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All references to NAT product part numbers (and associated images) are equivalent to AEM product part numbers.

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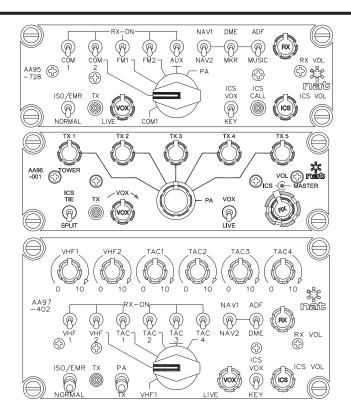
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#15-1925 Kirschner Road, Kelowna BC Canada, V1Y 4N7



AA9x Series Single Channel Audio Controller

**SM56** 



# **INSTALLATION AND OPERATION MANUAL**

Rev: 2.00 April 19, 2012

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# **IMPORTANT INFORMATION**

This manual has been produced to provide information unique to the AA9x Series Single Channel Audio Controller. Some of this information has been published previously in the SM01 Service manual (AA90/AMS40 Series Audio Controllers).

The information presented in this manual is for reference purposes only, and is intended to provide general information that can be used by the installer/technician to gain a fundamental understanding of the respective product. It is not intended to cover all variations of the AA9x Series audio controllers. Drawing packages for specific AA95, AA96 and AA97 units can be requested from AEM by contacting the Product Support Department.

Earlier versions of the AA9x Series (prior to Serial number 6000) may not be covered by the information in this manual. Please refer to SM01, or contact the Product Support Department at AEM.

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The status of this installation and operation manual is controlled by issue shown on the title page. The status of each section is controlled by revision shown in the footer of each page. All revisions affecting sections of this manual have been incorporated into the latest issue.

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All	Rev 2.00	Updated drawings and template	May 22, 2012			



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# **Section 1.0 Description**

# 1.1 Introduction

Information in this section consists of product description, design features and specifications for the AA9x Single Channel Audio Controller. All derivative product information shall be contained in the applicable manual supplement, which may be obtained from AEM as required. Review all notes, warning and cautions.

# 1.2 Purpose of Equipment

The AA9x series provide control for all aircraft audio, allowing selection of transmit and receive audio, LIVE, KEYED, or VOX intercom, interface for an additional hand held transmit microphone (hand mic), and pilot isolation/emergency operation.

Transmit and PA functions are controlled with a single rotary switch. Receive audio, ICS operations and tape audio are controlled with toggle switches. Received volume, ICS volume and ICS VOX squelch are individually adjusted with rotary controls. Sidetone (S/T) level is adjustable internally and the AA97 also has an individual RX level control for each transceiver.

# 1.3 Design Features

The AA9x series are Dzus rail mounted units with lighted faceplates. Transceiver interfacing is accomplished through directly switched microphones. To ensure maximum radio compatibility, it has a ground-reference keyline that incorporates no diodes or other steering components.

Independent control is provided for each audio channel within the controller, allowing sidetone, ICS audio and RX audio to be independently set.

Boom mic support is provided for the pilot and co-pilot, with both ICS and XMIT functions via cyclic or yoke switching. In some models, a third 'transmit capable' boom mic is added. Live (Hot Mic) and VOX ICS are also provided, with a 'transparent' function, allowing immediate transmission via this mode without further control panel switching and immediate return to ICS operation on completion. The ICS (intercom) function is achieved using dynamic noise reduction and active filtering. This provides the clearest possible ICS audio under high ambient noise conditions by rejecting airframe and wind noise and passing only voiceband information.

All audio, except the S/T of the radio in use and certain DIRECT AUDIO input signals, is muted during transmit for clarity. ICS operation allows transmit during any ICS mode by using the transmit PTT switch.

All switches, relay contacts and external connections are gold plated for maximum reliability. Switches and relays are sealed. G10-FR flame retardant circuit boards are postcoated for maximum moisture



resistance and corrosion prevention. Relays are sealed, high vibration rated (50g shock), dry nitrogen filled units.

# 1.4 Specifications

## 1.4.1 Electrical Specifications

Input P	<u>Power</u> Nominal Lighting Alert Power	27.5 Vdc Nominal 0.50 A Max. 27.5 Vdc @ 160 mA 27.5 Vdc Nominal 150 mA Max.
<u>Input S</u>	Signals Quantity	13 Receive channels. 7 Mic channels 1 ICS tie channel 1 or 2 direct channels
	Audio level	<ul><li>2.5V rms for receiver inputs.</li><li>0.25V rms for mic inputs.</li><li>2.5V rms for direct audio inputs.</li></ul>
	Impedance	1kΩ ± 10% for receive inputs. 1kΩ ± 10% for mic inputs. 1.6kΩ ± 10% for ICS tie input. 1.3kΩ ± 10% for Direct Audio 1 input. 100Ω ± 10% for Direct Audio 2 input.
	Circuitry Type	All are Single ended inputs.
	Coupling	< -40 dB
	Key lines	Pilot & Copilot Transmit PTT. Rear Hand mic Transmit PTT Pilot & Copilot ICS PTT. 3 Alerts - active low.
<u>Output</u>	Signals	S Alerts - active low.
	Quantity	6 Headphone outputs. Up to 7 Transmitter mic outputs (incl. PA) Up to 7 5 Transmitter keyline outputs (incl PA)
	Headphone	7.7 Vrms or 100 mW (20 dBm) into 600 $\Omega$ nominal
	Direct Audio1	10 mW (10 dBm) into 600 $\Omega$ nominal
	Direct Audio 2	0.1 mW (-10 dBm) 0.25 Vrms into 600 $\Omega$ nominal
	Alert level	90mV rms ±10% into 600 $\Omega$ nominal
	Circuitry Type	Headphones are balanced Mic and ICS Tie are single ended
	Distortion	<10% THD @ nominal power output



Audio Noise Level Coupling Output Regulation	>50 dB down from rated output (no signal) < -40 dB < 10% distortion and <3 dB max. of rated load output power at 400% and 75% of rated load
Bi-directional Signals	
Quantity	1 ICS tie channel
Audio level	0.34 Vrms for AEM ICS tie
Impedance	1.8 k $\Omega$ ±10% for AEM ICS tie input
Circuitry Type	Single ended
Miscellaneous	
American	One on LED will light for the result on easting

Annunciators

Green LED will light for transmit operation

#### 1.4.2 Physical Specifications

	AA95	AA96	AA97			
Height	1.90" (48.3 mm)	1.90" (48.3 mm)	3.00" (76.2 mm)			
Depth	6.82" (173.2 mm)	6.82" (173.2 mm)	6.82" (173.1 mm)			
Width	5.00" (127.0 mm)	5.00" (127.0 mm)	5.75" (146.1mm)			
Weight	2.1 lbs (955 g)	2.1 lbs. (955 g)	2.5lbs (1.14 kg)			
Mounting		Dzus rail				
Faceplate		Engraved acrylic edge l	lit panel			
Material/Finish	Chassis & cover are 5050-H32 brushed aluminum with conversion coating finish					
Connectors	Male 50 pin & 37 pin D-submin connectors with slide locks					

#### 1.4.3 Environmental Specifications

Temperature	-20° C. to +55° C (ambient) -55° C. to +85° C (survival)
Vibration/Shock	Conforms to DO-160C Cat. 'N'
Humidity	95% Non-condensing
Altitude	25,000 feet max

## 1.5 Unit Nomenclature

AA95-512 VHF1, VHF2, RT1, RT2, RT3, RT4, XCVRs NAV, AUX switched Nav-Aids 2 unswitched alerts provided RX and ICS level controls ICS Call LED from rear controller ICS Tie/Split switch



AA95-728	Full pilot and co-pilot support 2 Comm, 2 FM and AUX XCVR positions 5 Nav-Aids plus music input KEYED, LIVE, VOX ICS with front panel control 3-level alerting ICS Call annunciator Illuminated TX selector knob 1 Direct Audio input
AA95-729	Full support for Doctor, Nurse and Attendant ICS only for 2 positions plus patient 2 Comm, 2 FM and AUX XCVR positions ADF, Doppler and music inputs. 1 Direct input ICS CALL switch, PLT ISO annunciator 5 Nav-Aids plus music input KEYED, LIVE, VOX ICS with front panel control Illuminated TX selector knob
AA96-001	TX1, TX2, TX3, TX4, TX5 and PA XCVRs 2 NAV and 2 ADF unswitched RX inputs No internal alerting VOX/LIVE ICS with squelch adjustment Pilot/Co-pilot boom mic support with pilot priority 4 PAX ICS only support Front panel master RX and ICS level controls
AA96-400	Full support for Jumpmaster and observer VHF1, VHF2, FM1, FM2 INT and PA XCVRs 2 NAV and 2 ADF unswitched RX inputs KEYED/LIVE ICS operation 4 PAX ICS only supported Front panel RX and ICS level controls PIL ISO annunciator and ICS CALL pushbuttom
AA97-402	VHF1, VHF2, TAC1, TAC2, TAC3, TAC4 XCVRs and PA Each XCVR has independent RX level adjustment NAV1, NAV2, ADF1 and DME switched Nav-Aids 1 Direct Audio input 3 Audio alerts installed TX/PA and locking ISO/EMR switches No hand mic connection Pilot/co-pilot boom mic support with pilot priority 4 PAX ICS only supported Front panel RX and ICS level 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, postinstallation checks and installation drawings for the AA9x Series Single Channel Audio Controller.

**Note:** The AA95, AA96 and AA97 series single channel audio controllers are customized units and may have unique operational features that are different to the options described, or are not covered in this manual. Any questions should be directed to the AEM Product Support Department.

Review all notes, warnings and cautions.

# 2.2 Unpacking and Inspection

Unpack the equipment carefully. Inspect the unit visually for damage due to shipping and report all such claims immediately to the carrier involved. Check that all items listed below are present before proceeding and report any shortage immediately to your supplier:

- AA9x Series Single Channel Audio Controller
- Product Information Card
- Certificate of Conformity or Release Certification

## 2.2.1 Warranty

All Anodyne Electronics Manufacturing Corp. (AEM) products are warranted for 2 years. See the website www.aem-corp.com/warranty for complete details.

# 2.3 Continued Airworthiness

Maintenance of the AA9x Series Single Channel Audio Controller is 'on condition' only. Periodic maintenance of this product is not required.

# 2.4 Installation Procedures

## 2.4.1 Warnings

WARNING: High volume settings can cause hearing damage. Set the headset volume control to the minimum volume setting prior to conducting tests, and slowly increase the headset volume to a comfortable listening level.

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2.4.2 Cautions

## CAUTION:

Failure to follow the installation and wiring instructions provided in this manual for power and ground connections, including the rating of the circuit breaker, may lead to damage in the power input circuitry of the unit.

## 2.4.3 Cabling and Wiring

All 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. Unshielded wire types shall qualify 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 connector map in Section 2.7 as required.

Allow 3" from the end of the shielded wiring to the shield termination to allow the connector hood to be easily installed. Reference the interconnect drawing in Section 2.7 for shield termination details. Note that the hood is a "clamshell" hood, and is installed after the wiring is complete.

Maintain wire segregation and route wiring in accordance with the original aircraft manufacturers' Maintenance Instructions.

Unless otherwise noted, all wiring shall be a minimum of 22 AWG, except power and ground lines, which shall be a minimum of 20 AWG. Reference the Interconnect drawing for additional specifications. Check that the ground connection is clean and well secured, and that it shares no path with any electrically noisy aircraft accessories such as blowers, turn and bank instruments or similar loads.

## 2.4.4 In-line PTT Cordsets

In-line, push-to-talk (PTT) cordsets (also known as drop cords) can be used to create/provide PTT capability for the user headsets that do not have yoke or cyclic mounted PTT switches. For headsets connected to the PILOT or COPILOT inputs/outputs of the AA9x series, ICS and TX keylines are needed to properly activate the associated PTT circuitry inside the AA9x series. For headsets connected to the PASSENGER inputs/outputs of the AA9x series, a method of controlling the microphone on the headset is needed because of the 'hot mic' circuitry. This is best accomplished with a 'mic interrupt' switch in the PTT cordset.

There are numerous manufacturers of in-line PTT cordsets, offering many 'electrical' variations to accomplish different functions. To meet the operational requirements for headset stations supported by the AA9x series, AEM recommends the dual switch type: a 3-position (momentary/center-off/locking) slider switch for the ICS functions and a momentary push-button switch for the Transmit functions. Both switches provide a 'mic interrupt' function. The 3-position ICS switch will allow the user to change the switch settings to match the operational intercom mode that has been selected at the AA9x series (e.g., LIVE, KEYED or VOX). The cable should have 6 conductors with the MIC and PHONE pairs shielded (MIC wires must be shielded as a minimum). To ensure proper shielding, the shield(s) should be



terminated to the MIC LO connection at the airframe connector of the PTT cordset. See Figure 1 below for details.

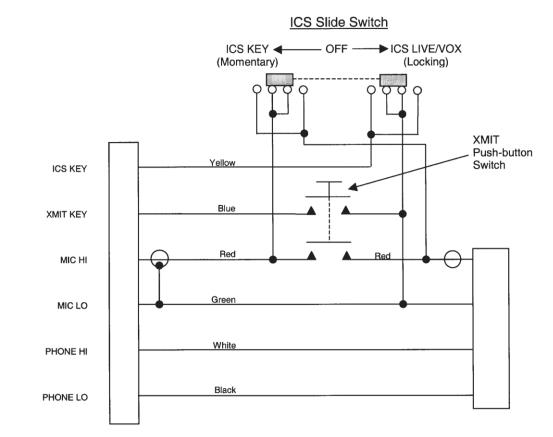


Figure 1: PTT Cord for Use with AEM Audio Controllers (XMIT and ICS)

To avoid complications in the aircraft, it is recommended that the same type of PTT cordsets be used for all headset locations in the aircraft. It is not good practice to create a situation where a specific cordset is needed for the copilot, which might cause operational errors if moved to a passenger location.

Although in-line PTT cordsets can be used to conveniently address a number of requirements for microphone and PTT control, they can also be a source of trouble if incorrectly configured, or improperly shielded.

Many in-line PTT cordsets use the PHONE LO connection as the ground reference for the ICS and TX PTT keylines. The PHONE LO connection in the AA9x series is floating, which will lead to incorrect keying of the intercom and radio systems if this type of cordset is used.

In-line PTT cordsets can be a source for crosstalk if the MIC wire pair in the cordset is not shielded. The source of the crosstalk is the high level Phones audio being coupled on to the MIC HI/LO pair in the in-line PTT cordset, because of the lack of shielding for this wire pair. Once the mic line is contaminated, the undesired audio can be sent into the audio system as 'mic audio', then processed and distributed to all other audio controllers via the ICS Tie Line.



#### 2.4.5 Post Installation Checks

#### 2.4.5.1 Voltage/Resistance Checks

#### Do not attach the AA9x Series until the following conditions are met.

Check the following:

- a) Check P101, pins <16> and <17> for +28 Vdc relative to ground.
- b) Check P101 pin <34> for continuity to ground (less than  $0.5\Omega$ ).
- c) Check P102 pin <19> for lights buss voltage.
- d) Check all Mic, phone, music and key lines for shorts to ground or adjacent pins.

#### 2.4.5.2 Power On Checks

Power up the aircraft's systems and confirm normal operation of all functions of the AA9x Series. Refer to Section 3 (Operation) for specific operational details.

- a) Begin with only the Pilot's headset installed, no hand mic. Confirm correct radio operation, both receive and transmit. Check yoke (or cyclic) switch action. Check radio audio inputs and selection of same.
- b) If there is a music source in the system turn it on and verify that music is muted in the CREW mode and removed in the PLT ISO mode. Check for proper mute operation. Do not proceed until the radios are functioning correctly. The S/T (sidetone) trimpot accessible through the left side of the controller and the transceiver internal trimpot may have to be adjusted for correct balance for the pilot. Adjustment of the individual radio RX levels should be set first with the AA9x series in Pilot ISO mode; then adjust the AA9x series front panel RX master volume control level in NORMAL mode.
- c) 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.
- d) Check the ICS Modes (ALL, CREW, PLT ISO), and the manual Fail-safe operation.
- e) Plug in the Co-pilot's headset. Check for correct ICS and SPLIT transmit operation. Check that the Co-pilot loses transmit capability during PLT ISO. Check yoke switch functions.
- f) Plug in the hand mic, if installed, and test for correct operation in all modes. (Hand mic activation does **not** illuminate the TX light.) Note that wiring faults for this accessory may cause peculiar loss of ICS or TX functions because it has over-riding priority in the system.
- g) Plug in any remaining headsets, and check for correct ICS operation. Note that an incorrect cordset (drop cord) or improper jack wiring may cause a wide range of problems from loss of audio to a tone heard in the headset. For further information, see section 2.4.4 above.
- i) To verify proper operation, all functions and levels shall be checked in-flight.
- j) Check preset adjustments are completed before aircraft departure.



Upon satisfactory completion of all performance checks, make all required log book entries, electrical load, weight and balance amendments and other documentation as required by your local regulatory agency before releasing the aircraft for service.

# 2.5 Adjustments and Connections

The unit is shipped 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 internal adjustments are located on the sides of the unit and are shown in Figure 2 and Figure 3.

#### 2.5.1 Left Side Panel Adjustments

The trimpots on the left side panel shown in Figure 2 are used to adjust the levels of audio in the user's headphones. Rotating the trimpots clockwise (cw) increases the level and counter clockwise (ccw) reduces it.



Figure 2: Left Side Panel Adjustments

## 2.5.1.1 ALERT LEVEL

The ALERT LEVEL trimpot is used to adjust the level for the internally generated Alert signals. Other parameters relating to these signals are adjusted from the right side panel.

## 2.5.1.2 S/T LEVEL

The S/T LEVEL trimpot adjusts the overall sidetone level of all selected transceivers (from the front panel).

## 2.5.1.3 VOX LEVEL

The VOX LEVEL trimpot sets the sensitivity level for the front panel VOX control (the level of audio required to activate microphones).

## 2.5.1.4 POWER ON

The POWER ON LED will illuminate to indicate that the unit is connected to the power supply.



## 2.5.2 Right Side Panel Adjustments

A variety of different signals can be selected to trigger the internal Alert signals. The trimpots on the right side panel shown in Figure 3 are used to adjust the characteristics of the audible signals that the user will hear.



Figure 3: Right Side Panel Adjustments

## 2.5.2.1 DIR AUD LEVEL

The DIR AUD LEVEL trimpot is used to adjust the audio level of the devices connected to the DIR AUD 1 input.

## 2.5.2.2 AUDIO ALERTS

AUDIO ALERT 1 is a single tone signal and AUDIO ALERTS 2 and 3 are two-tone signals.

## 2.5.2.3 TIME

The duration of AUDIO ALERT 3 can be adjusted from one to three seconds using the TIME trimpot.

## 2.5.2.4 TONE

The pitch of the signals can be adjusted using the relevant TONE trimpot.

## 2.5.2.5 RATE

The cycling rate of the two-tone signals can be adjusted using the RATE trimpots.

**Note:** The number and type of adjustments is dependent on the features specific to the particular AA95, AA96 or AA97 configuration.



# 2.6 Accessories Required But Not Supplied

Installation kit p/n AA90-IKC (crimp) (AEM Part No. D50S37SL-IKC) is required to complete the installation. The kit consists of one 50-Pin D-min Female Crimp Kit (D50SL-IKC) and one 37-Pin D-min Female Crimp Kit (D37SL-IKC):

#### D50SL-IKC consists of

Quantity 1 50 1* 1* 1 D37SL-IKC consists of	<b>Description</b> D-min 50 Socket Housing MS Crimp Socket Jack Screw Set Lock Clip Set 50 Pin Connector Hood	AEM Part No. 20-21-050 20-26-901 20-27-002 20-27-004 20-29-051
Quantity 1 37 1* 1* 1 * 1 * Use as required.	Description D-min 37 Socket Housing MS Crimp Socket Jack Screw Set Lock Clip Set 37 Pin Connector Hood	<b>AEM Part No.</b> 20-21-037 20-26-901 20-27-002 20-27-004 20-29-038

## 2.7 Installation Drawings

**Note:** There are multiple versions of the AA95, AA96 and AA97. For this reason, the documents listed below are supplied for reference only for units with Serial numbers 6000 and above. If specific model information is required, please contact the Product Support Department at AEM.

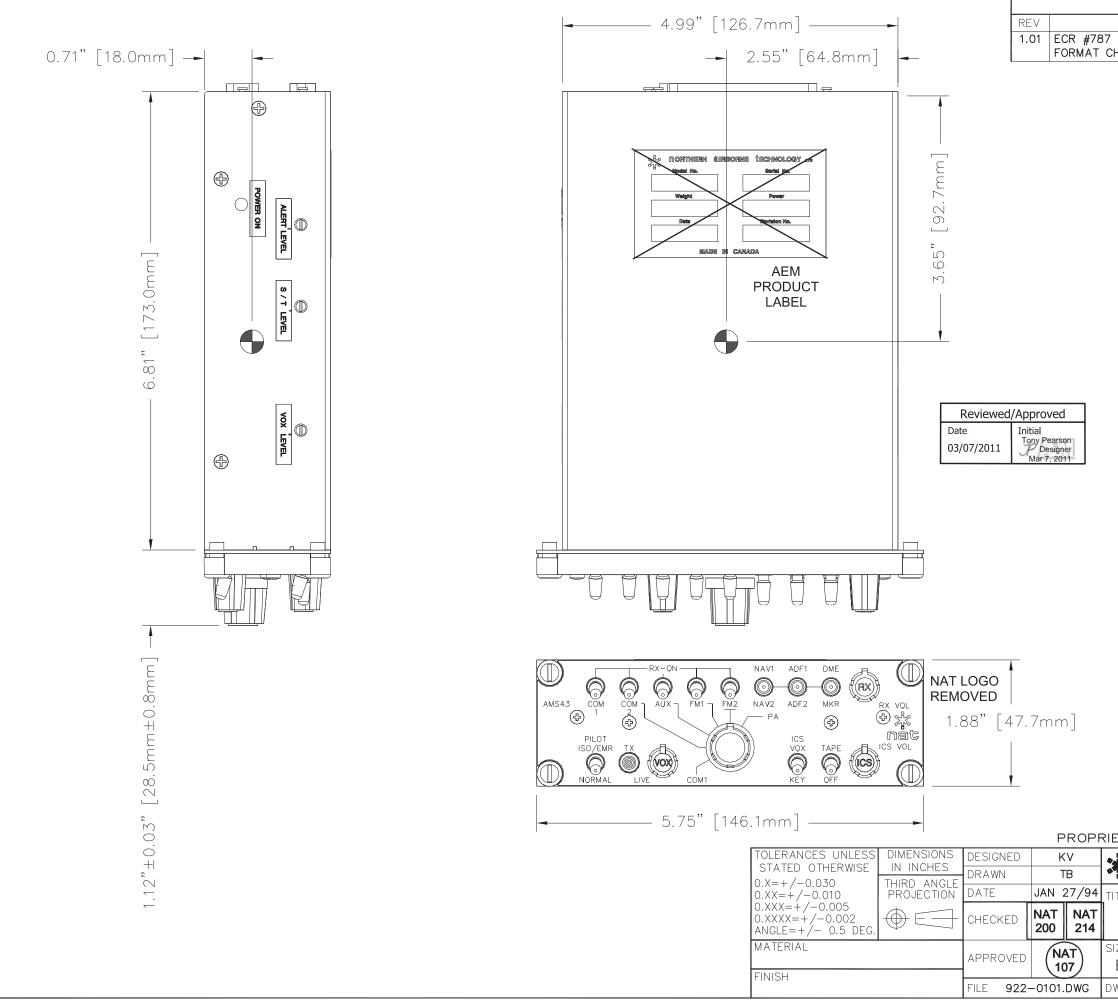
DOCUMENT	REV.	DESCRIPTION	ТҮРЕ	
AA95 and AA96 (	All vers	ions)		
AMS43\922-0	1.01	Audio Controller	Mechanical Installation	
AA95-728				
AA95\728\403-0	2.00	Audio Controller	Interconnect	
AA95\728\403-1	2.00	Audio Controller	Interconnect	
AA95\728\403-2	2.00	Audio Controller	Interconnect	
AA95\728\405-0	1.01	Audio Controller	Connector Map	
AA95\728\905-0	2.00	Audio Controller	Faceplate	
			-	



## AA95-729

AA95\729\403-0	1.00	Audio Controller	Interconnect
AA95\729\403-1	1.02	Audio Controller	Interconnect
AA95\729\403-2	1.01	Audio Controller	Interconnect
AA95\729\405-0	1.02	Audio Controller	Connector Map
AA95\729\905-0	2.00	Audio Controller	Faceplate
AA96-001			
AA96\001\403-0	1.00	Audio Controller	Interconnect
AA96\001\403-1	1.00	Audio Controller	Interconnect
AA96\001\403-2	1.00	Audio Controller	Interconnect
AA96\001\405-0	1.00	Audio Controller	Connector Map
AA96\001\905-0	1.11	Audio Controller	Faceplate
AA96-400			
AA96\400\403-0	1.01	Audio Controller	Interconnect
AA96\400\403-1	1.01	Audio Controller	Interconnect
AA96\400\403-2	1.01	Audio Controller	Interconnect
AA96\400\405-0	1.01	Audio Controller	Connector Map
AA96\400\905-0	1.11	Audio Controller	Faceplate
AA97-402			
AA97\402\403-0	1.02	Audio Controller	Interconnect
AA97\402\403-1	1.02	Audio Controller	Interconnect
AA97\402\403-2	1.02	Audio Controller	Interconnect
AA97\402\405-0	1.01	Audio Controller	Connector Map
AA97\402\905-0	1.11	Audio Controller	Faceplate
AA97\402\922-0	1.00	Audio Controller	Mechanical Installation

# Section 2.0 ends following the above documents

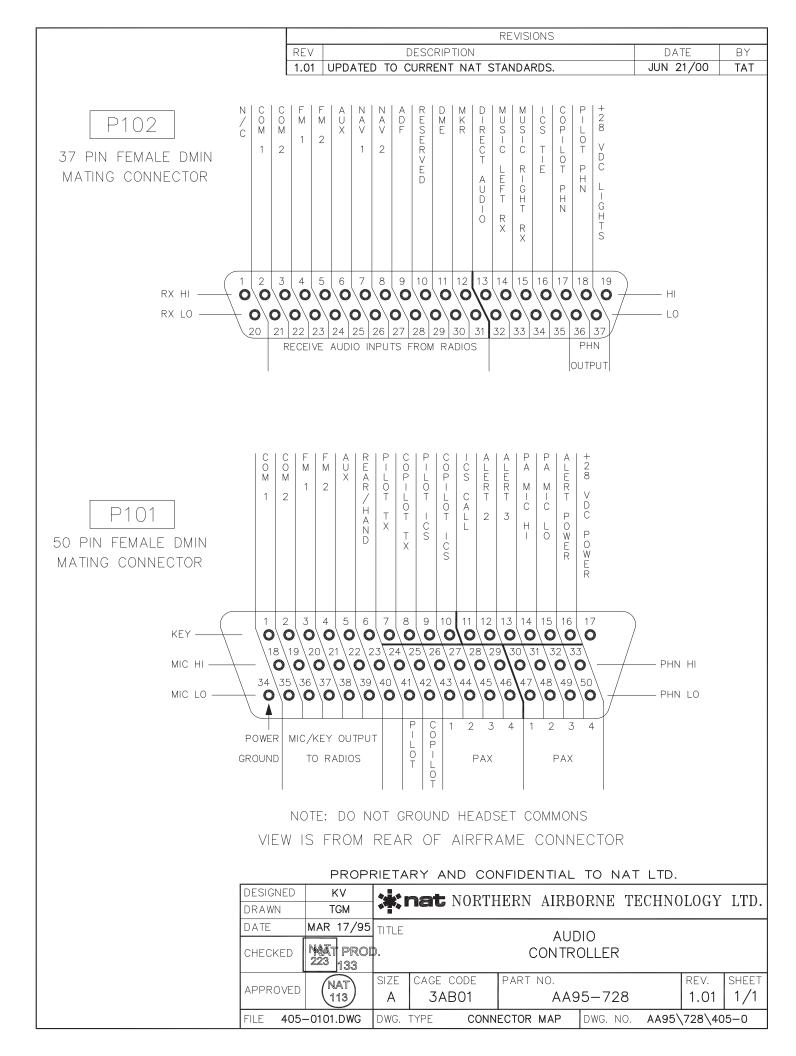


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	-	SHIELDED PAIF TO CLEAN AIR	R. CONI CRAFT	NECT SHIE GROUND.	ELDS TOGE GROUND	LINES USE TWISTED THER AND GROUND POINT SHOULD BE POWER GROUND.		
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		TO BE USED F REFER TO INS				COM SYSTEM ONLY. DETAILS.		
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ANODYNE ELECTRONICS MANUFACTURING IS PROHIBITED.	DO NOT	SCALE DRAWING	SCALE	: 1:1		No.: 403-0	SHEET 1	of 3
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POWER GROUND 34	
NAME       DATE       UNLESS OTHERWISE SPECIFIED:       ANODYNE       KELOWNA BC CAN         DRAWN       LAC       Mar 13/12       DIMENSIONS ARE IN INCHES TOLERANCES:       DIMENSIONS CORP       (250)-763	1088
CHECKED AND ACTIONAL ± 0.5 Deg	
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ANODYNE ELECTRONICS MANUFACTURING. NA ANY REPRODUCTION IN PART OR AS A WHOLE FINSH AND A L9015 AA95-728 2.0	·
PROHIBITED. DO NOT SCALE DRAWING SCALE: 1:1 DRAWING No.: 403-1 SHEET 2 of 3	

AA95-728	J102 P102 37 PIN FEMALE DMIN MATING CONNECTOR		
+28 VDC LIGHTS		+28 VDC LIGHTS	
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COM 2 RX HI COM 2 RX LO		С RX LO СОМ 2	
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AUX RX HI AUX RX LO			
NAV 1 RX HI NAV 1 RX LO		RX NAV 1	
NAV 2 RX HI NAV 2 RX LO		RX NAV 2	
ADF RX HI ADF RX LO		RX ADF	
RESERVED RESERVED			
DME RX HI DME RX LO		RX DME	
MKR RX HI MKR RX LO		RX MKR	
direct audio hi direct audio lo		HI ALERT LO MODULE	
N/C N/C	20		
MUSIC LEFT RX HI MUSIC LEFT RX LO		L RX L LO MUSIC	
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DRAWN       LAC       Mar 13/12         CHECKED       Call k       Mar 13/12	FRACTIONAL ± 0.5 Deg	MANUFACTURING CORP.	WWW.AEM-CORP.COM
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THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF	MATERIAL	SIZE CAGE CODE PART No.	REV
ANODYNE ELECTRONICS MANUFACTURING. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ANODYNE ELECTRONICS MANUFACTURING IS	FINISH N A	A L9015 AA95-728	2.00
PROHIBITED.	DO NOT SCALE DRAWING	SCALE: 1:1 DRAWING No.: 403-2 SHI	EET 3 of 3



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APPROVED	<u>/all</u> pc P	30 Mar 12	TWO PLACE DECIMAL ± 0.01 THREE PLACE DECIMAL ± 0.005			A I II	DIO CONTROLLER	1	
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ANODYNE ELECTRONICS MANUFACTURING IS PROHIBITED.		DO NOT SCALE DRAWING	SCALE	: 1:1	DRAWING	No.: 905-0	SHEET 1	of 3	

#### AA95-729 INSTALLATION NOTES

#### NOTES:

- ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE NOTED. USE TEFZEL M27500 OR SPEC44 (M81044) SHIELDED WIRE WITH SOLDER SLEEVES.
- A HEADSET, MICROPHONE AND ICS TIE LINES USE TWISTED SHIELDED PAIR. CONNECT SHIELDS TOGETHER AND GROUND TO CLEAN AIRCRAFT GROUND. GROUND POINT SHOULD BE THE SAME AS AIRCRAFT AUDIO SYSTEM POWER GROUND.
- DO NOT GROUND MICROPHONE OR HEADSET LO CONNECTIONS TO AIRFRAME.
- ADJUSTABLE LEVEL DIRECT AUDIO INPUT, AMPLIFIED.
- AIRCRAFT ENTERTAINMENT SYSTEM (MUSIC) MUST BE GROUND REFERENCED. IF NOT, A FLOATING GROUND ADAPTER BETWEEN THE AUDIO CONTROLLER AND ENTERTAINMENT SYSTEM WILL BE REQUIRED.

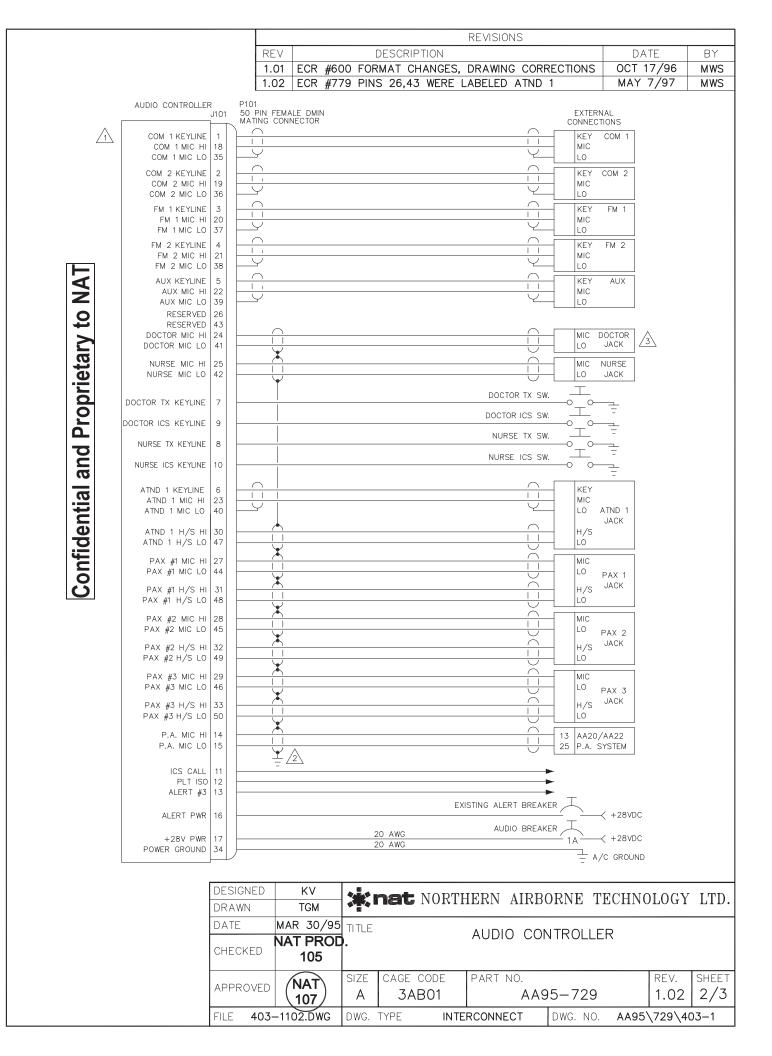
#### DEFINITIONS:

- N/C: NO CONNECTION. THE PIN IS <u>NOT</u> 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.

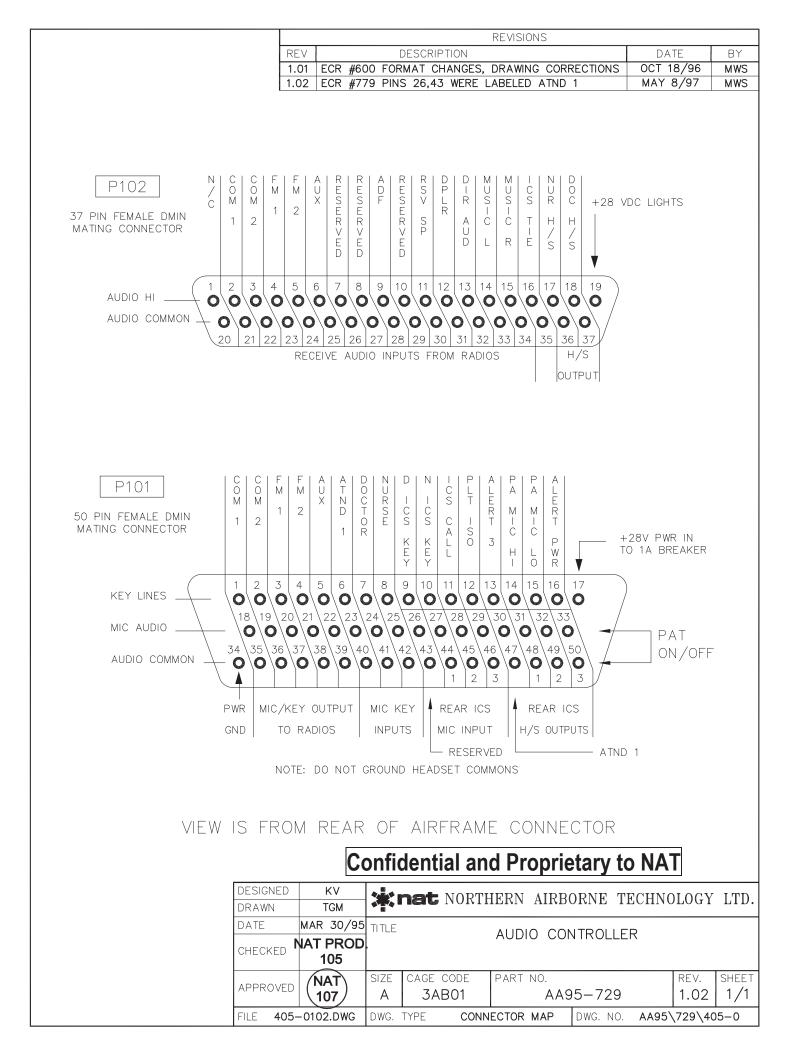
RESERVED SPARE:	RESERVED, BUT INSTRUCTIONS SHALL BE FOLLOWED TO ACTIVATE	
(RSV SP)	THE CIRCUITRY. A SPARE WIRE <u>SHALL</u> BE INSTALLED IN	
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# **Confidential and Proprietary to NAT**

REVISION	DATE	<b>*nat</b> NORT	THERN AIRBO	RNE	TECHNOLOGY	LTD.					
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		FM2 AL	PA			
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DRAWN LAC FED Z//12	IOLERANCES: RACTIONAL ± 0.5 Deg			CTURING CORP.	WWW.AE	M-CORP.COM
CHECKED 20-Feb-12	ANGULAR: MACH ± BEND ± IWO PLACE DECIMAL ± 0.01	TITLE:				
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ANODYNE ELECTRONICS MANUFACTURING. ANY REPRODUCTION IN PART OR AS A WHOLE	N/A NISH		9015	AA95-72	9	2.00
WITHOUT THE WRITTEN PERMISSION OF ANODYNE ELECTRONICS MANUFACTURING IS	N/A					
PROHIBITED.	DO NOT SCALE DRAWING	SCALE: 1:1	DRAWING	No.: 905-0	SHEET 1 c	of 3
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#### AA96-001 INSTALLATION NOTES

#### NOTES:

1	ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE NOTED.
	ALL WIRES SHOULD BE 22 AWG UNLESS VINERWISE NUTED.
	USE TEFZEL M27500 OR SPEC44 (M81044)
	SHIFL DED WIRE WITH SOLDER SLEEVES.

- A HEADPHONE, MICROPHONE AND ICS TIE LINES USE TWISTED SHIELDED PAIR. CONNECT SHIELDS TOGETHER AND GROUND TO CLEAN AIRCRAFT GROUND. GROUND POINT SHOULD BE THE SAME AS AIRCRAFT AUDIO SYSTEM POWER GROUND.
- DO NOT GROUND MICROPHONE OR HEADPHONE LO CONNECTIONS TO AIRFRAME.

#### **DEFINITIONS:**

N/C:	NO CO	NNECTI	ON.	THE	PIN	IS I	<u>10/</u>	CONI	NECT	ED '	ТО	ANYTHINC	;		
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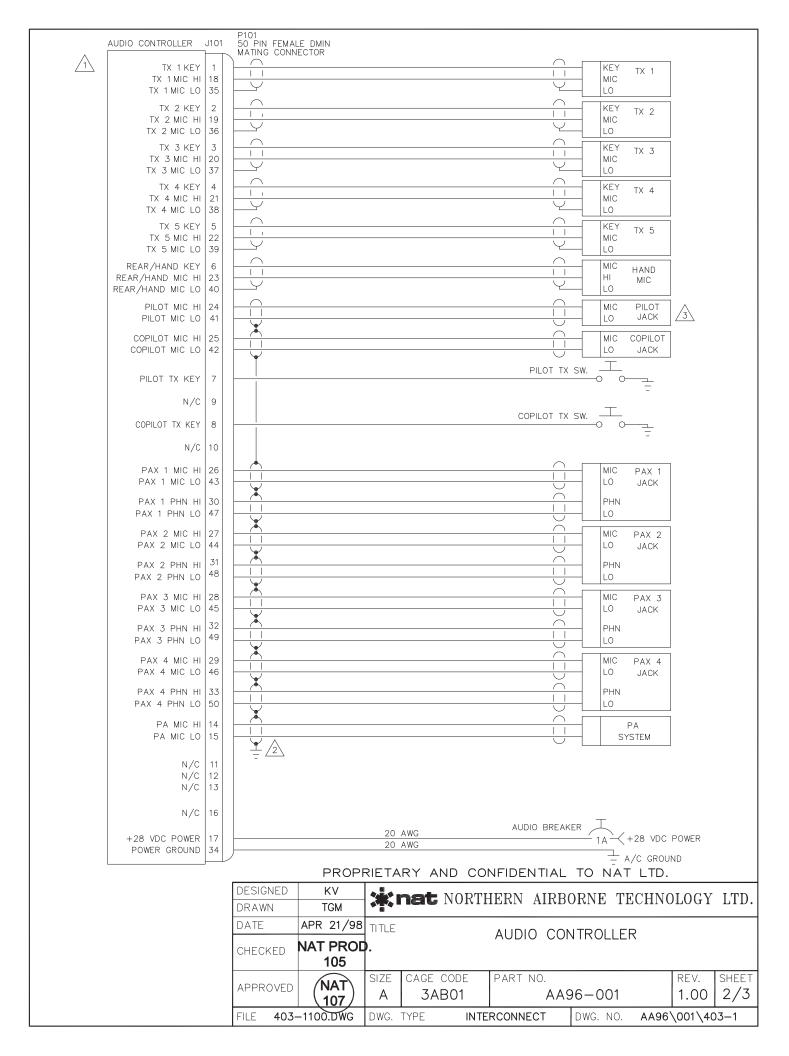
N/C SPARE: NO CONNECTION INTERNALLY, BUT A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.

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

#### DESIGNED ΚV **\* nat** Northern Airborne technology Ltd. DRAWN TGM APR 21/98 TITLE DATE AUDIO CONTROLLER NAT PROD CHECKED 105 CAGE CODE PART NO. SHEET **NAT** SIZE REV. APPROVED 3AB01 AA96-001 1.00 1/3107 А FILE DWG. TYPE INTERCONNECT DWG. NO. AA96\001\403-0 403-0100.DWG

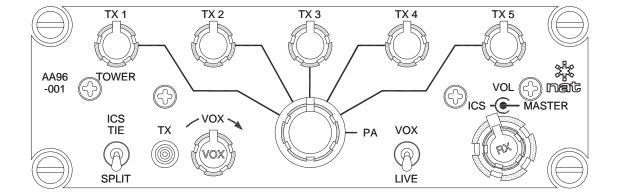
#### PROPRIETARY AND CONFIDENTIAL TO NAT LTD.



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	REVISIONS		
REV	DESCRIPTION	DATE	ΒY
1.01	FORMAT CHANGES ONLY	APR 14/98	TGM
1.10	ECR #1693 – 'G' HOLE WAS 0.375 DIA WITH		
	COUNTERSINK DIA OF 0.60.	APR 17/01	TAT
1.11	DOCCR01847 – UPDATED TO CURRENT STANDARDS.	NOV 14/06	TAT



CONFIDENTIAL	AND	PROPRIETARY	ТО	NAT	LTD.
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FILE	905-0.DWG	DWG.	TYPE	FACEPLATE	DWG. NO.	AAS	96\001\	905–0

	REVISIONS		
REV	DESCRIPTION	DATE	ΒY
1.01	ECR #1185 – FORMAT CHANGES.	JUNE 2/98	TGM

#### AA96-400 INSTALLATION NOTES

#### NOTES:

- ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE NOTED. USE TEFZEL M27500 OR SPEC44 (M81044) SHIELDED WIRE WITH SOLDER SLEEVES.
- HEADSET, MICROPHONE AND ICS TIE LINES USE TWISTED SHIELDED PAIR. CONNECT SHIELDS TOGETHER AND GROUND TO CLEAN AIRCRAFT GROUND. GROUND POINT SHOULD BE THE SAME AS AIRCRAFT AUDIO SYSTEM POWER GROUND.
- DO NOT GROUND MICROPHONE OR HEADSET LO CONNECTIONS TO AIRFRAME.

#### DEFINITIONS:

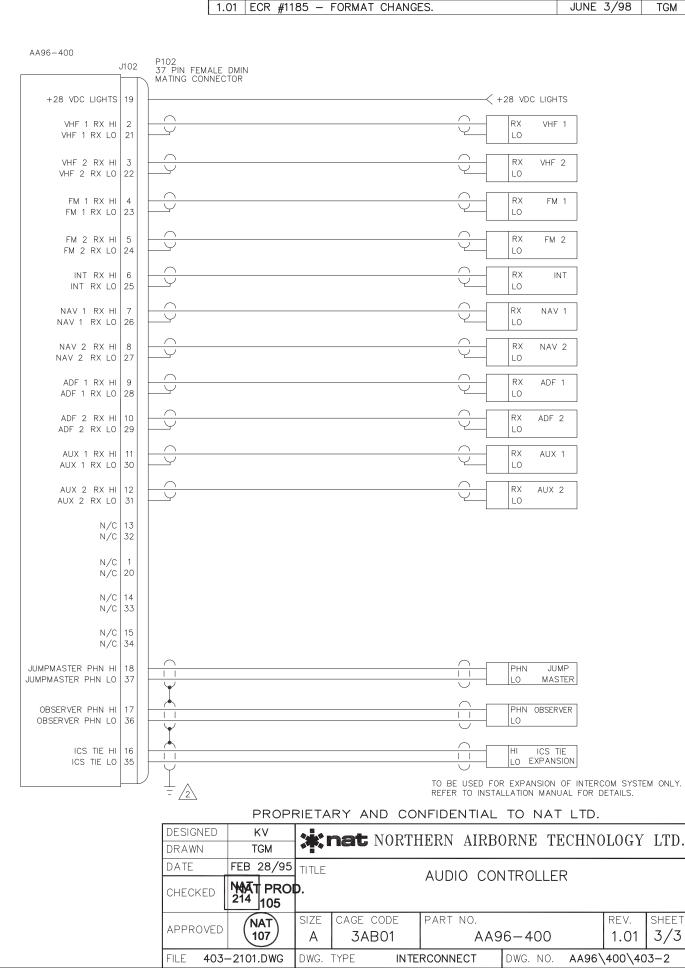
- N/C: NO CONNECTION. THE PIN IS <u>NOT</u> CONNECTED TO ANYTHING INTERNALLY, AND THEREFORE SHALL HAVE NO CONNECTION EXTERNALLY.
- N/C SPARE: NO CONNECTION INTERNALLY, BUT A SPARE WIRE SHALL BE INSTALLED IN THE WIRE HARNESS.
- RESERVED: MAY BE CONNECTED AND USED IN THE FUTURE. THE CIRCUITRY MAY BE PRESENT OR ADDED TO ACTIVATE THE FUNCTION. THE PIN MAY BE USED FOR TEST PURPOSES. THERE IS NO EXTERNAL CONNECTION.
- RESERVED SPARE: RESERVED, BUT INSTRUCTIONS SHALL BE FOLLOWED TO ACTIVATE (RSV SP) THE CIRCUITRY. A SPARE WIRE <u>SHALL</u> BE INSTALLED IN THE WIRE HARNESS.

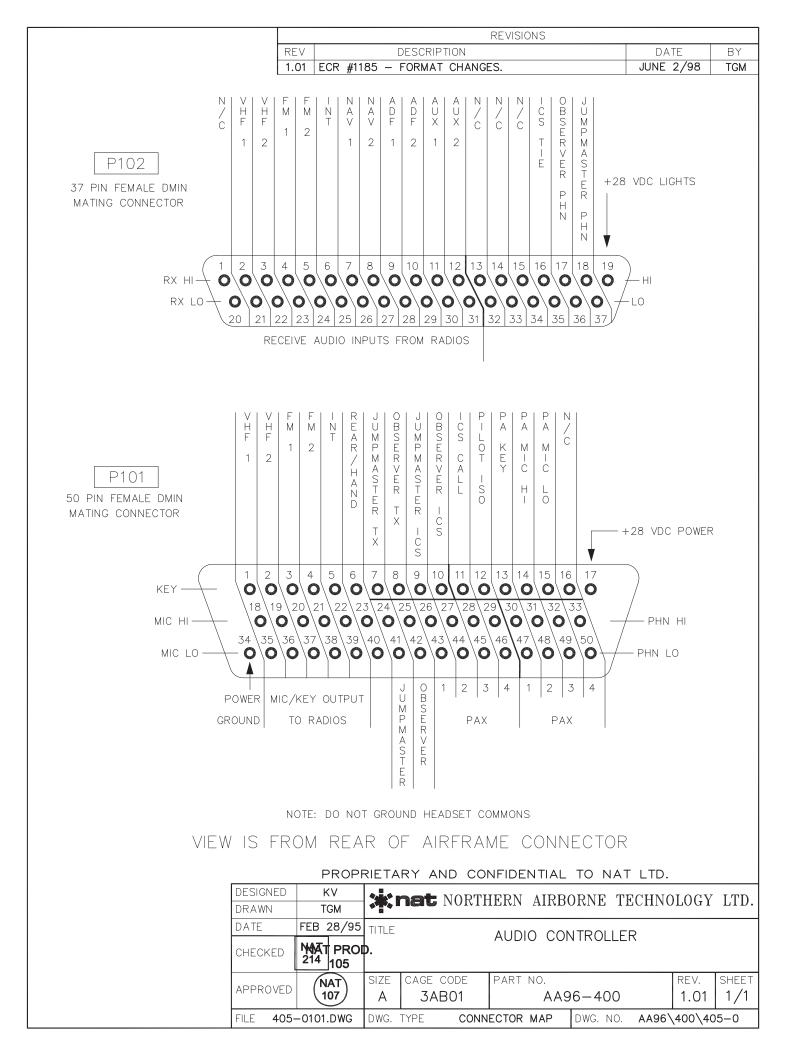
#### PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

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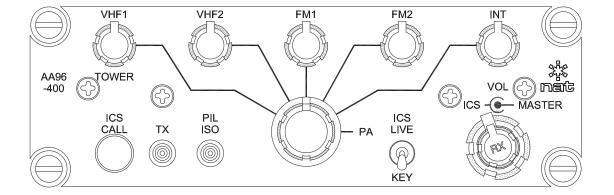
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	JUMPMASTER MIC HI	24								MIC	JM		
	JUMPMASTER MIC LO	41								LO	JACK	<u>_3</u>	
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	OBSERVER MIC LO	42	Ý							LO	JACK		
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	JUMPMASTER IX RET	'						JUMP	MASTER ICS SW.				
	JUMPMASTER ICS KEY	9								$-\circ_+\circ$			
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	PAX 3 MIC LO									LO	PAX 3		
	PAX 3 PHN HI	32							<u> </u>	PHN	JACK		
	PAX 3 PHN LO	49								LO			
	PAX 4 MIC HI									MIC			
	PAX 4 MIC LO	46								LO	PAX 4		
	PAX 4 PHN HI									PHN	JACK		
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			FILE 4	403–	1101.DWG	DWG.	TYPE I	NTEF	RCONNECT	DWG. N	0. <b>A</b> A	400\40	)3–1

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1.01	ECR #1185 – FORMAT CHANGES.	JUNE 3/98	TGM
-			





	REVISIONS							
REV	DESCRIPTION	DATE	ΒY					
1.01	FORMAT CHANGES ONLY	MAR 2/95	TGM					
1.02	ECR # 1185 - UPDATED, RX ADDED TO KNOB.	MAY 29/98	TGM					
1.10	ECR #1693 – 'G' HOLE WAS 0.375 DIA WITH							
	COUNTERSINK DIA OF 0.60.	APR 17/01	TAT					
1.11	DOCCR02060 - ADDED SHEET 3/3, UPDATED TO							
	CURRENT STANDARDS.	MAY 14/07	TAT					



DESIGNED	-	4	nat North	IFPN AI	PRODNE	TECHNO	MOCV	ITD		
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CHECKED	NAT 255		AUDIO CONTROLLER FRONT VIEW							
APPROVED	(NAT 131)	size A	cage code <b>3AB01</b>	part no. A	A96-40	0	REV. 1.11	sheet 1/3		
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	REVISIONS		
REV	DESCRIPTION	DATE	ΒY
1.01	EXTERNAL CONECTIONS TO RESERVED PINS REMOVED FROM SHEET 3.	FEB 20/96	MWS
1.02	UPDATED TO CURRENT NAT STANDARDS.	MAY 31/00	TAT

#### AA97-402 INSTALLATION NOTES

#### NOTES:

- ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE NOTED. USE TEFZEL M27500 OR SPEC44 (M81044) SHIELDED WIRE WITH SOLDER SLEEVES.
- A HEADPHONE, MICROPHONE AND ICS TIE LINES USE TWISTED SHIELDED PAIR. CONNECT SHIELDS TOGETHER AND GROUND TO CLEAN AIRCRAFT GROUND. GROUND POINT SHOULD BE THE SAME AS AIRCRAFT AUDIO SYSTEM POWER GROUND.
- DO NOT GROUND MICROPHONE OR HEADPHONE LO CONNECTIONS TO AIRFRAME.
- ADJUSTABLE LEVEL DIRECT AUDIO INPUT, AMPLIFIED.
- 5 TO BE USED FOR EXPANSION OF INTERCOM SYSTEM ONLY. REFER TO INSTALLATION MANUAL FOR DETAILS.

#### DEFINITIONS:

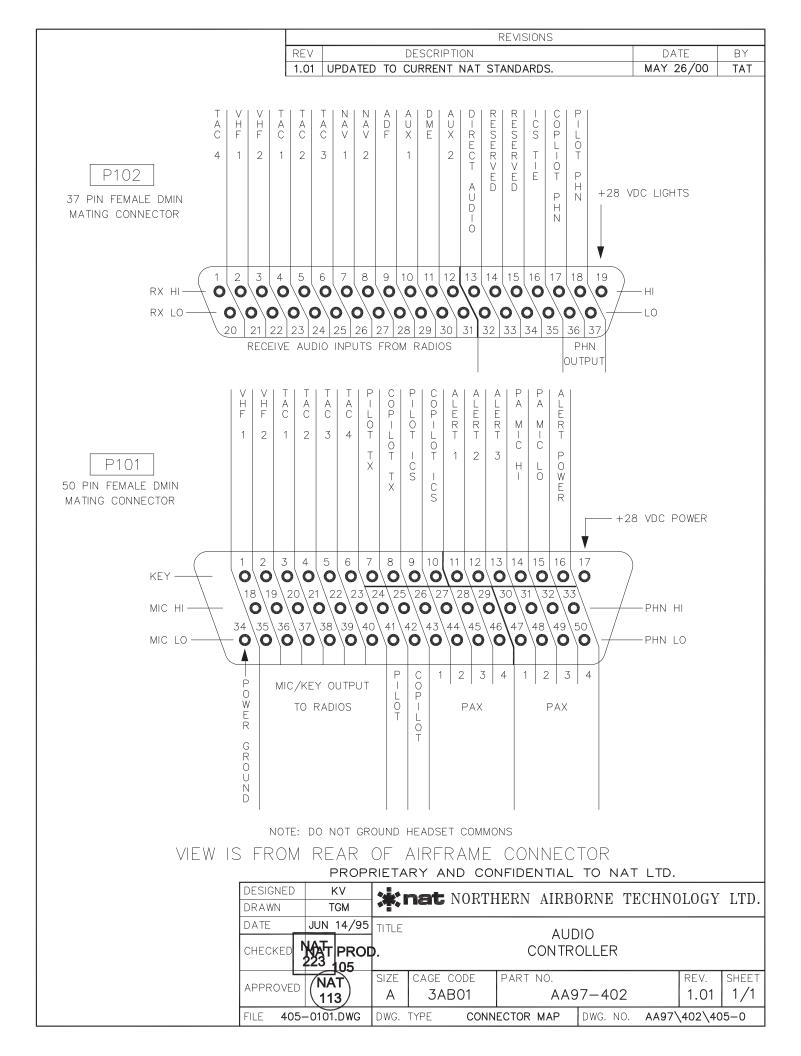
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#### DESIGNED ΚV **\* nat** Northern Airborne technology Ltd. DRAWN TGM JUN 13/95 TITLE NAT PROD. NAT33 DATE AUDIO CHECKED CONTROLLER 214 CAGE CODE 'nAŤ SIZE PART NO. REV. SHEET APPROVED 3AB01 AA97-402 1.02 1/3113 А 403-0102.DWG DWG. TYPE INTERCONNECT FILE DWG. NO. AA97\402\403-0

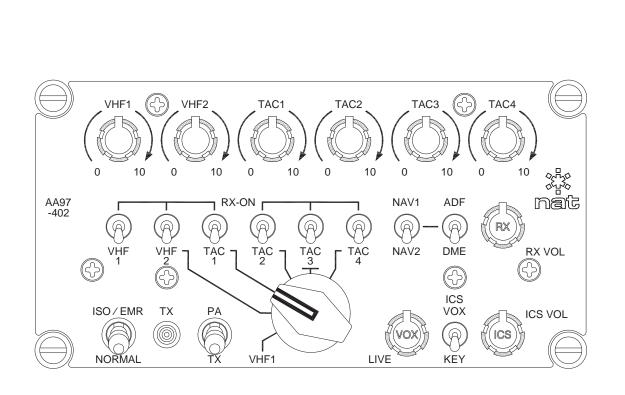
#### PROPRIETARY AND CONFIDENTIAL TO NAT LTD.

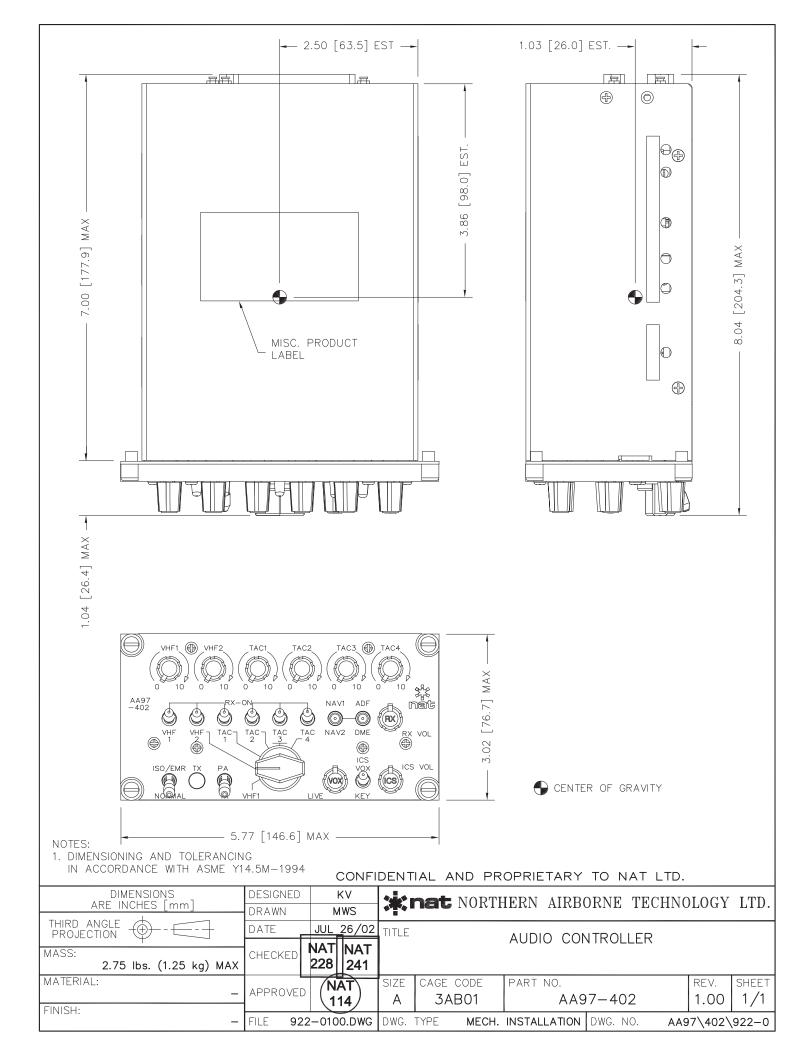
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			D100				REVISIONS					
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	CONFI	DENT	IAL AND PR	OPRIETARY TO NA	T LTD.	
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DRAWN	LJ			IERN AIRDURNE I	ECHNOLOGI	. דוחי
DATE	DEC 18/91	TITLE			-0	
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APPROVED	(NAT 131)	size A	CAGE CODE 3AB01	PART NO. AA97-402	REV. 1.11	SHEET 1/3
FILE	905-0.DWG	DWG.	TYPE	FACEPLATE DWG. NO.	AA97\402`	905-0
ENG-FORM: \905's\AA97-xxx.905-0110.DWT		•		•		







# Section 3.0 Operation

#### 3.1 Introduction

Information in this section consists of functional and operational procedures for the AA9x Series Single Channel Audio Controller.

**Note:** The AA95, AA96 and AA97 series single channel audio controllers are customized units, and may have unique operational features that are different to the options described, or are not covered in this manual. Any questions should be directed to the AEM Product Support Department.

## 3.2 General Information

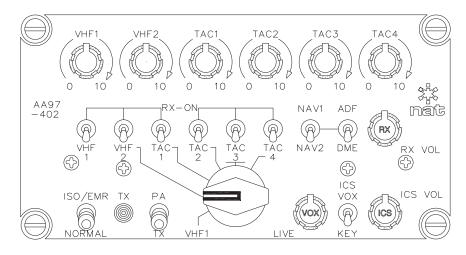


Figure 1: AA9x Operator Accessible Controls

The AA9x provides control for all aircraft audio, allowing selection of transmit and receive audio, LIVE, KEYED, or VOX intercom and interface for an additional hand held transmit microphone (hand mic). The AA95 and AA97 series of audio controllers allow selection of pilot isolation/emergency operation.

Sidetone level is adjustable internally, while receive (RX) and intercom (ICS) levels are adjustable on the front panel. In most AA9x configurations, all audio (except the sidetone of the radio in use) is muted during transmit for clarity. In the AA95 and AA97 series of controllers, the directly connected DIRECT AUDIO 2 input signal (see Section 3.6.1) remains un-muted during transmit. ICS operation will allow transmit during any ICS mode by using the PTT switch.



## 3.3 Controls and Indicators

In all AA9x controllers, transmit and PA functions are controlled with a single rotary selector switch, or (in some configurations) with the TX/PA Select switch. The main receive volume, ICS volume and ICS VOX squelch are individually adjusted with rotary controls. The ICS operations and receive audios are selected using color-coded toggle switches. In the AA95 and AA97 controllers, individual receive audio is selected with color-coded toggle switches. In the AA96 and AA97 controllers, individual receive volumes are adjusted using rotary controls.



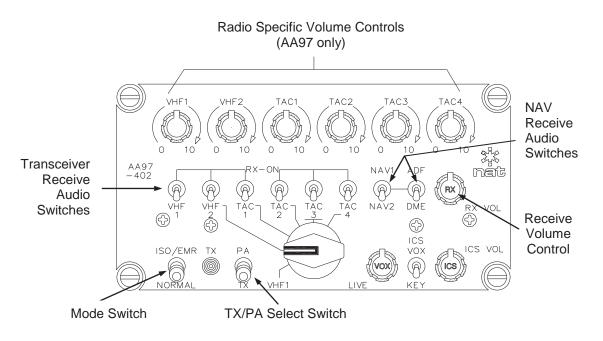


Figure 2: Receive Audio Select Switches

The transceiver receive audio select switches (white switch bats) are two position switches. When set to the 'up' position, the respective transceiver receive audio is selected on. When set to the 'down' position, the respective transceiver receive audio is selected off.

The NAV receive audio select switches (blue switch bats) are typically three position switches. When set to the 'up' or 'down' position, the respective NAV receive audio is selected on. When set to the 'center-off' position, the respective NAV receive audio is selected off.

The master receive volume control (RX VOL) adjusts all receive audio concurrently from 1% to full. It is important to set the individual radio volume controls to a nominal level and then use the master receive volume on the audio controller to adjust for changing flight conditions.



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When the red mode switch is set to NORMAL (AA95 and AA97's only), the passengers will hear the radio audio as selected on the controller. The passengers will not hear any radio audio when the red mode switch is in the ISO/EMR position.

#### 3.3.2 Transmit Selector Switch

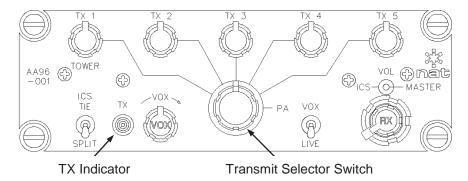


Figure 3: Transmit Select Switch

The transmit selector switch is a six position switch used to select the desired transceiver. For the AA95 and AA96, this switch typically selects the PA function when rotated fully clockwise. When the hand mic or transmit PTT switch is activated, the mic will be coupled to the radio (or PA) selected. The pilot has priority over the copilot during transmit operations.

Receive audio for the transceiver selected is automatically activated as a function of the rotary selector switch and no additional switching is needed to establish outside communication. During transmit, all audio selected is muted except the sidetone of the transceiver in use. In the AA95 and AA97's, Direct Audio 2 also remains un-muted during transmit.

The front panel TX indicator will illuminate green when either the pilot or co-pilot transmits. It will not light when the hand mic (if installed) is used.

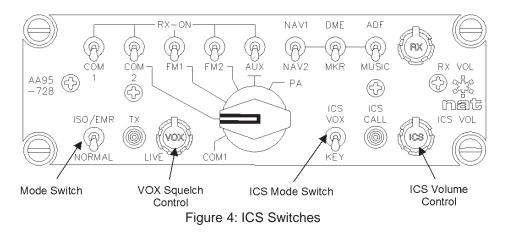
#### 3.3.3 ICS Functions

Intercom audio may be implemented in three modes: LIVE (on constantly), VOX (voice activated), or KEYED (active only when switched by ICS PTT switch). It is common to use the LIVE mode during ground operations, start-up, etc. and to use VOX or KEYED operation if conditions are so noisy that 'pilot fatigue' will result.

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#### 3.3.3.1 LIVE (Hot Mic Operation)

ICS mode switch (orange switch bat) set to the up (VOX) position and the VOX squelch control set to the full counter-clockwise position.

#### 3.3.3.2 KEYED ICS (PTT Operation)

ICS toggle switch (orange switch bat) set to the down (KEY) position. In some models of AA9x audio controllers, set the VOX squelch control to the full clockwise position. Keyed ICS is inherent to the pilot and copilot microphone circuits only. Passenger microphone circuits will be LIVE with this mode selected.

#### 3.3.3.3 VOX (Voice Activated)

ICS toggle switch (orange switch bat) set to the up (VOX) position. Set the ICS VOX Squelch control fully counter-clockwise and then slowly rotate clockwise until the intercom just becomes quiet. This setting will vary with ambient noise conditions and the quality and number of microphones connected in the system.

#### 3.3.3.4 General ICS Functions

Passenger ICS audio is LIVE when the controller is in the LIVE or KEYED mode of ICS operation. In the KEYED mode of operation the passenger microphones are LIVE. Utilize drop cord assemblies incorporating microphone circuit interrupt switches for keyed ICS operation. Passenger ICS is VOX triggered when VOX mode is selected.

All ICS audio is controlled by the front panel ICS volume control and may be varied to suit conditions. The ICS VOL control provides adjustment from approximately 1% to full output.

In the AA95 and AA97 models the mode switch (red switch bat) is used to select between NORMAL and PILOT ISO/EMR modes. In the NORMAL position (down), all operations of the ICS are functional as described above. When the switch is in the pilot isolate/emergency position (PILOT ISO/EMR), the pilot is isolated from the passengers. If the controller is operated in the ISO/EMR mode, ICS operation will continue (if there is no fault condition) between the passengers and copilot, but will exclude the pilot. See Section 3.5 for further details.

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## 3.4 Optional Features

Some of the more common optional features can be seen on the AA95-728 (shown in Figure 4, section 3.3.3) and Figure 5 below.

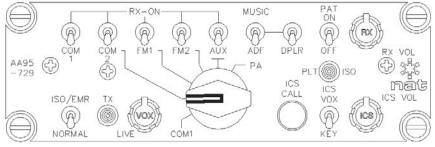


Figure 5: AA95-729

#### 3.4.1 ICS ISO and/or PLT ISO Annunciators

ICS ISO and/or PLT ISO annunciators indicate that the intercom connection to the other audio controllers (typically the pilot's) has been switched off.

#### 3.4.2 ICS CALL Annunciator

ICS CALL annunciator indicates that an ICS CALL switch is active and that the intercom connection between the audio controllers needs to be restored.

#### 3.4.3 ICS CALL Switch

ICS CALL switch used to signal other audio controllers (typically the pilot's) that an 'isolated' station needs to communicate with the pilot(s). The output from the switch is normally used to activate a CALL annunciator and/or a CALL tone.

#### 3.4.4 PAT ON/OFF Switch

PAT ON/OFF (Patient Headphone Audio Select) switch allows the crew to select the patient audio ON or OFF.

#### 3.4.5 ICS TIE/SPLIT Switch

ICS TIE/SPLIT switch allows for local selection of the intercom connection to other audio controllers in the aircraft intercom system. In the TIE position, intercom audio is shared with all other audio controllers. In the SPLIT position, intercom audio to/from all other audio controllers is deselected.



## 3.5 Emergency Operation (AA95 and AA97 models only)

When the red PILOT ISO EMR/NORMAL mode switch is set to the ISO/EMR position, the pilot is removed from the ICS bus and connected directly to the selected radios. This mode should be selected in the event of a box fault or power failure.

In the ISO/EMR mode, all functions are retained by the pilot, except ICS and possibly boom mic operation. If the box or airframe fault prevents the TX annunciator from lighting during transmit (indicating a failure in the mic keying circuit), then the hand mic should be used. A power fault of any kind will prevent the TX annunciator from lighting, giving an immediate indication of failure. If ICS audio is still available, then the power to the controller has not failed, and loss of the TX light indicates TX switch failure.

In the ISO/EMR mode, all switches work exactly as they do during NORMAL operation, except for the RX and ICS volume controls, which have no effect. The ISO/EMR function should be tested prior to flight to ensure proper operation and allow the radio levels to be set adequately for emergency operation.

Any selected receive audio is switched to the primary user (pilot) in the 'emergency' mode, but not to any passengers in the system. Audio level will be lower than in NORMAL operation because the signals are obtained directly from the radios, bypassing the electronics in the controller. This is provided for failure situations that make operation impossible in the NORMAL mode (i.e. loss of power or amplifier failure, etc.).

# 3.6 Audio Alerting Functions (AA95 and AA97 models only)

Two types of audio alerting are supported, Direct Audio and Internal Alerting. The use of these alerting features should be determined, defined and recorded so that the operator has an opportunity to use these features as they were intended for their specific installation.

#### 3.6.1 Direct Audio

Direct Audio is when an audio signal from an existing warning system is connected 'directly' into the audio system and is not front panel selectable. There are usually two Direct Audio inputs on the AA95 and AA97. Typically, Direct Audio 1 is an amplified/adjustable input and Direct Audio 2 input connects directly to the pilot's headset output.

#### 3.6.2 Internal Alerting

Internal Alerting is provided by up to three separate, internal tone generators that are coupled to the headset output. These tones are a function of the AA95 or AA97 itself and can be used to supplement existing warning tones (Low Rotor, Engine Out warnings in a Bell 206) or provide unique alerting capability for functions such as ICS Call, Rad Alt DH warning, etc. The internal alerts are configuration specific and how they will be used is determined at the time of installation. The Internal alerts are not front panel selectable.

End of Section 3.0

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