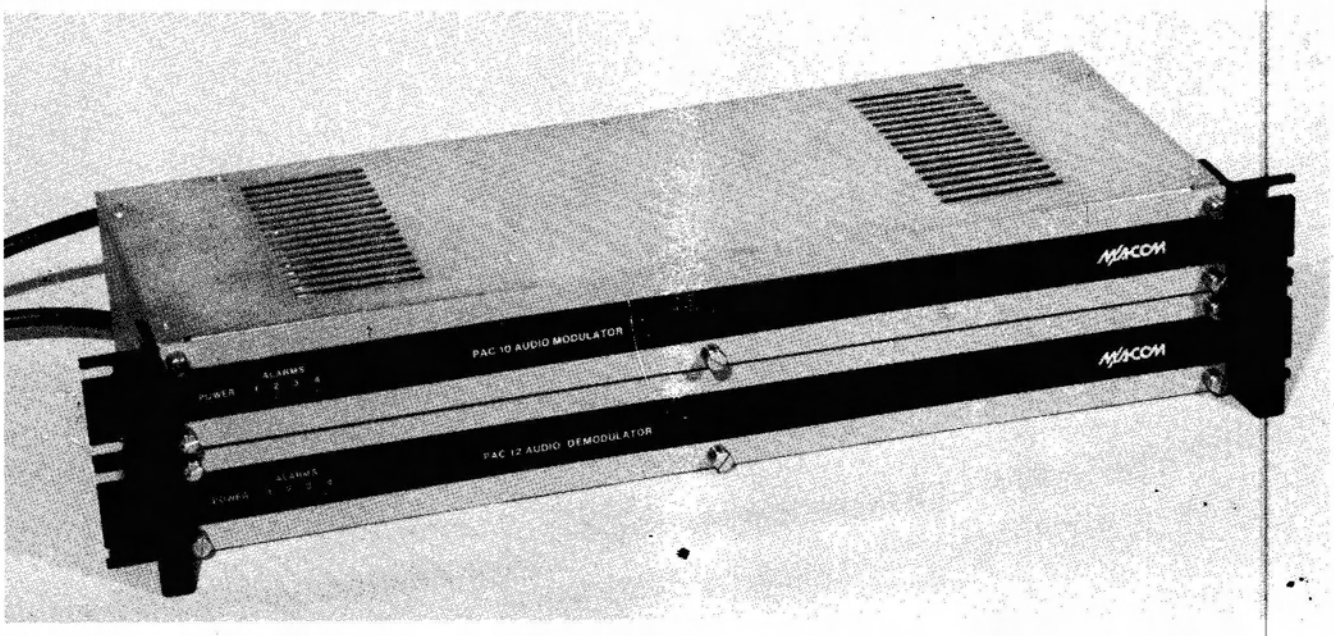
IM 808842

PAC-10/PAC-12



INSTALLATION AND OPERATION MANUAL

MACOM

SECTION 1
EQUIPMENT DESCRIPTION

INTRODUCTION

M/A-COM's PAC-10/12 Program Audio Channel System (Figure 1-1) provides wideband microwave relay systems with the capability of carrying high quality, multiple subcarriers above the baseband signal using subcarrier multiplexing techniques. This equipment is a cost-effective means of transmitting monaural or stereo programming or data channels with excellent signal-to-noise characteristics. The "slimline" PAC-10 Subcarrier Modulator and PAC-12 Subcarrier Demodulator units provide up to four high quality FM subcarrier channels while occupying a single rack space at each end of the link. The removable front panel provides ready access to internal components for servicing needs. Plug-in circuit cards allow for easy expansion to meet future requirements. No equipment modifications are necessary for this purpose. The PAC-10 Subcarrier Modulator and PAC-12 Subcarrier Demodulator units operate on their own internal 120 Vac Power Supplies. Optional power sources are 230 Vac, −24 Vdc, −48 Vdc, or an external ±12 Vdc supply. The PAC-10/PAC-12 System comes equipped with a carrier alarm detector. Subcarrier faults are locally annunciated by four subcarrier alarm LED's mounted on the front panel. Summary alarm dual interface Form-C contacts are available for supervisory use at a rear panel connector.

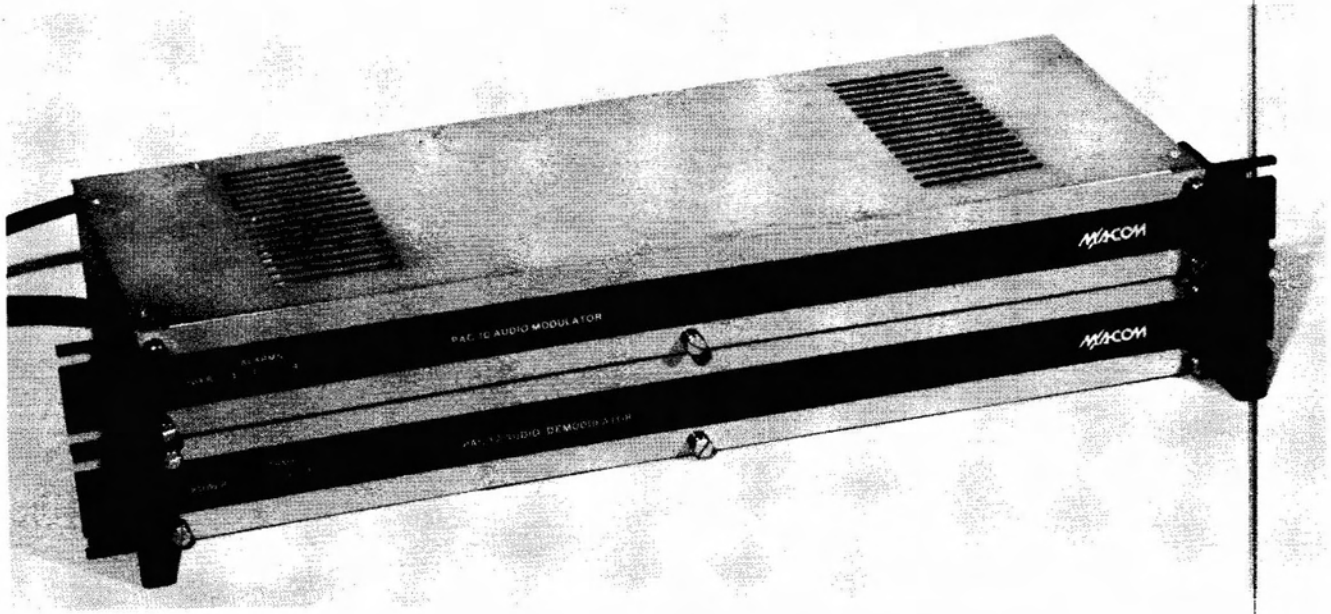


Figure 1-1. PAC-10 Subcarrier Modulator/PAC-12 Subcarrier Demodulator

SPECIFICATIONS

GENERAL

Subcarrier Frequencies	
Domestic	4.83, 5.2, 5.8, 6.2, 6.8, 7.5, and 8.3 MHz
CCIR	7.023, 7.5, 8.065, 8.3, and 8.59 MHz
Alarm	
Fault	loss of subcarrier or prime power
Indication	front panel LED 1-4
Output	Form C Contact – all connections available

ENVIRONMENTAL CONDITIONS

Ambient Temperature	
Operational	−30 to +55°C
Meets All Specs	+10 to +40°C
Relative Humidity	0 to 95% (+10 to +40°C)

PHYSICAL CHARACTERISTICS

Size	1.75" (h) x 19" (w) x 7.5" (d) (4.5 x 4.8 x 1.9 cm)
Weight	7 lbs. (3.2 kg)

PRIMARY POWER

AC Model	
Standard	120 Vac
Optional	220 Vac
DC Model (For 4 Channel Operation)	
+12 Vdc	350 mA
−12 Vdc	150 mA

SYSTEM PERFORMANCE*

Frequency Response (Ref 1 kHz @ 20 dB below TT)	
40 Hz to 100 Hz	+0.5 dB, −1.0 dB
100 Hz to 7.5 kHz	±0.5 dB
7.5 kHz to 15 kHz	+0.5 dB, −1.5 dB
Distortion (THD)	
@ 75 kHz Deviation**	less than 1%
Signal-to-Noise Ratio	
(Ref to 75 kHz TT Level)	70 dB

PAC-10 MODULATOR

Audio Levels	
Input Level (@ 75 kHz Deviation)***	+8 dBm (1 kHz TT)
Impedance	600 ohm balanced
Return Loss	26 dB
Pre-Emphasis (Can be strapped flat.)	
Standard	75 μs
Optional	50 μs
RF Subcarrier Output	
Modulation	FM
Level (P-P)	100 mV, nominal
Adjustable (P-P)	50 to 150 mV
Impedance	High Z Bridging, approximately 1.5K
Deviation (1 kHz TT)	75 kHz

PAC-12 DEMODULATOR

Audio Levels	
Output Level (@ 75 kHz Deviation)***	+8 dBm (1 kHz TT)
Adjustment Range	0 to +8 dB above TT level
Impedance	600 ohm balanced or strappable to less than 50 ohms
Return Loss	26 dB
RF Subcarrier Input	
Level (P-P)	50 to 150 mV
Impedance	High Z Bridging, approximately 1K

All specifications are subject to change without notice.

*All specifications meet or exceed RS-250B and CCIR standards.

**System design allows for 10 dB peak operation above this value.

***System levels are factory preset for +8 dBm input/output. Levels between 0 and +18 dBm input or output can be specified.

SECTION 2
THEORY OF OPERATION

PAC-10 SUBCARRIER MODULATOR

The "slimline" PAC-10 Modulator has a capacity of up to four audio program channels. A Subcarrier Modulator plug-in board operating on a preset subcarrier frequency is installed for each channel. A functional block diagram of the PAC-10 Subcarrier Modulator card is given in Figure 2-1.

The audio program input to each Modulator is received via its respective connector on the rear panel of the unit and fed to pins 1 and 2 of the card-edge connector. The input stage of each Modulator contains a resistor balanced bridge. Variable resistor R5 sets the FM deviation of the VCO to 75 KHz peak for a 1 KHz, +8 dBm test tone. The Modulator can be adjusted to accept a wide range of input levels (−3 to +18 dBm) because input stage overload problems are eliminated by placing the deviation control (R5) electrically before amplification. The voltage across R5 is differentially preamplified by U1A improving common mode rejection of the module.

The signal is sent to a Pre-Emphasis Network formed by R10, C6, and R26 in parallel with R31 which has a time constant of 75 μs (optionally 50 μs). The pre-emphasis disable jumper plug, W1, is normally installed between E1 and E2 (pre-emphasis enabled); when installed between E1 and E3 pre-emphasis is disabled and the response is "flat". In the "flat" configuration, the modulation sensitivity at all audio frequencies is the same as at 1 KHz when pre-emphasis is enabled.

A second audio preamplifier stage formed by U1B compensates for the high insertion loss of the RC Pre-Emphasis Network. The output of U1B is developed across a 1K ohm resistor and coupled to the VCO tuning varactor CR1. Capacitor C8 supplies an RF short for the varactor but is open at audio frequencies.

VCO U2 is an ECL integrated circuit oscillator that generates the subcarrier frequency. The frequency is established by C12, L3, and varactor CR1 acting as a tuned circuit. The audio modulation signal impressed on varactor CR1 controls deviation of the subcarrier, while a slowly varying error voltage from the phase-lock loop filter is also applied to the varactor and holds the average frequency constant at the subcarrier center frequency. Variable inductor L3 fine tunes the VCO linearity for minimum distortion. The output from pin 3 of U2 is a squarewave with an approximate amplitude of 0.9 to 1.0V peak-to-peak.

The VCO is maintained on the assigned subcarrier frequency by phase-locked loop frequency synthesizer U3, a single CMOS integrated circuit containing two frequency dividers, a crystal reference oscillator, and a phase detector. Part of the VCO output, from pin 3 of U2, is coupled to the PLL where it is divided by a factor of 400 and fed to the phase detector. The other input to the phase detector originates in an internal crystal reference oscillator that is divided by a factor of 1024. These two 17 KHz signals are compared by the phase detector to produce an error voltage. The resulting error voltage is passed thru the loop filter formed by R13, R14, R15, C9, and C10 and fed back to the VCO to provide any required frequency correction.

The FM subcarrier output of the VCO is fed through the subcarrier level control R25 to a tuned subcarrier amplifier Q1. This control is accessible on the front edge of the module and allows adjustment of the subcarrier level from 50 to 150 mV peak-to-peak. Amplifier Q1 amplifies and filters the signal. Higher order harmonics present in the squarewave VCO output are removed and the output becomes sinusoidal. Inductor L4 adjusts the resonant frequency of the tank circuit. The output is connected through R24 to the backplane buss via pin 15 of the card-edge connector. The subcarrier output is high impedance for easy bridging on the video line through the rear BB OUT connector.

Part of subcarrier amplifier's Q1's output is amplified by alarm detector amplifier Q2 to increase the signal level prior to detection and to isolate any harmonics due to detection from the output. Diodes CR3 and CR4 form a voltage doubling detector whose ouptut is filtered by C32, C33, and R36 producing a dc voltage that is proportional to the subcarrier level. This voltage is fed to one input of alarm comparator U5 where it is compared with a preset threshold set by R40. When the subcarrier output level is above the threshold, the output of U5 is −12V. If the level drops below the threshold, the output of U5 switches to 0V. The comparator output is routed via pin 10 of the card-edge connector for distribution to the backplane alarm logic circuitry.

PAC-12 SUBCARRIER DEMODULATOR

The "slimline" PAC-12 Demodulator has a capacity of up to four program audio channels. A Subcarrier Demodulator

board operating at a preset subcarrier frequency is installed for each channel. A functional block diagram of the PAC-12 Subcarrier Demodulator card is given in Figure 2-2.

The composite baseband signal is received at the rear panel BB IN connector and routed through the backplane buss to pin 15 of the card-edge connector. The signal is fed through a 1K ohm impedance matching resistor to subcarrier bandpass filter FL1. Filter FL1 which rejects both the baseband video and other subcarrier frequencies.

Subcarrier amplifier Q2 compensates for losses incurred in the filter and feeds the desired subcarrier signal to FM detector U2. A Quadrature Phase Shift Network comprised of capacitors, resistors and inductors provides the phase shift necessary for recovery of the audio signal by U2.

Alarm comparator U3 monitors the output from FM detector U2 and compares it with a preset threshold set by R32. When the signal is above the threshold, the output of U3 is −12V. If the signal drops below threshold or is absent, the output of U3 switches to 0V. The comparator output is routed via pin 10 of the card-edge connector for distribution to the backplane alarm logic circuitry.

The recovered audio signal at pin 6 of U2 is fed to emitter follower Q3 which provides a low impedance source for the audio De-Emphasis Network formed by R24 and C17. The time constant is 75 μs (optionally 50 μs). Jumper plug W3 normally is installed between E5 and E6 (de-emphasis enabled); when installed between E5 and E7, de-emphasis is disabled and the response is flat. Emitter follower Q1 has a high input impedance and a low output impedance to match the De-Emphasis Network to the low pass filter stage that follows.

A low pass filter and a notch filter are formed by two sections of U4 and associated components. The 22 kHz low pass filter shapes the audio noise bandwidth and also filters RF detection ripple from the FM detector. The 15.734 kHz Notch Filter functions to suppress any horizontal scanning components that may have cross-modulated onto the audio. At low frequencies, the signal passes through the path of series resistors R36 and R37. At higher frequencies, the signal passes through the path of series connected capacitors C28 and C29. However, at the 15.734 kHz notch frequencies, both paths pass the signal at an equal level but 180° out of phase, the net effect creating the desired null at the input of U4. Variable components R39 and C25 tune the filter to the desired notch frequency while R40 sets the Q of the circuit.

Integrated circuit U1 contains a pair of operational amplifiers that form the final audio output amplifier stage of the Audio Demodulator. The operational amplifiers are connected as inverting and non-inverting amplifiers producing signals that are equal in amplitude but opposite in phase. Variable resistor R9 functions as an audio level control that is normally set for a +8 dBm audio output level into a 600 ohm balanced load (jumpers W1 and W2 not installed). The Demodulator has an output level adjustment range of 0 to +18 dBm. Jumper plugs W1 and W2 provide a low impedance audio output (less than 50 ohms) when installed. The audio output signal is routed to pins 1 and 2 of the card-edge connector and fed via the backplane buss to its respective rear panel output connector.

PAC-10/12 CHASSIS

Excluding the front panel, the chassis assemblies for PAC-10 Subcarrier Modulators and PAC-12 Subcarrier Demodulators are identical. In addition to providing mechanical mounting and electrical connection facilities for the installed Subcarrier Modulator or Subcarrier Demodulator plug-in boards, the chassis contains the Power Supply module and Backplane board. A function- al block diagram of the PAC-10/PAC-12 Chassis is given in Figure 2-3.

POWER SUPPLY MODULE. The Power Supply module is available in five versions for operation from 120 Vac, 230 Vac , −24 Vdc, −48 Vdc, or external ±12 Vdc sources.

The 120/230 Vac Power Supplies use a modular power supply to produce the ±12 Vdc regulated voltages required by the unit. Power connection is by means of a 3-prong power cord supplied with the unit. The ac input line is protected by a fuse mounted on the rear panel.

Power connection of the −24 or −48 Vdc powered units is by means of 2-terminal barrier strip mounted on the rear panel of the chassis. The negative supply lead is internally fused. This fuse is accessible by removing the top cover of the chassis.

Power connection of the external ±12 Vdc Power Supply is by means of a 3-terminal barrier strip mounted on the rear panel of the chassis. Positive and negative supply leads are internally fused. These fuses are accessible by removing the top cover of the chassis.

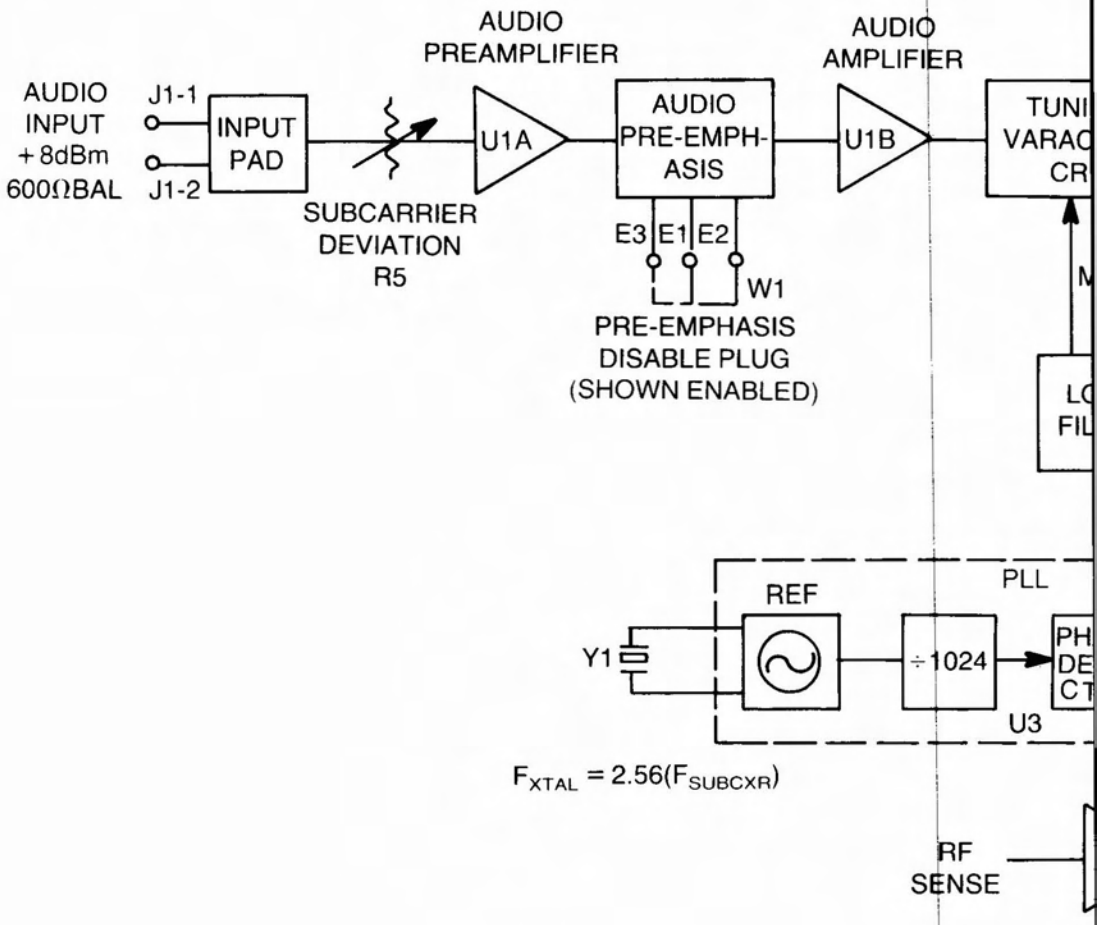
The Power Supply module also contains the POWER and ALARM LED's which are visible on the front panel of the unit.

BACKPLANE BOARD. The Backplane Board distributes the dc operating voltages and provides input/output signal busses between the installed circuit cards and the rear panel AUDIO and BB IN/OUT connectors. Next to each AUDIO connector is a small white jumper plug. When the plug is engaged (pushed in), the corresponding Subcarrier Modulator or Demodulator card is enabled. To disable, this plug must be disengaged (pulled out).

The Backplane Board also contains fault alarm circuitry, summary alarm relays and a rear panel 9-pin "D" type connector providing alarm relay contacts for supervisory use.

SUBCARRIER ALARM CIRCUITS. Each installed Subcarrier Modulator or Demodulator card outputs a dc alarm logic signal at pin 10 of its card-edge connector. These individual logic signals are applied to its respective LED driver FET (Q1, Q2, Q3 or Q4). During satisfactory operation, −12V is applied to the FET gate and the FET is cut-off. During a fault condition, 0V is applied to the FET gate and the FET saturates illuminating the corresponding ALARM LED on the front panel. The LED's are mounted on the Power Supply module and are connected on the backplane by J11 and its associated wiring harness.

SUMMARY ALARMS. The drain voltages of the LED driver FET's (Q1 through Q4) are OR'ed by diodes CR1 thru CR4 and resistor array RN1. During satisfactory operation, the voltage on RN1 saturates alarm relay driver FET Q5 and energizes relays K1 and K2. If power is lost or a subcarrier fault occurs, Q5 is cut-off and the relays are de-energized producing a summary alarm. Two sets of alarm relay contacts are available at the rear panel ALARMS connector; one set of relay contacts (K1) are connected to pins 2, 3 and 9. The second set of contacts (K2) are connected to pins 4, 5 and 8.


AUDIO
INPUT
+8dBm
600ΩBAL
J1-1
J1-2
INPUT
PAD
SUBCARRIER
DEVIATION
R5
AUDIO
PREAMPLIFIER
U1A
AUDIO
PRE-EMPH-
ASIS
E3
E1
E2
W1
PRE-EMPHASIS
DISABLE PLUG
(SHOWN ENABLED)
AUDIO
AMPLIFIER
U1B
TUNI
VARAC
CR
M
LC
FIL
PLL
REF
Y1
÷1024
PH
DE
CT
U3
$F_{XTAL} = 2.56(F_{SUBCXR})$
RF
SENSE

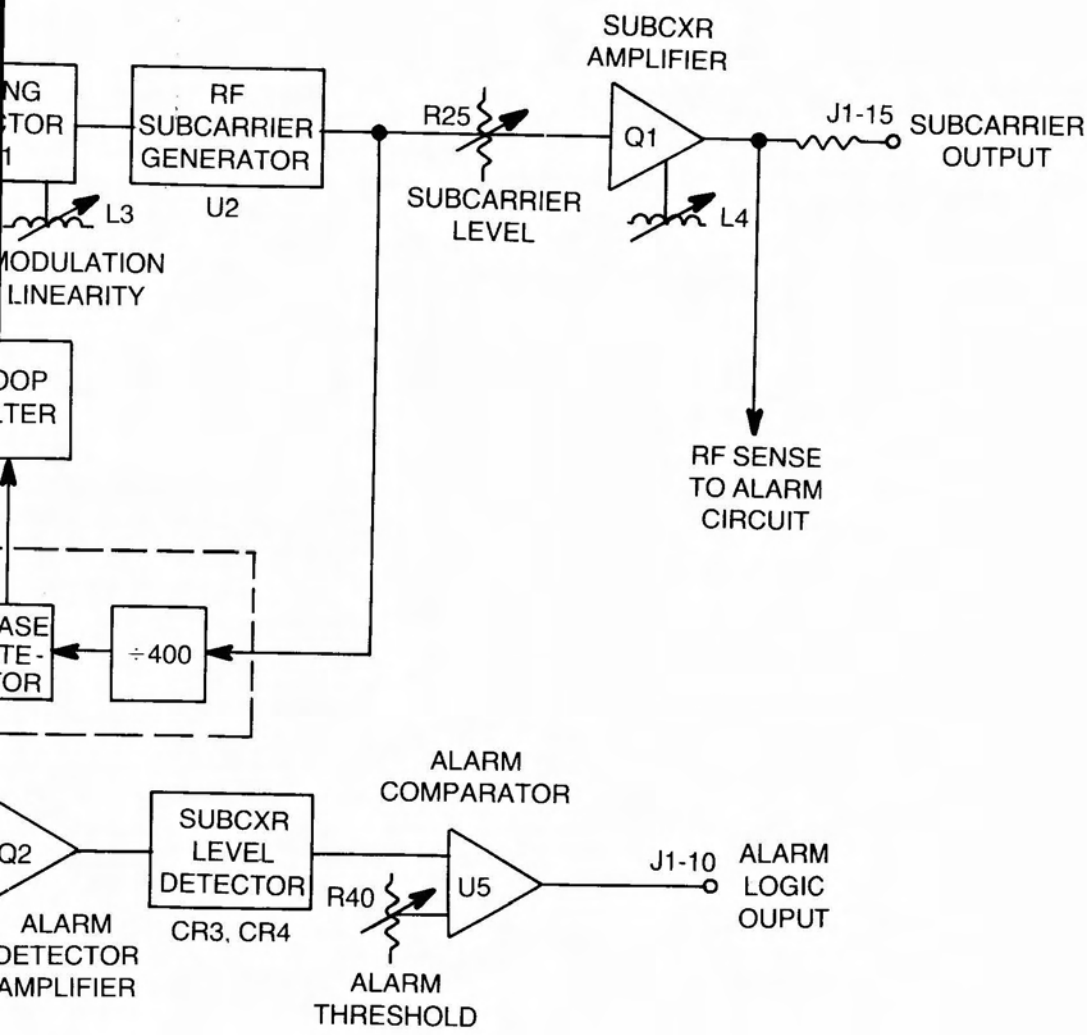
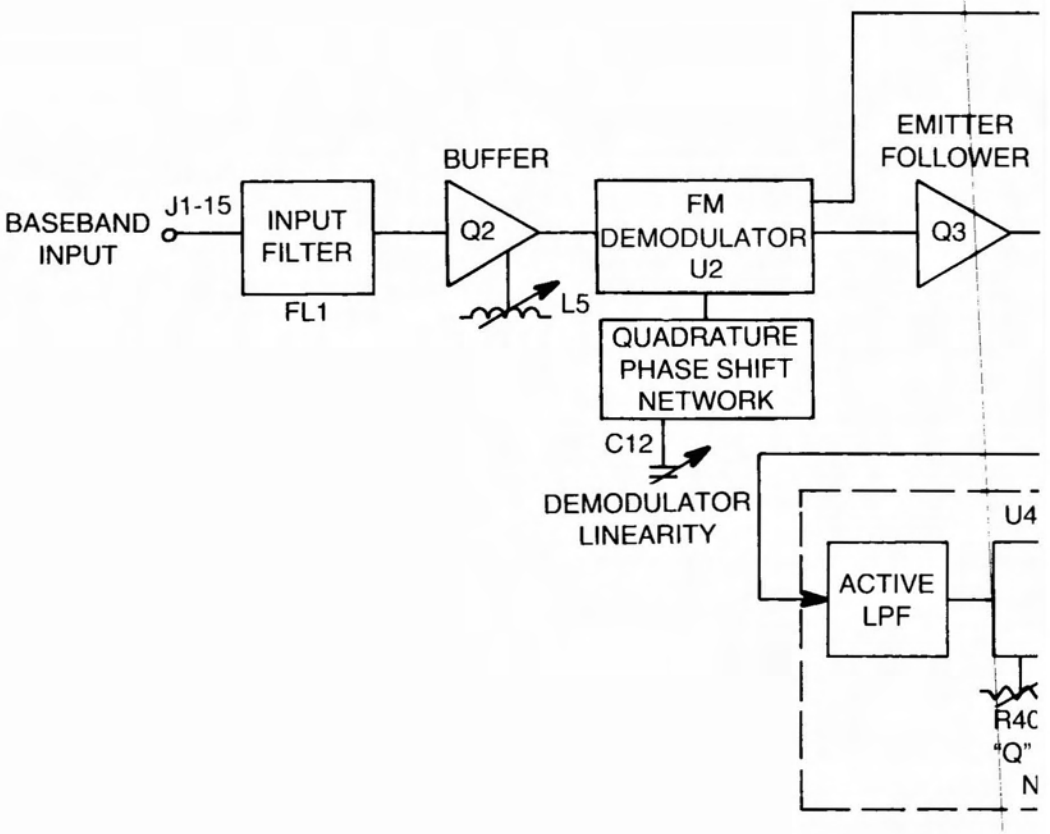


Figure 2-1. PAC-10 Subcarrier Modulator – Functional Block Diagram


BASEBAND INPUT
J1-15
INPUT FILTER
FL1
BUFFER
Q2
L5
FM DEMODULATOR U2
QUADRATURE PHASE SHIFT NETWORK
C12
DEMODULATOR LINEARITY
EMITTER FOLLOWER
Q3
U4
ACTIVE LPF
R40
"Q"
N

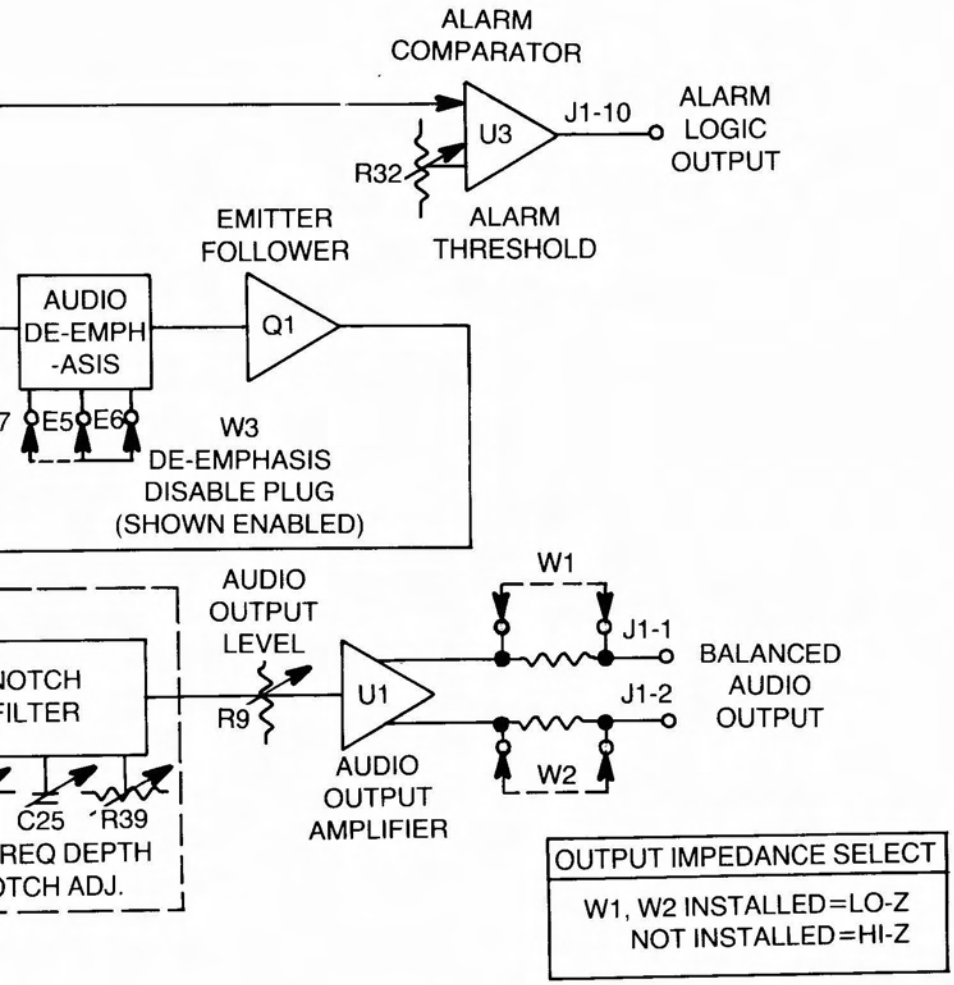
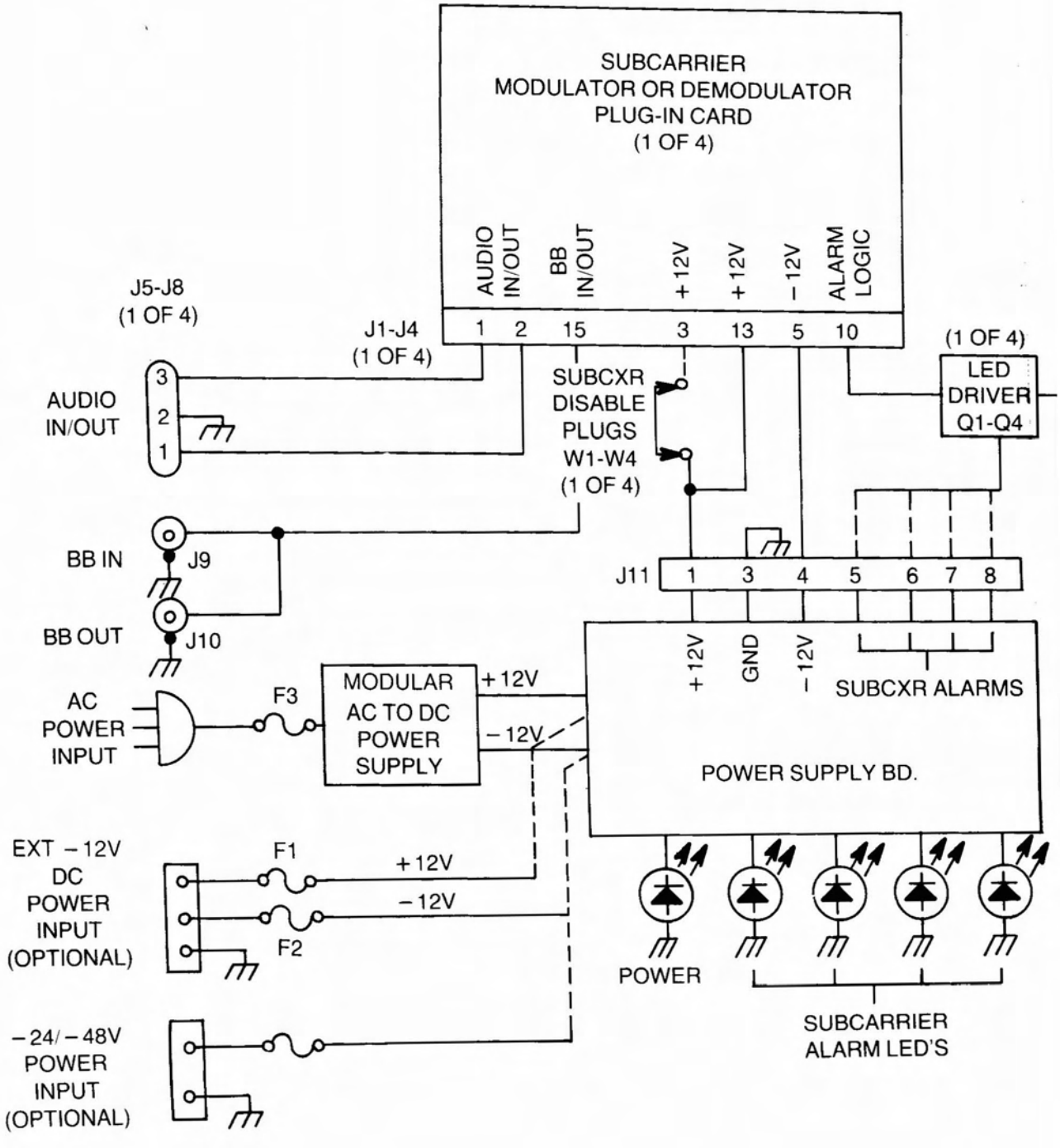


Figure 2-2. PAC-12 Subcarrier Demodulator – Functional Block Diagram


SUBCARRIER
MODULATOR OR DEMODULATOR
PLUG-IN CARD
(1 OF 4)
AUDIO IN/OUT
BB IN/OUT
+12V
+12V
-12V
ALARM LOGIC
J5-J8
(1 OF 4)
J1-J4
(1 OF 4)
1 2 15 3 13 5 10
(1 OF 4)
LED DRIVER Q1-Q4
AUDIO IN/OUT
3 2 1
SUBCXR DISABLE PLUGS W1-W4
(1 OF 4)
BB IN
J9
BB OUT
J10
J11
1 3 4 5 6 7 8
+12V
GND
-12V
SUBCXR ALARMS
AC POWER INPUT
F3
MODULAR AC TO DC POWER SUPPLY
+12V
-12V
POWER SUPPLY BD.
EXT -12V DC POWER INPUT (OPTIONAL)
F1
+12V
-12V
F2
POWER
SUBCARRIER ALARM LED'S
-24/-48V POWER INPUT (OPTIONAL)

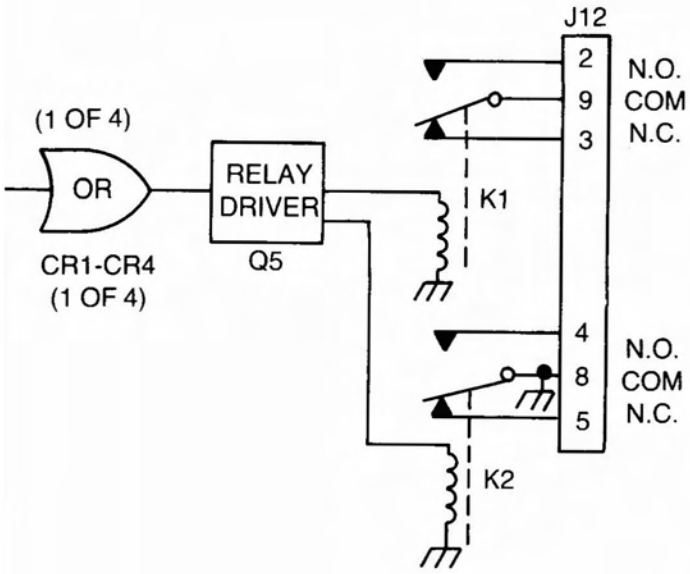


Figure 2-3. PAC-10/PAC-12 Chassis –
Functional Block Diagram

SECTION 3
INSTALLATION

UNPACKING AND HANDLING

UNPACKING. Each system is shipped with all equipment assembled and tested, and then packaged in appropriate shipping containers. Care should be taken when removing equipment from containers to prevent damage to the units. Ensure that all parts and accessories are removed from the container and packing material before they are discarded.

DO NOT discard the container or any packing material unitl mechanical inspection has been satisfactorily completed. This material must be available if a damage claim is to be made with the carrier.

MECHANICAL INSPECTION. Inspect the equipment for mechanical shipping damage. Make sure that the equipment is clean and no connectors, controls or indicators are broken, damaged, or loose.

NOTE

Do not alter any internal controls unless so directed in the following procedures. Units are completely aligned at the factory and may require only minor adjustments once installed.

DAMAGE IN SHIPMENT. Should any damage be discovered after unpack- ing the system, immediately file a claim with the carrier. A full report of the damage should be made and a copy forwarded to M/A-COM MAC, Inc. The company will then advise disposition of the equipment.

RETURN AUTHORIZATION. Subject to standard terms of the warranty policy, M/A-COM MAC, Inc. will repair all defective equipment.

Material forwarded to M/A-COM MAC, Inc. must be accompanied by a Return Authorization Tag which is available on request by calling our Customer Service Dept. at 617-272-3100.

INSTALLATION

MOUNTING. Excluding the front panel, chassis assemblies for the PAC-10 Subcarrier Modulators and PAC-12 Subcarrier Demodulators are identical. The "slimline" PAC-10/12 chassis is designed for mounting in standard 19-inch wide equipment racks and occupies a single rack space.

SIGNAL AND POWER CONNECTIONS. All signal and power connections are provided at the rear of the PAC-10/12 chassis as listed in Table 3-1 ((Figure 3-1).

POWER CONNECTIONS. AC line power enters the PAC-10/12 chassis by means of a 3-prong ac power cord. The unit standardly operates on 120 Vac line power. Optionally, it can be operated from 230 Vac or dc power sources. The ac input line is protected by a fuse mounted on the rear panel.

Power connection of -24 or -48 Vdc powered units is by means of a 2-terminal barrier strip. The negative supply lead is internally fused. This fuse is accessible by removing the top cover of the chassis.

Power connection of the external ± 12 Vdc supply is by means of a 3-terminal barrier strip. Positive and negative supply leads are internally fused. These fuses are accessible by removing the top cover of the chassis.

The PAC-10/12 units are designed for continuous operation and will be activated when connected to a power source. An ON-OFF switch is not provided.

AUDIO INPUT/OUTPUT SIGNAL CONNECTIONS. Connect 600 ohm (50 ohms optional) balanced audio input/output signals to plug-in terminal strips (AUDIO 1, AUDIO 2, . . , etc.).

The PAC-10 Subcarrier Modulator is factory adjusted for 75 KHz peak deviation with a 1 KHz, $+8$ dBm, audio test tone input. However, the unit can be adjusted to accept signals between 0 and $+18$ dBm. See alignment instructions in the Maintenance Section.

The PAC-12 Subcarrier Modulator is factory adjusted to provide a $+8$ dBm audio output level into a 600 ohm (50 ohms optional) balanced load. It has an adjustment range of 0 to $+18$ dBm.

Ensure that the small white jumper plug (next to the AUDIO connector) is engaged (pushed in) for all active channels.

SUMMARY ALARM CONNECTIONS. The 9-pin "D" type connector provides summary subcarrier fault alarm connection facilities for supervisory use as listed in Table 3-2.

Table 3-1. PAC-10/PAC-12 – Rear Panel Connectors

REF	TYPE	MARKING	FUNCTION
–	AC power cord		Line power connection for ac powered units only.
–	Barrier strip		Power connection for dc powered units only (optional).
F1,F2	Fuses, 0.5A AGC		Overload protection for dc powered units (remove top cover of unit for access.)
F3	Fuse, 1.0A AGC		Overload protection for ac powered units.
J5	Plug-in terminal strip	AUDIO 4	Audio 4 input/output signal.
J6	Plug-in terminal strip	AUDIO 3	Audio 3 input/output signal.
J7	Plug-in terminal strip	AUDIO 2	Audio 2 input/output signal.
J8	Plug-in terminal strip	AUDIO 1	Audio 1 input/output signal.
J9	Type BNC	BB OUT	Baseband output signal (PAC-10 Subcarrier Modulator only).
J10	Type BNC	BB IN	Baseband input signal (PAC-12 Subcarrier Demodulator only).
J12	9-pin D type	ALARMS	Summary alarm relay contacts.
W1,W2 W3,W4	Jumper plugs		The small white jumper plugs, next to each audio connector are used to enable or disable the associated Subcarrier card. When the plug is engaged (pushed in) the card is enabled. To disable, the plug must be disengaged (pulled outward).

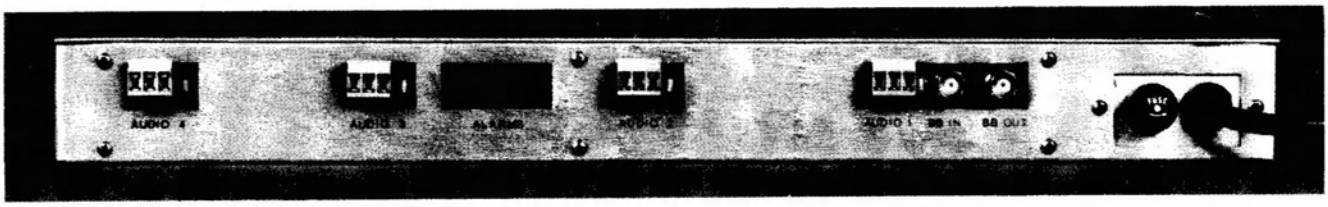


Figure 3-1. Signal and Power Connections

Table 3-2. Summary Alarm Interface Connections

J12 PIN NO.	ALARM FUNCTION
2	Normally Open
9	Common K1 Form C Contact
3	Normally Closed
4	Normally Open
8	Common (Grounded) K2 Form C Contact
5	Normally Closed
1,6	Saturated Collector Alarms (Optional)
7	+ 12 Vdc power for optional hot standby equipment.

SECTION 4
OPERATION

OPERATING CONTROLS AND INDICATORS

The operating controls and indicators for the PAC-10 Subcarrier Modulator and PAC-12 Subcarrier Demodulator are listed in Tables 4-1 and 4-2 respectively.

Table 4-1. PAC-10 Subcarrier Modulator – Controls and Indicators (Figures 4-1 and 4-2)

CONTROL OR INDICATOR	LEGEND	FUNCTION
FRONT PANEL		
LED (Green	POWER	Lights when power is applied to the unit.
4 LED Indicators (Red)	ALARMS 1-2-3-4	Lights when failure of associated subcarrier occurs.
Potentiometer R5		Subcarrier deviation control (located behind dress panel).
Potentiometer R25		Subcarrier level control (located behind dress panel).
REAR PANEL		
Fuse		Provides overload protection when unit is operated from an ac power source.
4 Jumper Plugs		The small white jumper plugs next to each audio connector are used to enable the associated subcarrier card. When plug is engaged (pushed in), the card is enabled. To disable, the plug must be disengaged (pulled outward).

Table 4-2. PAC-12 Subcarrier Demodulator – Controls and Indicators (Figures 4-3 and 4-4)

CONTROL OR INDICATOR	LEGEND	FUNCTION
FRONT PANEL		
LED (Green)	POWER	Lights when power is applied to the unit.
4 LED Indicators (Red)	ALARMS 1-2-3-4	Lights when failure of associated subcarrier occurs.
Potentiometer R9		Audio output level control (located behind dress panel).
REAR PANEL		
Fuse		Provides overload protection when unit is operated from an ac power source.
4 Jumper Plugs		The small white jumper plugs next to each audio connector are used to enable the associated subcarrier card. When plug is engaged (pushed in), the card is enabled. To disable, the plug must be disengaged (pulled outward).

Figure 4-1. PAC-10 Audio Modulator – Front View

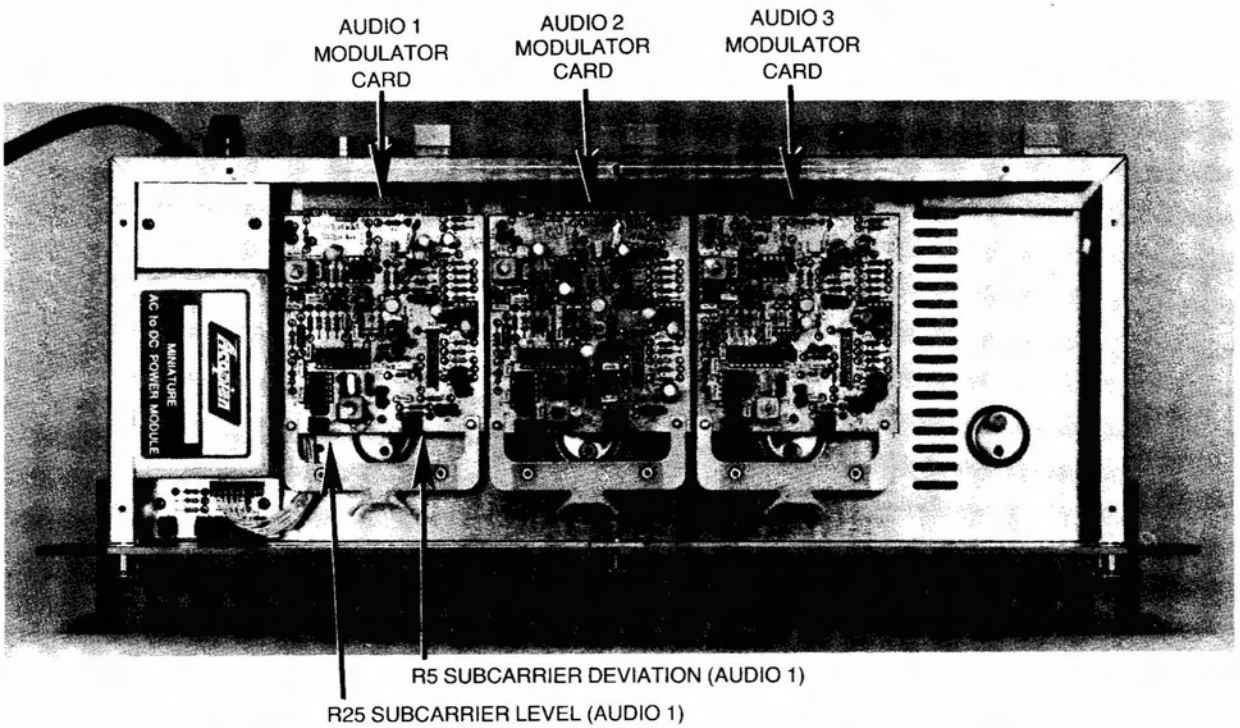


Figure 4-2. PAC-10 Audio Modulator – Internal View (3 Channel System Shown)

Figure 4-3. PAC-12 Audio Demodulator – Front View

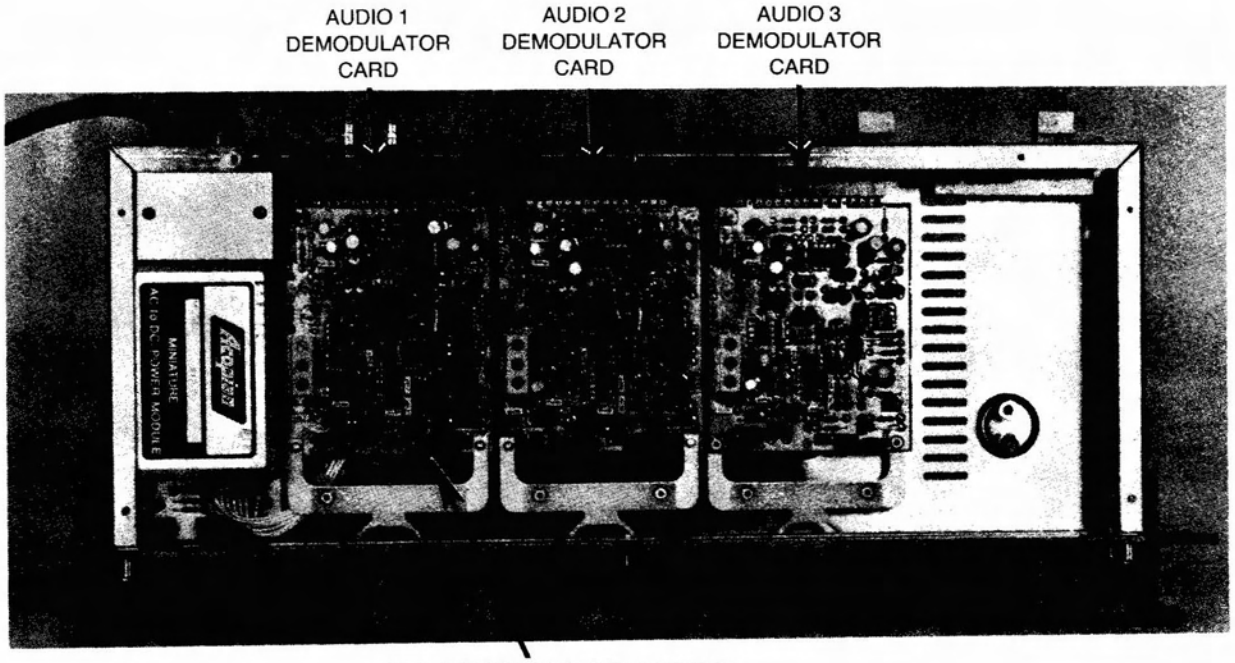


Figure 4-4. PAC-12 Audio Demodulator – Internal View (3 Channel System Shown)

SECTION 5
MAINTENANCE

MAINTENANCE

The PAC-10/PAC-12 Subcarrier Program Audio Channel System is factory aligned and does not require adjustment when first placed into service. Maintenance should be performed at regular intervals by qualifed service personnel.

These procedures are provided for use by a skilled technician, familiar with the operation of the test equipment required (Table 5-1). Test equipment operating instructions are not included herein except in precautionary notes. Equivalent test equipment may be substituted when necessary. All test cables should be as short as possible, all impedances should be matched, and terminations correctly located.

NOTE

If difficulty is experienced in obtaining the proper performance during any system test, the test equipment including all cables and terminations should be interconnected and tested to determine whether or not the test setup in contributing to the system performance readings in any manner.

MAINTENANCE LOG. Record all measurements and corrective action taken in a maintenance log as reference information for use in future alignment, maintenance and troubleshooting.

Table 5-1. Recommended Test Equipment

EQUIPMENT	MANUFACTURER'S TYPE (OR EQUIV.)
Digital Voltmeter	Fluke 8000A
RMS Voltmeter	Hewlett Packard HP3400A
Oscilloscope Calibrated	Tektronix 465
Audio Signal Generator	General Radio 1310A
Extender Cards	MAC PN 843193

PAC-10 SUBCARRIER MODULATOR ADJUSTMENTS

Align each Subcarrier Modulator individually. Using the small white jumper plugs on the rear panel next to the audio input connectors, enable the Subcarrier Modulator card under test by engaging its jumper (push in) and disable the remaining cards by disengaging their jumpers (pull outward).

Subcarrier level and deviation controls are accessible from the front of the unit by removing the front dress panel secured by five captive fasteners. Access to other adjustments and test points require removal of the top cover and removal of the unit from the rack or the use of a module extender card, M/A-COM MAC PN 843193.

Refer to Section 6 of this manual for detailed schematic diagrams and component location drawings.

SUBCARRIER LEVEL ADJUSTMENT.

Step 1. Connect a waveform monitor to the BB OUT connector, a scope terminated in 75 ohms may be substituted for the waveform monitor.

Step 2. Adjust the subcarrier level control, R25, for the desired subcarrier output level. This control is normally factory set for 100 mV peak-to-peak and has an adjustment range of 50 to 150 mV peak-to-peak.

SUBCARRIER DEVIATION ADJUSTMENT.

Step 1. Connect an audio signal generator to the AUDIO input of the Subcarrier Modulator under test. An unbalanced-to-balanced transformer will be required for an unbalanced signal generator output.

Step 2. Connect an FM modulation meter to the PAC-10 BB OUT connector.

Step 3. Apply a 1 kHz test tone, 600 ohm balanced audio signal at the desired level and adjust the subcarrier deviation control, R5, for 75 kHz peak deviation. This control is factory set for 75 kHz peak deviation at a 1 kHz, +8 dBm test tone input. However, the PAC-10 Subcarrier Modulator can be adjusted to accept input levels between zero and +18 dBm.

PRE-EMPHASIS DISABLE. The pre-emphasis disable jumper plug W1 is normally installed between terminals E1 and E2 (pre-emphasis enabled). To disable the Pre-Emphasis Network for "flat" response, install W1 between ter- minals E1 and E3.

PAC-12 SUBCARRIER DEMODULATOR ADJUSTMENTS

lign each Subcarrier Demodulator individually. Using the small white jumper plugs on the rear panel next to the audio input connectors, enable the Subcarrier Demodulator card under test by engaging its jumper (push in) and disable the remaining cards by disengaging their jumpers (pull outward).

The audio output level control is accessible from the front of the unit by removing the front dress panel secured by five captive fasteners. Access to other adjustments and test points require removal of the top cover and removal of the unit from the rack or the use of a module extender card, M/A-COM MAC PN 843193.

Refer to Section 6 of this manual for detailed schematic diagrams and component location drawings.

AUDIO OUTPUT LEVEL ADJUSTMENT

A PAC-10 Subcarrier Modulator operating on the same subcarrier frequency and emphasis may be used as a signal source to adjust the audio output level of the PAC-12 Subcarrier Demodulator under test. The Subcarrier Modulator should be properly adjusted for 75 kHz peak deviation for a 1 kHz test tone.

Step 1. Using 75 ohm coaxial cable connect the BB OUTput of the PAC-10 Subcarrier Modulator chassis to the BB INput connector of the PAC-12 Subcarrier Demodulator chassis.

Step 2. Depending on system requirements use Step 2a or 2b.

a. For a 600 ohm system, remove jumper plugs W1 and W2 from the Subcarrier Demodulator card and adjust the audio output level control, R9, for the desired output level.

This control is normally factory set for a +8 dBm output level. Although the PAC-12 will operate at average (test tone) audio output levels up to +18 dBm, operation above +8 dBm will reduce the system's 10 dB peak headroom by 1 dB per dBm.

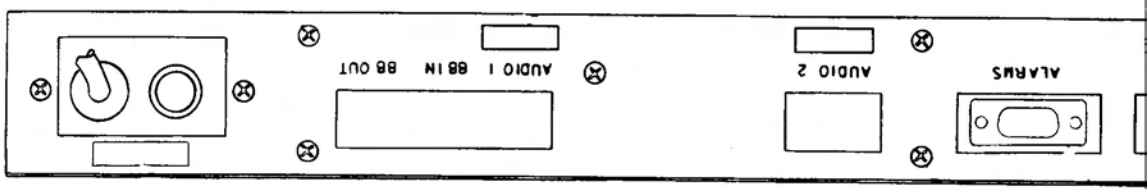
b. For a bridging system, select the low impedance output by installing jumper plugs W1 and W2 and adjust R9 for the desired output voltage.

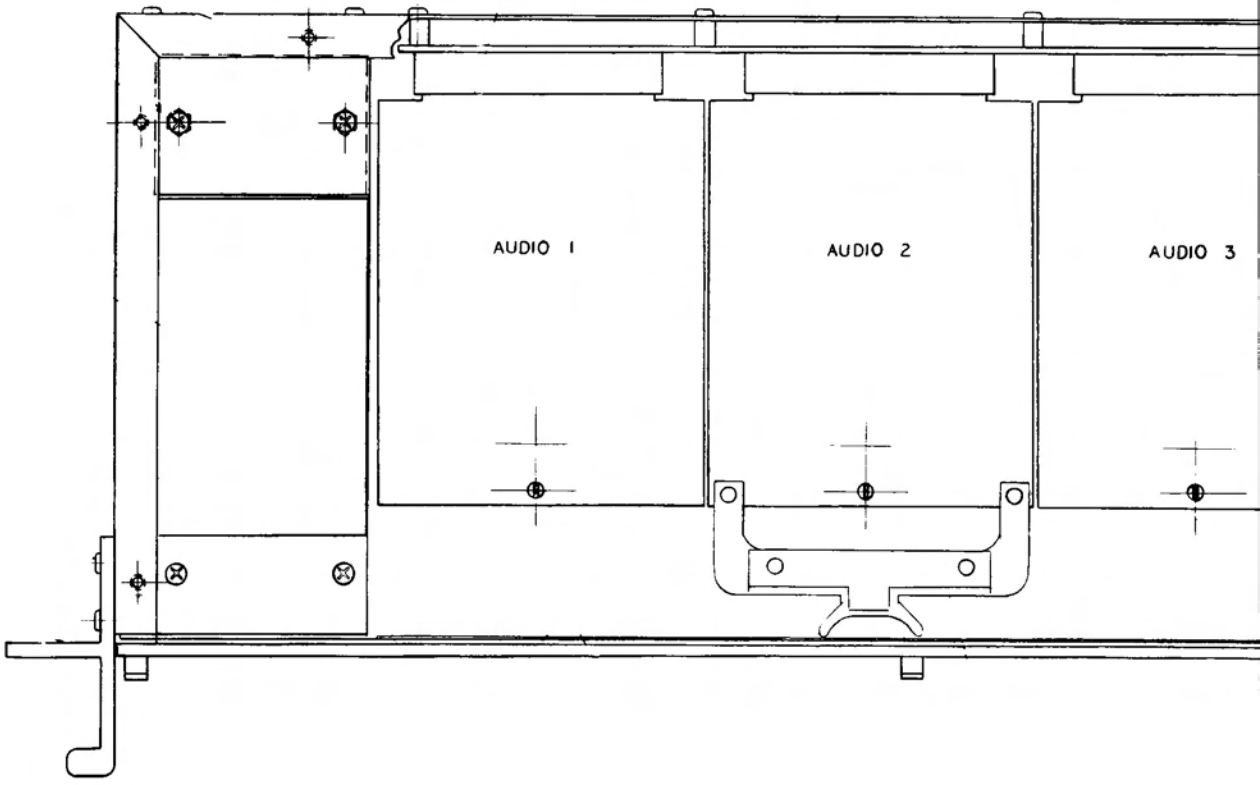
This control is normally factory set for 11.0V peak-to-peak output into an open circuit. Although the PAC-12 will operate at average (test tone) audio output levels up to 35V peak-to-peak into an open circuit, operation above 11.0V peak-to-peak will reduce the system's 10 dB peak headroom.

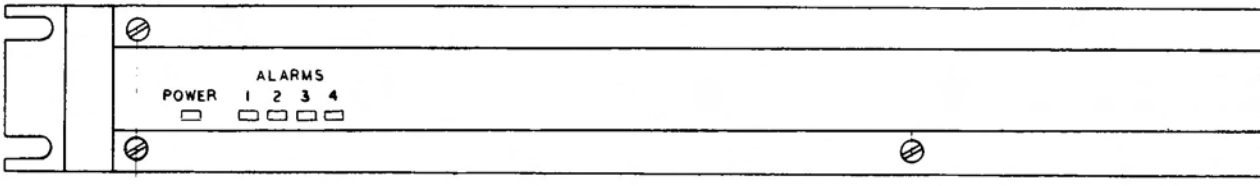
DE-EMPHASIS DISABLE. The de-emphasis disable jumper plug W3 is normally installed between terminals E5 and E6 (de-emphasis enabled). To disable the De-Emphasis Network for "flat" response, install W3 between terminals E5 and E7.

SECTION 6
DIAGRAMS

LIST OF DRAWINGS


AUDIO 1 BB IN BB OUT
AUDIO 2
ALARMS


AUDIO 1
AUDIO 2
AUDIO 3


ALARMS
POWER 1 2 3 4

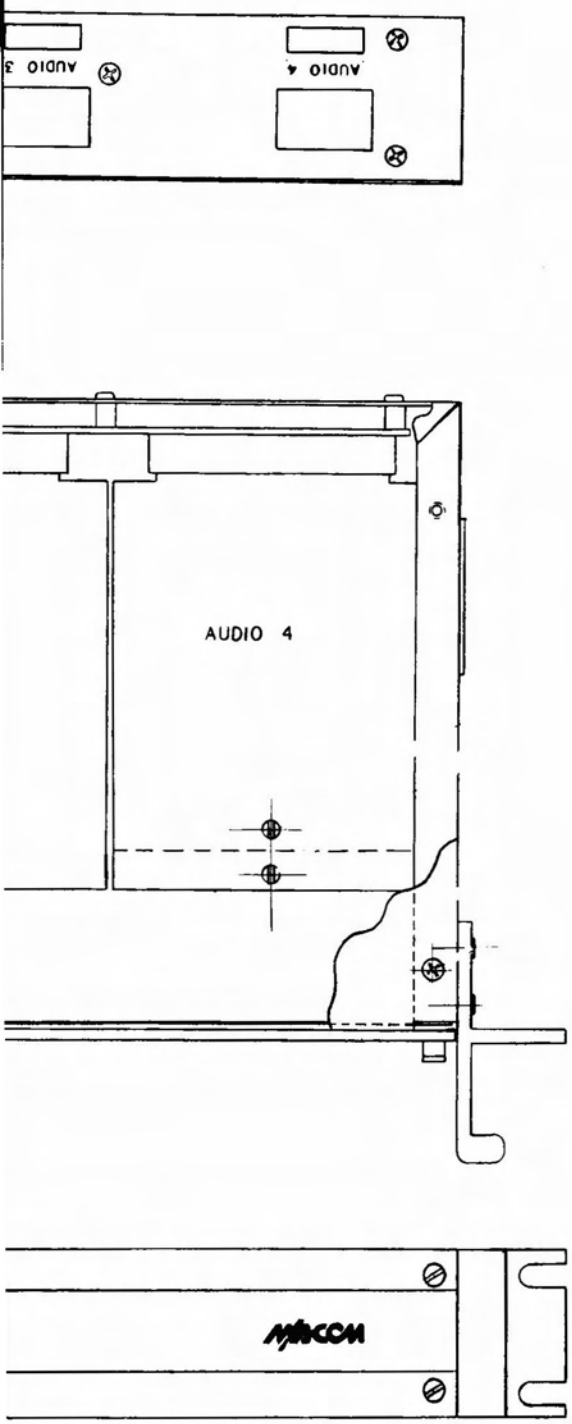
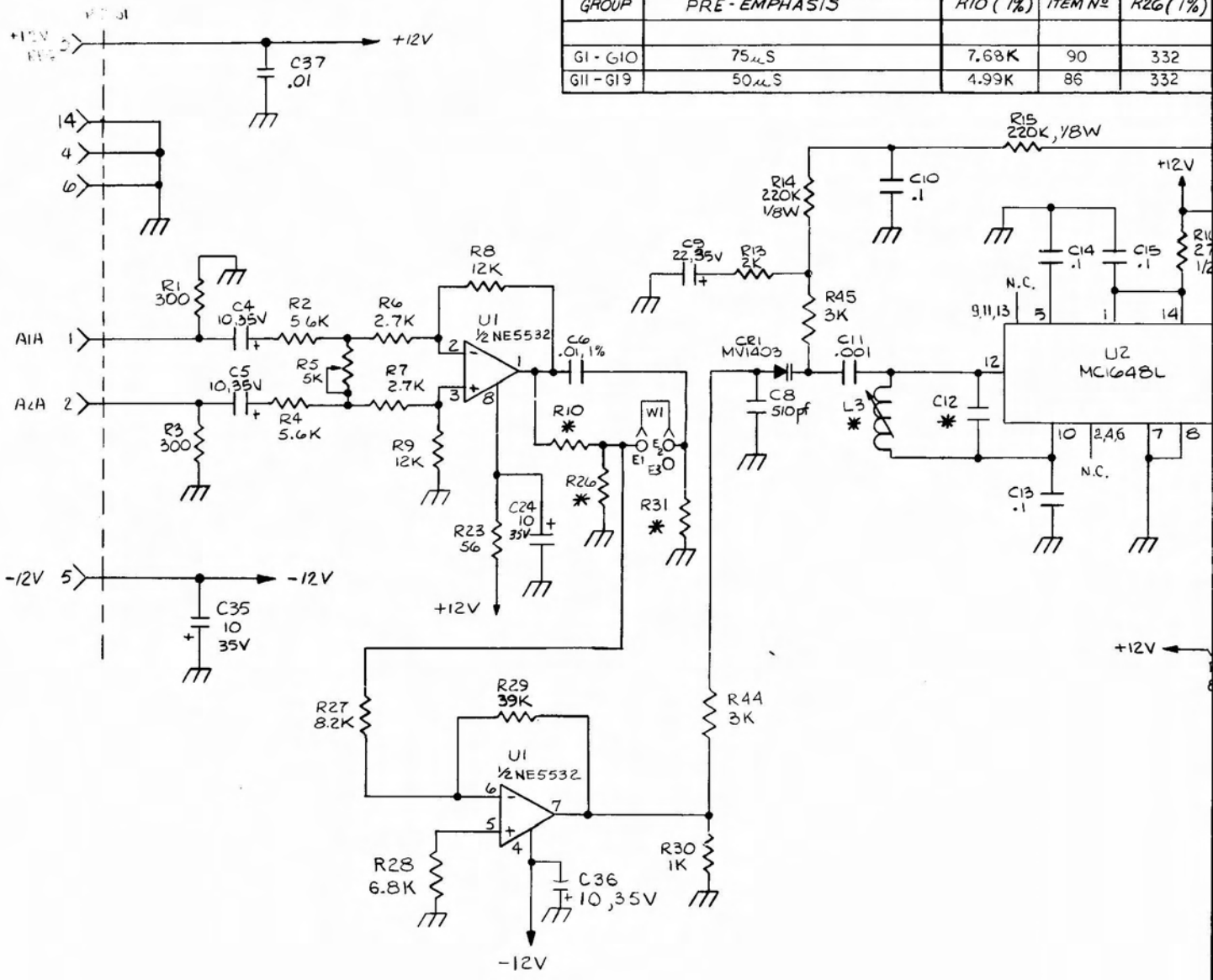


Figure 6-1. PAC-10/PAC-12 Audio Subcarrier Final Assembly PN 842350

TABLE I

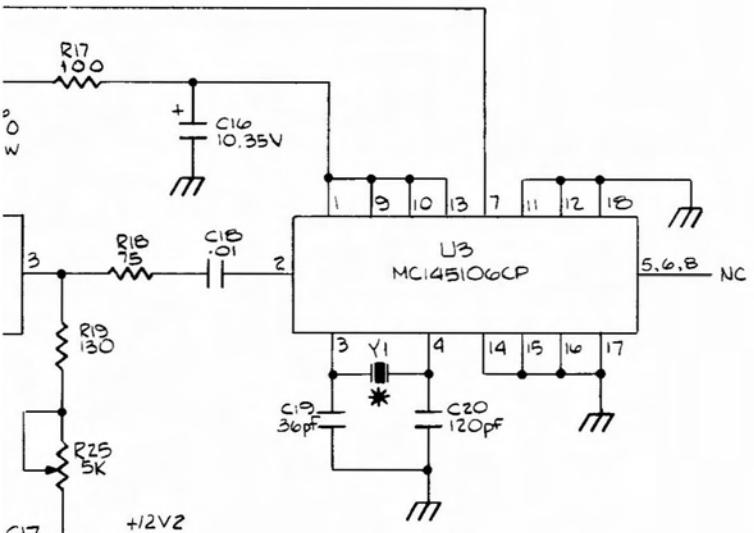
GROUP	FREQ (MHz)	YI (MHz)	ITEM Nº	C12 (pF)	ITEM Nº	L3 (μH)
G1, G11	4.83	12.3648	65	10	74	17.0 - 35
G2, G12	5.2	13.3120	66	22	75	7.5 - 17
G3, G13	5.8	14.8480	67	22	75	7.5 - 17
G4, G14	6.2	15.8720	68	22	75	7.5 - 17
G5, G15	6.8	17.4080	69	27	76	3.5 - 8.5
G6, G16	7.02	17.9710	70	39	77	3.5 - 8.5
G7, G17	7.5	19.2000	71	39	77	3.5 - 8.5
G8, G18	8.065	20.6500	72	39	77	3.5 - 8.5
G9, G19	8.3	21.2480	73	39	77	3.5 - 8.5
G10	8.59	21.9904	89	39	77	3.5 - 85

GROUP	PRE-EMPHASIS	R10 (1%)	ITEM Nº	R26 (1%)
G1 - G10	75μS	7.68K	90	332
G11 - G19	50μS	4.99K	86	332



ITEM Nº	L4 (µH)	ITEM Nº
78	3.5-8.5	81
82	3.5-8.5	81
82	3.5-8.5	81
82	1.7-3.9	80
81	1.7-3.9	80
81	1.7-3.9	80
81	1.7-3.9	80
81	0.9-2.1	79
81	0.9-2.1	79
81	0.9-2.1	79

ITEM Nº	R31 (1%)	ITEM Nº
88	3.48K	84
88	3.16K	87



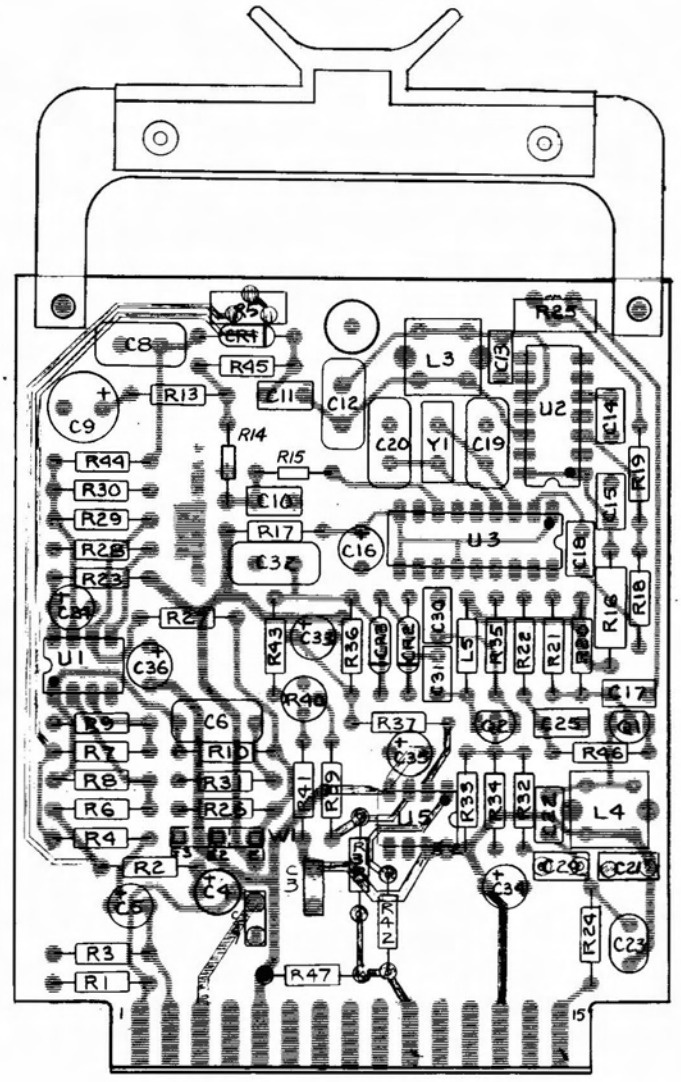
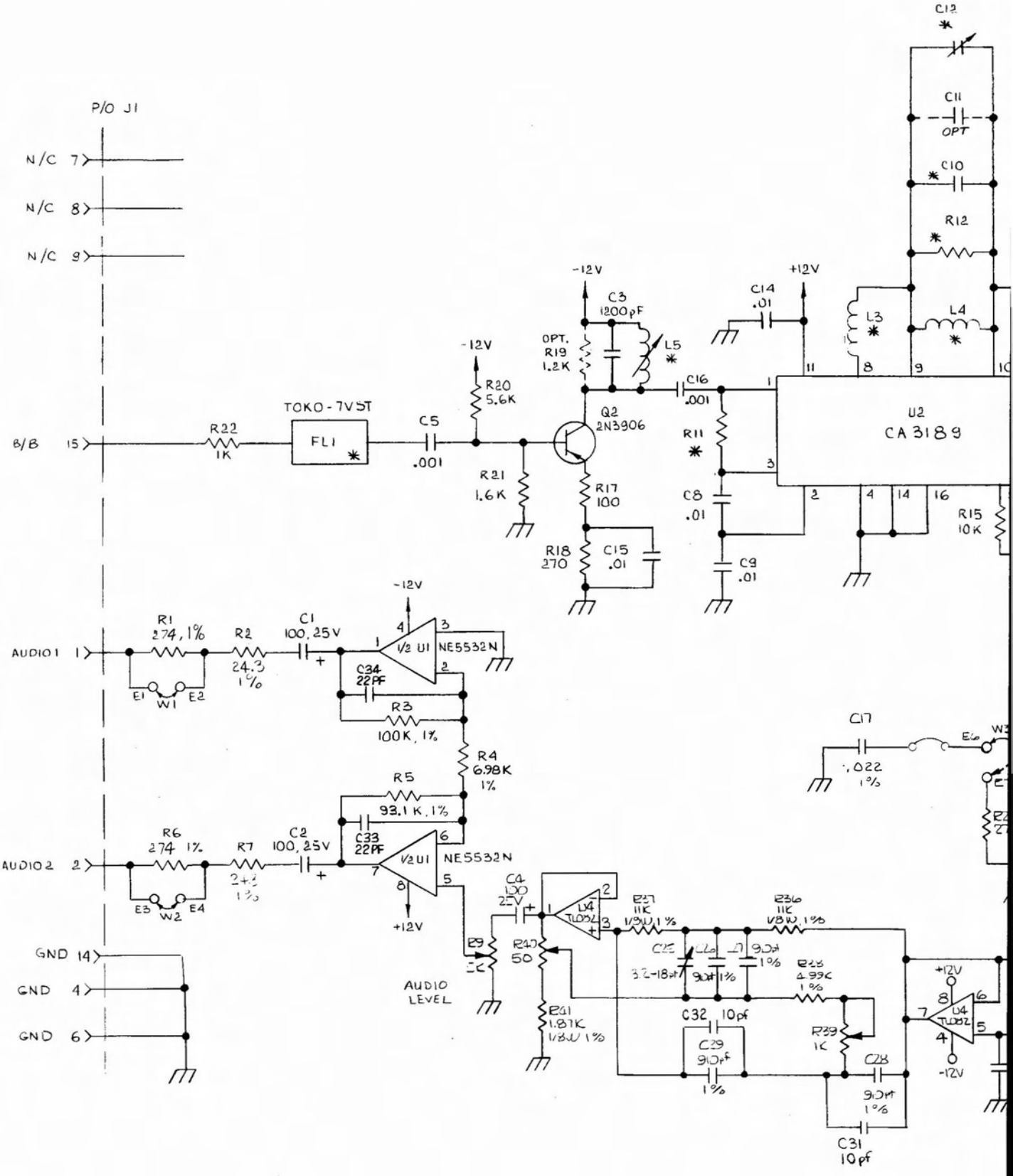
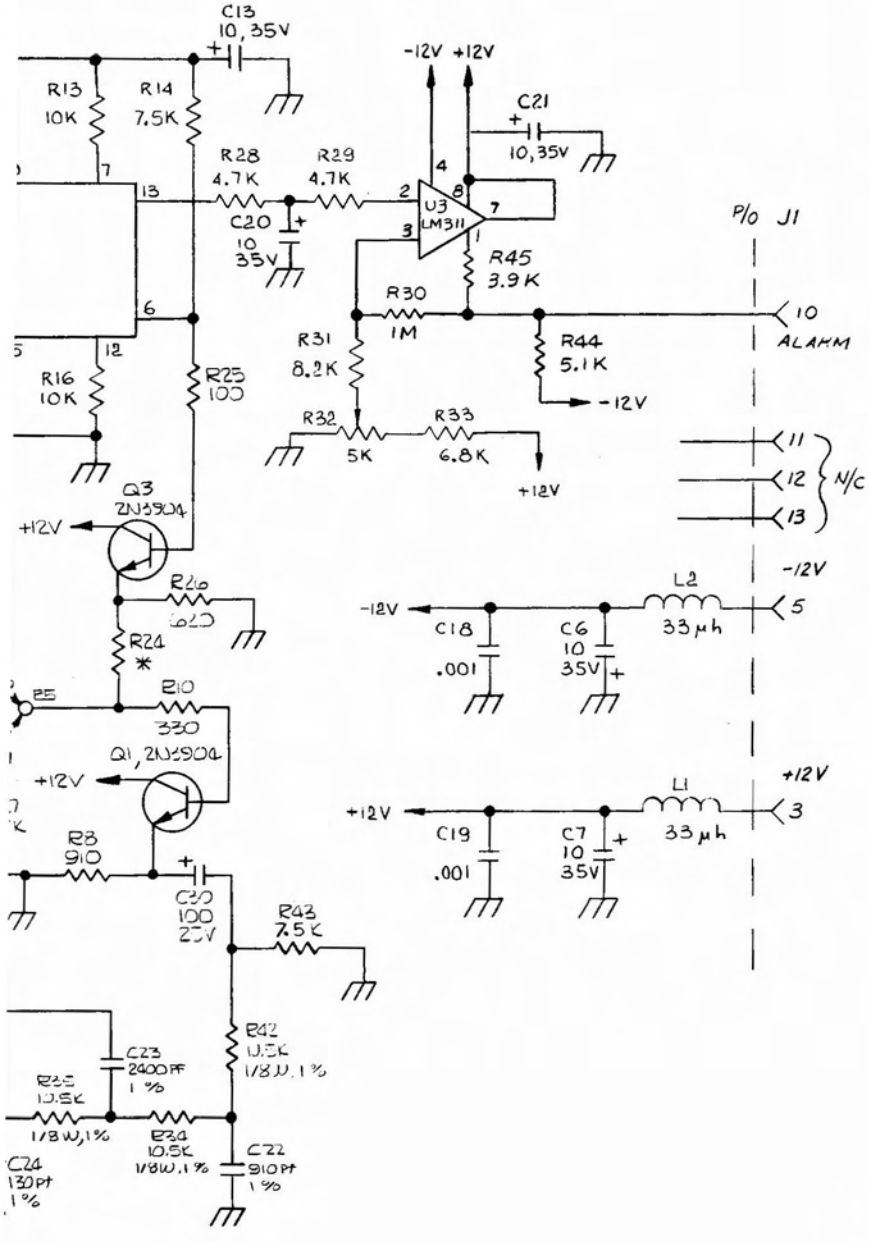


Figure 6-2. Transmitter Audio Board – Component Locations/Schematic Diagram PN 1841856


P/O J1
N/C 7
N/C 8
N/C 9
B/B 15
R22 1K
TOKO-7VST
FL1
C5 .001
-12V
R20 5.6K
R21 1.6K
C3 1200pF
OPT. R19 1.2K
L5
Q2 2N3906
R17 100
R18 270
C15 .01
+12V
C14 .01
L3
L4
C16 .001
R11
C8 .01
C9 .01
U2 CA3189
R15 10K
C12
C11 OPT
C10
R12
AUDIO 1
R1 274, 1%
R2 24.3 1%
E1 W1 E2
C1 100, 25V
1/2 U1 NE5532N
C34 22PF
R3 100K, 1%
R4 6.98K 1%
R5 93.1K, 1%
AUDIO 2
R6 274 1%
R7 2+2 1%
E3 W2 E4
C2 100, 25V
C33 22PF
GND 14
GND 4
GND 6
C4 100 25V
R9 2K
AUDIO LEVEL
R10 50
U4 TL082
R27 11K 1/8W 1%
R36 11K 1/8W 1%
C25 3.2-18pf
C26 90pf 1%
C7 90pf 1%
R28 4.99K 1%
R41 1.87K 1/8W 1%
C32 10pf
C29 90pf 1%
R39 1K
C28 90pf 1%
C31 10pf
C17 .022 1%
E6 W3



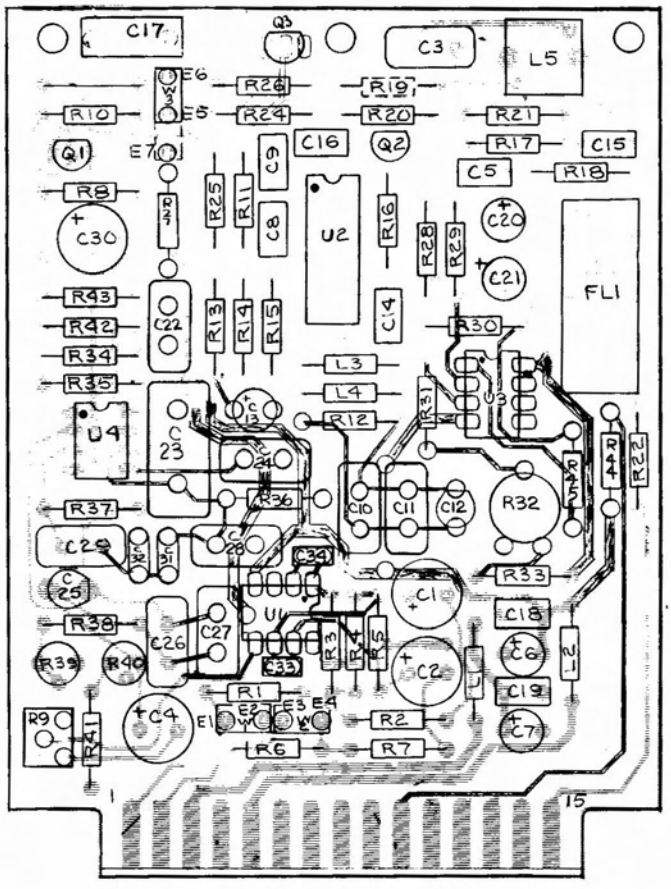
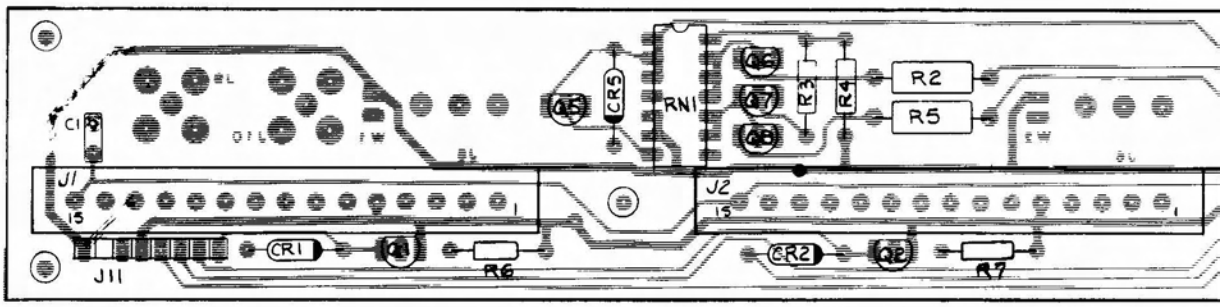
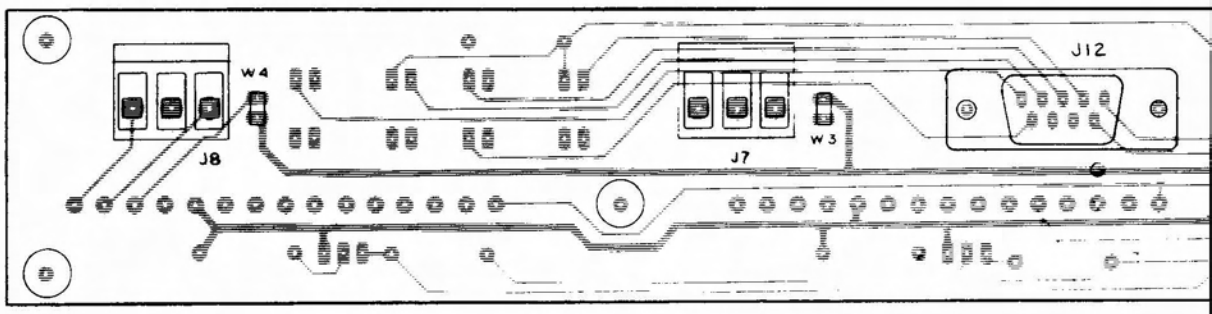
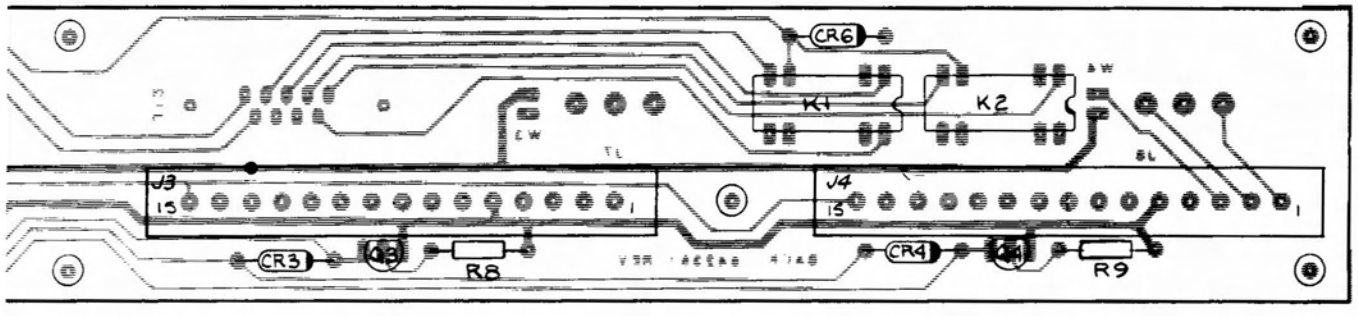


Figure 6-3. Receiver Audio Board – Component Locations/Schematic Diagram PN 1841854

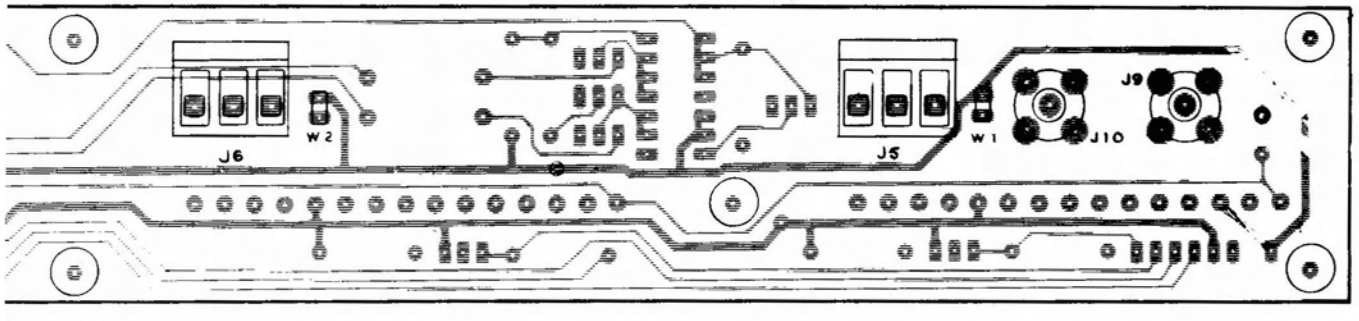

C1
J1
15
1
J11
CR1
Q1
R6
CR5
RN1
Q5
Q6
Q7
Q8
R3
R4
R2
R5
J2
15
1
CR2
Q2
R7

FR


W4
J8
J7
W3
J12

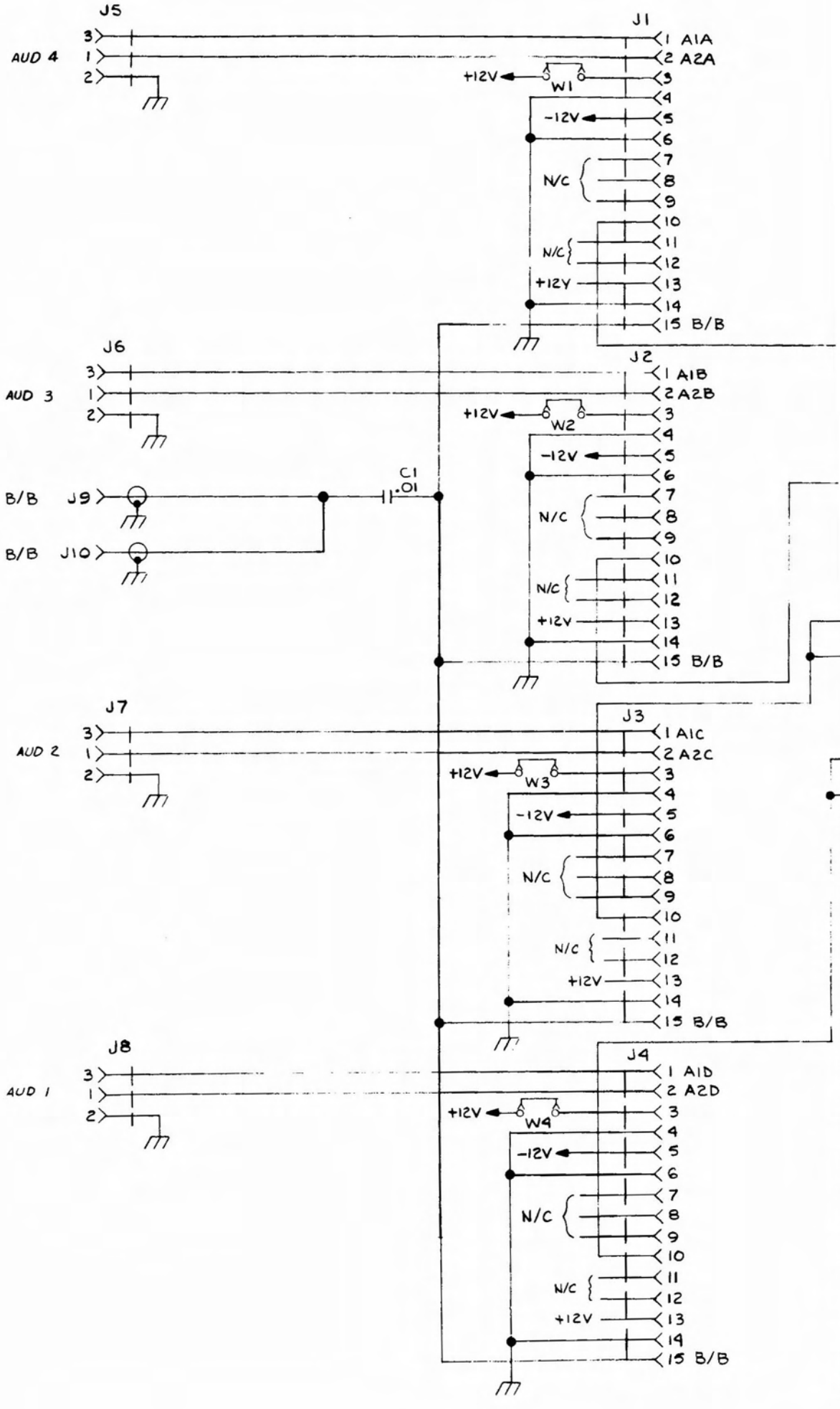


FRONT VIEW



BACK VIEW

Figure 6-4. Backplane Board – Component Locations
PN 842352


J5
AUD 4
3
1
2
J1
1 A1A
2 A2A
+12V
W1
3
4
-12V
5
6
N/C
7
8
9
10
N/C
11
12
+12V
13
14
15 B/B
J6
AUD 3
J2
1 A1B
2 A2B
W2
C1
.01
B/B J9
B/B J10
J7
AUD 2
J3
1 A1C
2 A2C
W3
J8
AUD 1
J4
1 A1D
2 A2D
W4

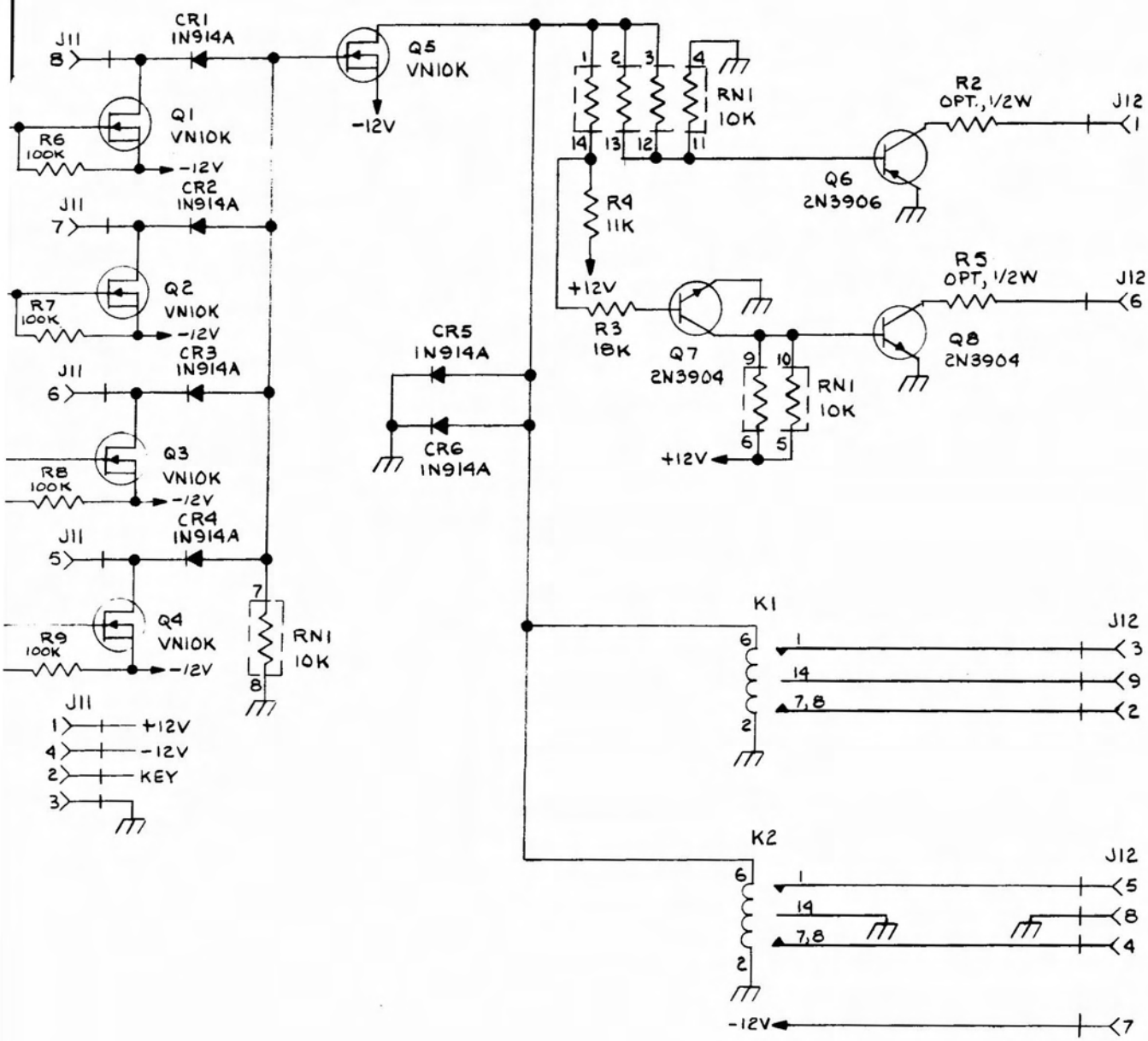
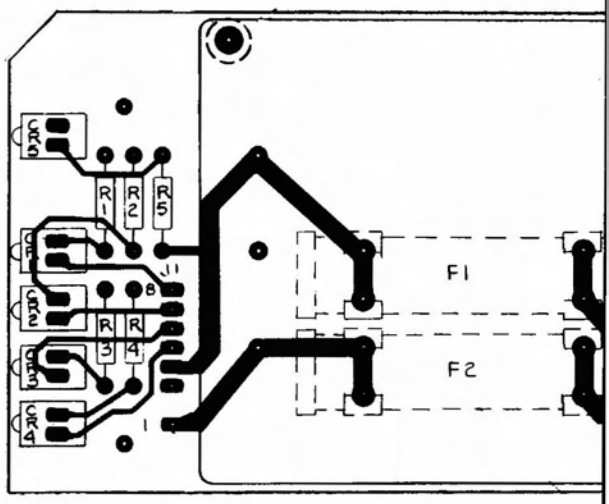
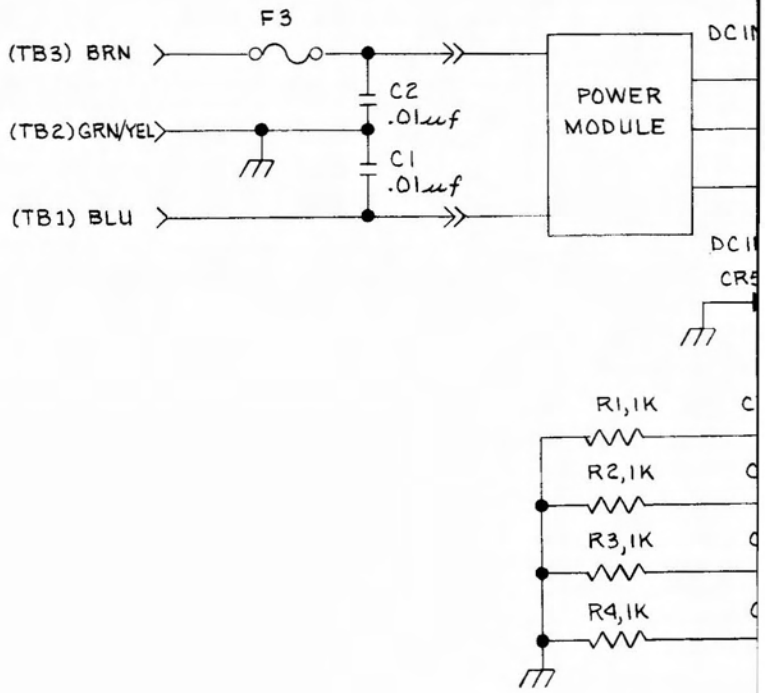
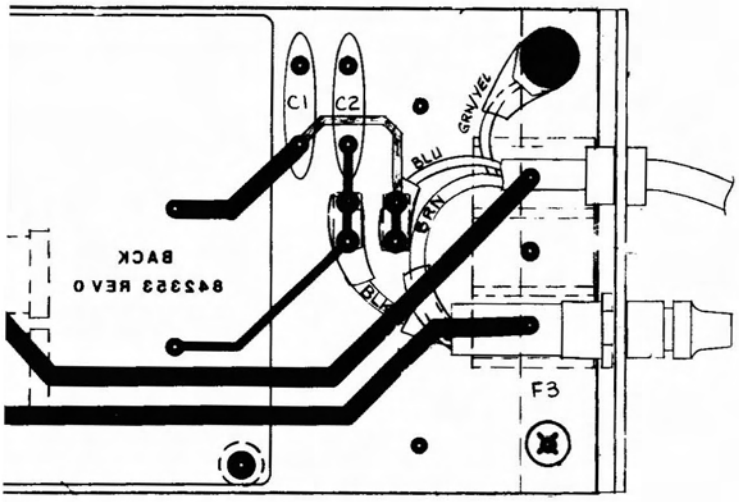


Figure 6-5. Backplane Board – Schematic Diagram
PN 842352


R1
R2
R5
R3
R4
F1
F2


F3
(TB3) BRN
(TB2) GRN/YEL
(TB1) BLU
C2
.01uf
C1
.01uf
POWER
MODULE
R1,1K
R2,1K
R3,1K
R4,1K



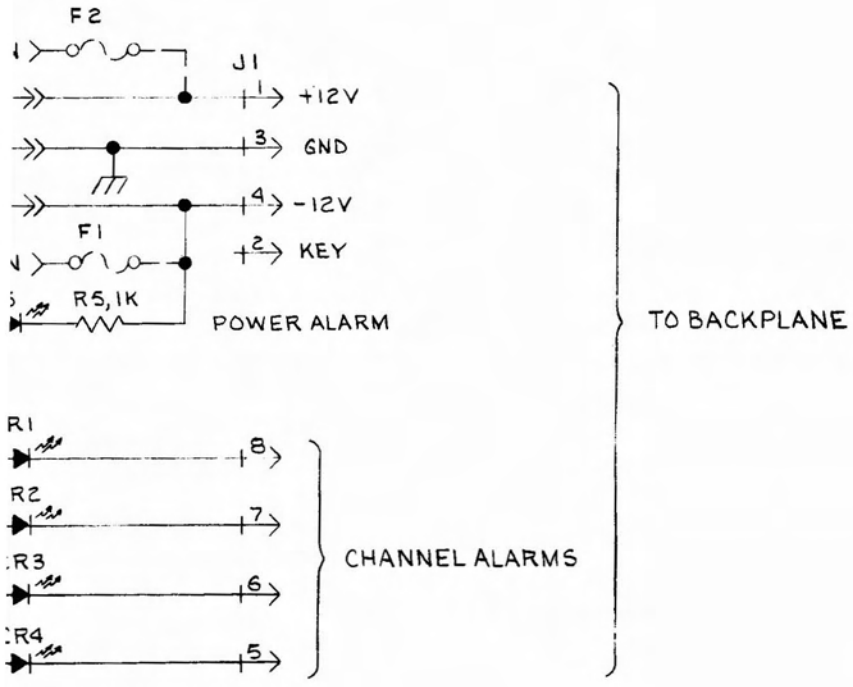
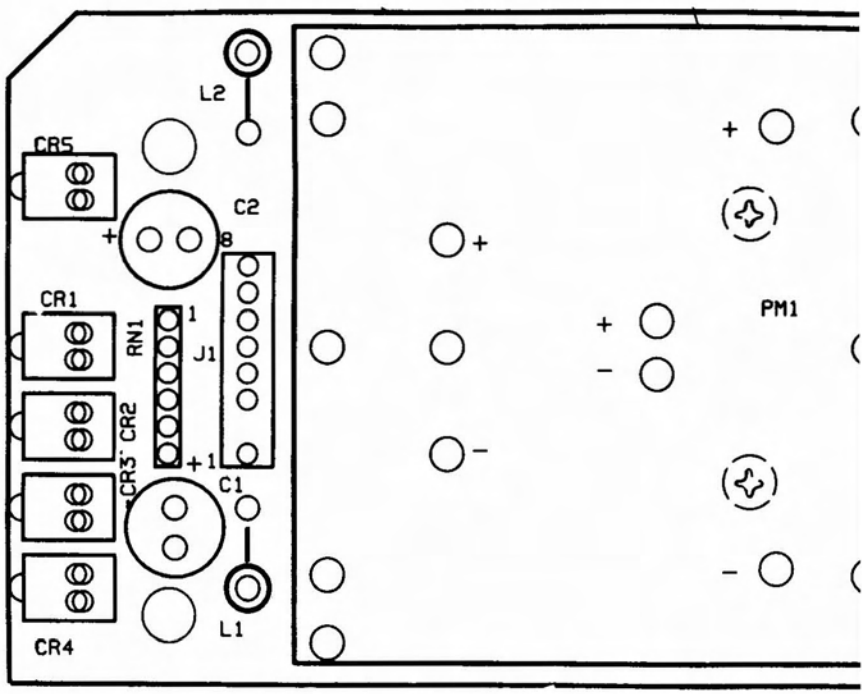
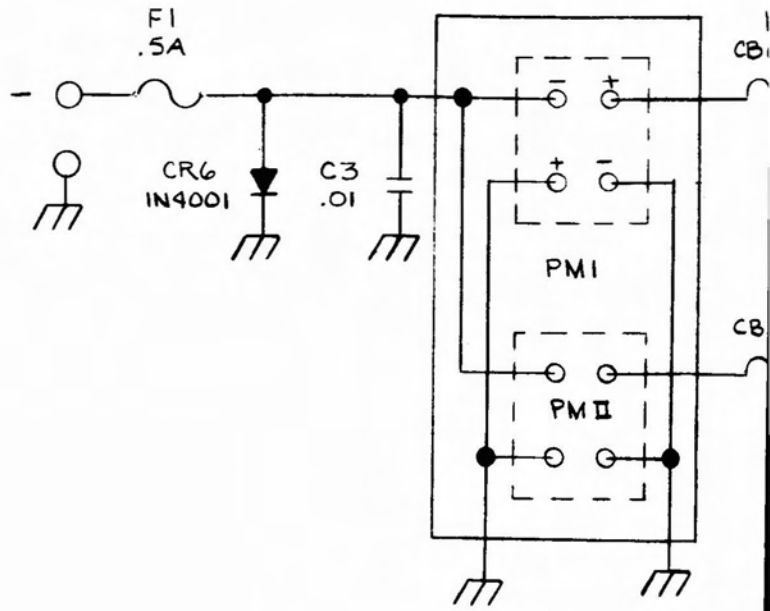
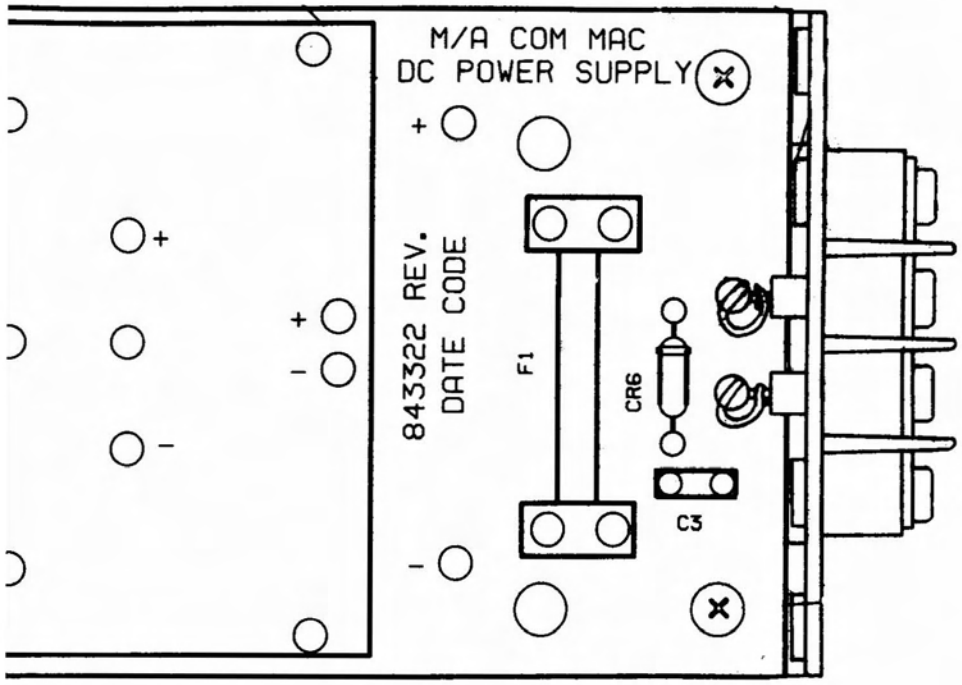


Figure 6-6. Power Supply – Component Locations/ Schematic Diagram PN 842354


L2
CR5
C2
CR1
RN1
J1
CR2
CR3
C1
CR4
L1
PM1


F1
.5A
CR6
IN4001
C3
.01
PM1
PM II
CB

RN1
1K



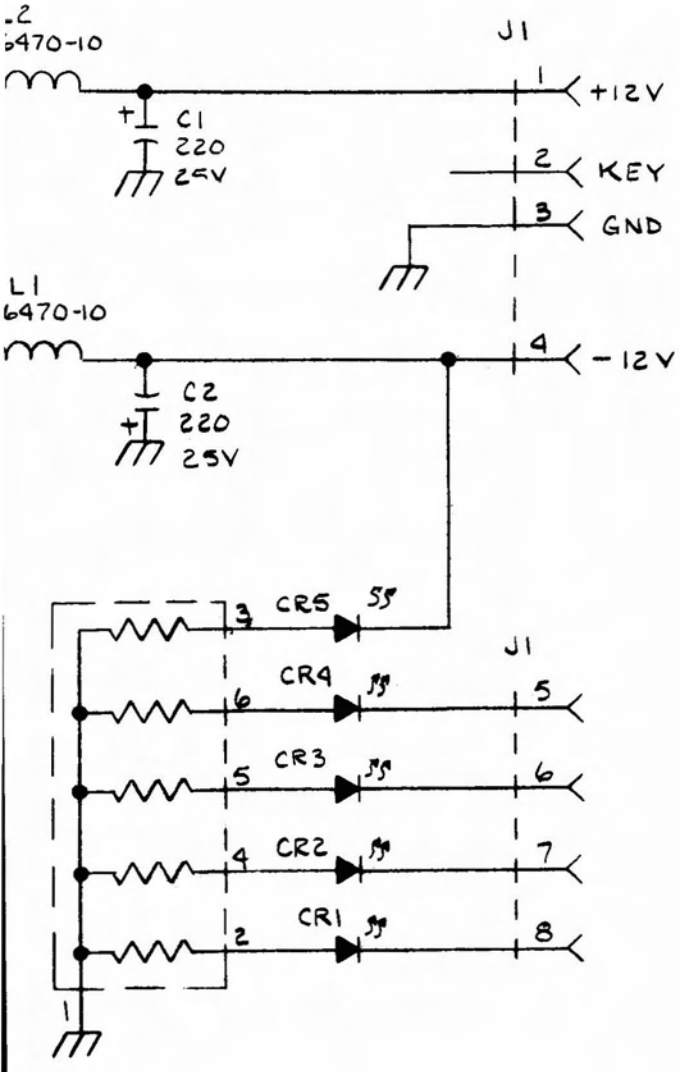


Figure 6-7. DC/DC Convertor – Component Locations/ Schematic Diagram PN 843322

SECTION 7
PARTS LISTS

LIST OF PARTS LISTS

PAC-10 MODULATOR ASSEMBLY (115 VAC) PN 842350-1

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display (115 Vac Input)	842354-1	MAC
	Modulator PWB Assembly	1841856	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-41	
	Standoff	88501-42	
	AC Protection Shield	842788-1	MAC
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

PAC-12 DEMODULATOR ASSEMBLY (115 VAC) PN 842350-2

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display (115 Vac Input)	842354-1	MAC
	Demodulator PWB Assembly	1841854	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-41	
	Standoff	88501-42	
	AC Protection Shield	842788-1	MAC
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
PAC-10 MODULATOR ASSEMBLY (DC INPUT) PN 842350-3			
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	DC/DC Convertor PWB Assembly	843322-1	MAC
	Modulator PWB Assembly	1841856	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

PAC-12 DEMODULATOR ASSEMBLY (DC INPUT) PN 842350-4

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	DC/DC Convertor PWB Assembly	843322-1	MAC
	Demodulator PWB Assembly	1841854	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
PAC-10 MODULATOR ASSEMBLY (230 VAC) PN 842350-5			
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display PWB Assembly	842354-3	MAC
	Modulator PWB Assembly	1841856	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

PAC-12 DEMODULATOR ASSEMBLY (230 VAC) PN 842350-6

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display PWB Assembly	842354-3	MAC
	Demodulator PWB Assembly	1841854	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
PAC-10 MODULATOR ASSEMBLY (±12 VDC IN) PN 842350-7			
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display PWB Assembly	842354-2	MAC
	Modulator PWB Assembly	1841856	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

PAC-12 DEMODULATOR ASSEMBLY (± 12 VDC IN) PN 842350-8

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Chassis	842349-1	MAC
	Cover	842348-1	MAC
	Extrusion, Side Mount	842356-1	MAC
	Backplane PWB Assembly	842352-1	MAC
	Power Supply & Display PWB Assembly	842354-2	MAC
	Demodulator PWB Assembly	1841854	MAC
	Wire Harness Assembly	842357-1	MAC
	Standoff	88501-42	
	Card Pull	842789-1	MAC
	Card Pull, Plastic	89918-4	
	Connector D	89360	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
AUDIO MODULATOR PWB ASSEMBLY 1841856			
	CAPACITORS		
All capacitors are in microfarads unless otherwise specified.			
C4,C5	10, 35V	189719A-9	
C6	0.01, 50V, 1%	188212-87	Polys
C8	510 pF	189017A-51	CM05ED511J03
C9	22, 35V	189139A-42	
C10	0.1, 63V	189010A-4	Polys
C11	0.001, 100V	189010A-1	Polys
C12	See Table		
C13,C14,C15	0.1, 63V	189010A-4	Polys
C16	10, 35V	189719A-9	
C19	36 pF	189094A	CM05ED360J03
C20	120 pF	189017A-12	CM05ED121J03
C23	200 pF	189008A-76	CM05ED201J03
C24	10, 35V	189719A-9	
C30	0.1, 63V	189010A-4	Polys
C32	560 pF	189008A-4	CM05ED561J03
C33,C34,C35,C36	10, 35V	189719A-9	
	DIODES		
CR1	MV1403	189449A-78	
CR2,CR3	Varactor HP5082-2800	189424	Hewlett Packard
	TERMINALS		
E1,E2,E3	Pin	188500-29	Berg 75401
	INDUCTORS		
All inductors are in microhenries unless otherwise specified.			
L3,L4	See Table		
L5	220	189169A-86	Delevan 1025-76
	TRANSISTORS		
Q1,Q2	2N3904	189700A	Motorola
	RESISTORS		
All resistors are in 1/4W 5% ohms unless otherwise specified.			
R1	300	189486A	RC07GF301J
R2	5.6K	189226A	RC07GF562J
R3	300	189486A	RC07GF301J
R4	5.6K	189226A	RC07GF562J
R5	Potentiometer 5K	88453-29	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
R6,R7	2.7K	189181A	RC07GF272J
R8,R9	12K	189492A	RC07GF123J
R10	See Table		
R13	2K	189488A	RC07GF201J
R14,R15	220K, 1/8W, 1%	89262-7	RN55D221RF
R16	270, 1/2W, 5%	88024	RC20GF271J
R17	100	189202A	RC07GF101J
R18	75	189280A	RC07GF750J
R19	130	189200A-17	RC07GF131J
R20	8.2K	189237A	RC07GFD822J
R21	3.9K	189224A	RC07GF392J
R22	330	189205A	RC07GF331J
R23	56	189232A	RC07GF560J
R24	1.5K	189236A	RC07GF152J
R25	Potentiometer 5K	88453-29	
R26	332, 1/8W, 1%	189256-32	RN55D332RF
R27	8.2K	189237A	RC07GFD822J
R28	6.8K	189182A	RC07GF682J
R29	39K	189494A	RC07GF393J
R30	1K	189220A	RC07GF102J
R31	See Table		
R32	10K	189227A	RC07GF103J
R33	27K	188078A	RC07GF273J
R34	5.6K	189226A	RC07GF562J
R35	200	189484A	RC07GF201J
R36,R37	4.7K	189225A	RC07GF472J
R38	1M	189238A-30	RC07GF105J
R39	6.2K	189200A-5	RC07GF622J
R40	Potentiometer 5K	188453-32	
R41	6.8K	189182A	RC07GF682J
R42	3.9K	189224A	RC07GF392J
R43	22K	189228A	RC07GF223J
R44,R45	3K	189490A	RC07GF301J
R46	62	189481A-18	RC07GF620J
R47	5.1K	189491A	RC07GF511J
	INTEGRATED CIRCUITS		
U1	NE5532	189975-42	
U2	MC1648L	189889-8	
U3	MC145106CP Stat Sense	189889-59	
U5	LM311	1879889-11	
	SHORTING PLUG		
W1	Shorting Plug	188500-23	

REF DES **DESCRIPTION** **PART NO.** **SIMILAR TO**

FREQ.	4.83	5.2	5.8	6.2	6.8	7.02	7.5	8.065	8.3	8.59
DASH #	1/11	2/12	3/13	4/14	5/15	6/16	7/17	8/18	9/19	10
C12	10 pF	22 pF	22 pF	22 pF	27 pF	39 pF	39 pF	39 pF	39 pF	39 pF
L3	17-35	7.5-17	7.5-17	7.5-17	3.5-8.5	3.5-8.5	3.5-8.5	3.5-8.5	3.5-8.5	3.5-8.5
L4	3.5-8.5	3.5-8.5	3.5-8.5	1.7-3.9	1.7-3.9	1.7-3.9	1.7-3.9	0.9-2.1	0.9-2.1	0.9-2.1
R10	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K	7.68K/4.99K
R31	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K	3.48K/3.16K
Y1	12.3648	13.3120	14.840	15.8720	17.4080	17.9710	19.2000	20.6500	21.2480	21.9904

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
AUDIO DEMODULATOR PWB ASSEMBLY 1841854			
	CAPACITORS		
All capacitors are in microfarads unless otherwise specified.			
C1,C2	100, 25V	189719A-4	
C3	1200 pF	189008A-84	CM05ED1200J03
C4	100, 25V	189719A-4	
C5	0.001, 100V	189010A-1	
C6,C7	10, 35V	189719A-9	Hilton SWT35Z10
C8,C9	0.01, 100V	189010A-2	
C10,C12	See Table		
C13	10, 35V	189719A-9	Hilton SWT35Z10
C14,C15	0.01, 100V	189010A-2	
C16	0.001, 100V	189010A-1	
C17	0.022, 1%	188214-35	Polyp
C18,C19	0.001, 100V	189010A-1	
C20,C21	10, 35V	189719A-9	Hilton SWT35Z10
C22	910 pF, 1%	189017A-5	CM05ED911J03
C23	2400 pF, 1%	189008-38	CM05ED2401J03
C24	130 pF, 1%	189008A-69	CM05ED131J03
C25	Variable, 3.2-18 pF	189017-29	Matsushita ECV1Z2-20P
C26,C27,C28,C29	910 pF, 1%	189017A-5	CM05ED911J03
C30	100, 25V	189719A-4	
C31,C32	10 pF, 300V	189007-10	DM5
C33,C34	22 pF	89008-48	DM5
	TERMINALS		
E1,E2,E3,E4,E5,E6,E7	Pin	188500-29	Berg
	FILTERS		
FL1	See Table		
	INDUCTORS		
All inductors are in microhenries unless otherwise specified.			
L1,L2	33	189169A-84	Delevan 1025-56
L3,L4,L5	See Table		
	TRANSISTORS		
Q1	2N3904	189700A	Motorola
Q2	2N3906	189727A	Motorola
Q3	2N3904	189700A	Motorola

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	RESISTORS		
All resistors are in 1/4W 5% ohms unless otherwise specified.			
R1	274, 1/8W, 1%	188541A-56	RN55D274RF
R2	24.3, 1/8W, 1%	189256A-76	RN55D24R3F
R3	100K, 1/8W, 1%	189330A	RN55D100RF
R4	6.98K, 1/8W, 1%	89262A-35	RN55D6R98F
R5	93.1K, 1/8W, 1%	89262A-39	RN55D93R1F
R6	274, 1/8W, 1%	188541A-56	RN55D274RF
R7	24.3, 1/8W, 1%	189256A-76	RN55D24R3F
R8	910	189200A-19	RC07GF911J
R9	Potentiometer 5K	88453-29	
R10	330	189205A	RC07GF331J
R11,R12	See Table		
R13	10K	189227A	RC07GF103J
R14	7.5K	189481A-44	RC07GF752J
R15,R16	10K	189227A	RC07GF103J
R17	100	189202A	RC07GF101J
R18	270	189485A	RC07GF271J
R20	5.6K	189226A	RC07GF562J
R21	1.6K	189481A-59	RC07GF162J
R22	1K	189220A	RC07GF101J
R24	See Table		
R25	100	189202A	RC07GF101J
R26	620	189200A-10	RC07GF621J
R27	27K	188078A	RC07GF273J
R28,R29	4.7K	189225A	RC07GF472J
R30	1M	189238A-30	RC07GF105J
R31	8.2K	189237A	RC07GF822J
R32	Potentiometer 5K	188453-92	
R33	6.8K	189182A	RC07GF682J
R34,R35	10.5K, 1/8W, 1%	189256A-78	RN55D10R5F
R36,R37	11K, 1/8W, 1%	188270A	RN55D11R0F
R38	4.99K, 1/8W, 1%	189256A-93	RN55D4R99F
R39	Potentiometer 1K	88453-38	
R40	Potentiometer 50	88453-35	
R41	1.87K, 1/8W, 1%	189327A-60	RN55D1R87F
R42	10.5K, 1/8W, 1%	189256A-78	RN55D10R5F
R43	7.5K	189481A-44	RC07GF752J
R44	5.1K	189491A	RC07GF512J
R45	3.9K	189224A	RC07GF392J
	INTEGRATED CIRCUITS		
U1	NE5532N	189975-42	
U2	CA3189	189889-87	
U3	LM311	189889-11	
U4	TL082	189889-85	

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	SHORTING PLUGS		
W1,W2,W3	Shorting Plug	188500-23	

FREQ.	4.83	5.2	5.8	6.2	6.8	7.02	7.5	8.065	8.3
DASH #	1/11	2/12	3/13	4/14	5/15	6/16	7/17	8/18	9/19
C10	–	–	–	–	–	68 pF	82 pF	75 pF	68 pF
C12	5-40 pF	3.2-18 pF	5-40 pF	5-40 pF	5-40 pD	3.2-18 pF	3.2-18 pF	3.2-18 pF	3.2-18 pF
FL1	4.83	5.2	5.8	6.2	6.8	7.02	7.5	8.065	8.3
L5	14-1/2T	14-1/2T	12-1/2T	9-1/2T	9-1/2T	7-1/2T	7-1/2T	7-1/2T	7-1/2T

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
BACKPLANE BOARD ASSEMBLY PN 842352-1			
	CAPACITORS		
All capacitors are in microfarads unless otherwise specified.			
C1	0.01, 100V, 5%	189010A-2	
	DIODES		
CR1,CR2,CR3,CR4,CR5,CR6	1N914A	89405	GE
	CONNECTORS		
J1,J2,J3,J4,J5	15 Pin, Card Edge	89760-31	
J5,J6,J7,J8	3 Position, Barrier Strip Plug	189892-21	
J9,J10	Straight BNC (F)	188357-47	
J11	Pin	188500-29	Berg
J12	9 Pin Connector D	89397-26	
	RELAYS		
K1,K2	Relay	89980-45	Sigma 191TE1C1-12G
	TRANSISTORS		
Q1,Q2,Q3,Q4,Q5	VN10K	89888-70	
Q6	2N3906	89727	Motorola
Q7,Q8	2N3904	89700	Motorola
	RESISTORS		
All resistors are in 1/4W 5% ohms unless otherwise specified.			
R3	18K	89279	RC07GF183J
R4	11K	89238-35	RC07GF113J
R6,R7,R8,R9	100K	89278	RC07GF104J
	RESISTOR NETWORKS		
RN1	10K	88540-32	
	SWITCHES		
W1,W2,W3,W4	Switch	189920-93	Cambion Clickit

POWER SUPPLY & DISPLAY PWB ASSEMBLY (115 VAC) PN 842354-1

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
	Power Supply 115 Vac In, ± 12V Out	89870-88	
	Bracket, AC Line & Fuse	842358-1	MAC
	Fuse Holder	89300-4	
	Fuse, 1A, AGC	88201	
	Power Cord	88305-46	
	Strain Relief Busing	89990-32	
	Terminal, Ring	88380-82	
	Terminal, Slip-On	88380-84	
	Tab, PCB Disconnect	88500-22	
	Pins	188500-29	Berg
C1,C2	Capacitor, 0.01 μF	89719-59	
CR1,CR2,CR3,CR4	LED, Red	89904-55	MAC
CR5	LED, Green	89904-45	MAC
R1,R2,R3,R4,R5	Resistor, 1K, 1/4W, 5%	89220	RC07GF101J

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
POWER SUPPLY & DISPLAY PWB ASSEMBLY (DC INPUT) PN 842354-2			
	Terminal Block, 3 Position	189892-24	
	Fuse Clip	89300-1	
	Fuse, 0.5A, AGC	88203	
	Pins	188500-29	Berg
CR1,CR2,CR3,CR4	LED, Red	89904-55	MAC
CR5	LED, Green	89904-45	MAC
R1,R2,R3,R4,R5	Resistor, 1K, 1/4W, 5%	89220	RC07GF101J

REF DES	DESCRIPTION	PART NO.	SIMILAR TO
DC/DC CONVERTOR PWB ASSEMBLY PN 843322			
	CAPACITORS		
All capacitors are in microhenries unless otherwise specified.			
C1,C2	100, 25V	189719-4	
C3	0.01, 10%	87211	
	DIODES		
CR1,CR2,CR3,CR4	LED, Red	89904-55	
CR5	LED, Green	89904-45	
CR6	1N4006	89440-58	
	FUSES		
F1	1/2A AGC		
	CONNECTORS		
J1	Terminal, Pin	188500-29	Berg
	INDUCTORS		
All inductors are in microhenries unless otherwise specified.			
L1,L2	100	89169-60	
	CONVERTERS		
PM1	DC/DC Converter PM 871 (For G1 Only)	89871-76	
PM1	DC/DC Converter PM 891 (For G2 Only)	88198-48	
	RESISTOR NETWORKS		
RN1	1K	188540-27	