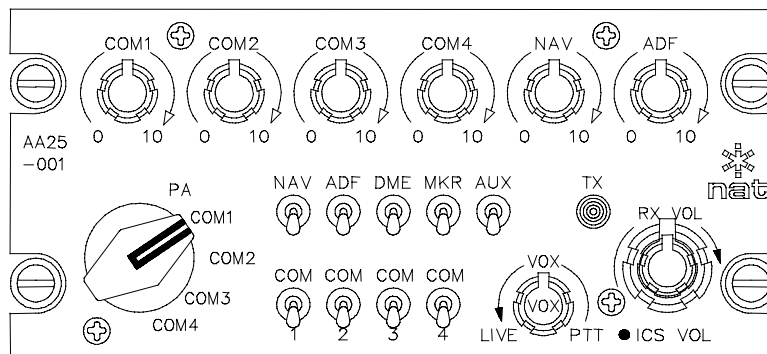
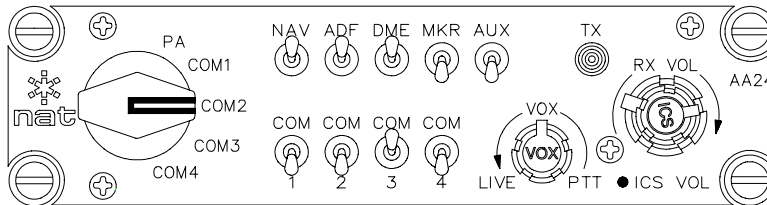




**SM18**

**AA24/AA25 Series  
Single User Audio Controller**



**INSTALLATION AND OPERATION MANUAL**

**REV 4.00 November 21, 2003**

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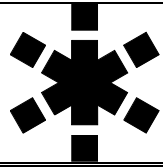
Periodically NAT will release manual amendments. In order to maintain the most accurate and up to date manual these amendments should be carried out immediately upon receipt and recorded on the following amendment record.

## AMENDMENT RECORD

Amendment Number	Amendment Date	Section(s) Changed	Date Entered	Entered By
#1	Jan 23/06	2		<b>Performed at factory</b>

Insert any Amendment Instruction sheets after this page.





**nat**

**INSTALL\_OPS  
MANUAL AMENDMENT**

**Manual: SM18 (AA24/AA25)**

**Amendment #: 1**

**Document # SM18\Install\_Ops\809-0001**

**Amendment Date: Jan 23, 2006**

The purpose of this amendment is to add the most recent revisions of drawings to the manual.

**Amendment Instructions:**

1	Remove Pages	Replace With Pages
	2-5 Rev 4.00	2-5 Rev 4.00 Amendment # 1

2	Remove Drawings (Section 2)	Replace or add Drawings (Section 2)
	AA24-001\405-0 Rev 1.01	AA24-001\405-0 Rev 1.02
	AA25-001\405-0 Rev 1.01	AA25-001\405-0 Rev 1.02

**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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## Section 1.0 Description

### 1.1 Introduction

---

This manual contains information on the AA24/AA25 Series Single User Audio Controller. All derivatives 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 AA24/AA25 series single-user Audio Controllers support one headset per box. Connection to other users in the system is made through the ICS Tie line. The small size and extensive radio and ICS functions make this unit an excellent choice for multi-station aircraft.

The AA24/AA25 series systems provide full boom-mic transmit and ICS functions for the user. The front panel controls permit user adjustment of frequently needed signals, such as intercom audio level, VOX threshold, and individual radio receive levels. Internal adjustments set default values for direct audio level and artificial side tone.

### 1.3 Features

---

The AA24/AA25 series systems employ NAT's unique audio processing which reduces noise and tailors the frequency response to produce clean, crisp intercom audio. Having high output power and low distortion results in better on-board communication.

Inputs are fully floating and include a dedicated alerting input. The tie line of the AA24/AA25 series is fully compatible with other NAT systems including AA80, AA82, AMS40 and AA95 series units. By keeping 'ICS TIE LINE' characteristics fully compatible with existing NAT products, it is possible to chain multiple systems together to a maximum of 4 units. The AA24/AA25 series have over-voltage and reverse-voltage protection, to ensure operability in severe aircraft environments. A front panel annunciator allows easy visual setting of the 'VOX' threshold, and also indicates transmit operation. In addition to all common features the AA25 also provides independent radio volume adjustment of up to 6 sources.

## 1.4 Specifications

---

### 1.4.1 Electrical Specifications

---

#### Power supply

Voltage	28 Vdc (reverse and over voltage protection)
Current	400 ma. max.
Lighting	28 Vdc @ 160 mA.
Headset Power	Phone output is nominal 600 $\Omega$ load Short circuit protected Typical 200 mW into headset David Clark H10-30/40 series recommended
Microphone	Industry standard 'carbon equivalent' type 250 mVrms for full output Amplified dynamic microphone preferred David Clark M1/DC, M3, M4 recommended (For low Z microphones, AA24-801 or AA25-801 are recommended)
Indicators	Transmit (green LED) VOX ICS triggered by ICS Tie Line (red LED)

#### Input Signals:

	4 aircraft transceiver radio inputs 5 navigational receiver inputs 2.5 V rms for full output 4.7 k $\Omega$ input impedance
	1 bi-directional ICS tie line 1 Vpp for full output 2.2 k $\Omega$ input impedance
Keylines	Transmit key is active low (33 ma. of current) Intercom key is active low (1 ma. of current)
Intercom line	NAT ICS tie line compatible 2k input impedance (340 mVrms level)

Output signals:

Transmitter audio lines	Non-adjustable, microphone connected directly to radio. (mic bias supplied by radio)
Transmitter key lines	Hard ground output (relay contacts 1 amp. max.) Green L.E.D. annunciator
Intercom line	340 mVrms into 2 k ohms (freq. response +/- 6 db from 250 to 4000 Hz)
Headset output	200 mW max. into 600 ohms (floating output) 300 mW max. into 150 ohms
Receive channel	freq. response +/- 6 dB from 300 to 5000 Hz
Intercom channel	freq. response +/- 6 dB from 500 to 3100 Hz
Sidetone channel	freq. response +/- 6 db from 225 to 5000 Hz
Direct input	freq. response +/- 6 db from 275 to 3100 Hz
Distortion	<2% THD
Isolation /crosstalk	>60 db min.
Signal/noise ratio	70 db min.

**1.4.2 Physical Specifications**

	AA24		AA25	
Height	1.49"	37.8 mm	2.62"	66.7 mm
Depth (max.)	7.55"	191.8 mm	7.44"	188.8 mm
Depth behind panel	5.84"	148.3 mm	5.83"	148.0 mm
Width (max.)	5.75"	146.0 mm	5.75"	146.0 mm
Width behind panel	4.9"	124.5 mm	4.9"	124.5 mm
Weight	1.2 lbs	500 g	1.5 lbs	680 g
Mounting	standard Dzus rails		standard Dzus rails	

### 1.4.3 Environmental Specifications

---

Operating Temperature	-40° C to +70° C
Storage Temperature	-55° C to +85° C
Altitude	25,000 ft. max.
Humidity	95 % Non-Condensing
Vibration	DO-160B category P, panel mounting 6g.
Shock	12 g. (any axis)

### 1.5 Unit Nomenclature

---

Model	Description / Distinction
<b>AA24-001</b>	COM1, COM2, COM3, COM4 + PA NAV, ADF, DME, MKR, & AUX receive switches +28 Vdc lights and +28 Vdc power high impedance headset and mic ICS, RX volume and VOX sq. controls
<b>AA25-001</b>	COM1, COM2, COM3, COM4 + PA NAV, ADF, DME, MKR, & AUX receive switches COM1 - 4, NAV & ADF level controls +28 Vdc lights and +28 Vdc power high impedance headset and mic ICS, RX volume and VOX sq. controls

End of section 1.0

## Section 2.0 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:

- AA24-001 or AA25-001 Audio Controller
- Warranty Card
- Operator's Manual
- 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, motor or blower, or significant interference to operation will result.

### **2.3.2 Cautions**

---

In all installations, use shielded cable exactly as shown and ground as indicated. Significant ground loop and noise problems may result from not following these guidelines.

Do not ground the microphone or headphone jacks.

Do not connect the microphone and headphone shields together.

Use caution when routing microphone and ICS Tie Line wiring, as they are low level signals prone to coupling from other sources.

Do not take a ground from the instrument panel or similar location that shares a ground return with a turn and bank, horizon or other motor driven instrument. This may cause the InterVox unit to pick up the sound of the motor as ground loop interference.

For best results, all headsets/microphones in the system should be of the same type to avoid VOX problems and uneven volume.

### **2.3.3 Cabling and Wiring**

---

All unshielded wire should be Tefzel MIL-M-22759/16 or equivalent. For shielded wire applications, use Tefzel MIL-M-27500 shielded wire with solder sleeves (for shield terminations) to make the most compact and easily terminated interconnect. Follow the wiring diagrams in Section 2.6 as required.

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

All wiring should be at least 22 AWG, except power and ground lines which should be at least 20 AWG. Ensure that all ground connections are clean and well secured.

### **2.3.4 Fuses and Breakers**

---

Power protection should be provided through a 1.0 A breaker, and not attached to any other existing breaker without additional protection.

### **2.3.5 Adjustments**

---

See **3D** drawing AA24\001\903-0 at the end of this section of the manual for the adjustment locations.

The unit ships from the factory with all internal adjustments set to the normal test levels. Once installed in the aircraft, it may be desirable to change some of these settings to best suit the local operating environment.

The Direct Audio level (**DIR AUD LEVEL**) and sidetone level (**S/T LEVEL**) can be adjusted at the time of installation. The adjustment pots are accessed through holes in the upper cover, and can be rotated clockwise to increase the level, and counterclockwise to decrease it.

## **2.3.6 Post-Installation Checks**

---

### 2.3.6.1 Voltage/resistance checks

**Do not attach the AA24 or AA25 until the following conditions are met.**

Check the following:

- a) Check J101, pin <1> for +28 Vdc relative to ground.
- b) Check J101, pin <9> for continuity to ground (less than 0.5  $\Omega$ ).

### 2.3.6.2 Power On checks

Install the **AA24 or AA25** and power up the ship's systems. Verify normal operation of all functions. Refer to Section 3 for specific operation details.

- a) Run through all installed functions, and check the ICS and TX functions for all users.
- b) Different headset models may have significantly different mic characteristics, which will affect 'VOX' squelch settings. The David Clark M-7 mic is much more active than the M-4 or M-1 mics, and may aggravate headset imbalance if used in a mixed system.

**Note:** 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. Failure to key or correctly modulate a transmitter is often the result of forgetting to connect all required grounds to the radio or external audio system.

- c) To verify proper operation, all functions and levels should be checked in-flight.

**If the unit functions satisfactory, make the required log entries and complete the required MOT/FAA paperwork, before releasing the aircraft for service.**

## **2.4 Continued Airworthiness**

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Maintenance of the **AA24-001 or AA25-001 Single User Audio Controller** is 'on condition' only. Periodic maintenance of this product is not required.

## 2.5 Accessories Required But Not Supplied

Both the AA24 and the AA25 Series Audio Controllers require Installation kit p/n AA24-IKC (crimp) or AA24-IKS (solder) to complete the installation. They consist of the following:

### AA24-IKC 37-pin and 15-pin D-min Female Crimp Kit (NAT Part No. D37S15SL-IKC)

Quantity	Description	NAT Part #
1	D-min 37 Socket Housing	20-21-037
37	MS Crimp Socket	20-26-901
1*	Jack Screw Set	20-27-002
1*	Lock Clip Set	20-27-004
1	37 Pin Connector Hood	20-29-038
1	D-min 15 Socket Housing	20-21-015
15	MS Crimp Socket	20-26-901
1*	Jack Screw Set	20-27-002
1*	Lock Clip Set	20-27-004
1	15 Pin Connector Hood	20-29-015

\* Use as required.

### AA24-IKS 37-pin and 15-pin D-min Female solder Kit (NAT Part No. D37S15SL-IKS)

Quantity	Description	NAT Part #
1	D-min 37 Socket Solder Cup	20-20-037
1*	Jack Screw Set	20-27-002
1*	Lock Clip Set	20-27-004
1	37 Pin Connector Hood	20-29-038
1	D-min 15 Socket Solder Cup	20-20-015
1*	Jack Screw Set	20-27-002
1*	Lock Clip Set	20-27-004
1	15 Pin Connector Hood	20-29-015

\* Use as required.

## 2.6 Installation Drawings

DRAWING	REV.	DESCRIPTION	TYPE	SERIAL #
<b>AA24-001</b>				
AA24-001\40324001	-	Single User Audio Controller	Interconnect	1005 – 1127
AA24-001\403-0	1.01	Single User Audio Controller	Interconnect	1128 and up
AA24-001\405-0	1.02	Single User Audio Controller	Connector Map	All
AA24-001\90324001	-	Single User Audio Controller	Mechanical	1005 – 1127
AA24-001\903-0	1.01	Single User Audio Controller	3-D	1128 and up
AA24-001\905-0	1.02	Single User Audio Controller (1 of 2)	Faceplate	All
AA24-001\922-0	1.01	Single User Audio Controller	Mech. Installation	All
<b>AA25-001</b>				
AA25-001\403-0	1.00	Single User Audio Controller	Interconnect	1001 – 1056
AA25-001\403-0	1.10	Single User Audio Controller	Interconnect	1057 and up
AA25-001\405-0	1.02	Single User Audio Controller	Connector Map	All
AA25-001\905-0	1.01	Single User Audio Controller (1 of 2)	Faceplate	All
AA25-001\922-0	1.01	Single User Audio Controller	Mech. Installation	All

Section 2.0 ends after these Drawings

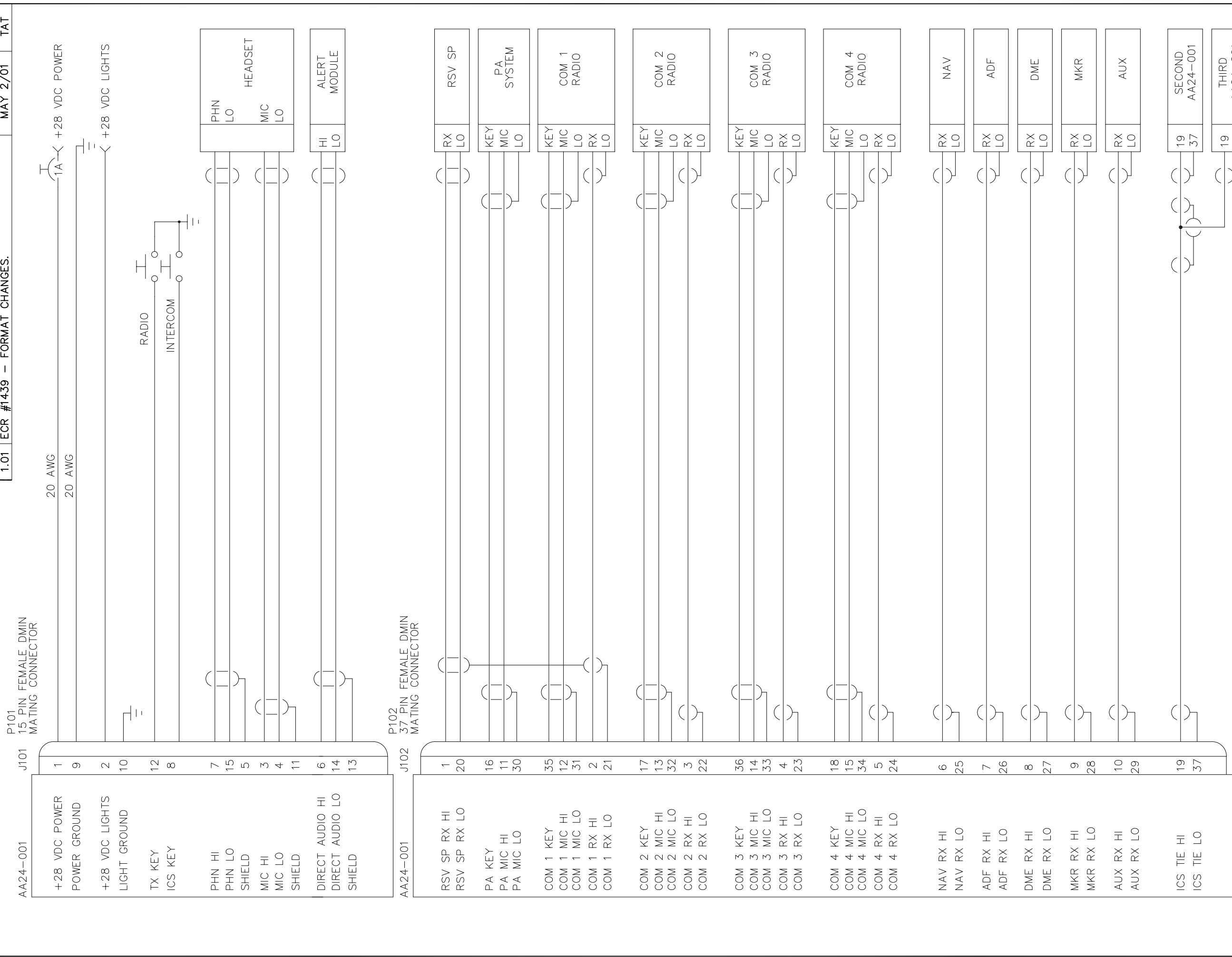






REV		DESCRIPTION		DATE		BY	
1.01	ECR #1439	- FORMAT CHANGES.		MAY 2/01		TAT	

REVISIONS	
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NOTE: UNLESS OTHERWISE SPECIFIED.

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.

DEFINITION:

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

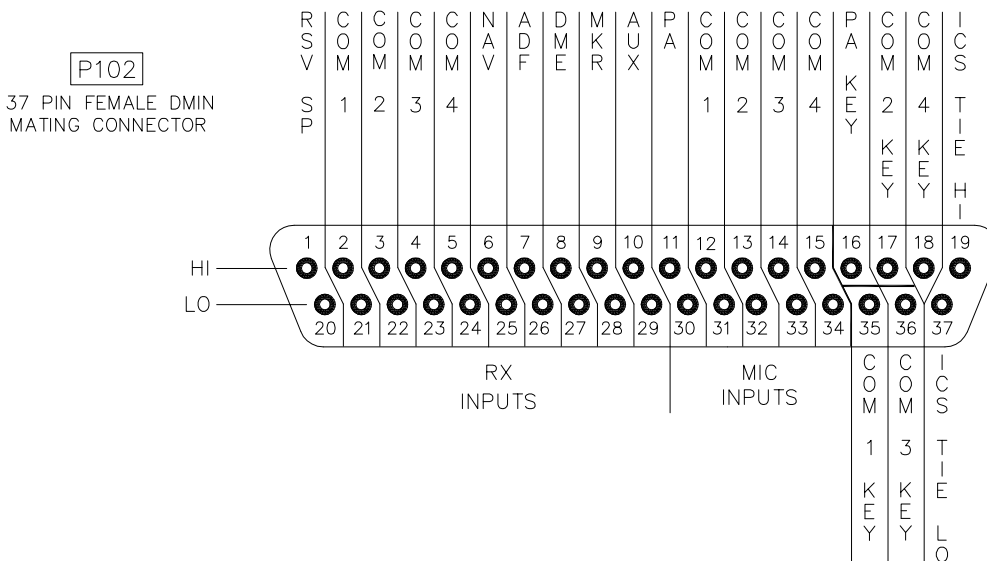
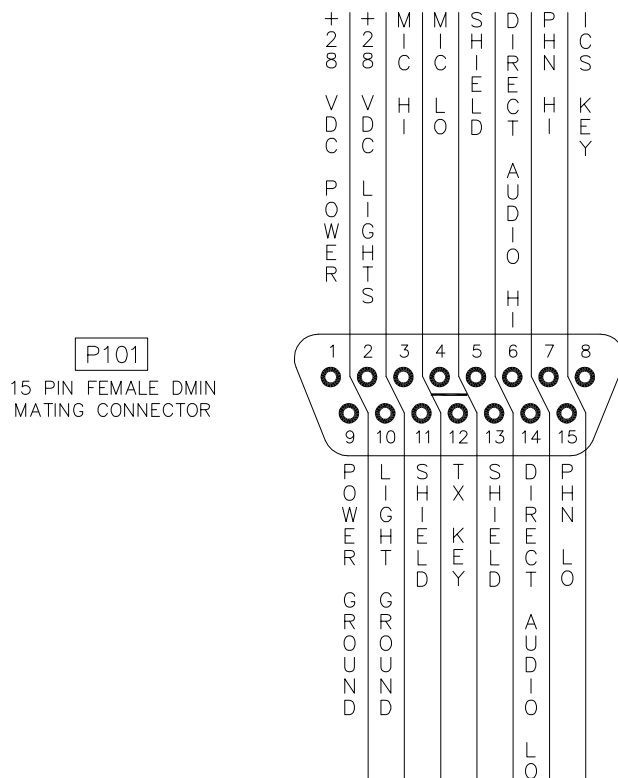
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APPROVED	NAT 107	SIZE	B
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		INTERCONNECT	AA24\001\403-0
		DWG. NO.	AA24\001\403-0
		REV.	1.01
		SHEET	1/1

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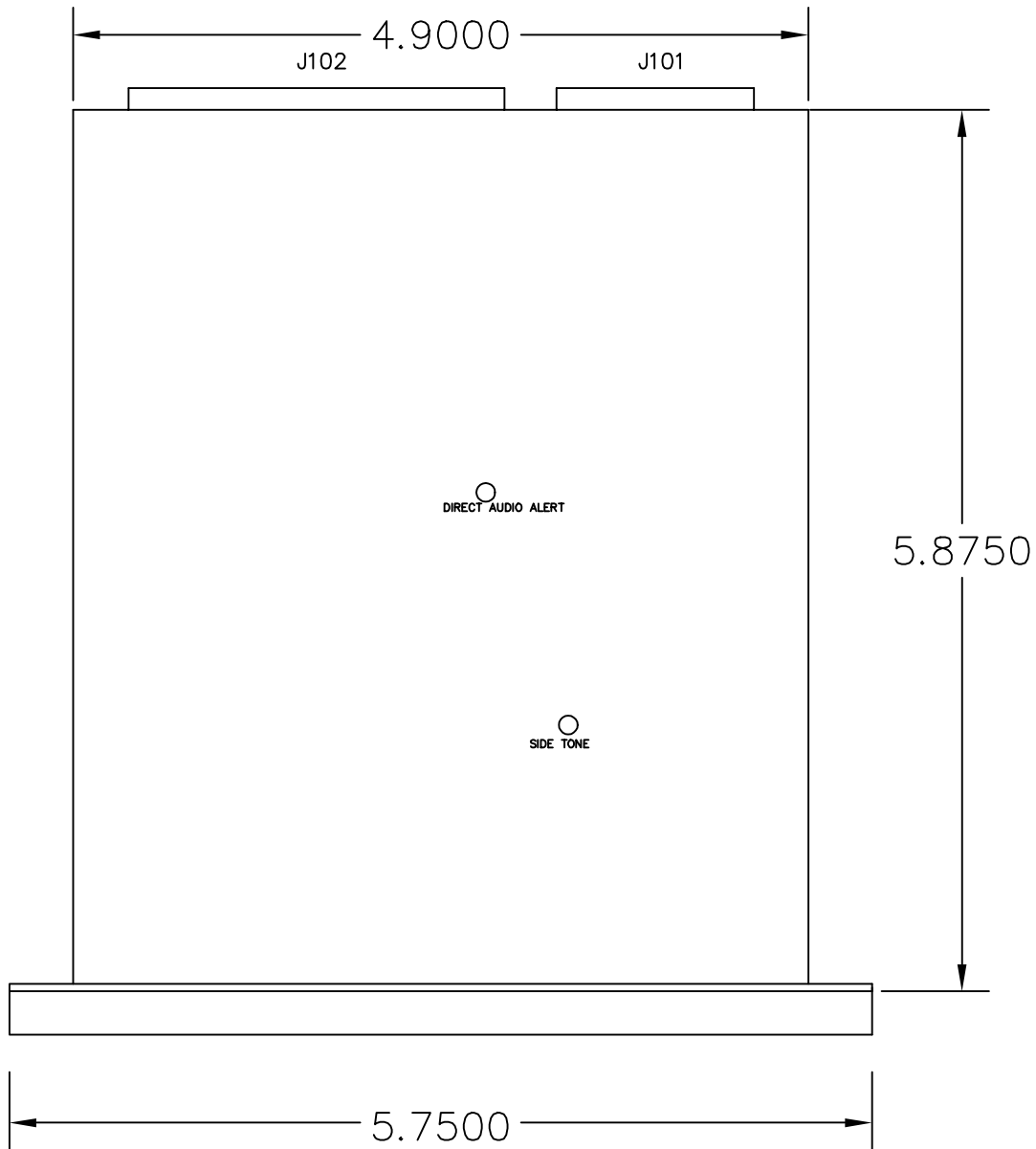


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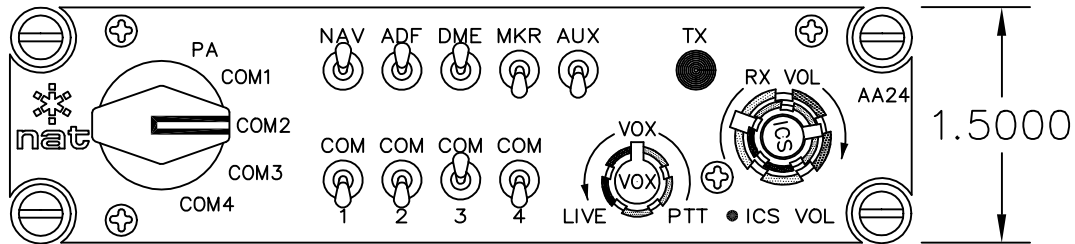
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CHECKED	<b>NAT 255</b>					
APPROVED	<b>NAT 131</b>	SIZE A	CAGE CODE 3AB01	PART NO. AA24-001	REV. 1.02	SHEET 1/1
FILE	405-0.DWG	DWG. TYPE	CONNECTOR MAP	DWG. NO.	AA24\001\405-0	





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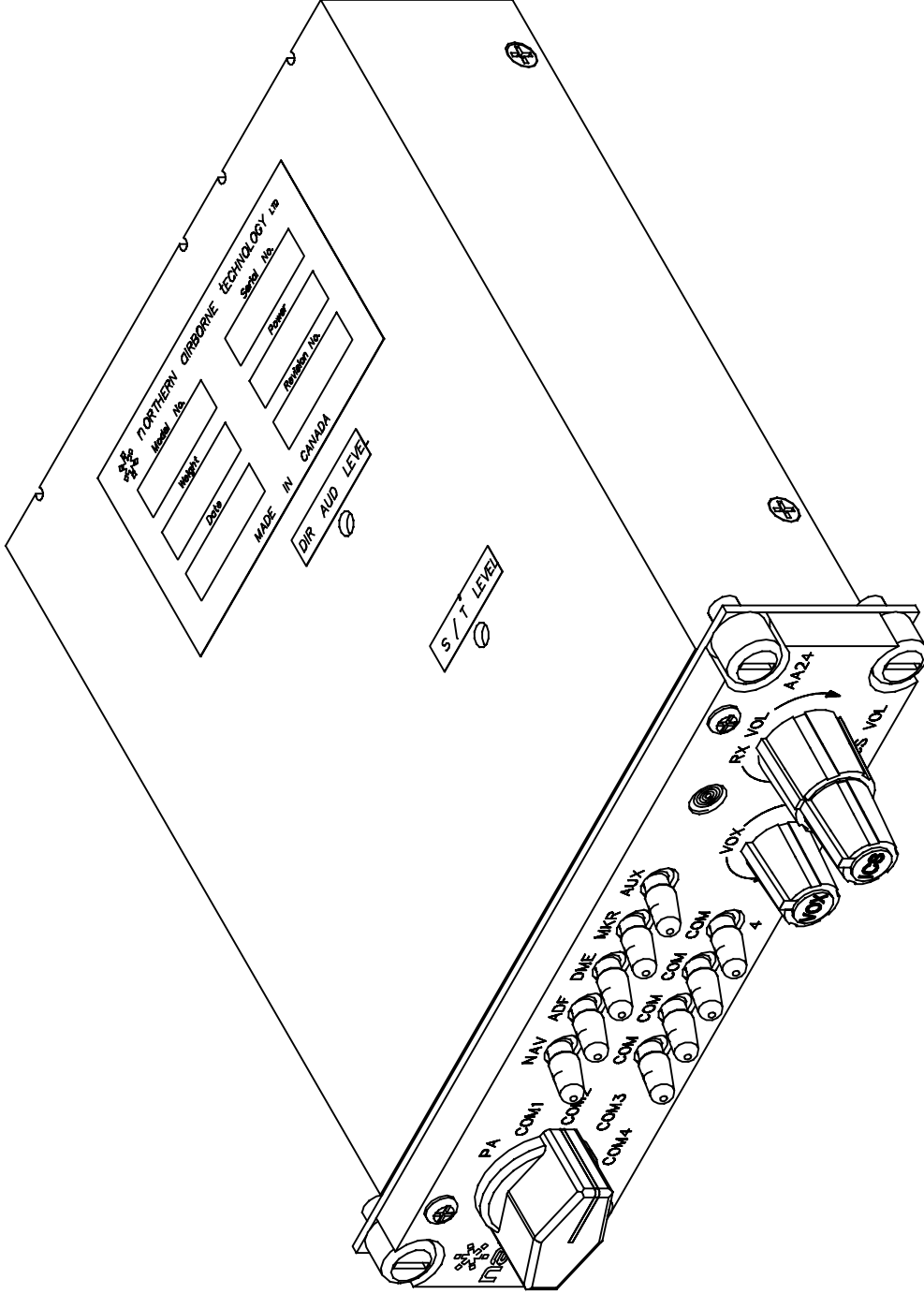


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		MECHANICAL	1/1	JUNE 10/93
		DESIGNED BY	DRAWN BY	APPROVED BY
		K VEITCH	K VEITCH	



REVISIONS

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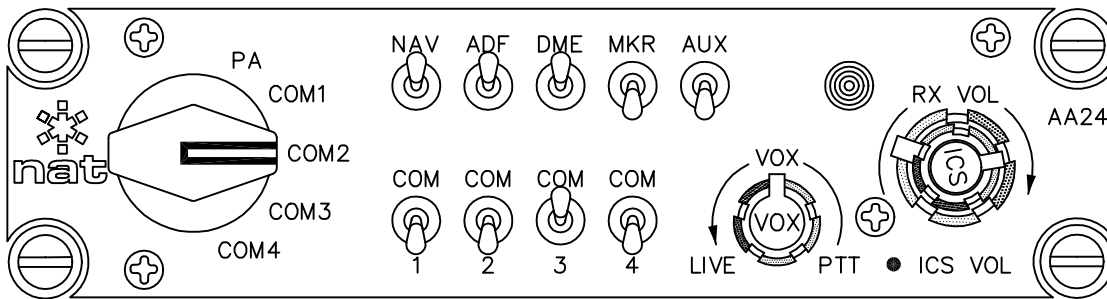
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APPROVED	<b>NAT 107</b>	SIZE	PART NO.
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		DWG. NO.	AA24\001\903-0





REVISIONS			
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1.02	ENGRAVE LAYER AND SHEET 2 ADDED	JUN 7/96	TGM



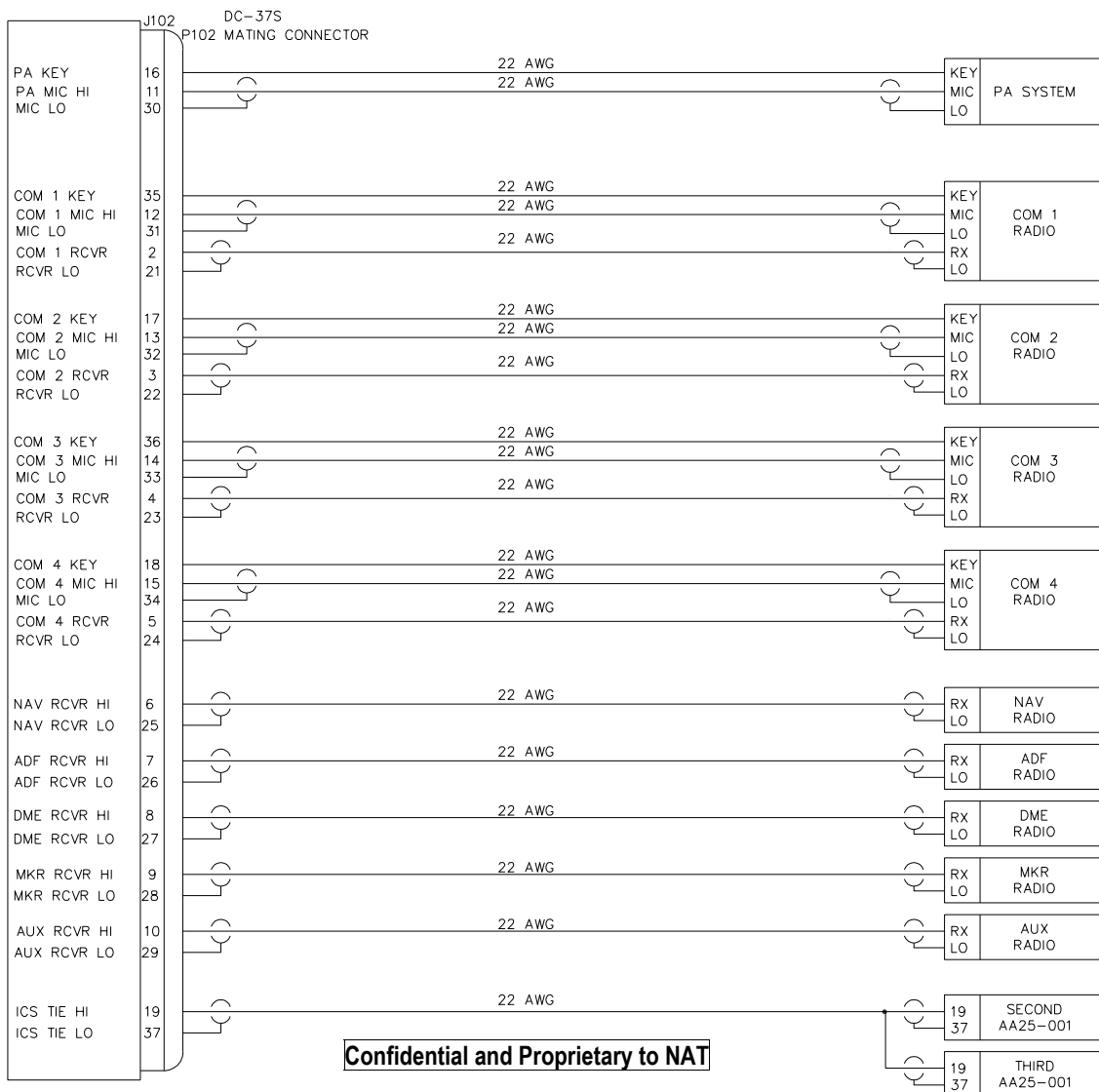
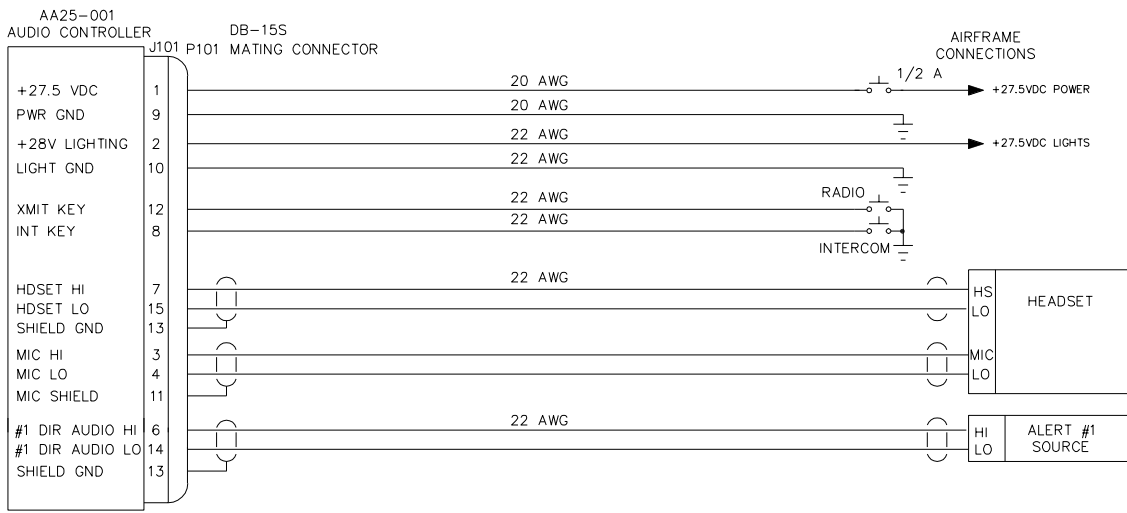
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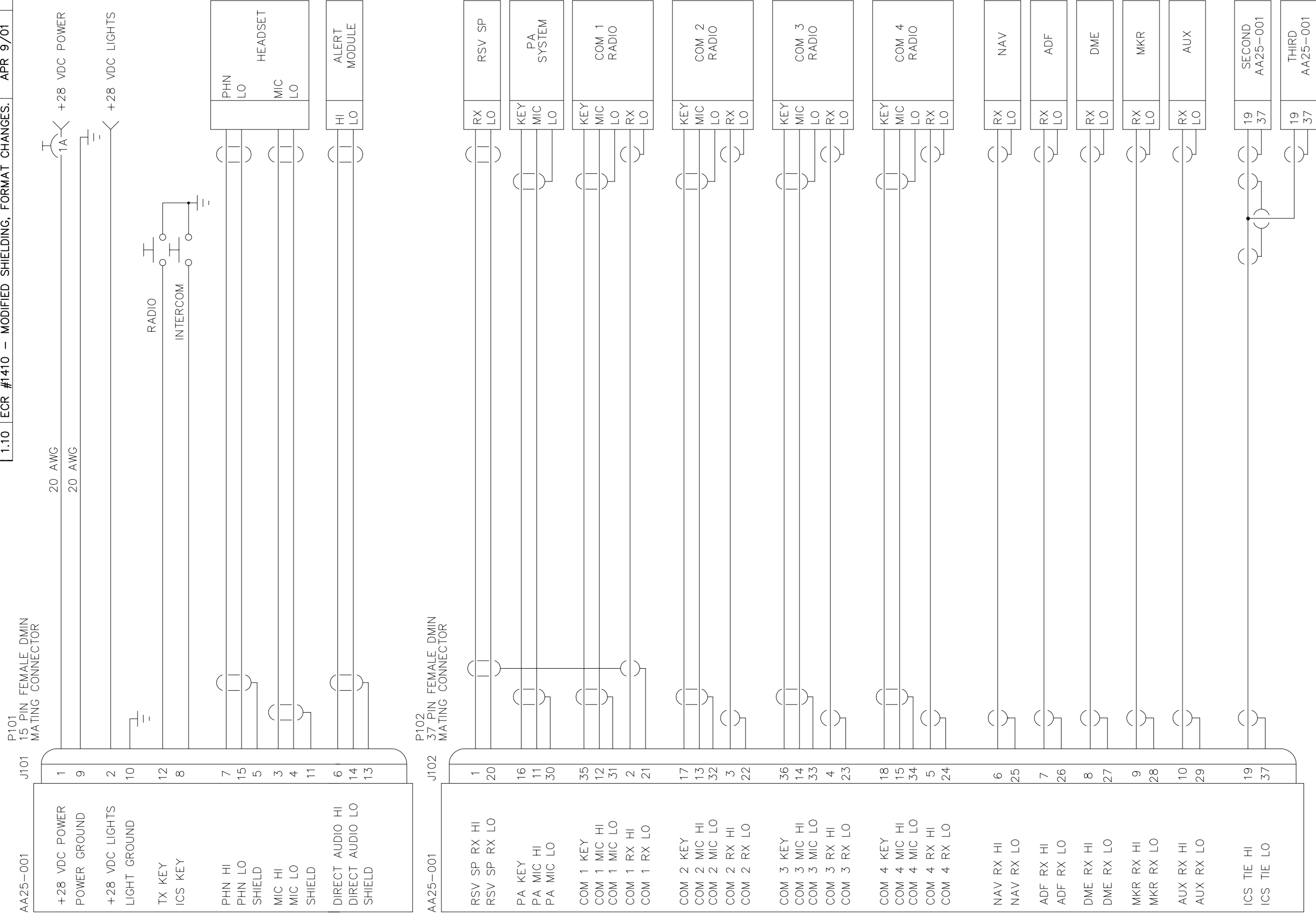
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				K VEITCH		AA25-001	INTERCONNECT
				APPROVED BY		DRAWING NUMBER	FILE NUMBER
				<b>NAT R&amp;D</b>		AA25-001\403-0	AA25-001\403-0100
				<b>101</b>			



REV	DESCRIPTION	DATE	BY
1.10	ECR #1410 - MODIFIED SHIELDING, FORMAT CHANGES.	APR 9/01	TAT

REV	DESCRIPTION	DATE	BY
1.10	ECR #1410 - MODIFIED SHIELDING, FORMAT CHANGES.	APR 9/01	TAT



NOTE: UNLESS OTHERWISE SPECIFIED.

ALL WIRES SHOULD BE 22 AWG. ALL WIRE SHOULD BE IN ACCORDANCE WITH MIL-W-22759. ALL SHIELDED WIRE/CABLE SHOULD BE IN ACCORDANCE WITH MIL-C-27500.

DEFINITION:

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

PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

DESIGNED	KV			
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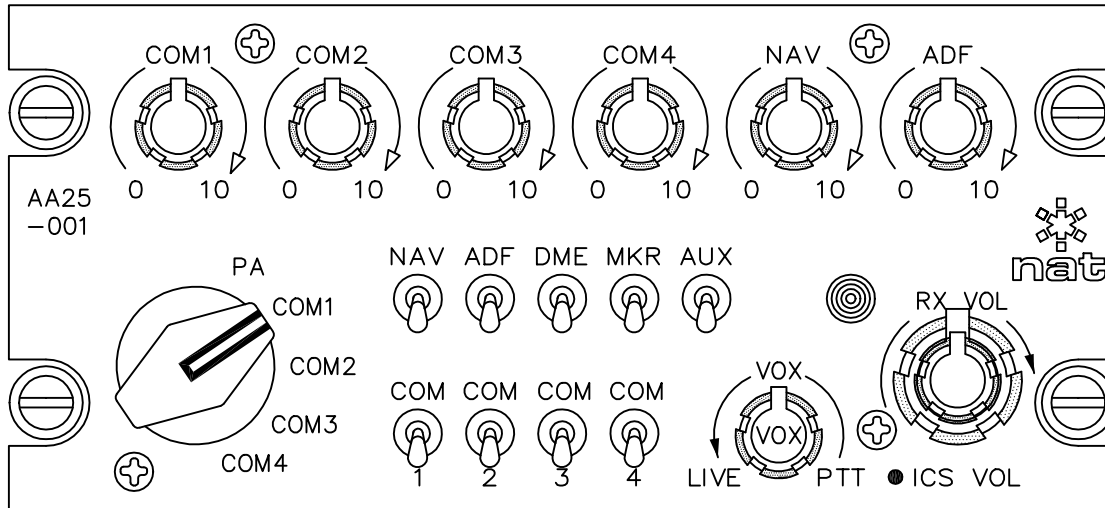
**nat** NORTHERN AIRBORNE TECHNOLOGY LTD.





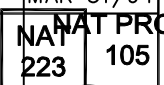





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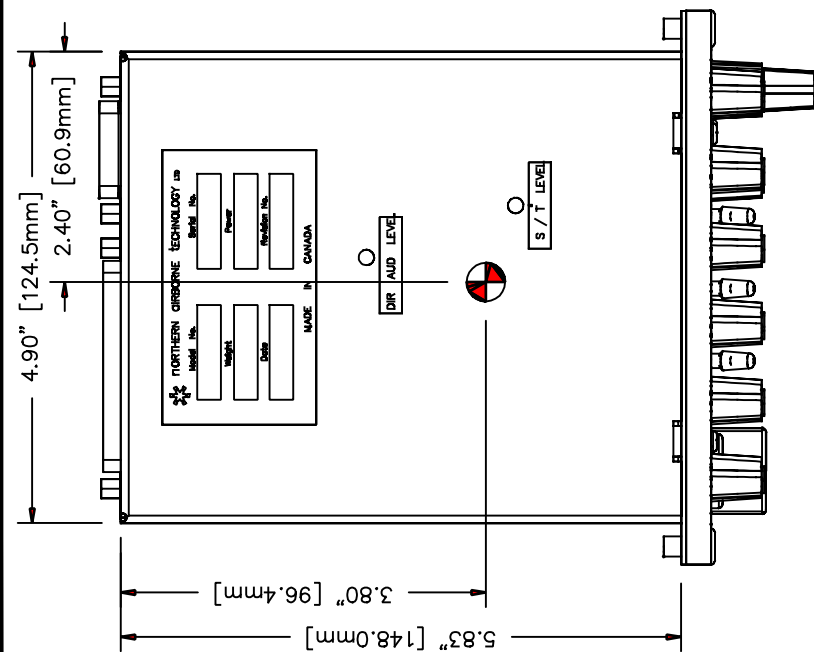


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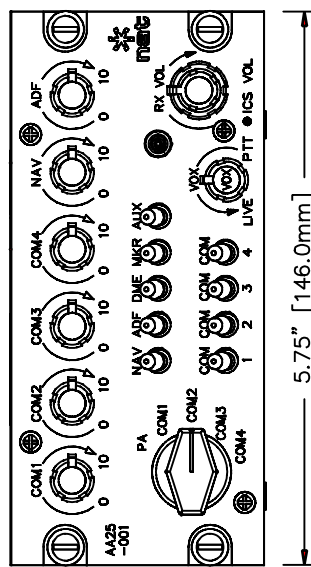
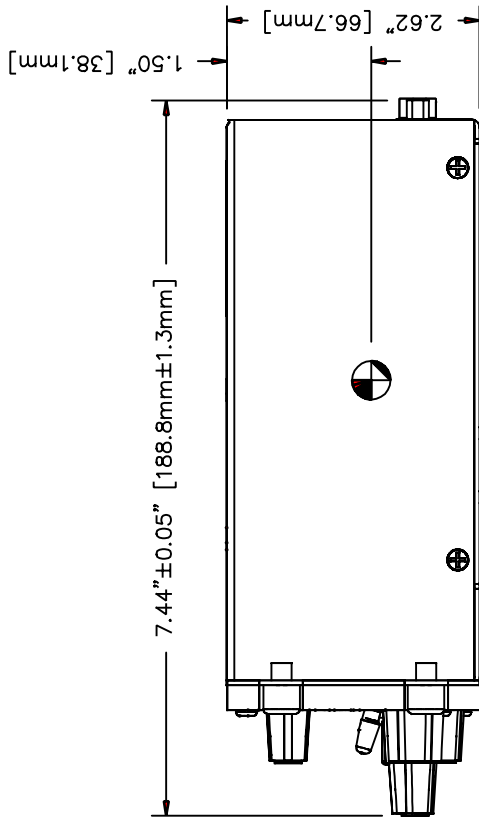
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DATE	MAR 31/94	TITLE	SINGLE USER AUDIO CONTROLLER			
CHECKED						
APPROVED		SIZE	CAGE CODE	PART NO.	REV.	SHEET
FILE	905-0101.DWG	A	3AB01	AA25-001	1.01	1/2
DWG. TYPE		FACEPLATE		DWG. NO. AA25\001\905-0		



REVISONS		DESCRIPTION	DATE	BY
REV	1.01	ECR #1410 - DRAWING WAS 903-0100.DWG, ADDED WEIGHT AND C OF G, REMOVED 'TX' FROM NEAR LED, FORMAT CHANGES.	APR 10/01	TAT



WEIGHT: 1.5 ±0.08 lbs. (0.68 ±0.03 kg)  
 CENTER OF GRAVITY ±0.10" (±2.5mm)



PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

DESIGNED	KV			
DRAWN	KV			
DATE	APR 19/94	TITLE		
CHECKED	<b>NAT NAT</b> 113 223	SINGLE USER AUDIO CONTROLLER		
APPROVED	<b>NAT</b> 107	SIZE	CAGE CODE	PART NO.
FILE	922-0101.DWG	A	3AB01	AA25-001
		DWG. TYPE	MECH. INSTALLATION	DWG. NO. AA25\001\922-0
			REV.	SHEET
			1.01	1/1

NORTHERN AIRBORNE TECHNOLOGY LTD.



## Section 3.0 Operation

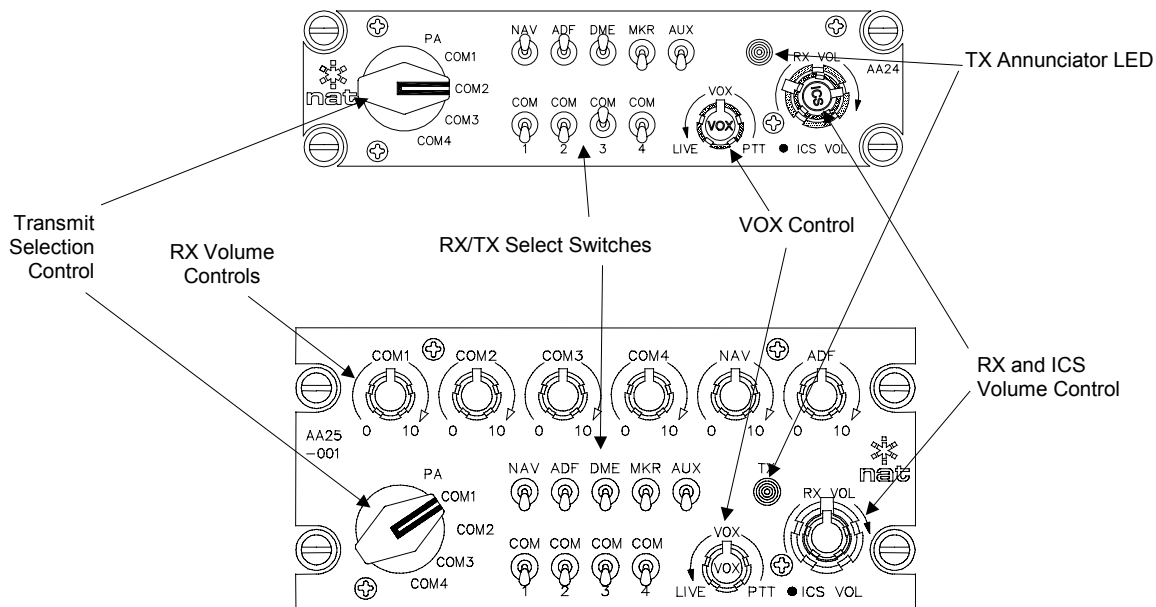
### 3.1 Introduction

Information in this section consists of the functional and operational procedures for the AA24/AA25 Series Single User Audio Controller.

### 3.2 General

The AA24/AA25 series single user audio controllers allow selection of transmit and receive audio, and LIVE, VOX or PTT intercom. One direct alerting input is provided to allow emergency alerting audio to pass unmuted to the user's headset. After transmitting on the radios the user's microphone automatically reverts back to intercom mode. The AA25 audio controller also provides central volume adjustment for all the aircraft audio.

### 3.3 Controls and Indicators



#### 3.3.1 Transmit selection

The rotary selector switch at the lower left of the panel selects the desired transmit function. When the radio PTT switch is activated, the microphone will be coupled to the radio or PA channel selected. Receive audio is automatically selected with the transmit selection, and no additional switching is needed to establish outside communication.

During transmission, the TX annunciator LED on the front panel will illuminate green.

### **3.3.2 Receiver/Transceiver Selection**

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The Receiver/Transceiver audio is selected from a double row of color-coded toggle switches. Receiver switch bats are blue, and transceiver switch bats are white. To connect the desired radio to the headphones, the relevant switch is toggled upwards.

On the AA25, independent volume controls are provided for the transceivers and the first two NAV aids.

### **3.3.3 Volume Control**

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The Volume control is a dual concentric knob.

#### **3.3.3.1 ICS Volume Control**

The inner knob of the dual control is ICS VOL and controls the intercom volume for all headsets. An internal trimpot sets the minimum level. With ICS VOL set fully ccw intercom volume will be at a minimum. As the operator rotates the control cw, intercom volume will increase.

In multiple station systems, the ICS volume adjusts only the local ICS audio level.

#### **3.3.3.2 RX Volume Control**

The outer knob of the dual control is RX VOL and controls the RX volume for all selected radios. With RX VOL fully ccw, volume will be at a minimum. As the operator rotates the control cw, volume will increase.

### **3.3.4 VOX Mode Control**

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The VOX Control selects the mode of operation of the intercom mic. When the control is in the centre of its range, the intercom is in the VOX mode (voice activated). As the control is rotated counterclockwise, the system becomes more sensitive, until in the fully counterclockwise position it is in LIVE mode (on constantly). As the control is rotated clockwise, the sensitivity decreases, until at the fully clockwise position it is in PTT mode (activated by cyclic or foot switch closure).

### **3.3.5 Audio Alerting Functions**

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The user receives audio alerting signals connected to the Direct Audio under all operating conditions of the AA24/AA25.

End of Section 3.0

