



- Mobile Satellite Radio User Guide



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Safety Information

For your safety and protection, read this entire user manual before you attempt to use the MSATe Radio. In particular, read this safety section carefully. Keep this safety information where you can refer to it if necessary.

Warning Symbols Used in this Manual



Warning

Potential Radio Frequency (RF) hazard. Where you see this alert symbol and WARNING heading, strictly follow the warning instructions to avoid injury to eyes or other personal injury.



Warning

Where you see this alert symbol and WARNING heading, strictly follow the warning instructions to avoid personal injury.



Danger

Electric shock hazard: Where you see this alert symbol and DANGER heading, strictly follow the warning instructions to avoid electric shock, injury or death.

Warnings for MSATe Radio



Safety Information

The MSATe Mobile Satellite Radio is a radio transmitter and receiver. When turned on and operating, the MSATe antenna transmits and receives radio frequencies to and from a satellite orbiting the earth.

Installed and used properly the MSATe Radio complies with the following safety standard: IEC 62368-1:2019, Standard For Audio/Video, Information and Communication Technology Equipment. The MSATe radio may be operated safely if no one is within one (1) meter of the satellite antenna's transmission path. The antenna should be installed and operated to ensure that passersby and passengers of vehicles with vehicle-mounted antennas will not be closer than the safe distance. There is a label on the antenna that notifies people of the safe distance. Please be sure that the label on the antenna remains visible and attached. If detached, replace immediately.

Use of the MSATe Radio in a manner that is inconsistent with the safety guidelines stated in this manual may result in physical harm or other harm to your health.

**Do Not Stand in Front of the Antenna**

This device emits radio frequency energy when in the transmit mode. To avoid injury, do not place head or other body parts in front of the satellite antenna when system is operational. Maintain a distance of one (1) meter (39.37 inches) away from the front of the MSATe antenna.

**Other Electronic Danger Warning**

To reduce the risk of fire or electric shock, do not submerge this product in water. Do not expose this product to rain or moisture unless it is specifically intended for outside use.

**Fuse Replacement**

Replace fuses with the same type and rating for protection against risk of fire.

**Blast/RF Warning**

Do not operate the MSATe Radio in areas where explosives are in use as the RF energy may cause hazardous conditions. Do not operate the MSATe Radio where two-way radios are prohibited. Turn the MSATe Radio off while at a petrol filling station or near fuels or chemicals.

**Installation Warning**

This product is to be installed by Authorized Service Centers. **WARNING:** Avoid exposure to microwave radiation. Keep a safe distance of minimum one (1) meter (39.37 inches) to the side and above the antenna. Always power the MSATe down prior to disconnecting or connecting the antenna.

The MSATe Transceiver Unit (TU) requires air cooling. Do not cover the TU or otherwise impede the flow of air across the unit.

**Qualified Service Warning**

Do not disassemble this product as there are no serviceable parts inside. This product should be serviced by an authorized Service Center when service or repair work is required. Personal injury may result if the transceiver unit or antenna unit is opened when power is applied.

**Accessories Warning**

Use of non-approved accessories can result in loss of performance, damage to the MSATe Radio, fire, electric shock or injury.

**Connecting Devices Warning**

Never connect incompatible products. When connecting the MSATe Radio to any other device, read the device's User Manual for detailed safety instructions.

**Medical Device Warning**

Various types of medical devices, including pacemakers, implantable defibrillators, and other implanted devices, may be subject to interference from electromagnetic fields emitted by this device. Consult with your physician and medical device manufacturer for information specific to your medical device. If you suspect interference, stop using this device.

**Lightning Protection Warning**

In fixed-site installations, ensure that ground straps and lightning arresters are correctly installed in accordance with approved National Electrical Code standards.

FCC Compliance

This equipment has been tested and is compliant with the limits for a class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication equipment. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and the receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

ISED Canada Compliance

Innovation, Science and Economic Development Canada CAN ICES-3 (B)/NMB-3(B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license exempt RSS(s).

Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

Ce dispositif contient les émetteurs/récepteurs autoriser-exempts qui sont conformes au permis RSS exempt du Canada d'innovation, de la Science et de développement économique.

L'opération est sujette aux deux conditions suivantes:

- Ce dispositif peut ne pas causer l'interférence.
- Ce dispositif doit accepter n'importe quelle interférence, y compris l'interférence qui peut causer le fonctionnement peu désiré du dispositif.

RADIATION EXPOSURE

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator and your body.

DÉCLARATION D'EXPOSITION AUX RADIATIONS:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

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Introduction



Powered by the SkyTerra 1 satellite, the Ligado MSAT services cover North and Central America, Northern South America, the Caribbean, Hawaii, and coastal waters.

MSATe Mobile Satellite Radio

The MSATe Mobile Satellite Radio is a powerful communications tool that works where you do. Designed for use on the Ligado MSAT Network, the MSATe supports continent wide Push-to-Talk (PTT), Voice and Data communications. In addition, the MSATe offers GPS capability and flexible interconnectivity to a variety of third-party Interoperability Devices, extending the reach of traditional Land Mobile Radio technology.

MSAT Push-To-Talk (PTT) Dispatch Radio Service

MSAT PTT Dispatch Radio is a real-time, voice-based service that provides point-to-multipoint and point-to-point communication at the push of a button, simply, quickly and reliably. The service is a cost-effective alternative to installing, maintaining, and relocating land-based two-way radio communication systems.

MSAT Telephony Voice

MSAT Telephony Voice service makes sending and receiving voice calls as easy as using any regular phone. Each MSATe has a local 10-digit number and can dial normally to reach any phone anywhere in the world. The MSATe is Government Emergency Telecommunications Service (GETS) compatible.

MSAT Tracking

MSAT Tracking enables the transmission of MSATe GPS coordinates whenever a user pushes the radio's PTT button, and at one-minute intervals during a telephone or data call. In addition, a dispatcher or fleet manager can poll a subscribing MSATe radio for location information anytime the unit is powered on.

Components

Standard MSATe Mobile Satellite Radio Packages:

MSATe LAND MOBILE	MSATe MARITIME	MSATe FIXED
<ul style="list-style-type: none"> • HUGHES 2110 TU with Mounting Bracket • Peiker HA40 Handset • SpaceCom LS22X Series Land Mobile Antenna • Antenna Cable (6m/20ft) • Power Cable 	<ul style="list-style-type: none"> • HUGHES 2110 TU with Mounting Bracket • Peiker HA40 Handset • SpaceCom LS32X Series Maritime Antenna • Antenna Cable (18.3m/60ft) • Power Cable 	<ul style="list-style-type: none"> • HUGHES 2110 TU with Mounting Bracket • Peiker HA40 Handset • SpaceCom LS22X Series Land Mobile Antenna • Antenna Cable (45.7m/150ft) • Power Cable • Pole Mounting Kit
OPTIONAL ACCESSORIES:	OPTIONAL ACCESSORIES:	OPTIONAL ACCESSORIES:
<ul style="list-style-type: none"> • Magnetic Mounting Kit or • Pole Mounting Kit 	<ul style="list-style-type: none"> • Pole Mounting Kit 	<ul style="list-style-type: none"> • Magnetic Mounting Kit

Radio Overview

Handset



HANDSET

Transceiver Unit



TU FRONT PANEL



TU BACK PANEL



MOUNTING BRACKET



POWER CABLE

Antennas



LAND MOBILE &
FIXED ANTENNA



MARITIME ANTENNA

User Interface (UI) Overview



Display



The display area contains, at any given time, one or more of the following information sets:

- Latitude/longitude of current location
- Dispatch Radio talkgroup assignment
- Menus for invoking various actions and functions
- Status messages
- Function success, error, or correctional messages
- "Soft" keys to support various functions

The display switches to "night-mode" automatically in low light conditions.

More detailed information about the display contents and functionality is detailed in the MMI functions chapter.

Indicator Definitions

ICONS		
Headset Icon		This indicator signifies that a headset is connected to the handset and recognized by the device (Note: headset connection is a standard 3.5mm jack, compatible with most standard headsets)
Talkgroup Lock Icon		This icon appears on the handset display when the talkgroup lock feature is enabled

POWER UP/DOWN INDICATORS

- **MSATe Logo**

On power up, the MSATe logo appears for a few seconds.

- **SEARCHING...**

The handset will display SEARCHING while it is attempting to log on to the network. Once the radio logs on, SEARCHING will disappear, and the default service display screen is displayed on the handset. If service is lost, SEARCHING will be displayed until service is restored.

DISPATCH MODE OPERATION INDICATORS

- **Tag Position (i.e. 01:XXXXXXX)**

Once a talkgroup is successfully downloaded, an associated two-digit tag number is assigned by the network and appears on the display screen. A radio can have up to 16 tag positions (including tag 00 for private mode operation).

- **BX SXX**

This indicator specifies the beam to which the radio has logged-on, as well as the radio received signal strength (i.e. B1 S99). Beam mapping is as follows:

Beam 0	EAST
Beam 1	EAST C
Beam 2	WEST C
Beam 3	WEST
Beam 4	SOUTH
Beam 5	A/H

Signal strength ranges from 0 (no signal) through 99.

- **No TG**

This indicator appears in the event that a talkgroup has not yet been downloaded to the radio.

- **TG Update**

This indicator appears when a talkgroup has been successfully downloaded to the radio, reconfigured or deleted from the radio over the air. Talkgroups download quickly when the radio is powered on. If the configuration of talkgroups is changed at the network while the radio is off, the talkgroup information will be downloaded via the signaling channel when a call is made or a manual beam cross-over is initiated.

- **DR**

This indicator appears when the radio is in idle state in Dispatch Radio mode.

- **In Use**

This indicator appears when a Dispatch Radio call is in progress. It will remain visible until the call has been terminated.

- **User On**

This indicator appears when the PTT key has been pressed and the communication channel has been accessed. The indicator is prompting you to begin speaking.

- **Vacant**

This indicator appears when the PTT key has been released. It indicates that the communication channel is available to any member of the talkgroup who wishes to speak.

- **PRIV**

This indicator appears when you select a private mode talkgroup (tag 00) and will remain displayed when the handset is in private mode (in idle state).

- **P1**

This indicator appears when you initiate a Priority-1 Emergency call.

Controls

Buttons

Power: The power button is the “on-off” switch for the handset. It is a “delayed action” button – you must keep it pressed for a second or two and then release it to initiate the power on or power off sequence. When pressed briefly, this key is used to end a telephone call. It is also used as a Quick Exit from any menu through which you are navigating. When you press the key, you are returned to the “idle” display screen.

PTT: Pressing and holding the PTT button initiates and maintains a Dispatch Radio call.

P1: Pressing this key initiates a Priority-1 Emergency Interruption Dispatch Radio call.

Physical Keys

Keypad Keys: The keypad contains alphanumeric keys for text entry and Voice number dialing.

Send: This key is used to initiate a telephone call and Dial-Out Dispatch sequence.

Up Arrow/Down Arrow: These keys are used primarily for the following functions:

- Volume adjustment
- Scrolling through various menus
- Scrolling through downloaded talkgroup tag positions

In certain contexts, the Up/Down arrows also serve as “soft keys.”

Soft Keys

Four “soft keys” are used to enable the following functions:

- Navigation through Menus
- Storage of data in the radio
- Selection of Dispatch Radio talkgroup tag positions
- Activation/Deactivation of various functions and features

These keys are called “soft keys” because the way they work depends on the context of the function currently being exercised on the handset. A soft key “label” is shown above the key in the display area.

Soft Key 1 (SK1): This key is located just below the display area and just above the SEND key. Its label is shown directly above it in the display area.

Summary of SK1 functionality:

- **Menu** – used to access various user menus. The “Menu” soft key indicator is displayed when the radio is in an idle state.
- **Clear** – used mainly while in editing mode (labeling talkgroup tag positions, labeling GPS positions, etc.). A single press deletes a single character; press and hold will delete the entire line of text.
- **Back** – used to back out of a given menu. This key generally brings you to the previous menu option without implementing changes (e.g. number storage, volume level setting, etc.) you made on the current menu.
- **Exit** – used to exit the main user menu section. This key takes you back to the default screen display.
- **No** – this key only appears when you attempt a manual beam cross-over, attempt to abort the commissioning process, or change the serial port configuration.

- GPS – used to activate/deactivate the GPS information indicator on the handset display screen during an active call. This soft key appears during a call.

Soft Key 2 (SK2): This key is located just below the display area and just above the END key. Its label is shown directly above it in the display area.

Summary of SK2 functionality:

- Group – provides access to a list of all downloaded talkgroup tag positions that the user can select from.
- Select – enables you to select desired talkgroup tag positions and various other functions and features.
- Ok – confirms selection of certain functions and features.
- Store – confirms selection of functions that store information in the radio such as commissioning info, talkgroup tag labels, GPS positions and various codes (lock code, password, etc.).
- Edit – used to inform the radio that you are about to enter alpha/numeric keys (for TG label, GPS Position Name, etc.).
- Yes – only appears when you initiate a manual beam cross-over, initiate the commissioning process, or change the serial port configuration.
- Save – used to save entered data such as a talkgroup label or save a GPS position to memory.

Soft Key 3 (SK3): This is the UP ARROW key.

Summary of SK3 functionality:

- Lock – only appears in Dispatch mode when radio is idle. Used to lock the radio to the current talkgroup.
- Unlock – only appears in Dispatch mode when radio is idle. Used to remove a talkgroup lock.
- EMG – only appears when the system lock prompt appears. Emergency circuit switched voice calls are not supported in the current radio.

Soft Key 4 (SK4): This is the DOWN ARROW key. As a soft key, SK4 is used to scroll down various menu items and lists, scroll through downloaded talkgroup tag positions, and decrease volume levels.

Alphanumeric Keyboard Mapping

The handset keypad letter reference is shown in the following table:

KEY NUMBER	KEY ALPHAS
1	1
2	A B C 2
3	D E F 3
4	G H I 4
5	J K L 5
6	M N O 6
7	P Q R S 7
8	T U V 8
9	W X Y Z 9
*	. - ' @ *
space 0	space
#	#

Character Entry

Character entry is typical of most cell phones. When entering text, press the required number key in rapid succession to select the appropriate letter for that key.

For example:

- To type the name "John," do the following:
 - Press the number "5" key once to select "J."
 - Press the number "6" key quickly three times to select "O."
 - Press the number "4" key quickly twice to select "H."
 - Press the number "6" key quickly twice to select "N."

Modes

Mode Selection

Menu: SERVICE MODE

When you SELECT the SERVICE MODE option on the Main Menu you can choose between Dispatch Radio and Voice mode.

Dispatch Radio – In this mode the radio can make and receive Push-To-Talk calls. It can also make and receive voice and data calls if the service is enabled and calls are not barred. This is the default mode of operation.

Voice – Selecting this mode puts the radio into voice mode where only traditional telephony voice calls can be made. The radio will ignore dispatch radio calls.

Voice Mode Configuration

System Settings

Menu: SYSTEM (password protected)

Call Bar – Voice ALLOWED/OUT BARRED/ALL BARRED

Allows you to bar outgoing voice calls or bar all voice calls. Pressing select toggles between options.

NUMBERS – V. – select to enter or edit the voice number of the radio.

Displaying Your Phone Number

Menu: ADMIN

VOICE ADMIN – VOICE # – Displays the voice phone number of the radio

Making and Receiving Calls

To make a voice call in voice or dispatch radio mode, simply enter the phone number, area code first and press the **green**, SEND key. After the SEND key is pressed, the loudspeaker in the handset will switch to low volume mode to allow the handset to be held to the ear and used as a regular phone handset. If an external speaker is plugged in, the radio will switch the audio to the handset speaker for the duration of the call. If a headset is plugged into the handset, the headset will continue to be used.

To end the call, press the **red**, END key. When the call is terminated, the display will show the time of the call for a few seconds and then revert to voice or dispatch idle mode according to the mode the call was initiated from. At this point the handset will revert to high volume mode and should not be held to the ear. Alternatively, if an external speaker is plugged in the audio will be routed back to the external speaker.

When an incoming call is received the handset will ring and display INCOMING CALL. To answer the call, press the **green**, SEND key. After the SEND key is pressed, the loudspeaker in the handset will switch to low volume mode to allow the handset to be held to the ear.

To reject the call and silence the ringer, press the **red**, END key.

During a call:

- The display will show the elapsed time of the call.
- The GPS soft key can be used to turn the GPS position display on and off.
- The MUTE soft key can be used to mute and unmute the microphone. The display will change to indicate the function of the soft key.
- The alphanumeric keys can be used to generate DTMF tones. The display will briefly change to display the keys pressed.
- The Up and Down scroll keys can be used to increase and decrease the speaker volume. The display will briefly change to display the volume level.
- The P1, PTT and **green**, SEND keys are not active during a call. The **red**, END key ends the call.

Phonebook

As an alternative to entering the phone number manually each time, numbers can be dialed from the phonebook. Simply SELECT the desired entry in the phonebook and press SEND.

Menu: NAMES

This accesses a 100-name phonebook. It can be reached from the VOICE ADMIN menu or directly from the NAMES soft key in voice mode.

View – view all the phonebook entries in alphabetical order. SELECT an entry to view the number and then press EDIT to change the name or number or press SEND to dial the number.

Add – add an entry to the phonebook – enter a name and then the phone number.

Find – enter one or more characters of a name to find it in the phonebook.

Delete – scroll through the phonebook and select an entry to delete.

GPS Position Reporting

If GPS position reporting is enabled from the network, the radio will report its position to the network every minute during a voice call.

Error Messages

If the network does not respond to the radio during a call attempt, “CALL FAILED” is displayed and a “fast busy” tone generated. Check the signal strength and try the call again.

If a call drops while in progress, for example because the signal is blocked by a bridge or building, an error tone is generated and “LOST CALL” is displayed. Move away from the obstruction and try the call again.

Dispatch Radio Mode (Push-To-Talk)

Dispatch Radio Mode (PTT) is the default mode for the handset. Here is a summary of the functionality available in this mode. Much of this functionality is detailed in the **UI Functions** chapter.

Making a Push-To-Talk (PTT) Call

1. Select a Normal Mode Talkgroup:

- Press the **Group** soft key and scroll through a list of downloaded talkgroups using the up/down arrow keys.
- Press the **Group** soft key and then enter the tag number associated with the desired talkgroup using the keypad.

2. Select a Private Mode Talkgroup:

- Press the **Group** soft key and scroll to the Private Mode talkgroup (**tag 00**) using the up/down arrow keys and enter the Directory Number (**DN**) of the talkgroup member with whom a conversation will occur.
- Press the **Group** soft key and enter the **00 tag** number using the keypad. Then enter the Directory Number (**DN**) of the talkgroup member with whom a conversation will occur.
- To quickly change the DN while the radio is idle press the # key. You will be prompted to enter a new DN.

3. Establish a Dispatch Radio Call:

- Press and hold **PTT** to initiate a Dispatch Radio call.

4. Receive a Dispatch Radio Call – private or normal:

- When you receive a Dispatch Radio call from another member of a talkgroup, the handset displays the Directory Number (**DN**) of the member initiating the call.
- Once **VACANT** is displayed on the screen, you can respond by holding and pressing **PTT**.

5. Initiate/Release a Dial-Out Dispatch call:

- You enable a Dial-Out Call by a) pressing and holding **PTT** to become the active speaker, and then b) pressing **SEND**.
- **VACANT** is displayed when the Dial-Out Call is initiated followed by a ringing tone.
- You receive confirmation that the call is successful when the call is answered and the PSTN user joins the call.
- To tear down the Dial-Out Call, press and hold **PTT** to become the active speaker and press **END**. While this process releases the PSTN caller, it leaves the Dispatch Radio call in **USER ON** state, allowing you to talk.

6. Initiate a Priority-1 Emergency Interruption:

- a. The handset has a Priority-1 Interruption feature which allows anyone to override the current speaker.
- b. You initiate the Priority-1 interruption call by pressing **P1**. Once the key is pressed, **P1** appears on the display and a Dispatch Radio call is established overriding the current speaker.

7. Initiate the talkgroup Lock/Unlock Feature (See the UI Functions Chapter for a description of this feature).

GPS Position Reporting

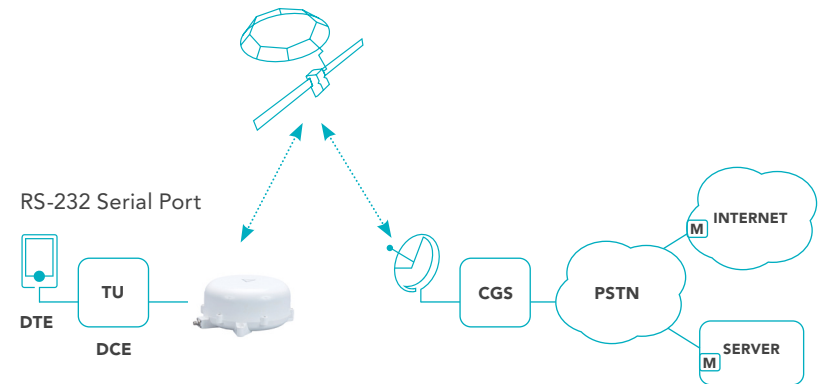
If GPS position reporting is enabled from the network, the radio will report its position to the network every time the PTT button is pressed.

Dial-Up Data Mode

The MSATe radio enables the transfer of low-speed data. The MSATe Radio can establish a 4.8 kbps dial-up data circuit, facilitating the transfer and receipt of secure data transactions.

Data communication is enabled through the use of a PC or other data terminal equipment (DTE) connected to the MSATe Satellite Radio. Standard AT modem commands are used to make data connections via the radio's RS-232 serial data port. Common applications include email, file transfer, and remote monitoring.

Prior to accessing Dial-Up Data, subscribers must first request activation of the service on the Ligado network. Once the service is activated, a data number is assigned to the MSATe Radio.



ATD <phone number>> ATA to answer

DTE: Data Terminal Equipment (PC)
DCE: Data Communication Equipment (Modem)

M PSTN Modem

Serial Port Mode Selection

The MSATe radio's serial port can be configured for three different modes of operation. Only one mode can be active at a time. The **UP/DOWN ARROW** keys will scroll through these options and the **SELECT** key is used to choose the mode.

Select the **DATA IO** option to enable data connectivity.

MENU → ADMIN → SERIAL PORT

- CROSSBAND: OFF
- DATA IO: **ON**
- GPS OUTPUT: OFF

Setting and Viewing Data Phone Number

The data phone number can be set and viewed using the following menu items:

To **Set/Edit Number**: MENU → SYSTEM → NUMBERS → DATA and press **EDIT**

(Note: The SYSTEM MENU is protected with a system password.)

To **View Number**: MENU → ADMIN → DATA ADMIN → DATA # and press **SELECT**.

Local DTE Data Rate

The local DTE data rate can be set from the **DTE PORT SPEED** menu. The **SELECT** key is used to scroll through the choices and the chosen data rate takes effect when the screen is exited with either the **BACK** or **END** key.

MENU → ADMIN → DATA ADMIN → DTE PORT SPEED

- **4800**
- 9600
- 19200

The default DTE port speed is **4800** bps and is the recommended setting unless the user's application requires a different speed.

Serial Port (RS-232)

The serial port is a female DB-9F connector and is required for the transfer of data, GPS NMEA output or Crossbanding.

When configured for data transfer (**DATA IO**) the serial port:

- Supports hardware RTS/CTS flow control
- Set for 8 data bits, 1 stop bit and no parity

The pin-out configuration when in Data Mode is shown below.

PIN	CIRCUIT SWITCHED DATA
1	DCD (Data Carrier Detect)
2	RD (Receive Data)
3	TD (Transmit Data)
4	DTR (Data Terminal Ready)
5	GND (Signal Ground)
6	DSR (Data Set Ready)
7	RTS (Request To Send)
8	CTS (Clear To Send)
9	RI (Ring Indicator)

Making and Receiving Data Calls

To enable the transfer of data, data calls are initiated from Data Terminal Equipment (DTE) devices such as a PC connected to the serial port. The DTE device sends standard AT modem commands to configure and initiate the data transfer call; the handset will display the following messages during data calls:

DATA CALL – when a data call is initiated by the radio

INCOMING DATA – when an incoming data call is received

DATA mm:ss – to display the elapsed time of the data call

Incoming data calls produce an audible ring on the handset.

During a data call (transfer of data):

- The user may press the **END** key to terminate a data call. Normally, data calls are terminated via the attached DTE device with AT commands.
- The **GPS** soft key can be used to turn the GPS position display on and off.
- Pressing any other keys will produce an error tone.

GPS Position Reports

If GPS position reporting is enabled on the network, the radio will transmit its position over the network when a data call is initiated and at one-minute intervals during the call.

Note: GPS reports at one-minute intervals may be suppressed during times when continuous user data is being transferred.

Error Messages

If the network does not respond to the radio during a call attempt, “**CALL FAILED**” will be displayed on the handset and a “**NO CARRIER**” message is sent to the DTE device. Check the signal strength and try the call again.

If a call drops while in progress, for example because the signal is blocked by a bridge or building, an error tone is generated, “**LOST CALL**” is displayed on the handset and a “**NO CARRIER**” message is sent to the DTE device. Move away from the obstruction and try the call again.

AT Command Reference

The following AT Commands are supported by the MSATe Radio.

COMMAND	DESCRIPTION
AT	Attention: AT is used to verify communications with MSATe modem and OK is returned.
A/	Re-Execute: A/ instructs modem to re-execute last command. No carriage return is required. It is commonly used to redial the last number.
ATA	Answer Call: ATA is used to answer an incoming data call.
ATD	Dial: dial a number and establish a data connection. ATD <dial string> ATDT <dial string> <dial string> Valid string characters are 0-9 # () , - <space>
ATE	Local Command Echo: determines if data is echoed to the DTE in command mode. ATE or ATE0 local command echo OFF ATE1 local command echo ON Default: ATE1 local command echo ON
ATF	User Data Echo: determines if data is echoed to the DTE in data mode. ATF or ATF0 user data echo OFF ATF1 user data echo ON Default: ATF0 user data echo OFF
ATH	Hang-Up: ATH will Hang-Up a data call.
ATO	Command Mode: ATO command is used to toggle from the Command Mode back to Data Mode . It is used in conjunction with the “+++” escape sequence command.

COMMAND	DESCRIPTION																
ATQ	<p>Response Codes: determines how response codes are handled</p> <p>ATQ or ATQ0 response codes WILL be displayed</p> <p>ATQ1 response codes will NOT be displayed</p> <p>Default: ATQ0 response codes WILL be displayed</p>																
ATS0	<p>Auto-Answer: determines if an incoming call will be auto answered</p> <p>ATS0 or ATS0=0 calls will NOT be auto answered</p> <p>ATS0=1 calls WILL be auto answered</p> <p>Default: ATS0=0 calls will NOT be auto answered</p>																
ATV	<p>Results Code Mode: determines if results codes are numerical or verbal</p> <p>ATV0 response codes will be numerical codes</p> <p>ATV1 response codes will be verbal codes</p> <p>List of response codes:</p> <table border="1"> <thead> <tr> <th>Numerical</th> <th>Verbal</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>OK</td> </tr> <tr> <td>2</td> <td>RING</td> </tr> <tr> <td>3</td> <td>NO CARRIER</td> </tr> <tr> <td>4</td> <td>ERROR</td> </tr> <tr> <td>7</td> <td>BUSY</td> </tr> <tr> <td>8</td> <td>NO ANSWER</td> </tr> <tr> <td>11</td> <td>CONNECT 4800</td> </tr> </tbody> </table> <p>Default: ATV1 response codes will be verbal codes</p>	Numerical	Verbal	0	OK	2	RING	3	NO CARRIER	4	ERROR	7	BUSY	8	NO ANSWER	11	CONNECT 4800
Numerical	Verbal																
0	OK																
2	RING																
3	NO CARRIER																
4	ERROR																
7	BUSY																
8	NO ANSWER																
11	CONNECT 4800																
ATZ	<p>Recall data configuration: recalls the data configuration as last stored by the AT&W command. If none, then use the default values.</p> <p>AT&W is not supported once the MSATe is power cycled. If a power cycle has occurred since using the AT&W command, ATZ will recall the default values.</p>																

COMMAND	DESCRIPTION
AT&C	<p>DCD signal mode: determines the state of the DCD signal line</p> <p>AT&C set the DCD to what it was last set at</p> <p>AT&C0 set the DCD permanently ON</p> <p>AT&C1 set the DCD ON when a data call has successfully CONNECTED</p> <p>Default: AT&C1 set the DCD ON when a data call has successfully CONNECTED</p>
AT&D	<p>DTR Signal Mode: determines the response to the DTR signal line</p> <p>AT&D or AT&D0 ignore DTR signal line</p> <p>AT&D1 drop data call when DTR goes inactive</p> <p>Default: AT&D1 drop data call when DTR goes inactive</p>
AT&F	<p>Recall Default Configuration: reset to default configuration</p> <p>Default Configuration:</p> <p>ATE1 local command echo ON</p> <p>ATF0 user data echo OFF</p> <p>ATS0=0 calls will NOT be auto answered</p> <p>ATQ0 response codes WILL be displayed</p> <p>ATV1 response codes WILL be verbal codes</p> <p>AT&C1 set the DCD ON when a data call has successfully CONNECTED</p> <p>AT&D1 drop data call when DTR goes inactive</p>
AT&W	<p>Store configuration: AT&W stores the current configuration</p> <p>Note: The configuration is only stored in volatile memory. If the MSATe radio is power cycled the radio will be reset to the default settings.</p>
+++	<p>Escape to Command Mode: +++ escape sequence toggles the unit from data mode to command mode</p>


User Interface (UI) Functions


One-Touch Key Functions

Lock/Unlock Talkgroup

This is a soft key (**Up-Arrow-SK3**) option used to initiate the talkgroup lock feature. The feature enables you to remain locked to a specific talkgroup tag position in an idle state regardless of activity from other downloaded talkgroups (subject to Network Monitor Codes).

When the handset is powered up and then goes into Idle State, **SK3** is the **LOCK** key. This indicates that the talkgroup feature is **unlocked** and that pressing SK3 will initiate the lock.

To **lock** the specific talkgroup, press **SK3**. The SK3 indicator then changes to **UNLOCK**, and  appears at the top of the display.

To **unlock** the specific talkgroup, press **SK3**. The SK3 indicator then changes back to **LOCK**, and the  icon disappears.

When you are in a Dispatch Radio or Voice call, SK1 toggles the display of GPS position.

If GPS information is currently displayed, press the SK1 to suppress the display. The GPS display is then erased.

If the GPS information is not currently displayed, press SK1 to restore the display.

PTT Operation

To initiate a Dispatch Radio call, **press and hold the PTT key**. The **CALLING** and **IN USE** indicators then appear in the display followed by **USER ON**, and an audible tone is emitted, indicating that you are the current speaker.

When you release the PTT key, the **VACANT** indicator is displayed on the handset, informing you that the channel is open to other talkgroup members. If there is no response after a period of time, the talkgroup will be dropped from the network. Control then reverts back to the idle Dispatch Radio screen display.

Audio Indicators

STATUS OR EVENT	SOUND	NOTES
Radio Info Message	Two quick high tones	Indicates one of the following: <ul style="list-style-type: none"> • Hardware failure; • Satellite link is lost (no service, could be network failure).
Lost Speaker	Two quick high tones	Indicates that the current party speaking has been cancelled and the radio has stopped transmitting.
Call Termination	Sounds like a “fast busy” tone	Indicates when the call is terminated because of the disconnection of satellite link.
Calling Failure Tone	Sounds like a “fast busy” tone	Indicates that a Circuit Switched call has failed during call set-up.
“USER ON” – Talk Ready	A short high/low tone	Indicates that the user can begin to talk in Dispatch Radio mode.
Talkgroup Vacant	A low tone	Indicates the talkgroup is available.
Power On / Power Off	A short high tone	Indicates the radio has been powered On/Off.
Incorrect Key	Two quick beeps	Indicates when a key is pressed out of sequence.

Main Menu

Press **MENU (SK1)** with the handset in idle mode to access the **Main Menu**. To exit the Main Menu when it is active, press **EXIT (SK1)** and the handset returns to idle mode.

The Main Menu has the following options:

- Lock: ON/OFF
- GPS
- Admin
- System
- Service Mode

Use the **Up Arrow** and **Down Arrow** keys to navigate the option list. The **option available for selection** is always **in the middle** and **highlighted**. Press **SELECT** to invoke the option you want.

The Main Menu options are detailed in the sections that follow.

Handset Lock and Unlock

This is a quick access feature option that allows you to “lock” the system, disabling all keypad functions. However, you still have the ability to initiate a Priority-1 Interrupt Dispatch Radio call when the radio is locked. When a call is received by a “locked” radio, or you attempt to initiate another function on the display, you will receive a prompt to enter the “unlock code” to facilitate answering of the call or other functionality.

When you first enter the Main Menu, the system lock is **OFF**.

1. Use the Up/Down arrows to highlight **LOCK: OFF**, then press **SELECT** to lock the system. The option then changes to **LOCK: ON**.
2. To unlock the system, select the **LOCK: ON** option in the Main Menu. At the prompt for the unlock code, **type in the code** and then select **OK**. The option then reverts back to **LOCK: OFF**. The default code is 0000 (four zeroes).

GPS Menu

You can obtain GPS information by selecting the **GPS** option on the Main Menu.

The GPS Menu has the following options.

- GPS On/Off
- Save Position
- Stored Positions

To exit the GPS Menu, press **BACK**, and you are returned to the Main Menu.

GPS On/Off

You can enable or suppress the display of continuous GPS on the handset display screen through use of this option.

If you are invoking this menu for the first time, GPS is disabled (OFF).

When GPS is enabled, GPS information is displayed or not displayed in the following contexts:

1. In Idle State: GPS info is displayed on screen.
2. In Call: GPS info is displayed on screen.
3. Navigating through Menus (including sub-menus and associated results): GPS info is NOT displayed on screen.

Use the Up/Down arrows to navigate to this option, and then press the **SELECT (SK2)** key. This will change the option display to ON or OFF, depending on the status before you selected the option.

Save Position

This feature allows you to capture a position at a given moment and associate it with a name tag stored in memory. The handset stores up to 25 positions in a circular memory (when 25 positions have been stored, storing a new position overwrites the oldest position). If you do not associate a name tag with a saved position, the **GPS time stamp** becomes the default position identifier.

Note: that the time stamp is GPS time, or approximately Coordinated Universal Time (UTC), not local time.

1. Press **SELECT** to invoke this option.
2. The latitude/longitude position is then displayed. Press **STORE** to store the position.
3. You will then be prompted to enter a tag name for this position. Use the alphanumeric keys to enter the tag name (use the **CLEAR** key to backspace if you make an error). Press **STORE** to initiate the storage of the position.
4. You will then be given a confirmation (**Position Stored**) and control goes back to the GPS Menu.

Stored Positions

You can view your stored GPS positions and edit a stored position name tag with this function.

1. Press **SELECT** to invoke this option. The list of stored position name tags (latest one first) is then displayed.
2. Scroll through the list using the up/down arrows. Press **SELECT** when the entry you want to edit is highlighted.
3. The full entry with name and position is then displayed. To edit the highlighted entry, press **EDIT**.
4. You will then be prompted to enter the updated name tag. Use the alphanumeric keys to enter the updated tag name (use the **CLEAR** key to backspace if you make an error). Press **STORE** to initiate the storage of the position.
5. Control goes back to the display of the updated tag and the position information. You may do further editing by pressing **EDIT**. If you are satisfied with the edited entry, press **BACK** to go back to the list so you can choose another entry, or press **BACK** again to go back to the GPS Menu.

Admin Menu

The **ADMIN** menu gives you capabilities to adjust the configuration of your radio. Press **SELECT** to invoke this menu. The ADMIN functions are as follows:

- Volume
- DR (Dispatch Radio) Admin
- X-Over
- Backlight
- Software Version
- Serial Port
- ESN/PSN

For each menu option, press **BACK** to go back to a previous screen and eventually back to the ADMIN menu. Press **BACK** to leave the ADMIN menu and go back to the MAIN menu.

Volume

The **VOLUME** menu option allows you to set the volume levels for the following items:

- Speaker – Dispatch Radio external Speaker
- Headset
- Earpiece

Adjust the volume as follows:

1. Navigate the list of ADMIN options and **SELECT** the **VOLUME** option.
2. Use the **up/down arrows** to navigate the list of items for which you can adjust the volume, and then **SELECT** the one you want to adjust.
3. Each option has six volume increments. The level of 1 – 6 is indicated by the number of right-arrows displayed.
4. **Increase** the volume for an item by pressing the **up arrow** and **decrease** with the **down arrow**. Each press of the key changes the level by one increment. The currently set level is displayed as you increase/decrease the volume.
5. Set the volume by pressing **OK**.

DR (Dispatch Radio) Admin

Navigate the ADMIN Menu and **SELECT** the **DR ADMIN** option. The DR ADMIN functions are detailed below.

Directory Number

1. Navigate the DR ADMIN Menu and **SELECT** the **DIRECTORY NUMBER** option.
2. The radio's four-digit directory number is displayed, press **BACK** to go back to the DR ADMIN menu.

Label TG

Use this option to assign a name to any or all downloaded talkgroup tag position(s). Navigate the DR ADMIN Menu and **SELECT** the **LABEL TG** option.

1. The list of current groups is displayed.
2. Navigate the list with the **up and down arrows**, and then **SELECT** the group you want to edit.
3. You will then be prompted to **ENTER LABEL** for the group tag. Use **CLEAR** to backspace over the existing tag. Use the alphanumeric keys to type in the new name.
4. Press **STORE** to save the updated tag and go back to the list of talkgroups, and then press **BACK** to go back to the DR ADMIN menu.
5. If you **CLEAR** all the text and then press **CLEAR**, you exit editing without changing anything. If you press **STORE** without changing anything, you are returned to the DR ADMIN menu.

P1 (Priority 1) Setup

Navigate the DR Admin Menu and **SELECT** this option to define the Priority 1 Emergency talkgroup.

You have a choice of setting up P1 in one of two ways:

NORMAL: **SELECT** this option (Default) to choose any active talkgroup or currently selected talkgroup to be the Priority-1 Emergency talkgroup when the P1 key is pressed.

DEFINE: **SELECT** this option to navigate the list of talkgroups. **SELECT** one of the downloaded talkgroups to be the Priority-1 talkgroup. Each time the P1 key is pressed, your defined talkgroup is initiated. Once you have selected the group, press **OK** to select the group and return to Idle mode.

X-Over

In the event that a manual beam cross-over is necessary, you can initiate it through this ADMIN Menu option.

Note that the list of beam options may be shorter, depending on those available from the satellite.

1. **SELECT** X-OVER and the following beam regions are displayed:
 - B0 – EAST
 - B1 – EAST C
 - B2 – WEST C
 - B3 – WEST
 - B4 – SOUTH
 - B5 – A/H
2. Navigate the list with the up/down arrows and **SELECT** the desired beam.
3. You will then be asked to confirm the selection by a **Continue?** prompt. Press **YES** to continue or press **NO** to cancel and return to the beam region options.

Throughout the cross-over process, the beam to which the radio is crossing-over flashes (e.g., X-OVER: B1- EAST). The **BEAM/SIGNAL** monitor is displayed throughout this process regardless of whether or not it is active. The current beam is displayed, and then the selected beam region is shown as the process is completed (i.e. B1 S99 to B0 S99). Once the process is complete, the beam to which the radio has crossed-over is displayed for three seconds. You will then be returned to the Idle display.

If you have selected a beam that is not accessible, "X-OVER FAILURE" will be displayed for several seconds. You will then be returned to the beam options list. Ensure that you have chosen the proper adjacent beam before initiating a manual beam cross-over.

Note that the radio automatically performs a beam cross-over sequence when required (e.g., traveling between beams).

Backlight

This option allows you to control the display's backlight. Press **SELECT** to go through the three different options for backlight display:

1. **EVENT** – The default configuration. The backlight is displayed for a short time after any key other than PWR or PTT is pressed, and the timer is restarted when any other key is pressed.
2. **CONSTANT** – The backlight is always ON.
3. **OFF** – The backlight is always OFF.

Software Version

Here you can view the software version for the transceiver unit, handset and antenna unit.

Serial Port

This option allows you to set up three different serial port configurations.

1. **SELECT** the SERIAL PORT option from the ADMIN Menu.
2. **SELECT** one of the three options to turn it on. Only one option can be activated at a time:
 - a. **DATA IO**: This is the default. Data IO must be selected to enable data connectivity for devices that subscribe to Dial-Up Data.
 - b. **CROSSBAND**: When this option is **ON**, third-party cross-band interfaces can access Dispatch Radio activity enabling MSAT interconnectivity to standard Land Mobile Radio equipment.
 - c. **GPS OUTPUT**: When this option is **ON**, GPS data received from the Antenna Unit (AU) can be sent to an external device in NMEA format. The GPS port speed is 4.8 kbps.
3. For each configuration, once you **SELECT** it, you will be asked to confirm the configuration. Press **YES** to confirm or **NO** to cancel.
4. With confirmation or cancellation, you will be returned to the Serial Port option Menu. Press **BACK** to go back to the ADMIN Menu.

ESN/PSN

This option allows you to see the Electronic Serial Number (ESN) and Part Serial Number (PSN).

1. **SELECT** the ESN/PSN option from the ADMIN Menu.

The Electronic Serial Number (ESN) and Part Serial Number (PSN) for the transceiver unit (TU) will be displayed.

System Menu

When you **SELECT** the **SYSTEM** option on the **Main Menu**, you will be prompted for the **System Password**. Type in the Password (the factory default is 1234) and press **OK**.

The options on the System Menu allow you to change certain system settings:

- Password
- Lock Code
- Beam/Signal: Off/On

Password

You can change the default **SYSTEM** password via this option.

1. **SELECT** the **PASSWORD** option on the System Menu.
2. **SELECT** the **SYSTEM** password option.
3. You will be prompted with **NEW SYSTEM PASSWORD**.
4. Type in the new password (use **CLEAR** to backspace if you make a mistake) and then press **OK**.
5. A confirmation screen is then displayed, asking you to re-enter the new password. Type it in again, and then press **STORE** to store the new password.
6. You are then returned to the Password Menu. Press **BACK** to go back to the System menu.

WARNING: The system password is not stored at the network level and as such cannot be recovered by Ligado. Please ensure internal records reflect this change.

Lock Code

You can change the 4-digit handset lock code via this option.

1. **SELECT** the **LOCK CODE** option on the System Menu.
2. You will be prompted to enter the new Lock Code. Type in the new Lock Code (use **CLEAR** to backspace if you make a mistake) and then press **OK**.
3. A confirmation screen is then displayed, asking you to re-enter the new code. Type it in again, and then press **STORE**.
4. You will then be returned to the System Menu.

Beam Signal OFF/ON

This option gives you the ability to enable or disable the display of the beam to which the radio has logged-on as well as the received signal strength. When the option shows **BEAM SIGNAL: OFF** and you **SELECT** it, the option changes to **BEAM SIGNAL: ON** and the beam display is **enabled**. When the option shows **BEAM SIGNAL: ON** and you **SELECT** it, the option changes to **BEAM SIGNAL: OFF** and the beam display is **disabled**.

When enabled, the beam display appears in:

- Idle State
- Call

Appendices

Technical Specifications

Weight	TU = 1.43 lb / 0.65 kg Handset = 0.84 lb / 0.38 kg Land Mobile Antenna = 4.6 lb / 2.09 kg Maritime Antenna = 10.3 lb / 4.67 kg
Dimensions	TU (WxHxD) = 6.5" x 5.5" x 1" / 165mm x 140mm x 27mm Handset (WxHxD) = 2.8" x 6.9" x 1.6" / 70mm x 175mm x 40mm Land Mobile Antenna (DIAxH) = 9.8" x 3.9" / 250mm x 100mm Maritime Antenna (DIAxH) = 11" x 11" / 280mm x 280mm
Power	Input voltage: 12 to 15.6 VDC Input current: 6 Amps max.
Fuses	Fuse: ATM, Mini Fuse 7.5A, 32V, 1 ² t: >40<=70 (Littelfuse part num. 029707.5) CAUTION: For continued protection against risk of fire, replace with only the same type and rating of fuse.
Humidity	98% at 100.4°F (38°C)
Operating Temperature	TU = -22°F (-30°C) to +131°F (+55°C) Handset = -4°F (-20°C) to +158°F (+70°C) Antenna = -22°F (-30°C) to +109°F (+43°C)
Storage Temperature	TU = -40°F (-40°C) to +185°F (+85°C) Handset = -40°F (-40°C) to +185°F (+85°C) Antenna = -67°F (-55°C) to +185°F (+85°C)
Dust	In accordance with SAE J1455 section 4.7
Rain	Antenna = Precipitation rate of 2"/hour

Error Messages

ERROR CONDITION	DEFINITION	ACTION
SEARCHING...	If signal strength bars are seen, the radio is in the process of connecting to the MSAT network. If signal strength bars are not seen, the radio cannot receive a satellite signal.	If the condition persists, check the radio has a clear view of the southern sky and that the antenna is connected and is functioning (e.g. can hear the servo motor in the antenna).
WAIT...	Signifies that the radio has not received a response to the PTT request from the MSAT network and is attempting several retries.	Continue to press the PTT key – If the call is successful, USER ON will be displayed. In the event a call fails, a PTT FAIL message will appear requiring the user to release the PTT key and try again.
PTT FAIL	Signifies the radio failed to receive a response to the PTT request from the MSAT network.	Release the PTT key and try again. If this message continues, contact Ligado Customer Technical Support 1-800-216-6728.
PRESSPT	Signifies the PTT key has been pressed then released just before the radio received the confirmation from the network.	Press and hold the PTT key in order to talk.
INVALID DN	Signifies the user has entered a Directory Number (DN) that is not a member of the private mode talkgroup currently active on the radio.	Ensure a valid DN is entered in tag position 00.

ERROR CONDITION	DEFINITION	ACTION
NO TG	No talkgroups have been downloaded to the radio.	If this condition persists, contact Ligado Customer Technical Support.
BLOCKED	Signifies that the radio's antenna signal to the satellite is blocked.	Ensure that the antenna has a clear line-of-sight to the satellite.
X-OVER FAILURE	Signifies that the user has initiated a manual beam cross-over to a beam that is not accessible. Following the appearance of the failure message the user will be returned to the beam options list.	Ensure that the appropriate adjacent satellite beam is chosen when initiating a manual beam cross-over.
RF POWER FAILURE	The radio detected a problem with its RF transmissions and disabled the transmitter.	Power cycle the radio. If this condition persists, contact Ligado Customer Technical Support.
WARNING! OVERHEAT	Signifies that the radio is overheating – This message will appear at 10 second intervals until the temperature is reduced. If the temperature continues to increase, then the radio will shutdown.	Move the radio to a cooler place, if the radio powers off, allow it to cool down before re-initiating the power-up sequence.
INVALID PASSWORD	Signifies the user has entered the wrong Dealer or SYSTEM Menu password.	Enter the correct password – If the password is unknown, the unit will need to be sent in for repair.

ERROR CONDITION	DEFINITION	ACTION
WRONG LOCK CODE	Signifies the user has entered the wrong Handset Lock Code.	If you cannot remember the lock code (default is 0000), enter the SYSTEM password (default 1234), when prompted to enter the code.
ANT FAILURE	This indicates the radio has detected a fault in the antenna and has shut it down.	Power cycle the radio – if this problem persists, contact Ligado Customer Technical Support.

Glossary

Glossary

Directory Number (DN) – A 4-digit identification number assigned by the MSAT Network to each radio. The radio displays the DN of the current speaker during each call as a means of notifying other subscribers who is talking.

Monitor Code – A code stored within each radio that controls when the radio should join a talkgroup conversation.

Priority-1 Interruption – Network feature which allows a radio user to interrupt a current speaker by pressing a specific key on the handset.

Private Mode – Private Mode allows two MSAT users to establish a private Dispatch Radio conversation over the Network. Users must be members of a Private Mode talkgroup before Private Mode conversations between them can take place.

PTT – MSAT Dispatch Radio users who wish to communicate with other MSAT users within a Talkgroup must press and hold a specific key on the handset. This key is referred to as the Push-to-Talk (PTT) key.

Tag Number – A 2-digit number corresponding to each Talkgroup to which the radio belongs. A radio can have up to a maximum of 15 Tag Numbers (and tag number 00 for Private Mode operation).

Talkgroup – A defined group of MSAT radio users within an organization that can talk together in a PTT conversation. Each radio can be a member of up to 15 talkgroups but can participate in only one conversation at a time. On the radio, talkgroups are identified by a 2-digit Tag Number.

