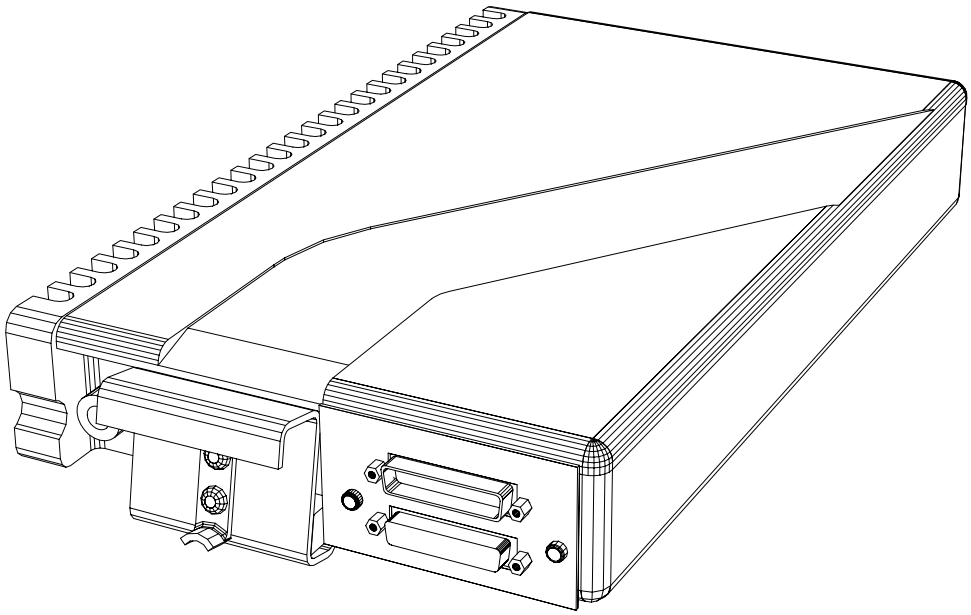
SM05

TAC/COM SERIES
VHF TRANSCEIVERS (NT030-NT150)



INSTALLATION AND OPERATION MANUAL

REV 4.00 November 26, 2003

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Kelowna BC, Canada
V1Y 4N7

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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 #	Amend. Date	Date Entered	Entered By

Table of Contents

Section 1.0 Description

1.1 Introduction

Tac/Com series transceivers have been optimized for full feature operation within the total Tac/Com system architecture, and provide agile operation over a wide range of RF frequencies.

Using a combination of serial and parallel tuning, these transceivers provide a simple interconnect with powerful channeling ability. The design of the transceivers also supports full encryption capability to DES 1027, or VGE formats without modification. Subaudible (CTCSS) tone coded squelch and DPL coding are also fully supported.

Various levels of scanning are supported in these fast lock synthesized radios, such as 'PRIORITY' or 'SCAN' list formats. These modes can emulate multiple 'guard' receiver operation under full control of the operator, and can be altered in the system software (control head). The basic radio stores 32 frequencies within 2 pages of non-volatile memory, any or all of which can be altered by the Tac/Com system control head as needed by the operator.

1.2 Purpose of Equipment

These transceivers are designed to meet the difficult airborne requirements of law enforcement and public service/public safety groups for tactical FM communication systems. The Tac/Com series of radio control heads provide a centralized location for tactical radio control of up to four transceiver systems, which can be of either NAT or other manufacture. Alphabetic labeling or identification of each radio channel is provided, as well as a display of receive and transmit frequencies, to ease pilot identification of the selected channel. Intended for aircraft use, these components may also be operated in vehicular applications (when correctly ordered) to provide the same capability for communications vans, emergency site co-ordination, or surveillance.

1.3 Design Features

The Tac/Com transceiver family uses advanced technology microprocessor controlled frequency synthesis, and NOVRAM channel data storage to provide its powerful features. The radio itself is completely modular, facilitating quick repair and service.

The physical enclosures for the Tac/Com transceivers are die-cast, with fully RF gasketed closures, to provide the most rugged possible unit. The design is qualified to MIL-STD 810D for environmental performance.

Many new band splits are supported by the Tac/Com family, providing airborne systems for new frequencies now required by land based law enforcement agencies and public service groups. These new splits can be mixed with other existing equipment via the Tac/Com control head to produce full function systems with minimum cost.

The thermal management of the radio is outstanding, resulting in minimal case temperature rise regardless of operational cycles. This is a significant departure from many existing systems which are at design limits even with low duty cycles.

A wide range energy conversion power supply is used in the transceivers for 28VDC operation, which significantly reduces both current consumption from the aircraft bus, and waste heat generation.

All transceivers have the same mounting footprint, RF connector, and plug-compatible interconnect, for ease of installation.

Unit covers have integral screws (anti-tamper) and hardware for ease of bench servicing (no more lost screws). Mating logic/interface connectors use gold contacts, and the Mil-spec type "N" RF connector is tarnish resistant, for improved performance in humid environments.

1.4 Specifications

1.4.1 System Specifications

Frequency range	NT30A	29- 41.995 MHz	
	NT30B	34- 49.995 MHz	
	NT136	138-155.995 MHz	
	NT150	148-173.995 MHz	
Input Power	Nominal 28 VDC		
Current Consumption	RX (squelched)	0.4-0.7 A (typ.)	
	TX	2.0 A (typ.)	
Frequency Stability	0.0005%		
Channel Spacing	5.0		kHZ*

Temperature Range	-30°C to +60°C
Humidity	to 90% (non-condensing/60°C)
Altitude	16,500' in unpressurized area
Duty Cycle	100% RX, 20% TX
CTCSS Tones	38 (From 67.0 Hz to 250.3 Hz EIA Std.)
DPL Codes (Digital Private Line)	83 (023 to 754)
Encryption Capability	-DES per FS1027 -GE Voice Guard -Transcrypt
Shock	EIA and MIL-STD-810D
Dimensions (H x W x D)	2.7" x 8.0" x 14.0" (W/R Version) 2.7" x 9.5" x 13.3"
Weight (less accessories)	8.5 lbs. (W/R Version) 9.5 lbs.

* Alternate 5.0/12.5 kHz spacing available on NT150 when used with Tac/Com II controls. On NT136-PAS, Tac/Com II provides 5.0/6.25 kHz spacing for European applications.

1.4.2 Transmitter Specifications

Conducted Spurious	-80 dB (-70 dB NT806)
Modulation	±4.5 kHz (Max.)
Distortion	Less than 2% (1000 Hz) Less than 5% (300 to 3000 Hz)
Deviation Symmetry	0.3 kHz maximum
Microphone Load Impedance	600 ohms
RF Output Impedance	50 ohms (Type "N" connector)

1.4.3 Receiver Specifications

Sensitivity	0.35 uV (EIA 12 dB SINAD) typical Normally set to 0.6 uV
Selectivity (EIA 2-signal method, 25kHz channels)	-80 dB
Spurious Response	-85 dB
Audio Output	Phones-Nominal 600 ohm line output 100 mW minimum (Transformer coupled output) Speaker-Nominal 4 W into 8 ohms. (Bridge output, DO NOT GROUND)

1.5 Unit Nomenclature

Tac/Com transceivers are identified by two groups of numbers. The first defines the frequency band, and the second defines any optional attributes of the R/T.

Part numbers:

NT150-000 W/R ← Denotes Weight Reduced

↑ ↖

Defines Frequency Band Defines Options

The options currently available are as follows:

-050	Separate 2 channel dedicated receiver module with USFS/OAS channels installed (NT150 only).
-060	Separate 2 channel dedicated receiver module with user defined guard channels (Some restrictions may apply).
-100	Separate DF Receiver (DF100-001), which will allow NT136 and NT150 transceivers to operate with NAT's TDF System.
-EUR	Transceiver modification to provide improved adjacent channel rejection for compliance with European specifications.
-EXT	Transceiver modification to allow the NT30B extended range of 33 to 50 MHz.

End of Section 1.0

Section 2.0 Installation

2.1 General

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

2.2 Unpacking and Inspection

a) 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:

Warranty Card
Release Certificate
Installation Manual

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

c) 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 the **date of shipment from NAT.**

2.3 Installation Procedures

2.3.1 Warnings ←*IMPORTANT !*

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 from not following these guidelines

2.3.2 Cautions

All audio installations can be severely degraded by incorrect wiring and shielding, and may result in much higher cross-talk, hum, and ground-loop interference. This should be considered when audio wiring to and from the radio installation is performed.

2.3.3 Cabling and Wiring

For shielded wire applications use Tefzel M27500 or Raychem spec 44 (81044) shielded wire with Raychem D140 or equivalent solder sleeves (for shielded terminations) to make the most compact and easy to terminate interconnect. Tailor the examples of installation diagrams in Section 2.4 for your own requirements.

Allow 3 inches from the end of the wire to the shield termination to allow the hood to be easily installed. Note the hood is a "clamshell" type, and is installed **after** the wiring is complete.

All channeling wiring should be 22 ga., except power and ground connections, which must be 20 ga. or larger, as indicated on the installation drawings. Ensure that the ground connection is clean, and well secured. Power to this system must be supplied from a separate breaker or fuse, and not bundled to any other source to prevent inadvertent system failure. A 3A slow-blow fuse or breaker is suggested for all models except the NT030B, which should use a 5A, slow-blow fuse or breaker. (28 VDC Source).

Coax cable should be RG-58C/U or similar mil-grade full coverage coax cable. At UHF frequencies, use of double shielded RG-223/U, or large diameter RG-213/U may be desired to reduce cable loss. Teflon dielectric cable is encouraged above VHF frequencies, or where cable runs exceed 8 feet. Note that at UHF frequencies, cable losses with even short runs may cut the ERP to less than 50% of spec.

To prevent RF interference between similar systems, it is recommended that VHF COMM and VHF FM coax runs be widely separated, or be made using triaxial cable, with the outer shield bonded to the airframe at one end only (transceiver end). In communication intensive application, BAD CABLE ROUTING AND SHIELDING MAY DRASTICALLY COMPROMISE OVER-ALL SYSTEM PERFORMANCE. SYMPTOMS WILL BE SPURIOUS SQUELCH OPENING, RFI AND GARBLED RECEPTION.

RF cables must be neatly terminated (solder or crimp), and tested FOR SHORTS (NOT WHILE CONNECTED TO THE RADIO!!) PRIOR TO SYSTEM CHECK-OUT. Avoid sharp bends in the coax cables (min. 3" radius) to prevent severe reflections, especially at UHF frequencies.

2.3.4 Mechanical Mounting

2.3.4.1 Tray mounting

Transceiver mounting is accomplished via a flat rack assembly, which must be securely attached to existing structure with AN3 or larger bolts with suitable locking hardware and washers. Note that the non-weight reduced radio is secured to the tray using a "TORX" (or six-sided spline) screw to reduce tampering with equipment.

Shock mounting of the tray is not required except in extraordinary circumstances where airframe vibration is very severe.

Ensure that the unit is securely mounted before any flight is attempted.

Do not mount the transceiver in the path of any hot air exhaust, dripping condensation, or oil leak.

Try to mount the transceiver close to the intended antenna location, as long cable runs will dramatically increase losses to the antenna.

2.3.4.2 Cabling

Installation cabling MUST allow the unit to be easily withdrawn for removal. Ensure an adequate service loop is allowed in the routing of the cable. Do NOT bundle the RF coax cable with the channeling wires.

Ground the transceiver with as short a ground wire as practical, and ensure the ground connection is clean, and of good quality.

2.3.4.3 Control Head

Do not mount the Tac/Com control head adjacent to, or bundle the cables with, a panel mounted ADF, or faint 'birdies', (RF noise) may result on the ADF from the control head's computer.

Ensure that the unit is securely mounted before any flight is attempted.

Note that the case is grounded, but it should be attached to a grounded surface for RFI shielding. A pin is provided for grounding the case and this must be connected via ITS OWN WIRE to a suitable ground, not jumpered to the power ground wire connection.

2.3.4.4 Antennas

Correct antenna placement and mounting is critical 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. Especially troublesome will be AM COMM and VHF FM antennas in close proximity.

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

Any blade or whip antenna must be surrounded by a ground plane surface (metallic, grounded material) equal in radius to the height of the antenna, as an absolute minimum. Poor grounding will result in severe reflected power and high levels of RFI throughout the airframe.

Keep cable bends to a minimum at the antenna and use 90 degree elbow adapters if sharp bends are required. 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 without severe degradation, but should not be adjacent to VHF AM COMM antennas, or cross-talk may result.

Use caution with cable routing and length on VHF systems. Sharp kinks, bends or coiled cable may adversely affect performance. Cable runs should be as short as possible for good performance. Use only high quality mil-rated cable (RG58C/U), microwave rated cable (RG214/U), or cable with a teflon dielectric for longer runs.

Type 'N' fittings should be used throughout, if possible, to prevent degradation over time, and to provide the best impedance match.

2.3.5 Antenna Selection Guide

This guide shows some industry standard antennas which can be used with NAT NT-Series Transceivers, and gives a range of mechanical choices where possible.

2.3.5.1 VHF Lo-Band Antennas 30-50 MHz Range

Transceiver	Tryvec/Avant	Comant	Foxtronics	Type
NT30A/B	AV224 (-15 to -6dBi)			Bent blade
	AV402 (-10 to -4dBi)			Whip
	AV404 (-3dBi avg.)			Whip
	AV430 (-8 to -4dBi)			Whip
	AV504 (-3dBi avg.)			Bent whip
		CI-233		Whip
			FLX-3050B	Active*

*The Foxtronics antenna will tune all channels with relatively low losses. An external coupler (Foxtronics) is required, along with an interface adapter from NAT (RS12-020).

Antennas with losses of over -6dBi (dB with respect to isotropic source) will dramatically reduce transmit power and receive sensitivity. Special order, fixed tuned, narrow bandwidth, single frequency whips are available from Comant. Spiral wound aircraft CB whip antennas (Antenna Specialist, etc.) can also be cut down in length to produce resonant antennas with very low losses for frequencies in the higher 30-50 MHz range. Note that these will be very narrow in bandwidth, and must be tuned (by cutting) very carefully.

Substantial ground plane area is required in this band split, and poor antenna locations may produce very large mismatch losses at different frequencies.

2.3.5.2 VHF Hi-Band Antennas 136-174 MHz Range

Transceiver	Comant	D&M	Type
NT136		C-63-4	Whip
	CI-177-1		Whip
NT150	CI-292-4	C63-4/A	Whip
	CI-292-3	C63-3/A	Bent Whip
	CI-145		Blade
	CI-177		Whip

2.3.6 Post-Installation Checks

2.3.6.1 Wiring Checks

a) With the Tac/Com control head disconnected from all of its mating connectors, make the following measurements on P100 SYSTEM connector (25 pin female), if used:

i) Check pin 1 and 2 for +28 VDC (or 14 VDC) relative to ground.

ii) Check pins 13, 14 and 15 for continuity to ground (below 0.5 ohms).

iii) Check pin 3 (28 VDC), pin 4 (14 VDC) or pin 5 (5 VDC) for proper lamp dimmer voltage. Check 16, 17 or 18 for continuity to ground as above (lamp return).

DO NOT ATTACH THE TAC/COM CONTROL HEAD until these conditions are met.

b) With the Tac/Com Transceiver disconnected from all of its mating connectors, make the following measurements on the airframe (female cable end) connector:

i) Check pin 1 and 2 for +28VDC relative to ground.

ii) Check pins 14 and 15 for continuity to ground (below 0.1 ohms).

iii) Check pin 6 for PTT action (closure to ground when keyed), and pin 5 for mic connection. Note that these are commonly reversed by accident, and will result in transceiver keying, but no modulation.

iv) Check pins 11 and 24 for continuity to the ship's audio system as required for RX audio.

d) ENSURE that neither pin 12 or 25 is connected to ground, or immediate failure of the radio will result. This (optional) speaker line is a bridge output, and must be floating above the airframe ground.

e) Ring out the channeling lines to the control head connector, and check for shorts on all shielded cables. Note that a quick check of these lines will save many wasted hours later, and possible control head and R/T damage.

f) Check the RF connector for continuity to the antenna, and open circuit to ground from the center conductor.

NEVER make a HI-POT test on this RF coax cable, unless the transceiver is KNOWN TO BE DISCONNECTED. Failure to follow this information will result in a damaged transceiver which is not covered by warranty!

DO NOT ATTACH THE TAC/COM TRANSCEIVER until the above conditions are met.

2.3.6.2 Performance Checks

a) Power up the ship's system with the Tac/Com control head and R/Ts installed, and turn on all of the radios and other accessories required for this system.

b) Check for correct radio operation and channeling, both receive and transmit, and Ensure that all status indications are correct (TX and SQ) Do not proceed until the radios are operating correctly. You may have to set the DISPLAY CONTRAST pot (on the LCD controls), or use the CONTRAST/BRIGHTNESS screen (reached after the last radio with the "RADIO" button) to obtain a suitable display.

c) Check each 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. Check that forward power is to specifications over the required band, as specified for the radio in use.

2.3.6.3 Diagnostic Hints

Ensure all antenna mounts are secure, cleanly grounded, and well terminated. Avoid sharp cable bends in the coax. Never mount any antenna on a composite surface unless a well grounded and adequately sized ground plane has been provided.

Unusual buzzes, hums or other background audio are symptomatic of multiple grounds, or noisy external systems such as blowers or pumps sharing wiring with the audio system connections. Failure to key or correctly modulate a transmitter is often caused by forgetting to connect all required grounds to the radio or external audio system.

A special caution is that no ground should be taken from the front panel, or similar location, that shares a ground return with a turn and bank, horizon, or other motor driven instrument. If this caution is not observed, the sound of the motor may be heard mixed in with receiver audio.

2.3.6.4 System Interaction

Fly the aircraft, and check levels and operation of all functions. Display contrast/dimming may have to be tailored for adequate viewing by the flight crew.

Ensure there is not any interaction between any transmit functions and received NAVAIDS, or other receiver functions. Antenna placement or cable routing may have to be changed if these problems are encountered. Ensure that there is not any interaction with Tac/Com control head operation and ADF performance. Relocation or re-routing of the interconnect cabling may be required if interference exists.

2.3.6.5 Final Inspection

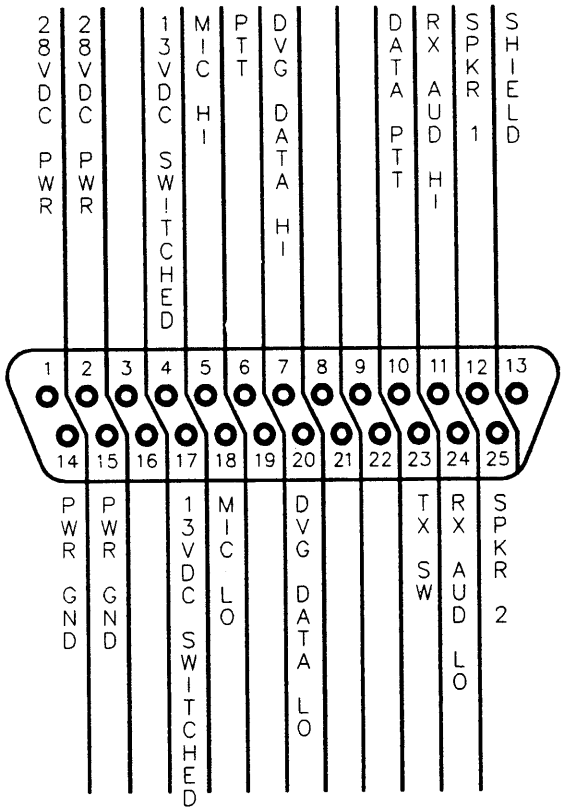
Before leaving the aircraft, Ensure that ALL THE MATING CONNECTORS ARE SECURELY FASTENED TO THE TAC/COM CONTROL HEAD. Also Ensure that the unit is securely fastened to the aircraft from the front panel. Ensure that the Tac/Com Transceivers are securely locked into the tray(s) and all mating connectors are securely fastened.

If all functions are satisfactory, the aircraft maybe released for service once all required log entries are made and the required MOT/FAA paperwork is completed.

2.4 Installation Drawings

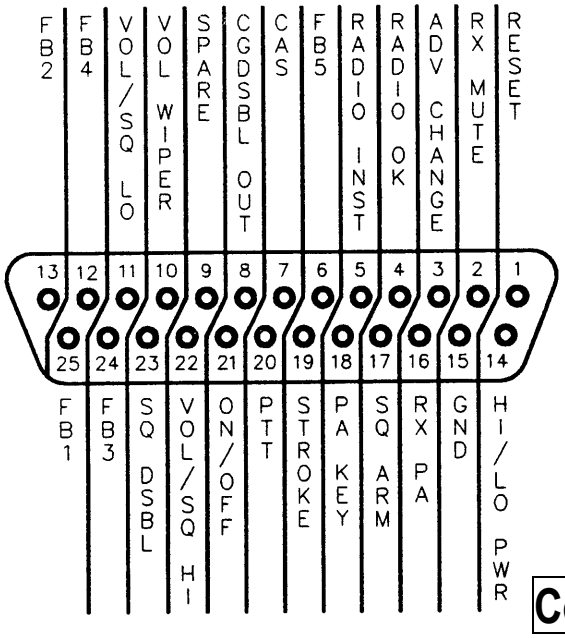
DRAWING	REV.	DESCRIPTION	TYPE
NTRT\405-0	1.01	NT Transceiver Connector Map	Connector Map
NT030 FOX\403-0	1.20	'N' I/F to NT30A/B and Foxtronics Antenna Coupler	Interconnect
NT030 FOX\403-1	1.20	'N' I/F to NT30A/B and Foxtronics Antenna Coupler	Interconnect
NT030.FOX\403A	A	'I/F to NT30A/B and Foxtronics Antenna Coupler	Interconnect
NT136.PAS\403	-	'N' I/F to NT136-PAS Transceiver	Interconnect
NT136.PAS\403-1B	B	'N' I/F to NT136-PAS Transceiver and Remote Atten.	Interconnect
NT150\403	-	'N' I/F to NT Series Transceiver	Interconnect
NT150.050\403-0	1.12	'N' I/F to NT150-050 Transceiver	Interconnect
NT150\403-1	-	'T' I/F to NT Series Transceiver	Interconnect
GEVOICE.GRD\403	B	'N' I/F to NT Series Transceiver & GE Voice Guard	Interconnect
NT-WR\927-0	1.10	Weight Reduced NT Series Transceiver	Mechanical
HS10-001\922-0	1.10	1 Radio Horiz. Mounting Tray For W/R Transceiver	Mechanical
HS20-001\922-0	1.10	2 Radio Horiz. Mounting Tray For W/R Transceiver	Mechanical
HS30-001\927-0	1.00	3 Radio Horiz. Mounting Tray For W/R Transceiver	Mechanical
VS10-001\922-0	1.10	1 Radio Vert. Mounting Tray For W/R Transceiver	Mechanical
VS20-001\922-0	1.10	2 Radio Vert. Mounting Tray For W/R Transceiver	Mechanical
VS30-001\922-0	1.10	3 Radio Vert. Mounting Tray For W/R Transceiver	Mechanical
VS\922-0	1.10	Single/Dual Vert. Mounting Tray For W/R Xcvr.	Mechanical

End of Section 2.0



AIRFRAME
CONNECTOR
P1Ø1
(TOP)

HARNESS:
TYPE DB25S (D-MIN FEMALE)



CONTROL HEAD
CONNECTOR
P1Ø2
(BOTTOM)

HARNESS:
TYPE DB25P (D-MIN MALE)

VIEW IS THE REAR OF THE HARNESS CONNECTOR.

REVISION	DATE
1.00	FEB 18/94
1.01	MAY 18/94

nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
WS2	NT TRANSCEIVER CONNECTOR MAP		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
T. MASTERS	N/A	CONNECTOR MAP	1/1
APPROVED BY	DRAWING NUMBER		FILE NUMBER
NAT R&D	NTRT\405-0		NTRT\405-0101

REVISIONS			
REV	DESCRIPTION	DATE	BY
A	DESIGN CHANGES.	JUN 25/91	MWS
1.20	ECR 2229 – CHANGED EXTERNAL FUSE RATING.	SEP 18/03	TAT

NT030–FOX INSTALLATION NOTES

NOTES:

1. ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE SPECIFIED. ALL WIRE SHOULD BE IN ACCORDANCE WITH MIL–W–22759. ALL SHIELDED WIRE/CABLE SHOULD BE IN ACCORDANCE WITH MIL–C–27500.

△2 INSTALL SPARE WIRE.

△3 USE THREE CONDUCTOR SHIELDED WIRE.

△4 USE 18GA. WIRE OR TWO 20 AWG. WIRES.

△5 RECEIVE AUDIO IS A FLOATING OUTPUT.

△6 SPEAKER AUDIO IS A BRIDGED OUTPUT, DO NOT GRUOND!

△7 CONNECT PIN 35 TO GROUND FOR NT030B OR
CONNECT PIN 36 TO GROUND FOR NT030A.) – RS12 ONLY

△8 JUMPER A–B FOR NT030B.
JUMPER B–C FOR NT030A.

△9 USE RG58C/U SHEILDED CABLE, OR BETTER.

△10 3 AMP FOR NT030A, 5 AMP FOR NT030B.

11. USE TEFZEL M27500 OR RAYCHEM SPEC44 (M81044) SHIELD WIRE WITH RAYCHEM SOLDER SLEEVES.

DEFINITION:

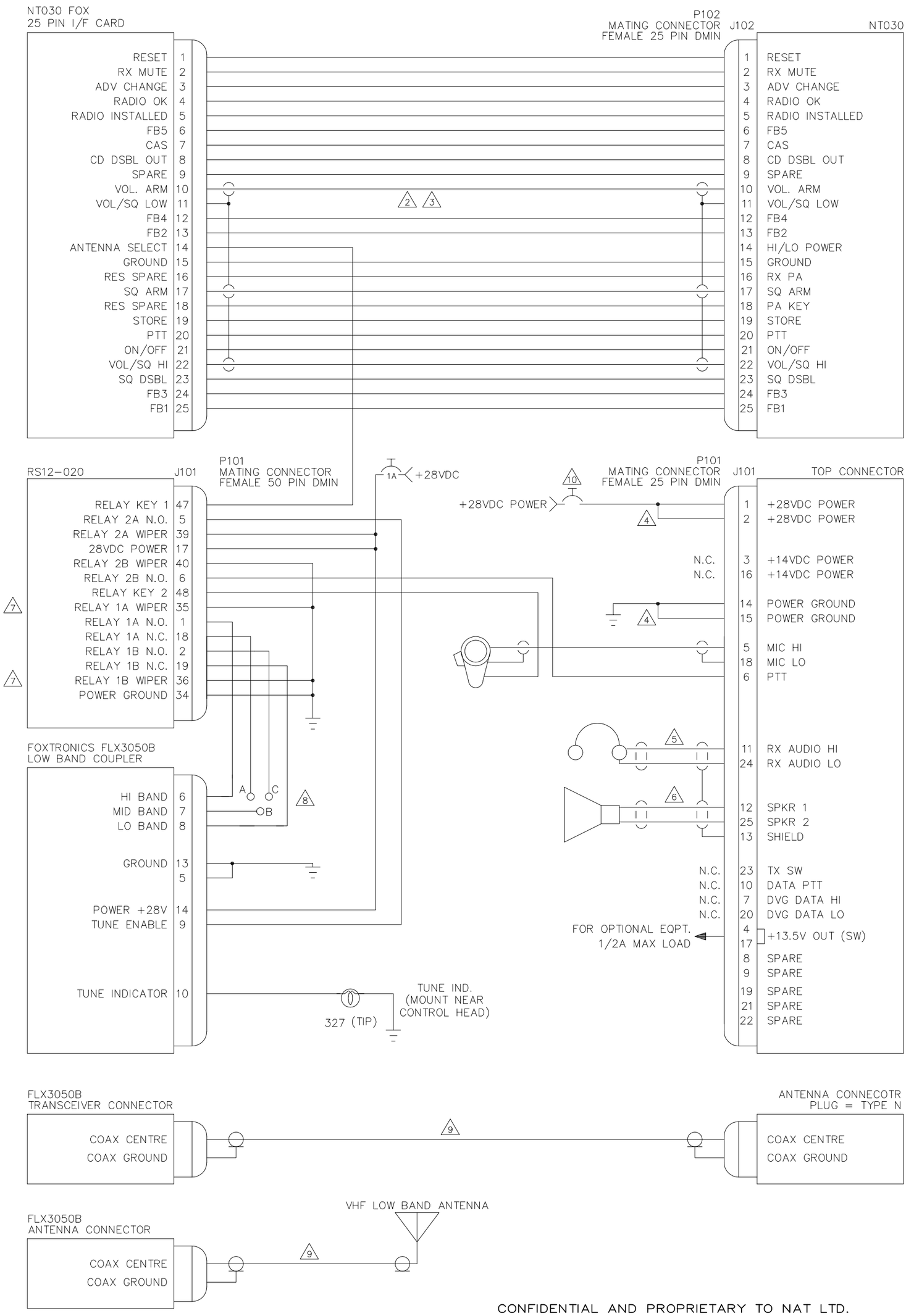
N/C: NO CONNECTION. THE PIN IS NOT CONNECTED TO ANYTHING INTERNALLY, AND THEREFORE SHALL HAVE NO CONNECTION EXTERNALLY.

N/C SPARE: NO CONNECTION INTERNALLY, BUT A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.

RESERVED: MAY BE CONNECTED AND USED IN THE FUTURE. THE CIRCUITRY MAY BE PRESENT OR ADDED TO ACTIVATE THE FUNCTION. THE PIN MAY BE USED FOR TEST PURPOSES. THERE IS NO EXTERNAL CONNECTION.

RESERVED SPARE: (RSV SP) RESERVED, BUT INSTRUCTIONS SHALL BE FOLLOWED TO ACTIVATE THE CIRCUITRY. A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.

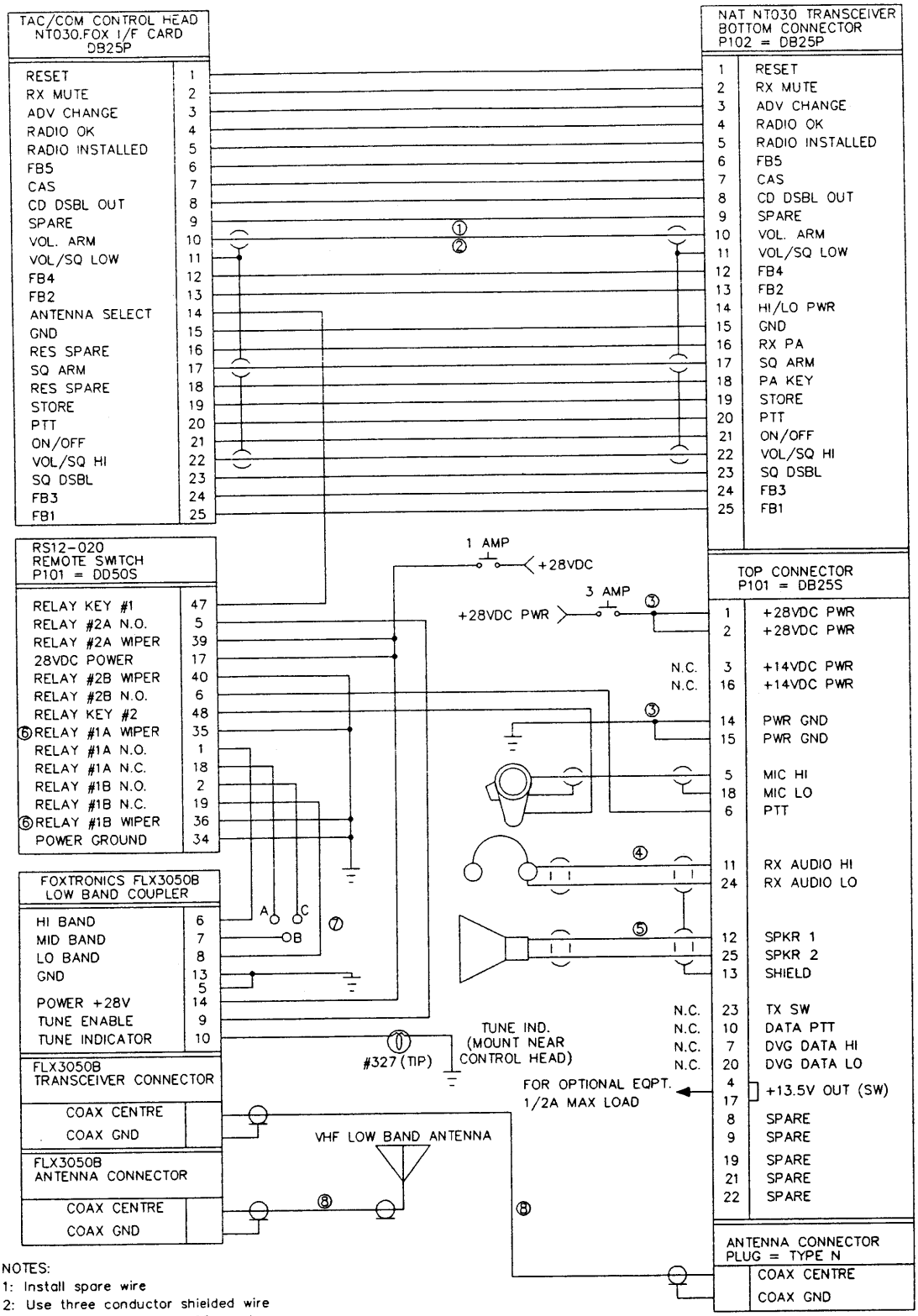
DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	DP					
DATE	FEB 22/89	TITLE ANTENNA				
CHECKED	NAT 255					
APPROVED	NAT 501	SIZE A	CAGE CODE 3AB01	PART NO. NT030 FOX	REV. 1.20	SHEET 1/2
FILE 403–0.DWG		DWG. TYPE INTERCONNECT		DWG. NO. NT030 FOX\403–0		



DESIGNED	–	nat NORTHERN AIRBORNE TECHNOLOGY LTD.				
DRAWN	DP					
DATE	FEB 22/89	TITLE ANTENNA				
CHECKED	NAT 255					
APPROVED	NAT 501	SIZE B	CAGE CODE 3AB01	PART NO. NT030 FOX	REV. 1.20	SHEET 2/2
FILE 403-0.DWG		DWG. TYPE INTERCONNECT		DWG. NO. NT030 FOX\403-1		

INTERCONNECT DRAWING FOR CONNECTING A NAT TAC/COM CONTROL HEAD NT-SERIES INTERFACE CARD TO A NAT TAC/COM NT030 TRANSCEIVER AND A FOXTRONICS FLX3050B ANTENNA COUPLER.
(INTERFACE CARD CH400-9 REV A OR CH400-91 REV A) (INTERFACE CARD TYPE: "N")

NT-030 AND FOXTRONICS



NOTES:
1: Install spare wire
2: Use three conductor shielded wire
3: Use 18ga. wire or two 20ga. wires
4: Receive audio is a floating output
5: Speaker audio is a bridged output, do not ground!
6: Connect pin 35 to ground for NT030B or connect pin 36 to ground for NT030A.)-RS12 ONLY
7: Jumper A-B for NT030B
Jumper B-C for NT030A
8: Use RG58C/U sheilded cable, or better.

Use Tefzel M27500 or Raychem spec44 (m81044) shielded wire with raychem solder sleeves

All wire should be 22ga. except for power & ground which should be 18ga.

REVISION	DATE
A	25 JUNE 91

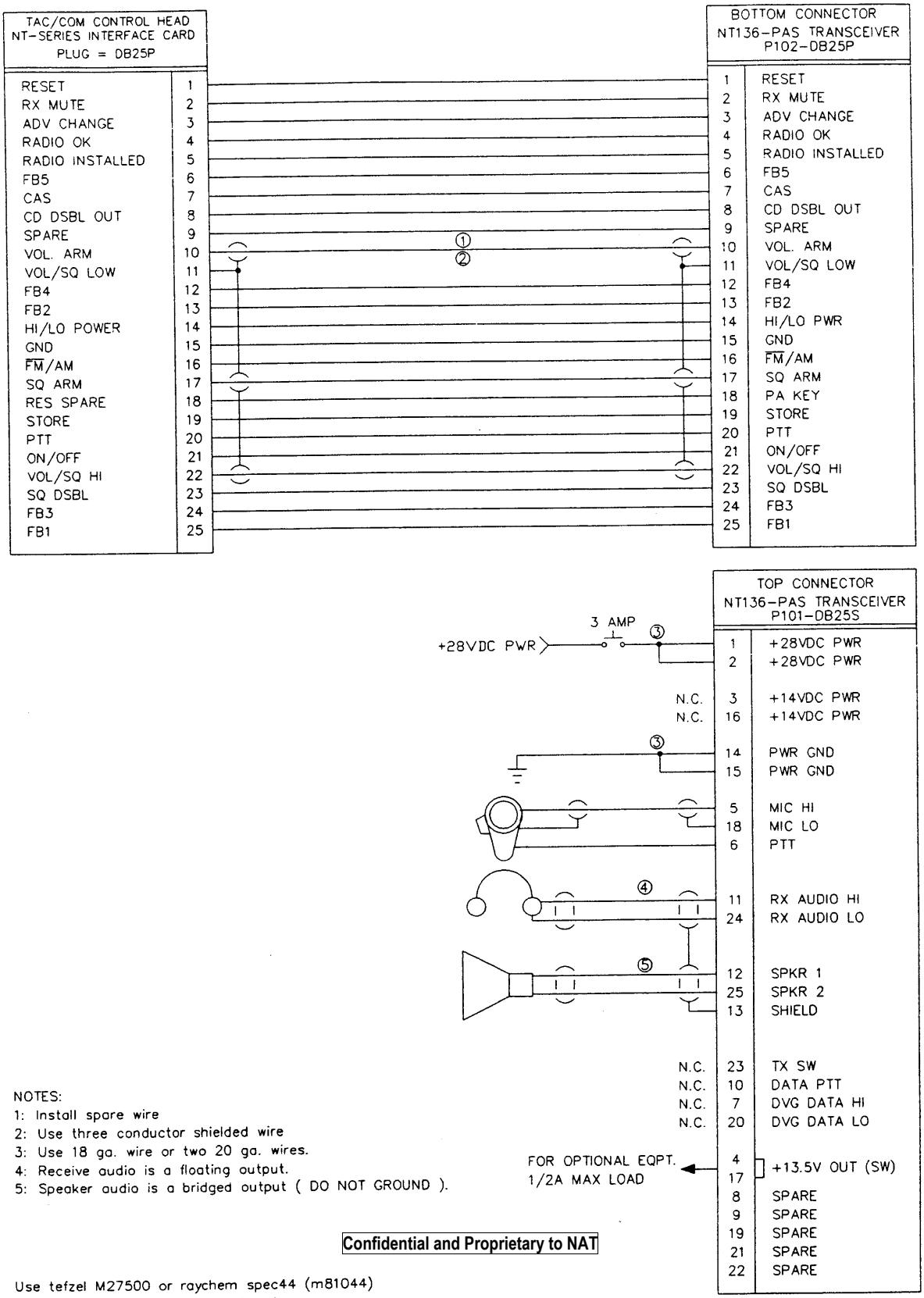
NORTHERN AIRBORNE TECHNOLOGY LTD.
SUITE 14,1925 KIRSCHNER RD. KELOWNA, B.C. V1Y-4N7

DESCRIPTION	PART NUMBER	DRAWING NUMBER
ANTENNA INTERCONNECT	NT30-FOX	NT030.FOX\403A
DATE	DRAWN BY	~~APPROVED BY~~
FEB. 07/91	M SAWCHUK	NAT PROD

INTERCONNECT DRAWING FOR CONNECTING THE NAT TAC/COM CONTROL HEAD NT SERIES INTERFACE CARD TO A NAT TAC/COM NT-PAS SERIES TRANSCEIVER.

NT136-PAS

(INTERFACE CARD CH400-9 REV A, CH400-91 REV A) (INTERFACE CARD TYPE: "N")



NOTES:
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4: Receive audio is a floating output.
5: Speaker audio is a bridged output (DO NOT GROUND).

Use tefzel M27500 or raychem spec44 (m81044) shielded wire with raychem solder sleeves

All wire should be 22ga. except for power & ground which should be 18ga.

REVISION	DATE

NORTHERN AIRBORNE TECHNOLOGY LTD.
SUITE 14,1925 KIRSCHNER RD. KELOWNA, B.C. V1Y-4N7

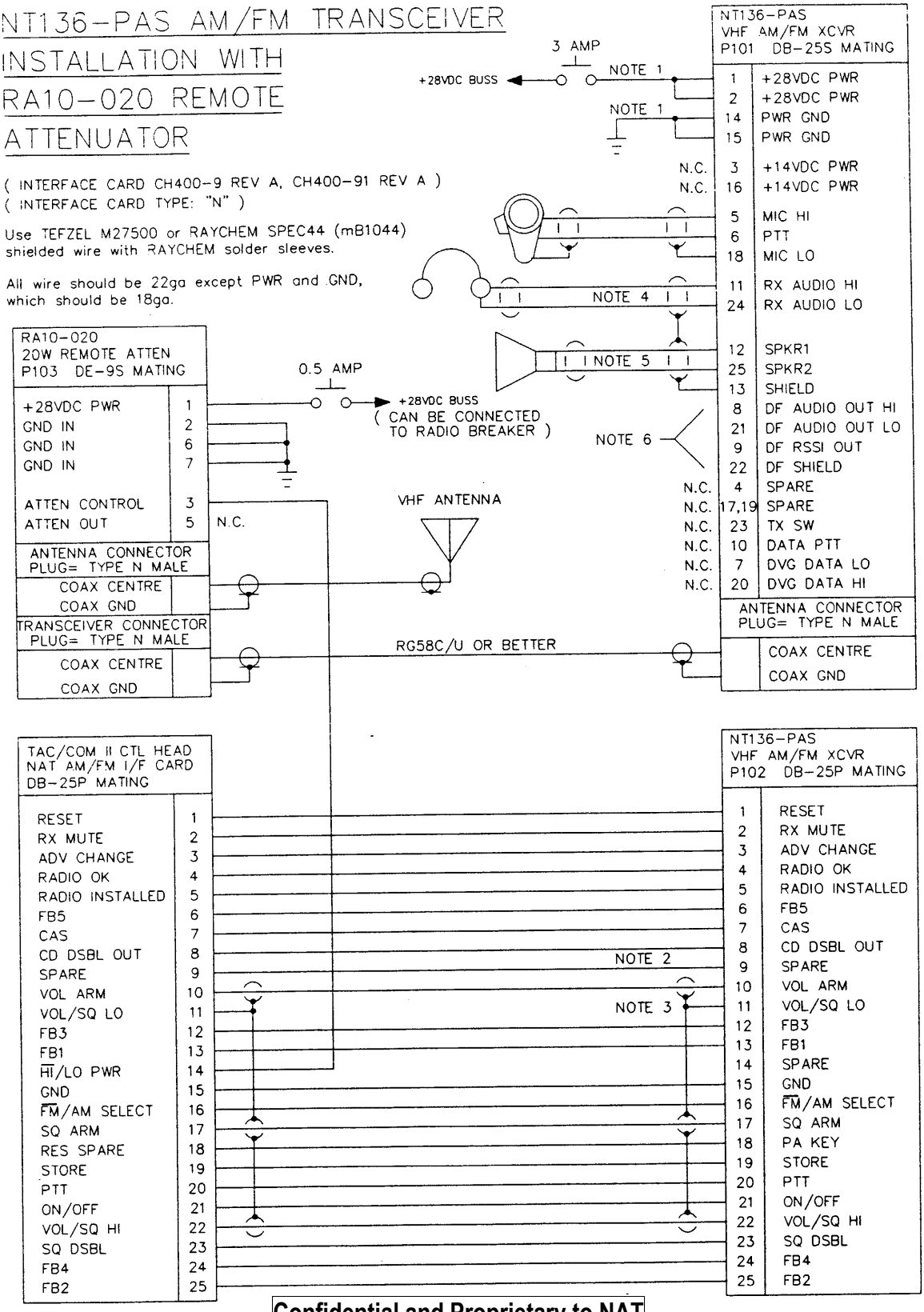
DESCRIPTION	PART NUMBER	DRAWING NUMBER
INTERCONNECT	NT136-PAS	NT136.PAS\403
DATE	DRAWN BY	APPROVED BY
25 JUNE 1991	SCOTT MOORE	NAT PROD

NT136-PAS AM/FM TRANSCEIVER INSTALLATION WITH RA10-020 REMOTE ATTENUATOR

(INTERFACE CARD CH400-9 REV A, CH400-91 REV A)
(INTERFACE CARD TYPE: "N")

Use TEFZEL M27500 or RAYCHEM SPEC44 (mB1044) shielded wire with RAYCHEM solder sleeves.

All wire should be 22ga except PWR and GND, which should be 18ga.



NOTES:

1. USE 18ga OR TWO 20ga WIRES.
2. INSTALL SPARE WIRES.
3. USE 3-CONDUCTOR SHIELDED WIRE.
4. RECEIVE AUDIO IS A FLOATING OUTPUT.
5. OPTIONAL SPEAKER CONNECTION IS A BRIDGED OUTPUT. DO NOT GROUND EITHER LINE.
6. RESERVED FOR DF SYSTEM.

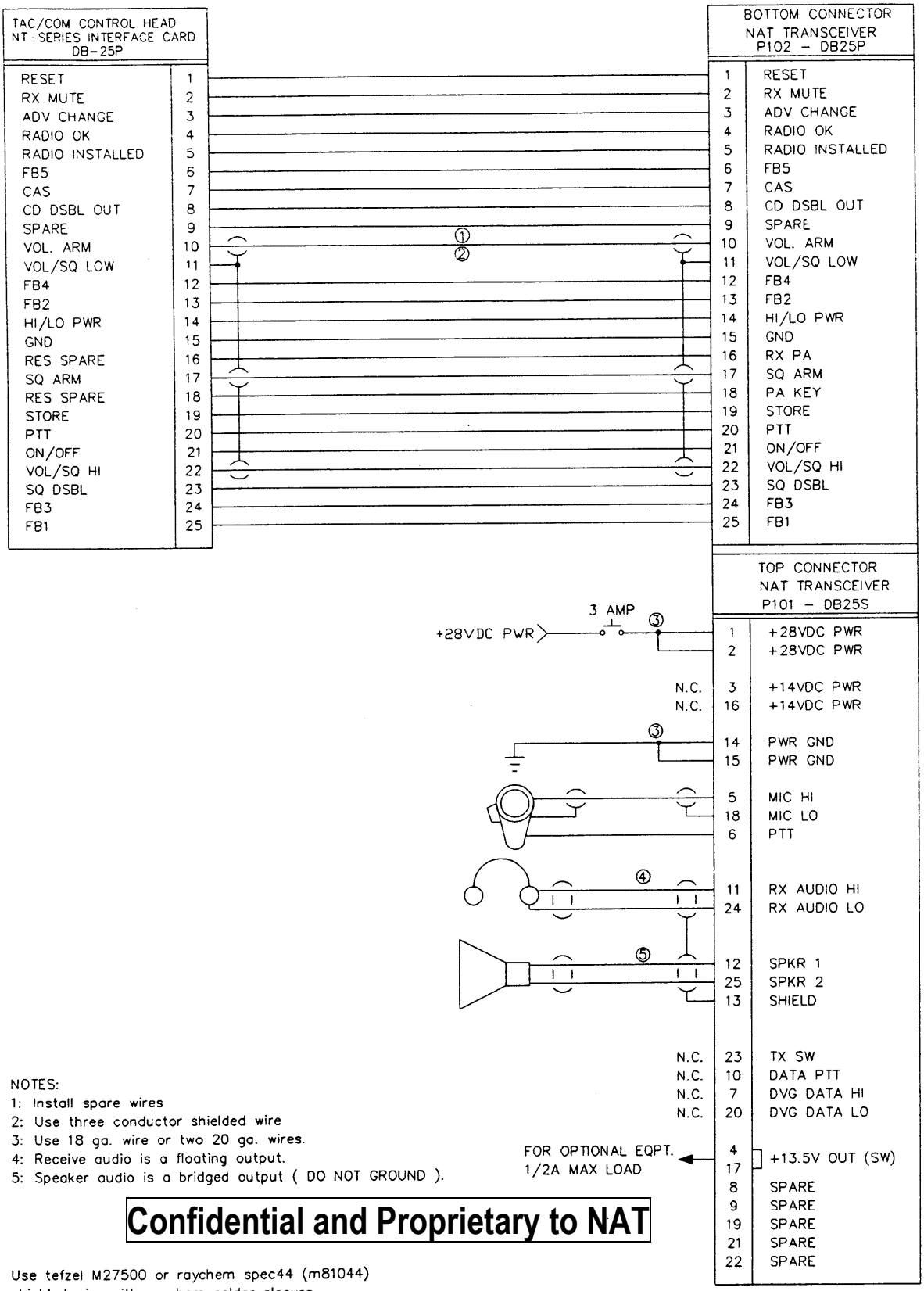
REVISION	DATE
A	25 JUNE 91
B	23 AUG 93

NORTHERN AIRBORNE TECHNOLOGY LTD.
1925 KIRSCHNER RD. KELOWNA, B.C.

PART NUMBER	DRAWING NUMBER	FILE NUMBER
NT136-PAS	NT136.PAS\403-1	NT136.PAS\403-1B
DESCRIPTION	SHEET	DATE
INTERCONNECT	1 OF 1	19 JUNE 91
DESIGNED BY	DRAWN BY	APPROVED BY
K. E. HORIE	K. E. HORIE	NAT PROD

INTERCONNECT DRAWING FOR CONNECTING THE NAT TAC/COM CONTROL HEAD NT SERIES INTERFACE CARD TO A NAT TAC/COM NT SERIES TRANSCEIVER.
(INTERFACE CARD CH400-9 REV A OR CH400-91 REV A) (INTERFACE CARD TYPE: "N")

NT-SERIES



NOTES:
1: Install spare wires
2: Use three conductor shielded wire
3: Use 18 ga. wire or two 20 ga. wires.
4: Receive audio is a floating output.
5: Speaker audio is a bridged output (DO NOT GROUND).

Use tefzel M27500 or raychem spec44 (m81044) shielded wire with raychem solder sleeves

All wire should be 22ga. except for power & ground which should be 18ga.

REVISION	DATE

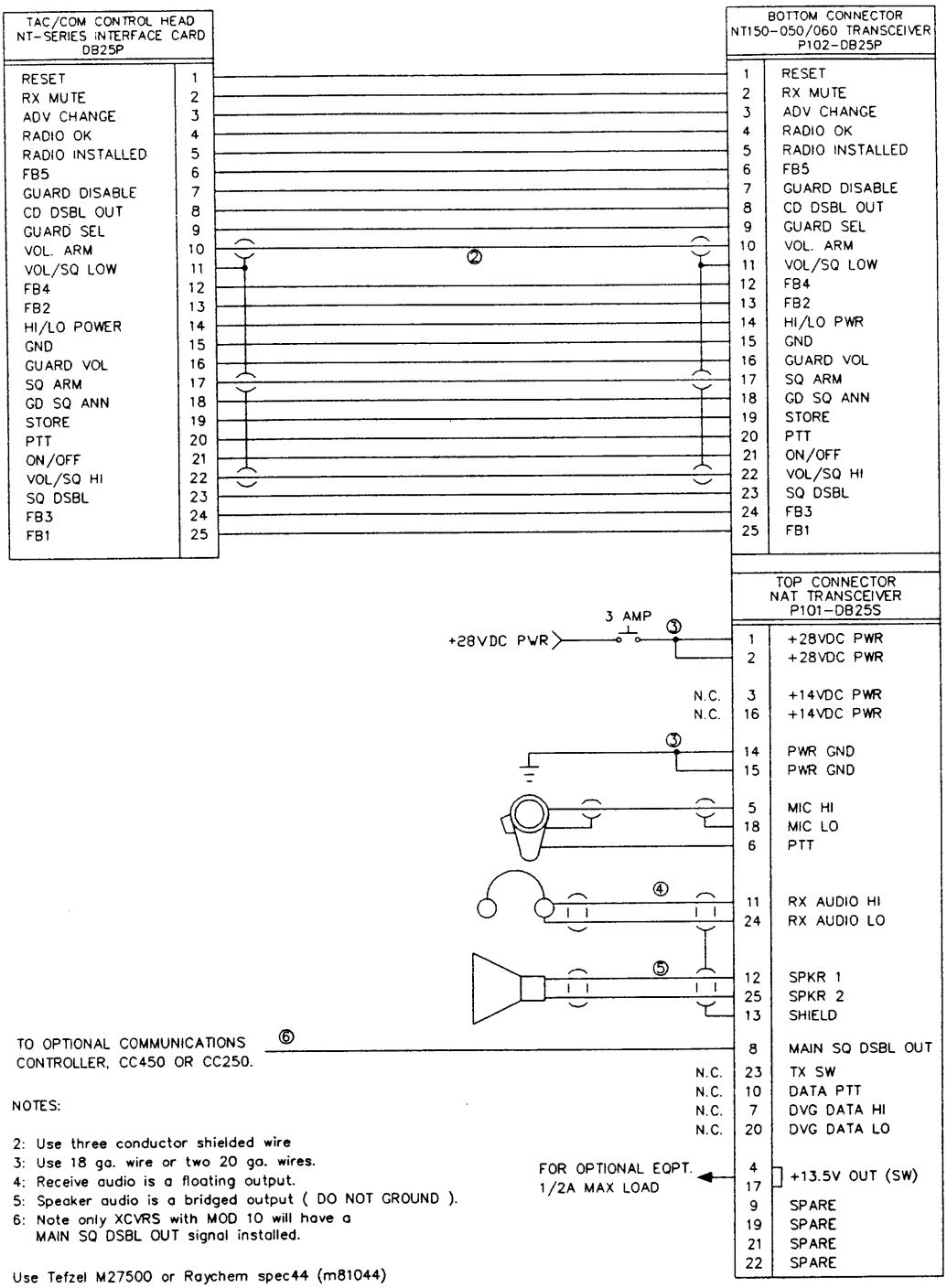
NORTHERN AIRBORNE TECHNOLOGY LTD.
SUITE 14,1925 KIRSCHNER RD. KELOWNA, B.C. V1Y-4N7

DESCRIPTION	PART NUMBER	DRAWING NUMBER
INTERCONNECT	NT150	NT150\403
DATE	DRAWN BY	APPROVED BY
25 JUNE 91	SCOTT MOORE	NAT PROD

INTERCONNECT DRAWING FOR CONNECTING A NAT TAC/COM CONTROL HEAD NT SERIES INTERFACE CARD TO A NAT TAC/COM NT SERIES TRANSCEIVER WITH GUARD RECEIVER.

(INTERFACE CARD CH400-91 REV A) (INTERFACE CARD TYPE: "V")

This Drawing applies to all NT150-050 Transceivers.



NOTES:

2: Use three conductor shielded wire
3: Use 18 ga. wire or two 20 ga. wires.
4: Receive audio is a floating output.
5: Speaker audio is a bridged output (DO NOT GROUND).
6: Note only XCVRS with MOD 10 will have a MAIN SQ DSBL OUT signal installed.

Use Tefzel M27500 or Raychem spec44 (m81044) shielded wire with raychem solder sleeves

All wire should be 22ga. except for power & ground which should be 18ga.

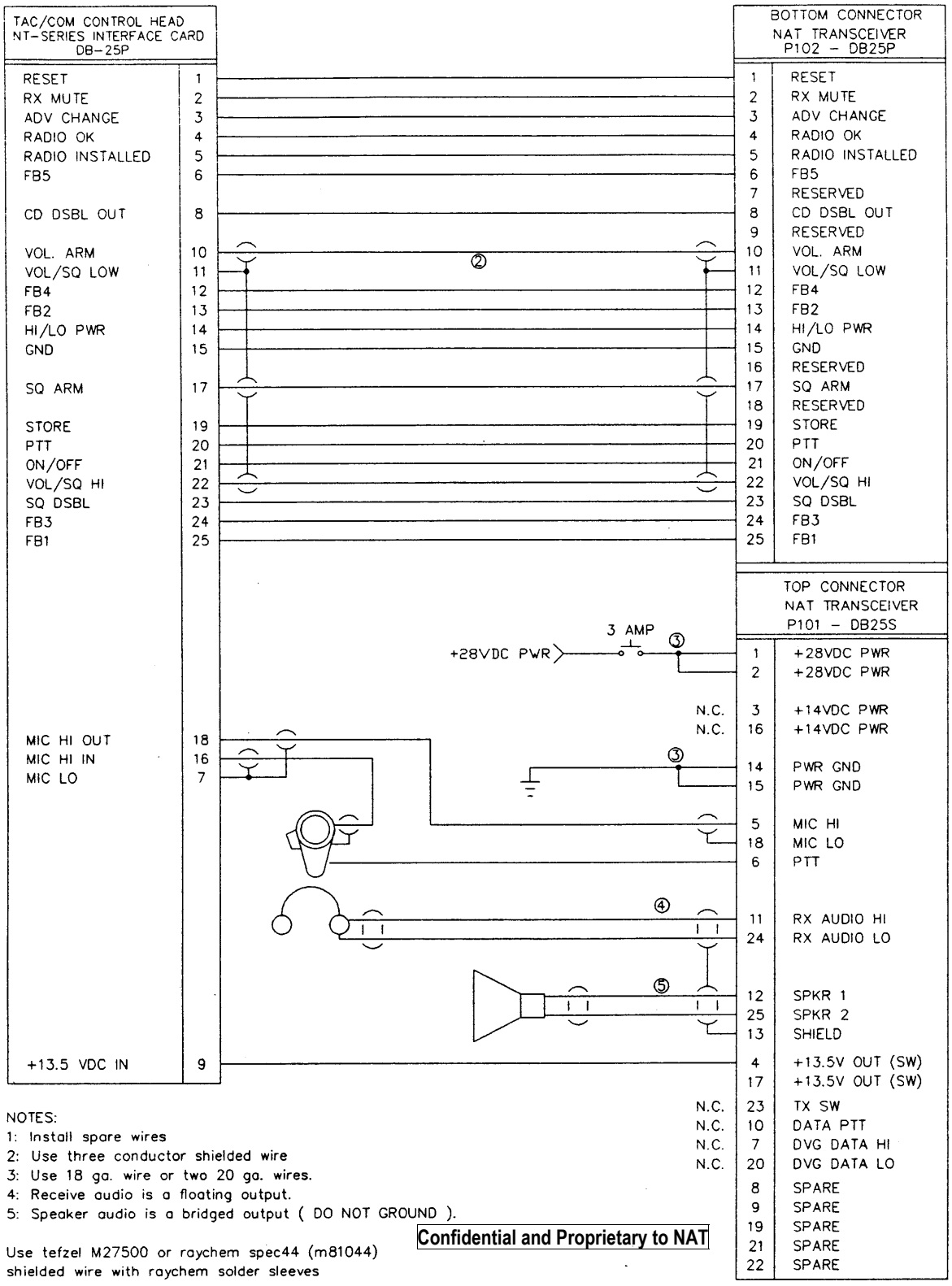
REVISION	DATE
--	JUNE 25/91
A	JUNE 17/93
B	AUG. 27/93
1.12	FEB. 18/94

nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
SCOTT MOORE	TAC/COM CONTROL HEAD, NT150-050 TRANSCEIVER		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
S.M. / T.M.	NT150-050	INTERCONNECT	1/1
APPROVED BY	DRAWING NUMBER		FILE NUMBER
NAT R&D	NT150.050\403-0		NT150.050\403-0112

INTERCONNECT DRAWING FOR CONNECTING THE NAT TAC/COM CONTROL HEAD NT SERIES I/F CARD WITH TRANSCRYPT MODULE TO A NAT TAC/COM NT SERIES TRANSCEIVER.

(INTERFACE CARD CH400-911) (INTERFACE CARD TYPE: "T")



NOTES:
1: Install spare wires
2: Use three conductor shielded wire
3: Use 18 ga. wire or two 20 ga. wires.
4: Receive audio is a floating output.
5: Speaker audio is a bridged output (DO NOT GROUND).

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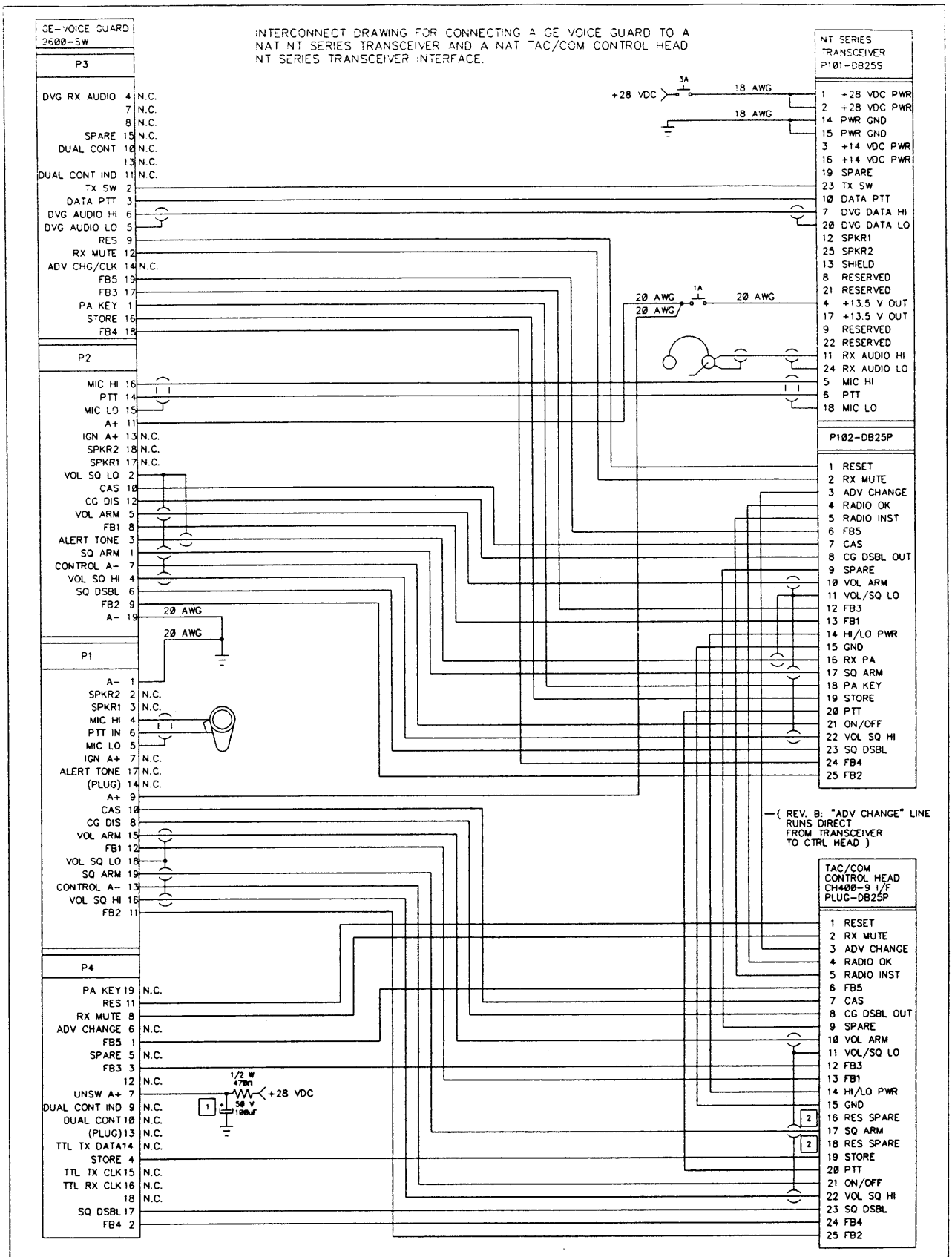
Use tefzel M27500 or raychem spec44 (m81044) shielded wire with raychem solder sleeves

All wire should be 22ga. except for power & ground which should be 18ga.

REVISION	DATE

NORTHERN AIRBORNE TECHNOLOGY LTD.
1925 KIRSCHNER RD. KELOWNA, B.C.

PART NUMBER	DRAWING NUMBER	FILE NUMBER
NT150-000	NT150\403-1	NT150\403-1
DESCRIPTION	SHEET	DATE
INTERCONNECT	1 OF 1	24 JUNE 93
DESIGNED BY	DRAWN BY	APPROVED BY
	SCOTT MOORE	NAT PROD



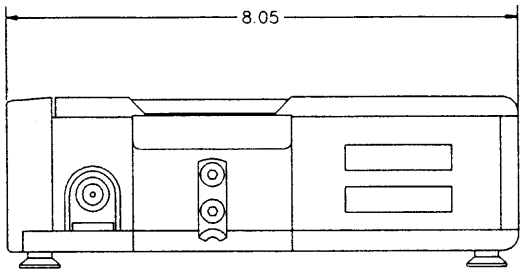
1. VOICE GUARD RAM WILL LOSE KEY WHEN POWER TO PIN P4-7 (UNSW A+) IS INTERRUPTED. UNSW A+ MAY ALSO BE CONNECTED TO AN ALTERNATE +14 VDC SUPPLY.
2. ALERT TONE IS NOT AVAILABLE ON NT136-PAS (AM/FM XCVR) AND NT150-050 (GUARD RX) MODEL TRANSCEIVERS. INSTEAD, CONNECT TRANSCEIVER P102-16,18 TO CONTROL HEAD I/F CARD PINS 16,18 AS PER REGULAR INTERCONNECT.

REVISION	DATE
A	3 SEPT 91
B	21 DEC 92

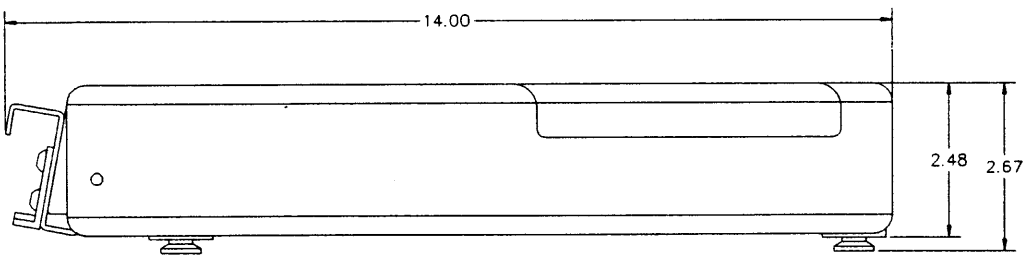
NORTHERN AIRBORNE TECHNOLOGY LTD.
1925 KIRSCHNER RD. KELOWNA, B.C.

PART NUMBER	DRAWING NUMBER	FILE NUMBER
	GEVOICE.GRD\403	GEVOICE.GRD\403B
DESCRIPTION	SHEET	DATE
VOICE GUARD	1 OF 1	17 JULY 91
DESIGNED BY	DRAWN BY	APPROVED BY
SCOTT MOORE	SCOTT MOORE	

WEIGHT-REDUCED NT-SERIES TRANSCEIVER



FRONT VIEW



SIDE VIEW

WEIGHT – NT30-SERIES VHF 8lbs. 8oz., 3875g.
NT136-806 VHF, UHF 8lbs. 5 oz. 3800g.

Confidential and Proprietary to NAT

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 4/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/-0.030 DIM. IN INCHES
0.XX=+/-0.010
0.XXX=+/-0.005
0.XXXX=+/-0.0005
ANGLE=+/- 0.5 DEG.

THIRD ANGLE PROJECTION

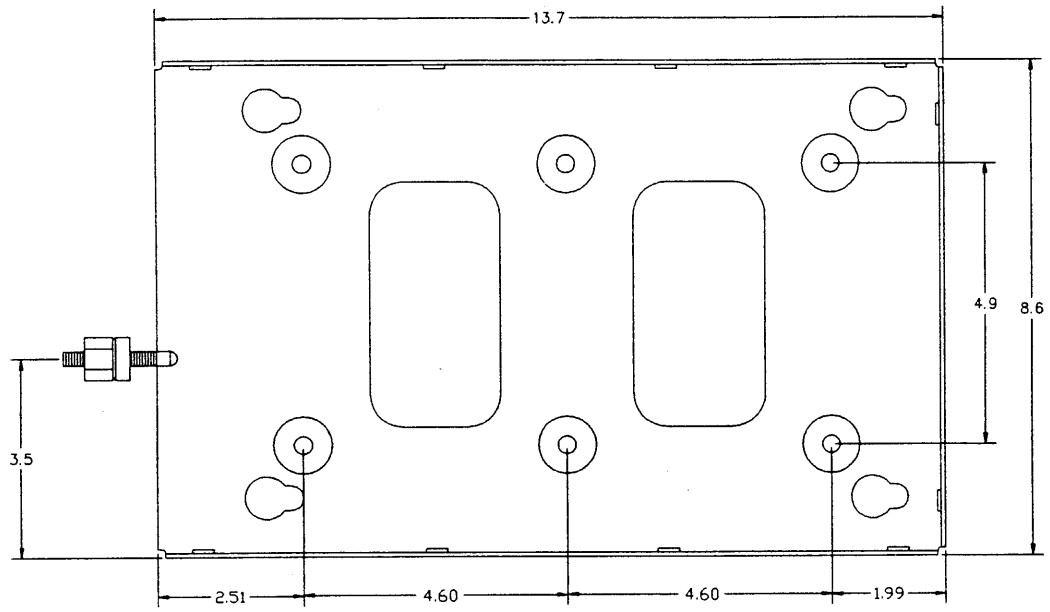
MATERIAL/FINISH

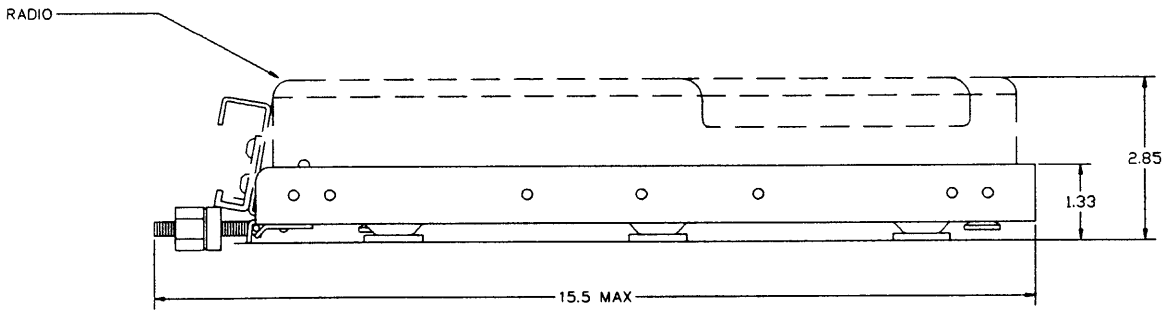
*nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
R WEISBECK	WEIGHT-REDUCED NT-SERIES TRANSCEIVER		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	NT-WR RADIOS	ORTHOGRAPHIC	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	NT-WR\927-0	NT-WR\927-0110	

1-RADIO HORIZONTAL MOUNTING TRAY FOR WEIGHT REDUCED TRANSCEIVERS

MOUNT TRAY WITH 1/4" SCREWS





Confidential and Proprietary to NAT

WEIGHT: 1 lb. 4 oz. (570g) (TRAY ASSEMBLY ONLY, WEIGHT DOES NOT INCLUDE RADIO.)

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 3/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/-0.030 DIM. IN INCHES
0.XX=+/-0.010
0.XXX=+/-0.005
0.XXXX=+/-0.0005
ANGLE=+/- 0.5 DEG.

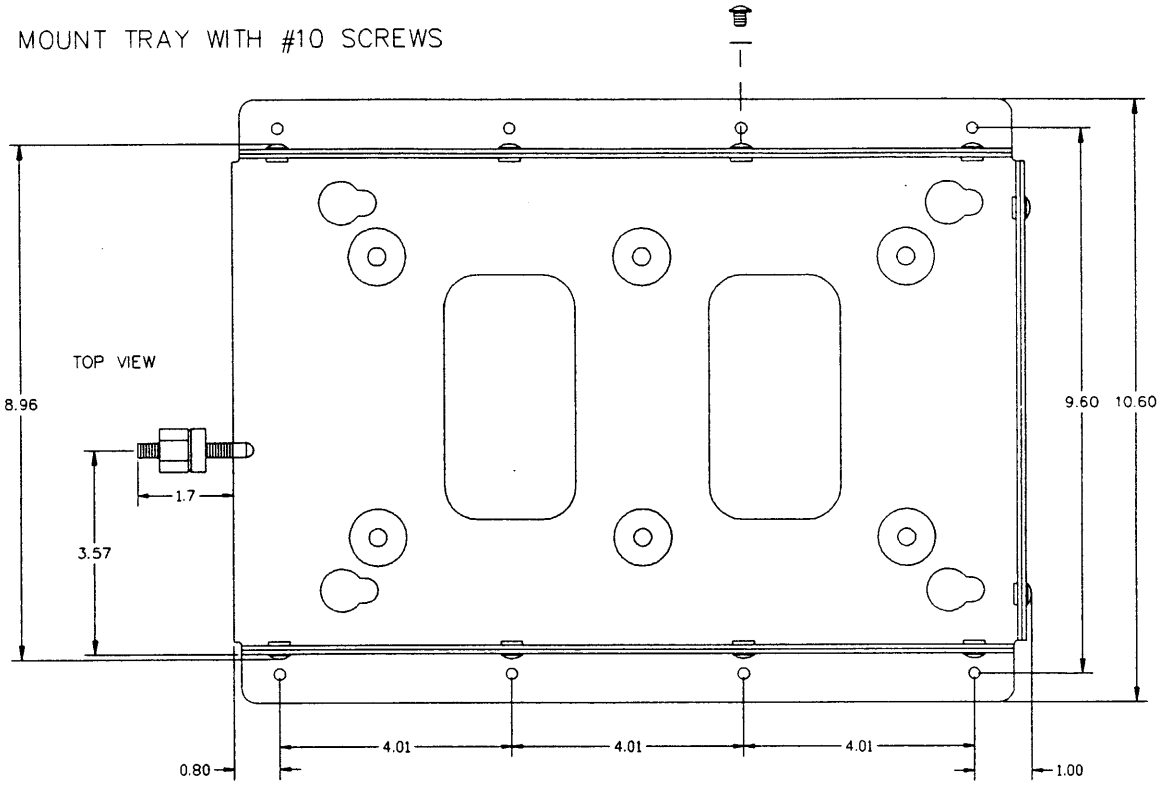
THIRD ANGLE PROJECTION

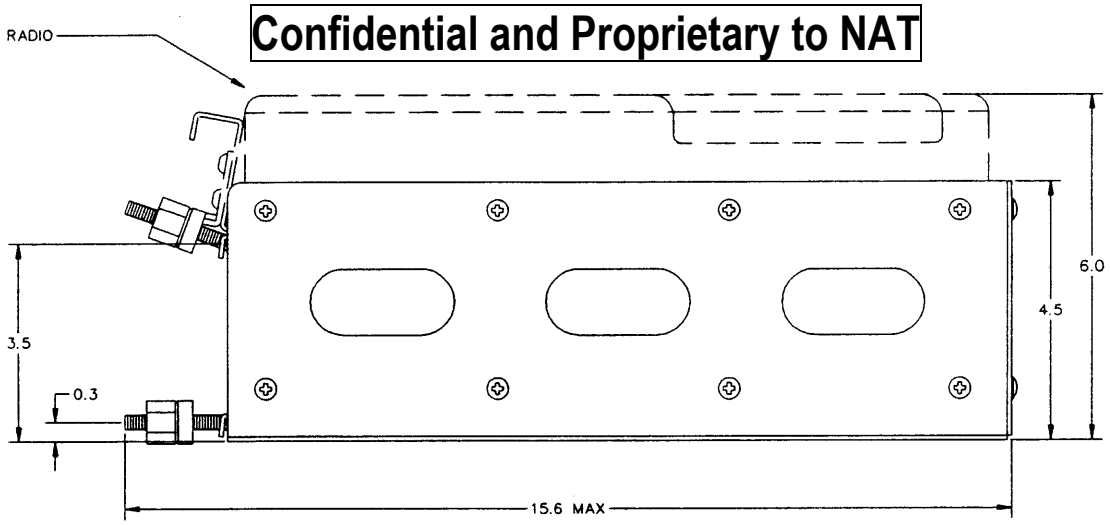
MATERIAL/FINISH
MATERIAL: 5052H32 AL. ALLOY 0.075 THICK
FINISH: POWDER COATED

*nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
R WEISBECK	1-RADIO HORIZONTAL MOUNTING TRAY		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	HS10-001	MOUNTING VIEW	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	HS10-001\922-0	HS10-001\922-0110	

2-RADIO HORIZONTAL MOUNTING TRAY FOR WEIGHT REDUCED TRANSCEIVERS





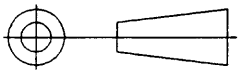
NOTE: HOLE AND SCREW LOCATIONS ON SIDE PANELS ARE APPROXIMATE DO NOT USE FOR MEASUREMENTS.

WEIGHT: 3 lbs. 14 oz. (TRAY ASSEMBLY ONLY, WEIGHT DOES NOT INCLUDE RADIOS.)

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 3/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/-0.030 DIM. IN INCHES
0.XX=+/-0.010
0.XXX=+/-0.005
0.XXXX=+/-0.0005
ANGLE=+/- 0.5 DEG.

THIRD ANGLE PROJECTION

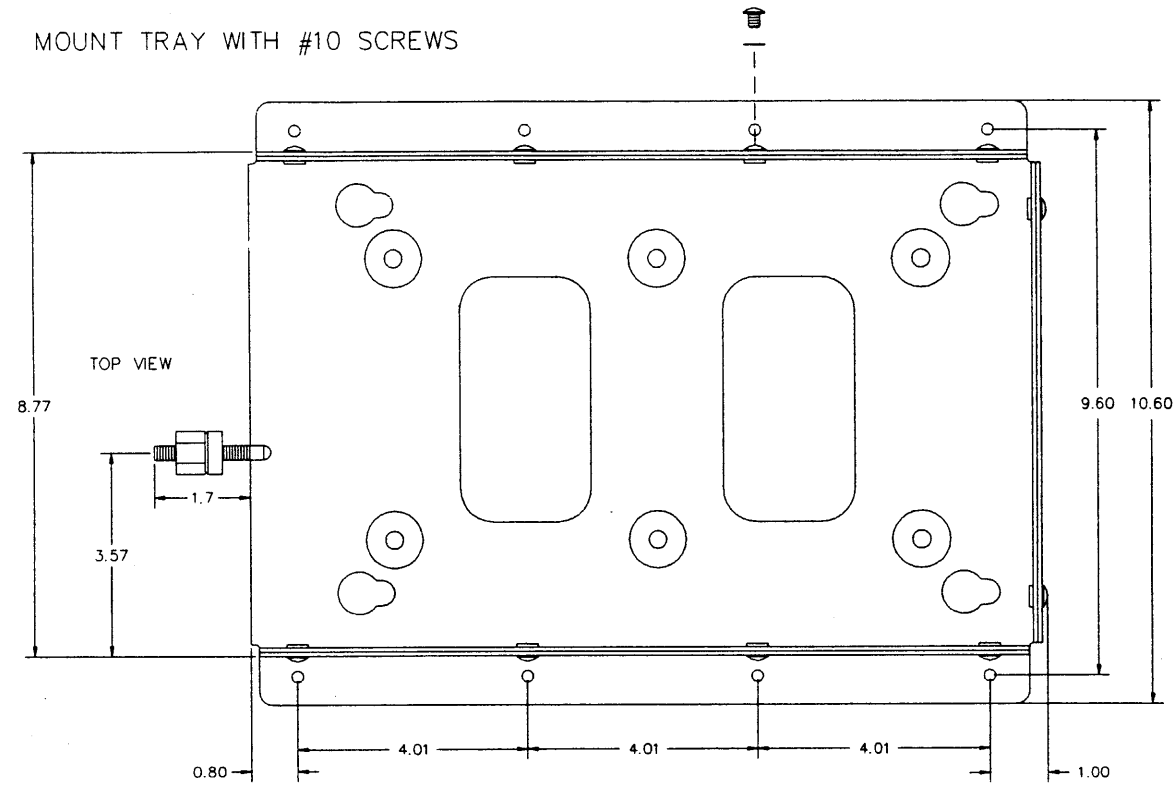


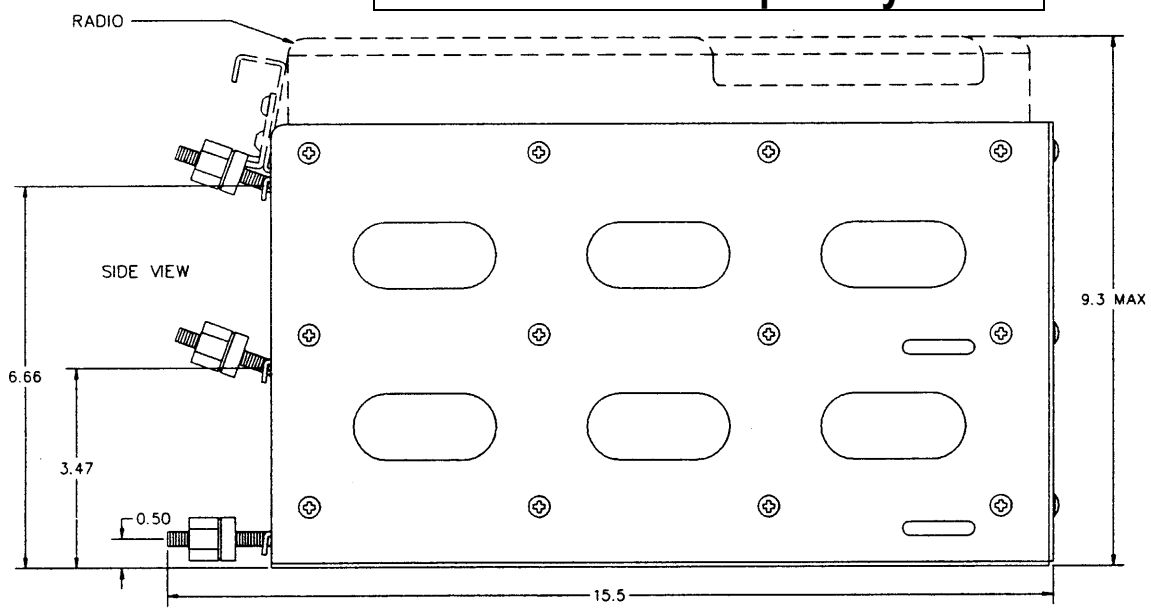
MATERIAL/FINISH
MATERIAL: 5052H32 AL. ALLOY 0.075 THICK
FINISH: POWDER COATED

NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
R WEISBECK	2-RADIO HORIZONTAL MOUNTING TRAY		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	HS20-001	MOUNTING VIEW	1/1
APPROVED BY	DRAWING NUMBER		FILE NUMBER
NAT R&D	HS20-001\922-0		HS20-001\922-0110

3-RADIO HORIZONTAL MOUNTING TRAY FOR WEIGHT REDUCED TRANSCEIVERS





NOTE: HOLE AND SCREW LOCATIONS ON SIDE PANEL ARE APPROXIMATE.

WEIGHT: 5 lbs. 13oz. (TRAY ASSEMBLY ONLY, WEIGHT DOES NOT INCLUDE RADIOS.)

REVISION	DATE
1.00	DEC. 15/93

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/-0.030 DIM. IN INCHES
0.XX=+/-0.010
0.XXX=+/-0.005
0.XXXX=+/-0.0005
ANGLE=+/- 0.5 DEG.

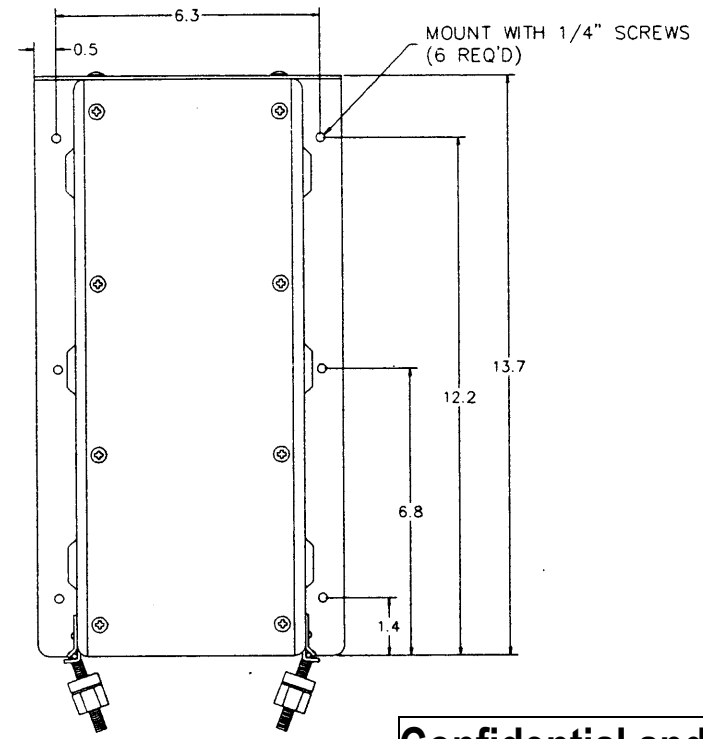
THIRD ANGLE PROJECTION

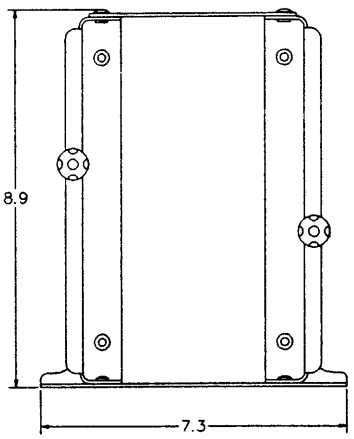
MATERIAL/FINISH
MATERIAL: 5052H32
AL. ALLOY 0.075 THICK
FINISH: POWDER COATED

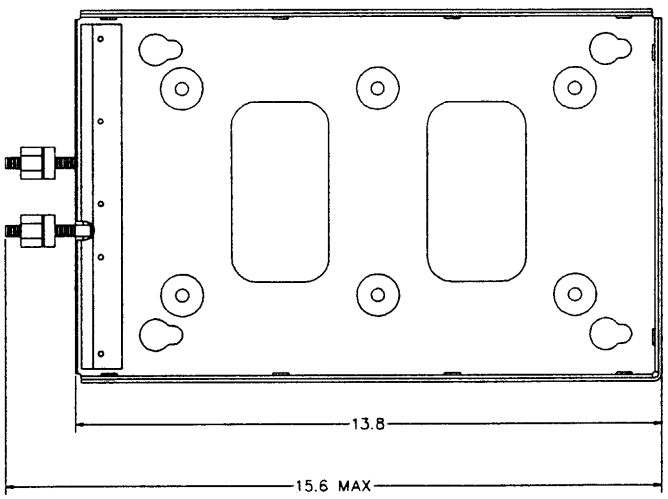
nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
DAVE VEITCH	3-RADIO HORIZONTAL MOUNTING TRAY		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
T BLACKSTOCK	HS30-001	ORTHOGRAPHIC	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	HS30-001\927-0	HS30-001\927-0100	

2-RADIO VERTICAL MOUNTING TRAY
FOR WEIGHT REDUCED TRANSCEIVERS





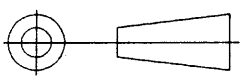


WEIGHT: 4 lbs. 1 oz. (TRAY ASSEMBLY ONLY, WEIGHT DOES NOT INCLUDE RADIOS.)

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 3/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/-0.030 DIM. IN INCHES
0.XX=+/-0.010
0.XXX=+/-0.005
0.XXXX=+/-0.0005
ANGLE=+/- 0.5 DEG.

THIRD ANGLE PROJECTION

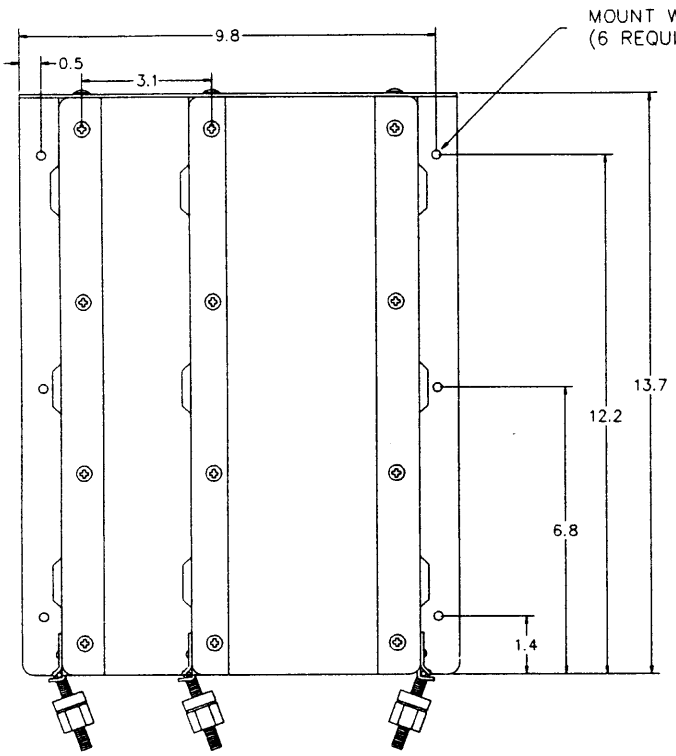


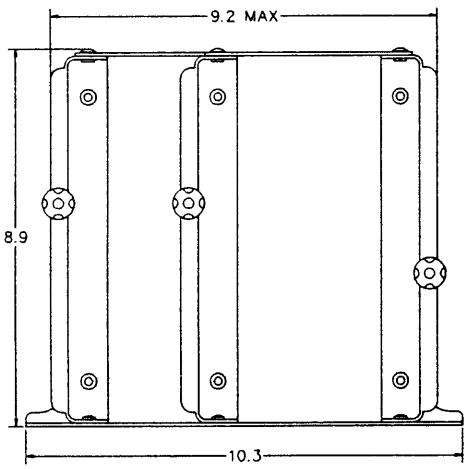
MATERIAL/FINISH
MATERIAL: 5052H32
AL. ALLOY 0.075 THICK
FINISH: POWDER COATED

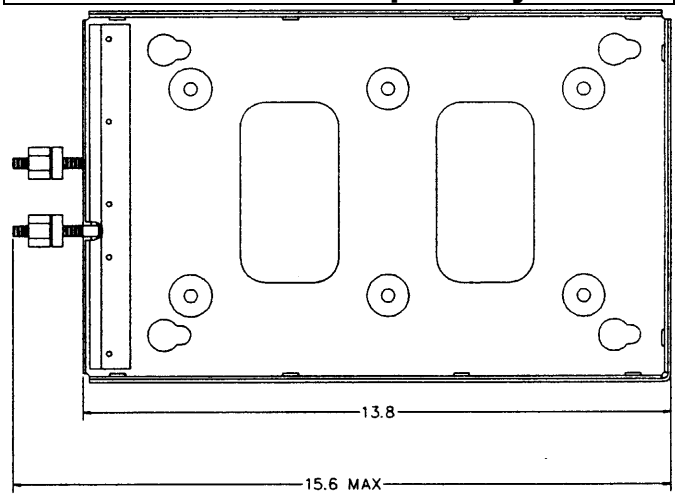
nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
R WEISBECK	2-RADIO VERTICAL MOUNTING TRAY		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	VS20-001	MOUNTING VIEW	1/1
APPROVED BY	DRAWING NUMBER		FILE NUMBER
NAT R&D	VS20-001\922-0		VS20-001\922-0110

3–RADIO VERTICAL MOUNTING TRAY
FOR WEIGHT REDUCED TRANSCEIVERS







WEIGHT: 6 lbs. 2 oz. (TRAY ASSEMBLY ONLY, WEIGHT DOES NOT INCLUDE RADIOS.)

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 3/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/–0.030 DIM. IN INCHES
0.XX=+/–0.010
0.XXX=+/–0.005
0.XXXX=+/–0.0005
ANGLE=+/– 0.5 DEG.

THIRD ANGLE PROJECTION

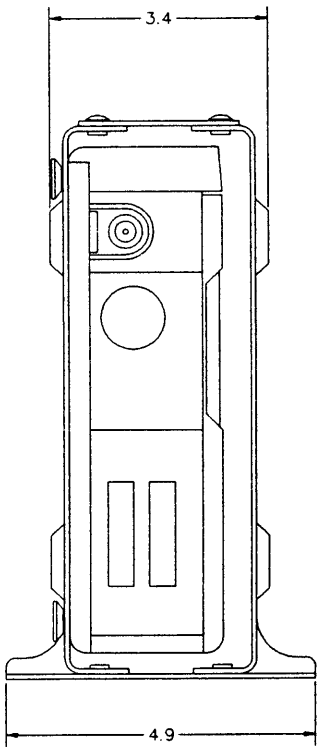
MATERIAL/FINISH
MATERIAL: 5052H32
AL. ALLOY 0.075 THICK
FINISH: POWDER COATED

nat NORTHERN AIRBORNE TECHNOLOGY LTD.

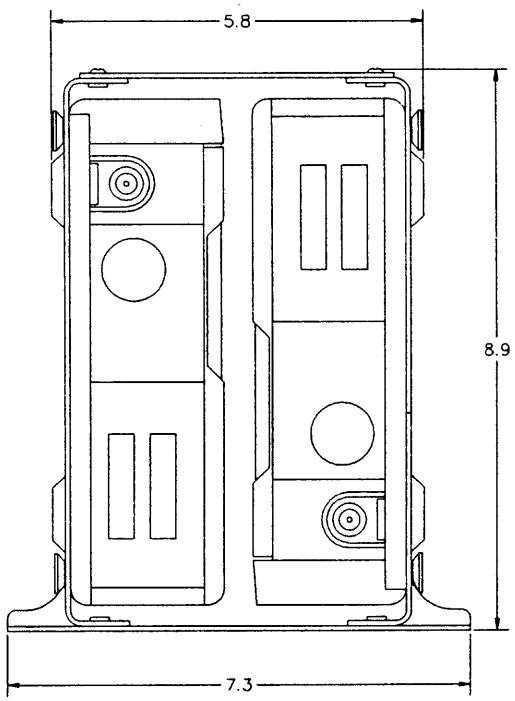
DESIGNED BY	DESCRIPTION		
R WEISBECK	3–RADIO VERTICAL MOUNTING TRAY		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	VS30–001	MOUNTING VIEW	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	VS30–001\922–0	VS30–001\922–0110	

SINGLE/DUAL VERTICAL MOUNTING TRAY FOR WEIGHT REDUCED TRANSCEIVER

SINGLE



DUAL



TOTAL DEPTH (INCLUDING PROTRUSIONS) – 15.6 in.

Confidential and Proprietary to NAT

REVISION	DATE
–	AUG. 12/93
1.10	JAN. 4/94

TOLERANCES UNLESS STATED OTHERWISE
0.X=+/–0.030 DIM. IN INCHES
0.XX=+/–0.010
0.XXX=+/–0.005
0.XXXX=+/–0.0005
ANGLE=+/– 0.5 DEG.

THIRD ANGLE PROJECTION

MATERIAL/FINISH

nat NORTHERN AIRBORNE TECHNOLOGY LTD.

DESIGNED BY	DESCRIPTION		
R WEISBECK	1 AND 2 RADIO MOUNTING VIEWS		
DRAWN BY	PART NUMBER	DRAWING TYPE	SHEET
R.W./T.B.	VS10/VS20	MOUNTING VIEW	1/1
APPROVED BY	DRAWING NUMBER	FILE NUMBER	
NAT R&D	VS\922-0	VS\922-0110	

Section 3.0 Operation

3.1 General

The NT Series radios can only be operated by the Tac/Com Control Head. All the operations of the RT are defined and manipulated by the operational features of the Control Head. For details regarding Control Head and NAT RT operation, see 'SECTION 3.0 OPERATION' in the TAC/COM CONTROL HEAD INSTALLATION AND OPERATION or SERVICE MANUAL.

End of Section 3.0