



Installation Manual
XM Satellite Radio Wireless Receiver
Model No. XMR050

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Installation Manual XMR050

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Revision Record

Revision Level	Description of Changes	Author	Approved by	Release Date
-	Initial Release	JH	DJG	9/27/05
A	Added Bluetooth antenna specifications and professional installation warning to section 1.2 and 2.3.4.1(6).	JH	DJG	11/18/05
B	Added foam pad (per vibration test results) to stack mount configuration drawing in Appendix B.	JH	JH	1/24/06
C	Changed Satellite Antenna cable requirements: Added Section 2.4.1 and changed Note 3 in App. C diagram. Added pre-activation information for XM Radio operation. Updated XM Radio phone number.	JH	DJG	4/05/06
D	Antenna coax cable length equation re-formatted to avoid confusion. Added receiver search instructions.	JH	JH	6/22/06



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1.0 General Information

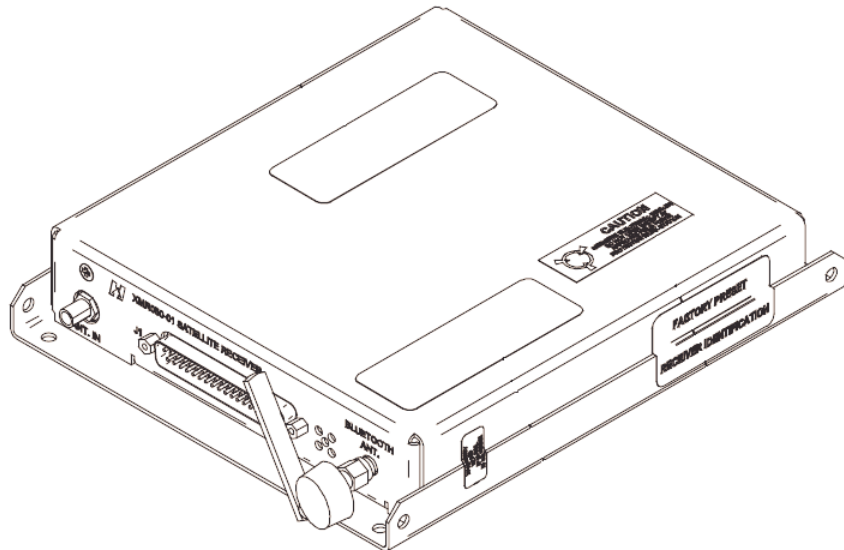
This manual provides product description and installation reference information for the Heads Up Technologies, XMR050 XM Satellite Radio Wireless Receiver.

1.1 Equipment Description

The XMR050 provides entertainment audio to the aircraft from XM Satellite Radio broadcast programming. The XMR050 is a remote mounted device that requires 14 – 28VDC power, ground, an XM signal source¹ and an audio interface. Audio interfaces include headphones or connection to aircraft audio panels.

A complete system would consist of the following components, sold separately:

- Heads Up Technologies XMR050 (illustrated here)

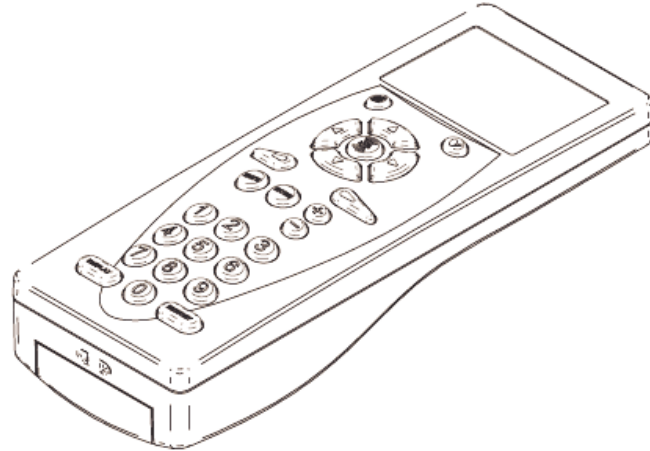


¹ An external XM certified antenna or any Heads Up Technologies XM receiver model equipped with an "Antenna Out" jack, including: XMD100, XMD076, XMD075, XMR800 and XMR400.



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- XMC050 XM Radio
Wireless Remote
Controller (illustrated here)



- Many options of XM Satellite Radio certified antennas are available and manufactured by Comant Industries. Single and combination function antennas are available. For a complete listing of available antennas, contact the Heads Up Technologies sales department at:

Email: info@heads-up.com **Web:** www.heads-up.com

Voice: 972-980-4890 **Fax:** 972-980-4843

- Optional system installation kit including necessary connectors, stack mounting hardware and installation documentation



1.2 Technical Specifications

STANDARD FEATURES	
Display	None. User interface through XMC050 controller
WX Interface	None
Audio Interface (Typical)	Stereo 600-ohm balanced transformer, 0dBV nominal level, <-50dBV (when muted) to +12dBV (Full volume)
Wireless Link	Bluetooth Class 2 (low power, 25 Ft. LOS Range) FCC ID # TGVXMSC63. This device complies with Part 15 of the FCC rules subject to the following two conditions: 1. This device may not cause harmful interference. 2. This device must accept all interference received, including interference that may cause undesired operation.
Wireless Antenna	GigaAnt Titanis 2.4GHz, P/N 2010B4844-01 Gain: 4.4dBi
PHYSICAL CHARACTERISTICS	
Receiver Weight	1.17 lbs.
Receiver Dimensions H, W, L	1.4 X 6.5 X 7.8 Inches (Refer to Appendix B for more detail)
Antenna Weight	Refer to specific antenna installation drawing
OPERATING LIMITS	
Power Input Voltage	11-32VDC, negative ground
Steady State Current	0.38A at 11.0VDC minimum power input voltage 0.30A at 13.8VDC power input voltage 0.18A at 27.6VDC power input voltage

1.2.1 Environmental Qualification Identification

IAW RTCA DO-160E Appendix A and Heads Up Technologies document XMR050-34, the following environmental category identification applies to the XMR050:

“DO-160E Env. Cat.,[(F2)X]BBB[SBM]HXXXFXZ[(B)(Z)]AZ[ZC][RR]M[Z2XXX]XXAX”

For a description of the equipment categories, refer to Environmental Qualification Form included in Appendix A.



2.0 Installation Instructions

2.1 Unpacking and Inspection

Verify all ordered parts listed were received and sustained no shipping damage. Where evidence of shipping damage exists, save the shipping carton and packing material to help substantiate your claim to the shipping company. Retain the original shipping carton and packing material in case you need to ship the unit for service.

2.2 System Identification Numbers

Take note of the (2) identification numbers that will be needed later after installation. The numbers are used for activating the XM Satellite Radio services, and communication addressing for the XMC050 controller. These numbers are as follows:

- Receiver ID – This is a 2-digit number printed on the nameplate next to the 9-digit serial number. This number will be the “receiver ID” set in the remote controller per the XMC050 user guide.
- Satellite Radio ID – This is the 8-digit alphanumeric code printed on the placard marked “Audio” located on the rear of the XMR050. This code will be presented to XM Satellite Radio for activation of the audio portion of the XMR050.

2.3 XMR050 Receiver Installation

2.3.1 Installation Considerations

The XMR050 is an entertainment device. The software contained in the XMR050 meets the requirements of RTCA DO-178B, Level E.

2.3.1.1 Location

The XMR050 shall be installed in any interior location of the aircraft that is within the environmental limits specified in Section 1.2.1 and should be at least 12 inches away from transmitting radio equipment.



2.3.1.2 Orientation

The XMR050 can be positioned in any orientation, however the effects of condensation that could develop in the selected area of the aircraft should be considered. If the XMR050 is located in such areas, the XMR050 should be positioned to prevent condensation from entering the D-Sub inter-connect as water wicks through the wire harness. Drip loops routed in the harness can usually prevent such action.

Another consideration to the orientation of the XMR050 is to allow easier viewing of the on-board power-on indicator during troubleshooting. The power LED is located next to the main interface connector, J1.

2.3.1.3 Cooling

The XMR050 is not equipped with air vents or fans, which can be blocked and therefore this consideration is not required.

2.3.1.4 XMR050 and XMC050 Communications

The wireless communications between the receiver and the controller uses Bluetooth Class 2 technology. This wireless link has a line-of-sight (LOS) range of at least 25-ft. Since the XMR050 is typically located in remote locations of the aircraft, this range must be considered. In addition, if the XMR050 is located in an effective radio frequency shielded area, the link may be weak or unable to be established.

In such cases where the location of the XMR050 may produce undesired operation with the XMC050 controller, the on-board antenna of the XMR050 can be extended. Refer to Section 2.3.4.1 for more information.

2.3.2 Mounting the XMR050

The XMR050 should be securely mounted to the aircraft structure using the (4) provided #10 diameter mounting holes IAW AC 43.13-2A, Chapter 2. An interface bracket or plate can be fabricated to attach to the aircraft structure, as required, IAW AC 43.13-2A, Chapter 2.

The mounting of the XMR050 enclosure must provide a DC bond to airframe ground of 0.003 Ohms or less.

2.3.3 Installation with Existing XM WX Receiver

If the XMR050 is being added to an existing XM Weather data receiver installation, such as a Heads Up Technologies XMD100, XMD076 or XMD075, the installation kit provides hardware to stack mount the XMR050 directly above the existing receiver. The XMR050 will require an additional 1.4 inches of clearance above the existing receiver.

Appendix B provides an illustration of this mounting scheme.



2.3.4 Electrical Interface Wiring

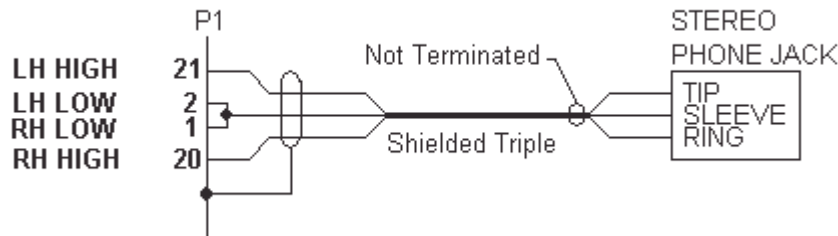
Refer to Appendix C for system wiring diagrams and wire type requirements. Wiring is to be performed IAW AC 43.13-1B, Chapter 11. The following connectors or similar, support the XMR050 and antenna installation:

Designation Box/Wiring	Vendor	Part Number	Description
P1	Military Specification	M24308/2-4F	D-Sub 37 Socket (Female) mates to the XMR050 J1
Ant. IN	Tyco/Amp	225532-3	M39012 SMA Plug, Straight
Ant. IN	Tyco/Amp	225609-3	M39012 SMA Plug, R/A

2.3.4.1 Wiring Notes

The following notes apply to aircraft wiring to be used with the XMR050 and antenna installation:

1. Power, P1-19: Use 22AWG (M22759/16-22 or equivalent) wire fed from a 1 Amp circuit breaker for both 14V and 28V aircraft. If the XMR050 is being installed with an existing XM receiver, the power can be spliced into the existing power leads.
2. Power Enable, P1-18: Must be energized for system operation. Apply power through switch or jumper to P1-19.
3. Stereo Audio Output: P1-20, 1, 21 and 2. Stereo entertainment audio is provided



from left and right 600-ohm transformer balanced outputs. This stereo entertainment output has sufficient output impedance and level range to be connected directly to headphones or to the “music” input of various crew audio panels or intercom systems. Connection directly to speakers is not recommended.

The illustration below is for a headphone jack:

NOTE: Use a ground isolated headphone jack where the “sleeve” of the jack is not electrically connected to the aircraft ground. If the audio cable run is less than 10 Ft.

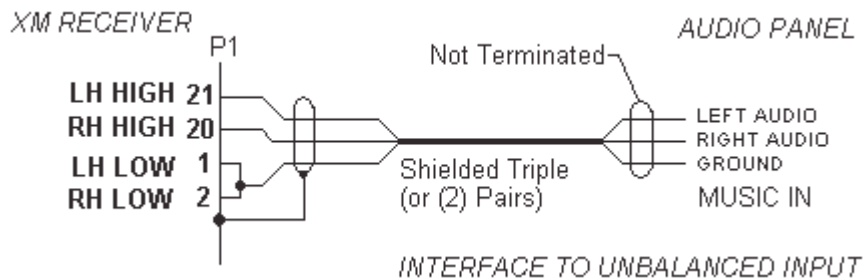
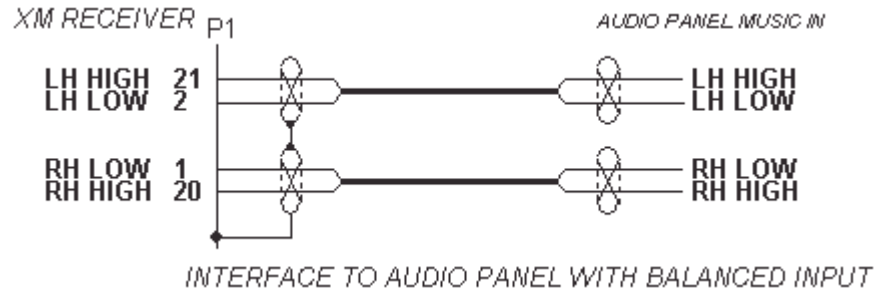


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from the receiver to the jack, then ground isolation should not be required.

The below illustrations show typical connections to aircraft audio panels:



4. Audio Muting: The XMR050 is equipped with a discrete input (active ground) that immediately mutes the audio, bypassing any volume control input from the user. In cases where the XMR050 audio is not routed through the aircraft audio panel and connected directly (such as to headphones or amplified speakers), this function may be required.
5. Satellite Antenna: For installations with an existing XM Receiver per Section 2.3.3 above, this jack will connect to the existing receiver's "Ant. Out" jack via a short patch cable is provided in the installation kit. If stack mounting is not possible, a longer patch cable will be required and provided by the installer.

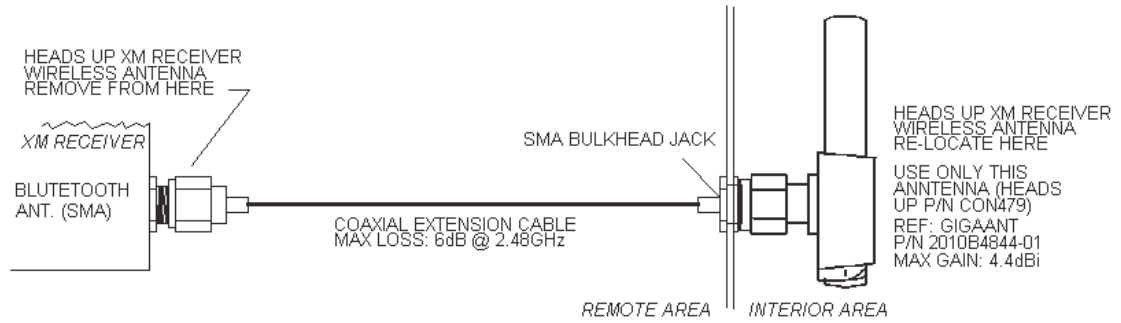
For installations without an existing XM Receiver, the installation of a XM Satellite Radio type certified antenna is required. Refer to Section 2.4 for antenna installation information.

6. Wireless Antenna Extension: If required, the on-board Bluetooth Antenna of the receiver can be re-located exactly as shown below to allow the wireless link to reach the cabin area of the aircraft.

WARNING: The below extension shall be performed by a professional installer and only after determining through analysis or test that this extension is necessary for proper operation.



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7. Ground Terminations: Wire ground straps used to terminate cable shields and equipment shall be as short as possible. All bonds shall be 0.003 Ohms or less.

2.3.5 Electrical Load Analysis

Prior to installation, an electrical load analysis should be performed specific to the aircraft. This analysis should be IAW AC 43.13-1B, Chapter 11. The following values may be used to support the analysis:

Equipment	14 VDC Aircraft Nominal/Maximum Load	28 VDC Aircraft Nominal/Maximum Load
XMR050	0.30 A	0.18 A

2.3.5.1 Power Circuit Protection

The power input to the XMR050 shall be circuit protected IAW the guidelines of AC 43.13-1B, Chapter 11, Section 2. A 1-Amp circuit breaker is required for use with the XMR050.



2.4 XM Satellite Antenna Installation Considerations

If installing the XMR050 with an existing Heads Up Technologies XM receiver equipped with an “Antenna Out”, an additional antenna is not required.

As required, the XMR050 is designed for use with various XM Satellite Radio type-certified antennas covering the S-Band from 2.332 GHz to 2.345 GHz. Due to the low signal levels inherent with satellite communications, the following guidelines and recommended practices should be adhered to for the design of the antenna installation:

- Install IAW AC 43.13-2A Chapter 3, AC 43.13-1B Chapter 11, antenna manufacturer instructions, and in a manner acceptable to the administrator.
- Mount the antenna on the top of the aircraft to an external surface such as the fuselage, away from vertical obstructions as to not “shadow” the antenna from line-of-sight reception of the satellites. (Mount antenna as high on the fuselage as practical). Relocation of other less location-sensitive transmitters may be necessary to achieve optimal XM reception performance.
- The mounting of the antenna must provide an electrical bond of 0.003 Ohms or less the airframe ground.

2.4.1 Antenna Coaxial Cable Installation

The correct cable loss of the antenna feed cable is critical to the performance of the system operation. The design configuration of the receiver’s input is preset to expect a total gain range of 22dB (+/- 2dB).

Typical XM Radio type-certified aircraft antennas are configured with a total gain of 30-34dB where 10dB of total cable loss provides the correct gain to the receiver. Always refer to the antenna specifications to insure the correct gain. If desired, additional loss of 0.3dB for each SMA connector can be added but is not crucial to system performance.

Table 1 below provides reference information for lengths for various 50-ohm cable types that are commonly used with SMA connectors to produce the acceptable loss when used with antennas with 30-34dB of gain.



Table 1 - Cable Length Chart

RG Type (Mil-C-17)	Loss Rating (dB/100-Ft.) @ 2.339GHz	Length Range (Ft.) @ 8 - 12dB Loss
142	20.6	38.8 – 58.3
400	23.41	34.2 – 51.3
316	40.87	19.6 – 29.4
178	68.82	11.62 – 17.4

When antennas of other gain values or other cable types are installed, the cable length can be determined using the equation below:

$$\text{Cable Length (Feet)} = \left(\frac{\text{Antenna Gain} - 22}{\text{Cable Loss Rating (in dB/100-Ft.)}} \right) \times 100$$

When the distance between the antenna and receiver is short, run the amount of cable required to meet the loss requirement and stow excess length. An alternative to stowing large amounts of excess cable is to install a low power RF attenuator in-line with the cable. This system requires a DC bias passing type attenuator that has a frequency rating that falls within the maximum satellite frequency of 2.345 GHz.

2.4.2 Interference from VHF and SATCOM Transmitters

- Mount the antenna no closer than 36 inches to VHF-Comm transmitters of 15 Watts or less. For more powerful transmitting antennas, XM separation should be a minimum of 48-inches. Installation pre-testing (see note below) should be performed if the separation is less than 60-inches.

If a XM/VHF-Comm combo style antenna is being installed and replacing the operation of an existing approved antenna installation, the existing separations are acceptable.

- SATCOM antennas transmit at 40 Watts and should be separated by the largest distance possible, or a minimum of 36-inches.
- When routing the XM antenna cable, the maximum possible separation from transmitter antenna feed cables must be considered, especially with SATCOM and other high power transmitters. Antenna feed cables of VHF transmitters of 15 Watts or less should only require a minimal separation.



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- Receive only antennas such as ADF and GPS do not produce interference and require little separation. The XM antenna should be placed as close as possible to these types of antennas to gain separation from transmitters.

NOTE:

Installation pre-testing is advised if this installation is being performed on several similar aircraft such as a fleet. A pre-test can be performed by mounting the antenna on a piece of aluminum sheet, approximately 24" in diameter or square, to serve as a temporary ground plane. This antenna assembly would then lay on the aircraft skin near the proposed installation location for an active ground test prior to cutting mounting holes. This has proven both beneficial and cost effective in past fleet installations since all transmit equipment can be operated and tested for XM receiver interference prior to the actual installation.

NOTE:

This installation manual does not contain approved data for type specific aircraft antenna installations.

2.5 Weight and Balance

A Weight and Balance calculation of the aircraft is required as part of the installation approval process. Following the guidelines as established in AC 43.13-1B, Chapter 10, Section 2, the W/B of the aircraft can be calculated using the weights of the system components listed below.

Description	Weight (lbs.)
XMR050 Receiver	1.17
XMRANT-01 (standard XM Antenna)	0.26
For other XM antennas not listed, refer to the applicable antenna installation drawing.	



3.0 System Checkout

The following XMR050 system-checkout aides are intended to assure proper installation and interfacing to the MFD, antenna and audio system. Familiarize yourself with:

- The XMC050 Controller operations guide.
- The audio system configuration to verify the XMR050 audio performs as intended.

3.1 Initial Installation Validation Test

Before applying power to the system, verify and complete the following:

- 100% continuity check performed and satisfactory.
- All interconnects and ground connections are fully made and seated.
- The aircraft's power source is at the proper voltage, 11VDC - 16VDC for 14V aircraft and 22VDC - 32VDC for 28V aircraft.
- Move aircraft to an outdoor area with a clear view of the southern sky, free of buildings, trees or other obstructions.
- Verify the XMC050 remote controller is set to the "receiver ID" of the XMR050. The "receiver ID" is located on the nameplate of the XMR050.

3.2 System Test

3.2.1 Service Activation

The XMR050 requires a service activation from XM Satellite Radio Inc. For installation purposes only, a temporary XM Satellite Radio service may be pre-activated from the factory. **This activation will terminate automatically without prior notice. To avoid unexpected deactivation, customers should contact XM Satellite Radio Inc. at 1-800-985-9200 to transfer the subscription immediately after installation.**

If the system has not been activated, the system can be tested with limited functionality, lacking full channel and category selection. A non-activated receiver will only receive the "XM Preview" channel (XM-1) and the "Emergency" channel (XM-247). Functions such as signal reception and audio distribution can be verified completely with a non-activated system.

Detailed activation instructions are available on Heads Up's web site at www.heads-up.com or contact Heads Up Technologies via email at service@heads-up.com.



3.2.2 Power System and Initial Test

1. Apply power to the XMR050 receiver and any other system applicable to the audio equipment. Some installations may include a XM power switch and if equipped, toggle to the ON position. The receiver is equipped with an on-board red LED indicator to show the receiver is powered-on.

NOTE: The XMC050 operations manual may be required to continue.

2. Power up the XMC050 controller and set the “Receiver ID” as required. If the “Receiver ID” is not known, put XMC050 controller in search mode as follows:
 - With the XMC050 powered, press the "receiver select" button on the remote (top right button).
 - Enter 4881 for password, then enter 88.
 - The display will show “Receiver ID Search”. XMC050 is now searching for available receivers that are in range of the communication link (25 feet).
 - When a receiver is found, the display will change to “Receiver ID Found” and list the ID number of the receiver. Note: If multiple receivers are active, all of the receiver ID’s will be listed. It is recommended to have only one receiver active at a time to avoid confusion.
 - Once the ID is determined, press the “receiver select” key again and type in the number then proceed at Step 3 below.
3. Verify the remote display is showing “Connecting to XX” where XX is the “Receiver ID” noted in Section 2.2 above. Allow at least 3-minutes for the initial connection link to establish. Ignore the connection retry message displayed on the controller during this time. Once this initial connection is made, further connections establish in a few seconds.
4. If the connection fails to establish after 3-minutes, try the following:
 - Move the controller closer to the XMR050
 - Evaluate the location of the XMR050 and determine if an extension is required. Refer to Section 2.3.4.1(6) above.
 - Verify the XMR050 is still powered. Check circuit breaker, connectors, etc.
 - Verify the charge indicator on the controller display shows a good charge. Replace batteries as required.



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5. Activate the audio equipment being fed by the XMR050 and adjust the volume using the XMC050 controller as needed.

NOTE:

At power-up, the XMR050 defaults to mute mode and will only output audio when connected to the XMC050 wireless controller.

6. Change the XM channel to zero, "0". The controller display should read "RADIO ID, SW VER" and verify the 8-digit code matches the "Satellite Radio ID" noted in Section 2.2 above.

Note: The "Satellite Radio ID" code must be presented to the aircraft owner, who will need it to acquire the subscription service and for other customer service needs with XM Satellite Radio.

7. Verify the operation of the external mute if equipped.
8. Move around the interior of the aircraft and verify the XMC050 is able to control the receiver from various areas of the cabin and cockpit.

Only until the operation has been verified, continue to the next section.

3.3 Ground EMI Check

The following procedure is to be performed to verify that no interference is noted through the use of the XMR050 system on other aircraft systems and vice-versa. The operation of the XMR050 system shall not result in NAV flags, constant location lightning strikes on any installed Stormscope, noise on COMM channels, or other phenomena.

A ground test should be adequate for the XMR050 since it operates the same in flight. If some aircraft systems cannot be verified on the ground, a flight test may be required.

Operate the aircraft systems as listed below and check the operation of both that system and the XMR050 system.



NOTE:

The XMC050 wireless controller is designed to conserve battery power and will enter power-save mode if no key presses have been made for 30-seconds. During aircraft system checks, press any key such as the "MEMORY" key as required to keep the XMC050 in an active mode.

A. Comm Radios:

1. Scan through radio channels to ensure there is no interference caused by the XMR050 and XMC050 controller.
2. Check local ground and tower frequencies to ensure there is no break in squelch caused by the installation.
3. Monitor the XM signal strength values of the XMR050 on the XMC050 controller and transmit on various frequencies.

B. GPS:

1. Ensure the correct position is displayed.

Verify no change in GPS signal strength with the XMR050 powered ON and OFF.

C. Autopilot:

1. Ensure the autopilot self-test passes OK with the XMR050 and XMC050 controller operating.

D. Other Aircraft Systems:

1. Verify that there is no adverse effect on flight instruments with the XMR050 operating.
2. Operate other aircraft systems, especially radio transmitters, while monitoring the XM signal strength values of the XMR050 on the XMC050 controller.



4.0 Factory Service Policies

4.1 Technical Support

Technical support or service questions may be submitted to the following:

Email: service@heads-up.com

Voice: 972-980-4890

Fax: 972-980-4843

A Heads Up Technologies customer support representative will respond as soon as possible. Heads Up Technologies business hours are 8:00 AM to 5:00 PM Central Time, Monday through Friday.

4.2 General Service Procedures

Service of a XMR050 component performed at the factory typically includes an overhaul consisting of a thorough inspection, repair as needed and functional tests. Antennas that are used in this system are not serviceable and can only be inspected and tested. Faulty or damaged antennas must be replaced.

Prepare a packing slip that includes the part number(s) and serial number(s) of the items to be returned, along with a complete description of the problem, requested service and special instructions. The packing slip must also include a contact name, daytime telephone number and return shipping address.

To return an item, securely pack it in the original shipping container, if possible. Ship it to the address provided by the Heads Up Technologies customer service representative.



Appendix A Environmental Qualification Form

XMR050 DO-160 Environmental Qualification Form

UUT NOMENCLATURE XM Radio Wireless Receiver		
TYPE/MODEL/PART NO. XMR050-01	TSO NUMBER N/A	
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION XMD076A-32, XMD076A-01 Qualification Test Plan		
MANUFACTURER Heads Up Technologies, Inc, 2033 Chenault Dr. #100 Carrollton, TX 75006		
REVISION & CHANGE OF DO-160 E, No Change	TESTING DATES 06-08-2005 and 07-01-2005	
TEST CONDITION	SECTION	QUALIFICATION CATEGORY / DESCRIPTION
TEMPERATURE AND ALTITUDE LOSS OF COOLING	4.0	F2 (-55°C+70°C, up to 55Kft) X
TEMPERATURE VARIATION	5.0	B (5°C/minute)
HUMIDITY	6.0	B (Severe Environment)
OPERATIONAL SHOCKS AND CRASH SAFETY	7.0	B (Crash: 20g random)
VIBRATION	8.0	S, Curves B and M
EXPLOSION	9.0	H (Env. II)
WATERPROOFNESS	10.0	X (Not qualified for this environment)
FLUIDS SUSCEPIBILITY	11.0	X (Not qualified for this environment)
SAND AND DUST	12.0	X (Not qualified for this environment)
FUNGUS	13.0	F (Qualified by Analysis)
SALT SPRAY	14.0	X (Not qualified for this environment)
MAGNETIC EFFECT	15.0	Z (0.3m separation)
POWER INPUT	16.0	B and Z 14V-28V (All A/C DC systems)
VOLTAGE SPIKE	17.0	A (600V)
AUDIO FREQUENCY SUSCEPIBILTY	18.0	Z
INDUCED SIGNAL SUSCEPTIBILITY	19.0	ZC
RF SUSCEPTIBILITY	20.0	RR (Standard HIRF)
EMISSION OF RADIO FREQUENCY	21.0	M (See Note ²)
LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	22.0	Z2XXX (Partially protected env.)

² This equipment intentionally transmits low power energy in the frequency range of 2.40 to 2.48GHz and is exempt from DO-160E Section 21.4. The EUT is qualified for these transmissions as a Class 2 Bluetooth wireless device under FCC part 15 regulations.



Installation Manual XMR050

UUT NOMENCLATURE XM Radio Wireless Receiver		
TYPE/MODEL/PART NO. XMR050-01	TSO NUMBER N/A	
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION XMD076A-32, XMD076A-01 Qualification Test Plan		
MANUFACTURER Heads Up Technologies, Inc, 2033 Chenault Dr. #100 Carrollton, TX 75006		
REVISION & CHANGE OF DO-160 E, No Change	TESTING DATES 06-08-2005 and 07-01-2005	
TEST CONDITION	SECTION	QUALIFICATION CATEGORY / DESCRIPTION
LIGHTNING DIRECT EFFECTS	23.0	X (N/A)
ICING	24.0	X (N/A)
ELECTROSTATIC DISCHARGE	25.0	A (15KV Human Contact)
FIRE AND FLAMMABILITY	26.0	X (Metal External Construction)

XMC050 DO-160 Environmental Qualification Form

UUT NOMENCLATURE XM Radio Wireless Controller		
TYPE/MODEL/PART NO. XMC050-()	TSO NUMBER N/A	
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION XMC050-32, XMC050 Env. Qualification Test Plan		
MANUFACTURER Heads Up Technologies, Inc, 2033 Chenault Dr. #100 Carrollton, TX 75006		
REVISION & CHANGE OF DO-160 E, No Change	TESTING DATES 06-20-2005 and 07-12-2005	
TEST CONDITION	SECTION	QUALIFICATION CATEGORY / DESCRIPTION
TEMPERATURE AND ALTITUDE LOSS OF COOLING	4.0	A1 (-15°C-+55°C, De-Comp- 55KFt) X
TEMPERATURE VARIATION	5.0	C (2°C/minute)
HUMIDITY	6.0	A (Standard Environment)
OPERATIONAL SHOCKS AND CRASH SAFETY	7.0	X (Not qualified for this environment)
VIBRATION	8.0	X (Not qualified for this environment)
EXPLOSION	9.0	X (Not qualified for this environment)
WATERPROOFNESS	10.0	X (Not qualified for this environment)
FLUIDS SUSCEPIBILITY	11.0	X (Not qualified for this environment)
SAND AND DUST	12.0	X (Not qualified for this environment)
FUNGUS	13.0	X (Not qualified for this environment)
SALT SPRAY	14.0	X (Not qualified for this environment)
MAGNETIC EFFECT	15.0	Z (0.3m separation)



Installation Manual

XMR050

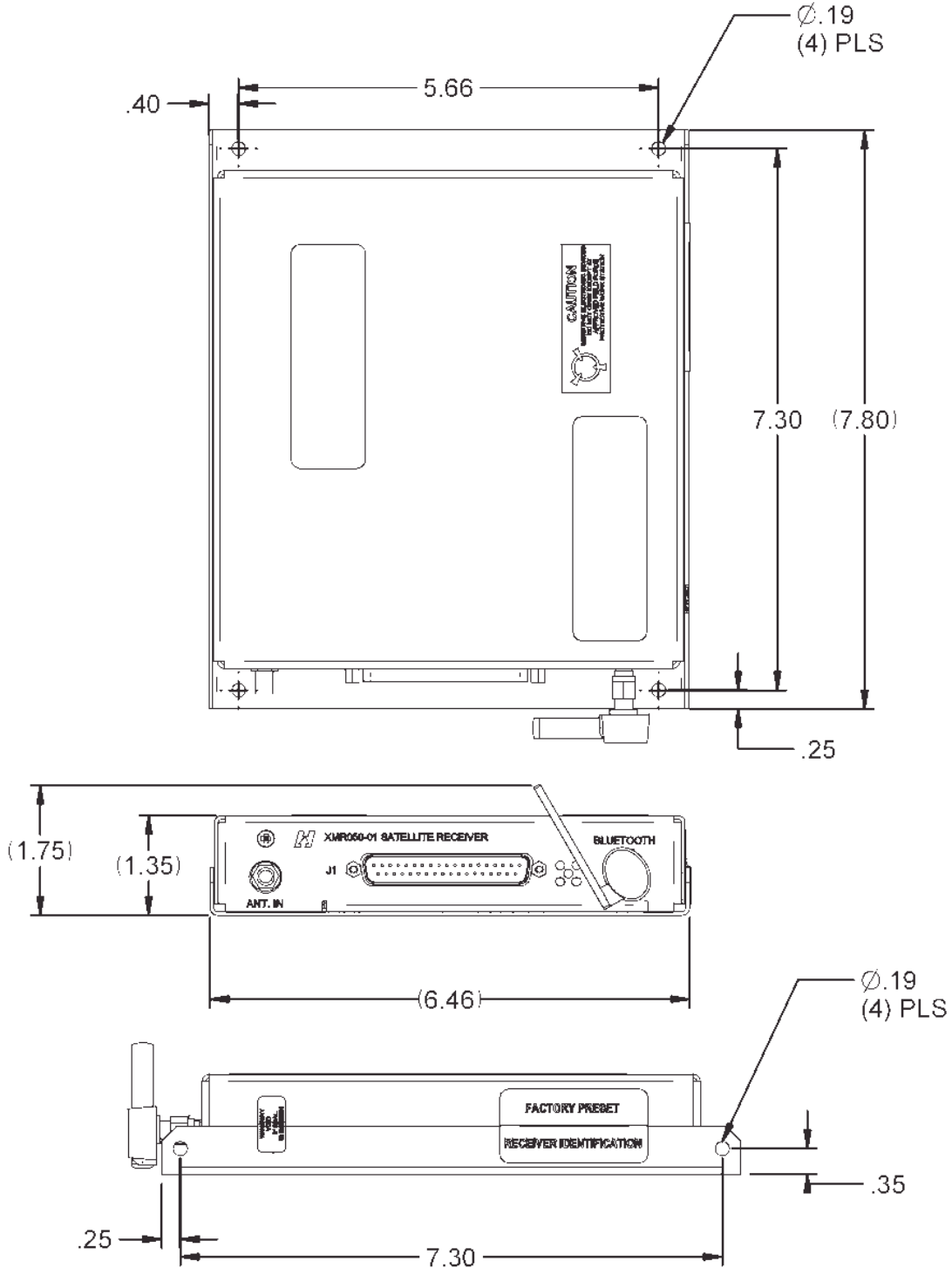
UUT NOMENCLATURE XM Radio Wireless Controller		
TYPE/MODEL/PART NO. XMC050-()		TSO NUMBER N/A
MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION XMC050-32, XMC050 Env. Qualification Test Plan		
MANUFACTURER Heads Up Technologies, Inc, 2033 Chenault Dr. #100 Carrollton, TX 75006		
REVISION & CHANGE OF DO-160 E, No Change		TESTING DATES 06-20-2005 and 07-12-2005
TEST CONDITION	SECTION	QUALIFICATION CATEGORY / DESCRIPTION
POWER INPUT	16.0	X (Not qualified for this environment)
VOLTAGE SPIKE	17.0	X (Not qualified for this environment)
AUDIO FREQUENCY SUSCEPTIBILITY	18.0	X (Not qualified for this environment)
INDUCED SIGNAL SUSCEPTIBILITY	19.0	X (Not qualified for this environment)
RF SUSCEPTIBILITY	20.0	X (Not qualified for this environment)
EMISSION OF RADIO FREQUENCY	21.0	M (See Note ³)
LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	22.0	X (Not qualified for this environment)
LIGHTNING DIRECT EFFECTS	23.0	X (Not qualified for this environment)
ICING	24.0	X (Not qualified for this environment)
ELECTROSTATIC DISCHARGE	25.0	A (15KV Human Contact)
FIRE AND FLAMMABILITY	26.0	C (By comparison analysis to UL 94V-0)

³ This equipment intentionally transmits low power energy in the frequency range of 2.40 to 2.48GHz and is exempt from DO-160E Section 21.4. The EUT is qualified for these transmissions as a Class 2 Bluetooth wireless device under FCC part 15 regulations.



Appendix B Mechanical Installation Diagrams

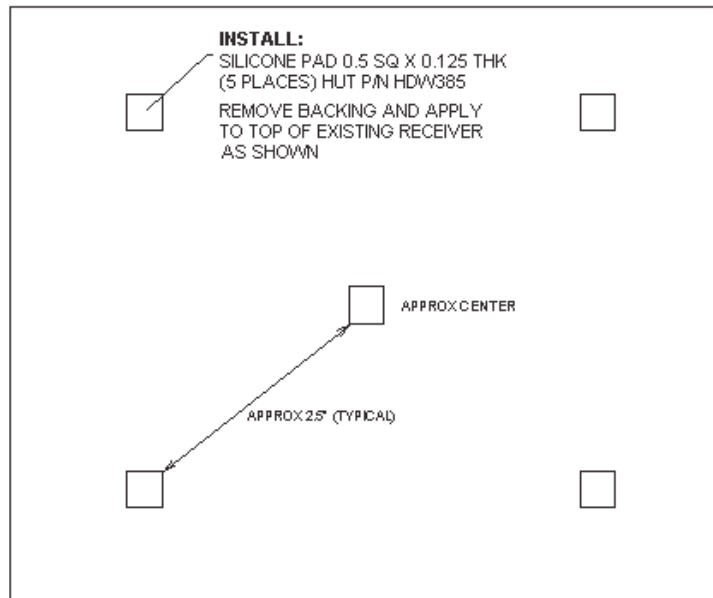
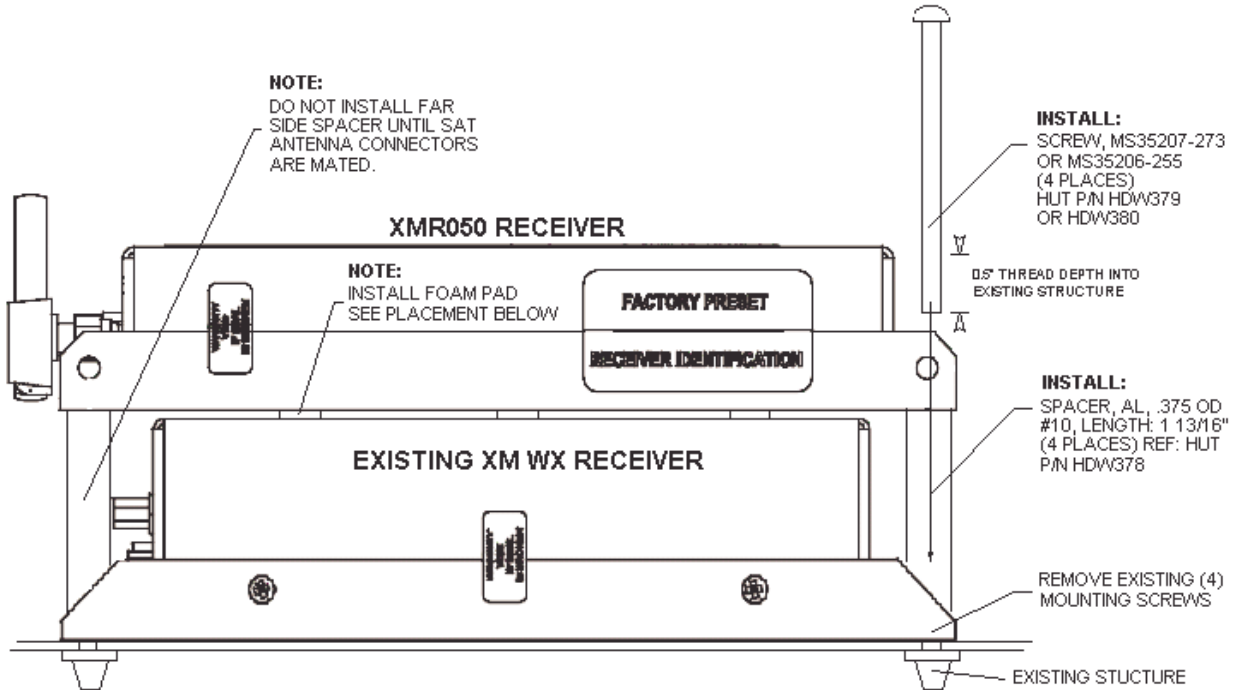
XMR050 RECEIVER DIMENSIONS





Installation Manual XMR050

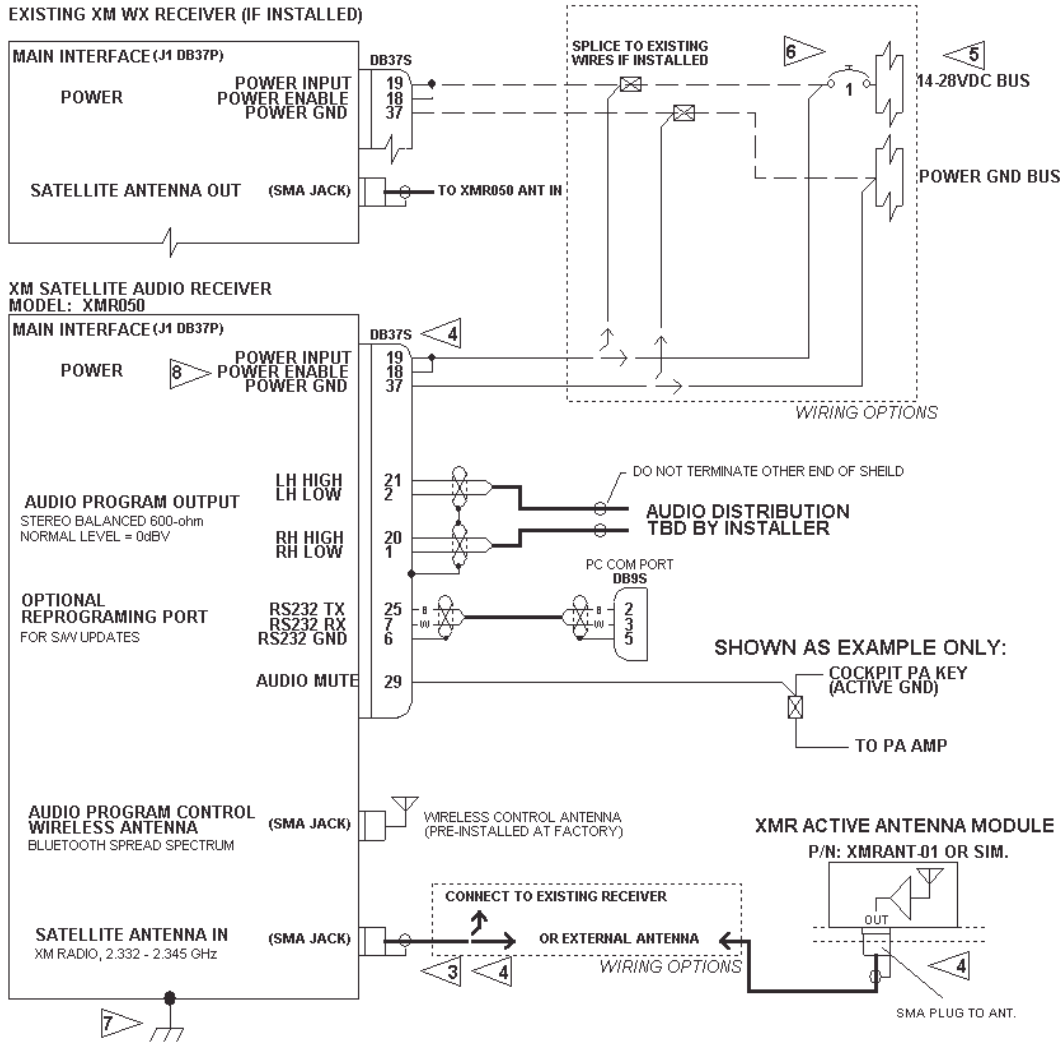
XMR050 STACK MOUNTING TO EXISTING XM WX RECEIVER





Appendix C Electrical Installation Diagrams

XMR050 RECEIVER WIRING



NOTES: UNLESS OTHERWISE SPECIFIED

- 1. ALL EQUIPMENT AND WIRING TO BE INSTALLED PER A/C MANUFACTURER AND FEDERAL AVIATION REQUIREMENTS, AS REQUIRED.
 - 2. ALL WIRE PER M22579/16-22 AND CABLE PER M27500 22TE3T14 OR AS REQUIRED BY AIRCRAFT REQUIREMENTS.
 - 3. REFER TO "XM SATELLITE ANTENNA INSTALLATION CONSIDERATIONS" SECTION FOR ANTENNA AND COAXIAL CABLE INSTALLTION REQUIREMENTS.
 - 4. RECOMMENDED MATING CONNECTORS:
(SMA PLUG, STRAIGHT) TYCO/AMP P/N 225532-3
(SMA PLUG, R/A) TYCO/AMP P/N 225609-3
(DB37S) M24308/2-4F
RECOMMENDED CONNECTOR CRIMPERS:
(SMA PLUG) TYCO/AMP P/N 220061-1
(DB) M22520/2-01 AND M22520/2-08 POSITIONER
 - 5. POWER BUS VOLTAGE SHALL NOT EXCEED RTCA/D0160D CATEGORY B AND Z.
 - 6. ALL WIRE, CABLE AND EQUIPMENT SHOWN FOR REFERENCE ONLY. TO BE SUPPLIED BY INSTALLER/USER.
 - 7. MOUNTING STRUCTURE SHALL PROVIDE CHASSIS GROUND CONNECTION TO AIRFRAME GROUND. CABLE SHIELDS TO BE TERMINATED TO CONNECTOR BACKSHELL.
 - 8. ENERGIZE (APPLY 14.28VDC/30mA) POWER ENABLE FOR UNIT OPERATION. USE ON/OFF SWITCH OR JUMPER DIRECT TO POWER WIRE AS SHOWN.
- OTHER CONNECTORS USED ARE TBD BY INSTALLER.