
CREATIVE CONTROL PRODUCTS

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UAI-10 UNIVERSAL AUDIO INTERFACE

OWNER'S MANUAL

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LIMITED WARRANTY

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UAI-10 UNIVERSAL AUDIO INTERFACE OWNER'S MANUAL

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SCHEMATICS SUPPLIED WITH BOARDS

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1.0 INTRODUCTION

The Creative Control Products UAI-10 Universal Audio Interface board is a low cost, easy to interface repeater and link audio mixer featuring DTMF Mute, and link Monitor-Mix control.

Audio inputs consist of repeater, link, control receiver, CW/Tone, and an auxiliary input for other audio sources such as a local microphone.

Audio outputs consist of repeater, link and a DTMF output for the DTMF decoder on your controller. Each audio output is adjustable to the level required by your system.

Control inputs to the UAI-10 consist of repeater COS (which is selectable high or low), DTMF mute, and an auxiliary output from your controller for the link mute function.

The UAI-10 has provisions to mute the DTMF tones from the repeater transmit audio. The ability to mute or pass DTMF tones out the link transmit audio is provided via a jumper on the circuit board.

Normally full audio is present at the repeater transmitter audio output. Whenever the repeater COS is activated, both the repeater and link audio are mixed together resulting in the condition called Monitor-Mix. This monitor-mix audio is adjustable so that the link receiver audio can be lower in volume than the repeater receiver audio. Also, whenever the auxiliary control input is activated, the link receive audio will be completely muted upon repeater COS activity. Either mute or monitor-mix operation is selectable so that normal repeater receiver audio will not be overpowered by the link receiver's audio.

The UAI-10 is the perfect answer for interfacing your repeater receiver, transmitter and link radio to any stand alone repeater controller such as our SRC-10 Smart Repeater Controller.

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SPECIFICATIONS

SIZE: 2 5/8 by 4 1/4 inches.

POWER: +8 to 15 volts DC at 19ma typical.

OPERATING TEMPERATURE: -30 to +50 degrees C.

CONNECTOR: Two 10 pin male in-line straight headers.

AUDIO INPUTS: Repeater receiver, link receiver, control receiver, auxiliary input, CW/tones. Each input has an input impedance of approximately 10K ohms.

AUDIO OUTPUTS: Output adjust range 0 to 5 volts P-P @ 1 volt P-P input, frequency response is flat from 100 to 3500 cycles.

MONITOR-MIX ADJUSTMENT RANGE: Approximately 16 dBv or from a minimum of approximately 1/6 of the audio input signal to full audio.

DTMF MUTE INPUT: Active low (ground).

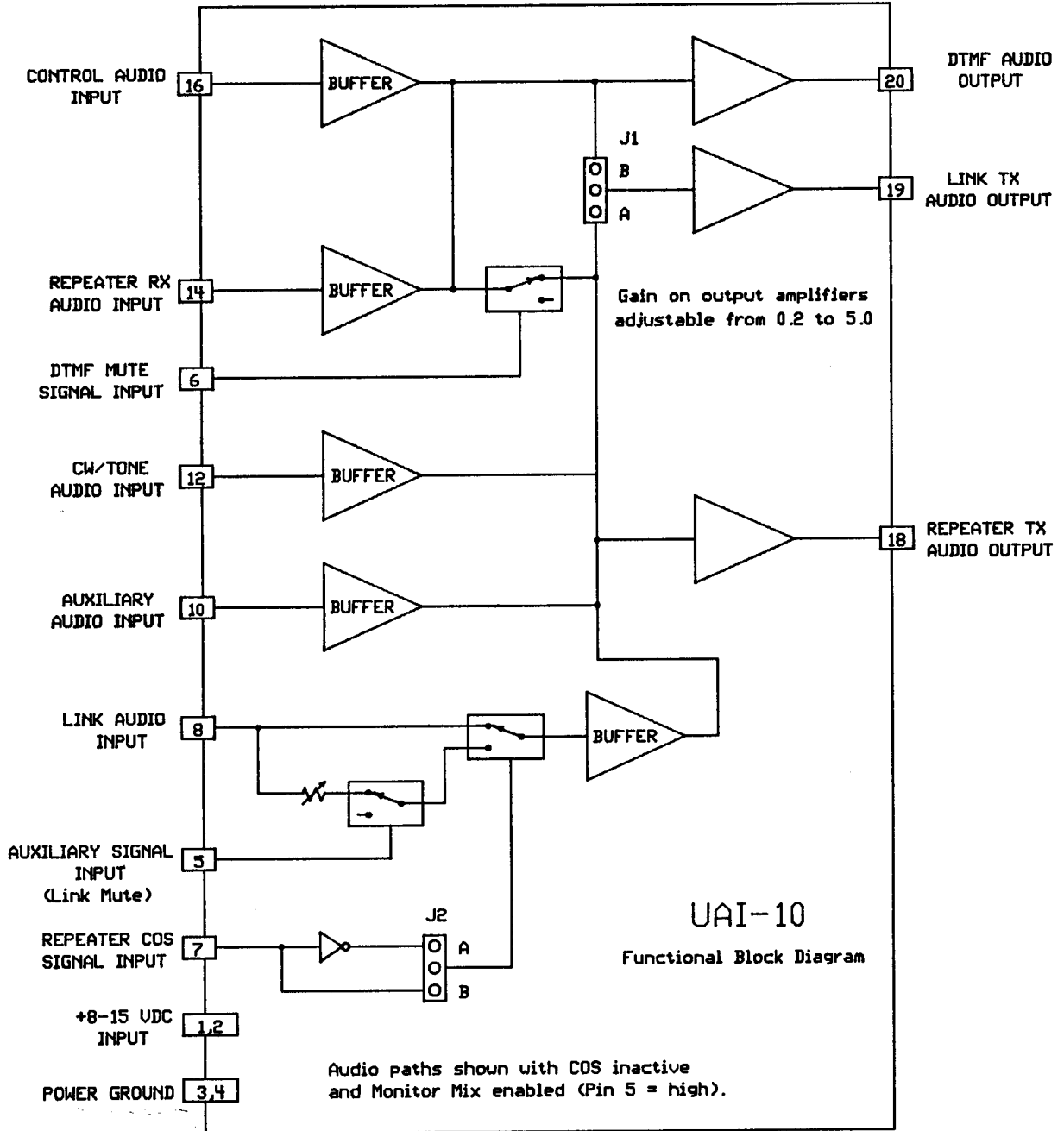
REPEATER COS INPUT: Selectable between an active low (ground) or an active high (3 to 15 volts).

AUXILIARY CONTROL INPUT: When this input is low (ground), link audio is muted during active repeater COS. When this input is high, the link audio is mixed with the repeater receiver audio (monitor-mix) during repeater COS activity.

LINK DTMF MUTE: By connecting the appropriate jumper, DTMF tones can be muted from the link transmit audio output or passed through to the link transmit audio output.

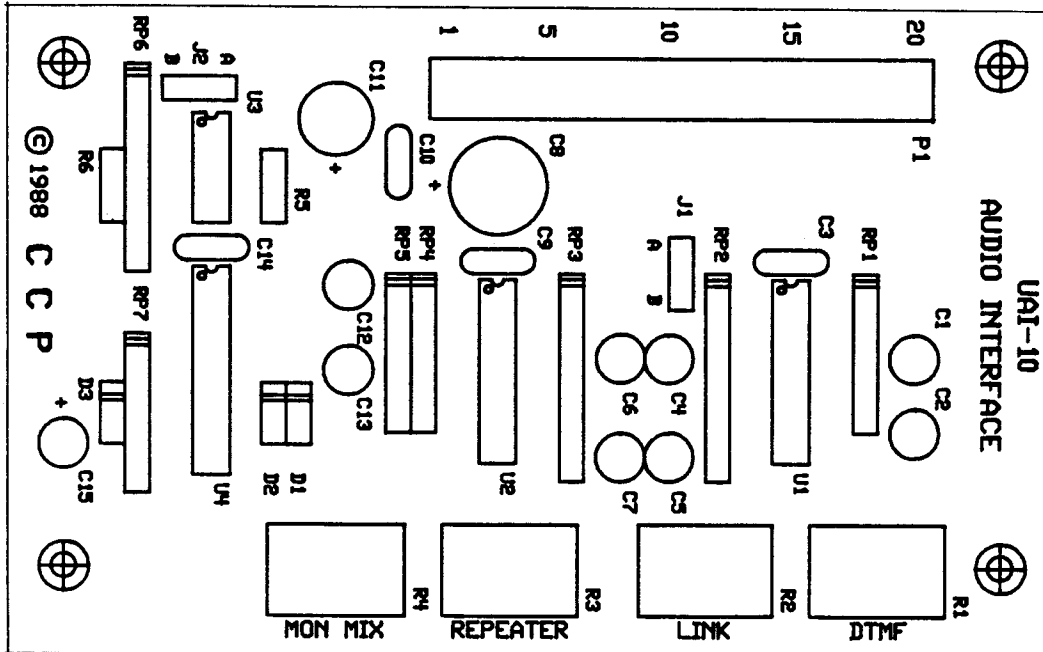
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UAI-10 BLOCK DIAGRAM



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UAI-10 BOARD COMPONENT LAYOUT



INTERFACE CONNECTOR (P1) PINOUT

- | | |
|------------------------------|------------------------------|
| 1. +8-15 VDC Input | 11. Audio Ground |
| 2. +8-15 VDC Input | 12. CW/Tone Audio Input |
| 3. Power Ground | 13. Audio Ground |
| 4. Power Ground | 14. Repeater RX Audio Input |
| 5. Auxiliary Control Input | 15. Audio Ground |
| 6. DTMF Mute Input | 16. Control RX Audio Input |
| 7. Repeater COS Input | 17. Audio Ground |
| 8. Link Receiver Audio Input | 18. Repeater TX Audio Output |
| 9. Audio Ground | 19. Link TX Audio Output |
| 10. Auxiliary Audio Input | 20. DTMF Audio Output |

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5.0 AUDIO INTERFACING & OPERATION

While interfacing the UAI-10 is fairly straight forward some clarification may be needed on a few points. It is assumed that all of the components of a typical repeater system share the same power supply ground potential or, in other words, all of the grounds from the various power supplies in the system are tied together.

All of the inputs and outputs of the UAI-10 are capacitively coupled therefore, the system designer needn't be concerned with matching DC levels on the inputs and outputs of the UAI-10 audio interface. Note, however, that ground pins (9,11,13,15,17) are provided for the audio signal inputs but no ground pins are provided for the audio signal outputs. The reason for the audio ground pins on the input and not the output is to provide shield connections at the high impedance point of each audio input. Note also, only one end of the audio lead shield should be connected to prevent any ground loop problems. The high impedance point on the output side of the UAI-10 audio interface will most likely be at the transmitter or transceiver transmit audio input. Thus, the audio lead shield should be connected to a ground at the transmitter and not be connected at the UAI-10 to again, prevent ground loops in the audio circuit.

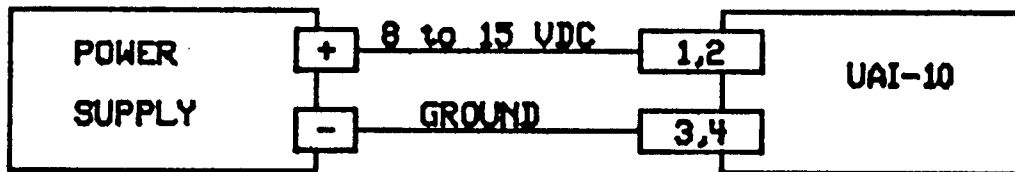
It is possible to interconnect the audio system without using shielded audio cable. However, this depends a lot on the construction of the repeater and the environment in which the repeater will be operating. If there is any concern about your particular repeater application or operating environment, perhaps shielded audio cable for the audio connections would be well worth the additional effort and expense.

5.1 INTERFACE CONNECTOR (P1)

The twenty pin interface connector (P1) is made up of two standard 10 pin straight in-line male headers. These headers use 0.10 inch center spacing and include a friction lock for improved mated retention. Two mating 10 pin female polarized connectors are provided with the UAI-10. They are also available from Molex, part #22-01-3107.

5.2 POWER

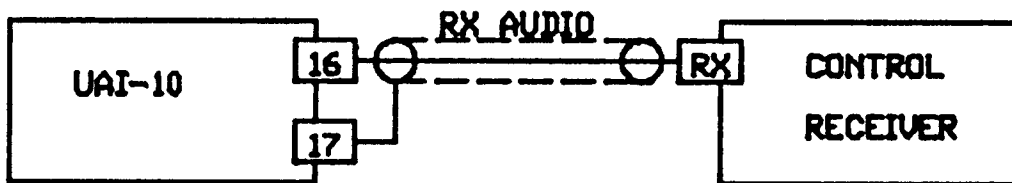
The UAI-10 input voltage, +8 to 15 volts DC is connected to pin #1 and 2 on the interface connector P1. Power ground is applied to pin #3 and 4. The current draw is approximately 19ma at +13.8 volts input. As always, be careful not to reverse the input voltage polarity or damage may occur.



POWER SUPPLY CONNECTIONS

5.3 COMMAND RX AUDIO INPUT

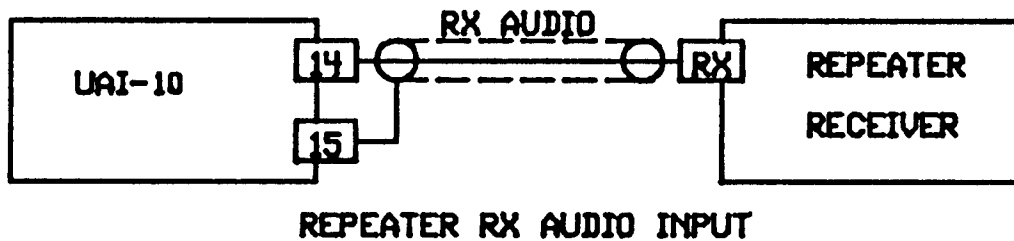
Audio is connected to pin #16 on the interface connector (P1) with the shield connected to pin #17. Audio that is connected to this input is directed only to the DTMF audio output, pin #11, on the interface connector. This is appropriate in that the DTMF decoder can be controlled without the DTMF tones being repeated out of the Repeater TX audio output. Because the UAI-10 input impedance is 10K, audio may be picked off from anywhere inside the receiver with minimum loading. Try to locate a point past the FM detector where the audio is squelch gated and de-emphasized. Optimum audio input should be between .25 and .75 volts peak to peak.



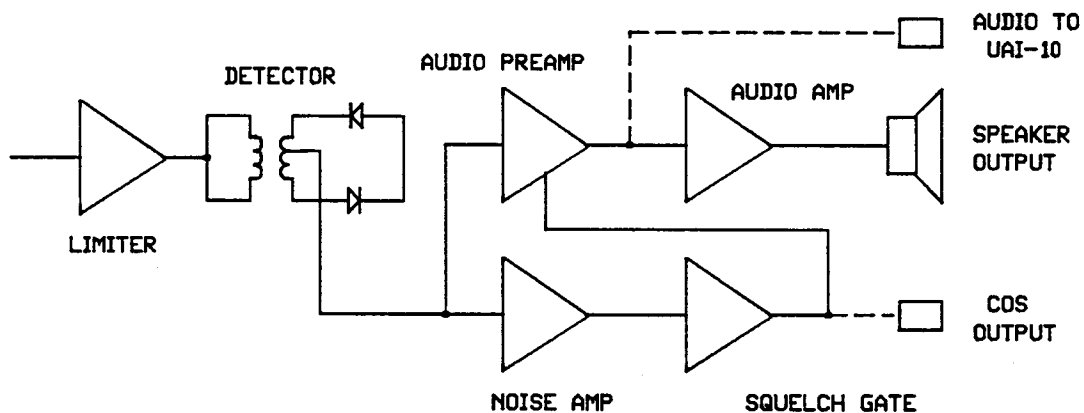
COMMAND RX AUDIO INPUT

5.4 REPEATER RX AUDIO INPUT

Audio is connected to pin #14 on the interface connector (P1) with the shield connected to pin #15. Audio that is connected to this input is directed to the DTMF Audio output, Link TX Audio output and the Repeater TX Audio output. Because the UAI-10 input impedance is 10K, audio may be picked off from anywhere inside the receiver with minimum loading to the audio circuit. Try to locate a point past the FM detector where the audio is squelch gated and de-emphasized. Audio that is connected before the de-emphasis network will sound tinny and may cause erratic DTMF commanding because of unmatched levels to the DTMF decoder. Refer to figure 5-1. Optimum audio input should be between .25 and .75 volts peak to peak.

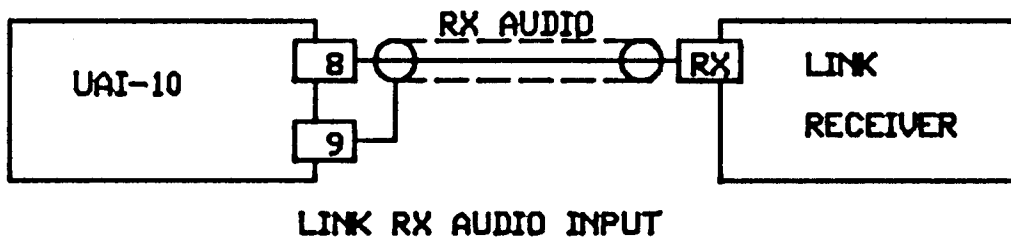


RECEIVER BLOCK DIAGRAM



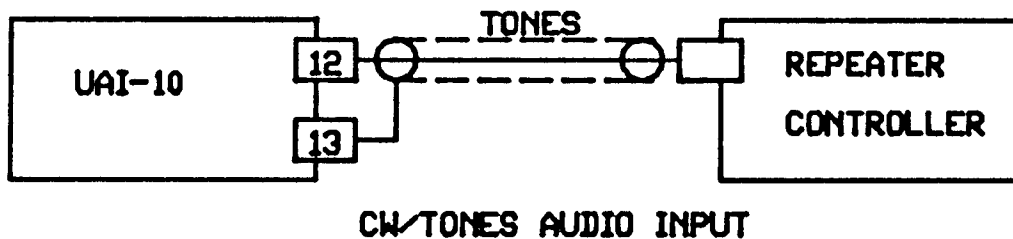
5.5 LINK RX AUDIO INPUT

Audio is connected to pin #8 on the interface connector (P1) with the shield connected to pin #9. Audio that is connected to this input is directed only to the Repeater TX Audio output. Because the UAI-10 input impedance is 10K, audio may be picked off from anywhere inside the receiver with minimum loading to the audio circuit. Try to locate a point past the FM detector where the audio is squelch gated and de-emphasized. Audio that is connected before the de-emphasis network will sound tinny and may cause erratic DTMF commanding because of unmatched levels to the DTMF decoder. Refer to figure 5-1. Optimum audio input should be between .25 and .75 volts peak to peak.



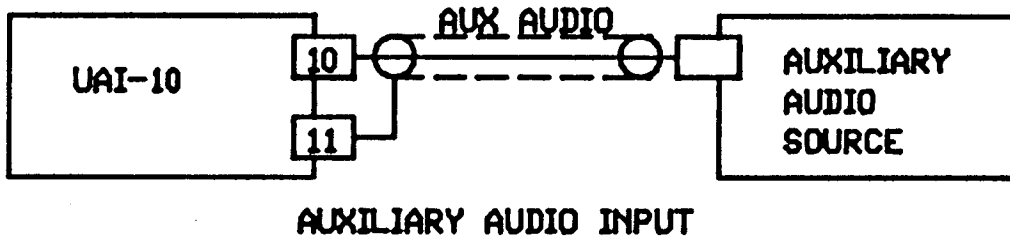
5.6 CW/TONES AUDIO INPUT

Audio is connected to pin #12 on the interface connector (P1) with the shield connected to pin #13. Audio that is connected to this input is directed only to the Repeater TX Audio output and originates at the repeater controller. Optimum audio input should be between .25 and .75 volts peak to peak.



5.7 AUXILIARY AUDIO INPUT

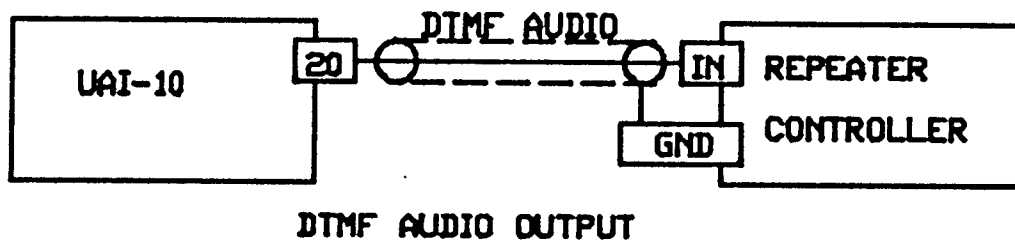
Audio is connected to pin #10 on the interface connector (P1) with the shield connected to pin #11. Audio that is connected to this input is directed only to the Repeater TX Audio output. Optimum audio input should be between .25 and .75 volts peak to peak.



5.8 DTMF AUDIO OUTPUT

The DTMF audio output is located on pin #20 on the interface connector P1. Note, however, that there is no ground pin provided for the audio signal output. The reason for the audio ground pins on the input and not the output is to provide shield connections at the high impedance point of each audio input. Note also, only one end of the audio lead shield should be connected to prevent any ground loop problems.

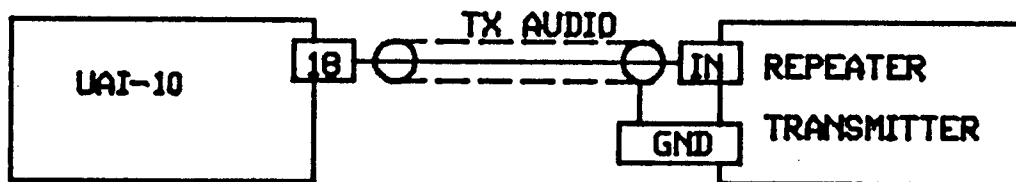
This output is connected to the DTMF decoder input found on your repeater controller. The audio output is set by adjusting R1 to the desired audio level needed to drive your DTMF decoder, typically about 1 volt peak to peak.



5.9 REPEATER TX AUDIO OUTPUT

The Repeater TX audio output is located on pin #18 on the interface connector P1. Note, however, that there is no ground pin provided for the audio signal output. The reason for the audio ground pins on the input and not the output is to provide shield connections at the high impedance point of each audio input. Note also, only one end of the audio lead shield should be connected to prevent any ground loop problems. The high impedance point on the output side of the UAI-10 audio interface will most likely be at the transmitter or transceiver transmit audio input. Thus, the audio lead shield should be connected to a ground at the transmitter and not be connected at the UAI-10 to again, prevent ground loops in the audio circuit.

For best results, connect this output into your repeater transmitter before its preemphasis network, although the microphone input may be acceptable. Be cautious, as connecting audio straight to the FM modulator will produce bassy sounding audio. The audio output is set by adjusting R3 to the desired audio level needed to drive your Repeater Transmitter audio.

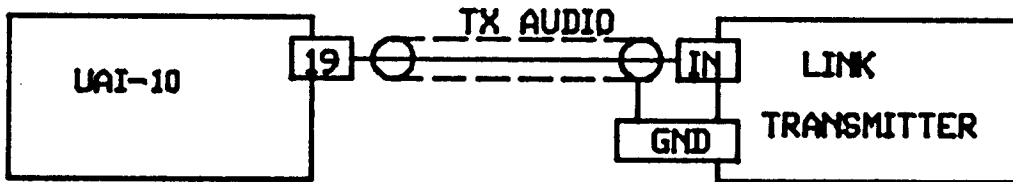


REPEATER TX AUDIO OUTPUT

5.10 LINK TX AUDIO OUTPUT

The Link TX audio output is located on pin #19 on the interface connector P1. Note, however, that there is no ground pin provided for the audio signal output. The reason for the audio ground pins on the input and not the output is to provide shield connections at the high impedance point of each audio input. Note also, only one end of the audio lead shield should be connected to prevent any ground loop problems. The high impedance point on the output side of the UAI-10 audio interface will most likely be at the transmitter or transceiver transmit audio input. Thus, the audio lead shield should be connected to a ground at the transmitter and not be connected at the UAI-10 to again, prevent ground loops in the audio circuit.

For best results connect this output to your link transmitter before its preemphasis network, although the microphone input may be acceptable. Be cautious, as connecting audio straight to the FM modulator will produce bassy sounding audio. The audio output is set by adjusting R2 to the desired audio level needed to drive your Link Transmitter audio.



LINK TX AUDIO OUTPUT

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6.0 LOGIC INTERFACING & OPERATION

The logic connections of the UAI-10 may require some special attention depending on the type of controller the UAI-10 audio interface will be used with. The DTMF MUTE, AUX OUTPUT (LINK MUTE) and REPEATER COS inputs were designed to be used with the SRC-10 repeater controller with no modifications. If a controller of other manufacture is used, the following guidelines should be heeded.

6.1 REPEATER COS SIGNAL INPUT

The Repeater COS (Carrier Operated Switch) Signal is produced by a circuit in your repeater receiver. It is connected to pin #7 on the UAI-10 interface connector P1. This input can be configured to activate with either a high or low signal.

The UAI-10 Repeater COS Signal is designed to operate with an active high Repeater COS Signal (greater than 3 volts in the active state) or an active low Repeater COS Signal (approximately ground or 0 volts in the active state). The only requirements on the Repeater COS Signal are that the voltage levels mentioned above be adhered to, the Repeater COS Signal input must not be allowed to float, and the Repeater COS Signal itself must have a relatively quick risetime. See Figure 6-1 for some representative Repeater COS Signal input circuits.

The input desired is achieved by jumpering the correct combination on the user programmable input header J2 (Figure 6-2). For a high input voltage, jumper header (J2) to the "B" position (the center jumper pin and the pin farthest away from P1). In this configuration, a voltage from +3 to 15 volts is acceptable, with the logic threshold between 2 and 3 volts. Inputs less than 3 volts may or may not trigger the input. For a low input, jumper header (J2) to the "A" position (the center jumper pin and the pin closest to P1). Here the signal needs to be a low (ground) to activate the logic.

If you are not sure at which level your receiver COS operates, measure the voltage at the receive COS output with the receiver squelch open.

COS Input Circuits

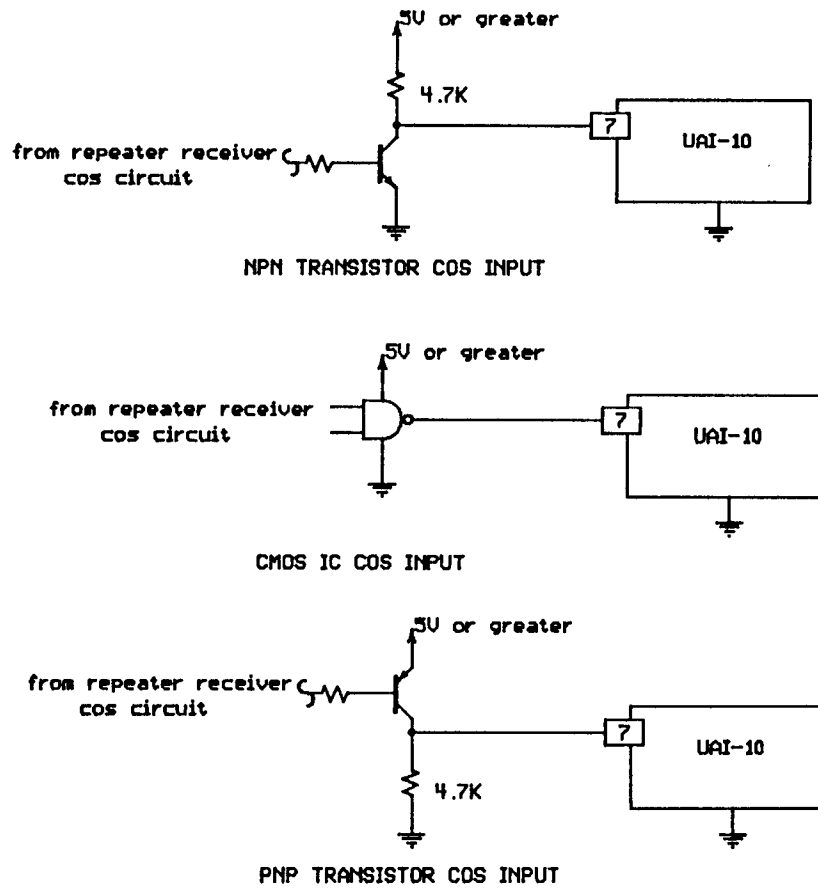


Figure 6-1

Programmable COS Jumper

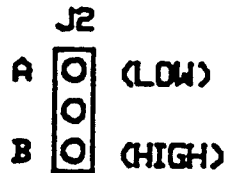


Figure 6-2

6.2 DTMF MUTE SIGNAL INPUT

The DTMF Mute signal is provided by the repeater controller and is connected to pin #6 on the interface connector P1. An active low (ground) is required to activate this function. Whenever the input is activated, the repeater receive audio is muted so that no DTMF tones are present at the repeater transmit output.

The DTMF Mute input is enabled when pulled low (ground) and is designed to be used with an open collector transistor, open drain power FET, or integrated circuit which has outputs utilizing these type devices. If another logic family is used to drive this input it MUST, in the high state (+V), swing to a minimum of $2/3$ the voltage used to power the UAI-10 audio interface which is connected to pins #1 and #2 of the UAI-10 interface connector. The users controller may have a much higher high state (+V) voltage than $2/3$ the voltage used to power the UAI-10 audio interface on an output designated to drive the UAI-10 DTMF Mute input but never must the voltage be lower. Also, the voltage must be lower than $1/3$ of the UAI-10 power supply voltage when in the low (ground) state. Usually, the simplest, safest, and most effective solution will be to add an npn transistor to the line controlling the UAI-10 DTMF Mute input as depicted in Figure 6-3.) Again, if the UAI-10 audio interface is to be used with the SRC-10 repeater controller, no modifications are required and the system can be connected as shown in the system block diagram.

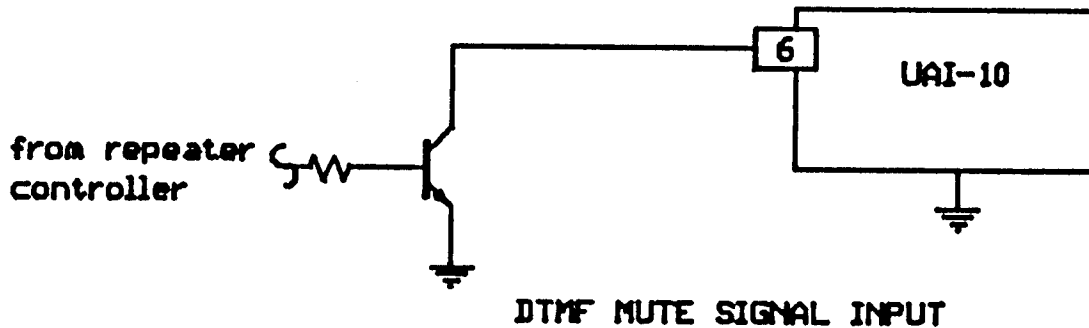


Figure 6-3

For the Link TX audio output, DTMF muting is selectable so that the DTMF tones from the repeater receiver are muted or passed through to the link transmit audio output. The desired operation is achieved by jumpering the correct combination on the user programmable header J1 (Figure 6-4). For Link DTMF Mute, jumper the header (J1) to position "A" (the center jumper pin and the pin nearest P1). For the DTMF tones to appear at the link transmit audio output, jumper header (J1) to position "B" (the center jumper pin and the pin farthest away from P1).

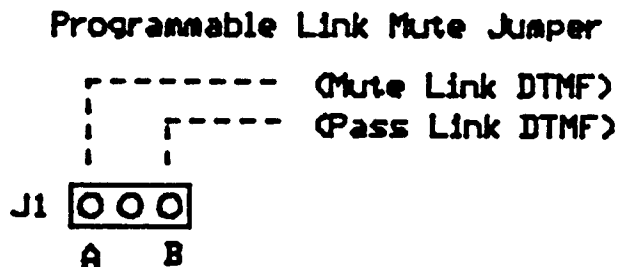


Figure 6-4

6.3 AUXILIARY FUNCTION SIGNAL INPUT

The Auxiliary Function signal originating from your repeater controller is connected to pin #5 on the interface connector P1. When enabled, the link receive audio will be completely muted from the Repeater transmitter audio output whenever the Repeater COS input is active. In normal repeater operation, the Link RX audio is passed through to the repeater TX audio output with no attenuation.

The Auxiliary Function input is enabled when pulled low (ground) and is designed to be used with an open collector transistor, open drain power FET, or integrated circuit which has outputs utilizing these type devices. If another logic family is used to drive this input it MUST, in the high state (+V), swing to a minimum of 2/3 the voltage used to power the UAI-10 audio interface which is connected to pins #1 and #2 of the UAI-10 interface connector. The users controller may have a much higher high state (+V) voltage than 2/3 the voltage used to power the UAI-10 audio interface on an output designated to drive the UAI-10 Auxiliary Function input but never must the voltage be lower. Also, the voltage must be lower than 1/3 of the UAI-10 power supply voltage when in the low (ground) state. Usually, the simplest, safest, and most effective solution will be to add an npn transistor to the line controlling the UAI-10 Auxiliary Function input as depicted in Figure 6-5.) Again, if the UAI-10 audio interface is to be used with the SRC-10 repeater controller, no modifications are required and the system can be connected as shown in the system block diagram.

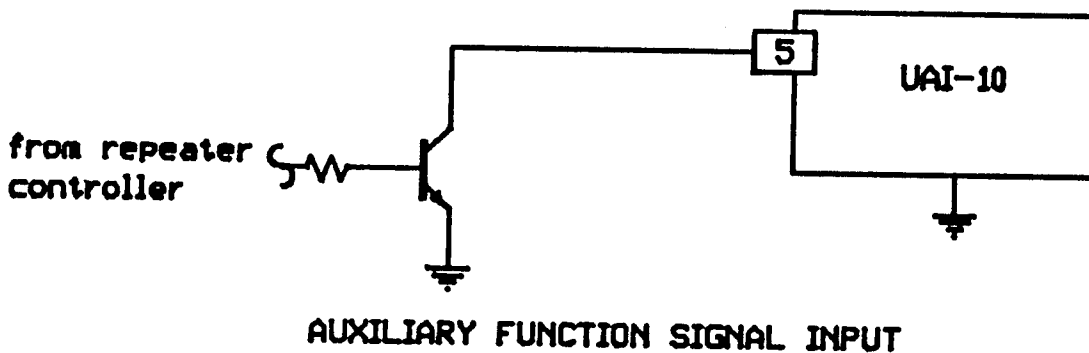


Figure 6-5

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7.0 ADJUSTMENTS

The UAI-10 is an audio mixer for your DTMF decoder, repeater and link transmitters. It features mixed and muted audio from the repeater, link and control receiver, a CW/Tone input, plus an auxiliary input. The most effective way to balance the levels of the various sources into the UAI-10, is to monitor the inputs with a scope, looking at the average peak levels.

The following adjustment procedure was prepared as basic guide lines in interfacing repeater audio. By no means is it the only way to equalize your repeater audio system. Certain adjustments may differ from what is stated in this manual to obtain the correct audio level and quality desired.

7.1 Repeater TX Audio (R3)

First of all, make sure that the proper deviation and peak limiting adjustments have been made at the repeater transmitter independent of all the UAI-10 adjustments.

While monitoring normal audio output from your repeater receiver, adjust the audio for approximately .75 volts peak to peak at pin #11 on the interface connector P1 as measured with an oscilloscope. This adjustment from your repeater receiver ensures a low noise level and that clipping does not occur in the input stages of the audio mixer.

After the repeater receiver has been set, adjust R3 for the proper audio level output from the repeater transmitter. Clock-wise generates maximum level out, while counter clock-wise provides minimum output. No other interface circuitry is necessary between the repeater audio input and the output from the UAI-10.

7.2 Link TX Audio (R2)

Again, make sure that the proper deviation and peak limiting adjustments at the link transmitter have been made, independent of all the UAI-10 adjustments.

After the repeater transmitter level has been set, adjust R2 for the proper audio level output from the link transmitter. Clock-wise generates maximum level out, while counter clock-wise provides minimum output.

7.3 DTMF Audio (R1)

With the repeater's receiver audio set, adjust R1 for the proper audio level output to the DTMF decoder, approximately 1 volt peak to peak. Clock-wise generates maximum level out, while counter clock-wise provides minimum output. No other interface circuitry is necessary between the DTMF decoder input and the output from the UAI-10.

7.4 Monitor-Mix (R4)

The monitor-mix audio is adjustable so that the link receive audio leaving the repeater transmitter can be full volume with R4 adjusted all the way counter clock-wise. Adjust R4 all the way clock-wise for minimum audio level of approximately 1/6 of the full audio signal level.

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8.0 SERVICE

8.1 TROUBLESHOOTING

Because the UAI-10 is designed with quality components, a component failure that would take the unit out of service is unlikely. The only maintenance recommended is that the interface connector be checked periodically for any broken or frayed connections.

If the UAI-10 fails to operate specific input or output functions, ensure that the COS and Link Mute Jumpers are installed correctly and that there are no hot components or IC's. If operation totally fails, check to see if the input voltage is adequate. Since all IC's are socketed, troubleshooting and repair should be moderately easy. A general checklist to follow is as follows:

- * Input voltage between 8 and 15VDC
- * All grounds connected
- * IC's seated in sockets
- * Interface connector firmly connected
- * No hot components
- * COS inputs operating correctly
- * COS an Link jumpers correctly installed

8.2 REPAIR SERVICE

If your UAI-10 needs to be returned for repair, contact the factory before shipping so that a Repair Authorization Number (RA#) can be issued. This will help keep track of your board and speed repair time. Please include a letter explaining the problem in detail, along with your name, callsign, address and phone number.

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9.0 SYSTEM BLOCK DIAGRAM

TYPICAL REPEATER CONNECTION

