

DANIELS ELECTRONICS LTD

**MOUNTAIN TOP
REPEATER**

MT-2 SERIES

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VHF MOUNTAIN TOP RADIO REPEATER

MT 2 SERIES

INSTRUCTION MANUAL SECTION 1
Issue 03 August 1988

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MT 2 REPEATER SYSTEM

GENERAL DESCRIPTION

The MT 2 repeater system is a VHF/UHF radio system which is characterized by high performance and reliability under the most severe environmental conditions. The total system is designed to provide dependable, low maintenance performance, even in the most difficult circumstances.

The MT 2 series of modules are packaged in the compact Eurostandard (5"h x 2.8"w x 7.5"d) housing, and are robustly designed for mountain top or transportable applications. All of the modules use high reliability components and each is accompanied with a complete operational and environmental Test Report on delivery.

Because the MT 2 repeater is specifically designed to deliver high performance under adverse conditions, extensive environmental testing is conducted over the temperature range -40° C to +60° C and the performance measured to ensure compliance with the design specifications and the Canadian Department of Communications (DOC) Radio Standards Specification (RSS 119). In addition, voltage stress/testing is done over the range of +10 to +17 Volts DC which is followed by a 24 hour burn-in.

SPECIFICATIONS

General Technical Specifications

Type: MT 2 series modularized VHF radio repeater plug-in RF units.
VHF Rx Model VR 2, VHF Tx Model VT 2

Frequency Ranges: 138-150Mhz, 150-162MHz, 162-174MHz

Modulation: 16K0F3EJN (Frequency Modulation)

Number of Channels: One

Channel Spacing: 25 kHz standard

Frequency Stability: ± 5 ppm -40°C to $+60^{\circ}\text{C}$ standard

Operating Temperature: -40°C to $+60^{\circ}\text{C}$

Humidity: up to 90% R.H. at 25°C

Antenna Impedance: 50 ohm

Antenna Connector: Type N standard

Supply Voltage: +13.8 VDC nominal (neg. gnd) operating range 10-17 VDC. (other voltages consult factory).

Supply Current: Total single station - receiver and transmitter inactive < 0.035A. Total single station-receiver and transmitter active < 1.35A.

Supply Protection: Reverse polarity, secondary transient protection.

Lightening Protection: Secondary protection provided with ferrite filtering and 'Transorb' protective device on each external connection . For optional glass encapsulated spark gap protection consult factory.

General Physical Specifications

- Size and Mounting:** Eurocard compatible, modular design, assembly comprises labeled plug-in modules, interchangeability for test and repair is facilitated. Shelf assembly is marked to show location of all included modules. Standard 19" rack assembly, optional enclosures and mounting available consult factory.
- Corrosion Prevention:** Anodized aluminum construction. Stainless Steel Hardware. Conformal Coated Glass Epoxy Printed Circuit Boards. Gold plated connectors.
- Test Points:** Test and adjustment points clearly marked for identification. An optional card extender is available for in-service tests and adjustments.
- External Connections:** RF connections made with type 'N' connector located on front panel. Audio, power and control connections made on the rear 'Mother Board' assembly.

Transmitter Specifications - VHF

R.F. Power Output: Adjustable 0.5 to 4.0 watt (continuous)

Frequency Range: 138 - 150Mhz, 150 - 162MHz, 162 - 174MHz

Duty Cycle: 100% at +60°C ambient

Spurious Emissions: -80 dB

Deviation: Preset to ± 3 kHz (capable ± 5 kHz)

Frequency Stability: ± 5 ppm -40°C to +60°C

Microphone Type: Low Impedance Transistor Dynamic Microphone,
for other types consult factory

Audio Input: Balanced 600 ohm or unbalanced (optional)

Audio Response: ± 1 dB 300Hz - 3KHz pre-emphasis

Audio Distortion: < 1.0% THD @ 1kHz @ 3KHz
deviation -40°C to +60°C.

Time-out: Selectable 5 min. ± 1 min.

Hot Standby: Selectable for data transmission

DOC Type Approval: VT-2 142 193 297C LAND
VT-2 142 821 545L MARINE

FCC Type Approval: H4JVT-2

Receiver Specifications - VHF

Type: Double conversion super-heterodyne, double balanced mixer / High Q, temperature compensated helical resonator preselector.

Frequency Range: 138 - 150MHz, 150 - 162MHz, 162 - 174MHz

Sensitivity: 0.2 uV for 12dB SINAD

Squelch: 0.15uV

Selectivity: < - 80 dB

First I.F.: 21.4MHz/ 8 pole filter

Second I.F.: 455KHz/ 6 pole filter

Spurious Response: - 85 dB

Intermodulation: - 70 dB

Frequency Stability: ± 5 ppm -40°C to $+60^{\circ}\text{C}$ AFC tracking optional

Audio Output: 600 ohm balanced line or optional unbalanced.
Flat response output, -6dBm @ 1KHz @ 3KHz deviation $\pm 1\text{dB}$ 100Hz-3KHz.
De-emphasis output, -12dBm @ 1KHz @ 3KHz deviation $\pm 1\text{dB}$ 300Hz-3KHz.

Audio Distortion: $< 2.5\%$ THD @ 1KHz tone @ 3KHz deviation -20°C to 60°C $< 3.5\%$ -40°C to $+60^{\circ}\text{C}$

Current Drain: Normal programmed options with 12dB de-emphasis recovered audio and R.F. preamplifier - 30mA.

DOC Type Approval: VR-2 142 193 298 LAND

DOC Type Approval: VR-2 142 821 532L MARINE

FCC Type Approval: Certified as complying with FCC Rules Part 15 in effect as of date of manufacture.

Modulation Acceptance: $\pm 5\text{kHz}$ (deviation) at 25kHz Channeling.

THEORY OF OPERATION - VHF TRANSMITTER

General

The MT-2 Series VHF Transmitter module consists of a main R.F. printed circuit board, Audio Processor module and a temperature compensated crystal element. The crystal element is a plug-in module that has been individually temperature calibrated and designed to be compatible and interchangeable with any of the MT-2 Series VHF transmitters. The VHF transmitter frequency range is covered in three frequency bands: 138-150 MHz, 150 - 162 MHz and 162 - 174 MHz.

R.F. Circuitry (No. 43-860622)

D.C. power is applied at two points to the transmitter: +9.5 Volts regulated to pins B6, Z6 and +10 to +17 Volts to pins B2, Z2. The +9.5 Volts DC supply is switched by several PTT lines that are activated externally or by the microphone. The +9.5 Volts DC switching transistors are Q8, Q9 and Q10. The +9.5 Volts DC source powers the oscillator Q1 and buffer - multiplier circuits Q2 to Q5. The +10 to +17 Volts DC Solar/Battery source powers the driver Q6 and final amplifier Q7. The +10 to +17 Volts DC source is used to control the R.F. power output. The R.F. output level is sensed before the low pass filter and a D.C. level is established to control the overall R.F. power output. Q11, Q12 and Q13 form the automatic power level control circuitry which regulates the RF output level to the final output stages Q6 and Q7. Control R49 sets the R.F. output to the required level.

The temperature compensated crystal module (TCXO) U2 is connected to the oscillator transistor Q1 (15 - 18 MHz fundamental mode) via contact pin J3-4 located on the VHF transmitter main printed circuit board assembly. Q2 provides a high level buffered output which drives tripler Q3 (44 - 60 MHz). Adjustable inductor L2 and L3 provide harmonic tuning, the output of which is critically coupled through capacitor C26. L5 and C28 peak the input drive to the 2nd tripler Q4. C33, C34 and C35 critically couple the desired frequency to transistor buffer Q5. C42, C43 and C44 peak the desired frequency (138 - 174 MHz) to the grounded emitter driver transistor Q6. The output of Q6 (approx. 150mW) is filtered through helical cavity F1. The filtered drive signal is fed to the final power transistor Q7 and the matching network C52 and C59 resonate the output signal. The transmitter power amplifier output is fed through a low pass harmonic filter comprised of L15, L16, L17, L18 and C61, C62, C63, C64, C65, C66 to the type 'N' output connector.

Audio Processor (No. 43-861421)

The audio processor module is powered by the regulated +9.5 Volts DC source. The +9.5 Volts DC source can be jumpered for continuous audio standby JU1 (external control JU2A or "fixed on" JU2B) or for switched standby JU2 (NORM). The continuous +9.5 Volts DC programming allows a fast audio rise time for digital applications (JU1 NORM). The Time-out Timer U4, is also located on the audio processor PCB. The Time-out Timer is programmable from 0 - 6 minutes and interrupts the PTT line whenever the transmitter is keyed on in excess of the selected timed value (5 MIN NORM). Q1 is the PTT timer trigger and reset transistor. When PTT is released before the timed value is reached the timer resets. If the timed value is exceeded the carrier must be "broken" to reset the timer. Q2 switches the PTT line and is controlled by the timer U4.

The audio processor module provides optional inputs for a range of applications with a variety of drive levels and impedances including: several audio sources, dynamic microphone input (standard), selectable 5 k ohm/600 ohm balance input - R33, selectable 5 k ohm/600 ohm Tone/Digital input - R48, and a subtone input (R28 level set). Each audio input, except subtone, has an adjustable level control to accommodate a -30dBm to 0dBm input: R34 for balanced input and R49 for Tone/Digital input. The microphone, balanced and tone/digital inputs can be enabled (or disabled) separately or simultaneously through programming cage jacks J3, J4 or J5 on the module. This will allow current saving in the hot standby mode. Each audio input (except subtone) is applied to a pre-amplifier/compressor circuit - U1, U2 and U3. These circuits provide an automatic gain control (AGC) level. The level for U2 and U3 is set by R32 (+3.0 kHz DEVIATION @ 1 kHz TONE NORM). The output is applied to U5B Buffer. JU6 selects the standard 6dB/octave pre-emphasis response or JU7 selects a flat audio response.

The microphone input to U1 has a fixed compression level selected by R8. Stage pre-amplification is provided by U5D and pre-emphasis network response by R17, C13. Operational amplifier U5C mixes input signals and produce a soft limited output. The soft limiting maintains the pre-emphasis response characteristics under high level audio input conditions. This characteristic provides better voice quality in circumstances where voice and signalling levels are unusually high as may be encountered in a multi-link repeater system where deviation at one or more sites is inadvertently set too high. Subtone input is applied at mixer U5A, and is then combined with the other input signals. The combined signal is applied to a 6db/octave low distortion splatter filter U6A, U6B and U6C. The output is set by U6D, a gain controlled amplifier. R56 adjusts the modulation drive to the crystal varicap control (deviation control). The deviation must always be re-calibrated when changing a crystal module. This is due to the individual crystal element characteristics.

Crystal Module (No. 43-861910)

The crystal module frequency is $\frac{fc}{9}$ where fc is the channel frequency.

The crystal Y1 operates in the fundamental mode and is mounted in a HC-25/U coldweld holder. The crystal plugs into a socket on the oscillator module PCB. R5, R4, C3, C2 and C4 provide temperature compensation over the -30°C to $+60^{\circ}\text{C}$ range and R7, R8 and R9 provide temperature compensation from -40°C to -30°C .

The crystal is tuned on frequency by L1 which is also part of the reactance modulating network R1, C1 and C1.

VHF TRANSMITTER ALIGNMENT

Test Equipment List

To align the transmitter the following test equipment or its equivalent is recommended:

Power supply, regulated 0-20 Volt 3 Amp current limited.

Power supply regulated 1A current limit, 9.5 Volt

Frequency counter, Sencore FC71

Wattmeter, Bird 6257, 10dB 25 W pad

Multimeter, Fluke 8050A

Distortion analyzer, Amber 3501

Modulation meter, Marconi TF 2304

Power sampler, - Communications Instruments Pad

Oscilloscope 300 MHz, Tektronix 2465

Communications test set, Marconi 2905

Alignment tool Johanson 8777

NOTE: Test points on all PCBs are surrounded by a diamond symbol.

Transmitter Alignment (No. 43-860622)

Apply power to the transmitter by using the SM-2 (System Monitor rack power supply) or by applying +9.5 Volts DC to pins B6, Z6, +13.8 Volts DC to B2, Z2 and ground to B30, Z30, B32, Z32. The DC supply to the transmitter must be well regulated and exactly +9.5 Volts DC.

Connect a 50 ohm dummy load (10w rating) to the front panel connector. Turn the front panel switch to ON and start the following procedure.

NOTE: In a normal operational unit the +9.5 Volts DC current is approx. 250mA and the 13.8 Volts DC current is approx. 900mA. Test conditions: maximum output into 50 ohms is approx. 6.0 Watts, no modulation. The following levels should be noted as they are the NORMAL values.

TP 1 approx. 400mV p-p 15 - 18 MHz Crystal Module output
 TP 2 approx. 300mV p-p 15 - 18 MHz Q1 Oscillator output

Set R49 - RF output level to max. fully C.W.

TP 3 approx. 600mV DC Q2 emitter bias L1 Peaked
 TP 4 approx. 4.0V p-p 15 - 18 MHz L1 Peaked
 * Scope probe will load the circuit slightly
 TP 5 approx. 50mVolts DC Q3 tripler bias L2 Peaked
 TP 6 approx. 5.0V p-p Q3 44 - 60 MHz L2, L3, L4, L5 Peaked
 * Scope probe will load the circuit slightly
 TP 7 approx. 100 mVolts DC Q4 tripler bias
 TP 8 approx. 280 mVolts DC Q5 138 - 174 MHz C33, C35, Peaked
 TP 9 approx. 6.0V p-p * Q5 output
 TP 10 9.1 Volt DC (switched 9.5 Volt DC supply)
 TP 11 approx. 0.6 Volts DC power sense level R49 set @4W
 TP 12 approx. 12.5 Volts DC power sense level R49 set @4W
 TP 13 approx. 15 V p-p * Q6 driver output C42, C44 Peaked
 TP 14 approx. 10 V p-p * F1 helical filter output F1 Peaked
 * Scope probe will load the circuit

R.F. Output at the TYPE N front panel connector should be approximately 5.0 - 6.5 watts when C52 and C59 are peaked.

Changing Frequency

The VHF transmitter is supplied by the factory in one of three frequency ranges: 138 - 150 MHz, 150 - 162 MHz and 162 - 174 MHz. If the alignment is in the same range as supplied by the factory, no component changes are required on the circuit board, but if the frequency change is from one range to another, the following components must be changed:

Frequency Change Component Values

Frequency	C12	C22	C51	C61	C60	C62
138 - 150	750pf	110pf	56pf	15pf	22pf	22pf
150 - 162	560pf	100pf	39pf	33pf	-	
162 - 174	470pf	100pf	22pf	22pf	-	

Install the new crystal firmly into its socket.
 Power the radio up under the previous conditions.

Verify TP 1 and TP 2. These levels should not change from what they were at the previous frequency.

Monitor TP4 and tune L1 for maximum output. Observe that the +9.5 Volts DC current peaks when L1 is peaked. Confirm TP3.

Monitor TP6 and tune L2, L3, L4 and L5 for maximum output at 44 - 60 MHz. Observe that the +9.5 Volts DC current, peaks when L2, L3, L4 and L5 are peaked. Confirm TP5. Note: Use a non-metallic tuning tool for all coil adjustments.

Monitor TP9 and tune C33, C35, C42 and C44 for maximum output. This adjustment involves several sharply tuned stages and is very critical. Observe the +9.5 Volts DC current. It should peak when C33, C35, C42 and C44 are peaked. If the output cannot be peaked, monitor the hot side of C35 and tune C33 and C35 for maximum output (approx. 4V p-p). Carry on with the procedure for C42 and C44. Confirm TP7 and TP8.

Monitor TP14 and adjust the helical filter (F1) capacitors for maximum output. Remove the oscilloscope probe and measure the R.F. output power at the antenna dummy load. Adjust C52 and C59 for maximum R.F. power.

Peak all coils and capacitors previously adjusted for maximum R.F. output.

All multiplier and buffer circuits on the +9.5 Volts DC supply are operated to saturation. The RF devices saturate at approximately 6.0 Volts DC. This relatively low saturation voltage ensures low temperature operation. To confirm that the coils and capacitors are precisely peaked, reduce the +9.5 Volts DC supply to +8.0 Volts and re-peak L1, L2, L3, L4, L5 C33 and C35. Reduce to +7.0 Volts and re-peak then to +6.0 Volts DC for final peaking. Note: The R.F. output level at the dummy load will drop significantly, however, the above components will still be adjusted to maintain a power level of approximately 2.0 watts. The output frequency will change but this will not significantly affect the multiplier - buffer circuit tuning. Raise the supply voltage to +9.5 Volts DC and re-peak C42, C44, F1, C52 and C59.

Set the crystal module on frequency.

With the input voltage adjusted to 13.8 Volts, set R49 (R.F. output level control) to give 4.0 watts.

Vary the floating supply voltage from +10.0 to +17.0 Volts DC. The R.F. output should vary between 2.5 watts and 4.5 watts.

Proceed with environmental testing.

Audio Processor Levels (No. 43-861421)

The audio processor is programmed at the factory for the following conditions:

Audio circuitry is switched on by a PTT signal JU1.
All audio input's are enabled JU3, JU4, JU5.
Pre-emphasis JU6.
Balanced input impedance 600 ohm (-8dBm input).
Tone/Digital input impedance 600 ohm (-8dBm input).
Low impedance dynamic microphone.
Subtone input 0.5 Vpp @100 HZ for ± 0.75 to ± 1 kHz deviation.
Balanced, Tone/Digital input's 1 kHz Tone for 3.2 kHz deviation.
Maximum deviation 5.0 kHz.
Time-out timer set at 5 min \pm 1 min.

Deviation Adjustment

Before adjusting the audio deviation, confirm that the transmitter RF output frequency is correct.

Connect the transmitter to a 50 ohm dummy load/power sampler and monitor F.M. deviation, distortion and audio frequency.

Connect the 600 ohm input to the incoming audio (pins B18, Z18). Set frequency to 1 kHz at desired audio level.

Increase R34 (Balanced Level Control) fully c.w (20 turn pot) for maximum gain.

Turn transmitter ON and adjust R32 for compression at ± 3.0 kHz deviation.

Increase the modulation frequency until maximum deviation occurs (peaks) then adjust R56 (deviation control) until the maximum deviation is ± 4.8 kHz. Reset the modulating frequency to 1 kHz and re-adjust R32 for ± 3.0 kHz. Repeat steps 5 & 6 until both conditions are met. Vary the audio signal from 1 kHz to 3 kHz and measure the + deviation and then the - deviation. Adjust R9 (Symmetry Control) until the + deviation is symmetrical. The variation between + deviation levels should not exceed 300Hz over the range of 1kHz to 3kHz.

Re check steps 5 & 6 and readjust if necessary.

With a 1 kHz Tone at -8dBm input level, the modulated output signal is ± 3.0 kHz deviation. Increasing the input level by +20dB should not increase the deviation by more than ± 4.0 kHz. This confirms the AGC action of compressor U2.

With a 2.5 kHz Tone at the desired audio input level, the modulated output signal is approx. +4.8 kHz deviation. Increase the input level +20dB and the deviation should not increase. This confirms the action of the soft limiter U5C.

With a 1 kHz Tone at the desired audio input level applied for +3.0 kHz deviation, adjust R34 (balanced input level control) until the output deviation is just controlled.

Confirm audio distortion by reducing the 1 kHz input tone level until +3.0 kHz deviation is reached and record distortion with the appropriate filter on the analyzer.

Confirm audio frequency response by referencing all output deviation measurements to a 1 kHz input tone @1 kHz deviation. Remove the balanced input signal. Apply an unbalanced signal to the Tone/Digital input (pin Z20) of 1 kHz at the desired audio level. Adjust R48 (Tone/Digital input level control) until the output deviation is just controlled. No further adjustments are required for any other deviation circuits.

Use the dynamic microphone to key the transmitter and adjust R10 (microphone gain control) for suitable microphone sensitivity. The time-out timer is normally set for 5 minutes. This can vary +1 min, over the temperature range of -40°C to +60°C. To reduce this interval insert the desired resistor in position R69 on the solder side of the audio processor PCB.

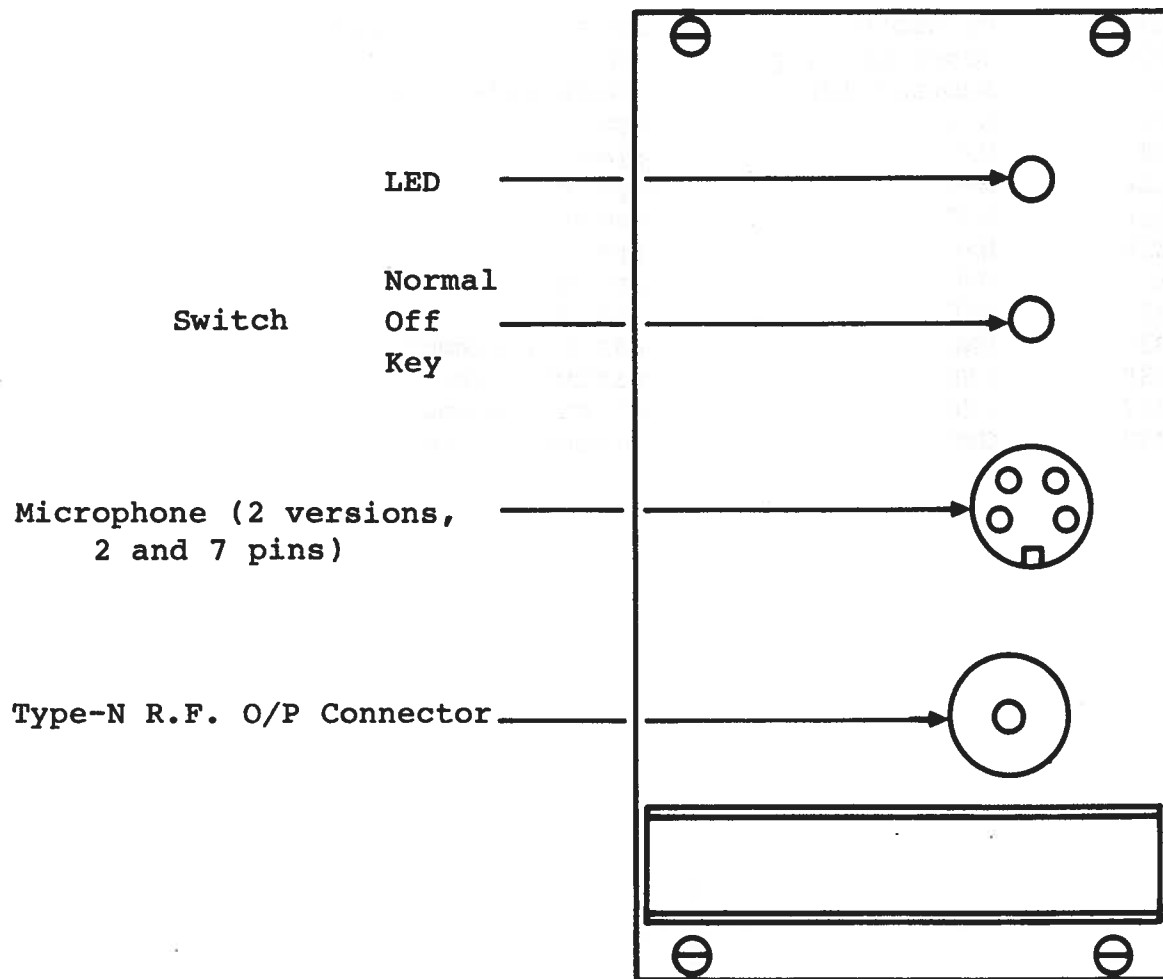
Functional Connections - VHF Transmitter

Male connector Type F to DIN41612

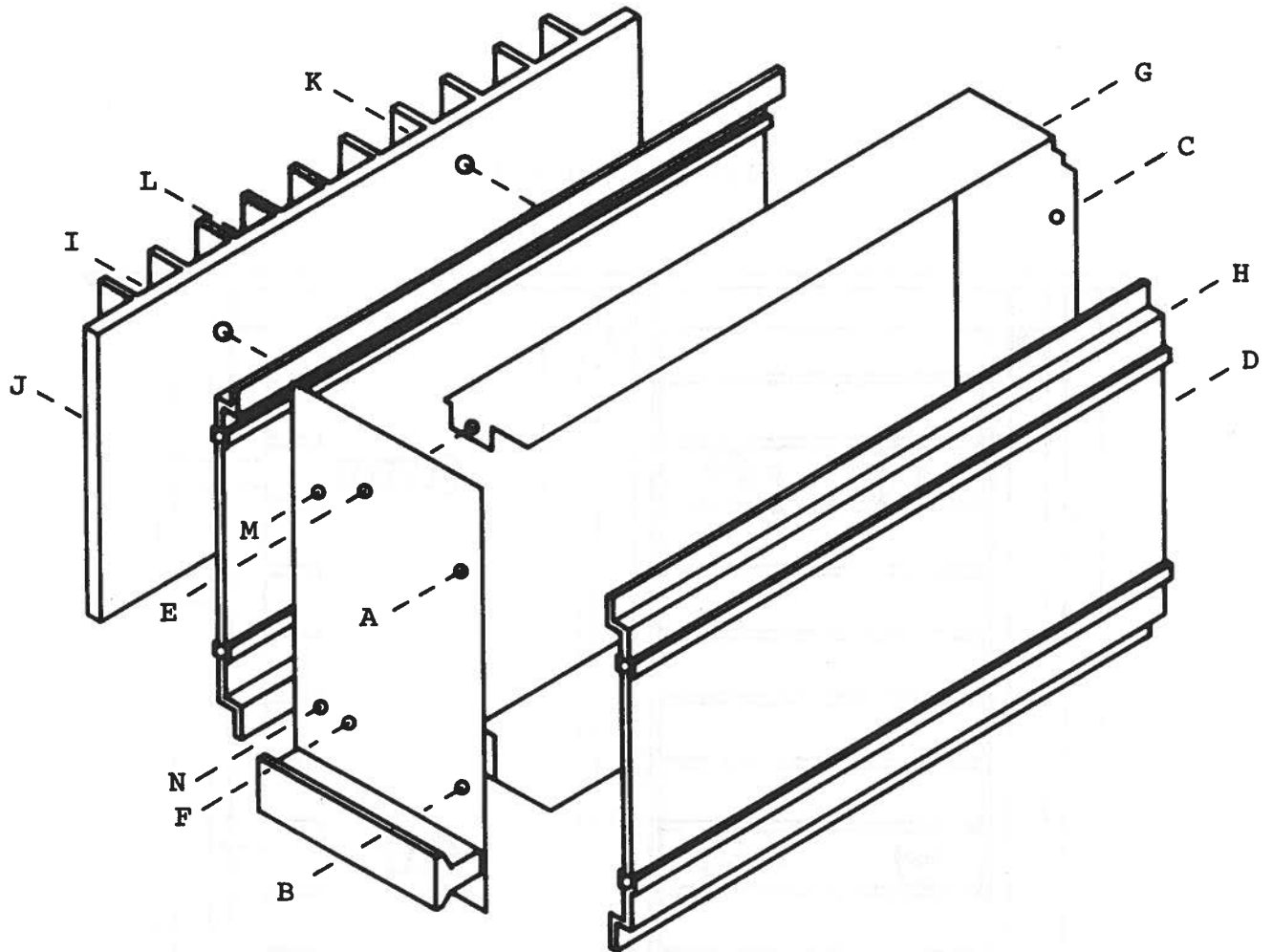
<u>PIN NUMBER</u>	<u>NAME</u>	<u>FUNCTION</u>
B2	+13.8 VDC	floating D.C. power to hybrid
Z2	+13.8 VDC	module (fuse optional)
B4	N/C	spare
Z4	N/C	spare
B6	+9.5 VDC	regulated power
Z6	+9.5 VDC	regulated power
B8	N/C	spare
Z8	N/C	spare
B10	P.T.T.	Tx enable with time out timer
Z10	P.T.T.	Tx enable with time out timer
B12	Audio En.	Tx audio enable
Z12	Audio En.	Tx audio enable
B14	P.T.T.	Tx enable no time out timer
Z14	P.T.T.	Tx enable no time out timer
B16	B - system	switched +9.5 VDC
Z16	B - system	switched +9.5 VDC
B18	Line	Tx balanced audio i/p
Z18	Line	Tx balanced audio i/p

B20	Rx audio	Rx audio to handset
Z20	Tone/dig. i/p	data i/p (option)
B22	Subtone i/p	subaudible tone i/p
Z22	N/C	spare
B24	N/C	spare
Z24	N/C	spare
B26	N/C	spare
Z26	N/C	spare
B28	N/C	spare
Z28	N/C	spare
B30	GND	circuit common
Z30	GND	circuit common
B32	GND	circuit common
Z32	GND	circuit common

Illustrations And Schematic Diagrams
Transmitter - Front Panel
Figure 1-1



Transmitter - Exploded View
Figure 1-2



Component Side Access:

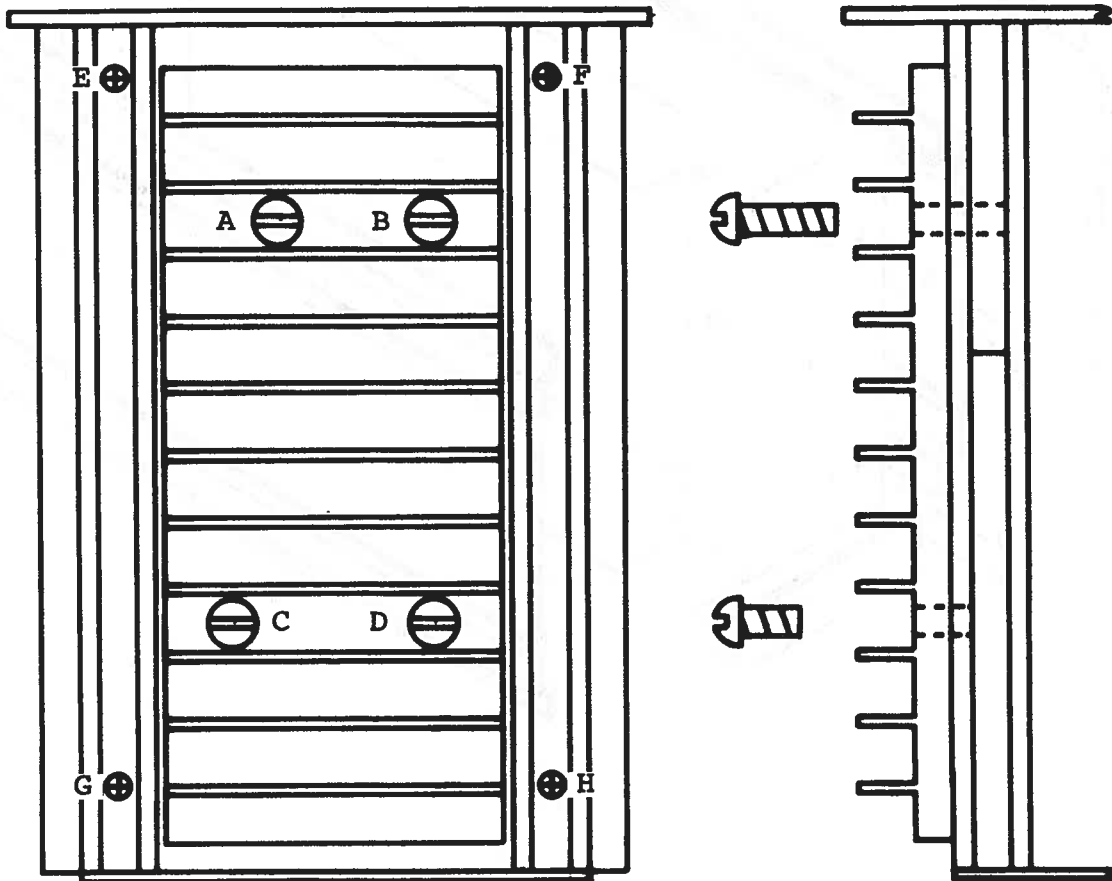
1. Remove screws A - D.
2. Lift off right side panel.

Solder Side Access:

1. Remove screws A - D
2. Lift off right side cover.
3. Remove screws E - H.
4. Lift off wrap-around shroud
5. Remove Heatsink screws I - L, remove Heatsink.
6. Remove PCB mounting screws (4) from left side cover.
7. Remove screws M - N.
8. Slide PCB and front panel out of left side extrusion.

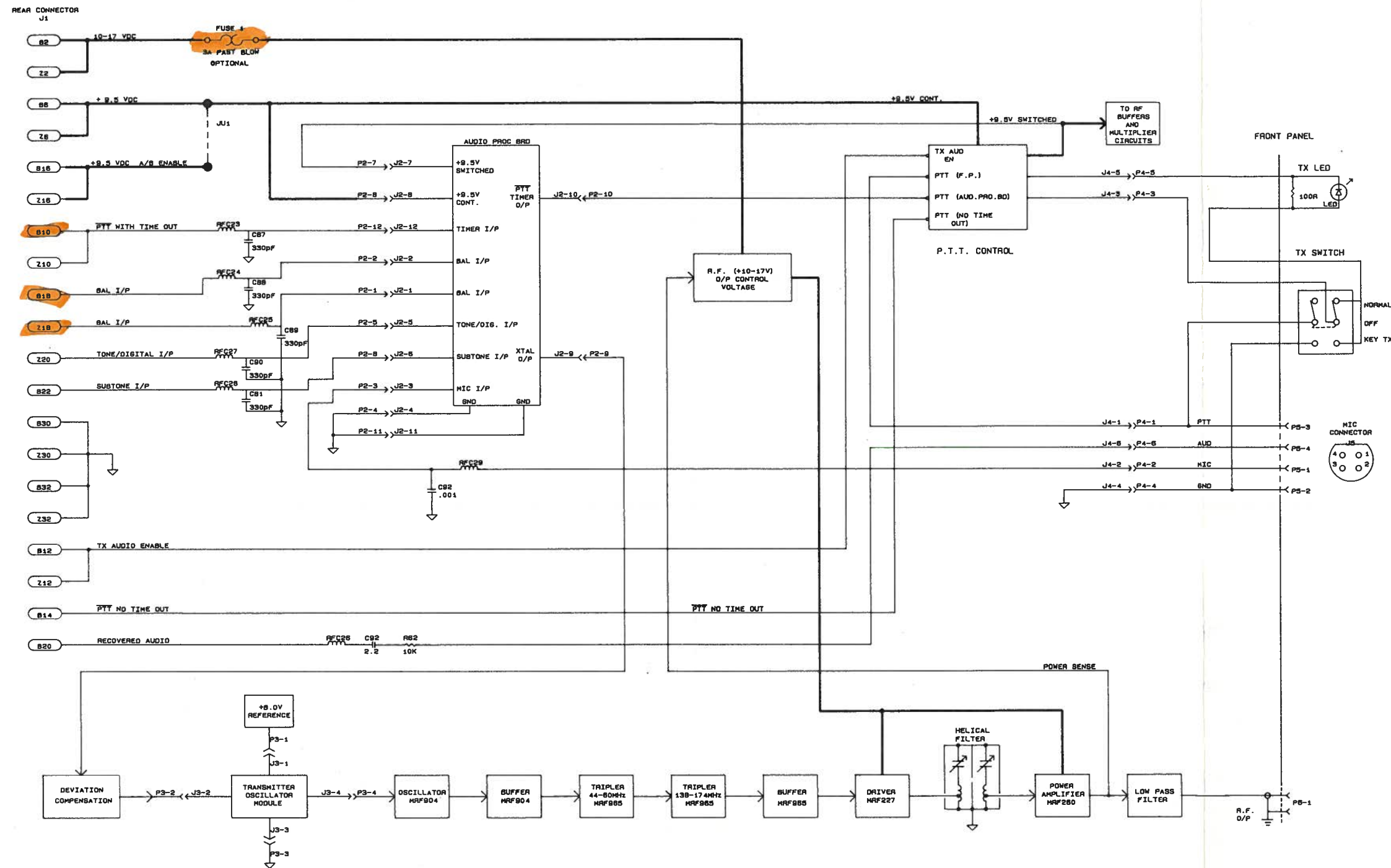
Transmitter-Heatsink Assembly
Figure 1-3

Transmitter Front



Heatsink Mounting Screws (10-32) A-D
PCB Mounting Screws (4-40) E-H

VHF Transmitter - Block Diagram
 43-860622U
 Figure 1-4

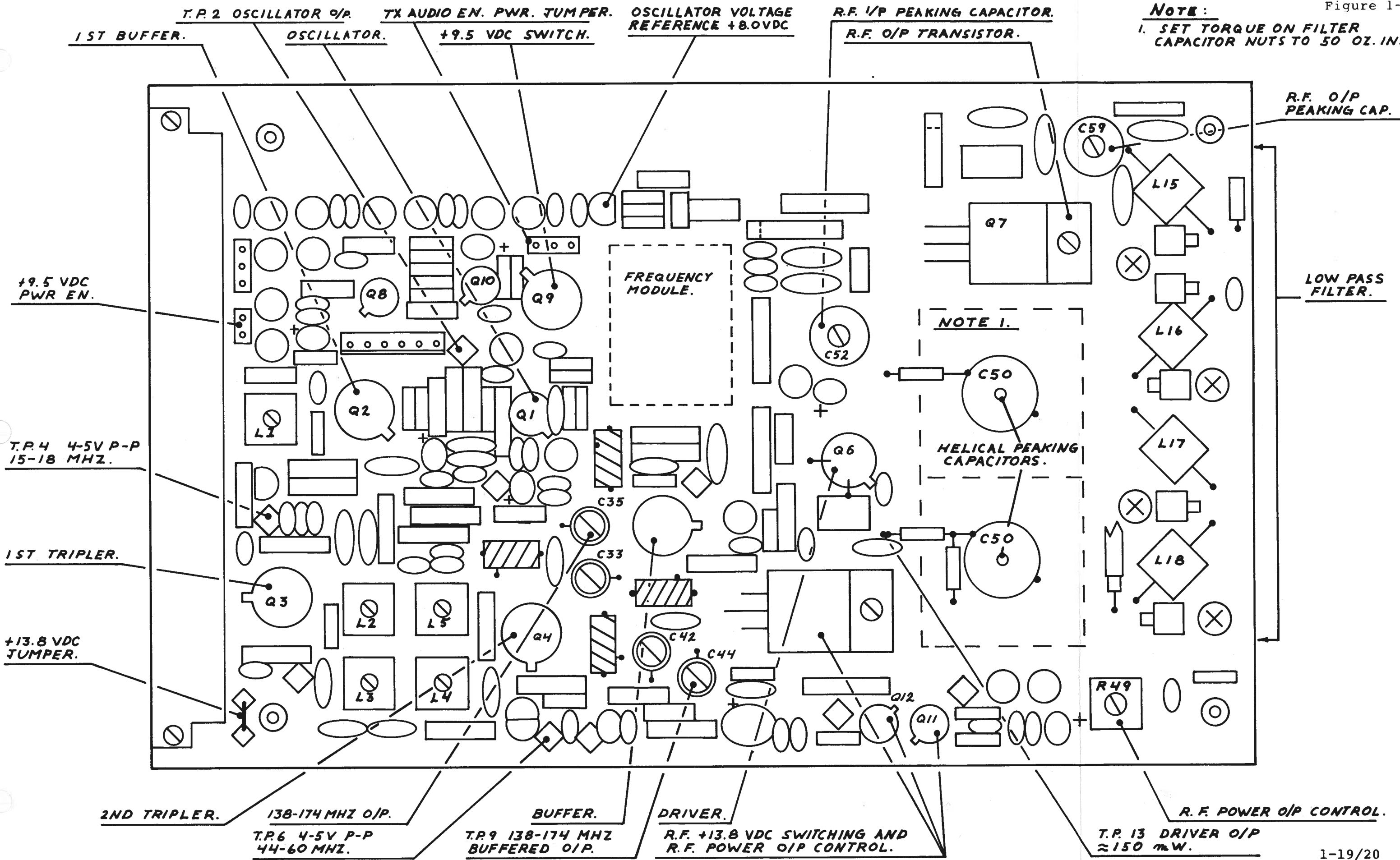


REV	DATE	DESCRIPTION	DRN	CHKD	APPROVED

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: INTERNAL CONNECTION DIAGRAM: VHF TRANSMITTER			
DRAWN: ALC	DATE: 15/07/88	DRAWING#:	43-860622U
CHECKED:	APPROVED:	MS-2.2	

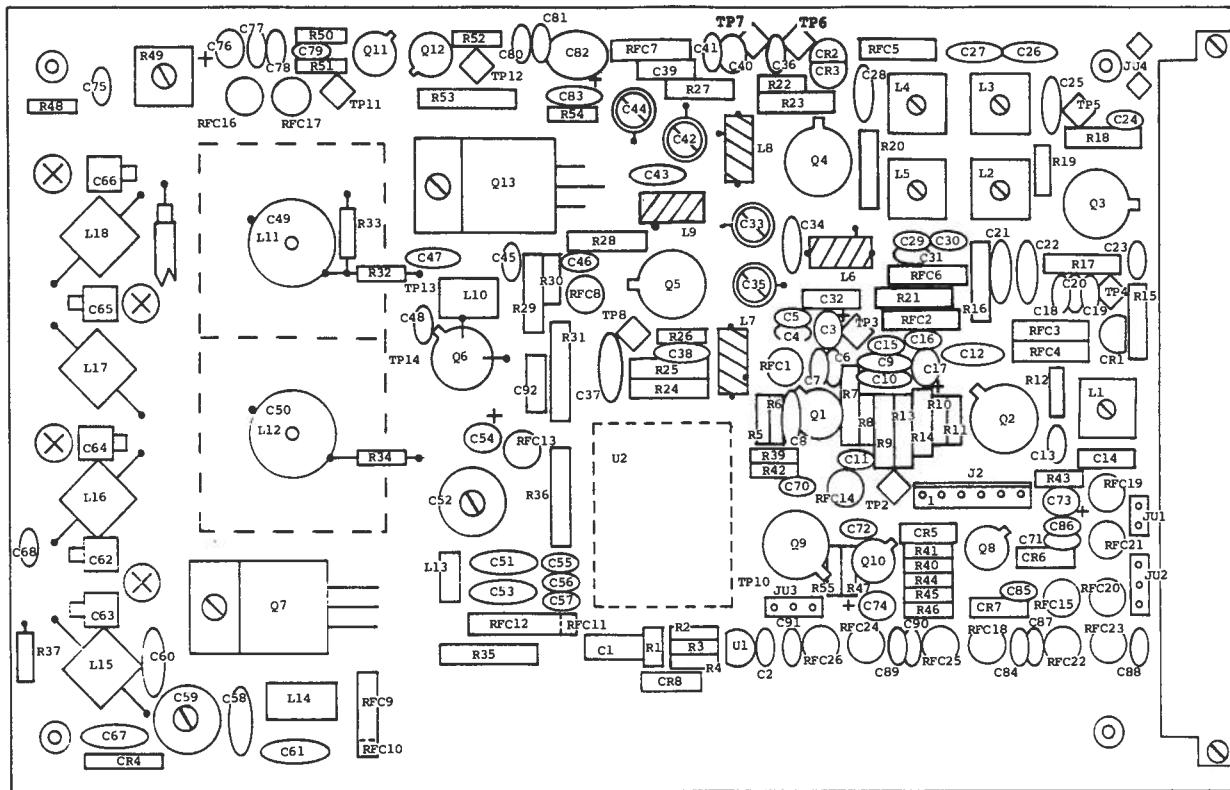
NOTE:

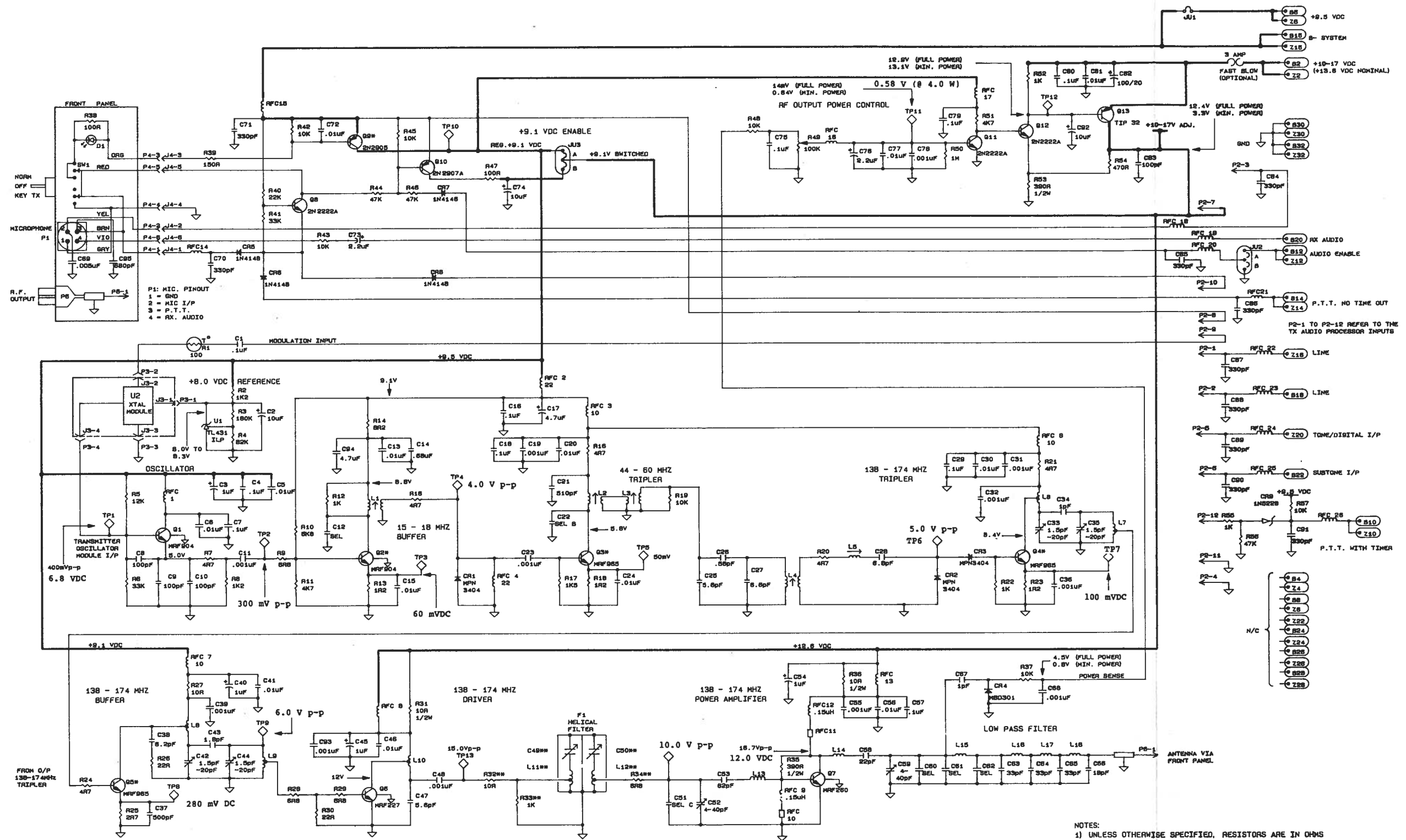
1. SET TORQUE ON FILTER CAPACITOR NUTS TO 50 OZ. IN.



VHF Transmitter - Component Layout

Figure 1-6





TEST PROCEDURE NOTES

1. AC TEST VOLTAGES WERE MEASURED USING: TEKTRONIX 2485 SCOPE P8131 10:1 PROBE
2. DC TEST VOLTAGES WERE MEASURED USING A FLUKE 75 DMM.
3. LO-BAND FREQUENCY RANGE (408.1-430 MHz) WAS USED FOR AC TEST MEASUREMENTS.

DATE	CODE	REV	APP	DESCRIPTION

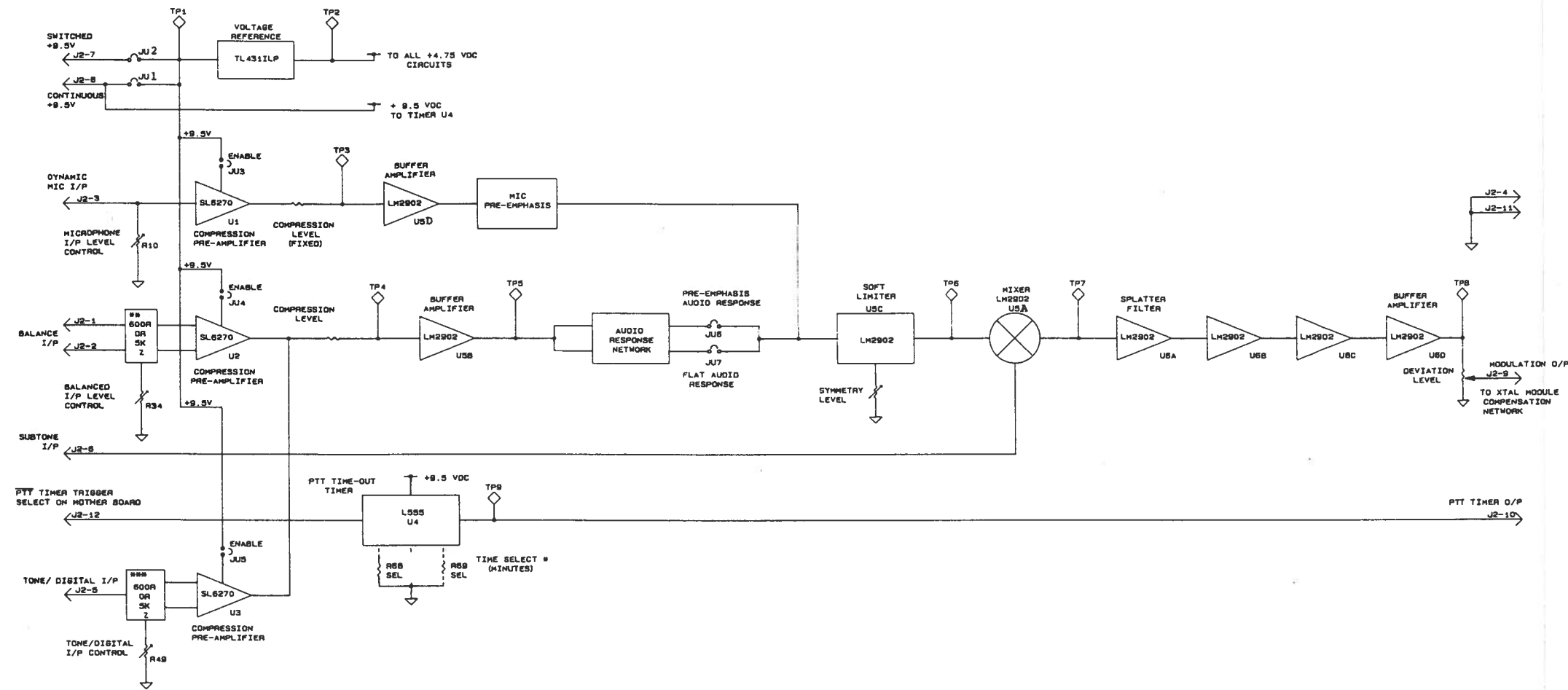
FREQ (MHz)	C12	C22	C51	C50	C51	C52
138-150	750	110	55	22	15	22
150-162	550	100	33	-	33	-
162-174	470	100	22	-	22	-

JUMPER FUNCTIONS
JU1: HOT/COLD STANDBY ENABLE
JU2: FAST AUDIO ENABLE
JU3: AUDIO POWER SOURCE
JU4: FUSE

HIGHEST REFERENCE DESIGNATORS
C55, R57, C56
Q13, RFC 26, L18
TP14
REFERENCE DESIGNATORS NOT USED
RFC5

- NOTES:**
- 1) UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS AND CAPACITORS ARE IN MICROFARADS
 - 2) ALL VOLTAGES MEASURED ARE DC UNLESS OTHERWISE STATED.
 - # DENOTES COMPONENT WITH HEATSINK
 - ** DENOTES COMPONENTS CONTAINED WITHIN HELICAL FILTER

DANIELS ELECTRONICS LTD.		43 6312 ST., VICTORIA, B.C. CANADA	
TITLE: TRANSMITTER MAIN PCB VHF			
DRAWN: ALC	DATE: 15/07/88	DRAWING NO: 43-860622S	
CHECKED:	APPROVED:		



- NOTES:
- STANDARD TEST CONDITIONS 1KHZ TONE @ 3KHZ DEVIATION
 - SEE PTT TIME-OUT VALUES LIST
 ** REMOVE R33 FOR SK I/P IMPEDANCE
 *** REMOVE R48 FOR SK I/P IMPEDANCE

DATE	CODE	REV	APP	DESCRIPTION

T.P.	LEVEL
T.P. 1	9.50 VDC
T.P. 2	4.75 VDC
T.P. 3	10 mVpp
T.P. 4	10 mVpp
T.P. 5	3 Vpp
T.P. 6	8 Vpp
T.P. 7	4 Vpp
T.P. 8	4 Vpp
T.P. 9	ACTIVE LOW

R88	R89	TIME +/- 1 MIN.
10M	00T	5 MINUTES

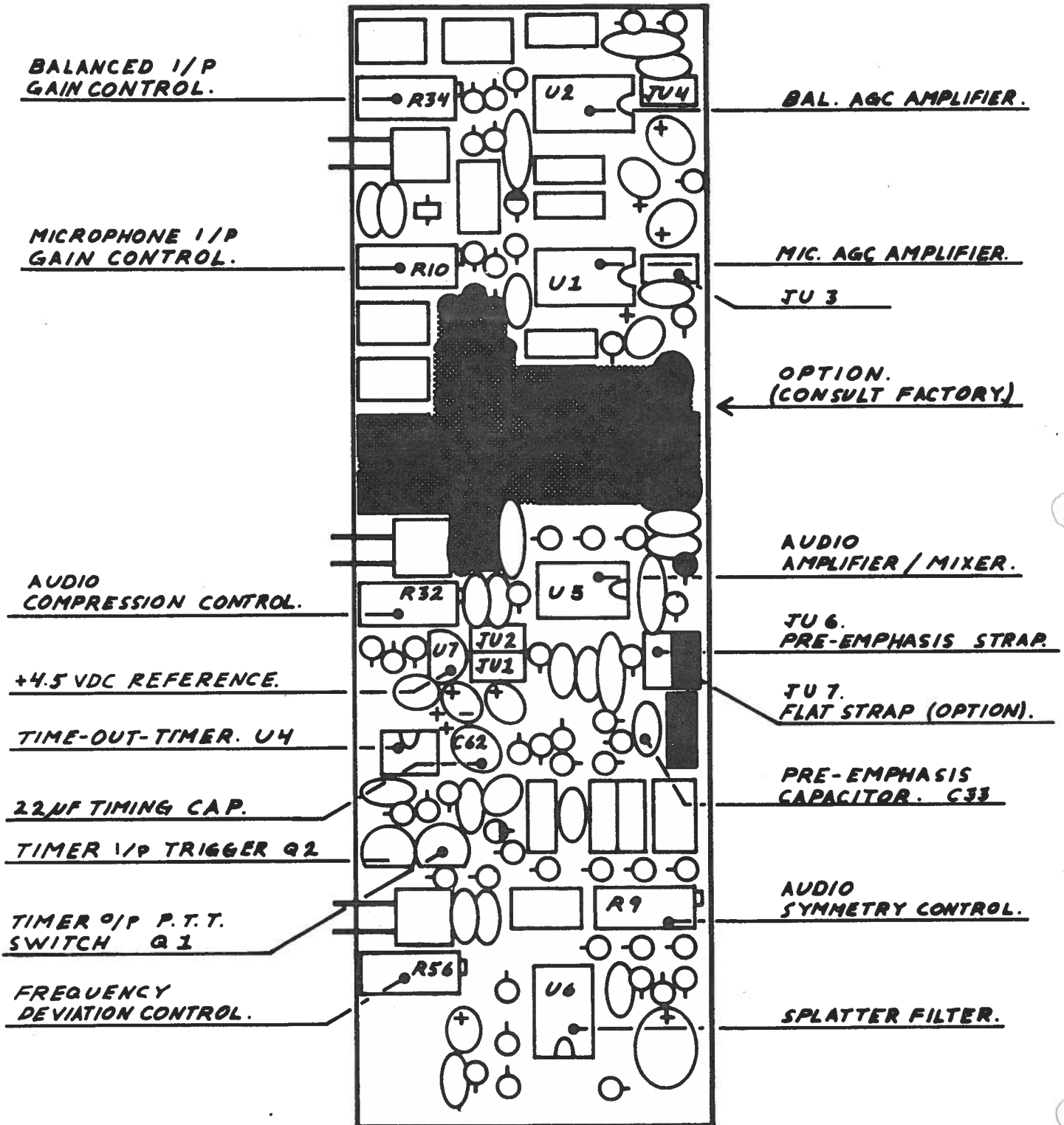
PIN #	FUNCTION
1, 2	BALANCED I/P
3	MICROPHONE I/P
4	GND
5	TONE/DIGITAL I/P
6	SUBTONE I/P
7	+9.5 VDC SW.
8	+9.5 VDC CONT.
9	MODULATION O/P
10	PTT TIMER O/P
11	GND
12	PTT TIMER TRIG.

JUMPER	FUNCTIONS
JU1	AUDIO PCB ACTIVE ON SW
JU2	AUDIO PCB ACTIVE CONT.
JU3	MICROPHONE ENABLE
JU4	BALANCE ENABLE
JU5	TONE/DIGITAL ENABLE
JU6	PRE-EMPHASIS AUDIO
JU7	FLAT AUDIO

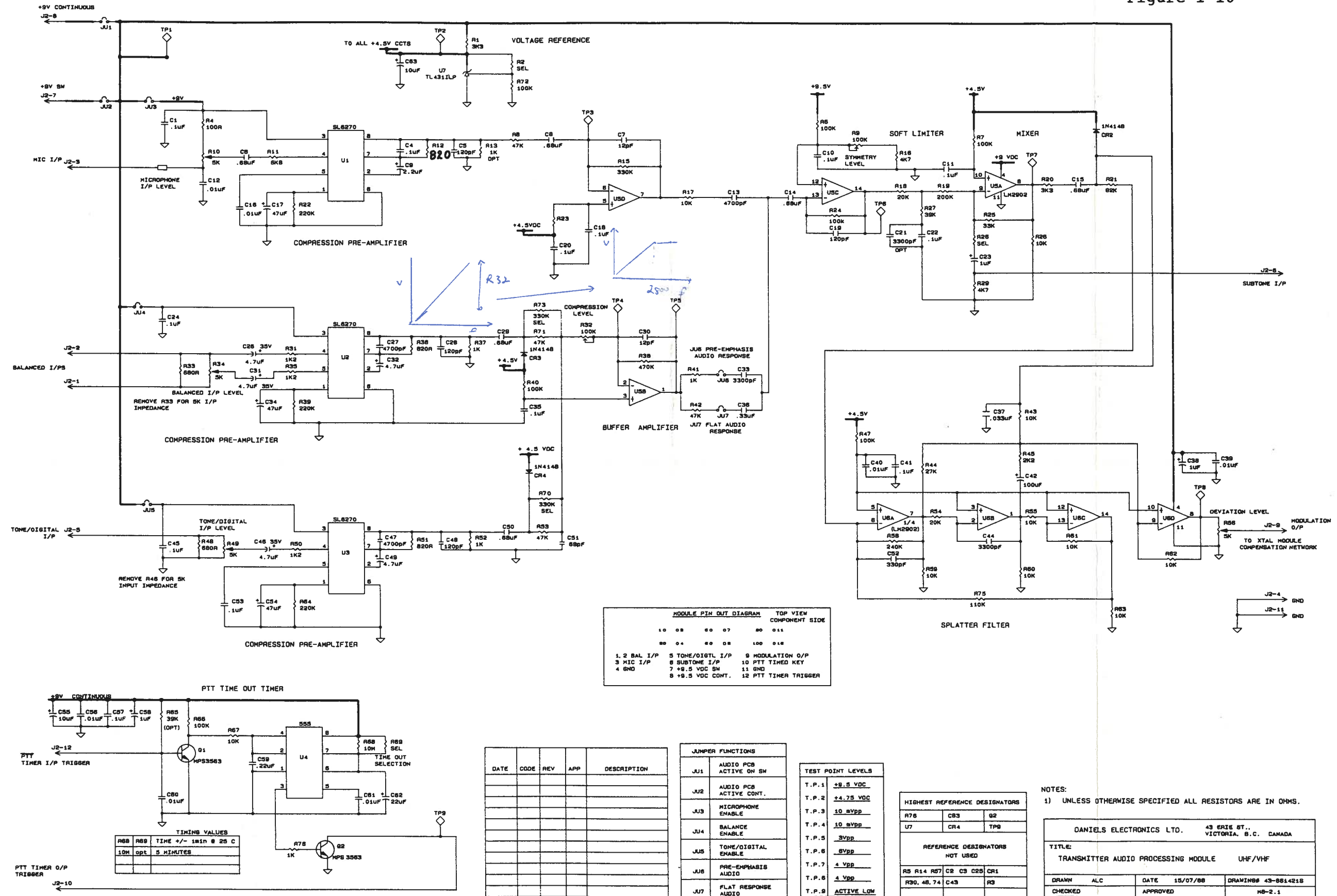
DANIELS ELECTRONICS LTD. 43 ERIE ST. VICTORIA, B.C. CANADA	
TITLE: TRANSMITTER AUDIO PROCESSING MODULE BLOCK DIAGRAM INCLUDES TIME-OUT TIMER	
DRAWN	DATE 15/07/88 DRAWING# 43-861421U
CHECKED	APPROVED MB-2.1

Transmitter Audio Processor - Component Layout
 Figure 1-9

**TRANSMITTER REAR.
 (CONNECTOR END)**



Transmitter Audio Processor -
Schematic Diagram 43-861421S
Figure 1-10



The audio processor module is a versatile circuit board that can provide several types of audio processing. The module also has an on board programmable push-to-talk (PTT) time-out-timer. A regulated +9.5 VDC power supply is required to power the module which can be configured for continuous or switched operation.

The audio processor module is designed for the MT-3 138-960 MHz transmitters and is backward compatible for the MT-2 transmitters. Not all of the modules capabilities are used when installed in a MT-2 transmitter.

PTT TIME-OUT-TIMER

The PTT time-out-timer (TOT) is a completely separate section of the audio processor module. The TOT is powered from the continuous +9.5 VDC supply (P2-4) and is programmable for various timeout periods.

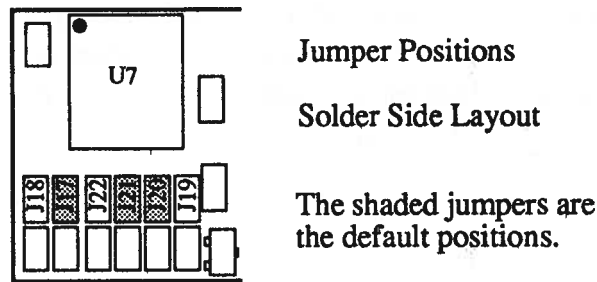
The TOT input trigger (P3-4) is normally high and in this state the timer is disabled. When the input trigger level falls below 2.0 VDC, the timer is activated, the TOT output trigger (P3-2) is pulled low, and the transmitter is keyed. If the input trigger rises above 2.4 VDC or if the timeout period is exceeded, the output trigger will go high, disabling the transmitter. If the timeout period is exceeded the TOT input trigger must go high and then low again in order to rekey the transmitter.

The timeout duration is jumper selectable from 1 second to 8 hours. Table 1 shows the timeout duration in minutes for the various jumper settings which are listed as enabled (E:jumper shorted - in) or disabled (D:jumper left open - out). The positions of the jumpers on the circuit board are shown in Figure 2. The standard factory setting of 5 minutes is shown in bold type in Table 1.

Table 1: Time-Out-Timer Settings

J17:J18	J22	J21	J20	J19	Timeout Duration (minutes)		
E:D/D:E/E:E	E	E	E	E	0.01	0.01	0.01
E:D/D:E/E:E	E	E	E	D	0.02	0.03	0.01
E:D/D:E/E:E	E	E	D	E	0.04	0.06	0.02
E:D/D:E/E:E	E	E	D	D	0.08	0.12	0.05
E:D/D:E/E:E	E	D	E	E	0.15	0.23	0.10
E:D/D:E/E:E	E	D	E	D	0.31	0.47	0.19
E:D/D:E/E:E	E	D	D	E	0.62	0.94	0.38
E:D/D:E/E:E	E	D	D	D	1.25	1.88	0.75
E:D/D:E/E:E	D	E	E	E	2.5	3.75	1.5
E:D/D:E/E:E	D	E	E	D	5.0	7.5	3.0
E:D/D:E/E:E	D	E	D	E	10	15	6.0
E:D/D:E/E:E	D	E	D	D	20	30	12
E:D/D:E/E:E	D	D	E	E	40	60	24
E:D/D:E/E:E	D	D	E	D	80	120	48
E:D/D:E/E:E	D	D	D	E	160	240	96
E:D/D:E/E:E	D	D	D	D	320	480	192

Figure 1: Time-Out-Timer Jumper Positions



911910 - 001

AUDIO SECTION

As mentioned earlier, the audio processor is a versatile module which can provide several types of audio processing through its five inputs. The module can be operated continuously or switched on as required.

POWER REQUIREMENTS

The audio processor module is powered by a regulated +9.5 VDC source which can be jumpered for continuous audio standby (jumper J2 enabled) or for switched audio standby (jumper J1 enabled). Jumpering the module for continuous audio standby allows fast audio risetimes but will increase the transmitter's standby current consumption. Power for the microphone input and the balanced input can be separately disabled by jumpers J3 and J4 respectively if the input is not required. This results in a current savings of approximately 11 mA per input. The current requirements for the audio processor module are shown in Table 2. The current for the TOT is approximately 4 mA when the transmitter is keyed and is included in the keyed values below.

Table 2: Current Consumption

FUNCTION	TRANSMITTER
	CURRENT DRAW keyed / unkeyed
Switched Audio Standby	
Both Microphone and Balanced Input enabled	29.0 / 0.5 mA
Only Microphone or Balanced Input enabled	17.5 / 0.5 mA
Only Auxiliary Input enabled	6.0 / 0.5 mA
Continuous Audio Standby	
Both Microphone and Balanced Input enabled	29.0 / 25.5 mA
Only Microphone or Balanced Input enabled	17.5 / 14.0 mA
Only Auxiliary Input enabled	6.0 / 2.5 mA

AUDIO PROCESSOR TURN-ON TIME

The turn-on time of the audio processor is 25 ms. This measurement is made with the standard factory settings with a 1 kHz tone applied to the balanced input. The turn-on time is the time it takes the audio processor to output a stable audio signal from the time its power (+9.5 VDC) is switched on. As mentioned earlier, the turn-on time can be virtually eliminated by configuring the audio processor module for continuous audio standby.

AUDIO CIRCUITRY

The audio processor module has five audio inputs which can be used to modulate the transmitter, four of which have a level control. The five inputs are combined by summing amplifier U4A which has an associated symmetry control (R14). Op-amp U4A together with U5A provide the limiting action for the audio processor. After the audio signals have been combined and limited, they are filtered by a 6 pole Butterworth filter (U5B, U5C, and U5D). The Q and cutoff frequency for each section of the Butterworth filter are shown on Figure 3, the audio processor module's schematic diagram. The output signal from the filter is then level adjusted by the deviation control pot, R29, before modulating the transmitter. In special applications, jumper J6 can be disabled and J7 enabled, this allows the transmitter to be modulated directly from the auxiliary input.

The 5 audio inputs on the audio processor module are:

- dynamic microphone input
- 600 ohm balanced input
- 2 subtone inputs
- auxiliary input.

Microphone Input

The microphone input has an automatically gain controlled (AGC) preamplifier whose input level is controlled by R2. The microphone input level control (R2) can accommodate a -25 dBm to 0 dBm input signal. The compression level for the microphone input is adjusted by R8.

Balanced Input

The 600 ohm balanced input also has an AGC preamplifier, input level control (R31), and compression level control (R38). Like the microphone input, the balanced input level control can accommodate a -25 dBm to 0 dbm input. The balanced input can have a standard 6 dB/octave pre-emphasis response by enabling jumper J9 or a flat-audio response by enabling jumper J10.

Auxiliary Input

The auxiliary input is a special input, it does not have an AGC preamplifier or an input level control. This input can be configured for a pre-emphasis response (enable J14) or a flat-audio response (enable J15). The compression level for this input is set by R48. When jumper J6 is disabled and jumper J7 is enabled, the auxiliary input can be used to directly modulate the transmitter. Care should be taken when directly modulating the transmitter with the auxiliary input because the MT-3 transmitters use direct FM modulation and there is no filtering or limiting action provided by the auxiliary input. The input level to the auxiliary input should be -18 dBm and can be driven by one of three inputs:

- the balanced input – J11 enabled
- the tone/digital input – J12 enabled
- the direct modulation input – J13 enabled

When the 600 ohm balanced input is connected to the auxiliary input, the balanced input level control can be used to adjust the level for the auxiliary input. When either the tone/digital input or the direct modulation input are used, the input level is not adjustable.

Subtone Inputs

There are two subtone inputs available on the audio processor module. Subtone input 1 is directly connected to summing amplifier U4A while subtone input 2 must be enabled by jumper J16. Subtone input 2 is also available as an output on P4-2 for special applications. Both subtone inputs have an input level control.

AUDIO PROCESSOR REPAIR AND MAINTENANCE

The audio processor module is mainly made up of surface mount devices which should not be removed or replaced using an ordinary soldering iron. Removal and replacement of surface mount components should be performed only with specifically designed surface mount rework and repair stations which have ESD protection.

AUDIO PROCESSOR MODULE PINOUT

Table 3 shows the pinout cross reference between the MT-2 transmitters and the MT-3 transmitters. As mentioned earlier, not all of the audio processor module's capabilities are used when it is installed in a MT-2 transmitter.

Table 3: MT-2/MT-3 Pinout Cross Reference

MT-2 Pin Number	MT-3 Pin Number	Signal
P2-1	P1-1	Balanced Input
P2-2	P1-2	Balanced Input
P2-3	P1-3	Microphone Input
P2-4	P1-4	Ground
P2-5	P2-1	Tone/Digital Input
P2-6	P2-2	Subtone 1 Input
P2-7	P2-3	+9.5VDC Switched
P2-8	P2-4	+9.5VDC Continuous
P2-9	P3-1	Modulation Output
P2-10	P3-2	TOT Output Trigger
P2-11	P3-3	Ground
P2-12	P3-4	TOT Input Trigger
Not Used	P4-1	Subtone 2 Input
Not Used	P4-2	Subtone 2 Output
Not Used	P4-3	Direct Modulation Input
Not Used	P4-4	Limited, Unfiltered Audio Output

STANDARD FACTORY SETTINGS

The audio processor is programmed at the factory for the following conditions:

Timeout timer: 5 minutes \pm 10%

Audio Circuitry: +9.5V switched operation

Maximum deviation: 5.0 kHz

Microphone input enabled

-10 dBm, 1 kHz signal produces 2.5 kHz deviation,
1 kHz signal compression set at 3.0 kHz deviation

Balanced input enabled

- pre-emphasis response

-8 dBm, 1 kHz signal produces 3.0 kHz deviation,
1 kHz signal compression set at 3.0 kHz deviation

Subtone input 1

-18 dBm, 100 Hz signal produces 500 Hz deviation.

Subtone input 2 disabled

Auxiliary input disabled

The following jumpers are enable for the above settings: J1, J3, J4, J6, J8, J9, J17, J20, and J21. All other jumpers are disabled.

STANDARD DEVIATION ADJUSTMENT

The following deviation adjustment procedure should be done each time the crystal module of the transmitter is changed due to individual crystal characteristics.

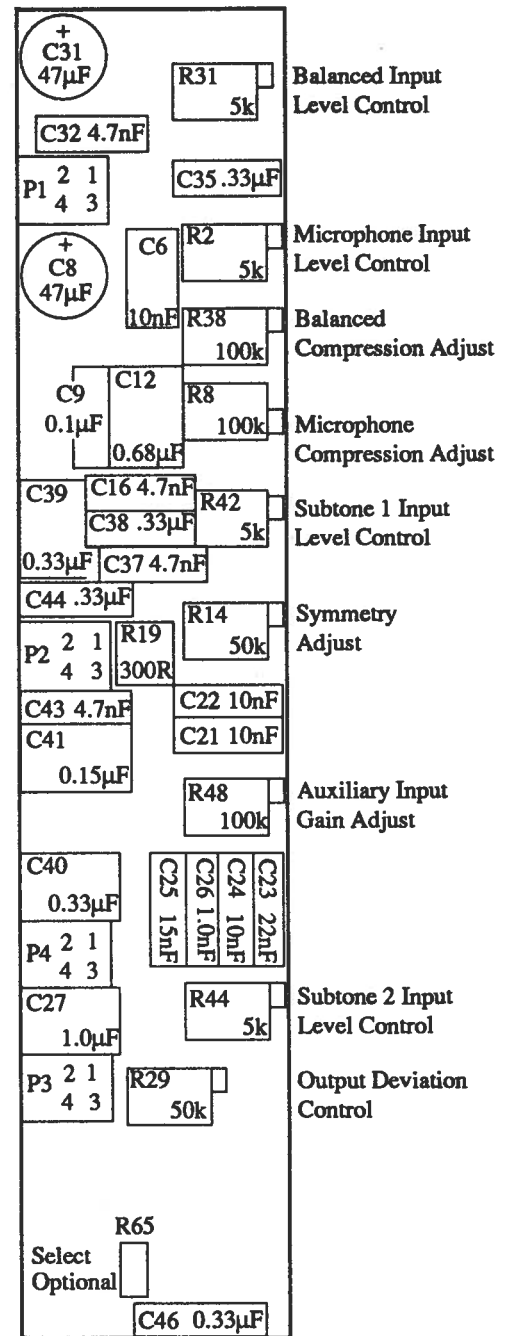
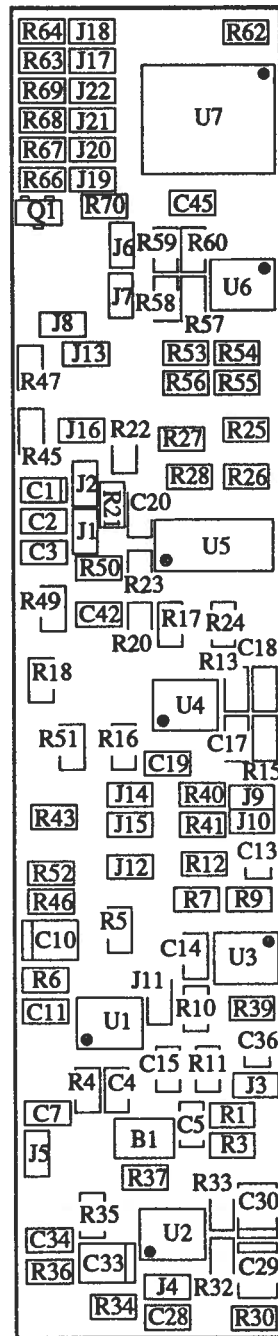
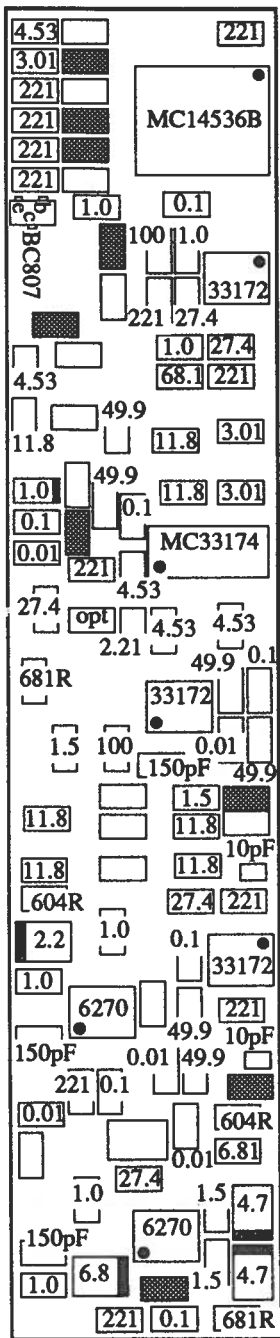
- 1) Before adjusting the audio deviation, confirm that the transmitter RF output frequency is correct.
- 2) Connect the transmitter to a 50 ohm dummy load/power sampler and monitor F.M. deviation, distortion, and audio frequency.
- 3) Connect the 600 ohm input to the incoming audio (pins B18, Z18). Set the audio frequency to 1 kHz at the desired level.
- 4) Increase the balance level control (R31:ccw) for maximum gain.
- 5) Turn the transmitter on
- 6) Adjust the balance compression level (R38:cw) for compression at \pm 3.0 kHz deviation.

- 7) Increase the modulation frequency until maximum deviation occurs (peaks), then adjust the deviation control (R29:cw) until the maximum deviation is ± 4.8 kHz.
- 8) Reset the modulating frequency to 1 kHz and re-adjust R38 for ± 3.0 kHz deviation.
- 9) Repeat steps 7 and 8 until both conditions are met.
- 10) Vary the audio signal from 1 kHz to 3 kHz and measure the + deviation and then the - deviation. Adjust the symmetry control (R14) until the \pm deviation is symmetrical. The variation between \pm deviation levels should not exceed 300 Hz over the 1 kHz to 3 kHz range.
- 11) Check steps 7 and 8 and re-adjust if necessary.
- 12) Adjust the balanced input level control (R31:ccw) until the deviation produced by a 1 kHz tone at -8 dBm falls below ± 3 kHz, then adjust R31 so that the deviation increases until compression is observed. The deviation should be ± 3 kHz.
- 13) A 1 kHz tone at -8 dBm input level should produce ± 3 kHz deviation. If not, go back to step 4 and make sure the pot is set for maximum gain and repeat the procedure. If so, increasing the input level by +20 dBm should not increase the deviation. This confirms that the AGC action of preamplifier U2 is working.
- 14) A 2.4 kHz tone at the desired audio input level should produce ± 4.8 kHz deviation. Increasing the input level by +20 dBm should not increase the deviation. This confirms that the limiting action of U4A and U5A is working.
- 15) Confirm audio distortion by reducing the 1 kHz tone level until ± 3 kHz deviation is reached and record the distortion with the appropriate filter on the analyzer.
- 16) Confirm the audio frequency response by referencing all output deviation measurements to a 1 kHz input tone at 1 kHz deviation.
- 17) Remove the signal to the balanced input (pins B18, Z18).
- 18) Apply a 1 kHz tone at -8 dBm to the microphone audio input. Set the microphone compression control (R8:cw) to produce ± 3 kHz deviation. Reduce the signal to -10 dbm and adjust the microphone input level control (R2:ccw) for 2.5 kHz deviation. Remove the signal.
- 19) Apply a 100 Hz tone at -18 dBm to the subtone 1 input and adjust the subtone 1 level control (R42:ccw) to produce ± 500 Hz deviation. Remove the signal.

****note:** the directions cw or ccw denote increasing signal levels

AUDIO PROCESSOR MODULE LAYOUT

FIGURE: 2



911910-002

■ Jumper default settings

SOLDER SIDE

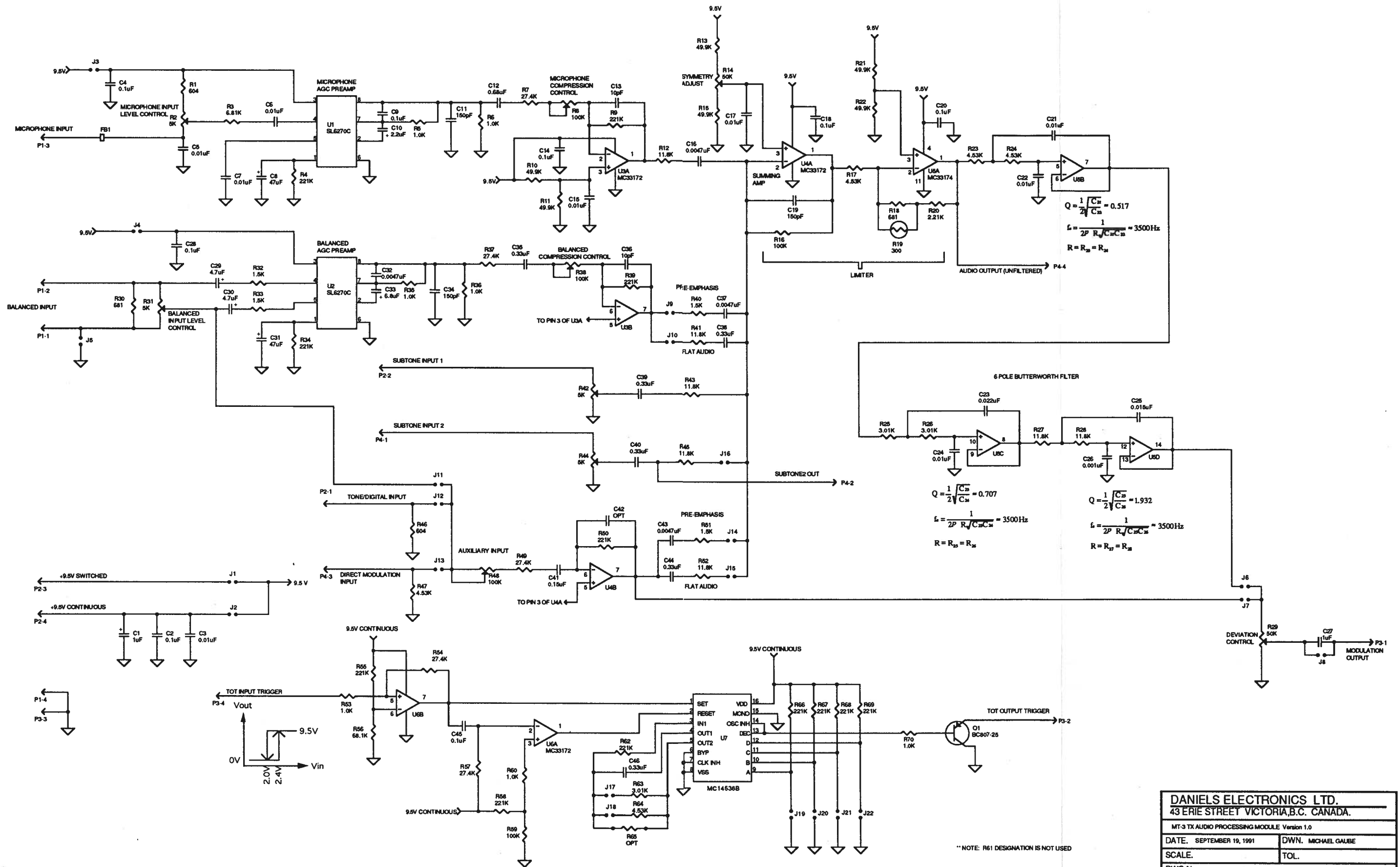
COMPONENT SIDE

Unless Otherwise Specified

All resistors KΩ

All capacitors in µF

MT-3 TX AUDIO PROCESSOR MODULE
SCHEMATIC DIAGRAM 43-911910-S
FIGURE: 3



** NOTE: R61 DESIGNATION IS NOT USED

DANIELS ELECTRONICS LTD.	
43 ERIE STREET VICTORIA, B.C. CANADA.	
MT-3 TX AUDIO PROCESSING MODULE Version 1.0	
DATE: SEPTEMBER 19, 1991	DWN. MICHAEL GAUBE
SCALE:	TOL.
DWG No. 43-911910-S	

PARTS LIST - AUDIO PROCESSOR MODULE

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
C1	CAP. SM., 1u0 TANT., 20%, 16V	14C-A5-105M16	1
C2	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C3	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C4	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C5	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C6	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C7	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C8	CAP, 47uF DIP. TANT., 20%, 20V	14-K6-476M20	2
C9	CAP, 0.1uF METAL-POLY 10%, 63V	11-A4-104K63	1
C10	CAP. SM., 2u2 TANT., 10%, 20V	14C-B5-225K20	1
C11	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C12	CAP, 0.68uF METAL-POLY 10%, 50V	11-D4-684K50	1
C13	CAP. SM., 10pF CER, 0805, C0G	05C-A1-100J1G	2
C14	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C15	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C16	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C17	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C18	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C19	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C20	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C21	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C22	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C23	CAP, 0.022uF METAL-POLY 10%, 63V	11-A3-223K63	1
C24	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C25	CAP, 0.015uF METAL-POLY 10%, 63V	11-A3-153K63	1
C26	CAP, 0.001uF METAL-POLY 10%, 63V	11-A2-102K63	1
C27	CAP, 1uF METAL-POLY 10%, 50V	11-D5-105K50	1
C28	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C29	CAP. SM., 4u7 TANT., 10%, 16V	14C-B5-475K16	2
C30	CAP. SM., 4u7 TANT., 10%, 16V	14C-B5-475K16	2
C31	CAP, 47uF DIP. TANT., 20%, 20V	14-K6-476M20	2
C32	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C33	CAP. SM., 6u8 TANT., 20%, 10V	14C-B5-685M10	1
C34	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C35	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C36	CAP. SM., 10pF CER, 0805, C0G	05C-A1-100J1G	2
C37	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C38	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6

PARTS LIST - AUDIO PROCESSOR MODULE (continued)

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
C39	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C40	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C41	CAP, 0.15uF METAL-POLY 10%, 63V	11-A4-154K63	1
C42	OPTIONAL SELECT VALUE, SM		1
C43	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C44	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C45	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C46	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
FB1	BEAD SM., FERRITE, 3mm x 5mm L	30FS-274335	1
P1	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P2	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P3	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P4	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
Q1	TRANS, BC807-25, PNP, G.P., SOT-23	63S-BC807-25	1
R1	RES. SM., 604R, 1206, 1%, 100 ppm	52C-B2-6040F1	2
R2	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R3	RES. SM., 6k81, 1206, 1%, 100 ppm	52C-B3-681R1F1	1
R4	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R5	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R6	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R7	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R8	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R9	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R10	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R11	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R12	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R13	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R14	POT. SM., 50k MULTI-TURN, VERT	46S-M3-503X	2
R15	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R16	RES. SM., 100k, 1206, 1%, 100 ppm	52C-B5-1003F1	2
R17	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R18	RES. SM., 681R, 1206, 1%, 100 ppm	52C-B2-6810F1	2
R19	THERMISTOR, 300R, NTC, 10%, RADL	55-NR301K	1
R20	RES. SM., 2k21, 1206, 1%, 100 ppm	52C-B3-2211F1	1
R21	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R22	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R23	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R24	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5

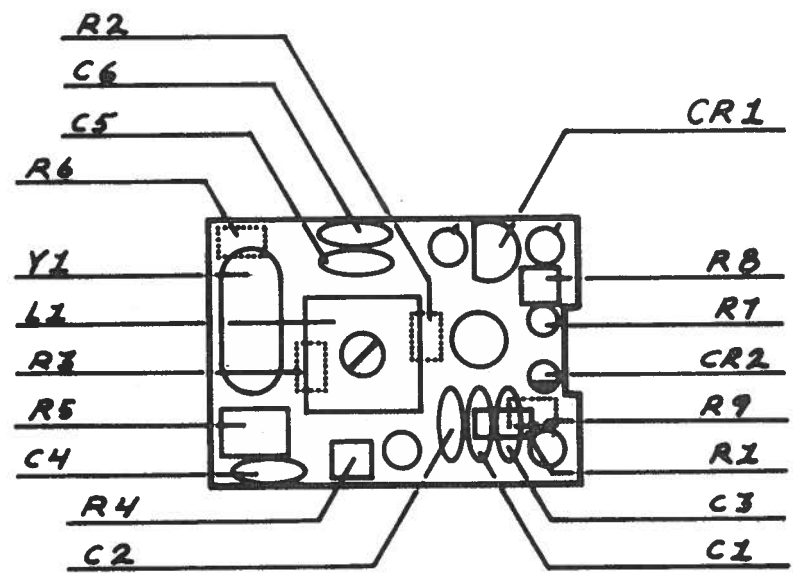
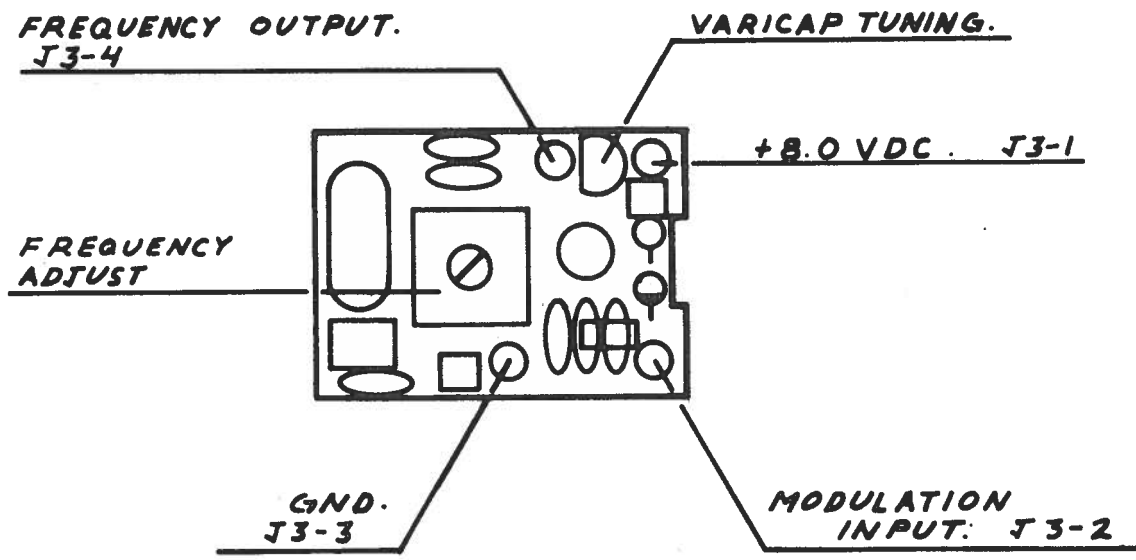
PARTS LIST - AUDIO PROCESSOR MODULE (continued)

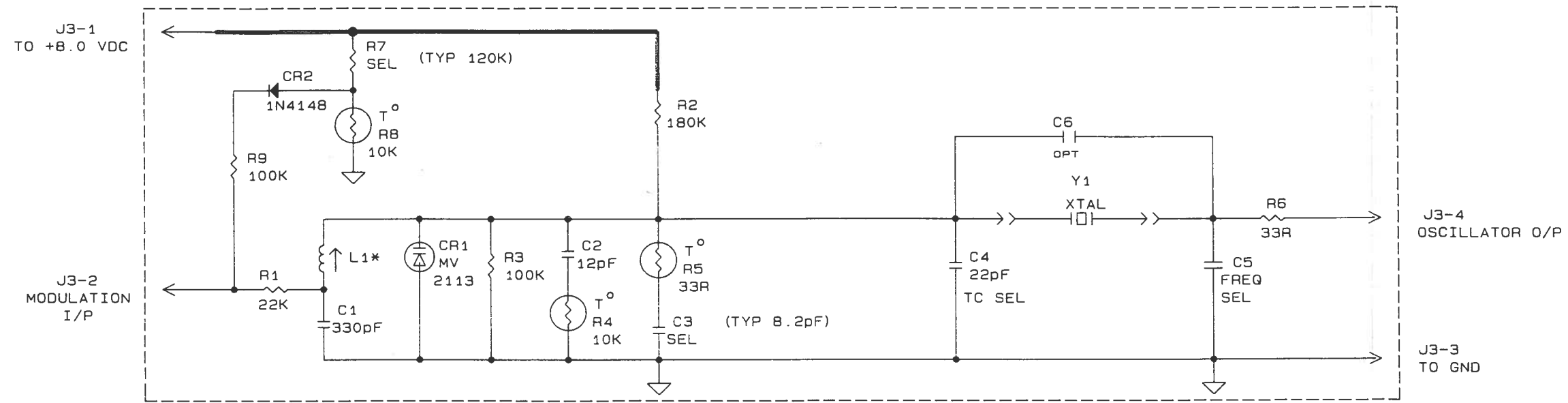
REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
R25	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R26	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R27	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R28	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R29	POT. SM., 50k MULTI-TURN, VERT	46S-M3-503X	2
R30	RES. SM., 681R, 1206, 1%, 100 ppm	52C-B2-6810F1	2
R31	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R32	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R33	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R34	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R35	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R36	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R37	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R38	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R39	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R40	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R41	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R42	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R43	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R44	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R45	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R46	RES. SM., 604R, 1206, 1%, 100 ppm	52C-B2-6040F1	2
R47	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R48	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R49	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R50	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R51	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R52	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R53	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R54	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R55	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R56	RES. SM., 68k1, 1206, 1%, 100 ppm	52C-B4-681R2F1	1
R57	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R58	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R59	RES. SM., 100k, 1206, 1%, 100 ppm	52C-B5-1003F1	2
R60	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R61	NOT USED		
R62	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12

PARTS LIST - AUDIO PROCESSOR MODULE (continued)

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
R63	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R64	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R65	OPTIONAL SELECT VALUE		1
R66	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R67	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R68	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R69	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R70	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
U1	I.C., SL6270C, VOGAD, SO-8	29A-6270	2
U2	I.C., SL6270C, VOGAD, SO-8	29A-6270	2
U3	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U4	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U5	I.C., MC33174 QUAD OP-AMP, SO-14	29OP-33174	1
U6	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U7	I.C., MC14536B PROG. TIMER, SO-16W	29T-14536	1
PCB	AUDIO PROCESSOR MODULE	43-911910	1

Transmitter Crystal Module (TCXO) - Component layout
 Figure 1-11





DATE	CODE	REV	APP	DESCRIPTION

HIGHEST REFERENCE DESIGNATORS		
R9	C6	L1
CR2	Y1	
REFERENCE DESIGNATORS NOT USED		

NOTES:
 1) RESISTORS IN OHMS, CAPACITORS IN MICROFARADS
 * L1 SELECT FOR VHF OR UHF

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: TRANSMITTER CRYSTAL MODULE		UHF/VHF	
DRAWN ALC	DATE 15/07/88	DRAWING# 43-861910S	
CHECKED	APPROVED	M10-1.0	

PARTS LIST - TRANSMITTER VHF

Main Circuit Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	10
C2	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C3	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C4	CAP, .1uF MONO 20% 100V	10-1042	10
C5	CAP, .01uF CER 80-20% 63V	05-1032	11
C6	CAP, .01uF CER 80-20% 63V	05-1032	11
C7	CAP, .1uF MONO 20% 100V	10-1042	10
C8	CAP, 100pF CER 2% 100V NPO	05-1016	4
C9	CAP, 100pF CER 2% 100V NPO	05-1016	4
C10	CAP, 100pF CER 2% 100V NPO	05-1016	4
C11	CAP, .001uF MONO 10% 200V	10-1022	12
C12	VALUE SELECTED	SEL	6
C13	CAP, .01uF CER 80-20% 63V	05-1032	11
C14	CAP, .68uF MONO 20% 50V	10-6840	1
C15	CAP, .001uF MONO 10% 200V	10-1022	12
C16	CAP, .1uF MONO 20% 100V	10-1042	10
C17	CAP, 4u7 TANT. DIP 10% 35V	14-4751	2
C18	CAP, .1uF MONO 20% 100V	10-1042	10
C19	CAP, .001uF MONO 10% 200V	10-1022	12
C20	CAP, .01uF CER 80-20% 63V	05-1032	11
C21	CAP, 510pF MICA 2% 500V	09-5115	1
C22	VALUE SELECTED	SEL	6
C23	CAP, .001uF MONO 10% 200V	10-1022	12
C24	CAP, .001uF MONO 10% 200V	10-1022	12
C25	CAP, 5p6 CER 2% 100V NPO	05-0566	3
C26	CAP, .56pF CER +/- .25pF 100V P100	05-0560	1
C27	CAP, 5p6 CER 2% 100V NPO	05-0566	3
C28	CAP, 6p8 CER 2% 100V NPO	05-0686	1
C29	CAP, .1uF MONO 20% 100V	10-1042	10
C30	CAP, .01uF CER 80-20% 63V	05-1032	11
C31	CAP, .001uF MONO 10% 200V	10-1022	12
C32	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	3
C33	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C34	CAP, 1pF CER +/- .25pF 100V P100	05-0100	2
C35	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C36	CAP, .001uF MONO 10% 200V	10-1022	12
C37	CAP, 500pF MICA 2% 500V	09-5015	1
C38	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	1
C39	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	3
C40	CAP, 1uF POLYFILM 10% 50V	11-1050	1
C41	CAP, .01uF CER 80-20% 63V	05-1032	11
C42	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C43	CAP, 1p8 CER +/- .25pF 100V NPO	05-0186	1
C44	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C45	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C46	CAP, .01uF CER 80-20% 63V	05-1032	11

C47	CAP, 5p6 CER 2% 100V NPO	05-0566	3
C48	CAP, .001uF MONO 10% 200V	10-1022	12
C49	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	2
C50	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	2
C51	VALUE SELECTED	SEL	6
C52	CAP, 4-40pF TRIMMER 250V GREY	15-4402	2
C53	CAP, 62pF MICA 2% 500V	09-6200	1
C54	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C55	CAP, .001uF MONO 10% 200V	10-1022	12
C56	CAP, .01uF CER 80-20% 63V	05-1032	11
C57	CAP, .1uF MONO 20% 100V	10-1042	10
C58	CAP, 22pF MICA 2% 500V	09-2200	1
C59	CAP, 4-40pF TRIMMER 250V GREY	15-4402	2
C60	VALUE SELECTED	SEL	6
C61	VALUE SELECTED	SEL	6
C62	VALUE SELECTED	SEL	6
C63	CAP, 33pF METAL CLAD MINI 10% 250V	16-3302	3
C64	CAP, 33pF METAL CLAD MINI 10% 250V	16-3302	3
C65	CAP, 33pF METAL CLAD MINI 10% 250V	16-3302	3
C66	CAP, 18pF METAL CLAD, MINI, 5% 250V	16-1802	1
C67	CAP, 1pF CER +/- .25pF 100V P100	05-0100	2
C68	CAP, .001uF MONO 10% 200V	10-1022	12
C69	CAP, .005uF CER Z5U 20% 1KV	05-5024	1
C70	CAP, 330pF MONO 10% 200V	10-3312	9
C71	CAP, 330pF MONO 10% 200V	10-3312	9
C72	CAP, .01uF CER 80-20% 63V	05-1032	11
C73	CAP, 2u2 TANT. DIP 20% 35V	14-2251	2
C74	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C75	CAP, .1uF MONO 20% 100V	10-1042	10
C76	CAP, 2u2 TANT. DIP 20% 35V	14-2251	2
C77	CAP, .01uF CER 80-20% 63V	05-1032	11
C78	CAP, .001uF MONO 10% 200V	10-1022	12
C79	CAP, .1uF MONO 20% 100V	10-1042	10
C80	CAP, .1uF MONO 20% 100V	10-1042	10
C81	CAP, .01uF CER 80-20% 63V	05-1032	11
C82	CAP, 100uF TANT 20% 20V	14-1072	1
C83	CAP, 100pF CER 2% 100V NPO	05-1016	4
C84	CAP, 330pF MONO 10% 200V	10-3312	9
C85	CAP, 330pF MONO 10% 200V	10-3312	9
C86	CAP, 330pF MONO 10% 200V	10-3312	9
C87	CAP, 330pF MONO 10% 200V	10-3312	9
C88	CAP, 330pF MONO 10% 200V	10-3312	9
C90	CAP, 330pF MONO 10% 200V	10-3312	9
C91	CAP, 330pF MONO 10% 200V	10-3312	9
C92	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	3
C93	CAP, .001uF MONO 10% 200V	10-1022	12
C94	CAP, 4u7 TANT. DIP 10% 35V	14-4751	2
C95	CAP, 680pF CER Z5R 10% 1KV	05-6814	1
CR1	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR2	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR3	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR4	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	1

CR5	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR6	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR7	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR8	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR9	DIODE, 1N5228B, ZENER, 3.9V	60-5228	1
D1	LED, RED, 0.193"od X 0.35"long	36-0300	1
L1	COIL, SHIELDED CAN, TX VHF/UHF	31-7110	1
L2	COIL, SHIELDED CAN TX VHF/UHF	31-7111	1
L3	COIL, SHIELDED CAN, TX VHF/UHF	31-7112	2
L4	COIL, SHIELDED CAN, TX VHF/UHF	31-7112	2
L5	COIL, SHIELDED CAN, TX VHF/UHF	31-7120	1
L6	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L7	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L8	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L9	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L10	COIL, 4T, 16AWG BELDSOL, 90deg LEADS	30-1706	1
L11	COIL, 8T, HELICAL, 16AWG COPPER	30-1710	2
L12	COIL, 8T, HELICAL, 16AWG COPPER	30-1710	2
L13	COIL, 2T, 16AWG BELDSOL, STR. LEADS	30-1708	1
L14	COIL, 4T, 16AWG BELDSOL, STR. LEADS	30-1707	1
L15	COIL, 2T, 16AWG BELDSOL, 90deg LEADS	30-1705	4
L16	COIL, 2T, 16AWG BELDSOL, 90deg LEADS	30-1705	4
L17	COIL, 2T, 16AWG BELDSOL, 90deg LEADS	30-1705	4
L18	COIL, 2T, 16AWG BELDSOL, 90deg LEADS	30-1705	4
Q1	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	2
Q2	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	2
Q3	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q4	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q5	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q6	TRANSISTOR, MRF 227, RFM TO-39CE	63-0227	1
Q7	TRANSISTOR, MRF 260, RF, TO-220CE	63-0260	1
Q8	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q9	TRANSISTOR, 2N2905, PNP, G.P. TO-5, MTL	63-2905	1
Q10	TRANSISTOR, 2N2907A, PNP	63-2907	1
Q11	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q12	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q13	TRANSISTOR, TIP32, PNP, TO-220 AB	63-0032	1
R1	THERMISTOR, 100R	55-1010	1
R2	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R3	RES, CHIP 180K	52-1840	1
R4	RES, 82K 0.5W 5% STD M FLM	56-0823	1
R5	RES, 12K 0.5W 5% STD M FLM	56-0123	1
R6	RES, 33K 0.5W 5% STD M FLM	56-0333	2
R7	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R8	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R9	RES, 6R8 0.6W 5% STD M FLM	56-1068	4
R10	RES, 6K8 0.5W 5% STD M FLM	56-0682	1
R11	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R12	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R13	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R14	RES, 8R2 0.6W 5% STD M FLM	56-1082	1
R15	RES, 4R7 0.6W 5% STD M FLM	56-1047	6

R16	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R17	RES, 1K5 0.5W 5% STD M FLM	56-0152	1
R18	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R19	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R20	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R21	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R22	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R23	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R24	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R25	RES, 2R7 0.6W 5% STD M FLM	56-1027	1
R26	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R27	RES, 10R 0.6W 5% STD M FLM	56-1100	1
R28	RES, 6R8 0.6W 5% STD M FLM	56-1068	4
R29	RES, 6R8 0.6W 5% STD M FLM	56-1068	4
R30	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R31	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R32	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R33	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R34	RES, 6R8 0.6W 5% STD M FLM	56-1068	4
R35	RES, 390R 0.6W 5% STD M FLM	56-1391	2
R36	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R37	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R38	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R39	RES, 330R 0.5W 5% STD M FLM	56-0331	0
R40	RES, CHIP 22K 5%	52-2230	1
R41	RES, 33K 0.5W 5% STD M FLM	56-0333	2
R42	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R44	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R45	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R46	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R47	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R48	RES, 10K 0.5W 5% STD M FLM	56-0103	7
R49	RES, CHIP 100K 5%	52-1040	1
R50	RES, 1M 0.5W 5% STD M FLM	56-0105	1
R51	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R52	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R53	RES, 390R 0.6W 5% STD M FLM	56-1391	2
R54	RES, 470R 0.5W 5% STD M FLM	56-0471	1
R55	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R56	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R57	RES, 10K 0.5W 5% STD M FLM	56-0103	7
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC2	CHOKE, 22uH, 10%	30-0220	2
RFC3	CHOKE, 10uH, 10%	30-0100	3
RFC4	CHOKE, 22uH, 10%	30-0220	2
RFC6	CHOKE, 10uH, 10%	30-0100	3
RFC7	CHOKE, 10uH, 10%	30-0100	3
RFC8	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC9	CHOKE, .15uH, 10%	30-1002	2
RFC10	FERRITE BEAD, 64 MIX, 0.138"od.,0.118"L	30-6410	2
RFC11	FERRITE BEAD, 64 MIX, 0.138"od.,0.118"L	30-6410	2

RFC12	CHOKE, .15uH, 10%	30-1002	2
RFC13	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC14	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC15	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC16	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC17	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC18	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC19	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC20	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC21	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC22	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC23	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC25	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC26	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
U1	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
	SOCKET, 0.040, GOLD PLATE	19-0040	4
	HOOD, RF, TYPE N CONNECTOR	19-1770	1
	CONNECTOR, TYPE N	19-1775	1
	PIN, SQUARE, 0.045", TIN PL.	19-2161	2
	HEADER, 6 SQR.PINS, TIN PL. 0.1" PCB MTG	19-6416	1
	MIC CONNECTOR, 4 PIN MALE, SCRW LCKG BLK	19-7030	1
	MIC CONNECTOR, 4 PIN FEM, SCRW LCKG BLK	19-7031	1
	CONNECTOR, FEM. 6 DUAL CONT. KEYED 22AWG	19-7726	1
	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	1
	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	2
	FUSE, 3 AMP FAST BLOW	25-0003	1
	HEATSINK, TO-46/TO-72, 2 PIECES, BLACK	27-2220	4
	HEATSINK, T0-39/TO-5, 0.5"od X 0.25" RED	27-2260	1
	PAD, TRANSISTOR MTG, NYLON, TO-5	33-0005	1
	INSULATOR, THERMALLY COND. TO-220, SILI.	33-0220	1
	CASE, LED, FLANGE & LOCKING RING	36-0310	1
	LUG, GROUND, #4, 2-3/32 HOLES, 23/32	37-4000	1
	NAME PLATE, VHF TX, MOD2	39-865210	1
	SILK SCREENING, FRONT PANEL TX	39-865710	1
	HEATSINK, BLACK EXT, VHF/UHF TX	39-873110	1
	SIDE PANEL, TX LEFT SIDE	39-873210	1
	HEATSINK, 1/4" ALM, VHF TX HEAT XFER BLK	39-873410	1
	COVER, WRAP AROUND	39-873510	1
	COIL FORM, VHF, Q200.5 X-LINKED POLYSTYR	39-873610	2
	COVER, BRASS, VHF HELICAL FILTER	39-873810	1
	FRONT PANEL, TX, 14HP.	39-874810	1
	EXTRUSION, HELICAL FILTER, VHF TX	39-875810	1
	MATTE FOIL LABELS, FP FREQ. STICKER	39-880510	1
	MATTE FOIL LABELS, TRANSMITTER TCXL	39-880710	1
	MATTE FOIL LABELS, TXV SERIAL NUMBER	39-880910	1
	NUT, CAPACITOR MOUNT	42-3469	2
	NUT, 4-40 HEX 3/16 x 1/16 SS	42-4400	4
	SEAL, SLOTTED, FOR VHF VAR. CAPS	42-4613	6
	PCB, VHF TRANSMITTER	43-860622	1
	FASTENER, QUICK RELEASE, GREY PKG.100	58-0003	4
	SIDE PANEL, EXTRUSION	58-0004	1
	HANDLE, FRONT PANEL, 14HP, GREY	58-0006	1

NUT, M2.5, HEX, PKG. OF 100	58-0010	4
SCREW, M2.5 x 10, CHEESE HEAD	58-2500	2
SCREW, M2.5 x 12, C/SK, FOR HANDLES	58-2504	2
WASHER, M2.5, SHAKEPROOF	58-2512	4
SCREW, M3 x 8, RAISED C/SK	58-3002	4
SCREW, M3 x 8, PAN HEAD, ZINC	58-3004	4
CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
SCREW, 10-32 x 3/8 PAN PHIL, MS SS	59-1037	2
SCREW, 10-32 x 9/16 PAN PHIL, MS SS	59-1056	2
SCREW, 4-40 x 1 1/2", PAN PHIL, MS SS	59-4150	6
SCREW, 4-40 x 5/16 PAN PHIL, MS SS	59-4331	2
SCREW, 4-40 x 3/8, PAN PHIL, MS SS	59-4337	4
SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	10
SCREW, 6-32 x 3/8 RD. SLOT, NYLON	59-6837	2
STANDOFF, 4-40 x 1/4, 7/32od, NO-ROT, NICK	67-4425	4
SWITCH NUT	70-2211	1
SWITCH, DPDT, ON-OFF-ON	70-3200	1
TUBING, TEFLON, 16AWG, THIN WALL	76-0016	1
TUBING, TEFLON, 24AWG, THIN WALL	76-0024	1
TUBING, PVC, 8AWG, CLEAR	76-1008	1
HEATSHRINK, 3/32", BLACK	76-2093	1
WASHER, SHAKEPROOF, .234-64, VHF VARI. CAP	77-1999	2
WASHER, LOCKING, #4 SPLIT SS	77-4001	19
WASHER, FLAT, #4 SS	77-4010	6
WASHER, NYLON, #4, SHOULDER INSULATING	77-4095	1
COAX, RG188A/U, TEF, WHT	82-0188	1
WIRE, TEFLON, 24AWG, STRANDED, BROWN	86-2401	1
WIRE, TEFLON, 24AWG, STRANDED RED	86-2402	1
WIRE, TEFLON, 24AWG, STRANDED ORANGE	86-2403	1
WIRE, TEFLON, 24AWG, STRANDED YELLOW	86-2404	1
WIRE, TEFLON, 24AWG, STRANDED VIOLET	86-2407	1
WIRE, TEFLON, 24AWG, STRANDED GREY	86-2408	1

Reference: VHF Transmitter Main Board Schematic 43-860622S

Audio Processor Board

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	9
C4	CAP, .1uF POLYFILM 10% 50V	11-1040	2
C5	CAP, 120pF CER 2% 100V NPO	05-1216	3
C6	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C7	CAP, 12pF CER 2% 100V NPO	05-1206	2
C8	CAP, .01uF POLYFILM 10% 63V/100V	11-1031	1
C9	CAP, 2u2 TANT. DIP 20% 35V	14-2251	1
C10	CAP, .1uF MONO 20% 100V	10-1042	9
C11	CAP, .1uF MONO 20% 100V	10-1042	9
C12	CAP, .01uF CER 80-20% 63V	05-1032	7
C13	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	2
C14	CAP, .68uF POLYFILM 10% 50V	11-6840	4

C15	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C16	CAP, .01uF CER 80-20% 63V	05-1032	7
C17	CAP, 47uF TANT. DIP 20% 20V	14-4760	2
C18	CAP, .1uF MONO 20% 100V	10-1042	9
C19	CAP, 120pF CER 2% 100V NPO	05-1216	3
C20	CAP, .1uF MONO 20% 100V	10-1042	9
C21	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C22	CAP, .1uF POLYFILM 10% 50V	11-1040	2
C23	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C24	CAP, .1uF MONO 20% 100V	10-1042	9
C26	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C27	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	2
C28	CAP, 120pF CER 2% 100V NPO	05-1216	3
C29	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C30	CAP, 12pF CER 2% 100V NPO	05-1206	2
C31	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C32	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C33	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C34	CAP, 47uF TANT. DIP 20% 20V	14-4760	2
C35	CAP, .1uF MONO 20% 100V	10-1042	9
C37	CAP, .033uF POLYFILM 10% 63V/100V	11-3331	1
C38	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C39	CAP, .01uF CER 80-20% 63V	05-1032	7
C40	CAP, .01uF CER 80-20% 63V	05-1032	7
C41	CAP, .1uF MONO 20% 100V	10-1042	9
C42	CAP, 100uF TANT 20% 20V	14-1072	1
C44	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C52	CAP, 330pF MONO 10% 200V	10-3312	1
C55	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C56	CAP, .1uF MONO 20% 100V	10-1042	9
C57	CAP, .01uF CER 80-20% 63V	05-1032	7
C58	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C59	CAP, .22uF MONO 20% 50V	10-2240	1
C60	CAP, .01uF CER 80-20% 63V	05-1032	7
C61	CAP, .01uF CER 80-20% 63V	05-1032	7
C62	CAP, 22uF TANT DIP 20% 20V	14-2262	1
C63	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
JU1	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
JU2	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
JU3	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
JU4	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
JU6	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
Q1	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
Q2	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
R1	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R2	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R4	RES, 100R 0.5W 5% STD M FLM	56-0101	1
R7	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R8	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R9	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2

R10	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R11	RES, 6K8 0.5W 5% STD M FLM	56-0682	1
R12	RES, 820R 0.5W 5% STD M FLM	56-0152	1
R13	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R15	RES, 330K 0.5W 5% STD M FLM	56-0334	1
R16	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R17	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R18	RES, 20K 0.5W 5% STD M FLM	56-0203	2
R19	RES, 200K 0.5W 5% STD M FLM	56-0204	1
R20	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R21	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R22	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R23	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R24	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R25	RES, 33K 0.5W 5% STD M FLM	56-0333	1
R26	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R27	RES, 39K 0.5W 5% STD M FLM	56-0393	1
R28	VALUE SELECTED	SEL	4
R29	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R31	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R32	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R33	RES, 680R 0.5W 5% STD M FLM	56-0681	1
R34	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R35	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R36	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R37	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R38	RES, 470K 0.5W 5% STD M FLM	56-0474	1
R39	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R40	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R41	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R44	RES, 27K 0.5W 5% STD M FLM	56-0273	1
R45	RES, 2K2 0.5W 5% STD M FLM	56-0222	1
R47	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R51	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R54	RES, 20K 0.5W 5% STD M FLM	56-0203	2
R55	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R56	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R58	RES, 240K 0.5W 5% STD M FLM	56-0244	1
R59	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R60	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R61	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R62	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R63	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R66	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R67	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R68	RES, 10M 0.6W 5% STD M FLM	56-0106	1
R69	VALUE SELECTED	SEL	4
R70	VALUE SELECTED	SEL	4
R71	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R72	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R73	VALUE SELECTED	SEL	4

R75	RES, 110K 0.5W 5% STD M FLM	56-0114	1
R76	RES, 1K 0.5W 5% STD M FLM	56-0102	4
U1	I.C. SL6270C, PRE-AMP, GAIN, 8 PIN	28-6270	2
U2	I.C. SL6270C, PRE-AMP, GAIN, 8 PIN	28-6270	2
U4	I.C. XRL555MD, TIMER, LOW PWR	28-0555	1
U5	I.C. LM2902D, OP AMP, QUAD, SO-14	28-2902	2
U6	I.C. LM2902D, OP AMP, QUAD, SO-14	28-2902	2
U7	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
	CAP, 68pF CER 2% 100V NPO	05-6806	0
	HEADER, 2 PIN-2 ROWS,RIGHT ANG, TIN	19-8022	3
	FERRITE BEAD, 64 MIX, 0.138"od.,0.118"L	30-6410	1
	PCB, AUDIO PROCESSOR, TX	43-861421	1

Reference: Schematic Transmitter Audio Processor - 43-861421S

Parts List - Crystal Module

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, 330pF CER 2% 100V N750	05-3318	1
C2	CAP, 12pF CER 2% 100V NPO	05-1206	1
C3	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	1
C4	CAP, 22pF CER 2% 100V N1500	05-2209	1
C5	VALUE SELECTED	SEL	2
C6	VALUE SELECTED	SEL	2
CR1	DIODE, MV2113, VARACTOR, 68pF@4V, TO-9	60-2113	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	1
L1	COIL, SHIELDED CAN, VHF TX CRYSTAL OSC.	31-7113	1
R1	RES, CHIP 22K 5%	52-2230	1
R2	RES, CHIP 180K	52-1840	1
R3	RES, CHIP 100K 5%	52-1040	2
R4	THERMISTOR, 10K	55-0103	2
R5	THERMISTOR, 33R	55-0330	1
R6	RES, CHIP 33R 5%	52-3300	1
R7	RES, 120K 0.5W 5% STD M FLM	56-0124	1
R8	THERMISTOR, 10K	55-0103	2
R9	RES, CHIP 100K 5%	52-1040	2
Y1	CRYSTAL, FUND. COLD WELD, 15 - 18MHz	20-1500	1
	SOCKET, 0.040, GOLD PLATE	19-0040	2
	TERMINAL PIN, .040", GOLD PLATE	19-1040	4
	ENCLOSURE, PLASTIC, GREEN, 1.0" X 0.75"	22-4290	1
	PCB, TX CRYSTAL OSCILLATOR	43-861921	1
	SCREW, 2-56 x 5/16, SLOT, BRASS	59-2560	1
	SPACER, 2-56 X 5/8, ALUMINIM	67-2560	1
	TUBING, TEFLON, 24AWG, THIN WALL	76-0024	1

Reference: Schematic Transmitter Crystal Module - VHF 43-861910S

THEORY OF OPERATION - VHF RECEIVER

General

The MT-2 Series VHF Receiver consists of four PCB's, the R.F. amplifier PCB, I.F. strip main PCB, squelch-audio PCB and the Rx crystal module PCB. The crystal module is a plug-in unit that has been environmentally calibrated. The crystal modules are interchangeable with any of the MT-2 Series VHF receivers. The VHF receiver covers the range of frequencies from 138 - 174 MHz with no component changes.

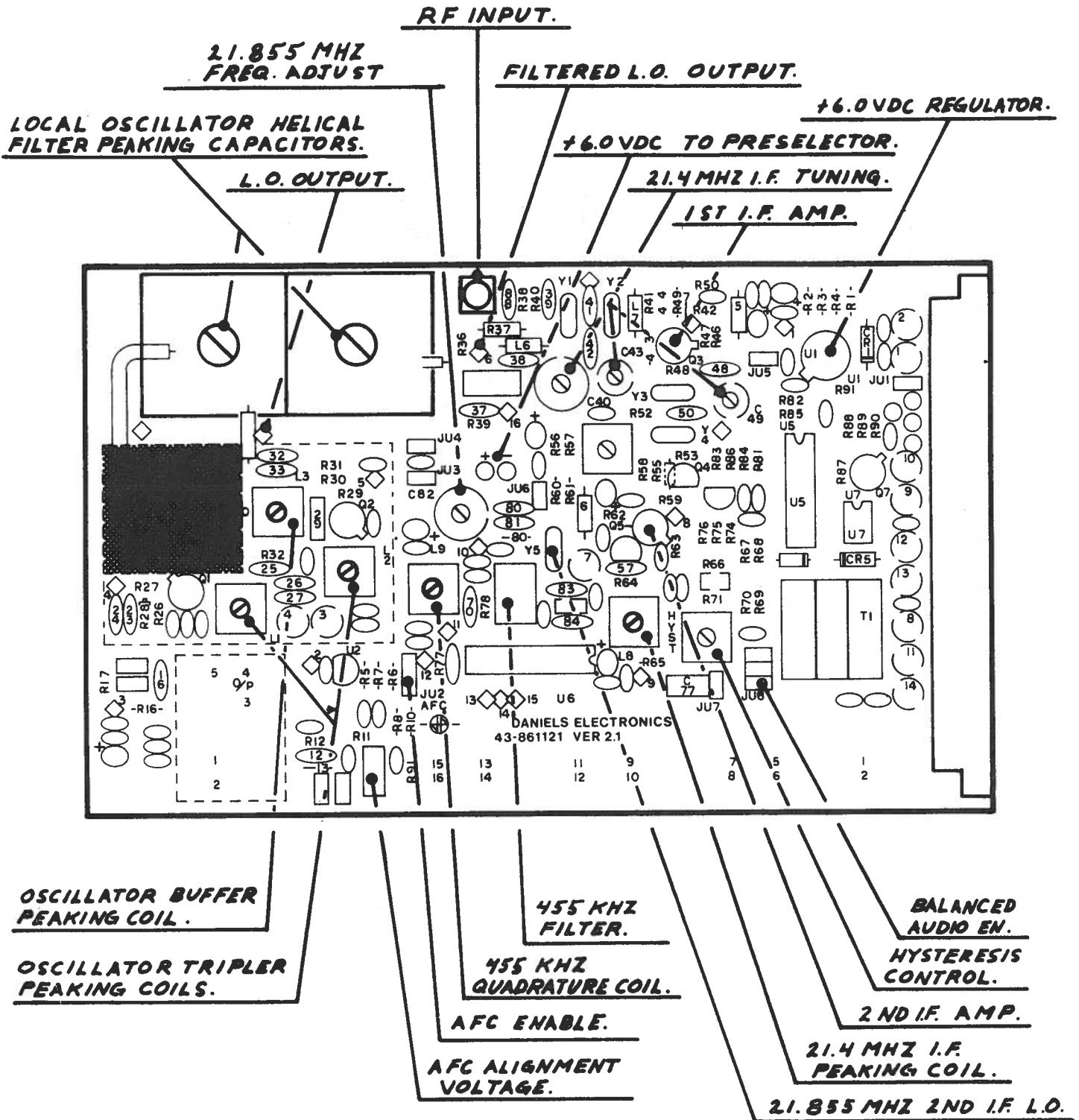
R.F. Stage Preamplifier (No. 43-865212)

D.C. power (+6.0 Volts DC) is applied to J3 on the R.F. pre-amplifier PCB. The input signal is fed into a TYPE N input connector and applied, via a high Q, 2 stage helical filter, to the high gain (+20db) low noise RF preamplifier. The output is further filtered by 1 additional high Q helical filter. The RF preamplifier gain is +20 dB, the total insertion loss of the helical filter sections is -8 dB thereby providing a net overall preselector stage gain of +12 dB. The output J2 is routed into the mixer on the main Rx PCB. The R.F. pre-amplifier Q1 is temperature compensated by Q2 and Q3 to provide a uniform gain response from -40°C to +60°C.

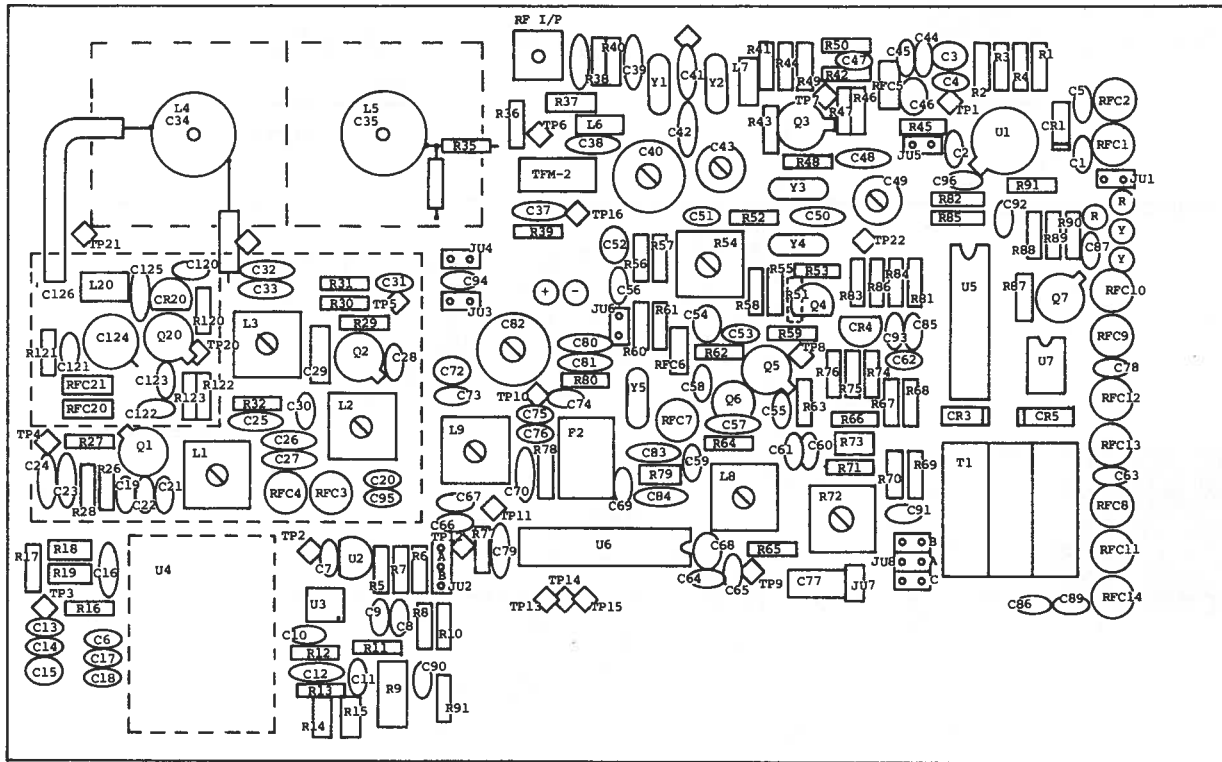
Receiver - Main Circuit Board (No. 43-861121)

The receiver operates on the +9.5 Volts DC supply applied at pins B6, Z6 at the main receiver circuit board connector. The +9.5 Volts DC regulated source is applied in part to the low temperature crystal compensation circuitry and also to the audio power amplifier U1 (Rx audio processor PCB). All other circuitry is regulated by U1 +6.0 Volts DC output. The receiver crystal module U4 (38 - 52 MHz overtone mode - crystal element) is coupled to the oscillator-tripler transistor Q1 (located on main receiver board) via J3-4. Q1 is biased compensated by positive coefficient R28 for optimal drive at extended low temperature. The output of Q1 ranges over 116.6 - 152.1 MHz and is peaked by L1. C25, C26, C27 provide critical coupling to buffer Q2. L2 peaks the output signal from Q2. The output signal is filtered by a 2 stage helical cavity F1 which is peaked by 2 integral high Q capacitors. The extremely pure F1 output is terminated and matched by a 3db pad and applied to a double balanced first mixer. The on channel signal from the R.F. pre-amplifier is combined at the first mixer with the crystal generated injection multiple frequency thereby generating a desired mixer product (or I.F. frequency) of 21.4 MHz. The 21.4 MHz I.F. signal is filtered by a 4 pole crystal section Y1 and Y2. Q3 provides 6dB I.F. gain and matching between filter sections. C40, C43 and C49 are adjusted to provide the best distortion/ sensitivity throughout the I.F. strip. The output of Q3 feeds a 4 pole crystal section Y3 and Y4. The second I.F. amplifier Q5 and Q6 provide high level I.F. gain. The amplifier has external features to vary the gain

VHF Receiver - Component Layout
 Figure 1-16



VHF Receiver - Component Layout
Figure 1-17



by preset levels. By adjusting the bias on Q6, the hysteresis control transistor, U5A, controls the overall sensitivity of the receiver. R72 sets the differential between minimum and maximum I.F. gain levels. U5A is normally activated by the squelch circuitry i.e. when a signal is strong enough to activate the squelch circuit, the hysteresis (sensitivity) control is overridden by internally grounding Pin Z28 via the mute switching circuitry.

L8 peaks the I.F. gain and feeds the output to pin 18 of U6 (MC3359). U6 is a multi-function FM processing I.C., the circuit provides IF limiting, second IF oscillator and mixing, discriminator and audio amplifiers/ buffers to support the IF, received audio and squelch operation of the UR-2 receiver. C82 adjusts crystal Y5 for the second mixer, L9 resonates the discriminator output for low distortion and signal/noise centered AFC. U6 pin 11 is the AFC (discriminator centre) voltage which feeds the crystal temperature compensation circuitry. The AFC can be selected by JU2A, which causes the voltage of U3A pin 3 to shift in response to variations in on-air channel frequency. The AFC assists in the pre-programmed crystal temperature compensation, and is not required to make the crystal track within its specified tolerances.

Audio Processor No. 43-870911

U6 Pin 10 is the unprocessed recovered audio and noise source, this signal feeds the UHF Rx Audio Processor PCB, U8 (schematic 43-870911). This signal is divided three ways, one portion is filtered and de-emphasized by C3, C4, C5, R1, R2, R3 and R4. The signal is audio switched by U1 which is under control of the squelch/mute circuitry. The audio signal is maintained at a constant level by the network input to U2A(LM2904D). U2A provides enough gain for a -12dBm output. This level is adjusted by R23 then routed to either the audio power amplifier U4 via JU2A, or directly to the Rx main PCB. On the main PCB the audio can be routed to an unbalanced output or programmed for 600 ohm balanced output by JU8.

U6 Pin 10 also feeds R9 and C9, this is the flat audio input. The input is audio switched by U1 (MC14066) which is controlled by the squelch circuitry. The signal is amplified by U3A, this stage must be enabled by JU3. The output level is set by R35, which is then routed to the audio power amplifier U4, or fed directly to the Rx main PCB. On the main PCB the audio may be routed to an unbalanced output or jumper programmed for a 600 ohm balanced output by JU8.

U6 P10 is also the noise source for squelch operation. The signal is fed to R39, C29 then the audio is trapped by networks C30, L1 and C31, L2. U2B (LM2904D) provides a temperature compensated first stage noise amplifier. The output then passes to a temperature compensated second stage noise amplifier in U6 located on the Rx main PCB. Squelch threshold is set by R52, the 2nd noise amplifier gain control. The noise level is converted to a D.C. level by CR5, CR6, C38 and C39. This level is the trigger for the squelch gate U5. U5 maintains

approx. 1db of inherent squelch differential. The squelch gate output operates the audio muting switch U1, and the hysteresis control on the I.F. strip via the mute switching circuitry.

The squelch gate operates the audio muting switch U1 to provide quieting of the receiver. Several diodes allow external muting of the receiver audio circuitry. The degree of quieting can be increased by using programming diodes CR2, CR3 and CR4. These diodes shift the audio biasing on U2A, U3A and U4 to provide deeper audio muting of the audio amplifier stages.

Q1 is used to sample the D.C. noise level and provide an approximation of signal strength, this level is routed to the SM-2 (System monitor) test panel.

Crystal Module - Receiver (VHF) (No. 43-864610)

The crystal module frequency is $\frac{fc-21.4 \text{ MHz}}{3}$ where fc is the channel frequency.

The crystal is operated in the overtone mode and is mounted in a HC-25/U coldweld holder. The crystal plugs into a socket pin within the TCXO module. A compensation network comprising of RT1, RT2 and RT3 provide temperature compensation ranging from -40°C to +60°C. Varicap D1 provides electronic tuning of the crystal frequency and frequency netting coil L1 facilitates crystal frequency calibration. Low temperature compensation is provided to the crystal module C19 by R18, R19 and R24 on the Rx main PCB.

RECEIVER ALIGNMENT (VHF)

Test Equipment List

To align the receiver, the following test equipment or its equivalent is recommended:

Power supply regulated 2A current limit, B & K
Frequency counter, Sencore FC71
Multimeter, Fluke 8050A
Distortion analyzer, Amber 3501
Oscilloscope 300 MHz, Tektronix 2465
Communications test set, Marconi 2905
Alignment tool Johanson 8777

Receiver Alignment

General

The VHF receiver as supplied by the factory, covers the complete band 138 - 174 MHz. In addition the unit is normally programmed in the following way:

- 1) audio de-emphasis response
- 2) high level audio output - increases current consumption by 4 mA - 6 mA;
- 3) 600 ohm balanced output

Apply power to the receiver by using the SM-2 (system monitor rack power supply) or by applying +9.5 VDC to pins B6, Z6 and ground B30, Z30, B32 and Z32.

During the factory alignment several jumpers were installed on the main PCB. JU3 applies +6.0 Volts DC to the oscillator-tripler stage, JU5 applies +6.0 Volts DC to the 1st I.F. amplifier, JU6 applies power to the 2nd I.F. amplifier. Unless the receiver current is greater than 40mA these jumpers should not have to be removed for troubleshooting. In a normal operational unit the +9.5 Volts DC current is 35mA. Test conditions: signal or modulation as indicated.

Test Points - Main Receiver Board

Test points are designated with a diamond shaped identification mark on all PCB.

TP 1	+6.0 Volts DC U1 Regulator output
TP 2	+3.8 - +4.2 Volts DC temperature compensation reference
TP 3	+2.0 - +3.5 Volts DC set by R9
TP 4	approx. +2.5 Volts DC remove cover screen to measure*
TP 5	approx. +3.1 Volts DC remove cover screen to measure May vary depending on factory calibration.

- * The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU3) under normal conditions is 8.0 mA.

TP 6	Channel dependent in the range 116 MHz to 152.6 MHz
TP 7	+4.0 Volts DC 1st I.F. amplifier emitter voltage*

- * The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU5) under normal conditions is 2.0 mA.

- TP 8 +3.3 Volts DC 2nd I.F. amplifier emitter voltage*
- * The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU6) under normal conditions is 1.0 mA.
- TP 10 455.000 kHz Injection point 1kHz tone @ 3kHz dev. -20dBm.
- TP 9 21.4 MHz injection \approx -95dBm @ 12dB Sinad
- TP 11 455.000 MHz measurement point, -70dBm input No Modulation
- TP 12 AFC voltage (discriminator reference centre)
- TP 13 Noise Amplifier (2nd stage) input
- TP 14 Noise Amplifier (2nd stage) output
- TP 15 2.2 Vpp (approx.) recovered audio & noise modulation ON, under standard test condition of -70dBm input 1 kHz Tone @3 kHz deviation.
- TP 16 21.4 MHz 1st IF injection -110dBm @ 12dB Sinad

Receiver Alignment Procedure

Disconnect the AFC jumper if used (JU2).
 Inject 455.000 kHz into TP 10 - pin 5 of U6 (MC3359) -20dBm, 1 kHz @3 kHz deviation. Monitor the recovered audio via balanced line output pins B26, Z26. Monitor the audio with a distortion analyzer using the appropriate audio filter, also monitor the audio level. Adjust the audio control level R23 on Audio Processor PCB to max. (normal factory setting), adjust R36 to the recovered audio level desired. Note very high audio levels > +15 dBm will cause clipping thereby producing high distortion readings. Peak the quadrature coil L9 for lowest distortion approximately 1.0%.

Monitor TP 12 with a D.C. voltmeter and in conjunction with lowest distortion an AFC voltage of +2.5 to +3.0 VDC should result. L9 is very sensitive to the AFC voltage level, therefore if +2.5 to +3.0 VDC cannot be achieved adjust L9 to as close as possible but not > +3.0 VDC.

Inject 21.4 MHz into TP 9 - U6 (MC3359) -50dBm, 1 kHz @3 kHz deviation. As above monitor the recovered audio. Adjust C82 for +3.0 V at TP 12. Reduce the input level to approx. -90db, Sinad meter should indicate a signal-to-noise ratio of 10-12db. If +3.0 VDC at TP12 cannot be achieved repeat 455 kHz alignment and set L9 to +2.0 VDC.

Inject 21.4 MHz into TP 16 (I.F. strip input) adjust C40, C43 and C49 for best sensitivity, peak L8 (slug position near top of coil shield). Confirm a sensitivity of approx. -110db for 12db Sinad. The fine adjustment for Low distortion and optimal sensitivity are interactive and must be carefully set after completing the initial tuning.

Monitor the oscillator output at TP6 with a frequency counter and/or an oscilloscope. Adjust R11 VREF for +3.0 Volts DC at pin 3 of U3A (No AFC). Peak L1, L2 and L3 for maximum output and optimal Sinad, observe changes in overall current consumption, ie: as L1, L2 and L3 peak, a corresponding increase in current will be observed. Peak the two capacitor tuning screws in the helical filter cavity F1. Remove the sealed screw top caps and use Johanson alignment tool 8777 or equivalent. Set the crystal module on to the desired frequency by setting frequency trimming coil inside the crystal module unit. If L.O. o/p rolls off at -40° C temperatures this can be corrected by adjusting L3 slug in 1/2 to 1 turn.

If difficulty is encountered in locating the peak position of the L.O. helical filter assembly, inject a high level +20dBm "on air" signal into J4 (RF I/p) on the main Rx PCB and adjust the oscillator controls (F1) and progressively decrease the signal generator for best Sinad.

Inject the desired channel frequency into J4, the R.F. mixer input port. Set the signal generator level to -70dBm, with standard modulation of 1 kHz Tone @3 kHz deviation, adjust the I.F. strip capacitors C40, C43, C49 and quadrature coil L9 for the lowest audio distortion. Reduce the signal input and re-adjust the above components and the L.O. controls L1, L2, L3, C124 and F1 for best Sinad (sensitivity). Alternate the distortion and sensitivity alignment until the optimum balance is achieved i.e. approx. -110 -114db for 12db sinad, approx. 0.7% to 1.2% distortion.

R.F. Preselector Alignment

If the frequency change on the pre-selector is within 5.0 MHz of the original factory calibration, the pre-selector can be tuned by removing the slotted sealing caps and setting the capacitors for best sinad (in the range -114/-117 dBm for 12db sinad). The preselector current consumption is approx. 3.2 mA.

If a frequency shift greater than 5.0 MHz is required the pre-selector should be tuned using a spectrum analyzer configured with a tracking generator. Although this is not essential it will speed the alignment procedure, due to the critical coupling and the precision alignment requirements. The helical R.F. amplifier assembly has an overall gain of +8 to +12 db. Retune the cavity capacitors until the output is at maximum. Connect the pre-selector to J4 (5mA) the R.F. input port and re-peak the helical filters for best sinad. Connecting the pre-selector may affect the distortion slightly; increase the input signal to -70dBm, 1 kHz Tone @3 kHz deviation, confirm that the audio distortion is maintained at 0.7% - 1.2% - re-adjust C40, C43 and C49 if necessary and confirm the receiver sensitivity meets the standard receiver specifications outlined above, repeat if necessary.

Final AFC Alignment

Measure TP 12 with a D.C. voltmeter and re-adjust C82 for an AFC voltage of +3.0 VDC (-70dBm i/p @ 1kHz tone). Connect JU2 to the AFC jumper. If the frequency is being monitored note the AFC loop connection. JU2 will cause the L.O. frequency to vary under different signal conditions:

- ie: 1) signal present
- 2) noise + squelched
- 3) noise + unsquelched

Reconfirm the recovered audio is at the desired level.

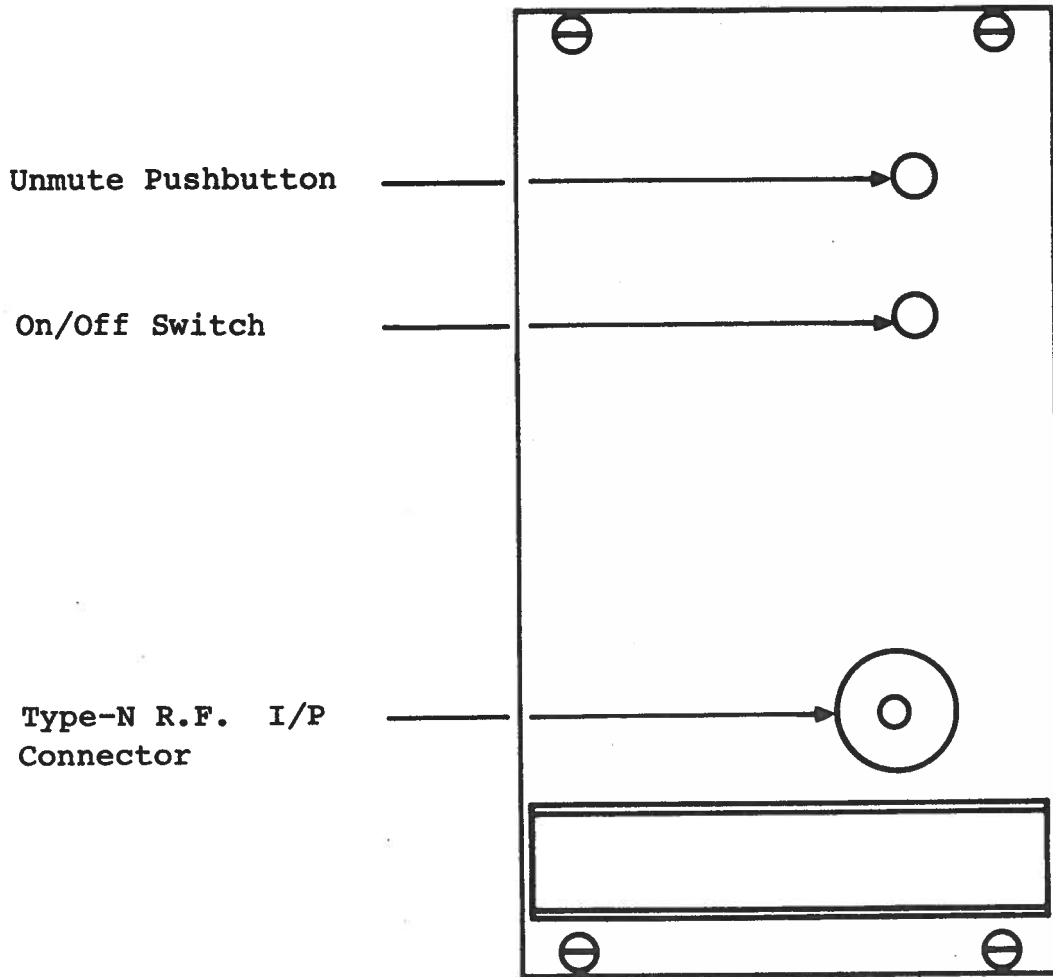
Proceed with environmental testing.

Functional Connections - VHF Receiver

Male connector Type F to DIN41612

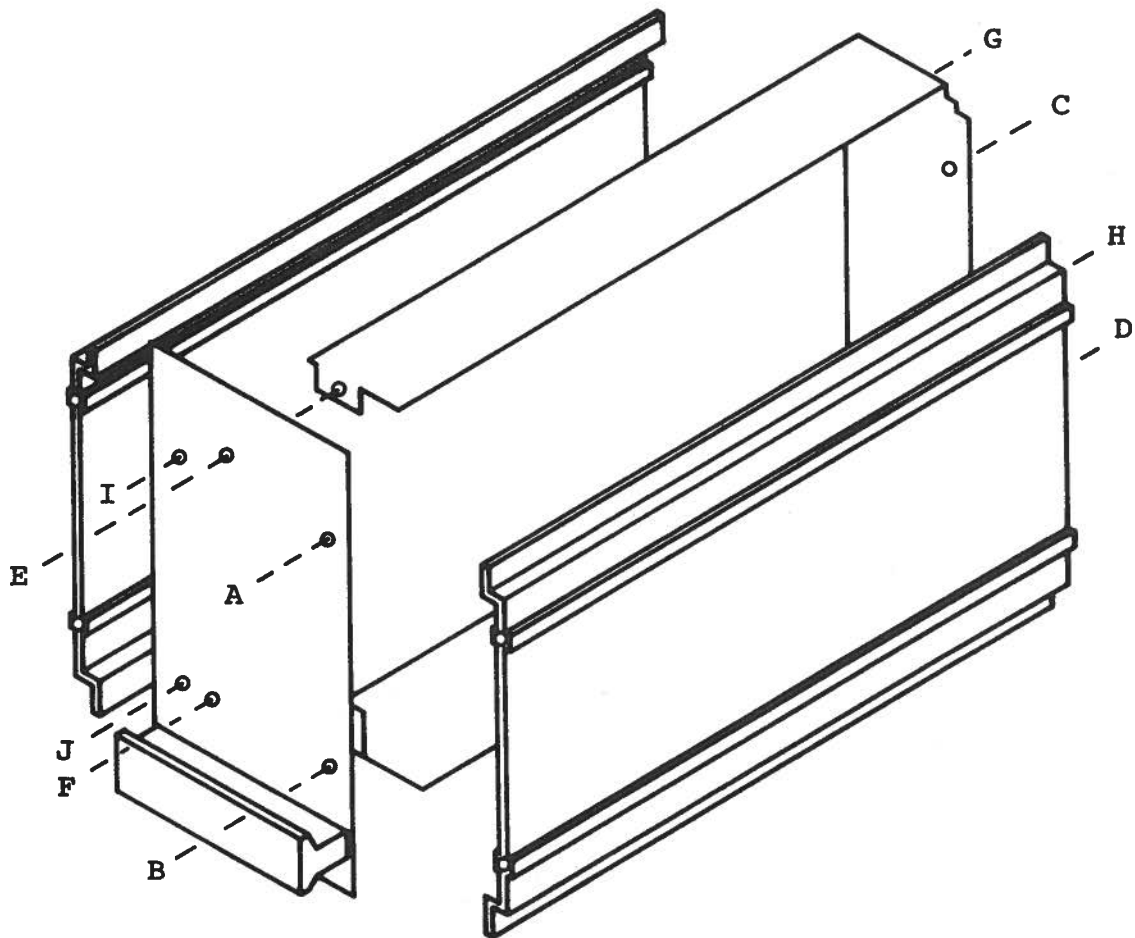
<u>PIN NUMBER</u>	<u>NAME</u>	<u>FUNCTION</u>
B2	N/C	spare
Z2	N/C	spare
B4	Audio	Audio to 8 ohm Spkr
Z4	6.0 VDC	Rx internal regulator o/p
B6	+9.5 VDC	regulated D.C. input
Z6	+9.5 VDC	regulated D.C. input
B8	N/C	spare
Z8	N/C	spare
B10	N/C	spare
Z10	N/C	spare
B12	C.O.R	carrier operated squelch
Z12	C.O.R	not isolated
B14	C.T.C.S.S. output	unprocessed recovered audio
Z14	C.T.C.S.S. SW	squelch disable
B16	A- system	switched +9.5 VDC
Z16	A- system	switched +9.5 VDC
B18	C.O.S. iso.	opto isolated switch (option)
Z18	C.O.S. iso.	opto isolated switch
B20	Unbal aud de-emp	audio unbal. squelch de-emp.
B22	Unbal aud flat	audio unbal. squelched flat
Z22	AFC	AFC DC voltage
B24	Carrier	carrier strength DC voltage
Z24	N/C	spare
B26	Line	Rx balanced audio o/p
Z26	Line	Rx balanced audio o/p
B28	Mute	Rx mute
Z28	Hysteresis	I.F. gain control
B30	GND	circuit common
Z30	GND	circuit common
B32	GND	circuit common
Z32	GND	circuit common

Illustrations And Schematic Diagrams
Receiver - Front Panel
Figure 1-13



Receiver - Exploded View

Figure 1-14



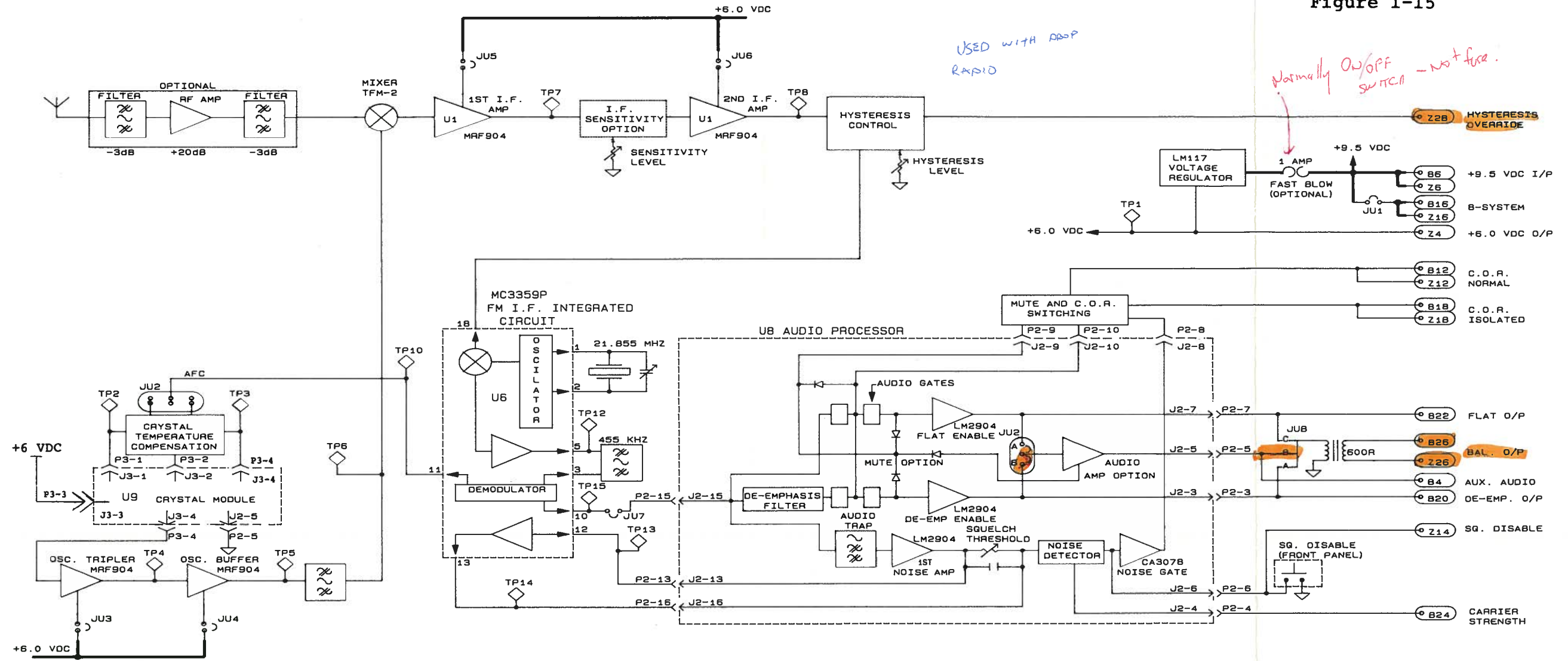
Component Side Access:

1. Remove screws A - D.
2. Lift off right side panel.

Solder Side Access:

1. Remove screws A - D
2. Lift off right side cover.
3. Remove screws E - H.
4. Lift off wrap-around shroud
5. Remove PCB mounting screws (4) from left side cover.
6. Remove screws I - J.
7. Slide PCB and front panel out of left side extrusion.

VHF Receiver - Block Diagram
43-861121U
Figure 1-15



USED WITH PRO P
RAPID

Normally ON/OFF SWITCH - NO + fuse.

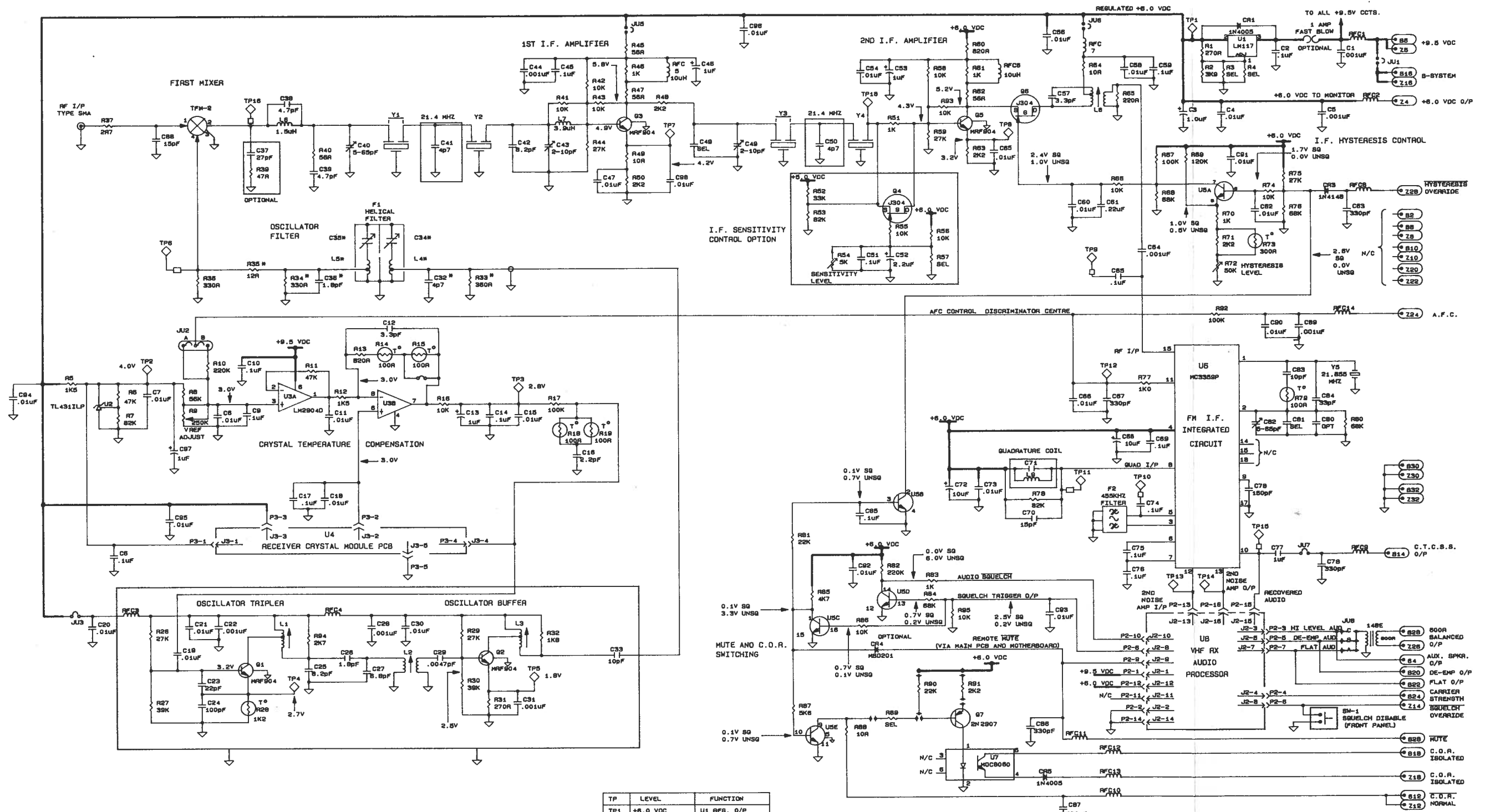
DATE	CODE	REV	APP	DESCRIPTION

RECEIVER JUMPER FUNCTIONS	
JU1	B-SYSTEM ENABLE
JU2 A	HARD AFC
JU2 B	SOFT AFC
JU3	~ 8mA OSC. POWER
JU4	N/R
JU5	~ 2mA 1st I.F. POWER
JU6	~ 6mA 2nd I.F. POWER
JU7	CTCSS AUDIO ENABLE
A	FLAT AUDIO BAL.
B	DE-EMPHASIS AUDIO BAL.
C	HIGH LEVEL AUDIO BAL.

TP	LEVEL	FUNCTION
TP1	+6.0 VDC	U1 REG. O/P
TP2	+2.8-3.0VDC	U2 REG. O/P
TP3	+2.0-3.5VDC	Vref ADJUST
TP4	~ +2.5VDC	Q1 BIAS
TP5	~ +2.0VDC	Q2 BIAS
TP6	384.7-448.6MHZ	MIXER INJECT.
TP7	~ +3.3VDC	Q3 BIAS
TP8	~ +3.1VDC	Q5 BIAS
TP9	~ 21.4MHZ	INJECTION POINT
TP10	458.000KHZ	INJECTION POINT
TP11	458.000KHZ	MEAS. POINT
TP12	+2.3-3.2VDC	AFC
TP13	Vpp	NOISE AMP I/P
TP14	Vpp	NOISE AMP O/P
TP15	2.2Vpp	RECOVERED AUDIO
TP16	21.4MHZ	I.F. STRIP INJECT.

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA
TITLE: RECEIVER BLOCK DIAGRAM VHF		
DRAWN ALC	DATE 15/07/88	DRAWING# 43-861121S
CHECKED	APPROVED	M1-2.1

VHF Receiver - Schematic Diagram
43-861121S
Figure 1-18



TEST PROCEDURE NOTES
1. LO-BAND FREQUENCY RANGE (408-1-430 MHz) WAS USED FOR AC TEST MEASUREMENTS.

DATE	CODE	REV	APP	DESCRIPTION

TP	LEVEL	FUNCTION
TP1	+5.0 VDC	U1 REG. O/P
TP2	+2.8-3.0VDC	U2 REG. O/P
TP3	+2.0-3.5VDC	Vref ADJUST
TP4	+2.5VDC	Q1 BIAS
TP5	+2.0VDC	Q2 BIAS
TP6	384.7-448.6MHz	MIXER INJECT.
TP7	+3.3VDC	Q3 BIAS
TP8	+3.1VDC	Q5 BIAS
TP9	21.4MHz	INJECTION POINT
TP10	488.000KHz	INJECTION POINT
TP11	488.000KHz	MEAS. POINT
TP12	+2.3-3.2VDC	AFC
TP13	Vpp	NOISE AMP I/P
TP14	Vpp	NOISE AMP O/P
TP15	2.2Vpp	RECOVERED AUDIO
TP16	21.4MHz	I.F. STRIP INJECT.

JUMPER FUNCTIONS
JU1 - B-SYSTEM ENABLE
JU2 A - HARD AFC
JU2 B - SOFT AFC
JU3 - BmA OSC. POWER
JU4 - N/R
JU5 - 2mA 1st I.F. POWER
JU6 - 2 mA 2nd I.F. POWER
JU7 - CTCSS AUDIO ENABLE
A - FLAT AUDIO BAL.
B - DE-EMPHASIS AUDIO BAL.
C - HIGH LEVEL AUDIO BAL.

HIGHEST REFERENCE DESIGNATORS		
R95 C88 CR5		
TP15 L8 RFC14		
UB Q7 JU8		
REFERENCE DESIGNATORS NOT USED		
R20-25, 38 CR2		

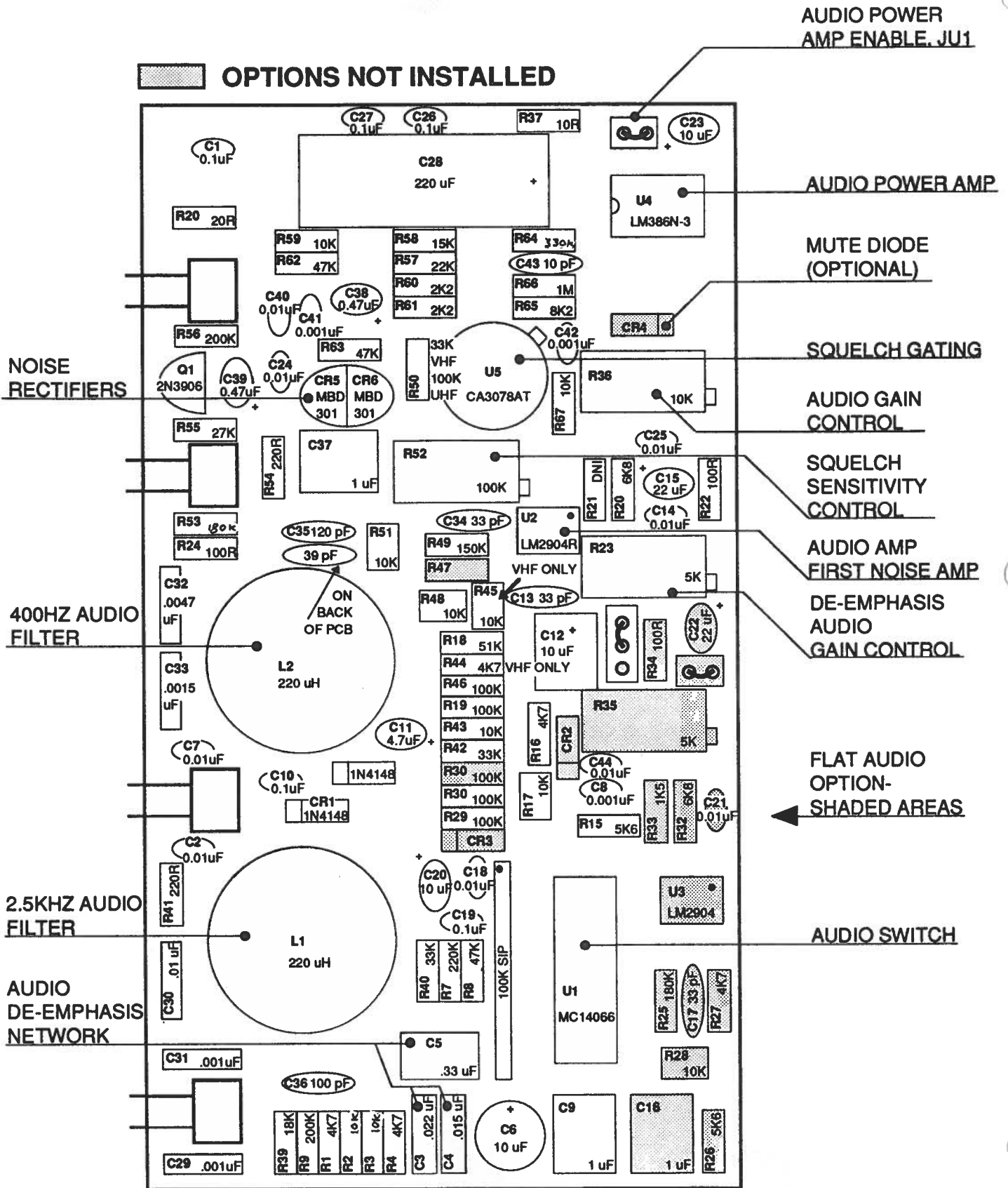
NOTES: 1) ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE SPECIFIED.
2) ALL TRANSISTORS DESIGNATED U5 ARE CONTAINED IN CA3083A TRANSISTOR ARRAY.
3) ALL VOLTAGES MEASURED ARE DC UNLESS OTHERWISE STATED.
* COMPONENTS CONTAINED WITHIN HELICAL FILTER

DANIELS ELECTRONICS LTD. 43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE:	RECEIVER VHF
DRAWN: ALC	DATE: 15/07/88
CHECKED:	APPROVED:
DRAWING#	43-861121S
	R1-2.1

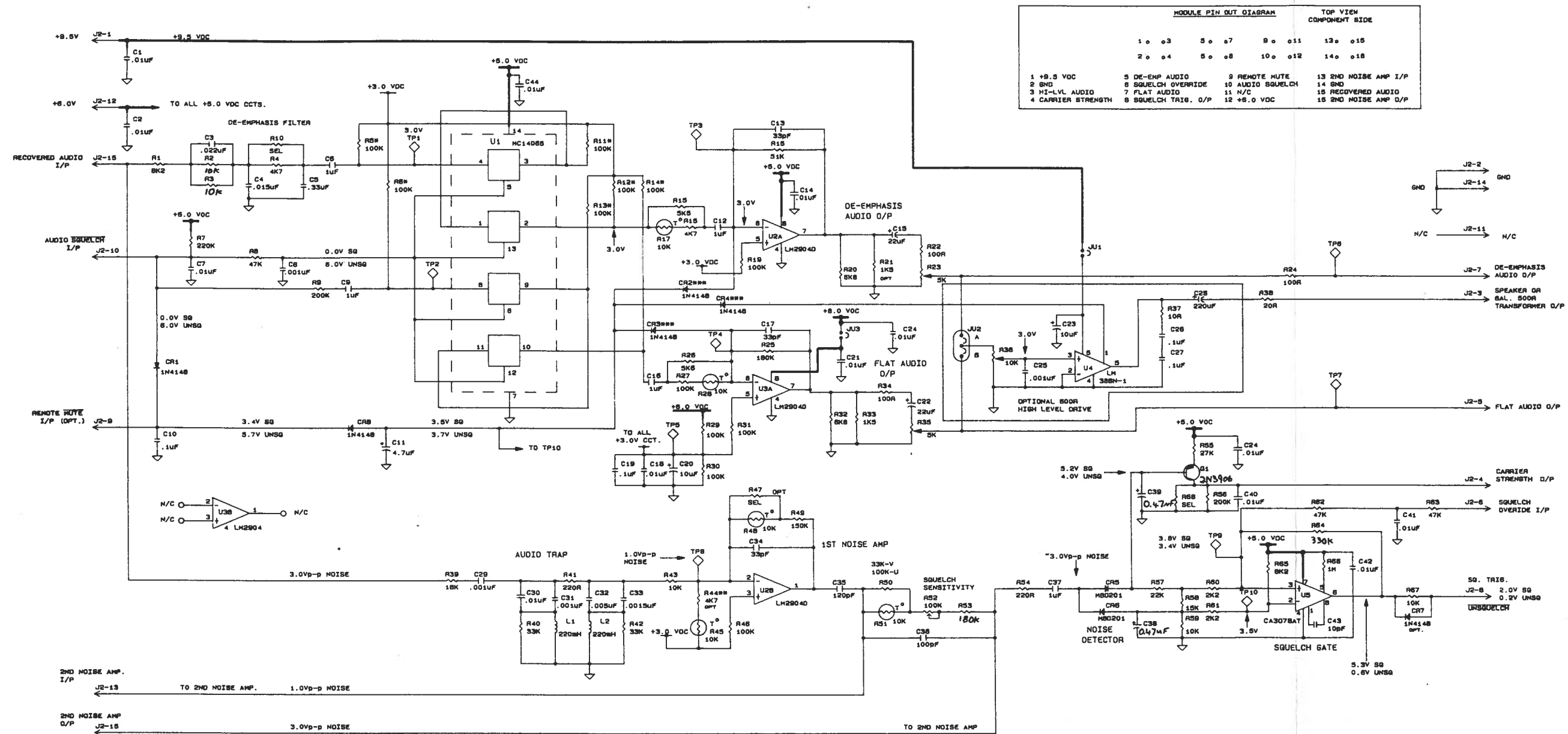
VHF Receiver Audio Processor - Component Layout

Figure 1-19

No. 43-870911



VHF Receiver Audio Processor
Schematic Diagram
43-870911
Figure 1-20



MODULE PIN OUT DIAGRAM				TOP VIEW COMPONENT SIDE			
1	o 3	5	o 7	9	o 11	13	o 15
2	o 4	6	o 8	10	o 12	14	o 16

1	+9.5 VDC	5	DE-EMP AUDIO	9	REMOTE MUTE	13	2ND NOISE AMP I/P
2	GND	6	SQUELCH OVERRIDE	10	AUDIO SQUELCH	14	GND
3	HI-LVL AUDIO	7	FLAT AUDIO	11	N/C	15	RECOVERED AUDIO
4	CARRIER STRENGTH	8	SQUELCH TRIG. O/P	12	+5.0 VDC	16	2ND NOISE AMP O/P

TEST PROCEDURE NOTES
1. LO-BAND FREQUENCY RANGE (405.1-430 MHz) WAS USED FOR AC TEST MEASUREMENTS.

DATE	CODE	REV	APP	DESCRIPTION

TP	LEVEL	FUNCTION
TP1	80mVp-p	DE-EMPHASIS AUDIO I/P
TP2	0.3Vp-p	FLAT AUDIO I/P
TP5	0.7Vp-p	SG. SWITCHED DE-EMP. AUDIO
TP4	—	SG SWITCHED FLAT AUDIO
TP8	+3 VDC	OP-AMP REFERENCE
TP6	0.7Vp-p	DE-EMPHASIS AUDIO O/P
TP7	—	FLAT AUDIO O/P
TP9	0.5Vp-p	1ST NOISE GATE I/P
TP8	3.1-3.9 VDC	SG. GATE TRIGGER LEVEL
TP10	3.6 VDC	SG. GATE O.C. REFERENCE

JUMPER FUNCTIONS	
JU1	AUDIO POWER AMP ENABLE
JU2	A HIGH LEVEL DE-EMP. AUDIO SELECT
JU2	B HIGH LEVEL FLAT AUDIO SELECT
JU3	FLAT AUDIO ENABLE

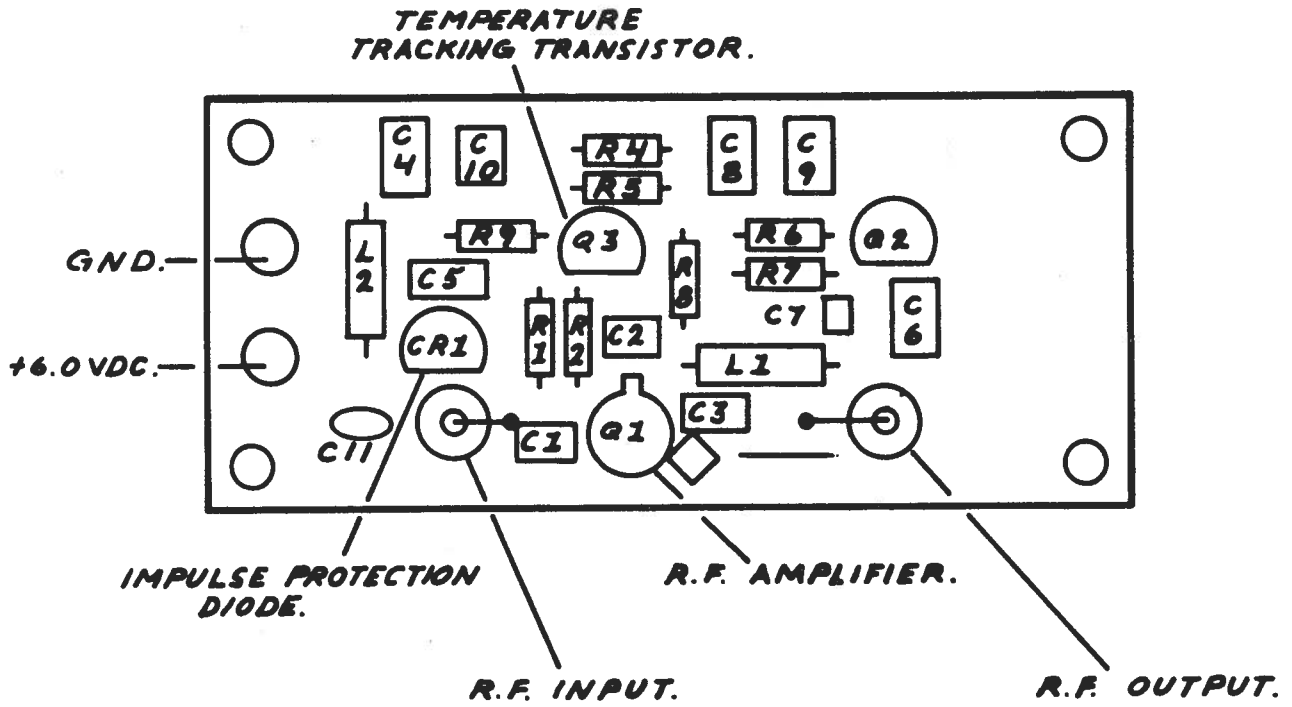
HIGHEST REFERENCE DESIGNATORS		
R88	C44	L2
TP10	Q1	U5
CR8		

REFERENCE DESIGNATORS NOT USED		

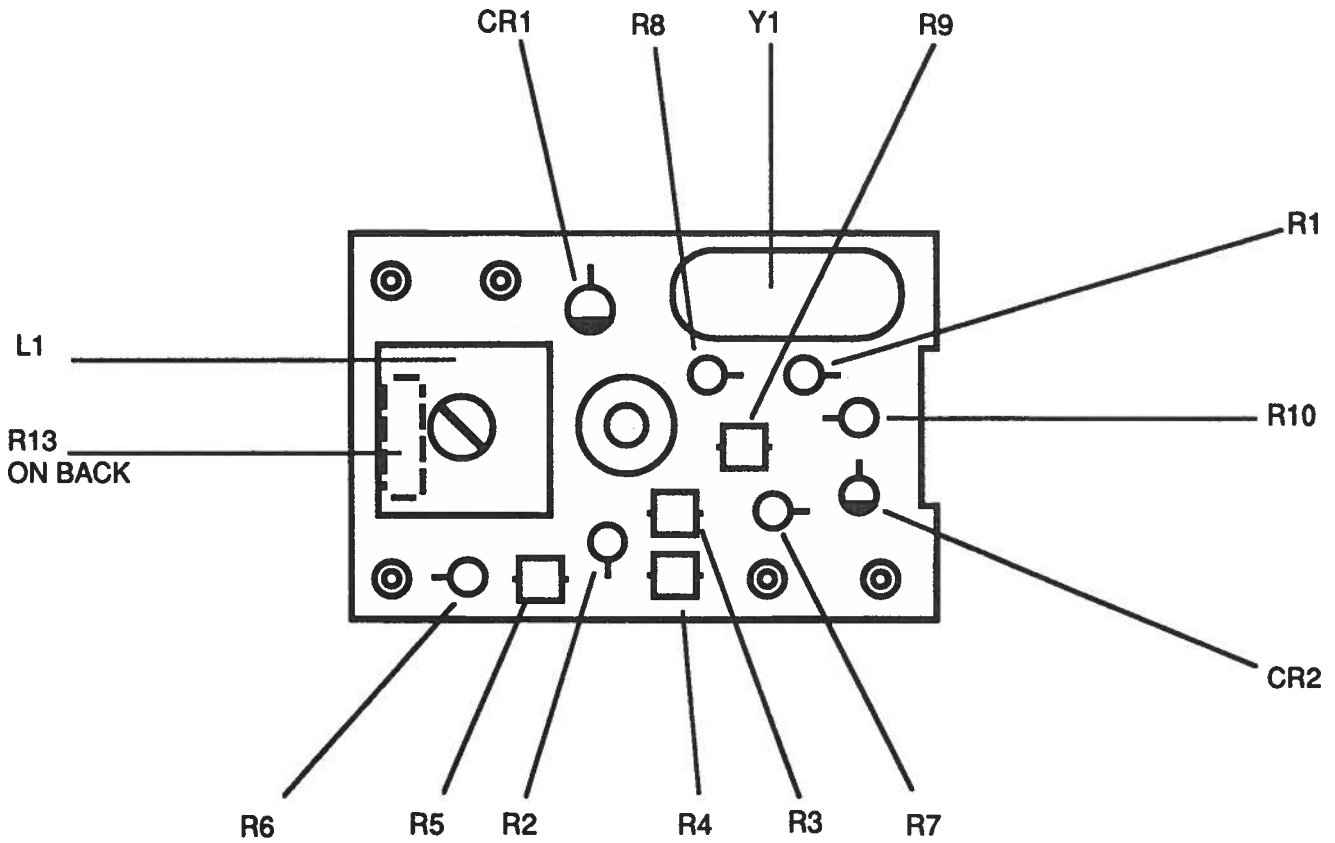
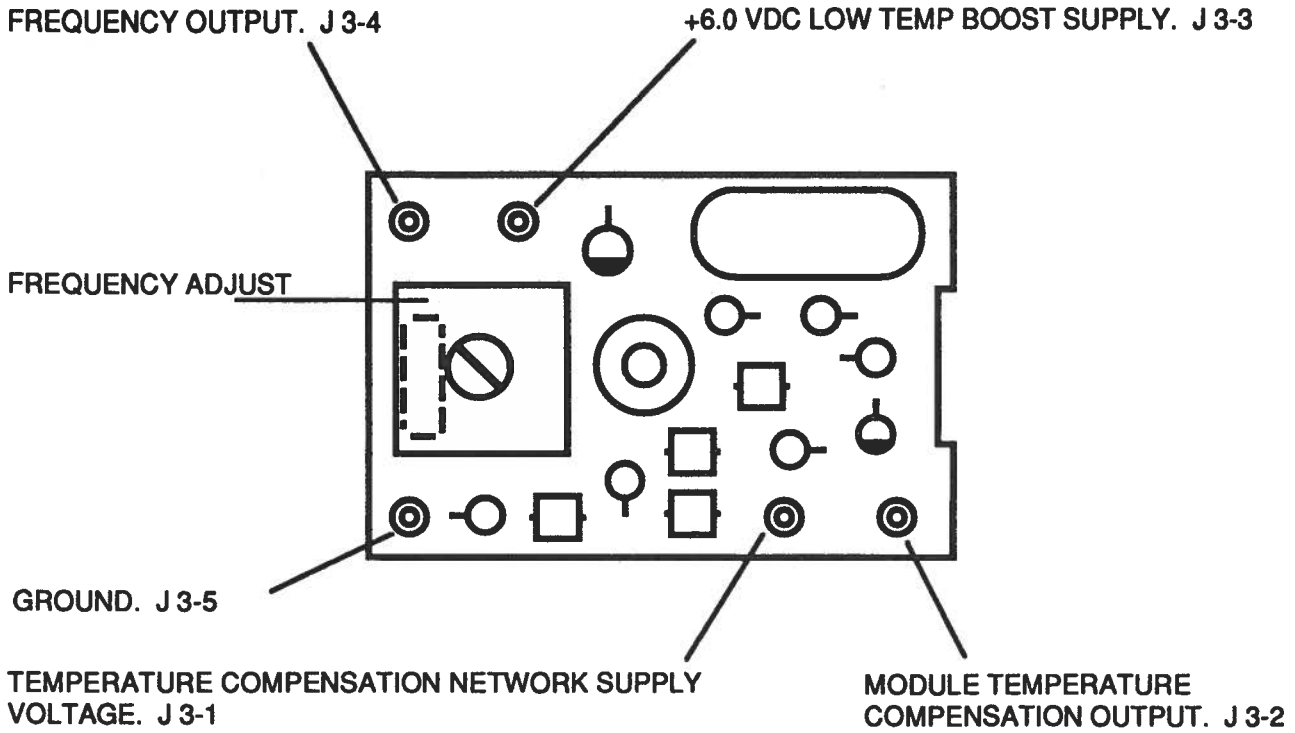
- NOTES:
1) ALL RESISTORS IN OHMS. CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2) ALL VOLTAGES MEASURED ARE DC UNLESS OTHERWISE STATED.
* RESISTORS PART OF 100K SIP PACKAGE
** COMPONENT USED ONLY ON VHF MODULES
*** DIODES INSTALLED AS DEEP MUTE OPTION

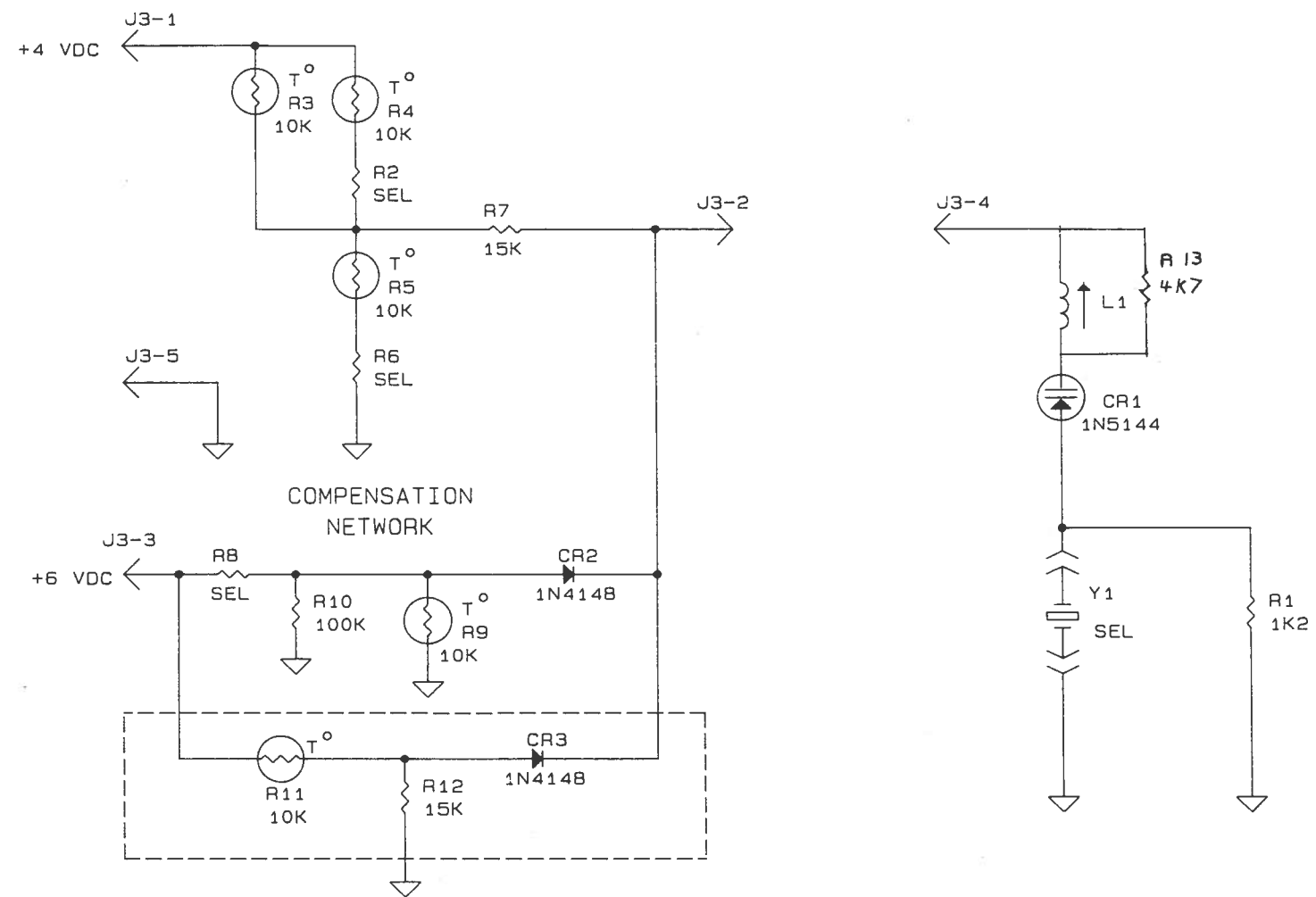
DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: RECEIVER AUDIO PROCESSING MODULE VHF/UHF			
DRAWN: ALC	DATE: 12/07/86	DRAWING#: 43-870911B	
CHECKED:	APPROVED:		H7-1.1

R.F. Amplifier Component Layout Figure
Figure 1-23



Receiver Crystal Module (TCXO) - Component Layout
 Figure 1-21



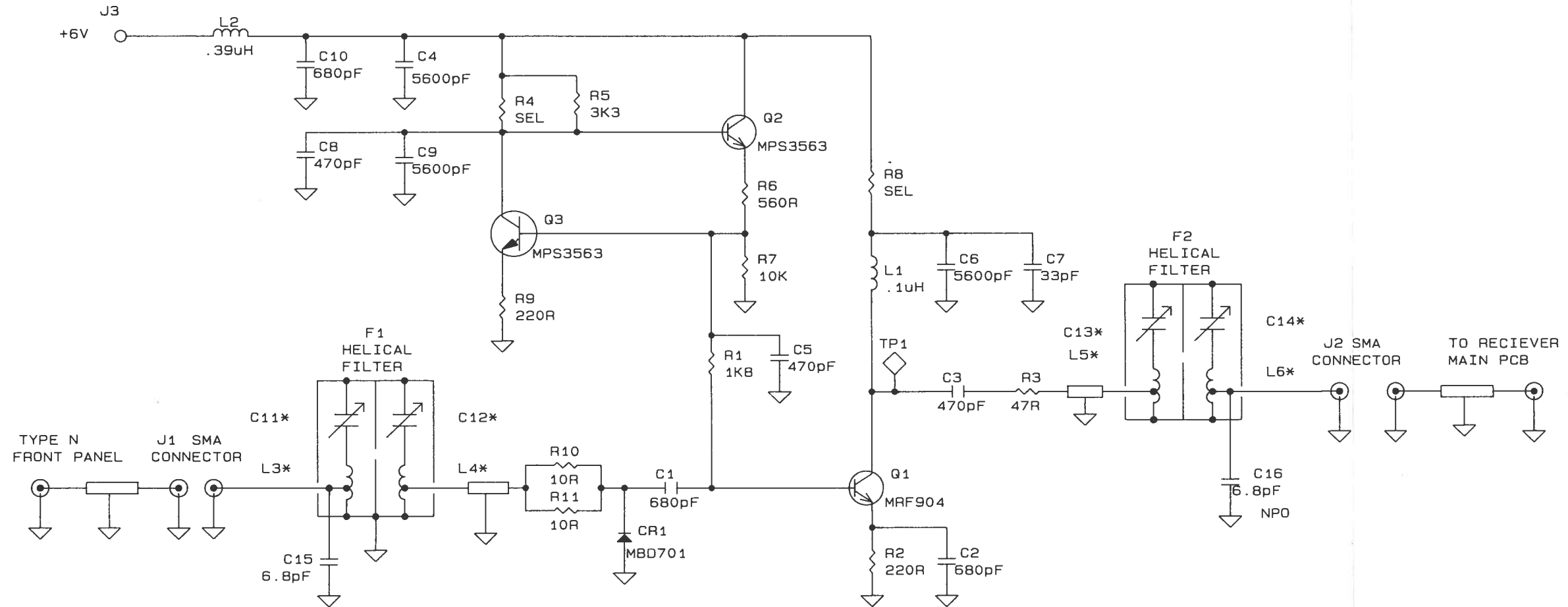


DATE	CODE	REV	APP	DESCRIPTION

HIGHEST REFERENCE DESIGNATORS		
R12	L1	Y1
CR3		
REFERENCE DESIGNATORS NOT USED		

NOTES:
 1) RESISTORS ARE IN OHMS 1/4 WATT, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE:		RECEIVER OSCILLATOR MODULE UHF/VHF	
DRAWN	ALC	DATE	15/07/88
CHECKED		APPROVED	
DRAWING#		43-864610S	
M9-1.0			



DATE	CODE	REV	APP	DESCRIPTION

HIGHEST REFERENCE DESIGNATORS		
R11	C16	L6
Q3	CR1	F2
TP1	J3	
REFERENCE DESIGNATORS NOT USED		

- NOTES:
- 1) RESISTORS ARE IN OHMS, CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED
 - 2) ALL CAPACITORS ARE SURFACE MOUNTED
- * DENOTES COMPONENTS CONTAINED WITHIN HELICAL FILTER

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: PRESELECT AND RF AMPLIFIER VHF			
DRAWN KPG	DATE 15/07/88	DRAWING# 43-865212	
CHECKED	APPROVED	M5-1.1	

PARTS LIST - RECEIVER VHF

Main Circuit Board

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .001uF MONO 10% 200V	10-1022	7
C2	CAP, .1uF MONO 20% 100V	10-1042	11
C3	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C4	CAP, .01uF CER 80-20% 63V	05-1032	30
C5	CAP, .001uF MONO 10% 200V	10-1022	7
C6	CAP, .1uF MONO 20% 100V	10-1042	11
C7	CAP, .01uF CER 80-20% 63V	05-1032	30
C8	CAP, .01uF CER 80-20% 63V	05-1032	30
C9	CAP, .1uF MONO 20% 100V	10-1042	11
C10	CAP, .01uF CER 80-20% 63V	05-1032	30
C11	CAP, .01uF CER 80-20% 63V	05-1032	30
C12	CAP, 3p3 CER +/- .25pF NPO	05-0336	2
C13	CAP, .1uF MONO 20% 100V	10-1042	11
C14	CAP, .01uF CER 80-20% 63V	05-1032	30
C15	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C16	CAP, 2p2 CER, +/- .25pF 100V NPO	05-0226	1
C17	CAP, .1uF MONO 20% 100V	10-1042	11
C18	CAP, .01uF CER 80-20% 63V	05-1032	30
C19	CAP, .01uF CER 80-20% 63V	05-1032	30
C20	CAP, .01uF CER 80-20% 63V	05-1032	30
C21	CAP, .01uF CER 80-20% 63V	05-1032	30
C22	CAP, .001uF MONO 10% 200V	10-1022	7
C23	CAP, 22pF CER 2% 100V NPO	05-2206	1
C24	CAP, 100pF CER 2% 100V NPO	05-1016	1
C25	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	2
C26	CAP, 1p8 CER +/- .25pF 100V NPO	05-0186	1
C27	CAP, 6p8 CER 2% 100V NPO	05-0686	1
C28	CAP, .001uF MONO 10% 200V	10-1022	7
C29	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	1
C30	CAP, .01uF CER 80-20% 63V	05-1032	30
C31	CAP, .001uF MONO 10% 200V	10-1022	7
C33	CAP, 10pF CER 2% 100V NPO	05-1006	2
C38	CAP, 4p7 CER 2% 100V NPO	05-0476	4
C39	CAP, 4p7 CER 2% 100V NPO	05-0476	4
C40	CAP, 5-65pF TRIMMER 250V YELLOW	15-5652	2
C41	CAP, 4p7 CER 2% 100V NPO	05-0476	4
C42	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	2
C44	CAP, .001uF MONO 10% 200V	10-1022	7
C45	CAP, .01uF CER 80-20% 63V	05-1032	30
C46	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C47	CAP, .01uF CER 80-20% 63V	05-1032	30
C48	VALUE SELECTED	SEL	3
C50	CAP, 4p7 CER 2% 100V NPO	05-0476	4
C53	CAP, .01uF CER 80-20% 63V	05-1032	30
C54	CAP, 1uF TANT DIP 20% 35V	14-1051	5

C55	CAP, .01uF CER 80-20% 63V	05-1032	30
C56	CAP, .01uF CER 80-20% 63V	05-1032	30
C57	CAP, 3p3 CER +/- .25pF NPO	05-0336	2
C58	CAP, .01uF CER 80-20% 63V	05-1032	30
C59	CAP, .1uF MONO 20% 100V	10-1042	11
C60	CAP, .01uF CER 80-20% 63V	05-1032	30
C61	CAP, .22uF MONO 20% 50V	10-2240	1
C62	CAP, .01uF CER 80-20% 63V	05-1032	30
C63	CAP, 330pF MONO 10% 200V	10-3312	6
C64	CAP, .001uF MONO 10% 200V	10-1022	7
C65	CAP, .1uF MONO 20% 100V	10-1042	11
C66	CAP, .01uF CER 80-20% 63V	05-1032	30
C67	CAP, 330pF MONO 10% 200V	10-3312	6
C68	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C69	CAP, .1uF MONO 20% 100V	10-1042	11
C70	CAP, 15pF CER 2% 100V NPO	05-1506	2
C72	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C73	CAP, .01uF CER 80-20% 63V	05-1032	30
C74	CAP, .1uF MONO 20% 100V	10-1042	11
C75	CAP, .1uF MONO 20% 100V	10-1042	11
C76	CAP, .1uF MONO 20% 100V	10-1042	11
C77	CAP, 1uF POLYFILM 10% 50V	11-1050	1
C78	CAP, 330pF MONO 10% 200V	10-3312	6
C79	CAP, 150pF MICA 2% 500V	09-1510	1
C81	VALUE SELECTED	SEL	3
C82	CAP, 5-65pF TRIMMER 250V YELLOW	15-5652	2
C83	CAP, 10pF CER 2% 100V NPO	05-1006	2
C84	CAP, 33pF CER 2% 100V NPO	05-3306	1
C85	CAP, .01uF CER 80-20% 63V	05-1032	30
C86	CAP, 330pF MONO 10% 200V	10-3312	6
C87	CAP, 330pF MONO 10% 200V	10-3312	6
C88	CAP, 15pF CER 2% 100V NPO	05-1506	2
C89	CAP, 330pF MONO 10% 200V	10-3312	6
C90	CAP, .01uF CER 80-20% 63V	05-1032	30
C91	CAP, .01uF CER 80-20% 63V	05-1032	30
C92	CAP, .01uF CER 80-20% 63V	05-1032	30
C93	CAP, .01uF CER 80-20% 63V	05-1032	30
C94	CAP, .01uF CER 80-20% 63V	05-1032	30
C95	CAP, .01uF CER 80-20% 63V	05-1032	30
C96	CAP, .01uF CER 80-20% 63V	05-1032	30
C97	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C98	CAP, .01uF CER 80-20% 63V	05-1032	30
CR1	DIODE, 1N4005, VR=60V, DO-41 PLASTIC	60-4005	1
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	1
F2	CRYSTAL FILTER, 455KHz, 6 ELEMENT	24-0455	1
JU1	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	4
JU2	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	1
JU3	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	4
JU4	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	4
JU6	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	4
JU8	HEADER, 3 PIN, 2 ROW, GOLD PLATE	19-8023	1
L1	COIL, SHIELDED CAN, RX VHF/UHF	31-7115	2

L2	COIL, SHIELDED CAN, RX VHF/UHF	31-7116	1
L3	COIL, SHIELDED CAN, RX VHF/UHF	31-7115	2
L6	CHOKE, 1.5uH, 10%	30-0015	1
L7	CHOKE, 3.9 uH, 10%	30-1039	1
L8	TRANSFORMER, ADJUSTABLE	73-2121	1
L9	COIL, QUADRATURE TK1302	31-6597	1
Q1	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	4
Q2	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	4
Q3	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	4
Q5	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	4
Q6	JFET, J304/K304, TO-92, STYLE 5	61-0304	1
R1	RES, 270R 0.5W 5% STD M FLM	56-2071	2
R2	RES, 3K9 0.5W 5% STD M FLM	56-0392	1
R3	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R4	VALUE SELECTED	SEL	3
R5	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R6	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R7	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R8	RES, 56K 0.5W 5% STD M FLM	56-0563	1
R9	POT, 250K, 25 TURN, VERT MTG, VERT SCREW	46-2546	1
R10	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R11	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R12	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R13	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R15	THERMISTOR, 100R	55-1010	4
R16	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R17	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R18	THERMISTOR, 100R	55-1010	4
R19	THERMISTOR, 100R	55-1010	4
R26	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R27	RES, 39K 0.5W 5% STD M FLM	56-0393	2
R28	TEMPSTOR, 1K2	55-2122	1
R29	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R30	RES, 39K 0.5W 5% STD M FLM	56-0393	2
R31	RES, 270R 0.5W 5% STD M FLM	56-2071	2
R32	RES, 1K8 0.5W 5% STD M FLM	56-0182	1
R33	RES, 360R 0.5W 5% STD M FLM	56-0361	1
R34	RES, 330R 0.5W 5% STD M FLM	56-0331	2
R35	RES, 12R 0.5W 5% STD M FLM	56-0120	2
R36	RES, 330R 0.5W 5% STD M FLM	56-0331	2
R37	RES, 2R7 0.6W 5% STD M FLM	56-1027	1
R40	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R41	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R42	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R44	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R45	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R46	RES, 1K 0.5W 5% STD M FLM	56-0102	6
R47	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R48	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R49	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R51	RES, 1K 0.5W 5% STD M FLM	56-0102	6

R58	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R59	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R60	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R61	RES, 1K 0.5W 5% STD M FLM	56-0102	6
R62	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R63	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R64	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R65	RES, 220R 0.5W 5% STD M FLM	56-0221	1
R66	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R67	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R68	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R69	RES, 120K 0.5W 5% STD M FLM	56-0124	1
R70	RES, 1K 0.5W 5% STD M FLM	56-0102	6
R71	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R72	POT, 50K, SINGLE TURN, HORIZ. MTG.	46-5030	1
R73	THERMISTOR, 300R	55-0301	1
R74	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R75	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R76	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R77	RES, 1K 0.5W 5% STD M FLM	56-0102	6
R78	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R79	THERMISTOR, 100R	55-1010	4
R80	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R81	RES, 22K 0.5W 5% STD M FLM	56-0223	1
R82	RES, 4K7 0.5W 5% STD M FLM	56-0472	1
R83	RES, 1K 0.5W 5% STD M FLM	56-0102	6
R84	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R85	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R86	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R87	RES, 5K6 0.5W 5% STD M FLM	56-0562	1
R88	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R92	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R93	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R94	RES, 2K7 0.5W 5% STD M FLM	56-0272	1
R95	RES, 10K 0.5W 5% STD M FLM	56-0103	9
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC2	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC3	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC4	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC5	CHOKE, 10uH, 10%	30-0100	2
RFC6	CHOKE, 10uH, 10%	30-0100	2
RFC7	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC8	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC9	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC10	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC11	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC14	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
U1	I.C. LM117LH, VOLT. REG, 3 PIN MET. CAN	28-0117	1
U2	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
U3	I.C. LM2904D, OP AMP, DUAL, SO-8	28-2904	1
U5	I.C. CA3083F, TRANS. ARRAY, 8 PIN DIP	28-3083	1
U6	I.C. MC3359P, FM IF, 18 PIN DIP	28-3359	1

Y1	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y2	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y3	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y4	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y5	CRYSTAL, 21.855MHZ, COLD WELD	20-2185	1
	SOCKET, 0.040, GOLD PLATE	19-0040	5
	HOOD, RF, TYPE N CONNECTOR	19-1770	1
	CONNECTOR, TYPE N	19-1775	1
	PIN, SQUARE, 0.045", TIN PL.	19-2161	6
	CONNECTOR, SMA, FEM., PCB MTG.	19-8002	1
	SHUNT, FOR 0.01" SQ. POST HEADER, GOLD	19-8201	1
	I.C. MOC8050, DARL OPTOCOUPLE, 8 PIN DIP	28-8050	1
	COIL, 8T, HELICAL, 16AWG COPPER	30-1710	2
	PAD, TRANSISTOR MTG, NYLON, TO-5	33-0005	1
	NAME PLATE, VHF RX, MOD2	39-865310	1
	SILK SCREENING, FRONT PANEL RX	39-865810	1
	SIDE PANEL, RX RIGHT, VHF	39-872110	1
	COVER, WRAP AROUND, RX	39-872410	1
	SHIELD, RX OSCILLATOR	39-872510	1
	COIL FORM, VHF, Q200.5 X-LINKED POLYSTYR	39-873610	2
	COVER, BRASS, VHF HELICAL FILTER	39-873810	1
	FRONT PANEL, RX, 14HP.	39-874710	1
	COAX, RIGID, VHF RX OSC. TO HEL.FIL	39-876010	1
	EXT, HELICAL FILTER, VHF/UHF TX	39-876110	1
	MATTE FOIL LABELS, FP FREQ. STICKER	39-880510	1
	MATTE FOIL LABELS, RECEIVER TCXL	39-880610	1
	MATTE FOIL LABELS, RXV SERIAL NUMBER	39-881110	1
	MODULE, MIXER, DOUBLE BALANCED	41-0002	1
	NUT, CAPACITOR MOUNT	42-3469	2
	NUT, 4-40 HEX 3/16 x 1/16 SS	42-4400	10
	SEAL, SLOTTED, FOR VHF VAR. CAPS	42-4613	2
	PCB, RECEIVER VHF/UHF	43-861121	1
	FASTENER, QUICK RELEASE, GREY PKG.100	58-0003	4
	SIDE PANEL, EXTRUSION	58-0004	1
	HANDLE, FRONT PANEL, 14HP, GREY	58-0006	1
	NUT, M2.5, HEX, PKG. OF 100	58-0010	4
	SCREW, M2.5 x 10, CHEESE HEAD	58-2500	2
	SCREW, M2.5 x 12, C/SK, FOR HANDLES	58-2504	2
	WASHER, M2.5, SHAKEPROOF	58-2512	4
	SCREW, M3 x 8, RAISED C/SK	58-3002	4
	SCREW, M3 x 8, PAN HEAD, ZINC	58-3004	4
	CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
	SCREW, 4-40 x 1 1/2", PAN PHIL, MS SS	59-4150	6
	SCREW, 4-40 x 3/8, PAN PHIL, MS SS	59-4337	4
	SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	6
	SCREW, 6-32 x 3/8 RD. SLOT, NYLON	59-6837	2
	TRANSISTOR, 2N2907A, PNP	63-2907	1
	STANDOFF, 4-40 x 1/4, 7/32od, NO-ROT, NICK	67-4425	4
	SWITCH, PUSH BUTTON, NORM. OPEN, RED	70-0020	1
	SWITCH, SPDT, ON-NONE-ON, PCB MOUNT	70-2210	1
	SWITCH NUT	70-2211	1
	TRANSFORMER, AUDIO	73-0148	1

TUBING, TEFLON, 20AWG	76-0020	1
TUBING, PVC, 10AWG, CLEAR	76-1010	1
HEATSHRINK, 3/32", BLACK	76-2093	1
WASHER, SHAKEPROOF, .234-64, VHF VARI. CAP	77-1999	2
WASHER, LOCKING, #4 SPLIT SS	77-4001	14
WASHER, FLAT, #4 SS	77-4010	12
WIRE, TEFLON, 24AWG, STRANDED RED	86-2402	1
WIRE, TEFLON, 24AWG, STRANDED YELLOW	86-2404	1
WIRE, TEFLON, 24AWG, STRANDED GREY	86-2408	1

Reference: Schematic Receiver Main Circuit Board Schematic M1-2.1 /
Drawing No. 43-861121S

VHF Preselector and R.F. Amplifier Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, 680pF CHIP 10% 100V NPO	06-6810	3
C2	CAP, 680pF CHIP 10% 100V NPO	06-6810	3
C3	CAP, 470pF CHIP 10% 100V NPO	06-4710	3
C4	CAP, 5600pF CHIP 10% 100V NPO	06-5620	3
C5	CAP, 470pF CHIP 10% 100V NPO	06-4710	3
C6	CAP, 5600pF CHIP 10% 100V NPO	06-5620	3
C7	CAP, 33pF CHIP 10% 100V NPO	06-3300	1
C8	CAP, 470pF CHIP 10% 100V NPO	06-4710	3
C9	CAP, 5600pF CHIP 10% 100V NPO	06-5620	3
C10	CAP, 680pF CHIP 10% 100V NPO	06-6810	3
C11	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	4
C12	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	4
C13	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	4
C14	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	4
C15	CAP, 6p8 CER 2% 100V NPO	05-0686	2
C16	CAP, 6p8 CER 2% 100V NPO	05-0686	2
CR1	DIODE, MBD701, HOT CAR., VR=70V, T0-92	60-0701	1
L1	CHOKE, 0.39 uH, 10%	30-0003	2
L2	CHOKE, 0.39 uH, 10%	30-0003	2
Q1	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	1
Q2	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
Q3	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
R1	RES, 1K8 0.5W 5% STD M FLM	56-0182	1
R2	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R3	RES, 47R 0.5W 5% STD M FLM	56-0470	1
R4	VALUE SELECTED	SEL	1
R5	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R6	RES, 560R 0.5W 5% STD M FLM	56-0561	1
R7	RES, 10K 0.5W 5% STD M FLM	56-0103	1
R8	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R9	RES, 220R 0.5W 5% STD M FLM	56-0221	2

R10	RES, 10R 0.5W 5% STD M FLM	56-0100	2
R11	RES, 10R 0.5W 5% STD M FLM	56-0100	2
	PIN, SQUARE, 0.045", TIN PL.	19-2161	2
	CONNECTOR, SMA, MALE, 90 DEGREE	19-8004	2
	CONNECTOR, SMA, FEM., BULKHEAD, PKG OF25	19-8006	2
	COIL, 8T, HELICAL, 16AWG COPPER	30-1710	4
	BRACKET,CAP. MTG. VHF PRESEL. NICK/AL	39-863510	1
	BRACKET,COIL MTG. VHF PRESEL. NICK/AL	39-863612	1
	EXTRUSION, HEL.PRESEL., VHF, 1 APERATURE	39-864810	2
	COIL FORM, VHF, Q200.5 X-LINKED POLYSTYR	39-873610	4
	SHIELD, RF AMP	39-875611	1
	COAX, RIGID, PRESELECTION TO RF AMP	39-876310	1
	NUT, CAPACITOR MOUNT	42-3469	4
	NUT, 4-40 HEX 3/16 x 1/16 SS	42-4400	12
	SEAL, SLOTTED, FOR VHF VAR. CAPS	42-4613	4
	PCB, RF AMPLIFIER, VHF/UHF PRESELECTORS	43-865220	1
	SCREW, 4-40 x 1 1/2", PAN PHIL, MS SS	59-4150	8
	SCREW, 4-40 x 1 5/8", PAN PHIL, MS SS	59-4163	4
	SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	4
	SCREW, 6-32 x 3/8 RD. SLOT, NYLON	59-6837	4
	SPACER, 0.125 x #4, CLEARANCE, ALUM.	67-4125	4
	HEATSHRINK, 3/32", BLACK	76-2093	1
	HEATSHRINK, 3/16" WHITE	76-2187	1
	WASHER, SHAKEPROOF, .234-64,VHF VARI.CAP	77-1999	4
	WASHER, LOCKING, #4 SPLIT SS	77-4001	16
	COAX, RG188A/U, TEF, WHT	82-0188	1

Reference: Schematic Preselector and R.F. Amplifier - VHF 43-865211S

VHF Receiver Audio Processor Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	5
C2	CAP, .01uF CER 80-20% 63V	05-1032	9
C3	CAP, .022uF POLYFILM 10% 63V/100V	11-2231	1
C4	CAP, .015uF POLYFILM 10% 63V/100V	11-1531	1
C5	CAP., .33uF POLYFILM 5/50V 10%	11-3340	1
C6	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C7	CAP, .01uF CER 80-20% 63V	05-1032	9
C8	CAP, .001uF MONO 10% 200V	10-1022	3
C9	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C10	CAP, .1uF MONO 20% 100V	10-1042	5
C11	CAP, .01uF CER 80-20% 63V	05-1032	9
C12	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C13	CAP, 33pF CER 2% 100V NPO	05-3306	2
C14	CAP, .01uF CER 80-20% 63V	05-1032	9
C15	CAP, 22uF TANT DIP 20% 20V	14-2262	1
C18	CAP, .01uF CER 80-20% 63V	05-1032	9
C19	CAP, .1uF MONO 20% 100V	10-1042	5
C20	CAP, 10uF TANT. DIP 20% 25V	14-1061	2

C23	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C24	CAP, .01uF CER 80-20% 63V	05-1032	9
C25	CAP, .001uF MONO 10% 200V	10-1022	3
C26	CAP, .1uF MONO 20% 100V	10-1042	5
C27	CAP, .1uF MONO 20% 100V	10-1042	5
C28	CAP, 220uF ELECTR. 16V	07-2213	1
C29	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	2
C30	CAP, .01uF POLYFILM 10% 63V/100V	11-1031	1
C31	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	2
C32	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	1
C33	CAP, .0015uF POLYFILM, 10% 63V/100V	11-1521	1
C34	CAP, 33pF CER 2% 100V NPO	05-3306	2
C35	CAP, 120pF CER 2% 100V NPO	05-1216	1
C36	CAP, 100pF CER 2% 100V NPO	05-1016	1
C37	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C38	CAP, .47uF TANT. DIP 20% 35V	14-4742	2
C39	CAP, .47uF TANT. DIP 20% 35V	14-4742	2
C40	CAP, .01uF CER 80-20% 63V	05-1032	9
C41	CAP, .001uF MONO 10% 200V	10-1022	3
C42	CAP, .01uF CER 80-20% 63V	05-1032	9
C43	CAP, 10pF CER 2% 100V NPO	05-1006	1
C44	CAP, .01uF CER 80-20% 63V	05-1032	9
CR1	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR5	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	2
CR6	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	2
CR7	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
L1	CHOKE, 220mH MINI TORODIAL, EPOXY	30-6220	2
L2	CHOKE, 220mH MINI TORODIAL, EPOXY	30-6220	2
Q1	TRANSISTOR, 2N3906, PNP, TO-92, ST.-1	63-2N3906	1
R1	RES, 8K2 0.5W 5% STD M FLM	56-0822	2
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, 4K7 0.5W 5% STD M FLM	56-0472	3
R5	RES, SIP, 100K, +/-2%, 7 PIN, #1 COMM	54-1040	1
R6	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R7	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R8	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R9	RES, 200K 0.5W 5% STD M FLM	56-0204	2
R10	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R11	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R12	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R13	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R14	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R15	RES, 5K6 0.5W 5% STD M FLM	56-0562	1
R16	RES, 4K7 0.5W 5% STD M FLM	56-0472	3
R17	THERMISTOR, 10K	55-0103	4
R18	RES, 51K 0.5W 5% STD M FLM	56-0513	1
R19	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R20	RES, 6K8 0.5W 5% STD M FLM	56-0682	1
R21	RES, 1K5 0.5W 5% STD M FLM	56-0152	1
R22	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R23	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	1

R24	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R29	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R30	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R37	RES, 10R 0.5W 5% STD M FLM	56-0100	1
R38	RES, 20R 0.5W 5% STD M FLM	56-0200	1
R39	RES, 18K 0.5W 5% STD M FLM	56-0183	1
R40	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R41	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R42	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R44	RES, 4K7 0.5W 5% STD M FLM	56-0472	3
R45	THERMISTOR, 10K	55-0103	4
R46	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R47	VALUE SELECTED	SEL	2
R48	THERMISTOR, 10K	55-0103	4
R49	RES, 150K 0.5W 5% STD M FLM	56-0154	1
R50 U	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R50 V	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R51	THERMISTOR, 10K	55-0103	4
R52	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R53	RES, 180k. 0.5W 5% STD M FLM	56-0184	1
R54	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R55	RES, 27K 0.5W 5% STD M FLM	56-0273	1
R56	RES, 200K 0.5W 5% STD M FLM	56-0204	2
R57	RES, 22K 0.5W 5% STD M FLM	56-0223	1
R58	RES, 15K 0.5W 5% STD M FLM	56-0153	1
R59	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R60	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R61	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R62	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R63	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R64	RES, 330k 0.5W 5% STD M FLM	56-0334	1
R65	RES, 8K2 0.5W 5% STD M FLM	56-0822	2
R66	RES, 1M 0.5W 5% STD M FLM	56-0105	1
R67	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R68	VALUE SELECTED	SEL	2
U1	I.C. HCF4066BEY, SQ. GATE, 14 PIN DIP	28-4066	1
U2	I.C. LM2904D, OP AMP, DUAL, SO-8	28-2904	1
U4	I.C. LM386N-3, AUDIO AMP, 8 PIN DIP	28-0386	1
U5	I.C. CA3078AT, OP AMP, 8 PIN MET. CAN	28-3078	1
	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	1
	HEADER, 2 PIN-2 ROWS, RIGHT ANG, TIN	19-8022	4
	PCB, AUDIO PROCESSOR, RX	43-870911	1

Reference: VHF/UHF Receiver Audio Processor drawing #43-860911S

Receiver Crystal Module Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
CR1	DIODE, 1N5144A, VARACTOR, D0-7, GLASS	60-5144	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
L1	COIL, SHIELDED CAN, VHF/UHF RX XTAL OSC	31-7118	1
R1	RES, 1K2 0.5W 5% STD M FLM	56-0122	1
R2	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R3	THERMISTOR, 10K	55-0103	5
R4	THERMISTOR, 10K	55-0103	5
R5	THERMISTOR, 10K	55-0103	5
R6	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R7	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R8	RES, 47K 0.5W 5% STD M FLM	56-0473	1
R9	THERMISTOR, 10K	55-0103	5
R10	RES, 100K 0.5W 5% STD M FLM	56-0104	1
R11	THERMISTOR, 10K	55-0103	5
R12	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R13	RES, CHIP 4K7 1206 SM	56-0472251	1
Y1	CRYSTAL, O.T., COLD WELD 43-48MHz	20-4000	1
	SOCKET, 0.040, GOLD PLATE	19-0040	2
	TERMINAL PIN, .040", GOLD PLATE	19-1040	5
	ENCLOSURE, PLASTIC, GREEN, 1.0" X 0.75"	22-4290	1
	PCB, RX CRYSTAL OSCILLATOR	43-864611	1
	SCREW, 2-56 x 5/16, SLOT, BRASS	59-2560	1
	SPACER, 2-56 X 5/8, ALUMINIM	67-2560	1

Reference: Schematic Receiver Crystal Module - 43-864610S

UHF MOUNTAIN TOP RADIO REPEATER

MT 2 SERIES

INSTRUCTION MANUAL SECTION 2
Issue 03 August 1988

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MT 2 REPEATER SYSTEM

GENERAL DESCRIPTION

The MT 2 repeater system is a VHF/UHF radio system which is characterized by high performance and reliability under the most severe environmental conditions. The total system is designed to provide dependable, low maintenance performance, even in the most difficult circumstances.

The MT 2 series of modules are packaged in the compact Eurostandard (5"h x 2.8"w x 7.5"d) housing, and are robustly designed for mountain top or transportable applications. All of the modules use high reliability components and each is accompanied with a complete operational and environmental Test Report on delivery.

Because the MT 2 repeater is specifically designed to deliver high performance under adverse conditions, extensive environmental testing is conducted over the temperature range -40° C to $+60^{\circ}$ C and the performance measured to ensure compliance with the design specifications and the Canadian Department of Communications (DOC) Radio Standards Specification (RSS 119). In addition, voltage stress/ testing is done over the range of +10 to +17 Volts DC which is followed by a 24 hour burn-in.

SPECIFICATIONS

General Technical Specifications

Type: MT 2 series modular UHF radio repeater plug-in RF units.
UHF Rx model UR 2, UHF Tx model(s) UT 2/ UT 2B

Frequency Range: 406.1 - 430MHz, 450-470MHz, other bands to order - consult factory.

Modulation: 16K0F3EJN (Frequency Modulation)

Number of Channels: One

Channel Spacing: 25 kHz standard

Frequency Stability: ± 5 ppm -40°C to $+60^{\circ}\text{C}$ standard

Operating Temperature: -40°C to $+60^{\circ}\text{C}$

Humidity: up to 90% R.H. at 25°C

R.F. Output Impedance: 50 ohm

Antenna Connector: Type N standard

Supply Voltage: +13.8 VDC nominal (neg. gnd) operating range 10-17 VDC. (other voltages consult factory).

Supply Current: Total single station - Receiver and transmitter inactive < 40 mA. Total single station-Receiver and transmitter active < 1.35A.

Supply Protection: Reverse polarity, secondary transient protection.

Lightening Protection: Secondary protection provided with ferrite filtering and 'Transorb' protective device on each external connection. For optional glass encapsulated spark gap protection consult factory.

General Physical Specifications

- Size and Mounting:** Eurocard compatible, modular design, assembly comprises labeled plug-in modules, interchangeability for test and repair is facilitated. Shelf assembly is marked to show location of all included modules. Standard 19" rack assembly, optional enclosures and mounting available consult factory.
- Corrosion Prevention:** Anodized aluminum construction. Stainless Steel Hardware. Conformal Coated Glass Epoxy Printed Circuit Boards. Gold plated connectors.
- Test Points:** Test and adjustment points clearly marked for identification. An optional card extender is available for in-service tests and adjustments.
- External Connections:** RF connections made with type 'N' connector located on front panel. Audio, power and control connections made on the rear 'Mother Board' assembly.

Transmitter Specifications - UHF

R.F. Power output: 0.5W to 2.0W continuously adjustable (UT-2) and 2.0W to 6.0W level continuously adjustable (UT-2B)

Frequency Range: 400MHz-430MHz, 450MHz-470MHz, other bands consult factory.

Duty Cycle: 100% at +55°C ambient

Spurious Emissions: < -80dBc

Deviation: Preset to ± 3 kHz (capable ± 5 kHz)

Frequency Stability: ± 5 ppm -40°C to +60°C

Audio Input: Balanced 600 ohm or unbalanced (optional)

Audio Response: ± 1 dB 300Hz - 3kHz pre-emphasis

Audio Distortion: <1.0% THD @ 1 kHz @ 3 kHz deviation -40°C to +60°C.

Time-out: Selectable 5 min. ± 1 min.

Hot Standby: Selectable for data transmission

DOC Type Approval:

UT-2	142	193	301C
UT-2B	142	193	302C

FCC Type Approval:

UT-2L	H4JUT-2L	(400-430 MHz)
UT-2BL	H4JUT-2BL	(400-430 MHz)
UT-2	H4JUT-2	(450-470 MHz)
UT-2B	H4JUT-2B	(450-470 MHz)

Receiver Specifications - UHF

Type: Double conversion super-heterodyne, double balanced mixer, High Q temperature compensated helical resonator preselector.

Frequency Range: 400MHz-430MHz, 450MHz-470MHz, other bands to order consult factory.

Sensitivity: 0.35 uV for 12dB SINAD RF pre-amp

Squelch: 0.2 uV with R.F. pre-amplifier.

Selectivity: > -80dB

First I.F.: 21.4MHz 8 pole filter

Second I.F.: 455 kHz 6 pole filter

Spurious Response: -80 dB

Intermodulation: -70 dB

Frequency Stability: ± 5 ppm -40°C to $+60^{\circ}\text{C}$; AFC tracking option

Audio Output: Balanced 600 ohm /or opt. unbalanced

Flat response output, -6dBm @1 kHz @3 kHz deviation ± 1 dB 100Hz-3 kHz

De-emphasis output, -12dBm @1 kHz @3 kHz deviation ± 1 dB 300Hz-3 kHz

De-emphasis: ± 1 dB 6dB/octave from 300Hz -3 kHz

Audio Distortion: < 2.5% THD @1 kHz @3 kHz deviation -20°C to 60°C < 3.5% -40°C to $+60^{\circ}\text{C}$

Current Drain: Normal programming -12dB de-emphasis recovered audio and R.F. pre-amplifier 40mA.

DOC Type Approval: UR-2 142 193 303

FCC Type Approval: Certified as complying with FCC Rules Part 15 in effect as of date of manufacture.

Modulation Acceptance: ± 5 kHz (deviation) at 25kHz Channeling.

THEORY OF OPERATION - UHF TRANSMITTER

General

The MT-2 Series UHF Transmitter module consists of a main R.F. printed circuit board, an audio processor module and the temperature compensated crystal element. The crystal element is a plug-in module that has been individually temperature calibrated and designed to be compatible and interchangeable with any of the MT-2 Series UHF transmitters. The UHF transmitter is available in two frequency ranges: 406.1 - 430 MHz, and 450 - 470 MHz.

R.F. Circuitry (No. 43-860922)

D.C. power is applied at two points to the transmitter: +9.5 Volts regulated to pins B6, Z6, and +10 to +17 Volts to pins B2, Z2. The +9.5 Volts DC supply is switched by several PTT lines that are activated externally or by the microphone. The +9.5 Volts DC switching transistors are Q8, Q9 and Q10. The +9.5 Volts DC source powers the oscillator Q1, buffer - multiplier circuits Q2 to Q5 and the power tripler Q19. The +10 to +17 Volts DC source powers the UHF hybrid module U1 in the 2 watt version and U1 and U2 in the 6 W version. The +10 to +17 Volts DC source is used to control the R.F. power output. The R.F. output is sensed before the output Low Pass Filter establishing a D.C. level to provide automatic control of the R.F. power output. Q11, Q12 and Q13 form the automatic power level control circuitry which regulates the RF output level to the final output stages Q6 and Q7. Control R49 sets the R.F. output to the required level.

The temperature compensated crystal module (TCXO) U2 is connected to the oscillator transistor Q1 (15 - 18 MHz fundamental mode) via contact pin J3-4 located on the UHF transmitter main printed circuit board assembly. U1 provides an 8.0 Volts DC reference voltage to crystal module U2. Q2 provides a high level buffered output which drives tripler Q3 (44 - 60 MHz). Adjustable inductors L2 and L3 provide harmonic tuning of the output which is critically coupled through C26. L5 and C28 peak the input drive to the 2nd tripler Q4. C33, C34 and C35 couple the desired frequency to buffer Q5. C42, C43 and C44 peak the desired frequency (138 - 174 MHz) to the padding network R120, R121 and R122. The input to the power tripler Q19 is peaked by C122. The desired frequency 406.1 - 470 MHz is peaked by C127 at the output of Q19. C128, L22 and C129 stage match and resonate the desired output harmonic signal which is then tuned through cavity F1. At the output of F1 the signal is routed through semi-rigid cable to U3 (position varies depending on 2W or 6W version). The hybrid output is then sampled by the power control circuitry. Semi-rigid coaxial cable feeds the output signal to the low pass filter and then to the output connector.

Audio Processor (No. 43-861421)

The audio processor module is powered by the regulated +9.5 Volts DC source. The +9.5 Volts DC source can be jumpered for continuous audio standby JU1 (external control JU2A or "fixed on" JU2B) or for switched standby JU2 (NORM). The continuous +9.5 Volts DC programming allows a fast audio rise time for digital applications (JU1 NORM). The Time-out Timer U4, is also located on the audio processor PCB. The Time-out Timer is programmable from 0 - 6 minutes and interrupts the PTT line whenever the transmitter is keyed on in excess of the selected timed value (5 MIN NORM). Q1 is the PTT timer trigger and reset transistor. When PTT is released before the timed value is reached the timer resets. If the timed value is exceeded the carrier must be "broken" to reset the timer. Q2 switches the PTT line and is controlled by the timer U4.

The audio processor module provides optional inputs for a range of applications with a variety of drive levels and impedances including: several audio sources, dynamic microphone input (standard), selectable 5 k ohm/600 ohm balance input - R33, selectable 5 k ohm/600 ohm Tone/Digital input - R48, and a subtone input (R28 level set). Each audio input, except subtone, has an adjustable level control to accommodate a -30dBm to 0dBm input: R34 for balanced input and R49 for Tone/Digital input. The microphone, balanced and tone/digital inputs can be enabled (or disabled) separately or simultaneously through programming cage jacks J3, J4 or J5 on the module. This will allow current saving in the hot standby mode. Each audio input (except subtone) is applied to a pre-amplifier/compressor circuit - U1, U2 and U3. These circuits provide an automatic gain control (AGC) level. The level for U2 and U3 is set by R32 (+3.0 kHz DEVIATION @ 1 kHz TONE NORM). The output is applied to U5B Buffer. JU6 selects the standard 6dB/octave pre-emphasis response or JU7 selects a flat audio response.

The microphone input to U1 has a fixed compression level selected by R8. Stage pre-amplification is provided by U5D and pre-emphasis network response by R17, C13. Operational amplifier U5C mixes input signals and produce a soft limited output. The soft limiting maintains the pre-emphasis response characteristics under high level audio input conditions. This characteristic provides better voice quality in circumstances where voice and signalling levels are unusually high as may be encountered in a multi-link repeater system where deviation at one or more sites is inadvertently set too high. Subtone input is applied at mixer U5A, and is then combined with the other input signals. The combined signal is applied to a 6db/octave low distortion splatter filter U6A, U6B and U6C. The output is set by U6D, a gain controlled amplifier. R56 adjusts the modulation drive to the crystal varicap control (deviation control). The deviation must always be re-calibrated when changing a crystal module. This is due to the individual crystal element characteristics.

Crystal Module (No. 43-861910)

The crystal module frequency is $\frac{fc}{27}$ where fc is the channel frequency.

The crystal Y1 operates in the fundamental mode and is mounted in a HC-25/U coldweld holder. The crystal plugs into a socket on the oscillator module PCB. R5, R4, C3, C2 and C4 provide temperature compensation over the -30°C to +60°C range and R7, R8 and R9 provide temperature compensation from -40°C to -30°C.

The crystal is tuned on frequency by L1 which is also part of the reactance modulating network R1, C1 and CR1.

UHF TRANSMITTER ALIGNMENT

Test Equipment List

To align the transmitter the following test equipment or its equivalent is recommended:

Power supply, regulated 0-20 Volt 3 Amp current limited.
Power supply regulated 1A current limit, 9.5 Volt
Frequency counter, Sencore FC71
Wattmeter, Bird 6257, 10dB 25 W pad
Multimeter, Fluke 8050A
Distortion analyzer, Amber 3501
Modulation meter, Marconi TF 2304
Power sampler, Socal
Oscilloscope 300 MHz, Tektronix 2465
Communications test set, Marconi 2905
Alignment tool Johanson 8777

NOTE: Test points on all PCBs are surrounded by a diamond symbol.

General

The UHF transmitter is supplied by the factory in two frequency coverage bands: 400 MHz - 430 MHz and 450 MHz - 470 MHz.

Transmitter Alignment (No. 43-860922)

Apply power to the transmitter by using the SM-2 (System Monitor rack power supply) or by applying +9.5 Volts DC to pins B6, Z6, +13.8 Volts DC to B2, Z2 and ground to B30, Z30, B32, Z32. The +9.5 Volts DC supply to the transmitter must be well regulated and exactly +9.5 Volts DC.

Connect a 50 ohm dummy load (10w rating) to the front panel connector. Turn the front panel switch to ON and start the following procedure.

NOTE: In a normal operational unit the +9.5 Volts DC current is approximately 600mA and the 13.8 Volts DC current is approximately 500mA. Test conditions: maximum output into 50 ohms is approximately 3.0 Watts, no modulation.

NOTE: Test points on the UHF PCB are highlighted by a diamond shape.

The following are normal operating levels:

TP 1 approx. 900mV p-p 15 - 18 MHz Crystal Module output
 TP 2 approx. 700mV p-p 15 - 18 MHz Q1 Oscillator output

Set R49 RF output level to max. (fully C.W.)

TP 3 approx. 70mV DC Q2 emitter bias L1 Peaked
 TP 4 approx. 5.0V p-p 15 - 18 MHz L1 Peaked
 * Scope probe will load the circuit slightly
 TP 5 approx. 50 mV DC Q3 tripler bias L2 Peaked
 TP 6 approx. 100 mV DC Q4 tripler bias
 TP 7 approx. 5.0 V p-p Q3 44 - 60 MHz L2, L3, L4, L5 Peaked
 * Scope probe will load the circuit
 TP 8 approx. 280 mV DC Q5 138 - 174 MHz C29, C31, Peaked
 TP 9 approx. 6.0 V p-p Q5 output - (Scope probe will load CCT.)
 TP 10 approx. 9.1 Volt DC (switched 9.5 Volt DC)
 TP 11 approx. 0.6 Volts DC power sense RF level R49
 TP 12 approx. 12.5 Volts DC power sense RF level R49
 TP 20 approx. 50 mW power tripler output.

R.F. output at the front panel connector is approximately 2.5 - 3.0 watts (2W version) when F1 helical filter is peaked. R.F. output 6.5-7.5 watts (6W version) when F1 helical filter is peaked.

Changing Frequency

The UHF transmitter is supplied by the factory in one of two frequency ranges: 400 - 430 MHz and 450 - 470 MHz. If the alignment is in the same range as supplied by the factory, no component changes are required on the circuit board, but if the frequency change is from one range to another, the following components must be changed:

Frequency Change Component Values

Band	C12	C22	C121	R124	Q20	C128	F1
406.1-430 MHz	750pf	110pf	56pf	2.7r	TAP 1 1/4T	TAP 1/4T	CUSTOM
450 - 470 MHz	560pf	100pf	33pf	6.8r	TAP 3/4T	TAP 1T	CUSTOM

To tune a transmitter to a new frequency use the following procedure:

Install the new crystal firmly into its socket.
Power the radio up under the previous conditions.

Verify TP1 and TP2. These levels should not change.
Monitor TP4 and tune L1 for maximum output. Observe that the +9.5 Volts DC current peaks when L1 is peaked. Confirm TP3.
Monitor TP6 and tune L2, L3, L4 and L5 for maximum output at 44-60MHz. Observe that the +9.5 Volts DC current peaks when L2, L3, L4 and L5 are peaked. Confirm TP5. Note: Use a non-metallic tuning tool for all coil adjustments.

Monitor the TP9 and tune C33, C35, C42 and C44 for maximum output. This adjustment involves several critically tuned stages and is very precise. Observe the current of the +9.5 Volts DC supply. It should peak when C33, C35, C42 and C44 are peaked. If the output cannot be peaked, monitor the hot side of C35 and tune C33 and C35 for maximum output (approx. 4 Vpp). Carry on with the procedure for C42 and C44. Confirm TP7 and TP8.

Monitor TP20 (PCB mounted SMA connector) with a low power watt meter (200 mW full scale). Adjust C122 and C127 with a non-metallic tuning tool for maximum power output. The optimal setting of C122/C127 coincides with a 'dip' or minimum current drawn from the +9.5 Volts DC supply.

Disconnect all power to the transmitter, inject a 0dBm on-air channel frequency signal at TP9 (PCB mounted SMA connector) and monitor the output of helical cavity F1 at the input to the hybrid module U3. Peak F1.

Re-connect D.C. power to the transmitter and monitor the output R.F. power at the Type N connector. Peak all coils and capacitors previously adjusted for maximum RF output.

All multiplier and buffer circuits on the +9.5 Volts DC supply are operated to saturation. The RF devices saturate at approximately 6.0 Volts DC. This relatively low saturation voltage ensures low temperature operation. To confirm that the coils and capacitors are precisely peaked, reduce the +9.5 Volts DC supply to +8.0 Volts and re-peak L1, L2, L3, L4, L5 C33 and C35. Reduce to +7.0 Volts and re-peak. Then to +6.0 Volts for final re-peaking. Note: the R.F. output level at the dummy load will drop significantly, however the above components will still be adjusted to maintain a power level of approximately 1.0 Watt. The output frequency will also shift slightly, however this will not significantly affect the multiplier - buffer circuit tuning.

Raise the supply voltage to +9.5 Volts DC and re-peak F1, C122 and C127 for maximum RF output.

Set the crystal module on frequency.
With the input voltage adjusted to 13.8 Volts, set R49 (R.F. output level control) to 2.0 watts or 6.0 watts depending on version.

Vary the floating supply voltage from +10.0 to +17.0 Volts DC. The R.F. output should remain within the range 1.0 - 2.0 watts (2 W version) or 3.0 watts to 6.0 watts (6 W version).

Proceed with environmental testing.

Audio Processor Levels (No. 43-861421)

The audio processor is programmed at the factory for the following conditions:

Audio circuitry is switched on by a PTT signal at J1.

All audio input's are enabled; J3, J4, J5.

Pre-emphasis - J6.

Balanced input impedance 600 ohm (-8dBm input).

Tone/Digital input impedance 600 ohm (-8dBm input).

Low impedance dynamic microphone.

Subtone input 0.5 Vpp @100 HZ for ± 0.75 to ± 1 kHz deviation.

Balanced and Tone/Digital inputs at 1 kHz Tone for ± 3.0 kHz deviation.

Maximum deviation ± 5.0 kHz.

Time-out timer set at 5 min (± 1 min).

Deviation Adjustment

Connect the transmitter to a 50 ohm dummy load/power sampler and monitor F.M. deviation, distortion and audio frequency.

Connect the 600 ohm input to the incoming audio (pins B18, Z18). Set frequency to 1 kHz at desired audio level.

Increase R34 (Balanced Level Control) fully c.w (20 turn pot) for maximum gain.

Turn transmitter ON and adjust R32 for compression at ± 3.0 kHz deviation.

Increase the modulation frequency until maximum deviation occurs (peaks) then adjust R56 (deviation control) until the maximum deviation is ± 4.8 kHz. Reset the modulating frequency to 1 kHz and re-adjust R32 for ± 3.0 kHz. Repeat steps 5 & 6 until both conditions are met.

Vary the audio signal from 1 kHz to 3 kHz and measure the + deviation and then the - deviation. Adjust R9 (Symmetry Control) until the \pm deviation is symmetrical. The variation between \pm deviation levels should not exceed 300Hz over the range of 1kHz to 3kHz.

Re check steps 5 & 6 and readjust if necessary.

With a 1 kHz Tone at -8dBm input level, the modulated output signal is ± 3.0 kHz deviation. Increasing the input level by +20dB should not increase the deviation by more than ± 4.0 kHz. This confirms the AGC action of compressor U2.

With a 2.5 kHz Tone at the desired audio input level, the modulated output signal is approx. +4.8 kHz deviation. Increase the input level +20dB and the deviation should not increase. This confirms the action of the soft limiter U5C.

With a 1 kHz Tone at the desired audio input level applied for +3.0 kHz deviation, adjust R34 (balanced input level control) until the output deviation is just controlled.

Confirm audio distortion by reducing the 1 kHz input tone level until +3.0 kHz deviation is reached and record distortion with the appropriate filter on the analyzer.

Confirm audio frequency response by referencing all output deviation measurements to a 1 kHz input tone @1 kHz deviation.

Remove the balanced input signal. Apply an unbalanced signal to the Tone/Digital input (pin Z20) of 1 kHz at the desired audio level. Adjust R48 (Tone/Digital input level control) until the output deviation is just controlled. No further adjustments are required for any other deviation circuits.

Use the dynamic microphone to key the transmitter and adjust R10 (microphone gain control) for suitable microphone sensitivity.

The time-out timer is normally set for 5 minutes. This can vary +1 min, over the temperature range of -40°C to +60°C. To reduce this interval insert the desired resistor in position R69 on the solder side of the audio processor PCB.

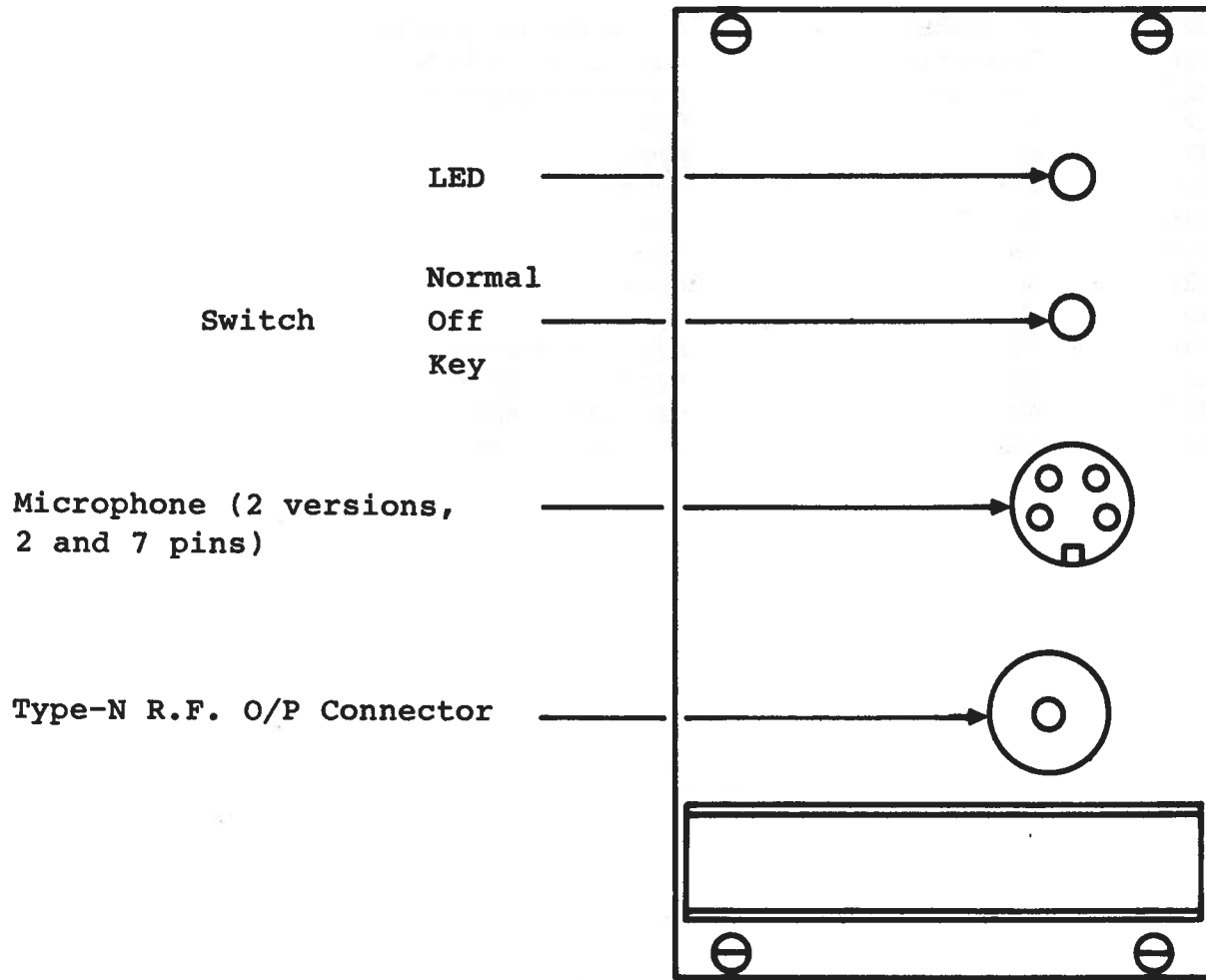
Functional Connections - UHF Transmitter

Male connector Type F to DIN41612

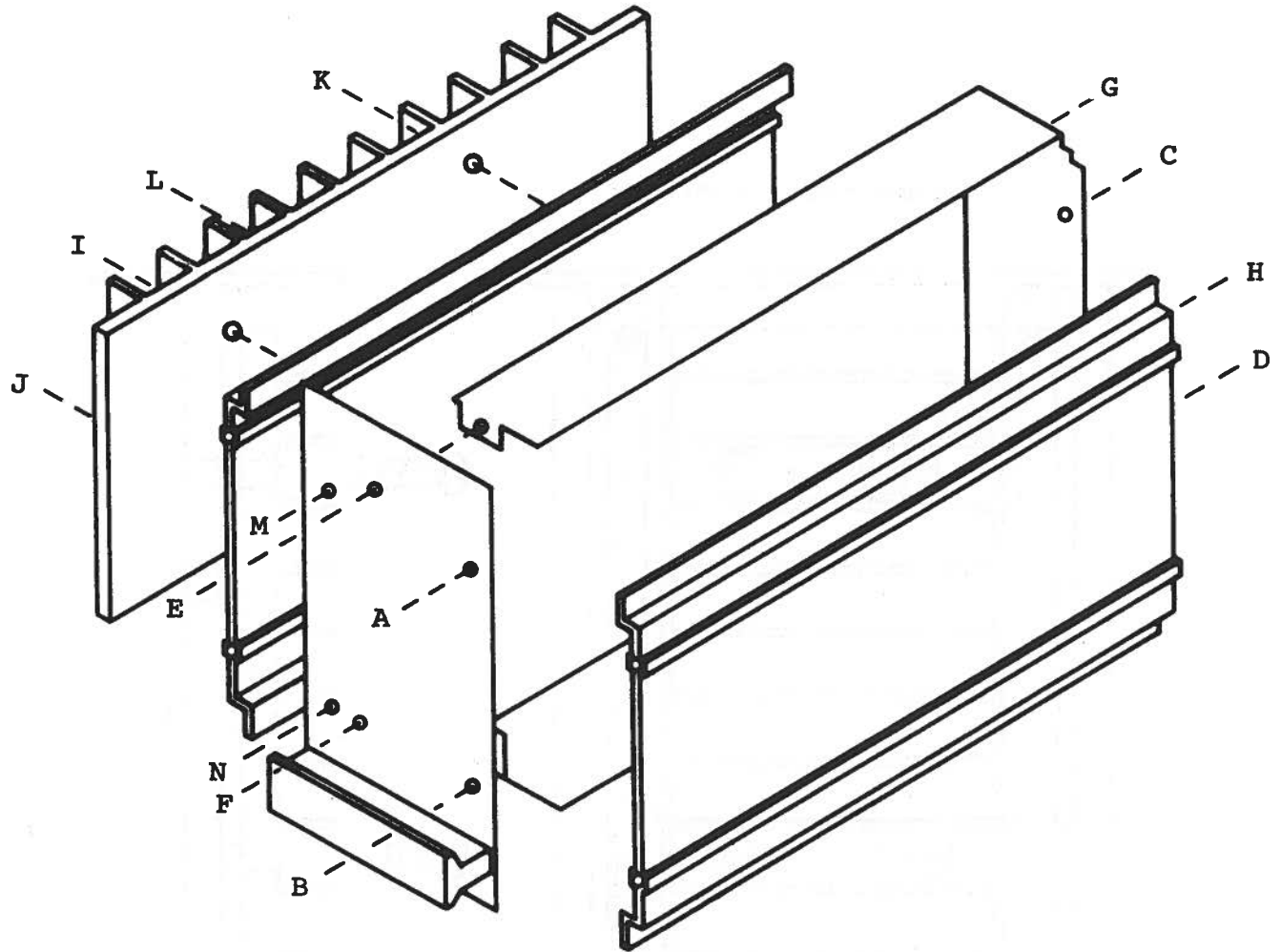
<u>PIN NUMBER</u>	<u>NAME</u>	<u>FUNCTION</u>
B2	+13.8 VDC	floating D.C. power to hybrid
Z2	+13.8 VDC	module
B4	N/C	spare
Z4	N/C	spare
B6	+9.5 VDC	regulated power
Z6	+9.5 VDC	regulated power
B8	N/C	spare
Z8	N/C	spare
B10	P.T.T	Tx enable with time out timer
Z10	P.T.T.	Tx enable with time out timer
B12	Audio En.	Tx audio enable
Z12	Audio En.	Tx audio enable
B14	P.T.T.	Tx enable no time out timer
Z14	P.T.T.	Tx enable no time out timer
B16	B- system	switched +9.5 VDC
Z16	B- system	switched +9.5 VDC
B18	Line	Tx balanced audio i/p
Z18	Line	Tx balanced audio i/p

B20	Rx audio	Rx audio to handset
Z20	Tone/dig. i/p	data i/p (option)
B22	Subtone i/p	subaudio tone i/p
Z22	N/C	spare
B24	N/C	spare
Z24	N/C	spare
B26	N/C	spare
Z26	N/C	spare
B28	N/C	spare
Z28	N/C	spare
B30	GND	circuit common
Z30	GND	circuit common
B32	GND	circuit common
Z32	GND	circuit common

Illustrations And Schematic Diagrams
UHF Transmitter - Front Panel
Figure 2-1



UHF Transmitter - Exploded View
Figure 2-2



Component Side Access:

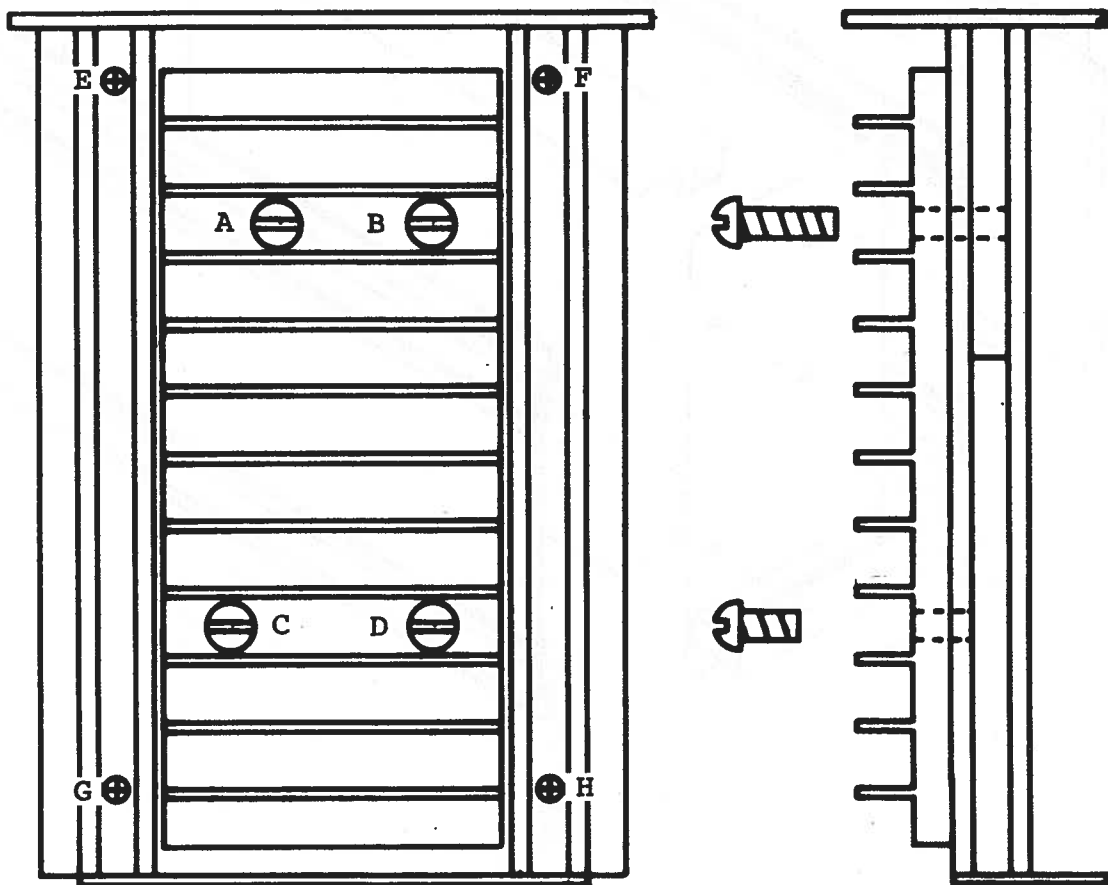
1. Remove screws A - D.
2. Lift off right side panel.

Solder Side Access:

1. Remove screws A - D
2. Lift off right side cover.
3. Remove screws E - H.
4. Lift off wrap-around shroud
5. Remove Heatsink screws I - L, remove Heatsink.
6. Remove PCB mounting screws (4) from left side cover.
7. Remove screws M - N.
8. Slide PCB and front panel out of left side extrusion.

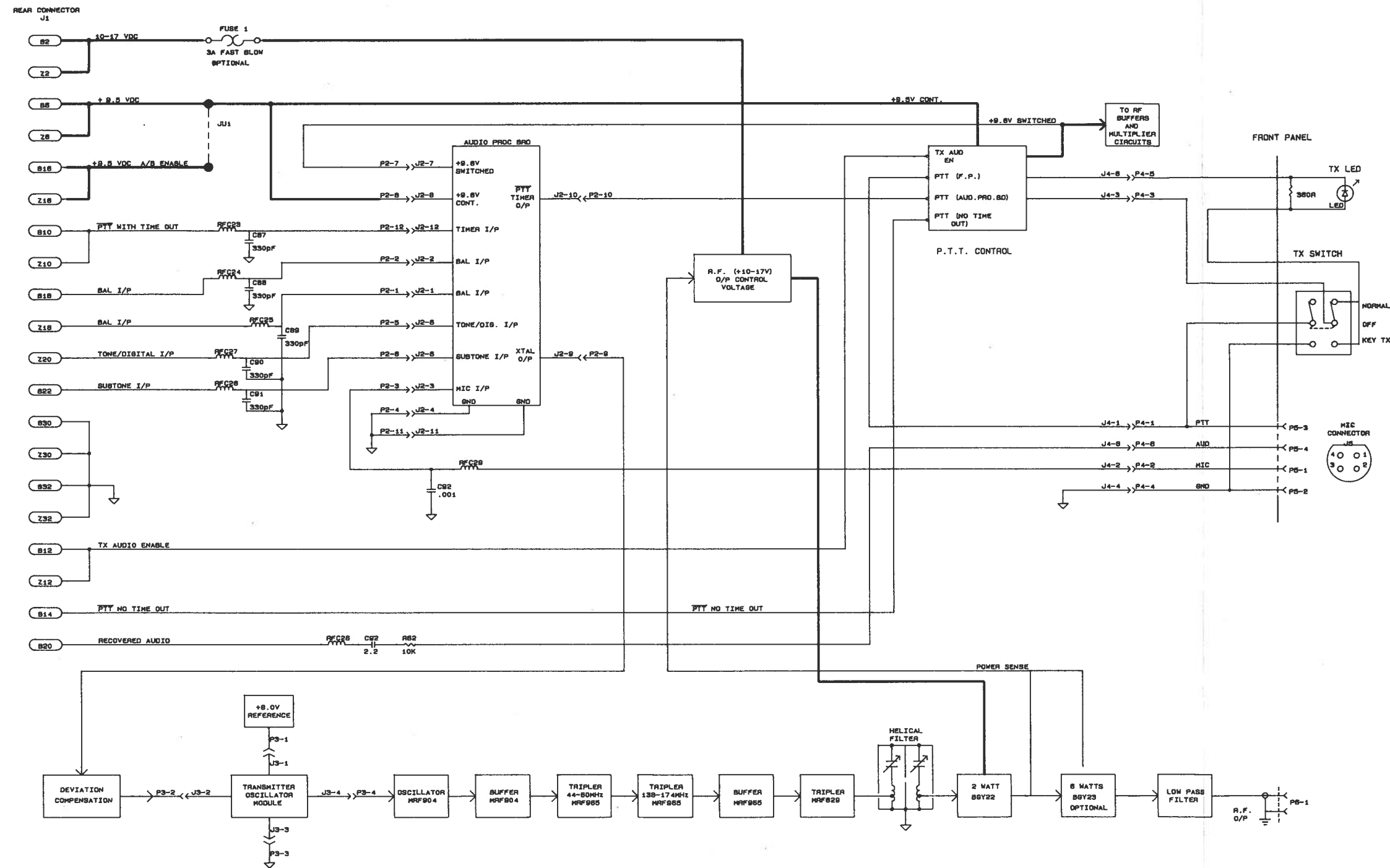
UHF Transmitter - Heatsink Assembly
Figure 2-3

Transmitter Front



Heatsink Mounting Screws (10-32) A-D
PCB Mounting Screws (4-40) E-H

UHF Transmitter - Block Diagram
43-860922U
Figure 2-4

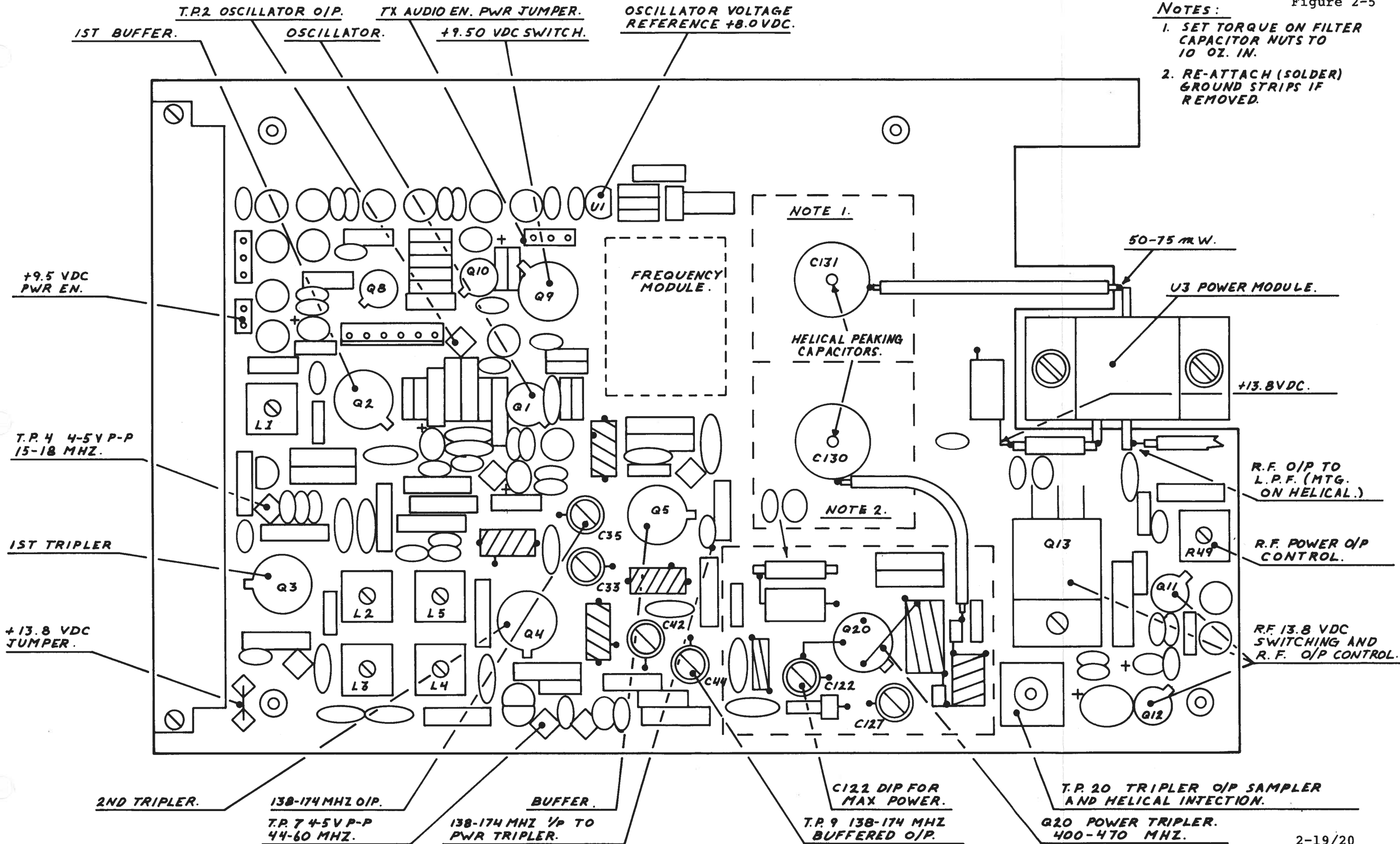


REV	DATE	DESCRIPTION	DRN	CHKD	APPROVED

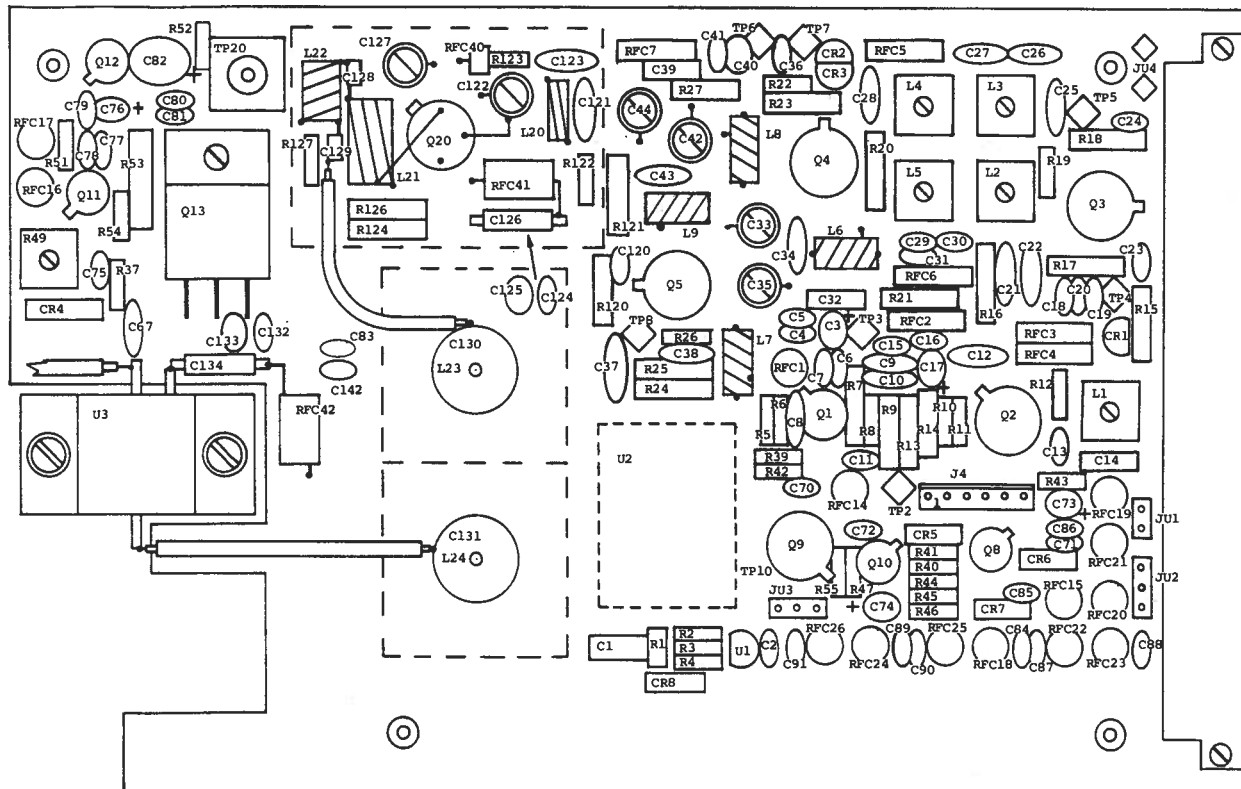
DANIELS ELECTRONICS LTD.		43 ERIE ST.. VICTORIA, B.C. CANADA	
TITLE: INTERNAL CONNECTION DIAGRAM: UHF TRANSMITTER			
DRAWN	ALC	DATE	15/07/88
CHECKED	APPROVED	DRAWING#	43-860922U
		H4-2.2	

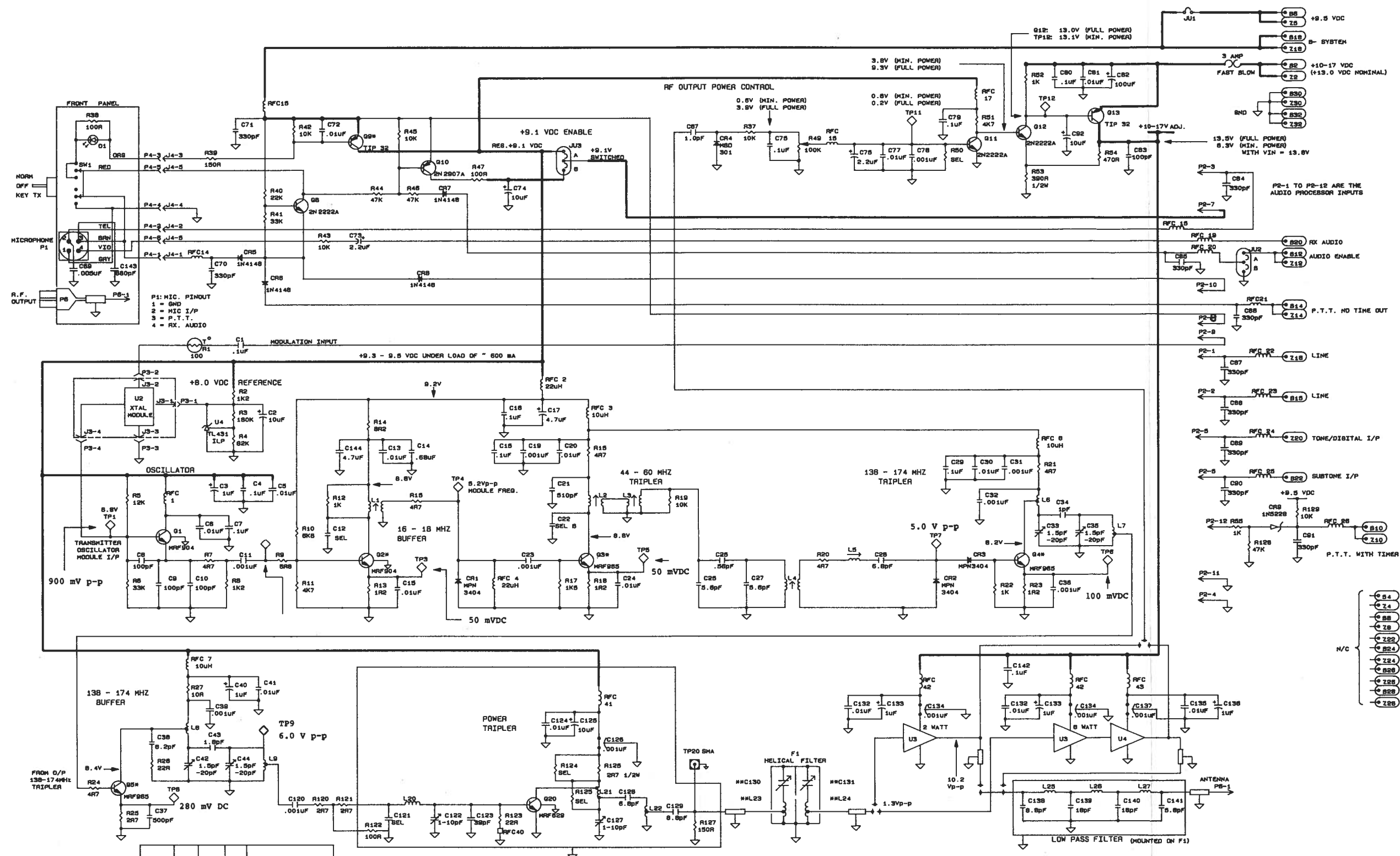
NOTES:

1. SET TORQUE ON FILTER CAPACITOR NUTS TO 10 OZ. IN.
2. RE-ATTACH (SOLDER) GROUND STRIPS IF REMOVED.



UHF Transmitter - Component Layout
Figure 2-6





TEST PROCEDURE NOTES

- AC TEST VOLTAGES WERE MEASURED USING: TEKTRONIX 2460 SCOPE PS131 10:1 PROBE
- DC TEST VOLTAGES WERE MEASURED USING A FLUKE 78 DMM.
- LO-BAND FREQUENCY RANGE (408.1-430 MHz) WAS USED FOR AC TEST MEASUREMENTS.

DATE	CODE	REV	APP	DESCRIPTION

FREQUENCY BAND SELECTION										
FREQ (MHz)	C12	C22	C121	C126	R50	R124	R126	Q20	F1	
408.1 - 430	750pF	110pF	56pF	.25T	5K5	27K	270R	1W	1.25	CUSTOM
450 - 470	560pF	100pF	33pF	1T	1.5K	.5M	N/A	3/4	CUSTOM	

JUMPER FUNCTIONS	
JU1	HT/COLD STANDBY ENABLE
JU2	FAST AUDIO ENABLE
JU3	AUDIO POWER SOURCE

HIGHEST REFERENCE DESIGNATORS		
C144	R129	C98
Q20	RFC 43	L27
TP20	US	

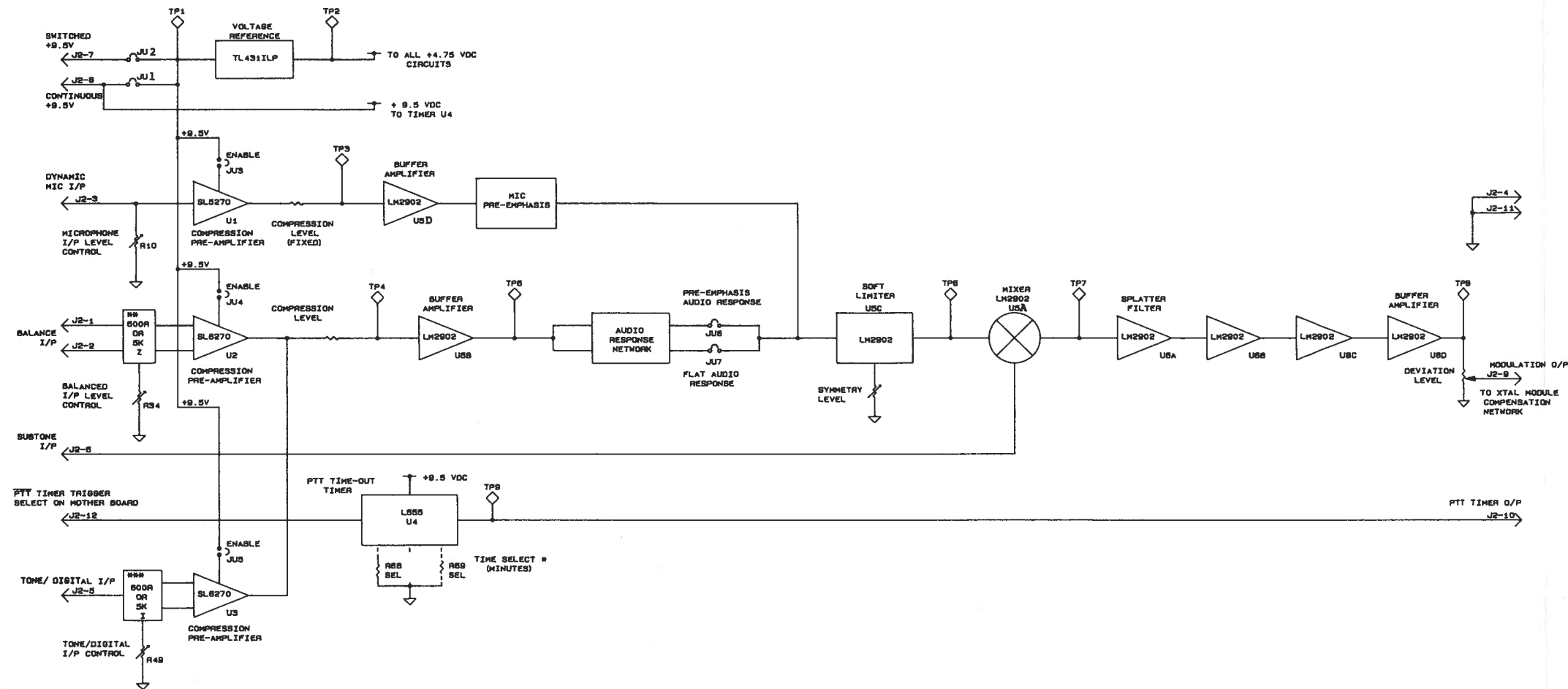
REFERENCE DESIGNATORS NOT USED		
R28-36, 48	R58-119	L10-18
C45-66, C68	C93-119	Q6, 7, 14-19
RFC5, 8-13	RFC27-38	TP8, 10
TP13-18		

NOTES:

- UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS AND CAPACITORS ARE IN MICROFARADS
- ALL VOLTAGES MEASURED ARE DC UNLESS OTHERWISE STATED.
- * DENOTES COMPONENT WITH HEATSINK
- ** DENOTES COMPONENTS CONTAINED WITHIN HELICAL FILTER

DANIELS ELECTRONICS LTD. 43 ERIE ST. VICTORIA, B.C. CANADA			
TITLE:		TRANSMITTER MAIN PCB UHF	
DRAWN	ALC	DATE	18/07/88
CHECKED		APPROVED	
		DRAWING #	43-860922S
			H4-2.2

Transmitter Audio Processor -
Block Diagram 43-861421U
Figure 2-8



- NOTES:
- 1) STANDARD TEST CONDITIONS 1KHZ TONE @ 3KHZ DEVIATION
 - 2) * SEE PTT TIME-OUT VALUES LIST
 ** REMOVE R33 FOR 5K I/P IMPEDANCE
 *** REMOVE R48 FOR 5K I/P IMPEDANCE

DATE	CODE	REV	APP	DESCRIPTION

T.P.	LEVEL
T.P. 1	9.50 VDC
T.P. 2	4.75 VDC
T.P. 3	10 mVpp
T.P. 4	10 mVpp
T.P. 5	3 Vpp
T.P. 6	8 Vpp
T.P. 7	4 Vpp
T.P. 8	4 Vpp
T.P. 9	ACTIVE LOW

R88	R89	TIME +/- 1 MIN.
10M	opt	5 MINUTES

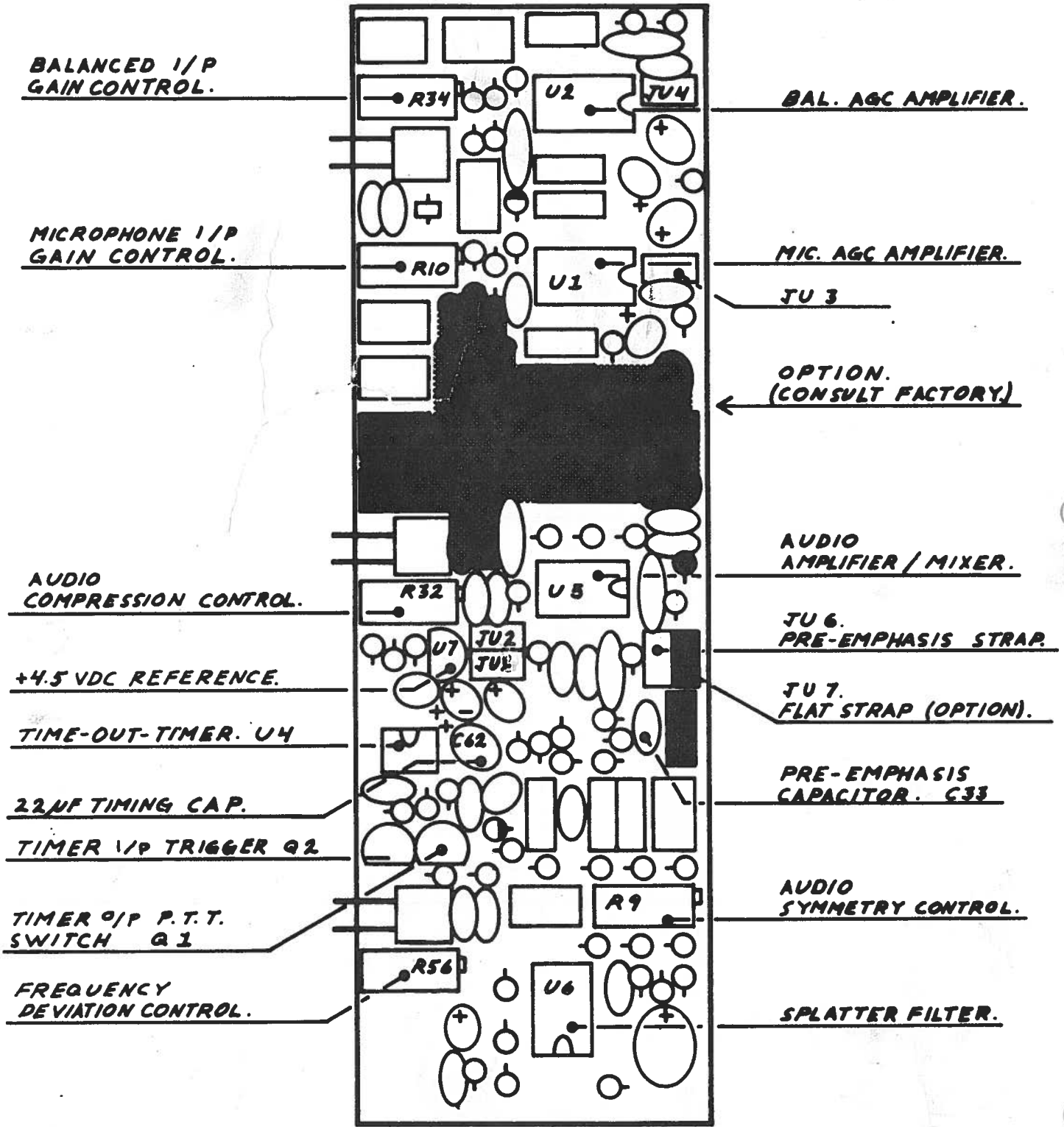
PIN #	FUNCTION
1, 2	BALANCED I/P
3	MICROPHONE I/P
4	GND
5	tone/OBTL I/P
6	SUBTONE I/P
7	+9.5 VDC SW.
8	+9.5 VDC CONT.
9	MODULATION O/P
10	PTT TIMER O/P
11	GND
12	PTT TIMER TRIS.

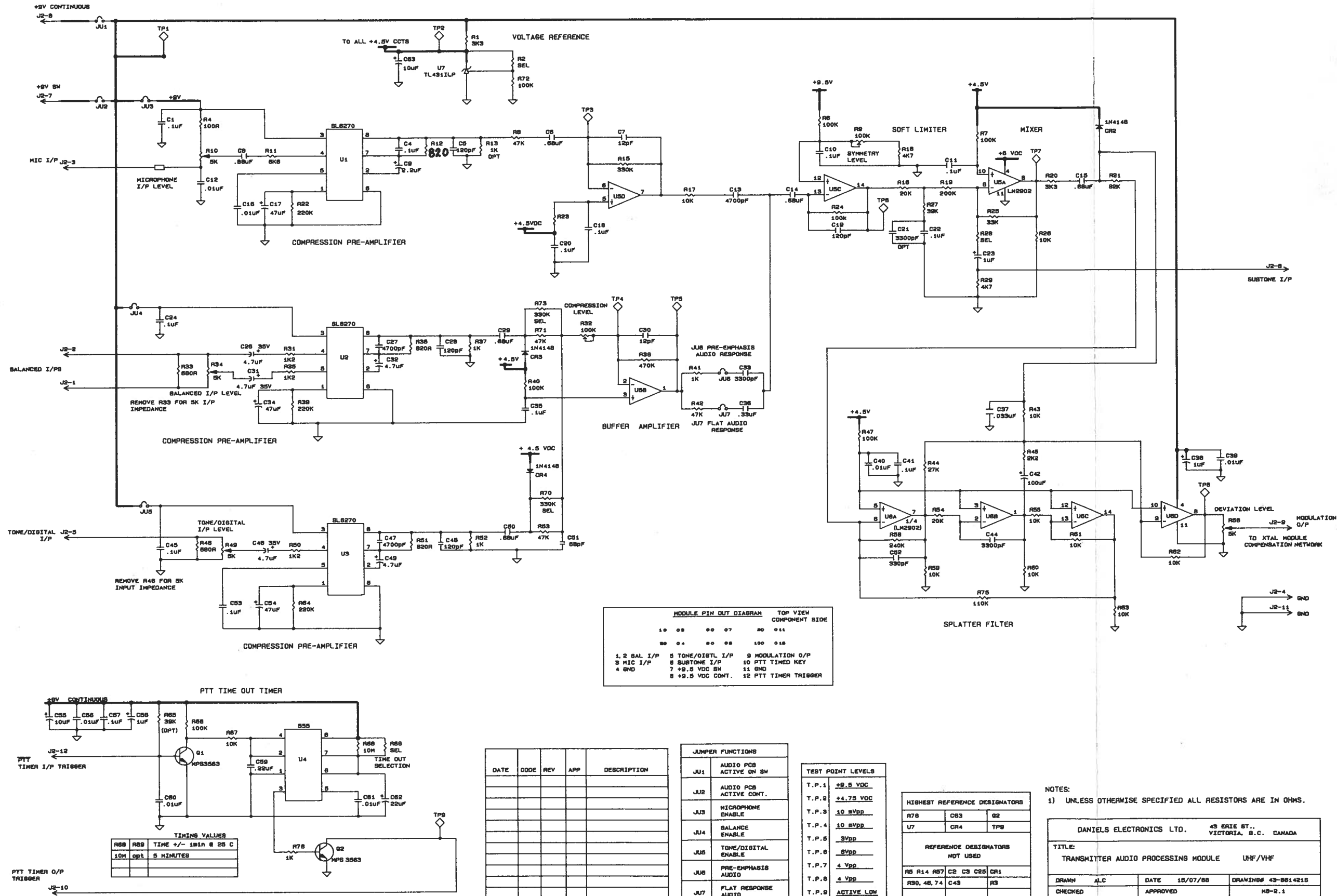
JUMPER	FUNCTIONS
JU1	AUDIO PCB ACTIVE ON SW
JU2	AUDIO PCB ACTIVE CONT.
JU3	MICROPHONE ENABLE
JU4	BALANCE ENABLE
JU5	tone/DIGITAL ENABLE
JU6	PRE-EMPHASIS AUDIO
JU7	FLAT AUDIO

DANIELS ELECTRONICS LTD. 43 6AIE ST., VICTORIA, B.C. CANADA	
TITLE: TRANSMITTER AUDIO PROCESSING MODULE BLOCK DIAGRAM INCLUDES TIME-OUT TIMER	
DRAWN	DATE 15/07/88 DRAWING# 43-861421U
CHECKED	APPROVED HB-2.1

UHF Transmitter Audio Processor - Component Layout
 Figure 2-9

**TRANSMITTER REAR.
 (CONNECTOR END)**





MODULE PIN OUT DIAGRAM TOP VIEW COMPONENT SIDE

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

1, 2 BAL I/P 5 TONE/DIGITAL I/P 9 MODULATION O/P
 3 MIC I/P 6 SUBTONE I/P 10 PTT TIMED KEY
 4 GND 7 +9.5 VDC SW 11 GND
 8 +9.5 VDC CONT. 12 PTT TIMER TRIGGER

TIMING VALUES

R88	R89	TIME +/- 1min @ 25 C
10M	0.1M	5 MINUTES

DATE	CODE	REV	APP	DESCRIPTION

JUMPER FUNCTIONS

JU1	AUDIO PCB ACTIVE ON SW
JU2	AUDIO PCB ACTIVE CONT.
JU3	MICROPHONE ENABLE
JU4	BALANCE ENABLE
JU5	TONE/DIGITAL ENABLE
JU6	PRE-EMPHASIS AUDIO
JU7	FLAT RESPONSE AUDIO

TEST POINT LEVELS

T.P. 1	+9.5 VDC
T.P. 2	+4.75 VDC
T.P. 3	10 mVpp
T.P. 4	10 mVpp
T.P. 5	5Vpp
T.P. 6	5Vpp
T.P. 7	4 Vpp
T.P. 8	4 Vpp
T.P. 9	ACTIVE LOW

HIGHEST REFERENCE DESIGNATORS

R76	C63	Q2
U7	CR4	TP9

REFERENCE DESIGNATORS NOT USED

R5	R14	R87	C8	C9	C25	CR1
R30	48	74	C43	R3		

NOTES:
 1) UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS.

DANIELS ELECTRONICS LTD. 43 ERIE ST., VICTORIA, B.C. CANADA

TITLE: TRANSMITTER AUDIO PROCESSING MODULE UHF/VHF

DRAWN	ALC	DATE	15/07/88	DRAWING#	43-861421S
CHECKED		APPROVED			HS-2.1

AUDIO PROCESSOR MODULE (PCB No. 43-911910)

The audio processor module is a versatile circuit board that can provide several types of audio processing. The module also has an on board programmable push-to-talk (PTT) time-out-timer. A regulated +9.5 VDC power supply is required to power the module which can be configured for continuous or switched operation.

The audio processor module is designed for the MT-3 138-960 MHz transmitters and is backward compatible for the MT-2 transmitters. Not all of the modules capabilities are used when installed in a MT-2 transmitter.

PTT TIME-OUT-TIMER

The PTT time-out-timer (TOT) is a completely separate section of the audio processor module. The TOT is powered from the continuous +9.5 VDC supply (P2-4) and is programmable for various timeout periods.

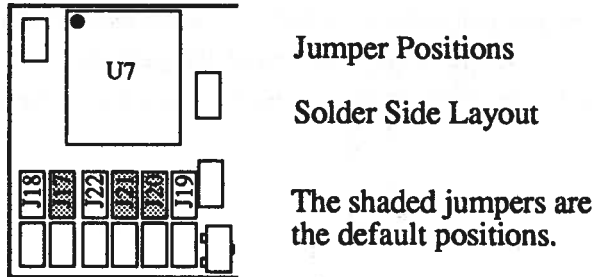
The TOT input trigger (P3-4) is normally high and in this state the timer is disabled. When the input trigger level falls below 2.0 VDC, the timer is activated, the TOT output trigger (P3-2) is pulled low, and the transmitter is keyed. If the input trigger rises above 2.4 VDC or if the timeout period is exceeded, the output trigger will go high, disabling the transmitter. If the timeout period is exceeded the TOT input trigger must go high and then low again in order to rekey the transmitter.

The timeout duration is jumper selectable from 1 second to 8 hours. Table 1 shows the timeout duration in minutes for the various jumper settings which are listed as enabled (E:jumper shorted - in) or disabled (D:jumper left open - out). The positions of the jumpers on the circuit board are shown in Figure 2. The standard factory setting of 5 minutes is shown in bold type in Table 1.

Table 1: Time-Out-Timer Settings

J17:J18	J22	J21	J20	J19	Timeout Duration (minutes)		
E:D / D:E / E:E	E	E	E	E	0.01	0.01	0.01
E:D / D:E / E:E	E	E	E	D	0.02	0.03	0.01
E:D / D:E / E:E	E	E	D	E	0.04	0.06	0.02
E:D / D:E / E:E	E	E	D	D	0.08	0.12	0.05
E:D / D:E / E:E	E	D	E	E	0.15	0.23	0.10
E:D / D:E / E:E	E	D	E	D	0.31	0.47	0.19
E:D / D:E / E:E	E	D	D	E	0.62	0.94	0.38
E:D / D:E / E:E	E	D	D	D	1.25	1.88	0.75
E:D / D:E / E:E	D	E	E	E	2.5	3.75	1.5
E:D / D:E / E:E	D	E	E	D	5.0	7.5	3.0
E:D / D:E / E:E	D	E	D	E	10	15	6.0
E:D / D:E / E:E	D	E	D	D	20	30	12
E:D / D:E / E:E	D	D	E	E	40	60	24
E:D / D:E / E:E	D	D	E	D	80	120	48
E:D / D:E / E:E	D	D	D	E	160	240	96
E:D / D:E / E:E	D	D	D	D	320	480	192

Figure 1: Time-Out-Timer Jumper Positions



911910 - 001

AUDIO SECTION

As mentioned earlier, the audio processor is a versatile module which can provide several types of audio processing through its five inputs. The module can be operated continuously or switched on as required.

POWER REQUIREMENTS

The audio processor module is powered by a regulated +9.5 VDC source which can be jumpered for continuous audio standby (jumper J2 enabled) or for switched audio standby (jumper J1 enabled). Jumpering the module for continuous audio standby allows fast audio risetimes but will increase the transmitter's standby current consumption. Power for the microphone input and the balanced input can be separately disabled by jumpers J3 and J4 respectively if the input is not required. This results in a current savings of approximately 11 mA per input. The current requirements for the audio processor module are shown in Table 2. The current for the TOT is approximately 4 mA when the transmitter is keyed and is included in the keyed values below.

Table 2: Current Consumption

FUNCTION	TRANSMITTER
	CURRENT DRAW keyed / unkeyed
Switched Audio Standby	
Both Microphone and Balanced Input enabled	29.0 / 0.5 mA
Only Microphone or Balanced Input enabled	17.5 / 0.5 mA
Only Auxiliary Input enabled	6.0 / 0.5 mA
Continuous Audio Standby	
Both Microphone and Balanced Input enabled	29.0 / 25.5 mA
Only Microphone or Balanced Input enabled	17.5 / 14.0 mA
Only Auxiliary Input enabled	6.0 / 2.5 mA

AUDIO PROCESSOR TURN-ON TIME

The turn-on time of the audio processor is 25 ms. This measurement is made with the standard factory settings with a 1 kHz tone applied to the balanced input. The turn-on time is the time it takes the audio processor to output a stable audio signal from the time its power (+9.5 VDC) is switched on. As mentioned earlier, the turn-on time can be virtually eliminated by configuring the audio processor module for continuous audio standby.

AUDIO CIRCUITRY

The audio processor module has five audio inputs which can be used to modulate the transmitter, four of which have a level control. The five inputs are combined by summing amplifier U4A which has an associated symmetry control (R14). Op-amp U4A together with U5A provide the limiting action for the audio processor. After the audio signals have been combined and limited, they are filtered by a 6 pole Butterworth filter (U5B, U5C, and U5D). The Q and cutoff frequency for each section of the Butterworth filter are shown on Figure 3, the audio processor module's schematic diagram. The output signal from the filter is then level adjusted by the deviation control pot, R29, before modulating the transmitter. In special applications, jumper J6 can be disabled and J7 enabled, this allows the transmitter to be modulated directly from the auxiliary input.

The 5 audio inputs on the audio processor module are:

- dynamic microphone input
- 600 ohm balanced input
- 2 subtone inputs
- auxiliary input.

Microphone Input

The microphone input has an automatically gain controlled (AGC) preamplifier whose input level is controlled by R2. The microphone input level control (R2) can accommodate a -25 dBm to 0 dBm input signal. The compression level for the microphone input is adjusted by R8.

Balanced Input

The 600 ohm balanced input also has an AGC preamplifier, input level control (R31), and compression level control (R38). Like the microphone input, the balanced input level control can accommodate a -25 dBm to 0 dbm input. The balanced input can have a standard 6 dB/octave pre-emphasis response by enabling jumper J9 or a flat-audio response by enabling jumper J10.

Auxiliary Input

The auxiliary input is a special input, it does not have an AGC preamplifier or an input level control. This input can be configured for a pre-emphasis response (enable J14) or a flat-audio response (enable J15). The compression level for this input is set by R48. When jumper J6 is disabled and jumper J7 is enabled, the auxiliary input can be used to directly modulate the transmitter. Care should be taken when directly modulating the transmitter with the auxiliary input because the MT-3 transmitters use direct FM modulation and there is no filtering or limiting action provided by the auxiliary input. The input level to the auxiliary input should be -18 dBm and can be driven by one of three inputs:

- the balanced input – J11 enabled
- the tone/digital input – J12 enabled
- the direct modulation input – J13 enabled

When the 600 ohm balanced input is connected to the auxiliary input, the balanced input level control can be used to adjust the level for the auxiliary input. When either the tone/digital input or the direct modulation input are used, the input level is not adjustable.

Subtone Inputs

There are two subtone inputs available on the audio processor module. Subtone input 1 is directly connected to summing amplifier U4A while subtone input 2 must be enabled by jumper J16. Subtone input 2 is also available as an output on P4-2 for special applications. Both subtone inputs have an input level control.

AUDIO PROCESSOR REPAIR AND MAINTENANCE

The audio processor module is mainly made up of surface mount devices which should not be removed or replaced using an ordinary soldering iron. Removal and replacement of surface mount components should be performed only with specifically designed surface mount rework and repair stations which have ESD protection.

AUDIO PROCESSOR MODULE PINOUT

Table 3 shows the pinout cross reference between the MT-2 transmitters and the MT-3 transmitters. As mentioned earlier, not all of the audio processor module's capabilities are used when it is installed in a MT-2 transmitter.

Table 3: MT-2/MT-3 Pinout Cross Reference

MT-2 Pin Number	MT-3 Pin Number	Signal
P2-1	P1-1	Balanced Input
P2-2	P1-2	Balanced Input
P2-3	P1-3	Microphone Input
P2-4	P1-4	Ground
P2-5	P2-1	Tone/Digital Input
P2-6	P2-2	Subtone 1 Input
P2-7	P2-3	+9.5VDC Switched
P2-8	P2-4	+9.5VDC Continuous
P2-9	P3-1	Modulation Output
P2-10	P3-2	TOT Output Trigger
P2-11	P3-3	Ground
P2-12	P3-4	TOT Input Trigger
Not Used	P4-1	Subtone 2 Input
Not Used	P4-2	Subtone 2 Output
Not Used	P4-3	Direct Modulation Input
Not Used	P4-4	Limited, Unfiltered Audio Output

STANDARD FACTORY SETTINGS

The audio processor is programmed at the factory for the following conditions:

Timeout timer: 5 minutes \pm 10%

Audio Circuitry: +9.5V switched operation

Maximum deviation: 5.0 kHz

Microphone input enabled

-10 dBm, 1 kHz signal produces 2.5 kHz deviation,
1 kHz signal compression set at 3.0 kHz deviation

Balanced input enabled

- pre-emphasis response
-8 dBm, 1 kHz signal produces 3.0 kHz deviation,
1 kHz signal compression set at 3.0 kHz deviation

Subtone input 1

-18 dBm, 100 Hz signal produces 500 Hz deviation.

Subtone input 2 disabled

Auxiliary input disabled

The following jumpers are enable for the above settings: J1, J3, J4, J6, J8, J9, J17, J20, and J21. All other jumpers are disabled.

STANDARD DEVIATION ADJUSTMENT

The following deviation adjustment procedure should be done each time the crystal module of the transmitter is changed due to individual crystal characteristics.

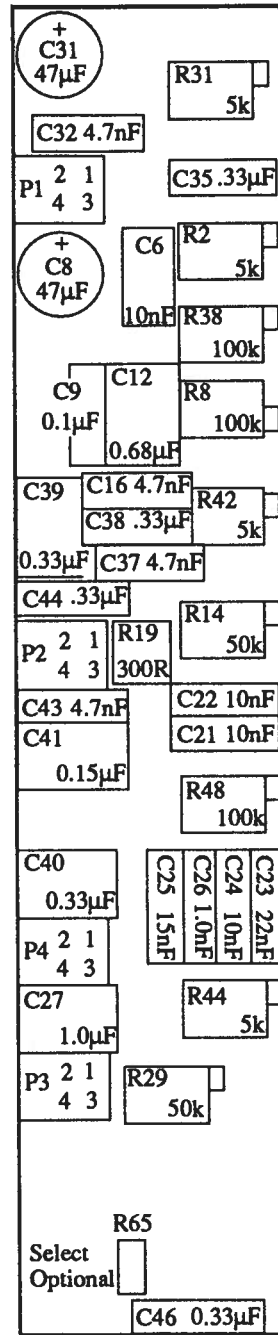
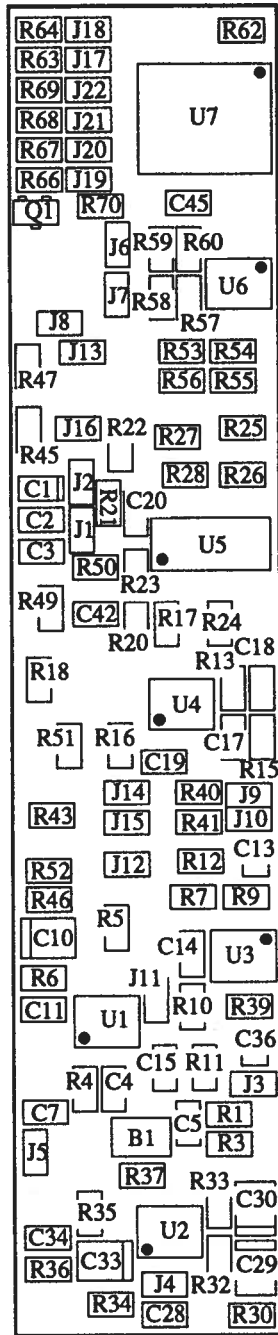
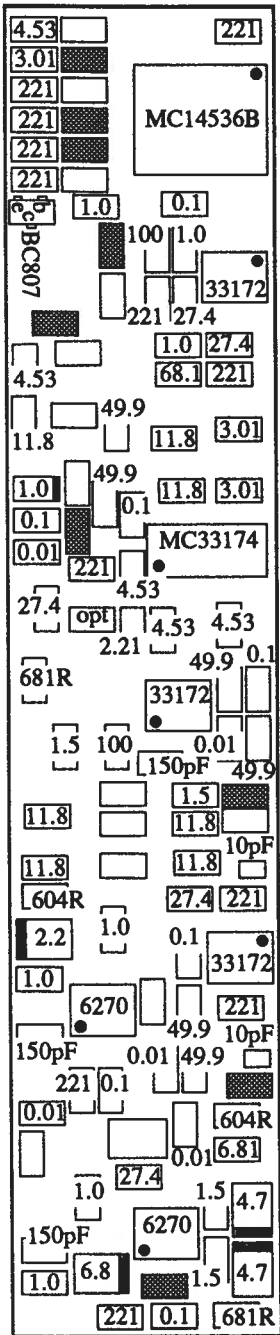
- 1) Before adjusting the audio deviation, confirm that the transmitter RF output frequency is correct.
- 2) Connect the transmitter to a 50 ohm dummy load/power sampler and monitor F.M. deviation, distortion, and audio frequency.
- 3) Connect the 600 ohm input to the incoming audio (pins B18, Z18). Set the audio frequency to 1 kHz at the desired level.
- 4) Increase the balance level control (R31:ccw) for maximum gain.
- 5) Turn the transmitter on
- 6) Adjust the balance compression level (R38:cw) for compression at \pm 3.0 kHz deviation.

- 7) Increase the modulation frequency until maximum deviation occurs (peaks), then adjust the deviation control (R29:ccw) until the maximum deviation is ± 4.8 kHz.
- 8) Reset the modulating frequency to 1 kHz and re-adjust R38 for ± 3.0 kHz deviation.
- 9) Repeat steps 7 and 8 until both conditions are met.
- 10) Vary the audio signal from 1 kHz to 3 kHz and measure the + deviation and then the - deviation. Adjust the symmetry control (R14) until the \pm deviation is symmetrical. The variation between \pm deviation levels should not exceed 300 Hz over the 1 kHz to 3 kHz range.
- 11) Check steps 7 and 8 and re-adjust if necessary.
- 12) Adjust the balanced input level control (R31:ccw) until the deviation produced by a 1 kHz tone at -8 dBm falls below ± 3 kHz, then adjust R31 so that the deviation increases until compression is observed. The deviation should be ± 3 kHz.
- 13) A 1 kHz tone at -8 dBm input level should produce ± 3 kHz deviation. If not, go back to step 4 and make sure the pot is set for maximum gain and repeat the procedure. If so, increasing the input level by +20 dBm should not increase the deviation. This confirms that the AGC action of preamplifier U2 is working.
- 14) A 2.4 kHz tone at the desired audio input level should produce ± 4.8 kHz deviation. Increasing the input level by +20 dBm should not increase the deviation. This confirms that the limiting action of U4A and U5A is working.
- 15) Confirm audio distortion by reducing the 1 kHz tone level until ± 3 kHz deviation is reached and record the distortion with the appropriate filter on the analyzer.
- 16) Confirm the audio frequency response by referencing all output deviation measurements to a 1 kHz input tone at 1 kHz deviation.
- 17) Remove the signal to the balanced input (pins B18, Z18).
- 18) Apply a 1 kHz tone at -8 dBm to the microphone audio input. Set the microphone compression control (R8:ccw) to produce ± 3 kHz deviation. Reduce the signal to -10 dbm and adjust the microphone input level control (R2:ccw) for 2.5 kHz deviation. Remove the signal.
- 19) Apply a 100 Hz tone at -18 dBm to the subtone 1 input and adjust the subtone 1 level control (R42:ccw) to produce ± 500 Hz deviation. Remove the signal.

****note:** the directions cw or ccw denote increasing signal levels

AUDIO PROCESSOR MODULE LAYOUT

FIGURE: 2



■ Jumper default settings

SOLDER SIDE

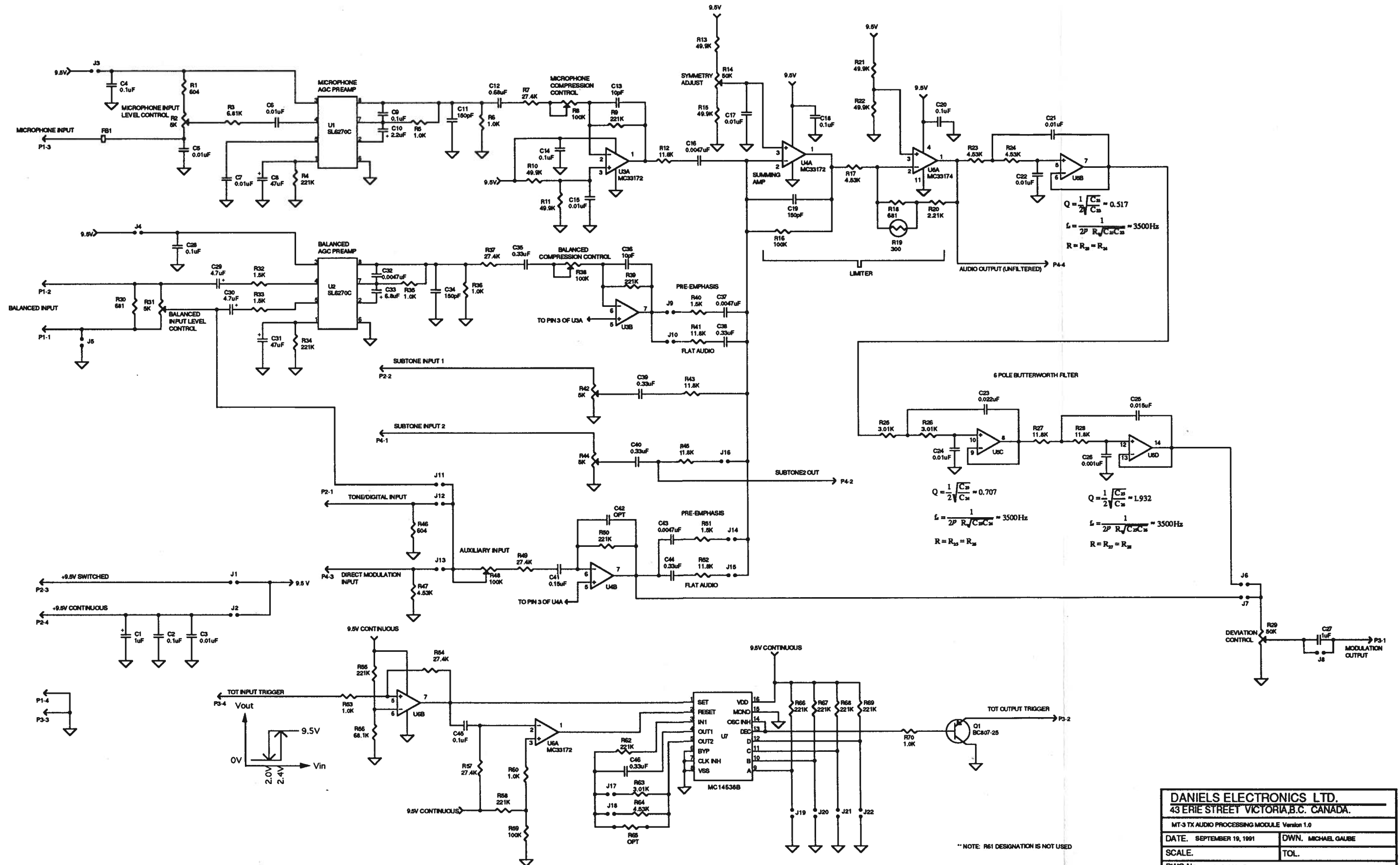
COMPONENT SIDE

Unless Otherwise Specified

All resistors KΩ
All capacitors in μF

911910-002

MT-3 TX AUDIO PROCESSOR MODULE
 SCHEMATIC DIAGRAM 43-911910-S
 FIGURE: 3



DANIELS ELECTRONICS LTD.	
43 ERIE STREET VICTORIA, B.C. CANADA.	
MT-3 TX AUDIO PROCESSING MODULE Version 1.0	
DATE: SEPTEMBER 19, 1991	DWN. MICHAEL GAUBE
SCALE:	TOL.
DWG No. 43-911910-S	

PARTS LIST - AUDIO PROCESSOR MODULE

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
C1	CAP. SM., 1u0 TANT., 20%, 16V	14C-A5-105M16	1
C2	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C3	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C4	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C5	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C6	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C7	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C8	CAP, 47uF DIP. TANT., 20%, 20V	14-K6-476M20	2
C9	CAP, 0.1uF METAL-POLY 10%, 63V	11-A4-104K63	1
C10	CAP. SM., 2u2 TANT., 10%, 20V	14C-B5-225K20	1
C11	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C12	CAP, 0.68uF METAL-POLY 10%, 50V	11-D4-684K50	1
C13	CAP. SM., 10pF CER, 0805, C0G	05C-A1-100J1G	2
C14	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C15	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C16	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C17	CAP. SM., 0.01uF CER, 1206, X7R	05C-B4-103K5R	5
C18	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C19	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C20	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C21	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C22	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C23	CAP, 0.022uF METAL-POLY 10%, 63V	11-A3-223K63	1
C24	CAP, 0.01uF METAL-POLY 10%, 63V	11-A3-103K63	4
C25	CAP, 0.015uF METAL-POLY 10%, 63V	11-A3-153K63	1
C26	CAP, 0.001uF METAL-POLY 10%, 63V	11-A2-102K63	1
C27	CAP, 1uF METAL-POLY 10%, 50V	11-D5-105K50	1
C28	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C29	CAP. SM., 4u7 TANT., 10%, 16V	14C-B5-475K16	2
C30	CAP. SM., 4u7 TANT., 10%, 16V	14C-B5-475K16	2
C31	CAP, 47uF DIP. TANT., 20%, 20V	14-K6-476M20	2
C32	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C33	CAP. SM., 6u8 TANT., 20%, 10V	14C-B5-685M10	1
C34	CAP. SM., 150pF CER, 1206, C0G	05C-B2-151J1G	3
C35	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C36	CAP. SM., 10pF CER, 0805, C0G	05C-A1-100J1G	2
C37	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C38	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6

PARTS LIST - AUDIO PROCESSOR MODULE (continued)

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
C39	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C40	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C41	CAP, 0.15uF METAL-POLY 10%, 63V	11-A4-154K63	1
C42	OPTIONAL SELECT VALUE, SM		1
C43	CAP, 0.0047uF METAL-POLY 10%, 63V	11-A2-472K63	4
C44	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
C45	CAP. SM., 0.1uF CER, 1206, X7R	05C-B5-104K5R	7
C46	CAP, 0.33uF METAL-POLY 10%, 50V	11-B4-334K50	6
FB1	BEAD SM., FERRITE, 3mm x 5mm L	30FS-274335	1
P1	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P2	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P3	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
P4	HEADER, 0.1", 2 PIN x 2 ROW, R.A.	19-10HDR022RA	4
Q1	TRANS, BC807-25, PNP, G.P., SOT-23	63S-BC807-25	1
R1	RES. SM., 604R, 1206, 1%, 100 ppm	52C-B2-6040F1	2
R2	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R3	RES. SM., 6k81, 1206, 1%, 100 ppm	52C-B3-681R1F1	1
R4	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R5	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R6	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R7	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R8	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R9	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R10	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R11	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R12	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R13	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R14	POT. SM., 50k MULTI-TURN, VERT	46S-M3-503X	2
R15	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R16	RES. SM., 100k, 1206, 1%, 100 ppm	52C-B5-1003F1	2
R17	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R18	RES. SM., 681R, 1206, 1%, 100 ppm	52C-B2-6810F1	2
R19	THERMISTOR, 300R, NTC, 10%, RADL	55-NR301K	1
R20	RES. SM., 2k21, 1206, 1%, 100 ppm	52C-B3-2211F1	1
R21	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R22	RES. SM., 49k9, 1206, 1%, 100 ppm	52C-B4-4992F1	6
R23	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R24	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5

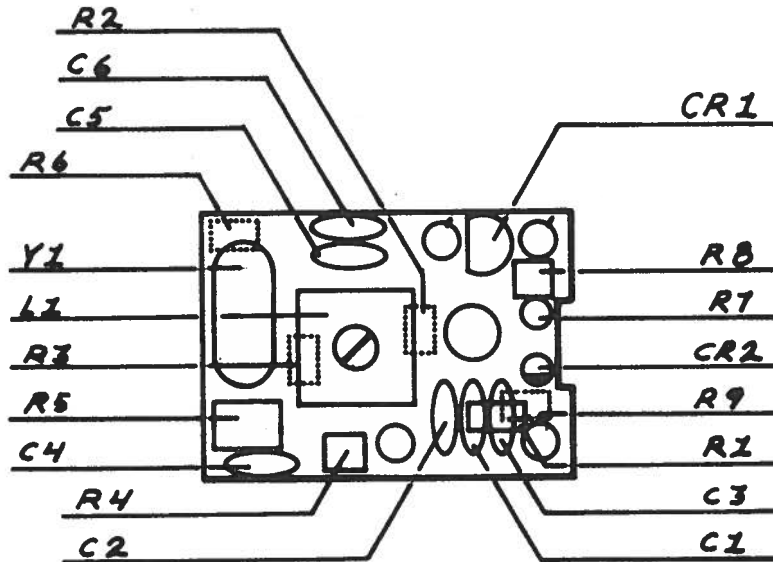
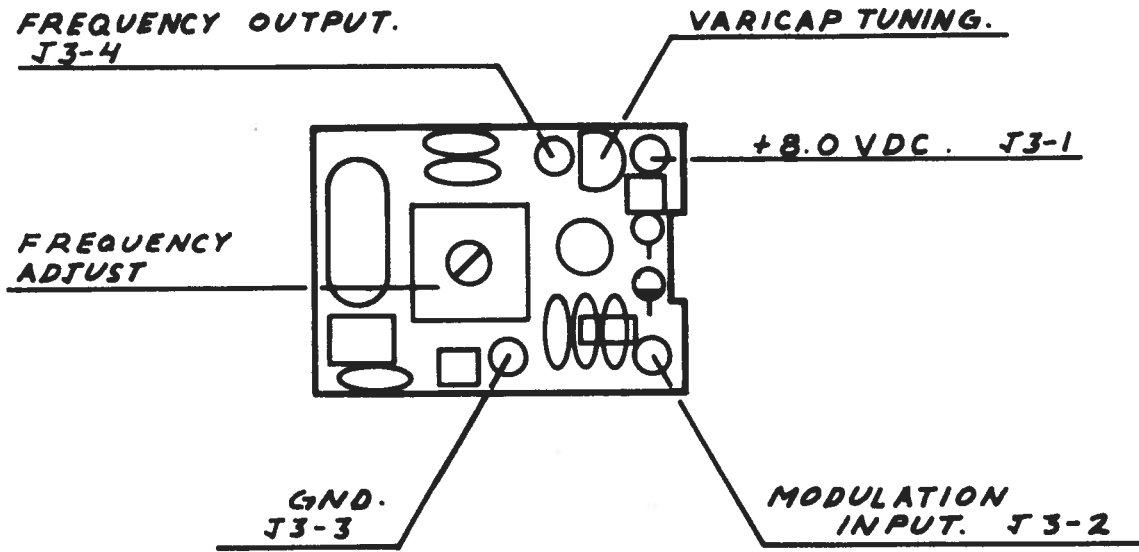
PARTS LIST - AUDIO PROCESSOR MODULE (continued)

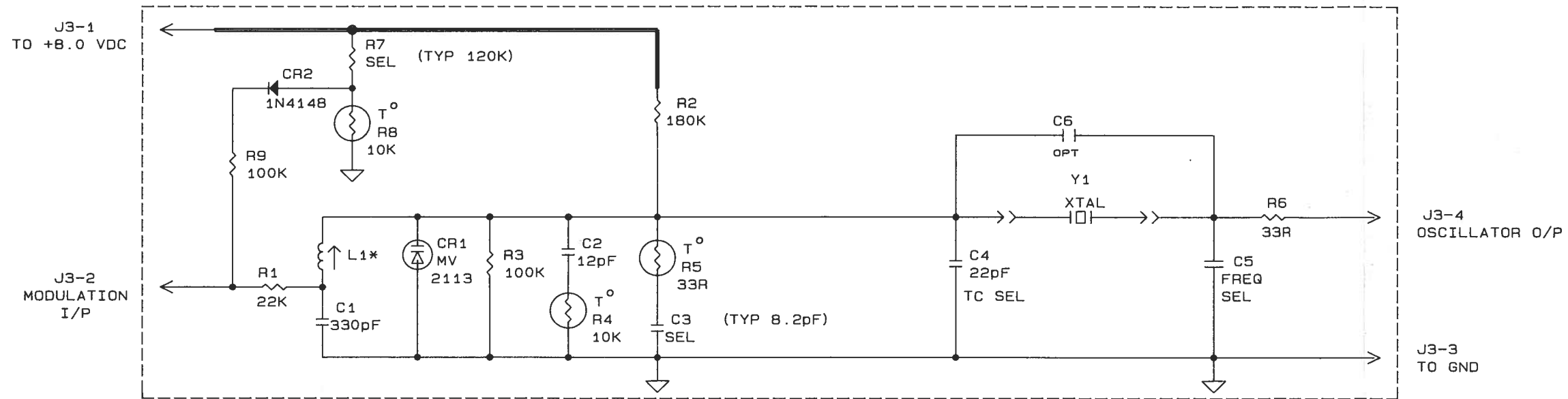
REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
R25	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R26	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R27	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R28	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R29	POT. SM., 50k MULTI-TURN, VERT	46S-M3-503X	2
R30	RES. SM., 681R, 1206, 1%, 100 ppm	52C-B2-6810F1	2
R31	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R32	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R33	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R34	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R35	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R36	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R37	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R38	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R39	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R40	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R41	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R42	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R43	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R44	POT. SM., 5k0 MULTI-TURN, VERT	46S-M2-502X	4
R45	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R46	RES. SM., 604R, 1206, 1%, 100 ppm	52C-B2-6040F1	2
R47	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R48	POT. SM., 100k MULTI-TURN, VERT	46S-M4-104X	3
R49	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R50	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R51	RES. SM., 1k50, 1206, 1%, 100 ppm	52C-B3-1501F1	4
R52	RES. SM., 11k8, 1206, 1%, 100 ppm	52C-B4-1182F1	7
R53	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R54	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R55	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R56	RES. SM., 68k1, 1206, 1%, 100 ppm	52C-B4-681R2F1	1
R57	RES. SM., 27.4k, 1206, 1%, 100 ppm	52C-B4-2742F1	5
R58	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R59	RES. SM., 100k, 1206, 1%, 100 ppm	52C-B5-1003F1	2
R60	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
R61	NOT USED		
R62	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12

PARTS LIST - AUDIO PROCESSOR MODULE (continued)

REF DESIG	DESCRIPTION	DANIELS PART NO	QTY
R63	RES. SM., 3k01, 1206, 1%, 100 ppm	52C-B3-3011F1	3
R64	RES. SM., 4k53, 1206, 1%, 100 ppm	52C-B3-4531F1	5
R65	OPTIONAL SELECT VALUE		1
R66	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R67	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R68	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R69	RES. SM., 221k, 1206, 1%, 100 ppm	52C-B5-2213F1	12
R70	RES. SM., 1k00, 1206, 1%, 100 ppm	52C-B3-1001F1	7
U1	I.C., SL6270C, VOGAD, SO-8	29A-6270	2
U2	I.C., SL6270C, VOGAD, SO-8	29A-6270	2
U3	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U4	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U5	I.C., MC33174 QUAD OP-AMP, SO-14	29OP-33174	1
U6	I.C., MC33172 DUAL OP-AMP, SO-8	29OP-33172	3
U7	I.C., MC14536B PROG. TIMER, SO-16W	29T-14536	1
PCB	AUDIO PROCESSOR MODULE	43-911910	1

Transmitter Crystal Module (TCXO)- Component Layout
 Figure 2-11





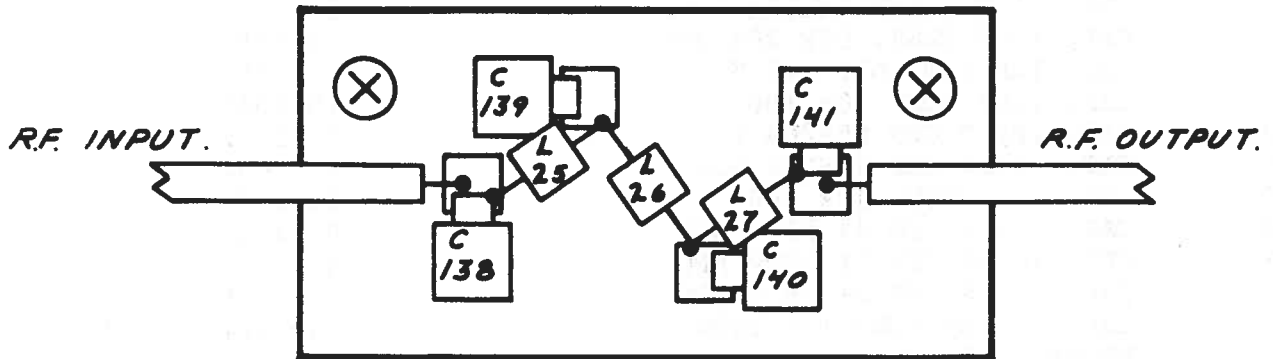
DATE	CODE	REV	APP	DESCRIPTION

HIGHEST REFERENCE DESIGNATORS		
R9	C6	L1
CR2	Y1	
REFERENCE DESIGNATORS NOT USED		

NOTES:
 1) RESISTORS IN OHMS, CAPACITORS IN MICROFARADS
 * L1 SELECT FOR VHF OR UHF

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: TRANSMITTER CRYSTAL MODULE		UHF/VHF	
DRAWN ALC	DATE 15/07/88	DRAWING# 43-861910S	
CHECKED	APPROVED	M10-1.0	

UHF Transmitter Low Pass Filter - Component Layout
Figure 2-13



PARTS LIST - TRANSMITTER UHF

Main Circuit Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF POLYFILM 10% 50V	11-1040	1
C2	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C3	CAP, 1uF TANT DIP 20% 35V	14-1051	2
C4	CAP, .1uF MONO 20% 100V	10-1042	9
C5	CAP, .01uF CER 80-20% 63V	05-1032	13
C6	CAP, .01uF CER 80-20% 63V	05-1032	13
C7	CAP, .1uF MONO 20% 100V	10-1042	9
C8	CAP, 100pF CER 2% 100V NPO	05-1016	4
C9	CAP, 100pF CER 2% 100V NPO	05-1016	4
C10	CAP, 100pF CER 2% 100V NPO	05-1016	4
C11	CAP, .001uF MONO 10% 200V	10-1022	9
C12	VALUE SELECTED	SEL	4
C13	CAP, .01uF CER 80-20% 63V	05-1032	13
C14	CAP, .68uF MONO 20% 50V	10-6840	1
C15	CAP, .001uF MONO 10% 200V	10-1022	9
C16	CAP, .1uF MONO 20% 100V	10-1042	9
C17	CAP, 4u7 TANT. DIP 10% 35V	14-4751	2
C18	CAP, .1uF MONO 20% 100V	10-1042	9
C19	CAP, .001uF MONO 10% 200V	10-1022	9
C20	CAP, .01uF CER 80-20% 63V	05-1032	13
C21	CAP, 510pF MICA 2% 500V	09-5115	1
C22	VALUE SELECTED	SEL	4
C23	CAP, .001uF MONO 10% 200V	10-1022	9
C24	CAP, .001uF MONO 10% 200V	10-1022	9
C25	CAP, 5p6 CER 2% 100V NPO	05-0566	2
C26	CAP, .56pF CER +/- .25pF 100V P100	05-0560	1
C27	CAP, 5p6 CER 2% 100V NPO	05-0566	2
C28	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C29	CAP, .1uF MONO 20% 100V	10-1042	9
C30	CAP, .01uF CER 80-20% 63V	05-1032	13
C31	CAP, .001uF MONO 10% 200V	10-1022	9
C32	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	4
C33	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C34	CAP, 1pF CER +/- .25pF 100V P100	05-0100	2
C35	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C36	CAP, .001uF MONO 10% 200V	10-1022	9
C37	CAP, 500pF MICA 2% 500V	09-5015	1
C38	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	1
C39	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	4
C40	CAP, 1uF POLYFILM 10% 50V	11-1050	2
C41	CAP, .01uF CER 80-20% 63V	05-1032	13
C42	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C43	CAP, 1p8 CER +/- .25pF 100V NPO	05-0186	1
C44	CAP, 1.5-20pF VARI., AIR DIEI., VERT MTG	15-8054	4
C67	CAP, 1pF CER +/- .25pF 100V P100	05-0100	2
C69	CAP, .005uF CER Z5U 20% 1KV	05-5024	1

C70	CAP, 330pF MONO 10% 200V	10-3312	9
C71	CAP, 330pF MONO 10% 200V	10-3312	9
C72	CAP, .01uF CER 80-20% 63V	05-1032	13
C73	CAP, 2u2 TANT. DIP 20% 35V	14-2251	2
C74	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C75	CAP, .1uF MONO 20% 100V	10-1042	9
C76	CAP, 2u2 TANT. DIP 20% 35V	14-2251	2
C77	CAP, .01uF CER 80-20% 63V	05-1032	13
C78	CAP, .001uF MONO 10% 200V	10-1022	9
C79	CAP, .1uF MONO 20% 100V	10-1042	9
C80	CAP, .1uF MONO 20% 100V	10-1042	9
C81	CAP, .01uF CER 80-20% 63V	05-1032	13
C82	CAP, 100uF TANT 20% 20V	14-1072	1
C83	CAP, 100pF CER 2% 100V NPO	05-1016	4
C84	CAP, 330pF MONO 10% 200V	10-3312	9
C85	CAP, 330pF MONO 10% 200V	10-3312	9
C86	CAP, 330pF MONO 10% 200V	10-3312	9
C87	CAP, 330pF MONO 10% 200V	10-3312	9
C88	CAP, 330pF MONO 10% 200V	10-3312	9
C90	CAP, 330pF MONO 10% 200V	10-3312	9
C91	CAP, 330pF MONO 10% 200V	10-3312	9
C92	CAP, .01uF POLYFILM 10% 63V/100V	11-1031	1
C120	CAP, .01uF CER 80-20% 63V	05-1032	13
C121	VALUE SELECTED	SEL	4
C122	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	2
C124	CAP, .01uF CER 80-20% 63V	05-1032	13
C125	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C126	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	4
C127	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	2
C128	CAP, 6p8 METAL CLAD MINI, +/- .5pF 250V	16-0682	2
C129	CAP, 6p8 METAL CLAD MINI, +/- .5pF 250V	16-0682	2
C130	CAP, .6-3.5pF VARI., AIR DIEI., VERT MTG	15-8055	2
C131	CAP, .6-3.5pF VARI., AIR DIEI., VERT MTG	15-8055	2
C132	CAP, .01uF CER 80-20% 63V	05-1032	13
C133	CAP, 1uF POLYFILM 10% 50V	11-1050	2
C134	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	4
C135	CAP, .01uF CER 80-20% 63V	05-1032	13
C136	CAP, 1uF TANT DIP 20% 35V	14-1051	2
C137	CAP, .001uF MONO 10% 200V	10-1022	9
C138	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C139	CAP, 18pF CER 2% 100V NPO	05-1806	2
C140	CAP, 18pF CER 2% 100V NPO	05-1806	2
C141	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C142	CAP, .1uF MONO 20% 100V	10-1042	9
C143	CAP, 680pF CER Z5R 10% 1KV	05-6814	1
C144	CAP, 4u7 TANT. DIP 10% 35V	14-4751	2
CR1	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR2	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR3	DIODE, MPN3404, PIN, CASE 182-02	60-3404	3
CR4	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	1
CR5	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR6	DIODE, 1N4148, SILCON, VR=75V	60-4148	4

CR7	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR8	DIODE, 1N4148, SILCON, VR=75V	60-4148	4
CR9	DIODE, 1N5228B, ZENER, 3.9V	60-5228	1
D1	LED, RED, 0.193"od X 0.35"long	36-0300	1
L1	COIL, SHIELDED CAN, TX VHF/UHF	31-7110	1
L2	COIL, SHIELDED CAN TX VHF/UHF	31-7111	1
L3	COIL, SHIELDED CAN, TX VHF/UHF	31-7112	2
L4	COIL, SHIELDED CAN, TX VHF/UHF	31-7112	2
L5	COIL, SHIELDED CAN, TX VHF/UHF	31-7120	1
L6	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L7	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L8	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L9	COIL, 5T, 20AWG BELDSOL, STR. LEADS	30-1699	4
L20	COIL, 2T, 16AWG BELDSOL, STR. LEADS	30-1700	1
L21	COIL, 3T, 18AWG BELDSOL, STR. LEADS	30-1701	1
L22	COIL, 5T, 20AWG BELDSOL,STR/180deg LEADS	30-1702	1
L23	COIL, 4T, HELICAL, 10AWG COPPER	30-1712	2
L24	COIL, 4T, HELICAL, 10AWG COPPER	30-1712	2
Q1	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	2
Q2	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	2
Q3	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q4	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q5	TRANSISTOR, MRF 965, RF, TO-46, MTL	63-0965	3
Q8	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q9	TRANSISTOR, TIP32, PNP, TO-220 AB	63-0032	2
Q10	TRANSISTOR, 2N2907A, PNP	63-2907	1
Q11	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q12	TRANSISTOR, 2N2222A, NPN, TO-12	63-2222	3
Q13	TRANSISTOR, TIP32, PNP, TO-220 AB	63-0032	2
Q20	TRANSISTOR, MRF 629, UHF, TO-39CE	63-0629	1
R1	THERMISTOR, 100R	55-1010	1
R2	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R3	RES, CHIP 180K	52-1840	1
R4	RES, 82K 0.5W 5% STD M FLM	56-0823	1
R5	RES, 12K 0.5W 5% STD M FLM	56-0123	1
R6	RES, 33K 0.5W 5% STD M FLM	56-0333	2
R7	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R8	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R9	RES, 6R8 0.6W 5% STD M FLM	56-1068	1
R10	RES, 6K8 0.5W 5% STD M FLM	56-0682	1
R11	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R12	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R13	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R14	RES, 8R2 0.6W 5% STD M FLM	56-1082	1
R15	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R16	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R17	RES, 1K5 0.5W 5% STD M FLM	56-0152	1
R18	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R19	RES, 10K 0.5W 5% STD M FLM	56-0103	6
R20	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R21	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R22	RES, 1K 0.5W 5% STD M FLM	56-0102	4

R23	RES, 1R2 0.6W 5% STD M FLM	56-1012	3
R24	RES, 4R7 0.6W 5% STD M FLM	56-1047	6
R25	RES, 2R7 0.6W 5% STD M FLM	56-1027	3
R26	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R27	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R37	RES, 10K 0.5W 5% STD M FLM	56-0103	6
R38	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R39	RES, 150R 0.5W 5% STD M FLM	56-0151	2
R40	RES, CHIP 22K 5%	52-2230	1
R41	RES, 33K 0.5W 5% STD M FLM	56-0333	2
R42	RES, 10K 0.5W 5% STD M FLM	56-0103	6
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	6
R44	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R45	RES, 10K 0.5W 5% STD M FLM	56-0103	6
R46	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R47	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R49	RES, CHIP 100K 5%	52-1040	2
R50	RES, 5K6 0.5W 5% STD M FLM	56-0562	1
R51	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R52	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R53	RES, 390R 0.6W 5% STD M FLM	56-1391	1
R54	RES, 470R 0.5W 5% STD M FLM	56-0471	1
R55	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R120	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R121	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R122	RES, CHIP 100K 5%	52-1040	2
R123	RES, 22R 0.5W 5% STD M FLM	56-0220	2
R124	RES, 2R7 0.6W 5% STD M FLM	56-1027	3
R125	VALUE SELECTED	SEL	4
R126	RES, 2R7 0.6W 5% STD M FLM	56-1027	3
R127	RES, 150R 0.5W 5% STD M FLM	56-0151	2
R128	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R129	RES, 10K 0.5W 5% STD M FLM	56-0103	6
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC2	CHOKE, 22uH, 10%	30-0220	2
RFC3	CHOKE, 10uH, 10%	30-0100	3
RFC4	CHOKE, 22uH, 10%	30-0220	2
RFC6	CHOKE, 10uH, 10%	30-0100	3
RFC7	CHOKE, 10uH, 10%	30-0100	3
RFC14	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC15	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC16	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC17	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC18	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC19	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC20	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC21	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC22	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC23	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC25	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC26	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC40	FERRITE BEAD, 64 MIX, 0.138"od.,0.118"L	30-6410	1

RFC41	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
RFC42	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	15
U1	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
U3	I.C., BGY22, UHF RF AMP MODULE, 2.5W	28-0022	1
	SOCKET, 0.040, GOLD PLATE	19-0040	4
	HOOD, RF, TYPE N CONNECTOR	19-1770	1
	CONNECTOR, TYPE N	19-1775	1
	PIN, SQUARE, 0.045", TIN PL.	19-2161	2
	HEADER, 6 SQR.PINS, TIN PL. 0.1" PCB MTG	19-6416	1
	MIC CONNECTOR, 4 PIN MALE, SCRW LCKG BLK	19-7030	1
	MIC CONNECTOR, 4 PIN FEM, SCRW LCKG BLK	19-7031	1
	CONNECTOR, FEM. 6 DUAL CONT. KEYED 22AWG	19-7726	1
	CONNECTOR, SMA, FEM., PCB MTG.	19-8002	1
	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	1
	HEADER, 3 PIN,SINGLE ROW, GOLD PLATE	19-8013	2
	FUSE, 3 AMP FAST BLOW	25-0003	1
	FUSE, 5AMP, type AGC-5	25-0005	1
	HEATSINK, TO-46/T0-72, 2 PIECES, BLACK	27-2220	4
	HEATSINK, T0-39/T0-5, 0.5"od X 0.25" RED	27-2260	1
	PAD, TRANSISTOR MTG, NYLON, TO-5	33-0005	1
	INSULATOR, THERMALLY COND. TO-220, SILI.	33-0220	1
	CASE, LED, FLANGE & LOCKING RING	36-0310	1
	LUG, GROUND, #4, 2-3/32 HOLES, 23/32	37-4000	1
	NAME PLATE, UHF TX, MOD2	39-865410	1
	SILK SCREENING, FRONT PANEL TX	39-865710	1
	SHIELD, FOR UHF TX TRIPLER, BRASS	39-872711	1
	HEATSINK, BLACK EXT, VHF/UHF TX	39-873110	1
	SIDE PANEL, TX LEFT SIDE	39-873210	1
	HEATSINK, 1/4" ALM, UHF TX HEAT XFER BLK	39-873310	1
	COVER, WRAP AROUND	39-873510	1
	COIL FORM, UHF, Q200.5 X-LINKED POLYSTYR	39-873710	2
	COVER, BRASS, UHF HELICAL FILTER	39-873910	1
	FRONT PANEL, TX, 14HP.	39-874810	1
	COAX, RIGID, UHF AMP I/P, 2W VERSION	39-875210	1
	COAX, RIGID, UHF AMP I/P, 6W VERSION	39-875310	1
	COAX, RIGID, UHF TRIPLER TO HEL.FIL.	39-875410	1
	COAX, RIGID, UHF AMP TO LOW PASS FILTER	39-875510	1
	COAX, RIGID, UHF LOW PASS FILTER TO O/P	39-875610	1
	EXTRUSION, HELICAL FILTER, UHF TX	39-875710	1
	MATTE FOIL LABELS, FP FREQ. STICKER	39-880510	1
	MATTE FOIL LABELS, TRANSMITTER TCXL	39-880710	1
	MATTE FOIL LABELS, TXU SERIAL NUMBER	39-881010	1
	NUT, 4-40 HEX 3/16 x 1/16 SS	42-4400	4
	SEAL, SLOTTED, FOR VHF VAR. CAPS	42-4613	4
	NUT, .12-80 FOR UHF VARI. CAPS	42-6389	2
	SEALS, SLOTTED, FOR UHF VAR. CAPS	42-6487	2
	PCB, UHF TRANSMITTER	43-860921	1
	FASTENER, QUICK RELEASE,GREY PKG.100	58-0003	4
	SIDE PANEL, EXTRUSION	58-0004	1
	HANDLE, FRONT PANEL, 14HP, GREY	58-0006	1
	NUT, M2.5, HEX, PKG. OF 100	58-0010	4
	SCREW, M2.5 x 10, CHEESE HEAD	58-2500	2

SCREW, M2.5 x 12, C/SK, FOR HANDLES	58-2504	2
WASHER, M2.5, SHAKEPROOF	58-2512	4
SCREW, M3 x 8, RAISED C/SK	58-3002	4
SCREW, M3 x 8, PAN HEAD, ZINC	58-3004	4
CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
SCREW, 10-32 x 3/8 PAN PHIL, MS SS	59-1037	2
SCREW, 10-32 x 9/16 PAN PHIL, MS SS	59-1056	2
SCREW, 4-40 x 1 1/2", PAN PHIL, MS SS	59-4150	6
SCREW, 4-40 x 5/16 PAN PHIL, MS SS	59-4331	5
SCREW, 4-40 x 3/8, PAN PHIL, MS SS	59-4337	4
SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	6
SCREW, 6-32 x 3/8 RD. SLOT, NYLON	59-6837	2
STANDOFF, 4-40 x 1/4, 7/32od, NO-ROT, NICK	67-4425	4
SWITCH NUT	70-2211	1
SWITCH, DPDT, ON-OFF-ON	70-3200	1
TUBING, TEFLON, 16AWG, THIN WALL	76-0016	1
TUBING, TEFLON, 24AWG, THIN WALL	76-0024	1
TUBING, PVC, 8AWG, CLEAR	76-1008	1
HEATSHRINK, 3/32", BLACK	76-2093	1
WASHER, SHAKEPROOF, 120-80, UHF VARI.CAP	77-1993	2
WASHER, LOCKING, #4 SPLIT SS	77-4001	18
WASHER, FLAT, #4 SS	77-4010	6
WASHER, NYLON, #4, SHOULDER INSULATING	77-4095	1
WIRE, TEFLON, 24AWG, STRANDED, BROWN	86-2401	1
WIRE, TEFLON, 24AWG, STRANDED RED	86-2402	1
WIRE, TEFLON, 24AWG, STRANDED ORANGE	86-2403	1
WIRE, TEFLON, 24AWG, STRANDED YELLOW	86-2404	1
WIRE, TEFLON, 24AWG, STRANDED VIOLET	86-2407	1
WIRE, TEFLON, 24AWG, STRANDED GREY	86-2408	1

Reference: - UHF Transmitter Drawing 43-860922S

Audio Processor Board

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	9
C4	CAP, .1uF POLYFILM 10% 50V	11-1040	2
C5	CAP, 120pF CER 2% 100V NPO	05-1216	3
C6	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C7	CAP, 12pF CER 2% 100V NPO	05-1206	2
C8	CAP, .01uF POLYFILM 10% 63V/100V	11-1031	1
C9	CAP, 2u2 TANT. DIP 20% 35V	14-2251	1
C10	CAP, .1uF MONO 20% 100V	10-1042	9
C11	CAP, .1uF MONO 20% 100V	10-1042	9
C12	CAP, .01uF CER 80-20% 63V	05-1032	7
C13	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	2
C14	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C15	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C16	CAP, .01uF CER 80-20% 63V	05-1032	7

C17	CAP, 47uF TANT. DIP 20% 20V	14-4760	2
C18	CAP, .1uF MONO 20% 100V	10-1042	9
C19	CAP, 120pF CER 2% 100V NPO	05-1216	3
C20	CAP, .1uF MONO 20% 100V	10-1042	9
C21	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C22	CAP, .1uF POLYFILM 10% 50V	11-1040	2
C23	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C24	CAP, .1uF MONO 20% 100V	10-1042	9
C26	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C27	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	2
C28	CAP, 120pF CER 2% 100V NPO	05-1216	3
C29	CAP, .68uF POLYFILM 10% 50V	11-6840	4
C30	CAP, 12pF CER 2% 100V NPO	05-1206	2
C31	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C32	CAP, 4u7 TANT. DIP 10% 35V	14-4751	3
C33	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C34	CAP, 47uF TANT. DIP 20% 20V	14-4760	2
C35	CAP, .1uF MONO 20% 100V	10-1042	9
C37	CAP, .033uF POLYFILM 10% 63V/100V	11-3331	1
C38	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C39	CAP, .01uF CER 80-20% 63V	05-1032	7
C40	CAP, .01uF CER 80-20% 63V	05-1032	7
C41	CAP, .1uF MONO 20% 100V	10-1042	9
C42	CAP, 100uF TANT 20% 20V	14-1072	1
C44	CAP, 3300pF MONO 10% 100V(or200V) COG .2"	10-3321	3
C52	CAP, 330pF MONO 10% 200V	10-3312	1
C55	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C56	CAP, .1uF MONO 20% 100V	10-1042	9
C57	CAP, .01uF CER 80-20% 63V	05-1032	7
C58	CAP, 1uF TANT DIP 20% 35V	14-1051	3
C59	CAP, .22uF MONO 20% 50V	10-2240	1
C60	CAP, .01uF CER 80-20% 63V	05-1032	7
C61	CAP, .01uF CER 80-20% 63V	05-1032	7
C62	CAP, 22uF TANT DIP 20% 20V	14-2262	1
C63	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
CR2	DIODE, 1N4148, SILICON, VR=75V	60-4148	2
CR3	DIODE, 1N4148, SILICON, VR=75V	60-4148	2
JU1	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
JU2	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
JU3	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
JU4	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
JU6	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	3
Q1	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
Q2	TRANSISTOR, MPS3563, NPN, TO-92, ST.-1	63-3563	2
R1	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R2	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R4	RES, 100R 0.5W 5% STD M FLM	56-0101	1
R7	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R8	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R9	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R10	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R11	RES, 6K8 0.5W 5% STD M FLM	56-0682	1

R12	RES, 820R 0.5W 5% STD M FLM	56-0152	1
R13	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R15	RES, 330K 0.5W 5% STD M FLM	56-0334	1
R16	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R17	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R18	RES, 20K 0.5W 5% STD M FLM	56-0203	2
R19	RES, 200K 0.5W 5% STD M FLM	56-0204	1
R20	RES, 3K3 0.5W 5% STD M FLM	56-0332	2
R21	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R22	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R23	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R24	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R25	RES, 33K 0.5W 5% STD M FLM	56-0333	1
R26	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R27	RES, 39K 0.5W 5% STD M FLM	56-0393	1
R28	VALUE SELECTED	SEL	4
R29	RES, 4K7 0.5W 5% STD M FLM	56-0472	2
R31	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R32	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R33	RES, 680R 0.5W 5% STD M FLM	56-0681	1
R34	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R35	RES, 1K2 0.5W 5% STD M FLM	56-0122	2
R36	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R37	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R38	RES, 470K 0.5W 5% STD M FLM	56-0474	1
R39	RES, 220K 0.5W 5% STD M FLM	56-0224	2
R40	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R41	RES, 1K 0.5W 5% STD M FLM	56-0102	4
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R44	RES, 27K 0.5W 5% STD M FLM	56-0273	1
R45	RES, 2K2 0.5W 5% STD M FLM	56-0222	1
R47	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R51	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R54	RES, 20K 0.5W 5% STD M FLM	56-0203	2
R55	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R56	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	3
R58	RES, 240K 0.5W 5% STD M FLM	56-0244	1
R59	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R60	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R61	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R62	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R63	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R66	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R67	RES, 10K 0.5W 5% STD M FLM	56-0103	10
R68	RES, 10M 0.6W 5% STD M FLM	56-0106	1
R69	VALUE SELECTED	SEL	4
R70	VALUE SELECTED	SEL	4
R71	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R72	RES, 100K 0.5W 5% STD M FLM	56-0104	7
R73	VALUE SELECTED	SEL	4
R75	RES, 110K 0.5W 5% STD M FLM	56-0114	1
R76	RES, 1K 0.5W 5% STD M FLM	56-0102	4

U1	I.C. SL6270C, PRE-AMP, GAIN, 8 PIN	28-6270	2
U2	I.C. SL6270C, PRE-AMP, GAIN, 8 PIN	28-6270	2
U4	I.C. XRL555MD, TIMER, LOW PWR	28-0555	1
U5	I.C. LM2902D, OP AMP, QUAD, SO-14	28-2902	2
U6	I.C. LM2902D, OP AMP, QUAD, SO-14	28-2902	2
U7	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
	CAP, 68pF CER 2% 100V NPO	05-6806	0
	HEADER, 2 PIN-2 ROWS, RIGHT ANG, TIN	19-8022	3
	FERRITE BEAD, 64 MIX, 0.138"od., 0.118"L	30-6410	1
	PCB, AUDIO PROCESSOR, TX	43-861421	1

Reference: Schematic Transmitter Audio Processor - 43-861421S

Parts List - Crystal Module

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, 330pF CER 2% 100V N750	05-3318	1
C2	CAP, 12pF CER 2% 100V NPO	05-1206	1
C3	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	1
C4	CAP, 22pF CER 2% 100V N1500	05-2209	1
C5	VALUE SELECTED	SEL	2
C6	VALUE SELECTED	SEL	2
CR1	DIODE, MV2113, VARACTOR, 68pF@4V, TO-9	60-2113	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	1
L1	COIL, SHIELDED CAN, UHF TX CRYSTAL OSC	31-7114	1
R1	RES, CHIP 22K 5%	52-2230	1
R2	RES, CHIP 180K	52-1840	1
R3	RES, CHIP 100K 5%	52-1040	2
R4	THERMISTOR, 10K	55-0103	2
R5	THERMISTOR, 33R	55-0330	1
R6	RES, CHIP 33R 5%	52-3300	1
R7	RES, 120K 0.5W 5% STD M FLM	56-0124	1
R8	THERMISTOR, 10K	55-0103	2
R9	RES, CHIP 100K 5%	52-1040	2
Y1	CRYSTAL, FUND. COLD WELD, 15 - 18MHz	20-1500	1
	SOCKET, 0.040, GOLD PLATE	19-0040	2
	TERMINAL PIN, .040", GOLD PLATE	19-1040	4
	ENCLOSURE, PLASTIC, GREEN, 1.0" X 0.75"	22-4290	1
	PCB, TX CRYSTAL OSCILLATOR	43-861921	1
	SCREW, 2-56 x 5/16, SLOT, BRASS	59-2560	1
	SPACER, 2-56 X 5/8, ALUMINIM	67-2560	1
	TUBING, TEFLON, 24AWG, THIN WALL	76-0024	1

Reference: Schematic Transmitter Crystal Module - UHF 43-861910S

Reference: - UHF Transmitter Drawing 43-860922S

THEORY OF OPERATION - UHF RECEIVER

General

The MT-2 Series UHF Receiver module is comprised of four sections, the R.F. preamplifier /preselector, main printed circuit /I.F. strip, audio processor /squelch submodule and the Rx crystal element module. The crystal element module is a plug-in unit that has been environmentally calibrated. The crystal modules are interchangeable with any of the MT-2 Series UHF receivers. The UHF receiver covers the 406.1 - 430 MHz and 450 - 470 MHz range of frequencies.

R.F. Stage Preamplifier (No. 43-865221)

D.C. power (+6.0 Volts DC) is applied to J3 on the R.F. pre-amplifier PCB. The input signal is fed into a TYPE N input connector and applied, via a high Q, 2 stage helical filter, to the high gain (+16db) low noise RF preamplifier. The output is further filtered by 2 additional high Q helical filters. The RF preamplifier gain is +16 dB, the total insertion loss of the helical filter sections is -12 dB thereby providing a net overall preselector stage gain of +3 dB. The output J2 is routed into the mixer on the main Rx PCB. The R.F. pre-amplifier Q1 is temperature compensated by Q2 and Q3 to provide a uniform gain response from -40°C to +60°C.

Receiver - Main Circuit Board (No. 43-861221)

The receiver operates on the +9.5 Volts DC supply applied at pins B6, Z6 at the main receiver circuit board connector. The +9.5 Volts DC regulated source is applied in part to the low temperature crystal compensation circuitry and also to the audio power amplifier U1 (Rx audio processor PCB). All other circuitry is regulated by U1 +6.0 Volts DC output. The receiver crystal module U4 (38 - 52 MHz overtone mode - crystal element) is coupled to the oscillator-tripler transistor Q1 (located on main receiver board) via J3-4. Q1 is biased compensated by positive coefficient R28 for optimal drive at extended low temperature. The output of Q1 ranges over 116.6 - 152.1 MHz and is peaked by L1. C25, C26, C27 provide critical coupling to buffer Q2. L2 peaks the output signal from Q2. C32 and C33 matches into the 2nd tripler Q20. C129 peaks the tripler output which, determined by the crystal frequency, ranges over 384.7 - 448.6 MHz. L20 is tapped for the desired band coverage. The tripler output signal is filtered by a 2 stage helical cavity F1 which is peaked by 2 integral high Q capacitors. The extremely pure F1 output is terminated and matched by a 3db pad and applied to a double balanced first mixer. The on channel signal from the R.F. pre-amplifier is combined at the first mixer with the crystal generated injection multiple frequency thereby generating a desired mixer product (or I.F. frequency) of 21.4 MHz. The 21.4 MHz I.F. signal is filtered by a 4 pole crystal section Y1 and Y2. Q3 provides 6dB I.F. gain and matching between filter sections. C40, C43

and C49 are adjusted to provide the best distortion/ sensitivity throughout the I.F. strip. The output of Q3 feeds a 4 pole crystal section Y3 and Y4. The second I.F. amplifier Q5 and Q6 provide high level I.F. gain. The amplifier has external features to vary the gain by preset levels. By adjusting the bias on Q6, the hysteresis control transistor, U5A, controls the overall sensitivity of the receiver. R72 sets the differential between minimum and maximum I.F. gain levels. U5A is normally activated by the squelch circuitry i.e. when a signal is strong enough to activate the squelch circuit, the hysteresis (sensitivity) control is overridden by internally grounding Pin Z28 via the mute switching circuitry.

L8 peaks the I.F. gain and feeds the output to pin 18 of U6 (MC3359). U6 is a multi-function FM processing I.C., the circuit provides IF limiting, second IF oscillator and mixing, discriminator and audio amplifiers/ buffers to support the IF, received audio and squelch operation of the UR-2 receiver. C82 adjusts crystal Y5 for the second mixer, L9 resonates the discriminator output for low distortion and signal/noise centered AFC. U6 pin 11 is the AFC (discriminator centre) voltage which feeds the crystal temperature compensation circuitry. The AFC can be selected by JU2A, which causes the voltage of U3A pin 3 to shift in response to variations in on-air channel frequency. The AFC assists in the pre-programmed crystal temperature compensation, and is not required to make the crystal track within its specified tolerances.

Audio Processor (No. 43-870911)

U6 Pin 10 is the unprocessed recovered audio and noise source, this signal feeds the UHF Rx Audio Processor PCB, U8 (schematic 43-870911). This signal is divided three ways, one portion is filtered and de-emphasized by C3, C4, C5, R1, R2, R3 and R4. The signal is audio switched by U1 which is under control of the squelch/mute circuitry. The audio signal is maintained at a constant level by the network input to U2A (LM2904D). U2A provides enough gain for a -12dBm output. This level is adjusted by R23 then routed to either the audio power amplifier U4 via JU2A, or directly to the Rx main PCB. On the main PCB the audio can be routed to an unbalanced output or programmed for 600 ohm balanced output by JU8.

U6 Pin 10 also feeds R9 and C9, this is the flat audio input. The input is audio switched by U1 (MC14066) which is controlled by the squelch circuitry. The signal is amplified by U3A, this stage must be enabled by JU3. The output level is set by R35, which is then routed to the audio power amplifier U4, or fed directly to the Rx main PCB. On the main PCB the audio may be routed to an unbalanced output or jumper programmed for a 600 ohm balanced output by JU8.

U6 P10 is also the noise source for squelch operation. The signal is fed to R39, C29 then the audio is trapped by networks C30, L1 and C31, L2. U2B (LM2904D) provides a temperature compensated first stage noise

amplifier. The output then passes to a temperature compensated second stage noise amplifier in U6 located on the Rx main PCB. Squelch threshold is set by R52, the 2nd noise amplifier gain control. The noise level is converted to a D.C. level by CR5, CR6, C38 and C39. This level is the trigger for the squelch gate U5. U5 maintains approx. 1db of inherent squelch differential. The squelch gate output operates the audio muting switch U1, and the hysteresis control on the I.F. strip via the mute switching circuitry.

The squelch gate operates the audio muting switch U1 to provide quieting of the receiver. Several diodes allow external muting of the receiver audio circuitry. The degree of quieting can be increased by using programming diodes CR2, CR3 and CR4. These diodes shift the audio biasing on U2A, U3A and U4 to provide deeper audio muting of the audio amplifier stages.

Q1 is used to sample the D.C. noise level and provide an approximation of signal strength, this level is routed to the SM-2 (System monitor) test panel.

Crystal Module - Receiver (UHF) (No. 43-864610)

The crystal module frequency is $\frac{fc-21.4 \text{ MHz}}{27}$ where fc is the channel frequency.

The crystal is operated in the overtone mode and is mounted in a HC-25/U coldweld holder. The crystal plugs into a socket pin within the TCXO module. A compensation network comprising of RT1, RT2 and RT3 provide temperature compensation ranging from -40°C to +60°C. Varicap D1 provides electronic tuning of the crystal frequency and frequency netting coil L1 facilitates crystal frequency calibration. Low temperature compensation is provided to the crystal module C19 by R18, R19 and R24 on the Rx main PCB.

RECEIVER ALIGNMENT (UHF)

Test Equipment List

To align the receiver the following test equipment or its equivalent is recommended:

Power supply regulated 2A current limit, B & K
Frequency counter, Sencore FC71
Multimeter, Fluke 8050A
Distortion analyzer, Amber 3501
Oscilloscope 300 MHz, Tektronix 2465
Communications test set, Marconi 2905
Alignment tool Johanson 8777

Receiver Alignment

General

The UHF receiver is supplied by the factory in 2 frequency coverage bands, 406.1 - 430 MHz and 450 - 470 MHz. The unit is normally jumper programmed for:

- (1) audio de-emphasis response.
- (2) high level audio output - increases current consumption 4 mA - 6 mA.
- (3) 600 ohm balanced output.

Apply the appropriate power to the receiver by using the SM-2 (system monitor rack power supply) or by applying +9.5 Volts DC to pins B6, Z6 and negative ground B30, Z30, B32 and Z32. The lab supply feeding the receiver must be well filtered and regulated.

During factory alignment several jumpers are installed on the main PCB. Jumper JU3 applies +6.0 Volts DC to the oscillator-tripler stage, JU4 applies +6.0 Volts DC to the output tripler stage, JU5 applies +6.0 Volts DC to the 1st I.F. amplifier, JU6 applies power to the 2nd I.F. amplifier. When the receiver current consumption significantly deviates from 45 mA, these jumpers may be removed to isolate circuitry for troubleshooting.

In a normal operational unit the +9.5 Volts DC receiver supply current is 45 mA. Test conditions: signal or modulation as indicated.

Test Points - Main Receiver Board

Test points are designated with a diamond shaped identification mark on the main PCB.

- | | |
|------|--|
| TP 1 | +6.0 Volts DC U1 Regulator output |
| TP 2 | +3.8 - +4.2 Volts DC temperature compensation reference |
| TP 3 | +2.0 - +3.5 Volts DC set by R9 |
| TP 4 | approx. +2.5 Volts DC remove cover screen to measure* |
| TP 5 | approx. +3.1 Volts DC remove cover screen to measure**
May vary depending on factory calibration. |

* The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU3) under normal conditions is 8.0 mA.

** The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU4) under normal conditions is 6.0 mA.

- | | |
|------|--|
| TP 6 | 384.7 to 448.6 MHz on frequency counter (\approx -15 dBm o/p level) |
|------|--|

- TP 7 +4.0 Volts DC 1st I.F. amplifier emitter voltage*
 * The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU5) under normal conditions is 2.0 mA.
- TP 8 +3.3 Volts DC 2nd I.F. amplifier emitter voltage*
 * The +6.0 Volts DC supply jumper which feeds this stage is outside the cover shield, the current through (JU6) under normal conditions is 1.0 mA.
- TP 10 455.000 kHz Injection point 1kHz tone @ 3kHz dev. -20dBm.
 TP 9 21.4 MHz injection \approx -95dBm @ 12dB Sinad
 TP 11 455.000 MHz measurement point, -70dBm input No Modulation
 TP 12 AFC voltage (discriminator reference centre)
 TP 13 Noise Amplifier (2nd stage) input
 TP 14 Noise Amplifier (2nd stage) output
 TP 15 2.2 Vpp (approx.) recovered audio & noise modulation ON, under standard test condition of -70dBm input 1 kHz Tone @3 kHz deviation.
- TP 16 21.4 MHz 1st IF injection -110dBm @ 12dB Sinad
 TP 17 TP 18 TP 19 (Not Desig.)
 TP 20 +1.4 Volts DC (approx.) - Tripler Bias

Receiver Alignment Procedure

Disconnect the AFC jumper if used (JU2).

Inject 455.000 kHz into TP 10 - pin 5 of U6 (MC3359) -20dBm, 1 kHz @3 kHz deviation. Monitor the recovered audio via balanced line output pins B26, Z26. Monitor the audio with a distortion analyzer using the appropriate audio filter, also monitor the audio level. Adjust the audio control level R23 on Audio Processor PCB to max. (normal factory setting), adjust R36 to the recovered audio level desired. Note very high audio levels > +15 dBm will cause clipping thereby producing high distortion readings. Peak the quadrature coil L9 for lowest distortion approximately 1.0%.

Monitor TP 12 with a D.C. voltmeter and in conjunction with lowest distortion an AFC voltage of +2.5 to +3.0 VDC should result. L9 is very sensitive to the AFC voltage level, therefore if +2.5 to +3.0 VDC cannot be achieved adjust L9 to as close as possible but not > +3.0 VDC.

Inject 21.4 MHz into TP 9 - U6 (MC3359) -50dBm, 1 kHz @3 kHz deviation. As above monitor the recovered audio. Adjust C82 for +3.0 V at TP 12. Reduce the input level to approx. -90db, Sinad meter should indicate a signal-to-noise ratio of 10-12db. If +3.0 VDC at TP12 cannot be achieved repeat 455 kHz alignment and set L9 to +2.0 VDC.

Inject 21.4 MHz into TP 16 (I.F. strip input) adjust C40, C43 and C49 for best sensitivity, peak L8 (slug position near top of coil shield).

Confirm a sensitivity of approx. -110db for 12db Sinad. The fine adjustment for Low distortion and optimal sensitivity are interactive and must be carefully set after completing the initial tuning.

Monitor the oscillator output at TP6 with a frequency counter and/or an oscilloscope. Adjust R11 VREF for +3.0 Volts DC at pin 3 of U3A (No AFC). Peak L1, L2 and L3 for maximum output and optimal Sinad, observe changes in overall current consumption, ie: as L1, L2 and L3 peak, a corresponding increase in current will be observed. Peak the two capacitor tuning screws in the helical filter cavity F1. Remove the sealed screw top caps and use Johanson alignment tool 8777 or equivalent. Set the crystal module on to the desired frequency by setting frequency trimming coil inside the crystal module unit. If L.O. o/p rolls off at -40° C temperatures this can be corrected by adjusting L3 slug in 1/2 to 1 turn.

If difficulty is encountered in locating the peak position of the L.O. helical filter assembly, inject a high level +20dBm "on air" signal into J4 (RF I/p) on the main Rx PCB and adjust the oscillator controls (F1) and progressively decrease the signal generator for best Sinad.

Inject the desired channel frequency into J4, the R.F. mixer input port. Set the signal generator level to -70dBm, with standard modulation of 1 kHz Tone @3 kHz deviation, adjust the I.F. strip capacitors C40, C43, C49 and quadrature coil L9 for the lowest audio distortion. Reduce the signal input and re-adjust the above components and the L.O. controls L1, L2, L3, C124 and F1 for best Sinad (sensitivity). Alternate the distortion and sensitivity alignment until the optimum balance is achieved i.e. approx. -110 -114db for 12db sinad, approx. 0.7% to 1.2% distortion.

R.F. Preselector Alignment

If the frequency change on the pre-selector is within 5.0 MHz of the original factory calibration, the pre-selector can be tuned by removing the slotted sealing caps and setting the capacitors for best sinad (in the range -114/-117 dBm for 12db sinad). The preselector current consumption is approx. 3.2 mA.

If a frequency shift greater than 5.0 MHz is required the pre-selector should be tuned using a spectrum analyzer configured with a tracking generator. Although this is not essential it will speed the alignment procedure, due to the critical coupling and the precision alignment requirements. The helical R.F. amplifier assembly has an overall gain of +2 to +5 db. Retune the cavity capacitors until the output is at maximum. Connect the pre-selector to J4 (5mA) the R.F. input port and re-peak the helical filters for best sinad. Connecting the pre-selector may affect the distortion slightly; increase the input signal to -70dBm, 1 kHz Tone @3 kHz deviation, confirm that the audio distortion is maintained at 0.7% - 1.2% - re-adjust C40, C43 and C49 if necessary and confirm the receiver sensitivity meets the standard receiver specifications outlined above, repeat if necessary.

Final AFC Alignment

Measure TP 12 with a D.C. voltmeter and re-adjust C82 for an AFC voltage of +3.0 VDC (-70dBm i/p @ 1kHz Tone). Connect JU2 to the AFC jumper. If the frequency is being monitored note the AFC loop connection. JU2 will cause the L.O. frequency to vary under different signal Conditions:

- ie: 1) signal present
- 2) noise + squelched
- 3) noise + unsquelched

Reconfirm the recovered audio is at the desired level

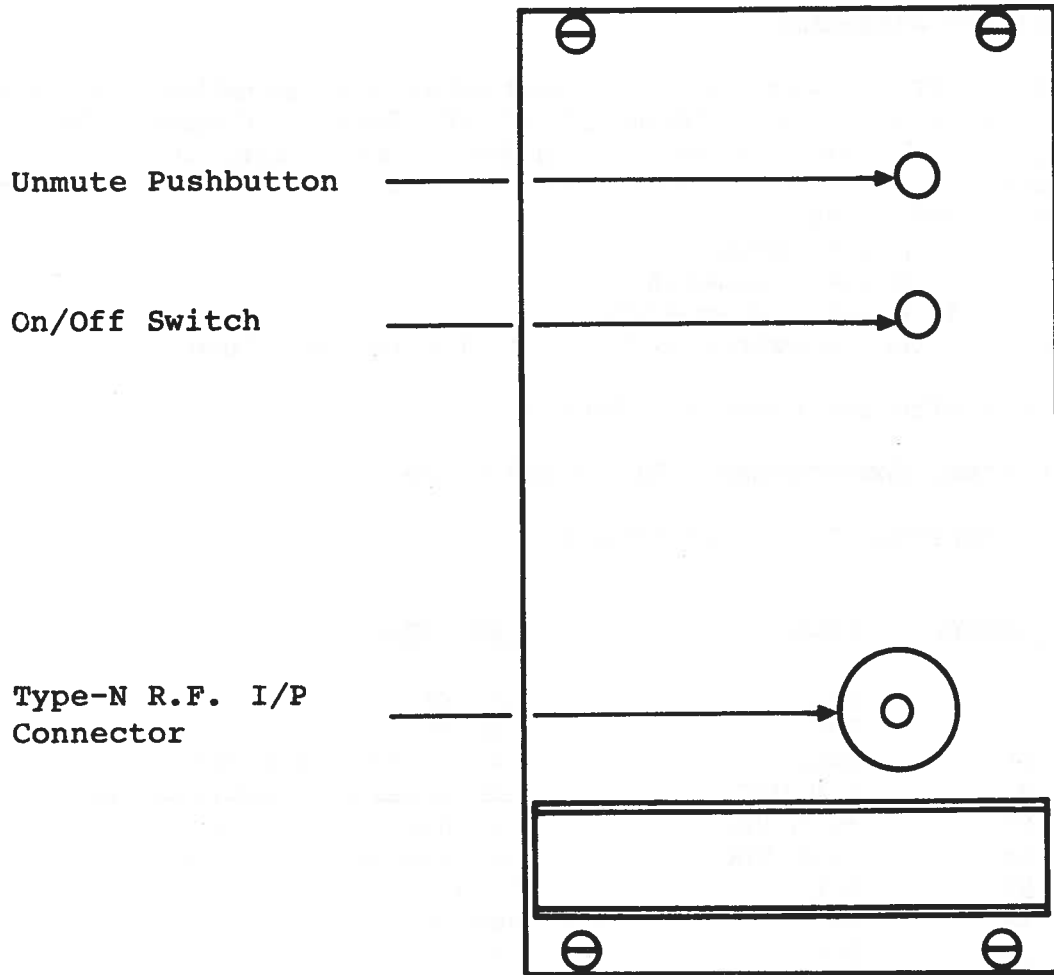
Proceed with environmental testing.

Functional Connections - UHF / VHF Receiver

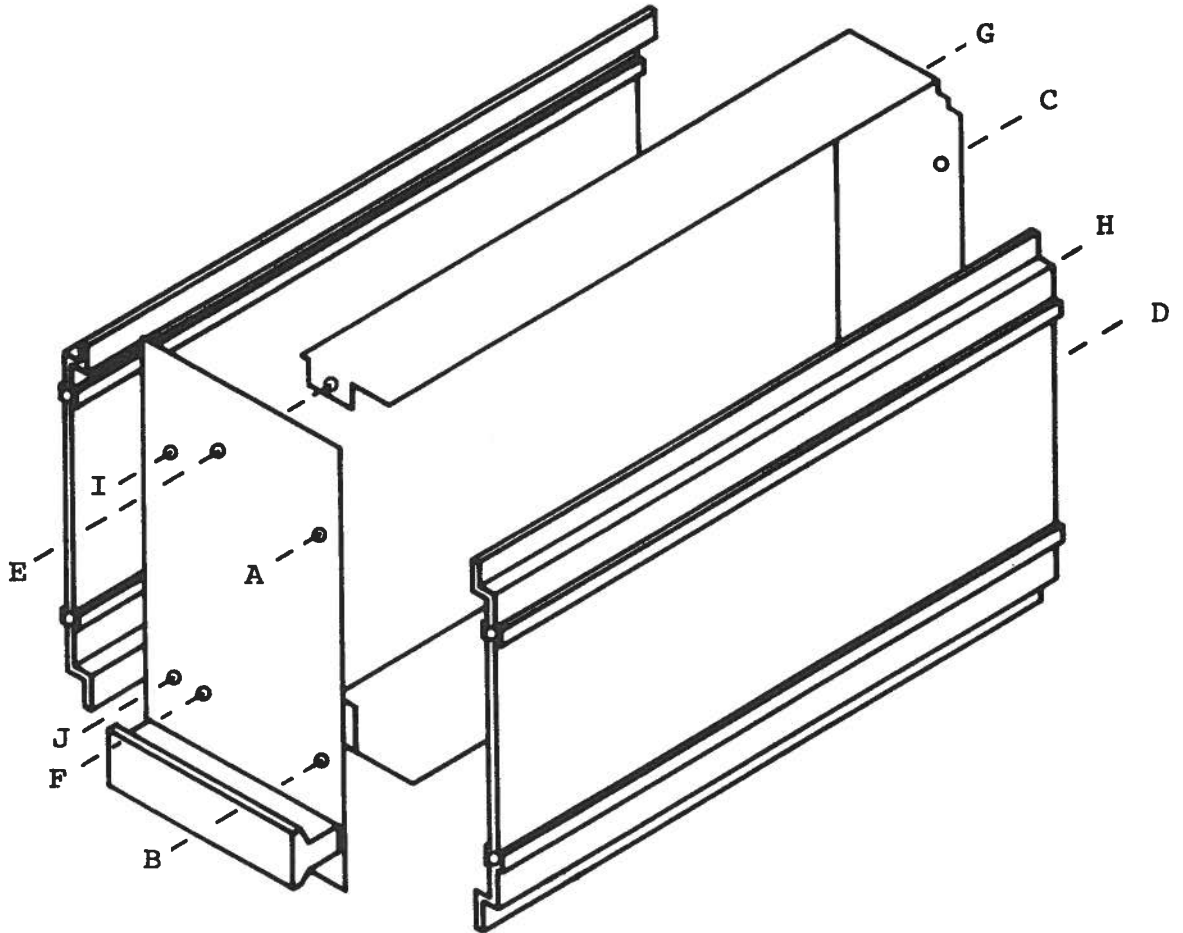
Male connector Type F to DIN41612

<u>PIN NUMBER</u>	<u>NAME</u>	<u>FUNCTION</u>
B2	N/C	spare
Z2	N/C	spare
B4	Audio	Audio to 8 ohm Spkr
Z4	6.0 VDC	Rx internal regulator o/p
B6	+9.5 VDC	regulated D.C. input
Z6	+9.5 VDC	regulated D.C. input
B8	N/C	spare
Z8	N/C	spare
B10	N/C	spare
Z10	N/C	spare
B12	C.O.R	carrier operated squelch
Z12	C.O.R	not isolated
B14	C.T.C.S.S.	output unprocessed recovered audio
Z14	C.T.C.S.S. SW	squelch disable
B16	A- system	switched +9.5 VDC
Z16	A- system	switched +9.5 VDC
B18	C.O.S. iso.	opto isolated switch (option)
Z18	C.O.S. iso.	opto isolated switch (option)
B20	Unbal aud de-emp	audio unbal. squelch de-emp.
B22	Unbal aud flat	audio unbal. squelched flat
Z22	N/C	spare
B24	Carrier	carrier strength DC voltage
Z24	A.F.C.	A.F.C. DC voltage
B26	Line	Rx balanced audio o/p
Z26	Line	Rx balanced audio o/p
B28	Mute	Rx mute
Z28	Hysteresis	I.F. gain control
B30	GND	circuit common
Z30	GND	circuit common
B32	GND	circuit common
Z32	GND	circuit common

ILLUSTRATIONS AND SCHEMATIC DIAGRAMS
UHF Receiver - Front Panel
Figure 2-14



UHF Receiver - Exploded View
Figure 2-15



Component Side Access:

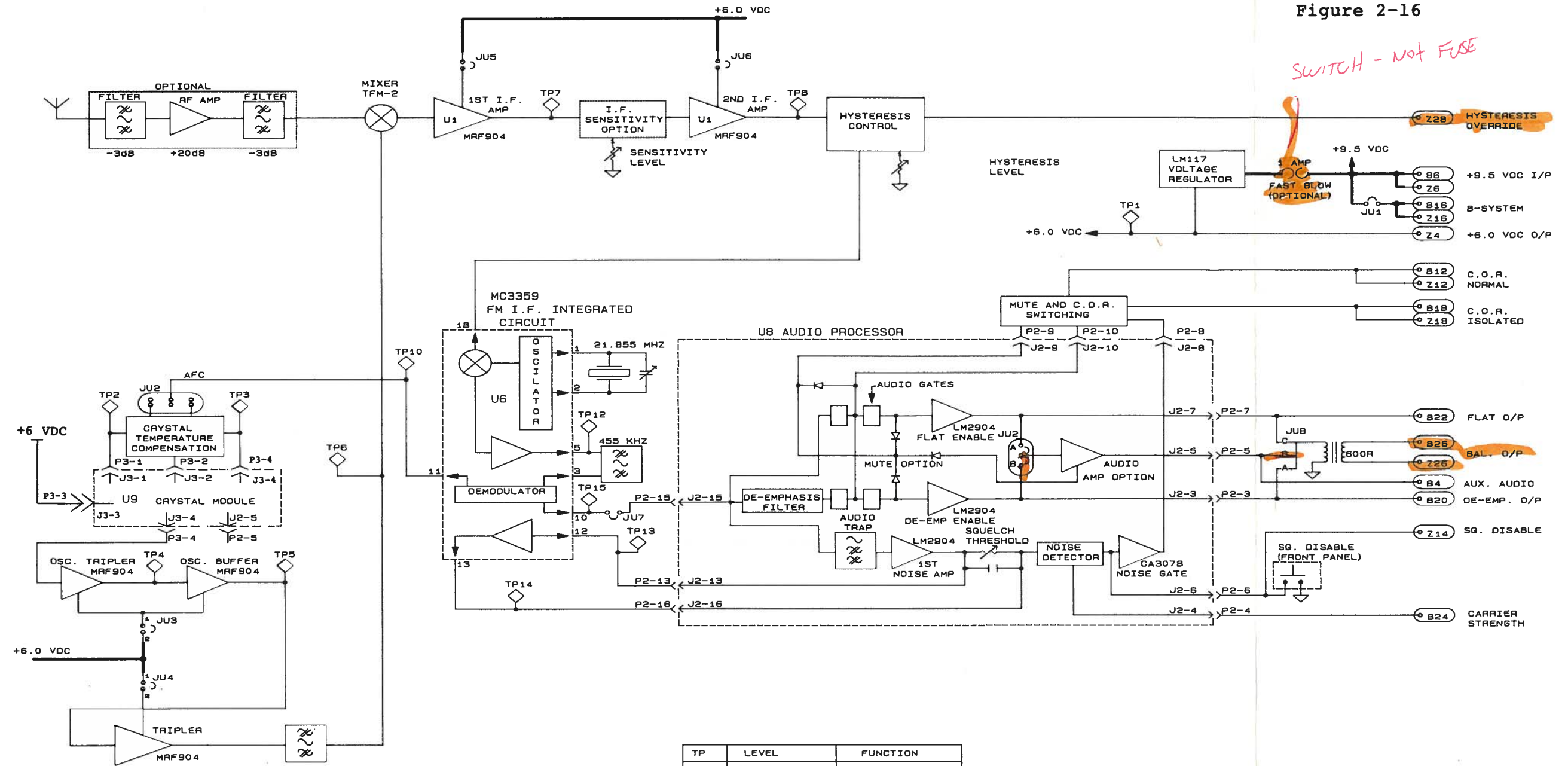
1. Remove screws A - D.
2. Lift off right side panel.

Solder Side Access:

1. Remove screws A - D
2. Lift off right side cover.
3. Remove screws E - H.
4. Lift off wrap-around shroud
5. Remove PCB mounting screws (4) from left side cover.
6. Remove screws I - J.
7. Slide PCB and front panel out of left side extrusion.

UHF Receiver - Block Diagram
43-861221U
Figure 2-16

SWITCH - NOT FUSE



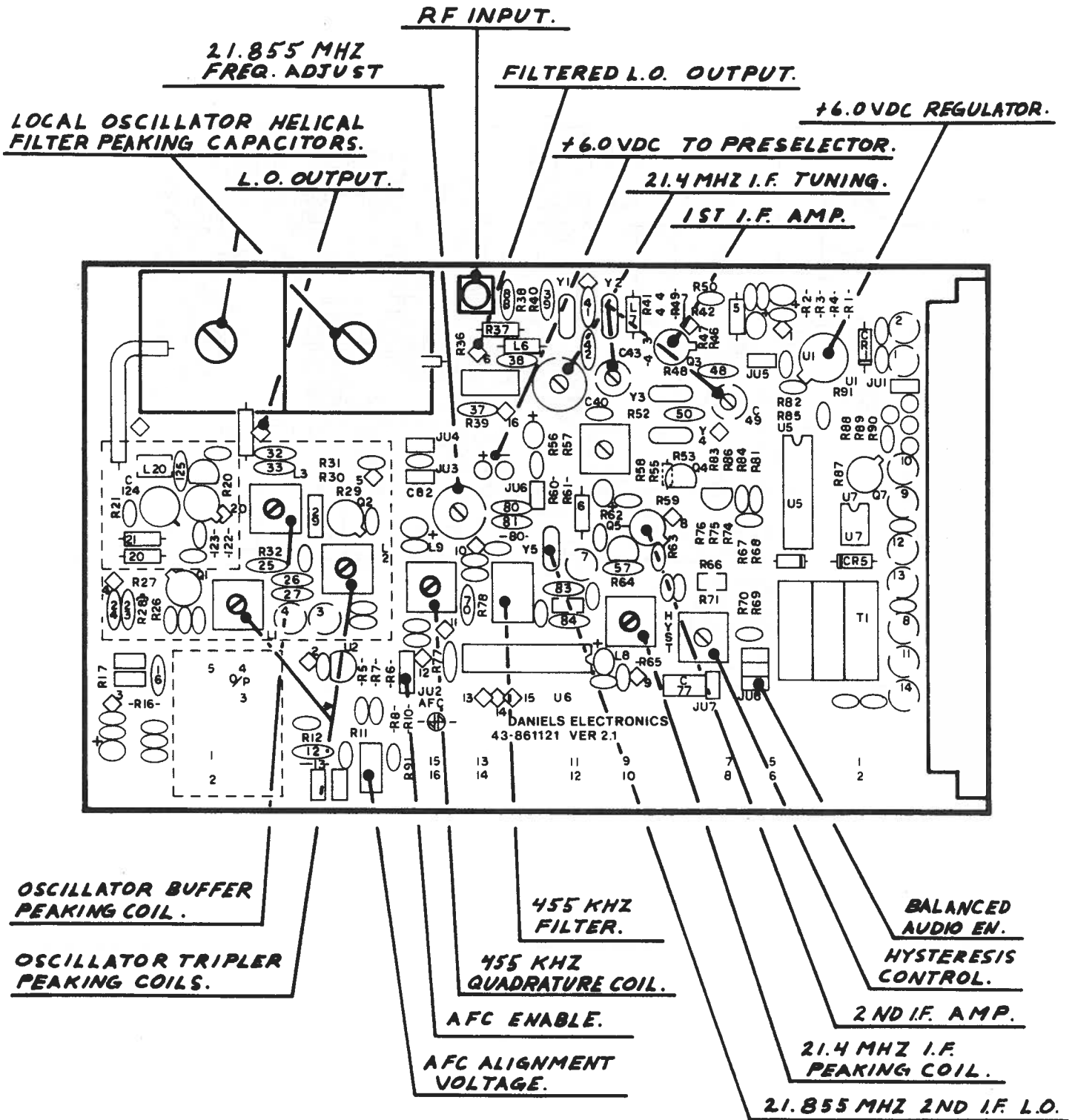
DATE	CODE	REV	APP	DESCRIPTION

RECEIVER JUMPER FUNCTIONS	
JU1	B-SYSTEM ENABLE
JU2 A	HARD AFC
JU2 B	SOFT AFC
JU3	~ 8mA OSC. POWER
JU4	~ 6mA TRIPLER POWER
JU5	~ 2mA 1st I.F. POWER
JU6	~ 6mA 2nd I.F. POWER
JU7	CTCSS AUDIO ENABLE
JUB A	FLAT AUDIO BAL.
JUB B	DE-EMPHASIS AUDIO BAL.
JUB C	HIGH LEVEL AUDIO BAL.

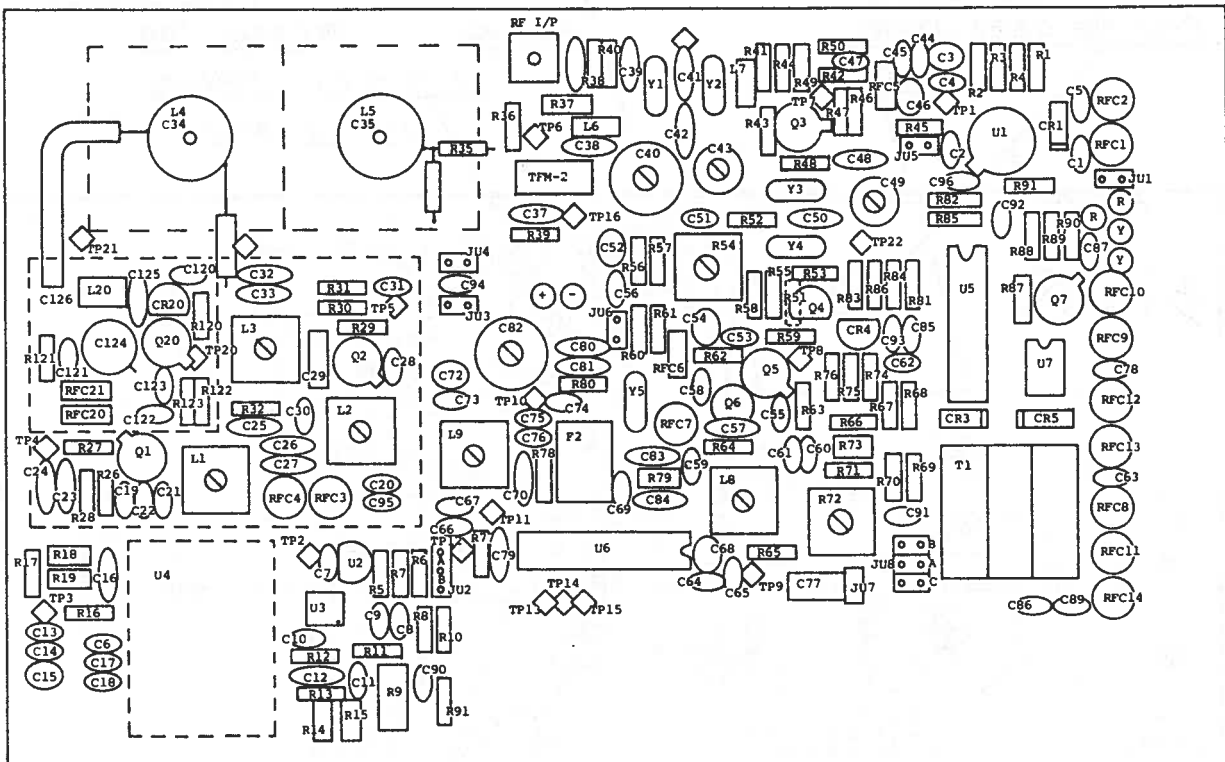
TP	LEVEL	FUNCTION
TP1	+6.0 VDC	U1 REG. O/P
TP2	+2.8-3.0VDC	U2 REG. O/P
TP3	+2.0-3.5VDC	Vref ADJUST
TP4	~ +2.5VDC	Q1 BIAS
TP5	~ +2.0VDC	Q2 BIAS
TP6	384.7-448.8MHZ	MIXER INJECT.
TP7	~ +3.3VDC	Q3 BIAS
TP8	~ +3.1VDC	Q5 BIAS
TP9	~ 21.4MHZ	INJECTION POINT
TP10	458.000KHZ	INJECTION POINT
TP11	458.000KHZ	MEAS. POINT
TP12	+2.3-3.2VDC	AFC
TP13	Vpp	NOISE AMP I/P
TP14	Vpp	NOISE AMP O/P
TP15	2.2Vpp	RECOVERED AUDIO
TP18	21.4MHZ	I.F. STRIP INJECT.
TP20	+1.4VDC	Q20 BIAS

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: RECEIVER BLOCK DIAGRAM UHF			
DRAWN ALC	DATE 15/07/88	DRAWING# 43-861221U	
CHECKED	APPROVED	M2-2.1	

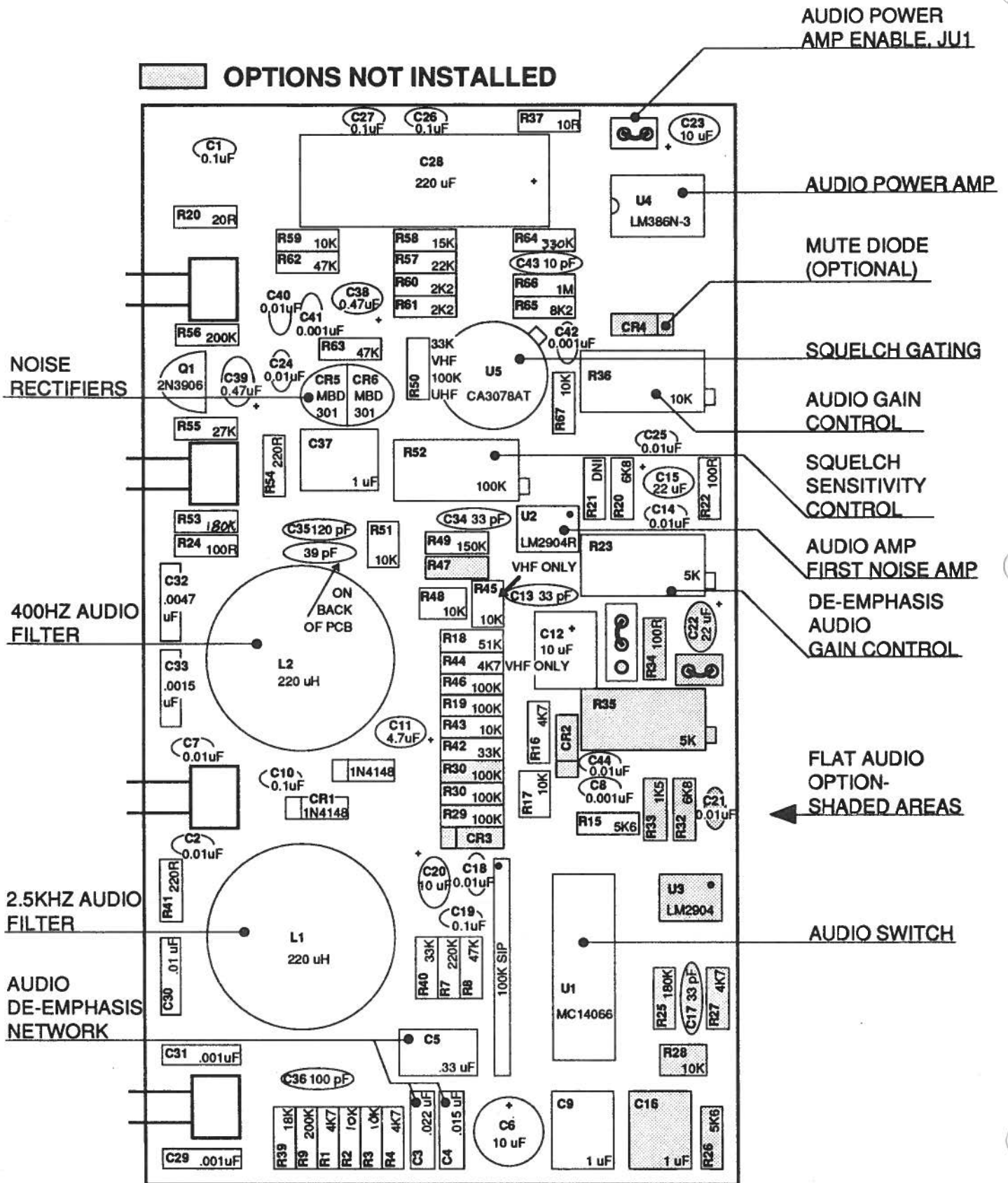
UHF Receiver - Component Layout
Figure 2-17



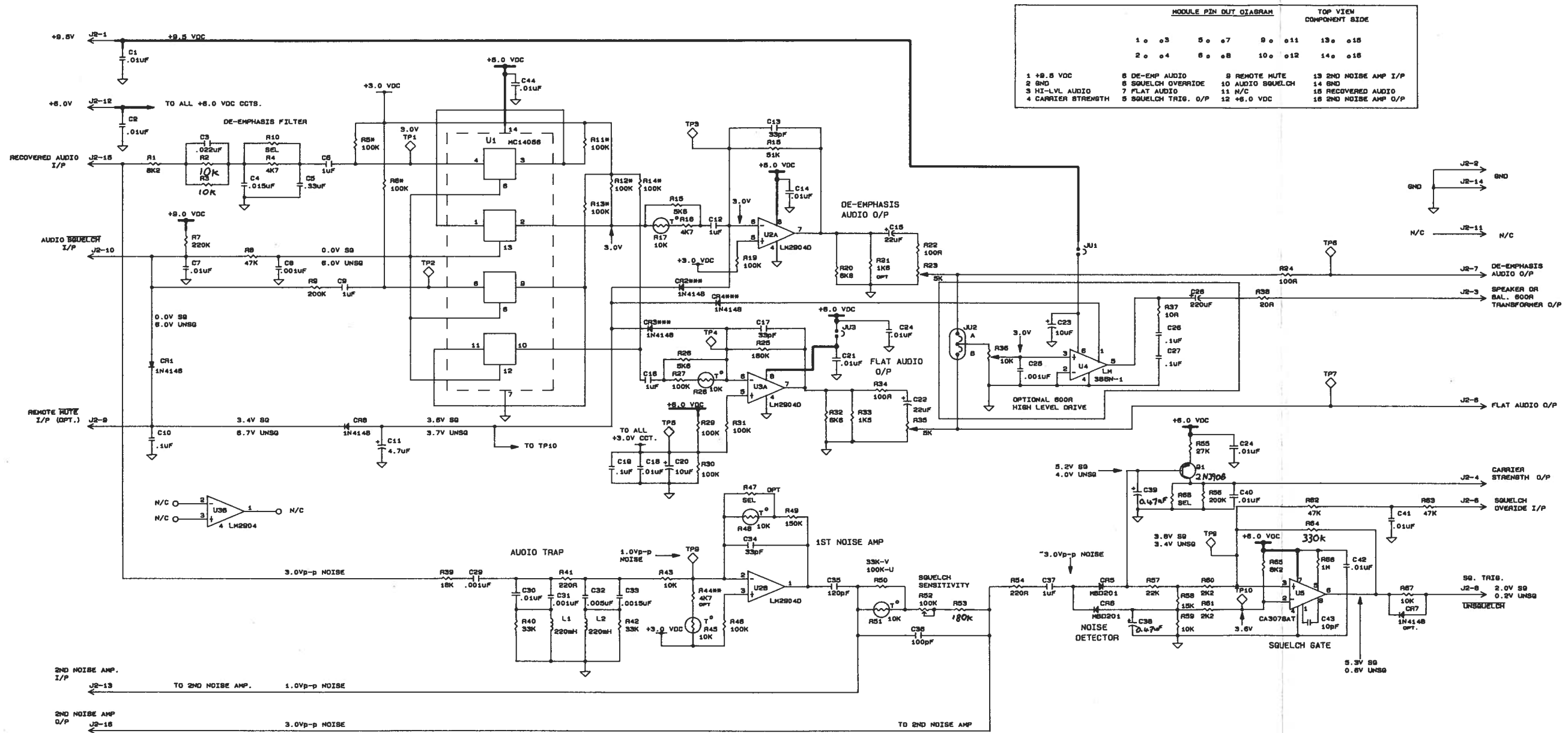
UHF Receiver - Component layout
Figure 2-18



UHF Receiver Audio Processor - Component Layout
 Figure 2-20
 No. 43-870911



UHF Receiver Audio Processor
Schematic Diagram 43-870911S
Figure 2-21



MODULE PIN OUT DIAGRAM			TOP VIEW COMPONENT SIDE				
1	03	8	07	9	011	13	015
2	04	8	08	10	012	14	016
1	+8.0 VDC	6	DE-EMP AUDIO	9	REMOTE MUTE	13	2ND NOISE AMP I/P
2	GND	8	SQUELCH OVERRIDE	10	AUDIO SQUELCH	14	GND
3	HI-LVL AUDIO	7	FLAT AUDIO	11	N/C	15	RECOVERED AUDIO
4	CARRIER STRENGTH	5	SQUELCH TRIG. O/P	12	+8.0 VDC	16	2ND NOISE AMP O/P

TEST PROCEDURE NOTES
1. LO-BAND FREQUENCY RANGE (400.1-430 MHz) WAS USED FOR AC TEST MEASUREMENTS.

DATE	CODE	REV	APP	DESCRIPTION

TP	LEVEL	FUNCTION
TP1	80mVp-p	DE-EMPHASIS AUDIO I/P
TP2	0.3Vp-p	FLAT AUDIO I/P
TP3	0.7Vp-p	SG. SWITCHED DE-EMP. AUDIO
TP4	---	SG SWITCHED FLAT AUDIO
TP5	+3 VDC	OP-AMP REFERENCE
TP6	0.7Vp-p	DE-EMPHASIS AUDIO O/P
TP7	---	FLAT AUDIO O/P
TP8	0.5Vp-p	1ST NOISE GATE I/P
TP9	3.1-3.8 VDC	SG. GATE TRIGGER LEVEL
TP10	3.6 VDC	SG. GATE D.C. REFERENCE

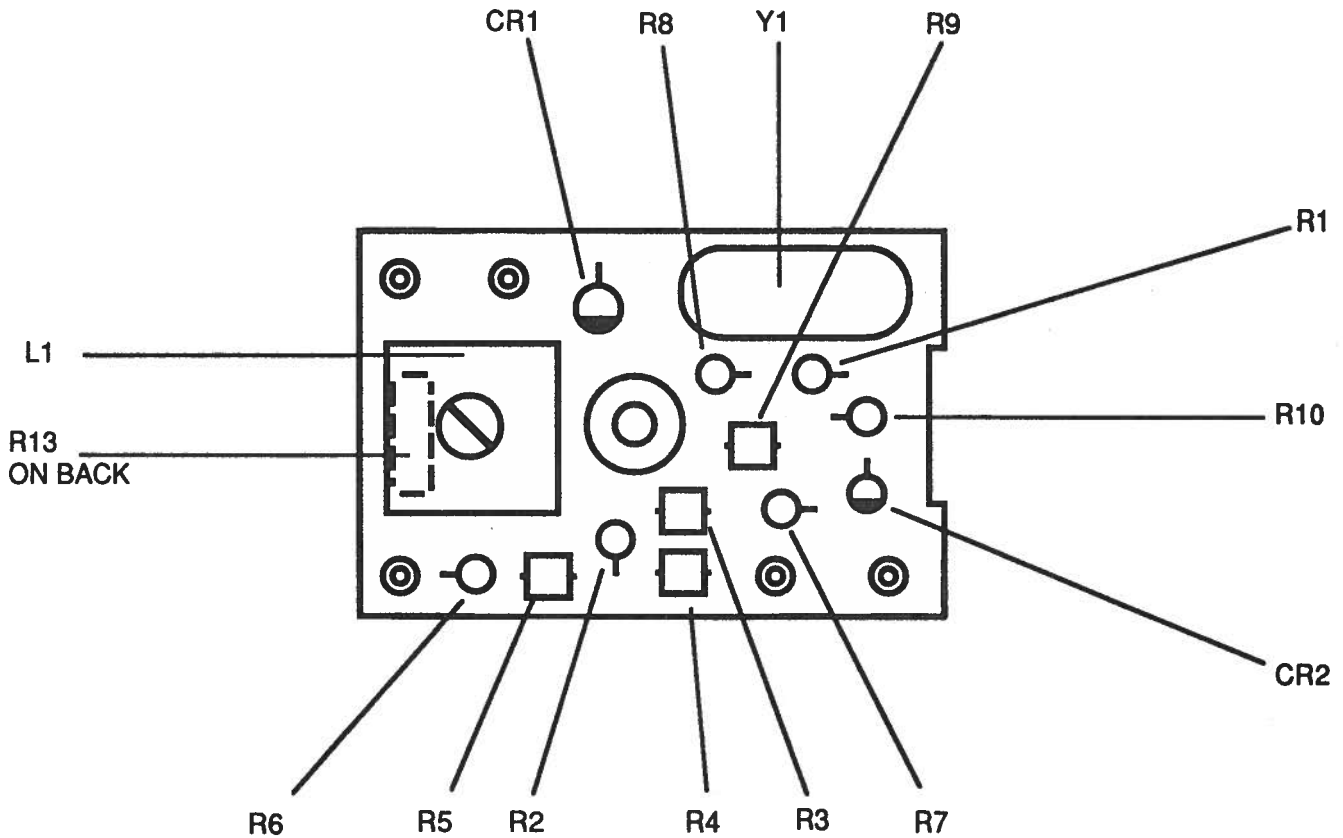
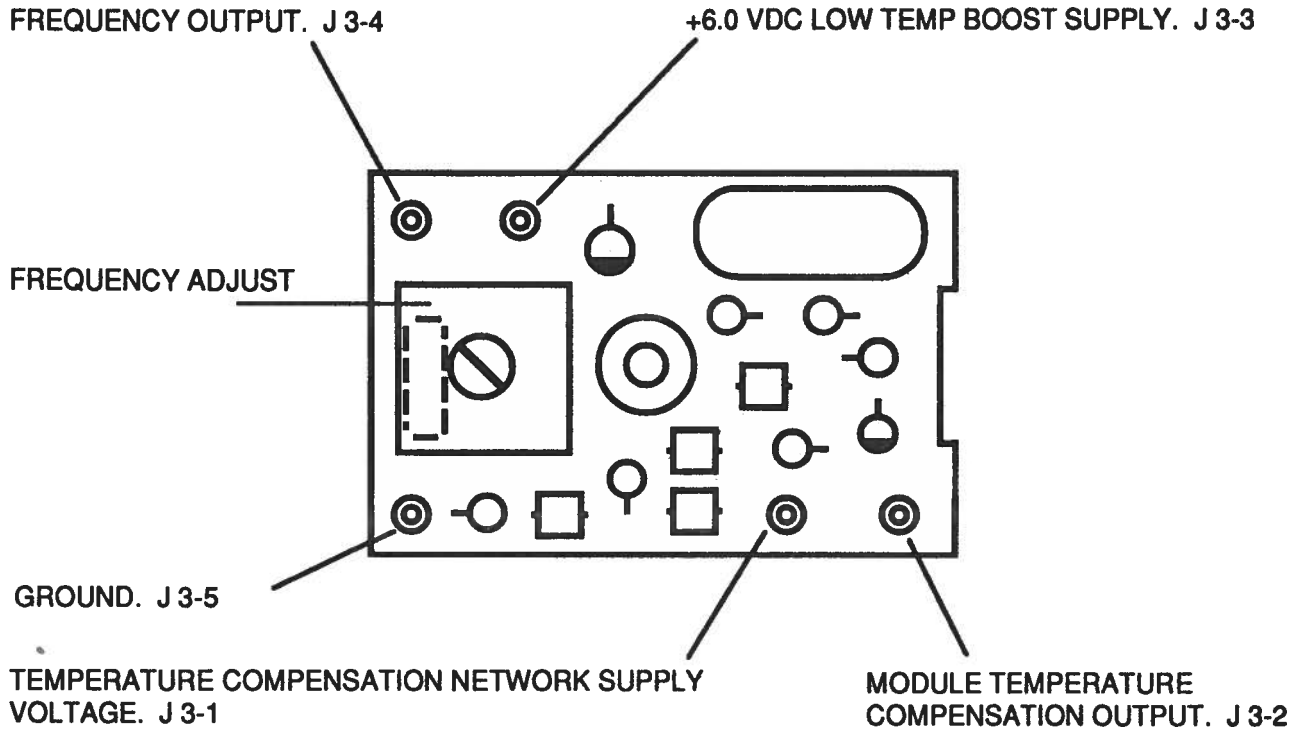
JUMPER FUNCTIONS	
JU1	AUDIO POWER AMP ENABLE
JU2	A HIGH LEVEL DE-EMP. AUDIO SELECT
JU3	HIGH LEVEL FLAT AUDIO SELECT
JU3	FLAT AUDIO ENABLE

HIGHEST REFERENCE DESIGNATORS		
R88	C44	L2
TP10	Q1	U5
CR8		
REFERENCE DESIGNATORS NOT USED		

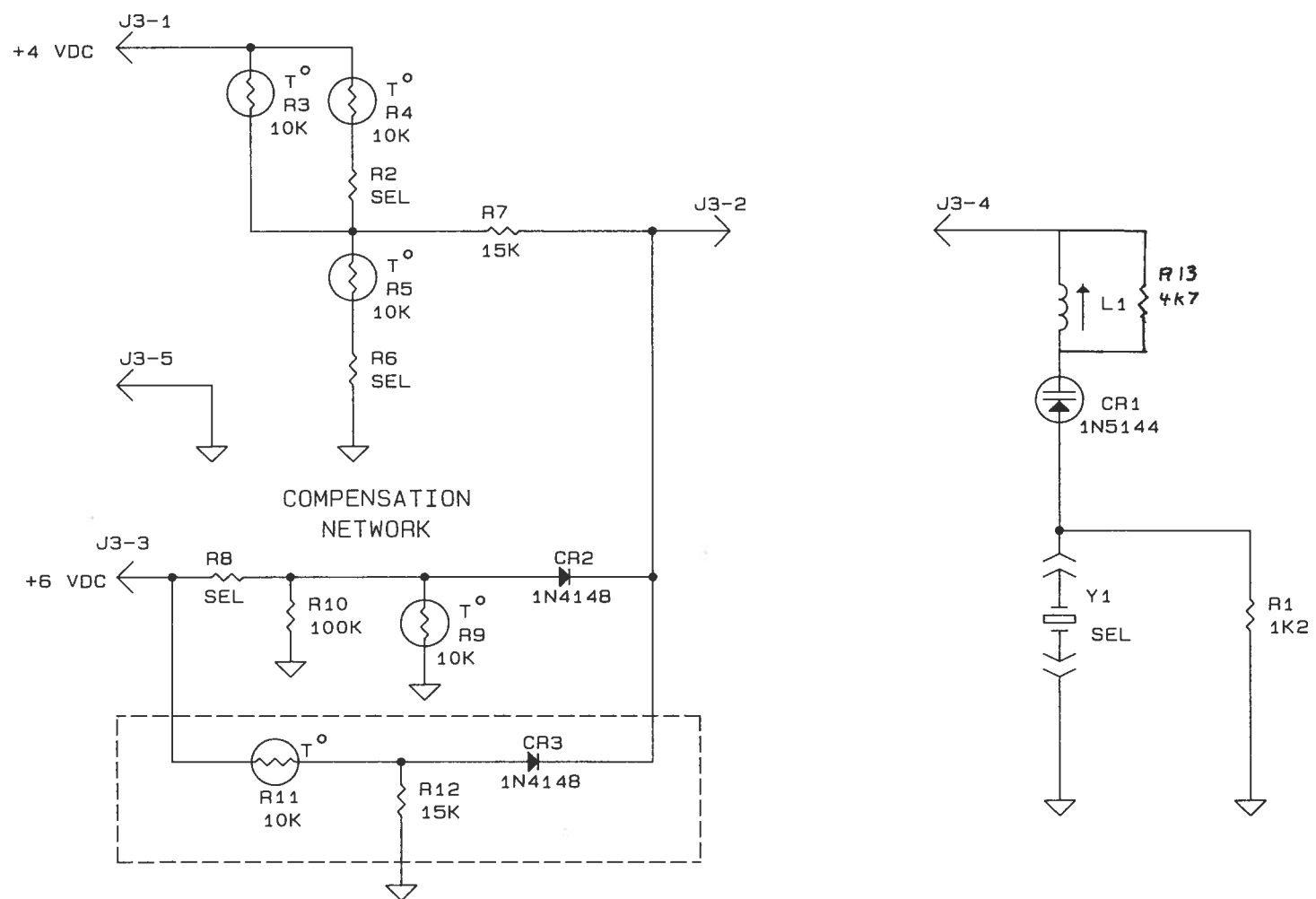
- NOTES:
1) ALL RESISTORS IN OHMS, CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2) ALL VOLTAGES MEASURED ARE DC UNLESS OTHERWISE STATED.
RESISTORS PART OF 100K SIP PACKAGE
COMPONENT USED ONLY ON VHF MODULES
DIODES INSTALLED AS DEEP MUTE OPTION

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE:		RECEIVER AUDIO PROCESSING MODULE VHF/UHF	
DRAWN: ALC	DATE: 15/07/88	DRAWING#: 43-870911S	
CHECKED:	APPROVED:		

Receiver Crystal Module (TCXO) - Component Layout
 Figure 2-22



Receiver Crystal Module (TCXO)
 Schematic Diagram 43-864610S
 Figure 2-23



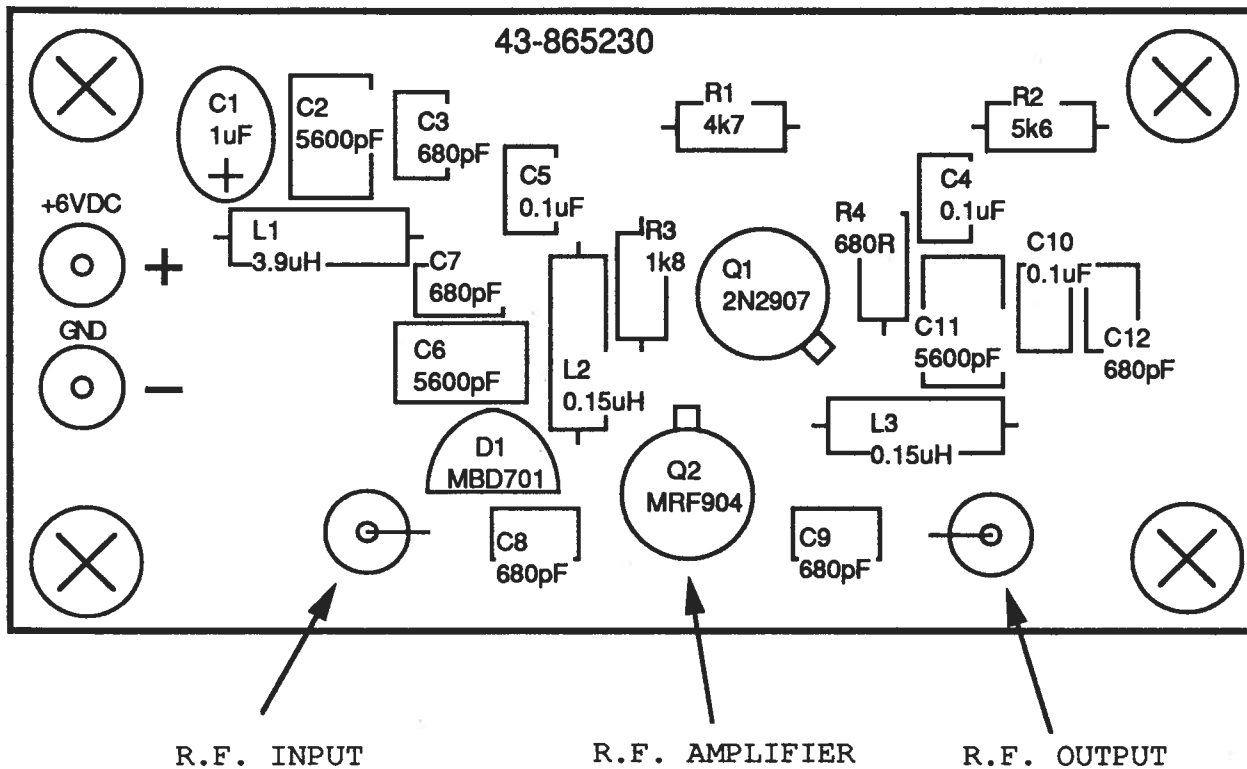
DATE	CODE	REV	APP	DESCRIPTION

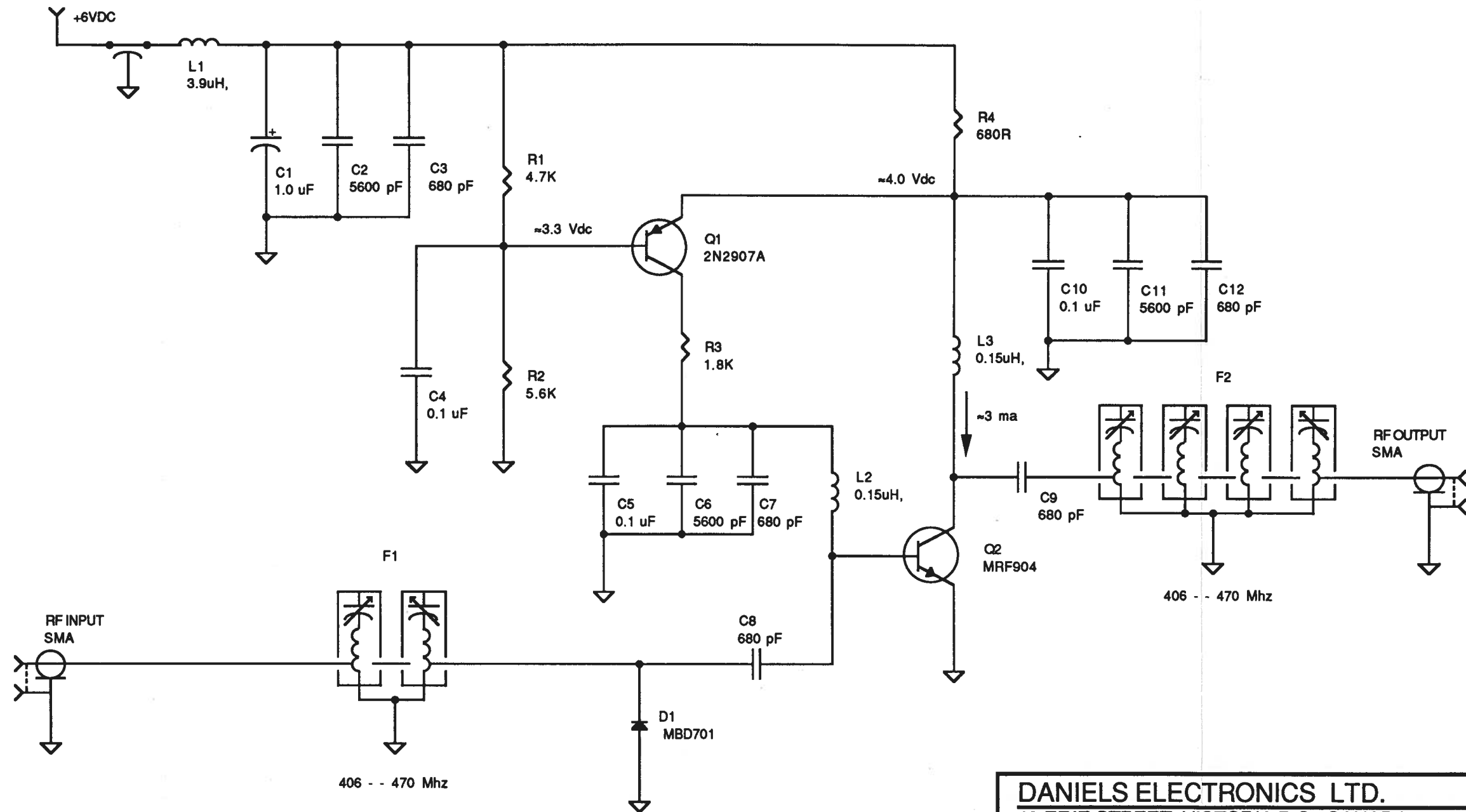
HIGHEST REFERENCE DESIGNATORS		
R12	L1	Y1
CR3		
REFERENCE DESIGNATORS NOT USED		

NOTES:
 1) RESISTORS ARE IN OHMS 1/4 WATT, CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED

DANIELS ELECTRONICS LTD.		43 ERIE ST., VICTORIA, B.C. CANADA	
TITLE: RECEIVER OSCILLATOR MODULE		UHF/VHF	
DRAWN ALC	DATE 15/07/88	DRAWING# 43-864610S	
CHECKED	APPROVED	M9-1.0	

R.F. Amplifier - Component Layout
Figure 2-24





DANIELS ELECTRONICS LTD.	
43 ERIE STREET VICTORIA, B.C. CANADA.	
RECEIVER RF AMPLIFIER	
DATE. JAN 22 / 90	DWN. C. GUNN
SCALE.	TOL.
DWG No. 43-865230S	

PARTS LIST - RECEIVER UHF

Main Circuit Board

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .001uF MONO 10% 200V	10-1022	8
C2	CAP, .1uF MONO 20% 100V	10-1042	11
C3	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C4	CAP, .01uF CER 80-20% 63V	05-1032	33
C5	CAP, .001uF MONO 10% 200V	10-1022	8
C6	CAP, .1uF MONO 20% 100V	10-1042	11
C7	CAP, .01uF CER 80-20% 63V	05-1032	33
C8	CAP, .01uF CER 80-20% 63V	05-1032	33
C9	CAP, .1uF MONO 20% 100V	10-1042	11
C10	CAP, .01uF CER 80-20% 63V	05-1032	33
C11	CAP, .01uF CER 80-20% 63V	05-1032	33
C12	CAP, 3p3 CER +/- .25pF NPO	05-0336	2
C13	CAP, .1uF MONO 20% 100V	10-1042	11
C14	CAP, .01uF CER 80-20% 63V	05-1032	33
C15	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C16	CAP, 2p2 CER, +/- .25pF 100V NPO	05-0226	1
C17	CAP, .1uF MONO 20% 100V	10-1042	11
C18	CAP, .01uF CER 80-20% 63V	05-1032	33
C19	CAP, .01uF CER 80-20% 63V	05-1032	33
C20	CAP, .01uF CER 80-20% 63V	05-1032	33
C21	CAP, .01uF CER 80-20% 63V	05-1032	33
C22	CAP, .001uF MONO 10% 200V	10-1022	8
C23	CAP, 22pF CER 2% 100V NPO	05-2206	1
C24	CAP, 100pF CER 2% 100V NPO	05-1016	1
C25	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	2
C26	CAP, 1p8 CER +/- .25pF 100V NPO	05-0186	1
C27	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C28	CAP, .001uF MONO 10% 200V	10-1022	8
C29	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	1
C30	CAP, .01uF CER 80-20% 63V	05-1032	33
C31	CAP, .001uF MONO 10% 200V	10-1022	8
C32	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C33	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C38	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C39	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C40	CAP, 5-65pF TRIMMER 250V YELLOW	15-5652	2
C41	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C42	CAP, 8p2 CER +/- .25pF 100V NPO	05-0826	2
C43	CAP, 2-10pF TRIMMER 250V YELLOW	15-2102	2
C44	CAP, .001uF MONO 10% 200V	10-1022	8
C45	CAP, .01uF CER 80-20% 63V	05-1032	33
C46	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C47	CAP, .01uF CER 80-20% 63V	05-1032	33
C48	VALUE SELECTED	SEL	4
C49	CAP, 2-10pF TRIMMER 250V YELLOW	15-2102	2

C50	CAP, 4p7 CER 2% 100V NPO	05-0476	6
C53	CAP, .01uF CER 80-20% 63V	05-1032	33
C54	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C55	CAP, .01uF CER 80-20% 63V	05-1032	33
C56	CAP, .01uF CER 80-20% 63V	05-1032	33
C57	CAP, 3p3 CER +/- .25pF NPO	05-0336	2
C58	CAP, .01uF CER 80-20% 63V	05-1032	33
C59	CAP, .1uF MONO 20% 100V	10-1042	11
C60	CAP, .01uF CER 80-20% 63V	05-1032	33
C61	CAP, .22uF MONO 20% 50V	10-2240	1
C62	CAP, .01uF CER 80-20% 63V	05-1032	33
C63	CAP, 330pF MONO 10% 200V	10-3312	6
C64	CAP, .001uF MONO 10% 200V	10-1022	8
C65	CAP, .1uF MONO 20% 100V	10-1042	11
C66	CAP, .01uF CER 80-20% 63V	05-1032	33
C67	CAP, 330pF MONO 10% 200V	10-3312	6
C68	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C69	CAP, .1uF MONO 20% 100V	10-1042	11
C70	CAP, 15pF CER 2% 100V NPO	05-1506	1
C72	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C73	CAP, .01uF CER 80-20% 63V	05-1032	33
C74	CAP, .1uF MONO 20% 100V	10-1042	11
C75	CAP, .1uF MONO 20% 100V	10-1042	11
C76	CAP, .1uF MONO 20% 100V	10-1042	11
C77	CAP, 1uF POLYFILM 10% 50V	11-1050	1
C78	CAP, 330pF MONO 10% 200V	10-3312	6
C79	CAP, 150pF MICA 2% 500V	09-1510	1
C81	VALUE SELECTED	SEL	4
C82	CAP, 5-65pF TRIMMER 250V YELLOW	15-5652	2
C83	CAP, 10pF CER 2% 100V NPO	05-1006	1
C84	CAP, 33pF CER 2% 100V NPO	05-3306	1
C85	CAP, .01uF CER 80-20% 63V	05-1032	33
C86	CAP, 330pF MONO 10% 200V	10-3312	6
C87	CAP, 330pF MONO 10% 200V	10-3312	6
C89	CAP, 330pF MONO 10% 200V	10-3312	6
C90	CAP, .01uF CER 80-20% 63V	05-1032	33
C91	CAP, .01uF CER 80-20% 63V	05-1032	33
C92	CAP, .01uF CER 80-20% 63V	05-1032	33
C93	CAP, .01uF CER 80-20% 63V	05-1032	33
C94	CAP, .01uF CER 80-20% 63V	05-1032	33
C95	CAP, .01uF CER 80-20% 63V	05-1032	33
C96	CAP, .01uF CER 80-20% 63V	05-1032	33
C120	CAP, .01uF CER 80-20% 63V	05-1032	33
C121	CAP, .01uF CER 80-20% 63V	05-1032	33
C122	CAP, .001uF MONO 10% 200V	10-1022	8
C123	CAP, .01uF CER 80-20% 63V	05-1032	33
C124	CAP, 1-10pF VARI., AIR DIEI., VERT MTG	15-8052	1
C125	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C126	CAP, 6p8 CER 2% 100V NPO	05-0686	3
C127	CAP, 1uF TANT DIP 20% 35V	14-1051	5
C128	CAP, .01uF CER 80-20% 63V	05-1032	33
CRI	DIODE, 1N4005, VR=60V, DO-41 PLASTIC	60-4005	1

CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	1
CR20	DIODE, MPN3404, PIN, CASE 182-02	60-3404	1
F2	CRYSTAL FILTER, 455KHz, 6 ELEMENT	24-0455	1
JU1	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	5
JU2	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	1
JU3	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	5
JU4	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	5
JU5	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	5
JU6	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	5
JU8	HEADER, 3 PIN, 2 ROW, GOLD PLATE	19-8023	1
L1	COIL, SHIELDED CAN, RX VHF/UHF	31-7115	2
L2	COIL, SHIELDED CAN, RX VHF/UHF	31-7116	1
L6	CHOKE, 1.5uH, 10%	30-0015	1
L7	CHOKE, 3.9 uH, 10%	30-1039	1
L9	COIL, QUADRATURE TK1302	31-6597	1
L20	COIL, SHIELDED CAN, RX VHF/UHF	31-7115	2
Q1	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	5
Q2	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	5
Q3	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	5
Q5	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	5
Q6	JFET, J304/K304, TO-92, STYLE 5	61-0304	1
Q20	TRANSISTOR, MRF 904, SM. SIG., TO-72 MTL	63-0904	5
R1	RES, 270R 0.5W 5% STD M FLM	56-2071	2
R2	RES, 3K9 0.5W 5% STD M FLM	56-0392	1
R3	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R4	VALUE SELECTED	SEL	4
R5	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R6	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R7	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R8	RES, 56K 0.5W 5% STD M FLM	56-0563	1
R9	POT, 250K, 25 TURN, VERT MTG, VERT SCREW	46-2546	1
R10	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R11	RES, 47K 0.5W 5% STD M FLM	56-0473	2
R12	RES, 1K5 0.5W 5% STD M FLM	56-0152	3
R13	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R15	THERMISTOR, 100R	55-1010	4
R16	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R17	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R18	THERMISTOR, 100R	55-1010	4
R19	THERMISTOR, 100R	55-1010	4
R26	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R27	RES, 39K 0.5W 5% STD M FLM	56-0393	2
R28	TEMPSISTOR, 1K2	55-2122	1
R29	RES, 8K2 0.5W 5% STD M FLM	56-0822	1
R30	RES, 39K 0.5W 5% STD M FLM	56-0393	2
R31	RES, 270R 0.5W 5% STD M FLM	56-2071	2
R32	RES, 1K8 0.5W 5% STD M FLM	56-0182	1
R35	RES, 12R 0.5W 5% STD M FLM	56-0120	1
R36	RES, 330R 0.5W 5% STD M FLM	56-0331	1
R40	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R41	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R42	RES, 10K 0.5W 5% STD M FLM	56-0103	9

R43	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R44	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R45	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R46	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R47	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R48	RES, 2K2 0.5W 5% STD M FLM	56-0222	4
R49	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R50	RES, 2K2 0.5W 5% STD M FLM	56-0222	4
R51	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R58	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R59	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R60	RES, 820R 0.5W 5% STD M FLM	56-0821	2
R61	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R62	RES, 56R 0.5W 5% STD M FLM	56-0560	4
R63	RES, 2K2 0.5W 5% STD M FLM	56-0222	4
R64	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R65	RES, 220R 0.5W 5% STD M FLM	56-0221	1
R66	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R67	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R68	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R69	RES, 120K 0.5W 5% STD M FLM	56-0124	1
R70	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R71	RES, 2K2 0.5W 5% STD M FLM	56-0222	4
R72	POT, 50K, SINGLE TURN, HORIZ. MTG.	46-5030	1
R73	THERMISTOR, 300R	55-0301	1
R74	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R75	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R76	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R77	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R78	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R79	THERMISTOR, 100R	55-1010	4
R80	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R81	RES, 22K 0.5W 5% STD M FLM	56-0223	1
R82	RES, 4K7 0.5W 5% STD M FLM	56-0472	1
R83	RES, 1K 0.5W 5% STD M FLM	56-0102	5
R84	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R85	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R86	RES, 68K 0.5W 5% STD M FLM	56-0683	6
R87	RES, 5K6 0.5W 5% STD M FLM	56-0562	1
R88	RES, 10R 0.5W 5% STD M FLM	56-0100	3
R91	RES, 100K 0.5W 5% STD M FLM	56-0104	3
R120	VALUE SELECTED	SEL	4
R121	RES, 4R7 0.6W 5% STD M FLM	56-1047	1
R122	RES, 27K 0.5W 5% STD M FLM	56-0273	5
R123	RES, 82R 0.5W 5% STD M FLM	56-0820	1
R124	RES, 2K7 0.5W 5% STD M FLM	56-0272	1
R125	RES, 10K 0.5W 5% STD M FLM	56-0103	9
R126	RES, 10K 0.5W 5% STD M FLM	56-0103	9
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC2	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC3	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC4	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10

RFC5	CHOKE, 10uH, 10%	30-0100	2
RFC6	CHOKE, 10uH, 10%	30-0100	2
RFC7	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC8	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC9	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC10	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC11	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC14	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	10
RFC20	CHOKE, .1uH 10%	30-0001	1
RFC21	CHOKE, 5.6uH, 10%	30-0056	1
U1	I.C. LM117LH, VOLT. REG, 3 PIN MET. CAN	28-0117	1
U2	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
U3	I.C. LM2904D, OP AMP, DUAL, SO-8	28-2904	1
U5	I.C. CA3083F, TRANS. ARRAY, 8 PIN DIP	28-3083	1
U6	I.C. MC3359P, FM IF, 18 PIN DIP	28-3359	1
Y1	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y2	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y3	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y4	CRYSTAL FILTER, 21.4MHZ, 4 POLE	24-2144	4
Y5	CRYSTAL, 21.855MHZ, COLD WELD	20-2185	1
	SOCKET, 0.040, GOLD PLATE	19-0040	5
	HOOD, RF, TYPE N CONNECTOR	19-1770	1
	CONNECTOR, TYPE N	19-1775	1
	PIN, SQUARE, 0.045", TIN PL.	19-2161	6
	CONNECTOR, SMA, FEM., PCB MTG.	19-8002	1
	SHUNT, FOR 0.01" SQ. POST HEADER, GOLD	19-8201	1
	I.C. MOC8050, DARL OPTOCOUPLE, 8 PIN DIP	28-8050	1
	COIL, 4T, 0.1 ID	30-1709	1
	COIL, 3 1/2T, HELICAL, 10AWG COPPER	30-1711	2
	COIL, 3 3/4T, HELICAL, 10AWG COPPER	30-1713	2
	PAD, TRANSISTOR MTG, NYLON, TO-5	33-0005	1
	NAME PLATE, UHF RX, MOD2	39-865510	1
	SILK SCREENING, FRONT PANEL RX	39-865810	1
	SIDE PANEL, RX RIGHT, UHF	39-872210	1
	COVER, WRAP AROUND, RX	39-872410	1
	SHIELD, RX OSCILLATOR	39-872510	1
	SHIELD DIVIDER, RX OSCILLATOR, BRASS	39-872610	1
	COIL FORM, UHF, Q200.5 X-LINKED POLYSTYR	39-873710	2
	COVER, BRASS, UHF HELICAL FILTER	39-873910	1
	FRONT PANEL, RX, 14HP.	39-874710	1
	COAX, RIGID, UHF RX OSC. TO HEL.FIL	39-875910	1
	EXT, HELICAL FILTER, VHF/UHF TX	39-876110	1
	MATTE FOIL LABELS, FP FREQ. STICKER	39-880510	1
	MATTE FOIL LABELS, RECEIVER TCXL	39-880610	1
	MATTE FOIL LABELS, RXU SERIAL NUMBER	39-881210	1
	MODULE, MIXER, DOUBLE BALANCED	41-0002	1
	NUT, 4-40 HEX 3/16 x 1/16 SS	42-4400	10
	NUT, .12-80 FOR UHF VARI. CAPS	42-6389	2
	SEALS, SLOTTED, FOR UHF VAR. CAPS	42-6487	2
	PCB, RECEIVER VHF/UHF	43-861121	1
	FASTENER, QUICK RELEASE, GREY PKG.100	58-0003	4
	SIDE PANEL, EXTRUSION	58-0004	1

HANDLE, FRONT PANEL, 14HP, GREY	58-0006	1
NUT, M2.5, HEX, PKG. OF 100	58-0010	4
SCREW, M2.5 x 10, CHEESE HEAD	58-2500	2
SCREW, M2.5 x 12, C/SK, FOR HANDLES	58-2504	2
WASHER, M2.5, SHAKEPROOF	58-2512	4
SCREW, M3 x 8, RAISED C/SK	58-3002	4
SCREW, M3 x 8, PAN HEAD, ZINC	58-3004	4
CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
SCREW, 4-40 x 1 1/2", PAN PHIL, MS SS	59-4150	6
SCREW, 4-40 x 3/8, PAN PHIL, MS SS	59-4337	4
SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	6
SCREW, 6-32 x 3/8 RD. SLOT, NYLON	59-6837	2
TRANSISTOR, 2N2907A, PNP	63-2907	1
STANDOFF, 4-40 x 1/4, 7/32od, NO-ROT, NICK	67-4425	4
SWITCH, PUSH BUTTON, NORM. OPEN, RED	70-0020	1
SWITCH, SPDT, ON-NONE-ON, PCB MOUNT	70-2210	1
SWITCH NUT	70-2211	1
TRANSFORMER, AUDIO	73-0148	1
TRANSFORMER, ADJUSTABLE	73-2121	1
TUBING, TEFLON, 20AWG	76-0020	1
TUBING, PVC, 10AWG, CLEAR	76-1010	1
HEATSHRINK, 3/32", BLACK	76-2093	1
WASHER, SHAKEPROOF, 120-80, UHF VARI.CAP	77-1993	2
WASHER, LOCKING, #4 SPLIT SS	77-4001	14
WASHER, FLAT, #4 SS	77-4010	12
WIRE, TEFLON, 24AWG, STRANDED RED	86-2402	1
WIRE, TEFLON, 24AWG, STRANDED YELLOW	86-2404	1
WIRE, TEFLON, 24AWG, STRANDED GREY	86-2408	1

UHF Preselector (VER 3.0) and R.F. Amplifier Board Parts List.

REF DESIG	DESCRIPTION	DANIELS PART No.	QTY
C1	CAP, POLAR, 1.0 uF, TANT DIP, 20%, 35V	14-1052	1
C2	CAP, 5600 pF, CHIP, 10%, 100V, NPO	06-5620	3
C3	CAP, 680 pF, CHIP, 10%, 100V, NPO	06-6810	5
C4	CAP, 0.1 uF, CHIP 10%, 50V, X7R	06-1040	3
C5	CAP, 0.1 uF, CHIP, 10%, 50V, X7R	06-1040	3
C6	CAP, 5600 pF, CHIP, 10%, 100V, NPO	06-5620	3
C7	CAP, 680 pF, CHIP, 10%, 100V, NPO	06-6810	5
C8	CAP, 680 pF, CHIP, 10%, 100V, NPO	06-6810	5
C9	CAP, 680 pF, CHIP, 10%, 100V, NPO	06-6810	5
C10	CAP, 0.1 uF, CHIP, 10%, 50V, X7R	06-1040	3
C11	CAP, 5600 pF CHIP 10%, 100V, NPO	06-5620	3
C12	CAP, 680 pF, CHIP, 10%, 100V, NPO	06-6810	5
C13	CAP, FEED-THRU, 1500pF, 100V, CER	08-1520	1
D1	DIODE, MBD701, HOT CAR, VR=70V, TO-92	60-0701	1
J1	COAX CONNECTOR, SMA, FEM, BULKHEAD	19-8006	2
J2	COAX CONNECTOR, SMA, FEM, BULKHEAD	19-8006	2
L1	INDUCTOR, 3.9uH, 10%	30-0039	1
L2	INDUCTOR, 0.15uH, 10%	30-1002	2
L3	INDUCTOR, 0.15uH, 10%	30-1002	2
Q1	TRANSISTOR, PNP, 2N2907A, TO-12	63-2907	1

Q2	TRANSISTOR, NPN, MRF904, RF, TO-72	63-0904	1
R1	RESISTOR, 4.7K, 0.5W, 5%, SFR16	56-0472	1
R2	RESISTOR, 5.6K, 0.5W, 5%, SFR16	56-0562	1
R3	RESISTOR, 1.8K, 0.5W, 5%, SFR16	56-0182	1
R4	RESISTOR, 680R, 0.5W, 5%, SFR16	56-0681	1
	WASHER, SHAKEPROOF, 120-80, UHF VARI CAP	15-1993	6
	NUT, 0.120-80, FOR UHF VARI. CAPS	15-6389	6
	SEAL, SLOTTED, FOR UHF VARI. CAPS	15-6487	6
	CAP, VARI, 0.6-3.5pF, VERT MTG, UHF	15-8055	6
	CONNECTOR, SMA, MALE, 90 DEG	19-8004	2
	COIL, 4T, 10 AWG COPPER, 0.380 ID	30-1712	6
	COIL FORM, UHF, 0.375 D BY 0.865 L	32-873710	6
	BRACKET, CAP MTG, UHF PRESEL, NICK/AL	39-863710	1
	BRACKET, COIL MTG, UHF PRESEL, NICK/AL	39-863810	1
	EXTRUSION, HEL PRESEL, UHF, 2 APETURES	39-864710	2
	EXTRUSION, HEL PRESEL, UHF, 1 APETURE	39-864910	1
	SHIELD, BRASS, RF AMP	39-865611	1
	COAX, RIGID,	39-876010	2
	NUT, 4-40 HEX, 3/16 BY 1/16	42-4400	18
	PCB, RF AMP VER 3.0	43-865230	1
	SCREW, MCH, 4-40 BY 1 1/2", PAN PHIL	59-4150	14
	SCREW, MCH, 4-40 BY 1 5/8", PAN PHIL	59-4163	4
	SCREW, MCH, 4-40 BY 1/4", PAN PHIL	59-4325	4
	SCREW, MCH, 6-32 BY 3/8 NYLON, RND SLOT	59-6837	6
	SPACER, 0.125 BY #4 CLEARANCE, ALUMINUM	67-4125	4
	WASHER, LOCKING #4 SPLIT SS	77-4001	22
	COAX, RG188A/U, TEF, WHT	82-0188I	7"
	WIRE, TEFLON, 24 AWG, STRANDED, BROWN	86-2401I	8"
	WIRE, TEFLON, 24 AWG, STRANDED, RED	86-2402I	8"
	SHIELD, UHF PRESELECTOR BODY	39-894710	1
	SHIELD, UHF PRESELECTOR AMP	39-894810	1

Reference: Schematic Preselector and R.F. Amplifier UHF 43-865230S

UHF Receiver Audio Processor Parts List

REF DESIG	DESCRIPTION	DANIELS PART No.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	5
C2	CAP, .01uF CER 80-20% 63V	05-1032	9
C3	CAP, .022uF POLYFILM 10% 63V/100V	11-2231	1
C4	CAP, .015uF POLYFILM 10% 63V/100V	11-1531	1
C5	CAP, .33uF POLYFILM 5/50V 10%	11-3340	1
C6	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C7	CAP, .01uF CER 80-20% 63V	05-1032	9
C8	CAP, .001uF MONO 10% 200V	10-1022	3
C9	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C10	CAP, .1uF MONO 20% 100V	10-1042	5
C11	CAP, .01uF CER 80-20% 63V	05-1032	9
C12	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C13	CAP, 33pF CER 2% 100V NPO	05-3306	2
C14	CAP, .01uF CER 80-20% 63V	05-1032	9
C15	CAP, 22uF TANT DIP 20% 20V	14-2262	1
C18	CAP, .01uF CER 80-20% 63V	05-1032	9
C19	CAP, .1uF MONO 20% 100V	10-1042	5
C20	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C23	CAP, 10uF TANT. DIP 20% 25V	14-1061	2
C24	CAP, .01uF CER 80-20% 63V	05-1032	9
C25	CAP, .001uF MONO 10% 200V	10-1022	3
C26	CAP, .1uF MONO 20% 100V	10-1042	5
C27	CAP, .1uF MONO 20% 100V	10-1042	5
C28	CAP, 220uF ELECTR. 16V	07-2213	1
C29	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	2
C30	CAP, .01uF POLYFILM 10% 63V/100V	11-1031	1
C31	CAP, .001uF POLYFILM 10% 63V/100V	11-1021	2
C32	CAP, .0047uF POLYFILM 10% 63V/100V	11-4721	1
C33	CAP, .0015uF POLYFILM, 10% 63V/100V	11-1521	1
C34	CAP, 33pF CER 2% 100V NPO	05-3306	2
C35	CAP, 120pF CER 2% 100V NPO	05-1216	1
C36	CAP, 100pF CER 2% 100V NPO	05-1016	1
C37	CAP, 1uF POLYFILM 10% 50V	11-1050	4
C38	CAP, .47uF TANT. DIP 20% 35V	14-4742	2
C39	CAP, .47uF TANT. DIP 20% 35V	14-4742	2
C40	CAP, .01uF CER 80-20% 63V	05-1032	9
C41	CAP, .001uF MONO 10% 200V	10-1022	3
C42	CAP, .01uF CER 80-20% 63V	05-1032	9
C43	CAP, 10pF CER 2% 100V NPO	05-1006	1
C44	CAP, .01uF CER 80-20% 63V	05-1032	9
CR1	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR5	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	2
CR6	DIODE, MBD301, HOT CAR., VR=30, TO-92	60-0301	2
CR7	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
L1	CHOKE, 220mH MINI TORODIAL, EPOXY	30-6220	2
L2	CHOKE, 220mH MINI TORODIAL, EPOXY	30-6220	2
Q1	TRANSISTOR, 2N3906, PNP, TO-92, ST.-1	63-2N3906	1

R1	RES, 8K2 0.5W 5% STD M FLM	56-0822	2
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, 4K7 0.5W 5% STD M FLM	56-0472	3
R5	RES, SIP, 100K, +/-2%, 7 PIN, #1 COMM	54-1040	1
R6	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R7	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R8	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R9	RES, 200K 0.5W 5% STD M FLM	56-0204	2
R10	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R11	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R12	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R13	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R14	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R15	RES, 5K6 0.5W 5% STD M FLM	56-0562	1
R16	RES, 4K7 0.5W 5% STD M FLM	56-0472	3
R17	THERMISTOR, 10K	55-0103	4
R18	RES, 51K 0.5W 5% STD M FLM	56-0513	1
R19	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R20	RES, 6K8 0.5W 5% STD M FLM	56-0682	1
R21	RES, 1K5 0.5W 5% STD M FLM	56-0152	1
R22	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R23	POT, 5K, 25 TURN, VERT MTG, SIDE SCREW	46-5027	1
R24	RES, 100R 0.5W 5% STD M FLM	56-0101	2
R29	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R30	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R37	RES, 10R 0.5W 5% STD M FLM	56-0100	1
R38	RES, 20R 0.5W 5% STD M FLM	56-0200	1
R39	RES, 18K 0.5W 5% STD M FLM	56-0183	1
R40	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R41	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R42	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R43	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R44	RES, 4K7 0.5W 5% STD M FLM	56-0472	3
R45	THERMISTOR, 10K	55-0103	4
R46	RES, 100K 0.5W 5% STD M FLM	56-0104	10
R47	VALUE SELECTED	SEL	2
R48	THERMISTOR, 10K	55-0103	4
R49	RES, 150K 0.5W 5% STD M FLM	56-0154	1
R50 U	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R50 V	RES, 33K 0.5W 5% STD M FLM	56-0333	3
R51	THERMISTOR, 10K	55-0103	4
R52	POT, 100K, 25 TURN, VERT. MTG, SIDE SCRW	46-1047	2
R53	RES, 180K 0.5W 5% STD M FLM	56-0184	1
R54	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R55	RES, 27K 0.5W 5% STD M FLM	56-0273	1
R56	RES, 200K 0.5W 5% STD M FLM	56-0204	2
R57	RES, 22K 0.5W 5% STD M FLM	56-0223	1
R58	RES, 15K 0.5W 5% STD M FLM	56-0153	5
R59	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R60	RES, 2K2 0.5W 5% STD M FLM	56-0222	3

R61	RES, 2K2 0.5W 5% STD M FLM	56-0222	3
R62	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R63	RES, 47K 0.5W 5% STD M FLM	56-0473	3
R64	RES, 330k 0.5W 5% STD M FLM	56-0334	1
R65	RES, 8K2 0.5W 5% STD M FLM	56-0822	2
R66	RES, 1M 0.5W 5% STD M FLM	56-0105	1
R67	RES, 10K 0.5W 5% STD M FLM	56-0103	5
R68	VALUE SELECTED	SEL	2
U1	I.C. HCF4066BEY, SQ. GATE, 14 PIN DIP	28-4066	1
U2	I.C. LM2904D, OP AMP, DUAL, SO-8	28-2904	1
U4	I.C. LM386N-3, AUDIO AMP, 8 PIN DIP	28-0386	1
U5	I.C. CA3078AT, OP AMP, 8 PIN MET. CAN	28-3078	1
	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	2
	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	1
	HEADER, 2 PIN-2 ROWS, RIGHT ANG, TIN	19-8022	4
	PCB, AUDIO PROCESSOR, RX	43-870911	1

Reference: VHF/UHF Receiver Audio Processor drawing #43-860911S

Receiver Crystal Module Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART No.	QTY
CR1	DIODE, 1N5144A, VARACTOR, D0-7, GLASS	60-5144	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
L1	COIL, SHIELDED CAN, VHF/UHF RX XTAL OSC	31-7118	1
R1	RES, 1K2 0.5W 5% STD M FLM	56-0122	1
R2	RES, 220K 0.5W 5% STD M FLM	56-0224	1
R3	THERMISTOR, 10K	55-0103	5
R4	THERMISTOR, 10K	55-0103	5
R5	THERMISTOR, 10K	55-0103	5
R6	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R7	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R8	RES, 56K 0.5W 5% STD M FLM	56-0563	1
R9	THERMISTOR, 10K	55-0103	5
R10	RES, 100K 0.5W 5% STD M FLM	56-0104	1
R11	THERMISTOR, 10K	55-0103	5
R12	RES, 15K 0.5W 5% STD M FLM	56-0153	3
R13	RES, CHIP 4K7 1206 SM	52-472251	1
Y1	CRYSTAL, O.T., COLD WELD 43-48MHZ	20-4000	1
	SOCKET, 0.040, GOLD PLATE	19-0040	2
	TERMINAL PIN, .040", GOLD PLATE	19-1040	5
	ENCLOSURE, PLASTIC, GREEN, 1.0" X 0.75"	22-4290	1
	PCB, RX CRYSTAL OSCILLATOR	43-864611	1
	SCREW, 2-56 x 5/16, SLOT, BRASS	59-2560	1
	SPACER, 2-56 X 5/8, ALUMINUM	67-2560	1

SYSTEM MONITOR/ DC POWER SUPPLY

MOUNTAIN TOP RADIO REPEATER

MT 2 SERIES

INSTRUCTION MANUAL SECTION 3
Issue 03 August 1988

GENERAL DESCRIPTION

System Monitor/ Power Supply

The system monitor/power supply module performs several functions:

1. A voltage regulator (+9.5 VDC) with an anti-latchup hysteresis circuit.
2. A selectable function test meter, controlled by a switch on the front panel, to check VSWR, power supply voltages, carrier strengths, etc.
3. An audio amplifier and loudspeaker.

Many of the transmitter and receiver functions are routed to the test monitor where they are jumper accessible and available for site monitoring (temperatures, battery charge levels, VSWR etc.) and telemetry.

SPECIFICATIONS:

System Monitor/Power Supply

- Type:** Model SM-2 universal test monitor and power supply.
- Power Requirements:** +13.8 VDC @ 5 A nominal
- Power Output:** Filtered voltage +13.8 VDC nominal, +10.0 VDC to +17.0 VDC float.
+9.5 VDC regulated @ 3A (max. current capability).
- Fusing:** +13.8 VDC line 5A SLO-BLO (optional)
- Hysteresis:** Power output shuts down when input level is $\leq +8.0$ VDC. Power output returns when input level is $\Rightarrow +11.0$ VDC. (internally calibrated)
HYDRO $\Rightarrow +9.0$ VDC
 $\Rightarrow +13.0$ VDC
- Audio Output:** 450 mW into 8 ohm load. Switched amplifier, selects A or B receiver output. Separate volume control.
- P.T.T.:** Front panel push-button override / keys P.T.T. bus.
- Test Jacks:** + - jacks for standard multimeter, 20K Ohm/V

Switch Functions:

Position

1. N.C.
2. +13.6 VDC input voltage nominal (+10v + 17 VDC Float)
3. +9.5 VDC from monitor power supply
4. A carrier strength (relative)
5. B carrier strength (relative)
6. A +6V receiver regulator
7. B +6V receiver regulator
8. A/B audio
9. A VSWR sense (optional)
10. B VSWR sense (optional)
11. A.F.C. receiver A
12. A.F.C. receiver B

THEORY OF OPERATION SYSTEM MONITOR

(Schematic 3-11/12 / Drawing # 43-862512S)

Audio Circuitry

Audio from the Receiver modules is applied via B20 (Rx A audio) and B30 (Rx B audio) to a front panel toggle switch SW-3. This switch applies both power and the incoming audio to U2, the audio being applied via R40 the front panel volume control. U2 provides +20 dB of audio gain, driving the outdoor 8 ohm type speaker to approximately 500 mW. When SW-3 is ON a LED is activated to indicate additional current is being used at the site. The audio circuitry draws approximately 20 mA.

Switch Functions/Test Monitor

As indicated in the SM-2 specifications, the 12 position rotary switch, SW-1, monitors several key levels in the repeater rack. The levels monitored are applied directly to the switch and are terminated at the front panel test jacks (red-positive, black-negative). Any standard 20K r/V meter is capable of monitoring the D.C. test levels.

P.T.T.

A PTT feature on the SM-2 front panel is provided to key either or both transmitters as per mother board programming. This feature allows quick power and frequency tests of the transmitter modules.

Power Supply

The power supply is operated on the floating solar/battery input at pins B2, Z2. D7 provides the zener reference for U1. R10, R11 are

selected for +9.50 (+.05V) VDC at the output pins B6, Z6. U1 drives Q2 via diodes D3, D4 and D5, the diodes provide the correct voltage drop to drive Q2. Q2 controls the 5 AMP. power transistor Q1. The output of Q1 is filtered by C5 and C7.

Hysteresis of the power supply is controlled by U3, U4 and Q3. U4 provides a D.C. reference level to PIN 3, U2. The o/p of U3 drives transistor switches Q4 and Q3. Q3, when switched on, uses R24 and R25 to provide a low voltage "drop-out" threshold that shifts PIN2, U3.

Q3, when switched OFF, uses R21 and R22 to provide a high voltage "activate" threshold that shifts PIN 2, U3. Therefore Q3 switches in the resistance values that allow U3 to develop hysteresis. Q4 is also switched by the output of U3, Q4 enables the regulator zener I/P to U1. When Q1 collector is high the regulator functions normally, upon a low o/p the regulator is disabled and the +9.5 VDC o/p is switched off.

ALIGNMENT PROCEDURE

Equipment List

Power Supply, regulated 0-20V, 0-3 AMP, Current Limiting
Multimeter, Fluke 75
Audio Generator
Load Resistor 4ohms 100 W.

General

The system monitor is calibrated by the factory for the following:

- 1) Audio o/p 500mW (+20dB)
- 2) +9.50 VDC \pm .05 VDC Regulator o/p @ 25°C
- 3) Hysteresis set to drop-out at +8.0 VDC \pm .10V
Hysteresis set to activate at +11.0 VDC \pm .10V.

Power Supply Alignment (Schematic M12-1.2).

Apply +13.8 VDC to the power I/P PINS B2, Z2. Ground PINS Z30, B32 and Z32. Measure the +13.8 VDC o/p at PINS B4, Z4, this voltage varies with the applied voltage. Measure PINS B6, Z6 this voltage should be +9.50 VDC \pm .05 VDC, with no load. Vary the I/P voltage from +10 to +17 VDC the o/p should remain at +9.50 VDC \pm .05.

Connect the 2.3A load to the +9.50 VDC output, confirm the applied voltage is set to +13.8 VDC. Adjust the I/P voltage from +10 to +17 VDC and verify the D.C. regulated +9.5 VDC corresponds to the test sheet provided.

NOTE: Ensure that the ground and power leads running to the monitor are at least # 16AWG so that "false" voltage drops do not occur.

If the +9.5 VDC o/p varies from the test sheet do not replace or reset the regulator until hysteresis is confirmed. With the load on, lower

the I/P voltage to $< +9.0$ VDC, the $+9.50$ VDC o/p should drop to 0 VDC, when the voltage is raised to $> +13.0$ VDC the $+9.50$ VDC regulator should activate. If the $+9.50$ VDC o/p is not within tolerances select R10/R11 for exactly $+9.50$ VDC.

With no load on the $+9.50$ VDC o/p the total current consumption should be $\approx 4-7$ mA @ $+13.8$ VDC. The current is drawn by U4 the hysteresis diode reference.

Changing Hysteresis Levels

Determine drop-out and activate levels required. (Factory Norm: Drop-out $< +8.0$ VDC, activate $> +11.0$ VDC). Adjust the select resistor combination R24//R25 with a resistor substitution box for the appropriate low voltage drop out. Install the necessary parallel resistances.

Adjust the select resistor combination R21//R22 with a resistor substitution box for the high voltage activate. Confirm the drop-out and activate voltages and install the selected values.

Typical Hysteresis Values

	Drop out R21//R22	Activate R24//R25
+8.0	150K//680K	
+9.4	470K//560K	
+11.0	820K / 470K	27K//82K
+13.0		20K//150K
		20K / 680K

Audio Alignment

Apply a -12 to -8 dBm 1kHz audio signal to PIN 20, place the audio switch (front panel) to a system and verify audio is present at the speaker. Repeat the above procedure for the B system, with the audio input at PIN30. Proceed with environmental testing.

Options

Consult factory for alignment supplements on special System-Monitor options.

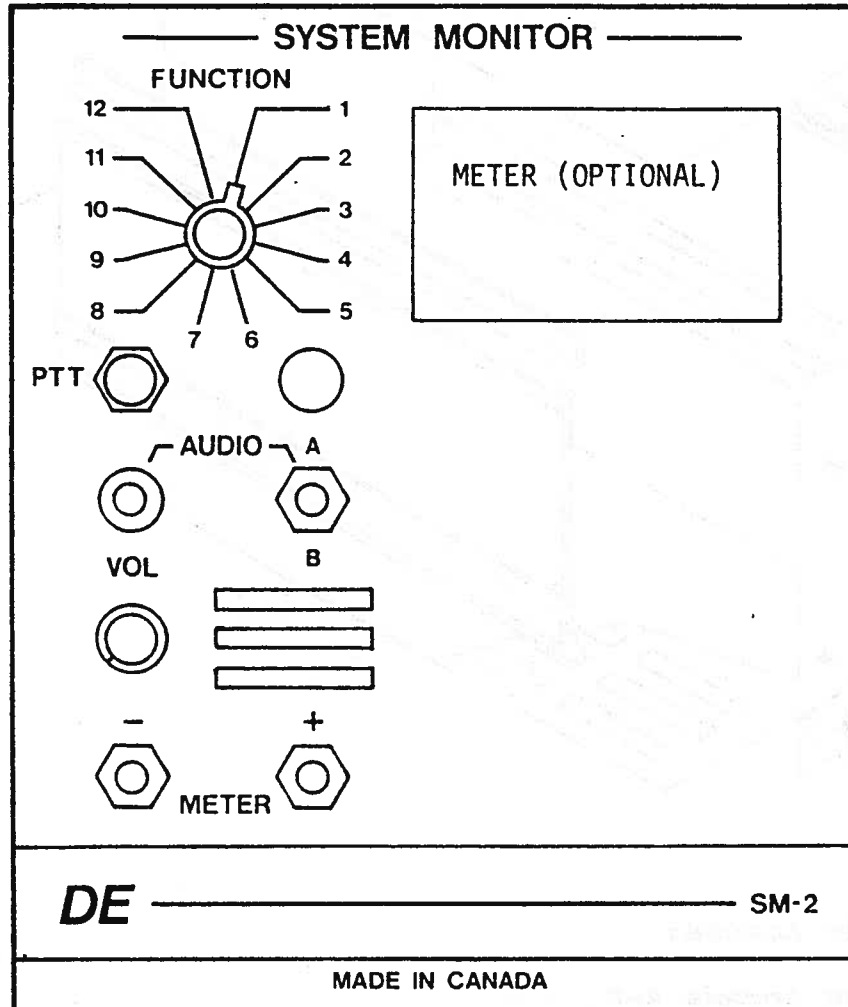
System Monitor Pin Out

Pin Number	Name	Function
B2	+10 - +17 VDC	Battery i/p Voltage
Z2	+10 - +17 VDC	Battery i/p Voltage
B4	+10 - +17 VDC	Filtered o/p Voltage
Z4	+10 - +17 VDC	Filtered o/p Voltage
B6	+9.5 VDC	Regulated o/p Voltage
Z6	+9.5 VDC	Regulated o/p Voltage
B8	A VSWR	VSWR (OPT.)
Z8	B VSWR	VSWR (OPT.)
B10	<u>PTT</u>	AUX PTT
Z10	<u>PTT</u>	(DIODE PROGRAMMED)
B12	A AFC	RX A AFC
Z12	B AFC	RX B AFC
B14	SPARE	N/C
Z14	SPARE	N/C
B16	SPARE	N/C
Z16	SPARE	N/C
B18	SPARE	N/C
Z18	SPARE	N/C
B20	A AUDIO	RX A AUDIO
Z20	SPARE	N/C
B22	SPARE	N/C
Z22	SPARE	N/C
B24	A +6.0 VDC	RX A REGULATOR
Z24	B +6.0 VDC	RX B REGULATOR
B26	B CARRIER	RX B SIGNAL STRENGTH
Z26	A CARRIER	RX A SIGNAL STRENGTH
B28	SPARE	N/C
Z28	SPARE	N/C
B30	B AUDIO	RX B AUDIO
Z30	GND	CIRCUIT COMMON
B32	GND	CIRCUIT COMMON
Z32	GND	CIRCUIT COMMON

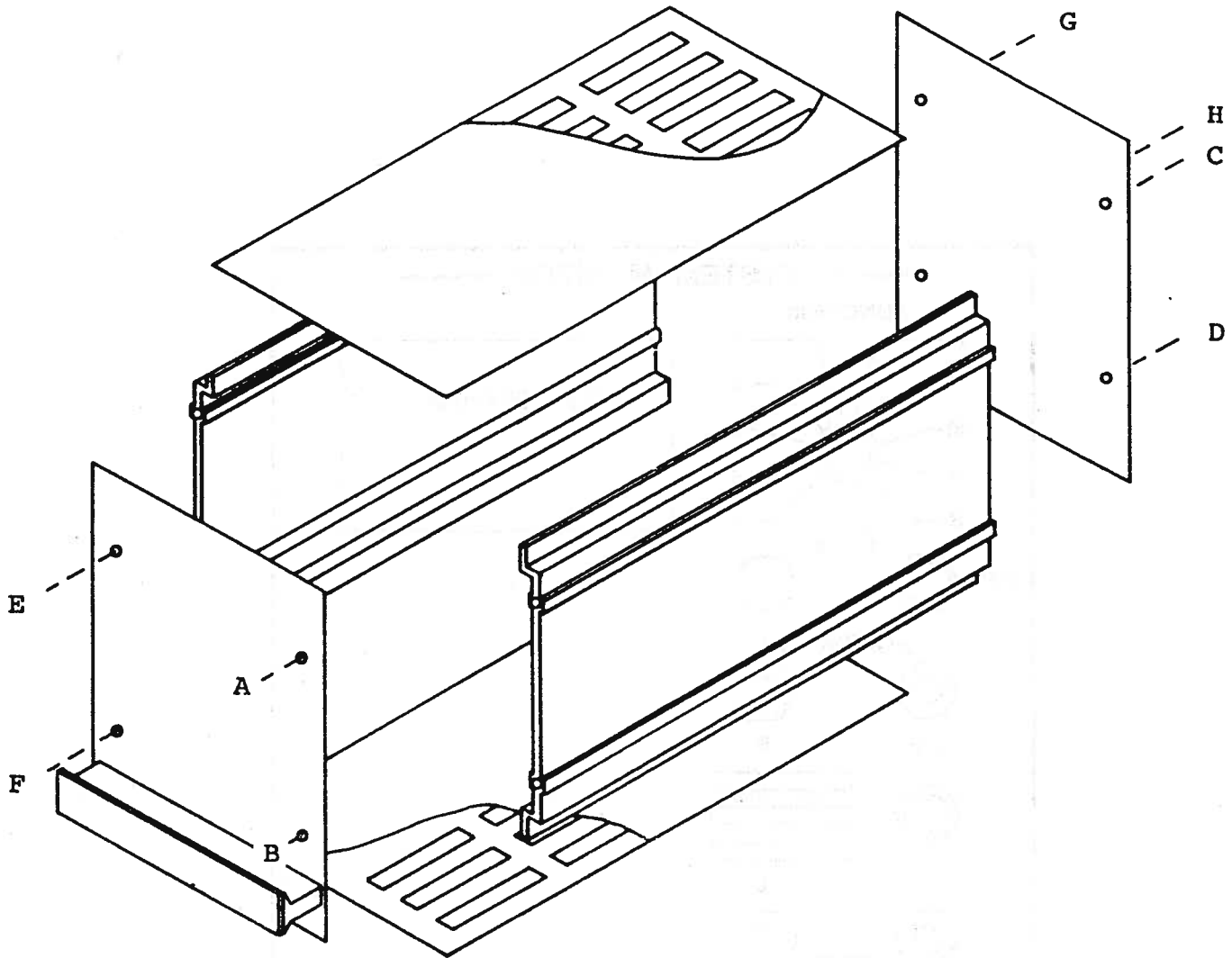
ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

Front Panel - System Monitor

Figure 3-1



Exploded View - System Monitor
Figure 3-2



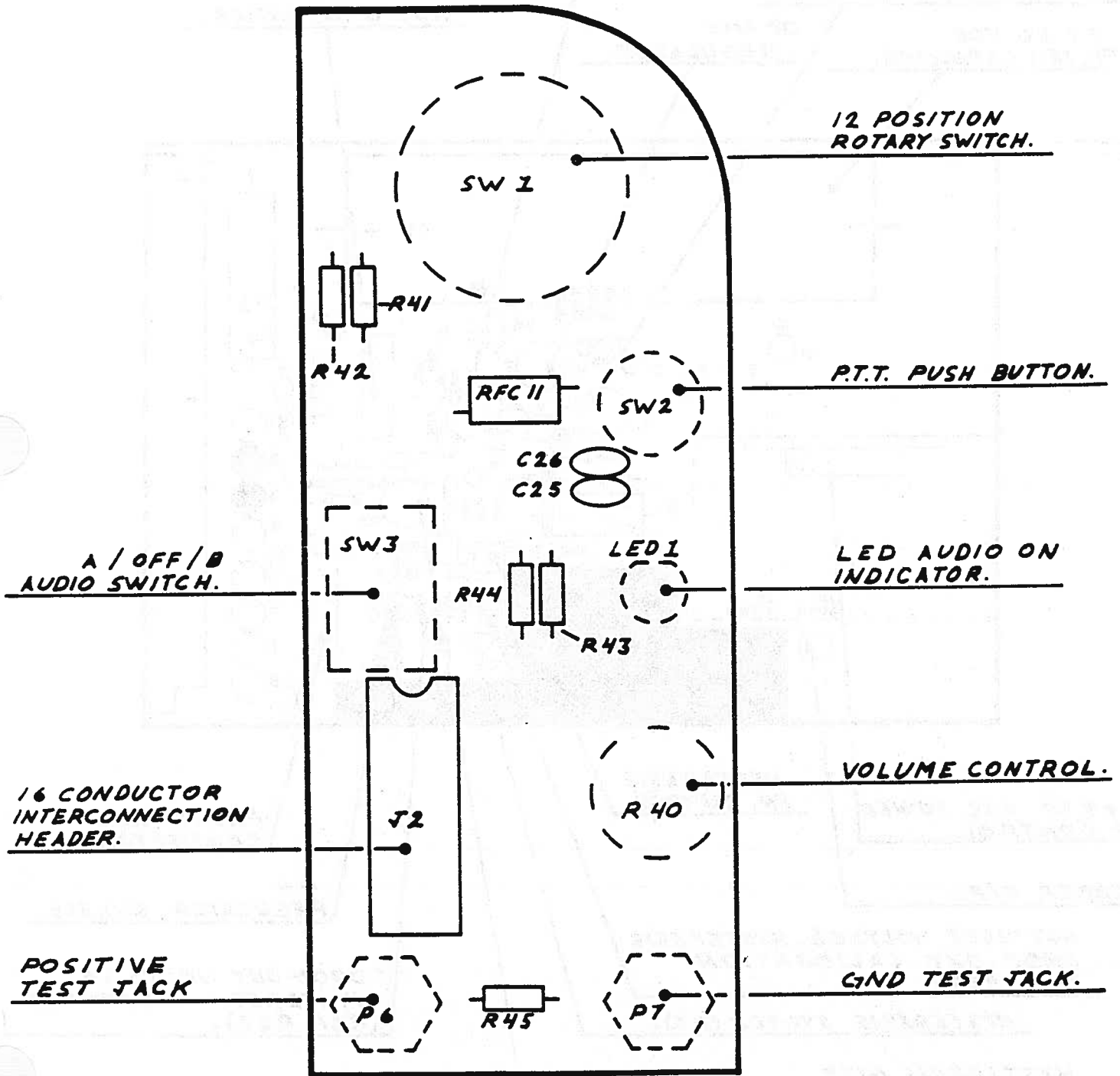
Component Side Access:

1. Remove screws A-D.
2. Lift off right side panel, top panel and bottom speaker panel (note speaker leads).

Solder Side Access:

1. Remove screws A-D.
2. Lift off right side cover, top panel and bottom speaker panel (note speaker leads).
3. Unplug P2.
4. Remove Q1 from socket (note conductive pad).
5. Remove screws E-H to detach front and rear panels.
6. Remove PCB mounting screws (4) from left side cover.
7. Slide PCB out of left side extrusion.

Switch PCB Component Layout - System Monitor
Figure 3-3



Component Layout - System Monitor
Figure 3-4

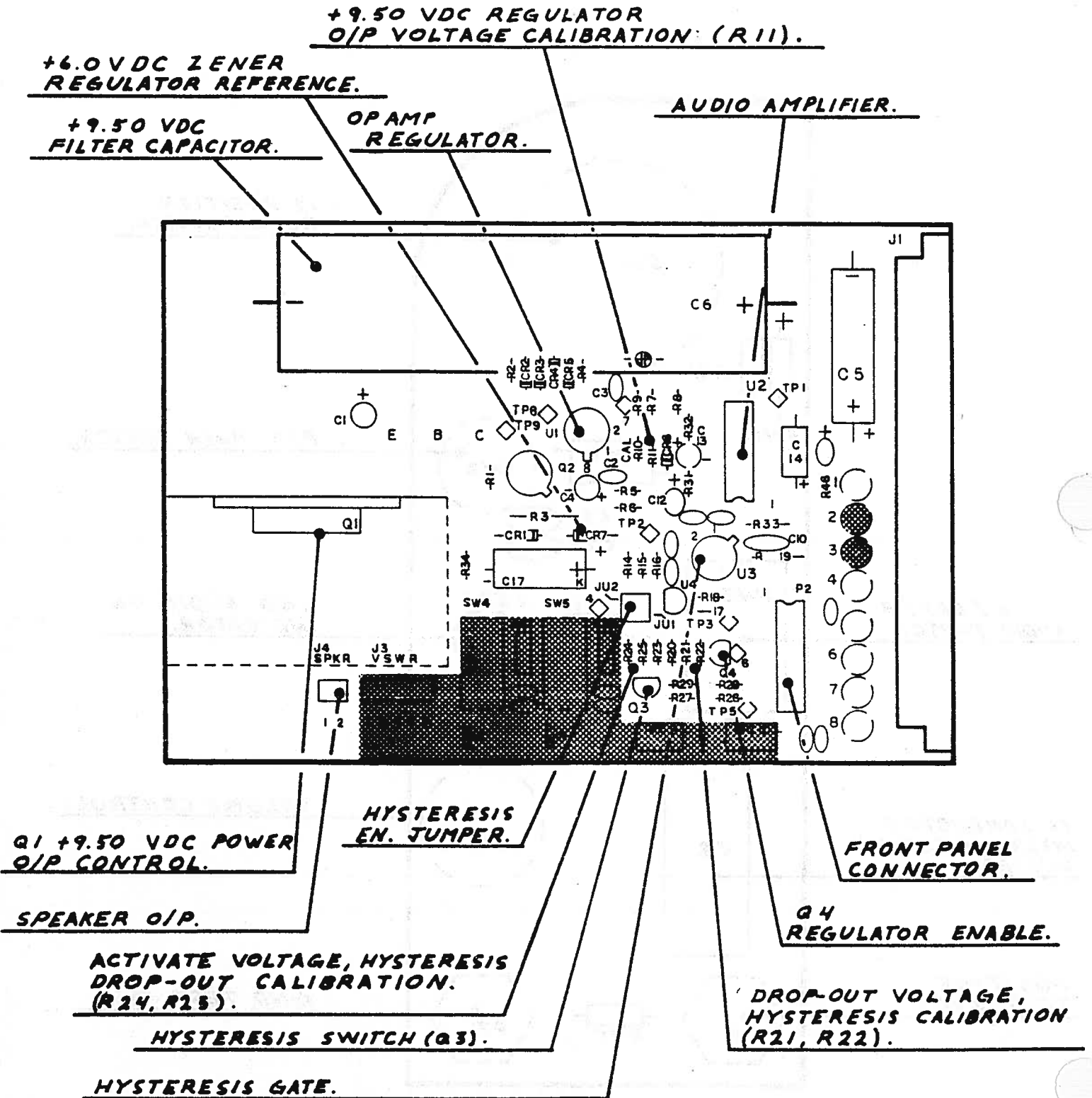
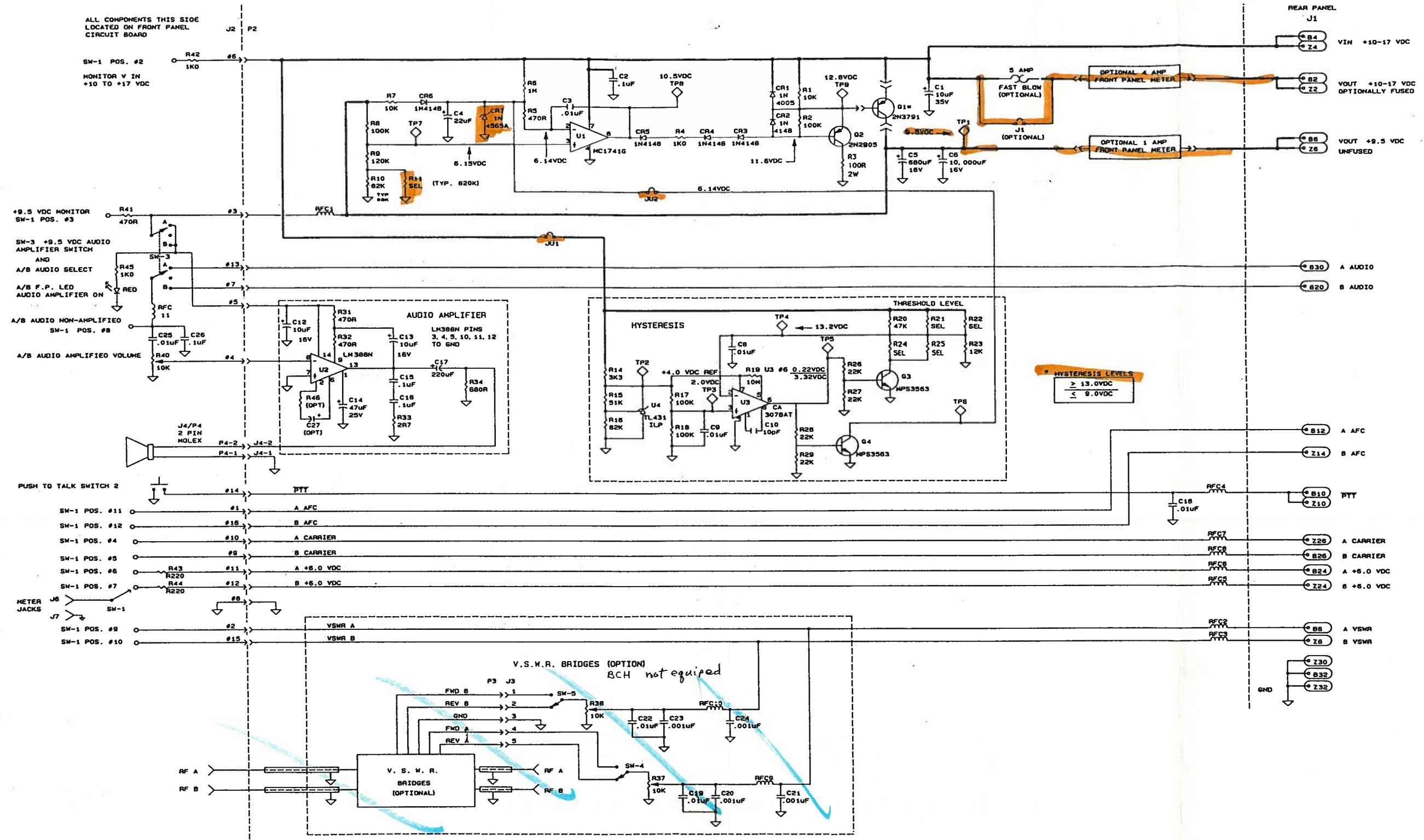


Figure 3-5



PARTS LIST - SYSTEM MONITOR

Main Circuit Board

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C2	CAP, .1uF MONO 20% 100V	10-1042	4
C3	CAP, .01uF CER 80-20% 63V	05-1032	5
C4	CAP, .22uF MONO 20% 50V	10-2240	1
C5	CAP, 680uF ELECTR. -10/+50% 25V CASE 01	07-6811	1
C6	CAP, 10,000uF ALUM ELEC. -10/+150%	07-1090	1
C7	VALUE SELECTED	SEL	5
C8	CAP, .01uF CER 80-20% 63V	05-1032	5
C9	CAP, .01uF CER 80-20% 63V	05-1032	5
C10	CAP, 10pF CER 2% 100V NPO	05-1006	1
C12	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C13	CAP, 10uF TANT. DIP 20% 25V	14-1061	3
C14	CAP, 47uF TANT. DIP 20% 20V	14-4760	1
C15	CAP, .1uF MONO 20% 100V	10-1042	4
C16	CAP, .1uF MONO 20% 100V	10-1042	4
C17	CAP, 220uF ELECTR. 25V	07-2211	1
C18	CAP, .01uF CER 80-20% 63V	05-1032	5
C25	CAP, .01uF CER 80-20% 63V	05-1032	5
C26	CAP, .1uF MONO 20% 100V	10-1042	4
CR1	DIODE, 1N4005, VR=60V, DO-41 PLASTIC	60-4005	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	5
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	5
CR4	DIODE, 1N4148, SILCON, VR=75V	60-4148	5
CR5	DIODE, 1N4148, SILCON, VR=75V	60-4148	5
CR6	DIODE, 1N4148, SILCON, VR=75V	60-4148	5
CR7	DIODE, 1N4565A, 6.4V, 0.01%/C, DO-35	60-4565	1
D1	LED, RED, 0.193"od X 0.35"long	36-0300	1
J1	CONNECTOR, TYPE F, 32, MALE, R/A PCB MTG	58-3200	1
J2	SOCKET, 16 PIN DIP	66-0016	2
P2	SOCKET, 16 PIN DIP	66-0016	2
P6	TIP JACK, 0.080 METAL CLAD, RED	19-6025	1
P7	TIP JACK, 0.080 METAL CLAD, BLACK	19-6026	1
Q1	TRANSISTOR, 2N3791, PNP, TO-204AA	63-3791	1
Q2	TRANSISTOR, 2N2905, PNP, G.P. TO-5, MTL	63-2905	1
Q3	TRANSISTOR, MPS3564, NPN	63-3564	2
Q4	TRANSISTOR, MPS3564, NPN	63-3564	2
R1	RES, 10K 0.5W 5% STD M FLM	56-0103	2
R2	RES, 100K 0.5W 5% STD M FLM	56-0104	4
R3	RES, 220R 0.6W 5% STD M FLM	56-1221	1
R4	RES, 1K 0.5W 5% STD M FLM	56-0102	3
R5	RES, 470R 0.5W 5% STD M FLM	56-0471	4
R6	RES, 1M 0.5W 5% STD M FLM	56-0105	1
R7	RES, 10K 0.5W 5% STD M FLM	56-0103	2
R8	RES, 100K 0.5W 5% STD M FLM	56-0104	4

R9	RES, 120K 0.5W 5% STD M FLM	56-0124	1
R10	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R11	VALUE SELECTED	SEL	5
R13	VALUE SELECTED	SEL	5
R14	RES, 3K3 0.5W 5% STD M FLM	56-0332	1
R15	RES, 51K 0.5W 5% STD M FLM	56-0513	1
R16	RES, 82K 0.5W 5% STD M FLM	56-0823	2
R17	RES, 100K 0.5W 5% STD M FLM	56-0104	4
R18	RES, 100K 0.5W 5% STD M FLM	56-0104	4
R19	RES, 10M 0.6W 5% STD M FLM	56-0106	1
R20	RES, 47K 0.5W 5% STD M FLM	56-0473	1
R21	VALUE SELECTED	SEL	5
R22	VALUE SELECTED	SEL	5
R23	RES, 12K 0.5W 5% STD M FLM	56-0123	1
R24	RES, 560K 0.5W 5% STD M FLM	56-0564	1
R25	RES, 20K 0.5W 5% STD M FLM	56-0203	1
R26	RES, 22K 0.5W 5% STD M FLM	56-0223	4
R27	RES, 22K 0.5W 5% STD M FLM	56-0223	4
R28	RES, 22K 0.5W 5% STD M FLM	56-0223	4
R29	RES, 22K 0.5W 5% STD M FLM	56-0223	4
R31	RES, 470R 0.5W 5% STD M FLM	56-0471	4
R32	RES, 470R 0.5W 5% STD M FLM	56-0471	4
R33	RES, 2R7 0.6W 5% STD M FLM	56-1027	1
R34	RES, 680R 0.5W 5% STD M FLM	56-0681	1
R40	POT, 10K, COND. PLAST, 1/2W, 1/8" SHAFT	46-0103	1
R41	RES, 470R 0.5W 5% STD M FLM	56-0471	4
R42	RES, 1K 0.5W 5% STD M FLM	56-0102	3
R43	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R44	RES, 220R 0.5W 5% STD M FLM	56-0221	2
R45	RES, 1K 0.5W 5% STD M FLM	56-0102	3
RFC1	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC4	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC5	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC6	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC7	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC8	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
RFC11	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	7
SW1	SWITCH, 12 POSITION ROTARY, NO STOP	70-3012	1
SW2	SWITCH, PUSH BUTTON, NORM. OPEN, RED	70-0020	1
SW3	SWITCH, SPDT, ON-NONE-ON, PCB MOUNT	70-2200	1
U1	I.C. MC1741G, OP AMP, 8 PIN METAL CAN	28-1741	1
U2	I.C. LM388N-3, AUD PWR AMP, 14 PIN, 1.5W	28-0388	1
U3	I.C. CA3078AT, OP AMP, 8 PIN MET. CAN	28-3078	1
U4	I.C. TL431ILP, PROG.VOLT.REF. TO-92	28-0431	1
	HEADER, 2 SQR.PINS, TIN PL. 0.1" PCB MTG	19-6412	1
	HEADER, 5 SQR.PINS, TIN PL. 0.1" PCB MTG	19-6415	1
	CONNECTOR, FEM. 2 DUAL CONT. KEYED 22AWG	19-7722	1
	CONNECTOR, FEM. 5 DUAL CONT. KEYED 22AWG	19-7725	1
	HEADER, 2 PIN DOUBLE ROW, GOLD PLATE	19-8122	1
	HEADER, 16 CONT, INS.DISP, NO STRAIN RELIEF	19-8160	2
	PLUG, 1/4" HOLE, BLACK PLASTIC	26-2603	1
	INSULATOR, THERMALLY CONDUCTIVE PAD TO-3	33-0003	1

PAD, TRANSISTOR MTG, NYLON, TO-5	33-0005	1
KNOB, 1/2"od, BLACK PLASTIC, W/POINTER	34-5000	1
KNOB, 1/2"od, BLACK PLASTIC, W/O POINTER	34-5001	1
CASE, LED, FLANGE & LOCKING RING	36-0310	1
HEATSINK, ANGLE STOCK, SYSTEM MONITOR	39-861710	1
SPEAKER PLATE, MONITOR	39-864211	1
SIDE PANEL, MONITOR LEFT	39-864410	1
NAME PLATE, SYSTEM MONITOR, MOD2	39-865110	1
SILK SCREENING, MONITOR, NO VSWR OR COAX	39-872310	1
GRILL, MONITOR, TOP	39-874410	1
FRONT PANEL, MONITOR, 21HP.	39-874910	1
BACK PANEL, MONITOR	39-875110	1
MATTE FOIL LABELS, SM SERIAL NUMBER	39-880810	1
NUT, 4-40 HEX 1/4 x 3/32 SS	42-4401	4
PCB, SYSTEM MONITOR, MAIN	43-862512	1
PCB, SWITCHES, SYSTEM MONITOR	43-863221	1
FASTENER, QUICK RELEASE, GREY PKG.100	58-0003	4
SIDE PANEL, EXTRUSION	58-0004	1
HANDLE, FRONT PANEL, 21HP, GREY	58-0008	1
NUT, M2.5, HEX, PKG. OF 100	58-0010	4
SCREW, M2.5 x 10, CHEESE HEAD	58-2500	2
SCREW, M2.5 x 12, C/SK, FOR HANDLES	58-2504	2
WASHER, M2.5, SHAKEPROOF	58-2512	4
SCREW, M3 x 8, RAISED C/SK	58-3002	4
SCREW, M3 x 8, PAN HEAD, ZINC	58-3004	4
SCREW, 4-40 x 5/16 PAN PHIL, MS SS	59-4331	4
SCREW, 4-40 x 1/2, PAN PHIL, MS SS	59-4350	2
SCREW, 4-40 x 1/4 PAN PHIL, MS SS	59-4525	8
SCREW, 6-32 x 5/8 PAN PHIL MS SS	59-6362	2
SOCKET, POWER TRANSISTOR, TO-3	66-0003	1
STANDOFF, 4-40 x 1/4, 7/32od, NO-ROT, NICK	67-4425	4
SPEAKER, 8 OHM, OUTDOOR	68-0008	1
SWITCH NUT	70-2211	2
SWITCH, SPDT, ON-OFF-ON, WIRE WRAP	70-3220	1
WASHER, LOCKING, #4 SPLIT SS	77-4001	8
WASHER, LOCKING, INTERNAL TOOTH, #4	77-4002	4
WASHER, NYLON, #4, 0.25"od, 0.0047 THICK	77-4045	4
WASHER, LOCKING, #6 SPLIT SS	77-6001	2
CABLE, RIBBON, 16 COND. COLOUR CODE #28	83-0016	1
WIRE, TEFLON, 16AWG, STRANDED GREEN	86-1605	1
WIRE, TEFLON, 16AWG, STRANDED BLUE	86-1606	1
WIRE, TEFLON, 16AWG, STRANDED WHITE	86-1609	1
WIRE, TEFLON, 24AWG, STRANDED, BROWN	86-2401	1

Reference: Schematic Diagram System Monitor - 43-862512S

INTERCONNECT/ MOTHER BOARD AND CHASSIS

MOUNTAIN TOP RADIO REPEATER

MT 2 SERIES

INSTRUCTION MANUAL SECTION 4
Issue 03 August 1988

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MT 2 REPEATER SYSTEM

GENERAL DESCRIPTION

The MT 2 repeater system is a VHF/UHF radio system which is characterized by high performance and reliability under the most severe environmental conditions. The total system is designed to provide dependable, low maintenance performance, even in the most difficult circumstances.

The MT 2 series of modules are packaged in the compact Eurostandard (5"h x 2.8"w x 7.5"d) housing, and are robustly designed for mountain top or transportable applications. All of the modules use high reliability components and each is accompanied with a complete operational and environmental Test Report on delivery.

Because the MT 2 repeater is specifically designed to deliver high performance under adverse conditions, extensive environmental testing is conducted over the temperature range -40° C to +60° C and the performance measured to ensure compliance with the design specifications and the Canadian Department of Communications(DOC) Radio Standards Specification (RSS 119). In addition, voltage stress/testing is done over the range of +10 to +17 Volts DC which is followed by a 24 hour burn-in.

GENERAL PHYSICAL SPECIFICATIONS

- Size and Mounting:** Eurocard compatible, modular design, assembly comprises labeled plug-in modules, interchangeability for test and repair is facilitated. Shelf assembly is marked to show location of all included modules. Standard 19" rack assembly, optional enclosures and mounting available consult factory.
- Corrosion Prevention:** Anodized aluminum construction. Stainless Steel Hardware. Conformal Coated Glass Epoxy Printed Circuit Boards. Gold plated connectors.
- Test Points:** Test and adjustment points clearly marked for identification. An optional card extender is available for in-service tests and adjustments.
- External Connections:** RF connections made with type 'N'connector located on front panel. Audio, power and control connections made on the rear 'Mother Board' assembly.

GENERAL SYSTEM

The **A system** and **B system** Rx/ Tx units are interchangeable in the appropriate Rx or Tx slot respectively. However, other than power supply connections and other essential functions, the **A system** is totally isolated from **B system**. This isolation allows hot/ cold standby to be implemented at a later date. The rack back panel (motherboard) makes extensive use of cage jacks to interconnect the **A** and **B systems** which will thereby support a number of field configurations i.e. link, drop, etc.

The power supply/ test monitor module consist of a voltage regulator (9.5 VDC) configured with a special anti-latchup hysteresis circuit. A selectable function test control switch (on the front panel of the monitor) is used to check VSWR, power supply voltages, carrier strengths, etc. An audio amplifier and loudspeaker is also built into the test monitor module. Many of the functions running into the Rx/ Tx units are routed (jumper accessed) to the test monitor for projected telemetry and future site monitoring analysis (temperatures, battery change levels, VSWR etc.)

The expansion module (shown left on figure 1) is half the width of the Rx or Tx module (7 HP 35mm versus 14 HP 70mm). This slot has been reserved to provide a basic repeater controller for a simple repeater system.

Figure 2 shows the motherboard/ backplane (viewed from the rear) and the position of the various Radio Module Connectors, the Inter-rack Connector and Programmable Inter-rack Headers. The Auxiliary Control Connector is shown on the upper right side of figure 2.

The Inter-rack Connector is a 50 pin IDC type using Ansley 50 conductor, flat ribbon/ shielded (ground plane) cable. The flat cable may be daisy-chained to facilitate as many racks as required for the site. The cable does not connect any functions to the "next" rack unless the corresponding cage jack is jumpered on the backplane/ motherboard.

The inter-rack programming header access's all functions on the rack and thereby any desired individual function may be selected and passed through to the next rack i.e. PTT, COS, BAC, I/O etc. Although this connector may also be used as an alternate access to I/O controller signals, it is primarily intended for inter-rack connections.

The system controller connector is a 48 pin Type F Male connector. The controller connector is directly connected to all the functions available on the backplane / motherboard. The connector has the same functions available as the inter-rack connector, the only difference is the control connector is directly connected to all the motherboard I/O functions (no programming header).

The female connector for the system control functions consists of individual crimp pins inserted into a blank connector shell, the protective shell housing can accommodate several types of cable i.e. ribbon, individual, multi-pin, shielded, etc. Although this connector accesses many points on the A system and B system it is unlikely all 48 connections will be used.

Typically your control/interfacing circuitry will be maintained on a separate rack level and not involve the expansion slot on the left side of the rack.

FUNCTIONAL CONNECTIONS

Backplane / Motherboard

Main Control Connector

The main control connector P1 is located at the extreme left of the rack (see fig. 1). This connector provides the same pin outs as the Aux control connector. The main control connector is a Type F 48 pin female.

Auxiliary Control Connector

The information presented on the Tx module and Rx module pin outs and back panel jumpers is terminated at the Main Control Connector, Aux Control Connector and the Inter-rack programming headers. The functions at the above connectors are the combined outputs of both A and B systems i.e. RXA, TXA, RXB and TXB.

The functions available on the control connector are extensive and should handle current and future control/programming applications for the Rx/Tx modules. In the event access is required to some other point of either module, numerous expansion or unused pins are available on the units. Depending on the application some of the repeater "programming" could be handled by direct connections on the back panel.

Aux Control and Main Control Connector Pin Designations

<u>Pin Number</u>	<u>Name</u>	<u>Function</u>
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. (isolated)	Isolated carrier operated relay (Opt.)
Z12	RXA C.O.R. (isolated)	Isolated carrier operated relay (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

<u>Pin Number</u>	<u>Name</u>	<u>Function</u>
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

MODULE INTERFACING RECOMMENDATIONS

The following information is intended to provide a guide pertaining to current consumption and other capabilities of the R.F. units as well as some additional design features on the Aux. control connector and Main control connector not previously discussed.

B4, Z4 +9.5 VDC Regulated

The voltage at the aux. control connector can be used to operate the control circuitry if desired. The O/P power available is approximately 200mA. The +9.5 VDC is fused in the system monitor has extensive filtering, R.F. choke isolation and TRANSORB impulse protection before and after the regulator circuitry.

One undesirable feature of using the +9.5 VDC is a low voltage protection circuit in the system monitor. If the battery voltage to the regulator circuitry drops below a set level the hysteresis switch in the power supply circuitry is activated and will not enable the O/P voltage until the batteries have recharged.

Typically calibrated hysteresis:

Battery at +8 VDC - power shutdown

Battery at +11 VDC - power start-up

D2, D4 A/B VSWR

The system monitor is equipped with an optional VSWR R.F. power sensor which can provide a corresponding level to the control system which indicate the relative condition of the antenna, transmitter, and R.F. cabling. This may be used for telemetry of the R.F. O/P levels or to indicate an R.F. system failure and thereby transfer to the back-up unit.

B6, Z6 A/B P.T.T. with Time-Out

The push to talk with time-out timer is normally 5 min. + 30 sec. The time is programmed internal to the Tx unit. P.T.T. is active low. The time-out function increases the Tx standby current to approx. 560uA with the time-out function only. Tx turn on time is approx. 30ms. without the audio ccts on hot standby.

D6 Back-up Override

Future expansion to a hot/cold standby system, preliminary specifications not available.

B8, Z8 A/B C.O.R.

This is the preferred carrier operated relay to be used to activate the P.T.T. Tx function. The O/P circuit is 2N2907A open collector and provides minimal current increases when ON.

D8, P.T.T.

Directly keys the transmitter. Tx turn on time is approx. 30ms without the audio ccts on hot standby.

B10, D28, C.T.C.S.S.

Direct audio from the FM discriminator O/P, no signal processing (filtering, squelch) has taken place. It is intended for tone panels (paging functions) where separate decoding can be used. Must be activated by JU7 on Rx main PCB.

D10, B26 CTCSS SW

Squelch disable. Upon signal processing, decoding, the squelch circuit can be triggered. Used in conjunction or independently with CTCSS O/P.

Z10 Back-up Alarm

Future expansion to a hot/cold standby system.

B12, Z12/ B28, Z28 C.O.R. Isolated

This carrier operated relay function is totally isolated from the Rx module by use of an opto-coupler. It can be used in conjunction with the on-isolated C.O.R. to provide an auxiliary C.O.R. Switch function.

The isolated C.O.R. may be used for any non-isolated C.O.R. function, however, to operate the MOC8050 opto-coupler I.C. requires an additional 10mA when the C.O.R. is activated. The C.O.R. O/P has an internal reverse polarity diode to protect the darlington driver. The C.O.R. operation must be enabled inside the Rx module.

D12, Z30 Flat Audio

This output has an audio response of +1dB from 60Hz - 3KHz reference to 1KHz deviation at 1KHz. The flat O/P must be enabled inside the Rx. The flat response enabling draws an additional 2mA.

B14, Z14, A/B System Enable

This input provides +9.5 VDC power to the specific system in event of a "back-up" requirement. Used in conjunction with alarm conditions from D6 and Z10.

D14, Z22 De-emphasized Audio

This output has an audio response of + 1 dB from 300Hz - 3KHz referenced to 1KHz deviation at 1KHz reference.

B16, D22 Tx Subtone I/P

The subtone I/P on the transmitter is mixed in the audio circuitry after the limiter. Typical I/P level is 60Hz @0.5Vpp for + 0.75KHz deviation. The input impedance is 5K Ω . The I/P level has a calibration resistor for different deviation requirements.

D16, Z18/D18, B18 Tx Line

The balanced I/P on the transmitter is normally set at 600 ohm, by removing a resistor on the Tx Bal. I/P the impedance can be changed to 5K Ω . Nominal I/P -12dBm @1KHz for 3KHz deviation, 600 ohm. All the transmitter I/P's (except subtone) have audio compression ccts, therefore if the level driving the transmitter is excessive the compression circuitry will prevent over deviation at any frequency without causing an increase in distortion. This feature will allow less "precise" set up of the output of the Rx to drive the Tx. There is the added benefit that deviation will remain constant through numerous repeater trunk systems.

B20, D20 Tx TONE/DIGITAL I/P

Although labelled TONE/DIGITAL input this unbalanced 600 ohm I/P to the transmitter serves as an additional or stand alone I/P to the transmitter for voice or tone information. A maximum data rate for this input has not been set, due to evaluations on group delay in the corresponding Rx units. As with the balanced I/P the TONE/DIGITAL I/P has audio compression therefore the above (Bal I/P) conditions apply (over deviation). This I/P may select 600 ohm or 5kr input impedance.

B22, Z26 Rx Mute

Active low this function kills the receiver audio. See previous information page 45 on muting options.

D24, D26 Rx Hysteresis

Active low this function allows the I.F. gain to go to maximum sensitivity. An internal control is used to set the hysteresis level. The hysteresis "range" will vary depending on the optional Rx RF preselector installed.

B24, Z24/D30, B30 Rx Line

See previous discussion on programming the balanced O/P for:

1. Flat response -6 dBm @1Khz
2. De-emphasis response -12dBm @1KHz

RADIO MODULE CONNECTOR DESIGNATIONS

- P1 - control card connector
- P2 - TXA connector
- P3 - RXA connector
- P4 - TXB connector
- P5 - RXB connector
- P6 - System monitor/power supply

INPUT/OUTPUT MOTHERBOARD JUMPER FUNCTIONS

- J1 - Power I/P 10 VDC - 17 VDC Maximum - 13.8 VDC nominal @3amp
Barrier strip connector min.
- J2 - Auxiliary control connector DIN, Type F female pins

- J3 - Program header consisting of 2 sections
 J3 01-25
 J3 26-50
 .025" square pins 0.1" grid gold plate
- J4 - Inter-rack connector 50 pin IDC, ribbon cable with a ground plane.
- NOTE: Where grounds or gnd functions are indicated on 3 pin jacks, the gnd is always on the left side of the jack.
- J5 - +9.5 VDC to program header (wire strap) used to supply +9.5 VDC to another rack via the inter-rack connector.
- J6 - 3 pin selection, connects P.T.T. TXB to the main bus or grounds P.T.T. TXB for test simulations. Time-out timer is active.
- J7 - 3 pin selection, connects P.T.T. TXB to the main bus or grounds P.T.T. TXB for test simulations. Time-out timer is not active.
- J8 - 3 pin selection, connects P.T.T. TXA to the main bus or grounds P.T.T. TXA for test simulations. Time-out timer is active.
- J9 - 3 pin selection, connects P.T.T. TXA to the main bus or grounds P.T.T. TXA for test simulations. Time-out timer is not active.
- J10 - 3 pin selection, connects P.T.T. TXA to the control connectors for either time-out or no time-out.
- J11 - 3 pin selection, connects P.T.T. TXB to the control connectors for either time-out or no time-out.
- J12 - connects non-isolated C.O.R. system monitor to C.O.R. bus.
- J13 - connects RXB C.O.R. to the main C.O.R. bus to the control connectors.
- J14 - connects RXA C.O.R. to the main C.O.R. bus to the control connectors.
- J15 - 3 pin selection, isolated C.O.R., one side grounds an internal diode in the receiver, if required. The other pin provides an auxiliary C.O.R. output and is not to be programmed with a jack. RXB
- NOTE: Using this method of C.O.R. increases Rx standby current.

- J16 - 3 pin selection, isolated C.O.R., one side grounds an internal diode in the receiver, if required. The other pin provides an auxiliary C.O.R. output and is not to be programmed with a jack. RXA
- J17 - RXB Flat Audio O/P - connects the RXB flat audio O/P to TXB TONE/DIGITAL I/P (or voice I/P)
- J18 - RXA Flat Audio O/P - connects the RXA flat audio O/P to TXA TONE/DIGITAL I/P (or voice I/P)
- J19 - RXB De-emphasis Audio O/P - connects the RXB de-emphasis O/P to TXB TONE/DIGITAL I/P (or voice I/P).
- J20 - RXA De-emphasis Audio O/P - connects the RXA de-emphasis O/P to TXA TONE/DIGITAL I/P (or voice I/P).
- J21 - RXB De-emphasis Audio O/P - connects system monitor to RXB de-emphasis audio O/P.
- J22 - RXA De-emphasis Audio O/P - connects system monitor to RXA de-emphasis audio O/P.
- J23 - RXB 600 ohm Balanced O/P - is an auxiliary balanced O/P for programming to either Tx I/P.
3 pin selection
- J24 - TXB 600 ohm Balanced O/P - is an auxiliary balanced input for programming to either Rx O/P.
- J25 - RXA 600 ohm Balanced O/P - is an auxiliary balanced input for programming to either Tx I/P.
3 pin selection
- J26 - TXA 600 ohm Balanced I/P - is an auxiliary balanced input for programming to either Rx O/P.
3 pin selection
- J27 - TXB Subtone I/P - auxiliary subtone I/P single pin.
- J28 - TXA Subtone I/P - auxiliary subtone I/P single pin.
- J29 - RXB Mute - connects the system monitor to RXB mute and/or the mute bus depending on the following jumpers.
- J30 - RX Mute - connects RXB mute to mute bus.
- J31 - RX Mute - connects RXA mute to mute bus.
- J32 - RXA Mute - connects system monitor to RXA mute and/or mute bus depending on above configuration.
- J33 - System Monitor Telemetry - O/P, future expansion TONE/DIGITAL.

- J34 - System Monitor Telemetry - O/P, future expansion Subtone.
- J35 - Auxiliary Tx B Audio Enable
- J36 - Auxiliary Tx A Audio Enable
- J37 - Unbalanced Rx B High Level Audio Output
- J38 - Unbalanced Rx A High Level Audio Output

NOTE: Each jumper described above has an additional solder pad beside the jumper to hand wire the motherboard to a specific configuration.

MOTHERBOARD INTERFACING RECOMMENDATIONS

Depending on the application the motherboard may be programmed directly e.g. connecting the audio Rx O/P's to the audio Tx I/P's or the Rx C.O.R. O/P's to the Tx P.T.T. I/P's. The options are available to use unbalanced, balanced, flat, de-emphasis audio to either A system or B system. By "hand wiring" the motherboard the minimum amount of control wires will be required and the shorter all control lines will be. However, all the above functions can also be monitored, routed or processed through the Aux control connector.

Generally the motherboard jacks provide a method to link the R.F. modules or provide auxiliary outputs.

All the functions that connect (link) the system monitor are for future expansion of a hot/cold standby, automated self diagnostics or on site telemetry. The jacks connecting the system monitor generally would not be used in the configuration of the control system.

SYSTEM INTER-RACK CONNECTIONS

J4 is the inter-rack connector, it is a 50 pin IDC connector with locking tabs, when a 2, 3 or 4 rack system is configured the J4 connection on each rack is daisy-chained to the next rack. the 50 conductor cable does not directly connect each function on the rack. For example to have the P.T.T. output on rack 1 enable the P.T.T. line on rack 2 the programming strap on the programming headers must be enabled.

Once again there is flexibility in the connection of multiple rack sites. The following options exist:

- a) connect the common functions of the 2 racks together by using the inter-rack connector and programming the headers or,
- b) use the control cable from each rack to link common functions through the control circuitry.

System Inter-rack Connector

The inter-rack connector has the same functions as the Aux. control connector and the main control connector, the J4 output of the inter-rack connector is listed below:

<u>Pin Number</u>	<u>Name</u>
1, 50	GND
2, 3, 4, 5	spare
7	9.5 VDC (not normally connected)
8	B VSWR
9	A VSWR
10	P.T.T. (with time-out)
11	Back-up override
12	C.O.R. non-isolated, open collector
13	P.T.T. no time-out
14	Back-up alarm
15	RXA CTCSS O/P
16	RXA CTCSS SW
17	RXA C.O.R. (isolated) common
18	RXA C.O.R. (isolated) common
19	RXA flat audio
20	RXA De-emp audio
21	B - system +9.5 VDC
22	A - system +9.5 VDC
23	RXB De-emphasis audio
24	TXB 600 ohm balanced I/P
25	TXB 600 ohm balanced I/P
26	TXB Subtone I/P
27, 28	N/C
29	TXA 600 ohm balanced I/P
30	TXA 600 ohm balanced I/P
31	TXB TONE/DIGITAL I/P
32	TXA TONE/DIGITAL I/P
33	N/C
34	TXA Subtone I/P
35	RXA Mute
36	N/C
37	RXA Hysteresis
38	RXA 600 ohm Bal. O/P
39	RXA 600 ohm Bal. O/P
40	RXB Hysteresis
41	RXB CTCSS SW

Pin Number

Name

42	RXB Mute
43	RXB CTCSS O/P
44	RXB C.O.R. Isolated
45	RXB C.O.R. Isolated
46	RXB 600 ohm Bal. O/P
47	RXB 600 ohm Bal. O/P
48	RXB flat audio
49	N/C
50	GND

GENERAL PROGRAMMING GUIDE

Rx Program

1. Select a receiver, determine the desired frequency of operation, determining the required sensitivity of operation. Normally the receiver comes with an R.F. pre-amplifier, providing an overall sensitivity of approximately -120 dBm @ 12dB SINAD. If this sensitivity and high selectivity is not required, a single cavity without R.F. amplifier can be provided. A sensitivity of approx. -113 dBm @12dB SINAD (VHF Rx specifications).
2. Set the squelch differential by adjusting the hysteresis of the receiver, i.e. spread between open and closed squelch.
3. Program Rx for C.O.R. operation (factory normally programmed for non-isolated open collector O/P Rx pin B12, Z12).
4. Select required audio response (factory normally de-emphasis audio O/P balanced -12dBm @1KHz @3KHz deviation - Rx pin B26, Z26).
5. Select AFC tracking for the Rx crystal module (factory normally has AFC tracking in place).

NOTE: Detailed receiver alignment available in the UHF/VHF Operation and Service Manual.

Tx Program

1. Select a transmitter, determine the desired frequency of operation, determine the required O/P power. Normally the Tx is set at maximum power 4 watts (VHF specification).
2. Select hot or cold audio standby (normally cold .. 30ms Tx "ON" time).

3. Select time-out function, normally 5 min. +1 min. time-out (10 meg ohm timer resistor).
4. Select the audio I/P circuits required (normally all I/P circuits are enabled TONE/DIGITAL I/P, balanced I/P and the microphone I/P). DO NOT use the microphone I/P for an auxiliary audio I/P, the microphone circuitry is specifically tailored to the dynamic microphone provided with the repeater system.
5. The audio I/P levels of the Tx units are set to handle -12dBm @1KHz for 3KHz deviation. All controls are factory set to provide the required compression/deviation ratio's. See detailed Tx alignment for adjustment of deviation levels.
6. De-emphasis audio (normal factory program).

NOTE: Detailed transmitter alignment available in the UHF/VHF Operation and Service Manual.

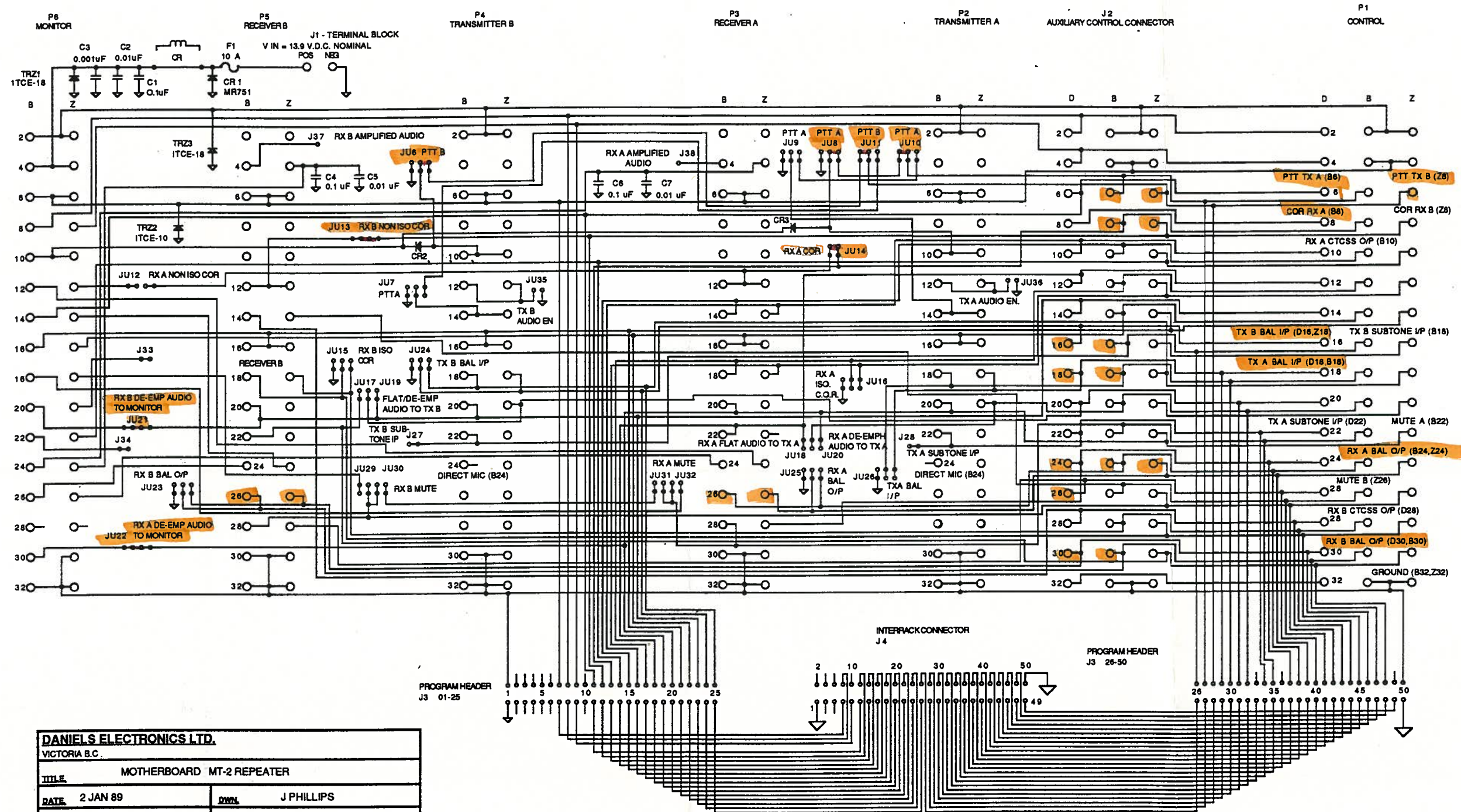
Rack Set-up

1. Install all the required modules in the rack in their appropriate position. Install the system monitor/power supply.
2. Apply power to the rack and confirm basic power system i.e. Rx functioning, Tx functioning. Disconnect power.

Motherboard Program - Approach

1. Determine the general format of Rx, Tx operation i.e. P.T.T. time-out function, required audio I/P's, O/P's, subtone I/P's, mute, hysteresis, etc.
2. Implement the programming by hand wiring the motherboard or by forming all the connections in the control circuitry.
3. For multiple rack operation use the inter-rack connector and program the desired common functions between the racks or use the next aux. control connector cable and form all the inter-rack connections in the control circuitry.

Figure 4-1A



DANIELS ELECTRONICS LTD.	
VICTORIA B.C.	
TITLE MOTHERBOARD MT-2 REPEATER	
DATE 2 JAN 89	DWN J PHILLIPS
SCALE N/A	DWG. No. 43-862321-S
TDL N/A	

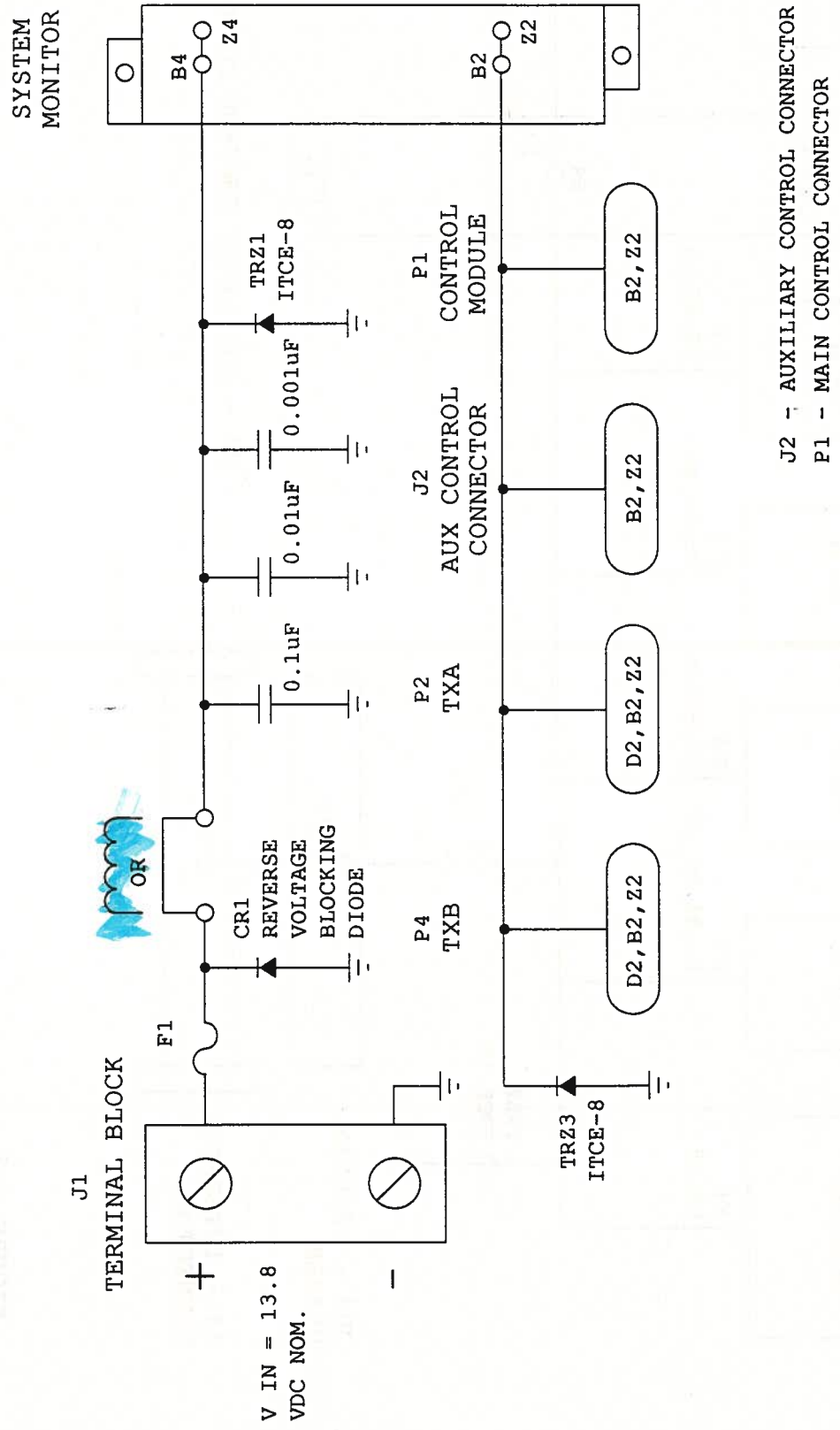


FIGURE 4-1
POWER INPUT

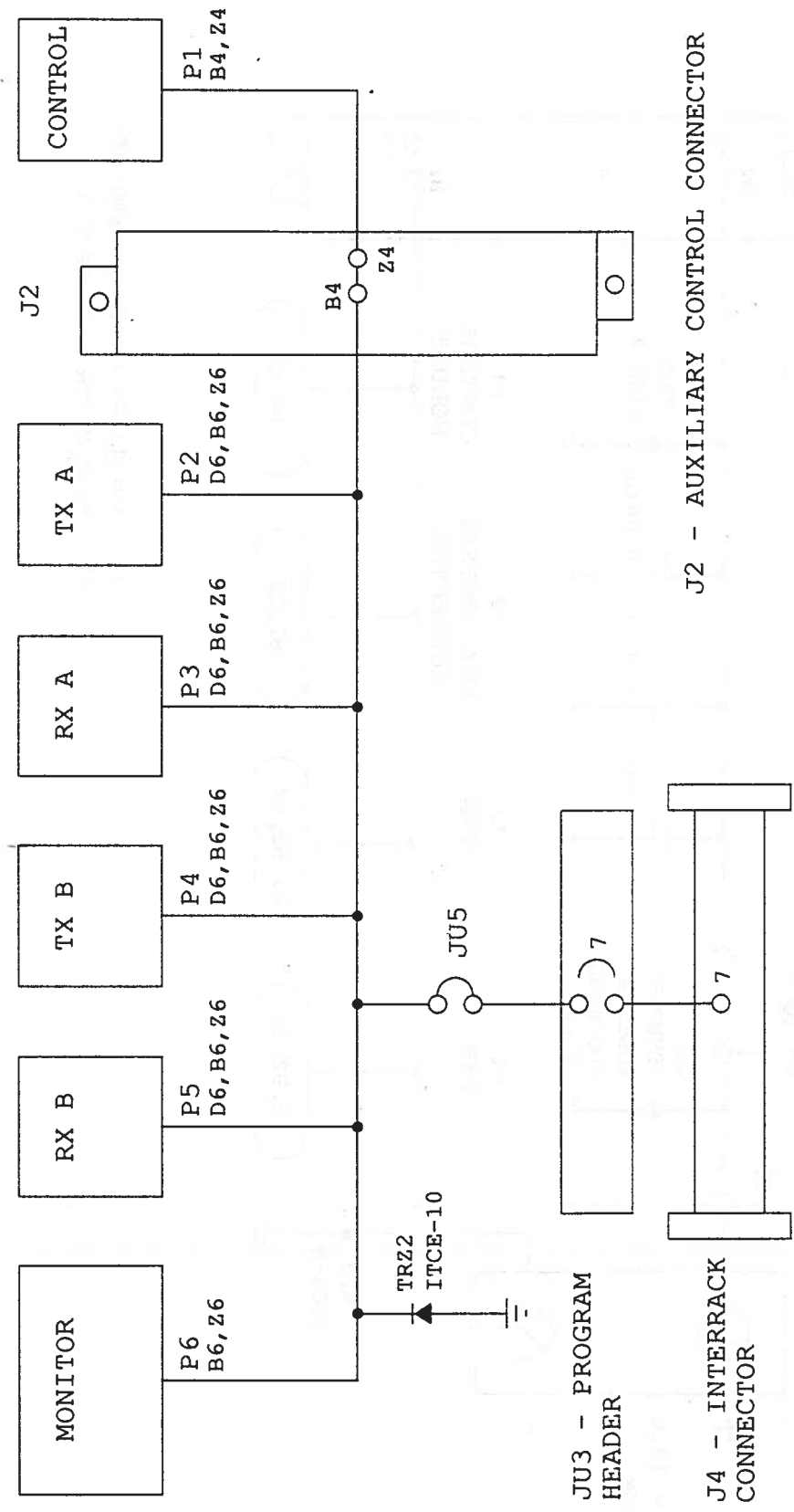


FIGURE 4-2
CONTINUOUS +9.5 VDC SYSTEM

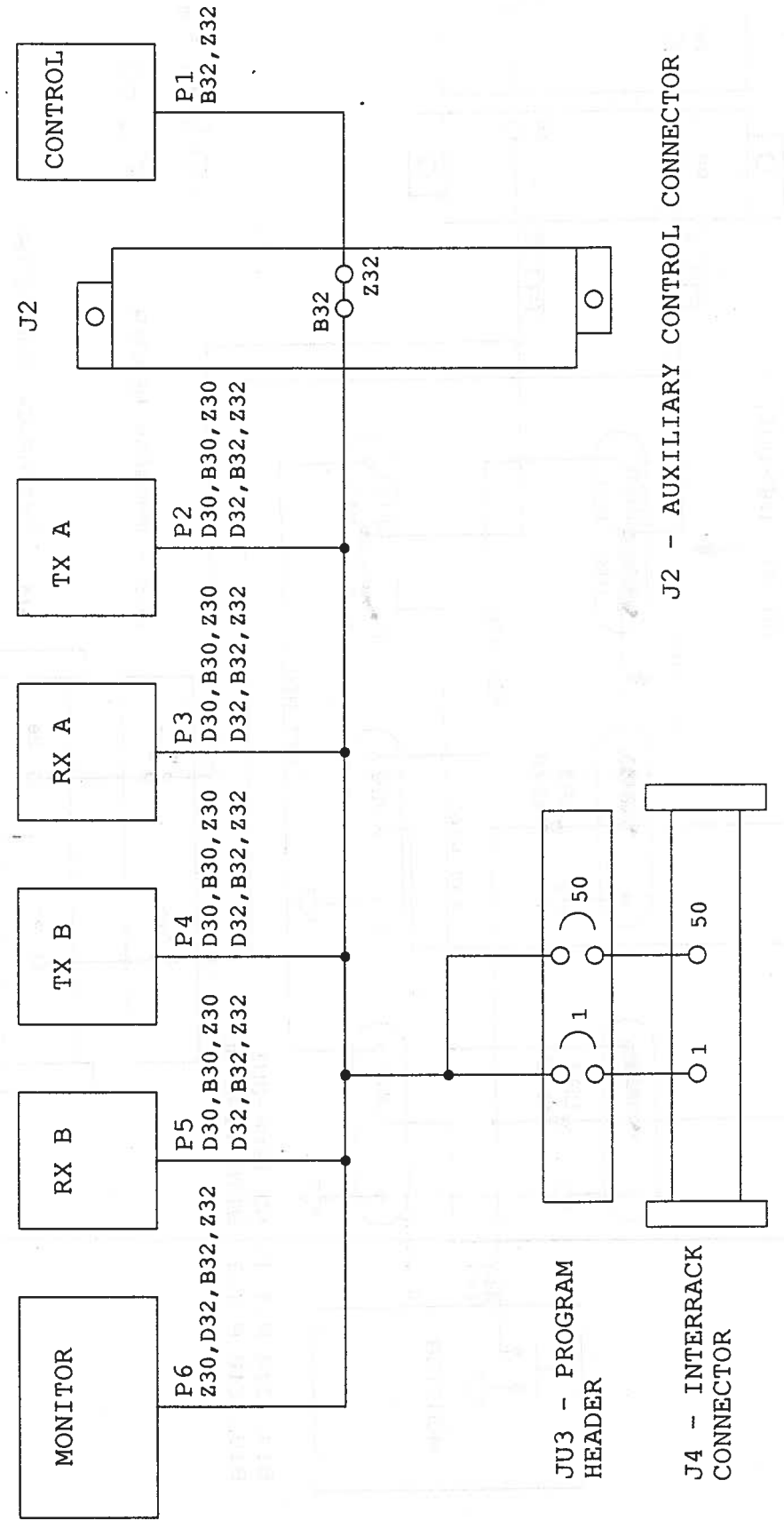
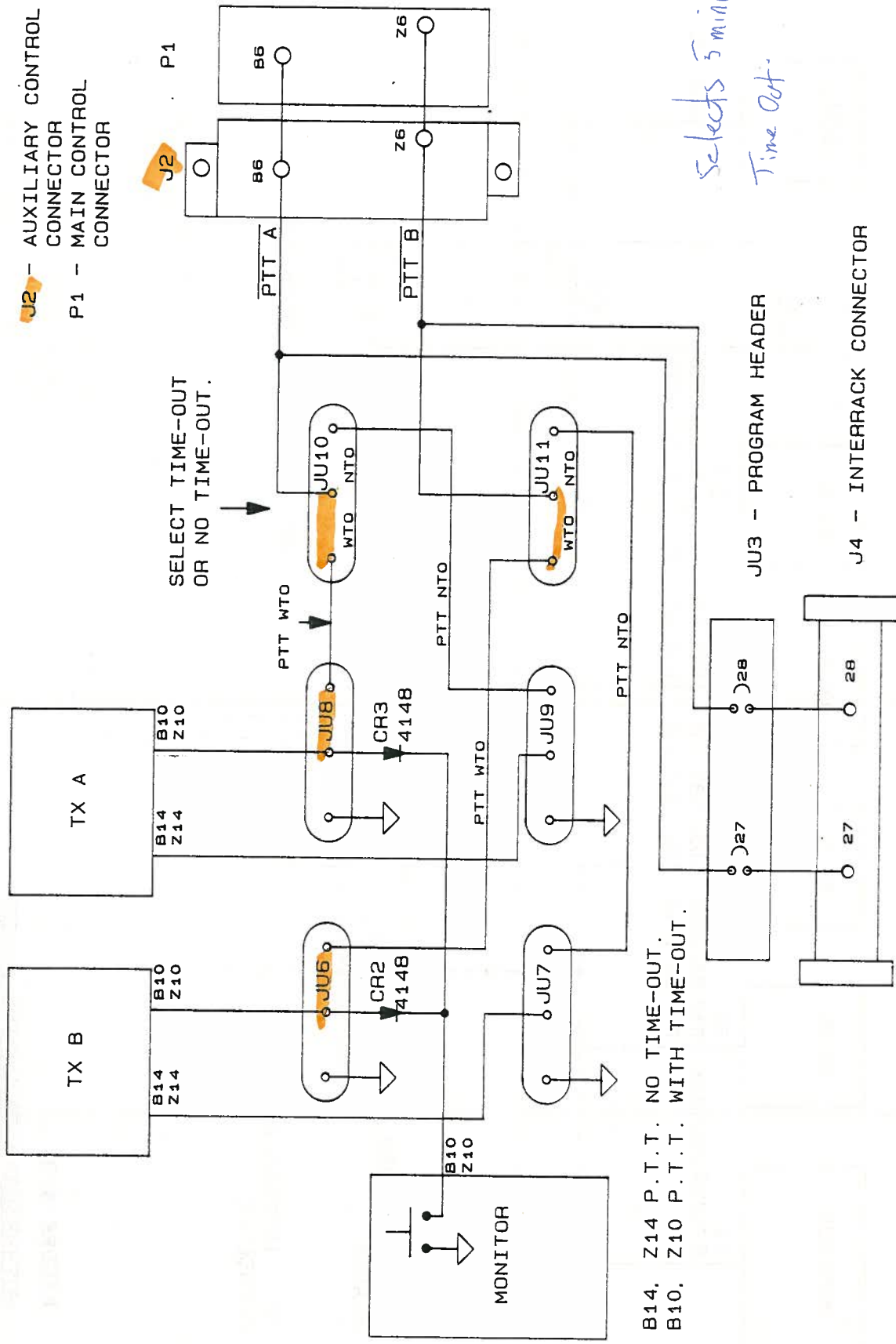


FIGURE 4-3
MOTHERBOARD GROUNDING SYSTEM



B14, Z14 P.T.T. NO TIME-OUT.
 B10, Z10 P.T.T. WITH TIME-OUT.

Figure 4-4
 COMBINED P.T.T.

MOTHERBOARD PUSH TO TALK (P.T.T.) JUMPER FUNCTIONS (REAR VIEW).

PTT Motherboard Layout
Figure 4-5

NO TIME-OUT GND, PTT B
PTT B TO CONTROL J7.

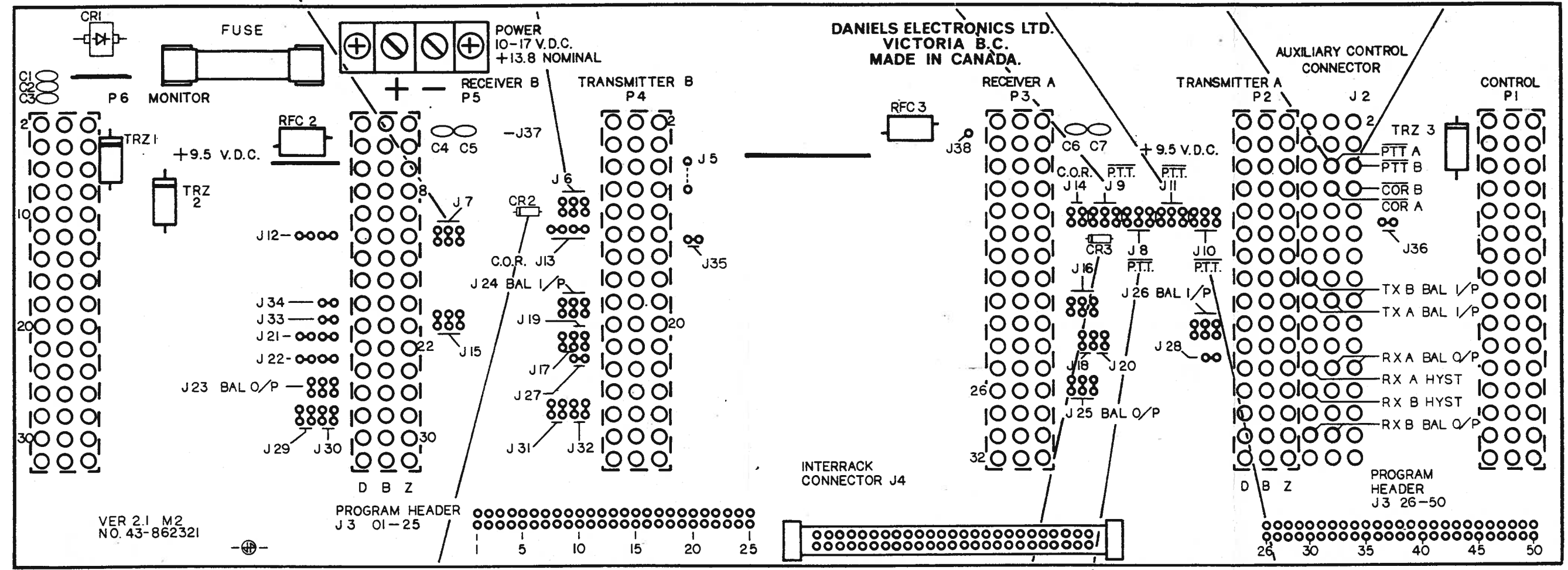
TIME-OUT GND, PTT B, PTT B
TO CONTROL J6.

J11. TIME-OUT, CONTROL BUSS, NO TIME-OUT,
(SELECTS PTT B WITH OR WITHOUT TIMER TO CONTROL CIRCUIT).

NO TIME-OUT GND, PTT A,
PTT A TO CONTROL J9.

PTT A CONTROL CONNECTION.

PTT B CONTROL CONNECTION.



PTT B ISOLATION DIODE TO
PTT MONITOR BUSS (MONITOR
RED PTT PUSH BUTTON).

PTT A ISOLATION DIODE TO
PTT MONITOR BUSS, (MONITOR
RED PTT PUSH BUTTON).

J8 TIME-OUT GND, PTTA,
PTT A TO CONTROL.

J10. TIME-OUT, CONTROL
BUSS, NO TIME-OUT (SELECTS
PTT A WITH OR WITHOUT TIMER
TO CONTROL CIRCUITRY).

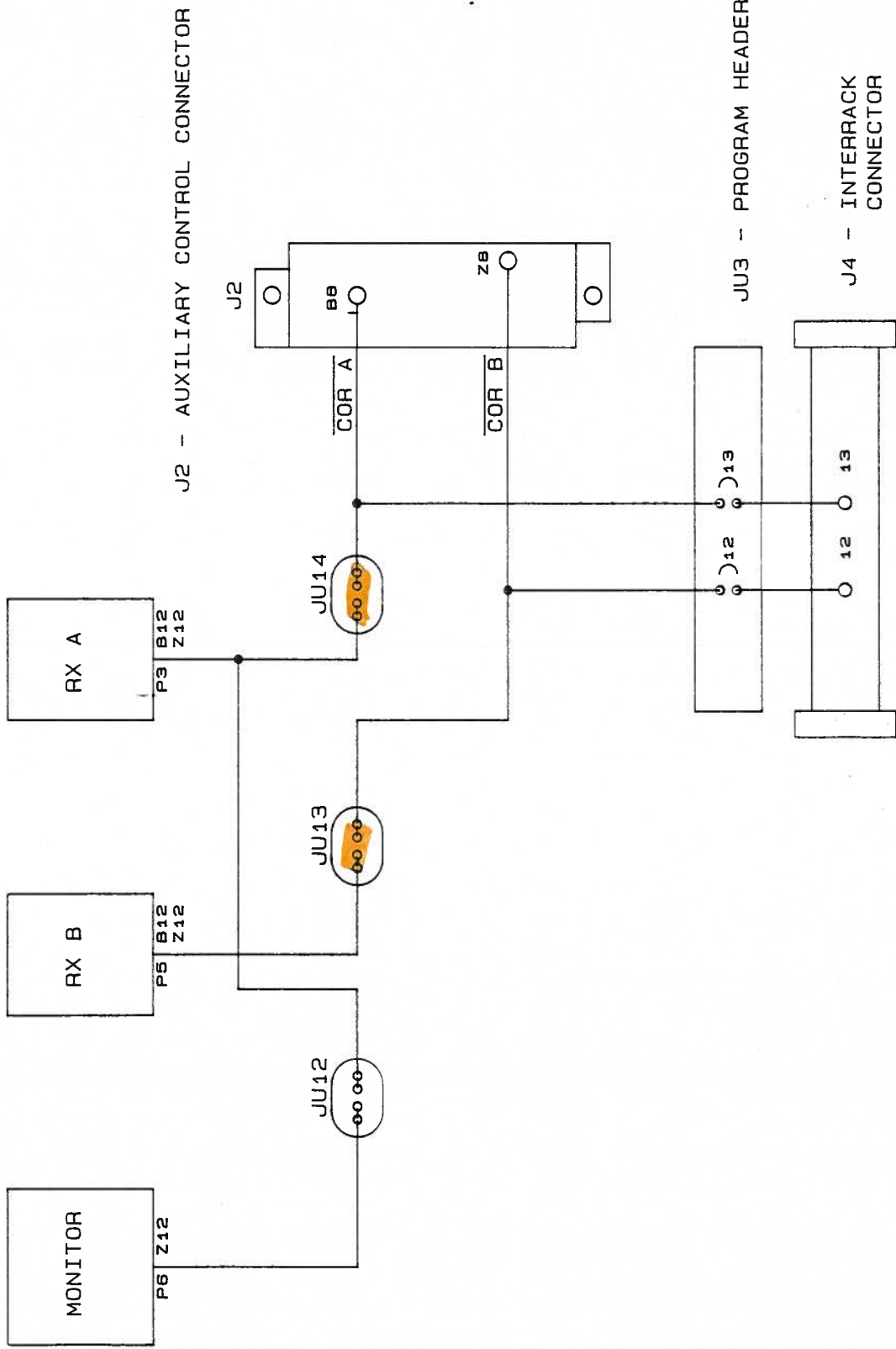
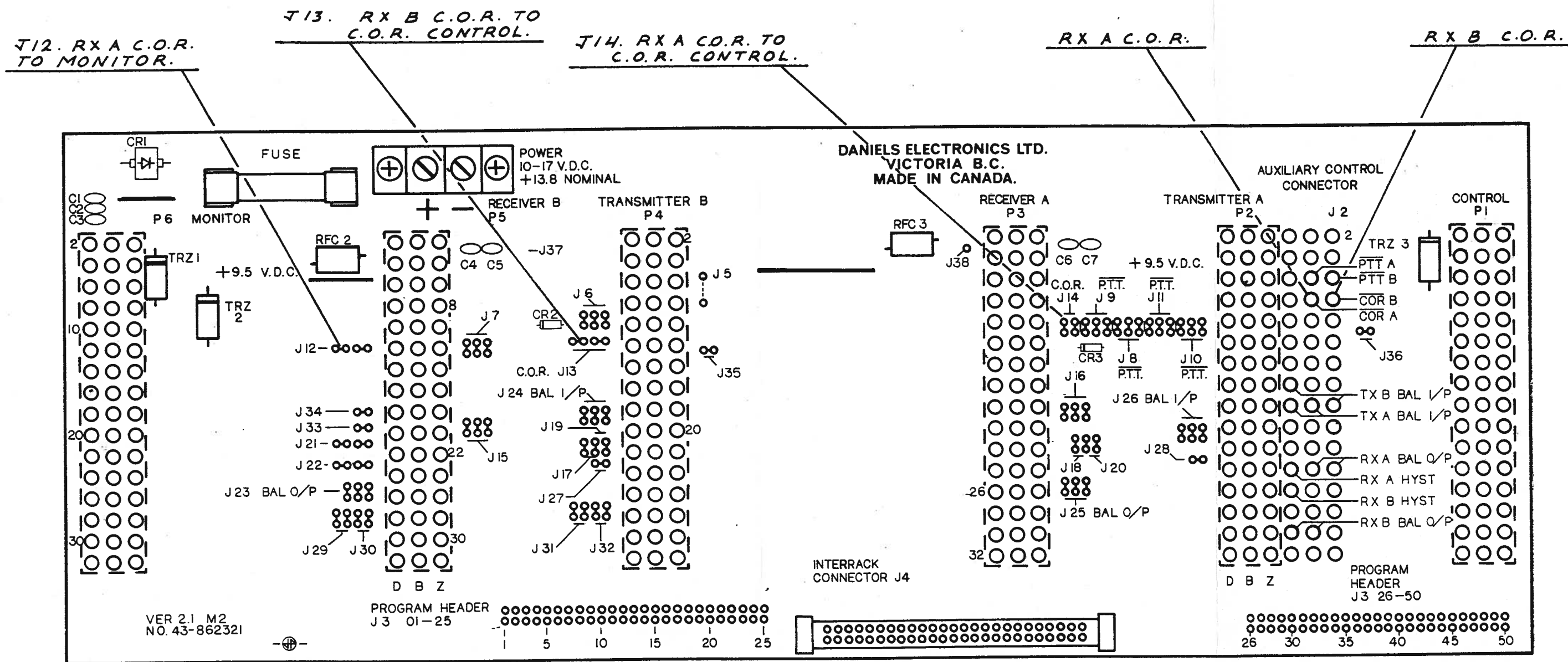


Figure 4-6
NON-ISOLATED COR PROGRAMMING

MOTHERBOARD CARRIER OPERATED RELAY (C.O.R.) JUMPER FUNCTIONS.
(REAR VIEW.)



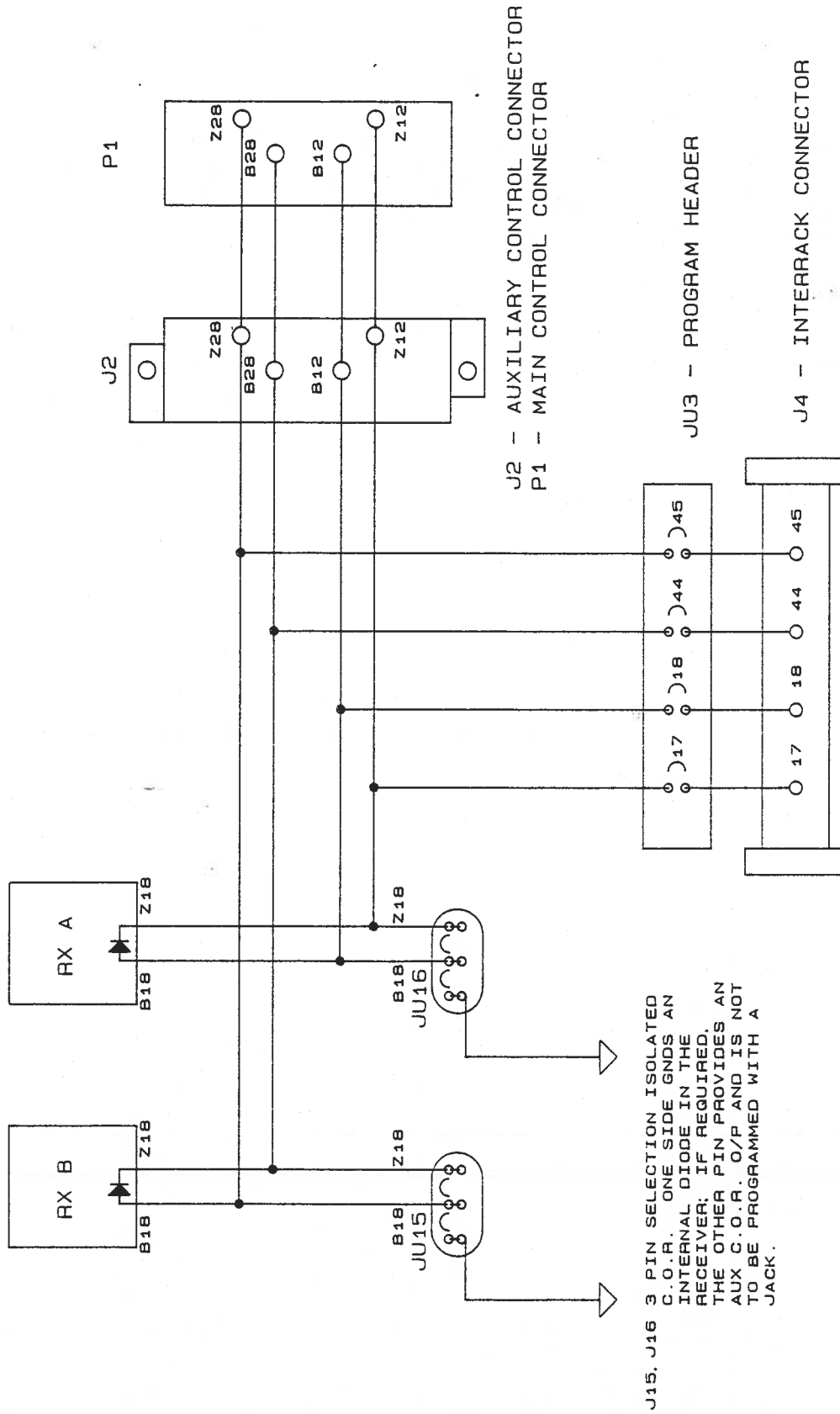
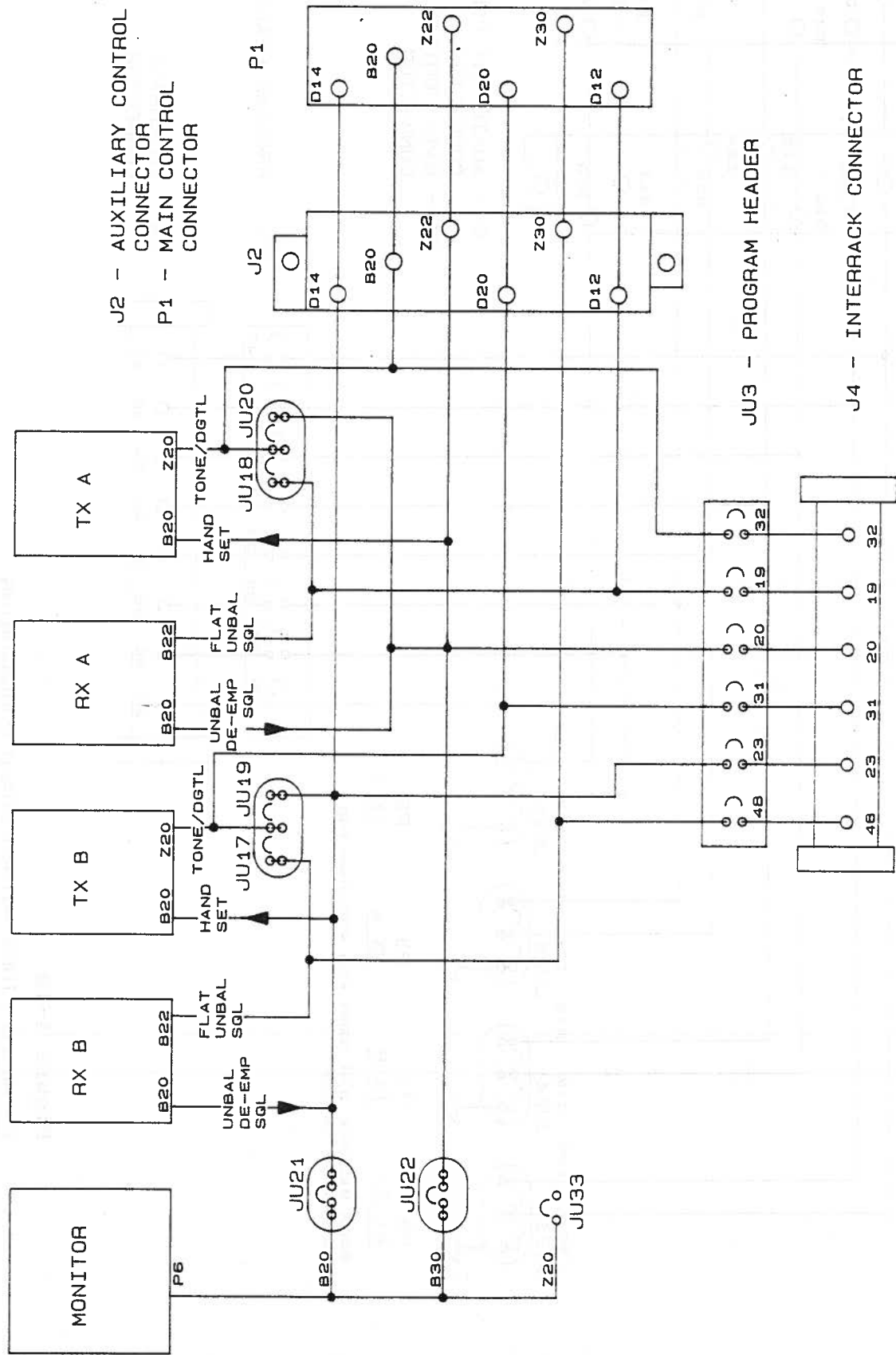


Figure 4-8
ISOLATED CARRIER OPERATED RELAY



J2 - AUXILIARY CONTROL CONNECTOR
P1 - MAIN CONTROL CONNECTOR

JU3 - PROGRAM HEADER

JU4 - INTERRACK CONNECTOR

Figure 4-9
FLAT/DE-EMPHASIS RX TO TX INTERCONNECT

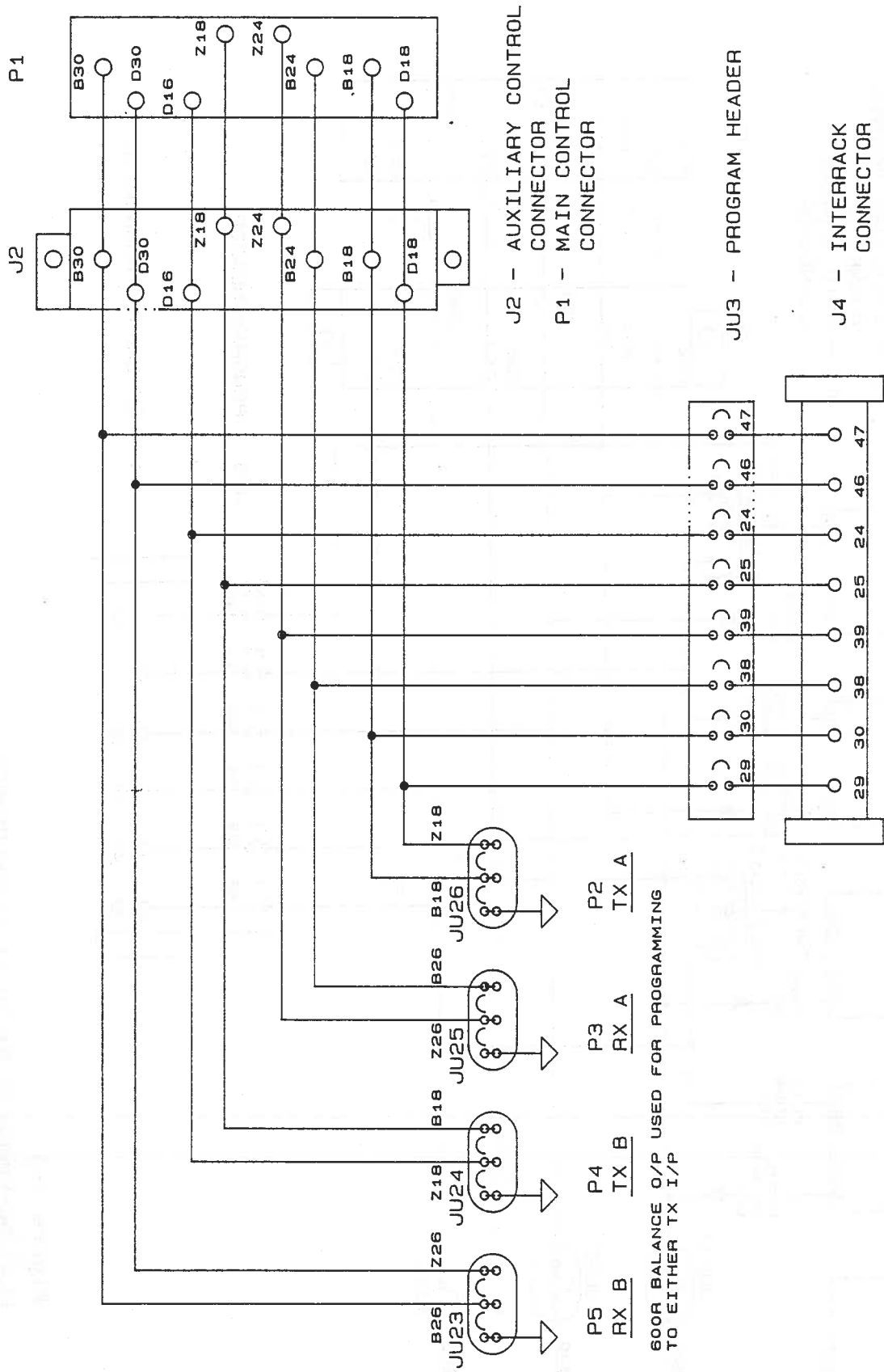
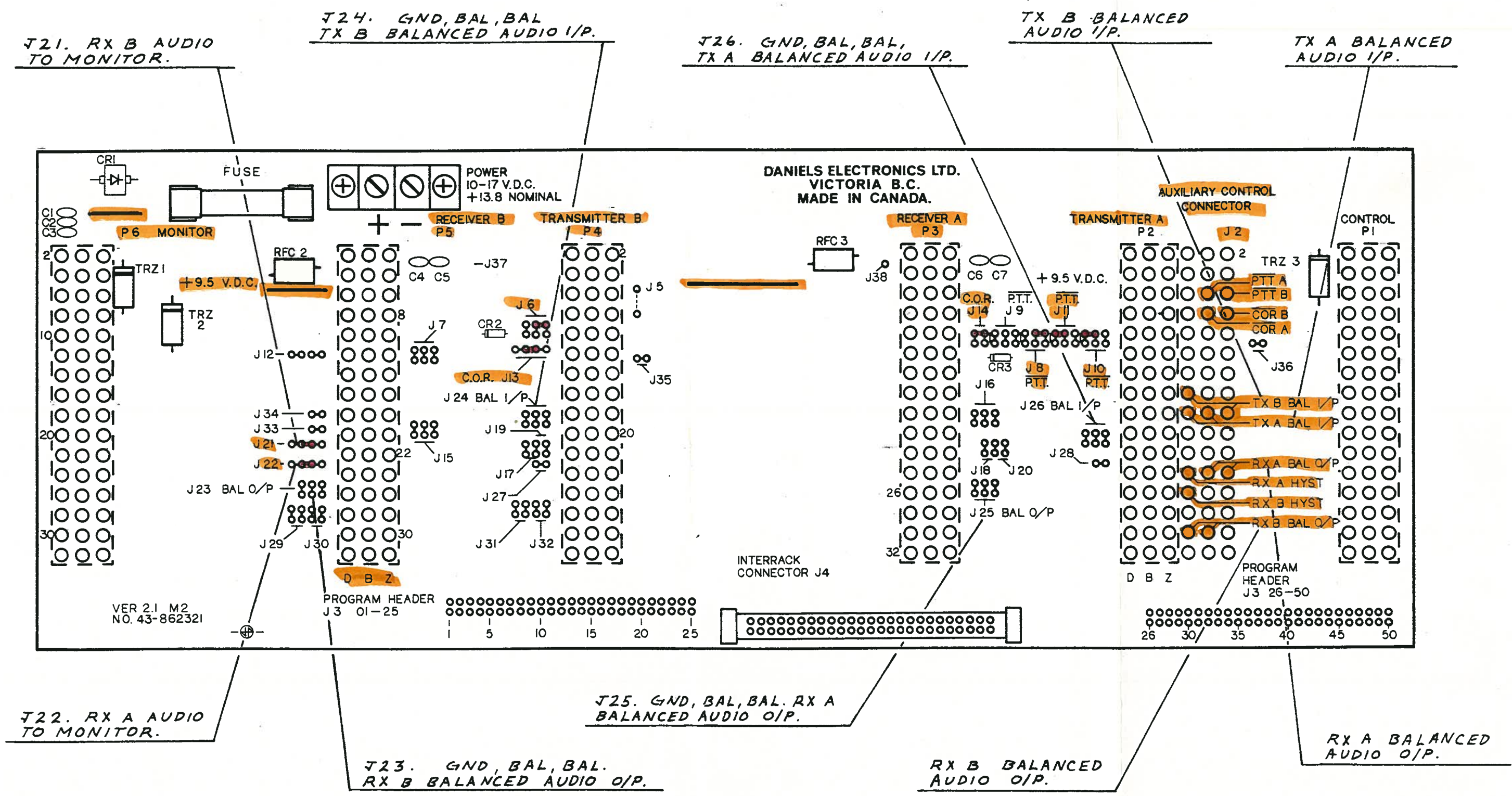


Figure 4-10
 BALANCED LINES MOTHER BOARD PROGRAMMING

MOTHERBOARD BALANCED AUDIO JUMPER FUNCTIONS (REAR VIEW).

Balanced Audio
Mother Board Layout
Figure 4-11



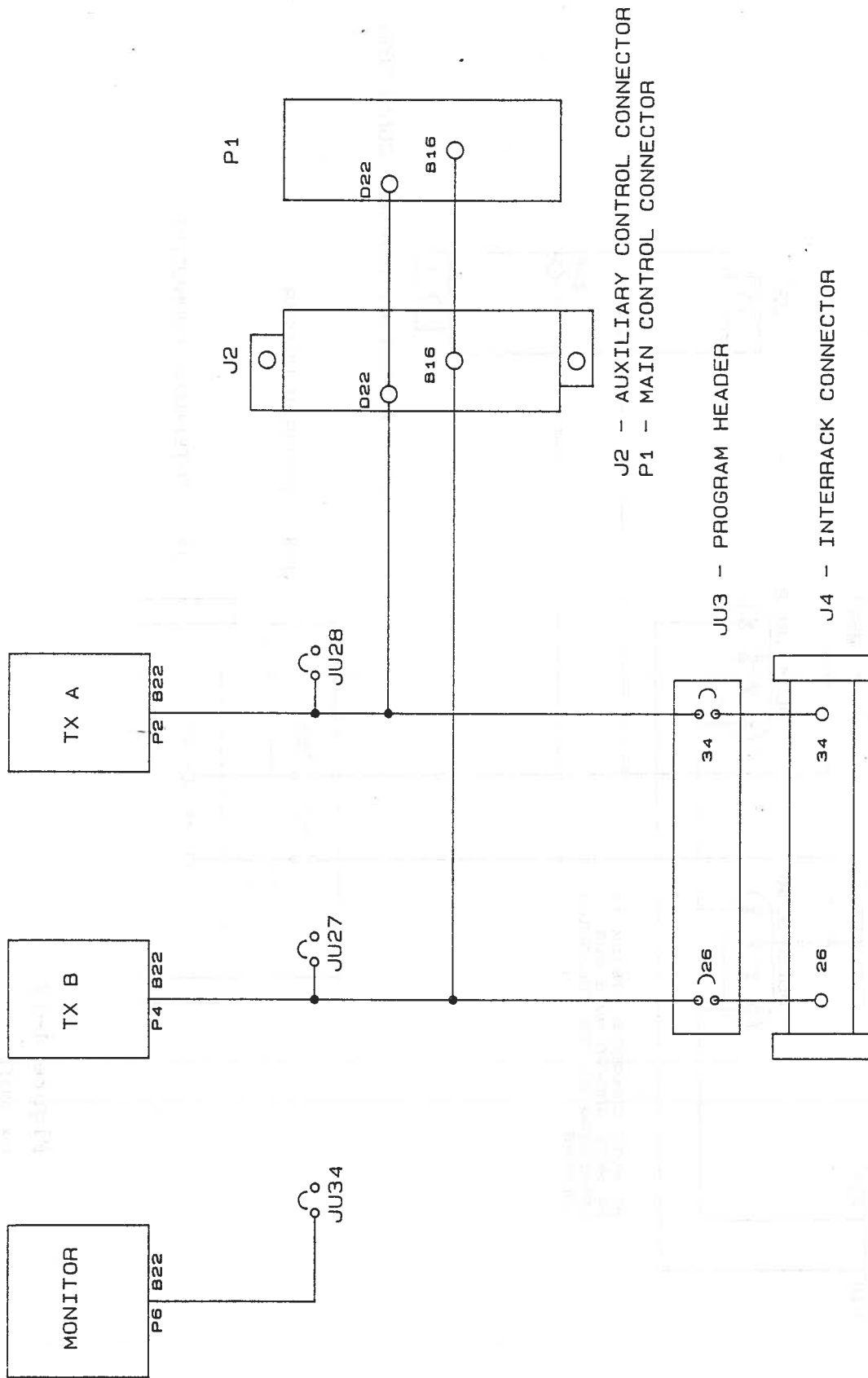


Figure 4-12
SUBTONE I/P PROGRAMMING

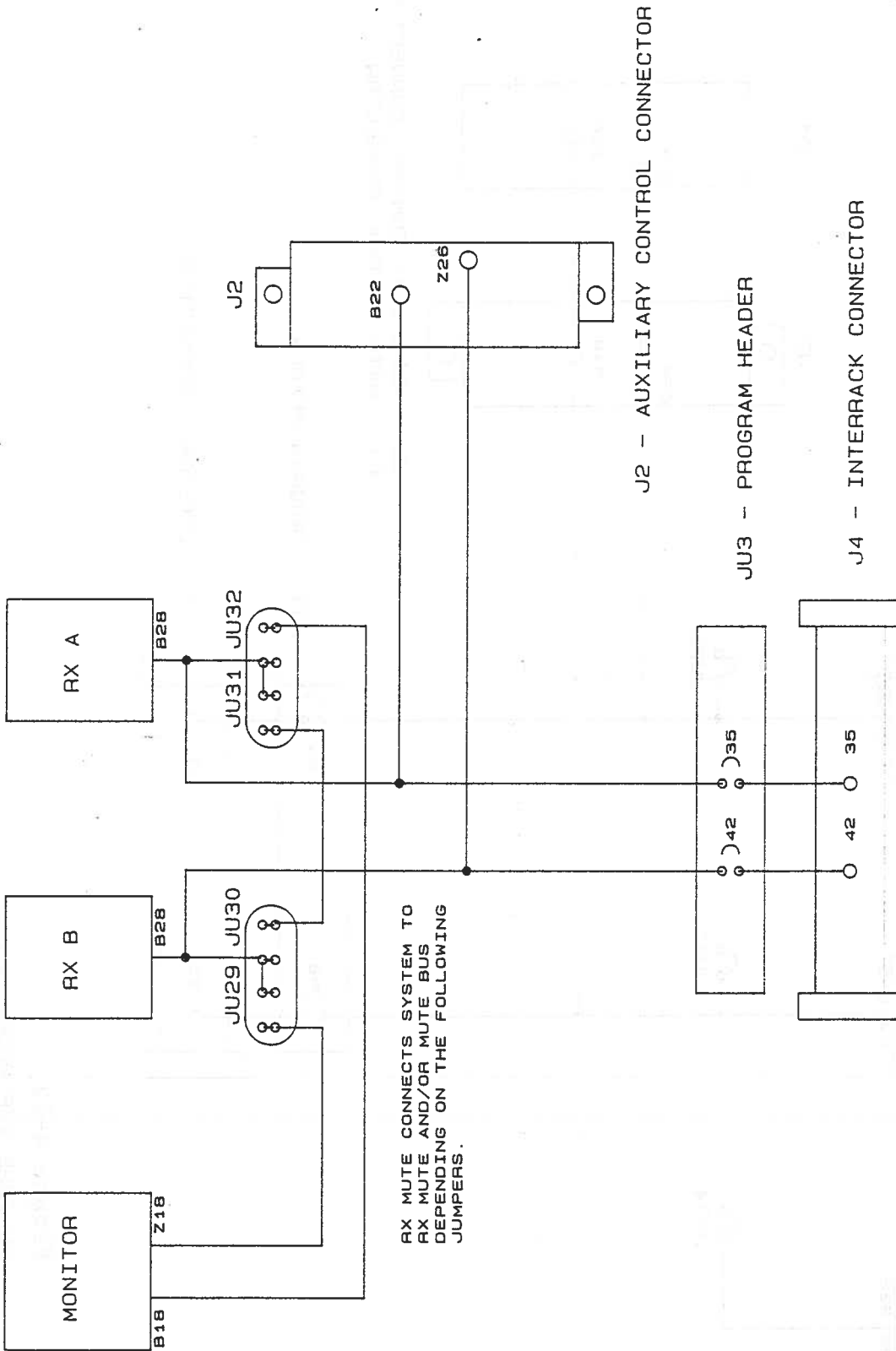


Figure 4-13
RX MUTE

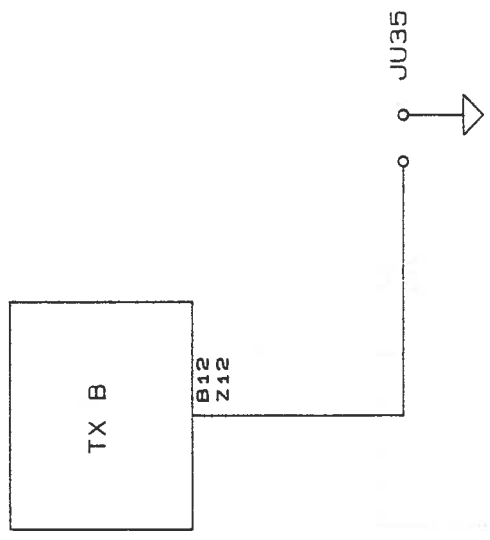
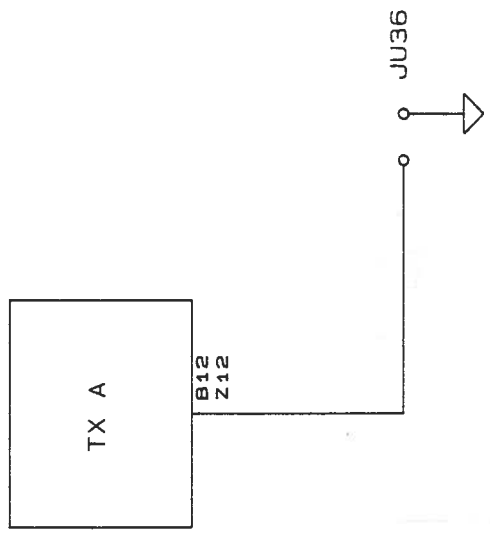


Figure 4-14
TRANSMITTER AUDIO ENABLE



Figure 4-15
RECEIVER AMPLIFIED AUDIO

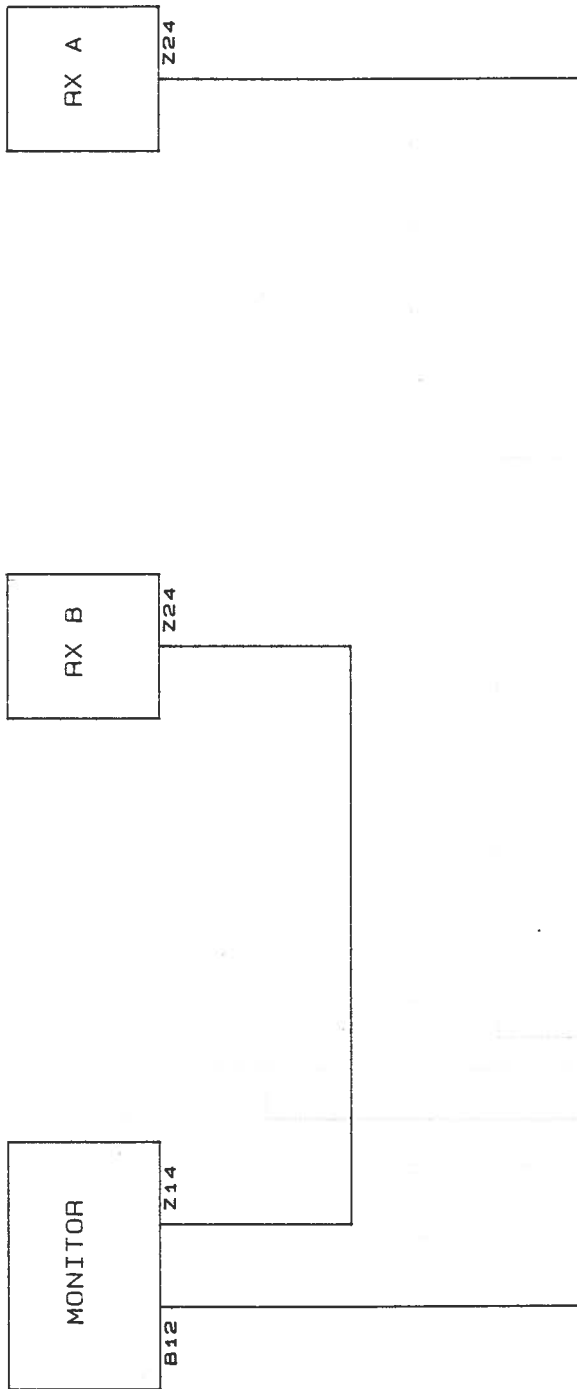


Figure 4-16
AFC MONITORING

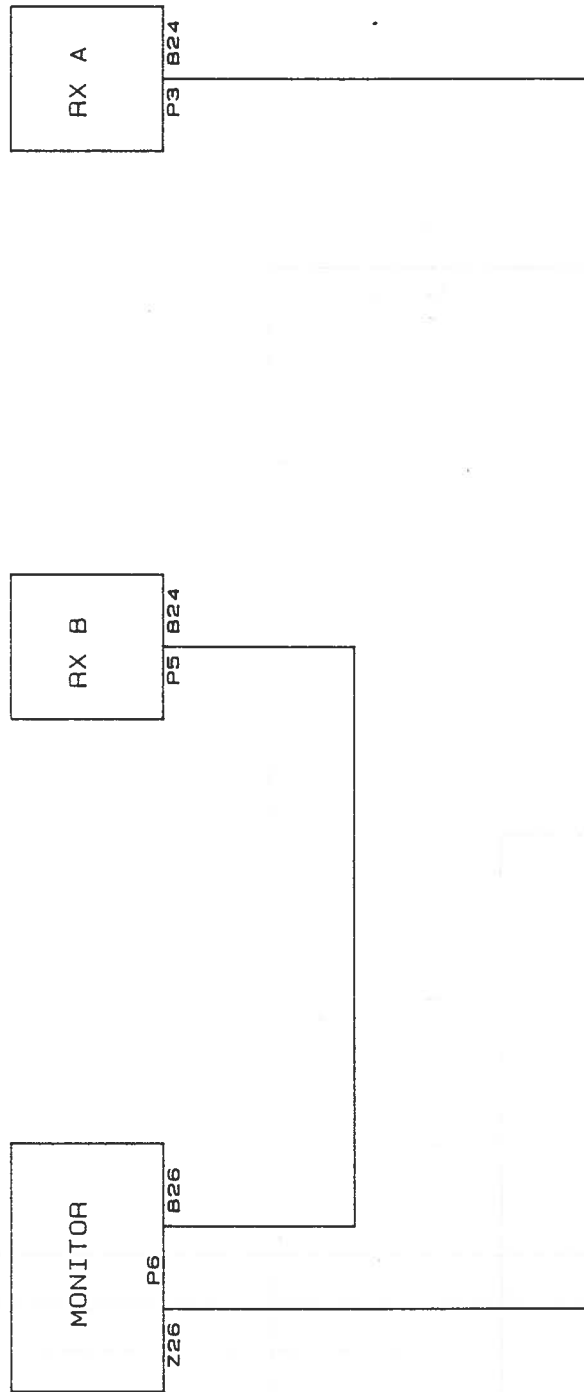
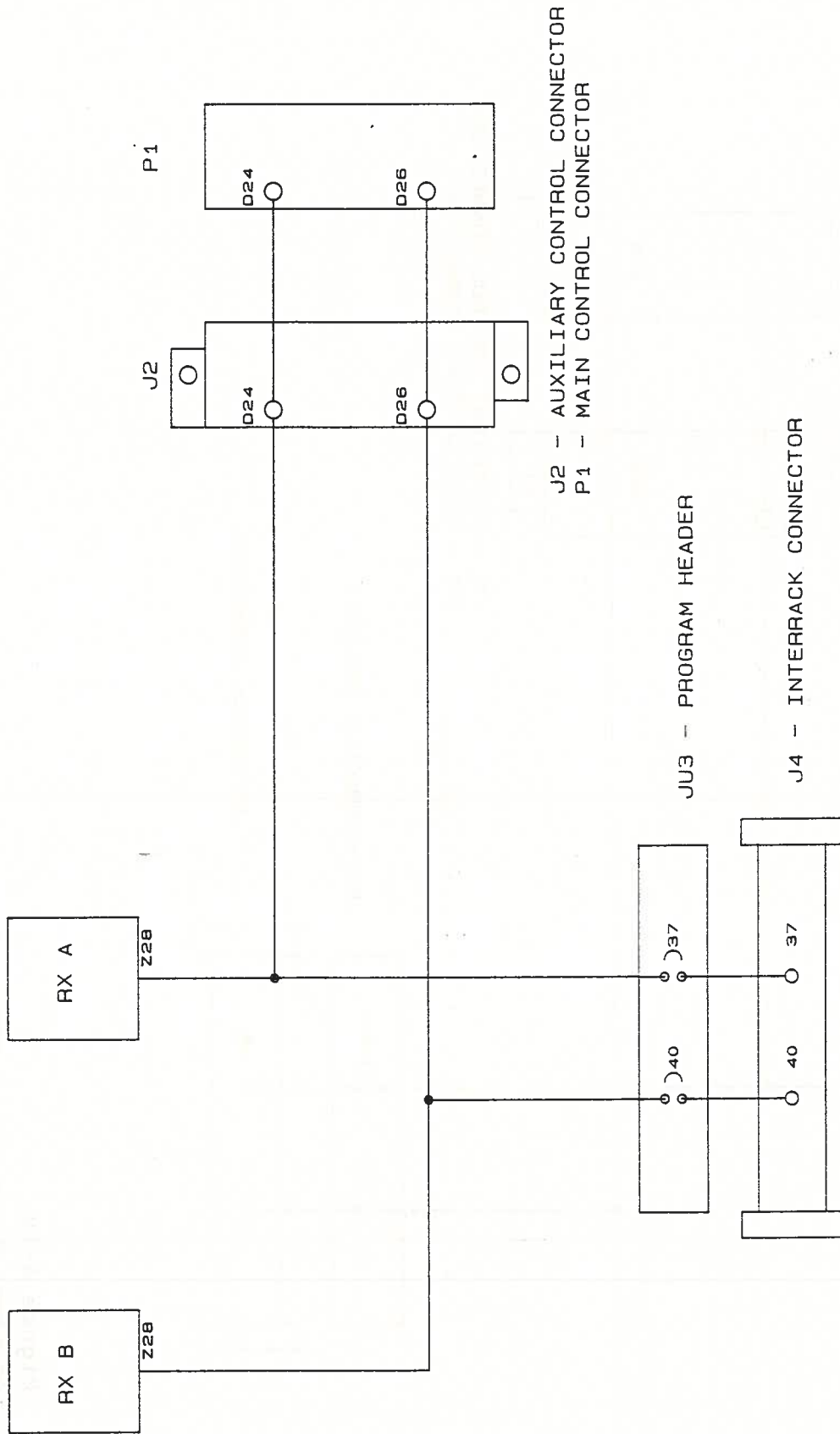


Figure 4-17
CARRIER STRENGTH MONITORING



J2 - AUXILIARY CONTROL CONNECTOR
 P1 - MAIN CONTROL CONNECTOR

Figure 4-18
 A/B HYSTERISIS

Used for Drops - Not Trends

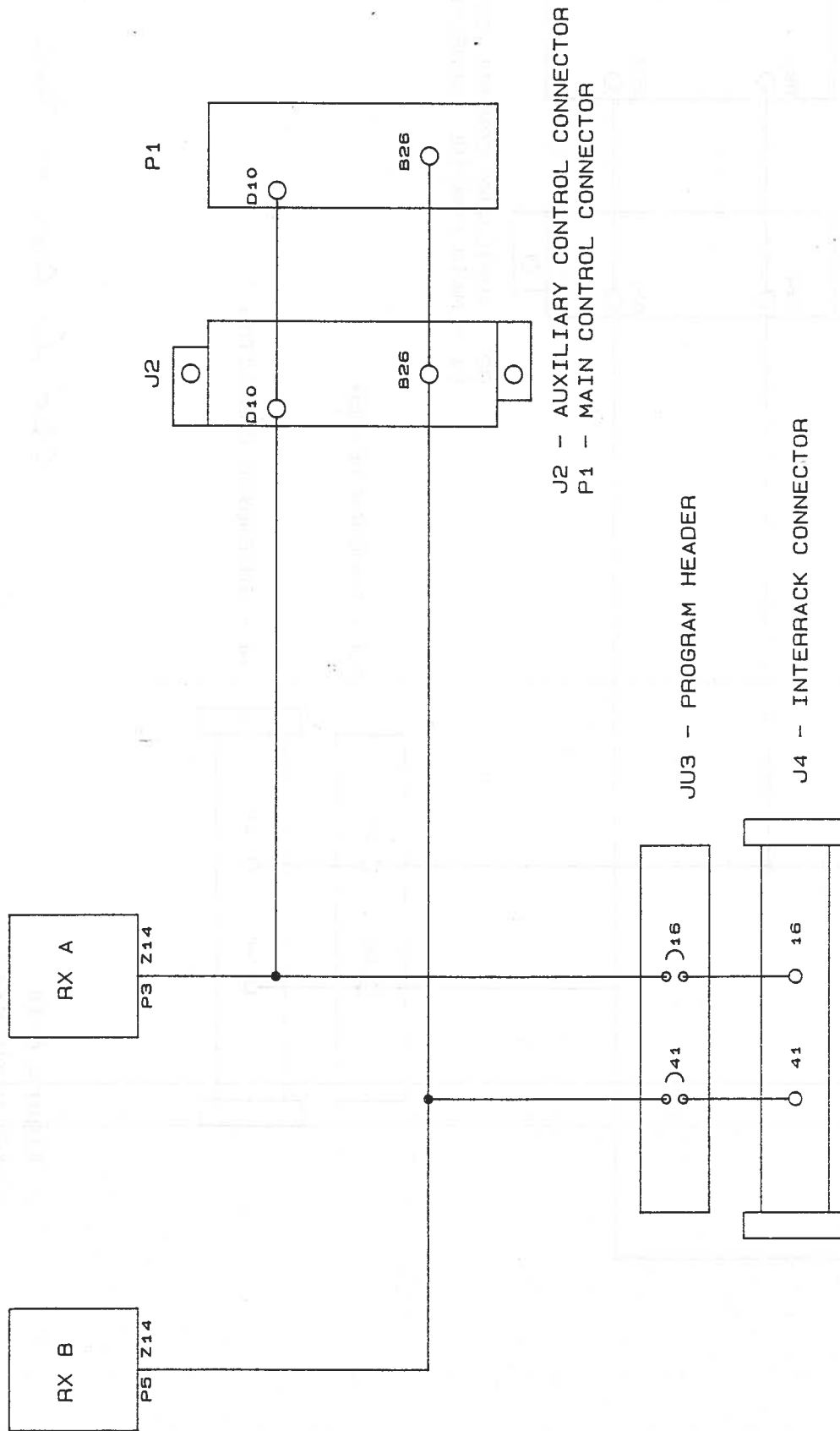
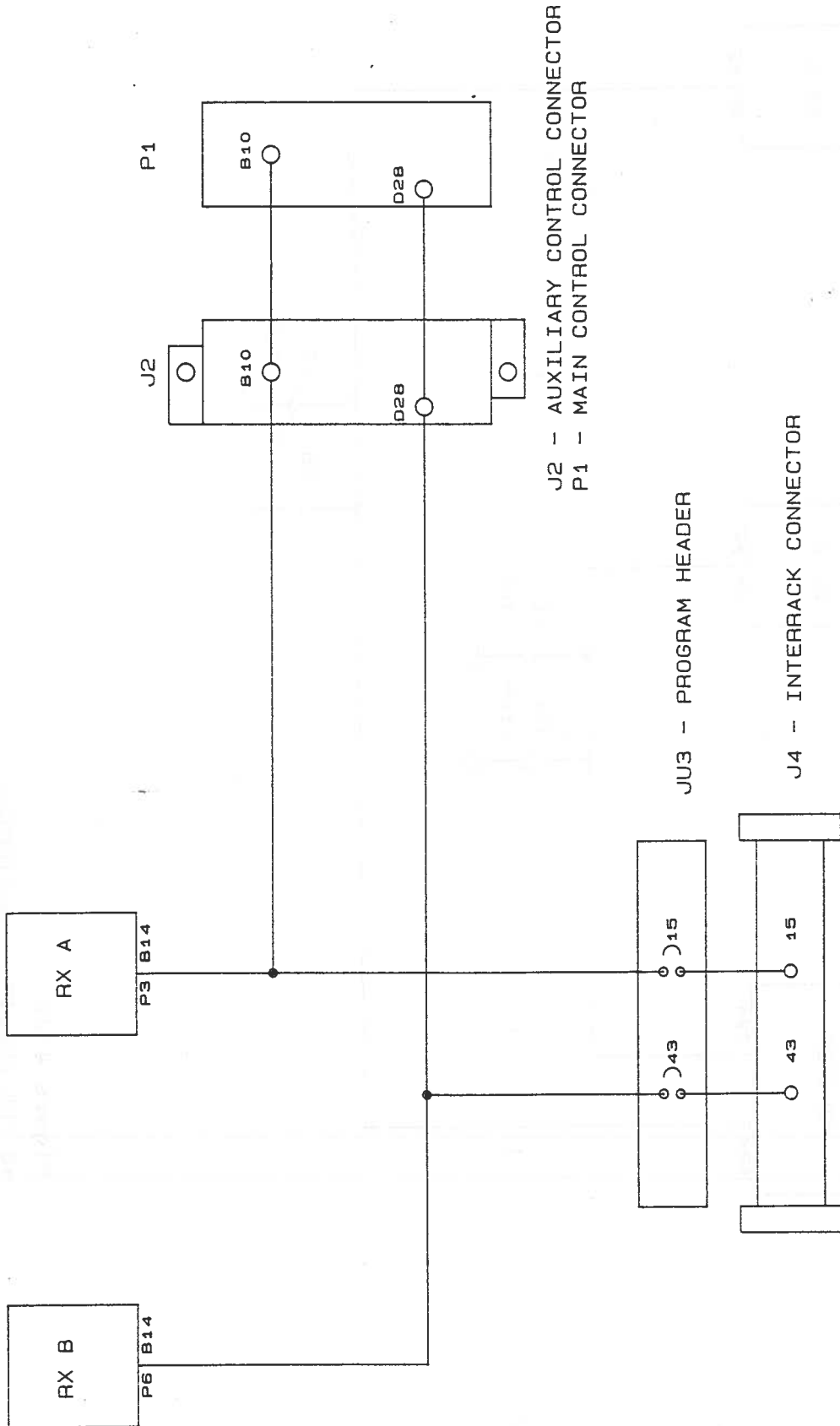


Figure 4-19
RECEIVER C.T.C.S.S. SWITCH



J2 - AUXILIARY CONTROL CONNECTOR
 P1 - MAIN CONTROL CONNECTOR

JU3 - PROGRAM HEADER

J4 - INTERRACK CONNECTOR

Figure 4-20
 RECEIVER A/B C.T.C.S.S. O/P

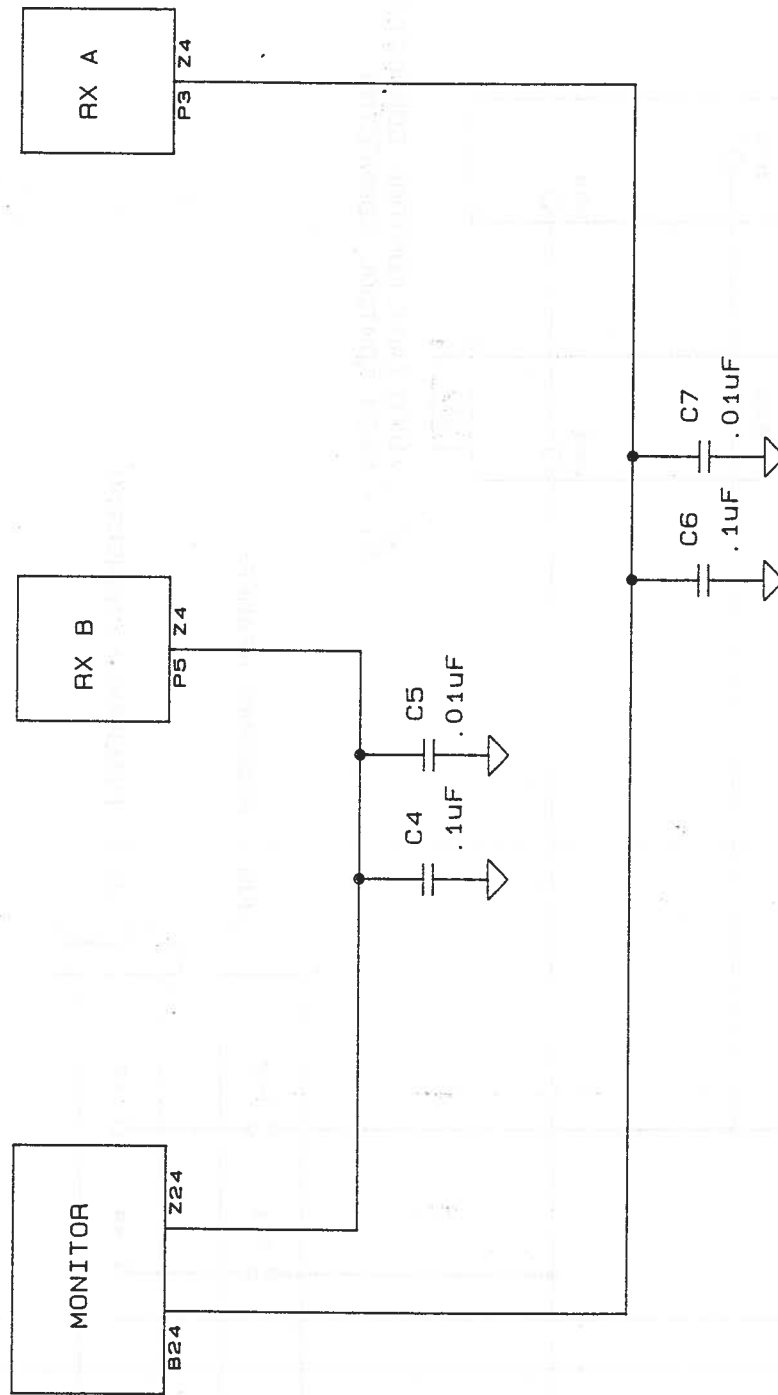
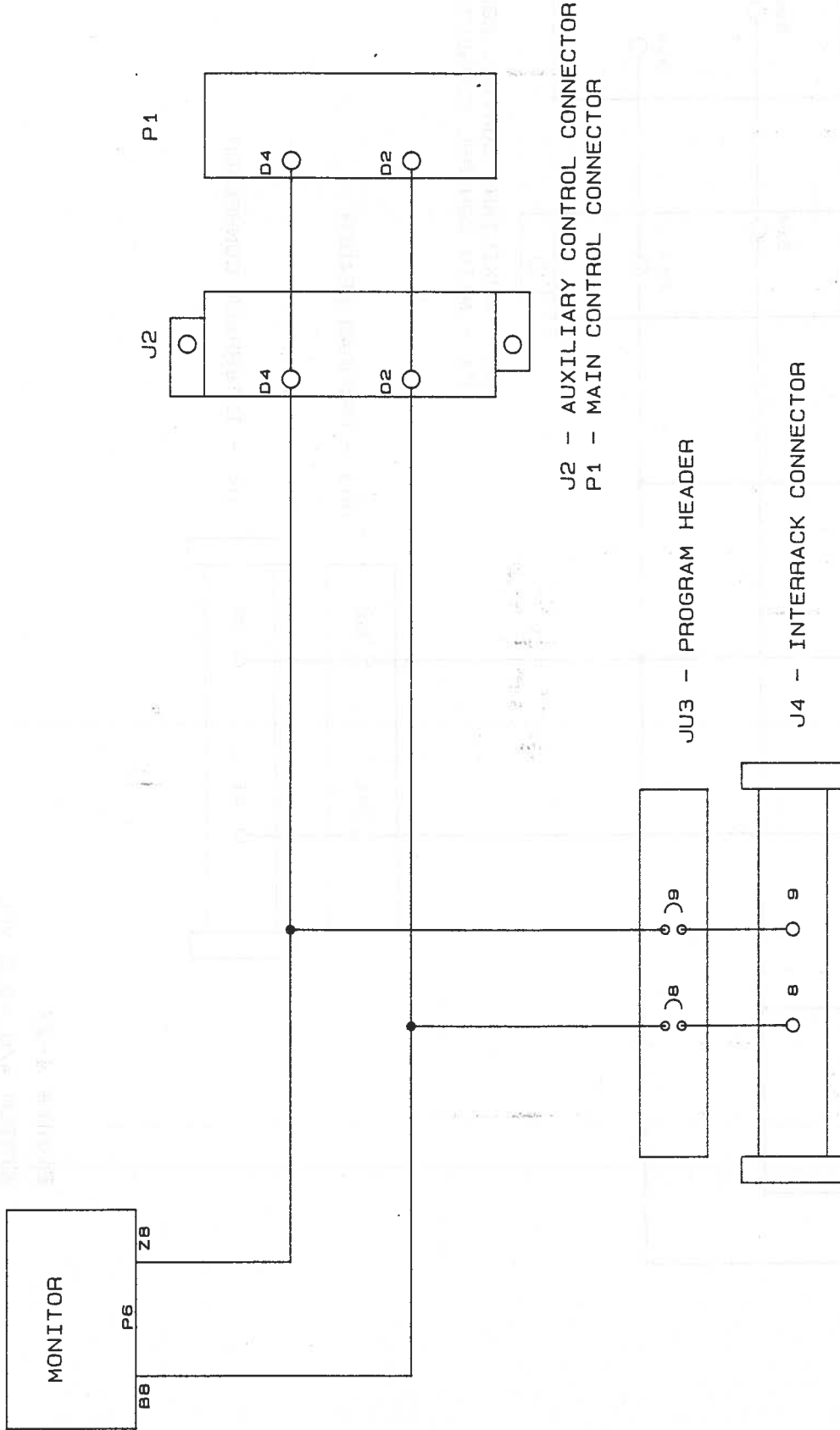


Figure 4-21
+6 VDC RECEIVER MONITORING



J2 - AUXILIARY CONTROL CONNECTOR
 P1 - MAIN CONTROL CONNECTOR

JU3 - PROGRAM HEADER

J4 - INTERRACK CONNECTOR

Figure 4-22
 VSWR SENSING

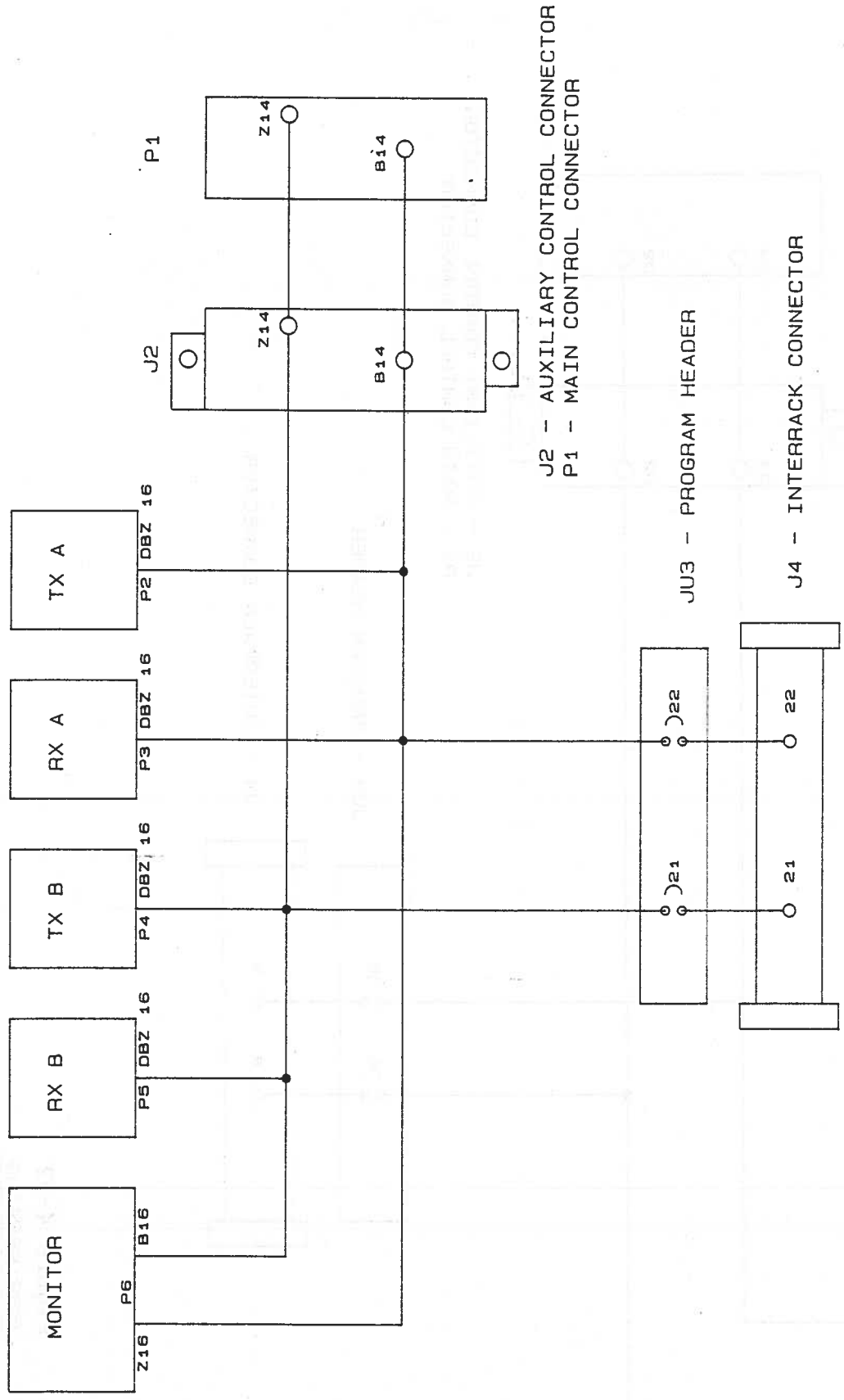
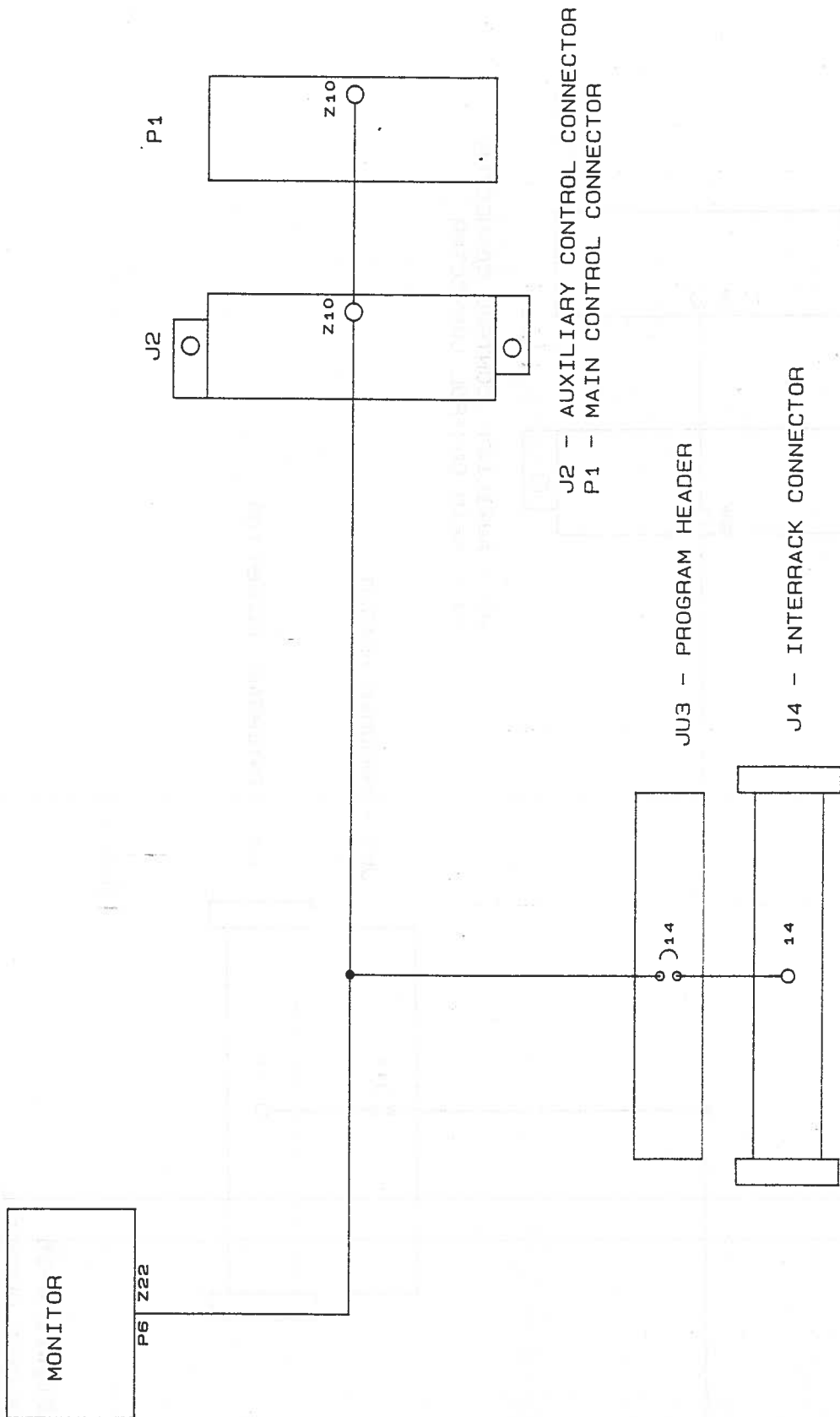


Figure 4-23
SYSTEM A/B +9.5 VDC

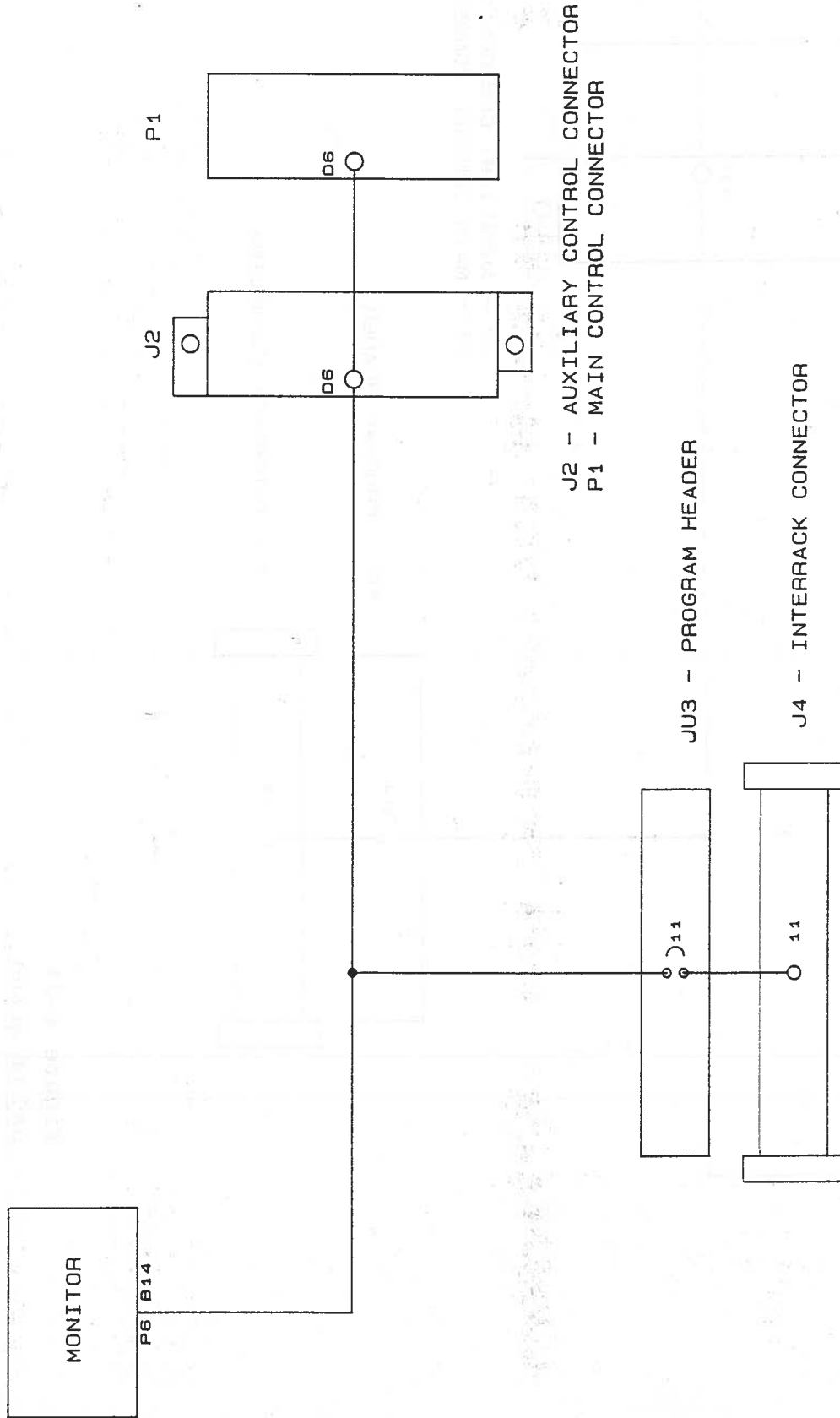


J2 - AUXILIARY CONTROL CONNECTOR
 P1 - MAIN CONTROL CONNECTOR

JU3 - PROGRAM HEADER

J4 - INTERRACK CONNECTOR

Figure 4-24
 BACKUP ALARM



J2 - AUXILIARY CONTROL CONNECTOR
P1 - MAIN CONTROL CONNECTOR

JU3 - PROGRAM HEADER

J4 - INTERRACK CONNECTOR

Figure 4-25
BACKUP OVERRIDE

PARTS LIST - INTERCONNECT/ MOTHERBOARD

Main Circuit Board Parts List

REF DESIG	DESCRIPTION	DANIELS PART NO.	QTY
C1	CAP, .1uF MONO 20% 100V	10-1042	3
C2	CAP, .01uF CER 80-20% 63V	05-1032	3
C3	CAP, .001uF MONO 10% 200V	10-1022	1
C4	CAP, .1uF MONO 20% 100V	10-1042	3
C5	CAP, .01uF CER 80-20% 63V	05-1032	3
C6	CAP, .1uF MONO 20% 100V	10-1042	3
C7	CAP, .01uF CER 80-20% 63V	05-1032	3
CRI	DIODE, MR751, VR=100V, 6.0A, 194-04 PLAS	60-0751	1
CR2	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
CR3	DIODE, 1N4148, SILCON, VR=75V	60-4148	2
J4	HEADER, 4 WALL, 50 CONT., MALE, PCB MTG.	19-5050	1
RFC2	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	2
RFC3	CHOKE, FERRITE, WIDE BAND 2.5 TURNS	30-0000	2
TRZ1	DIODE, 1N6378, TRANS.SUPP. 18V, CASE 41-11	60-6378	2
TRZ2	DIODE, 1N6375, TRANS.SUPP. 10V, CASE 41-11	60-6375	1
TRZ3	DIODE, 1N6378, TRANS.SUPP. 18V, CASE 41-11	60-6378	2
	PIN, SQUARE, 0.045", TIN PL.	19-2161	14
	CONNECTOR, 50 CONTACT, FEM, CENTRE KEY	19-5051	1
	HEADER, 2 PIN SINGLE ROW, GOLD PLATE	19-8012	7
	HEADER, 3 PIN, SINGLE ROW, GOLD PLATE	19-8013	12
	HEADER, 4 PIN, SINGLE ROW, GOLD PLATE	19-8014	2
	HEADER, 25 PIN-2 ROW, GOLD CON. TIN	19-8025	2
	FUSE, 10AMP (AGC) FAST BLOW	25-0010	1
	FUSE CLIP, PCB MTG., 1A1120-05	25-1010	2
	FRONT PANEL, BLANK, 14HP.	39-874210	1
	FRONT PANEL, BLANK, 7HP.	39-874310	1
	PLATE, FRONT COVER, SUBRACK HANDLE	39-874510	2
	PANEL, REAR, BOTTOM HINGED, 2.5mm ALUM.	39-874610	1
	SUBRACK, 19" COVER, TOP/BOTTOM	39-875010	2
	NUT, 4-40 HEX 1/4 x 3/32 SS	42-4401	2
	PCB, MOTHERBOARD	43-862321	1
	BACK PANEL FOR SUBRACK	58-0001	1
	HANDLE, SUBRACK, ALUM, U3	58-0002	2
	GUIDE RAIL, PLASTIC, 1 PCE.	58-1401	14
	SCREW, M2.5 x 12, CHEESE HEAD	58-2502	5
	SUBRACK, 3U/84HP, BASIC UNIT A ASSE	58-3084	1
	LEVER, LOCKING, SHELL CASE, 15mm	58-3202	2
	SHELL CASE, 15MM, FOR TYPE F CONN.	58-3204	1
	CONNECTOR, TYPE F 32, FEM, 4.5mm SLDR PIN	58-3250	6
	CONNECTOR, TYPE F, 48, MALE, 3.5mm SLDR. PIN	58-4800	1
	CONNECTOR, TYPE F, 48, FEM, CLSD.SOLD.LU	58-4850	1
	SCREW, M5 x 12 C/SK, ZINC PLATE	58-5002	4
	SOCKET HEAD SCREW, M5 X 12	58-5003	4
	STANDOFF, 0.114 CLEAR, SWAGE, 5/16L, 3/16od	67-2500	6

PRESS NUT, KNURLED, 8-32 THREAD	67-8005	2
TERM. STRIP, 2 SLOT SCREW TERM.	72-2000	1
TUBING, TEFLON, 16AWG, THIN WALL	76-0016	1
WASHER, LOCKING, INTERNAL TOOTH, #4	77-4002	2
BUS, #16 TINNED COPPER	80-1600	3
CABLE, RIBBON, 50 COND, GND PLANE, 2.75"	83-0050	1
CABLE, PVC, 22AWG, 8 FEET	83-8488	1