



**Audio Specialties Group
Products Division**

**MODEL AOB-2
INTERCOM-AUDIO INTERFACE ADAPTOR**

11/18/2011

1.1 Introduction

The AOB-2 Audio Interface Adapter provides a convenient and consistent method of interfacing unbalanced, powered intercom circuits with standard balanced audio equipment and unshielded, twisted – pair wiring.

1.2 Understanding Two-Wire Intercom

RTS™ by Telex and *Clear-Com Party-line™* products are known as *two-wire* intercom systems. Meaning both halves of a conversation coexist on a single electrical circuit. Break the circuit, and neither person hears the other. The name is derived from the electrical nature of a positive and negative, or signal-wire and return-path pair: *Two-Wires*. If the conversation between the two persons were separated such that each half of the conversation used a separate electrical circuit, there would be four-wires; two for each. All our lives in analog audio, we have used *four-wire* circuits, even for non-intercom uses. A vocal microphone on stage feeding a console input is an example of half of a four-wire circuit. It would not usually be called such, since it is not an intercom use, but it remains *one-half of a communications path from the stage to the intended listeners*. The reverse path, for example the console's talk-back microphone speaking through the stage monitors, is the other half of the conversation.

In order to accommodate the bi-directional nature of the signals on a two wire circuit, RTS and Clear-Com intercom systems are engineered around the use of a unique electrical circuit called a *current source*. Most audio equipment is designed with circuits that use *voltage sources*. This current source design is what allows multiple user stations, (belt-packs, etc) to daisy-chain along one cable without reducing the audio level and allows the bi-directional audio to exist on a single electrical circuit. It is for this reason that interfacing audio equipment to two-wire intercom circuits is a problematic process. If that weren't bad enough, the audio circuits are un-balanced and two separate circuits share a common ground in the XLR cable. This causes noises susceptibility and cross-talk that other professional audio equipment would be immune to. To make matters even more complicated, certain pins of the interconnection cables have 30V DC power and with RTS or Clear-Com TW, power is imbedded with the audio signal. One final note, the signal-return, (Pin-1 in a 3-pin XLR) or ground, is not ground at all, but an isolated reference which the system's Power-Supply generates. So, Pin-1 of any 3-Pin XLR connector must be isolated from all other Power or Audio ground points to prevent massive hums and noise from entering the intercom system.

1.3 Capabilities

While maintaining the bi-directional nature of a two-wire circuit, the AOB-2 overcomes many of the limitations of an RTS or Clear-Com circuit. 1: It eliminates the DC power. 2: It splits the two channels into separate cables. 3: It generates a balanced, ground isolated circuit for each channel.

The dual channel capability of the AOB-2 allows it to interface with both channels of an RTS type system simultaneously or to interface with Clear-Com systems. Note that when using the AOB-2 with a Clear-Com system, the balanced audio appears on the Channel-2 connectors.

1.4 Technical Details.

As mentioned in Section 1.2, the current-source circuit is what allows multiple users to connect to the same electrical circuit. This circuit requires a fixed termination value (200 ohms). Typically, it is provided by the system's power supply. If a power supply is not available or if two power supplies are tied together, the circuit will function poorly. If the termination is missing, the circuit will exhibit excessively high gain to the point of distortion and feed-back when a user activates a microphone. Too much termination, as when more than one power supply is connected to the same circuit, low audio levels will plague the users.

With RTS systems, the termination is generated by the power supply circuits. With Clear-Com, the termination value can be placed anywhere in the system by any single piece of equipment in the system.

Each system design has benefits and limitations:

RTS: The audio for CH-1 is embedded with the DC power; the power-supply provides the termination. If the power is disconnected, the user-stations will power-down so experiencing the excessively high-gain condition is rare.¹

Likewise, since the power supply can't provide power without terminating the circuit, if two supplies are used, they must be set to a "Dual-Mode" condition with configuration switches. The application notes in Section 3 show various ways to use multiple power supplies. The channels of each power-supply which is tied together must be set to "Dual-Mode" to allow for proper audio levels to be maintained.

Figure 3.1 shows the connection scheme for an RTS MCE-325. In this application, the CH-3/4 connection is used for audio application as IFB and Stage Announce (SA). Since no power-supply will be used, the current source circuits must be terminated by some other means to maintain proper audio levels. A resistive terminator plug can be constructed with two 200 ohm resistors soldered to an XLR connector and plugged into the loop connection of the AOB-2. (See Section 4 for details on wiring the terminator).

Clear-Com: Standard Clear-Com Party-line systems place the audio and power on separate pins in the XLR connector². This allows the audio to connect without the presence of a power source. The power supply is the most common source of the termination value but since the power and audio are not tied to the same wire, many Clear-Com products feature a termination option that the system designer can choose to be the source of the termination.

The AOB-2 is compatible with both RTS and Clear-Com systems, but since the two manufacturers differ in their use of the pins of the XLR connector, it is important to note that the one audio channel for a Clear-Com system is found on the CH-2 connector of the AOB-2.

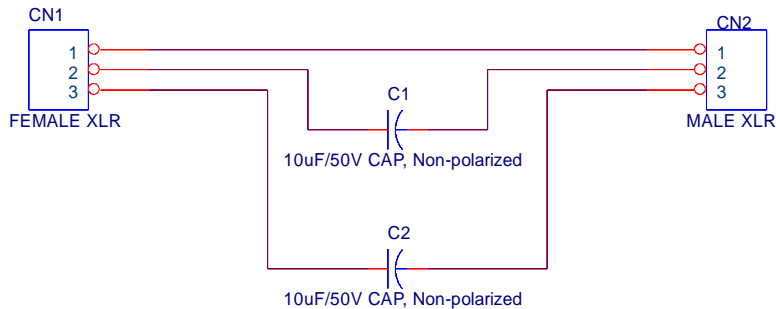
¹ RTS wiring provides two individual circuits on three pins. Pin-1 is common to both, Pin-2 is channel #1 and DC power.

² Clear-Com Partyline wiring uses three wires, one for audio and one for DC power. Pin-1 is common for audio and DC power.

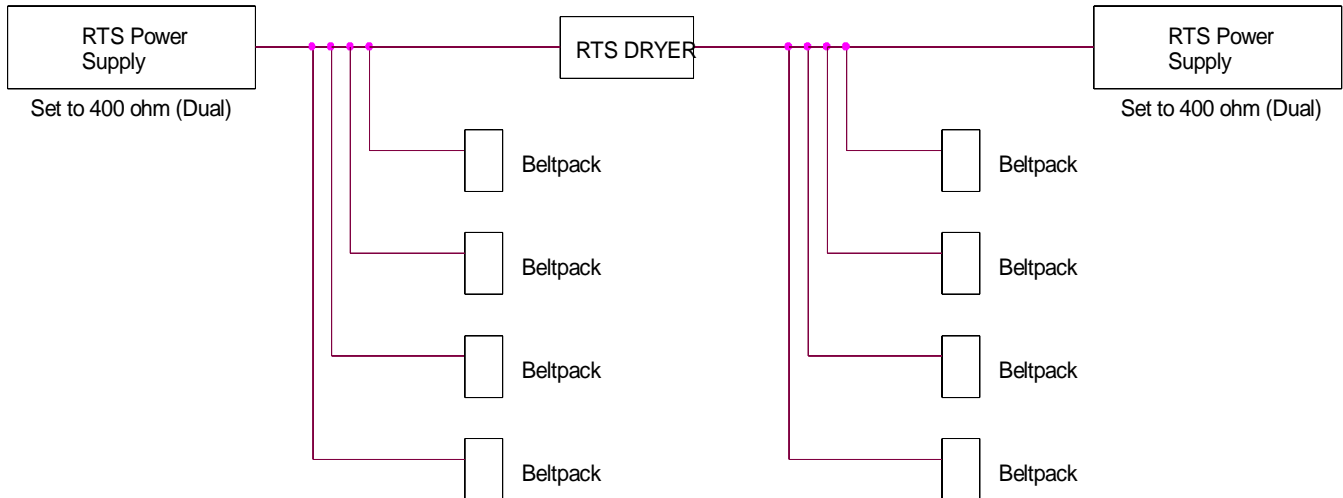
Wet Vs Dry.

This terminology deals with whether the audio circuit has DC power imbedded with the audio signal. *Wet* means voltage is present. *Dry* means that there is no DC voltage present. Much confusion lies in understanding this part of intercom technology.

RTS TW systems, more than Clear-Com, deal with this condition since the RTS specification places DC power on the same pin of the connector as the CH-1 audio signal. To remove, or better said, “block” the DC power along the length of a cable requires a Capacitor. A capacitor is an electrical device which lets alternating current (AC) to pass, but Direct Current can not. This little device does not remove DC from the entire circuit, but represents a point along the circuit that DC can not pass through.



RTS Dual-Channel DC Block “Dryer” adapter.



This drawing shows the use of the dryer to tie two systems together creating a common audio circuit while isolating the DC voltages.

For further detail on individual equipment manufactured by RTS and Clear-Com, please refer to the specifications and features as published by the manufacturers.

Panel Layouts

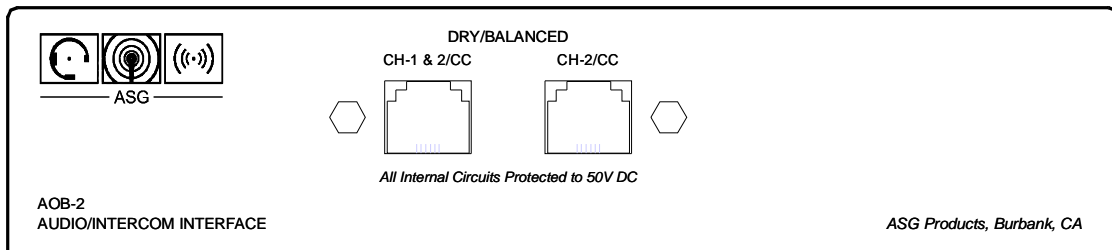
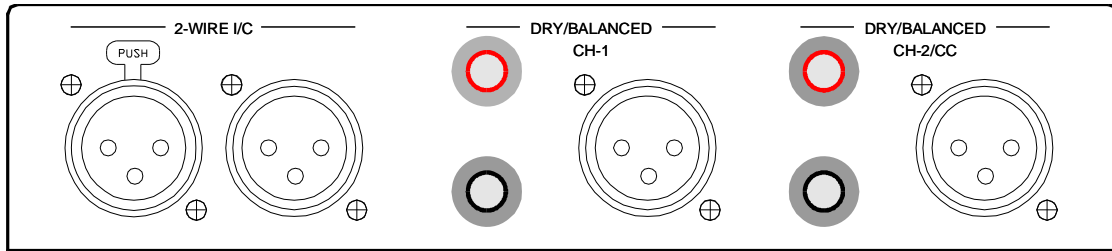


Figure 2.11
AOB-2 Front and Rear Panel Layouts

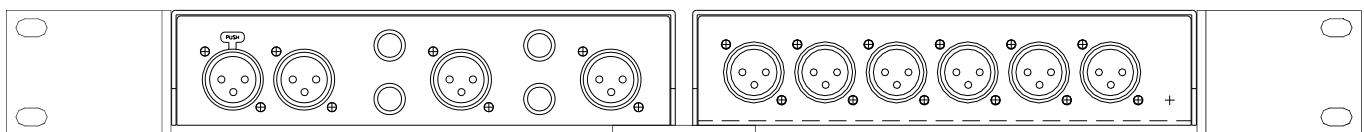


Figure 2.2
AOB-2 and IMB-111 Two-Wire Splitter
shown with the Dual Rack-mount kit.

Typical Applications

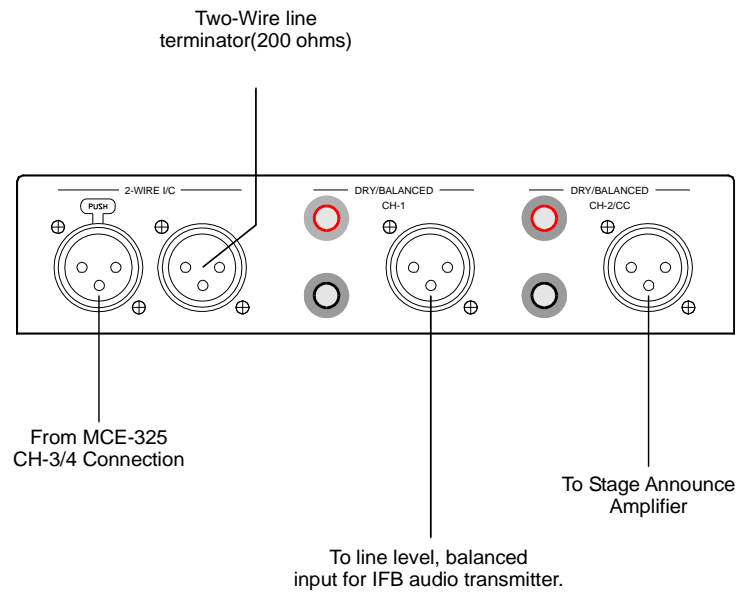


Figure 3.1
Telex MCE-325 CH-3/4 Audio Interfacing

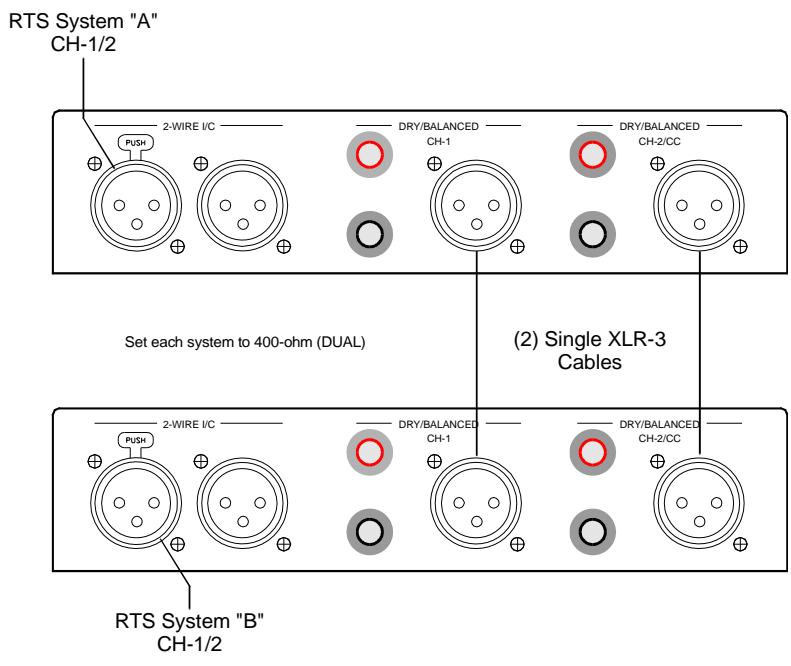


Figure 3.2
Bridging two separate RTS TW-Systems together

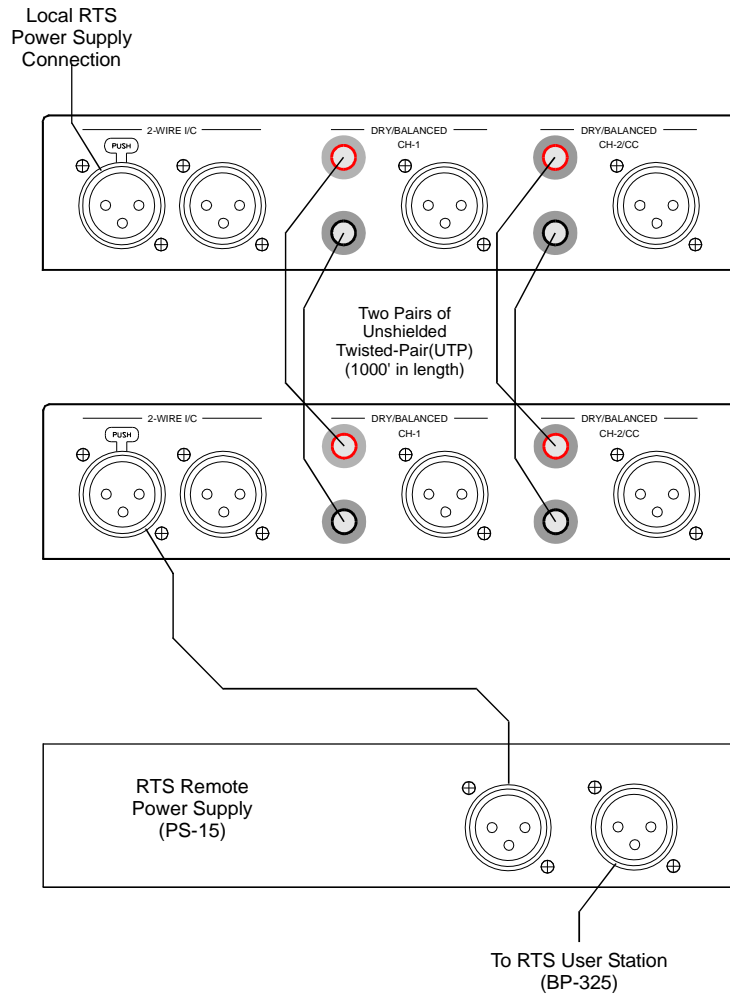


Figure 3.3
Using two AOB-2 units to split the two channels and extend the distance between the power supply and the remote user.

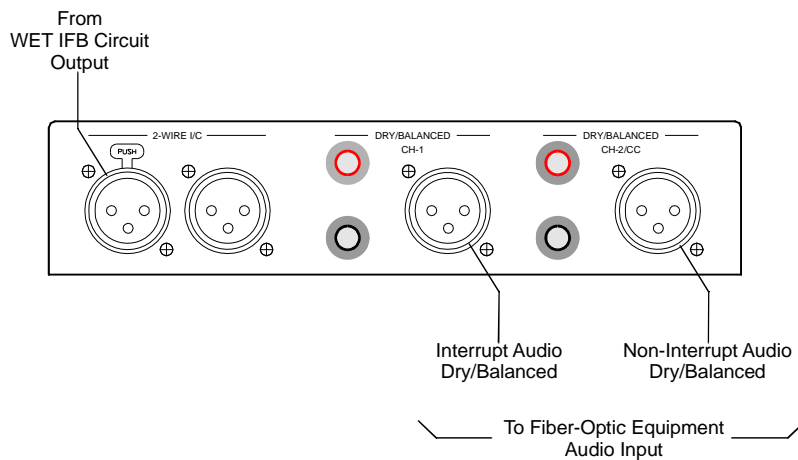


Figure 3.4
AOB-2 Used to interface Wet (DC Power) IFB circuits to Fiber-Optic equipment with un-protected line-level inputs.

Electrical Specifications

Balanced Audio In/Out

Nominal operating level: -2dBv

Maximum AC signal <1% THD+N: +7dBv

Maximum DC signal (peak or sustained): 50V

Environmental

Temperature Operating: 0° to 60° C

Do not expose unit to rain.

Dimensions

Height: 1.7”

Width: 7”

Depth: 2.6”

Weight: 1.1 LBS

Connector Pin-Out Detail

2-WIRE I/C

PIN-1	Common
PIN-2	Ch-1 Audio + Power (RTS) or Only Power (Clear-Com)
PIN-3	Ch-2 Audio (RTS) or Single Channel Audio (Clear-Com)

DRY/BALANCED CH-1

PIN-1	No Connection
PIN-2	Audio In-Phase with Intercom Circuit
PIN-3	Audio Reverse-Phase with Intercom Circuit

DRY/BALANCED CH-2/CC

PIN-1	No Connection
PIN-2	Audio In-Phase with Intercom Circuit
PIN-3	Audio Reverse-Phase with Intercom Circuit

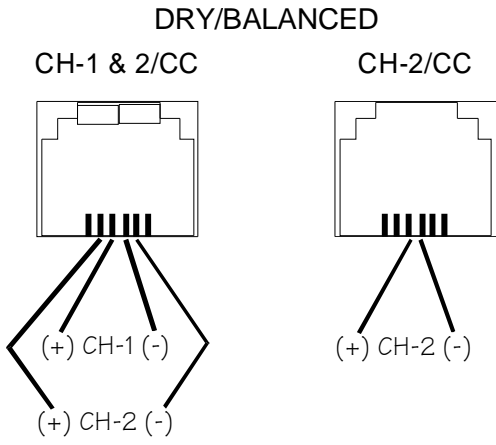
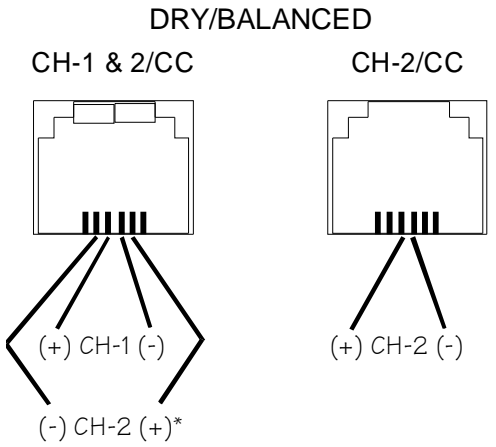


Figure 4.1 RJ-12 Connector Pin-out Detail (Presented CH-2 on Left connector with error in polarity)



**Corrected Polarity for All Units*

Figure 4.1 RJ-12 Connector Pin-out Detail