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Flightcell International Ltd

DZMx Installation Manual

Firmware Version: 2.19.0



Flightcell DZMx Installation Manual

MAN_DZ4_001

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Section 1 Installation Manual

This manual provides information on installation and configuration of the Flightcell DZMx. This manual has been updated for the firmware release 2.19.0. Additional functionality is regularly being developed and implemented for the DZMx.

Supplied documentation

The following installation documentation is provided on a USB stick with your DZMx. These documents may be referred to in some sections of the manual. The latest versions are also available on our support webpage, www.flightcell.com/support.

- » DZMx Wiring Diagrams
- » DZMx Mounting Diagrams
- » Flightcell Antenna Specifications
- » 3D CAD Drawings

DZMx Equipment

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

DZMx Connectors

A connector kit is supplied with the DZMx. This contains:

Supplied Connector Kits with the DZMx

Item	Quantity	Part Number
TNC connector	2	122108
BNC connector	1	112116
Either: D25 Connectors (commercial variants).		
» D25 crimp socket connector	1	M24308/2-3F
» D25 crimp plug connector	1	M24308/4-3F
» D25 metal backshell, straight	2	8655MH2501BKLF
Or: D38999 connector (military variants).		
Backshell	1	D38999/26WE-35SN M85049/38S-17W



Note: The TNC and BNC connectors are sized for RG-58 sized cable.

Ethernet/USB Connector Module

A Flightcell USB/Ethernet connector module is provided with each DZMx. It is used for terminating the DZMx's USB and Ethernet connections. It is compulsory that the 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. Versions are available with either D-type (commercial) or D38999 (military) connectors. Mating connectors for the wiring loom are included with the connector module.

List of parts provided with the USB/Ethernet kit

Item	Quantity	Part Number
Commercial (with D9 connector)	1	IDP_00013
Mating Connectors:		
» D9 crimp socket connector	1	1478762-9
» D9 metal backshell, straight	1	M24308/2-1F
Military (with D38999 connector)		
Mating Connectors		
» Backshell	1	M85049/38-11W
» Connector	1	D38999/26WB-35SN

DZMx Specifications

Versions and Part Numbers

The DZMx can be built in a wide range of configurations, with a range of hardware options. The DZMx part number for each variant designates these options. These are:

- » Installed modems (see "[Modem Configuration](#)" on [page 24](#) for a list of supported modems)
- » Faceplate options:
 - » DZUS (5½') mount
 - » GA (6¼") mount
- » Type of main connector
 - » Standard - two D25 connectors
 - » Military - one milspec D38999 connector
- » NVIS compliance
 - » NVIS-B
 - » NVIS-A (only available on versions with military connectors).

Following are the most common DZMx variants. Note that this list is not exclusive and other variants may be supplied to meet customers' specific requirements.

DZMx modem configuration options and part numbers

Configuration	DZUS mount	GA mount
No internal modems	DZP_04-000	DZP_04-010
Iridium Only	DZP_04-100	DZP_04-110
Iridium, military connectors, NVIS-A	DZP_04-120	
3G Cellular Only	DZP_04_200	DZP_04_210
Iridium + 3G Cellular	DZP_04-300	DZP_04-310
Iridium + Iridium	DZP_04-400	DZP_04-410
Iridium, military connectors, 4G Cellular, SBD modem	DZP_04-780	
Iridium + 4G Cellular	DZP_04-800	DZP_04-810
4G Cellular Only	DZP_04-900	DZP_04-910

Electrical

DZMx electrical specifications

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.

Part/Item	Parameter	Value
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 Dimensions

DZMx dimensions (metric units)

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

All extruded and machined metalwork is 6061 aluminium, passivated with a chromate conversion coating (except for the front panel) to maintain electrical conductivity between mechanical components and prevent corrosion. The front panel is black anodized.

DZMx Weights

DZMx weights for the various modem configurations

Modem Configuration	Weight
No internal modem	580g
Iridium	650g
Iridium + 3G Cellular	720g
Iridium + Iridium	720g

Environmental Qualifications

The DZMx complies with the following RTCA-DO160G standards.

Section	Description	Equipment Category	Category Description
Section 4.5.1	Ground Survival Low Temp and Short-Time Operating Low Temp	B2	B2 - Unpressurised, non-temp controlled, up to 25,000ft
Section 4.5.2	Operating Low Temp	B2	B2 - Unpressurised, non-temp controlled, up to 25,000ft
Section 4.5.3	Ground Survival High Temp and Short-Time Operating High Temp	A2	A2 - Partially temp controlled, pressurized to 15,000ft/temperature controlled, unpressurised up to 15,000ft
Section 4.5.4	Operating High Temp	A2	A2 - Partially temp controlled, pressurized to 15,000ft/temperature controlled, unpressurised up to 15,000ft
Section 4.6.1	Altitude	F1	F1 - Unpressurised, controlled temp, up to 55,000ft
Section 4.6.3	Overpressure	A2	A2 - Partially temp controlled, pressurized to 15,000ft/temperature controlled, unpressurised up to 15,000ft
Section 5	Temperature Variation	B	Internal, non-temperature controlled, 5°C min per min.

Section	Description	Equipment Category	Category Description
Section 7.2	Operational Shocks	A-5R	Standard operational shock and crash safety, Crash safety to Aircraft type 5, Test type R (All fixed wing and helicopter)
Section 7.3.1	Crash Safety (impulse)	B-5R	Standard operational shock and crash safety, Crash safety to Aircraft type 5, Test type R (All fixed wing and helicopter)
Section 7.3.3	Crash Safety (sustained)	B-5R	Standard operational shock and crash safety, Crash safety to Aircraft type 5, Test type R (All fixed wing and helicopter)
Section 8	Vibration	U-G	Robust (helicopters with unknown rotor related frequencies), Test curve G
Section 9	Explosion Proofness	H	Equipment contains hot spot surfaces and is non-spark producing under normal operating conditions.
Section 15	Magnetic Effect	Z	Less than 0.3m distance for a deflection of 1°.
Section 16	Power Input	B/Z	B - DC supplied by engine-driven alternators/rectifiers, Z - all types of aircraft electrical systems not covered by categories A and B.
Section 17	Voltage Spike	A	High degree of protection against damage by voltage spikes is required.
Section 18	Audio Frequency Conducted Susceptibility - Power Inputs	B/Z	B - DC supplied by engine-driven alternators/rectifiers, Z - all types of aircraft electrical systems not covered by categories A and B.
Section 19	Induced Signal Susceptibility	AC	A - Interference free operation is desirable, C - Equipment installed on aircraft whose primary power is constant frequency (e.g. 400Hz) or DC.
Section 20	Radio Frequency Susceptibility (Radiated and Conducted)	SS	Aircraft effects from external electromagnetic environment are minor and interference free operation on the aircraft is desirable but not required.
Section 21	Emission of Radio Frequency Energy	M	Equipment mounted in areas where apertures are EM significant and not directly in view of radio receiver's antennas.
Section 25	Electrostatic Discharge	A	Electronic equipment that is installed repaired or operated in an aerospace environment.

DZMx Manager

DZMx Manager is a browser utility that is used to configure the DZMx, including changing settings and editing the DZMx phonebook and message library. It is highly recommended that DZMx Manager is used to alter your DZMx settings as it provides a more intuitive interface than using the front panel. The DZMx Manager also allows users to import/export phonebooks, settings files and adjust the quick response messages.



Note: The audio settings are better suited to being changed using the DZMx front panel as you can hear the audio levels changing as you adjust the settings.

To use DZMx Manager:

- » Connect a laptop computer to the DZMx Ethernet port
- » Power up the DZMx
- » Open a web browser on the laptop and type in 192.168.4.1 then press enter; the home screen of DZMx Manager will open within the browser
- » Login as the **Installer** user. The default installer pin is **2468**
- » Edit the settings or phonebook or message library
- » Settings will be saved automatically after editing them



Note: The DZMx will now automatically update when settings are changed. A power-cycle after changing a setting is not required in most situations.

Permission Levels

Permission levels have been added to the DZMx Manager, to allow purchasers of the DZMx system to have more granular control of how best to configure their product.

Three different levels of roles, with individually configurable passwords, have been added to the DZMx Manager. These roles and default passwords, ordered from highest permission to lowest, are:

Role	Default Password
Installer	2468
Administrator	2580
Operator	9999

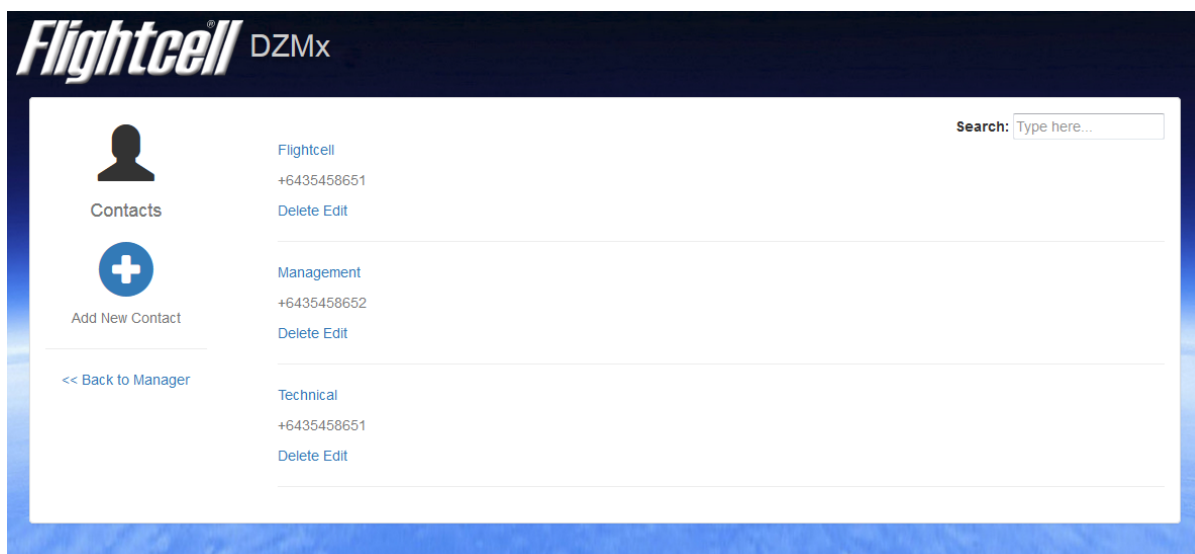
The installer role is capable of editing all DZMx settings and hardware options. The administrator role has access to all of the application features and configuration, but is unable to access hardware configurations. The operator is mainly limited to adjusting tracking and audio operational settings.



Note: Each password can be configured in the settings.

Phone Book Editor

The Phone Book Editor page allows users to delete, edit, search or add contacts. See the DZMx Manager image below for a screen shot of the Phone Book Editor page.



DZMx Manager phone book.



















Note: The first three numbers in the phone book will be assigned to the three speed dial keys.



Note: The remainder of this installation manual will explain how to set-up the DZMx using the front panel, not DZMx Manager.

DZMx Keypad References

The following table outlines the DZMx keypad buttons and how they are referenced throughout the manual. This will be a handy page to return to when unsure which button is being referenced.

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

Front Panel Installer Menu

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

Accessing the Installer Menu

On power up, only the limited range of operational settings that may need to be adjusted by the crew will be available on the menus, with the remainder password-protected.

To access the password-protected items:

- » Press MENU then scroll to **Hardware Config>>Installer Menu Enable**
- » Enter the password and press ENTER.

The default installer password is 2468.

Changing the Installer Password

The installer password can be changed as required:

- » Press MENU then scroll to **Hardware Config>>Change Installer Passwd**
- » Enter the new password and press ENTER
- » A pop up will display ***Pin Updated.***



Note: The installer password can be up to 10 digits long.

Firmware Upgrade

DZMx firmware is regularly updated to provide improvements and new features.

The DZMx is always shipped from manufacture with the latest firmware. However, if the DZMx has been in storage for some time, the installed firmware may not be the latest release.

It is recommended that once the DZMx has been installed you determine its firmware version by pressing MENU then scrolling to **Diagnostics>>About DZMx**, then check if more recent firmware is available on the Flightcell website at <http://www.flightcell.com/support>.

If newer firmware is available, it can be upgraded in two ways:

- » From a memory stick inserted in the DZMx USB port
- » Using DZMx Manager. This option is available if the software on your DZMx prior to the upgrade is V2.5.3 or later.

Upgrade using a USB Stick

To install the firmware from a memory stick:

- » Download the latest firmware from the Flightcell website and save onto the root directory on a USB memory stick
- » Ensure that there are no other firmware packages on the USB stick, as the wrong upgrade package may be used
- » Plug the memory stick into the DZMx USB connector installed in the aircraft or in the Ethernet/USB module supplied with the DZMx
- » Press MENU then scroll to **Hardware Config>>Firmware Upgrade**
- » Press ENTER to start the firmware upgrade.
- » After 5 seconds, the DZMx will indicate that a firmware update is in progress. When the update is complete, the DZMx will reboot and the home screen will reopen. The DZMx screen may go blank during an upgrade process as it will be updating the firmware on the display.



Note: Some memory sticks are formatted so that they cannot be read by the DZMx. If the firmware update fails, please try another memory stick.

Upgrade using DZMx Manager

To upgrade the firmware from DZMx Manager:

- » Download the latest firmware from the Flightcell website and save onto a known location on your PC
- » Open DZMx Manager and click "Upgrade system firmware" on the bottom of the home page; the System Upgrade page will open
- » Click **Choose File**, browse to the downloaded firmware package, then click Open
- » Click **Upload and Start Upgrade** to start the upgrade process.
- » After 5 seconds, the DZMx will indicate that a firmware update is in progress. When the update is complete, the DZMx will reboot and the home screen will reopen. The DZMx screen may go blank during an upgrade process as it will be updating the firmware on the display.



Note: Do NOT turn off the power to the DZMx while an update is in progress. Updates can take up to 50 minutes!

Diagnostics

The DZMx provides a range of diagnostic and system information on various aspects of the system. The DZMx also maintains a diagnostic log file, 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
- » Press MENU then scroll to **Diagnostic Menu>>Export System Log Files**
- » Remove the memory stick and extract the files on a PC.



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

Real-Time Diagnostics

Up-to-date information on the DZMx can be viewed in the DZMx. The following options in the **Diagnostics Menu** can be available:

- » **About DZMx:** Contains diagnostics on the 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 diagnostics on the GPS connection
- » **Sat Device Details:** Contains diagnostics on the satellite device
- » **Cell Modem Details:** Contains diagnostics on the cellular modem
- » **Cell Modem Data:** Contains diagnostics on the cell data connection
- » **Ext Modem Details:** Contains diagnostics on the external modem
- » **Tracking over IP:** Contains diagnostics on the tracking over IP. Performs a check on the set of settings used to enable Tracking over IP as well as a real time test using the configured tracking provider gateway.
- » **External Inputs:** Contains diagnostics on the external input levels.

Tracking-over-IP Diagnostics

The IP diagnostics screen performs a validation on both the DZMx settings (used for tracking over IP), and performs real time tests on the tracking provider the DZMx is currently configured for.

Settings Error Messages

The settings validation can show the following error messages:

- » "Invalid IP address/port": Ensure the IP address and port numbers are correctly set in **Tracking>>Transmission Options**
- » "Invalid APN setting": Ensure that the **APN** setting is valid with your network provider
- » "Cell Data not enabled": Ensure that the **Cell Data Enable** setting is currently On
- » "Cell Data unavailable in current flight state": The **Cell Data Enable** setting is configured to be disabled/off in the current flight state.
- » "Preferred Device is not Cell Modem": Ensure the **Tracking>>Transmission options>>Preferred Device** setting is not "Sat Only", preventing the Tracking-over-IP using the cell modem
- » "Cell Modem not enabled for tracking": Ensure that the **Hardware Config>>Modem Config>>Cell>>Use for tracking** setting is set to Yes.

Tracking Provider Test

When the diagnostics screen is displayed, the DZMx will attempt to establish a connection to the tracking provider's servers. The following error messages may be displayed:

- » "Tracking server unresponsive or wrong IP address/port" : Either the tracking providers server is currently unreachable, or the IP address/port have been entered incorrectly
- » "Tracking server unreachable": The tracking provider's gateway is unreachable, the tracking message sent cannot reach the tracking provider. In this case the tracking provider technical support might need to be contacted.
- » "Connection timeout": The DZMx has tried establishing a connection to the tracking provider but the attempt failed. It can be due to fluctuating Cell Network signal strength.
- » "Cell network signal insufficient": The DZMx is failing to send a tracking message to the tracking provider due to insufficient Cell Network signal strength, preventing any operation.

Section 2 DZMx Wiring Guide

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

- » *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" below
- » "Ethernet/USB Connector Module" below
- » "Audio Configuration" on page 27
- » "DZMx Antennas" on page 21
- » "SIM Cards" on page 22

Optional Installations

- » "DZMx Remote Head" on page 79
- » "Cabin Phone" on page 80
- » "Backlighting" on page 32
- » "DZMx Inputs/Outputs" on page 43

Power Supply

The DZMx unit and other components require aircraft DC power. Operating range is 12-32VDC. It is preferred 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 to protect the DZMx system
- » A 1 amp circuit breaker/fuse is recommended to protect an external modem (Iridium or cellular) module, if installed
- » A 1 amp circuit breaker/fuse is recommended to protect a Flightcell Iridium phone cradle, if installed
- » If combining two or all of the above on a single circuit breaker, a 3A circuit breaker/fuse is recommended.

Ethernet/USB Connector Module

A Flightcell USB/Ethernet connector module (pictured) is available for terminating the DZMx's USB and Ethernet connections. Versions are available with either D-type or D38999 connectors. Mating connectors for the wiring loom are included with the connector module.

The Ethernet/USB connector should always be installed as it provides the following features:

- » **Ethernet**- provides a connected device access to the cellular data and configuration using DZMx Manager.



- » **USB** - required for firmware upgrades and downloading diagnostics.

The cable run to the USB connector should be limited to 5m to ensure compliance with the USB 2.0 cable delay specification.



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 (0.325mm²)
- » **Other cabling** - 24 AWG stranded (0.205mm²).

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 Termination

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 ports wired off the main or secondary connector:

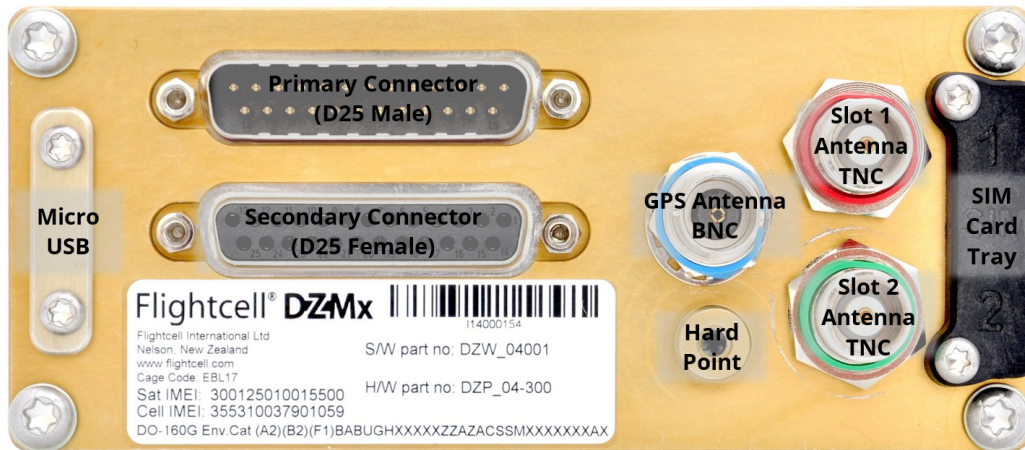
- » **Ethernet** - used for connecting a PC or other Ethernet-capable device
- » **USB** - used for firmware upgrades and connecting USB-only devices
- » **RS232** - available for serial data connections to legacy devices
- » **RS422/RS485** - used for serial data connections, and connection of a DZMx Remote Head.

Consideration should be given to the type and location of data ports installed. Optimum location will depend on the planned use of each data port.

Connector Pinouts (CIV)

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

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



DZMx back panel, standard civilian variant



Note: Variants with Iridium 9603 (SBD) modems also have a SMA female connector.

Primary Connector

Connector type: DB25M

Mating part: M24308/2-3F (or equivalent)

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 TX	Input	
13	AUX DATA Rx	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	
19	RS485 Tx-	Output	

Pin No	Function	Direction	Notes
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

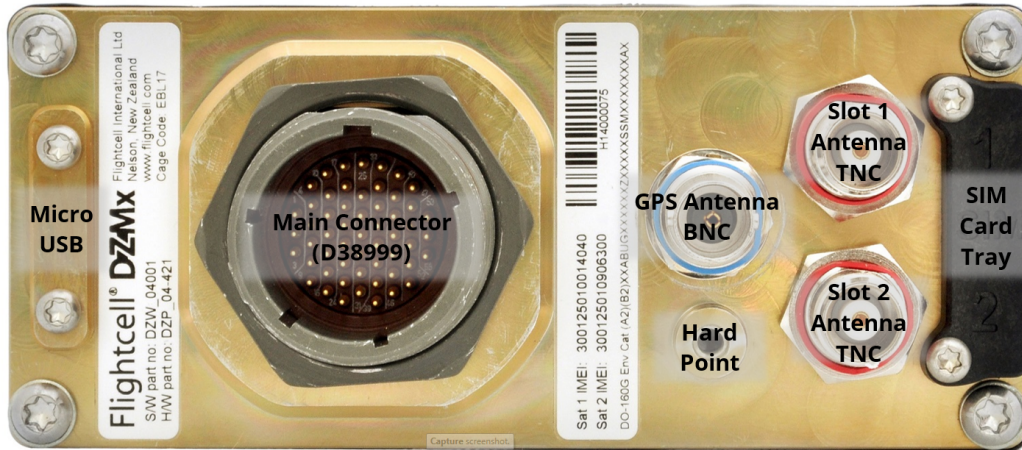
Mating Part: M24308/4-3F (or equivalent)

Pin No	Function	Direction	Notes
1	AUDIO FROM AUX TXCVR HI	Input	
2	AUDIO FROM AUX TXCVR LO	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 (MIL)

Refer to the Military wiring diagrams for the Flightcell DZMx and associated equipment (available from the Flightcell Support 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 back panel, military variant



Note: Variants with Iridium 9603 (SBD) modems also have a SMA female connector.

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
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

Pin No	Function	Direction	Notes
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	MIC TO DZMx 2 LO	Input	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 TX	Input	
45	AUX DATA RX	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	

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. It is preferable to mount the DZMx to minimise 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.

Refer to the following mechanical drawings (latest versions are available from the Flightcell website at <http://www.flightcell.com/support>) for dimensions and mounting details of the DZMx:

- » *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 Antennas

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

- » Single Iridium modem: Use a Flightcell Iridium/GPS antenna, Part Number: ANP_00012 (white) or ANP_00014 (black)
- » Dual Iridium modems: Use a Flightcell dual Iridium/GPS antenna, P/N ANP_00020
- » Single cellular modem: Use a separate Flightcell cellular antenna, P/N ANP_00018.

Installation of Iridium and GPS Antennas

The Flightcell Iridium/GPS antenna should be installed on the top of the aircraft where it 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 antenna cables must be selected to keep signal loss within accepted levels. Total signal loss on the Iridium connection between the DZMx or Iridium phone cradle and the antenna should not exceed 3dB at 1645MHz.

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

It is recommended that the antenna cable be reduced to RG58 for the last 300mm to the DZMx to assist with installation in the panel.

Antenna connectors on the DZMx and Flightcell antennas (as well as the supplied mating connectors) are colour coded to reduce installation errors, as follows:

Antenna Type	Colour (as seen in the Pinout images)
Iridium	Red
Cellular	Green
GPS	Blue

SIM Cards

SIM cards must be installed in the DZMx for the internal Iridium 9523 and cellular modems. A SIM card is not required for an Iridium 9603 (SBD only) modem.

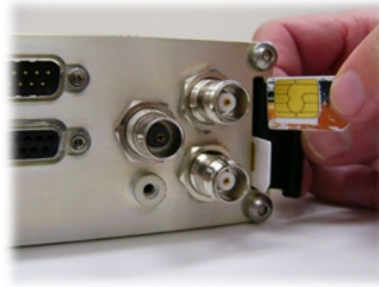
The DZMx uses standard SIM cards, rather than the micro and nano versions. Two versions of SIM card holders have been used in the DZMx. The first version was implemented on any DZMx manufactured before July 2014.

DZMx manufactured prior to July 2014

SIM cards are inserted into SIM card holder in the back of the DZMx.

To install SIM cards:

- » Remove the rubber plug or unscrew the cover plate from the SIM card slot on the back of the DZMx (if a rubber plug is fitted, fold the plug back against the side of the DZMx extrusion so the SIM card connectors are visible)
- » Insert the SIM card(s) into the appropriate slot, with the bevel facing towards the bottom of the DZMx and the gold contacts facing towards the antenna connectors. Be careful not to force the SIM card into the slot
- » Press the plug back into place or screw down the cover plate.

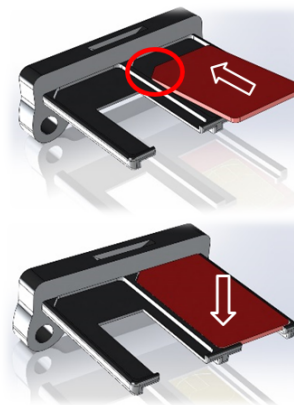


DZMx manufactured after July 2014

SIM cards are installed in a SIM card tray, which is then inserted into 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.



SIM Slot Designation

SIM card slots are usually allocated as follows:

- » SIM slot 1: Iridium
- » SIM slot 2: Cellular or second Iridium.



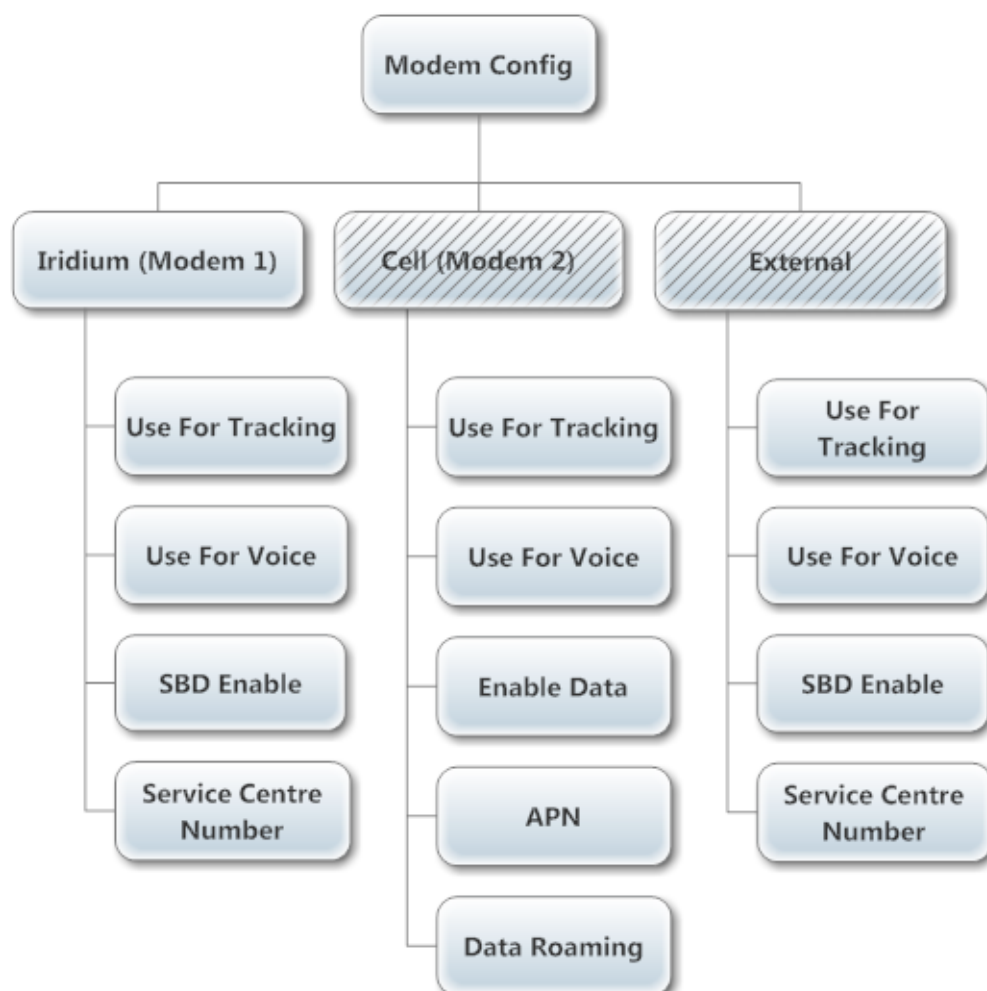
Note: Ensure that the SIM cards are in the correct slots, as they may be permanently damaged if incorrectly installed.

AT&T SIM Cards

Not all AT&T SIM cards are compatible with non-AT&T devices. For troubleshooting with AT&T SIM cards, visit the troubleshooting website [here](#).

Section 3 Modem Configuration

Settings for configuring the DZMx modems are found in the **Hardware Config>>Modem Config** menu.



Modem menu layout

Cellular Modems

The DZMx may have the following cellular modem types installed:

- » An internal Flightcell cellular modem
- » An external Flightcell cellular modem.

Iridium Modems

The DZMx may have the following satellite modem types installed:

- » An internal Flightcell Iridium 9523 modem
- » An Iridium 9603 modem (used for Short Burst Data only)
- » An Iridium PTT modem
- » An external Flightcell Iridium modem module (normally only mounted externally when the DZMx has a primary Iridium modem and a cellular modem installed in its internal slots)
- » An Iridium handset installed in a Flightcell phone cradle; the handset may be one of the following:
 - » Motorola 9505
 - » Iridium 9505A
 - » Iridium 9555
 - » Iridium Extreme

It may be necessary make some changes to the configuration of your satphone or SIM card before use.

Activating Modems

The settings for activating which modems are installed in your device will already be set prior to your DZMx being shipped, and therefore should not require changing. It may be required to specify which external modem is installed, if it was not purchased with your DZMx. To configure which modems are fitted or attached to your DZMx, you must update the hardware configuration settings via the DZMx Manager.

Configuring Modems

The DZMx can be fitted with various internal and external modem configurations. The Modem Config menu sub-options are dynamic and will only show the appropriate options for the modems fitted. The Modem Configuration menu example given below is for a typical configuration of one internal Iridium mode, one internal Cellular modem and one external Iridium modem:

- » Press MENU then scroll to **Hardware Config>>Modem Config**
- » Select **Iridium (Modem 1)**, **Cell (Modem 2)** or **External**, to show the configuration options for the appropriate modem.

Configure Iridium or Cellular tracking capability

By default, tracking messages are enabled for all modems. Use this setting if you have more than one Iridium or Cellular device fitted and you would like to use only one of them for tracking. Alternatively, if you would like to disable tracking for all fitted Iridium or Cellular devices, you can use the "Preferred Device" Tracking setting to only track on one type of device.

- » Navigate to **Hardware Config>>Modem Config>>Iridium (Modem 1)>>Use For Tracking**(or the Cell (Modem 2) or External) then press ENTER
- » Select **On** to enable, **Off** to disable.



Note: Disabling a device for tracking via this setting, or via the "Preferred Device" setting, will not affect the sending and receiving of text messages. Text messaging is always enabled.

Configure Iridium or Cellular voice calling capability

By default, voice calling function are enabled for all modems. The exception being for the Iridium 9603 modem, which is used for SBD messaging only.

- » Navigate to **Hardware Config>>Modem Config>>Iridium (Modem 1)>>Use For Voice** (or the Cell (Modem 2) or External) then press ENTER
- » Select **On** to enable, **Off** to disable.

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.

- » Navigate to **Hardware Config>>Modem Config>>Iridium (Modem 1)>>SBD Enable** then press ENTER
- » Select **On** to enable, **Off** to disable.



Note: This setting has no effect on cellular modems.

Configure Iridium Service Centre

If "(No SMS)" is displayed next to the Iridium modem's status message, the service centre number is incorrectly set. The DZMx will allow you to set the service centre number:

- » Navigate to **Hardware Config>>Modem Config>>Iridium (Modem 1)>>Service Centre Number** then press ENTER to show the list of Iridium Service Providers.
- » Use UP or DOWN to highlight the correct Iridium Service Provider
- » Press ENTER to save the setting or BACK to abort and return to the Modem Menu.



Note: This setting has no effect on cellular modems.

Disabling Cell Modems

Disable Cell Devices is a system-wide option, configurable via the DZMx Manager, that will control when and how to disable the cell modems. While disabled, all transmit or receive operations from the cell modems are inhibited by disabling the transmit and receive RF circuits. This setting can be set to disable automatically and/or manually.

When configured, the **Disable via Softkey** operation will be activated via key A or key B, whichever key is adjacent to the Cell modem status display when viewing the main screen.

- » Navigate to **DZMx Manager>>Settings>>Modem>>Cell Modems** section.
- » Modify the **Disable Cell Devices** setting and select either **Off**, **Disable via Softkey** or **Disable When In Flight**



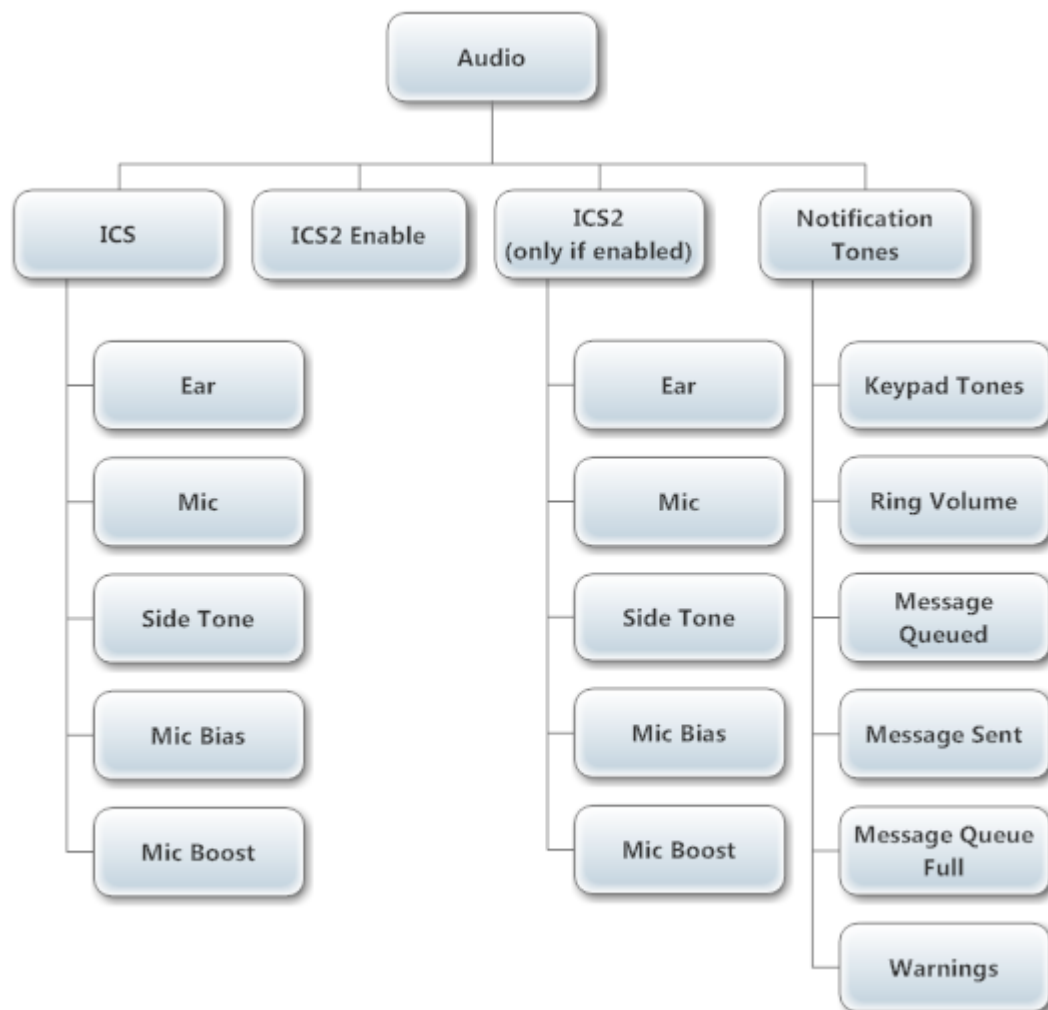
Note: When set to automatically disable in flight, the manual disable/enable key can override the automatic option until the next take off or landing.

Section 4 Audio Configuration

The DZMx is connected to the aircraft's audio system. A second audio connection is available for use in the following scenarios:

- » To provide separate connections for pilot and co-pilot
- » If there are two audio zones in the aircraft (e.g. one in the cockpit and one in the cabin).

The following figure shows the layout of the audio menus.



DZMx audio menu layout.

ICS Audio Installation

It is recommended that the DZMx is connected to spare radio positions on the ICS. AUDIO FROM DZMx HI/LO is connected direct to the audio input, and its levels adjusted using the DZMx audio menu. The DZMx is able to make two calls simultaneously, using either a single ICS channel or two different ICS channels.

Dual ICS Calling

The DZMx supports up to two connections to the audio panel/ICS. These connections may be used to allow the DZMx modems to have separate ICS channels. This allows two separate calls to occur on the separate ICS channels. Modems on hotkey, 'A', will route audio through ICS1, and modems on hotkey, 'B', will route audio through ICS2.

To use this configuration, enable the **"Dual Calling"** setting in DZMx Manager. This option can be found in the settings under the audio section.

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 operations. By default, call priority is off, however it can be enabled using the **"Call Priority"** setting in DZMx Manager. 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.

Adjusting Audio Volume

To adjust audio volumes between ICS (ear) and DZMx:

- » Set up a call to another party over the satellite or cellular link as appropriate
- » Press MENU then scroll to **Audio>>ICS>>Ear**
- » Use LEFT and RIGHT to adjust audio volume to the preferred level.



Note: As a short-cut from the main screen, press and hold either the LEFT or RIGHT key while in a call to display the volume adjustment screen.

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:

- » Press MENU then scroll to **Audio>>ICS>>Side Tone**
- » Select **Off** to disable, **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. The DZMx menu system provides users with sliders to set the volume levels on these events. Notification tones will be disabled if the audio volume is set to 0.

- » Go to MENU then scroll to **Audio>>Notification Tones** and select:
 - » **Keypad Tones:** Indicates when a button on the keypad has been pressed
 - » **Ring Volume:** Volume of the ringing tone from the DZMx

- » **Message Queued:** Indicates when a message has been queued to send
- » **Message Sent:** Indicates when a messages has been sent
- » **Message Queue Full:** Indicates when the message queue is full
- » **Warnings:** Indicates when there is an issue. A pop-up will provide more information.
- » Use LEFT and RIGHT to vary audio levels, or scroll down to disable each tone entirely
- » Press ENTER to save the setting
- » Repeat for any other notification tone.



Note: Many of the audio options will only display if the Installer Menu is enabled. See "Front Panel Installer Menu" on page 10 for more information.

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 Flightcell Support website 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 TO DZMx 1 or 2 HI/LO 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 TO DZMx 1 HI/LO lines are connected to the pilot microphone line and the MIC TO DZMx 2 HI/LO line 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 to either the MIC TO DZMx HI/LO 1 or 2.

Connecting to a Cell Phone Port on the Audio Panel

The DZMx can connect the preferred ICS channel (1 or 2) 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 panels at each crew position, this option enables crew to use the DZMx and connected phones individually on demand.

On aircraft using high impedance (electret, dynamic or carbon) microphones, a bias voltage is commonly required on MIC HI/LO lines to the audio panel, in order to energize the user's microphone when using the DZMx. If mic bias is required, this must be activated on the DZMx (refer to "[Configuring Microphone Bias](#)" on the facing page).

Adjusting Mic Volume

To adjust audio volumes between ICS and DZMx

- » Set up a call to another party over the satellite or cellular link as appropriate
- » Press MENU then scroll to **Audio>>ICS>>Mic**

- » Use UP and DOWN to adjust audio volume to the preferred level.

Configuring Mic Boost

The DZMx can use the Mic Boost to provide the mic levels an additional volume boost. The adjustment available in *Adjusting Audio Volume*, as above, is normally sufficient for most aircraft audio systems. If mic levels are insufficient, the Mic Boost option may be used to increase mic output by 10dB.

- » Press MENU then scroll to **Audio>>ICS>>Mic Boost**
- » Select **On** to activate and **Off** to deactivate Mic Boost.

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:

- » Press MENU then scroll to **Audio>>ICS>>Mic Bias**
- » Select **On** to provide bias power or **Off** to disable



Note: If you are in a call, it is necessary to press and hold MENU for 2 seconds during a call to access the menus

Section 5 Backlighting

The DZMx and DZMx Remote Head have a backlit keypad and LCD display. Backlight levels are adjusted separately for the DZMx and remote head. The DZMx can support variable lighting controlled from the aircraft dimmer control. Aircraft without dimmer controls can manually set the brightness to Day and Night levels. Day backlight is set at maximum brightness on both keypad and display. Night backlight can be adjusted separately for the keypad and LCD display.

External lighting provides the user with the ability to dim or brighten the display by adjusting the cockpit dimmer control. External lighting is only available if the DZMx has been installed with external lighting wiring.

A separate dimmer control can be used for each DZMx and remote head. The DZMx uses "General Purpose Input 5" for the dimmer control input. The remote head uses the "Lighting Control Input" (pin 10) for its external lighting input.

Switching Backlight Modes

To switch modes between Day, Night and External backlighting:

- » Press and hold the "*" key for 2 seconds
- » Scroll to **Backlight Mode**
- » Use LEFT and RIGHT to change the setting
- » Press END to exit the menu.

Altering Backlight Brightness Levels

Day and Night Modes

Backlight settings can be adjusted separately for the keypad and LCD display. To configure backlight settings on the DZMx or a remote head for Day and Night modes:

- » Press and hold the "*" key for 2 seconds
- » Select the Day or Night setting as above
- » Scroll down to **Display Brightness** or **Keypad Brightness**
- » Use LEFT and RIGHT to decrease/increase the brightness
- » Press END to save the setting and exit the menu.

External Lighting Mode

The minimum and maximum brightness levels can be set individually for both the DZMx and any remote heads. The external lighting has two modes, which is determined by the way you set the **Ext Lighting Calib Low** point. The external lighting options are:

External Lighting Options

Option 1: External lighting input controls night lighting and toggles Day/Night mode. This requires setting the 'Low calib' point to a level higher than the lowest input voltage (typically where a 'detent' switch). Turning the input below the 'detent' position switches the brightness to Day mode.

Option 2: External lighting input controls night lighting only (no Day/Night mode switch). This requires setting the 'Low calib' point at the minimum input voltage.

To change the brightness options for the external lighting on the DZMx or remote head:

- » Press and hold the "*" key for 2 seconds
- » Scroll to **Advanced** and press ENTER
- » Scroll to **Ext Lighting Config Low** and press ENTER
- » Set the dimmer control to the minimum position
- » Adjust the keypad and display minimum brightness using LEFT and RIGHT to match cockpit lighting levels
- » Scroll to **Input Calib.** then press ENTER
- » Press END to save the settings and exit the menu.

To change the maximum brightness options for the external lighting on the DZMx or remote head:

- » Press and hold the "*" key for 2 seconds
- » Scroll to **Advanced** and press ENTER
- » Scroll to **Ext Lighting Config High** and press ENTER
- » Set the dimmer control to the maximum position
- » Adjust the keypad and display maximum brightness using LEFT and RIGHT to match cockpit lighting levels
- » Scroll to **Input Calib.** then press ENTER
- » Press END to save the setting and exit the menu.

Checking Input Range

The **Input Calib.** options in the maximum and minimum brightness shows the raw input values, which update each time ENTER is pressed. These values need to be checked during installation to ensure that the hardware is functioning correctly. The following requirements are necessary for proper set-up of the external lighting:

- » The minimum position needs to have a smaller value than the maximum position
- » There should be a minimum difference of 50 for the DZMx display.
- » A remote head will typically have a difference of around 900.



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

Section 6 Tracking Configuration

The DZMx has an embedded GPS, which provides precise information on position, altitude and speed. This information can be sent to a tracking provider to enable the aircraft to be monitored and its movements tracked. To use the DZMx's 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.

The DZMx cannot provide continuous tracking due to the constraints of the networks used, but can transmit position reports 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.

Tracking settings can be configured using either the DZMx tracking menu, or using DZMx Manager.

Tracking Menus

Tracking is a major component of the DZMx. Tracking settings can be configured using DZMx Manager, or using the tracking menus (see below) on the DZMx.



DZMx tracking menu layout



Note: Most of the menu settings will not be visible unless the user has unlocked them through the "Front Panel Installer Menu" on page 10.

Changing Tracking Modes

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

To suspend or disable tracking:

- » Press MENU then scroll to **Tracking>>Tracking Mode**, select one of the following options:
 - » **Suspend:** Suspends tracking until the DZMx is next powered on.
 - » **Off:** Turns tracking off until it is manually enabled.
 - » **On:** Turns tracking on until it is disabled or suspended.

- » Press ENTER to save the setting.

Tracking can be enabled again by repeating the steps above, but selecting **On** instead of **Suspend** or **Off**.

Enabling HD Tracking

Whenever Tracking over IP is enabled, HD tracking can then be enabled or disabled using the **Enable HD Tracking** setting.

To enable or disable HD Tracking:

- » Press MENU then scroll to **Tracking>>Enable HD Tracking**, select one of the following options:
 - » **On**: Enables HD tracking, thus allowing up to 1 tracking message sent every 15 seconds by the DZMx while a data connection is available.
 - » **Off**: Turns HD tracking off, reverts to the periodic tracking interval as set-up in "[Periodic Events](#)" on page 40.
- » Press ENTER to save the setting.

Locking the Tracking Menu

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

To lock the tracking menu:

- » Press MENU then scroll to **Tracking>>Lock Tracking Menu**
- » Scroll to **Yes**, then press ENTER to lock the Tracking Menu
- » The Tracking Menu will be hidden from view when DZMx is next restarted.



Note: The tracking menu can be unlocked using DZMx Manager.

Configuring Tracking Settings

The DZMx is capable of sending tracking messages for a large range of events. See the following sections for setting up each tracking capability:

- » "[Tracking Providers](#)" on page 37
- » "[Tracking Transmission](#)" on page 39
- » "[Periodic Events](#)" on page 40
- » "[Triggered Events](#)" on page 41 (see "[Additional Tracking Applications](#)" below for alternative triggered events)

Additional Tracking Applications

The DZMx has supplementary tracking applications that can be enabled and configured to report data for various types of specific events. These applications often require connections to the DZMx inputs to trigger tracking events. Applications currently available for the DZMx are:

- » "[Automated Rescue Monitoring](#)" on page 47 (A.R.M.)
- » "[Alert Mode](#)" on page 48
- » "[Firefighting Mode](#)" on page 49
- » "[Geofence Suspend Mode](#)" on page 63

Configuring GPS

Configuring GPS Mode

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). For high speed or high altitude operations, it is necessary to change the GPS setting by pressing MENU then scrolling to **Hardware Config>>GPS Mode**. Available settings are:

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

GPS Display Options

The GPS 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
- » **dddmm.mmmm:** the aircraft's position is shown in degrees and minutes (to 4 decimal points)
- » **ddmmss:** the aircraft's position is shown in degrees, minutes and seconds
- » **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.

Setting the GPS Display

To set the GPS display:

1. Press MENU then navigate to **Display Setup Menu>GPS Display Options**
2. Press ENTER to select and use UP or DOWN to the required GPS display option
3. Press ENTER to save the setting or BACK to abort and return to the Display Setup Menu.

Tracking Providers

Flightcell does not provide a tracking service, but works with a number of tracking service providers who support DZMx data. Contact Flightcell for information on available tracking service providers or refer to the list of providers on our 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.

Communication Options

The DZMx supports several methods of transferring tracking data to the tracking provider. The DZMx system can be configured to use up to three modems and can use both the Iridium and Cellular networks interchangeably, based on which network is currently available with a good signal. The transmission method primarily supported by most tracking providers is via SBD or SMS on the Iridium Satellite network. Some providers now also support SMS on the cellular network, and use this as a preferred method due to the low cost of cellular text messages. Tracking providers cannot provide a cellular gateway in all countries, and so **Tracking over IP** via the cellular network, when supported, is the fastest and most cost-effective option. Some tracking providers prefer to receive PDOP (Positional Dilution of Precision) or HDOP (Horizontal Dilution of Precision). These are fields provided by the GPS and are slightly different ways to tell the tracking provider how accurate the position is. HDOP is used by default and is the recommended setting, but PDOP includes an additional vertical component and is required for some fire fighting reporting. The **Tracking uses PDOP** setting can only be set via the DZMx Manager on the Tracking tab.

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 back plate of the DZMx
 - » Pressing MENU then scrolling to **Diagnostics Menu>About DZMx**
- » **IMEI (International Mobile Equipment Identity):** A unique 16-digit number. Located on the back plate label of the DZMx or under the battery of the (optional) Iridium External Device.
- » **Iridium Phone Number:** If you have an Iridium modem or handset installed.
- » **Cellular Phone Number:** If you have a cell modem installed.

Configuring DZMx Tracking Destinations

Once the Tracking Server Provider has your account set up, the DZMx can now 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. The following list of tracking gateways that can be used with the DZMx:

SBD: Destination addresses are configured by your tracking service on the Iridium service [SPNet](#).

SMS: Destination address are configured on the DZMx. It is recommended that these be configured in [DZMx Manager](#).

Alternatively, the SMS addresses can be entered using the menu systems. To enter or edit a destination email address using the DZMx keypad:

- » Press MENU then scroll to **Tracking>>Transmission Options**, then select
 - » **Sat Destination:** To configure the satellite SMS destination
 - » **Cell Destination:** To configure the cellular SMS destination

To enter or edit a satellite SMS destination address:

- » Use UP and DOWN to scroll through the alphabet and character keys for the currently selected character
- » Press RIGHT to enter an additional character
- » Press BACK to backspace a character
- » Press ENTER to save the edited text

To enter or edit a destination cell phone number:

- » Use the "0" to "9" keys on the DZMx keypad to enter the number (press and hold the "0" key to enter the international dialling prefix "+")
- » Press BACK to backspace a digit
- » Press ENTER to save the edited number.



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

Configuring Tracking over IP using Cellular Data

If supported by your tracking provider, the DZMx can be configured, either via DZMx Manager or via the DZMx menu system, to send tracking messages via the cellular data connection to an IP port when a data connection is available. In order to utilise the cellular data connection for sending tracking messages, the following settings under the **Hardware Config>>Modem Config>>Cell (Modem 2)** need to be configured:

- » **APN:** The APN you need to specify will be dependant on which cellular network service provider you have an account with. The APN can be obtained from your cellular service provider.
- » **Data Enable:** This setting must be set to **On**. There must be a data connection active in order to send tracking messages to an IP port.

The tracking over IP settings can be found under the **Tracking>>Transmission Opts** menu.

- » **IP address:** Your tracking provider will advise you what IP address setting to use. Press and hold "0" to insert a '.' when entering the IP address. 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 setting 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.

Tracking Transmission

The DZMx can send position reports over:

- » The cellular network: Using SMS, or IP data.
- » 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 settings is enabled for any Iridium modems fitted. See "[Modem Configuration](#)" on [page 24](#) for further details.

Preferred Transmission Mode

The DZMx is able to prioritise the available networks used for sending tracking messages. This is particularly useful to allow you to prioritise the cheapest transmission method. It also allows tracking messages to be sent from one network while the other network is out of reception range, or is busy being used for calls/data. To set the preferred transmission mode:

- » Go to MENU then scroll to **Tracking>>Transmission Options>>Preferred device**
- » Select one of the following settings:
 - » **Try Sat First:** to use the Iridium satellite network if available; if messages aren't transmitted over Iridium, the DZMx will then send them over the cellular network
 - » **Try Cell First:** to use the cellular network if available; if messages can't be transmitted over cellular (for example if the aircraft is out of cell coverage), the DZMx will then send them over the Iridium satellite network
 - » **Sat Only:** to only use the Iridium network; tracking messages will be queued until this modem is unavailable
 - » **Cell Only:** to only use the cell network; tracking messages will be queued until this modem is unavailable.
- » Press ENTER to save the setting.



Note: When more than one transmission method per modem type is available, the DZMx will prioritise Tracking over IP over SMS for cellular modems, and SBD over SMS for Iridium modems. Your tracking provider will inform you what transmission methods they support, and the appropriate SMS destination and IP addresses must be configured correctly for the chosen provider. See the tracking provider configuration table in "[Tracking Providers](#)" on [page 37](#) for further details.



Note: During a satellite call, SBD will be unavailable. Therefore, the satellite modem will default to using SMS for tracking, until the call has ended.

Periodic Events

The DZMx is able to schedule recurring tracking events which can be configured to occur at designated intervals. The following events/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)
- » **Heading Timer:** The minimum time, in minutes, between position reports when the aircraft is changing heading

Setting Tracking Timers

To change the interval for the selected timer:

- » Go to MENU, then scroll to **Tracking>Periodic Events >...Timer** as appropriate
- » Use LEFT and RIGHT to vary the timer interval (shown in minutes)
- » Press ENTER to save the setting.



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

Configuring Heading Events

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:

- » Press MENU then scroll to **Tracking>>Periodic Events>>Heading Variation**
- » Use LEFT and RIGHT to change the heading variation (in degrees)
- » Press ENTER to save the setting.



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

Hover Events

The DZMx can be configured to send an event report when the helicopter starts 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 takeoff and landing. Hover cannot be enabled, if using speed only,

To configure the DZMx to send Hover position reports:

- » Press MENU then scroll to **Tracking>>Triggered Events>>Hover**,
- » Select **Yes** or **No**.

Triggered Events

Manual Position Events

The operator is able to send manual position reports by pressing MARK. This marks the GPS location of the aircraft at the time of pressing the button and sends this to the tracking provider. Manual position reports can also be sent with an additional pre-configured message attached. To configure manual position events:

- » Press MENU then scroll to **Tracking>>Triggered Events>>Manual Position**
- » Then select one of the following:
 - » **Position Only:** Pressing the MARK button will generate a manual position tracking message
 - » **Disabled:** Manual position reports are disabled
 - » **Pos with Text Msg:** When MARK is held for 2 seconds, it sends a selected text message (from message library) with the manual position report.

Power Up Events

To send a position report when aircraft power is supplied to the DZMx:

- » Press MENU then scroll to **Tracking>>Triggered Events>>Powerup Message,**
- » Select **Yes** or **No**.



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.

Takeoff and Landing Events

The DZMx can be configured to send takeoff and landing event reports at the start and end of each flight leg. The simplest approach is to use aircraft speed to trigger takeoff 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 takeoff and landing reports when hovering.

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 44](#) for instructions on how to configure a collective or squat switch.

To configure the DZMx to send Takeoff and Landing position reports, based on aircraft speed:

- » Press MENU then scroll to **Tracking>>Triggered Events>>Low Speed**
- » Use UP and DOWN to set the speed approximately 10 knots below stall speed (for a fixed wing aircraft) or at 5 knots for a helicopter.

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. Refer to ["DZMx Inputs" on page 44](#) for instructions on how to configure the oil pressure switch.

Message Queue

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.

Setting Queue Size

The queue size can be configured to store up to 20 messages.

- » Press MENU then scroll to **Tracking>>Message Queue>>Queue Size**
- » Press LEFT and RIGHT to vary the number of messages that can be stored.



Note: Once this message queue limit is reached, the oldest messages will begin to be deleted from the queue.

Setting Queue Type

The DZMx can be configured to either send the newest messages first, or the oldest messages first. To set the message queue type:

- » Press MENU then scroll to **Tracking>>Message Queue>>Queue Type**
- » Select: **Send Oldest First**, to send the oldest messages first and the newest last
- » Select: **Send Newest First**, to send the newest messages first and the oldest last.



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.

Restoring Unsent Messages

The DZMx may be powered off before sending all of the queued tracking messages. The DZMx is able to restore these unsent messages when next powered on using the following setting:

- » Press MENU then scroll to **Tracking>>Message Queue>>Restore Unsent Msgs**
- » Select: **On**, to save unsent messages and send when the network connection is restored
- » Select: **Off**, to delete unsent messages when the DZMx is powered down.



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

Section 7 DZMx Inputs/Outputs

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

The DZMx has a number of general purpose inputs (GPIs) which can be used to indicate some event or state on the aircraft, and general purpose outputs that can be used to indicate some event or state on the DZMx.

Uses of the inputs include:

- » Indicating an event, including, but not limited to:
 - » Engine start
 - » Takeoff
 - » 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, such as triggering an Iridium Push-to-Talk (PTT) transmission.

Use of the outputs include

- » Indicating an incoming call
- » Indicating power on/off of the DZMx.

DZMx Inputs

A standard DZMx has five inputs, with another seven inputs available on the optional DZMx Input Expansion Card (IEC). These inputs can be connected to trigger various actions and reports in the DZMx. For example, an input may be connected to a:

- » **Collective Switch:** To generate takeoff tracking messages
- » **Cockpit Lighting Control:** To control DZMx brightness externally from the dimmer control (only available on input 5, see ["Backlighting" on page 32](#))
- » **Oil Pressure Switch:** To generate engine start and stop messages.
- » **PTT Input:** To start/stop a PTT call (see ["Iridium Push-To-Talk \(PTT\)" on page 56](#))

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

- » Airline Mode
- » ["Firefighting Mode" on page 49](#)

Wiring Inputs

The inputs (five on the DZMx, seven additional inputs with the IEC), can tolerate a voltage range of 0-28VDC, with an over/under voltage protection to ± 32 VDC. The inputs have two states, **Open** (high voltage) or **Closed** (low voltage). Refer to the Flightcell Support website 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 (see ["Backlighting" on page 32](#)).

Configuring Inputs

These inputs can be set up on either the DZMx menus or using ["DZMx Manager" on page 7](#). In practice, it is easier to set them up using the menus as the DZMx reports the status of the input in real time. Events can only be triggered on inputs 1-3 by pulling them to ground, as they are two-state inputs. Inputs 4 and 5, and the seven on the IEC can be two-state or variable inputs.

To set up the inputs using the menus:

- » Press MENU then scroll to **Hardware Config>>Input Configuration**
- » Select the function that you want to assign to an input (e.g. **Takeoff Switch**)
- » Select **Input Designation**, then select the input which has been wired for that function, or select **Not Installed**
- » A pop-up will now 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 actually down), scroll to **Hardware Config>>Input Configuration>>Input Function>>Input Configuration** and change the selected condition.

Additional information on the input functions can be found in ["Triggered Events" on page 41](#).



Note: Some specialised input functions will only appear in the Input Configuration menu if the application (airline/firefighting/PTT) 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 dialling, or in a call
- » **Incoming Call:** Alerts the operator when there is an incoming call
- » **PTT Transmitting:** A device in the talkgroup is transmitting
- » **Received Msg:** Alerts the operator when a text message has been received or a call has been missed
- » **Power On:** Alerts the operator when the DZMx is powered on.

To select the allocation of the outputs and the blink pattern:

- » Press MENU then scroll to **Hardware Config>>Outputs Config** and select:
 - » **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]
 - » **PTT Transmititng Mode >>** [Off | Solid | Blink]
 - » **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]

Section 8 DZMx Applications

Flightcell provides specialised functions on the DZMx to support specific types of operation. These include:

- » ["Automated Rescue Monitoring" on the next page \(A.R.M.\)](#)
- » ["Alert Mode" on page 48](#)
- » ["Firefighting Mode" on page 49](#)
- » ["Iridium Push-To-Talk \(PTT\)" on page 56](#)
- » ["Dropbox File Transfer" on page 57](#)
- » ["SBD Document Transfer" on page 62](#)
- » ["Geofence Suspend Mode" on page 63](#)
- » ["OpenVPN Virtual Private Network Connection" on page 65](#)
- » ["Flightcell Remote Assistance" on page 71](#)
- » ["DZMx Manager" on page 7](#)

Other applications below are also available, but are not covered in this manual:

- » Airline Mode
- » Agriculture (Ag) Mode

For enquiries about upcoming applications or to request new applications, contact Flightcell (see ["Contact Details" on page 81](#)).

Automated Rescue Monitoring

Enabling A.R.M.

A.R.M. (also known as Automated Flight Following, or 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. button is pressed. To enable the A.R.M. feature:

- » Press MENU then scroll to **Tracking>>ARM Enable**
- » Select **On**.



Note: A.R.M. can only be configured with tracking providers which support this application. See ["Tracking Providers" on page 37](#) for more information on A.R.M. support.

Alert Mode

Enabling Alert Mode

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

The Alert mode setting can only be found in DZMx Manager, under the "Tracking" heading in the settings. When enabled, it is activated via a long press on the **A.R.M.** key.



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

Firefighting Mode

The firefighting application collects data from firefighting operations and sends real-time firefighting event and GPS position information to tracking providers and fire authorities. The Firefighting application can be configured using ["DZMx Manager" on page 7](#) or via the DZMx menus. When enabled, the DZMx will report fill events at the end of a fill, drop start events at the start of a drop, and drop end events when the tank is empty or the door/valve is closed.

Firefighting Inputs

Firefighting mode has additional support for the following inputs. Two separate water containers can be configured. The first container can be configured as a tank or a bucket. The second container can only be configured as a bucket. The settings for container 1 (generic) are as follows:

- » **Drop Type Select:** When configured, is used to indicate a full or half release of container 1
- » **Drop Release:** Tank or bucket door open input for container 1, but can also be used for container 2 (bucket) if used in conjunction with the Bucket Connected input.
- » **Drop Release Input Type:** The drop release input can be configured as a momentary release button or a maintained 'door open' input
- » **Fill Pump:** Tank pump is on or off.
- » **Fill Level:** Variable voltage fill level input or load cell input

The settings for container 2 (bucket only) are as follows:

- » **Bucket Drop Release:** Bucket drop release input
- » **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 Load Cell:** Variable voltage load cell input for measuring the volume of water carried.
- » **Bucket Connected:** Required by USFS if using bucket or when using two containers that share a single drop release input.

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 Type Select:** Gel/Foam is the selected additive
- » **Additive Pump:** Additive pump is on/off
- » **Additive Pump Input Type:** The additive pump can be configured as a button or a timed input

These inputs can be used on any of the DZMx Inputs. See ["DZMx Inputs" on page 44](#), for information on wiring and configuring the inputs.



Note: Only inputs 4 or 5 can be configured as a variable voltage inputs, ie for the fill level or the bucket load cell, unless an input expansion card (IEC) is fitted. An IEC will provide an additional 7 inputs.

Firefighting Settings

The Firefighting application, when enabled, has additional settings to support the configuration of an installation:

- » **Firefighting Enable:** Enable firefighting events and input configuration
- » **AWTC Connected:** An AWTC tank is fitted Yes/No

- » **On Board Units:** Units of volume used when specifying the fill pump and additive pump rates. Litres/U.S. Gallons/Imperial Gallons
- » **Event Report Units:** Units of volume to use in the message to the tracking provider when reporting fill and drop events. Litres/U.S. Gallons/Imperial Gallons
- » **Tank Volume:** The capacity of container 1, which can be either a water tank on board, or 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. Foam/Gel/Retardant
- » **Bucket Volume:** The capacity of container 2; the bucket connected to the bucket load cell input, specified in 'on board units'
- » **Min Valid Drop Time:** An optional setting. A drop release duration less than this time is ignored. The time unit is seconds.
- » **Partial Drop Time Limit:** If there is 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. This setting is only used with Container 1.

Firefighting Application Options and Configurations

Measuring the Water Level

The DZMx can determine the volume of water on board via one of these three methods:

- » **Automatic Water Tank Controller (AWTC):** The DZMx can be configured to interface to an AWTC which provides volume, flow selection, drop quantity, and drop signal information via a serial port connection. Aircraft fitted with an AWTC do not need to configure the Fill Pump, Tank Volume, Drop Type or Drop Release inputs.
- » **Fill Pump:** The DZMx input can be connected to a fill pump which will time how long the pump is running for. A separate flow rate setting will allow the DZMx to calculate the volume of water added on board. The Tank Volume setting must be set to the maximum volume of the water tank.
- » **Fill Level or Bucket Load Cell (variable voltage input):** Inputs 4 or 5 can be configured to measure a voltage level from a level gauge or load cell. The input must be calibrated at empty and full levels to produce an accurate reading. The Tank Volume setting must be set to the maximum volume of the water tank. If using the Bucket Load cell, the Bucket Volume must be set to the maximum volume of water that can be carried by the bucket.

Adding Additive

The DZMx will report as much information about the additive as is supplied, based on the configuration of the inputs and settings. If the additive pump is configured as a timed input, then the Additive Flow Rate setting will be used to determine the amount of additive added to the tank, and the Drop Start and Drop End event messages will include both the additive type and the concentration of additive in the tank. If a particular installation has an additive pump configured as a button press, then Drop Start and Drop End event messages will report that additive has been added, but because the volume of additive can not be determined, the additive concentration is not reported in the event message.

Determining the Additive Type

The DZMx can be configured to use either a setting or an input to determine the type of additive that has been added to the tank on activation of the additive pump. If an Additive Type input has been configured, then this input will be used to indicate what additive (foam or gel) will be added to the tank. If no Additive Type input is configured, then the Additive Type Loaded setting will be used instead. If neither the Additive Pump input nor Additive Type input are configured, the DZMx will use the Additive Type Loaded setting in every Drop Start and Drop End event message. The Additive Type Loaded setting can be set to None if no additive is used.

About the Unit Settings

The DZMx has two unit settings; the On Board unit, and the Event Report unit. All volume settings, such as flow rates and volumes associated with the Firefighting Application must all be specified using the same unit. The unit you choose to use for these settings is specified via the On Board unit setting. Changing the On Board unit, will not change the value entered for the flow rate and volume settings, eg if you set the tank volume to 100, then this value will remain the same if you change the On Board unit setting. If your configuration is using an AWTC, this device will send tank level volumes to the DZMx, so ensure the On Board setting, the AWTC, and all volume and flow rate settings, use volumes in the same unit.

The Event Report unit must be set to what your tracking provider or report collection body expects, eg NAFC like to receive their reports in Litres.

Any Fill Event or Drop Event messages generated and transmitted by the DZMx will use the Event Report unit. Quantities in the event report will appear either with L, Gal (US), Gal (UK), depending on the setting. If the On Board unit and the Event Report unit are not the same, the DZMx will perform the necessary conversion.

Fill Event Reporting

The DZMx will report a Fill Event when water is brought on board or when a bucket is filled. How the unit detects that a fill has taken place, when the DZMx records the position of the fill event, and when the fill is reported will depend upon how the water level is being measured. The volume reported in a Fill Event message will be how much has been taken on board during the current fill event at this particular location. If there are several fill events before a drop, the volume reported in each fill event will add up to the total volume on board. The total volume on board will always be reported at the start of a drop in the Drop Start message. Hover must be enabled if the system is configured to use a bucket load cell input since moving out of hover is required to trigger the fill event.

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.
AWTC	When the water level rises above 150 gal since the last reported Fill or Drop event.	When the water level stops rising.

What will appear in a Fill event report

VOL=<volume>;UNIT=<unit>;CID=<container>]

- » **volume:** Volume taken on board since the last Fill or Drop event message, converted to the configured Event Report Unit. xxxxxx.x
- » **unit:** L, gal(US), gal(UK)
- » **container:** container identifier; "Tank" or "Bucket" to indicate container 1 or container 2. Only included in a message if the Bucket Connected input is configured.

Determining the Quantity Dropped

A drop will be initiated by either the Drop Release input or by the drop field read from the AWTC. The Drop Release input can be configured either as a Momentary (button) signal or a Maintained (door open) signal.

The end of a drop will determined depending on the current configuration and how the water level is measured:

Drop Release Config	Water Level method	Drop Start Position	Drop End Position Marked	Drop Volume Calculated and Drop End Event Created
AWTC	AWTC	When drop button pressed	When tank door closed	When tank volume is level.
Drop Release	Fill Pump Drop Release is always treated as a Maintained type input if a Fill Pump is configured.	When door/button activated	When door closed/ button released	When button released. Uses Drop Type Select input or the Partial Drop Time limit to determine amount dropped. Assumes 100% if no Drop Type Select input or Partial Drop Type limit configured.
Drop Release Momentary	Fill Level or Load Cell	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.
Drop Release Maintained	Fill Level or Load Cell	When door opened	When empty or when door closed.	When door is shut and the Fill Level input is level, or when empty.

At the start of a drop, the DZMx will put the current volume and any other configuration information (eg additive added and additive concentration) in a Drop Start Event message. Configuration information included in the Drop Start message will depend on what information is available for a given configuration. If no Drop Type Select input is configured, then it will be assumed at the start of a drop that it will be a full drop.

If the DZMx is configured to interface to an AWTC, then drop percentage and flow setting selected will be received from this device and included in the Drop Start event message.

At the end of a drop, the DZMx will measure what remains in the tank and will calculate the actual percentage dropped and report that in the Drop End Event message. For systems configured with a fill pump, there is no method of measuring the volume at the end of a drop, so the Drop Select input, or the Partial Drop Time limit will be used to determine if a half or full load has been dropped. If no Drop Type Select input or Partial Drop Time Limit is configured, then every drop will be a full drop.

If using a fill level or load cell input to measure the volume dropped, then the DZMx will report the end of the drop when the water level drops to empty, or...

- » If the drop release input has been configured as a momentary (button) input; mark the end of drop position when the water level appears to be levelling, or...
- » If the drop release input has been configured as a maintained input; mark the end of drop position when the door closes.

In both the above cases, the Drop End Event message is delayed until the water level is has levelled off so that the remaining water volume reported in the Drop End message is reasonably accurate. This is typically around 5 seconds after marking the position of the actual end of drop.

What will appear in a Drop Start event report

[DROP=<config>;]VOL=<volume>;[FLOW=<flow>;]ADD=<additive>;[CON=<concentration>;]UNIT=<unit>[;CID=<container>]

- » **config:** (only if known, ie if AWTC or Door Select configured) None, 25%, 50%, 75%, 100%
- » **volume:** Current Volume, converted to the configured Event Report Unit. xxxxxx.x
- » **flow:** (only if AWTC fitted) flow setting selected; 1-8, S (salvo).
- » **additive:** either "None", "Foam", "Gel" or "Retardant"
- » **concentration:** (only if timed additive pump fitted), percentage of additive in drop xx.xxx

- » **unit:** L, gal(US), gal(UK)
- » **container:** container identifier; ; "Tank" or "Bucket" to indicate container 1 or container 2. Only included in a message if the Bucket Connected input is configured.

What will appear in a Drop End event report

[DROP=<measured>;DROP_ VOL=<volume>ADD=<additive>; [CON=<concentration>;] UNIT=<unit>[:CID=<container>]

- » **measured:** None, xxx.x% actual percentage dropped
- » **volume:** Dropped Volume, converted to the configured Event Report Unit. xxxxxx.x
- » **flow:** (only if AWTC fitted) flow setting selected; 1-8, S (salvo).
- » **additive:** either "None", "Foam", "Gel" or "Retardant"
- » **concentration:** (only if timed additive pump fitted), percentage of additive in drop xx.xxx
- » **unit:** L, gal(US), gal(UK)
- » **container:** container identifier; ; "Tank" or "Bucket" to indicate container 1 or container 2. Only included in a message if the Bucket Connected input is configured.

Changing the settings

Configuring Firefighting Mode

Firefighting Mode must be enabled in order to use the application, set other firefighting application settings, configure firefighting input settings and generate fire event reports. This section will outline the configuration procedure when using the DZMx menus.

To enable/disable Firefighting mode:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Firefighting Enable**
- » Select **Yes** or **No**.
- » When the setting has been selected, press ENTER to save.

When this option is enabled, the Firefighting Diagnostics page will be available via the Diagnostics menu. If the Firefighting Mode option is not visible in the Tracking menu, then your unit has not be licensed to use the Firefighting application. Contact Flightcell support for further details.

Setting Tank Options

If the Aircraft is fitted with an AWTC:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>AWTC connected**
- » Select **Yes** or **No**.
- » When the setting has been selected, press ENTER to save.

When the AWTC is connected and transmitting, the DZMx will show a '*' in the upper left hand side of the main screen. Also, when this option is enabled, the AWTC Diagnostics page will be available via the Diagnostics menu.

Setting On Board Units

Set this setting to the unit used for all volume and flow rate settings and the AWTC if configured:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>On Board Units**
- » Select **Litres** or **U.S. Gallons** or **Imperial Gallons**.
- » When the setting has been selected, press ENTER to save.

Setting Event Report Units

Set this setting to the unit used when generating event reports:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Event Report Units**
- » Select **Litres** or **U.S. Gallons** or **Imperial Gallons**.
- » When the setting has been selected, press ENTER to save.

Tank Volume

Set this setting to the maximum tank volume. This setting is used as a maximum limit when either a Fill Pump input or Fill Level input is configured:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Tank Volume**
- » Use the number keys to enter digits, press BACK to remove the end digit.
- » When the correct volume has been entered, press ENTER to save the new volume.

Bucket Volume

Set this setting to the maximum bucket volume. This setting is used as a maximum limit when the load cell I input is configured:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Bucket Volume**
- » Use the number keys to enter digits, press BACK to remove the end digit.
- » When the correct volume has been entered, press ENTER to save the new volume.

Specifying the Fill Pump Flow Rate

Set this setting to the fill pump flow rate in On Board units/minute. This setting is only used when a Fill Pump input is configured:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Fill Flow Rate**
- » Use the number keys to enter digits. Press and hold 0 to enter a decimal point. Press BACK to remove the end digit.
- » When the correct flow rate has been entered, press ENTER to save the new flow rate.

Specifying the Additive Type Loaded

If there is no additive type input configured, then this setting will be used to specify what additive is on board:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Additive Type Loaded**
- » Select **None** or **Foam** or **Gel** or **Retardant**.
- » When the setting has been selected, press ENTER to save.

Specifying the Additive Pump Flow Rate

Set this setting to the Additive Pump flow rate in On Board units/minute. This setting is only used when an Additive Pump input is configured:

- » Press MENU then scroll to **Tracking>>Firefighting Options>>Additive Flow Rate**
- » Use the number keys to enter digits. Press and hold 0 to enter a decimal point. Press BACK to remove the end digit.
- » When the correct flow rate has been entered, press ENTER to save the new flow rate.

Calibrating the Fill Level or Bucket Load Cell input

Once the Fill Level or Bucket Load Cell input setting has been configured to use one of the inputs (see "[DZMx Inputs](#)" on page 44), the input must be calibrated in order for the DZMx to produce the correct volume value when measuring the input voltage:

- » Select **Fill Level** or **Bucket Load Cell** from the **Hardware Config>>Input Configuration** menu to display the input configuration options.

- » With the tank empty, or with no water in the bucket (but with the empty bucket suspended), select **Calibrate Low Level** from the Fill Level menu and press ENTER to calibrate the empty tank/bucket to the current input voltage.
- » With the tank full, or mostly full, or with a full bucket suspended, select **Calibrate High Level** from the Fill Level or Bucket Load Cell menu and press ENTER . The DZMx will then prompt for the current volume in the tank or bucket. After entering in the amount, press ENTER to complete calibration. If using a load cell, and 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 tank/bucket volume specified in the **Tank Volume** or **Bucket Volume** setting.
- » With both full and empty limits calibrated, the fill level and bucket load cell input will measure the correct water volume. Note that if any part of the system is modified, ie changed to using a different bucket, then the system must be recalibrated. This can be performed while doing the first fill using the new bucket.

Configuring the DZMx to use multiple water delivery options

To configure the DZMx to use two containers, ie a tank and bucket, where both containers have separate drop release inputs, then configure container 1 settings for the tank and container 2 settings for the bucket. The additive inputs will apply to both containers, but will only be reported by whatever container is filling and dropping. When two containers are configured, fill events, and drop start and drop end event messages will be extended to identify which container has filled and dropped by adding the text "CID=Tank" or "CID=Bucket".

The Bucket Connected input

Configuring the bucket connected input is required if both containers need to be configured to use the same drop release input. In this configuration, the bucket load cell and bucket connected input must be configured for the bucket, but not the bucket release input. The Drop Release input must be configured as the drop input for both containers. Both containers will use the same drop release type configuration, ie momentary or maintained.

The Bucket Connected input will indicate to the DZMx which container is the currently active water container. The additive inputs (if configured) and the drop release input (if only one configured) will apply to whichever container is currently active.

Iridium Push-To-Talk (PTT)

Enabling PTT Mode

To enable PTT Mode, set the **"PTT Enable"** setting to **"Yes"** in DZMx Manager. This option can be found in the settings under the **"Modem"** section.

Configuring the PTT Input

See ["Configuring Inputs" on page 44](#) for designating and calibrating the PTT input.



Note: The Call Priority setting can be useful for automatically muting a PTT call when making a call on another modem. See ["Call Priority" on page 28](#) for more information.

Dropbox File Transfer

The DZMx provides the ability to upload and download files between a Dropbox folder (www.dropbox.com) and a memory stick inserted into the DZMx USB port.

Overview

A Dropbox account must first be created and configured via **www.dropbox.com**. It can be an existing account, or a new one can be created by signing up from the website. Once a Dropbox account has been created, it will be necessary to execute further configuration steps by following the **Setting up access to a Dropbox Folder** section below. Finally, the DZMx must be configured to connect to your Dropbox account in order to enable remote access to a Dropbox folder.

Hardware Requirements

The DZMx must be fitted with a cellular modem and configured to use cellular data. Refer to the "Configuring DZMx Data" section in the DZMx Installation manual for further details. Files can only be transferred if the cellular modem has a good signal and an active data connection. Ensure the cellular modem displays "Online" on the DZMx front panel display.

Setting up access to a Dropbox Folder

Once logged in to the dropbox.com web site, a **Dropbox Application**, also called "**Dropbox app**", must be set up. This is the mechanism that Dropbox uses to enable access to a dropbox directory by a remote device, such as the DZMx. The application creation process will result in a text string; an access token called the "**App token**". This token will enable remote access to either a specified Dropbox folder, or full access to all Dropbox folders.

Once an App token has been acquired, configuration is required on the DZMx. The App token must be entered into the **Dropbox Token** setting. The DZMx will then be able to download and upload files to and from a remote **Dropbox directory** to and from the specified **USB directory** of an inserted USB stick.

Obtaining a Dropbox Application Token

The first step is to create a Dropbox application which results in the generation of an app token:

- » Navigate to **<https://www.dropbox.com/developers/apps/create>**.

Create a new app on the Dropbox Platform

API v2

My apps

API Explorer

Documentation

HTTP

.NET

Java

JavaScript

Python

Swift

Objective-C

Community SDKs

References

Authentication types

Branding guide

Content hash

Data ingress guide

Developer guide

OAuth guide

v2 migration guide

Webhooks

Chooser

Saver

1. Choose an API

☒ **Dropbox API**
For apps that need to access files in Dropbox. [Learn more](#)

☐ **Dropbox Business API**
For apps that need access to Dropbox Business team info. [Learn more](#)

2. Choose the type of access you need

[Learn more about access types](#)

☒ **App folder** – Access to a single folder created specifically for your app.

OR

☒ **Full Dropbox** – Access to all files and folders in a user's Dropbox.

3. Name your app

Create app

- » For question 1 - *Choose an API*, choose 'Dropbox API'.
- » For question 2 - *Choose the type of access you need*, choose either option.
- » For question 3 - *Name your app*, type in a unique name for your application, it can be any name e.g. 'DZMX'.
- » Click on the "**Create app**" button at the bottom to progress to the next configuration screen.



Note: If "App folder" is selected, the dropbox files will be uploaded and downloaded from `www.dropbox.com/home/Apps/<app name>` where `<app name>` is the name typed into question 3. If a sub-directory is entered into the DZMX "Dropbox Directory" setting, then this directory will be created under the `<app name>` directory, eg files will appear in `www.dropbox.com/home/Apps/<app name>/<Dropbox Directory>`. Specifying a sub-directory is optional. The Dropbox Directory setting can be left blank.

The screenshot shows the DZMX Settings page for API v2. The page is divided into several sections:

- My apps**: Includes API Explorer, Documentation, HTTP, .NET, Java, JavaScript, Python, Swift, Objective-C, and Community SDKs.
- References**: Includes Authentication types, Branding guide, Content hash, Data ingress guide, Developer guide, OAuth guide, v2 migration guide, and Webhooks.
- Chooser**: Includes Saver and API v1.

The main content area shows the following settings:

- Status**: Development (with an 'Apply for production' button).
- Development users**: Only you (with an 'Enable additional users' button).
- Permission type**: Full Dropbox (with a help icon).
- App key**: g1cnujuxj0
- App secret**: Show (with a link to view the secret).
- OAuth 2**:
 - Redirect URIs**: A text input field containing 'https:// (http allowed for localhost)' and an 'Add' button.
 - Allow implicit grant**: A dropdown menu set to 'Allow'.
 - Generated access token**: A section with a 'Generate' button, which is highlighted by a blue arrow.
- Chooser/Saver domains**: A text input field containing 'example.com' and an 'Add' button. Below this field is a note: 'If using the Chooser or the Saver on a website, the domain of that site.'

- » On the second screen do not change any of the settings, simply click on the "**Generate**" button. Dropbox will now create a unique app token comprising a long sequence of characters.
- » **Copy** the app token and return to the DZMx Dropbox settings on the DZMx Manager webpage. Paste the **app token** into your Dropbox Token setting field. This will allow the DZMx to access Dropbox remote files and directories.

DZMx Dropbox Settings Configuration

Important: Note: DZMx Manager administrator or installer rights are required to access this menu. The following settings must be configured correctly before attempting to transfer files from the DZMx keypad:

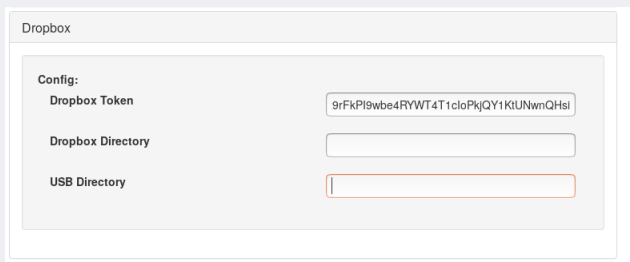
Once The dropbox application token has been obtained and copied, it has to be set up on the DZMx, along with 2 optional settings as below.

The DZMx Dropbox settings can only be modified with DZMx Manager from the : **Settings>>Dropbox** page.

Dropbox Token

A Dropbox App token (a long sequence of characters) obtained from a Dropbox account.

Configuration on the DZMx Manager:



Dropbox Directory

The directory path in the Dropbox Application that the files will be uploaded to and downloaded from.

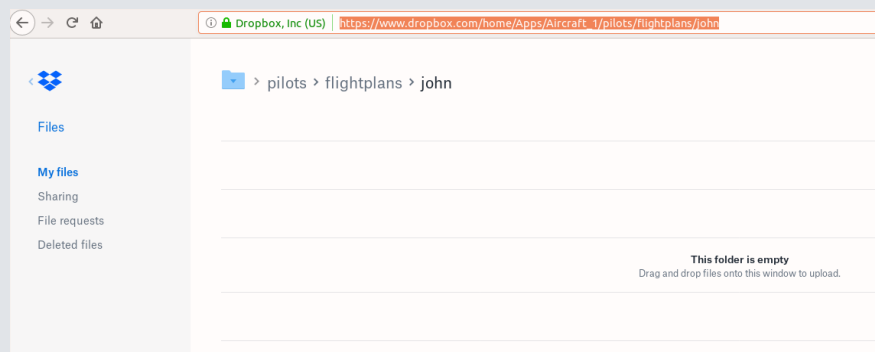
Optional: If left blank, the root directory is assumed.

Syntax: it uses forward slashes to separate subdirectories: **directory/sub-directory/sub-sub-directory**

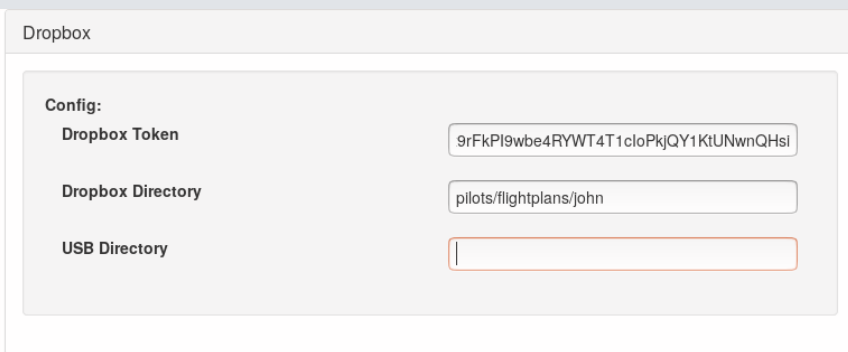
Pre-requisite: This directory exists or needs to be created on the Dropbox Application beforehand.

Configuration both on the Dropbox application and DzmX

On the dropbox application : Ensure the directory exists on the dropbox application.



On the DZMx Manager : replicate the directory path, previously created on the dropbox application.



USB Directory

The directory path on the USB drive that files will be downloaded to and uploaded from.

Optional : If left blank, the root directory is assumed.

Syntax: it uses forward slashes to separate subdirectories: for instance : **directory/sub-directory/sub-sub-directory**

Pre-requisite: This directory needs to exist on the DZMx USB key or be created beforehand.

Configuration on the Dzm Manager only

Dropbox	
Config:	
Dropbox Token	9rFkPI9wbe4RYWT4T1cloPkjQY1KiUNwnQHsl
Dropbox Directory	
USB Directory	flightdata/gps/john

Transferring files

Please refer to the **Dropbox File Transfer** section in the User Manual.

SBD Document Transfer

Sending documents to the DZMx

It is possible to send plain text emails to the DZMx via satellite SBD. Received documents are viewed using DZMx Manager. This is useful for transmitting NOTAM, weather, and passenger information.

Prerequisites

To use this feature, the DZMx must be registered with TracPlus. They will assign the unit a dedicated email address and ask for a list of nominated sender email addresses. Only nominated senders will be able to send plain text emails to the DZMx.

Transmission

The text must be in the body of the email and it must be sent in plain text format. HTML formatted emails will be rejected. The email will be split by TracPlus into the required number of SBD messages and then transmitted via Iridium to the DZMx. The sender will receive an acknowledgement email saying that the document has been received by TracPlus and forwarded to the DZMx. This acknowledgement does not guarantee delivery to the DZMx, only that it has reached the Iridium gateway. If the DZMx is powered down when you send the email, Iridium will queue the message at the gateway and send it when the DZMx next comes online. The DZMx will reassemble the separate SBD messages back into a single message and it can be viewed using [DZMx Manager](#).

Viewing the Email

Received emails are viewed by selecting **SBD Inbox** from the [DZMx Manager](#) home page. The SBD Inbox page will display a list of up to 10 received emails. For each email, the SBD Inbox will show if the email is partial or complete, the originator, and the date and time sent. Clicking on a email will display the email text. It is possible to read partially received emails that have not yet received all their SBD message parts. In marginal signal conditions, occasionally an SBD message will not be received by the DZMx. If an email does not receive all of the parts after a reasonable period of time, contact the sender and ask them to resend the email.



Note: TracPlus is the only tracking provider that supports this application. See "Tracking Providers" on page 37 for more information on setting up your tracking settings.

Geofence Suspend Mode

The Geofence suspend application allows operators to suspend tracking while the aircraft remains within a geographical radius. 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 be suspended.

Setting the Geofence Mode

- » Press MENU then scroll to **Tracking>>Geofence>>Geofence Mode** then select the required mode of operation.
- » Select: **Disabled** to disable the Geofence application. This will remove the geofence function from the MENU key.
- » Select: **Without Events** mode to suspend all tracking messages, except emergency, forms, ETM1000 and manual mark messages.
- » Select: **With Events** mode to suspend periodic and course change tracking messages as above, but all triggered events will still be transmitted.
- » Select: **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.



Note: Geofence suspend events, manually marked positions, form data transmissions, ETM1000 events and exceedences, and emergency messages are never suspended and will always be generated and transmitted according to the normal tracking rules.

Setting Geofence Radius

When activated, the geofence perimeter is fixed to a radius as specified via this setting. The radius can be set between 1 and 10 nautical miles:

- » Press MENU then scroll to **Tracking>>Geofence>>Geofence Radius**
- » Use LEFT and RIGHT to adjust the radius to the preferred distance.

Activating Geofence Suspend Mode

Geofence suspend mode can be activated via a single key press. Press and hold MENU to activate. The DZMx screen will momentarily display that tracking is now suspended and will also state the suspend radius. The geofence radius will be centred at your current position and the suspend radius set will be set to the Geofence Radius setting.

While inside the geofence perimeter, the main screen will display the distance from the centre of the geofence at the bottom of the main screen.

When geofence has been configured to use **Events on Cell Only** mode, the message queue size is increased to 100 if tracking over IP is available, but otherwise, the queue is increased to 40, in order to maximise the cost-saving benefits of tracking via cell modem. If the message queue reaches half full (50 or 20) due to no cell coverage, then the oldest message will be sent on whichever modem is available using the configured preferred network priority (ie, via satellite if available) to ensure the queue does not overflow. See ["Tracking Transmission" on page 39](#) for more details.

Leaving the Geofence Perimeter

When the aircraft flies outside the geofence perimeter, the DZMx will beep and pop-up a screen to notify the operator that they have flown beyond the geofence perimeter. Once the DZMx has left the geofence perimeter, geofence mode is cancelled and normal tracking and queue rules are resumed. Any queued messages will be sent on whichever modem is available using the configured preferred network priority. See ["Tracking Transmission" on page 39](#) for more details.

How to Recentre or Cancel Geofence Suspend Mode

While flying inside the geofence perimeter, it is possible to either recentre the perimeter radius on the aircraft's current position, or cancel geofence suspend mode and resume normal tracking operation. Both of these options are available from the **Geofence Options** menu.

- » If the DZMx is within a geofence perimeter, press and hold MENU until the **Geofence Options** menu appears.
- » Select either the **Cancel** or the **Recentre** option from the menu.
- » Recentring the geofence will reset the geofence radius to centre on the current position and the DZMx will remain in geofence suspend mode.
- » Cancelling the geofence will cancel geofence suspend mode and the DZMx will resume normal tracking.

OpenVPN Virtual Private Network Connection



The DZMx can connect to an **existing OpenVPN Virtual Private Network (VPN)**. A VPN is a network of devices connected together over one or more physical public networks such as the internet, and/or one or more local networks. The VPN maintains communications private and secure (encrypted), regardless of the nature and number of physical networks used to connect the devices together, as if the network was an actual physical private and secure network, such as local physical Ethernet network.



Note: For more information on how to create your own OpenVPN network, set up your own OpenVPN server, please consult the official website : <https://openvpn.net/index.php/open-source.html>

Important: The OpenVPN connection can re-route or redirect, some or all traffic, between the DZMx and the internet, through the connected Virtual Private Network (VPN). Therefore **correct configuration of the OpenVPN routing is essential**. The routing of the OpenVPN connection is usually achieved on the OpenVPN server configuration, which is deployed on the DZMx once it is connected to the VPN. More information on routing configuration is at : <https://openvpn.net/index.php/open-source/documentation/howto.html#redirect>

Configuration

Hardware

The DZMx must be fitted with a cellular modem and configured to use cellular data. See the "[Configuring DZMx Data](#)" on page 76 section in this manual for further information.

Settings Configuration

OpenVPN relies on a server based architecture. The various elements of configuration are generated by, and retrieved from, the OpenVPN server which hosts the Virtual Private Network. The OpenVPN connection configuration needs to be:

1. Contact your OpenVPN administrator to create and provide your DZMx with a user account, in the form of a set of one or many configuration files (see below)
2. The OpenVPN configuration file(s) need to be installed on the DZMx before being able to connect to a given OpenVPN network.

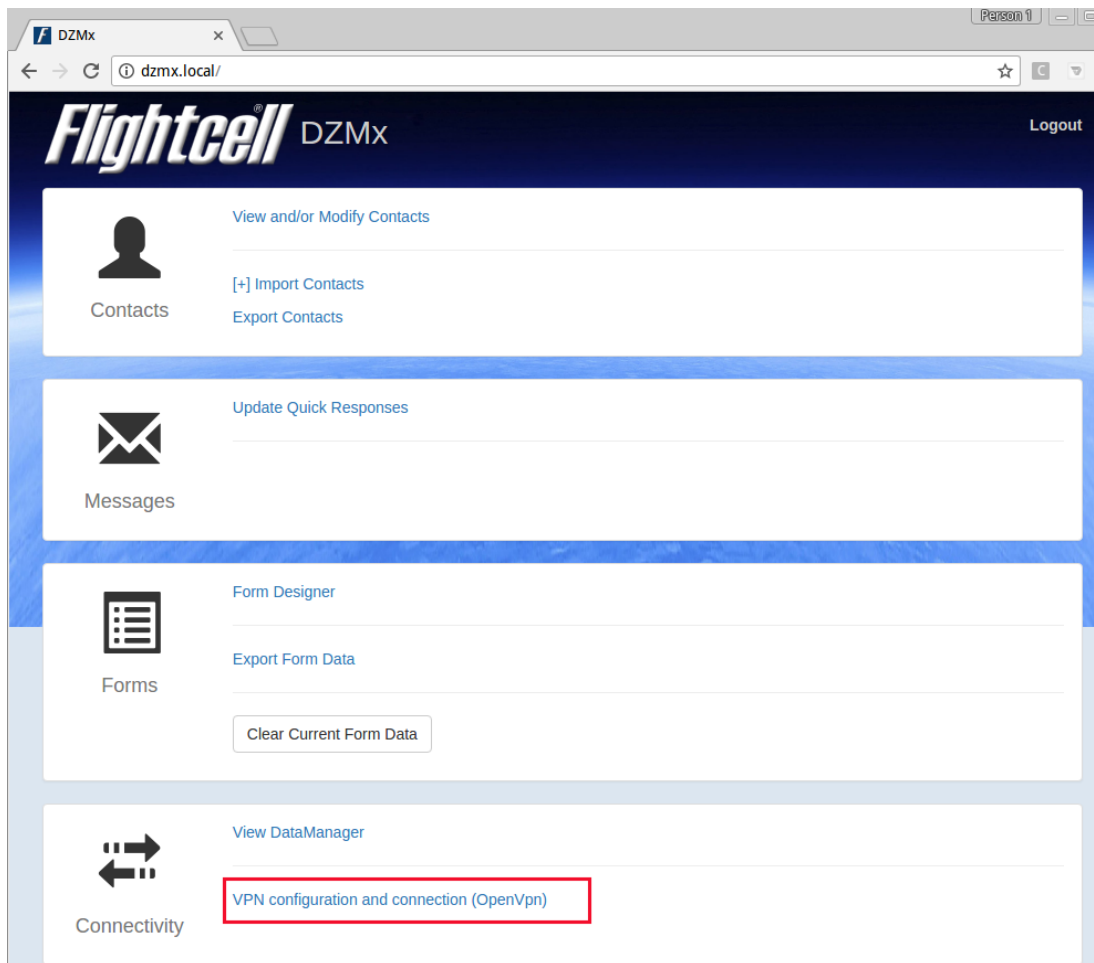
The OpenVPN connection file(s) and access can be installed and configured via the [DZMx Manager](#) web interface by following these steps:

- » Connect the DZMx to a workstation/laptop via Ethernet
- » Browse to the DZMx Web Manager: <http://dzm.x.local/> or by default 192.168.4.1



Note: if the linux ZeroConf / Windows Bonjour Discovery service is not installed on your machine use <http://192.168.4.1> instead.

- » Browse to **Connectivity** section and click the **VPN configuration and connection** link



VPN Configurations

The following configuration types are available : (**single-file** or **multi-file**, **auto-login** or **username + password**). These configuration reflect the possible set up options on the VPN server side, when your administrator generates a user account, as detailed below.

The **private key passphrase** is **optional** and reflects the SSH private key setup.



Note: Refer to the OpenVPN and OpenSSH documentation for more information on this topic.

Single File Configuration (default)

The "Single configuration package" option uses the OpenVPN all-in-one package configuration file (.ovpn extension)

This file contains of:

- Client SSL key for encryption purpose.
- All required SSL certificates for authentication purpose (i.e. ca.crt server certificate in order to authenticate the OpenVPN server).
- Client specific VPN configuration settings, defined and deployed by the OpenVPN server to the DZMx.

Warning!
Uploading a VPN configuration will *replace* the existing configuration on the DZMx.

VPN

<< Back to Manager

☒ Single configuration package
 ☐ Multi-file configuration

ovpn file (i.e. myvpn.ovpn): No file chosen
**required*

☐ Auto login
 ☐ Username+Password login

☐ No private key passphrase
 ☐ Passphrase encrypted private key (optional)

Multiple Files Configuration

The "Multiple file configuration" option requires the same files and elements of configuration as the single file configuration, however the Client SSL key, certificates and configuration package are in separate files and must be uploaded one-by-one:

☐ Single configuration package
 ☒ Multi-file configuration

ovpn file (i.e. myvpn.ovpn): No file chosen
**required*

CA certificate file (i.e. ca.crt): No file chosen
**required*

Client certificate file (i.e. client.crt): No file chosen
**required*

Client key file (i.e. client.key): No file chosen
**required*

☐ Auto login
 ☐ Username+Password login

☐ No private key passphrase
 ☐ Passphrase encrypted private key (optional)

Login Type

Different login types are offered by OpenVPN, these are reflected in the following Login type form. Please refer to the OpenVPN manual for more information.

Auto-login :

No username or password are required, in the case of auto-login profiles enabled on your VPN server, for a given user account.

Username+Password login:

Username and password are required by your VPN server for a given user account.

☐ Auto login ☒ Username+Password login

Enter user login

Required.

Enter Password

Required.

Private Key Passphrase:

OpenVPN offers to use unencrypted or encrypted private key files. In the case when your private key is encrypted, select the Passphrase encrypted private key option. Please refer to the OpenVPN and openssl documentation for more information.

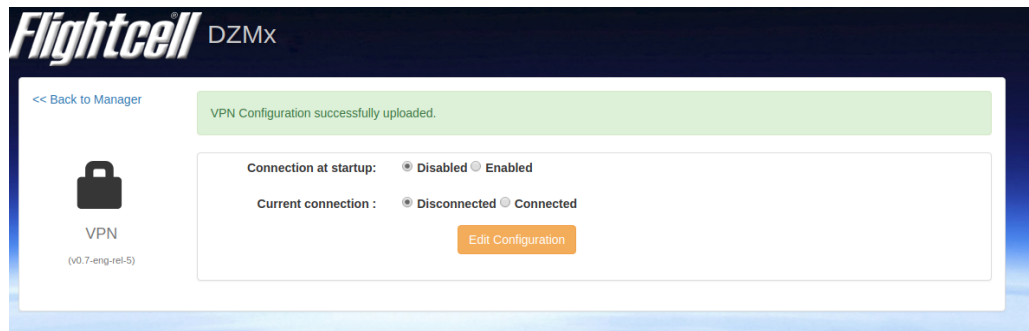
☐ No private key passphrase ☒ Passphrase encrypted private key (optional)

Enter Private key passphrase

Required.

Saving The Configuration

Click the Save VPN configuration button once all the required fields are filled in.



Note: The save button will not be enabled until all the required fields are filled in.

Establishing a VPN Connection

Once configured and saved, the VPN connection can be controlled via the DZMx keypad or the DZMx Manager web interface.

Verifying Connectivity and Routing Configuration

By default the VPN connection can be configured not to redirect any of the internet traffic. Or, alternatively, it can be configured to redirect all traffic via the connected VPN. This behaviour has to be configured on the OpenVPN server itself.

Important: OpenVPN routing configuration can potentially redirect all of the DZMx internet traffic, through the VPN connection. This can affect the behaviour of essential functions requiring an internet connection, such as [Tracking over IP](#), or [DropBox](#). Therefore it is **essential to verify the routing configuration of your VPN server**. More information on routing configuration can be found at : <https://openvpn.net/index.php/open-source/documentation/howto.html#redirect>

Error Messages and Diagnostic

During the set up or connection phases, errors can occur due to connectivity or file corruption issues.

Error Message	Diagnostic
Error: Data connection is not Enabled	The cellular data connection is not enabled, Enable the cell data connection
Error: Data connection offline. Check cell network signal and settings	The cellular data connection is enabled but offline, and unable to obtain internet connectivity. Checking the network signal and APN setting is necessary, as well as data allowance status.
Error: No data on Ethernet. Switch Ethernet configuration to CLIENT or STATIC.	In the specific case of the DZMx getting internet connectivity through an Ethernet connection on ground, the Ethernet configuration needs to be set to DHCP client or Static IP address mode. Please refer to the Hardware Configuration section for more information.
Error: VPN connection has failed. Retrying...	In cases when the connection quality or cellular network coverage is varying, or cut off the VPN connection can requires a few tries before getting established ok.
Error: VPN Server unreachable.	The OpenVPN server IP address or host name is wrong, or the VPN server IP or host name are correct but the server is not running or not responding.
Try again or reset VPN connection.	The connection failed and the most likely failure is an out of date user configuration, or a revoked access to the VPN. In this case use the VPN configuration menu to try and update the VPN configuration and then try connecting again. If the issue persists, contact your OpenVPN Server administrator to make sure that the DZMx still has a valid and current VPN access rights and configuration.
Error: VPN disconnection failed.	The VPN connection failed to disconnect, this can occur when the server is busy, the data connection is cut off, or when the DZMx is busy using the data connection for another task.

Error: Missing server CA certificate file, contact support.	This message can occur when the "CA server certificate" file is corrupt, unreadable or out of date. In order to establish a secure connection and authenticate the OpenVPN Server, a server certificate file is required. Contact the OpenVPN Administrator to check that the server.ca certificate is up to date. Then upload the certificate to the DZMx, via DZMx Manager, and try again.
Error: Unknown error, contact support.	An unexpected error occurred and it is something that is external to the VPN server or the user configuration. If this error message persists across 2 or more VPN connection attempt contact Flightcell Support.
Error in Configuration file.	The VPN configuration file(s) which have been uploaded to the DZMx are corrupt, out of date, or invalid. Try and upload the configuration file(s) again. If that doesn't work, contact your OpenVPN administrator in order to ascertain the validity of the current user configuration file(s).

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 and it can be done on the ground or in-flight. There are three steps involved:

1. Set up the connection to the Flightcell Remote Assistance Virtual Private Network.
2. Establish the connection to the Flightcell Remote Assistance VPN Network
3. Disconnect the VPN connection to the Flightcell Remote Assistance VPN Network



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 Startup**. In this instance go direct to step 2 "Establish a VPN Connection".



Note: For step 1 "Setup a Connection" you must obtain a password from the Flightcell support team. If they haven't supplied one already; take note of the DZMx serial number (from the **Diagnostics Menu** or the label on the back of the DZMx) and then contact the support team to request a user account and password.

Setting up a Connection

Setting up the connection must be completed before a VPN connection can be established to the Flightcell Remote Assistance VPN. This is a one-off configuration step and it will never need to be repeated. To set up a connection, once the Flightcell support team has provided you with a password:

- » Press the MENU key
- » Scroll to **Remote Assistance** and press ENTER
- » Ensure **Setup Connection** is highlighted and press ENTER
- » Enter the supplied password (see note above), and press ENTER
- » If the setup was successful a "Configuration received ok" message will be displayed.

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 configuration. The DZMx will operate normally throughout this process.

To establish a VPN connection:

- » Press the MENU key
- » Scroll to **Remote Assistance** and press ENTER
- » Ensure **Connect VPN** is highlighted, then press ENTER.
- » If the connection is successful a "VPN connection online" message will be displayed.
- » If the connection is unsuccessful a "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

Once connected it is possible to disconnect it at any time. Disconnection would normally be done once Flightcell support has finished assisting and has given the 'all-clear'. To disconnect a VPN connection:

- » Press the MENU key
- » Scroll to **Remote Assistance** and press ENTER
- » Ensure **Disconnect VPN** is highlighted and press ENTER
- » Scroll to **Yes** and press ENTER

Once the OpenVPN settings are configured and saved, the VPN connection status can be accessed both from the DZMx Manager 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 Startup

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

Error Messages and Diagnostics

During the set-up or connection phases, errors can occur due to connectivity or file corruption issues.

Error Message	Diagnostic
Error: Data connection is not Enabled	The cell data connection is not enabled. Enable the Cell Data connection
Error: Data connection offline. Check cell network signal and settings	The cell data connection is enabled, however it is offline and unable to obtain internet connectivity. Check the network signal and APN setting. Also check the data allowance status.
Error: No data on Ethernet. Switch Ethernet configuration to CLIENT or STATIC.	In the specific case of the DZMx getting internet connectivity through an Ethernet connection on the ground; the Ethernet configuration needs to be set to DHCP client or have a Static IP address. Please refer to the Hardware Configuration section for more information.
Error: VPN connection has failed. Retrying...	If the connection quality or cell network coverage is varying, or cut off, the VPN connection can require several attempts before becoming established.
Error: VPN Server unreachable	The Remote Assistance server IP address or host name is wrong, or the Remote Assistance server IP or host name are correct but the server is not running or not responding.
Try again or reset VPN connection.	The connection failed and the most likely cause of failure is an out of date user configuration, or a revoked access to the Remote Assistance. In this case use the Remote Assistance configuration menu to reset the connection configuration.
Error: VPN disconnection failed.	The Remote Assistance connection failed to disconnect, this can occur when the server is busy, the data connection is cut off or when the DZMx is busy using the data connection for another task.

Error: Missing server CA certificate file, contact support.	This message can occur when the "CA server certificate" file is corrupt, unreadable or out of date. In order to establish a secure connection and authenticate the Remote Assistance Server, a server certificate file is required. In this case contact Flightcell Support.
Error: Unknown error, contact support	An unexpected error occurred, due to a cause which is external to the Remote Assistance server or the user configuration. If this error message persists across 2 or more VPN connection attempts, please contact Flightcell Support.
Error in Configuration file	The Remote Assistance configuration is erroneous or has become corrupt after a download error.

Section 9 Phone Book

The DZMx has a phone book with a capacity to store up to 50 numbers. The first three numbers will be automatically assigned to the three speed dial keys. Phone book entries can be added, edited or deleted by either using the DZMx menu system or "[DZMx Manager](#)" on [page 7](#). DZMx Manager provides a quick and simple interface for importing contacts into the DZMx. The following are instructions for adding, editing and deleting phonebook entries using the DZMx screen/keypad.

Adding a New Contact

1. Press MENU then navigate to **PhoneBook>>Add/Edit**; the phone book will be displayed.
2. Scroll down to an empty contact and press ENTER; the DZMx will display *Enter number*.
3. Enter the number using the full international dialling string including country code and area code (e.g. +6435458659); press and hold the "0" key to get the "+" prefix.
4. Press ENTER; the DZMx will display *Enter name*.
5. Use UP and DOWN to scroll through the letters of the alphabet to the required letter, press RIGHT to move to the next character or BACK to backspace the last digit.
6. When the name has been entered, press ENTER to save the new contact.

Editing an Existing Contact

1. Press MENU then navigate to **PhoneBook>>Add/Edit**; the phone book will be displayed.
2. Scroll down to the contact to be altered and press ENTER; the DZMx will display the phone number.
3. Edit the number using the BACK key and the number keys.
4. After the number has been edited, press ENTER; the DZMx will then display the contact name.
5. Use the BACK key to remove characters from the name. The UP and DOWN keys are used to scroll through the letters of the alphabet to the required letter. Press RIGHT to move to the next character.
6. When the name has been entered, press ENTER to save the contact.

Deleting an Existing Contact

1. Press MENU then navigate to **PhoneBook>>Erase**; the phone book will be displayed.
2. Use UP and DOWN to scroll to the contact to be deleted.
3. Press ENTER to delete the selected contact.

Importing a Phonebook

- » Insert the USB memory stick holding the phonebook file in the DZMx USB port
- » Press MENU, then scroll to **Phonebook>>Import**.

Exporting a Phonebook

- » Insert a USB memory stick in the DZMx USB port
- » Press MENU, then scroll to **Phonebook>>Export**.

Speed Dial Keys

The speed dial keys SPD1, SPD2 or SPD3 are automatically configured to the first three numbers in the phonebook.



Note: DZMx Manager provides an alternative and often quicker interface for updating the DZMx phone book. See ["DZMx Manager" on page 7](#) for importing a Phonebook.

Section 10 Configuring DZMx Data

DZMx data can provide access to the internet for a connected PC, laptop, or Windows tablet. It does this using cellular data and the physical connection is via the DZMx Ethernet port.

Ethernet Configuration

It is recommended that the Flightcell USB/Ethernet module is installed to provide the necessary Ethernet connection. The DZMx requires the **Ethernet Configuration** to 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 i.e. 192.168.4.1 as their default IP gateway.:

DHCP Server Mode Configuration

- » Press MENU, then scroll to **Hardware Config>>Ethernet Configuration>>Select IP Address Mode**
- » Scroll to **DHCP Server**, then press ENTER.

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



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

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 DNS settings (optional).

Specifying static IP settings (IP address, Subnet Mask)

- » Scroll to **Static IP Configuration**, then press ENTER.
- » Scroll to **Host IP Address** and then specify the DZMx Ethernet interface IP address i.e. 192.168.4.1, then press ENTER.
- » Scroll to **Subnet Mask** and then specify the subnet mask that matched the IP address (previous step) i.e. 255.255.255.0, then press ENTER.

Optional Gateway and DNS configuration

Independently from the IP address mode, DNS server settings can be specified in order 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.

- » (Optional) Scroll to **Hardware Config>>Ethernet Configuration>>Static IP Configuration>>Gateway IP address** in order to specify the default internet gateway the DZMx will use, in the case where the internet connectivity is coming from a specific IP gateway (contact your cell network provider for more informations) i.e. 192.168.4.100, then press ENTER.
- » (Optional) To override the default DNS server configuration scroll to **Hardware Config>>Ethernet Configuration>>DNS Configuration>>DNS Server IP Address #1**, press ENTER and specify the

IP address for the **Primary** DNS server, then press ENTER. Repeat this step for the Secondary. Scroll to **DNS Server Address #2** in order to specify the Secondary DNS server IP Address.

Applying the specified Static IP configuration

- » Press MENU, then scroll to **Hardware Config >> Ethernet Configuration >> Select IP Address Mode**
- » Scroll to **Static IP Address**, then press ENTER.
- » This will apply the specified static IP settings and optional settings, Default gateway and DNS. This process can take a few seconds.



Note: In order to check which IP address is in use for the Ethernet connection, using the Main Menu scroll to the **Diagnostic >> About DZMx** Menu, then inspect the 3rd line **IP Address**

Enabling and Disabling Cellular Data

To enable or disable cellular data press MENU, then scroll to **Hardware Config>>Cell Data Configuration>>Data Enable** and select one of the following options:

- » **Off:** data is turned off at all times
- » **On Ground:** data is only available when the aircraft is on the ground
- » **In Flight:** data is only available when the aircraft is flying
- » **Always On:** data is always available when the DZMx is capable.

APN

The APN setting must be configured in order to establish a data connection. The Access Point Name (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 via DZMx Manager web interface, where you can type or paste in the APN. However it can also be entered from the DZMx keypad:

- » Press MENU, then scroll to **Hardware Config>>Cell Data Configuration>>APN**
- » Use UP and DOWN and the BACK key to enter the APN.
- » When the APN has been entered, press ENTER to save the new setting
- » Alternatively, press BACK repeatedly until all the characters have been deleted, and then press once more to abort the change.

Data Roaming

If it is necessary to use the data connection on another network or in another country, activate data roaming. To enable/disable data roaming:

- » Press MENU, then scroll to **Hardware Config>>Cell Data Configuration>>Data Roaming**.
- » Scroll to either **No** or **Yes**, then press ENTER.



Note: Data roaming can incur significant charges!

Enabling and Disabling Satellite Data

Modify the Satellite modem settings via DZMx Manager in **Settings>>View and/or Modify Settings>>Modems>>Internal Sat Modems** to enable and disable satellite data. This cannot be enabled from the DZMx keypad.

Section 11 External Hardware

This section outlines the available external hardware that can be installed with the DZMx. This external hardware helps expand the features available for the DZMx.

The following is a list of the external hardware available for the DZMx:

- » ["DZMx Remote Head" on the next page](#)
- » ["Cabin Phone" on page 80](#)
- » Iridium Cradle (refer to the Flightcell Support website for the Cradle installation guide)

DZMx Remote Head

One or two Flightcell DZMx Remote Heads may be installed to provide other crew or mission specialists with full remote control of the DZMx.

Each of the DZMx and remote heads must have a unique ID. The DZMx is Head A. The first remote head is Head B and the second Head C.

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 ["Backlighting" on page 32](#) for details on adjusting the brightness and the installing the external lighting input.

Refer to the Flightcell Support website for the wiring diagram of the remote head and DZMx.

Configuring DZMx

First, the DZMx needs to be configured to recognise the remote heads:

- » Press MENU, then scroll to **Hardware Config>>Head B Enable**.
- » Select **On** to enable, or **Off** to disable the remote head
- » Press ENTER to save the setting

If a second remote head is installed, repeat these steps for **Head C Enable**.

Configuring the Remote Heads

The remote heads now need to be allocated a head ID so that the DZMx can identify each remote head.

- » Press and hold "*" 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.



Note: Ensure that the DZMx and each remote head have separate head ID's.

Cabin Phone

A cabin phone - for example a cordless or corded phone - may be installed in the aircraft cabin. The DZMx supports a POTS phone (2-wire Plain Old Telephone System). This is connected to the **POTS RING** and **POTS TIP** outputs from the DZMx. A wiring diagram for this connection is provided in the DZMx wiring diagrams, see www.flightcell.com/support.

The DZMx is currently configured to support the ICG Jetphone and ePhone. Other phones may also be supported - **contact Flightcell International for details**.

Configuring DZMx to use a Cabin Phone

To enable the Cabin Phone:

- » Press MENU, then scroll to **Hardware Config>>Cabin Phone Enable**
- » Select **On** to enable, or **Off** to disable the cabin phone
- » Press ENTER to save the setting.



Note: The DZMx will need to be restarted after enabling Cabin Phone.

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 5458651
Fax	+64 3 5488091
Email	admin@flightcell.com
Website	http://www.flightcell.com

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 two years if your DZMx is registered on our product registration system, <http://www.flightcell.com/register>.

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 and Configuration 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/rma or contact Flightcell International (see "Contact Details" on the previous page).