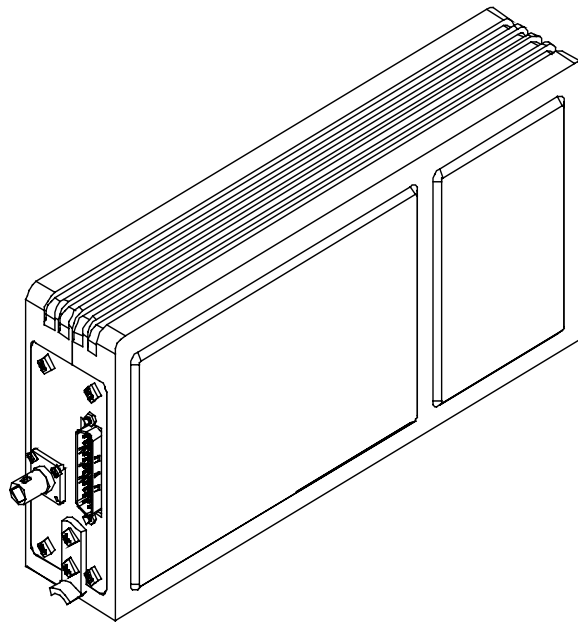




SM28

**NTX VHF-FM Series
Remote Mount Transceivers**



INSTALLATION AND OPERATION MANUAL

REV 4.10

June 1, 2004

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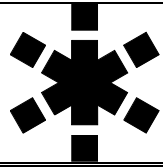
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Periodically NAT will release manual amendments. In order to maintain the most accurate and up to date manual these amendments should be carried out immediately upon receipt and recorded on the following amendment record.

AMENDMENT RECORD

Amendment Number	Amendment Date	Section(s) Changed	Date Entered	Entered By
1	Nov 19/04	2		Performed at factory
2	Jul 28/05	2		Performed at factory
3	Jan 14/08	2		

Insert any Amendment Instruction sheets after this page.



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**INSTALL_OPS
MANUAL AMENDMENT**

**Manual: SM28 NTX VHF-FM Series Remote Mount Transceiver Amendment #: 3
Document # SM28\Install_Ops\809-0003 Amendment Date: Jan 14, 2008**

The purpose of this amendment is to update sections 2.3.4, 2.3.5 and 2.3.6.

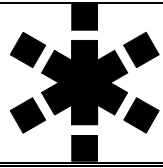
Amendment Instructions:

1	Remove Pages	Replace With Pages
	2-1 and 2-2 Rev. 4.10 Amendment # 1	2-1 and 2-2 Rev. 4.10 Amendment # 3
	2-3 and 2-4 Rev. 4.10	2-3 and 2-4 Rev. 4.10 Amendment # 3
	2-5 Rev. 4.10 Amendment # 2	2-5 Rev. 4.10 Amendment # 3

Note: Ensure that all drawings are inserted in the order shown on the latest drawing lists.

- 2 Update the Amendment Record sheet at the front of the manual.
- 3 Insert this page into the manual after the Amendment Record sheet (page ii).

Manual Amendment ends after the following amended pages



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**INSTALL_OPS
MANUAL AMENDMENT**

Manual: SM28 NTX066

Amendment #: 2

Document # SM28\Install_Ops\809-0002

Amendment Date: Jul 28, 2005

The purpose of this amendment is to update Section 2.0 with the **Installation Approval Test Procedure** (NTX066\634-0).

Amendment Instructions:

1	Remove Pages	Replace With Pages
	2-5 Rev. 4.10 Amendment #1	2-5 Rev. 4.10 Amendment #2

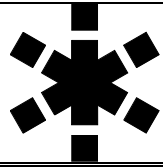
2	Add Drawings (Section 2)
	NTX066\634-0 Rev. 1.00

Note: Ensure that all drawings are inserted in the order shown on the latest drawing lists.

3 Update the Amendment Record sheet at the front of the manual.

4 Insert this page into the manual after the Amendment Record sheet (page ii).

Manual Amendment ends after the following amended pages



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**INSTALL_OPS MANUAL
AMENDMENT**

Manual: SM28 (NTX VHF-FM Transceivers) Amendment #: 1
Document # SM28\Install_Ops\809-0001 Amendment Date: Nov 19, 2004

The purpose of this amendment is to amend the cable and wiring specifications in line with Transport Canada requirements.

Amendment Instructions:

1	Remove Pages	Replace With Pages
	2-2 Rev. 4.10	2-1 to 2-2 Rev. 4.10 Amendment 1

- 2 Update the Amendment Record sheet at the front of the manual.
- 3 Insert this page into the manual after the Amendment Record sheet (page ii).

Manual Amendment ends after the following amended pages

IMPORTANT INFORMATION

FOR AVIONICS INSTALLATION FACILITIES

The NTX VHF-FM Series Remote Mount Transceivers are supplied without TSO certification, as no such standard presently exists for airborne VHF-FM radio transceivers. This equipment provides what is considered as 'supplemental' communications, and can be installed in an aircraft on a 'Non interference' basis. Installation should be performed using standard procedures applicable to aircraft radio installation, to ensure that the newly installed equipment does not interfere with any other equipment in the aircraft.

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

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Section 1 Description

1.1 Introduction

This manual contains information on the NTX VHF-FM Series Remote Mount Transceivers. All derivative products will be covered by manual supplements, which can be obtained from NAT as required.

Information in this section consists of purpose of equipment, features and specifications.

1.2 Purpose of Equipment

The NTX VHF-FM Series Remote Mount Transceivers are mounted using a custom 1/4 ATR tray and are operated using an NAT Tac/Com™ control head. The NTX066 models operate over 66 to 88 MHz on the VHF mid-band, and the NTX138 models are capable of receiving and transmitting over 138 MHz to 174 MHz on the VHF high band.

Primary applications include airborne Search and Rescue, Law Enforcement and Forestry communications.

1.3 Features

The existing Tac/Com™ series of control heads provide control for the transceivers.

The NTX066 range is 66.0000 to 87.9975 MHz, and the NTX138 VHF-FM models cover a frequency range of 138.0000-173.9975 MHz, both in 2.5 kHz increments. A maximum of 200 channels are available depending on the type of control head used. Depending on the model selected, the channels can include a receive frequency and CTCSS or DCS tone, transmit frequency and CTCSS or DCS tone, and an alphanumeric identifier.

Depending on the model selected, the transceiver provides wideband or narrowband receiver selectivity (selectable by the control head). Wideband operation provides a bandwidth of 25 kHz and narrowband operation provides a bandwidth of 12.5 kHz.

The NTX138 transceiver can also be selected with an optional guard receiver installed or a DF compatible output signal. The NTX138-100 provides a DF compatible output signal.

Voice Inversion Scrambling is available as an option, depending on the selected model.

A scan function allows scanning of selected channels. Transmit power of either 1 watt or 10 watts is selectable from the control head. Simplex and semi-duplex operations are available. DTMF encoding and direct keyboard programming can be added using NAT's DTE12.

1.4 Specifications

1.4.1 Electrical Specifications

Input power	28 Vdc nominal
Current consumption	
NTX066 and NTX138 models	300 mA receive/2.5 A transmit (typical) 500 mA receive/3.0 A transmit (max.)
Sidetone output	
NTX066 and NTX138 models	25 mW @ 600 Ω nominal
Microphone	
NTX066 and NTX138 models	Amplified dynamic or equivalent, 150 Ω balanced/unbalanced
Scrambling	3.1 kHz Voice Inversion (Optional on NTX138 and NTX066 models)
Frequency range	
NTX066 models	66.0 MHz to 87.9975 MHz
NTX138 models	138.000 MHz to 173.9975 MHz
Tone capability	38 EIA standard CTCSS tones 70 DCS tones
Operating mode	F3E simplex or semi-duplex

1.4.2 Receiver

Channel increments		2.5 kHz
Audio output		
NTX066 and NTX138 models		100 mW into 600 Ω , nominal
Sensitivity		
NTX066-000		0.50 μ V @ 12 dB SINAD
NTX138-050	Main	0.50 μ V @ 12 dB SINAD
	Guard	0.50 μ V @ 12 dB SINAD
NTX138-000		0.35 μ V @ 12 dB SINAD
NTX138-100	Main	0.35 μ V @ 12 dB SINAD
	DF	1.0 μ V @ 12 dB SINAD
Selectivity		-70 dB min. @ 25 kHz (Wideband) -60 dB min. @ 12.5 kHz (Narrowband)
Spurious response		-70 dB
Intermodulation		-70 dB

1.4.3 Transmitter

RF power output		1 W/10 W selectable
RF output impedance		50 Ω nominal
Modulation		
Wide band		\pm 5.0 kHz max., limited
Narrow band		\pm 2.5 kHz max., limited
Output spurious		-65 dB
Frequency stability		\pm 0.0003 %
FM noise		-45 dB
Distortion		<5% nominal, 10% max.

1.4.4 Physical Specifications

Height	2.21" (56.1 mm)
Overall length	11.38"(289.1 mm)
Length without connector	10.67" (271.1 mm)
Width	5.23" (271.2 mm)
Weight	4.0 lbs (1.8 kg)
Mounting	Custom NAT ¼ ATR tray mount (NTX-VT1)
Connector type	Male filtered 25-pin D-subminiature with Positronics V5 locking tabs
Antenna connector	Bulkhead female BNC

1.4.5 Environmental Specifications

Temperature	-30° C to +60° C
Altitude	25,000 feet
Humidity	95 %
Shock	12 g (any axis)

Environmental conformance:

DO-160C Env. Cat. B4-BA[MN]XXXXXXAB[AB]BAUAXXX

1.5 VHF-FM Radio Spurious Frequencies

All VHF-FM radios are subject to the reception of spurious signals. Avoid operation on these frequencies whenever possible.

The frequencies affected within the NTX066 radio are 66.00 MHz, 72.00 MHz, and 84.00 MHz.

The frequencies affected within the NTX138 radios are 138.000 MHz, 144.000 MHz, 156.000 MHz and 168.000 MHz.

1.6 Unit Nomenclature

Model	Description / Distinction
NTX066-000	66.0 MHz - 88.0 MHz VHF-FM transceiver. 200 channel memory. 38 CTCSS tones 70 DCS tones. 1 W or 10 W selectable. List, Priority or List+Priority scanning. Optional Voice Inversion Scrambling
NTX138-000	138 MHz - 174 MHz VHF-FM transceiver. 200 channel memory. 38 CTCSS tones 70 DCS tones. 1 W or 10 W selectable. List, Priority or List+Priority scanning. Optional Voice Inversion Scrambling
NTX138-050	138 MHz - 174 MHz VHF-FM transceiver. 200 channel memory. 38 CTCSS tones 70 DCS tones. 1 W or 10 W selectable. List, Priority or List+Priority scanning. 2 channel crystal controlled USFS guard receiver. Optional Voice Inversion Scrambling
NTX138-100	138 MHz - 174 MHz VHF-FM transceiver. 200 channel memory. 38 CTCSS tones 70 DCS tones. 1 W or 10 W selectable. List, Priority or List+Priority scanning. DF compatible output signal. Optional Voice Inversion Scrambling

End of section 1.0

Section 2 Installation

2.1 Introduction

Information in this section consists of: unpacking and inspection procedures, installation procedures, post-installation checks, and installation drawings.

2.2 Unpacking and Inspection

Unpack the equipment carefully, and locate the warranty card. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Note that each unit should have the following:

- NTX VHF-FM Series Remote Mount Transceiver
- Warranty Card
- Release certification

Verify that all items are present before proceeding and report any shortage immediately to your supplier.

2.2.1 Warranty

Complete the warranty card information and send it to NAT when the installation is complete. If you fail to complete the warranty card, the warranty will be activated on date of shipment from NAT.

Note: An appropriately rated facility, e.g. Certified Aircraft Repair Station, must install this equipment in accordance with applicable regulations. NAT Ltd's warranty is not valid unless the equipment is installed by an authorized NAT Dealer. Failure to follow any of the installation instructions, or installation by a non-certified individual or agency will void the warranty, and may result in a non-airworthy installation.

2.3 Installation Procedures

2.3.1 Warnings

Do not bundle any lines from this unit with transmitter coax lines. Do not bundle any logic, audio, or DC power lines from this unit with 400 Hz synchro wiring or AC power lines. Do not position this unit next to any device with a strong alternating magnetic field such as an inverter or significant interference to operation will result. In all installations, use shielded cable **exactly as shown** and ground as indicated. Significant problems may result if these guidelines are not followed.

2.3.2 Cautions

Severe degradation of audio installations may result from incorrect wiring and shielding. This could cause much higher cross-talk, hum, and ground-loop interference.

2.3.3 Notes

For maximum resistance to low frequency interference, electrically ground the case of the transceiver.

2.3.4 Cable and Wiring

All unshielded wire shall be selected in accordance with the original aircraft manufacturer's maintenance instructions or AC43.13-1B Change 1, Paragraphs 11-76 through 11-78. Wire types should be to MIL-W-22759 as specified in AC43.13-1B Change 1, Paragraphs 11-85, 11-86, and listed in Table 11-11. For shielded wire applications, use Tefzel MIL-C-27500 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in Section 2.5 as required.

To provide easy installation of the hood, allow 3 inches from the end of the wire to the shield termination. Note: Install the hood after the wiring is complete.

Installation cabling must allow the transceiver to be easily withdrawn for disconnection and field service adjustments. Ensure an adequate service loop in the routing of the cables.

All wiring should be 22 AWG, except power and ground connections, which must be 18 AWG or larger, as indicated on the installation drawings. Ensure that the ground connection is clean and well secured. To prevent inadvertent system failure, supply power to this system from a separate breaker or fuse not connected to any other device. NAT recommends a 5 A fuse or breaker (28 Vdc Source).

Coaxial cable should be in accordance with MIL-C-17 unless otherwise specified. Do not use coax with PVC insulation. NAT recommends Teflon dielectric cable at or above VHF frequencies or where cable runs exceed 8 feet. Note that at VHF frequencies, cable losses due to long cable runs and tight bends may cut the ERP (Effective Radiated Power) to less than 50% of specification.

To prevent RF interference between similar systems, NAT recommends that VHF FM coax runs be widely separated, or be made using triaxial cable. Bond the outer shield to the airframe at the transceiver end only.

In communication intensive applications, bad cable routing and shielding may drastically compromise over-all system performance. Symptoms will be spurious squelch opening, RFI (Radio-Frequency Interference), and garbled reception.

Neatly terminate RF cables (solder or crimp) and test for shorts prior to system check-out (not while connected to the radio!!). Keep cable bends to a minimum at the antenna.

Avoid sharp bends in the coax cables (minimum 3" radius) to prevent severe reflections. If sharp bends are required use 90° elbow adapters.

Fabrication and installation of wiring harness should be in accordance with the original aircraft manufacturer's maintenance instructions or AC43.13-1B Change 1, chapter 11, sections 5 to 13, 16 and 17.

Grounding and bonding should be in accordance with the original aircraft manufacturer's maintenance instructions or AC43.13-1B Change 1, chapter 11, section 15.

2.3.5 Antennas

Correct antenna placement and mounting is critical in order to achieve the best possible performance. In general, keep all antennas as widely separated as possible and clear of any large airframe obstructions. Avoid any placement that puts antennas of like frequencies close together.

Installation of the antenna should be in accordance with the aircraft manufacturer's instructions for continued airworthiness or AC43.13-1B Change 1, chapter 11, section 15 and AC 43.13-2A chapter 3. If possible, the antenna should be located a minimum of 12 ft from aircraft navigation receiver antennas and a minimum of 4 ft from aircraft communications and ELT antennas. Be careful not to choose separations that closely approximate $\frac{1}{4}$, $\frac{1}{2}$ or whole number multiples of the navigation or communication system wavelengths.

Bottom mounted antennas will perform best in flight, but poorest on the ground during testing. Antennas may be severely degraded by 'masking' effects of the fuselage or stabilizers, and generally give best performance when bottom mounted.

Surround any blade or whip antenna with a ground plane surface (metallic, grounded material) having a radius equal to or greater than the height of the antenna. Poor grounding will result in severe reflected power and high levels of RFI throughout the airframe.

Any antenna will be less prone to interference from rotor modulation and other undesirable stimuli if installed correctly and surrounded by a large metallic ground plane. Under the same conditions, it is also much less likely to cause interference to other aircraft systems (e.g., coupling into audio system, fluctuations in instrumentation, etc.). Poor grounding will result in severe reflected power and high levels of RFI throughout the airframe.

Avoid antenna locations that will become fouled with oil, water, fuel or dirt as this will degrade performance. Roof mounts (in close proximity to rotor blades) are permissible.

2.3.6 Mechanical Mounting

Installation of the transceiver should be in accordance with the aircraft manufacturer's instructions for continued airworthiness or AC 43.13-1B Change 1, chapter 7, sections 2 to 7, and AC 43.13-2A chapter 2.

The transceiver is tray-mounted and uses a custom 1/4 ATR style tray. Mount (with countersunk screws) onto a clean, grounded surface having a resistance of less than 0.5 ohms to airframe ground.

The transceiver may be mounted in any attitude, but upright (mounting hook at the bottom) is preferred for access and condensation drainage.

2.3.7 Post-Installation Checks

2.3.7.1 Voltage/resistance checks

Do not attach the transceiver until the following conditions are met.

Check the following:

- a) P101 pins <5> and <6> for +28 Vdc relative to ground.
- b) P101 pins <8> and <20> for continuity to ground (below 0.5 Ω).

Ensure that the antenna is disconnected for the following test or erroneous readings may be obtained.

- c) Radio coax connector for continuity to the antenna coax connector (shield and center conductor) and for open circuit from the center conductor to ground and open circuit from the center conductor to the shield.

2.3.7.2 Power On checks

- a) Install the transceiver and power up the ship's systems. Turn on the control head. Check the operation of all front panel controls. Adjust brightness and volume levels as required.
- b) Check all transmit and receive functions. Ensure the RX/TX status indicator lights green when keying the radio to transmit and amber when receiving.
- c) Check the SCAN function.

Note: You may be unable to hear the received audio if the tones do not match those set in the radio. To avoid any confusion, set the tones to **OFF** (via the Status Edit mode) during scanning so that all channels will be heard.

- d) Check the antenna feedline at the R/T with a through-line wattmeter and suitable frequency elements to ensure correct antenna matching. Reflected power in excess of 25% represents a serious problem, and should be investigated carefully, or serious RFI and system interference as well as possible radio damage may result. A VSWR measurement over 3.0:1 represents a significant loss in signal power to the antenna. Check that forward power is to specifications over the frequency band of the radio.

2.3.8 Post-Installation EMI Test

The purpose of this test is to identify any interference that the transceiver may cause with existing aircraft systems. The transceiver should be tested in accordance with the Installation Approval Test Procedure (see section 2.5) and the test results documented on the record sheets.

2.4 Continued Airworthiness

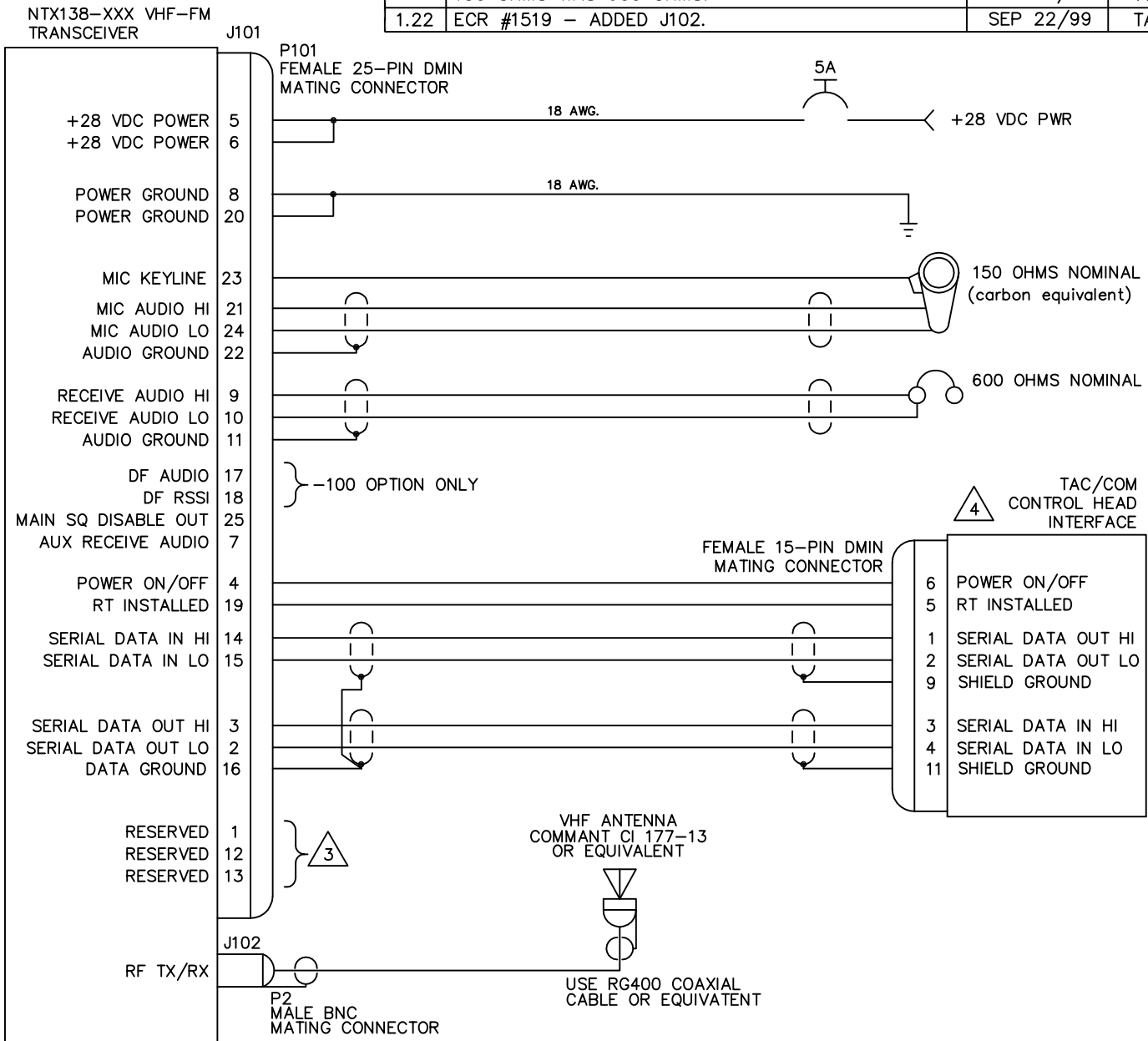
Maintenance of the NTX VHF-FM Series Remote Mount Transceiver is 'on condition' only. Periodic maintenance of these products is not required.

2.5 Installation Drawings

DRAWING	REV.	DESCRIPTION	TYPE
NTX138\403-0	1.22	Remote Mount Radio	Interconnect
NTX138\405-0	1.00	Remote Mount Radio	Connector Map
NTX138\922-0	1.02	Remote Mount Radio	Mechanical
NTX-VT1\922-0	1.00	Vertical Mount Tray	Mechanical
NTX138\634-0	1.00	Post-Installation EMI Test	Installation Approval Test Procedure
NTX066\634-0	1.00	Post-Installation EMI Test	Installation Approval Test Procedure

Section 2 ends after these Drawings

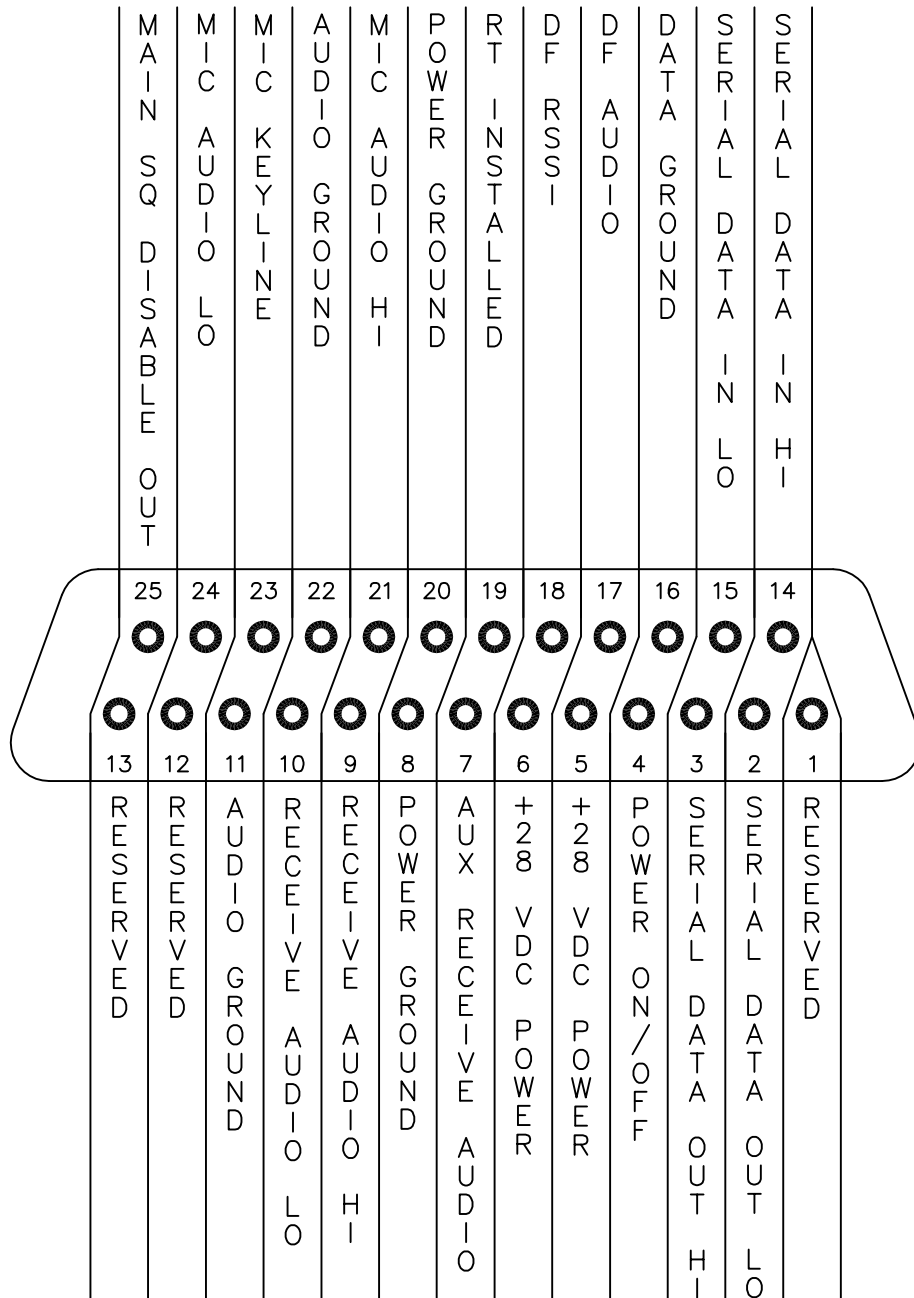
REVISIONS			
REV	DESCRIPTION	DATE	BY
1.01	PINS 1 & 2 SWAPPED ON J INTERFACE.	FEB 3/97	TGM
1.10	PINS 17, 18 & 25 CHANGED FROM RESERVED.	FEB 14/97	TGM
1.11	PIN 7 CHANGED FROM RESERVED.	FEB 19/97	TGM
1.20	ECR #759 PIN 25 OF J101 WAS RX ACTIVE	APR 11/97	MWS
1.21	ECR #950 - NOTE 4 & -100 OPTION ADDED, 150 OHMS WAS 600 OHMS.	AUG 21/97	TGM
1.22	ECR #1519 - ADDED J102.	SEP 22/99	TAT




- NOTES:
1. USE 22 AWG. WIRE UNLESS OTHERWISE NOTED.
 2. INSTALLATION KIT REQUIRED: NAT P/N NTX138-IKC (CRIMP PINS) OR NTX138-IKS (SOLDER CUPS)
 3. NO CONNECTION TO THESE PINS. RESERVED FOR OTHER FEATURES, FUTURE UPGRADES.
 4. THE NTX138-000, -100 REQUIRE THE 'J' INTERFACE CARD. THE NTX138-050 REQUIRES THE 'H' INTERFACE CARD.

PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

DESIGNED	RL	*nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TGM					
DATE	DEC 31/96	TITLE NTX VHF RADIO CONNECTIONS				
CHECKED	NAT 214					
APPROVED	NAT 107	SIZE	CAGE CODE	PART NO.	REV.	SHEET
FILE	403-0122.DWG	A	3AB01	NTX138	1.22	1/1
DWG. TYPE		INTERCONNECT		DWG. NO.		NTX138\403-0

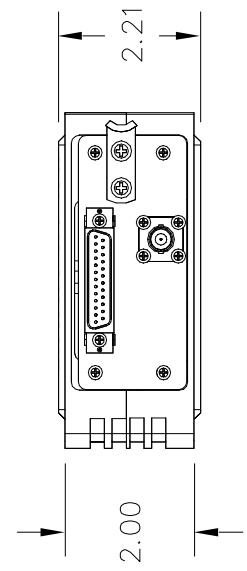
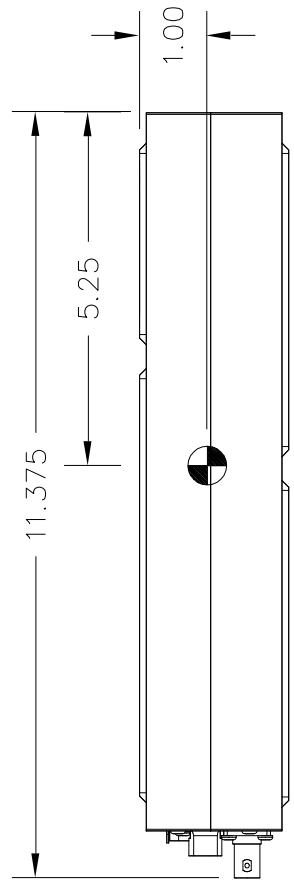
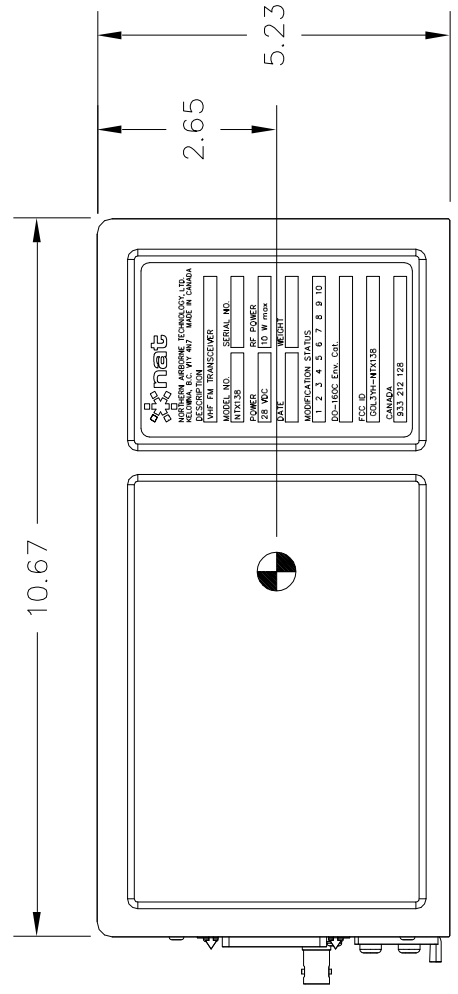


VIEW: REAR SIDE OF AIRFRAME CONNECTOR
 TYPE: AIRFRAME CONNECTOR IS 25-PIN D-SUBMINIATURE FEMALE (SOCKETS)

DESIGNED	JR	 NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	TGM					
DATE	MAY 1/97	TITLE VHF FM TRANSCEIVER				
CHECKED	NAT 206					
APPROVED	NAT 107	SIZE A	CAGE CODE 3AB01	PART NO. NTX138	REV. 1.00	SHEET 1/1
FILE	405-0110.DWG	DWG. TYPE CONNECTOR MAP			DWG. NO. NTX138\405-0	

REVISIONS

REV	DESCRIPTION	DATE	BY
1.01	ECR #797 - V5 HARDWARE WAS JACK POST, 4-40's WERE 6-32's ON FRONT PANEL. LABEL ADDED.	MAY 7/97	TGM
1.02	ECR #888 - LABEL ORIENTATION FIXED.	JULY 3/97	TGM



☉ DENOTES CENTER OF GRAVITY

WEIGHT: 4.0 Lbs. (1.8 Kg.)

DESIGNED	JR	nat NORTHERN AIRBORNE TECHNOLOGY LTD.		
DRAWN	TGM	TITLE: VHF FM TRANSCEIVER		
DATE	MAY 1/97	SIZE	CAGE CODE	PART NO.
CHECKED	NAT 206	A	3AB01	NTX138
APPROVED	NAT 107	DWG. TYPE	MECH. INSTALLATION	DWG. NO. NTX138\922-0
FILE	922-0102.DWG	REV.	1.02	SHEET 1/1



INSTALLATION APPROVAL TEST PROCEDURE

NAT Part #: **NTX138**
Document #: **NTX138\634-0**

Description: **Remote Mount FM Transceivers**
Rev: **1.00**

1. Post Installation EMI Test

The purpose of this test is to identify any interference that the NTX138 may cause with existing aircraft systems.

2. Test Conditions

The NTX138 should be installed and function tested. The antenna VSWR should be checked. A forward/reverse power check with an in-line wattmeter should show no more than 10% reflected power. For the following tests, insure that the transmit power is set to HI.

3. Methodology

Most of the EMI tests can be accomplished on the ground. In some cases, flight testing is required or is easier. If the aircraft is approved for IFR operations, then it is mandatory that interference between the NTX138 and the approach aids be checked in flight.

The GPS should be operational and navigating with at least the minimum compliment of satellites. The VHF comm should be set to the frequencies indicated with the squelch open. VOR/ILS/GS receivers should be set to the frequencies indicated and selected for display. If possible, set up a VOR/ILS ramp test set on the frequencies indicated and adjust the output until the flags are out of view. The transponder and encoder should be monitored with ramp test equipment. If possible set the ADF to a nearby navigation station.

Modulate the NTX138 transmitter on the indicated frequencies for at least 20 seconds. Observe the GPS for any degradation in satellite status or availability or flags. Listen for any noise or detected audio signals on the VHF comm(s). Listen for any noise or detected audio signals on the VOR/LOC receiver audio; look for any movement of flags or needles on the VOR/LOC/GS navigation display(s).

List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting. Assess the results.

If the aircraft is equipped with an autopilot or a stability augmentation system, then test fly the aircraft and verify that the operation of the NTX138 transceiver does not have adverse effects on these systems. After checking for gross effects at a safe altitude, fly an approach with each of the different navigation systems coupled to the autopilot (ILS, GPS etc.) and look for any anomalies.

4. Results

If the installed system passes all of the applicable EMI tests, then no further action is required. If interference is observed, then the interference must be assessed against the appropriate standards of airworthiness for the system in question. For example: it is permissible for a VFR certified GPS to lose navigation capability while the NTX138 is transmitting, providing that it recovers properly and promptly, but it is not permissible for an IFR Approach certified GPS to be affected in the same way. A complete discussion of all the standards of airworthiness to be applied in assessing EMI effects is beyond the scope of this document.

5. Procedure

- A. Operate the NTX138 transmitter on the following frequencies for at least 20 seconds. Observe the GPS for any degradation in satellite status, or availability, or flags.

FREQUENCIES	GPS #1		GPS #2	
	PASS	FAIL	PASS	FAIL
NTX138				
143.180 MHz				
143.1825 MHz				
157.5000 MHz				
157.5425 MHz				

NOTES:

- B. Determine if the image frequency for the VHF Comm falls within the range of the NTX138 unit. If so, select a set of frequencies that will cause the NTX138 to be set as close as possible to the image frequency. Any one of the many possible sets will suffice. Record these values in the spaces provided in the following chart. Modulate the NTX138 transmitter on the following frequencies for at least 20 seconds. Listen for any noise or detected audio signals on the VHF comm.

Example - Bendix/King KY 196A:

The first IF frequency is 11.4 MHz. The L.O. is above the received frequency (high side injection), therefore the image frequency is 22.8 MHz above the selected frequency. Set the KY 196A to 120.000 MHz and the NTX138 to 142.8000 MHz.

FREQUENCIES		RESULTS	
VHF #1	NTX138	PASS	FAIL
135.975	138.0000		
121.150	157.5000		
131.250	157.5000		
Image:			

FREQUENCIES		RESULTS	
VHF #2	NTX138	PASS	FAIL
135.975	138.0000		
121.150	157.5000		
131.250	157.5000		
Image:			

NOTES:

C. Determine if the image frequency for the VOR/ILS Nav falls within the range of the NTX138 unit. If so, select two sets of frequencies that will cause the NTX138 to be set as close as possible to the image frequency. Choose one set in the localizer frequency range, and one in the VOR frequency range. Record these values in the spaces provided in the following chart. Modulate the NTX138 transmitter on the following frequencies for at least 20 seconds. Listen for any noise or detected audio signals on the receiver audio; look for any movement of flags or needles on the navigation display.

FREQUENCIES		RESULTS	
VOR/ILS #1	NTX138	PASS	FAIL
108.000	162.0000		
108.100	162.1500		
Image:			
Image:			

FREQUENCIES		RESULTS	
VOR/ILS #2	NTX138	PASS	FAIL
108.000	162.0000		
108.100	162.1500		
Image:			
Image:			

NOTES:

- D. Modulate the NTX138 transmitter on the following frequencies for at least 20 seconds. Look for any movement of flags or needles on the navigation display.

FREQUENCIES		RESULTS	
G/S #1	NTX138	PASS	FAIL
334.7 (108.1)	167.3500		

FREQUENCIES		RESULTS	
G/S #2	NTX138	PASS	FAIL
334.7 (108.1)	167.3500		

NOTES:

Note: For the following tests, select frequencies at the top, middle and bottom of the range of the NTX138.

Frequency #1 _____ Frequency #2 _____

Frequency #3 _____

- E. At a safe altitude, engage the autopilot or stability augmentation system. Modulate the NTX138 transmitter on the above frequencies for at least 20 seconds. Observe any effect on the autopilot or stability augmentation system.

Observations:

F. Perform a coupled ILS approach to the aircraft's certified limits. Modulate the NTX138 transmitter on the above frequencies for at least 20 seconds. Observe any effect on the autopilot. Repeat for each different system such as ILS #2, GPS, FMS etc.

Observations:

G. List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting. Assess the results.

STEP	SYSTEM	PASS	FAIL	NOTES
1	Xponder & Encoder			
2	ADF 1 & 2			
3	VG			
4	Compass			
5	Directional Gyro			
6	Oil Pressure			
7	Fuel Pressure			
8	Oil Temp			
9	Amps			
10	Bus Voltage			
11	Fuel %			
12	Ng			
13	TOT			
14	Torque %			
15	Annunciators			
16	Digital Clock			



STEP	SYSTEM	PASS	FAIL	NOTES

NOTES:

End of Installation Approval Test Procedure



INSTALLATION APPROVAL TEST PROCEDURE

NAT Part #: **NTX066**
Document #: **NTX066\634-0**

Description: **Remote Mount FM Transceivers**
Rev: **1.00**

1. Post Installation EMI Test

The purpose of this test is to identify any interference that the NTX066 may cause with existing aircraft systems.

2. Test Conditions

The NTX066 should be installed and all functions should be tested. The antenna VSWR should be checked. A forward and reverse power measurement with an in-line wattmeter installed between the transceiver and antenna should show no more than 10% reflected power. For the following tests, ensure that the transmit power is set to HI.

3. Methodology

Most of the EMI tests can be accomplished on the ground. In some cases, in-flight-testing may be required/desired. If the aircraft is approved for IFR operations, it is mandatory that interference between the NTX066 and the approach aids be checked in-flight.

The GPS should be operational and navigating with at least the minimum compliment of satellites. The VHF comm should be set to the frequencies indicated in the applicable table with the squelch disabled. VOR/ILS/GS receivers should be set to the frequencies indicated in the applicable table and selected for display. If possible, set up a VOR/ILS ramp test set on the frequencies indicated in the applicable table and adjust the output until the flags are out of view. The transponder and encoder should be monitored with ramp test equipment. If possible, set the ADF to a nearby navigation station.

Modulate the NTX066 transmitter on the frequencies indicated in the applicable table for at least 20 seconds. Observe the GPS for any degradation in satellite status or availability, or flags. Listen for any noise or detected audio signals on the VHF comm(s). Listen for any noise or detected audio signals on the VOR/LOC receiver audio and look for any movement of flags or needles on the VOR/LOC/GS navigation display(s).

List the power plant, fuel and other electric instruments in the applicable table and note any anomalies that occur while transmitting. Assess the results.

If the aircraft is equipped with an autopilot or a stability augmentation system, test fly the aircraft and verify that the operation of the NTX066 transceiver does

not have adverse effects on these systems. After checking for gross effects at a safe altitude, fly an approach with each of the different navigation systems coupled to the autopilot (ILS, GPS etc.) and look for any anomalies.

4. Results

If the installed system passes all of the applicable EMI tests, no further action is required. If interference is observed, the interference must be assessed against the appropriate standards of airworthiness for the system in question. For example, it is permissible for a VFR certified GPS to lose navigation capability while the NTX066 is transmitting, providing that it recovers properly and promptly. It is not permissible for an IFR Approach certified GPS to be affected in the same way. A complete disclosure of all the standards of airworthiness to be applied in assessing EMI effects is beyond the scope of this document.

5. Procedures

- 5.1 Operate the NTX066 transmitter on the frequencies listed in Table 1 for at least 20 seconds. Observe the GPS for any degradation in satellite status, or availability, or flags.

Frequencies NTX066	GPS #1		GPS #2	
	Pass	Fail	Pass	Fail
68.200 MHz				
68.495 MHz				
75.020 MHz				
81.840 MHz				
87.520 MHz				
87.525 MHz				

Table 1

NOTES:

- 5.2 If the image frequency for the VHF Comm falls within the range of the NTX066 unit, select a set of frequencies that will cause the NTX066 to be set as close as possible to the image frequency. Any one of many possible sets can be used. Record these values in Table 2. Modulate the NTX066 transmitter on the frequencies listed in Table 1 for at least 20 seconds. Listen for any noise or detected audio signals on the VHF comm.

Example – Bendix/King KY 196A

The first intermediate frequency (I.F.) is 11.4 MHz. The local oscillator (L.O.) frequency is above the received frequency (high side injection) therefore, the image frequency is 22.8 MHz above the selected frequency. The frequency band for the NTX066 is from 66.000 MHz to 87.9975 MHz therefore, the second harmonic could cause interference with the VHF Comm. Set the KY 196A to 120.000 MHz and the NTX066 to 71.400 MHz. The image frequency for the KY 196A would then be 120.000 + 22.800 MHz, which equals 142.800 MHz. The second harmonic of 71.400 MHz is 142.800 MHz.

Channel	Frequencies		Results	
	Image	NTX066	Pass	Fail
VHF #1				
VHF #1				
VHF #2				
VHF #2				

Table 2

NOTES:

- 5.3 Modulate the NTX066 transmitter on the frequencies listed in Table 3 for at least 20 seconds. Listen for any noise or detected audio signals on the receiver audio and look for any movement of flags or needles on the navigation displays.

Channel	Frequencies		Results	
	VOR/ILS	NTX066	Pass	Fail
VOR/ILS #1	108.000 MHz	66.025 MHz		
VOR/ILS #1	108.100 MHz	66.025 MHz		
VOR/ILS #2	108.000 MHz	66.025 MHz		
VOR/ILS #2	108.100 MHz	66.025 MHz		

Table 3

NOTES:

5.4 Modulate the NTX066 transmitter on the frequencies listed in Table 4 for at least 20 seconds. Look for any movement of flags or needles on the navigation displays.

Channel	Frequencies		Results	
	G/S #	NTX066	Pass	Fail
G/S #1	334.7 (108.100)	66.025 MHz		
G/S #1	334.7 (108.100)	77.100 MHz		
G/S #1	334.7 (108.100)	87.995 MHz		
G/S #2	334.7 (108.100)	66.025 MHz		
G/S #2	334.7 (108.100)	77.100 MHz		
G/S #2	334.7 (108.100)	87.995 MHz		

Table 4

NOTES:

Note: For the following tests, select frequencies at the top, middle and bottom of the range of the NTX066.

Frequency #1 _____ Frequency #2 _____

Frequency #3 _____

5.5 At a safe altitude, engage the autopilot or stability augmentation system. Modulate the NTX066 transmitter on frequencies #1, #2 and #3 for at least 20 seconds. Observe any effect on the autopilot or stability augmentation system.

Observations:

5.6 Perform a coupled ILS approach to the aircraft's certified limits. Modulate the NTX066 transmitter on frequencies #1, #2 and #3 for at least 20 seconds. Observe any effect on the autopilot. Repeat for each different system such as ILS #2, GPS, and FMS etc.

Section 3 Operation

3.1 Introduction

Information in this section consists of the functional and operational procedures for the NTX VHF-FM Series Remote Mount Transceivers.

3.2 General

The NTX VHF-FM Series Remote Mount Transceivers are mounted using a custom 1/4 ATR tray and are operated using an NAT Tac/Com™ control head. The NTX138 models are capable of receiving and transmitting over 138-173.9975 MHz on the VHF high band, and the NTX066 models operate over 66.0 to 88.9975 MHz on the VHF mid-band.

The transceiver is controlled by a Tac/Com™ control head available from NAT Ltd. The relevant control head operation manual should be consulted for all operational information.

3.3 Configuration

The **NTX VHF-FM Series Remote Mount Transceiver has no normal user operational aspects**. The Tac/Com™ control head provides the user interface. During installation, or if the unit has been exchanged, it may be a requirement to change internal level adjustments. This should be done **ONLY BY FULLY QUALIFIED PERSONNEL**, as it requires removal of the transceiver's exterior case and use of test equipment to measure input and output levels.

End of section 3.0

