AUDIO CONTROL CARD

MOUNTAIN TOP RADIO REPEATER

MT 2 SERIES

INSTRUCTION MANUAL SECTION 5
Issue 02 August 1988

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MT 2 REPEATER SYSTEM - AUDIO CONTROL CARD

GENERAL DESCRIPTION

This section provides circuit description, installation procedures and basic test information for the Daniels Electronics Ltd. Audio Control Card.

The audio control card performs several functions:

1. 600r input/output circuitry.
2. Islolated, non interactive and independent audio controls for wide audio levels.
3. Switched audio routing.
4. Complete C.O.R and P.T.T programming for repeater control switching.

SPECIFICATIONS

Audio Control Card

Type:	Model AC-1 audio bridging, programming and interface card.
Power Requirements:	+7.0 VDC to +9.5 VDC @ 25 mA Nominal
Temperature Range:	-40°C to +60°C, 95% R.H.
Audio:	i/p levels -30 dBm to 0 dBm.o/p levels -20 dBm to +10 dBm. Terminations 600 r Response: Flat, +0, -1 dB 300Hz - 3kHz Distortion < 0.5% THD @ 1 kHz
Control Functions:	Diode internal programming for complete P.T.T., C.O.R., MUTE and related internal connections for the MT-2 series repeater.

Theory of Operation Audio Control Card (Schematic 43-882910)

Audio Circuitry

Four op-amps (U1A, U1B, U1C AND U1D) along with their peripheral components make up the audio bridge. U1A and U1B provide unity gain, their outputs branch to independent gain controlled amplifies U1C and U1D respectively.

U3 provides independent gain control from U1A and mixes the switched o/p from U1D.

U4 provides independant gain control from U1B and mixes the switched o/p from U1C.

All audio controls can be adjusted independently without audio interaction for the appropriate drop and link levels.

NOTE: "Drop or Link" controls are not designated on the schematic as the position of the receivers and transmitters may vary in the MT-2 series rack.

The o/p of U3 feeds to T1 a 600 r balanced transformer to the appropriate transmitter.

The o/p of U4 feeds to T2 a 600 r balanced transformer to the appropriate transmitter.

JU1 A/B enables/disables the audio bridging to U4 and to System A transmitter.

JU2 A/B enables/disables the audio bridging to U3 and to System B transmitter.

NOTE: The nominal current of the audio control card is 25mA, the VR-2 and VR-2 Receivers have an audio power amplifier configured on their outputs, these devices are not necessary when used with the audio control card. This will allow a current reduction of ≈10mA if they are disabled. Two jumpers and a 5k r pot can be installed on the receivers to re-route the audio and take advantage of the current saving. U2A is used to generate the d.c. offset reference voltage.

Repeater Control Circuitry

PTT control diodes CR1, CR2, CR3, and CR4 allow selection of the repeater site operation drop/link etc, by enabling the transmitters directly from the C.O.R. receiver o/p. The C.O.R. output can pull down a 600 r load to 0.1 VDC at -40°C (worst case) supply voltage +17 VDC.

JU3 and JU4 program shunts allow independent selection of System A internal receiver muting and/or System B, internal receiver muting.

JU5 and JU6 program shunts allow independent selection of System A receiver hysteresis overide and/or System B, internal receiver muting.

ALIGNMENT PROCEDURE AND INSTALLATION

Equipment List

Multimeter Fluke 8050
Communications Test Set, Marconi 2905
Control Card Test Adapter, Daniels 43-883010

General

Note: If your MT-2 series repeater uses the wired AUX. plug in control connector and you are installing the Audio Control Card you may remove the plug in connector and program all the control functions on the new card.

Use the Control Card Test Adapter and cable to access the audio PCB controls. Power the repeater site (+13.8 VDC).

Verify the PTT programming diodes are installed for the desired C.O.R to PTT enabling ie: drop link (see below).

Select J5 A/B and J6 A/B for the desired audio routing switch.

NOTE: When the MT-2 series rack is configured with the VHF TX/RX in rack slots 8, 22 and the UHF TX/RX in rack slots 36 and 50 the following logic applies:

Slot -	8	22	36	50	64
RF Module -	VHF TX	VHF RX	UHF TX	UHF RX	P.S.
	A System		B System		

1. Install CR4, CR1 and CR2 for drop/link operation

2. J5 A installed (audio enabled).

3. J6 B installed (audio disabled).

Apply a -70 dBm RF signal to the VHF receiver (A System) @ 1 kHz Tone @ 3 kHz deviation. With the transmitters connected, monitor F.M. deviation. Set R16 for 3 kHz deviation on the VHF TX and Set R20 for 3 kHz deviation on the UHF TX.

Disconnect the VHF RX input signal and apply a -70 dBm RF signal to the UHF receiver (B System) @ 1 kHz Tone @ 3 kHz deviation. With the VHF transmitter connected, monitor F.M. deviation. Set R26 for 3 kHz deviation.

AUDIO CONTROL CARD

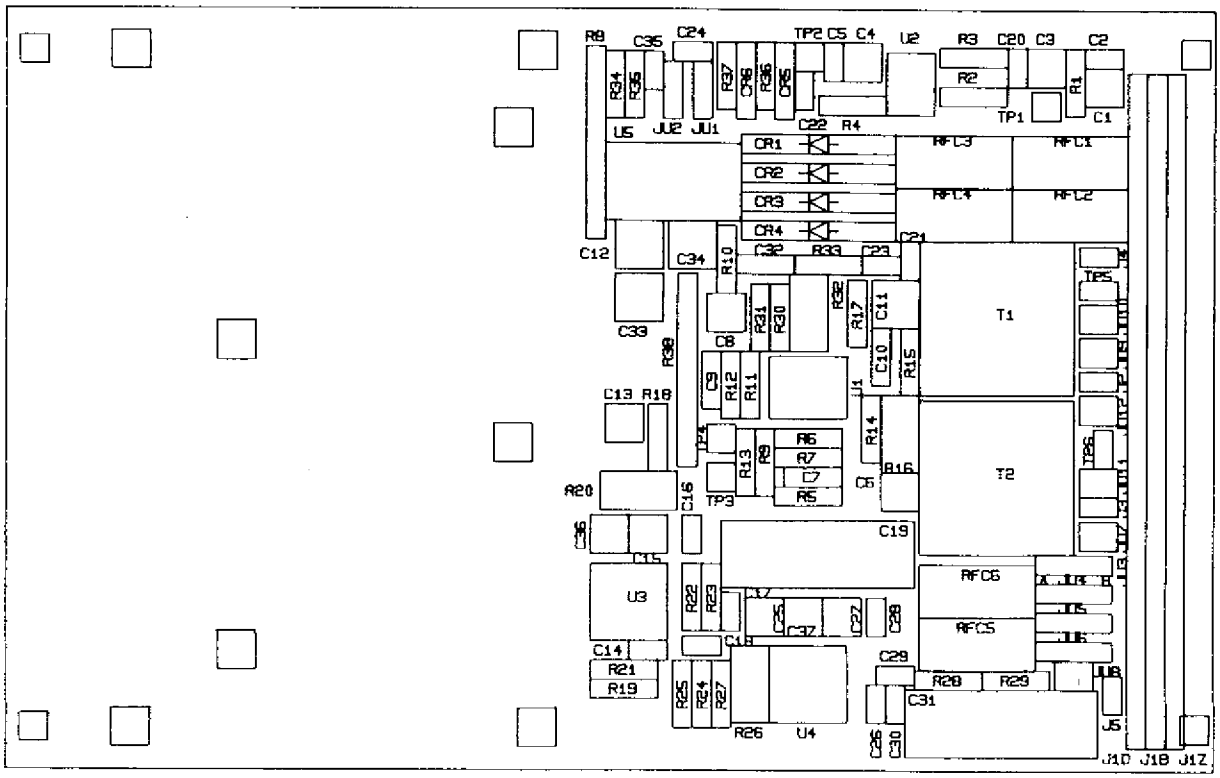
Pin Designations

Aux Control and Main Control Connector Pin Designations

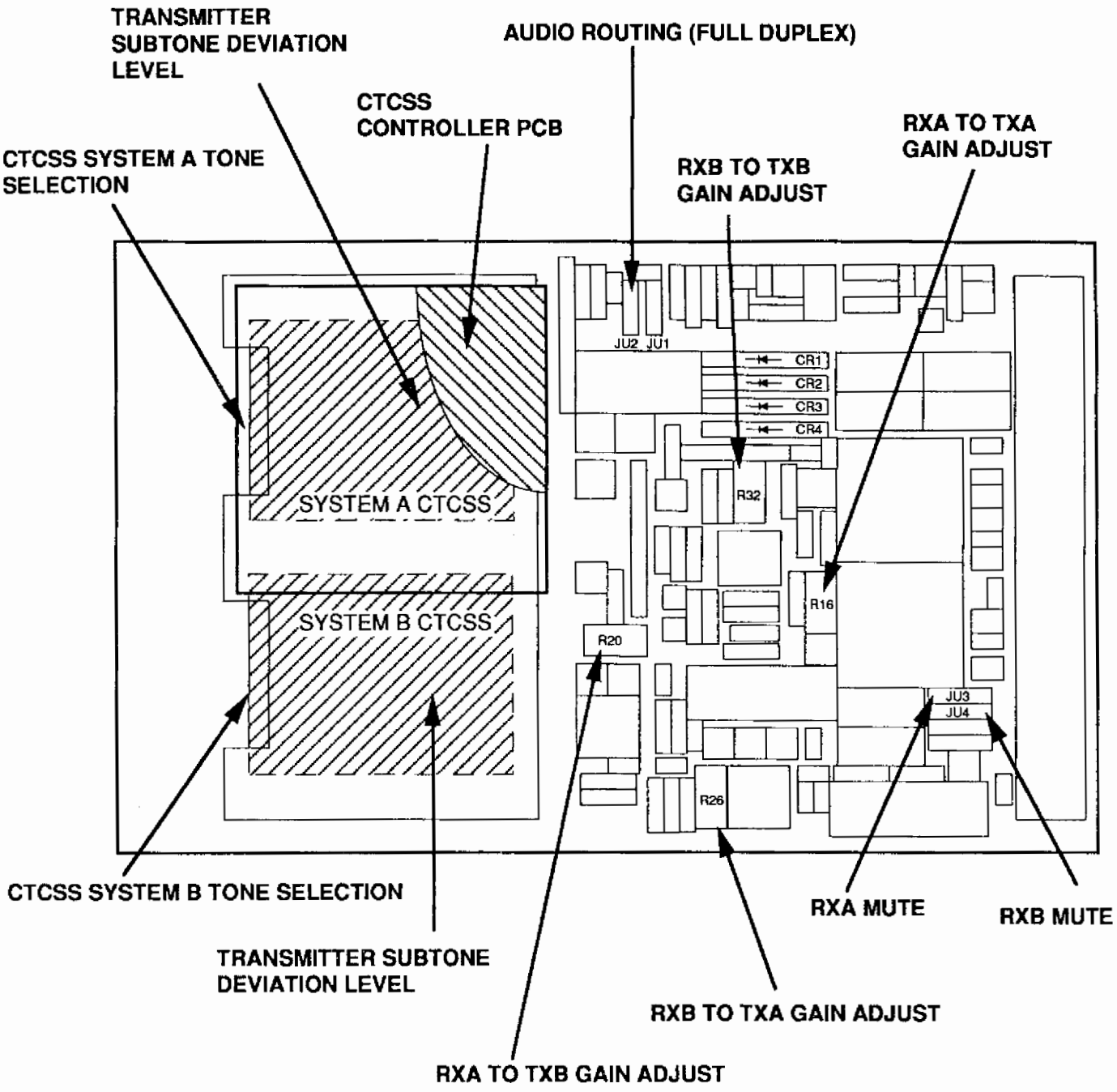
Pin Number	Name	Function
B2, Z2, B32, Z32,	GND	Circuit common
B4, Z4	+9.5 VDC	+9.5 VDC regulated
D2	VSWR	System monitor power sense
D4	VSWR	System monitor power sense
B6	P.T.T.	P.T.T. with a time-out Tx A
Z6	P.T.T.	P.T.T. with a time-out Tx B
D6	Back-up override	A system, B system override
B8	C.O.R. Rx A	Carrier operated relay non-isolated
Z8	C.O.R. Rx B	Carrier operated relay non-isolated
D8	P.T.T.	P.T.T. no time-out
Z10	Back-up alarm	Sense module failure
B10	RXA CTCSS O/P	Unprocessed recovered audio
D10	RXA CTCSS SW	Squelch override
B12	RXA C.O.R. relay (Isolated)	Isolated carrier operated (Opt.)
Z12 relay	RXA C.O.R. (Isolated)	Isolated carrier operated (Opt.)
D12	RXA flat audio	Flat audio O/P, unbal, squelched (Opt.)
B14	A/B-System +9.5 VDC	B System enable
Z14	B/A-System +9.5 VDC	A System enable
D14	RXB De-emp audio	De-emp. audio O/P unbalanced, squelched
B16	TXB Subtone I/P	Subtone I/P, no limiting
Z16	Spare	
D16	TXB line	600 ohm balanced I/P
Z18	TXB line	600 ohm balanced I/P
D18	TXA line	600 ohm balanced I/P
B18	TXA line	600 ohm balanced I/P
B20	TXA TONE/DIGITAL/I/P	Data I/P, Aux Voice I/P (Opt.)
D20	TXB TONE/DIGITAL/I/P	Data I/P, Aux Voice I/P (Opt.)
D22	TXA Subtone I/P	Subtone I/P, no limiting
B22	RXA Mute	RXB audio kill
Z22	RXA De-emp audio	De-emp. audio O/P unbalanced, squelched
D24	RXA Hysteresis	I.F. gain override
B24	RXA line	600 ohm balanced O/P
Z24	RXA line	600 ohm balanced O/P

D26	RXB Hysteresis	I.F. gain override
B26	RXB CTCSS SW	Squelch override
Z26	RXB Mute	RXA audio kill
D28	RXB CTCSS O/P	Unprocessed recovered audio
B28	RXB C.O.R. (isolated)	Isolated carrier operated squelch (Opt.)
Z28	RXB C.O.R. (isolated)	Isolated carrier operated squelch (Opt.)
D30	RXB line	600 ohm balanced O/P
B30	RXB line	600 ohm balanced O/P
Z30	RXB flat audio	Flat audio O/P unbal, squelched (Opt.)
D32	Spare	System Monitor B28, Z28

Illustrations And Schematic Diagrams
Component layout - Audio Control Card
Figure 5-1



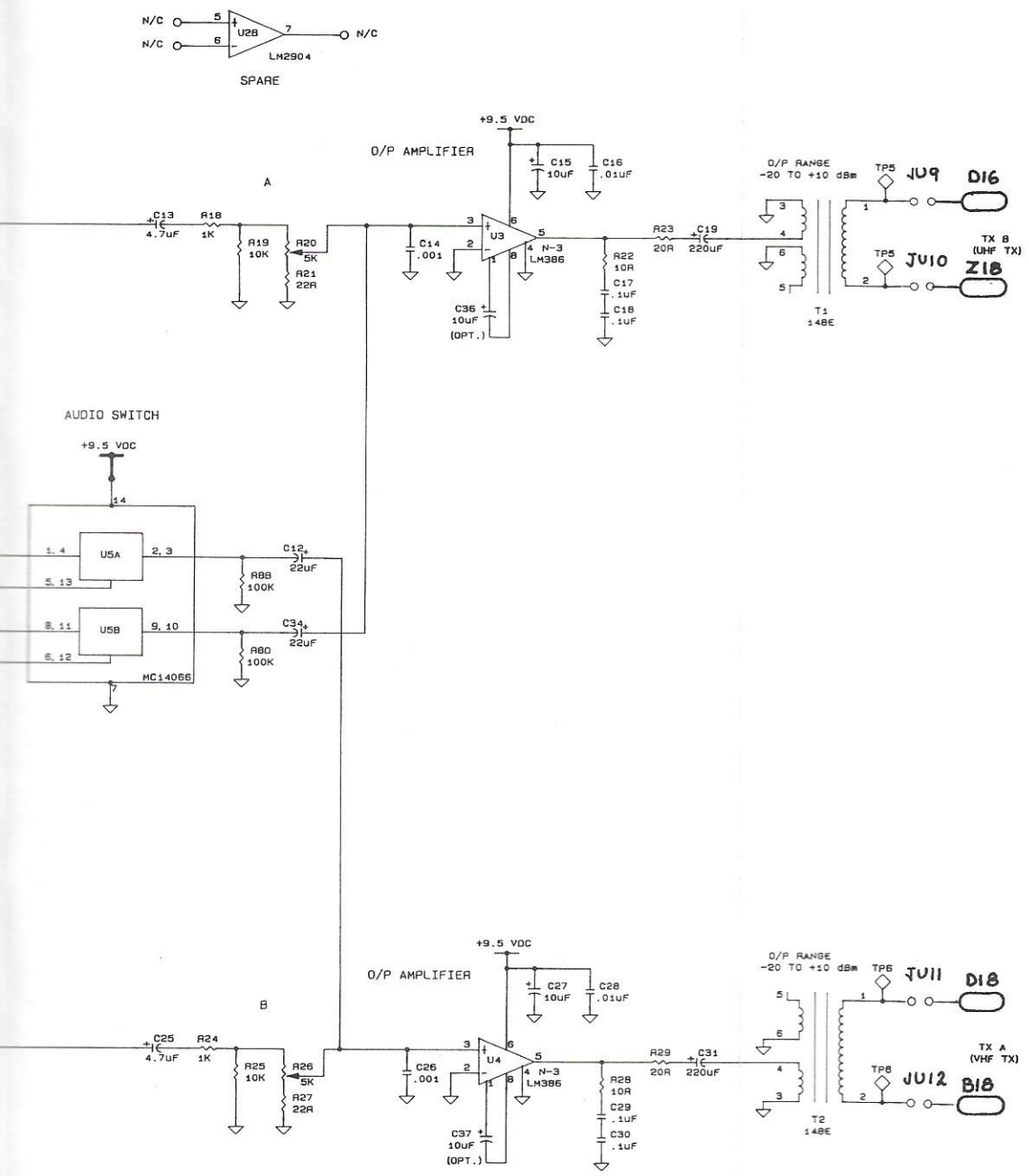
COMPONENT LAYOUT - AUDIO CONTROL CARD



C.O.R. / P.T.T. DIODE SELECTION

CR1 CORB / PTTA
CR2 CORA / PTTA
CR3 CORB / PTTB
CR4 CORA / PTTB

Audio Control Card
Schematic Diagram 43-882910S
Figure 5-2



NOTES :
1) ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE SPECIFIED.
2) ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3) R8 AND R38 ARE SIP RESISTORS.
4) APPLIES ONLY WHEN R.F. MODULES ARE INSTALLED IN RACK AS FOLLOWS:
VHF TX SLOT 8
VHF RX SLOT 22
UHF TX SLOT 36
UHF RX SLOT 50

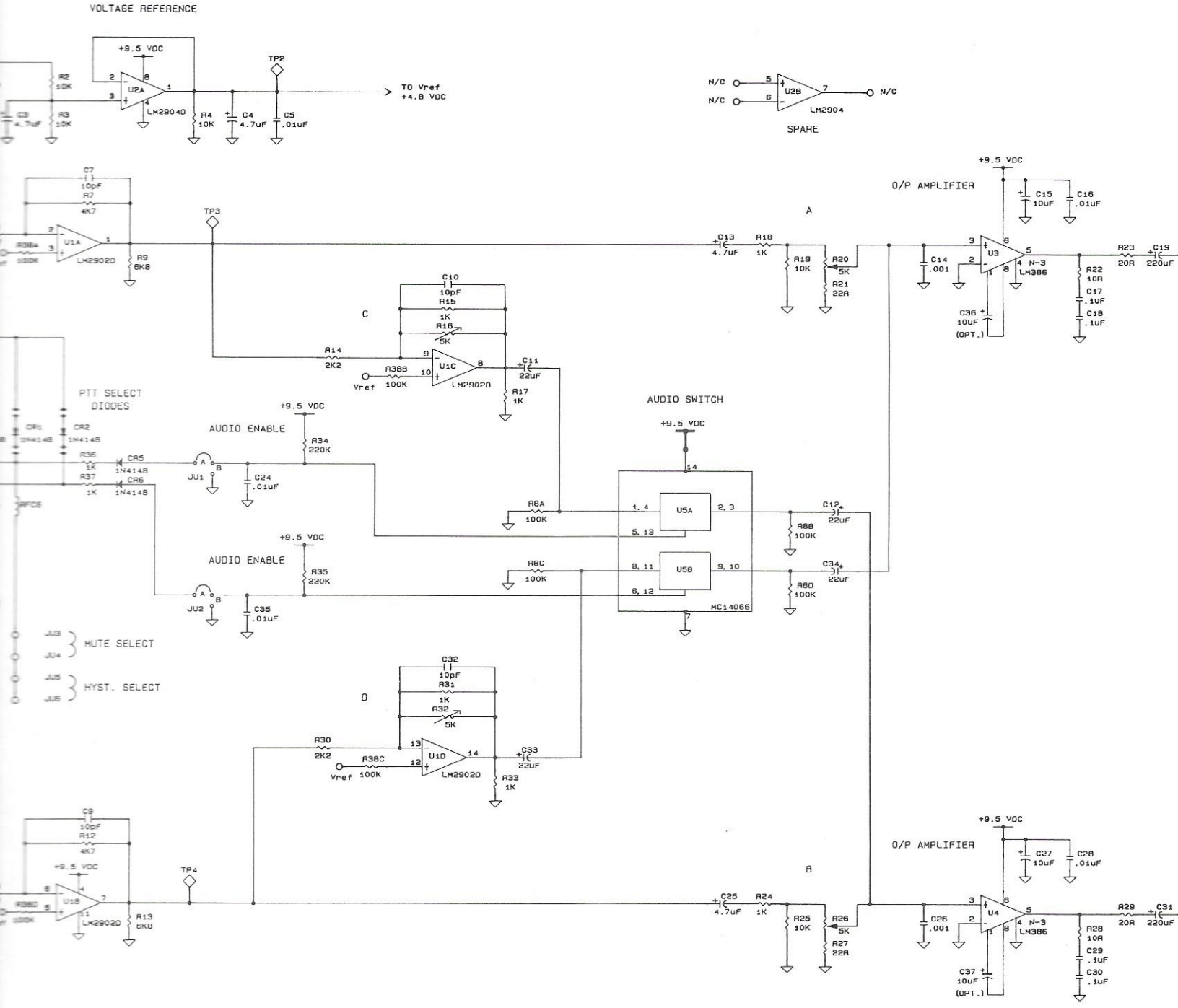
NOTE 4	PROGRAMMING DIODES
	UHF RX ENABLES VHF TX
	VHF RX ENABLES VHF TX
	UHF RX ENABLES UHF TX
	VHF RX ENABLES UHF TX

	JUMPER FUNCTONS	
	A	C.O.R. B ENABLE
	B	U5A DISABLE
	A	C.O.R. A ENABLE
	B	U5B DISABLE
	A	C.O.R. A TO MUTE A ENABLE
	B	C.O.R. B TO MUTE A ENABLE
	A	C.O.R. A TO MUTE B ENABLE
	B	C.O.R. B TO MUTE B ENABLE
	A	C.O.R. A TO HYST. A ENABLE
	B	C.O.R. B TO HYST. A ENABLE
	A	C.O.R. A TO HYST. B ENABLE
	B	C.O.R. B TO HYST. B ENABLE

HIGHEST REFERENCE DESIGNATORS		
R38	C37	CR6
RFC8	U5	JU12
TP6	T2	

REFERENCE DESIGNATORS NOT USED		

DANIELS ELECTRONICS LTD.	43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: AUDIO CONTROL CARD VHF/UHF		
DRAWN KPG	DATE 25/07/88	DRAWING# 43-882910
CHECKED	APPROVED	



NOTES :
1) ALL RESIST
UNLESS OTH
2) ALL CAPAC
UNLESS OT
3) R8 AND R3
4) APPLIES O
INSTALLED

DESCRIPTION

TP	LEVEL	FUNCTION
TP1	+9.5 VDC	I/P POWER
TP2	+4.8 VDC	D.C. OFFSET
TP3	SET IN RX.	RX A AUDIO
TP4	SET IN RX.	RX B AUDIO
TP5	USER DEF.	TX B BAL. 600R AUDIO
TP6	USER DEF.	TX A BAL. 600R AUDIO

* NOTE 4

PROGRAMMING DIODES	
CR1	UHF RX ENABLES VHF TX
CR2	VHF RX ENABLES VHF TX
CR3	UHF RX ENABLES UHF TX
CR4	VHF RX ENABLES UHF TX

JUMPER FUNCTONS		
JU1	A	C.O.R. B ENABLE
	B	U5A DISABLE
JU2	A	C.O.R. A ENABLE
	B	U5B DISABLE
JU3	A	C.O.R. A TO MUTE A ENABLE
	B	C.O.R. B TO MUTE A ENABLE
JU4	A	C.O.R. A TO MUTE B ENABLE
	B	C.O.R. B TO MUTE B ENABLE
JU5	A	C.O.R. A TO HYST. A ENABLE
	B	C.O.R. B TO HYST. A ENABLE
JU6	A	C.O.R. A TO HYST. B ENABLE
	B	C.O.R. B TO HYST. B ENABLE

HIGHEST REFERENCE DESIGNATORS		
R38	C37	CR6
RFC6	U5	JU12
TP6	T2	

REFERENCE DESIGNATORS NOT USED		

DANIELS ELECTRON

TITLE: AUDIO

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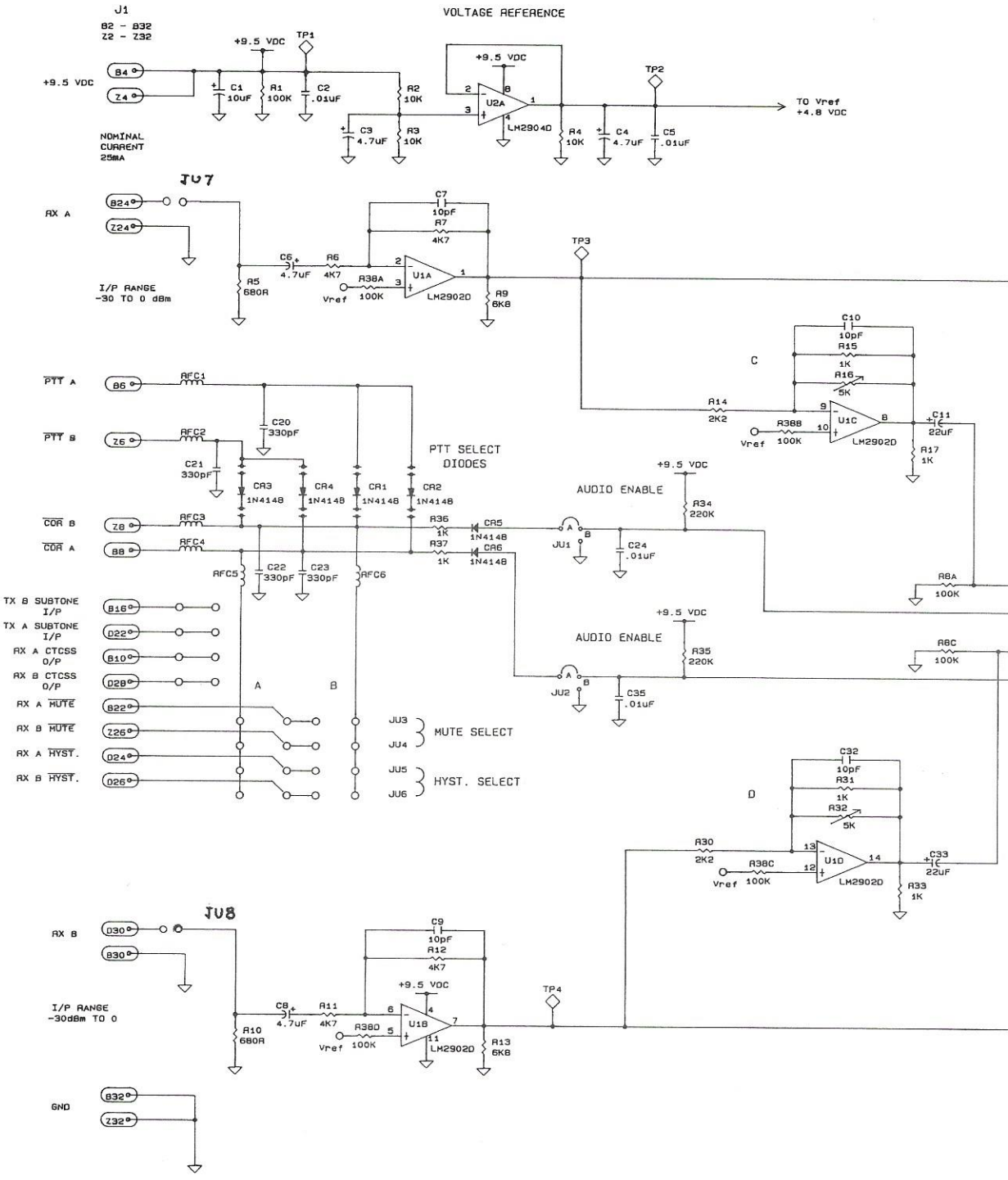

DATE	CODE	REV	APP	DESCRIPTION

TP	LEVEL	FUNCTION
TP1	+9.5 VDC	I/P POWER
TP2	+4.8 VDC	D.C. OFFSET
TP3	SET IN RX.	RX A AUDIO
TP4	SET IN RX.	RX B AUDIO
TP5	USER DEF.	TX B BAL. 600R AUDIO
TP6	USER DEF.	TX A BAL. 600R AUDIO

PARTS LIST - AUDIO CONTROL CARD

Main Circuit Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, 10uF TANT. DIP 20% 25V	14-1061	5
C2	CAP, .01uF CER 80-20% 63V	05-1032	6
C3	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C4	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C5	CAP, .01uF CER 80-20% 63V	05-1032	6
C6	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C7	CAP, 10pF CER 2% 100V NPO	05-1006	4
C8	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C9	CAP, 10pF CER 2% 100V NPO	05-1006	4
C10	CAP, 10pF CER 2% 100V NPO	05-1006	4
C11	CAP, 22uF TANT DIP 20% 20V	14-2262	4
C12	CAP, 22uF TANT DIP 20% 20V	14-2262	4
C13	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C14	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	2
C15	CAP, 10uF TANT. DIP 20% 25V	14-1061	5
C16	CAP, .01uF CER 80-20% 63V	05-1032	6
C17	CAP, .1uF POLYFILM 10% 50V	11-1040	4
C18	CAP, .1uF POLYFILM 10% 50V	11-1040	4
C19	CAP, 220uF ELECTR. 16V	07-2213	2
C20	CAP, 330pF MONO 10% 200V	10-3312	4
C21	CAP, 330pF MONO 10% 200V	10-3312	4
C22	CAP, 330pF MONO 10% 200V	10-3312	4
C23	CAP, 330pF MONO 10% 200V	10-3312	4
C24	CAP, .01uF CER 80-20% 63V	05-1032	6
C25	CAP, 4u7 TANT. DIP 10% 35V	14-4751	6
C27	CAP, 10uF TANT. DIP 20% 25V	14-1061	5
C28	CAP, .01uF CER 80-20% 63V	05-1032	6
C29	CAP, .1uF POLYFILM 10% 50V	11-1040	4
C30	CAP, .1uF POLYFILM 10% 50V	11-1040	4
C31	CAP, 220uF ELECTR. 16V	07-2213	2
C32	CAP, 10pF CER 2% 100V NPO	05-1006	4
C33	CAP, 22uF TANT DIP 20% 20V	14-2262	4
C34	CAP, 22uF TANT DIP 20% 20V	14-2262	4
C35	CAP, .01uF CER 80-20% 63V	05-1032	6
C36	CAP, 10uF TANT. DIP 20% 25V	14-1061	5
C37	CAP, 10uF TANT. DIP 20% 25V	14-1061	5
CR1	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
CR4	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
CR5	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
CR6	DIODE, 1N4148, SILCON, VR=75V	60-4148	6
J1	CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
R1	RES, 100K 0.5W 5% STD M FLM	56-0104	1
R2	RES, 10K 0.5W 5% STD M FLM	56-0103	5

R3	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R4	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R5	RES, 680R 0.5W 5% STD M FLM	56-0681	2
R6	RES, 4K7 0.5W 5% STD M FLM	56-0472	4
R7	RES, 4K7 0.5W 5% STD M FLM	56-0472	4
R8	RES, SIP, 100K, +/-2%, 10 PIN, #1 COMM	54-1041	2
R9	RES, 6K8 0.5W 5% STD M FLM	56-0682	2
R10	RES, 680R 0.5W 5% STD M FLM	56-0681	2
R11	RES, 4K7 0.5W 5% STD M FLM	56-0472	4
R12	RES, 4K7 0.5W 5% STD M FLM	56-0472	4
R13	RES, 6K8 0.5W 5% STD M FLM	56-0682	2
R14	RES, 2K2 0.5W 5% STD M FLM	56-0222	2
R15	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R16	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	4
R17	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R18	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R20	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	4
R21	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R22	RES, 10R 0.5W 5% STD M FLM	56-0100	2
R23	RES, 20R 0.5W 5% STD M FLM	56-0200	2
R24	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R25	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R26	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	4
R27	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R28	RES, 10R 0.5W 5% STD M FLM	56-0100	2
R29	RES, 20R 0.5W 5% STD M FLM	56-0200	2
R30	RES, 2K2 0.5W 5% STD M FLM	56-0222	2
R31	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R32	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	4
R33	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R34	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R35	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R36	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R37	RES, 1K 0.5W 5% STD M FLM	56-0102	8
R38	RES, SIP, 100K, +/-2%, 10 PIN, #1 COMM	54-1041	2
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
RFC2	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
RFC3	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
RFC4	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
RFC5	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
RFC6	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	6
T1	TRANSFORMER, AUDIO	73-0148	2
T2	TRANSFORMER, AUDIO	73-0148	2
U1	I.C. LM2902D, OP AMP, QUAD, SO-14	28-2902	1
U2	I.C. LM2904D, OP AMP, DUAL, SO-8	28-2904	1
U3	I.C. LM386N-3, AUDIO AMP, 8 PIN DIP	28-0386	2
U4	I.C. LM386N-3, AUDIO AMP, 8 PIN DIP	28-0386	2
U5	I.C. MC14066,QUAD ANALOG SW.,14 PIN DIP	28-4067	1