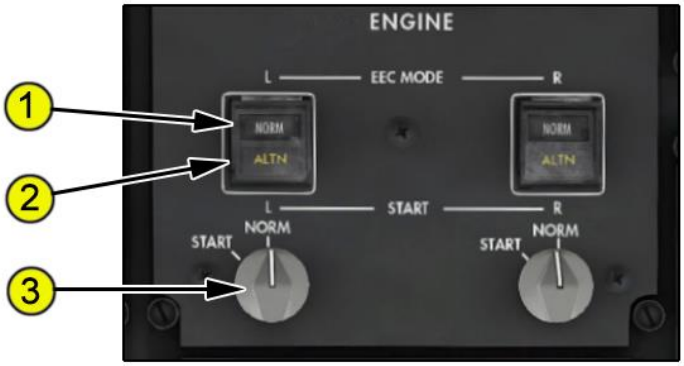
An APU fire signal causes the APU to shut down immediately. The APU extinguisher bottle is automatically discharged.
If the fire extinguishers, the APU Fire Warning indication will extinguish.

QWTip: *APU Fires can be simulated via the Flight Simulator Failures menu.*

Cargo Fire Protection System Information

QWTip: *Cargo Fires are NOT simulated.*

Engine Control Subpanel



1—Electronic Engine Control (EEC) Mode Switch

NORM

- Selects the normal engine control mode for engine control.
- The EEC sets thrust using N1 RPM as the controlling parameter.

Off (ALTN visible)

- Selects the alternate engine control mode for engine control.
- Thrust is set using N1 RPM as the controlling parameter.

2—Electronic Engine Control (EEC) Alternate (ALTN) Light

Illuminated (amber)

- The alternate engine control mode is either automatically or manually selected.

Related EICAS Messages: **ENG EEC MODE L, R**

3—START Selector

START

- Initiates engine start by commanding the fuel spar valve to open and the starter motors to energize.
- Releases to NORM at completion of start.

NORM

- The starter motor is de-energized**.**

Electronic Engine Control System Information

Engine General

(787-8) The aircraft is powered by two General Electric GEnx-1B67 engines which are rated at 69,400 pounds of takeoff thrust each OR two Rolls Royce Trent 1000A engines, which are rated at 69,294 pounds of takeoff thrust each.
(787-9) The aircraft is powered by two General Electric GEnx-1B70 engines. The engines are rated at 72,300 pounds of takeoff thrust each. OR two Rolls Royce Trent 1000C(D) engines, which are rated at 74,511 pounds of takeoff thrust each.
Each engine is controlled by an EEC. The EECs monitor autothrottle and flight crew inputs through the thrust levers to automatically control the engines.
Each engine has individual flight deck controls. Thrust is set by positioning the thrust levers. The thrust levers are positioned automatically by the autothrottle system or manually by the flight crew. Engine indications are displayed on the EICAS display.

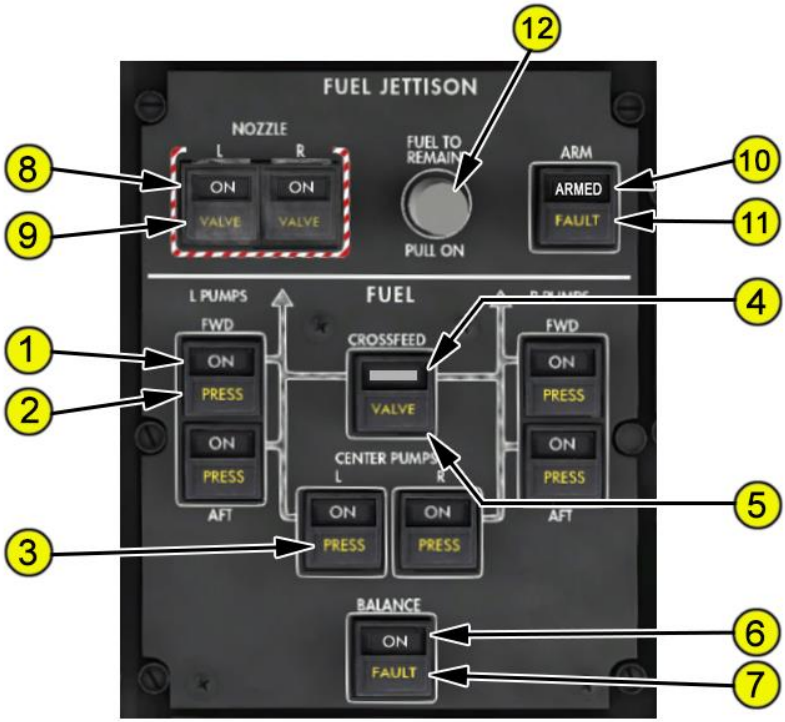
Engine Start and Ignition System Information

The engines can only be started using the autostart system.
The electrical system powers two starter motors mechanically connected to the N2 shaft via the accessory gearbox. During engine starts, power to run the starters is drawn from the airplane's electrical system. There are two power sources that can provide starter power; the APU and the forward external power. Normally, APU power is used to drive the engine starters.
Simultaneous engine start is only allowed when the APU is running and both APU starter generators are operational. Load shed always occurs during engine start. Shed systems appear on their respective synoptic with the majority appearing on the electrical synoptic.

How to Use

Autostart allows the EEC to control fuel and ignition. The autostart sequence is initiated by rotating the START selector to START and moving the FUEL CONTROL switch to RUN. For in-flight windmill starts the autostart sequence is initiated by moving the FUEL CONTROL switch to RUN.

Fuel Management Subpanel



1—Fuel Pump Switches

ON The fuel pump is selected ON.

Off (ON not visible) The fuel pump is selected off.

2—Forward and Aft Fuel Pump Pressure (PRESS) Lights

Illuminated (amber) Fuel pump output pressure is low.

Related EICAS Messages: **FUEL PUMP L AFT**
FUEL PUMP L FWD
FUEL PUMP R AFT
FUEL PUMP R FWD

3—Center Fuel Pump Pressure (PRESS) Lights

Illuminated (amber)

- Fuel pump output pressure is low with pump selected ON.
- Illumination is inhibited when the center tank fuel pump switch is selected OFF

Related EICAS Messages: **FUEL PUMP CENTER L (R)**

4—CROSSFEED Switch

On (bar visible) The crossfeed valve is selected open.

Related EICAS Messages: **FUEL CROSSFEED ON (Memo)**

Off (bar not visible) The crossfeed valve is selected closed.

5—Crossfeed VALVE Light

Illuminated (amber) The crossfeed valve is not in the selected position.

Related EICAS Messages: **FUEL CROSSFEED**

6—BALANCE Switch

ON The balance system is selected on.

Off (ON not visible)

- System is not commanded ON.
- Off is manually selected.
- Fuel balance is automatically commanded off for one of the following:
  - Fuel is already balanced
  - Fuel Jettison system is active
  - FUEL DISAGREE or FUEL QTY LOW messages are displayed
  - Aircraft is on ground and either engine running

7—Balance FAULT Light

Illuminated (amber) Fuel balance system is inoperative.

Related EICAS Messages: **FUEL BALANCE ON (Memo)**
FUEL BALANCE SYS

8—Fuel Jettison NOZZLE Switches

ON If inflight and jettison is armed, operates fuel jettison system valves to dump fuel overboard

Off (ON not visible) The jettison nozzle valve is selected closed.

9—Fuel Jettison Nozzle VALVE Lights

- **Illuminated (amber)** The jettison nozzle valve is not in the selected position.

Related EICAS Messages: **FUEL JETTISON MAIN**

10—Fuel Jettison ARM Switch

ARMED Arms the jettison system and Initializes fuel-to-remain at the MLW fuel quantity.

Off (ARMED not visible) Disarms the jettison system.

11—**Fuel Jettison FAULT Light**

Illuminated (amber) Fuel jettison is inoperative.

Related EICAS Messages: **FUEL JETTISON MAIN**

12—FUEL TO REMAIN Selector

PULL ON Changes the mode from MLW (maximum landing weight) to MAN (manual).

Rotate

- Clockwise to increase the MANUAL fuel-to-remain quantity.
- Counter-clockwise to decrease the MANUAL fuel-to-remain quantity.

Push Automatically selects the MLW fuel-to-remain quantity.

Fuel System Information

General

The fuel system supplies fuel to the engines and APU. The fuel is contained in a center tank, and left and right main tanks.

Fuel Tank Capacities

Tank	(787-8)		(787-9)	
	Gallons	Pounds	Gallons	Pounds
Left Main	5570	37,319	5520	36,984
Right Main	5570	37,319	5520	36,984
Center	22,200	148,740	22,340	149,678
Total	33,340	223,378	33,380	223,646

Fuel Indications

Quantity

Fuel quantity is measured by sensors in each tank. Total fuel quantity is displayed on the primary EICAS display. Tank quantities and total fuel quantity are displayed on the FUEL synoptic display.
Expanded fuel indications showing the left main, center, and right main tank quantities are displayed when non-normal conditions occur.
Due to the unique shape of the 787 composite wing, fuel quantity indications can fluctuate significantly during high pitch maneuvers, such as takeoff and go-around, especially at low fuel loads.

Temperature

Fuel temperature is displayed on the primary EICAS display. The temperature is normally displayed in white. It is displayed in amber when the fuel temperature approaches maximum or approaches the fuel freeze temperature entered on the flight management system CDU. During jettison, the TO REMAIN quantity replaces the EICAS display static air temperature and fuel temperature indications.
Fuel temperature and minimum fuel temperature are also displayed on the fuel synoptic display.

Fuel Pumps

Each fuel tank contains two AC-powered fuel pumps. A single pump can supply sufficient fuel to operate one engine under all conditions.
The two center tank fuel pumps are override/jettison pumps. These pumps have a higher output pressure than the left and right main tank fuel pumps. The center tank pumps override the main tank pumps so that center tank fuel is used before wing tank fuel.
When the main tank fuel pump switches are off, the switch PRESS lights illuminate and the EICAS advisory messages FUEL PUMP (L, R, FWD, or AFT) display. When the center fuel pump switches are off, the switch PRESS lights and pump pressure EICAS messages are inhibited.
When less than all engines/generators are operating, there may not be sufficient electrical power to operate all fuel pumps. In such cases, the fuel system automatically determines the best pumps to operate depending on how much electrical power is available. Certain fuel pumps may be load shed until enough electrical power is available. The indications that a fuel pump has load shed are that the pump switch PRESS light is illuminated and the pump is labeled LOAD SHED on the fuel synoptic.
The left main tank contains a DC-powered fuel pump. It has no controls or indicators, other than the fuel synoptic display. The DC pump operates automatically to provide fuel to the APU when AC power is not available and the APU selector is ON.

Fuel Pump Operation

Before start, the main tank pump switches should all be pushed ON. If the FUEL IN CENTER message is displayed, the center tank pump switches should also be pushed ON.
During flight, when the FUEL LOW CENTER message displays, the center tank pump switches should be pushed off.
If a center pump has low output pressure, the fuel pump switch PRESS light illuminates and the message FUEL PUMP CENTER (L or R) displays.
With the main tank pumps ON, a scavenge system operates automatically to transfer any remaining center tank fuel to the main tanks. Fuel transfer begins when either main tank quantity is less than approximately 35,000 pounds/16,000 kilograms (depending on fuel density) and the center tank pumps are off. The system is inhibited if the engine is on suction feed.

SUCTION FEED

When main tank fuel pump pressure is low, each engine can draw fuel from its corresponding main tank through a suction feed line that bypasses the pumps. As the aircraft climbs, dissolved air is released from the fuel in the tank due to the decrease in air pressure. This air may collect in the suction feed line and restrict fuel flow. At high altitude, thrust deterioration or engine flameout may occur as a result of the fuel flow reduction.
Fuel pressure can be provided from a main tank with operating fuel pumps to both engines by opening the fuel crossfeed valve. Continued crossfeed use results in a progressive fuel imbalance.

APU FUEL FEED

APU fuel is supplied from the left fuel manifold. APU fuel can be provided by any AC fuel pump supplying fuel to the left fuel manifold or by the left main tank DC fuel pump.
On the ground, with the APU switch ON and no AC power available, the DC pump runs automatically. With AC power available, the left aft AC fuel pump operates automatically, regardless of fuel pump switch position, and the DC fuel pump turns off.

FUEL CROSSFEED

The fuel manifolds are arranged so that any fuel tank pump can supply either engine. The crossfeed valve is closed during normal operations. The closed crossfeed valve isolates the left and right systems. The valve can be opened to feed an engine from the opposite fuel tank. If the valve position does not agree with the switch position, the CROSSFEED switch VALVE light illuminates and the EICAS advisory message FUEL CROSSFEED displays.

FUEL BALANCE SYSTEM

Fuel can be transferred from main tank to main tank using the fuel balance system. Fuel transfer is initiated by pushing the fuel balance switch ON. Fuel from the higher quantity main tank is transferred through its defuel/jettison valve to the lower quantity main tank through its inboard refuel valve. Transfer stops automatically when fuel is balanced.
Anytime the fuel balance system is selected ON and balance is not achieved, the balance system shuts down, the BALANCE switch FAULT light illuminates, and the EICAS advisory message FUEL BALANCE SYS is displayed. This occurs if there is a system failure or if the system is functional but inhibited.

Fuel balance operation is inhibited for any of the following reasons:

- Refueling, defueling, and ground transfer of fuel (using the refueling control panel)
- Prior to engine start and the APU is off
- The fuel balance system is failed
- A center tank pump is on
- On the ground and one or both engines are running
- Inflight and the fuel jettison system is active, or the FUEL DISAGREE or FUEL QTY LOW message shows

FUEL IMBALANCE

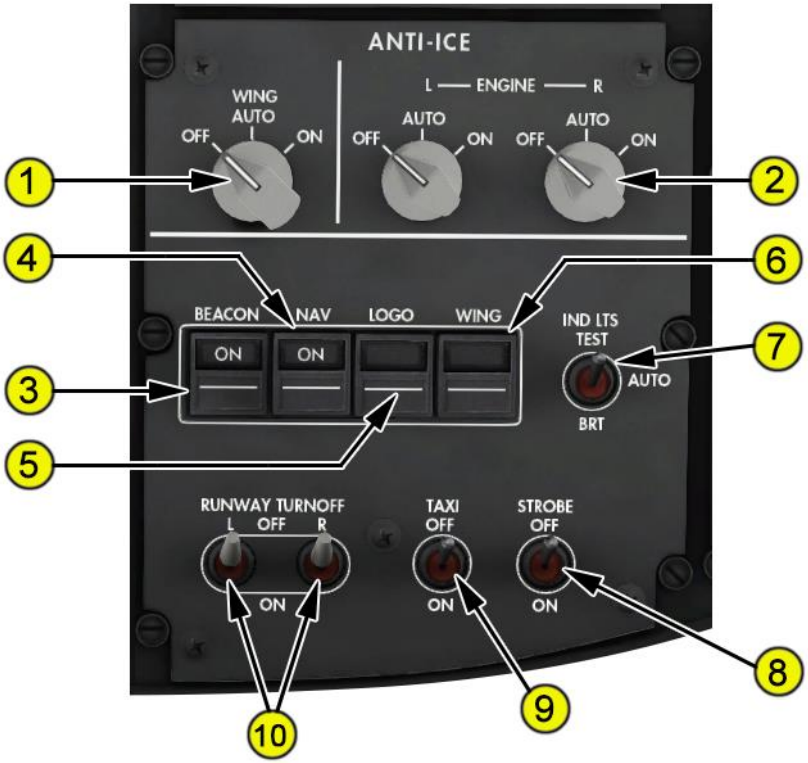
When the fuel quantity in left and right main tanks differs by a predetermined quantity, the EICAS alert message FUEL IMBALANCE displays.
Fuel balancing is accomplished by using either the fuel balance system or the manual crossfeed.
Manual crossfeed is initiated by opening the crossfeed valve and turning off the fuel pump switches for the fuel tank that has the lower quantity. Crossfeed may be done in any phase of flight.
The fuel balance system is initiated by pushing the fuel balance switch. The fuel balance system may be used in any phase of flight. It can be used on the ground if the engines are shutdown and the APU is running.

FUEL JETTISON

The fuel jettison system allows jettison from all fuel tanks. Fuel jettison is accomplished by opening the center tank jettison isolation valves and the main tank defuel/isolation valves. Fuel flows into the jettison/refuel manifold and is then jettisoned overboard through jettison nozzle valves inboard of each aileron.
Fuel jettison is initiated by pushing the FUEL JETTISON ARM switch to select ARMED. The jettison system automatically sets the fuel-to-remain to the maximum landing weight (MLW) fuel quantity. The TO REMAIN quantity replaces fuel temperature on the EICAS display.
Pull on and rotate the TO REMAIN selector to manually decrease or increase the TO REMAIN quantity.
Inflight, when the FUEL JETTISON ARM switch is armed and either fuel jettison NOZZLE switch is pushed ON, the defuel/isolation valves and jettison isolation

valves open. The fuel system automatically positions the valves as required to jettison fuel based on the selected TO REMAIN quantity.
The nozzles cannot open on the ground, regardless of switch positions.
Inflight, jettison time is displayed in minutes on the fuel synoptic when the jettison arm switch is positioned on while in the air. Jettison automatically stops when a value just above the FUEL TO REMAIN quantity is reached. The system closes the defuel/isolation valves and the jettison isolation valves.
At least 8700 pounds/3900 kilograms of fuel remains in each main tank after jettison is complete.

Anti-Ice & Exterior Lighting Subpanel



1. **WING ANTI-ICE Selector**

   OFF Wing ice protection system is not powered.

   AUTO Inflight, wing ice protection system is powered on and off automatically by the ice protection system.

   ON Inflight, wing ice protection system is powered on and operates without input from automatic ice detection system (with TAT less than 25ºC).

2. **ENGINE ANTI-ICE Selectors**

   OFF The engine anti-ice valves are commanded closed.

   AUTO Inflight, the engine anti-ice valves are opened or closed automatically by the ice detection system.

   ON The engine anti-ice valves are commanded open.

3. **BEACON Light Switch**
   ON Both top and bottom red anti-collision beacon lights operate.
4. **Navigation (NAV) Light Switch**
   ON The red, green, and white navigation position lights are illuminated.
5. **LOGO Light Switch**
   ON The stabilizer mounted logo lights illuminate the airline logo on the tail.
6. **WING Light Switch**
   ON The wing leading edge illumination lights are illuminated.
7. **Indicator Lights (IND LTS) Switch**
   TEST (spring-loaded) While the switch is being held in the TEST position:
   - Illuminates all annunciator lights to full check the bulbs
   - All display windows on the MCP blink on for 2 seconds, then off for 1 second and repeat until the TEST switch is released.

   AUTO *Not functional on the QW787*
   BRT (Bright) Sets all illuminated annunciator lights to full bright (overrides the automatic system operation).
8. **STROBE Light Switch**
   OFF The white anti-collision strobe lights on the tips of each wing and the tailcone are off.
   ON The strobe lights operate.
9. **TAXI Light Switch**
   OFF The taxi lights are extinguished.
   ON The taxi lights are illuminated.
10. **RUNWAY TURNOFF Light Switches**
    OFF The runway turnoff light is extinguished.
    ON The runway turnoff light is illuminated.

Anti-Ice System Information

The anti-ice and rain systems include:

- Automatic ice detection
- Engine anti-ice
- Wing anti-ice
- Pack inlet anti-ice
- Flight deck window heat
- Windshield wipers and washers
- Probe heat

The 787 has an automatic ice detection system that senses the existence of icing conditions. The system provides signals to control the engine, wing, and pack inlet anti-ice systems. Automatic ice detection is inhibited on the ground below 75 knots.

Engine Anti-Ice

The engine anti-ice system uses engine bleed air to provide engine core and cowl inlet ice protection. Engine anti-ice can be operated inflight or on the ground. The engine anti-ice indication EAI is displayed above the EICAS N1 indication when an engine anti-ice valve is open. The left and right engines have identical, independent anti-ice systems. This allows the remaining system to operate if one engine is shutdown.

How to Use

Automatic Operation

Inflight, when the ENGINE ANTI-ICE selector is in AUTO, engine anti-ice system operation is automatic. When icing conditions are detected, the engine anti-ice valves open and bleed air is supplied to the engine core and inlet cowl. When icing conditions are no longer detected, the engine anti-ice valves close and bleed air is no longer supplied to the engine core and inlet cowl.
Automatic operation of the engine anti-ice system is inhibited on the ground.

Manual Operation

On the ground or inflight, when the ENGINE ANTI-ICE selector is ON, bleed air opens the engine anti-ice valves and is supplied to the engine core and inlet cowl.

Wing Anti-Ice

The electric wing anti-ice system powers thermal anti-icing mats on four midwing leading edge slats on each wing.
Wing anti-ice is inhibited on the ground below 75 knots. Wing anti-ice may be momentarily shed (30 seconds maximum) during high electrical loads, such as during flap retraction.
The wing anti-ice annunciation WAI is displayed below the EICAS N1 indication when wing anti-ice is powered.

How to Use

Automatic Operation

Inflight, when the WING ANTI-ICE selector is in AUTO, wing anti-ice system operation is automatic. When icing conditions are detected, power is supplied to the thermal mats on the leading edge slats. When icing conditions are no longer detected, power is removed.
Automatic wing anti-ice operation is available in flight and on the ground above 75 knots airspeed.

Manual Operation

Inflight, when the WING ANTI-ICE selector is ON the wing anti-ice system on each wing is powered anytime TAT is below 25ºC.

Flight Deck Window Heat

All flight deck windows are electrically heated.

How to Use

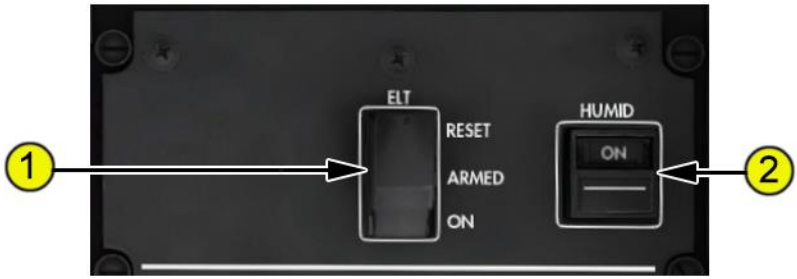
With the PRIMARY L SIDE, L FWD, R FWD, and R SIDE window heat switches in the ON position, the primary system operates automatically.
With the BACKUP L FWD and R FWD switches in the ON position, a backup antifogging system for the forward windows operates automatically if the primary window heat system fails.

Windshield Wipers/Washers

The forward windows are equipped with independently controlled, three-speed wipers. When the WIPER selector is OFF, the respective wiper is off and stowed. Washers are not simulated.

Probe Heat

Three pitot probes and two angle of attack probes are electrically heated for anti-ice protection when either engine is operating.



ELT & Humidity Control Subpanel

1—Emergency Locator Transmitter (ELT) Switch

RESET (spring-loaded)

- Stops ELT transmission if transmitting.
- Starts ELT self-test if not transmitting.

ARMED ELT starts transmitting if high deceleration is sensed.

ON ELT transmits continuously.

Related EICAS Messages: **ELT ON**

2—Humidification (HUMID)

ON Flight deck humidification system operates automatically.

Off (ON not visible) Humidification system does not operate.

Cargo Temp Control Subpanel

1—FWD CARGO FLOW Selector

LOW Normal ventilation for maintaining perishable cargo other than animal carriage

HIGH High ventilation flow demanded from air conditioning system for removing CO2 from live animal carriage

2—**Forward Cargo Air Conditioning (FWD CARGO A/C) Control**

- Provides automatic temperature control for the forward cargo compartment
- Turning the control toward C or W sets the desired target temperature between 40 degrees F (4 C) and 85 degrees F (27 C). Mid position (12 o'clock) sets approximately 60 degrees F (16 C).

OFF Disables heater and cargo refrigeration unit. Normal cargo heating provided by the forward equipment ventilation system.

3—**BULK CARGO TEMP Switch**

AUTO bulk cargo heating system targeting 70 degrees F (21 C)

OFF (AUTO not visible) bulk cargo heat is commanded off.

Related EICAS Messages: **CARGO HEAT BULK**

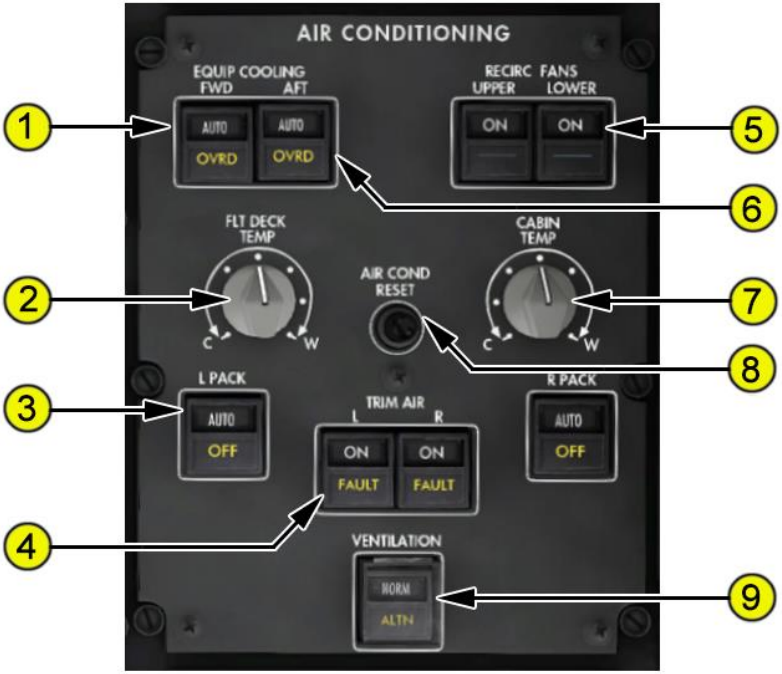
4—**Forward Cargo Air Conditioning (FWD CARGO A/C) OFF Light**

Illuminated amber

- Forward Cargo Heat Switch in the OFF positon

Related EICAS Messages: **CARGO HEAT FWD**

Air Conditioning Subpanel



1—Forward Equipment Cooling (EQUIP COOLING FWD) Switch

AUTO Forward equipment cooling mode is controlled automatically.

Off (AUTO not visible)

- forward equipment system fans fan are commanded off
- Forward cargo heat becomes inoperative
- OVRD illuminates

OVRD (override) illuminated (amber) SMOKE/OVRD mode is operating because:

- Off is selected manually

Related EICAS Messages: **EQUIP CLG OVRD FWD**

2—Flight Deck Temperature (FLT DECK TEMP) Control

- Selects the target flight deck temperature
- Turning the control toward C or W sets the desired temperature between 65°F (18°C) and 85°F (29°C).

3—PACK Switches

AUTO The pack is controlled automatically.

Off (AUTO not visible) Cabin air compressors are commanded off.

OFF illuminated (amber) Both associated cabin air compressors are not running:

- Automatically during engine start
- OFF is manually selected

Related EICAS Messages: **PACK L (R)**

4—TRIM AIR Switches

ON The trim air valve is commanded open.

Off (ON not visible)

- The trim air valve is commanded closed, and
- FAULT illuminates

FAULT illuminated (amber)

- The TRIM AIR switch is selected off

Related EICAS Messages: **TRIM AIR L (R)**

5—Recirculation Fans (RECIRC FANS) Switches

ON Provides automatic operation of the associated recirculation fans.

Off (ON not visible) The selected recirculation fans do not operate.

Related EICAS Messages: **RECIRC FAN LWR OFF**
RECIRC FAN UPR OFF

6—Aft Equipment Cooling (EQUIP COOLING AFT) Switch

AUTO Aft equipment cooling mode is controlled automatically.

Off (AUTO not visible)

- Both aft equip cooling supply fans and vent fan are commanded off
- Override valve is commanded open
- Aft cargo heat becomes inoperative
- OVRD illuminates

OVRD illuminated (amber) SMOKE/OVRD mode is operating because:

- Off is selected manually

Related EICAS Messages: **EQUIP CLG OVRD AFT**

7—Cabin Temperature (CABIN TEMP) Control

- Provides automatic passenger cabin temperature control.
- Turning the control toward C or W sets the passenger cabin master reference temperature between 65°F (18°C) and 85°F (29°C).

8—Air Conditioning Reset (AIR COND RESET) Switch Push:

- Button operates, but has no true simulation function

9—Alternate Ventilation (VENTILATION) Switch

NORM

- Environmental control system is configured for normal operation.

(787-8) ALTN

- illuminated (amber) Alternate ventilation valve is activated

(787-9) ALTN

- illuminated (amber) The forward and aft outflow valves are automatically repositioned towards the ten and one o'clock positions respectively when the aircraft is below 13,000 feet altitude and not on the ground.

Related EICAS Messages: **VENTILATION ALTN**

Pressurization Subpanel

1—OUTFLOW VALVE (FWD/AFT) Switches

AUTO Outflow valve controlled automatically.

MAN (manual) illuminated (amber)

- Outflow valve is controlled manually
- Bypasses automatic outflow valve control and cabin altitude limiter
- AUTO extinguished

Related EICAS Messages: **CABIN ALTITUDE AUTO** **OUTFLOW VALVE AFT (FWD)**

QWTip: *The positon of the outflow valves can be viewed on EICAS*

2—OUTFLOW VALVE MANUAL Switches

OPEN Moves the outflow valve toward open.

CLOSE Moves the outflow valve toward closed.

3—Landing Altitude (LDG ALT) Selector

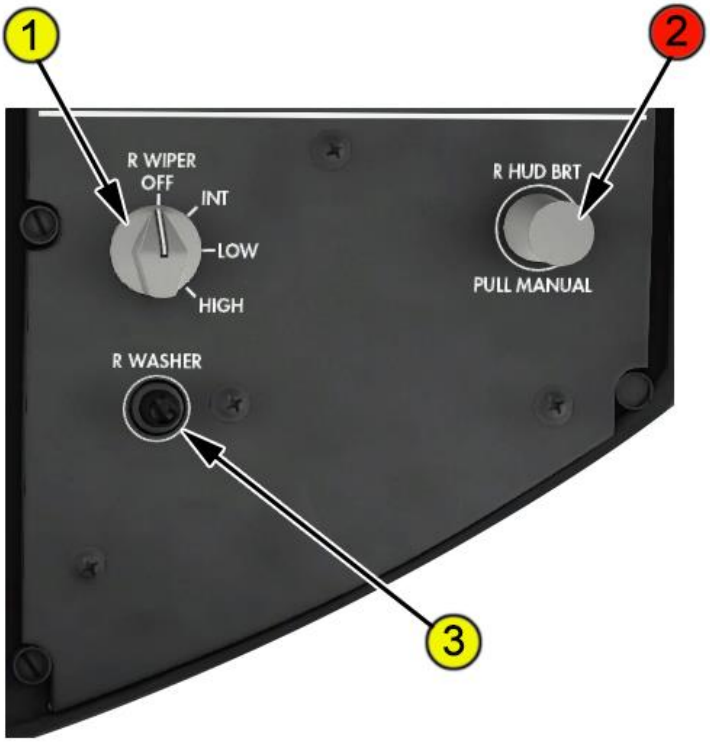
Pull ON, and then rotate

- Sets landing altitude manually
- Landing altitude followed by MAN displayed on EICAS

Related EICAS Messages: **LANDING ALTITUDE**

QWTip: *The selected Landing Altitude can be viewed on EICAS. The Landing Altitude normally is set automatically once a destination has been entered when programming an FMS route.*

Right Miscellaneous Controls Subpanel



1—R Wiper Switch

- **OFF** The wiper is stowed vertically.
- **INT (intermittent)** The wiper operates intermittently.
- **LOW** The wiper operates at low speed.
- **HIGH** The wiper operates at high speed.

2—R HUD BRT Switch (Not Simulated)

3—WASHER Switch

- **Push** Simulates Washer Fluid being applied.

Note: *No visual effects only Audible*

Main Instrumental Panel

The Main Instrument Panel has 3 areas:

- Captains Left Forward Instrument area
- First Officers Right Forward Instrument area
- Center Instrument area

In the Left Forward Instrument area, you will find the following equipment:

1. Left Outboard Display Unit
2. Left Inboard Display Units (Multifunction Display)
3. Left Instrument Source Select Panel

The Right Forward Instrument area mirrors the left area with the following equipment

1. Right Outboard Display Unit
2. Right Inboard Display Units (Multifunction Display)
3. Right Instrument Source Select Panel

The Center Instrument Panel separates both the left and right forward panel areas and has the following equipment:

- Integrated Standby Flight Display
- Landing Gear Controls
- Autobrake Controls

More detailed information about the Inboard and Outboard Displays on both the left and right forward instrument areas can be found in a speared section of the Flight Manual devoted to Displays Operation. This is because there are other panels that control the content of these displays, such as:

- Display Select panels
- EFIS Control Panels
- Instrument Source Select Panels

Outboard Display Units

1—Auxiliary (AUX) Display

- The AUX area outboard of each PFD.

2—Primary Flight Display (PFD)

- The PFDs present a dynamic color display of all the parameters necessary for flight path control.

3—Mini-Map

- The Mini-Maps present a tactical display map with a fixed range of 20 nautical miles.

QWTip: *For more information on the Aux Display, PFD & Mini-Map Display, see the Displays Section*

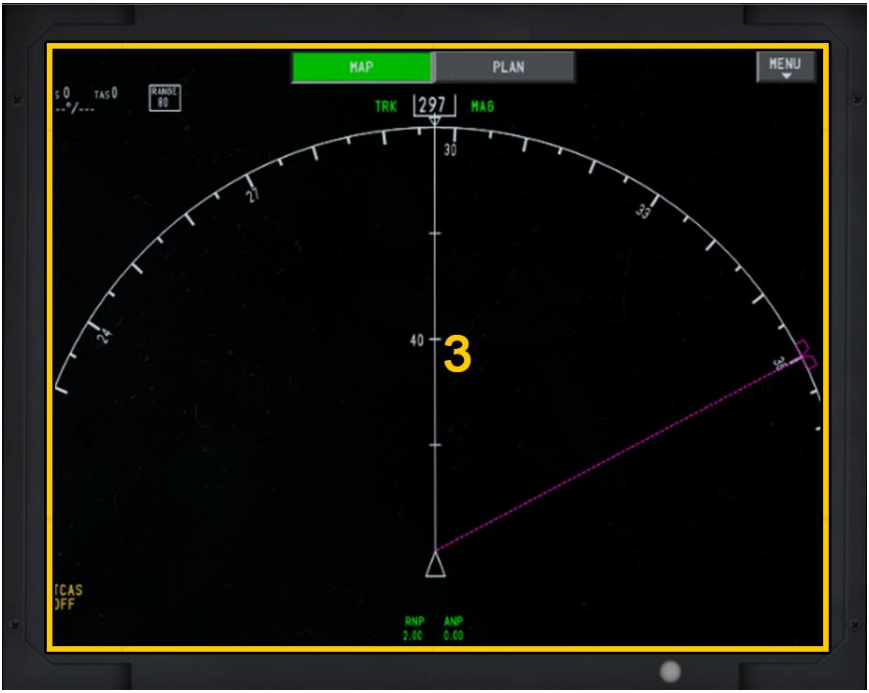
Inboard Display Units (Split Display Mode)

The inboard displays are capable of functioning as a Multifunction Display (MFD). As an MFD, it can operate as a Split Display or a Full ND Display. When it's operating as a Split Display (Shown above), there are 2 sides of the display as highlighted in the graphic above.

1. Outboard half
2. Inboard Half
   - EICAS must occupy the inboard section of one of the two Inboard Displays. On power up, EICAS occupies the inboard half of the Left Inboard Display. When EICAS is occupying an inboard half, nothing else can be placed on that inboard half until EICAS is moved away. The other Inboard display will have two halves available to display information. The other display can also be operated as a Full Navigation Display (ND) Mode.

QWTip: *For more detailed information see the Displays In-Depth Section*

Inboard Display Units (Full Display Mode)



One Inboard Display can be selected to display a Full Navigation Display when the EICAS is occupying the inboard section of the opposite side Inboard DU.

QWTip: *For more detailed information see the Displays In-Depth Section*

Figure H Left Inboard in Split Mode

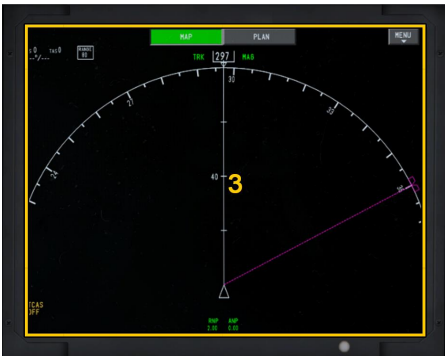


Figure I Right Inboard in Full ND Mode

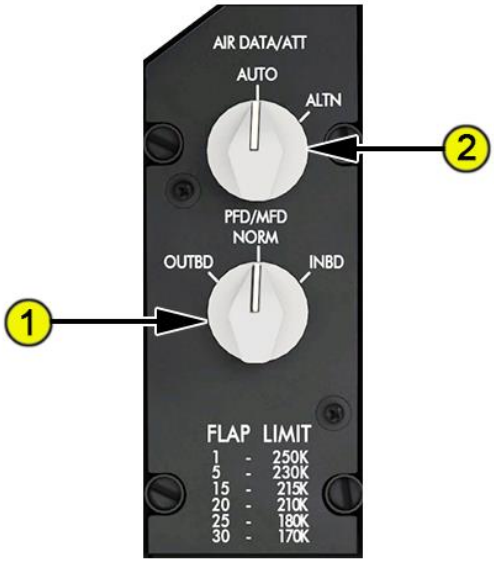
Display Unit (2D Pop-Up Display)

All Display Units can be "Popped Out" into a 2D display .

1. **Display Light Sensor (Virtual Cockpit - Typical)**
   - On the real 787, this small circle is am ambient light sensor that controls display brightness. But in the Virtual Cockpit, it is used to pop-out the display. Clicking the light sensor on the display in the VC will also close the display.
   - The Light sensor on the actual 2D Pop-Out is not clickable
2. **Pop-Out Close Button**
   - Once the panel has been popped out, a small X appears that allows you to close the panel.

Instrument Source Select Panels

1—PFD/MFD Selector



NORM Normal position.

INBD DU Non-normal position. When the selector is in this position:

- The outboard DU is blanked.
- The inboard DU displays the PFD in reversion mode and EICAS if EICAS was displayed on this side.

OUTBD DU Non-normal position. When the selector is in this position:

- The inboard DU is blanked.
- The outboard half of the outboard DU displays the PFD in reversion mode and EICAS if EICAS was displayed on this side.

QWTip: *For more information on the PFD/MFD Selector, see the Displays In-Depth Section*

QWTip: *The First Officers PFD/MFD selector is not simulated*

2—AIR DATA/ATT (Air Data/Attitude) Source Selector

AUTO Normal position

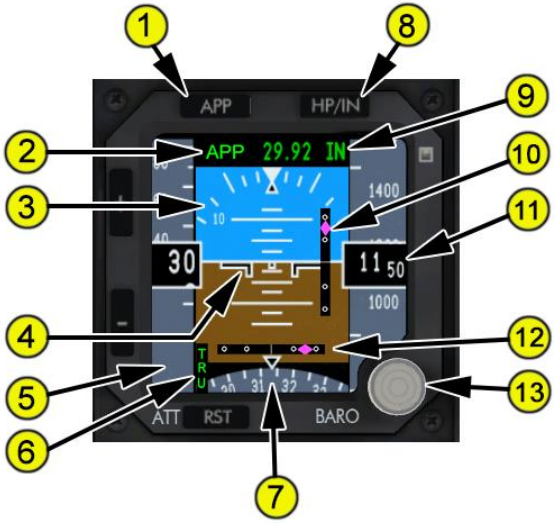
- Normal sources of Air Data and Inertial Reference Data are provided to the PFD and HUD. Backups are provided automatically when necessary.

ALTN Non-normal position.

- Manually selects backup data for the PFD and HUD

Related EICAS Messages: **ALTN ATTITUDE CAPT**
ALTN ATTITUDE FO
SGL SOURCE ATTITUDE

Integrated Standby Flight Displays (ISFD)



1—Approach (APP) Switch

Push

- When blank, selects APP

2—Approach Mode Annunciation Indicates approach mode selected.

Blank No approach deviation data displayed.

APP ILS/GLS localizer and glideslope deviation data displayed.

3—Attitude Display

- Displays aircraft attitude.
- Indicates bank in reference to the bank scale.
- Indicates the horizon relative to the aircraft symbol.

4—Aircraft Symbol Indicates aircraft position with reference to the horizon.

5—**Airspeed Indications** Indicates airspeed when above 30 knots.

6—Heading Source

TRU True heading

Blank Magnetic heading

Integrated Standby Flight Displays (ISFD)

7—Heading Indication Displays aircraft heading.

8—HP/IN (Hectopascals/Inch) Switch

Push Changes units of barometric reference.

9—**Barometric Setting**

- Indicates the barometric setting selected with the barometric selector.
- STD is displayed when selected with the barometric selector.

10—Glideslope Pointer and Scale

- The glideslope pointer indicates glideslope position relative to the aircraft:
- The pointer is in view when the glideslope signal is received.

11—Current Altitude

12—Localizer Pointer and Deviation Scale

- The localizer pointer indicates localizer position relative to the aircraft:
- The pointer is in view when the localizer signal is received.
- The scale is in view when the APP mode is selected.

13—Barometric Selector (BARO)

Rotate Changes barometric setting.

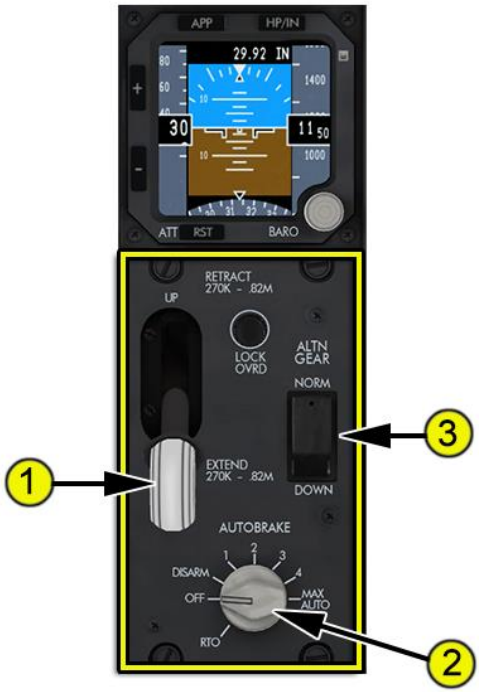
Push

- Selects standard barometric setting (29.92 inches Hg/1013 HPA).

Landing Gear Panel

1—Landing Gear Lever

UP The landing gear retracts.
DN The landing gear extends.



2 –AUTOBRAKE Selector

OFF Deactivates and resets the autobrake system.

DISARM

- Disengages the autobrake system.
- Releases brake pressure.

1, 2, 3, 4, MAX AUTO

- Selects the desired deceleration rate.

RTO

- Automatically applies maximum brake pressure when the thrust levers are retarded to idle above 85 knots.

3—Alternate Gear (ALTN GEAR) Switch

NORM The landing gear lever operates normally.
DOWN The landing gear extends by the alternate extension system.
Note: Alternate extension may be selected with the landing gear lever in any position.

Displays (In-Depth)

General

The flight instruments and displays supply information to the pilot on five flat-panel liquid crystal display units. The units display five primary groups of information:

- Primary Flight Display (PFD) with mini-map
- Navigation Display (ND)
- Engine Indication and Crew Alerting System (EICAS)
- Auxiliary Display (AUX)
- Multifunction Display (MFD)

Display Selection and Control

After power-up with the PFD/MFD selectors set to NORM, the displays are in the default configuration:

- PFDs are displayed on the two outboard display units (DUs)
- A normal-display ND is shown in the left MFD of the Captain inboard DU
- A full-display ND (two MFD windows) is shown on the First Officer inboard DU
- EICAS is displayed in the right MFD window of the Captain inboard DU
- The CDU is displayed in each MFD window of the lower DU

During normal operations, the displays are typically configured as follows:

- PFDs are displayed on the two outboard DUs
- EICAS is displayed in either the right MFD window of the Captain inboard DU or in the left MFD window of the First Officer inboard DU
- A normal-display ND is shown in the MFD window on the same inboard DU as EICAS
- A full-display ND (two MFD windows) is shown on the inboard DU without EICAS
- The CDU is displayed in each MFD window of the lower DU

Multifunction Display Management

There are a total of five MFDs available at any one time on the flight deck. However, five instances of the same MFD cannot be shown at the same time. If a display is currently shown, additional instances are managed in one of three ways:

- **Synchronized** A copy of an instance that is already displayed. Any change on one instance affects all other instances of that display.
- **Independent** Not linked to any other instance on the flight deck. Can be changed without affecting or being affected by other instances of that display.
- B**lank** When the selected display exceeds the maximum number of instances allowed, an existing instance of that display becomes blank with a message SELECT MFD. Additional pilot selection is required to

replace the blank display with another display, unless the default display for that location is not already shown.

The maximum number of instances each display format may be shown are:

Page Title	# per side	Instance Management
SYS	2	Independent
CDU	1	Independent
INFO	2	Independent
CHKL	1	Synchronized
COMM	1	Independent
ND	1	Independent

1—Select MFD If the number of instances requested for a display format exceeds the maximum available, SELECT MFD shows on the display

EFIS Control Panels

The EFIS control panels control display options, mode, and range for the respective PFDs and NDs.

If an EFIS control panel fails, the displays can be controlled through the backup EFIS/DSP display on the SYS page. The backup EFIS capability is available at all times, but inhibits inputs from the respective EFIS control panel.

The EFIS Control Panel allows control of any on-side ND. However, both pilots have access to the lower DU. If each pilot selects an ND into a window on the lower DU, a single, full-display ND is shown. The pilot that first selected an ND on the lower DU controls the full-display ND.

Display Select Panel

The display select panels (one for each pilot) on the glareshield provide control of the MFDs for the on-side inboard DU. Each DU has a left and right window. The currently selected MFD window (left or right) is indicated by the illuminated annunciator light above the corresponding display switch (L or R).

After a display unit is selected, the appropriate display is selected (SYS, CDU, INFO, CHKL, COMM, or ND). The ENG switch toggles the display of secondary engine formation on the EICAS display. The EICAS transfer switch toggles the EICAS display between the inboard half of the Captain and First Officer inboard DUs.

Each pilot also has a display select panel next to the lower display unit. These DSPs provide each pilot control of their half of the lower DU. This allows the selection of the same MFDs as on the upper DUs. However, these DSPs do not include the ENG, CANC/RCL, or EICAS transfer switches.

PFD/MFD Source Selector

The PFD/MFD selector is used to switch displays if there is undetected display unit failure.

When the selector is in the inboard position (INBD DU), the outboard display unit is blanked and the inboard display unit shows the cropped PFD and EICAS if EICAS was previously displayed on this side. Otherwise, whichever display that was shown in place of EICAS before the failure is shown.

When the selector is in the outboard position (OUTBD DU), the inboard display unit is blanked. The outboard half of the outboard display unit shows the cropped PFD. The inboard half displays EICAS if EICAS was previously shown on that side of the flight deck. Otherwise, whichever display that was shown in place of EICAS before the failure is shown

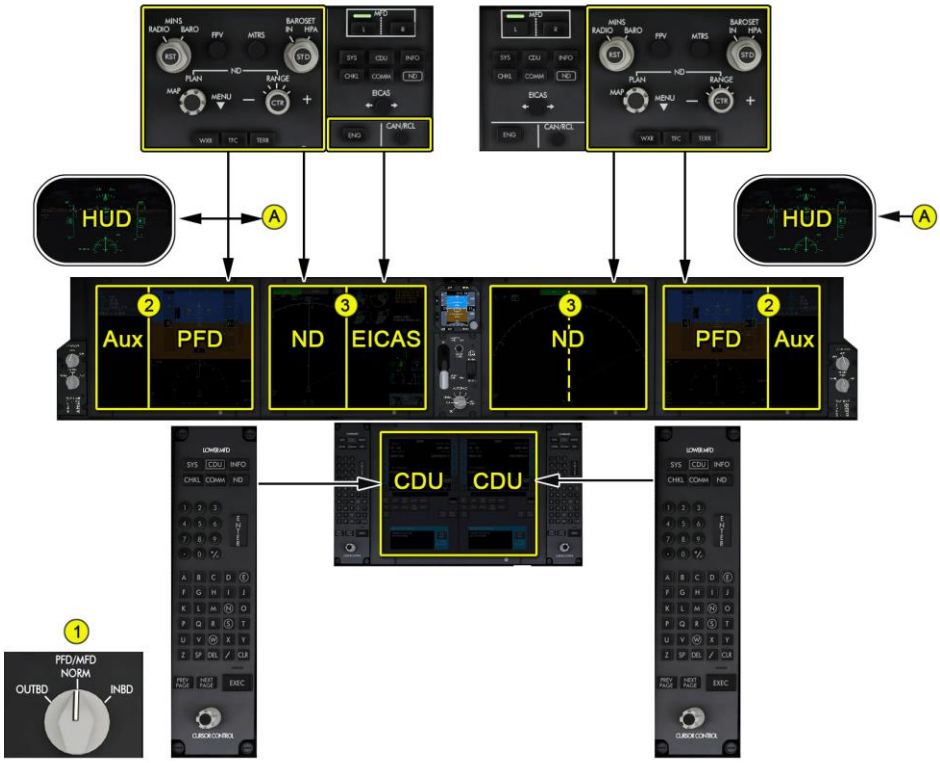
QWTip: *The Captains PFD/MFD selector can be used for those who prefer to consolidate the most important information onto One Display.*

QWTip: *The First Officers PFD/MFD selector is not simulated.*

Display Selection and Control Examples

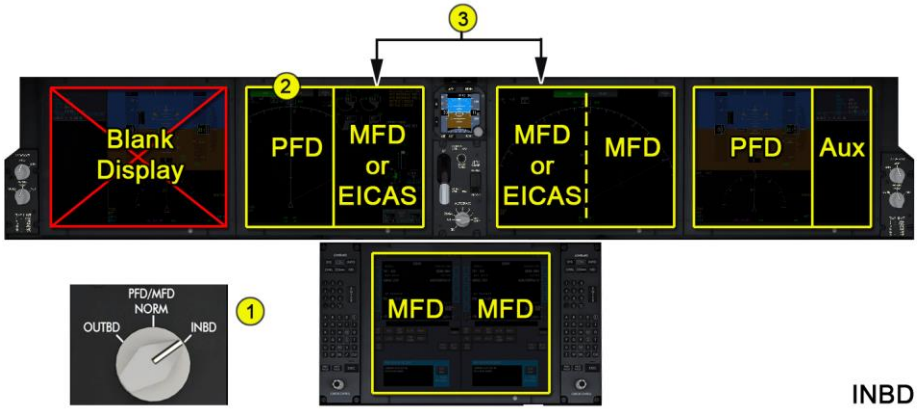
The following examples show display selections.

Default Display Configuration

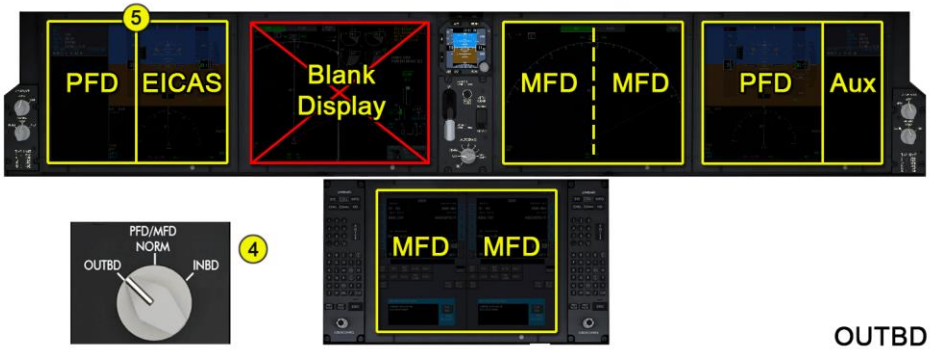


1. The Captains PFD/MFD DISPLAY selector is set to NORM.
2. The outboard display units display AUX data and PFDs.
3. The inboard display units display NDs and EICAS.

Display Unit Manual Switching (Captains Side Only)

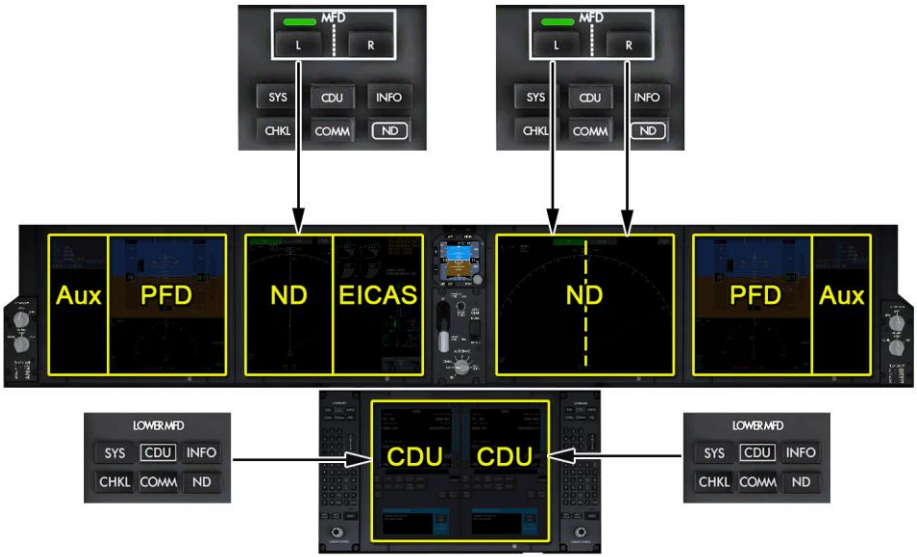


1. Failures of the Display Units are not simulated, but the Captains PFD/MFD selector can be set to INBD DU.
2. The PFD moves to the outboard MFD window of the inboard display unit. The PFD is cropped on both sides and the AUX display is removed.
3. The EICAS transfer switch on each EFIS control panel can still function normally.



4. To place EICAS on the outboard DU of either side, set the PFD/MFD selector to OUTBD DU.
5. The PFD moves to the outboard MFD window of the outboard display unit. The PFD is cropped on both sides, the AUX display is removed and EICAS is displayed on the outboard MFD window of the outboard display unit.

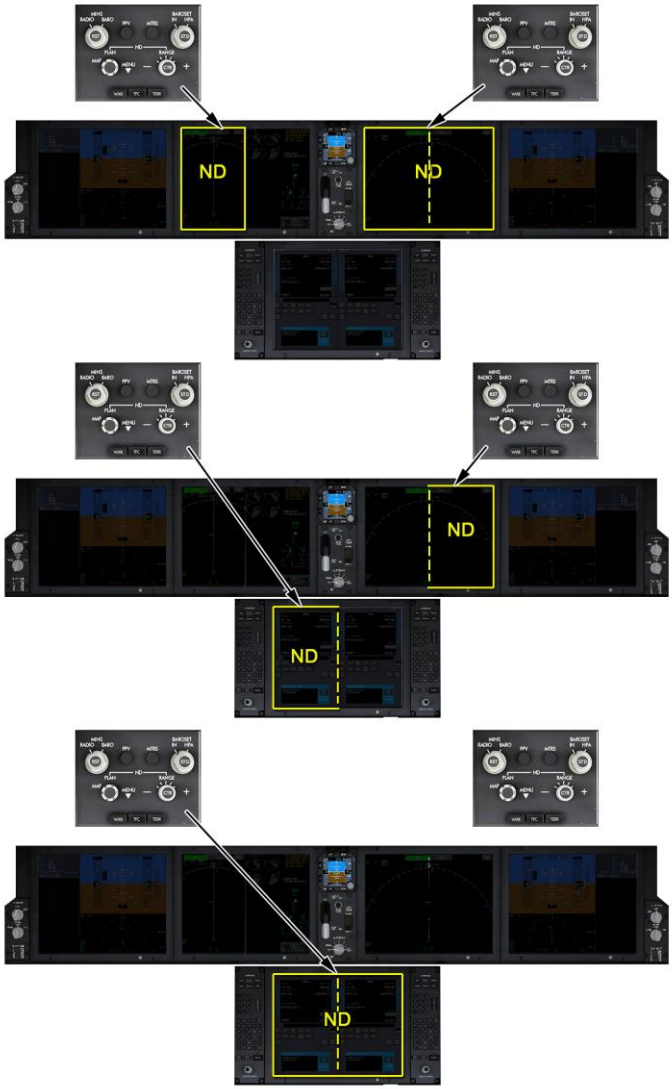
Display Select Panel MFD Selection



Only the display light of the last selected MFD switch is illuminated. Either the left or right display light may be illuminated, but not both. The inboard MFD section which is displaying EICAS cannot be selected while EICAS is being displayed. In the example graphic above, if the "R" button on the left Display Select Panel is pushed, the green light will not illuminate since the Right half of the Left Inboard Display is currently displaying EICAS. EICAS will need to be transferred to the other Inboard DU before the Right half of the left Inboard DU can be selected.

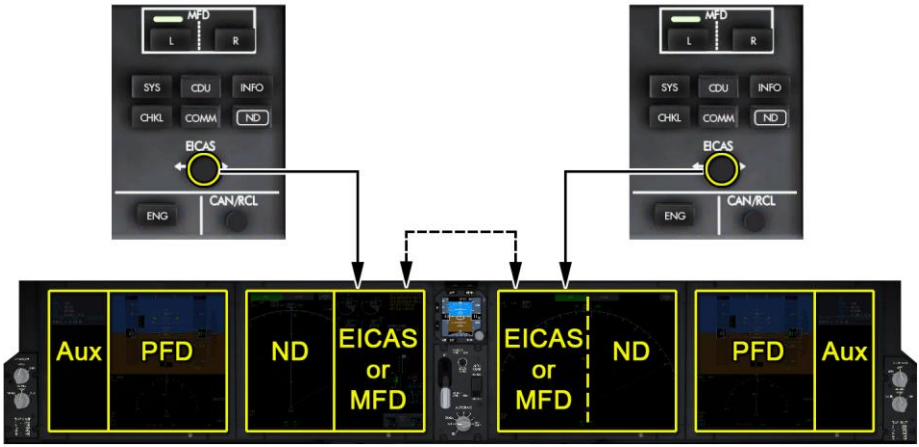
Read that a few more times, because I'm sure it was as confusing to read as it was say :-)

EFIS Control Panel Multiple ND Control



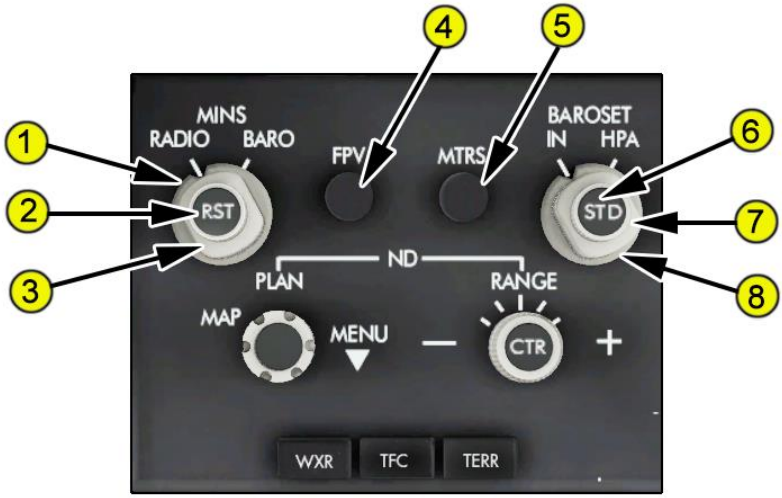
Each EFIS control panel controls the ND on the same side. If an ND is displayed on both MFD windows of the lower display unit, the 2 normal-display NDs combine to form a single full-display ND. The Captains EFIS control panel is used to control the full-display ND.

EICAS Transfer Switching



The EICAS transfer switches toggle the EICAS display between the Captain inboard DU and the First Officer inboard DU.

EFIS Control Panel—PFD Controls



1—Minimums (MINS) Reference Selector (outer)

- RADIO Selects radio altitude as the PFD minimums reference.
- BARO Selects barometric altitude as the PFD minimums reference.

2—Minimums Reset (MINS RST) Switch (inner)

Push

- Resets the PFD minimums alert display
- Blanks the minimums display when green

3—Minimums (MINS) Selector (middle)

Rotate (slew) Adjusts the PFD radio or baro minimums altitude.

4—Flight Path Vector (FPV) Switch

Push Displays the PFD flight path vector.

5—Meters (MTRS) Switch

Push Displays PFD altitude meters indications.

6—Barometric Standard (BARO STD) Switch (inner)

Push

- Selects the standard barometric setting (29.92 inches Hg/1013 HPA). If STD is displayed, selects the preselected barometric setting.
- If no preselected barometric setting is displayed, displays the last value before STD was selected.

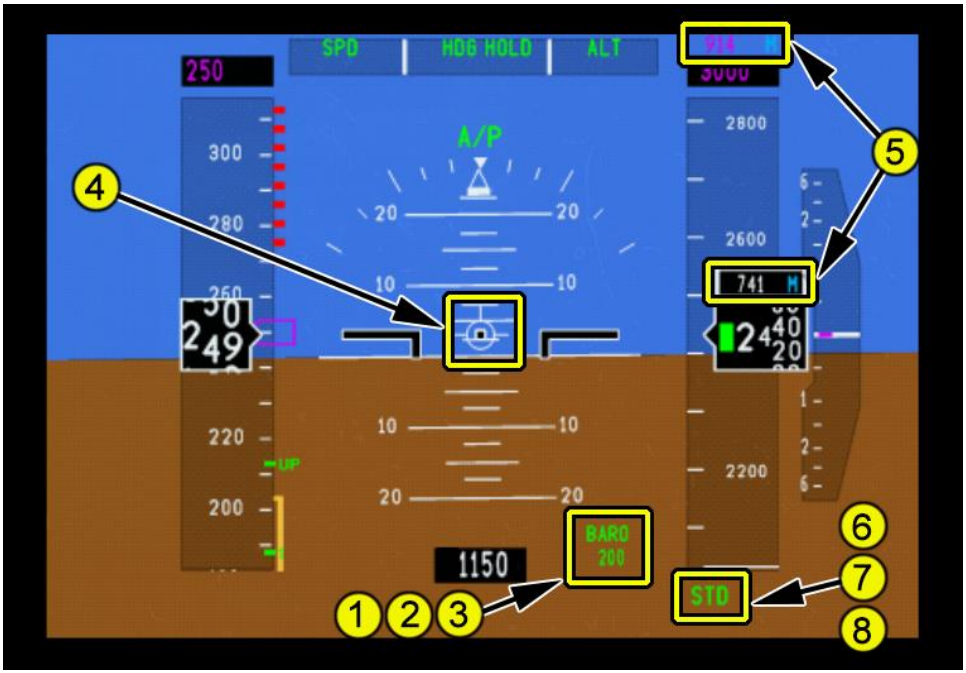
7—Barometric (BARO) Selector (middle)

Rotate (slew) Adjusts the PFD barometric reference.

8—Barometric (BARO) Reference Selector (outer)

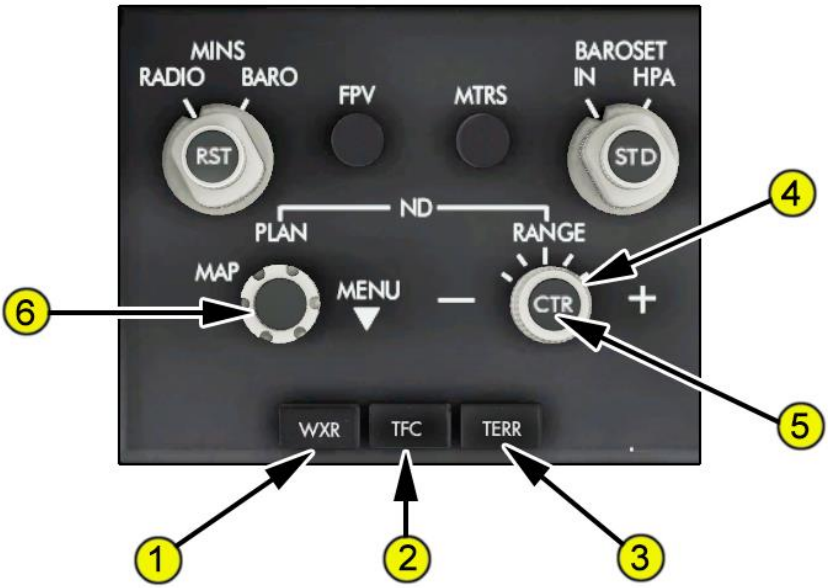
IN Selects inches of mercury as the PFD barometric reference.

HPA Selects Hectopascals as the PFD barometric reference.



1. Minimums (MINS) Reference Selector (outer)
2. Minimums Reset (MINS RST) Switch (inner)
3. Minimums (MINS) Selector (middle)
4. Flight Path Vector (FPV) Switch
5. Meters (MTRS) Switch
6. Barometric Standard (BARO STD) Switch (inner)
7. Barometric (BARO) Selector (middle)
8. Barometric (BARO) Reference Selector (outer)

EFIS Control Panel—PFD Controls



1, 2, 3—Map Switches

- Select detailed ND and mini-map information displays.
- Displays can be shown simultaneously.
- Second push removes the information.

1—WXR (Weather Radar)

Displays weather radar information.

QWTip: *More information about this switch can be found in the Weather Radar section*

2—TFC (Traffic)

Displays TCAS information.

QWTip: *More information about this switch can be found in the TCAS section*

3—TERR (Terrain)

Displays terrain data.

QWTip: *More information about this switch can be found in the Terrain section*

4—ND Range Selector (outer)

Selects the desired ND nautical mile range scale:

- Rotating clockwise/counter-clockwise increases/decreases ND range respectively
- Between 0.5 NM to 1280 NM

5—ND Center (CTR) Switch (inner)

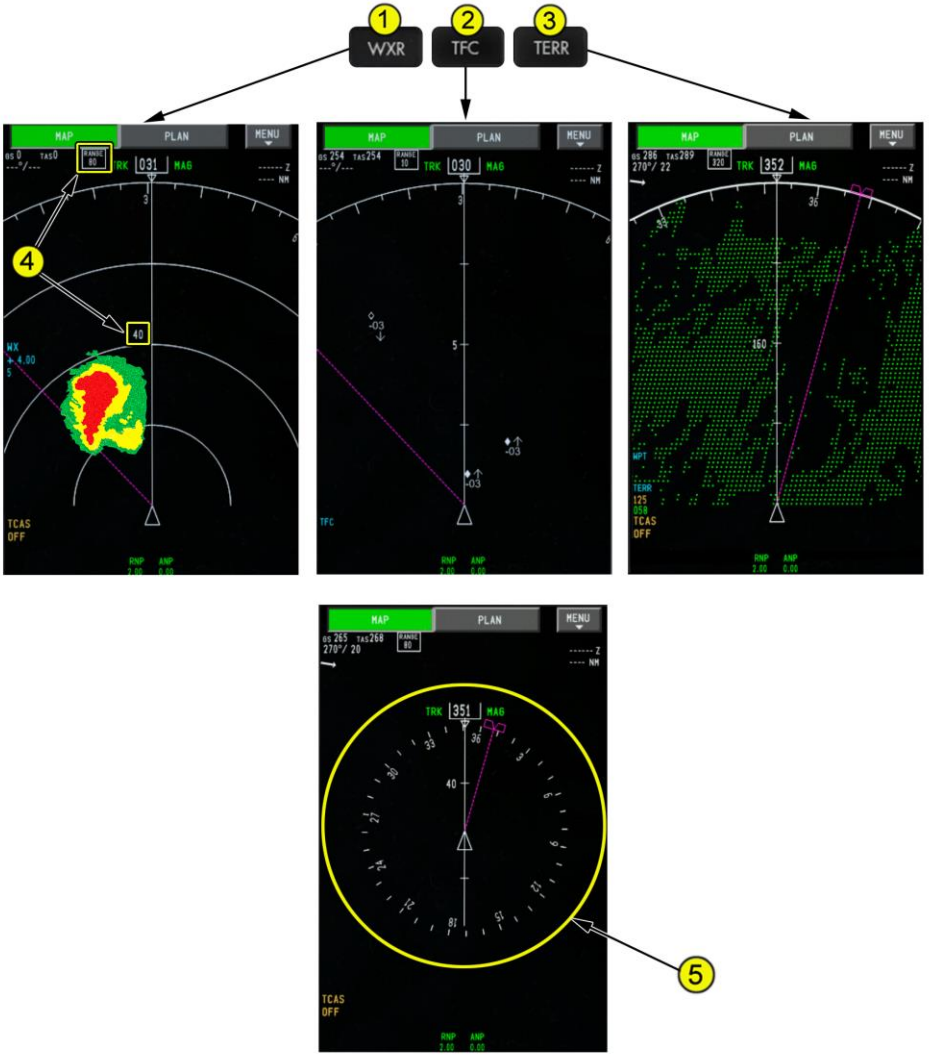
Push

- Displays the full compass rose (centered) for MAP mode.
- Subsequent pushes alternate between expanded and centered displays.

6—ND Mode Selected

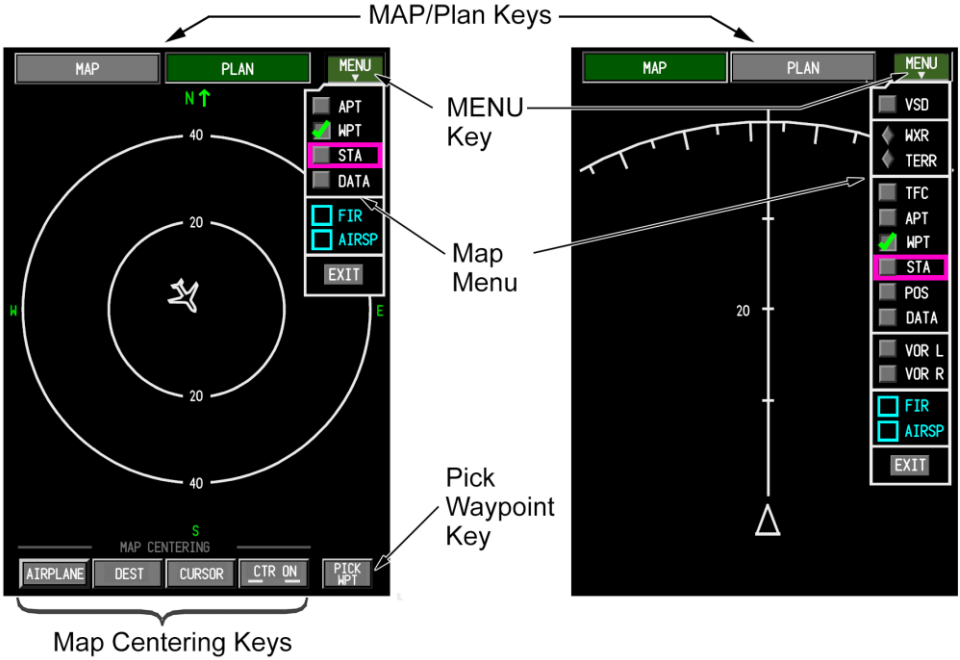
- T this knob and selector can be used to scroll through and select options available on the ND. This is also available by just clicking on the ND (Similar to using the Cursor Control Device—CCD)

EFIS Control Panel—ND Controls

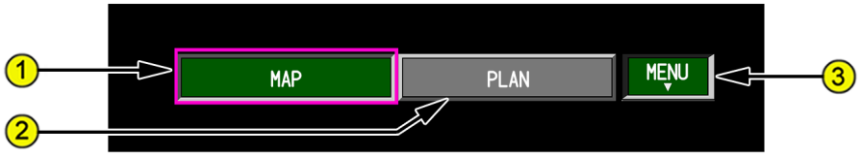


1. **WXR (Weather Radar)** (Mini-Map not shown)
2. **TFC (Traffic)** (Mini-Map not shown)
3. **TERR (Terrain)** (Mini-Map not shown)
4. **ND Range Selector (outer)**
5. **ND Center (CTR) Switch (inner)**

Map Keys and Information Selections



Map keys are selectable by clicking on or by using the ND Mode Selector on the EFIS control panel or the MFD Cursor Control Selector on the MFK. Each key is gray when available for selection and green when currently selected. Each key is cyan when disabled. Each selection on the drop-down menus shows a green check when currently selected. All map keys and information selections are highlighted by a magenta box when the cursor is placed on top of the item.



1. MAP Key

When selected –

- displays a moving, track-up route depiction
- displays FMC generated route and map information, airplane position, heading/track, VNAV path deviation, waypoints, including the active waypoint, within the selected range

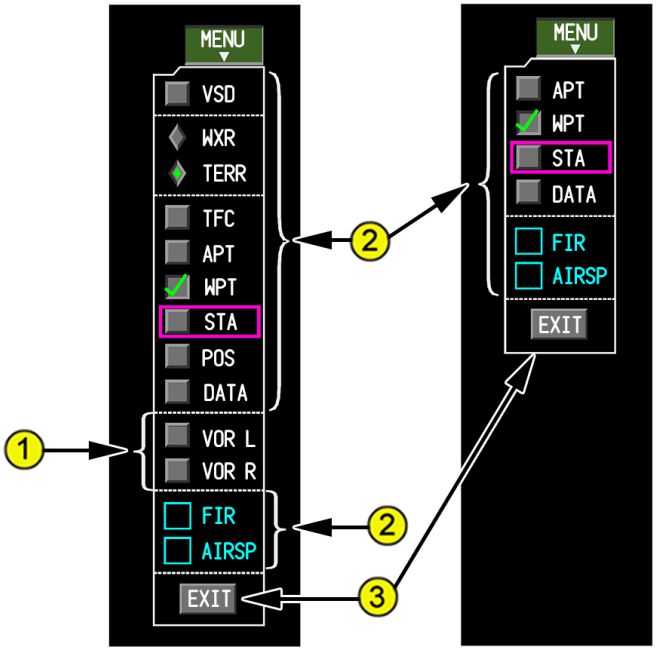
2. PLAN Key

When selected –

- displays a non-moving, true north-up, route depiction
- allows route step-through using the CDU legs page
- weather radar and TCAS are not displayed in PLAN mode

3. MENU Key

- Selected – displays a drop-down menu containing map information selections
- De-selected – removes menu from ND



1. VOR Selections

Displays the respective VOR pointer, VOR frequency or identification, and associated DME information.

2. Map Information Selections

Note: WXR and TERR are not selectable at the same time.

Note: Selections that are common to both MAP and PLAN modes retain their states when changing between the two formats. Selections also retain their states when changing to a different MFD display and then back to a ND mode.

VSD – Vertical Situation Display.

WXR (Weather Radar) – displays weather radar information.

QWTip: *More information about WXR can be found in the Weather Radar section*

TERR (Terrain) – displays terrain data.

QWTip: *More information about TERR can be found in the Ground Proximity Warning System Section*

TFC (Traffic) – displays TCAS information.

QWTip: *More information about TFC can be found in the TCAS section*

APT (Airport)

- displays airports on all ranges
- for ranges greater than 640 NM, APT will display as a star field. This is not dependent on being in an EXCESS DATA condition

WPT (Waypoint) – displays waypoints when the ND is in the 10, 20 or 40 NM range.

STA (Stations) –

- displays high and low altitude navigation aids, when the ND is in the 10, 20 or 40 NM range
- displays high altitude navigation aids, when the ND is in the 80, 160, 320, or 640 NM range
- for ranges greater than 640 NM, STA will display as a star field. This is not dependent on being in an EXCESS DATA condition

POS (Position) –

- displays IRS and GPS positions
- displays VOR raw data radials extended from the nose of the airplane to the stations displayed on the CDU NAV RAD page

DATA (Data) –

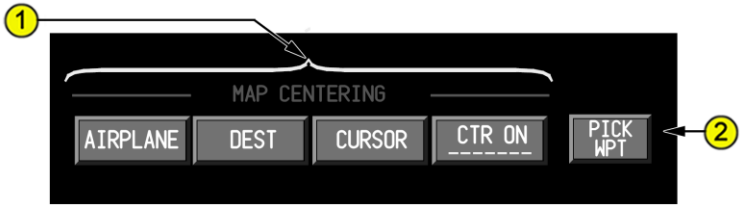
- displays the entered or procedural altitude and ETAs at each waypoint

- times are based on distance to go and groundspeed. They do not consider FMC performance predictions and may differ from other FMC ETAs that do

FIR (Flight Information Regions) – reserved for future development
AIRSP (Airspace) – reserved for future development

3. EXIT Key

Selected (momentary) – removes menu from ND.



1. Map Centering Keys (PLAN Mode only)

AIRPLANE (momentary push) –

- centers the map on the current latitude and longitude of the airplane
- the map does not continually re-center on the airplane

DEST (momentary push) –

- places the airplane on the center of the destination airport
- displayed cyan if no destination airport is entered in the flight plan

CURSOR (toggle on/off) –

- when activated, re-centers airplane on the position where the cursor clicks
- cursor changes shape when mode is active
- deactivated when any of the other centering keys are selected, the center on CURSOR key is re-selected, or the cursor leaves the ND

CTR ON – – – – –(momentary push) – centers on any database item (STA, WPT, APT) or latitude/longitude coordinate already entered in the scratch pad.

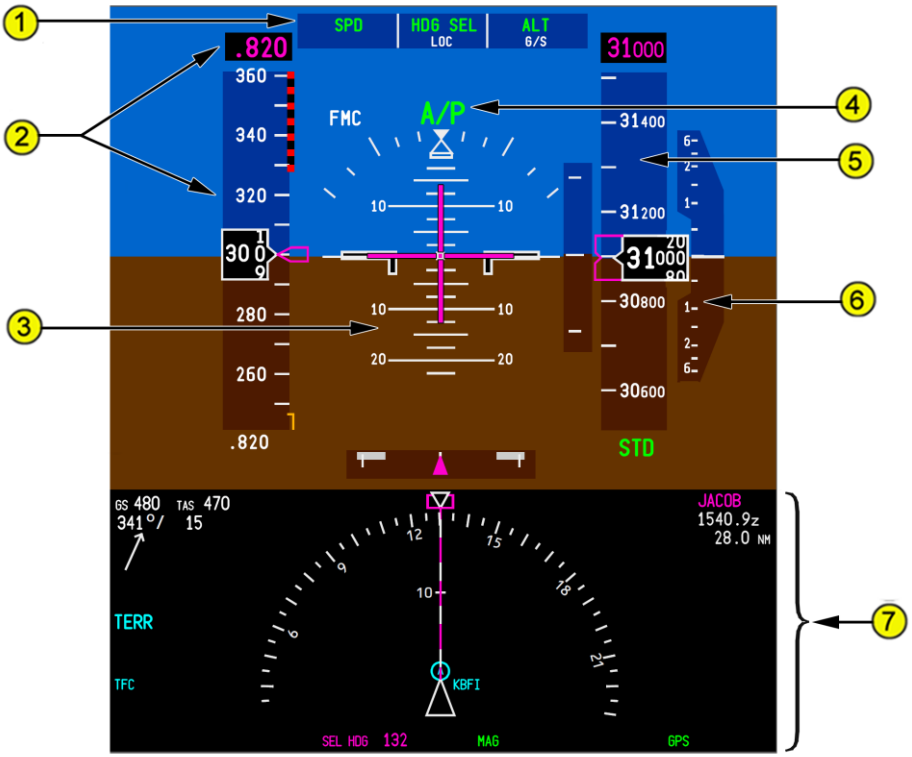
2. Pick Waypoint (PICK WPT) Key (PLAN mode Only)

Allows the pilot to graphically create a latitude/longitude point or select a visible waypoint, airport, or navigation aid:

• visible only when the cursor is on the ND map area –
•enabled when the scratch pad is empty
•disabled (cyan) when the scratch pad contains data
• when activated, the PICK WPT key label changes to CANCEL

Displays – Primary Flight Display

PFD Indications



1. **Flight Mode Annunciations**

***QWTip**: More information about the Flight Mode Annunciations can be found in the Autoflight section*

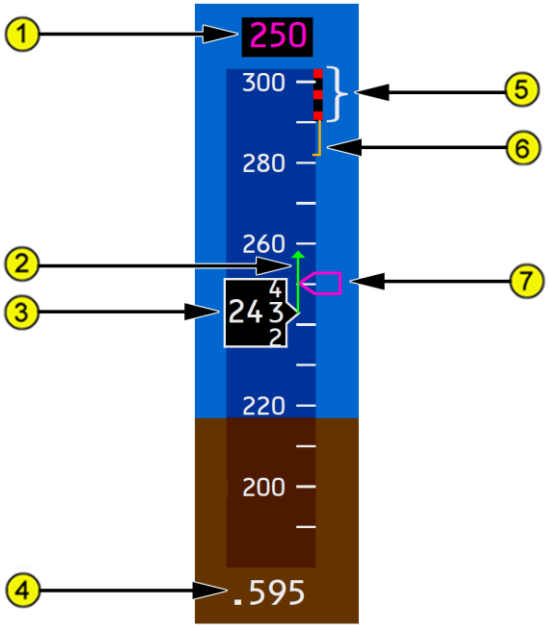
2. **Airspeed/Mach Indications**
   Displays air data reference system (ADRS) airspeed information and other airspeed related information.
3. **Attitude, Steering, and Miscellaneous Indications**
   Displays Inertial Reference System (IRS) attitude information.
4. **Autopilot, Flight Director System Status**

***QWTip**: More information about the Autoflight Status can be found in the Autoflight section*

5. **Altitude Indications**
   Displays ADRS altitude and other altitude–related information.
6. **Vertical Speed Indication**
   Displays ADRS vertical speed and other vertical speed information.
7. **Mini-map**
   Displays current IRS heading, track and other heading information.
   Displays the flight plan with associated information.

***QWTip**: More information about the Mini-Map Symbology can be found in the 'Displays – Navigation Display' section.*

PFD Airspeed Indications



1. **Selected Speed**
   Displays the airspeed/Mach selected in the mode control panel MCP IAS/MACH window.

***QWTip**: More information about the MCP can be found in the Autoflight section*

Displays the FMC computed airspeed/Mach when the MCP IAS/MACH window is blank.

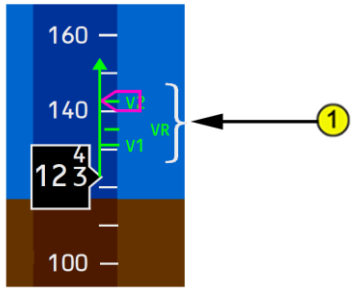
2. **Speed Trend Vector**
   Indicates predicted airspeed in ten seconds based on current acceleration or deceleration.
3. **Current Airspeed**
   - Indicates current ADRS airspeed.
   - The box around the current airspeed indication turns amber when airspeed is below minimum maneuvering speed.
4. **Current Mach**

Displays current ADRS Mach.

5. **Maximum Speed**
   Bottom of the bar indicates maximum airspeed as limited by the lowest of the following:
   - Vmo/Mmo, or
   - landing gear placard speed, or
   - flap placard speed
6. **Maximum Maneuvering Speed**
   Bottom of the amber bar indicates the maximum maneuvering speed. This airspeed provides 1.3 g maneuver capability to high speed buffet (or an alternative approved maneuver capability as preset by maintenance)
7. **Selected Speed Bug**
   - Points to the airspeed/Mach selected in the MCP IAS/MACH window.
   - Points to FMC computed airspeed when the MCP IAS/MACH window is blank.
   - When the selected speed is off scale, the bug is parked at the top or bottom of the tape, with only one half the bug visible.

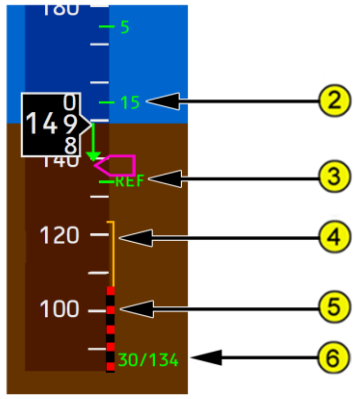
PFD Airspeed Indications

1. Takeoff Reference Speeds



Displays the takeoff reference speeds V1, VR (displays R if VR is within 4 knots of V1 or V2), and V2, selected on the CDU:

- displayed for takeoff
- NO V SPD is displayed if V speeds are not selected on the CDU
- V1 is displayed at the top of the airspeed indication when selected and if the value is off the scale
- V1 and VR are removed at lift-off
- V2 is removed on climb-out:
- •when flap retraction begins, or
- •after 10 minutes have passed without flap lever movement, or
- •after VREF has been selected (for a turn-back)



2. Flap Maneuvering Speeds

Indicates flap maneuvering speed for flap retraction or extension.

Not displayed above approximately 20,000 feet altitude.

3. Landing Reference Speed

Displays the VREF speed as selected on the CDU Approach Reference Page.

***QWTip**: More information about CDU Pages can be found in the Supplemental Flight Tutorial*

VREF speed is displayed at the bottom of the airspeed indication when the value is off the scale

4. Minimum Maneuvering Speed

Top of amber bar indicates minimum maneuvering speed. This airspeed provides:

- 1.3 g maneuver capability to stick shaker below approximately 20,000 ft
- 1.3 g maneuver capability to low speed buffet (or an alternative approved maneuver capability as preset by maintenance) above approximately 20,000 ft
- Displayed with first flap retraction after takeoff.

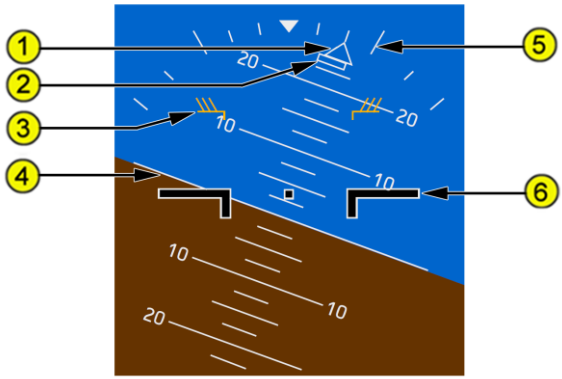
5. Minimum Speed

Indicates the airspeed where stick shaker activates.

6. Landing Flap and VREF Speed

Displays landing flap position and landing reference speed.

PFD Attitude Indications



1. Bank Pointer

Indicates ADRS bank angle in reference to the bank angle scale.
Indicates direction toward wings level.
Fills and turns amber if bank angle is 35º or more.

2. Slip/Skid Indication

Displaces beneath the bank pointer to indicate slip or skid.
Fills white at full scale deflection.
Turns amber if bank angle is 35º or more; fills amber if the slip/skid indication is also at full deflection.

3. Pitch Limit Indication

Indicates pitch limit (stick shaker activation point for the existing flight conditions).
Displayed when the flaps are not up, or at slow speeds with the flaps up.

4. Horizon Line and Pitch Scale

Indicates the IRS horizon relative to the airplane symbol.
Pitch scale is in 2.5º increments.

5. **Bank Scale**
   Fixed reference for the bank pointer.
   Scale marks are at 0º, 10º, 20º, 30º, 45º, and 60º.
6. **Airplane Symbol**
   Indicates airplane attitude with reference to the IRS horizon.

PFD Steering Indications

1. **Flight Director Pitch and Roll Bars**

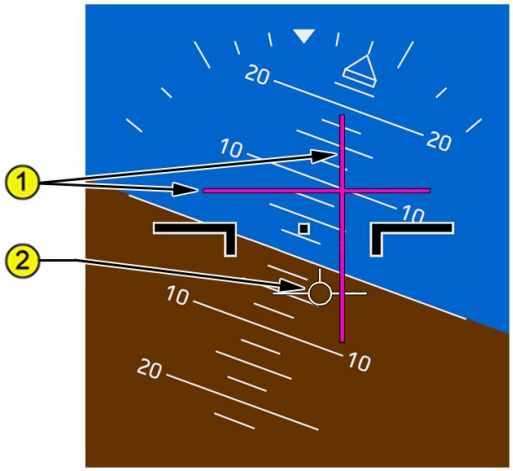
Indicates flight director pitch and roll steering commands.

2. **Flight Path Vector (FPV)**

Displays flight path angle and drift angle if:

- FPV is selected on the EFIS control panel, or
- FPA (flight path angle) is selected on the MCP

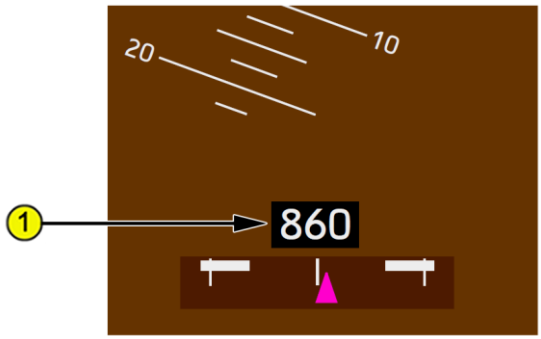
Flight path angle is displayed relative to the horizon line.
Drift angle is represented by the perpendicular distance from the centerline of the pitch scale to the FPV symbol.



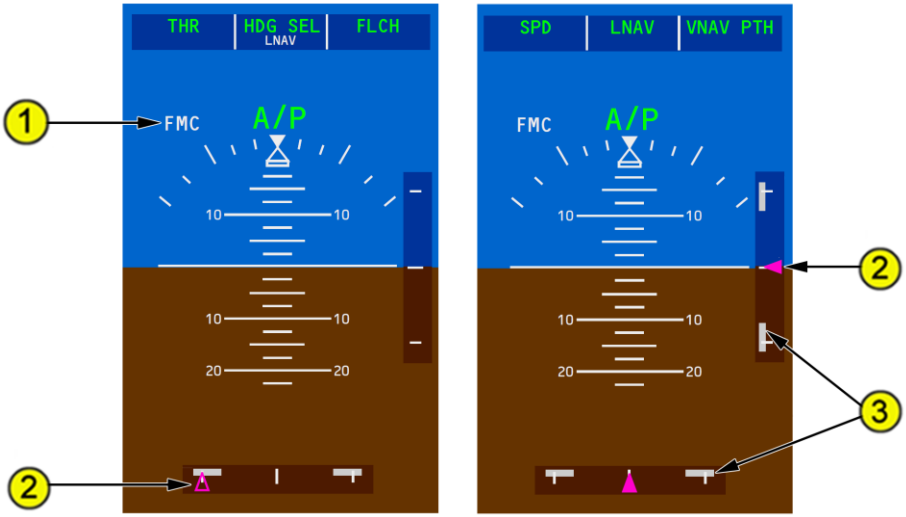
QWTip: *Additional Steering Commands and Alerts display on the PFD. More information about TCAS PFD Vertical Guidance can be found in the TCAS section.*
More information about Alerts displayed on the PFD can be found in the Warnings Section

PFD Radio Altitude Indications

1. **Radio Altitude**
   - Displays radio altitude below 2,500 feet AGL.
   - The display box is highlighted in white for 10 seconds when passing below 2,500 feet.
   - Turns amber when below radio altitude minimums.



PFD Navigation Performance



1. **Navigation Source Reference**

Displays the source of navigation performance for the navigation scales.

2. **Navigation Performance Scale (NPS) Deviation Pointer**
3. **Deviation Scales and Bars**

   Displays aircraft performance during LNAV and VNAV operations

PFD Instrument Landing System Indications

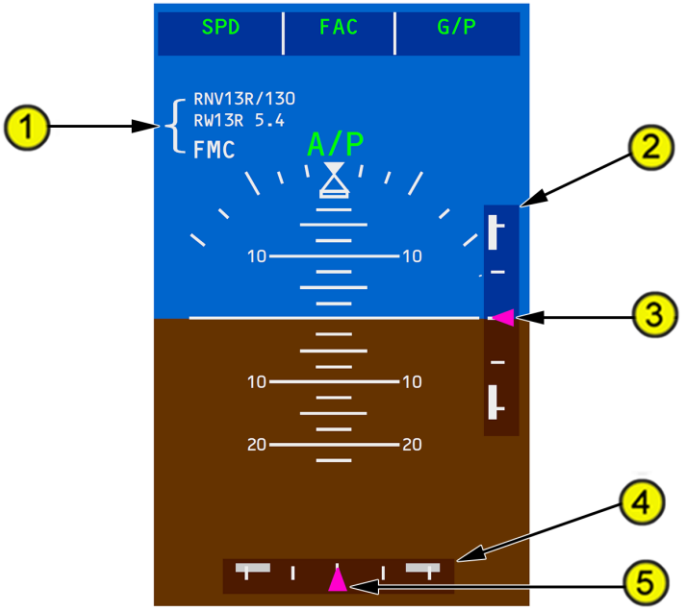
1. **Approach Reference and Navigation Source**
2. **Localizer Pointer and Scale**
   The pointer indicates the localizer relative to the airplane position
3. **Glideslope Pointer and Scale**
   The pointer indicates the glideslope relative to the airplane position
4. **Marker Beacon Indication**

The marker beacon indication appears flashing when over one of the marker beacon transmitters:

- IM – an airway or inner marker beacon
- MM – a middle marker beacon
- OM – an outer marker beacon

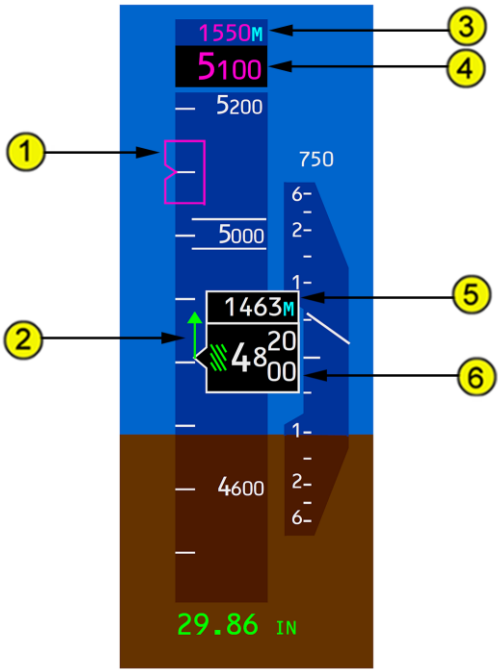
The indication flashes in cadence with the beacon identifier.

PFD Integrated Approach Navigation (IAN) Indications



1. **Approach Reference and Navigation Source**
2. **Glidepath Scale**
   The scale appears when capture occurs if either LNAV or VNAV is active, or LNAV is armed
3. **Glidepath Pointer**
   The pointer indicates glidepath position relative to the airplane position
4. **Final Approach Course Scale**
   The scale appears when capture occurs if either LNAV or VNAV is active, or LNAV is armed
5. **Final Approach Course Pointer**
   The pointer indicates the final approach course relative to the airplane position

PFD Altitude Indications



1. Selected Altitude Bug
Indicates the altitude set in the MCP altitude window.
When the selected altitude is off scale, the bug is parked at the top or bottom of the tape, with only one half the bug visible.

2. Altitude Trend Vector
Indicates expected altitude six seconds ahead in time based on the current vertical speed.

3. Selected Altitude – Meters
Displayed when MTRS is selected on the EFIS control panel MTRS switch.
Indicates selected altitude in meters (selected in feet in the MCP altitude window).
Displays in 10 meter increments.

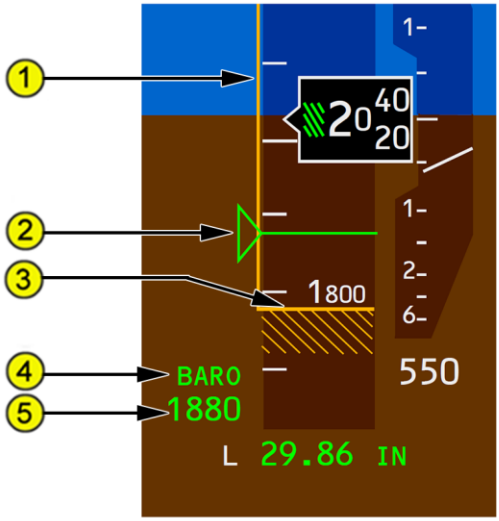
4. Selected Altitude
Displays the altitude set in the MCP altitude window.
The selected altitude box is highlighted in white between 750 feet and 200 feet prior to reaching the selected altitude.

5. Current Altitude – Meters
Displayed when MTRS is selected on the EFIS control panel MTRS switch.
Displays altitude in meters.

6. Current Altitude
Indicates current ADRS altitude.
Current altitude box –

- highlighted white between 750 feet and 200 feet prior to reaching the selected altitude
- highlighted amber when deviating beyond 200 feet from selected altitude. If deviation continues beyond 750 feet, amber highlight is removed

PFD Landing Altitude/Minimums Indications



1. Landing Altitude Reference Bar
Indicates the height above touchdown.
Amber bar – 0 to 500 feet above landing altitude.

2. BARO Minimums Pointer
When BARO minimums are displayed, the number is also represented as a triangular bug and line on the altitude scale.
Turns steady amber when the airplane descends below baro minimums.
When RA minimums are displayed after BARO minimums are selected, the bug remains on the altitude scale.

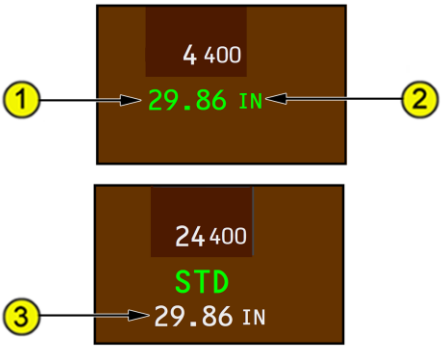
3. Landing Altitude Indication
The crosshatched area indicates the FMC landing altitude for the destination runway or airport.
Indicates the landing altitude for the departure runway or airport until 400 NM or one–half the distance to the destination, whichever occurs first.

4. Minimums Reference
Displays BARO when the EFIS control panel MINS reference selector is set to BARO.
Displays RADIO when the EFIS control panel MINS reference selector is set to RADIO.

5. Minimums
Displays the approach minimums altitude set using the EFIS control panel MINS selector:

- BARO minimums are feet MSL
- RADIO minimums are radio altitude feet AGL

PFD Barometric Indications



1. Barometric Setting

Indicates the barometric setting selected on the EFIS control panel barometric selector.

STD is displayed when STD is selected on the EFIS control panel barometric STD switch.

The display is boxed and changes to amber if a barometric setting is set and altitude climbs above the transition altitude, or if STD is set and altitude descends below the transition flight level.

2. Barometric Reference

Indicates the barometric setting units selected on the EFIS control panel barometric reference selector:

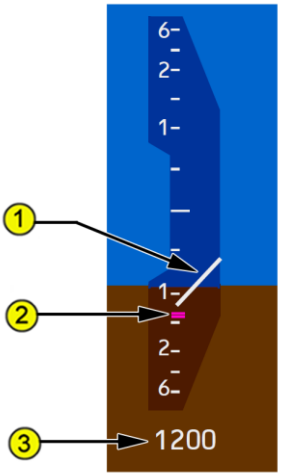
- IN is inches of mercury
- HPA is Hectopascals

3. Preselected Barometric Setting

A barometric setting can be preselected when STD is displayed.

The preset barometric setting is selected on the EFIS control panel barometric selector and is displayed below STD.

PFD Vertical Speed Indications



1. Vertical Speed Pointer

Indicates current vertical speed.

2. Selected Vertical Speed Bug

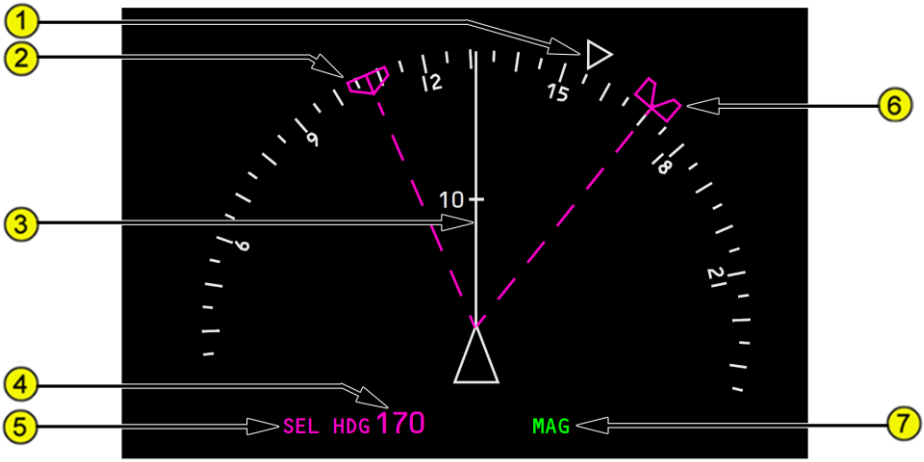
Indicates the speed selected in the MCP vertical speed window with the V/S pitch mode active.

3. Vertical Speed

Displays vertical speed when greater than 400 feet per minute.

The display is located above the vertical speed indication when climbing and below when descending.

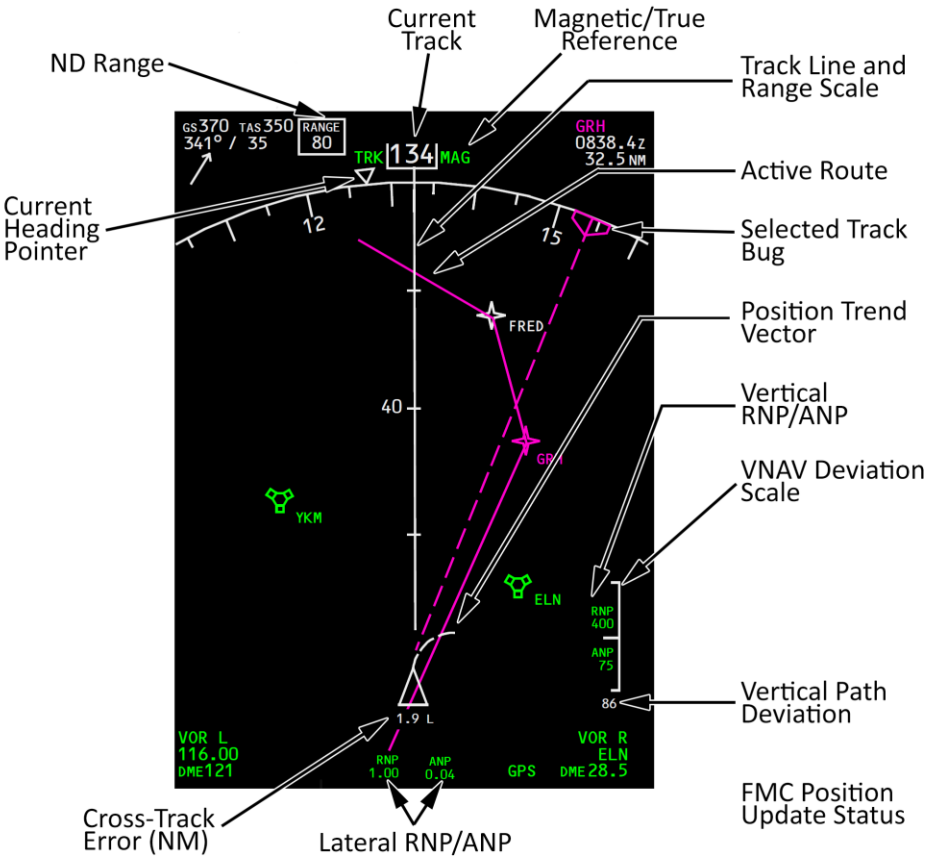
PFD Heading/Track Indications



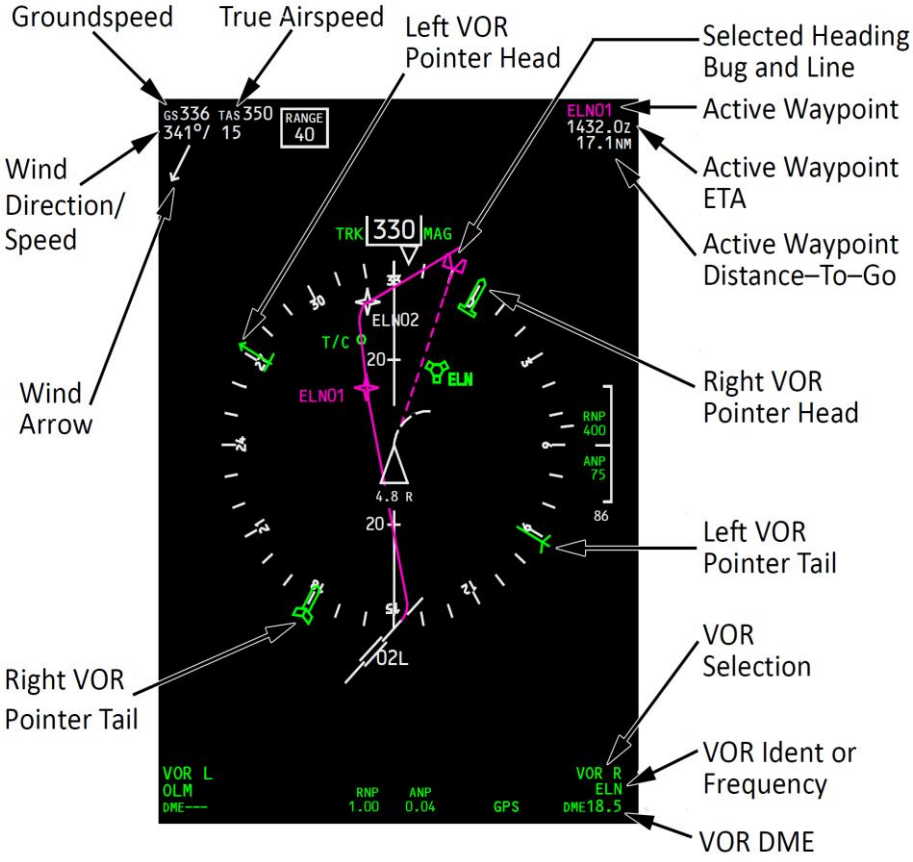
1. **Current Heading Pointer**
   Indicates current heading.
2. **Selected Track Bug (MCP Selection)**
   The selected track bug is displayed on the inside of the compass rose.
   If selected track exceeds display range, the bug parks on the side of the compass rose in the direction of the shorter turn to the track.
3. **Track Line**
   Indicates the current track.
4. **Selected Heading/Track (MCP Selection)**
   Digital display of the selected heading or track bug.
5. **Selected Heading/Track Reference (MCP Selection)**
   When HDG (heading) is selected, SEL HDG is displayed.
   When TRK (track) is selected, SEL TRK is displayed.
6. **Selected Heading Bug (MCP Selection)**
   The selected heading bug is displayed on the outside of the compass rose.
   If selected heading exceeds display range, the bug parks on the side of the compass rose in the direction of the shorter turn to the heading.
7. **Heading/Track Reference**
   Displays the automatic or manually selected heading/track reference:
   - MAG (magnetic north)
   - TRU (true north)

Displays – Navigation Display

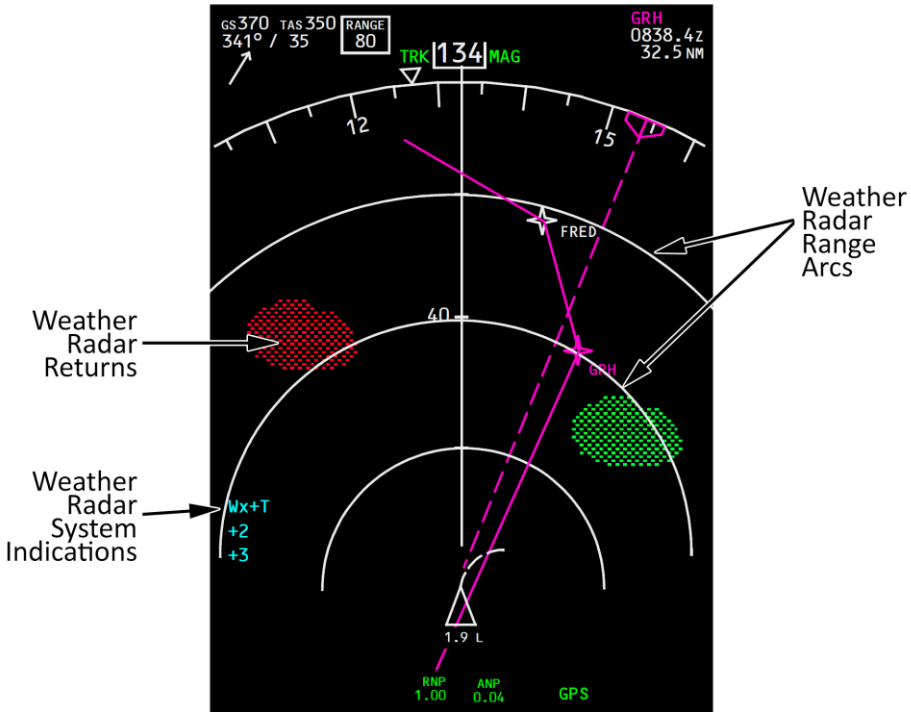
ND Map Mode (Expanded)



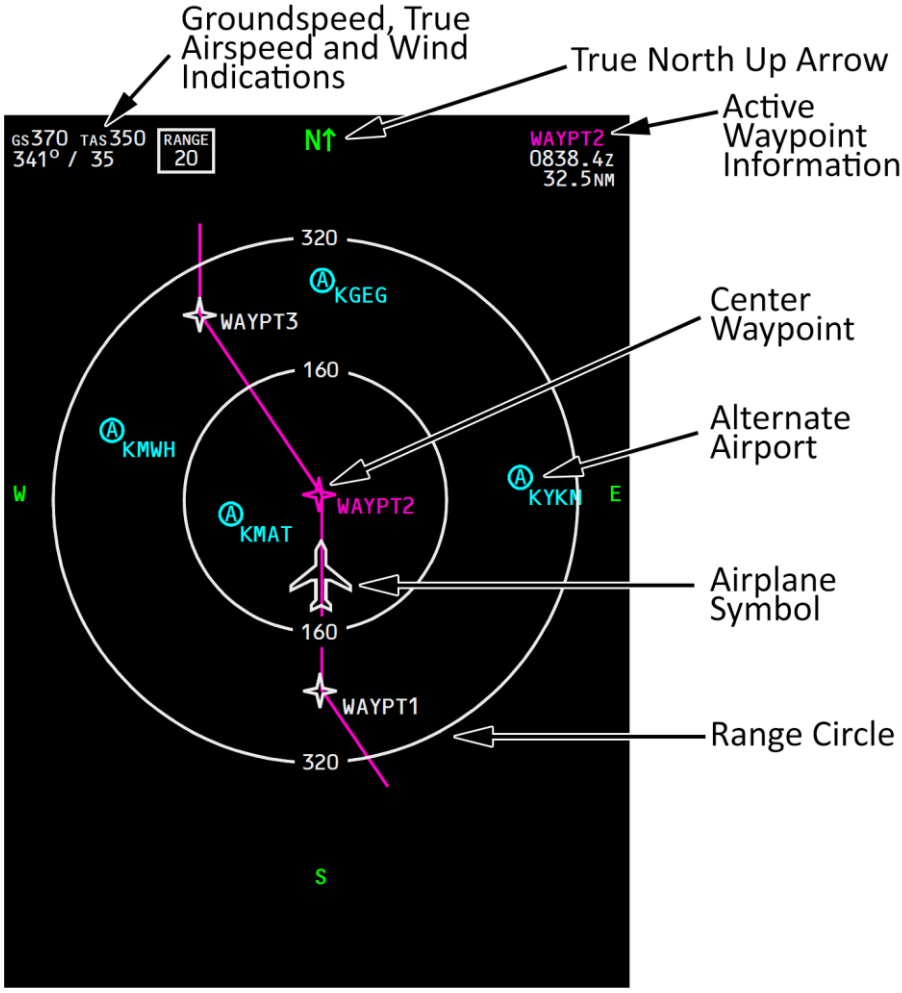
ND Map Mode (Full)



ND Weather Radar System Display Indications



ND Plan Mode


Groundspeed, True Airspeed and Wind Indications
True North Up Arrow
Active Waypoint Information
GS370 TAS350
341° / 35
RANGE 20
N↑
WAYPT2
0838.4z
32.5NM
320
KGEG
WAYPT3
160
KMWH
KMAT
WAYPT2
KYKM
W
E
S
160
WAYPT1
320
Center Waypoint
Alternate Airport
Airplane Symbol
Range Circle

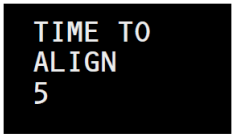
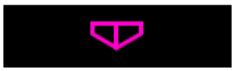
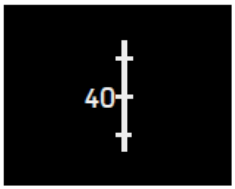
ND Symbology

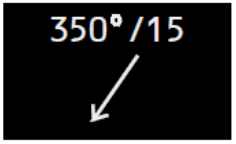
The following symbols can be displayed on each ND, depending on EFIS control panel switch selections. Colors indicate the following:

- W (white) – present status, range scales
- G (green) – dynamic conditions
- M (magenta) – command information, pointers, symbols, fly–to condition
- C (cyan) – nonactive or background information
- A (amber) – cautions, faults, flags
- R (red) – warnings

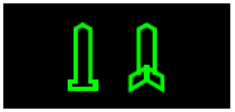
Heading, Track, and Speed

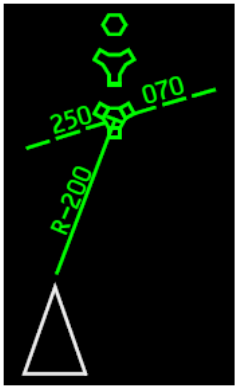
Symbol	Name	ND Mode	Remarks
	Track orientation (G), current track (W), and track reference (G)	MAP, MAP CTR	Displays TRK as the orientation, the current track, and MAG or TRU as the reference, and points to the heading on the compass rose.
	Selected Heading/Track (M), and heading/track reference (G)	mini-map	Displays SEL HDG or SEL TRK and MAG or TRU as the reference.
	Grid heading (W)	MAP, MAP CTR	Displays above 70º latitude.

	Time to align (W)	All	Indicates time remaining for IRU alignment. Replaces wind direction/speed and wind arrow, on the ground, during alignment.
	Selected heading bug (M)	MAP, MAP CTR, mini-map	Displays the MCP–selected heading. A dashed line (M) may extend from the marker to the airplane symbol. In the MAP mode with LNAV, LOC, or ROLLOUT active, the dashed line is removed 10 seconds after the selected heading bug is moved.
	Selected track bug (M)	MAP, MAP CTR, mini-map	Displays the MCP–selected track. A dashed line (M) may extend from the marker to the airplane symbol.
	Track line and range scale (W)	MAP, MAP CTR, mini-map	Indicates current track. Number indicates range.
	Heading/track reference (G) box (W) in TRU, box (A) if TRU displayed in descent	MAP, MAP CTR, mini-map	Indicates heading/track is referenced to magnetic north or true north. Switching from TRU to MAG displays a box around MAG for 10 seconds.

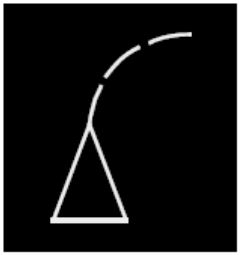
	Expanded compass (W)	MAP	Displays 90º of compass rose.
	Current heading pointer (W)	MAP, MAP CTR, mini-map	Points to current heading on the compass rose.
	Ground speed (W)	All	Current groundspeed.
	True airspeed (W)	All	Current true airspeed displayed above 100 knots.
	Wind direction/ speed and wind arrow (W)	All	Indicates wind bearing, speed, and direction, with respect to display orientation and heading/track reference. Arrow not displayed in the PLAN map mode.

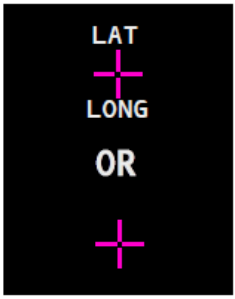
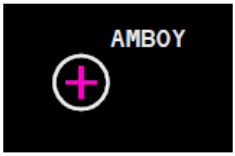
Radio Navigation

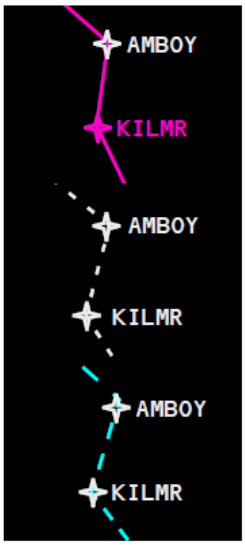
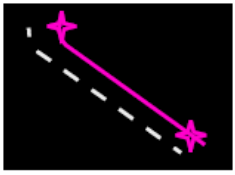
Symbol	Name	ND Mode	Remarks
	Left VOR (G) pointer head and tail	MAP, MAP CTR	Indicates bearing to (head) or from (tail) the tuned station, if selected on the respective MAP or MAP CTR drop-down menu.
	Right VOR (G) pointer head and tail		

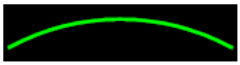
Symbol	Name	ND Mode	Remarks
	VOR (C, G), DME/TACAN (C, G), VORTAC (C, G)	MAP, MAP CTR, PLAN	When the STA key is selected, appropriate navaids are displayed (C). Tuned VHF navaids are displayed in green, regardless of menu key selection. When a navaid is manually tuned, the selected course and reciprocal are displayed.
	VOR/DME raw data radial and distance (G)		When the POS key is selected, the station radial extends to the airplane.
	VOR (G) selection	MAP, MAP CTR	Located lower left or right corner. Represents positions selected on the MAP or MAP CTR drop-down menu.
	VOR frequency or identifier (G)	MAP, MAP CTR	Frequency is displayed before identifier is decoded. Decoded identifier replaces the frequency. Small size characters indicate only DME information is being received.
	DME distance (G)	MAP, MAP CTR	Indicates DME distance to the referenced navaid.

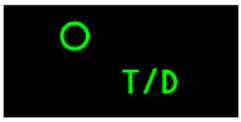
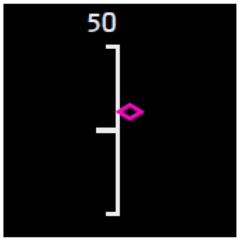
Map

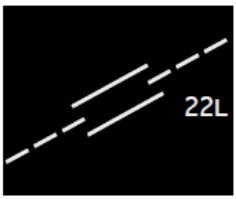
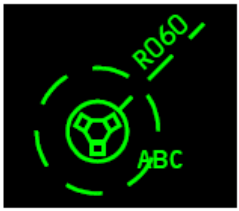
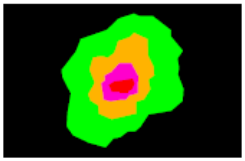
Symbol	Name	ND Mode	Remarks
	Airplane symbol (W), lateral path deviation (W), lateral ANP/RNP values (G, A)	MAP, MAP CTR	Current airplane position is at the apex of the triangle. Displays lateral path deviation distance.
	Airplane symbol (W)	mini-map	Current airplane position is at the apex of the triangle.
	Position trend vector (W) (dashed line)	MAP, MAP CTR, mini-map	Predicts position at the end of 30, 60, and 90 second intervals. Each segment represents 30 seconds. Based on bank angle and groundspeed. Selected range determines the number of segments displayed
	Airplane symbol (W)	PLAN	Indicates actual position and track along the flight plan route.

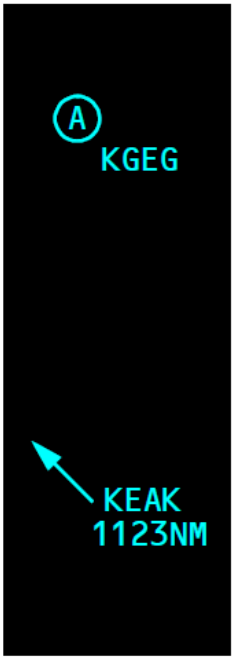
Symbol	Name	ND Mode	Remarks
	Waypoint: active (M), inactive (W)	MAP, MAP CTR, PLAN, mini-map	Active – represents the waypoint the airplane is currently navigating to. Inactive – represents the waypoints on the active route.
	Pick waypoint (PICK WPT) cursor (M)	MAP, MAP CTR, PLAN	Displayed when the PICK WPT key is selected. When the cursor highlights a waypoint, airport, or navaid, the letters "LAT" and "LONG" are removed.
	Highlighted waypoint (W)	MAP, MAP CTR, PLAN	Displayed when a visible route waypoint, background waypoint, airport, or navigation aid is passed over by the cursor.

Symbol	Name	ND Mode	Remarks
	Temporary waypoint (W)	MAP, MAP CTR, PLAN	Displayed after a waypoint is selected when PICK WPT cursor is active. Displays selected waypoint name if visible waypoint, airport, or navigation aid is selected. Displays latitude and longitude if visible waypoint, airport, or navigation aid is not selected.
	Flight plan route: active (M), modified (W), inactive (C)	MAP, MAP CTR, mini-map, PLAN	The active route is displayed with a continuous line (M) between waypoints. Active route modifications are displayed with short dashes (W) between waypoints. Inactive routes are displayed with long dashes (C) between waypoints.
	Offset path and identifier: active route (M), modified route (W)	MAP, MAP CTR, mini-map, PLAN	Presents a dashed line parallel to and offset from the active or modified route.

Symbol	Name	ND Mode	Remarks
	Route data: active waypoint (M), inactive waypoint (W)	MAP, MAP CTR, mini-map	When the DATA key is selected, entered or procedural altitude and ETAs for route waypoints are displayed. Times are based on distance to go and groundspeed. They do not consider FMC performance predictions and may differ from other FMC ETAs that do.
	Altitude range arc (G)	MAP, MAP CTR, mini-map	Based on vertical speed and groundspeed, indicates the approximate map position where the MCP altitude will be reached.
	Range readout (W) .	MAP, MAP CTR, PLAN	Shows the current selected range

Symbol	Name	ND Mode	Remarks
	Altitude profile point and identifier (G)	MAP, MAP CTR, mini-map	Indicates the approximate map position of the FMC calculated T/C (top-of-climb), T/D (top of- descent), and S/C (step climb). Predicted altitude/ETA points entered on the FIX page display the altitude/ETA along with the profile point. Deceleration points have no identifier.
	VNAV path pointer (M) and deviation scale (W)	MAP, MAP CTR	Displays vertical deviation from selected VNAV PATH. Displayed only during FMC descent phase of flight. Scale indicates ± 400 feet deviation. Digital display is provided when the pointer indicates more than ± 20 feet.
	Airport and runway (W)	MAP, MAP CTR, PLAN	Displayed when selected as the origin or destination and ND range is 80, 160, 320, or 640 NM.

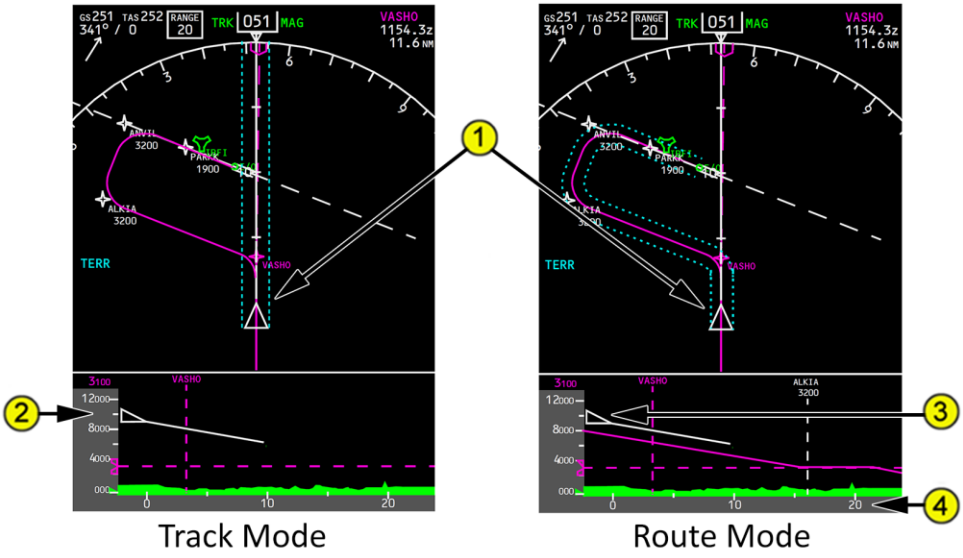
Symbol	Name	ND Mode	Remarks
	Airport (C)	MAP, MAP CTR, PLAN	Displayed when the APT key is selected. Origin and destination airports are always displayed, regardless of map switch selection.
	Airport and runway (W)	MAP, MAP CTR, PLAN mini-map	Displayed when selected as the origin or destination and ND range is 10, 20, or 40 NM. Dashed runway centerlines extend 14.2 NM.
	Selected reference point and bearing distance information (G)	MAP, MAP CTR, PLAN	Displays the reference point selected on the CDU FIX page. Bearing and/or distance from the fix are displayed with dashes (G).
	FMC position update status (G)	MAP, MAP CTR, mini-map	Indicates the system providing FMC position update.
	Weather radar returns (R, A, G, M)	MAP, MAP CTR, mini-map	The most intense areas are displayed in red, lesser intensity in amber, and lowest intensity green. Turbulence is displayed in magenta.

Symbol	Name	ND Mode	Remarks
	Selected map options (C)	MAP, MAP CTR, mini-map	Displays MAP menu selected map options.
	North up arrow (G)	PLAN	Indicates map background is oriented and referenced to true north.
	Holding pattern: active route (M), modified route (W), inactive route (C)	MAP, MAP CTR, PLAN	A holding pattern appears when in the flight plan. Depicts entry path until entry completed.
	Alternate airports (C)	MAP, MAP CTR, PLAN	PLAN: displays up to four alternate airports at all times. MAP, MAP CTR: displays the FMC or pilot selected primary alternate airport. Displays up to four alternate airports when the APT key is selected. Offscale airports (only with 1280NM scale selected), directional arrow relative to airplane position or PLAN center point and distance.

Vertical Situation Display (VSD)

The VSD presents a profile view of the airplane and its environment. It is located on the bottom third of the ND. Terrain, waypoint, and other information shown within the cyan dashed lines (VSD corridor) on the ND is shown in profile on the VSD.

Note: The VSD can be shown only when the ND is in MAP mode.



1. VSD Corridor

Displayed (cyan) – indicates area mapped by the VSD.

Track mode (default) – dashed lines are offset by 1 RNP from instantaneous track of airplane.

Route mode – dashed lines are offset from the Flight Management Flight Plan.

Automatically selected when:

- airplane is on ground –
  - •an active flight plan has been entered, and
  - •a departure runway has been selected, and
  - LNAV is armed
- airplane is in air –
  - •airplane is in any path-based mode such as LNAV, LOC, or FAC

2. Altitude Reference Scale

Displays altitude in reference to the vertical position of the airplane symbol, terrain, and other objects in the VSD background display.

3. Airplane Symbol

Indicates current airplane altitude (bottom of the triangle) and lateral position (point of the triangle) relative to terrain.

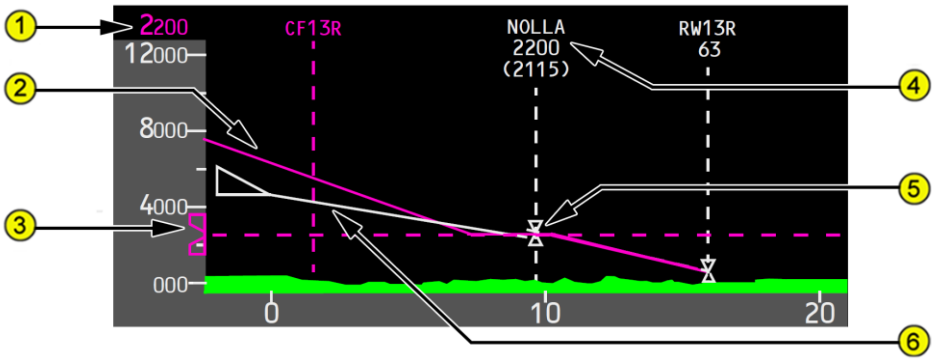
4. Horizontal Reference Scale

Displays range in nautical miles.

The scale is the full range selected on the EFIS control panel when the normal-display ND is used. The scale is twice the full range selected when the full-display ND is used.

Vertical Situation Display (VSD) - General & Flight Path Backgrounds

1. MCP Selected Altitude Readout



Displays the altitude set in the MCP altitude window.

2. Active Vertical Path

Displays the path that VNAV commands if active. The VSD must be in route mode for the active vertical path to be displayed.

During climbs, there is no VNAV path, so the line extends from the nose of the airplane to the predicted altitudes at each waypoint in the climb.

3. Selected Altitude Bug and Line

Indicates the altitude set in the MCP altitude window.

When the selected altitude is off scale, the bug is parked at the top or bottom, with only one half the bug visible. The dashed line does not park.

4. Waypoint ID and Anchor Line

Displayed with any altitude constraint directly beneath:

- dashed vertical line depicts lateral position

5. Altitude Constraint Symbol

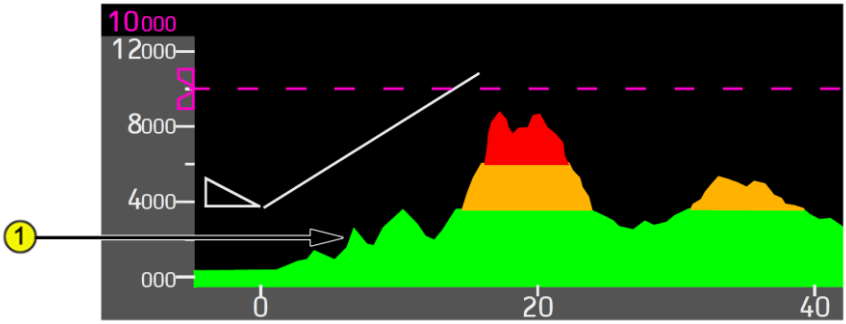
Displayed as triangle(s) on waypoint anchor line.

6. Vertical Flight Path Vector

Indicates current flight path angle as a function of vertical speed and groundspeed.

The length of the vector is fixed at one half of the VSD range.

Vertical Situation Display (VSD) – Terrain Backgrounds



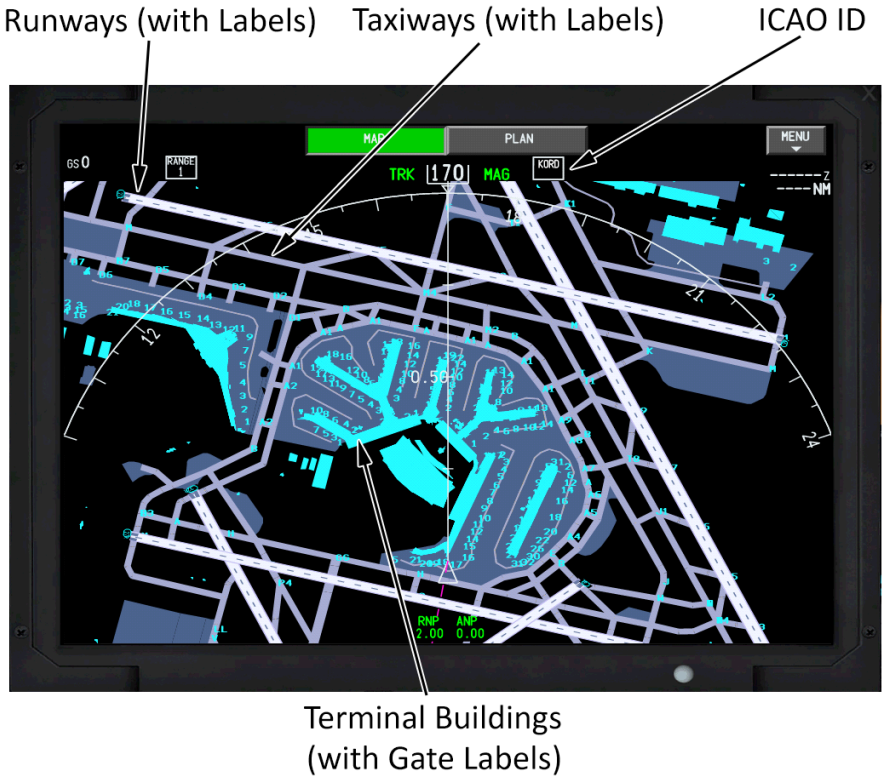
1. Terrain Profile Line

Represents the highest terrain within the enroute corridor:

- highest points of the terrain below and ahead of the airplane
- terrain is depicted so the actual altitude separation between the airplane and terrain is shown

Airport Map Display

The Airport Map is integrated with the ND. The Airport Map automatically displays at ranges of 5 NM or less if the airport is either the ORIGIN or DESTINATION airport in the active flight plan.

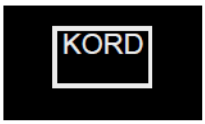
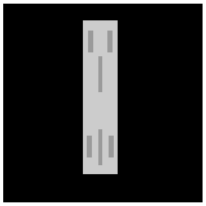


ScruffyDuck Software Airport Design Editor

The QualityWings 787 reads specially generated Airport Database files created with a tool by ScruffyDuck Software called Airport Design Editor. You can obtain this software by visiting the following website:
http://www.scruffyduck.org/airport-design-editor/4584106799
We have included several major airports and the Hub airports for all liveries that we have designed. The aircraft **does not** read the default airport scenery files, so any additional airports will need to be created using the Airport Design Editor software and placed in the following folder:

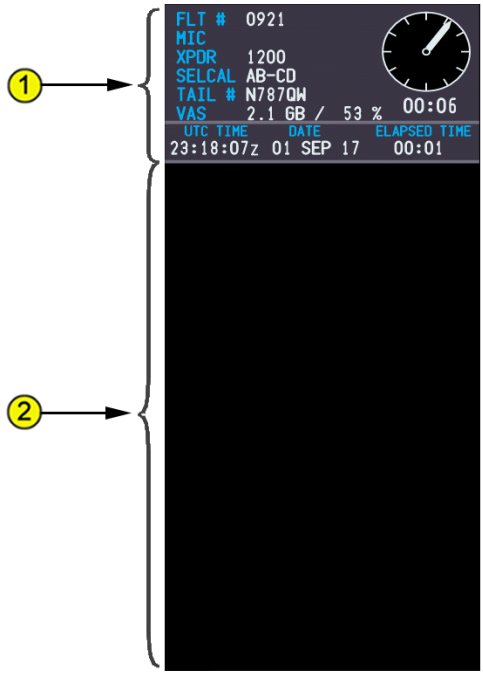
[SimRoot]\QualityWings\QW787\Navdata\APT Data

Airport Map Symbology

Symbol	Name	ND Mode	Remarks
	ICAO ID (W)	MAP, MAP CTR, PLAN	Airport ICAO Identifier in GRID Heading box. Displayed at all ranges except when in GRID Heading.
	Concourse and gates (C)	MAP, MAP CTR, PLAN	Concourses and Gates are displayed at a range of 5 NM or less
	Runway	MAP, MAP CTR, PLAN	Concourses and Gates are displayed at a range of 5 NM or less
	Runway identifier (W, C)	MAP, MAP CTR, PLAN	Concourses and Gates are displayed at a range of 5 NM or less
	Taxiway and taxiway identifier	MAP, MAP CTR, PLAN	Concourses and Gates are displayed at a range of 5 NM or less

Displays – Auxiliary (AUX) Display

The Auxiliary Display shows on the Outboard Display Units.



1. Flight Data Block

SELCAL ID |R|

- Shows theSELCAL ID
- If the aircraft registration number in the aircraft.ini file of the loaded repaint is a real life registration, then the actual SELCAL ID for that aircraft shows

TAIL #

- From Aircraft.cfg File

FLT #

- From FMS Route Page Entry

XPDR

- Tuned on the TCP XPDR Page

Date and time functions

- Operating using Clock functions

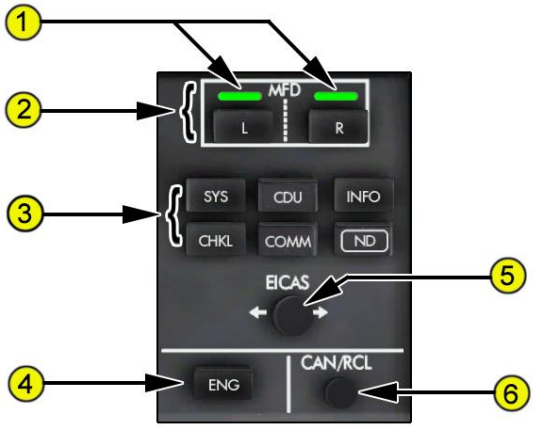
VAS

- Real-Time information about your PCs Virtual Address Space (VAS) Usage

2. ATC Message Block

3. ***QWTip:*** *More information about ATC Messages can be found in the Displays Comm Page section*

Display Select Panel



1—Display Lights Illuminates to show the MFD window the display select panel controls.

QWTip: *The light above the "R" on the left DSP and the "L" on the right DSP will not illuminate if EICAS is showing on the respective display*

2—Multifunction Display (MFD) Switches Selects the on-side MFD location (left or right window on each upper display unit) that is affected by pressing display switch(es).

3—Upper Display Switches Pushing the switch displays the associated format.

SYS System synoptics and maintenance information:

- System menu
- Status messages for dispatch
- Electrical system indications
- Hydraulic system indications
- Fuel system indications
- Air system indications
- Door system indications
- Landing gear/brake indications
- Flight control indications
- EFIS/DSP backup
- Maintenance functions
- Circuit breaker functions

CHKL Checklist

CDU Display emulation

COMM Communications

INFO Access to QualityWings Specific features

ND Navigation display

QWTip: *More information about Synoptics can be found in the Display System Synoptic Pages section*

4—ENG Display Switch Pushing the switch displays the secondary engine

information on EICAS. Pushing the switch a second time blanks secondary engine information.

***QWTip**: More information about Engine Pages can be found in the Display Pages section*

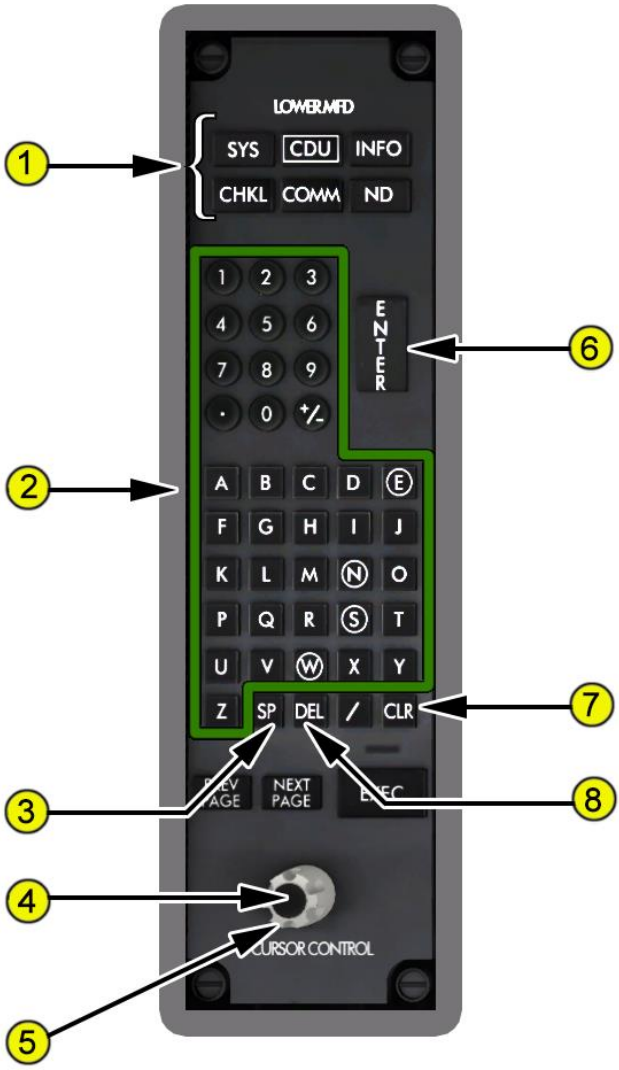
5—EICAS Transfer Switch Transfers EICAS format between the Captain and First Officer inboard display units.

6—Cancel/Recall (CANC/RCL) Switch Pushing the switch hides (Cancels) any displayed Caution/Advisory messages and then brings them back (Recalls) after they've all been hidden

Multi-Function Keypad (MFK)

Location: FWD Aisle Stand

There are two MFKs on the forward aisle stand, one on each side of the lower DU. Each MFK controls cursor position and operation on the on-side inboard DU and on-side MFD on the lower DU.



1—Lower Display Switches Pushing the switch displays the associated format. Pushing the same switch a second time causes the MFD format to be removed and the default format to be displayed.

SYS System synoptics and maintenance information:

- System menu
- Status messages for dispatch
- Electrical system indications
- Hydraulic system indications
- Fuel system indications
- Air system indications
- Door system indications
- Landing gear/brake indications
- Flight control indications
- EFIS/DSP backup
- Maintenance functions
- Circuit breaker functions

CHKL Checklist

CDU Display emulation

COMM Communications

INFO Airport map database cycles

ND Navigation display

QWTip: *More information about Synoptics can be found in the Display System Synoptic Pages section*

2—Alpha/Numeric Keys

Push

- Puts selected character in scratchpad.
- Slash (/) key - enters "/" in scratchpad.
- Plus Minus (+/-) key - first push enters "-" in scratchpad. Subsequent pushes alternate between "+" and "-".

3—Space (SP) Key

Push Enters a space in scratchpad.

4—Cursor Select Switch (Inner)

Push Selects the highlighted key on the MFD.

5—Cursor Control Selector (Outer)

Rotate Moves the highlight in a predetermined path to another selection on the active MFD

6—ENTER Key

Push Performs an associated action to the highlighted field.

7—Clear (CLR) Key

Push Clears last character of data in the scratchpad.

Push and hold Clears all scratchpad data.

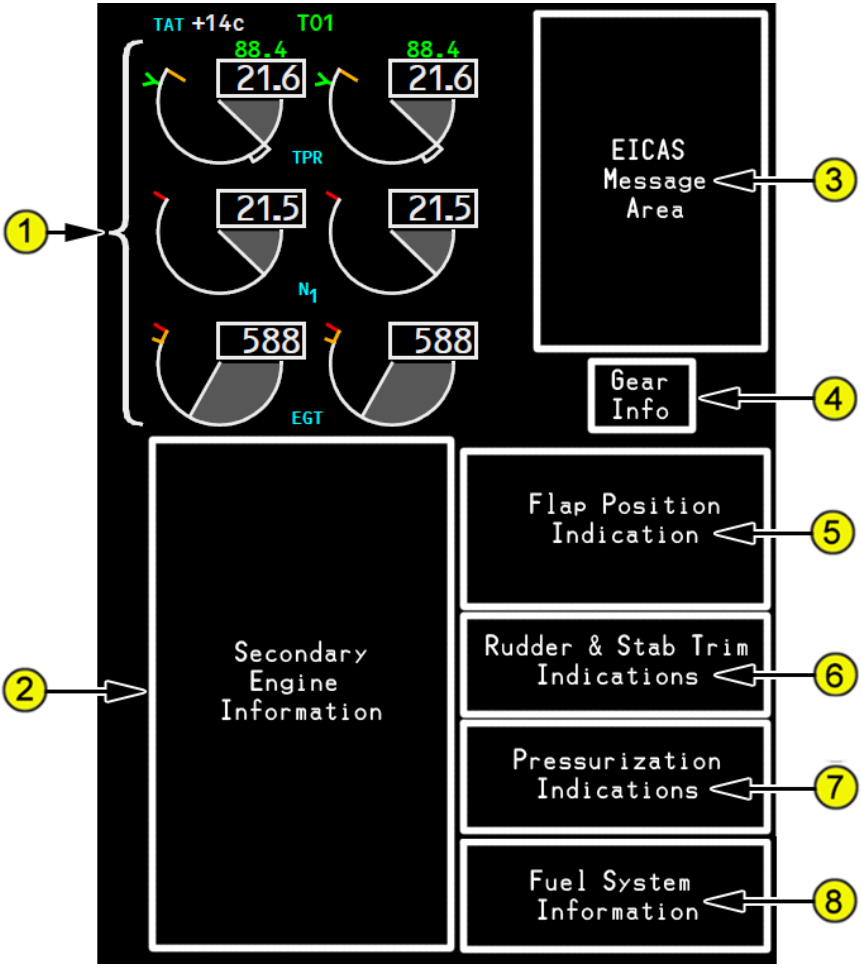
8—Delete (DEL) Key

Push Enters DELETE in scratchpad

Displays – EICAS Display

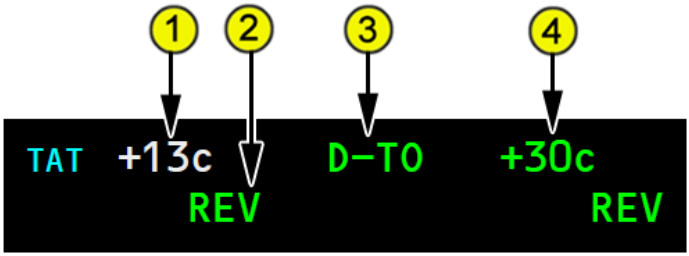
Engine Indicating and Crew Alerting System

EICAS consolidates engine and airplane system indications and is the primary means of displaying system indications and alerts to the flight crew. EICAS information may be displayed on the inboard or outboard MFD as desired by the flight crew.



1 – Mode Indications & Primary Engine Indications
2 – Secondary Engine Indications
3 – EICAS Message Area
4 – Gera Position Indications
5 - Flap Position Indications
6 - Rudder & Stab Trim Indications
7 - Pressurization Indications
8 - Fuel System Information

Mode Indications



1. Thrust Reference Mode
Displayed (green) – selected FMS thrust reference mode:

- TO – maximum rated takeoff thrust
- TO 1 – derate one takeoff thrust
- TO 2 – derate two takeoff thrust
- D–TO – assumed temperature derated takeoff thrust
- D–TO 1 – derate one assumed temperature derated takeoff thrust
- D–TO 2 – derate two assumed temperature derated takeoff thrust
- CLB – maximum rated climb thrust
- CLB 1 – derate one climb thrust
- CLB 2 – derate two climb thrust
- CON – maximum rated continuous thrust
- CRZ – maximum rated cruise thrust
- G/A – maximum go-around thrust

2. Assumed Temperature
Displayed (green) – selected assumed temperature (ºC) for reduced thrust takeoff.

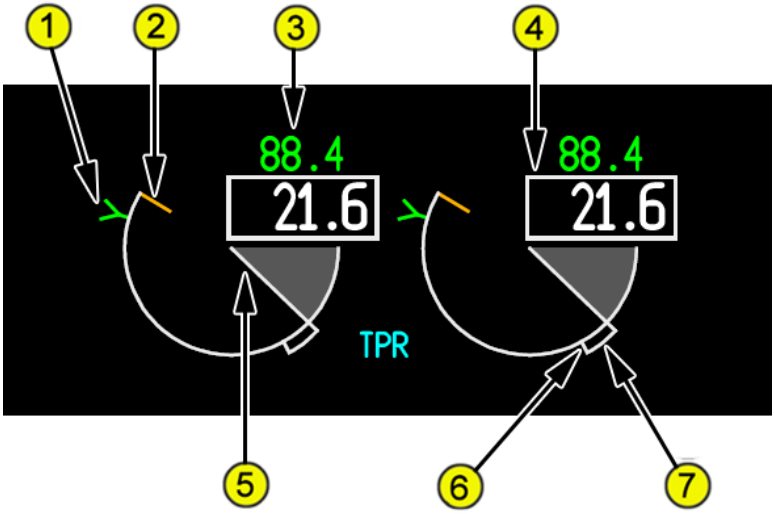
3. Thrust Reverser Indication
Displayed REV (amber) – reverser in transit.
Displayed REV (green) – reverser fully deployed.

Primary Engine Indications

TPR Indications (RR 787s Only)

***QWTip**: The Thrust Setting parameter for the Trent 787s is Total Pressure Ratio.*

1. **Reference/Target TPR Indication**



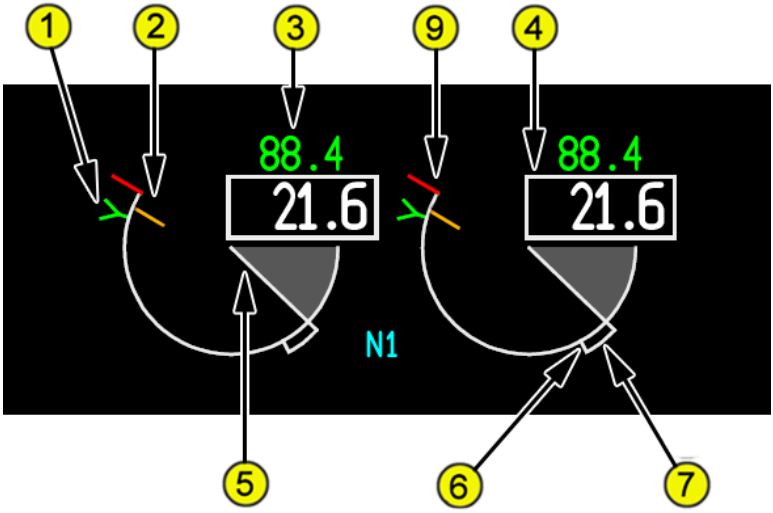
   Displayed (green) – reference TPR limit.
2. **Maximum TPR Line**
   Displayed (amber).
3. **Reference TPR**
   Displayed (green).
4. **Actual TPR**
   Displayed (white).
5. **Actual TPR Indication**
   Displayed (white).
6. **Commanded TPR**
   Displayed (white).
7. **Commanded TPR Sector**
   Displayed (white) – a momentary difference between engine TPR and TPR commanded by thrust lever position

Primary Engine Indications

N1 Indications (GE 787)

QWTip: *The Thrust Setting parameter for the GENx 787s is N1 Speed*

1. **Reference/Target N1 Indication**



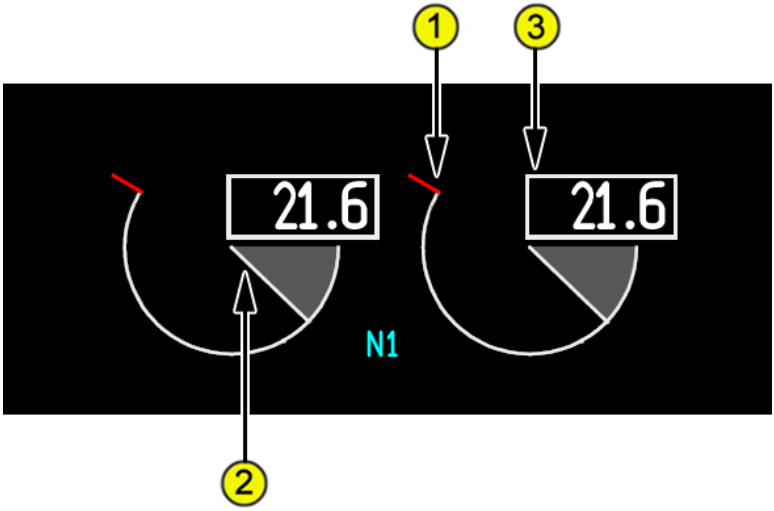
Displayed (green) – reference N1 limit.

2. **Maximum N1 Line**
   Displayed (amber).
3. **Reference N1**
   Displayed (green).
4. **Actual N1**
   Displayed (white).
5. **Actual N1 Indication**
   Displayed (white).
6. **Commanded N1**
   Displayed (white).
7. **Commanded N1 Sector**
   Displayed (white) – a momentary difference between engine N1 and N1 commanded by thrust lever position

Primary Engine Indications

N1 Indications (RR787)

***QWTip**: Hard Alternate Mode does not change the N1 display like the real 787*



1. **N1 Red Line**

Displayed (red) – N1 RPM operating limit.

2. **N1 Indication**

N1 RPM, displayed:

- (white) – normal operating range
- displayed (red) – operating limit reached

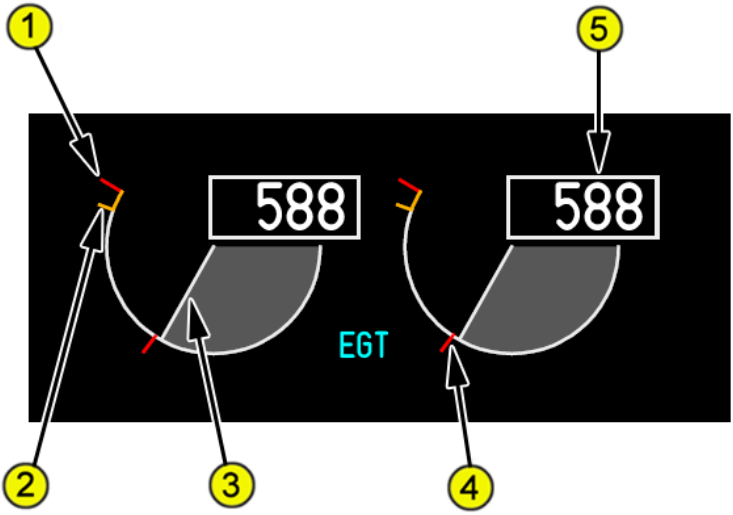
3. **N1**

Digital N1 RPM (%), displayed:

- (white) – normal operating range
- displayed (red) – operating limit reached

Primary Engine Indications

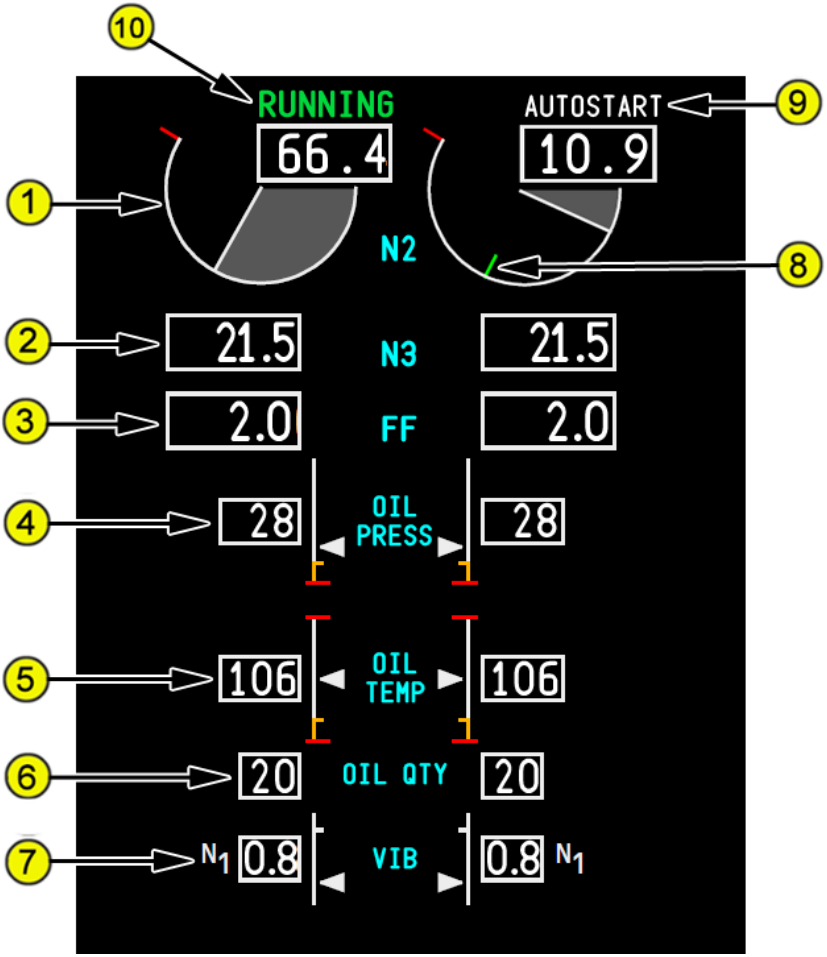
EGT Indications



1. **EGT Red Line**
   Displayed (red) – maximum takeoff EGT limit.
2. **EGT Amber Band**
   Displayed (amber) – maximum continuous EGT limit.
3. **EGT Indication**
   Displayed:
   - (white) – normal operating range
   - (amber) – maximum continuous limit reached
   - (red) – maximum start or takeoff limit reached
4. **EGT Start Limit Line**
   Displayed (red) when the engine fire switch is in and:
   - the FUEL CONTROL switch is in CUTOFF, or
   - the N2 RPM is below idle
5. **EGT**
   EGT (ºC), displayed:
   - (white) – normal operating range
   - (amber) – maximum continuous limit reached
   - (red) – maximum start or takeoff limit reached

Secondary Engine Indications

Pushing the switch displays the secondary engine information on EICAS. Pushing the switch a second time blanks secondary engine information.



1. **N2 Rotor Indication**
2. **N3 Rotor Indication (RR 787s only)**
3. **Fuel Flow Indication**
4. **Oil Pressure Indication**
5. **Oil Temperature Indication**
6. **Oil Quantity Indication**

7. **Vibration Indication**
8. **Idle Target Indication**

   Indicates approximate RPM where the engine can maintain self-sustained running operation.

   Displayed (green) –

   - fuel control switch is in the RUN position, and
   - engine is below idle

9. **Starting Mode**

   AUTOSTART (white) – EEC is in autostart mode.

   The **AUTOSTART** indication blanks when the system is no longer attempting an engine start.

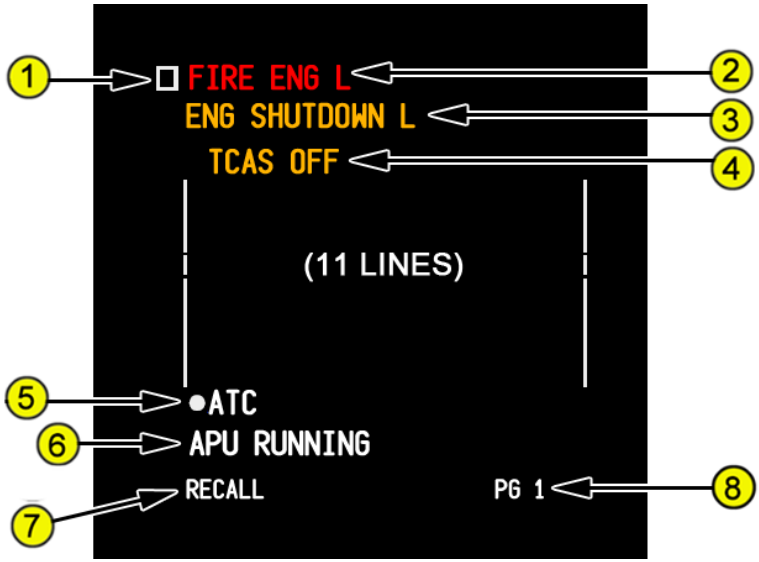
10. **RUNNING Indication**

    Displayed (green) –

    - fuel control switch is in the RUN position, and
    - engine is at or above idle

    The **RUNNING** indication blanks 30 seconds after engine reaches idle.

EICAS Message Area



1. **Checklist Icon**
   Displayed (white) –
   - indicates that a checklist exists for this message
   - no longer displayed when checklist complete
2. **Warning Messages**
   Displayed (red) –
   - highest priority alert messages
   - red alert messages remain displayed and cannot be canceled by pushing the CANC/RCL switch
3. **Caution Messages**
   Displayed (amber) –
   - next highest priority alert messages after warning messages
   - amber alert messages can be canceled or recalled by pushing the CANC/RCL switch
4. **Advisory Messages**
   Displayed (amber) –
   - lowest priority alert messages; indented one space
   - amber alert messages can be canceled or recalled by pushing the CANC/RCL switch

5. **Communication Messages**
   Displayed (white) –
   - preceded by white dot
   - COMM low messages indented one space
   - cannot be canceled by pushing the CANC/RCL switch
6. **Memo Messages**
   Displayed (white) –
   - reminder of selected state of controls or systems
   - cannot be canceled by pushing the CANC/RCL switch
   - EICAS alert messages have display priority over memo messages; some or all memo messages not displayed on current EICAS message page if insufficient message lines are available below alert messages
7. **RECALL Indication**
   Displayed (white) –
   - when CANC/RCL switch pushed
   - remains displayed for one second after switch released
8. **Page (PG) Number**
   Displayed (white) –
   - more than one page of alert or memo messages exists
   - indicates number of page selected

QWTip: *See the EICAS Message List section for more information about all EICAS messages that are programmed*

EICAS Message List

*Level A Messages (**WARNINGS**)*		
Message	Aural	Condition
AUTOPILOT DISC	Owl	All autopilots are disconnected
CABIN ALTITUDE	Siren	Cabin altitude is excessive
CONFIG DOORS	Siren	An entry, forward cargo, or aft cargo door is not closed and latched and locked during takeoff
CONFIG FLAPS	Siren	The flaps are not in a takeoff position during takeoff
CONFIG GEAR	Siren	A landing gear is not down and locked and one of these occurs: • A thrust lever is at idle below 800 feet radio altitude. • The flaps are in a landing position.
CONFIG PARKING BRAKE	Siren	The parking brake is set during takeoff.
CONFIG RUDDER	Siren	Rudder trim is not centered during takeoff
CONFIG SPOILERS	Siren	The speed brake lever is not DOWN during takeoff
CONFIG STABILIZER	Siren	The stabilizer is not in the greenband during takeoff
FIRE APU	Bell	Fire is detected in the APU
FIRE ENG L	Bell	Fire is detected in the left engine
FIRE ENG R	Bell	Fire is detected in the right engine
FIRE TEST IN PROG	Bell	A manually-initiated fire/overheat detection system test is in progress.
FIRE TEST PASS		A manually-initiated test of the fire/overheat detection system has been completed.
OVERSPEED	Siren	Airspeed is more than VMO/MMO

*Level B Messages (**CAUTIONS**)*		
Message	Aural	Condition
AIRSPEED LOW	Beeper	Airspeed is less than minimum maneuvering speed.
ALTITUDE ALERT	Beeper	A deviation from the MCP set altitude occurs.
AUTOPILOT	Beeper	The autopilot is in flight envelope protection.
AUTOTHROTTLE DISC	Beeper	Both autothrottles are disconnected
CABIN ALTITUDE AUTO	Beeper	Both outflow valve switches are in manual
CHKL INCOMPLETE NORM	Beeper	A non-normal checklist is not complete
DOOR AFT CARGO	Beeper	The aft cargo door is not closed and secure
DOOR FWD CARGO	Beeper	The forward cargo door is not closed and secure.
ELEC AC BUS L1	Beeper	The L1 AC bus is not energized
ELEC AC BUS L2	Beeper	The L2 AC bus is not energized
ELEC AC BUS R1	Beeper	The R1 AC bus is not energized
ELEC AC BUS R2	Beeper	The R2 AC bus is not energized
ENG SHUTDOWN	Beeper	Both engines were shut down by the FUEL CONTROL switches or the engine fire switches.
ENG SHUTDOWN L	Beeper	The left engine was shut down by the FUEL CONTROL switch or the engine fire switch
ENG SHUTDOWN R	Beeper	The right engine was shut down by the FUEL CONTROL switch or the engine fire switch
FLIGHT CONTROL MODE	Beeper	The flight control system is in the secondary mode.
FLIGHT CONTROLS	Beeper	Two or more flight control surfaces are inoperative
FUEL PRESS ENG L	Beeper	The left engine is on suction feed.
FUEL PRESS ENG R	Beeper	The right engine is on suction feed.

FUEL QTY LOW	Beeper	Either main tank decreases below 3800 pounds
HYD PRESS SYS C	Beeper	The center hydraulic system pressure is low.
HYD PRESS SYS C+R	Beeper	The right and center hydraulic system pressures are low.
HYD PRESS SYS L	Beeper	The left hydraulic system pressure is low.
HYD PRESS SYS L+C	Beeper	The left and center hydraulic system pressures are low
HYD PRESS SYS L+C+R	Beeper	All hydraulic system pressures are low.
HYD PRESS SYS L+R	Beeper	The left and right hydraulic system pressures are low.
HYD PRESS SYS R	Beeper	The right hydraulic system pressure is low
ICING ENG	Beeper	Ice is detected and an engine anti-ice selector is OFF
NAV INERTIAL SYS	Beeper	The IRS cannot support correct attitude, position, track, and groundspeed data
PACK L + R	Beeper	Both packs are inoperative
PRI FLIGHT COMPUTERS	Beeper	The flight control system is operating in the direct mode.
SPEEDBRAKES EXTENDED	Beeper	The speed brakes are extended and one or more of these occur: • The radio altitude is between 15 and 800 feet • The flap lever is in a landing setting • A thrust lever is not at idle
TERRAIN	Beeper	
THRUST ASYM PROT	Beeper	Thrust asymmetry protection is inoperative

*Level C Messages (**ADVISORY**)*		
Message	Aural	Condition
ALTN ATTITUDE CAPT	None	The Captains AIR DATA/ATT source selector is in ALTN.
ALTN ATTITUDE F/O	None	The F/Os AIR DATA/ATT source selector is in ALTN
ANTI ICE ON	None	All of these occur: • An ANTI-ICE selector is on • TAT is more than 10°C • Ice is not detected
AUTOBRAKE	None	The autobrake system is disarmed.
BOTTLE 1 DISCH ENG	None	The engine fire extinguisher bottle pressure is low.
BOTTLE 2 DISCH ENG	None	The engine fire extinguisher bottle pressure is low.
BOTTLE DISCH APU	None	The APU fire extinguisher bottle pressure is low.
BRAKE TEMP	None	One or more brake temperatures are high.
CARGO A/C FWD	None	The affected cargo heat is inoperative.
CARGO HEAT BULK	None	The affected cargo heat is inoperative.
DOOR BULK CARGO	None	The bulk cargo door is not closed and secure
DOOR ENTRY 1L	None	Entry door 1L is not closed and secure
DOOR ENTRY 1R	None	Entry door 1R is not closed and secure
DOOR ENTRY 2L	None	Entry door 2L is not closed and secure
DOOR ENTRY 2R	None	Entry door 2R is not closed and secure
DOOR ENTRY 3L	None	Entry door 3L is not closed and secure
DOOR ENTRY 3R	None	Entry door 3R is not closed and secure
DOOR ENTRY 4L	None	Entry door 4L is not closed and secure
DOOR ENTRY 4R	None	Entry door 5R is not closed and secure
DOORS	None	Two or more doors are not closed and secure
ELEC BATTERY OFF	None	BATTERY switch is OFF
ELEC CABIN/UTIL OFF	None	The CABIN/UTILITY power switch is off
ELEC GEN OFF APU L	None	The affected APU generator control breaker is open

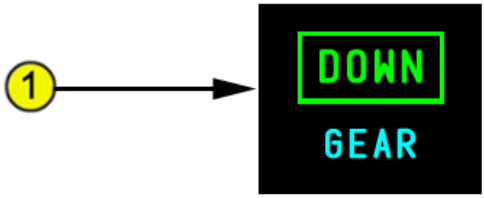
ELEC GEN OFF APU R	None	The affected APU generator control breaker is open
ELEC GEN OFF L1	None	The affected generator control breaker is open.
ELEC GEN OFF L2	None	The affected generator control breaker is open.
ELEC GEN OFF R1	None	The affected generator control breaker is open.
ELEC GEN OFF R2	None	The affected generator control breaker is open.
ELEC IFE/SEATS OFF	None	The IFE/PASS SEATS power switch is off
EMER LIGHTS	None	One of these occurs: • The emergency lights are on. • The emergency lights switch is not ARMED.
ENG EEC MODE L	None	The Left EEC is in the alternate control mode.
ENG EEC MODE R	None	The Right EEC is in the alternate control mode.
EQUIP COOLING AFT	None	The aft equipment cooling system is inoperative
EQUIP COOLING FWD	None	The forward equipment cooling system is inoperative
FD DOOR LOCK FAIL	None	The flight deck door power is off
FD DOOR OPEN	None	The flight deck door is open
FLAPS PRIMARY FAIL	None	The flaps primary mode is failed.
FMC INTERCEPT HDG	None	Both of these occur: • LNAV is armed • • The aircraft is not on an intercept heading to the active leg
FMC MESSAGE	None	An alerting message is in the CDU help window.
FUEL BALANCE SYS	None	One of these occurs: • The fuel balance system is failed. • A center tank pump is on. • On the ground and one or both

		engines are running. • • Inflight and the fuel jettison system is active, or the FUEL DISAGREE or FUEL QTY LOW message is displayed
FUEL IMBALANCE	None	The fuel balance function is on
FUEL IN CENTER	None	The center tank fuel quantity is at the level where the pump switches must be ON
FUEL LOW CENTER	None	The center tank fuel quantity is at the level where the pump switches must be off
FUEL PRESS ENG L+R	None	Fuel pressure to both engines is low
FUEL PUMP CENTER L	None	The left center fuel pump pressure is low
FUEL PUMP CENTER R	None	The right center fuel pump pressure is low
FUEL PUMP CTR L+R	None	Both center fuel pump pressures are low.
FUEL PUMP L AFT	None	The left aft fuel pump pressure is low
FUEL PUMP L FWD	None	The left forward fuel pump pressure is low
FUEL PUMP R AFT	None	The right aft fuel pump pressure is low
FUEL PUMP R FWD	None	The right forward fuel pump pressure is low
GPWS FLAP OVRD	None	The GPWS flap override is set to OVRD
GPWS GEAR OVRD	None	The GPWS gear override is set to OVRD
GPWS TERR_OVRD	None	The GPWS terrain override is set to OVRD
HYD OVERHEAT C1	None	The C1 pump temperature is high
HYD OVERHEAT C2	None	The C2 pump temperature is high
HYD OVERHEAT PRI L	None	The affected primary pump pressure is low
HYD OVERHEAT PRI R	None	The affected primary pump pressure is low
HYD PRESS C1	None	The C1 pump pressure is low
HYD PRESS C2	None	The C2 pump pressure is low
HYD PRESS DEM L	None	The affected demand pump pressure is low when commanded on
HYD PRESS DEM R	None	The affected demand pump pressure is low when commanded on
HYD PRESS PRI L	None	The affected demand pump pressure is low when commanded on
HYD PRESS PRI R	None	The affected demand pump pressure is low when commanded on
INSUFFICIENT FUEL	None	FMC estimated fuel at the destination is less

		than the entered RESERVES fuel
LANDING ALTITUDE	None	One of these occurs: • The FMC does not supply a landing altitude • • The landing altitude selector is pulled
MAIN BATTERY DISCH	None	The main battery is discharging
MAIN BATTERY LOW	None	The main battery charge is low
OUTFLOW VALVE AFT	None	The aft outflow valve switch is in manual
OUTFLOW VALVE FWD	None	The forward outflow valve switch is in manual
PACK L	None	The left pack is inoperative
PACK R	None	The right pack is inoperative
PASS OXYGEN ON	None	The passenger oxygen system is on
RAT UNLOCKED	None	The ram air turbine is not stowed and locked
RECIRC FAN LWR OFF	None	The lower recirculation fan switch is off
RECIRC FAN UPR OFF	None	The upper recirculation fan switch is off
SGL SOURCE ATTITUDE	None	Both AIR DATA/ATT source selectors are in the ALTN position
SLATS PRIMARY FAIL	None	The slats primary mode is failed
SPOILER PAIRS	None	More than two spoiler panels are failed
STABILIZER CUTOUT	None	Both stabilizer cutout switches are in CUTOUT
STABILIZER L2	None	The left stabilizer control path is failed
STABILIZER R2	None	The right stabilizer control path is failed
TCAS OFF	None	TCAS modes TA or TA/RA are not selected
TRIM AIR L	None	The left trim air valve is closed
TRIM AIR R	None	The right trim air valve is closed
VENTILATION ALTN	None	The alternate ventilation system is on
VNAV STEP CLIMB	None	
WEATHER RADAR SYS	None	The ActiveSky DLL could not be located
WINDOW HEAT	None	Window heat is off on two or more windows
WINDOW HEAT L FWD	None	Primary window heat for the left forward forward window is inoperative
WINDOW HEAT L SIDE	None	Primary window heat for the left side forward window is inoperative

WINDOW HEAT R FWD	None	Primary window heat for the right forward forward window is inoperative
WINDOW HEAT R SIDE	None	Primary window heat for the right side forward window is inoperative
WING ANTI-ICE OFF	None	The wing anti-ice selector is OFF

Landing Gear Position Indications

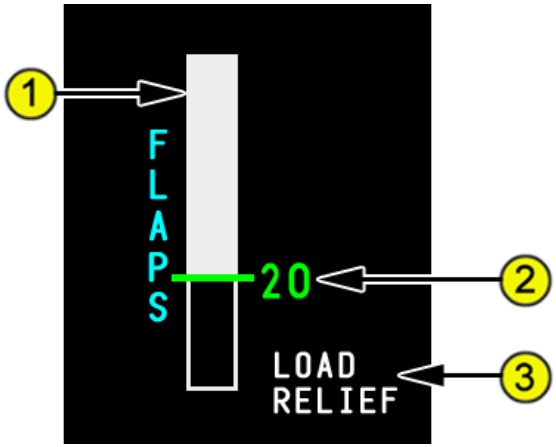


Gear Position Indication (Normal Display)
DOWN (green) – all landing gear are down and locked.
Crosshatched (white) – one or more landing gear are in transit.
UP (white) – all landing gear are up and locked (blanks after 10 seconds).
Empty box (white) – all landing gear position indicators are inoperative.

QWTip: *Non Normal Gear Indications (Expanded Gear Position) are not currently simulated*

Flap Position Indication

Displays combined flap and slat positions when all surfaces are operating normally and control is in the primary (hydraulic) mode. The indicator shows continuous motion.
The flap position indication is removed 10 seconds after slat retraction.



1. **Flap Position (white)**

UP – the slats and flaps are retracted.

1 – the slats extend to the midrange position.

5, 10, 15, 17, 18, and 20 –

- the slats remain in the midrange position
- the flaps extend to the commanded position

25 – the slats extend to the fully extended position. The flaps do not move.

30 – the flaps extend to the commanded position.

2. Flap Lever Position (line and number)

The line and number change color.

Magenta – the slats or flaps are in transit to the commanded position.

Green – the slats or flaps are in the commanded position.

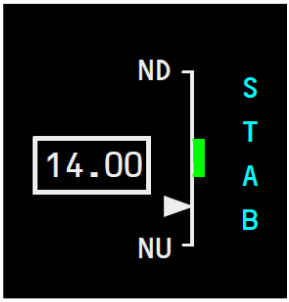
3. Flap LOAD RELIEF Indication

Displayed (white) – flap load relief is retracting the flaps, or inhibiting extension, as required to prevent air load damage due to excessive airspeed.

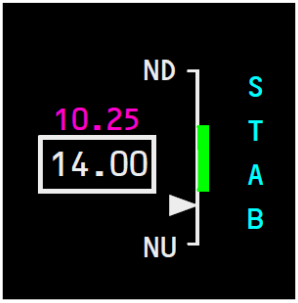
Rudder & Stab Trim Position Indications

The stabilizer and rudder trim position indications are displayed on the EICAS display and the flight controls synoptic. On the EICAS display, the indications are displayed full time on the ground and part-time in the air. The EICAS indications are removed after takeoff under normal conditions, but are automatically displayed for specific non-normal conditions. On the flight controls synoptic, the indications are full time.

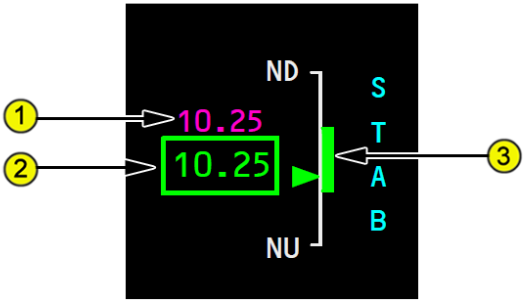
Stabilizer Position Indication



- FMC data not entered
- default green band displayed



- FMC data entered
- actual green band displayed
- stabilizer position not set



- FMC data entered
- actual green band displayed
- stabilizer position set

1. FMC Stabilizer Takeoff Setting

Displays (magenta) the FMC calculated stabilizer takeoff setting in units of trim.

When FMC data is not present or is invalid, the digital readout is not displayed.

2. Stabilizer (STAB) Position Indicator

Displays actual stabilizer position in 0.25 increments from 0.25 to 16.75 units of trim. Corresponding pointer position is displayed on the ND/NU (nose down/nose up) scale.

Box, digital readout and pointer display white anytime the trim pointer is outside the green band.

Box, digital readout and pointer display green when FMC performance data is entered and trim pointer is within the green band.

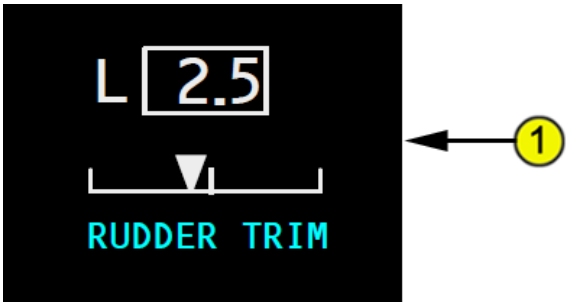
When the stabilizer trim is inoperative, the digital readout is replaced with an "X". The box, the "X" and the pointer display amber.

3. Takeoff Trim Green Band

The green band indicates the allowable takeoff trim range, based on gross weight and CG information from the FMC.

A default green band is displayed from 4 to 9 units of trim prior to performance data being entered into the FMC.

Rudder Trim Position Indication



1. RUDDER TRIM Indicator

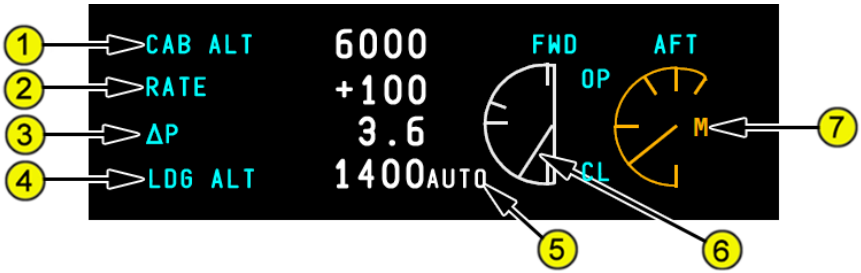
Digital readout displays rudder position in 0.2 increments from 0.0 to 1.0 unit and in 0.5 increments between 1.0 and 17.0 units of trim. An L or R is displayed to the left or right of the box for any non-zero rudder trim. Corresponding pointer position is displayed on the line scale below.

When the rudder signal is not present or is invalid, the digital readout, left/right indication and pointer are not displayed on the rudder position indicator.

Pressurization Indications

The cabin pressurization data will be displayed when the any of the following conditions are true:

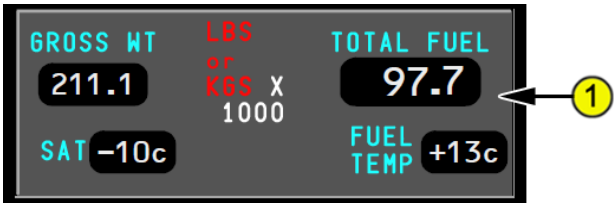
- EICAS caution message PACK L+R
- EICAS caution message CABIN ALTITUDE AUTO
- EICAS advisory message LANDING ALTITUDE
- EICAS advisory message OUTFLOW VALVE FWD
- EICAS advisory message OUTFLOW VALVE AFT
- Air Synoptic displayed on any MFD



1. **Cabin Altitude**
2. **Cabin Altitude Rate**
   + (plus) – rate of climb.
   – (minus) – rate of descent.
3. **Cabin Differential Pressure**
4. **Landing Altitude**
   Displays the Altitude of the Arrival airport from FMC or as dialed from the landing altitude selector
5. **Landing Altitude Selection**
   AUTO (white) – altitude set automatically from FMC.
   MAN (amber) – altitude set by landing altitude (LDG ALT) selector.
6. **Outflow Valves Position**
   OP – open.
   CL – closed.
   Pointer varies position to reflect outflow valve position from open to closed.
7. **Outflow Valve Control Source**
   M (manual) (amber) – manual control.
   Blank – automatic control.

Fuel System Information

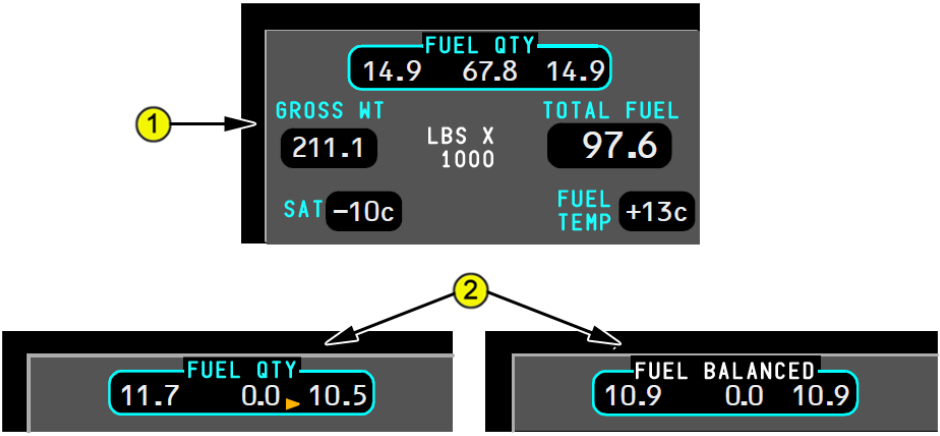
Normal Fuel Indications



1. Normal Fuel Indications
Total fuel quantity (kilograms or pounds x 1000).
Fuel temperature (ºC).

QWTip: *The option to use LBS or KGS in the QW787 is available on the DSP INFO Page in the QW Config Section. More information can be found here.*

Expanded Fuel Indications



1. Expanded Fuel Indications
The expanded FUEL QTY display (left main, center, and right main tank quantities) appears for any of the following conditions:

- crossfeed valve open
- one or more fuel tank quantity indications are inoperative

- the FUEL IN CENTER alert message is displayed (center tank quantity is amber)
- the FUEL QTY LOW alert message is displayed (low main tank quantity is amber)
- the FUEL LOW CENTER alert message is displayed (low center tank quantity is amber)
- the FUEL FLOW ENG alert message is displayed
- the INSUFFICIENT FUEL alert message is displayed (total fuel quantity is amber)
- the FUEL IMBALANCE alert message is displayed
- the airplane is on the ground and both engine(s) off
- the balance system is active
- the balance system is selected on and fuel is already balanced

2. Fuel Imbalance Indications

A fuel imbalance pointer is displayed on the expanded fuel quantity display next to the low tank quantity for the following imbalance conditions.

A solid amber fuel imbalance pointer is displayed if the FUEL IMBALANCE message is displayed.

A solid white fuel imbalance pointer is displayed if:

- the FUEL IMBALANCE message is not displayed and the main tank fuel differs by more than 100 kilograms, and
- either the crossfeed valve is open or the balance system is ON

The difference in fuel quantity which causes the FUEL IMBALANCE message to be displayed varies with total main tank fuel quantity.

The pointer flashes if fuel balance or crossfeed is going in the wrong direction.

When fuel is back in balance within 100 kilograms between the main tanks and the crossfeed valve is open or the balance system is ON, FUEL BALANCED replaces FUEL QTY on the expanded fuel quantity display and flashes for 5 seconds.

QWTip: *While the Fuel Balance Function works, not all indications show as indicated above on the QW87*

Displays – System (SYS) Synoptic Pages

System Pages are accessed by pushing the SYS button on the Display Select Panels. Synoptic Display Pages provide real-time information about the following aircraft systems:

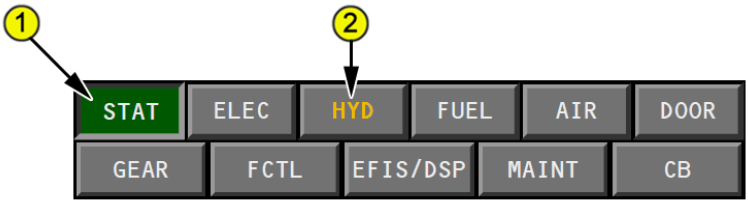
- Electrical Power
- Hydraulic Power
- Fuel
- Air Conditioning
- Doors
- Landing Gear & Brakes
- Flight Controls

The following page allows the crew to check the overall dispatch Status of the airplane:

- Status

Additional pages shown on the SYS menu are not available:

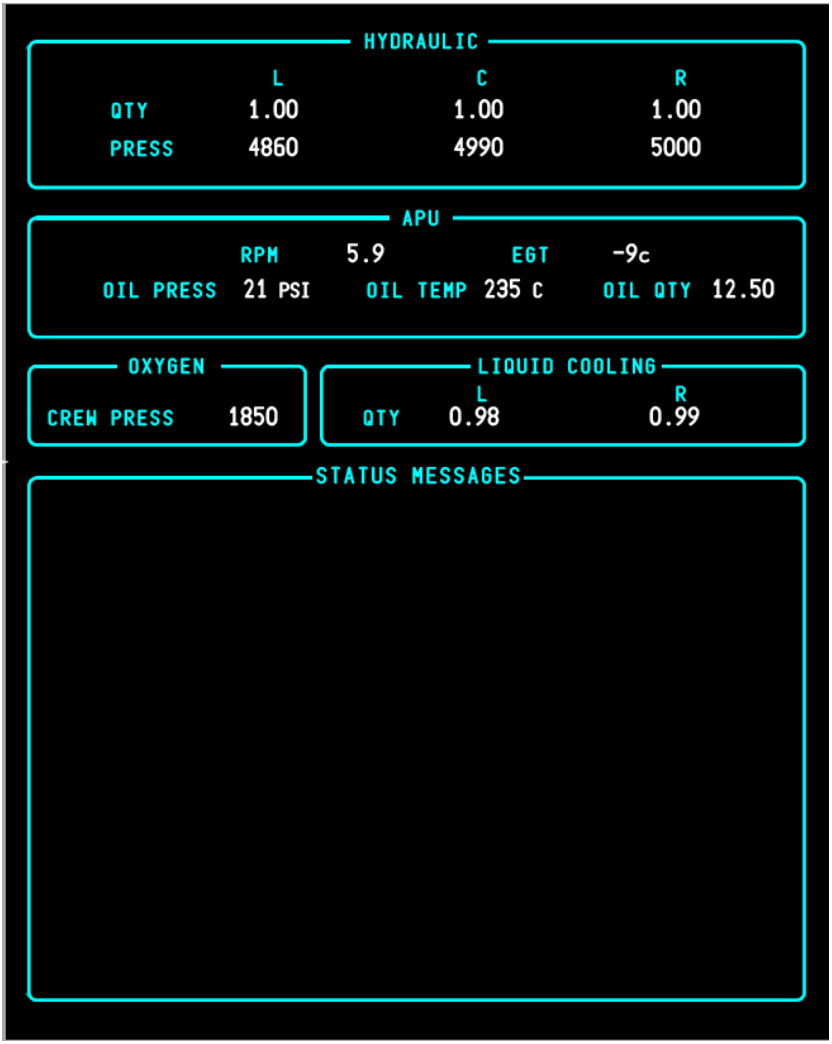
- EFIS/DSP Backup Control
- Maintenance Functions
- Circuit Breaker Functions



1. **System Page Display Key**
   Selected (green) – displays status display on selected MFD.
2. **System Menu Amber Text**
   System menu text changes color to amber whenever an EICAS caution message associated with a synoptic is triggered. All pages except STAT, EFIS/DSP, MAINT and CB exhibit this behavior

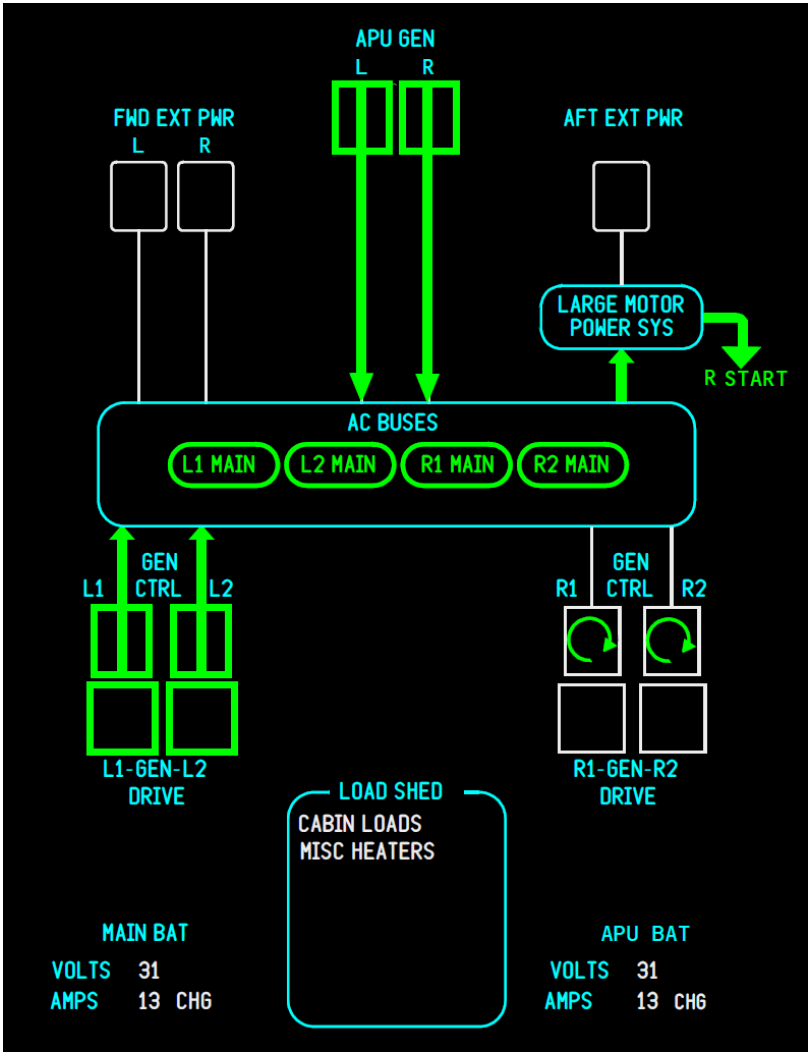
Status Display

The Status Display shows hydraulic, APU, oxygen system and cooling liquid indications and status messages. It can be accessed by pushing the STAT button on the Display Select Panels. Status Messages are not currently simulated.



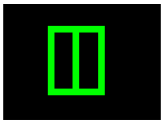
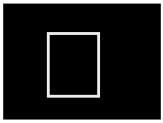
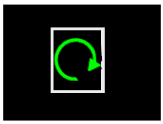
Electrical Synoptic Display

The electrical synoptic is shown by pushing the systems (SYS) display switch on the display select panel, then selecting the electrical (ELEC) synoptic key.



Synoptic Indication Symbology

Engine Generator Synoptic Indications

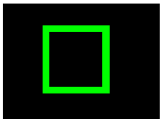
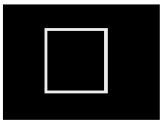
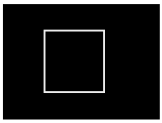
Symbol	Condition	Description
	Engine generator on (green)	Engine is running, and • engine GEN CTRL switch is ON • engine generator is powering buses
	Engine generator off (white)	Engine is not running, or engine GEN CTRL switch is OFF with engine running. If GEN CTRL switch is OFF with engine running, EICAS advisory message ELEC GEN OFF L1, L2, R1, R2 is shown.
	Engine starter on (white box with green arrow)	An engine start is in progress. Start power indication (green arrow) from Large Motor Power System symbol also shows at this time.
	Engine generator failed (amber)	Engine is running, and • GEN CTRL switch is ON • engine generator failure has occurred • engine generator is not powering buses • OFF light on GEN CTRL switch illuminates • EICAS advisory message ELEC GEN OFF L1, L2, R1, R2 shows

Synoptic Indication Symbology

Engine Generator Drive Synoptic Indications

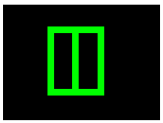
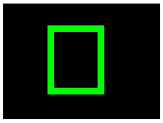
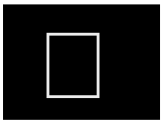
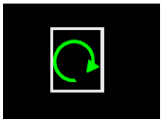
Symbol	Condition	Description
	Bus on (green)	L1,L2,R1,R2 bus is powered.
	Bus off (amber)	L1,L2,R1,R2 bus is not powered. Note: If the bus is unpowered because of a fault, EICAS caution message ELEC AC BUS L1,L2,R1,R2 shows.

Engine Generator Drive Synoptic Indications

Symbol	Condition	Description
	Engine generator drive on (green)	Engine is running and drive is connected.
	Engine generator drive off (white)	Engine is not running.
	Engine generator drive disconnected (amber)	Engine is running and drive is disconnected.
	Engine generator drive data invalid (white, low intensity)	Engine generator drive condition unknown.

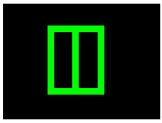
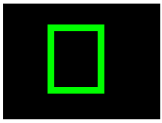
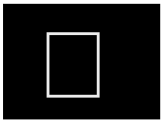
Synoptic Indication Symbology

APU Generator Synoptic Indications

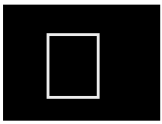
Symbol	Condition	Description
	APU generator on (green)	APU is running, and • APU GEN switch is ON • APU generator is powering buses
	APU generator available (green)	APU is running, and • APU GEN switch is ON • APU generator is available for power • APU generator is not powering buses
	APU generator off (white)	APU is not running, or APU GEN switch is OFF with APU running. If APU GEN switch is OFF with APU running, EICAS advisory message ELEC GEN OFF APU L,R also shows.
	APU starter on (white box with green arrow)	An APU start is in progress. Start Power Indication (green arrow) from Large Motor Power System symbol also shows at this time.
	APU generator failed (amber)	APU is running, and • APU GEN switch is ON • APU generator failure has occurred • APU generator is not powering buses • OFF light on APU GEN switch illuminates • EICAS advisory message ELEC GEN OFF APU L,R shows

Synoptic Indication Symbology

Forward External Power Synoptic Indications

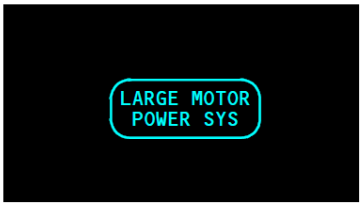
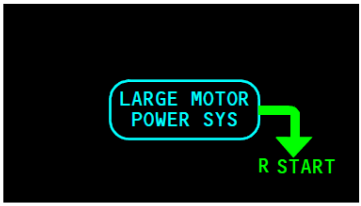
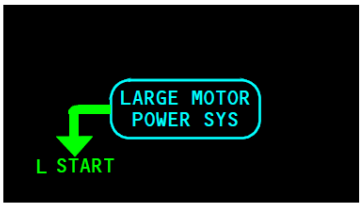
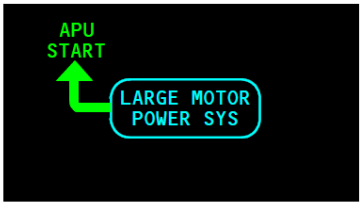
Symbol	Condition	Description
	Forward external power on (green)	Forward external power: • switch has been selected • is powering the buses • ON light illuminates in power switch
	Forward external power available (green)	Forward external power: • is plugged in, power quality is acceptable • switch has not been selected • AVAIL light illuminates in power switch
	Forward external power off (white)	Forward external power is not available.

Aft External Power Synoptic Indications

Symbol	Condition	Description
	Aft external power off (white)	Aft external power is not available.

Synoptic Indication Symbology

Large Motor Power System and Start Power Synoptic Indications

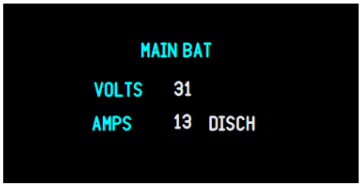
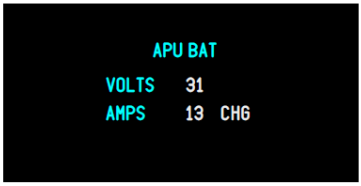
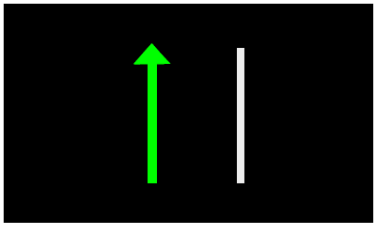
Symbol	Condition	Description
	Large Motor Power System (no power flowing to or from symbol)	Symbol represents all of the high power electrical motors. Power flow lines (green straight arrows) from aft external and main AC buses depict power flow to system when applicable. Power flow lines (90 degree green arrows) from the system shows during APU and engine start.
	Start Power Indication shows right engine start in progress (green arrow)	Both right engine starter on symbols show at this time.
	Start Power Indication shows left engine start in progress (green arrow)	Both left engine starter on symbols show at this time.
	Start Power Indication shows APU start in progress (green arrow)	Either the left or right APU starter on symbols show at this time.

Synoptic Indication Symbology

Miscellaneous Synoptic Indications

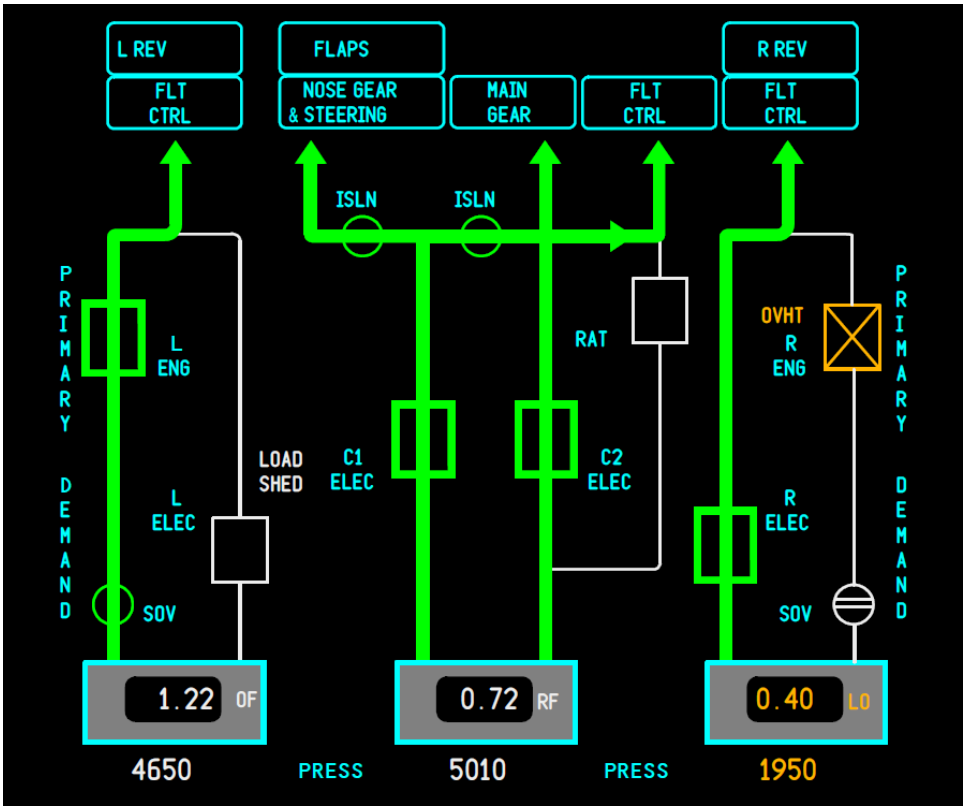
Symbol	Condition	Description
	Load Shed Message List (white text)	The most recent system impacted by load shed is listed at the top. AIR – LOAD SHED shows on AIR synoptic. CABIN LOADS – Power to one or more cabin systems have been reduced or shed: galley, galley floor heater(s), chiller, cabin lighting, IFE, door area heater(s). COMM/NAV – One or more communication or navigation loads have shed: VHF, TCP, HF, SATCOM, DME, flight interphone. EXT LIGHTS – One or more exterior lights have shed: beacon, strobe, wing landing, nose landing gear, taxi, navigation (position), logo, runway turnoff. FUEL – LOAD SHED shows on FUEL synoptic. HYD – LOAD SHED shows on HYD synoptic. MISC HEATERS – One or more heaters have shed. WINDOW HEAT – Flight deck window heat has shed.

Miscellaneous Synoptic Indications

Symbol	Condition	Description
	Main Battery Indications	VOLTS (white value) – battery charge in volts. If voltage level is low, the MAIN BATTERY LOW EICAS advisory message shows. AMPS (white value) – battery rate of charge or discharge in amps. CHG (white) – battery is charging. DISCH (white) – battery is discharging. If DISCH is indicated, the MAIN BATTERY DISCH EICAS advisory message shows.
	APU battery indications	VOLTS (white value) – battery charge in volts. AMPS (white value) – battery rate of charge or discharge in amps. CHG (white) – battery is charging. DISCH (white) – battery is discharging.
	Flow lines (green with arrow end or white solid)	Green flow lines with directional arrow show if power is flowing. White solid flow lines show if power is not flowing.

Hydraulic Synoptic Display

Hydraulic system indications are displayed by pushing the systems (SYS) display switch, then selecting either the status (STAT) synoptic key or the hydraulic (HYD) synoptic key.



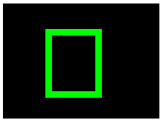
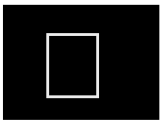
ISLN isolation valve *
ELEC electric driven pump
ENG engine driven pump
RAT ram air turbine
SOV shutoff valve
OVHT pump overheat indication

LO reservoir quantity low*
RF reservoir quantity refilling*
OF reservoir quantity overfill*

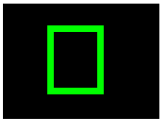
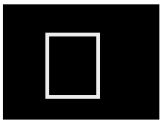
- *Not Simulated*

Synoptic Indication Symbology

Electric Motor Pump (EMP) Synoptic Indications

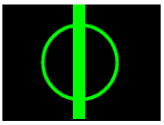
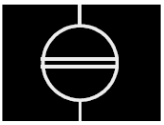
Symbol	Condition	Description
	EMP on (green)	Pump output pressure exceeds 2000 psi.
	EMP off (white)	Pump output pressure less than or equal to 2000 psi and pump is commanded off.
	EMP failed (amber)	Pump output pressure less than or equal to 2000 psi when commanded on.

Engine Driven Pump (EDP) Synoptic Indications

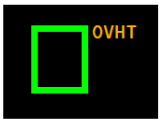
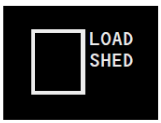
Symbol	Condition	Description
	EDP on (green)	Pump output pressure 2150 psi or greater.
	EDP off (white)	Pump output pressure less than 2150 psi and pump is commanded off.
	EDP failed (amber)	Pump output pressure less than 2150 psi, engine primary pump switch is ON and engine is running.

Synoptic Indication Symbology

EDP Shutoff Valves (SOV) Synoptic Indications

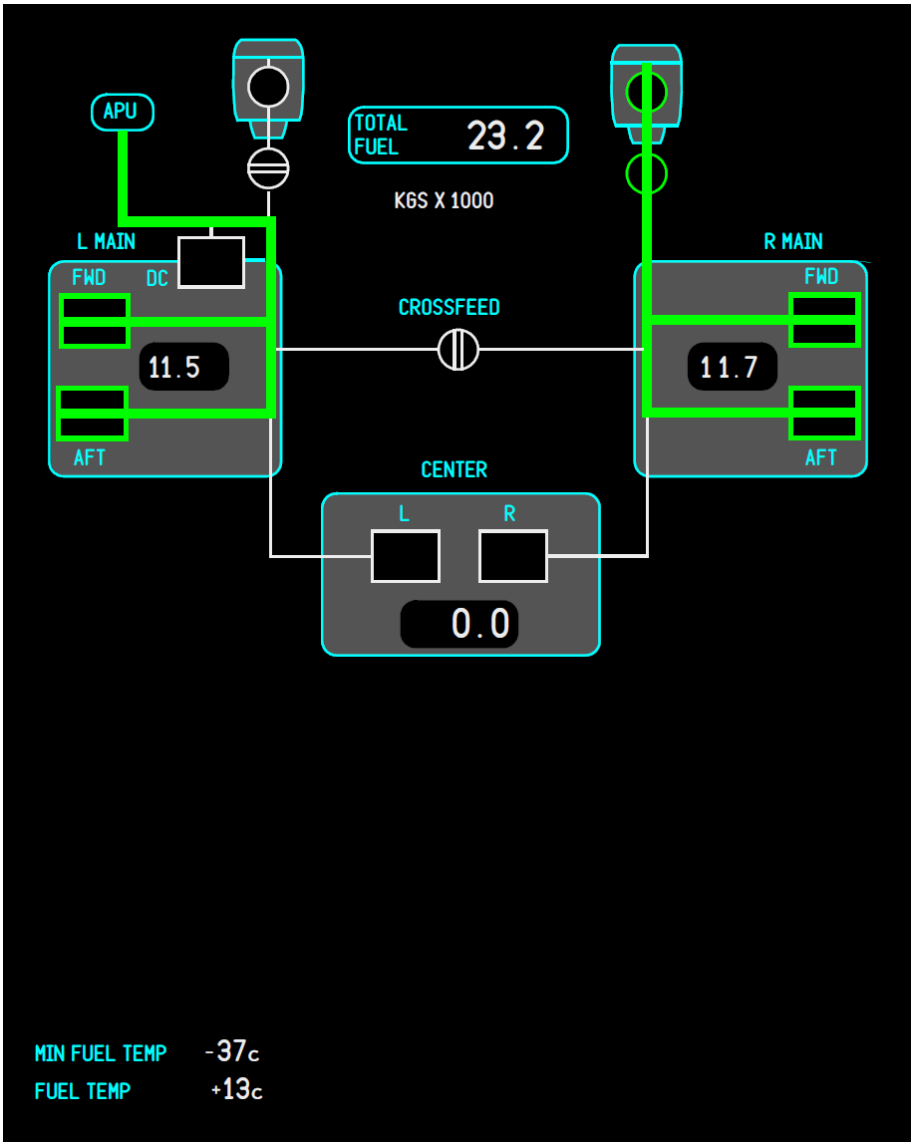
Symbol	Condition	Description
	Valve open (green)	Engine fire handle not pulled.
	Valve closed (white)	Engine fire handle pulled.

Miscellaneous Synoptic Indications

Indication	Condition	Description
	Pump overheat	Pump temperature exceeds limit
	Load shed indication	Pump has received load shed command
	Flow lines (green with arrow end or white solid)	Green flow lines with directional arrow display if a pump is on and no valves upstream or downstream are closed. Narrow white lines are unpressurized.
	Normal system pressure (white)	System pressure 3000 psi or greater.
	Low system pressure (amber)	System pressure less than 3000 psi.

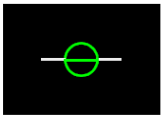
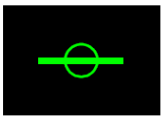
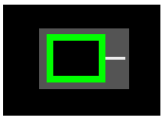
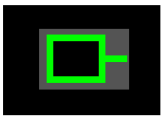
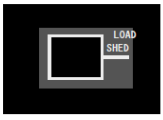
Fuel Synoptic Display

The fuel synoptic is displayed by pushing the systems (SYS) display switch, then selecting the FUEL synoptic key.



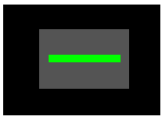
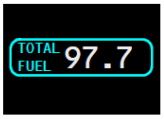
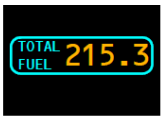
Synoptic Indication Symbology

Fuel Synoptic Indications

Symbol	Indication	Description
	Fuel Valve (white)	Fuel valve is closed.
	Fuel Valve (green)	Fuel valve is in transit.
	Fuel Valve (green)	Fuel valve is in open.
	Fuel Pump (green rectangle)	Fuel pump switch is ON.
	Fuel Pump (green rectangle with line)	Fuel pump switch is ON and pressure sensor detects pressure greater than 7 to 8 psig.
	Fuel Pump (white rectangle)	Fuel pump switch is OFF.
	Fuel Pump load shed (white)	Fuel pump switch is ON and pump has been load shed.

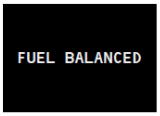
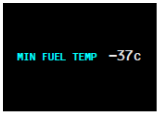
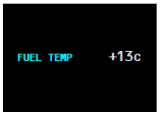
Synoptic Indication Symbology

Fuel Synoptic Indications

Symbol	Indication	Description
	Fuel Pump (amber rectangle with crossout)	Fuel pump failed or pump switch is ON and pressure sensor detects pressure less than 7 to 8 psig. Also shown following automatic shutoff of center tanks
	Normal Fuel Feed (green)	Fuel line is pressurized. Pressure sensor detects pressure greater than 7 to 8 psig.
	Suction Feed (amber)	Fuel line is unpressurized and suction flow is occurring.
	Total Fuel (white)	Normal indication.
	Total Fuel (amber)	INSUFFICIENT FUEL alert message is displayed.
	Main Tank Quantity (white)	Normal indication.
	Main Tank Quantity (amber)	Fuel tank quantity is low. FUEL QTY LOW message is displayed
	Tank Quantity (blank)	Tank quantity is invalid.

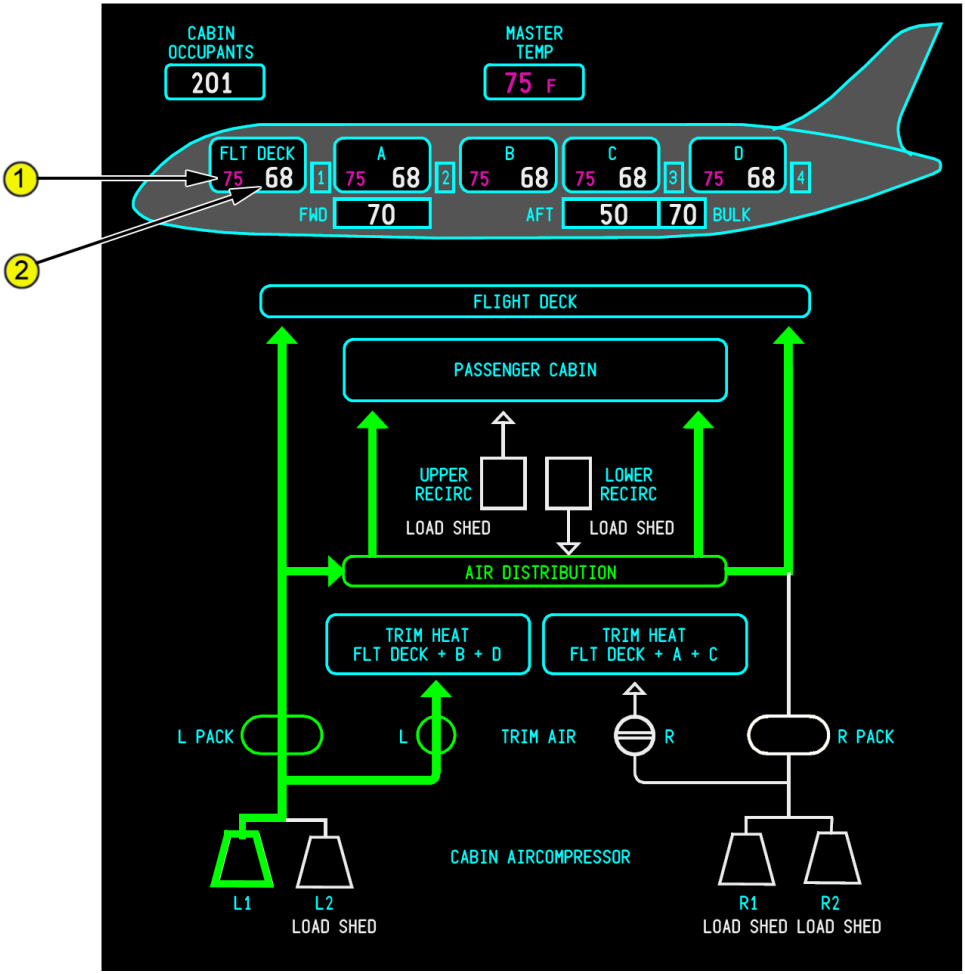
Synoptic Indication Symbology

Fuel Synoptic Indications

Symbol	Indication	Description
	Center Tank Quantity (white)	Normal indication.
	Center Tank Quantity (amber)	FUEL IN CENTER message is displayed.
	Center Tank Quantity (amber)	Center fuel tank quantity is low. FUEL LOW CENTER message is displayed.
	Pointer (amber)	FUEL IMBALANCE is displayed. The pointer is displayed next to the tank with the lower quantity.
	Pointer (white)	The crossfeed switch is ON or the balance switch is ON and the main tank quantities differ by more than 200 lbs (or 100 kgs). The pointer is displayed next to the tank with the lower quantity.
	Fuel Balanced (white)	Balanced indication. The fuel balanced indication flashes once fuel is within 200 lbs (or 100 kgs). of balanced.
	Minimum Fuel Temperature (temperature displayed white)	Normal indication. Displays the lowest of three tank temperatures.
	Fuel Temperature (temperature displayed white)	Normal indication.

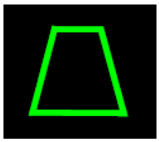
Air Conditioning Synoptic Display

The air systems synoptic is displayed by pushing the systems (SYS) display switch on the display select panel, then selecting the air systems (AIR) synoptic key.

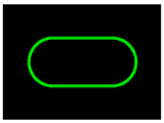


Synoptic Indication Symbology

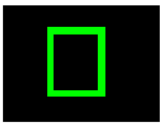
Cabin Air Compressor Synoptic Indications

Symbol	Condition	Description
	Compressor on (green)	Associated compressor is running and developing flow
	Compressor off (white)	Associated compressor is not developing flow

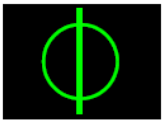
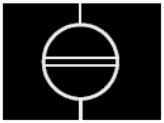
Pack Synoptic Indications

Symbol	Condition	Description
	Pack on (green)	Pack is running and developing conditioned airflow.
	Pack off (white)	Pack switch - OFF or both associated cabin air compressors are off and not PACK L(R) status message.

Recirculation Fan Synoptic Indications

Symbol	Condition	Description
	Fan on (green)	Upper fan or one of two lower fans is developing flow
	Fan off (white)	Upper fan or both lower fans are not running

Trim Air Valve Synoptic Indications

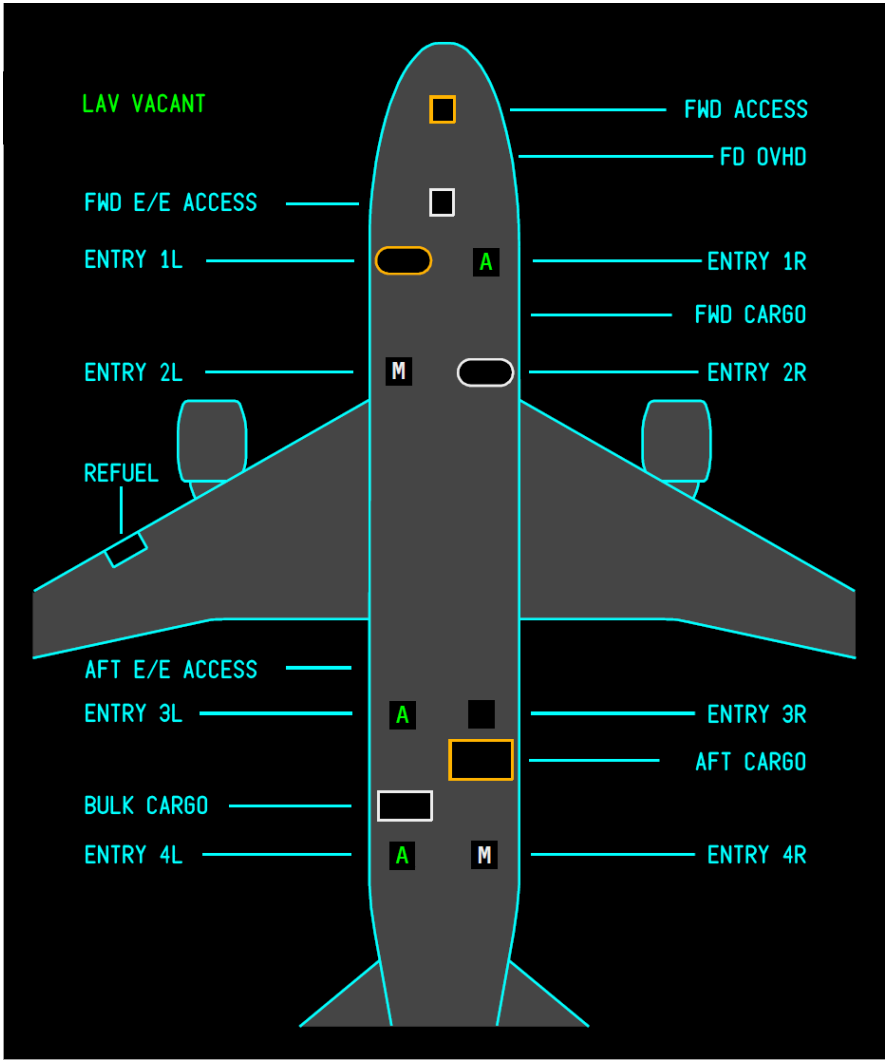
Symbol	Condition	Description
	Valve open (green)	
	Valve closed (white)	

Miscellaneous Synoptic Indications

	Number of cabin occupants as entered on the Cabin Attendant Panel	Blank if data missing or invalid.

Door Synoptic Display

The doors synoptic is displayed by pushing the systems (SYS) display switch on the display select panel, and then selecting the DOOR synoptic key from the menu page



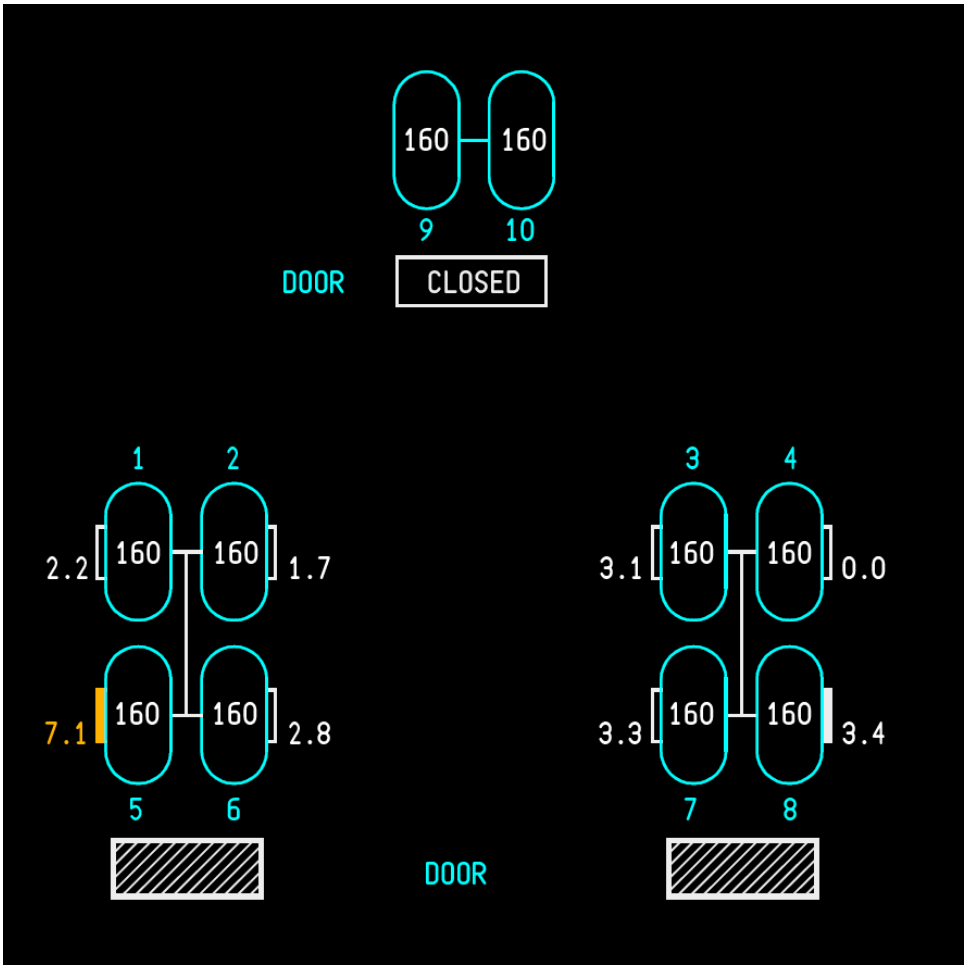
Synoptic Indication Symbology

Door Synoptic Indications

Symbol	Indication	Description
	Door symbol blank	Large cargo door is closed, latched, and locked. Flight deck overhead door, bulk cargo door, or an access door is closed and latched.
	Door symbol amber	Passenger entry or large cargo door is NOT closed, latched, and locked. Flight deck overhead door, bulk cargo door, or an access door is NOT closed and latched.
	Green letter A	Passenger door is closed, latched, and locked; and the slide in the automatic mode.
	White letter M	Passenger door is closed, latched, and locked; and the slide in the manual mode.
	Lavatory availability	LAV VACANT – lavatory is available. LAV OCCUPIED – lavatory is unavailable.

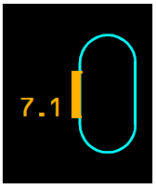
Landing Gear & Brakes Synoptic Display

The landing gear synoptic is displayed by pushing the systems (SYS) display switch, then selecting the landing gear (GEAR) synoptic key.



Synoptic Indication Symbology

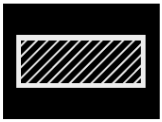
Brake Indications

Symbol	Condition	Description
	Brake Normal (white)	Brake temperature value in normal range from 0.0 to 4.9.
	Hottest Brake (solid white)	Brake temperature value from 3.0 to 4.9. Only one hottest brake symbol per truck is displayed at any time.
	Brake Overheat (solid amber)	Brake temperature value from 5.0 to 9.9. Multiple brake overheat symbols may appear simultaneously. Note: EICAS advisory message BRAKE TEMP is displayed.

Gear Door Indications

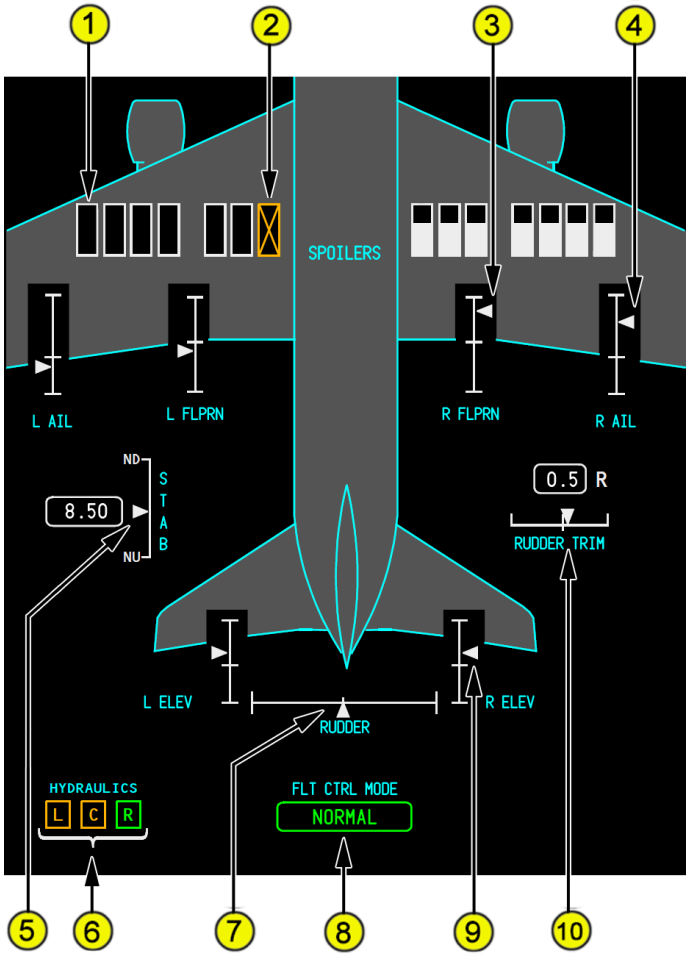
Symbol	Condition	Description
	Tire Pressure Normal (white)	
	Tire Pressure Abnormal (amber)	Indicates respective tire pressure in abnormal high or low range. Note: EICAS advisory message TIRE PRESS is displayed.

Gear Door Indications

Symbol	Condition	Description
	Door Closed	Indicates respective gear door is closed. Note: Nose gear doors indicate closed when the gear is down.
	Door In Transit	Indicates respective gear door is in-transit.

Flight Controls Synoptic Display

The flight controls synoptic is displayed by pushing the systems (SYS) display switch, then selecting the FCTL synoptic key from the menu page.



1—Spoiler Position
2—Failed Control Surface/Trim Function
3—Cursor Control Selector (Outer)
4 – Aileron Position
5 – Stabilizer Trim Position
6 - Hydraulic System Indications

- Green – the associated electrical system is functioning normally.
- Amber – the associated electrical system has failed.

7 – Rudder Position

8 -Flight Control Mode SECONDARY or DIRECT Indications

- When flight controls revert to secondary or direct modes the FLT CTRL MODE indication displays an amber SECONDARY or DIRECT to indicate which mode is in use.

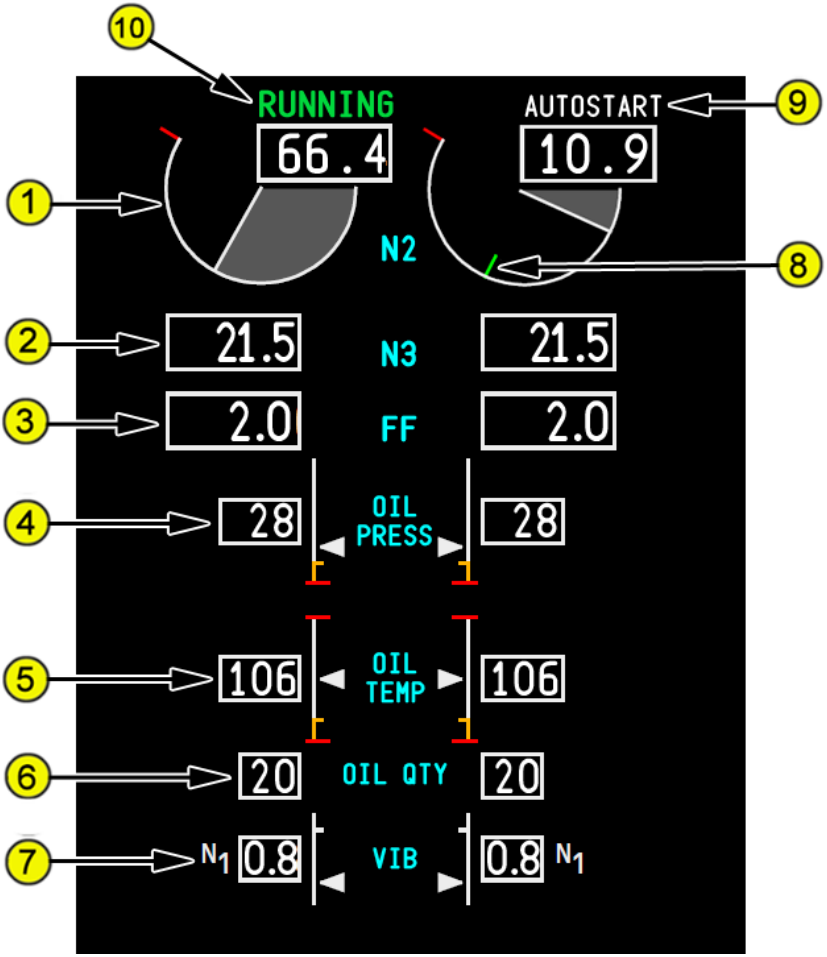
9 – Elevator Position

10 – Rudder Trim Position

.

Displays – Secondary Engine Page

Pushing the switch displays the secondary engine information on EICAS. Pushing the switch a second time blanks secondary engine information.



4. **N2 Rotor Indication**
5. **N3 Rotor Indication (RR 787s only)**
6. **Fuel Flow Indication**
7. **Oil Pressure Indication**
8. **Oil Temperature Indication**
9. **Oil Quantity Indication**

10. **Vibration Indication**
11. **Idle Target Indication**

    Indicates approximate RPM where the engine can maintain self-sustained running operation.

    Displayed (green) –

    - fuel control switch is in the RUN position, and
    - engine is below idle

12. **Starting Mode**

    AUTOSTART (white) – EEC is in autostart mode.

    The **AUTOSTART** indication blanks when the system is no longer attempting an engine start.

13. **RUNNING Indication**

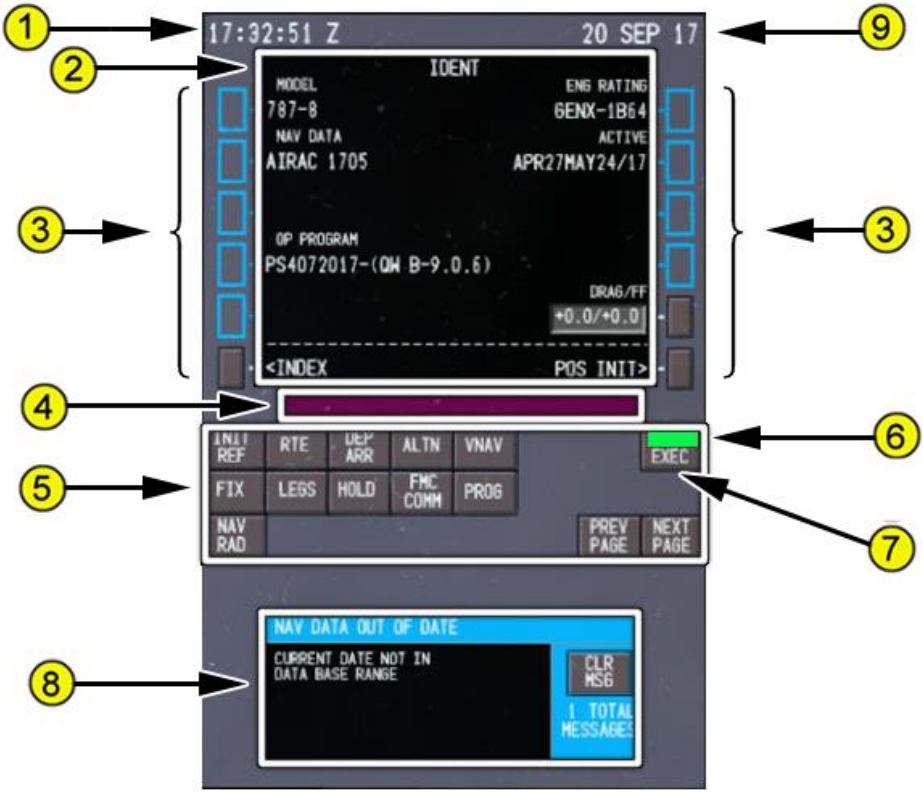
    Displayed (green) –

    - fuel control switch is in the RUN position, and
    - engine is at or above idle

    The **RUNNING** indication blanks 30 seconds after engine reaches idle.

Displays – FMS Control Display Unit (CDU)

An interactive graphical CDU can be displayed on any of the MFDs. The display is accessed by pushing the CDU switch on the associated display select panel or any multifunction keypad (MFK).



QWTip: *More information on loading the FMC can be found in the Supplemental Flight Tutorial*

1. **Time Display**
   Displays current UTC time from the GPS.
2. **Control Display Unit (CDU) Display**
   Displays FMS data pages.
3. **Line Select Keys**
   Select –
   - moves data from scratchpad to selected line
   - moves data from selected line to scratchpad
   - selects page, procedure, or performance mode as applicable
   - deletes data from selected line when DELETE displays in scratchpad
4. **Scratchpad**
   Displays crew entered data or crew line-selected data:
   - up to 34 characters may be entered in the scratchpad at one time
   - data may be transferred to and from the scratchpad by pushing the cursor select switch on the cursor control device or cursor control selector or by pushing the ENTER key on the multifunction keypad.
   - data may also be transferred to the scratchpad while using the PICK WPT function on the ND

QWTip: *Direct Key Entry mode allows you to use your keyboard to type into the scratchpad. You can also use your arrow keys to navigate within the CDU environment. To enter Direct Key entry mode, simply mouse click within the scratchpad. When the scratchpad changes from black to maroon in color, Direct Key Entry Mode is active. To exit this mode, simply click the scratchpad again and it will return to black.*
Please note that any key commands used within the Flight Sim environment (such as clicking P for pause) will not work until you exit Direct Key Entry Mode.

5. **CDU Function Keys**
   Select –
   - INIT REF – displays page for data initialization or for reference data
   - RTE – displays page to input or change origin, destination, route and flight number
   - DEP ARR – displays page to input or change departure and arrival procedures
   - ALTN – displays page to modify destination and route for alternate diversion
   - VNAV – displays page to view or change vertical navigation path data
   - FIX – displays page to create reference points on ND map

- LEGS –
  - •displays page to evaluate or modify lateral and vertical route data
  - •displays page to correlate route waypoints on the ND
- HOLD – displays page to create holding patterns and display holding pattern data, or to exit holding pattern
- FMC COMM – NOT SIMULATED on the QW787
- PROG – displays page to view dynamic flight and navigation data, including waypoint and destination ETAs, fuel remaining, and arrival estimates
- NAV RAD – displays page to view or control navigation radio tuning
- PREV PAGE – displays previous page of multiple page displays (for example, LEGS pages)
- NEXT PAGE – displays next page of multiple page displays

6. Execute Light

Illuminated (green) – active data is modified but not executed.

7. Execute (EXEC) Key

Push (while EXEC light is illuminated green) –

- activates data modification(s)
- extinguishes execute light

8. CDU Help Window

Displays error/help messages to the crew.

QWTip: *A help window is provided in both COMM and CDU displays at the bottom of the MFD to assist in resolving data entry errors and to display FMC information messages. Some help window messages clear automatically when the condition is removed. Others must be manually cleared using the CLR MSG key.*

9. Date Display

Displays current UTC date from the flight simulator

Displays – Checklists

Introduction

Normal electronic checklists can be displayed on any selected multifunction display (MFD). Electronic checklists can be displayed on any MFD by pushing the checklist display switch on the display select panel.

Electronic Checklist Operation

Pushing the checklist display switch on the display select panel displays the proper checklist. Only one checklist is displayed at a time.

Only Normal Checklists have been programmed on the QualityWings 787.

Normal Checklist Overview

These are the Normal Checklists Available:

- ✓ PREFLIGHT
- ✓ BEFORE START
- ✓ BEFORE TAXI
- ✓ BEFORE TAKEOFF
- ✓ AFTER TAKEOFF
- ✓ DESCENT
- ✓ APPROACH
- ✓ LANDING
- ✓ SHUTDOWN
- ✓ SECURE

As each normal checklist is completed, pushing the checklist display switch displays the next sequential normal checklist.
Some checklist steps must be checked–off by the pilot to be completed. Other checklist steps are automatically checked–off from sensed flight deck control positions, airplane system status, and/or EICAS messages.

Checklist Status

The CHECKLIST COMPLETE indicator is displayed at the bottom of all pages of the checklist when all of the line items are either complete, inactive, or overridden, and every page has been displayed. If the flight crew chooses not to perform a particular line item, the line item can be overridden by selecting the ITEM OVRD key at the bottom of the page. When a line item is overridden, the text changes color from white to cyan and the current line item box moves down to the next incomplete line item. If the flight crew chooses to not perform an entire checklist, the checklist can be overridden by selecting the CHKL OVRD key at the bottom of the page. When a checklist is overridden, the text of the entire checklist changes color from white to cyan, and the CHECKLIST OVERRIDDEN indicator is displayed at the bottom of all pages.

Normal Checklist Manual Resets

Manual checklist resets are required for the following conditions:

- RESET NORMAL – selecting the resets menu key and then the reset key labeled RESET NORMAL resets all normal checklists. The flight sequence begins again
- INDIVIDUAL CHECKLIST RESET – selecting the checklist reset key resets any displayed checklist. The checklist is then ready to accomplish again

Overrides

There are two types of override functions: item override and checklist override.

Item Override

Item override is used by the flight crew when an item in a checklist will not be accomplished or an item has been accomplished but the closed-loop sensing is not functioning correctly. Overriding an item when required allows the checklist to be completed.

The line item override key is available on all checklists. Selection of the line item override key changes the color of the highlighted step to cyan, indicating the step is not applicable and is overridden. Both closed loop and open loop steps can be overridden.

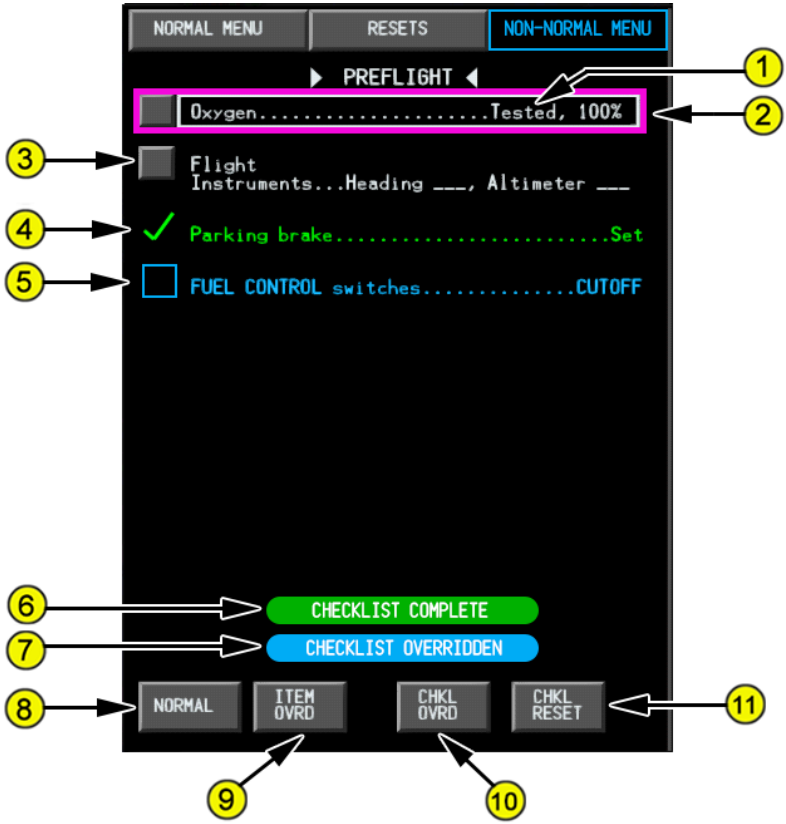
Conditional line items (both closed and open loop) cannot be overridden. Individual steps associated with conditional line items can be overridden.

Checklist Override

Checklist override is used by the flight crew when a checklist in the non-normal queue will not be accomplished or after the crew browses a checklist but does not intend to complete it.

By pressing the checklist override key, the displayed checklist changes color to cyan, indicating that it is overridden. The CHECKLIST OVERRIDDEN indicator is displayed at the bottom of the page. For non-normal checklists, all associated operational notes are removed from the operational notes page, and deferred line items are removed from the target normal checklist.

Normal Checklist



1. Checklist Line Item

Displayed (white) –

- when action is required, line item is incomplete
- when action is not required, line item remains white and is complete

Displayed (green) – line item is complete.

Displayed (cyan) – line item is inactive or overridden.

2. Current Line Item Box

Highlights current incomplete line item.

3. Open Loop Indicator

Indicates line item is an open loop action item. Requires crew confirmation to become complete.

4. Complete Indicator

Indicates line item is complete.

5. **Overridden Item**

As described in Item 1

6. **CHECKLIST COMPLETE Indicator**

Displayed when all line items are either complete, inactive, or overridden, and all pages have been displayed.

7. **CHECKLIST OVERRIDDEN Indicator**

Displays when checklist is overridden. All line items are displayed cyan.

8. **Normal Checklist (NORMAL) Key**

   Select –

   - displays next incomplete normal checklist
   - displays normal checklists menu page when all normal checklists are complete

9. **Line Item Override (ITEM OVRD) Key**

   Select – overrides line item in current line item box. Item is displayed cyan.

10. **Checklist Override (CHKL OVRD) Key**

    Select – removes displayed checklist:

    - all line items in the displayed checklist are overridden
    - deferred line items are no longer displayed on the applicable NORMAL checklist

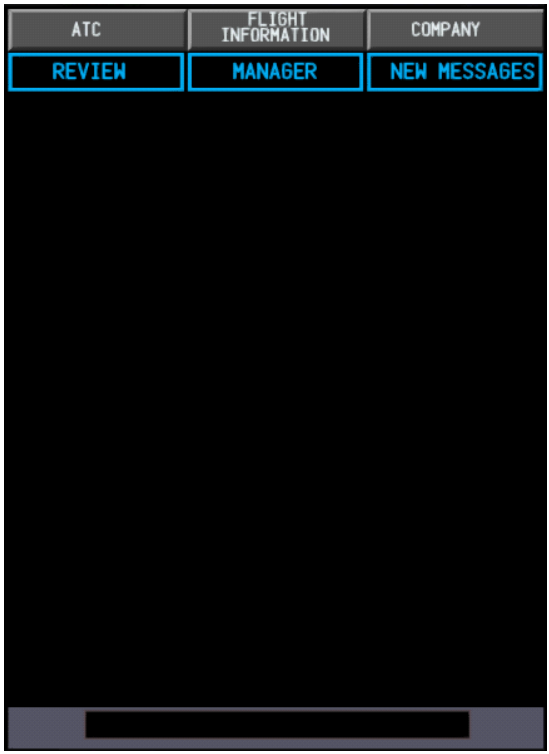
11. Checklist Reset (CHKL RESET) Key

    Select – checklist starts over. All open loop line items become incomplete and current line item box, cursor selection box, and cursor move to first incomplete line item.

Displays – COMM Page

MFD Communications Functions

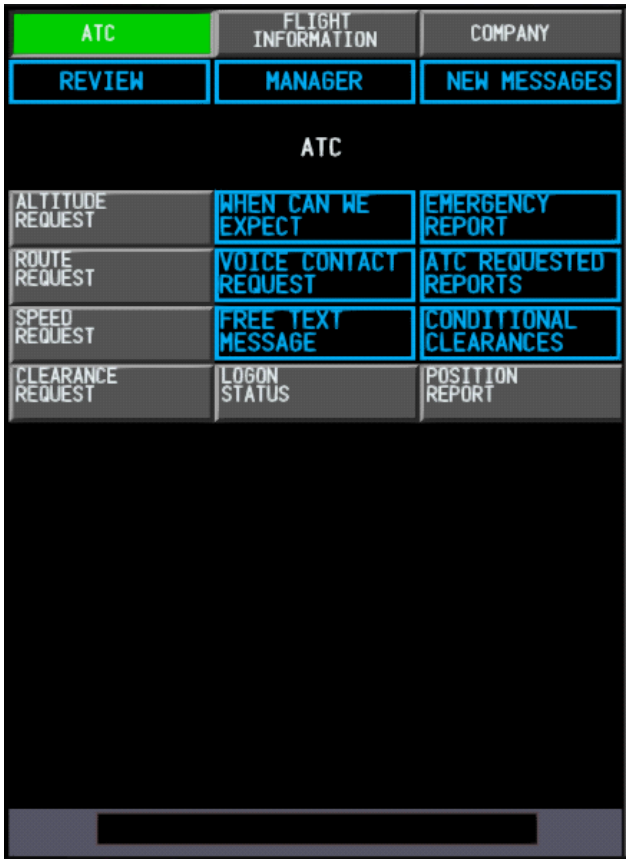
The MFD communications functions are used to control datalink features. Datalink communications can be established with participating ATC and company locations. ACARS and datalink radio management functions are provided through communications management menus.
The communication (COMM) display switch displays the communications main menu on the selected multifunction display (MFD). Message text entry is accomplished by entering data into the COMM scratchpad and transferring it to the appropriate area. Incoming message traffic is annunciated by an EICAS •ATC communication message and displayed in the ATC Message Block on both auxiliary displays as well as the Comm MFD.



ATC Datalink

ATC datalink communicates with participating air traffic control centers, reducing the need for VHF and HF voice communications.

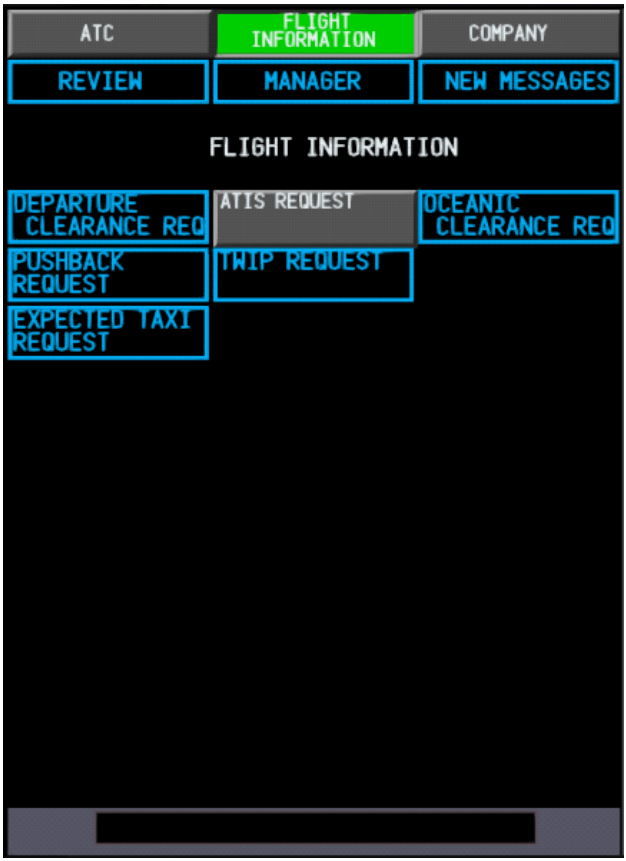
This page is reserved for future development on the QualityWings 787.



Flight Information

Flight Information Menu

The Flight Information menu provides access to FLIGHT INFORMATION downlink pages. The only function available on the QualityWings 787 is ATIS REQUEST. Unavailable functions are in blue.



ATIS Request

The ATIS REQUEST page allows downlink request for digital ATIS information without using voice radio. ATIS information may be viewed on the ATC Message Block or MFD.

1. AIRPORT

Valid entry is a four character ICAO identifier.

If a departure airport exists in the active route and the airplane is on the ground, the default entry is the departure airport. If the destination airport exists in the active route and the airplane is in flight, the default entry is the destination airport.

2. ATIS SELECTOR GROUP

The default is none selected. Only one selection can be made at a time The SEND key becomes active with selection. Pushing the SEND key requests the selected information. The options in Blue are unavailable on the QualityWings 787

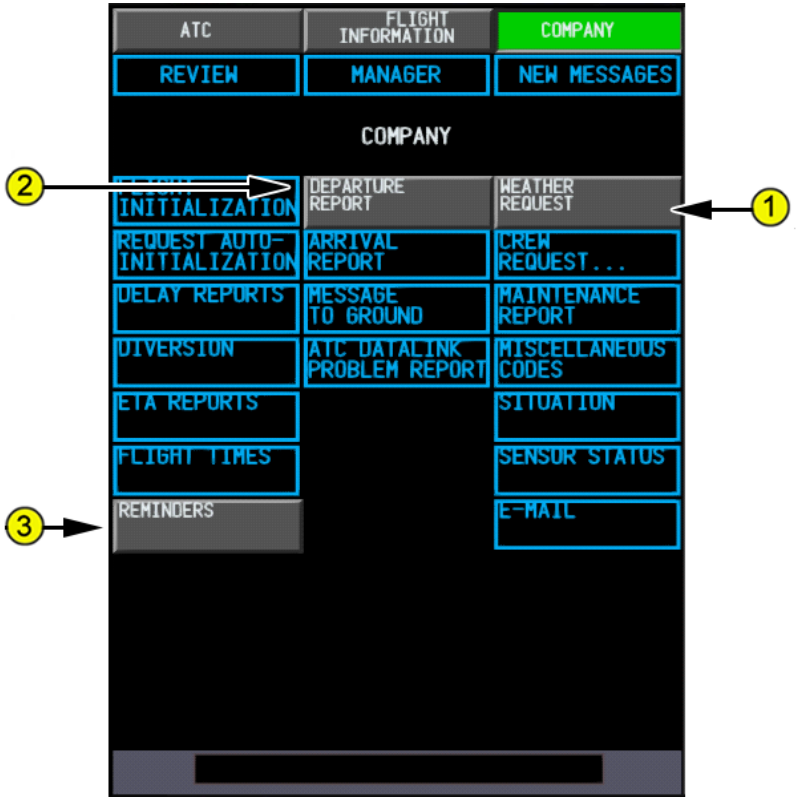
3. ATIS SOURCE

Select the radio button to choose the source of ATIS Request Source. Available sources are VATSIM and IVAO. The radio button for the selected source shows as a green diamond. **Press the SEND Button.** After sending the information request, the received message will automatically show in the MESSAGES tab that will open automatically. The ATIS information will also show in the AUX Display area of the Primary Flight Display.

Company Menu

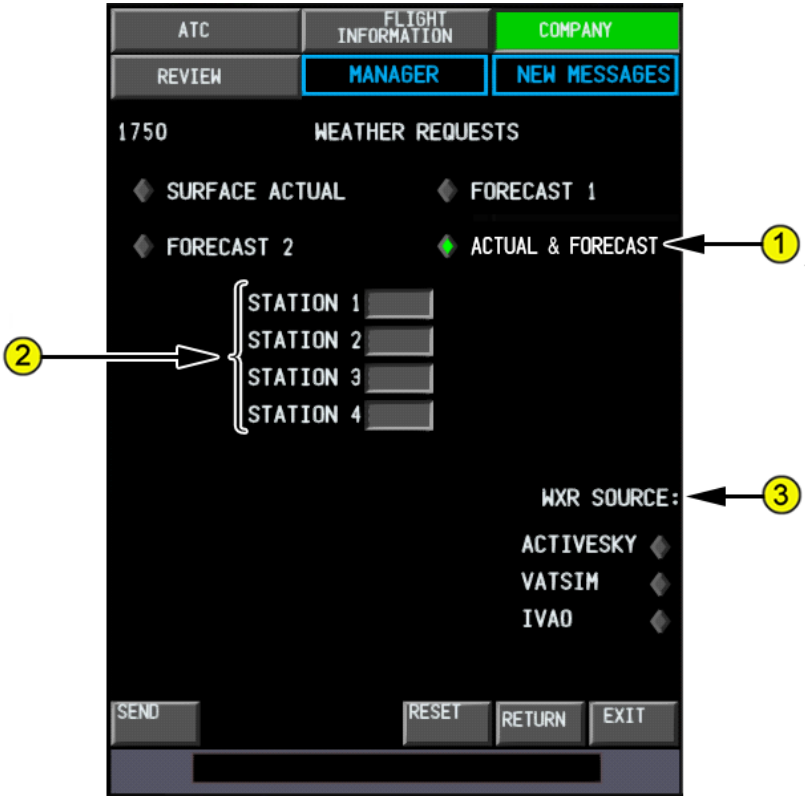
Available functions available on the Company Menu are:

1. WEATHER REQUESTS
2. REMINDERS
3. DEPARTURE REPORT



Weather Request

This page allows for Actual & Forecasted weather for up to 4 ICAO stations to be requested



1. **Actual & Forecast**
   The only available selection for Weather Requests
2. **Stations**
   Up to four ICAO stations can be entered in this area.
3. **WXR Source**
   Choose your source of weather. ActiveSky is a third party weather program that is not included with the QualityWings software but will need to be installed in order for Weather Requests under the ActiveSky selection to show.

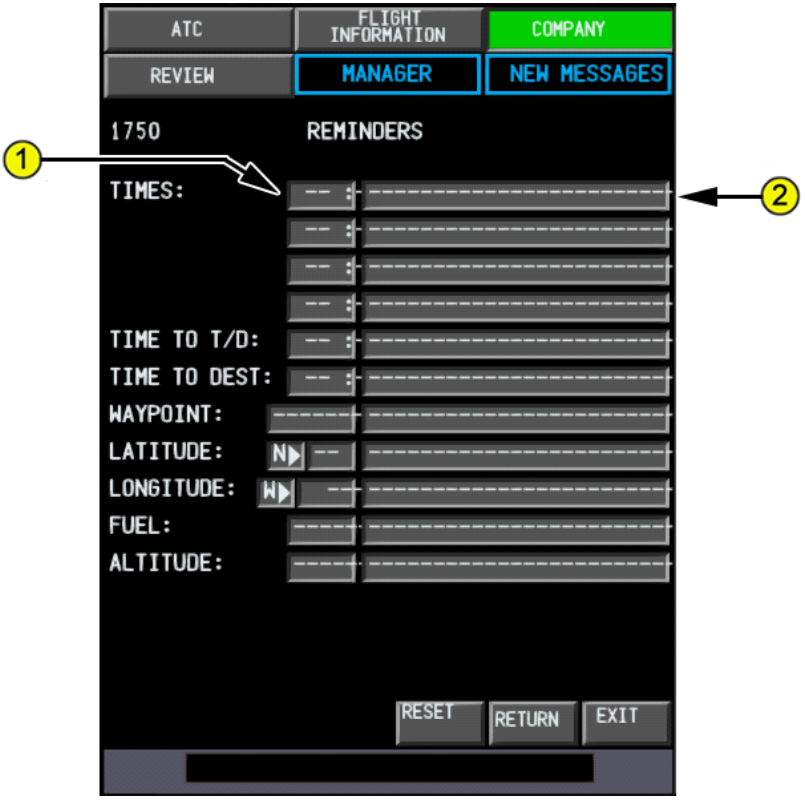
Press the SEND Button

After sending the information request, the received weather requests will automatically show in the MESSAGES tab that will open automatically.

Departure Report

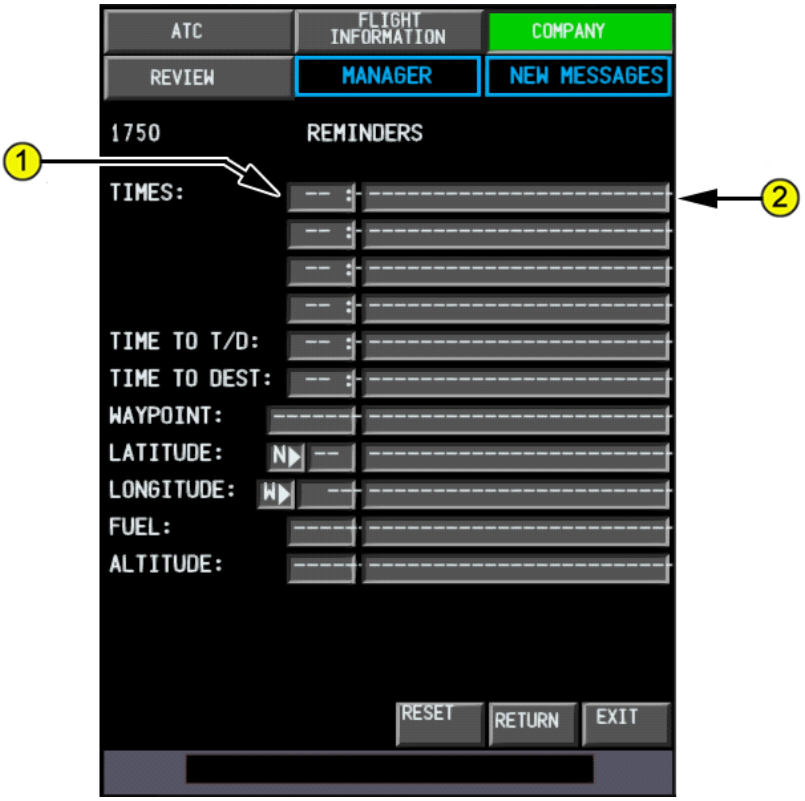
The Departure Report page automatically shows the following information:

- Out Time - Time that the aircraft departed the Gate
- Off Time – Time that the aircraft took off
- Fuel on Board – Total Fuel Quantity at departure
- Takeoff N1 – Takeoff N1
- Takeoff Flaps – Flaps used for takeoff



Reminders

The Reminders page allows you to manually enter reminders for several preset event types. When activated, Reminders show on the AUX Display of the PFD.



1. **Reminder Condition Column**
   Allows for the entry of a specific condition for a reminder. For instance, up to 4 entries are available for reminders at a UTC certain time in the **TIMES** section. If you wanted to be reminded about something at a certain amount of **TIME TO TOP OF DESCENT** or **TIME TO A DESTINATION**, you would enter the time in Minutes to those points. If you want to be reminded about reaching a specific **WAYPOINT, LATITITUDE** or **LONGTITUDE**, enter the info in the appropriate box. Reminders when you reach a specific **FUEL** Quantity or **ALTITUDE** are also available

2. Free Text

Entry of text that you would like to see for your specific reminder can be entered in this column. For instance, if you want to remind yourself to do something at a certain time, enter the UTC time that you would like to be reminded and then in the free text section for that time – enter the reminder information.

Displays – INFO Page

The INFO Page is shown by pushing the (INFO) display switch on the display select panel. The INFO Display allows access to the following pages:

INFO

- When a route is executed, shows departure airport information
- Shows arrival airport information 25 miles away from arrival

QW Config

- Allows for the selection of many customizable options

APP (Approach) Config

- Allows for quick approach setups

Jump Ahead

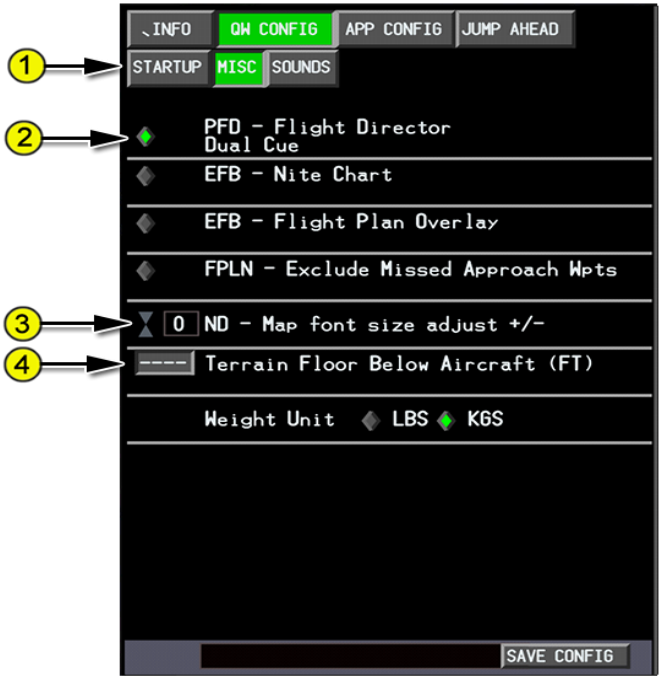
- Allows you to "Jump Ahead" in your flight

Note: The Airport Map Database shown on the lead page is NOT Selectable

QW Config

The QualityWings Config Page allows you to fully customize your 787 experience. There are 4 Option Category Pages:

- Startup
- Misc
- Sounds
- Display Units



1. Option Category Selection Button
2. Option Selection (Radio Button type)
   Select the button for the appropriate item to set options for that category...
3. Option Selection Adjustment Arrows
   Select UP arrow to increase value or DOWN arrow to decrease value. Value will be shown in adjacent box
4. Option Selection Number Box
   Use MFK to enter value into INFO page scratchpad, then select the box to transfer it into the box
5. Option Selection Button

Startup Options

- IRS Alignment Time (In Seconds)
  Choose how long you want IRS alignment to take
- CDU - Check Navdata Status
  If you get tired of the message alerting you that your Nav Data AIRAC Cycle is out dated, disable this
- ND – Minimum Runway Length (Airports)
  Sets the minimum runway length for an airport to display on the ND
- Battery Drain Time (In Seconds)
  Sets the time needed for the battery to drain

Misc Options

- EFB Nite Chart
  Enables Nite Mode of EFB by default
- EFB – Flight Plan Overlay
  Overlays active route on the EFB Terminal Charts
- FPLN – Exclude Missed Approach Wpts
  Removes Missed approach Waypoints from the Flightplan
- Weight Unit
  Allows for selection of weight in LBS or KGS
- Pause at TOD
  Allows for the selection of the simulator to be paused at the Top of Descent or for the simulation rate to be reduced to 1X if it were at a higher simulation rate
- Panel Autosave EnRoute
  Allows for Automatic saving of the panel settings at regular intervals
- Auto Step Climb
  Allows for the aircraft to perform Automatic Step Climbs
- Cabin Air Temp Unit
  Allows for selection of temperature in °F or °C
- FS2Crew
  Enables third party FS2Crew functionality (active after a restart)

Sounds Options

- Play Announcements (QWPAS)
  Turns QWPAS System On or Off
- GPWS Callouts
  Allows selection of Callouts
- Play Crew Announcements (QWCAS)
  Turns QWCAS System On or Off
- Mute on Lost Focus
  Allows to play sounds even when Flight Simulator window is not active

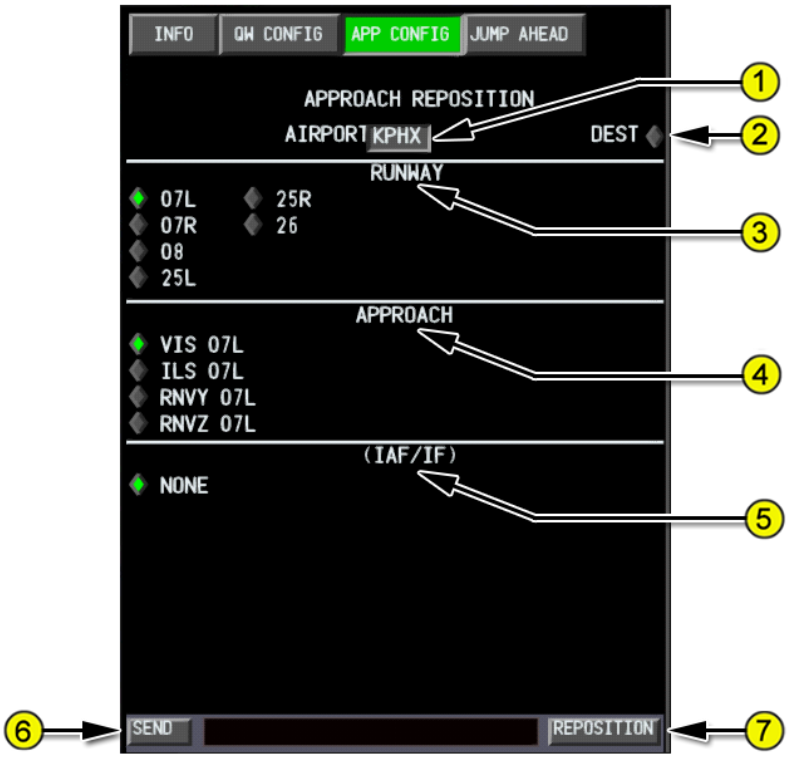
Display Units

- PFD Flight Director Dual Cue
  If selected Dual Cue option is selected
  If deselected, single cue is selected
- ND Map Font Size Adjust
  Allows adjustment of the ND Map fonts if readability is a problem
- Terrain Floor Below Aircraft (In Feet)
  Allows adjustment of the Terrain below aircraft
- Display Units Brightness Adjustment
  Allows for setting the default DU brightness (in %)
- VSD Terrain Always ON
  Allows for VSD Terrain to remain on at all times
- HUD Brightness Adjustment
  Allows for setting the default HUD brightness (in %)

QWTip: *This section will grow as we implement more of the options into the displays.*

APP Config

Not in the mood to load a flightplan? Think takeoff and cruise phases of flight are boring? Then you're going to love our new Approach Configuration Option. Whether you're inflight or just sitting on the tarmac, you can reposition this aircraft for a Visual or Instrument Approach to the Airport runway of your choosing. Once reposition, the simulator will be paused and you can set the aircraft up to suit the type of approach you've selected and how you want to fly it. Select the Autopilot ON if you want Autopilot guidance or hand fly her in using the flight director. Your choice.



1. **Airport Selection Box**
   Use the MFK to enter the desired ICAO airport code. Once a valid airport is entered, then the RUNWAY, APPROACH and IAF/IF options will be shown on the display.

2. **Destination Selection**
   If you have a Route loaded, selecting DEST takes your Route Destination and enters it into the Airport Selection box
3. **Runway Options**
   Once the airport has been selected, the available Runways are displayed. Choose a runway by selecting the adjacent radio button
4. **Approach Options**
   Once the runway has been selected, the available approach types are displayed. By default, a Visual Approach is selected. Choose an approach type for the selected runway by selecting the adjacent radio button

***QWTip**: Approach Charts for any selected Instrument Approaches will automatically display on the EFB*

5. **Initial Approach Fix (IAF/IF)**
   Displays the Initial Approach Fix or Initial Fix for any selected Instrument Approaches. If a Visual Approach is selected, then NONE will be the only selection available and NONE will remain selected.
6. **SEND Button**
   Sends the ICAO Airport code that you entered into the Airport Box.
7. **REPOSITION Button**
   Repositions aircraft based on all options selected. The Simulator will load Paused, at around 220 knots. Set options as needed.

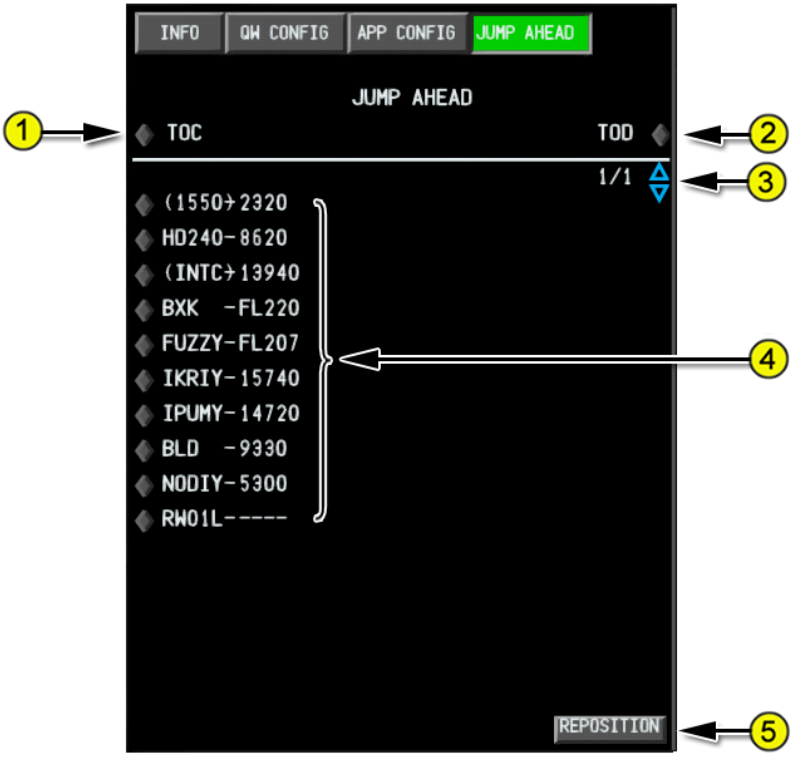
Approach Config Limitations

Approach Config will load paused to allow you to set up some remaining options before you un-pause:

- Turn off BOTH Flight Director Switches
- Turn on Captains Flight Director Switch
  - Confirm the Autoflight Mode on PFD is FLT DIR
- Click Autopilot CMD Switch
  - Confirm the Autoflight Mode on PFD is A/P
- Arm both Autothrottle Switches
- Click A/T Mode Switch
  - Confirm the A/T mode on FMA is SPD
- Click APP mode button on MCP
  - Confirm that LOC/GS is armed (or engaged) depending on approach type selected if you're doing an IFR approach
- Set Flaps to 15 Units
  - The Flaps will not move while paused, but you can see the magenta target for 15
- Confirm that MCP Speed is approx. 210 knots. If not, set it to 210 knots

Jump Ahead

QualityWings is pleased to introduce this new time saving feature for the 787 that allows you to skip ahead during your flight. Jump Ahead accounts for the change in aircraft weight along the route as well as the change in time/date. Jump Ahead only works when you have an Active Route and Active Cruise Altitude loaded in the Flight Management System.



1. **TOC (Top of Climb) Selector**
   Allows you to Jump Ahead to the Predicted Top of Climb
2. **TOC (Top of Descent) Selector**
   Allows you to Jump Ahead to the Predicted Top of Climb

3. **Page Selector**
    - Unavailable and Shows in cyan if there is only one page of waypoints,
    - Buttons turn grey and become selectable if there is more than more than one page of waypoints
4. **Available Waypoint Selector**
5. **Reposition Button**
   After selecting an available waypoint, TOC or TOD, clicking this button will reposition the aircraft. The Simulator will load Paused, at the appropriate speed and altitude of the selected Jump Ahead point.

Heads-Up Display (HUD)

Introduction

The airplane is equipped with two head-up displays (HUD); one for each pilot. The system projects flight data symbology onto a transparent glass "combiner" screen in the pilot's forward field of vision. This allows the pilot to see the data while looking through the forward windscreen. All information displayed on the HUD combiner is green.

The HUD and PFD receive flight data from the same sources, thus HUD indications match (repeat) PFD indications, though data format and Symbology may differ.

HUD Controls

To deploy the HUD, click on the HUD bracket or the cushioned pad on the glareshield as indicated in the graphic below. The HUD system does not have an ON/OFF switch. Manipulation of the FMS, EFIS, and MCP controls determines data output on both the HUD and PFD.

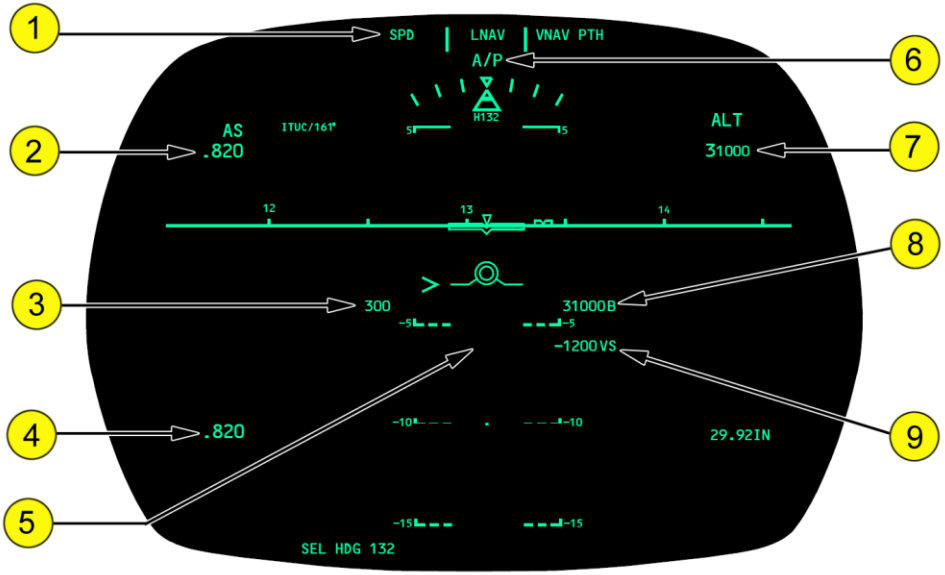
Symbology Control Switch

Symbology control switches located on the outboard side of each control wheel allow the pilot to alternate between the Full Symbology and Decluttered Display Modes.

Full Symbology Mode

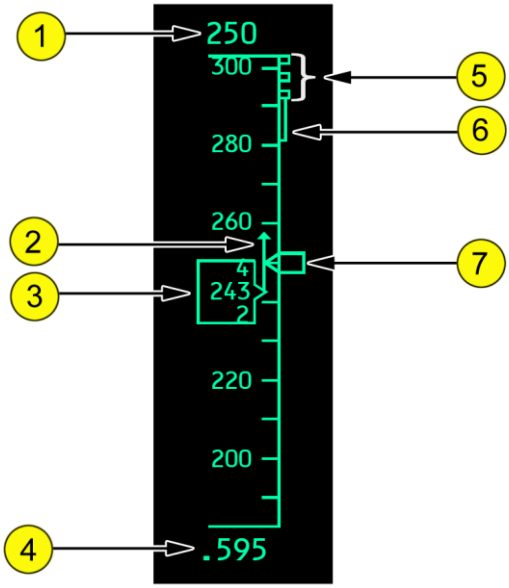
1. **Flight Mode Annunciations**
2. **Airspeed/Mach Indications**
3. **Attitude, Steering, and Miscellaneous Indications**
4. **Autopilot, Flight Director System Status**
5. **Altitude Indications**
6. **Vertical Speed Indication**
   Displays ADRS vertical speed.
7. **Compass Rose**
   Displays current IRS heading, track, and other related information.

Decluttered Symbology Mode



1. **Flight Mode Annunciations**
2. **Selected Speed**
3. **Current Airspeed**
4. **Current Groundspeed/Mach**
5. **Attitude, Steering, and Miscellaneous Indications**
6. **Autopilot, Flight Director System Status**
7. **Selected Altitude**
8. **Current Altitude**
9. **Vertical Speed Indication**
   Displays current ADRS vertical speed.

HUD Airspeed Indications

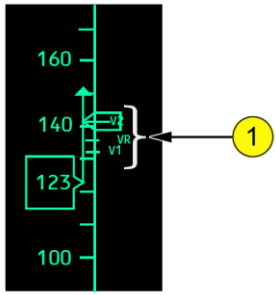


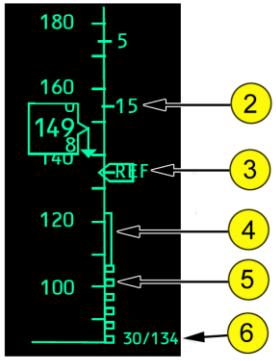
1. **Selected Speed**
2. **Speed Trend Vector**
3. **Current Airspeed**
   Indicates current ADRS airspeed.
   The box around the current airspeed indication flashes when airspeed is below minimum maneuvering speed.
4. **Current Groundspeed/Mach**
   Displays current groundspeed or Mach (if Mach is 0.40 or greater).
   When a transition occurs between the display of groundspeed and Mach number, the new display is highlighted with a box for 10 seconds.
5. **Maximum Speed**
6. **Maximum Maneuvering Speed**

Bottom of the bar indicates the maximum maneuvering speed. This airspeed provides 1.3 g maneuver capability to high speed buffet (or an alternative approved maneuver capability as preset by maintenance).

7. **Selected Speed Bug**

HUD Reference Speeds





1. **Takeoff Reference Speeds**
2. **VNAV Speed Band**
3. **Flap Maneuvering Speeds**
4. **Landing Reference Speed**
5. **Minimum Maneuvering Speed**

Top of bar indicates minimum maneuvering speed. This airspeed provides:

• 1.3 g maneuver capability to stick shaker below approximately 20,000 ft

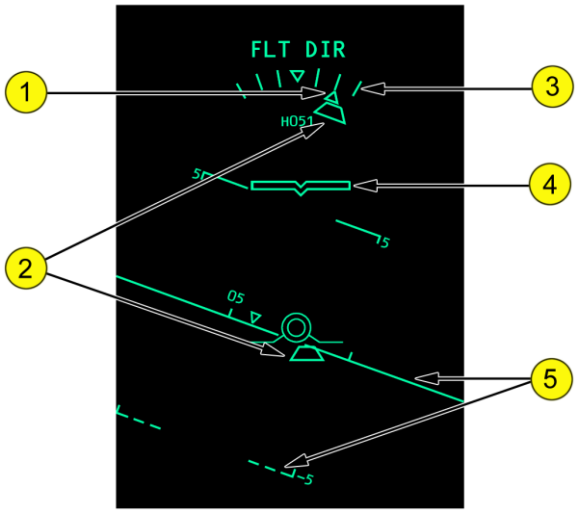
• 1.3 g maneuver capability to low speed buffet above approximately 20,000 ft

Displayed with first flap retraction after takeoff.

6 Minimum Speed

7 Landing Flap and VREF Speed

HUD Attitude Indications



1. Bank Pointer

Indicates ADRS bank in reference to the bank scale.

Fills if bank angle is 35º or more.

2. Slip/Skid Indications

Displaces to indicate slip or skid.

Fills at full scale deflection.

3. Bank Scale

Fixed reference for the bank pointer.

Scale marks are at 0º, 10º, 20º, 30º.

Enhanced scale marks at 45º and 60º are added to the scale if the airplane bank is within 10º of those bank angles.

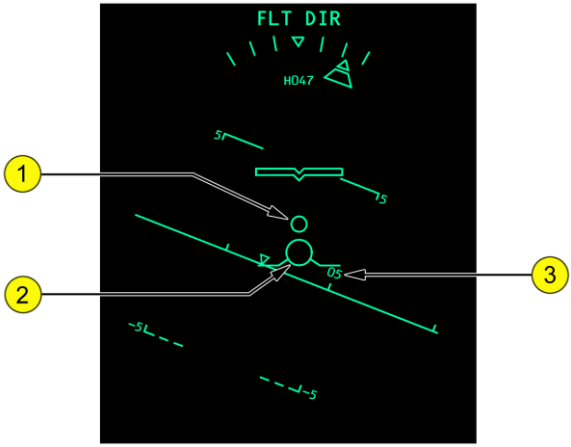
4. Airplane Symbol

5. Horizon Line and Pitch Scale

Indicates the IRS horizon and degrees of pitch.

Pitch scale displays 5º increments.

HUD Steering Indications



1. Flight Director Guidance Cue

Indicates flight director pitch and roll steering commands.

QWTip: *For more information about the Flight Director, see the Autoflight section.*

2. Flight Path Vector Symbol (FPV)

Displays current flight path angle and drift angle during flight:

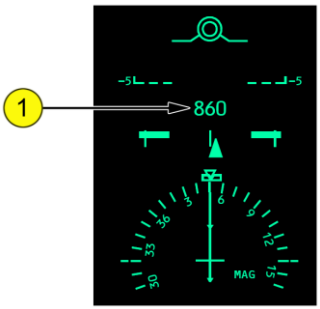
- flight path angle is depicted by the flight path vector symbol position on the pitch scale
- drift angle is represented by the perpendicular distance from the line drawn through the center of the pitch scale to the center of the flight path vector symbol
- shows as dashed lines instead of solid lines when limited laterally by other symbology or the display field-of-view

3. Horizon Line Heading Scale

Displays current heading.

Has tic marks every 5º and labels every 10º representing the heading value. Current heading is located at a point on the horizon line where a line drawn perpendicular to the horizon line goes through the center of the airplane symbol.

HUD Radio Altitude Indications



Radio Altitude

Referenced to the flight path vector symbol. The radio altitude indication maintains a set distance directly below the flight path vector symbol:

- displays below 2,500 feet AGL
- is boxed for 10 seconds after descending through 2,500 feet AGL
- is boxed when descending below radio altitude minimums. Box blinks for 2 seconds, then is steady

HUD Instrument Landing System Indications

1. Approach Reference

Displays the selected ILS/GLS identifier or frequency, approach front course, and ILS/GLS DME distance, and source annunciation.

2. Localizer Pointer and Scale

The pointer indicates the localizer relative to the airplane position

3. Glideslope Pointer and Scale

The pointer indicates the glideslope relative to the airplane position

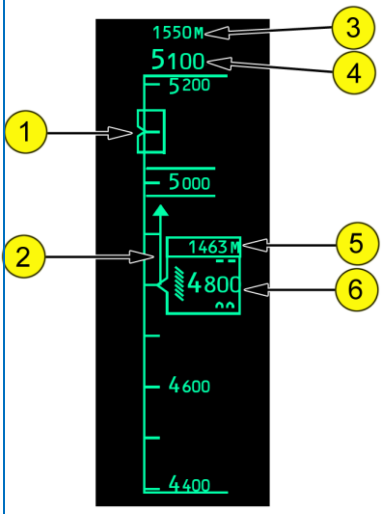
4. Marker Beacon Indication

The marker beacon indication appears flashing when over one of the marker beacon transmitters:

- IM – an airway or inner marker beacon
- MM – a middle marker beacon
- OM – an outer marker beacon

The indication flashes in cadence with the beacon identifier.

HUD Altitude Indications



1. Selected Altitude Bug
2. Altitude Trend Vector
3. Selected Altitude – Meters
4. Selected Altitude

Displays the altitude set in the MCP altitude window.

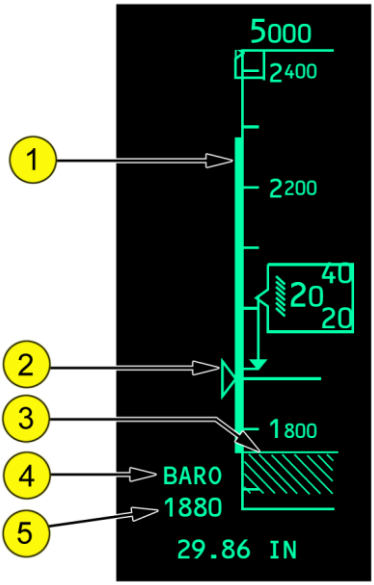
The selected altitude is boxed between 750 feet and 200 feet prior to reaching the selected altitude.

1. Current Altitude – Meters
2. Current Altitude

Indicates current ADRS altitude.

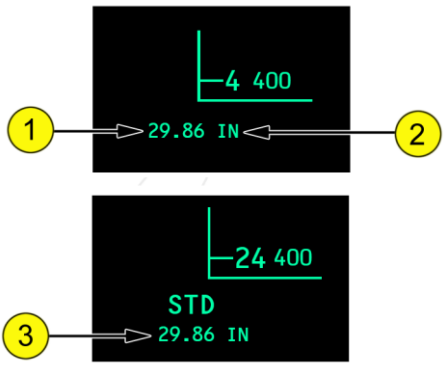
When deviating beyond 200 feet from selected altitude, boxed outline around current altitude flashes. Alerting terminates if deviation continues beyond 750 feet from selected altitude.

HUD Landing Altitude/Minimums Indications



1. Landing Altitude Reference Bar
Indicates height above touchdown.
2. BARO Minimums Pointer
When BARO minimums are displayed, the number is also represented as a triangular bug and line on the altitude scale.
3. Landing Altitude Indication
4. Minimums Reference
Displays BARO when the EFIS control panel MINS reference selector is set to BARO.
Displays RADIO when the EFIS control panel MINS reference selector is set to RADIO.
5. Minimums
Displays the approach minimums altitude set using the EFIS control panel MINS selector:
• BARO minimums are feet MSL
• RADIO minimums are radio altitude feet AGL

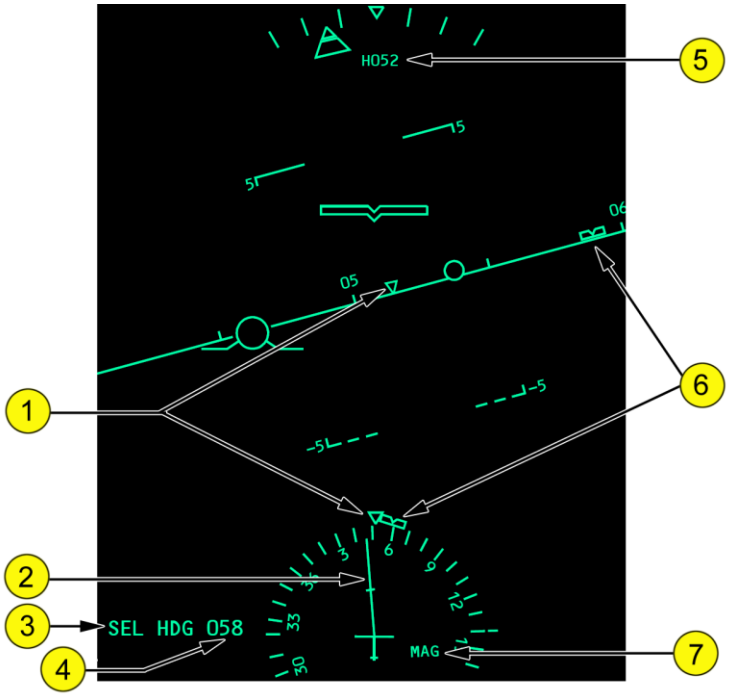
HUD Barometric Indications



1. Barometric Setting
Indicates the barometric setting selected on the EFIS control panel barometric selector.
STD is displayed when STD is selected on the EFIS control panel barometric STD switch.
The display is boxed if a barometric setting is set and altitude climbs above the transition altitude, or if STD is set and altitude descends below the transition flight level.
2. Barometric Reference
3. Preselected Barometric Setting

HUD Heading/Track Indications

- Note: The selected track bug and selected heading bug are not displayed at the same time.



1. **Current Heading Pointer**
2. **Track Line**
   Indicates the current track and drift angle.
3. **Selected Heading/Track Reference (MCP Selection)**
   When HDG (heading) is selected, SEL HDG is displayed.
   When TRK (track) is selected, SEL TRK is displayed.
   If selected heading/track exceeds display range, the bug parks on the side of the compass rose and horizon line heading scale, in the direction of the shorter turn to the heading. The symbol's outline is depicted with dashed lines, indicating that it can no longer display the selected heading/track.
4. **Selected Heading/Track (MCP Selection)**
   Digital display of the selected heading or track bug.

5. **Digital Heading**
   Digital heading displays current heading and corresponds to the heading on the horizon reference line.
6. **Selected Heading/Track Bug (MCP Selection)**
7. **Heading/Track Reference**
   Displays the automatic or manually selected heading/track reference:
   - MAG (magnetic north)
   - TRU (true north)

Glareshield Panel

1. **Accept/Cancel/Reject & Master Warning/Caution Switchlight**
2. **EFIS Control Panels**
3. **Display Select Panels**

QWTip: *More information about the EFIS Control Panels and Display Select Panels can be found in the Displays In-Depth section*

4. **Autoflight Mode Control Panel**

QWTip: *More information can be found in the Autoflight section*

Master WARNING/CAUTION Reset Switches and Lights

1. Master WARNING/CAUTION Reset Switch

Push –

- extinguishes master WARNING lights
- extinguishes master CAUTION lights
- silences the aural that accompanies the EICAS warning messages:
- •CABIN ALTITUDE
- •CONFIG GEAR, if displayed because landing gear not down and locked, any thrust lever at idle, and radio altitude less than 800 feet
- •FIRE
- •STABILIZER

2. •Master WARNING Light

Illuminated (red) –

- new EICAS warning message displayed, or
- ENGINE FAIL, PULL UP, or WINDSHEAR alert displayed on PFD

3. Master CAUTION Light

Illuminated (amber) – new EICAS caution message displayed.

Datalink Accept/Cancel/Reject Switches (Typical)

1. Accept (ACPT) Switch (Reserved for future development)

Push –

- a positive response to a displayed message is downlinked to the origin of the displayed message
- functions the same as selecting an MFD communications display ACCEPT command key

2. Cancel (CANC) Switch

Push –

- the message is removed from the display
- functions the same as selecting an MFD communications display CANCEL command key

3. Reject (RJCT) Switch (Reserved for future development)

Push –

- a negative response to the displayed message is downlinked to the origin of the displayed message
- functions the same as selecting an MFD communications display REJECT command key

Traffic Alert & Collision Avoidance System (TCAS)

TCAS alerts the crew to possible conflicting traffic. TCAS interrogates operating transponders in other airplanes, tracks the other airplanes by analyzing the transponder replies, and predicts the flight paths and positions. TCAS provides TCAS ND messages, voice annunciations, PFD vertical flight path guidance, and traffic displays of the other airplanes to the flight crew. TCAS operation is independent of ground–based air traffic control.

TCAS identifies a three–dimensional airspace around the airplane where a high likelihood of traffic conflict exists. The dimensions of this airspace are contingent upon the closure rate with conflicting traffic.

TCAS provides:

- resolution advisor (RA) and display
- traffic advisory (TA) and display
- proximate traffic display
- other traffic display

TCAS messages and TCAS traffic symbols can be displayed on the ND and mini-map. TCAS messages and TCAS traffic symbols cannot be displayed on the ND in plan mode.

TCAS messages TRAFFIC and TA ONLY may be displayed in all ND modes.

Resolution Advisories (RA) and Display

An RA is a prediction that another airplane will enter the TCAS conflict airspace within approximately 15 to 35 seconds

When TCAS predicts an RA:

- the TCAS red message TRAFFIC is displayed on the ND
- a TCAS voice annunciation sounds
- TCAS PFD vertical guidance is displayed

When the TCAS cyan message TFC is displayed on the ND, and the RA is within the display range of the ND, the TCAS RA Traffic symbol and its accompanying data tag is displayed on the ND.

The TCAS RA Traffic symbol is a filled red square. The RA data tag contains the altitude and the vertical motion arrow.

TRAFFIC, and the RA data tag information is displayed to the right of the label. The RA red data tag contains the distance, altitude, and the vertical motion arrow.

Traffic Advisories (TA) and Display

A TA is a prediction that another airplane will enter the conflict airspace in 20 to 48 seconds. TAs assist the flight crew in establishing visual contact with the other airplane.
When TCAS predicts a TA:

- the TCAS amber message TRAFFIC is displayed on the ND
- the TCAS voice annunciation TRAFFIC, TRAFFIC sounds once

When the TCAS cyan message TFC is displayed on the ND and the TA is within the display range of the ND, the TCAS TA Traffic symbol and its accompanying data tag are displayed on the ND.
The TA Traffic symbol is a filled amber circle. The TA data tag contains the altitude and the vertical motion arrow.
The TA labels are displayed below the RA labels. The TA data tag contains the distance, altitude, and vertical motion arrow.
When the TA is further from the airplane than the ND range currently displayed, the TCAS amber message OFFSCALE is displayed on the ND.

Proximate Traffic Display

Proximate traffic is another airplane that is neither an RA nor a TA but is within:

- six miles, and
- 1,200 feet vertically

When the TCAS cyan message TFC is displayed on the ND, and the Proximate Traffic is within the ND display range, the TCAS Proximate Traffic symbol is displayed on the ND.
The TCAS Proximate Traffic symbol is a filled white diamond. If the other airplane is providing altitude data, the Proximate Traffic data tag is displayed on the ND. The proximate traffic data tag contains the altitude and vertical motion arrow.

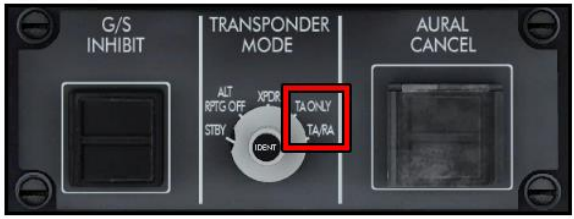
TCAS PFD Vertical Guidance

When TCAS predicts an RA, TCAS vertical guidance is displayed on the PFD for a maneuver to ensure vertical separation. Traffic avoidance is ensured by adjusting or maintaining a pitch attitude and vertical speed outside the displayed RA regions.
TCAS Guidance on the HUD is planned for future development

TCAS Normal Operation

TCAS is controlled from the Alerting and Transponder Control panel (ATP). TA/RA is normally selected. However, it is sometimes necessary to select TA ONLY to prevent nuisance RAs.

TCAS Controls (Alerting and Transponder Control Panel)



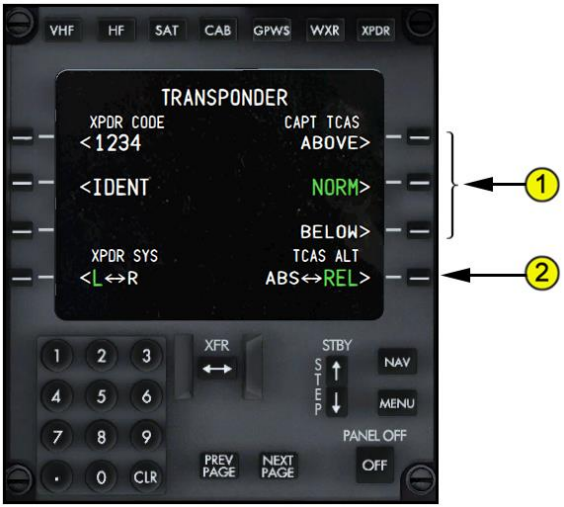
Transponder Mode Selector

TA ONLY (traffic advisory) –

- transponder and TCAS TA modes enabled
- all airplanes that would have been predicted as a RA are predicted as a TA

TA/RA (traffic advisory/resolution advisory) – transponder and TCAS TA and RA modes enabled.

TCAS Controls (Tuning and Control Panel)



1. XXXX TCAS Display

Push – selects the desired TCAS display mode.

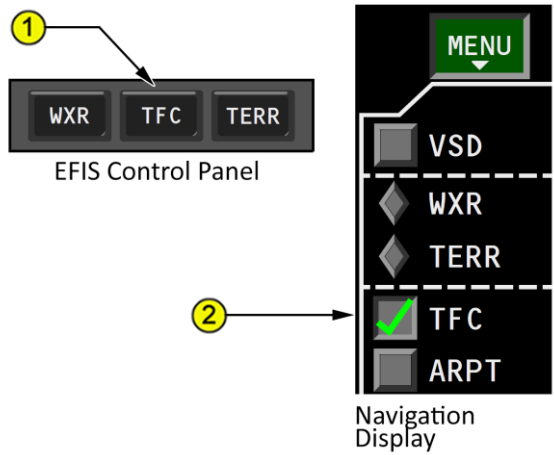
- ABOVE – displays TCAS traffic vertically from 2,700 feet below to 9,900 feet above current flight altitude.
- NORM (normal) – displays TCAS traffic vertically from 2,700 feet below to 2,700 feet above current flight altitude.
- BELOW – displays TCAS traffic vertically from 9,900 feet below to 2,700 feet above current flight altitude.
- The selected mode is highlighted in large green font.

2. XXXX TCAS Altitude (ALT)

Push – toggles traffic altitude readings between absolute altitude and relative altitude.

- ABS (absolute) – traffic absolute altitude readings show.
- REL (relative) – traffic relative altitude readings show.
- The selected mode is highlighted in large green font.

TCAS Display Selection



1. Traffic (TFC) Switch

Push –

- selection applied to both the navigation display and the PFD mini-map
- 80 mile range
- TFC displayed in cyan on the lower left of navigation display and mini-map
- traffic data displayed in MAP or MAP CTR modes Second push – deselects traffic display.

2. Traffic (TFC) Data Menu Selection

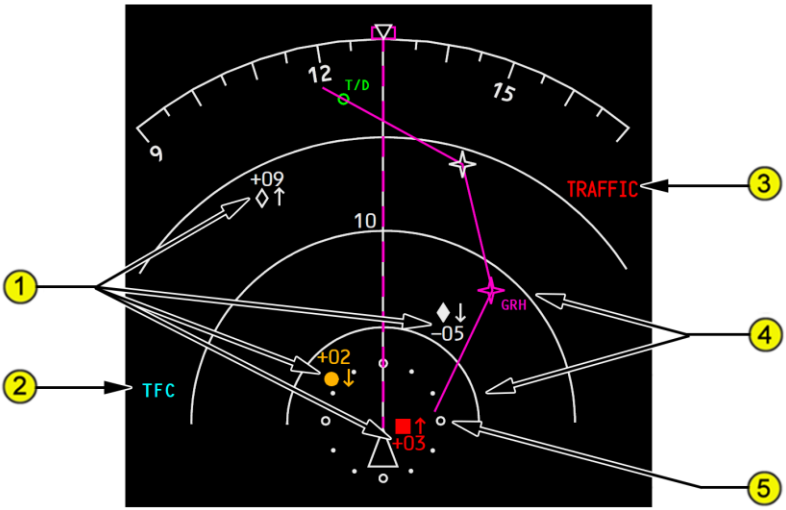
Selected –

- traffic data applied to navigation display only
- traffic data displayed in MAP or MAP CTR modes
- TFC displayed in cyan on the lower left of display

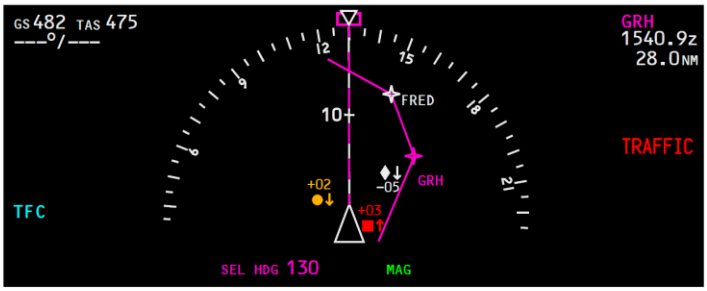
TCAS Traffic and Alert Message TRAFFIC Display

Displayed when TFC selected and respective ND is in MAP or MAP CTR mode.
Displayed automatically when:

- a RA or TA is occurring, and
- TFC not selected on either ND, and
- respective ND is in MAP or MAP CTR mode



Navigation Display



Mini-Map

1. Traffic Targets

Indicates relative position of traffic:

- filled red square indicates a resolution advisory (RA)
- filled amber circle indicates a traffic advisory (TA)
- filled white diamond indicates proximate traffic
- unfilled white diamond indicates other traffic
- number is relative or absolute altitude (as selected) of traffic in hundreds of feet; not displayed when altitude unknown
- vertical motion arrow indicates traffic climbing or descending at 500
- feet per minute or greater; not displayed for vertical motion less than 500 feet per minute

2. TCAS Mode Annunciations

TFC (cyan) –

- TCAS traffic display enabled
- TCAS traffic displayed in MAP or MAP CTR modes

TA ONLY (cyan) –

- TCAS cannot provide RAs
- all traffic that would have been RAs are predicted as TAs

3. TRAFFIC Alert Message

Displayed in all ND modes and ranges, whether TCAS traffic is displayed or not.

TRAFFIC (red) – RA is occurring.

TRAFFIC (amber) – TA is occurring, and RA is not occurring.

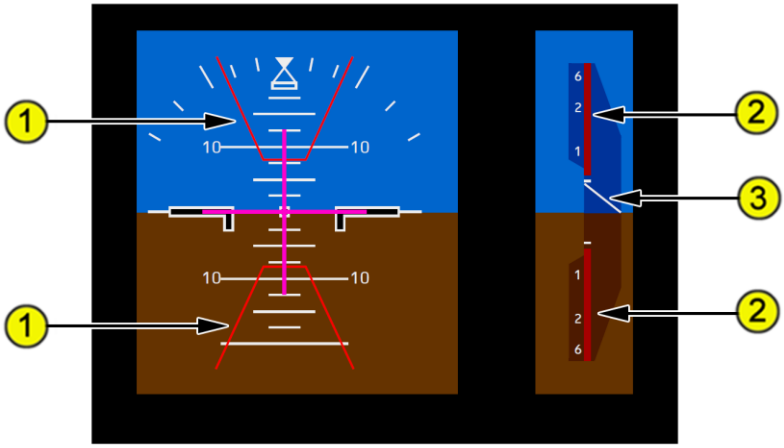
4. TCAS/Weather Radar Range Arcs

Displayed when TCAS or weather radar selected; replace range scale tics.

5. TCAS Three Mile Ring

Displayed when TCAS selected and range selected is less than 80 miles.

TCAS PFD Vertical Guidance



1. RA Pitch Region To Avoid (red outlined)

Displayed: (red) – RA is occurring.

· Note: For a single RA, only one red outlined RA pitch region, either above or below, is displayed at a time. For two or more RAs, two red outlined RA pitch regions may be displayed.

To ensure vertical separation, the center of the airplane symbol must be outside the red outlined RA pitch regions to avoid.

2. RA Vertical Speed Region to Avoid (red)

To ensure vertical separation, vertical speed must be outside the red RA vertical speed region to avoid.

3. Vertical Speed Pointer

Red – present vertical speed does not ensure RA traffic is avoided.

White – present vertical speed ensures RA traffic is avoided.

TCAS ND Messages

ND Message	Color	Description
TA ONLY	Cyan	TCAS cannot provide RAs. All traffic that would have been RAs are predicted as TAs.
TCAS FAIL	Amber	TCAS failed, or TCAS information cannot be displayed on ND.
TCAS OFF	Amber	TFC switch pushed to display traffic but TCAS not selected on transponder panel.
TFC	Cyan	TCAS traffic display enabled. Inhibited if following TCAS messages are displayed: TCAS FAIL, or TCAS OFF
TRAFFIC	Amber	TA is occurring
TRAFFIC	Red	RA is occurring

TCAS Voice Annunciation

Voice Annunciation	Condition	Response
LEVEL OFF, LEVEL OFF	Present pitch attitude and vertical speed are within the RA regions.	Reduce vertical speed to zero. Adjust pitch attitude and vertical speed to remain outside the RA regions.
CLEAR OF CONFLICT	TCAS PFD vertical guidance is no longer displayed and traffic changes to a TA symbol. Separation is increasing and the RA will not occur. However, the voice annunciation does not sound if TCAS can no longer predict the track of the RA airplane.	Attempt to visually locate traffic.

CLIMB, CLIMB	New RA, initial voice annunciation. Present pitch attitude and vertical speed are within the RA regions.	Increase pitch attitude and vertical speed to remain outside the RA regions.
DESCEND, DESCEND	New RA, initial voice annunciation. Present pitch attitude and vertical speed are within the RA regions.	Decrease pitch attitude and vertical speed to remain outside the RA regions.
MONITOR VERTICAL SPEED	New RA, initial voice annunciation. Present pitch attitude and vertical speed are outside the RA regions.	Continue to keep pitch attitude and vertical speed outside the RA regions.
TRAFFIC, TRAFFIC	New TA, initial voice annunciation.	Attempt to visually locate traffic.

TCAS Symbology

Symbol	Name	ND Mode	Remarks
	TCAS resolution advisory (RA), relative altitude (R)	MAP, MAP CTR, mini-map	The arrow indicates traffic climbing or descending at a rate greater than or equal to 500 fpm. At rates less than 500 fpm, the arrow is not displayed. The number and associated signs indicate altitude of traffic in hundreds of feet relative to the airplane. The number is below the traffic symbol when the traffic is below, and above the traffic symbol when the traffic is above the airplane. Absence of the number implies altitude unknown.
	TCAS traffic advisory (TA), relative altitude (A)		
	TCAS proximate traffic, relative altitude (W)		
	TCAS other traffic, relative altitude (W)		
	TCAS traffic alert message (RA–R, TA–A)	All	Displayed whenever a TCAS RA or TA is active. EFIS control panel TFC switch does not have to be selected on.
	TCAS mode (C)	MAP, MAP CTR, mini-map	Indicates the ND TCAS display is active.

	TCAS mode (C)	All	Indicates TCAS computer is not computing RAs. Displayed whether the EFIS control panel TFC switch is selected on or off.
	TCAS mode (A)	MAP, MAP CTR, mini-map	Displayed when the TCAS/ATC mode switch is not in TA ONLY or TA/RA, if traffic is selected. Not displayed if TCAS is failed.

Ground Proximity Warning System

Introduction

GPWS provides immediate alerts, and look-ahead obstacle and terrain alerts for potentially hazardous flight conditions involving imminent impact with the obstacles and the ground.

GPWS immediate alerts are based on radio altitude, barometric altitude, ADRS, glideslope deviation, and airplane configuration. GPWS alerts are provided for:

- altitude loss after takeoff or go-around, or
- excessive and severe descent rate, or
- excessive terrain closing rate, or
- unsafe terrain clearance when not in the landing configuration, or
- excessive deviation below ILS glideslope

GPWS provides bank angle voice annunciations and altitude voice annunciations during approach

GPWS also provides look-ahead terrain mode alerts by monitoring terrain proximity using the flight simulator terrain database. Proximate terrain data may be displayed on the NDs, VSDs, and mini-maps. If there is a potential terrain hazard, GPWS look-ahead alerts are provided based on estimated time to impact.

- Note: Terrain ahead of the airplane may exceed available climb performance. A GPWS caution or warning does not guarantee terrain clearance.

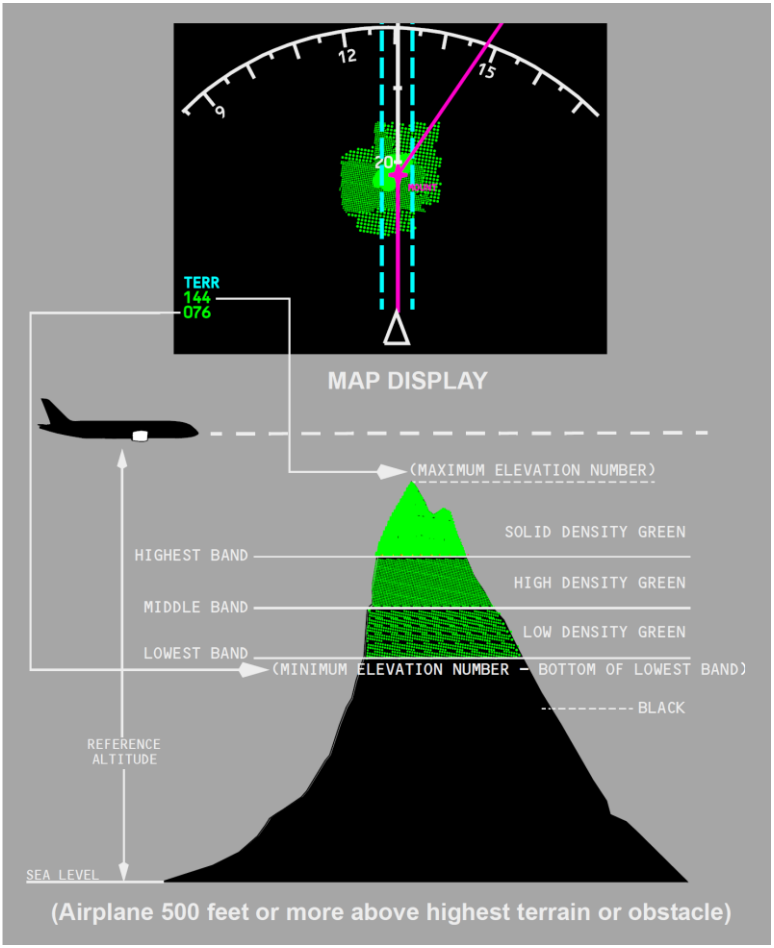
GPWS Look–Ahead Terrain Mode

A GPWS terrain database contains detailed terrain data. Terrain data is not designed to be used as an independent navigation aid.

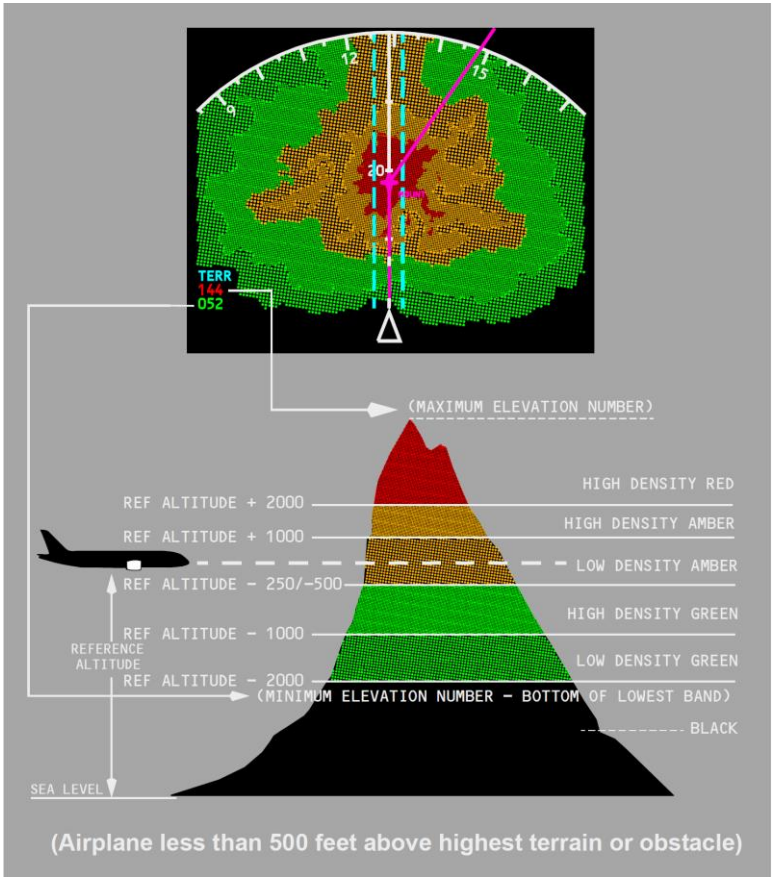
Selecting the ND TERR switch on the EFIS control panel displays obstacles, terrain, and the TERR indication on the NDs and mini-maps. Terrain and obstacles can also be displayed on the ND only (excluding mini-map) by selecting TERR on the ND drop-down menu.

The elevation of the highest and lowest terrain or obstacle is displayed on the ND in hundreds of feet above sea level (MSL) below the TERR indication. The color of each value corresponds to the color of the respective contour depicted.

When the airplane is 500 feet or more above the highest terrain or obstacle in the selected display range, terrain peaks are depicted independent of airplane altitude by three shaded contours of green. The highest terrain are depicted by solid green, intermediate height terrain are depicted by high density dotted green, and the lowest height terrain or obstacles are depicted by low density dotted green.



When the airplane is less than 500 feet above the highest terrain peaks in the selected display range and terrain peaks are depicted in varying densities of green, amber, and red, depending on the airplane height relative to the terrain or obstacle.



When a terrain alert occurs, the respective message is displayed on the ND. Terrain and weather radar cannot be simultaneously displayed on the same ND or mini-map, although, for example, a pilot can display weather on his ND, and terrain on his mini-map.

GPWS Look-Ahead Terrain Alerts

Voice Annunciation	Condition	Response
CAUTION TERRAIN	Master CAUTION lights Amber CAUTION TERRAIN EICAS message Amber TERRAIN on the NDs and mini-maps	40 to 60 seconds from projected impact with terrain.
TERRAIN TERRAIN (Whoop, Whoop) PULL UP	Master WARNING lights Red PULL UP on both PFDs Red TERRAIN on the NDs and mini-maps	20 to 30 seconds from projected impact with terrain.

GPWS Immediate Alerts

Voice Annunciation	Condition	Response
DON'T SINK	Master CAUTION light Amber DON'T SINK EICAS message	Altitude loss with flaps and/or gear up after takeoff or go-around.
GLIDESLOPE	Master CAUTION light Amber GLIDESLOPE EICAS message Amber BELOW G/S displayed on G/S INHIBIT switch	Excessive deviation below glideslope or glidepath. Pushing the G/S INHIBIT switch on the ATP inhibits the alert when pushed below 1,000 feet radio altitude.
Voice Annunciation	Condition	Response
PULL UP	Master WARNING lights Red PULL UP message on both PFDs	Follows SINK RATE alert when descent rate becomes severe, or follows TERRAIN alert with flaps and/or gear not in landing configuration when excessive terrain closing rate continues.
SINK RATE	Master CAUTION light Amber SINK RATE EICAS message	Excessive descent rate.

TOO LOW, FLAPS	Master CAUTION light Amber TOO LOW FLAPS EICAS message	Unsafe terrain clearance with flaps not in landing configuration at low altitude and airspeed. Push the FLAP OVRD (line select) soft key to OVRD on the GPWS page of the TCP to inhibit the alert.
TOO LOW, GEAR	Master CAUTION light Amber TOO LOW GEAR EICAS message	Unsafe terrain clearance with gear not in landing configuration at low altitude and airspeed. Push the GEAR OVRD (line select) soft key to OVRD on the GPWS page of the TCP to inhibit the alert.

Voice Annunciation	Condition	Response
TOO LOW, TERRAIN	Master CAUTION light Amber TOO LOW TERRAIN EICAS message	Follows DON'T SINK alert with gear and/or flaps up after takeoff or go-around for altitude loss at low altitude, or unsafe terrain clearance with gear and/or flaps not in landing configuration at low altitude and airspeed. Push the FLAP OVRD (line select) soft key to OVRD on the GPWS page of the TCP to inhibit the alert when the alert is due to flaps not in landing position. Push the GEAR OVRD (line select) soft key to OVRD on the GPWS page of the TCP to inhibit the alert, when the alert is due to gear not down.

Bank Angle Voice Annunciations

The voice alert BANK ANGLE sounds if bank angle exceeds 35°, 40°, and 45°.

Altitude Voice Annunciations during Approach

GPWS provides the following altitude voice annunciations during approach:

- 2500 feet – TWENTY–FIVE HUNDRED
- 1000 feet – ONE THOUSAND
- 500 feet – FIVE HUNDRED
- 100 feet – ONE HUNDRED
- 50 feet – FIFTY
- 40 feet – FORTY
- 30 feet – THIRTY
- 20 feet – TWENTY
- 10 feet – TEN
- 5 feet – FIVE

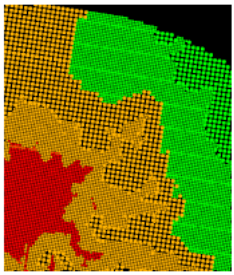
Approaching Minimums Voice Annunciation

GPWS provides the voice annunciation APPROACHING MINIMUMS at 100 feet above the altitude set by the Captain's MINS selector on the EFIS Control Panel.

Minimums Voice Annunciation

GPWS provides the voice annunciation MINIMUMS at the altitude set by the Captain's MINS selector on the EFIS Control Panel.

Look-Ahead Terrain Symbology

Symbol	Name	ND Mode	Remarks
	Terrain display (R, A, G, M)	MAP, MAP CTR, mini-map	Displays terrain data from the GPWS terrain database. Color and density vary based on terrain height vs. airplane altitude.
	Terrain mode annunciation (C); highest and lowest terrain or obstacle altitudes (R, A, G, M)	MAP, MAP CTR, mini-map	Look-ahead Peaks Terrain display enabled
	Terrain annunciation (R, A)	All	Look-ahead terrain caution alert active (A), look-ahead terrain warning alert active (R).

Weather Radar System Information

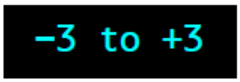
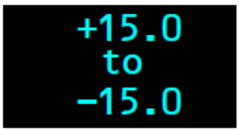
In order to have weather radar displayed in the QualityWings 787, you will need to have at least ActiveSky Next (or newer ActiveSky software) installed and running on your PC. Once ActiveSky is generating weather for your simulator, then it can be displayed.

The WXR switch on the EFIS control panel and the WXR check box on the ND drop-down menu perform the same function. Both control power to the transmitter/receiver and allow weather radar returns to display on the ND and/or mini-map.

***QWTip**: More information about the EFIS Control Panel and the Navigation Display Drop-Down Menu can be found in the Displays In-Depth section*

The radar display range automatically adjusts to the ND range selected on the EFIS control panel. |R| Weather Radar is available at ND ranges of 10NM through 160 NM on the QualityWings 787.

Weather Radar Symbology

Symbol	Name	ND Mode	Remarks
	WXR precipitation only mode (C)	MAP, MAP CTR, mini-map	Weather radar system is selected on the EFIS control panel or MAP mode drop-down menu.
	WXR and turbulence mode (C)		
	WXR receiver gain (C)		
	Mode used with down–tilt when ground mapping (C)		
	WXR antenna tilt (C)		

Forward Aisle Stand

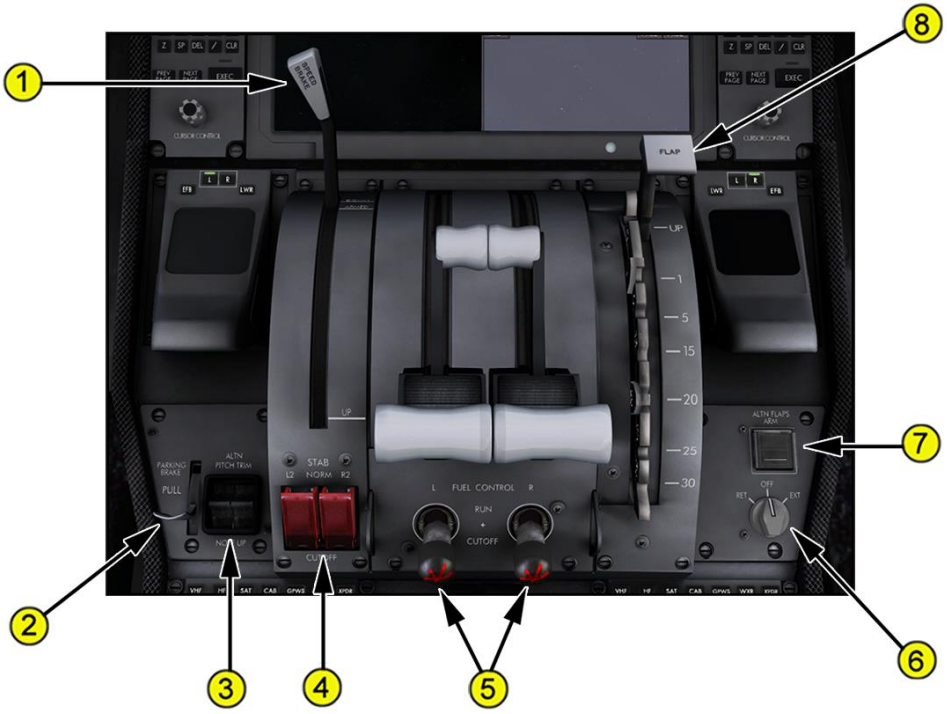
1. **Lower Display Unit**
2. **Multifunction Keypads**

***QWTip**: More information about the MFK can be found in the Displays In-Depth section*

Control Stand

1. **Control Stand**

Throttle Quadrant



1. Speedbrake Lever

On the ground:

- the speedbrake lever moves to DOWN and all spoiler panels retract if either thrust lever is advanced to the takeoff thrust position
- the speedbrake lever moves to UP and all spoiler panels extend if both reverse thrust levers are raised to the reverse idle detent

DOWN (detent) – all spoiler panels are retracted.

ARMED – the auto speedbrake system is armed.

UP – the required spoiler panels extend to their maximum in–flight or on–ground position (intermediate positions can be selected).

2. Parking Brake Lever

Pull – sets the parking brake when both brake pedals are simultaneously depressed.

Release – simultaneously depress both brake pedals.

3. **Alternate Stab Trim Switches**
   Spring-loaded to neutral.
   Push (both switches) –
   - on the ground, directly moves the stabilizer
   - in the air in normal mode, changes the trim reference airspeed
   - in the air in the secondary and direct modes, directly moves the stabilizer
4. **Stab Trim Cutout Switches**
   NORM – electrical power is supplied to the related stabilizer control unit
   CUTOUT – shuts off electrical power to the related stabilizer control unit.
5. **Fuel Control Switches**
   RUN –
   - opens the spar fuel valve
   - arms the engine fuel valve (the EEC opens the valve when required)
   - arms the selected ignitors (the EEC turns the ignitors on when required)

   CUTOFF –
   - closes the engine fuel valve (and spar fuel valve if start switch not in START)
   - removes ignitor power
   - unlocks the engine fire switch

   Illuminated (red) –
   - an associated engine fire is detected, or
   - the FIRE/OVERHEAT TEST switch is pushed
6. **Alternate Flap Selector Switch** (Reserved for future development)
7. **Alternate Flap Arm Switch** (Reserved for future development)
8. **Flap Lever**
   - Positions the slats and flaps hydraulically.
   - Flap positions for the 787-8 differ from the 787-9 and 787-10

Flap System Information

The flaps and slats are high lift devices that increase wing lift and decrease stall speed during takeoff, approach, and landing.
The airplane has an inboard and an outboard flap on the trailing edge of each wing, and one inboard and five outboard slats on the leading edge. A two-position Krueger flap provides a seal between the inboard slat and the engine nacelle on each wing.
There are Flap position differences between the 787-8 and the 787-9.

787-8

In the flaps 1 position, only the slats move. Flaps 5, 15, and 20 are takeoff flap positions. Flaps 25 and 30 are landing flaps positions. Flaps 20 is used for some non–normal landing conditions.

787-9

In the flaps 1 position, only the slats move. Flaps 5, 10, 15, 17, 18, and 20 are takeoff flap positions. Flaps 25 and 30 are landing flaps positions. Flaps 20 is used for some non–normal landing conditions.

To protect against inadvertent deployment during cruise, flap and slat extension from the UP position is inhibited when speed is more than 260 KIAS or altitude is above approximately 20,000 feet. This inhibit is only available in primary and secondary flap and slat modes.
On the QualityWings 787, only Primary Flap mode is simulated.

Flap/Slat Load Relief

In the primary mode, the flap load relief system protects the flaps from excessive air loads. If flap airspeed placard limits are exceeded with the flaps in the 15 through 30 position (787-8) or 10 through 30 position (787-9), LOAD RELIEF is displayed and the flaps automatically retract to a safe position appropriate to the airspeed. Load relief retraction is limited to flaps 5.
When airspeed is reduced, the flaps automatically re–extend as airspeed allows. Re–extension is limited to the commanded flap position.
The EICAS flap display indicates an in–transit flap condition and shows actual flap position. The flap lever does not move during flap load relief operation.

Flap Indications

Flap position indications are displayed on the primary EICAS display. More information about the Flap Position Indication on EICAS can be found here.

Pitch Trim Control Information

Primary pitch trim is controlled by the dual pitch trim switches on each control wheel. Both switches must be moved to command trim changes. The primary pitch trim switches are inhibited when the autopilot is engaged. Pitch trim does not move the control column.

In the normal mode, primary pitch trim operates differently on the ground than it does in flight. On the ground, the stabilizer is directly positioned when the pilot uses the pitch trim switches. Inflight, the pitch trim switches do not position the stabilizer directly, but make inputs to the PFCs to change the trim reference speed. The trim reference speed is the speed at which the aircraft would eventually stabilize if there were no control column inputs. Once the control column forces are trimmed to zero, the aircraft maintains a constant speed with no column inputs. Thrust changes result in a relatively constant indicated airspeed climb or descent, with no trim inputs needed unless airspeed changes.

When pilot trim inputs are made, the PFCs automatically move the elevators to achieve the trim change then move the stabilizer to streamline the elevator.

In the secondary or direct modes, primary pitch trim operates the same on the ground and inflight; the stabilizer is directly positioned when the pilot uses the primary pitch trim switches.

Alternate Pitch Trim

Alternate pitch trim is controlled by the dual pitch trim switches located on the control stand. Both switches must be moved to command trim changes.
Alternate pitch trim switches are inhibited when the autopilot is engaged. Pitch trim does not move the control column.
In the normal mode, alternate pitch trim operates differently on the ground than it does inflight. On the ground, the stabilizer is directly positioned when the pilot uses the alternate pitch trim switches. Inflight, the alternate pitch trim switches make changes to the trim reference speed. This is the same normal operation as the primary pitch trim switches.
In the secondary or direct modes, alternate pitch trim operates the same on the ground and inflight; the stabilizer is directly positioned when the pilot uses the alternate pitch trim switches.

Spoiler & Speedbrake System Information

There are 7 sets of spoilers, 4 outboard and 3 inboard of the flaperons, on the upper surface of each wing. The spoilers are numbered from left to right, 1 through 14. Spoilers on opposing wings are symmetrically paired.
Spoiler panels are used as speedbrakes to increase drag and reduce lift, both in flight and on the ground. The spoilers also supplement roll control in response to control wheel commands.
All three hydraulic systems supply 5 pairs of spoilers. Each hydraulic system is dedicated to a different set of spoiler pairs to provide isolation and maintain symmetric operation in the event of hydraulic system failure. The remaining two spoiler pairs are individually powered by two electrical buses.

Spoiler Speedbrake Operation

The 14 spoiler panels are used as speedbrakes.
The speedbrake spoilers are controlled by the speedbrake lever located on the control stand. The speedbrake lever has three marked positions:

- DOWN
- ARMED
- UP

The speedbrake lever can be placed in intermediate positions between ARMED and UP.
In the ARMED position, the spoilers extend and the speedbrake lever is driven aft to the UP position on landing when the main gear trucks untilt and both thrust levers are not in the takeoff range.

When the speedbrake lever is not in the ARMED position, the spoilers still automatically extend and the speedbrake lever is driven to the UP position when either of the following conditions occur:

- on the ground with groundspeed above 85 knots, either thrust lever was previously in the takeoff range, then both thrust levers are moved to the
- idle range (rejected takeoff), or
- on the ground and both thrust reverse levers are moved to the reverse idle detent

The spoilers automatically retract and the speedbrake lever is driven forward to the DOWN position, when any of the following conditions occur:

- on the ground, when either thrust lever is moved to the takeoff range, or
- on the ground, if there is a transition to in the air, or
- in the air, when either thrust lever is beyond 90% full travel

Automatic speedbrakes are only available in the normal mode.

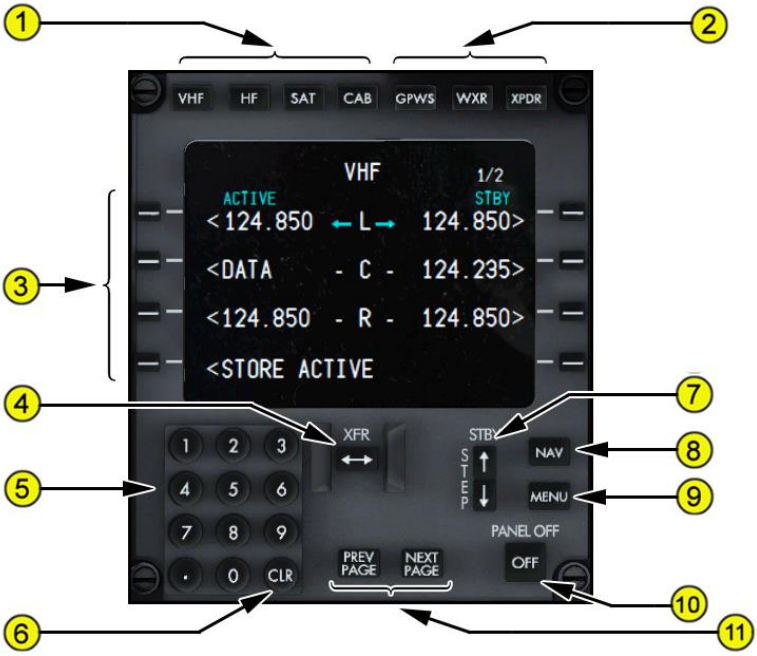
Aft Aisle Stand

1. **Aft Aisle Stand**

1. Tuning Control Panels
2. Engine Fire Control Panel
3. GPWS, ATC & Aural Cancel Switch Panel
4. Audio Control Panels
5. Rudder Trim Switch Panel
6. Floor Lights Switch
7. Flightdeck Door Switch Panel
8. Aislestand Light Switch

Tuning Control Panel (Virtual Cockpit)

The tuning and control panels (TCP) are used to tune and control the VHF, SATCOM, cabin interphone, and other airplane systems. The panels are designated left, center, and right, and are normally associated with the respective VHF radios.
HF Radio is not simulator on the QualityWings787



1. Communication System Mode Select Keys

Push – Selects desired communication tuning mode page for display

- VHF – VHF Radio Key
- HF – HF Radio Key (Not Simulated)
- SAT – SATCOM Key
- CAB – Cabin Interphone Key

2. Navigation System Mode Select Keys

Push – Selects desired navigation tuning mode page for display

- GPWS– GPWS Options Key
- WXR – Weather Radar System Key
- XPDR – ATC Transponder System Key

3. Line Select Keys

Push –

- selects function line to be updated
- moves data from scratchpad to selected line

4. Frequency Transfer (XFR) Switch

Push –

- transfers the STBY frequency or DATA to the ACTIVE frequency and tunes the selected radio to the new active frequency
- transfers the ACTIVE frequency or DATA to the STBY frequency

5. Numeric Keypad

Push – puts selected character in scratchpad.

6. Clear (CLR) Key

Push – clears last scratchpad character or scratchpad message.

- displays CLEAR
- subsequent pushes removes the word CLEAR

7. Standby (STBY) Frequency STEP Control

Active when a list (- N/X) number is displayed next to the STBY radio title.

Push (Up) – moves up in the stored frequency list for VHF and HF radios.

Push (Down) –

- moves down in the stored frequency list for VHF radio

8. Navigation (NAV) Key

Push – selects the ALTN NAV (alternate navigation)

9. MENU Key

Push – selects the MENU page for display of all system modes:
VHF, HF, SAT, CAB, GPWS, WXR, XPDR

10. Tuning & Control Panel OFF Switch

Push – removes associated TCP display and processor power.

11. Previous (PREV) / NEXT PAGE Keys

PREV PAGE – displays previous page of multiple page displays.

NEXT PAGE – displays next page of multiple page displays.

Tuning Control Panel (2D Pop-Up Display)

The Tuning Control Panel pop-up display has identical functionality to the panel in the Virtual Cockpit.
It can be accessed via the Flight Simulator **Views** Menu, or by toggling the Mic Switches on the Glareshield.

Once it's open, you can also close it using the (1) Close Switch on the top right corner of the panel.

VHF Page 1

1. Page Title

Displays selected mode for data displayed on page.

2. Line Title

Displays title of data on line below.

3. Scratchpad

Displays –

- numeric entries from keypad
- line selected data
- system messages

4. Page Number

Left number is page number. Right number is total number of related pages. Page number is blank when only one page exists.

5. Line

Displays –

- frequency or DATA associated with line title
- associated radio (L, C, R)
- transfer arrows (XFR switch transfers active and standby frequencies)

6. Store Active

Push – Stores active frequency on alternate frequency page.

VHF Page 2

1. List Number

Displays the number assigned to stored frequency below. The STBY frequency on page 1 is considered stored frequency number 1.

2. Frequency

Displays the stored frequency. A total of 8 frequencies may be stored on 1 STORED VHF page.

3. Dash Prompts

Indicates that a new frequency can be added to the stored list. Up to 8 frequencies are stored on each page.

SATCOM Page

1. SATCOM Channel Status

Displays associated SATCOM channel (-1 or -2) status:

- READY – system ready to make call
- DIALING – system is dialing or placing the call
- RINGING – call is ringing and waiting for ground station to answer
- ANSWERED – call has been picked up by ground station
- CALL FAIL – call failed to be received

2. SATCOM CALL Key

Push – MAKE CALL

- initiates a SATCOM call to the identifier / number listed below call key
- once call is in progress, prompt returns to END CALL

Push – END CALL

- cancels the current call
- prompt returns to MAKE CALL

Push – PREEMPT

- (displayed when another call is in progress)
- once call is in progress, prompt returns to END CALL

3. SATCOM Phone Number Identifier

Displays

- identifier station name to be called from directory
- No changes to this line can be made in the QualityWings 787

4. SATCOM Call Priority Key

Push – toggles through call priorities

- EMG – emergency call
- HGH – high priority call
- LOW – low priority call

Cabin Interphone Page

The Cabin Interphone Page is reserved for future QualityWings 787 Development

GPWS Page

The GPWS Page is reserved for future QualityWings 787 Development

Weather Radar Page

1. Gain Control

Push and hold –

- INCR – increases gain
- DECR – decreases gain
- current gain setting is displayed between line select keys 1L and 2L
- defaults to a calibrated gain level

2. Manual Antenna Tilt

Displayed when tilt control (TILT CTRL) is set to manual (MAN).

Push and hold –

- UP – slews antenna tilt up to a maximum of +15º
- DOWN – slews antenna tilt down to a maximum of -15º

3. Mode Switches

Push – selects desired mode.

WX – displays weather radar returns

4. Tilt Control

Push – selects manual (MAN) or automatic (AUTO) antenna tilt.

Selection is displayed in large green font.

QWTip: *More information about WXR can be found in the Weather Radar Section*

ATC Transponder Page

1. Transponder (XPDR) Code

Displays the current ATC transponder squawk code.

QWTip: *The squawk code is also displayed in the flight data block on the outboard side of each PFD on the AUX Display. More information about the Auxiliary (AUX) Display can be found in the Displays In-Depth section*

Transponder code is typed into the scratchpad and then entered using line select key 1L.

2. Identification (IDENT)

Push –

- transmits an identification signal
- the IDENT prompt changes to large green font for 10 seconds

3. Transponder System (XPDR SYS)

Push –

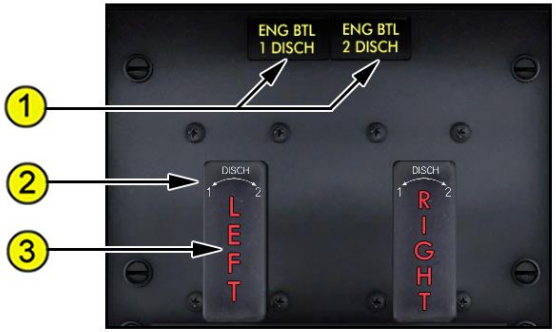
- toggles the selection of the left or right ATC transponder / TCAS system
- the selected system is highlighted in large green font

1. **XXXX TCAS Display (Future Development)**
   Push – selects the desired TCAS display mode.
   - ABOVE – displays TCAS traffic vertically from 2,700 feet below to 9,900 feet above current flight altitude.
   - NORM (normal) – displays TCAS traffic vertically from 2,700 feet below to 2,700 feet above current flight altitude.
   - BELOW – displays TCAS traffic vertically from 9,900 feet below to 2,700 feet above current flight altitude.
   - The selected mode is highlighted in large green font.

4. **XXXX TCAS Altitude (ALT) (Future Development)**
   Push – toggles traffic altitude readings between absolute altitude and relative altitude.
   - ABS (absolute) – traffic absolute altitude readings show.
   - REL (relative) – traffic relative altitude readings show.
   - The selected mode is highlighted in large green font.

QWTip: *More information about TCAS can be found in the TCAS section*

Engine Fire Control Panel



1. Engine Bottle Discharged (ENG BTL DISCH) Lights

Illuminated (amber) – the extinguisher bottle is discharged or has low pressure.

2. Engine Fire Switches

In (normal position, mechanically locked) – unlocks automatically for a fire warning

Out –

- Isolates engine components from airplane system and
- Allows for extinguishing attempts

3. Engine Fire Warning Lights

Illuminated (red) –

- an engine fire is detected, or
- the FIRE/OVERHEAT TEST switch is pushed

Engine Fire Protection System Information

Engine Fire Warning

The indications of an engine fire are:

- the fire bell sounds
- the master WARNING lights illuminate
- the EICAS warning message FIRE ENG (L or R) is displayed
- the engine fire switch LEFT or RIGHT fire warning light illuminates
- the engine fire switch unlocks
- the engine FUEL CONTROL (L or R) switch fire warning light illuminates

How to Use

Engine Fire Extinguishing

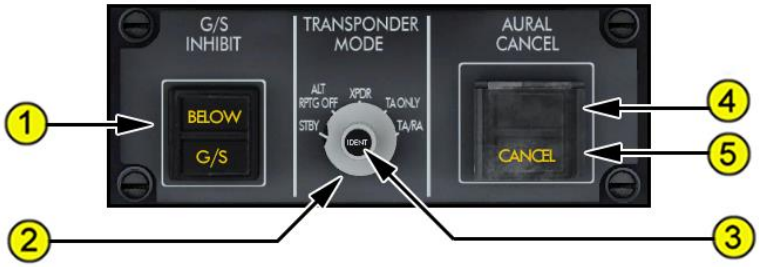
There are two fire extinguisher bottles. Either or both bottles can be discharged into either engine.
When the engine fire switch is pulled out, rotating the fire switch in either direction discharges a single extinguisher bottle into the associated engine. Rotating the engine fire switch in the other direction discharges the remaining extinguisher bottle into the same engine.
If an extinguisher bottle is discharged or has low pressure:

- the ENG BTL (1 or 2) DISCH light illuminates
- the EICAS advisory message BTL (1 or 2) DISCH ENG shows.

If the fire extinguishers, the APU Fire Warning indication will extinguish.

QWTip: *Engine Fires can be simulated via the Flight Simulator Failures menu.*

GPWS, ATC & Aural Cancel Switch Panel



1. Ground Proximity Glideslope Inhibit (G/S INHIBIT)

The BELOW G/S light illuminates when the GPWS senses excessive deviation below the ILS or GLS glideslope or the FMC generated flight path angle.

Push (amber BELOW G/S light illuminated) –

- inhibits GLIDESLOPE alert when pushed below 1,000 feet radio altitude
- extinguishes the BELOW G/S light

The inhibit function resets when:

- on the ground, or
- after a touch and go landing, or
- after a go-around, or
- when deselected by the flight crew

2. Transponder/TCAS Mode Selector

- STBY (standby) – transponder not active.
- ALT RPTG (altitude reporting) OFF –
- XPDR (transponder) –
- TA (traffic advisory) ONLY and TA/RA (resolution advisory)

QWTip: *For more information about the TA Only and TA/RA positions on the ATC Mode Selector, see the TCAS Section. .*

3. Identification (IDENT) Switch

Push – transmits an identification signal.

4. AURAL CANCEL Switch

Push (momentary) –

- cancels the active aural alert while the condition causing the alert remains active
- EICAS advisory message AURAL CANCELED shows while an aural alert is being canceled

5. CANCEL Light

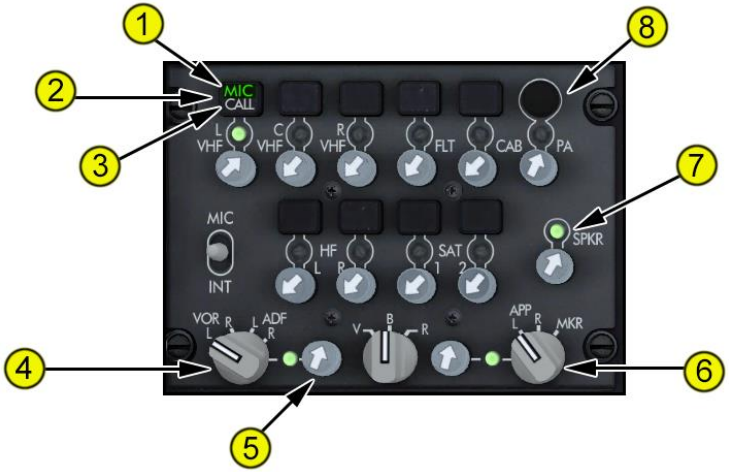
Illuminated (amber) –

- an aural alert is being canceled
- extinguishes when no aural alerts are being canceled

The cancel function resets when –

- the condition that caused the aural alert is no longer active, or
- on the ground and both engines are shut down, or
- airplane power is cycled off and then on

Audio Control Panels (Captains Only Simulated)



2. MIC Lights

Illuminated (green) – indicates the transmitter is selected.

3. Transmitter Select Switches

Push –

- the MIC light illuminates
- selects the receiver audio on, if not already manually selected on
- normally, only one switch is selected at a time for each crew station

Second push –

- deselects the transmitter
- deselects receiver audio

QWTip: *Only the L & R VHF, CAB and SAT Mic Switches are simulated.*

4. CALL Lights (Future Development)

5. VOR Receiver Selector

Selects the VOR receiver to be monitored:

- VOR L – left VOR and DME
- VOR R – right VOR and DME
- ADF L – (inop)
- ADF R – (inop)

6. Receiver Volume Controls

Push – turns the respective receiver audio on (raises volume) or off (decreases volume).

7. Approach (APP) Receiver Selector

Selects the approach receiver to be monitored:

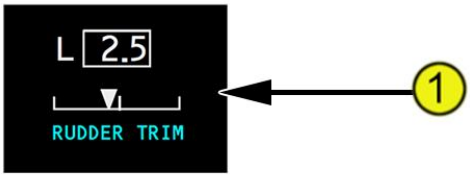
- APP L – left ILS/GLS and DME
- APP R – right ILS/GLS and DME
- MKR – marker beacon

8. Receiver Lights

Illuminated (green) – indicates the respective receiver volume control is manually selected on.

9. PA Mic Switch (Future Development)

Rudder Trim Switch Panel



EICAS Display

Aft Aisle Stand

1. RUDDER TRIM Indicator

Digital readout displays rudder position in 0.2 increments from 0.0 to 1.0 unit and in 0.5 increments between 1.0 and 17.0 units of trim. An L or R is displayed to the left or right of the box for any non-zero rudder trim. Corresponding pointer position is displayed on the line scale below.

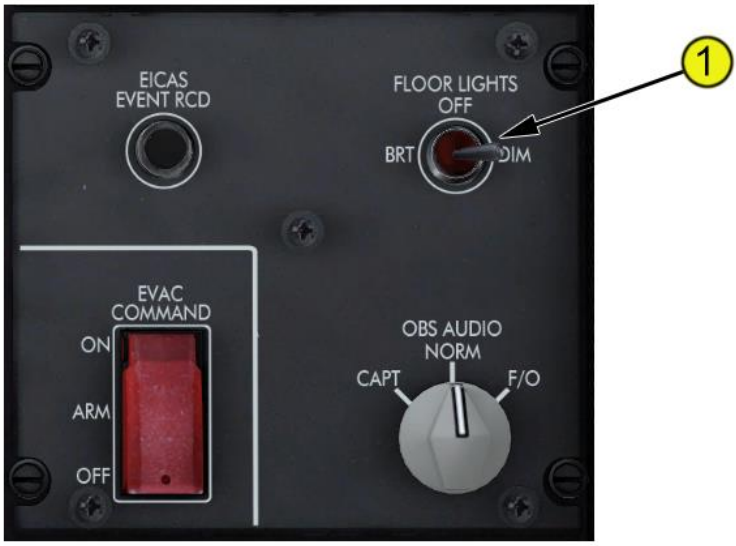
2. **RUDDER Trim** Selector

Spring-loaded to neutral.

Rotate –

- trims the rudder in the desired direction
- the rudder pedals move with rudder trim operation

Floor Lights Switch



1. **FLOOR LIGHTS Switch**
   OFF – the flight deck floor lights are not illuminated.
   BRT – the floor lights are illuminated bright.
   DIM – the floor lights are illuminated dim.

Flightdeck Door Switch Panel

1. **Flight Deck (FD) DOOR ACCESS Selector**
   UNLKD – door commanded unlocked while selector is held in this position.
   AUTO – door commanded locked when closed. Door unlocks after entry of emergency access code and expiration of timer unless crew selects DENY.
   DENY – denies emergency access keypad request. Further access keypad requests are automatically denied for an operator defined time delay.

Aislestand Light Switch

1. **AISLE STAND Panel (PNL) Light Control (outer)**

Rotate – adjusts the aisle stand instrument panel light brightness.

2. **AISLE STAND FLOOD Light Control (inner)**

Rotate – adjusts the aisle stand flood light brightness.

Autoflight System

Introduction

The automatic flight control system consists of the autopilot flight director system (AFDS) and the autothrottle system (A/T). The mode control panel (MCP) and the flight management computer (FMC) control the AFDS and the autothrottle system to perform climb, cruise, descent, and approach.

Autopilot Flight Director System (AFDS)

The AFDS consists of the autoflight computing systems and the MCP.
The MCP provides control of the autopilot, flight director, altitude alert, and autothrottle systems. The MCP is used to select and activate AFDS modes, and establish altitudes, speeds, and climb/descent profiles.

The autoflight systems provide control of the flight directors and autopilot. Flight director information displays on the primary flight displays (PFDs) and head-up displays (HUDs). The AFDS does not have direct control of the flight control surfaces. The autopilot controls the elevators, ailerons, flaperons, and spoilers through the fly–by–wire flight control system. Autopilot rudder commands are added only during an autopilot approach and landing. The autopilot controls nose wheel steering during rollout after an automatic landing.

MCP Mode Selection

MCP switches select automatic flight control and flight director modes. A light on the switch illuminates to indicate the mode is armed or active. Mode activation is indicated by the PFD and HUD roll and pitch flight mode annunciations. Autothrottle modes are discussed later in this section.

Most modes activate with a single push. These modes include:

- altitude hold (ALT)
- flight level change (FLCH SPD)
- flight path angle (FPA)
- heading hold (HDG HOLD)
- heading select (HDG SEL)
- track hold (TRK HOLD)
- track select (TRK SEL)
- vertical speed (V/S)

Other modes arm or activate with a single push. These modes are:

- glidepath (G/P) via APP switch
- glideslope (G/S) via APP switch
- lateral navigation (LNAV)
- localizer / final approach course (LOC/FAC)
- vertical navigation (VNAV)

All modes except G/S and G/P can be deselected by selecting another mode. All modes can be deselected by disengaging the autopilot and turning both flight directors off. After localizer and glideslope capture, the localizer and glideslope modes can be deactivated by disengaging the autopilot and turning both flight directors off, selecting the go–around mode, or if above 1,500 feet radio altitude, by reselecting APP (roll and pitch revert to default modes). The VNAV, LNAV, LOC, FAC, G/S and G/P modes can be disarmed by pushing the mode switch a second time (except when LNAV is automatically armed on go-around) Desired target values can be selected on the MCP for:

- airspeed
- altitude
- flight path angle
- heading
- Mach
- track
- vertical speed

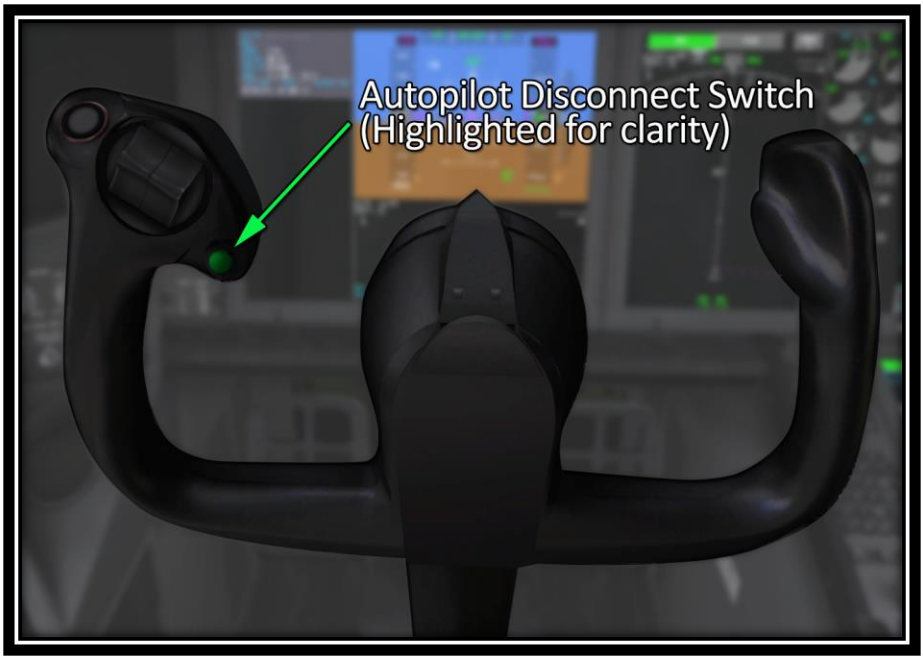
All of these parameters except vertical speed and flight path angle can be preselected prior to autopilot and/or flight director activation.

Autopilot Engagement

The autopilot is engaged by pushing either of the two MCP autopilot engage switches.

Autopilot Disengagement

Normal autopilot disengagement is through either control wheel autopilot disconnect switch.



The autopilots can also be disengaged via the MCP autopilot disengage bar,

Overriding with the control column or control wheel will also disengage the Autopilot (Rudder pedals do not disengage the A/P in the QW787).
The EICAS warning message **AUTOPILOT DISC** displays if the autopilot is manually or automatically disengaged.

Autopilot and Flight Director Mode Degradations

Autopilot

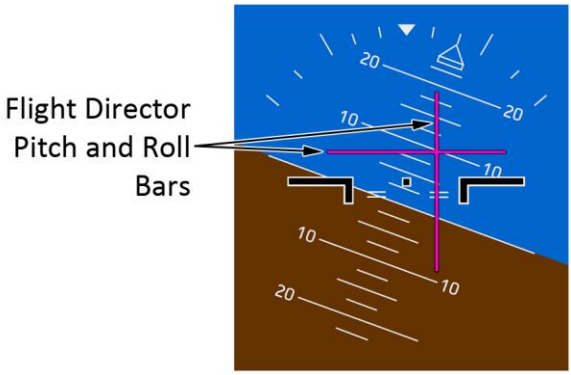
The autopilot system can detect the degradation of a specific autopilot mode. When an engaged mode degrades, the autopilot remains engaged in an attitude stabilizing mode based on inertial data. The condition is annunciated on the PFD and HUD by a line through the affected flight mode annunciation (amber line on the PFD) and the respective flight director bar is removed from the PFD and the flight guidance cue is removed from the HUD. The EICAS caution message **AUTOPILOT** displays to indicate the autopilot is operating in a degraded mode. When the degradation is no longer present the annunciations clear, the autopilot resumes using the mode, and a green box displays around the affected flight mode annunciation on the PFD and HUD for 10 seconds.

Flight Director

When a specific flight director mode degrades, the flight director provides an attitude stabilizing command based on inertial data. The condition is annunciated by removal of the affected (pitch or roll) flight director bar and the HUD flight guidance cue. When the degradation is no longer present, the flight director commands immediately return to view.

Flight Director Display

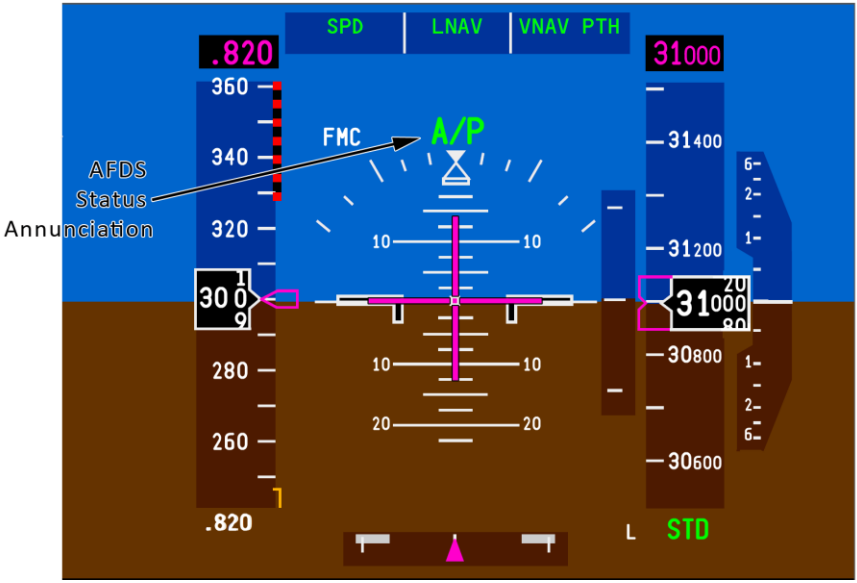
The flight director steering indications normally display any time the related flight director switch is ON.
A flight director mode failure, in either pitch or roll, causes the respective steering bar to disappear. When active, stall and overspeed protection functions also cause the pitch flight director bar to disappear.



AFDS Status Annunciation

The following AFDS status annunciations display just above the PFD and HUD attitude display:

- A/P – autopilots are engaged
- FLT DIR – flight director is ON and autopilots are not engaged
- LAND 3 –this annunciation is seen during a coupled Autoland approach.
- NO AUTOLAND –This annunciation is seen during an IAN approach



AFDS Flight Mode Annunciations

The flight mode annunciations display just above the PFD and HUD AFDS status annunciations. The mode annunciations, from left to right, are:

- autothrottle
- roll
- pitch

Active or captured modes display at the top of the flight mode annunciator boxes in large green letters. Armed modes (except for TO/GA in the air) display in smaller letters (white on the PFD) at the bottom of the flight mode annunciation boxes. Degradations of a specific mode while the autopilot is engaged annunciate by a line (amber on the PFD) through the mode annunciations. A green box displays around the mode annunciation for 10 seconds when a mode first becomes active, and when the line through a degraded mode is removed.

Autothrottle Modes

Autothrottle annunciations are:

- **THR** – Autothrottle applies thrust to maintain the climb/descent rate required by the pitch mode
- **THR REF** – Thrust set to the reference thrust limit displayed on EICAS
- **IDLE** – Displays while the autothrottle moves thrust levers to idle; IDLE mode is followed by HOLD mode
- **HOLD** – Thrust lever autothrottle servos are inhibited. The pilot can set thrust levers manually
- **SPD** – Autothrottle maintains the command speed. Speed can be set using the MCP IAS/MACH selector or by the FMC, as displayed on the CDU CLIMB, CRUISE, or DESCENT page. The autothrottle does not exceed the operating speed limits or the thrust limits displayed on the EICAS

Note: When only one autothrottle is connected and armed, the autothrottle mode annunciation is augmented by an "L-" or "R-" preceding the mode.

Roll Modes

Roll annunciations are:

LNAV –

- LNAV (armed) – LNAV is armed to activate when parameters are met
- LNAV (active) – LNAV activates when above 50 feet and in position to turn onto the active route leg. In flight, selection causes immediate activation if within 2 1/2 NM of the active leg
- On go-around, LNAV becomes active at 50 feet radio altitude with flight director only or 200 feet radio altitude with the autopilot engaged
- LNAV is deactivated by selecting any other roll mode or by disengaging the autopilot and turning both flight directors off

HDG –

- HDG SEL (active) – Airplane turns to or maintains the heading set in the MCP heading/track window
- HDG HOLD (active) – AFDS holds present heading. When turning, the AFDS holds the heading reached after rolling wings level

TRK –

- TRK SEL (active) – Airplane turns to or maintains the track set in the MCP heading/track window
- TRK HOLD (active) – AFDS holds present track. When turning, AFDS holds the track reached after rolling wings level

ATT –

- (active) – When the autopilot is first engaged or the flight director is first turned on in flight, the AFDS holds a bank angle between 5º and 30º and does not roll to wings level. When the bank angle is less than 5º, the AFDS returns to wings level (HDG HOLD or TRK HOLD). When the bank angle is greater than 30º, the AFDS returns to 30º of bank.

LOC –

- LOC (armed) – AFDS captures localizer when within range and within 120º of localizer course
- LOC (active) – AFDS follows the localizer course

FAC –

- FAC (armed) – AFDS captures the IAN final approach course
- FAC (active) – AFDS tracks the IAN final approach course along the inbound bearing

TO/GA –

- On the ground, TO/GA annunciates by positioning either flight director switch ON when both flight directors are OFF; or, by pushing either TO/GA switch with airspeed greater than 80 KIAS. TO/GA roll guidance becomes active at lift–off
- In flight, TO/GA is armed when flaps are out of up or glideslope is captured. There is no flight mode annunciation for TO/GA armed. TO/GA is activated in flight by pushing a TO/GA switch. The TO/GA roll mode maintains the existing ground track

ROLLOUT –

- • ROLLOUT (armed) – Displayed below 1500 feet radio altitude and activates at touchdown with weight on the wheels
- ROLLOUT (active) – After touchdown, AFDS uses rudder and nosewheel steering to steer the airplane on the localizer centerline

Pitch Modes

Pitch annunciations are:

TO/GA –

On the ground, TO/GA annunciates by positioning either flight director switch ON when both flight directors are OFF; or, by pushing either TO/GA switch with airspeed greater than 80 knots. The flight director PFD pitch bar and HUD guidance cue indicates an initial pitch of 8º up. TO/GA pitch guidance becomes active at lift-off.

After lift-off, the AFDS commands a pitch attitude to maintain:

- a target speed of V2 plus 15 knots or the airspeed at rotation (pitch attitude greater than 2º) plus 15 knots, whichever is greater
- if current airspeed remains above the target speed for 5 seconds, the target airspeed is reset to the lesser of current airspeed or V2 plus 25 knots
- the IAS/MACH window speed if the IAS/MACH window speed is changed to a speed greater than the target speed

Note: The AFDS uses the speed set in the IAS/MACH window for V2.

In flight, TO/GA is armed when flaps are out of up or glideslope is captured. When a go–around is initiated, the commanded speed is the MCP IAS/MACH window or current airspeed, whichever is higher, to a maximum of the IAS/MACH window speed plus 25 knots. GA displays as the thrust limit on the primary EICAS engine display.

VNAV –

VNAV is armed by pushing the VNAV switch:

- VNAV light illuminates
- VNAV annunciates on the PFD pitch mode annunciation in small white characters below the current pitch mode
- VNAV annunciates on the HUD pitch mode annunciation in small green characters below the current pitch mode
- VNAV activates above 400 feet and provides pitch commands to maintain the FMC computed airspeed/path:
- VNAV SPD (active) – AFDS maintains the FMC speed displayed on the PFD and HUD and/or the CDU CLIMB or DESCENT pages. If speed

intervention is selected, the MCP IAS/MACH selector is used to manually select the speed

- VNAV PTH (active) – AFDS maintains FMC altitude or descent path with pitch commands. If the MCP altitude window remains set to the current cruise altitude and the airplane is within two minutes of top of descent, the EICAS advisory message FMC MESSAGE displays and the CDU Help window opens with instructions to set a lower altitude before top of descent
- VNAV ALT (active) – When a conflict occurs between the VNAV profile and the MCP altitude, the airplane levels and the pitch flight mode annunciation becomes VNAV ALT. The airplane maintains altitude. To continue the climb or descent, change the MCP altitude and push the altitude selector or change the pitch mode
- when an early descent is desired, FLCH, V/S, or FPA may be selected to descend below the VNAV descent path. If, during the descent, VNAV is armed and the airplane descent path subsequently intercepts the VNAV descent path, VNAV activates in VNAV PTH
- V/S (active) – Pushing the MCP VS/FPA switch, opens the vertical speed window to display the current vertical speed. Pitch commands maintain the rate of climb or descent set in the VS/FPA window.
- FPA (active) – Pushing the MCP VS/FPA switch opens the flight path angle window to display the current flight path angle. Pitch commands maintain the flight path angle set in the VS/FPA window.
- FLCH SPD (active) – Pushing the MCP FLCH switch opens IAS/MACH window (if blanked). Pitch commands maintain IAS/MACH window airspeed or Mach.

ALT (active) – Altitude hold mode is activated by:

- pushing the MCP altitude HOLD switch, or
- capturing the selected altitude from a V/S, FPA, or FLCH climb or descent

G/S (active) – AFDS follows the ILS or GLS glideslope.

G/P (active) – AFDS follows the FMC glidepath.

FLARE (armed) – During autoland, FLARE displays below 1500 feet RA.

FLARE (active) – During autoland, flare activates between 60 and 40 feet radio altitude. FLARE deactivates at touchdown and smoothly lowers the nosewheel to the runway.

Autothrottle System

The autothrottle system provides thrust control from takeoff through landing. Autothrottle operation is controlled from the MCP and the CDUs. The MCP provides mode and speed selection. The CDU allows FMC reference thrust limit selection. When a pitch mode is active, the FMC selects the autothrottle modes and target thrust values.

The autothrottle can be operated without using the flight director or the autopilot. In this condition, the autothrottle operates in either the THR REF, SPD, HOLD or IDLE modes.

Switches highlighted in red depict modes that have Autothrottle system influence

On the QualityWings 787, when the autothrottle is used during a manual landing, thrust reduces to IDLE at 60 feet radio altitude The autothrottle does not automatically retard if the pitch mode is TO/GA.

The autothrottle can support stall protection if armed and disconnected. If speed decreases to near stick shaker activation, the autothrottle connects in SPD mode and advances thrust to maintain minimum maneuvering speed (approximately the top of the amber band) or the speed set in the mode control panel speed window, whichever is greater. The EICAS caution message AIRSPEED LOW is displayed.

Note: When the pitch mode is FLCH or TOGA, or the airplane is below 400 feet after takeoff, or below 100 feet radio altitude on approach, the autothrottle does not automatically engage.

Note: During a descent in VNAV SPD, the autothrottle may activate in HOLD mode and does not support stall protection.

The EICAS advisory message **AUTOTHROTTLE L or R** displays when the respective autothrottle servo fails. If the autothrottle is connected and only one autothrottle is armed, the PFD autothrottle flight mode annunciation displays L or R preceding the mode. For example, L SPD indicates only the left autothrottle is active in speed mode

Autothrottle Thrust Lever Operation

The autothrottle system moves either or both thrust levers to provide speed or thrust control, depending on the active mode.
Thrust levers can be manually positioned without disconnecting the autothrottle.
After manual positioning, the autothrottle system repositions the thrust levers to comply with the active mode. The autothrottle system does not reposition thrust levers while in HOLD mode.

Autothrottle Disconnect

The autothrottle system can be disconnected manually by pushing either autothrottle disconnect switch, except during conditions that cause the autothrottle to automatically activate.

The autothrottle can also be disconnected manually by positioning both A/T ARM switches to OFF, or individually by positioning the left or right A/T ARM switch to OFF. Positioning one or both A/T ARM switches to OFF prevents activation of all autothrottle modes for the affected autothrottle.

Autothrottle disconnect occurs automatically:

- when either reverse thrust lever is raised to reverse idle, or

- if the thrust levers are overridden during a manual landing, after the autothrottle has begun to retard the thrust levers to idle, or
- when both engines are shut down

The EICAS caution message **AUTOTHROTTLE DISC** displays and an aural alert sounds when the autothrottle is manually or automatically disconnected. The EICAS caution message and aural alert are inhibited if the disconnect occurs because of reverse thrust.

Automatic Flight Operations

Automatic Flight – Takeoff and Climb

Takeoff is a flight director only function of the takeoff/go–around (TO/GA) mode. The autopilot may be engaged after takeoff.

During preflight:

- With the autopilot disengaged and both flight director switches OFF, activation of TO/GA roll and pitch mode occurs when the first flight director switch is positioned ON
- PFD and HUD displays FLT DIR as AFDS status and TO/GA as the pitch and roll flight mode annunciations
- pitch command is set to approximately 8º up
- roll command is wings level

During takeoff prior to lift–off:

- with speed less than 50 knots, pushing a TO/GA switch activates the autothrottle in thrust reference (THR REF) and advances thrust levers to the selected reference thrust limit. When the autothrottle is not active by 50 knots, it cannot be activated until above 400 feet
- at 80 knots, autothrottle annunciation changes to HOLD
- with speed greater than 80 knots, pushing a TO/GA switch disarms LNAV and VNAV

At lift–off:

- pitch command target speed is V2 + 15
- roll command maintains ground track

After lift–off:

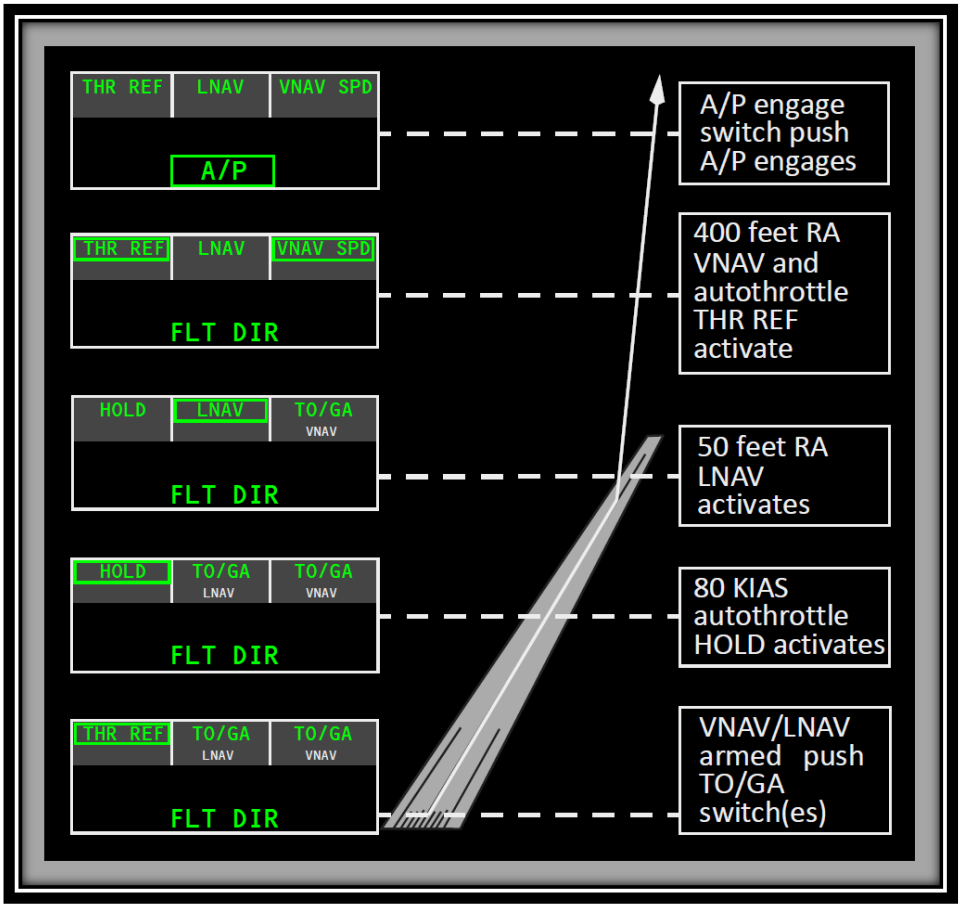
when a TO/GA switch is pushed:

- removes takeoff and climb derates and assumed temperature thrust reduction
- A/T in HOLD, A/T activates in THR REF

- at 50 feet radio altitude, LNAV activates, if armed. Roll commands bank to track the active route
- at 400 feet, VNAV activates, when armed. Pitch commands the current airspeed. The autothrottle sets the selected reference thrust and annunciates THR REF
- at acceleration height or altitude capture below acceleration height, pitch commands speed to 5 knots below takeoff flap placard speed. As flaps are retracted, pitch commands an acceleration to 5 knots below the placard speed of the commanded flap position
- when flaps are up, pitch commands an acceleration to VNAV climb speed. VNAV climb speed is the greater of:
  - flaps up maneuver speed, or
  - speed transition associated with origin airport
- at thrust reduction point (either an altitude or a flap position), FMC changes reference thrust limit to armed climb limit (CLB, CLB 1, or CLB 2)

The TO/GA mode is terminated by selecting any other pitch and roll mode or by activation of LNAV/VNAV.

Automatic Flight Takeoff Profile



Automatic Flight – Cruise

The autopilot and/or flight director can be used after takeoff to fly a lateral navigation track (LNAV) and a vertical navigation track (VNAV) provided by the FMS. Using LNAV and VNAV ensures the most economical operation.
Other roll modes available are:

- heading hold (HDG HOLD)
- heading select (HDG SEL)
- track hold (TRK HOLD)
- track select (TRK SEL)

Other pitch modes available are:

- altitude hold (ALT)
- flight level change (FLCH
- SPD)
- flight path angle (FPA)
- vertical speed (V/S)

Automatic Flight – Approach and Landing

The AFDS provides autopilot guidance for Instrument Landing System (ILS), GBAS Landing System (GLS) and approaches utilizing Integrated Approach Navigation (IAN).
ILS approaches are flown in the G/S and LOC modes with the approach path deviation data from the localizer and glideslope transmitters.
Pushing the APP switch arms the pitch and roll modes, but it is only after an approach procedure selection is made in the FMC the Automatic Flight System will couple for the approach. Glideslope/glidepath capture is inhibited until the localizer is captured.
Pushing the LOC/FAC switch arms the AFDS to capture and maintain an approach lateral flight path using an ILS localizer beam or a lateral path provided by the FMC. Descent on the localizer or final approach course can be accomplished using VNAV, V/S, FLCH, or FPA pitch modes. The LOC or FAC mode cannot capture if the intercept angle exceeds 45º.
With a command speed of VREF+5 knots and landing flaps, there is sufficient wind and gust protection available with the autothrottle active.

Integrated Approach Navigation

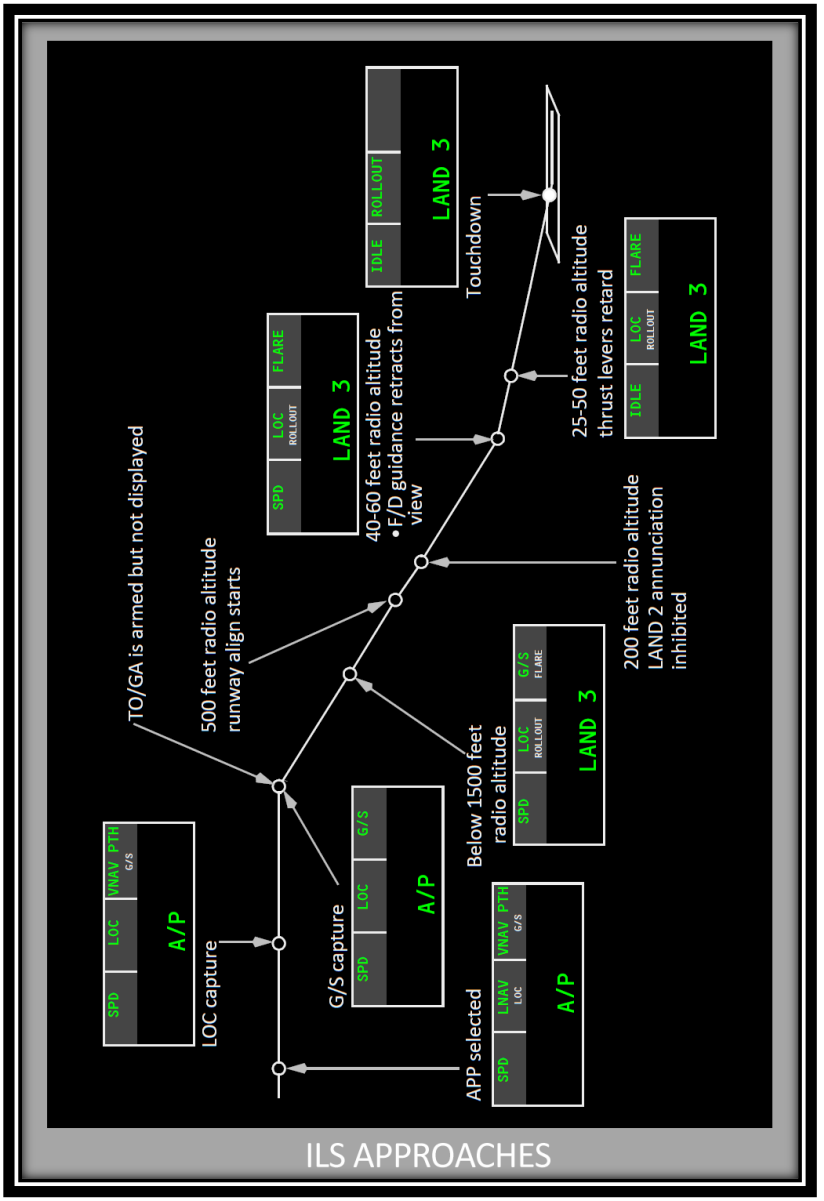
Integrated Approach Navigation allows the use of consistent procedures for all types of instrument approaches. Any approach that has a glidepath angle published in the navigation database can be flown using procedures, indications and alerts similar to those used for an ILS approach. The published glidepath angle can be found on the RTE LEGS page.

Approaches flown with IAN procedures always use FMC computed glidepath (G/P) for vertical path guidance and FAC for lateral guidance/

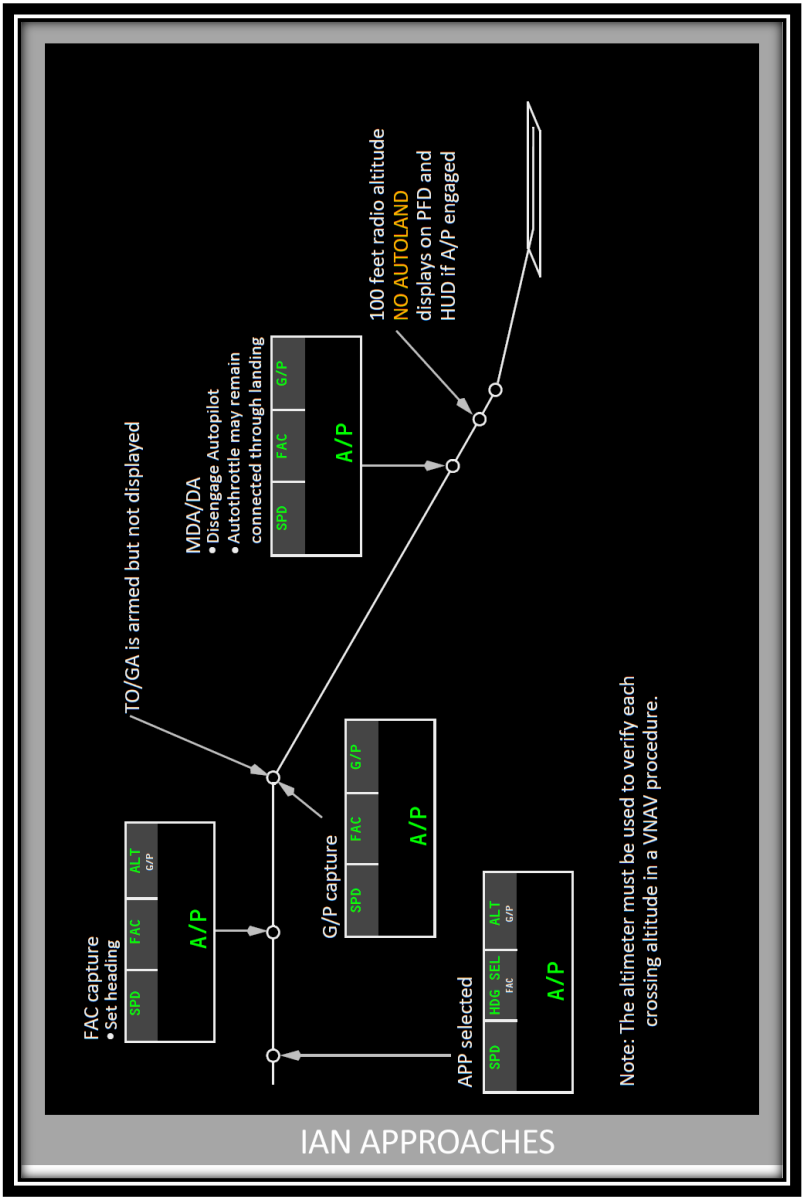
IAN requires using the APP switch on the MCP to arm the roll and pitch modes as the airplane nears the final approach segment. Approaches are flown to published minimums utilizing normal flight director guidance.

IAN does not support automatic landings, the pilot flying must disengage the autopilot and complete the landing manually. A NO AUTOLAND alert appears on the PFD and HUD if the autopilot remains engaged below 100 feet RA.

Automatic Flight Approach Profiles (ILS)



Automatic Flight Approach Profiles (IAN)



Flare

The flare mode brings the airplane to a smooth automatic landing touchdown. The flare mode is not intended for single autopilot or flight director only operation.

Flare is armed when LAND 3 is annunciated on the PFDs and HUDs. Below 350 feet radio altitude, the inboard spoilers are biased up incrementally. If the autopilot is subsequently disengaged, the spoiler bias is removed and a slight forward column control force may be required to maintain trim. At approximately 50 feet radio altitude, the autopilots start the flare maneuver. FLARE replaces the pitch flight mode annunciation.

Note: If a TO/GA go-around is initiated with spoilers in the biased position, the spoiler bias is removed.

During flare:

- flight director roll and pitch bars retract from view
- between 25 and 50 feet radio altitude, the autothrottle begins retarding thrust levers to idle
- PFD and HUD autothrottle annunciation changes from SPD to IDLE
- during landing rollout, the FLARE annunciation no longer displays, and the nose wheel is lowered to the runway

Rollout

Rollout provides localizer centerline rollout guidance. Rollout arms when LAND 3 annunciates.

Rollout activates at touchdown with weight on the wheels. ROLLOUT replaces the roll mode annunciation.

The autopilot controls rudder and nose wheel steering to track the localizer centerline.

On the QualityWings 787 autothrottle IDLE mode disconnects during touchdown. Rollout guidance continues until the autopilots are disengaged.

Automatic Flight - Go–Around

On the QualityWings 787, TO/GA is armed when flaps are in a landing configuration and radio altitude is less than 1500 feet. The thrust limit changes to GA flaps are extended to landing position, or glideslope/glidepath is captured. The reference thrust limit is locked in GA when flaps are in landing position or glideslope/glidepath is captured.

The TO/GA switches are inhibited when on the ground and enabled again when in the air for a go–around or touch and go.

With the first push of either TO/GA switch:

- roll and pitch activate in TO/GA
- autothrottle activates in thrust reference (THR REF) at full go–around thrust.
- the AFDS increases pitch to hold the selected speed as thrust increases
  - with an LNAV path available, LNAV automatically arms and activates: above 50 feet radio altitude

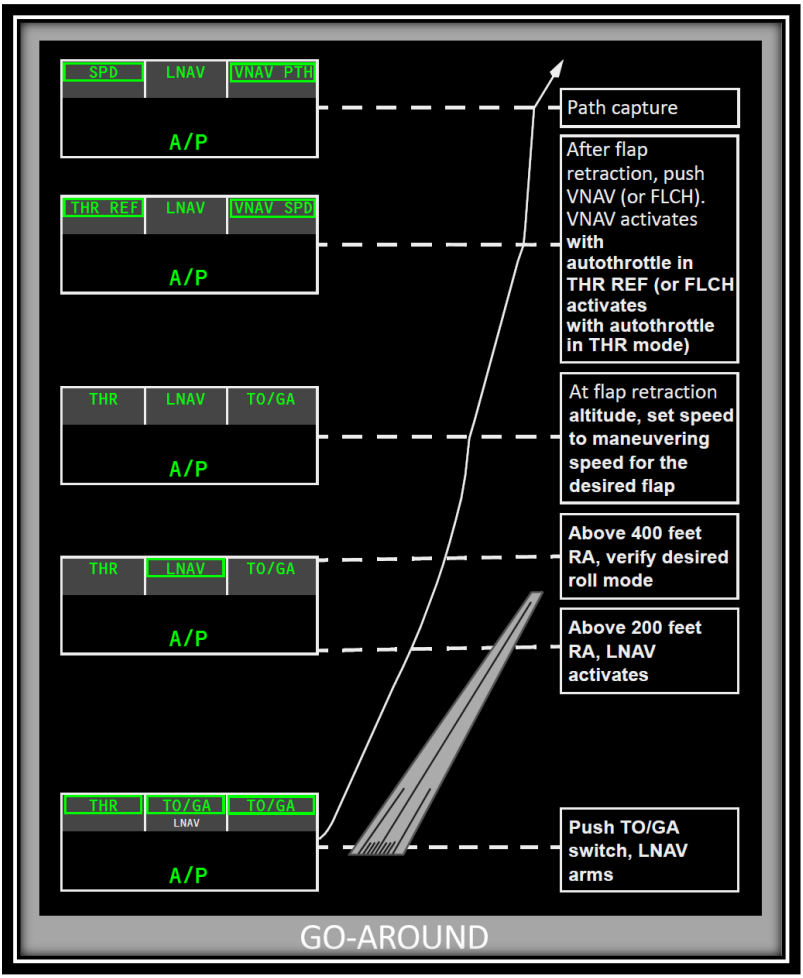
TO/GA level–off:

- at the set altitude, AFDS pitch mode changes to altitude hold (ALT)
- TO/GA remains the active roll mode until LNAV automatically activates or another roll mode is selected

TO/GA mode termination:

- below 400 feet radio altitude, disengage autopilot and turn off both flight directors, or automatic LNAV activation (after automatic LNAV activation, a different roll mode can be selected)
- above 400 feet radio altitude, select a different roll or pitch mode

Automatic Flight Go-Around Profile



Mode Control Panel

QWTip: *All Knobs and Windows on the MCP can be operated using your Mouse Scroll Wheel to increase and decrease values. Left clicks decrease, right clicks increase.*

Autopilot Flight Director System Controls

1. Autopilot (A/P) Engage Switches

Push (either switch can engage the autopilot) –

- when either flight director switch is ON, the autopilot engages in the selected flight director mode(s)
- when both flight director switches are OFF, the autopilot engages in:
  - heading hold (HDG HOLD) or track hold (TRK HOLD) as the roll mode, or if bank angle is greater than 5º, attitude hold (ATT)
  - vertical speed (V/S) or flight path angle (FPA) as the pitch mode

2. Autopilot Engaged Light

Illuminated (white) – all operating autopilots are engaged.

3. Flight Director (F/D) Switches

The left flight director switch activates the flight director steering indications on the left PFD and HUD. The right flight director switch activates the flight director steering indications on the right PFD and HUD.

ON –

- on the ground with both flight director switches OFF, the first flight director switch positioned ON arms the flight director in the takeoff go–around (TO/GA) roll and pitch modes. The flight mode annunciation appears on both PFDs and HUDs. Positioning the second switch ON displays the flight direction steering indications on the second PFD and HUD
- in flight, with the autopilot disengaged and both flight director switches OFF, the first flight director switch positioned to ON activates the flight director in:
  - heading hold (HDG HOLD) or track hold (TRK HOLD) as the roll mode, or if bank angle is greater than 5º, attitude hold (ATT)
  - vertical speed (V/S) or flight path angle (FPA) as the pitch mode
- in flight, with the autopilot engaged and both flight director switches OFF, the first flight director switch positioned to ON activates the flight director in the currently selected autopilot mode(s)

OFF –

- the flight director steering indications do not display, unless

4. Autopilot (A/P) DISENGAGE Bar

Pull down **–**

- with autopilot(s) engaged:
  - •disengages all autopilots
  - •displays the EICAS warning message AUTOPILOT DISC
  - •sounds an aural warning
  - •illuminates the master warning lights
  - prevents autopilot engagement
- disables bank angle protection
- exposes the amber and black stripes

Lift up **–**

- enables autopilot engagement
- enables bank angle protection
- hides the amber and black stripes

Autothrottle System Controls

1. **Autothrottle (A/T) ARM Switches**
   The left autothrottle arm switch controls the left engine autothrottle. The right autothrottle arm switch controls the right engine autothrottle.
   L and/or R – arms the selected autothrottle for mode activation. The selected autothrottle activates automatically when an AFDS mode (VNAV, FLCH, or TO/GA) is selected.

OFF –

- disconnects the selected autothrottle
- prevents selected autothrottle activation

2. **Climb/Continuous (CLB/CON) Thrust Switch**

On the ground and below 400 feet during takeoff, the switch is inoperative.

Push –

- with two engines operating, changes the engine thrust limit to the FMC selected climb thrust, or
- with only one engine operating, changes the thrust limit to maximum continuous (CON)

3. **Autothrottle (A/T) Engage Switch**
   Push – above 400 feet, with the autothrottle armed, activates the appropriate autothrottle mode for the selected AFDS pitch mode, or if no pitch mode, in the speed (SPD) mode.
4. **Autothrottle Engaged Light**

Illuminated (white) – an autothrottle mode is activated.

5. **To/GA Clickspot**

Push – Activate Takeoff Mode. Clickspot does the same thing as TO/GA switches on the thrust levers

Autopilot Flight Director IAS/Mach Controls

IAS/MACH Reference Switch
Push –

- alternately changes the IAS/MACH window between IAS and MACH displays (Mach must be 0.4 or greater to switch from IAS to Mach)
- inoperative when the IAS/MACH window is blank

2 IAS/MACH Window (Clickable and Scrollable)
Upper line displays speed selected by the IAS/MACH selector and lower line displays uplinked ATC speed clearance. (ATC Uplink is planned in future development)
IAS/MACH window is blank when the FMC controls the speed.
The display range is:

- 100 – 399 KIAS
- .400 – .950 Mach

The selected speed displays as the PFD selected speed.
The selected speed displays as the range to target speed
Upper line displays 200 knots and lower line is blank when power is first applied.
During climb, automatically changes from IAS to MACH at .840 Mach.
During descent, automatically changes from MACH to IAS at 310 KIAS.

IAS/MACH Selector
Rotate –

- sets the speed on upper line of IAS/MACH window as the selected speed on both the PFD and HUD
- inoperative when the IAS/MACH window is blank

Push –

- with VNAV active, alternately opens or closes the IAS/MACH window:
  - when the window is closed, the FMC computed target speed is active and displays on both the PFD and HUD
  - when the window is open, FMC speed–intervention is active and the IAS/MACH selector may be used to set the desired speed

4 Uplink Transfer (XFR) Switch (Future Development)

Push – Transfers the IAS or Mach value from the lower line to the upper line. If upper line was blank/closed, it now opens to the uplinked ATC value. Lower line blanks after the transfer.

5 ATC Uplinked Speed Clearance (Future Development)

The ATC uplink function is planned for future development on the QualityWings 787

Autopilot Flight Director Roll and Pitch Controls

1. Lateral Navigation (LNAV) Switch

Push –

- arms, selects, or disarms LNAV as the roll mode
- displays LNAV as armed mode on PFD (in white) and HUD roll flight mode annunciator. The previous roll mode remains active
- LNAV activates when the airplane is above 50 feet radio altitude and:
  - within 2.5 NM of the active leg
  - when not within 2.5 NM of the active leg and on an intercept heading to the active leg, remains armed then activates when approaching the active leg
  - when active, displays LNAV in green on the PFD and HUD roll flight mode annunciations
- selection of LNAV with the airplane not on a heading to intercept the active leg, displays FMC INTERCEPT HDG EICAS advisory message
- selection of LNAV when an active FMC route is not available displays NO ACTIVE ROUTE in the CDU help window
- LNAV maintains current heading when:
  - passing the last active route waypoint
  - passing the last waypoint prior to a route discontinuity
  - passing the last route offset waypoint
  - activating the inactive route or activating an airway intercept and not within LNAV engagement criteria
- on go-around when valid missed approach path exists, LNAV activates automatically at 50 feet radio altitude with flight director only or 200

feet radio altitude with the autopilot engaged. LNAV is deactivated by engaging any other roll mode or by disengaging the autopilot and turning both flight directors off

LNAV is deactivated:

- by selecting heading hold (HDG HOLD) or track hold (TRK HOLD)
- by selecting heading select (HDG SEL) or track select (TRK SEL)
- with LOC or FAC capture

LNAV is disarmed by pushing the LNAV switch a second time, or by arming LOC/FAC or APP.

2. LNAV Light

Illuminated (white) – the LNAV mode is armed or active.

3. Vertical Navigation (VNAV) Switch

Push –

- arms, selects, or disarms VNAV as the pitch mode
- displays VNAV as armed mode on PFD (in white) and HUD pitch flight mode annunciation below 400 feet
- VNAV activates at 400 feet AGL
- when VNAV is selected and the FMC has insufficient data to provide VNAV guidance (such as the gross weight is invalid or there is no end–of–descent point in descent) displays PERF/VNAV UNAVAILABLE in the CDU help window
- VNAV SPD, VNAV PTH or VNAV ALT pitch mode displays in green (engaged) on the PFD and HUD pitch flight mode annunciator
- in the VNAV SPD pitch mode, the AFDS commands pitch to hold target airspeed. The autothrottle operates in the THR REF, THR, IDLE or HOLD mode, as required by the phase of flight
- in the VNAV PTH pitch mode, the AFDS commands pitch to maintain FMC target altitude or the VNAV path. The autothrottle maintains speed
- in the VNAV ALT pitch mode, the AFDS commands pitch to maintain the MCP selected altitude when that altitude is lower than the VNAV commanded altitude in climb or higher than the VNAV commanded altitude in descent
- when VNAV is selected and VNAV commands a descent with the MCP altitude window above the current airplane altitude, the autopilot maintains the altitude at which VNAV was selected. When on an instrument approach using VNAV, selecting the missed approach altitude does not interfere with the VNAV descent

- when VNAV is selected and VNAV commands a climb with the MCP altitude window below the current airplane altitude, the autopilot maintains the altitude at which VNAV is selected
- •with the VNAV ALT pitch mode active, the autothrottle operates in the speed (SPD) mode
- with the VNAV PTH pitch mode active, the autothrottle operates in the following modes:
- •for climb or cruise – operates in the speed (SPD) mode
- •for descent – operates in the IDLE, HOLD, or speed (SPD) mode
- VNAV pitch guidance is available with one engine inoperative

VNAV is deactivated:

- by selecting TO/GA, FLCH SPD, V/S, FPA, ALT, G/S or G/P pitch mode

VNAV is disarmed by:

- pushing the VNAV switch a second time

4. VNAV Light

Illuminated (white) – the VNAV mode is armed or active.

5. Flight Level Change (FLCH) Switch

Push –

- selects FLCH SPD pitch mode
- FLCH SPD displays on the PFD and HUD pitch flight mode annunciation as the pitch mode
- when IAS/MACH window is blank, it opens to the current speed
- when IAS/MACH window is open, it displays command speed
- AFDS pitch holds MCP selected speed. When the MCP selected altitude is captured, the pitch flight mode annunciation changes to ALT
- A/T operates in THR. When thrust is retarded to idle, HOLD displays during descent. When MCP selected altitude is captured, A/T mode changes to SPD
- A/T advances or retards thrust levers to provide 500 FPM vertical speed for each 1000 feet altitude change
- AFDS attempts to reach the MCP selected altitude within two minutes if able with available thrust. Otherwise, A/T uses IDLE or CLB thrust to reach the MCP selected altitude
- with a higher altitude set in the altitude window, reference thrust limit changes to CLB when CRZ displays or to CON with an engine inoperative

6. Flight Level Change Light

Illuminated (white) – the flight level change mode is active.

Autopilot Flight Director Heading, Track, and Bank Angle Controls

1. Heading/Track (HDG/TRK) Reference Switch

Push – alternately changes the upper line of the heading/track window, PFD, HUD, and ND selected heading/track references between heading and track. Also changes the PFD and HUD roll flight mode annunciations, when the HDG or TRK mode is active.

2. Heading/Track Window (Clickable and Scrollable)

Upper line displays the selected heading or track and lower line displays uplinked ATC heading or track target. (ATC Uplink is planned in future development)

The selected heading or track displays on the PFD, HUD and ND.

If approach is armed, the heading/track in the MCP window automatically changes to the approach course at LOC or FAC capture.

Upper line displays 360º and lower line is blank when power is first applied.

3. ATC Uplinked Heading or Track (Future Development)

The ATC uplink function is planned for future development on the QualityWings 787

4. Uplink Transfer (XFR) Switch (Future Development)

Push – transfer the value from the lower line to the upper line. Lower line blanks after the transfer.

5. BANK LIMIT Selector (outer)

Rotate – sets the AFDS commanded bank limit when in the heading select (HDG SEL) or track select (TRK SEL) roll mode as follows:

- AUTO – varies between 15º – 25º, depending on TAS

- 10º, 15º, 20º, 25º or 30º – the selected value is the maximum, regardless of airspeed

6. Heading/Track Selector (middle)

Rotate –

- sets heading or track in the heading/track window and on the PFDs, HUDs, and NDs
- with heading select (HDG SEL) or track select (TRK SEL) as the active roll mode, the aircraft will turn in the direction of knob rotation to achieve the selected heading or track

7. Heading/Track Select (SEL) Switch (inner)

Push –

- selects heading select (HDG SEL) or track select (TRK SEL) as the roll mode
- displays HDG SEL or TRK SEL on the PFD and HUD roll flight mode annunciator
- AFDS turns the aircraft in the direction of least heading change to achieve the selected heading or track
- bank is limited by the bank limit selector

8. Heading/Track Hold (HOLD) Switch

Push –

- selects heading hold (HDG HOLD) or track hold (TRK HOLD) as the roll mode
- displays HDG HOLD or TRK HOLD on the PFD and HUD roll flight mode annunciator
- AFDS commands wings level and holds the heading or track established when wings level is established

9. Heading/Track Hold Light

Illuminated (white) – the heading/track HOLD mode is active.

Autopilot Flight Director Vertical Speed (V/S) and Flight Path Angle (FPA) Controls

1. **V/S – FPA Reference Switch**

Push – alternately changes the vertical speed/flight path angle window and PFD references between vertical speed and flight path angle. Also changes the PFD / HUD pitch flight mode annunciation, if the V/S or FPA mode is active.

2. **Vertical Speed/Flight Path Angle (V/S – FPA) Window (Clickable and Scrollable)**

Displays the selected vertical speed in 100 fpm increments or the selected flight path angle in 0.1 degree increments.
The display range is:

- V/S: -8000 to +6000 fpm
- FPA: -9.9º to +9.9º

Blank when the vertical speed (V/S) or flight path angle (FPA) pitch mode is not active. Display state can be pre-selected by pushing the V/S-FPA reference switch.
The selected vertical speed displays on the PFD vertical speed indication.
The selected flight path angle displays on the PFD attitude indicator.

3. **V/S – FPA Selector**

UP or DOWN – sets the vertical speed or flight path angle in the vertical speed/flight path angle window and on the PFDs.

4. **V/S – FPA Switch**

Push –

- engages V/S or FPA pitch mode

- displays V/S or FPA on the PFD and HUD pitch flight mode annunciation
- displays dashed line on the VSD indicating selected vertical speed as a target angle when V/S mode is selected
- displays the current vertical speed or flight path angle in the vertical speed/flight path angle window
- when the selected altitude is reached, the pitch mode changes to ALT
- AFDS commands pitch to maintain the vertical speed or flight path angle displayed in the vertical speed/flight path angle window
- when V/S or FPA is selected while in FLCH or VNAV, the autothrottle activates in speed (SPD) mode, when armed

5. V/S – FPA Light

Illuminated (white) – the vertical speed/flight path angle mode is active.

Autopilot Flight Director Altitude Controls

1. Altitude Window (Clickable and Scrollable)

Upper line displays the selected altitude and lower line displays an uplinked ATC altitude target.

The displayed altitude is the reference altitude for altitude alerting and level off.

The selected altitude displays on the PFD and HUD altitude tapes and the vertical situation display (VSD).

The altitude range is 0 to 50,000 feet.

Upper line displays 10,000 feet and lower line is blank when power is first applied.

2. Altitude Increment Selector (outer)

AUTO –

- the altitude selector changes in 100 foot increments

1000 – the altitude selector changes in 1,000 foot increments.

3. Altitude Selector (inner)

Rotate – sets the altitude in the altitude window and on the PFD, HUD and VSD altitude indication displays.

Push –

- during climb with no altitude constraints, and the altitude window set above the FMC cruise altitude, the cruise altitude is changed to the altitude window value
- during cruise:
  - •with the altitude window set above or below FMC cruise altitude, the FMC cruise altitude resets to the altitude window altitude

- •when in VNAV PTH or VNAV ALT pitch mode, the airplane begins a climb or descent toward the altitude window altitude

4. Altitude HOLD Switch

Push –

- selects altitude (ALT) as the pitch mode
- ALT displays on the PFD and HUD pitch flight mode annunciation
- the AFDS commands pitch to maintain the altitude when the switch was pushed

5. Altitude Hold Light

Illuminated (white) – the altitude hold mode is active.

6. **Uplink Transfer (XFR) Switch** (ATC Uplink is planned in future development)

Push – transfer the value from the lower line to the upper line. Lower line blanks after the transfer.

7. ATC Uplinked Altitude

The ATC uplink function is planned for future development on the QualityWings 787

Autopilot Flight Director Approach Mode Controls

1. Localizer / Final Approach Course (LOC/FAC) Switch

Push –

- arms, disarms, or captures back course (B/CRS), final approach course (FAC) or localizer (LOC) as the roll mode
- displays B/CRS, FAC or LOC in white (armed) on the PFD and in green on the HUD roll flight mode annunciation before localizer or course capture
- displays B/CRS, FAC or LOC in green (active) on the PFD and in green on the HUD roll flight mode annunciation after localizer or course capture
- arms the AFDS to capture and track inbound on the front course or IAN final approach course
- the capture point varies based on range and intercept angle
- capture can occur when an intercept track angle is within 120º of the localizer or final approach course

The localizer / final approach course mode can be disarmed before capture by:

- pushing the LOC/FAC switch a second time, or
- selecting LNAV

The localizer / final approach course mode can be disarmed after capture by:

- selecting a roll mode other than LNAV
- pushing a TO/GA switch
- pushing the APP switch
- disengaging the autopilot and turning both flight director switches off, or
- engaging an autopilot when in flight director only

2. Localizer / Final Approach Course Light

Illuminated (white) – the localizer or final approach course mode is armed or active.

3. Approach (APP) Switch

Push –

- arms, disarms, captures roll mode (LOC, FAC, B/CRS) pitch mode (G/S, G/P) for the approach selected in the FMC
- displays selected roll and pitch modes as armed on the PFD and HUD roll and pitch flight mode annunciations prior to localizer / lateral path and glideslope / glidepath capture
- displays selected roll and pitch modes in green (engaged) on the PFD and HUD roll and pitch flight mode annunciations after each one is captured
- AFDS captures and tracks the localizer / lateral path roll mode and captures the glideslope / glidepath in the pitch mode upon interception
- localizer / lateral path captures when intercept track angle is within 120º of localizer course
- glideslope / glidepath captures when intercept track angle is within 80º of localizer or final approach course

The approach mode can be disarmed or deactivated for any status of localizer and/or glideslope by disengaging the autopilot and turning both Flight Director switches OFF.

When both localizer and glideslope are armed, the approach mode can be disarmed by selecting APP, LOC, LNAV, or VNAV.

The approach mode deselects:

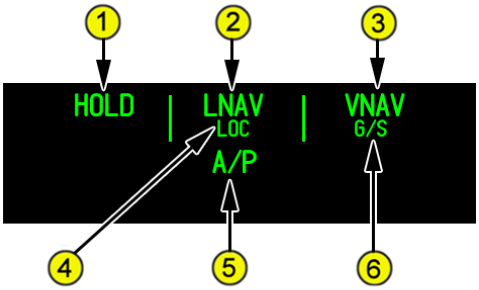
- by pushing APP when above 1,500 feet radio altitude
- with localizer captured and glideslope armed, by selecting heading select (HDG/TRK SEL) or heading hold (HDG/TRK HOLD)
- after localizer and glideslope are captured, by selecting TO/GA mode

4. Approach Light

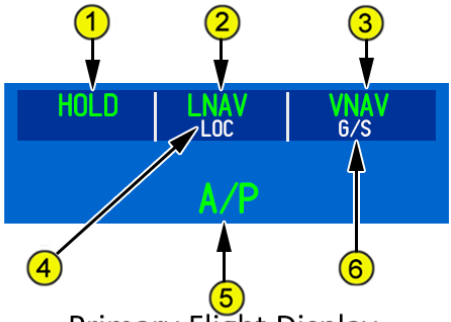
Illuminated (white) – the approach modes are armed or active.

PFD and HUD Flight Mode Annunciations (FMAs)

Note: When first engaged/activated, A/T, roll or pitch mode changes are emphasized for 10 seconds by a green box drawn around the mode.
Note: A horizontal line displays through the affected ACTIVE pitch or roll mode when a flight mode fault is detected (amber on the PFD and green on the HUD).



Heads-Up Display



Primary Flight Display

1. Autothrottle Modes (Active)

Displayed (green) –

- HOLD
- IDLE
- SPD
- THR
- THR REF

Note: When only one autothrottle is connected and armed, the autothrottle mode annunciation is augmented by an "L-" or "R-" preceding the mode.

2. AFDS Roll Modes (Active)

Displayed (green) –

- ATT
- FAC
- HDG HOLD
- HDG SEL
- HUD TO/GA
- LNAV
- LOC
- ROLLOUT
- TO/GA
- TRK HOLD
- TRK SEL

3. AFDS Pitch Modes (Active)

Displayed (green) –

- ALT
- FLARE
- FLCH SPD
- FPA
- G/S
- G/P
- TO/GA
- VNAV PTH
- VNAV SPD
- VNAV ALT
- V/S

4. AFDS Roll Modes (Armed)

Displayed (green on HUD, white on PFD) –

- FAC
- LNAV
- LOC
- ROLLOUT

5. Autoflight Status Annunciation

Displayed (green) –

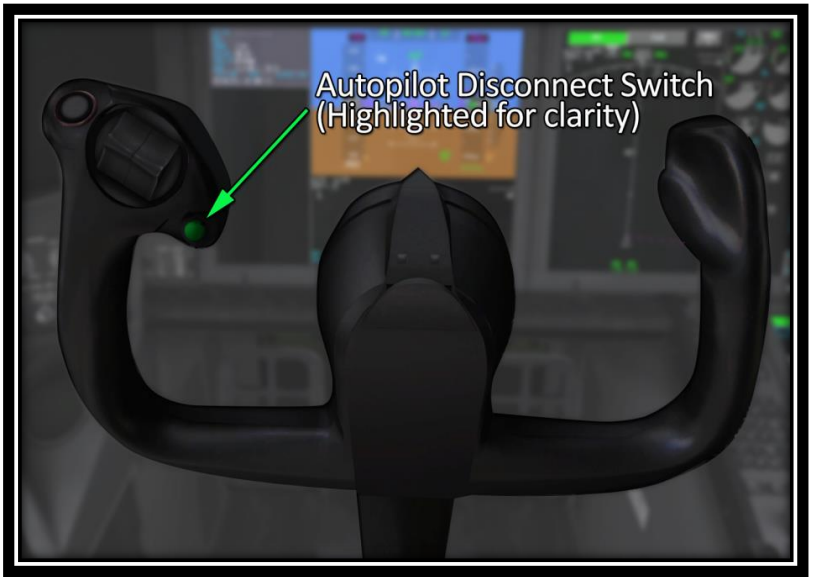
- A/P
- FLT DIR
- LAND 3

6. AFDS Pitch Modes (Armed)

Displayed (green on HUD, white on PFD) –

- FLARE
- G/P
- G/S
- VNAV

Autopilot Disconnect Switch



1. Autopilot Disconnect Switches

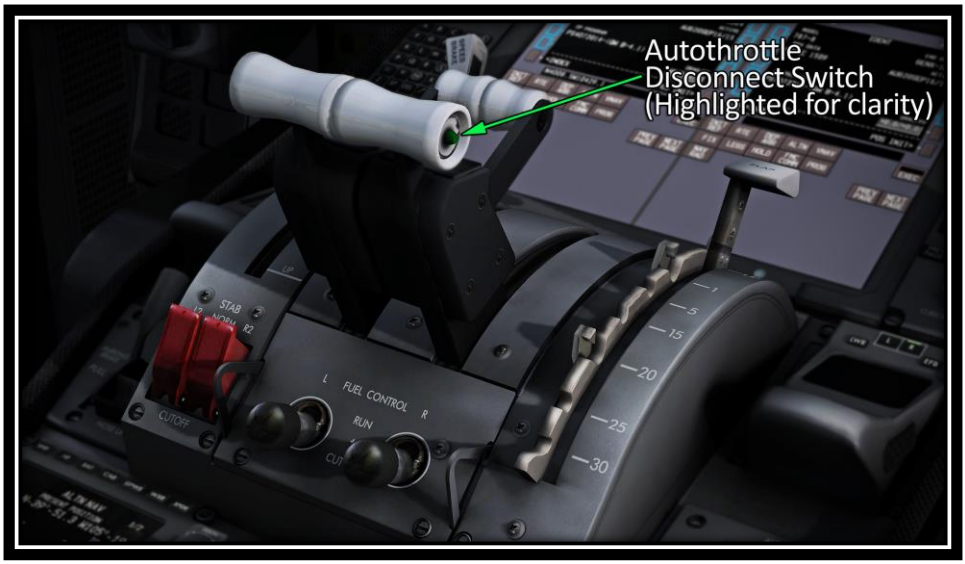
First push (either switch) –

- disengages the autopilot
- the master warning lights illuminate
- displays the EICAS warning message AUTOPILOT DISC
- sounds an aural warning

Second push – resets:

- the master warning lights
- EICAS warning message
- the aural warning

Autothrottle Disconnect Switches



1. Autothrottle Disconnect Switches

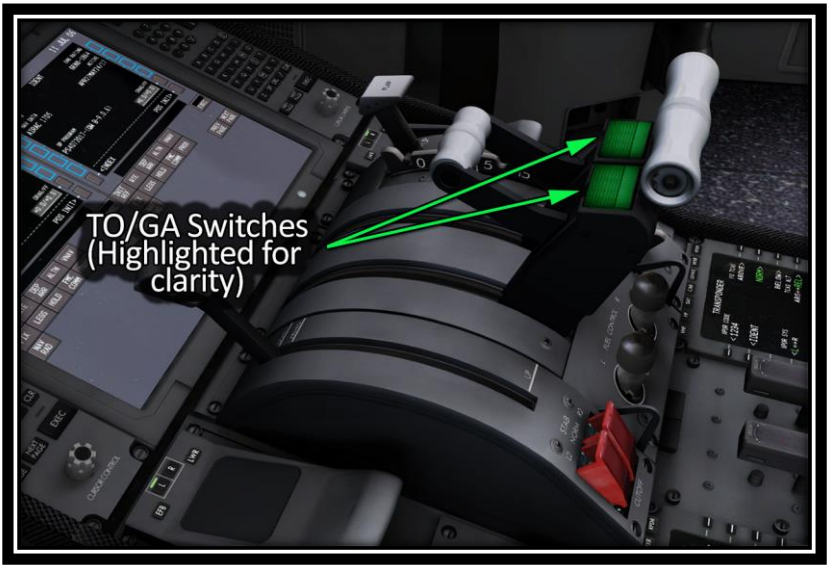
Push (either switch) –

- disconnects the autothrottle (both left and right)
- illuminates the master caution lights
- displays the EICAS caution message **AUTOTHROTTLE DISC**
- when the autothrottle automatically disconnects, resets the master caution lights and EICAS message

Second push –

- resets the master caution lights and EICAS message
- autothrottle remains armed

TO/GA Switches



1. Takeoff/Go-around (TO/GA) Switches

On the ground:

Push –

- below 50 knots and flaps out of up, activates autothrottle in THR REF mode at thrust limit selected on THRUST LIMIT page. If not pushed below 50 knots, autothrottle operation is inhibited until reaching 400 feet altitude
- pushing either switch above 80 knots disarms LNAV and VNAV

In flight:

Push (after lift-off with takeoff thrust limit displayed) –

- roll and pitch activate in TO/GA
- autothrottle activates in thrust reference (THR REF) at full go–around thrust.
- the AFDS increases pitch to hold the selected speed as thrust increases
- with an LNAV path available, LNAV automatically arms and activates: above 50 feet radio altitude

Flight Envelope Protection

Primary Flight Control System (PFCS)

The 787 features several envelope protection systems that we've programmed into the QualityWings 787. The primary flight control system provides flight envelope protection when operating in normal mode during manual. Flight envelope protection reduces the possibility of inadvertently exceeding the flight envelope by providing crew awareness of envelope margins through tactile, aural, and visual cues.

Envelope protection does not reduce pilot control authority.

The protection functions are described later in this section and include:

- bank angle protection (Protections from PFCS & A/P)
- overspeed protection (Protections from PFCS, A/P & A/T)
- stall protection (Protections from PFCS, A/P & A/T)

Autoflight System (AFDS)

In addition to primary flight control system protection, the autopilot and autothrottle systems prevent stall and overspeed. The EICAS caution message AUTOPILOT displays if the autopilot has begun flight envelope protection or if an amber line displays through the affected active roll or pitch flight mode annunciation.

When engaged, the autopilot limits bank angle to 30º, further assisting flight envelope protection.

Bank Angle Protection

Bank angle protection reduces the likelihood of exceeding the bank angle boundary due to external disturbances, system failures, or inappropriate pilot action.

Bank angle protection provides roll control wheel inputs when airplane bank angle exceeds the bank angle protection boundary of approximately 35°. If the boundary is exceeded, we've decreased the effectiveness of control wheel inputs (simulating the increased control wheel forces that would be experienced on the real life 787). If you release the control wheel within Bank Angle Protection, The PFC system will roll the airplane back within 30° of bank.

This roll command can be overridden by the pilot. Maximum control wheel deflection always commands maximum roll authority, but again to simulate the

additional wheel forces from the real-life aircraft your roll rate will decrease significantly. The autopilot disengage bar disables bank angle protection.

Overspeed Protection

PFCS

Overspeed protection is part of the Pitch Envelope Protection. This protection reduces the likelihood of inadvertently exceeding VMO or MMO by providing enhanced crew awareness of the approach to an overspeed condition.
The Primary Flight Control System does this by requiring the pilot to apply continuous forward column pressure, at twice the normal force, to maintain airspeed above VMO/MMO. As a result, on the QualityWings 787, you will find it difficult to get the aircraft to pitch nose down while Overspeed Envelope Protection is active.

AFDS

Overspeed protection is available with flaps up for all flight modes except G/S. With flaps out of up, flight envelope protection is only available in FLCH and TO/GA.

Stall Protection

Stall protection reduces the likelihood of inadvertently exceeding the stall angle of attack by providing enhanced crew awareness of the approach to a stall or to a stalled condition.
Stall protection limits the speed to which the airplane can be trimmed. At approximately the minimum maneuvering speed, the trim reference speed is limited by inhibiting trim in the nose up direction. As a result, on the QualityWings 787, you will find it difficult to get the aircraft to pitch nose up while Stall Envelope Protection is active.

Additional Protections & Features

Tail Strike Protection

During takeoff or landing, the PFCs calculate if a tail strike is imminent and decrease elevator deflection, if required, to reduce the potential for tail contact with the ground. Activation of tail strike protection does not provide feedback to the control column, Protection does not degrade takeoff performance and is compatible with the autoland system.

Asymmetry Compensation

In flight, when a roll or yaw asymmetry condition exists for any reason (not only thrust related), the flight control system initially attempts to maintain zero roll rate and sideslip. An automatic rudder input counters the yawing moment and an automatic lateral control input counters the rolling moment.

Electronic Flight Bag (EFB)

Introduction

The electronic flight bag (EFB) is an operating system with applications designed to assist the flight crew with routine tasks, enhance security, and reduce the reliance on paper documents. The flight crew uses the EFB display units located in the left and right side panels. The display units operate as slaved units on the QualityWings 787. They are not independent of each other. The EFB exchanges data with the FMC.

Under typical flight conditions, the majority of pilot interaction consists of manipulating bezel keys or using the touch screen on the display unit to move back and forth among applications, or within applications.

The suite of applications available on the QualityWings 787 are:

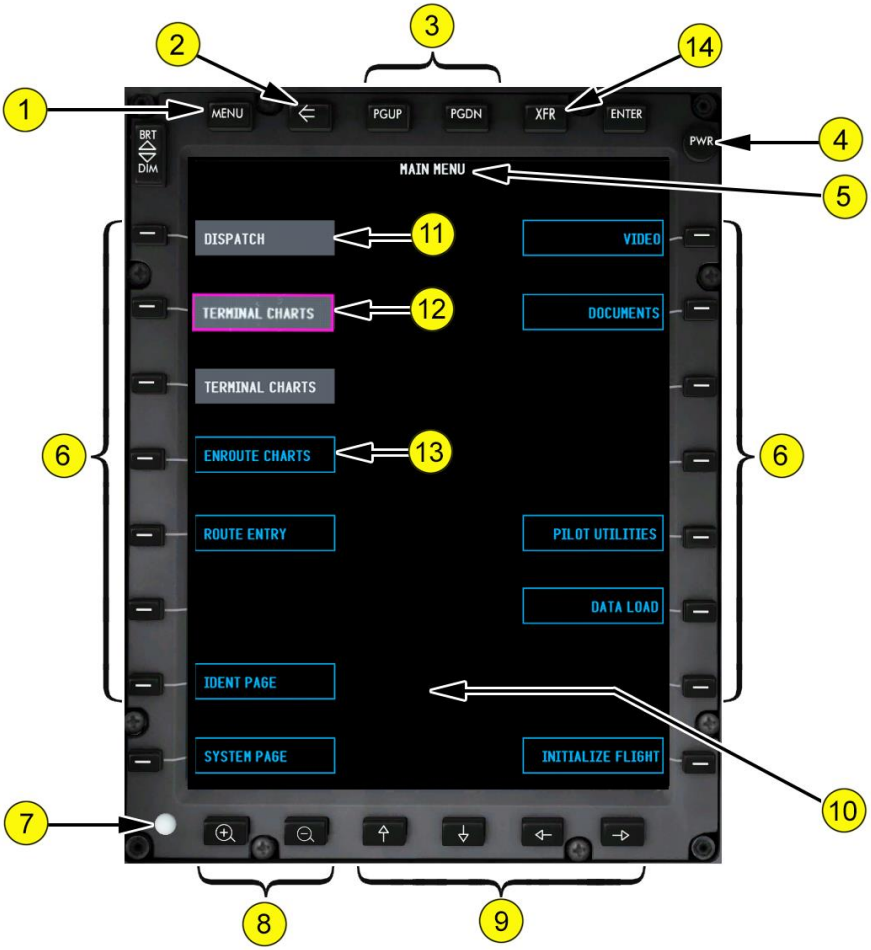
- Onboard Performance Tool
- Terminal Charts

Additional applications are possible in future releases.

Display Unit

The display unit is the main interface between the flight crew and the EFB and its applications. The display unit incorporates a touch screen and 30 keys located around the screen. There are 16 vertically located line select keys 8 on both sides, and 14 horizontally located bezel keys 8 across the top and 6 across the bottom.

- Note: Not all keys on the EFB are simulated on the QualityWings 787.



1. **MENU Key**

Selection displays the Main Menu page. Also, selecting MENU while in transfer (XFR) mode cancels the transfer mode.

2. **Back Key**

Selection returns the display to the previous screen.

3. **Page Up (PGUP) and Page Down (PGDN) Keys**

Selection moves the displayed information up or down when the material exceeds one display screen in length.

4. **Power (PWR) Switch**

Selection turns the display backlight on or off.

5. **Display Header**

Displays the page title

6. **Line Select Keys**

When applicable, selection activates the item adjacent to the line select key.

7. **Light Sensor**

Provides automatic brightness control for the EFB display.

8. **Zoom Keys**

Selection increases or decreases the zoom level. Left + key to zoom in, right – key to zoom out.

9. **Arrow Keys**

Moves the viewing window over the display in the direction of the selected arrow.

10. **Touch (Click) Sensitive Screen**

Enables direct selection of items on the display screen.

11. **Soft Keys**

Soft keys for available applications and functions display in white text with a gray background.

12. **Highlight Box**

A magenta highlight box displays around an available soft key when:

- the cursor is moved over the soft key, or
- the soft key is touched on the screen

13. **Unavailable Applications or Functions**

Soft keys for unavailable applications or functions display in cyan text in a cyan box. The application or function may be initializing and become available later.

14. **Transfer (XFR) Key (Day/Night Mode Toggle Key)**

Used to toggle the Terminal Charts between Night Mode and Day Mode

MAIN MENU Page

The MAIN MENU page contains access to all the hosted applications via soft keys displayed on the page. The MAIN MENU page also contains the INITIALIZE FLIGHT soft key. The MAIN MENU page can be displayed at any time by selecting the MENU bezel button.

1. DISPATCH
Application Soft Key
Selection starts the Dispatch Application

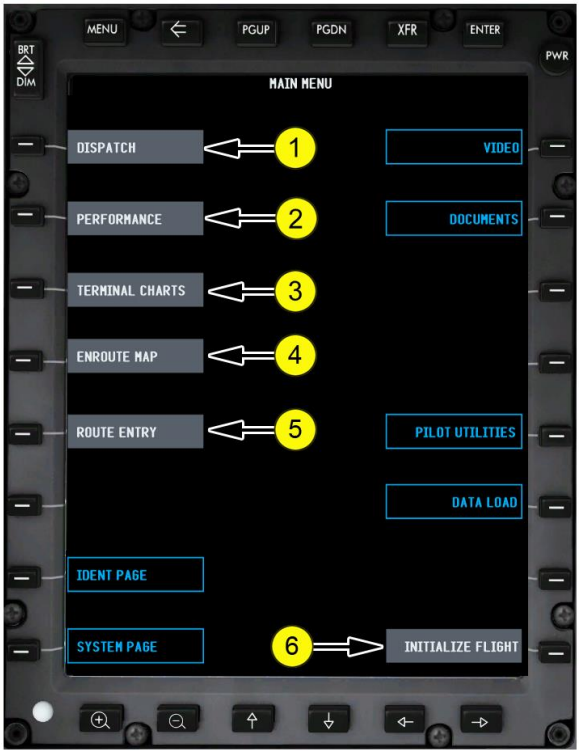
QWTip: *More information about the Dispatch Application can be found in the Dispatch section*

2. PERFORMANCE
Application Soft Key
Selection starts the performance application.

QWTip: *More information about the Performance Application can be found in the Onboard Performance Tool section*

3. TERMINAL CHARTS
Application Soft Key
Selection starts the terminal charts application.

QWTip: *More information about the Terminal Charts Application can be found in the Terminal Charts section*



4. ENROUTE MAP

Application Soft Key

Selection starts the Enroute Map Application

QWTip: *More information about the Enroute Map Application can be found in the Enroute Map section*

5. ROUTE ENTRY

Application Soft Key

Selection starts the Route Entry Application

QWTip: *More information about the Route Entry Application can be found in the* Route Entry *section*

6. INITIALIZE FLIGHT (CLOSE FLIGHT) Soft Key

Soft key shows grey once an FMC Route has been entered in the CDU. Once flight is initialized, but grey soft key displays CLOSE FLIGHT .Shows unavailable otherwise.

QWTip: *More information about Initializing a Flight can be found on the* *next page**.*

Initializing a Flight

The flight is initialized during the CDU/EFB Preflight Procedure.
After initializing the flight the following information is collected from the airplane systems and made available to the EFB applications:

- flight deck date and time
- GPS position
- true and magnetic heading
- origin and destination airports
- several performance data points
- departure runway
- outside air temperature
- altimeter setting
- gross weight

The INITIALIZE FLIGHT soft key shows as unavailable (Cyan). The key becomes available once an ORIGIN and DESTINATION have been entered on the FMS ROUTE page.
To initialize the flight select INITIALIZE FLIGHT from the MAIN MENU page. The button will change to CLOSE FLIGHT.

Closing a Flight

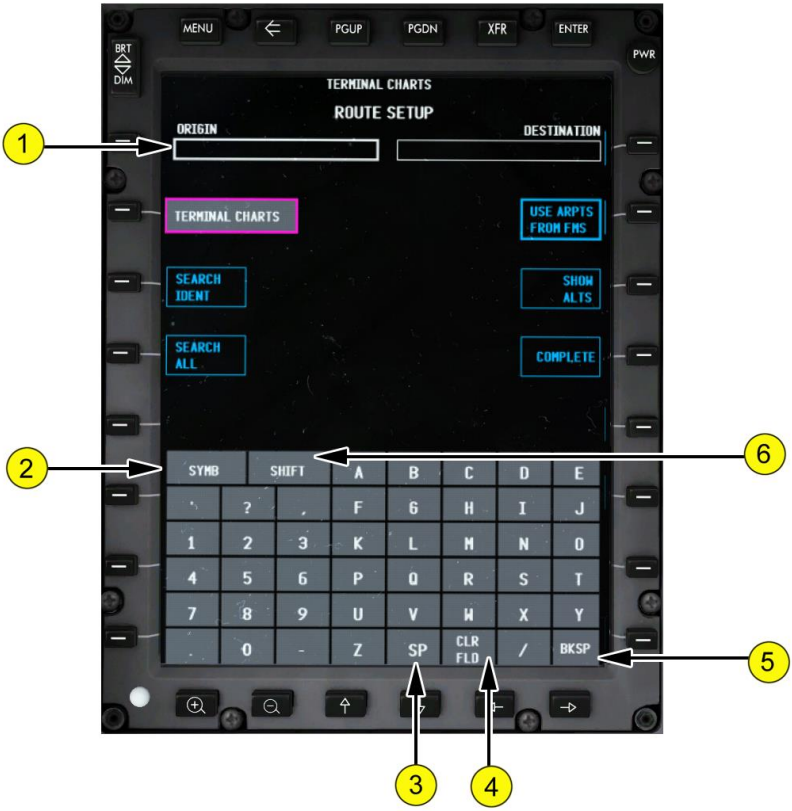
At the end of the flight, the EFB and its applications should be properly closed. To close the flight select CLOSE FLIGHT from the MAIN MENU page. This "cleans up" the EFB application data, effectively deleting all flight-specific information from memory.

- Note: The CLOSE FLIGHT soft key toggles to INITIALIZE FLIGHT after selection. If INITIALIZE FLIGHT is displayed on the soft key, the flight has already been closed.

EFB Virtual Keyboard Display

The virtual keypad can be used to type information, such as airport identifiers or performance data, into the EFB applications. The keypad is automatically activated for certain functions such as airport searches and performance data entry.

The typed selection displays in the active field and can either be in an application, or the field in the keypad itself. The typed data, when complete, is then entered into the appropriate field in the application, or searched for with the returned results listed above the keypad. Refer to each individual application description in this chapter for more information on using the keypad.



1. **Data Entry Field**
   Displays the data entered using the virtual keyboard. The data entry field will display in various locations on the screen depending on the current application being used (this example is for the Airport Search function).
2. **Symbol (SYMB)/Number (NUM) Key**
   Selection toggles between symbols and numbers on the numeric keypad. Displays cyan when not required for the active data entry field.
3. **Space (SP) Key**
   Inserts a blank space into the active data entry field.
4. **Clear Field (CLR FLD) Key**
   Deletes everything in the active data entry field.
5. **Backspace (BKSP) Key**
   Deletes the previous character in the active data entry field.
6. **SHIFT Key**
   Selection toggles between upper case and lower case on the ALPHA keypad. Displays cyan when not required for the active data entry field.

Onboard Performance Tool

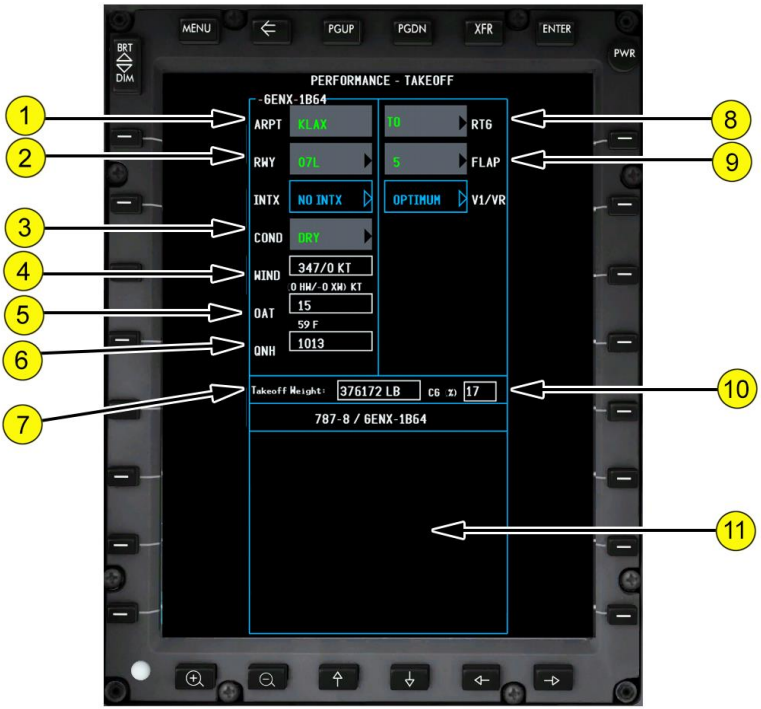
Overview

The Onboard Performance Tool (OPT) application calculates takeoff and landing performance using manually-entered data for a specific aircraft configuration under current conditions.

After selecting INITIALIZE FLIGHT on the EFB MAIN MENU page, the following information is retrieved from the FMC by the OPT application:

- origin airport
- departure runway
- destination airport
- outside air temperature
- altimeter setting
- aircraft gross weight

PERFORMANCE - TAKEOFF Inputs Page



1. **Airport (ARPT)**

Displays the airport identifier from the airport search function or transferred from the FMC route (RTE) page in the ORIGIN field. Manual entry of an airport on this page is not allowed.

2. **Runway (RWY)**

Displays the runway selected by the flight crew or transferred from the FMC route (RTE) page in the RUNWAY field.
Selection opens the drop-down list. Selecting a runway or EXIT closes the list. Runways closed by NOTAM display amber. If selected an error message is displayed but the program still performs the requested calculation.

3. **Runway Condition (COND)**

Displays the runway condition selected by the flight crew.
Selection opens the drop-down list. Selecting from the list or EXIT closes the list.

4. **WIND**

Displays the wind direction and speed (ddd/ss K) entered by the flight crew. The wind direction can be replaced with a headwind or tailwind component by entering a numeric value. Headwind components are positive values (i.e. 10) and tailwind components are negative values (i.e. -10).
A tailwind component can also be entered using a leading or trailing T entered with the wind velocity (i.e. T10 or 10T).

5. **Outside Air Temperature (OAT)**

Displays the temperature entered by the flight crew or transferred from the FMC TAKEOFF REF page 2 in the REF OAT field.
Temperature is displayed in the unit (Celsius or Fahrenheit) set by company policy. The default can be over-ridden by typing a C or F after the value entered.

6. **Barometric Pressure (QNH)**

Displays the barometric pressure entered by the flight crew or transferred from the data displayed on the primary flight display (PFD). HPA Only

7. **Takeoff Weight**

Displays the takeoff weight entered by the flight crew or transferred from the FMC performance initialization (PERF INIT) page in the gross weight (GR WT) field. The last occurrence of these entries is the takeoff weight displayed.

8. **Takeoff Thrust Rating (RTG)**

Displays the selected takeoff thrust rating.
Selection opens the drop-down list. Selecting from the list or EXIT closes the list.

9. **FLAPS**

Displays the selected takeoff flap setting. Selection opens the drop-down list. Selecting from the list or EXIT closes the list

10. Percent Center of Gravity [CG (%)]

Displays the percent center of gravity (CG %) entered by the flight crew. This is a mandatory entry but is not used in any performance calculation. It is used when transferring performance data to the FMC for the stabilizer trim calculation. The CG field becomes active only after an entry in the Takeoff Weight field.

11. Performance Data Display Area

Displays the airplane performance information for the corresponding conditions selected. Information displayed includes:

- flap setting
- engine out acceleration height
- runway and intersection if applicable
- takeoff gross weight
- engine power setting
- selected temperature
- V-speeds (V1, VR, V2)
- landing reference speed (VREF)
- runway information such as engine failure procedure

Calculating Takeoff Performance

Unless otherwise specified, all of the information in this section is referenced to the Takeoff page in the OPT application.

To complete a takeoff calculation, entries in the following fields are required:

- ARPT – origin airport
- RWY – planned departure runway
- COND – departure runway condition
- WIND – airport surface wind
- OAT – outside air temperature
- QNH – altimeter setting
- RTG – thrust rating
- FLAP – takeoff flap position
- Takeoff Weight – actual takeoff weight
- CG – center of gravity value

These required entries can be made by a combination of transferring data from the FMC and manual entry, or by manual entry alone.

The CALC soft key does not become available until all the required entries are complete.

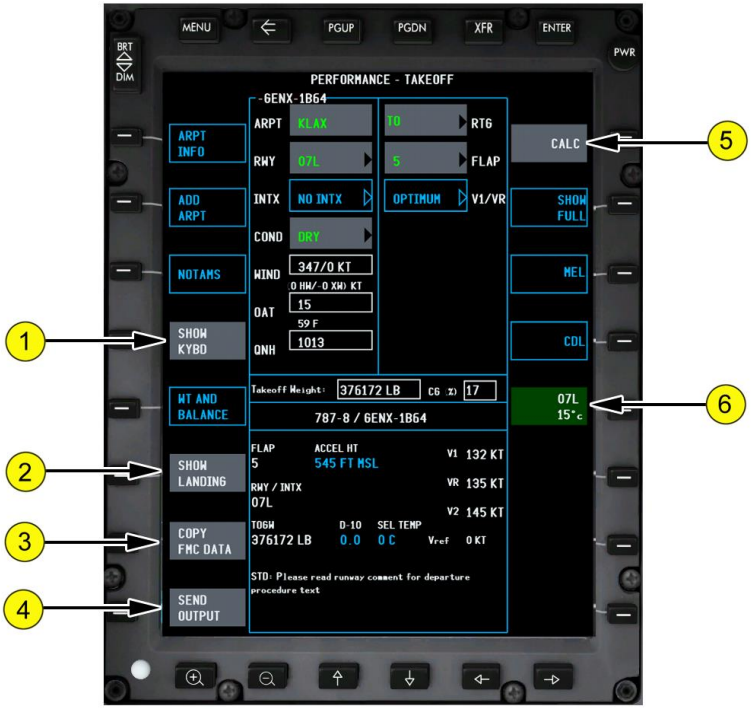
The following fields are also available for use when required:

- SHOW/HIDE KYBD – display or hide the keyboard
- SHOW LANDING – toggles between the Performance Takeoff and Landing pages
- COPY FMC DATA – copy data from the FMC for use in performance calculations
- SEND OUTPUT – send performance data to various locations
- CALC – initiates the performance calculation

After completing the takeoff data entries and selecting CALC, the following values are displayed in the performance results area:

- FLAP – flap setting
- ACCEL HT – engine out acceleration height
- V1, VR, V2 and VREF speeds
- RWY/INTX – runway and intersection
- TOGW – takeoff gross weight

PERFORMANCE - TAKEOFF Page



1. SHOW KYBD (Keyboard) Soft Key

Displays a touch sensitive keypad at the bottom of the page that is used for data entry.

2. SHOW LANDING Soft Key

Selection displays the Landing page.

3. COPY FMC DATA Soft Key

Selection copies data from the FMC to the takeoff and landing pages.

4. SEND OUTPUT Soft Key

Selection displays the send output menu. Active only after CALC has been performed. Send output choices may include:

- Send to FMC - transfers OPT information to the FMC
- Send to Printer - prints on the aircraft printer
- Send to Storage - saves data to storage for later retrieval

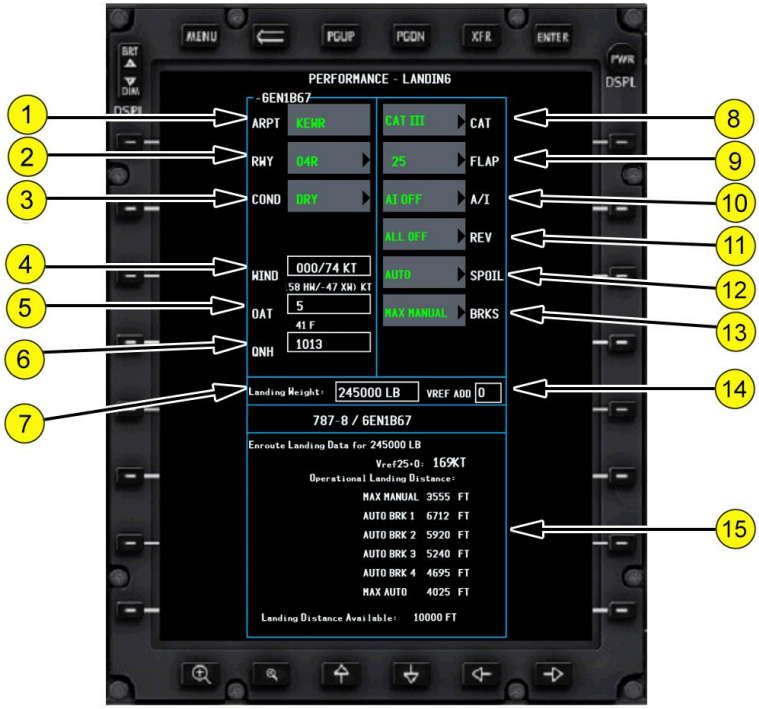
5. CALC (Calculate) Soft Key

Selection initiates the calculation of takeoff data.
Becomes active only after all the required data has been entered.

6. Full Length Runway Soft Key

Displays the runway and temperature data upon which the calculations are based.
Selection turns the soft key green and displays the full length runway data in the performance display area.

PERFORMANCE - LANDING Page



1. Airport (ARPT)

Displays the airport identifier from the airport search function or transferred from the FMC route (RTE) page in the DESTINATION field. Manual entry of an airport on this page is not allowed.

2. Runway (RWY)

Displays the runway selected by the flight crew or transferred from the FMC route (RTE) page in the RUNWAY field.

Selection opens the drop-down list. Selecting a runway or EXIT closes the list. Runways closed by NOTAM display amber. If selected an error message is displayed but the program still performs the requested calculation.

3. Runway Condition (COND)

Displays the runway condition selected by the flight crew.

Selection opens the drop-down list. Selecting from the list or EXIT closes the list.

4. **WIND**

Displays the wind direction and speed (ddd/ss K) entered by the flight crew. The wind direction can be replaced with a headwind or tailwind component by entering a numeric value. Headwind components are positive values (i.e. 10) and tailwind components are negative values (i.e. -10).
A tailwind component can also be entered using a leading or trailing T entered with the wind velocity (i.e. T10 or 10T).

5. **Outside Air Temperature (OAT)**

Displays the temperature entered by the flight crew or transferred from the FMC TAKEOFF REF page 2 in the REF OAT field.
Temperature is displayed in the unit (Celsius or Fahrenheit) set by company policy. The default can be over-ridden by typing a C or F after the value entered.

6. **Barometric Pressure (QNH)**

Displays the barometric pressure entered by the flight crew or transferred from the data displayed on the primary flight display (PFD). HPA Only

7. **Landing Weight**

Displays the landing weight entered by the flight crew or transferred from the FMC during COPY FMC DATA.

8. **Landing Category (CAT)**

Displays the selected Landing Minima.

9. **Flap**

   Displays the selected Landing Flaps

10. **Anti-Ice (A/I)**

    Displays the Anti-Ice configuration for Performance calculations

11. **Reverse Thrust (REV)**

    Displays the selected reverse thrust used in the landing for performance calculations

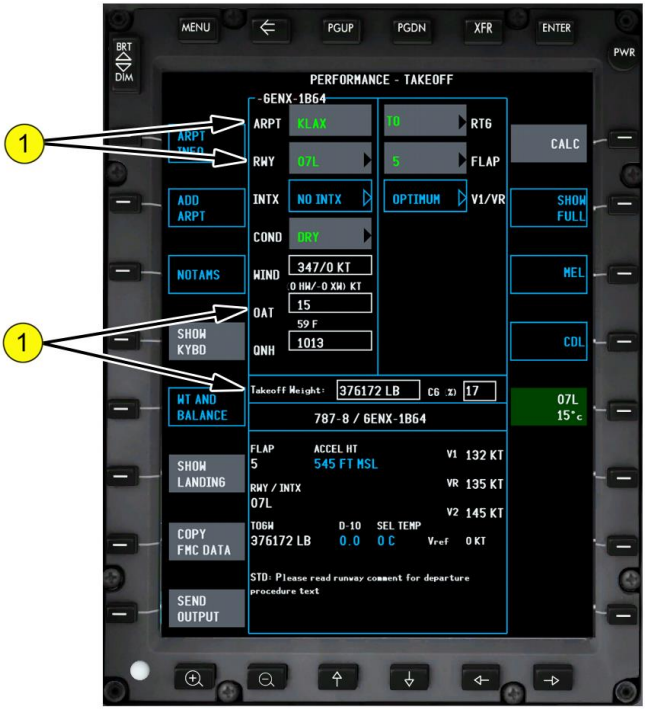
12. **Spoilers**

    Displays the selected Spoilers to be used during the landing for performance calculations. For examples, no spoilers or automatic speedbrakes

13. **Braking (BRKS)**

    Displays the selected braking to be used during the landing. For example manual braking versus automatic braking. This is used in performance calculations

PERFORMANCE - COPY FMC DATA function



1. Data transferred from the FMC

After selection of the COPY FMC DATA soft key, the transferred data from the FMC is displayed in the relevant fields. The fields that receive data from the FMC are:

- ARPT (origin, or destination when on the Landing page)
- RWY
- OAT
- Takeoff Weight

Terminal Charts

Overview

The Terminal Charts application provides the ability to find and display any terminal chart in the QualityWings 787 Navigation Database. The product ships with a database provided by Navigraph (www.navigraph.com).
The Navigation Database Cycle that ships with the products is shown below.
Initial Release

- AIRAC 1805

***QWTip**: More information about determining the current AIRAC Cycle can be found in the FMS Supplemental Section*

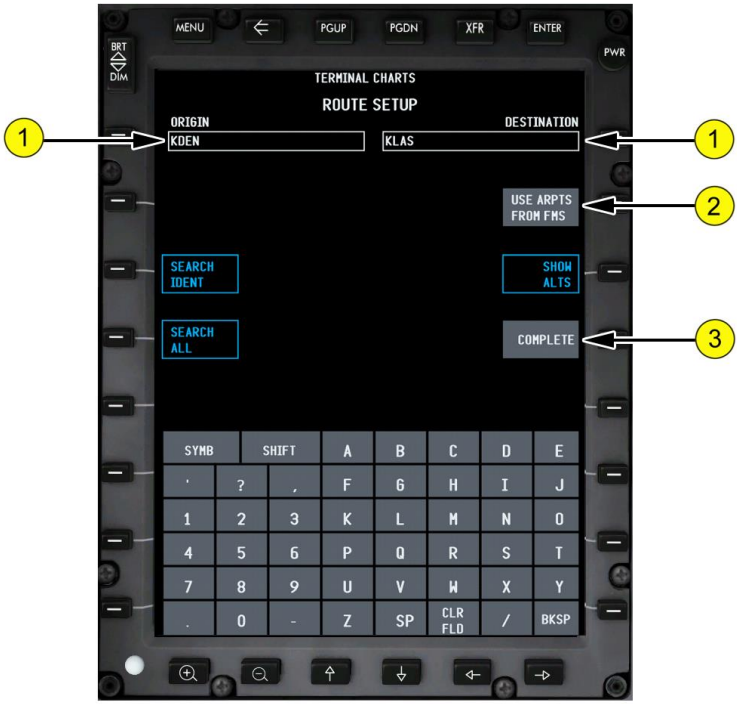
For a more current AIRAC Cycle database, you will a subscription to Navigraph.
The QualityWings 787 EFB will build Terminal Charts on the fly based on the manually entered airports or those sensed during the Initialization of the Flight in the EFB.
When the EFB is initialized, the application creates an origin and destination chart clip that pre-loads the charts anticipated for use during the flight.
The standard chart library may include the following chart types:

- Airport
- Departure
- Arrival
- Approach

Starting the Application

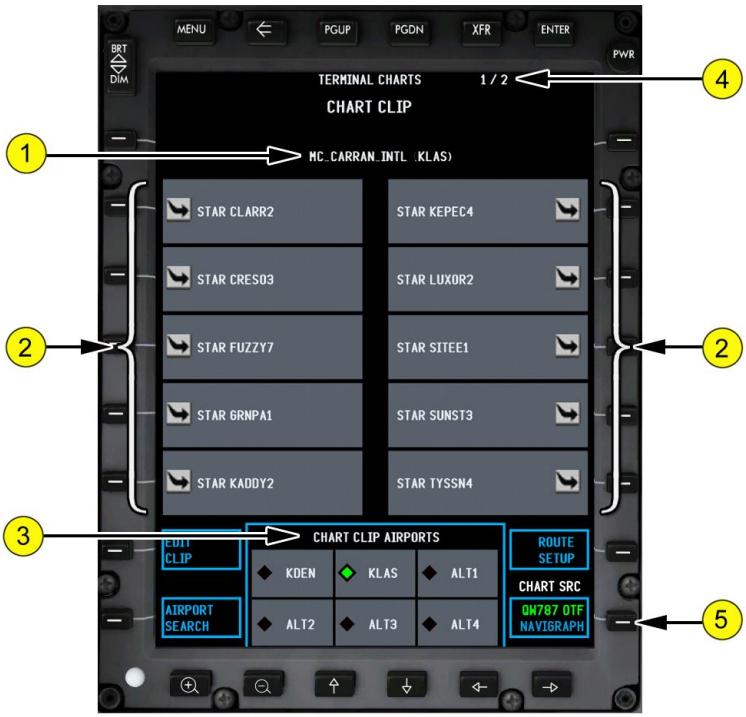
To start the Terminal Charts application, select TERMINAL CHARTS from the EFB MAIN MENU page. The ROUTE SETUP page displays when the application is first started.

TERMINAL CHARTS - ROUTE SETUP Page



1. **Origin and Destination Airports**
   The origin and destination airports can be entered on the ROUTE SETUP page. The origin and destination airports can be entered by copying them from the FMC, either automatically when the flight is initialized, or by selecting the USE ARPTS FROM FMC soft key. Any airport can be entered by typing an airport identifier.
2. **USE ARPTS FROM FMS Soft Key**
   Selection loads the ORIGIN and DESTINATION fields with those entered on the FMC Route page.
3. **COMPLETE Soft Key**
   Selection saves any changes and displays the CHART CLIP page.

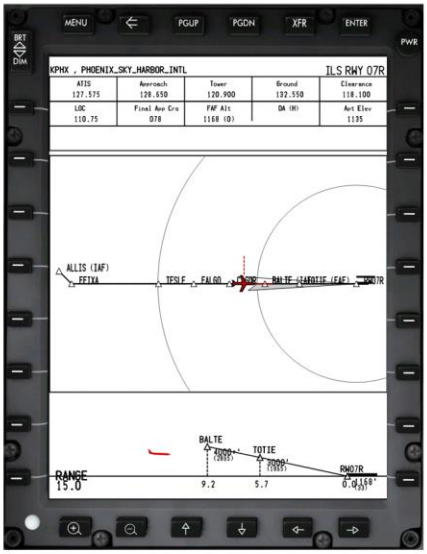
TERMINAL CHARTS - CHART CLIP Page



1. **Airport Identifier**
   Displays the current chart clip airport identifier.
2. **Charts Available for Selection (Charts Soft Keys)**
   Displays the charts that are available for selection to the Chart Clip. Changing the CHART TYPES selection changes the quick use displayed charts. Use the back arrow bezel key to return to the Chart Clip page. Selection displays the relevant chart.
3. **CHART CLIP AIRPORTS Field**
   Displays the available airports in the chart clip. Selection of an airport (green diamond) displays the Terminal Charts page for that airport
4. **Page Number**
   Displays the page number
5. **CHART SOURCE**
   Allows you to change the chart source. "On the Fly" charts generated using the Navigation Database or Navigraph Charts (subscription required).

Charts View Page

The QualityWings 787 EFB builds Terminal Charts on the fly using the Navigation Database loaded procedures. The ability to display Chart Images is also available. QualityWings DOES NOT provide any Jeppesen Images.



On the Fly Charts

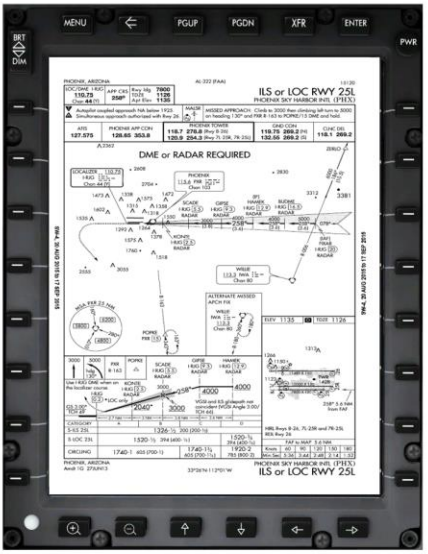
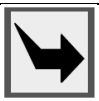


Chart Images*

*User loaded

On the Fly Chart: Chart Symbols

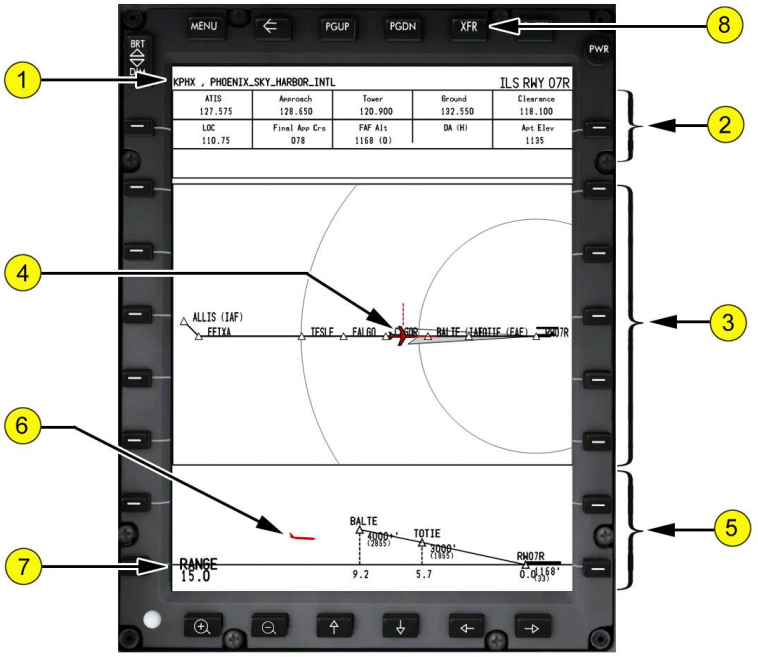
Symbol	Description
	Airport charts
	Departure charts
	Arrival charts
	Approach charts

On the Fly Charts

The following Terminal Charts are available on the fly:

- Standard Instrument Departures (SIDS
- Standard Terminal Arrival Procedures (STARS)
- Approach Plate

The following example the elements of an "On the Fly" Terminal Chart page on the EFB. The example is an Approach Plate.



1. **Chart Header**
   - Contains the procedure name
   - Contains the Airport (On Approach Plates)
2. **Approach Plate Header (Approach Plates Only)**

First Row

- Contains the Communications frequencies for the Airport

Second Row

- Contains the Navigation frequencies for the approach
- Contains Airport Elevation

3. Approach Plate Plan View (Approach Plates Only)

Displays Top down view of the approach

4. Airplane Symbol (Plan View)

Displays the actual aircraft position relative to the approach procedure

5. Approach Plate Vertical Profile View (Approach Plates Only)

Displays a side view of the approach

6. **Airplane Symbol (Vertical Profile View)**

Displays the actual aircraft position relative to the approach procedure

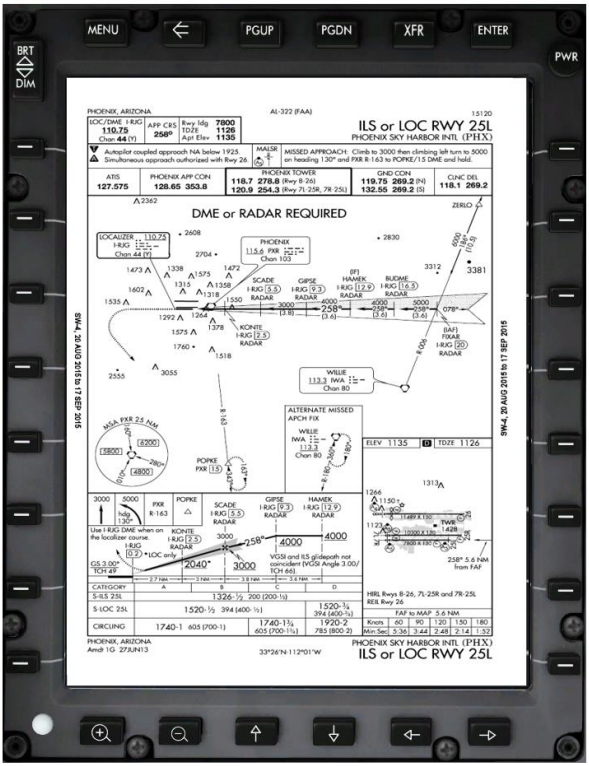
7. EFB Chart Range

Displays the range of the chart display. Adjustable using Display Unit Zoom keys

8. Transfer (XFR) Key (Day/Night Mode Toggle Key)

Used to toggle the Terminal Charts between Night Mode and Day Mode

Charts Images



The ability to load images to displays charts is possible as follows:

1. Upload the Chart Image to the following folder:
   Microsoft Flight Simulator X\QualityWings\QW787\EFB\Charts
2. The image format MUST be JPG
3. The image must named according to the following format:

Airport-Type-Procedure Name.jpg

Example: **KPHX-APP-ILS-25L.jpg**

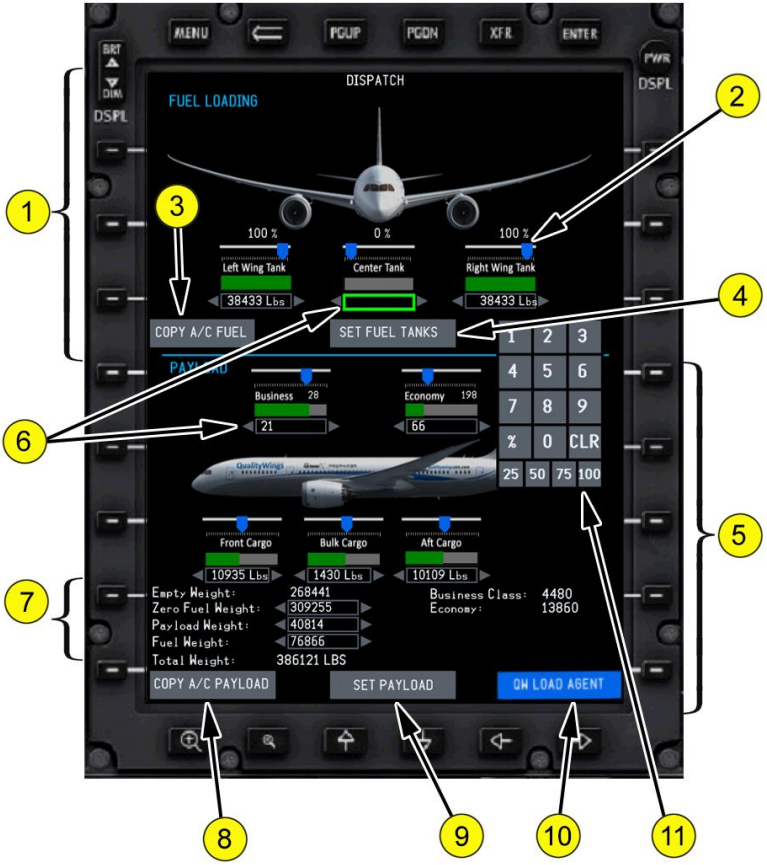
Note: If the procedure type is a SID or STAR, exclude the version number. example KPHX ARLIN3 STAR. Just name it STAR-ARLIN. That way it will still display even if the there is an update to Navdata or if the procedure version number changes.

Dispatch Application

Overview

|R| The Dispatch application provides the ability to set Fuel and Payloads within the simulator environment. The ability to set fuel and payloads prior to loading the aircraft in the simulator is still available using the QualityWings Dispatcher Application, but in response to customer request, this tool is available.

QWTip: *More information about the QualityWings Dispatcher Application can be found in the QualityWings Dispatcher Section*



1. **Fuel Loading Section**
   - Contains the selections for adjusting Fuel loads
   - The EFB Dispatcher does not load with the aircrafts current fuel situation shown

2. **Selection Sliders (Typical)**
   - Allows for the adjustment of the respective selection (Fuel Tank or Payload)
   - Moving to the right increases the quantity for the selected area
   - Moving to the left decreases the quantity for the selected area
   - Percentage of full for the selected area shows above the slider
   - Quantity shows below the fill bar below the slider
3. **Copy A/C Fuel**
   - Copies the current fuel loads from the aircraft to the EFB Dispatcher
4. **Set Fuel Tanks**
   After making selections, you must click this to set the fuel loads on the aircraft
5. **Payload Loading Section**
   - Contains the selections for adjusting Payloads (Passengers and Cargo)
   - The EFB Dispatcher does not load with the aircrafts current payload situation shown
6. **Precision Quantity Inputs**
   - Allows for the precise adjustments of the selected quantity for fuel, passenger loads and cargo loads (payloads)
   - Clicking the left arrow decreases the load for the selected area
   - Clicking the right arrow decreases the load for the selected area
   - To type in an exact amount of fuel, click the box to activate entry mode. Entry mode is indicated by a green border around the input box.
   - A number pad will open whenever entry mode is active (See item 10)
   - To exit entry mode, click on the box again. The green border will be removed when the mode has been exited. Any values in box are saved upon exiting
   - Area weight shows below the fill bar below the slider
7. **Calculated Weights Display**

Displays the following weights based on selections:

- Aircraft Empty Weight
- Fuel Weight
- Payload Weight
- Aircraft Total Weight (Gross Weight)
- Business Class Weight
- Economy Class Weight

8. **Copy A/C Payload**
   Copies the current payloads from the aircraft to the EFB Dispatcher
9. **Set Payload**
   After making selections, you must click this to set the payloads on the aircraft
10. **QW Load Agent**

QWTip: *More information about the QualityWings Load Agent Application can be found in the Dispatch Application Section*

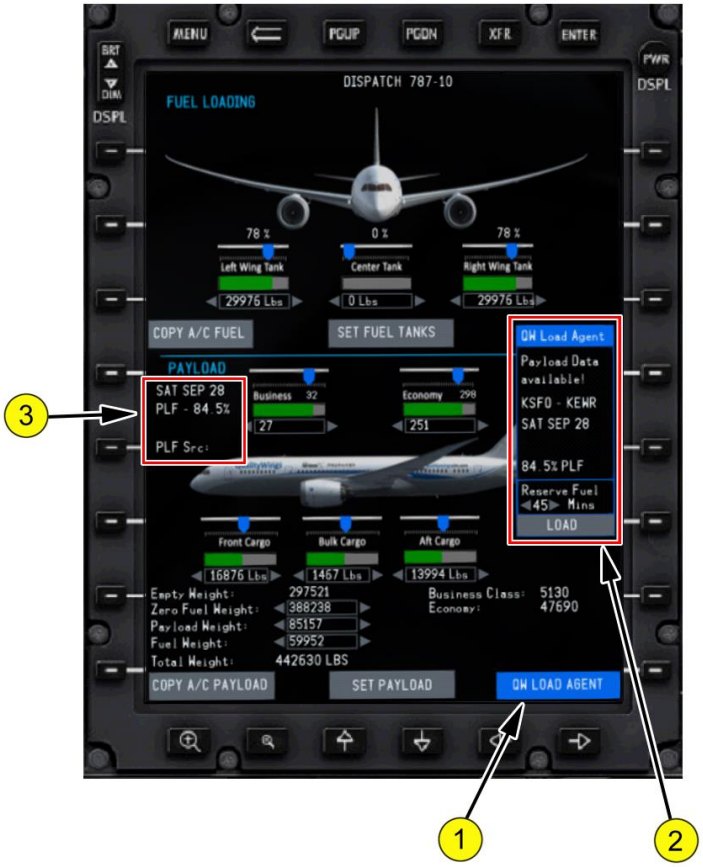
11. **Precision Quantity Input Number Pad**
    Allows for the input of quantities. Opens when any quantity input box is clicked.

QualityWings Load Agent

|R| New for Service Pack 2, the QualityWings Load Agent is a feature that becomes available after a route is loaded in the Flight Management System. Upon loading a route, Pay Load Factor (PLF) information is calculated and becomes available to use.

PLF information is based on information obtained from United States based 787 operators. The information varies based on several factors including but not limited to the day of the week.

PLF information is most accurate when you are using a US based 787 operator, but available even if you are flying a Non-US based operator.



1. **QW Load Agent Button**
   - Button becomes available after a flight is loaded in the FMS and after the flight is Initialized in the EFB
   - When clicked, it opens the opens the QW Load Agent Solution Box
2. **QW Load Agent**
   - When the QW Load Agent button is clicked, the Load Agent opens
   - Shows the available Payload Data
   - Shows the loaded Route
   - Shows the Date of week being used for the load Factor information (which is the current date of your flight in the simulator)
   - Shows the Pay Load Factor (PLF) in percentage based on the calculated data
   - Shows the Reserve Fuel. The default is for 45 minutes worth of reserve fuel. You can use the arrows to adjust this value for more or less reserve fuel time.

***QWTip**: The amount of Reserve Fuel will be equal to the amount of Fuel calculated at your destination on the FMS PROGress page. You can use the progress page to tweak help determine how much fuel you would like to have remaining at your destination.*

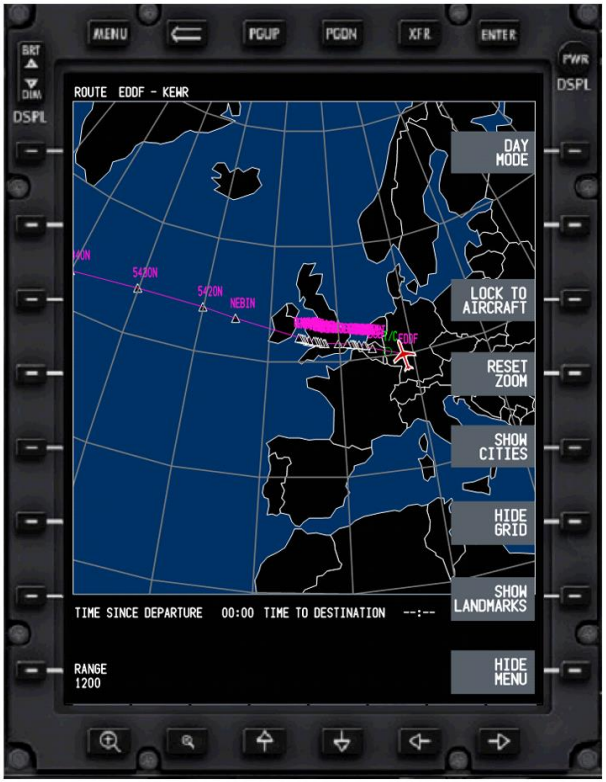
   - If you're satisfied with the Load Agents calculations, click LOAD to have the data entered into the Fuel Loading and Payload Dispatch sections.
   - **IMPORTANT**You will still need to SET FUEL TANKS and SET PAYLOAD for this information to be loaded into the aircraft.
3. QW Load Agent Data Block
   - Shows after Load Agent data has been successfully transferred to the EFB. You still need to SET FUEL TANKS and SET PAYLOAD!
   - Shows the Date of week being used for the load Factor information (which is the current date of your flight in the simulator)
   - Shows the Pay Load Factor (PLF) in percentage based on the calculated data
   - PLF Src (PLF Source) - shows the name of the airline in the database. This can also be non-US carriers but must be an airline that flies to a US airport. I.e. Norwegian, British Airways, Virgin, etc.

Enroute Map Application

Overview

|R| New for Service Pack 4, the Enroute Map application allows you to follow the progress of your flight on a world map.
The button on the EFB Main Menu will become active once valid origin and destination information has been programmed in the FMC.
The map can be clicked and dragged using your mouse. Use the scroll wheel to zoom in and out.
Alternatively the lower row of physical buttons can be used to adjust the view.

Using the menu on the screen, various layers (such as cities and landmarks) can be shown or hidden per user preference.



Route Entry Application

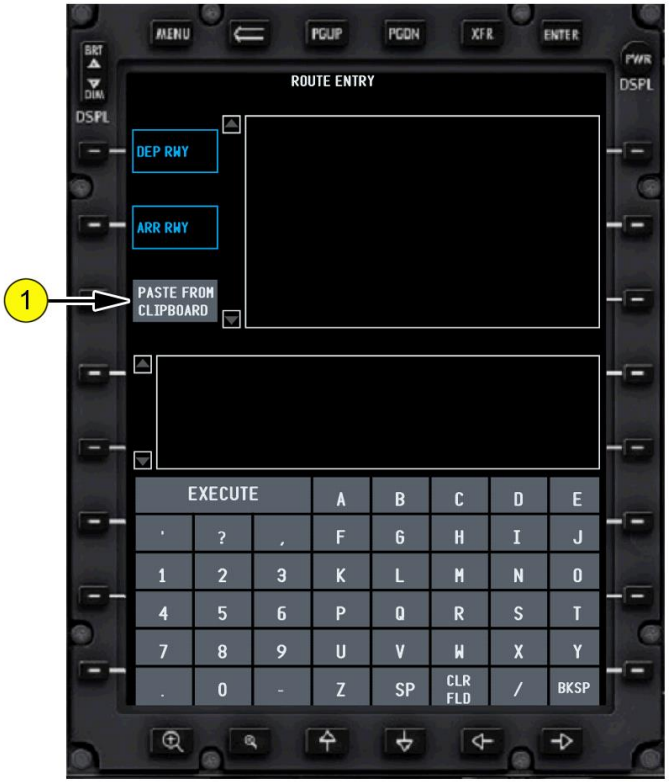
Overview

|R| New for Service Pack 4, the Route Entry application allows you to easily program a route by using a flightplan in text format.
There are various sources where you can either generate your own flightplan or use real world flightplans. Common sources are FSBuild, SimBrief, Navigraph Charts, Skyvector, Little Nav Map, Flightaware and many more…

QWTip: *The following flightplan is being used for further illustration: EDDF DCT TAU DCT SOGRI L608 DENUT L610 KOPUL Q60 UGNUS N14 BAKUR DCT NEBIN DCT 5420N DCT 5430N DCT 5340N DCT 5150N DCT ALLRY N358A EBONY J573 ENE Q480 BAF DCT KEWR*

Prerequisit:
Copy a flightplan text into your clipboard.

1. Paste from Clipboard
Click Button (1) to past the flightplan into the scratchpad. The EXECUTE button will turn green.



2. Execute the flightplan

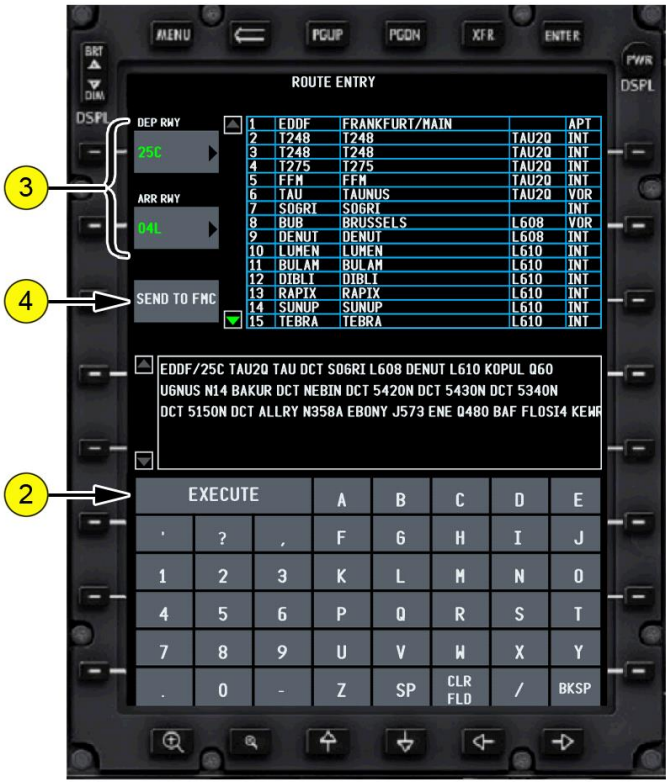
In order to generate the route from the textual flightplan, click the EXECUTE Button (2). You will now see all waypoints in the main table and can review your flightplan.
In case waypoints or procedures cannot be found in your navdata, an amber advisory message will be shown.
This might happen in case of a navdata cycle mis-match. Please consider updating your navdata to the latest cycle in this case.

3. Departure/Arrival runway

Buttons (3) allow you to alter your departure and arrival runways. The Route Entry application preselects the runways based on the flightplan.
Note that a change of runways may require you to execture (2) again. This is indicated by the EXECUTE text turning green.

4. Send to FMC

Send the route to the FMC using button (4). Once sent, verify and activate the route in the FMC.
Note that the cruise altitude needs to be manually programmed in the FMC.



Warning Systems

Introduction

Warning systems consist of:

- airspeed alerts
- engine indication and crew alerting system (EICAS)
- ground proximity warning system (GPWS)
- takeoff and landing configuration warning system
- traffic alert and collision avoidance system (TCAS)

Airspeed Alerts

Stall Warning

Warning of an impending stall is provided by left and right stick shakers, which independently vibrate the left and right control columns.

Airspeed Low

The EICAS caution message AIRSPEED LOW is displayed and the box around the current airspeed indication on the PFD is highlighted amber when airspeed is below minimum maneuvering speed.
This indication is accompanied by a beeper and Master WARNING/CAUTION light.

Takeoff V1 Airspeed

The voice annunciation VEE ONE sounds when airspeed reaches V1 during takeoff.

Overspeed Warning

The EICAS warning message OVERSPEED is displayed if airspeed is greater than VMO/MMO. The message remains displayed until airspeed is reduced below VMO/MMO.
This indication is accompanied by a siren and Master WARNING light.

Takeoff Configuration Warning System

The takeoff configuration warning system alerts the crew that the airplane is not configured for normal takeoff.

The takeoff configuration warning function is armed when:

- airplane is on the ground, and
- FUEL CONTROL switches are in RUN position, and
- either engine thrust is in takeoff range, and
- thrust reversers are not unlocked or deployed, and
- airspeed is less than V1

Takeoff configuration warnings consist of:

- illumination of the master warning lights, and
- activation of the aural warning siren, and
- display of applicable EICAS warning CONFIG message. Warning messages are:

Warning Message	Configuration
CONFIG DOORS	Cargo and/or passenger doors are not secured and locked and either engine's thrust is in the takeoff range on the ground.
CONFIG FLAPS	Leading edge and/or trailing edge flaps are not in takeoff position and either engine's thrust is in the takeoff range on the ground
CONFIG PARKING BRAKE	Parking brake is set and either engine's thrust is in the takeoff range on the ground.
CONFIG RUDDER	Rudder Trim not centered when either engine's thrust is in the takeoff range on the ground
CONFIG SPOILERS	Speedbrake lever is not DOWN when either engine's thrust is in the takeoff range on the ground.
CONFIG STABILIZER	Stabilizer not within the green band when either engine's thrust is in the takeoff range on the ground.

When a takeoff configuration warning occurs, pushing either Master WARNING/CAUTION reset switch resets the Master WARNING lights but does not silence the siren or clear the EICAS alert message. If thrust is decreased below takeoff range and the airplane is still not configured for takeoff, the Master WARNING lights are extinguished and the siren is silenced.

Landing Configuration Warning System

The landing configuration warning system alerts the crew the landing gear is not extended for landing. The EICAS warning message CONFIG GEAR is displayed if:

- the airplane is in flight, and
- any landing gear is not down and locked, and
- any of the following configurations exist:
- •either thrust lever closed and radio altitude less than 800 feet, or
- •FLAP lever in landing position

If the message is displayed because a Thrust lever is closed at low radio altitudes, pushing either Master WARNING/CAUTION reset switch silences the siren and extinguishes the Master WARNING lights. The message remains displayed until the Thrust levers are advanced or landing gear is down and locked. If the message is displayed because the FLAP lever is in landing position, the siren cannot be silenced by pushing a Master WARNING/CAUTION reset switch and the message remains displayed. The siren sounds and the message is displayed until the landing gear is down and locked.

Speedbrake Lever Extended Beyond ARMED During Landing

In flight, the EICAS caution message SPEEDBRAKE EXTENDED alerts the crew if:

- the SPEEDBRAKE lever is extended beyond ARMED with airplane radio altitude 15 feet or greater, and one or more of the following
- conditions:
- •radio altitude is 800 feet or less, or
- •FLAP lever in landing position, or
- •thrust lever angle 5 degrees or more above idle stop for 15 seconds When SPEEDBRAKE EXTENDED message is displayed in flight, pushing either Master WARNING/CAUTION Reset switch silences the siren and extinguishes the Master CAUTION lights. The EICAS message remains displayed until the SPEEDBRAKE lever is DOWN or at ARMED.

MCP Selected Altitude Alert

Altitude alerting is provided when approaching or departing the altitude selected in the MCP altitude window.

Approaching MCP Selected Altitude

At 750 feet prior to reaching the selected altitude, a c-chord sounds and a highlighted white box is displayed around the selected altitude and the current altitude on the PFD. The highlights are no longer displayed when within 200 feet of the selected altitude.

Departing MCP Selected Altitude

When departing the selected altitude by 200 feet, the EICAS caution message ALTITUDE ALERT is displayed, and a highlighted amber box is displayed around the current altitude. The message and amber highlight are no longer displayed when:

- subsequently reapproaching to within 200 feet of the selected altitude, or
- a new MCP altitude is selected, or
- departing more than 750 feet from the selected altitude

QualityWings Control Panel

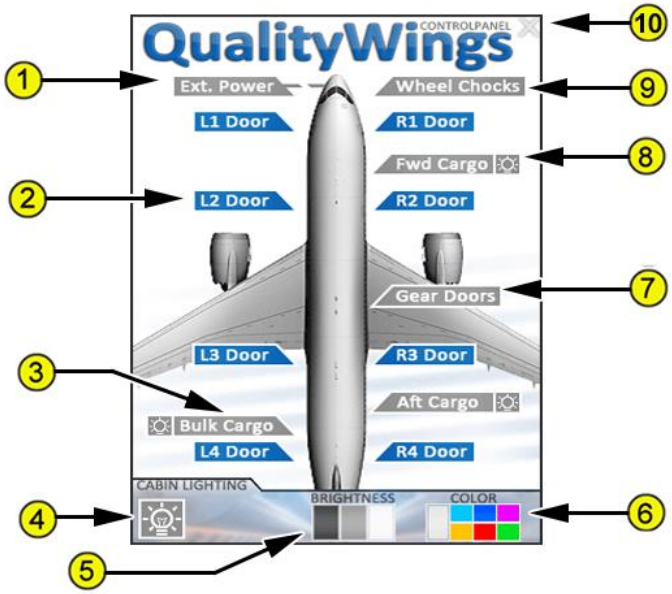
The QualityWings Control Panel is a quick way control the following actions:

- Connecting External Power Carts to the Aircraft
- Opening/Closing Entry Doors
- Opening/Closing Cargo Doors
- Opening/Closing Landing Gear Doors
- Operating Cargo Compartment Lighting
- Operating the Boeing 787 Cabin Lighting
- Changing the Boeing 787Cabin Lighting Scene Colors

The Control Panel can be accessed via the Flight Simulator Views Menu or more conveniently, by clicking the on the Center post between the forward Flightdeck windshields.

On the Early Production 787, the center post between the windows was a different design and we've included this design only on the Boeing 787 liveries. In this case, click on the Compass Card to Open/Close the Control Panel.

1. **Compass Card**
   Click to Open/Close the QualityWings Control Panel
2. **Close Button**
   Once the QualityWings Control Panel is open, click the "X" to close it



1. **External Power**
   - Click to Supply External Power. Aircraft must not move.
     - Grey – External Power Not Connected
     - Green – External Power Connected to aircraft
2. **Entry Door Control (Typical)**
   - Click to Open Close respective Door
     - Blue – Door Closed
     - Red – Door Open
3. **Cargo Door Control (Typical)**
     - Click to Open Close respective Door Grey – Door Closed
     - Red – Door Open
4. **Cabin Lighting Control**
   - Click to turn Cabin lighting On or Off
     - Grey – Lighting OFF
     - Yellow – Lighting ON

5. **Cabin Lighting Brightness**
   Choose between Dim (Dark Grey box), Medium (Light grey box) and Bright (White Box) illumination
6. **Cabin Lighting Scene Color**
   - Choose between 6 different colors scenes
   - Only available when lighting control is turned ON
7. **Gear Doors Control**
   - Click to Open Close Main and Nose Landing Gear Doors
     - Grey – Door Closed
     - Red – Door Open
8. **Cargo Compartment Lighting Control (Typical)**
   - Small light bulb indicates the status of the cargo compartment lighting
   - Click small light bulb to turn lights on or off
     - Grey – Lighting OFF
     - Yellow – Lighting ON
9. **Wheel Chocks** |R|
   - Click to place wheel chocks at the Main and Nose Landing Gear
10. **QualityWings Control Panel Close Button**
    - Click to Close the Control Panel

QualityWings Sounds

QWPAS

A QualityWings mainstay, QWPAS has now been rebranded as the **Q**uality**W**ings **P**assenger **A**nnouncement **S**ystem (QWPAS) instead of the Prerecorded Announcement System. QWPAS still provides pre-recorded Flight Attendant announcements, but is being expanded to include Human announcements.

Preflight Announcements

Boarding

Plays after flight plan is loaded into FMC, and when L1 or L2 doors are open and the parking brake is set. Set brakes first, open either the L1 or L2 door and then load flightplan (EXEC required)

Departure

Plays shortly after main cabin entry doors are closed. Boarding announcement must be completed.

Standard Safety Demo

Plays shortly after the Gate Departure Announcement. If the aircraft is too close to the departure runway, the announcement may not play!

Inflight Announcements

Flight Attendant After Takeoff Welcome Announcement (All New)

Plays as aircraft is passing through 5,000 Feet Radio Altitude during climbout

After Takeoff

Plays as aircraft is passing through 10,000 Feet Radio Altitude during climbout

Cruise Announcement

Plays as the aircraft reaches Top of Climb as defined in the FMS and the seatbelt sign turned OFF.

Customs Information

Played at a point shortly during or shortly after cruise to brief passengers on US Customs declaration info (Travel to the US)

Immigration

Played at a point shortly during or shortly after cruise to brief passengers on Non US immigration info (Travel from the US to other countries)

Initial Descent

Plays as the aircraft starts its descent as the first warning to passengers to prepare for landing

Final Approach

Plays as aircraft begins its final approach as the final warning to passengers to prepare for landing

Seatbelts On

Flight Attendant Arrival Preparation

Alerts the F/A to be seated for arrival. Plays as the aircraft is on short final

Flight Attendant Departure Preparation

Alerts the F/A to be seated for departure. Plays as the aircraft approaches the departure runway as specified in the FMS. Dep Runway MUST be specified!

After Landing Announcements

After Landing

Plays during Landing Rollout below 35 knots

Airline/Region-Specific Announcements

We have provided Airline or Region Specific Announcements for all liveries that we provide. At a minimum, a custom Safety Demo is included for each airline. In some cases, a custom After Takeoff Announcement is provided.

QWCAS

The QualityWings Crew Audio System (QWCAS) is you Virtual Flightcrew. It consists of calls from the Pilot Flying and the Pilot Monitoring at various stages of operation, from Preflight all the way through landing.

Electronic Checklist Reminders

Preflight
Before Start
Before Takeoff
Before Taxi
After Takeoff
Descent
Approach
Landing

Standard Callouts

Autobrakes OFF
- Played after Autobrakes disengaged during landing roll

Autopilot ON
- Played when Autopilot is engaged

Check Thrust
- Called to ensure that thrust is moving to or at thrust reference

Engine Start Declaration
- Played when starting engines

LAND 3
- Announced at 1500 feet RA when Autoland 3 is annunciated during an Automatic Approach

Runway Verification
- Prior to entering runway set in FMS

80 Knots
- Upon passing 80 knots during takeoff roll

Thrust Set
- Called when thrust is set to the Thrust Reference indicated on EICAS

Pilot Flying Start Engines Command
- Commanded during Pushback

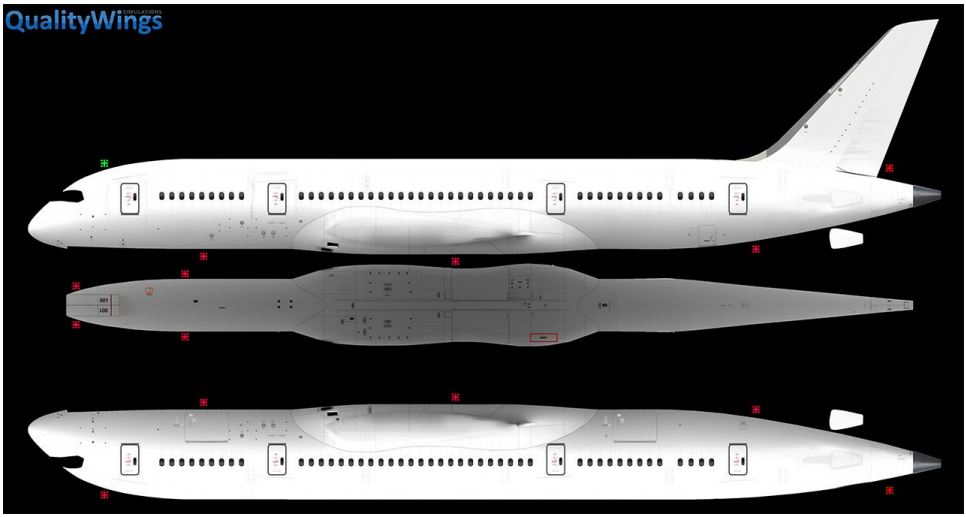
Rotate
- Pilot Monitoring callout to rotate at the VR speed set in FMS

V2
- Pilot Monitoring callout to fly the V2 speed set in FMS

Repaint Kit

The QualityWings 787 Repaint kit allows you to repaint your favorite liveries onto the 787. It's easy enough for the novice painter, but deep enough for the more advanced painters to appreciate.

The paintkit must be downloaded from the QualityWings website download section. All repaint kit files are all in Photoshop Document file type (.PSD). QualityWings does not provide the program (Photoshop) necessary to edit these files.



Kit Contents

QW788 Master PK (787-8)

QW789 Master PK (787-9)

- 3 sided Fuselage Master textures
- 4096x4096
- Used to perform the initial fuselage painting
- Transfer textures from here to the FUSE and STAB textures
- Help Layers included

QW788_Fuse1_T
QW788_Fuse2_T
QW788_Fuse3_T
QW788_Stabs_T (787-8)
QW789_Fuse1_T
QW789_Fuse2_T
QW789_Fuse3_T
QW789_Stabs_T (787-9)

- Textures must be transferred from the Paintkit masters to these FUSElage and STABilizer Textures
- Allows for small customizations such as color matching for flightdeck window frames, Ram Air scoop color matching and plugged window configuration matching.

QW787_L_EngineGE_T
QW787_R_EngineGE_T
QW787_L_EngineRR_T
QW787_R_EngineRR_T

- Textures for the different engine variants as well as optional placards are available
- Help Layers included

QW787_L_Wing_T
QW787_R_Wing_T

- Wing textures and options such as Registration Numbers and Wing stripes included

QW787_Crew_T

- Contains textures for the flightcrew uniforms and Ground Power Carts for customization

Texture Size

We opted to keep the kit texture size at 4096 to allow for better detailing during painting. We strongly suggest that you resize the all textures to 2048 for use in the FSX Simulator for the best experience. 2048 textures offer the best balance of quality and performance in the simulator.

PSD Breakdown

Exporting Liveries

Repaint textures should be exported as .DDS files
Included in the kit is an example Export folder. It contains the following files inside:

- QW789_Fuse1_T
- QW789_Fuse2_T
- QW789_Fuse3_T
- QW789_Stabs_T
- QW787_Crew_T
- Texture.ini
- Texture.cfg
- Thumbnail

Texture.Common Folder

In this included Exporting example folder, you will notice that the Engine Textures and Wing Textures are not included. A standard batch of engine and wing textures are part of a common folder. The texture.common folder is located in the QualityWings 787-8 folder. It contains the Engine textures, Wing Textures, Crew, Bump and Specular textures.
If you do not need to paint any of the textures from the common folder, do not include them in your export. The simulator will automatically grab them from the common folder because of the included texture.CFG file that points to the Common "Fallback" folder.

Creating QWL Files

Select all files and create a zip file. After the Zip file is created, rename the Zip extension from .ZIP to .QWL.
The QualityWings Dispatcher can only read .QWL files.

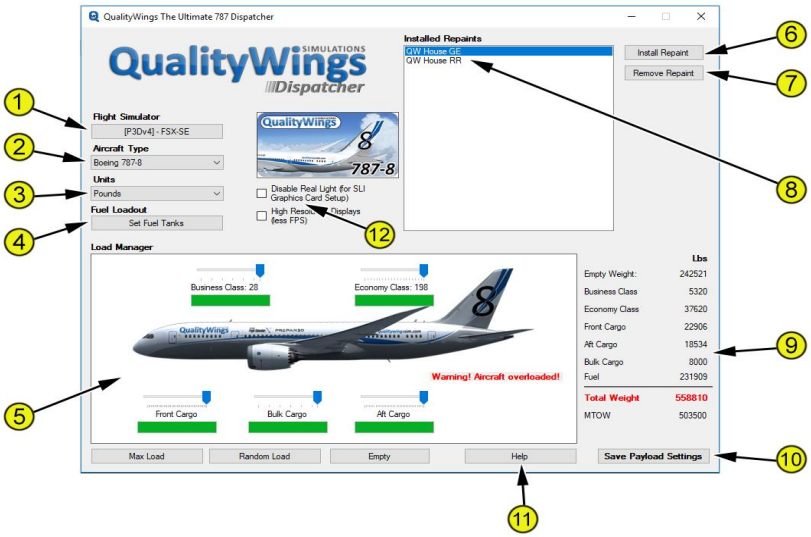
***QWTip**: More information about the QualityWings Dispatcher utility can be found in the QualityWings Dispatcher section.*

***QWTip**: More information about the Repaint Kit can be found in the documentation found in the Repaint Kit.*

QualityWings Dispatcher

The QualityWings Dispatcher tool allows you to configure your Ultimate 787 Collection as follows:

- Configure Fuel Tank
- Configure Payloads
- Perform Basic Fuel Calculations
- Install/Remove Liveries



1. Flight Simulator Selection
2. Aircraft Type
3. Units
4. Fuel Loadout
5. Payload Manager
6. Install Repaint
13.
7. Remove Repaint
8. Installed Repaint List
9. Load Manager Weights
10. Save Payload Settings
11. Help
12. Visual Options

A more detailed explanation of all functions follows

1. **Flight Simulator Selection** If you have the Ultimate 787 Collection installed in multiple simulators, this button allows you to toggle between the different

versions. On the picture, the Dispatcher is currently operating in FSX Mode as indicated by the brackets [ ] around FSX. Choices are FSX, FSX-SE, P3Dv4

2. **Aircraft Type**
   Select the Aircraft Variant you want to load or install repaints for
3. **Units**
   Select either Kilograms or Pounds to be displayed in the Load Manager.
4. **Fuel Loadout**
   Opens an additional window which lets you set the desired fuel quantity.
5. **Payload Manager**
   Allows you to configure your payload stations individually. Simply drag the Sliders to adjust each station's load. You will get a red warning if your aircraft weight exceeds the Maximum Allowed Take Off Weight.
6. **Install Repaint**
   Download a Repaint from the Downloads section on qualitywingssim.com and save it on your local hard drive. Press the "Install Repaint" button and browse to the file to install it. You will get a confirmation if the installation was successful.
7. **Remove Repaint**
   Removes a selected repaint from your installation. The removal of the QualityWings House Livery is not possible.
8. **Installed Repaint List**
   A list of Repaints installed for the selected Aircraft Type. Select a Repaint to configure.
9. **Load Manager Weights**
   Lists all the currently configured payload weights of the airplane.
10. **Save Payload Settings**
    Always save your settings after having made changes to your payload. Changes will not be effective until being saved.
11. **Help**
    Opens a Help Document which contains the same information that you are reading right now.
12. **Visual Options**
    FSX: Limited Night Lighting
    Select this to reduce VAS Usage only if you're experiencing issues with VAS
    P3D: Disable Real Light™ (for SLI Graphics Card Setup)
    Users with SLI Graphics Cards setups may need to select this option as poor performance with RealLight™ may be experienced
    P3D: High Resolution Displays (less FPS)
    Select this to use higher resolution displays with the understanding that you may experience a degradation in Frames per Second

How to

Install Repaints

Airline liveries are available for download in the Downloads section at www.qualitywingssim.com
Once you have download a livery, save it to your local Hard Drive (or local drive of your choice).

1. Open the QualityWings Dispatcher from your Start Menu
2. Select your desired Simulator using the 'Flight Simulator' Selection button
3. Select your desired Aircraft Type using the "Aircraft Type' button
4. Select 'Install Repaint'
5. Browse to your previously downloaded livery and Select the livery (or liveries) that you would like to install. Click "Open".
6. You should now see a confirmation that the installation was successful.

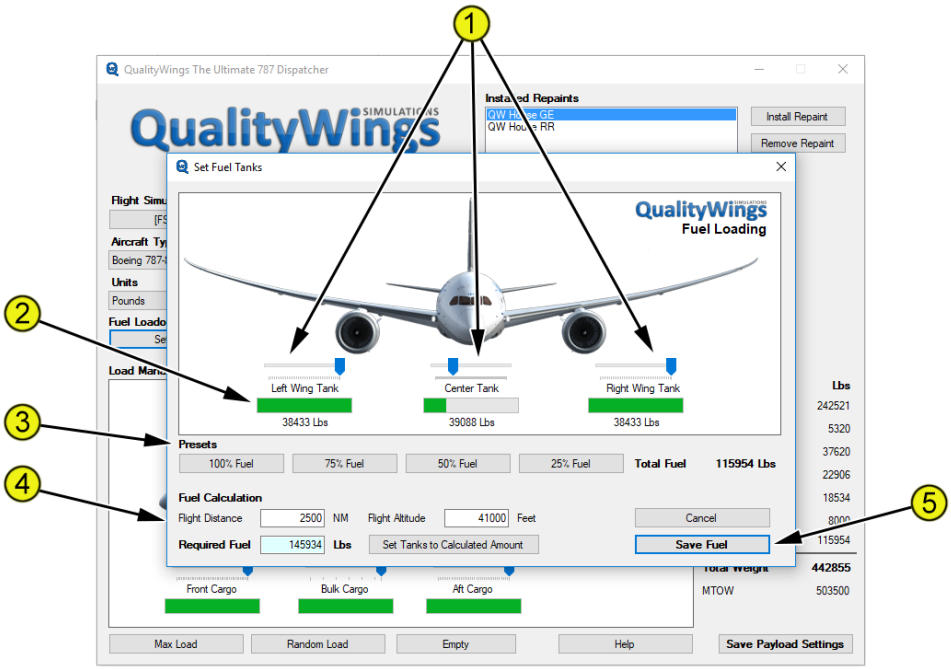
Remove Repaints

1. Open the QualityWings Dispatcher from your Start Menu
2. Select your desired Simulator using the 'Flight Simulator' Selection button
3. Select your desired Aircraft Type using the "Aircraft Type' button
4. Select the repaint that you would like to remove in the list
5. Select 'Remove Repaint'
6. Confirm that you would really like to remove the selected repaint by clicking Yes on the dialog box that opens
7. Once the livery has been removed, confirmation that it has been removed is that it no longer shows in the list of liveries within the Dispatcher tool.

Configure Fuel Tanks

The Fuel Loadout button allows you to manually configure all 3 Fuel Tanks. The Fuel Tanks can also be configured based on the provided Fuel Calculator.

WTip: *Fuel and Payload can be loaded conveniently via EFB. More information about the EFB can be found in the EFB Dispatch Application section.*



1. **Fuel Tank Sliders**
   Allows for manual selection of fuel tank quantities.
2. **Fuel Tank Quantities**
   Shows the Currently Selected Fuel Tank Quantities
3. **Fuel Tank Preselects**
   Allows for preselected capacities of the fuel tanks
4. **Fuel Calculator**
   Basic Fuel calculator
5. **Save Fuel Button**
   Required for any changes to Fuel Quantity to be saved to the Aircraft.cfg file

Manual Fuel Configuration

To manually configure the fuel tanks, you can move the sliders to any desired quantity. To save changes, click the Save Fuel button.

Preselected Fuel Tank Capacity

The Fuel Tanks can be set to any one of 4 preselected quantities:

- 100% Full
- 75% Full
- 50% Full
- 25% Full

To save changes, click the Save Fuel button.

Fuel Calculator

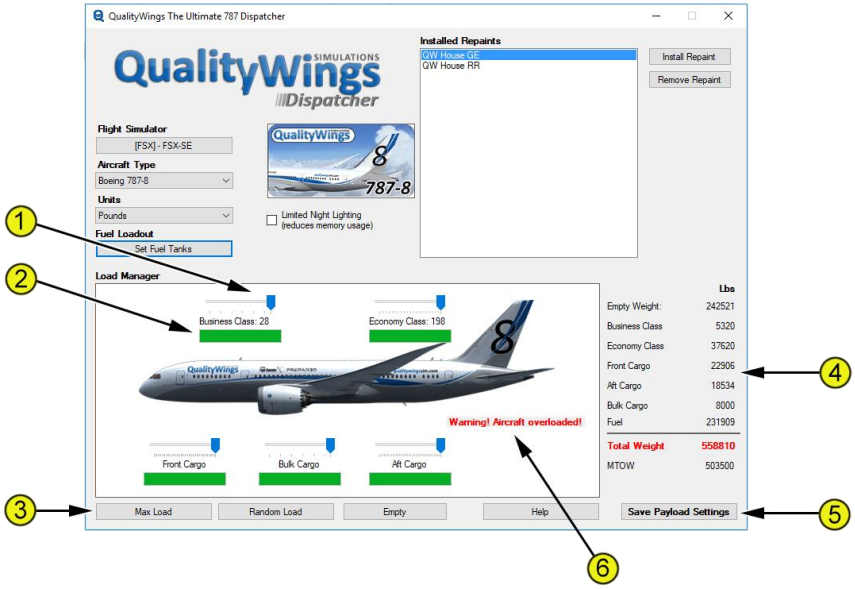
The Fuel Calculation Tool allows you to configure the fuel tank quantities based on Flight Distance and Flight Altitude. These values take into account the basic aircraft performance characteristics to provide a recommendation on the Required Fuel.

Enter the Flight Distance in Nautical Miles (NM) and the Cruising Altitude. The Required Fuel will shows. Select the 'Set Tanks to Required Amount' button and the tank quantities will increase. To save changes, click the Save Fuel button.

Configure Payload (Load Manager)

The Load Manager allows you to manually configure the aircraft Payload (Passengers and Cargo). The Payload can also be configured to preselects.

QWTip: *Fuel and Payload can be loaded conveniently via EFB. More information about the EFB can be found in the EFB Dispatch Application section.*



1. **Payload Sliders**
   Allows for manual selection of Passenger and Cargo area quantities.
2. **Payload Area Quantities**
   Shows the Currently Selected Payload area Quantities
3. **Payload Preselects**
   Allows for preselected quantities for the payload. A Maximum Payload, random payload can be generated or no payload can be selected.
   - Note: Carrying too much payload can place the aircraft in an overweight situation. A warning message will show in this case, but this DOES NOT prevent you from saving settings.
4. **Load Manager Weights**
   Lists all the currently configured payload weights of the airplane.
5. **Save Payload Settings Button**
   Required for any changes to Payload to be saved to the Aircraft.cfg file
6. **Overweight Aircraft Warning Message**
   Displays if Aircraft exceeds Maximum Takeoff Weight

QualityWings Config File

In addition to options available from the Displays System INFO page, some options are only available bya manually editing entries onto a Text based Configuration file.
This file is located in your QualityWings folder inside of the Flight Simulator folder. It can be opened using Microsoft Notepad, although the file extension may not be recognized when you initially try to use Notepad for the edit.

Available options

//--------- Options below CAN ONLY BE SET FROM QW787.CFG File ----------

DuLinesize=1	Display Unit line thickness
GaugeRefreshRate=18	Display Gauge refresh rate
Battery=1	Battery on
SystemsOn=1	Turns on all systems on aircraft load startup
DiscATOnAPDisc=1	Disarm Auto throttle whenever MCP Autopilot master is disconnected
DiscPFCOnAPDisc=1	Disconnect PFC whenever autopilot master is disconnected
daytime_lightsplashes=1	Enable daytime light splashes
HiFiSnapshotDir=	Full path to folder where Activesky snapshot files are located. Not required by default.
HiFiConnectDir=	Full path to folder where Activesky DLL file is located. Not required by default.
GpwsAltCalloutAbove=	Feet above the callout altitude the altitude callouts are made. (default is 5 ft)

DisplayProgETE=1	Displays ETE to destination on progress page (actual ETE is in accelerated rate, IOW if you are at 4X and the ETE is 40 mins, it will display 10 mins as the ETE (amber if above 1x, blue if below 1x))
AccelHt=1000	Acceleration height
TransAlt=8000	Transition altitude (default 18000)
CostIndex=	default Cost Index
SetSpdOffwhenAPMasterSetOff=1	Disables speed hold when autopilot is disengaged, regardless if it's done on the MCP
ExcludeDisco=	Inhibit creation of discontinuities
WxrBrt=	Weather display brightness setting (0.0 - 1.0)
LoadFuelonAircraftLoad=	Load config fuel on aircraft load (i.e. fuel from external dispatcher)
CduAutoCalcVspeeds=1	Automatically calculates v speeds whenever CDU takeoff page is opened
CduAutoCalcZfw	Automatically calculates ZFW whenever perf page is opened
LoadFuelonFlightPlanLoad=1	Loads fuel if stored flightplan contains trip and reserve fuel info
LoadPanelStateonAcLoad=1	Load default panel state on aircraft load
PanelState=filename	Default panel state file

VASdisplay=1	Virtual Address memory display on AUX panel (on by default in FSX, off by default in P3D)
dynamic_lighting=1	Dynamic lighting on (reads from P3D by default)
FlightPlansFolder=	Folder/path Location of stored flight plans
SetMCPCruiseAltonFlightPlanLoad=1	Sets the MCP cruise altitude to the cruise altitude in the stored flight plan when loaded.
SetMCPAltOnAutoStepClimb=1	Sets the new step altitude in the MCP window when step climb position is reached in auto step climb mode. (off by default)
QwPasSafetyDemoMinRwyDist=	Minimum distance away from the departure runway for the safety demo announcement to play (default 3400 ft)
QwPasFASeatedRwyDist=	Minimum distance away from the departure runway for the FA seated announcement to play. (default 1700 ft)
ArmPauseAtDistFromDest=1	Arms Pause at distance from Destination (displays on CDU DES page when armed)
PauseAtDistFromDest=	Distance to pause at from destination (value of zero, feature is off), also simultaneously reduces to 1X at same distance. Enter distance in NM.
DisplayEFBLandmarks=1	Displays landmark positions on EFB chart (based on landmark.txt file)
DescForecastAlt1=	Allows to preset the descent altitudes on the CDU FORECAST page

DescForecastAlt2=	Allows to preset the descent altitudes on the CDU FORECAST page
DescForecastAlt3=	
DescForecastAlt4=	
PFDSkyColor=R,G,B	Use custom RGB sky color on PFD
PFDSGndColor=R,G,B	Use custom RGB ground color on PFD
mute_on_lost_focus=	Allows to let sounds play even if Flight Simulator is not the active window (default 1)

Feature Index

Product Support

E-Commerce Support

Support related to your transaction or problems with the Flight1 Wrapper is handled via the Flight1 Support Site:
http://www.flight1.com/view.asp?page=service

Product Technical Support

All product technical support is handled via a web forum system. There is no telephone based support.

Please visit us on our forums at http://qwsim.flight1.net/forums/forums.html

QualityWings staff members do not have assigned hours of operation, but we periodically monitor these forums several times daily, excluding holidays. Our staff is not required to work weekends so any forum post or support ticket may not be answered during weekend or holiday hours. We ask that you remain patient when waiting for a response as we have members patrolling the forums at varying times due to our locations around the globe. When posting to the forum(s), please make sure you direct your post to the correct forum. Misdirected posts may not get a staff reply.

About the QualityWings 787 Team

Corey Ford (President) (2007)
- Master Textures Development
- Advisor

Ernie Alston (2009)
- General Systems & FMS Programming

Kyle Schurb (2015)
- Virtual Cockpit Texture Development

Lars Roennig (Vice President) (2009)
- Exterior Modeling
- Autoflight & Flight Control Systems Programming

Nick Peterson (2009)
- Flight Dynamics Programming

Emil Serafino (2007)
- Sounds Development

Contractor
- Virtual Cockpit Modeling

Credits

Beta Testing Team

It is not easy to work with a product that is not working correctly for months, but continue to have the energy to look for bugs. We sincerely thank our Beta Testing Team for continually pushing us to push the envelope.

- Adam Gungah
- Anthony Eyre
- Elliot Grubb
- Eric Triantafilo
- Hakan Saplakoglu
- Jason Ang
- Jiahao Shen
- Jon Ostrower
- Kristian Nørregaard
- Manjeet Thind
- Mark Lloyd
- Marlon Carter
- Patrick Kazmierczak
- Randy Smith
- Will Westlake
- Scott Gustafson

Additional Contributions

- Jakub Suszynski
- Ronan Barton
- Troy Caines
- Henrik Isaksen
- Ian Kalter
- Marc Brodbeck
- Tom Gilmore
- Nick Hesler
- Jordan King

Partners

- Flight1
- FSFX Packages
- Federico Sucari
- Hans Hartman
- Navigraph

Product Version Information

Release Information

Service Pack 4	**V1.4.0**	**(03-07-2021)**
Service Pack 3 + Update 1	V1.3.1	(08-02-2020)
Service Pack 3	V1.3.0	(05-18-2020)
Service Pack 2 + Update 1	V1.2.1	(10-07-2019)
Service Pack 2	V1.2.0	(10-03-2019)
Service Pack 1 + Update 3	V1.1.3	(03-24-2019)
Service Pack 1 + Update 2	V1.1.2	(09-23-2018)
Service Pack 1 + Update 1	V1.1.1	(06-05-2018)
Service Pack 1	V1.1.0	(05-23-2018)
Initial Release + Hotfix 2	V1.0.2	(11-12-2017)
Initial Release + Hotfix 1	V1.0.1	(10-12-2017)
Initial Release	V1.0.0	(10-02-2017)

How to determine your Version

The current version of the product can be found on the FMC IDENT Page under OP PROGRAM:

QW1.4.0 is equal to Version 1.4.0

Current Release Information

If you purchased the product ON or AFTER March 07, 2021 then you should be using Version V1.4.0. **No further Updates need to be installed in this case.**

Changelog

Service Pack 4 (Version 1.4.0)

Fixes/Improvements

- Autopilot: LNAV early turns improved
- Autopilot: VNAV PATH descent logic improved
- Autopilot: improved FLCH / VNAV SPD logic
- Autothrottle: improved speed control
- VC: Display and HUD brightness controls enabled
- VC: Exterior shadow model added (P3D only)
- VC: Updated versions of TFDi TrueGlass & RealLight for P3Dv5.1 support
- VC: Updated textures with improved quality and brightness (P3D only)
- VC: Primary Flight Computer switch is springloaded (while it should not)
- VC: Flood lights remain on without power fixed
- VC: HUD blanks out taxi/landing lights (P3D only)
- TCAS: improvements to traffic display and advisory logic
- HUD: Altitude bug/ window clipping issues fixed
- HUD: track line is linked to HDG bug instead of showing current track and drift angle
- HUD: FPV/FD improved
- CDU: Step size '0' does not clear predicted step climbs
- CDU: Unable to delete Step climb from waypoint on Legs Page
- CDU: various step climb improvements
- CDU: LEGS page – step climb entry /400S is not accepted as FL400
- CDU: Descent forecast winds not applied when entered manually
- CDU: Pos report Page - fuel in wrong units vs Prog page (when units are KGS)
- PFD: When QNH is preselected, baro display converts to 1013 Hpa
- PFD/HUD: smoothness improvements
- ND: step climb location not recalculated when inserting a direct to a waypoint
- DU: various dimming issues fixed
- EICAS: calculated takeoff trim does not turn green when actual position matches
- Misc: excessive landing / taxi light brightness (P3Dv5 only)
- EFB: pressing '.' On keypad opens sent output page
- EFB: TO Performance corrections
- Exterior: Logo light does not show in dusk/dawn conditions

- Exterior: improved bogey tilt and gear compression animation
- Exterior: improved Semi-levered gear functionality (-10 only)
- FDE: Improved taxi behavior
- FDE: Corrected flap/slat sequencing for -9 and -10
- FDE Corrected 787-8 RR drag coefficient
- FDE: Corrected time to climb accuracy
- FDE: Modified drag profiles for more accurate off profile descent and approach
- FDE: Fixed incorrect reverse thrust setting for -10
- FDE: Corrected roll control aileron/spoiler mix
- FDE: Corrected AoA for various configurations and airspeeds
- FDE: Corrected flare behavior

Additions

- EFB: Route Entry function to import flightplans in text format
- EFB: Enroute Map to follow flight progress on a world map
- EFB: On-the-fly charts can be scrolled through using the PG UP / PG DN buttons
- PFD: Rising Runway
- DU/HUD brightness control via Master/HUD Brightness Control Knobs

Service Pack 3 – Update 1 (Version 1.3.1)

Fixes/Improvements

- WXR: Weather Radar can't find proper paths when ASP3D and ASN are installed
- WXR: Weather Data Request METAR/TAF not working with ActiveSky
- WXR: config entries for snapshot dir gets corrupted after saving config from DU
- EFB: CTD when selecting Navigraph as Chart source (FSX-SE only)
- EFB: Incorrect Navigraph Chart Label for few selected airports
- EFB: Navigraph charts do not dim
- EFB: Dispatch page weights do not add up properly
- CDU: CTD when selecting LTAI as destination on RTE page
- CDU: Autostepclimb inop
- CDU: HOLD still shows after being deleted on the legs page
- CDU: POS FUEL value occasionally incorrect when weight units are set to KGS
- HUD: 3 degree G/S line should stay parallel with the horizon
- HUD: 3 degree G/S line shows when TOD is reached and Vref set
- FS2CREW: Enabling of FS2Crew only works on LEFT side of DU, not on right side
- ND: TCAS does not show all traffic (P3D only)
- ND: Airport Map and Terrain do not dim
- ND: Range Arcs should show when TFC is selected ON using the TFC Button
- ND: RNP on wide ND does not match setting on CDU POS REF 2 page
- ND: DME errors
- CHKL: Checklists do not reset when new flightplan gets entered
- CHKL: Shutdown checklist typo FUEL "CONTRL" changed to FUEL "CONTROL"
- VC: Excessive display reflections (P3Dv5 only)
- Exterior: Engine fan shows too transparent (P3Dv5 only)
- Exterior: Dome light illuminates outside of fuselage (P3Dv5 only)
- Misc: Loading a default panelstate overrides WeightUnit setting
- Misc: Holding improvements
- Jump Ahead: Sim reduces to 1x when Jump Ahead is initiated

Additions

- EFB: Navigraph Chart Quality adjustable to reduce FPS impact
- SOUNDS: "Mute on lost focus" option (mute_on_lost_focus=0)
- CDU: Landing Weight can be entered/edited on Approach page
- HUD: Brightness control on QW CONFIG page added

Service Pack 3 (Version 1.3.0)

Fixes/Improvements

- CDU: Place bearing/distance does not work with two letter nav waypoints
- CDU: Descent Page speed entries in backwards order (should be Mach/Ias)
- CDU: scratchpad entries have to be repeated multiple times before accepted
- CDU/AUX: Calendar date displayed is incorrect by one day in January
- CDU: Forecast page, Activesky snapshot folder not found (FSX-SE)
- CHKL: Shutdown checklist Wxr radar status not detected
- HUD: FPV display over-reacting to wind effects
- HUD: Compass rose heading bug not working
- HUD: Compass does not switch between HDG and TRK mode.
- HUD: Numerous visual improvements and fixes
- ND: Weather Radar not working with native FSX-SE Active Sky
- ND: ILS final approach waypoints being off slightly to the right of rwy centerline
- ND: Terrain display is offset by a few degrees
- PFD: FO FPV does not stay on when selected
- PFD: Minimums bar on the altitude tape displays in reset mode
- DU: EICAS does not transition to FO side when SYS page is on left side of FO DU
- Panelsave: various improvements and fixes
- VC: "STAB CUTOFF" text fixed to read "STAB CUTOUT"
- Sounds: Flightcrew briefings and callouts play even if QWCAS is disabled
- Exterior: Wing vortex generators appear black in certain lighting conditions
- HYD: C ELEC pump logic reworked
- EFB: TO PERF does not show the Baro pressure in InHG
- Autoflight: Holding pattern logic improved
- EICAS: "CONFIG FLAPS" warning does not clear on 787-9
- EICAS: VNAV STEP CLIMB does not clear after step climb
- CTD: various stability improvements
- JumpAhead: Elapsed time does not adjust when using Jump Ahead feature

Additions

- FS2Crew Support (QW Config has option to enable/disable)
- EFB: Navigraph charts support (Navigraph subscription required)
- HUD: Brake Deceleration Scale

- CDU/EICAS: Insufficient fuel warning
- CDU: SID/STAR speed restrictions
- Panelsave: Default Preflight Panelstate added
- Prepar3Dv5 compatibility
- ASP3D (ActiveSky P3D) compatibility

Service Pack 2 – Update 1 (Version 1.2.1)

Fixes/Improvements

- QW LOAD AGENT not setting payload correctly when citypair is not in database
- 787-8 EFB OPT always shows 0 as MTOW
- Flaps 20 take off FLAP CONFIG warning
- Flaps 20 take off GEAR CONFIG warning
- Strobes do not always default to OFF when initializing
- Cold and Dark Panelstate does not set exterior lights properly
- FSX only: 787-10 VC yoke buttons disconnected from yoke
- FSX only: 787-10 VC wipers inop

Service Pack 2 (Version 1.2.0)

Fixes/Improvements

- Reworked weather radar for improved stability, range and realism
- Cockpit Display fonts & alignment improved
- Fuel Prediction shows -nan(ind) when loading a saved flight with uplinked winds
- VC - FO EFB clickspots are out of alignment
- VC - External Power "Avail" annunciators do not work occasionally
- VC - Pedestal appears too bright when Interior Shadows are disabled (P3Dv4 only)
- VC - cockpit certificates read -8 for all variants
- VC - improved button/switch animations
- VC - HUD occasionally disappears below 30ft AGL
- VC - Yoke deflection angle corrected
- Exterior - Main Gear Tires too glossy
- Exterior - SODE jetway position too high
- Flaps 17/18/20 not recognized as valid take off settings
- PFD - Flight Director does not appear until MCP speed gets changed
- ND - "Time to Align" overlaps MAP/PLAN buttons in Plan Mode on full ND
- Display brightness setting does not get saved when clicking "SAVE CONFIG" on the QW CONFIG screen
- Panelstate - When loading a panelstate where the APU was running, the APU is shutdown but the switch in the ON position. APU should be up and running.
- FMC OPT/RECMD/MAX altitude logic flawed
- EFB - Passenger count and cargo weights incorrect for -9 and -10
- EFB - Landing Distances show as '0' when using "copy from FMC". Fixed by re-selecting the runway

- EFB - Mismatch between FMC/EICAS and EFB weights
- CDU - When entering a value to change the STEP SIZE, the scratchpad does not clear
- Excessive thrust increase/decrease during turns
- TCAS does not filter traffic outside of altitude limits (BELOW/NORM/ABOVE)
- QW Dispatcher - Pax weight changed to 190lbs
- Tail Strobe lightsplash missing (P3Dv4 only)
- White Engines appear slightly gray-ish (P3Dv4 only)
- Improvements to Panel State saving / loading
- Anti-Skid system fixed
- Exit positions for SODE jetways fixed
- Strobe lights default to OFF when loading the plane on the ground

Additions

- Boeing 787-10 variant
- VATSIM Transponder compatibility
- Custom SELCAL
- Engine windmilling effect
- Wheelchocks
- Option to customize PFD colors added (see documentation)
- New QW loadagent in EFB
- Customized airline specific EFB graphics

Service Pack 1 – Update 3 (Version 1.1.3)

Fixes/Improvements

- Significant stability improvements (CTD fixes)
- AUTOPILOT: Autothrottle oscillations when trying to hold speed above Mach 0.85
- AUTOPILOT: ILS autotuning does not set the runway CRS
- AUTOPILOT: ILS capturing and tracking in strong crosswinds improved
- AUTOPILOT: Various VNAV fixes
- PANEL STATE: When loading a saved flight, the panelstate specified in the qw787.cfg gets loaded instead of the panelstate matching the flight
- PANEL STATE: When loading a saved flight in high altitude the engines shutdown
- HOLDS: Aircraft unable to exit holds
- CDU DES FORECAST: Wind uplink should not work when no altitudes entered
- CDU VNAV CLB: climb Mach speed can't be changed manually
- CDU PROG page: Fuel burn prediction not accurate (decreases during long flights)
- CDU PROG page: Mach Speed always displays a zero for the 3rd digit
- CDU PROG page: Pressing POS REF does not do anything
- CDU PROG page: CTD when pressing LSK L6 (POS REF)
- CDU ROUTE REQUEST: new Flightplan files do not show up if plane is already loaded
- CDU TAKEOFF REF page: D-TO label is missing derate number. i.e. "D-TO 1"
- CDU POS REPORT page: says PROGESS instead of PROGRESS
- CDU DESCENT page: Block altitudes do not show properly
- CDU: When no transition level gets entered, the transition altitude should be used
- CDU LEGS page: Pressing LEGS again should bring it back to page 1
- CDU APPR page: invalid Vref entries should not be accepted
- CONFIG: GaugeRefreshrate always resets to 0 when saved from the QW Config page
- DU: Combination of CHKL and INFO causes INFO page to not respond to inputs
- EICAS: When gear is up and locked, the word UP should be white instead of GREEN
- FUEL SYNOPTIC: fuel temp shows +-XX
- PFD: Coffin corner not simulated
- PFD/HUD: Barber Pole disappears below 200 ft AGL
- PFD: When Mach is selected, the Speed Bug does not adjust to hold Mach during climb/descent when AP and FD are both off
- HUD: Glideslope Reference line position not accurate
- HUD: at 400ft AGL HUD F/D - FPV suddenly shifts far to the left on landing
- HUD: HUD and Avionics go off after a while (787-8 only)
- HUD: Baro HPA/In displayed at the same time
- HUD: Gap between ILS identifier / course and DME distance
- HUD: LAND 3 and NO AUTOLAND annunciations missing
- ND: TOD not calculated/displayed when approach without transition selected

- EFB: Take Off Performance Calculation inaccurate when heavy and high
- EFB: Map range missing from approach chart
- EFB: Up/Down arrow buttons don't work on charts page
- ACP: Left VHF switch monitors right VHF and left VHF is heard all the time
- ACP: No way to shutoff Navigation Audio, even if it's selected Off
- EXTERIOR: Nose wheel does not steer during GSX pushback
- VIRTUAL COCKPIT: Text night lighting issues (P3Dv4)
- WIND DATA: Incorrect AS snapshot file path support in qw787.cfg
- CONTROLS: Parking brake should not set when no Battery or Towing Power is avail
- CONTROLS: Aircraft loses control after using SLEW mode
- CONTROLS: slow trim speed when trimming is assigned via FSUIPC
- CONTROLS: Auto Spoilers should not retract until throttles are moved into TO range
- JUMP AHEAD: aircraft initialization in new position improved
- SOUNDS: 5ft EGWPS callout added
- SOUNDS: FIRE TEST Level A warning sound does not mute / should not play at all
- FDE: improved lateral stability
- FDE: improved taxi characteristics
- FDE: fuel flow and climb performance accuracy improved on all variants
- FDE: improved AOA/pitch accuracy in various flight regimes and flap configs
- FDE: improved drag accuracy
- FDE: improved N1/TPR accuracy at various pitch/thrust settings
- MULTIPLAYER: Reduced data flow (packets) for multiplayer servers
- MISC: Performance / VAS optimization

Additions

- Remote CDU support for CDU and EFB added
- CDU: RTE DATA and WIND Pages added. Automatic uplink from ActiveSky
- PBR Exterior Models added (P3Dv4.4 only)
- CONFIG option to show temperatures in Degrees C added
- EFB: charts "map centering locked on aircraft" added
- EFB: Ability to display landmarks (such as Big Ben) in EFB
- 'Sim Builder's Kit' Documentation added for homebuilders
- CDU support for direct CDU Keypresses (via Lvars) added

Service Pack 1 – Update 2 (Version 1.1.2)

Fixes/Improvements

- QW CONFIG: "SAVE CONFIG" fills up fuel tanks
- QW CONFIG: some options do not get saved
- QW CONFIG: some options can not be set / selected
- PFD: straight in IAN approach (RNAV/VOR/NDB) are missing approach name, DME and Rwy info in upper left corner
- PFD: LNAV/VNAV deviation indicators on the PFD remain frozen until RNAV Approach active
- PFD: Minimum Maneuver Speed and stall speed bands move too fast when flap config changes
- PFD: Missing yellow ground level marker on departure
- EICAS: Oil temperature too low
- EICAS: Engine vibration is too high.
- EICAS: N1 indication jumps up when passing 80kts during take off roll (RR only)
- EFB: Dispatch: complete remake
- EFB: Dispatch: Seat count on 787-9 incorrect
- EFB: OPT: take off performance calculation enhanced to provide optimal flap and derate settings
- EFB: Enable EFB Brightness controls
- FMS - LNAV: EDDM 08R INPU2E SID draws full circle at DM048 to DM076 after crz alt has been entered
- FMS - "Transition Level" Completely Missing from VNAV DES Page. Akin to Transition Alt but for the Descent.
- FMS: VNAV initial climb speed does not command V2+15
- FMS: improvements to lateral and vertical route depiction
- FMS: improvements to lateral and vertical route tracking
- FMS: VNAV Wind Forecast Page added
- FMS: DIRECT TO will cause the T/D symbol to be off course on ND
- FMS: After go around programming a new route is missing the first waypoint of the new route
- SYSTEMS: Anti-Ice logic reworked
- SYSTEMS - FUEL SYNOPTIC: Crossfeed valve logic issues
- SYSTEMS: TOGA key assignment does not work
- SYSTEMS: Fuel jettison does not work on 787-9 model
- SYSTEMS: Engines stuck in full thrust after take off (noticed on RR)
- SYSTEMS: EMER LIGHT EICAS message shows after loading a panelstate

- SYSTEMS: Overspeed warning triggers prematurely when P3D settings are set to "true airspeed" instead of "indicated airspeed"
- VISUALS: VC night lighting textures improved (RealLight)
- VISUALS: VC material reflectivity improved
- VISUALS: left RR engine reflectivity issues
- VISUALS: top fuselage beacon splash on wings too bright
- VISUALS: Vertex welding issue on APU Door. Causes dark shadow in corner of APU door
- VISUALS: "Mirror" windows on exterior model
- VISUALS: Some parts, such as the vertical fuse "joints" are inverted in the bump maps, causing these to look pushed into the fuselage.
- VISUALS: Users are confused when STORM lights override all other light controls. Changed logic to initialize DOME light instead of STORM light when loading at night
- VISUALS: text night lighting does not work on TCP buttons (fixed in P3D only)
- VISUALS: blurry MCP Text since V1.1.1 Hotfix
- VISUALS: Landing Lights and Runway Turnoff Lights ON result in significant performance decrease
- SOUNDS: HUD Declutter and AP Disconnect switches on Yoke are missing correct sounds
- SOUNDS: ALT chime inhibited when approach mode is active
- APPROACH CONFIG: Curve from origin drawn to first waypoint instead of DIRECT TO
- APPROACH CONFIG: Hitting "SAVE CONFIG" when APP CONFIG page was open before, triggers APP repositioning
- FLIGHT DYNAMICS: undesired stick shaker after rotation and general AoA improvements
- FLIGHT DYNAMICS: excessive ground taxi thrust
- FLIGHT DYNAMICS: climb performance adjusted
- QW DISPATCHER: added options to enable HD gauges and RealLight (P3D only)
- QW DISPATCHER: fuel planner adjustments

Additions

- SOUNDS: Reverse thrust and gear retraction sounds improved
- SOUNDS: New ground roll sounds and refinements to cockpit sounds in general
- SOUNDS: AT Servo and Autobrake disengage sounds added

Service Pack 1 – Update 1 (Version 1.1.1)

Fixes/Improvements

- NTDLL.DLL crashes related to weather radar (P3Dv4)
- Updated Navigraph navdata causes various issues
- Autosave should not trigger messages on CDU
- VNAV Descent profile issues
- Event ID A/T Disconnect
- DIRECT or EXIT HOLD while holding does not make aircraft exit the HOLD
- ATC Callsign "Experimental"
- PFD/HUD: Stall speed indication on speedtape incorrect
- Throttles retract to idle or half power after take off on some systems
- Autopilot oscillates on systems with less than 10 FPS (P3Dv4)
- FSUIPC assigned axes compatibility improved
- FLCH/VNAV SPD transition after ALT HOLD can lead to overspeed
- 787-8 OEW too low
- Messagebox #42 BtSwEvent
- QW Dispatcher can't install a livery if that particular livery texture-folder already exists
- 787-9 RR TPR command sector draws a complete circle when pressing F4
- 787-9 pulls to the side during taxi/take off run
- SHIFT+CTRL+A warps aircraft to Lat/Lon 0,0
- Low volume ground roll audible when plane is parked (Cold and dark)
- Parts of the fuselage appear darker than the rest on some systems (P3Dv4)
- Exterior models: Passenger models not properly cut (P3Dv4)
- 787-8 RR exterior model actually shows GE engines (P3Dv4)
- VC MCP textures: "MENU" text and symbol alignment
- VC MCP textures: CAN/RCL instead of CANC/RCL
- VC panel text resolution has been increased (P3Dv4)

Service Pack 1 (Version 1.1.0)

Fixes/Improvements

- CDU: PROGRESS Page fuel value occasionally showing "NULL" (OR -nan(ind))
- CDU/EFB: Correct engine types in all areas of the CDU and EFB
- CDU: Invalid entry shown when trying to enter a ZFW of 142.9 at the PERF INIT Page. WeightUnit = KGS
- CDU: When pressing the LEGS page it should default to page 1/x (customer report. Needs to be verified if correct)
- CDU: Fuel prediction on CDU shows incorrectly with insufficient fuel
- CDU: Fuel prediction on CDU is different than that one the ND
- CDU: Fuel Remaining on CDU PROG page shows as "-nan(ind)" for destination airport
- CDU: POS Fuel on POS REPORT page shows lower than current fuel on board
- CDU: Negative fuel remaining on PROG and VNAV CRZ pages
- CDU: Very high Cost Index required for optimum speeds
- CDU: Help message "computed TOD before TOC" shown, even though TOC could easily be reached before TOD
- CDU: RAD/NAV page .50 freq increments error
- CDU: LRC Cruise not available
- CDU: TakeoffCG Trim value not transferred from EFB.
- CDU: Takeoff 2/2scratchpad not cleared after entering wind info
- CDU: Route Data Page count differs from actual RTE LEGS page
- CDU: Missing approach selection for KDEN RNAVZ 35R
- CDU: Clearing a message should also clear the same message on the other CDU
- CDU: Waypoint ETA and fuel different on CDU LEGS and PROG pages
- CDU: Implementation of high speed climb tables (for 250/10000 restriction)
- CDU: Standard thrust reduction height changed from 800ft to 1500ft
- CDU: Step climb OPT ALT sometimes exceeds MAX ALT
- CDU: when selecting NEXT HOLD button, the page can not be left without selecting a HOLD
- CDU: ETA times on RTE LEGS page and PROGRESS page do not match the ETAs displayed on the ND
- PFD/ND: Heading pointer and Trackline on the Hud and Mini Map are reversed where the HDG pointer is showing track and the track line is showing heading
- PFD: VRef the same speed always for flaps 30
- PFD: 787-9 does not display flaps up cues. However as soon as a negative rate of climb is introduced they appear
- PFD: Minimums alert display and RESET minimums don't work

- PFD: LAND 3 should not annunciate unless AUTOPILOT engaged, AT engaged and APP modes (LOC/GS) active
- PFD: FLARE and ROLLOUT FMAs remain active even after landing
- PFD: FLARE and ROLLOUT FMAs show with autopilot disengages
- PFD: Overspeed barber pole bouncing up and down by 1kt
- PFD: Flight Path Vector incorrect
- ND: Airport ICAO codes on ND sometimes show second ICAO code below (of airports far away)
- ND: VNAV Vertical Deviation Symbol does not resemble the one used on newer Boeing models
- ND: vertical deviation symbol not clipped.
- ND: Terrain radar peak values show different values for CAPT/FO and depending on Range
- ND: ETA on waypoints incorrect
- ND: no GRID display above 70N
- ND: in high latitudes the ND/minimap still shows the MAG TRK (even though label correctly changed to TRU)
- ND: Left and right DME show different values, even though tuned to same station
- EICAS: "Not On Intercept Heading" displayed when LNAV activated on ground
- TCP: sometimes ceases to work after a long flight
- TCP: Rounding issues when tuning frequency
- HUD: F/D Erratic after initial rotation when on speed and course
- HUD: text overlap when METERS option is selected on
- HUD: FPV too thin
- HUD: F/D circle too thin
- EFB: CDU does not preview flaps data when take off data is sent from EFB to CDU
- EFB: consistently calculates Vr < V1
- EFB: PG UP / PG DN buttons sometimes require multiple presses. Also check if PG DN when on 2/2 will bring it back to 1/2 in real life
- EFB: current gross weight instead of planned landing weight used for landing speed calculation
- SYSFUEL: Fuel Cutoff VLV shows as open even though cutoff switch is OFF
- SYSFCTL: Trim value shown on SYS-FCTL page does not increment in steps of 0.25 (like on the EICAS)
- SYSHYD: Hydraulic system never pressurizes when engines are off
- QW CONFIG page: 30 ft. GPWS callout tied to 300 ft callout
- VC: Hole/space in cockpit door below FD Door
- VC: Radio / Baro knob inop on FO side (stuck in radio)
- Exterior: plugged windows shiny in dusk/dawn
- Exterior: RR Engine 2 Fan not placed straight (wobbling)

- Exterior: Landing Gear not displaying properly in Aircraft Selection screen
- Exterior: Engine fan animation not smooth during startup/shutdown
- Exterior: Nose landing light always shows in foggy conditions (even if switched OFF)
- Exterior: Right side plugged windows are slightly transparent
- Exterior: RR Engine 1 Reverse Thrust Blocker Doors not animated correctly
- Exterior: Flaperons droop with no hydraulic power. Rare on real 787
- Exterior: Config option to show light splashes even during daytime
- Exterior: ram air inlets/outlets remain open when packs are not running (but switched to AUTO)
- Exterior: 787-9 right MLG spring missing attachment point
- Exterior: light splashes on fuselage show even without electrical power
- Exterior: wings vibrate during turbulence when using Active Sky
- CENTER Controls key assignment does not center rudder (only aileron)
- LNAV: over/undershooting improved
- VNAV: earlier activation of 240/10000 restriction on descent to allow for deceleration
- CTD when 35 or more chart images are loaded to the EFB
- MCP: Attempting to use V/S yields readings between -30 and +30 when FS unit settings are set to metric
- MCP: Mach speed window format changed from .XX to .XXX
- TCAS TA never goes away
- EICAS FUEL LOW CENTER logic
- KGS option is not saved when being set on QWConfig Page (even after clicking SAVE CONFIG)
- HUD/FD/Dome Light sometimes disappears after a long flight
- IRS instantly aligns when powering up from cold and dark (even if switches OFF)
- Descent Profile incorrect when stored Flight Plan is loaded
- Option to display VSD terrain always
- Newly entered Direct To course/track does not allow for turning radius of aircraft
- COMMCOMPANY: Departure report page not working
- INFO page: shows departure/destination runway information
- When changing the cruise altitude in the VNAV CRZ page, the plane shows off course on the ND
- When initiating STEP CLIMB/changing altitude the LNAV track is re-drawn 20 miles to the left
- Alt intervention logic
- Fuel is not properly loaded from the Dispatcher
- Payload areas renamed to match Dispatcher
- Dispatcher does not find steam path sometimes
- Pan rates very slow in predefined views (other than captain view)

- camera definitions for right side wing views added
- TO Derate logic improved
- RAT shows developing pressure on synoptic even when RAT is not producing power
- Forward terrain warning (PULL UP callouts) triggered while departing LSZH rwy 16
- Option to temporarily inhibit forward terrain warning
- Aircraft does not fly hold speed depicted on hold page when holding
- slight fuel burn even though engines and APU are not running
- Before Start Checklist does not autofill the trim setting
- ILS & FAC capture sometimes turns in the opposite direction initially
- Sounds: fan noise can be heard even though plane is cold and dark
- Sounds: Flap callouts made at incorrect times
- Sounds: "Rotate" callout plays delayed if V1 and VR are close to each other
- Sounds: Minimums Callout always based on RADIO ALT (even if BARO selected)
- Sounds: GPWS callouts play approximately 10ft above the actual altitude that got called out
- FDE: 787-9 nose wheel contact point fixed
- FDE: improved ground handling / taxi
- FDE: improved roll and pitch authority
- FDE: improved braking behavior
- FDE: improved engine spool rate

Additions

- Dynamic lighting (P3D only)
- Optional high resolution displays (P3D only)
- ND: Airport Map taxiway, runway, and gate highlighting
- EFB Dispatch page added to modify fuel / payload on the fly
- Panelstate automatically saved whenever the user saves the flight in the FSX menu
- Config Page entry for PauseAtTOD and 1xAtTOD
- INFO: Departure/Destination airport info shown
- EFB: chart altitude restrictions displayed for STARS
- CDU: "Pause at distance from destination" option added to descent page
- Support for key assignments for autopilot / autothrottle events
- Config option to set location of Activesky Snapshot files

HotFix2 (Version 1.0.2)

Fixes/Improvements

- Random CTDs while weather radar is operating
- CTD when loading panelstate after loading saved flight
- Problems maintaining altitude when using FSUIPC
- A/T Speed mode is unable to hold airspeed at very high cruise altitudes
- Mach number cannot be changed in certain scenarios
- FLCH engagement selected speed logic
- Autopilot initially turns into opposite direction upon localizer capture
- ILS: frequency auto tuning
- ILS: Runway course gets tuned even if localizer not intercepted yet
- ILS: unable to capture at high intercept angles
- Pressurization: Cabin alt descends below airport elevation at high altitude airports
- Fuel: center tank scavenge system
- Fuel flow and fuel tank quantity not affected by KGS option
- Arming spoilers using joystick axis
- FSUIPC assigned flap axis is reversed
- Inboard spoilers remain slightly extended after go around
- PFD/ND: Text overlaps
- PFD: 3rd airspeed digit cutoff in compact mode
- ND: Unable to exit PICK WPT mode on FO ND MAP
- ND: FIX/ETOPS range ring not showing when waypoint is out of map range
- ND: ETOPS line style changed
- ND: Button highlight boxes not showing on full ND mode
- ND: Map scale incorrect in full plan mode
- ND: Airport map not displayed correctly for highly complex airports
- ND: Airport map display misaligned in crosswind
- ND: wide FO side menu clickspot does not cover entry select box (only the diamond)
- 2D DU popups can not be closed by clicking the light sensor
- CDU: VNAV CRZ Page LSK 6L typo
- CDU: FIX page radial only option
- CDU: FIX page maximum distance increased
- CDU: setting cruise IAS manually does not affect airspeed
- CDU: Mouse highlight not working on FIX page
- CDU: Help message not matching selected weight unit
- CDU: RTE page CO route cut off
- TCP: frequency tuning
- EFB: CTD when pressing PGDN button

- EFB: Departure chart clip page only shows page 1/1
- EFB: XFR button not working on 2D popup
- FS Setting: incompatibility with "true airspeed" FS speed setting
- FS Setting: incompatibility with "metric" FS altitude setting
- QW Dispatcher: unable to find FSX Steam path
- QW Dispatcher: changing units does not affect aircraft
- QW Dispatcher: Bulk Cargo weight issues
- QWCAS Sound improvements

Additions

- Flight Controls using keyboard arrow keys
- Autopilot disconnect and warning sound cancel using key command
- EFB: invalid autobrake settings highlighted in yellow
- EICAS: 'COMM' memo when new COMM message received

HotFix1 (Version 1.0.1)

Fixes/Improvements

- -Removes gauge expiration
- -Random loss of elevator control
- -CTD when selecting "NEW MESSAGES" on SYS COMM page
- -Overspeed warning triggered too early and doesn't clear
- -ATIS request not working
- -Assigned joystick flap axis doesn't work
- -VC texture issues when using "Reduced Memory Usage" panel option with DX10 preview enabled
- -Product installer does not find FSX Steam installation path automatically
- -VC on 787-9 shows a random black placard shadow on phone
- -MCP FPA window shows two decimal digits instead of one
- -Selecting 'WXR' (after selecting the 'MENU' key) on the FO's TCP causes the lower TCP to react

Additions

- Units now can be changed from LBS to KGS on the QWCONFIG DU page instead of the qw787.cfg
- Changing units from LBS to KGS is no longer limited to the CDU only
- Quick Start Guide