

5.12. RF EXPOSURE REQUIRMENTS [§§ 1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.12.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

- (1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
- (2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
- (3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
- (4) Any other RF exposure related issues that may affect MPE compliance

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All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Calculation Method of RF Safety Distance:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2} = \frac{EIRP}{4 \cdot \pi \cdot r^2}$$

Where:
P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.12.2. RF Evaluation

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	Compliance with FCC Rules
Minimum calculated separation distance between antenna and persons required: *89.4 cm	Manufacturer' instruction for separation distance between antenna and persons required: 90 cm
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to User's Manual for RF Exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

RF EXPOSURE DISTANCE LIMITS

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}} = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}}$$

S = 0.2 mW/cm²

G = Maximum Gain of External Antenna = 3 dBi

EIRP = 40.03 + 3.0 = 43.03 dBm = 10^{43.03/10} mW = 20090.9 mW (Worst Case)

$$(\text{Minimum Safe Distance, } r) = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}} = \sqrt{\frac{20090.9}{4 \cdot \pi \cdot (0.2)}} \approx 89.41 \text{ cm}$$

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NOTES

ESD CAUTION



This unit contains static sensitive devices. Wear a grounded wrist strap and/or conductive gloves when handling printed circuit boards.

FCC COMPLIANCE INFORMATION

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/her own expense.

Do not use the TFM-550 in the frequency band 406.0 MHz – 406.1 MHz. This frequency band reserved for distress beacons.

WARNING: For compliance with FCC RF Exposure Requirements, the mobile transmitter antenna installation shall comply with the following conditions:

1. The transmitter antenna gain shall not exceed 3 dBi.
2. The transmitter antenna is required to be located outside of a vehicle and kept at a separation distance of 90 cm or more between the transmitter antenna of this device and persons during operation.

WARNING AND DISCLAIMER

Changes or modifications not expressly approved by Technisonic Industries could void the user's authority to operate the equipment.

This manual is designed to provide information about the TFM-550. Every effort has been made to make this manual as complete and accurate as possible.

WARRANTY INFORMATION

The Model TFM-550 Transceivers are under warranty for one year from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

Technisonic Industries Limited
240 Traders Boulevard
Mississauga, Ontario L4Z 1W7

Tel: (905) 890-2113
Fax: (905) 890-5338

SECTION 3 – INSTALLATION INSTRUCTIONS

3.1 GENERAL

This section contains information and instructions for the correct installation of the TFM-550, VHF/FM Transceiver.

Make certain that the correct frequencies are pre-programmed in accordance with the equipment user's valid FCC operator's license, prior to installation.

3.2 EQUIPMENT PACKING LOG

Unpack the equipment and check for any damage that may have occurred during transit. Save the original shipping container for returns due to damage or warranty claims. Check that each item on the packing slip has been shipped in the container. Verify that the equipment display and backlighting configuration are the same as those ordered.

3.3 TRANSCEIVER INSTALLATION

The TFM-550 Transceiver is designed to be Dzus mounted and should be installed in conjunction with an IN-550 installation kit. See Figure 3-1a for an outline drawing of the unit with dimensions to facilitate the installation.

3.4 INSTALLATION KIT - CONTENTS

The IN-550 installation kit consists of:

1. One 15 pin Cannon D mating connector (female) complete with crimp pins and hood.
2. One 9 pin Cannon D mating connector (male) complete with crimp pins and hood.
3. Three BNC antenna mating RF connectors (male).

3.5 ANTENNA INSTALLATION

Antenna, Comant P/N CI-292-3 or suitable equivalent, may be utilized for VHF. Antenna, Comant P/N CI-275 or suitable equivalent, may be utilized for UHF and the Foxtronics model FLX-3050B antenna/tuning system or Sensor Systems P/N S65-8282-34 may be utilized for the VLO band. A suitable whip antenna cut for a specific VLO frequency may also be used. The antenna gain for any band may not exceed a maximum gain of 3 dBi. The antenna should be mounted on the bottom of the aircraft whenever possible and must be located at least 90 cm (36 inches) from any occupant in the airframe. Consult with instructions provided with the antennas. Connect RF cables from antennas to the back of the TFM-550 unit by utilizing the BNC mating connector provided in the installation kit. The VHF Low band (top) and UHF (middle) BNC connectors are located on the rear, above the 15 pin D connector and the VHF high band BNC connector is below the 9 pin D. If an external antenna tuner (ATU) is to be used, the ATC-550 (P/N 991102-1) will have to be utilized to control it. The ATC-550 is an external box to the TFM-550. See Figure 3-1b.

3.6 INSTALLATION - PIN LOCATIONS AND CONNECTIONS

The pin numbers and locations for the 15 pin and 9 pin Cannon D located on the rear of the TFM-550 transceiver are shown below. Pin connections are listed in TABLES 3-1 and 3-2.



FIGURE 3 Transceiver mounted view of 15 pin female and 9 pin male connector