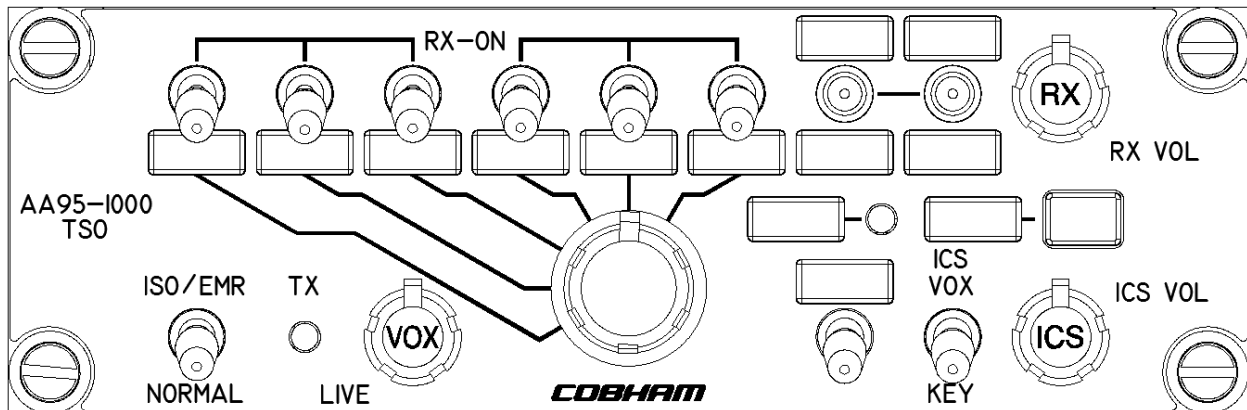




Installation and Operation Manual

AA95-1000TSO Single Channel Audio Controller



REVISION 1.01

IMPORTANT NOTICE

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1.1 Introduction

Information in this section consists of product description, design features and specifications for the AA95-1000TSO Single Channel Audio Controller.

Review all notes, warnings and cautions.

1.2 Product Description

The AA95-1000TSO provides 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 and ICS operations are controlled with toggle switches. Receive volume, ICS volume and ICS VOX squelch are individually adjusted with rotary controls. Sidetone (S/T) level is adjustable internally.

1.3 Design Features

The AA95-1000TSO is a Dzus rail mounted unit with NVIS Green B lighted faceplate. Transceiver interfacing is accomplished through directly switched microphones. To ensure maximum radio compatibility, it has a ground referenced keyline that does not incorporate 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, co-pilot and rear pilot, with both ICS and XMIT functions via cyclic or yoke switching. Live (Hot Mic) and VOX ICS are also provided, designed to allow 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 DIRECT AUDIO input signal, is muted during transmit for clarity. ICS operation allows transmit during any ICS mode by using the transmit PTT switch.

All external interconnects, switches and relay contacts are gold plated for maximum reliability. Switches and relays are sealed. 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.

The front panel is designed with removable legends allowing the installer to configure the panel top match functions of previous AA95 models. The unit backlighting is adjustable from 0-28VDC lighting bus installations. Both backlighting and indicator lighting is compatible with most NVIS "Green" cockpit environments.



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1.4 Specifications

1.4.1 Electrical Specifications

Input Power	27.5 Vdc Nominal 0.50 A max
Lighting	27.5 Vdc @ <1 mA Backlighting Color: NVIS Green B $u'=0.131$; $v'=0.623$; $r=0.057$, Backlighting Luminance= $1.0\pm 0.5fL$ Indicator Color: NVIS Green B $u'=0.131$; $v'=0.623$; $r=0.057$ Indicator Luminance: $15\pm 5fL$
Input Signals	
Quantity	11 receive channels 7 mic channels 1 ICS tie channel 1 direct channel
Audio level	2.5 Vrms for receiver inputs 0.25 Vrms for mic inputs 0.34 Vrms for ICS tie input 2.5 Vrms for direct audio inputs
Impedance	1 k $\Omega \pm 10\%$ for receive inputs 100 $\Omega \pm 10\%$ for mic inputs 1.6 k $\Omega \pm 10\%$ for ICS tie input 1.3 k $\Omega \pm 10\%$ for Direct Audio input
Circuitry Type	All are single ended inputs
Coupling	<-60 dB
Keylines	Pilot & copilot transmit PTT Rear hand mic transmit PTT Pilot & copilot ICS PTT 2 Alerts - active low 1 Call Switch Output with Chime 1 Call/ISO Indicator Input
Output Signals	
Quantity	6 Headset outputs 6 Transmitter mic outputs 5 Transmitter keyline outputs
Rated level:	
Headset	7.7 Vrms or 100 mW (20 dBm) into 600 Ω
Direct Audio	10 mW (10 dBm) into 600 Ω
Alert	90 mVrms $\pm 10\%$ into 600 Ω
Impedance	20 Ω max



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Circuitry Type	Balanced headset outputs for high common mode noise rejection
Frequency Response:	
Sidetone	<3 dB from 350 Hz to 6000 Hz
Receive inputs	<3 dB from 350 Hz to 6000 Hz
Intercom	<3 dB from 350 Hz to 3000 Hz
Alert 1	1.5 kHz \pm 20%
Alert 2	Same as Alert 1 but swept @ 2 cycles/sec
Call Chime	Approximately the same as Alert 2 but on for 2 sec
Distortion	<10% THD @ rated power output
Audio Noise Level	>60 dB down from rated output (without signal)
Coupling	<-55 dB
Output Regulation at 400% and 75% of rated load.	<10% distortion / Δ 3 dB max of rated output power
Annunciators	Green LED will light for transmit operation Green LED will light for CALL or ISO operation

1.4.2 Physical Specifications

Height	1.88" (47.6 mm)
Depth	6.83" (173.4 mm)
Width (behind panel)	4.99" (126.7 mm)
Weight	2.1 lbs. (955 g)
Mounting	Dzus rail
Faceplate	Engraved acrylic edge lit panel
Material/Finish	Chassis & cover are 5052-H32 brushed aluminum with chromate conversion finish
Connectors	Male 50 pin & 37 pin D-submin with slide locks

1.4.3 Environmental Specifications

Operating Temperatures	-20°C to +55°C
Survival Temperatures	-55°C to +85°C
Altitude	25,000 ft. Max
Humidity	95%
Shock	6g (any axis)
Vibration	RTCA/DO-160C Categories P and S

Qualification of the AA95-1000TSO Single Channel Audio Controller was completed in accordance with DO-160A Env. Cat. A1B1/A/PS/XXXXXXABABA



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1.4.4 Product Approval

FAA: TSO-C50c (RTCA/DO-170 Class Ia, RTCA/DO-160 A & C)

Section 1 ends



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Section 2 Installation

2.1 Introduction

Information in this section consists of unpacking and inspection procedures, installation procedures, post-installation checks and installation drawings for the AA95-1000TSO Single Channel Audio Controller.

Review all notes, warnings and cautions.

2.2 Airworthiness Limitations

The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

There are no new (or additional) airworthiness limitations associated with this equipment and/or installation.

Maintenance of the AA95-1000TSO Single Channel Audio Controller is 'on condition' only. Periodic maintenance of this product is not required.

2.3 Installation Procedures

2.3.1 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.

2.3.2 Cautions

CAUTION:

Do not bundle any lines from this unit with transmitter coax feed 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 audio interference will result.

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

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.

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2.3.3 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 interconnect drawing 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. Refer to 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. Aircraft harnessing shall permit the unit to be removed from the panel for easy access to all side adjustments. Do NOT mount the unit until all adjustments have been performed.

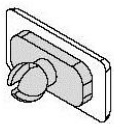
Maintain wire segregation and route wiring in accordance with the original aircraft manufacturers Maintenance Instructions.

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. Power to this unit must be supplied from a separate circuit breaker or fuse (fast blow), and not attached to any other circuit breaker without additional protection. Verify that the selected circuit breaker size and wire gauge are adequate for the installation using the techniques specified in AC43.13-1B Change 1, Paragraphs 11-47 through 11-51 and 11-66 through 11-69.

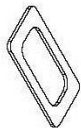
2.3.4 Legend Installation

Custom removable legends are to be ordered and installed by the customer.

Each AA95-1000TSO requires a set of legends, either purchased individually (Part no. 55-08-xxxx, where xxxx is the description of the legend, e.g., "COM1") or as a legend kit (Part no. AA95LK-xxx). Each kit consists of a number of printed legends and blanks (to suit customer requirements), and each legend comes complete with a black gasket, either attached or loose in the bag.



Legend



Gasket

When installing the legends for the first time, each legend must be fitted with a black gasket to ensure uniformity of legend lighting. The gasket fits into place on the back of the legend, but is easily dislodged or damaged. Take particular care to ensure that it is properly positioned before snapping the legend fully into place. If a replacement gasket is required, the whole legend must be ordered.

If it is necessary to remove or replace a legend, carefully lever the legend away from the faceplate, and insert the new or replacement legend as described above.

CAUTION

If the faceplate is damaged in any way during this process, light leakage may occur, which will necessitate returning the unit to the manufacturer for repair or replacement.



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2.3.5 Post-Installation Checks

Perform any required adjustments of preset levels, and ensure that the audio controller is properly mounted and secured prior to flight.

2.3.5.1 Voltage/Resistance Checks

Do not attach the AA95-100TSO until the following conditions are met.

Check the following:

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

2.3.5.2 Power On Checks

Power up the aircraft's systems and confirm normal operation of all functions of the AA95-100TSO. Refer to Section 3 (Operation) for specific operational details.

- a) Start with only the pilot's headset installed. Check for correct ICS, radio, and transmit 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, and then the front panel RX master volume control.
- b) Unusual buzzes, hums or other background audio are symptomatic of multiple grounds or noisy external systems sharing the same wire bundle. Note that incorrect jack wiring is a common fault, especially for passenger stations, and may cause loss of audio, a tone on the headset lines, or other problems. Failure to key or correctly modulate a transceiver may be caused by missing grounds on the radio or audio controller.
- c) Plug in the hand mic and test for correct operation. 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.
- d) Plug in the remaining headsets and check for proper operation. Note that an incorrect drop cord or improper jack wiring may cause a wide range of problems from loss of audio to a tone heard in the headset.
- e) To verify proper operation, all functions and levels should be checked in-flight.
- f) Check that 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.

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2.4 Adjustments and Connections

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 internal adjustments are located on the sides of the unit and are as follows:

2.4.1 Left Side Panel Adjustments



The trimpots on the left side panel are used to adjust the levels of audio in the user's headphones. Rotating the trimpots cw increases the level, and ccw reduces it.

The **ALERT LEVEL** trimpot is used to adjust the levels for the three internally generated Alert signals. Other parameters relating to these signals are adjusted from the right side panel (see section 2.5.2.)

The **S/T LEVEL** trimpot adjusts the internal gain of the sidetone of the selected transceiver (from the front panel) in the user's headphones.

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

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

2.4.2 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 are used to adjust the characteristics of the audible signals that the user will hear.

Audio Alert 1 is a single tone signal and Audio Alert 2 and the call chime are two tone signals. The pitch of the signals can be adjusted using the relevant **TONE** trimpot, and the cycling rate of the two-tone signals can be adjusted using the **RATE** trimpots. The duration of the call chime can be adjusted from one to three seconds using the **TIME** trimpot.

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



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2.5 Accessories Required But Not Supplied

Installation kit p/n D50S37SL-IKC (crimp) is required to complete the installation. The kit consists of the following:

Quantity	Description	COBHAM Part No.
1	50 Pin D-min Female Crimp Kit	D50SL-IKC
1	37 Pin D-min Female Crimp Kit	D37SL-IKC

D50SL-IKC consists of:

Quantity	Description	COBHAM No.
1	D-min 50 Socket Housing	20-21-050
50	MS Crimp Socket	20-26-901
1*	Jack Screw Set	20-27-002
1*	Lock Clip Set	20-27-004
1	50 Pin Connector Hood	20-29-051

D37SL-IKC consists of:

Quantity	Description	COBHAM No.
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

* Use as required.

2.6 Installation Drawings

DRAWING	REV.	DESCRIPTION	TYPE	SERIAL No.
AA95-1000TSO-403-0	1.01	Audio Controller	Interconnect	All
AA95-1000TSO-405-0	1.01	Audio Controller	Connector Map	All
AA95-1000TSO-905-0	1.00	Single Channel Audio Controller	Faceplate	All
AA95-1000TSO-922-0	1.01	Audio Controller	Mech. Installation	All

Section 2 ends following the above documents

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Section 3 Operation

3.1 Introduction

Information in this section consists of functional and operational procedures for the AA95-1000TSO Single Channel Audio Controller.

3.2 General Information

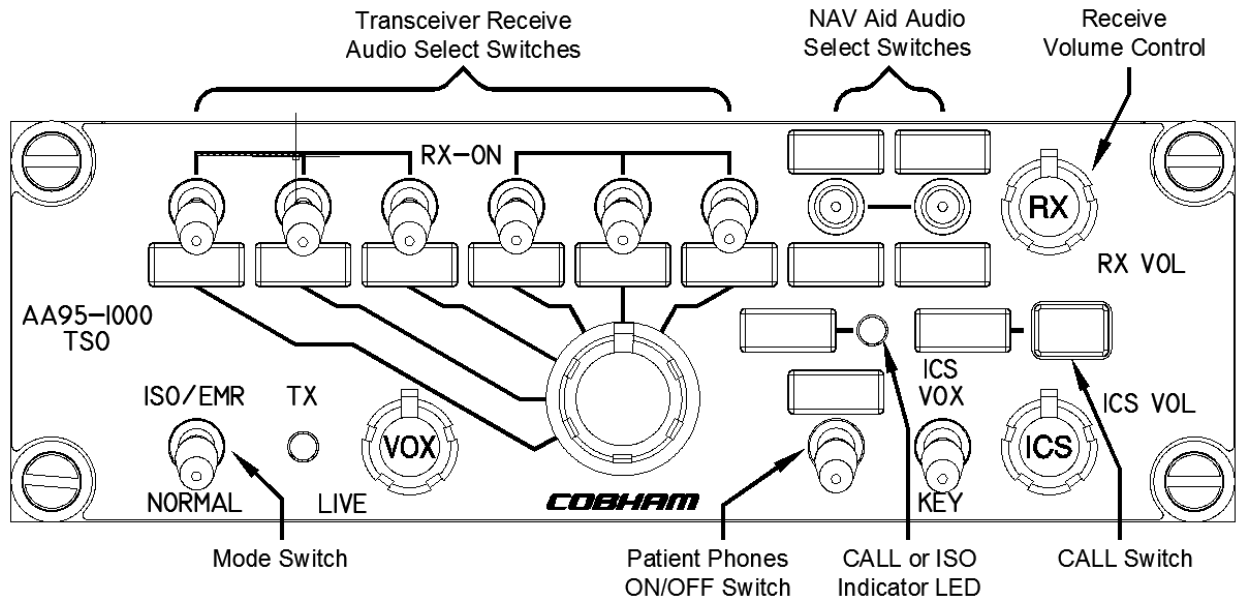
The AA95-1000TSO provides control for all aircraft audio, allowing selection of transmit and receive audio, LIVE, KEYED, or VOX intercom, interface for an additional hand held transmit microphone (hand mic), and pilot isolation/emergency operation.

Sidetone level is adjustable internally, and receive (RX) and intercom (ICS) levels are adjustable on the front panel. All audio, except the sidetone of the radio in use and the directly connected DIRECT AUDIO input signal (see Section 3.5.1), is muted during transmit for clarity. ICS operation allows transmit during any ICS mode by using the PTT switch.

3.3 Controls and Indicators

All transmit functions are controlled with a single rotary selector switch. Receive audio and ICS operations are controlled with color-coded toggle switches. Receive volume, ICS volume and ICS VOX squelch are individually adjusted with rotary controls.

3.3.1 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.

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When the Patient Phones ON/OFF switch is placed in the OFF position, the PAT Phones output is disconnected. This is normally used when a PAX station is connected to a user whom the installer wishes to have controlled access to the interphone system, such as an airlifted patient on board an air medical aircraft who should not hear all interphone communications. However, the PAT phones output can be used for any PAX user if the PAT switch is left on.

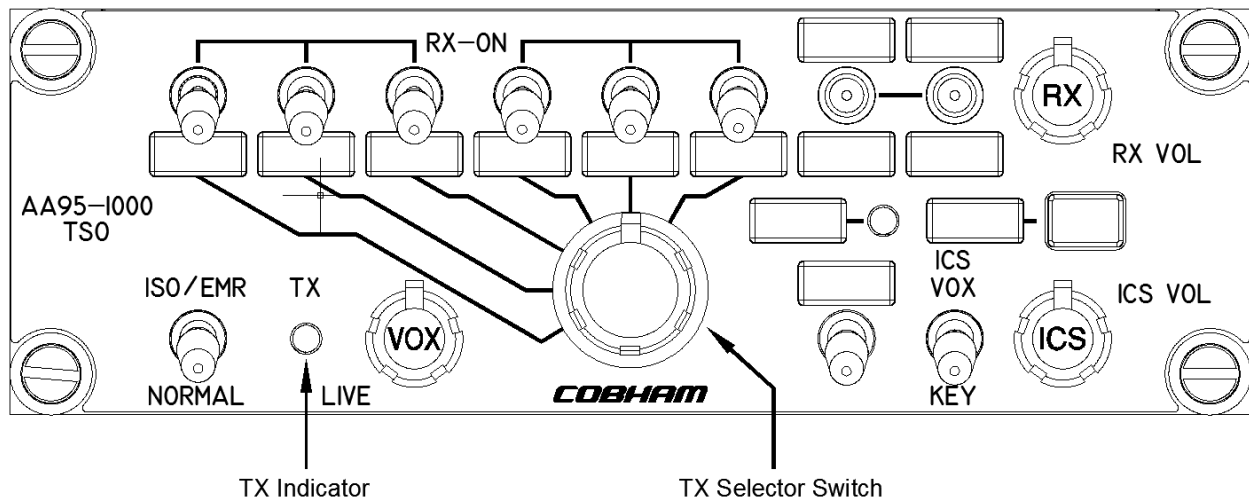
When the CALL/ISO input to the AA95-1000TSO is grounded, the CALL/ISO indicator LED will light. When the CALL button is pressed, the call chime will activate and a CALL switch connection from the AA95-1000TSO to another AA95-1000TSO CALL/ISO input will cause the CALL/ISO indicator LED to illuminate.

The NAV receive audio select switches (blue switch bats) are 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, then use the master receive volume on the audio controller to adjust for changing flight conditions.

When the red mode switch is set to NORMAL, 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



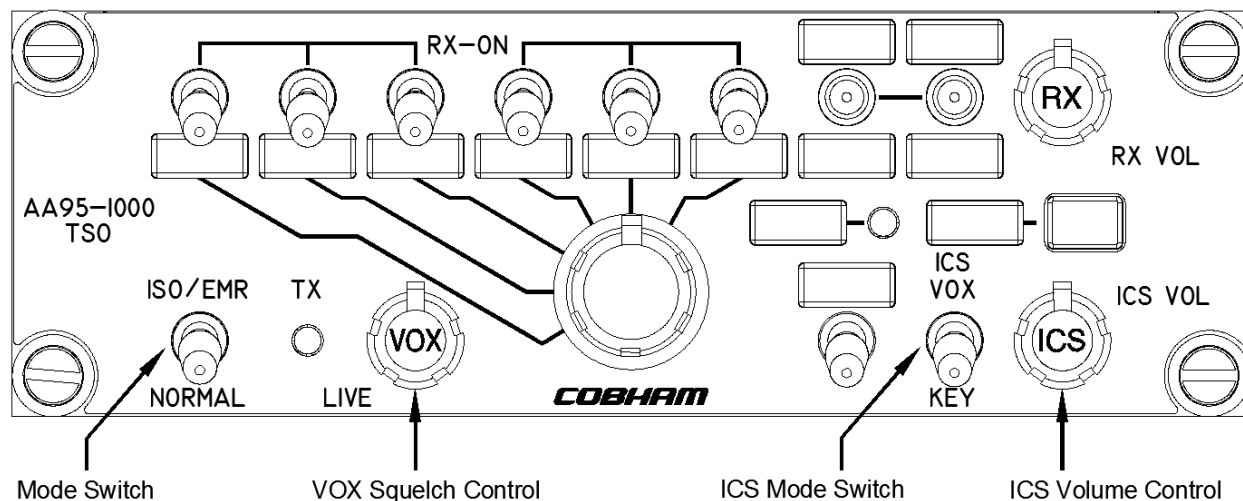
The transmit selector switch is a six position switch used to select the desired transceiver. When the hand mic or transmit PTT switch is activated, the mic will be coupled to the radio selected. The pilot has priority over the copilot during transmit operations.

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.

The front panel TX indicator will illuminate green when either the pilot or co-pilot transmits.

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3.3.3 ICS Functions



3.3.3.1 ICS Modes

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.

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.

KEYED ICS (PTT Operation)

ICS toggle switch (orange switch bat) set to the down (KEY) position. Keyed ICS is inherent to the pilot and copilot microphone circuits only.

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.

3.3.3.2 General ICS Functions

Passenger ICS audio is LIVE when the controller is in the LIVE or KEYED mode of ICS operation. It is VOX triggered when that mode is selected. The passengers are always LIVE unless interrupted by an in-line PTT cord, or if the controller is set for VOX operation. Passenger and observer (copilot) operations can be optimized by using in-line PTT type cord assemblies designed for use with NAT audio controllers. 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.

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 rest of the



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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 3.4 for further details.

3.4 Emergency Operation

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.)

3.5 Audio Alerting Functions

Two types of audio alerting are supported in the AA95-1000TSO: 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.

3.5.1 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 is one Direct Audio input on the AA95-1000TSO. Direct Audio is amplified/adjustable and is connected directly to the pilot's headset output.

3.5.2 Internal Alerting

Internal Alerting is provided by three separate, internal tone generators that are coupled to the headset output. These tones are a function of the AA95-1000TSO itself, and can be used to supplement existing warning tones (Low Rotor, Engine Out warnings) or provide unique alerting capability for functions such as ICS Call, Radar Altimeter DH warning, etc. The internal alerts and how they will be used, are determined at the time of installation and are not front panel selectable.

Section 3 ends
