

R A D I O N I C S

Long Range Radio Alarm Systems

C472TX/TP & C474TX/TP RF Transmitter Modules Installation Instructions

Introduction

The C472TX and C472TP RF Transmitter Modules operate in the 450 to 470 MHz frequency band (UHF). The C474TX and C474TP RF Transmitter Modules operate in the 138 to 174 MHz frequency band (VHF). The operating frequency of the transmitter module must match the operating frequency of the RF receiver or repeater. The RF Transmitter Module can be located up to 30 miles (50 kilometers) from its associated RF receiver.*

The C601 Encoder provides the transmitter with the information and power required to transmit signals (this is output at a 2 watt level). It also supplies a transmitter keying signal, and transmission data for the C472TX, C472TP, C474TX and C474TP modules.

Each RF transmitter module outputs the RF signal to a BNC antenna cable connector. The transmitters are

designed to work into a 50 ohm load. The type of antenna used in any given installation depends on environmental factors and line of sight conditions.

The C472 Transmitter Module is equipped with Enclosure Tamper and Antenna Supervision features. The antenna supervision circuit operates by comparing forward and reflected power (i.e., Standing Wave Ratio or SWR) during a signal transmission. If the SWR output is connected back to a supervised zone at the control panel, the wiring from the control panel and the encoder to the transmitter is supervised.

*The actual range of any RF signaling system depends on line-of-sight conditions, transmitting and receiving antenna gain, signal loss through antenna cable runs, receiver sensitivity, noise and variable environmental conditions.

The C472 and C474 Transmitters work with the following Radionics R.F products:

Protected Site	Via	Central Station
C601 Encoder	C471R/473R	D6500 Security Receiver (equipped with C6560 RF Line Card and C6565 RF Terminator Card.)

Preparation

The difference between the TX and TP models of both transmitters is the presence of a Private Line Tone (or CTCSS) module. This module allows the TP models to be used in systems operating with repeaters using CTCSS circuits, and other manufacturers' systems which require a private line tone for repeater or receiver access. (Hereafter, the transmitter modules will be referred to by their numbers only, unless a distinction between the TX and TP model is necessary. Consider a reference to the C472 to include both models).

For the C472 transmitters, the operating frequency (as specified by the installing company) is set by installing the appropriate plug-in jumpers on the transmitter.

For the C474 transmitters, some operating frequencies can be set using the jumpers, while others must be set at the factory. Consult the RF Sales Market Manager for information on a specific frequency.

Recommended RF Testing Equipment:

- Watt meter (of appropriate power rating and frequency range).
- Short length of coaxial cable (with appropriate connectors).
- Attenuator (either a step attenuator of appropriate frequency, or a set of fixed attenuators, or as a minimum, one fixed attenuator of 9dB rating).
- Portable frequency counter.
- Volt-ohm meter.

Following are some basic guidelines for installing the RF system components:

Determine the best location for mounting the antenna, transmitter module and control/communicator. Considerations:

- Height above ground.
- Line-of-sight to RF receiver or repeater unit.

- Length of coaxial cable from the antenna to the transmitter module.
- Length of wire run from the encoder to the transmitter module.
- Access (or the ability to restrict access) to the transmitter module, antenna and cable.
- Temperature variation exposure.

Antenna Location

The transmitter antenna should usually be mounted indoors at the highest point possible (see Figure 1). Directional antennas should be aligned with the receiver antenna using a map and compass.

Avoid areas where metallic objects stand between the transmitter antenna and receiver antenna (e.g., large water pipes, aluminum siding, aluminum foil backed insulation, air ducts, wire mesh construction material, etc.). Choose an antenna of the appropriate frequency, such as the C740A, C742 or C744 Antenna.

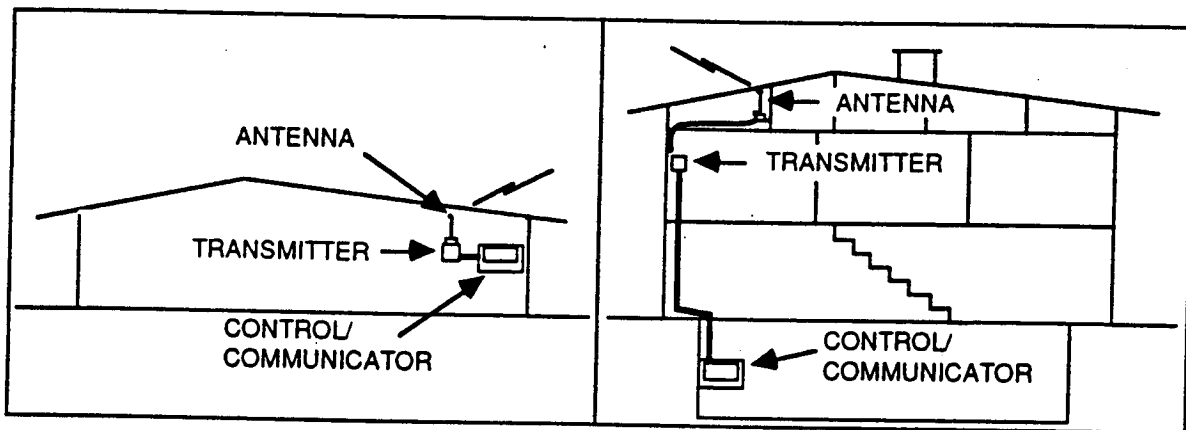


Figure 1: Antenna Mounting Locations

Transmitter Module Location

The length of coaxial cable between the transmitter module and the antenna should be kept to a minimum. Where feasible, mount the transmitter module close to the antenna. If the control panel cannot be mounted near the antenna, mount the transmitter module near the antenna and use shielded cable to connect the transmitter module to the encoder.

Although the antenna can often be mounted in the attic or crawl space, the transmitter module should not be mounted in areas where it will be exposed to wide temperature variations (such as in the attic). The transmitter module should be mounted in a controlled environment (such as an upper-floor closet) when possible.

The following chart determines the type of coaxial cable necessary for connection of the antenna to the transmitter module. The distance shown is the maximum recommended cable length. Each foot of cable reduces the strength of the signal leaving the antenna, so it is important to keep the length of cable runs to a minimum. Cable connectors also cause signal loss. To reduce the number of connectors used in the installation use the appropriate connector for each type of coaxial cable. Signal loss can be a critical factor when the signal is transmitting over a long distance to the remote receiver or repeater.

For UHF Transmitters

RG-58/U or RG-223/U	less than 15'
RG-8A/U or RG-213/U	less than 50'
1/2 inch Helix	less than 100'

For VHF Transmitters

RG-58/U or RG-223/U less than 25'
 RG-8A/U or RG-213/U less than 85'
 1/2 inch Helix less than 175'

1. Use the C740A or C742 Antenna with the C472 Transmitter, and the C744 Antenna with the C474 Transmitter.
2. Mount the antenna and connect it to the cable according to the instructions. Run the cable to the transmitter mounting location. Install the appropriate cable end connector according to the instructions.

The transmitter is equipped with a female BNC connector. If any type of connector other than a BNC male is used, a BNC adaptor is required. When making a connection between the C472 or C474 transmitter and RG-8A/U coaxial cable, Radionics model C722 connector should be used (see Figure 2).

3. Install the control/communicator according to instructions provided with the unit.
4. Install the encoder according to instructions provided with the unit.

Transmitter	Antenna	Connector at Transmitter	Connector at Antenna	Type of Coaxial Cable
C472	C740A (Omni)	BNC Male	None (soldered)	RG-58A/U
C472	C742 (Yagi)	C722	C729	RG-8A/U
C474	C744 (Omni)	BNC Male	None (soldered)	RG-58A/U

Figure 2: Antenna Connections Chart

Installation

Mounting the Transmitter

1. Set the frequency the transmitter is to operate on by covering the appropriate plug-in jumpers. The Frequency Setting Chart provides quick reference. **Note:** Some C474 transmitters are pretuned at Radionics (see Figure 3).

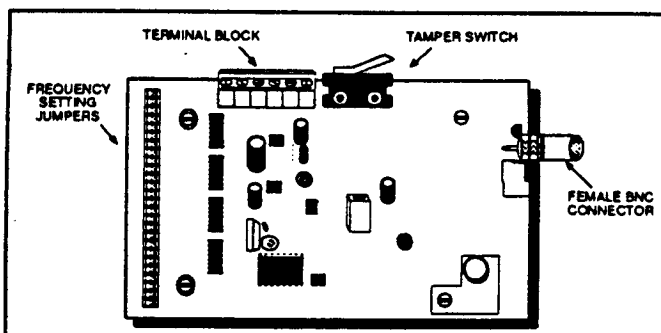


Figure 3: C472/C474 Transmitter

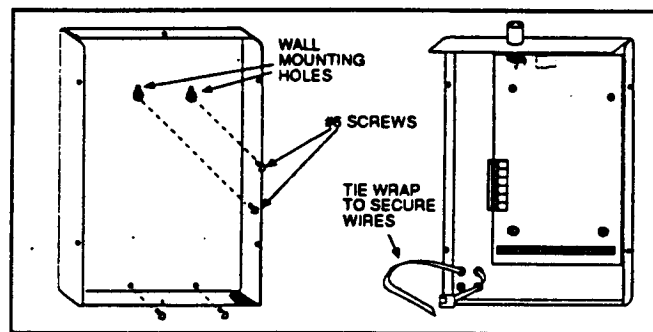


Figure 4: Transmitter Enclosure

Warning: Activating the transmitter without a proper antenna connection can damage the transmitter circuitry. Do not apply power to the unit before the antenna (or other 50 ohm load) is connected.

2. Mount the transmitter enclosure directly to the wall with four #6 screws, as shown. (See Figure 4)

Connecting the Antenna

Connect the antenna cable to the transmitter module using the coaxial cable connector. A standard female BNC Connector is provided on the transmitter.

Connecting the Encoder

Connect the transmitter to the C601 Encoder as shown in Figure 5. Secure the wires to the enclosure using the grommet (provided) and a tie wrap (see Figure 4). Use at least 18 gauge wire.

Programming

Refer to the *C601 Encoder Program Entry Guide* (RPN 74-05904-000).

C472/C474 Terminal	Function	C601 Terminal	Control/Communicator
+12 V	+12VDC	4	N/A
DAT	Modulation	2	N/A
GND	Earth Ground	3	N/A
TRB	Antenna Supervision	N/A	Hardwire Zone
TAMPER	Tamper	1	Hardwire Zone or C601 Zone
PLT	Private Line Tone	N/A	N/A

Figure 5: Wiring Connections

Testing

Warning! Notify the Central Station before beginning testing.

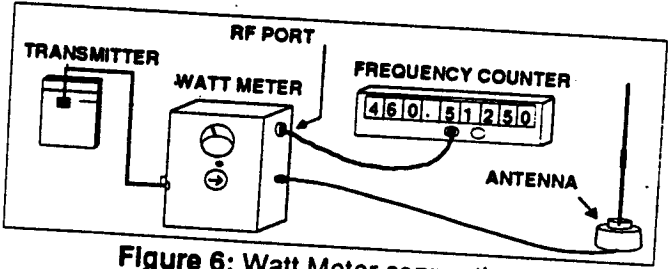


Figure 6: Watt Meter connections

1. Use a Watt meter to check forward and reflected power through the cable and antenna (see Figure 6). This is done to check the cable for shorts or impedance problems. A signal must be transmitted to conduct this test.
 - a. Disconnect the antenna cable from the BNC connector on the transmitter module.
 - b. Connect a short length of coaxial cable (testing cable) to the BNC connector on the transmitter module.
 - c. Connect a Watt Meter between the testing cable and the antenna cable.
 - d. Follow the Watt Meter manufacturer's instructions for testing forward and reflected power. To activate the transmitter, fault a protective zone on the control panel or hold down the test button (if provided).
 - e. The Watt Meter readings must fall within the following parameters:
 Forward Power: 1.8 watts minimum
 Reflected Power: 0.2 watts maximum

A short or open in the cable, connectors or antenna could cause the reflected power reading to exceed the maximum limit. If the reflected power reading exceeds the maximum limit, check all connections using standard troubleshooting practices. Also check to make sure the antenna is tuned properly. Repeat the steps above to re-check the Watt Meter readings.

2. Disconnect the Watt Meter from the testing cable and antenna cable. Install an attenuator between the testing cable and the antenna cable. If using a step attenuator, adjust settings according to the instructions supplied with the unit. A safety margin of at least 9 dB should be established.
3. Initiate alarm and restoral signals from the protective loops of the control panel.
4. Confirm that the proper signals were received at the Central Station.
5. If the Central Receiving System displayed the appropriate signals, the attenuation test is complete. Disconnect the attenuator. Remove the testing cable. Reconnect the antenna cable to the BNC jack on the transmitter module. Proceed to step 6.

If the appropriate signals were not displayed at the Central Receiving System, re-check all connections between the transmitter module and the antenna. If you are using a Yagi antenna (e.g. the C742), re-check the directional alignment of the antenna to the Remote Receiver or Repeater unit. After making the necessary adjustments, repeat steps 4 through 6.

If signals are still not displayed at the Central Receiving System the signal strength may be inadequate for the range between the transmitting antenna and the receiver or repeater antenna. It may be necessary to install a gain device in the system. Consult your Radionics representative for assistance.

6. Repeat steps 3 and 4 to ensure proper antenna cable connection.
7. Enter the readings for forward and reflected power, attenuation margin, frequency and the date on the Radio Frequency Transmitter Test and Maintenance Record Label.

Maintenance

MAINTENANCE CHECKS SHOULD BE PERFORMED AT LEAST ONCE A YEAR. Periodic maintenance checks should include all hardware and wiring in the system, as well as power and frequency output from the transmitter module. Data can be recorded on the Radio Frequency Transmitter Test and Maintenance Record label which should be attached to the transmitter enclosure.

Note: Radionics recommends that all C601 Encoders be programmed to send test signals at least once a day to monitor proper operation of the system.

Specifications

Power Input

12 VDC supplied by the control/communicator through the C601. No power is supplied to the RF transmitter module until needed for a signal transmission.

Current Requirements

500 mA maximum

Wiring Connections

Five wire connection to the C601 and control/communicator (shielded).

18 AWG: 100 ft.

22 AWG: 40 ft.

Antenna Connection

Standard female BNC connector jack provided
Recommended antenna cable: Up to 15 feet of RG-58/U with C740A or C744 antenna or 50 feet of RG-8A/U (Belden 9251 or equivalent) with C742 antenna using C722 and C729 connectors.

Enclosure

Dimensions: 5.5" x 3.75" x 1.375"

Color: Grey

Installation: Wall mount

RF Signal Output for C472 UHF Transmitter

Frequency Band*: 450 to 470 MHz
Power: 2.0 watts nominal
Output impedance: 50 ohms
Emission Type: 10K0F2D
Spurious and Harmonics: -45dBc minimum
Frequency Stability
@ -30°C to +50° C: 0.0005%

RF Signal Output for C474 VHF Transmitter

Frequency Band*: 138 to 174 MHz
Power: 2.0 watts nominal
Output impedance: 50 ohms
Emission Type: 10K0F2D
Spurious and Harmonics: <-45dBc
Frequency Stability
@ -30°C to +50 C: 0.0005%

*Frequency needs to be set before operating.

UHF Frequency Chart

X = Jumper Installed. - = No Jumper

JUMPER SETTING	00000	00001	11111	11112	22222
	12345	67890	12345	67890	12345
FREQUENCY					
457.5125	X--XX	XXXXXX	-XXX-	-XX--	X--XX
457.5250	XX--X	X-XX-	XX-X-	---XX	-XXX-
457.5375	XXXX-	X--XX	-----X	-XX-X	---XX
457.5500	XXX-X	X-X--	XX-X-	---XX	-XXX-
457.5625	X-X-X	--X--	-X--X	--X-X	-X-XX
457.5750	XX--X	X-X--	XX-X-	---XX	-XXX-
457.5875	X-XXX	---XX	X--X-	X-X--	XX---
457.6000	XXX-X	XXXX-	XXXXX	X--XX	X-XX-
457.6125	X-XXX	----X	X--X-	X-X--	XX---
458.1875	XX-X-	----X	XXX--	-X-X-	-X-X-
460.9000	XXXXX	XXXXX	XXXX-	XX-XX	XX-X-
460.9125	XXXXX	-X-XX	X--X-	XX--X	XXXXX
460.9250	XX-XX	XXXXX	XXXX-	XX-XX	XX-X-
460.9375	X-XX-	--XXX	-XX--	--X--	XXXXX
460.9500	XXXXX	XXX-X	XXXX-	XX-XX	XX-X-
460.9625	XXXXX	-X---	X----	-X--X	XXXXX
460.9750	XX-XX	XXX-X	XXXX-	XX-XX	XX-X-
460.9875	X-X--	X-XX-	-XX--	-X---	-XXX-
461.0000	XXXXX	XXXXX	XXXXX	XX-XX	-X-X-
465.9000	XXXXX	XXXXX	XXXX-	-X-XX	---X-
465.9125	X-----	----X	-X--X	-XX-X	-XXXX
465.9250	XX-XX	XXXXX	XXXX-	-X-XX	---X-
465.9375	X-----	X-X-X	-----	--X--	---XX
465.9500	XXXXX	XXX-X	XXXX-	-X-XX	---X-
465.9625	X--XX	XX-X-	-X-XX	XXX--	---XX
465.9750	XX-XX	XXX-X	XXXX-	-X-XX	---X-
465.9875	X-XX-	-X---	-XX-X	X-X--	-XXXX
466.0000	XXXXX	X-XXX	XXXXX	-X-XX	X--X-
467.7500	XXX-X	X-X-X	XXXX-	XX-XX	XX-X-
467.7625	X-X--	-----	-X-X-	-XX--	X-XXX
467.7750	XX--X	X-X-X	XXXX-	XX-XX	XX-X-
467.7875	XX-X-	---X-	XX--X	XX-X-	-X-X-
467.8000	XXX-X	X-XXX	XXXXX	XX-XX	-X-X-

UHF Frequency Chart (cont'd.)

X = Jumper Installed. - = No Jumper

JUMPER SETTING	00000	00001	11111	11112	22222
	12345	67890	12345	67890	12345
FREQUENCY					
467.8125	X X - X -	X X - - X	X - X X X	X - - X X	X - - X -
467.8250	X X - - X	X - X X X	X X X X X	X X - X X	- X - X -
467.8375	X X - X X	X X X - -	X - X - -	- - X - -	X - X - -
467.8500	X X X - X	X - X - X	X X X X X	X X - X X	- X - X -
467.8625	X - - X X	X X X X X	- - X X -	X X - X -	X - X X -
467.8750	X X - - X	X - X - X	X X X X X	X X - X X	- X - X -
467.8875	X - X - X	- - X X X	X - X X -	X - - - -	- X X X X
467.9000	X X X - X	X - X X X	X X X X -	X X - X X	- X - X -
467.9125	X X - - -	- X X X X	- X - - X	X - - - -	- - - X -
467.9250	X X - - X	X - X X X	X X X X -	X X - X X	- X - X -
469.5000	X X X - X	X - X X X	X X X X -	- X - X X	- X - X -
469.5500	X X X - X	X - X - X	X X X X -	- X - X X	- X - X -

VHF Frequency Chart

X = Jumper Installed. - = No Jumper

JUMPER SETTING	51.2	25.6	12.8	6.4	3.2	1.6	0.8	0.4	0.2	0.1	0.05	0.025	0.0125
FREQUENCY													
154.60000	-	X	X	X	X	X	-	X	-	X	X	X	X
173.23750	-	X	-	-	X	X	X	-	X	X	X	-	-
173.26250	-	X	-	-	X	X	X	-	X	X	-	X	-
173.28750	-	X	-	-	X	X	X	-	X	X	-	-	-
173.31250	-	X	-	-	X	X	X	-	X	-	X	X	-
173.33750	-	X	-	-	X	X	X	-	X	-	X	-	-
173.36250	-	X	-	-	X	X	X	-	X	-	-	X	-

The following frequencies cannot be set by installing jumpers. The frequency must be set at the factory.

154.45625 154.47875 173.20375 173.39000

154.46375 154.57000 173.21000 173.39625

154.47125

© 1991, 1992 Radionics, Inc., Salinas, CA, U.S.A. All rights reserved.

™ The Radionics logo is a registered trademark of Radionics, Inc., Salinas, CA.



Radionics™

Radionics, Inc., 1800 Abbott Street
Salinas, CA, 93901, U.S.A.
Customer Service: (800) 538-5807

Radionics, 1 Park Gate Close, Bredbury
Stockport, Cheshire, SK6 2SZ, England
Technical Support: (061) 494-0851