

Instruction Manual



**PCL-606
(940-960 MHz)**

**MONAURAL
STUDIO TRANSMITTER LINK**

Revised
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GLOSSARY

AFC	automatic frequency control
AGC	automatic gain control
FET	field effect transistor
IC	integrated circuit
IMD	intermodulation distortion
IPA	intermediate power amplifier
LED	light-emitting diode
LO	local oscillator
MUX	multiplex
NC	normally closed
NO	normally open
PC	printed circuit
RCVR	receiver
SCA	subsidiary communications authority
SRD	Step Recovery Diode
SNR	signal-to-noise ratio
STL	studio-to-transmitter link
THD	total harmonic distortion
TTL	transistor-transistor logic
XMTR	transmitter

SECTION 1

SYSTEM CHARACTERISTICS

1.1 INTRODUCTION

The model PCL-606 Studio-to-Transmitter Link (STL) is designed to convey monaural program material from a studio site to a transmitter site. The PCL-606 also simultaneously conveys control and secondary programming subcarriers. This equipment may also be used to provide high-quality program transmission in intercity relay service.

The PCL-606 series of equipment is a family of equipment that can operate in several bands from 148 MHz through 1.7 GHz. This manual is for a monaural system operating in the 940 MHz to 960 MHz region.

1.2 SYSTEM SPECIFICATIONS

The system specifications for a monaural PCL-606 in the 940 - 960 MHz band are as follows:

Frequency Range	940-960 MHz
Program Frequency Response	0.25 dB from 30 Hz to 15 kHz
Distortion: THD and IMD	0.2% (0.2%) or less from 30 Hz to 15 kHz. Typically better than 0.1% at 1 kHz.
SNR (ultimate 15 kHz bandwidth de-emphasized)	72 dB (typically 75 dB)
Operating temperature	0°C to +50°C
Emission	110F3 (no subcarrier) 110F9 (26 kHz control subcarrier) 230F9 (67 kHz program subcarrier)

1.2.1 Transmitter Specifications

Type	Solid state, direct FM, frequency synthesized, crystal referenced
RF Power	5 watts minimum, 10 watts maximum Type N connector

Frequency stability	±.00025%
Deviation	40 kHz for 100% modulation
Harmonic suppression	Better than 60 dB below carrier
Spurious emission	Better than 60 dB below carrier
Program	+10 dBm, 600 ohm resistive, balanced, floating barrier strip connector.
Multiplex	1.5 V p-p, unbalanced BNC connector
Power requirements	100/120/220/240 Vac ±10% 50-60 Hz, 70 watts
Dimensions	8.9 cm (3.5 inches) high 48.4 cm (19 inches) wide 40.7 cm (16 inches) deep
Shipping weight	12.7 kg (28 lb) domestic

1.2.2 Receiver Specifications

Sensitivity de-emphasized 15 KHz bandwidth	Less than 30 microvolts for 60 dB SNR
IF Bandwidth	3 dB 90 kHz
Narrow	60 dB 400 kHz 80 dB ±1 MHz
Program outputs	30 Hz to 15 kHz, +10 dBm, 600 resistive, balanced, floating barrier strip connector
Multiplex outputs (2)	22-85 kHz, 1.5 V pp unbalanced BNC connector
Power requirements	100/120/220/240 Vac ±10% 50-60 Hz, 30 watts
Dimensions	8.9 cm (3.5 inches) high 48.4 cm (19 inches) wide 40.7 cm (16 inches) deep
Shipping weight	12.7 kg (28 lb) domestic

1.3 SYSTEM FEATURES

In addition to establishing a new industry standard for performance, the PCL-606 incorporates many new and innovative features to aid in the installation, operation, and maintenance of a system. Some of the features are:

- o A PIN Diode Attenuator in the receiver to allow optimization of SNR performance in high-density, high-signal-strength areas.
- o A wide-band, adjustment-free, digital FM demodulator.
- o Dual ceramic, adjustment-free, very low distortion IF filters offering unprecedented selectivity.
- o The choice of two selectable IF bandwidths to optimize distortion as a function of adjacent or alternative channel rejection (wide bandwidth not recommended for dual monaural applications).
- o A built-in peak reading meter for all major functions.
- o A four-decade logarithmic true signal strength meter.
- o Built-in internal test metering capability.
- o Important status functions implemented with two-color LED indicators.
- o Designed to have a minimum of adjustments for trouble-free operation.
- o Modular construction that provides excellent shielding and at the same time allows easy access to components.
- o Built-in receiver switch-over circuits that permit a pair of PCL-606s to accomplish automatic switch-over upon detection of a fault without additional transfer panels.

It is recommended that the manual be studied at least through Section 5 before attempting to install the system.

1.4 OPERATIONAL CONTROLS

1.4.1 Purpose

This subsection describes the controls and adjustments of a PCL-606 system that the user will encounter in normal operation and initial setup. The units once installed and set up require no further operator attention.

1.4.2 Transmitter Front Panel

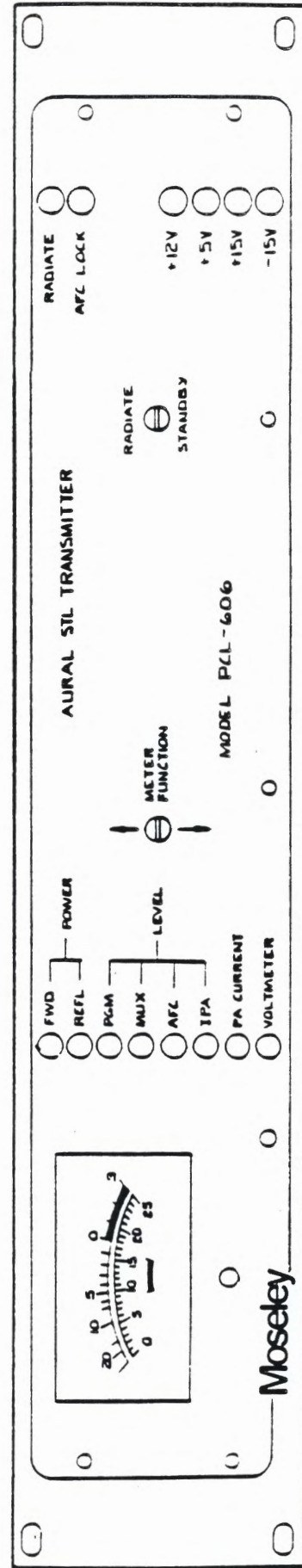
The PCL-606 transmitter front panel depicted in Figure 1-1 contains eight LED indicators for the metering function. One of the LEDs is always on to indicate the function displayed on the panel meter. The function displayed may be changed by activating the METER FUNCTION switch up or down. Each activation causes the function to change by one step in the direction selected. The meter functions and scales used are:

<u>Function</u>	<u>Scale</u>	<u>Units</u>	<u>Notes</u>
FWD POWER	dB	dB	Power in dB relative to full output. 0 dB = full output.
REFL POWER	dB	dB	Power in dB relative to full output. 0 dB = 100% reflected power.
PGM LEVEL	dB	dB	0 dB = +10 dBm from 600 source 100% modulation.
MUX LEVEL	Linear	kHz	Deviation of the main carrier by the subcarriers.
AFC LEVEL	Lower arc	None	Meter should indicate within lower arc.
IPA LEVEL	Lower arc	None	Meter should indicate within lower arc.
PA CURRENT	Linear	Tenths of Amperes	15 = 1.5 amps
VOLTMETER	Linear	Volts	Internal test probe socket.

Figure 1-1
Transmitter Front Panel

PCL-606
(960)

1-5



The meter is an absolute value peak-reading type with fast ballistics, since the purpose of the meter is to observe the peak values of modulation which affect the deviation of the Transmitter. When using the meter in the VOLTMETER mode, a bicolor LED located near the test probe socket will indicate the polarity of the voltage being measured (red = +, green = -, and orange = ac).

Four power supply LEDs indicate the condition of each of the power supplies. The normal indication is green. A power supply failure will cause the LED to extinguish.

The two transmitter status LEDs are of the two-color, red-green type. The AFC LOCK LED is green when the FMO Synthesizer has achieved a lock condition. When AFC LOCK is red, it indicates that an unlock condition exists. This inhibits any radiation of RF power, resulting in the RADIATE LED being red. When power is initially applied to the Transmitter, it is normal for the AFC LOCK LED to be red for several seconds.

The RADIATE LED will be green when the Transmitter is supplying RF power and red when not supplying RF power. This LED is controlled by internal interlock controls, the RADIATE/STANDBY switch, and any external logic associated with main/standby operation.

The RADIATE/STANDBY switch functions as an on/off switch for the RF power output. In the RADIATE position, the RF power will be on provided all of the internal interlocks are enabled. In the STANDBY position, RF radiation is controlled by external switching control and the internal interlocks.

1.4.3 Receiver Front Panel

The operation of the receiver front panel controls is very similar to the transmitter controls. Figure 1-2 shows the receiver front panel.

A METER FUNCTION switch can step up or down the selection of the function to be displayed on the meter. The receiver meter has four scales. The top scale is calibrated in dB (absolute value peak indicating) followed by a four-decade logarithmic scale, which in turn is followed by a 0 to 25 linear scale. A small center reference scale on the bottom is used for relative go/no-go indications. The scale used for each function is:

<u>Function</u>	<u>Scale</u>	<u>Units</u>	<u>Notes</u>
PGM LEVEL	dB	dB	0 dB is +10 dBm into 600 ohm load.
MUX LEVEL	Linear	kHz	Deviation of the main carrier by the sub-carriers.
RF LEVEL	Log	micro-volts	RF signal level at the receiver input.
LO1 LEVEL	Lower arc	None	Meter should indicate within lower arc.
LO2 LEVEL	Lower arc	None	Meter should indicate within lower arc.
LO3 LEVEL	Lower arc	None	Meter should indicate within lower arc.
RF GAIN	Linear	Volts	15 = full gain, 0 = max attn.
VOLTMETER	Linear	Volts	Internal test probe socket.

The three power status LEDs indicate green if the respective power supply is operating and are not illuminated if the supply voltage is not present.

Two dual-color status LEDs indicate the operational status of the Receiver; these are SIGNAL and OPERATE. The SIGNAL LED is green when there is sufficient RF signal to exceed a user-established threshold of RF signal that correlates to the minimum SNR that is acceptable to the user. When the SIGNAL LED is red, there is insufficient signal to meet the minimum SNR requirements and the Receiver is placed in a non-operating muted condition, which is indicated by a red OPERATE LED. When the receiver is operating properly, the OPERATE LED is green.

The OPERATE/TRANSFER switch is two-position, with the TRANSFER position being momentary. It is used to cause a switch-over to an alternate PCL-606 Receiver when a pair is used in a main/standby configuration. Only one receiver will have its OPERATE LED green; this is the receiver supplying the program and multiplex material.

1.4.4 Transmitter Operational Adjustments

Without removing the cover of the Transmitter, the user has access to several operational adjustments. These adjustments are primarily used to balance the various program levels when used in main/standby configurations. The locations of these adjustments are shown on the transmitter cover.

The PGM LEVEL, MUX 1 LEVEL, and MUX 2 LEVEL controls are used to establish the nominal levels for program and multiplex inputs. If the user's voltages are not the factory-established standard of +10 dBm into 600 OHMS for program material or 1.5 volts peak-to-peak for each multiplex input, then these adjustments may be used to compensate for the difference. When a steady-state reference level at 400 Hz is applied at the normal station program inputs (i.e., before limiting) and with PGM LEVEL selected on the front panel, adjust the PGM LEVEL control to indicate 0 dB on the transmitter meter when the station program level meters indicate 100% modulation and/or 0 dB.

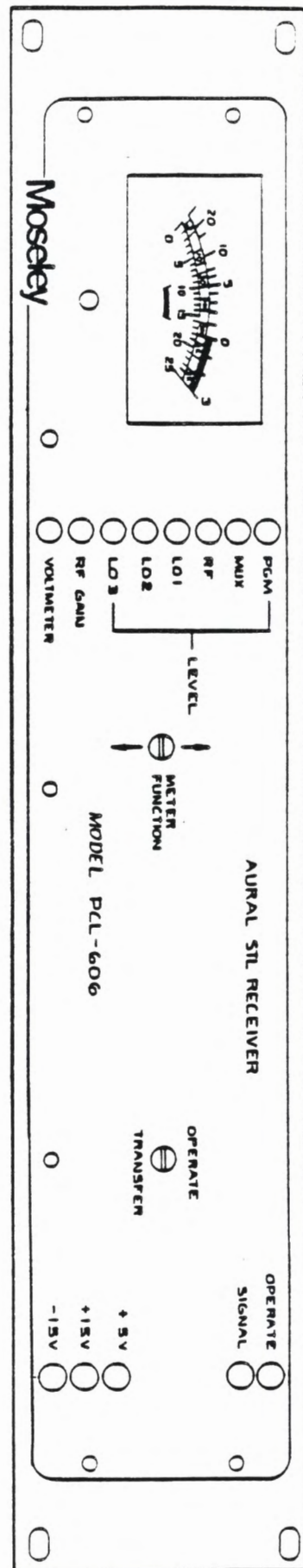


Figure 1-2
Receiver Front Panel

Applying one subcarrier at a time (the other subcarrier disabled) with the MUX LEVEL meter function selected on the front panel, adjust the corresponding MUX level control to indicate the deviation of the main carrier by the subcarrier, nominally 4 kHz for the 26 kHz subcarrier and 6 kHz for the 67 kHz subcarrier. When both subcarriers are applied, the meter indicates the total main carrier deviation of 10 kHz. NOTE that the meter indicates the subcarrier level and not the modulation on the subcarrier.

1.4.5 Receiver Operational Adjustments

Four operational adjustments are accessible through the top cover of the Receiver. These adjustments are normally made at the time of installation to tailor the PCL-606 Receiver to the user's environment. The locations of the adjustments are identified on the receiver cover.

The BASEBAND LEVEL control establishes the output level of the program signal from the Receiver. It has a nominal value of +10 dBm into 600 ohms for 100% modulation when shipped from the factory. NOTE: The BASEBAND LEVEL control affects the MUX as well as the program output level; therefore, if it is changed, a corresponding change in the MUX LEVEL control will be necessary to bring the MUX levels into line.

The MUX LEVEL control establishes the output voltage of all subcarrier outputs. It is initially set at 1.5 volts peak-to-peak for a subcarrier that deviates the main carrier 4 kHz (26 kHz MUX channel 1), and approximately 2.25 V p-p for a subcarrier that deviates the main carrier 6 kHz (67 kHz MUX channel 2). This control has no effect on the output level.

The MUTE THRESHOLD control establishes the RF signal level below which the Receiver becomes muted. This control is factory set at the RF signal level that produces approximately a 45 dB SNR. A counterclockwise rotation of this control decreases the threshold voltage. In the fully counterclockwise direction, the Receiver in most cases will not mute in the absence of a signal.

The RF GAIN adjustment is a control designed to optimize the SNR of the Receiver by minimizing the effects of RF intermodulation distortion. There are two distinct cases where this control should be used. This first is where the receiver RF signal exceeds 1500 microvolts. The RF GAIN control should be adjusted so that the receiver signal is approximately 1500 microvolts as indicated by the front panel meter.

The second case where the RF GAIN control is valuable is when a number of other signals in the band exceed the desired signal. To achieve optimum results, establish a 400 Hz reference level channel on an audio analyzer, and then remove the modulation. Use the RF GAIN adjustment to reduce the RF input while observing the resulting noise on the audio analyzer. If any interference is being caused by other signals, the SNR will improve until the signal is reduced to a point where the lack of on-channel signal begins to contribute more to the noise. Adjust for a peak in SNR.

Figure 1-3 depicts the basic shape of the SNR curve with and without high-level signals in the band. It should be emphasized that it is not necessarily only high-level adjacent channels that can cause interference. There are many combinations of signals that can give rise to intermodulation distortion, which will cause the resultant product to fall within the desired passband.

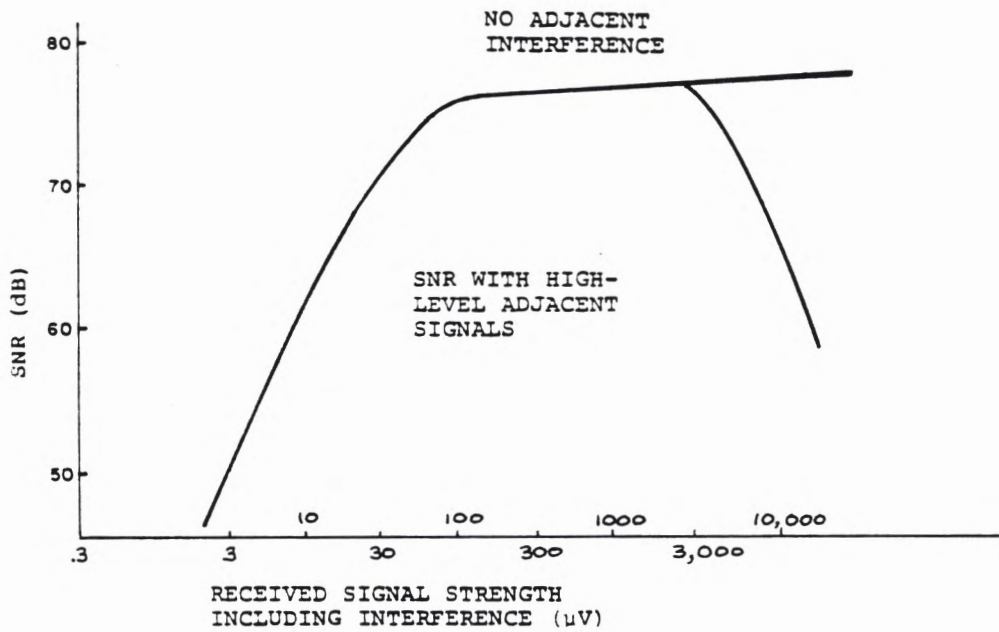


Figure 1-3
Typical SNR Curves

SECTION 2

SYSTEM DESCRIPTIVE INFORMATION

2.1 TRANSMITTER

Block and Level 92D1264
Schematic 91D7314
Assembly 21D2757

The PCL-606 transmitter is a high-fidelity broadband FM transmitter operating in the 950 MHz STL band with a power output of 5 to 8 watts. It is capable of transmitting the program signal and two multiplex subcarriers with little degradation of signal quality over one link. The linearity and FM noise characteristics of the direct FM oscillator are exceptional. The transmitter is modular in construction and operation, and the system description given below follows the signal flow through the various modules.

Mono Audio Processor

Three signal inputs are provided in the Mono Audio Processor module: one mono signal and two multiplex signals. The mono program signal is +10 dBm into 600 ohms. Two switches provide for the in/out selection of 75 μ s pre-emphasis and 15 kHz low-pass filter processing of the mono program signal. The multiplex inputs are 1.5 V p-p. Level adjustments are provided for all three signals which are then fed to a summing amplifier. They are combined into a mono baseband signal and sent to the FMO synthesizer module.

FMO Synthesizer

The mono signal (program plus MUX) is used to modulate the frequency modulated oscillator (FMO) in the FMO Synthesizer module. The FMO (60-80 MHz) is ultralinear, very low noise. This oscillator is phase locked to a crystal-controlled reference oscillator; the phase lock loop contains the frequency programming switches which allow the synthesizer to be changed in frequency by 10 kHz increments. The RF output of the 60-80 MHz FMO then goes through a low pass filter to attenuate any harmonics. With 100% composite stereo modulation, the RF signal will deviate ± 40 kHz from the chosen center frequency. The output power at this point is approximately 1 milliwatt.

950 MHz Up Converter

To preserve the low noise and low distortion characteristics of the FMO, the traditional method of multiplying up to 950 MHz was avoided. Instead, a scheme was chosen consisting of a single up-conversion utilizing a high-side local oscillator operating at 1020 MHz. This process takes place in the Up Converter Module. The signal from the FMO enters one port of the double balanced mixer; the signal from the first LO multiplier at 1020 MHz enters the module through a bandpass filter to attenuate any harmonics and then enters the LO port of the double balanced mixer. The output of the mixer contains both the sum and difference frequencies of the two input signals. The frequency required is the lower product at approximately 950 MHz. This is selected by the 950 MHz bandpass filter, which eliminates all other mixer products. The output level at this point is approximately 10 dBm. The signal is then fed to the intermediate power amplifier (IPA), which has about 30 dB of gain; this raises the level of the signal sufficiently to drive the final RF amplifier.

The output frequency of the Up Converter is controlled by the frequency set by the FMO synthesizer. This can be set in 10 kHz steps from 60-80 MHz. The lower product of the 60-80 MHz signal mixed with the fixed 1020 MHz output of the first LO multiplier determines the frequency at the output of the Up Converter module, yielding a frequency range between 940-960 MHz.

First Local Oscillator and Multiplier

The First Local Oscillator and Multiplier module contains a 51 MHz overtone crystal oscillator, which is then buffered. The crystal itself is temperature controlled in a 65°C oven to maintain the frequency of this module to ± 2 parts per million over the operating temperature range. The output of the buffer amplifier is fed to the multiplier chain, which consists of two stages of frequency doublers and a step-recovery diode multiplier with a multiplication factor of 5. This provides an overall multiplication factor of 20. The output of the step-recovery diode multiplier is filtered through a bandpass filter to select the desired frequency of 1020 MHz. The output power of this module is approximately +7 dBm, which is fed to the Up Converter module.

RF Amplifier

The RF Amplifier module consists of four stages of tuned amplifiers, which take the 100 mW input signal and raise it to the nominal 8-watt transmitter output. The output of the RF amplifier is passed through a low pass filter to attenuate all higher order harmonics to a level of at least -60 dBc. The output circuit contains two directional couplers with detectors that provide an indication of the forward and reflected power of the RF amplifier.

Transmitter Control

The Transmitter Control board has several functions. One of these is to sense the output of the FMO Synthesizer module. If this module goes out of lock, then the radiate control logic circuit in the Transmitter Control board provides a signal to the power supply to turn off the 12.5 volt power to the IPA and RF amplifier, causing the transmitter to stop radiating. This board contains a differential amplifier stage, which senses the voltage drop across a current sampling resistor in the RF amplifier to give a front panel meter indication of final amplifier current. This board also contains the buffer amplifiers for sending the forward power and AFC signals to the rear panel remote sampling connector.

Metering and Status

The Metering and Status board is used to monitor forward power, reflected power, program level, MUX level, AFC level, intermediate power amplifier output level, and RF amplifier output-stage current. These functions are selected via the front panel METER FUNCTION switch. The signals are routed through a multiplex IC to an absolute-value peak sampling amplifier, which drives the analog meter after the signal has been processed by a meter ballistics compensator to give the meter an extremely rapid rise time. This module also contains two bicolor red-green light emitting diodes (LEDs), which are the front panel indicators for RADIATE and AFC LOCK status. Also included are four green LEDs to indicate the presence of +15 V, -15 V, +5 V, and +12 V from the Power Supply module.

Power Supply

The Transmitter Power Supply module converts any of four ac input voltages (100, 120, 220, or 240 Vac) into the one unregulated and four regulated dc voltages required for the operation of the transmitter. The +12.5 V, 2.5 A output has a digital enable which allows the Transmitter Control board in conjunction with the FMO Synthesizer to shut the Transmitter down during the periods of loss of AFC lock on the FM oscillator. The other outputs are +15 V and -15 V at 250 mA and +5 V at 250 mA. This module also provides an unregulated 9 V supply, which is used to heat the crystal oven in the first local oscillator.

2.2 RECEIVER

Block and Level 92D1263
Schematic 91D7312
Assembly 21D2739

The PCL-606 Receiver is a high-fidelity composite FM receiver operating in the 950 MHz STL band with an input sensitivity of less than 20 microvolts for 60 dB program SNR. It is capable of receiving the mono signal and two multiplex subcarriers with little degradation of signal quality over one link. The high dynamic range, selectivity, and low noise characteristics of the receiver are exceptional. The receiver is modular in construction and operation, and the system description below follows the signal flow through the various modules.

Preselector Filter

The antenna input signal is first passed through the Preselector Filter module, which is a five-pole interdigital (comb-line) bandpass filter with very low insertion loss. This filter attenuates energy that would be fed to the pre-amplifier and first mixer at the image frequency and also ensures that any high-level, out-of-band signals, will not block the subsequent amplifier stages.

Preamplifier and First Mixer

The output of the preselector filter is fed to the 950 MHz Preamplifier and First Mixer module. This module establishes the quieting characteristics of the Receiver. Typical receiver performance is shown in Figure 2-1.

The input signal is first passed through the PIN diode attenuator, which allows the user to adjust the RF signal levels for optimum output signal-to-noise ratio. The signal is then split by a 3-dB 90° hybrid coupler and amplified by two low-noise amplifiers. It is recombined by a similar coupler and then passed through an image noise filter to the first double balanced mixer.

The couplers and double amplifiers provide a very high dynamic range preamplifier to minimize overload problems in high-density RF environments. High-side injection is used for the first local oscillator signal into the double balanced mixer at about 1020 MHz. The output at 70 MHz is amplified by the first IF amplifier, which is a low-noise, field-effect amplifier with high dynamic range. The signal is passed through a 70 MHz matching network to the 50 ohm output port of the Preamplifier and First Mixer module.

First Local Oscillator and Multiplier

The First Local Oscillator and Multiplier module contains an oven-controlled overtone crystal oscillator. The oscillator signal is buffered and passed through two stages of doubling. The output signal is then passed through a step-recovery diode multiplier, where it is multiplied by 5. At this point the overall multiplication is 20. The output signal is selected by taking the output of the step-recovery diode multiplier and passing it through the 1020 MHz bandpass filter. This signal, whose level is at about +7 dBm, is fed to the Preamplifier and First Mixer module.

Double Converter

The signal is then fed to the Double Converter module, which establishes the selectivity characteristics of the Receiver. A plot of the typical selectivity (narrow IF mode) is shown in Figure 2-2.

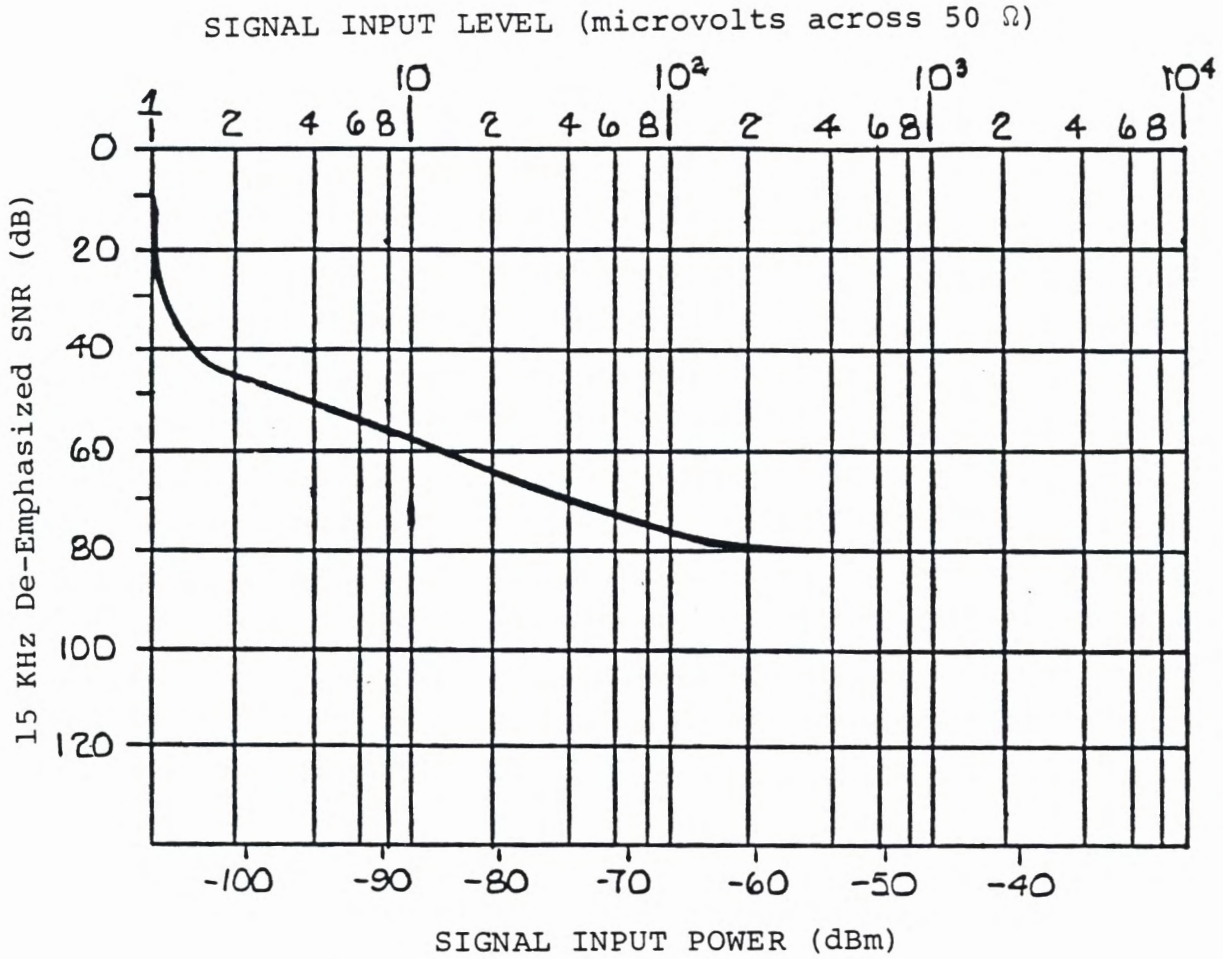


Figure 2-1

Typical Quieting Characteristics
of PCL-606 Receiver

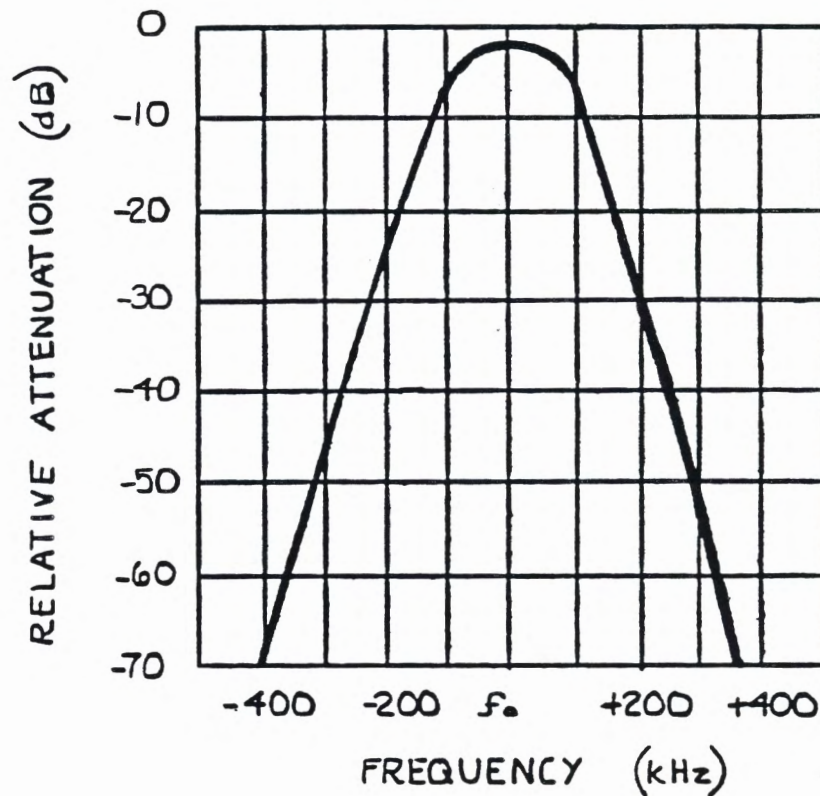


Figure 2-2

Typical Selectivity Characteristics of
PCL-606 Receiver - Narrow IF mode

The input signal is converted from 70 MHz to 3 MHz in two stages. It passes to the second 70 MHz IF amplifier and a fourth-order 70 MHz bandpass filter. From there it enters the input of the second double balanced mixer, where it is mixed with the 80.7 MHz second local oscillator signal. The output of this mixer then feeds the 10.7 MHz IF amplifier, which consists of three amplifier stages and two ceramic phase-linear bandpass filters. The second of these two filters is switch-selectable to allow the user to minimize distortion in those situations where the added selectivity is not necessary.

The output of the second filter is amplified and passed on to the third double balanced mixer, which uses the third LO signal at 13.7 MHz. The output of this mixer is then bandpass filtered through a phase-linear 3 MHz network and passed on to the FM Demodulator module.

Second and Third Local Oscillator

The Second and Third Local Oscillator module provides two local oscillator signals to the Double Converter module. The second local oscillator consists of a fundamental crystal oscillator operating at 20.175 MHz. The LO signal is buffered and then multiplied (by four) using two push-push doublers. The output is bandpass filtered for purity and sent to the second double balanced mixer. The frequency of the second local oscillator is adjustable by about ± 20 kHz; this is used to center the 10.7 MHz IF signal in the middle of the bandpass characteristics of the ceramic IF filters in the Double Converter module. The output level of the second local oscillator is approximately +7 dBm.

The third local oscillator consists of a 13.7 MHz fundamental crystal-controlled oscillator followed by a buffer amplifier and a 13.7 MHz low-pass filter. This signal at about +7 dBm is then fed to the third double balanced mixer in the Double Converter module.

FM Demodulator

The FM Demodulator module has three major functions. One is to extract the baseband information from the FM carrier. The second function is to generate the RF signal strength voltage that is applied to the meter in the RF LEVEL position, and the third is to establish the mute or squelch threshold of the receiver. The signal is first passed through a 3 MHz IF amplifier and a phase-linear 3 MHz bandpass filter. At this point the signal is split and sent to both the FM demodulator and the log IF amplifier.

For FM demodulation, the signal runs through a four-stage limiting IF amplifier, the output of which passes on to the ultra-linear pulse-counting FM demodulator. This demodulator is extremely wide band and adjustment free. The output of the FM demodulator is low-pass filtered and sent to a low noise baseband amplifier, which raises the signal level to a useful system level. The output is then sent to the Mono Baseband Processor module.

The signal from the 3 MHz IF bandpass filter is also sent to a four-stage logarithmic IF amplifier and amplitude detectors to generate the logarithmic signal used in the RF signal strength metering circuit. The output voltage of this circuit allows meaningful readings to be taken of RF levels over a range of 3 microvolts to about 3 millivolts. This signal is sent to the front panel metering circuit to indicate input RF level. This signal also goes to the mute comparator, where it is compared against an adjustable reference to set the mute or squelch threshold of the receiver. The comparator output is sent to the Mute and Transfer module.

Mono Baseband Processor

The main functions of the Mono Baseband Processor Module are to split the mono baseband signal into two frequency bands: .1 Hz to 15 kHz for mono program information; and 22 kHz to 100 kHz for MUX. Two switches provide for the in/out selection of 75 μ s deemphasis and 15 kHz low-pass filtering of the mono program signal. This module also contains the FET mute switch. The signal is first filtered through the adjacent channel low-pass filter and passed on to the FET mute switch, which is controlled by the mute comparator output of the Mute and Transfer Module. The signal is then passed through a high-frequency amplitude corrector, which compensates for the baseband high-frequency rolloff caused by the 10.7 MHz IF bandpass filter in the double convertor module, to restore proper amplitude response to the mono baseband signal.

The signal is then fed to an in/out selectable 75 μ s de-emphasis and in/out selectable 15 kHz low-pass filter. The output of this circuit is then buffered and passed to a +10 dBm floating output amplifier.

The output of the high-pass amplitude corrector is also passed to a 22 kHz MUX high-pass filter and then goes to a MUX low-pass filter, which is then buffered to yield the MUX normal output of 1.5 V p-p.

Metering and Status

The Receiver Metering and Status board measures program level, MUX level, the RF signal strength level, the output levels of the three local oscillators, and the RF gain voltage. One of these voltages or a voltage at TP1, the meter probe input, is selected through a multiplex IC switch, which is controlled by the front panel METER FUNCTION switch. The output signal is then fed to an absolute-value peak detecting amplifier and a meter ballistics compensator. After processing by the ballistics compensator to give the meter a very rapid but controlled response time, the signal is fed to the front panel meter.

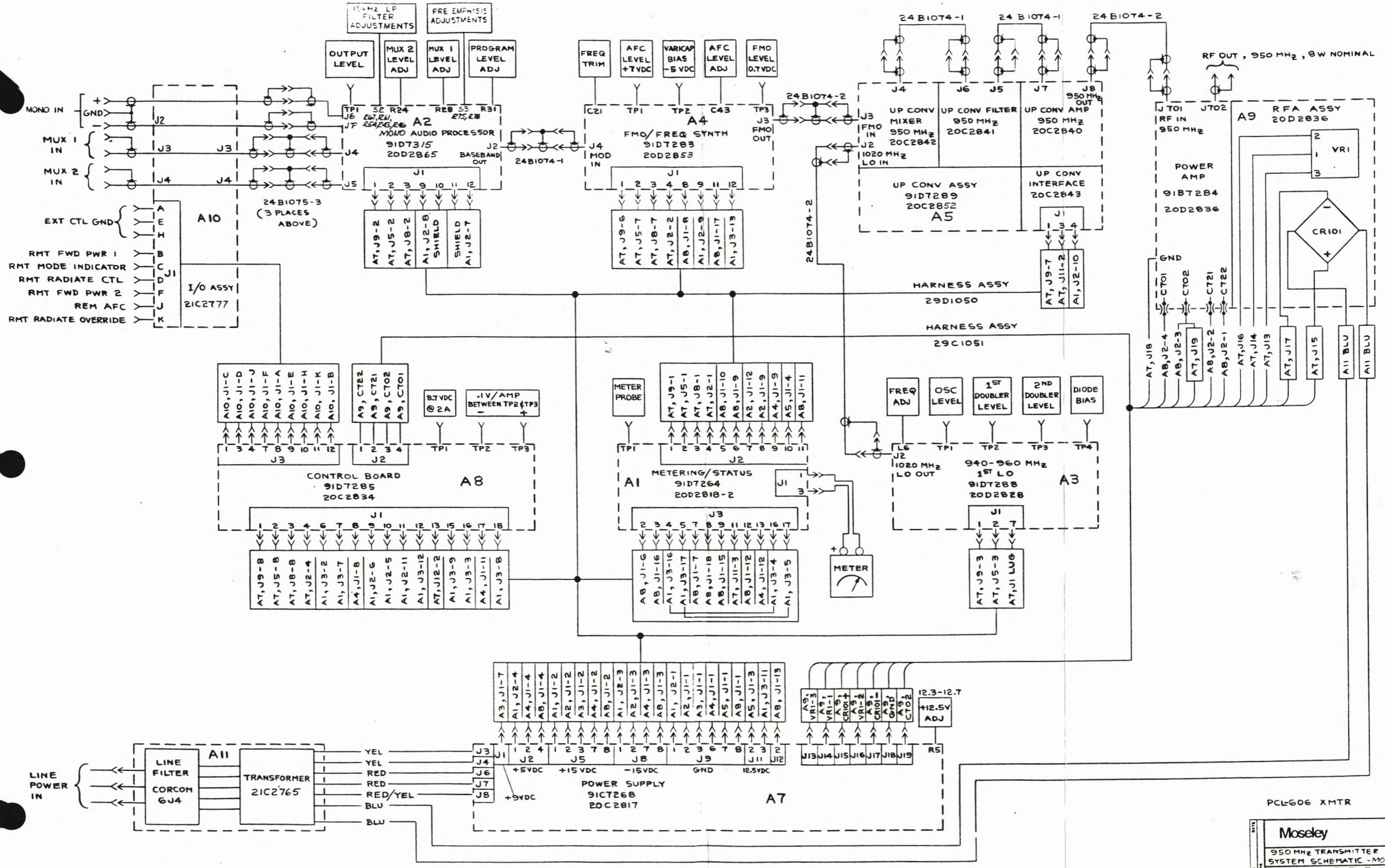
This module contains the front panel LEDs. Two bicolor red-green LEDs indicate the status of operate or standby and whether or not there is adequate signal strength to overcome the receiver's preset mute threshold. There are also three green LEDs to indicate the presence of the +15 V, -15 V, and +5 V regulated supplies.

Mute and Transfer

The Mute and Transfer module provides for automatic change-over between two receivers where one is intended for hot standby service. This module contains the logic circuit to determine which of the two receivers is capable of operating. It also contains the relay which will physically disconnect the outputs of the receiver not in service. This allows the mono and MUX outputs of the two receivers to be bridged together to provide a single, switched, program line, and a single, switched MUX line. The Mute and Transfer module also contains the RFI filtering and shielding of the receiver input/output lines.

Power Supply

The Receiver Power Supply module converts one of four possible ac input voltages (100, 120, 220, or 240 Vac) to the three regulated dc voltages and one unregulated dc voltage required to operate the receiver. The regulated voltages are +15 V and -15 V at about 500m A, +5 V at 500m A, and +9 V unregulated, which is used to power the crystal oven in the first local oscillator.



91D7314

PCL606 XMTR

Moseley

950 MHz TRANSMITTER
SYSTEM SCHEMATIC - MONO

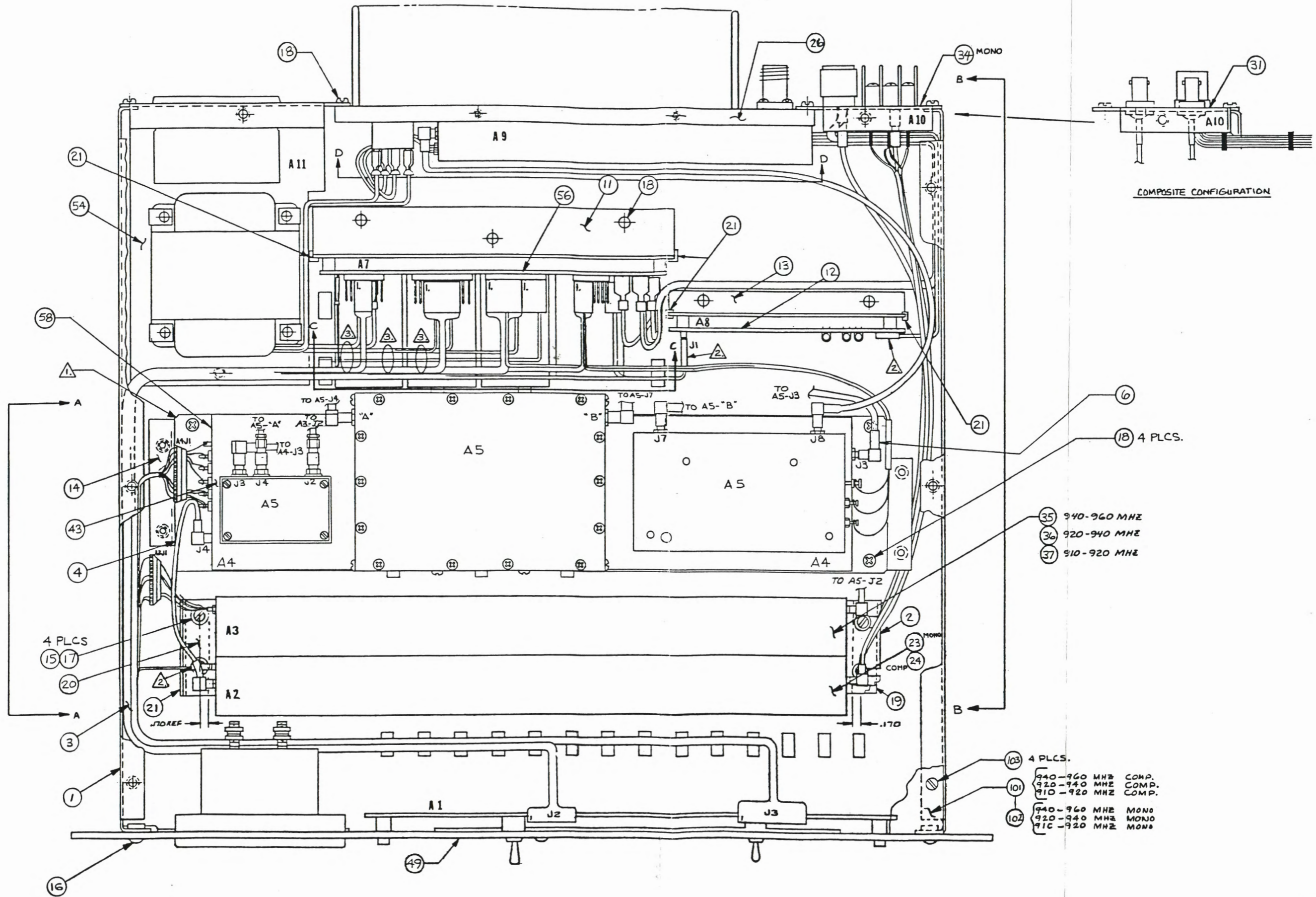
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DATE: 10/14/64

SCALE: N/A

REV: 1

91D7314



COMPOSITE CONFIGURATION

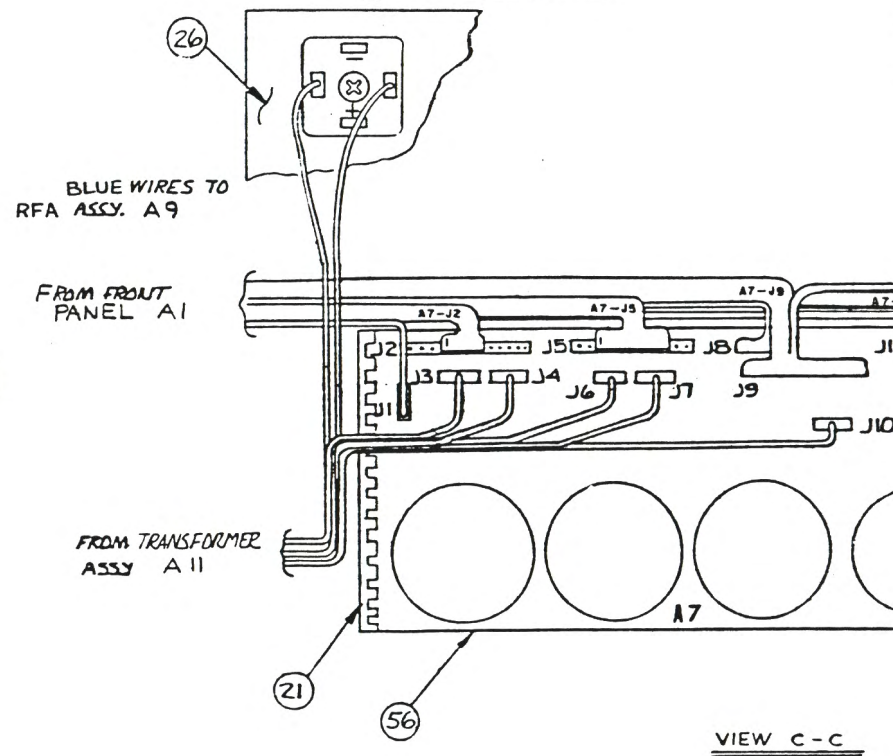
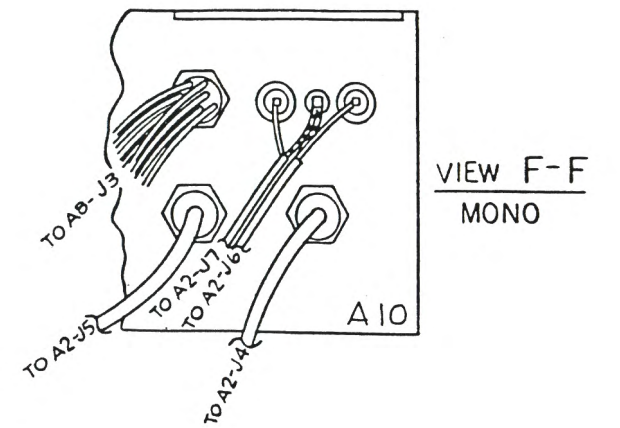
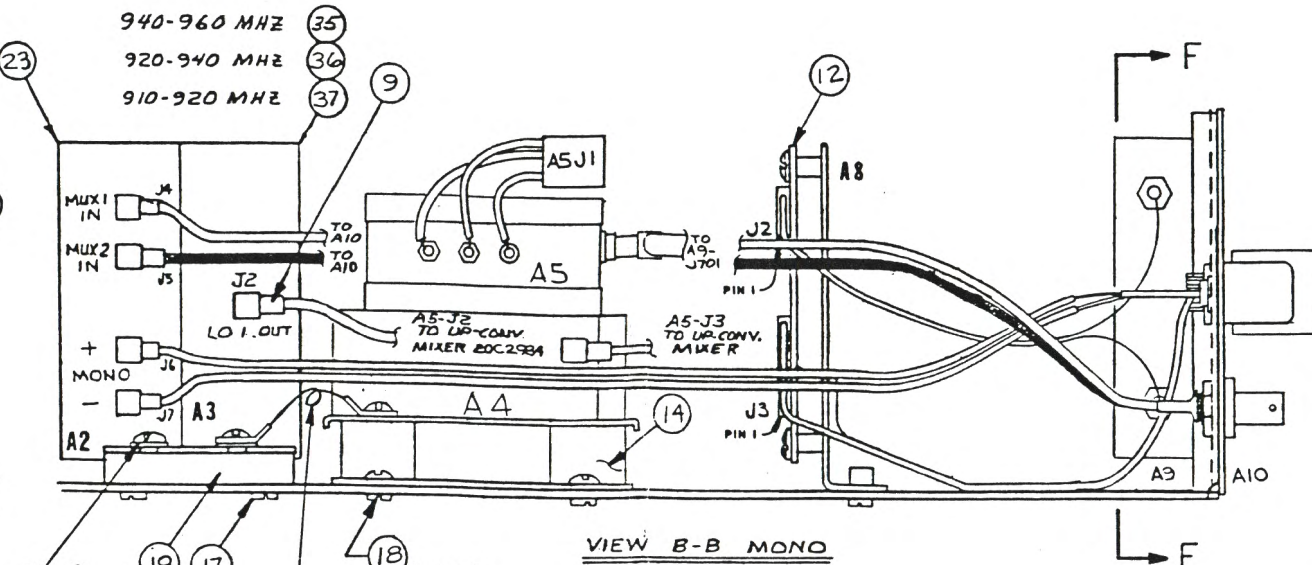
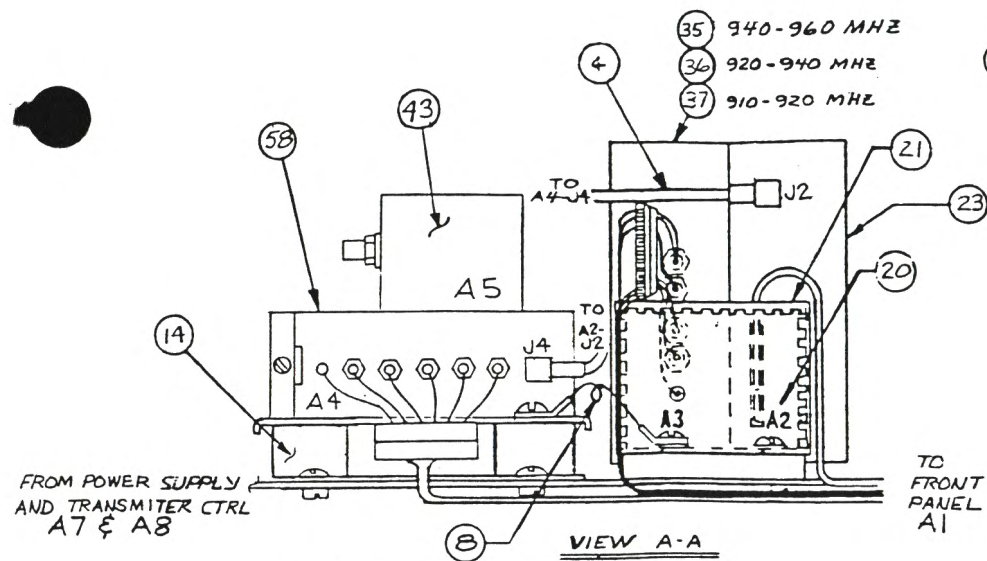
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- 36 920-940 MHE
- 37 910-920 MHE

- 103 4 PLCS.
- 101 940-960 MHE COMP.
- 920-940 MHE COMP.
- 910-920 MHE COMP.
- 102 940-960 MHE MONO
- 920-940 MHE MONO
- 910-920 MHE MONO

Moseley

XMTR ASSY - PCL-606

TOL. FRAC. 1/16 3/32 1/8 1/4 3/8 1/2 1 2 3 4 5 6 8 10 12 15 20 25 30 40 50 60 70 80 100 120 150 200 250 300 400 500 600 800 1000
DRW. CAH 16 JUL 69 SCALE FULL
CHK. PCL 10-20-69
ENG. 21D2757 AB



BLUE WIRES TO RFA ASSY. A9

FROM FRONT PANEL A1

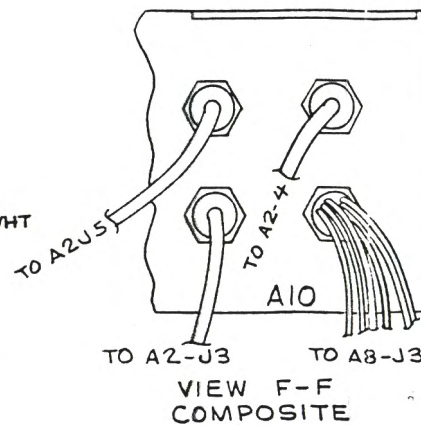
FROM TRANSFORMER ASSY A11

- J19 - BRN
- J13 - ORN
- J14 - YEL/WHT
- J15 - GRN
- J16 - BLU
- J17 - VIO
- J18 - BLK TO RFA A9

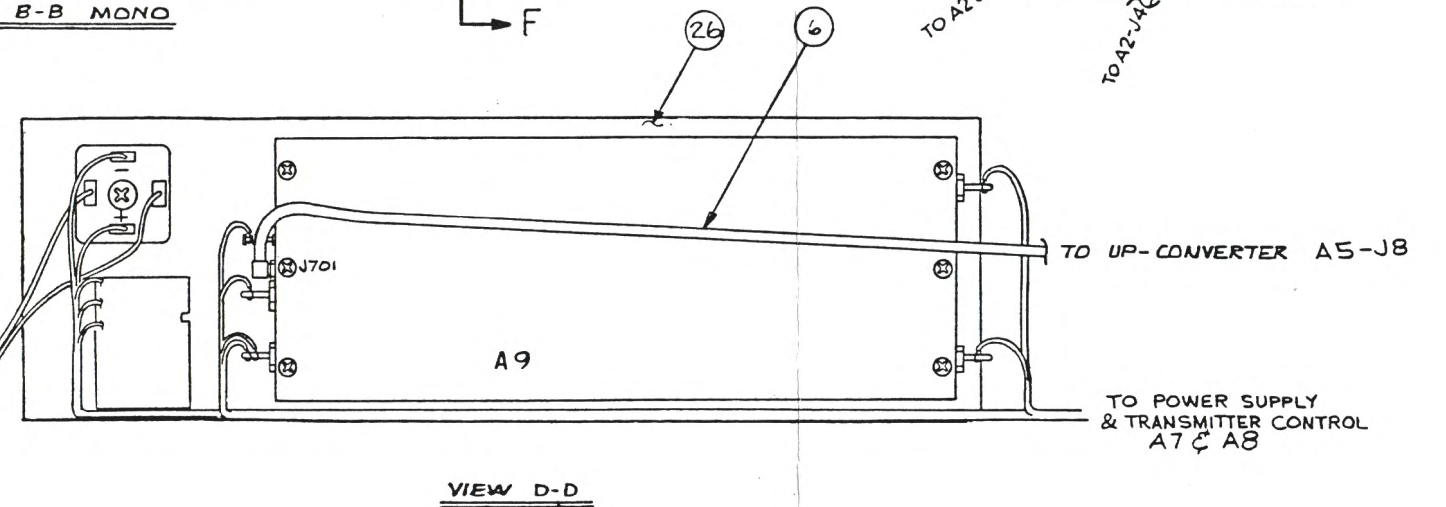
VIEW C-C

CONNECTIONS AND WIRE COLORS FOR POWER SUPPLY A7

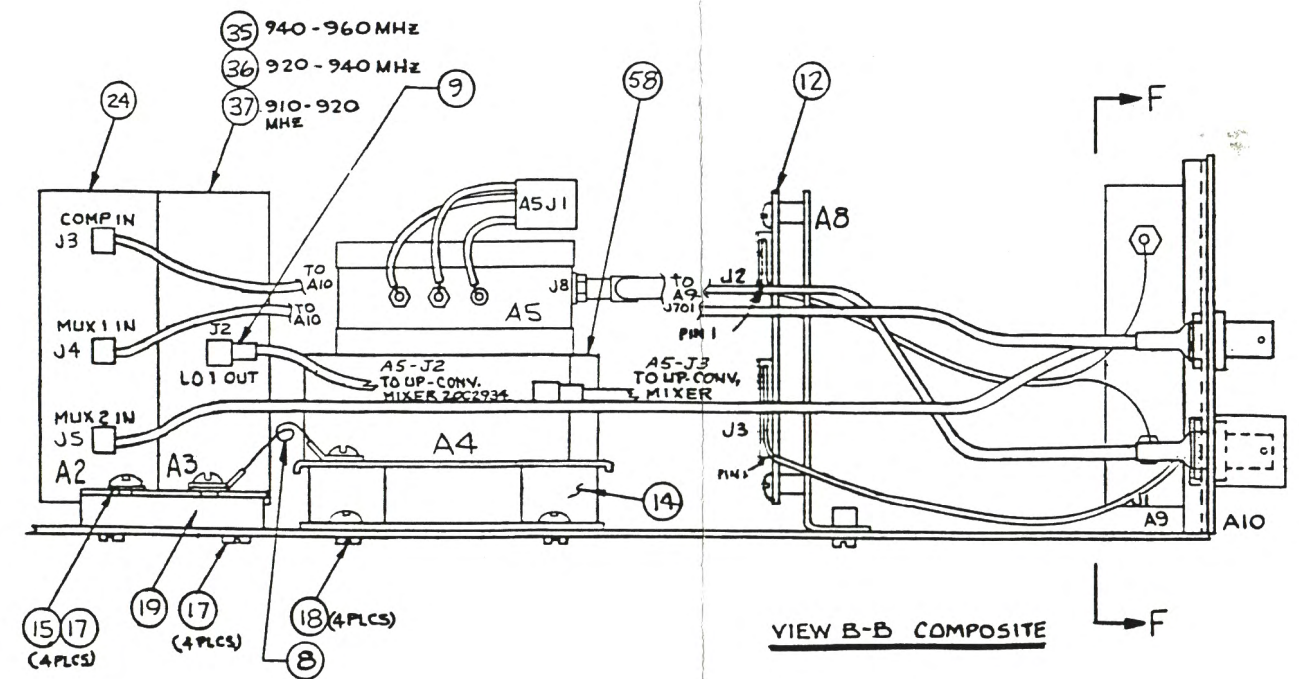
- | | |
|-----------------------------------|---------------------------------|
| FROM FRONT PANEL TO J1 - YEL | FROM FRONT PANEL TO J11 - BRN |
| FROM FRONT PANEL TO J2 - ORN | FROM TRANSMITTER TO J12 - WHT |
| FROM TRANSFORMER TO J3 - YEL | FROM RFA ASSY. TO J13 - ORN |
| FROM TRANSFORMER TO J4 - YEL | FROM RFA ASSY. TO J14 - YEL/WHT |
| FROM FRONT PANEL TO J5 - RED | FROM RFA ASSY. TO J15 - GRN |
| FROM TRANSFORMER TO J6 - RED | FROM RFA ASSY. TO J16 - BLU |
| FROM TRANSFORMER TO J7 - RED | FROM RFA ASSY. TO J17 - VIO |
| FROM FRONT PANEL TO J8 - BLU | FROM RFA ASSY. TO J18 - BLK |
| FROM FRONT PANEL TO J9 - BLK | FROM RFA ASSY. TO J19 - BRN |
| FROM TRANSFORMER TO J10 - RED/YEL | |



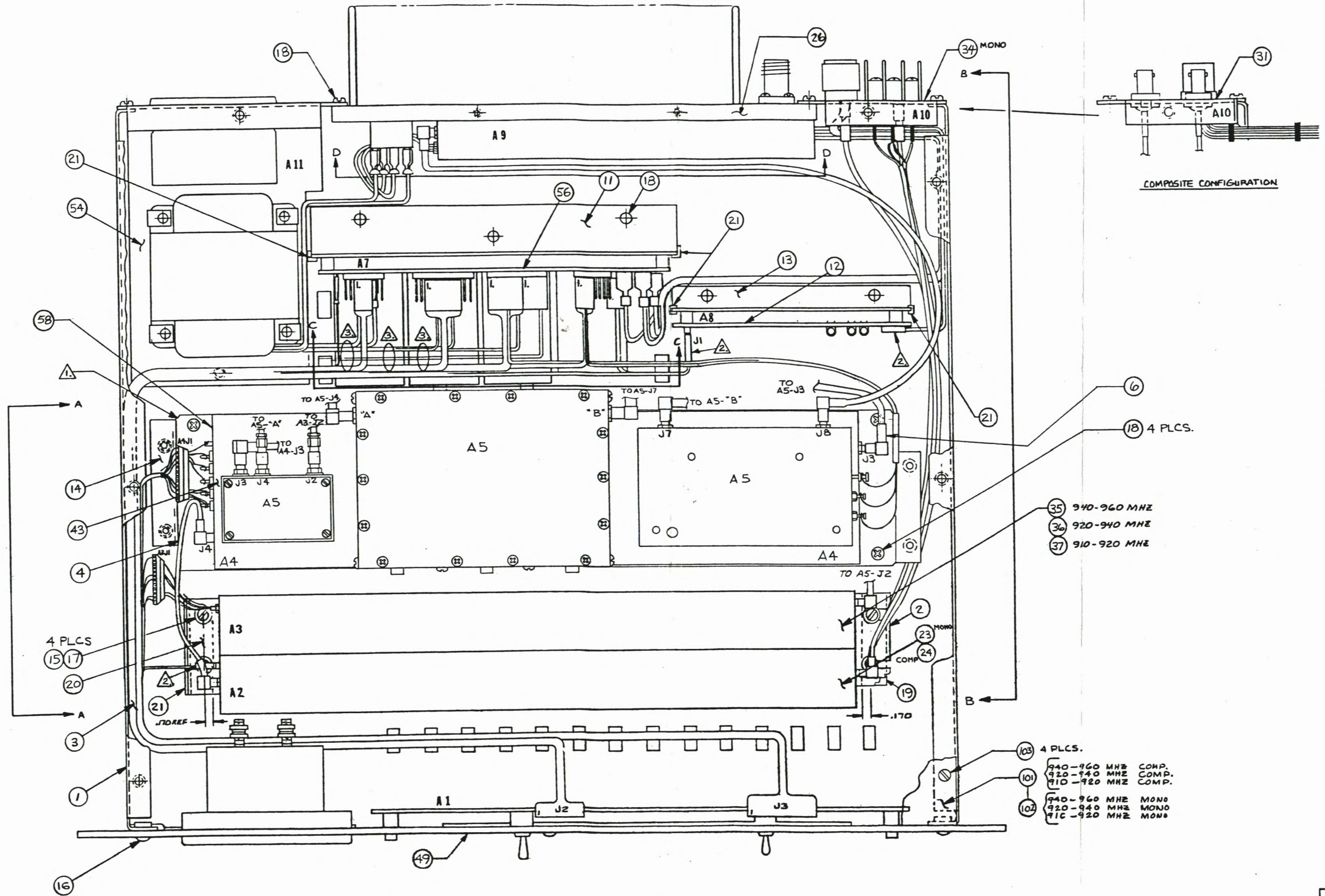
VIEW F-F COMPOSITE



VIEW D-D



VIEW B-B COMPOSITE

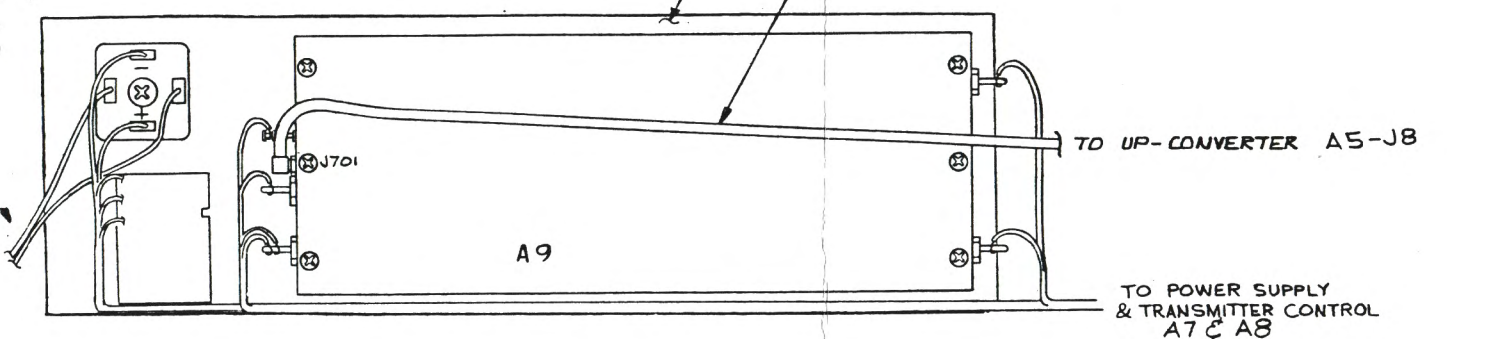
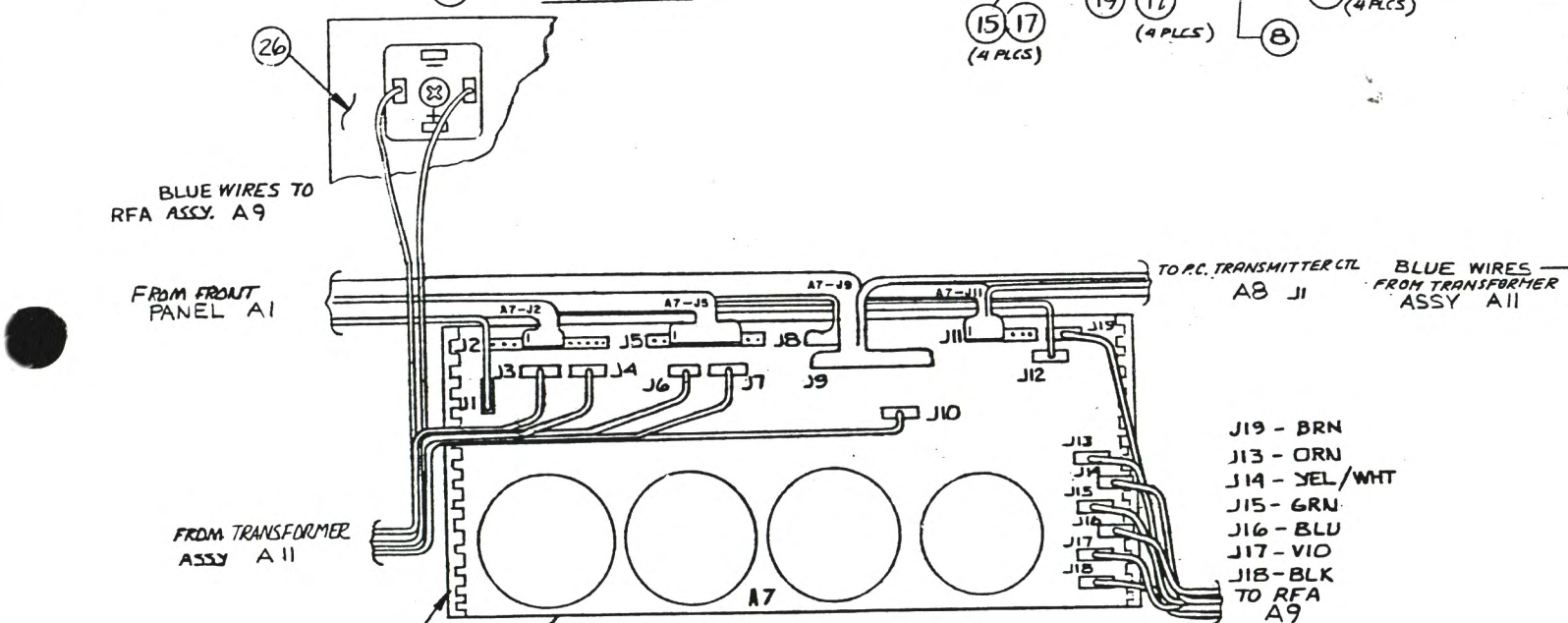
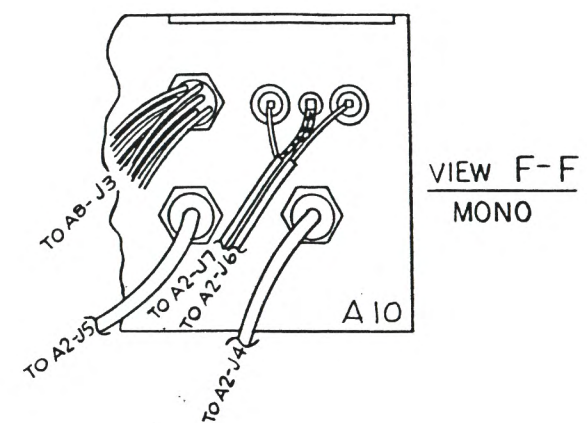
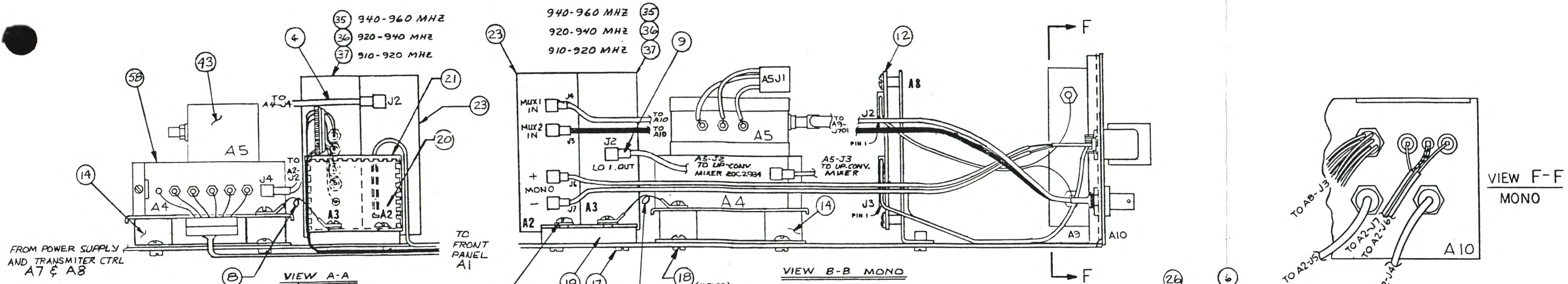


COMPOSITE CONFIGURATION

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- 36 920-940 Mhz
- 37 910-920 Mhz

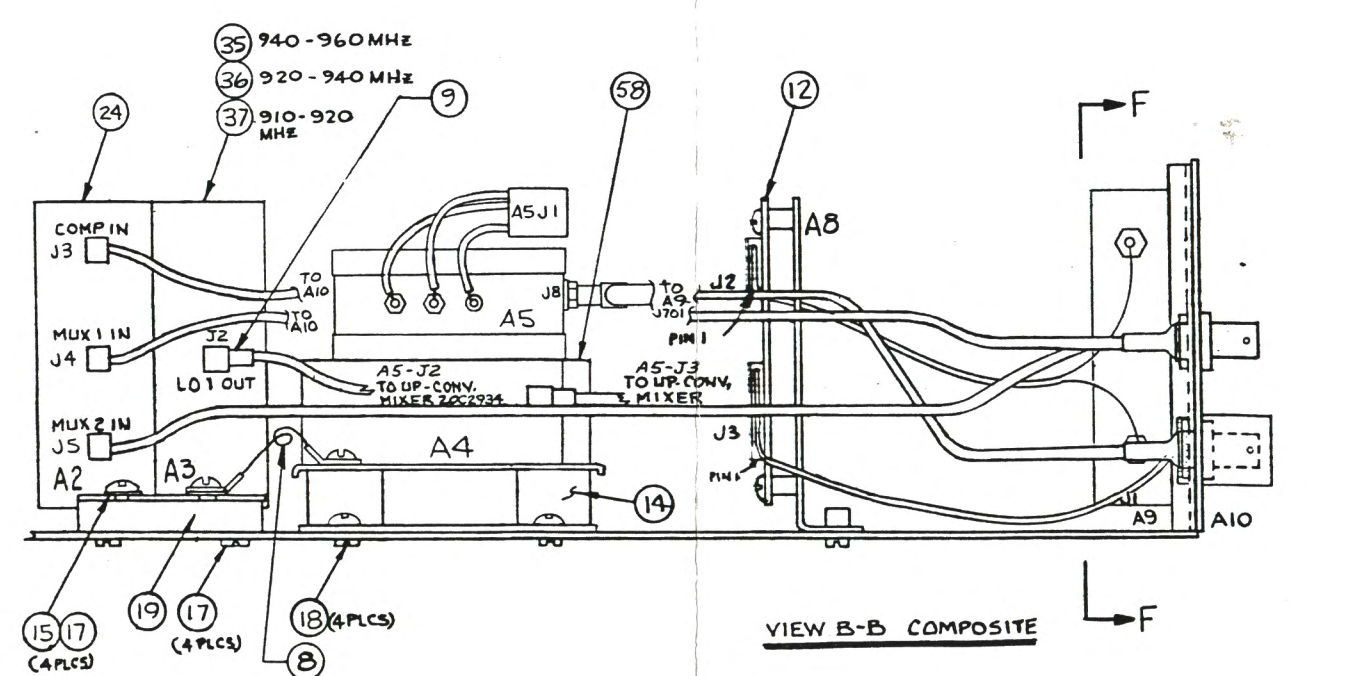
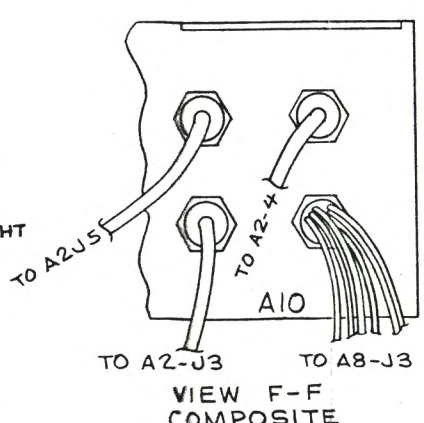
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- 101 940-960 Mhz COMP.
- 920-940 Mhz COMP.
- 910-920 Mhz COMP.
- 940-960 Mhz MONO
- 920-940 Mhz MONO
- 910-920 Mhz MONO

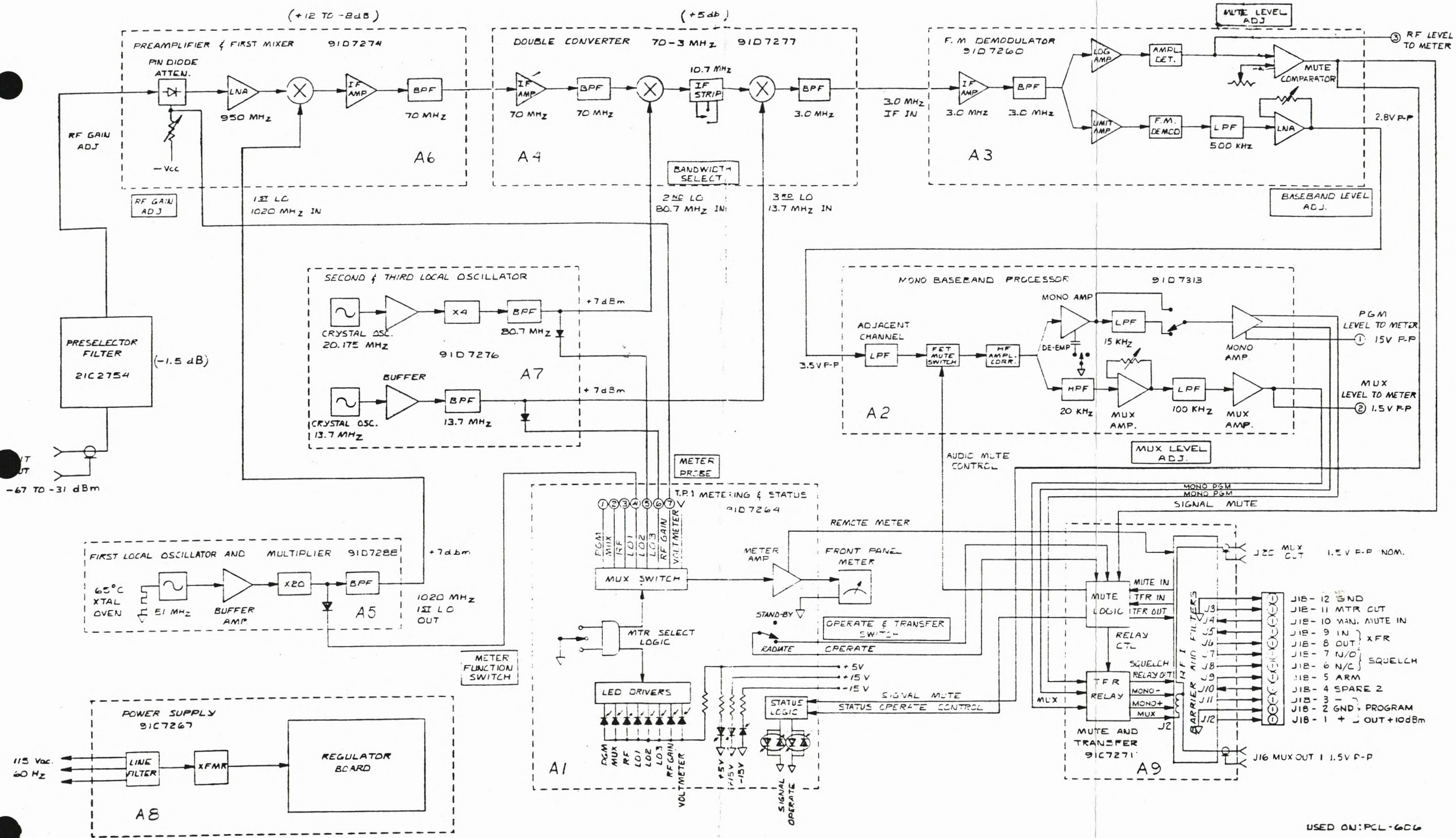
Moseley
 XMT-606
 PCL-606
 TOL. 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.001. 31385508676933403819178758221379023839736661969993728 ± .001. 62771017353866807638357516442758047679473323939987456 ± .001. 125542034707733615276715032885516095358946647879974912 ± .001. 251084069415467230553430065771032190717893295759949824 ± .001. 502168138830934461106860131542064381435786591519899648 ± .001. 1004336277661868922213720263084128762871573183039799376 ± .001. 2008672555323737844427440526168257525743146366079598752 ± .001. 4017345110647475688854881052336515051486292732159197504 ± .001. 8034690221294951377709762104673030102972585464318395008 ± .001. 16069380442589902755419524209346060205945170928636790016 ± .001. 32138760885179805510839048418692120411890341857273580032 ± .001. 64277521770359611021678096837384240823780683714547160064 ± .001. 128555043540719222043356193674768481647563667429094320128 ± .001. 257110087081438444086712387349536963295127334858188640256 ± .001. 514220174162876888173424774699073925990254669716377280512 ± .001. 1028440348325753776346849549398147851980509339432754561024 ± .001. 205688069665150755269369909879629570396101867886550912048 ± .001. 411376139330301510538739819759259140792203735773101824096 ± .001. 822752278660603021077479639518518281584407471546203648192 ± .001. 1645504557321206042154959279037036563168814943092407296384 ± .001. 3291009114642412084309918558074073126337629886184814576768 ± .001. 6582018229284824168619837116148146532675259772369629153536 ± .001. 13164036458569648337239674232296293065350519544739258307072 ± .001. 26328072917139296674479348464592586130701039089478516614144 ± .001. 52656145834278593348958696929185172261402078178957033228288 ± .001. 105312291668571186797917393858370344522804156377914074456576 ± .001. 210624583337142373595834787716740689045608312755828149111152 ± .001. 421249166674284747191669575433481378091216625511656298222304 ± .001. 842498333348569494383339150866962756182433251023312596444608 ± .001. 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226156424318506804772481083765625943110848287616900411281020214837248 ± .001. 4523128486370136095449621675



- J19 - BRN
- J13 - ORN
- J14 - YEL/WHT
- J15 - GRN
- J16 - BLU
- J17 - VIO
- J18 - BLK TO RFA A9

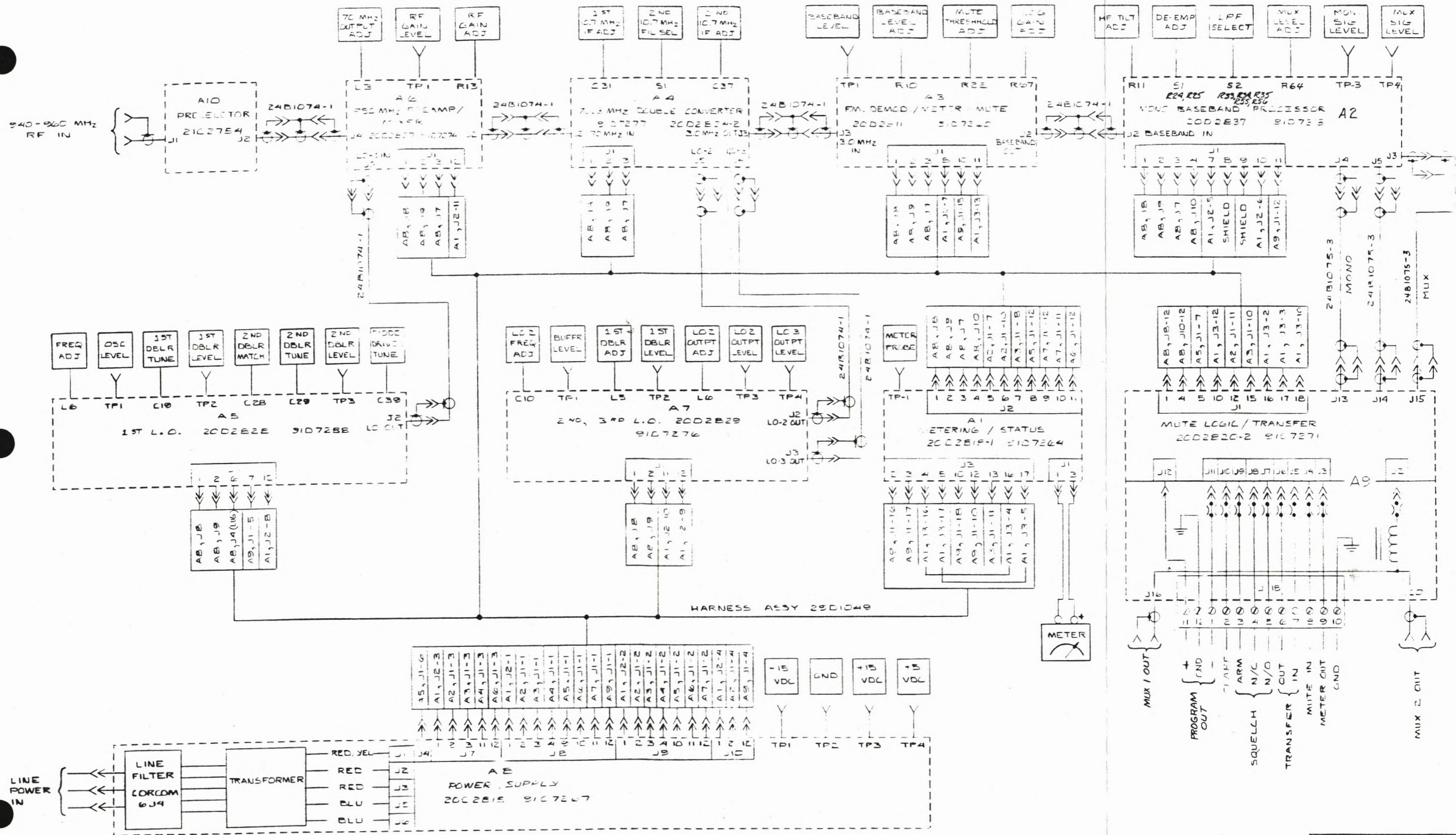
- CONNECTIONS AND WIRE COLORS FOR POWER SUPPLY A7**
- | | |
|-----------------------------------|---------------------------------|
| FROM FRONT PANEL TO J1 - YEL | FROM FRONT PANEL TO J11 - BRN |
| FROM FRONT PANEL TO J2 - ORN | FROM TRANSMITTER TO J12 - WHT |
| FROM TRANSFORMER TO J3 - YEL | FROM RFA ASSY. TO J13 - ORN |
| FROM TRANSFORMER TO J4 - YEL | FROM RFA ASSY. TO J14 - YEL/WHT |
| FROM FRONT PANEL TO J5 - RED | FROM RFA ASSY. TO J15 - GRN |
| FROM TRANSFORMER TO J6 - RED | FROM RFA ASSY. TO J16 - BLU |
| FROM TRANSFORMER TO J7 - RED | FROM RFA ASSY. TO J17 - VIO |
| FROM FRONT PANEL TO J8 - BLU | FROM RFA ASSY. TO J18 - BLK |
| FROM FRONT PANEL TO J9 - BLK | FROM RFA ASSY. TO J19 - BRN |
| FROM TRANSFORMER TO J10 - RED/YEL | |





USED ON: PCL-606

Moseley	
950 MHz RECEIVER	
BLOCK LEVEL DIAG. - MONO	
DATE	SCALE NONE
REV	9201263



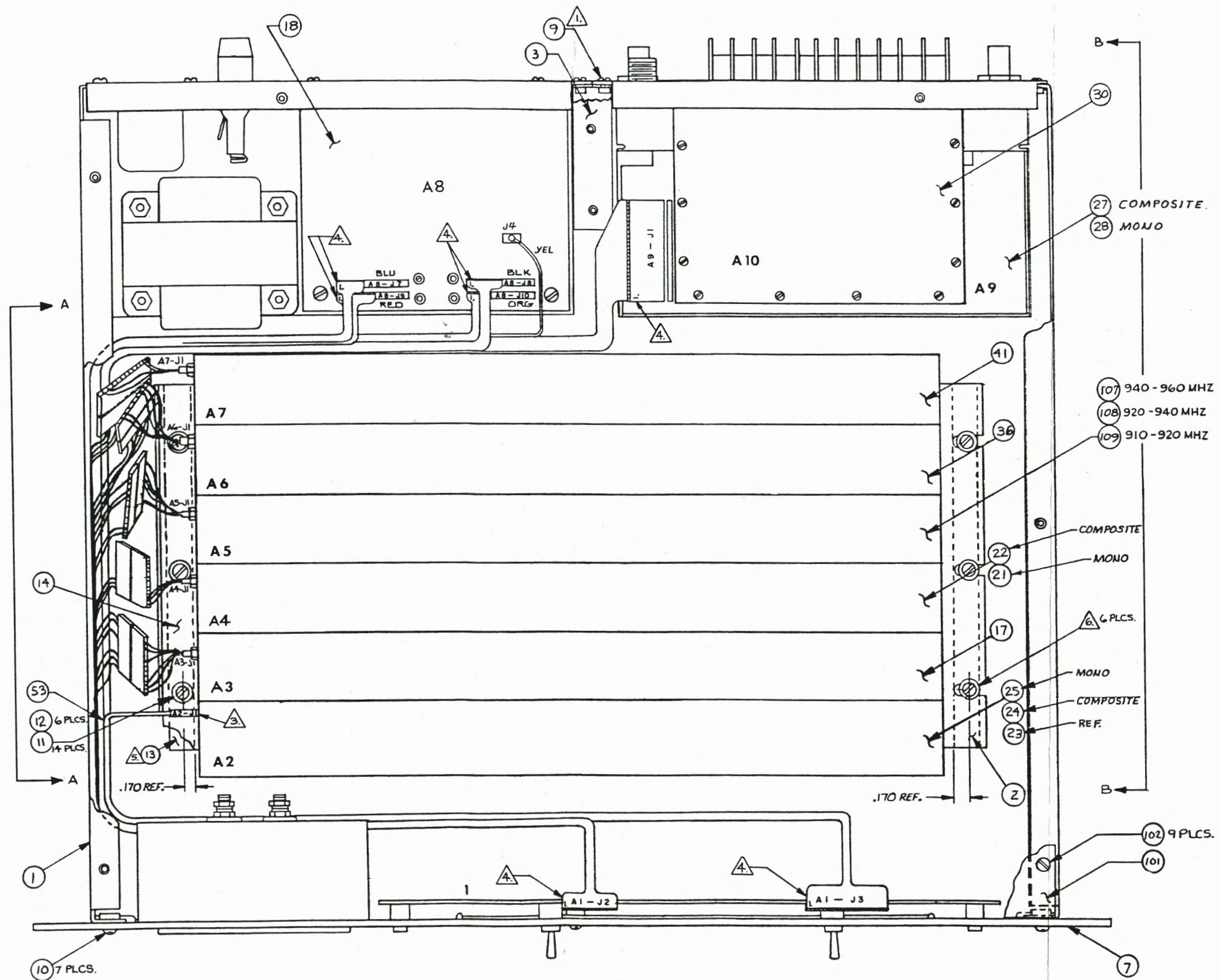
Moseley

980 MHz RECEIVER-MONO SYSTEM SCHEMATIC

FOR PARTS LIST SEE SCALE NONE

REV. 10-72

91D7312



REL. FOR PROD. REV. 10/18/68 DATE 10/18/68 BY GRS	Moseley	
	RECEIVER ASSY PCL-606	
	VOL. FRACT. 2 1/2 SHEET NO. 10	SCALE: FULL
	2102739 U	

SECTION 3

MOSELEY ASSOCIATES, INC. GENERAL INFORMATION

3.0 CUSTOMER SERVICE INFORMATION

Moseley Associates, Inc. has a Technical Services Department to assist product users who experience difficulties. Our service is available at two levels: telephone consultation and factory service. Different circumstances apply whether the product(s) are under Warranty/Service Agreement or are outside Warranty/Service Agreement status.

Please read the manual; a large portion of telephone calls to Moseley request information which is needed due to unfamiliarity with the equipment. The majority of those questions are already answered by the Installation/Operation sections of each manual. If these do not help your problem, the first step in any factory service transaction should always be telephone consultation.

Telephone Consultation

If telephone consultation/assistance is necessary, please have the following information available prior to calling the factory:

- A. Model Number and Serial Number of unit,
- B. Shipment date or date of purchase of an Extended Service Agreement
- C. Suspected Module identification markings,
- D. Be prepared to accurately describe the problems with the unit: Constant or intermittent? Precise symptoms? Meter readings? Operational frequency of unit?
- E. Factory test data sheets, if applicable.

Once you are prepared with this information, contact our Technical Services Department for assistance. A Technical Services Representative who knows your product(s) is available during normal work hours (8:00 a.m. to 5:00 p.m., Pacific Time, Monday through Friday). Please have patience if the particular representative you should talk to is busy. Leave your name, call letters, equipment type and telephone number(s) where you can be reached in the next few hours. Someone will get back to you as soon as possible.

Please be prepared to keep telephone consultations as short as possible in order to free up the Technical Services Representative to help someone else in trouble. Usually the Technical Services Representative will make suggestions and

recommendations for your next step. After trying these, you may call back if you continue to experience problems.

For telephone assistance call (805)968-9621.

After Hours Emergency (Only) Telephone Consultation

Emergency service is provided from 5:00 p.m. to 10:00 p.m., Pacific Time, Monday to Friday, and from 8:00 a.m. to 10:00 p.m., Pacific Time, on weekends and holidays. For telephone assistance call (805)968-9621.

This after hours service is for emergencies only. Please do not expect our representative to know the status of your order, to take parts orders or to be equipped to help with installation problems.

Factory Service

Arrangements for factory service can be made after consultation with the factory Technical Service Representative and his assignment to you of a Return Authorization (R.A.) Number. This number expedites your equipment's routing from the Receiving Department to Technical Services.

When returning your equipment to Moseley Associates, Inc., the following suggestions are offered to assist you. If you are returning a module, ensure that the module is packed sufficiently to withstand the rigors of the journey. Make sure that the shipping carton is packed evenly and fully, with packing material filling all voids so that the module cannot shift inside the shipping carton. The package should also be marked in red with the words "Electronic Equipment" or "Fragile". Remember, the condition of the module is totally dependent on the care taken in the packing. Reference the Return Authorization Number that you had previously obtained from the factory on the outside of the carton or on the shipping label. Make sure that the name of your company is listed on the shipping label, and insure your module appropriately.

If you are shipping a complete chassis, all modules should be tied down as they were originally received. On some Moseley Associates equipment, shipping screws are required on the underside or topside of the chassis.

Include any and all descriptions of the difficulties encountered with your equipment in the field. This will greatly assist us in processing your equipment and returning it as expeditiously as possible.

Use the original shipping carton in which your equipment was supplied, if possible. Ensure that the carton is packed evenly and fully with packing material filling any voids so that the chassis cannot shift inside the carton. Make sure the carton is sealed properly with either nylon-reinforced tape or shipping sealing tape. Mark the outside of the carton "Electronic Equipment - Fragile" in big, red letters. This will assist in the survival of the equipment in the shipping process. Again, bear in mind that the survival of the unit depends almost solely on the preparation taken in shipping it.

When returning your equipment to our factory, please address it to the following:

MOSELEY ASSOCIATES, INC.
Attn: Technical Services Dept.
111 Castilian Drive
Goleta, California 93117

Display your Return Authorization Number clearly on the shipping label, and insure the equipment for the appropriate amount.

All equipment must be shipped prepaid; Moseley Associates, Inc. will return the equipment prepaid under Warranty and Service Agreement conditions, and either freight collect or billed for equipment not covered by Warranty or a Service Agreement.

GENERAL

Replacement Modules

Moseley Associates encourages the purchase of recommended spare parts kits to allow the customer to be totally self-sufficient with regard to parts. We recognize that there are extenuating circumstances when troubleshooting to the component level is neither practical nor possible. If this is the case, replacement module exchange may be the most expedient way of correcting the problem. Each product manual lists recommended spares.

Non-frequency sensitive replacement modules are normally available for immediate shipment. If you require a replacement module from Moseley Associates, please give your shipping address to our Technical Services Engineer. If the module or equipment to be supplied to your company is to be held at the airport with a telephone number to call, please provide at least two telephone numbers. This will often expedite the delivery or pickup of the replacement module or equipment.

Field Repair

Always try to isolate the problem to a specific area or module, if possible. By comparing the actual wave shapes and levels with those referenced on the block and level diagrams or schematics, the problem can often be localized to the component level.

If an integrated circuit is suspect, carefully remove the original and plug in the new one in the same direction. These devices are installed one way only. Plugging in a new device backward may damage the newly installed component or the surrounding circuitry. If a suspect device operates intermittently or appears to drift, Freeze Mist may aid in diagnosing the problem.

If a soldered component has to be removed from a printed circuit board, do the following:

Use a 40 W soldering iron with a 1/8 inch tip. Do not use a soldering gun. Excessive heat may cause damage!

Remove all the solder contacting the lead or leads from the component and from the associated printed circuit pad. To assist in the removal of the solder, solder-sipping braid, such as solder wick, is very useful. Once the solder has been removed, remove the component from the board.

When installing the new component, pre-bend the leads of the replacement component so that they will easily fit into the appropriate PC board holes. Solder each lead of the component to the bottom side of the board with a 40 W soldering iron with a 1/8 inch tip. Always use a good brand of rosin-core solder. The solder joint should be smooth and shiny. Also, be sure that excessive heat is not used in this soldering operation. Excessive heat will damage the printed circuit pad that comes in contact with the new component. Finally, cut each lead of the replacement component close to the solder on the pad side of the printed circuit board with a pair of diagonal cutters. Then remove all residual flux with either flux cleaner or a cotton swab moistened with flux cleaner.

SECTION 4
INSTALLATION

4.1 UNPACKING

The PCL-606 Transmitter and Receiver should be carefully unpacked and inspected for shipping damage. Should inspection reveal any shipping damage, visible or hidden, immediately file a claim with the carrier. Keep all packing materials until the performance of the system is confirmed.

We recommend that the top covers of both the Transmitter and Receiver be removed for a superficial inspection of the internal components. This should ascertain that all modules, assemblies, and cables are mechanically secure.

Four screws are used to hold the FMO Synthesizer module in place during shipment. They should be removed from the top of the transmitter cover before installation. Retain these shipping screws and reinstall them if the Transmitter is to be moved. This will prevent damage to the modules inside.

CAUTION

Do not attempt any adjustments of any kind until the nature of each adjustment is understood.

Do not apply power to the Receiver until the procedure in Section 4.2 is completed.

Do not apply power to the Transmitter until the procedure in Section 4.2 is completed and a proper load is connected to the RF output.

Do not remove the covers on the transmitter RF Amplifier module.

Do not attempt disassembly or inspection of the receiver Preselector Filter module.

Replace the top covers. All adjustments normally used during installation and operation are accessible through the top covers.

4.2 LINE VOLTAGE SELECTION

The Transmitter and Receiver each have the capability of operating at one or four nominal ac power source voltages: 100, 120, 220, or 240 Vac, 50-60 Hz. The units are shipped for 120 Vac operation, unless otherwise specified.

The ac power connector on each unit contains a voltage selector card (PC card) and a fuse. The PC card can be inserted four different ways. Verify that the PC card is set for the line voltage to be supplied to the unit. The voltage selected can be observed on the PC card through the window in the ac power connector.

If the voltage selector card needs to be changed to match the available power, do the following: Unplug the power cord, and slide the access window to the left. Pull out the FUSE PULL lever and remove the fuse. With small needle-nose pliers, firmly grasp the PC card and remove it with a straight pull.

Select the operating voltage by orienting the PC card to position the desired voltage number on the top left side. Replace the PC card with the needle-nose pliers.

If the voltage selector card is changed, change the fuse in accordance with the following:

<u>Line Voltage</u>	<u>Transmitter Fuse (A)</u>	<u>Receiver Fuse (A)</u>
100	2	1
120	2	1
220	1	0.5
240	1	0.5

Return the FUSE PULL lever to its normal position and insert the fuse into the holders. Slide the window to the right and install the ac power cord.

4.3 PREINSTALLATION CHECKOUT

While the user has both the Transmitter and Receiver at the same location, we suggest that a preinstallation checkout of the system be performed before mounting the equipment in racks separated by many miles.

The minimum equipment to perform a bench test setup are:

1. An RF wattmeter with a measurement range of 5 to 12 watts (Bird 43, or equivalent).
2. A 50 Ohm, 10 watt dummy load for 950 MHz with 30 dB attenuation output capability (Sierra 661A-30, or equivalent).
3. A low-distortion audio signal generator (Tektronix SG505, or equivalent).
4. An audio distortion analyzer (Tektronix AA501, or equivalent).
5. Variable attenuator, 0 to 100 dB at 950 MHz (Kay Model 432D, or equivalent).

More extensive testing can be accomplished using a stereo generator and demodulator combination and/or a subcarrier generator and demodulator combination.

Observe these precautions when performing any bench test:

CAUTION

ALWAYS OPERATE THE TRANSMITTER TERMINATED
INTO A PROPER 50-OHM LOAD.

ALWAYS ATTENUATE THE SIGNAL INTO THE
RECEIVER TO LESS THAN 3000 MICROVOLTS
(Approximately 75 dB attenuation between the
Transmitter and Receiver).

Failure to observe these precautions can cause the transmitter final transistor to be destroyed, or the receiver preamplifier transistors may be damaged.

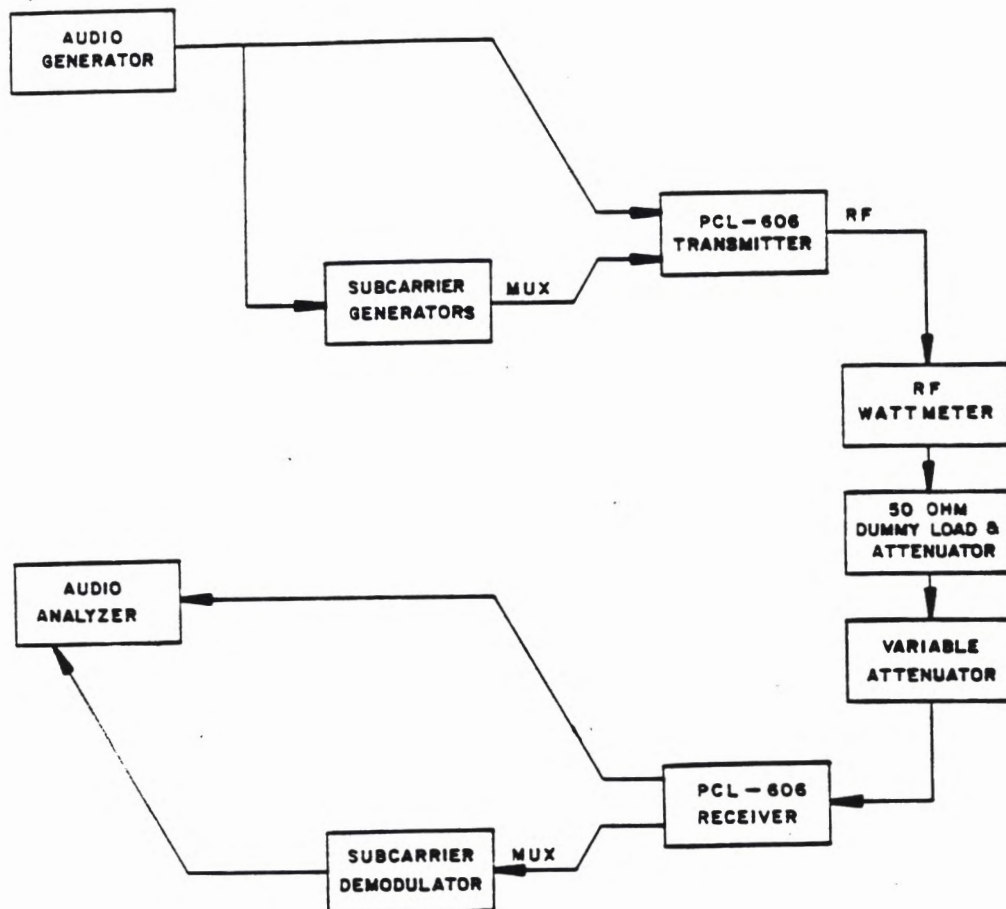


Figure 4-1. Typical bench test setup

Figure 4-1 shows one of several possible bench test setups.

With the wattmeter and dummy load installed, apply ac power to the Receiver. The three power indicator LEDs on the front panel will be green, indicating that the internal power supplies are operational. The OPERATE and SIGNAL LEDs will be red, indicating that there is no RF.

Apply ac power to the Transmitter and place the RADIATE/STANDBY switch in the RADIATE position. The four power status LEDs will be green. The AFC LOCK and RADIATE LEDs will be red for several seconds and then turn green. Observe that the wattmeter will indicate between 5 to 8 watts and that the transmitter meter will provide readings of FWD POWER and REFL POWER. A brief period after the RADIATE LED becomes green, the OPERATE and SIGNAL LEDs on the Receiver will change from red to green. The RF LEVEL meter position on the Receiver may be selected to determine the strength of the RF signal applied to the receiver. Adjust the variable attenuator until an input signal strength of approximately 1000 microvolts is indicated. It should be mentioned that in any bench testing where the Transmitter and Receiver are in close proximity, there can be sufficient RF leakage from the cables to render computations of applied signal strength impractical based upon power and attenuation data.

Apply a +10 dBm, 600 ohm source, signal from the audio signal generator at 400 Hz to the program input of the Transmitter. The PGM LEVEL at the transmitter and receiver meters may be selected and should indicate 0 on the dB scale. The output voltage from the program output of the Receiver can be fed to an audio analyzer. The output voltage should be approximately +10 dBm into 600 ohms. The audio input signal may be removed and the program signal-to-noise ratio (SNR) determined:

$$\text{SNR} = 20 \log \frac{(\text{RMS voltage with modulation})}{10 (\text{RMS voltage without modulation})}$$

While this concludes the basic bench test of the units, the user may want to run further experiments to become familiar with the system. Sections 2, 5 and 6 should be consulted for a thorough understanding of the STL system before proceeding with any higher level testing.

Receiver Selectivity Selection

When the receiver is shipped from the factory, it is normally set in the narrow IF mode. If you desire to operate the unit in the wide IF mode to decrease system distortion, the alignment procedures in Section 6 should be consulted for required adjustments. The specific alignments are in Section 6.3.6 (Distortion Alignment).

4.4 RACK INSTALLATION

The PCL-606 units are designed for mounting in standard rack cabinets, preferably between waist and shoulder height. The Transmitter and Receiver have mounting holes for Chassis Trak C-300-5-1-14 chassis rack slides. If the rack will accept chassis rack slides, their use is recommended. If chassis rack slides are used, be sure to leave at least a 15-inch service loop in all cables to the equipment.

When mounting the Transmitter or Receiver in a rack, the unit must have an unobstructed free flow of air for cooling purposes across the rear cooling fins. Continued operation in a confined environment can cause the ambient temperature to exceed specification, resulting in reduced life or catastrophic failure.

When two PCL-606 Receivers are in a system at a site, it is recommended that they be mounted adjacent to each other in the rack. This will facilitate automatic switchover interconnect. When a PCL-606 Receiver is used with a PCL-505 or PCL-303 Receiver, a transfer panel (such as a TPR-2) must be used to accomplish automatic switchover, and should be mounted between the two receivers. Receiver automatic switchover interconnections are detailed in Section 4.9.2.

When two Transmitters are in a system at a site, an automatic transfer panel such as the TPT-2 should be mounted between them. The TPT-2 will allow interconnection of a PCL-606 with another PCL-606, PCL-505, or PCL-303 Transmitter and can provide automatic switchover in the event of a detectable failure in the Transmitter, as shown in Section 4.9.1.

4.5 ANTENNA INSTALLATION

The installation of the antennas and associated feed lines determines to a large extent the long-term reliable operation of the STL. Experience has indicated that a reasonably clear path having an 0.6 Fresnel zone clearance along with good feed-line installation results in a highly predictable signal level at the receiver. The appendix contains a series of instructions, calculation sheets, typical gain and loss characteristics, and nomographs to enable the received signal level to be predicted. Since the PCL-606 has a signal strength meter, it is possible to determine the quality of the antenna installation and path compared to the calculations.

Experience at 960 MHz has indicated that for reliable year-round operation with a predominately overland path and 0.6 Fresnel zone clearance, a 20 dB fade margin should be used. At least a 25 dB fade margin should be allowed if the path is over water or flat terrain with little vegetation.

4.6 TRANSMISSION CABLES

The transmission cable between antenna and Transmitter or Receiver should be coaxial cable whose loss characteristics are known. Typical quality low-loss foam dielectric lines such as Andrew LDF4-50, a 0.5 inch diameter cable, has a 2.4 dB loss per 100 feet at 950 MHz. This cable will generally be adequate where the total cable run (at both Transmitter and Receiver) is less than 300 feet, and there is a good transmission path of less than 10 miles.

When the total transmission cable length exceeds 300 feet, an obstructed or grazing path occurs, or the path length exceeds 10 miles, a lower loss cable such as Andrew LDF5-50, a 7/8 inch diameter cable with a loss of 1.4 dB per 100 feet, is recommended.

To reduce system losses, it is important to select type N connectors that are designed for the type of transmission cable used in the system. The connectors must then be installed in accordance with the manufacturer's recommendations. It sometimes will take only one improperly installed connector to reduce the received signal strength sufficiently to provide only marginal system performance.

Reasonable care should be exercised during the installation of the transmission cable. Never put a sharper bend radius in the cable than recommended by the manufacturer. Too sharp a bend can cause internal cable damage that is not observable on the outside of the cable. This damage can result in excessive loss in the cable. Since the higher quality transmission cables are relatively inflexible, Moseley Associates has available several short "pigtail" assemblies. These "pigtails" are designed to attach to the ends of the transmission cable and allow movement of the equipment or antenna with less chance of damaging the transmission cable itself. These "pigtails" and appropriate connectors are available in installation kits for the more popular types of transmission cable.

Figure 4-2 shows typical transmitter RF connections for the transmission cable to the antenna, and Figure 4-3 shows typical receiver RF connections.

Should it be desired to mount the antenna on a series-fed standard broadcast tower, the required isolation can be obtained with the installation of a Moseley Associates Isocoupler at the base of the series-fed antenna. Isolation at standard broadcast frequencies is high, and the Isocoupler introduces only approximately 1.5 dB loss at the STL frequency.

4.7 PROGRAM AND MULTIPLEX INSTALLATION - TRANSMITTER

Figure 4-4 depicts the typical interconnection of a PCL-606 as would normally be found at the studio. The program material is first passed through an automatic gain control (AGC) such as the Moseley TGR-340 to first establish the nominal system levels. This is followed by a frequency-conscious audio limiter, such as the Moseley TFL-280, to prevent overmodulation of the system as the result of the normal pre-emphasis curve used in FM broadcasts.

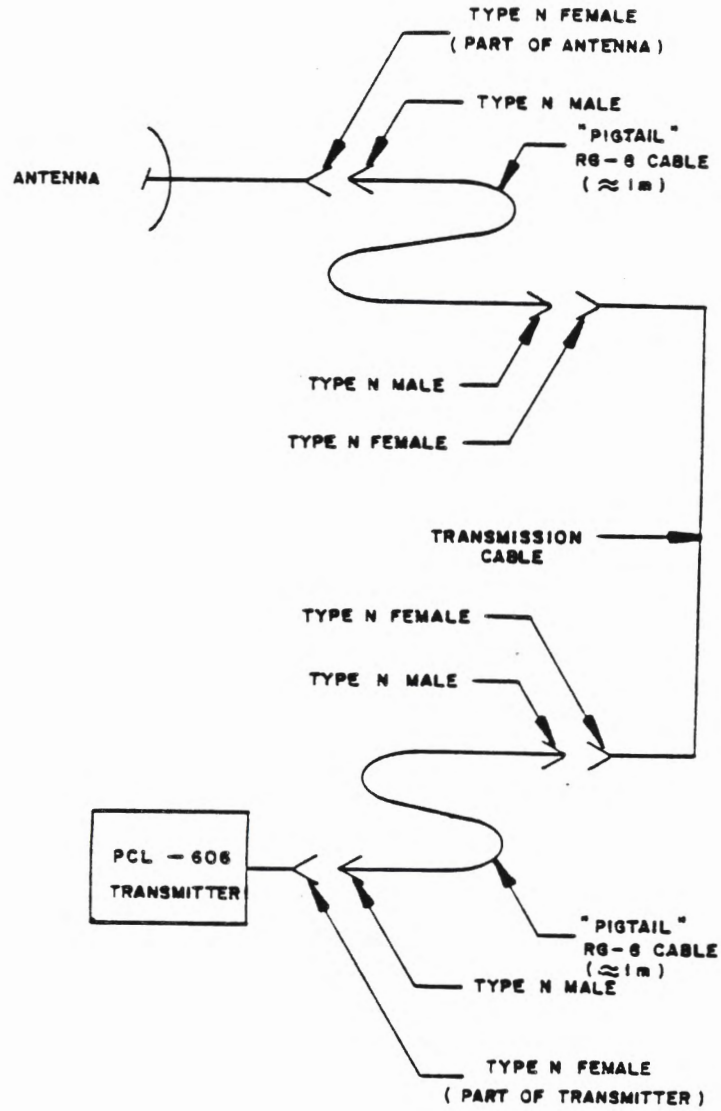


Figure 4-2

Typical PCL-606 Transmitter RF Connects

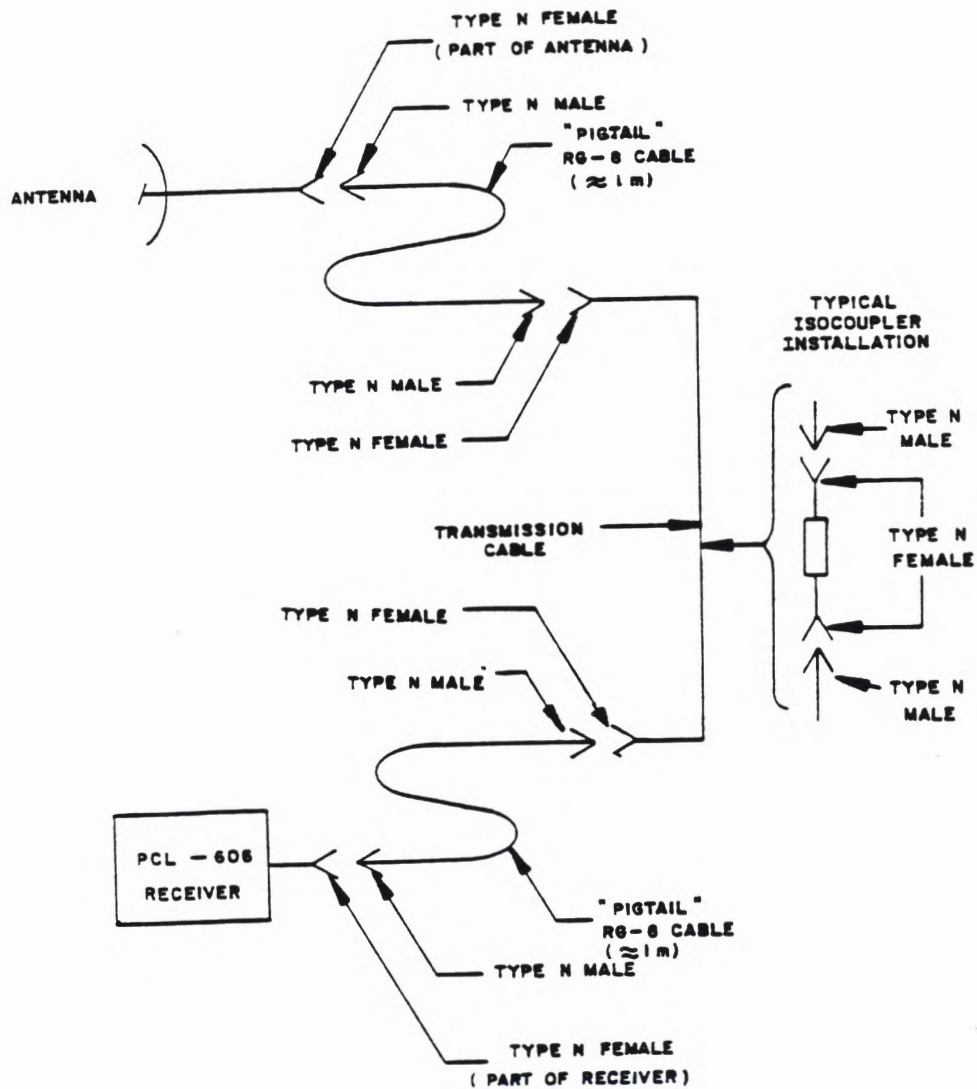
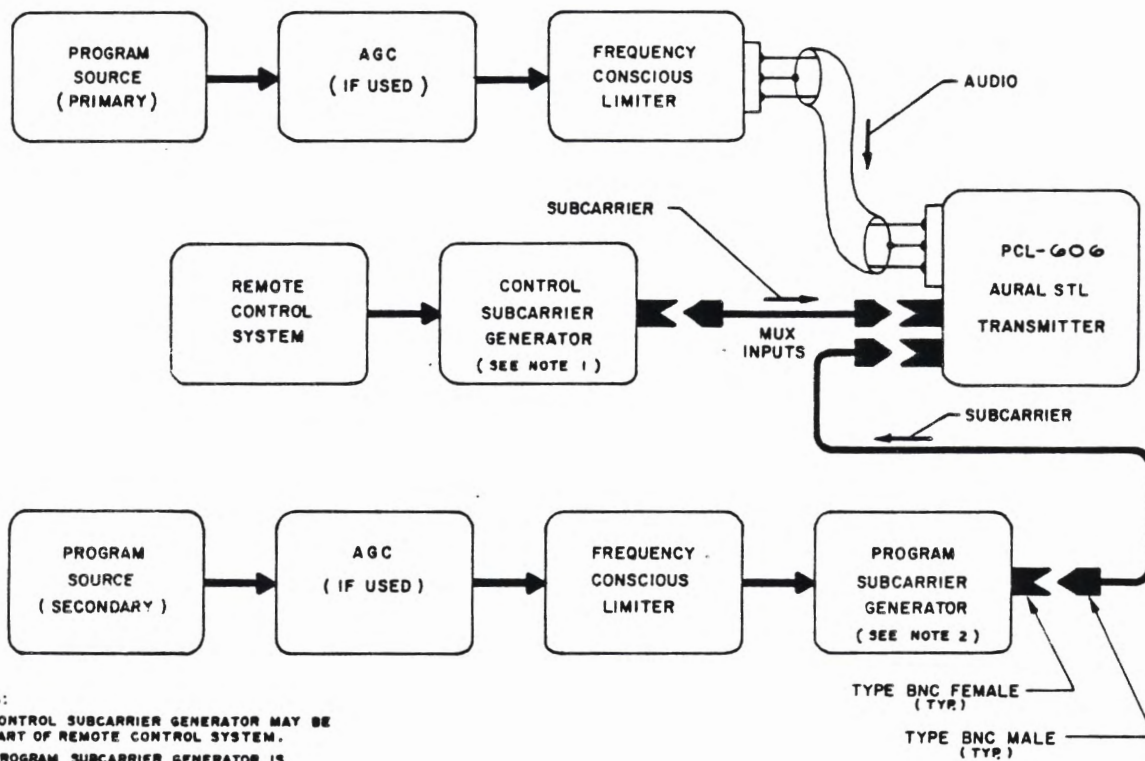


Figure 4-3

Typical PCL-606 Receiver RF Connects



NOTES:

1. CONTROL SUBCARRIER GENERATOR MAY BE PART OF REMOTE CONTROL SYSTEM.
2. PROGRAM SUBCARRIER GENERATOR IS MODEL SC 6-B OR EQUIVALENT.
3. COAX CABLE IS RG 58A/U OR EQUAL.

Figure 4-4

PCL-606 Transmitter (Mono)
Program and Multiplex Connections

The limiter output is then fed into the program input of the PCL-606. The standard program signal is balanced, +10 dBm from a 600 ohm source for 100 percent modulation.

CAUTION

Never overmodulate the STL transmitter, as this will cause increased distortion in the received signal and, possibly, interference to other users in the STL band.

The secondary program audio is generally passed through an AGC stage and/or a frequency conscious limiter into a subcarrier generator, such as the Moseley SCG-8, with a center frequency of 67 kHz. The subcarrier for the secondary program audio is fed to the PCL-606 MUX-2 subcarrier input with an unbalanced shielded cable (RG-58 A/U typical) with BNC connectors. An input level of 1.5 V p-p corresponds to a main carrier deviation of 6.0 kHz by the MUX-2 subcarrier.

Where a control subcarrier is desired, a subcarrier frequency of 26 kHz is typically used. The modulated subcarrier may be generated internally in the remote control equipment as in the case of the Moseley MRC series. In any case, the control subcarrier is applied to the MUX-1 input on the PCL-606 Transmitter with a peak-to-peak signal of 1.5 volts using BNC connectors on coaxial cable (RG-58 A/U typical). This signal will produce a main carrier deviation of 4 kHz by the MUX-1 subcarrier.

Multiplex inputs into the PCL-606 Transmitter are wide-band inputs. It is assumed that the equipment supplying signals to be fed into the Transmitter contain the band limiting filters necessary to limit the signals to the spectrum for the intended use, ie 26 kHz \pm 3 kHz for control subcarrier, and 67 kHz \pm 1.10 kHz for secondary program audio.

If the external equipment generates any spurious signals, these signals will be accepted by the Transmitter and passed to the Receiver. Any spurious signals may cause interference among the program and subcarrier information, and may increase the occupied bandwidth to the extent that interference will be experienced by neighboring users in the STL Band.

4.8 PROGRAM AND MULTIPLEX INTERCONNECT - RECEIVER

At the outputs of the PCL-606 Receiver, the audio-band output of the FM demodulator is split and filtered into two bands. The program outputs are from 30 Hz to approximately 15 kHz. The multiplex outputs are bandpass filtered to pass the frequency range of 22 kHz to 85 kHz.

Figure 4-5 depicts a typical interconnection of a PCL-606 Receiver at the remote transmitter site. The balanced +10 dBm output is interconnected to the program input of the Transmitter with twisted pair, shielded cable.

The secondary program audio (on the STL 67 kHz subcarrier) is demodulated by a unit such as the Moseley SCD-8. The baseband audio is passed to a subcarrier generator at 67 kHz, the normal SCA program carrier, which in turn is fed to the main transmitter multiplex input. The multiplex outputs may also be fed to the control subcarrier demodulator for use by the control system. Some control systems such as the Moseley MRC series have their own internal subcarrier demodulation capability, and an external demodulator is not required. Note that since both multiplex outputs contain the same 20 to 85 kHz spectrum, the subcarrier demodulators are required to further filter the spectrum as required for their individual purposes.

4.9 MAIN/STANDBY INTERCONNECT

The PCL-606 Transmitter and Receiver can be interfaced with other PCL-606, PCL-505 or PCL-303 systems to form a redundant backup system that provides for automatic change-over between equipment in the event a detectable failure occurs. The Moseley model TPT-2 (Transfer Panel Transmitter) is used to accomplish automatic switchover for transmitters in all combinations. The model TPR-2 (Transfer Panel Receiver) is required on all but PCL-606 to PCL-606 receiver combinations.

4.9.1 Transmitter Interconnect

When two transmitters are interconnected with a TPT-2 to form a main/standby pair, the composite and subcarrier generator output is routed to each transmitter in parallel. The RF output of each transmitter is routed to the respective RF input on the TPT-2. The transmission cable to the antenna is connected to the antenna type N connector of the TPT-2. Figure 4-6 details the interconnection of these

signals. Important: For proper operation with a TPT-2, both transmitter RADIATE/ STANDBY switches should be in the STANDBY position. In addition, the interlock control between the transmitters and the TPT-2 should be wired as follows:

Interlock Control

<u>TPT-2 Terminal</u>	<u>PCL-606</u>	<u>PCL-505</u>	<u>PCL-303</u>
A	A10-J1-B	J1-B	J403-F
B	A10-J1-D	J1-D	J403-C
C	A10-J1-C	J1-C	J403-D
GND	A10-J1-A	J1-A	J403-A

4.9.2 Receiver Interconnect, PCL-606, PCL-606

A pair of PCL-606 Receivers used in a main/standby configuration can be interconnected to perform automatic switchover if a detectable failure occurs in the on-line Receivers. As shown in Figure 4-7, the antenna is routed to each Receiver through a power divider such as the Moseley model PD-1000. The use of a power divider is recommended so that the impedance as seen by each Receiver is approximately 50 ohms.

The program outputs are paralleled using twisted pair shielded wire. The multiplex outputs are paralleled using a BNC "T" connector. This is permissible since the multiplex outputs are switched internal to the Receiver. Only one of the Receivers at a time will have any output. The interlock control is achieved by first interconnecting the ground (GND) on the two Receivers. Then XFR IN of each Receiver is wired to XFR OUT of the other Receiver. GND, XFR IN, and XFR OUT are located on the barrier strip on the rear of the Receivers.

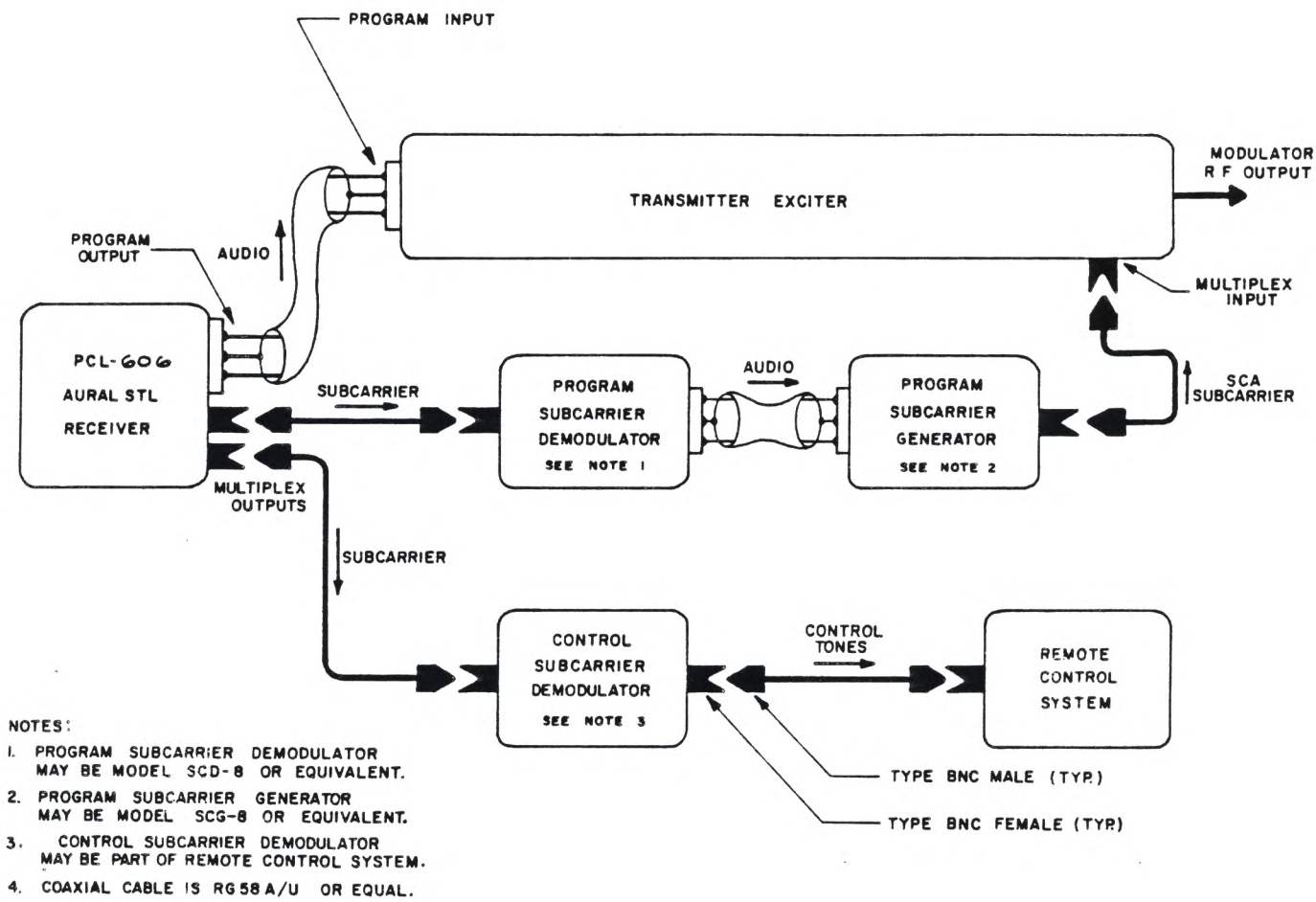


Figure 4-5

PCL-606 Receiver (Mono)
Program and Multiplex Connections

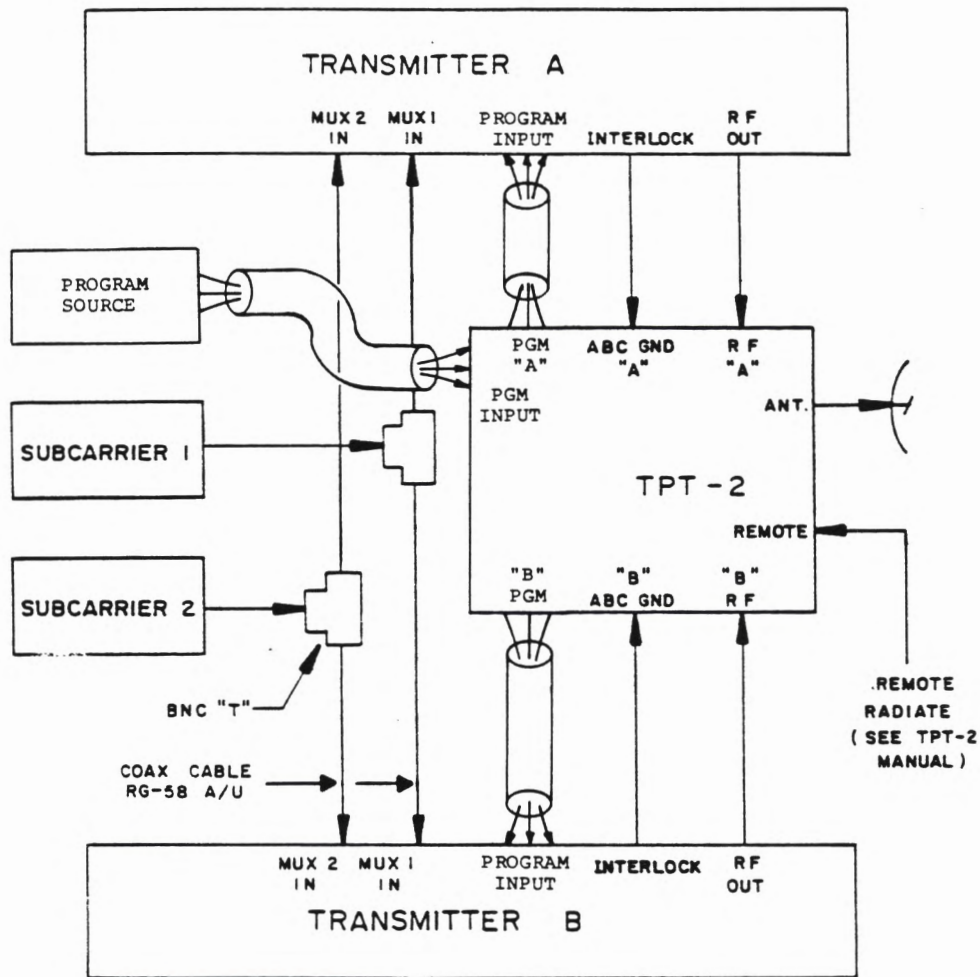
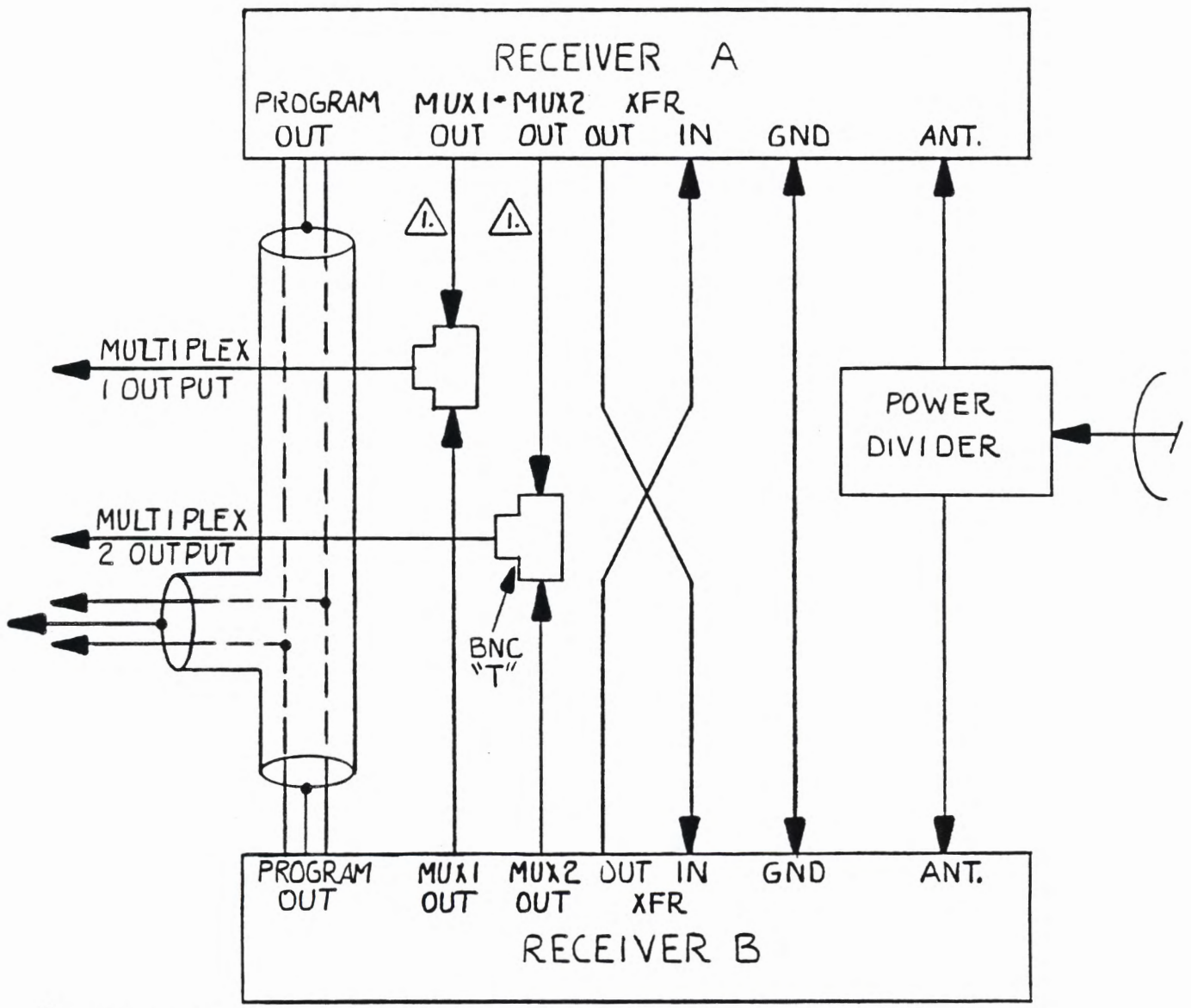


Figure 4-6

Main/Standby Transmitter Interconnect



△ COAX CABLE RG-58 A/U.

Figure 4-7

M/S Receiver Interconnect PCL-606-606

4.9.3 Receiver Interconnect, PCL-606/Other

The PCL-606 Receiver may be used with other Moseley STL receivers such as the PCL-505 and PCL-303 in a main/standby configuration provided that a TPR-2 (Transfer Panel Receiver) is used to perform the switching between the two receivers. A typical installation is detailed in Figure 4-8. Note that only one multiplex output can be used from the receivers; however, there are two parallel multiplex outputs on the TPR-2 to provide the control and secondary audio multiplex outputs.

4.10 REMOTE CONTROL OF THE STL TRANSMITTER

The PCL-606 transmitter has been designed to be operated by remote control. Radiate/standby control capability, as well as metering outputs for power and AFC, are built in.

Figure 4-9 shows the interconnections required for remote control of the transmitter. All connections to the transmitter are made via A10-J1 on the rear of the unit. The interconnecting cable should have not more than a few hundred ohms resistance per conductor. The panel itself is shown schematically; this entire assembly is available from Moseley Associates as the Model ECP-5 Extension Control Panel.

The RADIATE/STANDBY switch will place the transmitter in a radiating condition when closed. It is electrically interconnected with the control switch on the transmitter itself, which should be placed in STANDBY for remote control operation. The AFC and Output meters give relative indications of these two parameters. The two calibration potentiometers are set to give a suitable meter deflection, as for example, half-scale.

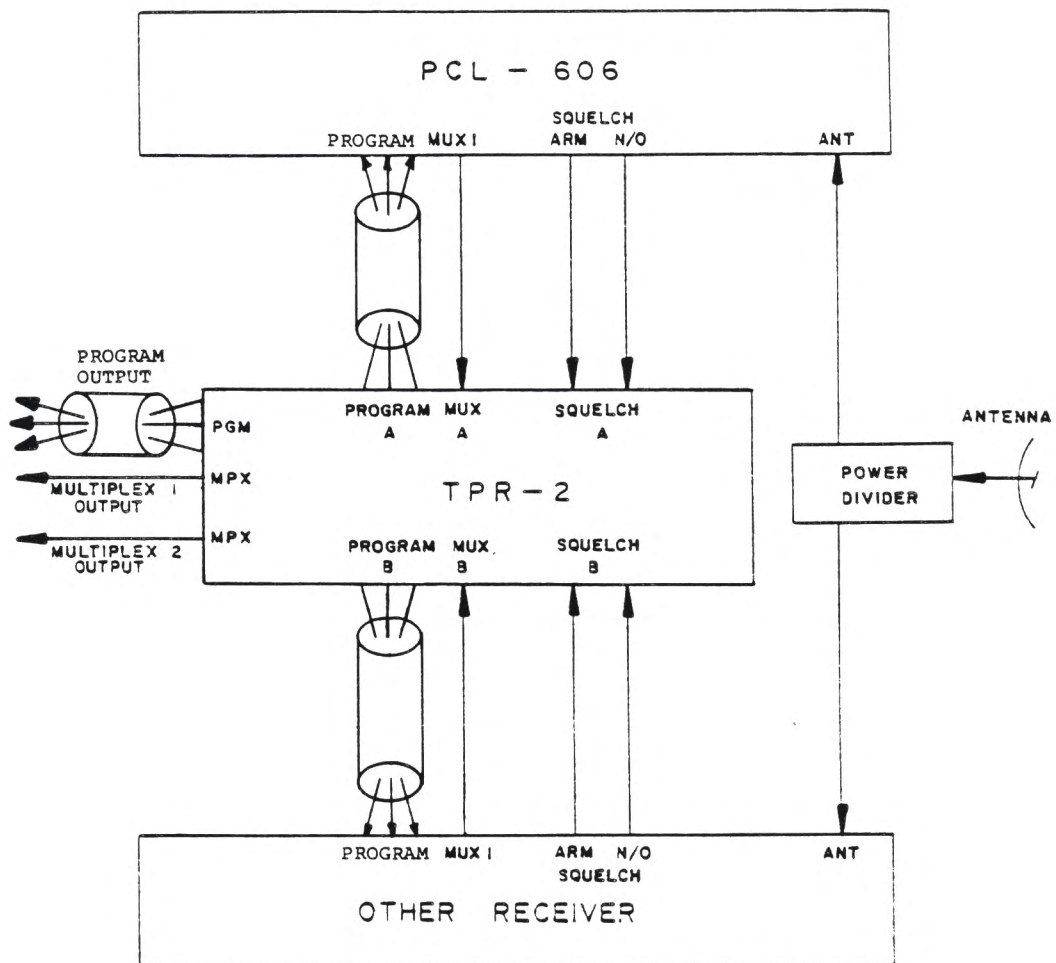


Figure 4-8

M/S Receiver Interconnect 606/Other

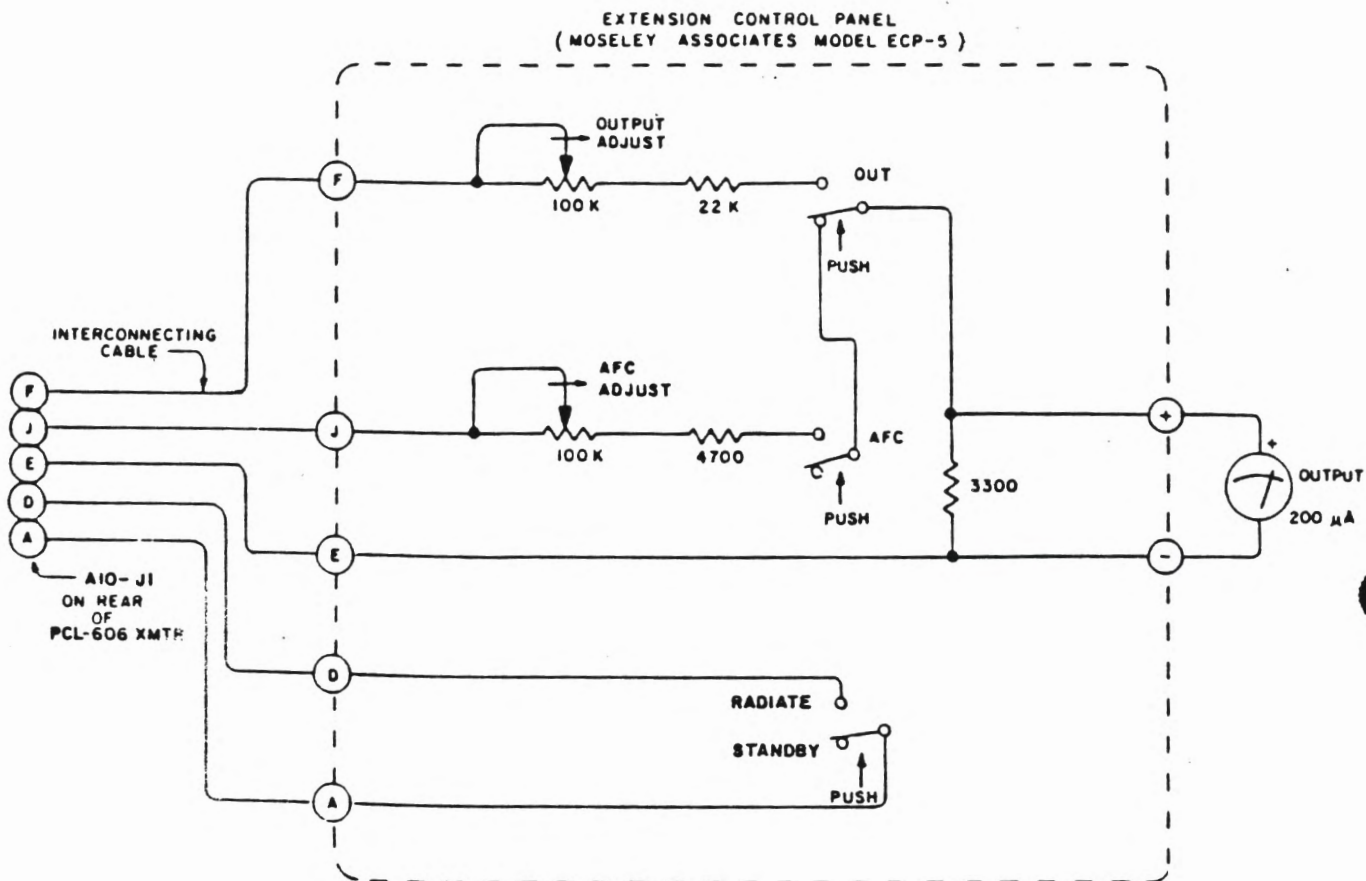


Figure 4-9

Ext. Control Panel Connector

SECTION 5

MODULE CHARACTERISTICS

5.1 INTRODUCTION

This section provides theory of operation, schematics, and parts lists for the PCL-606 modules.

5.2 MODULE DESCRIPTIONS

The modules are discussed in the following order:

TRANSMITTER

- A. Mono Audio Processor
- B. FMO Synthesizer
- C. Up Converter
- D. First Local Oscillator and Multiplier
- E. RF Amplifier
- F. Metering and Status
- G. Transmitter Control
- H. Power Supply

RECEIVER

- I. Preselector Filter
- J. Preamplifier and First Mixer
- K. First Local Oscillator and Multiplier
- L. Double Converter
- M. Second and Third Local Oscillator
- N. FM Demodulator
- O. Mono Baseband Processor
- P. Metering and Status
- Q. Mute and Transfer
- R. Power Supply

MONO AUDIO PROCESSOR

Schematic 91D7315
Component Layout 20D2865

The Mono Audio Processor Module sets the proper amplitude relationship between the three input signals: Mono program, MUX 1 and MUX 2. The mono program signal has selectable (in/out) 75 μ s pre-emphasis and 15 kHz low-pass filtering. These signals are then linearly combined by U2 into one mono baseband signal, which is sent to the FMO to frequency-modulate the transmitter carrier.

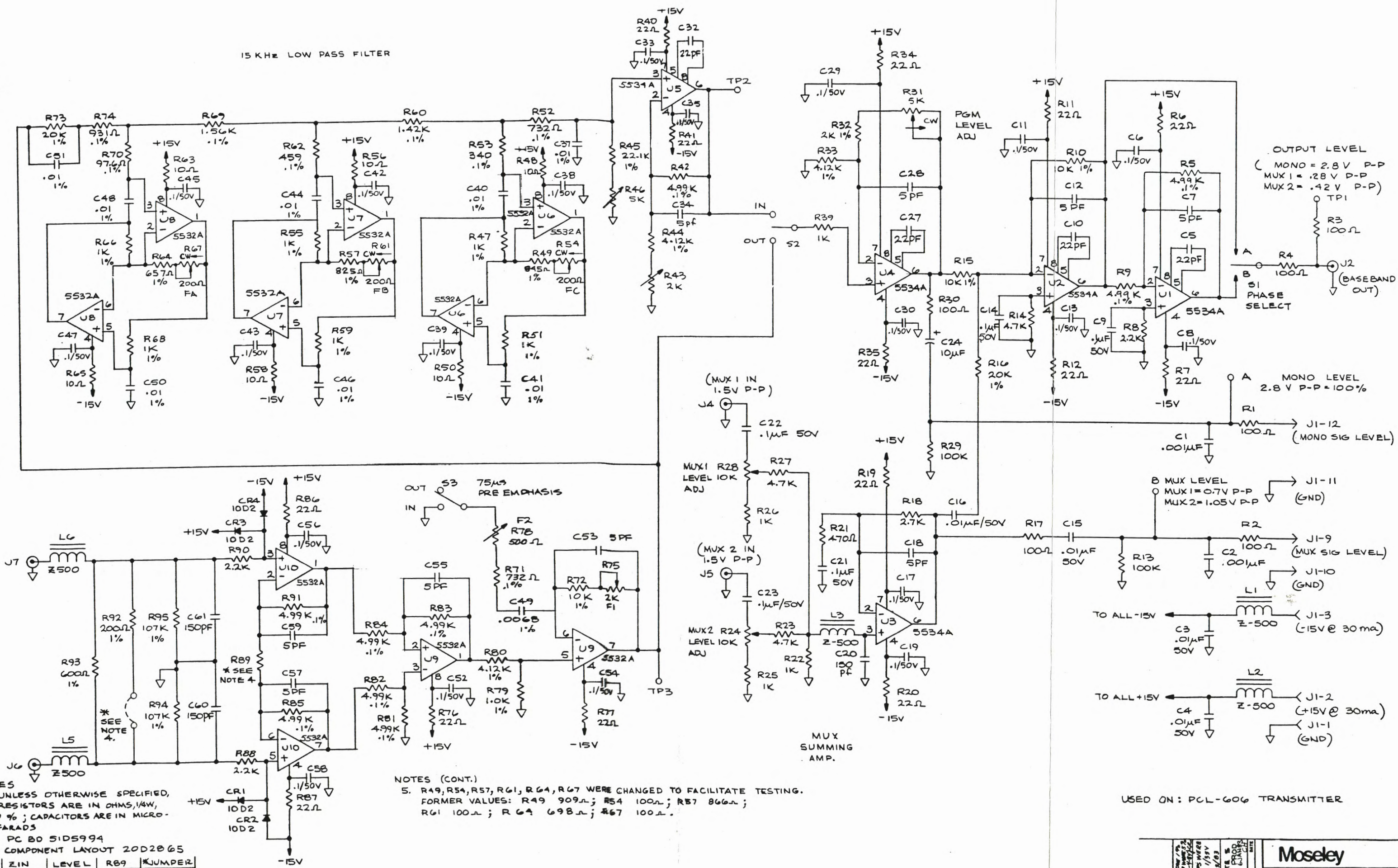
The mono program signal is terminated in 600 ohms by R93. U9 and U10 form a balanced differential amplifier. R79 and R80 form a 14 dB attenuator to decrease the signal levels being applied to the pre-emphasis and 15 kHz low-pass filter circuitry. When S3 is in the OUT position, one-half of U9 acts as a unity gain buffer. When S3 is in the IN position, U9 acts as a modified 75 μ s preemphasis: F1 (R75) is used to adjust the gain to +3 dB at 2 kHz, and F2 (R78) is used to adjust the gain to +18 dB at 20 kHz. The output of U9 is then sent to an active 15 kHz low-pass filter consisting of U6, U7 and U8. This filter uses a technique called "Impedance Transform" such that the .1% resistors act as inductors, the capacitors C37 and C51 act as resistors, and the ICs and associated components act as capacitors. The result is a 7-pole elliptical filter with a 15.9 kHz cutoff frequency. The transmission zeros for the filter are established as follows: FA (R67) is adjusted to 44.5 kHz; FB (R61) is adjusted to 22.5 kHz; and FC (R54) is set to 26.5 kHz. In split mono applications, these adjustments are used to phase match the filters. Gain (R43) is used to compensate the insertion loss of the filter and is normally adjusted at 5 to 10 kHz. LF TILT (R46) is used to control the low-frequency characteristics of the filter and is usually adjusted at 100 Hz. S2 provides for the in/out selection of the 15 kHz filter.

With a +10 dBm 400 Hz mono program signal at J6 and J7, the program level control (R31) is used to set the output level at J2 (baseband out) to 2.8 V p-p. This corresponds to 40 kHz deviation of the carrier frequency. With a 1.5 V p-p,

26 kHz subcarrier input at J4, MUX 1 level control (R28) is used to set the output level at J2 to .28 V p-p, which represents 4 kHz carrier deviation by the subcarrier. With a 1.5 Vp-p 67 kHz subcarrier level at J5, MUX 2 level control (R24) is used to set the output level at J2 to 0.42 V p-p, which equals 6 kHz carrier deviation by this subcarrier. All level adjustment controls possess enough range to accommodate a ± 4 dB deviation in the input levels from normal levels previously defined.

A signal phase select switch is incorporated to ensure a noninverted system baseband phase relationship (input of the transmitter to output of the receiver). For a 950 MHz band operation, this should be set in the "B" position. Output samples from the module are also sent to the front-panel metering and status module for indication of modulation levels. J1-12 carries mono program meter information and J1-9 carries MUX meter levels.

15 KHz LOW PASS FILTER



OUTPUT LEVEL
 (MONO = 2.8 V P-P
 MUX 1 = .28 V P-P
 MUX 2 = .42 V P-P)

MONO LEVEL
 2.8 V P-P = 100%

- NOTES
1. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS, 1/4W, 10 % ; CAPACITORS ARE IN MICRO-FARADS
 2. PC BD 51D5994
 3. COMPONENT LAYOUT 20D2065
 - 4.

NOTES (CONT.)

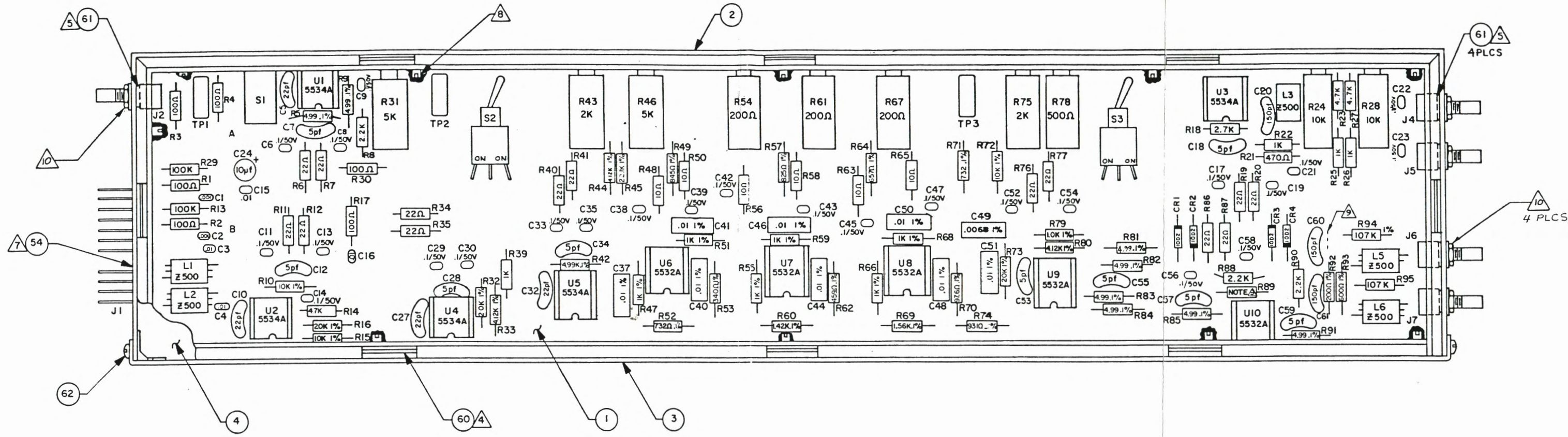
5. R49, R54, R57, R61, R64, R67 WERE CHANGED TO FACILITATE TESTING. FORMER VALUES: R49 909Ω; R54 100Ω; R57 866Ω; R61 100Ω; R64 698Ω; R67 100Ω.

Z IN	LEVEL	R89	JUMPER
600Ω	+10db	NONE	NONE
600Ω	0 db	4.64K	NONE
150Ω	+10db	10K	ADD

USED ON: PCL-606 TRANSMITTER

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www.SteamPoweredRadio.Com

Moseley	
SCHEMATIC	
MONO AUDIO PROCESSOR	
DATE	SCALE
9/10/73	C
9107315	



NOTES

1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/4W, 10%, CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD 51D5994
3. SCHEMATIC 91D7315.

ITEM NO: 9301409

Moseley	
COMPONENT LAYOUT	
MONO AUDIO PROCESSOR	
<small>TOL. PRACT. ± 10% RES. ± 5% CAP. ± 10% DIM. ± 0.1mm</small>	
<small>DRW: S. J. 3/25/82 SCALE: 2/1</small>	
<small>CHE: S. J. 11-1-82</small>	
2002865 G	

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
25	4500013	RES 931 OHM 1/8W .1% R74	RN55E93108	1.000	EA
26	4510046	RES 825 OHM 1/8W 1% R57	RN55C8250F	1.000	EA
27	4500039	RES 340 OHM 1/8W .1% R53	RN55E3400B	1.000	EA
28	4500047	RES 732 OHM 1/8W .1% R52,R71	RN55E7320B	2.000	EA
29	4500021	RES 459 OHM 1/8W .1% R62	RN55E4590B	1.000	EA
30	4510004	RES 200 OHM 1/8 W 1% R92	RN55E2000F	1.000	EA
31	4510640	RES 600 OHM 1/8W 1% R93	RN55E6000F	1.000	EA
32	4500112	RES 4.99K OHM 1/8W .1% R5,R9,R42,R81,R82,R83,R84,R85,R91	RN55E4991B	9.000	EA
33	4500062	RES 1.56K 1/8W .1% R69	RN55E1561B	1.000	EA
34	4510087	RES 4.12K OHM 1/8W 1% R33,R44,R80	RN55E4121F	3.000	EA
35	4510269	RES 107K OHM 1/8W 1% R94,R95	RN55C1073F	2.000	EA
36	4510293	RES 2.00K OHM 1/8W 1% R32	RN55C2001F	1.000	EA
37	4410023	RES 10 OHM 1/4W 10% R48,R50,R56,R58,R63,R65	RC07GF100K	6.000	EA
38	4510657	RES 22.1K OHM 1/8W 1% R45	RN55E2212F	1.000	EA
39	4510665	RES 1.00K OHM 1/8W 1% R47,R51,R55,R59,R66,R68,R79	RN55E1001F	7.000	EA
40	4500054	RES 1.42K 1/8W .1% R60	RN55E1421B	1.000	EA
41	4510756	RES 657 OHM 1/8W 1% R64	RM55E6570F	1.000	EA
42	4310280	CAP .001 100V C1,C2	C315C102MIR5CA	2.000	EA
43	4310165	CAP .01UF/100V W/O.1IN LD SPCG C3,C4,C15,C16	CY15A103M	4.000	EA
44	4250718	CAP POLYCARB .01/100 1% C37,C40,C41,C44,C46,C48,C50,C51	25UB103F	8.000	EA
45	4310264	CAP .1 50V 25U 20% C6,C8,C9,C11,C13,C14,C17,C19,C21,C22,C23,C29, C30,C33,C35,C38,C39,C42,C43,C45,C47,C52,C54,C56, C58	5020ES50RD104M	25.000	EA
48	4250726	CAP POLYCARB .0068/100V 1% C49	25UB682F	1.000	EA
49	4280079	CAP TANT EPOX-DIP 10/25V 20% C24	196D106X0025KA1	1.000	EA
50	4210043	CAP MICA DIP 5PF +/- 0.5 C7,C12,C18,C28,C34,C53,C55,C57,C59	DM-15-050D	9.000	EA
51	4210100	CAP MICA DIP 22PF 5% C5,C10,C27,C32	UM-15-220J	4.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
52	4210308	CAP MICA DIP 150PF 5% C20,C60,C61	DM-15-151J	3.000	EA
53	3610003	DIO 1002 200V 1A SI D039 CR1,CR2,CR3,CR4	1002	4.000	EA
54	3090222	CONN 12PIN SNGL ROW RTANG HDR J1	1-87233-2	1.000	EA
55	3090230	CONN SMB PC RT ANG MALE BLKHD J2,J4,J5,J6,J7	2110-1511-000	5.000	EA
56	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3	430-101	3.000	EA
57	3250016	SKT DUAL IN LINE 8 PIN U1,U2,U3,U4,U5,U6,U7,U8,U9,U10	640463-1	10.000	EA
58	3190782	SW UPDT PC S2,S3	573-21190301100	2.000	EA
59	3190253	SW SLD S1	23 021 114	1.000	EA
60	1310093	CLIP PCL-606	05C2882	B	16.000 EA
61	1130491	WSHR SST 5710-35-16	5710-35-16		5.000 EA
62	1050129	SCR PNH PHPS 4-40 X 1/4 SST			2.000 EA

FMO SYNTHESIZER

Schematic 91D7283
Parts List 20D2854

The FMO Synthesizer module consists of three main sub-groups: the RF group, the digital group, and the loop filter. The RF group includes the oscillator (FMO), buffer, reference oscillator, and low-pass filter. The digital group includes a level translator, a presettable divide-by-N counter, and a phase/frequency comparator.

These three groups provide a functional module that has good short-term stability, low noise, and is tunable over a wide frequency range. Selecting the appropriate divide ratio synthesizes the crystal-controlled reference oscillator and ensures long-term stability.

The FMO (frequency modulated oscillator) consists of low-noise field effect transistor Q4 in an RF grounded base configuration. The drain of Q4 is connected to the resonant circuit inductor and capacitors. The capacitance for this circuit is provided by C42, C43, C44, and C45. The inductance consists of a stripline inductor on the PC board. Feedback to cause oscillation is from the drain to the source consisting of C44 and C45. The normal frequency range of the oscillator is 60 to 80 MHz.

Modulation is applied to CR9, which is a variable capacitance diode. CR9 is coupled to the resonant circuit by C42. R44 adjusts the bias on CR9 and is set for minimum modulation distortion, usually approximately -5 volts. R53 adjusts the amount of modulation on the bias voltage applied to CR9. 3.5 V peak-to-peak input at J4 will produce 100% modulation (50 kHz deviation), or 2.8 V peak-to-peak input at J4 will produce 100% modulation (40 kHz deviation).

Integrated circuit U11 is a buffer amplifier and drives Q1 and low-pass filter L5 and L6, which attenuate the harmonics of the FMO. The frequency stability of the FMO is maintained by CR8, which is attached to the stripline inductor through C39. A voltage generated by the AFC circuitry changes the capacitance of CR8, which is also part of the tuning of the FMO resonant circuit. This AFC circuitry changes the capacitance of CR8, which is also part of the tuning of the FMO resonant circuit. This AFC voltage is derived by phase comparing the divided output of the FMO with the divided output of a crystal reference oscillator.

Q1 is a buffer amplifier which acts as a level translator to TTL levels to drive U6. U6 is a decade counter prewired to divide by 10. Its output is connected to the input of a four-decade presettable divide-by-N counter, U1 through U4. Setting of the divide ratio is done by S1 through S4. S1 sets the most significant digit. The overall divide ratio may be set to any number up to 99,990. The usual divide ratios are 60,000 to 80,000, which will lock the FMO between 60 MHz and 80 MHz.

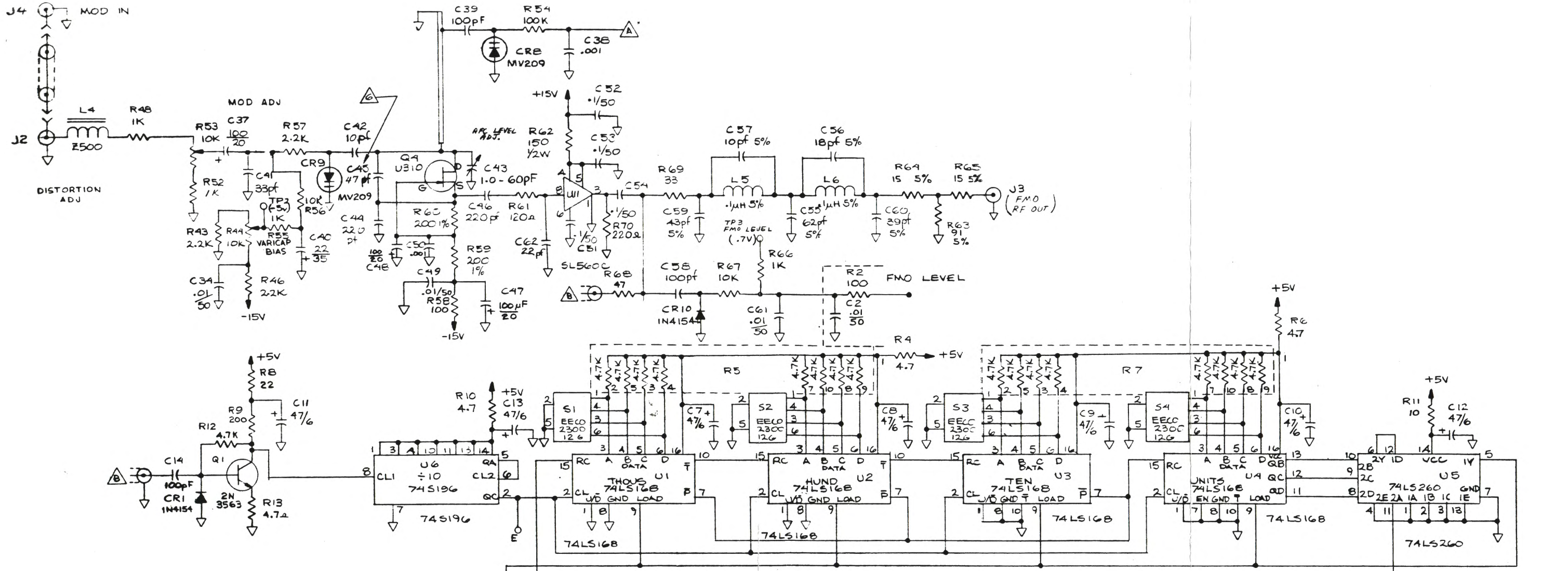
U5 is a five-input NOR gate used to drive the load line. It is connected so that the counter divides by N exactly. Since the duration of the load pulse is too short to drive phase/frequency comparator U9, it is stretched to approximately 50% duty cycle by U7. U7 is a nonretriggerable one-shot. The frequency of the square wave at pin 14 of U9 is 1 kHz when the AFC is locked.

Crystal Y1, Q3 and Q2 comprise a reference oscillator and buffer. Frequency Trim control C21 is used to set the output frequency of this oscillator to 4.096 MHz. This is divided by 4096 in U8, which delivers a 1kHz reference frequency to pin 3 of phase/frequency comparator U9.

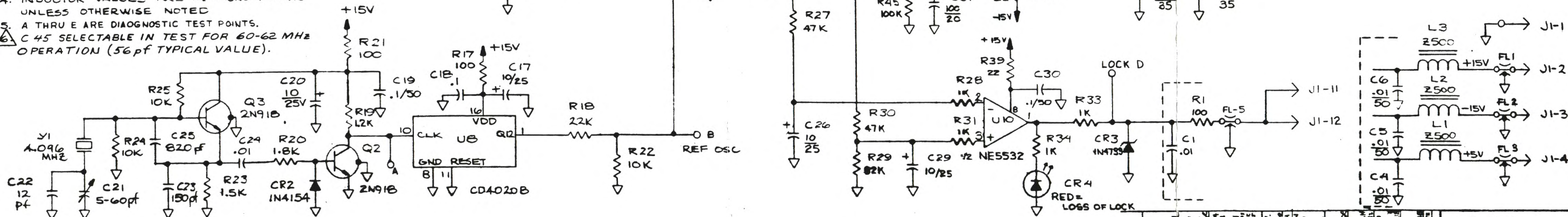
The average dc voltage at the output of U9 pin 13 is internally biased to half the supply voltage, and deviates from this by an amount which is proportional to the phase difference of the two 1kHz signals at pins 3 and 14.

Loop filter U10 is an integrating low-pass filter that removes most of the 1kHz component of the phase comparator output. It also provides dc gain to decrease the very low frequency noise of the FMO. Further filtering of the AFC voltage is then delivered to CR8 through R54, closing the AFC loop. AFC level adjust C43 is used to place the phase-locked loop in the center of its operating control range. This is indicated by a nominal +7 V level at TP1 (AFC Level).

The average voltage at U9 pin 1 is +5 V when the loop is locked. If the loop becomes unlocked, the average voltage drops to 2.5 V. This causes the output of U10 pin 1 to change from plus to minus, which lights the red LOSS OF LOCK LED on the module. When lock is lost, the voltage at J1-11 and J11-12 drops from +5 V to 0 V, causing the 12.5 V power supply voltage to drop to 1.5 V, which removes the 8watt RF output.



- NOTES:
- UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 1/4W, 10%; ALL CAPACITORS ARE IN MICROFARADS.
 - TRIM & DRILL: SYNTHESIZER 51C5951
 - COMPONENT LAYOUT: SYNTHESIZER 2CD254
 - INDUCTOR VALUES ARE IN MICROHENRYS UNLESS OTHERWISE NOTED
 - A THRU E ARE DIAGNOSTIC TEST POINTS.
 - C 45 SELECTABLE IN TEST FOR 60-62 MHz OPERATION (56pf TYPICAL VALUE).



FREQUENCY TRIM

J	CAS VALUE WAS: 15-51PF
A	ECO 485
F	CH 1 WAS 50PT. 25 AUG 85
G	ADDED NOTE 6. 85032222
H	NOTE 3: 150818
I	ECO 485
F	ECO 485
E	ECO 485
D	ECO 485
C	ECO 485
B	ECO 485
A	ECO 485

Moseley
SCHEMATIC
RMO/30001 60-80MHz
9107293

MOSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301516

DESCRIPTION: ASSY FMO/SYNTH 60-80 MHZ
 ENG.DRAWING NO.: 20D2854 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473170	PCB FMO/SYNTH PCL-606	51D5951	G	1.000 EA
3	3150133	SW 10P BCD ROT OUTPUT "ORANGE" S1,S2,S3,S4	230012G		4.000 EA
4	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3	430-101		3.000 EA
5	3390549	LED RED 2.0x20 WIDE RT/HOLDER CR4	550-0406		1.000 EA
6	3340775	XTAL 4.096 HC-25 FMO PCL-606 Y1	30A0078	AO	1.000 EA
7	3250495	SKT PIN .0850DX.200L GOLD FIN Y1	450-3286-01-03		2.000 EA
8	3250016	SKT DUAL IN LINE 8 PIN U10	640463-1		1.000 EA
9	3250024	SKT DUAL IN LINE 14 PIN U5,U6,U7	640357-1		3.000 EA
10	3250032	SKT DUAL IN LINE 16 PIN U1,U2,U3,U4,U8,U9	640358-1		6.000 EA
11	3661121	IC DEC/BI-QUIN COUNT/LATCH U6	74S196		1.000 EA
12	3680261	IC BIN COUNT/DIVIDER U8	CD4020BE		1.000 EA
13	3680253	IC PHASE-LOCKED LOOP U9	CD4046BE		1.000 EA
14	3660388	IC SN74121N MONOMULTI ST U7	SN74121N		1.000 EA
15	3660966	IC SN74LS260N DU 5IN NOR U5	SN74LS260N		1.000 EA
16	3661105	IC DEC 4BIT UP/DWN SYNC COUNT U1,U2,U3,U4	N74LS168AN		4.000 EA
17	3730967	IC DUAL OP AMP U10	NE5532AN		1.000 EA
18	3730769	IC SL560C U11	SL560C		1.000 EA
19	4020640	IDCTR MINI-RED .1 UH 5% L5,L6	MR .10 5%		2.000 EA
20	4020467	FERROX CUBE 500 OHM L1,L2,L3,L4	VK200 10/3B		4.000 EA
21	3640307	XT U310 Q4	U310		1.000 EA
22	3630076	XT NS2N3563 .2W600M030V50M2P Q1	2N3563		1.000 EA
23	3630001	XT NS2N918 .4W600M030V50M2P Q2,Q3	2N918		2.000 EA
24	3610250	DIO 30V 6/30 PF T092 MV209 CR8,CR9	MV209		2.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
25	3600178	DIO Z1N4733A 5.1V 1W 5% A1AY CR3	1N4733A Z5.1A	1.000	EA
26	3600145	DIO 1N4154 25V 4NS SI D035 CR1,CR2,CR5,CR10	1N4154	4.000	EA
27	4250486	CAP POLYCARB .1/100V 3% C15	220B104H	1.000	EA
28	4350401	CAP CHIP 100PF 5% P90 C39	100B101JP500X	1.000	EA
29	4210100	CAP MICA DIP 22PF 5% C62	DM-15-220J	1.000	EA
30	4410130	RES 120 OHM 1/4W 10% R61	RC07GF121K	1.000	EA
31	4370359	CAP VAR 1.0-60PF GLASS EMBBAND C43	TP60C	1.000	EA
32	4350500	CAP ADJ 5-60PF C21	GXD60000	1.000	EA
33	4210530	CAP MICA DIP 820PF 5% C25	DM-15-821J	1.000	EA
34	4210308	CAP MICA DIP 150PF 5% C23	DM-15-151J	1.000	EA
35	4210068	CAP MICA DIP 12PF 5% C22	DM-15-120J	1.000	EA
36	4210266	CAP MICA DIP 100PF 5% C14,C58	DM-15-101J	2.000	EA
37	4210084	CAP MICA DIP 18PF 5% C56	DM-15-180J	1.000	EA
38	4210555	CAP MICA DIP 10PF 5% C57	DM15-100J	1.000	EA
39	4210217	CAP MICA DIP 62PF 5% C55	DM-15-620J	1.000	EA
40	4210175	CAP MICA DIP 43PF 5% C59	DM-15-430J	1.000	EA
41	4210142	CAP MICA DIP 33PF 5% C41	DM-15-330J	1.000	EA
42	3291069	FILTER FEED THRU SM THD FL1,FL2,FL3,FL4,FL5	859619-1	5.000	EA
43	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C33	196D225X0035JA1	1.000	EA
44	4280038	CAP TANT EPOX-DIP 1/35V 20% C36	196D105X0035HA1	1.000	EA
45	4210167	CAP MICA DIP 39PF 5% C60	DM-15-390J	1.000	EA
46	4280095	CAP TANT EPOX-DIP 22/35V 10% C32,C40	196D226X9035PE4	2.000	EA
47	4280152	CAP TANT EPOX-DIP 100/20V 10% C31,C37,C47,C48	196D107X9020TE4	4.000	EA
48	4280079	CAP TANT EPOX-DIP 10/25V 20% C17,C20,C26,C28,C29,C35	196D106X0025KA1	6.000	EA
49	4280129	CAP TANT EPOX-DIP 47/6V 20% C7,C8,C9,C10,C11,C12,C13,C16	196D476X0006JA1	8.000	EA
50	4310272	CAP .01 50V X7R 10% C1,C2,C3,C4,C5,C6,C24,C34,C49,C61	5018EM50RD103K	10.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
51	4310264	CAP .1 50V Z5U 20% C18,C19,C27,C30,C51,C52,C53,C54	5020ESSORD104M	8.000	EA
52	2201119	CABLE BOTH END PIGTAIL 11.5	24C1064-11.5 C	1.000	EA
53	4350666	CAP CHIP .001 UF 5% P90 C38,C50	100B102JP50X	2.000	EA
54	4350575	CAP CHIP 47 PF 5% P90 C45	100B470JP500X	1.000	EA
55	4350419	CAP CHIP 220PF 5% P90 C44,C46	100B221JP200X	2.000	EA
56	4350591	CAP CHIP 10PF 5% P90 C42	100B100JP500X	1.000	EA
57	4630695	PUT CER PC PIN 10K OHM .75W20T R44,R53	43P103	2.000	EA
58	1641927	W BUSS 22GA	298	.417	FT
59	3090230	CONN SMB PC RT ANG MALE BLKHD J3	2110-1511-000	1.000	EA
61	2300853	ASSY CABLE FMO/SYNTH PCL-606	24B1089	A	1.000 EA
62	1050129	SCR PNH PHPS 4-40 X 1/4 SST			2.000 EA
63	4410387	RES 12K OHM 1/4W 10% R51	RC07GF123K		1.000 EA
64	4410411	RES 22K OHM 1/4W 10% R18	RC07GF223K		1.000 EA
65	4410486	RES 82K OHM 1/4W 10% R29	RC07GF823K		1.000 EA
66	4410429	RES 27K OHM 1/4W 10% R42	RC07GF273K		1.000 EA
67	4410437	RES 33K OHM 1/4W 10% R41	RC07GF333K		1.000 EA
68	4410353	RES 6.8K OHM 1/4W 10% R15	RC07GF682K		1.000 EA
69	4410452	RES 47K OHM 1/4W 10% R27,R30	RC07GF473K		2.000 EA
70	4410247	RES 1K OHM 1/4W 10% R28,R31,R33,R34,R37,R38,R48,R52,R55,R66	RC07GF102K		10.000 EA
71	4410379	RES 10K OHM 1/4W 10% R22,R24,R25,R26,R56,R67	RC07GF103K		6.000 EA
72	4410270	RES 1.8K OHM 1/4W 10% R20	RC07GF182K		1.000 EA
73	4410262	RES 1.5K OHM 1/4W 10% R23	RC07GF152K		1.000 EA
74	4410254	RES 1.2K OHM 1/4W 10% R19,R47	RC07GF122K		2.000 EA
75	4410080	RES 47 OHM 1/4W 10% R68	RC07GF470K		1.000 EA
76	2091064	COVER BOTTOM FMO/SYNTH PCL-606	05C2888	D	1.000 EA
77	4410338	RES 4.7K OHM 1/4W 10% R12	RC07GF472K		1.000 EA
78	4410288	RES 2.2K OHM 1/4W 10% R14,R43,R46,R57	RC07GF222K		4.000 EA
79	4410015	RES 4.7 OHM 1/4W 10% R4,R6,R10,R13	RC07GF4R7K		4.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
80	4510004	RES 200 OHM 1/8 W 1% R59,R60	RN55E2000F	2.000	EA
81	4420162	RES 150 OHM 1/2W 10% R62	RC20GF151K	1.000	EA
82	4410122	RES 100 OHM 1/4W 10% R1,R2,R3,R17,R21,R35,R36,R58	RC07GF101K	8.000	EA
83	4410049	RES 22 OHM 1/4W 10% R8,R16,R32,R39	RC07GF220K	4.000	EA
84	4410064	RES 33 OHM 1/4W 10% R69	RC07GF330K	1.000	EA
85	4460010	RES 10 OHM 1/4W 5% R11	RC07GF100J	1.000	EA
86	4540183	RES SIP 4.7K OHM 1/4W 10% R5,R7	750-101-4.7K	2.000	EA
87	1130491	WSHR SST 5710-35-16	5710-35-16	1.000	EA
88	1310093	CLIP PCL-606	05C2882	20.000	EA
89	2090991	FRAME FMO/SYNTH XMTR PCL-606	05D2870	1.000	EA
90	2090967	FRAME BASE MODULE PCL-606	05C2867	1.000	EA
91	4410163	RES 220 OHM 1/4W 10% R9,R70	RC07GF221K	2.000	EA
92	4410494	RES 100K OHM 1/4W 10% R40,R45,R54	RC07GF104K	3.000	EA
93	2202307	ASSY COAX SMB/S-SMB PC/RT 10 J2 TO J4	24B1091-3	1.000	EA
94	2110237	HEATSINK TO-5 PUSH-ON U11	#1115B	1.000	EA
95	4460747	RES 15 OHM 1/4W 5% R64,R65	RC07GF150J	2.000	EA
96	4461018	RES 91 OHM 1/4W 5% R63	RC07GF910J	1.000	EA

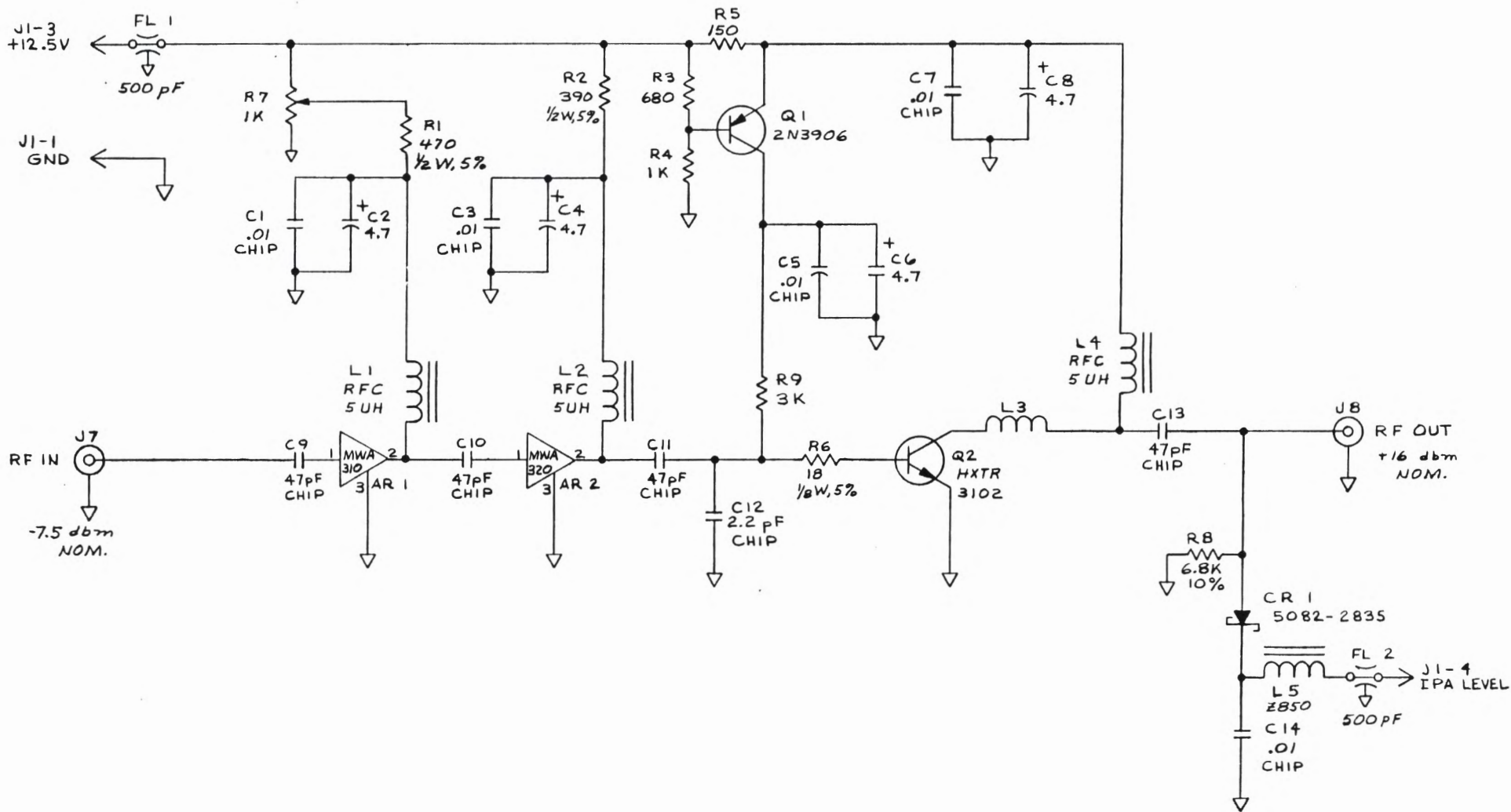
UP CONVERTER

Schematic	91C7384
	91B7381
Assembly	20C2934
	20C2935
Parts List	9104753
	9302027
	9302068

The Up Converter module, 950 MHz, consists of three separate sub-assemblies. First is the Up Converter mixer, 950 MHz, which consists of a double balanced mixer (U1). Next is the Up Converter filter, 950 MHz, which is a five-pole, interdigital, tunable bandpass filter designed so that the 1020 MHz LO signal and the 1090 MHz sum of the LO and FMO signals are more than -60 dB below the 950 MHz carrier frequency. The last subassembly is the Up Converter amplifier, 950 MHz, which is a three-stage broadband RF amplifier with the first two stages operating class A linear and the output stage operating in compression to minimize any changes in gain over a wide temperature range.

The output of the 60-80 MHz frequency modulated oscillator (FMO) (0 ± 2 dBm) is fed into the double-balanced mixer along with the 1020 MHz fixed local oscillator signal ($+8 \pm 2$ dBm). The resulting 940-960 MHz signal level is typically -10 dBm. The signal is then filtered and amplified to a nominal +16 dBm output, which in turn is fed to the RF Amplifier module. A high degree of repeatability and reliability is achieved by using advanced microstrip design technology in the broadband amplifier.

An output power detector (CR1, R8, C14) is provided for the Up Converter amplifier. Relative power is detected and relayed to the front panel meter via the Metering and Status board. In the IPA LEVEL position, the front panel meter shows a relative power indication for the Up Converter amplifier and should read in the shaded area of the lower reference arc.



3. COMPONENT LAYOUT: 20C2935

2. P.C. BOARD: 51C6048

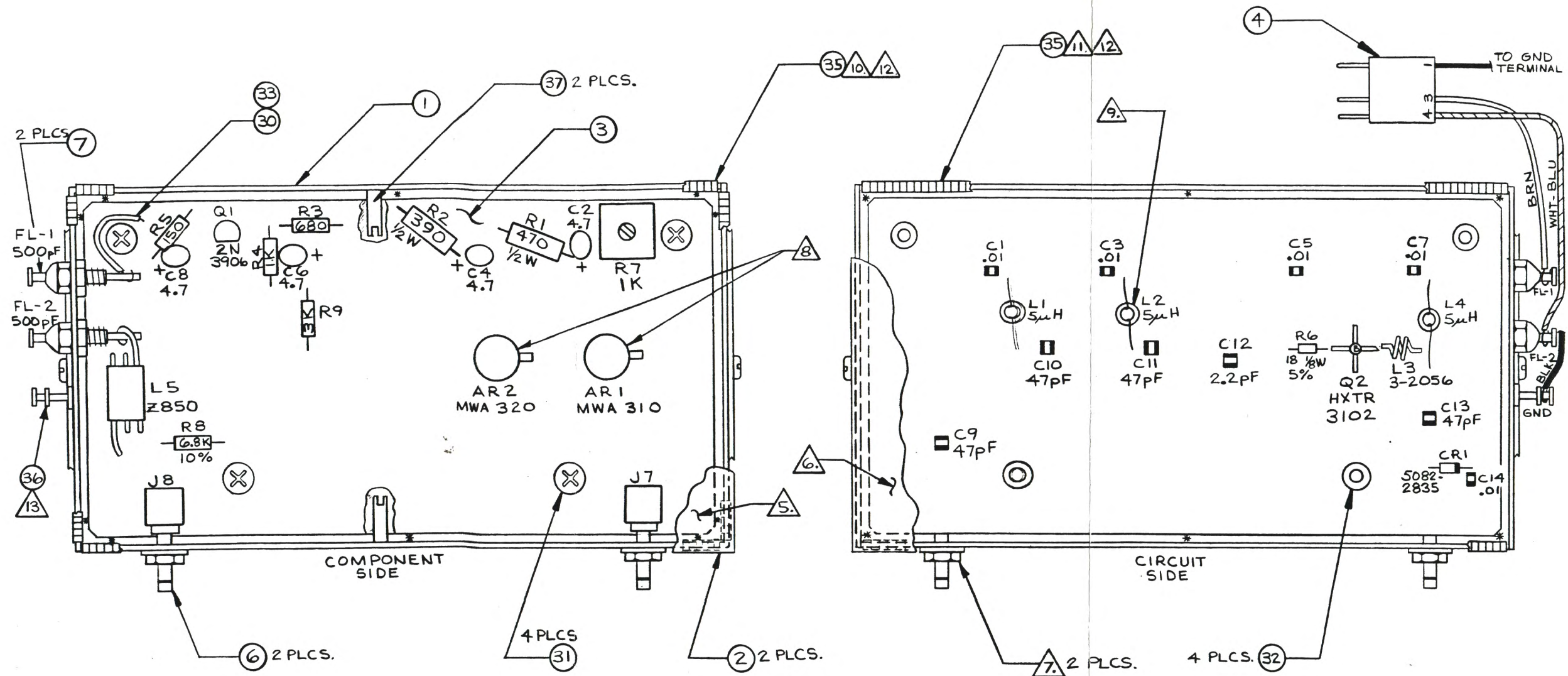
1. UNLESS OTHERWISE SPECIFIED:
 RESISTOR VALUES ARE IN OHMS, 1/4 WATT, 5%
 CAPACITOR VALUES ARE IN MICROFARADS

NOTES:

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REL FOR PROD ECO 4610 7 OCT 85 CH		DATE	
Moseley			
SCHEMATIC, 890-960 MHz UP-CONVERTER AMP			
TOL: FRACT. ± 1/20, .5% ± .20, .002 ± .015, < ± 1/2"		SCALE: —	
DWN: CAH 10-1-85		CHK: CAH 10-1-85	
ENR: CAH 10-1-85		91C7384 A	



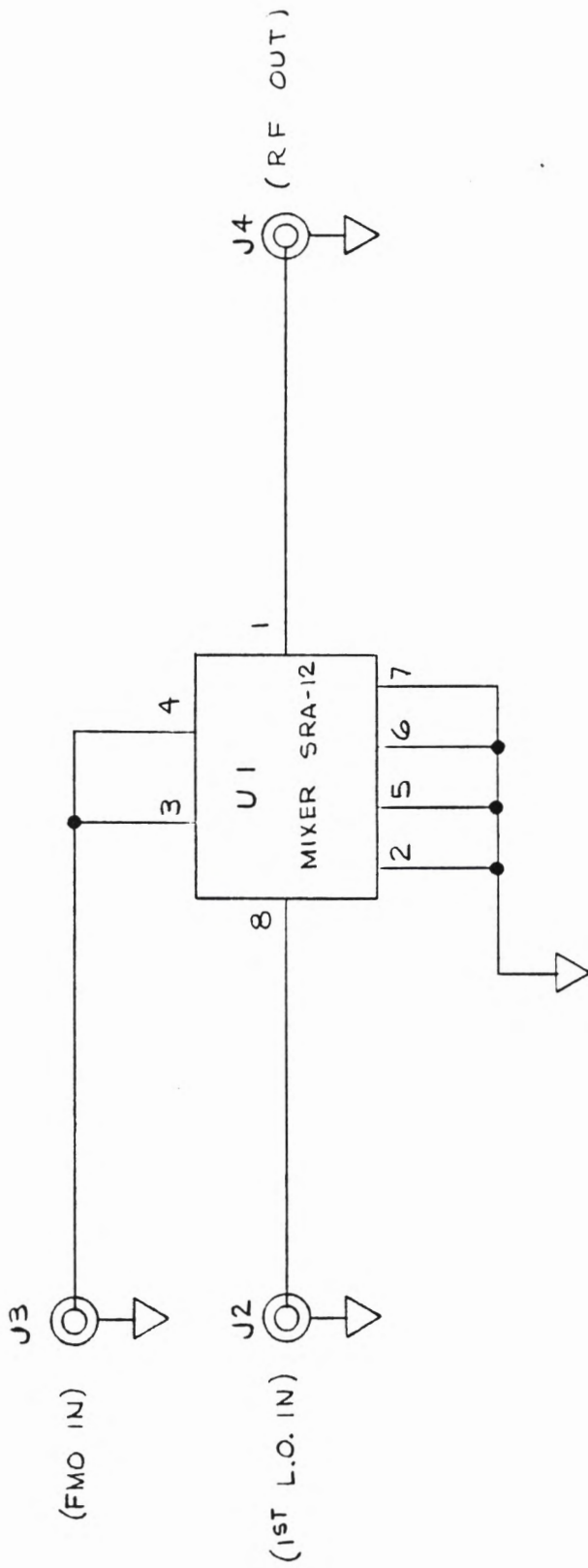
- ▲ 13. TERMINAL (ITEM 36) IS SOLDERED TO FRAME (ITEM 1).
 - ▲ 12. SPOT SOLDER STICKLEFINGERS (ITEM 35) ON INSIDE SURFACE OF FRAME AT * LOCATIONS, 10 PLCS COMP. SIDE, 6 PLCS CIRCUIT SIDE.
 - ▲ 11. INSTALL STICKLEFINGERS (ITEM 35) ON BOTTOM OF FRAME ON THE LONG SIDES ONLY (CIRCUIT SIDE).
 - ▲ 10. INSTALL STICKLEFINGERS (ITEM 35) ALL AROUND TOP EDGE OF FRAME (COMP. SIDE).
 - ▲ 9. SURFACE MOUNT ACCEPTABLE ON L1, L2 & L4.
 - ▲ 8. AR1 & AR2 TO BE FLUSH WITH P.C. BOARD.
 - ▲ 7. TORQUE REQUIREMENT ON ITEM 6 TO BE 3 IN.-LBS. MAXIMUM.
 - ▲ 6. INSTALL COVER ON CIRCUIT SIDE SO THAT MOUNTING HOLES ARE POSITIONED OVER STANDOFFS (ITEM 32).
 - ▲ 5. INSTALL COVER ON COMPONENT SIDE SO THAT ACCESS HOLE IS POSITIONED OVER R7.
4. USE SILVER BEARING SOLDER SN 62 PER QQS571 ON ALL SURFACE MOUNTED COMPONENTS.
3. SCHEMATIC: 91C 73 84
2. PC BD: 51C 6048
1. UNLESS OTHERWISE SPECIFIED:
RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%
CAPACITOR VALUES ARE IN MICROFARADS

NOTES:

www.SteamPoweredRadio.Com

ITEM NO: 9302027

ITEM 31 WAS FIL. HD. SCREW.		ADD WIRE COLORS		ADD NOTE 13		ECO 4661		15 JAN 86 CH	
ADD NOTES: 10, 11, 12		ADD ITEMS: 35, 36, 37		ECO 4622		20 NOV 85 CH		REL FOR PROD	
ECO 4610		17 OCT 85 CH		DATE		REVISIONS		DATE	
MOSLEY		COMPONENT LAYOUT		UP-CONV. AMP 890-960 MHZ		TOL: FRACT. = 1/32, XX = .001, XXX = .010, <= 1/2"		DWN CAH 4 MAY 85 SCALE: 2 X	
CHK XCR 7 MAY 85		ENG DAH 6 JAN 85		20C2935		C			



2. COMPONENT LAYOUT: 20C2944.

1. PC BOARD: 51C6051.

NOTES:

REVISIONS		DATE	
Δ	REV 1	10/1/85	10/1/85
Δ	REV 2	10/1/85	10/1/85
Δ	REV 3	10/1/85	10/1/85
Δ	REV 4	10/1/85	10/1/85
Δ	REV 5	10/1/85	10/1/85
Δ	REV 6	10/1/85	10/1/85
Δ	REV 7	10/1/85	10/1/85
Δ	REV 8	10/1/85	10/1/85
Δ	REV 9	10/1/85	10/1/85
Δ	REV 10	10/1/85	10/1/85
Δ	REV 11	10/1/85	10/1/85
Δ	REV 12	10/1/85	10/1/85
Δ	REV 13	10/1/85	10/1/85
Δ	REV 14	10/1/85	10/1/85
Δ	REV 15	10/1/85	10/1/85
Δ	REV 16	10/1/85	10/1/85
Δ	REV 17	10/1/85	10/1/85
Δ	REV 18	10/1/85	10/1/85
Δ	REV 19	10/1/85	10/1/85
Δ	REV 20	10/1/85	10/1/85
Δ	REV 21	10/1/85	10/1/85
Δ	REV 22	10/1/85	10/1/85
Δ	REV 23	10/1/85	10/1/85
Δ	REV 24	10/1/85	10/1/85
Δ	REV 25	10/1/85	10/1/85
Δ	REV 26	10/1/85	10/1/85
Δ	REV 27	10/1/85	10/1/85
Δ	REV 28	10/1/85	10/1/85
Δ	REV 29	10/1/85	10/1/85
Δ	REV 30	10/1/85	10/1/85
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Δ	REV 95	10/1/85	10/1/85
Δ	REV 96	10/1/85	10/1/85
Δ	REV 97	10/1/85	10/1/85
Δ	REV 98	10/1/85	10/1/85
Δ	REV 99	10/1/85	10/1/85
Δ	REV 100	10/1/85	10/1/85

Moseley

SCHEMATIC
UP-CONVERTER MIXER

TOL: FRACT. = 1/2% . XX = 48M . XIE = 21M . <= 1/2"
DWN: A4 1-1-85 SCALE: -
CHK: 1-2 7-2-85
ENG: 1-1-85 91B7381 A

MOSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
SANTA BARBARA, CA 93117-3093
(805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9104753

DESCRIPTION: ASSY UPCONVERT 890-960 MHZ
ENG.DRAWING NO.: 20C2934 A

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.		QUANTITY PER	UM
1	2091924	PLATE MOUNTING UPCONV	05C3115	A	1.000	EA
2	2202638	ASSY COAX SMB/RT-SMB/RT 5"	24B1074-6	B	1.000	EA
3	9302027	ASSY UP-CONV AMP 890-960 MHZ	20C2935	C	1.000	EA
4	9302092	ASSY PRESEL 960MHZ	20C2947	A	1.000	EA
5	9302068	ASSY UPCONV MIXER 890-960	20C2944	B	1.000	EA
6	1050186	SCR PNH PHPS 4-40 X 1/2 SST			4.000	EA
7	1050129	SCR PNH PHPS 4-40 X 1/4 SST			8.000	EA
8	2201986	ASSY CA SMB/RT-SMB/S 6"	24B1075-1	D	1.000	EA

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 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9302027

DESCRIPTION: ASSY UP-CONV AMP 890-960 MHZ
 ENG.DRAWING NO.: 20C2935 C

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	2091932	FRAME UP CONV AMP	0583116 B	1.000	EA
2	2091940	COVER ENCL UP CONV AMP	0583117 B	2.000	EA
3	3473816	PCB UP-CONVERTER AMP	51C6048 A	1.000	EA
4	2301059	ASSY CA UP CONV AMP	2481119 A	1.000	EA
5	4010971	COIL AIR L3	03-2056 A	1.000	EA
6	3090230	CONN SMB PC RT ANG MALE BLKHD J7,J8	2110-1511-000	2.000	EA
7	4350088	CAP FD THRU 500PF FL1,FL2	2425001X5U0501A	2.000	EA
8	3630464	XT 2N3906 Q1	2N3906	1.000	EA
9	3640299	XT HXTR-3102 Q2	HXTR-3102	1.000	EA
10	4050209	CHOKER RF 7.2 UH +/- 20% L1,L2,L4	0383012 B	3.000	EA
11	4020368	FERROX-CUBE 850 OHM L5	VK 200 20/48	1.000	EA
12	3610045	DIO 5082-2835 FAST CR1	5082-2835	1.000	EA
13	3731163	IC HYBRID LIN AMP AR1	MWA 310	1.000	EA
14	3731171	IC HYBRID LIN AMP AR2	MWA 320	1.000	EA
15	4630067	POT CER PC PIN 1K OHM .5W R7	3386R-1-102	1.000	EA
16	4450078	RES 18 OHM 1/8W 5% R6	RC05GF180J	1.000	EA
17	4410353	RES 6.8K OHM 1/4W 10% R8	RC07GF682K	1.000	EA
18	4460812	RES 150 OHM 1/4W 5% R5	RC07GF151J	1.000	EA
19	4460135	RES 680 OHM 1/4W 5% R3	RC07GF681J	1.000	EA
20	4460143	RES 1K OHM 1/4W 5% R4	RC07GF102J	1.000	EA
21	4460218	RES 3K OHM 1/4W 5% R9	RC07GF302J	1.000	EA
22	4470068	RES 390 OHM 1/2W 5% R2	RC20GF391J	1.000	EA
23	4470076	RES 470 OHM 1/2W 5% R1	RC20GF471J	1.000	EA
24	4350161	CAP .01UF CHIP C1,C3,C5,C7,C14	W100BF103MP	5.000	EA
25	4350773	CAP CHIP 2.2 PF +/- .25PF P90 C12	100B2R2CP500X	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
26	4350575	CAP CHIP 47 PF 5% P90 C9,C10,C11,C13	100B470JP500X	4.000	EA
27	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C2,C4,C6,C8	196D475X0035JA1	4.000	EA
30	1641943	W BUSS 26GA	299/1	.060	FT
31	1050129	SCR PNH PHPS 4-40 X 1/4 SST		4.000	EA
32	1230119	SPCR 1/4 RND 4-40 X 3/8 BRS	2371	4.000	EA
33	1560259	TBG TEFLON 26AWG NAT	TFT200-26	.040	FT
34	1010297	SCR PNH SLTD #2 X 1/4 TYP B		2.000	EA
35	1290097	STICKLEFINGER 16 LI	97-380-A	1.500	EA
36	3290566	TERM SWAGE	1300A 4.5	1.000	EA
37	1210176	TERM SOLDER	STU-125-4	2.000	EA

MUSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
SANTA BARBARA, CA 93117-3093
(805) 968-9621

PAGE: 1

DATE: 7/17/87

PARENT ITEM: 9302068

DESCRIPTION: ASSY UP CONV MIXER 890-960
ENG. DRAWING NO.: 2002944 B

REF	COMPONENT	COMPONENT DESCRIPTION	ENG. DRAWING NO.	QUANTITY	
NBR	ITEM NBR	& COMMENTS		PER	UM
1	3473881	PCB UP-CONV MIXER 890-960	5106051 A	1.000	EA
2	2091361	ENCL UP-CONV MIXER 100-500 MHZ	0502963 D	1.000	EA
3	3350188	MIXER U1	SRA-12	1.000	EA
4	3090230	CONN SMB PC RT ANG MALE BLKHD J2, J3, J4	2110-1511-000	3.000	EA

FIRST LOCAL OSCILLATOR
AND MULTIPLIER

Schematic 91D7288
Parts List 20D2828

The output LO signal is derived from a crystal-controlled oscillator, which uses an oven-mounted crystal for frequency stability. The signal is buffered and then quadrupled by a pair of active push-push doublers. Filtering is provided between each multiplication to remove unwanted harmonics. The signal is amplified and fed to a step-recovery diode multiplier, and the output is filtered to select the desired harmonic. The signal is then attenuated to control the output impedance and to reduce the power to the level required by the mixer.

On-board power supply regulation eliminates frequency drifts due to line voltage variations.

The output local oscillator signal is derived from crystal-controlled oscillator Q1. This third overtone crystal is temperature stabilized by a 65°C proportionally controlled oven. The output frequency is adjustable by tuning FREQ ADJ L6; this adjustment causes only small output amplitude variations. Oscillator buffer Q2 isolates the oscillator, preventing frequency pulling when adjusting the multipliers.

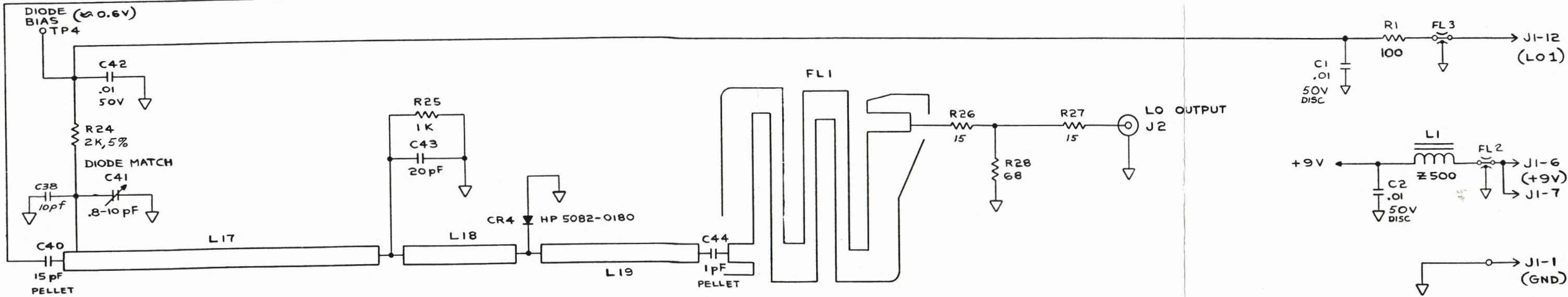
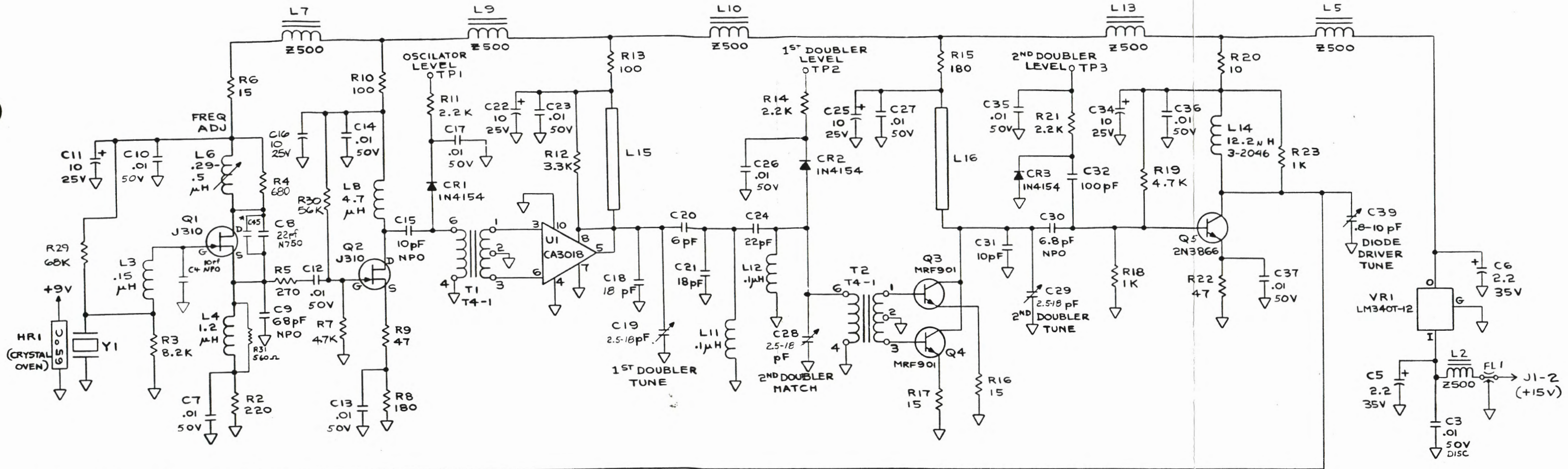
The output of the buffer is doubled in an active push-push doubler. The single-ended input from the buffer is split into two out-of-phase voltages in T1 and fed to the bases of two transistors of integrated array U1. The output of these two transistors is summed at their collectors. The close matching of the integrated transistors provides suppression of the fundamental signal driving the bases. The fundamental frequency is further suppressed by an interstage bandpass filter consisting of L15, C18 to C21, L11, C24, L12 and C26.

The second doubler consists of Q3 and Q4. The circuit is essentially the same as the first doubler, but a discrete-component design is used because of the higher frequency and power that are required.

The output of the second doubler is amplified by Q5 to the power level (120 mW) required by the diode multiplier. The output of Q5 is tuned by C39 and impedance matched in two stages to the step-recovery diode multiplier by C38, C41, and L17, and then by C43 and L18. The diode self-bias current is determined by R25.

Diode CR4, the step-recovery diode multiplier, converts the input sinusoidal signal to a stream of impulses. These impulses are fed to an unloaded microstrip quarter-wave resonator (L19), which is tuned to the desired output frequency.

C44 provides a dc block and coupling to the 50 ohm input of output filter FL1. The output of the filter is loaded with a 3 dB attenuator, reducing the output power to that required by the first mixer and providing some control over the impedance seen by the filter. The undesired harmonic multiples of 200 MHz removed from the desired frequency are suppressed at least 40 dB. The output power is between +5 and +12 dBm.



X5 MULTIPLIER

NOTES:

- UNLESS OTHERWISE SPECIFIED: RESISTORS ARE IN OHMS, 1/4 W, 10% CAPACITORS ARE IN MICROFARADS
- TRIM AND DRILL 51D5944
- COMPONENT LAYOUT 20D2828
- L15 THRU L19 AND FL1 ARE FOIL OF THE P.C BOARD

DWG. NO.	20D2828-1	20D2828-2	20D2828-3	20D2828-4	20D2828-5	20D2828-6
STOCK NO.	9301276	9301524	9301532	9301581	9301599	9301607
1ST. LO FREQ.	1020 MHz	1000 MHz	980 MHz	1010-1030 MHz	990-1010 MHz	980-990 MHz
C45	2.2 pF NPO	4.7 pF NPO	6.8 pF NPO	2.2 pF NPO	4.7 pF NPO	6.8 pF NPO

USED ON: PCL-606 XMTR & RCVR

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REVISED	DATE	BY	REASON
1	10/10/74	JM	INITIAL DESIGN
2	11/15/74	JM	REVISIONS
3	12/15/74	JM	REVISIONS
4	1/15/75	JM	REVISIONS
5	2/15/75	JM	REVISIONS
6	3/15/75	JM	REVISIONS
7	4/15/75	JM	REVISIONS
8	5/15/75	JM	REVISIONS
9	6/15/75	JM	REVISIONS
10	7/15/75	JM	REVISIONS
11	8/15/75	JM	REVISIONS
12	9/15/75	JM	REVISIONS
13	10/15/75	JM	REVISIONS
14	11/15/75	JM	REVISIONS
15	12/15/75	JM	REVISIONS

Moseley
SCHEMATIC -
940-960 MHz 1ST LO
91D7288 G

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 (805) 968-9621

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DATE: 6/30/87

PARENT ITEM: 9301276

DESCRIPTION: ASSY LD 1ST TX 940-960 PCL-606
 ENG.DRAWING NO.: 2002828-1 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	2002828-7 T	1.000	EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	2481085 A	1.000	EA

PARENT ITEM: 9301524

DESCRIPTION: ASSY LD 1ST TX 920-940 MHZ 606
 ENG.DRAWING NO.: 2002828-2 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	2002828-7 T	1.000	EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1 D	1.000	EA
102	3340825	XTAL 50.000 MHZ PCL-606 Y1	30A0079-2 D	1.000	EA
103	4300018	CAP DISC NPO 2.2PF C45	DTZ-2R2	1.000	EA
103	4300034	CAP DISC NPO 4.7PF C45	DTZ-4R7	1.000	EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	2481085 A	1.000	EA

PARENT ITEM: 9301532

DESCRIPTION: ASSY LD 1ST TX 910-920MHZ 606
 ENG.DRAWING NO.: 2002828-3 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	2002828-7 T	1.000	EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1 D	1.000	EA
102	3340833	XTAL 49.000 MHZ PCL-606 TX Y1	30A0079-3 D	1.000	EA
103	4300018	CAP DISC NPO 2.2PF C45	DTZ-2R2	1.000	EA
103	4300042	CAP DISC NPO 6.8PF C45	DTZ-6R8	1.000	EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	2481085 A	1.000	EA

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PARENT ITEM: 9301581

DESCRIPTION: LO 1ST RX PCL-606 940-960 MHZ
 ENG.DRAWING NO.: 20D2828-4 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301276	ASSY LO 1ST TX 940-960 PCL-606	20D2828-1 T	1.000	EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1 D	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA

PARENT ITEM: 9301599

DESCRIPTION: LO 1ST RX PCL-606 920-940 MHZ
 ENG.DRAWING NO.: 20D2828-5 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301524	ASSY LO 1ST TX 920-940 MHZ 606	20D2828-2 T	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA
102	3340825	XTAL 50.000 MHZ PCL-606 Y1	30A0079-2 D	1.000	EA

PARENT ITEM: 9301607

DESCRIPTION: LO 1ST RX PCL-606 910-920 MHZ
 ENG.DRAWING NO.: 20D2828-6 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301532	ASSY LO 1ST TX 910-920MHZ 606	20D2828-3 T	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA
102	3340833	XTAL 49.000 MHZ PCL-606 TX Y1	30A0079-3 D	1.000	EA

RF AMPLIFIER

Schematic 91C7379
Assembly 20D2937
Parts List 20D2937

The RF Amplifier module is a three-stage power amplifier designed to produce 6 watts nominal output power over the 890-960 MHz band when driven with a +16 dBm nominal input signal. The heart of the module is a high gain UHF power amplifier hybrid device (AR1) that exhibits excellent stability and ruggedness. AR1 provides 22 dB of adjustable gain that is factory-set in the transmitter for 6 watts by adjustment of R1. Field adjustment of R1 is not recommended since other design considerations will be compromised (i.e., DC power consumption, temperature stability, efficiency, etc.). **CAUTION: INPUT POWER MUST BE LIMITED TO +19 dBm (80 mW) OR PERMANENT DAMAGE TO THE MODULE MAY RESULT.**

The final stage current monitor sample is derived across R2 plus any additional line losses to provide 0.2 Volt/Amp sensitivity. This sample is fed to the Transmitter Control board for conditioning and then routed to the Metering and Status board for front panel indication at the PA Current position. Normal indications should be 0.8-1.2 Amp as read on the meter bottom scale.

The seven-section low-pass filter following AR1 is realized in a semi-lumped configuration utilizing microstripline inductors, open-circuited stubs and lumped capacitors C8 and C9. The filter attenuates the second and third harmonic emissions to better than -60 dBc per FCC requirements.

The dual-directional coupler is fabricated using stripline technology to provide high-directivity, therefore assuring accurate forward and reflected power sampling. Detectors CR1 and CR2 provide DC meter samples for reflected and forward power, respectively. These sample voltages are fed to the Transmitter Control board for conditioning and directed to the Metering and Status board for front panel meter indications. Forward power is 0 dB for nominal 6 watts output. Reflected power indication is > -10 dB for a well-matched load and 0 dB for an open or short circuit.

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PARENT ITEM: 9302035

DESCRIPTION: ASSY RFA 960 MHZ PCL-600
ENG.DRAWING NO.: 20D2937-2 C

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
6	2350767	ASSY HARNESS RFA 960 MHZ	29C1064 A	1.000	EA
100	9302621	ASSY RFA 960 MHZ PCL-600	20D2937-1 C	1.000	EA

METERING AND STATUS

Schematic 91D7264
Parts List 20D2818-2

The transmitter Metering and Status board includes three main sections:

1. Eight separate metering functions
2. Power supply and operating status indicators
3. RADIATE/STANDBY switch

Metering Functions

Potentiometers R1 through R8 are used as input adjustments. Resistors R31 through R38 have been selected to increase the allowable input voltage. The values selected are explained in note 4 on the schematic.

U4 acts as a switch to select one of the eight metering channels. The selected channel is based on a binary code produced by U2, which is an up/down counter. U2 is incremented and decremented by METER FUNCTION switch S1, U3, and associated circuitry.

U1 decodes the output of the counter and, by activating one of eight LEDs, indicates the position selected.

The output of U4 (the multiplex switch) is buffered and amplified by U7. The output of this buffer is used by half of U5 to indicate the polarity of the input signal (red equals plus, and green equals minus). The output of U7 also drives the absolute value amplifier.

Figure F-1 is a simplified diagram of the absolute value amplifier. It is included to show the difference in gain between a negative and positive input. The values shown in parentheses are for a typical full-scale input. The output of the absolute amplifier is connected to U5, the meter ballistics amplifier.

U5 acts as an attenuator and meter acceleration amplifier. R9 is used to adjust the meter ballistics response. The output of this circuit is connected to the meter through J1.

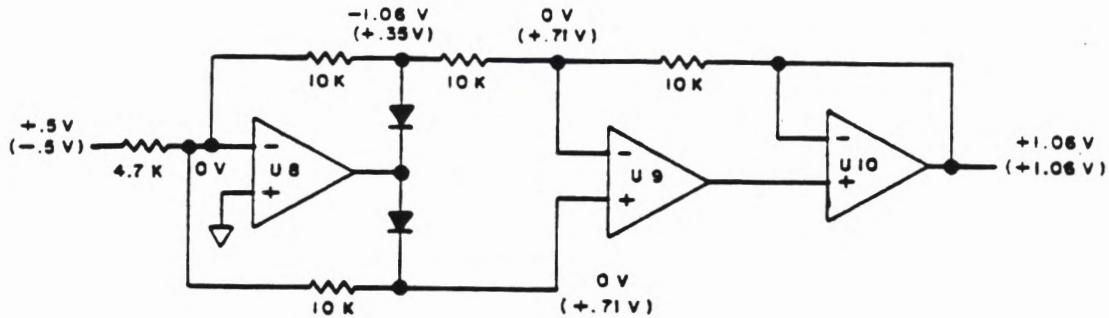


Figure F-1. Simplified diagram of absolute value amplifier.

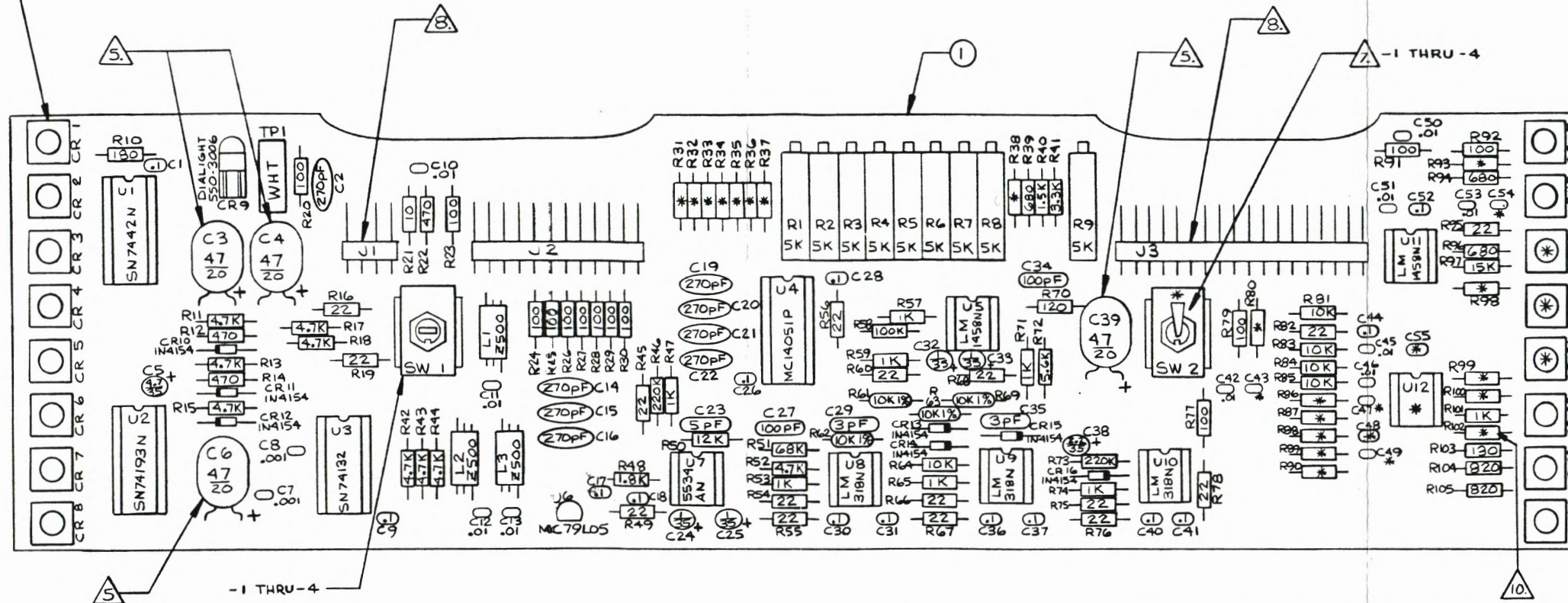
Status Indicators

LEDs CR21 through CR24 are used to indicate the status of the power supplies. CR17 and CR18 indicate the status of the transmitter. U11 is used as a TTL threshold detector. R97 and R101 set the threshold at approximately 2 volts referred to the input. U12 and associated circuitry are not presently used.

Control Switch

RADIATE/STANDBY switch S2 is a double-pole, double-throw switch used to activate logic circuits within the transmitter, and is connected through the harness to rear panel connector A10-J1-C for remote indication of the RADIATE/STANDBY mode.

DASH 1: 13 PLCS.
 DASH 2: 14 PLCS.
 DASH 3: 14 PLCS.
 DASH 4: 14 PLCS.



* DASH 1 DASH 2 DASH 3 DASH 4	* DASH 1 DASH 2 DASH 3 DASH 4
R 98 OMIT OMIT 680 680	R32 1K 4.7K 4.7K 1K
R 99 OMIT OMIT 22 22	R31 82K 22K 22K 22K
R 100 OMIT OMIT 820 820	R38 82K 82K 82K 82K
C 47 OMIT OMIT .01μF .01μF	R86 OMIT OMIT 10K 10K
C48 OMIT OMIT 0.1μF 0.1μF	R87 OMIT OMIT 10K 10K
C49 OMIT OMIT .01μF .01μF	CR 19 OMIT OMIT INSTALL INSTALL
C54 OMIT OMIT .01μF .01μF	CR 20 OMIT OMIT OMIT OMIT
C55 OMIT OMIT 0.1μF 0.1μF	CR 21 OMIT INSTALL INSTALL OMIT
R80 OMIT 100 100 OMIT	R88 OMIT OMIT 22 22
C43 OMIT .01μF .01μF OMIT	R89 OMIT OMIT 10K 10K
R37 4.7K 22K 22K 4.7K	R90 OMIT OMIT 10K 10K
R36 4.7K 22K 22K 4.7K	SW-2 ON NONE/ON ON NONE/ON ON NONE/ON ON NONE/ON
R35 22K 4.7K 4.7K 22K	U12 OMIT OMIT INSTALL INSTALL
R34 1K 4.7K 4.7K 1K	R102 OMIT 560 1.2K 560
R33 1K 22K 22K 1K	R93 OMIT OMIT 100 100

3. SCHEMATIC: 91D7264

2. P.C. BOARD: 51D5934

1. UNLESS OTHERWISE SPECIFIED:

RESISTOR VALUES ARE IN OHMS, 1/4W, 10%.
 CAPACITOR VALUES ARE IN MICROFARADS.

NOTES:

VERSION	ITEM NUMBER	DESCRIPTION / USE
-5	9205006	METERING & STATUS BD., NEUTER
-4	9204769	330/450 MHZ RX
-3	9204983	1.50-1.71 GHZ TX
-2	9204199	330/450 MHZ, 960 MHZ TX
-1	9204165	960 MHZ, 1.50-1.71 GHZ RX

VERSION	ITEM NUMBER	DESCRIPTION / USE
S	9205006	METERING & STATUS BOARD
R	9204769	330/450 MHZ RX
P	9204983	1.50-1.71 GHZ TX
11	9204199	330/450 MHZ, 960 MHZ TX
M	9204165	960 MHZ, 1.50-1.71 GHZ RX

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PARENT ITEM: 9204199

DESCRIPTION: ASSY MTRNG & STATUS TX PCL-606
 ENG.DRAWING NO.: 20D2818-02 S

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	9205006	SUBASSY NEUTER MTRG/STAT BD	20D2818-05	5	1.000 EA
2	4410411	RES 22K OHM 1/4W 10% R31,R33,R36,R37	RC07GF223K		4.000 EA
3	4410338	RES 4.7K OHM 1/4W 10% R32,R34,R35	RC07GF472K		3.000 EA
4	4410486	RES 82K OHM 1/4W 10% R38	RC07GF823K		1.000 EA
5	3390614	LED GRN 7-12@20 DIFFUSED 75DEG CR21	HLMP-3507		1.000 EA
6	3390606	LED HOUSE P-C-LITE CR21HSG	PCR 740 CTP		1.000 EA
7	3190774	SW DPDT ON NONE ON 577 2112 SW2	0601-201		1.000 EA
8	4410213	RES 560 OHM 1/4W 10% R102	RC07GF561K		1.000 EA
9	4410122	RES 100 OHM 1/4W 10% R80	RC07GF101K		1.000 EA
10	4310272	CAP .01 50V X7R 10% C43	5018EM50RD103K		1.000 EA

TRANSMITTER CONTROL

Schematic 91D7285
Parts List 20C2834

The Transmitter Control board is divided into three main functional sections:

1. Radiate control logic
2. Final power amplifier (PA)
current signal conditioner
3. Metering buffer amplifiers

Radiate Control Logic

The transmitter radiate control logic consists of Q1, U1 and their associated circuitry. This circuit will allow the transmitter to radiate when the following conditions are simultaneously met:

1. The front panel RADIATE/STANDBY switch is in the RADIATE position. Or the front panel RADIATE/STANDBY switch is in the STANDBY position and pin D of the back panel remote connector (A10-J1) is at ground potential. Either condition will appear as a ground potential on J1 pin 18 on the Transmitter Control board.
2. The AFC lock signal from the FMO Synthesizer module is greater than +2 V. This will appear as +2 V or more on J1 pin 17 on the Transmitter Control board.
3. Pin K of the back panel remote connector (A10-J1) is floating (not connected to ground). This will appear as +5V on J3 pin 11 on the Transmitter Control board.

When all of the above input conditions occur, the output of U1 will go from +0.4 V to +5 V. This signal appears on J1 pin 13. The signal is sent to the +12.5 V power supply, enabling it to supply power to the intermediate power

amplifier (IPA) and RF amplifier (RFA) and thus allowing the transmitter to radiate. The output from U1 also appears on J1 pin 12 and is used to control the front panel RADIATE status indicator.

PA Current Signal Conditioner

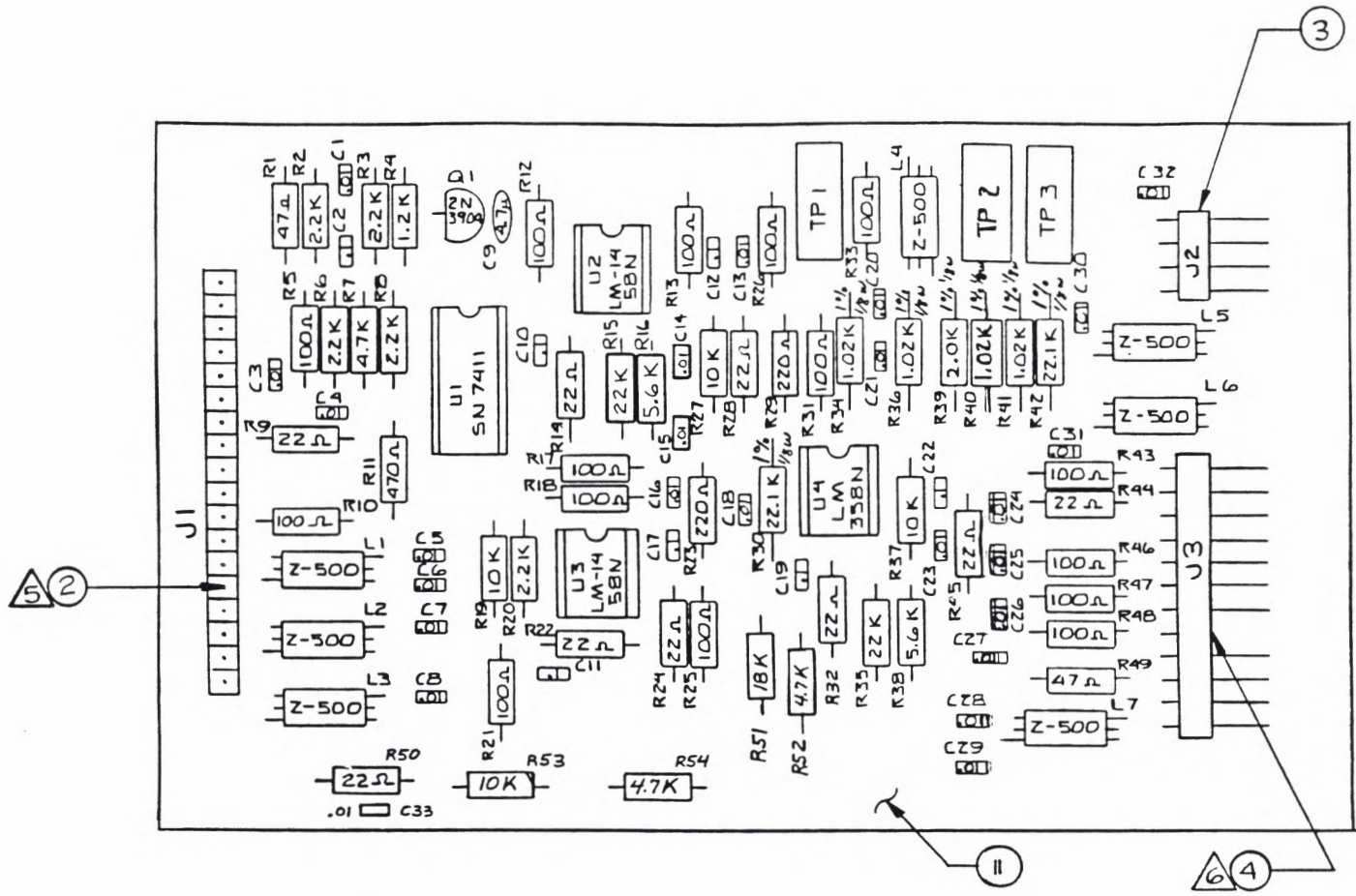
Differential amplifier U4 and associated circuitry condition and amplify the PA current sample to give a front panel meter indication of final power amplifier current. The voltage drop appearing across PA current sampling resistor R705 (in the RF Amplifier module) is presented to the Transmitter Control board on J2 pins 3 and 4. The voltage between TP2 and TP3, as measured with a floating voltmeter, will be 0.1 V for each Ampere of current drawn by the final PA transistor. This voltage contains a +12.5 V common mode component which is removed by the differential amplifier. The differential component is amplified and sent to the Metering and Status module from J1 pin 11.

Metering Buffer Amplifiers

The forward power sample from the RF Amplifier enters the Transmitter Control board on J2 pin 2 and is amplified by the first section of U2. The output of U2 pin 7 is fed to J1 pin 10 for front panel meter display. This output also drives two buffer amplifiers (the second section of U2 and the first section of U3) for remote metering and hot standby purposes. These outputs appear on J3 pins 7 and 12.

The second section of U3 is used to buffer the FMO Synthesizer AFC signal for a remote meter. The input to this amplifier is from J1 pin 8, and the amplifier output is sent to J3 pin 4.

The reflected power sample from the RF Amplifier enters this module on J2 pin 1 and is amplified by the second section of U4. The output is sent to J1 pin 9 for front panel meter display.



ITEM NO: 9204215

NOTES:

1. UNLESS OTHERWISE SPECIFIED
ALL RESISTOR VALUES ARE IN OHM, 1/4W, 10%;
ALL CAPACITOR VALUES ARE IN MICROFARADS, 50V.
2. P.C. BOARD 51C 5952
3. SCHEMATIC 91D72B5

Moseley			
COMPONENT LAYOUT TRANSMITTER CONTROL			
TOL: FRACT. $\leq 1/32$, .XX = .00, .XXX = .010, $\leq 1/32$			
DWN	AVS	11-11-81	SCALE: 2X
CHK	ACE	11-17-81	
ENG	AS	11-17-81	20C2834 GI

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PARENT ITEM: 9204215 DESCRIPTION: ASSY XMTR CONTROL
 ENG.DRAWING NO.: 20C2834 GI

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473121	PCB XMTR CONTROL ASSY	51C5952	F	1.000 EA
2	3090297	CONN 18 PIN SNGL ROW STR HDR J1	1-87224-8		1.000 EA
3	3090347	CONN 4 PIN SNGL ROW RTANG HDR J2	87233-4		1.000 EA
4	3090222	CONN 12PIN SNGL ROW RTANG HDR J3	1-87233-2		1.000 EA
5	3250024	SKT DUAL IN LINE 14 PIN U1	640357-1		1.000 EA
6	3250016	SKT DUAL IN LINE 8 PIN U2,U3,U4	640463-1		3.000 EA
7	3601139	IC,TRIPLE 3-INPUT AND GATE U1	DM7411N		1.000 EA
8	3730215	IC LM1458N OPAMP DUAL U2,U3	LM-1458N		2.000 EA
9	3730983	IC LM358N U4	LM358N		1.000 EA
10	3630456	XT 2N3904 Q1	2N3904		1.000 EA
12	4020467	FERROX CUBE 500 OHM L1,L2,L3,L4,L5,L6,L7	VK200 10/38		7.000 EA
13	4310272	CAP .01 50V X7R 10% C1,C3,C4,C5,C6,C7,C8,C13,C14,C15,C16,C18,C20, C21,C23,C24,C25,C26,C27,C28,C29,C30,C31,C32,C33	5018EM50RD103K		25.000 EA
14	4310264	CAP .1 50V Z5U 20% C2,C10,C11,C12,C17,C19,C22	5020ES50RD104M		7.000 EA
15	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C9	196D475X0035JA1		1.000 EA
17	4410122	RES 100 OHM 1/4W 10% R5,R10,R12,R13,R17,R18,R21,R25,R26,R31,R33,R43, R46,R47,R48	RC07GF101K		15.000 EA
18	4410049	RES 22 OHM 1/4W 10% R9,R14,R22,R24,R28,R32,R44,R45,R50	RC07GF220K		9.000 EA
19	4410205	RES 470 OHM 1/4W 10% R11	RC07GF471K		1.000 EA
20	4410254	RES 1.2K OHM 1/4W 10% R4	RC07GF122K		1.000 EA
21	4410288	RES 2.2K OHM 1/4W 10% R2,R3,R6,R8,R20	RC07GF222K		5.000 EA
22	4410338	RES 4.7K OHM 1/4W 10% R7,R52,R54	RC07GF472K		3.000 EA
23	4410379	RES 10K OHM 1/4W 10% R19,R27,R37,R53	RC07GF103K		4.000 EA
24	4410411	RES 22K OHM 1/4W 10% R15,R35	RC07GF223K		2.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY	
				PER	UM
25	4410346	RES 5.6K OHM 1/4W 10% R16,R38	RC07GF562K	2.000	EA
26	4410080	RES 47 OHM 1/4W 10% R1,R49	RC07GF470K	2.000	EA
27	4510061	RES 1.02K 1/8W 1% R34,R36,R40,R41	RN55C1021F	4.000	EA
28	4510186	RES 22.1K OHM 1/8W 1% R30,R42	RN55D2212F	2.000	EA
29	4510293	RES 2.00K OHM 1/8W 1% R39	RN55C2001F	1.000	EA
30	4410163	RES 220 OHM 1/4W 10% R23,R29	RC07GF221K	2.000	EA
31	4410403	RES 18K OHM 1/4W 10% R51	RC07GF182K	1.000	EA
32	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3	430-101	3.000	EA

TRANSMITTER POWER SUPPLY

Schematic 91C7268
Assembly 21C2765
Parts List 20C2817
20D2836 (partial)

The Transmitter Power Supply module consists of an ac power connector, transformer, rectifiers, capacitive filters, and series pass regulators. The power supply has four output voltages: +15, -15, +5, and +12.5 V. Each is regulated by a series IC regulator. All except the +12.5 V regulator are fixed. The 12.5 V output is adjustable and is factory set to 12.5 V. The 12.5 V output may be reduced to 1.5 V or less by reducing the voltage at pin 12 from its normal level of +5 V to zero. This will occur if the AFC loses lock or if the RADIATE/STANDBY switch is turned to STANDBY.

CAUTION

Failure to ground the third lead of the input power cord may result in hazardous shocks to personnel.

The ac power connector includes fuse F1, an RF filter, and the voltage selector card (PC card). The PC card can be inserted four different ways, which allows the user to select one of the four input voltage ranges listed below:

<u>Nominal Voltage (rms)</u>	<u>Minimum Voltage (rms)</u>	<u>Maximum Voltage (rms)</u>	<u>Line Fuse</u>
100	90	110	2 A
120	108	132	2 A
220	198	242	1 A
240	216	264	1 A

The voltage selected can be observed on the PC card through the window in the ac power connector.

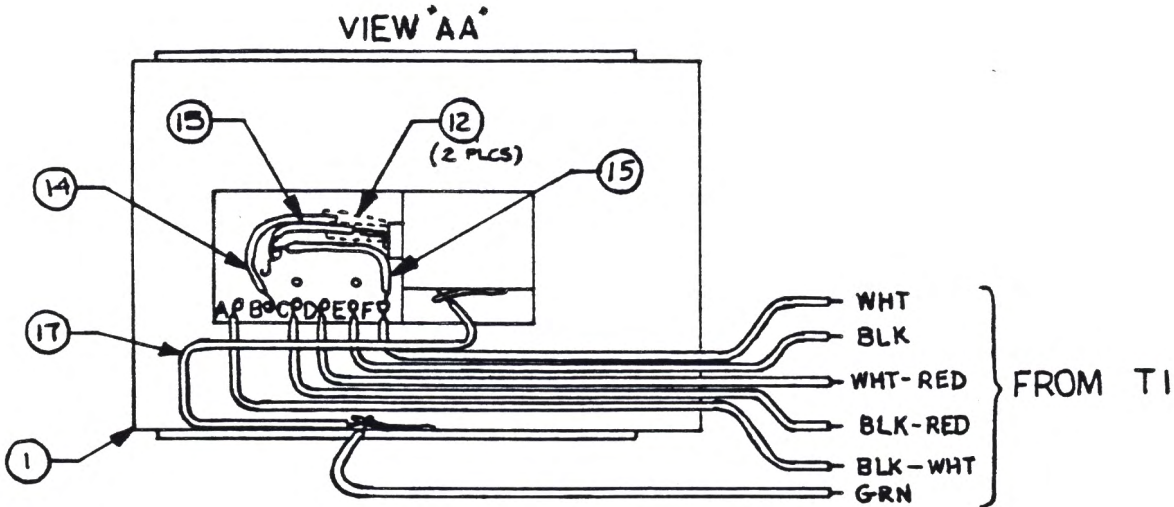
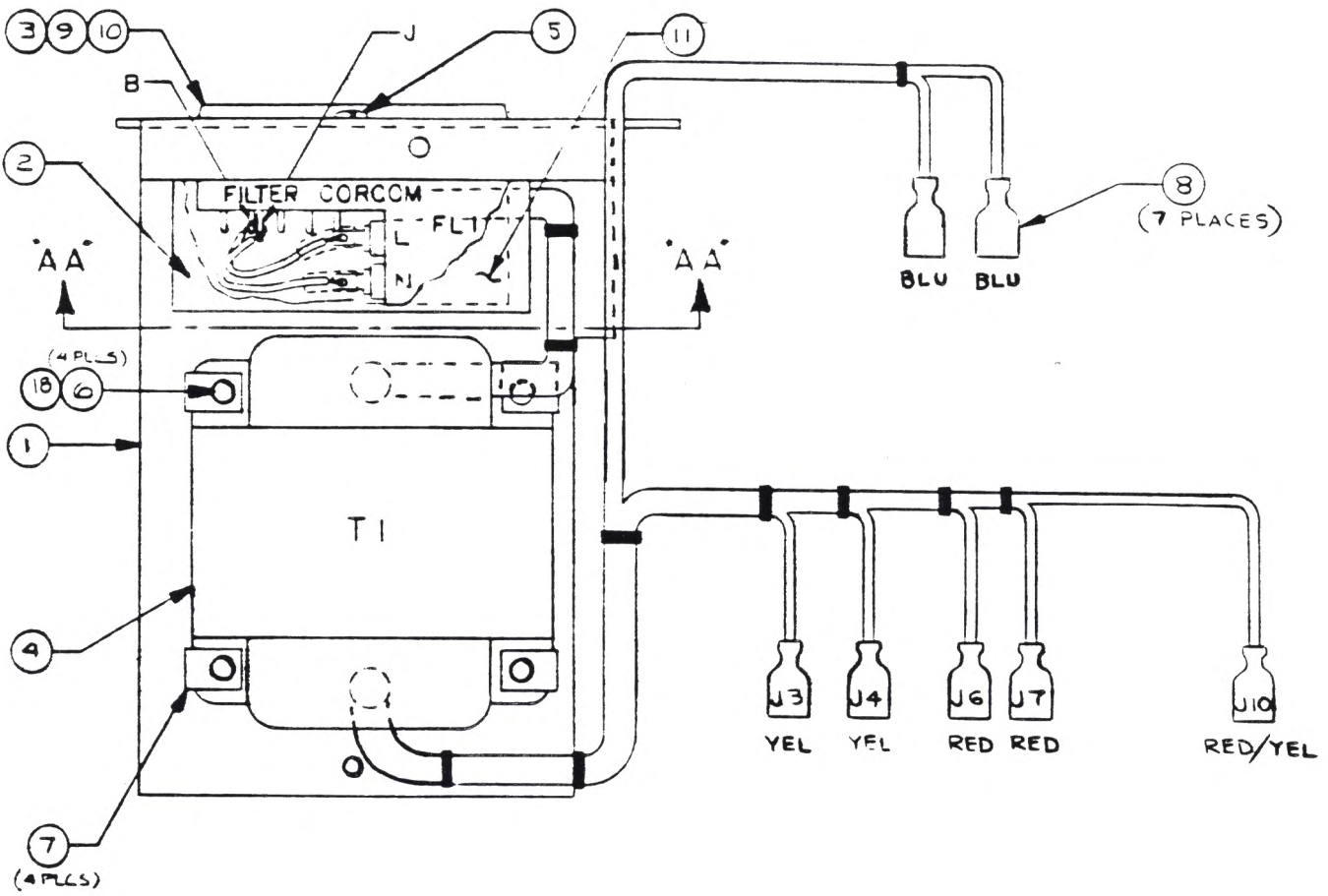
If the voltage selector card needs to be changed to match the available power, do the following: Unplug the power cord, and slide the access window to the left. Pull out the FUSE PULL lever and remove the fuse. With small needle-nose pliers, firmly grasp the PC card and remove it with a straight pull.

Select the operating voltage by orienting the PC card to position the desired voltage number on the top left side. Replace the PC card with the needle-nose pliers.

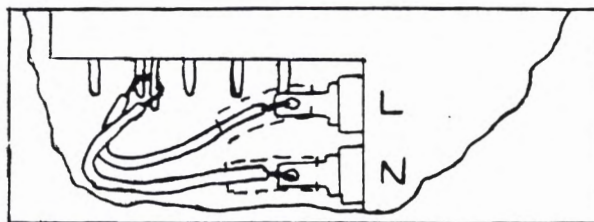
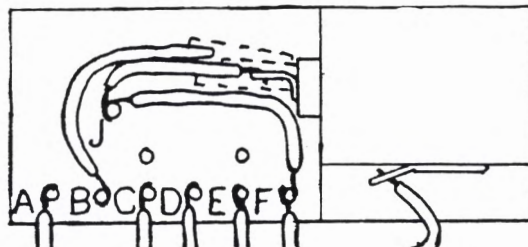
If the voltage selector card is changed, change the fuse to agree with the above list. Return the FUSE PULL lever to its normal position and insert the fuse into the holders. Slide the window to the right and install the ac power cord.

The voltage selector card changes the primary connections for step-down transformer T1. The transformer has two primary windings which are placed in parallel for 120 Vac operation and in series for 240 Vac operation. One winding is tapped for 100 Vac or 220 Vac operation.

The Power Supply module includes the rectifiers and regulators for the +15V, -15V, and +5 V supplies. The rectifier and regulator for the 12.5 V supply are mounted on the RF Amplifier heat sink. Note: R5 adjusts the output level of the +12.5 V supply; when the transmitter is radiating, this voltage should be between +12.3 and +12.7 volts for proper operation. J1 provides an unregulated +9 V used to power the crystal oven for the first LO crystal.



H	ECO 4501	6.10.85	DATE		Moseley	
			PCL-606 TRANSFORMER ASSY. TX.			
			TOL: FRACT. $\pm 1/32$, .XX $\pm .030$, .XXX $\pm .010$, $< \pm 1/2^\circ$		SCALE:	
			DWN			
			CHK			
ENG						
REVISIONS			MGMT. APPR.		21C2765	H



PARENT ITEM: 9203597

DESCRIPTION: ASSY XMTR PCL-606
 ENG. DRAWING NO.: 20C2817-1 U

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
2	3472743	PCB POWER SUPPLY TR S PCL-606	51C5933 H	1.000	EA
3	4270047	CAP PWR LYTIC 4000/30V C2,C5,C9	360X402G030AA2A	3.000	EA
4	4350682	CAP LYTIC 7200/30V C13	3186BA722U030BP	1.000	EA
5	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C1,C3,C4,C6,C7,C8	196D225X0035JA1	6.000	EA
6	4280244	CAP TANT EPOX-DIP 10/50V C11	T368C106M050AS	1.000	EA
7	4310132	CAP DISC .01/50V C14	UK-50-103	1.000	EA
8	4280251	CAP TANT EPOX-DIP 2.2/50V C12	T368B225M050AS	1.000	EA
9	4410379	RES 10K OHM 1/4W 10% R1	RC07GF103K	1.000	EA
10	4630745	POT CER PC PIN 2K OHM .5W 25T R5	64W202	1.000	EA
11	4460820	RES 180 OHM 1/4W 5% R4	RC07GF181J	1.000	EA
12	4410338	RES 4.7K OHM 1/4W 10% R2,R6	RC07GF472K	2.000	EA
13	4410049	RES 22 OHM 1/4W 10% R3	RC07GF220K	1.000	EA
14	3610003	DIO 10D2 200V 1A SI D039 CR1,CR4,CR5,CR8	10D2	4.000	EA
16	3610078	DIO BRIDGE 100V 2A CR2,CR3	MDA-201	2.000	EA
18	3630456	XT 2N3904 Q1,Q2	2N3904	2.000	EA
19	4020467	FERROX CUBE 500 OHM L1,L2,L3,L4,L5	VK200 10/3B	5.000	EA
20	3290830	LUG GND J1,J3,J4,J6,J7,J10,J13,J14,J15,J16,J17,J18,J19	836	13.000	EA
21	3290020	TEST PT BLK VERT TP4	105-0853-001	1.000	EA
22	3290087	TEST PT BLUE VERT TP3	105-0860-001	1.000	EA
23	3290046	TEST PT RED VERT TP2	105-0852-001	1.000	EA
24	3290111	TEST PT WHITE VERT TP6	105-0851-001	1.000	EA
25	3290053	TEST PT ORANGE VERT TP1	105-0856-001	1.000	EA
26	3290038	TEST PT BROWN VERT TP5	105-0858-001	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
27	1290188	SIL PAD VR1,VR2,VR3	7403-09-FR-51	3.000	EA
28	2110278	HEATSINK VR1,VR2,VR3	60348-TT	3.000	EA
29	3090271	CUNN 12PIN SNGL ROW STR HDR J5,J8,J9	1-87224-2	3.000	EA
30	1050129	SCR PNH PHPS 4-40 X 1/4 SST VR1,VR2		2.000	EA
31	1050590	NUT HEX 4-40 1/4 FLATS SST VR1,VR2		2.000	EA
33	3650223	RGLTR UA7915UC 15V 1.5A T0220 VR3	7915UC	1.000	EA
34	3650173	RGLTR UA7805UC 05V 1.0A T0220 VR1	UA7805UC	1.000	EA
35	3650207	RGLTR UA7815UC 15V 1.5A T0220 VR2	7815UC	1.000	EA
36	3090396	CUNN 4 PIN SNGL ROW STR HDR J12	87224-4	1.000	EA
37	3090578	CUNN STRAIGHT SIN ROW 8 PIN J2,J11	65502-108	2.000	EA
38	1090554	NUT HEX 6-32 SM PATT VR3		1.000	EA
39	1090455	SCR PNH SLTD 6-32 X 1/4 NYL VR3		1.000	EA
40	1050624	WSHR LK #4 INTL T CD PL VR1,VR2		2.000	EA
42	1150010	SCR BDH SLTD 10-32 X 1/4 C2,C5,C9,C13		8.000	EA
43	1150127	WSHR LK #10 INTL T C2,C5,C9,C13		8.000	EA

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PARENT ITEM: 9204975 DESCRIPTION: ASSY POWER SUPPLY 1.5-1.71GHZ
 ENG.DRAWING NO.: 20C2817-2 U

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
2	3472743	PCB POWER SUPPLY TR S PCL-606	51C5933 H	1.000	EA
3	4270047	CAP PWR LYTIC 4000/30V C2,C5,C9	36DX402G030AA2A	3.000	EA
4	4270146	CAP PWR LYTIC,4000/40V C13	DCM402U040AA2A	1.000	EA
5	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C1,C3,C4,C6,C7,C8	196D225X0035JA1	6.000	EA
6	4280244	CAP TANT EPOX-DIP 10/50V C11	T368C106M050AS	1.000	EA
7	4310132	CAP DISC .01/50V C14	UK-50-103	1.000	EA
8	4280251	CAP TANT EPOX-DIP 2.2/50V C12	T368B225M050AS	1.000	EA
9	4410379	RES 10K OHM 1/4W 10% R1	RC07GF103K	1.000	EA
10	4630877	POT CER PC PIN 5K OHM .5W 25T R5	64W502	1.000	EA
11	4460085	RES 240 OHM 1/4W 5% R4	RC07GF241J	1.000	EA
12	4410338	RES 4.7K OHM 1/4W 10% R2,R6	RC07GF472K	2.000	EA
13	4410064	RES 33 OHM 1/4W 10% R3	RC07GF330K	1.000	EA
14	3610003	DIO 10D2 200V 1A SI D039 CR1,CR4,CR5,CR8	10D2	4.000	EA
16	3610078	DIO BRIDGE 100V 2A CR2,CR3	MDA-201	2.000	EA
18	3630456	XT 2N3904 Q1,Q2	2N3904	2.000	EA
19	4020467	FERROX CUBE 500 OHM L1,L2,L3,L4,L5	VK200 10/38	5.000	EA
20	3290830	LUG GND J1,J3,J4,J6,J7,J10,J13,J14,J15,J16,J17,J18,J19	836	13.000	EA
21	3290020	TEST PT BLK VERT TP4	105-0853-001	1.000	EA
22	3290087	TEST PT BLUE VERT TP3	105-0860-001	1.000	EA
23	3290046	TEST PT RED VERT TP2	105-0852-001	1.000	EA
24	3290111	TEST PT WHITE VERT TP6	105-0851-001	1.000	EA
25	3290053	TEST PT ORANGE VERT TP1	105-0856-001	1.000	EA
26	3290038	TEST PT BROWN VERT TP5	105-0858-001	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
27	1290188	SIL PAD VR1,VR2,VR3	7403-09-FR-51	3.000	EA
28	2110278	HEATSINK VR1,VR2,VR3	6034B-TT	3.000	EA
29	3090271	CONN 12PIN SNGL ROW STR HDR J5,J8,J9	1-87224-2	3.000	EA
30	1050129	SCR PNH PHPS 4-40 X 1/4 SST VR1,VR2		2.000	EA
31	1050590	NUT HEX 4-40 1/4 FLATS SST VR1,VR2		2.000	EA
33	3650223	RGLTR UA7915UC 15V 1.5A T0220 VR3	7915UC	1.000	EA
34	3650173	RGLTR UA7805UC 05V 1.0A T0220 VR1	UA7805UC	1.000	EA
35	3650207	RGLTR UA7815UC 15V 1.5A T0220 VR2	7815UC	1.000	EA
36	3090396	CONN 4 PIN SNGL ROW STR HDR J12	87224-4	1.000	EA
37	3090578	CONN STRAIGHT SIN ROW 8 PIN J2,J11	65502-108	2.000	EA
38	1090554	NUT HEX 6-32 SM PATT VR3		1.000	EA
39	1090455	SCR PNH SLTD 6-32 X 1/4 NYL VR3		1.000	EA
40	1050624	WSHR LK #4 INTL T CD PL VR1,VR2		2.000	EA
42	1150010	SCR BDH SLTD 10-32 X 1/4 C2,C5,C9,C13		8.000	EA
43	1150127	WSHR LK #10 INTL T C2,C5,C9,C13		8.000	EA

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PARENT ITEM: 9102526

DESCRIPTION: ASSY XFMR PCL-606
 ENG.DRAWING NO.: 21C2765 H

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	2031912	CHASSIS TRANSFORMER TX PCL-606	05C2825 E	1.000	EA
2	2031896	COVER CORCOM	05B2815 B	1.000	EA
3	3370046	CONN PWR W/FUSE FILTER FL1	6J4 6J4	1.000	EA
4	4090445	XFMR 8-P-100 T1	3-1107 C	1.000	EA
5	1050129	SCR PNH PHPS 4-40 X 1/4 SST		1.000	EA
6	1090208	SCR PNH PHPS 6-32 X 3/8 SST		4.000	EA
7	1090109	CLIP NUT 6/32	SL-210-06-2	4.000	EA
8	3110004	CONN FASTON .250IN CRIMP INSUL	2-35-0804-2	7.000	EA
9	3430055	LBL FUSE "1AMP-2AMP"	85-1503	1.000	EA
10	3370111	FUSE 2 AMP FAST-BLO	AGC 2	1.000	EA
11	3430063	LBL "CAUTION-HIGH VOLTAGE"	10A1058-1 AO	1.000	EA
12	1560028	TBG SHRINK 1/8" CLEAR	FIT 221 1/8CL	.400	FT
14	1641554	W STRD 18GA BLACK 16/30	1555 BLACK	.150	FT
15	1641646	W STRD 18GA WHITE 16/30	1555 WHITE	.250	FT
17	1641604	W STRD 18GA GREEN 16/30	1555 GREEN	.420	FT
18	1090604	WSHR FL #6 CD PL	AN960-6 CAD 1	4.000	EA

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PARENT ITEM: 9301334 DESCRIPTION: ASSY RFA 950MHZ TX PCL-606
 ENG.DRAWING NO.: 20D2836 Z

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	2090199	ENCL COVER 950 MHZ PA	05C2510-2	L	1.000 EA
2	2110294	HEATSINK 950MHZ PWR AMP PCL606	05C2829	D1	1.000 EA
3	3470267	PCB 950MHZ PWR AMP XMTR	51A5750	B1	1.000 EA
4	4010880	COIL AIR 3T 22BUS 1/4 L703,L704,L706,L708,L709,L712	3-2047	A	6.000 EA
5	2091254	BASE ENCL 950 MHZ PA PCL-606	05C2510-1	L	1.000 EA
7	4010567	COIL AIR 6T 22BUS 7/32LH L711	3-2022	B0	1.000 EA
8	4460028	RES 18 OHM 1/4W 5% R710	RC07GF180J		1.000 EA
9	4590022	RES .16 OHM 2W 5% R705	BWH .16 2W 5%		1.000 EA
10	4590063	RES 1 OHM 2W 5% R702,R703	BWH 1 2W 5%		2.000 EA
11	4490017	RES 220 OHM 2W 5% R701	RC42GF221J		1.000 EA
12	4460036	RES 51 OHM 1/4W 5% R707,R708	RC07GF510J		2.000 EA
13	4410247	RES 1K OHM 1/4W 10% R706,R709	RC07GF102K		2.000 EA
14	3290582	TERM	1300T-2		1.000 EA
16	4370003	CAP PC MT VAR 5.4-1.3PF C712,C715,C717,C724,C728	187-0103-005		5.000 EA
17	4370284	CAP 2-5PF C726	278-0105-005		1.000 EA
18	4350401	CAP CHIP 100PF 5% P90 C708	100B101JP500X		1.000 EA
19	4350146	CAP CHIP 33PF 5% P80 C709	C17AH330J500PS		1.000 EA
20	4350161	CAP .01UF CHIP C705,C710,C714,C716,C719,C720	W100BF103MP		6.000 EA
23	4350542	CAP CHIP 2.7 PF +/- .25PF P90 C730	100B2R7CP500X		1.000 EA
26	4370276	CAP CER VAR 1-3PF C729	MC50A1H030		1.000 EA
28	4350591	CAP CHIP 10PF 5% P90 C731	100B100JP500X		1.000 EA
29	3610045	DIO 5082-2835 FAST CR701,CR702	5082-2835		2.000 EA
30	3610284	DIO BRIDGE 100V/25A CR101	MDA2501		1.000 EA
31	3640117	XT 26064 3.0W960M15V0.5A Q702	26064		1.000 EA
32	3640109	XT NPD1-12B 5.8W866M036V.25A Q701	D1-12B		1.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
33	3640133	XT NPDM5-12B 29W 036V02A Q703	DM5-12B	1.000	EA
34	3640364	XT,RF PWR,LOW,806-960 MHZ Q704	26057	1.000	EA
35	3650363	RGLTR VARV 5.0A T03 VR1	LM338-K-STEEL	1.000	EA
36	1250190	COVER INSULATING T0-3	A22-2003	1.000	EA
37	3030178	CONN TYPE N RCPT 1/8 DIA HOLES J702	UG-58 A/U	1.000	EA
38	3030400	CONN SMB BLKHD STR ML SLDR POT J701	2019-1511-000	1.000	EA
39	3250214	SKT XSTR/LAM VR1	LST2202-2	1.000	EA
40	4010625	COIL AIR L713,L714,L715	3-2028 N/C	3.000	EA
41	1290162	SIL PAD VR1	7403-09-FR-05	1.000	EA
42	1090638	BSHG MS-10 NYL #6 VR1	B51547F002	2.000	EA
43	1130301	WSHR LK #8 EXT T SST		2.000	EA
44	1130277	NUT HEX 8-32 1/4 FLATS SST		2.000	EA
45	1641927	W BUSS 22GA	298	.080	FT
46	1050103	SCR PNH PHPS 4-40 X 3/16 SS		2.000	EA
47	1050145	SCR PNH PHPS 4-40 X 5/16 SS		8.000	EA
48	1050202	SCR PNH PHPS 4-40 X 9/16 SS		4.000	EA
49	1050582	NUT HEX 4-40 SM PATT SST		4.000	EA
50	1050632	WSHR LK #4 SR CD PL		4.000	EA
51	1090471	SCR PNH PHPS #6 X 1/2 TYP B		2.000	EA
52	1560390	TAPE COPPER 1	1194	5.000	IN
53	2202000	ASSY CA SMB/RT SMB/RT 16"	2481074-2 B	1.000	EA
55	1641893	W BUSS 16GA	295	1.000	FT
56	1641257	W STRD 26GA WHITE-YELLOW	BU-734-26#94	.080	FT
57	1641240	W STRD 26GA WHITE-ORANGE	BU-734-26#93	.080	FT
58	1641232	W STRD 26GA WHITE-RED	BU-734-26#92	.080	FT
59	1641224	W STRD 26GA WHITE-BROWN	BU-734-26#91	.080	FT
60	1560242	TBG TEFLON 24AWG NAT	TFT200-24	.250	FT
61	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C15,C16	196D225X0035JA1	2.000	EA
62	2350619	ASSY HARNESS 950AMP TX PCL-606	29C1051 G	1.000	EA
63	1130129	SCR PNH PHPS 8-32 X 3/4 SST		1.000	EA
64	1130319	WSHR LK #8 SR SST		1.000	EA
65	1130335	WSHR FL #8 SST	AN960-C8	1.000	EA
67	1560234	TBG TEFLON 22AWG NAT	TFT200-22	.146	FT
68	1641075	W STRD 26GA ORANGE-WHITE	BU-734-26#39	.250	FT
69	3291051	FILTER FEED THRU LG THD FL701,FL702,FL703,FL704	859617-1	4.000	EA
70	4450086	RES 6.2 OHM 1/8W 5% R712	RC05GF6R2J	1.000	EA
71	4350047	CAP FD THRU 20% 470PF C701,C702,C721,C722,C731	54-794-002-471M	5.000	EA
72	3290566	TERM SWAGE	1300A 4.5	1.000	EA

PARENT ITEM: 9301334

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DATE: 6/30/87

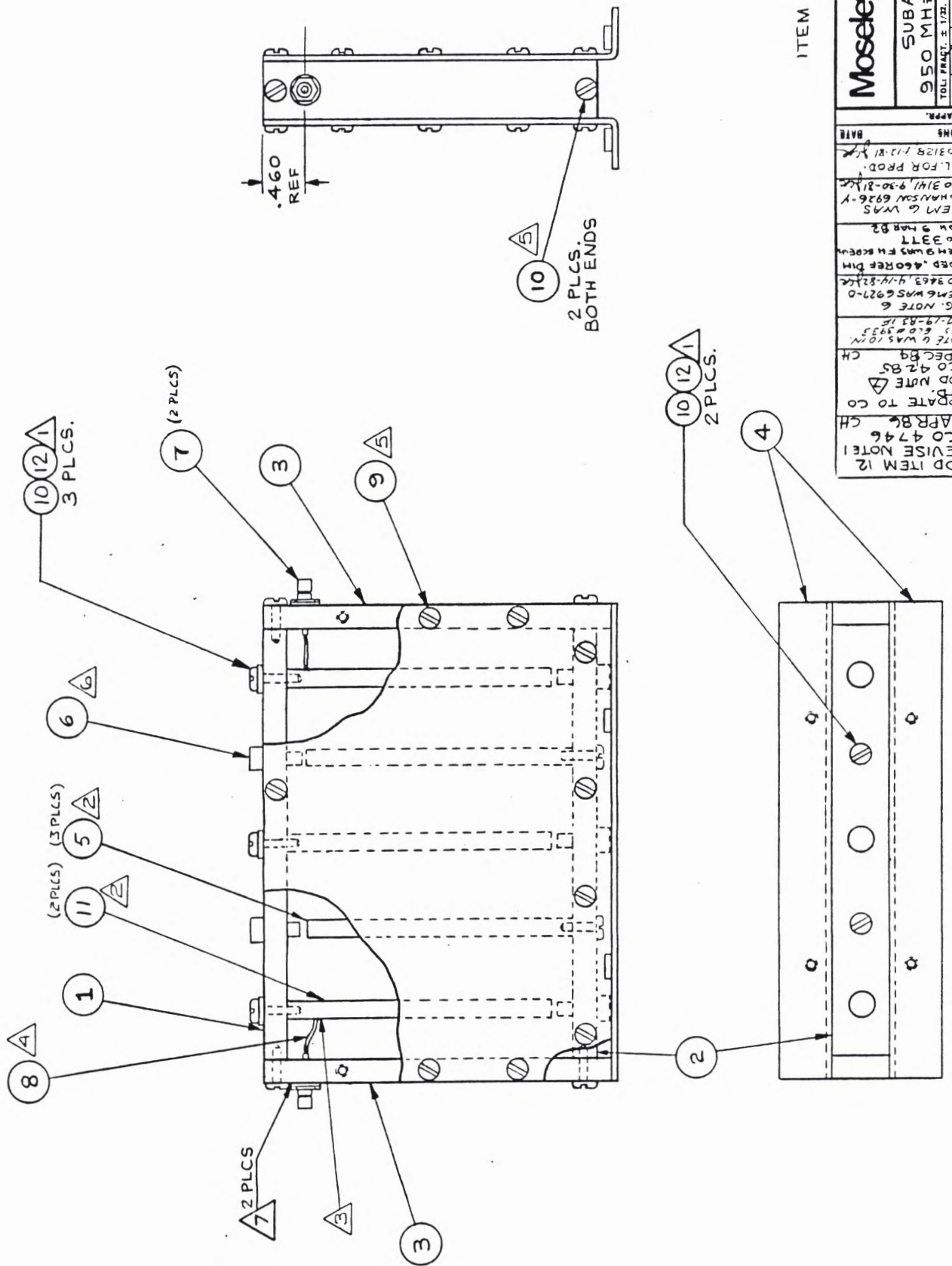
REF COMPONENT NBR ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
73 1290097	STICKLEFINGER 16 LI	97-380-A	1.200	EA

PRESELECTOR FILTER

Schematic (N/A)
Parts List 20C2826

The signal received the antenna is passed to a bandpass filter, the preselector filter. This filter is tuned to the STL band at 940 to 960 MHz. Signals out of band are rejected by at least 70 dB.

The preselector filter is a five-element, interdigital bandpass filter with a maximum insertion loss of 1.5 dB. The ripple bandwidth is 20 MHz centered on 950 MHz. The filter prototype is a five-element Chebyscheff, 0.1 dB ripple, low-pass filter.



ITEM NO 9301250

		SUBASSY -	
		950 MHz PRESELECTOR	
TOL. PRAC. ± 1/32"	XX ± .001"	XXX ± .010"	SCALE: FULL
CHK. J.S.	2-23-51	2-23-51	20C2826 F
ENG. J.F.M.	2-11-51		
Mgmt. Appr.			
REVISIONS			
DATE	BY	DESCRIPTION	
11-03-28 11:28 AM	J.S.	REL. FOR PROD.	
	A	ECO 3141, 9-30-21	ITEM 6 WAS 6926-Y ITEM 7 WAS 6926-Y LBY 9 MAR 82
	B	ECO 3311	ITEM 9 WAS FOR SCREW
	C	ECO 3463, 4-14-82	ADDED .460 REF DIM
	D	CHG. NOTE 6	ITEM 6 WAS 6927-0
	E	NOTE 6 WAS 10 IN.	7-19-83 IS
	F	ECO 4285	ADD NOTE 4
	G	ECO 4746	REVISOR NOTE 1
	H	BAPR 84	
	I	ADD ITEM 12	

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PARENT ITEM: 9301250

DESCRIPTION: SUBASSY 950 PRESEL PCL-606
ENG. DRAWING NO.: 20C2826 F

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.		QUANTITY PER	UM
1	2031789	ENCL BACK PRESELECTOR PCL-606	05B2782	E	1.000	EA
2	2010874	ENCL FRONT PRESELCTOR PCL-606	05B2781	D	1.000	EA
3	2031797	ENCL SIDE PRESELECTOR PCL-606	05B2783	D	2.000	EA
4	2090819	COVER PRESELECTOR PCL-606	05B2780	C	2.000	EA
5	2062461	ROD PRESELECTOR PCL-606	05A2784	C	3.000	EA
6	4350377	CAPACITIVE TUNING ELEMENT	6927-OSL		5.000	EA
7	3030400	CONN SMB BLKHD STR ML SLDR POT	2019-1511-000		2.000	EA
8	1641919	W BUSS 20GA	297		.125	FT
9	1050129	SCR PNH PHPS 4-40 X 1/4 SST			28.000	EA
10	1050178	SCR PNH PHPS 4-40 X 7/16 SST			9.000	EA
11	2062537	ROD DRILLED PRESELECT PCL-606	05A2816	C	2.000	EA
12	1050624	WSHR LK #4 INTL T CD PL			5.000	EA

PREAMPLIFIER AND FIRST MIXER

Schematic 91D7274
Parts List 20D2827

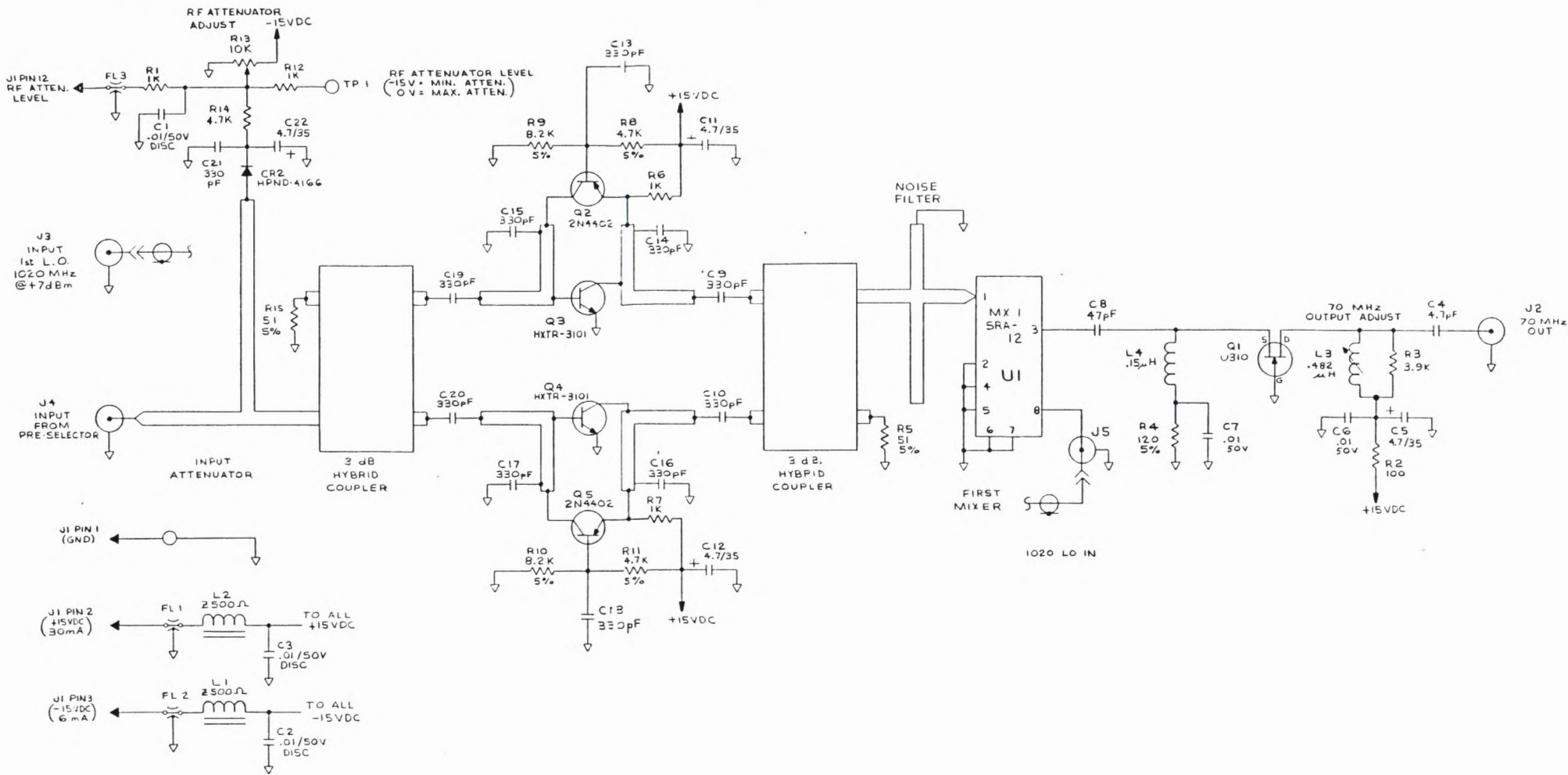
The Preamplifier and First Mixer module has been designed to provide optimum service in the most hostile RF environments. A PIN diode attenuator, the preamplifier, the first mixer, and the first IF preamplifier have been integrated into the module. The input signal is attenuated and then split by a hybrid coupler, amplified, and recombined. The amplified signal is converted down by a double balanced mixer to the first IF frequency of 70 MHz.

The input signal is applied to a PIN diode attenuator normally set to minimum attenuation. This low-pass (0.5 dB) input attenuator can optionally reduce the input signal at least 15 dB in very high level RF environments.

The signal is split by a 3 dB 90° hybrid coupler. The two outputs are amplified by the preamplifier, which consists of low-noise amplifiers Q3 and Q4. These amplifiers are input matched for best noise figure. They are actively biased by Q2 and Q5 to maintain close control over quiescent conditions.

The amplified outputs are recombined in the second hybrid coupler and then fed through a noise filter to the first mixer (U1). The signal is mixed with the 1020 MHz first LO signal to produce the first IF signal at 70 MHz. The image frequency is reactively terminated by a shunt stub.

The output of the mixer is applied to IF preamplifier Q1, which is also matched for best noise performance. The input characteristics of this device provide a low VSWR termination of the mixer at the IF frequency. The amplified IF signal is bandpass filtered and impedance matched to the 50 ohm output.

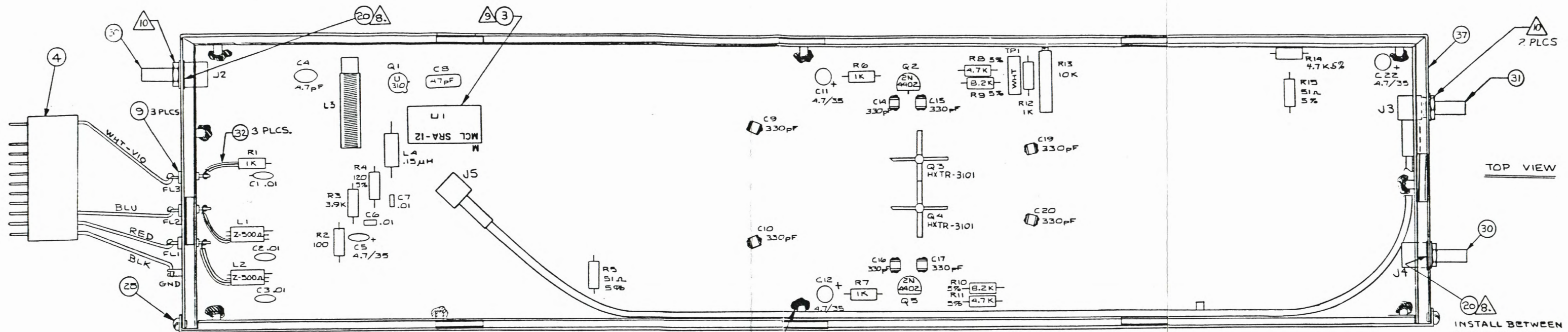


NOTES:

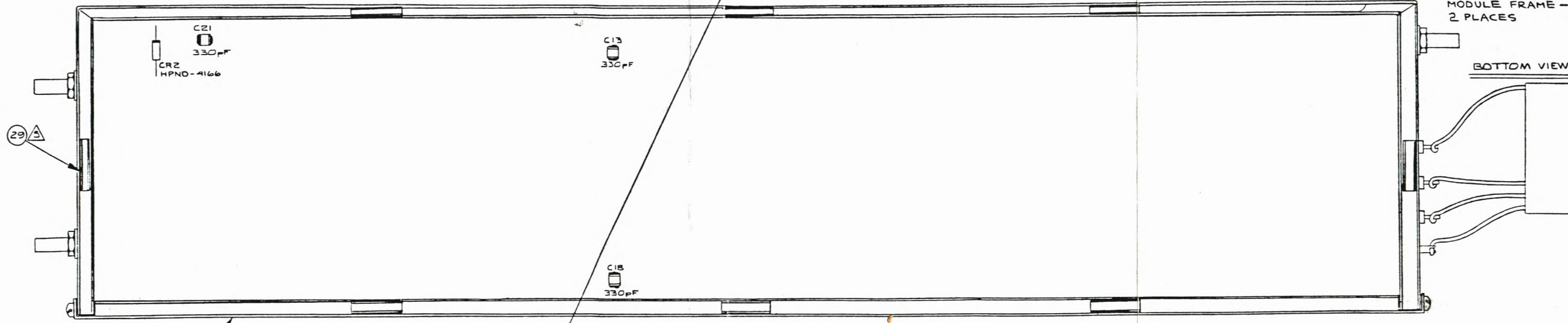
1. UNLESS OTHERWISE SPECIFIED:
RESISTOR VALUES ARE IN OHMS, 1/4 WATT, 10%
CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD SIDE 943.
3. COMPONENT LAYOUT 20D2827

Moseley			
950 PRE-AMP & MIXER			
<small>TOL: FRACT. ± 1/2% .XX ± .01, .XXX ± .01, < ± 1/2%</small>			
OWN	CAH	16 JUL 91	SCALE: NONE
CHK	PL	16-81	
END	REV	06/81	91D7274 H

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www.SteamPoweredRadio.Com



TOP VIEW



BOTTOM VIEW

INSTALL BETWEEN SMB CONN AND MODULE FRAME - 2 PLACES

- NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS, 1/4 W 10% AND CAPACITOR VALUES ARE IN MICROFARADS.
 2. SCHEMATIC 9107274
 3. P.C. BOARD 5105943

SOLDER PINS TO TOP SIDE OF P.C. BOARD, 9 PLCS.

ITEM NO: 9301268

Moseley	
COMPONENT LAYOUT	
BEO PRE AMP & MIXER PCL-606	
DATE	SCALE
2002	1:1
2002827 N	

MUSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301268

DESCRIPTION: ASSY PREAMP/1STMX 950MHZ PCL6
 ENG.DRAWING NO.: 20D2827 N

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473055	PCB PREAMP/1ST MIXER PCL-606	5105943	H	1.000 EA
3	3350188	MIXER U1	SRA-12		1.000 EA
4	2300804	ASSY CABLE 950 PREAMP PCL-606	2481084	A	1.000 EA
5	3630225	XT PS2N4402 .35W150M040V.6A9P Q2,Q5	2N4402		2.000 EA
6	3640281	XT HXTR-3101 Q3,Q4	HXTR-3101		2.000 EA
7	3640307	XT U310 Q1	U310		1.000 EA
8	3610235	DIO HPND-4166 CR2	HPND-4166		1.000 EA
9	3291069	FILTER FEED THRU SM THD FL1,FL2,FL3	859619-1		3.000 EA
10	4042065	IDCTR .482 UH 8.5T GR TYPE E L3	T7-116 8.5T3/8E		1.000 EA
11	4020509	IDCTR MINI-RED .15UH 10% L4	MR.15 10%		1.000 EA
12	4020467	FERROX CUBE 500 OHM L1,L2	VK200 10/3B		2.000 EA
13	4300034	CAP DISC NPO 4.7PF C4	DTZ-4R7		1.000 EA
14	4350526	CAP CHIP 330PF 5% P90 C9,C10,C13,C14,C15,C16,C17,C18,C19,C20,C21	100B331JP500X		11.000 EA
15	4310132	CAP DISC .01/50V C1,C2,C3	UK-50-103		3.000 EA
16	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C5,C11,C12,C22	196D475X0035JA1		4.000 EA
17	4210183	CAP MICA DIP 47PF 5% C8	DM-15-470J		1.000 EA
18	4310272	CAP .01 50V X7R 10% C6,C7	5018EM50RD103K		2.000 EA
19	4630299	POT CER PC PIN 10K OHM .75W R13	3006P-1-103		1.000 EA
20	1130491	WSHR SST 5710-35-16	5710-35-16		2.000 EA
21	4410247	RES 1K OHM 1/4W 10% R1,R6,R7,R12	RC07GF102K		4.000 EA
22	4460036	RES 51 OHM 1/4W 5% R5,R15	RC07GF510J		2.000 EA
23	4460291	RES 8.2K OHM 1/4W 5% R9,R10	RC07GF822J		2.000 EA
24	4460242	RES 4.7K OHM 1/4W 5% R8,R11,R14	RC07GF472J		3.000 EA
25	4460655	RES 120 OHM 1/4W 5% R4	RC07GF121J		1.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
26	4410122	RES 100 OHM 1/4W 10% R2	RC07GF101K	1.000	EA
27	4410320	RES 3.9K OHM 1/4W 10% R3	RC07GF392K	1.000	EA
28	1050129	SCR PNH PHPS 4-40 X 1/4 SST		2.000	EA
29	1310093	CLIP PCL-606	05C2882	16.000	EA
30	3090230	CUNN SMB PC RT ANG MALE BLKHD J2,J4	2110-1511-000	2.000	EA
31	2202315	ASSY COAXSMB PC/RTSMB/RT 12.25 J3-J5	2481092-1	1.000	EA
32	1560226	TBG TEFLON 20AWG NAT R1,L1,L2	TFT200-20	.250	FT
33	3290152	JACK TEST WHITE R ANGLE TPI	430-101	1.000	EA
34	2091403	COVER MODULE PREAMP/1ST MIX	05C2939	2.000	EA
37	2091049	FRAME PREAMP/MIXER RX PCL-606	05D2875	1.000	EA
38	2090967	FRAME BASE MODULE PCL-606	05C2867	1.000	EA

FIRST LOCAL OSCILLATOR
AND MULTIPLIER

Schematic 91D7288
Parts List 20D2828

The output LO signal is derived from a crystal-controlled oscillator, which uses an oven-mounted crystal for frequency stability. The signal is buffered and then quadrupled by a pair of active push-push doublers. Filtering is provided between each multiplication to remove unwanted harmonics. The signal is amplified and fed to a step-recovery diode multiplier, and the output is filtered to select the desired harmonic. The signal is then attenuated to control the output impedance and to reduce the power to the level required by the mixer.

On-board power supply regulation eliminates frequency drifts due to line voltage variations.

The output local oscillator signal is derived from crystal-controlled oscillator Q1. This third overtone crystal is temperature stabilized by a 65°C proportionally controlled oven. The output frequency is adjustable by tuning FREQ ADJ L6; this adjustment causes only small output amplitude variations. Oscillator buffer Q2 isolates the oscillator, preventing frequency pulling when adjusting the multipliers.

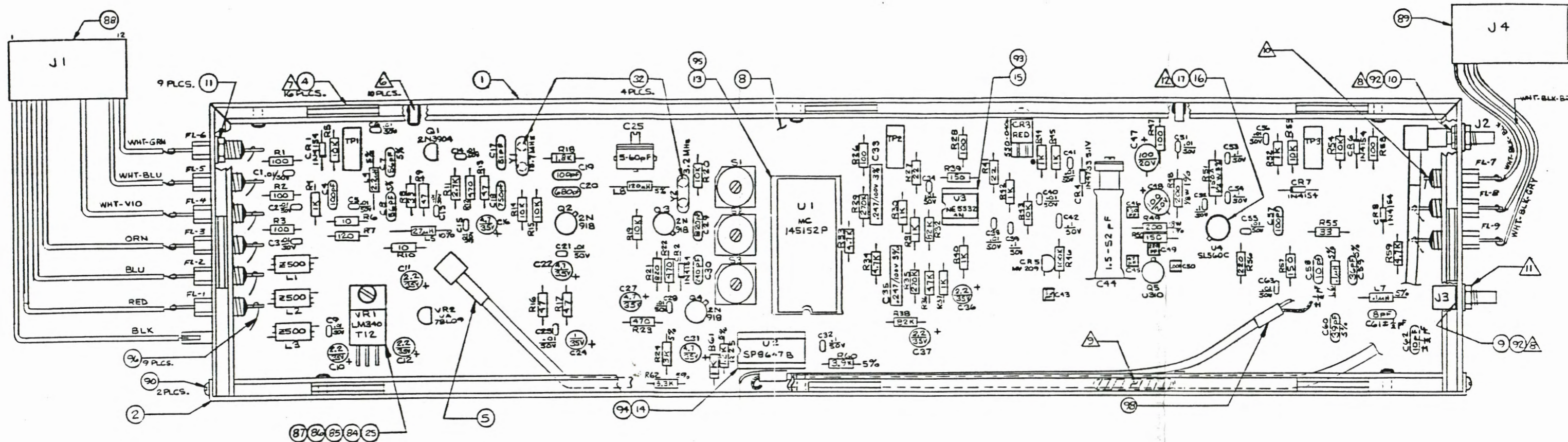
The output of the buffer is doubled in an active push-push doubler. The single-ended input from the buffer is split into two out-of-phase voltages in T1 and fed to the bases of two transistors of integrated array U1. The output of these two transistors is summed at their collectors. The close matching of the integrated transistors provides suppression of the fundamental signal driving the bases. The fundamental frequency is further suppressed by an interstage bandpass filter consisting of L15, C18 to C21, L11, C24, L12 and C26.

The second doubler consists of Q3 and Q4. The circuit is essentially the same as the first doubler, but a discrete-component design is used because of the higher frequency and power that are required.

The output of the second doubler is amplified by Q5 to the power level (120 mW) required by the diode multiplier. The output of Q5 is tuned by C39 and impedance matched in two stages to the step-recovery diode multiplier by C38, C41, and L17, and then by C43 and L18. The diode self-bias current is determined by R25.

Diode CR4, the step-recovery diode multiplier, converts the input sinusoidal signal to a stream of impulses. These impulses are fed to an unloaded microstrip quarter-wave resonator (L19), which is tuned to the desired output frequency.

C44 provides a dc block and coupling to the 50 ohm input of output filter FL1. The output of the filter is loaded with a 3 dB attenuator, reducing the output power to that required by the first mixer and providing some control over the impedance seen by the filter. The undesired harmonic multiples of 200 MHz removed from the desired frequency are suppressed at least 40 dB. The output power is between +5 and +12 dBm.



NOTES:

- 1. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, 1/4W, 10%; CAPACITOR VALUES ARE IN MICROFARADS.
- 2. SCHEMATIC: 9107321
- 3. P.C. BD.: SID6006
- 4. U1 THRU U4 ARE INSTALLED WITH SOCKETS.
- 5. ALL CHIP CAPACITORS TO BE SOLDERED WITH SILVER BEARING SOLDER. (KESTER SN62 OR EQUIV.)
- 6. SOLDER TERMINALS TO TOP SIDE OF P.C. BD. AS SHOWN, 11 PLACES.
- 7. INSTALL CLIPS (ITEM 4) ON FRAME & FRAME BASE (ITEMS 1 & 2) AS SHOWN, BOTH SIDES (TOTAL: 16 PLCS.)
- 8. INSTALL WASHER (ITEM 92) ON J2 AND J3 (ITEMS 9 & 10) BEFORE INSTALLING P.C. BD. INTO FRAME.

- 9. ATTACH ITEMS 98 & 5 TO FRAME WITH RTV. AVOID DRESSING CABLES OVER 'OPEN' AREA OF P.C. BOARD.
- 10. ATTACH LEAD TO FEED-THRU CAPACITOR FL-7 CLOSE ENOUGH TO CAPACITOR TO TRIM TERMINAL TO NOT TOUCH ITEM 5 CONNECTOR.
- 11. MOUNTING NUT FOR J3 MUST BE INSTALLED WITH A TORQUE WRENCH SET AT 3 IN-LBS.
- 12. INSTALL U4 J25 ±.032 ABOVE P.C. BD.

Moseley	
COMPONENT LAYOUT 65 - 96 MHz. 2nd. L.O. / SYNTH & 3rd. L.O.	
TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, < ± 1/2°	
DWN	SCALE:
CHK	20D2882
ENG	F

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PAGE: 1
 DATE: 6/30/87

PARENT ITEM: 9301276

DESCRIPTION: ASSY LD 1ST TX 940-960 PCL-606
 ENG.DRAWING NO.: 20D2828-1 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	20D2828-7	T	1.000 EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	24B1085	A	1.000 EA

PARENT ITEM: 9301524

DESCRIPTION: ASSY LD 1ST TX 920-940 MHZ 606
 ENG.DRAWING NO.: 20D2828-2 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	20D2828-7	T	1.000 EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1	D	1.000-EA
102	3340825	XTAL 50.000 MHZ PCL-606 Y1	30A0079-2	D	1.000 EA
103	4300018	CAP DISC NPU 2.2PF C45	DTZ-2R2		1.000-EA
103	4300034	CAP DISC NPU 4.7PF C45	DTZ-4R7		1.000 EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	24B1085	A	1.000 EA

PARENT ITEM: 9301532

DESCRIPTION: ASSY LD 1ST TX 910-920MHZ 606
 ENG.DRAWING NO.: 20D2828-3 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9302605	ASSY 1ST LD 950 MHZ 600	20D2828-7	T	1.000 EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1	D	1.000-EA
102	3340833	XTAL 49.000 MHZ PCL-606 TX Y1	30A0079-3	D	1.000 EA
103	4300018	CAP DISC NPU 2.2PF C45	DTZ-2R2		1.000-EA
103	4300042	CAP DISC NPU 6.8PF C45	DTZ-6R8		1.000 EA
104	2300812	ASSY CABLE 950 1ST LD PCL-606 J1	24B1085	A	1.000 EA

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PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301581

DESCRIPTION: LO 1ST RX PCL-606 940-960 MHZ
 ENG.DRAWING NO.: 20D2828-4 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301276	ASSY LO 1ST TX 940-960 PCL-606	20D2828-1 T	1.000	EA
102	3340791	XTAL 51.000 MHZ PCL-606 TX Y1	30A0079-1 D	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA

PARENT ITEM: 9301599

DESCRIPTION: LO 1ST RX PCL-606 920-940 MHZ
 ENG.DRAWING NO.: 20D2828-5 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301524	ASSY LO 1ST TX 920-940 MHZ 606	20D2828-2 T	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA
102	3340825	XTAL 50.000 MHZ PCL-606 Y1	30A0079-2 D	1.000	EA

PARENT ITEM: 9301607

DESCRIPTION: LO 1ST RX PCL-606 910-920 MHZ
 ENG.DRAWING NO.: 20D2828-6 T

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
101	9301532	ASSY LO 1ST TX 910-920MHZ 606	20D2828-3 T	1.000	EA
102	3340809	XTAL PCL-606 RX Y1	30A0082 C	1.000	EA
102	3340833	XTAL 49.000 MHZ PCL-606 TX Y1	30A0079-3 D	1.000	EA

DOUBLE CONVERTER

Schematic 91D7277
Parts List 20D2824-1 (Composite)
20D2924-2 (Mono)

Much of the selectivity of the Receiver is provided by the 70 MHz to 3 MHz Double Converter module. The input signal at 70 MHz is amplified and bandpass filtered and then converted to the second IF frequency at 10.7 MHz. The bandwidth of the second IF circuit is user selectable by switching out the second filter in the IF. This does not change the gain of the IF. The 10.7 MHz signal is converted to the third IF frequency at 3 MHz, bandpass filtered, and passed to the output.

After preamplification in the Preamplifier and First Mixer module, the input signal is amplified by Q1 to overcome the insertion loss of the 70 MHz bandpass filter. This amplifier also acts as an impedance transformer from the 50 ohm input impedance to the 3000 ohm impedance of the filter.

The primary purpose of the 70 MHz bandpass filter is to reduce undesired signals to levels that will not cause intermodulation in the second mixer and second IF amplifiers. The 1 dB bandwidth of this filter is 500 kHz, and its 10 dB bandwidth is 1.6 MHz. The output of the filter is impedance transformed down to 50 ohms to match the mixer.

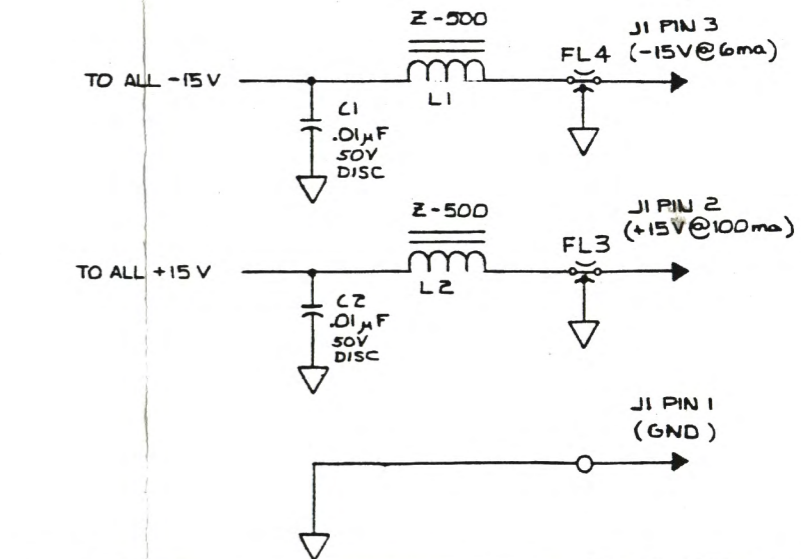
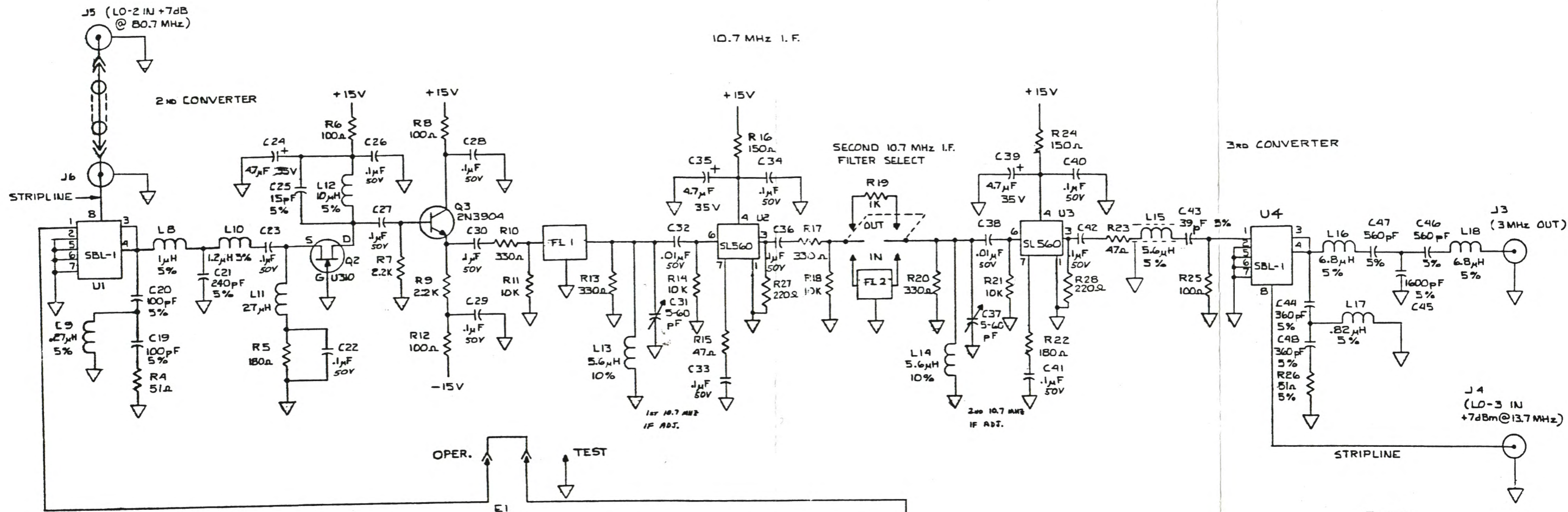
The signal input to second mixer U1 is mixed with the 80.7 MHz second LO signal to produce the second IF signal at 10.7 MHz. The local oscillator signals are provided by the Second and Third Local Oscillator module.

The second mixer is double balanced, and its IF port (10.7 MHz) is diplexed. The low-pass leg (L8, C21, L10 with a 14 MHz cutoff) connects the signals centered on 10.7 MHz to the first 10.7 MHz amplifier (Q2). The high-pass leg (C20, L9, C19) terminates higher frequency signals in R4.

The output of the first 10.7 MHz amplifier (Q2) is buffered by emitter follower Q3. The source impedance required by filter FL1 is set by R10.

The 10.7 MHz IF filters FL1 and FL2 are linear phase monolithic ceramic resonators. L13 and C31, and L14 and C37, allow slight adjustment of the center frequency of the filters to align both filters on the IF frequency. Amplifiers U2 and U3 maintain the signal level through the filters. Inductor L15 and capacitor C43 form a harmonic and noise filter for the third mixer.

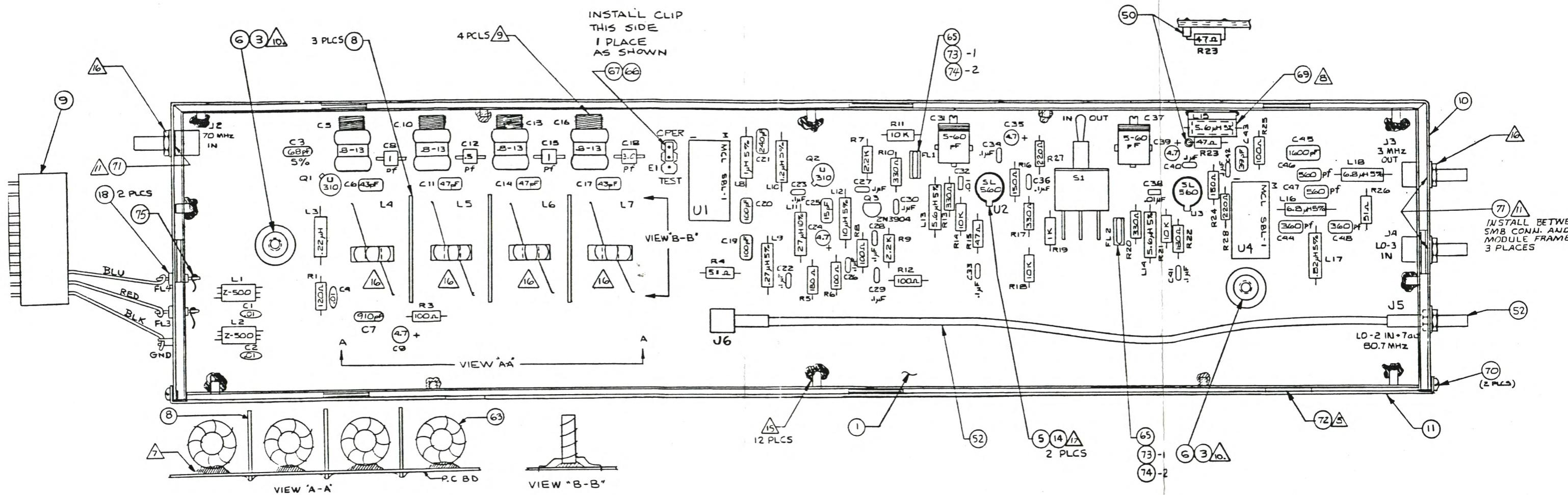
The input to third mixer U4 is mixed with the 13.7 MHz third LO signal to produce the third IF signal at 3 MHz. The third mixer is also double balanced and diplexed. The output signal is sent to the FM Demodulator module.



NOTES:

- UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 1/4 W, 5%; CAPACITORS ARE IN MICROFARADS; INDUCTORS IN MICRO HENRYS.
- TRIM & DRILL SID5945
- COMPONENT LAYOUT 20D2824

DATE		Moseley	
3.21.85		SCHEMATIC	
REVISIONS		70-3 MHz DOUBLE CONVERTER	
MGT. APPR.		TOL: FRACT. ± 1/32, .XX ± .30, .XXX ± .10, < ± 1/2°	
DWN		SCALE:	
CHK		91D7277	
ENG		L	



NOTES:
 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR ARE IN OHMS, 1/4 W, 5%, AND CAPACITOR VALUES ARE IN MICROFARADS.
 2. SCHEMATIC 31D7277
 3. P.C. BOARD 51D5945

Moseley	
COMPONENT LAYOUT	
70-3 DOUBLE CONVERTER	
TOL. PRAC. 0.125 0.062 0.031 0.015 0.007 0.003 0.001 0.0005	
DWG. NO. 13-9-58(1) SCALE: 2 X	
CHK. BY: [signature] DATE: 10-27-41	
2002824 AA	

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 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301177

DESCRIPTION: ASSY DBL CONV 70-3MHZ MONOPCL6
 ENG.DRAWING NO.: 20D2824-2 AA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473022	PCB 70-3MHZ DBL CONV PCL-606	51D5945	1.000	EA
2	3630456	XT 2N3904 Q3	2N3904	1.000	EA
3	1090182	SCR PNH PHPS 6-32 X 1/4 SST		4.000	EA
4	3350196	MIXER BAL U1,U4	SBL-1	2.000	EA
5	3730769	IC SL560C U2,U3	SL560C	2.000	EA
6	1230986	STDF 1/4 RND 6-32 X 7/8 AL	8160-A-0632	2.000	EA
7	3640307	XT U310 Q1,Q2	U310	2.000	EA
8	2062529	SHIELD PARTITION	05B2810	3.000	EA
9	2300820	ASSY CABLE DBL CONV PCL-606	24B1086	1.000	EA
10	2091031	FRAME DBL CONV RCVR PCL-606	05D2874	1.000	EA
11	2090967	FRAME BASE MODULE PCL-606	05C2867	1.000	EA
12	2091163	ASSY MODULE COVER CKT DBL CONV	05C2901	1.000	EA
13	2091155	ASSY MODULE COVER COMP DBL CON	05C2900	1.000	EA
14	2110237	HEATSINK TO-5 PUSH-ON	#1115B	2.000	EA
15	3190782	SW DPDT PC S1	573-21190301100	1.000	EA
16	3090230	CONN SMB PC RT ANG MALE BLKHD J2,J3,J4	2110-1511-000	3.000	EA
18	3291069	FILTER FEED THRU SM THD FL3,FL4	859619-1	2.000	EA
19	4310264	CAP .1 50V 25U 20% C22,C23,C26,C27,C28,C29,C30,C33,C34,C36,C40,C41, C42	5020ESS0RD104M	13.000	EA
20	4310272	CAP .01 50V X7R 10% C32,C38	5018EM50RD103K	2.000	EA
21	4210548	CAP MICA DIP 910PF 5% C7	DM-15-911J	1.000	EA
22	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C9,C24,C35,C39	196D475X0035JA1	4.000	EA
23	4210167	CAP MICA DIP 39PF 5% C43	DM-15-390J	1.000	EA
24	4210266	CAP MICA DIP 100PF 5% C19,C20	DM-15-101J	2.000	EA
25	4210076	CAP MICA DIP 15PF 5% C25	DM-15-150J	1.000	EA
26	4210373	CAP MICA DIP 240PF 5% C21	DM-15-241J	1.000	EA
27	4210480	CAP MICA DIP 560PF 5% C46,C47	DM-15-561J	2.000	EA
28	4210423	CAP MICA DIP 360PF 5% C44,C48	DM-15-361J	2.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
29	4210225	CAP MICA DIP 68PF 5% C3	DM-15-680J	1.000	EA
30	4210183	CAP MICA DIP 47PF 5% C11,C14	DM-15-470J	2.000	EA
31	4220075	CAP MICA DIP 1600PF 5% C45	DM-19-162J	1.000	EA
32	4310132	CAP DISC .01/50V C1,C2,C4	UK-50-103	3.000	EA
33	4350518	CAP CHIP .5 PF +/- .1PF P90 C12	100B0R5BNMS500X	1.000	EA
34	4210175	CAP MICA DIP 43PF 5% C6,C17	DM-15-430J	2.000	EA
35	4240198	CAP 3.0 PF +/- .1PF W/LEADS C18	100B3R0BNMS500X	1.000	EA
36	4370201	CAP MIN VAR PC .8-10PC C5,C10,C13,C16	MVM010W	4.000	EA
37	4350500	CAP ADJ 5-60PF C31,C37	GXD60000	2.000	EA
38	4350708	CAP CHIP 1 +/- .25PF P90 W/LEADS C8,C15	100B1R0BNMS500X	2.000	EA
39	4460051	RES 100 OHM 1/4W 5% R3,R6,R8,R12,R25	RC07GF101J	5.000	EA
40	4460820	RES 180 OHM 1/4W 5% R5,R22	RC07GF181J	2.000	EA
41	4460838	RES 330 OHM 1/4W 5% R10,R13,R17,R20	RC07GF331J	4.000	EA
42	4460192	RES 2.2K OHM 1/4W 5% R7,R9	RC07GF222J	2.000	EA
43	4460317	RES 10K OHM 1/4W 5% R11,R14,R18,R21	RC07GF103J	4.000	EA
44	4460812	RES 150 OHM 1/4W 5% R16,R24	RC07GF151J	2.000	EA
45	4460788	RES 47 OHM 1/4W 5% R15,R23	RC07GF470J	2.000	EA
46	4460036	RES 51 OHM 1/4W 5% R4,R26	RC07GF510J	2.000	EA
48	4460655	RES 120 OHM 1/4W 5% R1	RC07GF121J	1.000	EA
49	4460143	RES 1K OHM 1/4W 5% R19	RC07GF102J	1.000	EA
50	4130035	FERRITE BEAD R23	K S 001 00/38	1.000	EA
52	2202299	ASSY COAX SMB/S-SMB PL/RT 8.25 J5-J6	2481091-2	A1	1.000 EA
53	4020517	IDCTR MINI-RED .27 UH 5% L9	MR .27 5%	1.000	EA
54	4020624	IDCTR 1.0 UH 5% MR 1.0 L8	MR 1.0 5%	1.000	EA
55	4020525	IDCTR MINI-RED 1.2UH 5% L10	MR 1.2 5%	1.000	EA
56	4020459	LNK/FU MINI-RED 10UH 5% L12	MR 10 / 5%	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
57	4020541	IDCTR MINI-RED .22 UH 5% L3	MR .22 5%	1.000	EA
58	4020673	IDCTR MINI-RED 27UH 10% L11	MR 27 10%	1.000	EA
59	4020566	IDCTR MINI-RED 5.6 UH 5% L13,L14,L15	MR 5.6 5%	3.000	EA
60	4020574	IDCTR MINI-RED 6.8 UH 5% L16,L18	MR 6.8 5%	2.000	EA
61	4020582	IDCTR MINI-RED .82 UH 5% L17	MR .82 5%	1.000	EA
62	4460077	RES 220 OHM 1/4W 5% R27,R28	RC07GF221J	2.000	EA
63	4050191	TOROID PC MOUNTING L4,L5,L6,L7	03-3011	C1 4.000	EA
64	4020467	FERROX CUBE 500 OHM L1,L2	VK200 10/3B	2.000	EA
65	3250941	SKT 3 PIN FL1,FL2	1-583773-1	2.000	EA
66	3090370	CONN 3 PIN SNGL ROW STR HDR E1	87224-3	1.000	EA
67	3250917	JUMPER MINI FOR 2 PINS=.025/.1 E1	65474-001	1.000	EA
69	2062602	SHIELD MAGNETIC CYLIN PCL-606 L15	0582836	B 1.000	EA
70	1050129	SCR PNH PHPS 4-40 X 1/4 SST		2.000	EA
71	1130491	WSHR SST 5710-35-16 J2,J3,J4	5710-35-16	3.000	EA
72	1310093	CLIP PCL-606	05C2882	B 16.000	EA
74	3350279	FLTR CERAMIC SFE-10.7-MX2-A FL1,FL2	SFE-10.7-MX2-A	2.000	EA
75	1641927	W BUSS 22GA	298	.250	FT

SECOND AND THIRD LOCAL OSCILLATOR

Schematic 91D7276
Parts List 20D2829

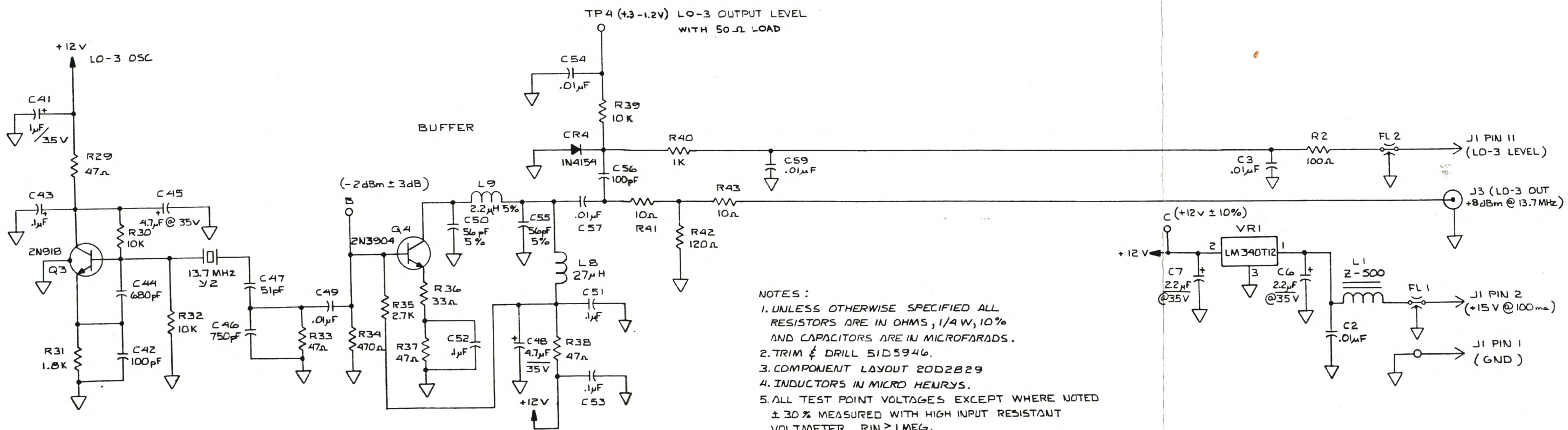
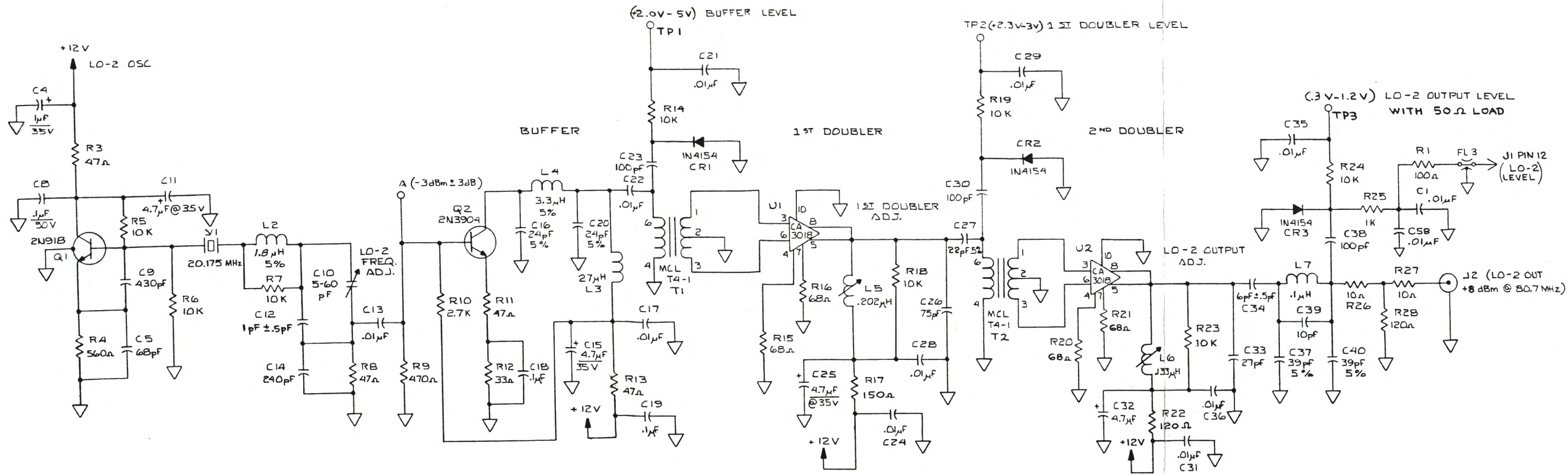
The Second and Third Local Oscillator module provides two local oscillator signals (80.7 MHz and 13.7 MHz) to the Double Converter module.

The Second Local Oscillator consists of crystal-controlled oscillator Q1 and crystal Y1, operating at 20.175 MHz. LO2 Frequency Adjust C10 can pull the crystal frequency by approximately ± 5 kHz. The LO signal is buffered by Q2 and sent to first push-push frequency doubler U1 and associated circuitry. TP1 (buffer level) monitors the drive level to the first doubler and should indicate between +2 V and +5 V on a high impedance voltmeter. First Doubler Adjust L5 tunes the output of the first doubler, and the voltage at TP2 (First Doubler Level) should indicate between +2.3 V and +3.0 V.

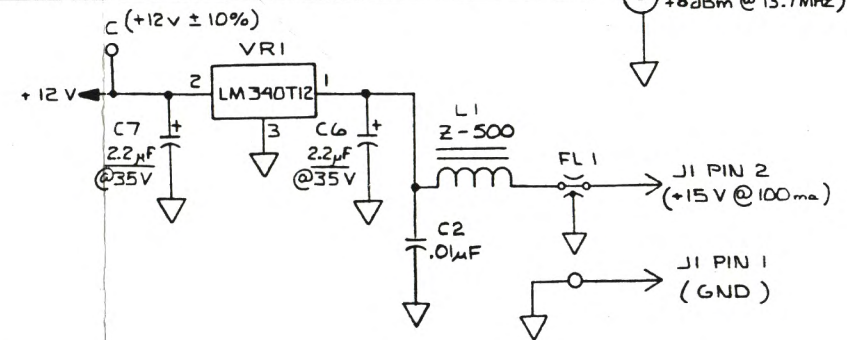
The output of the First Doubler drives second push-push Frequency Doubler U2 and associated circuitry. Both frequency doublers use well balanced input transformers and tightly matched monolithic transistors, yielding excellent rejection of fundamental and odd order harmonics at their outputs.

LO2 Output Adjust L6 is used to tune the second doubler for maximum output at TP3 (LO2 Output Level). This voltage should be between +0.8 V and +1.2V. The output of the second local oscillator is applied to J2 at a level of +5 dBm to +10 dBm at a frequency of 80.7 MHz adjustable by ± 20 kHz.

The third local oscillator consists of crystal-controlled oscillator Q3 and 13.7 MHz crystal Y2, followed by buffer amplifier Q4 and a 13.7 MHz low-pass filter. The LO3 output level at TP4 should be between +0.8 V and +1.2 V. The output signal appears at J3 at a level of +5 dBm to 10 dBm. Extremely low noise floors are achieved in both the second and third local oscillators by using the crystals as series resonant bandpass filters between the oscillators and their buffer amplifiers.

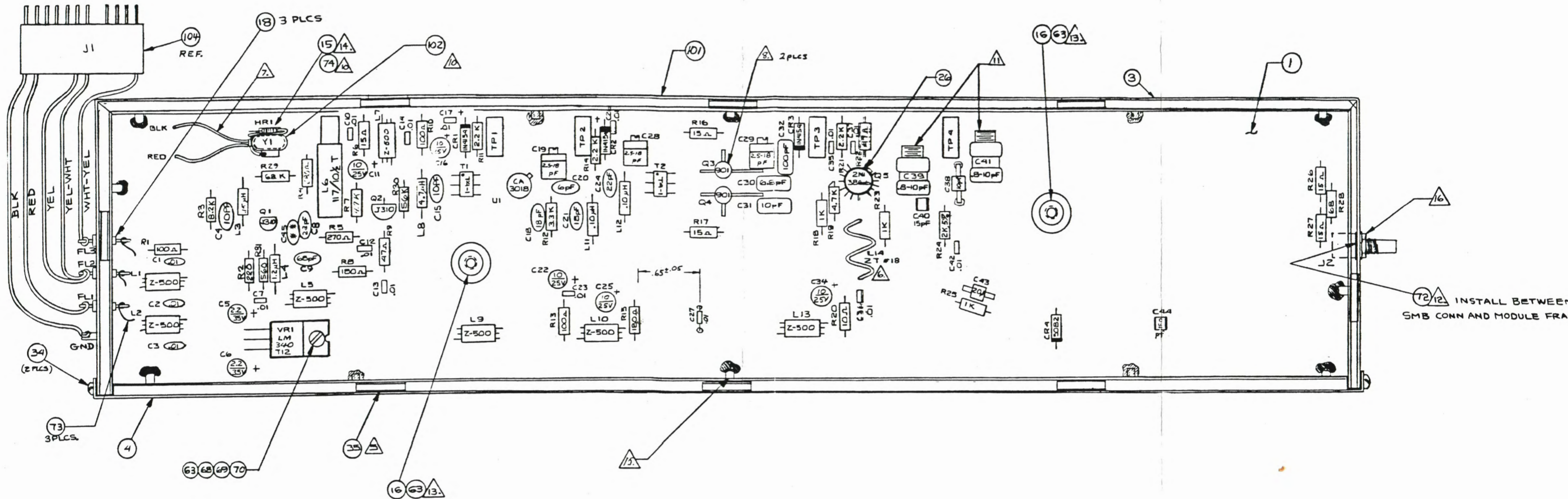


NOTES:
 1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 1/4 W, 10% AND CAPACITORS ARE IN MICROFARADS.
 2. TRIM & DRILL SID5946.
 3. COMPONENT LAYOUT 20D2829
 4. INDUCTORS IN MICRO HENRYS.
 5. ALL TEST POINT VOLTAGES EXCEPT WHERE NOTED ± 30% MEASURED WITH HIGH INPUT RESISTANT VOLTMETER RIN ≥ 1MEG.



91D7276

DESIGNED BY	DATE	PRODUCTION	REVISIONS
ECG	11-2-87		
ADD'L BY	DATE	REVISION	DESCRIPTION
APPROVED BY	DATE	REVISION	DESCRIPTION
Moseley			
80.7/13.7 2nd/3rd LO			
PCL 606 SCHEMATIC			
DATE	BY	SCALE	OTHER
11-2-87	ECG	NONE	
91D7276			F



FREQUENCY OPTION TABLE

COMP. LAYOUT	20D2828-1	20D2828-2	20D2828-3
STOCK NO.	9301276	9301524	9301532
1st LO FREQ.	1020 MHz	1000 MHz	980 MHz
** C45 VALUE	2.2 pF NPO	4.7 pF NPO	6.8 pF NPO
** C45 STOCK NO.	4300018	4300034	4300042
X-TAL STOCK NO.	3340791	3340825	3340833

COMP. LAYOUT	20D2828-4	20D2828-5	20D2828-6
STOCK NO.	9301581	9301599	9301607
RCVR FREQ.	940-960 MHz	920-940 MHz	910-920 MHz
** C45 VALUE	2.2 pF NPO	4.7 pF NPO	6.8 pF NPO
** C45 STOCK NO.	4300018	4300034	4300042
X-TAL STOCK NO.	3340809	3340809	3340809

COMP. LAYOUT	20D2828-7
STOCK NO.	9302605
RCVR FREQ.	1020 MHz
** C45 VALUE	2.2 pF NPO
** C45 STOCK NO.	4300018
X-TAL STOCK NO.	3340791

NOTES:

- UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 1/4W, 10% AND CAPACITOR VALUES ARE IN MICROFARADS.
- SCHEMATIC 9107280.
- PC BOARD 5105944

Moseley

COMPONENT LAYOUT

940-960 MHz 1st LO

FORM 15 (REV. 5-53) SCALE: 2:1

DATE: 11/16/71

20D2829 T

MOSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301243

DESCRIPTION: ASSY LO 80.7/13.7 2ND/3RD PCL6
 ENG.DRAWING NO.: 20D2829 K

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473030	PCB 80 7/13.7 -2ND/3RD LO	5105946 J	1.000	EA
2	2091007	FRAME 2ND&3RD LO RCVR PCL-606	0502871 F	1.000	EA
3	2090967	FRAME BASE MODULE PCL-606	05C2867 E	1.000	EA
4	2090975	COVER MODULE PCL-606	05C2868 0	2.000	EA
5	3250495	SKT PIN .0850DX.200L GOLD FIN	450-3286-01-03	4.000	EA
6	1310093	CLIP PCL-606	05C2882 B	16.000	EA
7	4310264	CAP .1 50V 25U 20% C8,C18,C19,C43,C51,C52,C53	5020ES50RD104M	7.000	EA
8	4310272	CAP .01 50V X7R 10% C1,C2,C3,C13,C17,C21,C22,C24,C28,C29,C31,C35, C36,C49,C54,C57,C58,C59	5018EM50RD103K	18.000	EA
9	4210050	CAP MICA DIP 10PF +/- 0.5 C39	DM-15-100D	1.000	EA
10	4210100	CAP MICA DIP 22PF 5% C27	DM-15-220J	1.000	EA
11	4210233	CAP MICA DIP 75PF 5% C26	DM-15-750J	1.000	EA
12	4210266	CAP MICA DIP 100PF 5% C23,C30,C38,C42,C56	DM-15-101J	5.000	EA
13	4210373	CAP MICA DIP 240PF 5% C14	DM-15-241J	1.000	EA
14	4210449	CAP MICA DIP 430PF 5% C9	DM-15-431J	1.000	EA
15	4210506	CAP MICA DIP 680PF 5% C44	DM-15-681J	1.000	EA
16	4210514	CAP MICA DIP 750PF 5% C46	DM-15-751J	1.000	EA
17	4210191	CAP MICA DIP 51PF 5% C47	DM-15-510J	1.000	EA
18	4210209	CAP MICA DIP 56PF 5% C50,C55	DM-15-560J	2.000	EA
19	4210225	CAP MICA DIP 68PF 5% C5	DM-15-680J	1.000	EA
20	4210118	CAP MICA DIP 24PF 5% C16,C20	DM-15-240J	2.000	EA
21	4210126	CAP MICA DIP 27PF 5% C33	DM-15-270J	1.000	EA
22	4210167	CAP MICA DIP 39PF 5% C37,C40	DM-15-390J	2.000	EA
23	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C6,C7	196D225X0035JA1	2.000	EA
24	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C11,C15,C25,C32,C45,C48	196D475X0035JA1	6.000	EA
25	+350500	CAP ADJ 5-60PF C10	GXD60000	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
26	4370367	CAP MICA DIP 6PF C34	CM05FD060D03	1.000	EA
27	4210001	CAP MICA DIP 1PF +/- 0.5 C12	DM-15-0100	1.000	EA
28	4280038	CAP TANT EPOX-DIP 1/35V 20% C4,C41	196D105X0035HA1	2.000	EA
29	3600145	DIO 1N4154 25V 4NS SI D035 CR1,CR2,CR3,CR4	1N4154	4.000	EA
30	4410247	RES 1K OHM 1/4W 10% R25,R40	RC07GF102K	2.000	EA
31	4410270	RES 1.8K OHM 1/4W 10% R31	RC07GF182K	1.000	EA
32	4410379	RES 10K OHM 1/4W 10% R5,R6,R7,R14,R18,R19,R23,R24,R30,R32,R39	RC07GF103K	11.000	EA
33	4410023	RES 10 OHM 1/4W 10% R26,R27,R41,R43	RC07GF100K	4.000	EA
34	4410296	RES 2.7K OHM 1/4W 10% R10,R35	RC07GF272K	2.000	EA
35	4410064	RES 33 OHM 1/4W 10% R12,R36	RC07GF330K	2.000	EA
36	4410080	RES 47 OHM 1/4W 10% R3,R8,R11,R13,R29,R33,R37,R38	RC07GF470K	8.000	EA
37	4410122	RES 100 OHM 1/4W 10% R1,R2	RC07GF101K	2.000	EA
38	4410130	RES 120 OHM 1/4W 10% R22,R28,R42	RC07GF121K	3.000	EA
39	4410205	RES 470 OHM 1/4W 10% R9,R34	RC07GF471K	2.000	EA
40	4410213	RES 560 OHM 1/4W 10% R4	RC07GF561K	1.000	EA
41	4410106	RES 68 OHM 1/4W 10% R15,R16,R20,R21	RC07GF680K	4.000	EA
42	4410148	RES 150 OHM 1/4W 10% R17	RC07GF151K	1.000	EA
43	2300838	ASSY CABLE 2ND & 3RD LO PCL606	24B1087	A	1.000 EA
44	3340759	XTAL 20.175MHZ PCL-606 2ND LO Y1	30A0080	A0	1.000 EA
45	3340767	XTAL 13.7MHZ PCL-606 3RD LO Y2	30A0081	A0	1.000 EA
46	1560226	TBG TEFLON 20AWG NAT R2	TFT200-20	.100	FT
47	3630001	XT NS2N918 .4W600M030V50M2P Q1,Q3	2N918	2.000	EA
48	3630456	XT 2N3904 Q2,Q4	2N3904	2.000	EA
49	3650074	REGTR LM340T12/7812 VARV1.5A VR1	LM340T-12	1.000	EA
50	3730041	IC CA3018 XSTR ARRAY U1,U2	CA-3018	2.000	EA
51	4100038	XFMR MCL T4-1 T1,T2	MCL T4-1	2.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
52	4020681	IDCTR 1.8 UH 5% L2	MR 1.8 5%	1.000	EA
53	4020657	IDCTR 3.3 UH 5% L4	MR 3.3 5%	1.000	EA
54	4020665	IDCTR 2.2 UH 5% L9	MR 2.2 5%	1.000	EA
55	4042008	COIL VAR .202UH GREEN L5	SERIES 117 5/2T	1.000	EA
56	4042073	IDCTR 3.5T UR6 .133 UH TYPE E L6	T7-117 3.5T.133	1.000	EA
57	4020640	IDCTR MINI-RED .1 UH 5% L7	MR .10 5%	1.000	EA
58	4020673	IDCTR MINI-RED 27UH 10% L3,L8	MR 27 10%	2.000	EA
59	4020467	FERROX CUBE 500 OHM L1	VK200 10/3B	1.000	EA
60	1290188	SIL PAD VR1	7403-09-FR-51	1.000	EA
61	1090182	SCR PNH PHPS 6-32 X 1/4 SST		1.000	EA
62	1090554	NUT HEX 6-32 SM PATT		1.000	EA
63	1090588	WSHR LK #6 SR SST		1.000	EA
64	3291069	FILTER FEED THRU SM THD FL1,FL2,FL3	859619-1	3.000	EA
65	3090230	CONN SMB PC RT ANG MALE BLKHD J2,J3	2110-1511-000	2.000	EA
66	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3,TP4	430-101	4.000	EA
67	1050129	SCR PNH PHPS 4-40 X 1/4 SST		2.000	EA
68	1130491	WSHR SST 5710-35-16	5710-35-16	2.000	EA

FM DEMODULATOR

Schematic 91D7260
Parts List 20D2811

The FM Demodulator module performs three major functions:

1. Extraction of baseband information from the frequency modulated input signal.
2. Generation of dc metering signal proportional to the logarithm of the input RF carrier over a three-decade range.
3. Generation of a mute signal to squelch the receiver when the RF input signal is too low for reliable operation.

FM Demodulator

The 3 MHz RF signal at J3 is fed to a low-noise amplifier, U4 and its associated circuitry, where it receives approximately 30 dB of voltage amplification. This signal passes through a 3 MHz phase linear bandpass filter (L8 through L10 with C83 and C84). The output of this filter drives a high-gain (60 dB) nonsaturating symmetrical limiting amplifier U6. The amplitude-limited signal is then fed to a precision charge count FM detector to extract the baseband information.

The FM detector operates as follows: Q15, Q16 and Q18 form a differential amplifier with Q13 and Q14 serving as constant-current collector loads. This amplifier has a gain in excess of 30 dB. Q10 and Q17 in conjunction with diodes CR15 through CR17 form low-noise voltage clamps to ensure nonsaturating action of the differential amplifier transistors. The current outputs of the differential amplifier alternately charge C62 and C63 through diodes CR12 and CR13. These capacitors are then alternately discharged through Q11 and Q12, the total current being proportional to the signal frequency. Q11 and Q12 serve as current to voltage converters whose outputs are combined and integrated in a 500 kHz low-pass filter (L4 and L5 and associated circuitry). The output from this filter contains the baseband information.

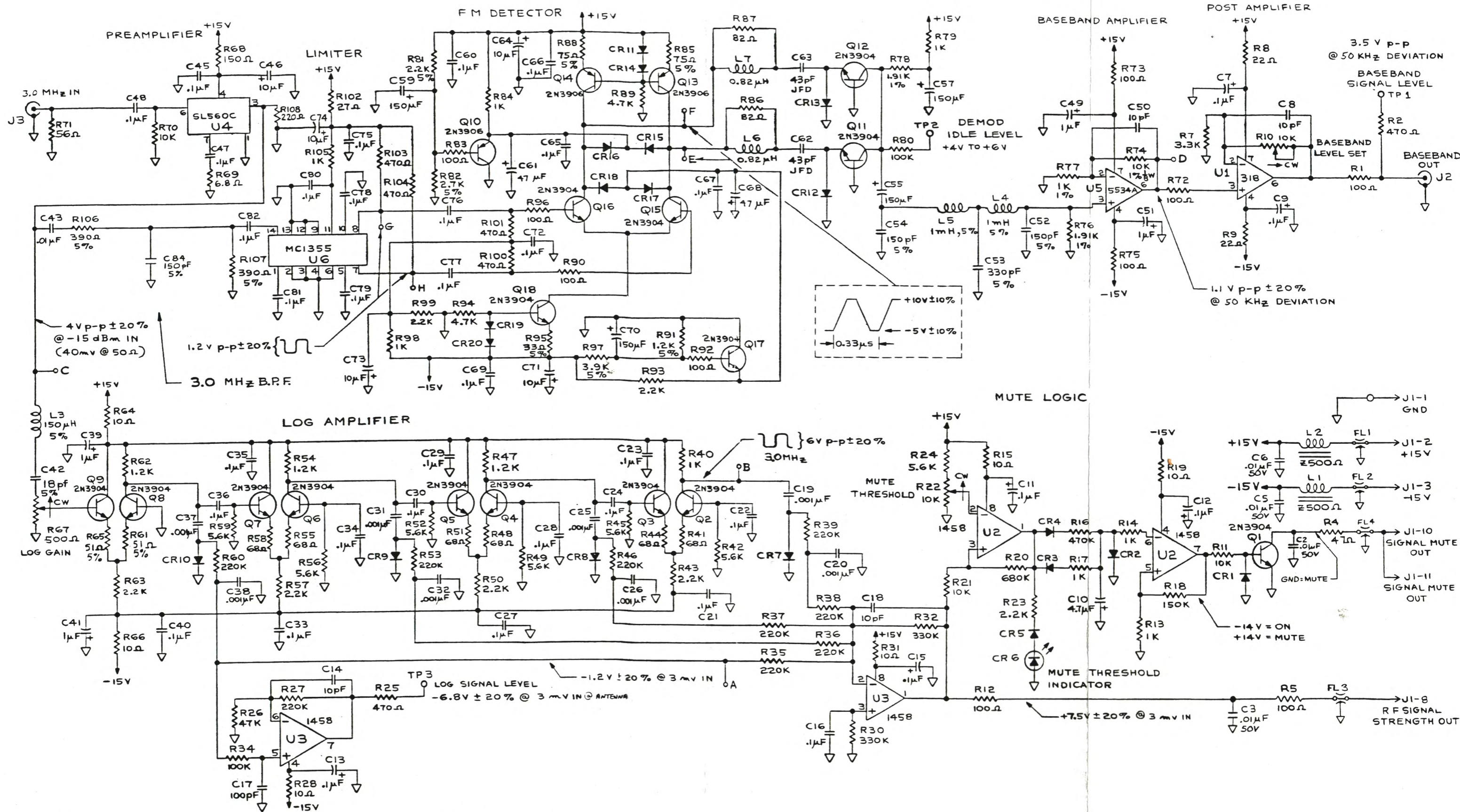
A two-stage low-noise amplifier (U5 and U1) then amplifies the baseband signal to a useful system level. Baseband Level Adjust R10 is set to deliver a 3.5 V p-p signal at J2 for an FM signal with 50 kHz deviation or 2.8 V p-p signal at J2 for an FM signal with 40 kHz deviation. This FM detector is inherently wideband, linear, and adjustment free.

RF Signal Strength Detector (Log Amplifier)

The RF signal from U4 is also sent to a four-stage successive limiting differential amplifier (Q2 through Q9) through a simple bandpass filter (L3 and C42). Each stage of this amplifier drives an amplitude detector (CR7 through CR10), which in conjunction with the summing amplifier U3 produces a dc metering signal at J1-9 that is proportional to the logarithm of the RF input level over three decades of amplitude. This voltage is used to indicate RF signal strength over the range of 3 microvolts to 3000 microvolts on the front panel meter. LOG GAIN control R67 is used to establish the linearity of the signal sent to the Metering and Status module.

Mute Logic

The RF signal strength voltage from the log amplifier is also sent to comparator U2, which compares this level to a preset reference voltage established by MUTE Threshold Adjust R22. Decreasing this reference voltage decreases the signal strength required to initiate the mute condition. Whenever the logic circuitry is in the mute condition, MUTE Threshold indicator CR6 will glow red. A 2 dB hysteresis is built into the mute logic to eliminate "chattering" near the mute threshold. Also network CR3, CR4, R16, R17, and C10 provide a fast-attack, slow-release (1 ms and 1.5 seconds respectively) to and from the mute mode to eliminate "thumps". The mute signal is brought out on J1-10 and J1-11.



- NOTES:
- UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS, 1/4W, 10% CAPACITORS ARE IN MICROFARADS DIODES ARE IN4154
 - PC BOARD 51D5926
 - COMPONENT LAYOUT 20D2811
 - POINTS "A" THRU "H" ARE DIAGNOSTIC TEST POINTS

FOR USE @ 3.0 MHz USED ON: PCL-606

G		F		E		D		C		B		A	
<p>Moseley</p> <p>SCHMATIC - FM DEMOD, METER AND MUTE</p> <p>91D7260 IG</p>													

MUSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 SANTA BARBARA, CA 93117-3093
 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9301284

DESCRIPTION: ASSY FM DEMOD PCL-606
 ENG.DRAWING NO.: 2002811 P

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473071	PCB FM DEMOD PCL-606	5105926 J	1.000	EA
2	3730173	IC LM318N OPAMP HISPEED U1	LM-318N	1.000	EA
3	3730215	IC LM1458N OPAMP DUAL U2,U3	LM-1458N	2.000	EA
4	3730769	IC SL560C U4	SL560C	1.000	EA
5	3730728	IC NE5534AN OPAMP LO NOISE U5	NE-5534AN	1.000	EA
6	3730348	IC MC1355P AMP FM/IF U6	MC1355P	1.000	EA
7	3600145	DIO 1N4154 25V 4NS SI D035 CR1,CR2,CR3,CR4,CR5,CR7,CR8,CR9,CR10,CR11,CR12, CR13,CR14,CR15,CR16,CR17,CR18,CR19,CR20	1N4154	19.000	EA
8	3390549	LED RED 2.0x2.0 WIDE RT/HOLDER CR6	550-0406	1.000	EA
9	3630456	XT 2N3904 Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q11,Q12,Q15,Q16,Q17, Q18	2N3904	15.000	EA
10	3630464	XT 2N3906 Q10,Q13,Q14	2N3906	3.000	EA
11	4020467	FERROX CUBE 500 OHM L1,L2	VK200 10/38	2.000	EA
12	4020483	LNK/FU MINI-RED 150UH 5% L3	MR 150 5%	1.000	EA
13	4020475	IDCTR MINI-RED 1.0 MH 5% L4,L5	MR 1000 5%	2.000	EA
14	4020178	IDCTR RF .82 UH L6,L7	9230-18	2.000	EA
18	4630299	POT CER PC PIN 10K OHM .75W R10,R22	3006P-1-103	2.000	EA
19	4630679	POT CER PC PIN 500 OHM .75W R67	3006P-1-501	1.000	EA
20	4210050	CAP MICA DIP 10PF +/- 0.5 C8,C14,C18,C50	UM-15-100D	4.000	EA
21	4210084	CAP MICA DIP 18PF 5% C42	UM-15-180J	1.000	EA
22	4210266	CAP MICA DIP 100PF 5% C17	UM-15-101J	1.000	EA
23	4210308	CAP MICA DIP 150PF 5% C52,C54,C84	UM-15-151J	3.000	EA
24	4210415	CAP MICA DIP 330PF 5% C53	UM-15-331J	1.000	EA
26	4240149	CAP GL 43PF 5% C62,C63	UY01430J	2.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
27	4310108	CAP DISC CER .001/1KV C19,C20,C25,C26,C31,C32,C37,C38	DD-102G	8.000	EA
28	4310132	CAP DISC .01/50V C2,C3,C5,C6	UK-50-103	4.000	EA
29	4310264	CAP .1 50V 25U 20% C7,C9,C11,C12,C13,C15,C16,C21,C22,C23,C24,C27, C28,C29,C30,C33,C34,C35,C36,C40,C45,C47,C48,C60, C65,C66,C67,C69,C72,C75,C76,C77,C78,C79,C80,C81, C82	5020ES50RD104M	37.000	EA
30	4280038	CAP TANT EPOX-DIP 1/35V 20% C39,C41,C49,C51	196D105X0035HA1	4.000	EA
31	4280053	CAP TANT EPOX-DIP 4.7/35V 10% C10	196D475X0035JA1	1.000	EA
32	4280079	CAP TANT EPOX-DIP 10/25V 20% C46,C64,C71,C73,C74	196D106X0025KA1	5.000	EA
33	4280178	CAP TANT EPOX-DIP 150/15V 20% C55,C57,C59,C70	196D157X0015TE4	4.000	EA
34	2062412	SHIELD MAGNETIC CYLINDER L4,L5	05B2746	A0	2.000 EA
35	2300846	ASSY CABLE FM DEMOD PCL-606 J1	24B1088	B	1.000 EA
36	2110237	HEATSINK TO-5 PUSH-ON U4	#1115B		1.000 EA
37	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3	430-101		3.000 EA
39	3250016	SKT DUAL IN LINE 8 PIN U1,U2,U3,U5	640463-1		4.000 EA
40	3250024	SKT DUAL IN LINE 14 PIN U6	640357-1		1.000 EA
41	3090230	CONN SMB PC RT ANG MALE BLKHD J2,J3	2110-1511-000		2.000 EA
42	4410023	RES 10 OHM 1/4W 10% R15,R19,R28,R31,R64,R66	RC07GF100K		6.000 EA
43	4410122	RES 100 OHM 1/4W 10% R1,R5,R12,R72,R73,R75,R83,R90,R92,R96	RC07GF101K		10.000 EA
44	4410148	RES 150 OHM 1/4W 10% R68	RC07GF151K		1.000 EA
45	4410247	RES 1K OHM 1/4W 10% R13,R14,R17,R40,R79,R84,R98,R105	RC07GF102K		8.000 EA
46	4460630	RES 1.2K 1/4W 5% R47,R54,R62,R91	RC07GF122J		4.000 EA
47	4410379	RES 10K OHM 1/4W 10% R11,R21,R70	RC07GF103K		3.000 EA
48	4410494	RES 100K OHM 1/4W 10% R34,R80	RC07GF104K		2.000 EA
49	4410510	RES 150K OHM 1/4W 10% R18	RC07GF154K		1.000 EA
50	4410726	RES 6.8 OHM 1/4W 10% R69	RC07GF6R8		1.000 EA
51	4410049	RES 22 OHM 1/4W 10% R8,R9	RC07GF220K		2.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
52	4410056	RES 27 OHM 1/4W 10% R102	RC07GF270K	1.000	EA
53	4460192	RES 2.2K OHM 1/4W 5% R23,R43,R50,R57,R63,R81,R93,R99	RC07GF222J	8.000	EA
54	4460200	RES 2.7K OHM 1/4W 5% R82	RC07GF272J	1.000	EA
55	4410536	RES 220K OHM 1/4W 10% R27,R35,R36,R37,R38,R39,R46,R53,R60	RC07GF224K	9.000	EA
56	4460614	RES 33 OHM 1/4W 5% R95	RC07GF330J	1.000	EA
57	4460697	RES 3.9K OHM 1/4W 5% R97	RC07GF392J	1.000	EA
58	4410551	RES 330K OHM 1/4W 10% R30,R32	RC07GF334K	2.000	EA
59	4460101	RES 390 OHM 1/4W 5% R106,R107	RC07GF391J	2.000	EA
60	4410304	RES 3.3K OHM 1/4W 10% R7	RC07GF332K	1.000	EA
61	4410205	RES 470 OHM 1/4W 10% R2,R25,R100,R101,R103,R104	RC07GF471K	6.000	EA
62	4410338	RES 4.7K OHM 1/4W 10% R89,R94	RC07GF472K	2.000	EA
63	4410452	RES 47K OHM 1/4W 10% R26	RC07GF473K	1.000	EA
64	4410577	RES 470K OHM 1/4W 10% R16	RC07GF474K	1.000	EA
65	4410346	RES 5.6K OHM 1/4W 10% R24,R42,R45,R49,R52,R56,R59	RC07GF562K	7.000	EA
66	4410106	RES 68 OHM 1/4W 10% R41,R44,R48,R51,R55,R58	RC07GF680K	6.000	EA
67	4410593	RES 680K OHM 1/4W 10% R20	RC07GF684K	1.000	EA
68	4460648	RES 75 OHM 1/4W 5% R85,R88	RC07GF750J	2.000	EA
69	4520250	RES 1.91K OHM 1/4W 1% R76,R78	RN60D1911F	2.000	EA
70	4520037	RES 1K OHM 1/4W 1% R77	RN60D1001F	1.000	EA
71	4510145	RES 10.0K OHM 1/8W 1% R74	RN55C1002F	1.000	EA
72	2090967	FRAME BASE MODULE PCL-606	05C2867	E	1.000 EA
73	2090983	FRAME F.M. DEMOD RCVR PCL-606	05D2869	J	1.000 EA
74	1050129	SCR PNH PHPS 4-40 X 1/4 SST			2.000 EA
75	4410114	RES 82 OHM 1/4W 10% R86,R87	RC07GF820K	2.000	EA
76	2090975	COVER MODULE PCL-606	05C2868	D	2.000 EA
77	1310093	CLIP PCL-606	05C2882	B	16.000 EA
78	4410080	RES 47 OHM 1/4W 10% R4	RC07GF470K	1.000	EA
79	4410098	RES 56 OHM 1/4W 10% R71	RC07GF560K	1.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
30	3291069	FILTER FEED THRU SM THD FL1,FL2,FL3,FL4	859619-1	4.000	EA
81	1130491	WSHR SST 5710-35-16	5710-35-16	2.000	EA
82	4460036	RES 51 OHM 1/4W 5% R61,R65	RC07GF510J	2.000	EA
83	1560226	TBG TEFLON 20AWG NAT L8	TFT200-20	.062	FT
84	4410163	RES 220 OHM 1/4W 10% R108	RC07GF221K	1.000	EA
85	4260137	CAP TANT EPOX-DIP 47/20V C61,C68	196D476X0020PE4	2.000	EA
86	4310272	CAP .01 50V X7R 10% C43	5018EM50RD103K	1.000	EA
87	1641927	W BUSS 22GA L8	298	.083	FT

MONO BASEBAND PROCESSOR

Schematic 91D7313
Parts List 20D2837

The Mono Baseband Processor Module performs five main functions:

1. Mutes the program and subcarrier output when commanded by the Mute and Transfer Module.
2. Applies high-frequency response correction to the baseband signals to compensate for the high-frequency roll-off caused by the 10.7 MHz IF filters.
3. Divides the input baseband signal into separate program and subcarrier channels.
4. Provides selectable (in/out) 75 μ s de-emphasis of the program channel.
5. Provides selectable (in/out) 15 kHz low-pass filtering of the program channel.

The 2.5 V p-p baseband signal from the FM Demodulator Module enters the composite baseband processor through J2. It first passes through a low-pass filter (consisting of inductors L4 through L7 and capacitors C5 and C8 through C11) to attenuate high-frequency adjacent channels which otherwise might cause slew rate limiting in the stages that follow.

The filtered output is passed to mute switch U2, which consists of series-shunt FET switches. A +5 V control voltage at J1 pin 11 or 12 causes control logic U1 to drive the mute switch into the MUTE state. Control voltages less than +0.6 V allow the mute switch to pass the baseband signal to buffer amplifier U4.

The output of U4 feeds high-frequency correction amplifier U3. This amplifier adds a controlled boost to frequencies between 10 kHz and 80 kHz to compensate for the attenuation of the baseband caused by the 10.7 MHz IF bandpass filters. HF TILT adjustment R11 is used to set the amount of high-frequency boost. The output of U3 is split and routed to both the mono and multiplex amplifier channels.

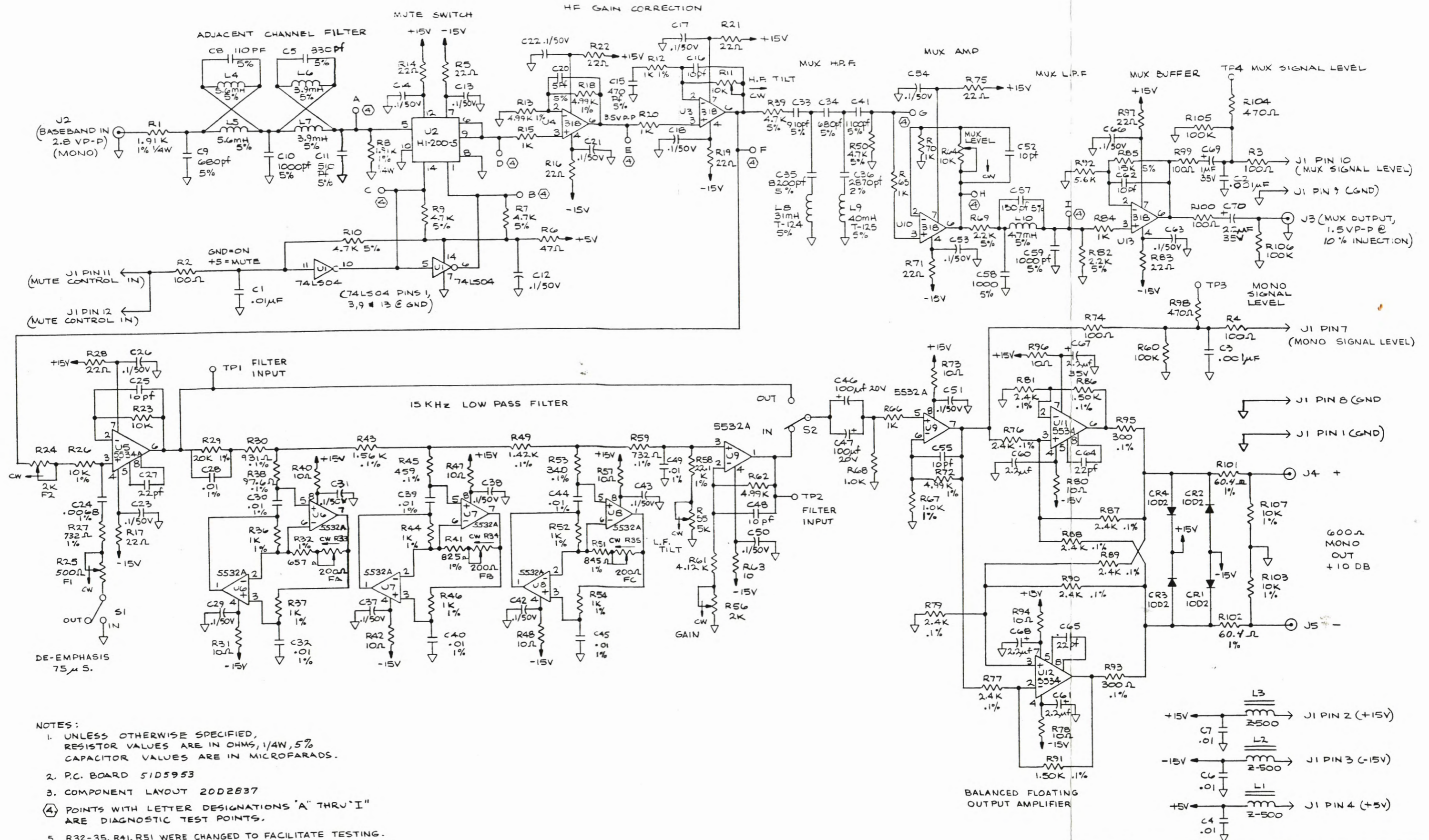
The signal flow through the mono program channel begins with a selectable (in/out) 75 μ s de-emphasis. When S1 is in the OUT position, U5 acts as a unity gain buffer. When S1 is in the IN position, the de-emphasis is adjusted as follows: F1 (R24) is used to attenuate the signal 3 dB at 2.0 kHz, and F2 (R25) is used to adjust the gain 18 dB at 20 kHz. The output of U5 is then sent to the 15 kHz low-pass filter and S2.

This filter uses a technique called "Impedance Transform" such that the .1% resistors act as inductors, the capacitors act as resistors, and the ICs and associated components act as capacitors. The result is a 7-pole elliptical filter with a 15.9 kHz cutoff frequency. The transmission zeros for the filter are established as follows: FA (R33) is adjusted to 44.5 kHz; FB (R34) is adjusted to 22.5 kHz; and FC (R35) is set to 26.5 kHz. In split mono applications, these adjustments are used to phase match the filters. Gain (R56) is used to compensate the insertion loss of the filter and is normally adjusted at 5 to 10 kHz. LF TILT (R55) is used to control the low-frequency characteristics of the filter and is usually adjusted at 100 Hz. S2 provides for the in/out selection of the 15 kHz filter.

U9, U11 and U12 and their associated circuitry, form a transformerless +10 dBm 600 ohm output amplifier. C46 and C47 provide a dc reference of 0 volts to U9. The output of U9 is sent to the front-panel metering through J1 pin 7, and the floating output amplifier. This amplifier provides approximately 5 dB of head room for +15 dB of signal output prior to clipping.

The signal flow to the MUX channel begins with the output of the U3 driving the 22 kHz MUX high-pass filter (L8 and L9, and C33 and C36 through C41) which attenuates the mono program signal and passes the MUX subcarriers. MUX amplifier U10 then amplifies the subcarriers to a useful signal level. MUX level adjustment R64 is used to set the gain of this amplifier.

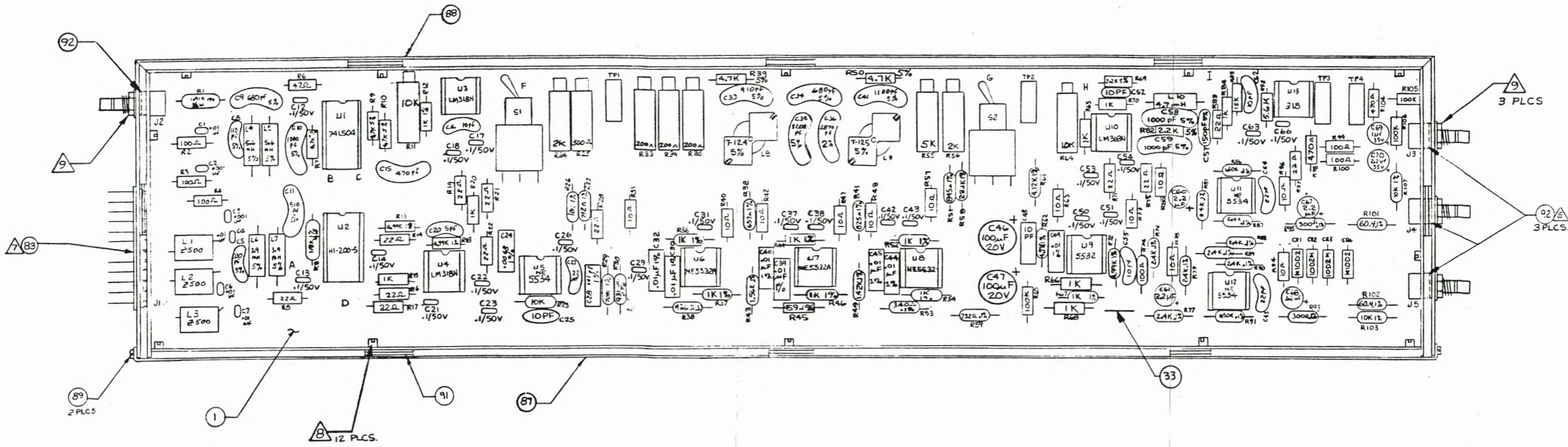
The output of U10 is passed through the 100 kHz MUX low-pass filter (L10, C53 and C59) to attenuate any high-frequency noise. This filter exhibits a high-frequency rise in passband response between 22 kHz and 100 kHz to compensate for the subcarrier amplitude and rolloff caused by the 10.7 MHz IF bandpass filters. The output from this filter is then buffered by amplifier U13.



NOTES:

- UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/4W, 5% CAPACITOR VALUES ARE IN MICROFARADS.
- P.C. BOARD 51D5953
- COMPONENT LAYOUT 20D2837
- POINTS WITH LETTER DESIGNATIONS 'A' THRU 'I' ARE DIAGNOSTIC TEST POINTS.
- R32-35, R41, R51 WERE CHANGED TO FACILITATE TESTING. FORMER VALUES: R32 698Ω; R33 100Ω; R34 100Ω; R35 100Ω; R41 866Ω; R51 909Ω.

ADD FILTER INPUT NEAR TP1 AND TP2		DATE
ECO 4.6.73		9/17/83
27 JAN 86 CH		
F REVISIONS: 2-31/82		
G FROM: 17 18 11		
H 23 WBS 75%		
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J FROM: 17 18 11		
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NOTES:
 1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS $\frac{1}{4}$ W
 5%. CAPACITOR VALUES ARE IN MICROFARADS.
 2. P.C. BOARD 51D5953
 3. SCHEMATIC 91D7313.

ITEM NO: 9301417

Moseley	
COMPONENT LAYOUT	
MONO. BASEBAND PROC.	
DATE	REV
DE 12/77	2X
20D2837	G

PARENT ITEM: 9301417

DESCRIPTION: ASSY BASEBAND PROC MONO PCL606
 ENG.DRAWING NO.: 20D2837 G

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473139	PCB MONO BASE BAND PROC PCL606	51D5953	E	1.000 EA
2	3730173	IC LM318N OPAMP HISPEED U3,U4,U10,U13	LM-318N		4.000 EA
3	3730728	IC NE5534AN OPAMP LO NOISE U5,U11,U12	NE-5534AN		3.000 EA
4	3660685	IC SN74LS04N HX INV U1	SN74LS04N		1.000 EA
5	3730934	IC HI-200-5 U2	HI3-0200-5		1.000 EA
6	3730967	IC DUAL OP AMP U6,U7,U8,U9	NE5532AN		4.000 EA
7	4280038	CAP TANT EPOX-DIP 1/35V 20% C69	196D105X0035HA1		1.000 EA
8	4210100	CAP MICA DIP 22PF 5% C27,C64,C65	DM-15-220J		3.000 EA
9	4210043	CAP MICA DIP 5PF +/- 0.5 C20	DM-15-050D		1.000 EA
10	4310280	CAP .001 100V C2,C3	C315C102MIR5CA		2.000 EA
11	4310272	CAP .01 50V X7R 10% C1,C4,C6,C7	5018EM50RD103K		4.000 EA
12	4210415	CAP MICA DIP 330PF 5% C5	DM-15-331J		1.000 EA
13	4210472	CAP MICA DIP 510PF 5% C11	DM-15-511J		1.000 EA
14	4210548	CAP MICA DIP 910PF 5% C33	DM-15-911J		1.000 EA
16	4210456	CAP MICA DIP 470PF 5% C15	DM-15-471J		1.000 EA
17	4210506	CAP MICA DIP 680PF 5% C9,C34	DM-15-681J		2.000 EA
18	4210274	CAP MICA DIP 110PF 5% C8	DM-15-111J		1.000 EA
19	4220018	CAP MICA DIP 1000PF 5% C10,C58,C59	DM-19-102J		3.000 EA
20	4250726	CAP POLYCARB .0068/100V 1% C24	250B682F		1.000 EA
21	4210050	CAP MICA DIP 10PF +/- 0.5 C16,C25,C48,C52,C55,C62	DM-15-100D		6.000 EA
23	4280160	CAP TANT EPOX-DIP 100/20V C46,C47	196D107X0020TE4		2.000 EA
24	4250718	CAP POLYCARB .01/100 1% C28,C30,C32,C39,C40,C44,C45,C49	250B103F		8.000 EA
25	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C60,C61,C67,C68,C70	196D225X0035JA1		5.000 EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
27	4220232	CAP MICA DIP 8200PF 5% C35	DM-19-822J	1.000	EA
28	4220174	CAP MICA DIP 2870PF 2% C36	DM-19-F2871G	1.000	EA
29	4220026	CAP MICA DIP 1100PF 5% C41	DM-19-112J	1.000	EA
32	4210308	CAP MICA DIP 150PF 5% C57	DM-15-151J	1.000	EA
33	1641927	W BUSS 22GA	298	.080	FT
36	4520250	RES 1.91K OHM 1/4W 1% R1,R8	RN6001911F	2.000	EA
37	4460051	RES 100 OHM 1/4W 5% R2,R3,R4,R74,R99,R100	RC07GF101J	6.000	EA
38	4460754	RES 22 OHM 1/4W 5% R5,R14,R16,R17,R19,R21,R22,R28,R71,R75,R83,R97	RC07GF220J	12.000	EA
39	4460738	RES 47 OHM 1/4W 5% R6	RC07GF470J	1.000	EA
40	4460119	RES 470 OHM 1/4W 5% R98,R104	RCR07G471J	2.000	EA
41	4460242	RES 4.7K OHM 1/4W 5% R7,R9,R10,R39,R50	RC07GF472J	5.000	EA
42	4460317	RES 10K OHM 1/4W 5% R23	RC07GF103J	1.000	EA
44	4460143	RES 1K OHM 1/4W 5% R15,R20,R65,R66,R68,R70,R84	RC07GF102J	7.000	EA
45	4510665	RES 1.00K OHM 1/8W 1% R12,R36,R37,R44,R46,R52,R54,R67	RN55E1001F	8.000	EA
46	4510145	RES 10.0K OHM 1/8W 1% R26,R103,R107	RN55C1002F	3.000	EA
47	4460010	RES 10 OHM 1/4W 5% R31,R40,R42,R47,R48,R57,R63,R73,R78,R80,R94,R96	RC07GF100J	12.000	EA
48	4510103	RES 4.99K OHM 1/8W 1% R13,R18,R62,R72	RN55E4991F	4.000	EA
49	4510749	RES 845 OHM 1/8W 1% R51	RN55E8450F	1.000	EA
50	4510756	RES 657 OHM 1/8W 1% R32	RM55E6570F	1.000	EA
51	4510046	RES 825 OHM 1/8W 1% R41	RN55C8250F	1.000	EA
52	4500021	RES 459 OHM 1/8W .1% R45	RN55E4590B	1.000	EA
53	4500054	RES 1.42K 1/8W .1% R49	RN55E1421B	1.000	EA
54	4500062	RES 1.56K 1/8W .1% R43	RN55E1561B	1.000	EA
55	4500005	RES 97.0 OHM 1/8W .1% R38	RN55E97R6B	1.000	EA
56	4500039	RES 340 OHM 1/8W .1% R53	RN55E3400B	1.000	EA
57	4500047	RES 732 OHM 1/8W .1% R27,R59	RN55E7320B	2.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
58	4510657	RES 22.1K OHM 1/8W 1% R58	RN55E2212F	1.000	EA
59	4400481	RES 100K OHM 1/4W 5% R60,R105,R106	RC07GF104J	3.000	EA
60	4510624	RES 60.4 OHM 1/8W 1% R101,R102	RN55E60R4F	2.000	EA
61	4500104	RES 300 OHM 1/8W .1% R93,R95	RN55E3000B	2.000	EA
62	4500096	RES 1.5K OHM 1/8W .1% R86,R91	RN55E1501B	2.000	EA
63	4500088	RES 2.4K OHM 1/8W .1% R76,R77,R79,R81,R87,R88,R89,R90	RN55E2401B	8.000	EA
64	4400192	RES 2.2K OHM 1/4W 5% R69,R82	RC07GF222J	2.000	EA
66	4400341	RES 15K OHM 1/4W 5% R85	RC07GF153J	1.000	EA
67	4510160	RES 20.0K OHM 1/8W 1% R29	RN55E2002F	1.000	EA
68	4500013	RES 931 OHM 1/8W .1% R30	RN55E9310B	1.000	EA
69	4510087	RES 4.12K OHM 1/8W 1% R61	RN55E4121F	1.000	EA
70	4630729	POT CER PC PIN 5K OHM .75W 20T R55	43P502T000	1.000	EA
71	4630695	POT CER PC PIN 10K OHM .75W 20T R11,R64	43P103	2.000	EA
72	4630760	POT CER PC PIN 2K OHM .75W 20T R24,R56	43P202	2.000	EA
73	4630794	POT CER PC PIN 200 OHM .75W 20T R33,R34,R35	43P201	3.000	EA
74	4630679	POT CER PC PIN 500 OHM .75W R25	3006P-1-501	1.000	EA
75	4020053	IDCTR MINI-RED 4.7 MH L10	MR 4700	1.000	EA
76	4041067	ASSY 39.56MH CUP CORE COIL L9	02C1400-125 E	1.000	EA
77	4041059	ASSY 30.89MH CUP CORE COIL L8	02C1400-124 E	1.000	EA
78	4020046	IDCTR MINI-RED 3.9 MH 5% L6,L7	MR 3900 5%	2.000	EA
79	4020699	IDCTR MINI-RED 5.6 MH 5% L4,L5	MR 5600 5%	2.000	EA
80	4020467	FERROX CUBE 500 OHM L1,L2,L3	VK200 10/3B	3.000	EA
81	3610003	DIO 10D2 200V 1A SI D039 CR1,CR2,CR3,CR4	10D2	4.000	EA
82	3250016	SKT DUAL IN LINE 8 PIN U3,U4,U5,U6,U7,U8,U9,U10,U11,U12,U13	640463-1	11.000	EA
83	3090222	CONN 12PIN SNGL ROW RTANG HDR J1	1-87233-2	1.000	EA
84	3090230	CONN SMB PC RT ANG MALE BLKHD J2,J3,J4,J5	2110-1511-000	4.000	EA

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
85	2090975	COVER MODULE PCL-606	05C2868	D	2.000 EA
86	3290152	JACK TEST WHITE R ANGLE TP1,TP2,TP3,TP4	430-101		4.000 EA
87	2090967	FRAME BASE MODULE PCL-606	05C2867	E	1.000 EA
88	2091171	FRAME BASEBAND PROC MOND 606	05D2909	F	1.000 EA
89	1050129	SCR PNH PHPS 4-40 X 1/4 SST			2.000 EA
91	1310093	CLIP PCL-606	05C2882	B	16.000 EA
92	1130491	WSHR SST 5710-35-16	5710-35-16		4.000 EA
93	3190782	SW OPDT PC S1,S2	573-21190301100		2.000 EA
94	3250024	SKT DUAL IN LINE 14 PIN U1,U2	640357-1		2.000 EA
95	4310264	CAP .1 50V Z5U 20% C12,C13,C14,C17,C18,C21,C22,C23,C25,C29,C31,C37, C38,C42,C43,C50,C51,C53,C54,C63,C66	5020ES50RD104M		21.000 EA
96	4460259	RES 5.6K OHM 1/4W 5% R92	RC07GF562J		1.000 EA

METERING AND STATUS

Schematic 91D7264
Parts List 20D2818-1

The receiver Metering and Status board includes three main sections:

1. Eight separate metering functions
2. Power supply and operating status indicators
3. OPERATE/TRANSFER switch

Metering Functions

Potentiometers R1 through R8 are used as input adjustments. Resistors R31 through R38 have been selected to increase the allowable input voltage. The values selected are explained in note 4 on the schematic.

U4 acts as a switch to select one of the eight metering channels. The selected channel is based on a binary code produced by U3, which is an up/down counter. U2 is incremented and decremented by METER FUNCTION switch S1, U3, and associated circuitry.

U1 decodes the output of the counter and, by activating one of eight LEDs, indicates the position selected.

The output of U4 (the multiplex switch) is buffered and amplified by U7. The output of this buffer is used by half of U5 to indicate the polarity of the input signal (red equals plus, and green equals minus). The output of U7 also drives the absolute value amplifier.

Figure P-1 is a simplified diagram of the absolute value amplifier. It is included to show the difference in gain between a negative and positive input. The values shown in parentheses are for a typical full-scale input. CR16 and C38 (not shown) provide peak detection of ac waveforms. The output of the absolute amplifier is connected through the harness to an output terminal on the back panel of the receiver and to U5, the meter ballistics amplifier.

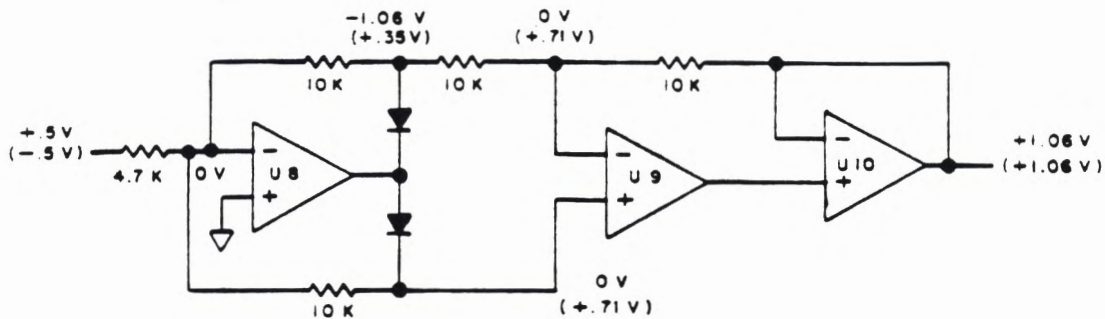


Figure P-1. Simplified diagram of absolute value amplifier.

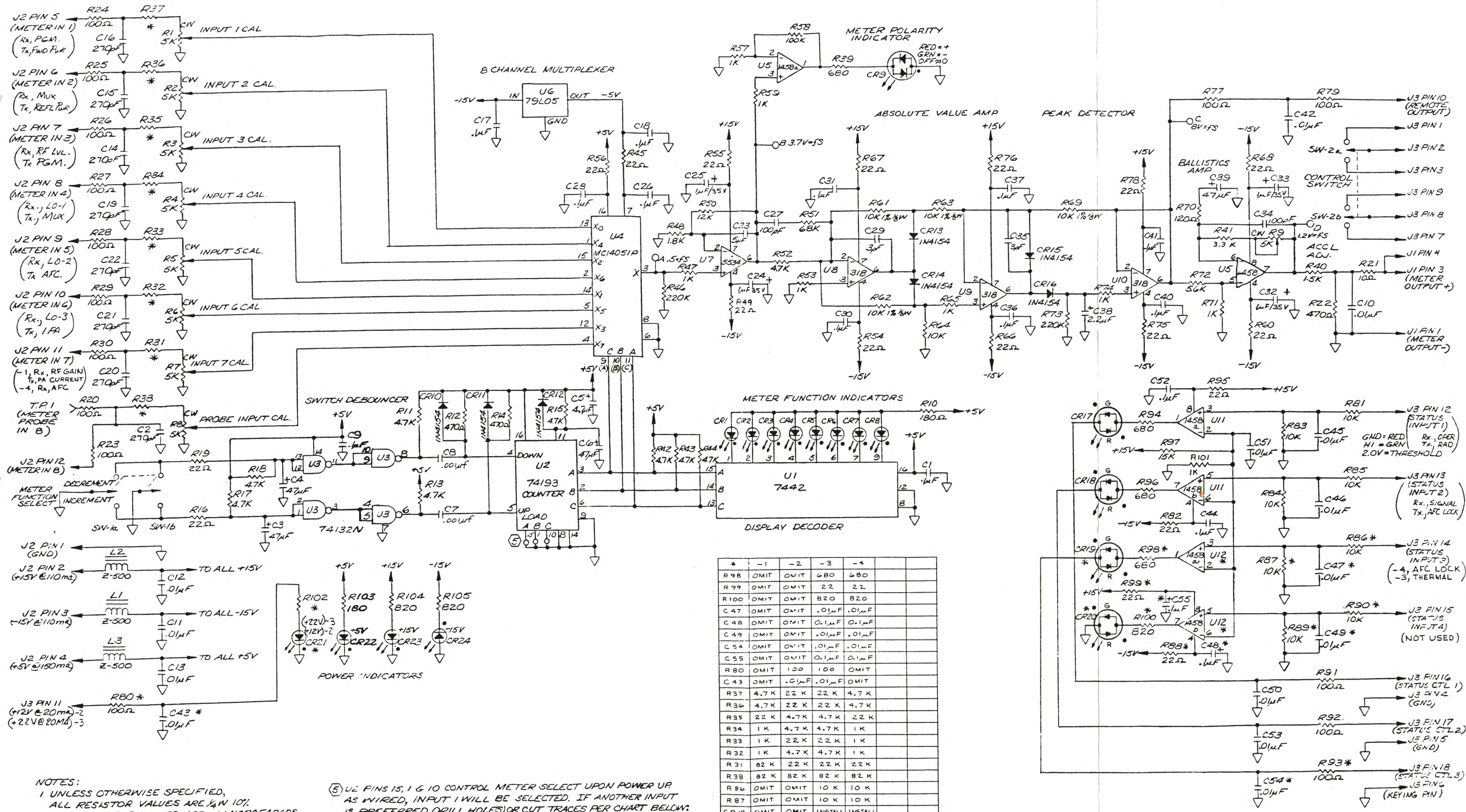
U5 acts as an attenuator and meter acceleration amplifier. R9 is used to adjust the meter ballistics response. The output of this circuit is connected to the meter through J1.

Status Indicators

LEDs CR22 through CR24 are used to indicate the status of the power supplies. CR17 and CR18 indicate the status of the receiver. U11 is used as a TTL threshold detector. R97 and R101 set the threshold at approximately 2 volts referred to the input. U12 and associated circuitry are not presently used.

Control Switch

OPERATE/TRANSFER switch S2 is a double-pole, double-throw switch used to activate logic circuits within the receiver.



* -1	-2	-3	-4		
R 98	OMIT	OMIT	680	680	
R 99	OMIT	OMIT	22	22	
R 100	OMIT	OMIT	820	820	
C 47	OMIT	OMIT	.01µF	.01µF	
C 48	OMIT	OMIT	.01µF	.01µF	
C 49	OMIT	OMIT	.01µF	.01µF	
C 54	OMIT	OMIT	.01µF	.01µF	
C 55	OMIT	OMIT	.01µF	.01µF	
R 80	OMIT	100	100	OMIT	
C 43	OMIT	.01µF	.01µF	OMIT	
R 37	4.7K	22K	22K	4.7K	
R 36	4.7K	22K	22K	4.7K	
R 35	22K	4.7K	4.7K	22K	
R 34	1K	4.7K	4.7K	1K	
R 33	1K	22K	22K	1K	
R 32	1K	4.7K	4.7K	1K	
R 31	82K	22K	22K	22K	
R 38	82K	82K	82K	82K	
R 86	OMIT	OMIT	10K	10K	
R 87	OMIT	OMIT	10K	10K	
CR 19	OMIT	OMIT	INSTALL	INSTALL	
CR 20	OMIT	OMIT	OMIT	OMIT	
CR 2	OMIT	INSTALL	INSTALL	OMIT	
R 88	OMIT	OMIT	22	22	
R 89	OMIT	OMIT	10K	10K	
R 90	OMIT	OMIT	10K	10K	
SW-2	ON NOISE	ON NOISE	ON NOISE	ON NOISE	
U 12	OMIT	OMIT	INSTALL	INSTALL	
R 102	OMIT	SMD	1.2K 1/8W	SMD	
R 93	OMIT	OMIT	100	100	

NOTES:
 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE 1/4W 10%. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 2. PC BOARD 51D5934
 3. COMPONENT LAYOUT 20D2818
 4. R31 THRU R38 VALUES ARE BASED ON THE FOLLOWING DESIGN CRITERIA:
 FULL SCALE RANGE
 1V TO 3.2V → R=4.7K
 3.2V TO 10V → R=22K
 10V TO 32V → R=82K

5. U2 PINS 15, 16 & 10 CONTROL METER SELECT UPON POWER UP AS WIRED, INPUT 1 WILL BE SELECTED. IF ANOTHER INPUT IS PREFERRED (DRILL HOLES) OR CUT TRACES PER CHART BELOW:

INPUT SELECT	1	2	3	4	5	6	7	8
CUT TRACE	NONE	15	1	16/15	10	10&15	16/10	10&15

6. ALL DIAGNOSTIC VOLTAGES ARE ±20%

ADD SHEET 2 TO THIS PART TO COMPLETE BOARD. CHANGE ONLY: THIS BOARD IS NOT TO BE REWORKED. RELEASE TO PRODUCTION: 10/19/22. VILK 240PF. CITY 32.33.34. SW 4.32 VENE. MUSEUM. PH. 10/19/22. RELEASE TO PRODUCTION: 10/19/22. ECO 3044 32.33.34. MUSEUM. PH. 10/19/22. RELEASE TO PRODUCTION: 10/19/22. ECO 3044 32.33.34. MUSEUM. PH. 10/19/22.

Moseley
 CHEM-METERING AND STATUS BOARD
 TOL PRACT. 2 1/16 23 9 20 200 2 1/16 2 1/16
 DATE: 10/19/22
 91D7264 K

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(805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9204165

DESCRIPTION: ASSY MTRNG & STATUS PCL-606
ENG. DRAWING NO.: 20D2818-01 S

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
1	9205006	SUBASSY NEUTER MTRG/STAT BD	20D2818-05 S	1.000	EA
2	4410338	RES 4.7K OHM 1/4W 10% R36,R37	RC07GF472K	2.000	EA
3	4410411	RES 22K OHM 1/4W 10% R35	RC07GF223K	1.000	EA
4	4410247	RES 1K OHM 1/4W 10% R32,R33,R34	RC07GF102K	3.000	EA
5	4410486	RES 82K OHM 1/4W 10% R31,R38	RC07GF823K	2.000	EA
6	3190766	Sw DPDT ON-NONE-(ON) Sw2	0601-210	1.000	EA

MUTE AND TRANSFER

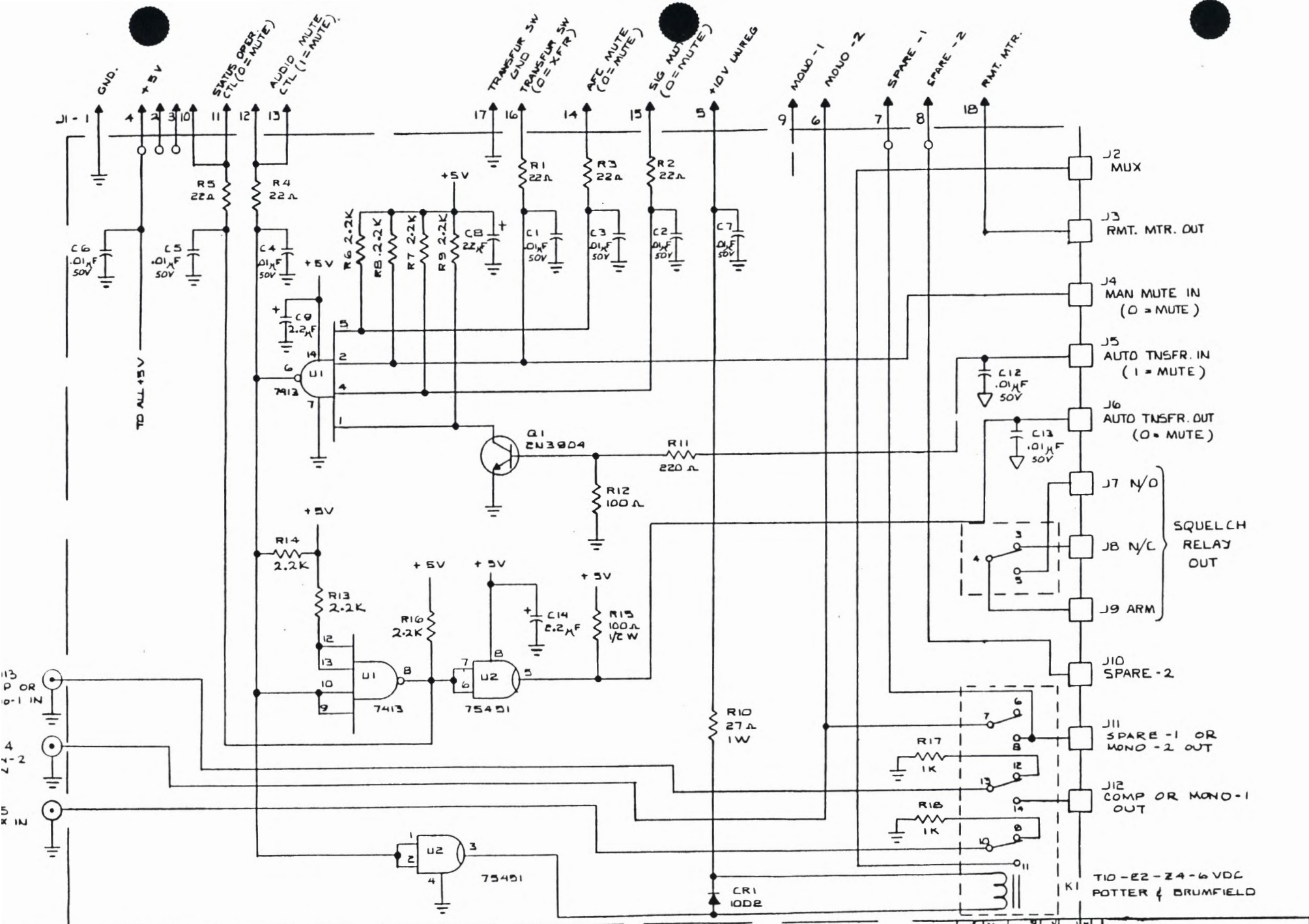
Schematic 91C7271
Parts List 20D2820

The Mute and Transfer module contains the necessary logic to squelch the receiver during periods of insufficient RF signal strength. This module also provides automatic changeover between two PCL-606 receivers when one is intended for hot standby service.

The Mute and Transfer module will go into the mute mode whenever pins 1, 2, 4, or 5 of U1 are in a TTL logic low state (0.0 V to +0.4 V). This will occur whenever one or more of the following conditions are present:

1. The front panel OPERATE/TRANSFER switch is in the TRANSFER position, forcing J1 pin 16 to a logic low level.
2. The signal mute line from the FM Demodulator module goes to a logic low level, forcing J1 pin 14 low.
3. The rear panel manual mute input (J18-8) is grounded, forcing J4 to a logic low level.
4. The rear panel auto transfer input (J18-7) is above +2.0 V. This signal will appear on J5, forcing the collector of Q1 to a logic low level.

When one of the above conditions is present, pin 6 of U1 will go to a TTL logic high state (+2.5 V to +5.0 V). This signal appears at J1 pins 12 and 13 and is sent to the Composite Baseband Processor module to activate the FET mute switch. This signal also drives the second half of U1, where it is inverted and sent to J1 pins 10 and 11 to control the front panel OPERATE status LED. Pin 8 of U1 also drives the first half of U2. When the receiver is muted, pin 5 of U2 will be at logic low. This signal exits the module on J6 and goes to the rear panel auto transfer output on J18-6.



NOTES:
 1. UNLESS OTHERWISE SPECIFIED
 RESISTOR VALUES ARE IN OHMS, 1/4W, 10%
 AND CAPACITOR VALUES UNLESS SPECIFIED ARE IN MICROFARADS.
 2. P.C. BOARD SIC 5936.
 3. COMPONENT LAYOUT ZDD2B20

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Moseley	
MUTE LOGIC AND TRANSFER BOARD PCL-606	
TOL PART. # 1/8" .25 ± .004	SCALE: N.C.N.L.
OWN: [initials]	DATE: 11-7-81
CHK: [initials]	BY: [initials]
106	91C 7271 E

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 (805) 968-9621

PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9204181

DESCRIPTION: ASSY MUTE & TRANSFER PCL-606
 ENG.DRAWING NO.: 2002820-1 F

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
	1560234	TBG TEFLON 22AWG NAT	TFT200-22	.150	FT
	1641927	W BUSS 22GA	298	.170	FT
	2202350	ASSY COAX SMB/RT SMB PCRT 12.5	2481093-3	2.000	EA
	3090255	CONN 18PIN SNGL ROW RTANG HDR	1-87233-8	1.000	EA
	3250010	SKT DUAL IN LINE 8 PIN	040463-1	1.000	EA
	3250024	SKT DUAL IN LINE 14 PIN	640357-1	1.000	EA
	3270337	RELAY 4PDT 6VDC	T10-E2-Z4-6VDC	1.000	EA
	3291085	PC JACK .040 PIN	09-9064-1-06	11.000	EA
	3473105	PCB MUTE & TRANSFER PCL-606	51C5930	1.000	EA
	3610003	DIO 1002 200V 1A SI 0039	1002	1.000	EA
	3630456	XT 2N3904	2N3904	1.000	EA
	3660115	IC SN7413N DU 4I NAND ST	SN7413N	1.000	EA
	3600917	IC SN75451P DU AND HIGHV OC	SN75451BP	1.000	EA
	4280046	CAP TANT EPOX-DIP 2.2/35V 20%	1960225X0035JA1	3.000	EA
	4310272	CAP .01 50V X7R 10%	5018EM50RD103K	9.000	EA
	4410049	RES 22 OHM 1/4W 10%	RC07GF220K	5.000	EA
	4410122	RES 100 OHM 1/4W 10%	RC07GF101K	1.000	EA
	4410163	RES 220 OHM 1/4W 10%	RC07GF221K	1.000	EA
	4410247	RES 1K OHM 1/4W 10%	RC07GF102K	2.000	EA
	4410288	RES 2.2K OHM 1/4W 10%	RC07GF222K	7.000	EA
	4420147	RES 100 OHM 1/2W 10%	RC20GF101K	1.000	EA
	4430104	RES 27 OHM 1W 10%	RC32GF270K	1.000	EA

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DATE: 6/30/87

PARENT ITEM: 9204330

DESCRIPTION: ASSY MUTE & TRANSFER PCL-606
 ENG. DRAWING NO.: 20D2820-2 F

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG. DRAWING NO.	QUANTITY PER	UM
	1560234	TBG TEFLON 22AWG NAT	TFT200-22	.150	FT
	1641927	W BUSS 22GA	298	.170	FT
	2202356	ASSY COAX SMB/RT SMB PCRT 12.5	2481093-3	3.000	EA
	3090255	CONN 18PIN SNGL ROW RTANG HDR	1-87233-8	1.000	EA
	3250016	SKT DUAL IN LINE 8 PIN	640463-1	1.000	EA
	3250024	SKT DUAL IN LINE 14 PIN	640357-1	1.000	EA
	3270337	RELAY 4PDT 6VDC	T10-E2-Z4-6VDC	1.000	EA
	3291085	PC JACK .040 PIN	09-9064-1-06	11.000	EA
	3473105	PCB MUTE & TRANSFER PCL-606	51C5936	1.000	EA
	3610003	DIO 10D2 200V 1A SI D039	10D2	1.000	EA
	3630456	XT 2N3904	2N3904	1.000	EA
	3660115	IC SN7413N DU 4I NAND ST	SN7413N	1.000	EA
	3660917	IC SN75451P DU AND HIGHV DC	SN75451BP	1.000	EA
	4280046	CAP TANT EPOX-DIP 2.2/35V 20%	196D225X0035JA1	3.000	EA
	4310272	CAP .01 50V X7R 10%	5018EM50RD103K	9.000	EA
	4410049	RES 22 OHM 1/4W 10%	RC07GF220K	5.000	EA
	4410122	RES 100 OHM 1/4W 10%	RC07GF101K	1.000	EA
	4410163	RES 220 OHM 1/4W 10%	RC07GF221K	1.000	EA
	4410247	RES 1K OHM 1/4W 10%	RC07GF102K	2.000	EA
	4410288	RES 2.2K OHM 1/4W 10%	RC07GF222K	7.000	EA
	4420147	RES 100 OHM 1/2W 10%	RC20GF101K	1.000	EA
	4430104	RES 27 OHM 1W 10%	RC32GF270K	1.000	EA

RECEIVER POWER SUPPLY

Schematic 91C7267
Assembly 21D2741
Parts List 20C2815

The Receiver Power Supply module consists of three sub-assemblies: the ac power connector, step-down transformer T1, and the regulator PC board.

CAUTION

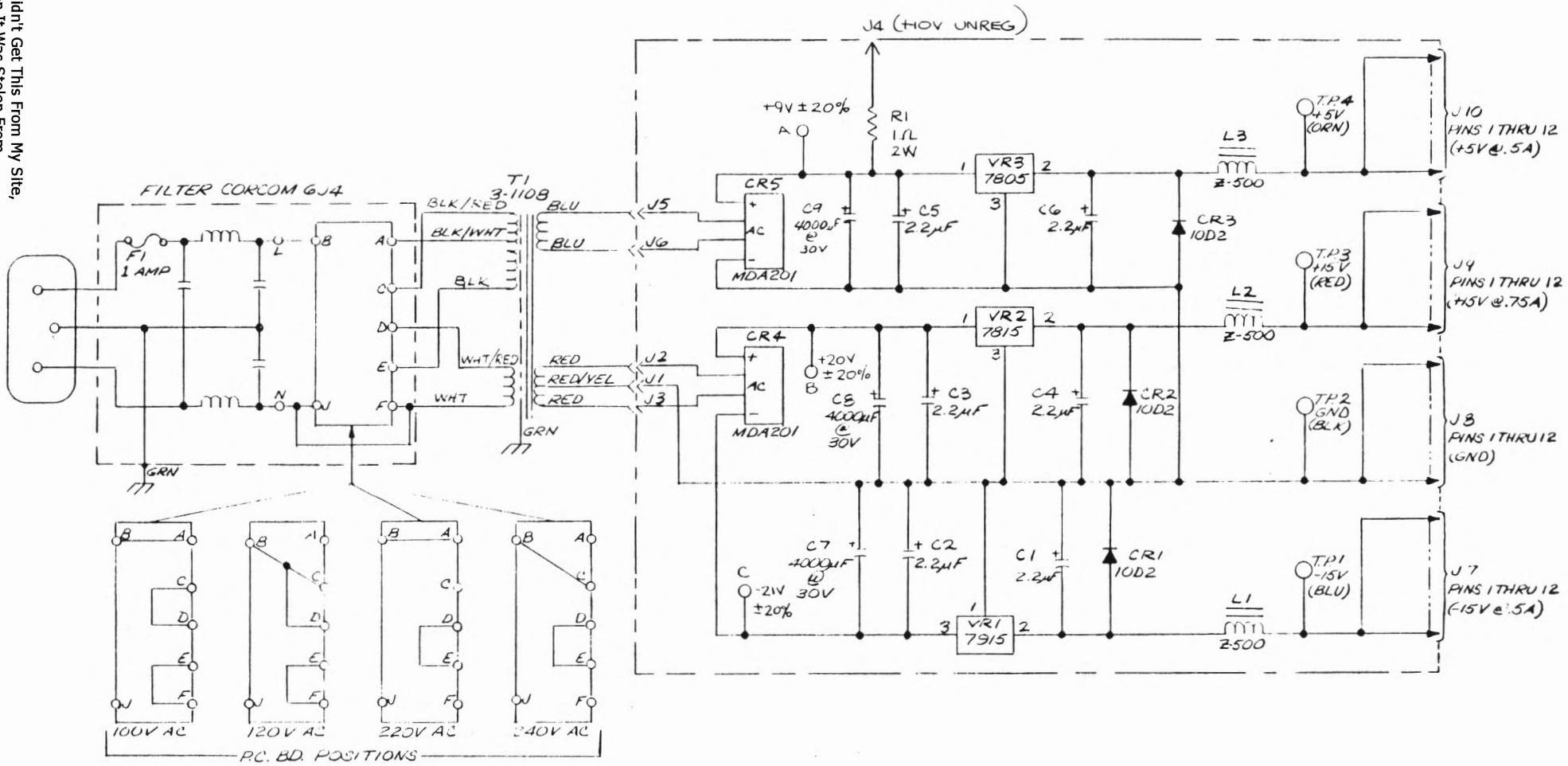
Failure to ground the third lead of the input power cord may result in hazardous shocks to personnel.

The ac power connector includes fuse F1, an RF filter, and the voltage selector card (PC card). The PC card can be inserted four different ways, which allows the user to select one of the four input voltage ranges listed below:

<u>Nominal Voltage (rms)</u>	<u>Minimum Voltage (rms)</u>	<u>Maximum Voltage (rms)</u>	<u>Line Fuse</u>
100	90	100	1 A
120	108	132	1 A
220	198	242	0.5 A
240	216	264	0.5 A

The voltage selected can be observed on the PC card through the window in the ac power connector.

If the voltage selector card needs to be changed to match the available power, do the following: Unplug the power cord, and slide the access window to the left. Pull out the FUSE PULL lever and remove the fuse. With small needle-nose pliers, firmly grasp the PC card and remove it with a straight pull.



NOTES

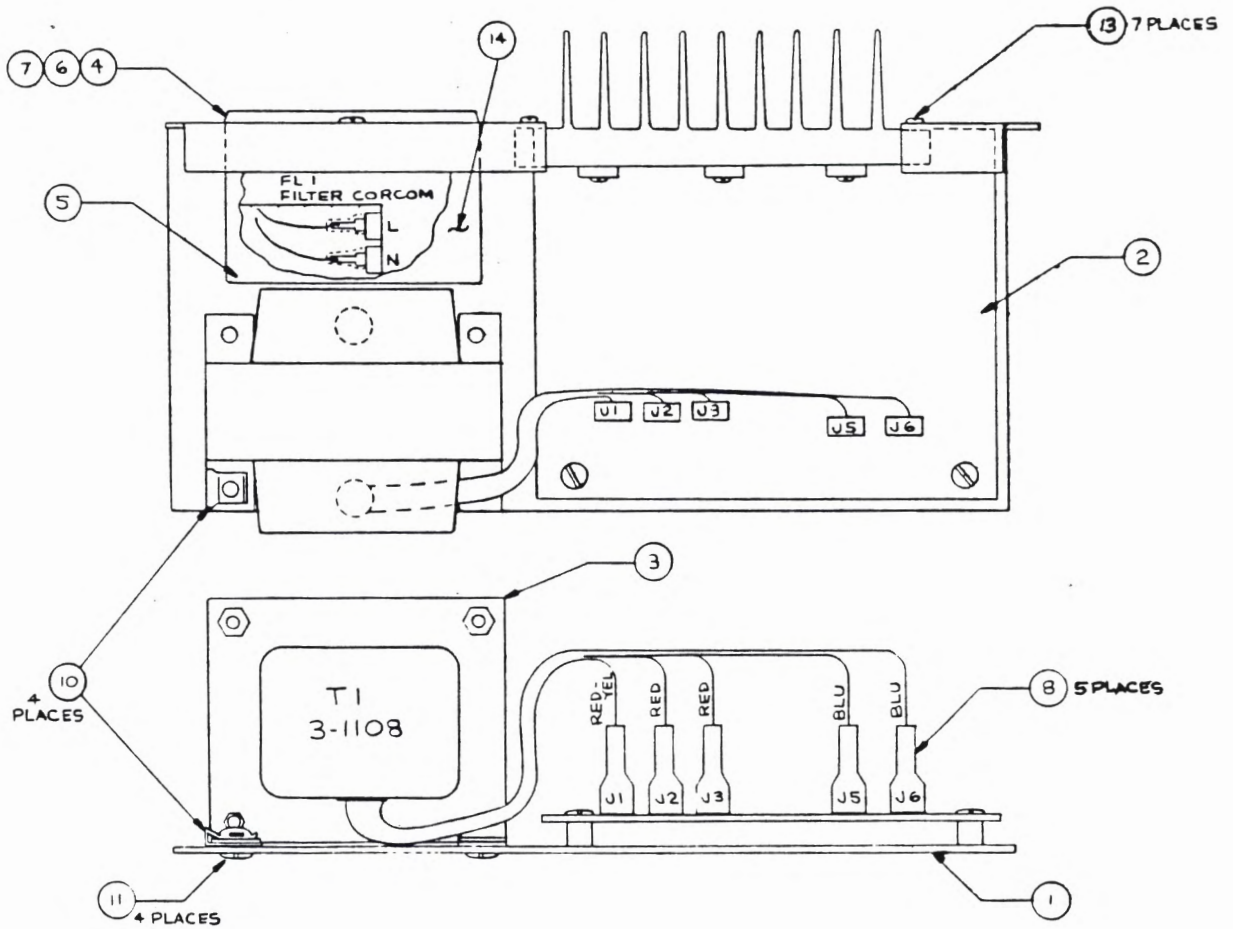
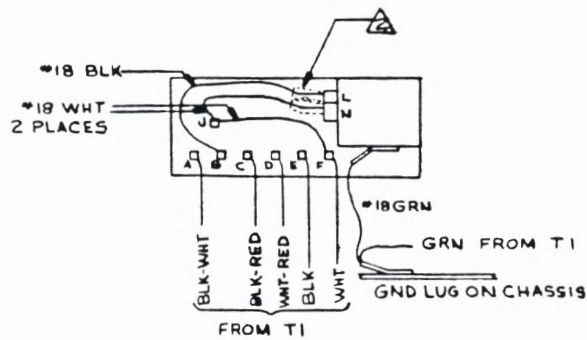
1. PC BOARD 5105931.
2. COMPONENT LAYOUT 2002615

USED ON: PCL 606 RCVR

DELETED FILM REV 1-11-00 150 0015		RELEASE TO PRODUCTION		DATE	
REV 3866 3-24-84		DESIGNED BY R. J. W.		DATE	
DRAWN BY R. J. W.		CHECKED BY R. J. W.		DATE	
SCALE		SCALE		SCALE	
TOLL: PRNKT 2 1/2" 3/8" 2 1/2" 3/8" 2 1/2" 3/8"		91C7267		C	

Moseley

SCHEM. - POWER SUPPLY
AC VR



QTY.	DESCRIPTION	REF. DES.	STOCK NO.	ITEM
1	LABEL, HIGH VOLTAGE, AVERY (ORN)	FL1	3430063	14
7	SCREW, S.S. B.H. 4-40 X 1/4		1050129	13
				12
4	SCREW, S.S. B.H. 6-32 X 3/8		1090208	11
4	CLIP NUT, SHURLK SL-210-06-2 #6-32		1090109	10
				9
5	CONN., AMP 2-35-0904-2	J1-3, 5, 6	3110004	8
1	FUSE, BUSS ASC 1A 250V	F1	3370095	7
1	LABEL, CORCOM 85-1502 1/2A. TO 1 A.	FL1	3430048	6
1	COVER, CORCOM MAI 5B2815	FL1	2031896	5
1	FILTER CORCOM, 6J4	FL1	3370046	4
1	TRANSFORMER, 3-1108	T1	4090437	3
1	R.C. BOARD, MAI 20C 2815		920473	2
1	CHASSIS, MAI 5C2762		2031813	1
*	POWER SUPPLY, RCVR. 21D274/		910242	*

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 POWER SUPPLY, RCVR.
 21D274/

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PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9204173

DESCRIPTION: ASSY POWER SUP RCVR PCL-606
 ENG.DRAWING NO.: 20C2815 K

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
1	3473097	PCB PWR SUPPLY RCVR PCL-606	51C5931 E	1.000	EA
2	2110260	HEATSINK PWR SUPPLY PCL-606	05B2764 A0	1.000	EA
3	4280046	CAP TANT EPOX-DIP 2.2/35V 20% C1,C2,C3,C4,C5,C6	196D225X0035JA1	6.000	EA
4	4270047	CAP PWR LYTIC 4000/30V C7,C8,C9	36DX402G030AA2A	3.000	EA
7	4590063	RES 1 OHM 2W 5% R1	BWH 1 2W 5%	1.000	EA
9	3610003	DIO 10D2 200V 1A SI D039 CR1,CR2,CR3	10D2	3.000	EA
10	3610078	DIO BRIDGE 100V 2A CR4,CR5	MDA-201	2.000	EA
12	3650223	RGLTR UA7915UC 15V 1.5A T0220 VR1	7915UC	1.000	EA
13	3650207	RGLTR UA7815UC 15V 1.5A T0220 VR2	7815UC	1.000	EA
14	3650173	RGLTR UA7805UC 05V 1.0A T0220 VR3	UA7805UC	1.000	EA
16	4020467	FERROX CUBE 500 OHM L1,L2,L3	VK200 10/3B	3.000	EA
17	1150010	SCR BDH SLTD 10-32 X 1/4		6.000	EA
18	3290087	TEST PT BLUE VERT TP1	105-0860-001	1.000	EA
19	3290020	TEST PT BLK VERT TP2	105-0853-001	1.000	EA
20	3290040	TEST PT RED VERT TP3	105-0852-001	1.000	EA
21	3290053	TEST PT ORANGE VERT TP4	105-0856-001	1.000	EA
22	1050129	SCR PNH PHPS 4-40 X 1/4 SST		5.000	EA
23	1290188	SIL PAD	7403-09-FR-51	3.000	EA
24	1050665	WSHR SHLDR #4 NYL	B51547F019	3.000	EA
25	3090271	CONN 12PIN SNGL ROW STR HDR J7,J8,J9,J10	1-87224-2	4.000	EA
27	3290830	LUG GND J1,J2,J3,J4,J5,J6	836	6.000	EA
28	1150127	WSHR LK #10 INTL T		6.000	EA

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PAGE: 1

DATE: 6/30/87

PARENT ITEM: 9102112

DESCRIPTION: ASSY PWR SUPPLY RCVR PCL-606
 ENG.DRAWING NO.: 2102741 E0

REF NBR	COMPONENT ITEM NBR	COMPONENT DESCRIPTION & COMMENTS	ENG.DRAWING NO.	QUANTITY PER	UM
	1050129	SCR PNH PHPS 4-40 X 1/4 SST		7.000	EA
	1090109	CLIP NUT 6/32	SL-210-06-2	4.000	EA
	1090208	SCR PNH PHPS 6-32 X 3/8 SST		4.000	EA
	2031813	CHASSIS POWER SUPPLY PCL-606	05C2762	1.000	EA
	2031896	COVER CURCOM	05B2815	1.000	EA
	3110004	CONN FASTON .250IN CRIMP INSUL	2-35-0804-2	5.000	EA
	3370046	CONN PWR w/FUSE FILTER	6J4 6J4	1.000	EA
	3370095	FUSE 1 AMP FAST-BLO	AGC 1	1.000	EA
	3430048	LBL FUSE "1/2AMP-1AMP"	85-1502	1.000	EA
	3430063	LBL "CAUTION-HIGH VOLTAGE"	10A1058-1	1.000	EA
	4090437	XFMR 8-P-98	3-1108	1.000	EA
	9204173	ASSY POWER SUP RCVR PCL-606	20C2815	1.000	EA

SECTION 6

ALIGNMENT PROCEDURES

6.1 INTRODUCTION

This section presents the alignment procedures for the PCL-606 and a list of recommended test equipment. Also included are descriptions of all module adjustments, general troubleshooting information, and test fixture diagrams. Relevant troubleshooting information is included at the end of each alignment procedure.

6.2 TEST EQUIPMENT

Table 6-1 lists the test equipment recommended for use in the alignment procedures. Equivalent items of test equipment may also be used.

6.3 ALIGNMENT PROCEDURES

The PCL-606 alignment procedures include the following:

1. STL frequency alignment
2. Receiver sensitivity
3. Receiver selectivity
4. Transmitter deviation, and receiver output level calibration
5. Ultimate signal-to-noise ratio
6. Distortion alignment

Table 6-1. Recommended test equipment.

<u>Instrument Type</u>	<u>Suggested Model</u>	<u>Critical Specification</u>
COUNTER	Tektronix DC-508A 1.3 GHz Counter Note: For dual links on same frequency, include Option 01	Single Link ±5 ppm Dual Link ±0.2 ppm
DIRECTION COUPLER	Microlab/FXR Model CB-49B	30 dB 1.0 2.0 GHz
ATTENUATOR, 50-OHM LOAD	Philco 662A-30 or Sierra 661A-30	50 Ohm 30 dB
ATTENUATOR, ADJUSTABLE	Kay Elemetrics Model 432D	50 Ohm 1, 2, 3, 5, 10 & 20 dB steps
RF SIGNAL GENERATOR	Hewlett-Packard Model 8640B with Option 01 & 02	Freq. Range: 0.5 MHz to 1024 MHz Residual FM: Less than 30 Hz, 20 Hz to 15 kHz Less than 10 Hz, 300 Hz to 3 kHz Output Level Accuracy: ±3.5 dB -7 to -47 dBm ±4.0 dB -47 to -137 dBm Output Impedance: 50 Ohm FM Deviation Bandwidth: dc to 250 kHz
DISTORTION MEASUREMENT	Hewlett-Packard Model 339A or Tektronix AA501 with SG505 and TM503 Main Frame	Distortion Measurement Residual Noise: (80 kHz) 92 dB Input Impedance: 100k Ohm shunted by less than 100 pF Accuracy: 20 Hz to 20 kHz ±2% 10 Hz to 110 kHz ±4%

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<u>Instrument Type</u>	<u>Suggested Model</u>	<u>Critical Specification</u>
AUDIO OSCILLATOR	Hewlett-Packard 204C	Oscillator Frequency Range: 10 Hz to 110 kHz Output Level: 3 V rms into 600 Ohm Distortion: 10 Hz to 20 kHz -95 dB (0.00187%) THD 600 Ohm output frequency range 20 kHz to 100 kHz
RF SPECTRUM GHZ ANALYZER 3 GHZ	Hewlett-Packard Model 8559A with 18IT display	Frequency Band: 0.01-3 GHz Dynamic Range: 0.01 to greater than 70 dB Display Range: Log 10 dB/div and 1 dB/div Display Accuracy: Log Less than 2 dB over full range Input Impedance: 50 Ohm SWR: 1.3 dB 10 dB input attenuation
AUDIO SPECTRUM ANALYZER	Tektronix Model 7L5 with Option 25 and L3 Plug-in 7603 Main Frame	Input Impedance: 1 M Ohm/28 pF Input Frequency: 10 Hz to less than 500 kHz Display Range: 80 dB, log 10 dB/div
POWER METER AND SENSOR	Hewlett-Packard Model 435A with Model 8481A Power Head	Accuracy: ±1% of full scale Power Range: -25 dBm (3 Microw) to +20 dBm (100 mW) full scale
OSCILLOSCOPE	Tektronix Model T932A	Bandwidth: 35 MHz
MULTIMETER	Data Precision Model 935	Floating input
50 Hz FILTER	Figure 6-11	
600 OHM LOAD RESISTOR	RN5506000F	600 Ohms, 1%, ¼ W

6.3.1 STL Frequency Alignment

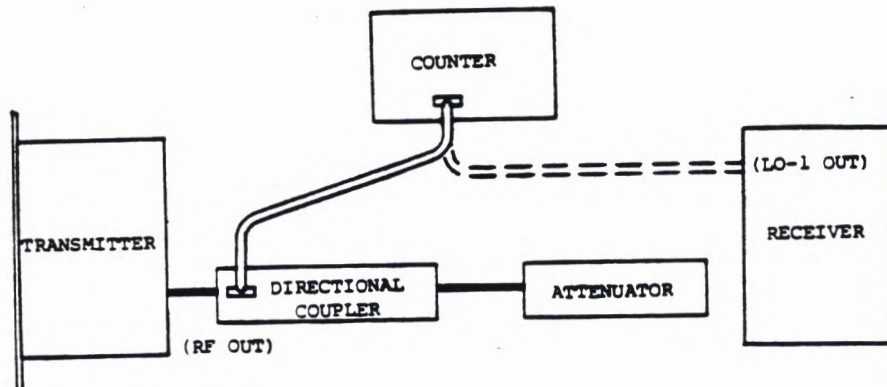
Specification:

$\pm 0.00025\%$, 0° to 50° C (± 2.375 kHz at 950 MHz)

± 500 Hz at 25° C (77° F)

Description:

The STL frequency is aligned by using a counter to measure the transmitter output frequency and the receiver first local oscillator frequency. A high-precision counter (± 0.2 ppm) is recommended to align STL links that are used in a redundant installation. If such a counter is not available, we recommend that both STL systems be aligned at the same time using the same counter. A difference greater than 2 kHz between the STL transmitter center frequency and receiver center frequency will result in degradation of the distortion, separation, and crosstalk performance.



CAUTION: Place the transmitter RADIATE/STANDBY switch in STANDBY until the coupler and attenuator are connected.

Figure 6-1. Test setup for frequency alignment.

Test Equipment:

<u>Name</u>	<u>Manufacturer</u>	<u>Model</u>
Counter	Tektronix	EC-508A with option 01
Directional Coupler	Microlab	FXR CB-49N
Attenuator, Load	Philco	662A-30

Procedure:

1. Connect the equipment as shown in Figure 6-1.
2. Position the transmitter RADIATE/STANDBY switch to the RADIATE position. Verify that the RADIATE, AFC LOCK, and +12 V status LEDs are green.

Using the METER FUNCTION switch, select the FWD POWER position. Verify that the front panel meter reads between -3 and +2 dB on the top scale.
3. Check the serial number label on the back of the STL transmitter for its operating center frequency. The counter should indicate the frequency within 8 kHz of the specified center frequency. If it does not, proceed to the troubleshooting portion of this procedure and verify that the First LO and FMO are operating at their specified frequencies.
4. While monitoring the counter, adjust the transmitter First LO frequency adjustment for a reading of the specified transmitter frequency ± 200 Hz.
5. Using the METER FUNCTION switch on the STL receiver, select the LO 1 position. Verify that the indication is within the lower arc on the receiver front panel meter.
6. Calculate the receiver first LO frequency by adding 70 MHz to the frequency specified on the serial number label at the back of the PCL-606 Receiver.

7. Connect a frequency counter to the output of the receiver first LO. (Note: If an adapter is not available, the MUX 1 connector may be temporarily removed from the transmitter for this purpose.) The counter should indicate a frequency within ± 8 kHz of the frequency calculated in Step 6. If it does not, proceed to the troubleshooting portion of this procedure.
8. Using the counter, adjust the receiver First LO frequency adjustment for a reading within ± 200 Hz of the frequency calculated in Step 6.

Note: If two STL systems are installed for redundant operation, both should be aligned for frequency at the same time.

Troubleshooting:

1. The crystal in the transmitter First Local Oscillator should be 950.000 MHz/51.000 MHz.
2. The crystal frequency of the Receiver First LO should be the same as that specified on the serial number label on the back of the PCL-606 Receiver.
3. If the First LO fails to meet the ± 8 kHz specified in this procedure, the crystal oven should be checked to ensure that it is operating at $65^{\circ} \text{ C} \pm 5^{\circ} \text{ C}$.
4. If the transmitter frequency fails to meet the ± 8 kHz specified in this procedure and the First LO appears to be operating to specification, the FMO should be checked to ensure that it is operating at its designed frequency. The FMO frequency may be calculated as follows:

$$\text{FMO frequency} = 1020 \text{ MHz minus the transmitter center frequency}$$

The FMO frequency should be within ± 1 kHz of the value calculated.

5. A red AFC lock status will inhibit the green +12 V power supply status indicator and cause the RADIATE status indicator to remain red.

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6.3.2 Receiver Sensitivity

Specification:

20 Micro-V, or less, for 60 dB SNR 15 KHz bandwidth, de-emphasized.

Description:

The sensitivity of the PCL-606 STL Receiver is verified using a signal generator and a 50 Hz high pass filter.

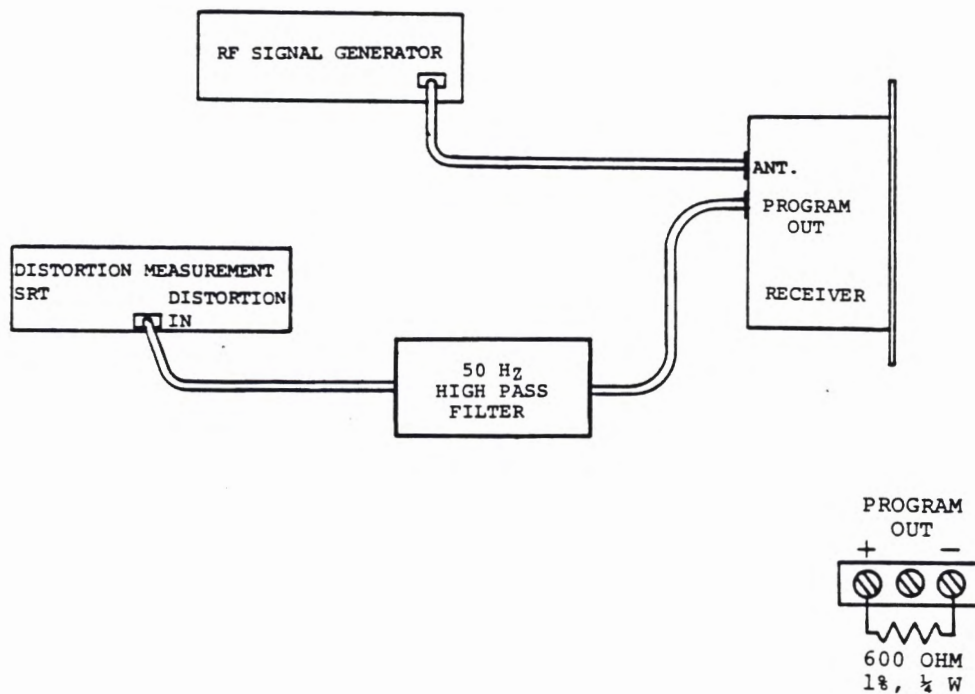


Figure 6-2. Sensitivity test setup.

Test Equipment:

<u>Name</u>	<u>Manufacturer</u>	<u>Model</u>
RF Signal Generator	Hewlett-Packard	HP-8640B
50 Hz Filter		(See Figure 6-11)
600 Ohm Resistor	RN55D6000F	600 Ohm, 1%, 1/4 W
Distortion Measure- ment Set	Hewlett-Packard	HP-339A

Procedure:

1. Connect the equipment as shown in Figure 6-2, and set the controls on the signal generator as follows:

Meter Level	Volts
AM Modulation	Off
FM Deviation	Off
Range MHz	1024/512
Frequency Tuned	Tuned to center frequency (indicated on serial number label on back of STL receiver).
Output Level	-40 dBm
RF	On

Adjust the output level on the signal generator for a reading of 3 mV on the signal generator meter.

2. Using the METER FUNCTION switch on the PCL-606 Receiver, select the RF LEVEL meter position. Verify that the meter reads within the 3K range of the middle scale. If it does not, verify that TP1 on the Preamplifier and First Mixer module is between -14 and -16 V prior to troubleshooting.
3. While monitoring the center scale of the receiver meter, switch the OUTPUT LEVEL ADJ on the signal generator from -40 to -110 and verify that the signal strength reads within the meter range for each setting. If it does not, proceed to paragraph 6.4.N, FM Demodulator Log Gain Adjust, prior to continuing the test, and perform the calibration adjustments given there.

4. Using the METER FUNCTION switch on the receiver, select the PGM LEVEL position.

Set the FM Deviation on the RF Signal generator to ON.

Set the modulation frequency on the signal generator to 400 Hz.

Adjust the deviation control on the signal generator so that the meter on the STL receiver reads 0 dB on the top scale. Verify that the deviation on the signal generator reads 40 ± 7 kHz.

5. Set the controls on the distortion measurement equipment for a 0 dB reference.

Set the FM Deviation on the RF signal generator to OFF.

Position the controls on the distortion measurement equipment for a reading of 60 dB SNR.

Reduce the RF LEVEL adjustment on the RF signal generator until the distortion measurement equipment reads 60 dB.

Observe the RF level output of the signal generator; it should indicate less than 20 Micro-V.

6. Set the controls on the distortion measurement equipment for a signal-to-noise ratio of 40 dB.

Reduce the RF level on the signal generator until the mute threshold LED on the FM Demodulator module indicates red. Observe the RF level output of the signal generator; it should indicate between 8 and 12 Micro-V. If not, the MUTE THRESHOLD ADJ on the FM Demodulator module should be rotated fully counterclockwise. Then set the RF level output of the signal generator to 10 Micro-V and adjust the MUTE THRESHOLD ADJ until the mute threshold LED changes from off to red.

Troubleshooting:

1. The cable between the RF signal generator and the STL receiver should be kept at a minimum to reduce insertion loss. As an example, a 3-foot cable (RG-58) will cause a 1 dB or 10% loss in signal.
2. Prior to troubleshooting, verify that the RF GAIN ADJ on the Preamplifier and First Mixer module is fully clockwise and that TP1 reads between -14 and -16 volts.
3. Verify the RF gain distribution outlined in paragraph 6.5.2, step 5 (General Troubleshooting Information).

6.3.3 Receiver Selectivity

Specification:

<u>Bandwidth</u>	<u>1st 10.7 MHz IF</u>	<u>2nd 10.7 MHz IF</u>
±90 kHz	1.5 dB	3 dB
±400 kHz	30 dB	60 dB
±1 MHz	70 dB	80 dB

Description:

The STL link selectivity is determined by positioning the 2ND 10.7 MHz FIL SEL switch located on the receiver Double Converter module to the IN or OUT position. In general, this switch should be placed in the IN position when strong adjacent channels exist within 1 MHz of the STL center frequency. Unless otherwise specified on the purchase order, this switch is placed in the IN position during factory alignment.

Changing the STL receiver selectivity affects the distortion and multiplex output performance of the STL link. If you desire to operate the receiver in the wide IF mode to reduce system distortion, it will be necessary to perform the alignments in sections 6.3.6 (Distortion Alignment).

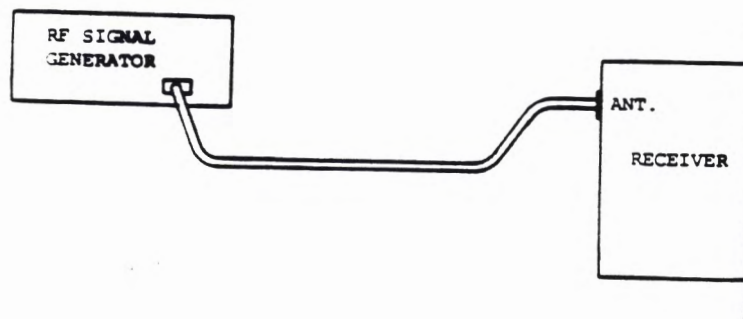


Figure 6-3. Selectivity test setup.

Test Equipment:

RF Signal Generator

Hewlett-Packard 8640B

Procedure:

1. Connect the equipment as shown in Figure 6-3. Set the controls on the signal generator as follows:

Meter Level	Volts
AM Modulation	Off
FM Deviation	Off
Range MHz	1024/512
Frequency Tuned	Tuned to the center frequency (indicated on the serial number label on the back of the STL receiver).
Output Level	-40 dBm
RF	On

Adjust the output level on the signal generator for a reading of 3 mV on the signal generator meter.

2. Using the receiver METER FUNCTION switch, select the RF LEVEL meter position. Verify that the meter reads within the 3K range of the middle scale.
3. Position the OUTPUT LEVEL switch on the signal generator to -100. Verify that the receiver meter reads within the 3 Micro-V range on the center scale. Note the position of the meter reading as a reference for the -60 dB point.

4. Position the OUTPUT LEVEL on the signal generator to -40. Increase the frequency on the signal generator until the meter reading on the receiver front panel is the same as the value noted in paragraph 3. Subtract the carrier frequency from the value indicated on the signal generator. The value calculated indicates the positive -60 dB point.
5. Decrease the frequency on the signal generator until the meter reads the same as the value noted in paragraph 3. Subtract the frequency indicated on the signal generator from the center frequency. This value indicates the -60 dB bandwidth point.
6. The bandwidth calculated in paragraphs 4 and 6 should be no greater than ± 800 kHz when the 2nd 10.7 MHz FIL SEL switch is in the OUT position, or no greater than ± 400 kHz when the switch is in the IN position.

Troubleshooting Notes

The cable between the RF signal generator and the STL receiver should be kept at a minimum to reduce insertion loss. As an example, a 3-foot cable (RG-58) will cause a 1 dB or 10% loss in signal.

Use of the RF gain adjustment on the Preamplifier and 1st Mixer module may cause the meter reading to be less than 3mV. In this event, the RF gain should be reset to 15 on the bottom meter.

6.3.4 Transmitter Deviation, and Receiver Output Level Calibration

Specification:

Transmitter: +10 dBm, from 600 Ohm source input equals ± 40 kHz deviation.

1.5 V p-p MUX 1 equals ± 4 kHz deviation.

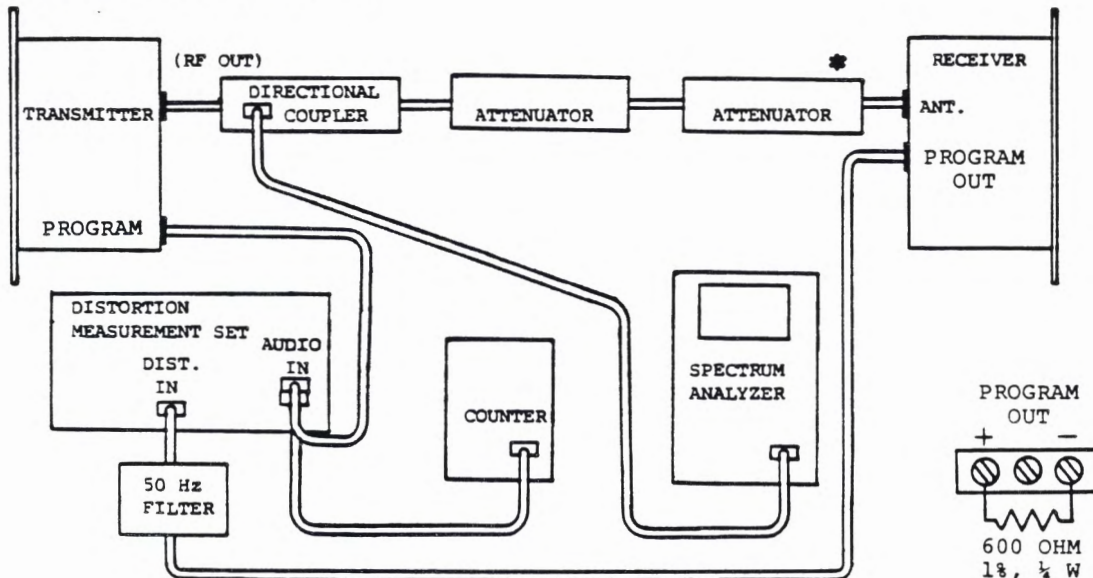
1.5 V p-p MUX 2 equals ± 6 kHz deviation.

Receiver: Program output equals +10 dBm into 600 Ohm load with 40 kHz deviation (30 Hz - 15 kHz).

MUX output equals 1.5 V p-p for 4.0 kHz deviation (20 kHz - 100 kHz).

Description:

The deviation and modulation sensitivity of the program information is aligned using a Bessel null function as a reference. The MUX channel is aligned using an RF generator as a reference.



CAUTION: Place the transmitter RADIATE/STANDBY switch in STANDBY until the coupler and attenuator are connected.

*CAUTION: To avoid receiver damage, initially set attenuator for maximum attenuation.

Figure 6-4. Test setup for deviation alignment.

Test Equipment:

Counter	Tektronix DC-508A
Directional Coupler	Microlab FXR CB49N
Attenuator, 50 Ohm Load	Philco 662A-30
Attenuator, Adjustable	Kay Elemetrics 432D
RF Signal Generator	HP-8640B
Distortion Measurement Set	HP-339A
Audio Oscillator	HP-204C
Spectrum Analyzer	HP-8559A
50 Hz Filter	(See Figure 6-11)
600 Ohm Resistor, 1%, ¼W	RN 55D6000 F
Oscilloscope	Tektronix T932A

Procedure:

1. Connect the equipment as shown in Figure 6-4.
2. Adjust the audio oscillator of the distortion measurement set for an output voltage of +10 dBm from 600 Ohm source at 16.62 kHz as follows:
 - a. Position the meter function switch to the oscillator level position and adjust the oscillator level controls for a reading of 1.00 V rms on the meter.
 - b. Using the counter to monitor the oscillator frequency, position the frequency controls for a reading of 16.62 kHz.
3. Position the STL transmitter RADIATE/STANDBY switch to the RADIATE position.

Using the METER FUNCTION switch, select the FWD POWER position and verify that the meter reads -3 dB and +2 dB on the top scale.

- Using the spectrum analyzer, monitor the modulated RF output of the STL transmitter. The controls of the spectrum analyzer should be in the following positions:

Frequency Band GHz	01-3
Time/DIV	Auto
Trigger	Free run
FREQ/SPAN/DIV	50 kHz/DIV with 3 kHz bandwidth
Input ATTEN	30
REF Level	-20
10 dB/DIV	Depress
Tuning	STL transmitter center frequency

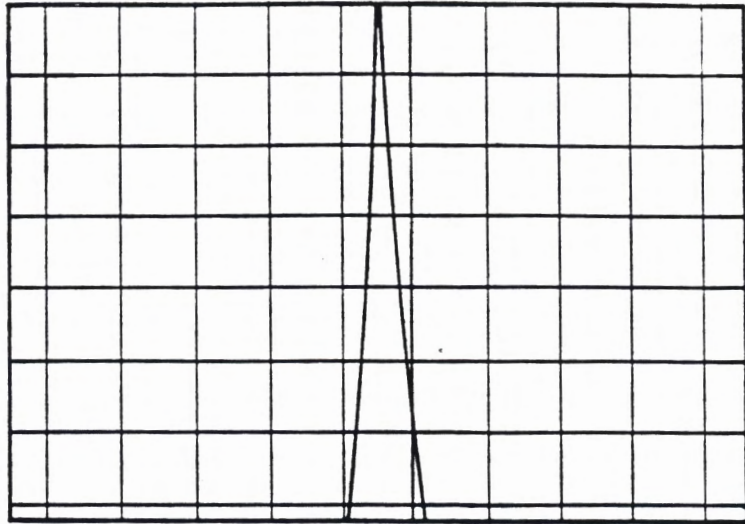
- Disconnect the program input to the transmitter and adjust the display on the spectrum analyzer so that the waveform is at the top graticule (see Figure 6-5A).

Reconnect the program audio input to the STL transmitter. The display on the spectrum analyzer should be similar to Figure 6-5A.

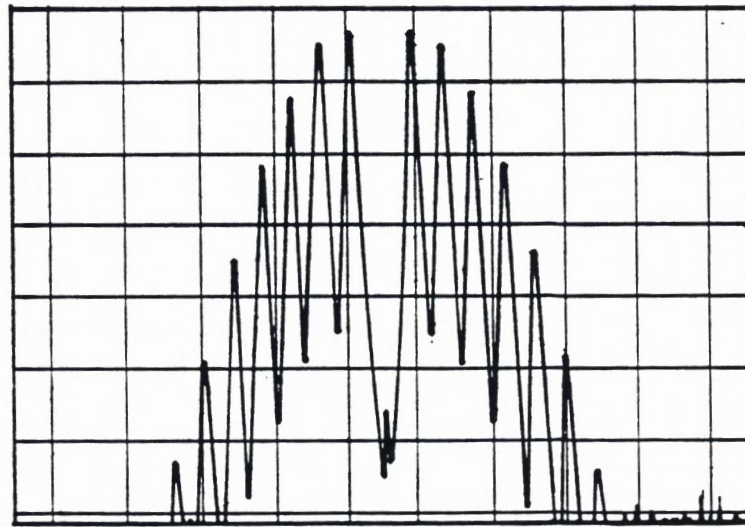
Adjust PGM Level Adjust R31 on the Mono Audio Processor module for a Bessel null function of at least -50 dB on the spectrum analyzer.

Using the METER FUNCTION switch on the STL transmitter, select the PGM LEVEL function. Adjust R3 on the STL transmitter Metering and Status board for a reading of 0 dB on the top scale of the meter.

- Using the METER FUNCTION switch on the STL receiver, select the RF LEVEL position.



(A)



(B)

Vert = 10 dB/Div
 Hor = 50 kHz/div and
 3 kHz bandwidth

Figure 6-5. Bessel null function waveforms.

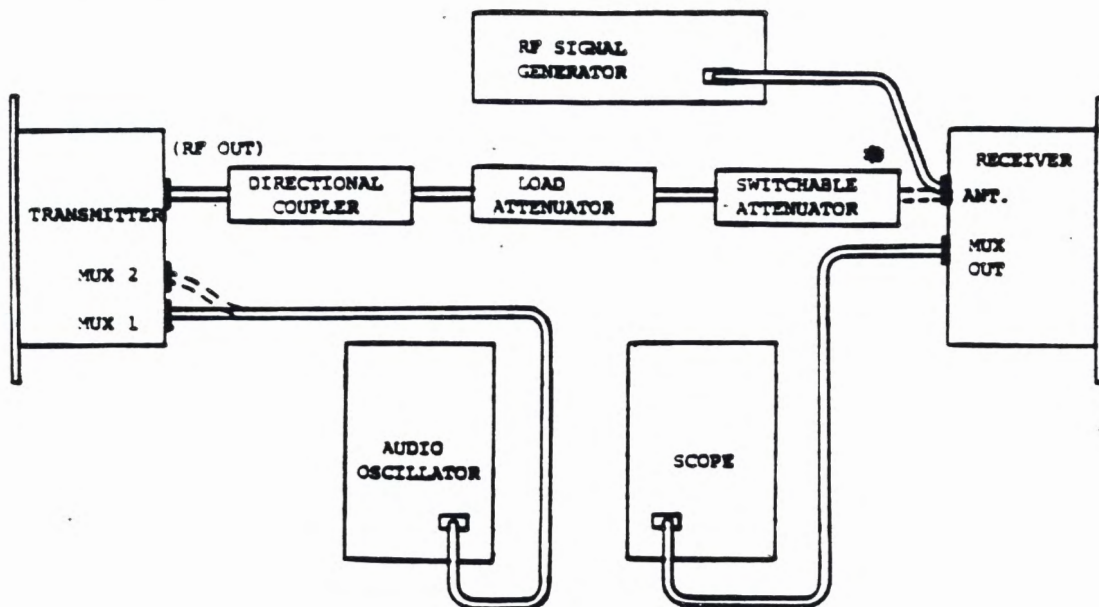
Position the switches on the adjustable attenuator for an RF level reading between 1K and 3K μ V on the receiver meter.

Set the controls on the distortion measurement set as follows:

Meter Function	Reference level
Frequency	1.0 kHz
Meter Input Range	+10 dB

With the oscillator output connected to the STL transmitter, connect the meter input in parallel with the oscillator output and adjust the Relative Adjust for a 0 dB reference on the distortion measurement set. Reconnect the distortion input to the composite output of the STL receiver.

On the receiver FM Demodulator module, adjust Baseband Level Adjust R10 for a reading of 0 dB on the distortion measurement set. Using the receiver METER FUNCTION switch, select the PGM LEVEL position and adjust R1 on the Metering and Status board for a reading of 0 dB on the top scale.



CAUTION: Place the transmitter **RADIATE/STANDBY** switch in **STANDBY** until the coupler and attenuator are connected.

***CAUTION:** To avoid receiver damage, initially set attenuator for **maximum attenuation**.

Figure 6-6. Test setup for MUX channel alignment

7. Position the STL transmitter RADIATE/STANDBY switch to the STANDBY position.

Connect the equipment as shown in Figure 6-6, and adjust the controls on the RF signal generator as follows:

Meter Function	FM
AM	Off
Modulation Frequency	26 kHz
FM	INT
Peak Deviation	10 kHz
Range	1024/512 MHz
Output Level	-40
Frequency Tune	Tune to the center frequency (specified on serial number label of STL receiver).
Peak Deviation	Adjust FM control for a meter reading of 5 kHz.

While monitoring the oscilloscope, adjust MUX Level Adjust R31 on the STL receiver Mono Baseband Processor module for a reading of 1.5 V p-p.

Using the receiver METER FUNCTION switch, select the MUX LEVEL position.

Adjust R2 on the receiver Metering and Status board for a reading of 4 on the lower scale of the receiver meter.

8. On the RF signal generator, adjust the modulation frequency to 67 kHz and the FM deviation for 6.0 kHz.

Note the reading on the receiver meter. It should be between 5.5 and 6.5 on the lower scale. This reading will be used as a reference to align the transmitter MUX 2 deviation. Connect the output of the adjustable attenuator to the RF input of the STL receiver.

9. Position the STL transmitter RADIATE/STANDBY switch to the RADIATE position.

Using the scope, adjust the output of the audio oscillator for a voltage of 1.5 V p-p, and a frequency of 26 kHz. Connect the audio oscillator output to the MUX 1 input of the STL transmitter.

Adjust the MUX 1 Level Adjust R28 on the transmitter Mono Audio Processor module for a reading of 4 on the lower scale of the receiver meter.

Using the transmitter METER FUNCTION switch, select the MUX LEVEL position.

Adjust R4 on the transmitter Metering and Status board for a reading of 4 on the meter lower scale.

Connect the audio oscillator to the transmitter MUX 2 input and adjust the oscillator to a frequency of 67 kHz.

Using the receiver meter as a reference, on the transmitter Mono Audio Processor module, adjust MUX 2 Level Adjust R24 for the reading noted in paragraph 8. The meter reading on the transmitter front panel should be between 5.5 and 6.5 on the lower scale.

Troubleshooting:

1. When aligning STL systems as a dual or redundant installation, one STL transmitter should be used as a reference. In this case, the second STL transmitter would be aligned using the first STL receiver as a reference. The second STL receiver would be aligned using the first STL transmitter as a reference. As a final verification, the second STL transmitter would be checked

using the second STL receiver. Using any combination of transmitter and receiver, the program audio band should be flat within ± 0.25 dB. The result from the multiplex band measurements should be within 10%.

2. Using a single 10.7 MHz I.F. (reference paragraph 6.3.3, Receiver Selectivity) will result in a higher MUX 2 output. In this event, we recommend that the input at the subcarrier demodulator be reduced to compensate for the increase in signal level produced by the STL receiver.
3. The multiplexed output is lowest when the carrier center frequency of the transmitter and receiver are identical. This phenomenon is more pronounced when the STL receiver is in the narrow I.F. mode (2ND 10.7 MHz FIL SEL switch set to IN).

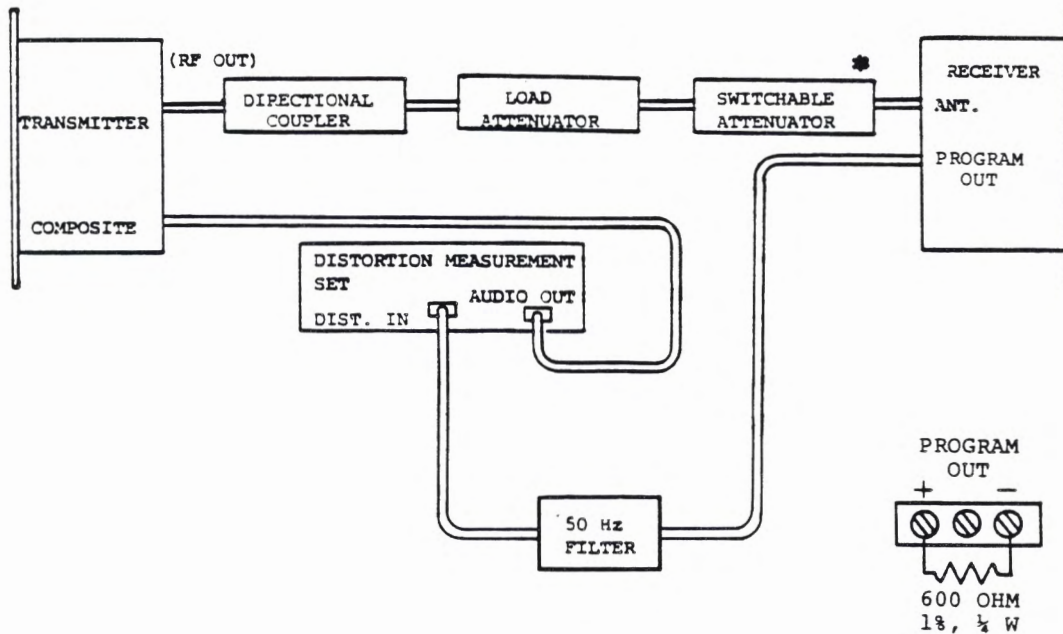
6.3.5 Ultimate Signal-to-Noise Ratio

Typical Values:

Ultimate SNR 15 KHz de- 72 dB or better
emphasized.

Description:

The STL ultimate program SNR (50 Hz to 15 kHz), verified using a distortion measurement set. The STL receiver SNR (quieting) is verified during the receiver sensitivity test (paragraph 6.3.2).



CAUTION: Place the transmitter RADIATE/STANDBY switch in STANDBY until the coupler and attenuator are connected.

*CAUTION: To avoid receiver damage, initially set attenuator for maximum attenuation.

Figure 6-7. Test setup for signal-to-noise ratio measurement.

Test Equipment:

Directional Coupler	Microlab/FXR CB-49N
Attenuator, 50 Ohm Load	Philco, 662A-30
Attenuator, Adjustable	Kay Elemetrics Corp., 432D
Distortion Measurement Set	Hewlett-Packard, HP-339A
50 Hz High Pass Filter	(see Figure 6-11)
600 Ohm Resistor, 1%, ¼W	RN 55D6000 F

Procedure:

1. Connect the equipment as shown in Figure 6-7, and set the controls on the distortion measurement set as follows:

Meter Function	REF Level
Meter Input	+10 dBm
Frequency	400 Hz

2. Set the controls on the STL transmitter as follows:

RADIATE/STANDBY	RADIATE (Radiate LED green)
METER FUNCTION	PGM LEVEL

3. Using the METER FUNCTION switch on the STL receiver select the PGM LEVEL position.
4. Adjust the oscillator output level on the distortion measurement set for a reading of 0 dB on the top scale of the transmitter meter.

Rotate the REFERENCE ADJUST on the distortion measurement set for a 10 dB reference on its front-panel meter. Disconnect the program input at the STL transmitter rear panel.

Using the INPUT RANGE switch on the distortion measurement set, measure the ultimate wideband SNR. (Note: The reference is +10 dB; hence, a meter input range indicating -60 and a meter reading of -6 would indicate an SNR of -76 dB.)

5. Position the INPUT RANGE switch to +10 dB and reconnect the audio input to the STL transmitter program input.

Troubleshooting:

1. Verify the 15 KHz filters on the STL transmitter, mono audio processor and STL receiver mono baseband processor are in the "in" position.
2. If the STL link fails to meet the ultimate SNR specification, the sensitivity test (paragraph 6.3.2) should be performed on the receiver prior to troubleshooting the transmitter.
3. If the STL link fails to meet the SNR specification, and the transmitter is suspected, the following method may be used to help isolate the problem:
 - a. Using the 80 kHz filter on the distortion measurement set, measure the output of the Composite Audio Processor module for a reading at least 5 dB greater than specified for the ultimate SNR.
 - b. Substitute the first LO signal (1020 MHz) using an RF signal generator such as the HP-8640B at an output level of +10 dBm.
 - c. Substitute the FMO signal using the RF signal generator at an RF level of +5 dBm.

NOTE: FMO frequency = First LO frequency minus STL Center frequency.

6.3.6 Distortion Alignment

Specification:

Narrow IF

0.2% or less from 30 Hz
to 15 kHz. Typically
better than 0.1% at 1.0
kHz

Description:

A distortion measurement set is used to align the STL receiver 10.7 MHz IF filter for minimum distortion. This method assumes the FMO will contribute a negligible amount of distortion to the overall reading. The FMO distortion can be verified independently of the receiver by referring to section 6.4B (FMO Synthesizer).

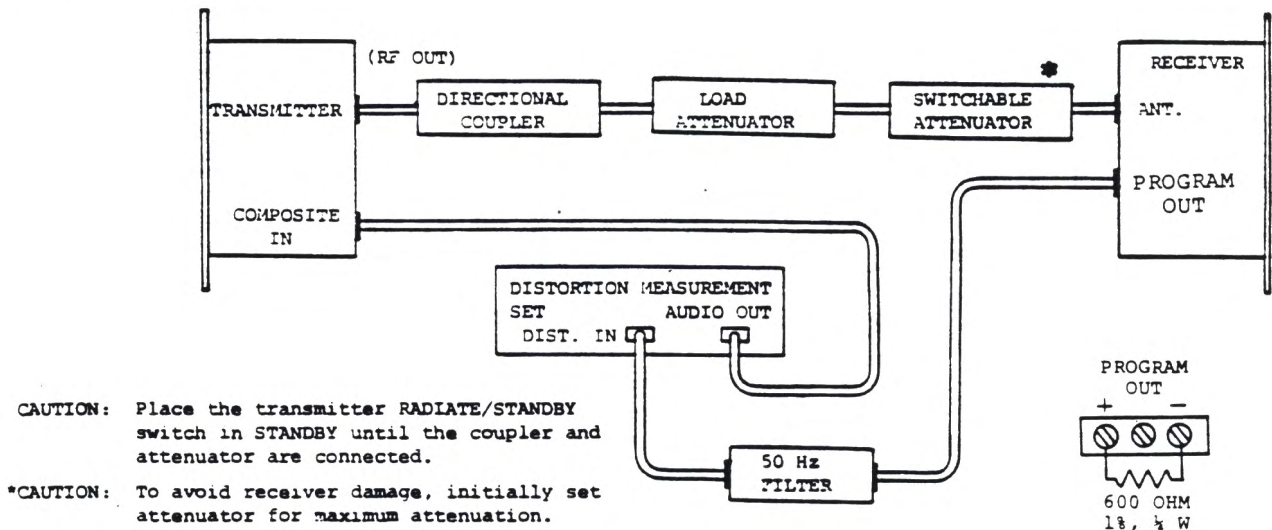


Figure 6-8. STL distortion alignment

Test Equipment:

Directional Coupler	Microlab/FXR CB-49B
Attenuator, 50 Ohm Load	Philco, 662A-30
Attenuator, Adjustable	Kay Elemetrics Corp., 432A
600 Ohm Resistor, 1%, ¼W	RN 55D6000 F
50 Hz Filter	Figure 6-11

Procedure:

1. Connect the equipment as shown in Figure 6-8, and adjust the controls on the distortion measurement set as follows:

Meter Function	Input level
Filters	400 Hz - In 80 kHz - In
Distortion Range	0.3%
Input Range	+10 dB
Frequency	1.0 kHz
Oscillator Level	+10 dBm from 600 Ohm source

2. Position the RADIATE/STANDBY switch on the STL transmitter to the RADIATE position. The RADIATE status LED should be green. Using the METER FUNCTION switch on the transmitter, select the FWD POWER position and verify that the meter reads between -3 and +2 dB on the top scale.

Using the METER FUNCTION switch on the transmitter, select the PGM LEVEL function and verify that the meter reads between -1 and +1 dB on the top scale.

3. Using the METER FUNCTION switch on the STL receiver, select the RF LEVEL function.

Position the switches on the adjustable attenuator for a reading between 1k and 3k Micro-V on the middle scale of the receiver meter.

Using the METER FUNCTION switch on the receiver, select the PGM LEVEL function. The meter should read between -1 and +1 dB on the top scale.

Set the frequency to 15 kHz and verify that the meter of the distortion measurement set reads between .9 and 1.1 Vac rms.

Adjust the METER FUNCTION switch on the distortion measurement set to the DISTORTION position.

4. Position the 2ND 10.7 MHz FIL SEL switch to the OUT position on the receiver Double Converter module. Using the distortion measurement set, adjust the following controls on the Double Converter module and the Second and Third Local Oscillator module for minimum distortion:

- a. 1ST 10.7 MHz IF ADJ

- b. LO 2 FREQ ADJ

NOTE: If the STL receiver is being operated in the wideband mode, this completes the distortion alignment. The reading on the distortion meter should now be less than 0.13%. Switch the frequency on the distortion measurement set to 1.0 kHz and verify that the reading is less than 0.10%.

5. On the Double Converter modules, switch the 2ND 10.7 MHz FIL SEL switch to the IN position.

Rotate the 2ND 10.7 MHz IF ADJ for a minimum reading on the distortion measurement set.

The distortion reading should now be less than 0.2%. Switch the frequency on the distortion measurement set to 1.0 kHz. Verify that the distortion reading is less than 0.1%.

NOTES: The above procedure ensures that the STL

link may be used in either the narrow- or wide-band position. If the STL receiver is to be used exclusively in the narrow-band position, steps 4 and 5 may be repeated two to three times to optimize the distortion reading.

Troubleshooting:

1. The following procedure may be used to determine if the 10.7 MHz filters are a source of high distortion:
 - a. Remove FL-1 from the receiver Double Converter module and replace it with a 1.0 k Ohm resistor. The resistor leads should first be cut between 0.3 and 0.4 inch from the body. The ends of the resistor leads should then be flattened using a pair of needle-nose pliers so they can be inserted in the FL-1 socket. The cover should then be replaced and the screws tightened.
 - b. Position the 2ND 10.7 MHz FIL SEL switch to the OUT position.
 - c. Using the distortion measurement set, the distortion reading should now be less than 0.05% at 15 kHz. If it is not, additional troubleshooting will be required prior to determining the performance of the 10.7 MHz IF filters.
2. An RF input to the STL receiver exceeding 6 mV may cause an indication of high distortion.
3. The distortion of the Mono Baseband Processor module in the receiver can be tested independently by applying the output of the distortion measurement set's audio oscillator to the input of the Mono Baseband Processor module. An input voltage of 1.05 V RMS (2.8 V p-p) should produce an output of +10 dBm into a 600 Ohm load.

6.4 MODULE ADJUSTMENTS

This subsection is intended to

1. Provide additional technical information
2. Assist during alignment troubleshooting
3. Assist during module replacement.

The modules are discussed in the same order used in Section 5. Also included are adjustment instructions to be used during troubleshooting, module repair, or module replacement for the following modules:

FMO Synthesizer

First Local Oscillator and Multiplier

RF Amplifier

Metering and Status (Transmitter)

Double Converter

Metering and Status (Receiver)

6.4.A Mono Audio Processor

75 μ s Pre-emphasis

- In/Out Switch used to select 75 μ s pre-emphasis. In the OUT position, U9 acts as a unity gain buffer. In the IN position, U9 provides high-frequency boost in the 2 kHz region.
- F1 Sets the lower corner of the high-frequency boost to +3 dB at 2.0 kHz.
- F2 Sets the upper slope of the pre-emphasis curve to +18 dB at 20 kHz.

Note: F1 and F2 adjustments are made with the 15 kHz low-pass filter in the OUT position.

15 kHz Low-Pass Filter

- FA Used to set a transmission zero at 26.5 kHz.
- FB Used to set a transmission zero at 22.5 kHz.
- FC Used to set a transmission zero at 44.5 kHz.
- In/Out Affects the program channel only. In the OUT position, it selects the wideband mode. In the IN position, it selects a 15 kHz 7-pole elliptical filter.
- Gain Used to compensate for the insertion loss of the 15 kHz filter so that both the wideband and 15 kHz modes can be set to the same reference level.
- LF TILT Used to adjust the low-frequency response of the 15 kHz filter between 30 Hz and 1 kHz.

6.4.B FMO Synthesizer

FREQ TRIM Frequency Trim Adjustment. Used to tune the reference oscillator. The frequency switching described below adjusts the frequency in 10 kHz increments. This adjustment is used as a vernier between those 10 kHz increments.

LOSS OF LOCK This LED gives a red indication when the AFC loses lock.

AFC LVL TP1 AFC Level Test Point. Monitors the dc level of the AFC loop. It is normally set to +7 V.

A = VARICAP BIAS ADJ Varicap Bias Adjustment. Used to adjust the FMO for minimum distortion.

TP2 = VARICAP BIAS LVL Varicap Bias Level Test Point. A dc test point used to monitor the bias on the Vari-cap.

B = DISTORTION ADJ This circuit is disabled.

MODULATION ADJ Modulation Adjustment. Used to set the FMO deviation. It is normally set to ±40 kHz with 2.8 V p-p input.

AFC LVL ADJ AFC Level Adjustment. Sets the free run oscillator frequency. Rotating it clockwise causes the frequency to decrease. The final adjustment is made by monitoring TP1 (above) to a value of +7 V.

FMO LVL TP3 FMO Level Test Point. A dc test point used to monitor the output of the FMO oscillator.

Frequency Selector Switches (Internal):

S1: Tens of Megahertz
S2: Megahertz
S3: Hundreds of kilohertz
S4: Tens of kilohertz

FMO Adjustment:

Test Equipment

RF Signal Generator	HP-8640B
Mixer	Mini-Circuit 2AD-1
Adjustable Attenuator	Kay Elemetrics Corp., 432B
RF Spectrum Analyzer	HP-8559A
Distortion Measurement Set	HP-339A
50 Hz Filter	Figure 6-11
Counter	Tektronix BC-508A
Multimeter	Data Precision 935
Power Meter	HP-435A with 8481A Power Sensor

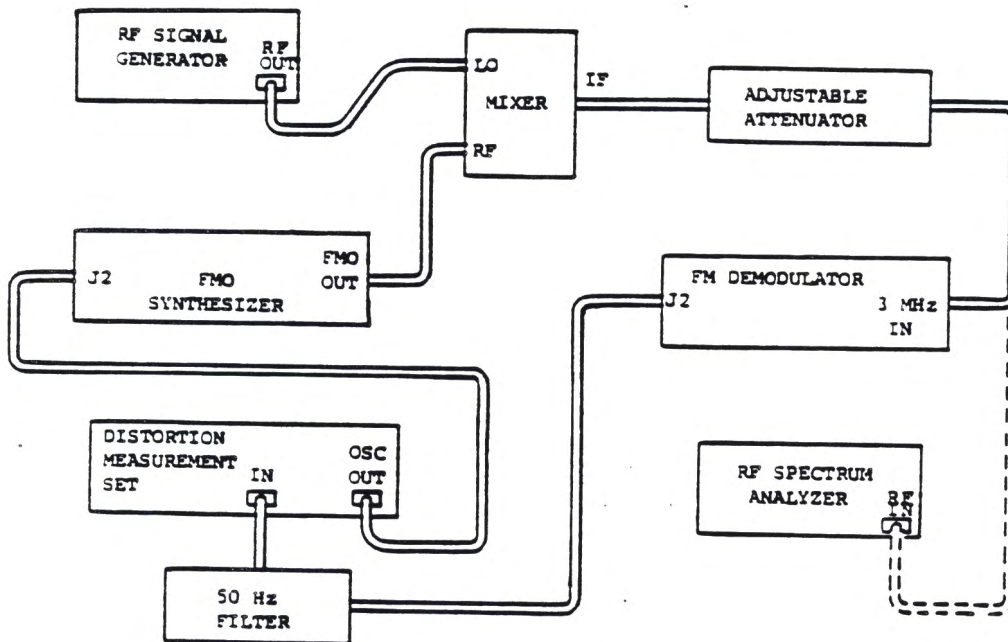


Figure 6-9. Test setup for FMO adjustment.

Procedure:

1. Connect the equipment as shown in Figure 6-13.

Using the counter, measure the output frequency of the FMO.

FMO frequency equals 1020 MHz minus transmitter frequency.

Note: If the frequency is greater than 10 kHz away from the desired frequency, remove the top cover and position frequency selector switches S1 through S4 for the desired frequency.

Adjust the frequency trim on the FMO so that the counter reads the desired frequency.

Note: If the FMO LOSS OF LOCK is red, it will be necessary to first adjust the AFC level to accomplish this step. See Step 4 below.

Reconnect the FMO output to the RF input of the mixer.

2. Adjust the controls on the RF signal generator for a frequency that is 3 MHz above the FMO frequency and for an output of +10 dBm.

Using the RF spectrum analyzer, position the switches on the adjustable attenuator for an output level of between -20 and -25 dBm at 3 MHz.

Reconnect the adjustable attenuator to the FM demodulator.

3. Adjust the oscillator output on the distortion measurement set for a frequency of 1 kHz and a level of 1.00 V rms (2.8 V p-p).

4. Distortion and AFC Level Alignment.

Using the multimeter, monitor TP1 (AFC Level) and adjust the AFC LVL ADJ so that the voltmeter reads between 6.9 and 7.1 V.

Using the distortion measurement set, verify that the output of the FM demodulator is between 1.0 and 1.5 V rms.

Measure the distortion of the output of the FM demodulator, and adjust the Varicap Bias adjustment on the FMO (adjustment A) for a minimum distortion reading.

Note: Normally there are two settings of the Varicap Bias adjustment that will produce minimum distortion. Varicap bias should be adjusted to the setting that produces the lowest distortion.

Readjust the AFC LVL ADJ so that the voltmeter reads between 6.9 and 7.1 V.

Repeat this procedure until the varicap bias is set for minimum distortion and the AFC level adjustment is between 6.9 and 7.1 V.

Set the frequency on the distortion measurement set for 15 kHz and verify that the distortion is less than 0.05%.

5. Modulation Level.

Using the counter, set the output frequency of the distortion measurement set oscillator to 16.62 kHz. Verify that the oscillator output voltage is 1.00 V rms.

Adjust the FMO deviation for ± 40 kHz as follows, using the Bessel null function waveforms in Figure 6-5:

- a. Connect the output of the adjustable attenuator to the RF spectrum analyzer and disconnect the audio input from the FMO. Establish the reference level shown in Figure 6-5A on the RF spectrum analyzer.
- b. Reconnect the audio from the distortion measurement set to the FMO and adjust the MODULATION ADJ on the FMO from minimum to the first Bessel null function (Figure 6-5B).

6. Reconnect the adjustable attenuator to the FM demodulator.

Verify that the AFC level at TP1 is between 6.9 and 7.1 V.

Verify that the distortion at 15 kHz is less than 0.05%.

Repeat Steps 3 through 5 of this procedure as required to achieve the above results.

7. Using the Power Meter, verify that the output of the FMO is between 0 dB and +5 dB.

Notes:

- A. S1, S2, S3 and S4 are used to set the FMO frequency between 60 and 80 MHz.
- B. The FM distortion is normally adjusted using a mixer and FM demodulator of known quality. The quality of the FM demodulator can be verified as follows:
 - i. Set the signal generator (mixer LO) frequency 3.000 MHz above the FMO (mixer RF) frequency and measure the distortion.
 - ii. Set the signal generator (mixer LO) frequency 3.000 MHz below the FMO (mixer RF) frequency and measure the distortion.
 - iii. The FM demodulator distortion is equal to the absolute value of measurement (i) minus measurement (ii). The difference should be less than 0.02%.
- C. If ordering a replacement FMO from the factory, please specify the operating frequency of the transmitter.

6.4.C Up Converter

This module includes a mixer, 950 MHz filter, and IPA amplifier.

Mixer: The mixer requires no adjustment.

950 MHz Filter: The insertion loss of the filter is between 2 to 3 dB between 940 MHz and 960 MHz. It is designed to provide an additional 30 dB of attenuation of the first LO signal, normally 1020 MHz, and greater than 60 dB of the upper sideband, normally 1080 MHz to 1100 MHz. All adjustments are internal and considered to be factory adjustments.

IPA (Intermediate Power Amplifier): C1 (internal) is adjusted for maximum power output. With an input of -10 dBm, the output should be between +19 and +21 dBm between 940 MHz and 960 MHz.

6.4.D First Local Oscillator and Multiplier

FREQ Frequency Adjust. Sets the first LO output frequency.

OSC
LVL Oscillator Level Test Point. Provides a dc voltage used to verify that the oscillator is functioning.
TP1

1ST
DBLR First Doubler Tune Adjustment. Used to tune maximum dc potential at TP2 (1st Doubler Level).
TUNE

1ST
DBLR First Doubler Level Test Point. Provides a dc voltage used to verify that the 1st doubler is functioning.
LVL

2ND
DBLR Second Doubler Match Adjustment. Used to tune for maximum dc voltage at TP2 (1st Doubler Level).
MATCH

2ND
DBLR Second Doubler Tune. Used to tune for maximum dc voltage at TP3 (2nd Doubler Level).
TUNE

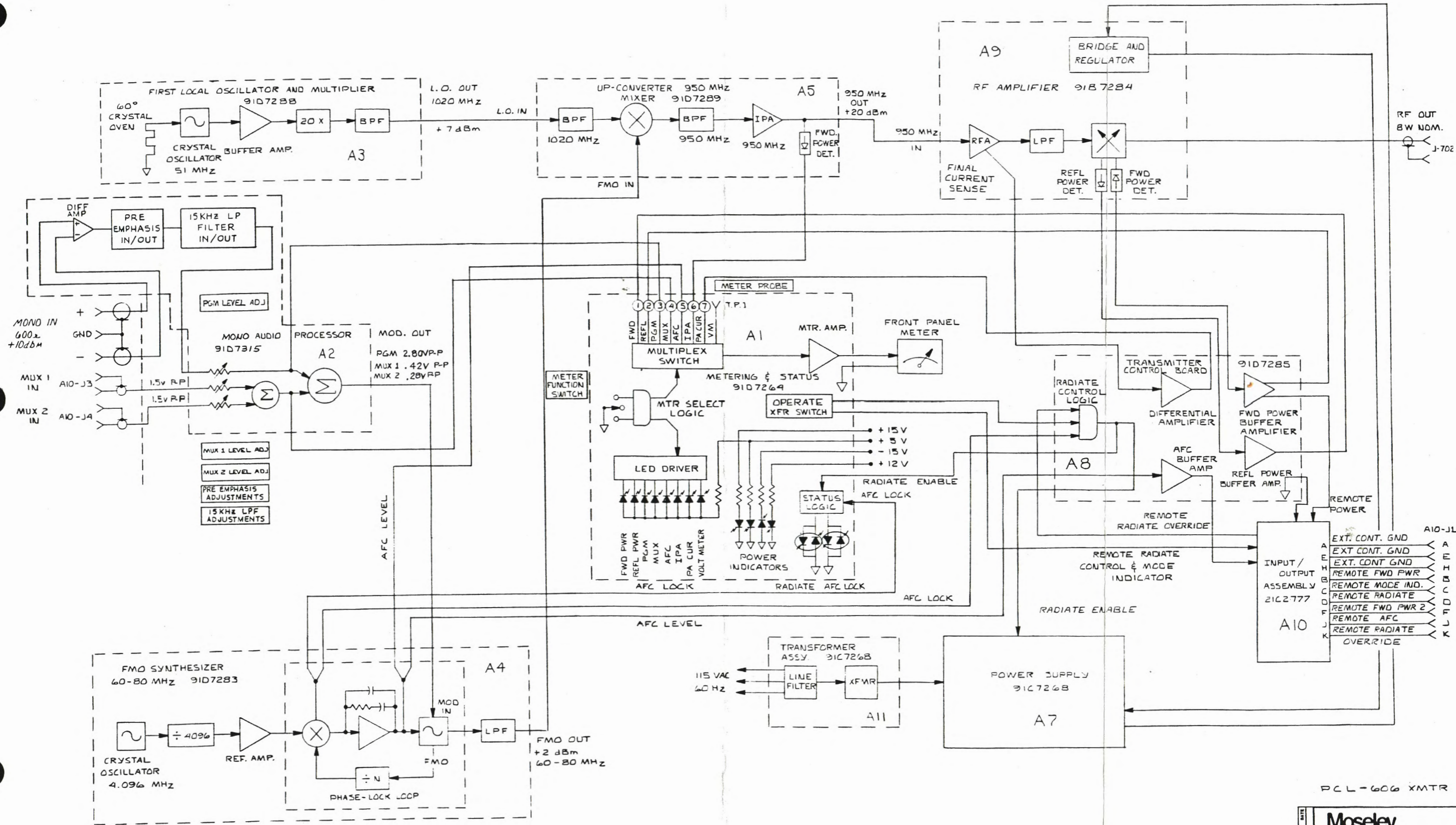
2ND
DBLR Second Doubler Level Test Point. A dc test point used to verify that the second doubler is functioning. TP3
LVL

DIO
DRVR Diode Drive Tune Adjustment. Used to tune for maximum power output.

DIO
MATCH Diode Match Adjustment. Used to tune for maximum power output.

DIO
BIAS Diode Bias Test Point. A dc test point used to verify that the step recovery diode is properly biased (0.4 to 0.8 V).
TP4

Notes: When installed in the PCL-606 STL transmitter, the frequency output of this module should be 1020 MHz with a power output between +5 and +10 dBm. This measurement should be made on a low-power wattmeter.



PCL-606 XMTR

Moseley
 950 MHz TRANSMITTER
 BLOCK LEVEL DIAG-MONO
 SCALE: 1:1
 9201264

6.4.E RF Amplifier

C706	Input match adjustment
C707	Input match adjustment
C709	First interstage match adjustment
C712	Second interstage match adjustment
C724	Output match adjustment
C725	Third interstage match adjustment
C728	Second harmonic suppression adjustment

RF Amplifier Alignment

1. Set the HP-8640B signal generator (or equivalent) to center frequency at a power level of -10 dBm.
2. Connect the output of the signal generator to the input of the Intermediate Power Amplifier (IPA).
3. Connect the output of the RF Amplifier to an appropriate power meter.
4. Set the deviation of the signal generator to 5 MHz.
5. Note: When tuning the RF Amplifier, the final output current should be monitored from the meter PA CURRENT position for a maximum of 1.7 A.
6. Adjust C706, C707, C709, C712, C725 and C724 for maximum power while keeping the final stage current below 1.7 A.

Note: Final stage current is adjusted by C724.

7. Spurious and second harmonic emissions should be monitored by using a 30 dB coupler and spectrum analyzer. If the second harmonic needs to be "tuned out", adjust C728 so that the second harmonic is greater than:

-10 P out + 43 dB

6.4.F Metering and Status

- R1 Used to adjust the FWD POWER meter function. 0 dB = 100% power (5 to 10 watts).
- R2 Adjusts the REFL POWER meter function. Adjust to 0 dB with the antenna disconnected.
- R3 Used to adjust the PGM LEVEL meter function. 0 dB equals 40 kHz deviation.
- R4 Used to adjust the MUX LEVEL meter function. 4 on the lower scale equals 4 kHz deviation of the main carrier by the subcarrier.
- R5 Used to adjust the AFC LEVEL meter function. 7 volts equals midscale on the lowest arc.
- R6 Used to adjust the IPA LEVEL meter function. Adjust to midscale on the lower arc when the IPA is producing between 19.5 and 21.0 milliwatts of power.
- R7 Used to adjust the PA CURRENT meter function. Using a digital voltmeter with a floating input, measure the differential voltage between TP1 and TP2 on the Transmitter Control board when the transmitter is in the RADIATE position. The power amplifier final current is then equal to ten times this value. R7 is then adjusted so that the lower scale of the meter will indicate a value 100 times the value indicated by the digital voltmeter.
- R8 Used to adjust the VOLTMETER function of the meter. Using a jumper, connect TP1 of the Metering and Status board to TP2 of the power supply and adjust R8 for a value of 15 on the lower scale.
- R9 Adjusts the meter ballistics. The meter is normally adjusted for a 0.25 dB overshoot by switching between the REFL POWER meter function and the PGM LEVEL meter function with a 0 dB input (program input = +10 dBm from a 600 Ohm source).

6.4.G Transmitter Control

- TP1 A dc test point used to measure the relative forward power.
- TP2 TP2 and TP3 are used to monitor the power amplifier final output current. The measurement is made using a floating input dc voltmeter. Ten times the voltage measured equals the current of the final stage in the RFA amplifier.
- TP3 See TP2 above.

6.4.H Power Supply

- R5 Used to adjust the +12.5 V power supply output voltage when the transmitter is in the RADIATE position.

6.4.I Preselector Filter

The five tuning elements on the STL receiver preselector are aligned at the factory using a return loss technique. Attempting to tune the preselector for insertion loss only generally results in degraded performance of the STL receiver.

Measuring the STL receiver noise performance (paragraph 6.3.2) is an indirect method of verifying the preselector performance.

An insertion loss greater than 2 dB is an indication that the preselector is failing to meet its performance criteria. When making this measurement, care should be taken to ensure that the cables do not adversely affect the measurements. Figure 6-10 shows the proper method of measuring the preselector insertion loss.

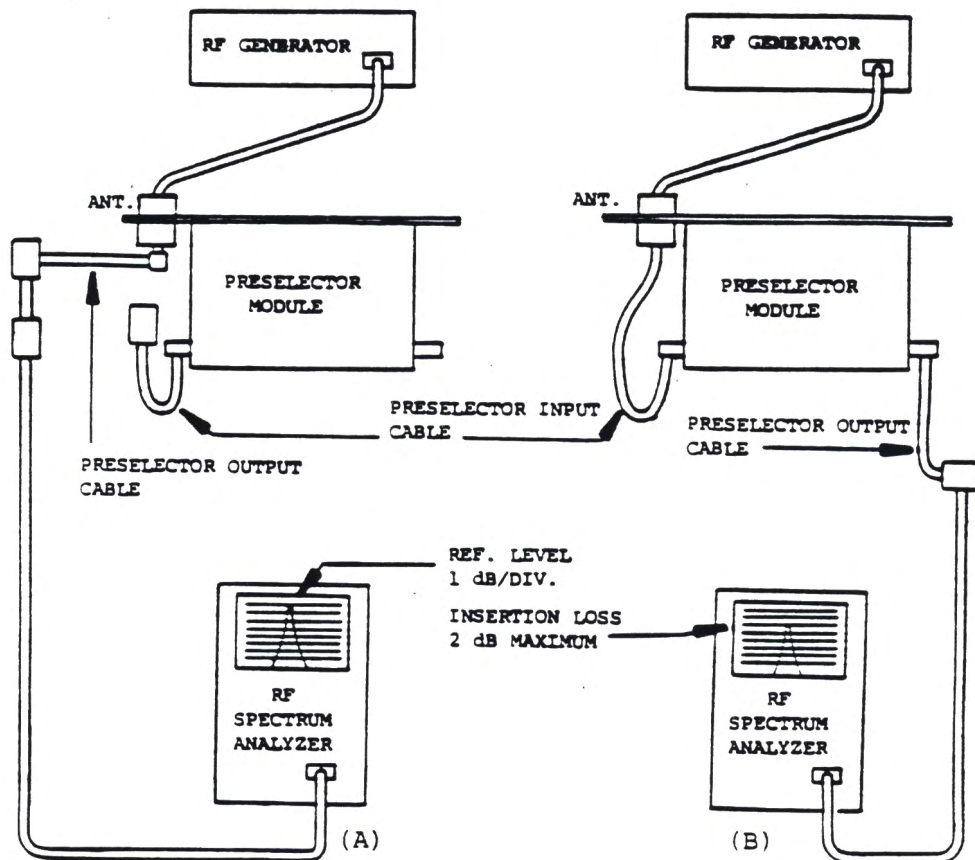


Figure 6-10. Test setup for measuring the preselector insertion loss.

6.4.J Preamplifier and First Mixer

70 MHz 70 MHz Output Adjustment. Alignment is performed using an RF signal generator and the receiver front-panel meter in the RF LEVEL position.
OUT ADJ

Set the RF Signal Generator as follows:

Frequency As specified on the serial number label.

FM Deviation OFF

RF Level Set to 300 to 1K on the middle scale of the STL receiver meter.

Adjust the 70 MHz OUT ADJ (L3) for maximum receiver meter indication. NOTE: Greater accuracy can be achieved by monitoring the rear panel MTR OUT (meter output) terminal with a dc voltmeter.

RF GAIN RF Gain Level Test Point. Used to monitor the negative dc voltage on the pin diode attenuator.
LVL
TP1

RF GAIN RF Gain Adjustment. During servicing and alignment, this adjustment is set for a reading between -14 V and -16 V on TP1 (RF Gain Level).
ADJ

When installed at the Broadcast Transmitter site, this adjustment may range between 0 and 15, as indicated on the STL receiver meter lower range when the RF GAIN function is selected.

6.4.K First Local Oscillator and Multiplier

Determine the STL receiver first LO output as follows:

Receiver frequency + 70 MHz = first LO frequency

The adjustments for the receiver First Local Oscillator and Multiplier module are identical to those specified in Paragraph 6.4.D for the transmitter First Local Oscillator and Multiplier module.

6.4.L Double Converter

Note: The 10.7 MHz IF is adjusted for minimum distortion at the desired selectivity.

2ND
10.7 MHz

Filter Select Switch. IN = narrow band performance; OUT = wideband performance. In general, the narrow band (IN) position is selected when strong adjacent channels exist within 1 MHz of the STL operating frequency. In the OUT position, the 2nd 10.7 MHz IF filter and adjustment are disabled.

1ST
10.7 MHz
IF ADJ

IF Adjustment. Adjust for minimum distortion.

2ND
10.7 MHz
IF ADJ

IF Adjustment. Adjust for minimum distortion.

Note: The LO2 FREQ ADJ on the second and third Local Oscillator module and the first 10.7 MHz IF ADJ and second 10.7 MHz IF ADJ on the Double Converter module interact. See paragraph 6.3.6, Distortion Alignment, for additional information.

If the STL receiver is being repaired by installing a factory-aligned Double Converter module, acceptable performance should be obtained by aligning the LO2 FREQ ADJ on the second and third Local Oscillator module to the frequency specified on the Double Converter module.

70 MHz
BPF ADJ
(1 to 4)

Bandpass Filter Adjustments. The alignment of the 70 MHz bandpass filter can be checked indirectly by verifying the receiver noise performance to within 20 Micro-V of the value specified on the final test data sheet included in this manual. (See paragraph 6.3.2, STL Receiver Sensitivity).

70 MHz Bandpass Filter Alignment

1. Substitute a 1 k Ohm resistor for FL1 as follows:

Remove the top cover of the Double Converter module. To aid reinstallation, note the position of the number 1 on FL1, and remove FL1.

Install a 1 k Ohm resistor in the FL1 socket by trimming the resistor leads 0.3 to 0.4 inch beyond the resistor body length and flattening both ends of the resistor leads with a pair of long-nose pliers so they fit into the socket.

2. Set the second 10.7 MHz FIL SEL switch to the OUT position.
3. Connect the RF signal generator (HP-8640B of equivalent) to the 70 MHz input of the Double Converter module.

Set the following:

Frequency to 70.000 MHz

RF level to -37 dB

FM deviation to 1 MHz

4. Using a digital voltmeter, monitor TP3 (Log Level) on the FM Demodulator module.
5. Reinstall the top cover of the Double Converter module and secure the screws.
6. Adjust the 70 MHz BPF ADJ (1-4) capacitors for a maximum reading on the digital voltmeter. Repeat this step two or three times to ensure a maximum reading.
7. Reinstall FL1 as follows:

Remove the top cover from the Double Converter module.

Remove the 1 k Ohm resistor from the FL1 position.

Reinstall FL1 in the orientation previously noted.

Reinstall the Double Converter module top cover and secure the screws.

8. After alignment of the 70 MHz bandpass filter, both the STL receiver sensitivity (paragraph 6.3.2) and the STL link distortion (paragraph 6.3.6) alignment procedures should be performed.

6.4.M Second and Third Local Oscillator

LO2
FREQ
ADJ

LO2 Frequency Adjust. Adjusts the LO2 frequency between 80.670 kHz and 80.730 kHz. Exact frequency for the purpose of alignment is determined by the 10.7 MHz IF. The exact frequency used during factory alignment is indicated on the Doubler Converter module and is also indicated on the final test data sheet. If this value changes during routine maintenance and alignment, the new frequency should be noted in both places.

BFR
LVL
TP1

Buffer Level Test Point. A dc test point used to indicate that the oscillator and buffer are functioning.

1ST
DBLR
ADJ

First Doubler Adjustment. Adjust for maximum dc level at TP2 (1st DBLR Level).

1ST
DBLR
LVL
TPT2

First Doubler Level Test Point. A dc test point used to verify that the first doubler is functioning.

LO2
OUT
ADJ

LO2 Output Adjustment. Adjust for maximum LO2 RF output.

Note: If a power meter is not available, the LO2 Output may be tuned for a maximum dc level at TP3 (LO2 Output Level).

LO2
OUT
LVL
TP3

LO2 Output Level Test Point. A dc test point used to indicate that the second doubler is functioning.

LO3
OUT
LVL
TP4

LO3 Output Level Test Point. A dc test point used to verify that the third LO (13.7 MHz oscillator) is functioning.

Note: The LO2 frequency affects the STL receiver distortion and stereo crosstalk performance. When installing a replacement module in an STL receiver, the frequency should be set to the value specified on the Double Converter module.

6.4.N FM Demodulator

LOG GAIN ADJ	Log Gain Adjustment. Calibrates the RF LEVEL meter function. To accomplish this, the RF GAIN ADJ on the Preamplifier and First Mixer module should be at 0 attenuation (-14 V to -16 V). With 10 mV of signal applied to the RF input, R3 on the Metering and Status board should be adjusted for a reading of 3K on the middle scale. The input should then be reduced to 100 Micro-V, and the LOG GAIN ADJ on the FM Demodulator should be adjusted for 100 on the middle scale. The 3, 10, 30, 100, 300, 1K, and 3K levels should be checked to ensure that the meter reads between the upper and lower line on the meter for each range. As a general rule, R3 on the Metering and Status board is used to adjust the full scale or 3K reading, and the LOG GAIN ADJ on the FM Demodulator module is used to adjust the linearity in the 100 to 300 Micro-V range.
LOG LVL TP3	Log Level Test Point. A dc test point used to monitor the first stage of the meter log amplifier.
DEMODO LVL TP2	Demodulator Level Test Point. A dc test point with a voltage proportional to the frequency of the 3 MHz IF. Normally this voltage is between +4 and +6 Vdc.
MUTE THR ADJ	Mute Threshold Adjust (LED). Indicates status of mute logic (red = mute).
MUTE THR ADJ	Mute Threshold Adjust. Adjusts the mute logic threshold; threshold = 10 Micro-V input signal with RF gain at 15 on receiver meter (TP1 on the Preamplifier and First Mixer module at -14 V to -16 V).
BB LVL ADJ	Baseband Level Adjust. Adjust the output of the baseband including the composite and multiplex levels. ± 40 kHz deviation = 2.8 V p-p.
BB LVL TP1	Baseband Level Test Point. An ac test point used to monitor the output level of the baseband processor. ± 40 kHz deviation = 2.8 V p-p.

6.4.0 Mono Baseband Processor

HF TILT ADJ High-frequency tilt adjust. Used to adjust the high-frequency baseband response in the 10 kHz to 20 kHz region.

MUX LEVEL ADJUST Multiplex level adjustment. Adjusts the multiplex level output of the mono baseband processor module. Normally adjusted so that 4 kHz deviation equals 1.5 V p-p at 26 kHz.

MUX LEVEL TP4 Multiplex Level Test Point. An ac coupled test point used to measure the multiplex level. 4 kHz deviation at 26 kHz equals 1.5 V p-p.

4.4.16 75 μ s De-Emphasis

In/Out In the OUT position, U5 acts as a unity gain buffer. In the IN position, U5 de-emphasizes the signals between 2 kHz and 20 kHz.

F1 Sets the audio response to -3 dB at 2 kHz.

F2 Sets the audio response to -18 dBm at 20 kHz.

Note: F1 and F2 should be adjusted with the In/Out de-emphasis switch in the IN position and the 15 kHz switch in the OUT position.

4.4.17 15 kHz Low-Pass Filter

FA Used to set a transmission zero at 44.5 kHz.

FB Used to set a transmission zero at 22.5 kHz.

FC Used to set a transmission zero at 26.5 kHz.

In/Out This affects the mono program channel only. In the OUT position, the wideband mode is selected. In the IN position, a 7-pole 15 kHz low-pass filter is selected.

Gain Used to compensate for the insertion loss of the 15 kHz filter. Used to set the output level of the 15 kHz filter to the same level as the wideband output.

LF TILT Used to adjust the low-frequency response of
the 15 kHz filter between 30 Hz and 1 kHz.

MONO PROGRAM Mono Level Test Point. An ac coupled test
LEVEL TP3 point used to measure the mono program
level.

6.4.P Metering and Status

- R1 Adjusts the PGM LEVEL meter function on the receiver Metering and Status board. Zero dB on the top scale of the meter equals ± 40 kHz deviation of the program signal.
- R2 Adjusts the MUX LEVEL function of the meter. A reading of 4 on the lower scale equals 4 kHz deviation of the main carrier by the 26 kHz subcarrier. The meter indication for the 67 kHz deviation is given on the test data sheet (Section 8).
- R3 Used to adjust the RF LEVEL function. A reading of 3K on the center scale of the meter equals 3000 Micro-V of input signal. Other controls that affect this setting are: the RF GAIN Adjust on the Preamplifier and First Mixer module, and the LOG GAIN Adjust on the FM Demodulator module. (See Paragraph 6.4.N LOG GAIN ADJ for the alignment of this meter function.)
- R4 Adjust to center of the lowest scale for the LO1 LEVEL meter function.
- R5 Adjust to center of the lowest scale for the LO2 LEVEL meter function.
- R6 Adjust to center of the lowest scale for the LO3 LEVEL meter function.
- R7 Adjusts the RF GAIN meter function. Adjust to 15 on the lower scale when TP1 on the Preamplifier and First Mixer module is between -14 V and -16 V.
- R8 Adjusts the VOLTMETER function of the meter. Adjust by connecting a test probe between TP1 on the Metering and Status board and TP5 on the Power Supply module.
- R9 Adjusts the meter ballistics. The meter is normally adjusted for a 0.25 dB overshoot by switching between the VOLTMETER meter function (with no input) and the PGM LEVEL meter function with a 0 dB input (program input = +10 dBm into 600 Ohms).

6.4.Q Mute and Transfer

The Mute and Transfer module requires no adjustment.

If a failure is suspected in the Mute and Transfer module, the following information may be useful in isolating the problem:

1. A mute signal from the FM Demodulator (Mute Threshold Adjust LED red) will de-energize the mute relay and disconnect the program and multiplex audio outputs.
2. This module may be externally muted, either by a remote mute input or a transfer input from a dual STL receiver.
3. The transfer mode is activated by the STL receiver OPERATE/TRANSFER switch. Disconnecting J3 will open this circuit and eliminate the possibility of either a short circuit or bad switch.

6.4.R Power Supply

Input Voltage: Check the voltage indicated on the voltage selector card (see Paragraph 4.2).

Output Voltages: The output voltages are pre-determined by an internal reference in the IC regulator chips. Overvoltage generally indicates a failure of the appropriate chip. Zero output voltage generally indicates a short circuit in one of the STL receiver modules. This can be verified by removing J1 through J4 and checking the output voltage.

Poor regulation generally results from either a high load (greater than 0.75 A) or poor mechanical connection with the heat sink.

6.5 GENERAL TROUBLESHOOTING INFORMATION

Description:

The information below will assist in troubleshooting an STL transmitter or receiver to the module level.

Test Equipment:

Attenuator 50-Ohm Load	Philco	662A-30
Counter	Tektronix	DC-508A
Directional Coupler	Microlab/FXR	Model CB-49B
Distortion Measurement Set	Hewlett-Packard	Model 339A
Power Meter and Sensor	Hewlett-Packard	Model 435A with Model 8481A Power Sensor
RF Signal Generator	Hewlett-Packard	Model 8640B
RF Spectrum Analyzer	Hewlett-Packard	Model 8559A
Stereo Demodulator	QEI	Model 691
Multimeter	Data Precision	Model 935
600 Ohm Resistor 1%, 1/4W	RN 55D6000 F	

6.5.1 Transmitter Troubleshooting Procedure

1. Connect the equipment as shown in Figure 6-1, and position the RADIATE/STANDY switch to the RADIATE position.
2. Verify that the +15 V, -15 V, and +5 V status lights are green. If they are not, power supply voltages should be checked before proceeding.

3. Verify that the RADIATE, AFC LOCK, and +12 V status indicators are green. The AFC LOCK indicator is controlled by the FMO. The RADIATE status indicator is controlled by the Transmitter Control board, and the +12 V indicator is controlled by the Power Supply. Also, the wiring harness and the Metering and Status board may lead to faulty indications.
4. Using the final test data sheet (Section 8) as a reference, use the METER FUNCTION switch to select the following positions:

AFC LEVEL - The meter should indicate within the lower black arc. If it does not, the FMO AFC Level should be aligned before proceeding.

IPA LEVEL - The IPA Level should read within the lower black arc. If it does not, the following steps should be taken:

Verify that the +12 V is between 12.25 and +12.75 V.

Using the power meter, verify that the input to the IPA amplifier on the Up Converter is at least -10 dBm. If it is, the problem is located in the Up Converter amplifier.

Verify that the output of the Up Converter mixer is at least -6 dBm. If it is, the problem is located in the 950 MHz Up Converter bandpass filter.

Measure the output of the First Local oscillator and Multiplier module for a value of between +5 and + 10 dBm.

Using the power meter, measure the output of the FMO for a value between 0 and +5 dBm.

6.5.2 Receiver Troubleshooting Procedure

1. Connect the equipment as shown in Figure 6-2, and adjust the RF signal generator as indicated in procedure 6.3.2, Step 1.
2. Verify that the power supply status LEDs on the front panel are green. If they are not, use the multimeter to verify the power supply output voltages prior to proceeding.
3. Using the METER FUNCTION switch, verify that the LO1 LEVEL, LO2 LEVEL, and LO3 LEVEL meter readings are within the lower arc on the meter.
4. Using the METER FUNCTION switch, select the RF GAIN position and verify that the meter reads 15. If it does not, adjust the RF GAIN ADJ on the Preamplifier and First Mixer module so that TP1 on the Preamplifier and First Mixer module reads between -14 and -16 V.
5. The following procedure is used to measure the gain distribution of the receiver for proper performance:
 - a. Using the procedure outlined in Paragraph 6.4.I, measure the preselector insertion loss for a minimum of 2 dB.
 - b. Reconnect the preselector output to the preamplifier input.
 - c. Using the RF signal generator and spectrum analyzer, measure the Preamplifier and First Mixer conversion gain for a value between +10 and +14 dBm. Note: Use the output of the RF signal generator to establish a reference on the spectrum analyzer; then measure the 70 MHz output of the Preamplifier and First Mixer module. Add preselector insertion loss to the gain indicated by the spectrum analyzer to determine the Preamplifier and First Mixer conversion gain.
 - d. Using the output of the Preamplifier and First Mixer module as a reference, measure the conversion gain of the Double Converter module. The 3 MHz output should be between +3 and +7 dB greater than the 70 MHz input.

- e. Connect the output of the RF signal generator to the input of the FM Demodulator. The output of the RF signal generator should be set for a frequency of 3 MHz at a level of -25 dBm with an FM deviation of 5 kHz. The output of the FM Demodulator should be 0.28 V p-p. If it is not, troubleshooting of the FM Demodulator is indicated. If it is, troubleshooting of the Mono Baseband Processor or the Mute and Transfer modules is indicated.

6.6 TEST FIXTURE DIAGRAMS

The test fixture shown in Figures 6-11 has been designed to interface with the equipment specified in Table 6-1.

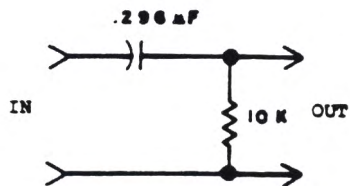


Figure 6-11. 50 Hz high-pass filter.

SECTION 7

RECOMMENDED SPARES

7.1 INTRODUCTION

This section contains replacement parts information. The next two subsections contain information on complete replacement modules, which is the most expedient method of correcting a problem. The last subsection describes the spare parts kit and optional spare parts kits for those who wish to troubleshoot to the component level. Price information on the recommended spares is available upon request.

7.2 SPARE TRANSMITTER MODULES

<u>Module</u>	<u>Drawing Number</u>	<u>Module Item No.</u>	<u>Stock Location</u>
Mono Audio Processor	20D2865	9301409	2211
FMO Synthesizer	20C2847	9103011	2212
Up Converter	20C2848	9103003	2212
First Local Oscillator	20D2828	9301276	2211
RF Amplifier	20D2836	9301334	2211
Metering and Status	20D2818-2	9204199	2211
Transmitter Control	20C2834	9204215	2211
Power Supply	20C2817	9203597	2211

7.3 SPARE RECEIVER MODULES

<u>Module</u>	<u>Drawing Number</u>	<u>Module Item No.</u>	<u>Stock Location</u>
Preselector Filter	21C2754	9102138	2211
Preamp and First Mixer	20D2827	9301268	2211
First Local Oscillator	20D2828	9301276	2211
Double Converter*	20D2824-2	9301177	2211
Second and Third Local Oscillator	20D2829	9301243	2212
FM Demodulator	20D2811	9301284	2211
Mono Baseband Processor*	20D2837	9301417	2211
Metering and Status	20D2818-1	9204165	2211
Mute and Transfer	21D2775	9102591	2211
Power Supply	21D2741	9102112	2075

*These modules are matched sets and should be replaced together.

7.4 SPARE PARTS KITS

The following pages describe the spare parts kit and optional spare parts kits. These kits contain component level replacements.

MOSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 GULETA, CA. 93117
 (805) 968-9621

DATE 11/18/86

KIT NUMBER: ST-42A 08/16/85

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3350196	SBL-1 MIXER BAL	1
3390549	550-0406 LED RED 2.0@20 WIDE RT/HOLDER	1
3390580	550-3006 LED DUAL (90)	1
3390598	521-9177 LED DUAL	1
3390606	PCR 740 CTP LED HOUSE P-C-LITE	3
3390614	HLMP-3507 LED GRN 7-12@20 DIFFUSED 75DEG	3
3600145	1N4154 DIO 1N4154 25V 4NS SI D035	5
3600178	1N4733A 25.1A DIO 1N4733A 5.1V 1W 5% ALAY	1
3610003	10D2 DIO 10D2 200V 1A SI D039	1
3610045	5082-2835 DIO 5082-2835 FAST	1
3610078	MDA-201 DIO BRIDGE 100V 2A	1
3610235	HPND-4166 DIO HPND-4166	1
3610243	HP 5082-0180 DIO 5082-0180	1
3610250	MV209 DIO 30V 6/30 PF T092 MV209	1
3610268	5082-2811 DIO 5082-2811	1
3610284	MDA2501 DIO BRIDGE 100V/25A	1
3630001	2N918 XT NS2N918 .4W600M030V50M2P	1
3630076	2N3563 XT NS2N3563 .2W600M030V50M2P	1
3630175	2N3866 XT NP2N3866 05W500M055V.4A	1
3630225	2N4402 XT PS2N4402 .35W150M040V.6A9P	1
3630456	2N3904 XT 2N3904	2
3630464	2N3906 XT 2N3906	1
3640109	D1-12B XT NPD1-12B 5.8W866M036V.25A	1
3640133	DM5-12B XT NPDM5-12B 29W 036V02A	1

MOSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 GULETA, CA. 93117
 (805) 968-9621

DATE 11/18/86

KIT NUMBER: ST-42A 08/16/85

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3640273	MRF 901 XT MRF901	1
3640281	HXTR-3101 XT HXTR-3101	1
3640299	HXTR-3102 XT HXTR-3102	1
3640307	U310 XT U310	1
3640315	J310 XT FET J310	1
3640364	26057 XT, RF PWR, 10W, 806-960 MHZ	1
3650074	LM340T-12 RGLTR LM340T12/7812 VARV1.5A	1
3650132	MC79L05 ACP RGLTR MC79L05 05V 0.1A T092	1
3650173	UA7805UC RGLTR UA7805UC 05V 1.0A T0220	1
3650207	7815UC RGLTR UA7815UC 15V 1.5A T0220	1
3650223	7915UC RGLTR UA7915UC 15V 1.5A T0220	1
3650363	LM338-K-STEEL RGLTR VARV 5.0A T03	1
3660115	SN7413N IC SN7413N DU 4I NAND ST	1
3660206	SN7442N IC SN7442N BCD-DECIMAL	1
3660388	SN74121N IC SN74121N MONOMULTI ST	1
3660420	SN74132N IC SN74132N QU 2IN NAND ST	1
3660602	SN74193N IC SN74193N BINUPDWNC02CLCK	1
3660685	SN74LS04N IC SN74LS04N HX INV	1
3660917	SN75451BP IC SN75451P DU AND HIGHV OC	1
3660966	SN74LS260N IC SN74LS260N DU 5IN NOR	1
3661105	N74LS168AN IC DEC 4BIT UP/DWN SYNC COUNT	1
3661121	74S196 IC DEC/BI-QUIN COUNT/LATCH	1
3661139	DM7411N IC, TRIPLE 3-INPUT AND GATE	1
3680139	MC14051P IC MC14051P 8CH MUX R280 7V	1

ITEM NUMBER: 9051467 #### S/P PCL-606&C 910-960 MHZ

PAGE 3

MUSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
GOLETA, CA. 93117
(805) 968-9621

DATE 11/18/86

KIT NUMBER: ST-42A 08/16/85

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3680253	CD4046BE IC PHASE-LOCKED LOOP	1
3680261	CD4020BE IC BIN COUNT/DIVIDER	1
3730041	CA-3018 IC CA3018 XSTR ARRAY	1
3730173	LM-318N IC LM318N OPAMP HISPEED	1
3730215	LM-1458N IC LM1458N OPAMP DUAL	1
3730348	MC1355P IC MC1355P AMP FM/IF	1
3730728	NE-5534AN IC NE5534AN OPAMP LO NOISE	1
3730769	SL560C IC SL560C	1
3730934	HI3-0200-5 IC HI-200-5	1
3730967	NE5532AN IC DUAL OP AMP	1
3730983	LM358N IC LM358N	1

MUSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 GULF TA, CA. 93117
 (805) 968-9621

KIT NUMBER: ST-42C

DATE 11/19/86

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3350196	SBL-1 MIXER BAL	1
3390549	550-0406 LED RED 2.0@20 WIDE RT/HOLDER	1
3390580	550-3006 LED DUAL (90)	1
3390598	521-9177 LED DUAL	1
3390606	PCR 740 CTP LED HOUSE P-C-LITE	3
3390614	HLMP-3507 LED GRN 7-12@20 DIFFUSED 75DEG	3
3600145	1N4154 DIO 1N4154 25V 4NS SI D035	5
3600178	1N4733A 25.1A DIO 21N4733A 5.1V 1W 5% ALAY	1
3610003	1002 DIO 1002 200V 1A SI D039	1
3610045	5082-2835 DIO 5082-2835 FAST	1
3610078	MDA-201 DIO BRIDGE 100V 2A	1
3610235	HPND-4166 DIO HPND-4166	1
3610250	MV209 DIO 30V 6/30 PF T092 MV209	1
3610268	5082-2811 DIO 5082-2811	1
3610276	5082-0325 DIO STEP RECOVERY 5082-0325	1
3610284	MDA2501 DIO BRIDGE 100V/25A	1
3630001	2N918 XT NS2N918 .4W600M030V50M2P	1
3630076	2N3563 XT NS2N3563 .2W600M030V50M2P	1
3630225	2N4402 XT PS2N4402 .35W150M040V.6A9P	1
3630308	2N5179 XT NS2N5179 .2W900M020V50M1P	1
3630456	2N3904 XT 2N3904	2
3630464	2N3906 XT 2N3906	1
3640299	HXTR-3102 XT HXTR-3102	1
3640307	U310 XT U310	1

MUSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 GOLIETA, CA. 93117
 (805) 908-9021

KIT NUMBER: ST-42C

DATE 11/19/80

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3640315	J310	1
	XT FET J310	
3640414	LT 1001 A	1
	XT LT 1001 A	
3640422	MRF 581	1
	XT MRF 581	
3650074	LM340T-12	1
	RGLTR LM340T12/7812 VARV1.5A	
3650124	MC78L12ACP	1
	RGLTR MC78L12 12V 0.1A T092	
3650132	MC79L05 ACP	1
	RGLTR MC79L05 05V 0.1A T092	
3650173	UA7805UC	1
	RGLTR UA7805UC 05V 1.0A T0220	
3650207	7815UC	1
	RGLTR UA7815UC 15V 1.5A T0220	
3650223	7915UC	1
	RGLTR UA7915UC 15V 1.5A T0220	
3650363	LM338-K-STEEL	1
	RGLTR VARV 5.0A T03	
3660115	SN7413N	1
	IC SN7413N DU 4I NAND ST	
3660206	SN7442N	1
	IC SN7442N BCD-DECIMAL	
3660368	SN74121N	1
	IC SN74121N MONOMULTI ST	
3660420	SN74132N	1
	IC SN74132N DU 2IN NAND ST	
3660502	SN74193N	1
	IC SN74193N BINUPDOWNC02CLCK	
3660635	SN74LS04N	1
	IC SN74LS04N HX INV	
3660917	SN75451BP	1
	IC SN75451P DU AND HIGHV OC	
3660966	SN74LS260N	1
	IC SN74LS260N DU 5IN NOR	
3661105	N74LS168AN	1
	IC DEC 48IT UP/DWN SYNC COUNT	
3661121	74S196	1
	IC DEC/BI-QUIN COUNT/LATCH	
3661139	DM7411N	1
	IC TRIPLE 3-INPUT AND GATE	
3680139	MC14051P	1
	IC MC14051P 8CH MUX R280 7V	
3680253	CD40463E	1
	IC PHASE-LOCKED LOOP	
3680251	CD40205E	1
	IC BIN COUNT/DIVIDER	

MOSELEY ASSOCIATES, INC.
 111 CASTILIAN DRIVE
 GOLETA, CA. 93117
 (805) 968-9621

KIT NUMBER: ST-42C

DATE 11/19/86

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3730173	LM-318N IC LM318N OPAMP HISPEED	1
3730199	LM-324N IC LM324N OPAMP SNGL SUPL	1
3730215	LM-1458N IC LM1458N OPAMP DUAL	1
3730348	MC1355P IC MC1355P AMP FM/IF	1
3730728	NE-5534AN IC NE5534AN OPAMP LO NOISE	1
3730769	SL560C IC SL560C	1
3730934	HI3-0200-5 IC HI-200-5	1
3730967	NE5532AN IC DUAL OP AMP	1
3730983	LM358N IC LM358N	1
3731163	MWA 310 IC HYBRID LIN AMP	1
3731171	MWA 320 IC HYBRID LIN AMP	1
3731189	MHW208A3 IC HI GAIN RF PWR AMP	1

ITEM NUMBER: 9051897 #### OP S/P PCL-606&C 910-960 MHZ

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MOSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
OLETA, CA. 93117
(805) 968-9621

KIT NUMBER: SO-42C

DATE 11/19/86

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3270337	T10-E2-24-0VDC RELAY 4PDT 6VDC	1
3350253	PCL1-16-8-05 OVEN XTAL PCL 1-16-8-65	1
3370095	AGC 1 FUSE 1 AMP FAST-BLD	1
3570111	AGC 2 FUSE 2 AMP FAST-BLD	1
4090437	3-1108 B XFMR 8-P-98	1
4090445	3-1107 C XFMR 8-P-100	1
4260287	LP2725J35CIP3 CAP LYTIC 2700/35V	1
4270047	360X402G030AA2A CAP PWR LYTIC 4000/30V	1
4350582	3186BA722U0308P CAP LYTIC 7200/30V	1

MOSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
GOLETA, CA. 93117
(805) 968-9621

DATE 11/18/86

KIT NUMBER: SX-42A 08/16/85

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3340759	30A0080 AO XTAL 20.175MHZ PCL-606 2ND LO	1
3340767	30A0081 AO XTAL 13.7MHZ PCL-606 3RD LO	1
3340775	30A0078 AO XTAL 4.096 MC-25 FMD PCL-606	1
3340791	30A0079-1 D XTAL 51.000 MHZ PCL-606 TX	1
3340809	30A0082 C XTAL PCL-606 RX	1

ITEM NUMBER: 9051905 #### OP CRYSTAL PCL-606&C 940-960 MHZ

PAGE 1

MUSELEY ASSOCIATES, INC.
111 CASTILIAN DRIVE
SANTA ANA, CA. 92705
(714) 968-9021

DATE 11/19/86

KIT NUMBER: SX-425

COMPONENT ITEM NO.	MANUFACTURER NUMBER/ ITEM DESCRIPTION	QTY PER
3340759	30A0080 AO XTAL 20.175MHZ PCL-606 2ND LO	1
3340767	30A0081 AC XTAL 13.7MHZ PCL-606 3RD LO	1
3340775	30A0078 AO XTAL 4.096 HC-25 FMD PCL-606	1
3341062	30A0093-1 B XTAL TX PCL-606 102.00 MHZ	1
3341070	30A0094 B XTAL RX 1ST L.O.	1

APP

SYSTEM CALCULATIONS

Reference Number _____

Prepared By _____

Date _____

CUSTOMER _____

SYSTEM GAINS

- | | | |
|--|---|-----------|
| 1. Transmitter Power Output (Model # _____) (_____ W) | + | _____ dBm |
| 2. Transmitter Antenna Gain (Antenna Type _____) | + | _____ dBi |
| 3. Receiver Antenna Gain (Antenna Type _____) | + | _____ dBi |
| 4. Total Gain | + | _____ dBm |

SYSTEM LOSSES

- | | | |
|--|---|----------|
| 5. Path Loss (_____ miles/ _____ km) | - | _____ dB |
| 6. Transmission Line Loss (Total ft. _____ / _____ m)
Type _____) | - | _____ dB |
| 7. Connector Loss (Total) | - | _____ dB |
| 8. Other Losses _____ | - | _____ dB |
| 9. Total Loss | - | _____ dB |

SYSTEM CALCULATIONS

- | | | |
|---|---|-----------|
| 10. Total Loss (Line 9) | - | _____ dB |
| 11. Total Gain (Line 4) | + | _____ dBm |
| 12. Effective Received Signal | | _____ dBm |
| 13. Minimum Signal Required for _____ dB SNR
(Model _____) | - | _____ dBm |
| 14. Fade Margin | | _____ dB |

NOTES:

950 MHz MICROWAVE PATH EVALUATION INSTRUCTIONS

The enclosed System Calculation sheet, nomograms, table and Fresnel zone clearance formula can be used to prepare a preliminary evaluation of a 950 MHz microwave link. The following instructions will aid you in completing the Microwave System Calculation sheet.

- A. Line One. Enter the power output of the transmitter in dBm. Examples: 5w = +37.0 dBm, 6.5w = +38.0 dBm, 7w = +38.5 dBm, 8w = +39.0 dBm. (dBm = $30 + 10 \text{ Log } P_o$ [in watts])
- B. Lines Two and Three. Enter on these lines the Transmitter and Receiver antenna gains over an isotropic source. Refer to the nomogram in Figure 4 which gives the power gain of a parabolic reflector at 950 MHz. Note: If the manufacturer quotes a gain in dBd (referred to a dipole), dBi is approx. dBd +1.1 dB.
- C. Line Four. Total lines 1, 2, and 3 and enter here. This is the total gain in the proposed system.
- D. Line Five. The proposed path should be plotted on a seven and one-half minute topographical map which can be obtained from the United States Geological Survey. Mail orders for maps west of the Mississippi River should be addressed to The Geological Survey, Distribution Section, Federal Center, Denver, Colorado, 80225, and for maps east of the Mississippi River to The Geological Survey, Distribution Section, Washington, D.C., 20242. Maps of Alaska may also be ordered from The Geological Survey, 520 Illinois Street, Fairbanks, Alaska, 99701. State indexes and a folder describing topographic maps are furnished free on request.

Using ground elevation information obtained from the topographical map, a path profile should be prepared using either true earth or 4/3 earth's radius graph paper. To obtain the necessary path clearance for a clear path, all obstacles in the path of the rays must be cleared by a distance of 0.6 of the first Fresnel zone. Be sure to include recently erected structures, such as buildings, towers, water tanks, etc., that may not appear on the map. The following formula may be used to determine 0.6 first Fresnel zone clearance.

$$H = 1316 \sqrt{\frac{A \times B}{P \times F}}$$

H = Height in feet*

A = Distance from terminal to obstruction in miles

P = Path length in miles

B = P - A in miles

F = Frequency in MHz

Draw a straight line on the path profile clearing any obstacle in the path by the distance determined above. This line will then indicate the required antenna and/or tower height necessary at each end. If it is impossible to provide the necessary clearance for a clear path, a minimum clearance of 30 feet should be provided. Any path with less than 0.6 first Fresnel zone clearance, but more than 30 feet can generally be considered a grazing path.

On line five enter the amount of path loss as determined by Figure 1, "Nomogram for Clear Path Attenuation," or Figure 2, "Nomogram for Grazing Path Attenuation."

- E. Line Six. Enter the total transmission line loss. Typical losses are shown in Table 1.
- F. Line Seven. Enter the total connector losses. A nominal figure of -0.5 dB is reasonable. (Based on 0.125 dB/mated pair.)
- G. Line Eight. Enter all other miscellaneous losses here. Such losses might include power dividers, duplexers, diplexers, isolators, iso-couplers, and the like.
- H. Line Nine. Total lines 5, 6, 7, and 8 and enter here. This is the total loss in the proposed system.
- I. Line Ten. Enter the total loss from line 9.
- J. Line Eleven. Enter the total gain from line 4.
- K. Line Twelve. Subtract line 11 from line 10. This is the unfaded signal level to be expected at the receiver.
- L. Line Thirteen. Using the information found in Table 2, enter here the minimum signal required for 60 dB signal-to-noise ratio.

*This dimension is actually a radius and can be used to consider the clearance needed when the proposed path passes near a building, tower, storage tank, etc.

M. Line Fourteen. Subtract line 13 from line 12 and enter here. This is the amount of fade margin in the system. Typical fade margins that should be allowed are 20-25 dB for very short paths (up to 5 miles), 15 dB for median paths (5-15 miles) and increasing fade margins for longer distances (greater than 15 miles) up to a maximum of 35 dB.

TABLE 1.

Typical Transmission Line Loss at 950 MHz

<u>Type</u>	<u>Loss (dB/100') (dB/100m)</u>	
1/2" Foam Dielectric (low loss)*	2.6	8.3
7/8" Foam Dielectric (low loss)+	1.5	4.6
1-5/8" Foam Dielectric (low loss)°	0.9	3.0

*Such as Andrew LDF4-50A

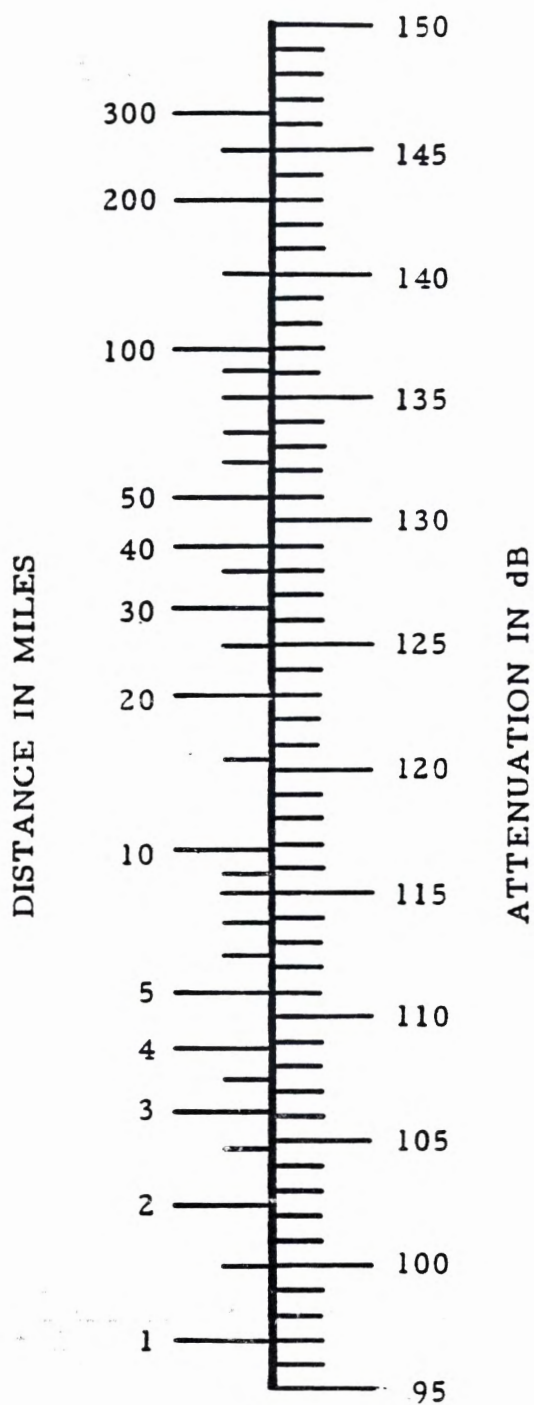
+Such as Andrew LDF5-50A

°Such as Andrew LDF7-50A

TABLE 2.

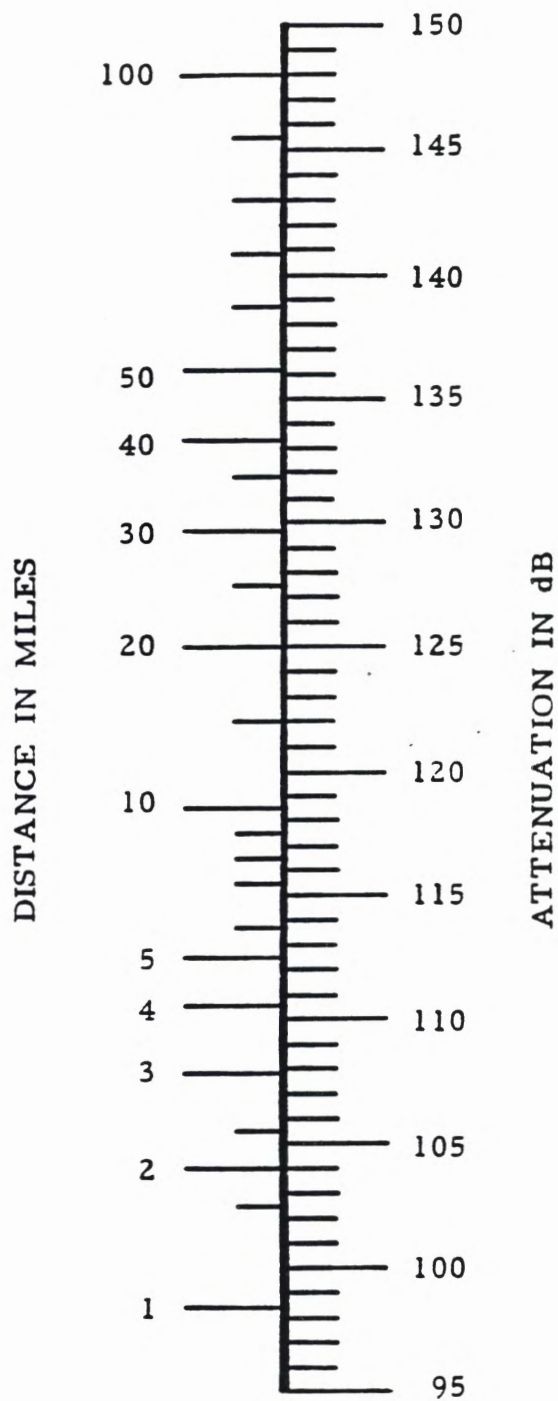
Typical Received Signal Strength required for 60 dB SNR

<u>Model</u>	<u>dBm \equiv μV</u>	
PCL-606	-84.0	14.1
PCL-606/C	-66.0	112.1 (for demodulated L or R)
PCL-505	-83.0	15.8
PCL-505/C	-67.0	99.9 (for demodulated L or R)
PCL-101	-79.0	25.1



After K. Bullington

Figure 1. Nomogram for Free Space Attenuation Clear Path



After K. Bullington

Figure 2. Nomogram for Space Attenuation Grazing Path

(Use this chart with great care -- consult Moseley Associates, Inc. in the case of any grazing path.)

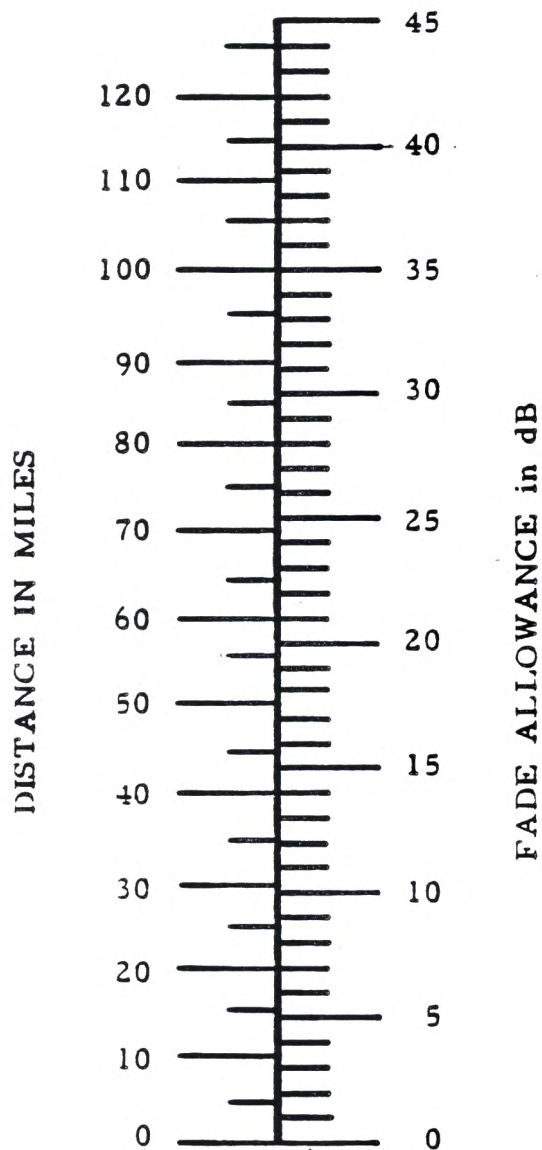
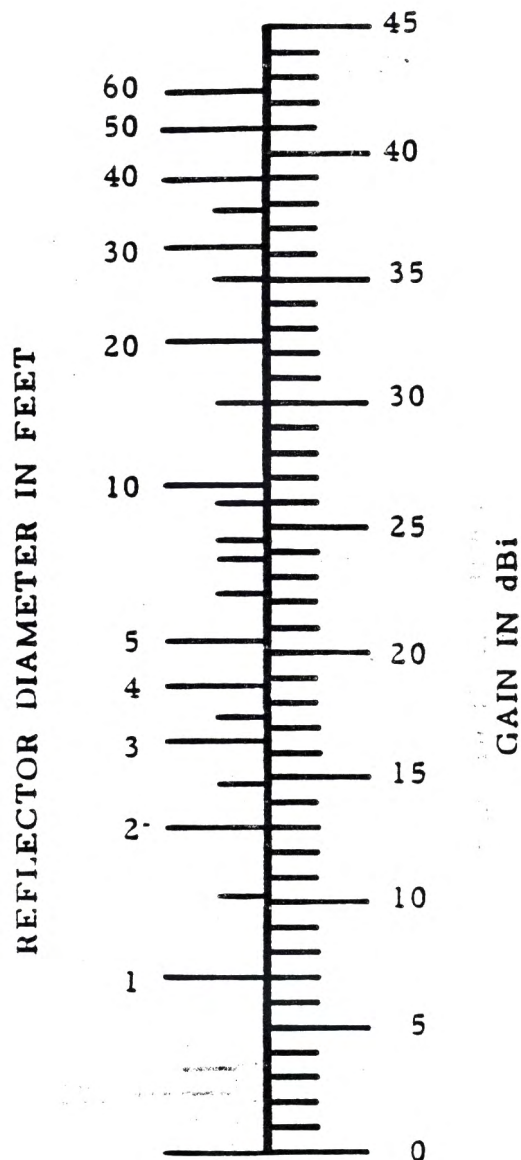


Figure 3. Fading Allowance at 950 MHz

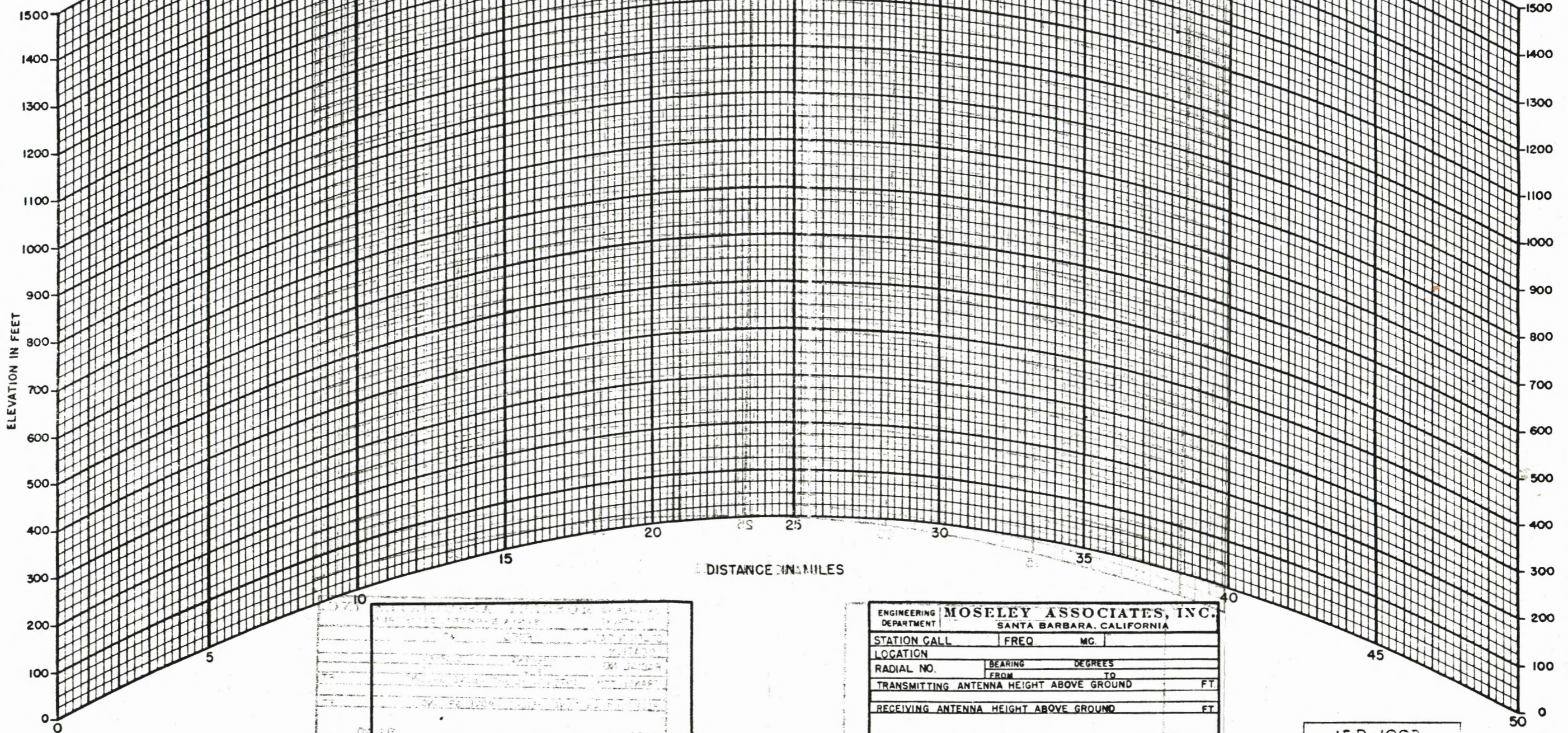
Based on 55% Aperture Efficiency



$$dBi = 10 \log \left[0.55 \frac{\pi^2 D^2}{\lambda^2} \right]$$

Figure 4. Nomogram for Determination of Apparent Power Gain of a Parabolic Reflector at 950 MHz

CURVE DETERMINED FOR TRUE EARTH RADIUS



POINT TO POINT PLAN

STATION 1: _____

STATION 2: _____

DATE: _____

ENGINEERING DEPARTMENT: **MOSELEY ASSOCIATES, INC.**
 SANTA BARBARA, CALIFORNIA

STATION CALL: _____ FREQ: _____ MC

LOCATION: _____

RADIAL NO. _____ BEARING _____ DEGREES

FROM _____ TO _____

TRANSMITTING ANTENNA HEIGHT ABOVE GROUND _____ FT.

RECEIVING ANTENNA HEIGHT ABOVE GROUND _____ FT.

DATE: _____ FIG. NO. _____

15B-1003