Flightcell

DZMx Installation Manual

DZMx Product Revision 7.0

Firmware 4.13.0

117-00008 Rev 3.9.1 Flightcell DZMx Installation Manual

Effective Date: 11 July 2025

Flightcell Support

Section 1: Revisions & Approvals

Revision	Effective Date	Approved By	Reasons for Change
1.0	04 Aug 2021	James Mace	DZMx Installation Manual re-issued with a new document number 117-00008 as per SOP-75 Design Configuration Management. The previous versions of this manual MAN_DZ4_001 with revisions 1.0 to 27.0 are still available on request. DZMx Firmware Release 4.8.0 for DZP_04 Rev 5.0 and 4.0; and Firmware Release 3.8.0 for DZP_04 Rev 3.0
2.0	16 Nov 2021	James Mace	Release of DZP_04 Rev 6.0. Updated Backlighting section to improve readability. Minor document changes
3.0	18 Feb 2022	James Mace	Release of DZP_04 Rev 6.1. Updated instructions for configuration of DZMx data and activation of firewall between ethernet and Wi-Fi networks. Updated details for management of cellular data connections. DZMx Firmware Release 4.8.1 for DZP_04 Rev 4.0, 5.0, 6.0 and 6.1; and Firmware Release 3.8.1 for DZP_04 Rev 3.0
3.1	31 Mar 2022	James Mace	Manual released for DZMx Firmware Release 4.8.2 DZP_04 Rev 4.0, 5.0, and 6.x and Firmware Release 3.8.2 for DZP_04 Rev 3.0.
3.2	20 June 2022	James Mace	Manual released for DZMx Firmware Release 4.9.0 for DZP_04 Rev 4.0, 5.0, and 6.x and 3.9.0 for DZP_04 Rev 3.0.
3.3	6 October 2022	James Mace	Manual released for DZMx Firmware Release 4.9.1 for DZP_04 Rev 4.0, 5.0, and 6.x and 3.9.1 for DZP_04 Rev 3.0. New function for Over the Air updating of cellular modem.
3.4	11 October 2022	Brodie Hemmings-Sykes	Minor correction to firmware revision
3.5	15 March 2023	James Mace	Manual released for DZMx Firmware Release 4.10.0 for Rev 4.0, 5.0, and 6.x.
3.6	15 December 2023	James Mace	Manual released for DZMx Revision 7.0 and for Firmware Release 4.11.0 for Rev 4.0, 5.0, and 6.x and 7.0
3.7	18 January 2024	James Mace	Further updates to manual

3.8	17 January 2025	Philip Hutchings	Manual released for DZMx Revision 7.0 and for Firmware Release 4.12.0 for Rev 4.0, 5.0, and 6.x and 7.0 Addition of ICA in Section 8, Phone book expanded to 100 contacts, Addition of new features. Appendix 4 – Software Defined Receiver (SDR). Appendix 5 – ARINC 429 Appendix 6 – Firefighting Application Firmware Release 4.13.0
3.9	16 April 2025	Philip Hutchings	Certus configuration corrections
3.9.1	11 July 2025	Philip Hutchings	Update antenna coax specifications, sim cards and connector kits

CONTENTS

Section 2: Introduction

This manual provides information on installation and configuration of the DZP_04 Flightcell DZMx. Previous revisions of this manual have the document number MAN_DZ4_001 and are still available on request.

Applicability of this Manual

This manual applies to DZP_04 Flightcell DZMx revision 7.0 with firmware 4.12.0.

Firmware 4.12.0 can also be applied as a firmware upgrade on all Revision 4.0, 5.0 and 6.x DZMx, but the Software Defined Receiver functions will not be available.

New in Revision 7.0 and Firmware 4.12.0

New features and enhancements are available with Revision 7.0 and firmware 4.12.0.

Revision 7.0

Optional Software Defined Receiver (SDR)

A Software Defined Receiver can be installed as an additional expansion card and provides for reception of a range of different radio transmissions. The SDR card is installed at production.

See next section for additional capabilities provided by the SDR.

Optional ARINC429

The DZMx supports an optional ARINC 429 dual receiver, single transmitter expansion card.

For the ARINC 429 dual receiver to be used, the ARINC 429 hardware card must be installed in the DZMx and it must be running firmware v4.12 or higher

SMA antenna jack installed on all versions.

Previously an SMA jack has been installed on some variants of the DZMx. The SMA jack will now be installed on all versions of the DZMx, with a dust cover where not connected.

Firmware 4.12.0

Firmware v4.12.0 is a feature release for:

- Controller API (CAPI)
- Certus IP Tracking
- ARINC429 Logging
- UAT 978 Support (beta)
- GDL-90 Support for transmitting ADSB data
- AIS NMEA UDP Broadcaster over Ethernet and WiFi
- Phonebook expanded to 100 contacts
- Support for emailing settings/logs to maintenance
- Auto start of Software Defined Receiver (SDR) on power-up

Firmware v4.12.0 also includes changes in functionality to call forwarding. A new global call forwarding disable setting has been introduced. This may impact customers currently utilising call forwarding on their DZMx. See the Call Forwarding section in the Operators Manual for mitigation steps

Software Defined Receiver support

The SDR can receive a wide range of transmissions, including:

- AM radio – AM mono audio channels
- FM radio – wide band (200kHz channel bandwidth) mono FM audio reception.
- NBFM – narrow band (12kHzchannel bandwidth) FM mono radio.
- ADSB-IN 1090 MHz
- AIS (vessel identification and tracking system) 162 MHz.

Configuration and operation of the SDR and associated applications is provided in a separate manual. Refer to Appendix 4

Advanced routing functions

Support for enhanced networking on DZMx where more than one IP data capable modem is installed (two cell modems or a Certus modem), including automatic failback.

See *Appendix 2: Advanced routing* functions on page 87.

Iridium Certus support

The DZMx supports an Iridium Certus modem, providing an IP data connection and voice connection over the Iridium Certus service.

Initial support is for the Guardian G6 and G6S mid-band Iridium Certus modems.

See *Appendix 3: Configuration of Iridium Certus* service on page 93.

Enhanced Wi-Fi security

Enhanced security features have been implemented on the DZMx Wi-Fi service.

See *DZMx Wi-Fi* on page 44.

Firmware 4.13.0

GPS Logging rate setting

SDR Audio receiver auto mute when on a DZMx call

Dual Cell Dual Gateway Routing option

DZMx custom routing configuration

AIS and SDR license removal. Earlier units running v4.12.0 with SDR and AIS licenses loaded will continue to work as normal

SDR Antenna Configuration

Section 3: DZMx Equipment

The DZMx should be inspected when received to check for any visible damage or missing components.

Connectors

Connector kits are supplied with the DZMx and with associated parts including the DZMx Remote Head and antennas.

The content of the connector kits depends on the version of the DZMx. Details of the connector kit contents are provided in Appendix 1.

Ethernet/USB Connector Module

It is compulsory that DZMx USB and Ethernet connections are installed on the aircraft. If the USB/Ethernet connections are not installed into the aircraft, it will severely limit troubleshooting and support capabilities.

A Flightcell USB/Ethernet connector module is provided with each DZMx to provide a convenient option for terminating the DZMx USB and Ethernet connections.

It is acceptable to install alternative USB and Ethernet connectors if the DZMx module is not convenient.

The connector module is available with either D-type (commercial) or D38999 (military) connectors. The connector module and its connector kit are included in DZMx Connector kit (See Appendix 1 for details).

Section 4: DZMx Specifications

Variants and Part Numbers

The DZMx can be built in a wide range of configurations, with a range of hardware options. The part number is DZP_04 and the 3 – 9 digit dash number immediately following DZP_04 designates the variant of the DZMx.

The available variants may change from time to time. The options available to build up the different variants are:

- Installed modems.
- Faceplate options:
  - DZUS (5½”) mount
  - GA (6¼”) mount
- Type of main connector
  - Standard - two D25 connectors
  - Military - one mil spec D38999 connector
- NVIS compliance
  - NVIS-B
  - NVIS-A / Mil Std 3009 (only available on versions with military connectors)
- Embedded Wi-Fi and Bluetooth capability
- Expansion cards:
  - ARINC 429
  - Input Expansion (providing seven additional general purpose inputs)
  - Second Ethernet (providing a second ethernet connection; this is recommended if the an Iridium Certus modem is to be used with the DZMx
  - Software Defined Receiver (SDR).

Dimensions

Dimension	DZUS mount	GA mount
Faceplate Width	146mm	158mm
Extrusion Width	126mm	126mm
Faceplate Height	57mm	60mm
Extrusion Height	54mm	54mm
Depth (from Front face to Rear face)	110mm	110mm

Electrical

Part/Item	Parameter	Value
Power	Input Voltage	12-32VDC
	Supply Current	Up to 1A @ 28VDC
ICS to DZMx	Input Levels (V_{RMS})	20mV to 1.15V, adjustable
		775mV nominal
	Input Impedance	600Ω
Microphone Bias Voltage		12V via 2.2kΩ
DZMx to ICS	Output Levels (V_{RMS})	Up to 5V, adjustable
		775mV nominal
	Output Impedance	150Ω
Backlighting	Input Control	0 to 28VDC
		User calibrated High/Low set-points
	Colour	Green 520nm. Designed for NVIS-B compliance.
GPS	Antenna Bias Voltage	5V
	Antenna Current	Up to 100mA
	Sensitivity	-162dBm (with Flightcell Antenna)
	Time to First Fix	26s
General Purpose Inputs	Inputs Levels (V_{in})	0 to 28VDC
General Purpose Outputs	Levels (V_{out})	0 to 32VDC
	Max Current (I_{out})	500mA

DZMx Wi-Fi and Bluetooth Transmit Power

Wi-Fi		
	Tx power (dBm)	17.3
	Antenna gain (dBi)	2.6
	Total power (dBm)	19.9
	Total power (mW)	97.7
Bluetooth		
	Tx power (dBm)	10.0
	Antenna gain (dBi)	2.6
	Total power (dBm)	12.6
	Total power (mW)	18.2

Environmental Qualifications

The DZMx is tested against and complies with RTCA-DO160G.

Details of the DO160G compliance are provided in the DZMx Declaration of Design and Performance (DDP), document 120-00001 Issue 2.2.

The DZMx DO160 test results are available on request from tech@flightcell.com.

Section 5: Installation

Mounting the DZMx

The DZMx should be mounted where the flight crew or radio operator have a clear view of the display and can easily use the keypad.

The DZMx LCD is designed for optimum readability when viewed at angles between 60° above the display to 20° below. Avoid mounting the unit where the display will be viewed at an oblique angle, as it may not be clearly readable. Preferably where there is minimal sunlight shining on the display. The ideal location is in the panel where it is readily viewed by, and accessible to the pilot or pilots.

If the DZMx is installed in the pedestal, for ease of use it is preferable to install it as near to the front of the pedestal as possible.

Mechanical drawings showing dimensions and mounting details are available on the Flightcell website www.flightcell.com/resources:

- DZUS/GA Mech Assembly, for versions with DZUS front plate and D25 main connectors
- GA/GA Mech Assembly, for versions with GA front plate and D25 main connectors
- DZUS/Mil Mech Assembly, for military versions with DZUS front plate and D38999 main connectors.

CAD solid model files are also available on request from Flightcell International. Contact tech@flightcell.com for more information.

DZMx Wiring Guide

Refer to the following wiring diagrams for the Flightcell DZMx and associated equipment (available from www.flightcell.com/resources:

- Civilian Wiring Diagrams for versions of the DZMx with D25 main connectors
- Military Wiring Diagrams for versions of the DZMx with D38999 main connectors.

Necessary Installations

- Power Supply
- Ethernet/USB Connector Module
- Audio connection to audios system/ICS
- DZMx Antennas
- SIM Cards

Optional Installations

- DZMx Remote Head
- Backlighting control
- DZMx Inputs/Outputs

Power Supply

The DZMx unit and other components require aircraft DC power. Operating range is 12 - 32VDC. It is recommended that the DZMx be connected to the emergency (primary) power bus on the aircraft. This is to ensure successful operation of tracking (including engine start/stop data) and emergency calls.

When operating on a nominal 28V supply, circuit breakers or fuses of the following rating should be used between DZMx system components and the power supply:

- A 2-amp circuit breaker/fuse is recommended for the DZMx system.
- A 1-amp circuit breaker/fuse is recommended for the external modem (Iridium or cellular) module, if installed.
- A 1-amp circuit breaker/fuse is recommended for the Flightcell Iridium phone cradle, if installed.

If combining two or more circuits on a single circuit breaker, a 3A circuit breaker/fuse is recommended.

Ethernet/USB Connector Module

A Flightcell USB/Ethernet connector module (pictured) is included in the supplied DZMx Connector kit for terminating its USB and Ethernet connections.

Versions are available with either a D-type connector (part number IDP_00013) or D38999 connector (part number IDP_00012). Mating connectors for the wiring loom are included with the connector module.

An Ethernet and USB connection should always be installed as they provide the following functions:

- Ethernet – provides a connected device access to the DZMx data connections and to DZMx Connect
- USB – required for firmware upgrades and downloading diagnostics. The cable run to the USB connector should be limited to 5m of proper USB Cable to ensure compliance with the USB 2.0 cable delay specification.

An alternative USB or Ethernet socket may be used if preferred.

The DZMx Ethernet may be wired direct to a computer, switch or router if a permanent connection is required.

Note: It is essential that a USB and Ethernet connection is installed in an accessible location.

Fabricating Wiring Harnesses

All wiring should be carried out with aviation specification fireproof cable.

Screened cable should be used where indicated in the wiring diagrams. Where cable screen connections are not explicitly shown, they should be left unterminated.

The following minimum wiring specification is recommended:

- Power supply - 22 AWG stranded (0.325mm^2).

- Other cabling - 24 AWG stranded (0.205mm^2).

It is recommended that enough slack be left in the main cable to enable the DZMx to be partially removed from the aircraft panel for service or to exchange the Iridium and/or cellular SIM card.

Grounding and Shielding Terminations

The DZMx provides a chassis ground connection on the primary connector. This can be connected to a local aircraft chassis ground point if required. If the DZMx is mounted in a DZUS rack, the housing is grounded to the DZUS rails via the DZUS connectors and contact between the front panel metalwork and the DZUS rails.

If the DZMx has a GA front panel it is recommended to bond the DZMx to aircraft chassis ground via either the hardpoint on the rear of the DZMx or the chassis ground pin on the primary connector.

Installing Data Ports

The DZMx has several data connections wired off the main or secondary connector:

- **Ethernet** – used for connecting a PC or other Ethernet-capable device.
- **USB** – used for firmware upgrades and connecting USB-only devices.
- **RS232** – available for serial data connections to some external devices and as a debug port.
- **RS422/RS485** – used for serial data connections, and connection to one or more DZMx Remote Heads.

Two additional data connections are available by installation of optional expansion cards in the DZMx.

- **ARINC 429** – used to send and receive over the aircraft ARINC 429 data bus. See Appendix 5 for more details
- **Second Ethernet** – used to provide a second Ethernet connection.

Connector Pinouts (civilian versions)

Refer to the Civilian wiring diagrams for the Flightcell DZMx and associated equipment available on the Flightcell website www.flightcell.com/resources.

The standard civilian variant of the DZMx uses two D25 connectors. Refer to the figure below for the layout of the DZMx backplate.

DZMx Backplate, Standard Civilian Variant

Note: Revision 7.0 DZMx have an additional connector (SMA female) as standard. This is used with an Iridium 9603 (SBD) modem or Software Defined Receiver, if installed. If this is not in use, it is fitted with a blanking cap.

Primary connector

Connector type: DB25M J1

Pin No	Function	Direction	Notes
1	POWER GROUND	Ground	DC power supply ground
2	DC SUPPLY POSITIVE	Power	DC power supply
3	I/O GND	Ground	
4	GENERAL PURPOSE INPUT 2	Input	
5	GENERAL PURPOSE INPUT 3	Input	
6	RS485 Tx+	Output	
7	RS485 Rx-	Input	
8	AUDIO FROM DZM1 LO	Output	LO audio output to ICS 1
9	MIC TO DZMx 1 HI	Input	Unbiased/biased (configurable)
10	MIC TO DZMx 2 HI	Input	Unbiased/biased (configurable)
11	POTS TIP	I/O	For optional telephone handset
12	AUX DATA IN	Input	
13	AUX DATA OUT	Output	
14	CHASSIS GND	Ground	Internally connected to DZMx Chassis
15	GENERAL PURPOSE INPUT 5	Input	Lighting dimmer input (optional)
16	GENERAL PURPOSE INPUT 1	Input	
17	GND	Ground	
18	GENERAL PURPOSE INPUT 4	Input	

Pin No	Function	Direction	Notes
19	RS485 Tx-	Output	
20	RS485 Rx+	Input	
21	AUDIO FROM DZM1 HI	Output	HI audio output to ICS 1
22	MIC TO DZMx 1 LO	Input	Return for audio input from ICS 1
23	MIC TO DZMx 2 LO	Input	Return for audio input from ICS 2
24	POTS RING	I/O	For optional telephone handset
25	AUX DATA GND	Ground	
D25 shell	CHASSIS GND	Ground	

Secondary Connector

Connector type: DB25F J2

Pin No	Function	Direction	Notes
1	AUDIO FROM AUX TXCVR	Input	
2	AUDIO FROM AUX TXCVR	Input	
3	AUDIO FROM DZMx 2 HI	Output	HI audio output to ICS 1
4	OUTPUT 1A	Output	Isolated output 1 Terminal A
5	OUTPUT 2A	Output	Isolated output 2 Terminal A
6	GPIO3	Input	Reserved for Optional Capabilities
7	USB VBUS	Power	
8	USB D+	I/O	
9	USB D-	I/O	
10	GPIO5	Output	Reserved for Optional Capabilities
11	GPIO6	Output	Reserved for Optional Capabilities
12	ETH 10/100 TX+	Output	
13	ETH 10/100 TX-	Output	
14	AUDIO TO AUX TXCVR HI	Output	
15	AUDIO TO AUX TXCVR LO	Output	
16	AUDIO FROM DZM2 LO	Output	LO audio output to ICS 2
17	OUTPUT 1B	Output	Isolated output 1 Terminal B
18	OUTPUT 2B	Output	Isolated output 2 Terminal B
19	GPIO4	Input	Optional: ARINC-429 RX Channel 2 -
20	USB GND	Ground	
21	GPIO7	I/O	Reserved
22	GPIO1	Input	Reserved
23	GPIO2	Input	Reserved
24	ETH 10/100 RX-	Input	
25	ETH 10/100 RX+	Input	
D25 shell	CHASSIS GND	Ground	

Connector Pinouts (military versions)

Refer to the military wiring diagrams for the Flightcell DZMx and associated equipment (available from the Support page of the Flightcell website).

The standard military variant of the DZMx uses a single D38999 connector. Refer to the figure below for the layout of the DZMx backplate.

DZMx backplate, military variant

Note: Revision 7.0 DZMx have an additional connector (SMA female) as standard. This is used with an Iridium 9603 (SBD) modem or Software Defined Receiver, if installed.

Military Connector

Connector type: D38999/24WE-35PN

Mating part: D38999/26WE-35SN (or equivalent)

Pin No	Function	Direction	Notes
1	ETH 10/100 TX-	Output	
2	ETH 10/100 RX+	Input	
3	ETH 10/100 RX-	Input	
4	AUDIO FROM DZMx 2 LO	Output	LO audio output to ICS 2
5	ETH 10/100 TX+	Output	
6	SHIELD	Shield	Spare Shield Connection
7	SHIELD	Shield	Spare Shield Connection
8	CHASSIS GND	Ground	
9	GPIO5	Output	Reserved for Optional Capabilities
10	AUDIO FROM DZMx 2 HI	Output	HI audio output to ICS 2

Pin No	Function	Direction	Notes
11	AUDIO TO AUX TXCVR HI	Output	
12	AUDIO FROM DZMx 1 HI	Output	HI audio output to ICS 1
13	OUTPUT 1B	Output	Isolated output 1 Terminal B
14	OUTPUT 1A	Output	Isolated output 1 Terminal A
15	OUTPUT 2B	Output	Isolated output 2 Terminal B
16	GPIO6	Output	Reserved for Optional Capabilities
17	POWER GROUND	Ground	DC power supply ground
18	AUDIO TO AUX TXCVR LO	Output	
19	AUDIO FROM DZM1 LO	Output	LO audio output to ICS 1
20	RS485 RX+	Input	
21	RS485 RX-	Input	
22	GPIO2	Input	Reserved for Optional Capabilities
23	OUTPUT 2A	Output	Isolated output 2 Terminal A
24	GPIO7	I/O	Reserved for Optional Capabilities
25	DC SUPPLY VOLTAGE	Input	DC power supply
26	MIC TO DZMx 2 HI	Input	HI audio input from ICS 2
27			LO audio input from ICS 2
28	RS485 TX+	Output	
29	RS485 TX-	Output	
30	GPIO1	Input	Reserved for Optional Capabilities
31	USB D+	I/O	
32	POTS RING	I/O	For optional cabin phone
33	AUDIO FROM AUX TXCVR LO	Input	
34	MIC TO DZMx 1 LO	Input	LO audio input from ICS 1
35	SHIELD	Shield	Spare Shield Connection
36	SHIELD	Shield	Spare Shield Connection
37	AUX DATA GND	Ground	
38	USB VBUS	Power	
39	USB D-	I/O	
40	POTS TIP	I/O	For optional cabin phone
41	AUDIO FROM AUX TXCVR HI	Input	
42	MIC TO DZMx 1 HI	Input	HI audio output from ICS 1
43	SHIELD	Shield	Spare Shield Connection
44	AUX DATA IN	Input	

Pin No	Function	Direction	Notes
45	AUX DATA OUT	Output	
46	USB GND	Ground	
47	GPIO3	Input	Reserved for Optional Capabilities
48	GPIO4	Input	Reserved for Optional Capabilities
49	I/O GND	Ground	
50	GENERAL PURPOSE INPUT 2	Input	
51	GENERAL PURPOSE INPUT 1	Input	
52	GENERAL PURPOSE INPUT 5	Input	Optional: Lighting dimmer input
53	GENERAL PURPOSE INPUT 3	Input	
54	GENERAL PURPOSE INPUT 4	Input	
55	I/O GND	Ground	

Installing a DZMx Remote Head

A Flightcell DZMx Remote Head is a remotely located control head for the DZMx, with identical display and keypad. One or two Remote Heads may be installed to provide other crew or mission specialists with full remote control of the DZMx.

Wiring the Remote Head

The Remote Head connects to the DZMx using the RS422/RS485 serial data connections. The Remote Head also requires a 12-32VDC power supply. Two additional connections are a ground connection to the chassis, and a lighting input for external lighting control. Backlighting of the DZMx and Remote Heads can be configured individually, see page 32 for details on adjusting the brightness and the installing the external lighting input.

A wiring diagram of the Remote Head is included in the wiring diagrams for the DZMx.

A termination resistor may be required on RS485 RX. Refer to wiring diagrams

Configuring the DZMx for a Remote Head

Configure the DZMx to recognise the Remote Heads:

- On the DZMx control head, go to *MENU* > *Hardware Config* > *Head B Enable*.
- In DZMx Connect, go to *Settings* > *Hardware* > *Head*.

If a second Remote Head is installed, repeat these steps for *Head C*.

Configuring the Remote Heads

A head ID must be allocated to each Remote Head so that the DZMx can identify it. To allocate an ID:

- Press and hold the **BACK** key on the designated Remote Head for 2 seconds, then release. Scroll down to *Advanced* > *Head ID*
- Use the **RIGHT** and **LEFT** arrow keys to select the correct head ID (either Head B or Head C), then press **END** to save.

DZMx Antennas

Flightcell supplies a range of antennas, the choice of which will depend on DZMx modem configuration:

- Single Iridium modem: Use a Flightcell dual Iridium/GPS antenna, ANP_00043
- Dual Iridium modems: Use a Flightcell Iridium/GPS antenna, P/N ANP_00043, and a single Iridium antenna, ANP_00045
- Single cellular modem: Use a Flightcell cellular antenna, P/N ANP_00033
- Dual cellular modems: Use a Flightcell dual cellular antenna, P/N ANP_00041 or two cellular antennas, P/N ANP_00033.

Antennas ANP_00033, ANP_00043 and ANP_00045 are all TSO'd.

Note: A GPS antenna is required for date time stamping of data and messages. If the Flightcell ANP_00043 antenna is not used an appropriate 3rd party GPS antenna MUST be fitted.

Installation of Iridium and GPS Antennas

Specification drawings for the DZMx antennas are available on the Flightcell website at www.flightcell.com/resources. It is the responsibility of the installer to obtain the correct certification to install antennas on the airframe.

The Flightcell Iridium/GPS antenna and Iridium antenna should be installed on the top of the aircraft where they will have an unrestricted view of the sky, mounted as close to horizontal as possible. The following should be considered when determining a mounting location:

- Maintain good separation from other antennas. Preferred separation is 750mm from L-band (GPS), TCAS or transponder antennas, but a lesser separation can be applied if there is limited space on the aircraft
- On a helicopter, the antenna can be installed below the rotor blades, but avoid installing it close to the rotor hub, as the hub and inner rotor can block the antenna's view of the sky
- Keep coax cable lengths short to minimize attenuation of transmit and receive signals.

Installation of Cellular Antennas

A Flightcell cellular antenna should preferably be installed on the underside of the aircraft to provide best connection to the cellular network. Typical location is below the cockpit to minimise antenna cable length. The minimum recommended separation between the cell antenna and other antennas is 600mm.

Guidelines for Antenna Cables

Iridium and cellular antenna cables must be selected to keep signal loss within accepted levels. Total signal loss on the Iridium connection between the Flightcell DZMx Plus or Iridium phone cradle and the antenna should not exceed 3dB at 1625MHz.

Total loss of on the cellular connection should be kept as close as possible to not exceed 3dB for the frequency range of 700MHz to 2700MHz. It is highly recommended to use a high-quality low loss cable.

To prevent RF connector damage while staying within the 3 dB total cable loss for Iridium systems:

- The primary RF cable may remain a larger, lower-loss type for most of the run.
- For the final 300 mm (maximum 1 ft) leading into the LRU TNC connector, the cable must transition to a lighter, more flexible coax such as RG400 or equivalent, using a certified adapter or splice.
- This transition section must be installed with appropriate strain relief and cable support, ensuring compliance with aviation standards and maintaining RF performance.

This minimizes mechanical load on the RF connector of the LRU especially during installation and removal, preventing failures while preserving signal integrity within the allowable loss margin.

The maximum recommended length for different common antenna cable types is:

Cable Length	Cable Specification
Up to 3m	RG58C/U or RG400
Up to 6.5m	LMR200 or RG142A/U-9006 cellfoil
Up to 8m	RG213
Up to 17m	LMR400
Up to 26m	LMR600

This table is a guideline, and a suitable equivalent may be used.

Antenna connectors on the DZMx and Flightcell antennas are colour coded to reduce installation errors, as follows:

Antenna Type	Colour
Iridium	Red
Cellular	Green
GPS	Blue

Antenna for Software Defined Receiver

An antenna is required if the Software Defined Receiver is installed in the DZMx. For best results the appropriate frequency band antenna must be installed. This is due to the wide frequency range and multiple modes available of operation.

The DZMx supports the following software defined receiver capabilities:

- AM reception – AM mono audio channels
- FM reception – wide band (200kHz channel bandwidth) mono FM audio reception.
- NBFM – narrow band (12kHzchannel bandwidth) FM mono audio reception.
- ADSB-IN 1090 reception
- UAT 978MHz reception
- AIS 162MHz reception

Section 6: Configuration

Accessing Installation and Configuration Settings

Many of the DZMx configuration settings are hidden during normal operation. To access these settings, the Installer Menu needs to be activated. The Installer Menu will remain active until the DZMx is next powered off. If a menu item mentioned in this manual cannot be found ensure that the Installer Menu has been activated.

Configuring the DZMx

The DZMx can be configured using the DZMx keypad and display or using DZMx Connect. Most settings are available on both interfaces.

It is recommended that DZMx Connect is used to configure and to change settings as it is faster and provides a more intuitive interface than the DZMx keypad.

However, it is useful to use the DZMx keypad when real-time feedback on the configuration is preferred:

- Adjusting audio settings.
- Configuring the general purpose inputs.

Configuration using the DZMx Keypad

Most keys on the DZMx keypad have more than one function. The following table outlines how the DZMx keys are referenced throughout the manual.

Icon	Manual Reference		Icon	Manual Reference
	CALL			5, SPD2
	END			6, RIGHT, SPD3
	A			7, MSG
	B			8, DOWN, DIR
	1, MARK			9, MODE
	2, UP, A.R.M., ALERT			0, +, MENU
	3, EMER			*, BACK

	4, LEFT, SPD1			#, ENTER, POWER

Navigating the Menus

To access the menu system:

- Press **MENU**. If the DZMx is on a phone call, press and hold **MENU** to access the menus.
- Use the **UP** and **DOWN** arrow keys to navigate between the menu options.
- Use the **LEFT** and **RIGHT** arrow keys to scroll left or right, to increase, decrease or navigate menus.
- Press **ENTER** to select the highlighted item or to confirm a setting change.
- Press **BACK** to cancel a setting or to move back a menu level.
- Press **END** to cancel a setting change or to exit the menu and return to the main screen.

Instructions will be provided throughout the Manual in the format *MENU* > *Forms* > *Form Entry* etc.

The > indicates that you will need to select **ENTER** and scroll to a menu heading using the arrow keys.

Configuring using DZMx Connect

The DZMx Connect application can be used to configure the DZMx, change settings and edit the DZMx phonebook and Quick Message Library, as well as to access a number of other DZMx functions.

DZMx Connect is available as a browser application on a smart device (including Android smartphones) or PC.

There are three ways to use DZMx Connect:

Hardwired Computer Connection

- Connect a computer to the DZMx Ethernet port.
- Power up the DZMx and wait for it to fully initialise.
- Open a web browser, type 192.168.4.1 in the address bar and press **ENTER**. The home screen of DZMx Connect will open in the browser.

If the DZMx has been allocated a fixed IP address, or the DZMx is set up as a DHCP client, then it is necessary to enter this address (this could be, for example, 192.168.4.100).

This IP address can be determined by selecting *MENU* > *Diagnostics Menu* > *About DZMx.*

Wireless Laptop Connection

- Check that Wi-Fi is enabled. Look for a Wi-Fi icon located at the top right-hand side of the DZMx display. If the Wi-Fi icon is not present it can be checked and enabled in one of three ways:
  - Press and hold the MODE key until “Enabling Wi-Fi” is displayed on the display. Wi-Fi can also be disabled with a subsequent LONG press of the MODE key.

- Connect a PC or laptop to the DZMx via an Ethernet cable. Using the DZMx keypad, go to *MENU > Hardware Config > Wireless and Networks > Wi-Fi Enable*.
- To connect via Wi-Fi:
  - Open Wi-Fi settings on the laptop, select the Wi-Fi address for the DZMx, then enter the password (the default password is *flightcell*).
  - Open a web browser on the laptop and type in 192.168.2.1 then press **ENTER**; the home screen of DZMx Connect will open within the browser.

Smart Device Connection

- Connect the smart device to the DZMx Wi-Fi:
  - Default SSID: *DZMx Wi-Fi*
  - Default password: *flightcell* (all lower case)
- On any device, open a browser and type in 192.168.2.1
- The initial screen is a discovery screen and the DZMx should be discovered automatically. The **DISCOVER** button is only required if the process needs to be repeated.
- If the DZMx Wi-Fi IP address has been manually configured, it will be necessary to enter the IP address manually. Click **Manual Entry** and enter the IP address. After the first use of a custom IP address, the app will remember the address in the **Stored Devices** list.
- Click on the discovered DZMx unit to open DZMx Connect.

To watch a short video explaining DZMx Connect capabilities Click here (demonstrated on the iOS app).

Permission levels

Permission levels allow control over how the DZMx is configured. Three levels or roles with individually configurable passwords are available within DZMx Connect.

To access Permissions using DZMx Connect:

- Select **LOGIN** at the top of the screen. The login screen will open.
- Select **Installer** or **Administrator** from the dropdown list to the right of Authenticate as:
- Enter the related **PIN** number from the list below.

Role	PIN number	Responsibility
Installer	2468	The installer can edit all settings and hardware options.
Administrator	2580	An administrator can access all application features and configuration, but is unable to access hardware configurations.

To Access Installer Menus Using DZMx Keypad:

- Go to *MENU > Hardware Config > Installer Menu Enable*, press **ENTER**
- Enter the **Installer Password** and press **ENTER.** The default Password is **2468**.

Changing the Installer Password

The installer password can be changed as required:

- On the DZMx control head, go to *MENU* > *Hardware Config* > *Change Installer Passwd*
- On DZMx Connect, go to *Settings* > *Preferences* > *Access Management*.

Note: It is important to record the password. If the password is forgotten, it will be necessary to reset the DZMx factory settings before the password protected functions can be used again

Audio Installation and Configuration

The DZMx supports the following audio services:

- Telephony over the Iridium and cellular networks (depending on the modems installed in the DZMx).
- Iridium PTT, a Push-to-Talk service using the Iridium network to provide one-to-many PTT calling.
- Telephony over a mobile phone connected to the DZMx Bluetooth service.

Configuring DZMx Audio

To configure DZMx audio:

- On the DZMx keypad, go to *MENU* > *Audio*
- On DZMx Connect, go to *Settings* > *Audio*.

Connection to the Aircraft Audio System

Audio from the above services is connected into the aircraft audio system or intercom (ICS) to enable aircrew, mission crew or passengers to use these connections.

The DZMx can be connected to the aircraft audio system or ICS in several ways, depending on the aircraft configuration and type of operation.

It is recommended that audio from the DZMx is connected to spare radio positions on the ICS if possible.

Modem connections to the ICS are configured using DZMx Connect**.** Go to *Settings* > *Audio* > *Modems*.

Single or Dual ICS Connections

The DZMx supports one or two connections to the audio panel/ICS, ICS1 and ICS2.

The dual ICS connections may be used to allow the DZMx to be connected to two different audio panels on the aircraft, or to allow different audio connections to be used simultaneously.

Mirroring audio on dual ICS connections

If the DZMx has connections to two audio panels but it is desirable to have the same audio mirrored to both

- On DZMx Connect, go to *Settings* > *Audio* > *Modems*
- Set all four ICS connections (Slot 4 ICS, Slot 5 ICS, Exxt ICS, Bluetooth ICS) to ICS1

» Select *Mirror Audio to ICS2*. Toggle slider to activate and select DONE.

Providing for Modems to be Connected to Separate ICS Connections

The two ICS connections may be used to allow the DZMx modems or connected Bluetooth device to connect to separate ICS channels, allowing separate calls to occur on the separate respective ICS channels.

Typically, this is used where ICS1 and ICS2 are connected to different audio positions on the ICS.

Each of the modems and Bluetooth device may be allocated to either ICS1 or ICS2.

Dual Calling

The DZMx can make two calls simultaneously:

» If the two ICS connections are wired, separate calls on ICS1 and ICS2.
» If only ICS1 is wired to the audio system, two calls on the single ICS channel.

Call Priority

A modem which has been given priority will automatically mute all other calls when it makes or receives a call. When a priority call has ended, it automatically unmutes any other call. This can be particularly useful if a call on a modem is vital to vehicle aircraft operations. By default, call priority is off, however it can be enabled using the **"Call Priority"** setting for each modem in DZMx Connect. Go to *Settings* > *Audio* > *Modems*. This option can be found in the settings under the audio section. This setting is particularly useful for simultaneous calls on a single ICS channel.

Audio from the DZMx to the ICS

Audio from the DZMx is connected direct to the ICS input, and its levels adjusted using the DZMx audio menu.

Audio from the ICS to the DZMx (microphone installation)

The DZMx can be installed in aircraft systems with either high impedance or low impedance microphones. Most (but not all) civil aircraft operate high impedance (electret) microphone systems. Most (but not all) military aircraft operate low impedance microphone systems. Refer to www.flightcell.com/resources for wiring diagrams for the microphone connections.

Low Impedance Microphones

When installing the DZMx with an ICS that uses low impedance mics, the DZMx must be connected to a line level Radio/Comms port. If a line-level port is not available and the DZMx is to be connected direct to the mic line, then a tactical radio adaptor will be needed to match impedances. Options include the NAT AA34-300, Jupiter JA34-001 or PS Engineering 200-002-0002.

High Impedance Microphones

There are several options for connecting the DZMx into an audio panel/ICS with high impedance microphones. The way in which the DZMx is connected will depend on your system configuration and operational requirements.

As the Iridium satellite phone and cell phone are both full duplex, it is preferable to use the DZMx on a hot mic connection, rather than PTT (keyed). The DZMx will typically be installed in one of the following ways:

- Connecting Directly to a Headset Microphone Line
- The MIC lines are spliced to one or more headset microphone inputs on the audio panel. As these microphone inputs have mic bias provided by the audio panel, the DZMx should have mic bias disabled
- The way this is configured will depend on how many headsets are to have access to the DZMx.
  - If only the pilot is to use the DZMx, its MIC TO DZMx 1 HI/LO lines are connected only to the pilot's microphone line.
  - If both pilot and co-pilot are to use the DZMx, the MIC lines are connected to the pilot microphone line and the MIC lines are connected to the co-pilot microphone line.
  - If more than two microphones need to have access to the DZMx, an external switch is required to select the active microphone input.
- Connecting to a Cell Phone Port on the Audio Panel. The DZMx MIC line can be connected to the cell phone port on the audio panel.
- Connecting to a Spare Radio Position on the Audio Panel.
- On aircraft with separate audio control heads at each crew position, this option enables crew to use the DZMx and connected phones individually on demand. In this case it may be necessary to provide mic bias.

Configuring Microphone Bias

In some aircraft with high impedance headsets, where the mic line is connected direct to the DZMx, it is necessary to provide bias power to energise the headset microphone.

To activate mic bias power to the MIC line:

- On the DZMx Control Head, go to *MENU* > *Audio* > *ICS* > *Mic Bias*.
- On DZMx Connect., go to *Settings* > *Audio* > *ICS1 or ICS2*.

Configuring Side Tone

Side tone is normally provided by the aircraft audio panel or ICS, but in some installations may not be available. Side tone can be supplied by the DZMx if required.

This can be configured using the:

- On the DZMx Control Head, go to *MENU* > *Audio* > *ICS* > *Sidetone* .
- On DZMx Connect, go to *Settings* > *Audio* > *ICS1 or ICS2*.

Select **Off** to disable side tone, **When on Call** to enable only during a call, or **Always On** to leave active all the time.

Configuring Notification Tones

Notification tones are used to notify the crew of specific events. Notification tones can be enabled or disabled in the audio menu. Notification tones include:

- Keypad tones.
- Message queue full, which sounds when the tracking message queue is full.
- Warnings, which notify when there is an issue; in this case a popup will show the details of the issue.
- Incoming or outgoing Bluetooth call.

Configuring Ring Tones

The DZMx provides ring tones on incoming and outgoing calls.

- Some operators find the incoming tone obtrusive or distracting, and prefer to install an alternative call annunciator. The ring tone for incoming calls can be suppressed by going to *Settings* > *Audio* > *Tones* > *Incoming Ring Tone* and toggling to **Off**.
- Sip Client Ring Tone; Stops the DZMx ringtone generation if Certus G6/G6-S has its ringtone enabled

Note: A call annunciator can be configured to announce incoming calls. See *DZMx Outputs* on page 61 for details on wiring and configuring a call annunciator.

Adjusting Audio Volume

Audio levels can be adjusted on DZMx Connect or the DZMx Control head, however as there is a short lag when using DZMx Connect, it is recommended that audio levels are adjusted using the DZMx Control head.

To adjust audio volumes to the ICS (EAR):

- Set up a call to another party over the satellite or cellular link as appropriate
- Select *MENU* > *Audio* > *ICS* > *Ear*
- Use the **LEFT** and **RIGHT** keys to adjust the audio volume to the preferred level.
- Select **END** to save and return to the main screen.

To adjust audio volumes from the ICS to the DZMx (MIC):

- Set up a call to another party over the satellite or cellular link as appropriate.
- Go to *MENU* > *Audio* > *ICS* > *Mic* and use the **LEFT** and **RIGHT** keys to adjust the audio volume to the preferred level.
- Select **END** to save and return to the main screen.

Iridium Push-To-Talk (IrPTT)

Iridium PTT is a licensed feature.

To use IrPTT, it is necessary to

- Subscribe to the IrPTT service through your Iridium Service Provider

» Purchase an Iridium PTT licence from Flightcell to activate the IrPTT service.

Configuring the DZMx for IrPTT

To enable and configure your DZMx for IrPTT using DZMx Connect, go to *Settings* > *Modem* > *Internal Sat modems* and select **PTT Enable**.

If you wish to have the DZMx start up in IrPTT mode, select **Start PTT on Boot**.

Configuring the IrPTT Input

When operating in IrPTT mode, transmissions must be triggered, in one of three ways:

» Using the pilot's radio PTT switch (the preferred option).

» A dedicated remote mounted IrPTT switch

» If a PTT switch is not configured, from the DZMx keypad

Configuring the audio panel and DZMx to trigger an IrPTT transmission

If using IrPTT, the DZMx should be connected to a spare transceiver position. The PTT keyline for that transceiver position is then wired to one of the DZMx General Purpose Inputs – see *DZMx Inputs* on Page 56 for details of how to wire and configure the Input.

If a spare transceiver position is not available, then a vacant receiver position for audio can be used and a separate PTT switch should be installed to trigger IrPTT transmissions.

Note: The Call Priority setting can be useful for automatically muting a IrPTT call when making a call on another modem.

Advanced Audio Settings

DZMx Connect contains a powerful audio panel which enables audio quality from the DZMx to the aircraft audio panel/ICS to be adjusted.

Go to *Audio Manager*.

Modem Configuration

The DZMx can be configured with up to three internal modems and one external modem or satellite phone.

Cellular Modems

The following cellular modems may be installed in the DZMx:

» A 4G (LTE) modem

» A 450 MHz modem.

Different countries or geographic areas use different cellular bands, due to international and national radio frequency licensing agreements.

In Revision 4.x DZMx and later, three different modem versions are used for different geographic regions. The three modem options are:

» EMEA (Europe, Middle East, Africa)

- APAC (Asia/Pacific and South America)
- Americas and Band 14 (North America, including the US Public Safety Band, band 14).

There is considerable overlap in the bands offered by the different modem versions, so some modems can be used in more than one geographic area, with some reduction in the bands available.

When ordering the DZMx, it is essential that the version with the correct regional modem is ordered. Please contact tech@flightcell.com for more information on the appropriate modem for your operational area.

Iridium Modems

Internal modems

The following satellite modems may be installed in the DZMx:

- One or two internal Flightcell Iridium 9523 narrowband modems; this modem provides voice, tracking and short burst data services
- An Iridium 9603 modem (used for Short Burst Data only).

External Modems and Phones

One external modem or satellite phone can be connected to the DZMx via its RS232 serial port:

- A Flightcell Iridium Modem
- An Iridium handset installed in a Flightcell Iridium Phone Cradle; these may be:
  - Iridium 9505A
  - Iridium 9555
  - Iridium Extreme.

The modem and the phone handsets provide the same functions (except for Iridium PTT) as the internal Iridium modem, providing phone calling, messaging, and data. These functions are all controlled by the DZMx, so it is not necessary to use the phone keypad.

To configure the DZMx for the connected phone or modem, in DZMx Connect, go to *Settings* > *Hardware* > *External* > *Debug Port Config*, select the modem or cradle version:

- Iridium 9505A
- Iridium 9555
- Iridium Module
- Iridium Extreme

You will need to check the detailed configuration for each modem and external device in *Settings* > *Modem*.

Iridium Certus modems

If a satellite data service is required, the Guardian G6 or G6S Iridium Certus midband terminals can be installed and integrated with the DZMx. These terminals provide

- An IP data connection at 88kbps uplink and downlink

- A voice service. Configuring the DZMx for other external devices

Configuring the DZMx for other external devices

Other devices may be connected to the DZMx RS232 serial port. The DZMx needs to be configured to recognise and control the connected device.

In DZMx Connect, go to *Settings* > *Hardware* > *External* > *Debug Port Config,*

The following are currently supported:

- Rhotheta Direction Finder
- Erickson AWTC
- ETM Cycle Counter
- AFDAU (Automated Fire Data Acquisition Unit).

SIM Cards

SIM cards may be required for operation of the DZMx modems

- A SIM card is required for a DZMx cellular modem
- A SIM card is required for an internal Iridium 9523 if it is to be used for phone calling and SMS messaging
- A SIM card is required for a Flightcell Iridium modem
- A SIM card is not required for the internal Iridium 9523 modem if it is to be used only for Iridium PTT or for Iridium SBD
- A SIM card is not required for an Iridium 9603 (SBD only) modem.

The DZMx uses standard SIM cards, rather than the micro and nano versions.

A SIM card is required for the G6 or G6S terminals, but these are supplied already installed.

SIM Slot Designation

The two DZMx SIM card slots are allocated as follows:

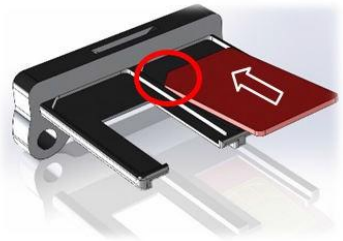
- SIM 1 is allocated to the modem (Iridium or cell) in internal slot 4.
- SIM 2 is allocated to the modem (Iridium or cell) in internal slot 5.

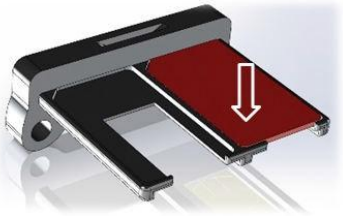
Note: Iridium and cellular SIM cards can be used in both slots depending on the unit configuration purchased.

Installing SIM cards

SIM cards are installed in the SIM card tray inserted in the back of the DZMx. To install SIM cards:

- Undo the screws securing the SIM card tray and remove the tray.
- Preferably place the tray on the edge of a hard surface such as a table or book.
- Position the SIM card with the bevelled corner (circled in drawing) forward and contacts downward, then slide the front edge into the recess in the front of the tray.
- Tilt the card downward until it clicks into the groove in the tray.
- Insert the tray into the slot on the back of the DZMx and secure in place with the two cap screws.





Note: Ensure that the SIM cards are in the correct slots, as they may be permanently damaged if incorrectly installed.

Iridium SIM cards supplied with your DZMx

If selected by the customer at time of order, the DZMx with Iridium modems can be shipped with an unregistered Iridium SIM. This must be registered to your Iridium Service Provider's account (ISP) when you are ready to activate your Iridium service.

To transfer the SIM card to your ISP, please contact Flightcell International at tech@flightcell.com advising the serial number of your DZMx and the name of your ISP.

Configuring Modems

The DZMx is configured prior to shipment with default settings for the installed modems. However, you may need to check and modify these settings. This is done in DZMx Connect. Go to *Settings* > *Modems*.

Configure which modems are used to transmit tracking data

By default, tracking messages are enabled for all modems. If more than one Iridium device or more than one cell modem is installed, only one of each should be activated for tracking.

If the internal Iridium 9523 modem is used for Iridium PTT, then the other Iridium modem (9523 or 9603) or external Iridium device should be configured for tracking.

Configure Iridium or cellular voice calling capability

By default, voice calling is enabled for all modems, except for the Iridium 9603 modem, which is used for SBD messaging only, and the 450 MHz cellular modem, which is for data only.

Configure Iridium SBD Transmission

If your Iridium modem has been provisioned to send SBD messages to your chosen tracking provider, then ensure SBD transmission is enabled for your Iridium device. If you do not wish your device to send SBD messages, then disable SBD transmission.

Configure the Iridium Service Centre

Most Iridium accounts use the standard Iridium Service Centre for handling SMS messages. However, some Iridium Service Providers use different SSNs (e.g. Telstra and Pivotel in Australian; DISA for US military).

If **(No SMS)** is displayed next to the Iridium modem's status message on the DZMx display, the service centre number is incorrectly set. The service centre number can be selected:

- Use DZMx Connect. Go to *Settings* > *Modem* > *Modem 1* > *Service Centre Number* and select the correct option
- Use the DZMx control head. Go to *MENU* > *Hardware Config* > *Modem Config* > *Iridium Modem 1* > *Service Centre Number* and select the correct option.

Configure the cellular APN

It is necessary to set the APN (Access Point Name) for the cellular modems to allow the modem to use cellular data services. You will need to determine the APN for your cellular provider; this can normally be obtained from their website. This is often (but not always) **Internet**.

Enable or disable data

Use this setting to enable or disable data services for the selected modem.

Data Roaming

If a cell modem is operated outside its home country, it is usually necessary to activate data roaming to allow use of local cellular services.

Disabling Cell Modems

In some cases, it may be a requirement to disable cell modems in flight for operational or regulatory reasons.

The DZMx may be configured so that:

- Cell modems are always enabled.
- Cell modems can be disabled via softkey – the modem can be disabled manually on the DZMx, using a long press on the A or B softkey allocated to that modem.
- Cell modems are automatically disabled when the aircraft is in flight.

When a cell modem is disabled, all transmit and receive functions are completely disabled.

These settings can be changed using DZMx Connect. Go to *Settings* > *Modem* > *Cell modems*.

Note: When set to automatically disable in flight, the manual disable/enable key can override the automatic option until the next take-off or landing.

Configuring the cellular bands used by the DZMx cellular modem

The cellular modems installed in the DZMx can access 4G (LTE) and if available, 3G and 2G (GSM) services on the cell networks. For each of these services, there will usually be several cellular frequency bands.

3G and 2G services are being retired on cell networks around the world, but the timing of this varies by country and network.

The cell modem will switch automatically between services and bands, under the control of the network. This may result in the modem operating on a service and band which does not provide the best available performance, e.g. the modem may be operating on 3G even though a faster service is available on 4G.

The cellular bands used by the DZMx can be configured to improve its performance. On DZMx Revisions 5.0 or later, the cell modems can be locked into 4G using the DZMx Advanced Band Select settings.

To lock to specific services and bands,

- Go to *Settings* > *Preferences* > *Regional* > *Cell Modem Region* and select *Advanced Band Select*
- Go to *Settings* > *Preferences* > *Advanced Band Select* and select the preferred band(s).
- The following table shows the cellular bands and frequencies for the different regional variants in the DZMx Revision 5 and later.

Region	LTE (4G)	UMTS (3G)	GSM (2G)
APAC (Asia Pacific/ South America)	B1 (2100) B3 (1800) B5 (850) B7 (2600) B8 (900) B28 (700)	B1 (2100) B5 (850) B8 (900)	 900 1800
EMEA (Europe, Middle East and Africa)	B1 (2100) B3 (1800) B7 (2600) B8 (900) B20 (800) B28 (700)	B1 (2100) B8 (900)	 900 1800
Europe 450MHz	B3 (1800) B7 (2600) B20 (800) B31 (450)	B1 (2100) B8 (900)	900 1800
Americas with Band 14	B2 (1900) B4 (1700) B5 (850) B12 (700) B13 (700) B14 (700) B17 (700) B66 (1700)	B2 (1900) B4 (1700) B5 (850)	-

The following guidelines can be considered when using advance band select:

- Only use Advanced Band Select on Revision 5 DZMx or later
- Lower frequency cellular bands (in the range 700 to 850 MHz) will generally give better service than higher frequency bands.

Backlighting

The DZMx and DZMx Remote Head have a backlit keypad and LCD display.

The display and keypad backlighting can be adjusted independently.

Display and keypad lighting can be controlled:

- Manually from the DZMx keypad
- From the cockpit dimmer control. Where one or more remote heads are installed, the control head and remote head may be controlled independently, or the inputs may be coupled together for control by a single dimmer control.

NVIS Backlighting Options

The DZMx and remote head are available in either NVIS-B compatible or NVIS-A versions. Most DZMx installations will be NVIS-B; the NVIS-A versions are only required by some military organisations (mainly in the USA).

The NVIS-A versions use NVIS-A LEDs in the display for night operation only, using NVIS-B LEDs during day operation, and use NVIS-A LEDs in the keypad.

Manual Backlight Control from the DZMx keypad

- The operator can access the lighting settings from the '**Head Menu'** by pressing the * key for 2 seconds then releasing.
- Select the backlight mode (**Day** or **Night**) by highlighting **Backlight Mode** and using the **LEFT**◀ or **RIGHT** ▶ keys
- Scroll down to **Display Brightness** and use the **LEFT** ◀ or **RIGHT** ▶ keys to change the brightness level
- Scroll to **Keypad Brightness** and use the **LEFT** ◀ or **RIGHT** ▶ keys to change the brightness level
- Changes are stored and take effect immediately.
- To exit the Head Menu press the **BACK** or the **END** keys.

External Backlight Control from a Dimmer

Wiring the external dimmer control

An external dimmer control is connected

- On the DZMx: To General Purpose Input 5 (military D38999 pin 52 or civilian DB25 pin 15) on the DZMx.
- On a remote head: Direct to the dimmer control input (pin 10).

To Test External Lighting Input

First, ensure the dimmer lighting control input is working correctly as follows:

- Enter the '**Head Menu'** by pressing the * key for 2 seconds.
- Select ***Advanced*** > ***Head Diagnostics***

- Adjust the dimmer control through its full range and observe the **'Input**:' value changing, it should swing between approximately 0 and 3200 for a nominal input range of 0 to 28 volts, however a smaller range may be used

External Lighting Control Modes

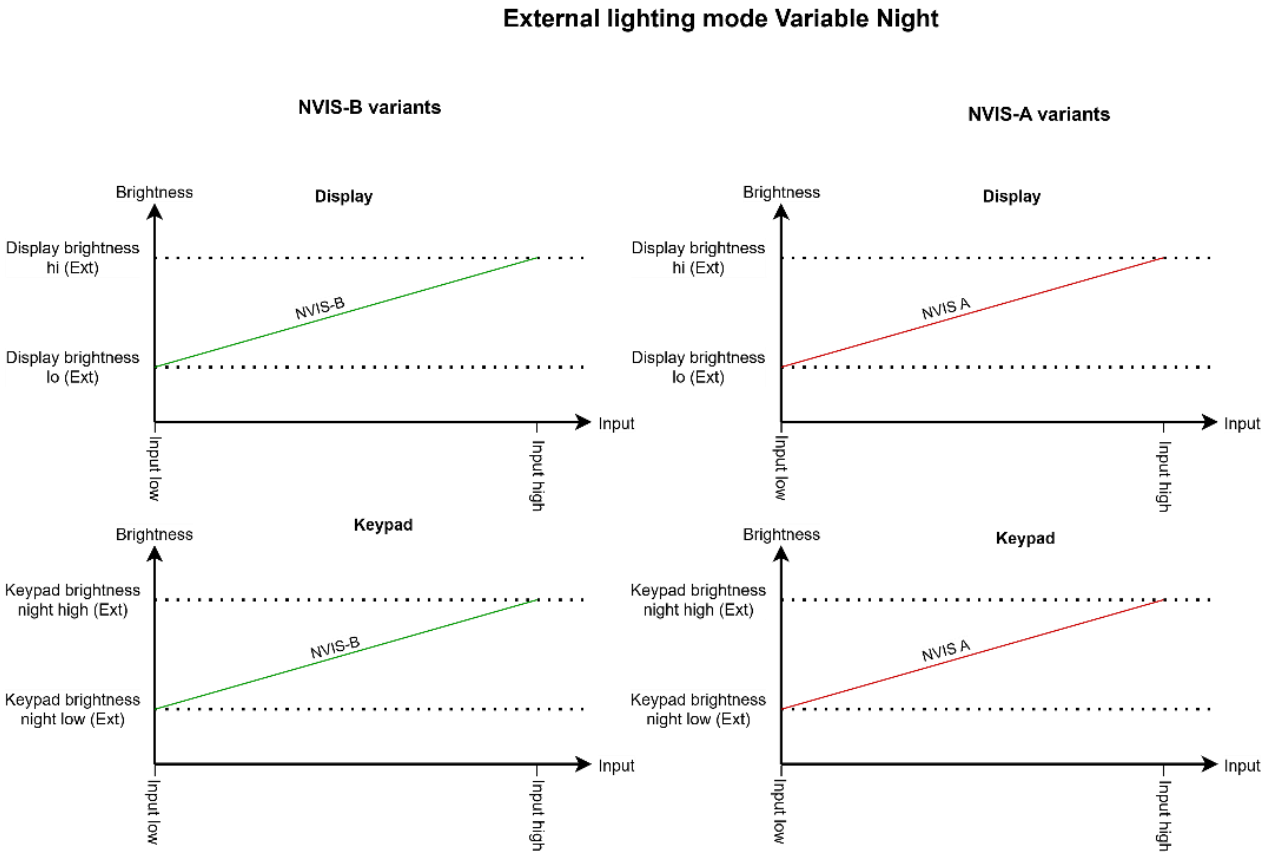
There are a range of ways an external dimmer control can operate. The DZMx has several modes designed to provide for the different options.

- External lighting mode **Day-Night**
  - **Variable Night** – backlighting is calibrated for night only
  - **Variable Night/Fixed Day** – backlighting varies during night but switches to fixed level during the day, when the dimmer control is rotated below a detent.
- External lighting mode **Night-Day** – **Variable Night and Variable Day**, transitioning at a designated input threshold.

Configuring External Lighting modes

Configure 'Variable Night' Settings

- Enter the **'Head Menu'** by pressing the ✱ key for 2 seconds.
- Set Backlight Mode to **<Ext >**
- Set **Ext B'light** Mode to **<Day-Night >** using the **LEFT** ◀ or **RIGHT** ▶ arrow keys.
- Select **External Lighting Config** press **ENTER**.
- Select **Ext Lighting Night Low** press **ENTER**.
- Set the dimmer control to its minimum.
- Adjust the following settings:
  - Set **Display brightness lo** to desired brightness.
  - Set **Keypad brightness lo** to desired brightness.
  - Select the **Input calib. (hit Enter) <value >** row and press the **ENTER** key to sample the input. Note, this value may be overridden by using the **LEFT** ◀ and **RIGHT** ▶ keys to adjust.
  - Exit the menu one level by pressing the **BACK** key.
- Repeat steps 5 to 7 above for **Ext Lighting Night High,** setting the dimmer control to its maximum.



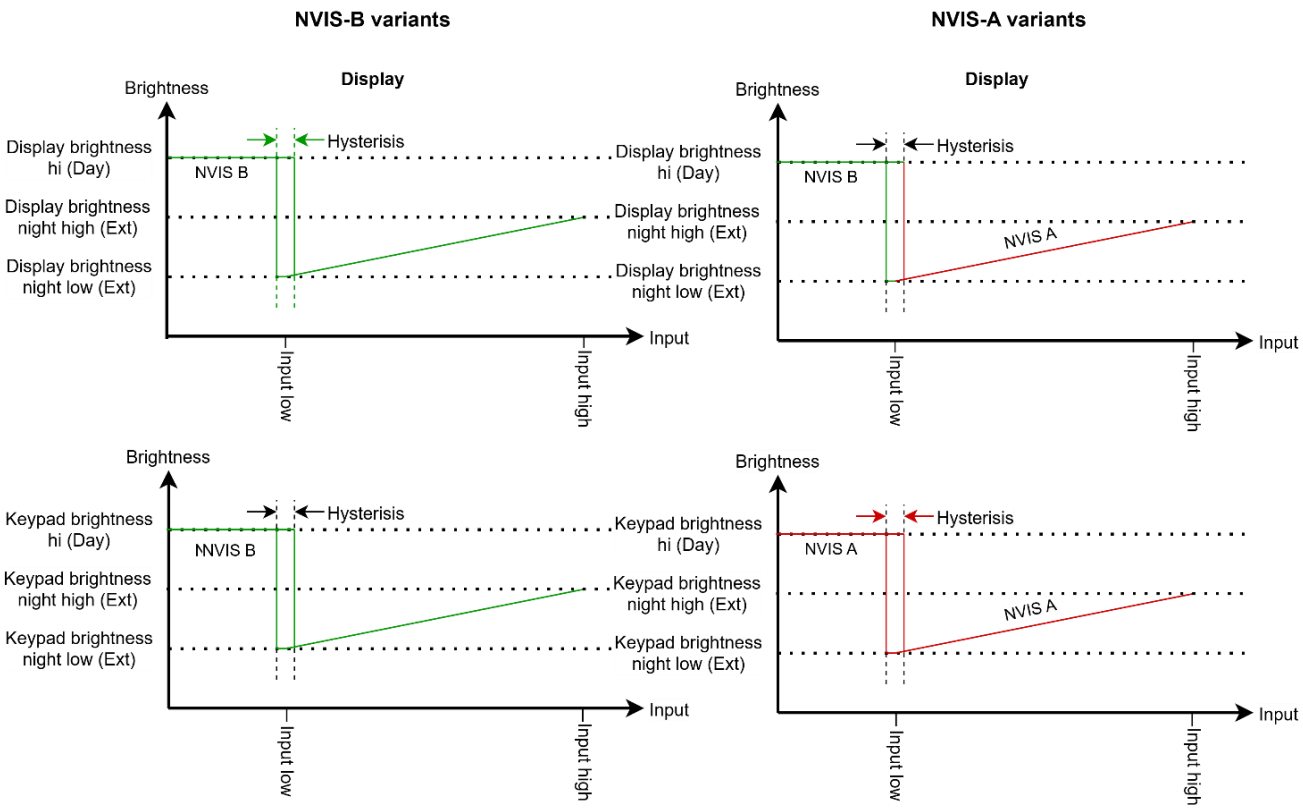
Configure 'Variable Night / Fixed Day' Settings

Follow the steps as per **Variable Night** mode, but in step 6 above set the dimmer control to the detent position.

In this configuration the backlighting will now switch to the **'Day'** brightness settings once the input is below the detent.

Note: A hysteresis band is used to prevent the accidental switching into day mode, or flickering between modes, the size of which can be adjusted using the **Ext Lighting Hysteresis** setting, see **Input Filtering** section below.

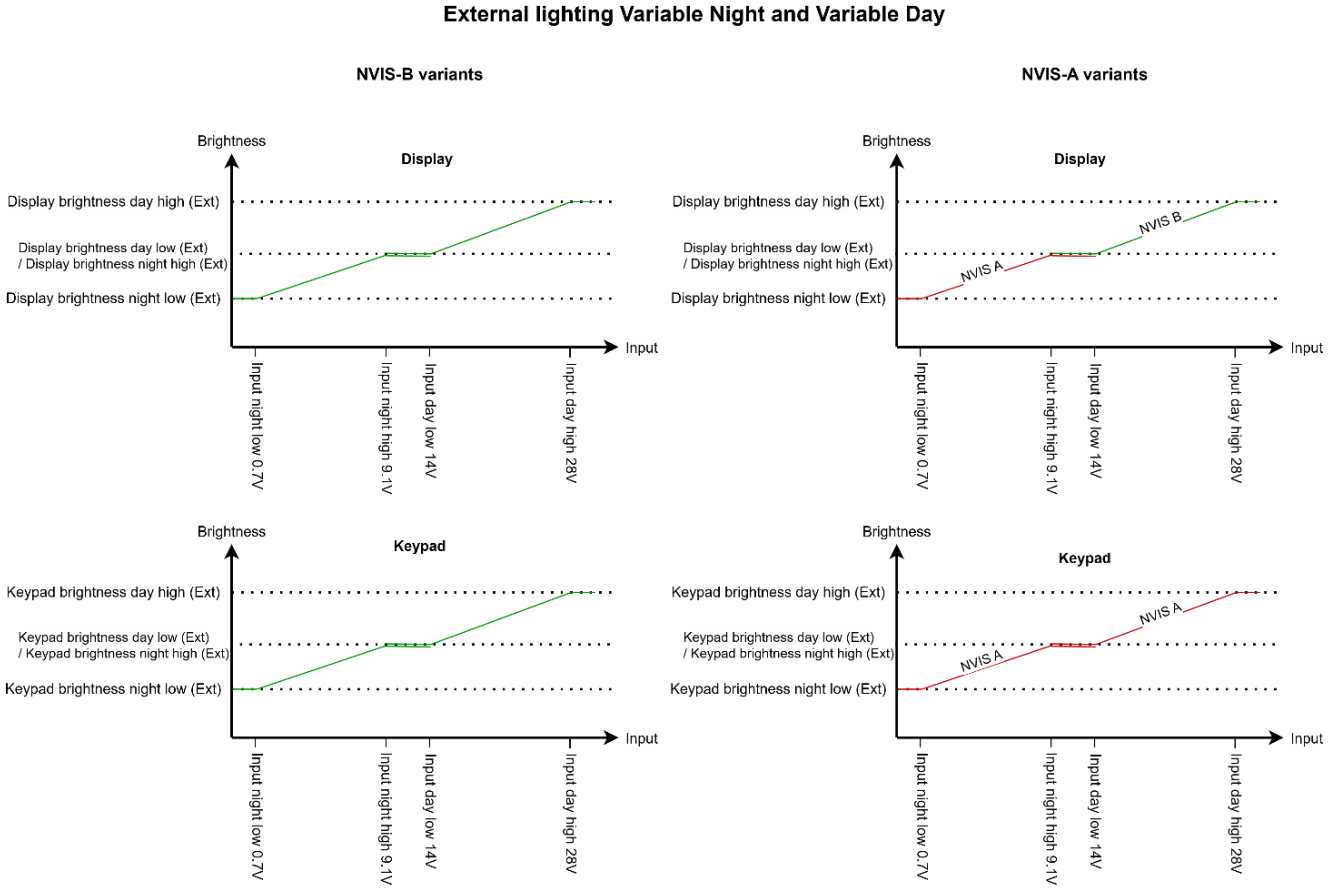
External lighting mode Variable Night - Fixed Day



Configure 'Variable Night and Variable Day' Settings

- Enter the **Head Menu** by pressing the ✱ key for 2 seconds.
- Set **Backlight** mode to <**Ext** > .
- Set **Ext B'light Mode** to <**Night-Day** > using the **LEFT** ◀ or **RIGHT** ▶ arrow keys.
- Follow steps 5 to 7 as per **Configure variable night mode** above, setting the dimmer control and night brightness as desired for the 'night' range.
- Repeat the steps 5 to 7 above for configuring **Ext Lighting Day Low/High'** settings as desired for the 'day' range.

Note: The voltage values in the diagram below are examples only. The actual values when the head backlighting is calibrated may differ.



External Brightness Control Settings Rules

The external dimmer control can only drive with a 'positive slope' i.e. the 'high' values must be greater than the 'low' values, as follows:

- Display/Keypad Brightness High values must be greater than Display/Keypad Brightness low values respectively.
- **Input calib** value for **Night High** must be greater than **Night Low**.
- If Ext B'light Mode is set to Night-Day then:
  - **Input calib** value for **Day High** must be greater than **Day Low**
  - **Input calib** value for **Day Low** must be greater than **Night High**

However, when in **Variable night** and **Variable day** mode the day brightness levels may be set to the same or lower than the night values if desired.

Input Filtering

The **Ext Lighting Hysteresis** setting is in units of ADC counts as per the input value, and it is used to filter out small changes on the input to avoiding 'flickering'.

It is also used in the **Ext B'light Mode** = **Day-Night** mode to help prevent accidental switching into **Day** mode, as illustrated in the diagram.

Note: Making the hysteresis value too large will cause a 'dead spot' in the control, which will be particularly noticeable in a configuration with a small input swing.

Night / Day Switching Margins

To avoid potentially hazardous mode switching e.g. from night today due to drift on the input, a switching margin/offset may be added during configuration by overriding the dimmer **Input calib** values by using the **LEFT** ◀ and **RIGHT** ▶ keys.

Tuning these values should be done in association with the **Ext Lighting Hysteresis** value.

Note: It is recommended that the lighting control input should vary between 0V and 28V between minimum and maximum lighting respectively.

DZMx Data

The DZMx can provide a connection to the internet over a cellular data connection or over a connected Certus modem (such as the Guardian G6 or G6S). Connected devices such as a mission computer, laptop, phone or tablet, or medical device can connect to the DZMx via its Ethernet port or Wi-Fi connection.

The DZMx data connections and services are configured in DZMx Connect in *Settings* > *Network*. Alternatively they can be configured on the DZMx control head in *MENU* > *Hardware Config* > *Wireless and Networks*.

Note: Menus for DZMx data settings have been changed in DZMx firmware 3.8.1/4.8.1. Network settings have been brought together in *Settings* > *Network*.

Advanced data routing functions

Advanced routing capabilities have been introduced on the DZMx from firmware 4.11 to provide improved data services where the DZMx has more than one data-capable modem installed, for example if the DZMx has more than one cell modem installed, and/or an Iridium Certus modem.

Configuration of advanced routing functions is described *Appendix 2: Advanced routing* functions, on Page 87.

Ethernet Configuration

The DZMx has one standard Ethernet port. A second Ethernet port is available as an option.

DZMx Ethernet can be configured to suit the network configuration on the aircraft.

Note: It is recommended to configure Ethernet settings on the DZMx control panel if the DZMx does not have Wi-Fi.

The DZMx can be set as a DHCP server, a DHCP client, or allocated a fixed IP address.

- DHCP server is the default mode. This is used where another device connects over Ethernet direct to the DZMx.
- DHCP client mode may be used where the DZMx is connected to a switch or router which operates as the DHCP server. The DZMx will be allocated an IP address by the connected switch or router.
- A static IP address may be required in some network configurations.

These options can be selected using DZMx Connect or on the DZMx control head.

To determine the IP address the DZMx is using, go to *MENU > Diagnostics Menu > About DZMx*.

Note: The DZMx IP address will only be shown in the diagnostics page if the DZMx is connected to an Ethernet connection.

DHCP Server Mode Configuration

The DZMx operates as an internet router while in DHCP Server mode. The default IP address for the DZMx is 192.168.4.1.

When a device is connected to the DZMx Ethernet connection, the DZMx DHCP server will allocate the connected device an IP address in the range 192.168.4.xxx.

Note: When using this mode, ensure that there are no other devices on the network configured as a DHCP server.

DHCP Client IP Mode

In this mode, NAT interface can be activated if required.

Static IP Address Configuration

The DZMx is able to configure its Ethernet connections with a host IP address, gateway IP address, and DNS server.

Host IP address

The host IP address is the IP address of the DZMx.

Default Gateway Configuration

The default gateway is the IP address of the network node that serves as an access point to the rest of the network. Leave blank if the DZMx is providing the data connection to external devices on the network.

DNS Configuration

Optionally, the DNS server settings can be configured to set up to two separate DNS servers (primary and secondary).

Summary of DZMx Ethernet configuration options

DHCP Server	DHCP Client	Static IP Address
	NAT Interface Mode	Host IP Address Host Subnet Mask Gateway IP Address DNS Primary Server DNS Secondary Server NAT Interface Mode

Configuring the Secondary Ethernet Connection

The secondary Ethernet can be configured in the same way as the primary Ethernet.

Note: Configuration options for the secondary ethernet connection will only be available if the second ethernet circuit card is installed in the DZMx.

Controlling IP packet forwarding

The DZMx provides a mechanism to enable/disable IP forwarding between Wi-Fi and Ethernet, to allow wired networks to be isolated from the wireless network.

This is configured by going to *Settings* > *Network* > *Firewall*.

When enabled, data can be forwarded between the DZMx Ethernet and Wi-Fi networks. When disabled, wired and Wi-Fi networks connected over the DZMx cellular data connection are separated.

Configuring Cellular Data

Cellular data can be enabled or disable in DZMx Connect by going to *Settings* > *Modems*.

If the DZMx has one cell modem, this will be designated Modem 2. If dual cell modems are installed, these will be Modem 1 and Modem 2.

Data roaming can be enabled

- Toggle *Enable Data* to on to allow cellular data to be used.
- Set *Data Roaming* if you need to allow cellular data to be used outside the area coverage of your cellular account.

Set the Access Point Name (APN).

The APN setting must be configured to establish a data connection. The Access Point Name (APN) is the name your cellular modem uses to set up a connection to the gateway between your carrier's cellular network and the public Internet. The APN you need to specify will depend on the cellular network service provider. The APN is often published on the service provider's web site.

This setting is easier to enter via DZMx Connect, where you can type or paste in the APN. It can also be entered using the DZMx remote head.

DZMx Wi-Fi

The DZMx has Wi-Fi capability installed as a standard feature (designated by a W at the end of the product's part and dash number e.g.: DZP_04-xxxW in Revision 3.0, DZP_04-xxx-xxW in Revision 4.0 or later).

DZMx Wi-Fi allows the DZMx to act as an access point to connected devices, enabling the DZMx to be used to route DZMx data connections to connected devices, including:

- PCs.
- Tablets.
- Smartphones.
- Medical devices.
- Other specialised devices.

Starting Wi-Fi

It is possible to toggle Wi-Fi on and off from the front panel using a long press on the **MODE** key.

When Wi-Fi is enabled, a wireless icon will appear at the top right of the screen on the front panel.

Disabling Wi-Fi

Wi-Fi can be disabled on the DZMx if it is not required. Go to *MENU* > *Hardware Config* > *Wireless and Networks* > *Wireless Enable*, or in DZMx Connect *Connectivity* > *Wi-Fi* .

If it is necessary to disable Wi-Fi so it cannot be overridden by the flight crew, the **MODE** key function can be disabled using DZMx Connect**.**

- Go to *Settings* > *Preferences* > *Main Screen Options* > *Mode Button Function*.
- Select required option (*Disabled, Toggle Wi-Fi, Toggle Bluetooth, Toggle BT and Wi-Fi*).

If it is necessary to disable Wi-Fi so it cannot be overridden by the flight crew, the ***MODE*** key function can be disabled using DZMx Connect**.**

- Go to *Settings* > *Preferences* > *Main Screen Options* > *Mode Button Function*.
- Select required option (*Disabled, Toggle Wi-Fi, Toggle Bluetooth, Toggle BT and Wi-Fi*).

Wi-Fi Settings

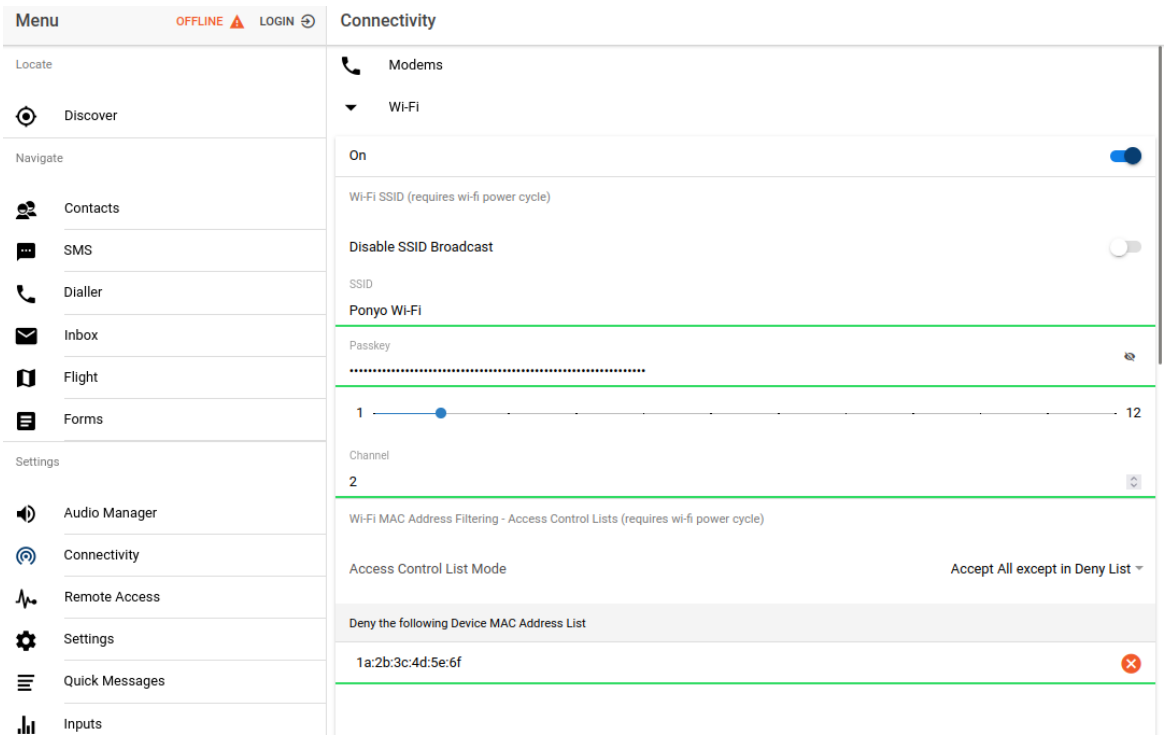
The default Wi-Fi settings are:

- SSID *DZMx Wi-Fi*
- Passcode *flightcell*

Note: It is strongly recommended the SSID and Passkey be changed to unique values for each DZMx installation (aircraft).

Note: The Wi-Fi security settings in the DZMx have been upgraded from firmware 4.11.0

Wi-Fi settings can be configured using DZMx Connect. Go to *Connectivity* > *Wi-Fi*.



The wireless security settings can be modified in DZMx Connect on the *Connectivity* page. :

SSID

The DZMx will normally broadcast the SSID to facilitate connection to the DZMx Wi-Fi.

If required, SSID Broadcast can be disabled to prevent unauthorised persons seeing the DZMx Wi-Fi. Only devices that have previously logged into the DZMx Wi-Fi and have the current SSID and passkey will connect automatically.

Passkey

When the passkey is changed, the DZMx will require the new passkey include one or more of each of the following: Upper case letter; lower case letter; number; special character.

Once the passkey has been changed and Wi-Fi settings updated, the passkey is no longer human-readable and will be represented by a string of characters, in order to prevent copying of the passkey.

Advanced security via access control

The DZMx can implement enhanced security by limiting the specific devices which can access its Wi-Fi.

A MAC address is a unique identifier for an electronic device such as a smartphone, tablet or PC.

MAC address filtering is available to allow only specified MAC addresses into the Wi-Fi network or deny specific MAC addresses from connecting to the Wi-Fi network. This is handled by the Access Control List.

To allow only specific devices to connect to DZMx Wi-Fi:

» In *Access Control List Mode*, select *Deny All Except in Accept List*

- If a connected device is shown in *Currently Connected to Wi-Fi Device MAC Address*, click on + to add to the Accepted list
- Otherwise, the MAC address for the device can be entered manually.

Once any devices are added to this list, only those devices will be able to connect to the DZMx Wi-Fi.

To remove devices from the list, click on the X next to the MAC address.

To deny specific devices access to DZMx Wi-Fi,

- In Access Control List Mode, select *Accept All Except in Deny List*
- If a connected device is shown in *Currently Connected to Wi-Fi Device MAC Address*, click on + to add to the Denied list
- Otherwise, the MAC address for the device can be entered manually.

Once any devices are added to this list, those specific devices will not be able to connect to the DZMx Wi-Fi.

To remove devices from the list, click on the X next to the MAC address.

DZMx Bluetooth™

DZMx Bluetooth is a built-in option that works with any DZMx that has a DZP_04-xxxW or DZP_04-xxx-xxW part and dash number.

DZMx Bluetooth is a licensed application; purchase of a Wi-Fi or Bluetooth licence is required to activate Bluetooth on the DZMx.

DZMx Bluetooth provides the ability to pair a mobile device, such as mobile phone or tablet, to the aircraft ICS/headset. This is like the hands-free operation in a motor vehicle.

Functionality includes:

- Making and receiving calls on a mobile device and talk via the ICS and headset.
- Listening to streaming media on a headset from a mobile device.

If Bluetooth menu options are not available, this functionality will need to be purchased and then activated with a software key supplied by Flightcell International Ltd.

Note: Cellphone and Bluetooth technologies are regularly changing. Autoconnection and maintenance of a reliable connection between cellphones and the DZMx via Bluetooth cannot be guaranteed.
A cellphone connected via Bluetooth to the DZMx should not be used for mission critical communication. Call forwarding to the DZMx cellular number is advised.

Enabling Bluetooth

Once Bluetooth is enabled, it is possible to toggle it on and off from the front panel using a long press on the **MODE** key.

When Bluetooth is enabled, the Bluetooth icon will appear at the top right of the screen on the front panel.

Bluetooth can be disabled in the DZMx Control Head menu: Go to *MENU* > *Hardware Config* > *Wireless and Networks* > *Bluetooth Enable*.

Pairing

- Check that the Bluetooth icon is showing on the DZMx display.
- Make the DZMx Bluetooth discoverable using the:
  - DZMx Connect. Go to *Connectivity* > *Bluetooth*. Ensure Bluetooth is toggled **On**.
  - DZMx Control Head. Go to *MENU*. > *Hardware Config* > *Wireless and Networks* > *Bluetooth Discoverable*.
- Enable Bluetooth on the mobile device settings and select the 'DZMx Bluetooth' device.
- A pairing notification message with a confirmation code will appear on the DZMx Control Head and the mobile device. Ensure they are the same number.
- Press the **ENTER** key on the DZMx Control Head, then select **Pair** on the mobile device.

Connecting paired Bluetooth devices

The DZMx may be configured to require devices to be connected manually each time, or to automatically connect the last connected device.

- Use DZMx Connect. Go to *Connectivity* > *Bluetooth***.** Toggle Discoverable **ON** and Auto connect **ON.**
- Use the DZMx keypad. Go to *MENU* > *Hardware Config* > *Wireless and Networks* > *Bluetooth Autoconnect*.

Note: The auto-connect functionality may vary depending on the mobile device and the level of support provided by the operating systems.

A high degree of variability is present across all Android devices. They may need to be connected manually

Hands Free Calling

The DZMx supports a Bluetooth audio hands free profile called HFP. If a Bluetooth device is connected in this mode and pairing has been successful, the DZMx will display a mobile phone icon in the top left corner of its display (see 'Pairing' above). If a user receives or initiates a call on the paired mobile device, the audio will be routed to/from the ICS/Headset.

Media Streaming

The DZMx supports a Bluetooth Audio Streaming Protocol (A2DP). If a Bluetooth device is connected and pairing has been successful, the DZMx will display a musical icon in the top left corner of its display (see 'Pairing' above). When the user starts audio playing on the connected mobile device it will be audible through the ICS/Headset.

IMPORTANT NOTE RELATING TO DZMx BLUETOOTH MODEM: To comply with FCC requirements, the BT800 must not be co-located or operating in conjunction with any other antenna or transmitter.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1. Reorient or relocate the receiving antenna.

2. Increase the separation between the equipment and receiver.

3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

4. Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

DZMx Messaging

The DZMx can send and receive text messages (SMS) over its satellite and cellular connections.

Messages can be composed and sent from DZMx Connect.

The DZMx also has a Quick Message Library containing up to 50 pre-defined messages. These can be sent to a cellphone or satellite phone or attached to a position report (*see Configuring Manual Position Reports* on Page 54).

Editing the Quick Message library

Quick Messages can be added, deleted or edited in DZMx Connect in *Quick Messages*.

Adding a position to Quick Messages

The DZMx can be configured to include the aircraft position when a quick message is sent. The received message will show the position and a small preview, and the position can be opened on Google Maps.

To provide for attachment of a position, go to *Settings* > *Tracking* > *General* and turn on *Include Position in Quick Msg*.

DZMx Tracking

The DZMx has an embedded GPS, which provides precise information on the current state of the aircraft.

This information can be sent to a tracking provider to enable the aircraft to be monitored and its movements tracked.

The DZMx tracking system provides information on:

- Position, altitude, heading and speed
- Flight state - on ground, hovering, flying, unknown

To use the DZMx tracking capability, it is necessary to enter a contract with a tracking service to receive, process and display tracking information. The DZMx must then be configured to work with that tracking service.

Position reports are sent at intervals. The DZMx cannot provide continuous tracking due to the constraints of the networks used but can transmit position reports with an event code attached at regular pre-programmed intervals.

As well as periodic position reports, the DZMx can be configured to automatically send event reports – these are position reports with an event code attached.

Note: If a cellular only unit is installed, an appropriate GPS antenna is required for Tracking. (Flightcell ANP_00043 antenna is an Iridium/GPS TSO'd antenna)

Note: Most of the menu settings will not be visible unless the user has unlocked the Installer Menu

Changing Tracking Modes

Tracking settings can be configured using either the DZMx tracking menu or by using DZMx Connect.

Tracking can be disabled (until re-enabled) or suspended (for the current flight only).

To suspend or disable tracking, using the DZMx Control Head go to *MENU* > *Tracking* > *Tracking Mode* or on DZMx Connect go to *Settings* > *Tracking* > *General* > *Tracking mode* and select one of the following options:

- **On**: Turns tracking on until it is disabled or suspended.
- **Suspend**: Suspends tracking until the DZMx is next powered on
- **Off**: Turns tracking off until it is manually enabled

Locking the Tracking Menu

By default, some tracking settings are unlocked and can be altered by the crew to change the main tracking timers.

To lock the tracking menu so the crew cannot change these settings:

- On the DZMx Control head go to *MENU* > *Tracking Lock* > *Tracking Menu*
- On DZMx Connect, go to *Settings* > *Tracking* > *General*.

  The Tracking Menu will be hidden from view when the DZMx is next restarted.

Top Line Display Options

Operating and trip information is displayed on the top line of the DZMx screen and can be varied to meet your needs. The current available options for the display line are:

- **Off**: no information shown
- **Speed and Heading**: the aircraft's speed and heading are shown in knots and degrees relative to true north (rather than magnetic north)
- **Clock**: the current time and date is shown in UTC (not local) time
- **TTAF**: Total Time Airframe
- **DFT**: Daily Flight Time
- **Trip**: Current trip time.

To set the top line display using the:

- DZMx keypad. Go to *MENU* > *Display Setup Menu* > *Top Line Options* or
- DZMx Connect. Go to *Settings* > *Preferences* > *Top Line Options*.

Tracking Providers

Flightcell does not provide a tracking service but works with tracking service providers who support DZMx data. Contact Flightcell for information on available tracking service providers or refer to the list of providers on the Flightcell website (http://www.flightcell.com/tracking/tracking-providers).

If you have a preferred tracking provider who is not currently supported by Flightcell, please contact us at info@flightcell.com. We are always prepared to support additional providers.

Setting up the Tracking Service Provider

Before your tracking service provider can configure your tracking account, you may need to provide them with the following information:

- **DZMx Serial Number:** Used to identify your aircraft when data is sent to a tracking provider. You can find your serial number in one of three places:
  - On the DZMx packaging
  - On the serial number label on the back plate of the DZMx.
- By using the DZMx keypad. Go to *MENU* > *Diagnostics Menu* > *About DZMx*. The serial number will be displayed. Press **END** to return to the main screen.
  - **International Mobile Equipment Identity (IMEI):** This is a unique 16-digit number which is located on the backplate label of the DZMx or under the battery of the (optional) Iridium External Device.
  - This can also be found by using the DZMx keypad. Go to *MENU* > *Diagnostics Menu* > *Sat Device Details*. The IMEI number will be displayed.
- **SIM Card:** The DZMx will usually be delivered with an unlocked, inactivated Iridium SIM Card installed. To activate an account on this SIM card, contact Flightcell and advise the name of your Iridium Service Provider. The contract of this SIM card can then be transferred to your ISP, who will activate an account for this SIM Card.
- **Iridium Phone Number** if you have an Iridium SIM card installed.

- **Cellular Phone Number** if you have a cell modem installed.

TrackingTransmission

The DZMx can send position reports over:

- The cellular network: Using an IP data connection.
- The Iridium network: Using the Short Burst Data service (SBD) or SMS.

If you wish to enable a particular modem for tracking, ensure the "**Use for Tracking"** modem setting is enabled and additionally, the "**SBD Enable**" modem setting is enabled for any Iridium modems.

Preferred Transmission Mode

The DZMx can prioritise the available networks used for sending tracking messages. This is particularly useful to allow you to prioritise the cheapest transmission method, enabling least cost tracking while allowing the DZMx to fall back to the alternate network if there is no coverage on the preferred network.

DZMx also allows tracking messages to be sent from modem while the other is in use for calls/data.

To set the preferred transmission mode:

- Using DZMx Connect. Go to *Settings* > *Tracking* > *Transmission* > *Preferred Device*
- Using the DZMx keypad. Go to *MENU* > *Tracking* > *Transmission Options* > *Preferred Device*.

Device Settings have two main tracking options

Satellite i.e. SBD/SMS messages

IP i.e data packets using Certus or cellular data connection

- Select one from the list below.
  - **Sat SBD/SMS First:** Will try any satellite SBD/SMS device before any IP device (Cell or Certus)
  - **Certus/Cell IP First**: Will try any IP device (Cell or Certus) before any satellite SBD/SMS device.
  - **Sat SBD/SMS Only:** No Certus or cellular IP devices will be used.
  - **Certus/Cell IP Only:** No satellite SBD/SMS devices will be used.

Note: During a satellite call, SBD will be unavailable. To ensure tracking is not interrupted, the satellite modem will default to Iridium SMS for tracking, until the call has ended.

Configuring DZMx Tracking Destinations

Once the Tracking Service Provider has your account set up, the DZMx can be configured to send tracking messages to your selected providers. The destination gateways for Iridium and cellular networks need to be configured for each tracking service, they will provide you with the destination addresses. The following tracking gateways can be used with the DZMx:

- **Iridium SBD**: Destination addresses are configured by your tracking service provider on the Iridium service SPNet.
- **Iridium SMS:** Configure in DZMx Connect. Go to *Settings* > *Tracking* > *Transmission* and enter the destination number.
- **Cellular Tracking over IP**: Enter the IP address and port number in DZMx Connect. Go to *Settings* > *Tracking* > *Transmission* and enter the provided details.

Note: If a method of transmission is not supported by your tracking provider, leave the destination address for that transmission method blank.

Configuring Tracking over IP using Cellular Data

If supported by your tracking provider, the DZMx can be configured to send tracking messages via the cellular data connection to an IP address when a data connection is available.

- Configure the following settings in DZMx Connect: Go to *Settings* > *Modem*.
  - **Access Point Name (APN)** for your cellular network**:** this can be obtained from your cellular service provider or from their website. The normal default APN is **Internet**
  - **Enable Data:** This setting must be set to **On**. There must be a data connection active to send tracking messages to an IP port.
- Configure in DZMx Connect. Go to *Settings* > *Tracking* > *Transmission*.
  - **IP address:** Your tracking provider will advise you what IP address setting to use. An example is: 123.123.5.6
  - **IP port:** Your tracking provider will advise you what IP port number to use. An example is: 12021.
  - **IP Timeout Profile:** There are three possible settings; **Short, Medium** (default) and **Long**. The IP timeout configures the delay used to wait on the connection to the IP gateway from the tracking provider when attempting to send the messages. The shorter the delay, the faster the tracking system will fall back onto another network service to send tracking messages if transmission over IP fails. Setting this to Long will make the system more resilient when the connection is poor, and maximise the use of tracking over IP, but messages could take longer to send.

Configuring Periodic Events

The DZMx can be configured to send position reports at designated intervals, which depend on aircraft activity. The following events or timers can be configured individually:

- **Periodic Timer:** The time, in minutes, between sending automated position reports while in flight (15 seconds for HD tracking).
- **On Ground Timer:** The time, in minutes, between sending automated position reports while on the ground (not in flight).
- **Taxiing Timer:** The time, in minutes, between sending automated position reports while taxiing.
- **Hover Timer:** The time, in minutes, between sending automated position reports while hovering. Hover events will replace the periodic events when they are due to be sent.

Hovering can only be reported for a helicopter which has a collective or weight on wheels switch to detect take-off and landing. The hover timer cannot be enabled if using speed only.

- **Heading Timer:** The minimum time, in minutes, between position reports when the aircraft is changing heading.

To Change the Interval for the Selected Timer:

Using DZMx Connect. Go to *Settings* > *Tracking* > *Periodic*. Select the required periodic timer settings.

Using the DZMx keypad. Go to *MENU* > *Tracking* > *Periodic Events*. Use the **LEFT** ◀ key to reduce the interval and the **RIGHT** ▶ key to increase the interval. The intervals are displayed in minutes. Press the **ENTER** key to save the setting. Press **END** return to the main screen.

Note: Any timer can be disabled by setting its interval to zero.

Enabling HD Tracking

While tracking interval over Iridium is set in minutes, with tracking over cellular IP, the interval can be reduced to 15 seconds (High Definition Tracking).

To enable or disable HD Tracking using DZMx Connect. Go to *Settings* > *Tracking* > *General* > *HD Tracking Mode* and select one of the following options:

- **Off**: Turns HD tracking off, reverts to the periodic tracking interval as set-up in "Periodic Events".
- **Cell HD**: Turns HD tracking on for cell, sending position reports at the “HD Timer” rate (default is every 15 seconds). If messages start to queue, due to being in a poor signal area, then the frequency of the tracking messages will drop back to standard periodic intervals. The rate will switch back to using the HD interval setting as soon as the cell modem gets a good signal and cell data becomes available again.
- **Full HD**: Turns HD tracking on for cell, sending position reports at the HD Timer rate, and stores positions at the same rate when on sat, sending them as a group at a rate of one message every 4 x the HD Timer rate. The DZMx will send messages out via an SBD message at 4 x HD Timer intervals to maintain an HD interval track log when cell data is not available. If cell data is disabled, or no cell modem is fitted it is possible to track in Full HD mode continuously using SBD exclusively. Each SBD message will contain up to 3 crumbs as historical reports, as well as the current position. If the HD interval is set to longer than 15 seconds, then the SBD message interval will also change in Full HD mode e.g. to every 2 minutes when the HD interval is set to 30 seconds.

Note: The DZMx will not track at the HD rate when on the ground. The DZMx will use the **On Ground** periodic timer setting (which may be disabled by setting to 0).

Configuring the Heading Timer

If the **Heading Timer** is configured, a position report will be sent as soon as a specified change in heading occurs.

To set the heading variation that triggers a heading change report using DZMx Connect. Go to *Settings* > *Tracking* > *Periodic Settings* > *Heading Variation*.

Note: The heading timer only specifies a minimum delay between heading events.

Configuring Automated Event Reports

Power Up

To send a position report when aircraft power is supplied to the DZMx and when the DZMx is powered off, go to *Tracking* > *Triggered* > *Power Notification*.

Note: It is recommended that the DZMx be connected to the primary power bus on the aircraft so that the power up message is created when the aircraft is first powered on.

Take-off and Landing Events

The DZMx can be configured to send take-off and landing event reports at the start and end of each flight leg. The simplest approach is to use aircraft speed to trigger take-off and landing reports. This is ideal for fixed wing aircraft. However, while this approach can be used for helicopters, it is not ideal as it can result in false take-off and landing reports when hovering.

To configure the DZMx for take-off and landing events using aircraft speed, go to *DZMx Connect* > *Settings* > *Triggered* and set a speed just below take-off speed for the aircraft, and a landing speed just below the aircraft's landing speed.

For helicopters, it is recommended that a collective switch or squat switch (also known as a "wheels on ground" or "weight on wheels" switch) be used to activate these reports. See DZMx Inputs on Page 59 for details on wiring and configuring the inputs.

Hovering

If in HD tracking mode and hover is enabled, and the aircraft is hovering (speed < 15kts), then the HD tracking rate will drop to 30 seconds on cell and will drop back further to use the slower Periodic Timer rate when cell data is not available, messages are queueing, or speed = 0 (and drops out of HD Mode). If the aircraft is hovering, and hover is not enabled, then the tracking rate will drop to using the standard Periodic Timer rate whilst the aircraft speed is 0 but will switch back to HD as soon as the aircraft is moving again.

Engine Start and Stop Events

The DZMx can be configured to send an event report when the engine starts and stops. Typically, this is triggered by the transmission oil pressure warning light circuit. See DZMx Inputs on Page 59 for details on wiring and configuring the inputs.

Configuring Manual Position Reports

The **MARK** key on the DZMx keypad can be configured to send a variety of manual reports:

- Long press of **MARK** key:
  - **A position report only**, to the tracking service, or

- **Position with text message:** When **MARK** is held for 2 seconds, it opens a list of pre-programmed text messages that can be sent with the manual position report.

- Short press of the **MARK** key:
  - **A position report only**, to the tracking service, or
  - **A mission mark** – this prompts the user to press one of the coloured keys on the DZMx keypad, then the mission number; this is sent to the tracking service, or
  - **Mark and text** contacts – send a position and message (from the DZMx Quick Message Library) to one or more SMS recipients and the tracking service. This prompts the user to select one of the first 10 Quick Messages to send to the tracking service, along with the current position, and to also send a text message to any contacts in the phonebook that have also been subscribed to be notified of that particular message. Each of the first 10 Quick Messages are assigned an index 1-10, in the order as they appear in the Quick Message list page on DZMx Connect or in the Pick From List page on the DZMx. When prompted, select the appropriate index of the quick required.
  - **Text Contact List** Only – a message is sent by SMS to selected contacts; follow the prompt and enter a number corresponding to a specific message in the DZMx Quick Message Library (see below for details of how to configure the message recipients for this option). A position may also be sent with the message if configured in *Settings* > *Tracking* > *General Settings*.

These options are configured using DZMx Connect. Go to *Settings* > *General* > *Mark Long Button Press/Mark Short Button Press*.

Note: These options are not supported by all tracking service providers. Check with your service provider before activating these options.

Sending messages to contact groups

Pre-defined messages can be sent to one or more contacts when *Mark and text contacts* is selected.

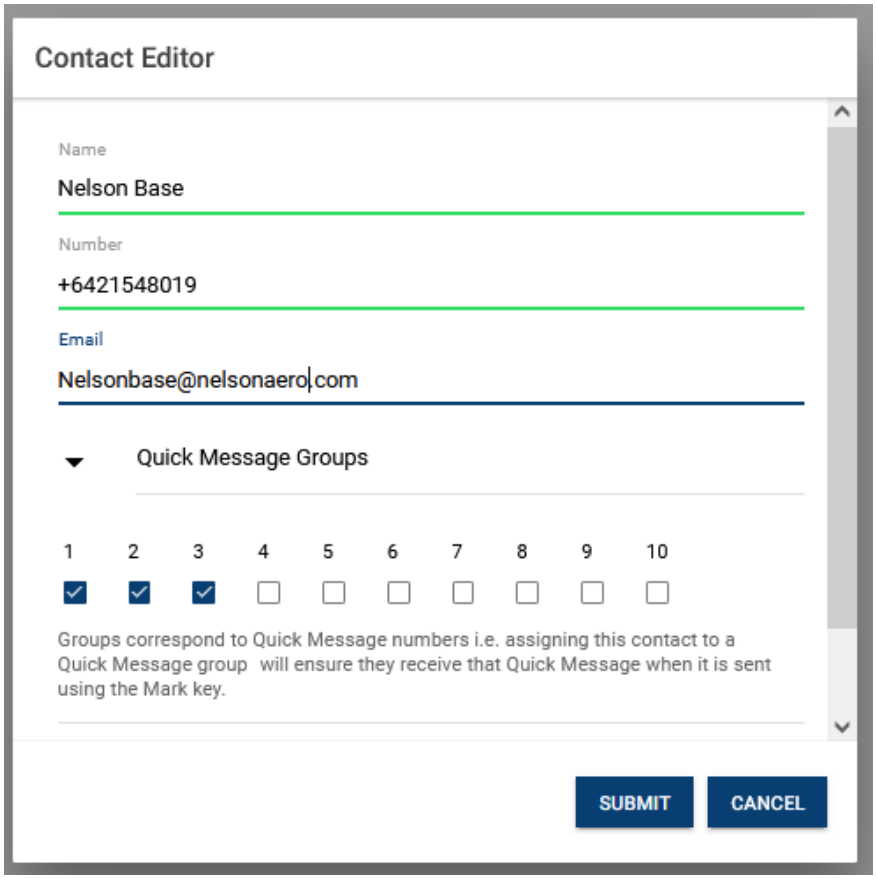
Additional information can optionally be included with the message if the following options are configured in *Settings* > *Tracking* > *General Settings*:

- The aircraft registration number is entered; if the registration number is not entered, the DZMx serial number will be used instead
- The aircraft position will be included if selected.

Configuring message recipients

The recipients for each Quick Message can be designated using DZMx Connect.

- In DZMx Connect, go to *Contacts*
- For the selected contact, swipe the arrow to the left and click *Edit*
- Click Quick Message Groups
- Tick the index numbers of the messages you want to be sent to this contact
- Repeat for additional contacts.



If both the phone number and email address are filled out for a contact, the message will be sent by both email and SMS. If only the phone number or the email address is filled out, the message will be sent only by SMS or email, respectively.

Note: If different messages are to be sent to the same recipient by email and SMS, it is necessary to create duplicate contacts for that recipient.

Configuring transmission of event reports to selected recipients

The DZMx can send automated event reports to the tracking service.

It can also be configured to send event reports by SMS and/or email to selected recipients.

Additional information can optionally be included with the event report if the following options are configured in *Settings* > *Tracking* > *General Settings*:

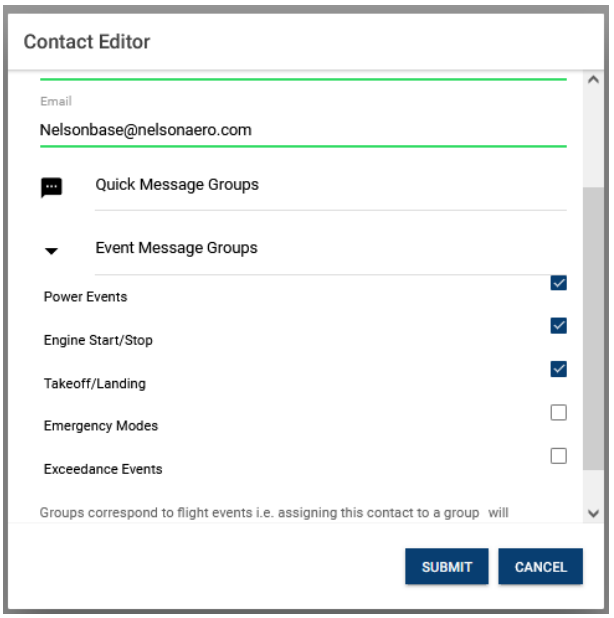
- The aircraft registration number is entered; if the registration number is not entered, the DZMx serial number will be used instead
- The aircraft position will be included if selected
- Flight timer information will be included in take off and landing event reports if selected.

Note: Event reports can be sent by SMS and/or email even if DZMx tracking is not being used.

Configuring recipients for event reports

One or more recipients for each event report can be designated using DZMx Connect.

- In DZMx Connect, go to *Contacts*
- For the selected contact, swipe the arrow to the left and click *Edit*
- Click *Event Message Groups*
- Tick the event reports to be sent to this contact.



Events that can optionally be sent are Power up and power down, engine start/stop, takeoff/landing, emergency events and exceedance events.

If both the phone number and email address are filled out for a contact, the event report will be sent by both email and SMS. If only the phone number or the email address is filled out, the event report will be sent only by SMS or email, respectively

Note: If different messages are to be sent to the same contact by email and SMS, it is necessary to create duplicate contacts.

Managing the DZMx MessageQueue

The DZMx sends position reports and other messages to the selected networks as soon as they are created. Occasionally, the DZMx may lose network connection, which will cause messages to be stored in a message queue until a network connection is restored.

- The behaviour of this queue can be configured using DZMx Connect**.** Go to *Settings* > *Tracking* > *Queue*
- Queue size can be set up to store up to 20 messages. Queue size can be entered using text or the sliding bar.
- Using the dropdown menu select the Queue type. Either "**send the newest messages first** or "**oldest messages first**".
- **Restore Unsent** Msgs; unsent messages in the queue are retained in DZMx memory when it is powered down and sent when the DZMx is started up again. This function can be toggled on or off

Note: Some tracking providers are unable to cope with tracking messages that are out-of-order, so it may be required to use the **Send Oldest First** setting.

Note: Messages older than 24 hours will not be restored.

Automated Rescue Monitoring

Automated Rescue Monitoring (A.R.M) also known as Automated Flight Following (AFF) is an optional automated flight monitoring system. When A.R.M. is activated, your tracking service monitors position reports from the aircraft and raises an alert when reports are overdue by a specified period, or (optionally) if the aircraft is stationary for a specified period.

Enabling A.R.M. allows for the feature to be activated when the A.R.M. key is pressed. To enable the A.R.M. function using the DZMx keypad go to *MENU* > *Tracking* > *ARM Enable*.

Not all Flightcell tracking providers support A.R.M. before activating A.R.M., contact your tracking service provider to determine if they support this function.

Note: A.R.M. can only be configured with tracking providers who support this application.

Alert Mode

Alert Mode allows users to send special alert messages in specific circumstances (e.g. Under Fire).

Alert mode setting can only be enabled using DZMx Connect. Go to Settings > Tracking > Automated Remote Monitoring. Toggle “Arm enabled” off and “Alert Mode Enabled” on.

When enabled, Alert mode is activated using a long press on the DZMx keypad **A.R.M.** key.

Note: A.R.M. and Alert mode cannot be enabled at the same time.

Geofence Suspend Mode

The Geofence Suspend application allows operators to suspend tracking while the aircraft remains within a set geographical radius. This enables position reports to be supressed while the aircraft is operating in a localised area, e.g. during crop dusting or Airwork operations.

Moving outside the geofence perimeter will cause geofence mode to be cancelled and normal tracking to resume. Whilst within the perimeter, periodic tracking is suspended and depending on how geofence suspend mode is configured, triggered events, such as take-offs and landings, can also suspended.

Setting the Geofence Mode

- Set the Geofence radius using:
  - DZMx Connect app. Go to *Settings* > *Tracking* > *Geofence* > *Geofence Settings* > *Geofence Radius*. Enter the Geofence radius then select **Done**.
  - DZMx keypad. Go to *MENU* > *Tracking* > *Geofence* > *Geofence Radius*, press **ENTER**. Use the left ◀ key to reduce the Geofence radius and the right ▶ key to increase the Geofence radius. Press **ENTER** to save then press **END** to return to the main screen.
- Configure the Geofence Mode Using:
  - DZMx Connect app. Go to *Settings* > *Tracking* > *Geofence* > *Geofence Mode*. Select the Geofence Mode from the list below. When selected, select OK then select DONE.
  - DZMx keypad. Press *MENU* > *Tracking* > *Geofence* > *Geofence Mode*. Select the Geofence mode from the list below.

- **Disabled** to disable the Geofence application. This will remove the geofence function from the **MENU** key.
- **Without Events** mode to suspend all tracking messages, except emergency, forms, ETM1000 and manual mark messages.
- **With Events** mode to suspend periodic and course change tracking messages as above, but all triggered events will still be transmitted.
- **Events on Cell Only** mode to operate as per With Events mode but with the additional cost- saving feature to only send event messages via cell modem.

Triggered event messages will be queued if the cell modem has no signal until the cell modem obtains a connection to the cell network, or the aircraft flies out of the geofence perimeter. Refer to the DZMx Operators Manual for details of how to activate a geofence.

DZMx Inputs and Outputs

The DZMx has General Purpose Inputs/Outputs (GPIO) which can be configured to trigger alerts or tracking messages during operation, or to signify some event. The DZMx has five inputs and two outputs. Another seven inputs can be installed with the optional Input Expansion Card (IEC).

DZMx Inputs

The DZMx general purpose inputs (GPIs) can be used to indicate some event or state on the aircraft. A standard DZMx has five inputs, with another seven inputs available on the optional DZMx Input Expansion Card (IEC). An input may be used for a range of functions:

Uses include:

- Indicating an event, including, but not limited to:
  - Engine start and engine stop
  - Take-off and landing
  - Release of water from a fire-fighting tank
- Indicating a level, such as the amount of water in a fire fighting tank
- Triggering an action on the DZMx, for example:
  - **Vary backlighting** on the DZMx when controlled from a cockpit lighting controller
  - **PTT button** to make a PTT transmission
  - **Custom button** to cancel DZMx audio alerts
  - **Custom button** to turn on or off Wi-Fi and Bluetooth

To trigger an event report; connect to a:

- **Collective switch** or **Weight on Wheels** (Weight on Ground) switch to generate take-off tracking messages
- **Oil pressure switch:** To generate engine start and stop messages.
- **Cockpit lighting control** to control DZMx brightness externally from the dimmer control (only available on input 5).
  - **Rotor brake light** to trigger a Rotor Brake On/Off report.

- **Winch control** to trigger winch out/in report.
- Custom key to trigger a **Mark** report.

To trigger an action; connect to a:

- Momentary button to start/stop a IrPTT transmission.
- Custom button to turn on or off Wi-Fi and Bluetooth.

Additional applications can be activated on the DZMx which provides a large range of additional functions for the inputs. These include:

- Airline Application
- Firefighting Application (see details in the DZMx Firefighting Application Manual).

Custom Inputs can be used for custom applications in addition to those provided already provided on the DZMx.

Wiring the inputs

The inputs can tolerate a voltage range of 0-28VDC, with an over/under voltage protection to ±32VDC. The inputs have two states, **Open** (high voltage) or **Closed** (low voltage). Refer to the Flightcell website at www.flightcell.com/resources for the wiring diagrams.

Two ground return pins are provided for the five primary GPIs (pin 3 and pin 17 of the primary connector); these are internally connected to power ground and aircraft chassis ground, so the aircraft chassis can be used as a ground return for these GPIs if required.

Input 5 can be configured as either a standard input (see "Configuring Inputs" below), or as a cockpit dimmer control for the DZMx keypad/LCD brightness.

Configuring the inputs

These inputs can be set up on either the DZMx keypad (at *MENU* > *Hardware Config* > *Input Configuration*) or using DZMx Connect (*Settings* > *Inputs*). In practice, it is easier to set them up using the DZMx control head as the DZMx reports the status of the input in real time.

Inputs 1 to 12 can be used either as two-state or as variable inputs.

Inputs 6-12 (on the input expansion card) can only be configured as variable inputs using DZMx Connect.

Note: If Input 5 is to be used for the cockpit dimmer control, it cannot be used for other functions.

To set up the inputs:

Go to *MENU* > *Hardware Config* > *Input Configuration*.

- Select the function that you want to assign to an input (e.g. **Take-off Switch**)
- Select Input Designation, then select the input which has been wired for that function or select **Not Installed**.
- If using the DZMx Control Head a pop-up will show the current state the DZMx reads from this input (e.g. **Up/Down, On/Off**).

» If the state is wrong (e.g. DZMx reports "**Collective is Up**" when it is down, go to **Input Configuration** and change the selected condition.

Note: Some specialised input functions will only appear in the Input Configuration menu if the application (e.g. airline, firefighting or IrPTT) is enabled.

DZMx Outputs

The DZMx has two outputs, which are switches that can be used to turn an electrical signal on or off. A typical use of an output is to energise a ring alert light on the aircraft panel.

Each output has two terminals, A and B. The output consists of an isolated switch, internal to the DZMx. When the output is active, the switch is closed (terminals A and B are connected). When output is inactive, the switch is open (terminals A and B are disconnected). The outputs can be configured to flash or simply turn on/off.

The events that can be configured to trigger the outputs on the DZMx are:

- **Off Hook:** Turned on when the operator is in a call.
- **Incoming Call:** Alerts the operator when there is an incoming call.
- **PTT Transmitting:** A device in the talk group is transmitting IrPTT.
- **Received Msg:** Alerts the operator when a text message has been received or a call has been missed.
- **Power Indicator**: Alerts the operator when the DZMx is powered on.

To select the allocation of the outputs and the blink pattern using the DZMx control head, go to *MENU* > *Hardware Config* > *Outputs Config* and select the appropriate setting.

- Off Hook Output > [Disabled | Output 1 | Output 2]
- Off Hook Mode > [Off | Solid | Blink]
- Incoming Call Output > [Disabled | Output 1 | Output 2]
- Incoming Call Mode > [Off | Solid | Blink]
- PTT Transmitting Output > [Disabled | Output 1 | Output 2] (IrPTT)
- PTT Transmitting Mode > [Off | Solid | Blink] (IrPTT)
- Received Msg Output > [Disabled | Output 1 | Output 2]
- Received Msg Mode > [Off | Solid | Blink]
- Power Indicator Output > [Disabled | Output 1 | Output 2]
- Power Indicator Mode > [Off | Solid | Blink].

GPS

Configuring DZMx GPS

The default setting for the GPS receiver in the DZMx provides for a maximum operating altitude of 12,000 meters and a maximum ground speed of 310m/s (603 knots, or 1116 km/hr).

If the aircraft operates at high speed or high-altitude you can change the GPS settings using DZMx Connect. Go to *Settings* > *Preferences* > *GPS* and select **General Purpose, High Altitude** or **High Speed** from the dropdown box. Select **OK** followed by **DONE.**

Setting	Max Altitude (*m*)	Max Horizontal Speed (m/s; knots; km/hr)	Max Vertical Speed (m/s; knots; km/hr)
General Purpose	12,000	310; 603; 1116	50; 97; 180
High Altitude	50,000	250; 486; 900	100; 184; 360
High Speed	50,000	500; 972; 1800	100; 184; 360

Exporting GPS data

The DZMx can stream NMEA data from its internal GPS system to an external device (such as a Flightcell SmartHUB) as UDP over its data connection.

To activate, in DZMx Connect, go to *Settings* > *Preferences* > *GPS* and turn on GPS Agent.

The destination IP address and port can be configured if required.

The default setting is IP address 192.168.4.255, port 3131.

GPS Logging Rate

The GPS logging rate can be set at 1 Hz or 4 HZ. This is the internal logging rate and external logging rate.

Activate in DZMx Connect. Go to Settings > Preferences > GPS > GNSS Logging Rate

Configuring DZMx Data

DZMx data can provide access to the internet for a connected PC, laptop, or Windows tablet over a cellular data connection. These devices can connect to the DZMx via its Ethernet port or Wi-Fi connection.

Ethernet Configuration

It is recommended that the Flightcell USB/Ethernet module is installed to provide the necessary Ethernet connection.

The DZMx can be set as a DHCP server, a DHCP client, or allocated a fixed IP address.

These can be selected using DZMx Connect. Go to Settings > Preferences > Local Network > Local Network Settings**.**

To access the DZMx data connection, the Ethernet configuration should be set to DHCP Server or Static IP address mode. When configured with a static IP address, or when configured in DHCP

Server mode, the DZMx cellular data internet connection can be shared and is available via its Ethernet port.

Configure connected network devices to use the DZMx IP address 192.168.4.1 as their default IP gateway.

DHCP Server Mode Configuration

The DZMx can be set as a DHCP server, a DHCP client, or allocated a fixed IP address.

These can be selected using DZMx Connect. Go to Settings > Preferences > Local Network > Local Network Settings.

The DZMx operates as an internet router while in DHCP server mode. When a PC or laptop is plugged in using the DZMx Ethernet port, the DZMx DHCP server will allocate the connected device an IP address in the range 192.168.4.xxx.

Note: When using this mode ensure that there are no other devices on the network configured as a DHCP server.

Static IP Address Mode Configuration

The DZMx can be assigned static IP settings, this includes a static IP address, a subnet mask, a default gateway (optional) and Domain Name System (DNS) settings (optional).

Static IP settings (IP address, Subnet Mask) are set using DZMx Connect.

- Go to Settings > Preferences > Local Network > Local Network Settings.
- Select “Static IP Address” in the dropdown menu.
- Select OK then DONE.

A static IP address may also be set using the DZMx Control Head:

- Using the keypad select MENU > Hardware Config> Wireless and Network > Static IP Configuration >press ENTER.
- Scroll to Host IP Address, press ENTER and then specify the DZMx Ethernet interface IP address e.g. 192.168.4.100, then press ENTER.
- Scroll to Subnet Mask and then specify the subnet mask that matched the IP address (previous step) usually 255.255.255.0, then press ENTER. If the gateway IP address does not need to be configured Press END to return to the main screen.

Optional Gateway and DNS Configuration

Independently from the IP address mode, DNS server settings can be specified to use a specific DNS server. This will work with all 3 possible modes (DHCP client, server, or Static IP address). This is optional as it overrides default settings provided by DHCP mode and is only required if internet connectivity is needed in static address mode.

Default Gateway: Specify which network gateway provides internet connectivity to the DZMx. This can be an internet default gateway.

The following steps are optional.

- Using the DZMx Control Head keypad select MENU > Hardware Config > Wireless and Networks > Static IP Configuration > Gateway IP address > press ENTER.
- To specify the default internet gateway, the DZM will where the internet connectivity is coming from a specific IP gateway (contact your cell network provider for more information) i.e. 192.168.4.100, then press **ENTER**. Press **END** to return to the main screen.
- To override the default DNS server configuration using the DZMx Control Head keypad select *Menu* > *Hardware Config* > *Wireless and Networks* > *DNS Configuration* > *DNS Server IP Address #1*> press *ENTER*.
- Specify the IP address for the Primary DNS server, then press *ENTER*. Repeat this step for the DNS Server Address #2 to specify the Secondary DNS server IP Address. Press *END* to return to the main screen.

Applying the Specified Static IP Configuration

To apply the specified static IP settings and optional settings, Default gateway and DNS use the DZMx Control Head keypad.

- Select MENU > Hardware Config > Wireless and Networks> Select IP Address Mode > Static IP Address > press ENTER.

  This process can take a few seconds. A window advising "**Ethernet configuration update please wait**" will appear. Press END to return to the main screen.

Note: To check which IP address is in use for the Ethernet connection, using the DZMX Control Head keypad: Select *Menu* > *Diagnostics Menu* > *About DZMx*. The Ethernet IP address will be displayed.

Configure Cellular Data

To enable or disable cellular data using DZMx Connect.

- Go to Settings > Modems > Modem 2.
- Toggle "*Enable Data*" to on to allow cellular data to be used.
- Set *Data Roaming* to allow cellular data to be used outside the area coverage of your cellular data account.
- Set the Access Point Name (APN).

Note: Data roaming can incur significant charges

The APN setting must be configured to enable a data connection to be established. The APN is the name of the setting your cellular modem uses to set up a connection to the gateway between your carrier's cellular network and the public Internet. The APN you need to specify will depend on the cellular network service provider. The APN is often published on the service provider's web site.

This setting is easier to enter using DZMx Connect as you can type in or paste in the APN. It can also be entered using the DZMx Control Head.

Enabling and Disabling Satellite Data

Modify the satellite modem settings using DZMx Connect. Select *Settings* > *Modem* > *Internal Sat Modems* to enable and disable satellite data. This cannot be enabled using the DZMx Control Head keypad.

DZMx Data Logging

The DZMx provides several data logging functions

Flight data – see GPS Data Logging

The DZMx logs GPS data at one second intervals, including aircraft position, speed, heading and altitude, and GPS quality metrics.

Cellular Network Data Logging

The DZMx logs network parameters for the cellular network, along with aircraft position, altitude, speed and heading. An optional speed test can also be activated, which records uplink and downlink speeds at programmed intervals.

This data can be used to review cellular network performance. Contact tech@flightcell.com for more information on analysing network performance.

DZMx Flight Data Recorder

The DZMx can automatically transmit log data using the DZMx Email Outbox feature.

Using DZMx Connect, go to *Settings* > *Preferences* > *Logging Email Reporting* to specify which logs are transmitted and to activate automatic emailing of the logs.

DZMx Email Outbox

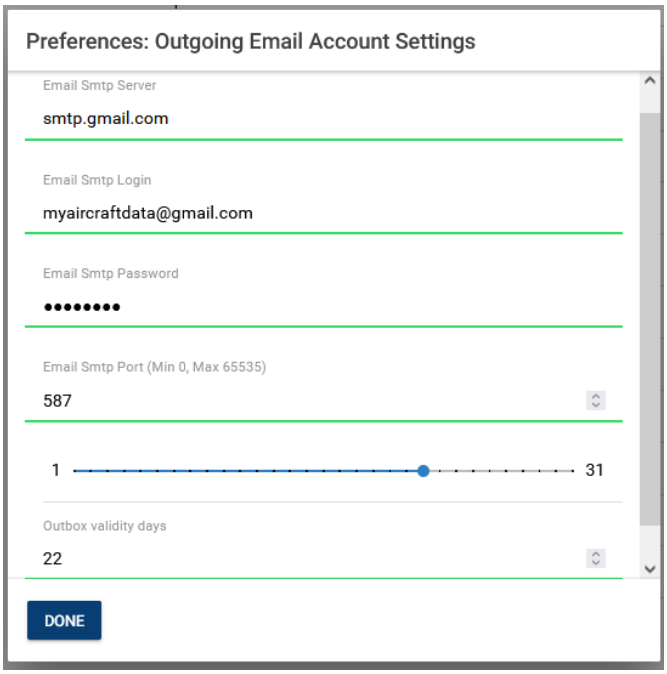
The DZMx can transmit these data logs via email. To do this, the email outbox must be configured.

Using DZMx Connect go to ***Settings > Preferences > Outgoing Email Account***.

Enter the following settings: (these can be for an existing email account, or you can set up an email account):

- Email SMTP Server.
- Email SMTP email Login.
- Email SMTP Password.
- Email SMTP Port.

An example of these settings using a Gmail account for sending the data, and an in-house account as the destination is shown to the right.



Next, configure the DZMx to transmit the data:

- Go to *Settings* > *Preferences* > *Logging Email Reporting*
- Enter the destination email address
- Select what data is to be emailed
- Toggle **Logging Send Email Data Automatically** on if you want the data to be sent automatically. If selected, the DZMx will send the data for each flight when it is next powered on.

GPS Data Logging

The DZMx logs GPS data at one second intervals, including aircraft position, speed, heading and altitude, and GPS quality metrics.

Cellular Network Data Logging

The DZMx logs network parameters for the cellular network, along with aircraft position, altitude, speed and heading. An optional speed test can also be activated, which records uplink and downlink speeds at programmed intervals.

This data can be used to review cellular network performance. Contact tech@flightcell.com for more information on analysing network performance.

Note: The DZMx speed test uses a significant amount of data so should only be used when necessary to gather link bandwidth data.

DZMx Flight Data Recorder

The DZMx has an inbuild flight data recording function that includes an inertial measurement unit and barometric pressure sensor. The output from these sensors is logged at one second intervals.

The following raw sensor data is logged:

- Angular rotation in all 3 axes (radians per second, relative to the DZMx).
- Acceleration in all 3 axes (G force, relative to the DZMx).

The inertial data is fused and logged to provide:

- Airframe pitch (degrees).
- Airframe roll (degrees).
- Pressure (millibars).
- Pressure altitude (reference to 1013.25 millibars).

Disclaimer

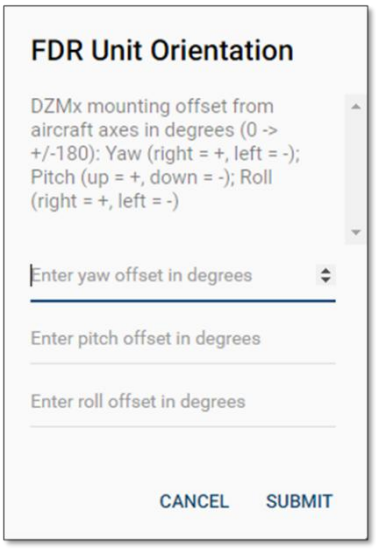
The Flight Data Recording system in the DZMx uses a six degree of freedom sensor fusion technique and thus all pitch and roll values output are a best estimate based on measured angular rate (prone to drift) and estimated gravity vector (which can be distorted by accelerations). This must not be used for navigational or control purposes.

Setting up the Flight Data Recorder

The DZMx flight recorder must be calibrated for the orientation of the DZMx to provide a baseline for measures of pitch and roll.

The baseline is set based on the aircraft orientation on the ground.

The DZMx factory setting has zero offsets. To set its Mounting Offsets:



- Install the DZMx in its final location
- Using DZMx Connect go to *Flight* > *Flight Icon*
- Note down the pitch and roll shown on the artificial horizon (AH) gauge
- If the DZMx is installed at an angle to the longitudinal axis of the aircraft, estimate the offset in degrees
- Click on the gear icon on the top right
- Enter the following (in degrees)
  - Pitch recorded from the AH
  - Roll recorded from the AH
  - Estimated yaw.
- Click *Enter* to confirm the orientation on the flight display. The AH should now show zero pitch or roll.

Note: If the DZMx is not aligned to any of the aircraft axes, data readings will be incorrect unless this step is performed at installation.

Transmitting flight exceedances

The DZMx Flight Data system can detect and transmit flight exceedances:

- Rapid ascent and descent
- Excess G Force

- Excess turn rate
- Excess pitch change.

To set up transmission of flight exceedances:

- Go to *Settings* > *Tracking* > *Flight Monitor Settings*
- Select which exceedances to transmit
- Set the exceedance threshold for each
- Enter the email address for exceedance reports
- Select if the exceedance reports are to be sent
  - Via email the nominated email address, and/or
  - To your tracking service provider attached to a position report.

Recording and Transmitting Maintenance Data

The DZMx supports maintenance timers (also known as a Hobbs Meter). The DZMx can record and transmit the following:

- **TTAF** (Total Airframe Flight Time (hrs)). This records all flight time in hours and tenths of hours. The aircraft airframe hours are entered on installation, and this is incremented during every flight.

Note: The starting TTAF value can only be done once so it is important to set it correctly. A pin number or Hobbs password is required from Flightcell to change the flight hours after the initial set up.

- **DFT** (Daily Flight Time) This is a continuous timer that records flight time in hours and tenths of hours. It must be manually resent, and can be reset daily or reset periodically to allow the user to measure a flight or sequence of flights.
- **Trip** (Trip time (hh:mm)) This is an hour and minute timer that resets every flight. It can also be reset mid-flight to record certain operations or flight legs.
- **Lands** (Landings)
- **Starts** (Engine Starts)
- **Check Due –** to record hours since the last maintenance check and alert when the next check is due.

Maintenance data can be accessed on the DZMx, and can be sent automatically to the tracking service, and emailed automatically to an address configured on the DZMx.

The destination address for the maintenance data can be set in DZMx Connect. Go to *Settings* > *Preferences* > *Hobbs and Maintenance* to enter the maintenance email address and second maintenance address.

The maintenance data can be accessed on the DZMx using either the:

- DZMx or Remote Head User Interface (UI): Go to *MENU* > *Timers*
- DZMx Connect. Go to *Flight* > *Flight Timers*.

Daily Flight Reporting

DFT can be manually reset either each day, or at the end of a series of flights. It is not possible to reset any timers our counters while the aircraft is in flight.

The landing and start counters are reset automatically when the DFT is reset; they cannot be reset individually.

To reset the DFT and counters

- Using the DZMx UI menu go to *MENU* > *Timers* > *DFT* > *Reset DFT*. Selecting **YES** will reset the DFT timer and the landing and engine start counters.
- Using DZMx Connect go to **Flight > Flight Timers** > Reset

If a maintenance email address is specified, a maintenance email (or emails) will be sent automatically before the counters are reset.

Check Due Counter

The DZMx can record hours since the last maintenance check and advise when a check is due.

This can be configured in DZMx Connect by going to *Settings* > *Preferences* > *Hobbs and Maintenance*. Here you can set:

- Hours till next check
- Check due warning – hours advance warning that a check is due.

The DZMx maintains an 'hours since last check' timer and subtracts it from the **Check Due** hours and displays the result as **Check Due** on the DZMx UI **Timers** menu and/or DZMx Connect **Flight Timers** page.

The DZMx will add new flight hours to the 'hours since last check' timer while in flight, resulting in the displayed **Check Due** counter decrementing when in flight.

If the hours since last check exceed the **Check Due** hours setting, then the **Check Due** will change to **Check Overdue** along with a negative value on the **Timers** menu on the DZMx UI or on DZMx Connect.

To set the 'hours since last check' counter

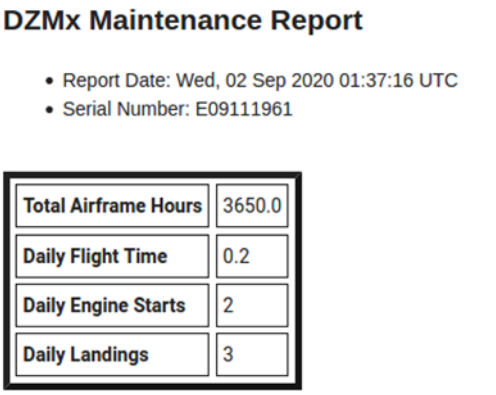
- Using the UI, select **Check Due**, then enter the number of hours flown since the last check. Hold down the **+/0** key to enter part hours to one decimal place.
- Using DZMx Connect, go to *Flight* > *Flight Timer* > *Check Due* > *Set* and enter the hours since last check, then **SUBMIT.**

Content of a Maintenance Email

The data is emailed to the tracking provider. Two email Maintenance email addresses can be nominated.

The subject line of the maintenance email will be **[DZMx Maintenance Report] from < serial number >** and will contain the following text:

- The **TTAF** and daily flight timers are sent in the take-off message to the tracking provider.
- The **TTAF, DFT, Trip, Lands** and **Starts** are sent in the landing message to the tracking provider
- The **Trip** counter is not included in the email since this is automatically reset on every flight.



Maintenance Email Attached Data File

Attached to the maintenance email will be a JSON formatted file which will contain all the maintenance data. The data in the attachment will be as follows:


```
{
 "report_type":"dzmx_maintenance",
 "report_created":"Wed, 02 Sep 2020 01:37:16 UTC",
 "dzmx_details":{
  "serial_number":"E09111961",
  "firmware_version":"dzmx-3.5.1r799",
  "aircraft_reg":"ZK-POO"
 },
 "maintenance data":{
  "TTAF":3650.0,
  "DFT":0.2,
  "daily_engine_starts":2,
  "daily_landings":3
    }
}
```


Configuring the DZMx for maintenance reporting

Prerequisites:

- The **Outgoing Email Account Settings** must be set up first for the Maintenance email to be transmitted,
- **Tracking** must be enabled and either a take-off or a take-off speed must be configured for Hobbs and maintenance email data to be included in landing and take-off messages,
- An **Oil Pressure Input** must be configured for engine starts to be counted and visible in the **Timer** page,
- A **Take-Off Input** or a **Take-Off Speed** must be configured for landings to be counted and visible on the **Timer** page.
- The **Maintenance Email Address** and/or 2nd Maintenance Address must be set for a maintenance email to be sent. To setup using DZMx Connect go to **Settings > Preferences > Hobbs and Maintenance**
- The **Check Due Hours** setting must be set and the **Check Due Warning Hours** must be set to see a check due warning pop-up message.

Configuring Maintenance Data Using DZMx Connect

Maintenance data to be sent can be selected by both the Installer and the Operator using DZMx Connect. The maintenance email is sent automatically when the daily timers are reset.

Using DZMx Connect go to *Settings* > *Preferences* > *Hobbs and Maintenance* to modify the following settings:

- **Count Engine Starts**: (This can be toggled on/off)
- **Count Landings:** (This can be toggled on/off)
- **Check Due Hours** (Min 1, Max 10000): Enter the Flight Hours.
- **Check Due Warning Hrs** (Min 0, Max 10): Adjust using the scroll bar or type in the number of hours.
- **Send in Tracking Msg:** (This can be toggled on/off) If this is toggled off none of the counters or timers will appear in the landing message sent to the tracking provider.
- **Maintenance Email Address**: This can be a different email address to what was set up in the DZMx Outbox.
- **2nd Email Address:** This is an additional email setting to allow for a second maintenance email to be sent.

Forms

Forms is a feature developed to aid operators to collect data and analyse flight trends. Forms can be used to enter and report operational data. Data can be entered into forms on the DZMx keypad or on DZMx Connect.

Form design and modification requires installer privileges. Only New Data and View Data options are visible to Operators.

Forms are created and configured using DZMx Connect.

Manage Forms Using DZMx Connect

To Create a Form

Up to 25 user-defined form templates can be created. A maximum of 50 recorded data entry lines can be recorded in this file. Older ones will drop off the end and are not written to the file.

To create a form on DZMx Connect, go to **Forms**, click on the "**+**" icon, and enter a name for the form. Click **SUBMIT** to create the form template.

Note: The form name is limited to 25 characters.

The **General** page provides the following prompt options:

- Transmission Options
  - **Include Position** – Toggle On or Off. Includes speed and altitude when sent.
  - Report to Tracking Provider – Toggle On or Off
  - **Email Address** – data can be sent to an email address via cellular
- Form Triggers
- Form prompt – options are No Prompt, On Start-up, On Landing and Flight Timer.

- Flight Time prompted forms will prompt after the given number of hours specified from when the form was enabled. After a Flight Time prompted form has been filled in, the next prompt will occur at the number of hours specified since the prompt trigger time (i.e. not the time since the form was filled in).

The **Fields** page is used to create data entry fields in the form:

- Select the "**+**" symbol.
- A **Form Editor** window will open.
- Enter a unique **Field Name >** select whether the form must be completed **(Mandatory**) or does not have to be completed **(Optional).** If Mandatory is selected the form cannot be completed unless all the mandatory fields are filled in.
- Type: Select the response e.g. **On/Off, Yes/No, Number or Text.**

Note: The ***Number*** and ***Text*** fields have a maximum length of 25 characters.

Enter, view, edit or delete data

Go to **FORMS > Available Forms.** Select the required form.

Sliding left will expose the following options:

- **New Data** -This option will only be available if the form has been enabled and allows the user to fill in a form entry.
- **View Data** – shows any form data
- **Edit** – Edit the form template
- **Delete** – Removes the template and any associated data.

To view, export or delete data

- Go to **View Data**.
- A specific entry can be viewed in detail by clicking on it.
- The complete form data can be downloaded using the download button located at the top right of the title bar. Data is downloaded to the downloads file on a PC, or to a selected destination on a smart device.
- The form data can be deleted using the delete button located at the top right of the title bar.

Enable/Disable specific form(s)

The tick box ☑ to the left of the form name allows the installer to enable/disable the form. A tick indicates the form is enabled.

Disabling a form will cancel any active trigger on that form. It will also cause the flight hours to reset to 0 for that form if the trigger type is set to Flight Time. Flight time will only start to accrue for the form when it is re-enabled.

Forms DZMx Interface

This section describes what forms application functions are available and configurable using the DZMx menu.

The Forms List

To see which forms are available select *MENU* > *Forms*

If there are no form templates **Timers** will be the top item and **Forms** will not appear in the menu list.

Enabled and Disabled Forms

By default, the forms list will show only enabled forms. If there are any forms disabled a menu option **Show All Forms** will be displayed. Select **Show All Forms** to view the disabled forms in the list.

Forms List Tags

Forms in the forms list are prefixed with a character.

- **Disabled Tag:** Forms in the forms list prefixed with **-** (minus) character are disabled forms. An operator cannot fill in a disabled form and disabled forms will never be triggered. A disabled form can be enabled by an Operator and an installer. Select the form by pressing **ENTER** > **Form Enabled** > Confirm by selecting either **No** or **Yes**
- **Triggered Tag:** Forms in the forms list prefixed with a ✱(asterisk) character have been triggered and the tag indicates that the form is due to be filled in. The tag will disappear once the form has been completed.

Filling a Form

- Go to **MENU** > **Forms**. The number of forms in the list is displayed at the top of the screen.
- Enabled forms in the **Forms** list display the name of the **Form Field**. If data is already entered the entered value will appear to the right of the Form Field name.
- If a form has been triggered by an event (e.g. start-up or flight time), the DZMx will beep and display the **Form Field** list. The name of the triggered form be highlighted and appear at the top of the list. Press **ENTER** to access the field entry screen.
- The field entry screen options are:
  - No/Yes
  - On/Off
  - **Number**: Use the keypad to enter the number.
  - **Text field**: Select the **DOWN** key. The number 9 will appear on the screen. Use the ▲ key to scroll through the alphabet. Select the first letter, use the ▸ key to enter the next letter followed by the ▲ key to scroll through the alphabet. Repeat to complete the text. Select **ENTER** to complete the field entry.
- At the bottom of the form fields, Select **Form Complete** to save the entry. The form will transmit to the email destinations as per the template settings.
- The screen will return to the list of forms and the cursor will highlight the next form in the list to be completed.
- If any mandatory fields have not been filled in a warning will pop up; **Form Entry Required: <**field name **>** and then the form entry cursor will be moved to the required field.

Incomplete Forms

If a form has not been completed the data entered will remain and can be completed later. If however the unit is powered off the data will be lost.

Form Entry Required

It is not possible to complete a form if any mandatory fields have not been filled in.

- To remind the operator to complete the form(s) **Form Entry Required** will appear across the top line of the main screen
- Use the **MODE** key to access the triggered forms**.** Pressing the **Mode** key will cycle through each triggered form.
- Complete each form then select the **MODE** key again to exit to the main menu screen.
- If the DZMx is powered off before an actively prompted form has been completed the form will appear on the screen when the DZMx is next powered on.

Clear Form

To remove data from a **Form Entry** field prior to selecting **Form Complete.**

- Select **MENU** while on the **Form Entry** screen.
- Press ENTER > Clear Form > ENTER.
- **"Form Fields Cleared"** will appear on the screen.
- The DZMx will not display a **Yes/No** confirm option.
- Press **END** to return to the Main menu.

Form List Sub-menu

To access the Forms sub menu go to **MENU > Forms >** (name of form) **> MENU** .

The following form editing options are available in the sub menu:

Sub Menu	Operator	Installer
Form Configuration	x	x
Form Enabled	x	x
Export Form History	x	x
Delete Form History		x

Form Configuration

Selecting **Form Configuration** will show the following settings, This is a view only screen, the displayed information cannot be edited.

- Report to Track Provider: Yes/No
- Email:<email address >
- Include Position: Yes/No
- Prompt Trigger: <trigger type > e.g. On Landing

Form Enabled

Select **Form Enabled** > Confirm by selecting either **No** or **Yes**

> **Note:** Disabling a form will cancel any active trigger on that form. It will also cause the flight hours to reset to 0 for that form. If the trigger type is set to Flight Time. Flight time will only start to accrue for the form when it is re-enabled.

Export Form History

Exports the data for the selected form to a USB stick. If no USB stick is inserted or if there is no data to export a **Form error USB error** message will appear**.**

Delete Form History

All data records that have been recorded for the selected form can be deleted.

Select **Delete Form History** > Confirm by selecting either **No** or **Yes**.

Section 7: DZMx Applications

Flightcell has developed specialised applications on the DZMx to support specific types of operation.

DZMx Applications and Licences

Some DZMx applications require a licence to be activated. If the licence has been purchased with the DZMx, then the application will be activated before delivery. If the licence is required after delivery of the DZMx, the application licences can be installed using DZMx Connect.

To purchase an application licence, contact Flightcell at info@flightcell.com.We will send you a licence file.

To load the licence file:

- Open DZMx Connect and enter the installer password.
- Go to **About**; this will show a list of licences currently installed on the DZMx.
- Click on **UPLOAD LICENSE** and follow the prompts.
- Restart the DZMx.

DZMx Applications

These following licensed applications are described in this manual:

- DZMx Wi-Fi – this application activates the Wi-Fi and Bluetooth services on the DZMx.
- DZMx Bluetooth – this application activates only the Bluetooth service on the DZMx.
- Iridium Push-To-Talk (IrPTT).
- Iridium Certus.
- SDR & Marine AIS (License not required with firmware v4.13.0 or higher)

For information on the following applications, contact Flightcell International at info@flightcell.com

- Firefighting application.
- Dropbox file transfer application.
- SBD mailbox application.
- Airline application.
- Agriculture application.
- Loadcell application.

Section 8: Maintenance, Diagnostics and Support

Diagnostics

The DZMx provides a range of diagnostic and other information on various aspects of the system.

Real-Time Diagnostics

The DZMx diagnostic pages may enable you to resolve any configuration or other issues.

The following options in the **Diagnostics Menu** may be available:

About DZMx	Contains the DZMx serial number, firmware version, IP address, memory usage and whether a USB device is mounted.
System Information	Contains the serial numbers for the fitted cards
GPS Diagnostics	Contains information on the GPS connection
Sat Device Details	Contains information on the IMEI and network status of the satellite device
Cell Modem Details	Contains information on the IMEI of the cellular device, and on the status and band used by the cellular modem
Cell Modem Data	Contains information on the cell data connection
Ext Modem Details	Contains information on an external modem or phone in a cradle
Tracking over IP	Contains diagnostic information on the tracking over IP function. Performs a check on the settings used to enable Tracking over IP as well as a real time test using the configured tracking provider gateway
Local Network Info	Contains diagnostics on the status of the Bluetooth and Wi-Fi connections
Fire bucket diagnostics	Contains information on fire bucket (only if Fire App installed)
External Inputs	Contains diagnostics on the current status of the DZMx General Purpose Inputs
Export System Log Files	Exports system log files for diagnostics and support

Exporting Diagnostic Log Files

The DZMx maintains diagnostic log files, capturing key information on system performance. This information can be exported to a memory stick installed in the DZMx USB socket.

To export log files to a memory stick:

- Install a USB memory stick in the DZMx USB port
- Go to *MENU* > *Diagnostic Menu* > *Export System Log Files*. When the download is completed press **END** to return to the main screen.
- Remove the memory stick and extract the files on a PC.
- Logfiles can also be downloaded in DZMx Connect.
- Go to **About**, click on the signal strength bars on the top right. 

» Click on **Device Logs** > **Download all.** A zip file containing the logfiles will be downloaded to your default download folder.

Note: These files are not user-readable. They should be forwarded to Flightcell International with a description of any problems.

Firmware Upgrades

Flightcell regularly releases firmware upgrades to provide new features, enhancements to existing features and bug fixes.

Flightcell does not recommend downgrading firmware versions.

The duration of the upgrade will vary and is dependent on the previous firmware version installed. It will take between 5 and 40 minutes to complete.

The DZMx must remain connected to a power supply at all times.

A firmware upgrade can be carried out in two ways:

» Using DZMx USB port upgrade method.

» Using DZMx Connect upgrade method.

Before commencing the upgrade:

Check the current DZMx firmware using the DZMX Control Head. Go to *MENU* > *Diagnostics Menu* > *About DZMx***.** This should show firmware 3.x.x. or 4.x.x. If the current firmware version is 2.x.x or 1.x.x, please contact the Flightcell technical support team - phone: +64 3 545 8651 or email: tech@flightcell.com.

If using the USB upgrade method, download the firmware directly from: https://www.flightcell.com/support/firmware and save it to a USB memory stick.

If using DZMx Connect upgrade method, download the firmware directly from https://www.flightcell.com/support/firmware and save it to the PC or laptop hard drive.

Ensure the aircraft is on ground power or there is enough battery power to run the DZMx for at least 1 hour (DZMx draws approximately 1A at 28VDC).

To perform the upgrade:

Using the DZMx USB port:

» Insert the USB memory stick into the DZMx USB port.

» Go to **MENU** > **Hardware Config** > press **ENTER.**

» If necessary, enable the DZMx extended menus using **Installer Menu Enable**, enter the installer password, then press **ENTER**.

» Scroll down to **Firmware Upgrade** and press **ENTER**. The upgrade will commence.

» Follow the prompts on the DZMx display.

Using DZMx Connect:

» Open DZMx on a connected laptop or PC

- Go to ***About***
- Select **Upgrade** and browse to the saved firmware file.
- Select **Upload** and wait for the firmware file to upload to the DZMx. Once the file has been fully uploaded the upgrade process will start automatically. The display and keyboard may alternatively flash on and off during this period, and the DZMx will reboot.
- When the DZMx has rebooted, on the DZMx go to *MENU* > *Diagnostics Menu* > *About DZMx*, press **ENTER**. Check that the new firmware version is displayed.

Upgrading the DZMx cellular modem firmware

DZMx now supports Firmware-Over-The-Air (FOTA) for Americas, APAC/SA and Europe cellular modems. This allows Flightcell to upgrade the modem firmware over the DZMx cellular data connection.

This feature was added so existing customers may have the cell modem firmware updated to meet network compliance standards.

FOTA is supported in DZMx firmware 4.11.0, and is available on DZMx Revision 5.0 or later. FOTA is enabled by default, but can be disabled in DZMx Connect by going to *Settings* > *Modem* > *Cell Group Settings* > *Enable Cell FOTA*.

To register the DZMx for a cell modem firmware upgrade, contact Flightcell at tech@flightcell.com.

You will be requested to provide the serial number and IMEI of the cell modem to be upgraded. This can be found on the DZMx at *MENU* > *Diagnostics Menu* > *Cell Modem FOTA*.

Or go to the Flightcell website under RMA – Cell Modem Upgrades and complete the relevant upgrade form.

Flightcell Remote Assistance

Flightcell Remote Assistance Virtual Private Network (VPN) allows Flightcell support staff to remotely connect to a DZMx and help with diagnostics, using a secure encrypted connection. This requires either a cellular data connection or a wired Ethernet connection.

Initial Remote Assistance Setup

Remote Assistance must be set up on the DZMx before it can be used. This is a one-off configuration step and will never need to be repeated.

To set up a connection, request a password from Flightcell International Support (tech@flightcell.com). You will need to provide the serial number of the DZMx.

- Using the DZMx keypad go to *MENU* > *Remote Assistance* > *Setup Connection* or
- Using DZMx Connect go to *Remote Access*.
- Enter the password provided by Flightcell and press **ENTER**

If the setup was successful a **Configuration received ok** message will be displayed.

Note: If the DZMx connection has been set up previously, the **Setup a Connection** option will not be displayed and instead you will have three menu options: **Connect VPN**, **Reset Connection** and **Enable at Start up**. In this instance go direct to step 2 **"Establish a VPN Connection".**

Establishing a VPN Connection

This provides a secure connection between the DZMx and Flightcell support team. The support staff will receive a notification and they will be able to remotely access the DZMx.

The DZMx will operate normally throughout this process.

To establish a VPN connection:

- Using the DZMx keypad go to *MENU* > *Remote Assistance* > *Connect VPN*, then press **ENTER** or
- Using DZMx Connect select *Remote Access* and toggle **Connect** to **ON.**

If the connection is successful a "**VPN connection online"** message will be displayed.

If the connection is unsuccessful an **"Error: VPN connection has failed**" message will be displayed.

Note: An unsuccessful connection can occur when a data connection is unreliable, or the remote assistance server is unreachable.

Disconnect a VPN Connection

You can disconnect a VPN at any time. Disconnection would normally be done once Flightcell support has finished assisting and has given the 'all-clear'. The VPN connection can be disconnected on the DZMx UI or on DZMx Connect.

Once the OpenVPN settings are configured and saved, the VPN connection status can be accessed both from DZMx Connect and from the DZMx screen configuration Menu.

Other Menu Options

Reset Connection

This menu option resets and updates the Remote Assistance connection and you will typically be directed to do this by Flightcell Support.

Enable at Start-up

This menu option forces the DZMx to automatically establish a VPN Remote Assistance connection on start-up. This feature is useful for long-term monitoring and diagnosis.

Inspections/Continued Airworthiness/Maintenance

Periodic maintenance of the Flightcell DZMx / DZMx Plus is not required and is “on condition” only. Instructions for Continued Airworthiness (ICA) are not required per 14 CFR Part 21 for these products.

Flightcell recommends the DZMx / DZMx Plus be inspected for proper operation, secure attachment, integrity of connectors and wiring, and any evidence of damage including the external antennas as part of the required annual or periodic aircraft inspection.

Flightcell does recommend that an annual check be carried out on the inertial measurement unit for correct post installation calibration with the aircraft on the ground and referenced to the aircraft A/H

Refer to DZMx / DZMx Plus Installation Manual, Flight Data Recorder – Setting up the Flight Data Recorder section.

The Flightcell DZMx / DZMx Plus do not contain batteries.

Section 9: Obtaining Documentation and Information

Documentation

Comprehensive documentation is available on the Flightcell website at www.flightcell.com/resources.

Technical support

For technical support contact Flightcell

- By email, tech@flightcell.com
- By phone, +64 3 545 8651

Contact Details

Mailing Address

Flightcell International Limited

PO Box 1481

Nelson 7040 New Zealand

Physical Address

Flightcell International Limited

98 Vickerman Street

Nelson 7010 New Zealand

Telephone	+64 3 545 8651
Fax	+64 3 548 8091
Email	info@flightcell.com
Website	http://www.flightcell.com

Section 10: Warranty

Flightcell International Limited's quality products are proudly designed and manufactured to the highest standards in New Zealand. Your DZMx is warranted for one year from date of sale. Your warranty can be extended to five years if you have purchased the extended warranty and your DZMx is registered on our product registration system. To register your product, go to https://www.flightcell.com/support/product-registration-and-warranty

The DZMx warranty covers Flightcell manufactured items only. Any ancillary items may be covered by individual manufacturer warranties.

The warranty is void if any labels are removed or if it is determined that your DZMx has been:

- Connected to a power supply delivering more than 32 Volts
- Connected with reverse polarity
- Installed in direct contravention to the guidelines outlined in the Flightcell DZMx Installation Manual
- Physically damaged, or a fault has occurred due to the product being used beyond what is considered normal use, causing unusual deterioration of the product.

If the product is deemed to be faulty or in need of repair, please complete a Returned Materials Authorization form on www.flightcell.com/support or contact Flightcell International.

Section 11: Abbreviations

Abbreviation	Definition
ADS-B	Automatic Dependent Surveillance - Broadcast
AIS	Automatic Identification System – Marine
A.R.M	Automated Rescue Monitoring
A2DP	Advanced Audio Distribution Profile
AFF	Automated Flight Following
API	Application Programming Interface
AWTC	Automatic Water Tank Controller
Calib	Calibration
Config	Configuration
DFT	Daily Flight Timer
DTMF	Dual Tone Multiple Frequency
EMER	Emergency
Ext	External
GPS	Global Positioning System
HD Tracking	High-Definition Tracking
HFP	Hands Free
ICS	Internet Connection Sharing
IP	Internet Protocol address
IrPTT	Iridium Push to Talk
LCD	Liquid Quartz Display
NOTAM	Notices to Airmen
PTT	Push to Talk – Radio/ICS – and Iridium
SATCOM	Satellite Communication
SBD	Iridium Short Burst Data
SDR	Software Defined Receiver
SIM	Subscriber Identity Module
SMS	Short Message Service
TTAF	Total Time Airframe Hours
VoIP	Voice over Internet protocol
VPN	Virtual Private Network

Appendix 1: Connector Kits & Associated Parts

Connector kits provided with the DZMx

Description	Supplied with	Component description	Qty/ kit
CNP_00003 - Flightcell Cradle D38999 Connector Kit	Flightcell Iridium Phone Cradles with military connectors OBSOLETE	122108 - TNC crimp plug, RG58	1
		D38999/26WD-35SN Straight plug	1
		D38999/26WD35SN15A - D38999 Strain Relief Cradles	1
CNP_00004 - Flightcell Cradle D25 Connector Kit	Flightcell Iridium Phone Cradles with civilian connectors	122108- TNC crimp plug, RG58	1
		M24308/2-3F Crimp and Poke Socket with Contacts (Female)	1
		5-1478762-3- Metal Back Shell for DB Size connectors Straight (25 way)	1
CNP_00005 - Dual Antenna BNC/TNC Connector Kit	Dual Iridium/GPS antennas	112182 - BNC plug R/A 50 OHM Crimp	1
		122150 – TNC plug R/A 50 OHM Crimp	1
CNP_00029 - Single Antenna TNC Connector Kit	Single Iridium antennas	122150 – TNC plug R/A 50 OHM Crimp	1
CNP_00030 - Flightcell DZMx Remote Head Connector Kit	Flightcell DZMx Remote Head	5-1478762-2- Metal Back shell for DA Size connectors Straight (15 way)	1
		M24308/2-2F DA15S M24308 Crimp and Poke Socket with Contacts (Female)	1
CNP_00035 - Flightcell DZMx Civilian Connector Kit	Flightcell DZMx - all versions with standard (D-25) connectors	M24308/2-3F - DB25S M24308 Crimp and Poke Socket with Contacts (Female)	1
		M24308/4-3F - DB25P M24308 Crimp and Poke Plug with Contacts (Male)	1
		5-1478762-3 - Metal Back Shell for DB Size connectors Straight (25 way)	2
		122108 - TNC crimp plug, RG58	2
		112116 - BNC crimp plug, RG58	1
		IDP_00013 - Flightcell USB/Ethernet Civilian Connector Box	1
		M24308/2-1F - DE9S M24308 Crimp and Poke Socket with Contacts (Female)	1
		1478762-9 - Metal Back shell for DE Size connectors Straight (9 way or 15 way HD)	1

Description	Supplied with	Component description	Qty/ kit
CNP_00037 - Flightcell DZMx Military Connector Kit	Flightcell DZMx - all versions with military (D38999) connectors	D38999/26WE35SN Straight plug	1
		M85049/38S-17W - D38999 Strain Relief DZM2	1
		122108 - TNC crimp plug, RG58	2
		112116 - BNC crimp plug, RG58	1
		IDP_00012 - Flightcell USB/Ethernet Military Connector Box	1
		D38999/26WB35SN Straight plug	1
		M85049/38S-11W - D38999 Strain Relief B Shell	1
CNP_00038 - Triple Antenna BNC/TNC/TNC Connector Kit	Flightcell DZMx – legacy configuration	112182 - BNC Plug R/A 50 OHM Crimp	1
		122150 - TNC Plug R/A 50 OHM Crimp	2
CNP_00039 - Flightcell Iridium Modem Connector Kit	Flightcell Iridium modem	M24308/4-2F Crimp and Poke Plug with Contacts (Male)	1
		5-147862-2 - Metal Back shell for DA Size connectors Straight (15 way)	1
		122108- TNC crimp plug, RG58	1
CNP_00044 - Flightcell DZMx Civilian (3T) Connector Kit	Flightcell DZMx Civilian 3 Transceiver versions	112116 - BNC Straight Crimp Plug, RG58	1
		122108 - TNC Straight Crimp Plug, RG58	2
		132113 - SMA Straight Crimp Plug, RG58	1
		M24308/2-3F - DB25S M24308 Crimp and Poke Socket with Contacts (Female)	1
		M24308/2-1F - DE9S M24308 Crimp and Poke Socket with Contacts (Female)	1
		5-1478762-3 - Metal Back Shell for DB Size connectors Straight (25 way)	2
		1478762-9 - Metal Back shell for DE Size connectors Straight (9 way or 15 way HD)	1
		M24308/4-3F - DB25P M24308 Crimp and Poke Plug with Contacts (Male)	1
		IDP_00013 – Flightcell USB/Ethernet Civilian Connector Box	1
CNP_00045 - Flightcell DZMx Military (3T) Connector Kit	Flightcell DZMx Military 3 Transceiver versions	112116 - BNC Straight Crimp Plug, RG58	1
		122108 - TNC Straight Crimp Plug, RG58	2
		132113 - SMA Straight Crimp Plug, RG58	1
		D38999/26WE-35SN Straight plug	1
		M85049/38S-17W - D38999 Strain Relief E-Shell	1
		M85049/38S-11A - D38999 Strain Relief B Shell	1
		D38999/26WB-35SN Straight plug	1

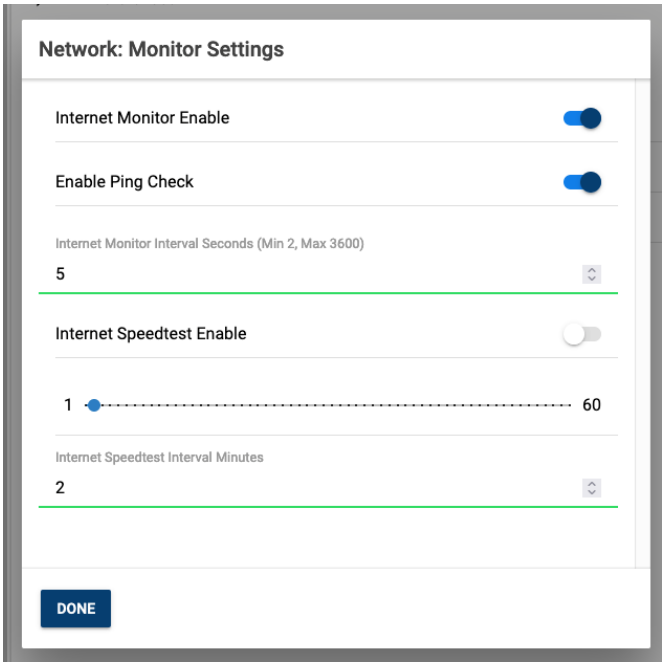
Appendix 2: Advanced routing functions

Configuring advanced routing

Where the DZMx has more than one data-capable modem (e.g. two cell modems and/or a Certus modem), the DZMx advanced routing provides for improved data connections and automatic failover when moving in and out of network coverage. For example, the DZMx can switch its data from a preferred cellular network to a second network depending on network coverage, and switch to Certus satellite data when outside cellular coverage.

Configuring preferred gateway and automatic fail over

The DZMx supports an advanced internet monitor and routing interface to allow a user to configure their preferred gateway (cellular or satellite) and select a policy for automatic failover. The system is based around two components:



- Network Monitor – this system runs periodically on each internet connected interface using a logical OR of three methods to establish if that gateway has internet connectivity (ping, DNS request and http request).
- The network monitor can also be used to periodically run an automated speed-test. This is only run on cellular interfaces to avoid high satcom costs. The speed-test is disabled by default.

  Note: the ping can be disabled from the connectivity test if required.
- Routing Manager – this system also runs periodically. It uses the output of the internet monitor and the selected routing policy to determine the best interface to use for internet connectivity.

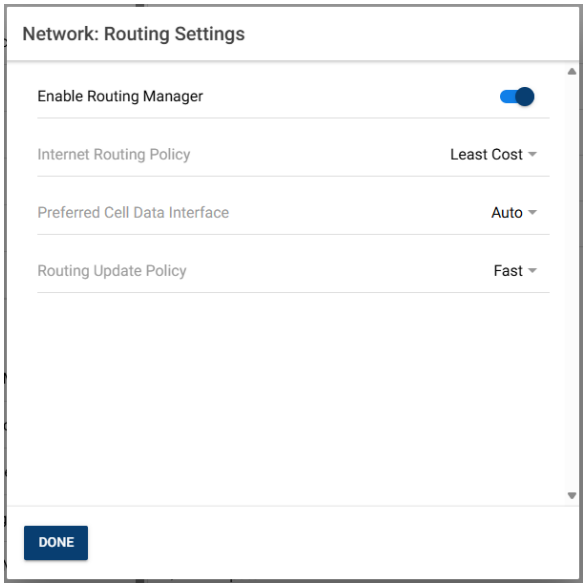
Network routing can be enabled and disabled. When disabled, the DZMx will use a default static cellular configuration without automatic failover.

Network Routing Settings

Network routing is configured in *Settings>Network Routing*.

The automated routing options available are as follows:

- Cellular only –satcom interfaces are ignored
- Satcom only – all cellular interfaces are ignored
- Prefer cellular – always use cellular when available otherwise use satcom
- Prefer satcom – always use satcom when available otherwise use cellular
- Least cost – same as cellular.
- Dual Cell, Dual Gateway – use Cell Modem 1 for all traffic over ETH1 (secondary ethernet) and Wi-Fi, use Cell Modem 2 for all traffic over ETH (primary ethernet)



Additionally, when two cell modems are installed, the preferred interface may be selected:

- Auto
- Slot 4
- Slot 5

Notes:

The Dual Cell, Dual Gateway Option is a fixed routing option designed for circumstances where two separate networks are required e.g. medical applications where cell modem 1 may be for public traffic and cell modem 2 for medical equipment/data. In this mode:

- There is no failover mechanism between modems
- The primary ethernet must be configured as DHCP server or in static mode. In static mode the installer may need to manually configure:
  - A default route through the DZMx i.e. specify DZMx IP address as gateway
  - A DNS server to be used i.e. 8.8.8.8 for google DNS
- The DZMx display will only indicate traffic (up/down arrows) for the cell modem 1 on the top line of the display.
- When changing network routing configurations or ethernet DHCP modes, the system may require a reboot for all changes to correctly take effect.

Connectivity & Diagnostics

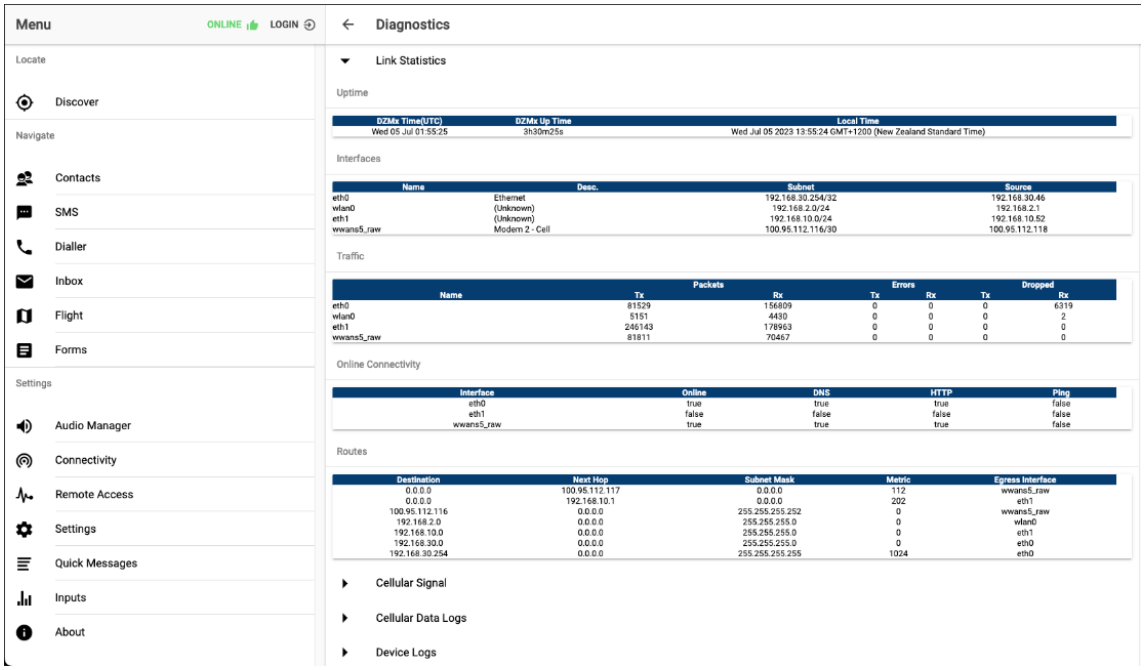
Once enabled, the DZMx will use the available data connections in accordance with the routing policy set on the device. In the most common scenarios, the Satcom data connection will be used only when lower-cost cellular interfaces are unavailable.

The active route is shown by an icon ⇅ on the DZMx display

The online connection status can be obtained on the *About* > *Diagnostics* > *Link Statistics*, in the Online Connectivity page on DZMx Connect. If the terminal is connected to the primary ethernet, the *eth0* row is the relevant row. If the terminal is connected to the secondary ethernet, the *eth1* row is the relevant row.

The currently used connection is identified in the first row of the Routes table.

Note: The diagnostics page is accessed via the icon at the top right of the About page .



Network Monitor API endpoints

Two non-authenticated HTTP endpoints exist to let an external agent query the internet and interface connectivity status:

http://<ipaddress>:8080/datamanager/api/internetstatus/ This endpoint shows the current global connectivity and interface in use. The json response is shown below.

```
{
    "dns_ok": true,
    "http_ok": true,
    "ping_ok": false,
```

```
        "online": true,
        "timestamp": "2023-09-07T00:15:46Z",
        "interface": "Generic",
        "defaultRoute": {
                "nexthop": "192.168.30.254",
                "metric": "200",
                "name": "eth0",
                "destination": "0.0.0.0",
                "mask": "0.0.0.0"
        }
}
```


http://<ipaddress>:8080/datamanager/api/interfacestatus/

This endpoint shows the connectivity status of all available gateway interfaces. The json response is shown below.


```
[
{
        "timestamp": 1694045994,
        "interface": "eth0",
        "online": true,
        "http_ok": true,
        "dns_ok": true,
        "ping_ok": false,
        "latency": -1
},
{
        "timestamp": 1694045994,
        "interface": "wwans5_raw",
        "online": true,
        "http_ok": true,
        "dns_ok": true,
        "ping_ok": true,
        "latency": 320
}
]
```

Custom Route Configuration

Overview

The DZMx provides a gateway to the internet for connected devices, but not all devices are capable of internet access. In some cases “certified” devices are only capable of connecting and/or addressing requests directly to the device/router directly connected by Ethernet cable (DZMx in this case).

The DZMx now provides a custom route configuration that allows such devices to communicate with an external server (i.e. located in the internet) through a specific port. Once configured the DZMx will perform DNAT (destination network address translation) and SNAT (source network address translation) and the necessary forwarding to ensure that all traffic using a defined port on a specific ethernet interface is routed to the same port on the external server.

Notes:

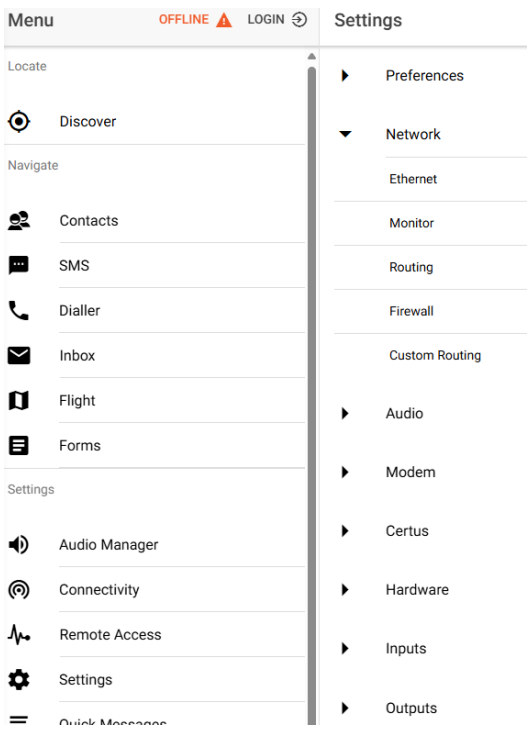
- This address translation and forwarding is gateway ambivalent. i.e. it will work with the DZMx gateway failover capability.
- This routing will provide bi-directional traffic flow, however cellular providers implement a variety of NAT techniques for sharing one IP address between multiple cellular devices. This can prevent server initiated (push) traffic from reaching the DZMx since the cellular providers block that at source unless a device has a static IP address. In practice this means that a DZMx connected device should operate on a polling basis to determine if it needs to request updated data from the external server.
- Care should be taken when using this custom routing in conjunction with the Network->Firewall->Wi-Fi/Ethernet Forwarding Setting. It is recommended that this setting is enabled.

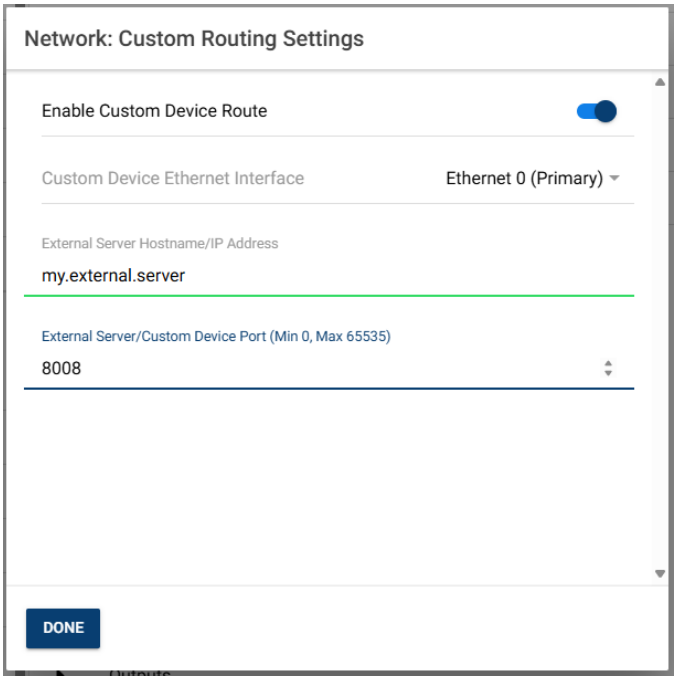
Custom Route Configuration

The custom route configuration can be accessed through an “Installer” login in DZMx Connect. To access the configuration go to Settings → Network → Custom Routing

There are 4 settings used to control the routing function:

- Enable Custom Device Route – this turns the routing on (if valid settings are in place) or off.
- Custom Device Ethernet Interface – this specified the DZMx interface that the relevant device is connected to.
- External Server Hostname/IP Address – this specifies the internet hostname or IP address of the external server
- External Server/Custom Device Port – this specifies the port to be re-routed to/from the external server.


Menu
OFFLINE
LOGIN
Settings
Locate
Discover
Navigate
Contacts
SMS
Dialler
Inbox
Flight
Forms
Settings
Audio Manager
Connectivity
Remote Access
Settings
Preferences
Network
Ethernet
Monitor
Routing
Firewall
Custom Routing
Audio
Modem
Certus
Hardware
Inputs
Outputs


Network: Custom Routing Settings
Enable Custom Device Route
Custom Device Ethernet Interface
Ethernet 0 (Primary)
External Server Hostname/IP Address
my.external.server
External Server/Custom Device Port (Min 0, Max 65535)
8008
DONE

Appendix 3: Configuration of Iridium Certus service

The DZMx can support an externally connected Certus Satellite terminal, providing:

- Data connectivity
- Voice services.

Currently, only the Guardian G6 and G6S Certus modems are supported, but further Certus options may be supported in future.

The G6 and G6S provide an IP data connection at 88kbps uplink and downlink.

Certus License and Application Activation

In order to use Certus, the DZMx must be connected via ethernet to the G6 and have the appropriate Certus license.

Once licensed, the Certus G6 administration interface can be accessed at http://192.168.10.1.

Data connectivity and voice services can be managed through the DZMx Connect Application and the DZMx front panel user interface.

Network Settings

For the correct operation of a connected Certus G6 terminal, the following network configuration can be used. This document assumes that the primary DZMx ethernet port (designated Eth0) is used for other locally networked devices, with the secondary (Eth1) port used for the Certus G6 terminal. If only a single ethernet port is available, the secondary port settings shown below should be used on Eth 0.

Secondary Port Settings (Settings > Network > Ethernet Settings)

Setting	Suggested Value
Secondary Ethernet Configuration	Static IP
Eth1 Host IP Address	192.168.10.52
Eth1 Subnet Mask	255.255.255.0
Eth1 Gateway Address	192.168.10.1
Eth1 DNS Server #1	8.8.8.8
Eth1 DNS Server #2	
DZMx Eth1 Nat Interface	On

Certus Settings

The Certus settings available in DZMx Connect are split into General Settings and G6 Specific Settings.

Certus General Settings

Go to *Settings* > *Certus* > *General Settings*.

Setting	Suggested Value
Certus Terminal Type	G6 or G6S (Certus 100)
Use For Voice	On/Off: activates voice services
Call Audio Priority	3rd priority
Use For Tracking	On/Off. See Tracking: Transmission Settings Note: Ensure Certus data enabled
Enable Data	On/Off: Allow system to use Certus as an active data connection according to advanced routing rules

Settings for G6 and G6S

Go to *Settings* > *Certus* > *G6 Settings*.

Setting	Suggested Default Value
G6 IP Address	*192.168.10.1*
G6 MQTT Port	*8001*
G6 API user	*admin*
G6 API Password	See G6 documentation
SIP Server Address	*192.168.10.1*
SIP User	*user1* or *user2*
SIP Password	See G6 documentation

Note: The Certus G6 uses a VOIP system to provide the voice calling interface via the DZMx. This relies on a SIP server on the G6 system. To ensure voice calling is possible, the SIP settings must be correct in accordance with the G6 documentation.

Connectivity & Diagnostics

Data Connectivity

The Certus terminal data is enabled via the setting shown in the previous section. Once enabled, the DZMx will use the G6 data connection in accordance with the routing policy set on the DZMx. *(Settings* > *Network* > *Monitor & Settings* > *Network* > *Routing*). In the most common scenarios, the Satcom (Certus) data connection will be used only when lower-cost cellular interfaces are unavailable. Other routing options allow for Satcom (Certus) only, Cellular only or preferred interface connections.

The online connection status is shown in *About* > *Diagnostics* > *Link Statistics*, in the Online Connectivity section. If the terminal is connected to the primary ethernet, the *eth0* row is the relevant row. If the terminal is connected to the secondary ethernet, the *eth1* row is the relevant row.

The currently used connection is identified in the first row of the Routes table.

Note: The diagnostics page is accessed via the icon at the top right of the About page

Certus G6 Terminal Status

The terminal status can be found in *About* > *Diagnostics* > *Certus*

Diagnostic Information

Some diagnostic information relating to the Certus terminal may be found by accessing the DZMx diagnostics at *Menu* > *Diagnostics Menu* > *Certus Device Details*.

DZMx Connect Web Interface

The diagnostic and system status available through DZMx Connect is described in the previous Data & Connectivity section.

Dialing, Answering and Terminating Calls

Calls can be dialed, answered or terminated on the DZMx keypad and display, or on DZMx Connect. Call management can be accessed through the dialer page of DZMx Connect.

The Certus terminal will appear as a separate dialer interface at the bottom of the page.

Appendix 4: Software Defined Receiver (SDR) Installer DZMx

Overview

The DZMx supports the following software defined receiver capabilities:

- AM reception – AM mono audio channels
- FM reception – wide band (200kHz channel bandwidth) mono FM audio reception.
- NBFM – narrow band (12kHzchannel bandwidth) FM mono audio reception.
- ADS-B-IN 1090 reception
- UAT 978MHz
- AIS 162MHz reception

The SDR can store several preset channels to allow easy switching between user defined presets.

The SDR function is limited to platform 4 variants of the DZMx.

Antenna

The SDR covers a wide frequency range and multiple modes. Aircraft may use different antenna types, dependent on primary mode of operation.

It is recommended that installers use an appropriate frequency band antenna for optimizing receiver accuracy.

To ensure of the correct antenna off set, on the DZMx unit, you need to select Mode > Band > Select Antenna Type > and choose between ADSB- Default, Cell Default or AIS-Default

Proximity to high power transmitters

Care should be taken when locating the SDR antenna as high-power transmitters could introduce a risk to the RF amplifier.

Ensure that the supplied 50-ohm Broadband Limiter is connected to the SDR SMA RF connector. (This only applies to those variants with the SDR fitted)

Mitigation at installation

Ensure that the antenna is not plugged/unplugged when the unit is powered

Ensure correct antenna spacing as per Standard Practices recommendations where possible

Isolating SDR during HF transmissions

SDR License and Application Activation

To use SDR facilities the DZMx must include the radio hardware module and have the appropriate **SDR** and **marine-AIS** license.

Once licensed the SDR menu screen can be accessed through the DZMx front panel by a “Short Press” of the Mode key or via DZMx Connect on a connected mobile device or laptop, by entering http://<unit-ip-address>/radio

With Firmware v4.13.0 or higher the SDR and marine-AIS License is not required.

Radio User Interfaces

The SDR can be operated through either a web interface through a connected device, or through the front panel. This document will cover the use of both interfaces.

DZMx Front Panel Interface

The DZMx front panel interface is available by pressing the Mode Key. (Short Press)

The DZMx SDR menu display looks like the image below when inactive.

Activate/De-activate Radio

The image below shows a typical DZMx SDR display.

The radio can be activated and de-activated by toggling the power function key (item 1). During activation it will take a few seconds for the radio display to activate.

When activated the radio will be set to the configuration in use when it was last de-activated.

The four option boxes correspond to the four function keys next to the display. (items 8, 9, 1 & 7)

1 – Power toggle (Function key toggles power)

2 – Station name indicator

3 – Frequency indicator

4 – Reception mode indicator

5 – Squelch level indicator (Left and Right arrow keys change level)

6 – Volume indicator (Up and down keys change volume)

7 – Mute/Unmute (Function key mutes/unmutes)

8 – Preset menu (Function key opens selection list)

9 – Frequency/Band menu (Function key opens frequency and band controls)

Changing Radio Configuration

To change settings of the configuration, the user can use the arrow and enter keys as follows:

Frequency adjustment in MHz,

Press the Band function key (item 9)

Select “Enter Frequency (MHz) and Press Enter

Set frequency using the number keypad to the desired frequency

Decimal point is a long press on Zero key

To delete a character, use the Back key

Press Enter when correct frequency has been set

To select the radio band

Press the Band function key (item9)

Select Radio Band and press Enter

Scroll to desired band from list using the Up/Down arrows and Press Enter

Additional key functions when in audio modes (AM, FM, NBFM)

Use the Up/Down arrow keys to adjust radio volume. 0 - Minimum, 100 - Maximum

Use the Left/Right arrow keys to adjust squelch. 0 - 20

Press the Mute function key to toggle Mute (item7)

Note: Mute is independent of volume control and overrides the volume setting i.e. setting mute enabled will mute the system regardless of volume level.

Preset Station Management

The front panel has limited options for preset management. The addition, deletion, editing, import, and export of presets are performed in the SDR Web User Interface. (see paragraph below for web interface).

Note: The DZMx will save the last manually entered frequency as “User Preset” to enable easier recall of manually entered stations. It will only update the user preset if that frequency is not already available in a stored preset

Preset Activation

Press the Chan function key (item 8)

Select the desired preset, press Enter

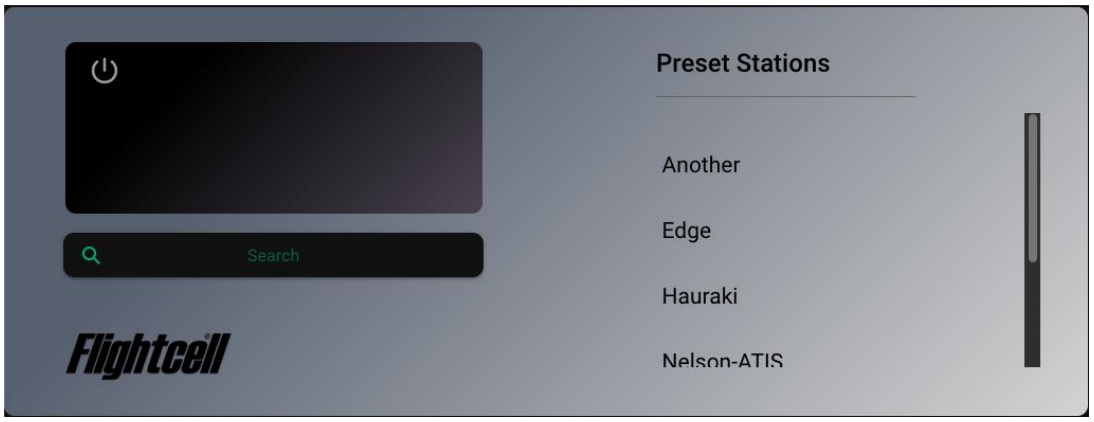
Flightcell SDR Web Interface

The Flightcell SDR web interface is available through the wireless or wired network interfaces at the following locations:

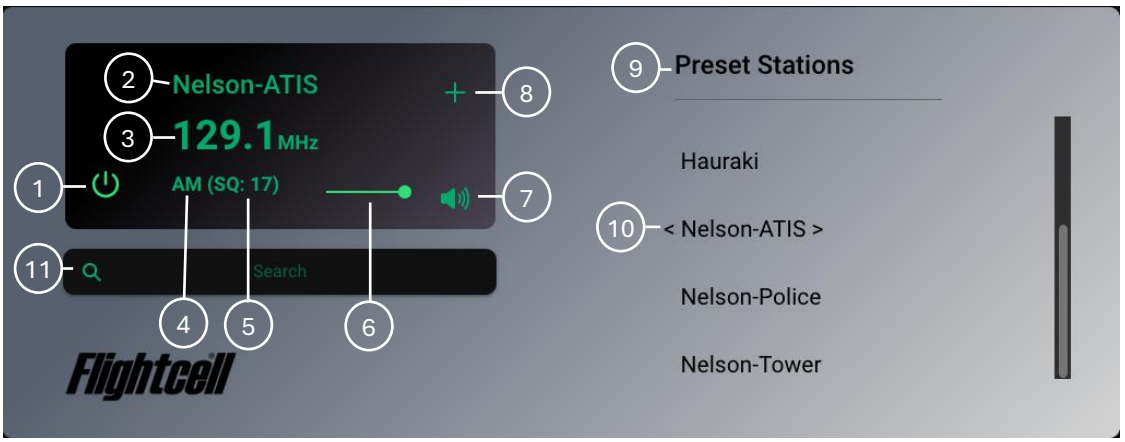
- http://192.168.4.1/radio (ethernet when configured as DHCP server)
- http://<dzmx-ip-address>/radio (ethernet when configured as DHCP client or DHC static)
- http://192.168.2.1/radio (when user device is connected to the DZMx Wi-Fi)

The web interface presents more options for radio control than the front panel user interface and is the preferred interface for preset station entry and management by using a connected PC or iPad

The Flightcell SDR Web looks like the image below when inactive.



The image below shows a typical SDR display, once activated using the green Power button (item 1). When activated the radio will be set to the configuration in use when it was de-activated.



1 – Power indication and switch (click to toggle)

2 – Station name indicator (click to edit)

3 – Frequency indicator (click to edit)

4 – Reception mode indicator (click to change)

5 – Squelch level indicator (click to edit)

6 – Volume indicator (drag to change)

7 – Mute/Unmute (click to toggle)

8 – Preset add/update (click to store/update current settings)

9 – Preset station list (hover over to show import/export functions)

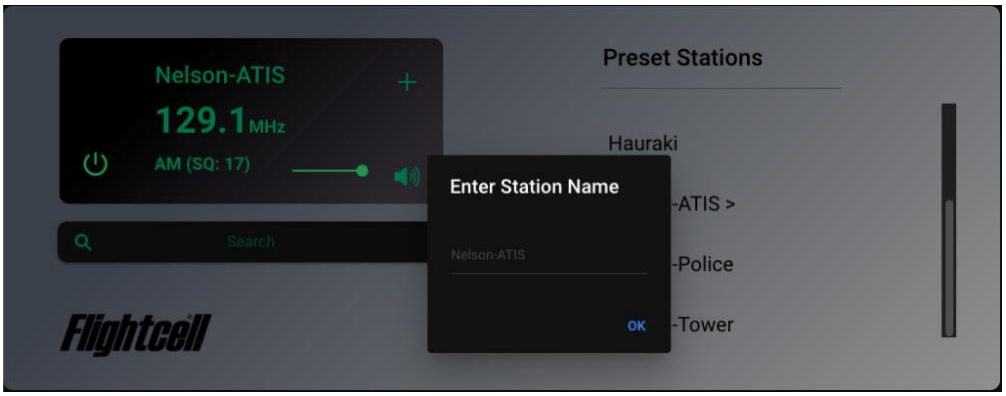
10 – Currently activated preset

11 – Preset search filter

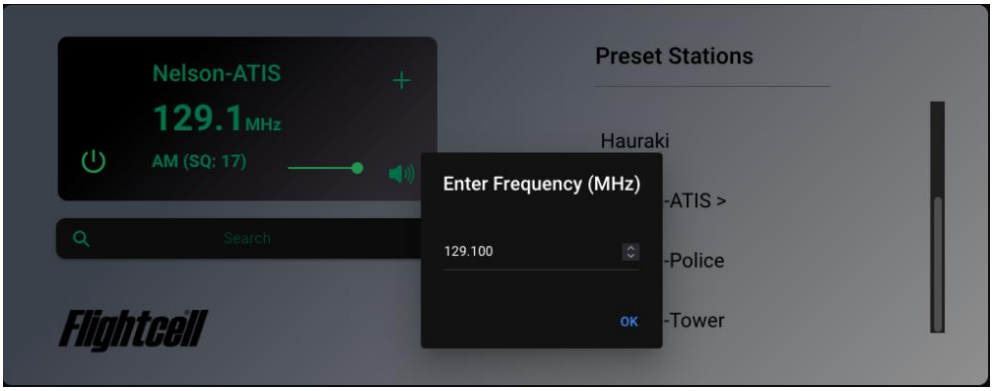
Changing Radio Configuration

To change any aspect of the current configuration (items 1to 8) the user can click on the green text or icon. For items 2 -5 a dialog will be presented to allow a new value to be entered:

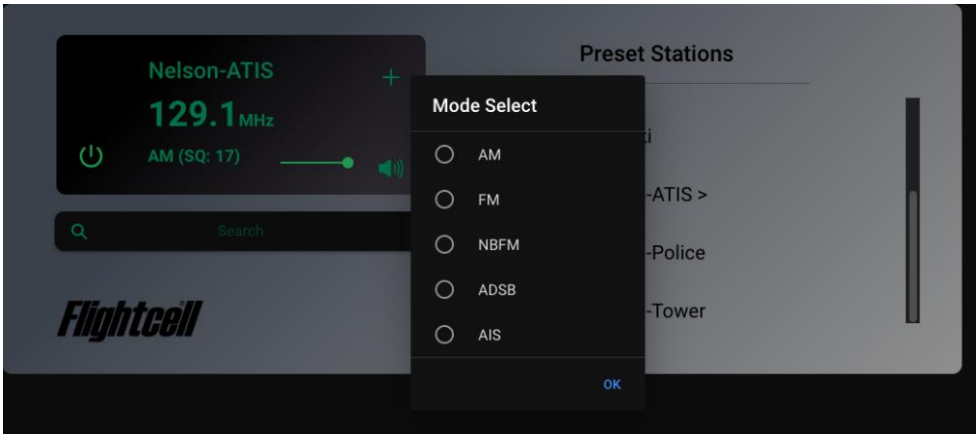
Station Name



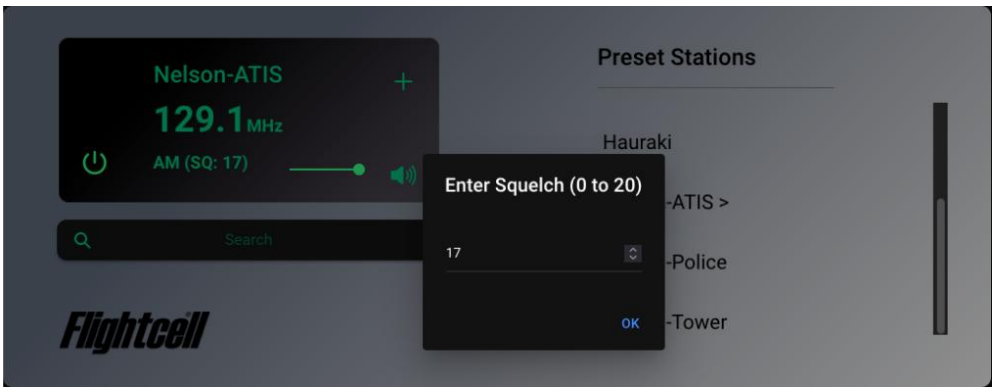
Frequency adjustment in MHz



Reception mode selection



Squelch level: 0 = No squelch, 20 = Full squelch



The volume control is a slider that can be dragged.

The mute/unmute is a button that toggles the mute setting. This is independent of volume control and overrides the volume setting i.e. setting mute enabled will mute the system regardless of volume level.

Preset Station Management

Preset Update/Add

The green plus button (item 8) is used to store the current radio configuration to a named preset.

- If the name exists (or is not edited), it will update the existing preset with the new settings.
- If the station name entered is new, a new preset will be added

Preset Activation

To activate a preset, the user simply needs to click on the list item.

Preset Deletion

To delete a preset, the user can place/hover the mouse over the preset name in the list. A delete bin button will appear that allows the user to permanently delete the stored preset.

Preset Search

To find a preset, the user simply needs to type part of the name into the search box to filter the list of presets down to those matching the search term

Preset Import/Export

The user can also import and export a list of preset stations from/to a text file if desired. Placing the mouse over the Preset Stations heading (item 9) will cause the import and export buttons to be displayed. (items 12,13)

Clicking the export button (item 12 above) will download a file to the user's device.

Clicking the import button (item 13) will open a dialog to select an appropriate file for import.

Preset File Format

Note: The import/export files use a standard format called JSON. Each station is defined between curly brackets. The square brackets enclose the list of stations, separated by commas. These files can be edited/generated manually but must retain this format and the correct field names/capitalisation.


```
[{
	"name": "Nelson-ATIS",
	"mode": "am",
	"frequency": 129100000,
	"squelch": 10,
	"volume": 100,
	"mute": false
}, {
	"name": "Nelson-Tower",
	"mode": "am",
	"frequency": 127400000,
	"squelch": 12,
	"volume": 100,
	"mute": false
}]
```


Radio Modes

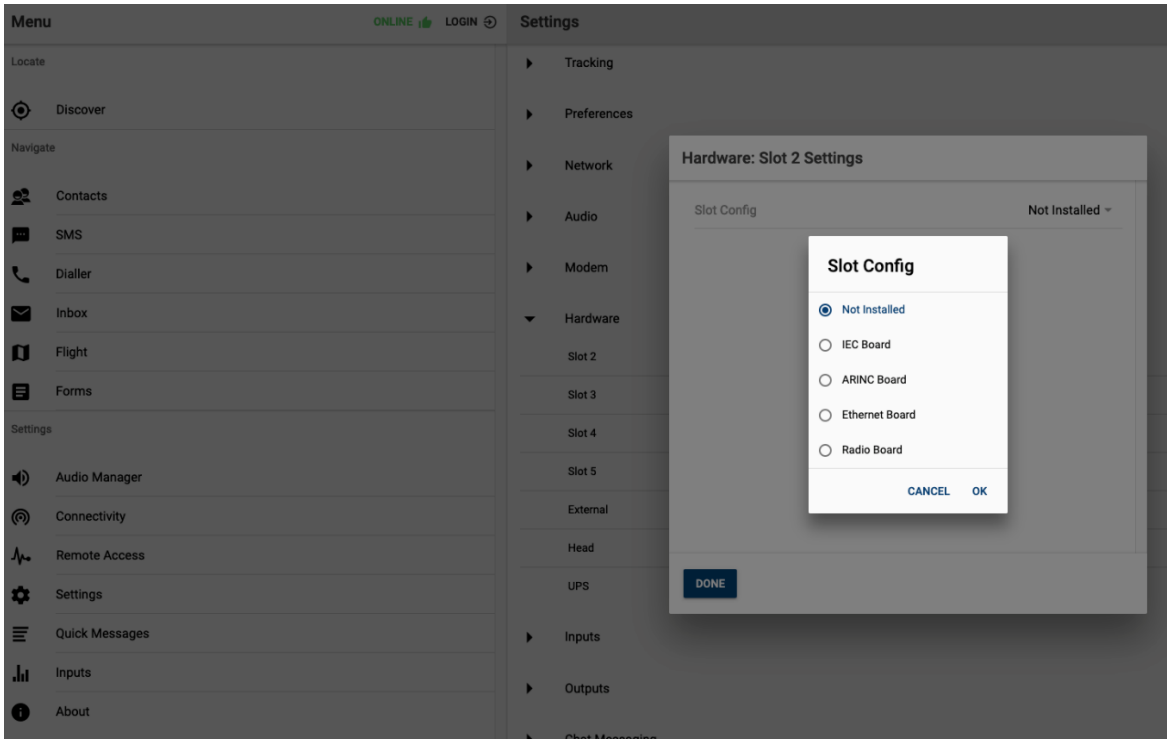
The radio has six operational modes (AM, FM, NBFM, AIS, UAT & ADSB-IN).

The first three are audio modes and when activated the audio will be available to the user through the DZMx BTL and BTR audio channels.

The ADSB-IN 1090MHz, UAT 978MHz and AIS 162.0MHz modes are fixed frequency digital channels. When selected the non-relevant controls (frequency, volume, squelch, mute, preset store etc.) become inactive until an audio mode is selected. Since ADSB-IN, UAT and AIS are fixed modes, they cannot be stored as presets.

SDR Settings

The SDR settings available in DZMx Connect relate only to the hardware slot options. The radio is now an option in the hardware for slots 2-5.



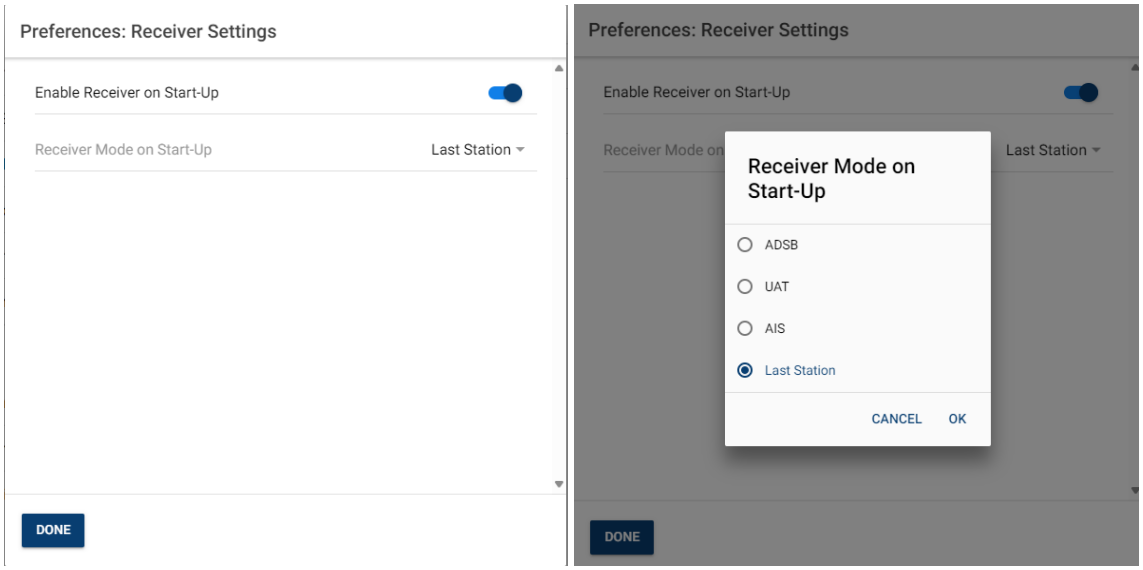
Operator configurable start up modes

The operator can set the Flightcell SDR to start up in a mode of their choice. This reduces the need to switch on the SDR by starting in a selected mode on initial power up or not. The SDR start up modes are as follows.

Enable at Startup – On - Off

- Receiver Mode on Startup
  - ADSB
  - UAT
  - AIS
  - Last Station

- This configuration is only available on DZMx Connect. To enable, go to **Settings->Preferences->Receiver**
- Press Done when completed



- This will enable the selected mode setting at start up
- The operator can change the selection during operation to any other radio mode
- Should the SDR be switched off during flight while the DZMx is still powered, it will restore to receiver Mode on start-up when switched on again.
- The SDR can also be set to auto-mute when on a phone call. To enable this in DZMx Connect, go to **Settings->Preferences->Receiver** and set to on Auto-Mute Receiver on Call. If set the receiver will automatically mute and unmute during a DZMx call. If unset, the receiver will continue to play audio during any DZMx call.

SDR ADS-B IN and UAT 978MHz

Overview

The SDR ADS-B IN receive function has an associated GDL-90 data stream transmission capability. When enabled the DZMx will stream GDL-90 messages over a broadcast UDP link on an assigned port. This can be used by external Electronic Flight Bag applications to provide a situational awareness view on a connected tablet.

ADSB-IN 1090MHZ and UAT 978MHz

The SDR provides a 1090MHz S-Mode ADSB-IN and UAT 978MHz (USA only) reception capability. Once activated, the user can use the Flight Page in DZMx Connect to view aircraft in the vicinity. The Map tab and Air Traffic tabs provide two different views. The Air Traffic view provides a TCAS like representation of traffic.

Both views identify:

- Other traffic – Green on map, blue hollow diamond on TCAS
- Proximate traffic – Yellow on map, blue filled diamond on TCAS
- Traffic advisory – Red on map, yellow circle on TCAS

On the map display, the aircraft colour fades slowly to transparent after it loses contact, before fully disappearing after 120seconds. Hovering over an aircraft will show flight details for that aircraft.

In the air traffic view, the slider adapts the scale of the display.

Configuration

GDL-90 License and Application Activation

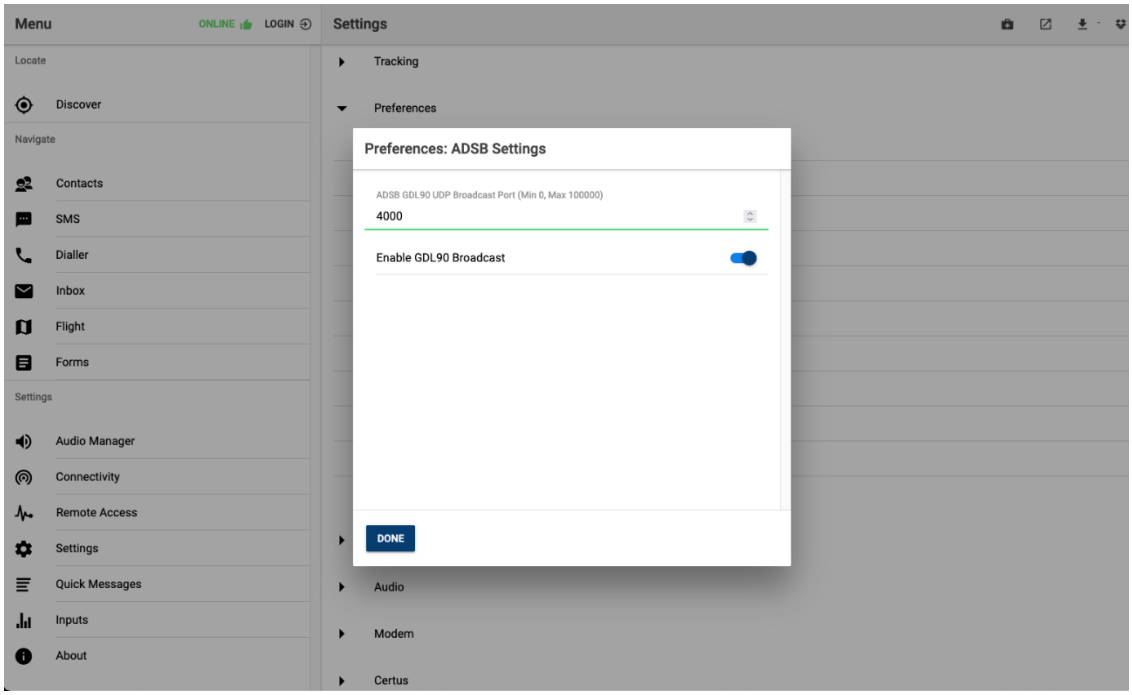
To use the GDL-90 streaming capability, the DZMx must be connected via Wi-Fi to the receiving device and have the valid SDR licenses. (Firmware v4.13.0 and higher, SDR license is not required)

The ADS-B mode of the frequency monitor should be selected.

The UDP streaming function can be configured using the DZMx Connect interface.

GDL-90 Settings

The GDL-90 settings available in DZMx Connect may be found in (Settings -> Preferences -> ADSB)



Setting	Suggested Value
ADSB GDL90 UDP Broadcast Port	4000
Enable GDL90 Broadcast	On/Off: activates/disables the streaming function

Note: The DZMx will require a power cycle if the port setting is changed to ensure the change takes effect.

GDL-90

Supported Message Types

When the GDL-90 UDP streaming function is enabled and the frequency monitor is set to ADSB mode, the following message types will be broadcast:

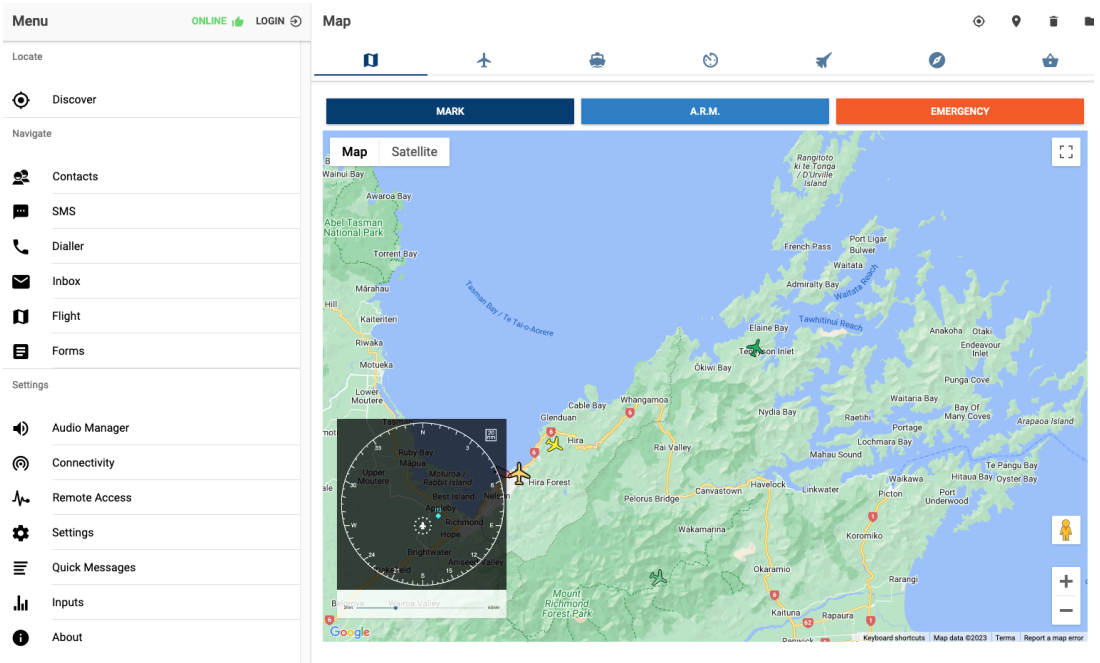
- Heartbeat – once per second
- Own ship report – once per second
- Own ship geometric altitude report – once per second
- Foreflight ID Message – once per second
- Traffic Report – on reception of traffic data

Electronic Flight Bag Configuration

The device to be used should be connected to the DZMx Wi-Fi.

To receive ADS-B data the external application should be set to receive on the same port as the DZMx Broadcasts UDP. The configuration will be according to the EFB provider instructions. Once setup, ADS-B IN traffic should then be available in the application. Check with your EFB provider if GDL-90 ADS-B data is supported over Wi-Fi or contact Flightcell International by emailing tech@flightcell.com

The application display can be compared to the Flight Page in DZMx Connect to verify the traffic is correctly received.



SDR AIS

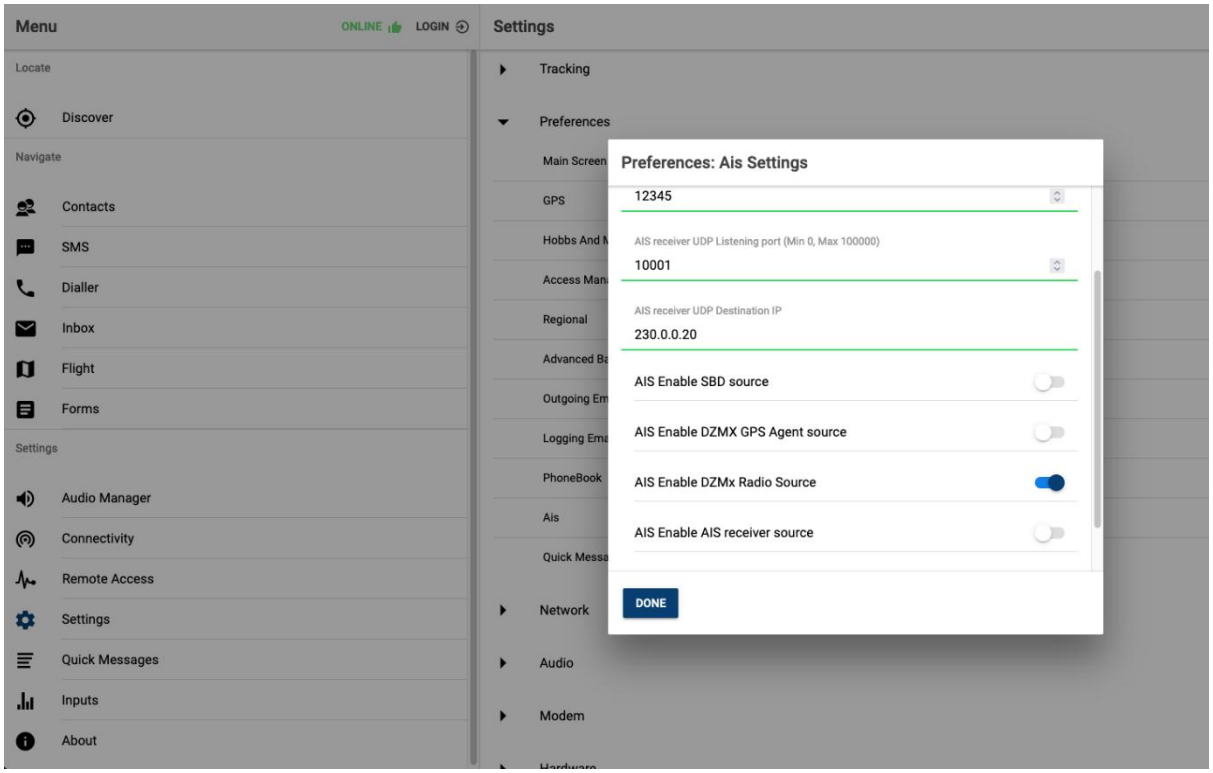
Overview

The SDR provides a 162MHz AIS reception capability. Although AIS may work using various antennas, it is recommended that installers use an appropriate frequency band antenna for accurate results.

The SDR AIS receive function has an associated NMEA data stream transmission capability. When enabled the DZMx will stream NMEA AIS messages over a broadcast UDP link on an assigned port. This can be used by external Electronic Flight Bag applications to provide a situational awareness view on a connected tablet.

AIS

The SDR provides a 162MHz AIS reception capability. The radio must be assigned as a source for AIS displays using DZMx Connect (**Settings->Preferences->AIS**) if the user wishes to view the information on the DZMx Connect Flight Page.

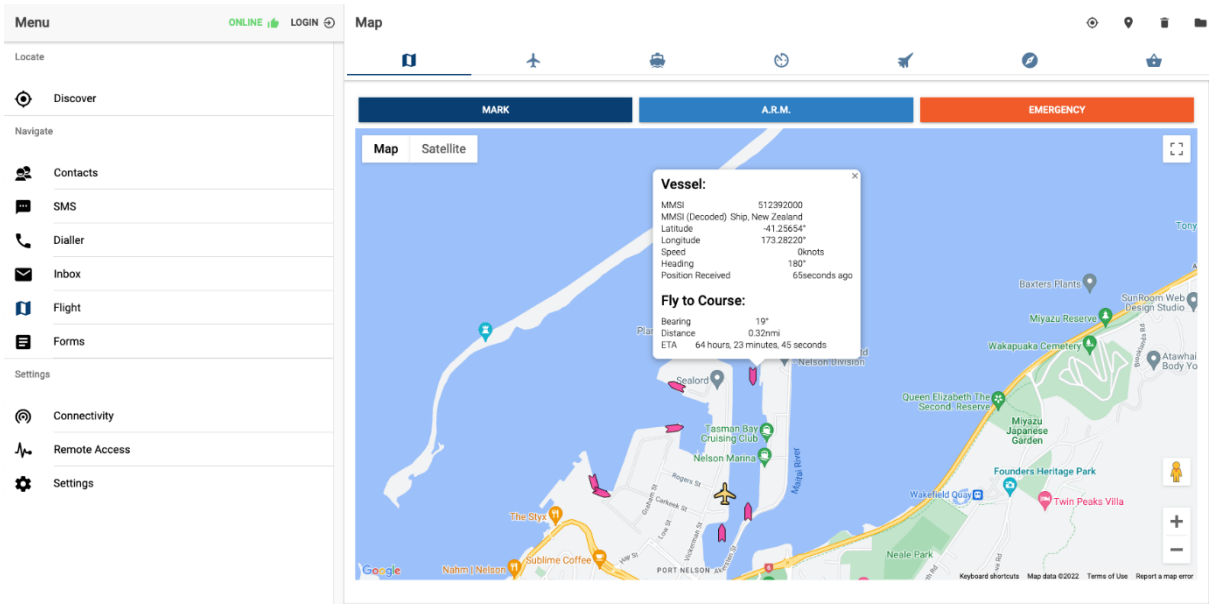


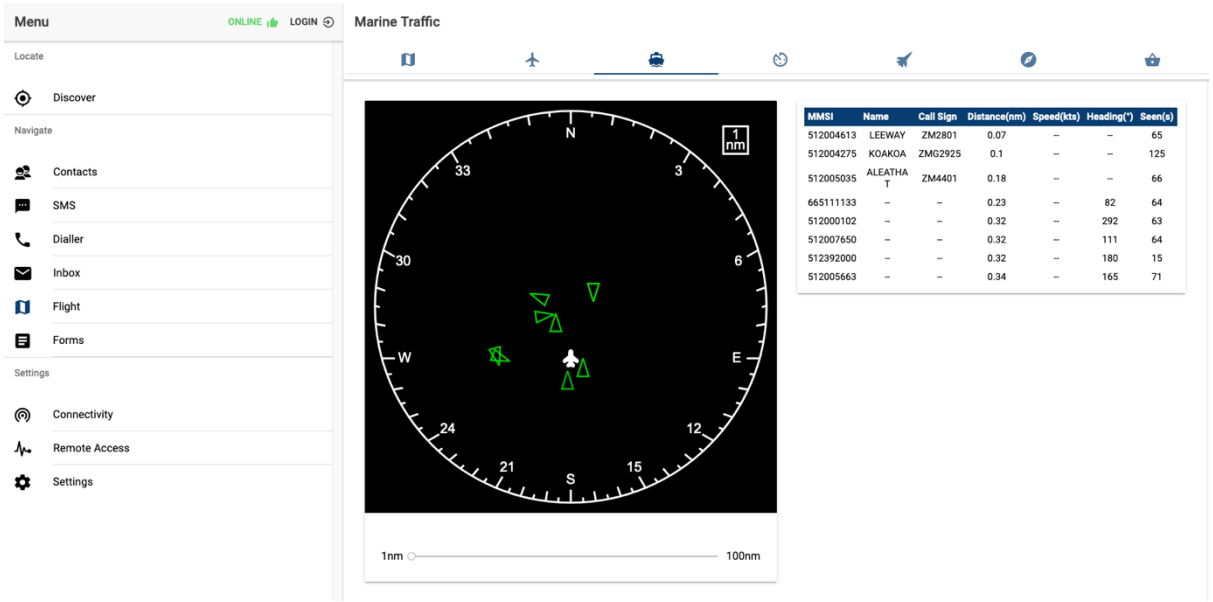
Once activated on the SDR and assigned as a source in DZMx Connect, the user can use the Flight Page in DZMx Connect to view vessels in the vicinity. The Map tab and Marine Traffic tabs provide two different views. The Marine Traffic view provides an AIS instrument like representation of traffic.

On both displays the vessel colour fades slowly to transparent after it loses contact, before fully disappearing after 10minutes.

Clicking on a vessel in the map view will provide vessel information and details on a “Fly to Course” including bearing, distance and ETA to that vessel.

Clicking on a vessel in the marine traffic view list will highlight that vessel in the display by filling in the icon. The slider can be used to adapt the scale





MMSI	Name	Call Sign	Distance(nm)	Speed(kts)	Heading(°)	Seen(s)
512004613	LEEWAY	ZM2801	0.07	–	–	65
512004275	KOAKOA	ZMG2925	0.1	–	–	125
512005035	ALEATHA T	ZM4401	0.18	–	–	66
665111133	–	–	0.23	–	82	64
512000102	–	–	0.32	–	292	63
512007650	–	–	0.32	–	111	64
512392000	–	–	0.32	–	180	15
512005663	–	–	0.34	–	165	71

Note: The DZMX stores a list of vessel names, MMSI and type internally to make recall easier

Configuration

AIS License and Application Activation

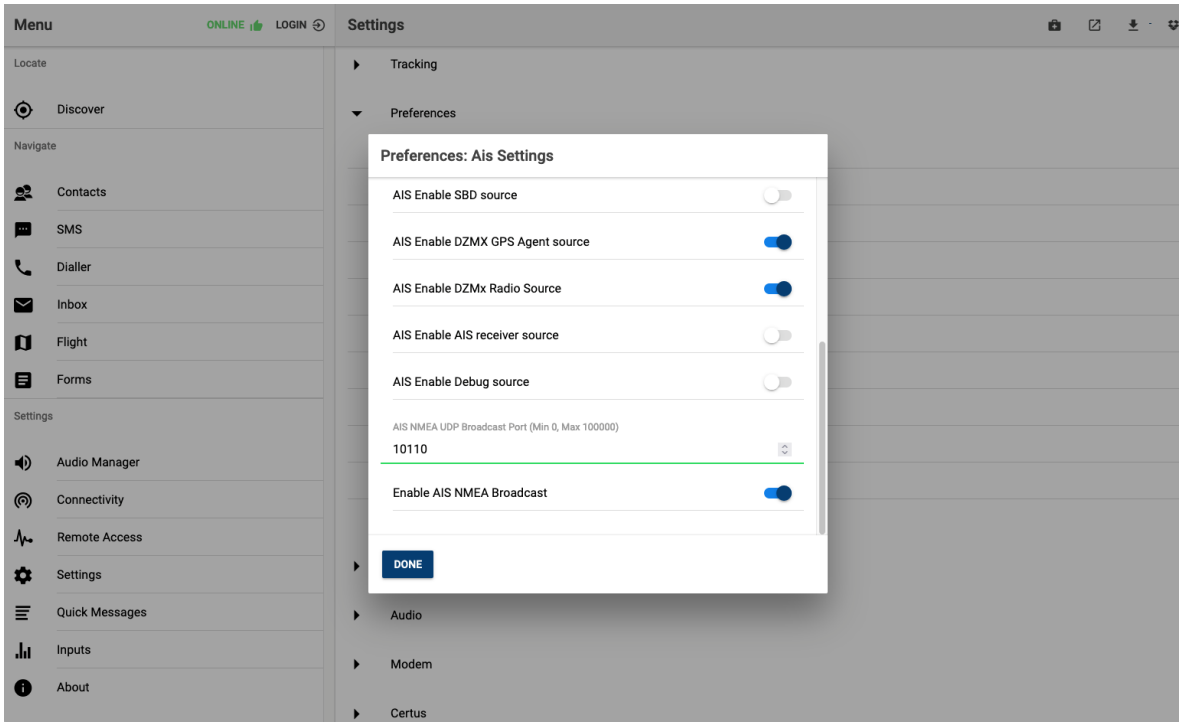
To use the NMEA streaming capability, the DZMx must be connected via Wi-Fi to the receiving device and have valid **SDR** and **marine-AIS** licenses installed. (Firmware v4.13.0 and higher, SDR license is not required)

The AIS mode of the frequency monitor should be selected.

The data streaming function to a connected device (UDP - User Datagram Protocol) can be configured using the DZMx Connect interface

AIS UDP Broadcast Settings

The AIS UDP Broadcast settings available in DZMx Connect may be found in (**Settings -> Preferences -> AIS**). Scroll down to find them.



Setting	Suggested Value
AIS NMEA UDP Broadcast Port	10110
Enable AIS NMEA Broadcast	On/Off: activates/disables the streaming function

Note: The DZMx will require a power cycle if the port setting is changed to ensure the change takes effect

External Application Configuration

The device to be used should be connected to the DZMx Wi-Fi.

To receive AIS data the external application should be set to receive on the same port as the DZMx Broadcasts UDP. The configuration will be according to the provider instructions. Once setup, AIS traffic should then be available in the application.

The application display can be compared to the Flight Page in DZMx Connect to verify the marine traffic is correctly received.

AIS Displayed on Electronic Flight Bags (EFBs)

AIS data can be displayed over Wi-Fi to DZMx Connect and some 3rd Party EFBs

Contact Flightcell International to find out which 3rd Party EFB's are available to display AIS tech@flightcell.com

Appendix 5: DZMx ARINC 429 Installation

Overview

The DZMx supports an optional ARINC 429 dual receiver, single transmitter expansion card.

An authorised installer can set the ARINC 429 logging functions as follows.

- enable the recording of data from the two ARINC 429 receivers into a CSV file in the DZMx flight data directory
- modify, download and upload an ARINC 429 label filter to ensure only the desired labels are recorded
- set the speed, label flip and parity enforcement on each receiver channel
- setup auto-send via email of ARINC 429 flight data on power up, in a similar manner to other flight data logs

Note: The DZMx can receive ~500 ARINC 429 100kbps messages per second per receive channel without data loss. The HW filter should be used to ensure that the message rate to be logged does not exceed that.

ARINC 429

For the ARINC 429 dual receiver to be used, the ARINC 429 hardware card must be installed in the DZMx and it must be running firmware v4.12 or higher

Configuration

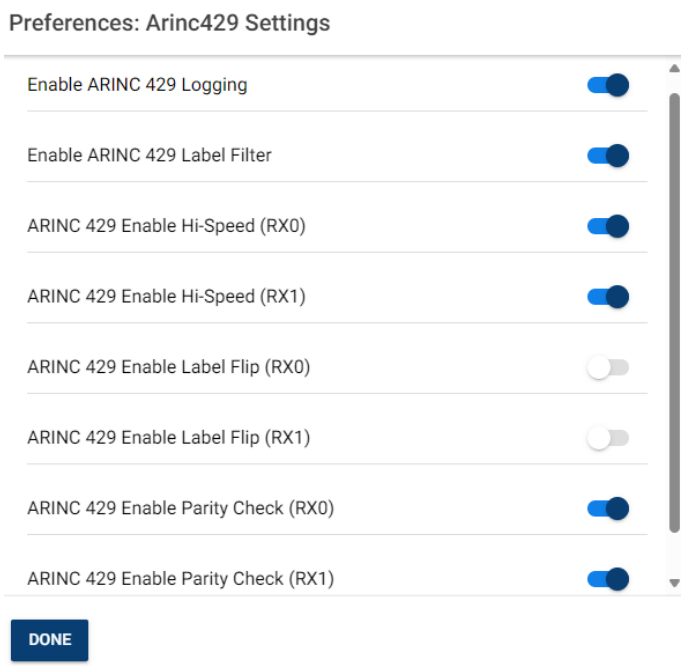
To configure the DZMx ARINC 429 receiver, you need to be logged in to DZMx Connect as an Installer.

To log in, refer to Section 6: Configuration in the DZMx Installation Manual.

Setting the DZMx for ARINC 429

Once logged into DZMx Connect as an installer, go to **Settings > Preferences > ARINC 429**

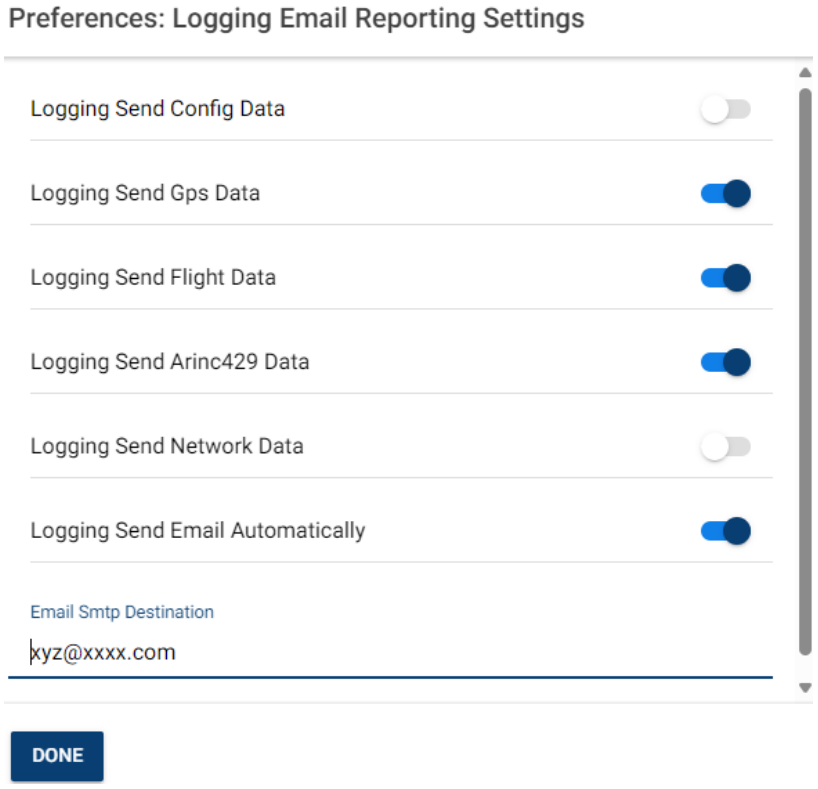
Set ARINC 429 settings as below and select Done



Logging Email Reporting Settings

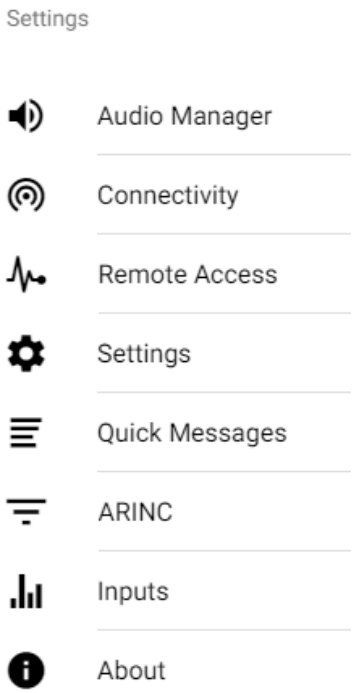
The DZMx can automatically transmit log data using the DZMx Email Outbox feature. Using DZMx Connect, go to **Settings > Preferences > Logging Email Reporting** to specify which logs are transmitted and to activate automatic emailing of the logs.

Using DZMx firmware v4.12 or later, ARINC 429 Data is available for selection together with other **"logging email reporting"** settings as required.



ARINC 429 DZMx Connect Interface

The Arinc 429 status, label filter and data feed can all be accessed through the DZMx Connect sidebar menu ARINC page. The user must be logged in as an Installer to do this.

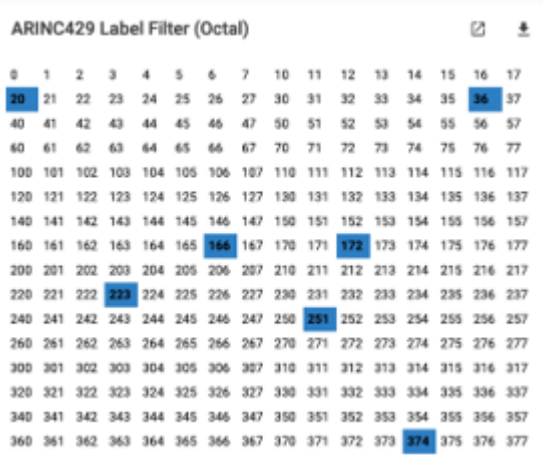


ARINC 429 Status

The ARINC 429 Status shows the current status of the ARINC 429 settings.

ARINC 429 Label Filter

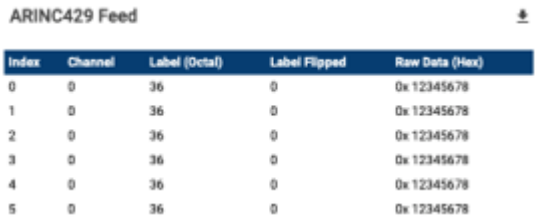
The ARINC 429 Label Filter allows the user to click on a label to activate/de-activate a label filter.



As defined by the ARINC 429 specifications, these labels are in Octal (base 8) format. This section also allows a user to download and upload a JSON formatted filter table by selecting on the upload or download icons in the top righthand corner

ARINC 429 Feed

The ARINC 429 Feed displays the current output being logged into file. Since ARINC can run at high speed, this feed may lag the actual log file. It is provided mainly for diagnostic and setup purposes. This section also allows the user to download the current log file.


ARINC429 Feed

Index	Channel	Label (Octal)	Label Flipped	Raw Data (Hex)
0	0	36	0	0x 12345678
1	0	36	0	0x 12345678
2	0	36	0	0x 12345678
3	0	36	0	0x 12345678
4	0	36	0	0x 12345678
5	0	36	0	0x 12345678

Select the Download icon in the top right corner to do this.

Appendix 6: Aerial Firefighting Application Manual

Firmware Version 4.12.0 and later

Introduction

The Flightcell DZMx can be used to provide automated reporting of aerial firefighting operations, to meet the requirements of fire management agencies such as the National Aerial Firefighting Centre (NAFC) in Australia and the US Forest Service (USFC). It collects data from the aircraft and sends real-time firefighting events and GPS position information to tracking providers and fire authorities.

Where does the firefighting data come from?

The DZMx can capture firefighting data in two ways:

- From the DZMx General Purpose Inputs (GPIs). which can be connected to various parts of the firefighting installation.
- From the data output of an Automatic Water Tank Controller (AWTC). This data is sent as regular reports over a serial data connection.

What data is produced?

Firefighting data is sent as event reports to a tracking service provider in real-time. There are three fire-specific events sent to tracking providers:

- Fill Event, including amount of water picked up
- Drop Start Event
- Drop End Event, including amount of water dropped

How to install?

Before configuring the Fire App, make sure that the DZMx is set up for tracking, and can send position reports to the tracking provider. Refer to the DZMx Installation Manual, DZMx Tracking section.

Then, follow the appropriate steps in the Fire App Installation Guide below.

Then, verify the configuration with the Fire App Testing Guide below.

For configurations that require using the DZMx GPIs, general information can be found in the DZMx Installation Manual, DZMx Inputs and Outputs section. Note that an input expansion card may be needed for some firefighting configurations, especially if both a bucket and tank are installed. The DZMx comes with five GPIs. The input expansion card provides seven additional GPIs. Information on the Input Expansion Card option can be provided by your Flightcell reseller or installer.

Settings Reference

This is a reference for all the settings directly related to the Firefighting Application, and what they mean.

Firefighting Inputs

The firefighting application supports the following inputs:

Input name	Connects to	States	Used to detect	Used to report	Calibration value(s)
Fill Pump	Fill Pump	Off, on	Pump start and stop	Amount of water loaded into the tank Amount of water dropped	Pump flow rate
Drop Release / Bucket Drop Release	Tank or bucket door	Open, closed	Door opened Door open	Tank or bucket door opened (momentary release, door closes passively) Tank or bucket door open (door maintained open until switch released)	
Drop Type Select	Drop Type Select input	Door 1 selected, Both doors selected	What doors are open	Whether a drop is a partial (50%) drop or a full drop	
Fill Level / Bucket Load Cell	Fill level indicatior / Bucket load cell indicator	Variable input	Fill Level / Load on hook	Amount of water loaded into the tank Amount of water dropped	High and low calibration values
Additive Pump	Additive pump	Off, on	Additive pump start Additive pump time active	Whether additive was used (momentary input) Amount of additive injected (maintained input)	Pump flow rate
Additive Type Select	Additive type select switch	Foam, gel	Type of additive selected	Type of additive used	
Bucket Connected	Bucket connected switch	Open, closed	Whether a bucket is connected	Which container is selected (bucket or tank)	

Two separate water containers can be configured, a tank and a bucket. The settings for the tank are as follows:

- **Fill Pump**: Tank pump status (on or off).
- **Fill Level**: Volume of water in the tank (variable voltage).
- Only one of these two inputs (Fill Pump or Fill Level) need to be configured. If both are configured, Fill Level will take priority.
- **Drop Release**: Tank drop release input. Can also be used for the bucket if used in conjunction with the Bucket Connected input. Using the Drop Release Input Type setting, the drop release input can be configured as a momentary release button or a maintained 'door open' input.
- **Drop Type Select**: Indicates a full or half release of the tank. If half the tank is already released, attempting to release half the tank again will result in no water being dropped. For use with a Fill Pump input.

The settings for buckets are as follows:

- **Bucket Load Cell**: Load cell input for measuring the volume of water in the bucket (variable voltage).
- **Bucket Drop Release**: Bucket drop release input. Using the Bucket Drop Release Input Type, the bucket drop release input can be configured as a momentary release button or a maintained 'door open' input
- **Bucket Connected**: Indicates whether the tank or bucket is connected. Required when the installation allows for switching between a tank and a bucket.

By using the Bucket Connected input, if two containers are installed, they can share a single drop release input if desired. If so, the Bucket Drop Release input should not be configured, and the Drop Release input should be configured for both the tank and bucket. However, the Drop Type Select input will not work for the bucket in this configuration.

The DZMx can also be configured to add additive to either container. If two containers are in use, then the DZMx will use the Bucket Connected input to determine which container to use:

- **Additive Pump**: Additive pump status (on or off) + **Additive Pump Input Type**: The additive pump can be configured as a button or a timed input

Using the Additive Pump Input Type setting, the additive pump can be configured as a button (momentary) or a timed input (maintained).

- **Additive Type Select**: Switches between Gel/Foam as the selected additive.

These inputs can be used on any of the DZMx Inputs. See "DZMx Inputs" in the Installation Manual, for information on wiring and configuring the inputs.

Firefighting Settings

The following settings can be used to configure the Fire App:

- **Firefighting Enable**: Enables the fire app.
- **Kawak AWTC Connected**: Allows a Kawak AWTC to be connected to the DZMx RS-485 port.

- **Debug Port Config**: Setting this to ‘Erickson AWTC’ allows an Erickson AWTC to be connected to the DZMx RS-232 port. This is not a Fire App setting, it is under Hardware -> External on DZMx Connect, or Hardware Config on the DZMx main screen.
- **Hover**: Enables detecting if an aircraft is hovering or not. Required for Fire App configurations with a helicopter and no AWTC. This is not a Fire App setting, it is under Tracking -> Periodic on DZMx Connect, or Tracking -> Periodic Events on the DZMx main screen.
- **On Board Units**: Unit of volume the tank/bucket capacity is measured in. Options are Litres/U.S. Gallons/Imperial Gallons. All other Fire App settings (e.g. tank volume, fill pump rate) are assumed to be in the same unit that is configured in the Onboard Units setting.
- **Event Report Units**: Unit of volume to use in the messages to the tracking provider when reporting fill and drop events. Options are Litres/U.S. Gallons/Imperial Gallons.
- **Tank Volume**: The capacity of the water tank, specified in 'on board units'.
- **Bucket Volume**: The capacity of the bucket, specified in 'on board units'.
- **Fill Flow Rate**: The flow rate of the fill pump specified in 'on board units' per minute.
- **Additive Flow Rate**: The flow rate of the additive pump specified in 'on board units' per minute.
- **Additive Type Loaded**: What type of additive has been loaded into the additive tank. Options are Foam/Gel/Retardant.
- **Min Valid Drop Time**: Advanced setting. A drop release duration less than this time is ignored. The unit is seconds. Not to be used in conjunction with the Drop Type Select Input. 1 is not a valid value for this setting.
- **Partial Drop Time Limit**: Advanced setting. If a tank is configured with no Drop Type Select input and no Fill Level input, then configuring this setting allows for detection of a partial or full drop. The time unit is seconds. If the drop duration is less than Partial Drop Time Limit, then the drop volume will be reported as half the volume in the tank. The next drop will always be reported as a full drop. Note that 1 is not a valid value for this setting.
- **Max Valid Fill Time**: Advanced setting. Sets a maximum time the Fill Pump input can be active for a fill to be valid. The unit is seconds.
- **Maximum Fill Speed**: Only for fixed wing aircraft with a Fill Level input installed. Setting this to a value other than 0 will cause the DZMx to record the tank level on the ground instead of in the air. It will only record the tank level as long as it is stable and under the set speed. The unit is knots.
- **Water Tank Calibration Volume**: For use with the Fill Level input. Normally this will be set as part of installation, not manually. Specified in ‘on board units’. The Fill Level input has low and high calibration values in the Input Config settings. The low calibration value is always for an empty tank, but the high calibration value is for the Water Tank Calibration Volume. Ideally, this would be a full tank to increase accuracy.
- **Bucket Calibration Volume**: For use with the Bucket Load Cell input. Normally this will be set as part of installation, not manually. Specified in ‘on board units’. The Bucket Load Cell input has low and high calibration values in the Input Config settings. The low calibration

value is always for an empty tank, but the high calibration value is for the Bucket Calibration Volume. Ideally, this would be a full bucket to increase accuracy.

» **Fire Tank Data Logging**: Advanced setting. Logs fire app data until the DZMx is powered off and on again. For diagnostic support.

Fire App Logic

This section describes when tracking messages are sent from the Fire App. It leaves out many details and edge cases. If you want more detail on how the tracking system works, contact Flightcell.

Filling Logic Table

Water Level method	Fill Position Marked	Fill Level measured and Fill Event Created
Fill Pump	When the fill pump is switched off.	When the fill pump is switched off. The fill level is calculated based on the fill pump running time.
Fill Level / Load Cell	At Take-off, or when moving out of Hover (if enabled), and only if the water level has increased since the last reported Fill or Drop event.	The measured water volume is level. This is typically a few seconds after moving out of hover or after take-off.
Erickson AWTC	When the water level stops rising quickly.	When the measured water volume is level.
Kawak AWTC	When the fill pump is switched off.	When the measured water volume is level and the aircraft is not hovering.

Dropping Logic Table

Water Level method	Drop Release Config	Drop Start Position	Drop End Position Marked	Drop Volume Calculated and Drop End Event Created
Fill Pump	Drop Release	When door/button activated	When door closed/ button released	When button released. Uses the Drop Type Select input or the Partial Drop Time limit to determine the amount dropped. Assumes 100% if no Drop Type Select input or Partial Drop Type limit configured
Fill Level or Load Cell	Drop Release Momentary	When button pressed	When empty or as Fill Level drop rate starts to level off.	After button released and when the Fill Level input is level or when empty
Fill Level or Load Cell	Drop Release Maintained	When door opened	When empty or when door closed	When door is shut and the Fill Level input is level, or when empty
Erickson AWTC	Erickson AWTC	When drop button pressed and tank not empty	When tank door closed or tank volume is level	When tank volume is level
Kawak AWTC	Kawak AWTC	When drop button pressed and tank not empty	When tank door closed or tank empty	When tank volume is level

Fire App Installation Guide

This section contains instructions to configure a DZMx to use the Firefighting Application. Follow the Fire App General Installation Instructions section first, and then the section relevant to the aircraft's configuration.

The Fire App settings are available either on the main screen or through DZMx Connect (see table below). Instructions in the rest of this section use the DZMx main screen unless otherwise specified. For more information on configuring inputs, refer to Section 6 of the Installation manual, input configuration section.

	DZMx Screen	DZMx Connect
Main Settings	MENU -> Tracking -> Firefighting Options > Firefighting Enable > Yes	Settings -> Tracking -> Fire > Firefighting Enable
Input Settings	MENU -> Hardware Config -> Input Configuration	Settings -> Inputs -> Fire

The DZMx currently supports the following configurations:

- Bucket with fill/drop input lines
- Tank with fill/drop input lines
- Erickson AWTC
- Kawak AWTC
- AFDAU-T1
- Tank or bucket with fill/drop input lines and switch to indicate whether a tank or bucket is connected

Fire App General Installation Instructions

Before installing, ensure the following general steps have been taken:

- Ensure you have the Fire license. If you do not, you will be unable to use the Fire App. Licenses can be checked through DZMx Connect -> About -> License. If you do not have the Fire license, contact Flightcell support.

Using the DZMx main screen Menu

- Turn Firefighting Mode on

  (**Tracking -> Firefighting Options > Firefighting Enable > Yes**).
- If the aircraft will be filling while hovering, turn hovering on

  (**Tracking -> Periodic Events -> Hover > Yes**) as some configurations rely on detecting the difference between hovering and flying.
- Set Onboard Units

  (**Tracking -> Firefighting Options -> Onboard Units**) to the unit the tank/bucket capacity is measured in. The options are Litres, U.S. Gallons, or Imperial Gallons. **All other Fire App settings (e.g. tank volume) are assumed to be in the same unit that is configured in the Onboard Units setting.** Changing the Onboard Units setting will not change the value of any other settings. For example, if you set the tank volume to 100 liters, then change the Onboard Units to US gallons, then the tank volume will now be 100 gallons.
- Set Event Report Units

  (**Tracking -> Firefighting Options -> Event Report Units**) to the unit your tracking provider wishes to receive the fill/drop amounts in. The options are Litres, U.S. Gallons, or Imperial Gallons. For example, NAFC likes to receive their reports in Litres.

After installing, make sure to test the configuration. See the Fire App Testing Guide section for more information.

Instructions for Aircraft with a Bucket

Using the DZMx main screen Menu

- Set Bucket Volume to the volume of the bucket
  (**Tracking -> Firefighting Options -> Bucket Volume**).
- Connect the Bucket Drop Release input to one of the DZMx input lines, and configure the input
  (**Hardware Config -> Input Configuration -> Bucket Drop Release -> Input Designation**). Also configure the Input Type (maintained or momentary) and Input Configuration (normally closed or normally open).
- Optionally, set up additive inputs if you wish to track additives (See section 'Instructions for Additive Inputs').
- Connect the Bucket Load Cell input to one of the DZMx input lines, and configure the input
  (**Hardware Config -> Input Configuration -> Bucket Load Cell -> Input Designation**).
- Connect the Bucket Connected input to one of the DZMx input lines, and configure the input
  (**Hardware Config -> Input Configuration -> Bucket Connected -> Input Designation**). Also configure the Input Configuration (normally closed or normally open).
- Calibrate the Bucket Load Cell input:
  - With an empty bucket suspended, select Calibrate Low Level from the Bucket Load Cell menu
  - (**Hardware Config -> Input Configuration -> Bucket Load Cell -> Calibrate Low Level**) and press **ENTER** to calibrate.
  - With a full bucket suspended, select Calibrate High Level from the Bucket Load Cell menu
  - (**Hardware Config -> Input Configuration -> Bucket Load Cell -> Calibrate High Level**) and press **ENTER**.
- The DZMx will then prompt for the current volume in the bucket. After entering in the amount, press ENTER to complete calibration. If you are reading the load off the load cell to enter into the high calibration setting, remember to take off the weight of the bucket from the displayed weight. The volume entered cannot be higher than the full bucket volume specified in the Bucket Volume setting.
  - Note that if any part of the system is modified (i.e. changing to a different bucket) then the Bucket Load Cell input must be recalibrated. This can be performed while doing the first fill using the new bucket.
- Ensure the Fill Level, Fill Pump and Drop Release inputs are not installed: (Bucket Drop Release should be installed, Drop Release should not)
  - Hardware Config -> Input Configuration -> Fill Level -> Input Designation
  - Hardware Config -> Input Configuration -> Fill Pump -> Input Designation

- Hardware Config -> Input Configuration -> Drop Release -> Input Designation

Instructions for Aircraft with a Tank

Using the DZMx main screen Menu

- Set Tank Volume to the volume of the tank
  (**Tracking -> Firefighting Options -> Tank Volume**).
- Connect the Drop Release input for the tank to one of the DZMx input lines, and configure the input
  (Hardware Config -> Input Configuration -> Drop Release -> Input Designation). Also configure the Input Type (maintained or momentary) and Input Configuration (closed when doors closed or open when doors closed).
- Optionally, set up additive inputs if you wish to track additives (See section 'Instructions for Additive Inputs').
- Tanks can be set up to work with either a Fill Pump input or a Fill Level input. Only one needs to be set up. If you have the choice, Flightcell recommends using a Fill Level input, because with a Fill Pump input there is no way to tell exactly how much water has been dropped, and performing partial drops requires wiring an extra input.
- To set up a tank with a Fill Level input:
  - Connect the Fill Level input to one of the DZMx input lines, and configure the input
  - **(Hardware Config -> Input Configuration -> Fill Level -> Input Designation**).
  - If the aircraft is fixed wing, and the aircraft is being filled on the ground, set the Maximum Fill Speed setting (Tracking -> Firefighting Options -> Maximum Fill Speed). This records the tank level on the ground instead of in the air, if the tank level is stable and under the set speed. This is not mandatory, but it is recommended for more accurate fill level tracking. To disable this, leave the Maximum Fill Speed setting at zero.
  - Calibrate the Fill Level input:
    - With an empty tank, select Calibrate Low Level from the Fill Level menu (Hardware Config -> Input Configuration -> Fill Level -> Calibrate Low Level) and press ENTER to calibrate.
    - With a full, or almost full tank, select Calibrate High Level from the Fill Level menu
    - (Hardware Config -> Input Configuration -> Fill Level -> Calibrate High Level) and press ENTER. The DZMx will then prompt for the current volume in the tank. After entering in the amount, press ENTER to complete calibration. The volume entered cannot be higher than the full tank volume specified in the Tank Volume setting.
    - Note that if any part of the system is modified (i.e. changing to a different tank) then the Fill Level input must be recalibrated. This can be performed while doing the first fill using the new tank.

- To set up a tank with a Fill Pump input:
  - Connect the Fill Pump input to one of the DZMx input lines, and configure the input

(**Hardware Config -> Input Configuration -> Fill Pump -> Input Designation**). Also configure the Input Configuration (closed when pump off or open when pump off).

- Set the Fill Flow Rate to the flow rate of the pump per minute
  (**Tracking -> Firefighting Options -> Fill Flow Rate**).
- If setting up partial drops is desired, connect the Drop Type Select input to one of the DZMx input lines, and configure the input
  (**Hardware Config -> Input Configuration -> Drop Type Select -> Input Designation**). Also configure the Input Configuration. This input selects either dropping only door one or both doors. It is used to report partial drops (either dropping 50% of the tank, or all of it).

Instructions for Aircraft with an Erickson AWTC

Using the DZMx main screen Menu

- Set the Debug Port Configuration to “Erickson AWTC”
  (**Hardware Config -> Debug Port Config > Erickson AWTC**).
- Connect the Erickson AWTC to the DZMx RS-232 Debug Port.
- Optionally, set up additive inputs if you wish to track additives (See section ‘Instructions for Additive Inputs’).

Instructions for Aircraft with a Kawak AWTC

Using the DZMx main screen Menu

- Turn the Kawak AWTC Connected setting on
  (**Tracking -> Firefighting Options -> Kawak AWTC Connected**)
- Set Tank Volume to the volume of the tank
  (**Tracking -> Firefighting Options -> Tank Volume**).
- Connect the Kawak AWTC to the DZMx RS-485 Port, refer to wiring diagrams for correct connection
- The Kawak AWTC already tracks additives, so no additional inputs are required

Instructions for Aircraft with an AFDAU-T1

Using the DZMx main screen Menu

- Set the Debug Port Configuration to “AFDAU”
  (Menu > Hardware Config > Debug Port Config > AFDAU).
- Connect the AFDAU-T1 to the DZMx RS-232 Debug Port, refer to wiring diagrams for correct connection
- The AFDAU tracks required telemetry, so no additional inputs are required.

Instructions for Additive Inputs

The DZMx will report additives in drop events if they are configured. There are several ways to configure additive inputs.

There are two options for telling the DZMx what additive the aircraft is using.

- The **Additive Type Loaded** setting - Always uses the selected additive. This has options for Foam, Gel, Retardant, or None. Set the setting to a value other than None to use this method using the DZMx main screen Menu
  (Tracking -> Firefighting Options -> Additive Type Loaded).

- The **Additive Type Select** input - Allows for switching between Foam and Gel additives. Retardant is not usable with this method. To do this, connect the Additive Type Select input to one of the DZMx input lines, and configure the input. Using the DZMx main screen Menu
  (Hardware Config -> Input Configuration -> Additive Type Select -> Input Designation). Also configure the Input Configuration.

There are three options for telling the DZMx when the additive has been added and quantity.

- **No Additive Pump input** - The additive will be always added. The concentration of the additive will not be stored.
- **Additive Pump input (momentary)** - If the input is activated, the additive will be added. The concentration of the additive will not be stored.
- **Additive Pump input (maintained)** - If the input is activated, the additive will be added. The concentration of the additive will be stored based on the Additive Flow Rate and how long the input was activated for. This is the only option which allows for reporting how much additive has been dropped.

For options 2 and 3, to configure the Additive Pump input, connect the Additive Pump input to one of the DZMx input lines, and configure the input. Using the DZMx main screen Menu
(Hardware Config -> Input Configuration -> Additive Pump -> Input Designation).
Also configure the Input Type (maintained or momentary) and Input Configuration (closed when pump off or open when pump off).

Instructions for Aircraft with a Tank or Bucket

This is an advanced configuration.

- Install a tank and bucket as normal following the instructions above. However:
- To save an input, do not install the Bucket Drop Release switch. Instead, the tank and bucket can share the standard Drop Release switch. This is optional.
- Tank events will only be recorded when the Bucket Connected input is off. Bucket inputs will only be recorded when the Bucket Connected input is on.

Advanced settings

There are several settings for the Fire App that haven't been described in the main installation instructions. See the Fire App Settings Reference section above for more information. Some of these settings are only available through DZMx Connect. They are as follows:

- Max Valid Fill Time
- Min Valid Drop Time
- Partial Drop Time Limit

- Fire Tank Data Logging

Fire App Testing Guide

This section contains tests to verify your configuration. There are tests for the following configurations:

- Fill Pump configured
- Fill Level / Bucket Load Cell configured
- Erickson AWTC configured
- Kawak AWTC configured

Before starting any of these tests:

- Restart the DZMx to ensure any settings changes have been applied.
- Ensure you are properly connected to your tracking provider. For example, press the MARK key to send a tracking message, and view it through the tracking provider.
- Open the fire diagnostics screen on the DZMx screen (Main Menu -> Diagnostics Menu -> Fire Tank Diagnostics / Fire Bucket Diagnostics / AWTC Diagnostics). This page contains useful information to help test the Fire App.

Fill Pump configured

- Start with the tank empty.
- Turn the fill pump on for a similar amount of time to how long a real fill would take (or, do a real fill).
- Check tank volume has increased on the diagnostics screen and a fill message has been sent.
- Turn drop release on for a similar amount of time to how long a real drop would take (or, do a real drop).
- Check tank volume has dropped and drop start/drop end messages have been sent.

Fill Level / Bucket Load Cell configured

- Start with the tank/bucket empty, and the aircraft grounded or hovering.
- Add water to tank/bucket (at least 20% of max volume)
- Check tank/bucket volume has increased on the diagnostics screen.
- Start flying.
- Check fill message has been sent and tank/bucket state has returned to level.
- Turn drop release on and drop some water, then turn drop release off.
- Check tank/bucket volume has dropped, drop start/drop end messages have been sent, and tank/bucket state has returned to level.

Erickson AWTC configured

- Start with the tank empty.
- Fill it with at least 250 gal of water.
- Check tank volume has increased on the diagnostics screen and a fill message has been sent.
- Activate drop signal, drop some water and then deactivate drop signal.
- Check tank volume has dropped on the diagnostics screen and drop start/drop end messages have been sent.

Kawak AWTC configured

- Start with the tank empty, and the aircraft grounded.
- Fill it with at least 250 gal of water.
- Check tank volume has increased on the diagnostics screen and a fill message has been sent.
- Activate drop signal, drop some water and then deactivate drop signal.
- Check tank volume has dropped on the diagnostics screen and drop start/drop end messages have been sent.

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Technical support

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