



USER'S MANUAL

FOR THE

TRULINK®

WIRELESS INTERCOM
SYSTEM



April 2007

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USER'S MANUAL
FOR THE
TRULINK[®]
WIRELESS INTERCOM
SYSTEM

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FCC COMPLIANCE

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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CHAPTER 1 GENERAL

1.1 INTRODUCTION

This document will introduce the operator to the many features and capabilities of TruLink[®] Wireless Intercommunication System. It will provide the operator with the instructions necessary for the proper handling and operation of TruLink and its component parts, and basic instructions for maintaining the TruLink in proper working order.

1.2 DEFINITIONS AND ABBREVIATIONS

1.2.1 Definitions of Terms Used

The definitions of terms used in this document are as follows:

- Channel A collection of specific frequencies that define the RF link.
- Network A collection of slaves and one master that form the communication group.
- Sidetone User's own audio heard in the user's ear.

1.2.2 Abbreviations and Acronyms

Abbreviations and acronyms used in this document are listed below:

- BIT Built-in Test
- FHSS Frequency Hop Spread Spectrum
- LPD Low Probability Detection
- LPI Low Probability Intercept
- mAh milli-Ampere hour
- NiMH Nickel Metal Hydride
- NVG Night Vision Goggles
- PTT Push-To-Talk
- SynVoice Synthetic Voice (recorded voice messages)
- TAP TruLink Access Point Transceiver
- TPT TruLink Portable Transceiver

- TSS TruLink Support Station
- DPT TruLink Dual Port Transceiver
- VOX Voice Operated Keying

1.3 TRULINK DESCRIPTION

TruLink is a versatile wireless system in that it operates in various situations and environments. In scenarios where portable intercom functionality is needed, only TruLink Portable Transceivers (TPTs) are required.

The TruLink system is a fully duplex system that permits multiple users to speak simultaneously. Unlike conventional walkie-talkies, TruLink users can converse among themselves without pressing a Push to Talk button or waiting for another user to finish their transmission.

The system supports 50 channels (0-49). Depending on the system configuration, up to 31 users can be logged on to a channel. Each channel is an independent network. A TruLink network is composed of one TruLink unit designated as the master and all other TruLink units operating as slaves.

The TruLink Support Station (TSS) is also available with the ability to charge commercially available NiMH batteries while still in a TPT unit, display built-in test (BIT) results, and set the channel on up to six TPTs at a time.

Table 1.6-1 provides a list of the TruLink equipment and part numbers, embedded within the TPT, TAP and DTP part number is a specified configuration which is factory loaded in the unit, i.e., 780-1000-001-CF00xx-Mx, where the CF00xx-Mx is configuration specific. Please see specific configuration addendums for details on the individual configurations.

A picture of each of the units in the TruLink system is shown in Figure 1.6-1.

1.4 NETWORK CONFIGURATION

A TruLink network is composed of one master unit and a group of slave units. The master unit is the central point of the TruLink network. All slave-to-slave communications are routed through the master. When a network includes a TAP or a DPT, it is typically designated the network master. However, any TPT can be set to be the master.

1.5 CAPABILITIES

TruLink uses a modulation technique, Frequency Hop Spread Spectrum (FHSS), which provides security improvements for Low Probability Intercept (LPI) and Low Probability Detection (LPD), over conventional narrow-band radios that are susceptible to intercept by low-tech scanners. The technique also provides some resistance to interference caused by undesired signals and multipath.

TruLink's rugged construction is built to withstand extreme environments of: temperatures, sand, dust and moisture. Rugged environments also involve high noise and poor RF conditions. TruLink uses advanced Digital Signal Processing (DSP) technology to mitigate these effects.

1.6 TRULINK EQUIPMENT

The TruLink system can be composed of the following equipment:

**Table 1.6.1
 TruLink Equipment List**

NAME	PART NUMBER	COMMENT
TruLink Access Point (TAP)	780-2000-001-CF00xx-Mx780-2000-002-CF00xx-Mx (equipped with dust caps for the connectors)	Typically employed to connect the TruLink System to radios or wired intercom systems
TruLink Portable Transceiver (TPT)	780-1000-001-CF00xx-Mx	Handheld wireless unit
TruLink Dual Port Transceiver (DPT)	780-1000-003-CF00xx-Mx	Handheld wireless unit which is typically used to interface TruLink to wired intercom systems
TruLink Support Station (TSS)	(TSS) 780-3000-001	Recharges NiMH batteries in the TPT



SUPPORT STATION
780-3000-001



**PORTABLE
TRANSCEIVER**
780-1000-001



DUAL PORT TRANSCEIVER
780-1000-003



ACCESS POINT
780-2000-001
(SHOWN)

34559

Figure 1.6-1. TruLink Components

CHAPTER 2 OPERATION

2.1 OVERVIEW

The TPT is the portable unit in the TruLink wireless communication system. The operator wears the TPT along with a headset that includes headphones and a microphone. The TPT has an operator interface consisting of buttons for input and an audio voice menu, known as SynVoice, for output.

The operator interface consists of five keys, a two-colored LED and an audio voice menu, SynVoice. The SynVoice is a sampled phrase database that is used as an audio display, instead of a visible display, to indicate selections and status.

Key presses in response to a voice menu modify the operation of the TPT.

The keys on the TPT unit are: *PTT*, *M*, *up arrow*, *down arrow*, and ***. For every key pressed, a *KEY CLICK* sound is heard in the headset.

2.2 PHYSICAL DESCRIPTION

The TPT is a handheld device as shown in Figure 2.3.2-1. The key elements of the unit are the keypad, antenna and headset jack, powered by three AA batteries.

The keypad is ergonomically designed to facilitate use with gloves. The antenna is designed to be flexible and durable. The headset jack is strategically located on the bottom to allow the headset cord to drape naturally.


It measures approximately 7.75 inches high (with antenna) by 2.9 inches wide by 1.9 inches in depth (with belt clip). See Figures 2.3.4-1 and -2. The TPT weighs approximately 11 oz. (without batteries).

2.3 BATTERIES

2.3.1 Installing/Changing

The battery compartment is located under the hinged cover on the back of the TPT unit (see Figure 2.3.2-1). To access the batteries, rotate the thumbscrew counterclockwise until disengaged and raise the cover. Remove the depleted batteries and install fresh batteries with the positive end down.

CAUTION

 Battery type switch must be properly set to avoid damaging the TPT unit.

Set the battery type switch to match the battery installed (up for NiMH or down for alkaline). Close the cover and rotate the thumbscrew clockwise till finger tight. Do not over tighten screw to avoid damaging the battery compartment.

Note

- ☞ NiMH batteries must be fully charged before using the TPT. Batteries can be installed in a TPT and then placed in the TSS for charging, or fully charged in an external battery charger before installing in a TPT.

2.3.2 Battery Type

The TPT uses three AA batteries. Either NiMH or alkaline cells may be used. NiMH batteries must be rated at greater than 1800 mAh.

Note

- ☞ Batteries are not included in the purchase of the TPT or DTP.

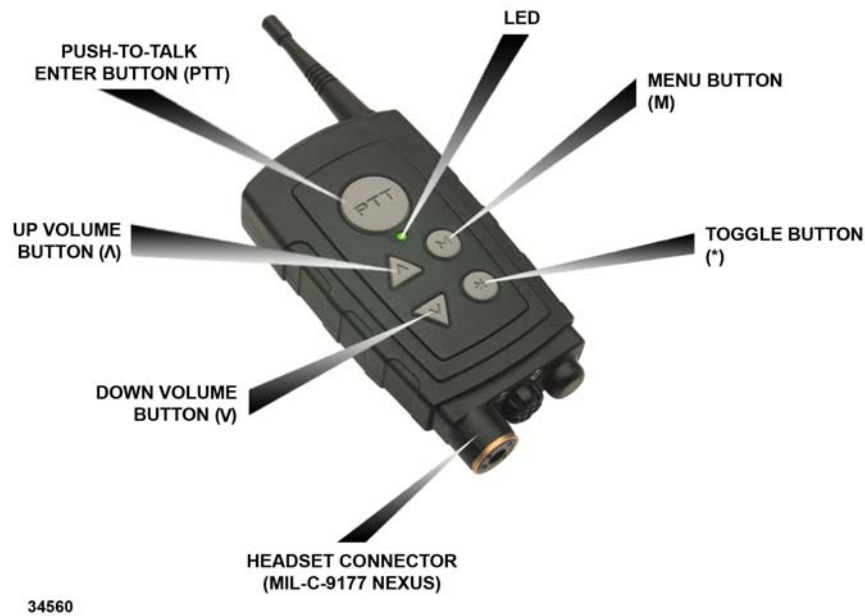


Figure 2.3.2-1. TruLink Portable Transceiver (TPT)

<i>TPT</i> BUTTON	FUNCTION
∧ and ∨ (held simultaneously)	Power On/Off
∧	Volume Up
∨	Volume Down
M	Menu, scrolls through Menu Options
*	Toggle, toggles through Menu Sub-Options
PTT	Push-To-Talk/Enter, use as a Push-To-Talk button and to enter/confirm Menu selections.

2.3.3 Low Battery Warning

The TPT is designed to operate for approximately 8 hours on a fresh set of batteries. After approximately 7½ hours, the operator will get two battery indications; an audible “BATTERY LOW” SynVoice warning through the headset, and a blinking red LED, BATTERY LOW, on the front of the unit. After 20 minutes of additional use, the SynVoice will announce “BATTERY EMPTY” through the headset. Shortly thereafter the TPT will automatically turn off.

2.3.4 Charging the TPT

When the low battery warning sounds, the operator may either install a fresh set of batteries or recharge them. Alkaline batteries must be replaced for continued use. NiMH batteries can be recharged while still in the TPT unit. Simply place the unit into an open holder on the TSS and power the TSS up. As the batteries are charging, the LED will blink with an alternate red/green color. The LED will illuminate with a steady green light when the batteries are fully charged.

Note

- ☞ NiMH batteries must be recharged within 8 hours of “Battery Empty” or automatic shutdown. Failure to do so may render batteries unable to be charged in the Support Station.

See Figures 2.3.4-1 and 2.3.4-2 for unit dimensions and additional battery installation information.

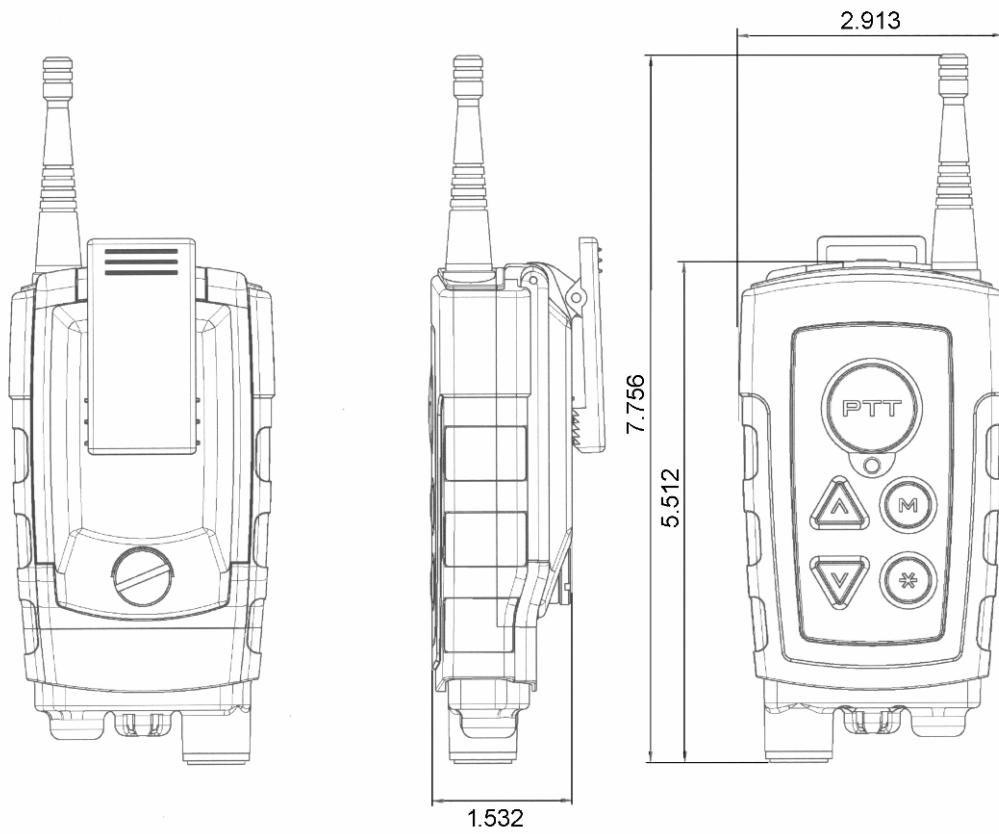


Figure 2.3.4-1. TPT Unit Dimensions (Inches)

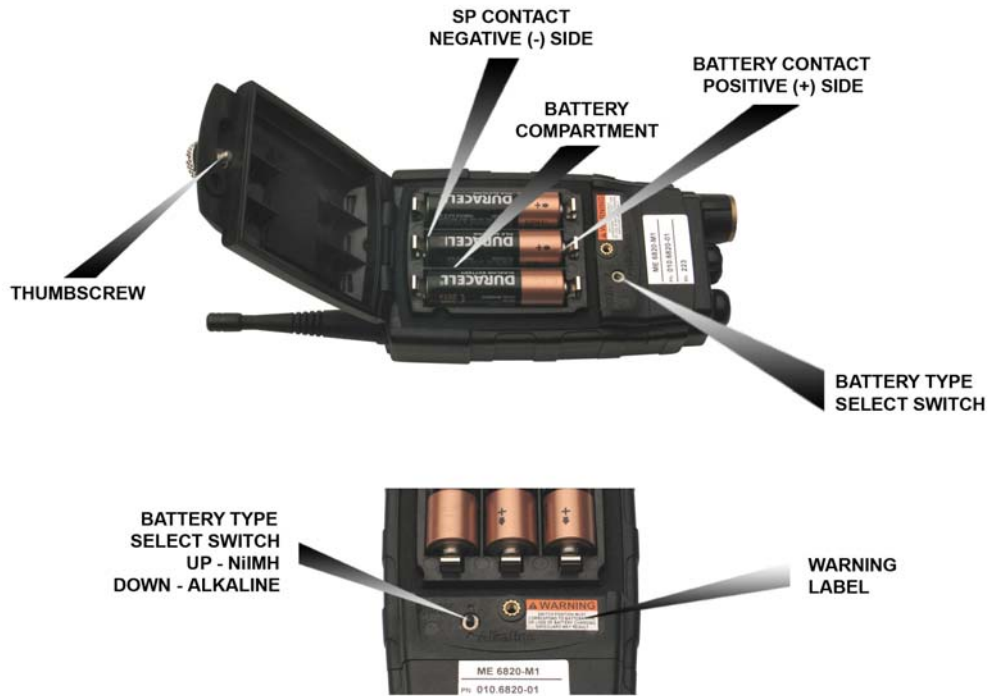


Figure 2.3.4-2. Battery Installation

2.4 ANTENNA

The TPT antenna is designed with a flexible tip for rugged use. It is also designed for easy replacement. Simply rotate the antenna counterclockwise to remove. Place a new antenna over the connector and rotate clockwise to install.

2.5 HEADSET

The TPT can be configured in the factory to use a number of standard headsets. Consult the appropriate configuration addendum for the default headset setting.

2.6 TPT STATUS AND INDICATORS

The unit's status and operation are indicated visually via LEDs, and audibly via tone and SynVoice. The operator should become familiar with the visual and audible indicators before powering up a TPT unit.










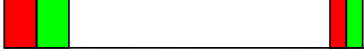




2.6.1 Visual Indicators

The TPT provides a two-color LED to signal various indications to the operator. Table 2.6-1 provides a summary of the LED indications.

Table 2.6.1-1
LED Indications

STATUS	COLOR	ON TIME (MS)	OFF TIME (MS)
BATT OK, Slave logged on to network	GREEN	100	1900
LOW BATT, Slave logged on to network	RED	100	1900
CHARGE BATT, Slave logged on to network	RED-GREEN	50 + 50	1900
NORMAL, Master logged on to network	GREEN	100/100	150/1650
LOW BATT, Master logged on to network	RED	100/100	150/1650
CHARGE BATT, logged on to network	RED-GREEN	50 + 50/50 + 50	150/1650
CONNECTED BATT OK, Slave connected to platform	GREEN	200/100	800/900
CONNECTED LOW BATT, Slave connected and low battery	RED	200/100	800/900
CONNECTED CHARGE, Slave connected and charging battery	RED-GREEN	100 + 100/50 + 50	800/900
CONNECTED BATT OK, Master connected to platform	GREEN	200/100/100	800/150/650
CONNECTED LOW BATT, Master connected and low battery	RED	200/100/100	800/150/650
CONNECTED CHARGE, Master connected and charging battery	RED-GREEN	100 + 100/50 + 50/50 + 50	800/150/650
OUT OF RANGE, normal battery	GREEN	500	500
OUT OF RANGE, low battery	RED	500	500
OUT OF RANGE, charging battery	RED-GREEN	250 + 250	500
POWER UP BOOT	RED	1000	0
POWER UP	RED	1000	0
MALFUNCTION (BIT failure, fatal error)	RED	1000	0
SW DOWNLOAD READY	GREEN	200	200
SW DOWNLOAD IN PROGRESS	GREEN	10	100

Table 2.6.1-1
LED Indications (Continued)

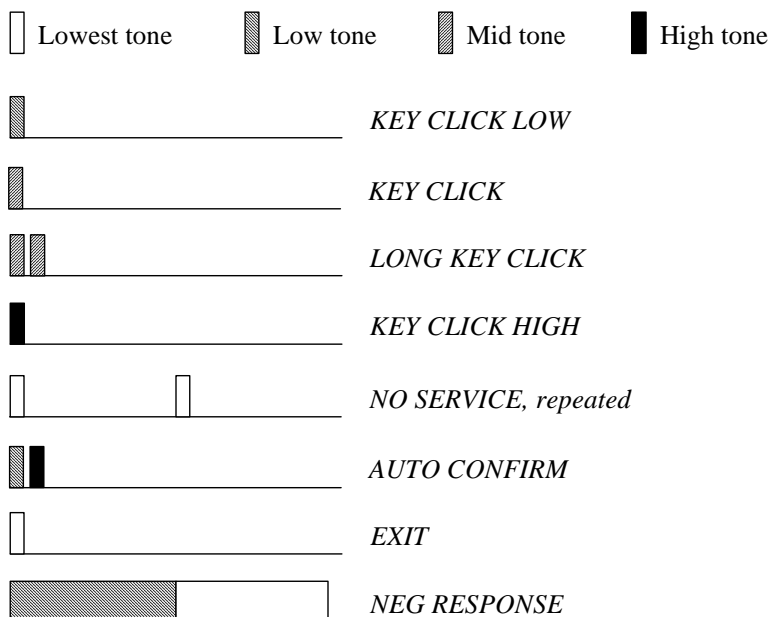
 Red  Green	
	Batt OK, Slave logged on to network
	Batt LOW, Slave logged on to network
	Batt CHARGING, Slave logged on to
	Batt OK, Master
	Batt LOW, Master
	Batt CHARGING, Master
	Batt OK, CONNECTED Slave logged
	Batt LOW, CONNECTED Slave logged
	Batt CHARGING, CONNECTED Slave
	Batt OK, CONNECTED Master
	Batt LOW, CONNECTED Master
	Batt CHARGING, CONNECTED
	Batt OK, Out of Range
	Batt LOW, Out of Range
	Batt CHARGING, Out of Range
	POWER_UP or MALFUNCTION
	SW DOWNLOAD READY
	SW_DOWNLOADING

2.6.2 Audible Indicators

The TPT sends a number of different tones to the operator headset. Table 2.6.2-1 provides a listing of these tones and their meanings.

**Table 2.6.2-1
Audio Indications**

SOUNDS	EXPLANATION
KEY CLICK LOW	A special warning key click at min volume
KEY CLICK	Short tone sound for every key press
LONG KEY CLICK	Tone for 10 channel step
KEY CLICK HIGH	A special warning key click at max volume
NO SERVICE	No net selected or available
EXIT	Exit from any mode to default mode
NEG RESPONSE	Connection reject, undefined operation, no network available



2.6.3 SynVoice Phrases

The operator may be advised of status or configuration by verbal audio phrases called SynVoice. Table 2.3.6-1 provides a listing of the available SynVoice phrases and their meanings. The actual phrases heard by a TPT user will vary depending on the installed configuration.

Table 2.3.6-1
Summary of Available SynVoice Phrases (Configuration-Dependant)

PHRASE NO.	SynVoice PHRASE	COMMENT
1	CHANNEL ZERO	
...	...	
50	CHANNEL FORTY NINE	
71	MASTER	
72	SLAVE	
73	EXTERNAL AVAILABLE	The destination mode is now available in the menu.
74	DESTINATION NORMAL	
81	LED NORMAL	
82	LED HIGH	LED setting for intense sunshine.
83	LED NVG	
84	LED TIME	LED will be turned off after a configurable time.
85	LED OFF	
89	LOGGED ON	Successfully logged on or started a network.
90	CONFIGURATION ERROR	The unit has a different system configuration then the master of the network. The unit will not be able to log on to this master.
91	VOX OFF	
92	VOX ON	
93	KEY LOCK OFF	
94	KEY LOCK ON	
103	ORDER CHANGE MASTER	
104	ORDER SYNCHRONIZE AP	
105	FAST KEY M OFF	Normal mode.
106	FAST KEY M ON	Monitor mode.
107	LOW BATTERY WARNING 1	First battery warning level reached
108	LOW BATTERY WARNING 2	Second battery warning level reached
133	ORDER CHANGE MASTER LOST	Order maker is informed that all units did not answer to the order.
134	ORDER CHANGE MASTER OK	Order maker is informed that all units have answered to the order.
135	ORDERED CHANGE MASTER	Unit is informed that another unit, the order maker, will take over as master of the network.
136	ORDER SYNCHRONIZE AP LOST	Order maker is informed that all units did not answer to the order.
137	ORDER SYNCHRONIZE AP OK	Order maker is informed that all units have answered to the order.
138	ORDERED SYNCHRONIZE AP	Unit is informed that an AP will try to take over as master of the network.

2.7 TPT OPERATION

The TruLink network is designed to operate with one unit functioning as a MASTER and all other units as SLAVES. The MASTER broadcasts received audio from one slave TPT to all other SLAVE TPTs on the wireless network, as well as the wired ICS. If no TAP or DPT is in the network, then one TPT must be set to act as the MASTER. The following paragraphs describe the TPT operation without a TAP in the network. For operation with a TAP, see Section 4.

2.7.1 Introduction to TPT Man-Machine Interface

The user interacts with the TPT through the keypad and headset audio. The keypad accepts input from the user. The TPT advises the user with audio as either tones or pre-recorded voice (SynVoice) through the headset.

In general, the user initiates a command by pressing the *M* key. This starts an audio menu. By repeatedly pressing the *M* key, the TPT will respond with the next menu item. Upon reaching the desired item, the * key is used to cycle through the options (settings) available for the menu item. When the user has reached the desired setting, the *PTT* key is pressed to establish and confirm the setting.

2.7.2 Power ON/OFF

Note

- ☞ If a TPT unit is turned on and does not log on to a net, the TPT is designed to turn itself off after two minutes to conserve battery life.

The operator should connect their headset and position their microphone directly in front of their mouth.

To switch the power on or off, the up and down arrow keys (▲ and ▼) are used together. Press and hold both buttons for about 1 second until the LED illuminates green. When the unit has been powered, the operator can start a network or automatically logon to an existing network.

2.7.3 Start-Up

When a TPT unit is powered on the operator will hear a SynVoice announcement “*Channel xx, Slave*” or “*Channel xx, Master*” indicating the current channel setting and whether the TPT unit is set to master or slave. Pressing the menu button “*M*” will cycle through the SynVoice start-up menu options, which are:

- “*Channel xx*”
- “*Master/Slave*”
- “*Order Synchronize Access Point*”

These are the only options available until the TPT is part of a TruLink network.

2.7.3.1 Starting a Network

When not located near the MASTER TAP or DPT, a group of TPTs can set up a standalone network.

The operator most likely to remain in the workgroup should start-up their TPT first, and set it to MASTER. Only one TPT should be set to MASTER for a given channel. ALL other TPTs on a given channel should be set to SLAVE (default setting).

An operator can only switch a TPT between SLAVE and MASTER before the unit logs on to a network. If a unit is logged on to a network, the operator must cycle power to access the proper change menu.

If the *PTT* button is not pressed within a few seconds of making a change, the new setting is aborted and no changes are made.

To change to MASTER: Press the menu (*M*) button until “*Slave*” is announced. Press the toggle button (*) until “*Master*” is announced then immediately press the enter button (*PTT*) to accept the change.

If the TPT unit is set to MASTER, it will logon to the network (which is itself) automatically after a few seconds or after the operator presses the enter button (*PTT*). The operator will hear a voice announcement “*Logon OK*”.

2.7.3.2 Logging On to a Network

When logging on to an existing network, a TPT unit must be set to SLAVE.

A SLAVE will only announce, “*Logon OK*”, if it finds and logs on to a MASTER on the same channel.

To logon to an existing network: turn ON the TPT, set it to SLAVE (if needed), set it to the proper channel, and wait for it to automatically logon to the network. The operator will hear a voice announcement “*Logon OK*”.

Note

- ☞ To change a TPT to a SLAVE: Press the menu (*M*) button until “*Master*” is announced. Press the toggle button (*) until “*Slave*” is announced then immediately press the enter button (*PTT*) to accept the change.

If no network is available a “NEG RESPONSE” tone is heard, followed by a “NO SERVICE” tone which is repeated until the next logon try.

If logon fails due to a mismatch of system configuration, the operator will hear a SynVoice message “CONFIGURATION ERROR” in the headset. This is followed by a “NO SERVICE” tone, which is repeated until next logon try.

The unit tries to logon for approximately two minutes. If unsuccessful, the user is notified by SynVoice “AUTO POWER OFF” and the power is automatically turned off. The operator can access the start-up menu and change channels until either the unit successfully logs on to the network or it powers down.

2.8 SETTINGS

When the unit has logged on to a network, the operator typically has access to the following settings with consecutive presses of the *M* key:

- CHANNEL [channel list]
- VOX [on/off]
- KEY LOCK [on/off]
- LED [normal, NVG, high, time, or off]
- ORDER CHANGE MASTER
- ORDER SYNCHRONIZE ACCESS POINT

The actual SynVoice menu a user hears is dependant on the configuration installed in the TPT (or DPT). Some configurations do not have all these messages, others include more SynVoice messages. Consult the appropriate configuration addendum for details. The *M* key is used for cycling between the available menu selections.

The * is used for changing the settings of the selected item. When a setting has been changed, *PTT* is used for confirming the new setting.

If the settings menu has been accessed and no further action is taken, after a few seconds the unit exits the menu and the operator will hear a “MENU EXIT” tone in his headset.

2.8.1.1 CHANNEL Setting for TPT

Changing the channel when the unit is MASTER of the network is not recommended since the action will disconnect all logged on operators.

To change the channel:

- Press and release the *M* button until the SynVoice announces the CHANNEL setting, e.g., “CHANNEL ONE”.
- Press and release * to step through the channel list. If * is held down for more than 0.5 seconds a “LONG KEY CLICK” will be heard instead of the ordinary key click. One long key click corresponds to ten steps in the channel list. When * is released a SynVoice message informs the operator of the selected setting, e.g., “CHANNEL ONE”. If the selected channel is not the desired channel, press * again.

- To confirm the selected channel, press *PTT*. If the setting is not confirmed within a few seconds of the change, the menu will be exited without any changes.

If the unit is a MASTER, it will automatically start a new network. If the unit is a SLAVE, it will automatically try to find and logon to a network.

2.8.1.2 VOX Setting

The VOX setting, voice operated keying, can be toggled on or off.

- Press and release the *M* button until the SynVoice announces the VOX setting, e.g. “VOX ON”.
- Press and release * to change setting between ON or OFF. When * is released a SynVoice message informs the operator of the selected setting, e.g., “VOX OFF”. If the selected setting is not the desired setting, press * again.
- To confirm the selected channel, press *PTT*. If the setting is not confirmed within a few seconds of the change, the menu will be exited without any changes.

2.8.1.3 KEY LOCK Setting

When KEY LOCK is enabled it protects against accidental key press. With key lock on, the operator can send an Emergency PTT or exit the mode.

- Press and release the *M* button until the SynVoice announces the KEY LOCK setting, i.e., “KEY LOCK OFF”.
- Press and release * once to turn on key lock. When * is released a SYNVOICE message informs the operator of the selected setting, e.g., “KEY LOCK ON”. If the selected setting is not the desired one, press * again.
- To confirm the selected channel press *PTT*. If the setting is not confirmed within a few seconds of the change, the menu will be exited without any changes.

To exit the KEY LOCK mode:

- Press and release the *M* button once. The SynVoice announces the KEY LOCK setting, i.e., “KEY LOCK ON”.
- Press and release * once to turn off KEY LOCK. When * is pressed, KEY LOCK mode is immediately exited and the SynVoice message informs the operator of the selected setting, e.g., “KEY LOCK OFF”.

2.8.1.4 LED Setting

The LED has five available settings:

1. Normal – LED is visible to naked eye in ambient light (or darkness).
2. High – LED is brighter than normal.
3. NVG – LED is less visible to naked eye. Night vision goggles are required.
4. Time – LED only functions for a few seconds after power-up and then turns off.

5. Off – LED is always off. No visible status is available, including power. This setting is not normally recommended.

The LED settings cycle through; “LED NORMAL”, “LED HIGH”, “LED NVG”, “LED TIME”, and “LED OFF”.

- Press and release the *M* button until the SynVoice announces the LED setting, e.g. “LED NORMAL”.
- Press * to cycle through the selection list of LED settings, one key click corresponds to one step in the selection list. When * is released a SynVoice message informs the operator of the selected setting, e.g., “LED NVG”. If the selected setting is not the desired one, press * again.
- To confirm the setting press *PTT*. If the setting is not confirmed within a few seconds of the change, the menu will be exited without any changes.

2.8.1.5 ORDER CHANGE MASTER Setting

Changing the MASTER unit of the network will temporarily disconnect all logged on operators.

Order Change Master is used to switch the MASTER unit of a network. It swaps the roles of MASTER and SLAVE between the issuing SLAVE and the current MASTER. This should only be employed when TPTs are part of a standalone network (no TAP or DPT).

- From the SLAVE unit, press and release the *M* button until the old SLAVE unit emits a SynVoice message “ORDER CHANGE MASTER”.
- Press and release *PTT* once to initiate the change setting. When *PTT* is released a SynVoice message, “ORDER CHANGE MASTER OK”, confirms the change to the operator. At the same time, everyone on the network is alerted to the impending change via the SynVoice message “AUTO CHANGE MASTER”.
- The new MASTER unit then begins a network logon procedure. The successful logon is confirmed to the operator via the SynVoice message “LOGON OK”.
- Within one minute all other units on the network, including the old MASTER unit that is now a SLAVE, re-logon to the network of the new MASTER. The successful logon is confirmed to the operator via the SynVoice message “LOGON OK”, and communication can then continue as before.

2.8.1.6 ORDER SYNCHRONIZE ACCESS POINT Setting (Changing TAP Channel)

This setting is used only when there is a connected TAP MASTER unit in the network. For a description of this setting, see Paragraph 4.4.

2.8.2 Talking on the Network

The user is offered three methods of speaking on the network.

With the first mode, the user breaks VOX by talking. The user knows VOX has been broken when his sidetone is heard. Note that the TPT's VOX setting must be in VOX ON for this method to work.

With the second method, the user presses the PTT button. This method is useful if the VOX is not enabled and in noisy environment when it may be hard to break VOX.

To make an emergency announcement on the net, the operator can press the PTT twice within 0.5 seconds. This will grant immediate access to a voice channel on the net.

It should be noted that the destination of the transmission is not dependent of the access method in this configuration. However, the priority differs in between these access methods with VOX as the lowest priority and emergency as the highest priority.

2.8.2.1 Transmission Rejection

When the operator wants to transmit and the network is full, a "NEG RESPONSE" sound is heard in the operator headset. The operator can then try to use an access method with higher priority.

2.8.2.2 Transmission Indication

When the operator transmits successfully, a side tone is generated to the operator's headset.

2.8.3 Volume Adjustment

The up and down arrow keys (▲ and ▼) are used to adjust the volume. A "KEY CLICK" sound indicates a change of volume level. The volume is never completely shut off. If the user tries to decrease the volume lower than the minimum level, the "KEY CLICK LOW" sound is heard instead of the normal key click.

If the user tries to increase the volume higher than the maximum level, the "KEY CLICK HIGH" sound is heard instead of the normal key click. To increase the volume one more step higher, press and hold the up arrow key (▲) for three seconds. This will override the normal high setting to a maximum level. At the same time a repeating warning signal is started to alert the user of the overridden volume limit. If the down arrow key (▼) is pressed the volume is reduced one level and the volume is again set to the NORMAL limit.

2.8.4 Out of Range

If an operator takes a SLAVE TPT unit out of range and the radio connection with the MASTER is lost, a "NO SERVICE" sound is heard in the headset. At the same time the LED indicates OUT_OF_RANGE.

The SLAVE automatically tries to re-logon to the same MASTER. If successful the operator will be notified with a SynVoice message “LOGON OK”. Otherwise the operator will hear a “NEG RESPONSE” tone.

If the unit does not successfully logon to a network within approximately two minutes, the unit’s power is automatically turned off. Before turning off the power the operator is notified with SynVoice message “AUTO POWER OFF”.

2.8.5 Key-Click

Every key pressed generates a key-click sound to the headset.

2.8.6 Power-On BIT Failure

If any errors are encountered during the power-on BIT testing, the LED indicates MALFUNCTION. If this occurs the unit requires servicing and should be taken out of service.

2.9 TPT CHECK OUT PROCEDURE

The following should be performed before using the unit(s):

- Ensure that the unit uses fresh alkaline cells or newly charged NiMH cells.
- Ensure that one unit is started as a master on an unused channel. Confirm that other TPTs, on the same channel can successfully log on to the master.

CHAPTER 3 TRULINK ACCESS POINT

3.1 OVERVIEW

The TruLink Access Point (TAP) is used as either the long-range radio interface or as an interface to a wired ICS. It is typically used for fixed installations. One TPT SLAVE and one TAP MASTER, as shown in Figure 3.1-1, constitute a network. The TAP incorporates three audio ports and one data port.

Radios are connected to the audio connectors of the TAP. The TAP provides the necessary audio and keying connections needed to operate external radios. When used to interface to a wired intercom system, one audio connector is employed.

The operation of the audio connectors is dependant on the configuration installed on the TAP.

The data port is only used for configuration installation.

Depending on configuration, up to 31 TPTs can be connected to the TAP with a maximum of up to six TPTs transmitting simultaneously.



Figure 3.1-1. TPT and TAP Network

3.2 PHYSICAL DESCRIPTION

The TAP is powered by DC power from the host vehicle. It measures 8.7 inches in length by 5.7 inches wide by 2.3 inches high. It weighs approximately 2.9lbs. The physical characteristics are shown in Figure 3.3.1-1.

The TAP has connectors for power, antenna, audio and data. There are also two pushbuttons, one for setting the channel and one to operate the status LED. See Figure 3.3.1-2 for a picture of the TAP controls, indicator and connectors.

3.3 TAP INSTALLATION

3.3.1 Mounting

The TAP has four flanges for bolting the unit into the host vehicle. The flanges are bare metal to facilitate connection to ground. The mounting surface should be cleaned to bare metal to ensure a good chassis ground.

It is recommended that the TAP be located near the data and audio devices to avoid long lengths of cabling. The unit also needs to be accessible by the operator for channel selection and to view the LED status indicator.

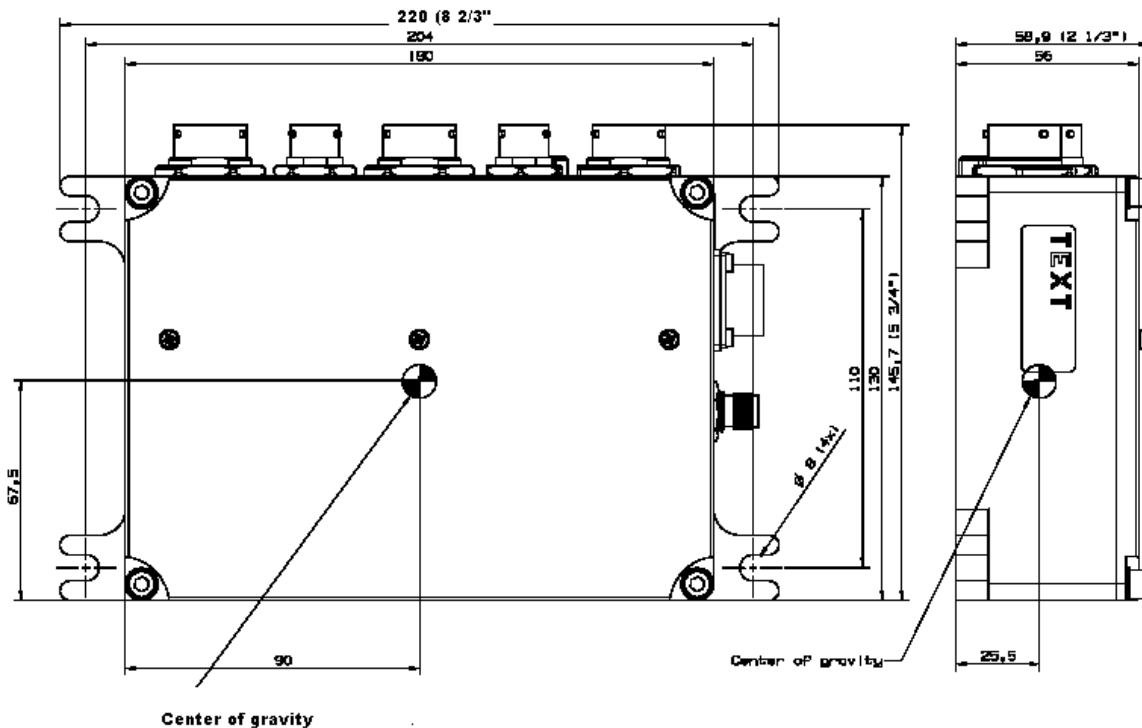


Figure 3.3.1-1. TAP Unit Dimensions (Inches)

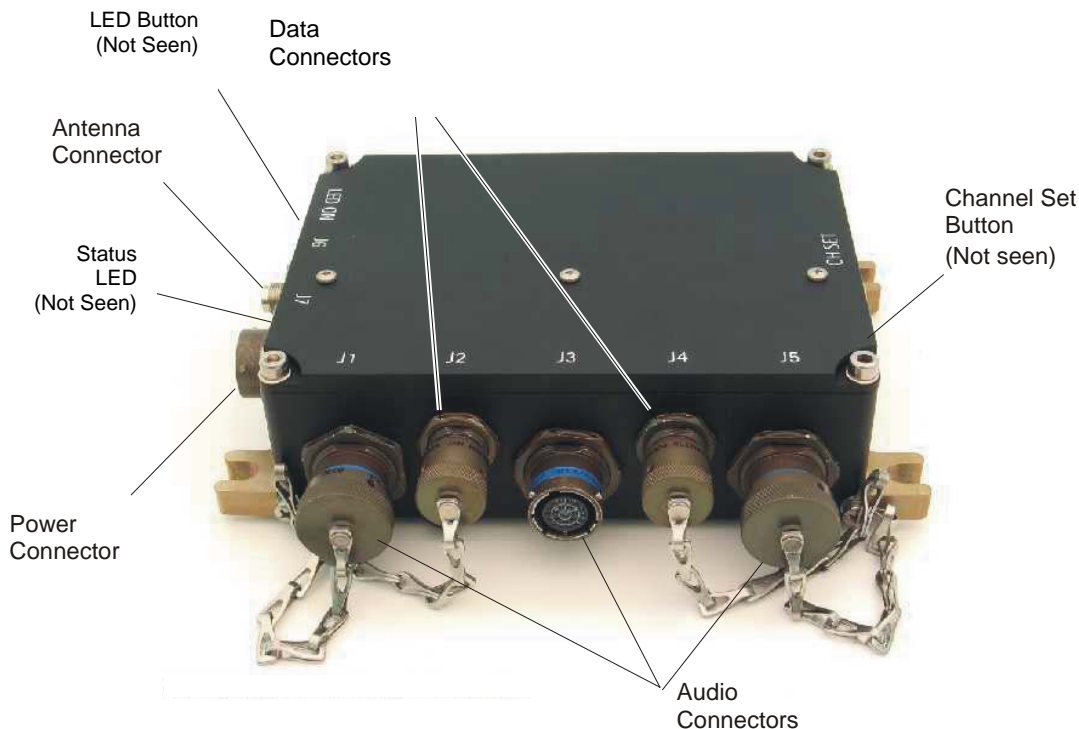


Figure 3.1.1-2. TAP Controls and Connectors

3.3.2 Connections

3.3.2.1 Power Connector

The power connector is marked J7. The vehicle DC power source must be supplied through a 1 Amp fuse or circuit breaker (not supplied).

3.3.2.2 Antenna Connector

The antenna connector is marked J6. The antenna connected to the TAP is chosen according to the physical installation (vehicle, vessel or aircraft) and connects via a TNC-male with 50-Ohm impedance. The standard antenna provided can be directly mounted to the TAP, or remotely mounted not more than ten feet away via a cable (not supplied). The antenna must be located so that there is a clear (RF) path between it and the users. The antenna cannot be located within a metal enclosure.

3.3.2.3 Audio Connectors

The three audio connectors are marked J1, J3 and J5. The connectors are identical except that each is keyed to mate with only one cable. Each connector has provisions for line level audio input and output, both 600 Ohms. Additionally, a floating PTT discrete output is available. Both PTT wires must be connected for proper operation. The low PTT line should be connected to the intercom return.

The audio connectors may be connected to either long-range radios or to a wired ICS through a crew station headset port. Up to three radios may be connected to the TAP.

When used to interface to a wired intercom system, one TAP audio connector is typically connected to a headset port of a crew station.

The function of these connectors is dependant on the system's configuration.

3.3.2.4 Data Connectors

The two data connectors are marked J2 and J4. Connector J2 is used to load and configure the TAP. It is not a part of routine operation. Connector J4 is not used.

3.4 TAP OPERATION

A TAP is always operated as a MASTER. However, it requires a TPT SLAVE unit to change channels.

3.4.1 Power ON/OFF

When power is applied to a host vehicle, a connected TAP unit is powered on automatically. The TAP will always start-up as a MASTER unit on the channel it was previously set to when the vehicle power was removed. If the channel is unknown, an operator can set the TAP channel using a TPT SLAVE unit and the Order Synchronize Access Point setting described below. This setting can also be used at any time during normal operation if it becomes necessary to change the network channel.

3.4.2 Echo Elimination Procedure

This procedure is employed when connecting a TAP to a wired ICS station. This procedure is provided as a reference only. Due to electrical variations in different manufacturer's products, the procedure may need to be altered to achieve acceptable results.

When the TAP is configured for use with a wired intercom system, this procedure must be employed to eliminate echo in the TruLink system caused by the wired ICS station's sidetone.

The following procedure usually is required only during a wired system installation or replacement of a wired system intercom station. However, it can be performed if there is a noticeable echo on a TPT.

This procedure will eliminate echo on a TPT when a TAP is connected to a wired system.

- Set wired system station to intercom selection.
- Set wired system station to HOT MIC selection.
- Set wired system station volume to approximately 50% setting.
- Confirm that no headset is connected to the wired system crew station.
- VOX sensitivity set to minimum (if present on crew station ICS)

- Ensure all other stations are not transmitting on the intercom or have an open MIC. If no headset is connected to a crew station, no action is required.
- Ensure that the station is receiving no long-range radio audio.
- Power up the wired system and the TAP.
- On the TAP, press and hold the Channel SET and LED pushbuttons at the same time for five seconds.
- Power up a TPT and test for echo by speaking to the wired ICS.
- If echo is heard, reduce the station's volume control slightly until the echo is eliminated.

3.4.3 ORDER SYNCHRONIZE ACCESS POINT Setting (Change TAP Channels)

When a TAP is in the network, it is always the MASTER. Changing the channel of the MASTER unit of the network will disconnect all logged on operators. All operators will have to change to the new channel for their unit to be re-connected to the original network.

This setting allows a TPT unit the ability to change the channel of a TAP.

- Notify all operators on the network that the channel is about to be changed.
- Set the SLAVE unit to the channel desired for the TAP.
- Press and release the *M* button until the SynVoice announces the "ORDER SYNCHRONIZE ACCESS POINT" setting.
- Press and release the * button on the TPT. The user will hear SynVoice announce "ORDER SYNCHRONIZE ACCESS POINT".
- Press and hold the "SET CHANNEL" button on the TAP.
- Press and release the *PTT* button on the TPT.
- The SLAVE unit will initiate a re-logout to the new network channel of the MASTER. The successful logout is confirmed to the operator via the SynVoice message "LOGON OK", and communication can then continue between operators on this channel.
- For operation with groups of vehicles in close proximity, the TAP channels in groups of ten should be avoided (for example: CH 1, CH11 and CH 21)

3.4.4 ORDER CHANGE MASTER Setting

CAUTION

- ☞ The ORDER CHANGE MASTER setting should not be used when a TAP is operating as the MASTER in a network. It may be used when a TPT is used as a MASTER.

ORDER CHANGE MASTER is used to switch out the MASTER unit of a network. It swaps the roles of MASTER and SLAVE between the issuing SLAVE and the current MASTER. For further information, see Paragraph 3.8.1.5.

3.4.5 Logging on to a Network

The TAP will always act as a MASTER. Therefore it will start a network at power-up and will always succeed in the network logon. The TAP should be powered up before any TPTs are turned on.

3.4.6 Status Indications

The TAP status and operation are indicated visually with a two-color LED on the side of the TAP unit. Press and hold the LED button to view the status LED. See Table 3.4.6-1 for an explanation of the status LED indications. If a TPT is logged on to the TAP, some indications also appear as sounds and SynVoice messages in the TPT connected headset.

Note

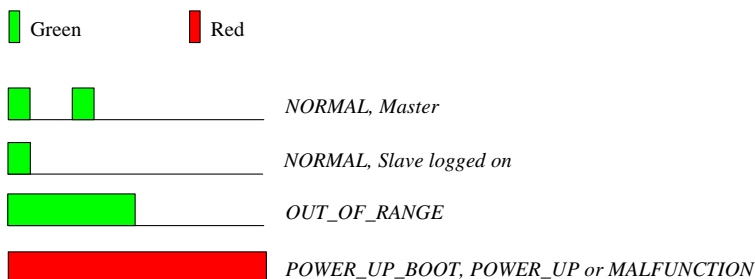
 The LED on the TAP is NOT NVG compatible.

3.4.6.1 Power-On BIT Failure

If any errors are encountered during the power-on BIT testing, the LED indicates MALFUNCTION.

**Table 3.4.6-1
Status LED Indications**

CURRENT STATUS	COLOR	ON TIME MS	OFF TIME MS
Normal, Master logged on	GREEN	100	1900
Normal, Slave logged on	GREEN	100/100	150/1650
Power-up	RED	1000	0
Malfunction (BIT failure, fatal error)	RED	1000	0
Out-of-range (Slave only)	GREEN	500	500
Ready for SW download	RED	1000	0
SW download in progress	RED	1000	0



3.5 TAP CHECK OUT PROCEDURE

The following should be performed before using a TAP.

- Start up the TAP and check that TPTs configured as slaves can log in on to it and communicate.

CHAPTER 4

TRULINK DUAL PORT TRANSCEIVER

4.1 OVERVIEW

The Dual Port Transceiver (DPT) is typically employed for temporary connections to wired intercom systems. When connected to the wired system, it acts like a TAP and is usually the network master. However it only has one interface connector. Depending on configuration, the DPT may also be used as a handheld unit. See Figure 4.1-1.



34555

Figure 4.1-1. Dual Port Transceiver

When used as an interface to wired intercom systems, the DPT connects to the wired system via an application specific interface cable. Due to its connector arrangement, an application specific cable is required to connect most headsets. The unit is powered from three AA NiMH or alkaline batteries.

4.2 PHYSICAL DESCRIPTION

The Dual Port TPT has the same physical characteristics as the TPT with the exception of the connector interface. The Dual Port TPT uses multiple pinned connectors on the bottom of the unit instead of a single Nexus connection as is on the TPT. See Figure 4.2-1.

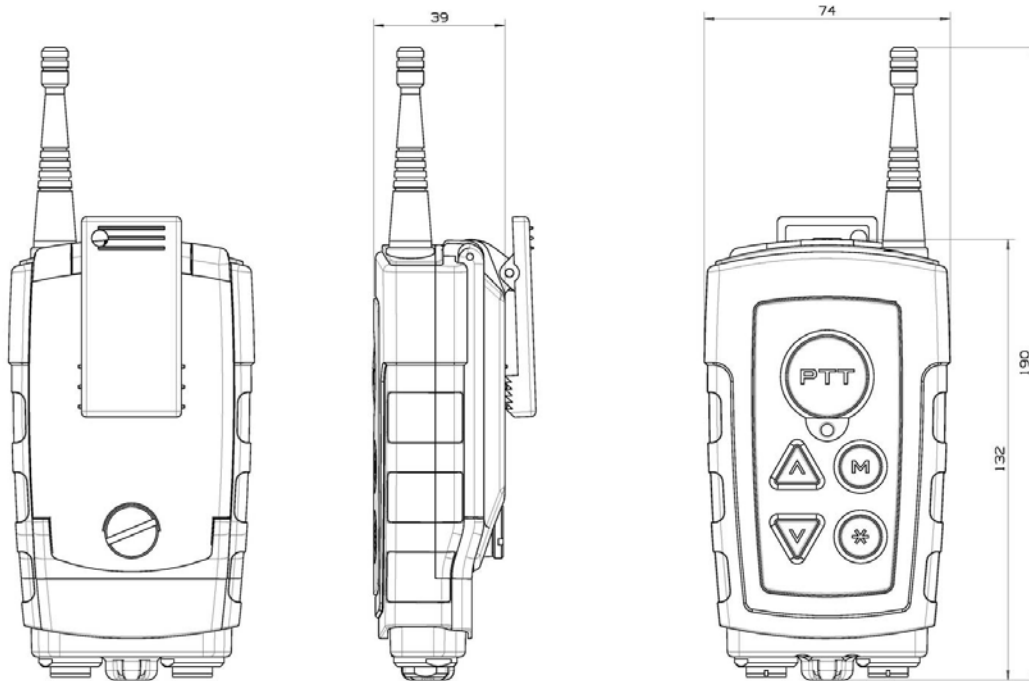


Figure 4.2-1. Dual Port Transceiver (DPT) Unit Dimensions

4.3 OPERATION

The operation of the DPT is similar to the TPT. Functions such as power up/down, SynVoice messages, battery installation, status indications, etc., follow the descriptions shown for the TPT. Please refer to that section for details.

Note

- ☞ Rechargeable batteries (NiMH) must be removed from the DPT and charged in a commercial battery charger. The TruLink Support Station, 780-3000-001, cannot be employed to charge the DPT's batteries.

4.3.1 ICS Interface

The Dual Port Transceiver connects to the wired system via an interface cable. This cable is specific to the type of wired system. Different interface cables are used in various aircraft/vehicles. When connecting a Dual Port TPT, the crew station must be configured correctly or echo will occur. Typically, the DPT is the network MASTER. See the correct addendum for your installation.

After the cable is connected and the unit is powered up slave TPTs can be turned on. They will log on to the master DPT

In order to set up the channel on a Dual Port TPT, the user must plug in the programming cable to the Headset Port and then connect a headset to the cable. Channel selection is the same as a TPT.

4.3.2 Logging on to a Network

When used for wired intercom system interface, the DPT will always act as a MASTER. Therefore it will start a network at power-up and will always succeed in the network logon. The Dual Port TPT should be powered up before any TPTs are turned on. For a description of how to logon a TPT, see Paragraph 2.7.3.2.

Note

- ☞ This procedure is provided for reference only. Due to electrical variations in different manufacturers products, the procedure may need to be altered to achieve acceptable results.

When the DPT is configured for use with a wired intercom system, this procedure must be employed to eliminate echo in the TruLink system caused by the station's sidetone.

This procedure will eliminate echo on a TPT when a DPT is connected to a wired system.

- Set wired system station to intercom selection.
- Set wired system station to HOT MIC selection.
- Set wired system station volume to approximately 50% setting.
- VOX sensitivity set to minimum (if present on station ICS).
- Connect the DPT (using the appropriate aircraft interface cable) to the aircraft.
- Confirm no headset is connected to the wired system station.
- Insure all other stations are not transmitting on the intercom or have an open MIC. If no headset is connected to a station, no action is required.
- Ensure that the station is receiving no long-range radio audio.
- Power up the wired system and the DPT.
- Power up a TPT and test for echo by speaking to the wired ICS.

If echo is heard, reduce the station's volume control slightly until the echo is eliminated.

Echo should be eliminated. If still present, try backing off on the volume knob again slightly until echo is eliminated. If it is still present, back off again slightly and power OFF then ON. Repeat steps as necessary to eliminate echo. Turning the Dual Port Transceiver OFF then ON causes the DPT to train the system.

4.4 DUAL PORT TRANSCEIVER CHECK OUT PROCEDURE

The following should be performed before using a Dual Port Transceiver:

- Ensure that the unit uses fresh alkaline cells or newly charged NiMH cells.
- Start up the Dual Port TPT and see if a SLAVE TPT can log onto it.
- Confirm that audio conversations are possible with all connected parties (see configuration addendum).

CHAPTER 5 TRULINK SUPPORT STATION (TSS)

5.1 OVERVIEW

The TSS is a standalone device that provides the ability to charge the commercially available NiMH batteries while installed in a 780-1000-001 TPT unit, display Built-in Test (BIT) results and set the channel on up to six transceivers at one time.

5.2 PHYSICAL CHARACTERISTICS

The TSS is powered by standard 120VAC, 60Hz power. The AC power cable, Telephonics Part No. 780-3500-001, is supplied with the TSS. The TSS measures 11.75 inches in length by 9.75 inches wide by 4.75 inches high and weighs approximately 12 pounds. There are six plug-in brackets located on top of the TSS. Red and green LEDs provide the status indications for each bracket and a four digit numeric display is used for TPT channel selection. An ON/OFF switch and a pushbutton reset circuit breaker are located on the side of the TSS. The TSS controls and indicators are shown in Figure 5.2-1. An enlargement of the display overlay is shown in Figure 5.2-2.

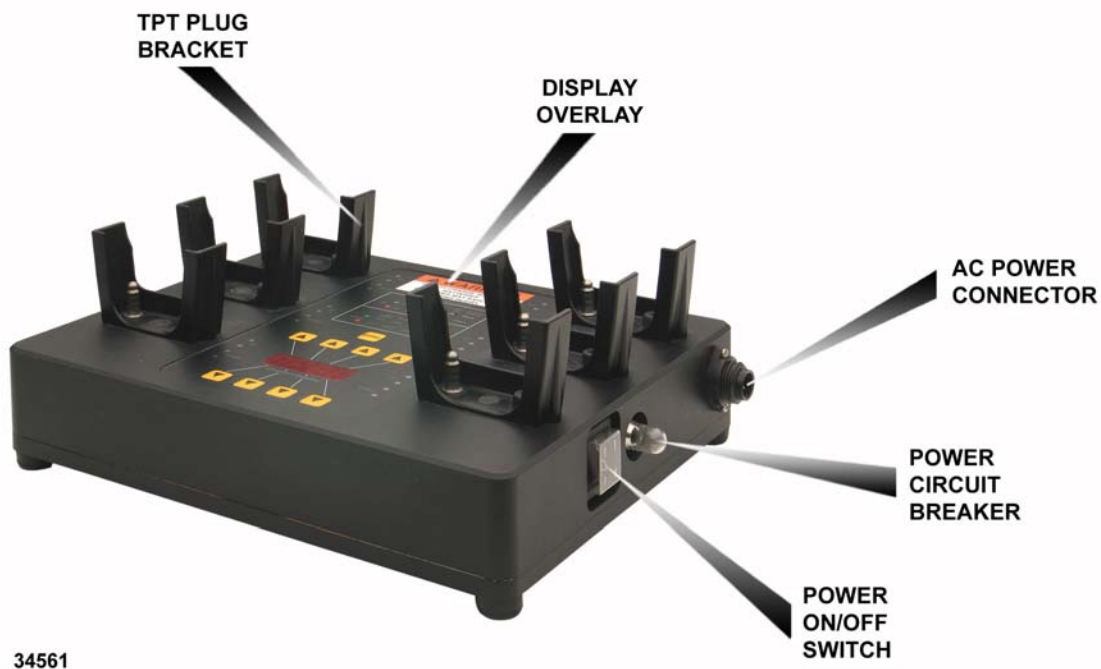


Figure 5.2-1. TSS Controls and Indicator

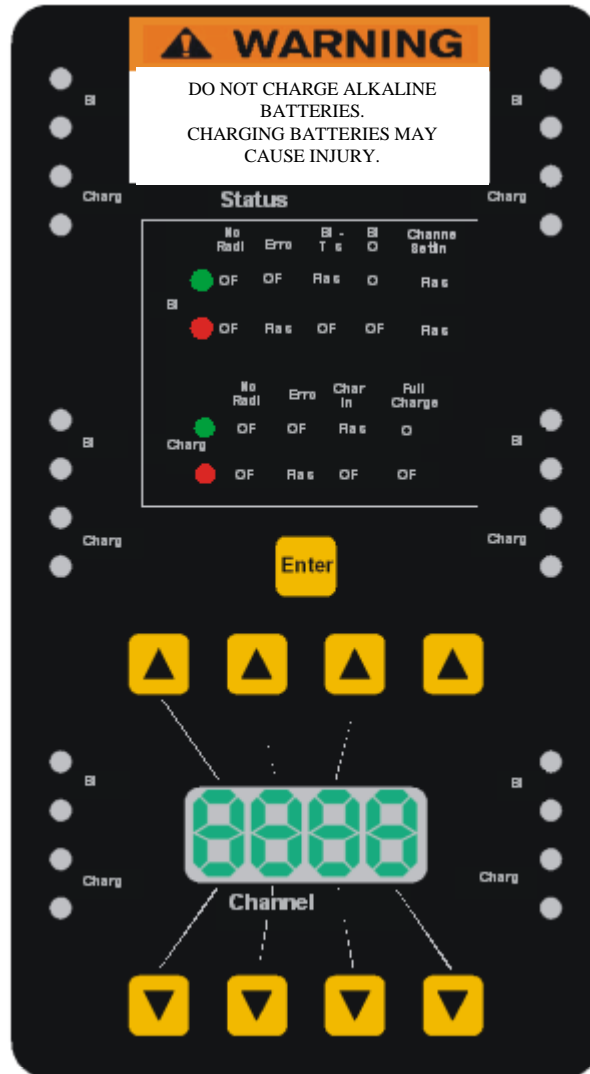


Figure 5.2-2. TSS Display Overlay

5.3 CHARGE INDICATION

The display overlay consists of two LEDs (red and green) for charge indication at each TPT plug-in bracket. The charge LED indications are shown in Table 5.3-1.

**Table 5.3-1
Charge LED Indication**

CURRENT STATUS	RED LED	GREEN LED
No Radio	OFF	OFF
Error including TPT with non-rechargeable batteries	FLASHING 50%	OFF
Charging	OFF	FLASHING 50%
Fully charged	OFF	ON
Radio detected, but charge status from battery not yet updated	FLASHING 50%	FLASHING 50%

5.4 BIT INDICATION

The display overlay consists of two LEDs (red and green) for BIT indication at each TPT plug-in bracket. The BIT LED indications are shown Table 5.4-1.

**Table 5.4-1
BIT LED Indications**

CURRENT STATUS	RED LED	GREEN LED
No Radio	OFF	OFF
Error	FLASHING 50%	OFF
Performing BIT	OFF	FLASHING 50%
BIT OK	OFF	ON
Setting of Channel	FLASHING 50%	FLASHING 50%

5.5 TPT CHANNEL SELECTION

This procedure will set the channel for every TPT resident on the TSS. A single TPT cannot be isolated and set individually.

- On the TSS four segment display, use the up and down arrows to select the desired channel for the TPTs.
- Press and release ENTER key once to initiate the change setting. All TPT units will now be set to the same channel.

5.6 TSS CHECK OUT PROCEDURE

The following should be performed before using the TSS:

- Connect the unit to 120 VAC. Check that the LED digits light up.
- For each TPT slot, insert a TPT. Check that the BIT is started.

APPENDIX A
UNIT SPECIFICATIONS

TPT AND DPT SPECIFICATIONS

DESCRIPTION	VALUE
FREQUENCY	2.4 GHz ISM band
RF POWER OUTPUT	100 mW (default) 1 - 100 mW (+20 dBm) factory programmable
RANGE	Up to 1500 ft. (unobstructed line-of-sight)
DIMENSIONS	4.8 inches in length by 2.9 inches in width by 1.9 inches in depth
WEIGHT	Approximately 11 oz. without batteries
OPERATING TIME	8 Hours Min (3 AA batteries)
PHYSICAL CHANNEL SPACING	300 KHz
3 dB PHYSICAL CHANNEL BANDWIDTH	192 KHz
MODULATION	$\pi/4$ DQPSK
PHYSICAL CHANNEL BIT RATE	384 Kbps
SPEECH ENCODING	32 Kbit/sec ADPCM
NUMBER OF CHANNELS	50
NUMBER OF USERS PER CHANNEL	31
NUMBER OF SIMULTANEOUS SPEAKERS	6
SPREAD SPECTRUM	Frequency hopping/50 HPS
OPERATING TEMPERATURE	-40°C to +55°C

TAP SPECIFICATIONS

DESCRIPTION	VALUE
FREQUENCY	2.4 GHz ISM band
RF POWER OUTPUT	100 mW (default) 1 - 100 mW (+20 dBm) factory programmable
RANGE	Up to 1500 ft. (unobstructed line-of-sight)
DIMENSIONS	8.7 inches in length by 5.7 inches in width by 2.3 inches high
WEIGHT	2.9 lbs
POWER	9-33VDC nominal @ 1A max. Feed must have 1A fuse.
PHYSICAL CHANNEL SPACING	300 KHz
3 dB PHYSICAL CHANNEL BANDWIDTH	192 KHz
MODULATION	$\pi/4$ DQPSK
PHYSICAL CHANNEL BIT RATE	384 Kbps
SPEECH ENCODING	32 Kbit/sec ADPCM
NUMBER OF CHANNELS	50
NUMBER OF USERS PER CHANNEL	31
NUMBER OF SIMULTANEOUS SPEAKERS	6
SPREAD SPECTRUM	Frequency hopping/50 HPS
OPERATING TEMPERATURE	-40°C to +55°C

TSS SPECIFICATIONS

DESCRIPTION	VALUE
INPUT VOLTAGE	120VAC, 50/60 Hz (It is strongly recommended that this unit be powered from a GFI outlet)
INPUT CURRENT	1A
OPERATING TEMPERATURE	0°C to +50°C
STORAGE TEMPERATURE	-20°C to +70°C
DIMENSIONS	11.75 inches in length by 9.75 inches wide by 4.75 inches high (no TPT's installed)
WEIGHT	Approximately 12 lbs

APPENDIX B
CONNECTOR DATA

TELEPHONICS CORPORATION
COMMUNICATION SYSTEMS DIVISION

LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: J1 Audio Interface				Protective Cap PN: 8LTE02B13		
CONNECTOR STD: MIL-C 38999 MS27468T13B35SN				MATING CONN. MS27467T13B35PN		
CONNECTOR MFG'R: SOURIAU				MATING CONNECTOR MFG'R: SOURIAU		
CONNECTOR P/N: 8LT7C13B35SN				MATING CONNECTOR P/N: 8LT5C13B35PN		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/Output	Technical Specs	Signal Description
AUDIO_IN- (Note 1)	-46 dBm to +12 dBm	300 To 3400 Hz	21	Input	Nominal: 0 dBm. Input line impedance (Audio1_IN): 600 Ohm. For reference only. See addendum manual for actual settings	(RX-path) Placing different impedance nets in the connector changes the impedance. The signal is transformer isolated.
AUDIO_IN+			14			
AUDIO_OUT- (Note 1)	-99 dBm to +11 dBm	300 To 3400 Hz	16	Output	Nominal: +10 dBm Output line impedance (Audio1_Out): 600 Ohm For reference only. See addendum manual for actual settings	(TX-path) Placing different impedance nets in the connector changes the impedance. The signal is amplified with a dual operational amplifier. The signal is transformer isolated
AUDIO_OUT+			2			
CTR_DATA_1_OUT-			11	Output	Closed: Max current: 0.14 A Max resistance: 15 Ohm Open: Max voltage: 30 V Max leak current: 0.1 mA	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_OUT+			12			
CTR_DATA_1_IN-			4	Input	Non detect: Max current: 0.18 mA Max voltage: 0.95 V Detect: Min Current: 0.3 mA Min voltage: 2.2 V	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_IN+			3			
Note 1: Signal levels are factory programmable. Default = -4.4 dBm						

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LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: J2 Data Interface				Protective Cap P/N: 8LTE02B09		
CONNECTOR STD: MIL-C 38999 MS27468T09B35SN				MATING CONN. MS27467T09B35PN		
CONNECTOR MFG'R: SOURIAU				MATING CONNECTOR MFG'R: SOURIAU		
CONNECTOR P/N: 8LT7C09B35SN				MATING CONNECTOR P/N: 8LT5C09B35PN		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/ Output	Technical Specs	Signal Description
RX	RS232	Max 115.2 kbit/s	4	Input/ Output	VT100 or ANSI compatible. ASCII transfer protocol. 8 bit data, 1 stop bit, No parity, 38400 baud.	Asynchronous data interface. This interface consists of two RS-232 lines. The RS-232 transceiver is a SP3232EEA from SIPEX.
TX			6			
GND			1			

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COMMUNICATION SYSTEMS DIVISION

LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: J3 Audio Interface						
CONNECTOR STD: MIL- MIL-C 38999 MS27468T13B35SA				MATING CONN. MS27467T13B35PA		
CONNECTOR MFG'R: SOURIAU				MATING CONNECTOR MFG'R: SOURIAU		
CONNECTOR P/N: 8LT7C13B35SA				MATING CONNECTOR P/N: 8LT5C13B35PA		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/ Output	Technical Specs	Signal Description
AUDIO_IN- (Note 1)	-77 dBm to -2 dBm	300 To 3400 Hz	21	Input	Nominal 0 dBm. Input line impedance (Audio1_IN): 600 Ohm. For reference only. See addendum manual for actual settings	(RX-path) Placing different impedance nets in the connector changes the impedance. The signal is transformer isolated.
AUDIO_IN+			14			
AUDIO_OUT- (Note 1)	-99 dBm to +11 dBm	300 To 3400 Hz	16	Output	Nominal 0 dBm. Output line impedance (Audio1_Out): 600 Ohm. For reference only. See addendum manual for actual settings	(TX-path) Placing different impedance nets in the connector changes the impedance. The signal is amplified with a dual operational amplifier. The signal is transformer isolated
AUDIO_OUT+			2			
CTR_DATA_1_OUT-			11	Output	Closed: Max current: 0.14 A Max resistance: 15 Ohm Open: Max voltage: 30 V Max leak current: 0.1 mA.	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_OUT +			12			
CTR_DATA_1_IN-			4	Input	Non detect: Max current: 0.18 mA Max voltage: 0.95 V Detect: Min Current: 0.3 mA Min voltage: 2.2 V	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_IN+			3			
Note 1: Signal levels are factory programmable. Default = -4.4 dBm						

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COMMUNICATION SYSTEMS DIVISION

LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: J4 Data Interface				Protective Cap P/N: 8LTE02B09		
CONNECTOR STD: MIL-C 38999 MS27468T09B35SA				MATING CONN. MS27467T09B35PA		
CONNECTOR MFG'R: SOURIAU				MATING CONNECTOR MFG'R: SOURIAU		
CONNECTOR P/N: 8LT7C09B35SA				MATING CONNECTOR P/N: 8LT5C09B35PA		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/ Output	Technical Specs	Signal Description
Data Hi	RS485	2 Mbps	6	Input/ Output	Not yet implemented	High Speed Data Bus. This interface consists of two RS485 lines. The RS485 transceiver is a MAX3485 from MAXIM. The direction is configured by the FPGA. The signals have over voltage protection and EMI-filters.
Data Lo			5			
Clock Hi			4			
Clock Lo			3			
GND			1			

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LRU ID: TruLink™ Access Point (TAP)						
LRU CONNECTOR: J5 Audio Interface				Protective Cap PN: 8LTE02B13		
CONNECTOR STD: MIL--C 38999 MS27468T13B35SB				MATING CONN. MS27467T13B35PB		
CONNECTOR MFG'R: SOURIAU				MATING CONNECTOR MFG'R: SOURIAU		
CONNECTOR P/N: 8LT7C13B35SB				MATING CONNECTOR P/N: 8LT5C13B35PB		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/ Output	Technical Specs	Signal Description
AUDIO_IN- (Note 1)	-46 dBm to +10 dBm	300 To 3400 Hz	21	Input	Nominal 0 dBm. Input line impedance (Audio1_IN): 600 Ohm. For reference only. See addendum manual for actual settings	(RX-path) Placing different impedance nets in the connector changes the impedance. The signal is transformer isolated.
AUDIO_IN+			14			
AUDIO_OUT- (Note 1)	-99 dBm to +11 dBm	300 To 3400 Hz	16	Output	Nominal -10 dBm. Output line impedance (Audio1_Out): 600 Ohm For reference only. See addendum manual for actual settings	(TX-path) Placing different impedance nets in the connector changes the impedance. The signal is amplified with a dual operational amplifier. The signal is transformer isolated
AUDIO_OUT+			2			
CTR_DATA_1_OUT-			11	Output	Closed: Max current: 0.14 A Max resistance: 15 Ohm Open: Max voltage: 30 V Max leak current: 0.1 mA.	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_OUT+			12			
CTR_DATA_1_IN-			4	Input	Non detect: Max current: 0.18 mA Max voltage: 0.95 V Detect: Min Current: 0.3 mA Min voltage: 2.2 V	Discrete signal. The signal is isolated by an optocoupler.
CTR_DATA_1_IN+			3			
Note 1: Signal levels are factory programmable. Default = -4.4 dBm						

POWER

LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: Power						
CONNECTOR STD: MIL-C 26482				MATING CONN. MS3116E14-5S		
CONNECTOR MFG'R: CANNON				MATING CONNECTOR MFG'R: CANNON		
CONNECTOR P/N: KPT02E-14-5P				MATING CONNECTOR P/N: KPT06E14-5S		
Signal Name	Signal Level	Signal Freq	Pin Number	Input/ Output	Technical Specs	Signal Description
+28VDC	DC	DC	A, B	Input	Fused protected 60V, 650mA. Current consumption, 12V, without load: 4.8 mA. PTC-resistor: 650 mA Tranzorb: 39V	Supply voltage: 9 to 33 VDC. User must protect with 1A circuit breaker.
+28VRTN	DC	DC	C, D, E			

ANTENNA

LRU ID: TruLink Access Point (TAP)						
LRU CONNECTOR: ANT						
CONNECTOR TNC FEMALE-				MATING CONN.		
CONNECTOR MFG'R: TBD				MATING CONNECTOR MFG'R: TBD		
CONNECTOR P/N: TBD (TNC FEMALE)				MATING CONNECTOR P/N: TBD (TNC MALE)		
Signal Name	Signal Type	Pin Number	Input/ Output	Technical Specs	Signal Description	
Antenna	RF Antenna	1	Input/Output	Frequency Range: 2,400 MHz to 2,484 MHz	RF transmit / receive signal. Connection to a 50 Ohm antenna	

TPT CONNECTORS

The TPT connector is a female 4-pole NEXUS receptacle.

The TPT connection is designed for use with a NEXUS plug connector having four segmented connections as shown:



32552

PIN NO.	SIGNAL NAME HEADSET MODE (NOTE 1)	SIGNAL NAME POWER/DATA MODE (NOTE 2)
1	MIC+	RXD (RS 232)
2	Earphone+	Ground
3	MIC-	TXD (RS 232)
4	Earphone-	Power

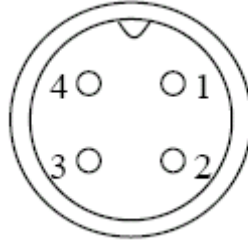
Note 1: Headset mode defines operation when a headset is plugged into the TPT.

Note 2: Power/Data mode defines operation when TPT is installed in TSS

TSS CONNECTORS

Power Input

Connector: AMPENOL T3110000



Pin 1 – Neutral
Pin 2 – Line
Pin 3 – Not Connected
Pin 4 - Ground

TPT Plug-in Bracket Connector for SS.

The TPT plug-in bracket connector is a NEXUS plug connector having four segmented connections as shown below:

DUAL PORT TRANSCEIVER CONNECTORS

Headset Interface

The connector is a female 7-pole ODU/Lemo type jack.

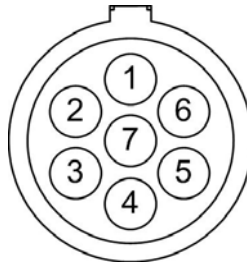


Figure 1. Headset Connector Outside View

CONNECTOR PIN-OUT

The pin-out of the connector is defined as:

Table 1
Pin-out of 7-Pole Headset Jack

PIN NR J2	SIGNAL NAME	COMMENT
1	MIC+	
2	MIC-	
3	Earphone Left +	
4	Earphone Left -	
5	Earphone Right +	
6	Earphone Right -	
7	Control input	

EXTERNAL AUDIO/DATA INTERFACE

Connector type

The connector is a female 8-pole ODU/Lemo type jack.



Figure 2. External Audio/Data Interface

CONNECTOR PIN-OUT

The pin-out of the connector is defined as:

Table 2
Pin-out of 8-Pole Audio Jack

PIN NR J3	SIGNAL NAME	COMMENT
1	Audio IN +	
2	CTRL_DATA2_IN	
3	Audio OUT +	
4	CTRL_DATA1_OUT	
5	DATA_IN_EXT	RS-232
6	DATA_OUT_EXT	RS-232
7	Power IN	11 – 15 V DC
8	GND	