

## T5 Tactical Headset



# CONTENTS

Electrostatic Discharge Sensitive (ESDS) Device Handling .....	3
Part List Notes .....	3
Specifications .....	4
Product Description .....	5-10
Single Comm Module Controls .....	6
Dual Comm Module Controls .....	6
Manufactured Versions .....	11
Packaging Part Lists, T5 Headset, All Versions .....	11
User Replaceable Parts List .....	11
System Configurations .....	12-13
Cables and Replacement Parts .....	14
Disassembly Procedures .....	15-19
Test Procedures .....	20-26
Definitions .....	20
Troubleshooting .....	27-29
Service Manual Revision History .....	30

**IMPORTANT NOTE:** These products are RoHS compliant. Use ONLY lead free solder when making repairs.

**CAUTION:** The Bose® T5 Tactical Headset contains no user serviceable parts. To prevent warranty infractions, refer servicing to warranty service stations or factory service.

## PROPRIETARY INFORMATION


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NOT BE REPRODUCED OR USED FOR ANY OTHER PURPOSE.

# ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICE HANDLING

This unit contains ESDS devices. We recommend the following precautions when repairing, replacing or transporting ESDS devices:

- Perform work at an electrically grounded work station.
- Wear wrist straps that connect to the station or heel straps that connect to conductive floor mats.
- Avoid touching the leads or contacts of ESDS devices or PC boards even if properly grounded. Handle boards by the edges only.
- Transport or store ESDS devices in ESD protective bags, bins, or totes. Do not insert unprotected devices into materials such as plastic, polystyrene foam, clear plastic bags, bubble wrap or plastic trays.

## PART LIST NOTES

1. The individual parts located on the PCB are listed in the part list.
2. This part is referenced for informational purposes only. It is not stocked as a repair part. Refer to the next higher or lower level assembly for a replacement part.
3.  This part is critical for safety purposes. Failure to use a substitute replacement with the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards.

# SPECIFICATIONS

## Bose® T5 TECHNICAL INFORMATION OVERVIEW

Mono and stereo available	Single Comm and Dual Comm options
Weight (on head)	455g
Control Module Weight	300g
Dual Comm radio or intercom cables	120g (max/each)
Nominal Headband Clamping Force	2.1 +/- 0.1 lbs.
Ear cup to Control Module Cable Length	420 +/- 50 mm
Push-to-talk (PTT) on control module	One momentary PTT switch for single comm Two momentary PTT switches for dual comm
Live Mic Switch	2-position (on/off) toggle type switch, used to transmit continuously within the intercom
ANR ON/OFF on control module	2-position (on/off) toggle type switch, powers headset in dismounted operations
Talk-through (TTC switch	User-selectable, 4 position rotary, Binaural Position one: off Position two: 0db gain Position three: medium gain Position four: high gain
Battery Power	2 AA batteries ANR Only: 40 hours minimum TT Only: 100 hours minimum ANR and TT: 30 hours minimum
Current Draw	16 mA RMS nominal at 24v
Operating noise environment	Full ANR performance up to 123 dBSPL. Reduced ANR from 124dBSL up to 130 dBSPL Max
Earphone sensitivity	104 ± 3dB SPL (active) for a 0±0.1 dBV input 94 ± 4dB SPL (bypass)
Input Impedance	1000Ω±10% per channel (binaural) 500Ω±10% (monaural)
Attenuation	Performance will vary depending on the vehicle noise profile and crew position.
Boom microphone	Electret or Dynamic
Temperature Rating	-40°C to +65°C Operating -57°C to +71°C Storage
EMI	MIL-STD-461F

# PRODUCT DESCRIPTION

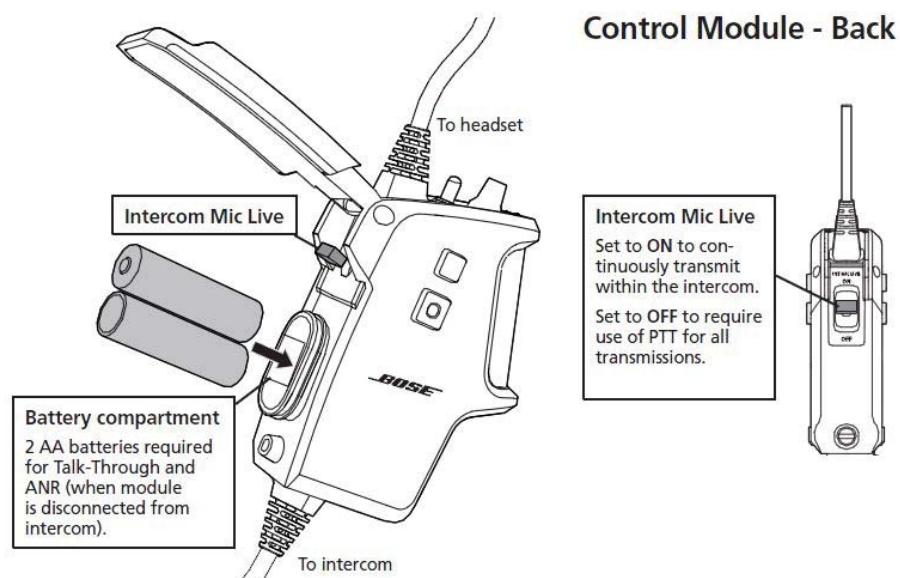
## OVERVIEW

The Bose® T5 Tactical Headset (T5TH) offers an unsurpassed combination of full-spectrum noise reduction, comfort and clear audio in an ergonomic and rugged form factor that is compatible with a variety of helmets, intercoms and radio systems. The optional dual-communications designed control module provides additional mission flexibility, which allows soldiers to easily adapt the headset to fit specific mission needs.

The T5 Tactical Headset is designed to be used by infantry and other military personnel who are primarily operating in and around tactical wheeled vehicles. These users engage in mission-critical communications and require effective noise reduction. Interpersonal communication and situational awareness are paramount, so they value products that are operationally flexible for mounted and dismounted use cases without sacrificing hearing protection.

## KEY BENEFITS

- Clear, two-way communication provides increased situational awareness via intercom, radio and Talk-Through feature.
- Reduction of both continuous and impulse noise provides hearing protection and allows for increased focus on mission-critical tasks and information.
- Certain configurations can support simultaneous communications with two different devices.
- Improved ergonomic design supports both mounted and dismounted operations, and the seamless transition between the two.
- Designed to fit securely and comfortably under combat helmets to support longer mission profiles.
- Designed for rugged combat use while being intuitive and easy to use with limited training.
- Easily field-repairable and upgradeable.



# PRODUCT DESCRIPTION

## Single Comm Module Controls

### Control Module - Front/Top

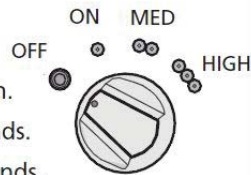
#### Active Noise Reduction (ANR)

ANR is automatically activated when module connects to intercom. Use switch only when disconnected from intercom.

#### Talk-Through\*

Select level:

- ON - to hear nearby conversation.
- MED - to hear more distant sounds.
- HIGH - to hear distant, quiet sounds.



#### Push-To-Talk (PTT)

Primary Intercom/Radio

#### Clothing clip

Loosen center screw to rotate clip or move clip to opposite side of module.

**Note:** Talk-Through and Active Noise Reduction (ANR) features are powered by two (2) AA batteries when the control module is disconnected from the intercom.

\*Talk-Through limits volume to protect user from loud environments.

## Dual Comm Module Controls

### Control Module - Front/Top

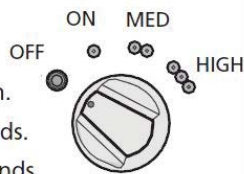
#### Active Noise Reduction (ANR)

ANR is automatically activated when module connects to intercom. Use switch only when disconnected from intercom.

#### Talk-Through\*

Select level:

- ON - to hear nearby conversation.
- MED - to hear more distant sounds.
- HIGH - to hear distant, quiet sounds.



#### Push-To-Talk (PTT)

(I) Primary Intercom/Radio  
(II) Secondary Portable Radio

#### Clothing clip

Loosen center screw to rotate clip or move clip to opposite side of module.

**Note:** Talk-Through and Active Noise Reduction (ANR) features are powered by two (2) AA batteries when the control module is disconnected from the intercom.

\*Talk-Through limits volume to protect user from loud environments.



# PRODUCT DESCRIPTION

The T5 headset is capable of working in noise environments with sound pressure levels up to 115dB(C) SPL which means it is most useful in small and large wheeled vehicles as well as many fixed and rotary wing aircraft.

The T5 headset consists of four main assemblies:

1. An active noise canceling headphone (two ear cups with ear cushions)
2. A suspension system (Napeband with over-the-head Velcro straps to support the weight)
3. A control cable assembly which provides power management, houses the necessary user interface controls and adapts the headphone to the customer's needs (by changing cables to be compatible with desired source). The control cable assembly can be removed from the earcups and replaced in the field.
4. A noise canceling boom microphone enabling communications. The microphone can be easily replaced in the field.

The earcups each contain external-facing microphones and circuitry to allow Talk-Through, or the ability to monitor external sounds such as speech without having to lift the earcups off of the ear. This talk-through (TT) circuit limits external sounds to be no greater than 85dB at the ear. The T5 headset has a volume control for the talk-through feature with volume settings will be OFF; unamplified, medium amplification and high amplification. In all settings, the above mentioned 85dB limit is enabled.

The ear cushions used on the headset contribute to the performance as well as the overall comfort of the headset. The ear cushions consist of polyurethane foam inside a polyurethane film.

The napeband consists of a single, arc shaped spring formed to tuck behind the nape of the user's neck and head and to provide the desired clamping force. Two yokes connect the spring to the earcups. The assembly is adjustable to fit most head sizes. The yokes and earcup interface allow for rotation in 2 axes in order to allow optimum fit for performance as well as for comfort. Additionally, the assembly includes a soft pad to provide cable routing and a comfortable fit behind the head for extended wear periods. The napeband / yoke assembly can be completely disconnected from the earcups for replacement.

The control cable mates to the bottom of the left ear cup via a connector and housing that is screwed to the earcup for robustness. This housing also mounts the flexible gooseneck boom with integral noise canceling boom microphone. The control module contains a smart power management system which can power the headset off of an external (vehicle) power source or can use the on-board 2 AA batteries. In either case, the headset is fully functional to provide active noise reduction (ANR), clear two way communications and talk-through capability. The headset is also configured to provide passive noise reduction and clear two way communications when there is no power source (fail safe mode). The control module is configurable via cable selection to enable connection of up to two input sources at any one time including inter-coms, portable communication radios or other auxiliary audio or communication devices.

The control module also includes an integrated clothing clip that enables the module to be securely mounted to a variety of clothing or equipment in a variety of orientations that best suit the application at hand. The clothing clip can be mounted on both the front and the back face of the control module in order to facilitate operation with either the left or the right hand or to cater to different user preferences.

# PRODUCT DESCRIPTION

The control module switches and buttons are designed to be easily operated while wearing typical work gloves with a material thickness of up to 3mm. They are also designed to provide tactile feedback during operation and configured such that the mode of the switch can be recognized visually or by feel.

The switches and their functions include:

1. Push to Talk (PTT) switch(es) (Momentary-Off)
2. 4-position rotary switch Talk Through (TT) control. The Talk Through circuit can be powered by either the intercom (if applicable) or the 2-AA batteries in the control module.
3. Battery powered Active Noise Reduction (ANR) Switch (On-Off)
4. ICS Mic live Switch (Live-Mic, Mic-Off) This switch is used to enable continuous active (latched) PTT mode for Intercom communications.

The boom microphone is serviceable and replaceable in the field. It is a dynamic microphone which consists of a flexible gooseneck boom and a noise cancelling dynamic microphone capsule. The Boom Microphone output is specific to the device it is attached to and is achievable by selecting the appropriate cable. Some options may include a pass-through while others may include a +24dB gain to simulate an electret microphone's output level. If gain is needed, the power is provided by the input device OR from the control module depending on the specific input cable. Some options may include a pass-through dynamic 150 ohm, single ended or differential microphone.

## Operation Modes (Power Compatibility)

The power modes listed below are determined by the combination of cables plugged into the device as well as voltages that are present in different locations or vehicles. Any combination of power modes based on input connections or signals can be configured within the electronics of the control module including but not limited to the following scheme.

### External Power Source

- Unpowered (0 – 6.0 VDC )
- Battery powered ANR (2-AA batteries)
- Gain switchable Talk Through only
- Selectable Output Level and Frequency Response (Both parameters follow the state of ANR and/or Talk-Through)
- Boom Microphone Output is specific to device it the is attached to and is configured inside the input cable. Some options may include a pass through while others may include a +24dB gain to simulate an electret microphone's output level. If gain is needed, the power is provided by the input device OR from the control module depending on the specific input cable.

### Low Power (6.1 - 13.5 VDC)

- Battery powered ANR
  - ANR Switch position has no effect
- Gain switchable Talk Through



# PRODUCT DESCRIPTION

## Operation Modes (Power Compatibility) (continued)

### Intercom Power (13.6 – 32.0 VDC)

- Battery powered ANR
  - ANR Switch does not operate
- Selectable Gain switchable Talk Through
- Boom Microphone Output is specific to device it is attached to and is configured inside the input cable. Some options may include a pass through while others may include a +24dB gain to simulate an electrets level. If gain is needed, the power is provided by the input device OR from the control module depending on the specific input cable.

### Battery Power (2x 1.5V AA ;1.8 – 3.2 VDC)

- ANR Switch OFF and Talk Through Switch OFF
  - ANR off
  - Talk Through off
  - Unpowered Output Level and Frequency Response
  - Boom microphone output depends on cable and device it is attached to.
- ANR Switch ON and Talk Through Switch OFF
  - ANR on
  - Talk Through off
  - Powered Output Level and Frequency Response
  - Boom microphone output depends on cable and device it is attached to.
- ANR Switch ON and Talk Through Switch in any ON position
  - ANR on
  - Talk Through on
  - Powered Output Level and Frequency Response
  - Boom microphone output depends on cable and device it is attached to.
- ANR Switch OFF and Talk Through Switch in any ON position
  - ANR off
  - Talk Through on
  - Powered Output Level and Frequency Response
  - Boom microphone output depends on cable and device it is attached to.

## Operation Modes (Audio Management) Dual Comm Versions:

The headset is designed to support multiple audio sources through ports located at the bottom of the in-line control module. The behavior of each port has been designed to support a wide range of applications. Any combination and presentation of input and output audio signals can be configured within the electronics of the control module, including but not limited to the following scheme.

Port 1 is intended to be the primary communications port and can support binaural or monaural sources. When the source is monaural, the cable for that device is wired such that the monaural signal is paralleled so that it is made compatible with the binaural connection and the user will always hear the audio from Port 1 in both ears. Whenever Port 1 is connected, pressing PTT 1 shorts the control line to the Port 1 source which enables transmission of the boom microphone signal to the Port 1 source. If there is no source connected to Port 1, nothing happens when PTT 1 is pressed.

# PRODUCT DESCRIPTION

Operation Modes (Audio Management) Dual Comm Versions (continued):

Port 2 is intended to be a secondary communications port. The presentation of this source's audio to the headset depends upon the presence of a cable plugged into Port 1.

If Port 1 has a cable plugged in, the audio from the Port 2 device will only be presented to the left earcup. In order to properly mix the audio between the multiple sources while maintaining the dynamic range of the headset, the two signals will each be reduced by 6dB. The reduction will occur as soon as the second cable is attached to the port on the bottom of the control module .

If Port 1 does not have a cable plugged in, the audio from the Port 2 device will be presented to both earcups and will not be reduced by 6dB.

Binaural devices may be connected to Port 2, however the cable connecting this type of source to the control module will mix the two separate channels onto one signal line and present the device as a mono device to the headset. Whenever Port 2 has a cable connected to it, pressing PTT 2 shorts the control line to ground of the Port 2 source which enables transmission of the boom microphone signal to the Port 2 source. If there is no cable connected to Port 2, nothing happens when PTT 2 is pressed. The "Mic live" switch has no effect on any Port 2 device under any configuration.

The table below describes how the headset manages the multiple audio sources based on what cables are connected as well as how the PTT buttons function. An N/A in a cell means there is no cable connected or there is no function. There are many variations of this that are possible.

<b>Mode of operation</b>	<b>Port 1</b>	<b>Port 2</b>	<b>Left Earcup</b>	<b>Right Earcup</b>
Unpowered	X	N/A	Port 1	Port 1
Unpowered	N/A	X	Port 2	Port 2
Unpowered	X	X	Port 1 + Port 2	Port 1 + Port 2
Battery Powered	X	N/A	Port 1	Port 1
Battery Powered	N/A	X	Port 2	Port 2
Battery Powered	X	X	Port 1	Port 2
ICS powered 6-32 V	X	N/A	Port 1	Port 1
ICS powered 6-32 V	X	X	Port 1 + Port 2	Port 1

## MANUFACTURED VERSIONS

Version Description	Material Master / SKU Number
HDST/MOD ASSY, SINGLE COMM, MONAURAL	349999-1100
HDST/MOD ASSY, SINGLE COMM, BINAURAL	349999-1200
HDST/MOD ASSY, T5, DUAL COMM	349999-2000
HDST ASSY, T5, DUAL, W/M-ICOMM/R-SEC CBLs	374120-2000

## PACKAGING PART LISTS

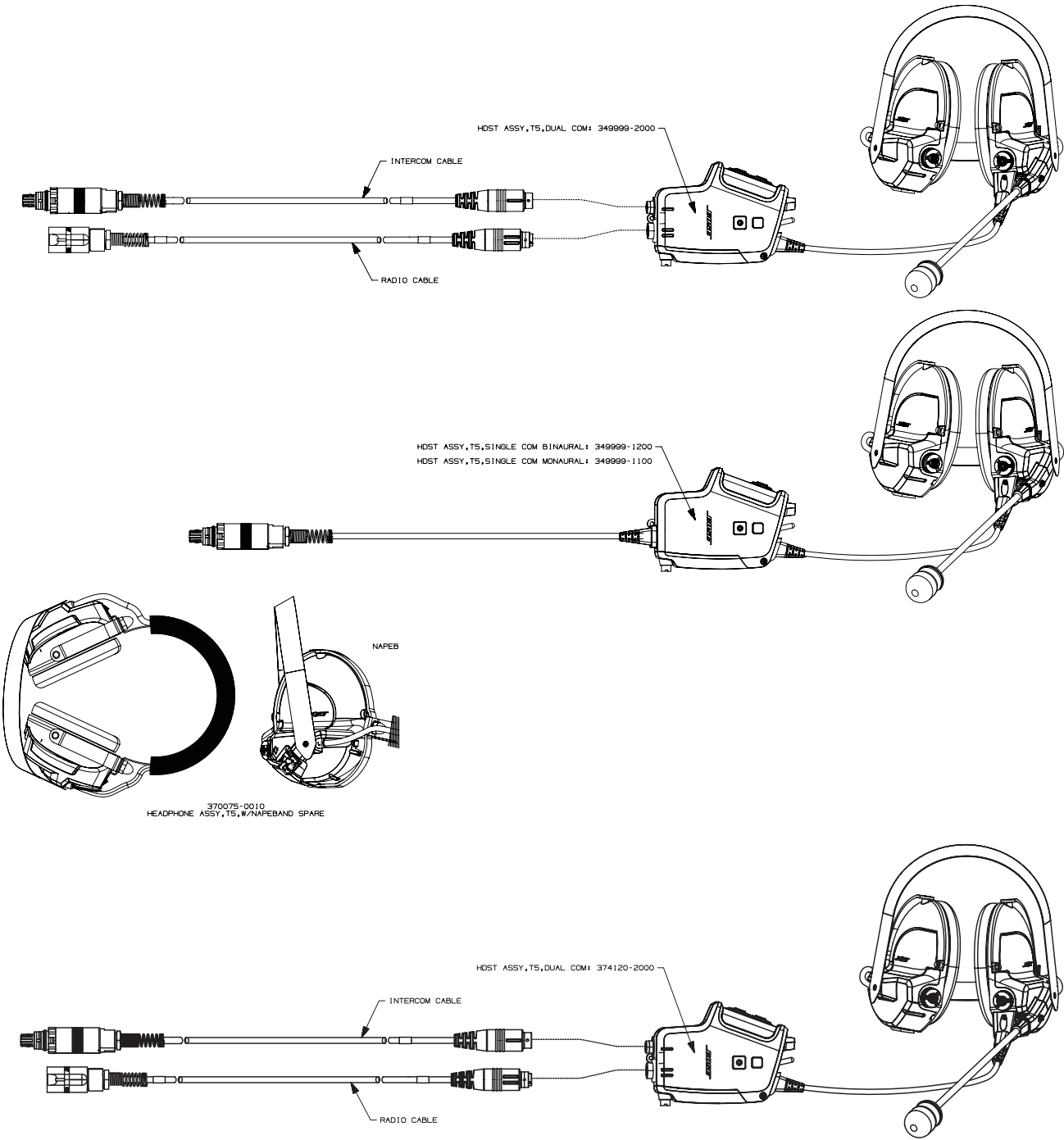
T5 Headset, All Versions

Item Number	Description	Part Number	Qty.
1	HDST/MOD ASSY, SINGLE COMM, MONAURAL HDST/MOD ASSY, SINGLE COMM, BINAURAL HDST/MOD ASSY, T5, DUAL COMM	350006-1100 350006-1200 350006-2000	1
2	CARTON, RSC, 9.00X7.00X5.25, C	277035-01	1
3	CARTON, RSC, 19.00X15.00X12.13, C	277036-01	1
4	BAG, POLY, 16x14	178245-1	1
5	PKG, 3/16 HIGH BUBBLE COHESIVE	196054	2
6	BAG, POLY, 3x7x.18 BUBBLE	149277	2
7	BATTERY, AA SIZE, PAIR	263269-002	1
8	GUIDE, T5, SINGLE COMM GUIDE, T5, DUAL COMM	355885-0010 354584-0010	1

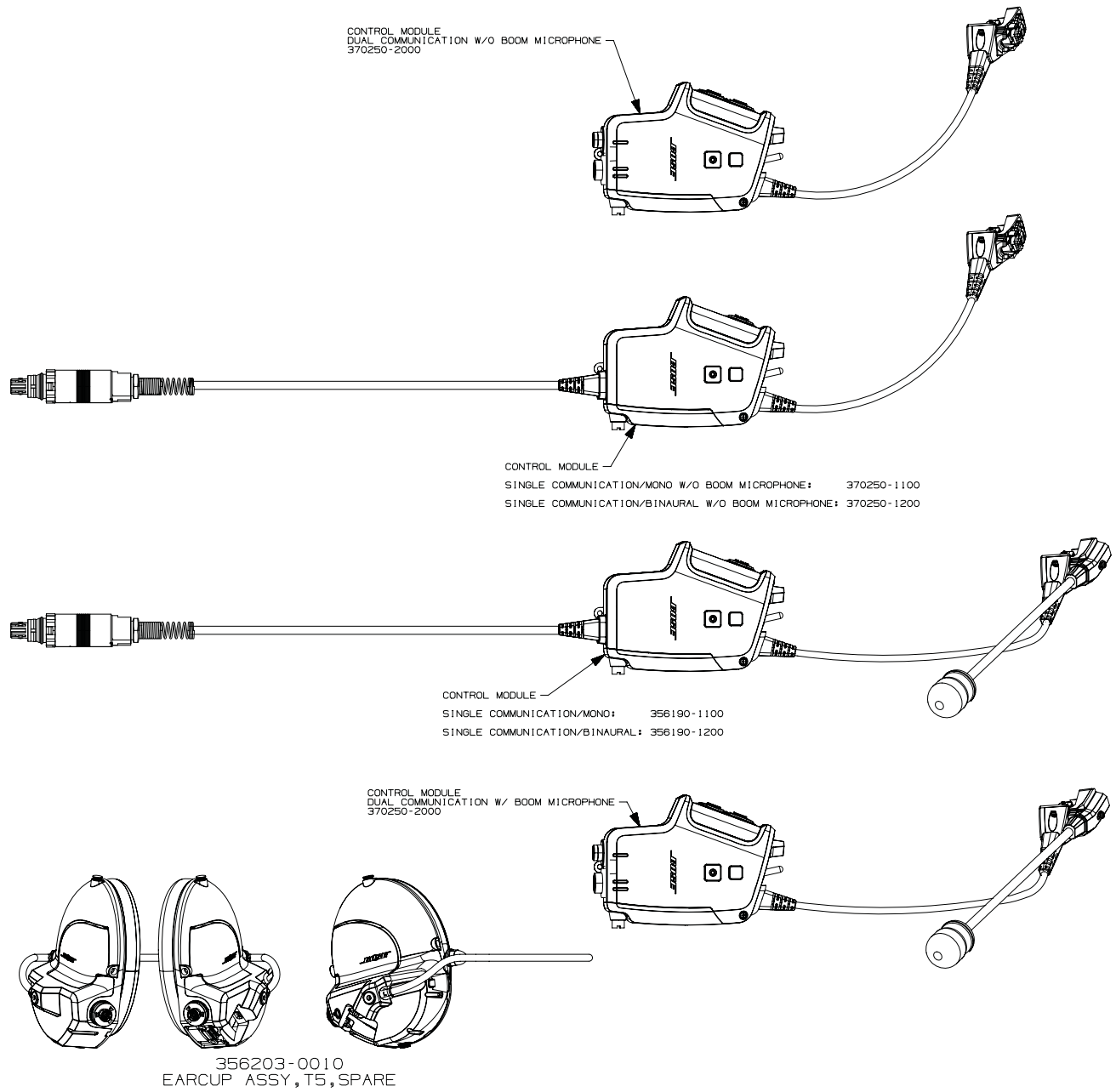
## USER REPLACEABLE PARTS LIST

Item Number	Description	Part Number	NSN Number
1	CABLE, DUAL, ICOMM, T5, AMP/CONN, NF, MONO	354702-1110	
2	CABLE, DUAL, RADIO, T5, NF, PRIMARY	354704-1130	
3	CABLE, DUAL, ICOMM, T5, AMP/CONN, NF, BINAURAL	354702-1220	
4	CABLE, DUAL, RADIO, T5, NF, SECONDARY	354704-2130	
5	MODULE ASSY, T5, DUAL COMM, SPARE	356190-2000	
6	MODULE ASSY, T5, SINGLE COM, MONAURAL, SPARE	356190-1100	
7	MODULE ASSY, T5, SINGLE COM, BINAURAL, SPARE	356190-1200	
8	BOOM MIC ASSY, SPARE	356195-0010	
9	WINDSCREEN, BOOM MIC, SPARE	280191-001	5965-01-525-1684
10	NAPEBAND/YOKE ASSY, W/COVER, SPARE	356199-0010	
11	NAPEBAND, COVER, SPARE	280187-001	5965-01-525-2019
12	HEADSTRAP KIT, SPARE	277285-001	5965-01-525-1695
13	EAR CUSHION PAIR, SPARE	356202-0010	
14	EARCUPS ASSY, T5, SPARE (WITHOUT NAPE BAND / YOKE ASSEMBLY)	356203-0010	
15	CLOTHING CLIP, SPARE	310490-0010	
16	BATTERY DOOR, MODULE, SPARE	356205-0010	
17	CASE, HEADSET, T5	361424-0010	
18	HEADPHONE ASSY, T5, W/NAPEBAND, SPARE	370075-0010	
19	MOD ASSY, W/O BOOM MIC, T5, SINGLE, MONAURAL	370250-1100	
20	MOD ASSY, W/O BOOM MIC, T5, SINGLE, BINAURAL	370250-1200	
21	MOD ASSY, W/O BOOM MIC, T5, DUAL, COMM	370250-2000	
22	HEADPHONE ASSY W/NAPEBAND, T5	370075-0010	

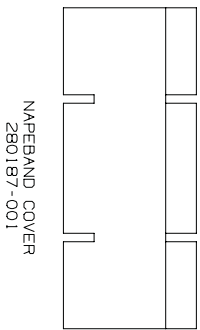
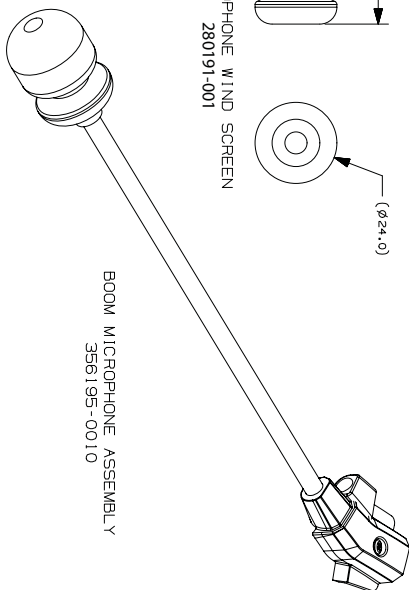
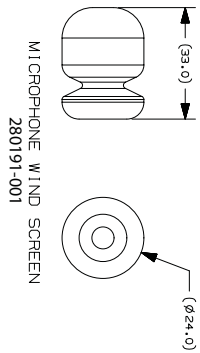
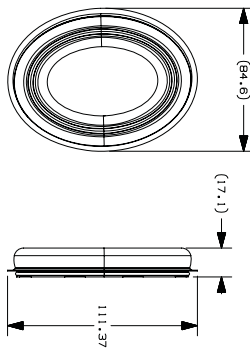
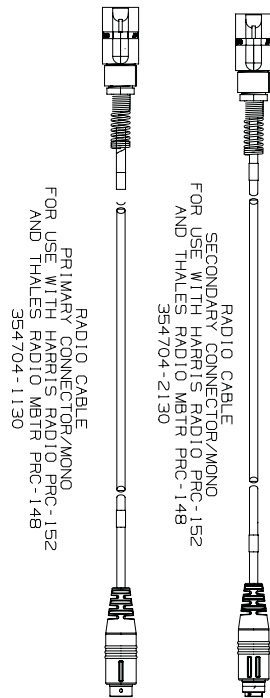
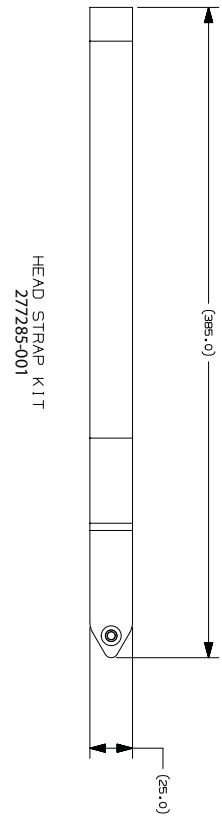
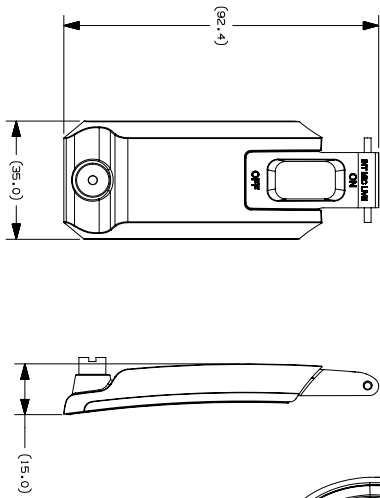
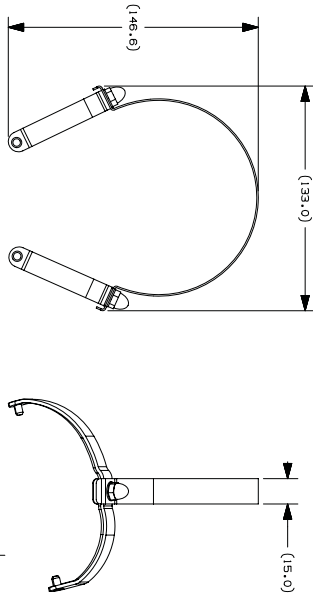
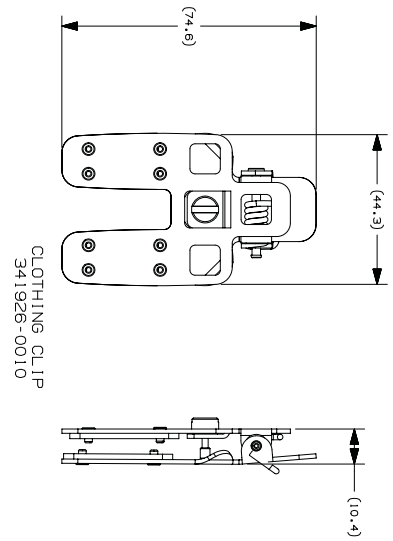
# System Configurations



# System Configurations (continued)



# Cables and Replacement Parts





# DISASSEMBLY PROCEDURES

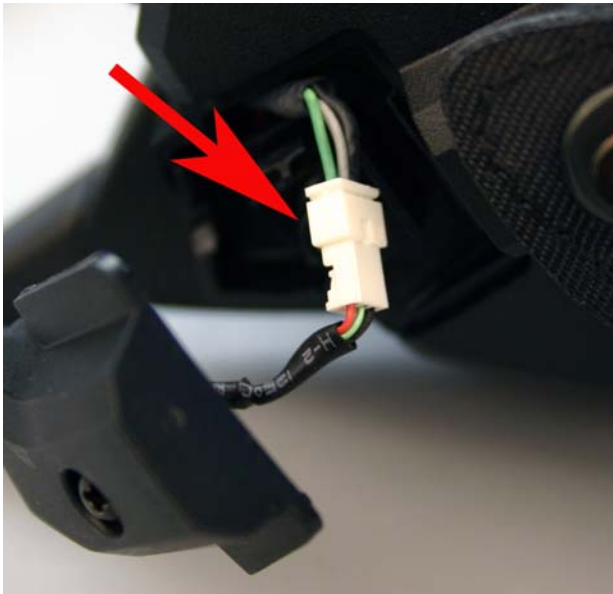
**IMPORTANT NOTE:** These products are RoHS compliant. Use ONLY lead free solder when making repairs.

## 1. Boom Microphone Replacement

**1.1** Loosen the captive screw that retains the boom microphone base to the left earcup.



**1.2** Gently pull the base of the boom microphone away from the earcup. Unplug the boom microphone connector from the wiring harness.



**Note:**

Reverse this procedure for installing a replacement boom microphone.

## 2. Ear Cushion Replacement

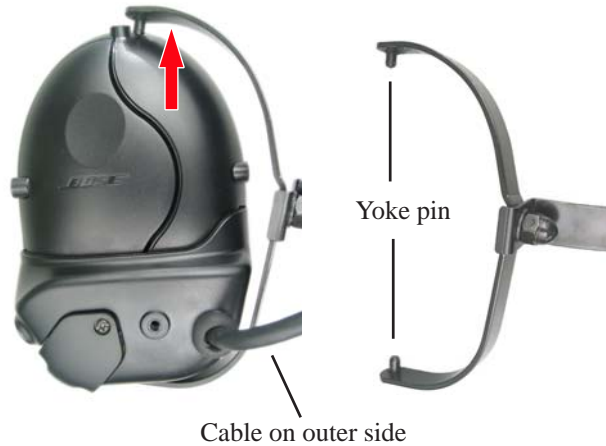
**2.1** Insert your fingers at the location indicated in the photo at left and pull off the ear cushion from the earcup.

**2.2** Remove any residual glue from the earcup assembly.

**2.3** Remove and discard the tape liners from the replacement ear cushion.



# DISASSEMBLY PROCEDURES



**2.4** Align and press the replacement ear cushion onto the earcup assembly until it snaps into place. Ensure it is fully seated.

## 3. Nape Band Replacement

**3.1** Remove nape band cover

**3.2** Press upward on nape band yoke until the yoke pin clears the earcup. Disengage the lower yoke pin from the earcup. Perform this step on the other earcup.

**3.3** Insert the replacement nape band upper yoke pin into the earcup upper pin hole. Press downward on the yoke and engage the lower yoke pin in the earcup lower pin hole.

**3.4** Replace the nape band cover. Only the middle portion secures the earcup wire to the nape band.

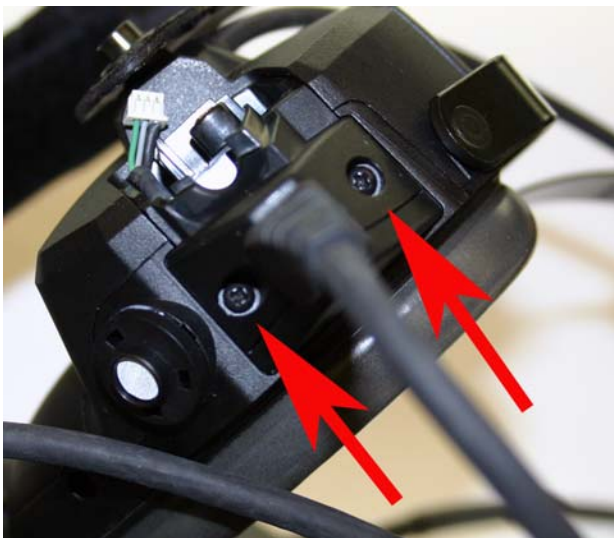
**Note:** The cable running between the earcups should be on the outer side of the yoke. Remove and reuse serial number label on replacement nape band. Attach new product label to nape band.

## 4. Earcup Assembly Replacement

**Note:** The earcup assembly includes both earcups, the nape band w/cover and the head strap.

**4.1** Remove the two captive screws that secure the control module cable / boom microphone to the bottom of the left earcup.

**4.2** Gently pull the control module cable /



# DISASSEMBLY PROCEDURES

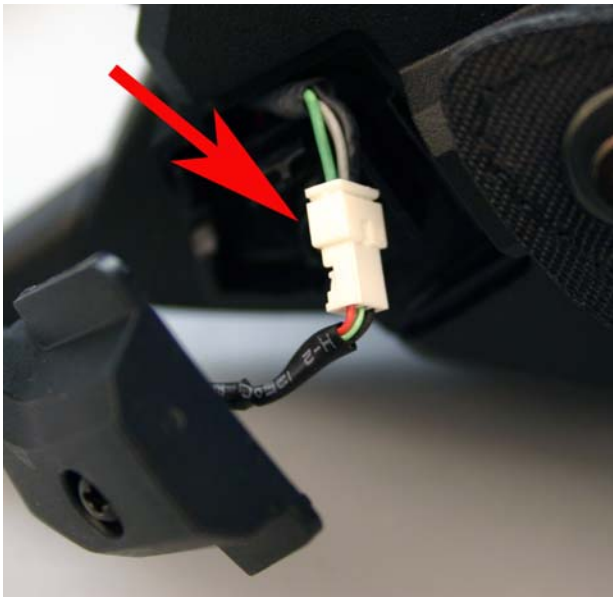


boom microphone assembly straight down and away from the earcup. It should unplug from the left earcup connector as a unit.

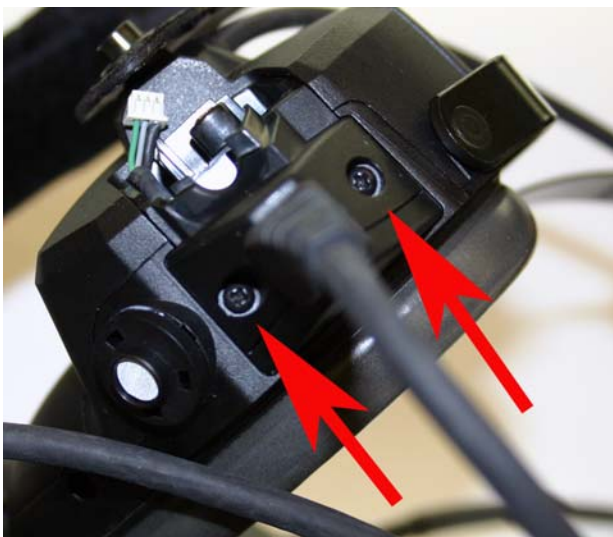
## 5. Control Module Replacement

**Note:** The control module is not repairable. It is a sealed unit. The control module cables are not replaceable separately from the control module.

**5.1** Loosen the captive screw that secures the boom microphone assembly to the left earcup. Gently pull the boom mic assembly away from the earcup.



Unplug the boom microphone from the earcup wiring harness.



**5.2** Loosen the two captive screws that secure the control module cable to the bottom of the left earcup. Gently pull the

# DISASSEMBLY PROCEDURES



control module cable straight down. It should unplug from the bottom of the left earcup.

## 6. Battery Cover Replacement

**6.1** On the control module, loosen the captive screw that holds the battery door closed over the batteries. Do not completely remove the screw.



**6.2** On the control module, remove the screw and nut that secure the battery cover. Take care to not lose the small nut. It is not captive to the control module.

**Reassembly Note:** The small nut should be re-installed on the same side as the clothing clip, as shown in the photo at left.



## 7. Head Strap Assembly Replacement

**7.1** Using a T10 Torx head wrench, remove the screw securing the head strap to the earcup assembly. Repeat this for the other earcup.

**7.2** Reattach the replacement head strap using the screw removed in step 7.1.

**Note:** The replacement head strap comes as a set. Ensure the strap loops are facing



## DISASSEMBLY PROCEDURES

outward on each earcup. When worn, the straps should interlock without twisting.



### 8. Attachment Clip Replacement / Relocation

**8.1** Remove the screw securing the attachment clip to the control module.



**8.2** Align the square alignment holes on the replacement clip to the alignment feature on the control module and secure with the screw removed in step 8.1.

**Note:** The clip can be installed on either side of the control module and either perpendicular or parallel to the cable.

# TEST PROCEDURES

**Note:** The following procedures contain two separate test procedures.

The first test is for internal Bose® repair centers that have the required Bose final audio test system.

The second test procedure is a less complex light-up-and-play type test for repairs performed in the field.

## Internal Bose Repair Center Tests

### Equipment Required

The following hardware and software are needed to perform the tests described herein. Equivalent hardware may be substituted.

**IMPORTANT NOTE:** These products are RoHS compliant. Use ONLY lead free solder when making repairs.

### Bose Final Audio Test System

This system connects to the headset and provides all stimulus signals necessary to excite the headset for listening tests.

The room in which tests are performed must be within the following range of environmental conditions:

- Temperature - between 62°F and 82°F
- Humidity - between 10% and 90% R.H.
- Ambient Noise - less than 45 dB(C)SPL
- Noise Signal for noise attenuation listening.
  - The test system must produce broad band noise, 50 Hz to 10 kHz, approximately pink (third-octave spectrum flat vs. frequency) below 1 kHz and third-octave spectrum weighted approximately inversely with frequency above 1 kHz, overall level 94 dB SPL  $\pm 3$  dB. Duration of 30 minutes or more and must not repeat more than one time during that interval.

### Test Setup

- Install two AA batteries into the control module for talk through capability.
- Connect the headset to the intercommunications system

### Definitions

**Background Noises** Noise present in the absence of other excitation, including the following:

- **Hum** Constant low frequency signal, caused by power line interference.
- **Hiss** Steady, broad mid-to-high frequency signal caused by noise of headset electronics.
- **Static** Intermittent crackling signal, caused by external electrical interference.
- **Whine** Sharp continuous signal, caused by narrow overvoltage pulses on power line.
- **Ripple** Noises caused by interference on power supply line at various frequencies.

**Instability** Noises related to acoustic leaks or malfunctions compromising stability, including the following:

- **Squeal** Mid-to-high frequency variable tone.
- **Motor-boating** Lower frequency periodic noise.
- **Buzz** Harmonic produced by vibration in the presence of an audio signal. This noise is usually related to mechanical faults.

**Overload** Noises related to movement, pressure or impact on headset as well as extremely high external noise, including the following:

- **Click** Sharp transient caused by collapse of driver diaphragm. Generally very noticeable.
- **Thump** Low frequency transient, caused by saturation of headset electronics.
- **Pop** Low frequency transient, caused by saturation of ANR loop.



# TEST PROCEDURES

## 1. Active Noise Reduction (ANR) Operation, Quiet Environment

### Setup Conditions:

- Talk Through (TT) switch - OFF
- Power supply input - 3.0 Volts (2 AA batteries) in control module
- Headset microphone switch - OFF
- Headset battery ANR switch - OFF

**1.1** In a quiet environment, listen to the ANR operation as you stand still. Ensure that the earcups are properly seated on your head.

**1.2** Slowly compress the cups against your head with your hands. Move the earcups with your hands to simulate rapid head and jaw movement.

**1.3** Lift one of the earcups off of the ear slightly at the back of the jaw to create a small air leak. Listen for overload or instability conditions. Perform this step for the other earcup.

**PASS/FAIL Criteria.** Overload or instability should not be heard under any test conditions. When creating a leak in the back of the jaw, short term (less than 1 second) instability is allowed. If the instability is sustainable by holding the earcup in the position where the instability was heard, the headset has failed this test.

## 2. Active Noise Reduction (ANR) Operation, Loud Environment

### Setup Conditions:

- Talk Through (TT) switch - Off
- Power supply input - 3.0 Volts (2 AA batteries) in control module
- Headset microphone switch - Off
- Headset battery ANR switch - Off
- Sound Booth Noise Switch - On
- Sound Booth Audio Switch - Off

**2.1** Listen to ANR operation as you stand still. Ensure that the earcups are sealed to your head.

**2.2** Slowly compress the cups against the head with your hands. Move the earcups with your hands to simulate rapid head and jaw movement. Listen for overload or instability conditions.

**PASS/FAIL Criteria.** ANR Operation should be apparent. Overload or instability should not be heard under any test conditions.

## 3. Talk -Through (TT) Operation, ANR OFF

This test is to verify talk-through balance and intelligibility.

### Setup Conditions:

- TT switch - Talk-through ON 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off
- Sound Booth Noise Switch - Off
- Sound Booth Audio Switch - On

**3.1** Talk-through Balance - Listen to the audio signal while facing the signal source.

**3.2** Block the left talk through microphone with your hand and listen to the audio signal through the right.

**3.3** Uncover the left side and cover the right side. Listen to the audio signal through the left side.

**PASS/FAIL Criteria.** The audio signal should be heard at the same level in both sides of the headset and there should be no noticeable background noise.

**3.4** Talk-through Intelligibility. Listen to a minimum of four words from the audio signal.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**3.5** Talk-through Gain Switching. Move the TT rotary switch to the 5dB position.

# TEST PROCEDURES

**PASS/FAIL Criteria.** Words should be heard clearly and be recognizable.

**3.6 Talk-through Compressor Operation.** Listen to the audio signal. Move the gain switch to the +15dB position. Wait for the sound of words to stabilize before listening to a minimum of four words from the audio signal.

**PASS/FAIL Criteria.** The level of sound heard through the talk-through must not increase dramatically after the sound of the words stabilizes. If verification is needed compare ambient sound at increased gain level to sound heard through the talk-through system. If headset's compressor takes longer than five words to stabilize, it is a failure.

## 4. Talk-through Operation, Active Noise Reduction (ANR) ON, Quiet Environment

This test verifies proper Talk-through balance, intelligibility and compressor operation.

### Set-Up Conditions:

- TT switch - Talk-through ON - 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off
- Sound Booth Noise Switch - Off
- Sound Booth Audio Switch - On

**4.1 Talk-through Gain.** Listen to the Talk-through background noise in a quiet environment. Exercise the TT Switch to +5dB and +10dB positions respectively.

**PASS/FAIL Criteria.** The noise of the TT circuit should increase for both earcups at the +5dB position, and then increase for both earcups again at the +10dB position. The headset should not oscillate with either +5 or +10dB gain.

## 5. Talk-Through Operation, ANR ON

This test is to verify Talk- through balance, and intelligibility.

### Set-Up Conditions:

- TT switch - Talk-through ON 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - On
- Sound Booth Noise Switch - Off
- Sound Booth Audio Switch - Off

**5.1 Talk-through Balance.** Listen to the audio signal while facing the signal source. Block the left talk through microphone with your hand and listen to the audio signal through the right.

**5.2** Uncover the left side and cover the right side. Listen to the audio signal through the left side.

**PASS/FAIL Criteria.** The audio signal should be heard at the same level in both sides of the headset and there should be no noticeable background noise.

**5.3 Talk-through Intelligibility.** Listen to a minimum of four words from the audio signal.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**5.4 Talk-through Gain Switching.** Exercise the TT Rotary switch to the 5dB position.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**5.5 Talk-through Compressor Operation.** Listen to the audio signal. Switch the gain switch to +15 dB. Wait for the sound of the words to stabilize before listening to a minimum of four words from the audio signal.

# TEST PROCEDURES

**PASS/FAIL Criteria.** The level of sound heard through the talk-through must not increase dramatically after the sound of the words stabilizes. If verification is needed compare ambient sound at increased gain level to sound heard through the talk-through system. If headset's compressor takes longer than 5 words to stabilize, it is a failure.

## 6. Talk-Through Operation, ANR OFF, Quiet Environment

This test is used to verify Talk-through balance, intelligibility, and compressor operation.

### Set-Up Conditions.

- TT switch - Talk-through ON - 0dB
- Power supply input...3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off
- Sound Booth Noise Switch - Off
- Sound Booth Audio Switch - On

**6.1** Talk-through (TT) Gain. Listen to the Talkthrough background noise in a quiet environment. Exercise the TT Switch to +5dB and +10dB positions respectively.

**PASS/FAIL Criteria.** The noise of the TT circuit should increase for both earcups at the +5dB position, and then increase for both earcups again at the +10dB position. The headset should not oscillate with either +5 or +10dB gain.

## Field Repair Light-up-and-Play Tests

### 1. Intercomm/Radio Communications Test

After repair, connect the headset to a compatible radio or intercomm system and verify that all functions work properly. Once the headset has passed test, it can be returned to use.

**1.1** Connect the headset control module cable to the radio or intercomm.

**1.2** Play an audio signal to the headset. Verify that you can hear the audio being fed to the headset from the radio or intercomm.

**1.3** Speak into the microphone. Verify that your voice signal is being received by the radio / intercomm.

**1.4** Disconnect the headset from the radio or intercomm and perform the battery powered tests located after the below noise definitions.

### Definitions

**Background Noises** Noise present in the absence of other excitation, including the following:

- **Hum** Constant low frequency signal, caused by power line interference.
- **Hiss** Steady, broad mid-to-high frequency signal caused by noise of headset electronics.
- **Static** Intermittent crackling signal, caused by external electrical interference.
- **Whine** Sharp continuous signal, caused by narrow overvoltage pulses on power line.
- **Ripple** Noises caused by interference on power supply line at various frequencies.

**Instability** Noises related to acoustic leaks or malfunctions compromising stability, including the following:

- **Squeal** Mid-to-high frequency variable tone.
- **Motor-boating** Lower frequency periodic noise.
- **Buzz** Harmonic produced by vibration in the presence of an audio signal. This noise is usually related to mechanical faults.

**Overload** Noises related to movement, pressure or impact on headset as well as extremely high external noise, including the following:

- **Click** Sharp transient caused by collapse of driver diaphragm. Generally very noticeable.
- **Thump** Low frequency transient, caused by saturation of headset electronics.
- **Pop** Low frequency transient, caused by saturation of ANR loop.

# TEST PROCEDURES

## 2. Active Noise Reduction (ANR) Operation, Quiet Environment

### Setup Conditions:

- Talk Through (TT) switch - OFF
- Power supply input - 3.0 Volts (2 AA batteries) in control module
- Headset microphone switch - OFF
- Headset battery ANR switch - OFF

**2.1** In a quiet environment, listen to the ANR operation as you stand still. Ensure that the earcups are properly seated on your head.

**2.2** Slowly compress the cups against your head with your hands. Move the earcups with your hands to simulate rapid head and jaw movement.

**2.3** Lift one of the earcups off of the ear slightly at the back of the jaw to create a small air leak. Listen for overload or instability conditions. Perform this step for the other earcup.

**PASS/FAIL Criteria.** Overload or instability should not be heard under any test conditions. When creating a leak in the back of the jaw, short term (less than 1 second) instability is allowed. If the instability is sustainable by holding the earcup in the position where the instability was heard, the headset has failed this test.

## 3. Active Noise Reduction (ANR) Operation, Loud Environment

### Setup Conditions:

- Talk Through (TT) switch - Off
- Power supply input - 3.0 Volts (2 AA batteries) in control module
- Headset microphone switch - Off
- Headset battery ANR switch - Off

**3.1** Listen to ANR operation as you stand still. Ensure that the earcups are sealed to your head.

**3.2** Slowly compress the cups against the head with your hands. Move the earcups with your hands to simulate rapid head and jaw movement. Listen for overload or instability conditions.

**PASS/FAIL Criteria.** ANR Operation should be apparent. Overload or instability should not be heard under any test conditions.

## 4. Talk -Through (TT) Operation, ANR OFF

This test is to verify talk-through balance and intelligibility.

### Setup Conditions:

- TT switch - Talk-through ON 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off

**4.1** Talk-through Balance - Listen to an audio source such as spoken word.

**4.2** Block the left talk through microphone on the earcup with your hand and listen to the audio signal through the right.

**4.3** Uncover the left side and cover the right side microphone. Listen to the audio signal through the left side.

**PASS/FAIL Criteria.** The audio signal should be heard at the same level in both sides of the headset and there should be no noticeable background noise.

**4.4** Talk-through Intelligibility. Listen to a minimum of four words from the audio source.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**4.5** Talk-through Gain Switching. Move the TT rotary switch to the 5dB position.

**PASS/FAIL Criteria.** Words should be heard clearly and be recognizable.

# TEST PROCEDURES

**4.6 Talk-through Compressor Operation.** Listen to the audio source. Move the gain switch to the +15dB position. Wait for the sound of words to stabilize before listening to a minimum of four words from the audio signal.

**PASS/FAIL Criteria.** The level of sound heard through the talk-through must not increase dramatically after the sound of the words stabilizes. If verification is needed compare ambient sound at increased gain level to sound heard through the talk-through system. If headset's compressor takes longer than five words to stabilize, it is a failure.

## 5. Talk-through Operation, Active Noise Reduction (ANR) ON, Quiet Environment

This test verifies proper Talk-through balance, intelligibility and compressor operation.

### Set-Up Conditions:

- TT switch - Talk-through ON - 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off

**5.1 Talk-through Gain.** Listen to the Talk-through background noise in a quiet environment. Exercise the TT Switch to +5dB and +10dB positions respectively.

**PASS/FAIL Criteria.** The noise of the TT circuit should increase for both earcups at the +5dB position, and then increase for both earcups again at the +10dB position. The headset should not oscillate with either +5 or +10dB gain.

## 6. Talk-Through Operation, ANR ON

This test is to verify Talk- through balance, and intelligibility.

### Set-Up Conditions:

- TT switch - Talk-through ON 0dB
- Power supply input - 3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - On

**6.1 Talk-through Balance.** Listen to the audio source while facing it. Block the left talk through microphone on the earcup with your hand and listen to the audio signal through the right.

**6.2** Uncover the left side and cover the right side microphone. Listen to the audio signal through the left side.

**PASS/FAIL Criteria.** The audio signal should be heard at the same level in both sides of the headset and there should be no noticeable background noise.

**6.3 Talk-through Intelligibility.** Listen to a minimum of four words from the audio source.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**6.4 Talk-through Gain Switching.** Exercise the TT Rotary switch to the +5dB position.

**PASS/FAIL Criteria.** Words should be heard clearly, and should be recognizable.

**6.5 Talk-through Compressor Operation.** Listen to the audio signal. Switch the gain switch to +15 dB. Wait for the sound of the words to stabilize before listening to a minimum of four words from the audio signal.

# TEST PROCEDURES

**PASS/FAIL Criteria.** The level of sound heard through the talk-through must not increase dramatically after the sound of the words stabilizes. If verification is needed compare ambient sound at increased gain level to sound heard through the talk-through system. If headset's compressor takes longer than 5 words to stabilize, it is a failure.

## 7. Talk-Through Operation, ANR OFF, Quiet Environment

This test is used to verify Talk-through balance, intelligibility, and compressor operation.

### Set-Up Conditions.

- TT switch - Talk-through ON - 0dB
- Power supply input...3.0 Volts (2 AA Batteries) in Control Module
- Headset Microphone switch - Off
- Headset Battery ANR Switch - Off

**7.1 Talk-through (TT) Gain.** Listen to the Talk-through background noise in a quiet environment. Exercise the TT Switch to +5dB and +10dB positions respectively.

**PASS/FAIL Criteria.** The noise of the TT circuit should increase for both earcups at the +5dB position, and then increase for both earcups again at the +10dB position. The headset should not oscillate with either +5 or +10dB gain.



# Troubleshooting

Some field issues may be related to confusion regarding the different configurations and modes of operation of the headset. Refer to the product description section of this manual for more information regarding this before troubleshooting.

**Note:** No internal parts of the headset or control module are serviceable in the field.

The headset is field repairable at a higher level, i.e. control module, earcups, cables, etc. The list of user replaceable parts is located on page 11 of this manual. Problems associated with the headset (driver faults, earcup PCB faults, etc.) require the product to be returned to Bose Corporation for repair.

The troubleshooting steps below describe problems that can be resolved in the field. Refer to the list of Listening Test Defects in the Test Procedures section for additional information and specific failure descriptions.

Symptom	Verification/Solution
No Audio  No Audio from one Earcup	<ul style="list-style-type: none"> <li>Is ANR present? Are you connected to the vehicle? Power is provided by the vehicle when connected to it. Connect known good headset to same connection on the vehicle. Do you have audio now? If so problem is with headset. Check all cables, earcups and control module for damage. If still no audio replace earcup assembly. If not, problem is with the connection or equipment in the vehicle.</li> <li>Check sidetone. If you cannot hear your own voice, have someone using another headset on the same intercom circuit speak. If you can hear them, you may have a bad microphone. If still no audio, problem could be in the cable, control module or earcups. Replace the cable. Okay? If not, replace control module. Okay? If not, then replace earcups.</li> </ul>
Intermittent Operation and/or One or Both Ears Intermittent.	<ul style="list-style-type: none"> <li>Check Talk-Through (TT) switch setting – The TT circuits are designed to deliver audio at a level up to 85 dB SPL at your ear. An externally overloaded TT circuit will cause interrupted audio in the earcups, preventing sound pressure levels of &gt;85 dB SPL from getting to the ear. This occurs if the TT gain setting is too high at the rotary switch on the control module and you communicate too loudly, overwhelming the signal and causing audio dropouts.</li> <li>Check batteries - There is no LED on the product to allow monitoring of the battery power level. Low battery when in ANR or TT mode will cause intermittent operation or clicking every few seconds to indicate weak batteries. Unit will continue to operate in this mode for some time before the batteries fail entirely and the unit operation reverts to fail-safe operation mode. ANR will be intermittent with clicking every few seconds.</li> <li>Check that all cables for damage and are fully seated. Replace cable as needed.</li> <li>Connect a known good control module and cable. Connect to a known good source and retest. If still intermittent, replace earcups. If audio is good with known good control module, replace original control module.</li> </ul>
One ear completely inoperative: (No ANR and no audio whether switched on or off).	<ul style="list-style-type: none"> <li>Check all cables for damage.</li> <li>Connect a known good control module and cable. Connect to a known good source and retest. If still inoperative, replace earcup assembly.</li> </ul>

# Troubleshooting

Symptom	Verification/Solution
<p>No Output from Microphone</p> <p>Low microphone output, intermittent microphone transmissions or difficult to break intercom squelch.</p>	<ul style="list-style-type: none"> <li>• Check for damage or contamination, i.e. rust, chewing tobacco, debris. If mic is damaged or contaminated, replace it.</li> <li>• Check microphone connection to the headset. Ensure wiring harness is not damaged and that the connector pins are not bent and connector is properly seated.</li> <li>• Replace microphone with a known good one. Retest. If okay, replace original microphone.</li> </ul>
<p>No Active Noise Reduction (ANR) or Reduced ANR</p>	<ul style="list-style-type: none"> <li>• Make sure unit is turned on.</li> <li>• Check power. Battery or external? ANR switch only controls battery powered ANR, not external (vehicle) powered. ANR will be on all the time when connected to vehicle power.</li> <li>• Check for defective cables, cracking of strain reliefs and/or bent pins. Replace cable as needed.</li> <li>• Check position of Talk-Through (TT) rotary switch - The talk-through function allows external audio from the microphone to be fed through the headset without removing it, i.e. to speak to someone in the same vehicle. Leaving TT on will reduce ANR and should only be used when needed. Talk-through switch must be OFF for ANR to work completely.</li> <li>• Check for low battery if not vehicle powered. There is no LED on the product to allow monitoring of the battery power level. Low battery when in ANR or TT mode will cause intermittent operation or clicking every few seconds to indicate weak batteries. Unit will continue to operate in this mode for some time before the batteries fail entirely and the unit operation reverts to fail-safe operation mode. ANR will be intermittent with clicking every few seconds.</li> <li>• Check all cables, earcups and control module for damage. Check for damage or blockage of the microphone ports on the earcups. These microphones are used to pick up noise in the environment in order to cancel it. Damage or blockage will affect ANR functionality.</li> <li>• Check for defective switches on control module. If inoperative, replace control module.</li> <li>• Connect a known good control module and cable. Connect to a known good source and retest. If still bad ANR, replace earcups.</li> </ul>
<p>Audio from only one source on Dual Comm versions</p>	<ul style="list-style-type: none"> <li>• Port 1 is primary source and Port 2 is the secondary source. Ensure you have correct cables and connections for the desired mode of operation. Refer to the Dual Comm Mode of Operation table listed previously in this manual.</li> <li>• Check all cables and control module for damage.</li> <li>• Connect known good cables from the control module to the radio. Retest. If okay, replace original cable.</li> <li>• Connect known good control module. If okay, replace control module.</li> <li>• Ensure control module switches are not intermittent. If bad, replace control module.</li> </ul>
<p>Unpowered (Fail Safe) Mode Not Working When Not Connected to Vehicle</p>	<ul style="list-style-type: none"> <li>• Single Comm – Headset Not capable of operating in unpowered fail-safe mode when in dismounted mode. Will allow for ANR and TT when operating dismounted on battery power.</li> </ul>

# Troubleshooting

Symptom	Verification/Solution
Mic Live Switch not working on Port 2 (Dual Comm versions)	<ul style="list-style-type: none"> <li>By design, the Mic live switch has no effect on any Port 2 device under any configuration.</li> </ul>
Live Mic Button Not Working	<ul style="list-style-type: none"> <li>Button is located on the back of the control module. This button is only enabled while operating from vehicle power. It is disabled when operating from portable radios.</li> <li>Check switch function with vehicle power to see if it is intermittent. If so, replace control module.</li> </ul>
Talk-through (TT) Not Working	<ul style="list-style-type: none"> <li>Check all cables, earcups and control module for damage. Check control module for bad TT rotary switch.</li> <li>Replace microphone with a known good one. Retest. If okay. Replace original microphone.</li> <li>Connect a known good control module and down cable and connect to a known good source and retest. If still not working, replace earcups.</li> </ul>
(PTT) Button Not Working Properly	<ul style="list-style-type: none"> <li>Check vehicle radio. Connect a known good headset to vehicle connector. If okay, problem is with headset. Check connectors and cables for damage.</li> <li>Connect a known good control module to the earcup assembly. Retest on vehicle radio. If okay, replace control module. If still bad, problem is in the earcup assembly.</li> </ul>
Latched Mode of the Push To Talk (PTT) Button Not Working Properly	<ul style="list-style-type: none"> <li>Latched mode of PTT – Intercom mic/line switch - Enabled only in presence of vehicle or vehicle supplied power. Used inside vehicle over intercom. Allows comms over a radio that is connected to the intercom. PTT allows audio pass-through to radio.</li> </ul>
Loud clicking/ticking or thumping noise in either or both ears.	<ul style="list-style-type: none"> <li>Inspect the driver for any debris such as hair or sand.</li> <li>Remove ear cushion. Check the driver membrane for dimples or creases. If found, replace the earcup assembly.</li> </ul>
Buzzing/humming noises when touching Electro-Luminescent instrument panels.	<ul style="list-style-type: none"> <li>If noise is continuous and increases when your hand is moved closer to the instrument panel, then the headset is probably receiving interference from the lighting. This is particularly true if when you touch grounded metal the noise goes away.</li> </ul> <p>These noises will not harm the headset; however, they may be annoying and distracting for the user.</p>
Static heard through headset	<ul style="list-style-type: none"> <li>Connect to a known good source. If okay, problem is with the source.</li> <li>Check cables and earcups for damage. Check earcup driver membrane for debris or damage such as dimples or creases.</li> <li>Connect known good control module and cable. If good, replace control module. If still bad, replace earcups.</li> </ul>
High frequency squeal or oscillation	<ul style="list-style-type: none"> <li>Inspect the driver for any debris such as hair or sand.</li> <li>Remove ear cushion. Check the driver membrane for dimples or creases. If found, replace the earcup assembly.</li> <li>Check for missing or deteriorated ear cushions.</li> </ul>

## Service Manual Revision History

Date	Revision Level	Description of Change	Change Driven By	Pages Affected
3/2016	00	Document released at revision 00.	Service manual release	All

Specifications and Features Subject to Change Without Notice

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