

INSTRUCTION BOOK

**NEXCOM VERSION 3 (V3)
UHF/VHF RADIO**

**T6-TU-F AND T6-TV-F
TRANSMITTERS**

TYPE FA **XXXXXX**

CONTRACT NO. 693KA8-24-D-00016

CONTRACTOR:
INDRA AIR TRAFFIC, INC.
11300 W 89TH ST
OVERLAND PARK
KS 66214

**U.S. DEPARTMENT OF TRANSPORTATION (DOT)
FEDERAL AVIATION ADMINISTRATION (FAA)**

27 June 2025

Document Control		
	Name	Date
Prepared	Robert Amies	20 Jun 2025
Checked	Karl Stokes	20 Jun 2025
Approved	Doug Kennedy	27 Jun 2025

Document	
Part Number	580133-0003
Title	TIB (T6-TU-F and T6-TV-F)
Cage	9G6Y8

[illegible]

TABLE OF CONTENTS

PARAGRAPH	PAGE
TABLE OF CONTENTS	III
LIST OF ILLUSTRATIONS.....	IX
LIST OF TABLES.....	XIII
SECTION 1 GENERAL INFORMATION AND REQUIREMENTS	1-1
1.1 Introduction.....	1-3
1.1.1 Purpose.	1-3
1.1.2 Scope.....	1-3
1.2 Equipment Description.	1-4
1.2.1 Overview.....	1-4
1.3 Relationship of units.	1-8
1.3.1 Standalone Configurations.....	1-8
1.3.1.1 Transmitter with no Filter.	1-8
1.3.1.2 Transmitter using Internal Filter.	1-8
1.3.1.3 Transmitter using External Filter.	1-8
1.3.2 Transmitters in Main/Standby Configuration	1-9
1.3.2.1 Transmitters in Main/Standby Configuration (no filters).....	1-9
1.3.2.2 Transmitters in Main/Standby Configuration (internal filters).....	1-9
1.3.2.3 Transmitters in Main/Standby Configuration (external filters).....	1-9
1.3.3 Transceiver Configurations.....	1-10
1.3.3.1 Transmitter and Receiver in Transceiver Configuration (no filters).	1-10
1.3.3.2 Transmitter and Receiver in Transceiver Configuration (with internal filters).	1-10
1.3.3.3 Transmitter and Receiver in Transceiver Configuration (with external filters).	1-10
1.3.4 VoIP Connectivity.	1-11
1.4 Equipment Specification Data.	1-12
1.4.1 Labels.....	1-12
1.4.1.1 Nameplate Data.....	1-12
1.4.1.2 Warranty Label.	1-12
1.4.1.3 Manufacturer's Label.	1-12
1.4.1.4 Product Safety Label.	1-13
1.4.2 Functional Characteristics.....	1-14
1.4.2.1 Park Air T6F Transmitter specifications.	1-14
1.4.3 External Power Requirements.....	1-14
1.4.4 Environmental Characteristics.	1-15
1.5 Equipment and Accessories Supplied.....	1-16
1.6 Equipment Required but not Supplied.	1-17
SECTION 2 TECHNICAL DESCRIPTION	2-1
2.1 Introduction.....	2-1
2.1.1 Functional Block Diagrams.	2-1
2.2 Simplified Theory of Operation.....	2-4

2.3	Detailed Theory of Operation	2-4
2.3.1	Sub-system Elements.....	2-4
2.3.1.1	Digital Radio Control (DRC).....	2-4
2.3.1.2	Transmitter Front Panel Control (TFPC).....	2-4
2.3.1.3	Inter-Connection Board (ICB).....	2-5
2.3.1.4	Fan Assembly.....	2-5
2.3.1.5	FAA Radio Interface (FRI).....	2-5
2.3.1.6	Transmitter Power Regulator (TPR).....	2-6
2.3.1.7	Transmitter Power Supply (TPS).....	2-6
2.3.1.8	Antenna Transfer Relay (ATR).....	2-6
2.3.1.9	VHF Transmitter RF (VTR)	2-7
2.3.1.10	VHF Transmitter Power Amplifier (VTP).....	2-7
2.3.1.11	UHF Transmitter RF (UTR)	2-7
2.3.1.12	UHF Transmitter Power Amplifier (UTP).....	2-7
2.3.1.13	VHF Transmitter Tunable RF Filter.....	2-8
2.3.1.14	UHF Transmitter Tunable Filter.....	2-9
SECTION 3	OPERATION	3-1
3.1	Introduction.....	3-1
3.1.1	Interface Descriptions.....	3-1
3.1.1.1	FAA Radio Interface (FRI).....	3-3
3.1.1.2	LAN 1 and LAN 2.....	3-5
3.1.1.3	Cavity Filter.....	3-6
3.1.1.4	RF Output (Antenna).....	3-6
3.1.1.5	Power.....	3-6
3.1.1.6	Reference Frequency Monitor (REF MON).....	3-7
3.1.1.7	Microphone/Headset Connector.....	3-7
3.1.1.8	LAN 3.....	3-7
3.2	Controls and Indicators.....	3-9
3.2.1	Front panel operation.....	3-9
3.2.1.1	OLED Display.....	3-10
3.2.1.2	Soft Function Keys.....	3-10
3.2.1.3	Status Indicator.....	3-11
3.2.1.4	Filter Tuning Port.....	3-11
3.2.2	Rear Panel Connectors.....	3-12
3.3	Install, Switch-on, and Checkout.....	3-12
3.3.1	Install the Radio.....	3-12
3.3.2	Switch-on the Radio.....	3-12
3.3.3	Home Screen.....	3-13
3.3.4	The Settings Menus.....	3-13
3.3.5	Status.....	3-18
3.3.6	BIT System Service Level.....	3-20
3.3.7	Information.....	3-20
3.3.8	Front Panel HMI (Display) Lock.....	3-22
3.3.9	Front Panel HMI (Display) Information Option.....	3-22
3.3.10	How to View and Set a LAN IPv4 Address	3-23
3.3.11	How to do a Factory Reset from the Front Panel.....	3-24
SECTION 4	STANDARDS AND TOLERANCES	4-1
4.1	Introduction.....	4-1

4.2	Standards and Tolerances.	4-1
SECTION 5 PERIODIC MAINTENANCE		5-1
5.1	Introduction.....	5-1
5.2	Performance Checks.	5-1
SECTION 6 MAINTENANCE PROCEDURES.....		6-1
6.1	Introduction.....	6-1
6.2	Performance Checks.	6-1
6.2.1	Operating Frequency.....	6-1
6.2.1.1	Test Equipment Required.....	6-1
6.2.1.2	Procedure.	6-1
6.2.2	RF Output Power.	6-2
6.2.2.1	Test Equipment Required.....	6-2
6.2.2.2	Procedure.	6-2
6.2.3	Modulation Level.....	6-3
6.2.3.1	Test Equipment Required.....	6-3
6.2.3.2	Procedure.	6-3
6.3	Other Maintenance Procedures.	6-4
6.3.1	Filter Tuning (to maximize signal strength).....	6-4
6.3.1.1	Required test equipment.....	6-4
6.3.1.2	Procedure.	6-4
SECTION 7 CORRECTIVE MAINTENANCE		7-1
7.1	Introduction.....	7-1
7.2	Onsite Corrective Maintenance.....	7-1
7.2.1	Reference Frequency Adjustment.....	7-1
7.2.1.1	Test Equipment Required.....	7-1
7.2.1.2	Procedure.	7-1
7.2.2	Filter Tuning.	7-2
7.2.3	RF Output Power Adjustment.....	7-2
7.2.4	Modulation Adjustment.	7-2
7.2.5	Fan failure.	7-2
7.2.6	Power Failure (Fuse Replacement).	7-2
7.2.6.1	AC Fuse.	7-3
7.2.6.2	DC Fuse.	7-4
7.3	Offsite Repair.....	7-4
SECTION 8 PARTS LIST.....		8-1
8.1	Introduction.....	8-1
8.2	Parts List.	8-1
SECTION 9 INSTALLATION, INTEGRATION, AND CHECKOUT.....		9-1
9.1	Introduction.....	9-1
9.2	Unpacking and Repacking.	9-1
9.2.1	Unpacking.....	9-1
9.2.2	Repacking.	9-1
9.2.2.1	Packing in OEM Box.	9-1

9.2.2.2	Packing in non-OEM Box.....	9-2
9.3	Input Requirement Summary.....	9-2
9.4	Installation Procedures.....	9-2
9.4.1	Radio Configuration Procedures.....	9-3
9.4.1.1	Switch on the Radio.....	9-3
9.4.1.2	Check/Adjust the Reference Frequency.....	9-3
9.4.1.3	Factory Reset.....	9-3
9.4.1.4	MDT Port (LAN 3) IP Address.....	9-3
9.4.1.5	Configure the Radio.....	9-3
9.4.1.6	Check/Adjust Operating Frequency.....	9-3
9.4.1.7	Tune the Filter.....	9-3
9.4.1.8	Set RF Power Output.....	9-3
9.4.1.9	Set Modulation Level.....	9-3
9.4.1.10	Check VSWR at Transmitter Output.....	9-4
9.4.1.11	Set TX Timeout and PTT Reference Voltage.....	9-4
9.4.1.12	Set Audio Input to Analog or VoIP.....	9-4
9.4.1.13	Configure VoIP Parameters.....	9-4
9.4.1.14	Save Configuration.....	9-4
9.5	Inspection.....	9-5
9.5.1	Inspection From the Front Panel.....	9-5
9.5.2	Inspection From the MDT.....	9-5
9.5.2.1	Settings and Information Available via the MDT Interface.....	9-5
SECTION 10	MDT SOFTWARE	10-1
10.1	Introduction.....	10-1
10.2	Maintenance Data Terminal Description.....	10-1
10.3	Interface Control Documentation (ICD).....	10-2
10.4	Remote Monitoring and Control.....	10-3
10.4.1	Web Server Menus.....	10-4
10.4.1.1	Settings.....	10-4
10.4.1.2	Status.....	10-7
10.4.1.3	Information.....	10-8
10.4.2	Service Status.....	10-8
10.4.2.1	BIT System Service Level.....	10-8
10.4.3	How to Guides.....	10-9
10.4.3.1	How to Install New Firmware.....	10-9
10.4.3.2	How to Escalate a BIT Status Message.....	10-12
10.4.3.3	How to Clear BIT History.....	10-12
10.4.3.4	How to Store a Preset.....	10-13
10.4.3.5	How to Set a Front Panel HMI (Display) Lock.....	10-13
10.4.3.6	How to Disable Functions on a LAN Port.....	10-13
10.4.3.7	How to Export Radio Settings.....	10-14
10.4.3.8	How to Import Radio Settings.....	10-14
10.4.3.9	How to Set User Text.....	10-15
10.4.3.10	How to Change the Web Server Password.....	10-15
10.4.3.11	How to Change the Service Status Output.....	10-16
10.4.3.12	How to Change the Ready Output on Reduced Service.....	10-16
10.4.3.13	How to Export SNMP MIBs.....	10-16
10.4.3.14	How to Configure Syslog.....	10-17
10.4.3.15	How to View and Export the Local System Log.....	10-17
10.4.3.16	How to Reboot the Radio.....	10-17
10.4.3.17	How to Customize the HMI Display Screen Information.....	10-18

10.4.3.18	[redacted]	10-18
10.4.3.19	How to Measure the DC Input Voltage.	10-18
10.4.3.20	How to Set and Trim the RF Output Power	10-19
10.4.3.21	How to Set and Trim the Audio Line In Level.....	10-19
10.4.3.22	How to Set and Amend the Modulation Depth	10-20
SECTION 11 TROUBLESHOOTING SUPPORT DATA.....		11-1
11.1	Introduction.....	11-1
11.2	Alarm Indications.	11-1
11.2.1	Status Message Procedure.....	11-1
11.2.2	Radio Health.	11-2
11.2.3	How to access the web server.	11-3
11.3	Controls and Indicators.	11-3
11.4	Turn-on and Checkout.	11-3
11.5	Remote Monitoring and Control.	11-3
11.6	Troubleshooting.....	11-4
APPENDIX A SECOND LEVEL SUPPORT AND WARRANTY SERVICE		A-1
A.1	Second-Level Engineering Support Contact Information.	A-1
A.2	Warranty Service Procedure.	A-1
APPENDIX B GLOSSARY AND ABBREVIATIONS.....		B-1
APPENDIX C ANTENNA RADIATION LIMITS		C-1
C.1	Health and Safety	C-1
APPENDIX D STRUCTURED HMI MENUS (MDT).....		D-1
D.1	Introduction.....	D-1
D.2	Main Menu.....	D-1
D.3	Status Menu.	D-1
D.4	Settings Menu.	D-2
D.5	Information Menu.	D-7
APPENDIX E STRUCTURED HMI MENUS (TFPC).....		E-1
E.1	Introduction.....	E-1
E.2	Status Menu.	E-1
E.3	Settings Menu.	E-2
E.4	Information Menu.	E-3
APPENDIX F INTERFACE CONTROL DOCUMENT (ICD).....		F-1

This page is intentionally blank.

LIST OF ILLUSTRATIONS

Figure 1-1.	Common Solution across the two Transmitter Variants.....	1-5
Figure 1-2.	Common Rack-mount Solution across the two Transmitter Variants (T6-TV-F, T6-TU-F).....	1-7
Figure 1-3.	Transmitter with no Filter.....	1-8
Figure 1-4.	Transmitter using Internal Filter.....	1-8
Figure 1-5.	Transmitter using External Filter.....	1-8
Figure 1-6.	Main/Standby Transmitters (no filters)	1-9
Figure 1-7.	Main/Standby Transmitters (internal filters)	1-9
Figure 1-8.	Main/Standby Transmitters (external filters).....	1-9
Figure 1-9.	Transceiver Configuration (no Filter).....	1-10
Figure 1-10.	Transceiver Configuration (Internal Filter)	1-10
Figure 1-11.	Transceiver Configuration (External Filter)	1-10
Figure 1-12.	Radio Connected to two VCCS.....	1-11
Figure 1-13.	Radio Connected to a VCCS via Ethernet Switches.....	1-11
Figure 1-14.	Nameplate Label.....	1-12
Figure 1-15.	Warranty label	1-12
Figure 1-16.	Manufacturer's label.....	1-12
Figure 1-17.	Product safety label	1-13
Figure 2-1.	T6-TU-F Technical Block Schematic.....	2-2
Figure 2-2.	T6-TV-F Technical Block Schematic.....	2-3
Figure 2-3.	Transmitter Front Panel Control.....	2-5
Figure 2-4.	Transmitters in Main/Standby Configuration.....	2-6
Figure 2-5.	Transmitter and Receiver in Transceiver Configuration	2-7
Figure 3-1.	Transmitter Interface Block Diagram.....	3-1
Figure 3-2.	Front Interfaces of T6F Transmitter	3-2
Figure 3-3.	Rear Interfaces of the T6-TV-F Transmitter	3-2
Figure 3-4.	Rear Interfaces of the T6-TU-F Transmitter	3-2
Figure 3-5.	Pin Configuration of the REM INT 15-pin DIN socket on the FRI	3-4
Figure 3-6.	Front View of T6F Transmitter	3-9
Figure 3-7.	Front Panel Display	3-10
Figure 3-8.	Filter Tuning Port Location.....	3-11
Figure 3-9.	Rear Panel Connectors of T6-TV-F Transmitter	3-12
Figure 3-10.	Example of the Home Screen	3-13
Figure 3-11.	Loudspeaker Volume Screen.....	3-13
Figure 3-12.	Settings Screen	3-13
Figure 3-13.	Settings List Screen	3-14
Figure 3-14.	Channel Display with Cursor	3-14
Figure 3-15.	Channel Display with repositioned Cursor.....	3-14
Figure 3-16.	Channel Display after Editing	3-14
Figure 3-17.	Status Screen	3-18
Figure 3-18.	Status List Screen	3-18
Figure 3-19.	Information Screen.....	3-20
Figure 3-20.	Information List Screen.....	3-20
Figure 3-21.	HMI Lock Active Screen.....	3-22

Figure 3-22.	Customised HMI Lock Active Screen.....	3-22
Figure 3-23.	LAN IP Address Display.....	3-23
Figure 3-24.	LAN Address Editing Screen – First Octet	3-23
Figure 3-25.	LAN Address Editing Screen – Second Octet.....	3-23
Figure 3-26.	Factory Reset “Initialising” Screen	3-24
Figure 3-27.	Factory Reset “Please Wait...” Screen.....	3-24
Figure 3-28.	Factory Reset “Reset all settings?” Screen.....	3-25
Figure 6-1.	Transmitter Frequency Test Setup.....	6-1
Figure 6-2.	RF Output Power Test Setup.....	6-2
Figure 6-3.	Modulation Level Test Setup	6-3
Figure 6-4.	Sensitivity Measurement for Filter Tuning	6-4
Figure 6-5.	Tuning Port Location	6-6
Figure 7-1.	Reference Frequency Test Setup.....	7-1
Figure 7-2.	Settings Screen	7-1
Figure 7-3.	Reference Oscillator Adjustment Screen.....	7-2
Figure 7-4.	Reference Oscillator Resultant Screen	7-2
Figure 7-5.	Fuse Locations on Rear of T6F Transmitter.....	7-3
Figure 7-6.	Exploded View of AC Connector Showing Fuse Drawer	7-3
Figure 7-7.	DC fuse mounting	7-4
Figure 9-1.	Radio contents inside the shipping package.....	9-1
Figure 9-2.	MDT Settings/Radio Screen Image.....	9-5
Figure 9-3.	MDT Information/System Display.....	9-6
Figure 10-1.	LAN 1 and LAN 2 Ports	10-1
Figure 10-2.	LAN 3 (MDT) Port	10-2
Figure 10-3.	Web Server Authentication Screen	10-3
Figure 10-4.	Main Web Server Screen.....	10-4
Figure 10-5.	Settings Screen Example.....	10-4
Figure 10-6.	Updated Setting.....	10-5
Figure 10-7.	Current Status Screen	10-7
Figure 10-8.	Firmware Details Screen	10-9
Figure 10-9.	Details of New Firmware	10-9
Figure 10-10.	Upload Progress Screen	10-10
Figure 10-11.	Install Progress Display.....	10-10
Figure 10-12.	Upload Complete Message.....	10-10
Figure 10-13.	Firmware Install Request.....	10-11
Figure 10-14.	Stored Firmware Details.....	10-11
Figure 10-15.	BIT Escalate Screen Image	10-12
Figure 10-16.	BIT escalation Confirmation	10-12
Figure 10-17.	Clear BIT History Message	10-12
Figure 10-18.	Preset Update Confirmation	10-13
Figure 10-19.	HMI (Display) Lock Confirmation	10-13
Figure 10-20.	LAN Port Disable Functions Confirmation.....	10-14
Figure 10-21.	Import Radio Settings Progress Screen	10-14
Figure 10-22.	Import Radio Settings Completion Screen	10-14
Figure 10-23.	User Text Setting Screen.....	10-15

Figure 10-24.	Change Password Dialog Box	10-15
Figure 10-25.	Password Update Confirmation.....	10-15
Figure 10-26.	Reboot Warning Screen.....	10-17
Figure 10-27.	MDT RF Output Power Settings	10-19
Figure 10-28.	Audio Line In Level	10-19
Figure 10-29.	Modulation Depth Setting	10-20
Figure 11-1.	MDT Information/System Display	11-3

This page is intentionally blank.

LIST OF TABLES

Table 1-1.	T6F Transmitter specifications	1-14
Table 1-2.	Input Power Requirements	1-14
Table 1-3.	T6F Transmitter Environmental Specifications.....	1-15
Table 1-4.	T6F Transmitter Vibration Specifications	1-15
Table 1-5.	VHF Transmitter Supplied Equipment.....	1-16
Table 1-6.	UHF Transmitter Supplied Equipment.....	1-16
Table 1-7.	DC Supply Cable Colorings	1-16
Table 1-8.	Required Tools and Test Equipment	1-17
Table 2-1.	VHF Transmitter Filter Electrical Specifications	2-8
Table 2-2.	VHF Transmitter Filter Mechanical Specifications.....	2-8
Table 2-3.	VHF Transmitter Filter Environmental Specifications.....	2-8
Table 2-4.	UHF Transmitter Filter Electrical Specifications	2-9
Table 2-5.	UHF Transmitter Filter Mechanical Specifications.....	2-9
Table 2-6.	UHF Transmitter Filter Environmental Specifications.....	2-9
Table 3-1.	Interface List (T6-TU-F and T6-TV-F).....	3-3
Table 3-2.	Transmitter REM INT Connector.....	3-4
Table 3-3.	FRI PTT Keying Voltage Ranges.....	3-5
Table 3-4.	FRI Operational Status	3-5
Table 3-5.	LAN 1/2 Connector Pin-out	3-6
Table 3-6.	Input Power Requirements	3-6
Table 3-7.	AC Power Cable Locking Mechanisms.....	3-7
Table 3-8.	MIC / HEADSET Socket Configuration	3-7
Table 3-9.	LAN 3 Connector Pin-out	3-8
Table 3-10.	Front Panel Controls and Indicators	3-9
Table 3-11.	Soft Function Keys.....	3-10
Table 3-12.	Status Indicator Indications	3-11
Table 3-13.	Radio Settings and Explanations	3-15
Table 3-14.	ICAO VHF Channels and Spacings Relationship to Frequency	3-17
Table 3-15.	ICAO UHF Channels and Spacings Relationship to Frequency	3-17
Table 3-16.	Status List.....	3-19
Table 3-17.	BIT System Service Levels	3-20
Table 3-18.	Information List.....	3-21
Table 3-19.	Status Menu Soft Key Icons	3-22
Table 4-1.	Standards and Tolerances	4-1
Table 5-1.	Transmitter Performance Checks	5-1
Table 6-1.	VHF Cavity Filter Tuning Preset Chart.....	6-5
Table 6-2.	VHF Incremental Frequency Adjustment.....	6-5
Table 6-3.	UHF Cavity Filter Tuning Preset Chart.....	6-5
Table 6-4.	UHF Incremental Frequency Adjustment.....	6-6
Table 7-1.	Power Failure (Alarm) Messages	7-3
Table 8-1.	Transmitter Parts List	8-1
Table 10-1.	MDT Settings Menu	10-6
Table 10-2.	MDT Status Menu	10-7

Table 10-3.	MDT Information Menu.....	10-8
Table 10-4.	BIT Status Screen.....	10-8
Table 11-1.	Status (Alarm) Messages.....	11-1
Table 11-2.	Radio Health Messages	11-2
Table 11-3.	Troubleshooting Guide.....	11-4
Table C-1.	RF Power Density Limits	C-1
Table D-1.	MDT Main Menu	D-1
Table D-2.	MDT Status Menu	D-1
Table D-3.	MDT Settings Menu.....	D-2
Table D-4.	MDT Information Menu.....	D-7
Table E-1.	TFPC Status Menu	E-1
Table E-2.	TFPC Settings Menu	E-2
Table E-3.	TFPC Information Menu	E-3

SECTION 1 GENERAL INFORMATION AND REQUIREMENTS

Health and Safety

Disposal

	This equipment is covered by the European Directive 2012/19/EU (WEEE). Items must not be disposed of in domestic waste. Disposal must be made using designated collection facilities appointed by the government or the local authorities in your area. RoHS Directive 2011/65/EU compliant including amendment 2015/863.
---	--

Warnings

A warning is used to show possible danger to personnel. In this documentation, warnings are shown as in the following example:

WARNING

Dangerous voltage: You must be suitably qualified to connect a mains supply to the equipment. You must be careful of high radio frequency (RF) voltages on the ANTENNA connector on the rear of the radio. This is indicated by the RF voltage warning symbol ()
This applies to transmitters only.

Antenna radiation: The transmit antenna must be installed such that the resultant radiated field strength is below national limits, see Appendix C for limits and examples.
The safe distance must be calculated for each installation.

Cautions

A caution is used to show possible danger to the equipment. In this documentation, cautions are shown in the following format:

CAUTION: An operating procedure, practice, etc., which if not strictly observed, could result in damage to, or destruction of, equipment.

Notes

A note is used provide informative guidance to a particular item of text, and is shown in the following format:

NOTE: An operating procedure, condition, etc., the nature of which requires that it be highlighted.

FCC Statement

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.

Warning: Changes or modifications made to equipment without the approval of Indra Air Traffic Inc. or parties authorized by Indra Air Traffic Inc. could invalidate the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1.1 INTRODUCTION.

This section defines the purpose, scope, and applicability of the Technical Instruction Book (TIB).

1.1.1 Purpose.

The purpose of the TIB is to:

- Describe the Indra Air Traffic Inc. (Indra) T6-TV-F and T6-TU-F radio transmitters (referred to as T6F Transmitters) in sufficient detail to allow installation and maintenance staff to understand the functions and features of the transmitters.
- Provide detailed installation instructions.
- Provide detailed operational procedures.
- Provide detailed maintenance procedures.
- Provide trouble shooting guidelines.

1.1.2 Scope.

- SECTION 1 - General Information and Requirements: provides a brief description of the T6F transmitters and describes the physical and functional characteristics.
- SECTION 2 - Technical Description: provides simplified theory of operation of the T6F transmitters supported by functional block diagrams.
- SECTION 3 - Operation: describes the controls, indicators, and connectors, and provides operating instructions for the T6F transmitters.
- SECTION 4 - Standards and Tolerances: specifies the required characteristics of the important parameters of the T6F transmitters.
- SECTION 5 - Periodic Maintenance: states the required preventative maintenance of the T6F transmitters.
- SECTION 6 - Maintenance Procedures: details the procedures to meet the preventative maintenance requirements of the T6F transmitters.
- SECTION 7 - Corrective Maintenance: Details the procedures needed to address fault conditions within the radio.
- SECTION 8 - Parts List: lists the details of the component parts of the delivered T6F transmitters.
- SECTION 9 - Installation, Integration, and Checkout: details the procedure to install the radio and set it in operation.
- SECTION 10 - Computer Software: documents the Management Information Base (MIB), Interface Control Document (ICD), and Maintenance Data Terminal (MDT) access to the web server functionality within the T6F transmitters.
- SECTION 11 - Trouble Shooting Support Data: provides a step-by-step guide to the cause and rectification of possible symptoms non-operation of the T6F transmitters.
- Appendix A - Second Level Support and Warranty Service: Guide to offsite assistance and warranty repair.
- Appendix B - Glossary and Abbreviations: lists abbreviations and definitions of terms used within the TIB.
- Appendix C - Antenna Radiation Limits: details safe operating environments near antennas, and how to calculate them.
- Appendix D - Structured HMI Menus (MDT): details the settings available via the web interface for the T6F transmitters.
- Appendix E - Structured HMI Menus (TFPC): Complete list of TFPC menus and options.
- Appendix F - Interface Control Document (ICD): Reference to attached ICD.

1.2 EQUIPMENT DESCRIPTION.

Each radio is a single Line Replaceable Unit (LRU).

Each transmitter consists of the following sub-elements:

- Indra T6 Series 3 Radio (referred to as T6 radio) transmitter (VHF or UHF).
- RF Cavity Filter (VHF or UHF).
- FAA Radio Interface (FRI) module.
- Common radio chassis and interconnecting cables.

T6F radios operate using the current 25 kHz channel-spacing assignment in their respective radio frequency (RF) bands. Each radio band supports signal-in-space communications using a double sideband-amplitude modulation (DSB-AM) waveform. The VHF radios also have frequency tuning capabilities to operate on 8.33 kHz channel-spacing assignments in accordance with International Civil Aviation Organization (ICAO) defined standards. Likewise, the UHF radios have frequency tuning capabilities to operate on 12.5 kHz channel-spacing assignments.

T6F radios are functionally compatible with the existing National Airspace System (NAS) equipment, equipped with an analog audio interface as well as two ED-137C compliant Internet Protocol (IP)-based audio interfaces supporting NAS subsystems and components.

1.2.1 Overview.

The FAA T6F transmitter is an analog and IP, voice, and data radio, with the flexibility for any ATC scenario.

The T6F transmitter provides:

- VHF frequency range of 112.000 MHz to 150.000 MHz.
- UHF frequency range of 225.000 MHz to 399.975 MHz.
- Software defined analog and digital waveform options.
- A choice of audio codecs for Voice over Internet Protocol (VoIP) operation; G.711 and G.729.

The T6F transmitter features:

- Low power consumption.
- Extended service interval and service lifetime.
- No materials specified in the Restriction of Hazardous Substances (RoHS 2).
- Flexibility for IP operation on any network through IPv4 and IPv6 addressing.
- VoIP operation in accordance with all editions of ED-137.
- Flexibility for VoIP operation through G.711 and G.729 audio codecs.
- Monitoring and control in accordance with ED-137.
- Comprehensive monitoring and control of radio features through Simple Network Management Protocol (SNMP).
- Accurate timestamps on built-in-test (BIT) status messages through Network Time Protocol (NTP) functionality.
- Hypertext Transfer Protocol (HTTP) web interface for configuration.

Figure 1-1 below illustrates the radio's dimensions and shows the location of the major components within the 19-inch chassis.

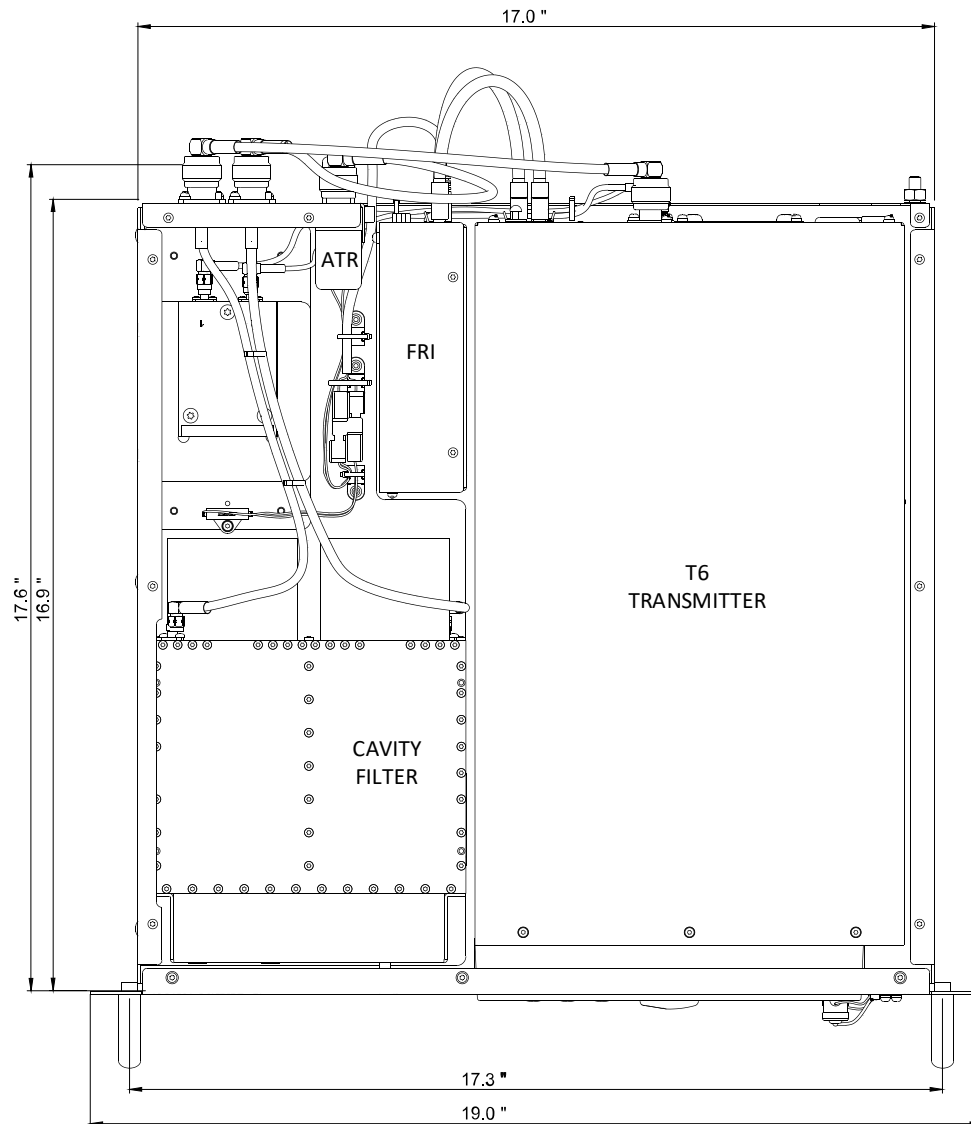


Figure 1-1. Common Solution across the two Ttransmitter Variants

NOTE: 1. In the upper diagram top cover is removed for illustration purpose.
2. The height of the radio is 3.5"/2U

Rack/Mount Description

As previously detailed, the FAA radio design is a single LRU and therefore does not need special rack mounting shelves or kits to mount individual modules. As illustrated in Figure 1-2 below, both the transmitter types (T6-TV-F, T6-TU-F) have the same standard 19-inch rack mount arrangement.

An individual radio sits on a pair of L-shaped brackets mounted in the rack.

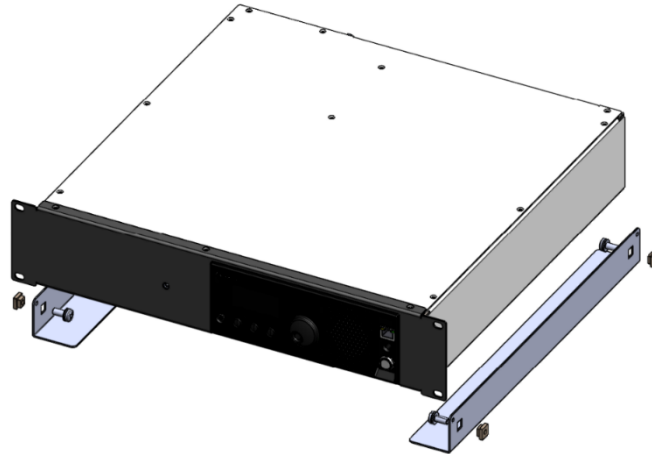


Figure 1-2. Common Rack-mount Solution across the two Transmitter Variants (T6-TV-F, T6-TU-F)

1.3 RELATIONSHIP OF UNITS.

WARNING

Dangerous voltage: You must be careful of high radio frequency (RF) voltages on the ANTENNA connector on the rear of the radio. This is indicated by the RF voltage warning symbol (⚡). This applies to the transmitters in the following configurations. Ensure the antenna, or filter and antenna, are connected correctly before applying PTT.

A transmitter can be used as a standalone transmitter: no filter, the internal filter, or an external filter. These configurations are illustrated in subparagraph 1.3.1 below.

A pair of transmitters can be used in a main/standby configuration: no filter, internal filters, external filters. These configurations are illustrated in subparagraph 1.3.2 below.

A transmitter and receiver can be connected in a transceiver configuration: no filter, internal filters, external filters. These three configurations are illustrated in subparagraph 1.3.3 below.

1.3.1 Standalone Configurations.

1.3.1.1 Transmitter with no Filter.

The ‘no filter’ configuration is shown in Figure 1-3 below.

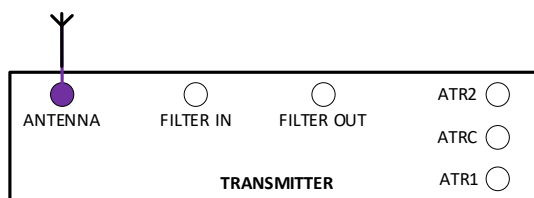


Figure 1-3. Transmitter with no Filter

1.3.1.2 Transmitter using Internal Filter.

The ‘internal filter’ configuration is shown in Figure 1-4 below.

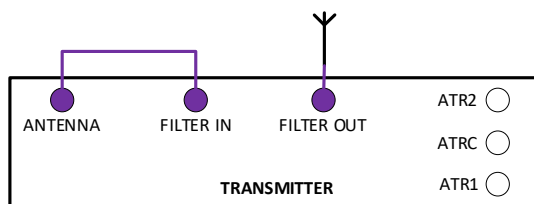


Figure 1-4. Transmitter using Internal Filter

1.3.1.3 Transmitter using External Filter.

The ‘external filter’ configuration is shown in Figure 1-5 below.

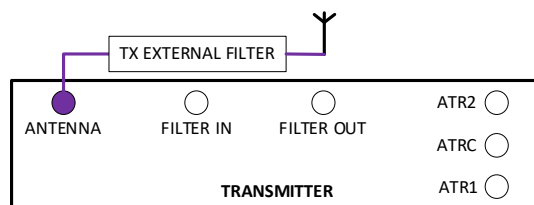


Figure 1-5. Transmitter using External Filter

1.3.2 Transmitters in Main/Standby Configuration

1.3.2.1 Transmitters in Main/Standby Configuration (no filters)

The ‘no filter’ configuration is shown in Figure 1-6 below.

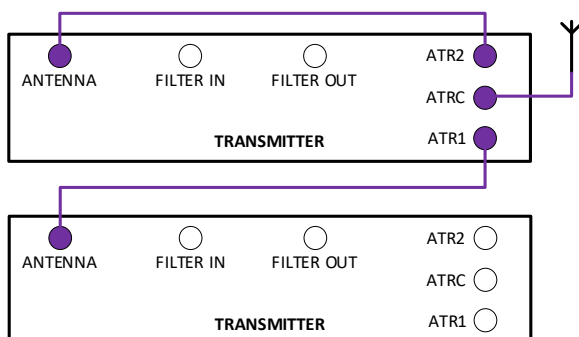


Figure 1-6. Main/Standby Transmitters (no filters)

1.3.2.2 Transmitters in Main/Standby Configuration (internal filters)

The ‘internal filter’ configuration is shown in Figure 1-7 below.

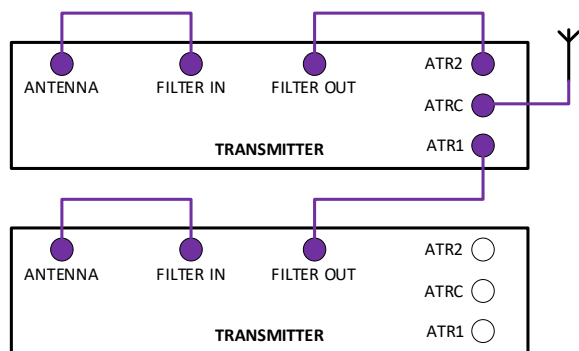


Figure 1-7. Main/Standby Transmitters (internal filters)

1.3.2.3 Transmitters in Main/Standby Configuration (external filters)

The ‘external filter’ configuration is shown in Figure 1-8 below.

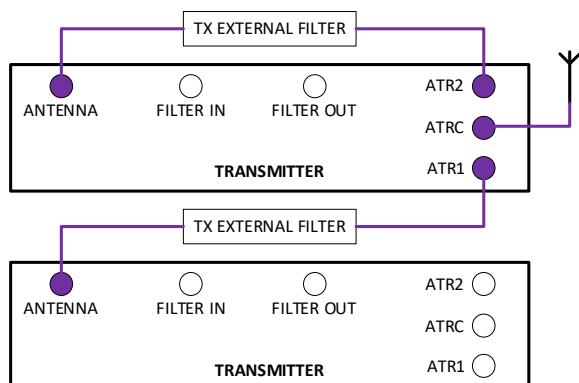


Figure 1-8. Main/Standby Transmitters (external filters)

1.3.3 Transceiver Configurations.

1.3.3.1 Transmitter and Receiver in Transceiver Configuration (no filters).

Figure 1-9 below shows a transmitter and receiver in transceiver configuration utilizing no filter.

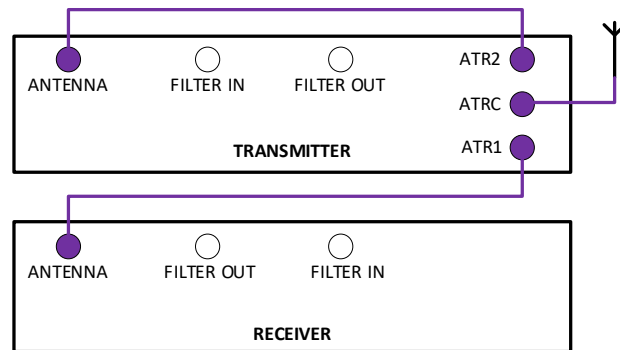


Figure 1-9. Transceiver Configuration (no Filter)

1.3.3.2 Transmitter and Receiver in Transceiver Configuration (with internal filters).

Figure 1-10 below shows a transmitter and receiver in transceiver configuration utilizing the internal filter.

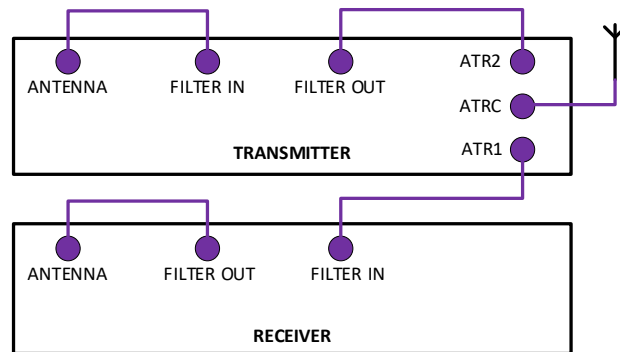


Figure 1-10. Transceiver Configuration (Internal Filter)

1.3.3.3 Transmitter and Receiver in Transceiver Configuration (with external filters).

Figure 1-11 below shows a transmitter and receiver in transceiver configuration utilizing an external filter.

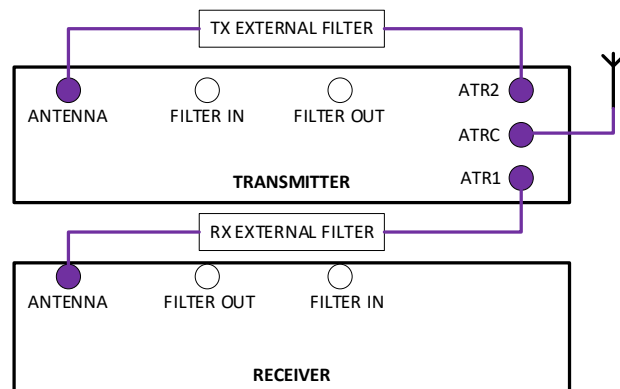


Figure 1-11. Transceiver Configuration (External Filter)

1.3.4 VoIP Connectivity.

There are two ED-137 Ethernet connection options LAN 1 and LAN 2, on the rear of the radio, as shown in Figure 10-1 later in this document.

Both LAN ports are configurable for VoIP, SNMP or a combination.

They are also configurable for both IPv4 and IPv6 networks.

Figure 1-12 below shows how a radio can be connected to two digital Voice Communications Control Systems (VCCS).

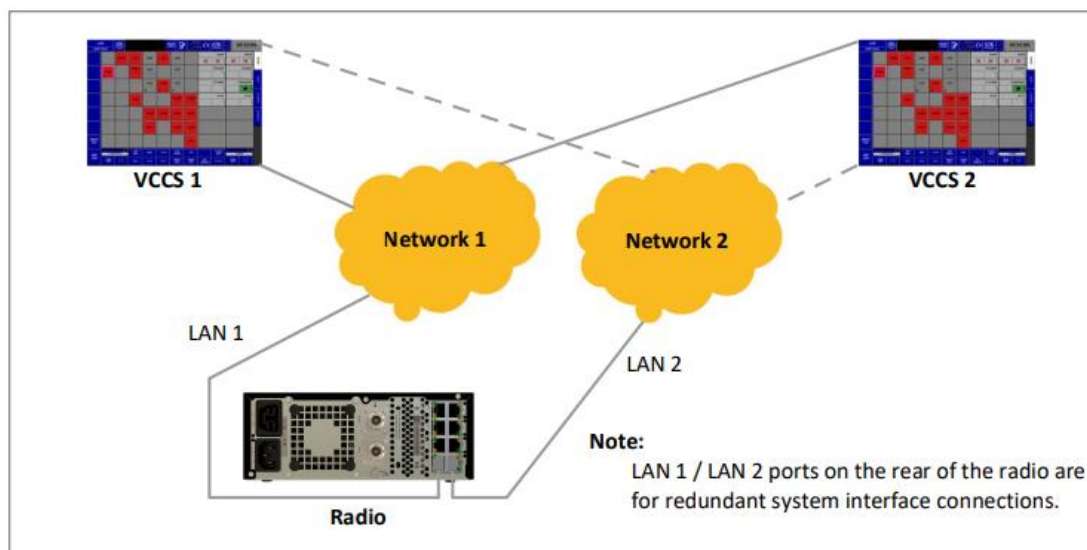


Figure 1-12. Radio Connected to two VCCS

Figure 1-13 below shows a radio connected to a VCCS via Ethernet switches.

If the LAN 1 or LAN 2 connection or an Ethernet switch fails, the link to the VCCS is maintained.

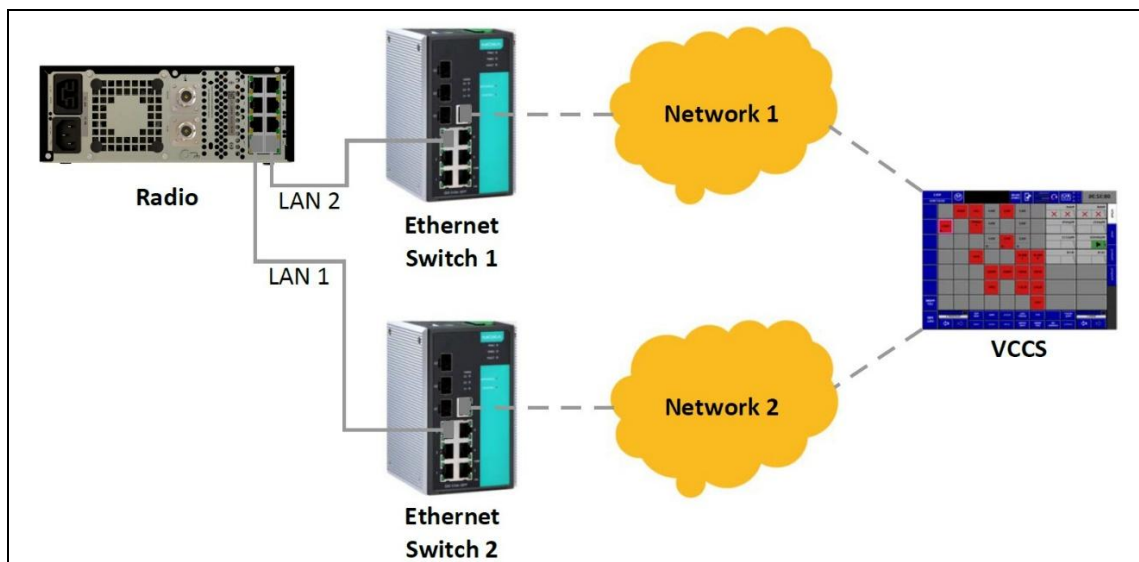


Figure 1-13. Radio Connected to a VCCS via Ethernet Switches

1.4 EQUIPMENT SPECIFICATION DATA.

1.4.1 Labels.

1.4.1.1 Nameplate Data.

An example of the transmitter nameplate labels is shown in Figure 1-14 below. These adhere to FAA standard, FAA-G-2100J subparagraph 3.3.5.5.

The serial number label includes a 2-dimensional data matrix code and is on the front of the radio.



Figure 1-14. Nameplate Label

1.4.1.2 Warranty Label.

A warranty label - example shown in Figure 1-15 below - is located under the nameplate label on the front of the radio.



Figure 1-15. Warranty label

1.4.1.3 Manufacturer's Label.

The manufacturer's label is on the bottom of the radio; example shown in Figure 1-16 below.



Figure 1-16. Manufacturer's label

1.4.1.4 Product Safety Label.

The product safety label is on the top of the radio; example shown in Figure 1-17 below.



Figure 1-17. Product safety label

1.4.2 Functional Characteristics.

1.4.2.1 Park Air T6F Transmitter specifications.

Table 1-1. T6F Transmitter specifications

Parameter	Value	
Operating frequencies	VHF: 112.000 MHz to 150.000 MHz UHF: 225.000 MHz to 399.975 MHz	
Frequency Stability	±1 ppm	
Dimensions:	Unpacked:	
Height	2U, 3.5 inches (89 mm)	Packed for shipping:
Width	19.0 inches (482 mm); full rack	8.3 inches (210 mm)
Depth	19.0 inches (482 mm) including connectors and cables	25.6 inches (650 mm)
	20.5 inches (522 mm) including connectors, cables, and handles	22.8 inches (580 mm)
Weight	UHF: 31.0 pounds (14.0 kg) VHF: 34.4 pounds (15.6 kg)	34.2 pounds (15.5 kg) 37.6 pounds (17.1 kg)
RF Input Impedance	50-Ω nominal	
Waveform	VHF: A3E DSB-AM Voice with 25 kHz and 8.33 kHz channel spacings. UHF: A3E DSB-AM Voice with 25 kHz channel spacings	
Audio Response (25 kHz)	+0.5/-3.5 dB	300 Hz to 3.4 kHz
	-30 dB ±5 dB	@ 100 Hz
	-35 dB ±5 dB	@ 5 kHz
Audio Response (8.33 kHz)	+0.5/-3.5 dB	350 Hz to 2.5 kHz
	-20 dB ±5 dB	@ 100 Hz
	-35 dB ±5 dB	@ 3.2 kHz
Audio Input Level	-30 dBm to +10 dBm	
Audio Input Source Impedance	Balanced 600 ohm (±10 %)	
Modulation Depth	5 % to 95 % (Default 95 %)	
Distortion	<5 % at 95 % modulation	
Maximum RF Output	50 W before filter losses	
Reference Frequency Monitor Output Level	-20 dBm, 50-Ω nominal	

1.4.3 External Power Requirements.

The power input requirements for the radios are detailed in Table 1-2 below.

Table 1-2. Input Power Requirements

Source	Voltage (V)	Connector	Fuse	Current (A)	
				Maximum	Typical
AC	108 – 132 VAC, 57 – 63 Hz	Chassis mounted 3-wire IEC C14 plug	Fuse size 20 mm, 5 A, 10 kA AIC	5.0	2.2
DC	21.6 – 28.8 VDC, negative ground	Chassis mounted Saf-D-Grid plug	Fuse size 0, 20 A, 10 kA AIC	20.0	10.4

Grounding is provided via the ¼”-20 ground lug located near the power inlets.

1.4.4 Environmental Characteristics.

Table 1-3 below lists the environmental specifications for the T6F transmitters.

Table 1-4 lists the vibration specifications.

Table 1-3. T6F Transmitter Environmental Specifications

Environmental Specifications		
Parameter	Operating Conditions	Non-operating Conditions
Temperature Range	-10 - +50 °C (14 - +122 °F)	-40 - +70 °C (-40 - +158 °F)
Relative Humidity (RH)	5 % to 95 %, with the RH above 40 °C (104 °F) being based on the dew point at 40 °C (104 °F)	Up to 100 % including condensation due to temperature change; subject to radio being dried out before operating.
Altitude (maximum)	Operating: 12,000 ft (3,658 m)	Storage: 50,000 ft (15,250 m)

Table 1-4. T6F Transmitter Vibration Specifications

Parameter	Non-Operating Conditions
Vibration	MIL-STD-801H: Method 516.8, Procedure II (Transportation on road) Method 516.6, Procedure VI (Bench Handling) Method 514.8, Procedure I (General Vibration)

1.5 EQUIPMENT AND ACCESSORIES SUPPLIED.

Each transmitter is supplied as follows:

- VHF transmitter: See Table 1-5
- UHF transmitter: See Table 1-6

Table 1-5. VHF Transmitter Supplied Equipment

Qty	Name	Description	Manufacturer Part Number
1	T6-TV-F	FAA VHF Transmitter	24-04635051/2
1	AC supply lead	T6F AC supply lead (3 m) IEC to NEMA	17L03INEMA8S
1	DC supply lead	T6F DC supply lead (10 ft) SAF-D-Grid Unterminated	17L05DCSF10S
2	Coaxial link cable	N-Type (male) terminated coaxial cable (300 mm)	17L11000140
1	D-type connector	15-way D-type connector plug	20M01150101
		15-way D-type connector shell	20M09150101
1	Quick-start leaflet	Hardcopy Quick Start Guide for T6F in English	31-2T6FQSEN
1	Safety leaflet	Hardcopy Safety Leaflet for T6F in English	31-3T6FSLEN

Table 1-6. UHF Transmitter Supplied Equipment

Qty	Name	Description	Manufacturer Part Number
1	T6-TU-F	FAA UHF Transmitter	24-04645052/2
1	AC supply lead	T6F AC supply lead (3 m) IEC to NEMA connector	17L03INEMA8S
1	DC supply lead	T6F DC supply lead (10 ft) SAF-D-Grid Unterminated	17L05DCSF10S
2	Coaxial link cable	N-Type (male) terminated coaxial cable (300 mm)	17L11000140
1	D-type connector	15-way D-type connector plug	20M01150101
		15-way D-type connector shell	20M09150101
1	Quick-start leaflet	Hardcopy Quick Start Guide for T6F in English	31-2T6FQSEN
1	Safety leaflet	Hardcopy Safety Leaflet for T6F in English	31-3T6FSLEN

The DC supply cable supplied with the radio will be coloured with either international cable colours or North American cable colours and should be connected to the DC supply in accordance with the Table 1-7 below.

Table 1-7. DC Supply Cable Colorings

DC Supply Connection	International Cable Colours	North American Cable Colours
DC Positive	Brown	Black
DC Negative	Blue	White
Not Connected	Green / Yellow ⁽¹⁾	Green ⁽¹⁾
⁽¹⁾ Protective Earth Connection is provided to the radio through the AC mains lead.		

1.6 EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following items are not supplied with the radio:

- Equipment rack
- L brackets for radio to rest on in the rack
- Mounting hardware (screws or bolts) to fix the front of the radio to the rack.
- General tools and test equipment

Table 1-8 below lists the general tools and test equipment (T&TE) items that are required at each installation site. These items are not supplied with the transmitters. Equivalent T&TE are acceptable. No special-to-type tools are required.

Table 1-8. Required Tools and Test Equipment

Item Number	Tool or Test Equipment	Description	Manufacturer	Part Number
1	Test Equipment	Communications Service Monitor CMA180, model 1173.2000K18 (or equivalent)	Rohde & Schwarz	CMA-180-FAA-A
2	Test Equipment	Digital Multimeter	Fluke	289
3	Test Equipment	Radio Test Box		
4	Tool	Laptop or Desktop computer (MDT) with web browser, such as Google Chrome, Mozilla Firefox, Microsoft Edge. Minimum operating system: Windows 11.	-	-
5	Tool	4mm hex key (Allen key) - Draper 33529 (or equivalent)	Draper	33529
6	Tool	Wrench for ¼”-20 nut on ground lug - Draper 84646 (or equivalent)	Draper	84646

This page is intentionally blank.

SECTION 2 TECHNICAL DESCRIPTION

2.1 INTRODUCTION.

The block level schematics below indicate the technical aspects of the sub-system elements used in the T6-TU-F and T6-TV-F. Detailed technical descriptions of these elements are included in paragraph 2.3 ‘Detailed Theory of Operation’.

2.1.1 Functional Block Diagrams.

The radios are considered as LRUs and therefore no module servicing/repair or replacement is necessary. Radio health status and fault diagnostics are available via the radio front panel or the Maintenance Data Terminal (MDT) interface, refer to subparagraph 10.2 for further detail of the MDT. To illustrate what modules are used within each radio type and to detail their subsystem elements, Figure 2-1 and Figure 2-2 below show the functional block diagrams of the two transmitter variants.

Technical descriptions of the modules are presented in subparagraph 2.3.1 below.

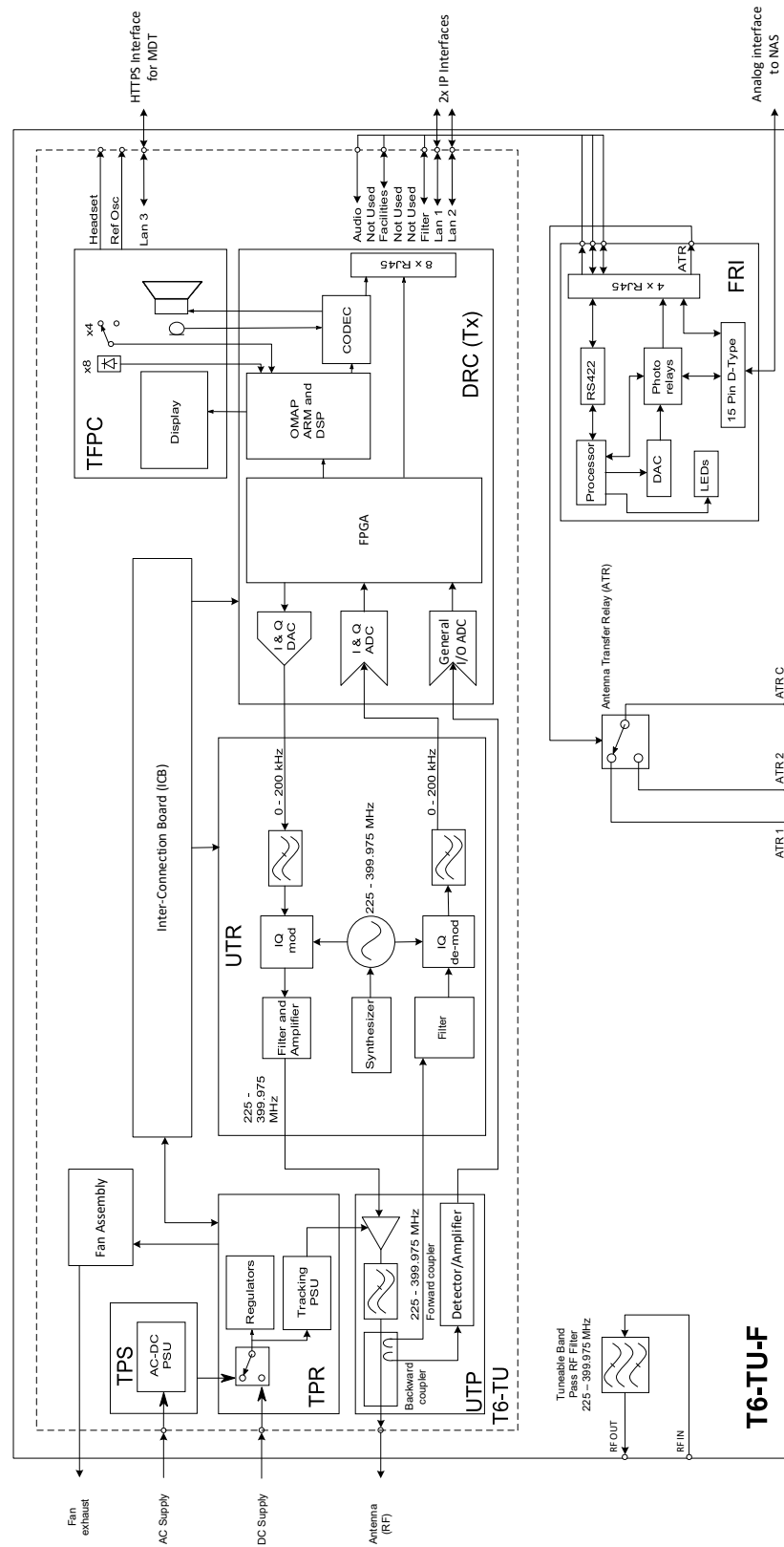


Figure 2-1. T6-TU-F Technical Block Schematic

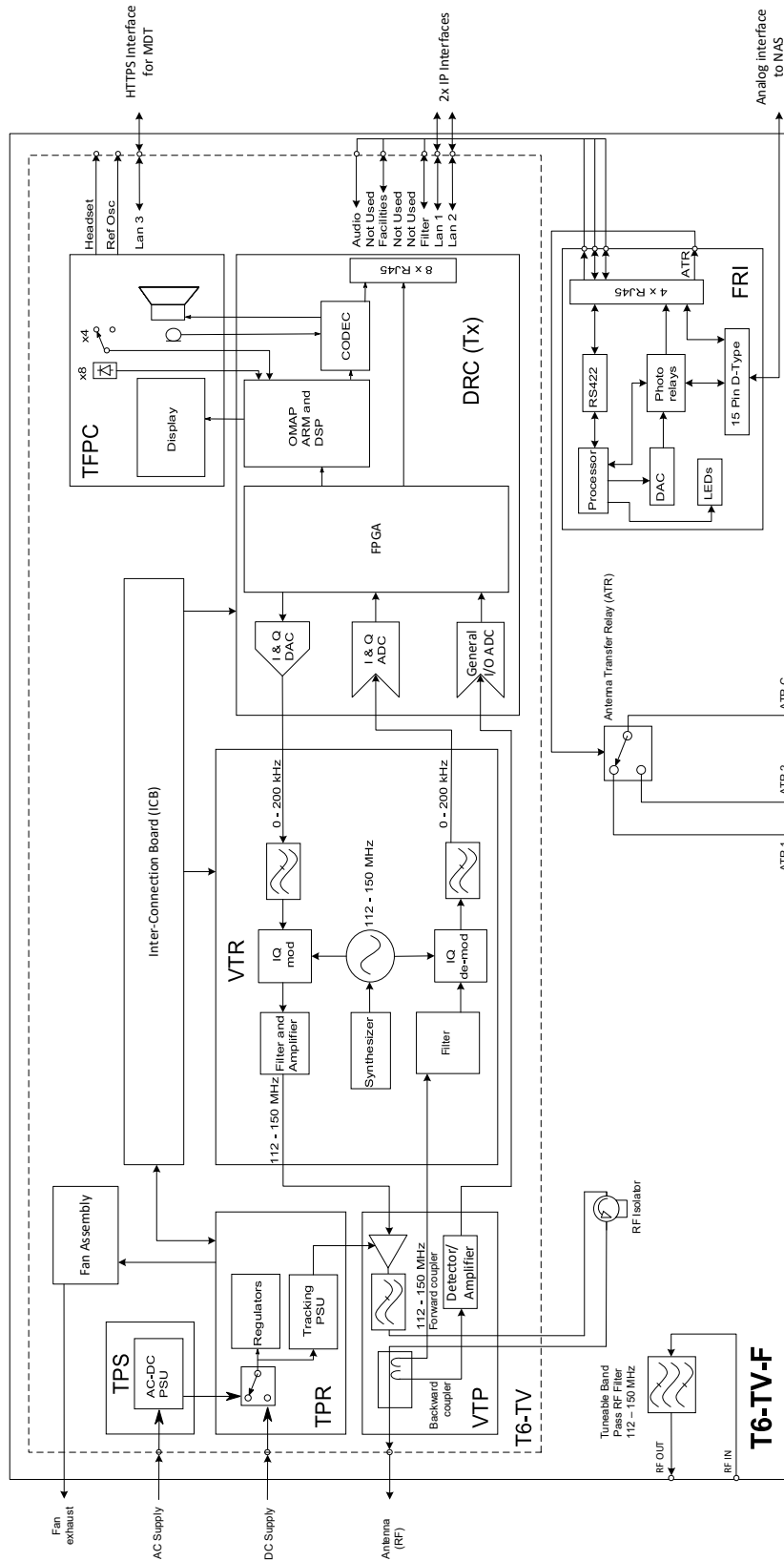


Figure 2-2. T6-TV-F Technical Block Schematic

2.2 SIMPLIFIED THEORY OF OPERATION.

The primary function of the transmitter is to receive an audio signal from an FAA air traffic controller and/or VCCS and transmit the DSB-AM signal to an aircraft.

The transmitter is tuned to a particular ICAO channel to match the requirements of the Facility Transmitting Authorization (FTA).

The transmitter logs its activity and stores the information in an internal database.

The transmitter also monitors its own performance and status, and displays relevant information, for example, alarm conditions, on the screen on the front panel of the radio, and via the Ethernet ports, for example, to the MDT.

A web server is hosted in the radio. The web server is accessed via a network connection to any of the Ethernet ports on the radio.

The web server monitors the radio and allows control of radio settings for installation and operation.

Options and firmware are installed via the web server.

2.3 DETAILED THEORY OF OPERATION.

2.3.1 Sub-system Elements.

The following subparagraphs provide detailed functional descriptions of each sub-system element illustrated in the functional block schematics Figure 2-1 and Figure 2-2 above. These descriptions are provided to give Level 1 and Level 2 technicians an understanding of how each radio functions.

2.3.1.1 Digital Radio Control (DRC).

The DRC controls all aspects of radio operation, including HMI and ground interfaces. It performs all waveform modulation and demodulation.

In the transmit path the DRC (Tx) takes in audio either in analog form (microphone, 4 wire lines) or digital (IP). It applies gain to the line inputs. The DRC selects the appropriate audio source based on PTT, applies the appropriate channel filtering and drives converters at 20 MHz sample rate to provide analog baseband quadrature drive signals to the transmit RF stages, which will amplitude modulate the RF carrier. Quadrature analog feedback signals from the RF stages are digitized at a sample rate of 20 MHz allowing the DRC to close the transmitter linearization feedback loop in the digital domain.

NOTE: When PTT summation mode is selected, audio from any Real-time Transport Protocol (RTP) stream with the same PTT priority level will be summed together to modulate the carrier.

The DRC controls the fan (see subparagraph 2.3.1.4).

2.3.1.2 Transmitter Front Panel Control (TFPC).

The TFPC forms the Human Machine Interface (HMI) for the radio. The HMI may be used for display and set-up of a sub-set of the radio functions, and this is conducted via a display, rotary encoder and three soft function keys. The rotary encoder and three soft keys are context sensitive, and their functions change according to the menu screen displayed. The TFPC has a 3-part Busy indicator to indicate Tx \ Rx activity. The Status indicator surrounds the rotary encoder and indicates equipment state. These are illustrated in Figure 2-3 below.

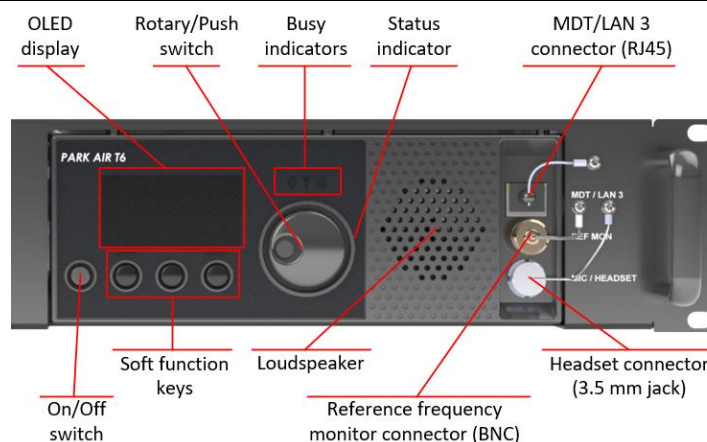


Figure 2-3 Transmitter Front Panel Control

The TFPC sub-assembly is encased in an injection molded plastic fascia which also houses the display and loudspeaker for local audio monitoring.

The TFPC sub-assembly is connected internally via a flexible flat cable (FFC) connection. The TFPC has a Lemo connector for microphone/headset audio, a reference frequency output via a BNC connector, and a RJ45 LAN port for the MDT.

2.3.1.3 Inter-Connection Board (ICB).

The ICB carries all signals between the sub-assemblies. The only exceptions are connected using coax cables:

- VHF PA Drive: RF drive from VHF Transmitter RF (VTR) to VHF Transmitter PA (VTP)
- UHF PA Drive: RF drive from UHF Transmitter RF (UTR) to UHF Transmitter PA (UTP)
- VHF PA Feedback: RF from VHF Transmitter PA (VTP) to VHF Transmitter RF (VTR)
- UHF PA Feedback: RF from UHF Transmitter PA (UTP) to UHF Transmitter RF (UTR)

2.3.1.4 Fan Assembly.

The fan assembly consists of a speed monitored/controlled fan with a speed output and a fan mounting plate. The nominal maximum speed is 9,000 revolutions per minute (RPM).

The fan direction of airflow is air from inside the radio blown out. This airflow cools all parts of the radio. Exhaust air is output from the rear of the equipment. The operator interface is at the front of the equipment.

If the fan fails, the radio presents a visual warning to the front panel display, and a message to the remote monitoring systems via MDTS and SNMP.

The radio has temperature sensors to measure ambient temperature and internal temperature of the radio close to the source of heat generation. If the ambient temperature exceeds 55 °C (131 °F) the radio presents a visual warning to the operator and to the remote monitoring systems. If the internal temperature exceeds 85 °C (185 °F) the radio inhibits itself from transmitting to protect itself and presents a visual warning to the operator and to the remote monitoring systems. The fan is controlled by the DRC.

2.3.1.5 FAA Radio Interface (FRI).

The FRI is a module fitted inside the T6F chassis that provides the analog interface to the FAA NAS. The interface requirements include remotely configurable push to talk (PTT) circuit, voltage and grounding PTT input, PTT confirmation, and audio interfaces.

To satisfy the PTT input level requirements and rather than ‘repurposing’ any existing T6 interface to provide a serial bus capable of setting the required PTT threshold, the T6 radio’s RS422 serial interface remains unchanged except for adding a new message to it to control the PTT setting. The Interface Module has a microprocessor and software to decode the relevant PTT signal level.

The FRI contains field-effect transistor (FET) devices for ATR control and receiver mute input, and metal-oxide-semiconductor field-effect transistor (MOSFET) relays for signaling. There are other components for buffering and to provide LED status indication and power supply regulation for the various circuits. The receive and transmit analog audio interfaces pass straight through the FRI.

The FRI is a simple module but does run dedicated firmware

2.3.1.6 Transmitter Power Regulator (TPR).

The TPR performs the following functions:

- On / Off switching. The on-off switch signal connects to this module, and it generates the inhibit signal to the transmitter power supply (TPS).
- AC / DC switchover. It should select the Mains power supply unit (PSU) output provided that the AC line voltage is sufficient to guarantee correct operation of Mains PSU at its rated load.
- Regulated output voltages of +28 VDC, +15 VDC, -15 VDC and +5 VDC.
- Supply the PA Tracking Supply from a high-efficiency buck / boost converter. The output is adjustable between 15 VDC and 50 VDC to keep the PA working at best efficiency.

2.3.1.7 Transmitter Power Supply (TPS).

The TPS takes power from the AC mains and supplies a 24 VDC to the TPR.

Key features are:

- Peak output power capacity of 300 W (VHF models) or 400 W (UHF models) to supply additional current during modulation peaks.
- Mains input suitable for 108 VAC to 132 VAC operation
- Remote on/off switching.
- Line to signal a fault prior to the 24 VDC failing.

2.3.1.8 Antenna Transfer Relay (ATR).

The ATR is a mechanical RF relay in the transmitter used to connect the Common port (ATRC) to one or other of the two input/output ports (ATR1 and ATR2). All three ports have Type N female connectors.

ATR1 is normally closed (N/C) and ATR2 is normally open (N/O).

The use of the ATR is illustrated in the following conceptual illustrations extracted from FAA-E-37021:

- Main/Standby transmitter configuration – Figure 2-4
- Transmitter and receiver in transceiver configuration - Figure 2-5

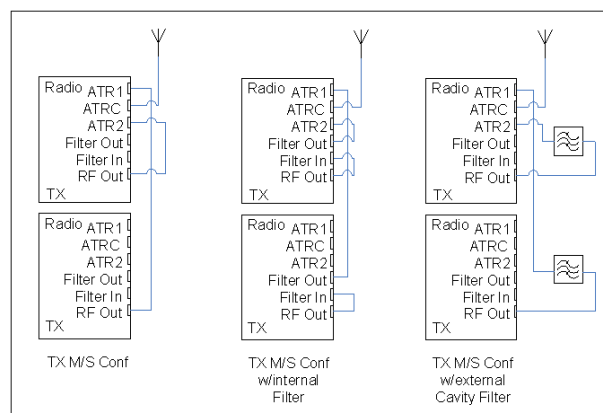


Figure 2-4. Transmitters in Main/Standby Configuration

In the configurations shown in Figure 2-4 above:

- ATRC connects to the TX antenna
- ATR1 inputs to the RF output of the standby transmitter
- ATR2 inputs to the RF output of the main transmitter

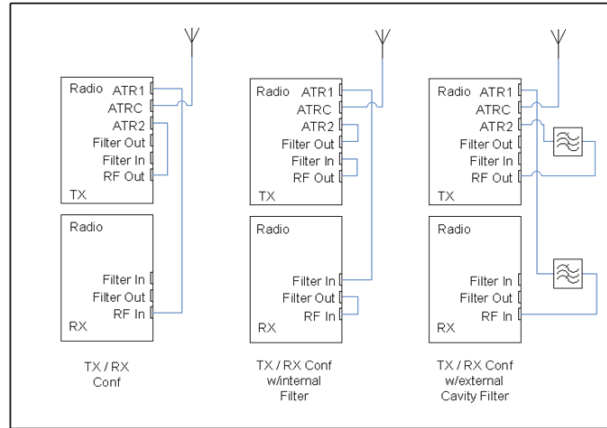


Figure 2-5. Transmitter and Receiver in Transceiver Configuration

In the configurations shown in Figure 2-5 above:

- ATRC connects to the TX/RX antenna
- ATR1 outputs the received RF to the RF input of the receiver
- ATR2 inputs the RF output from the transmitter

2.3.1.9 VHF Transmitter RF (VTR)

The VTR performs the RF processing and amplification between the DRC and the VTP for transmit. The VTR modulates IQ baseband signals from the DRC on to a RF carrier; this is amplified and filtered before passing to the VTP. A feedback signal from the VTP is IQ demodulated, filtered and passed to the DRC.

2.3.1.10 VHF Transmitter Power Amplifier (VTP)

The VTP is the RF power amplifier in the VHF transmitter.

The VTP takes the RF drive signal from the VTR small-signal transmitter sub-assembly and amplifies it to its final output power for transmission. The RF output is filtered to remove carrier harmonics. The VTP also provides a small signal feedback signal to allow closed loop control of the transmitter. The VTP has a fixed gain of 38 +/- 3dB with a maximum peak output power of 200 W, 50 W carrier. The frequency range of the VTP is 112 MHz to 150 MHz.

2.3.1.11 UHF Transmitter RF (UTR)

The UTR performs the RF processing and amplification between the DRC and the UHF transmitter power amplifier (UTP) for transmit. The UTR modulates IQ baseband signals from the DRC on to a RF carrier; this is amplified and filtered before passing to the UTP. A feedback signal from the UTP is In-phase quadrature (IQ) demodulated, filtered and passed to the DRC.

2.3.1.12 UHF Transmitter Power Amplifier (UTP)

The UTP is the RF power amplifier in a UHF transmitter.

The UTP takes the RF drive signal from the UTR small-signal transmitter sub-assembly and amplifies it to its final output power for transmission. The RF output is filtered to remove carrier harmonics. The UTP also provides a small signal feedback signal to allow closed loop control of the transmitter. The UTP has a fixed gain of 38 +/- 3 dB with a maximum peak output power of 200 W, 50 W carrier. The frequency range of the UTP is 225 MHz to 399.975 MHz.

2.3.1.13 VHF Transmitter Tunable RF Filter.

The specifications of the VHF transmitter filter are detailed in Table 2-1 through Table 2-3 below.

Table 2-1. VHF Transmitter Filter Electrical Specifications

Electrical Specifications	
Tunable Frequency Band	108 – 156 MHz
Nominal Impedance	50 Ω
Insertion Loss	≤ 0.8 dB
Selectivity	4.5 dB typical @ ± 800 kHz 17 dB typical @ ± 2 MHz
Return Loss	18 dB minimum
RF Power Handling	100 W CW; 400 W pep
Thermal Stability	≤ 2 kHz per 1 $^{\circ}\text{C}$ change

Table 2-2. VHF Transmitter Filter Mechanical Specifications

Mechanical Specifications	
RF Connectors	SMA female on back (internal to T6-RV-F) Type N female external to T6-TV-F
Dimensions	243 x 170 x 75 mm (9.57 x 6.7 x 2.95 inches)
Weight	2.2 kg (4.85 pounds)
Tuning	Single tuning shaft (Hex key)

Table 2-3. VHF Transmitter Filter Environmental Specifications

Environmental Specifications	
Operating Temperature Range	-20 - +55 $^{\circ}\text{C}$ (-4 - +131 $^{\circ}\text{F}$)
Storage Temperature Range	-40 - +70 $^{\circ}\text{C}$ (-40 - +158 $^{\circ}\text{F}$)
Humidity	5 % to 95 % non-condensing
Altitude	Operating: $\leq 5,000$ m ($\leq 16,000$ ft) Storage: $\leq 15,000$ m ($\leq 49,000$ ft)
Vibration	EN 60068-2-6 EN 60068-2-27 EN 60068-2-64 MIL-STD-801G Method 516.6, Procedure VI Bench Handling

2.3.1.14 UHF Transmitter Tunable Filter.

The specifications of the UHF transmitter filter are detailed in Table 2-4 through Table 2-6 below.

Table 2-4. UHF Transmitter Filter Electrical Specifications

Electrical Specifications	
Tunable Frequency Band	225 – 400 MHz
Nominal Impedance	50 Ω
Insertion Loss	1.0 dB typical 1.1 dB maximum
Selectivity	12 dB typical @ ± 2 MHz 19 dB typical @ ± 3.1 MHz
Return Loss	18 dB minimum
RF Power Handling	100 W CW; 400 W pep
Thermal Stability	≤ 2 kHz per 1 $^{\circ}\text{C}$ change

Table 2-5. UHF Transmitter Filter Mechanical Specifications

Mechanical Specifications	
RF Connectors	SMA female on back (internal to T6-RV-F) Type N female external to T6-TV-F
Dimensions	243 x 170 x 75 mm (9.57 x 6.7 x 2.95 inches)
Weight	2.2 kg (4.85 pounds)
Tuning	Single tuning shaft (Hex key)

Table 2-6. UHF Transmitter Filter Environmental Specifications

Environmental Specifications	
Operating Temperature Range	-20 - +55 $^{\circ}\text{C}$ (-4 - +131 $^{\circ}\text{F}$)
Storage Temperature Range	-40 - +70 $^{\circ}\text{C}$ (-40 - +158 $^{\circ}\text{F}$)
Humidity	5 % to 95 % non-condensing
Altitude	Operating: $\leq 5,000$ m ($\leq 16,000$ ft) Storage: $\leq 15,000$ m ($\leq 49,000$ ft)
Vibration	EN 60068-2-6 EN 60068-2-27 EN 60068-2-64 MIL-STD-801G Method 516.6, Procedure VI Bench Handling

This page is intentionally blank.

SECTION 3 OPERATION

3.1 INTRODUCTION.

This paragraph describes the layout and functions of the radio interfaces.

3.1.1 Interface Descriptions.

NEXCOM V3 transmitters have the following interfaces:

- Alternating Current (AC) input power receptacle, 3-conductor for 120 VAC, 60 Hz nominal supply
- Direct Current (DC) input power receptacle, 2-conductor for 24 VDC nominal supply
- Remote radio interface (FRI) connector for audio and signal specific applications
- Maintenance Data Terminal (MDT) interface
- Remote/Local Internet Protocol (IP) interfaces
- Front panel local microphone/headset Lemo connector
- Radio frequency (RF) input type N connector interface
- RF cavity filter interfaces
- RF antenna transfer relay (ATR) interfaces
- Reference Frequency Monitor connector

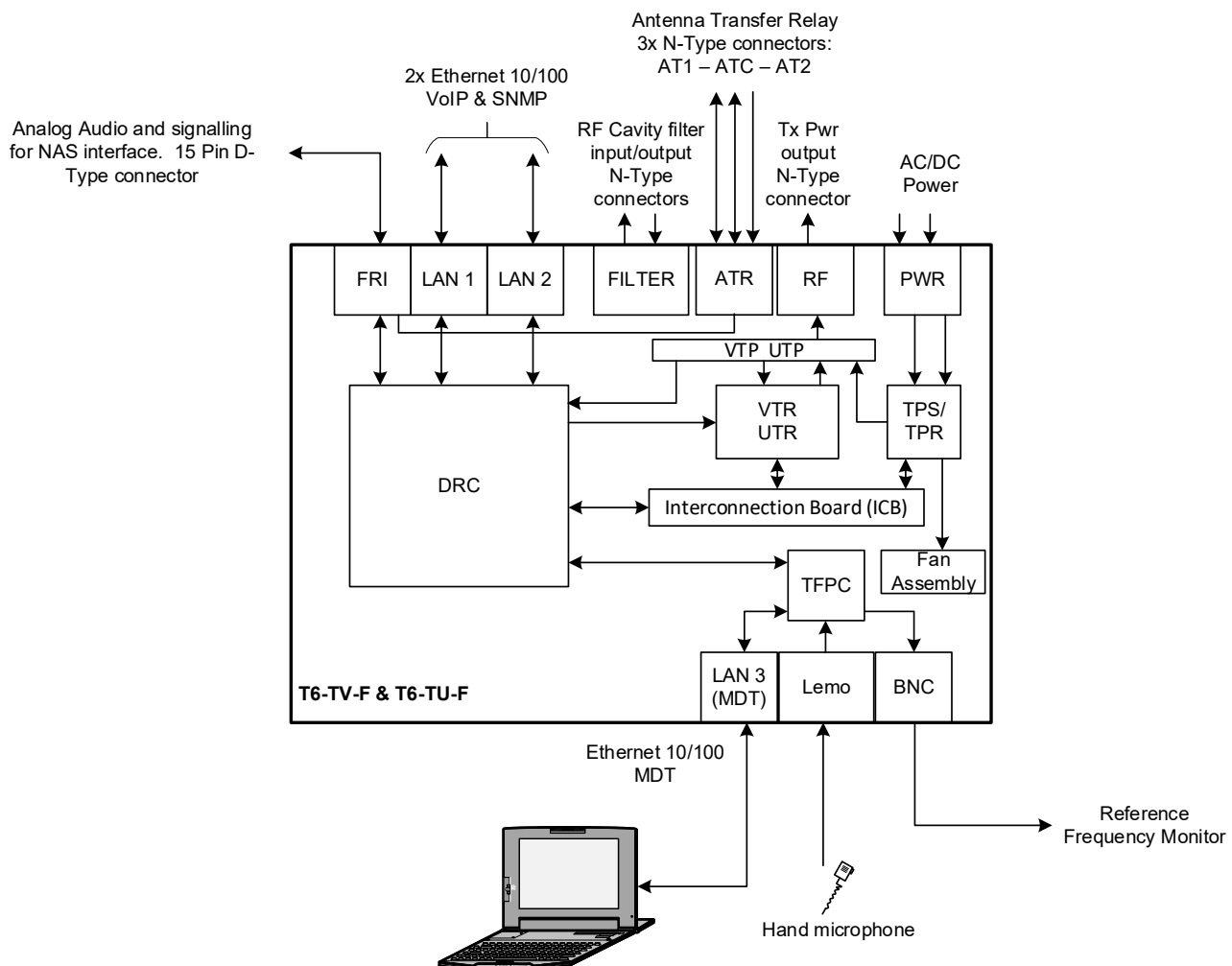


Figure 3-1. Transmitter Interface Block Diagram

The physical locations of the interfaces depicted in Figure 3-1 above are shown in Figure 3-2, Figure 3-3, and Figure 3-4 below.

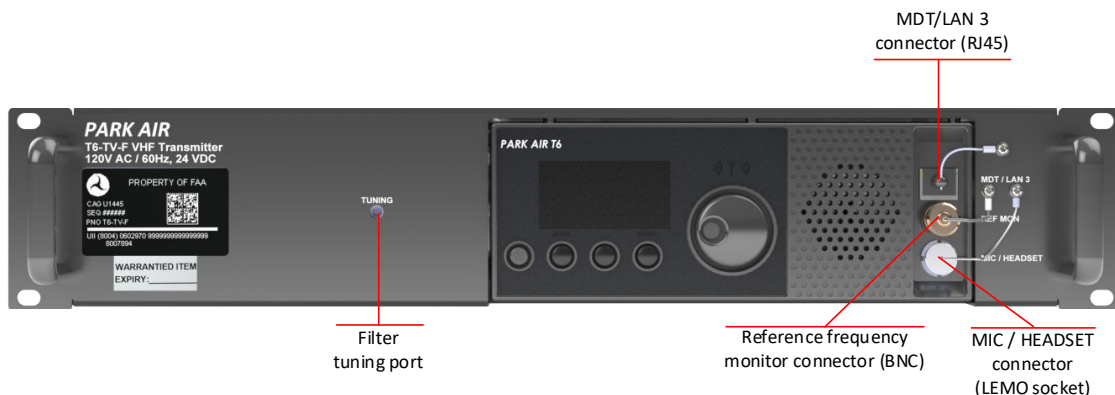


Figure 3-2. Front Interfaces of T6F Transmitter

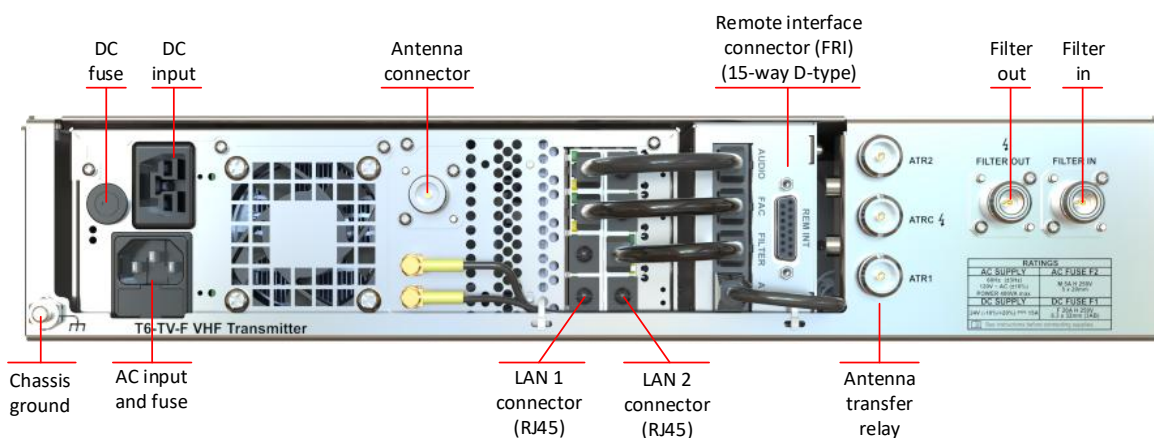


Figure 3-3. Rear Interfaces of the T6-TV-F Transmitter

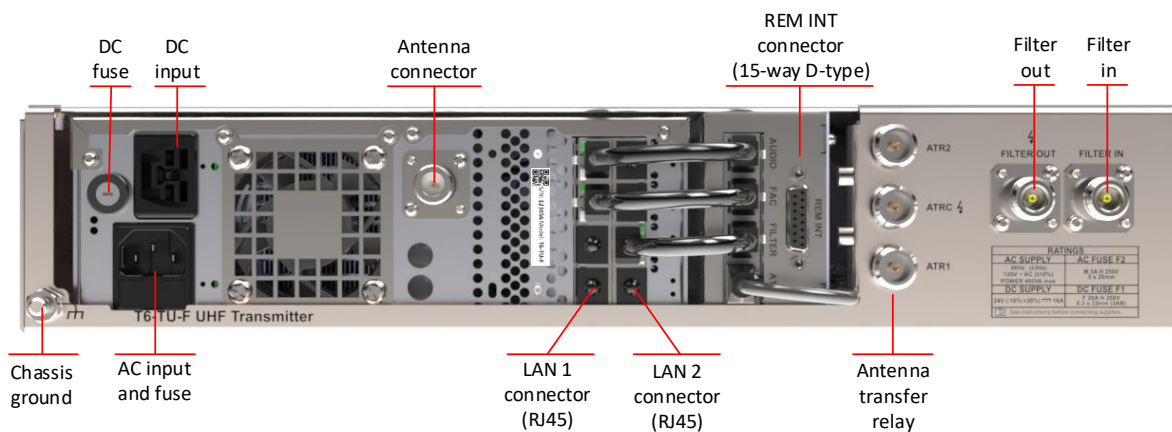


Figure 3-4. Rear Interfaces of the T6-TU-F Transmitter

CAUTION: The three RJ45 jumper leads shown in the image above are ‘internal’ to the T6F radio and should not be removed. If, however, they are dislodged replace them as seen in the above image.

The functional interfaces for transmitters are listed in Table 3-1 below.

Table 3-1. Interface List (T6-TU-F and T6-TV-F)

Interface	Function	Connector	Qty	Type
Power	AC Power input		1	108 to 132 VAC, 57-63 Hz single phase 3 Wire Line/Neutral/Ground IEC C14
	DC Power input		1	21.6 to 28.8 VDC, Negative ground Saf-D-Grid
	Grounding to FAA-STD-019		1	¼"-20 ground lug
RF	Transmitter Out	Antenna	1	Type N female
	Reference Oscillator	REF MON	1	BNC female 50 Ω, 20 MHz @ >-20 dBm
	RF Cavity Filter In	Filter IN	1	Type N female
	RF Cavity Filter Out	Filter OUT	1	Type N female
	ATR Common	ATRC	1	Type N female
	ATR N/O	ATR2	1	Type N female
	ATR N/C	ATR1	1	Type N female
Data	Ethernet	LAN 1	1	RJ45 RX/TX
	Ethernet	LAN 2	1	RJ45 RX/TX
	Ethernet	LAN 3	1	RJ45 RX/TX
Keying	Push-To-Talk (PTT) – Ground and Voltage keying	REM INT	1	DB15 female
	PTT Confirmation	REM INT	1	DB15 female
Audio	Transmit Audio In	REM INT	1	DB15 female
	Microphone/Headset	Mic/Headset	1	Lemo, 5-way 0 V PTT Audio: Passive: 5 mV to 20 mV (default) Active: 40 mV to 250 mV. Headset/sidetone output: 0 V to 3 V pk-pk

3.1.1.1 FAA Radio Interface (FRI).

This interface translates the required standard T6 analog audio and signaling and Facilities functions to those required specifically by the FAA for integration to Remote-Control Equipment and Voice Control Switch Systems. The user interface (REM INT) is presented on a 15-way D Type female connector and mimics that which is currently used by the FAA on the NEXCOM V1 radios. The pin out configuration is shown in Figure 3-5 below.

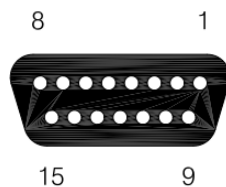


Figure 3-5. Pin Configuration of the REM INT 15-pin DIN socket on the FRI

The pin out details for transmitters can be found in Table 3-2 below.

The FRI module is providing simple level shifting of PTT keying voltages, straight through connection of audio, isolated signal confirmation outputs, and control of the ATR. The FRI uses the radio's RS422 serial communication connection to allow adjustment (via the MDT) of the PTT voltage keying threshold. The PTT keying voltage range available is presented in Table 3-3 below.

Connectivity between the T6 radio and the FRI is via three straight-through RJ45 connectors. Each connector is labelled the same on the T6 radio as the FRI (Audio, Facilities and Filter) so as not to confuse if either be disconnected at any time. There is a fourth RJ45 connector on the FRI which is connected to the ATR.

Table 3-2. Transmitter REM INT Connector

Pins	Signal	Level	Impedance	Notes
2	Voice audio	-30 dBm to +10 dBm	600 Ω	Pass through from transmitter
3				
7	Transmitter ground key (Input)	(<100 Ω to ground) – Keyed (Open [$>1\text{ M}\Omega$]) – Unkeyed		10 mA maximum <40 VDC
1	Transmitter ground key (ground 0V)			
15	Transmitter Voltage Key (Input)	Keyed: Key Voltage > Threshold Setting Unkeyed: Key Voltage $\leq$ Threshold Setting Or No connection to the Transmitter Voltage Key Input Pin		0.5 mA Maximum sink includes hysteresis
8	Transmitter Voltage Key (Ground 0 V)			
5	Transmit Confirmation	Differential Impedance between pins: <10 Ω = Confirm, Open [$>1\text{ M}\Omega$] = Not active	Two Isolated pins (> 1 $\text{M}\Omega$ to ground for each pin)	1 A maximum <80 VDC
6				

Pins 4, 9, 10, 11, 12, 13, and 14 are not utilized in the transmitters

Table 3-3. FRI PTT Keying Voltage Ranges

Parameter	Applicable Radio(s)	Applicable Ranges	Keying Threshold Tolerance	Default Setting	Increment	Hysteresis
Adjustable Voltage Keying Threshold	Transmitter	8 VDC to 24 VDC or -8 VDC to -24 VDC	+/-0.5 VDC	8 VDC	1 V	1 V $\pm$ 0.25 V

NOTE: For added refinement of the PTT voltage keying threshold, the increment is adjustable in 1 V steps (+/- allowed tolerance).

To verify operational status of the FRI, each RJ45 connector provides visual indication of the current state and is detailed in Table 3-4 below.

Table 3-4. FRI Operational Status

Connector	LED	Illuminated when
Audio	Green	-
	Amber	PTT is active
Facilities	Green	The Interface is powered, and the processor is running
	Amber	Transmit confirmation is active
Filter	Green	A serial message is being sent to, or received from, the attached radio
	Amber	-
ATR	Green	-
	Amber	Antenna transfer is active

3.1.1.2 LAN 1 and LAN 2.

These interfaces, on the rear of the radio, are configurable for VoIP, SNMP, or a combination. They are also configurable for both IPv4 and IPv6 networks.

Each LAN connector has a unique media access control (MAC) address.

Each LAN connector must be connected to a separate subnet.

[redacted]

The pin-out for the LAN 1/2 connector is shown in Table 3-9 below.

Table 3-5 LAN 1/2 Connector Pin-out

Connector	Pin	Signal	Characteristics
 LAN 1/2 RJ45	1	TD+ output	Balanced 100-ohm output, 10/100 Mbits per second.
	2	TD- output	
	3	RD+ input	Balanced 100-ohm input, 10/100 Mbits per second.
	4	Not connected	
	5	Not connected	
	6	RD- input	Balanced 100-ohm input, 10/100 Mbits per second.
	7	Not connected	
	8	Not connected	
A valid link illuminates amber LED  and flashing amber LED indicates activity. 100 Mbits illuminates green LED  , 10 Mbits off.			

3.1.1.3 Cavity Filter.

The cavity filter, accessed via Type N female connectors, facilitates RF bandpass filtering of the outgoing RF signals. The technical specifications of the filters are detailed in subparagraphs 2.3.1.13 and 2.3.1.14 of this document.

3.1.1.4 RF Output (Antenna).

This interface is provided by a Type N female connector for the transmission of an RF signal (maximum output power of the radio is 50 W) to an antenna, or the input of a transmitter filter, either internal or external.

3.1.1.5 Power.

The power input requirements for the radios are detailed in Table 3-6 below.

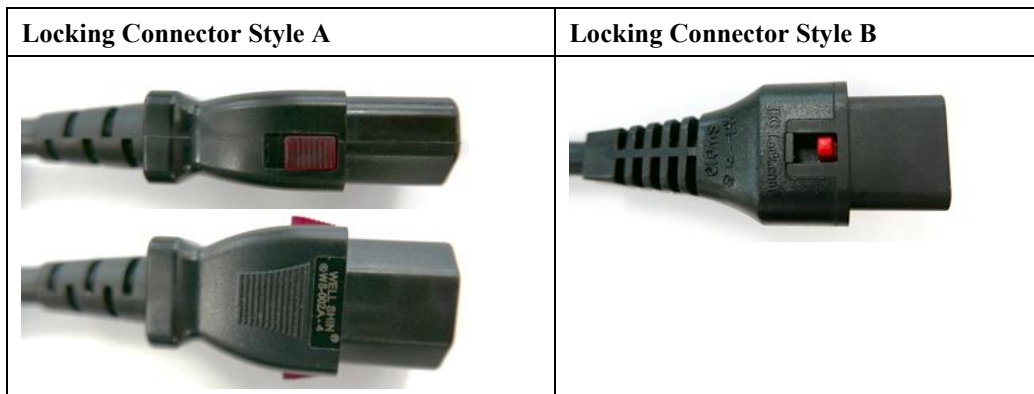
Table 3-6. Input Power Requirements

Source	Voltage (V)	Connector	Fuse	Current (A)	
				Maximum	Typical
AC	108 – 132 VAC, 57 – 63 Hz	Chassis mounted 3-wire IEC C14 plug	Fuse size 20 mm, 5 A, 10 kA AIC	8.0	2.2
DC	21.6 – 28.8 VDC, negative ground	Chassis mounted Saf-D-Grid plug	Fuse size 0, 20 A, 10 kA AIC	20.0	10.4

Grounding is provided via the ¼”-20 ground lug located near the power inlets.

To release the AC cable from the AC inlet of the radio the Red release tab on the connector must be pulled back to release the locking mechanism and allow the cable to be removed. There are two styles of locking mechanism as shown in

Table 3-7 below.

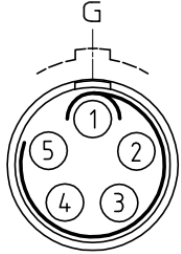
Table 3-7. AC Power Cable Locking Mechanisms**3.1.1.6 Reference Frequency Monitor (REF MON).**

The reference frequency can be monitored via the 50-Ω BNC RE MON connector on the front panel of the radio. The actual reference signal is inhibited unless Reference is selected from the Settings menu (refer to subparagraph 7.2.1). The signal is 20 MHz @ >-20 dBm.

3.1.1.7 Microphone/Headset Connector.

The microphone/headset is connected via the LEMO socket (Lemo EEG.1B.305.CLN) on the front panel of the radio. The pin-out is detailed in Table 3-8 below.

Table 3-8. MIC / HEADSET Socket Configuration

	Pin	Function	Characteristics
	1	Microphone input	PASSIVE (non-powered): 5 mV to 20 mV rms (default). ACTIVE (powered): 40 mV to 250 mV rms.
	2	Microphone ground	
	3	Headset/Sidetone output	0 V to 3 V pk-pk receive audio. Default headset volume setting is 30 %. Sidetone volume is relative to the headset volume setting. It can be set HIGH or LOW. Default setting is LOW.
	4	Microphone PTT	0 V PTT.
	5	Ground (0 V)	

3.1.1.8 LAN 3.

The LAN 3 Ethernet connection is available on the front panel of the radio. The LAN 3 port has the same functionality as the LAN 1 and LAN 2 ports although its intended primary function is for connection to a local MDT (laptop) for maintenance via the radio's in-built web server interface (MDTS).

The web interface is the primary interface for accessing and changing T6F radio configuration parameters. For enhanced security, the different network services (VoIP, SNMP, web interface) can be individually disabled on each of the three LAN ports. The one exception to this is that the web interface cannot be disabled on LAN 3 (this is to prevent the scenario where access to the web interface is inadvertently disabled on all three LAN ports - it would not be possible to gain access to re-enable the web interface).

[redacted]

Operational settings can be implemented via the front panel of the radio (refer to paragraphs 3.2 and 3.3 below), or remotely via the MDT or other networked web browser (refer to paragraph 10.4 later in this document).

The pin-out for the LAN 3 connector is shown in Table 3-9 below.

Table 3-9 LAN 3 Connector Pin-out

Connector	Pin	Signal	Characteristics
 LAN 3 RJ45	1	TD+ output	Balanced 100-ohm output, 10/100 Mbits per second.
	2	TD- output	
	3	RD+ input	Balanced 100-ohm input, 10/100 Mbits per second.
	4	Not connected	
	5	Not connected	
	6	RD- input	Balanced 100-ohm input, 10/100 Mbits per second.
	7	Not connected	
	8	Not connected	
	A valid link illuminates amber LED  and flashing amber LED indicates activity. 100 Mbits illuminates green LED  , 10 Mbits off.		

3.2 CONTROLS AND INDICATORS.

3.2.1 Front panel operation.

Figure 3-6 below shows the location of the front panel controls (FPCs) and indicators.

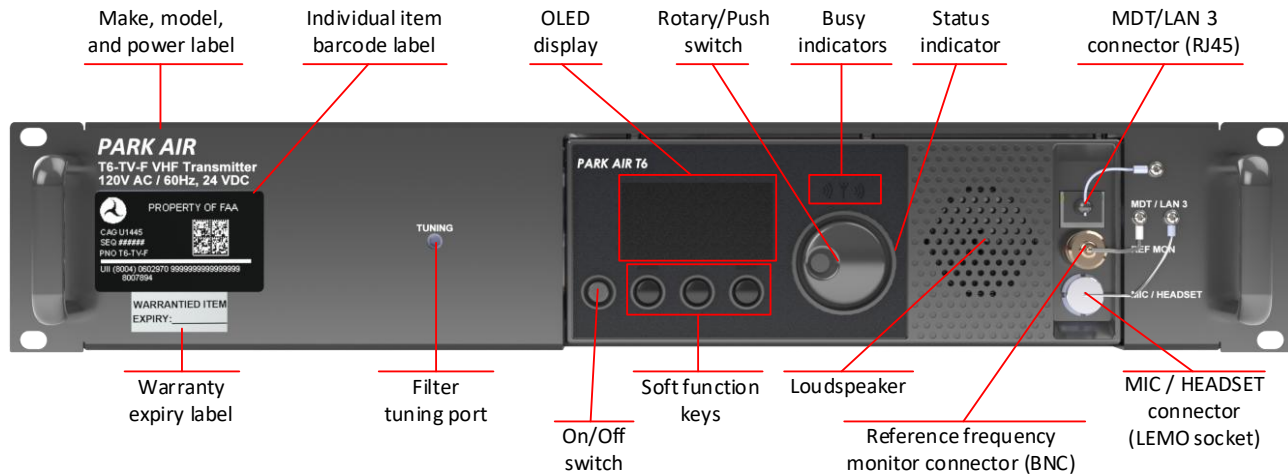


Figure 3-6. Front View of T6F Transmitter

Table 3-10 below highlights the FPCs and indicators and provides references to further details.

Table 3-10. Front Panel Controls and Indicators

Interface	Image	Control
On/Off switch		Front panel on/off switch for the radio Turns the power on/off internal to the radio. The power cables are the power disconnect devices to the radio.
Busy indicators		The busy indicator illuminates green when the radio transmits.
Rotary/Push switch		Changes selected volume setting. Changes the display menu. Changes values.
		Selects. Saves settings.
OLED Display	Refer to subparagraph 3.2.1.1	
Soft function keys	Refer to subparagraph 3.2.1.2	
Status indicator	Refer to subparagraph 3.2.1.3	
Filter tuning port	Refer to subparagraph 3.2.1.4	

3.2.1.1 OLED Display.

THE high-resolution organic light emitting diode (OLED) display provides textual output to operator.

In the example shown in Figure 3-7 below, two parameter fields are shown, and one is blank. Up to three parameter fields can be shown or blank.

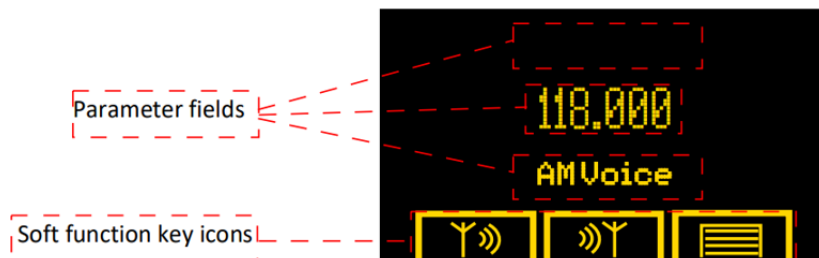


Figure 3-7. Front Panel Display

The display brightness decreases after 24 hours

3.2.1.2 Soft Function Keys.

There are three soft function keys below the display. Soft function icons are shown above the keys, in the display. They are described in Table 3-11 below.

Table 3-11. Soft Function Keys

Soft Function Icon	Function	Notes
	Push To Talk	The busy indicator illuminates 
	Transmit inhibited	The soft function key is disabled.
	Menu	
	Home	
	Back	Previous menu.
	Tab	Moves the cursor.
	Enter	Enter edit mode (same as when rotary/push switch is pushed)
	Save	Saves the parameter that has been entered.

3.2.1.3 Status Indicator.

The Status indicator is the ring of light around the rotary/push switch. The meanings of the various illuminations are detailed in Table 3-12 below.

Table 3-12. Status Indicator Indications

Status Indicator	Action	Notes
	Steady green	BIT status is Full Service .
	Steady yellow	BIT status is Reduced Service .
	Flashing yellow	BIT status is No Service (e.g., escalated external BIT signal (E-BIT)).
	Steady red	BIT status is No Service .
	Rotating red/blue ring	Radio actioning user request (e.g., factory reset).

3.2.1.4 Filter Tuning Port.

Access to the internal filter tuning interface is via the tuning port on the front panel, through which a 4 mm hexagonal wrench (Allen™ key) is inserted and rotated to adjust the center frequency of the filter. The location of the filter tuning port is shown in Figure 3-8 below. The hexagonal wrench must be rotated manually, and gently at the ends of the filter range; electric drive is not permitted.



Figure 3-8. Filter Tuning Port Location

NOTE: The symbols that are depicted in subparagraph 3.2.1 are used in this document.

3.2.2 Rear Panel Connectors.

The rear panel of the transmitter is shown in Figure 3-9 below.

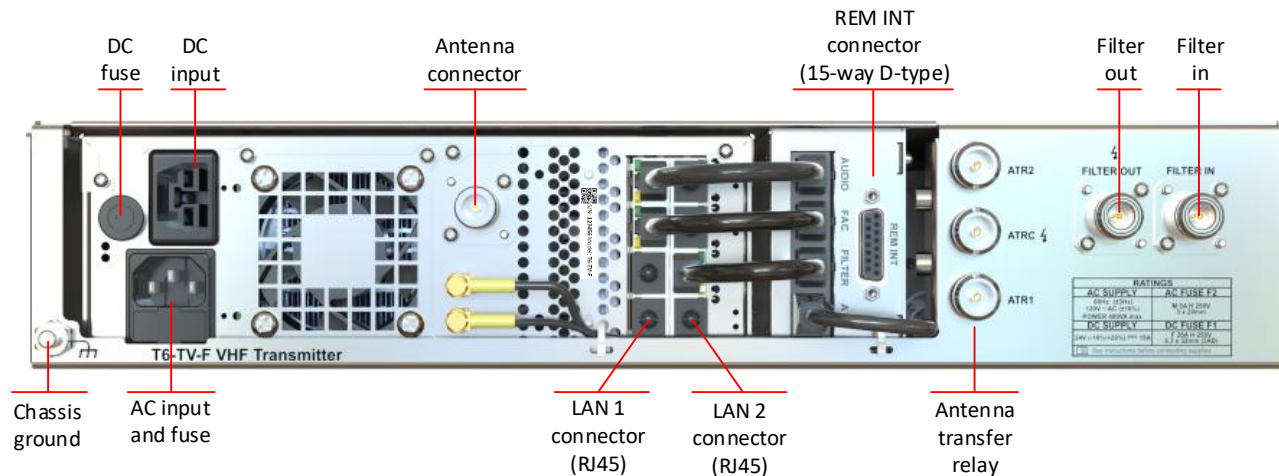


Figure 3-9. Rear Panel Connectors of T6-TV-F Transmitter

3.3 INSTALL, SWITCH-ON, AND CHECKOUT.

The easy-to-use menu-driven T6F radio has a clear, easy-to-read screen and icons. To help the user, the switch and soft key icons detailed in subparagraph 3.2.1 are shown in the instruction steps.

3.3.1 Install the Radio.

- 1 Fit the radio into its allocated slot in the equipment rack.
- 2 Screw/bolt the front of the radio onto the rack.
- 3 Make sure that the radio is grounded via the 1/4"-20 grounding lug on the rear of the radio.
- 4 Make sure the radio is connected to an AC (120 V, 60 Hz) and/or DC (24 V, negative ground) supply of the correct rating.
- 5 Make sure the antenna cable is connected correctly.

Full installation instructions are detailed in paragraph 9.4 later in this document.

3.3.2 Switch-on the Radio.

To switch the radio on, push the on/off switch on the front panel.



The radio then initializes:

- The busy indicator illuminates.
- The display shows "Initialising..."
- The busy indicator image disappears
- The radio then shows the Home screen, and the status indicator ring illuminates green.



Initialising...



3.3.3 Home Screen.

The default Home screen shows the operating channel, the current waveform, and two soft key icons. An example screen is shown in Figure 3-10 below.



Figure 3-10. Example of the Home Screen

The channel shown is the International Civil Aviation Organization (ICAO) channel as defined in Annex 10 to the Convention on International Civil Aviation. The channel designation is dependent on the carrier frequency and the channel spacing (refer to Table 3-14 and Table 3-15).

While the home screen is shown, rotating the rotary push switch will adjust the loudspeaker or headset volume. This is illustrated in Figure 3-11 below



Figure 3-11. Loudspeaker Volume Screen

The display will return to the home screen after three seconds of inactivity on the volume screen. The display will return to the home screen after five minutes of inactivity on any other screen.

3.3.4 The Settings Menus.

The Settings menu provides access to all the settings by which the radio is configured.

To find Settings:

- 1 From the Home screen use the soft keys to select the Menu icon.
- 2 Rotate the rotary/push switch until Settings is shown in the middle parameter field. The resultant screen image is shown in Figure 3-12 below.

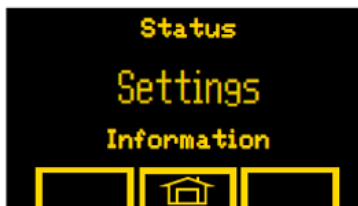


Figure 3-12. Settings Screen

- 3 To enter the settings list, push the rotary/push switch. The settings list appears as shown in Figure 3-13 below.



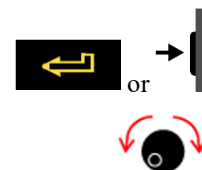


Figure 3-13. Settings List Screen

To change a setting, using the channel setting (change from 118.000 to 118.250) as an example:

- 1 Rotate the rotary/push switch until the required setting (Channel in this example) is shown in the middle parameter field of the display.

- 2 Press the Enter soft key or push the rotary/push switch.



- 3 Rotate the rotary/push switch to select the required channel.
If a cursor (line under “118”) is shown, as in this example, (Figure 3-14 below):



Figure 3-14. Channel Display with Cursor

- 4 Use Tab soft key to move the cursor.
The cursor repositions under “000” (Figure 3-15 below).



Figure 3-15. Channel Display with repositioned Cursor

- 5 Rotate the rotary/push switch to select value.



- 6 To save the new setting, select the Save soft key or push the rotary/push switch.

There is a five second delay between a setting being saved and it being stored in the radio’s memory. The display will show the saved parameter, as in this example (Figure 3-16 below).



Figure 3-16. Channel Display after Editing

All the radio’s settings are shown, in order, in Table 3-13.

To go back to the Settings screen select the Back soft key.



To go back to the Home screen select the Home soft key.



Table 3-13. Radio Settings and Explanations

Settings (Typical display)	Description	Notes	Default
Volume LOUDSPEAKER	LOUDSPEAKER or HEADSET volume	Selection of LOUDSPEAKER (shown) or HEADSET volume. Adjust the volume setting with the rotary/push switch.	LOUDSPEAKER
Loudspeaker ON	Loudspeaker ON/OFF	Turn the loudspeaker on or off	ON
HMI Brightness HIGH	Front panel Human Machine Interface (HMI) display brightness setting	HIGH or LOW	HIGH
118.000	Channel	ICAO channel value. A description of how ICAO channels and spacings relate to frequency is in Table 3-14 and Table 3-15	118.000 (VHF) 225.000 (UHF)
Preset OFF	Channel preset	OFF or 1 to 100, set to OFF if the channel is changed manually. Presets are stored via the web server, see subparagraph 10.4.3.4.	OFF
Step 25 kHz	Channel spacing	Selection of 8.33 kHz or 25 kHz steps for VHF. Selection of 12.5 kHz or 25 kHz steps for UHF	25 kHz
Reference 50.0%	Reference frequency	0.0% to 100.0 % Adjusted during trimming of the reference frequency	-
Offset 0.0 kHz	Carrier offset	Allows for carrier offset to be applied to the current channel frequency, depending on the current frequency and radio model (U/V)	0
TX Power Mode LOW	TX power mode	Sets the configurable range of the transmit RF power output setting. LOW: 2 W to 17 W HIGH: 17 W to 50 W.	LOW
RF Power 2 W	Output power setting	Configures the radio's RF power output, dependent on the power mode setting.	2
Mod Depth 95%	Modulation depth	Configures the modulation depth of the transmitted audio (as a percentage). Range: 5 to 95	95
ALCON	Automatic level control	When ON, this maintains the modulation with the modulation setting tolerance for input levels within a 30 dB range from a threshold at 10 dB below the average speech line level setting, subject to maximum line level limits.	ON
Mute ON	Mute	When ON, the mute level is fixed at -15 dB below average speech level for analog audio input.	ON

Settings (Typical display)	Description	Notes	Default
MicPASSIVE	Microphone type	Configures the radio whether an active or passive microphone is connected to the front panel.	PASSIVE
SidetoneLOW	Sidetone volume	Adjusts level of the sidetone volume generated by the transmitter.	LOW
LineIn-13dBm	Line In audio level	Configures the Line In level (in dBm) with respect to average speech.	-13
RadioACTIVE	Radio ACTIVE or INACTIVE status	ACTIVE – the radio is operationally active (IP RRC terminology). INACTIVE - the radio is operationally inactive (IP RRC terminology).	ACTIVE
ActiveAUTO	Radio active or inactive control	AUTO or MANUAL AUTO – two radios autonomously select one as active and the other as INACTIVE. MANUAL – radios are selected as ACTIVE or INACTIVE externally.	AUTO
RF SwitchCtrlOFF	28 V DC supply for RF switching	ON or OFF Display only, this setting can only be changed remotely	OFF
IP1150.18.2.100	IPv4 address (LAN 1)	Example of IPv4 address (LAN 1)	0.0.0.0
NM1255.255.255.0	Subnet mask (LAN 1)	Example of subnet mask (LAN 1)	0.0.0.0
IP210.5.60.1	IPv4 address (LAN 2)	Example of IPv4 address (LAN 2)	0.0.0.0
NM2255.255.255.0	Subnet mask (LAN 2)	Example of subnet mask (LAN 2)	0.0.0.0
IP3192.168.1.1	IPv4 address (LAN 3)	Example of IPv4 address (LAN 3)	192.168.1.1
NM3255.255.255.0	Subnet mask (LAN 3)	Example of subnet mask (LAN 3)	255.255.255.0
DG192.168.1.100	Default Gateway	The IPv4 address of the default Ethernet switch. Example of Default Gateway address	0.0.0.0
SIP1PORT 05060	Session Initiation Protocol for LAN 1	Set to port number to be used for SIP connection for LAN 1	05060
SIP2PORT 05060	Session Initiation Protocol for LAN 2	Set to port number to be used for SIP connection for LAN 2	05060
SIP3PORT 05060	Session Initiation Protocol for LAN 3	Set to port number to be used for SIP connection for LAN 3	05060

Settings are changed to suit system engineering and/or user requirements. A web server is hosted in the radio.

To access the web server, see paragraph 10.4 Remote Monitoring and Control.

To set a radio setting via the web server, see subparagraph 10.4.3 How to Guides.

The Table 3-14 below gives examples of how the ICAO VHF channels and spacings relate to the frequency of the radio.

Table 3-14. ICAO VHF Channels and Spacings Relationship to Frequency

ICAO channel (shown on radio's display)	Channel spacing (kHz)	Actual frequency (to 4 decimal places)	Deviation from 25 kHz spacing channel
112.000	25 kHz	112.0000 MHz	0
112.005	8.33 kHz	112.0000 MHz	0
112.010	8.33 kHz	112.0083 MHz	+8.3 kHz
112.015	8.33 kHz	112.0166 MHz	+16.6 kHz
112.025	25 kHz	112.0250 MHz	0
112.030	8.33 kHz	112.0250 MHz	0
112.035	8.33 kHz	112.0333 MHz	+8.3 kHz
112.040	8.33 kHz	112.0416 MHz	+16.6 kHz
112.050	25 kHz	112.0500 MHz	0
112.055	8.33 kHz	112.0500 MHz	0
112.060	8.33 kHz	112.0583 MHz	+8.3 kHz
112.065	8.33 kHz	112.0666 MHz	+16.6 kHz
:	:	:	:
149.975	25 kHz	149.9750	0
149.980	8.33 kHz	149.9750	0
149.985	8.33 kHz	149.9833	+8.3 kHz
149.990	8.33 kHz	149.9916	+16.6 kHz

Table 3-15 below gives examples of how the UHF channels and spacings relate to the frequency of the radio.

Table 3-15. ICAO UHF Channels and Spacings Relationship to Frequency

ICAO channel (shown on radio's display)	Channel spacing (kHz)	Actual frequency (to 4 decimal places)	Deviation from 25 kHz spacing channel
225.000	25 kHz	225.0000 MHz	0
225.002	12.5 kHz	225.0000 MHz	0
225.012	12.5 kHz	225.0125 MHz	+12.5 kHz
225.025	25 kHz	225.0250 MHz	0
225.027	12.5 kHz	225.0250 MHz	0
225.037	12.5 kHz	225.0375 MHz	+12.5 kHz
225.050	25 kHz	225.0500 MHz	0
225.052	12.5 kHz	225.0500 MHz	0
225.062	12.5 kHz	225.0625 MHz	+12.5 kHz
:	:	:	:
399.975	25 kHz	399.9750	0
399.977	12.5 kHz	399.9750	0
399.987	12.5 kHz	399.9875	+12.5 kHz

3.3.5 Status.

This is the operational status of the radio. To find Status:

- 1 From the Home screen select the Menu soft key.
- 2 Rotate the rotary/push switch until Status is shown in the middle parameter field. This is shown in Figure 3-17 below.



Figure 3-17. Status Screen

- 3 To enter the Status list, push the rotary/push switch. The Status list screen is shown (Figure 3-18 below).



Figure 3-18. Status List Screen

- 4 To select Status Messages, Monitoring, Interruptive Test, or Status Reset, rotate the rotary/push switch until your required selection is shown in the middle parameter field.
- 5 Push the rotary/push switch.



To go back to the Menu screen, push the Back soft key.



To go back to the Home screen, push the Home soft key.



The Status list is shown in Table 3-16 below.

Table 3-16. Status List

Status	Description	Notes
FULL SERVICE	BIT system service level	See subparagraph 3.3.6 BIT System Service Level
Status Messages	FULL SERVICE or REDUCED SERVICE or NO SERVICE and: AC Supply DC Supply Ambient Temp System External BIT signal (E-BIT) Fan Radio Health	No Messages Only relevant status messages are shown, see subparagraph 11.2.1 Status Message Procedure.
Monitoring	ETI *****h:**m AC Connected DC Not Connected DC Supply *.* V Ambient Temp * °C Internal Temp * °C	Only relevant measurements are shown. All measurements are monitored continuously.
Interruptive Test	Built in test, performed at the current TX power configuration. Measures: Forward power (W) Reflected power (W) Modulation depth (%)	...
Status Reset	Clears the current BIT status and returns status to FULL SERVICE	If there is a continuous fault condition the next iteration of the test will raise the alarm again.

NOTE: No Messages text is shown with a FULL SERVICE radio.
Relevant status messages are shown with a REDUCED SERVICE or NO SERVICE radio.
When faults are detected and the home screen is shown, relevant messages are shown.

3.3.6 BIT System Service Level.

Table 3-17 below lists the BIT System Service Levels

Table 3-17. BIT System Service Levels

Status	Description	Procedure
FULL SERVICE	The radio is operational to specification.	No action required.
REDUCED SERVICE	The radio is operational but does not meet specification.	Find the status message/s shown, see subparagraph 11.2.1 Status Message Procedure.
NO SERVICE	The radio is not operational.	Find the status message/s shown, see subparagraph 11.2.1 Status Message Procedure.

The radio service level is adjustable by the user as necessary. For example, the ambient temperature status message is set to display REDUCED SERVICE. The user may select to display NO SERVICE. See subparagraph 10.4.3.2 How to Escalate a BIT Status Message.

3.3.7 Information.

This is the information about the radio.

To find Information:

- 1 From the Home screen select the Menu soft key.
- 2 Rotate the rotary/push switch until Information is shown in the middle parameter field. The Information screen appears (Figure 3-19 below)



Figure 3-19. Information Screen

- 3 To enter the Information list, push the rotary/push switch. The Information list screen is shown (Figure 3-20 below).



Figure 3-20. Information List Screen

4 To view more information, rotate the rotary/push switch.



To go back to the Menu screen, select the Back soft key.

To go back to the Home screen, select the Home soft key.

An example information list is shown in Table 3-18 below.

Table 3-18. Information List

Screen (top line)	Information	Description	Notes
Model	T6-TV-F 24-04635051/2	Radio model number. Product code identification number.	Example of radio model number. Example of product code identification number.
Serial No.	140322	Serial number	Example of serial number
Option Installed	T6-O-112-150 T6-O-225-400 T6-O-AMV T6-O-50W T6-O-G729	VHF 112 MHz to 150 MHz UHF 225 MHz to 400 MHz AM voice 50 W maximum output power G.729 voice compression codec	Examples of options installed on the radio.
Boot Installed	65-00000843/1	Boot code version number	/1 is an example of version.
Firmware Installed	65-00000919 1.1.0-rc3 65-00000811/1	Tx complex programmable logic device (CPLD) firmware and version.	
LAN 1 MAC	00:15:8b:00:56:70	MAC address – LAN 1	Example of MAC address
LAN 2 MAC	00:15:8b:00:56:71	MAC address – LAN 2	Example of MAC address
LAN 3 MAC	00:15:8b:00:56:72	MAC address – LAN 3	Example of MAC address
User Text		User definable text up to 20 characters	To set User Text, see 0

3.3.8 Front Panel HMI (Display) Lock.

The front panel HMI display can be locked from the web server, see subparagraph 10.4.3.5 How to Set a Front Panel HMI (Display) Lock.

When the lock is set, the front panel has limited functionality. The Home screen (Figure 3-21 below) will show that the lock is active.

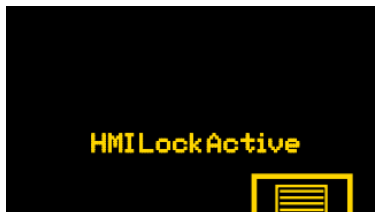


Figure 3-21. HMI Lock Active Screen

Front panel functionality is limited to:

- Volume adjustment
- Accessing the Status menu

The Status menu is accessed via the Menu soft key.

Selecting the Menu soft key presents the soft key icons shown in Table 3-19 below.

Table 3-19. Status Menu Soft Key Icons

Soft function icon	Function	Notes
	Home	Returns display to Home screen
	Back	Previous menu

The HMI Lock Active screen as illustrated in Figure 3-21 above can be customized as described in subparagraph 3.3.9.

3.3.9 Front Panel HMI (Display) Information Option.

The front panel display can be customized to show basic information such as ‘User Text’, ‘Serial Number’, etc. The Home Screen will display the requested information; example shown in Figure 3-22 below.



Figure 3-22. Customised HMI Lock Active Screen

This customization is done via the web interface, see subparagraph 10.4.3.17 How to Customize the HMI Display Screen Information.

3.3.10 How to View and Set a LAN IPv4 Address

NOTE: It should not be necessary to change the LAN 3 address from its default 192.168.1.1, but it can be changed by using the procedure below.

To view the IP address for a LAN port (LAN 3 (MDT port) used in this example):

- 1 From the front panel Home screen, press the Main menu soft key. 
- 2 Rotate rotary/push switch until Settings is shown in the middle parameter field. 
- 3 Press the rotary/push switch to enter the Settings list. 
- 4 Rotate rotary/push switch until IP3 192.168.1.1, for LAN 3, appears in the middle parameter field (Figure 3-23 below). IP3 indicates the IP address for LAN 3. The displayed value (192.168.1.1) is the current IP address for LAN 3. 



Figure 3-23. LAN IP Address Display

To change the IP address, continue with the following:

- 5 Press the rotary/push switch to enter the editing mode.
The screen should appear as in Figure 3-24 below.
The line under the first octet of the address is the cursor. 



Figure 3-24. LAN Address Editing Screen – First Octet

- 6 Rotate the rotary push switch until the required value appears for this octet. 
- 7 Press the Cursor soft key to move the cursor to the next octet field.
The screen should appear as in Figure 3-25 below (or something similar depending on the change made). 



Figure 3-25. LAN Address Editing Screen – Second Octet

- 8 Rotate the rotary push switch until the required value appears for this octet. 

- 9 Repeat actions 7 and 8 until all four octets are as required.
- 10 Press the rotary/push switch to save the IP address.
- 11 Press the Back soft key to return to the Settings list screen.
- 12 Check the Mask setting by rotating the rotary/push switch one position clockwise. Middle parameter field will show NM3 255.255.255.0 or similar, where NM3 represents Network Mask 3, and 255.255.255.0 is the mask for IP address IP3. If the Mask setting needs changing, the process is very similar to that above for changing the IP address.
- 13 Press the Home screen soft key to return to the Home screen.



3.3.11 How to do a Factory Reset from the Front Panel.

A factory reset function is available and is accessed from the radio front panel and the web server. To do a factory reset do the following steps.

- 1 Make sure the radio is connected to an AC and/or DC supply, and it is turned 'OFF'.
- 2 Push and hold the rotary/push switch and press the on/off button.
- 3 Continue to hold the rotary/push switch. The radio then initializes.
- 4 The Busy Indicators icon illuminates.
- 5 The display will appear as in Figure 3-26 below.



Figure 3-26. Factory Reset "Initialising" Screen

NOTE: Keep the rotary switch held in while the radio is initializing.

- 6 The display will appear as in Figure 3-27 below.

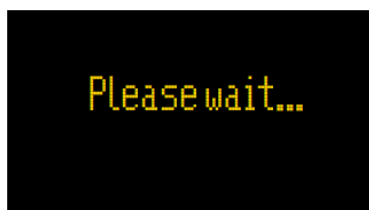


Figure 3-27. Factory Reset "Please Wait..." Screen

- 7 As soon as "Please wait..." appears on the display, release the rotary/push switch.
- 8 The display will appear as in Figure 3-28 below.

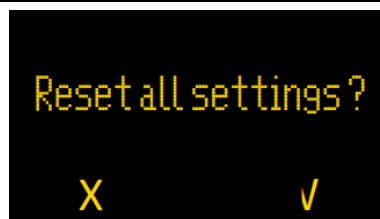


Figure 3-28. Factory Reset “Reset all settings?” Screen

- 9 Press the soft key below the relevant symbol. The “X” will take the user back to the Home screen and the radio will function in its previous state. Selecting the “ü” will factory reset the radio.

NOTE: When resetting the radio there is a countdown for five seconds and then the radio will restart.

This page is intentionally blank.

SECTION 4 STANDARDS AND TOLERANCES

4.1 INTRODUCTION.

This section provides a listing of radio performance parameters, with standard values and tolerances, as measured in tests performed in SECTION 6 of this instruction book. Critical performance parameters are identified by an arrow in the left margin of Table 4-1.

4.2 STANDARDS AND TOLERANCES.

Table 4-1 below lists the parameters that can be measured and their standard values and allowable deviations.

Table 4-1. Standards and Tolerances

Parameter		Procedure Reference Paragraph	Standard	Tolerance Limit	
				Initial	Operating
→ a	Operating Frequency	6.2.1	Assigned frequency as per FTA	±0.00001 percent	±0.0005 percent
→ b	RF Output Power	6.2.2	Low Power Mode		
			10 W or Commissioned value	±1.0 W	±2.0 W
			High Power Mode		
			30 W or Commissioned value	±2.0 W	±4.0 W
→ c	Modulation Level	6.2.3	Voice		
			95 percent	60 to 95 percent	60 to 95 percent
			1004 Hz Tone		
			90 percent	75 to 95 percent	75 to 95 percent

This page is intentionally blank.

SECTION 5 PERIODIC MAINTENANCE**5.1 INTRODUCTION.**

This section lists the maintenance checks for the T6F Transmitters.

Performance checks need to be performed after the following actions:

- Initial installation
- Completion of any corrective maintenance
- Return to service of any radio removed for repair or replacement.

5.2 PERFORMANCE CHECKS.

Table 5-1 below lists the performance checks with references to their relevant standards and maintenance procedures.

Table 5-1. Transmitter Performance Checks

Performance Check	Reference Paragraph or Table	
	Standards and Tolerances	Maintenance Procedures
Operating Frequency	Table 4-1.a	6.2.1
RF Output Power	Table 4-1.b	6.2.2
Modulation Level	Table 4-1.c	6.2.3

This page is intentionally blank.

SECTION 6 MAINTENANCE PROCEDURES

6.1 INTRODUCTION.

The T6F radio is an LRU and, therefore, there are no user serviceable internal parts.

6.2 PERFORMANCE CHECKS.

6.2.1 Operating Frequency.

The purpose of this test is to ensure the Transmitter Frequency accuracy meets the standards and tolerances. This is a measurement of the accuracy of the transmitter frequency synthesizer.

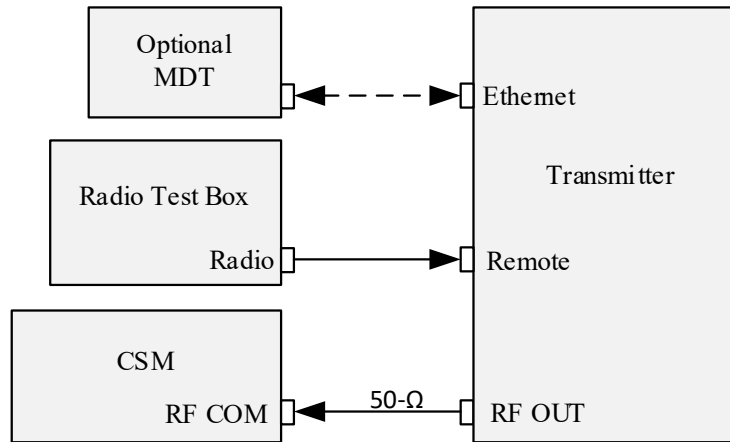


Figure 6-1. Transmitter Frequency Test Setup

6.2.1.1 Test Equipment Required.

- Communications System Monitor (CSM; Rohde & Schwarz CMA180 or equivalent)
- Radio Test Box
- Coaxial RF cable, 50 Ω , N-type Male to N-type Male
- Coaxial RF cable, 50 Ω , BNC Male to BNC Male
- MDT Laptop (Optional)
- Ethernet Cable (Optional)

6.2.1.2 Procedure.

- 1 Configure the transmitter for testing (Figure 6-1):
 - a. Connect the Radio Test Box to the remote port of the transmitter.
 - b. Connect the CSM to the RF output on the transmitter.
 - c. Configure the CSM to measure the transmitter frequency under test.
- 2 Key the transmitter using the Radio Test Box.
- 3 Measure the frequency and verify the frequency accuracy meets the standards and tolerances.
- 4 Un-key the transmitter.
- 5 If the frequency accuracy does not meet the standards and tolerances, perform the necessary reference frequency adjustments as per subparagraph 7.2.1 later in the document.
- 6 If no further testing is required, return the transmitter to service.

6.2.2 RF Output Power.

The purpose of this procedure is to verify the transmitter power output level meets the standards and tolerances.

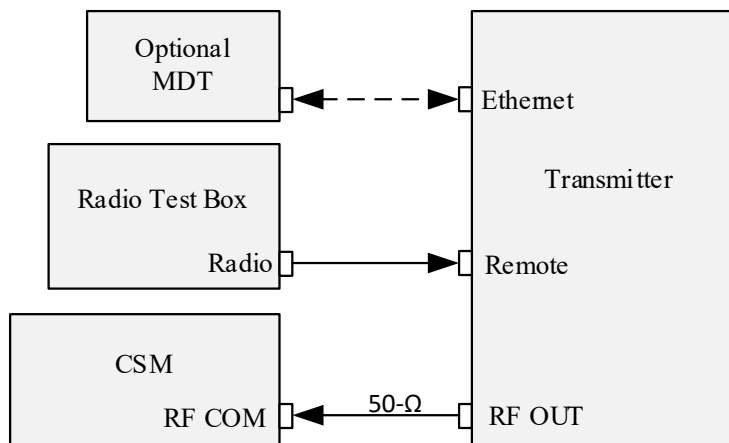


Figure 6-2. RF Output Power Test Setup

6.2.2.1 Test Equipment Required.

- Communications System Monitor (CSM; Rohde & Schwarz CMA180 or equivalent)
- Radio Test Box
- Coaxial RF cable, 50 Ω , N-type Male to N-type Male
- Coaxial RF cable, 50 Ω , BNC Male to BNC Male
- MDT Laptop (Optional)
- Ethernet Cable (Optional)

6.2.2.2 Procedure.

- 1 Configure the transmitter for testing (Figure 6-2):
 - a. Connect the Radio Test Box to the remote port of the transmitter.
 - b. Connect the CSM to the RF output on the transmitter.
 - c. Configure the CSM to measure RF Power output for the frequency under test.
- 2 Key the transmitter using the Radio Test Box
- 3 Measure and verify the power output meets the standards and tolerances.
- 4 Un-key the transmitter.
- 5 If the measured output power is not correct, it can be set and trimmed from the MDT by following the procedure described in subparagraph 7.2.1 later in this document.
- 6 If no further testing is required, return the transmitter to service.

6.2.3 Modulation Level

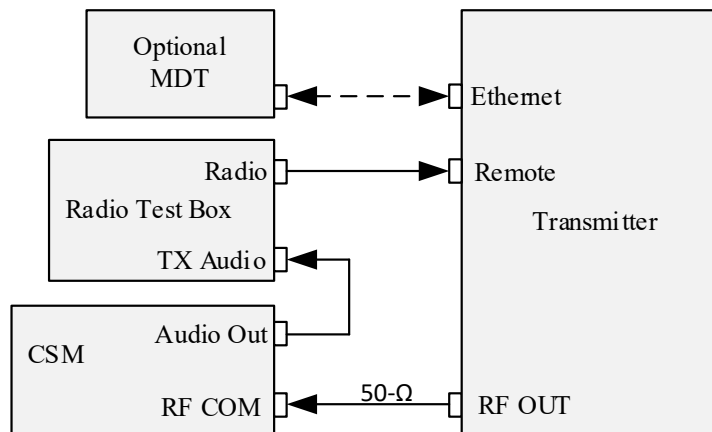


Figure 6-3. Modulation Level Test Setup

6.2.3.1 Test Equipment Required

- Communications System Monitor (CSM; Rohde & Schwarz CMA180 or equivalent)
- Radio Test Box
- Coaxial RF cable, 50 Ω , N-type Male to N-type Male
- MDT (Optional)
- Ethernet Cable (Optional)

6.2.3.2 Procedure

- 1 Connect the transmitter for testing (Figure 6-3)
 - a. Connect the Radio Test Box to the remote port of the transmitter.
 - b. Configure the transmitter to operate at a frequency offset at least 50 kHz from any operational frequencies.
 - c. Connect the CSM to the RF output on the transmitter.
 - d. Configure the CSM to measure AM modulation for the frequency under test.
 - e. Set the CSM Audio Frequency (AF) Out for 600 Ohms.
 - f. Set the CSM Audio Frequency (AF) generator to provide a -8.0 dBm, 1004 Hz tone.
 - g. Connect Audio Out from the CSM to the TX Audio connector on the Radio Test Box.
- 2 Key the transmitter using the Radio Test Box.
- 3 Measure and verify that the AM modulation depth meets the standards and tolerances.
- 4 Un-key the transmitter.
- 5 Return the transmitter to its operational frequency.
- 6 If no further testing is required, return the transmitter to service.

6.3 OTHER MAINTENANCE PROCEDURES.

6.3.1 Filter Tuning (to maximize signal strength).

If considered necessary, the tuning of the cavity filter is to be checked.

CAUTION: When tuning the filter turn the 4 mm Allen key gently by hand, never with an electric driver.

6.3.1.1 Required test equipment.

- CSM (Rohde & Schwarz CMA180 or equivalent)
- Coaxial RF cable, 50 Ω , N-type Male to N-type Male
- 4 mm hex key (Allen key)

6.3.1.2 Procedure.

- 1 Make connections to the radio as shown in Figure 6-4 below, namely:
 - a. At the T6F radio make sure a co-axial link from the ANTENNA connector to FILTER IN connector is connected
 - b. At the T6F radio make sure a co-axial link from the FILTER OUT connector to the ATR2 connector is connected
 - c. Connect the radio test set to the ATRC connector of the radio.

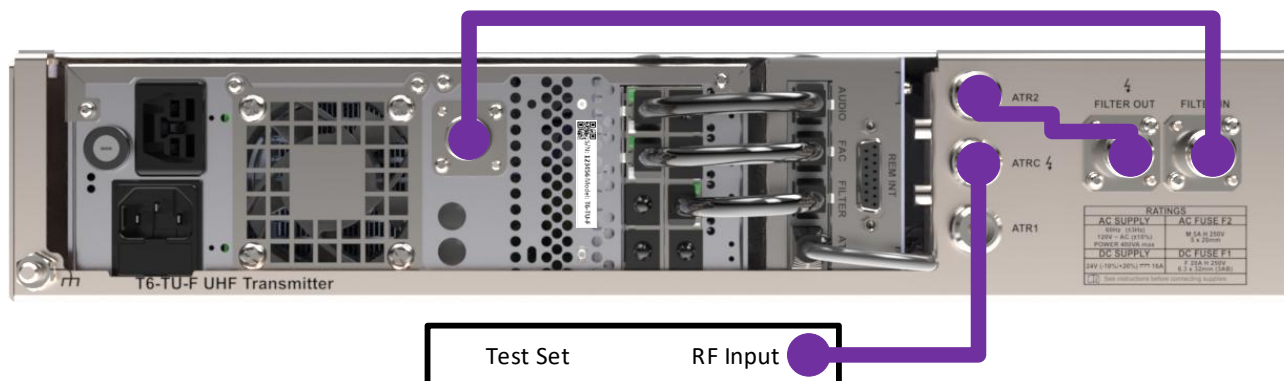


Figure 6-4. Sensitivity Measurement for Filter Tuning

- 2 Make sure the transmitter RF signal is set to the required frequency.
- 3 Set the test set RF output level to 2 W (unmodulated).
- 4 Set the radio test set to measure RF power (using a scale of 10 W).
- 5 Refer to the caution, note, text, and tables below before commencing the tuning procedure.

CAUTION: Cavity filters contain tuning mechanisms that are fragile. Be careful when tuning. Use minimal force when approaching the end of their adjustment range to prevent damage. The tuning of the filter must be done manually and gently. The use of electrically driven hex keys is not permitted.

NOTE: If the radio trips Voltage Standing Wave Ratio (VSWR) during the tuning process, continue to tune the filter to achieve maximum power while the radio is tripped. Then de-key and key the radio once more. The radio will key at the full 2W output power with no VSWR alarm, and the filter adjustment can be completed to set maximum power while the radio is not under a VSWR alarm.

The lowest frequency of the filters is when the tuning is set fully counterclockwise (starting position). Table 6-1 (VHF) and Table 6-3 (UHF) below provide a guide to the number of clockwise turns required from that starting position to reach the approximate position for the operating frequency. The tuning tables show the frequency in whole MHz increments. If the frequency falls between two increments, always pick the lower number of turns from the chart as the point from which to fine tune the filter.

The tables also list the incremental turns from the previous lower frequency to the stated frequency.

Table 6-2 (VHF) and Table 6-4 (UHF) show the incremental number of turns per MHz in three ranges of filter frequency. These give an indication of the filter's sensitivity when fine tuning the filter.

Table 6-1. VHF Cavity Filter Tuning Preset Chart

Frequency (MHz)	Number of Clockwise Turns from:		Frequency (MHz)	Number of Clockwise Turns from:		Frequency (MHz)	Number of Clockwise Turns from:	
	Starting Position	Previous Frequency		Starting Position	Previous frequency		Starting Position	Previous frequency
112	7.75		125	18.30	0.70	138	26.45	0.55
113	8.65	0.90	126	19.00	0.70	139	27.05	0.60
114	9.55	0.90	127	19.60	0.65	140	27.55	0.50
115	10.40	0.85	128	20.35	0.70	141	28.10	0.55
116	11.30	0.90	129	21.00	0.65	142	28.60	0.50
117	12.10	0.80	130	21.60	0.60	143	29.15	0.55
118	12.95	0.85	131	22.30	0.70	144	29.65	0.50
119	13.70	0.75	132	22.90	0.60	145	30.15	0.50
120	14.50	0.80	133	23.50	0.60	146	30.65	0.50
121	15.30	0.80	134	24.20	0.70	147	31.15	0.50
122	16.05	0.75	135	24.70	0.50	148	31.60	0.45
123	16.80	0.75	136	25.35	0.65	149	32.05	0.45
124	17.60	0.80	137	25.90	0.55	150	32.50	0.45

The average incremental adjustment is approximately as shown in Table 6-2 below.

Table 6-2. VHF Incremental Frequency Adjustment

Frequency Range (MHz)	Turns per MHz
112 – 124	0.82
125 – 137	0.65
138 - 150	0.51

Table 6-3. UHF Cavity Filter Tuning Preset Chart

Frequency (MHz)	Number of Clockwise Turns from:		Frequency (MHz)	Number of Clockwise Turns from:		Frequency (MHz)	Number of Clockwise Turns from:	
	Starting Position	Previous Frequency		Starting Position	Previous frequency		Starting Position	Previous frequency
225	8.15		285	26.65	1.25	345	41.95	1.35
230	10.15	2.00	290	27.90	1.25	350	43.30	1.35
235	12.00	1.85	295	29.15	1.25	355	44.65	1.35
240	13.80	1.80	300	30.40	1.25	360	46.05	1.40
245	15.50	1.70	305	31.60	1.20	365	47.40	1.35
250	17.10	1.60	310	32.80	1.20	370	48.80	1.40
255	18.60	1.50	315	34.10	1.30	375	50.15	1.35
260	20.10	1.50	320	35.40	1.30	380	51.50	1.35
265	21.50	1.40	325	36.65	1.25	385	52.80	1.30
270	22.85	1.35	330	37.95	1.30	390	54.20	1.40
275	24.15	1.30	335	39.30	1.35	395	55.60	1.40
280	25.40	1.25	340	40.60	1.30	400	57.05	1.45

The average incremental adjustment is approximately 0.28 turns per MHz.

Table 6-4. UHF Incremental Frequency Adjustment

Frequency Range (MHz)	Turns per MHz
112 – 124	0.31
125 – 137	0.25
138 - 150	0.27

- 6 Via the radio's front panel TUNING port (Figure 6-5 below), rotate the tuning mechanism fully, but gently, counterclockwise as far as it will go. This sets the filter at its lowest frequency (starting point for tuning).



Figure 6-5. Tuning Port Location

- 7 Adjust tuning by turning clockwise the number of turns specified in the appropriate table above.
- 8 At the radio, PTT and fine tune for maximum RF power at the radio test set. Clockwise rotation will increase the tuned frequency of the filter; counterclockwise rotation will lower it.

SECTION 7 CORRECTIVE MAINTENANCE

7.1 INTRODUCTION.

This section describes appropriate onsite corrective maintenance processes.

The T6F radio is a single LRU built for standard 19-inch rack mounting. There are no user serviceable internal parts. The transmitter LRU contains a T6 radio, cavity filter, ATR, and FRI.

Paragraph 7.2 details the adjustments that can be made to correct issues that are out of specification.

7.2 ONSITE CORRECTIVE MAINTENANCE.

As mentioned in paragraph 7.1 above, the allowable onsite corrective procedures are detailed in the following subparagraphs.

7.2.1 Reference Frequency Adjustment.

If the operating frequency is outside the tolerance limits, as measured in subparagraph 6.2.1 follow the procedure detailed below.

Purpose: To set the reference frequency to 20 MHz so that the transmitter channels are set accurately to their required frequencies.

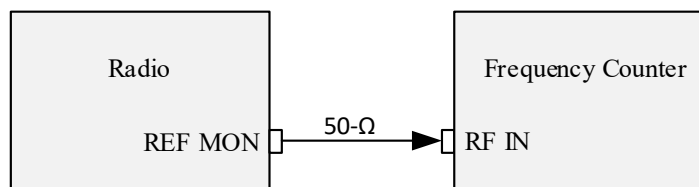


Figure 7-1. Reference Frequency Test Setup

7.2.1.1 Test Equipment Required.

- RF frequency counter.
- 50-Ω coaxial cable (BNC connector for radio end; suitable connector for frequency counter end).

CAUTION: Make sure the stability, accuracy and resolution specifications of the frequency counter used exceed that of the reference oscillator. Wherever possible, use an external frequency standard, for example, Global Positioning System (GPS) or an off-air standard.

7.2.1.2 Procedure.

- 1 Connect the radio and frequency counter as shown in Figure 7-1 above.
- 2 From the front panel of the radio select Menu soft key.
- 3 Rotate the rotary/push switch until Settings shows on the display. The resultant screen image is shown in Figure 7-2 below.



Figure 7-2. Settings Screen

- 4 Press the rotary/push switch.
- 5 Rotate the rotary/push switch until Reference xx.x% shows in the middle parameter field.
- 6 Press the rotary/push switch.
NOTE: Reference oscillator output is enabled immediately.
An example screen image is shown in Figure 7-3 below.

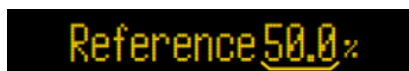


Figure 7-3. Reference Oscillator Adjustment Screen

- 7 Rotate the rotary/push switch to adjust the reference frequency until the counter displays 20.000000 MHz $\pm$ 1 Hz.
The setting is automatically saved on adjustment.
An example resultant screen image is shown in Figure 7-4 below.

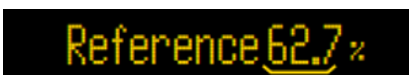


Figure 7-4. Reference Oscillator Resultant Screen

- 8 Press the rotary/push switch.
NOTE: Reference oscillator output is disabled immediately.



7.2.2 Filter Tuning.

Refer to subparagraph 6.3.1

7.2.3 RF Output Power Adjustment.

If, during routine RF output power testing (subparagraph 6.2.2 earlier in the document) or other maintenance procedure, it is determined that the RF output power is not at the required level, it can be set and/or trimmed by following the procedure described in subparagraph 10.4.3.20 later in the document.

7.2.4 Modulation Adjustment.

If the Modulation Depth (default is 95 %) needs changing, this can be done from the TFPC by following the process outlined in subparagraph 3.3.4, or from the MDT as detailed in subparagraph 3.

7.2.5 Fan failure.

If the radio reports a failure of the fan, the radio is to be replaced, and the removed radio sent to Indra for repair.

7.2.6 Power Failure (Fuse Replacement).

If the primary or secondary power source to the radio is lost, a message will appear on the front panel display. The message, description and associated action are presented in

Table 7-1 below.

Table 7-1. Power Failure (Alarm) Messages

Message	Description	Action
AC Supply	AC supply failed/disconnected	Check the AC supply. Do a continuity test of the AC fuse.
DC Supply	DC supply less than minimum DC voltage level DC supply failed/disconnected	Check the DC supply Do a continuity test of the DC fuse.

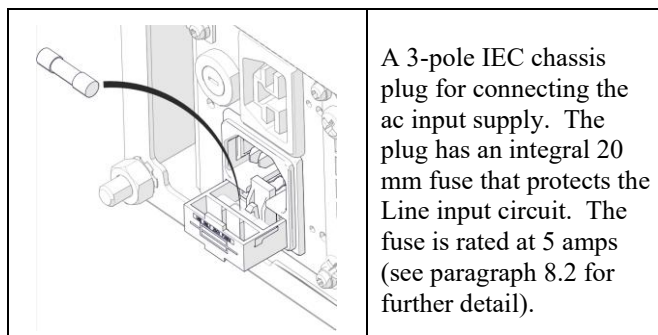
One of the causes might be the failure of a fuse, so a continuity test of the fuse is required.

The fuses are located near the chassis-mounted power input plugs on the rear of the radio as shown in Figure 7-5 below.

**Figure 7-5. Fuse Locations on Rear of T6F Transmitter**

7.2.6.1 AC Fuse.

An exploded view of the AC fuse drawer is presented in Figure 7-6 below.

**Figure 7-6. Exploded View of AC Connector Showing Fuse Drawer**

To remove the AC fuse:

- 1 Remove the AC power supply cable
- 2 Pull fuse drawer open
NOTE: The drawer does not remove completely (see Figure 7-6 above)
- 3 Lift out fuse

Check the continuity of the fuse with an ohmmeter or a DMM (resistance measurement setting).

If the meter indicates continuity across the ends of the fuse, put it back in the drawer, and close the drawer gently.

If the fuse is 'open circuit' (blown) replace it with an appropriate new one (see paragraph 8.2 for details for new fuse).

7.2.6.2 DC Fuse.

An exploded view of the DC fuse arrangement is presented in Figure 7-7 below.

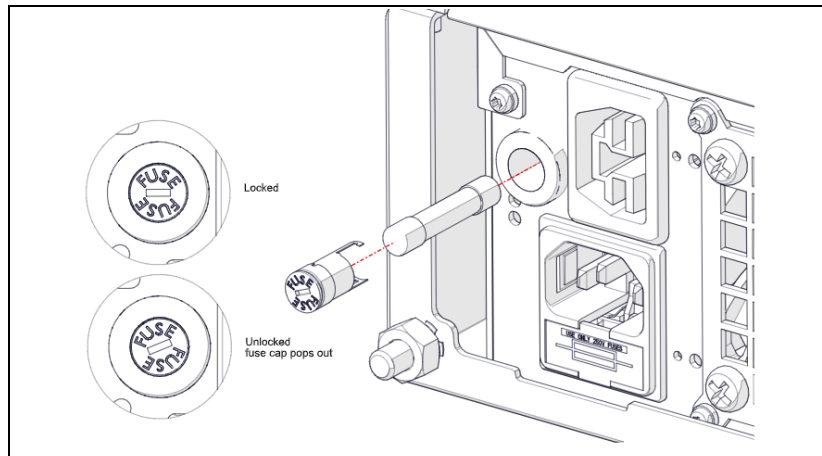


Figure 7-7. DC fuse mounting

To remove the DC fuse:

- 1 Remove the DC power supply cable
- 2 Use a flat-head (1 mm x 5 mm tip) screwdriver to turn the fuse cap anticlockwise about one-eighth turn until the fuse cap pops out.

Check the continuity of the fuse with an ohmmeter or a DMM (resistance measurement setting).

If the meter indicates continuity across the ends of the fuse, put it back in the fuse cap, and return it to the radio (align the notch in the fuse cap to the vertical as shown in Figure 7-7 above).

If the fuse is 'open circuit' (blown) replace it with an appropriate new one (see paragraph 8.2 for details for new fuse).

7.3 OFFSITE REPAIR.

All offsite repairs will be managed by FAALC. If a radio is faulty it will need to be removed from the rack and suitably packaged for sending to FAALC.

To remove the radio from the rack:

- 1 Remove the power cable(s) from the rear of the radio.
- 2 Remove the REM INT connector.
- 3 Remove all external RF connectors.
- 4 Remove the grounding cable.
- 5 Unscrew/Unbolt the front of the radio from the rack.
- 6 Gently pull the radio by its handles out of the rack bearing in mind the weight of the radio.
- 7 When the radio is nearly out hold it by the sides so that the rear of the radio does not swing down with the possibility of damaging the rear connectors, or hitting the person removing the radio, or being dropped because of the sudden increase in weight on the arms of the operative.

Procedures for sending radios for repair are outlined in Appendix A.

SECTION 8 PARTS LIST

8.1 INTRODUCTION.

This section presents a list of the replacement parts applicable to the T6F transmitters.

8.2 PARTS LIST.

The parts list for the transmitters is presented in Table 8-1 below.

Table 8-1. Transmitter Parts List

Name of Part	Description	Indra Reference	Manufacturer Reference
T6-RU-F	FAA UHF Transmitter	24-04645052/2	Indra
T6-RV-F	FAA VHF Transmitter	24-04635051/2	Indra
AC supply lead	AC power supply cable (3 m)	17L03INEMA8S	Indra
DC supply lead	DC power supply cable (10 ft)	17L05DCSF10S	Indra
AC fuse	Fuse size 20 mm 5 A 10 kA	Indra Park Air 29L01050200S	Littlefuse Inc 0234005.MXP
DC fuse	Fuse size 0 20 A 10 kA	Indra Park Air 29L01450203S	Littlefuse Inc 0314020.MXP
Coaxial link cable	Coaxial cable (300 mm) terminated at each end with male N-type connectors	17L11000140	Indra
15-way D-type connector	15-way D-type connector plug	20M01150101	Amphenol L717SDA15P
	15-way D-type connector shell	20M09150101	Amphenol L17DTZK15KMFT

This page is intentionally blank.

SECTION 9 INSTALLATION, INTEGRATION, AND CHECKOUT

9.1 INTRODUCTION.

This section details the procedures to unpack, install, configure, and test the T6F transmitter.

9.2 UNPACKING AND REPACKING.

9.2.1 Unpacking.

Carefully remove, or cut, any tape that may be sealing the box. Open the box the radio is packed in. The radio will be presented as shown in Figure 9-1 below, with the power cables and leaflets positioned on top of the radio.



Figure 9-1. Radio contents inside the shipping package

Read the enclosed *Equipment Safety Information* leaflet, and the *Park Air T6F Radio Quick Start Guide*.

Remove the radio and accessories, and place on a table or work bench.

Check the radio for physical damage.

Retain all packaging until the radio is installed and tested.

If possible, retain all packaging (e.g., box, foam, plastic bags) for later packing of a radio, for dispatch to another site, or to FAALC for repair.

9.2.2 Repacking.

Packing is required if a radio is being put into storage, is being sent to another site for installation, or is being sent for repair.

It is preferred that any radio being packed for whatever reason is packaged in Indra's Original Equipment Manufacturer (OEM) packaging. This may be the packaging that is onsite, or the packaging that a new radio has been delivered in, for example, a replacement radio may have been delivered to the site that has reported a faulty radio.

If the OEM packaging is not available, packaging must be of an equivalent or better quality such that the radio will not be damaged in transit.

In either case include required/relevant documentation pertaining to the radio inside the box.

9.2.2.1 Packing in OEM Box.

Ensure that all eight pink foam protectors are properly fixed in the box and lid.

Put the radio into the plastic bag and place it in the box as shown in Figure 9-1 above.

Close the lid.

9.2.2.2 Packing in non-OEM Box.

The radio should be packed in a sturdy cardboard container. The radio must be surrounded by rigid foam, or other suitable padding, to ensure that the radio is protected and does not move inside the container. Include any relevant/required paperwork in the box and tape the box closed with package tape if appropriate.

9.3 INPUT REQUIREMENT SUMMARY.

Although the radio can be commissioned in a standalone environment it is designed to be mounted in a standard 19-inch rack fitted with suitable L-shaped brackets (see Figure 1-2 in subparagraph 1.2.1) within an FAA equipment room.

The other necessary requirements are:

- Grounding point
- AC and/or DC power supply of appropriate standard (see subparagraph 1.4.3).
- REM INT network cable for connection to REM INT interface.

9.4 INSTALLATION PROCEDURES.

WARNING

Dangerous voltage: You must be suitably qualified to connect a mains supply to the equipment.

You must have a suitable AC and/or DC supply and a suitable antenna or antennas. An accessory headset is required for a functional test of the headset port, otherwise the loudspeaker can be used for audio reception testing.

Fit the radio into the equipment rack:

- 1 Hold the radio by the handles on the front panel.
- 2 Lift the radio into the rack so that the radio rests on the L brackets (see Figure 1-2 in subparagraph 1.2.1).
- 3 Gently push the radio fully into the rack.
- 4 Ensure the front of the radio is screwed/bolted to the rack.

Connect the Cables:

- 5 Make sure the radio is grounded via the ¼"-20 grounding lug on the rear of the radio.
- 6 Make sure the antenna cable, or filter/antenna cable, is fitted correctly.
- 7 Make sure the AC and/or DC supply cables are connected correctly.
- 8 Connect the REM INT connector.
- 9 If the radio is being used as a standalone transmitter, with or without a filter, ensure the RF cable connections as per subparagraph 1.3.1 are secured properly.
- 10 If the radio is being used as part of a main/standby pair, ensure the RF cable connections as per subparagraph 1.3.2 are secured properly.
- 11 If the transmitter is being used with a receiver in a transceiver configuration, ensure the RF cable connections as per subparagraph 1.3.3 are secured properly.
- 12 Connect a microphone/headset if required.

9.4.1 Radio Configuration Procedures.**9.4.1.1 Switch on the Radio.**

Refer to paragraph 3.3 for details.

Make sure the Status Indicator ring is green.

9.4.1.2 Check/Adjust the Reference Frequency.

Refer to subparagraph 7.2.1 for details.

9.4.1.3 Factory Reset.

Perform a factory reset to ensure all the factory default settings have been applied.

Refer to subparagraph 3.3.11 for details.

9.4.1.4 MDT Port (LAN 3) IP Address.

The default address for LAN 3 is 192.168.1.1 and should not need to be changed.

However, in the interests of uniformity, if the radio site uses a different IP address for its MDT access, the address can be changed by using the process described in subparagraph 3.3.10.

9.4.1.5 Configure the Radio.

Configure the radio for its operational requirements.

Subparagraph 3.3.4 provides outlines of procedures from the front panel, and subparagraph 10.4 provides outlines of procedures from the MDT.

The following subparagraphs provide itemized procedures.

9.4.1.6 Check/Adjust Operating Frequency.

Set the STEP (default is 25 kHz) and operating frequency by following the process outlined in subparagraph 3.3.4.

9.4.1.7 Tune the Filter.

If the internal filter is being used, tune the filter as described in subparagraph 6.3.1.

If an external filter is being used, ensure it is tuned to the same frequency as the transmitter.

9.4.1.8 Set RF Power Output.

Set the TX Power Mode (default is LOW) and RF Power (default is 2 W) settings from the TFPC by following the process outlined in subparagraph 3.3.4, or from the MDT as detailed in subparagraph 10.4.3.20.

9.4.1.9 Set Modulation Level.

Set the Mod Depth (default is 95 %) from the TFPC by following the process outlined in subparagraph 3.3.4, or from the MDT as detailed in subparagraph 3.

9.4.1.10 Check VSWR at Transmitter Output

From the front panel Status menu, select Interruptive Test.

If no VSWR fault is indicated on the front panel display, there is no VSWR issue.

If VSWR fault is indicated on the front panel display:

- Check the physical RF connections on the rear of the radio.
- Check that the filter (if used) is tuned correctly (refer to subparagraphs 9.4.1.6 and 6.3.1).
- From the front panel Status menu, select Status Reset (this will clear the VSWR alarm).
- Run the Interruptive Test again. If the VSWR alarm returns, disconnect the antenna and/or external filter connectors and check the antenna and/or external filter items independently.
- If these items are within specification, reconnect them to the radio, reset the status, and run the Interruptive Test again.
- If VSWR alarm returns, change the radio.

9.4.1.11 Set TX Timeout and PTT Reference Voltage

From the MDT, select Settings/AM Voice/Transmit:

- Scroll to Transmit Timeout (seconds) and enter the required value (default is 0).
- Scroll to PTT Reference Voltage (V) and enter the required value (default is 8).

9.4.1.12 Set Audio Input to Analog or VoIP

The default is analog unless VoIP has been enabled for the relevant LAN.

From the MDT, select Settings/ AM Voice/ VoIP, and enable/disable VoIP as required.

9.4.1.13 Configure VoIP Parameters

From the MDT, select Settings/ AM Voice/ VoIP, and enter the appropriate values.

9.4.1.14 Save Configuration.

Store the configuration of the radio so that (if required) a replacement radio can be configured easily with the same profile.

Refer to subparagraph 10.4.3.7 for details.

The procedure for installing a saved configuration into a new radio is detailed in subparagraph 10.4.3.8.

9.5 INSPECTION.

The status and settings of the radio can be viewed via the front panel display or the MDT.

9.5.1 Inspection From the Front Panel.

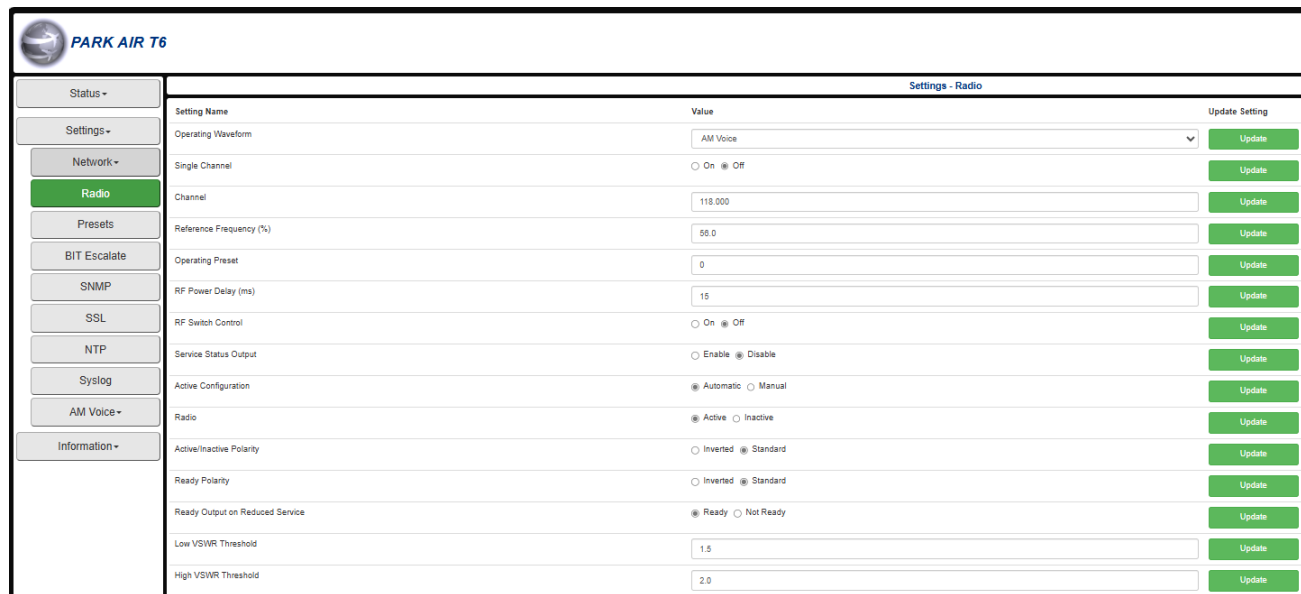
Refer to paragraphs 3.2 and 3.3 for method of using the front panel display.

9.5.2 Inspection From the MDT.

Refer to paragraph 10.4 for method of using the MDT.

9.5.2.1 Settings and Information Available via the MDT Interface.

An example of a Settings display is shown in Figure 9-2 below.



The screenshot shows the 'Settings - Radio' interface for a 'PARK AIR T6' device. On the left is a sidebar with navigation buttons: Status, Settings, Network, Radio (highlighted), Presets, BIT Escalate, SNMP, SSL, NTP, Syslog, AM Voice, and Information. The main area displays a table of settings with columns for Setting Name, Value, and Update Setting.

Setting Name	Value	Update Setting
Operating Waveform	AM Voice	Update
Single Channel	☐ On ☒ Off	Update
Channel	118.000	Update
Reference Frequency (%)	50.0	Update
Operating Preset	0	Update
RF Power Delay (ms)	15	Update
RF Switch Control	☐ On ☒ Off	Update
Service Status Output	☐ Enable ☒ Disable	Update
Active Configuration	☒ Automatic ☐ Manual	Update
Radio	☒ Active ☐ Inactive	Update
Active/Inactive Polarity	☐ Inverted ☒ Standard	Update
Ready Polarity	☐ Inverted ☒ Standard	Update
Ready Output on Reduced Service	☒ Ready ☐ Not Ready	Update
Low VSWR Threshold	1.5	Update
High VSWR Threshold	2.0	Update

Figure 9-2. MDT Settings/Radio Screen Image

If the user ‘hovers’ over a setting, in most cases, a pop-up window will appear to explain the setting in more detail and show the default value.

An example of an Information display is shown in Figure 9-3 below.



Status-

Settings-

Information-

System

Options

Firmware

Import / Export

Information - System

System Information

Setting Name	Value	Update Setting
Model	T6-TV-F	
Front Panel HMI Lock	☐ On ☒ Off	<button>Update</button>
Front Panel HMI Lock Line 1	None	<button>Update</button>
Front Panel HMI Lock Line 2	None	<button>Update</button>
User Text		<button>Update</button>
Equipment	24-04635051/2	
Serial Number	219809	
Boot Installed	65-00000843/1/REL	
Firmware Installed	65-00000919/1.1.0-rc4	
Firmware Installed	65-00000812/3/REL	
Firmware Installed	65-00000920/1.2.1	

System Actions:

Information	Action
Reboot Radio	<button>Reboot Radio</button>
Clear BIT History	<button>Clear BIT History</button>
Admin Password	<button>Change Password</button>
Identify Radio	<button>Identify Radio</button>

Figure 9-3. MDT Information/System Display

SECTION 10 MDT SOFTWARE

10.1 INTRODUCTION.

This Section describes the software functions of the radio.

The T6F radios contain firmware only. There are no software programs that need to be run manually. All actions are selected via the front panel, MDT, or remotely via the FAA network.

10.2 MAINTENANCE DATA TERMINAL DESCRIPTION.

Each radio hosts its own web server application to provide control and monitoring functionality. This web server application removes the need for dedicated Maintenance Data Terminal Software (MDTS). No special software or application software is required for the government laptops or computers, only a standard web browser.

The web server interface can be accessed via any of the radio's Ethernet connectors. [redacted]

The T6F radio supports several web browsers:

- Google Chrome™
- Mozilla Firefox™
- Microsoft Edge™ (Chromium based only)

It is recommended that Google Chrome™ or the latest Microsoft Edge™ (Chromium based) web browsers are used.

NOTE: Other browsers may work satisfactorily, though presentation formats may be irregular, and will not harm the radio. However, the three browsers named above are the only ones that have been tested with the radios.

The radio web server can be accessed via a direct Ethernet connection to any of the three available Ethernet ports on the radio or via an Ethernet connection through the user's network to the radio.

There are two ED-137 Ethernet connections, LAN 1 and LAN 2 (see Figure 10-1 below), on the rear of the radio primarily for the connection to the user's radio network.

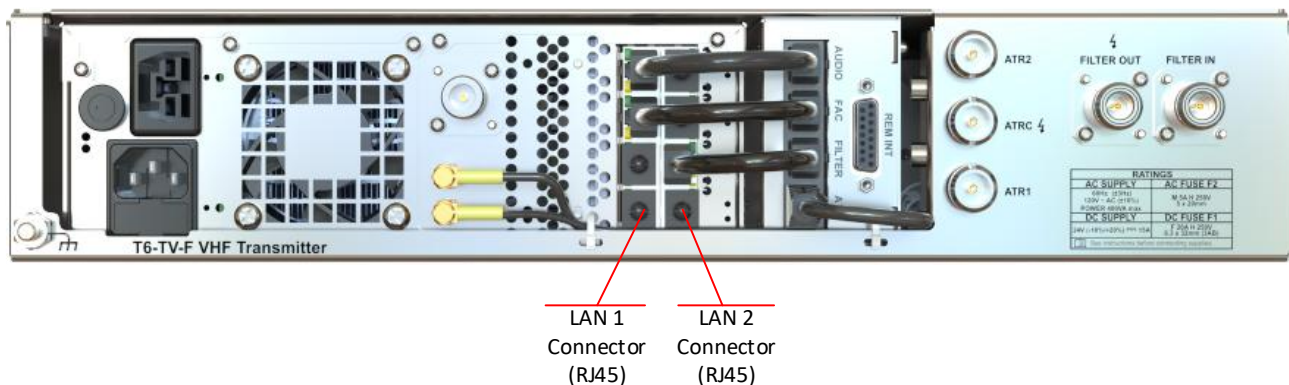


Figure 10-1. LAN 1 and LAN 2 Ports

IP network resiliency is ensured by the two LAN ports on the rear of the radios.

Each LAN connector has a unique MAC address. Each LAN connector must be connected to a separate subnet. LAN ports are configurable for Voice Over IP (VoIP), SNMP, web server interface, or a combination of these. They are also configurable for both IPv4 and IPv6 networks. For VoIP, ED-137C volumes 1 (Ground Radio Station (GRS)), 4 (Recording), and 5 (Supervision) are supported.

A third Ethernet connection, LAN 3, is available on the front panel of the radio (see Figure 10-2 below). The LAN 3 port has the same functionality as the LAN 1 and LAN 2 ports although its intended primary function is for connection to a local MDT (laptop) for configuration and maintenance. Its default IP address is 192.168.1.1.



Figure 10-2. LAN 3 (MDT) Port

The web interface is the primary interface for accessing and changing V3 radio configuration parameters. For enhanced security the different network services (VoIP, SNMP, web interface) can be individually disabled on each of the three LAN ports. The one exception to this is that the web interface cannot be disabled on LAN 3 (this is to prevent the scenario where access to the web interface is inadvertently disabled on all three LAN ports - it would not be possible to gain access to re-enable the web interface).

[redacted] Software updates will be made available when necessary to ensure compliance to new and/or updated standards (for example, ED-137C). These updates to radio software can be installed via the radio web server.

The web server monitors the radio and when required, allows users to change operational parameters such as operating frequency and transmitter power levels. The web server provides control of all radio settings for installation and operation in line with FAA requirements.

Appendix D provides full descriptions of the web server menus within the transmitter.

10.3 INTERFACE CONTROL DOCUMENTATION (ICD).

The ICD and Management Information Base (MIB) are referenced in Appendix F.

10.4 REMOTE MONITORING AND CONTROL.

A web server is hosted in the radio. This web server has a self-help text facility which gives information by “hovering over” the relevant text.

The manufacturer’s default IP address for the MDT port is 192.168.1.1. If the local default IP address for the MDT port is different, it should have been set during the installation procedure (refer to subparagraph 9.4.1.4).

If you do not know the IP address for the MDT port, refer to subparagraph 3.3.10.

To access the web server:

- 1 Make sure you have a suitable laptop or desktop to access the radio.
Usually the MDT would be connected to the LAN 3 port on the front of the radio. However, a laptop or desktop can be connected to the radio via a direct Ethernet connection to any of the LAN 1, LAN 2, or LAN 3 connectors, or via an Ethernet connection through the user’s network to the radio. [redacted]

- 2 Connect the MDT to the LAN 3 port on the front of the radio.

- 3 Open the browser software on the laptop or desktop.

The T6F radio supports several web browsers:

- Google Chrome™
- Mozilla Firefox™
- Microsoft Edge™ (Chromium based only)

Indra recommends that Google Chrome™ or the latest Microsoft Edge™ (Chromium based) web browser is used.

NOTE: Other browsers may work satisfactorily, though presentation formats may be irregular, and will not harm the radio. However, the three browsers named above are the only ones that have been tested with the radios.

- 4 Enter the IP address of the radio in the browser address bar (see subparagraph 3.3.10 to check the IP address) and press the Enter/Return key.

Username and Password are requested as shown in Figure 10-3 below.

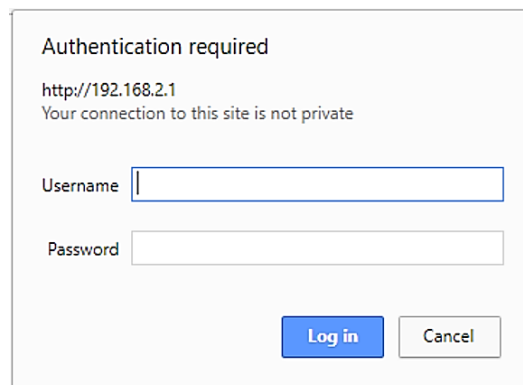
A screenshot of a web browser's authentication dialog box. The title bar says "Authentication required". Below the title, it shows the URL "http://192.168.2.1" and a warning "Your connection to this site is not private". There are two input fields: "Username" and "Password". At the bottom right, there are two buttons: "Log in" (highlighted in blue) and "Cancel".

Figure 10-3. Web Server Authentication Screen

- 5 Enter your Username and Password. The default Username and Password are both set to “admin”. The web server appears as shown in Figure 10-4 below.

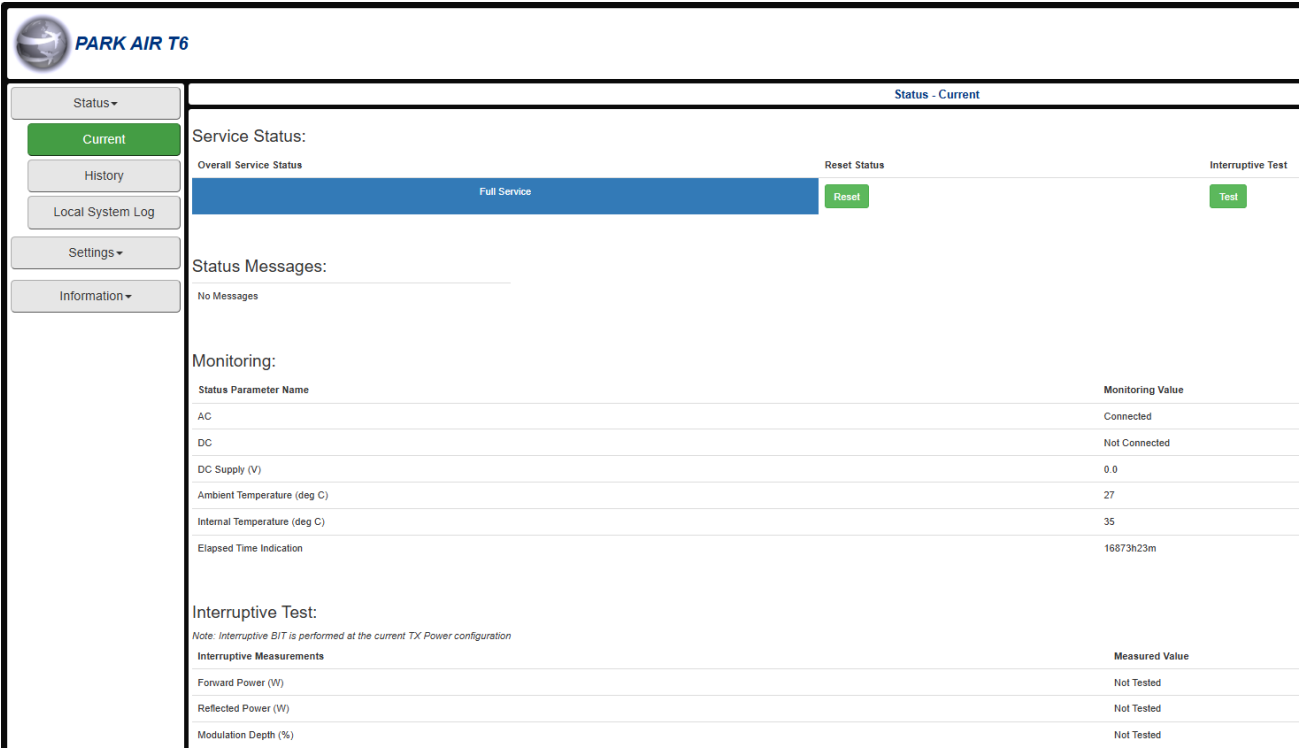


Figure 10-4. Main Web Server Screen

10.4.1 Web Server Menus.

10.4.1.1 Settings.

To change a setting, LAN 2 IPv4 IP Address is shown as an example:

- 1 Click on **Settings ▾**
- 2 Click on **Network ▾**
- 3 Click on **LAN 2**
- 4 Enter the new IP address (192.168.3.5 in this example) in the IPv4 IP Address Value box as shown in Figure 10-5 below.

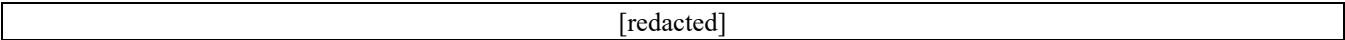


Figure 10-5. Settings Screen Example

- 5 Click on **Update**
- The Update Setting field will show **Updating**

When updated, the new value will show and the Update Setting field will illuminate green (Figure 10-6 below).

IP Address	192.168.3.5	Update
------------	--	---------------------------------------

Figure 10-6. Updated Setting

There is a five second delay between a setting being saved and it being stored in the radio's memory.

All the Settings categories are shown in Table 10-1 below.

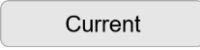
Table 10-1. MDT Settings Menu

Setting	Description	Notes
Network▼ LAN 1 LAN 2 LAN 3 Routing	Drop down menu for IP LAN 1 IP settings LAN 2 IP settings LAN 3 IP settings Routing settings	 A sub-menu of Network. Includes IPv4 and IPv6 settings. A sub-menu of Network. Includes IPv4 and IPv6 settings. A sub-menu of Network. Includes IPv4 and IPv6 settings. A sub-menu of Network.
Radio	Basic radio settings	Includes RF switch control and RF power delay
Presets	Preset channel designators	...
BIT Escalate	BIT escalation settings	...
SNMP	Simple Network Management Protocol settings	
[redacted]	[redacted]	[redacted]
NTP	Network Time Protocol settings	
Syslog	Remote logging via industry standard syslog protocol	Supports two remote servers. Local logging is available in syslog format via a sub-menu of Status.
AM Voice▼ Universal Transmit VoIP Recording	Drop down menu for AM-voice settings Universal settings for AM-voice Transmit settings for AM voice Voice over Internet Protocol settings Recorder settings	 A sub-menu of AM-voice. A sub-menu of AM-voice. Includes active/inactive settings A sub-menu of AM-voice. Includes VCCS settings. A sub-menu of AM-voice.

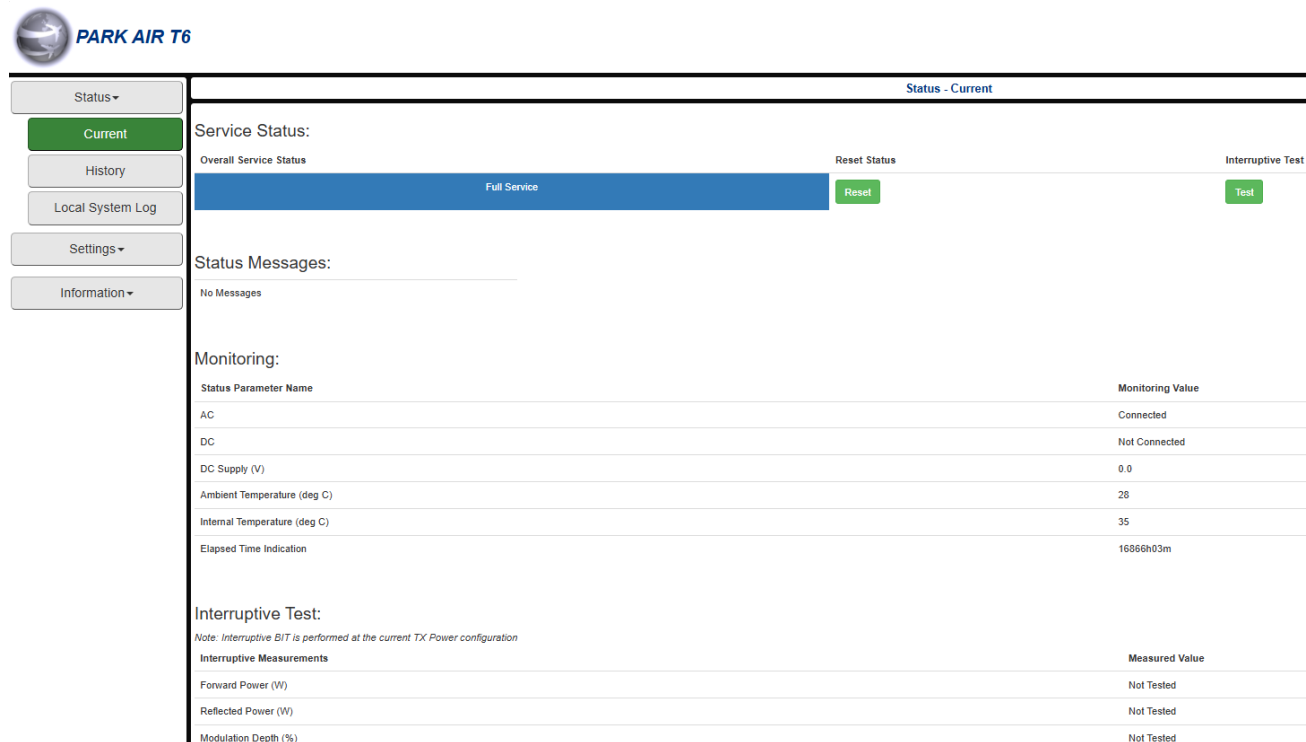
A complete listing of all MDT menus and settings is presented in the Interface Control Document (ICD) attached to this TIB (TI 6600.39).

10.4.1.2 Status.

To view the current Service Status of the radio:

- 1 Click on 
- 2 Click on 

The status of the radio is shown:



PARK AIR T6

Status - Current

Service Status:

Overall Service Status: Full Service Reset Status Interruptive Test

Status Messages:

No Messages

Monitoring:

Status Parameter Name	Monitoring Value
AC	Connected
DC	Not Connected
DC Supply (V)	0.0
Ambient Temperature (deg C)	28
Internal Temperature (deg C)	35
Elapsed Time Indication	1686h03m

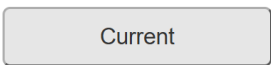
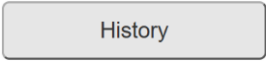
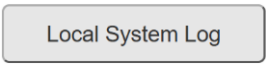
Interruptive Test:

Note: Interruptive BIT is performed at the current TX Power configuration

Interruptive Measurements	Measured Value
Forward Power (W)	Not Tested
Reflected Power (W)	Not Tested
Modulation Depth (%)	Not Tested

Figure 10-7. Current Status Screen

Table 10-2. MDT Status Menu

Status	Description	Notes
	Current Service Status	Service Status. Reset Status button Interruptive Test button Status Messages. Monitoring.
	Service Status history	Elapsed Time, Event type, Severity and Overall Service Status of each event.
	Local System Log	Local Log 1 Export Local Logs

NOTE: No Messages text is shown with a FULL SERVICE radio. Relevant status messages are shown with a REDUCED SERVICE or NO SERVICE radio.

10.4.1.3 Information.

To view the information about the radio, click on
The screen appears as shown in Table 10-3 below.

Information▼

Table 10-3. MDT Information Menu

Information	Description	Notes
System	Basic radio information and actions	Model. Front Panel HMI Lock. Serial Number. Boot and Firmware Installed numbers.
Options	Installed options	
Firmware	Installed firmware	
Import/Export	Import and export of radio settings	

10.4.2 Service Status.

Service Status is the reporting of all three service states as outputs on the T6F radio. The three status values are “Full Service”, “Reduced Service” and “No Service” as shown in Table 10-4 below.

10.4.2.1 BIT System Service Level.**Table 10-4. BIT Status Screen**

Service Status	Description	Procedure
Full Service	The radio is operational to specification.	No action required
Reduced Service	The radio is operational but does not meet specification.	Find the status messages shown, see 11.2.1 Status Message Procedure.
No Service	The radio is not operational.	Find the status messages shown, see 11.2.1 Status Message Procedure.

The radio service level is adjustable by the user as necessary. For example, the ambient temperature status message is set to display REDUCED SERVICE. The user may select to display NO SERVICE. See subparagraph 10.4.3.2 How to Escalate a BIT Status Message.

10.4.3 How to Guides.

The following subparagraphs provide step-by-step MDT instructions to complete selected radio configurations.

10.4.3.1 How to Install New Firmware.

When new firmware for the T6 radio becomes available it can be installed from the web server. Indra Park Air will issue a service bulletin to indicate when new firmware is released.

To check the existing firmware:

On the web server:

- 1 Click on **Information▼** and then **Firmware**

Figure 10-8 shows an example screen image.

Operating Firmware Details:			
Firmware	Time Stamp	Released Version	
65-00000841/10.1.0	2018-04-13T14:57:24Z	true	

Stored Firmware Details:				
Location	Details	Select File	Upload	Install
Area 1	payload_md5=510dcebd1911273b88a889fe139b65de pack_type=t5s3 pack_ver=2 payload_pcin=65-00000841/10.1.0 pack_date=2018-04-13T14:57:24Z rel=true	Choose File No file chosen		
Area 2	Click left button to get information	Choose File No file chosen		

Figure 10-8. Firmware Details Screen

- 2 Compare the part number of the firmware in the service bulletin (Figure 10-9 below) with the part number of the firmware listed under Operating Firmware Details (Figure 10-8 above).

Firmware	Time Stamp	MD5 Checksum	Released Version
65-00000841/5/REL	2017-05-15T11:08:36Z	e71aea69475ad173e6dbf33222fa925a	true

Figure 10-9. Details of New Firmware

If the parts numbers are the same, the firmware is up to date. If the part numbers are different:

- 3 Click on **Area 1** and **Area 2** to see any files already uploaded to the radio.

Area 1 and Area 2 are download areas within the radio. If a file has been previously uploaded to either of these areas, the details will be shown.

- 4 Compare the part number of the firmware in the service bulletin with the part number (payload_pcin) of the firmware in either Area 1 or Area 2.

If the new firmware has not been uploaded to either Area it will need to be issued by Indra Park Air.

To receive the new firmware:

- 5 Contact Second Level Engineering Support (SLES).
If SLES want the firmware updated they will provide a file containing the new firmware.

To upload the firmware to a radio:

- 6

On the web server, click on

Information▼

 and then

Firmware
- 7

Click on

Choose File

 next to the Area where the firmware is to be uploaded. Use the area that does not contain the current operating version of firmware.
- 8

Go to and select the firmware file.
- 9

On the webserver click on the upload icon

⬆️
- An Upload Progress bar is shown (Figure 10-10 below).

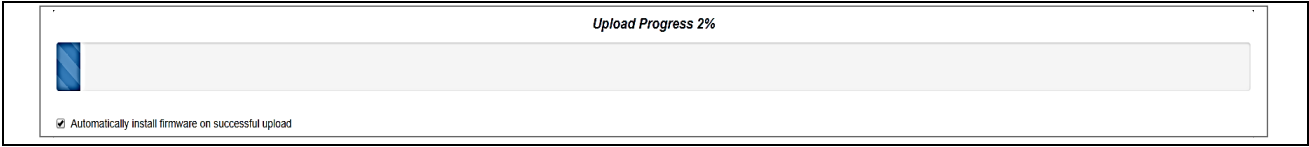


Figure 10-10. Upload Progress Screen

- 10

If you wish to install the firmware automatically, check the “Automatically install firmware on successful upload” box (lower left corner in Figure 10-10 above) while the firmware file is uploading.
- If “Automatically install firmware on successful upload” was checked, the web server installs the firmware, and an Install Progress display is presented as shown in Figure 10-11 below.



Figure 10-11. Install Progress Display

If “Automatically install firmware on successful upload” was not checked, the upload will progress to completion, and the Upload Complete message will be presented as shown in Figure 10-12 below.

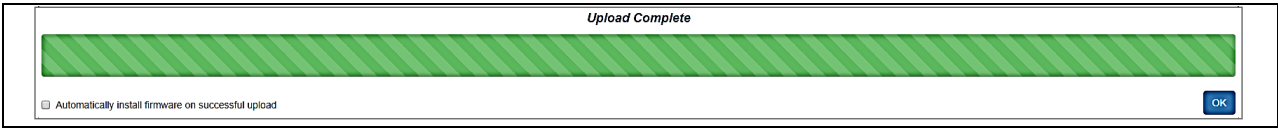


Figure 10-12. Upload Complete Message

- 11

Click on

OK

To manually install the firmware to the radio:

- 12

Click on the install icon

⬆️

 next to the Area into which the firmware was uploaded (Figure 10-8).

A message is shown (Figure 10-13 below).

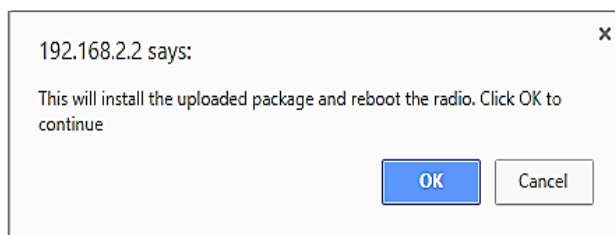


Figure 10-13. Firmware Install Request

- 13 Click on 

An Install Progress bar is shown.

When complete the radio will reboot and the web server will disconnect. It will reconnect automatically dependent on browser settings. If not, refresh the web page after a minute.

To check that the firmware has been installed correctly:

- 14 When the web server reconnects, click on  and then 
- 15 Click on  or  to see the file uploaded earlier (Figure 10-14 below).



Figure 10-14. Stored Firmware Details

- 16 Check the payload_pcin of the file against the part number of the file listed under Operating Firmware Details. If the part numbers match, the Firmware has been installed successfully.

10.4.3.2 How to Escalate a BIT Status Message.

To escalate a BIT Status Message, ambient temperature is shown as an example:

- 1 On the web server, click on **Settings▼** and then **BIT Escalate**
- 2 Next to the required setting (Ambient Temperature in this example), check the Escalated box. The Update button will change color from green to orange (Figure 10-15 below).

Settings - BIT Escalate		
Setting Name	Value	Update Setting
AC	☒ Normal ☐ Escalated	<button>Update</button>
DC Supply (V)	☒ Normal ☐ Escalated	<button>Update</button>
Ambient Temperature (°C)	☐ Normal ☒ Escalated	<button>Update</button>
Fan	☒ Normal ☐ Escalated	<button>Update</button>
Degraded Performance	☒ Normal ☐ Escalated	<button>Update</button>
VSWR	☒ Normal ☐ Escalated	<button>Update</button>
Reduced Power	☒ Normal ☐ Escalated	<button>Update</button>
Amplifier	☒ Normal ☐ Escalated	<button>Update</button>
System	☒ Normal ☐ Escalated	<button>Update</button>

Figure 10-15. BIT Escalate Screen Image

- 3 Click on **Update**

When the setting updates, the new value will show and the Update Setting field will illuminate green as depicted in Figure 10-16 below.

Ambient Temperature (°C)

☐ Normal ☒ Escalated

Update

Figure 10-16. BIT escalation Confirmation

If the relevant escalated BIT Status Message is triggered, the radio front panel and web server will show NO SERVICE.

10.4.3.3 How to Clear BIT History.

- 1 On the web server, click on **Information▼** and then **System**
- 2 Click on **Clear BIT History** A message is presented as shown in Figure 10-17 below.

192.168.2.5 says:

WARNING! This will clear the current BIT history. Are you sure?

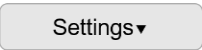
OK

Cancel

Figure 10-17. Clear BIT History Message

- 3 Click on **OK**
The Action field will show **Clearing** and, when BIT history is cleared, **Clear BIT History**

10.4.3.4 How to Store a Preset.

- 1 On the web server, click on  and then .
- 2 Go to the required preset and enter the channel designation in the Value box.
- 3 Click on .

The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green (Figure 10-18).

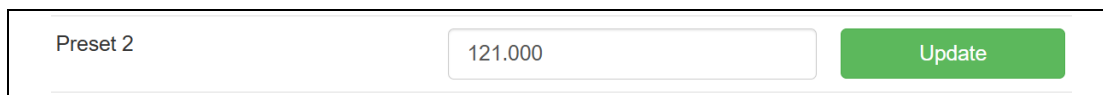
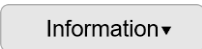
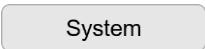
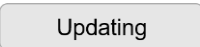


Figure 10-18. Preset Update Confirmation

10.4.3.5 How to Set a Front Panel HMI (Display) Lock.

- 1 On the web server, click on  and then .
- 2 Go to the Front Panel HMI Lock setting and check the 'On' box.
- 3 Click on .

The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green (Figure 10-19).

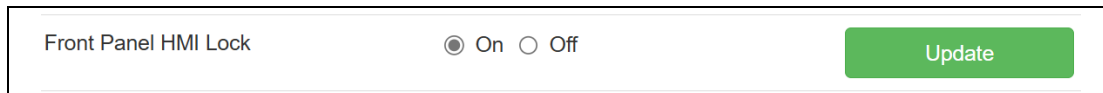
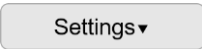
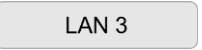


Figure 10-19. HMI (Display) Lock Confirmation

When the lock is set, the front panel of the radio has limited functionality, see 3.3.8 Front Panel HMI (Display) Lock.

10.4.3.6 How to Disable Functions on a LAN Port.

- 1 On the web server, click on  and then .
- 2 Select ,  or  as applicable.
- 3 Go to the Web Server, or SNMP setting
- 4 Click on .
- 5 Click on .

The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green (Figure 10-20).

Setting Name	Value	Update Setting
Web Server	☐ Enable ☒ Disable	Update
SNMP	☐ Enable ☒ Disable	Update

Figure 10-20. LAN Port Disable Functions Confirmation

When a function is disabled, the corresponding port(s) cannot be used to write to or read from the function’s data.

NOTE: Web Server cannot be disabled on the LAN 3 port. The web server must be accessible from at least one port. To enable functions on a LAN port, follow the above instructions but in step 4 check ‘Enable’ button.

10.4.3.7 How to Export Radio Settings.

- 1 On the web server, click on

Information▼

 and then

Import/Export
- 2 Click on

Export Configuration
- An .xml file of the radio settings will be downloaded to the default download area.

10.4.3.8 How to Import Radio Settings.

- 1 On the web server, click on

Information▼

 and then

Import/Export
- 2 Click on

Choose File
- 3 Go to and select the settings file.
- 4 Click on

Import Configuration
- An Upload Progress bar is shown (Figure 10-21).

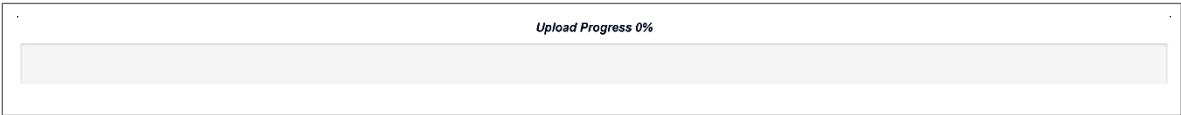


Figure 10-21. Import Radio Settings Progress Screen

When the upload is complete, a message is shown (Figure 10-22).

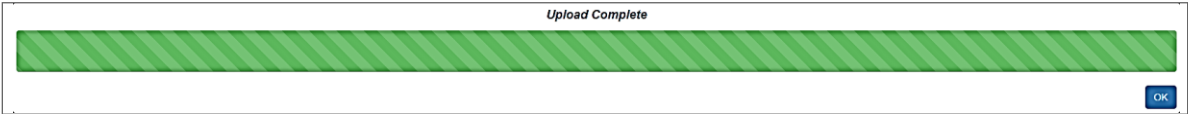


Figure 10-22. Import Radio Settings Completion Screen

- 5 Click on

OK

10.4.3.9 How to Set User Text.

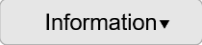
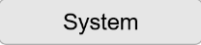
- 1 On the web server, click on  and then .
- 2 Enter the required text in the User Text setting Value box (Figure 10-23).



Figure 10-23. User Text Setting Screen

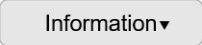
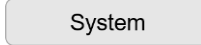
- 3 Click on .

When the User Text updates, the text will show and the Update Setting field will illuminate green.

The text will be shown on the front panel of the radio. To find the User Text, see subparagraph 3.3.7 Information.

NOTE: If the text entered is longer than twenty characters it will be rejected by the radio and the text will not update.

10.4.3.10 How to Change the Web Server Password.

- 1 On the web server, click on  and then .
- 2 Go to the System Actions/Admin Password setting.
- 3 Click on .

A Change Password dialog box will appear (Figure 10-24).

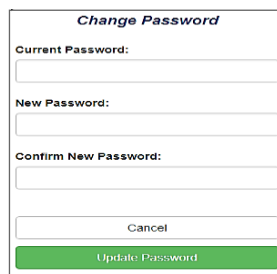
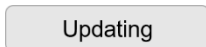


Figure 10-24. Change Password Dialog Box

- 4 Enter the current password, a new password and confirm the new password.
- 5 Click on .

The box will show



When complete, a dialog box will appear (Figure 10-25).

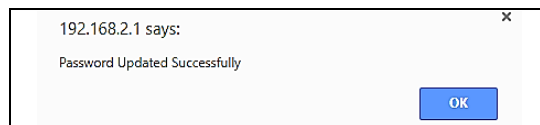
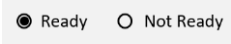


Figure 10-25. Password Update Confirmation

- 6 Click on .

10.4.3.11 How to Change the Service Status Output.

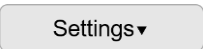
- 1 On the web server, click on  and then .
- 2 Go to the Service Status Output setting.
- 3 Click on .
- 4 Click on .

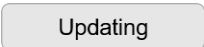
The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green.

- 5 Return to the web server home page.

10.4.3.12 How to Change the Ready Output on Reduced Service.

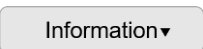
- 1 On the web server, click on  and then .
- 2 Go to the Ready Output on Reduced Service setting.
- 3 Click on .
- 4 Click on .

The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green.

- 5 Return to the web server home page.

10.4.3.13 How to Export SNMP MIBs.

- 1 On the web server, click on  and then .
- 2 Go to the Export SNMP MIBs.
- 3 Click on .

The MIB files are exported as a ZIP file and downloaded to the default download directory, as configured in the current web browser.

- 4 Extract the required MIB files and place them into an “SNMP” manager folder.
- 5 Close the separate MIB files screen.
- 6 Minimize the information folder.
- 7 Return to the web server home page.

NOTE: The T6F radios support both the ED-137/5C MIB as well as its own MIB which allows configuration and monitoring of parameters not available via ED-137/5C. The ED-137/5C MIB definition is the commercial property of EUROCAE and as such must be obtained directly from them. The bespoke T6F MIB definitions are stored within the radio and available for the user to download via the MDT by the process described above.

10.4.3.14 How to Configure Syslog.

- 1 On the web server, click on **Settings▼** and then **Syslog**
- 2 Go to the Local Syslog Enable setting.
- 3 Click on **Ready** ☒ **Not Ready** ☐
- 4 Click on **Update**
The Update Setting field will show **Updating**
When the setting updates, the new value will show and the Update Setting field will illuminate green.
- 5 To activate Remote Server 1 and/or Remote Server 2 repeat steps 3 to 4.
- 6 To test event logging, click on **Send Test Message**
- 7 Return to the web server home page.

NOTE: The typical Server Port setting for User Datagram Protocol (UDP) is 514 and for Transmission Control Protocol (TCP) it is 601.

10.4.3.15 How to View and Export the Local System Log.

- 1 On the web server, click on **Status▼** and then **Local System Log**
Logged events are shown on the screen.
- 2 Click on **Export Local Log 1**
The log files are exported as a text file and downloaded to the default download directory, as configured in the current browser.
- 3 Return to the web server home page.

10.4.3.16 How to Reboot the Radio.

- 1 On the web server, click on **Information▼** and then **System**
- 2 Go to the System Actions
- 3 Click on **Reboot Radio**

A warning will be shown in a pop-up screen (Figure 10-26 below).

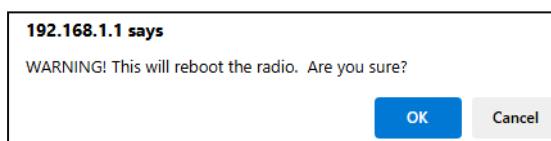
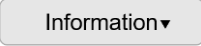
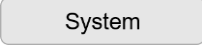


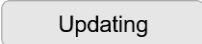
Figure 10-26. Reboot Warning Screen

- 4 Click on **OK**

The radio reboots (see subparagraph 3.3.2).

10.4.3.17 How to Customize the HMI Display Screen Information.

- 1 On the web server, click on  and then .
- 2 Go to the Front Panel HMI Lock Line 1 and/or Front Panel HMI Lock Line 2 setting.
- 3 Click on the drop-down arrow.
- 4 Choose from the drop down list the information that is to be displayed on the HMI display screen.
- 5 Click on .

The Update Setting field will show .

When the setting updates, the new value will show and the Update Setting field will illuminate green.

- 6 Return to the web server home page.

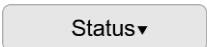
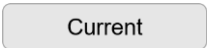
10.4.3.18 [redacted]

[redacted]

10.4.3.19 How to Measure the DC Input Voltage.

The DC voltage value is displayed on the current status page of the MDT.

To view the current Service Status of the radio:

- 1 Click on .
- 2 Click on .

The current status of the radio is shown. See subparagraph 10.4.1.2 for screen shot image.

10.4.3.20 How to Set and Trim the RF Output Power

The main power setting mechanisms (by FPC and MDT) set the power level to an integral number of watts. If the measured output power does not match the setting, or a non-integral wattage is required, it is possible to ‘trim’ the power in approximately 0.1 W steps from the MDT, as follows:

- 1 Select Settings/ AM Voice/ Transmit.
The following lines appear on the screen (Figure 10-27 below)

TX Power Mode	☐ High ☒ Low	Update
RF Power (Watts)	2	Update
RF Power Trim (Watts)	0.0	Update

Figure 10-27. MDT RF Output Power Settings

- 2 Alter the Power and trim parameters as required.
The color of the Update button(s) will change from green to amber.
- 3 Click on the amber update button(s).
The update will be made, and the color of the Update button will revert to green.

10.4.3.21 How to Set and Trim the Audio Line In Level

The main Audio Line In level setting mechanisms (by FPC and MDT) set the level to an integral number of dBm. If the measured Audio Line In level does not match the setting, or a non-integral level is required, it is possible to ‘trim’ the level in approximately 0.1 dB steps from the MDT, as follows:

- 1 Select Settings/ AM Voice/ Transmit
- 2 Scroll until the following lines show on the screen (Figure 10-28 below)

Audio Line In Level (dBm)	-13	Update
Audio Line In Level Trim (dB)	0.0	Update

Figure 10-28. Audio Line In Level

- 3 Alter the Audio Line In level and trim parameters as required.
The color of the Update button(s) will change from green to amber.
- 4 Click on the amber update button(s).
The update will be made, and the color of the Update button(s) will revert to green.

10.4.3.22 How to Set and Amend the Modulation Depth

If the depth of modulation needs setting or changing from the MDT:

- 1 Select Settings/ AM Voice/ Transmit.
The following line appears on the screen (Figure 10-29 below)

Modulation Depth (%)	95	Update
----------------------	---------------------------------	---------------------------------------

Figure 10-29. Modulation Depth Setting

- 2 Alter the modulation parameter as required.
The color of the Update button will change from green to amber.
- 3 Click on the amber update button.
The update will be made, and the color of the Update button will revert to green.

SECTION 11 TROUBLESHOOTING SUPPORT DATA

11.1 INTRODUCTION.

This section describes alarm conditions and provides a troubleshooting guide.

The T6F radios monitor and report status and fault conditions.

11.2 ALARM INDICATIONS.

Alarm conditions are reported to the front panel of the radio (see subparagraph 11.2.1 below) and the LAN ports (see subparagraph 11.2.2 below).

11.2.1 Status Message Procedure.

If the Status Indicator (the ring of light around the rotary/push switch) is steady yellow, flashing yellow, or steady red, read the message on the front panel display and refer to Table 11-1 below for possible reasons.

Table 11-1. Status (Alarm) Messages

Message	Possible Cause
AC Supply	AC supply failed/disconnected
DC Supply	DC supply less than minimum DC voltage level DC supply failed/disconnected
VSWR	VSWR too high
Ambient Temp	Ambient temperature too high
System	Active communication is lost
Fan	Internal fan failure
Radio Health	Integral radio failure

Remedial actions are suggested in paragraph 11.6 Troubleshooting.

11.2.2 **Radio Health.**

An internal radio failure is shown on an MDT. With access to the radio's web server, the Radio Health messages as detailed in Table 11-2 below may be shown.

Table 11-2. Radio Health Messages

Radio Health message	Description
Degraded Performance	An internal control system parameter may not be to specification.
Reduced Power	Transmit power has been automatically reduced by more than 3 dB due to one or more internal or external faults.
Power Removed	Transmit power has been automatically reduced to zero due to one or more internal or external faults.
Not On Frequency	An internal fault prevents the radio locking to the selected frequency.
Not Calibrated	Valid calibration data is not detected.
Internal Fault	Detection of an internal fault (radio)

If an internal radio failure clears, the radio health message clears.

Make sure that radio failure is not due to an external failure, for example, antenna circuit VSWR.

If the internal fault condition is still shown, replace the radio and return it to Indra for repair.

- NOTE:**
- (1) A radio whose Service Status changes to No Service, automatically becomes Inactive. The faulty radio drops its SIP session in accordance with ED-137.
 - (2) Radio operation is inhibited when the radio is Inactive.

11.2.3 How to access the web server.

Paragraph 10.4 provides details to access the web server.

Menus and sub-menus are selected by clicking on the appropriate buttons at the left-hand side of the screen.

As an example, the Information/System screen is shown in Figure 11-1 below.

Information - System

Setting Name	Value	Update Setting
Model	T6-TV-F	
Front Panel HMI Lock	☐ On ☒ Off	<button>Update</button>
Front Panel HMI Lock Line 1	None	<button>Update</button>
Front Panel HMI Lock Line 2	None	<button>Update</button>
User Text		<button>Update</button>
Equipment	24-94635951/2	
Serial Number	219809	
Boot Installed	65-00000843/1/REL	
Firmware Installed	65-00000919/1.1.0-rc4	
Firmware Installed	65-00000812/3/REL	
Firmware Installed	65-00000920/1.2.1	

System Actions:

Information	Action
Reboot Radio	<button>Reboot Radio</button>
Clear BIT History	<button>Clear BIT History</button>
Admin Password	<button>Change Password</button>
Identify Radio	<button>Identify Radio</button>

Figure 11-1. MDT Information/System Display

11.3 CONTROLS AND INDICATORS.

Refer to paragraph 3.2.

11.4 TURN-ON AND CHECKOUT.

Refer to paragraph 3.3.

11.5 REMOTE MONITORING AND CONTROL.

Refer to paragraph 10.4.

11.6 TROUBLESHOOTING.

Table 11-3 below provides a troubleshooting guide.

Table 11-3. Troubleshooting Guide

Symptom	Possible cause	Remedial Action
Radio does not power up.	Power cables not connected.	Connect AC/DC power cables.
	Fuse(s) failed.	Check AC/DC fuse(s) and replace if necessary.
	Power cables failed	Check AC/DC voltages with DMM
	Power to rack has failed.	Check rack power supply and rectify if necessary.
	Radio is damaged/faulty	Replace radio.
Status indicator ring on rotary / push switch on front panel is illuminated yellow or red.	Fault with radio or reduced service indication.	Select the Syslog file / Radio History information (see subparagraph 10.4.3.15).
Reduced Service Indication - VSWR alarm.	Antenna path, load, filter, and/or coaxial cables connectors.	Check coaxial cable, any filtering in the system (including tuning), or the antenna. Check using procedure detailed in subparagraph 9.4.1.10.
Reduced Service Indication - High Temperature. Ambient Temperature alarm.	Environmental conditions or radio fault.	Measure the local environment temperature. Compare with environmental conditions (subparagraph 1.4.4). Make sure the cabinet cooling operates: • Is the Fan status message shown? • Check if the fan is rotating. If it is not rotating, replace radio.
Reduced Service Indication - Ethernet disconnected or network failure.	Network failure, incorrect configuration, or radio fault.	Using command prompt from a PC on the network, ping the radio IP address. If the radio responds to ping requests, connect to the radio webserver, check the Syslog file radio history information (see subparagraph 10.4.3.15). If the radio does not respond to ping requests there may be a network issue or radio fault. This will need to be investigated locally to the radio.
System alarm	Active communication is lost	Make sure that other system equipment is correctly connected.
Radio Health alarm	Integral radio failure	See subparagraph 11.2.2 Radio Health.
Low RF output power	Power mode set to LOW (2 – 17 W) when it should be HIGH (17 – 50 W)	Set TX Power Mode to HIGH – from front panel select Menu/Settings/TX Power Mode and scroll to HIGH.
	If in the correct power mode, RF Power setting may be incorrect.	Set RF Power to correct value – from front panel select Menu/Settings/RF Power and scroll to required power level.
Cannot measure Reference Frequency, even though frequency counter connected to Reference Monitor port.	Reference setting not selected.	Refer to subparagraph 7.2.1.

Symptom	Possible cause	Remedial Action
MDT not working via LAN 3 port.	Incompatible web address	Set correct IP address using front panel (subparagraph 3.3.4).
	Faulty MDT connection	Use a different MDT cable. If that works, original cable was faulty. If it does not work with new cable, try using MDT on LAN 1 or LAN 2: If it works, fault with LAN 3 port; replace radio. If it does not work, try another MDT.
	Fault with MDT.	Try another MDT.
	Fault with radio	Replace radio.

This page is intentionally blank.

APPENDIX A SECOND LEVEL SUPPORT AND WARRANTY SERVICE

This appendix outlines the procedures for support and warranty repair of T6F radios.

A.1 Second-Level Engineering Support Contact Information.

Second level engineering assistance for T6F radios is provided by the NAS Communications Team, AJW-153. Contact the air-to-ground field support team using the following telephone numbers.

This support is available 24 hours a day, seven days a week.

(405) 954-0066: 0800 – 1600, Monday through Friday, Central Time

(866) 432-2622: All other days and times (on duty for Emergencies Only)

A.2 Warranty Service Procedure.

The T6F UHF and VHF radios are covered by warranty. The warranty expiration date is shown on a label attached to the front of the radio.

NOTE: Removing the radio cover will void the warranty resulting in delays in repair and additional expense. This equipment is not to be opened without prior authorization.

Warranty service procedures are as follows:

- 1 Site With Failed LRU:
 - Place order for LRU replacement through the Logistics Center Support System (LCSS).
 - Go to the LCSS portal (<https://lcss.faa.gov>)
 - Follow the ordering procedures provided on the website

NOTE: If you do not have access to LCSS or have issues placing an order, call the Customer Care Center (405) 954-3793 for assistance.

- 2 FAA Logistics Center (FAALC):
 - Ship serviceable LRU to site.
- 3 Site with failed LRU:
 - Print out the shipping label(s) and any additional paperwork.
 - Return the repairable asset to FAALC.

CAUTION

CAUTION: Pack the repairable asset in the shipping container that the replacement unit was received in using the original packing material to ensure a safe return to FAALC.

- 4 Indra:
 - If all information is in order, repair failed LRU and return serviceable unit to the FAALC.
 - If returned LRU is found to be out of warranty, contact the FAALC to discuss item.

This page is intentionally blank.

APPENDIX B GLOSSARY AND ABBREVIATIONS

Glossary of Abbreviations, Acronyms and Technical Terms

%	percent (parts per hundred)
°C	Degrees Celsius: a measure of temperature
°F	Degrees Fahrenheit: a measure of temperature
4-wire E&M	Analog transmit and receive audio with squelch and PTT signaling
A	Ampere(s): measure of electrical current flow
A/G	Air/Ground
A3E	Radio emission designation: Double-sideband amplitude modulation, single channel, telephony
AC	Alternating Current
Active	The radio is operationally active (IP RRC terminology)
ADC	Analog to Digital Converter
[redacted]	[redacted]
AFSS	Automated Flight Service Stations
AGC	Automatic Gain Control
AIC	Ampere Interrupting Capacity: the rating of a protective device, such as a fuse or circuit breaker; indicates the maximum fault current it can safely interrupt. It is measured in Amps RMS Symmetrical and represents the current level up to which the device can operate without causing damage to equipment or personnel.
ALC	Automatic Level Control
AM	Amplitude Modulation: the amplitude of the carrier is modulated by the amplitude of the audio signal.
ARM	Advanced RISC Machine
ARP	Address Resolution Protocol
ATC	Air Traffic Control: the primary purpose of ATC is to prevent collisions, organize and expedite the flow of traffic in the air, and provide information and other support for pilots.
ATM	Air Traffic Management: aims at ensuring the safe and efficient flow of air traffic.[1] It encompasses three types of services: • air traffic services including air traffic control (ATC), air traffic advisory services, flight information services and alerting services, • airspace management, the purpose of which is to allocate air routes, zones, flight levels to different airspace users and the airspace structure, and • air traffic flow and capacity management consisting in regulating the flow of aircraft as efficiently as possible to avoid congestion in airspace and airports.
ATR	Antenna Transfer Relay: a relay within the T6F transmitter to switch RF signals to/from the radio antenna.
BIT	Built-In-Test: self-testing capability built into the radio.
BNC	Bayonet Neill-Concelman (connector)
[redacted]	[redacted]
Carrier offset	See Offset carrier.
Chromium	Chromium is an open-source web browser project developed by Google that serves as the foundation for many popular browsers, including Google Chrome, Microsoft Edge, and Opera. It's a core technology designed to create a safer, faster, and more stable way to experience the web. Chromium's open-source nature allows for continuous development and customization, leading to a more agile and secure browsing experience.
CMA180	Communications service monitor manufactured by Rohde & Schwarz.
CPLD	Complex Programmable Logic Device
CSM	Communications System Monitor; for example, Rohde & Schwarz CMA180 or equivalent.
CW	Continuous wave
DAC	Digital to Analog Converter
dB	Decibel: a relative unit of measurement usually of electrical signal, but also of audio volume. It expresses the ratio of two values of a power on a logarithmic scale. When expressing a power ratio,

	a change in power by a factor of 10 corresponds to a 10 dB change in level. Half power equates to approximately a 3 dB loss.
DB15	15-pin electrical connector
dBi	Decibels relative to isotropic: a unit of measurement that describes how much power an antenna transmits in a single direction when compared to an isotropic radiator, which transmits in all directions at once. The difference between the two is called antenna gain, which is represented as a numerical value in dBi. The acronym dBi is also written out as decibels relative to isotrope, decibels relative to isotropic radiator, decibels over isotropic, decibels over isotropic antenna, decibels relative to an isotropic reference antenna and other variations.
dBm	dB relative to 1 mW
dBm0	power in decibel-milliwatts (dBm) measured at a zero-transmission level point. dBm0 is a concept used (amongst other areas) in audio/telephony processing since it allows a smooth integration of analog and digital chains.
dBr	dB relative to a specified level
DC	Direct Current
DDC	Dynamic Delay Compensation
[redacted]MD	[redacted]
DG	Default Gateway: the network node, usually a router on a TCP/IP network, that devices use to access other networks when no other routes are specified.
DMM	Digital Multimeter
DOD	Department of Defense (United States of America)
DRC	Digital Radio Control
DSB-AM	Double Sideband – Amplitude Modulation: a form of radio transmission.
DSP	Digital Signal Processor
E-BIT	External BIT signal
E1	2 Mbit/s E-carrier system frame structure (ITU-T adopted)
ED-137	Interoperability standards for VoIP ATM components: this standard is made of different independent sections (named "Volumes"), each dealing with different aspects concerning VoIP in ATM, namely radio, telephone, recording, supervision. ED137 aims at being a common standard covering all communication options and modes used by the ATM community.
ED-137C	One of the volumes of ED-137. The scope of ED-137C is to define the rules for VoIP implementations to support ATM communications and their interoperability.
EN 60068	An international standard, published by the International Electrotechnical Commission (IEC), for the environmental testing of electrotechnical products.
ESD	Electrostatic Sensitive Device, or Electrostatic Discharge, depending on context.
Ethernet	A family of wired computer networking technologies commonly used in local area networks. It was first standardized as IEEE 802.3 in 1983.
ETI	Elapsed Time Indicator: indicates the total amount of time the radio has been powered on (hours and minutes).
EU	European Union: a supranational political and economic union of 27 member states that are located primarily in Europe.
FAA	Federal Aviation Authority
FAA-E-37021	FAA Specification: Product Description requirements for NEXCOM V3 radios.
FAA-G-2100J	FAA Specification: Electronic Equipment, General Requirements
FAA-STD-025F	FAA Standard: Preparation of Interface Documentation
FAALC	FAA Logistics Center
Factory Reset	Resets the radio back to its factory default settings.
FCC	Federal Communications Commission
FET	Field-effect transistor
FFC	Flexible Flat Cable
FIR	Flight Information Region: a specified region of airspace in which a flight information service and an alerting service (ALRS) are provided. ICAO delegates which country is responsible for the operational control of a given FIR. A flight information service and an alerting service are the basic levels of air traffic service, providing information pertinent to the safe and efficient conduct of flights and alerting the different relevant authorities should an aircraft be in distress. These are available to all aircraft through an FIR.
FPC	Front Panel Control

FPGA	Field-Programable Gate Array
FRI	FAA Radio Interface: 15-way
ft	feet: a measure of distance (304.8 mm)
FTA	Facility Transmitting Authorization
G.711	Loss-less, 2:1 compression ratio audio codec
G.729	Low bandwidth, 16:1 compression ratio audio codec
GHz	GigaHertz: a measure of frequency (thousand million cycles per second)
Google Chrome	Web browser manufactured by Google LLC, an American multinational corporation and technology company focusing on online advertising, search engine technology, cloud computing, computer software, quantum computing, e-commerce, consumer electronics, and artificial intelligence
GPS	Global Positioning System
GRS	Ground Radio Station
HMI	Human Machine Interface
HTTP	Hypertext Transfer Protocol: an application layer protocol designed to transfer information between networked devices and runs on top of other layers of the network protocol stack.
[redacted]	[redacted]
Hz	Hertz: a measure of frequency.
ICAO	International Civil Aviation Organization: a United Nations agency which helps 193 countries to cooperate and share their skies to their mutual benefit.
ICB	Interconnection Board: a circuit board providing links between other modules in an electrical system.
ICD	Interface Control Document: a design document that describes the detailed, as-built implementation of the functional requirements contained in the IRD. (NAS System Engineering Manual)
IEC	International Electrotechnical Commission: a not-for-profit membership organization, whose work underpins quality infrastructure and international trade in electrical and electronic goods.
IEEE	Institute of Electrical and Electronics Engineers: an American public charity for electrical engineering, electronics engineering, and other related disciplines.
IEEE 802.3	A working group and a collection of standards defining the physical layer and data link layer's media access control (MAC) of wired Ethernet.
IF	Intermediate Frequency
Inactive	The radio is operationally inactive (IP RRC terminology)
Indra	Indra Air Traffic Inc.
Inhibit(ed)	Radio is prevented from transmitting and/or receiving by the user
Interface	A functional and physical connection at a boundary. (See the NAS System Engineering Manual.)
IP	Internet Protocol: A standard protocol designed for use in interconnected systems of packet-switched computer communication networks. It provides for transmitting blocks of data from sources to destinations, where sources and destinations are hosts identified by fixed-length addresses. The protocol also provides for fragmentation and assembly of long data blocks, if necessary, for transmission through small-packet networks.
IP Address	The Internet Protocol address assigned to hosts that identifies a host on the network for IP communication.
IPv4	Internet Procol version 4: provides 32-bit IP addresses
IPv6	Internet Procol version 6: provides 128-bit IP addresses
IRD	Interface Requirements Document: a formal document that provides FAA interface requirements between two elements, including type of interface (electrical, pneumatic, hydraulic, etc.) and the interface characteristics (functional or physical). (NAS System Engineering Manual)
kg	Kilogram(s): a measure of weight (thousand grams)
kHz	kiloHertz: a measure of frequency (thousand cycles per second)
LAN	Local Area Network: a data communication system that lies within a limited spatial area, has a specific user group and topology, and is not a public switched telecommunications network, but may be connected to one. LANs are usually restricted to relatively small areas, such as rooms, buildings, and aircraft.
lb.	pound(s) weight: a measure of weight (453.6 grams)
LCSS	Logistics Center Support System
LED	Light Emitting Diode
LO	Local Oscillator

LRU	Line replaceable Unit: the lowest level system component that the user can replace. The user cannot replace components within an LRU.
m	meter(s): a measure of length.
MAC	Media Access Control. A Media Access Control (MAC) address, sometimes referred to as a hardware or physical address, is a unique, 12-character alphanumeric attribute that is used to identify individual electronic devices on a network.
Main/standby	The radio is operationally main or standby (analog radio control terminology)
MDT	Maintenance Data Terminal: a computer used to access the web server within a T6F radio.
MDTS	Maintenance Data Terminal Software: computer application software required on an MDT to enable access to the controls of a radio. Specific MDTS is not required for the T6F radios, just a web browser.
MIL-STD-801G	See MIL-STD-801H
MIL-STD-801H	A United States Military Standard that specifies environmental tests to determine whether equipment is suitably designed to survive the conditions that it would experience throughout its service life. The standard establishes chamber test methods that replicate the effects of environments on the equipment rather than imitating the environments themselves. Although prepared specifically for U.S. military applications, the standard is often applied for commercial products as well.
NEMA	The National Electrical Manufacturers Association: an organization that forms the standards for the manufacturing of medical imaging equipment and electrical equipment in the United States of America.
MHz	MegaHertz: a measure of frequency (million cycles per second)
MIB	Management Information Base: a database used for managing the entities in a communication network. It is a critical component of the Simple Network Management Protocol (SNMP), which allows devices on a network to be monitored and controlled.
mm	Millimeter(s): a measure of length (1/1000 th of a meter).
MΩ	MegaOhm(s): a measure of electrical resistance (one million ohms).
MOSFET	Metal-oxide-semiconductor field-effect transistor
Mozilla Firefox	Web browser manufactured by the Mozilla Corporation that coordinates and integrates the development of Internet-related applications, by a global community of open-source developers, some of whom are employed by the corporation itself.
Microsoft Edge	Web browser manufactured by Microsoft Corporation, an American multinational corporation and technology conglomerate.
NAS	National Airspace System: a network of both controlled and uncontrolled airspace, both USA and oceanic. It also includes air navigation facilities, equipment and services; airports and landing areas; aeronautical charts, information and services; rules and regulations; procedures and technical information; and manpower and material.
NEXCOM	Next Generation Air/Ground Communications
NIST	National Institute of Standards and Technology (United States of America)
NTP	Network Time Protocol: an internet protocol used to synchronize with computer clock time sources in a network. It belongs to and is one of the oldest parts of the TCP/IP suite. The term NTP applies to both the protocol and the client-server programs that run on computers.
Ω	Ohm(s): a measure of electrical resistance (one volt per ampere).
Octet	A block of eight binary bits (00000000 – 11111111) usually presented in their decimal equivalent form (0 – 255) especially in an IPv4 address, e.g., 192.168.1.1.
OEM	Original Equipment Manufacturer
Off-air standard	an extremely high stability RF frequency source, for example GPS
Offset carrier	[also known as Climax operation] provides radio coverage over a large sector by a single air traffic controller via a few linked ground stations operating on the same designated channel. Bandwidth constraints limit the number of offset channels to five for a designated 25 kHz channel, and two for a designated 8.33 kHz channel.
Ohm	Unit of electrical resistance: a measure of electrical resistance (one volt per ampere).
OID	Object Identifier. It is an address used within SNMP to identify devices and their statuses.
OLED	Organic Light Emitting Diode
OMAP	Open Multimedia Applications Platform
OSI	Open Systems Interconnection: A logical structure for communications networks standardized by the International Organization for Standardization (ISO).

	NOTE: Adherence to the standard enables any OSI-compliant system to communicate with any other OSI-compliant system.
payload_pcin	Part number of radio firmware
PD	Product Description, in particular FAA-E-37021 (requirements for NEXCOM V3 radios).
PSU	Power Supply Unit
PTT	Press-to-transmit or push-to-talk
REF MON	Reference frequency monitoring socket on the front panel of a T6F radio.
RF	Radio Frequency
RF Carrier Squelch	This feature allows audio signals to be routed to the FRI connector, speaker, and headset only after a certain RF signal level threshold has been reached.
RFC1213-MIB	This memo defines the second version of the Management Information Base (MIB-II) for use with network management protocols in TCP/IP-based internets.
RH	Relative Humidity: refers to the moisture content (water vapor) of the atmosphere, expressed as a percentage of the amount of moisture that can be retained by the atmosphere (moisture-holding capacity) at a given temperature and pressure without condensation.
RJ45	8 position 8 contact (8P8C) connector
RoHS	Restriction of Hazardous Substances in Electrical and Electronic Equipment: EU rules restricting the use of hazardous substances in electrical and electronic equipment to protect the environment and public health.
RORS	Ready Output on Reduced Service
RPM	Revolutions per Minute: a measure of rotational speed.
RRC	Radio Remote Control
RSSI	Received Signal Strength Indication
RS422	Differential data signaling standard
RTP	Real-time Transport Protocol
RTSP	Real Time Streaming Protocol
Rx or RX	Receive or receiver
S/N	Signal to Noise ratio
Saf-D-Grid	Connector system as a safe appliance connector for DC power distribution in Information and Communication Technology equipment.
[redacted]	[redacted]
SINAD	(Signal plus Noise plus Distortion) to (Noise plus Distortion) ratio
SIP	Session Initiation Protocol: a signaling protocol used for initiating, maintaining, and terminating communication sessions that include voice, video and messaging applications in Internet telephony.
SLES	Second Level Engineering Support
SMA	SubMiniature version A: electrical signal connector
SNMP	Simple Network Management Protocol: a networking protocol used for the management and monitoring of network-connected devices in IP networks.
SQP	Signal Quality Parameter
[redacted]	[redacted]
[redacted]	[redacted]
Subnet Mask	The address mask that distinguishes the network ID (i.e. sub-network) from the host ID in an IP address. For IPv4, this is a 32-bit (four field 8-bit) address mask. For IPv6, this is a 128-bit (eight field 16-bit) address mask.
Syslog	Remote logging via industry standard syslog protocol
T&TE	Tools and Test Equipment
T6	Generic term for Indra Park Air ATC radio
T6-RU	Indra Park Air UHF receiver (component of T6-RU-F)
T6-RV	Indra Park Air VHF receiver (component of T6-RU-F)
T6-RU-F	FAA NEXCOM Version 3 UHF Receiver made by Indra.
T6-RV-F	FAA NEXCOM Version 3 VHF Receiver made by Indra.
T6-TU-F	FAA NEXCOM Version 3 UHF Transmitter made by Indra.
T6-TV-F	FAA NEXCOM Version 3 VHF Transmitter made by Indra.
T6F	Generic term for FAA NEXCOM Version 3 ATC radio made by Indra.
TCP	Transmission Control Protocol: one of the main protocols of the Internet protocol suite. It originated in the initial network implementation in which it complemented the Internet Protocol. Therefore, the entire suite is commonly referred to as TCP/IP. TCP provides reliable, ordered, and

	error-checked delivery of a stream of octets (bytes) between applications running on hosts communicating via an IP network. Major internet applications such as the World Wide Web, email, remote administration, and file transfer rely on TCP, which is part of the transport layer of the TCP/IP suite. [redacted]
TFPC	Transmitter Front Panel Control; the control panel on the front of a T6F transmitter.
TIB	Technical Instruction Book
[redacted]	[redacted]
Tx or TX	Transmit(ter)
U	A height dimension for equipment racks and equipment in racks (1.75 inches)
UDP	User Datagram Protocol
UHF	Ultra High Frequency: radio frequency spectrum 300 MHz to 3 GHz FAA UHF spectrum is 225 MHz to 400 MHz
URI	Uniform Resource Identifier
V	Volt: a measure of electrical potential.
V1	Version 1
V3	Version 3
VAC	Volts AC: a measure of AC voltage
VCCS	Voice Communications Control System: controls and connects various voice communication systems used for Air Traffic Management such as VHF TX/RX, telephone, and other ATC communications.
VDC	Volts DC: a measure of DC voltage
VHF	Very High Frequency: radio frequency spectrum 30 MHz to 300 MHz FAA VHF spectrum is 112 MHz to 150 MHz
VoIP	Voice over Internet Protocol: digitally encoded audio that is transmitted over an IP network.
VSWR	Voltage Standing Wave Ratio: used to indicate impedance mismatches within RF circuitry, particularly the interface between radios and antennas and, therefore, RF power losses..
W	Watt: a measure of power. (volts x amperes in a non-reactive electrical load)
ZIP	Compress multiple computer files into a single .ZIP file/folder

APPENDIX C ANTENNA RADIATION LIMITS

C.1 Health and Safety

WARNING

Antenna radiation: The transmit antenna must be installed such that the resultant radiated field strength is below national limits. The safe distance must be calculated for each installation.

United States of America

The RF power density limits according to FCC directive CFR 47 Part 2.109, are shown in Table C-1 below:

Table C-1. RF Power Density Limits

Frequency MHz	Occupational level (W/m ²)	General population level (W/m ²)
112.000 - 300.000	10.0	2.00
399.975	13.34	2.70

The general equations for Occupational level:

For 100 to 300 MHz, RF power density = 10 W/m², and

For 300 to 400 MHz, RF power density = $f/30$ W/m²

where f = frequency in MHz.

The general equations for General population level:

For 100 to 300 MHz, RF power density = 2.0 W/m² and,

For 300 to 400 MHz, RF power density = $f/150$ W/m²

where f = frequency in MHz.

Example

The safe distance from the antenna can be predicted using the equation:

$$R = \sqrt{\frac{PG}{4\pi S}}$$

where

R = distance to center of radiation in meters (m)

P = average power input to antenna in Watts (example, 50 W carrier with 95% modulation = 73 W)

G = antenna gain as a ratio (example, 2 dB = $10^{2/10} = 1.585$)

S = permissible power density in W/m² from values specified above.

Based on this formula and using a 2 dBi antenna, frequency of 118.000 MHz and a measured carrier power of 50 W, for occupational workers:

- The predicted safe distance from the center of the radiation would be 1.0 m.

For persons not classed as occupational workers, and including the public in general:

- The minimum safe distance would be 2.2 m.

NOTE: Safe distances are rounded up to the nearest 0.1 m.

This page is intentionally blank.

APPENDIX D STRUCTURED HMI MENUS (MDT)

D.1 Introduction.

This appendix tabulates the headings and subheadings presented on the MDT. The following subparagraphs are split out to match the major tabbed sections of the T6F web interface. The subparagraphs are then split further into sub-settings according to the web page on which they appear.

The MDT/Web Interface settings are presented in the Interface Control Document (ICD) attached to this TIB (TI 6600-38).

Within the web server menus help messages are presented when the cursor hovers over the menu item.

D.2 Main Menu.

The Main menu is depicted in Table D-1 below.

Table D-1. MDT Main Menu

Status
Settings
Information

D.3 Status Menu.

The Status Menu is depicted in Table D-2 below

Table D-2. MDT Status Menu

Menu Item	Items	Example Values
Current	Service Status	
	Overall Service Status (OSS)	Full Service
	Status Messages	No Messages
	Monitoring	
	AC	Connected
	DC	Not Connected
	DC Supply (V)	0.0
	Ambient Temperature (deg C)	23
	Internal Temperature (deg C)	35
	Interruptive Test	
	Forward Power (W)	
	Reflected Power (W)	
	Modulation Depth (%)	
	Elapsed Time Indication (ETI)	16412h19m
History	Log of Activity	ETI; Event; Severity; OSS
Local System Log	Local Log 1	
	Export Local Logs	

D.4 Settings Menu.

The Settings menu is depicted in Table D-3 below.

Table D-3. MDT Settings Menu

Setting	Setting Name	Example Values
Network		
LAN 1/2	Web Server	Enable/Disable
	SNMP	Enable/Disable
	MAC Address	00:15:8b:00:56:70
	IPv4	Enable/Disable
	IP Address	0.0.0.0
	Subnet Mask	0.0.0.0
	IPv6	Enable/Disable
	IP Address	::
	IPv6 Prefix	64
LAN 3	SNMP	Enable/Disable
	MAC Address	00:15:8b:00:56:72
	IPv4	Enable/Disable
	IP Address	192.168.1.1
	Subnet Mask	255.255.255.0
	IPv6	Enable/Disable
	IP Address	::
	IPv6 Prefix	64
Routing	IPv4 Default Gateway	0.0.0.0
	IPv6 Default Gateway	::
	IPv4 Static Route 1/2/3/4	
	Destination Network	
	Destination Netmask	
	Gateway	

Settings Menu continued

Setting	Setting Name	Example Values
Radio	Operating Waveform	AM Voice
	Single Channel	On/Off
	Channel	118.000
	Reference Frequency (%)	0.0 – 100.0
	Operating Preset	1 - 100
	RF Power Delay (ms)	0
	RF Switch Control	On/Off
	Service Status Output	Enable/Disable
	Active Configuration	Automatic/Manual
	Radio	Active/Inactive
	Active/Inactive Polarity	Inverted/Standard
	Ready Polarity	Inverted/Standard
	Ready Output on Reduced Service	Ready/Not Ready
	Low VSWR Threshold	1.5
	High VSWR Threshold	2.0
Presets	Preset # (1-100)	118.000
BIT Escalate	AC	Normal/Escalated
	DC Supply (V)	Normal/Escalated
	Ambient Temperature (°C)	Normal/Escalated
	Fan	Normal/Escalated
	Degraded Performance	Normal/Escalated
	VSWR	Normal/Escalated
	Reduced Power	Normal/Escalated
	Amplifier	Normal/Escalated
	System	Normal/Escalated
[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]

Setting	Setting Name	Example Values
	[redacted]	[redacted]
	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
	[redacted]	[redacted]
NTP	NTP Enable	Enable/Disable
	NTP Server 1/2/3/4 Address (IPv4/IPv6)	User text
	NTP Server 1/2/3/4 Reach	000
	NTP Synchronised	Yes/No
Syslog	Local Syslog Enable	Enable/Disable
	Remote Server 1/2	Sub menu
	Remote Syslog Enable	Enable/Disable
	Server Address (IPv4/IPv6)	User text
	Server Port	514
	Transport Protocol	TCP/UDP
	Log Radio Events	Enable/Disable
	Log Security Events	Enable/Disable
	Log Settings Changes	Enable/Disable
	Diagnostics	

Settings Menu continued

Setting	Setting Name	Example Values
AM Voice		
Universal	Volume	Loudspeaker/Headset
	Loudspeaker	On/Off
	Microphone	Active/Passive
Transmit	PTT	Keyed/Not Keyed
	PTT Source	None
	Carrier Offset (kHz)	0.0
	TX Power Mode	High/Low
	RF Power (Watts)	2
	RF Power Trim (Watts)	0.0
	Modulation Depth (%)	95
	PTT Reference Voltage (V)	8
	PTT Polarity	Inverted/Standard
	ALC	On/Off
	ALC Attack	Short
	ALC Release	Long
	Mute	On/Off
	Local PTT	Enable/Disable
	Remote PTT	Enable/Disable
	VoIP PTT	Enable/Disable
	VoIP ALC	On/Off
	VoIP Audio Gain (dB)	0
	Tone Keying	Enable/Disable
	Tone Keying Frequency (Hz)	2040
	Tone Keying Level (dB)	-10
	Transmit Timeout (seconds)	0
	Transmit Audio Delay (ms)	0
	Sidetone Volume	High/Low
	Audio Line In Level (dBm)	-13
	Audio Line In Level Trim (dB)	0.0
	Transmit Monitoring	Enable/Disable
	Local Keying Priority	Test (Lowest)
	Remote Keying Priority	Normal
	Test PTT	On/Off

Settings Menu (AM Voice) continued

Setting	Setting Name	Example Values
VoIP	LAN 1/2/3 (IPv4); LAN 1/2/3 (IPv6)	
	VoIP	Enable/Disable
	SIP Port	5060 (1 – 65535)
	Jitter Buffer (ms)	20
	Payload Size	Default (20 ms)
	Allowed URI 1-10	Up to 60 characters
	Emergency URI 1-10	Up to 60 characters
	RTP Port 1-10	Enable/Disable
	RTP Port 1-10	5002 (1 – 65535)
	Maintenance Mode	On/Off
	Preferred CODEC	G.711 (A, μ), G.729
	PTT Summation	Summation/Blocking
	Coupling PTT Summation	Summation/Blocking
	Differentiated Services (DiffServ)	Enable/Disable
	Voice Differentiated Services Code Point (DSCP)	CS0 – CS7
	Signalling Differentiated Services Code Point (DSCP)	CS0 – CS7
	URI Checking	Enable/Disable
	Link Session	Enable/Disable
	SIP Trying	Enable/Disable
	Own URI	User text
	ED-137 Version	ED-137C
Recording	Recorder Interface 1/2/3/4	Sub menu
	Enable	Enable/Disable
	URI	User text
	IP address	0.0.0.0
	SIP Port	5060 (0 – 65535)
	Remote RTSP Port	554 (0 – 65535)
	Local RTSP Port	0 (0 – 65535)
	Local Media Port	6000 (0 – 65535)
	Use SIP	Enable/Disable
	RTSP Transport	UDP/TCP
	Media Transport	UDP/TCP
	Interleaved	Enable/Disable
	Keep Alive Interval (seconds)	20 (5 – 60)
	ED-137 Version	ED-137C
	Differentiated Services (DiffServ)	Enable/Disable
	Differentiated Services Code Point (DSCP)	AF31 (011010)
	Always Connect	On/Off
	Record Non VoIP Audio	On/Off
	Record No Media	Enable/Disable
	CODEC	g.711 A-Law

D.5 Information Menu.

The Information menu is depicted in Table D-4 below.

Table D-4. MDT Information Menu

Setting	Sub-settings	
System	System Information	Displayed Information/Option
	Model	e.g., T6-RV-F
	Front Panel HMI Lock	On/Off
	Front Panel HMI Lock Line 1/2	None
	User Text	
	Equipment	e.g., 24-04635051/2
	Serial Number	e.g., 140322
	Boot Installed	e.g., 65-00000922/1.y.z-jb9
	Firmware Installed	e.g., 65-00000919/1.1.0-rc1
	Firmware Installed	e.g., 65-00000812/4/0/0
	Firmware Installed	e.g., Unknown
	System Actions:	Action Button
	Reboot Radio	Reboot Radio
	Clear BIT History	Clear BIT History
	Admin Password	Change Password
	Identify Radio	Identify Radio
Options	Enabled Options	Description
	T6-O-112-150	112 MHz – 150 MHz Frequency Range for T6 Radios
	T6-O-225-400	225 MHz – 400 MHz Frequency Range for T6 Radios
	T6-O-AMV	AM-Voice Waveform for T6 Radios
	T6-O-50W	50 W Maximum Power Output for T6 Radios
	T6-O-G729	G.729 VoIP Compression Codec
Firmware	Operating Firmware Details	Displayed Information
	Firmware	e.g., 65-00000919/1.1.0-rc4
	Stored Firmware Details	
	Area 1	
	Area 2	
Import/Export	Options	Action Button
	Import Configuration from file	Import Configuration
	Export Configuration from file	Export Configuration
	Export SNMP MIBs	Export MIBs
	Export Local Logs	Export Local Log 1

This page is intentionally blank.

APPENDIX E STRUCTURED HMI MENUS (TFPC)
E.1 Introduction.

This appendix tabulates the menus and sub-menus presented on the TFPC display.

E.2 Status Menu.

The Status menu is depicted in Table E-1 below.

Table E-1. TFPC Status Menu

Menu Item	Sub-Menu Item	Description/Options
FULL SERVICE		Radio is fully operative
Status Messages		Messages are displayed only when there is reduced service
Monitoring	ETI	Estimated Time Indication
	AC	Connected/Not Connected
	DC	Connected/Not Connected
	DC Supply	Measured DC voltage
	Ambient Temp	Temperature in °C
	Internal Temp	Temperature in °C
Interruptive Test		Press rotary/push switch to execute interruptive test
Status Reset		Press rotary/push switch to reset Status

E.3 Settings Menu.

The Settings menu is depicted in Table E-2 below.

Table E-2. TFPC Settings Menu

Menu Item	Example Values	Description/Options
Volume	LOUDSPEAKER	LOUDSPEAKER or HEADSET
Loudspeaker	ON	ON or OFF
HMI Brightness	HIGH	HIGH or LOW
Channel	118.000	ICAO channel number
Preset	15	1 to 100
Step	25 kHz	25 kHz or 8.33 kHz (VHF) 25 kHz or 12.5 kHz (UHF)
Reference	61.2 %	Adjust until Reference Frequency is within tolerance
Offset	0.0 kHz	±8, ±7.5, ±7.3, ±5, 4, ±2.5, 0
TX Power Mode	LOW	LOW (2 – 17 W) or HIGH (17 – 50 W)
RF Power	2 W	2 to 50 W dependent on TX Power Mode
Mod Depth	95 %	5 to 95 %
ALC	ON	ON or OFF
Mute	ON	ON or OFF
Mic	PASSIVE	ACTIVE or PASSIVE
Sidetone	LOW	LOW or HIGH
Line In	-13 dBm	-30 to -10 dBm
Radio	ACTIVE	ACTIVE or INACTIVE
Active	AUTO	AUTO or MANUAL
RF Switch Ctrl	OFF	ON or OFF
IP1	0.0.0.0	IP1 address
NM1	0.0.0.0	IP1 Mask
IP2	0.0.0.0	IP2 address
NM2	0.0.0.0	IP2 Mask
IP3	192.168.1.1	IP3 address
NM3	255.255.255.0	IP3 Mask
DG	0.0.0.0	Default Gateway IP address
SIP1 PORT	05060	SIP1 PORT Number
SIP2 PORT	05060	SIP2 PORT Number
SIP3 PORT	05060	SIP3 PORT Number

E.4 Information Menu.

The Information menu is depicted in Table E-3 below.

Table E-3. TFPC Information Menu

Menu Item	Example Display
Model	T6-RV-F 24 24-03610031/1
Serial Number	140322
Option Installed	T6-O-112-150 (VHF) T6-O-225-400 (UHF)
Option Installed	T6-O-AMV
Option Installed	T6-O-50W
Option Installed	T6-O-G729
Boot Installed	65-00000843/1
Firmware Installed	65-00000919 1.1.0-rc1
Firmware Installed	65-00000812/4.0.0
Firmware Installed	Unknown
LAN 1 MAC	00:15:8b:01.19.fb
LAN 2 MAC	00:15:8b: 01.19.fc
LAN 3 MAC	00:15:8b: 01.19.fbd
User Text	

This page is intentionally blank.

APPENDIX F INTERFACE CONTROL DOCUMENT (ICD)

An ICD has been developed for the T6F radio / MDT interface, in accordance with FAA standard FAA-STD-025F, which states:

The MDT interface(s) **shall** be defined in a contractor developed Interface Control Document (ICD) prepared in accordance with FAA-STD-025F that, at a minimum, includes the following: Interface connection protocols, MDTS and Radio MIB parameter details (e.g., radio command/query/monitoring parameter syntax), addressing protocols, error checking protocols, built-in error messages and all radio generated error codes.

This ICD describes the connectivity to, and functions of, the web server that is incorporated into all versions of the Indra T6F radios (T6-RU-F, T6-RV-F, T6-TU-F, and T6-TV-F).

Included within the ICD is the Indra Park Air Management Information Base (MIB).

The MIB can be downloaded from the radio as described in subsection 10.4.3.13.

The ICD is appended to this TIB (TI 6600.39).

This page is intentionally blank.