


| | |
|---------------------|---------------------------|
| CLASS RF | DWG NO. 273139 |
|---------------------|---------------------------|

| REVISIONS | | | | |
|-----------|---|-------|-----|-------|
| REV | DESCRIPTION | CHECK | ENG | DATE |
| 01 | ECN-36327:UPDATE FIGURES; CHANGE NAME TO TTH, UPDATE EARCUSHION SECTION | VAB | AM | 11/04 |
| 01A | UPDATE TO INCLUDE TTH S2 | | AM | 07/10 |
| 01B | UPDATED TTHS2 TT BATT. LIFE TO 240 HRS. | | AM | 09/10 |
| 01C | UPDATED TTHS2 VOLT. RANGE | | AM | 07/11 |
| 01D | VARIOUS UPDATES | | AM | 10/11 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

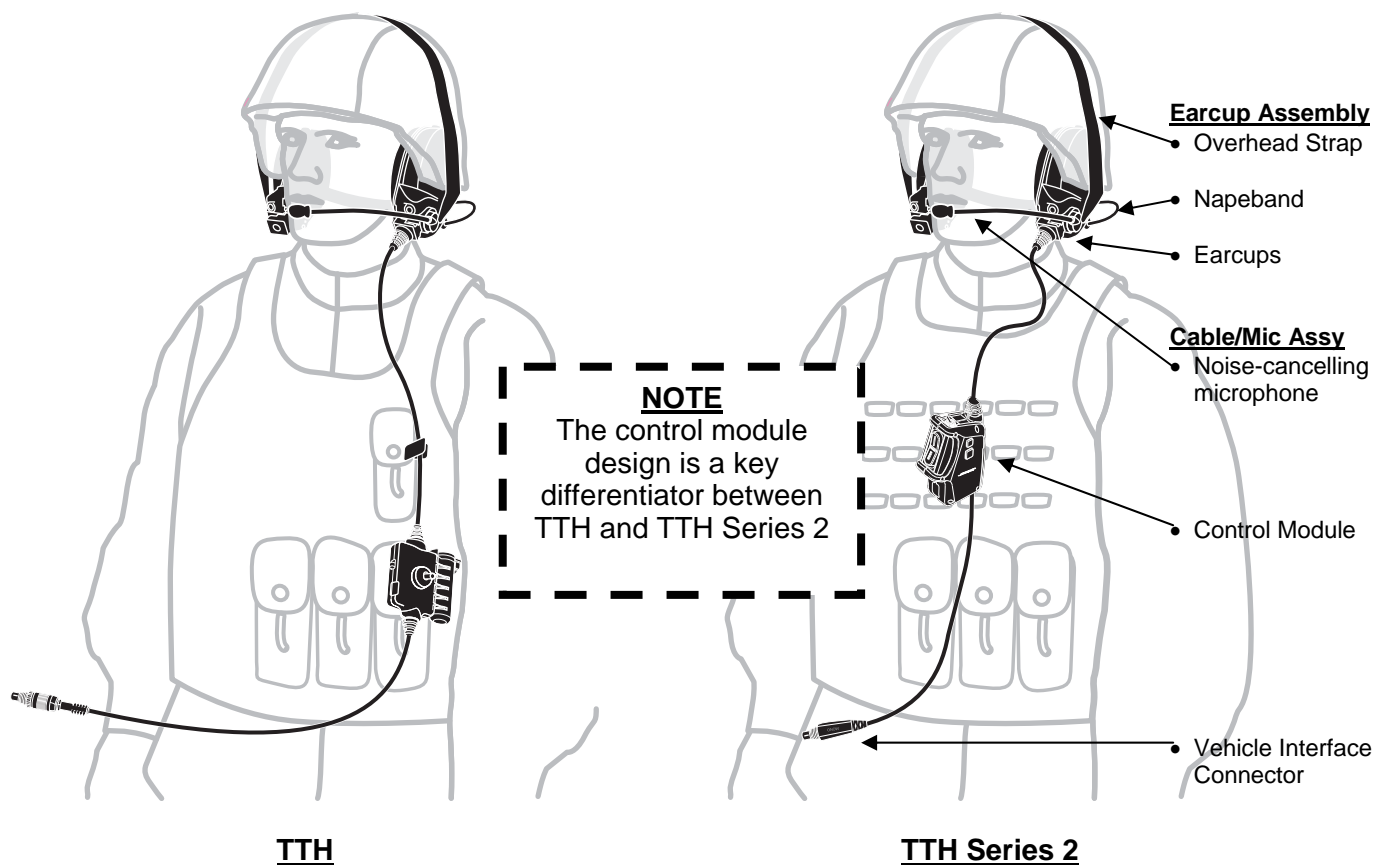
APPLICABLE DOCUMENTS:

| | | | | | | | |
|------------|---------------------------|------------------|---|---------------|-------------|-------------------|-------------|
| DOC LVL | DRAFTER A. MANGIAMELI | DATE 02/05/04 |  FRAMINGHAM, MA 01701-9168 | | | | |
| 3 | CHECKER J. BROWN | 02/27/04 | DESCRIPTION MANUAL, OPERATING & MAINTENANCE (TTH & TTH Series 2) | | | | |
| 2 | ENGINEER A. MANGIAMELI | 02/05/04 | | | | | |
| 1 | RLS TO PROD | | SIZE A | FSCM 32108 | CLASS RF | DWG NO. 273139 | REV. 01D |
| | | | | | | SHT 1 OF 25 | |

1. HEADSET FEATURES

The Bose® TriPort® Tactical Headsets (TTH & TTH Series 2) are active noise reduction (ANR) communication headsets intended to be used by military passengers of wheeled combat vehicles. The TTH headsets include an earcup assembly (earcups and napeband) and a cable/microphone assembly. The headsets adjust to fit various heads using adjustment overhead hook and loop straps to ensure proper fit for noise attenuation. The cable/microphone can be installed on either the left or right earcup.

In addition to passive attenuation each earcup contains an independent ANR system. The talk-thru circuit (TTC) allows for local communication when the headset is either connected or disconnected from the vehicle. The TTC is a user-selectable feature and is powered via a single AA size battery in the control module and utilizes the microphones on the front of each earcup. Each earcup has an independent TTC to allow left/right localization.



2. TECHNICAL INFORMATION

| | TTH | TTH Series 2 |
|--|---|---|
| Headset can be donned and doffed without removing helmet. | ✓ | ✓ |
| Cable/boom microphone assembly is replaceable and can be positioned on left or right side. | ✓ | ✓ |
| Mono and stereo versions available. | ✓ | ✓ |
| Weight (on head) | 16 oz. maximum | Same |
| Spring force (on head) | 1.8 lbf. maximum | Same |
| Push-to-talk (PTT) on the control module | 3-position (latched / off / momentary) toggle type switch | 3-position (latched / off / momentary) rocker type switch |
| Talk-through (TTC) | User-selectable, Binaural, up to 240 hours operational time with one AA alkaline battery | User-selectable, Binaural, 240 hours minimum operational time with one AA alkaline battery |
| ANR Power / Current Draw | 5.5 to 32 VDC / 16 to 220 mA Fail-safe operation allows 2-way communications with loss of voltage input or talk-through power. | 13.5 to 32 VDC / 38 mA Peak except during turn-on Fail-safe operation allows 2-way communications with loss of voltage input or talk-through power. |
| Operating noise environment | Up to 95dBA SPL | Same |
| Earphone sensitivity | 106 ± 3 dB SPL for a 0 ± 0.1 dBV input | Same |
| Input Impedance | 500 ± 10 ohms | Same |
| Boom microphone | 150 ± 22.5 ohm Impedance -70 ± 4 dB sensitivity | 150 ± 22.5 ohm Impedance -70 ± 4 dB sensitivity Dust proof |
| Temperature Rating | -40°C to +65°C Operating -57°C to +71°C Storage | -40°C to +65°C Operating -57°C to +71°C Storage |
| EMI | Qualified for fields up to 50 V/m | Qualified for fields up to 50 V/m with improved performance for reduced audio interference with the latest IED jamming devices and other electronics. |
| Attachment Clip | Cable mounted | Mounted on the control module and compatible with MOLLE webbing. Clip is removable and may be attached to either side of the control module and rotated into three different positions. |

3. HEADSET CONNECTORS AND CONTROLS

The connectors and controls for the TTH and TTH Series 2 headsets are integrated into the cable/microphone assembly normally attached to the left earcup of the headset. The assembly may be mounted on the right earcup if desired.

The control module on the cable/microphone assembly has a three-position push-to-talk (PTT) switch as well as a two-position talk-thru circuit (TTC) switch as shown in Figure 2.0b and 2.0c. The PTT switch is mounted on the face of the control module and is spring loaded to the center (disabled) position with a momentary PTT position and latched live intercom position. The control module may also be connected to the communications microphones typically installed on protective masks. When the external microphone connector is connected, the control module automatically disengages the headset boom microphone to receive signals from the external microphone.

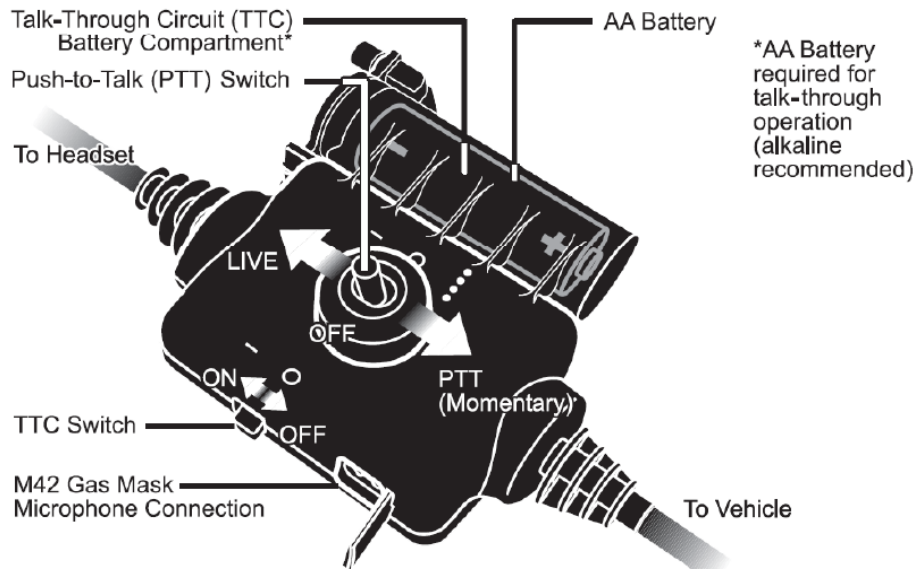


Figure 2.0b TTH Control Module Features

| COMPONENT | FUNCTION |
|------------------------------------|---|
| Microphone Boom and Cable Assembly | Transmits user's voice into intercom or radio channel |
| PTT Switch | Used when transmitting on and listening to intercom channel or radio. The latched position allows the user to communicate on the vehicle intercom. The OFF (center position allows the user to listen only. The Momentary (down) position allows the user to communicate on the vehicle intercom and the selected radio. Please note that these function could vary by intercom. Please consult the intercom manual. |
| Vehicle Interface Connector | Provides quick-disconnect for operator. |
| TTC Switch | Used to monitor ambient noise environment when desired. |
| M42 Gas Mask Microphone Connection | Allows M116/G microphone in the M42 gas mask to be plugged into the headset. |
| Battery Compartment | Contains AA alkaline battery to power TTC. |

In addition to offering all of the same features as the TTH, the TTH Series 2 has been redesigned for better ergonomics with an integrated attachment clip.

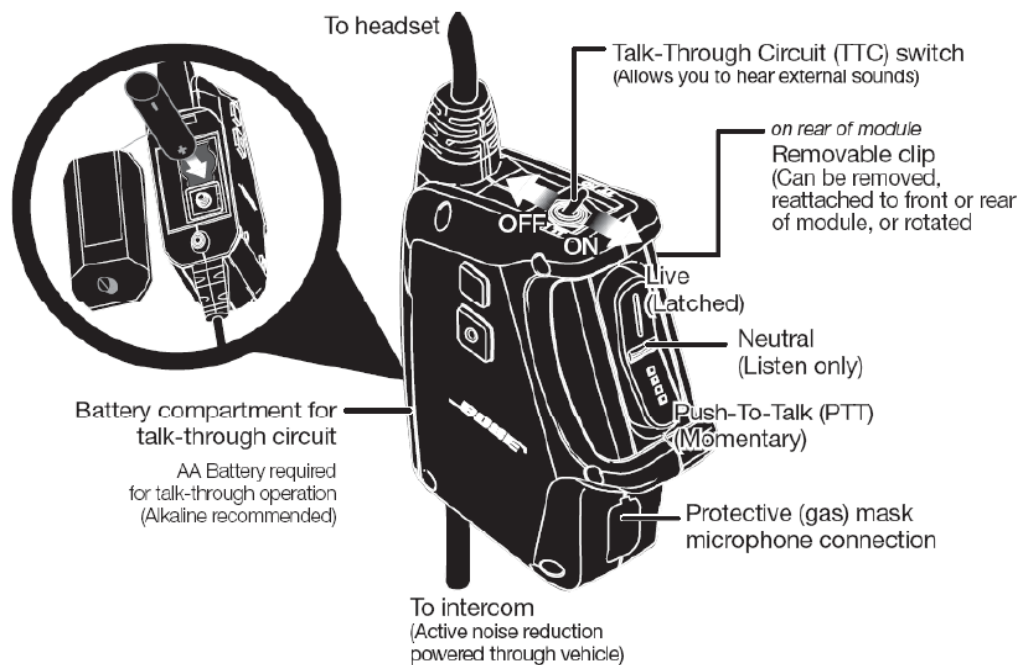







Figure 2.0c TTH Series 2 Control Module Features

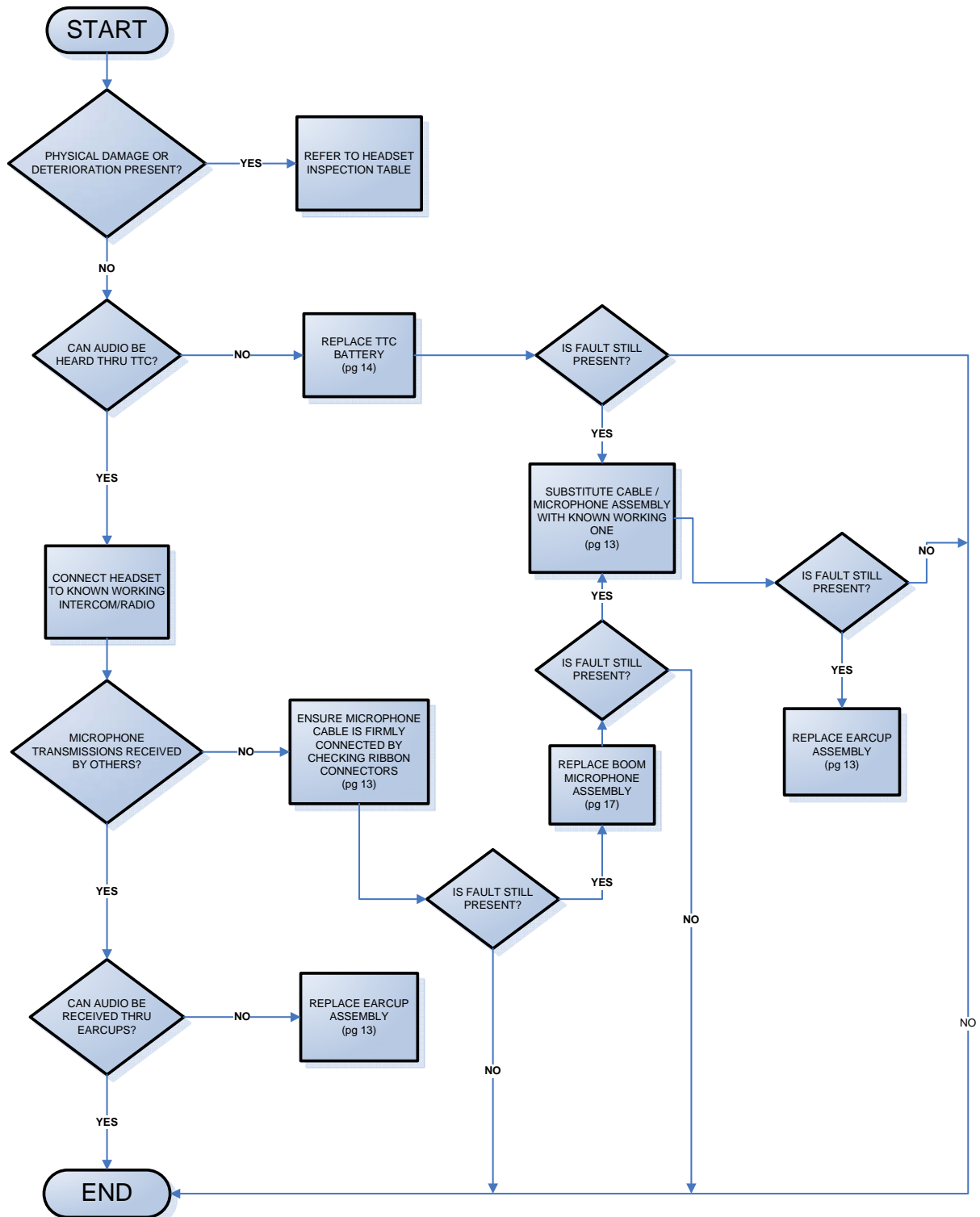
| COMPONENT | FUNCTION |
|------------------------------------|--|
| Microphone Boom and Cable Assembly | Transmits user’s voice into intercom or radio channel |
| PTT Switch | Used when transmitting on and listening to intercom channel or radio. The latched position allows the user to communicate on the vehicle intercom. The OFF (center position allows the user to listen only. The Momentary (down) position allows the user to communicate on the vehicle intercom and the selected radio. Please note that these function could vary by intercom. Please consult the intercom manual. |
| Vehicle Interface Connector | Provides quick-disconnect for operator. |
| TTC Switch | Used to monitor ambient noise environment when desired. |
| M42 Gas Mask Microphone Connection | Allows M116/G microphone in the M42 gas mask to be plugged into the headset. |
| Battery Compartment | Contains AA alkaline battery to power TTC. |

Vehicle Interface Connector

| Desc. | Physical Appearance | | | Connection Pin-out | |
|----------|--|--|--|--------------------|--------------------------|
| | TTH Series 2 | TTH | | Pin | Function |
| Monaural |  |  |  | 1 | Shield |
| | | | | 2 | PTT |
| | | | | 3 | Ground (power and audio) |
| | | | | 4 | Boom mic Ground** |
| | | | | 5 | Left/Right earcup audio |
| | | | | 6 | Boom mic Signal** |
| | | | | 7 | Power |
| Binaural |  |  | | Shield Contact | Shield |
| | | | | 1 | Right earcup audio |
| | | | | 2 | PTT |
| | | | | 3 | Ground (power and audio) |
| | | | | 4 | Boom mic ground** |
| | | | | 5 | Left earcup audio |
| | | | | 6 | Boom mic signal |
| | | | | 7 | Power |

****Mic ground must be connected to the power/phone ground (pin 3) in the intercom for the microphone circuit to function.**

4. HEADSET TROUBLESHOOTING



Headset Inspection Table

| Component | Condition | Corrective Measures |
|-----------------------|--|---------------------------|
| Earcup Assembly | Check for cracks and other visible damage to the housing. | Replace earcup assembly* |
| Napeband | Check for visible damage. | Replace earcup assembly* |
| Earcushions | Check for visible cuts. Check that uniform pressure does not cause bottoming against earcup. | Replace earcushions.* |
| Cloth Scrim in Earcup | Check for tears or excessively dirty. | Replace scrim* |
| Cables | Check for cuts, kinks, or frayed area on cable. | Replace cable/mic assy* |
| Connectors | Check for dents or other physical damage; Corrosion buildup. | Replace cable/mic assy* |
| Battery Compartment | Check for leakage, dents, corrosion buildup or other physical damage. | Replace cable/mic assy* |
| Boom Microphone | Check for visible damage to microphone assembly. | Replace boom microphone * |
| TTC Microphones | Check for visible damage or blockage of the metal screens in front of the TTC microphones on the front of each earcup. | Replace earcup assembly* |

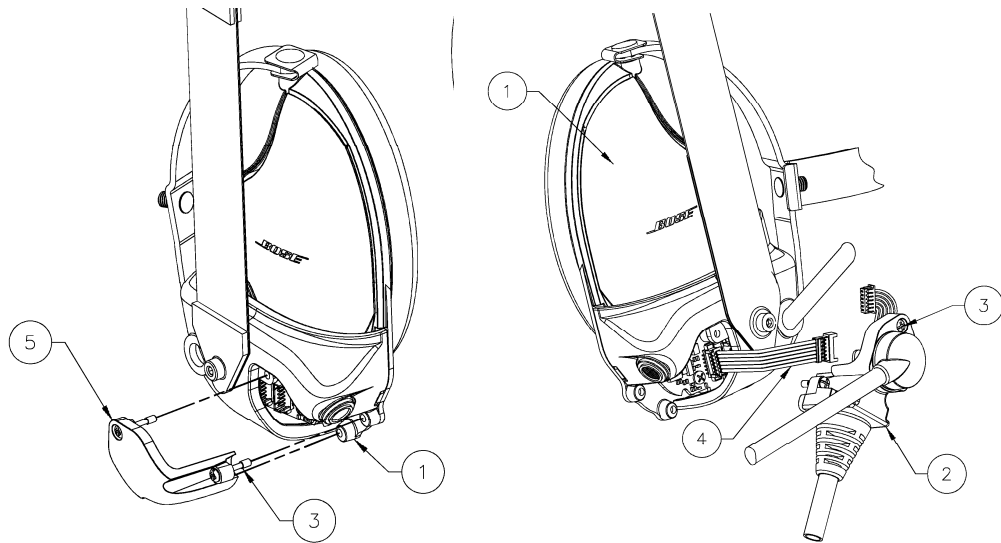
* Refer to applicable removal and replacement procedure.

5. HEADSET COMPONENTS REMOVAL AND REPLACEMENT PROCEDURES

5.1 Moving Cable/Microphone Assembly to Opposite Earcup

a. Removal

1. Using cross-tipped screwdriver loosen three captive screws (3) securing cable/microphone assembly (2) to earcup assembly (1) and the decorative cover (5) to opposite earcup assembly (1).



2. Unplug connector connecting the cable/microphone assembly (2) to the jumper cable coming off the earcup printed circuit board and remove the cable/microphone assembly.

b. Replacement

1. Plug cable connector from the cable/microphone assembly (2) into the jumper cable (4) coming off the earcup printed circuit board.

CAUTION

Ensure no wires are pinched during reassembly of the electronics cover to the earcup assembly.

2. Using cross-tipped screwdriver, secure cable/microphone assembly (2) to the earcup assembly (1).
3. Using cross-tipped screwdriver, secure decorative cover (5) to opposite earcup assembly.

5.2 Earcushion and Scrim Removal and Replacement

CAUTION
Do not attempt to remove
the earcushion by pulling on
the soft earcushion material.

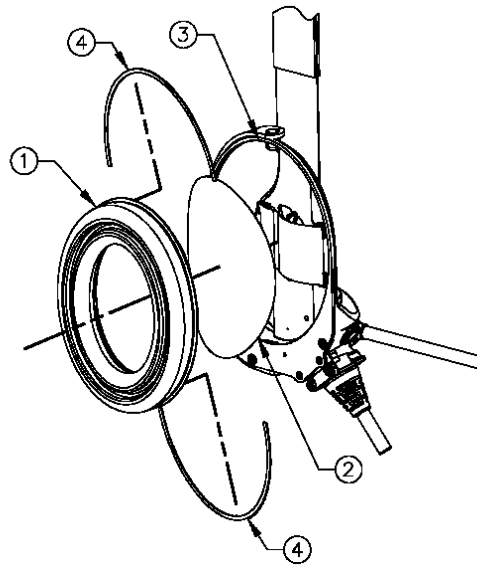


Figure 4.2 Earcushion and Scrim Removal and Replacement

a. Removal

1. Remove earcushion (1) from earcup assembly (3) by inserting fingers inside earcup between scrim (2) and earcushion and firmly pulling out. Remove any excess tape residue from the earcup surface.
2. Remove scrim (2) after earcushion (1) is removed.

b. Replacement

1. Align scrim (2) and place over screen in earcup assembly (3).
2. Remove and discard release liners (4) from tape on earcushion assembly.
3. Align and set earcushion (1) on earcup assembly (3) and snap in place.

5.3 Windscreen and O-ring Removal and Replacement

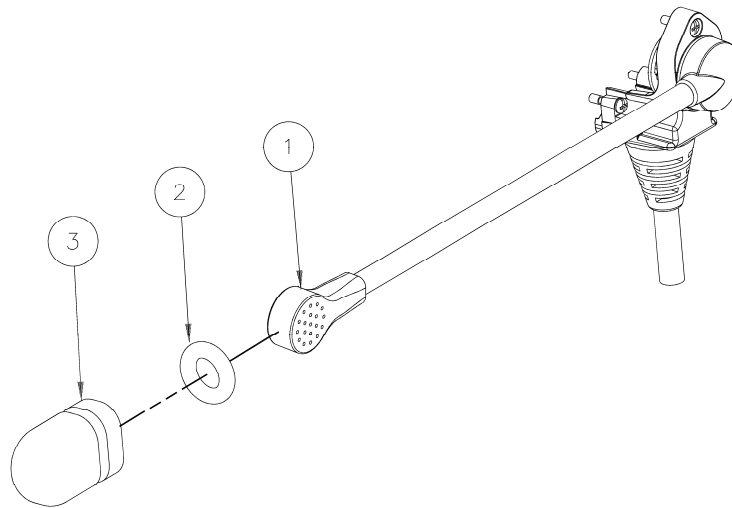


Figure 4.3 Windscreens and O-ring Removal and Replacement

a. Removal

1. Grasp O-ring (2) between thumb and forefinger and slide O-ring (2) and windscreen (3) off microphone (1).
2. Separate O-ring (2) from windscreen (3).

CAUTION

When placing windscreen/O-ring on microphone, be careful not to tear windscreen.

b. Replacement

1. Compress closed end of windscreen (3) and place inside O-ring (2) until O-ring is midway on windscreen.
2. Slide O-ring (2) with windscreen (3) onto microphone (1) and adjust O-ring until windscreen is secured.

5.4 Overhead Strap Assembly Removal and Replacement

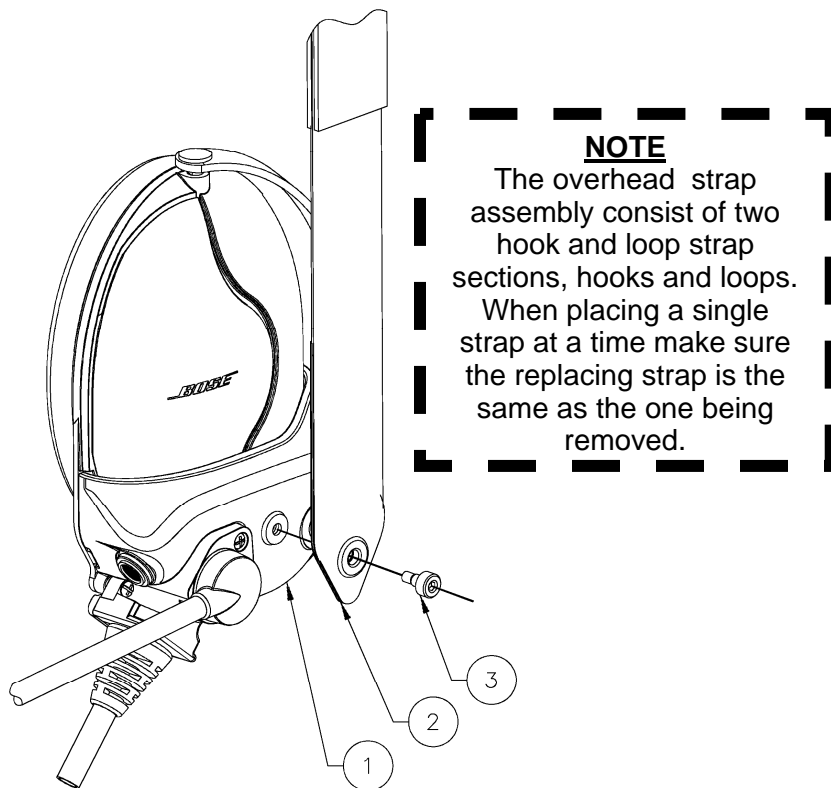


Figure 4.4 Overhead Strap Assembly Removal and Replacement

a. Removal

Using a hex (Allen type) wrench remove screw (3) securing overhead strap (2) to earcup assembly (1).

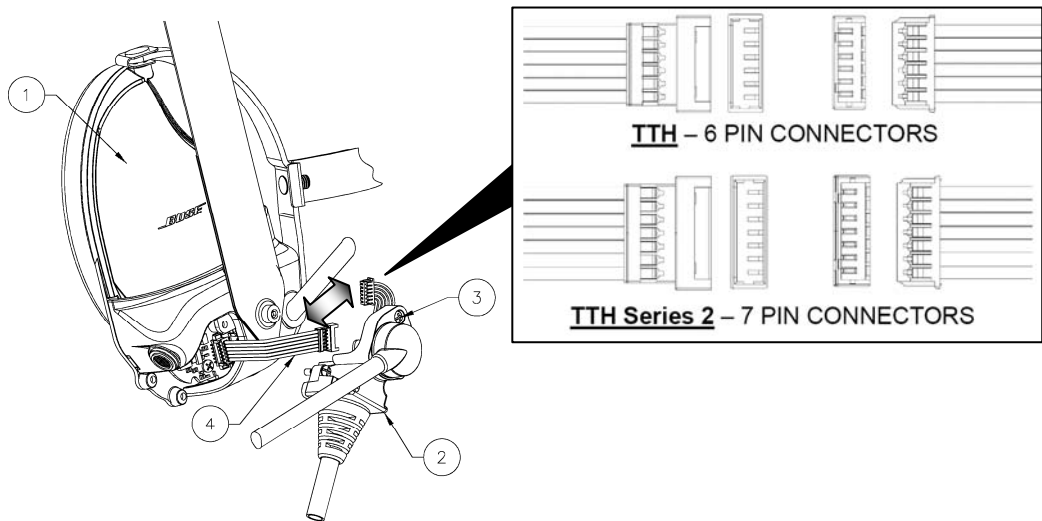
b. Replacement

Place screw (3) through opening in end of overhead strap (2) and use a hex (Allen type) wrench to secure to earcup assembly (1).

5.5 Cable/Microphone Assembly Removal and Replacement

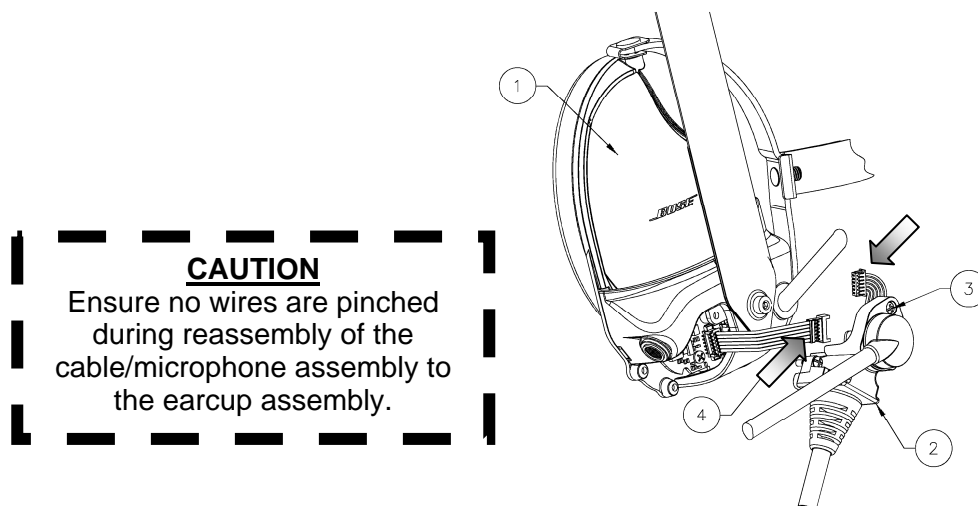
a. Removal

1. Using cross-tipped screwdriver loosen three captive screws (3) securing cable/microphone assembly (2) to earcup assembly (1). Unplug connector connecting the cable/microphone assembly (2) to the jumper cable coming off the earcup printed circuit board and remove the cable/microphone assembly.



b. Replacement

1. Plug cable connector from the cable/microphone assembly (2) into the jumper cable (4) coming off the earcup printed circuit board.

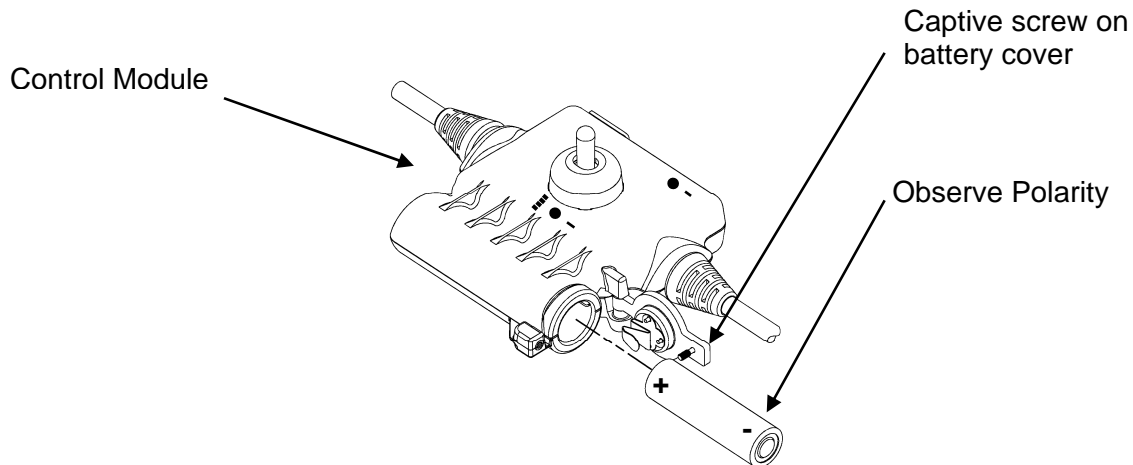


2. Using cross-tipped screwdriver, secure cable/microphone assembly (2) to the earcup assembly (1).

5.6 Alkaline Battery Removal and Replacement

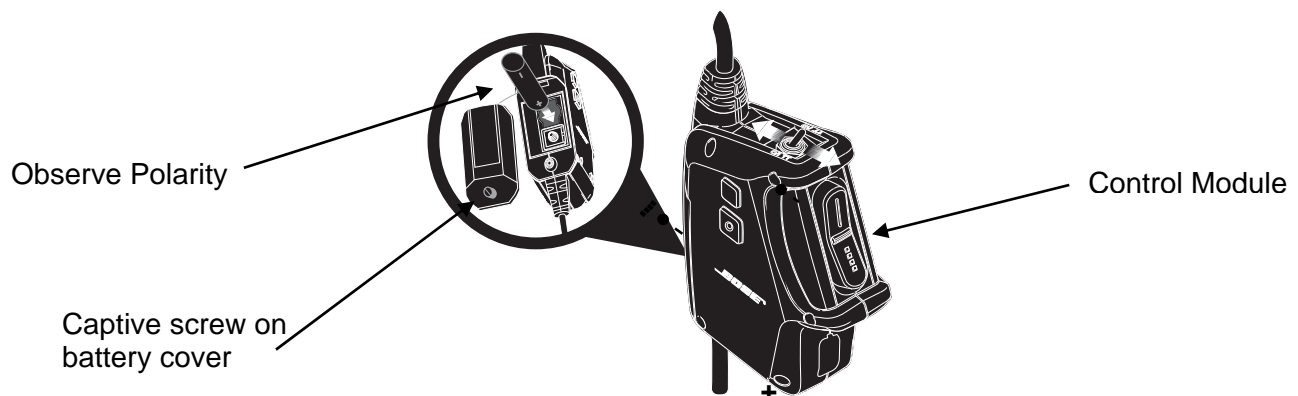
a. TTH Battery Removal and Replacement

1. Using flat-tipped screwdriver, loosen the captive screw on the battery cover and rotate to open the battery compartment.
2. Remove old battery and insert replacement battery positive end first into the battery compartment.
3. Close battery cover and tighten screw using flat-tipped screwdriver.



b. TTH Series 2 Battery Removal and Replacement

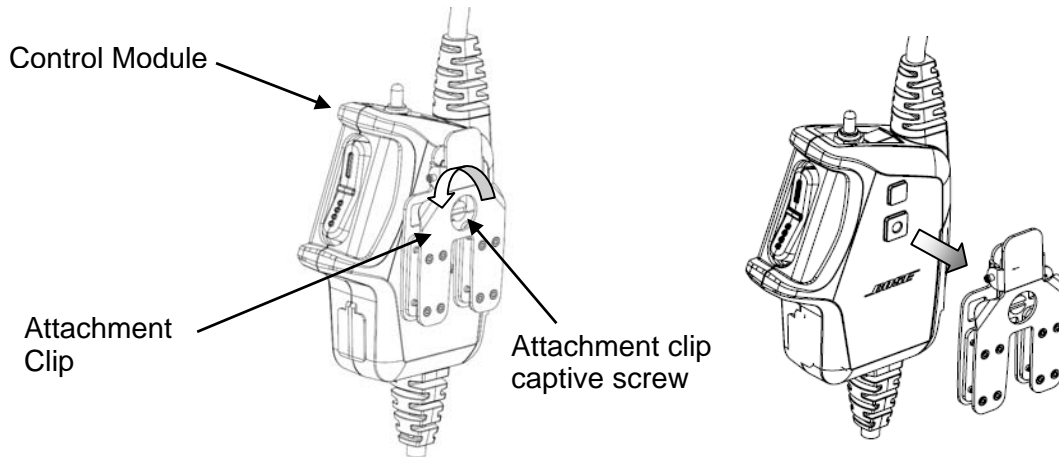
1. Using flat-tipped screwdriver, loosen the captive screw on the battery cover and rotate to open the battery compartment. Battery door is connected to the control module via a stainless steel tether.
2. Remove old battery and insert replacement battery positive end first into the battery compartment.
3. Close battery cover by inserting the tab on the battery cover into the slot in the control module and rotating the battery cover closed.
4. Tighten screw using flat-tipped screwdriver.



5.7 Attachment Clip Removed, Replacement or Adjustment (TTH Series 2 ONLY)

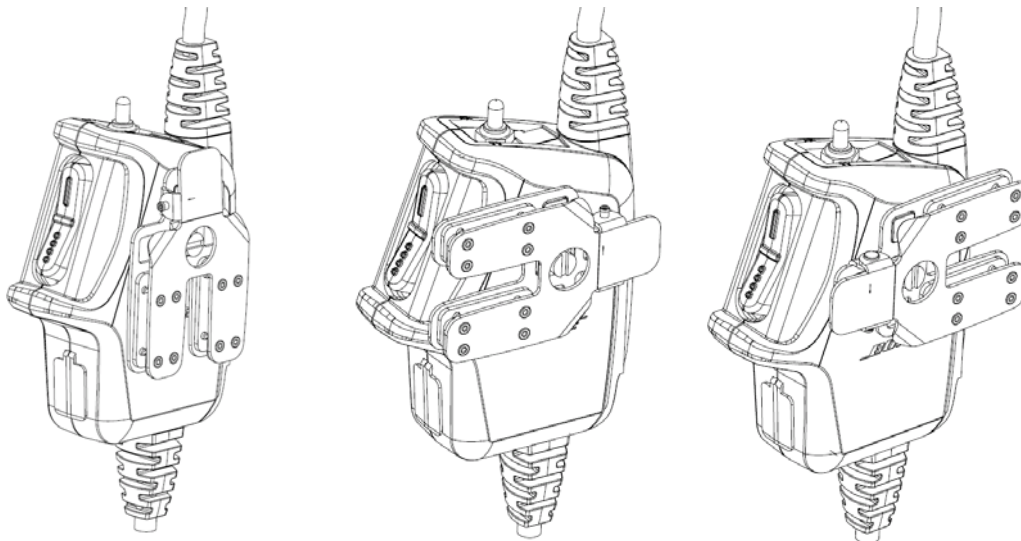
a. Removal

1. Using a flat-tipped screwdriver loosen the captive screw securing attachment clip to the control module and remove clip from the control module.



b. Replacement and Adjustment

1. Attachment clip can be rotated into 3 different positions.

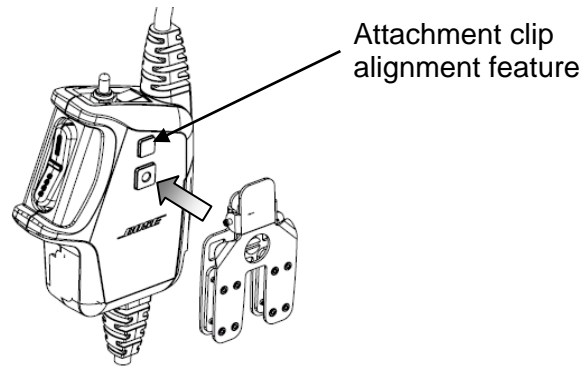


Position 1

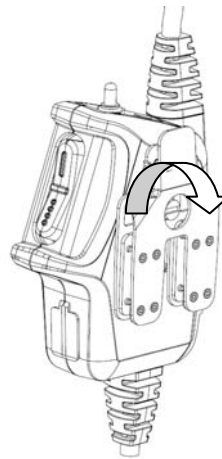
Position 2

Position 3

2. Position attachment clip on the control module in the desired orientation. Rotate the attachment clip 90 degrees in either direction, lining up the square feature on the control module with the square hold in the attachment clip.



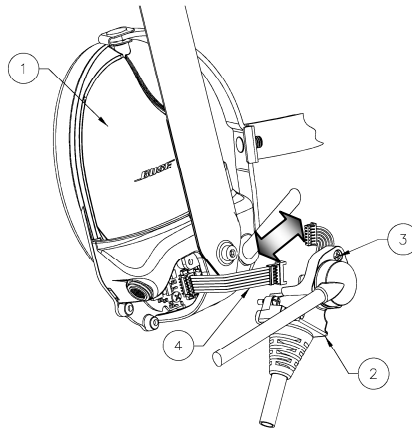
3. Using flat-tipped screwdriver, secure attachment clip to the control module.



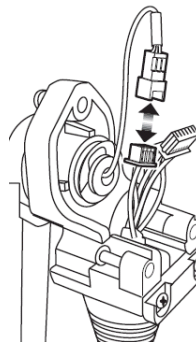
5.8 Boom Microphone Removal and Replacement

a. Removal

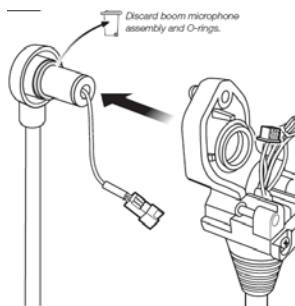
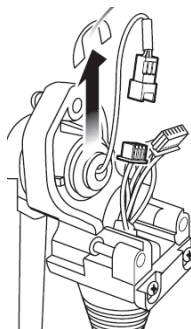
1. Using cross-tipped screwdriver loosen three captive screws (3) securing cable/microphone assembly (2) to earcup assembly (1). Unplug connector connecting the cable/microphone assembly (2) to the jumper cable coming off the earcup printed circuit board and remove the cable/microphone assembly.



2. Unplug the 3-pin connector connecting the boom microphone to the cable assembly.



3. Remove the e-ring securing the boom microphone in place and remove and discard the boom microphone.

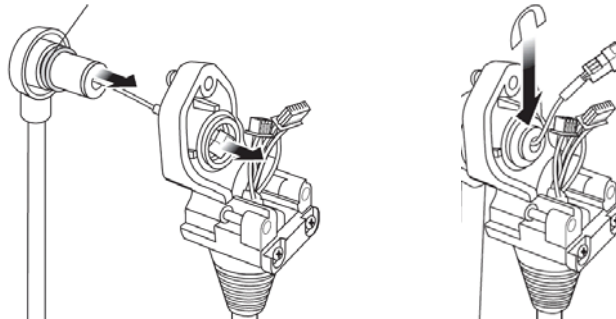


NOTE

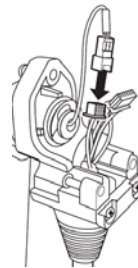
Remove o-rings with microphone assembly. O-rings may remain in barrel when microphone assembly is removed.

b. Replacement

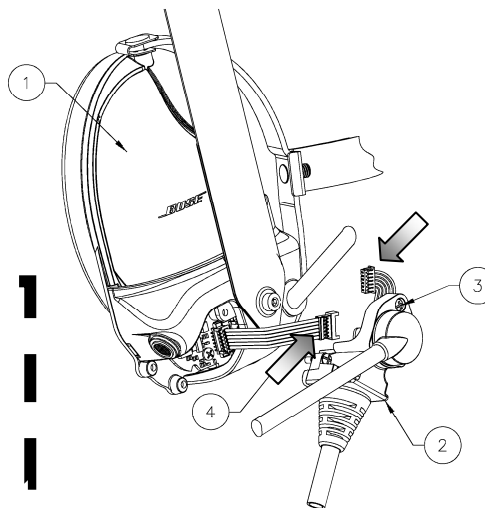
1. Insert microphone through barrel of the plastic housing. Push replacement microphone with 2 new o-rings into the barrel of the plastic housing and secure in place with e-ring.



2. Plug 3-pin connector from the microphone assembly into the mating 3-pin connector on the cable assembly. Ensure connectors are securely seated.



3. Plug cable connector from the cable/microphone assembly (2) into the jumper cable (4) coming off the earcup printed circuit board.



CAUTION

Ensure no wires are pinched during reassembly of the cable/microphone assembly to the earcup assembly.

4. Using cross-tipped screwdriver, secure cable/microphone assembly (2) to the earcup assembly (1).

Appendix A

Additional Technical Information

Voltage Range

The headset shall operate in one of three different modes as a function of the applied voltage. The operating modes shall be identified as “Unpowered”, “Low Power” and “Intercom”, and each mode shall be active with the voltage applied at the power contacts of the vehicle interface connector.

| Operating Mode | Voltage Range | |
|------------------------|-----------------|-----------------|
| | TTH | TTH Series 2 |
| Unpowered | 0.0 – 5.8 VDC | 0.0 – 13.5V |
| Unpowered or Low Power | 5.8 – 6.1 VDC | -- |
| Low Power | 6.1 – 11.0 VDC | -- |
| Low Power or Intercom | 11.0 – 13.5 VDC | -- |
| Intercom | 13.5 – 32.0 VDC | 13.5 – 32.0 VDC |

Over Voltage

The headset shall survive and operate without malfunction when a pulse of duration 100 μ s and potential 36V above ground is applied to the power line. The pulse repetition rate shall not exceed 1 pulse every 10ms.

Ripple and noise

The headset shall operate through and reject power supply ripple up to 2.7V peak to peak from 300 Hz to 4500 Hz. During exposure to ripple, the headset shall not product any noise greater than 65 dB SPL.

Intercom Mode Operation (Standard Operating Mode)

When operating at Intercom Mode the headset shall have the following current draw characteristics under any condition, except during turn-on:

| Current Draw | |
|---|---------------------|
| TTH | TTH Series 2 |
| At least 40ma but less than 220 mA peak | Less than 38mA peak |

In Intercom Mode, the headset shall have the following functional characteristics:

| Functional Characteristics | TTH | TTH Series 2 |
|---------------------------------------|-----|----------------|
| Active ANR | ✓ | ✓ |
| Selectable Talk-through | ✓ | ✓ |
| Powered Output Level | ✓ | ✓ |
| Powered Frequency Response | ✓ | ✓ |
| Active microphone preamplifier output | ✓ | Not Applicable |

Low Power Mode Operation

When operating in Low Power Mode the headset shall have the following current draw characteristics on the head in 85dBA red noise:

| Current Draw | |
|--|--|
| TTH | TTH Series 2 |
| Less than 16mA RMS and less than 180mA peak under any condition, except during turn-on | Less than 16mA peak under any condition, except during turn-on |

In Low Power Mode, the headset shall have the following functional characteristics:

| Functional Characteristics | TTH | TTH Series 2 |
|---|-----|----------------|
| Active ANR | ✓ | |
| Selectable Talk-through | ✓ | ✓ |
| Powered Output Level | ✓ | |
| Powered Frequency Response | ✓ | |
| Inactive microphone preamplifier output | ✓ | Not Applicable |

Unpowered Mode Operation

When operating in Unpowered Mode the headset shall have the following current draw characteristics on the head in 85dBA red noise:

| Current Draw | |
|-------------------|-------------------|
| TTH | TTH Series 2 |
| Less than 1mA RMS | Less than 1mA RMS |

In Unpowered Mode, the headset shall have the following functional characteristics:

| Functional Characteristics | TTH | TTH Series 2 |
|---|-----|----------------|
| Inactive ANR | ✓ | ✓ |
| Selectable Talk-through | ✓ | ✓ |
| Unpowered Output Level | ✓ | ✓ |
| Unpowered Frequency Response | ✓ | ✓ |
| Inactive microphone preamplifier output | ✓ | Not Applicable |

PTT Switch

The PTT switch shall provide the following function at the vehicle interface connector:

| Switch Position | Function |
|------------------|--|
| Up, latching | PTT line (contact #2) connected to ground (contact #3) through $470 \pm 5\%$ ohms (power dissipation in this resistor is less than 0.1W) |
| Center, latching | PTT line (contact #2) open circuit |
| Down, momentary | PTT line (contact #2) connected to ground (contact #3) through 10 ohms maximum |

The boom microphone output signal shall not be muted or disconnected from the vehicle interface connector in any PTT mode. The vehicle interface connector shall conform to the pinouts described in Section 3.0 of this document.

Input Impedance

The headset shall not cause damage to the intercom audio circuits under any circumstances. The audio input impedance of the headset assembly shall be as follows:

| Power Mode | Audio Input Impedance |
|------------------------|-----------------------|
| Intercom and Low Power | $500 \pm 10\%$ ohms |
| Unpowered | No less than 10 ohms |

Insulation resistance

The insulation resistance of the headset assembly between any interconnection terminals and any exposed metal cover shall not be less than 10 Megaohms.

Dielectric withstanding voltage

The headset assembly shall withstand, without flashover or breakdown, the application of a 100Vrms alternating potential of commercial line frequency for 10 seconds.

Crosstalk

The headset assembly shall provide at least 60dB of separation between the transmit (mic) and the receive (audio input) as well as the transmit (mic) and power lines.

Microphone preamplifier output (TTH only)

This section is only applicable to TTH. The TTH Series 2 product design does not include an integrated microphone preamplifier output circuit.

TTH ONLY: In the Intercom Mode the boom microphone preamplifier circuit shall provide an output capable of driving 200mVrms into an unbalanced load of $150 \pm 10\%$ ohm AC impedance and not less than 300 ohms DC resistance. The preamplifier shall provide a gain of 24 ± 1 dB with any dynamic microphone. The preamplifier shall have a flat frequency response between 300 to 4500 Hz. Harmonic distortion shall be less than 5% for an output of 100mVrms in 24dB gain mode. The preamplifier shall be bypassed in the Low Power and Unpowered modes.

Microphone Impedance

The electrical impedance of the microphone at any frequency over the range of 400 to 6000 Hz shall be such that the output voltage shall remain -56 ± 4 dBm @ 1kHz re. 103 dB SPL when connected to a 150 ohm load impedance.

Talk-through circuit (TTC)

The headset shall incorporate a talk-through circuit to permit monitoring of the ambient sound field and direction finding. When mounted on a simulated real head fixture (mannequin), at 22°C, 50% RH the TTC shall produce gain of 0 ± 6 dB when measured in the 500 Hz octave band and an acoustic frequency response within 0 ± 8 dB when measured in one octave frequencies between 300 and 4500 Hz and corrected for diffuse field response of the fixture.

The talk-through circuit shall limit direct earcup output to between 86dB(A) SPL maximum and 72dB(A) minimum with the output corrected for the diffuse field response of the fixture.

The headset assembly shall accept a number 15A (AA) battery per ANSI C18.1 for operation of the TTC. When exposed to 90 dB, 1kHz noise field with a fresh battery, the TTC shall provide the following battery life:

| | TTH | TTH Series 2 |
|--------------|--------------------|---------------------|
| Battery life | 240 hrs Minimum | 240 hrs Minimum |

Audio Output Level

The headset at 22°C, 50% RH shall product an output level of 106 ± 3 dB SPL corrected for the diffuse fields response of the fixture for a 0 ± 0.1 dBV input audio signal at 500Hz when in either the Intercom or Low Power Mode. With the headset in the Unpowered Mode, the output level shall be 94 ± 4 dB SPL corrected for the diffuse field response of the fixture in the octave around 500 Hz for a 0 ± 0.1 dBV input audio signal.

Harmonic Distortion

The harmonic distortion of the earphone assembly in Low Power and Intercom Modes shall not exceed 5% for a 0 ± 0.1 dBV input at 500 Hz and it shall not exceed 10% with the input adjusted for an output of 100dB SPL at 500 Hz and then swept from 300 Hz to 4500 Hz. The harmonic distortion of the earphone assembly in Unpowered Mode shall not exceed 5% for a -6 ± 0.1 dBV input at 500 Hz and it shall not exceed 10% with the input adjusted for an output of 94dB SPL at 500 Hz and then swept from 300 Hz to 4500 Hz.

Talk Through Circuit (TTC)

The headset shall incorporate a talk-through circuit to permit monitoring of the ambient sound field and direction finding. When mounted on a simulated real head fixture (mannequin), at 22°C, 50% RH the TTC shall produce gain of 0 ± 6 dB when measured in the 500 Hz octave band and an acoustic frequency response within 0 ± 8 dB when measured in one octave frequencies between 300 and 4500 Hz and corrected for diffuse field response of the fixture.

The talk-through circuit shall limit direct earcup output to between 86dB(A) SPL maximum and 72dB(A) minimum with the output corrected for the diffuse field response of the fixture.

Boom Microphone Sensitivity

The dynamic boom microphone sensitivity shall be -56 ± 4 dBm @ 1kHz re. 103dB SPL.