



FM-TX-4000 Mini Series Owner's Manual

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SAFETY NOTICES

- 1. THIS DEVICE IS FOR PART 90 LICENSED OR EXPORT USE ONLY. Equipment may be operated only with a Part 90 license issued by the FCC. The user is responsible for operating the equipment in compliance with FCC rules. Operation of this equipment without a valid FCC license could result in the issuance of fines to the user, or the seizure of the equipment.**
- 2. This product is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. This device is not authorized for general population, consumer or any other use.**
- 3. This is NOT an intrinsically safe device. Do not take into area where intrinsic safety is required. Bodily harm may result if warning is ignored.**

4. **DURING INSTALLATION, DO NOT OPERATE TRANSMITTER WITHOUT ANTENNA CONNECTED TO ANTENNA PORT.** Failure to do so will result in damage to the unit and void the warranty.
5. **The transmitter is FCC approved under FCC ID: OPH-MINITX4000.** Changes or modifications not expressly approved by K&A Wireless, LLC will void the user's authority to operate the equipment.
6. **This product must be professionally installed.** Additional installation instructions will be provided to professional installers to insure compliance with RF exposure requirements and must be for occupational use only and cannot be used in public applications.
7. **The radio and its antenna is required to be mounted and kept at least 20 cm away from any part of the user's torso or head and must not be co-located or operating in conjunction with any other antenna or transmitter.**
8. **In host devices where the distance between the antenna and the body of the user is equal to or less than 20 cm, the device must be evaluated using specific FCC and Industry Canada test procedures for SAR and requires separate approval. Users are required to consult with K&A Wireless LLC for all portable installations.**

The modular transmitter must have buffered modulation/data inputs (if such inputs are provided) to ensure that the module will comply with part 15 requirements under conditions of excessive data rates or over-modulation. Modular TX uses Analog Frequency Modulation. It requires the modulation video signal to be limited to 1Vpp. This is clearly noted in the Users Manual.

The modular transmitter must have its own power supply regulation. Modular TX contains a power regulator for most of the circuitry. However the RF Power Amplifier receives voltage directly from the input. The input voltage is required to be between 3 and 5Vdc and the RF PA, would stop operating if 6V or higher are connected to it (Datasheet attached). The operating voltage is clearly noted in the Users Manual.

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

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

FCC NOTICE

The equipment has been tested and found to comply with the limits of a CLASS B device pursuant to PART 15 of the FCC

Rules. These limits are designed to provide reasonable protection against harmful interference.

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.

Emission designator for the FM-TX-4000 Mini series transmitter unit is: 13M7F3F.

The transmitter label is shown below. Please confirm that the label on the transmitter is conforms to the label shown. Any transmitters having a non-conforming label will be in violation of the license.

If the FCC ID label is not visible from outside the host device, then an additional label is required on the outside of the host device stating 'Contains FCC ID: OPH-MINITX4000'



Figure 1. FCC label on every FM-TX-4000 Mini series unit.

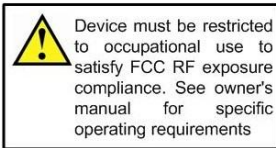
RF EXPOSURE TRAINING

This product is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC

limits. This device is not authorized for general population, consumer or any other use.

This module is approved for operation as a single modular approval under FCC Part 90. For compliance with FCC RF Exposure requirements the following requirements shall be met:

- ⤴ The module can be used with an antenna with a maximum gain of 15dBi.
- ⤴ The radio and its antenna are required to be mounted and kept at least 20 cm away from any part of the user's torso or head and must not be co-located or operating in conjunction with any other antenna or transmitter.
- ⤴ A label indicating that the module is for occupational/controlled conditions will be placed as shown in the pictures below



- ⤴ To control the end user exposure and ensure compliance of the device containing this module with the occupational/controlled environment exposure limits, always adhere to the following procedures:
 - ⤴ Place a label in a conspicuous location of the device indicating that the device is for use in occupational/controlled conditions only.
 - ⤴ Transfer this RF Exposure information, including the proximity allowed between the

transmitter and the user's body, to the manual of the final product this module is integrated in.

PARTS LIST

The FM-TX-4000 series Analog Video Transmission system comes complete with the following items:

1. FM-TX-4000 Mini series transmitter
2. Wire Dipole antenna

The transmitter operation can be confirmed by using a EV-RX-2000 series receiver unit from K&A. This receiver series displays the video images on an NTSC compatible (PAL compatible, if your camera source is PAL) monitor.

Additional accessories available through K&A Wireless:

1. Dipole antenna for receiver
2. 12-dB panel antenna for receiver
3. 5-dB vehicle-mounted antenna with magnetic base for receiver
4. 7-dB vehicle mounted antenna for receiver
5. 9-dB vehicle-mounted antenna for receiver
6. 11-dB vehicle mounted antenna for receiver

PRODUCT DESCRIPTION

The FM-TX-4000 Mini series transmitter is a two-channel analog FM, video transmitter operating in the 2.4 GHz ISM band. The FM-TX-4000 Mini series provides a cost effective

solution to long-range transmission available for industrial, government/municipality or for export applications.

The ISM band is a harmonized band and is available worldwide. In the US, however, the FM-TX-4000 Mini series transmitter is designated for PART 90 use and requires a license to be obtained by the end user.

In addition to the enhanced performance, the FM-TX-4000 Mini series provides a rudimentary security feature, which decreases the ability of unwanted parties from receiving and re-broadcasting the transmitted signal. Keep in mind that with the addition of the security feature, the receiver and transmitter will not work with off-the-shelf transmission systems.

Transmitter

The FM-TX-4000 Mini series transmitter is shown in Figure 1. The transmitter is packaged for integration inside a camera only. It has four (4) wires available - two wires (black - and red +) for power, one wire for video (yellow) and a channel change wire (blue: ground for channel 2, open for channel 1). ***The system must be installed to operate at a Minimum of 20 cm away from all persons.***



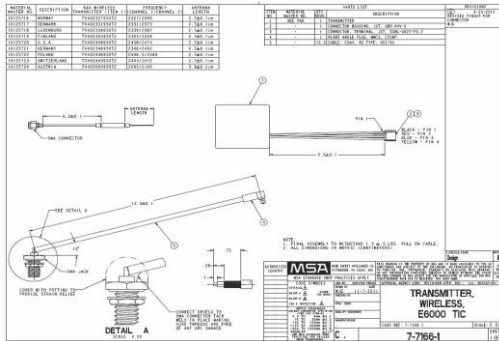


Figure 2. Photo and K&A drawing for FM-TX-4000, wire dipole antenna, and MMCX male to SMA female coax.

The transmitter is supplied with a K&A antenna (part #: TBA) to comply with FCC regulations, as shown in Figure 2. Any attempt to operate the system without an antenna or an antenna that is not approved by K&A, in writing, will result in damage to the system and will nullify any warranty and MAY VIOLATE FCC LICENSE AGREEMENT.

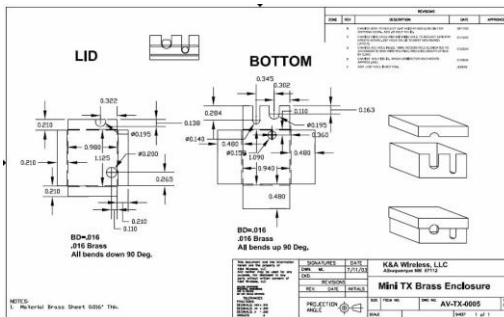


Figure 3. Brass Box drawing for FM_TX_4000

Transmitter Installation

The transmitter is designed to be integrated into your camera system. To install the transmitter, connect the red wire to the battery (or regulator output), connect the black wire to ground or the negative terminal of your battery (or regulator output).

For the video connection, you should have requested either a high-Z or low-Z video input. This is the termination setting. If a low-Z input is required (this is in cases where the camera is directly tied to the transmitter with no other connections), the transmitter will measure approximately 75ohms at the video leads. In this case, confirm that the voltage coming from the camera does not exceed 1Vp-p. **FAILURE TO DO SO WILL VIOLATE FCC LICENSE APPROVAL.**

In cases where a high-Z setting is requested, (when the camera is required to drive a monitor and a transmitter without any video buffer amplifiers in the camera), the video input on the transmitter will measure approximately 1kOhm. In this case, confirm that both the monitor (or load) is connected and the transmitter is also connected. Measure the impedance of the parallel combination and confirm that it measures approximately 75ohm. Connect the video to the camera (confirm that the yellow transmitter video wire is connected to the positive video connection on the camera). In this case, confirm that the video level at the transmitter does not exceed 1Vp-p. **FAILURE TO DO SO WILL VIOLATE FCC LICENSE APPROVAL.**

Apply power to the camera and confirm that the camera is functional.

Additional documentation may be provided for specific installations.

SPECIFICATIONS

Specifications for the FM-TX-4000 Mini SERIES

RF	
Operating Frequencies	2458 MHz Channel 1 2474 MHz Channel 2
Frequency Stability	+/- 0.005%
Output Power	10-500 mW factory set (+10 to 26.99 dBm)
Output Impedance	50 ohms MMCX Female Connector
Modulation	Direct Wideband FM
Modulation Designators	2 Channel Transmitters 13M7F3F
Spurious and Harmonics	less than 35 dBc
Video	
Formats	NTSC or PAL
Pre-Emphasis	CCIR 405-1
Frequency Response	<10 Hz to 5.5 MHz (+/-3dB)
Video Input Levels and Impedances	1 Volt Pk/Pk @75 ohms (Transmitter Terminated) 1 Volt Pk/Pk @ 6K ohms (Customer Terminated)
Distortion	Less than 2% for all types
Modulation Sense	Positive Input increases Frequency (Negative Sense Available)
Input Power	
Input Voltage	5 volts DC
Input Current	350mA @ 5 Volts DC (typical @ 500mW)

Input Power	1.75 watts nominal (500mW RF output power)
Low Battery Shutdown	Adjustable 3.0 to 5.0 Volts DC
Microprocessor ON/OFF	Open Drain/Collector (Low for Shutdown)
Environmental	
Operating Temperature	-20 to +60 C (Case Temperature)
Humidity	95% Non-Condensing
Mechanical	
Size	2.85 X 2.5 X 1.3 centimeters
Weight	1.0 Ounces
Other	
FCC ID	OPH-MINITX4000

TROUBLESHOOTING

